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2012 ANNUAL REPORT

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Managing

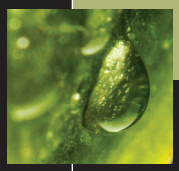
nonpoint source pollution in Texas

Texas Commission on Environmental Quality

Texas State Soil & Water Conservation Board

SFR-066/12

January 2013



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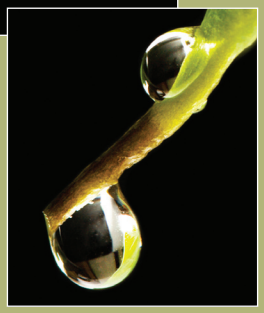

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January 2012

Letter From THE Executive Directors

2012 ANNUAL REPORT

The EPA provides grant funding to Texas to implement the *Texas Nonpoint Source (NPS) Management Program* . The *NPS Management Program* outlines Texas' comprehensive strategy to protect and restore waters impacted by NPS pollution. The *NPS Management Program* utilizes regulatory, voluntary, financial, and technical assistance approaches to achieve a balanced program. The responsibility for implementing this program is divided between the TCEQ and the TSSWCB.

While the record-setting drought and wildfires of the past few years have had significant impacts on the state, the NPS Program has continued to achieve success, including recognition by EPA for two water-quality improvement "Success Stories," updating the *NPS Management Program,* and implementing the state's Watershed Action Planning (WAP) process. The update to the *NPS Management Program* was approved by the EPA on August 17, 2012.

WAP is an approach that emphasizes the role of partner agencies and stakeholders, relies on sound technical information, and makes available multiple options to provide the flexibility needed to address varied watershed conditions and circumstances. The objective of the approach is to plan, implement, and track water quality management strategies to protect and restore water quality in an efficient, effective, and appropriate manner. The ultimate goal of the WAP process is to achieve restoration of designated uses in impaired water bodies. This can be accomplished by attaining socially acceptable and economically bearable solutions based on environmental goals that are grounded in defensible water quality standards and supported by credible water quality data.

We are pleased to present the *2012 Annual Report* of the state's *NPS Management Program.* The report highlights our achievements in managing NPS pollution and meeting the goals of the program in 2012. In partnership with the EPA and other federal, state, regional, and local watershed stakeholders, the TCEQ and the TSSWCB look forward to implementing an effective program that has the support of stakeholders, and is accountable and transparent to the citizens of Texas.

Sincerely,

Rex Isom
Executive Director
Texas State Soil and
Water Conservation Board

Zak Covar
Executive Director
Texas Commission on
Environmental Quality

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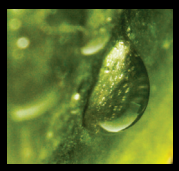

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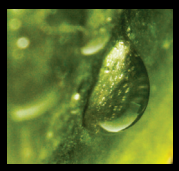


Introduction

Defining Nonpoint Source Pollution

Nonpoint source (NPS) pollution is all water pollution that does not come from point sources. Point sources are regulated "end-of-pipe" outlets for wastewater or stormwater from industrial or municipal treatment systems.

NPS pollution occurs when rainfall or snowmelt flows off the land, roads, buildings, and other features of the landscape. This runoff carries pollutants into drainage ditches, lakes, rivers, wetlands, coastal waters, and even underground sources of water. NPS pollution also includes flow of polluted water from sources such as car washing and leaking septic tanks. Common NPS pollutants include:

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

Some NPS pollution originates as air pollution deposited onto the ground and into waterways, called atmospheric deposition. Changes in the flow of waterways due to dams and other structures—hydromodification—can also cause NPS pollution.

What Guides Nonpoint Source Pollution Management in Texas?

Under the federal Clean Water Act (CWA), Texas and other states must establish water quality standards for waters in the state, regularly assess the status of water quality, and implement actions necessary to achieve and maintain those standards. The long-term goal of the *Texas NPS Management Program* is to protect and restore the quality of the state's water resources from the adverse effects of NPS pollution. This is accomplished through cooperative implementation using the organizational tools and strategies defined below.

Partnerships

The Texas Commission on Environmental Quality (TCEQ) is designated by law as the lead state agency for water quality in Texas, including the issuance of permits for point source discharges and abatement of NPS pollution from sources other than agricultural or silvicultural. The Texas State Soil and Water Conservation Board (TSSWCB) is the lead agency in the state for planning, implementing, and managing programs and practices for preventing and abating agricultural and silvicultural NPS pollution. The TCEQ and TSSWCB jointly administer the *Texas NPS Management Program.*

Management of NPS pollution in Texas involves partnerships with many organizations to coordinate, develop, and implement the *Texas NPS Management Program*. With the extent and variety of NPS issues across Texas, cooperation across political boundaries is essential. Many local, regional, state, and federal agencies play an integral part in managing NPS pollution, especially at the watershed level. They provide information about local concerns and infrastructure and build support for the pollution controls that are necessary to prevent and reduce NPS pollution. By coordinating with these partners to share information and resources and to develop and implement strategies together, the state can more effectively focus its water quality protection and restoration efforts.

Texas Updates the State Nonpoint Source Management Program

Section 319 of the federal CWA requires states to develop and periodically update a plan for managing NPS pollution. Texas Governor Rick Perry submitted the 2012 update to the *Texas NPS Management Program* to the U.S. Environmental Protection Agency (EPA) on June 18, 2012. The EPA granted approval on August 17, 2012.

In Texas, the water quality assessment indicates NPS pollution contributes to approximately 45% of the water quality impairments to rivers and streams and 48% of the water quality impairments to lakes in Texas.

South Fork of the Guadalupe River in Hunt - *Photo by Travis Linscomb, Upper Guadalupe River Authority*

To address these issues, the *NPS Management Program* has been developed to utilize regulatory, voluntary, financial, and technical assistance approaches to achieve a balanced program. NPS pollution is managed through assessment, planning, implementation, and education. The state has established long- and short-term goals and objectives for guiding and tracking the progress of NPS management in Texas. Success in achieving the goals and objectives is included in this report.

Implementation of the *Texas NPS Management Program* involves partnerships among many organizations. With the extent and variety of NPS issues across Texas, cooperation across political boundaries is essential. Many local, regional, state, and federal agencies play an integral part in managing NPS pollution, especially at the watershed level. They provide information about local concerns and infrastructure and build support for the kind of pollution controls that are necessary to prevent and reduce NPS pollution. By establishing coordinated frameworks to share information and resources, the state can more effectively focus its water quality protection efforts.

The EPA's NPS Program makes available federal grant funds through the EPA to states for the implementation of best management practices (BMPs). In 2012, Texas received $7,431,000 in federal funds under Section 319(h). A major new element in the *NPS Management Program* is the inclusion of the Watershed Action Planning (WAP) process and the Priority Watersheds Report. The WAP process is a new initiative of the water quality planning programs in the state to respond to the increasing challenges faced by the programs. These challenges include the large number of water quality impairments documented in the state and the need to coordinate among multiple stakeholders. The WAP process guides statewide water quality planning by selecting management strategies to address water quality issues through a collaborative approach. This comprehensive planning approach allows for greater flexibility and the public participation process facilitates coordination and leveraging resources.

Goals for Nonpoint Source Management

Long-Term Goal

The long-term goal of the *Texas NPS Management Program* is to protect and restore water quality affected by NPS pollution through 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, NPS-impacted watersheds, vulnerable and impacted aquifers, or areas where additional information is needed.

Goal Two—Implementation

Implement Total Maximum Daily Load (TMDL) Implementation Plans (I-Plans) and/or Watershed Protection Plans (WPPs) and other state, regional, and local plans/ programs to reduce NPS pollution by targeting implementation activities to the areas identified as impacted or potentially degraded with respect to use criteria by NPS pollution.

Goal Three—Education

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

The Watershed Approach

Protecting the state's streams, lakes, bays, and aquifers from the impacts of NPS 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:

- 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 accepted, economically bearable, and based on environmental goals.

Lanana Creek - *Photo by Jeremiah Poling, Angelina and Neches River Authority*

Figure 1-1.

Social, Economic, and Environmental Considerations to Achieve Water Quality Restoration

Watershed Action Planning

The WAP process was initiated by the Texas water quality planning programs to respond to the increasing challenges of addressing water quality issues. This comprehensive approach ensures coordination among all stakeholders as well as providing greater flexibility, and leveraging of resources. The WAP process provides for three levels of coordination. First, coordination at the local level allows stakeholders an opportunity to provide a local perspective, better document circumstances, and suggest strategies and priorities. Second, at the program level, interagency workgroups of surface water quality program partners meet to consider local input and other information for integration into program activities. Third, statewide interagency coordination allows for project development and the implementation of water quality management strategies through the appropriate venues and with watershed stakeholder support.

The WAP process utilizes relevant information from existing planning tools and information developed from the coordination process to develop and track water quality management strategies. Selected management strategies are documented and tracked through the WAP Table (excerpt shown in Table 1-1). The WAP Table is maintained by TCEQ, with the support of partner agencies, and includes information identifying the segment, the water quality impairment or priority interest, what will be done to

address the water quality issue (i.e., which strategy will be applied), the current status of that strategy, and the lead entity. The WAP process increases the transparency of the state's water quality planning programs by presenting the list of priority waters in such a manner as to communicate activities and intentions collectively to affected stakeholders and the public at large.

Significant progress has been made towards the goals of the WAP process throughout the 2012 fiscal year with cooperation of the WAP partners including the TSSWCB, the Clean Rivers Program (CRP) partners (typically river authorities), and the five TCEQ Water Quality Planning Division program areas—Texas Surface Water Quality Standards (TSWQS), Surface Water Quality Monitoring (SWQM), CRP, TMDL, and the NPS Program.

The WAP partners met throughout the fall of 2011 to undertake a statewide review of impairments, to document any restoration strategies previously determined, and to recommend strategies for those impairments without a previously-determined strategy. Meetings were organized by river basins and were further grouped by CRP partner or geographic nexus. The recommended strategies—along with the status of the strategy, and the lead agency or TCEQ group responsible for tracking progress on the strategy—were documented and published in the WAP Table. The WAP Table is the public document summarizing the water quality management information maintained by the agencies. The WAP partners agreed to update the WAP Table at a minimum of every two years, following the state's approval of a new *Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d) (Integrated Report)*. An excerpt of the WAP Table is provided in Table 1-1.

An interactive, web-based WAP Tool is being developed to replace the existing WAP Table (Excel spreadsheet) that captures the WAP decisions. Upon completion of the WAP Tool, the WAP Table information will be migrated to the finalized WAP Tool. Following the migration, the WAP partners will be trained on data input.

Table 1-1.
Watershed Action Planning Table Excerpt

Segment & Assessment Unit	Segment Name	Impairment	Ingegrated Report Category	WAP Strategy	Status	Lead
0222_01	Salt Fork Red River	Bacteria	5b	Monitoring	Scheduled	TCEQ-Clean Rivers Program
0606_01	Neches River Above Lake Palestine	Bacteria	5c	Evaluation	Planning	TCEQ- SWQM
1208_01	Brazos River Above Possum Kingdom Lake	Bacteria	5b	TSWQS Review	Underway	TCEQ- TSWQS
1014_01	Buffalo Bayou Above Tidal	Bacteria	4a	TMDL/I-Plan	Underway	TCEQ-TMDL
1221_01	Leon River Below Proctor Lake	Bacteria	5b	WPP, WQS Review	Underway	TSSWCB-Statewide Resource Management
1815	Cypress Creek	Special Interest	SI	WPP	Underway	TCEQ- NPS

Progress in Improving Water Quality

Section 319(h) of the CWA requires that state NPS 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 NPS pollution control actions in order to "…attain or maintain applicable water quality standards or the goals and requirements of the Clean Water Act."

The two primary ways of measuring improvement in water quality are through:

- reductions in pollutant loadings resulting from management measures implemented, estimated with the help of models or other calculations
- water quality improvements measured by changes in pollutant concentrations before and after implementation of management measures

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

Hunt crossing on the South Fork Guadalupe River in Hunt - *Photo by Tara Bushnoe, Upper Guadalupe River Authority*

Reductions in Pollutant Loadings

Lower Colorado River Authority's Creekside Conservation Program

The Creekside Conservation Program, administered by the Lower Colorado River Authority (LCRA) with CWA Section 319(h) funding managed by the TSSWCB and provided by the EPA, is a partnership between LCRA, private landowners, the U.S. Department of Agriculture–Natural Resources Conservation Service (USDA–NRCS), and local soil and water conservation districts (SWCDs). The Creekside Conservation Program provides a cost-share incentive to help reduce soil erosion and agricultural NPS pollution on privately owned land. The Creekside Conservation Program is being conducted in Bastrop, Blanco, Burnet, Colorado, Fayette, Lampasas, Llano, Matagorda, San Saba, Travis, and Wharton Counties.

In fiscal year 2012, this effort placed 6,535 acres under conservation management. BMPs installed in the last year included one pond, 7,585 linear feet of cross fencing, and 116 acres of brush management. Additionally, prescribed grazing and upland wildlife habitat management

North Fork of the Guadalupe River in Hunt - *Photo by Travis Linscomb, Upper Guadalupe River Authority*

practices were implemented on all 6,535 management acres.

According to the Texas BMP Evaluation Tool (TBET), these BMPs achieved the following load reductions:

Sediment	15 tons
Phosphorus	2,511 lbs
Nitrogen	26,265 lbs

In addition to technical and financial assistance, the LCRA project coordinator promoted the Creekside Conservation Program at two workshops and field days with a total of approximately 200 attendees. More information can be found at <lcra.org/community/conservation/creekside.html>.

San Antonio River Education

The San Antonio River Authority (SARA) received a CWA Section 319(h) grant from the TCEQ for a bacteria reduction project in the River Walk portion of the Upper San Antonio River. The project is an implementation measure of the Upper San Antonio WPP. A community approach was taken and the River Walk Watershed Alliance consisting of local governmental, business, and neighborhood associations was formed to tackle the problem of changing people's behavior to reduce bacteria in the river. The Alliance initiated an education campaign to change behaviors that contributed to bacteria in the river. *Escherichia coli* (*E. coli*) data collected prior to the project and after implementation of the education campaign indicate that greater than 25 percent reduction has been attained. Additionally, a vacuum pavement washing system paid for under the project was used on walkways, parking lots, and other non-traffic surfaces surrounding the River Walk. This unit it is one of several units operating in the area. The following reductions were quantified for pavement washing system

Sediment	2.3 tons
E. coli	10 trillion (MPN)

Additional River Walk Watershed Alliance activities and information can be found at <www.riverlifeloveit.org>.

Water Quality Improvements

Buck Creek Success Story

The Buck Creek watershed covers 289 square miles within the Red River Basin in the Central Great Plains of Texas. Located in the southeastern corner of the Texas Panhandle near the Oklahoma state line, Buck Creek is a small stream surrounded by rural and agricultural landscapes, with land uses primarily devoted to row crops and grasslands.

Water quality data collected between 1997 and 2005 showed that the geometric mean for *E. coli* bacteria concentrations within Buck Creek was 262.08 colony-forming units of bacteria per 100 milliliters of water (262.08 CFU/100 mL). TSWQS require that *E. coli* levels not exceed a geometric mean of 126 CFU/100 mL over a seven-year assessment period. Because data showed elevated bacteria levels, TCEQ added Buck Creek to the *CWA Section 303(d)* List of impaired waters in 2000 for not supporting its primary contact recreation use.

Beginning in May 2004, Texas A&M AgriLife Research personnel, funded by a CWA Section 319 grant from the TSSWCB, conducted water quality monitoring in Buck Creek to identify potential pollutant sources contributing to the creek.

Texas A&M AgriLife Research, the Texas Water Resources Institute (TWRI), and the TSSWCB jointly guided local stakeholders through the watershed planning process for Buck Creek. Stakeholders reviewed the water quality monitoring results, bacterial source tracking findings, and watershed modeling scenarios to make decisions on water quality goals and priority BMPs needed to restore and protect water quality in Buck Creek. The project team conducted education and outreach, including field days for agricultural producers to demonstrate BMP implementation and to encourage the producers to adopt BMPs as a way to both improve water quality and enhance their operations.

Local landowners voluntarily implemented a number of agricultural BMPs to support grazing management, including:

- Installing off-stream alternative watering sources for livestock, which can reduce in-stream bacteria levels by 50–85 percent by making upland areas more desirable and drawing livestock away from riparian areas

- Implementing prescribed grazing systems to adjust stocking rates and grazing intensity
- Installing cross-fencing to manage livestock distribution and access to riparian areas.

In collaboration with landowners, the TSSWCB certified nine water quality management plans (WQMPs) that implemented prescribed grazing on 29,630 acres. The NRCS developed conservation plans that include prescribed grazing on an additional 4,520 acres. Landowners also collaborated with the USDA Wildlife Services to conduct feral hog (an invasive species) abatement and removal activities. In total, Wildlife Services performed aerial control on 45,867 acres, removing 258 hogs.

Water quality monitoring data show that the long-term *E. coli* geometric mean in Buck Creek now complies with the state's water quality standard. Data show a decrease in the geometric mean from 262.08 CFU/100 mL (1997–2005) to 31.07 CFU/100 mL (2002–2009). As a result, TCEQ removed a 28-mile segment of Buck Creek from the state's list of impaired waters in 2010 for bacteria. The success of this effort is attributed to education and outreach programming and landowners' voluntary implementation of BMPs throughout the watershed.

Over $719,000 in CWA Section 319(h) funds from the TSSWCB, paired with more than $459,000 in non-federal matching funds from Texas A&M AgriLife Research, supported these efforts in the Buck Creek watershed. The full EPA Buck Creek Success Story can be found at the following website <water.epa.gov/polwaste/nps/success319/tx_buck.cfm>.

Tres Palacios Success Story

Tres Palacios Creek (Segment 1502) flows through Wharton and Matagorda Counties in south central Texas and eventually empties into Tres Palacios Bay. The stream segment was placed on the *Texas 303(d)* List in 1996 for not attaining its contact recreation use criteria due to elevated bacteria levels.

Public outcry in 2002 focused attention on the increasing amount of illegal dump sites and illegal discharging of septic waste along segment 1502 in Matagorda County. In consultation with the TCEQ and the EPA, the LCRA used CWA Section 319 funds to develop an anti-dumping public education and enforcement campaign. The outreach part of the project involved installing "No Dumping" signs at 37 bridge crossings, creating billboards with anti-dumping slogans in 24 locations, airing a 30-second radio spot on 12 radio stations, and organizing three local cleanup events in the Tres Palacios watershed. The enforcement portion of the project involved funding an illegal dumping hot line, security cameras, and multiple investigations of illegal dumping sites. Segment 1502 was not included on the *2010 Texas 303(d) List* because bacteria levels met contact recreation use criteria. *E. coli* data used for the *Integrated Report* assessments can be found in Table 2.1.

Funding for this project involved multiple in-kind sources and the cooperation of many partners. A total of $177,000 of CWA Section 319 funds were used to initiate the project with TCEQ and LCRA in 2003. LCRA and its partners provided over $118,000 in matching funds. The Capital Area Council of Governments and LCRA provided additional funding for the activities in the amount of $79,000.

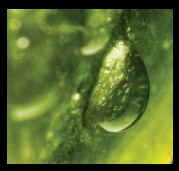
The EPA Tres Palacios Success Story can be found on the EPA NPS Program website at <water.epa.gov/polwaste/nps/success319/tx_tres.cfm>.

Table 2-1.
E.coli Data on Tres Palacios Creek

Assessment Year	Number of Samples	Geomean (cfu/100mL)	Criteria (cfu/100mL)
2010	23	111.7	126
2008	20	135.01	126
2006	32	238	126
2004	69	141	126
2002	69	141	126

Note 1: Geomeans calculated for E. coli grab samples taken at TCEQ Station12517 on Segment 1502.
Note 2: Segment 1502 was not reassessed in 2004.

Sunset on Coleto - *Photo by Steve Szafranski, courtesy of GBRA*



Progress Toward Meeting the Goals and Objectives of the Texas Nonpoint Source Management Program

The TCEQ and the TSSWCB have established goals and objectives for guiding and tracking the progress of NPS management in Texas. The goals describe high-level guiding principles for all activities under the *Texas NPS 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 NPS Management Program*.

Clean Water Act Section 319(h) Grant Program

Section 319(h) of the CWA established a grant that is appropriated annually by Congress to the EPA. The EPA then allocates these funds to the states to implement activities supporting the Congressional goals of the CWA. The TCEQ and the TSSWCB target these grant funds toward NPS activities consistent with the long- and short-term goals defined in the *Texas NPS Management Program*.

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

In fiscal year 2012, the TCEQ had 38 active multi-year CWA Section 319(h) grant-funded projects totaling in a budget of approximately $15 million in federal funds, addressing a wide range of NPS issues (Figure 3-1). These projects focus on the development and implementation of WPPs and TMDLs where the primary sources of NPS pollution are not agricultural or silvicultural. Other project types include low impact development (LID) projects, support of a state-wide volunteer water quality monitoring program, urban stormwater retrofits, on-site sewage facility (OSSF) maintenance and education, and a variety of BMPs chosen on the basis of local water quality priorities.

In fiscal year 2012, the TSSWCB had 52 active multi-year CWA Section 319(h) grant-funded projects totaling in a budget of approximately $14 million in federal funds addressing a wide array of agricultural and silvicultural NPS issues (Figure 3-2). Specific projects include developing and implementing WPPs and TMDLs, supporting targeted educational programs, and implementing BMPs to abate NPS pollution from dairy and poultry operations, silvicultural activities, grazing operations, and row crop operations.

Figure 3-1.
TCEQ Fiscal Year 2012 Nonpoint Source Grant-Funded Projects

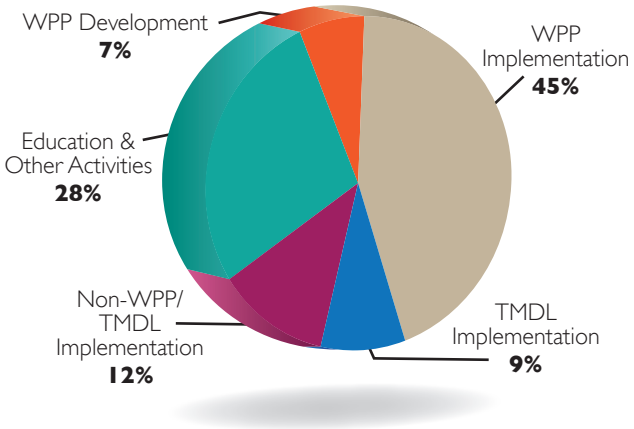
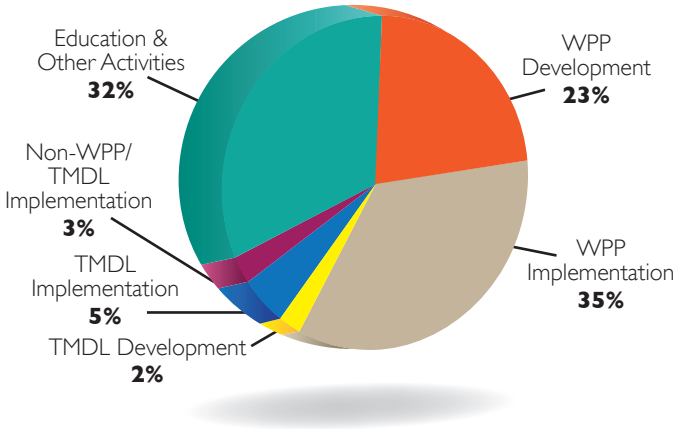


Figure 3-2.
TSSWCB Fiscal Year 2012 Nonpoint Source Grant-Funded Projects



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 NPS 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 private sector and citizen groups. The TCEQ's SWQM Program, operating from the central office and 16 regional offices, conducts both routine ambient monitoring and special studies. In addition, the CRP, a collaboration between the 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, the TCEQ acquires water quality data from other state and federal agencies, river authorities, and municipalities after assuring the quality of the data are comparable to that of data collected by the TCEQ's programs.

Data are assessed by the TCEQ to determine if a water body meets its designated uses or if water quality improvement activities are achieving their intended goals. For impaired waters, water quality data can be used in the development of WPPs and TMDLs. Data are also used to determine sources of pollution and the adequacy of regulatory measures, watershed improvements, and restoration plans. The data collection primarily guides the distribution of CWA Section 319(h) grant funds toward water quality assessment activities in high priority, NPS-impacted watersheds, vulnerable and impacted aquifers, or areas where additional information is needed.

Texas Integrated Report

Section 305(b) of the CWA requires all states to assess the quality of surface waters every two years. The *2010 Integrated Report* describes the status of all surface water bodies of the state evaluated for the given assessment period. To accomplish this, the TCEQ uses data collected during the most recent seven-year period (December 1, 2001-November 30, 2008). The descriptions of water quality present a snapshot of conditions during the limited time period considered in the assessment. Water bodies identified as impaired by NPS pollution are given priority for CWA Section 319(h) grants and other available funding. Guidance for developing the assessment is based on a set of methods that apply the TSWQS, or goals for water quality. These methods are developed by the TCEQ with the advice of a diverse group of stakeholders, and are detailed in the *2010 Guidance for Assessing and Reporting Surface Water Quality in Texas* (available online at <www.tceq.texas.gov/assets/public/compliance/monops/water/10twqi/2010_guidance.pdf>.

The *CWA Section 303(d)* List is an important management tool produced as part of the Integrated Report. It identifies waters for which the existing preventative measures, such as permits that limit discharge of wastewater and the technology used by the dischargers, are not sufficient to meet TSWQS (impairments). The *CWA Section 303(d)* List must be approved by EPA prior to being implemented by TCEQ water quality management programs.

Categories Indicate Water Quality Status

The *2010 Integrated Report* assigns each assessed water body to one of five categories in order to report water quality status and potential management options to the public, the EPA, state agencies, federal agencies, municipalities, and environmental groups. These categories indicate the status of a water body and describe how the state will approach identified water quality problems. Table 3-1 defines the five categories and shows the number of water bodies assigned to each assessment category in 2010.

Water bodies on the *CWA Section 303(d)* List (Category 5 of the *Integrated Report*) are those water bodies that require remedial action by the state to restore water quality. The combination of the water body with the pollutant or condition of concern is called an *impairment*. For example, the concentration of dissolved oxygen (DO) is one of the criteria used to determine the support of the aquatic life use. If DO concentrations are too low, the water body being evaluated will have an aquatic life use impairment. In some cases a single water body may be impaired for multiple parameters. This explains why the

Table 3-1.
Number of Water Bodies Assigned to Each Assessment Category in the 2010 Integrated Report

Category	Definition	Number of Water Bodies
1	Attaining all the water quality standards and no use is threatened.	33
2	Attaining some of the designated uses, no use is threatened, and insufficient or no data and information are available to determine if the remaining uses are attained or threatened.	405
3	Insufficient or no data and information to determine if any designated use is attained. Many of these water bodies are intermittent streams and small reservoirs.	282
4	The standard is not supported or is threatened for one or more designated uses but does not require the development of a TMDL.	55
5	The water body does not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants *(CWA Section 303(d) List)*. Category 5 is the *CWA Section 303(d) List*.	440
Totals		**1215**

Table 3-2.

Number of Impairments in the *2010 Integrated Report* Requiring Remedial Action

Category	Definition	Water Body Classification		Total Number of Impairments
		Classified	Unclassified	
5	5a—TMDL scheduled or underway	89	96	185
	5b—Water Quality standards review scheduled or under way or undergoing Use Attainability Analysis	74	174	248
	5c—Need additional monitoring	100	88	188
Total Number of Impairments in Category 5		**263**	**358**	**621**

total number of impairments in Table 3-2 is greater than the number of water bodies in Category 5 in Table 3-1. Since a water body has multiple uses, it may fall into different categories for different uses. In that case, the overall category for the water body is the one with the highest category number.

The *Integrated Report* further divides these water bodies into subcategories to reflect additional options for addressing impairments.

- For water bodies in Category 5a, a TMDL is underway, scheduled, or will be scheduled
- Water bodies in Category 5b require a review of the existing TSWQS before a TMDL is scheduled
- Those water bodies in Category 5c require additional data and information before a TMDL or review of the water quality standard is scheduled

Table 3-2 shows the total number of impairments broken down by the category designation. The categories must be applied to each combination of water body and parameter for determining support.

Summary of the 2010 Integrated Report

The *2010 Integrated Report* assessed the water quality of 1,215 water bodies. Enough data was available to determine at least one use attainment for 1,066 of these water bodies.

Of the 1,066 water bodies, 440 were classified as Category 5 water bodies. This was a slight increase from the *2008 CWA Section 303(d) List*, which included 386 water bodies. The total number of impairments also increased from 518 to 621 (Table 3-2). Public comment was solicited from February 8 through March 5, 2010. The *2010 Integrated Report* was approved for submission to the EPA by the TCEQ on August 25, 2010, and was approved by EPA on November 18, 2011.

Summary of 2010 Impairments

Impairments identified in the 2010 Integrated Report have been grouped by the parameter and the beneficial use of the water body affected (Table 3-3). Elevated levels of bacteria

Table 3-3.

Summary of Impairments Identified on the *CWA Section 303(d) List* for the *2010 Integrated Report*

Impairment Group	Media	2008 Number of Impairments	2010 Number of Impairments	Use
Bacteria	in water	274	303	recreation
	in shellfish	21	15	oyster waters
	beaches	2	1	beach use
Dissolved oxygen	in water	84	94	aquatic life
Toxicity	in ambient water	5	2	aquatic life
	in ambient sediment	6	6	
Organics	in water	0	0	fish consumption, aquatic life
	in fish or shellfish	34	94	
Metals (except mercury)	in water	4	6	fish consumption, oyster waters, aquatic life
	in fish or shellfish	0	0	
Mercury	in water	1	1	fish consumption, oyster waters, aquatic life
	in fish or shellfish	17	23	
Dissolved solids	chloride	16	13	general
	sulfate	6	9	
	total dissolved solids	8	13	
Temperature	in water	0	0	general
pH	in water	16	17	general
Nutrients	nitrogen	0	0	general, public water supply
Biological	habitat, macrobenthic community, or fish community	24	24	aquatic life
Totals		**518**	**621**	

represent 52 percent of the listed impairments. Many of these bacteria impairments are the result of urban and agricultural NPS pollution. Low DO, impairing many of the same water bodies, results in an unhealthy environment for aquatic life. DO levels can be affected by both point source and NPS oxygen-demanding substances, including nutrients, which over-enrich aquatic plant and algae communities. Contaminants in fish tissue may originate from a variety of sources and typically include compounds that persist and bioaccumulate in the environment over long periods of time (such as PCBs and certain pesticides). Some of these contaminants were banned through federal regulation in the 1970s but continue to be present based on recent sampling efforts.

Continuous Water Quality Monitoring Network

In 2001, the TCEQ established a continuous water quality monitoring network (CWQMN). The purpose of the network is to use advanced technologies to enhance the state's SWQM program. CWQMN sites are designed to meet site-specific data needs. Most sites monitor conventional parameters such as temperature, pH, DO, and specific conductance. Several of the sites can also monitor nutrients, turbidity, and/or chlorophyll.

The CWQMN collects and displays ambient water quality data in near real time, meaning that the data collected in the field are reported almost immediately to the TCEQ. The stations, located throughout Texas, use a combination of *in situ* probes and automated analysis instruments. Data are transmitted from the stations to the TCEQ using phone modems, wireless modems, and satellite telemetry. Once data are transferred, they are stored in the Leading Environmental Analysis and Display System (LEADS) database. The data can be accessed by the public via the Web at <www.texaswaterdata.org>.

During fiscal year 2012, the TCEQ accomplished the following:

- Developed unique sondes for the Lower Rio Grande Valley (LRGV) CWQMN stations to mitigate physical and biological fouling
- took four stations out of service including North Bosque River at Cooper's Crossing, Big Cypress, Rio Grande at Rio Grande City, and Lake Whitney

Continuous Water Quality Monitoring Station control and power center in the Guadalupe River Basin - *Photo by GBRA*

- established two new cooperative station with TSSWCB on the Pecos River near Langtry, Texas, and near Orla, Texas

In fiscal year 2012, the TCEQ worked to improve data return, data management, operator training, and instrument selection and continued incorporating measurement of bio-fouling and drift at selected sites; these efforts will be continued in fiscal year 2013. Additional CWQMN sites may be deployed, relocated, or removed in fiscal year 2013.

The TCEQ maintains a prioritized list of continuous monitoring proposals for deployment in fiscal year 2013 and beyond. Personnel from water programs throughout the TCEQ, with input from cooperators outside the agency, base the list on the following criteria:

- demonstrated data needs
- availability of monitoring technology to address the specific data needs
- intended use of data
- availability of personnel—internal or external—for operation and maintenance (including data validation)

Numerous organizations cooperate with the TCEQ in the CWQMN by funding operation and maintenance of selected stations and/or operating stations. These organizations include the following:

- Barton Springs / Edwards Aquifer Conservation District
- Bexar Metropolitan Water Supply
- City Public Service Energy of the City of San Antonio
- City of San Antonio—Public Center for Environmental Health
- Colorado River Municipal Water District
- Cow Creek Groundwater Conservation District
- Edwards Aquifer Authority
- Guadalupe-Blanco River Authority (GBRA)
- International Boundary and Water Commission, U.S. Section (IBWC)
- Nueces River Authority
- San Antonio Water System
- SARA
- South Texas Groundwater Alliance
- Toyota
- TSSWCB
- United States Geological Survey (USGS)
- Waste Management, Inc.
- Water Monitoring Solutions, Inc.

Several of the CWQMN sites have been established based on a need to monitor NPS pollution. The NPS sites include seven sites in the North Bosque watershed, three Edwards Aquifer recharge monitoring sites, 14 sites in the Upper Rio Grande watershed, eight sites in the Lower Rio Grande watershed, three in the Guadalupe River watershed, and two sites in the Upper Colorado River watershed.

Rio Grande Watermaster Continuous Water Quality Monitoring Network

Data from the CWQMN sites on the Rio Grande are used to assist with water use and agricultural production in the Rio Grande region. Agricultural return flows re-enter the Rio Grande at numerous locations between Falcon Dam and Anzalduas Dam. The Anzalduas Reservoir is an important diversion point for irrigation water for both Texas and Mexico. When the agricultural return-flows entering Anzalduas Reservoir from Mexico contain high concentrations of total dissolved solids (TDS), Mexico can divert those flows around the Anzalduas Reservoir via a constructed bypass called the El Morillo Drain to a coastal lagoon and then to the Gulf of Mexico.

The TCEQ installed the first CWQMN stations in the Lower Rio Grande on Anzalduas Reservoir at the dam and at

Hardwicke Farms in December 2006. The Anzalduas Dam station continues today but the Hardwicke Farms station was destroyed by Hurricane Alex in 2010 and was subsequently relocated. There are now eight CWQMN stations in the Lower Rio Grande project. The stations monitor temperature and specific conductance, which estimates TDS by multiplying specific conductance by 0.65. Water quality data are collected every 15 minutes and telemetered to the TCEQ database. Electronic notifications are automatically distributed when TDS concentrations are greater than 999 milligrams per liter (mg/L).

Based on these notifications, the Rio Grande Watermaster can request release of freshwater by the IBWC. The freshwater is released from upstream storage to dilute TDS to acceptable concentrations for irrigation purposes. The Watermaster also requests that the IBWC verify proper operation of the El Morillo Drain by Mexico. If Mexico does not release flows from the El Morillo Drain as scheduled, the waters released by the IBWC are taken from Mexico's water allocation.

Guadalupe River Basin Continuous Water Quality Monitoring Network

The GBRA received a CWA Section 319(h) grant to establish three real-time CWQMN stations throughout the Guadalupe River Basin from 2010 to 2012. The last station to be installed during this project was placed on Sandies Creek (Segment 1803B) southeast of Westhoff, Texas. The Sandies Creek TCEQ continuous ambient monitoring station was established and began remotely transmitting data to the TCEQ CWQMN on August 31, 2012. Sandies Creek was listed on the state *CWA Section 303(d) List* in 2006 for impairments of 24-hour DO mean, 24-hour DO minimum and *E. coli* (geometric mean). A TMDL study by the TSSWCB is currently underway to address these issues.

The station is located in the heart of the Eagle Ford shale development activities and within one mile of several newly established oil wells and (new) oil transfer pipelines. The placement of this station allowed the GBRA to observe a minor rainfall event over a three day period in December of 2011 that resulted in a negligible increase in stream flow, but a sizable spike in specific conductance from 2,500 microsiemens per centimeter (µS/cm) to 5,900 µS/cm. The station also confirmed the current stream impairments by recording a minimum DO level of 0.1 mg/L and a mean DO level of 4.0 mg/L over the 11 months of deployment data captured in fiscal year 2012. Sandies Creek has a "high" aquatic life use standard with a minimum DO requirement of 3.0 mg/L and a mean of 5.0 mg/L. The Guadalupe basin CWQMN sites continue to be run and maintained by GBRA to show baseline water quality conditions and improvements over time.

North Bosque River Watershed Assessment

The North Bosque River is located in central Texas with its headwaters originating in Erath County and extending over 90 miles before entering Lake Waco in McLennan County. From upstream to downstream the river flows by the cities of Stephenville, Hico, Iredell, Clifton, and Valley Mills. Excessive algal growth related to elevated nutrient concentrations lead to inclusion of the North Bosque River on the 1998 *CWA Section 303d List*. Through the TMDL process, phosphorus was identified as the nutrient limiting algal growth, and TMDLs for soluble phosphorus were approved for the North Bosque River in 2001. The I-Plan, adopted in 2002, focuses on improved management of animal waste as a primary strategy for addressing nonpoint sources of soluble phosphorus and sets phosphorus effluent limits on municipal wastewater treatment plants for point source controls.

To evaluate the effectiveness of I-Plan activities, the Texas Institute for Applied Environmental Research (TIAER) at Tarleton State University is monitoring surface water quality within the North Bosque River watershed through funding provided by the CWA Section 319(h) grant program. The monitoring involves routine sampling every two weeks at eight stations and storm sampling at seven of these stations with analysis of soluble phosphorus, total phosphorus, various nitrogen forms, and total suspended solids (TSS). Chlorophyll-*a* and bacteria are also routinely sampled, while stream stage and flow are recorded continuously at the seven storm monitoring stations. The purpose of this project is to evaluate progress toward meeting water quality goals, which includes various reductions in soluble phosphorus at stations along the river with an average reduction of about 50 percent.

During the past year, water quality data from the mid-1990s through 2011 were evaluated using trend analysis techniques on two datasets, one representing routine data and the other representing loadings derived from routine and storm data combined with continuous flow measurements. These analyses indicate decreasing trends in soluble phosphorus at four of six stations along the main stem of the North Bosque River and on two major tributaries (Table 3-4). Decreases at the main-stem station directly below Stephenville correlate to implementation of phosphorus control practices at the Stephenville wastewater treatment plant.

The effectiveness of implemented NPS management measures is demonstrated by the decrease in soluble phosphorus levels at the Green Creek station. NPS pollution has been identified as the primary source on the

TIAER field crew conducting routine monitoring on the North Bosque River near Iredell

Table 3-4.

Trends in soluble phosphorus along the North Bosque River for routine and loading data

Down arrows indicate a decreasing trend, while circles indicate no trend.

Station	Location	Years Evaluated	Routine	Loading
Main-stem Stations along the North Bosque River				
17226	Above Stephenville	1997-2011	●	●
11963	Below Stephenville	1994-2011	▼	▼
11961	Near Hico	1993-2011	▼	▼
18003	Near Iredell	2003-2011	●	no data
11956	Near Clifton	1996-2011	▼	▼
11954	Near Valley Mills	1996-2011	▼	▼
Major Tributary Stations				
13486	Green Creek	1996-2011	▼	●
11826	Neils Creek	1996-2011	▼	▼

Green Creek tributary which does not have any direct point source discharges. Decreases in soluble phosphorus at the station on Neils Creek (a least impacted station) and stations on the North Bosque River near Clifton and Valley Mills occurred largely prior to 2000, before practices were put in place, making it difficult to assess the impact of more recent phosphorus control practices.

In measuring progress based on I-Plan guidance comparing routine samples of soluble phosphorus to flow, the four most downstream index stations have met water quality goals in seven to nine of the past 11 years. At the fifth index station, which is upstream of Stephenville, the water quality goal was met in four of those years.

In 2011, elevated concentrations above target levels did occur at the three most downstream stations, but these exceedances were expected due to the very low flow rates during that time, brought on by extreme drought conditions. To aid in linking NPS management activities to improvements in water quality, an updated geospatial database of the location of waste application fields associated with animal feeding operations is being developed with completion expected within the next year of the project.

Goal Two—Implementation

The second goal of the *Texas NPS Management Program* involves the effective management of CWA Section 319(h) grant funds and the leveraging of additional funds. The state implements activities with the goal of

North Bosque near Hico under high flow conditions - *Photo by TIAER*

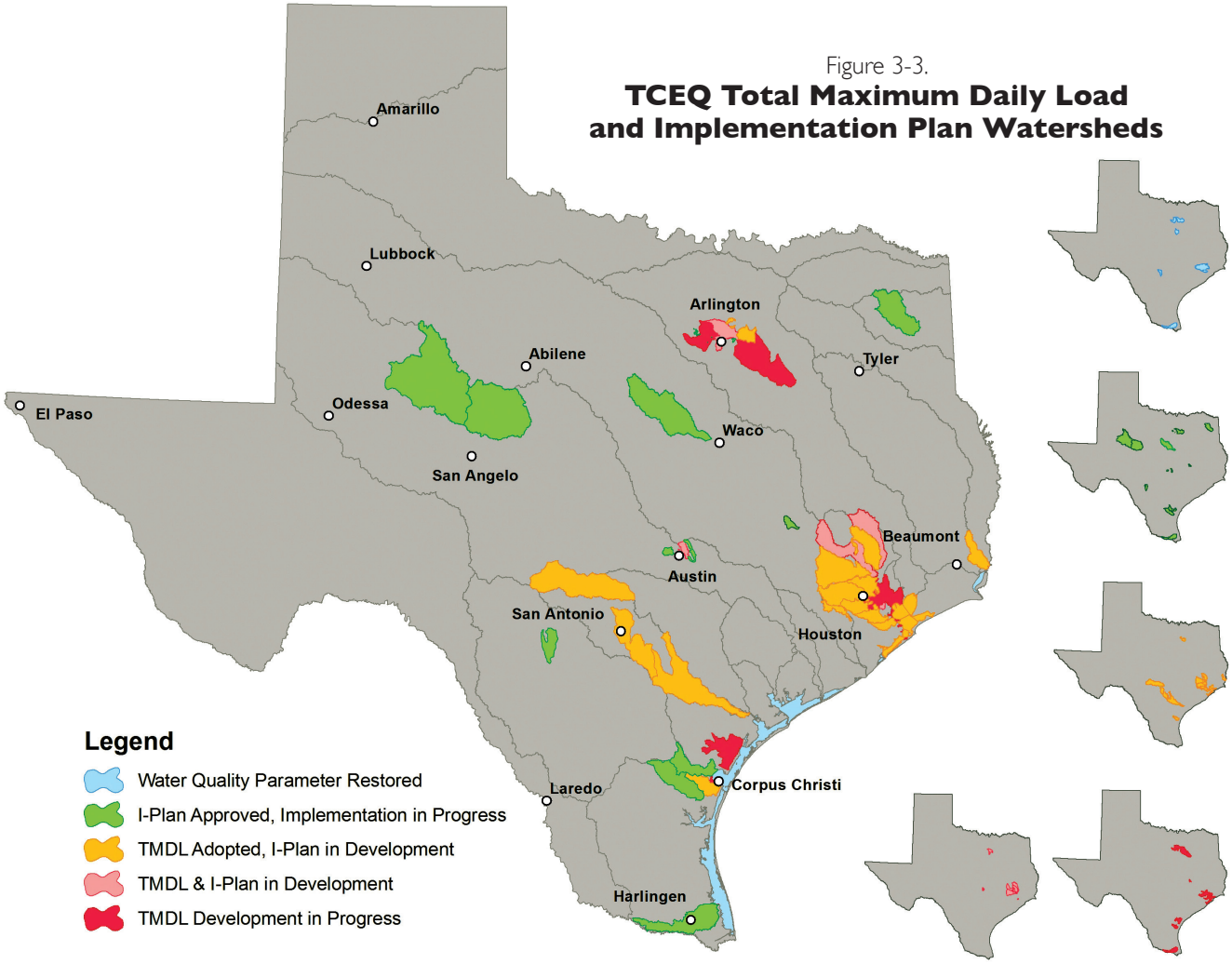


Figure 3-3.
TCEQ Total Maximum Daily Load and Implementation Plan Watersheds

preventing and reducing NPS pollution in surface water, groundwater, wetlands, and coastal areas. Activities include the implementation of TMDL I-Plans, WPPs, and the Texas Groundwater Protection Strategy; the development of TSSWCB-certified WQMPs; implementation of BMPs on agricultural and silvicultural lands; and other identified priorities.

Total Maximum Daily Loads and Implementation Plans

The state's TMDL program works to improve the quality of impaired or threatened water bodies in Texas. It is a major component of the state's strategy for managing water quality in Texas surface waters. The federal mandate for state TMDL programs is contained in Section 303(d) of the CWA. The EPA's implementing regulations in Title 40, Code of Federal Regulations, Part 130, require states to identify waters where effluent limitations alone are not sufficient to meet SWQS. The CWA further requires that, where point source controls are not sufficient to attain SWQS, a TMDL must be established to account for and allocate loadings from point, nonpoint, and natural sources of pollution.

The TCEQ and the TSSWCB are both responsible for developing TMDLs for Texas' water bodies. The TCEQ develops most TMDLs in Texas; however, the TSSWCB is involved in and may take the lead in developing TMDLs in watersheds where agricultural or silvicultural nonpoint sources are significant contributing pollutant sources. The TCEQ and the TSSWCB coordinate closely on all TMDLs in which agricultural or silvicultural NPS pollutants are involved, no matter which agency leads TMDL development. Regardless of who develops a TMDL, the TCEQ has jurisdiction for managing the overall quality of surface waters in Texas. The TCEQ must therefore adopt all TMDLs developed for Texas and is responsible for submitting adopted TMDLs to the EPA for approval.

The state is committed to developing TMDLs in a timely manner and implementing all approved TMDLs. Table 3-5 illustrates the status of the TCEQ's TMDL and TMDL I-Plan development.

Stakeholder groups drive the development of I-Plans for TMDLs. The TCEQ encourages stakeholders to begin work on an I-Plan before the TMDL is completed. This early start means that problems can be addressed more quickly.

It is essential to engage stakeholders in the watershed when developing plans to reduce pollution. Stakeholders—anyone whose interests may be affected by a TMDL project—provide the local expertise for identifying site-specific problems, targeting those areas for cleanup, and determining what measures will be most effective. Stakeholders include, among others, permitted wastewater dischargers, municipal and county governments, regional or state governmental agencies, agricultural producers,

recreational clubs, homeowners associations, environmental groups, industry groups and lobbyists, and interested individuals. Experts from local, regional, state, and federal agencies and universities also participate by giving technical and scientific support.

As of August 31, 2012, the TCEQ had approved TMDL I-Plans for several streams, reservoirs, and estuaries that are impaired in part due to NPS pollution. Table 3-5 lists TMDL watersheds with primarily NPS impairments, the uses of concern, the status toward meeting the designated uses, and total area restored or underway.

Watershed Protection Plans

The TCEQ and the TSSWCB apply the Watershed Approach to managing NPS pollution by supporting the development and implementation of WPPs. These plans are developed through local stakeholder groups who coordinate activities and resources to manage water quality. In Texas, WPPs facilitate the restoration of impaired water bodies and/or 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 WPPs can take many forms, the development of plans funded by CWA Section 319(h) grants must follow guidelines issued by the EPA. These guidelines can be found in the *Nonpoint Source Program and Grants Guidelines for States and Territories*, <www.epa.gov/fedrgstr/EPA-WATER/2003/October/Day-23/w26755.htm>.

In 2012, the TCEQ and the TSSWCB facilitated the development and implementation of WPPs 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 for preventing NPS pollution under the federal CWA is dedicated to the development and implementation of WPPs where NPS pollution has contributed to the impairment of water quality. There are also WPPs being developed, or that have been developed in Texas, by third parties independently of assistance from the TSSWCB and the TCEQ.

Table 3-5.

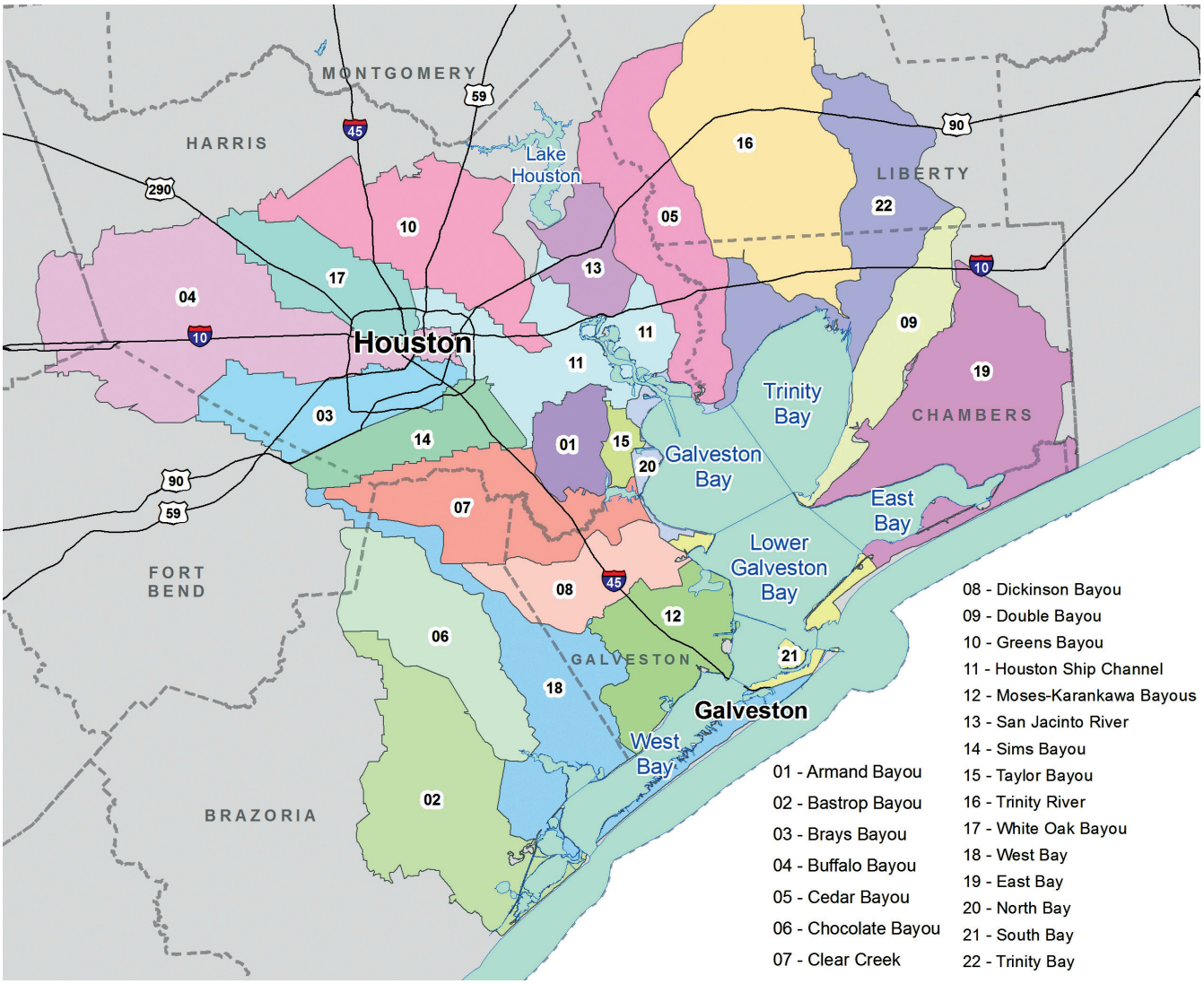
Total Maximum Daily Load Implementation Status for Nonpoint Source Related Water Quality Impairments

Uses of Concern & Watershed Name	Status	Segments with TMDLs*	Estuary Square Miles	Stream Miles	Reservoir Acres
Aquatic Life	**Total Restored**		**11**		
Lake O' the Pines	Underway	1			2,102
Contact Recreation					
Carters Creek	Underway	3		28	
Gilleland Creek	Underway	1		5	
Guadalupe River Below Canyon Lake	Underway	1		4	
Fish Consumption	**Total Restored**			**63**	**333**
Arroyo Colorado	Restored	2		63	333
Trinity River Basin in Dallas & Tarrant counties	Progress	3		127	2,710
Trinity River Basin in Fort Worth	Progress	5		11	38
Lake Worth	Underway				3,560
General	**Total Restored**			**30**	
Clear Creek: TDS and Chloride	Restored	1		30	
Colorado River Below E.V. Spence Reservoir	Progress	1		66	
E.V. Spence Reservoir	Progress	1			14,950
North Bosque River	Progress	2		119	
Petronila Creek	Underway	1		35	
Public Water Supply	**Total Restored**				**3,943**
Aquilla Reservoir	Restored	1			3,943
TOTAL Area Restored or Underway			**11**	**518**	**31,912**
TOTAL Area Restored			**11**	**93**	**4,276**

**Whole or partial segments counted as one unit. Some segments are duplicated due to impairment by multiple parameters.*

Figure 3-4.

Galveston Bay Estuary Program Watersheds



The following web link provides an overview and summary of WPPs in progress or completed in Texas by the TSSWCB, <www.tsswcb.texas.gov/wpp>, and the TCEQ, <www.tceq.texas.gov/goto/wpp>. Additional information regarding WPPs can be found in Chapter 4 of this report.

Texas Coastal Nonpoint Source Control Program

Section 6217 of the federal Coastal Zone Act Reauthorization Amendments of the Coastal Management Act requires coastal states and territories with federally approved Coastal Zone Management Programs to develop and implement a Coastal Nonpoint Source Pollution Control Program. At the federal level, Section 6217 is jointly administered by the National Oceanic and Atmospheric Administration (NOAA) and the EPA.

State coastal NPS programs must provide for implementation of management measures in conformity with guidance published by the EPA and NOAA. Management measures are defined as economically achievable measures for the control of NPS that reflect the greatest degree of pollutant reduction achievable through the application of the best available NPS pollution control practices.

NOAA and the EPA have approved the majority of the management measures in the Texas Coastal NPS Pollution Control Program, granting conditional approval to the program. Only a few measures relating to operating OSSFs; roads, highways, and bridges; new development; existing development; watershed protection; and site development remain to be fully addressed. Texas continues to implement its coastal NPS program and communicate with the federal agencies to achieve full approval of the outstanding conditions.

The Galveston Bay Estuary Program

The Galveston Bay Estuary Program (GBEP) is part of a network of 28 National Estuary Programs in the United States working with local stakeholders to restore and protect estuaries that are threatened by pollution, development, and overuse. GBEP addressed NPS through development and implementation of WPPs and TMDL I-Plans, NPS outreach and education through GBEP's stewardship campaign, and development and implementation of structural and nonstructural BMPs through water quality improvement projects.

With the help of the Estuary Program's strategic planning and direction, 80 percent of impaired water bodies in the Galveston Bay area are managed under a watershed-based plan. Figure 3-4 shows Galveston Bay subwatersheds covered by watershed-based management plans.

GBEP watershed activity updates as of fiscal year 2012 are as follows:

Moses-Karankawa Bayous

GBEP partnered with Texas A&M AgriLife's Coastal Watershed Program to initiate development of a WPP plan for Highland Bayou in 2010. Highland Bayou is listed on the *CWA Section 303(d) List* of Impaired Waters for low DO and high bacteria concentration. Phase one was funded by American Recovery and Reinvestment Act funds and included a watershed characterization report and public participation plan, which was completed in 2011. For phase two, funded by CWA Section 320 funds, the project area has expanded to include all waters from Moses to the Karankawas Bayous in order to more holistically include area land use activities and stakeholders. Development of the plan will continue in 2012 and 2013.

Double Bayou

GBEP partnered with the Houston Advanced Research Center to initiate watershed planning for Double Bayou in 2010. Double Bayou is listed on the *CWA Section 303(d) List* of Impaired Waters for low DO and high bacteria concentration. Phase I was funded by American Recovery and Reinvestment Act funds and included a watershed characterization report and public participation plan, which was completed 2011. Project partners have received CWA Section 319 funding from the TSSWCB to develop a WPP.

Cedar Bayou

GBEP partnered with the Houston-Galveston Area Council (H-GAC) to begin developing a WPP for Cedar Bayou. Development of this plan began in 2011 to address impaired benthic community in the above tidal segment, address elevated levels of bacteria, and provide outreach concerning the Dioxin and PCB impairments in the tidal portions. GBEP helped develop the proposal and provided state funds to help match a CWA Section 319 grant administered by the TSSWCB. The WPP is expected to be completed in the fall of 2013.

Armand Bayou

GBEP partnered with the University of Houston at Clear Lake's Environmental Institute of Houston to retrofit a three acre detention pond and create a stormwater treatment wetland. The Armand Bayou wetland treats run-off from 19 acres on the University proper including buildings, parking lots, and managed landscapes. The wetland flows into Horsepen Bayou, a tributary to Armand Bayou, which is impaired for high levels of bacteria and low levels of DO. The wetland was monitored prior to and after the wetland was completed to provide valuable data to share with local and regional stormwater managers and watershed protection programs. Data and results are being compiled and will be reported in 2013.

League City

GBEP provided technical support to the City of League City for development of a CWA Section 319 grant proposal to the TCEQ's NPS Program. In addition, GBEP provided state funds for match. The League City NPS Implementation Project will create a three-acre demonstration park that will put in place BMPs that will be monitored and

(RIGHT) Volunteer Community Planting Day at Constructed Wetland, Armand Bayou Watershed - *Courtesy of the University of Houston at Clear Lake*

Constructed Wetland in the Armand Bayou Watershed - *Courtesy of the University of Houston at Clear Lake*

available to developers, the public, and surrounding communities. As a part of the project, modeling of stormwater runoff in the city will be conducted. The modeling results will be used to evaluate and develop appropriate stormwater ordinances. Finally, a program will be developed that will include strategies for retrofitting commercial, residential and public properties with green infrastructure, to gauge LID effectiveness, and the use of incentives. The project got underway in the fall of 2011. The first major output has been a public meeting to review the LID park and seek feedback on the type of LID practices that would be of interest to the residents and users of the park.

Galveston Bay Oyster Waters

GBEP partnered with the Galveston Bay Foundation to establish an education campaign to reduce boater waste in and around marinas. The results of an Oyster Waters TMDL acknowledged boater waste as one of several sources of human bacteria entering bay waters and recommended the creation of an I-Plan to improve boater waste management and reduce bacterial contributions from these sources. Under the campaign, an active stakeholder group was developed, relevant educational materials were created, and briefs regarding current laws and regulations affecting boater waste were developed. The Galveston Bay Foundation continues to implement the campaign. Boater Waste campaign efforts have resulted in a 30% increase in the number of pump-out stations around the bay from 2008 to 2012. (See Table 3-6.)

Table 3-6.
Galveston Bay Boater Pump-out Stations

Year	Number of Stations
2008	12
2009	7*
2010	12
2011	13
2012	17**

**Decrease in pump-out stations caused by Hurricane Ike*
***Two additional pump-out stations under construction*

Outcomes

- Watershed characterization reports for two water bodies: Highland and Marchand Bayou in Galveston County and West and East Forks of Double Bayou in Chambers County.
- Four water quality improvement projects implemented, including Armand Bayou treatment wetland; Gum Bayou (Dickinson Bayou watershed) Clear Creek Independent School District stormwater treatment detention basin; Dickinson Public Library WaterSmart landscape demonstration rain garden; and the annual TrashBash© clean up.
- Establishment of watershed planning groups in six watersheds, including Double Bayou, Cedar Bayou, Highland Bayou, Armand Bayou, Bastrop Bayou and the West Bay watershed.

Results

- **Short-Term:** Created wetlands and flood mitigation capacity in three Galveston Bay area tributaries; 80% of impaired water bodies in the Galveston Bay area are managed under a watershed-based management plan; knowledge regarding the environmental needs and potential actions in subwatersheds increased.
- **Intermediate:** Implementation of WPPs increased public and stakeholder engagement in water quality improvements at the watershed level; increased coordination and more strategic implementation of water quality improvement activities.
- **Long-term:** Reduction of NPS pollutant loadings and improved in-stream water quality in targeted tributaries. Long-term data is being collected at three water quality improvement project sites.

Coastal Bend Bays & Estuaries Program

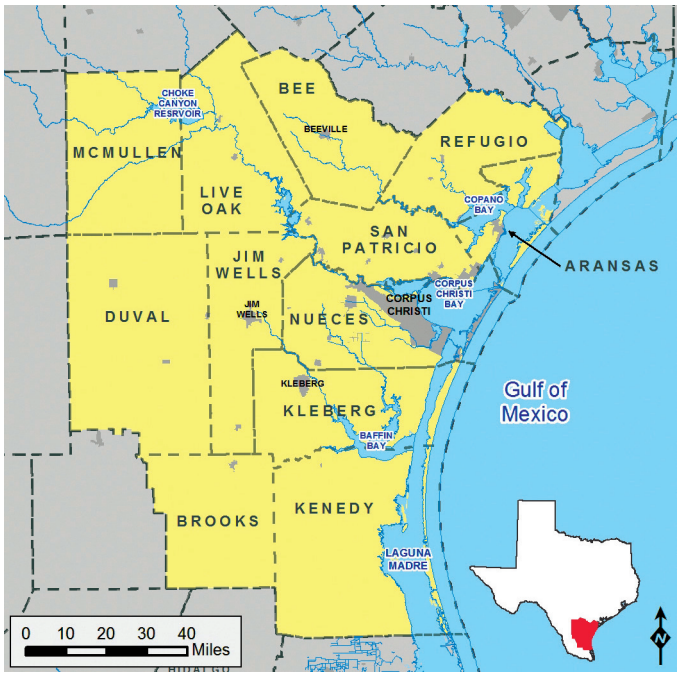
Coastal Bend Bays & Estuaries Program (CBBEP) is a local non-profit 501(c)(3) organization dedicated to protecting and restoring bays and estuaries in the Texas Coastal Bend. CBBEP is a member of EPA's National Estuary Program. It is the mission of the CBBEP to implement the Comprehensive Conservation and Management Plan, the *Costal Bend Bays Plan,* to protect and restore the health and productivity of the bays and estuaries while supporting continued economic growth and public use of the bays. The Program area encompasses 75 miles of estuarine environment along the south-central Texas coastline and includes 12 counties of the region known as the Coastal Bend, extending from the landcut in the Laguna Madre, through the Corpus Christi Bay system, and north to the Aransas National Wildlife Refuge. (See Figure 3-5.) CBBEP provides technical and financial assistance through workshops, conferences, and grants to Coastal Bend area municipalities, universities, and non-profits. CBBEP supports the use of stormwater management initiatives that include illicit discharge detection and elimination, construction site stormwater

runoff control, post construction stormwater management in new developments, pollution prevention for municipal operations public education and outreach, and public involvement and participation. As an example, CBBEP provides financial and technical support to multiple locally driven efforts with a primary goal of improving water quality within bays, streams, and beaches listed as impaired for aquatic life use, contact recreation, and public health. Each effort focuses on solutions to water quality problems, including the development of BMPs that will be implemented by local governments and citizens.

CBBEP is working with Aransas County, the City of Rockport, and Aransas First to implement BMPs that will enhance a series of small ephemeral ponds and reduce loadings to the adjacent Tule Creek. By clearing invasive vegetation (primarily Chinese Tallow and Brazilian Pepper) and sculpting levees, the retention capacity of two one-acre ponds will be increased. An existing stormwater drain on U.S. Route 35 currently discharges directly into Tule Creek, bypassing the wetland ponds. A diversion pipeline from this storm drain is being planned in coordination with the Texas Department of Transportation (TxDOT), to divert stormwater into the improved wetland ponds. When completed, the project site will host elementary school field trips to illustrate how pollutants travel through natural and anthropogenic drainage systems into the bays and estuaries.

Figure 3-5.

Coastal Bend Bays and Estuaries Program Area



The Texas Groundwater Protection Committee and Pesticide Management

The Texas Groundwater Protection Committee (TGPC) was established by the Texas Legislature in 1989. It was formed as an interagency committee with representatives from nine state agencies and the Texas Alliance of Groundwater Districts. The TGPC strives to identify areas where new groundwater programs can be implemented or where existing programs can be enhanced. It works to protect groundwater as a vital resource by bridging the gaps between existing state groundwater programs and by improving coordination between member agencies. Specific management measures to which the TGPC focuses attention are described in the *Texas State Management Plan for the Prevention of Pesticide Contamination of Groundwater (PMP) (2001)* <www.tceq.state.tx.us/assets/public/comm_exec/pubs/sfr/070_01.pdf> and the Texas NPS Management Program.

The focus of the *PMP* is the implementation of management practices that prevent groundwater degradation by the use of pesticides or help to remediate groundwater degraded by the use of pesticides. One useful tool for pesticide management is the TCEQ's *Interagency Pesticide Database (IPD)*, which is an endeavor to compile groundwater pesticide monitoring data for the whole state. The *IPD* includes data for more than 197,757 pesticides or other chemical analytes, from analyses on 10,193 groundwater samples, collected from 5,944 wells. Data was provided by 12 agencies and other entities.

During the 2012 monitoring period, a combined total of 250 groundwater samples were collected for inclusion in the *IPD* by the TCEQ and the Texas Water Development Board (TWDB), on which 425 immunoassay analyses were conducted to screen for the presence of individual pesticides, and 20 laboratory analyses were completed using a total or four methods that quantitate nearly 50 pesticides.

Agricultural Chemicals Subcommittee

The Agricultural Chemicals Subcommittee (ACS) of the TGPC was created to be the primary vehicle for interagency coordination and communication regarding pesticide groundwater issues. The ACS provides guidance for the implementation of the *PMP* by suggesting avenues of investigation, by reviewing monitoring plans and reports, providing assessment materials, and by making response recommendations. Groundwater pesticide monitoring, which is a considerable part of pesticide management, has been carried out in the Texas Panhandle and urban areas. Specific monitoring in these areas included cotton crop areas, public water supply wells with known atrazine detections, general urban wells, and golf course wells. This pesticide monitoring has primarily been performed by the TCEQ. Additional pesticide monitoring has been carried out through the Cooperative Monitoring Program primarily with the TWDB. In this program, analytical methods are used to screen for pesticides across the state aquifers for nonpoint sources of pesticides.

The ACS and the TCEQ, supported by a recent EPA initiative, continue to focus on the management of pesticides by first assessing and classifying them as pesticides of interest (POIs) or pesticides of concern (POCs). Under this course the *PMP* still acts as the foundational guide, and groundwater pesticide monitoring still serves as a primary component in making assessments. All 57 pesticides on an EPA list of targeted pesticides were assessed by TCEQ by the end of the 2012 calendar year.

Nonpoint Source Task Force

The TGPC reactivated the NPS Task Force in the fourth quarter of fiscal year 2010. The primary goal of the NPS Task Force is "to prevent and abate NPS pollution of ground-

water." In order to accomplish this, the Task Force provides recommendations and serves as the primary mechanism for strategizing a coordinated approach for preventing and addressing NPS groundwater pollution in the state. In fiscal year 2012, the Task Force finalized input to groundwater sections of the update to the *Texas NPS Management Program.* In addition, the Task Force focused on determining users and availability of data from the aquifer vulnerability assessment conducted in the 1980s. Since users of the aquifer vulnerability assessment are limited to three programs within state agencies, the Task Force determined that making the existing vulnerability assessment information available in geographic information system (GIS) shape files, rather than a full update to aquifer vulnerability for the state, would be beneficial at this time. Furthermore, the NPS Task Force provided the following recommendations to the TGPC:

Enhance availability and accessibility of groundwater geospatial data (ex. shape files) to the public from existing groundwater quality reports.

Recommend new projects to address NPS pollution issues and information gaps. Recommendations of the TGPC and its Subcommittees are now considered in the ranking of projects for CWA Section 319(h) grants in Texas as of the 2012 update to the Texas NPS Management Program.

Additionally, the Task Force requested deactivation. The TGPC may reactivate the Task Force at the time that additional tasks are determined necessary for the group to address.

Public Outreach and Education Subcommittee

The primary goals of the Public Outreach and Education (POE) Subcommittee are to develop and implement educational outreach programs for landowners concerned with groundwater protection and environmental health issues and to facilitate interagency communication and coordination to provide support for landowner educational outreach projects. Activities include developing educational materials, coordination of outreach programs and special projects with a focus on the NPS-related issues of abandoned well closure, OSSF maintenance, domestic drinking well sampling and the TEX*A*Syst groundwater quality protection program. The POE Subcommittee has developed a number of Frequently Asked Questions (FAQs) in order to assist statewide newsletter editors and webmasters in disseminating groundwater-related information to the public. NPS-related FAQ topics include groundwater quality (pesticides and radionuclides) and septic systems. Nine new FAQ fact sheets were published in fiscal year 2012 (eight regarding oil and gas activities, one regarding statewide water well databases). TGPC FAQs can be found at <www.tgpc.state.tx.us/FAQs.htm>.

Clean Water State Revolving Fund Loans for Nonpoint Source Projects

Another tool available in Texas is the Clean Water State Revolving Fund (CWSRF), which is administered by the TWDB. The CWSRF is a loan program authorized under the federal CWA and is capitalized by an annual grant from EPA. This program provides funding assistance in the form of 20-30 year loans at interest rates lower than the market offers. Although the majority of the loans are made to publically owned wastewater treatment and collection systems, the TWDB can also provide loans for NPS pollution abatement projects through the CWSRF. Loans can be made to towns, counties, groundwater conservation districts, SWCDs, and other public agencies, as well as to private individuals and non-profit organizations.

A water quality based priority system is used to rank potential applicants and fund projects with the greatest environmental benefits. Projects eligible for funding must be an identified practice within a WQMP, TMDL I-Plan, or WPP, a NPS management activity that has been identified in the *Texas Groundwater Protection Strategy*, or a BMP or plan listed in the *Texas NPS Management Program* or the National Estuary Program. Loans can be used for planning, designing, and constructing wastewater treatment facilities (WWTFs), wastewater recycling and reuse facilities, and collection systems. Some of the other activities eligible for funding assistance include agricultural, rural, and urban runoff control; estuary improvement; NPS education; and wet weather flow control, including stormwater that is not associated with a Texas Pollutant Discharge Elimination System (TPDES) permit.

The TWDB has increased its efforts to identify potential applicants for loan projects that would address NPS-related water quality problems in the state. Staff members from the TWDB, the TCEQ, and the TSSWCB meet regularly to coordinate efforts to identify water bodies that are impacted by NPS pollutants and to identify potential applicants for CWSRF assistance to support implementation of management practices to address the problem. The TSSWCB and the TCEQ provide input on funding needs from information gathered during the development of the *Integrated Report,* TMDLs, TMDL I-Plans, and WPPs. The TWDB uses this information during the development of the annual Intended Use Plan for the CWSRF program. The TWDB has adjusted its rating criteria to include consideration of the problem areas identified by the TSSWCB and the TCEQ in determining eligibility and priorities for funding assistance.

La Feria Waste Collection System

The TWDB has worked with, and received loan applications from, numerous communities with NPS projects during fiscal year 2012. The City of La Feria was approved for funding in April 2012 to extend wastewater collection into areas with failing septic systems. The City of La Feria is in Cameron County and is located within the Arroyo Colorado Watershed. The Arroyo Colorado has been on the *CWA Section 303(d) List* for bacteria since 1996. This project will provide first-time access to public wastewater for over 80 residences and will eliminate threats to public health and increase public safety. The project will decrease the flow of pollutants into the Arroyo Colorado, which is the key goal of the Arroyo Colorado WPP. For more information visit <www.twdb.state.tx.us>.

Permeable Friction Course

Research funded by TxDOT to evaluate measures that reduce the pollutants in highway stormwater runoff is recognized nationwide. One current area of research conducted at the University of Texas at Austin is water quality improvements associated with the use of a Permeable Friction Course (PFC). A PFC is a sacrificial layer of porous asphalt approximately two inches thick that is placed on top of conventional pavement, either concrete or asphalt. Previous monitoring of runoff quality from rural highways has documented up to 90 percent pollutant removal with the use of a PFC. The Edwards Aquifer Rules require removal of 80 percent

Pollutant Removal Effectiveness Monitoring of Permeable Friction Course - *Photo by TxDOT*

of suspended solids in runoff. With the use of a PFC all the treatment required by the rules can occur within the pavement itself.

During the past year, TxDOT has continued to fund monitoring to document the pollutant removal performance of this paving material on urban freeways. The data collected to date indicates that PFCs continue to provide substantial water quality benefit on larger highways (four lanes in each direction) with higher traffic levels and curb and gutter drainage systems (Table 3-7). Although the initial focus for the Department was the use of this material to comply with the requirements of the Edwards Aquifer Rules, installation of PFCs is now occurring more widely across the state with over 250,000 tons applied on 32 projects in the past year.

Litter Prevention Education, Litter Pick Up, and Street Sweeping

TxDOT's Don't Mess with Texas® and Adopt-a-Highway litter prevention campaign has been educating and motivating Texans to prevent litter since 1986. The campaign includes the creation and placement of advertising messages (television, radio, print, billboard, and online banner ads), the "Report a Litterer" program, an annual "Trash-Off," "Campus Cleanup" program, sponsorship of scholarships for students involved in litter prevention, a "Road Tour" that conveys a litter prevention message at various statewide public events, the "Litter Force Team" (which teaches elementary-age children about the perils of littering and how they can "Blast the Trash" in Texas), distribution of litterbags and bumper stickers, and a corporate partner program. For more information, visit <www.dontmesswithtexas.org>. The litter pick up program is a comprehensive effort to collect litter that is not prevented by the programs listed above. Statewide litter prevention efforts, pick up of roadside litter, and street sweeping decreases litter that would otherwise be washed into Texas's waterways by stormwater.

Overall, the most recent study, completed in 2010, indicates that food litter items, one of the most prevalent types of litter along Texas's highways, decreased 76% between 2005 and 2009. The next study will begin in fiscal year 2013. The Adopt-a-Highway program — which originated in Texas — has branched into 49 states, Canada, Great Britain, Japan, New Zealand, Australia, and Mexico and has more than 1.3 million volunteers nationwide. Approximately 10% of the roadways maintained by TxDOT have been adopted by about 4,000 Texan volunteer groups. The recently launched Report a Litterer mobile device application has been downloaded more than 3,000 times. More than 15,000 litterers have been reported and subsequently sent a re-usable litterbag and friendly reminder that littering is not acceptable. Out of 422 applications, three students received awards under the ninth annual Don't Mess with Texas® Scholarship program. The "Road Tour" participated in 14 events across the state including local festivals, jamborees, concerts, sporting events, conventions, etc. The Don't Mess with Texas® Litter Force superhero mascots visited 53 elementary schools in 32 cities and reached nearly 18,000 students. In addition, TxDOT spent $38,627,214 on various elements of the litter pick up program and street sweeping (see Table 3-8 for quantities).

Table 3-7.

Comparison of the Water Quality of Runoff from Conventional Pavement and Permeable Friction Course

Constituent	Conventional Pavement	Permeable Friction Course	Reduction %
TSS (mg/L)	259	21.2	92
NO_3^+/NO_2^- (mg/L)	1.25	0.41	67
Total P (mg/L)	0.52	0.11	80
Total Copper (µg/L)	52.8	20.6	61
Total Lead (µg/L)	153	3.35	98
Total Zinc (µg/L)	294	140	52

Table 3-8.

Fiscal Year 2012 Litter Pick Up and Street Sweeping Totals (estimates)

Function	Fiscal Year 2012 Total Units
Removal and Disposal of Litter	1,388,938 acres
Spot Removal and Disposal of Litter	109,654 acres
Illegal Dumpsite Removal and Disposal	8,740 cubic yards
Patrolling to Remove Debris	2,691,922 miles
Routine Street Sweeping	361,279 lane-miles*

**A lane-mile is the centerline length (in miles) multiplied by the number of lanes.*

Freshwater Habitat Protection and Restoration: South Llano Vegetation Restoration

Severe drought conditions in 2011 led to wildfires that scorched almost 9,000 acres near Junction, Texas. Huge swaths of vegetation were scorched from the landscape, and

TxDOT's Litter Force Team Web Site Educates Kids About Reducing Litter <http://dontmesswithtexas.org/litterforce/>

large deposits of ash and soil lay unanchored and ready to wash into the rivers and creeks of the North and South Llano Rivers watersheds with the next rain, potentially smothering aquatic habitats.

Texas Parks and Wildlife Department's (TPWD) Watershed Policy and Management Program had been working with the South Llano Watershed Alliance, a citizen's group, on native black bass restoration in the South Llano River. The two organizations developed a plan to enlist impacted landowners in an experiment in vegetation recovery by providing them with a specifically formulated seed mix for scorched land, having them seed small plots, and then observing and recording the results. These two groups enlisted other partners for this effort, including the NRCS, Texas Forest Service (TFS), Texas Tech University's Llano River Field Station, Native American Seed, and the Upper Llanos SWCDs. TPWD provided the funding and the South Llano Watershed Alliance facilitated and coordinated the workshop to enlist and instruct interested landowners. Over 70 impacted and interested landowners attended the fall 2011 workshop, which began with an indoor session where experts representing each of the partners covered specific topics related to the recovery of the scorched land. The participants also made a field trip to representative sites burned by the wildfires where demonstrations for erosion control, exclosures, and seedling use had been put in place. At the end of the workshop all participants were given a pound of the scorched land seed mix for their experimental plots. Participants left knowing BMPs for vegetation recovery, and how to participate as citizen scientists in the recovery experiment on their land. At the request of workshop participants a field trip has been scheduled for fiscal year 2013 to observe the recovery efforts at the demonstration field sites.

Household Hazardous Waste Collection Program

The TCEQ Household Hazardous Waste Collection Program gives local governments an opportunity to offer Texans an alternative disposal option for household waste that would otherwise be considered hazardous. Household Hazardous Waste Collections are most commonly funded and organized by municipalities and county governments, with assistance on program requirements provided by the TCEQ.

Results from Household Hazardous Waste Collections, including one-day events as well as permanent collection facilities, are reported annually to the TCEQ. In calendar year 2011, 254 household hazardous waste programs and regional events collected more than 6,241 tons of household hazardous waste throughout Texas.

Take Care of Texas Program

The Take Care of Texas Program is a statewide education campaign designed to help all citizens take care of the Texas environment, including improving water quality and preventing NPS pollution. The TCEQ maintains the program's website <www.takecareoftexas.org> and offers free materials to help educate citizens and communities on the Texas environment.

Materials offered by the Take Care of Texas program include publications on how to practice environmentally responsible lawn care to improve water quality and reduce water use. During fiscal year 2012, over 35,000 copies of these publications were provided to local governments, schools, and organizations for use in environmental education programs.

Richland Chambers Creek Watershed

Through the National Water Quality Initiative (NWQI), the USDA-NRCS in Texas targeted over 150,000 acres to enhance water quality in seven contiguous sub-watersheds, collectively known as the Chambers Creek Watershed, above the Richland Chambers Reservoir in the Trinity River Basin. The reservoir was built by Tarrant Regional Water District as part of their water system and provides household water for the 1.8 million people in Fort Worth.

Using funds from the Environmental Quality Incentives Program (EQIP), NRCS is providing financial assistance and technical advice to producers on the planning and implementation of conservation practices focused toward water quality protection in the watershed, located in Ellis and Navarro Counties. These producers invest in voluntary conservation practices to help improve water quality. The seven sub-watersheds of Chambers Creek have water quality impairments of sediment and DO, which qualifies them for the NWQI program. Partners in the NWQI project are the Tarrant Regional Water District, TSSWCB, TCEQ, and the EPA, as well as the Navarro and Ellis-Prairie SWCDs.

In fiscal year 2012, 55 producers signed 61 NWQI contracts totaling $4,337,208. Conservation practices included in these contracts are cover crop, residue and tillage management, no-till/strip till/direct seed, forage and biomass planting, pond, herbaceous weed control, grade stabilization structure,

grassed waterway, prescribed grazing, range planting, pipeline, watering facility, filter strip, and brush management. The conservation practices are being applied to 18,886 acres.

Eagle Mountain Reservoir

The Eagle Mountain Reservoir project is a coordination of partners providing technical assistance to agricultural producers to plan and implement conservation treatments that will reduce the high levels of nutrient and sediment loading into Eagle Mountain Reservoir, a 9,200 acre lake on the West Fork of Trinity River northwest of Fort Worth. The reservoir is part of the Tarrant Regional Water District's system that serves the municipal water needs of the Fort Worth area.

The partners ; NRCS, TSSWCB, Wise County SWCD and Tarrant Regional Water District, are working one-on-one with landowners to plan and apply conservation practices to address the bacteria impairment in the Eagle Mountain Reservoir watershed. Technical assistance funds from NRCS EQIP matched by SWCD director time, outreach, and education work by Tarrant Regional Water District and SWCD employee salary expenses.

In fiscal year 2012, 111 conservation plans were developed to address water quality resource concerns on 21,366 acres in the Eagle Mountain project. Thirty-eight of the plans have been developed into contracts, obligating $160,574. The conservation practices in these contracts are critical area planting, grade stabilization structures, forage and biomass planting, range planting and brush management and cover 5,365 acres.

Coastal Prairie Wetland Restoration at Sheldon Lake State Park

Sheldon Lake State Park, a 2,800 acre area, was once coastal prairie and pine/oak savanna dotted and crossed by circular and linear marsh basins. Rice farming and reservoir construction inundated, filled, or drained almost all of its prairie wetlands. Now, the Park's agricultural lands are being restored to original prairie wetland matrix by TPWD, Texas A&M AgriLife Extension Service, and the Wetland Restoration Team with the support of the TSSWCB and the EPA. This restoration effort will:

- Provide visitors an authentic view of the region's original landscape
- Serve as an inexpensive and innovative demonstration of how previously cultivated land with historic wetlands can be restored and utilized as filters for stormwater runoff as well as habitat
- Restore critical freshwater prairie wetland habitat for migratory waterfowl and resident water birds and grassland birds
- Provide an educational "platform" for students to learn first-hand the importance of wetland habitat and the need for wetland restoration within their community

The on-the-ground restoration is managed and conducted by Texas AgriLife Extension Service and the Wetland Restoration Team, which is comprised of trained

(ABOVE) Marissa Sipocz of Texas A&M AgriLife Extension - Sea Grant shows characteristic wetland soil features to Master Naturalist volunteers

(RIGHT) Texas Master Naturalist and Wetland Restoration Team member Tom Betros works with two Montgomery County fifth grade students

Master Naturalist volunteers who specialize in wetland education and restoration. The trained team mentors, in turn, work with local students providing the knowledge and experience about the restoration process, the plants, and proper methodology. The mentors provide individual guidance, act as quality control for the restoration, and provide the students an understanding of the importance of wetlands and the overall importance of the restoration process.

In fiscal year 2012, three wetland field days were held at Sheldon Lake State Park. The goal of each field day was to inform attendees of the benefits of restoring critical freshwater wetlands from previously developed agricultural lands. Presentations from local experts were followed by hands-on site visits to the individual wetland cells. Additional field days are being planned for fiscal year 2013. Between field days and student visits, a total of 844 people have been reached and introduced to the wetland restoration at Sheldon Lake State Park.

Arroyo Colorado Innovative Stormwater Regional Detention Facilities

Rapid urbanization in the last twenty years has resulted in increased nutrient concentrations and low DO in the Arroyo Colorado. A contribution to this increase in pollutant loading can result from stormwater runoff, a significant cause of NPS pollution. With CWA Section 319(h) funding, the Environmental Engineering Department at Texas A&M University Kingsville (TAMU-K) has developed and implemented a project with the City of McAllen to assess nutrient loading reduction through both pollutant load reduction and runoff flow mitigation.

Specific BMPs have been implemented at McAllen stormwater regional detention facilities (RDF) located at the Morris Middle School and McAuliffe Elementary. The BMPs include vegetated retention basins, stormwater wetlands and a wedge-wire technology microscreen structure. The Morris Middle School RDF wetland has a drainage area of approximately 5,125 acres that collects stormwater from an urbanized, 70% residential and 30% commercial, area. The stormwater flows through a 3.6 mile ditch into the RDF. The RDF has a footprint of 30 acres with the wetland nearer the inlet. The McAuliffe Elementary RDF occupies 28 acres with an urbanized watershed drainage area of approximately 1,207 acres; 80% residential and 20% commercial. The BMPs at the McAuliffe Elementary RDF include a microscreen structure constructed at the RDF inlet. Preliminary flow data from storm events at the McAuliffe RDF demonstrate significant stormwater volume reduction, and hence a reduction in the associated pollutant loading including nitrogen, phosphorous and suspended solids. Preliminary data collected at the Morris RDF wetland facility indicate a probable load reduction in nitrogen, phosphorous, and suspended solids, and a potential for limited flow reduction. Additional data collection and analysis are planned through the fall of 2012.

Goal Three–Education

The third goal of the *Texas NPS Management Program* is to conduct education and technology transfer activities to raise awareness of NPS pollution and activities that contribute to the degradation of water bodies, including aquifers, by NPS pollution.

Education is a critical aspect of managing NPS pollution. Public outreach and technology transfer are integral components of every WPP, TMDL, and I-Plan. This section highlights some of the NPS education and public outreach activities conducted in Texas in fiscal year 2012.

Texas Stream Team

Texas Stream Team is a statewide organization committed to improving water quality through citizen led data collection, stakeholder engagement, and watershed education and outreach. The Texas Stream Team is based at the Meadows Center for Water and the Environment, formerly known as the River Systems Institute at Texas State University - San Marcos, and is administered primarily through a cooperative CWA Section 319(h) grant-funded partnership between the Meadows Center, the TCEQ, and the EPA. Texas Stream Team citizen monitors sample streams, reservoirs, and tidal areas for various parameters including DO, specific conductivity, pH, secchi depth, temperature, *E. coli,* nitrate-nitrogen, orthophosphate, turbidity, streamflow, and conduct field observations, including flow severity. Data are collected in accordance with a Quality Assurance Project Plan and a multi-phase citizen training certification process.

In an effort to better support the statewide partners and more effectively utilize citizen-collected data, Texas Stream Team is implementing a number of programmatic modifications in 2012. Principally, Texas Stream Team is increasing local and regional partnerships, as well as facilitation of collaborative watershed management efforts, and is concentrating program resources toward fulfillment of existing, on-the-ground project needs. Additionally, citizen-based science education, outreach, and hands-on projects are being developed and expanded to improve citizen involvement in watershed restoration, protection, and water quality management. Another development, the new online Dataviewer, launched at the beginning of 2012, has resulted in:

1. reduced program input time and cost;
2. significantly increased the ability of monitors to review and ensure the quality of their data; and
3. increased engagement from citizen monitors who now see their data being used.

Specific program information is available at <txstreamteam.meadowscenter.txstate.edu>.

Texas Watershed Planning Training Project

Watershed planning efforts continue to expand across Texas supported by the TCEQ, the TSSWCB, the EPA, and a growing network of watershed coordinators and water professionals. To support those efforts, a successful training program and set of forums organized by the TWRI are held in the state providing information to watershed planners where needs have been identified.

As a part of this program, water professionals assemble biannually to meet and share knowledge at the Texas Watershed Coordinator Roundtables. Texas Watershed Coordinator Roundtables provide a forum for establishing and maintaining dialogue between watershed coordinators and facilitate interactive solutions to common watershed issues faced throughout the state. Over 60 water professionals attended each of the two Texas Watershed Coordinator Roundtables held in Waco and College Station in 2012. Topics discussed included statewide land-use trends, implementation tracking, updates on the national and regional CWA Section 319(h) grant program, and partner program activities and information.

Brazos River near Mineral Wells - *Photo by Jack Davis, BRA*

To further support watershed efforts in the state, a variety of training opportunities were made available to watershed coordinators and other water professionals. In January 2012, a Stakeholder Facilitation Training was held in conjunction with the Texas Watershed Coordinator Roundtable in Waco. The Stakeholder Facilitation Training highlighted tools used to effectively identify, engage, and involve stakeholders throughout a watershed to restore and maintain healthy environmental conditions. Thirty watershed coordinators and water resource professionals attended the Stakeholder Facilitation Training.

Other training opportunities to be offered in fiscal year 2013 include two week-long Texas Watershed Planning Short Courses, two "Introduction to Modeling" sessions, classes on the use of Load Duration Curves (LDCs) and the Spatially Explicit Load Enrichment Calculation Tool (SELECT), and two sessions of "Fundamentals of Developing a Water Quality Monitoring Plan."

These efforts are supported by a collaborative project between the TWRI, AgriLife Extension, AgriLife Research, the TCEQ, TIAER, the TSSWCB, and the EPA. Through funding from the TCEQ and the EPA, it is the goal of this project to provide tools, training, and coordination opportunities for watershed planners and coordinators throughout Texas to ensure consistent, high quality WPPs are developed and implemented and water quality improvements are achieved and sustained.

For more information on Texas Watershed Coordinator Roundtables and upcoming training opportunities for watershed planners and water professionals, as well as guidance on watershed planning, see the Texas Watershed Planning website <watershedplanning.tamu.edu>.

Texas Watershed Steward Program

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

A total of 44 workshops have been conducted in watersheds across the state since inception of the program. Participants have been comprised of landowners, agricultural producers, city personnel and officials, business owners, state and federal environmental agency staff, public schools and universities, and other watershed residents for a total of 2,181 trained Texas Watershed Stewards. In fiscal year 2012, 12 workshops were held in various cities, such as Dallas, San Angelo, El Paso, Smithville, and San Antonio, with a total of 536 people in attendance.

Pre- and post-test data collected at each event showed that 31% of participants gained knowledge, and 98% believed the TWS program enabled them to be better stewards of their watersheds. Results of delayed six-month post surveys showed that:

- 85% of trainees had participated or planned to participate in at least one community cleanup
- 68% had participated or planned to participate in local planning/zoning decisions
- 82% indicated they had or would communicate with their elected officials regarding water quality issues.

Furthermore, over 85% of attendees indicated they now more closely monitor

individual action that might impact water quality, and 76% have either adopted or maintained management practices that have a positive impact on water quality.

For more information on the Texas Watershed Steward Program, online course, or to pre-register for an upcoming Texas Watershed Stewards event, please visit <tws.tamu.edu>.

Project Based Learning Academy in the Geronimo Creek Watershed

In the summer of 2012, GBRA and the Seguin Independent School District teamed up to offer a unique educational experience for high school students. Titled the *Project Based Learning Academy,* students had the opportunity to earn 1.5 credits toward the Technology and Speech requirements for graduation. Students spent time in the field at locations throughout the watershed as well as in the classroom and lab on campus.

Students participated in investigation and research on Geronimo Creek. In addition to a tour of the watershed and a creek cleanup, the students received "one-on-one time" with aquatic macroinvertebrates, learning about the relationship between water quality and aquatic life. In an effort to develop community awareness, students also designed several public outreach tools. As part of the curriculum, students presented their projects to local civic groups as well as the Seguin Independent School District Board. Plans for the future include presentations to the Geronimo Creek Watershed Steering Committee.

Westfield Estates Watershed Protection Plan

In fiscal year 2012, H-GAC and watershed project partners had a series of educational events to assist Westfield Estates residents. A major outreach campaign was initiated to educate residents about proper OSSF maintenance. An evening workshop drew over 40 local residents to an informative and interactive presentation about septic system maintenance. This event was part of a coordinated effort to educate residents on OSSF contamination, a primary source of bacterial contamination in the community. In support of this effort, H-GAC sent several mail outs to the residents, and coordinated with the Houston area Bacteria Implementation Group, whose project area includes the Westfield Estates Community, on related education planning efforts. Additionally, H-GAC staff conducted an ongoing monitoring effort throughout the watershed, and talked with residents directly about issues in the watershed. To plan and coordinate educational efforts, H-GAC held an annual formal stakeholders meeting, and several individual meetings with key partners. In addition, H-GAC staff attended meetings, or coordinated efforts with, other local entities, including a Harris County Precinct 2 community meeting and meetings of the Halls Ahead study group of the Harris County Flood Control District, among others, to educate these entities about the efforts and issues of the community.

Statewide Bacterial Source Tracking Infrastructure and State of the Science Conference

Bacteria are the number one cause of water quality impairment in Texas; however, identifying the sources of these bacteria is difficult in many watersheds. Bacterial Source Tracking is a technology being used to help local stakeholders identify the sources and target efforts to improve water quality. Utilizing support from TSSWCB, Texas AgriLife Research and the University of Texas School of Public Health-El Paso Regional Campus have invested in equipment and personnel to apply and advance this technology while building capacity for state-wide BST application. To date, BST has been utilized in eight watersheds across the state and over 1,300 known sources of fecal material have been catalogued. Additionally, DNA markers are being developed and refined as are the methods used in BST analysis.

With these and the efforts of other, BST is a rapidly changing science. The host of new information currently available and continually being developed is not readily distributed or known to state and federal agency personnel. This lack of information transfer has spurred the need for a statewide informational workshop geared toward bringing those in attendance up to speed on recent advances in BST technologies, methodologies, applications, and results. With funding from and in partnership with the TSSWCB, the TWRI, the University of Texas School of Public Health-El Paso Regional Campus, and Texas A&M AgriLife Research hosted the 2012 Bacterial Source Tracking – State of the Science Conference on Feb. 28-29, 2012 in New Braunfels. The conference brought together nearly 120 participants from 13 different states to hear discussions on BST and current practices, scientific advances and improvements in application. Attendees were also informed on the "State of the Science" by leading experts from across the United States and shown how BST can assist them in their efforts to improve water quality and protect human health.

Lone Star Healthy Streams: Keeping Texas Waters Safe and Clean

The Lone Star Healthy Streams program aims to educate Texas livestock producers and land managers on how to best protect Texas waterways from bacterial contributions associated with the production of livestock as well as those arising from feral hogs. To achieve this goal, groups of research scientists, resource conservation agencies, agricultural groups and producers collaborated to compile five Lone Star Healthy Streams manuals, which include BMPs known to reduce *E. coli* contributions to rivers and streams from beef cattle, dairy cattle, horses, poultry and feral hogs. In addition to reducing bacterial contributions, the BMPs listed in the manuals allow livestock and land owners to further protect Texas waterways from sediment, nutrient, and pesticide runoff. The Lone Star Healthy Streams program is a partnership between the Texas A&M AgriLife Extension Service, TSSWCB, and TWRI.

The Lone Star Healthy Streams program has been well received by producers across the state and endorsed by seven livestock groups and three natural resource agencies. In fiscal year 2012 alone, two to three beef cattle educational programs have been delivered each month, reaching over 3,000 producers throughout Texas. In addition to direct delivery of these educational programs, the Lone Star Healthy Streams website <lshs.tamu.edu> averages 45 unique visitors per month. Printed copies of the manuals are now available, and will also be available electronically for download on the AgriLife Extension Bookstore. Publication numbers for the manuals are as follows: Beef Cattle (B-6245), Dairy Cattle (B-6253), Horses (B-6254), Poultry (B-6255), and Feral Hogs (B-6256). To facilitate delivery throughout the state, standardized presentations accompanying each manual have been

developed and delivered. Further, to reach a broader audience, the information contained in the manuals is being converted into an interactive website.

A final component of the Lone Star Healthy Streams program has been to evaluate the effectiveness of a variety of BMPs including proper grazing management and providing alternative water and shade. Results indicate that substantial reductions can be achieved by providing alternative water supplies and utilizing rotational grazing of creek pastures. Providing alternative water was found to reduce the amount of time that cattle spend in the stream by over 40% thus reducing their direct contributions to bacterial loading. Further, bacteria runoff from rotationally grazed pastures was found to not be significantly different than those concentrations from ungrazed pastures indicating that rotational grazing was an effective practice. Work continues on evaluating the impacts of using alternative shade. The first two trials yielded 11 and 31% reductions in the amount of time that cattle spent in streams. Further work in the next fiscal year will confirm the effects of this practice.

Buffalo Creek in Blanco County in Rosa Ranch, Spring 2012 - *Photo by Bobby Humphrey of LCRA*

Progress in Developing and Implementing Watershed Protection Plans

In Texas, WPPs are locally developed water quality plans that coordinate activities and resources to manage water quality. They facilitate the restoration of impaired water bodies and/or 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 factors with social and economic considerations.

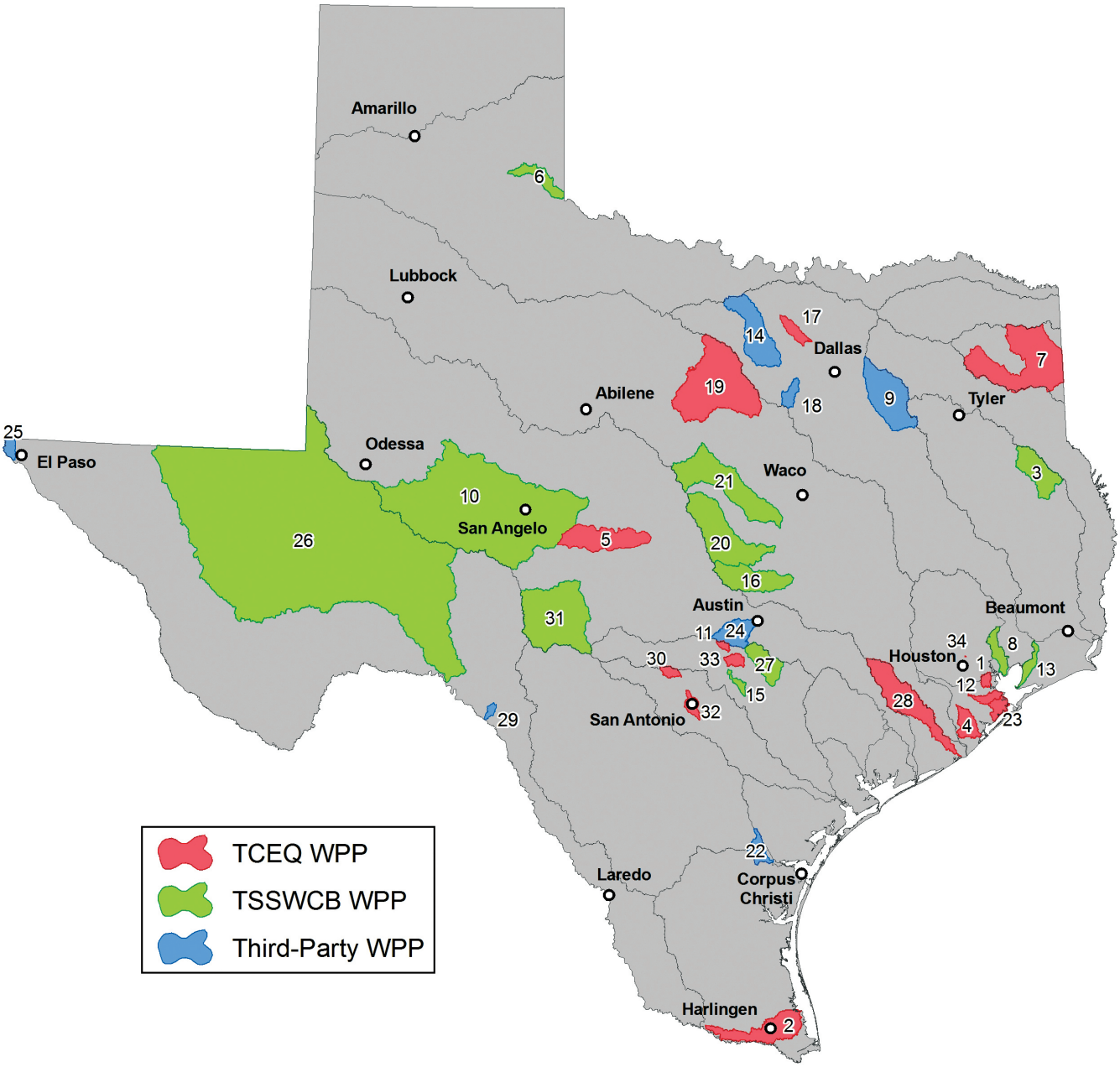
While WPPs can take many forms, the development of plans funded by CWA Section 319(h) grants must follow guidelines issued by the EPA. These guidelines can be found in *Nonpoint Source Program and Grants Guidelines for States and Territories*, <www.epa.gov/fedrgstr/EPA-WATER/2003/October/Day-23/w26755.htm>.

In fiscal year 2012, the TCEQ and the TSSWCB facilitated the development and implementation of WPPs throughout Texas by providing technical assistance and/or funding through grants to local partners. There are also WPPs that are being developed or have been developed in Texas independently of this grant funding. The following list is not intended to be a comprehensive list of all the WPP efforts currently underway in Texas. See Figure 4-1 and Table 4-1 for WPPS in Texas.

A Cove on Lake Granbury - *Photo Courtesy of Jody Cason, BRA*

Figure 4-1.

Map of watersheds with Watershed Protection Plans being developed or implemented in Texas



01-Armand Bayou
02-Arroyo Colorado
03-Attoyac Bayou
04-Bastrop Bayou
05-Brady Creek
06-Buck Creek
07-Caddo Lake
08-Cedar Bayou
09-Cedar Creek Reservoir
10-Concho River
11-Cypress Creek
12-Dickinson Bayou
13-Double Bayou
14-Eagle Mountain Reservoir
15-Geronimo Creek
16-Granger Lake
17-Hickory Creek
18-Lake Arlington
19-Lake Granbury
20-Lampasas River
21-Leon River
22-Lower Nueces River
23-Moses-Karankawa Bayous
24-Onion & Barton Springs
25-Paso del Norte
26-Pecos River
27-Plum Creek
28-San Bernard
29-San Felipe Creek
30-Upper Cibolo Creek
31-Upper Llano River
32-Upper San Antonio River
33-Upper San Marcos
34-Westfield Estates

Table 4-1.

Texas Watershed Protection Plans

TSSWCB WPPs	LINKS
Attoyac Bayou	<attoyac.tamu.edu>
Buck Creek	<buckcreek.tamu.edu>
Cedar Bayou	<www.cedarbayouwatershed.com>
Concho River	<www.tsswcb.texas.gov/managementprogram/conchowpp>
Double Bayou	<www.tsswcb.texas.gov/managementprogram/doublebwpp>
Geronimo Creek	<geronimocreek.org>
Granger Lake	<www.tsswcb.texas.gov/managementprogram/granger >
Lampasas River	<www.lampasasriver.org>
Leon River	<www.brazos.org/LeonRiverWPP.asp>
Upper Llano River	<southllano.org>
Pecos River	<pecosbasin.tamu.edu>
Plum Creek	<plumcreek.tamu.edu>
TCEQ WPPs	**LINKS**
Armand Bayou	<www.h-gac.com/community/water/watershed_protection/armand/default.aspx>
Arroyo Colorado	<www.arroyocolorado.org>
Bastrop Bayou	<www.bastropbayou.org>
Brady Creek	<www.ucratx.org/NPSBrady.html>
Caddo Lake	<www.netmwd.com/Caddo%20Lake%20Protection%20Plan/Caddo_index.html>
Cypress Creek	<www.cypresscreekproject.org>
Dickinson Bayou	<www.dickinsonbayou.org>
Halls Bayou-Westfield Estates	<www.h-gac.com/community/water/watershed_protection/westfield/default.aspx>
Hickory Creek	<www.cityofdenton.com/index.aspx?page=172>
Lake Granbury	<www.brazos.org/gbWPP.asp>
Moses-Karankawa Bayous	<mokabayousalliance.org>
San Bernard River	<www.h-gac.com/go/sanbernard>
Upper Cibolo Creek	<www.ci.boerne.tx.us/index.aspx?nid=147>
Upper San Antonio River	<www.sara-tx.org/public_resources/library.php#enviro_monitoring>
Third-Party WPPs	**LINKS**
Cedar Creek Reservoir	<nctx-water.tamu.edu/meetings>
Eagle Mountain Reservoir	<nctx-water.tamu.edu/meetings>
Lake Arlington	<www.arlingtontx.gov/water/lakearlingtonmasterplan.html >
Lower Nueces River	<www.nuecesriverpartnership.org>
Onion Creek and Barton Springs	<www.waterqualityplan.org>
Paso del Norte	<www.pdnwc.org/319h.html>
San Felipe Creek	<www.cityofdelrio.com/index.aspx?NID=574>

Texas Watershed Protection Plan Highlights

Plum Creek

Plum Creek flows for 52 miles from its headwaters north of Kyle downstream towards Lockhart and Luling draining a 400 square mile watershed that includes much of Caldwell and Hays Counties and a small portion of Travis County. The creek has been included on the *CWA Section 303(d) List* since 2002 due to high levels of bacteria and on the *Integrated Report* since 1998 for concerns for nutrient enrichment. The Plum Creek WPP, published in February 2008, was developed by the Plum Creek Watershed Partnership Steering Committee – a group of local stakeholders facilitated by the Texas A&M AgriLife Extension Service – through a CWA Section 319(h) grant from the TSSWCB. Based on planned and completed WPP implementation efforts, the partnership developed a Rationale for Reclassifying Plum Creek (Segment 1810) from Category 5 to Category 4b on the 2010 *Integrated Report* to support removal of the water body from the Texas *CWA Section303(d) List.* EPA concurred that the rationale adequately demonstrated how pollution control would lead to TSWQS attainment in a reasonable period of time and approved reclassification. The Partnership also completed the *2012 Update to the Plum Creek Watershed Protection Plan*, which summarizes funding, outreach, and implementation activities that have occurred in the watershed since the plan was adopted.

The Plum Creek WPP is in its fourth year of a ten-year implementation process. During the past year, significant progress toward achieving a number of WPP components has been made. Public involvement and education continues to be a key focus of implementation. Over 61 meetings, workshops, and trainings were conducted in fiscal year 2012 reaching over 1,978 individuals for 3,160 contact hours including: four Steering Committee meetings, 12 public and local-government meetings, 24 planning meetings and 21 educational events that included the annual Feral Hog Management Workshop, Luling Foundation Water Field Day, Caldwell County Expo, Bastrop-Caldwell County Wildlife Management Association Extravaganza, First Annual Chisolm Trail Roundup Natural Resources Fair, Fifth Annual Lockhart Cleanup Event and Texas Watershed Steward workshop.

Implementation efforts also continued in the urban sector throughout the watershed. The City of Kyle, wrapped up their final year of a TCEQ CWA Section 319(h) grant to implement a variety of pollution prevention strategies. In addition to structural modifications such as the reengineering of multiple regional detention facilities, Kyle has implemented key outreach measures that have engaged local stakeholders to play a role in water resource protection. Kyle conducted their annual Plum Creek Watershed Clean-Up event and included the new Lake Kyle Preserve and Steeplechase Parks to remove trash and debris from inside the park area and Plum Creek. The City of Lockhart has been implementing a TCEQ CWA Section 319(h) grant to clean storm drains and install inlet filters; expand household hazardous waste disposal service to include fats, oils, and grease; maintain pet waste collection stations; mark storm sewers; and implement a stormwater education program. The City of Lockhart hosted the Annual Town Branch Cleanup in City Park in September 2012. This event continues to be successful with a total of 300 volunteers participating, totaling 900 volunteer hours this year. Over 2,130 pounds of trash were removed, 311 pounds of materials were recycled, and park beautification projects were completed. The project cleaned up over four miles of lake and river banks in the six pocket parks that have walking trails connected to City Park.

The Partnership has remained involved in regional planning, with representation on the Technical Advisory Group for Kyle's Region L feasibility study for using reclaimed water. Hays County, the City of Buda, and the Plum Creek Watershed Partnership joined together to improve wastewater management in the Hillside Terrace Subdivision, submitting a second pre-application for TWDB CWSRF financial assistance for engineering costs and connection of 262 homes. The City of Buda will be offered a $400,000 CWSRF loan for the planning and design phase of the project, with total costs for construction of $5.6 million.

The Partnership has implemented a plan for long-term sustainability through the development and signing of an interlocal agreement with 12 local partner entities providing cash and in-kind services to support 40 percent of the cost of a full-time, local watershed coordinator. The 12 entities include Caldwell and Hays Counties, the City of Lockhart, the City of Luling, the City of Kyle, the City of Uhland, the City of Buda, GBRA, Plum Creek Conservation District, Polonia Water Supply Corporation, Hays County SWCD, and the Caldwell-Travis SWCD. These funds were used as match for a CWA Section 319(h) grant from the TSSWCB. The recently hired coordinator is actively facilitating WPP implementation efforts, and has already assisted Caldwell County in obtaining a solid waste grant from the Capital Area Council of Governments to conduct four household waste cleanup events across the county.

Utilizing CWA Section 319(h) grants from TSSWCB, the Caldwell-Travis SWCD continued to provide technical assistance and financial incentives to agricultural producers for the development and implementation of WQMPs in the Plum Creek watershed. In fiscal year 2012, three WQMPs were developed with producers in the watershed. BMPs being installed in the Plum Creek watershed include grass planting, cross-fencing, pipelines, water wells, grassed waterways, and watering facilities. The grant also supported a local Extension wildlife position that actively promotes feral hog management through one-on-one technical assistance to landowners, online reporting, and development of publications (two), educational program delivery (17), press releases (four), and blog articles (three).

In support of the WPP, the GBRA continued to conduct intensive surface water quality monitoring on Plum Creek and its tributaries through CWA Section 319(h) funding from the TSSWCB. Sampling included targeted routine ambient, wastewater effluent, and spring flow samples that were collected at 51 sites throughout the watershed.

Arroyo Colorado

The Arroyo Colorado, an ancient distributary channel of the Rio Grande, extends about 90 miles from Mission to the Laguna Madre in the LRGV. Flow in the Arroyo is sustained by wastewater discharges, agricultural irrigation return flows, urban runoff, and base flows from shallow groundwater. To address the Arroyo Colorado's water quality impairments for depressed DO, as well as nutrient concerns, the Arroyo Colorado Watershed

(LEFT) Morris Regional Detention Facility wetland - *Photo courtesy of TAMU-K*

(BELOW) Newly Constructed Wetland at the Valley Nature Center in Weslaco, TX - *Photo by TAMU-K*

(FAR LEFT) Rainwater Harvesting System at the City of Edinburg Boys & Girls Club - *Courtesy of TAMU-K*

(LEFT) LID parking lot bioretention strip South Texas College in McAllen, TX - *Courtesy of TAMU-K*

Partnership developed a WPP for the Arroyo Colorado in 2007.

Progress has been made in meeting many of the milestones outlined in the WPP. Upgrading the area's wastewater infrastructure was a major component of the milestone schedule. Ten WWTFs have either upgraded or constructed new facilities and 22 colonias have received wastewater service. In addition, many watershed residents have been educated about the Arroyo Colorado through the various outreach activities conducted by the Partnership and Watershed Coordinator.

TAMU-K has partnered with various cities to form the LRGV Storm Water Task Force. Currently the Task Force is working with TCEQ to construct LID practices throughout the Arroyo Colorado watershed, which will educate area residents about LID and research the effectiveness of the practices. LID practices are currently being constructed in the cities of La Feria, Weslaco, Harlingen, San Juan, Brownsville, and Alton. The goal is to institutionalize the use of these practices into the approach that local governments and area residents take for stormwater management. In addition, the Task Force is beginning a project to develop a database and create an inventory of the current urban BMPs within the LRGV. Eventually the database will be used as a research and reference tool for area stormwater management and provide the capability of developing detailed maps of BMP locations. Additionally, as noted in Chapter 3, the City of McAllen has completed retrofitting several stormwater regional detention facilities with water quality enhancement features.

The Partnership has also formed a nonprofit group called the Arroyo Colorado Conservancy (ACC) in order to raise local funds to ensure future sustainability of the Partnership. During this past fiscal year, the financial work group discussed several fundraising options, which lead to the decision to host a raffle of donated items from local businesses. In 2013, the ACC will be holding a membership drive throughout the Rio Grande Valley. The Steering Committee members will be asking local businesses in and around their cities to support the ACC by becoming business sponsors/members of the ACC through monetary support.

The TSSWCB, Hidalgo and Southmost SWCDs, continued to provide technical and financial assistance to develop and implement WQMPs to address NPS pollution in the Arroyo Colorado watershed. Over 109,000 acres of agricultural lands are currently under conservation plans.

Education and outreach to local agricultural producers and landowners has remained a priority for the Arroyo Colorado Watershed Partnership. TSSWCB and Texas A&M AgriLife Extension have been working over the last year to educate agricultural producers on how to better manage their acreage to reduce the potential for NPS pollution. In order to achieve these potential reductions, Texas A&M AgriLife Extension has been supporting and promoting technical assistance and financial incentive programs to increase the number of participating producers. Attending grower field days as well as hosting field days, developing and disseminating factsheets, promoting soil testing, and developing a survey tool to evaluate barriers to BMP adoption by agricultural producers are just some of the tasks being accomplished through this effort. Essential to the success of these efforts is coordination with multiple partners including County Extension Agents, SWCDs, and commodity organizations such as Texas Citrus Mutual, Rio Grande Valley Sugarcane Growers, Texas Vegetable Association, and the Texas Farm Bureau.

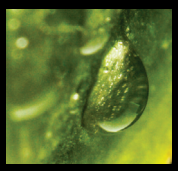
Lake Granbury

Lake Granbury is an impoundment of the Brazos River that lies fully within Hood

County. The City of Granbury, the City of DeCordova Bend, and numerous residential developments surround this reservoir. A bacteria concern has existed at Lake Granbury due to the high incidence of man-made cove developments and reliance on septic tanks for wastewater disposal. Developments in areas without collection and treatment systems currently rely on either holding tanks or septic systems. There are an estimated 9,000 septic systems located around Lake Granbury. Many of these are adjacent to shallow, man-made coves that offer little interaction with the main body of the reservoir. This lack of mixing means that incoming pollutants undergo very little dilution. The stakeholders for the Lake Granbury WPP adopted a goal of a geometric mean of 53 MPN/100ml for *E. coli*. The stakeholders selected three types of management measures for inclusion in the WPP: local orders/ordinances and homeowner's association regulations, physical management measures, and a broad educational program. In 2011, the Brazos River Authority (BRA) received a CWA Section 319(h) grant from the TCEQ to implement the Lake Granbury WPP. After receiving the grant award, BRA subcontracted with Texas A&M AgriLife Research to implement the WPP.

Over the past year, 15 presentations reaching about 400 people have been conducted. Presentations were presented to civic groups, business leaders, and homeowner groups. Topics have ranged from rain barrel installation to septic tank maintenance. Additionally, programs at local schools have reached nearly 600 students. Outreach to media outlets has led to the routine segments in the newspaper, as well as public service announcements on the local radio station. Publications addressing waterfowl feeding and a guide to septic systems for home inspectors were also produced. A county order was drafted addressing pump-out records for holdings tanks. These holding tanks were of considerable concern due to their proximity to the lake. A website was created that gives visitors access to numerous fact sheets and educational materials on topics including septic systems, aerobic treatment units, lawn care, and pet waste. Additionally, a grant proposal was submitted to install wetland plants along a section of Bee Creek in order to reduce bacteria entering the lake. The Port Ridglea East subdivision is a lakeside development that has historically exhibited high bacteria counts, mainly due to the presence of aging septic systems. This area is one of the WPP's priority areas. The Acton Municipal Utility District secured two Community Block Development Grants in previous years to tie about 60 households into the District's sewer system. Acton Municipal Utility District will seek another grant in order to continue the sewer expansion, which will result in another 30-35 households being connected to a regional wastewater collection system.

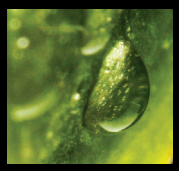
Lake Granbury - *Photo by Jody Cason, BRA*



Abbreveations

ACC	Arroyo Colorado Conservancy
ACS	Agricultural Chemicals Subcommittee of the TGPC
BMP	Best Management Practice
BRA	Brazos River Authority
BST	Bacterial Source Tracking
CBBEP	Coastal Bend Bays & Estuaries Program
CRP	TCEQ Clean Rivers Program
CWA	Clean Water Act
CWSRF	TWDB Clean Water State Revolving Fund
CWQMN	TCEQ Continuous Water Quality Monitoring Network
DO	Dissolved Oxygen
E. coli	*Escherichia coli*
EPA	U.S Environmental Protection Agency
EQIP	Environmental Quality Incentives Program (EQIP)
FAQ	Frequently Asked Questions
GBEP	TCEQ Galveston Bay Estuary Program
GBRA	Guadalupe-Blanco River Authority
GIS	Geographic Information System
H-GAC	Houston-Galveston Area Council
IBWC	International Boundary and Water Commission, U.S. Section
IPD	Interagency Pesticide Database
I-Plan	Implementation Plan for a TMDL
Integrated Report	*Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d)*
lbs	Pounds
LCRA	Lower Colorado River Authority
LDC	Load Duration Curve
LEADS	Leading Environmental Analysis and Display System
LID	Low Impact Development
LRGV	Lower Rio Grande Valley
µg/L	micrograms per liter
mg/L	milligram per liter
MPN	most probable number
NOAA	National Oceanic and Atmospheric Administration
NPS	Nonpoint Source
NRCS	USDA – Natural Resources Conservation Service
NWQI	USDA National Water Quality Initiative
OSSF	On-Site Sewage Facility
PCBs	Polychlorinated biphenyls
PMP	*Texas State Management Plan for the Prevention of Pesticide Contamination of Groundwater*
POC	Pesticide of Concern
POI	Pesticide of Interest
POE	TGPC Public Outreach and Education Subcommittee
RDF	Regional detention facility for stormwater
SARA	San Antonio River Authority
SELECT	Spatially Explicit Load Enrichment Calculation Tool
SWCD	TSSWCB Soil and Water Conservation District
SWQM	TCEQ Surface Water Quality Monitoring
TAMU-K	Texas A&M University-Kingsville
TBET	Texas BMP Evaluation Tool
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TFS	Texas Forest Service
TGPC	Texas Groundwater Protection Committee
TIAER	Texas Institute for Applied Environmental Research at Tarleton State University
TMDL	Total Maximum Daily Load
TPDES	TCEQ Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TSS	Total Suspended Solids
TSSWCB	Texas State Soil and Water Conservation Board
TSWQS	TCEQ Texas Surface Water Quality Standards
TWDB	Texas Water Development Board
TWRI	Texas Water Resources Institute
TxDOT	Texas Department of Transportation
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WAP	Watershed Action Planning
WPP	Watershed Protection Plan
WQMP	Water Quality Management Plan
WWTF	Wastewater Treatment Facility

Upper Medina River - *Photo courtesy of SARA*



Texas NPS Management Program Milestones

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2012 [1] Estimate	2012 Actual	Comments
ST1/A	NPS Assessment Report	The state will produce the Integrated Report in accordance with applicable EPA guidance	Integrated Report	1	0	Draft submitted to EPA in 2013
LT/2	NPS Management Program Updates	The state will update the Management Program in accordance with applicable EPA guidance	Management Program updates	0	0	
LT/7	NPS Annual Report	The state will produce the NPS Annual Report in accordance with applicable EPA guidance	NPS Annual Report	1	1	
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	
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	
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	14	
ST2/A	Priority Watersheds Report Updates	The state will update the Priority Watersheds Report based upon information and recommendations derived through the Watershed Action Planning process as described in the Management Program	Priority Watersheds Report Updates	0	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	1	1	

Continued

Texas NPS Management Program Milestones *Continued*

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2012 (1) Estimate	2012 Actual	Comments
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)	10	11	
ST3/C,D	Watershed Training	The state will provide a forum to facilitate the transfer of information between watershed professionals in the state	Texas Watershed Coordinator Roundtable	2	2	
ST3/B,F,G	Volunteer Monitoring	The state will provide support for local volunteer monitoring groups. These groups provide water quality data to the state water quality planning program and gain insight into resolving water quality issues	Texas Stream Team Participation (numbers of stations monitored)	250	271	
ST3/C,F,G	Urban BMPs	The state will provide technical and financial assistance to local communities to support the implementation of urban BMPs	Coastal Urban BMP Guidance Manual	0	0	
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	
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	9	9	
ST2/A,C	Watershed Coordination	The state will support watershed coordination projects which facilitate the implementation of WPPs	Watershed coordination projects	15	14	Numbers reflect active projects.
ST1/D	Develop WPPs	The state will support projects which provide for the development of WPPs which satisfy applicable EPA guidance	WPP development projects	16	14	Numbers reflect active projects.
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	25	22	Numbers reflect active projects.
ST1/D	Develop TMDLs and I-Plans	The state will support projects which provide for the development of TMDLs and I-Plans which satisfy applicable state, federal, and program regulations and guidance	TMDL and I-Plan development projects	1	1	

Texas NPS Management Program Milestones *Continued*

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2012 (1) Estimate	2012 Actual	Comments
ST2/D	Implement TMDLs and I-Plans	The state will support projects which provide for the implementation of management measures specified in TMDLs and I-Plans which satisfy applicable state, federal, and program regulations and guidance	TMDL I-Plan implementation projects	9	7	Numbers reflect active projects.
ST2/B,C	Load Reductions	The state will support projects which provide for the reduction of loadings of NPS pollutants	NPS load reduction projects	29	21	Numbers reflect active projects.
ST2/B,C	Load Reductions (Nitrogen)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ(2)	158,516 lbs/yr	
ST2/B,C	Load Reductions (Phosphorus)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ	23,400 lbs/y	
ST2/B,C	Load Reductions (Sediment)	The state will ensure project reductions are reported utilizing GRTS	GRTS Report	RQ	195,048 tons/yr	
ST2/E	Effectiveness Monitoring	The state will support projects which provide for the collection and analysis of water quality and other watershed information for the purpose of evaluating the effectiveness of BMPs	Effectiveness monitoring projects	31	24	Numbers reflect active projects.

(1) Milestone estimates were based upon existing grant commitments (up to and including fiscal year 2012 CWA Section 319(h) grant commitments between EPA, the State, and collaborating entities).

(2) RQ – Reportable Quantity – the value is to be reported in the NPS Annual Report.

Rocky Creek - *Photo by Jack Davis, BRA*

2012 ANNUAL REPORT

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

TEXAS STATE SOIL & WATER CONSERVATION BOARD

Managing

nonpoint source pollution in Texas