

# Nonpoint Source Pollution Management in Texas

## 2020 ANNUAL REPORT



Texas Commission on  
Environmental Quality



Texas State Soil & Water  
Conservation Board

SFR-066 / 20  
JANUARY 2021

Funding provided by the Environmental Protection Agency through Clean Water Act Section 319(h) grant funds.



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Published and distributed by the

Texas Commission on Environmental Quality  
P.O. Box 13087, Austin, TX 78711-3087

Texas State Soil and Water Conservation Board  
1497 Country View Lane, Temple, TX 76504-8806



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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. Responsibility to implement 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 2020, 32 watershed protection plans that satisfy EPA's Nine Key Elements for Watershed Based Plans have been accepted by EPA. Together with partners and stakeholders, TCEQ and TSSWCB are actively engaged in implementing voluntary management measures identified in the watershed-based plans.

We are pleased to present the 2020 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 EPA and other federal, state, regional, and local watershed stakeholders, TCEQ and 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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Frio River, Texas  
(Source iStock)



Frio River, Texas  
(Source iStock)

## Chapter 1 | *Introduction*

### Defining Nonpoint Source Pollution

**N**onpoint 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
- 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. According to the Texas Water Code Chapter 26, primary responsibilities of TCEQ include the issuance of permits for point source discharges and 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 responsible for planning, implementing, and managing programs and practices that prevent and abate agricultural and silvicultural nonpoint source pollution. TCEQ and 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 extent and 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-term 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 Total Maximum Daily Load (TMDL) implementation plans and/or watershed protection 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.
- 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. Participants in the WAP process first review identified water quality issues, which are typically water bodies listed as impaired on the CWA Section 303(d) list of impaired waters, 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 for 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 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 TSSWCB, Clean Rivers Program partners (typically river authorities), and the five TCEQ Water Quality Planning Division program areas—Texas Surface Water Quality

Standards Group, 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 and the actions that are planned to address the impairment or concern, the party responsible for undertaking the action, and a means of tracking progress. The recommended strategies are documented in the [WAP Strategy Table<sup>1</sup>](#), which summarizes the water quality management information. Data from the table, and special projects associated with impaired water bodies, are available through the [WAP Public Viewer<sup>2</sup>](#), an interactive, web-based application. Water quality management strategies identified through the WAP process are implemented on a continuing basis. This 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.



Frio River, Texas  
(Source iStock)

<sup>1</sup><http://www.tceq.texas.gov/waterquality/planning/wap/>  
<sup>2</sup><https://www80.tceq.texas.gov/WapWeb/public/map.htm>



Big Bend National Park, TX  
(Source iStock)



Big Bend National Park, TX  
(Source iStock)

## Chapter 2

# Progress in Improving Water Quality

Section 319(h) 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.
- Monitoring the water body long-term.

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

### Implementing the Lower Nueces River Watershed Protection Plan On-Site Sewage Facility (OSSF) Strategy

In fiscal year 2020, the Nueces River Authority used CWA Section 319(h) funds from TCEQ and the United States Environmental Protection Agency (EPA) to implement the septic system repair and replacement management measure identified in the watershed protection plan.

A total of 19 systems have been inspected, six systems were replaced, three systems were repaired, and three systems were in good working condition. Assuming two people per household, each using 70 gallons of water per day, and using literature values for pollutant concentrations in effluent, the estimated fiscal year 2020 load reductions from five OSSF replacements and three repairs are:

Pollutant	Load Reduction
E. coli	$7.12 \times 10^{14}$ cfu/100mL <sup>1</sup>
Nitrogen	168.75 lb
Phosphorus	31.90 lb

1cfu/100mL – colony forming units per 100 milliliters



Llano River - Llano, TX  
(Source iStock)

## Implementing Best Management Practices in Upper San Marcos River

To alleviate the impacts on water quality as a result of increasing development and construction in the Upper San Marcos River watershed, two projects were completed in April 2020. The two management practices were the Hutchison biofiltration pond and a storm water mitigation/erosion control project known as the Hog trap. These management practices were chosen to receive upgrades because they had been failing to perform as intended and their locations provided the ability to receive storm water runoff from areas with high impervious cover. The Hogtrap was a project originally constructed by Texas State University and receives runoff from nine acres of the Texas State University campus that is 74% impervious cover. The large amount of runoff received by the Hogtrap over time led to erosion of the hillside and the deposition of sediment and other nonpoint source pollutants into Sessom Creek, a tributary of the San Marcos River. This project increased the capacity of a series of pipes below the surface of the hillside that divert and treat storm water runoff. This project also repaired the hillside and installed soil stabilization textiles and broken stone to prevent erosion in the future.



Hutchison Pond  
(Source Texas State University)

The Hutchison biofiltration pond is highly visible to the public as it is located near a popular river access point and receives runoff from downtown San Marcos. The pond was constructed using engineered soils and native plants that filter out pollutants from runoff. Once treated, the storm water runoff flows through an underdrain and into the San Marcos River. The estimated fiscal year 2020 load reductions from the Hogtrap retrofit and the Hutchison biofiltration pond are:

Pollutant	Load Reduction
<i>E. coli</i>	5.35 * 10 <sup>12</sup> cfu/100mL
Nitrogen	68.96 lb
Phosphorus	19.4 lb
Sediment	56,300 lb

## Implementing the Creekside Conservation Program in the Lower Colorado River Basin

For thirty years, Lower Colorado River Authority has relied on a partnership between private landowners, United States Department of Agriculture - Natural Resources Conservation Service (NRCS), and local soil and water conservation districts to administer the Lower Colorado River Authority Creekside Conservation Program. Utilizing a EPA CWA Section 319(h) grant through TSSWCB, the program provides technical and financial assistance to agricultural producers, implementing best management practices (BMPs) on private property within the Colorado River watershed of Bastrop, Blanco, Burnet, Colorado, Fayette, Lampasas, Llano, Matagorda, San Saba, Travis and Wharton counties.



Cross Fence Creekside Conservation Program  
(Source Lower Colorado River Authority)

During fiscal year 2020, the Creekside Conservation Program provided financial assistance to 10 producers, placing a total of 5,338 acres of private lands under conservation management plans. These conservation management plans include practices such as prescribed grazing, alternative water source development, upland wildlife habitat management and guidance for BMP implementation. Notable BMPs completed through the program include 15,931 feet of crossing fencing, the installation of one solar pumping plant and one grade-stabilization structure, and 160 acres of brush management.

Using the Texas Best Management Practices Evaluation Tool to estimate nonpoint source pollution reduction, the Creekside Conservation Program achieved the following:

Pollutant	Load Reduction
Nitrogen	26,459 lb
Phosphorus	3,406 lb
Sediment	1,986 tons

## Implementing Agricultural Best Management Practices in the Leon River Watershed

The Leon River watershed, located in the Brazos River Basin, is bound by Proctor Lake upstream and Belton Lake downstream. The Leon River is approximately 190 miles long and the watershed is approximately 1,375 square miles covering portions of Comanche, Bell, Erath, Hamilton, and Coryell counties. A small portion of the watershed lies within Mills County.

The Hamilton-Coryell Soil and Water Conservation District received an EPA CWA Section 319(h) grant through TSSWCB to reduce agricultural nonpoint source pollution in the Leon River watershed.

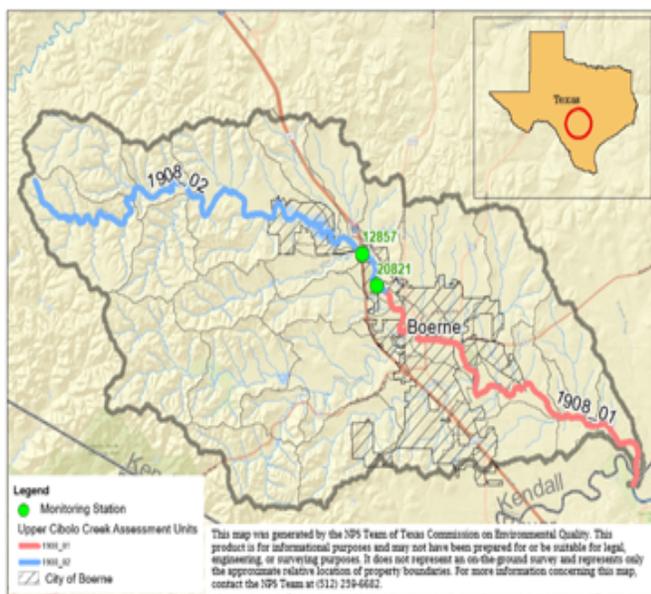
In fiscal year 2020, six certified water quality management plans (WQMP) were implemented in the watershed covering 1,410 acres. Of those 1,410 acres, 73 acres were cropland, 168 pasture, and 991 rangeland. Notable BMPs installed through this project include 3,588 feet of cross fence, 6,430 feet of livestock pipeline, two-2,500-gallon water facility storage tanks, 248 acres of brush management, 10 acres of range seeding and one pumping plant.

According to the Texas Best Management Practices Evaluation Tool, the following load reductions have been achieved:

Pollutant	Load Reduction
Nitrogen	224.69 lb
Phosphorus	4,043.71 lb

FIGURE 2.1

### Map of the Upper Cibolo Creek Watershed



## Water Quality Improvements

TCEQ and TSSWCB work together to identify water quality improvements where the implementation of nonpoint source BMPs are a contributing factor. Once a candidate is identified, a “success story” is written and sent to 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 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

#### Local Partnerships and Community Involvement in Growing City Leads to Improved Water Quality in the Upper Cibolo Creek

##### WATER QUALITY IMPROVED

Upper Cibolo Creek is in Central Texas and flows through the City of Boerne, in Kendall County. The Upper Cibolo Creek was listed for failing to meet water quality standards for bacteria in the 2006 Texas Water Quality Inventory and 303(d) List (Integrated Report). The City of Boerne, collaborating with the Upper Cibolo Creek Watershed Partnership and the Cibolo Nature Center, developed a CWA Section 319(h) funded watershed protection plan accepted by EPA in 2013. Efforts to implement the watershed protection plan by the Cow Creek Groundwater Conservation District, the district that represents Boerne and surrounding areas, focused on outreach and education. BMP implementation and stakeholder response to education events, has led to water quality improvements in the Upper Cibolo Creek. As a result, TCEQ delisted Upper Cibolo Creek assessment unit (AU) 1908\_02 from the impaired waterbodies list for bacteria in the 2018 Integrated Report (Figure 2.1).

##### PROBLEM

First listed in 2006, UCC *E. coli* geometric mean was 476 colony forming units (cfu)/100 milliliter (mL), nearly quadruple the state standard of 126 cfu/100 mL for primary contact recreation use. This limestone bottom stream runs through the center of the City of Boerne and is a tourist attraction. High concentrations of bacteria, as well as concerns for nutrients, threatened this natural resource.

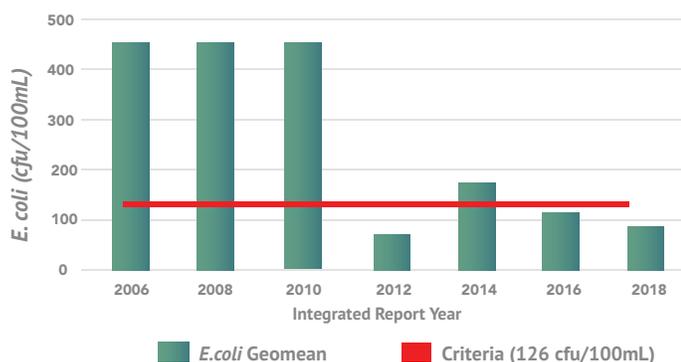
##### PROJECT HIGHLIGHTS

The City of Boerne installed six pet waste stations along the Upper Cibolo Creek on public parkland and posted signs to discourage residents from feeding ducks. The city also planted multiple bald cypress trees along riparian zones to improve runoff

filtration, create a buffer, and provide bank stabilization. These enhancements improve water quality while calling attention to activities that can contribute to water quality problems.

To address rapid growth and significant land use changes in the surrounding area, the city adapted the San Antonio River Authority's Low Impact Development guidance document to meet these needs. The city's master plan also considers modifications to development ordinances that include establishment of riparian buffers and Low Impact Development as part of new development in sensitive areas. In areas of existing development, the master plan evaluates opportunities to improve riparian buffers on city-

FIGURE 2.2  
*E. coli* Assessment Data  
*E. coli* in Upper Cibolo Creek



owned properties and outlines potential zoning changes to protect riparian corridors, stream slopes, and mature trees.

While physical water quality improvement projects were successfully implemented, perhaps the greatest achievements in the Upper Cibolo Creek watershed were the public outreach and education events. Watershed partners reached thousands of community members through public meetings, technical workshops, newsletters, creek cleanup events, education programs within schools, and a water conservation festival. Of note are the OSSF workshops held by the city. Both workshops were well-attended. The first workshop had a wait list of 50 people.

TSSWCB, Texas Water Resources Institute, Texas A&M AgriLife Extension, and Texas A&M AgriLife Research have hosted education and outreach programs in the Upper Cibolo Creek watershed since 2010. These programs focus on water quality, feral hog management, livestock management, septic systems management, and water well protection. Field days to demonstrate BMPs to landowners were also held with some events reaching over 850 stakeholders.

Homeowners were also encouraged to harvest rainwater to conserve water and reduce stormwater runoff. The Cow Creek Groundwater Conservation District also led education efforts on rainwater harvesting, offering several well-attended workshops, and tours of existing residential systems.

## RESULTS

TCEQ originally listed AU 1908\_02 on the 2006 Integrated Report because of high bacterial levels at surface water quality monitoring station 12857. In years 2012-2016, there were inadequate amounts of data to analyze for the Integrated Report, so the impairment was carried forward. Data for 2012-2014 are shown (Figure 2.2) for illustrative purposes. An additional monitoring station was added to the AU in 2015 (station 20821) to increase the amount of available data. Surface water quality data taken from the two stations were combined to assess the AU in the 2018 Integrated Report. In this report, the *E. coli* geomean for AU 1908\_02 was below the 126 cfu/100 mL primary contact recreation use criterion. As a result, the AU was removed from the impaired waters list.

## PARTNERS AND FUNDING

As of 2020, watershed partners have spent approximately \$758,842 on water quality improvements and education and outreach efforts, combining \$455,305 in CWA Section 319(h) funds with \$303,537 matched by local efforts. Locally organized creek cleanups, interaction with permanent educational displays, and participation in outreach events are expected to help sustain improvements to water quality.

## Implementing Conservation Practices and Conducting Watershed Outreach Improves Water Quality in the Navasota River Watershed

### WATER QUALITY IMPROVED

The Navasota River is one of many rural water bodies listed as impaired on the 303(d) List due to elevated levels of *Escherichia coli* (*E. coli*) bacteria. The Navasota River was first listed in 2002 and Cedar Creek, a tributary of the Navasota River, was listed in 2004. TSSWCB utilized CWA Section 319(h) funding from EPA and partnered with the local Soil and Water Conservation District, Texas A&M AgriLife Extension, Texas Water Resources Institute and Texas A&M AgriLife Research to host numerous educational events for stakeholders to learn about local water quality issues. These events also focused on the management of feral hogs, riparian areas, septic systems, livestock and water wells. TSSWCB and Texas Water Resources Institute worked with local stakeholders to develop a watershed protection plan to address the impairments and other water quality concerns. Through these efforts, water quality was improved and two AUs of the Navasota River (1209\_02 and 1209\_03) and Cedar Creek (AU 1209G\_01) were removed from the state's list of impaired waters.

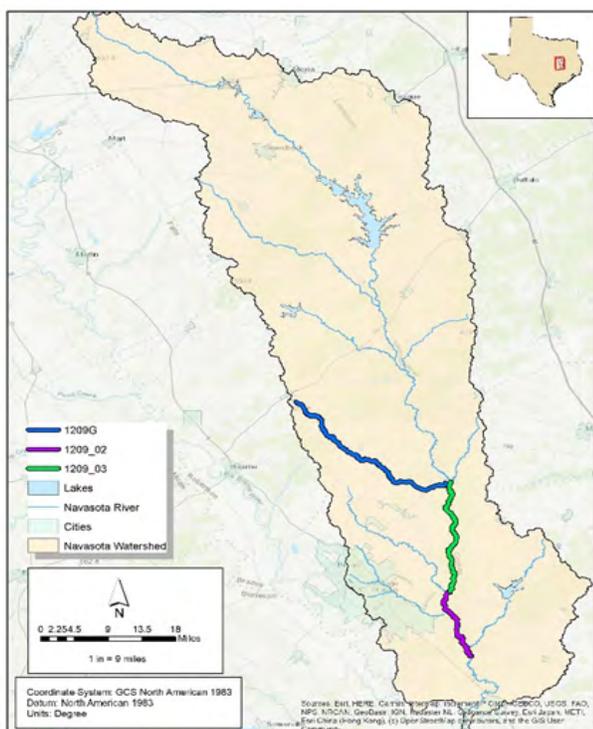
### PROBLEM

The Navasota River (Figure 2.3) is a sub-watershed within the Brazos River Watershed in East Central Texas that empties into the Brazos River in Grimes County. The majority of the land use is rural, being used for cattle and poultry operations, or recreational/wildlife uses, except for the Bryan-College Station area in Brazos County, and small towns in neighboring counties.

Surface water quality data collected in the Navasota River from 1995 to 2000, and Cedar Creek from 1995-2002 showed that Fecal Coliform and *E. coli* levels exceeded the water quality criterion for primary contact recreation. As a result, TCEQ added the Navasota River and Cedar Creek to the 2002 and 2004 CWA Section 303(d) list of impaired waters respectively for not supporting the primary contact recreation use.

FIGURE 2.3

*The Navasota River Watershed in East Central Texas*



**PROJECT HIGHLIGHTS**

Texas State Soil and Water Conservation Board, Texas Water Resources Institute, Texas A&M AgriLife Extension, and Texas A&M AgriLife Research have been hosting education and outreach programs in the Navasota River watershed since 2007. These programs focused on water quality, feral hog management, riparian area protection, livestock management, septic systems management, and protecting water wells. Field days to demonstrate BMPs to landowners were also held with some of the events.

In 2013, Texas State Soil and Water Conservation Board and Texas Water Resources Institute began working with stakeholders to develop a watershed protection plan. The stakeholder group that led the watershed protection plan development consisted of representatives from agricultural producers, wildlife interests, soil and water conservation districts, county governments, cities and concerned citizens. Stakeholders worked together to identify management measures to address the potential sources of pollution in the watershed.

Texas State Soil and Water Conservation Board partnered with Brazos County, Bedia Creek, Navasota, and Robertson County Soil and Water Conservation Districts, to develop and implement six WQMPs in the watershed. Most of the WQMPs were on poultry animal feeding operations that included grazing, covering over 3,666 acres. These plans included alternative water sources, prescribed grazing, cross-fencing, animal mortality facilities, composting facilities, nutrient management and waste utilization. In addition, the U.S. Department of Agriculture’s Natural Resources Conservation Service worked with landowners in both subwatersheds to implement conservation practices using Environmental Quality Incentives Program funding. The conservation practices implemented included prescribed grazing, grass and range planting, nutrient management, animal mortality facilities, composting facilities, conservation cover, livestock pipeline, water troughs and ponds.

**RESULTS**

Water quality monitoring data show that the long-term *E. coli* geometric means meet the state water quality standard for primary contact recreation in portions of the Navasota River in 2012 (AU 1209\_02) (101.51 cfu/100mL for data collected from 2003-2010) and 2018 (AU 1209\_03) (54.48 cfu/100 mL for assessment data collected from 2009-2016) and for Cedar Creek (AU 1209G\_01) in 2014 (117.05 cfu/100mL for data collected from 2005-2012). Consequently, portions of the Navasota River and Cedar Creek were removed from the Texas 303(d) list in the 2012, 2014, and 2018 Texas Integrated Report of Surface Water Quality.

The success of this effort can be attributed to increased stakeholder awareness due to educational programs focused on improving water quality, the watershed planning process, and conservation practices being implemented in the watershed. Conservation practices continue to be implemented in the watershed since the delisting of the Navasota River (AU 1209\_02) and Cedar Creek (AU1209G). Water quality monitoring continues to track and measure interim progress to implement the watershed protection plan and ensure this restoration effort remains a success.

**PARTNERS AND FUNDING**

Over \$28,000 in EPA CWA section 319(h) funds (provided through TSSWCB), combined with more than \$250,000 in non-federal funds from TSSWCB, Texas Water Resources Institute, Texas A&M AgriLife Extension, and Texas A&M AgriLife Research, supported the delivery of the educational programs and development of the watershed protection plan.

Brazos County, Bedia Creek, Navasota, and Robertson County Soil and Water Conservation Districts worked with landowners to voluntarily implement conservation practices to reduce the impact of livestock and poultry operations in the watershed. TSSWCB and Natural Resource Conservation Service worked through the soil and water conservation districts to provide state funding and federal Farm Bill funding to landowners as financial incentives to implement BMPs and provide technical assistance in the Navasota River watershed.



Fall Autumn Landscape  
Austin, TX  
(Source iStock)



Fall Autumn Landscape  
Austin, TX  
(Source iStock)

## Chapter 3

# *Progress toward Meeting the Goals and Objectives of the Texas Nonpoint Source Management Program*

TCEQ and 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. EPA allocates these funds to the states to implement nonpoint source pollution reduction activities supporting the congressional goals of the CWA. TCEQ and 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 specific nonpoint source implementation projects. In fiscal year 2020, Texas received \$6,399,528 in CWA Section 319(h) federal grant funds to utilize and award to sub-grantees across the state. In turn, sub-grantees provided \$4,266,353 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 2020, TCEQ had 48 active CWA Section 319(h) grant-funded projects totaling approximately \$10.5 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 2020, TSSWCB had 35 active CWA Section 319(h) grant-funded projects totaling approximately \$9.1 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.



Texas Hill Country  
(Source iStock)

FIGURE 3.1  
TCEQ Fiscal Year 2020 Nonpoint Source Grant Funds by Project Type

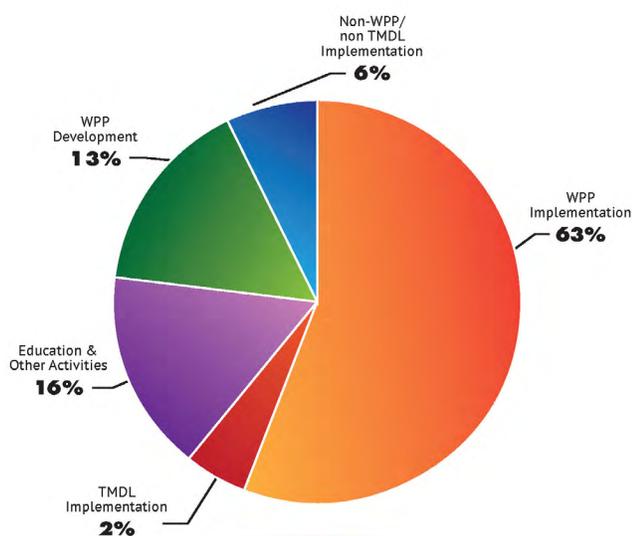
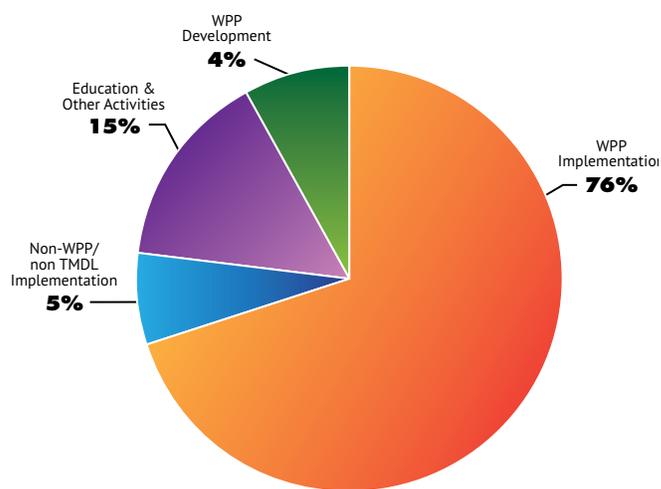


FIGURE 3.2  
TSSWCB Fiscal Year 2020 Nonpoint Source Grant Funds by Project Type



## 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. 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 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 2020 Integrated Report was approved by TCEQ in March 2020 and by the EPA in May 2020. The assessment methods for the 2020 Integrated Report are detailed in the [2020 Guidance for Assessing and Reporting Surface Water Quality in Texas](#)<sup>3</sup>.

### 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, EPA, state agencies, federal agencies, municipalities, and environmental groups.

<sup>3</sup>[https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/20bxir/2020\\_guidance.pdf](https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/20bxir/2020_guidance.pdf)

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 2020 Integrated Report.

TABLE 3.1

**Number of Water Bodies Assigned to Each Assessment Category in the 2020 Integrated Report**

Category	Definition	Number of Water Bodies
1	All designated uses are supported, no use is threatened.	90
2	Available data and/or information indicate that some, but not all of the designated uses are supported.	334
3	Insufficient or unreliable available data and/or information to make a use support determination.	110
4	Available data and/or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed.	124
5	Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed. Category 5 is the CWA Section 303(d) list of impaired waters.	432
<b>Total</b>		<b>1090</b>

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

<sup>4</sup>[https://www.tceq.texas.gov/waterquality/monitoring/swqm\\_realtime.html](https://www.tceq.texas.gov/waterquality/monitoring/swqm_realtime.html)

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. 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 to reflect additional options for addressing impairments:

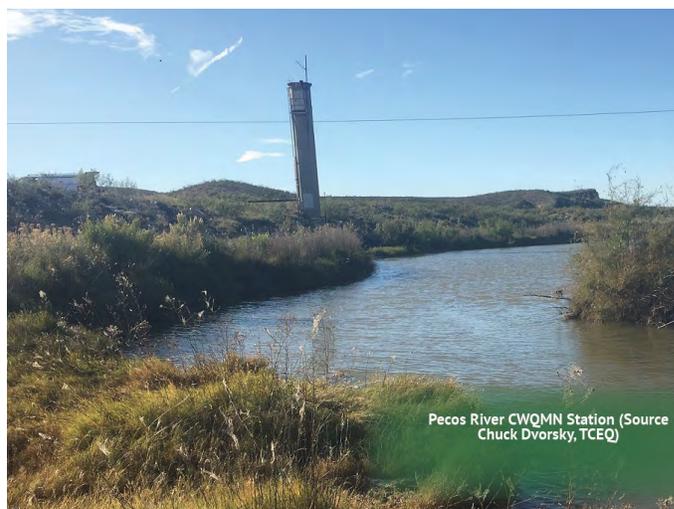
- Water bodies in Category 5a have a TMDL underway, scheduled, or to be scheduled.
- Water bodies in Category 5b require a review of the water quality standards for the water body to be conducted before a management strategy is selected.
- Water bodies in Category 5c require additional data and information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

**2020 INTEGRATED REPORT**

The Commission approved the 2020 Integrated Report in March 2020. EPA approved the 2020 Integrated Report in May 2020. TCEQ is preparing for the development of the 2022 Integrated Report.

*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 2020, TCEQ had 33 active sites (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



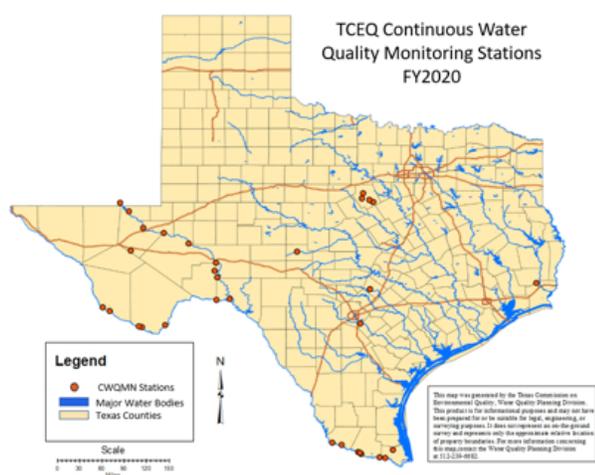
Pecos River CWQMN Station (Source: Chuck Dworsky, TCEQ)

implementation plans and watershed protection plans, characterize existing conditions, and evaluate spatial and temporal trends. You can find site information and data at the [Continuous Water Quality Monitoring](#)<sup>4</sup> webpage .

The Pecos River drains much of eastern New Mexico and west Texas. Contributions from agricultural return flows and naturally occurring nonpoint sources from geologic deposits increase the concentrations of chloride, sulfate, and total dissolved solids (TDS) in water to levels many times higher than ambient surface

FIGURE 3.3

### Active Continuous Water Quality Monitoring Stations in Fiscal Year 2020



waters. In 2004, TCEQ deployed a network of seven continuous water quality monitoring stations in Texas to document water quality and water quality improvement in support of TSSWCB's implementation of the Pecos River Watershed Protection Plan.

The Pecos River enters Texas near Red Bluff, New Mexico, and joins the Rio Grande near Langtry, Texas. TCEQ established a continuous water quality monitoring station near Red Bluff, New Mexico in June 2011 to document the quality of Pecos River water entering Texas.

TSSWCB continues to rely on the continuous monitoring data to document changes in water quality for the Watershed Protection Plan. The Pecos River Interstate Compact Commission also uses this information in regards to the protection of present development within the states, annual water accounting, facilitating the construction of works, and participating in special research projects beneficial to Texas and New Mexico, as the quantity and quality of the water delivered from New Mexico to Texas is an important consideration.

### Texas Stream Team Monitoring

The Texas Stream Team program is administered within the Watershed Services Division at The Meadows Center for Water and the Environment (the Meadows Center), a research institute located at Texas State University. Texas Stream Team is a statewide network

<sup>4</sup><https://www.TexasStreamTeam.org>

of trained water quality citizen scientists and supportive partner organizations that work together to gather information about the natural resources of Texas. Texas Stream Team citizen scientists receive certification after completing training to collect water quality and environmental parameters from monitoring sites along rivers, lakes, and streams. All water quality and environmental data collected under the Texas Stream Team program is available to the public. The Meadows Center receives CWA Section 319(h) funds from TCEQ and the EPA to administer the statewide program.

In fiscal year 2020, Texas Stream Team and its partners conducted 65 trainings across the state, which resulted in over 484 volunteers trained in water quality monitoring. Additionally, citizen scientists volunteered 3,043 hours of their time, traveled a cumulative distance of 42,700 miles, and conducted 1,912 monitoring events at 305 active stations on rivers, lakes, and streams across Texas. Many monitoring events took place on water bodies implementing or developing watershed protection plans such as the Arroyo Colorado, Upper Cibolo Creek, Upper San Marcos River, Dry Comal/Comal River, Shoal Creek, Plum Creek, and Cypress 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 2020, Texas Stream Team gave five presentations to 137 adults and students at Spring Lake. In addition, Texas Stream Team staff held 79 education and outreach events around the state, reaching an additional 1,660 people.

Unfortunately, due to COVID-19, Texas Stream Team cancelled a total of five scheduled trainings and four educational events between March and August of 2020. As a result, Texas Stream Team staff decided to focus on transitioning trainings to online instruction and work to make other resources accessible online. Currently, Texas Stream Team has transitioned its Riparian Evaluation Citizen Scientist training to online instruction. For more information visit the [Texas Stream Team webpage](#)<sup>5</sup> .

FIGURE 3.4

### Active Texas Stream Team Monitoring Sites in Fiscal Year 2020



## 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 LAVACA RIVER WATERSHED PROTECTION PLAN

The Lavaca River Watershed covers 909 square miles of the Matagorda Basin and is largely comprised of agricultural lands used for hay, livestock pasture and crop production. The Lavaca River was first identified as impaired in the 2008 Texas Integrated Report 303(d) list for elevated levels of *E. coli* and depressed dissolved oxygen, and Rocky Creek was first listed in the 2014 Texas Integrated Report for *E. coli*. The watershed protection plan development process began in fall 2016 and the final watershed protection plan was published in summer 2018. In fall 2018, the Texas Water Resources Institute and the Lavaca-Navidad River Authority began a watershed protection plan implementation project with CWA Section 319(h) funds from TCEQ and EPA. The first year of the project focused on developing relationships between the new watershed coordinator and local stakeholders, presenting the watershed protection plan at meetings throughout the watershed, the inaugural Lavaca River Watershed Protection Plan newsletter, and writing grants to support outreach programs throughout the watershed and greater Matagorda Basin. Since the beginning of implementation, over 2,000 acres of the watershed have been protected through the Environmental Quality Incentives Program.

The watershed coordinator helped develop grant applications for the area, that was awarded in the beginning of fiscal year 2020 and will be covering counties within the Lavaca River watershed. In June, the first iteration of a quarterly direct mailer project was sent out. It focused on stocking rate BMPs for grazing cattle in Lavaca County. The response to the first educational postcard was successful, with the NRCS office in Hallettsville receiving two to three calls daily resulting in several planned site visits. This campaign also includes pre- and post-evaluation efforts to assess knowledge gained, resource agency awareness, and which practices are implemented as a result of the mailers. A statewide stormwater education program is also being developed by another Matagorda Basin watershed coordinator, along with an OSSF educational direct mailer campaign scheduled for Jackson County as part of the project.

Much of fall 2019 was spent scheduling education programs to be delivered throughout the watershed during calendar year 2020. A landowner riparian BMP workshop was delivered in

February. There were 29 attendees that owned or managed 4,598.5 acres in the watershed. A multiple-choice test was given before and after the workshop, and the results showed a 14% knowledge gain (mean pre-test score: 78.34, mean post-test score: 89.29). Additional programs were scheduled for April, May and September, but were postponed due to COVID-19. The coordinators for these programs have spent much of the third and fourth quarter of fiscal year 2020 converting their curriculum to be delivered in an online format. The statewide education program, Healthy Lawns and Healthy Waters (HLHW), was originally scheduled for May but was delivered by webinar in August to residents of the Lavaca River Watershed by being hosted through the Jackson County extension office. Participants were able to receive their complimentary soil test results by dropping off samples at their county extension office. The extension agent then mailed the samples to the HLHW program coordinator and the program coordinator delivered test results to the participants via e-mail. The program had 20 attendees; 91% said they would adopt the BMPs presented during the webinar and there was a 52% knowledge increase among participants.



While COVID-19 has created an obstacle for implementing a watershed protection plan through traditional means, it has created the opportunity for watershed coordinators throughout the state to be creative with outreach and education efforts. Relationships with local environmental organizations have been strengthened during the last half of fiscal year 2020, as groups

work together to secure watershed protection plan implementation funding during insecure economic times. Surface water quality monitoring in the watershed has been able to continue safely, and 14 months of surface water quality data has been collected. Alternative outreach and education methods through direct mailers and digital engagement are being evaluated and refined. These strategies will complement established implementation programming approaches once in-person meetings are considered safe to resume.

### **IMPLEMENTING THE BRADY CREEK WATERSHED PROTECTION PLAN**

Brady Creek has been listed on the Texas Integrated Report of Surface Water Quality 303(d) list as impaired for depressed dissolved oxygen since 2004. The depressed dissolved oxygen listing is the result of occurrences of 24-hour minimum and 24-hour average dissolved oxygen concentrations that consistently measure less than the 3.0 milligrams per liter (mg/L) 24-hour minimum and the 4.0 mg/L average dissolved oxygen criteria assigned to Brady Creek. To address the dissolved oxygen impairment, the Brady Creek Watershed Protection Plan calls for the installation of several structural BMPs at drainage outlets located along Brady Creek in the City of Brady, Texas. This project implements two of the BMPs recommended in the Brady Creek Watershed Protection Plan.

Stakeholders that participated in the watershed protection plan development have been re-engaged for the implementation of the BMPs recommended in the Brady Creek Watershed Protection Plan. In fiscal year 2020, a structural BMP consisting of a 12' diameter vortex separator was installed. Construction included a concrete head wall installed around an existing 24" corrugated under-street culvert, and a concrete channel that connects to a 24" polypropylene pipe that connects to the vortex separator. Construction also included a 24" diameter polypropylene discharge pipe, wingwalls, and apron at the discharge point. Although COVID-19 presented unanticipated challenges and caused unavoidable delays, the construction phase of the project was completed in July 2020. The City of Brady served as a project partner, providing personnel and machinery during construction.



The installation will capture stormwater flows from a subbase of Brady Creek, route it to the vortex separator for treatment, and discharge the treated stormwater into Brady Creek. Two automatic

samplers that will collect user defined flow-paced samples were also installed. These samplers will collect flow weighted composite stormwater samples for laboratory analyses (one prior to treatment, and one after treatment). The analytical data will be used to evaluate BMP effectiveness.

Implementation of the education and outreach program of the Brady Creek Watershed Protection Plan is included as a stand-alone BMP in this project. Press releases, public service announcements, educational presentations, and other activities increase awareness within the community by providing residents with information and encouraging the implementation of the Brady Creek Watershed Protection Plan. This nonstructural BMP is critical to the overall success of the depressed DO mitigation strategy.

### **IMPLEMENTING THE PLUM CREEK WATERSHED PROTECTION PLAN**

In 2006, TSSWCB and Texas A&M AgriLife Extension Service introduced a new concept to a group of citizen stakeholders from the Plum Creek watershed which led to the creation of Texas' very first watershed protection plan. Under guidance from TSSWCB, the Plum Creek Watershed Partnership was established to address elevated bacteria levels within the Plum Creek watershed. The Plum Creek Watershed Partnership was the first to get their watershed protection plan accepted by EPA and it was the first to put together local funding to match federal dollars to hire a local watershed coordinator. The Plum Creek Watershed Partnership is currently working towards complete implementation of all management measures outlined in the Plum Creek Watershed Protection Plan.



## **Implementation of Stormwater Management Best Management Practices**

The City of Lockhart began a project in March 2020 to restore riparian areas of Town Creek, a tributary of Plum Creek located almost entirely in the City of Lockhart. With funding provided by TCEQ and EPA through a CWA Section 319(h) grant, the city is currently implementing riparian restoration measures that will increase riparian buffer no-mow zones, and planting buffer stripping consisting of native species like switch grass, goldenrod and eastern gamma. Additionally, the City of Lockhart has installed a 2,000 square foot rain garden downstream of a two-acre pond to slow down and naturally filter stormwater during rain events.

## **Education and Outreach**

The Plum Creek Watershed Partnership in collaboration with Texas A&M AgriLife Extension Service held a Riparian and Stream Ecosystems Workshop in Fall 2019 at Lockhart State Park in Lockhart, Texas, that drew 44 attendees. This training focused on the nature and function of streams as well as benefits and direct impacts from healthy riparian zones. This riparian education program covered an introduction to riparian principles, watershed processes, basic hydrology, erosion/deposition principles, and riparian vegetation. The program also covered potential causes of degradation, possible resulting impairment(s), and available local resources including technical assistance and tools that can be employed to prevent and/or resolve degradation. The day wrapped up on the banks of Clear Fork Creek where workshop attendees were educated by the Natural Resource Institute on wildlife management and feral hog trapping.

The Annual Keep Lockhart Beautiful Plum Creek/Town Branch/Lockhart Springs Cleanup took place on November 2019 and drew over 110 attendees. Local officials, citizens, and businesses of Lockhart banded together to pick up litter at seven different sites around Lockhart resulting in the removal of over 350 pounds of refuse from four and a half miles of roads and creek bank.

## **Wildlife Management**

In 2013, the Plum Creek Watershed Partnership applied for grant funds from Texas Department of Agriculture to implement a bounty program to mitigate the growing feral hog population in Caldwell County. This program occurs annually from February to August. Since implementation began, there have been more than 15,000

feral hogs removed from Caldwell County and the Plum Creek watershed due to the hard work of local area stakeholders. Due to current COVID-19 social distancing parameters, the annual feral hog seminar delivered by the Meadows Center was held virtually in July. The feral hog seminar focused on techniques to identify feral hog signs, trapping methods, as well as testimonials from local wildlife management professionals.

## **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 2020, 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 2020 the TCEQ Nonpoint Source Program, TMDL Program, and TSSWCB coordinated and worked with stakeholders to develop two watershed protection plans in four watersheds: Mission, Aransas, Arenosa, and Garcitas.

Stakeholders provide local expertise to identify 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.

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 EPA and the National Oceanic and Atmospheric Administration (NOAA).



The majority of the required management measures have been approved, and in fiscal year 2020 Texas obtained approval on the on-site disposal system measure. Remaining management measures hydromodification, urban runoff, and run-off from non-TxDOT roads, highways, and bridges are pending federal review and approval. The 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 2020, Texas A&M AgriLife Extension Service 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 2020, the State began to implement the septic system inspection management measure. The strategy includes a five-pronged approach:

1. Authorized Agents and Maintenance On-Site Disposal System Inspections.
2. WBP On-Site Disposal System Inspections.
3. Point-of-Sale Real Estate On-Site Disposal System Inspections.
4. Direct Contracting for On-Site Disposal System Inspections.
5. On-Site Disposal System Education and Outreach.

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

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.

In fiscal year 2019, Texas developed a technical manual, *Guidance for Sustainable Stormwater Drainage on the Texas Coast (Stormwater Manual)*, to provide additional guidance and resources to coastal communities. In fiscal year 2020, the document was undergoing further revisions in response to federal comments.

### HYDROMODIFICATION

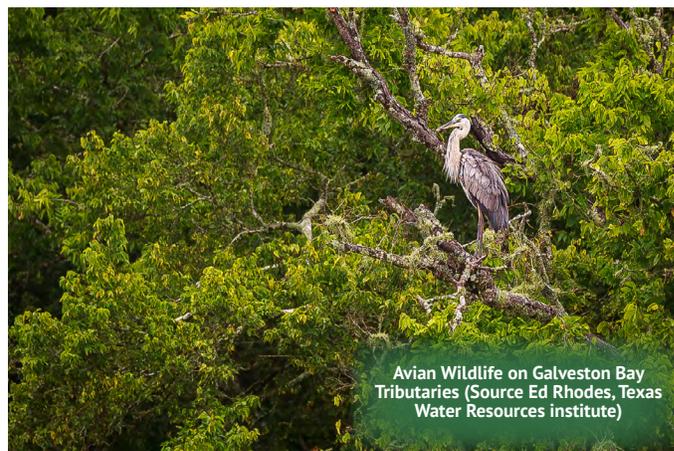
In fiscal year 2020, Texas continued to work with EPA and NOAA on developing a program to address outstanding conditions related to the Hydromodification management measures. In 2008 Texas developed a Hydromodification Best Management

Practices Manual which describes several recommended practices that are consistent with the Hydromodification management measures. The Texas program to address these outstanding management measures encourages voluntary adoption of the State's hydromodification manual. To encourage the voluntary adoption of these practices and recommendations, Texas has committed to integrating the State's hydromodification manual guidance into its *Guidance for Sustainable Stormwater Drainage on the Texas Coast*. This guidebook will be distributed to communities, county authorities and other relevant planning authorities in the coastal nonpoint management area through workshops and other outreach efforts. Additional voluntary initiatives, as well as regulatory activities, further support the implementation of the Hydromodification management measures.

### Estuary Programs in Texas

#### GALVESTON BAY ESTUARY PROGRAM

The Galveston Bay Estuary Program (GBEP) is one of two estuary programs in the state of Texas and one of 28 nationwide. GBEP is a non-regulatory program of TCEQ, and together with its partners is tasked with implementing the Galveston Bay Plan, 2<sup>nd</sup> Edition. This Comprehensive Conservation Management Plan seeks to preserve Galveston Bay for future generations. The Action Plans, Improving



Avian Wildlife on Galveston Bay Tributaries (Source Ed Rhodes, Texas Water Resources Institute)



Ambient Water Quality Testing (Source Ed Rhodes, Texas Water Resources Institute)

Water Quality through both Nonpoint and Point Source Pollution Abatement, continue to be top priorities of the program. These are two of the three action plans listed in the Galveston Bay Plan's Plan Priority One, Ensure Safe Human and Aquatic Life Use.

### **BST on Tributaries of Trinity and Galveston Bays**

Nonpoint source pollution continues to be one of the most challenging water quality issues facing the Galveston Bay Watershed. Particularly, elevated bacteria levels create a public health concern and therefore a need for reduction.

Starting in fiscal year 2018, GBEP partnered with Texas A&M University's Texas Water Resources Institute to implement a water quality monitoring regime that would address bacteria concerns in five watersheds that feed into Trinity and Galveston Bays. This project sought to characterize the sources of bacteria entering the bays through Bacterial Source Tracking (BST). This information could then be used by decision makers to reduce bacteria in the watersheds.

In fiscal year 2020, the Texas Water Resources Institute team conducted monthly water sampling at locations on Buffalo, Double, Cedar and Dickinson Bayous and Clear Creek. By working with local experts, the team was able to identify significant contributors of bacteria in each watershed, for which fecal samples were obtained. The isolates of these fecal samples were then used to supplement the Texas *E. coli* BST Library. These isolates, in addition to those already contained within the library, were compared to the isolates obtained from the water samples.

The BST analysis performed by Texas Water Resources Institute provided a unique profile that identified and quantified the different contributors of *E. coli* for each watershed. Results from this study as shown in Figure 3.5 indicate that wildlife (non-avian and avian) were the leading contributors of bacteria (56%). Contributors of this category include wildlife such as feral hogs, raccoons, opossums, rodents, and other small mammals, as well as various avian sources. Cattle and other livestock, as well as domestic pets, make up an additional 16% of the identified isolates. Human sources were detected at all sites and accounted

for 8% of the total classifications, and 20% of the isolates were unidentifiable. The Texas Water Resources Institute's analysis was unable to distinguish between isolates of different non-avian species, such as deer and feral hogs.

*E. coli* is used by TCEQ as a fecal indicator bacteria in freshwater to determine if a waterbody is impaired due to elevated levels of bacteria that do not meet water quality standards. Contact recreation can therefore be impacted by elevated levels of bacteria making it potentially unsafe for human use. This project provides a snapshot of key contributors of *E. coli* in each watershed. That information will help decision makers reduce bacteria levels by knowing the biggest contributors of bacteria upfront, and ultimately save municipalities resources and time. This project also allowed for further implementation of existing watershed-based plans including the Double Bayou, Cedar Bayou and Dickinson Bayou watershed protection plans, and the Bacteria Implementation Group Implementation Plan. Find more information on this project in the final report at the [Galveston Bay Estuary Program's webpage](#)<sup>6</sup>.

### **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. CBBEP targets nonpoint source pollution issues by conducting research projects to determine sources of pollution. In addition, 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 that may periodically be found in high concentrations in bay systems by partnering with stakeholders and scientists to sample soils and runoff to identify areas of concern. The information is being 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.

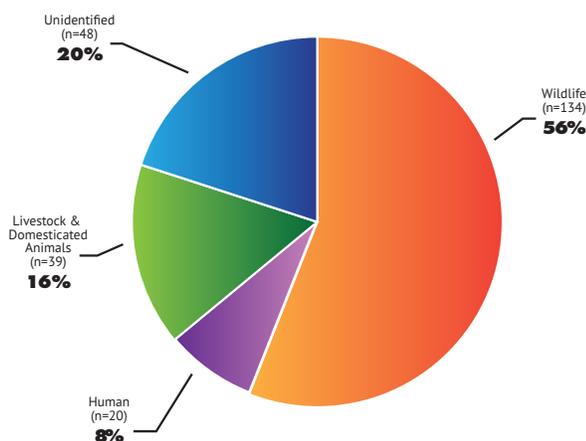
Additionally, CBBEP continues working with the Center for Coastal Studies at Texas A&M University – Corpus Christi to expand their water quality sampling and outreach activities to the rural areas of the Oso Bay watershed. Coordination between urban and rural watershed communities is vital for efforts to understand and restore the Oso Bay Watershed.

In fiscal year 2020, CBBEP initiated a project to sample nutrients monthly in Petronila Creek, a tributary to Baffin Bay. The health of Baffin Bay has been of great concern to scientists and concerned citizens due to fish kills, water quality problems, and food web changes in the bay. This sampling is being conducted to support the Petronila Creek Implementation Plan. The data will be used to identify nutrient sources.

Also in fiscal year 2020, CBBEP partnered with Texas Sea Grant to develop an early phase watershed plan for Baffin Bay that would build upon existing watershed protection efforts.

FIGURE 3.5

#### **Source *E. coli* Classifications Across all Five Sampling Sites**



<sup>6</sup><https://gbep.texas.gov/>

The Baffin Bay Working Group consists of researchers, commercial and recreational fisherman, landowners, ranchers, business owners, local governments, and federal and state agencies. This working group has identified various watershed protection needs, which will require the development of a watershed protection plan and funding to address. The plan will identify locally driven mechanisms to voluntarily address complex water quality and land use issues across multiple jurisdictions, promoting unified approaches to seek funding to ensure that this bay system continues to support the local, regional, and state economy. For more information visit the [Coastal Bend Bay's Estuary Program webpage](http://www.cbep.org/)<sup>7</sup>.

### *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 Committee (TGPC) was established by the Texas Legislature in 1989 as an interagency committee to protect this resource. TGPC consists of nine state entities and an association of groundwater districts. TGPC strives to improve interagency coordination and continues developing and updating the comprehensive groundwater protection strategy for the state. 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 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, 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 five statewide events that occurred in fiscal year 2020, TGPC distributed several thousand Fact Sheets and displayed information on groundwater protection. 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 26 counties for basic groundwater quality data. For more information visit the [TGPC's website](https://tgpc.texas.gov/)<sup>8</sup>.

### *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 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,



<sup>7</sup><http://www.cbep.org/>  
<sup>8</sup><https://tgpc.texas.gov/>

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, TCEQ, and 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 2020.

#### Coastal Communities Nonpoint Source Pollution Prevention Outreach Project

The Houston-Galveston Area Council's Coastal Communities program provides outreach resources and support for small communities without municipal separate storm sewer permits in watersheds along the upper Texas Gulf Coast. The project focuses on the Bastrop and Double Bayou watersheds, which have EPA approved watershed protection plans. A comprehensive website (the Coastal Communities Toolbox) contains tools to help communities build outreach plans to engage their residents and promote behavior changes to reduce nonpoint sources of pollution in local waterways. Targeted behaviors include pet waste disposal; fats, oils, and grease disposal; litter and illegal dumping; and OSSF maintenance and repair.

During the final year of this project, project staff focused on updating the Toolbox and encouraging use among city staff. Updates included the completion of a full year's worth of nonpoint source messaging available in various social media and print formats to download and customize for each community's needs. Project staff hosted a training and a roundtable on the Toolbox (held virtually due to COVID-19) to review how to use the resource and determine what stakeholders want included in future expansions.

Continued engagement with community officials also resulted in an OSSF education and implementation effort with the Village of Bailey's Prairie. Project and city staff worked together to coordinate a Homeowner Education Workshop on OSSF maintenance for residents and, with support from local industrial partners, septic system pump-outs for residents who attended

and met the standard criteria for the Houston-Galveston Area Council's Wastewater Assistance Program. Project staff provided the workshop and helped create the materials to engage residents, but city staff identified residents and managed communication. This cooperative effort resulted in the education of 11 residents and the preventative pump-out of six systems at risk of future failure. For more information, see the [Coastal Communities project website](#)<sup>9</sup>.



White Pelicans on Bastrop Bayou  
(Source Houston-Galveston Area Council)

#### Outdoor Classrooms Irma Lewis Seguin Outdoor Learning Center

Nestled on the banks of Geronimo Creek in Seguin Texas, is the Irma Lewis Seguin Outdoor Learning Center. In 2018, through 319(h) TCEQ grant funding, Guadalupe-Blanco River Authority hired a teacher consultant to develop water quality programming to be presented during field trips to students from local school districts. The Environmental Education Site Coordinator was able to springboard from long-established water quality lessons such as macroinvertebrate studies, and was tasked with creation of additional lessons, including use of a Stream Table Trailer which demonstrates erosion and nonpoint source pollution. Other tasks included finding and training volunteers, and scheduling what came to be called *Outdoor Classrooms* events. The lessons are vertically aligned, so that students who come year after year build on prior knowledge. Students are verbally assessed at the end of each



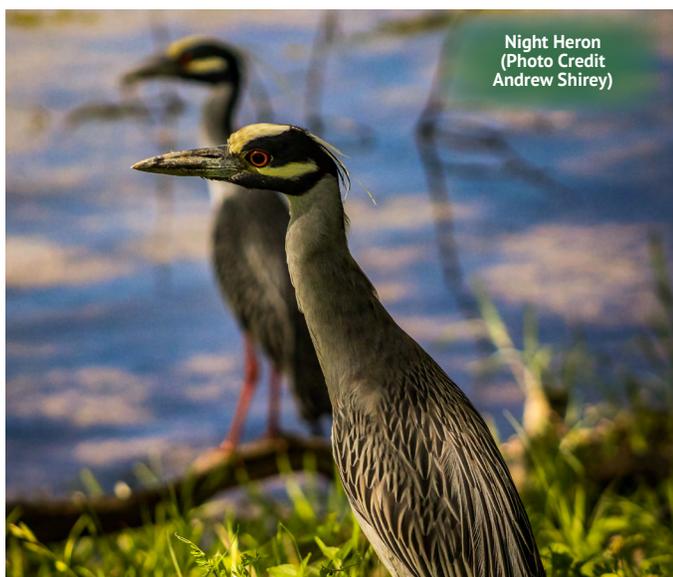
Stream Table  
(Source Guadalupe-Blanco River Authority)

STREAM TRAILER

<sup>9</sup><http://www.coastalcommunitiestx.com/>

lesson, and teacher evaluations indicate a very strong approval of content presented and the opportunities presented for interactive learning.

Thousands of students in grades 2-5 (Seguin and Navarro Independent School Districts) have learned a great deal about water quality in the Geronimo Creek watershed due to these lessons. In the first year of the program (2018-2019), 2,543 students engaged in these lessons. An additional 1,192 students participated in *Outdoor Classrooms* during the 2019-20 school year prior to COVID-19 closing of schools in early spring. Water quality lessons continued to be embedded into learning agendas during 2020 summer camps.



Night Heron  
(Photo Credit  
Andrew Shirey)

### *Statewide Delivery of Lone Star Healthy Streams Feral Hog Component and Providing Technical Assistance on Feral Hog Management in Priority Watersheds*

The Lone Star Healthy Streams (LSHS) Feral Hog program initiatives for federal fiscal year 2020 included the promotion of healthy watersheds through face-to-face educational programming, distance-based education, resource creation, interagency collaborations and social media outreach. Conventional and innovative efforts were implemented to increase awareness, understanding and knowledge of the biology, impacts and economics, methods of removal, and laws and regulations related to feral hog management in Texas. One-on-one technical assistance was provided to increase the efficacy of direct landowner feral hog abatement efforts. Priority watersheds were targeted in order to reduce damages in areas where feral hogs had the greatest potential to contribute to water quality issues. The LSHS Feral Hog program is funded by a CWA Section 319(h) grant provided by EPA and activities were facilitated by the Texas A&M AgriLife Extension Service and the Texas A&M Natural Resources Institute. One Extension Associate was employed centrally and located proximate to priority watersheds.

During fiscal year 2020, a total of 23 educational wild pig programs were conducted statewide. Face-to-face programming included one four-hour wild pig workshop, including eight one and a half hour programs, 13 one-hour programs and one multi-day educational booth presentation. Face-to-face programs were delivered within target watersheds throughout the project area. Additionally, three remotely administered online trainings were conducted in priority watersheds across Texas. Educational programming through face to face and remote delivery reached a total of 1,157 attendees and amassed a total of 1,342 direct contact hours. A total of two direct technical assistance site visits were also conducted within priority watersheds. Post program evaluations showed that 78.6% of surveyed participants reported knowledge gained concerning feral hog biology, legal control options, efficient trap/bait techniques and types/extent of feral hog damage. These evaluations further detailed that 94.3% of participants rated themselves as having an “excellent” or “good” understanding of feral hog biology, legal control options, efficient trap/bait techniques, and types/extent of feral hog damage following their attendance of a wild pig workshop or event.

COVID-19 resulted in greatly reduced conventional wild pig programming for the reported date ranges and required the ongoing implementation of alternative educational strategies. The response by the Texas A&M AgriLife Extension Service and the Texas A&M Natural Resources Institute directed emphasis towards expanded innovative outreach techniques as well as the development of distance-based options for continued wild pig outreach efforts. To date a total of six interactive online wild pig courses were created in lieu of conventional programming. The statewide online feral hog reporting tool documented a total of 1,439 hogs sighted or removed based on 107 total reports. Educational resource media created as of July 2020 included seven blog articles and six distance-based interactive wild pig courses. The feral hogs Facebook page received 215,581 impressions, 9,367 clicks, 6,892 engagements and 443 “Likes” from a total reach of 108,127 users. The feral hogs Twitter page “tweeted” 216 times, received 324 “favorites” and currently has 726 followers. A total of three AgriLife Communications news releases further promoted educational programs and feral hog abatement within priority watersheds. At least 15 prioritized conferences and meetings were attended by project personnel.

LSHS Feral Hog program staff maintained working relationships with watershed coordinators, project managers and other related personnel across the state through both face-to-face and online collaborations. Staff also served as specialists, providing expertise in feral hog related educational programming and field-based technical assistance to County Extension Agents associated with the Texas A&M AgriLife Extension Service. Collaborations among multiple federal and state agencies and public organizations increased the effectiveness and outreach of this program. For instance, organizations such as the Texas Water Resources Institute, Texas A&M Natural Resources Institute, NRCS, Texas Parks and Wildlife Department, Texas Animal Health Commission, Texas Wildlife Services, United States Department

of Agriculture - Animal and Plant Health Inspection Service, Texas Department of Agriculture, Wildlife Management Associations, various private home owners associations and Texas Master Naturalists chapters helped to assist in programming, resource creation and/or distributed wild pig educational resources.

### *Watershed Coordinator Development Program*

To ensure that high quality watershed protection plans continue to be developed, implemented, and water quality improvements are achieved and sustained, Texas Water Resources Institute is coordinating with Texas A&M University faculty, Practical Stats, and other partners to provide training, coordination and professional development for watershed planners and coordinators throughout Texas and across the nation.

During fiscal year 2020, the program successfully delivered three educational events. In December 2019, the weeklong “Applied Environmental Statistics” course, which focuses on teaching statistical evaluation methods tailored to water resources management, was conducted in College Station. This event had 28 attendees with 92% rating the course as good to excellent. In the spring of 2020, COVID-19 presented unprecedented scheduling and hosting challenges for the project team. Delivery of the “Introduction to Watershed Modeling” course and “Texas Watershed Coordinator Roundtable” meetings were both converted to online delivery and modified to facilitate this change in delivery. The daylong “Introduction to Watershed Modeling” course saw a sharp rise in participation with 92

attendees participating and learning about in-depth modeling tools used for watershed protection planning.

Attendees provided a 97% overall satisfaction rating with the course in its online format. The Watershed Coordinator Roundtable had 86 people attend online. Original content planned for this meeting was tabled for a later meeting and content was developed that focused agency updates regarding COVID-19 impacts on watershed planning activities. Roundtable attendees provided a 91% overall satisfaction rating. Delivery of “Social Marketing Training” was also planned for early summer 2020, but has been delayed since in-person delivery of the content is preferred. Plans are also being made for the next delivery of the Texas Watershed Planning Short Course.

In addition to the courses, the project maintains the Watershed Coordinators Listserv with 375 subscribers. The listserv sends updates and announcements of training opportunities and issues relevant to water quality and watershed planning. Information on these courses and guidance on watershed planning is available on the [Texas Watershed Planning website](#)<sup>10</sup>. This website had 2,081 unique users and 4,041 page views to date for fiscal year 2020. The courses, listserv, and website have led to significant improvements in watershed planning and implementation efforts in Texas.

This project continues to educate numerous water resource professionals, ensuring that watershed protection efforts are adequately implemented thus resulting in enhanced water quality restoration efforts statewide.



Upper San Marcos River  
(Photo Credit  
Jennifer Idol)

<sup>10</sup><https://twri.tamu.edu/our-work/engaging-educating/texas-watershed-planning/>



Guadalupe River, Texas  
(Source iStock)



Guadalupe River, Texas  
(Source iStock)

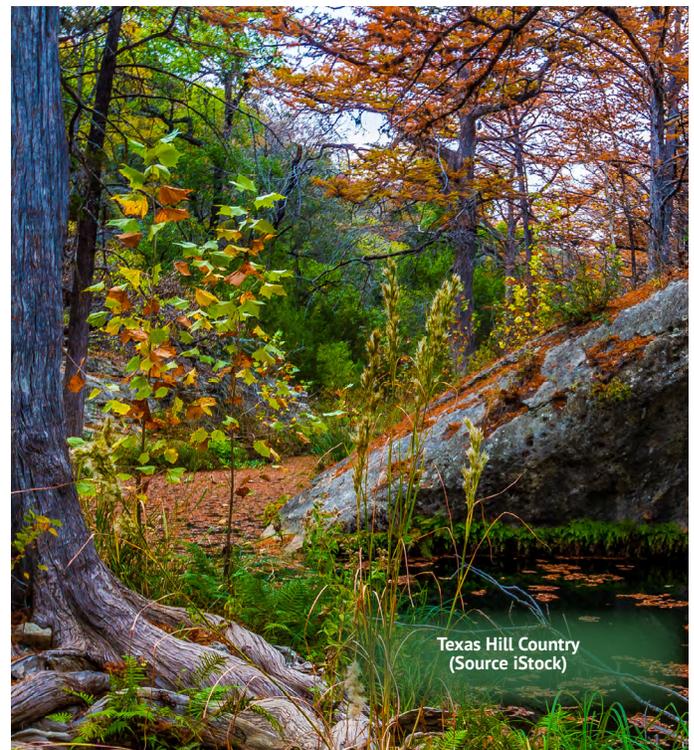
## Chapter 4

# *Developing and Implementing Watershed Protection Plans*

TCEQ and 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 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. You can find these guidelines in the [Nonpoint Source Program and Grants Guidelines for States and Territories](#)<sup>11</sup>.

TCEQ and TSSWCB have facilitated the development and implementation of approximately 43 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 to address nonpoint source pollution under the federal CWA 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 are also developed by third parties independent from TCEQ and TSSWCB. Watershed protection plans being developed or implemented in Texas at the end of fiscal year 2020 are shown in Figure 4.1.

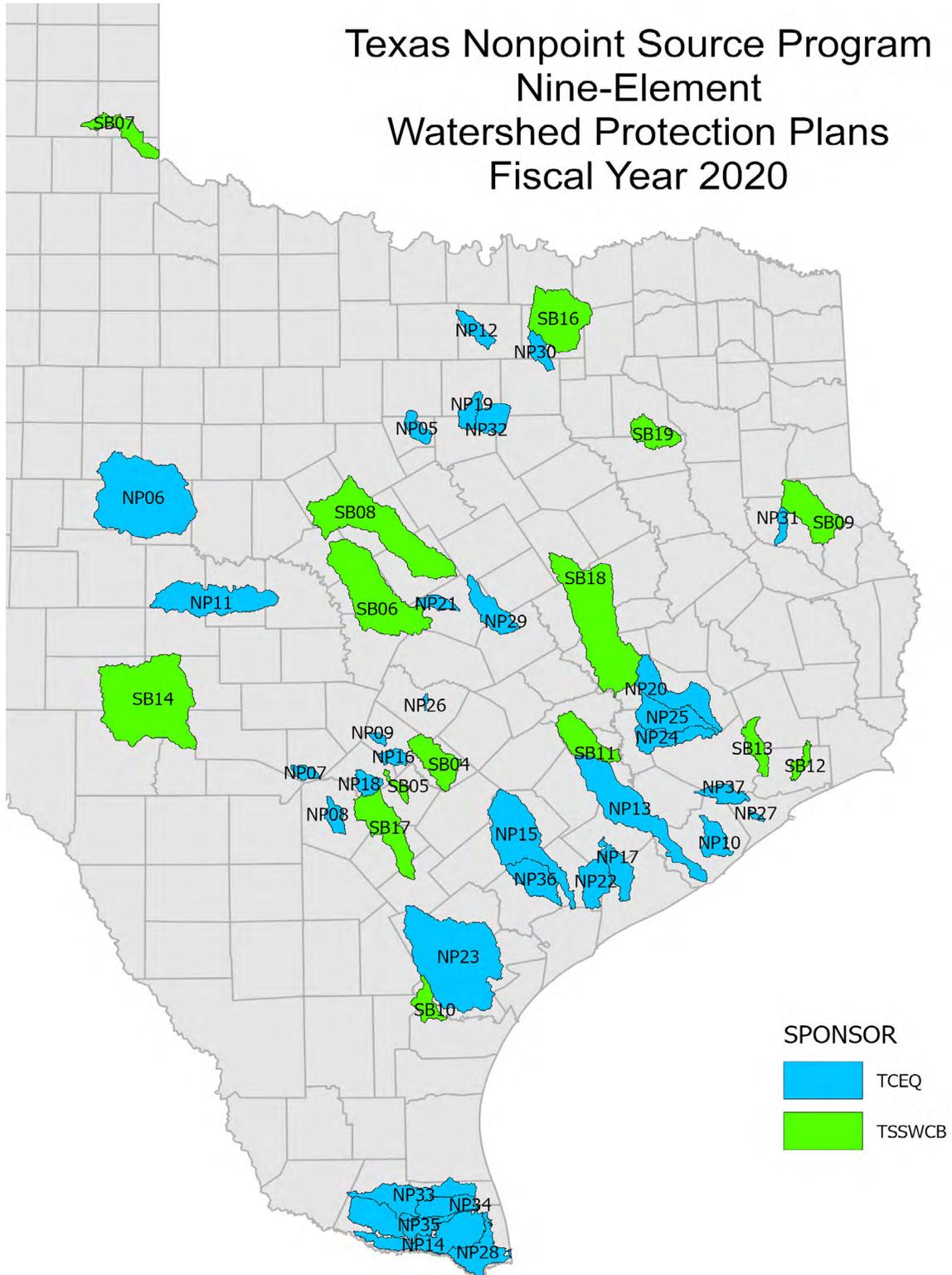
Watershed protection plans which are under development or being implemented are listed in Table 4.1. Neither the map nor table are intended to be a comprehensive list of all the watershed planning efforts currently underway in Texas because there may be other local planning efforts not funded by CWA Section 319(h) funds.



Texas Hill Country  
(Source iStock)

<sup>11</sup><https://www.epa.gov/nps/319-grant-program-states-and-territories>

FIGURE 4.1  
 Map of Watersheds with Watershed Protection Plans Being Developed or Implemented



**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 Creek
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
NP14	Arroyo Colorado
NP10	Bastrop Bayou
NP29*	Big Elm Creek
NP11	Brady Creek
NP22	Carancahua Bay
NP36*	Clear Creek
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
NP27*	Highland Bayou
NP32*	Joe Pool Lake
NP31*	La Nana Bayou

table continued on next page

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

ID	TCEQ 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
NP13	San Bernard River
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/Lake Creek

## Watershed Protection Plan Highlights

### Big Elm Creek Watershed Protection Plan

Big Elm Creek, a tributary to Little River, stretches 62.8 miles through a drainage area of 305 square miles covering parts of McLennan, Bell, and Milam Counties in central Texas. The Big Elm Creek watershed protection planning process began in Fall 2018 under a CWA Section 319(h) grant from TCEQ and EPA to address bacterial impairments within the watershed. The watershed is predominately rural; however, the eastern edge of the City of Temple lies within the watershed.

Led by the Texas Water Resources Institute, local stakeholders consisting of landowners, concerned citizens, local and state officials, Texas A&M AgriLife Extension, NRCS, Texas A&M Forest Service, and Texas Master Naturalists all came together to discuss water quality issues in the Big Elm Creek watershed. Over the course of seven public meetings, a watershed plan was developed

for Big Elm Creek. This plan is currently under review by the EPA, with implementation measures currently in the planning phases.

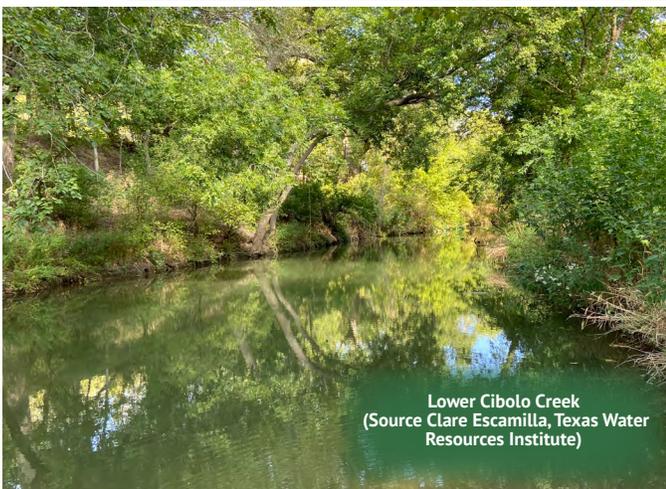
In fiscal year 2020, Texas Water Resources Institute conducted public stakeholder meetings, met with city and county officials, local Farm Bureau and Soil and Water Conservation District members, spoke about water quality concerns at Texas A&M AgriLife Extension Service events and communicated through public press releases, website updates and e-mail. In fall 2019, Texas Water Resources Institute hosted a *Texas Riparian and Stream Ecosystem* training in Oscar, Texas. Attended by 39 participants, the workshop covered proper riparian and stream function, native riparian vegetation, BMPs, roles of forests and trees in watershed function, agricultural nonpoint source pollution, and feral hog management.

### Mid and Lower Cibolo Creek Watershed Protection Plan

Mid and Lower Cibolo Creek is a mixed rural and urban watershed located east of San Antonio. The watershed is predominately rural with a highly developed urban area emerging near the Interstate



Upper San Marcos River  
(Photo Credit  
Andrew Shirey)



Lower Cibolo Creek  
(Source Clare Escamilla, Texas Water  
Resources Institute)

### DEVELOPMENT OF THE WATERSHED PROTECTION PLAN

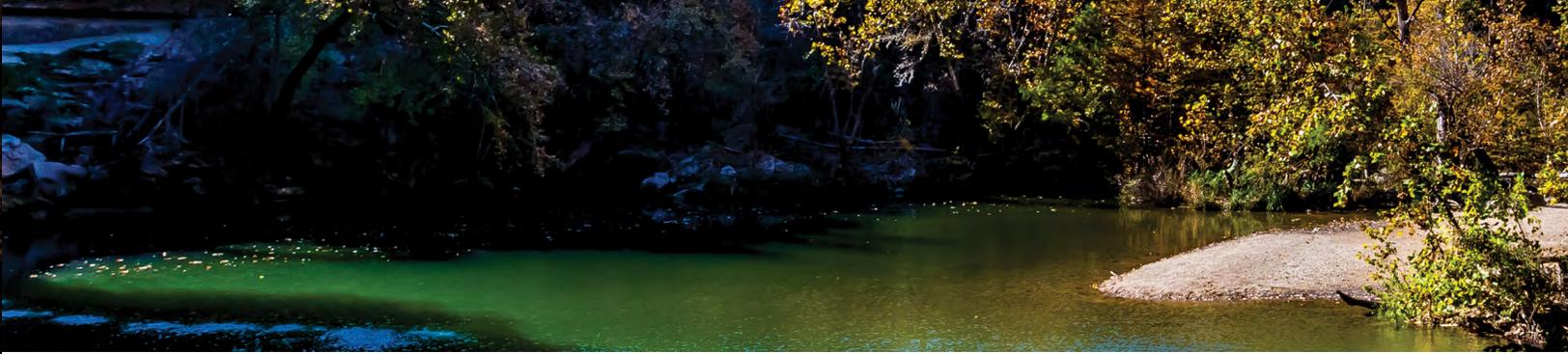
With State funds from TSSWCB, Texas Water Resources Institute and the San Antonio River Authority worked with local stakeholders from 2017 to 2020 to develop a watershed protection plan to address increased bacteria and nutrient levels in Mid and Lower Cibolo Creek. Local input was sought during stakeholder meetings and specialized workgroup meetings to help develop voluntary management measures and interim goals to address water quality impairments and concerns.

Management measures were selected based on stakeholder input, interest in adopting practices, and potential for achieving defined water quality goals. A range of measures were selected including (1) developing conservation plans; (2) promoting technical assistance for feral hog control; (3) identifying and repairing or replacing failing septic systems; (4) increasing proper pet waste management; (5) implementing and expanding urban stormwater runoff management; (6) managing sanitary sewer overflow and unauthorized discharges; (7) planning and implementing wastewater reuse; and (8) reducing illicit dumping. Education and outreach to landowners, city officials/employees, and the greater watershed community is also a major component of each management measure. The Mid and Lower Cibolo Creek Watershed Protection Plan was accepted by EPA in August 2020 and will transition from planning to implementation.

35 and Interstate 10 corridors. Located in Guadalupe, Bexar, Wilson and Karnes counties, Cibolo Creek meanders south approximately 90 stream miles before its confluence with the San Antonio River and includes Martinez Creek, Salatrillo Creek and Clifton Branch. Increasing residential development and suburbanization, natural resource exploration, and property size fragmentation are all modifying watershed hydrology and potential pollutant loading to the waterbody. These stresses coupled with natural environmental factors led to several *E. coli* and dissolved oxygen impairments and concerns for impaired fish communities and elevated nutrients. To address these impairments and concerns, the Texas Water Resources Institute in partnership with the San Antonio River Authority and TSSWCB worked with local stakeholders to develop a watershed protection plan designed to address water quality issues in the watershed.



Hamilton Pool, Texas  
(Source iStock)



Hamilton Pool, Texas  
(Source iStock)

## Abbreviations

<b>BMP</b>	Best Management Practice	<b>TDS</b>	Total Dissolved Solids
<b>CBBEP</b>	Coastal Bend Bays and Estuaries Program	<b>TGPC</b>	Texas Groundwater Protection Committee
<b>CFU</b>	Colony Forming Units	<b>TSSWCB</b>	Texas State Soil and Water Conservation Board
<b>COSSI</b>	Coastal On-site Sewage Inventory	<b>TxDOT</b>	Texas Department of Transportation
<b>CWA</b>	Clean Water Act	<b>WAP</b>	Watershed Action Planning
<b>CWQMN</b>	Continuous Water Quality Monitoring Network	<b>WQMP</b>	Water Quality Management Plan
<b>CZARA</b>	Coastal Zone Act Reauthorization Amendments		
<b><i>E. coli</i></b>	Escherichia coli		
<b>EPA</b>	U.S. Environmental Protection Agency		
<b>GBEP</b>	TCEQ Galveston Bay Estuary Program		
<b>GRTS</b>	Grants Reporting Tracking System		
<b>HLHW</b>	Healthy Lawns Healthy Waters		
<b>Integrated Report</b>	The Texas Integrated Report of Surface Water Quality for CWA Sections 305(b) and 303(d)		
<b>lb</b>	Pounds		
<b>LSHS</b>	Lone Star Healthy Steams		
<b>Meadows Center</b>	The Meadows Center for Water and the Environment at Texas State University		
<b>ml</b>	Milliliter		
<b>NOAA</b>	National Oceanic and Atmospheric Administration		
<b>NRCS</b>	Natural Resources Conservation Service		
<b>OSSF</b>	On-Site Sewage Facility		
<b>PPG</b>	Performance Partnership Grant		
<b>TCEQ</b>	Texas Commission on Environmental Quality		



Upper San Marcos River  
(Photo Credit  
Andrew Shirey)





Brazos Bend, Texas  
(Source iStock)

# Appendix A

## Management Program Milestones

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2020 <sup>1</sup> Estimate	2020 Actual	Comments
ST1/A	Nonpoint Source Assessment Report	The state will produce the Integrated Report in accordance with applicable EPA guidance	Integrated Report	0	1	
LT/2	<i>Nonpoint Source Management Program Updates</i>	The state will update the Management Program in accordance with applicable EPA guidance	Management Program updates	0	0	
LT/2	Nonpoint Source Performance Partnership Grant (PPG) End of Year Reports	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	Due to EPA January 2021

table continued on next page

# Texas Nonpoint Source Management Program Milestones

(continued)

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2020 <sup>1</sup> Estimate	2020 Actual	Comments
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	0	0	
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 based upon information and recommendations derived through the WAP process as described in the Management Program	Priority Watersheds Report Updates	1	0	
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	0	0	Postponed due to COVID-19
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	1	One canceled due to COVID-19

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# Texas Nonpoint Source Management Program Milestones

(continued)

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2020 <sup>1</sup> Estimate	2020 Actual	Comments
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	305	
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	4	
ST2/A,C	Watershed Coordination	The state will support watershed coordination projects which facilitate the implementation of WPPs	Watershed coordination projects	9	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	3	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	51	
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	

table continued on next page

## Texas Nonpoint Source Management Program Milestones (continued)

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2020 <sup>1</sup> Estimate	2020 Actual	Comments
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	4	
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	32	
ST2/B,C	Load Reductions (Nitrogen)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ <sup>(2)</sup>	98,121.02 lbs/yr	Numbers reflect projects with load reductions reported in fiscal year 2020
ST2/B,C	Load Reductions (Phosphorus)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ <sup>(2)</sup>	71,799.47 lbs/yr	Numbers reflect projects with load reductions reported in fiscal year 2020
ST2/B,C	Load Reductions (Sediment)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ <sup>(2)</sup>	2,753.21 tons/yr	Numbers reflect projects with load reductions reported in fiscal year 2020
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	10	Numbers reflect active projects

<sup>1</sup> Estimates are from the 2017 Texas Nonpoint Source Management Program report

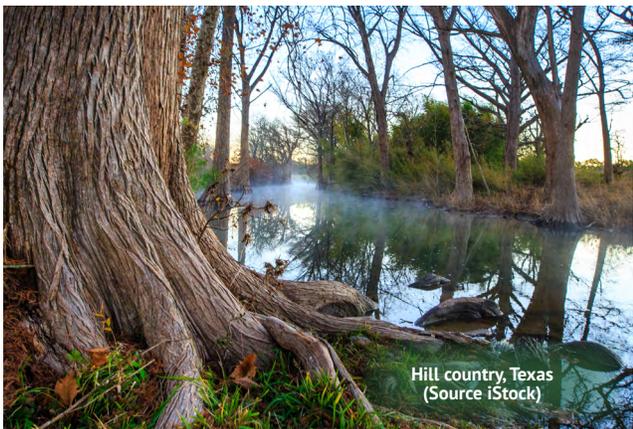
<sup>2</sup> RQ – Reportable Quantity



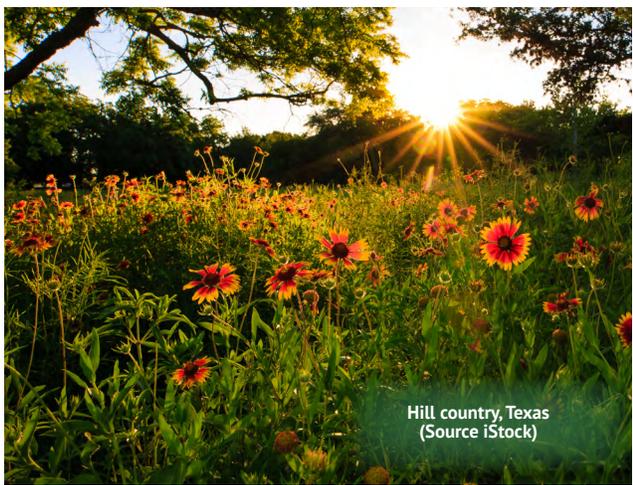
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