Managing

NONPOINT SOURCE POLLUTION IN TEXAS
2014 ANNUAL REPORT

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

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Texas Commission on Environmental Quality

Texas State Soil & Water Conservation Board


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Letter *From the* Executive Directors

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 voluntary, regulatory, financial, and technical assistance approaches to achieve a balanced program. The responsibility for implementing this program is divided between the TCEQ and the TSSWCB.

Since the issuance of new *Nonpoint Source Program and Grants Guidelines for States and Territories* in 2013, an increased emphasis has been placed on the implementation of watershed-based plans (WBPs) within impaired waters. Despite significant funding cuts since 2009, Texas has consistently worked with partners across the state to develop WBPs. To date, seven WBPs have been accepted by EPA, and more than fifteen others are under active development across the state. The TCEQ and TSSWCB facilitate the development, implementation, and buy-in of these plans to encourage adoption of voluntary measures to protect and restore water bodies.

The NPS Program has continued to achieve additional successes, including recognition by the EPA for two water-quality improvement "Success Stories" and implementing the state's Watershed Action Planning (WAP) process. The ultimate goal of the WAP process is to achieve restoration of designated uses in impaired water bodies. The WAP process 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. This process will be integral to the continued development and implementation of WBPs in Texas. This is accomplished by attaining socially acceptable and economically bearable solutions based on environmental goals which are grounded in defensible water quality standards and supported by credible water quality data.

We are pleased to present the *2014 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 partnership with the EPA and other federal, state, regional, and local watershed stakeholders, the TCEQ and the TSSWCB look forward to the continued implementation of 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

Richard A. Hyde, P.E.
Executive Director
Texas Commission on
Environmental Quality

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1 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 hydro-modifications, 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.

The Texas Nonpoint Source Management Program

The 2012 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d), indicates NPS pollution contributes to approximately 45 percent of the water quality impairments to rivers and streams and 42 percent of the water quality impairments to lakes in Texas. To address these issues, the *Texas 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. This report documents the success in achieving these goals and objectives.

The EPA's NPS Program makes CWA Section 319(h) federal grant funds available to states. The grant funds can support a wide variety of activities including implementation of best management practices (BMPs), technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of specific NPS implementation projects. In fiscal year 2014, Texas received $7,206,000 in CWA Section 319(h) federal grant funds to utilize and award to sub-grantees across the state.

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 implementing the short-term goals of 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 Watershed Protection Plans (WPPs) and/or Total Maximum Daily Load (TMDL) Implementation Plans (I-Plans) and other state, regional, and local plans/ programs to reduce NPS pollution by targeting activities to the areas identified as impacted 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.

Clean Water Act Section 319(h) Grant Guidelines

On April 12, 2013 the EPA issued new *Nonpoint Source Program and Grants Guidelines for States and Territories*. This guidance applies to recipients of CWA Section 319(h) federal grant funds, and replaces the previous guidelines that have been in effect since fiscal year 2004. These guidelines became effective in fiscal year 2014. The following is a link to the updated guidelines: <water.epa.gov/polwaste/nps/upload/319-guidelines-fy14.pdf>.

The new guidelines provide updated program direction, an increased emphasis on watershed project implementation in watersheds with impaired water bodies, and increased accountability measures. In an effort to increase the focus of CWA Section 319(h) funding on watershed project implementation, the new guidelines indicate states should set aside at least 50 percent of their allocation for watershed projects to provide an appropriate balance between implementation of watershed-based plans (WBP) and other important planning, assessment, management, and statewide NPS programs and projects.

Other significant changes in the revised guidelines include:

- emphasis on the importance of states updating their NPS management programs to ensure that funds are targeted to the highest priority activities
- emphasis on taking a watershed-based approach to restore NPS-impaired waters
- provision of a limited amount of funding to protect unimpaired/high quality waters
- specifications for supplemental information to be submitted with TMDLs developed using CWA Section 319(h) funds
- increased emphasis on coordination with the U.S. Department of Agriculture (USDA) Farm Bill programs as a way to leverage water quality investments
- flexibility for statewide NPS monitoring and assessment activities, for measuring success, and in targeting watershed restoration and protection efforts
- incentives to use the Clean Water State Revolving Fund (CWSRF) and other state or local funding for NPS watershed projects by providing additional flexibility with CWA Section 319(h) funds when states provide funding for watershed projects equal to their total CWA Section 319(h) allocation

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.

Figure 1.1
Social, Economic, and Environmental Considerations to Achieve Water Quality Restoration

Watershed Action Planning

A major element in the *Texas NPS Management Program* is the inclusion of the Watershed Action Planning (WAP) process and the Priority Watersheds Report. The WAP process is an initiative of the water quality programs in the state that guides statewide water quality planning. Management strategies to address water quality issues are selected through a collaborative approach and documented in the Priority Watersheds Report. This comprehensive planning approach facilitates greater coordination and leveraging of resources.

Funding challenges, new guidelines, increasing populations, and evolving environmental policies create new challenges for the state water quality planning programs. These challenges elevate the importance of incorporating the WAP process in the NPS Program to direct funding to watersheds with nine-element WBPs. The WAP process encourages sufficient planning of WBPs prior to implementation to ensure that NPS funds are spent efficiently and targeted towards well-planned projects.

The WAP process supports the integration of state water quality planning programs by providing a framework and a mechanism for enhanced coordination among state water quality planning programs and stakeholders. Coordination at the local level allows stakeholders opportunities to provide a local perspective and provide input into water quality management strategies and priorities. Interagency workgroups of surface water quality planning professionals meet to consider local input and other information for integration into program activities. Interagency coordination at the state and federal level allows for more effective development of projects, leveraging of resources, and the implementation of water quality management strategies with watershed stakeholder support.

The WAP process integrates information from existing planning tools and from the coordination process to develop and track water quality management strategies. In the first phase of the WAP process, water quality management strategies were documented and periodically updated 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) Group, Surface Water Quality Monitoring (SWQM) Program, CRP, TMDL Program, and the NPS Program. Information collected includes segment identification, 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 recommended strategies are documented and published in the WAP Table, a public spreadsheet summarizing the water quality management information maintained by the agencies. The WAP Table is located on the TCEQ's Watershed Action Planning website: < http://www.tceq.texas.gov/waterquality/planning/wap/>. An interactive, web-based application is being developed to replace the existing WAP Table spreadsheet.

Overall, the WAP process increases the transparency of the state's water quality planning programs by presenting a list of priority waters in such a manner as to communicate activities and intentions collectively to affected stakeholders and the public at large. Water quality management strategies identified through the WAP process are implemented on a continuing basis. Since September 2012, the WAP process has helped in the prioritization of water bodies for restoration efforts, the collection of water quality data, the adoption of TMDLs in the Houston area, and the completion of WPPs.

2 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 NPS 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:

- measuring actual results from implementing management measures
- calculating estimated load reductions with the help of models or other calculations

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 habitat and reduced use of fertilizers and pesticides.

Reductions in Pollutant Loadings

North Concho River Bank Stabilization to Prevent Erosion

Numerous existing and potential sources of NPS water pollution have been identified within the Concho River Basin. These include: urban runoff, feedlot waste, cropland erosion, on-site wastewater disposal, streamflow losses, and management of rangeland and pastureland. Using TCEQ's NPS funding, the Upper Colorado River Authority (UCRA) has implemented a successful NPS abatement program along the North Concho River in San Angelo for the last 10 years. This program is responsible for reducing pollutant loadings to the target stream and has improved water quality conditions. The success of the program is the result of installing several major runoff control structures as well as coordinated public outreach and education activities. Bank stabilization efforts have helped reduce sediment loading to the river. A comparison of pre- and post-construction dissolved oxygen (DO) data collected from the Continuous Water Quality Monitoring Network (CWQMN) station immediately below the project site indicated that after completion, higher minimum DO values were being maintained in this section of the river. Severe daily fluctuations in DO also decreased, improving the aquatic environment.

North Concho River with bank stabilizing BMPs

The construction phase of bank stabilization was completed in October 2013. Subsequently, the UCRA calculated pollutant load reductions. These were calculated by measuring the volume of highly erodible material removed from the river bank during the bank stabilization construction phase and then using known values of pollutants attributed to these materials to calculate the amount of pollutants removed. According to the report, these BMPs achieved the following load reductions:

Nitrogen	17.5 lbs
Phosphorus	28.7 lbs
Sediment	298.5 tons
E. coli	100 million cfu

Coastal Zone On-Site Sewage Facilities Reconnaissance, Training, and Replacement

Texas A&M AgriLife Research (AgriLife), with funding from the TCEQ's CWA Section 319(h) grant program, worked from 2012 through 2014 to inspect, and where needed, replace malfunctioning anaerobic on-site sewage facilities (OSSFs) in Brazoria, Galveston, Harris, and Nueces counties. OSSFs are a potential contributor of nutrients and bacteria in Dickinson Bayou, Lower Oyster Creek, Galveston Bay, Oso Bay, Corpus Christi Bay, and other coastal watersheds. This project was implemented to help meet the requirements of the Coastal Zone Act Reauthorization Amendments (CZARA) Section 6217.

A total of 63 septic systems were inspected over the course of the project. Over 39,150 gallons of septage were removed, enabling thorough inspections of 59 septic systems. Four sites were not pumped due to restricted access to the tanks, risk of damaging tank components, or site conditions that were hazardous for pumping. Common problems noted during inspection of anaerobic septic systems included:

- lack of proper operation and maintenance
- undersized tanks and drainfields
- deteriorated system components
- drain-fields installed in unsuitable soil conditions

Twenty-one septic systems were selected for replacement based on the severity of failure, impact on human and environmental health, and proximity to impaired waterways and coastal waters. Twenty were replaced in FY14, and one will be completed in FY15. AgriLife collaborated with licensed designers and the property owners to select systems providing optimal treatment with minimal maintenance and maximum years of user satisfaction. The annual pollutant reductions for the replacement of the malfunctioning systems are approximately:

Nitrogen	307 lbs
Phosphorus	51 lbs
Suspended Solids	5,315 lbs
E. coli	0.4 quadrillion cfu

AgriLife also established and maintained cooperative relationships with Authorized Agents, watershed coordinators, stakeholders, and County Extension Agents to promote public outreach events and encourage participation in the inspection program. During fiscal year 2014, the "Introduction to Septic Systems" trainings were offered four times to homeowners wanting to understand more about their OSSF. The trainings addressed homeowners' frequently asked questions (FAQs) and provided a basic understanding of the operation and maintenance of OSSFs. A total of 84 people participated in the trainings. Responses to the course evaluations were positive and indicated a willingness to adopt practices to pump-out the septic tanks as needed and limit pollutant loading to the septic system.

Right: Liquid waste surfacing in a yard along Chocolate Bayou *(Source: Texas A&M AgriLife Research)*

Below: Pumping and inspecting a septic tank near Lake Jackson *(Source: Texas A&M AgriLife Research)*

Public awareness of septic tank operation and maintenance was achieved through public outreach events and site visits to pump out and inspect septic tanks. Forty-two of the septic tanks pumped and inspected did not meet the criteria for replacement. Annual estimated pollutant reductions from improved management and maintenance practices adopted by about 74 percent of the participants in the inspection and outreach program are as follows:

Nitrogen	8.78 lbs
Phosphorus	28 lbs
Suspended solids	9,064 lbs
E. coli	0.9 quadrillion cfu

Arroyo Colorado Agriculture BMP Implementation

Through multiple CWA Section 319(h) grants provided by the TSSWCB, the Southmost and Hidalgo Soil and Water Conservation Districts (SWCDs) have allocated funds to address agricultural NPS pollution in the Arroyo Colorado watershed. Since 1999, 457 Water Quality Management Plans (WQMPs) covering over 32,650 acres have been implemented across the watershed.

In fiscal year 2014, 21 of the 457 WQMPs covering 923.6 acres were implemented in the watershed. Of these 923.6 acres, 813.5 acres were cropland and 110.1 acres were hayland. Irrigation BMPs compose the majority of installed practices in the Arroyo Colorado watershed. A total of 210 acres of irrigation land was leveled and 11,813 feet of irrigation pipeline was installed. These two practices complement each other and have enabled producers to better utilize their resources. According to the Texas Best Management Practices Evaluation Tool (TBET), these BMPs achieved the following load reductions:

Nitrogen	4,119 lbs
Phosphorus	688 lbs
Sediment	835 tons

Additional information regarding the efforts in the Arroyo Colorado watershed may be found at <arroyocolorado.org>.

Agricultural BMPs in the Plum Creek Watershed

Through CWA Section 319(h) grants provided by the TSSWCB, Caldwell-Travis SWCD in cooperation with the Hays SWCD has allocated funds to address agricultural NPS pollution in the Plum Creek watershed. Since 2008, 16 WQMPs have been implemented across the watershed.

In fiscal year 2014, five WQMPs were written for a total of 866 acres. The BMPs installed include: water wells, pipelines to transport water for livestock, watering facilities, grass planting, cross fencing, prescribed grazing, herbaceous weed control, nutrient management, and heavy use area protection. Based on the TBET, these BMPs achieved the following load reductions:

Nitrogen	1,973 lbs
Phosphorus	144 lbs
Sediment	5.2 tons

Additional information regarding the efforts in the Plum Creek watershed may be found at < http://plumcreek.tamu.edu/>.

Lower Colorado River Authority's Creekside Conservation Program

The Lower Colorado River Authority (LCRA) received a CWA Section 319(h) grant from the TSSWCB to support the Creekside Conservation Program. This program is a partnership between LCRA, private landowners, the United States Department of Agriculture - Natural Resources Conservation Service (NRCS) and local SWCDs. The Creekside Conservation Program provides a cost-share incentive to help reduce soil erosion and agricultural NPS pollution on privately owned land. The program was conducted in Bastrop, Blanco, Burnet, Colorado, Fayette, Lampasas, Llano, Matagorda, San Saba, Travis, and Wharton counties. Four workshops and four field days were held with approximately 400 people attending these events.

As a result of this program, 7,913 acres were placed under conservation management. BMPs installed in the last year included one alternative water source, 11,483 feet of cross fencing, and 698 acres of brush management. Additionally, prescribed grazing and upland wildlife habitat management practices were implemented on all 7,913 management acres. Based on the TBET, these BMPs achieved the following load reductions:

Nitrogen	33,311 lbs
Phosphorus	3,049 lbs
Sediment	112 tons

Additional information regarding LCRA's Creekside Conservation Program may be found at < http://www.lcra.org/community-services/land-conservation>.

Water Quality Improvements

Texas' lead NPS agencies, the TSSWCB and the TCEQ, work together to identify instream water quality improvements where the implementation of NPS BMPs is a contributing factor. Once a strong candidate is identified, a "success story" is written and sent to the EPA for approval. Incremental improvements in water quality are also important. Linking instream reductions of NPS pollutants to land management practices is scientifically challenging because changes on the land occur over varying temporal and spatial scales and contributions to the stream are rainfall driven. As a result, changes in stream water quality often lag behind implementation of NPS BMPs, and many years of implementation may be needed before significant improvements in a stream are observed. Despite these challenges, Texas has seen measurable water quality improvements.

Success Story Highlights

Colorado River Below E.V. Spence Reservoir Success Story

The Colorado River below E.V. Spence Reservoir (Segment 1426) is located within Coke and Runnels counties in West Central Texas. The segment begins below E.V. Spence Reservoir and flows for over 60 miles until it reaches O.H. Ivie Reservoir. Water quality grab samples collected between March 3, 1996 and February 6, 2001, showed a mean chloride concentration of 898 mg/L. This exceeded the site-specific chloride standard for Segment 1426, which is 610 mg/L. The TCEQ completed two TMDLs and one I-Plan to address chloride and total dissolved solids in the segment.

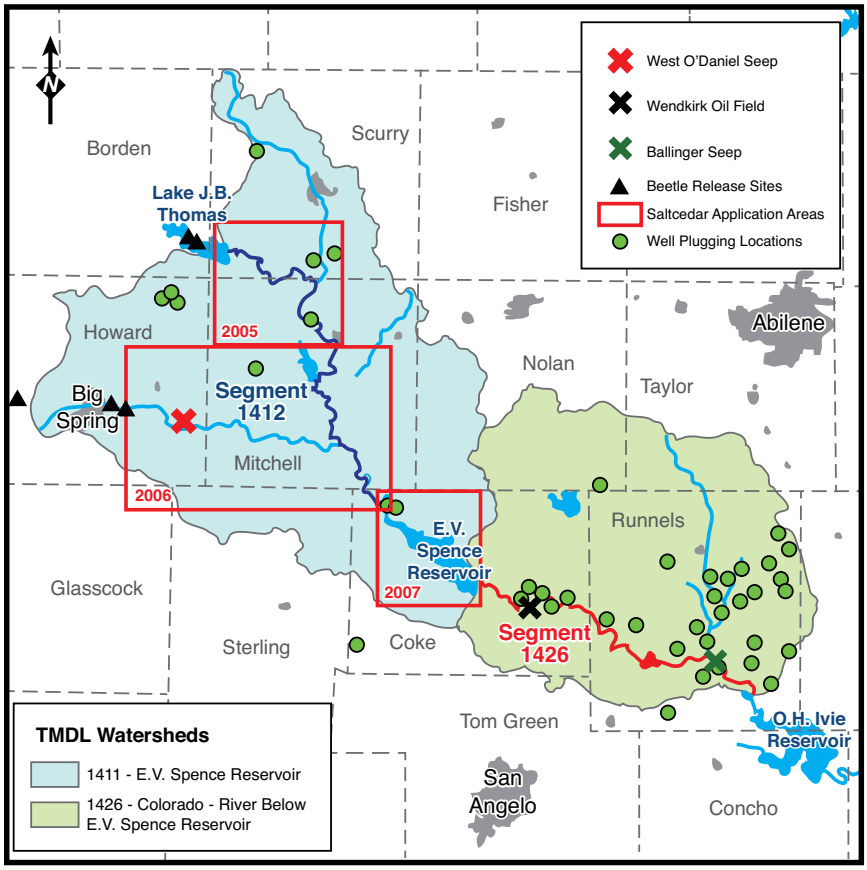
Control of Saline Sources Through Well Plugging

Potential sources of chloride in the contributing watershed included noncompliant oil and gas wells, invasive brush species, and natural salt deposits. The TCEQ partnered with the Texas Railroad Commission (RRC) to implement several management measures identified in the I-Plan. Between February 2003 and August 2007, 272 abandoned, unplugged, or non-compliant oil and gas wells were plugged in Runnels, Coke, Nolan, Mitchel, Howard, and Scurry counties. In 2008, a 300-foot recovery trench was installed across the West O'Daniel Seep in Howard County and wells were plugged in both the Ballinger Seep and the Wendkirk Oil Field in Runnels and Coke counties respectively. Additional abatement control strategies by the RRC were funded in fiscal year 2014, under the TCEQ's CWA Section 319(h) grant program.

Control of Saline Sources Through Chemical and Biological Controls

The TSSWCB also implemented several management measures identified in the I-Plan. A targeted brush control project was initiated to chemically treat saltcedar by aerial application of the herbicide Arsenal®, in a 150-foot corridor along the Colorado River from below Lake J.B. Thomas to E.V. Spence Reservoir. Saltcedar is an invasive species that has the ability to transport salts from groundwater to its leaves. Surface water salinity increases when the leaves drop in the fall. Saltcedar also uses excessive amounts of water which reduces in-stream flow and

Figure 2.1
Locations Where Arsenal® was Applied Along the Colorado River



consequently increases chloride concentrations. Through this effort, a total of 11,391 acres were treated from 2005 through 2007. The estimated life of a one-time chemical treatment of Arsenal® is approximately 15 years.

The TSSWCB also implemented biological control of saltcedar. Mediterranean leaf beetles *(Diorhabda elongate)* were released in 2004 along Beals Creek near Big Spring and in Lake J.B. Thomas. By 2008, the leaf beetles had defoliated about 140 acres of saltcedar trees. No beetle damage was seen on any other plants in the area and the native grasses had recovered after approximately two years.

The TSSWCB worked cooperatively with the Upper Colorado SWCD, Mitchell SWCD, Coke County SWCD, the Colorado River Municipal Water District, the Texas Department of Agriculture (TDA), Texas Parks and Wildlife Department (TPWD), U.S. Fish and Wildlife Service, the NRCS, Texas A&M AgriLife Extension Service and local landowners for the targeted control of saltcedar.

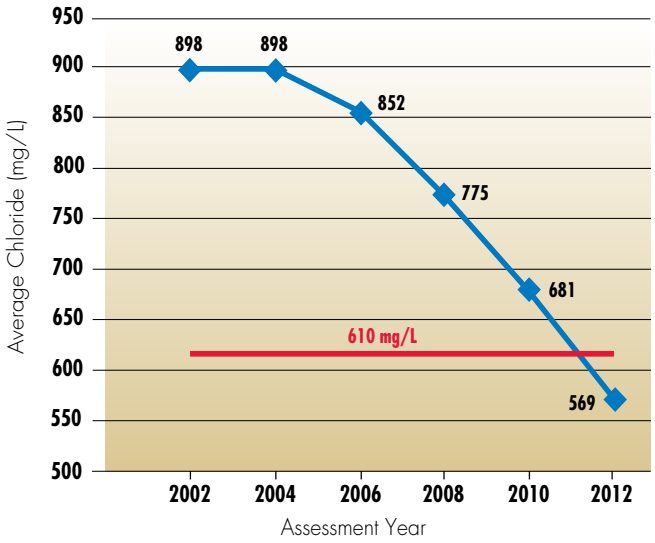
Saltcedar defoliated by leaf beetles *(Source: Allen Knutson, Texas A&M AgriLife)*

Results

There has been a significant downward trend in chloride concentrations since the segment was originally identified as impaired in 2002. This downward trend, indicated in Figure 2.2, corresponds with the implementation of the salt-reduction management measures identified in the TMDL I-Plan. The TCEQ and TSSWCB funded projects contributed to these reductions. The average chloride concentration decreased from 898 mg/L in the 2002 Integrated Report to 569 mg/L in the 2012 Integrated Report. This improvement in water quality resulted in the segment meeting its chloride standard.

Figure 2.2

Average Chloride Concentration in the Colorado River



(Segment 1426 was not assessed during the 2004 Assessment)

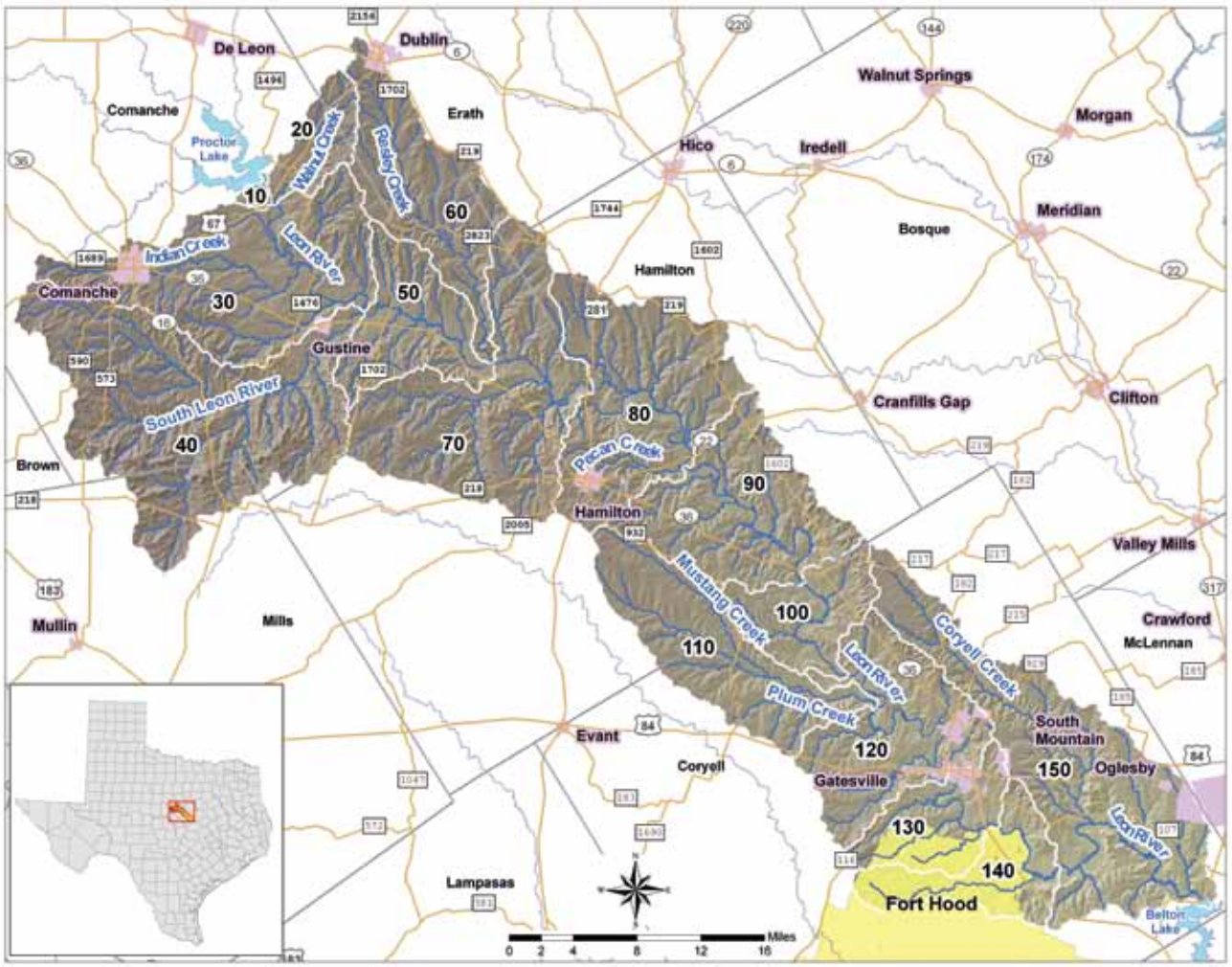
Leon River and Pecan Creek Success Story

Implementing Conservation Practices and Conducting Watershed Outreach

The 1,375 square mile Leon River watershed in central Texas is bounded by Proctor Lake upstream and Belton Lake downstream (Figure 2.3). The Leon River is 190 miles

Figure 2.3

The Leon River Watershed in Central Texas



Numbers represent subwatersheds within the Leon River watershed. Restored waters are within subwatersheds 10 and 80.

long, and drains portions of Comanche, Erath, Hamilton, and Coryell counties. The watershed is largely rural, with most of the land suited for grazing by cattle and goats; a few animal feeding operations are also present. Pecan Creek, a tributary of the Leon River, shares the land use features of the larger watershed.

Water quality data collected in the Leon River from 1990 to 1995 showed that fecal coliform levels exceeded the bacteria water quality standard for contact recreation. As a result, the TCEQ added the river to the 1996 CWA Section 303(d) List of Impaired Waters (303(d) List) for not supporting its primary contact recreation use.

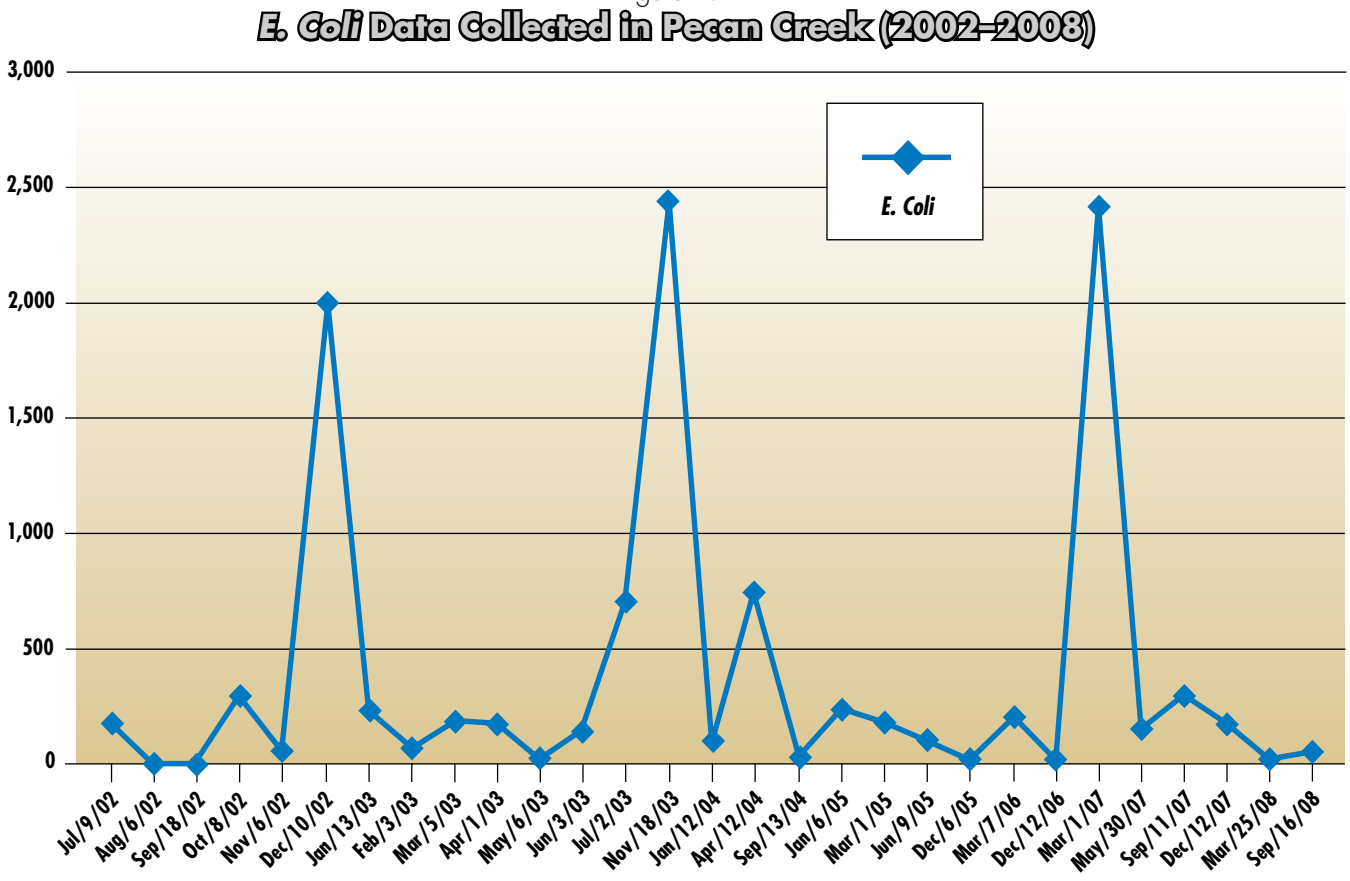
In 2000, the water quality standard for bacteria changed from fecal coliform to an *E. coli*-based bacteria standard. The new standard requires that *E. coli* levels not exceed a geometric mean of 126 colony-forming units (cfu) per 100 mL of water. Data collected from 1998 to 2005 showed that the geometric mean for *E. coli* exceeded the contact recreation standard in Pecan Creek. The TCEQ subsequently added Pecan Creek to the 2006 303(d) List for not supporting its primary contact recreation use.

The TSSWCB provided CWA Section 319(h) grant funding to develop a WPP to address the bacteria impairments in the Leon River watershed. The stakeholder group that led the development of the WPP consisted of representatives from Commissioners' Courts (i.e. county governments), agricultural producers, wildlife interests, SWCDs, the dairy industry, cities and various other interests in the watershed. Stakeholders within the watershed voluntarily implemented BMPs, as the result of a successful outreach and education program.

The TSSWCB, partnering with the Upper Leon SWCD and the Hamilton-Coryell SWCD, certified and implemented a total of 13 WQMPs in the impaired watersheds. The Upper Leon SWCD in Comanche and Erath counties implemented eight WQMPs on 1,857 acres. The Hamilton-Coryell SWCD implemented five WQMPs on 1,097 acres near Pecan Creek.

Several animal feeding operations were included in these WQMPs. These plans included BMPs such as alternative water sources, prescribed grazing, cross-fencing, grassed waterways, nutrient management, and grass planting. In addition, the NRCS worked with landowners in both subwatersheds to implement conservation practices on over 2,800 acres using Environmental Quality Incentives Program funding and another 1,840 acres using Agricultural Water Enhancement Program funding. The conservation practices implemented with these two sources of funding included prescribed grazing, grass and range planting, nutrient management, residue management, conservation cover, water wells, water troughs, and ponds.

Figure 2.4



The geometric mean (123.81 cfu/100 mL) indicates that the creek meets the primary contact recreation standard.

Results

Water quality monitoring data show that the long-term *E. coli* geometric means meet the state water quality standard for contact recreation in a portion of the Leon River (121.83 cfu/100 mL for assessment data collected from 2003–2010) and all of Pecan Creek (123.81 cfu/100 mL for assessment data collected from 2001–2008) (Figure 2.4). Consequently, the entire length (11.9 miles) of Pecan Creek (segment 1221C_01) was removed from the state's list of impaired waters in 2010. In addition, a 3.9-mile segment in the upper portion of Leon River (segment 1221_07, from the confluence of Walnut Creek upstream to Lake Proctor) was removed from the impaired waters list in 2012. These water bodies currently support all of their designated uses. Water quality monitoring continues to track and measure interim progress to implement the WPP and ensure this restoration effort remains a success.

Incremental Water Quality Improvement Highlights

Dissolved Oxygen Improvements in the Arroyo Colorado River

The TCEQ classifies the Arroyo Colorado River into two distinct segments, the Tidal segment and the Above Tidal segment. The Tidal segment is designated as having a high aquatic life use. Currently it does not support this aquatic life use in the upper 7.1 miles of the segment where DO concentrations are sometimes lower than the criteria established for high aquatic life. This portion of the Arroyo Colorado is known as the "Zone of Impairment". The segment was first identified as impaired for DO on Texas' 1996 303(d) List and is still included on the 2012 List. The Above Tidal segment has been designated as having an intermediate aquatic life use and supports this use.

To address the DO impairment in the Tidal segment, the Arroyo Colorado Watershed Partnership was formed. The Partnership is a group of local, state, and federal organizations that meet to discuss water quality issues in the watershed. The Partnership completed a WPP to address the DO impairment in 2007. The plan specifically addressed loading of nutrients and sediments to the Arroyo Colorado River that contribute to fluctuations in DO levels.

Since 2007, numerous projects have been completed, or are underway, to address the elements of the WPP. These projects include implementation of agricultural BMPs, upgrades to wastewater treatment facilities, connection of colonias to wastewater treatment plants, addressing urban stormwater issues through stormwater permit requirements, and outreach and education. Specific information on the projects can be found on the website for the Arroyo Colorado Watershed Partnership <http://arroyocolorado.org/partnership/>.

Since the WPP was finalized in 2007, an improvement to DO levels in the tidal portion of the Arroyo Colorado has been observed. The average DO concentration in the tidal portion of the Arroyo Colorado before 2008 was 4.85 mg/L (1969-2007), and the average from 2008 through 2013 was 6.14 mg/L.

Soluble Phosphorus Reductions in the North Bosque River

The North Bosque River stretches over 100 river miles from its headwaters north of Stephenville, Texas, to Lake Waco, a drinking water supply for the City of Waco and surrounding area. Starting in 1996, the TCEQ identified high nutrients and excessive algae as a problem along the North Bosque River (Segments 1226 and 1255).

Researchers working with the TCEQ identified soluble reactive phosphorus as the primary nutrient driving excessive algal growth. In 2001, TMDLs aimed at reducing soluble phosphorus were adopted for the North Bosque River. The TCEQ and the TSSWCB developed an I-Plan in 2002 describing regulatory and voluntary actions needed. Major regulatory actions included enhanced nutrient management plans for Concentrated Animal Feeding Operations as well as continuing education for facility operators and new phosphorus effluent limitations for municipal wastewater treatment facilities. Voluntary actions focused on improved land management practices, including the development of comprehensive nutrient management plans for all animal feeding operations in the watershed; the haul-off of dairy manure and promotion of composting as a beneficial use for dairy manure outside the watershed.

The Texas Institute for Applied Environmental Research (TIAER) at Tarleton State University is monitoring water quality along the North Bosque River to evaluate reductions in soluble phosphorus associated with the implementation of two TMDLs. The TIAER has monitored at several locations since the mid-1990s, five of which are index stations for evaluating the effectiveness of I-Plan measures. These five stations are spaced along the North Bosque River from north of Stephenville, near the headwaters, to Valley Mills, near the mouth of the river into Lake Waco. Monitoring includes routine grab samples and storm monitoring of rainfall-runoff events.

While the 2012 Integrated Report continues to indicate water quality concerns regarding soluble phosphorus and excessive algae in the North Bosque River, conditions are improving. Statistical trend analyses of data collected from October 1997 through September 2013 indicate significant reductions in soluble phosphorus at four of the five index stations. The concentrations of soluble phosphorous at stations above and below the City of Stephenville are shown in Figures 2.5 and 2.6.

Overall, phosphorus concentrations downstream of Stephenville are reduced by more than 50%. In 2013, phosphorus concentrations met the TMDL target at the three downstream index sites. However, at the two upstream stations, phosphorus concentrations increased from the prior year, and TMDL targets were not met.

Figure 2.5

Soluble Phosphorus Concentrations in the North Bosque River Above Stephenville

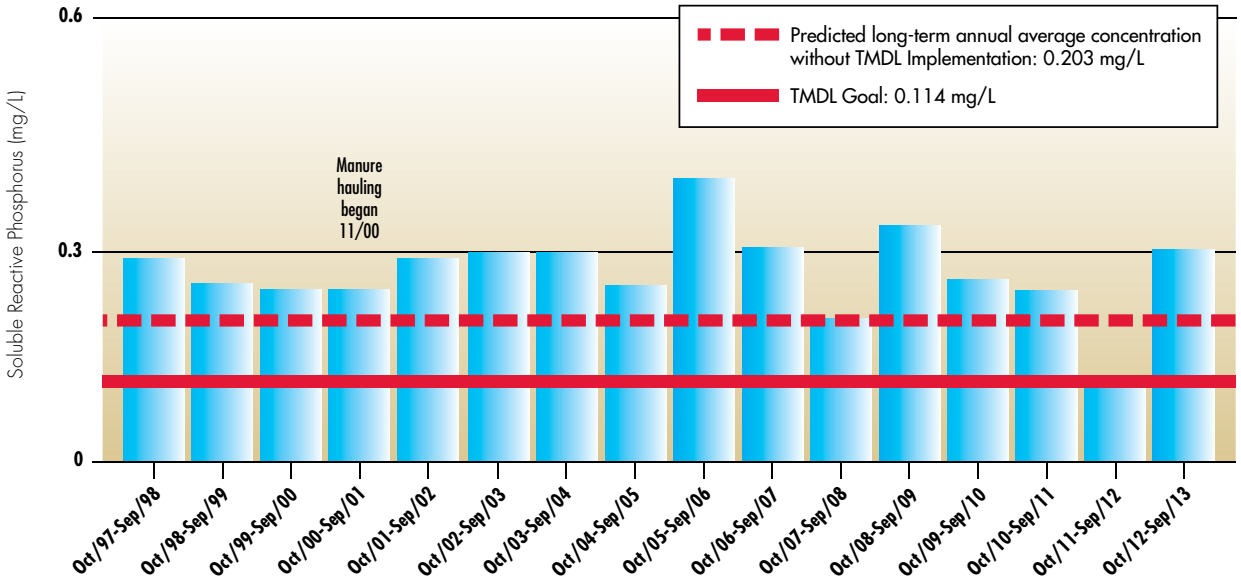
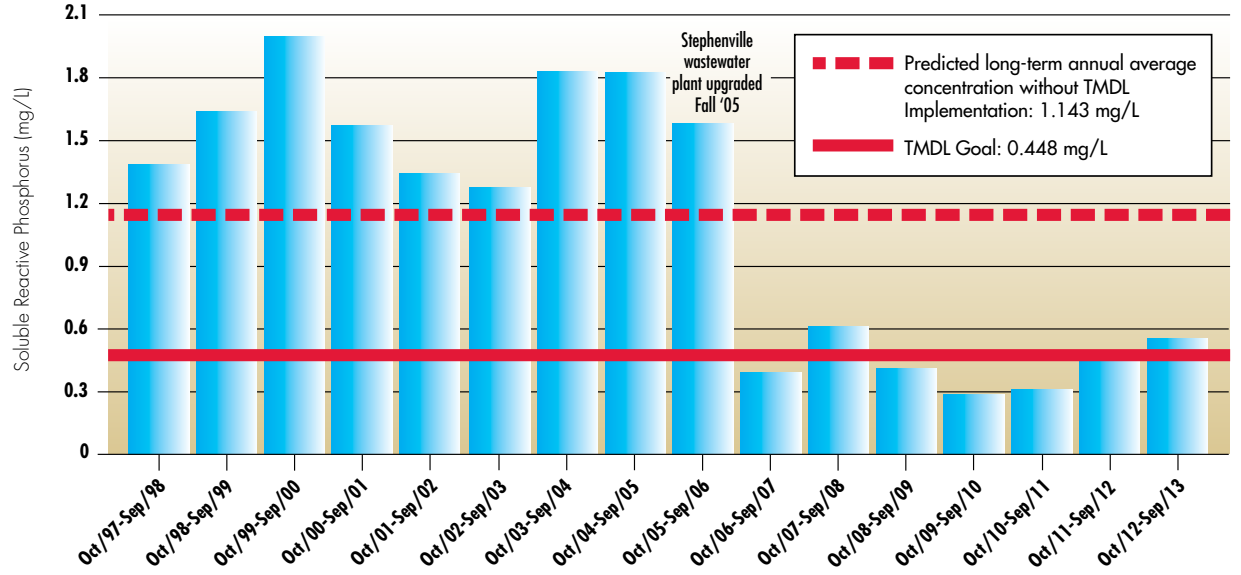


Figure 2.6

Soluble Phosphorus Concentrations in the North Bosque River Below Stephenville



Due to drought, the river had little to no flow at the station above Stephenville most of the year. Downstream of Stephenville, flows were lower than usual, but more constant due to discharges from the municipal WWTF. Phosphorus concentrations increased at both these two upstream sites in 2013. The drought conditions were extreme above Stephenville, where monitoring staff were able to obtain only five samples all year, which is about 20% of the usual number collected. Consequently, results at the two upstream stations are not representative of average conditions and do not necessarily reflect increased nutrient contributions from the watershed.

Since implementation of phosphorus control by the Stephenville wastewater treatment facility began in late 2005, noticeable reductions in soluble phosphorus have occurred at the two closest downstream stations. Annual grab samples have consistently met target concentration levels at three of the five index stations, and a fourth station has met the standard in four out of the last six years. While drought conditions in recent years have decreased the amount of runoff and therefore limited the number of samples collected, improvements in water quality due to changes in management practices within the watershed are apparent.

Reductions in phosphorus have been connected to the haul-off and composting of dairy manure within smaller tributaries of the North Bosque River and implementation of other NPS management practices, as documented in previous NPS annual reports.

3 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 2014, the TCEQ had 38 active multi-year CWA Section 319(h) grant-funded projects totaling approximately $14 million in federal funds, and 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 statewide volunteer water quality monitoring program, urban stormwater retrofits, OSSF education and maintenance, and a variety of BMPs chosen on the basis of local water quality priorities.

In fiscal year 2014, the TSSWCB had 50 active multi-year CWA Section 319(h) grant-funded projects totaling approximately $13 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 2014 Nonpoint Source Grant-Funded Projects

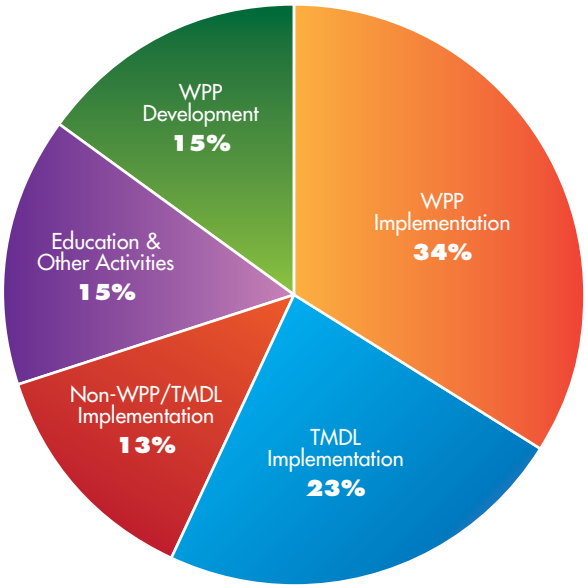
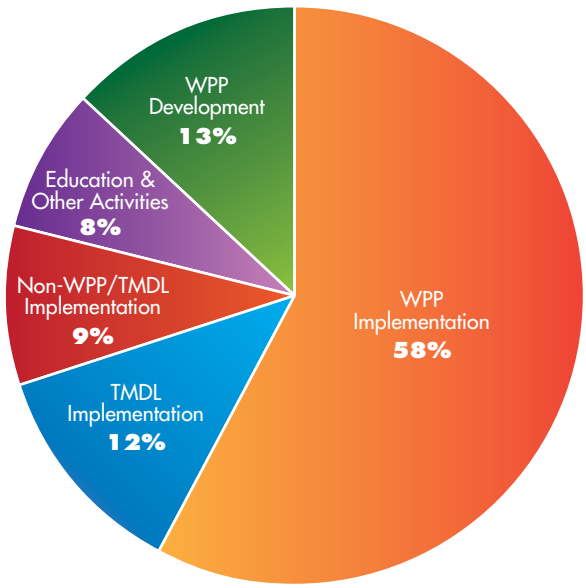


Figure 3.2
TSSWCB Fiscal Year 2014 Nonpoint Source Grant-Funded Projects



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 Austin 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 potential sources of pollution and the adequacy of regulatory measures, watershed improvements, and restoration plans. The data collection 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 TCEQ produces a new report every two years in even-numbered years, as required by law. The 2012 Integrated Report describes the status of all surface water bodies of the state evaluated for the given assessment period. The TCEQ used data collected during the most recent seven-year period (December 1, 2003-November 30, 2010) to assess the quality of surface water bodies of the state. The descriptions of water quality for each assessed water body in the Integrated Report represent 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 through the WAP process. The assessment guidance includes methods to determine designated use attainment for water quality standards. These methods are developed by the TCEQ with the advice of a diverse group of stakeholders, and are detailed in the *2012 Guidance for Assessing and Reporting Surface Water Quality in Texas* (available online at <www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012_guidance.pdf>).

The 303(d) List is an important management tool produced as part of the Integrated Report. It identifies waters for which the existing preventative measures are not sufficient to meet TSWQS. The 303(d) List must be approved by the EPA prior to being implemented by TCEQ water quality management programs.

Water Quality Status Categories

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

Water bodies on the 303(d) List (Category 5 of the Integrated Report) are those that require remedial action to restore water quality. The combination of the water body and pollutant or condition of concern is called an impairment. For example, the concentration of DO is one of the criteria used to determine aquatic life use support. 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 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 water quality standards for the water body to be conducted before a management strategy is selected
- those water bodies in Category 5c require additional data and information to be collected or evaluated before a management strategy is selected

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.

Table 3.1
Number of Water Bodies Assigned to Each Assessment Category in the 2012 Integrated Report

Category	Definition	Number of Water Bodies
1	Attaining all the water quality standards and no use is threatened.	38
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.	385
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.	300
4	The standard is not supported or is threatened for one or more designated uses but does not require the development of a TMDL.	81
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.	410
Totals		1,214

Summary of the 2012 Integrated Report

The 2012 Integrated Report assessed the water quality of 1,214 water bodies. Sufficient data was available to assess uses for 914 water bodies. Of these, 491 were determined to not be attaining one or more of the uses. The combination of the water body and pollutant is called an impairment. Some water bodies are impaired for more than one pollutant, so the total number of impairments (568) is larger than the total number of impaired water bodies (491) in Categories 4 and 5 shown in Table 3.2.

Of the 1,214 water bodies, 410 were classified as Category 5 water bodies (Table 3.1). This was a slight decrease from the 2010 303(d) List, which included 440 water bodies. The total number of impairments also decreased from 621 to 568 (Table 3.3). The 2012 Integrated Report was approved by the TCEQ on February 13, 2013, and was approved by the EPA on May 9, 2013.

Table 3.2

Number of Impairments in the 2012 Integrated Report Requiring Management Action

Category	Definition	Water Body Classification		Total Number of Impairments
		Classified	Unclassified	
5	5a—TMDL scheduled or underway	81	85	166
	5b—Water Quality standards review scheduled or under way or undergoing Use Attainability Analysis	60	142	202
	5c—Need additional monitoring	110	90	200
Total Number of Impairments in Category 5		251	317	568

Table 3.3

Summary of Impairments Identified on the 303(d) List for the 2012 Integrated Report

Impairment Group	Media	2010 Number of Impairments	2012 Number of Impairments	Use
Bacteria	in water	303	257	recreation
	in shellfish	15	15	oyster waters
	beaches	1	1	beach use
Dissolved Oxygen	in water	94	90	aquatic life
Toxicity	in ambient water	2	2	aquatic life
	in ambient sediment	6	6	
Organics	in water	0	0	fish consumption, aquatic life
	in fish or shellfish	94	99	
Metals (except mercury)	in water	6	4	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	23	23	
Dissolved Solids	chloride	13	11	general
	sulfate	9	9	
	total dissolved solids	13	14	
Temperature	in water	0	0	general
pH	in water	17	17	general
Nutrients	nitrogen	0	0	general, public water supply
Biological	habitat, macrobenthic community, or fish community	24	19	aquatic life
Totals		621	568	

Summary of Impairments on The 2012 Integrated Report

Impairments identified in the 2012 Integrated Report have been grouped by the parameter and the beneficial use of the water body affected (Table 3.3). Elevated levels of bacteria represent 45 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, was found to be the cause in about 16 percent of the impairments. Low DO can result in an unhealthy environment for aquatic life.

Status of The 2014 Integrated Report

The 2014 Integrated Report is currently under development by the TCEQ. The data used to assess water quality ranges from December 1, 2005 to November 30, 2012.

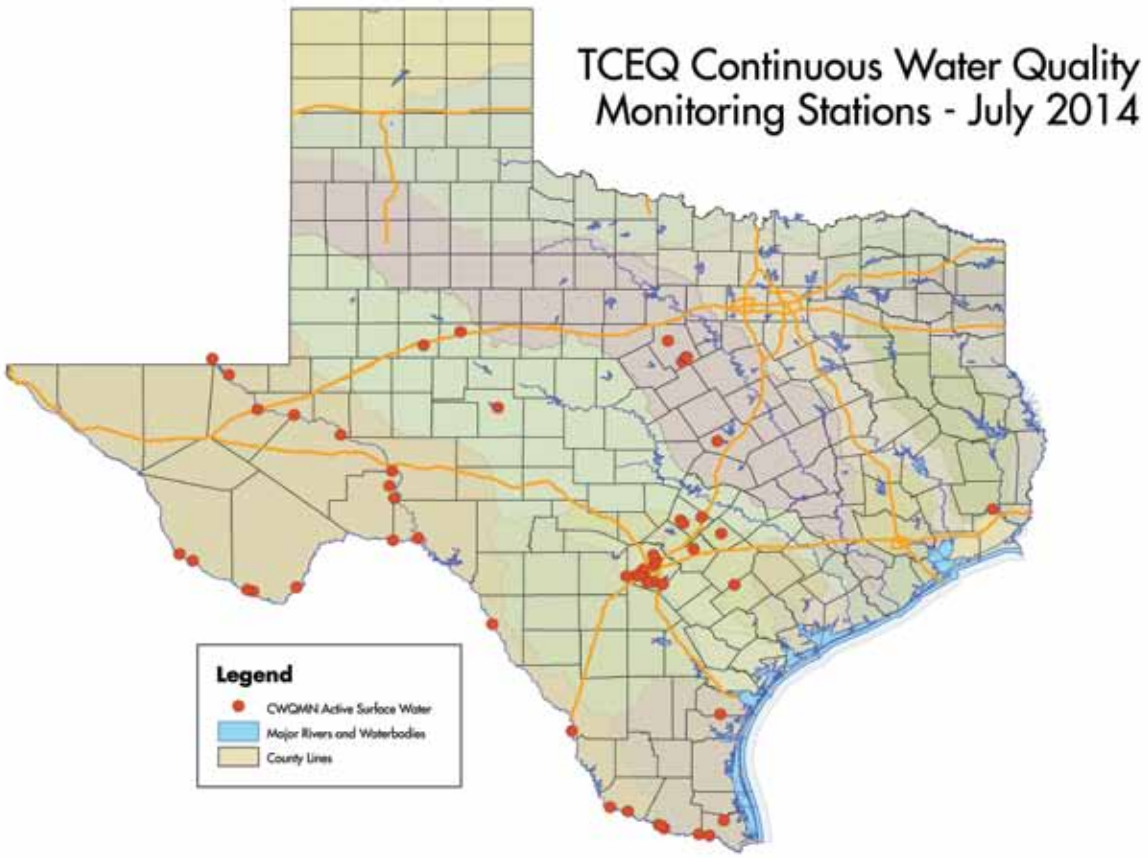
Continuous Water Quality Monitoring

The TCEQ has developed—and continues to refine—a network of continuous water quality monitoring sites on priority water bodies. The agency maintains 50-60 sites in its CWQMN. The number and locations of sites varies from year to year. In the summer of 2014, the TCEQ had 52 active stations. At these sites, instruments measure basic water quality conditions every 15 minutes.

CWQMN monitoring data may be used by the TCEQ or other organizations to make water resource management decisions, target field investigations, evaluate the effectiveness of water quality management programs such as TMDL I-Plans and WPPs, characterize existing conditions, and evaluate spatial and temporal trends. The data are available online at <www.texaswaterdata.org>.

The monitoring network is used daily to guide decisions on how to better protect certain segments of rivers or lakes. From 2004 to 2014, the TCEQ developed a network of 14 CWQMN sites on the Rio Grande and Pecos Rivers. The primary purpose is to monitor levels of dissolved salts to protect the water supply in the Amistad Reservoir. The Pecos River CWQMN stations also supply information on the effectiveness of the Pecos River WPP. These stations are operated and maintained by the U.S. Geological Survey (USGS) through cooperative agreements with the TCEQ and the TSSWCB. Other uses of this data include development of water quality models. The TCEQ utilized CWA Section 319(h) funds to purchase advanced instruments designed to continuously monitor nitrate and phosphate in ambient waters and equipment designed to reduce instrument fouling and increase the effective deployment durations. These instruments and equipment will be tested in cooperation with the USGS and the TIAER.

Figure 3.3
Continuous Water Quality Monitoring Station Locations



Arroyo Colorado

During fiscal year 2014, the TCEQ deployed a unique continuous water quality monitoring station in the tidal segment of the Arroyo Colorado at Rio Hondo in Hidalgo County. This segment is listed in the Integrated Report for multiple impairments. The automated monitoring station collects water quality hourly at multiple depths. Water quality varies from eutrophic fresh surface water to anoxic saltwater at the bottom of the channel. Continuous water quality monitoring at this station has been extremely difficult because of biologic fouling near the surface and hydrogen sulfide in the anoxic saltwater near the bottom. By conducting vertical profiles hourly instead of every 15 minutes, the impact of biologic fouling and hydrogen sulfide is reduced.

Texas Stream Team Monitoring

The Texas Stream Team is a statewide network of citizen scientists and partner organizations that is dedicated to improving water quality through citizen-led data collection, stakeholder engagement, and watershed education. The program is based out of The Meadows Center for Water and the Environment at Texas State University, and is primarily administered through a cooperative CWA Section 319(h) grant funded partnership with The Meadows Center for Water and the Environment, the TCEQ, and the EPA.

The Texas Stream Team citizen scientists are certified under a training process to collect water quality parameters from assigned monitoring sites. The water quality parameters include temperature, pH, DO, specific conductance, water turbidity, *E. coli*, nitrate-nitrogen, orthophosphate, and field observations. The data are collected in accordance with an approved Quality Assurance Project Plan. After undergoing a quality assurance check, the data are posted onto the Texas Stream Team's Dataviewer <https://aqua.meadowscenter.txstate.edu/>, where visitors can click on a specific site and download the historical water quality data that have been collected.

Watershed-wide data are also compiled and analyzed in summary reports which are available to partner organizations, local water resource managers, local stakeholders, citizen scientists, and the general public in order to give a more complete picture of the quality of local water bodies.

In fiscal year 2014, the Texas Stream Team published data summary reports on citizen scientists' data in the Upper San Marcos, Medina River, Nolan Creek, Cypress Creek, Gilleland Creek, Canyon Lake, Blanco River, Lake Livingston, Cibolo Creek, Lower San Marcos River, and White Rock Creek Watersheds. In addition, 218 new citizen scientists became certified to collect water quality data for the Texas Stream Team, 1,214 monitoring events occurred, and 81 new monitoring sites were created.

The Texas Stream Team partners with organizations across the state that help support local Stream Team monitoring groups in their data collection. In 2014, the Texas Stream Team partnered with The Texas Conservation Alliance, a non-profit organization that is dedicated to enhancing and sustaining wildlife habitat and protecting natural resources in Texas. The Texas Conservation Alliance organized three trainings in East Texas, and recruited members from their organization to become citizen scientists. Many of the people who were trained at these workshops were then put in contact with several of the river authorities in East Texas, such as the Lower Neches River Authority, the Sabine River Authority, and the Angelina and Neches River Authority. Numerous other river authorities affiliated with TCEQ's CRP also partner with Texas Stream Team. The citizen scientists certified at trainings are able to share their data with these CRP partners.

In addition to the main activities of education, outreach, and volunteer water quality monitoring, the Texas Stream Team also focuses water quality education, outreach, and monitoring in specific watersheds. The following watersheds were identified by the TCEQ and TSSWCB for partnerships due to a TMDL I-Plan or a WPP either being under development or being implemented:

- Arroyo Colorado (WPP)
- Upper Cibolo Creek (WPP)
- Cedar Bayou (WPP)
- Gilleland Creek (TMDL I-Plan)
- Cypress Creek (WPP)
- Plum Creek (WPP)
- Orange County Watersheds (TMDL)

Texas Stream Team Paddlers collecting water samples *(Source: TST)*

The Texas Stream Team also began implementing a new program called Texas Stream Team Paddlers. This program seeks kayakers and canoeists who are interested in getting involved in citizen science. The Paddlers are trained and provide monthly monitoring along their favorite paddling trail. This new program will help to expand the Texas Stream Team's monitoring coverage of Texas waterways because paddlers are able to monitor locations that are not accessible by land. In doing so, they will join a team of nearly 8,000 citizen scientists who, since 1991, have volunteered approximately 45,000 hours of their time – service valued at more than a $1 million – to protect the waters of Texas. Their observations and data will support conservation efforts and academic research that can contribute to a de facto early warning system to alert management organizations of spills or other threats to water quality.

Goal Two— Implementing Programs to Reduce NPS Pollution

The second goal of the *Texas NPS Management Program* is to implement activities that prevent and reduce 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

Working with stakeholders in watersheds where pollution limits the full beneficial use of surface waters, the TMDL Program develops targets for reducing pollution and helps communities build plans to clean up waterways. TMDL I-Plans are developed concurrently with TMDLs to increase the pace at which Texas improves impaired waterways.

It is essential that stakeholders in the watershed develop the 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 areas, 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, lobbyists, and interested individuals. Experts from universities and local, regional, state, and federal agencies also participate by giving technical and scientific support.

Several TMDL I-Plans are supported by CWA Section 319(h) grants. These include I-Plans for contact recreation in Carters, Clear, and Gilleland Creeks; the Guadalupe River above Canyon Lake; the Houston–Galveston Region; and the Greater Trinity Region.

As of August 2014, stakeholders are implementing 140 TMDLs under 16 approved I-Plans for waterways that are impaired, in part, by NPS pollution. Table 3.4 lists TMDL watersheds impaired in part by NPS pollution. Additional information on the status of activities and restoration efforts in these watersheds is outlined in Appendix A.

Houston-Galveston Area Communities Collaborate for Improved Water Quality

Water quality testing found that bacteria concentrations are elevated in numerous waterways in the Houston–Galveston region. High bacteria concentrations might pose a risk to people who swim or wade in natural waters—activities called primary contact recreation in the state's standards for water quality.

Community stakeholders formed the 31-member Bacteria Implementation Group (BIG) to protect recreational safety by reducing bacteria concentrations in their waterways. The BIG I-Plan, which implements numerous bacteria TMDLs for regional waterways, was approved by the TCEQ in January of 2013. The I-Plan covers waterways over a 2,200 square-mile area in 10 counties, including all or parts of 56 cities.

Stakeholders of this very diverse group represent several governmental and nongovernmental organizations in the region. These include cities, river authorities, counties, utility districts, businesses, academic institutions, and nonprofit groups.

All this local collaboration is paying off for Houston area waterways—bacteria concentrations are declining in waterways covered by the I-Plan. These improvements are due, in part, to:

- improvements in the regulation and maintenance of septic systems, sanitary sewer collection systems, and municipal wastewater treatment facilities
- increased preservation of natural habitat around waterways, the addition of wetland features, landscaping, and wet-bottom detention basins
- heightened awareness among residents through outreach and participation in the development of WBPs for the area

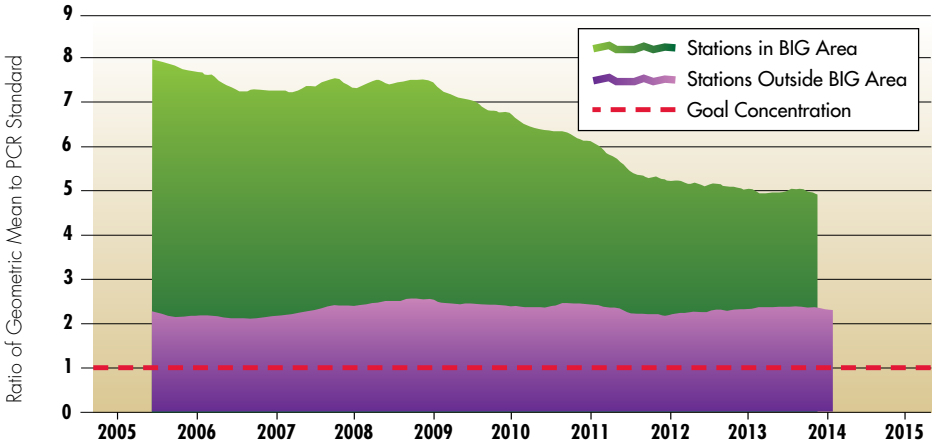
The BIG's success has not gone unnoticed. Communities across the state have looked at the extensive I-Plan written by the BIG, and have improved their own plans as a result of it. The Armand Bayou watershed group joined the BIG in 2014, taking advantage of the BIG's years of work on bacteria problems.

Table 3.4.
TMDL Watershed Impaired by NPS Pollution

Uses of Concern & Watershed Name	Status of Restoration[1]	Links to Project Websites
Aquatic Life		
Lake O' the Pines	Underway	www.tceq.texas.gov/waterquality/tmdl/nav/19-lakepines/19-lakepines.html
Contact Recreation		
Carters Creek	Underway	www.tceq.texas.gov/waterquality/tmdl/85-carterscreek.html
Houston–Galveston Region	Some Improvement	www.tceq.texas.gov/waterquality/tmdl/nav/42-houstonbacteria/42-big-houstonarea
Gilleland Creek	Underway	www.tceq.texas.gov/waterquality/tmdl/nav/69-gillelandcreekbacteria/69-gillelandcreekbacteria.html
Guadalupe River Below Canyon Lake	Underway	www.tceq.texas.gov/waterquality/tmdl/nav/65-guadalupe/65-guadalupebacteria
Greater Trinity Region	Underway	www.tceq.texas.gov/waterquality/tmdl/nav/66-greatertrinitybacteria/66-trinityimplementation
Fish Consumption		
Arroyo Colorado	Some Improvement	www.tceq.texas.gov/waterquality/tmdl/07-arroyoleg.html
Trinity River Basin in Dallas & Tarrant counties	Some Improvement	www.tceq.texas.gov/waterquality/tmdl/05-dalleg.html
Trinity River Basin in Fort Worth	Some Improvement	www.tceq.texas.gov/waterquality/tmdl/02-fwleg.html
Lake Worth	Underway	www.tceq.texas.gov/waterquality/tmdl/63-lakeworthpcbs.html
General		
Clear Creek	Restored	www.tceq.texas.gov/waterquality/tmdl/08-ccchlor.html
Colorado River Below E.V. Spence Reservoir	Some Improvement	www.tceq.texas.gov/waterquality/tmdl/nav/32-colorado/32-colorado.html
E.V. Spence Reservoir	Some Improvement	www.tceq.texas.gov/waterquality/tmdl/04-spence.html
North Bosque River	Significant Improvement	www.tceq.texas.gov/waterquality/tmdl/06-bosque.html
Petronila Creek	Underway	www.tceq.texas.gov/waterquality/tmdl/nav/32-petronila/32-petronila-tds
Public Water Supply		
Aquilla Reservoir	Restored	www.tceq.texas.gov/waterquality/tmdl/10-aquilla.html

[1] *Restored only for the parameters addressed in the TMDL I-Plan; the waterway may have other impairments.*

Figure 3.4
Comparison of Bacterial Trends in Waterways Within and Outside the BIG Management Area



The red dotted line represents the goal concentration.
Source: H-GAC, 2014, in "Two Decades of Success: The Clean Rivers Program"

In 2013, the BIG released a list of assessment units with the highest bacteria levels in the BIG project area. After just a year, nearly all ten streams have seen improvements. One stream, Shramm Gully, improved enough to meet primary contact recreation standards. Figure 3.4 shows a trend of decreasing bacterial concentrations in waterways of the BIG management area.

Texas Coastal Management Program

CZARA Section 6217 of the Federal Coastal Management Act requires coastal states with federally approved coastal zone management programs to develop and implement a program to control coastal NPS pollution. The Texas Coastal Management Program (CMP) was created to improve coastal management and ensure the long-term economic and ecological productivity of the coast through the application of the best available NPS pollution control practices. The Texas General Land Office administers the CMP, and is advised by members of the Coastal Advisory Committee which includes staff from TCEQ, TPWD, TSSWCB, and Texas Department of Transportation.

The Texas Coastal NPS Management Program is conditionally approved, as a few outstanding management measures need to be further addressed in order to grant the program full approval. The CMP and networked resource agencies continue to implement the Texas NPS Pollution Control Program and address the outstanding measures in coordination with the federal agencies to achieve full approval.

Implementation of Roadway and Urban Development Measures

In 2013 a grant project was awarded through the CMP's Coastal Impact Assistance Program to the University of Texas at Austin's Center for Research in Water Resources, to facilitate effective implementation of coastal stormwater BMPs for off-system roadways and urban development. A BMP technical guidance document was developed and outreach such as stakeholder trainings and planning assistance was provided. The project identified jurisdictions responsible for managing coastal roadways and urban stormwater systems, conducted outreach targeting the identified coastal jurisdictions, developed an inventory of existing management practices and watershed characteristics, and provided technical guidance, training, and planning assistance to these jurisdictions. The project is in its final phase and will be completed by June 2015. Further information and the stormwater BMP guidance document can be found on the project website <http://txcoastalbmp.org/>.

Groundwater Protection and Pesticide Management

The Texas Groundwater Protection Committee (TGPC) was established by the Texas Legislature in 1989 as an interagency committee with representatives from nine state agencies and the Texas Alliance of Groundwater Districts. The TGPC actively identifies opportunities to improve existing groundwater quality programs and promotes coordination between agencies. The TGPC also strives to improve or identify areas where new or existing programs could be enhanced to provide added protection. Major responsibilities of the TGPC are:

- to improve interagency coordination in the area of groundwater protection
- to develop and update a comprehensive groundwater protection strategy for the state
- to study and recommend to the Legislature groundwater protection programs for areas in which groundwater is not protected by current regulation
- to publish an interagency groundwater monitoring and contamination report
- to file with the governor, lieutenant governor, and speaker of the House of Representatives a report of the TGPC's activities during the biennium preceding each regular legislative session, including any recommendations for legislation for groundwater protection
- to develop the form and content of notices of groundwater contamination
- to advise the TCEQ on the development of agricultural chemical plans to prevent groundwater pollution

The TCEQ and the TGPC have developed the *Texas State Management Plan for the Prevention of Pesticide Contamination of Groundwater (PMP)* (2001), found at: <www.tceq.state.tx.us/assets/public/comm_exec/pubs/sfr/070_01.pdf>. These management practices can help prevent groundwater degradation by the use of pesticides or help to remediate groundwater degraded by the use of pesticides. TGPC FAQs can be found at <www.tgpc.state.tx.us/FAQs.php>.

The TGPC executes its responsibilities through various subcommittees, including the Public Outreach and Education Subcommittee (POE) and the Agricultural Chemicals Subcommittee (ACS). Each of these subcomittees is described below.

Public Outreach and Education Subcommittee

Public water supplies are regulated through the TCEQ under the authority of the federal Safe Drinking Water Act. However, the majority of Texans using groundwater as a water supply are private well owners, and live in rural or suburban settings. Private water well owners do not have the same safeguards associated with testing, standards, and government oversight that protect public water supplies. The primary goals of the POE are to develop and implement educational outreach programs for landowners concerned with groundwater protection and environmental health issues. 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. TEX*A*Syst helps rural residents take decisive actions to preserve the quality of their drinking water, prevent water pollution, and protect health.

Agricultural Chemicals Subcommittee

The ACS is the primary forum for interagency coordination and communication regarding groundwater issues related to pesticides and for the implementation of the Pesticide Management Plan (PMP). The PMP provides guidance for the implementation of management practices that prevent groundwater degradation by the use of pesticides. Using the PMP as a guide, the ACS oversees pesticide monitoring in groundwater by member agencies in the Texas Panhandle for cotton crop areas and public water supply wells with known atrazine detections. Monitoring of general urban and golf course wells has been added to the PMP in recent years to cover possible NPS contamination of urban areas. Pesticide monitoring analyses results are compiled in the TCEQ's *Interagency Pesticide Database*, which contains data for nearly 200,000 pesticide or other chemical analyses.

During the 2014 monitoring period, 218 well samples and 41 quality assurance samples were collected by the TCEQ, Texas Water Development Board (TWDB) and local Groundwater Conservation Districts (GCDs). A total of 243 immunoassay analyses were conducted for atrazine, and 25 of these samples were also analyzed for triazines. The results of this ongoing monitoring confirm that there is no significant groundwater contamination from pesticides in Texas. The only consistently detected pesticide is atrazine, but within most areas, it remains well below levels of concern.

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. The GBEP addresses NPS pollution 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. GBEP watershed project activity updates for fiscal year 2014 are as follows:

Lower Galveston Bay Watershed

GBEP is working with Texas A&M University's Texas Coastal Watershed Program (TCWP) in an effort to improve stormwater quality in Harris, Galveston and Brazoria

A bioswale is just one measure to reduce runoff. *(Source: GBEP)*

counties by demonstrating the use of engineered wetlands as a stormwater BMP. The multi-functionality of stormwater wetlands sites provides flood control measures, water quality improvements, natural habitat, and where appropriate, public green space. TCWP is building partnerships with local governments and entities with these pilot projects, as well through the education of local government staff, school communities and other groups with presentations, printed media, workshops, and volunteer events.

Moses–Karankawa Bayous

GBEP partnered with TCWP to initiate development of a WPP for Highland Bayou in 2010. Highland Bayou is listed in the Integrated Report for low DO and high bacteria concentration. Phase I of the project, which was completed in 2011, was funded by American Recovery and Reinvestment Act funds and included a watershed characterization report and public participation plan. Under phase II, funded by CWA Section 320 funds, the project area has been expanded to include all waters from Moses to the Karankawa Bayous in order to more holistically include land use activities and stakeholders.

Double Bayou

GBEP partnered with the Houston Advanced Research Center in 2010 to initiate a WPP for Double Bayou. Double Bayou is listed on the 303(d) List for low DO and high bacteria concentration. Phase I was funded by American Recovery and Reinvestment Act funds. Phase I included a watershed characterization report and public participation plan, and was completed in 2011. Project partners received fiscal year 2011 CWA Section 319(h) funding from the TSSWCB to further develop the WPP. GBEP will provide additional funding to support the finalization and submission of the WPP in 2015.

Cedar Bayou

GBEP partnered with the Houston-Galveston Area Council (H-GAC) in 2011 to begin developing a WPP for Cedar Bayou, to address the impaired benthic community in the above tidal segment, elevated levels of bacteria, and provide outreach concerning the dioxin and polychlorinated biphenyl impairments in the tidal portions. GBEP helped develop the proposal and provided state funds to help match a CWA Section 319(h) grant administered by the TSSWCB. Modeling, sampling and development of the WPP is ongoing with the WPP expected to be completed in mid-2015.

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 runoff from 19 acres on the university campus which includes 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 project site 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. Preliminary analyses indicated pollutant removal for multiple constituents. This was influenced by both flow rate reductions and retention time. The project also evaluated the ability of the stormwater wetland to treat water from Horsepen Bayou. Water was pumped during dry weather through the stormwater wetland by a solar pump. Preliminary analysis showed that although feasible in freshwater riverine systems, the tidal nature of Horsepen Bayou limited the ability of the pump and treat technology due to the intrusion of saline water during dry periods.

League City

GBEP provided technical support to League City for development of a CWA Section 319(h) grant proposal to the TCEQ's NPS Program. In addition, GBEP provided state funds for match. League City is creating a three-acre municipal park with LID BMPs that will be monitored and evaluated on the basis of environmental effectiveness, functionality, and costs. Information obtained from the project will be 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 includes strategies for retrofitting commercial, residential, and public properties with green infrastructure and evaluates LID effectiveness.

Protecting 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 bacteria entering bay waters. The TMDL I-Plan activities to improve boater waste management and reduce bacterial contributions from these sources included an education campaign. 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. Campaign efforts have resulted in a 30

percent increase in the number of pump-out stations around the bay from 2008 to 2012.

In an effort to coordinate outreach and education efforts with the upper Galveston Bay watershed in the Dallas area, the GBEP is funding a project with Galveston Bay Foundation to implement an outreach campaign called Cease the Grease developed by the City of Dallas Water Utilities. This campaign has shown measureable success in reducing fats, oil, and grease (FOG) related sanitary sewer overflows in the Dallas area. The campaign will be implemented in the Galveston Bay region through the City of Nassau Bay. Results from the Galveston Bay region will be shared with campaign partners, the City of Dallas, as well as potential future partners and other regions looking for examples of a successful FOG reduction campaign.

Back the Bay Public Awareness Campaign

Back the Bay is GBEP's public awareness campaign designed to engage citizens in the Houston-Galveston region to improve water quality, conserve water, and protect fish and wildlife habitat. The campaign was created through a stakeholder-driven process and began with a pilot concept in 2010. By 2013, it was fully implemented in the 5-county region surrounding Galveston Bay. The campaign offers a fun and interactive way for residents to learn about the benefits of, and their connection to, one of the region's most valuable natural resources. The campaign also features tips for residents to help preserve the Bay and surrounding waterways.

Visitors to the Back the Bay booth learn about water quality *(Source: GBEP)*

Clean Water State Revolving Fund Loans for Nonpoint Source Projects

Another tool for addressing NPS pollution available in Texas is the 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 the EPA. This program provides funding assistance in the form of 20 to 30 year loans at interest rates lower than the market offers. Although the majority of the loans are made to publicly owned wastewater treatment and collection systems, the TWDB can also provide CWSRF loans for NPS pollution abatement projects. Loans can be made to towns, counties, GCDs, SWCDs, and other public agencies, as well as to nonprofit organizations.

A water quality-based priority system is used to rank potential applicants and fund projects, including NPS projects. To be eligible, a project 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 identified in the *Texas NPS Management Program* or the National Estuary Program. Loans can be used for planning, designing, and constructing wastewater treatment facilities, wastewater recycling and reuse facilities, collection systems, and OSSFs. Other activities eligible for funding assistance include agricultural, rural, and urban runoff control; estuary improvement; NPS education; and wet weather flow control, including stormwater management activities that are not associated with a Texas Pollutant Discharge Elimination System Municipal Separate Storm Sewer System 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. They also

seek to identify potential candidates for Green Project Reserve funding, which can offer some loan forgiveness in return for construction of LID practices.

Implementation Project Highlights

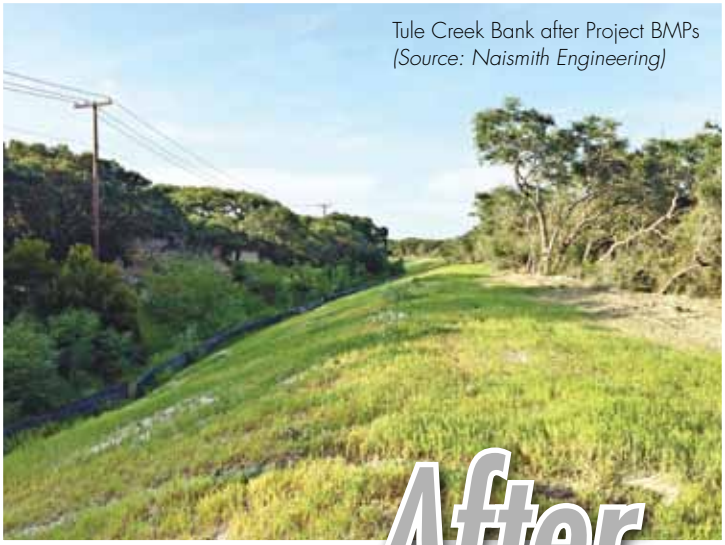
Tule Creek Sedimentation Controls

Little Bay, located north of Corpus Christi in Rockport, Texas, is a favorite fishing, boating, and birding destination for Aransas County residents and tourists but deteriorating water quality is threatening the future health of this bay system. Past studies have indicated a decline in water quality within Little Bay. Because Tule Creek is the largest contributor of non-tidal flow into the bay, it has become the primary focus in recent restoration efforts.

The Tule Creek Stormwater Best Management Practice Improvement Project has been led by Naismith Engineering, Inc. of Corpus Christi, under the direction of Aransas County. The Tule Creek watershed encompasses approximately 2,340 acres throughout the City of Rockport, the Town of Fulton, as well as unincorporated areas within Aransas County. Tule Creek carries stormwater runoff from these areas as well as effluent from Rockport's wastewater treatment plant into Little Bay (which is managed by the Aransas County Navigation District). Two projects were implemented to help improve water quality in Little Bay by preventing suspended solids from entering Tule Creek, thereby improving the quality of stormwater run-off that is discharged into Little Bay. An overabundance of sediment can increase turbidity, negatively affect seagrass and marsh vegetation, and carry harmful bacteria and nutrients. Tule Creek drains an urbanizing watershed where the population has increased significantly over the last two decades. With this urbanization trend expected to continue, the pressure on the watershed ecosystem will also increase. Thus, all governmental entities that have a stake are actively involved in a cooperative effort to protect Little Bay.

The first of two BMP projects funded by TCEQ's CWA Section 319(h) funds, was the creation of a sediment pond in 2011, which allows suspended solids to settle out. The second BMP project in 2014, upstream of the sediment pond, widened the creek to decrease the slope of an erosive bank and stabilize the banks with vegetation and rock rip-rap. Before the BMP installation, the banks were steep and sparsely vegetated which led to severe erosion during storm events. Construction was completed at the end of June 2014 and the site thus far has had successful vegetative growth from the hydromulch and native vegetation regrowth. Sediment controls were put in place to control erosion during construction and they will remain in place until the vegetation has become established. It is expected that the re-grading and stabilization of the slopes will reduce erosion of the creek banks and, in conjunction with the sediment pond, significantly reduce sediment discharge into Little Bay.

A water quality and habitat monitoring program was conducted throughout the implementation of the BMPs, as well as a modeling assessment. At this time, additional monitoring events and data evaluation are necessary to complete the model and fully understand the impacts of the BMPs on stormwater quality. A partnership between the County, local municipalities, and local entities has formed primarily as the result of Aransas County and community interest to improve the quality of life through proper stormwater management and ecological restoration.



Tule Creek Bank after Project BMPs
(Source: Naismith Engineering)

Tule Creek Bank before Project BMPs
(Source: Naismith Engineering)

League City – Watersmart Project Park

League City, through partnerships with the Texas A&M AgriLife Extension Service, Texas Sea Grant and the GBEP, created the 3.75 acre Ghirardi Family WaterSmart Park in the Clear Creek Watershed. This park has traditional park amenities including a pavilion, walking trails, and a playground. It also has much more. Seven demonstration stormwater BMPs were seamlessly integrated into the park design: a 270 square foot green roof, 125 square feet of rain gardens, 560 square feet of pervious paver parking area, a 500 gallon rain water harvesting cistern, a 1,120 square foot drainage swale, a 900 square foot vegetated buffer, and a 575 square foot compost-on-turf-grass demonstration plot. These BMPs were selected because they are appropriate to implement in home and commercial landscapes, and with the exception of green roofs, can easily be used to treat stormwater in new and existing development. Efforts are ongoing to inform citizens and local stakeholders about this project. Five presentations were given throughout the watershed during park construction. A dedication ceremony officially opened the park in March 2014. A subsequent community workshop was held, and media exposure was garnered via stories in *Change Magazine*, *Texas A&M University Times*, Galveston County's *The Daily News*, and a story on Houston Public Media (News 88.7 KUHF).

Clear Creek is impaired for both bacteria and DO and is a part of the larger BIG effort for watersheds in the Houston/Harris County region. The Ghirardi Family WaterSmart Park is the first of its kind in the Houston-Galveston Area and serves both educational and research purposes. The tract of land that is now the park was donated to the city as park space when the surrounding neighborhood was created. A monitoring program to assess the ability of the installed BMPs to reduce bacteria, nitrogen, and phosphorus loads into Clear Creek was established, and monitoring will continue during the final year of this project (fiscal year 2015).

The Ghirardi Family WaterSmart park includes a pervious paver parking area, rain gardens, and a rain water harvesting cistern. *(Source: Texas Sea Grant)*

City of Houston – White Oak Bayou LID

Whiteoak Bayou in Houston has significantly elevated levels of fecal bacteria. It was included in a 2009 TMDL and in the regional I-Plan for bacteria adopted in 2013 for several waterways in the Houston area with similar levels of bacteria. More than 85 percent of the bacteria enters the bayou with rainfall runoff, along with about half of the sediment and nutrient pollution.

Beginning in 2010, the TCEQ NPS Program funded the City of Houston to conduct a demonstration of roadway LID BMPs (tree boxes and rain gardens) along a two-block segment of Darling Street in the Cottage Grove neighborhood, which drains to Whiteoak Bayou. This area of Houston has been converting lot-by-lot from single family properties to townhomes, which increases the impervious cover from about 50 percent to 90 percent. The LID BMPs, designed to reduce bacteria pollution by about 90 percent, were selected to use the opportunity of residential redevelopment to reduce bacteria pollution even while impervious cover is increasing.

In the summer of 2014, 26 tree boxes were installed along Darling Street, and six rain gardens have been installed at two of the intersections. Pre-installation storm

Low Impact development in White Oak Bayou- Cottage Grove project – City of Houston *(Source: TCEQ)*

event monitoring was conducted to provide a baseline for runoff water quality in the area. The City of Houston has secured a multi-year maintenance agreement to assure the continuing function of the LID features, as well as a contract to monitor the water quality results for the runoff treated by the BMPs after installation and site stabilization.

Guadalupe River Above Canyon Lake

Stakeholders are in the third year of implementing their TMDL I-Plan to protect contact recreation uses in Segment 1806, the Guadalupe River Above Canyon Lake. Their plan includes several goals and activities related to reducing nonpoint sources of bacteria, such as waste from pets and wild birds. The areas of concern are within the city of Kerrville.

Several organizations are active in the stakeholder group, including city and county government, a research facility, two state agencies and the regional river authority. For a full list of the partners, see the webpage <http://www.tceq.texas.gov/waterquality/tmdl/nav/65-guadalupe/65-guadalupebacteria>.

Pet waste disposal station – Guadalupe River *(Source: GBRA)*

NPS grants are supporting the accomplishment of multiple management measures in the stakeholders' I-Plan. One such measure is the installation of structures that discourage birds nesting under highway bridges. By January 2013, the bird deterrent structures were installed on three bridge spans over the river. Grants are also supporting management of waterfowl along the river, development of a septic system guide for homeowners, and collection of water samples in the river.

Pet waste stations throughout the City of Kerrville remove pet waste, and keep it from reaching the river. At Flat Rock Park alone, the Upper Guadalupe River Authority (UGRA) usually collects 80 to 100 pounds of waste per month. Since November 2010, residents have kept more than 3,700 pounds of pet waste from polluting the river by using this collection station.

UGRA also sponsors an annual river cleanup. Although ancillary to the direct goal of reducing bacteria, the clean-up provides a great way to raise awareness of the importance of keeping the river clean and results in the removal of several tons of trash each year. The river authority also programmed and installed an interactive kiosk, featuring the water education program "Water Down the Drain," at the Riverside Nature Center. The program guides users through several activities that teach how pollution can be washed into waterways, the effects of such pollution, and what can be done to prevent it. This kiosk will be rotated among other public venues in the community.

Protecting Recreational Uses in Gilleland Creek

Stakeholders are in the third year of implementing their TMDL I-Plan to protect contact recreation uses in Gilleland Creek. Their plan includes several goals and activities related to reducing nonpoint sources of bacteria in stormwater runoff. The watershed includes portions of the cities of Pflugerville, Round Rock, and Austin, and unincorporated areas of Travis County.

Several organizations are active in the stakeholder group, including city and county governments, research facilities, and state and regional agencies. For a full list of the partners, see the webpage <http://www.tceq.texas.gov/waterquality/tmdl/nav/69-gillelandcreekbacteria/69-gillelandcreekbacteria.html>.

The stakeholders have made many strides forward in implementing their plan to reduce bacteria in the creek. Their plan addresses OSSFs, agricultural land management, pet waste, stormwater, and public awareness.

To reduce bacteria from pet waste, the City of Pflugerville and Travis County installed additional pet waste stations, and the City of Round Rock surveyed park users about their pet waste disposal habits to raise awareness and improve the outreach messages.

Travis County and the City of Austin adopted new rules requiring a setback from Gilleland Creek for future development. These setbacks will create natural buffers between the stream and urban runoff.

One of the implementation activities supported by TCEQ's CWA Section 319(h) grant, involved a study to examine improvements to management practices that remove pollutants from stormwater runoff before they reach the creek. The Center for Research in Water Resources at the University of Texas at Austin led the study and was assisted by staff from the city of Pflugerville and Geosyntec Consultants. Two existing detention basins were identified in Pflugerville that served similar residential areas.

One of the basins, Pon Court, acted as the test site for an improved stormwater detention basin. Its outlet pipe was retrofitted with an automated valve that allowed all of the stormwater runoff from the contributing watershed to remain in the basin for a desired length of time after a rain event. The valve could be remotely opened after a period of time (24 hours for the purpose of this study), allowing the runoff to discharge to Gilleland Creek.

The second basin, Copperhead Drive, was the control site; its outlet was not modified. This drainage system was used to evaluate the bacteria concentrations in a standard flood control basin compared with that of the retrofitted basin at Pon Court. The structure in Pon Court was effective in reducing concentrations of total Kjeldahl nitrogen, nitrate+nitrite, and suspended solids compared with the control pond. Due to weather conditions, project personnel were unable to collect sufficient bacteria samples to provide a valid statistical comparison for *E. coli* removal. While not statistically valid, the data collected do show that a higher bacteria removal occurred in the summer at the Pon Court system compared to the Copperhead Drive system, based on the difference between inlet to outlet *E. coli* concentrations at each basin.

Automated controller retaining runoff in Pon Court basin *(Source: UT Austin-CRWR)*

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 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 fiscal year 2014.

Texas Watershed Planning Trainings

Since 2007, the Texas Water Resources Institute's (TWRI) Texas Watershed Planning Program has had more than 1,447 attendees at its Texas Watershed Planning Short Course, the biannual Watershed Coordinator Roundtables, and other relevant trainings. These trainings, organized by the Institute and supported by the TCEQ, the TSSWCB, and the EPA, promote sustainable and proactive approaches to managing water quality.

In fiscal year 2014, the program offered the weeklong Texas Watershed Planning Short Course in November 2013 with 20 water professionals attending. Evaluations showed these attendees were satisfied with the course and had a 79 percent increase in knowledge gained. The Watershed Coordinator Roundtables, which provide water professionals an additional forum for continued dialogue, included a mini-roundtable titled "Improving Watershed Program Efficiency and Success". A full roundtable meeting was held in July 2014 with 61 attendees. One multi-day course, "Watershed Modeling using Load Duration Curves" and "The Spatially Explicit Load Enrichment Calculation Tool (SELECT)" was held in February 2014 with 11 attendees. Eighty-eight percent of the attendees rated the course as good to excellent. The course, "Fundamentals of Developing a Water Quality Monitoring Plan" was held in October 2013 with 19 attendees who provided a 95 percent rating of the course as good to excellent.

The program offered two new courses in fiscal year 2014 on social marketing and applied environmental statistics. The social marketing course, "Content, Conversations, and Discoverability – Quality Outreach and the Internet for Natural Resource Professionals," was a two-part course offered June 18 and 19 in College Station and had 17 attendees for both days. The workshop explored using social media effectively in natural resource outreach programs. "Applied Environmental Statistics" was held August 25-29, 2014 with 35 attending. The course covered applied statistical methods tailored to the environmental sciences.

In addition to the courses, the Texas Watershed Planning Program maintains the Watershed Coordinators Listserv with 388 subscribers. The listserv sends updates and announcements of training opportunities and issues relevant to water quality and watershed planning. Information on these courses and guidance on watershed planning is available on the Texas Watershed Planning website <http://watershedplanning.tamu.edu/>. This website had 1,315 users and 4,438 page views for fiscal year 2014. The courses, listserv and website have led to greater coordination in watershed planning efforts in Texas.

Lone Star Healthy Streams: Feral Hog Component

The Lone Star Healthy Streams (LSHS) Feral Hog program focused on promoting healthy watersheds through the implementation of watershed-based feral hog educational programs. These programs were designed to increase citizen awareness, understanding and knowledge about the biology, impacts, economics, methods of removal, and laws and regulations concerning the management of feral hogs in Texas. Additionally, one-on-one technical assistance relating to feral hog management was provided to increase the effectiveness of feral hog population reduction efforts undertaken by the public. These efforts were focused in priority watersheds where feral hogs have the potential to contribute to water quality issues. The LSHS Feral Hog program is funded by a CWA Section 319(h) grant provided by the TSSWCB and the EPA. On-the-ground activities are facilitated by the Texas A&M AgriLife Extension Service's Wildlife and Fisheries Sciences (WFSC) Extension Unit, which employs two Extension Associates centrally housed within priority watersheds.

Efforts over the past fiscal year included eight one-on-one technical guidance site visits and 77 face-to-face

Participants at the Texas Watershed Planning Short Course, Bandera *(Source: TSSWCB)*

Providing technical assistance to landowners *(Source: TX A&M AgriLife Extension, Mark Tyson)*

presentations with a total of 4,938 attendees. The presentations resulted in 97 percent of surveyed participants reporting knowledge gained concerning feral hogs and their management. A statewide online feral hog reporting tool counted 559 hogs sighted and 319 hogs removed based on 133 total reports. Other outreach efforts extend into social media including four web videos which were viewed 3,251 times, a feral hogs Facebook page which has 2,051 "Likes", and a feral hogs Twitter page which has 87 followers. Additional media coverage included 23 blog articles, 15 newspaper interviews, 10 AgriLife Communications news releases, three magazine articles and a radio interview.

WFSC Extension Unit staff maintained working relationships with watershed coordinators and related personnel across the state through both face-to-face and online collaborations. WFSC staff also served as specialists, providing expertise in feral hog related educational programming and field-based technical assistance to County Extension Agents associated with the Texas A&M AgriLife Extension Service. Collaborations with multiple federal and state agencies and public organizations increased the effectiveness and outreach of this program. The NRCS, TWPD, Texas Animal Health Commission, Texas Wildlife Services, TDA, Wildlife Management Associations and Texas Master Naturalist's chapters have all helped distribute educational resources.

Trash Bash

The annual River, Lakes, Bays N' Bayous Trash Bash® is a volunteer-based waterway cleanup event held at multiple locations across the Houston-Galveston area. In 2014, a total of 4,622 volunteers participated at 16 sites in the region. Of those volunteers, 1,926 were under 18 years of age. Approximately 37 tons of trash was collected, and 369 tires were gathered for recycling. Volunteers cleaned 157 miles of shoreline, and 2,858 lbs of material were recycled.

For the 2014 Trash Bash®, a new interactive game, Pitch the Poop, was introduced and provided to all 16 locations. For this game, participants toss a bag of "poop," typically modeling clay inside a pet waste disposal bag, into one of two trash cans placed on either side of an informative backboard. Scoring two out of three bags of poop into the trash can wins the pitcher a dispenser of pet waste disposal bags.

A "Marine Debris Biodegradation Timeline" poster was exhibited at all sites to supplement educational materials and provide a visual of the life cycle of common trash items. Some sites also included watershed demonstrations to help increase awareness and understanding of water conservation.

Coastal Bend Council of Governments NPS Education

The Coastal Bend region contains three rivers and two reservoirs used for recreation and drinking water. There are at least ten major bay and estuary systems in this region that serve as nurseries for different aquatic species, and supply shrimp and oysters across Texas and the United States. Because of the valuable resources in this region, a definitive tool is needed to educate the public in South Texas about the consequences of dumping into the storm

Volunteers at a Trash Bash Event *(Source: H-GAC)*

drains and waterways and the effects it has on the bays, rivers, estuaries, and wildlife. The Coastal Bend Council of Governments (CBCOG) continues to annually implement a stormwater education and outreach campaign for the 12 counties of the Coastal Bend region, titled *Think Blue South Texas*. It focuses on educating the general public and school children about the effects of stormwater pollution, not picking up pet waste, and dumping into the storm drains.

In fiscal year 2014, the CBCOG conducted regional education and training activities in five elementary schools, reaching a total of 1,176 students. Teachers often request the CBCOG to provide presentations when they teach units on environmental or water science. Besides learning about water conservation and pollution at school, the students are also taking this new knowledge home to family members, further educating the community.

Statewide Riparian and Stream Ecosystem Education Program

TWRI has partnered with the TSSWCB, Texas Riparian Association, Texas A&M Forest Service, TPWD, NRCS, Nueces River Authority, and the Texas Tech University Llano River Field Station to conduct Riparian and Stream Ecosystem Education programs across the state. Riparian degradation is a major threat to water quality, instream habitat, terrestrial wildlife, aquatic species, and overall stream health. Conversely, proper management, protection, and restoration of riparian areas decreases bacteria, nutrient, and sediment loadings to water bodies; lowers in-stream temperatures; improves DO levels; improves aquatic habitat; and ultimately, improves aquatic insects and fish community integrity.

To improve the management of these sensitive and vital ecosystems across Texas, riparian education programs are needed so that landowners and land managers can understand the nature and function of riparian zones, the benefits and services they provide, and BMPs to protect them. The more people who understand and appreciate the stream and riparian areas results in more areas that will be managed to protect them. This will not only reduce NPS pollution, but it will provide ecosystem functionality and economic benefits to the community. TWRI has coordinated a Riparian Team that includes experts from state agencies and universities across the state which has resulted in better coordination of programs within Texas.

This program has a website with online tools and education modules <http://texasriparian.org/>, and <http://naturalresourcestraining.tamu.edu/courses/texas-riparian/>, and includes 1,160 subscribers, a listserv with over 200 members, and a Facebook page with 164 followers. Workshops are being conducted in watersheds where WPPs and TMDL efforts are ongoing. Workshops have been conducted in the following watersheds: Plum Creek, Leon River, Geronimo and Alligator Creeks, Upper Llano River, Carters Creek, Lavaca River Basin, San Bernard River Watershed, Arroyo Colorado, Cedar Bayou, and Guadalupe River above Canyon Lake. In addition, workshops were held for the Watershed Management and Hydrologic Sciences Graduate Course and Statewide Texas Riparian Association and Society for Ecological Restoration State Meeting. In 2014, a total of 479 people participated in 12 workshops across the state. Course evaluations from participants indicated one hundred percent of the respondents would recommend the program, and 96 percent of the respondents said they plan to adopt management practices that were discussed during the workshop. Evaluation responses included 274 people who owned or managed land that totaled more than 80,515 acres. Of those 274 people, 31 percent owned 100-8,500 acres and 37 percent owned 1-99 acres.

Riparian Workshop Education Event *(Source: TWRI, Nikki Dictson)*

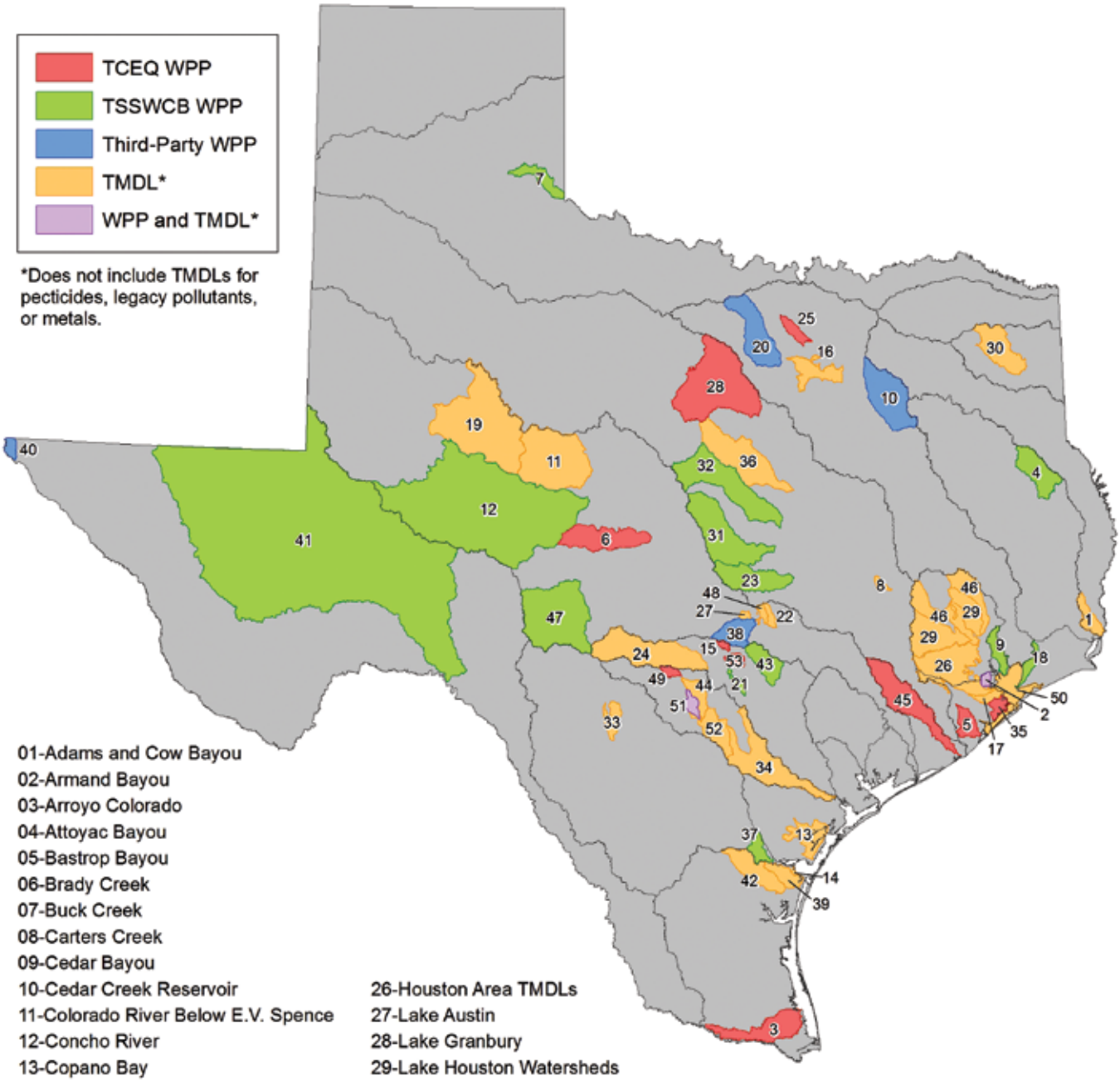
4 Developing and Implementing Watershed Protection Plans

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*, <http://water.epa.gov/polwaste/nps/upload/319-guidelines-fy14.pdf>.

In fiscal year 2014, 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 to address 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. In Texas, WPPs are also developed by third parties independently of assistance from the TSSWCB and the TCEQ. Figure 4.1 is a map of WPPs being developed or implemented in Texas at the end of fiscal year 2014. Table 4.1 is a list of the same WPPs and links to more information. Neither the map nor table is intended to be a comprehensive list of all the WPP efforts currently underway in Texas.

Figure 4.1

Map of Watersheds With Watershed Protection Plans or TMDL I-Plans Being Developed or Implemented



01-Adams and Cow Bayou
02-Armand Bayou
03-Arroyo Colorado
04-Attoyac Bayou
05-Bastrop Bayou
06-Brady Creek
07-Buck Creek
08-Carters Creek
09-Cedar Bayou
10-Cedar Creek Reservoir
11-Colorado River Below E.V. Spence
12-Concho River
13-Copano Bay
14-Corpus Christi Beaches
15-Cypress Creek
16-Greater Trinity TMDLs
17-Dickinson Bayou
18-Double Bayou
19-E.V. Spence Reservoir
20-Eagle Mountain Reservoir
21-Geronimo Creek
22-Gilleland Creek
23-Granger Lake
24-Guadalupe River Above Canyon Lake
25-Hickory Creek
26-Houston Area TMDLs
27-Lake Austin
28-Lake Granbury
29-Lake Houston Watersheds
30-Lake O' the Pines
31-Lampasas River
32-Leon River
33-Lower Sabinal River
34-Lower San Antonio River
35-Moses-Karankawa Bayous
36-North Bosque River
37-Lower Nueces River
38-Onion & Barton Springs
39-Oso Bay and Oso Creek
40-Paso del Norte
41-Pecos River
42-Petronila Creek
43-Plum Creek
44-Salado Creek
45-San Bernard
46-San Jacinto River
47-Upper Llano River
48-Spicewood Springs and Walnut Creek
49-Upper Cibolo Creek
50-Upper Coast Oyster Waters
51-Upper San Antonio River
52-Upper San Antonio River
53-Upper San Marcos

Table 4.1
Watershed Protection Plans in Texas

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.harc.edu/work/Double_Bayou_Watershed_Protection_Plan
Geronimo Creek	www.geronimocreek.org/Plan.aspx
Granger Lake	www.tsswcb.texas.gov/managementprogram/granger
Lampasas River	www.lampasasriver.org
Leon River	www.brazos.org/LeonRiverWPP.asp
Lower Nueces River	www.nuecesriverpartnership.org/
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-bayou.aspx
Arroyo Colorado	arroyocolorado.org/
Bastrop Bayou	www.bastropbayou.org/
Brady Creek	www.ucratx.org/nps.html
Cypress Creek	cypresscreekproject.squarespace.com/
Hickory Creek	www.cityofdenton.com/departments-services/sustainable-denton/water/hickory-creek-319-grant-project/watershed-protection-plan
Lake Granbury	www.brazos.org/gbWPP.asp
Highland Bayou & Moses-Karankawa Bayous	mokabayousalliance.org
San Bernard River	www.h-gac.com/community/water/watershed_protection/san-bernard-river.aspx
Upper Cibolo Creek	www.ci.boerne.tx.us/index.aspx?nid=147
Upper San Antonio River	www.bexarfloodfacts.org/watershed_protection_plan/
Upper San Marcos River	smwatershedinitiative.org/
Bridge Documents (Accepted as WPPs)	**LINKS**
Colorado River Below EV Spence Reservoir	https://www.tceq.texas.gov/assets/public/compliance/monops/nps/watersheds/ColoradoRiverBelowEVSpenceTMDL_BridgeDoc_Final.pdf
Third-Party WPPs	**LINKS**
Cedar Creek Reservoir	nctx-water.tamu.edu/media/1475/ccwpp.pdf
Eagle Mountain Reservoir	nctx-water.tamu.edu/media/5314/eagle mountain background.pdf
Onion Creek and Barton Springs	www.waterqualityplan.org
Paso del Norte	www.pdnwc.org/319h.html

Watershed Protection Plan Highlights

Lampasas River

The Lampasas River begins in western Mills County and flows southeast for 75 miles through a primarily rural landscape before it is dammed five miles southwest of Belton to form Stillhouse Hollow Lake. Above Stillhouse Hollow Lake, the Lampasas River was identified as impaired on the 2002 303(d) List due to elevated bacteria levels. As a result of this impairment, Texas A&M AgriLife Research – Blackland Research and Extension Center partnered with the TSSWCB through a CWA Section 319(h) grant provided by the EPA to collaborate with local watershed stakeholders to develop a WPP for the Lampasas River watershed.

The Lampasas River Watershed Partnership was formed to coordinate the development of the WPP and consists of a Steering Committee and two topical workgroups as well as a Technical Advisory Group. The Partnership utilized an updated land use analysis, a historic water quality analysis, population data and firsthand knowledge of the area to prioritize primary focus areas for various BMPs. The Partnership also identified responsible parties, implementation milestones, estimated financial costs for individual management measures, and outreach and education activities. The WPP described the estimated load reductions expected from full implementation of all management measures with the goal of meeting water quality standards. The WPP was accepted by the EPA in May 2013.

Lampasas River *(Source: Blackland TX AgriLife Extension, Lisa Prcin)*

Progress has already been made towards implementation through education and outreach measures outlined in the WPP. There have been nine NRCS Riparian Area Management Workshops held in the watershed to date, focusing on riparian management for the landowner and land managers. Other educational workshops, with topics ranging from private well water to rain water harvesting, have been held in the watershed as shown in Table 4.2. The Rainwater Harvesting for Homeowners program, which was held in June 2014, allowed participants to build and take home their own rainwater harvesting barrel.

Table 4.2
Workshops/Trainings Held in the Lampasas River Watershed

Workshops/ Trainings	Date	Participants
Texas Well Owner Network Training	June 2013	54
Lone Star Healthy Streams- Cattle, Horses and Feral Hogs Workshop	September 2013	25
Feral Hog Management Workshop	October 2013	66
Maintenance of On-site Septic Facility Workshop	2014	71
Rainwater Harvesting for Homeowners Workshop	June 2014	47

In coordination with Texas A&M AgriLife Research – Blackland Research and Extension Center, TIAER has been utilizing a CWA Section 319(h) grant from the TSSWCB to measure trends in water quality through intensive surface water quality monitoring on the Lampasas River and its tributaries. This monitoring began in early 2014 and will occur over 24 months. Monitoring consists of monthly routine ambient sampling at 10 sites as well as flow biased sampling quarterly.

The next fiscal year will include implementation of the agriculture management measures by Hill Country SWCD in the form of technical assistance and financial incentives to agricultural producers for the development and implementation of WQMPs in the Lampasas River Watershed. Texas A&M AgriLife Research will continue to facilitate the

Partnership and coordinate with stakeholders to provide educational programs as outlined in the WPP.

Upper San Antonio River

In 2011, the San Antonio River Authority (SARA) received a CWA Section 319(h) grant to update the existing WPP. The update, completed in 2014, reflects progress made in persistent bacteria impairments and nutrient concerns in the Upper San Antonio River. The Bexar Regional Watershed Management Water Quality Focus Group, an interagency group which meets to coordinate watershed issues and responses, provided the forum for stakeholder involvement. Regular participants in this group include SARA, the City of San Antonio, San Antonio Water Systems, Bexar County, other local governments, the Edwards Aquifer Authority, state and federal environmental agencies, and private firms and organizations active in watershed management.

The 2006 WPP analysis identified the San Antonio Zoo as a primary source of excess bacteria in the dry weather flow of the urban portion of the river, but found that stormwater flows contributed more than 90 percent of the total annual bacteria loading. The WPP called for an ultraviolet disinfection system to treat the waterway draining the zoo, several BMPs to address targeted sources, and expanded stormwater quality features to restore the urban river to contract recreation use standards.

Several elements of the plan were installed in 2014, including the zoo outlet disinfection system and zoo drainage improvements. Other management measures previously implemented include avian and bat deterrence structures underneath bridges, and expanded measures to control wastewater system contributions. The TCEQ awarded CWA Section 319(h) funding to support two projects implementing the plan: targeted outreach and walkway cleaning in the River Walk area, and extensive use of low impact development BMPs at the Mission Library redevelopment site. The Mission Library BMP's were completed in 2014.

During the 2014 update to the WPP, SARA Watershed Monitoring staff collected samples at five sites in Alazan Creek, Apache Creek, San Pedro Creek, and the Upper San Antonio River during four storm events. This monitoring confirmed that the bacteria concentrations during storm events were consistently an order of magnitude greater than the overall average concentrations. It also identified a specific "hot spot" location on Alazan Creek at Tampico Street where bacteria concentrations in storm flows were 2-5 times higher than at the other stations.

The update to the WPP also included an analysis of opportunities for improving water quality in the urbanized watershed. The "Subwatershed-Specific BMP Assessment" identified many public properties where retrofit BMPs could be installed. A focused examination of an 840 acre portion of the upper San Pedro Creek watershed found opportunities to retrofit 50 bioretention ponds, 22,000 feet of grassy infiltrating swales, and two sand filters that would accomplish a total estimated reduction of 10^{13} organisms/year of *E. coli*. The 2014 update to the WPP calls for reducing bacteria in the river by 35 percent over the next 40 years – about six percent with the zoo disinfection system, 28 percent with BMPs treating storm runoff, and 1 percent with other measures – for a total reduction in *E. coli* of about 2×10^{15} cfu. Progress will be measured, and the plan will be adapted as management strategies are implemented over time.

Left: Stormwater on Alazan Creek *(Source: SARA)*

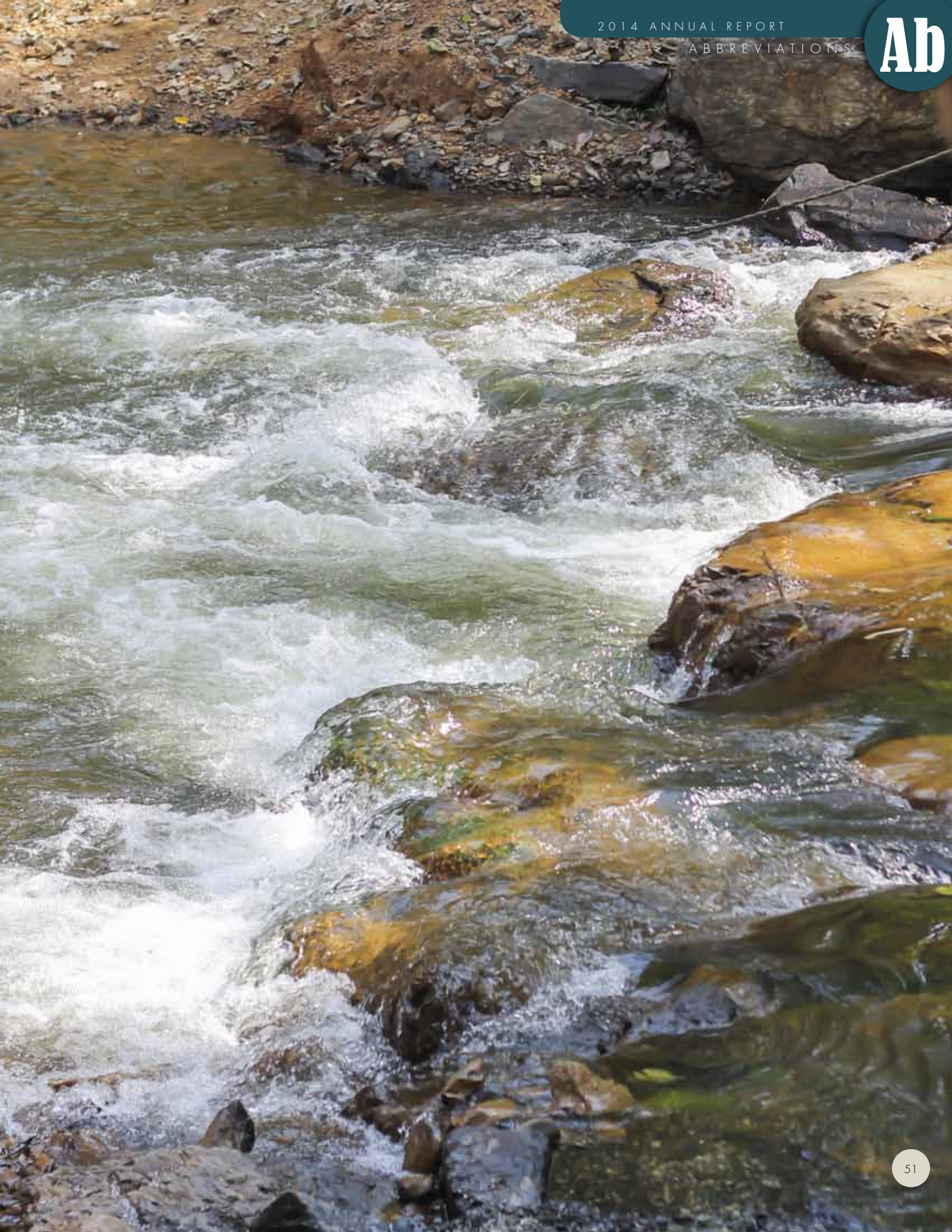
Below: Rain Garden at San Antonio River Authority Environmental Center *(Source: SARA)*

Ab Abbreviations

ACS	Agricultural Chemicals Subcommittee of the TGPC
BIG	Bacteria Implementation Group
BMP	Best Management Practice
CBCOG	Coastal Bend Council of Governments
CFU	Colony-Forming Units
CMP	Texas Coastal Management Program
CRP	TCEQ Clean Rivers Program
CRWN	Colorado River Watch Network
CWA	Clean Water Act
CWQMN	TCEQ Continuous Water Quality Monitoring Network
CWSRF	Clean Water State Revolving Fund
CZARA	Coastal Zone Act Reauthorization Amendment
DO	Dissolved Oxygen
E. coli	Escherichia coli
EPA	U.S. Environmental Protection Agency
FAQ	Frequently Asked Questions
FOG	Fats, Oil, and Grease
GBEP	TCEQ Galveston Bay Estuary Program
GCD	Groundwater Conservation District
GRTS	Grants Reporting and Tracking System
H-GAC	Houston-Galveston Area Council

(continued)

I-Plan	Implementation Plan for a TMDL
Integrated Report	Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d)
lbs	Pounds
LCRA	Lower Colorado River Authority
LID	Low Impact Development
LSHS	Lone Star Healthy Streams
mg/L	milligram per liter
mL	milliliter
NPS	Nonpoint Source
NRCS	USDA Natural Resources Conservation Service
OSSF	On-Site Sewage Facility
POE	Public Outreach and Education Subcommittee
PMP	Pesticide Management Plan
RRC	Texas Railroad Commission
SARA	San Antonio River Authority
SRF	State Revolving Fund
SWCD	TSSWCB Soil and Water Conservation District
SWQM	TCEQ Surface Water Quality Monitoring
TBET	Texas Best Management Practices Evaluation Tool
TCEQ	Texas Commission on Environmental Quality
TCWP	Texas Coastal Watershed Program
TDA	Texas Department of Agriculture
TGPC	Texas Groundwater Protection Committee
TIAER	Texas Institute for Applied Environmental Research
TMDL	Total Maximum Daily Load
TPWD	Texas Parks and Wildlife Department
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
UCRA	Upper Colorado River Authority
UGRA	Upper Guadalupe River Authority
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
WAP	Watershed Action Planning
WBP	Watershed-Based Plan
WFSC	Texas A&M AgriLife Extension Service Wildlife and Fisheries Sciences Extension Unit
WPP	Watershed Protection Plan
WQMP	Water Quality Management Plan



APPENDIX A
Texas NPS Management Program Milestones

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2014[3] Estimate	2014 Actual	Comments
ST1/A	NPS Assessment Report	The state will produce the Integrated Report in accordance with applicable EPA guidance.	Integrated Report	1	0	The EPA approved the 2012 Integrated Report on May 9, 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	Next Update Due in 2017
LT/7	NPS Annual Report	The state will produce the NPS Annual Report in accordance with applicable EPA guidance.	NPS Annual Report	1	1	Will be Printed in January 2015
LT/2-5	Section 319(h) Grant Program Solicitation	The state will conduct individual TCEQ and TSSWCB solicitations for Section 319(h) grant funding.	Grant Solicitation Documentation	2	2	One from Each Agency
LT/2-5	Section 319(h) Grant Program Application	The state will prepare individual TCEQ and TSSWCB grant program applications and submit them to EPA for Section 319(h) grant funding.	Grant Application Documentation	2	2	One from Each Agency

(continued)

Texas NPS Management Program Milestones *continued*

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2014[3] Estimate	2014 Actual	Comments
LT/2	Section 319(h) Grant Program Reporting	The state will report grant funded activities to the Grants Reporting and Tracking System (GRTS) in accordance with EPA guidance.	GRTS Updates	4	4	Two from Each Agency
ST2/A	Priority Watersheds Report Updates	The state will update the Priority Watersheds Report based upon information and recommendations derived through the WAP process as described in the Management Program.	Priority Watersheds Report Updates	1	0	The Priority Watershed Report will be updated in mid fiscal year 15.
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	November 2013
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	10	
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 sites monitored)	250	433	From TST Annual Report

Texas NPS Management Program Milestones *continued*

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2014[3] Estimate	2014 Actual	Comments
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 Character-ization	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	1	11	
ST2/A,C	Watershed Coordination	The state will support watershed coordination projects which facilitate the implementation of WPPs.	Watershed Coordination Projects	9	10	
ST1/D	Develop WPPs	The state will support projects which provide for the development of WPPs which satisfy applicable EPA guidance.	WPP Development Projects	7	11	
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	14	26	
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	0	5	(1) Project of 17 TMDLs, (3) I-Plans for 26 TMDLs, (1) TMDL Addendum

Texas NPS Management Program Milestones *continued*

Goals / Objectives	Milestone	Milestone Description	Milestone Measurement	2014[3] Estimate	2014 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	6	13	
ST2/B,C	Load Reductions	The state will support projects which provide for the reduction of loadings of NPS pollutants.	NPS Load Reduction Projects	15	14	Numbers reflect FY14 projects with load reductions reported.
ST2/B,C	Load Reductions (Nitrogen)	The state will ensure project reductions are reported utilizing GRTS.	GRTS Report	RQ[2]	35,775 lbs/yr	Numbers reflect FY14 projects with load reductions reported.
ST2/B,C	Load Reductions (Phosphorus)	The state will ensure project reductions are reported utilizing GRTS.	GRTS Report	RQ	3,351 lbs/yr	Numbers reflect FY14 projects with load reductions reported.
ST2/B,C	Load Reductions (Sediment)	The state will ensure project reductions are reported utilizing GRTS.	GRTS Report	RQ	8,459 tons/yr	Numbers reflect FY14 projects with load reductions reported.
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	17	15	Numbers reflect active projects.

[1] *Milestone estimates were based upon existing grant commitments (up to and including fiscal year 2013 CWA Section 319(h) grant commitments between EPA, the State, and collaborating entities).*

[2] *RQ – Reportable Quantity*

[3] *Estimates are from the 2012 Texas NPS Management Program report*