



Status Report: Implementing TMDLs to Reduce Phosphorus Improving Water Quality in the North Bosque River

Environmental Concern

High concentrations of nutrients can cause excessive growth of algae and other aquatic plants, which can impair the aesthetic value of a river. Algae can also lead to taste and odor problems in drinking water, and may reduce the dissolved oxygen available in the water to support fish and other aquatic life. Beginning in 1996, the TCEQ identified high concentrations of nutrients and algae as a problem in the North and Upper North Bosque Rivers (Segments 1226 and 1255).

Since then, stakeholders have made substantial improvements in water quality (see “Environmental Progress”). This report summarizes progress and activities to improve water quality through fiscal year (FY) 2014. The state’s fiscal year is September 1 through August 31.

The TCEQ developed total maximum daily loads (TMDLs) to reduce phosphorus in Segments 1226 and 1255. The commission adopted the TMDLs in 2001. A TMDL is like a budget; it determines how much of a particular pollutant a water body can receive and still meet state standards for surface water quality. Discharges of the pollutant are then allocated among source categories within the watershed to stay within the overall budget—or *total load*—as defined in the TMDL.

Phosphorus was chosen as the TMDL target because analysis showed that reducing phosphorus would have the most effect on preventing algal growth. In statewide assessment guidance, chlorophyll *a* is measured to indicate whether concentrations of nutrients, which include phosphorus, nitrogen, and other substances—may be high enough to cause adverse conditions such as excessive algal growth. The TCEQ and project partners are monitoring both phosphorus and chlorophyll *a* over time at five index sites to determine improvements in water quality.

In 2002, the TCEQ and the Texas State Soil and Water Conservation Board (TSSWCB) developed an implementation plan (I-Plan) describing the regulatory and voluntary actions needed to reduce phosphorus and algal growth in the segments, along with a schedule for implementing them. Since then, stakeholders in the watershed have voluntarily undertaken additional measures (not contained in the I-Plan) to improve the water quality of the North Bosque River.



Environmental Goal

The TMDL I-Plan is designed to reduce the annual average concentration of soluble reactive phosphorus in the North Bosque River. Soluble reactive phosphorus has the highest correlation with algal growth, and is the most available form of the nutrient; therefore, it was selected as the target pollutant. Reduction goals are site-specific, and range from 39 to 62 percent.

Implementation Activities

The general approach to implementing the North Bosque River TMDLs is to reduce phosphorus loading. The following list identifies regulatory and voluntary actions that have been implemented. Most of these activities have been completed.

- **Regulation**
 - Issuing new and amended permits for concentrated animal feeding operations (CAFOs) and wastewater treatment facilities (WWTFs) that require phosphorus effluent limits for municipal WWTFs and enhanced nutrient management plans for dairies.
 - Monitoring by TCEQ Field Operations for compliance with permits.
 - Revising rules for all animal feeding operations (AFOs), and especially for CAFOs.
 - Continuing education for facility operators.

Figure 1. North Bosque River Watershed



Protecting Texas
by Reducing and
Preventing Pollution

Texas Commission on Environmental Quality
Surface Water Quality Monitoring Program
Mail Code 165
Post Office Box 13087
Austin, Texas 78711-3087

Texas Statewide Mapping System (TSMS) Projection



Map Created on March 26, 2015.

Legend

- WWTP Outfall
- Active CAFOs 2014
- TCEQ CWQM Stations
- TCEQ TMDL Index Sites
- U.S. Highways
- State Highways
- TMDL Project Segment
- Surface Water Segment
- Stream Traces
- Lakes
- County Boundaries
- City Boundaries
- Watershed



This map was edited by the Surface Water Quality Monitoring Team of the Texas Commission on Environmental Quality. No claims are made to the accuracy or completeness of the data or to its suitability for a particular use. For more information concerning this map, contact Charles Dvorsky, Continuous Water Quality Monitoring Coordinator, at (512)239-5550 or by e-mail to charles.dvorsky@tceq.texas.gov.

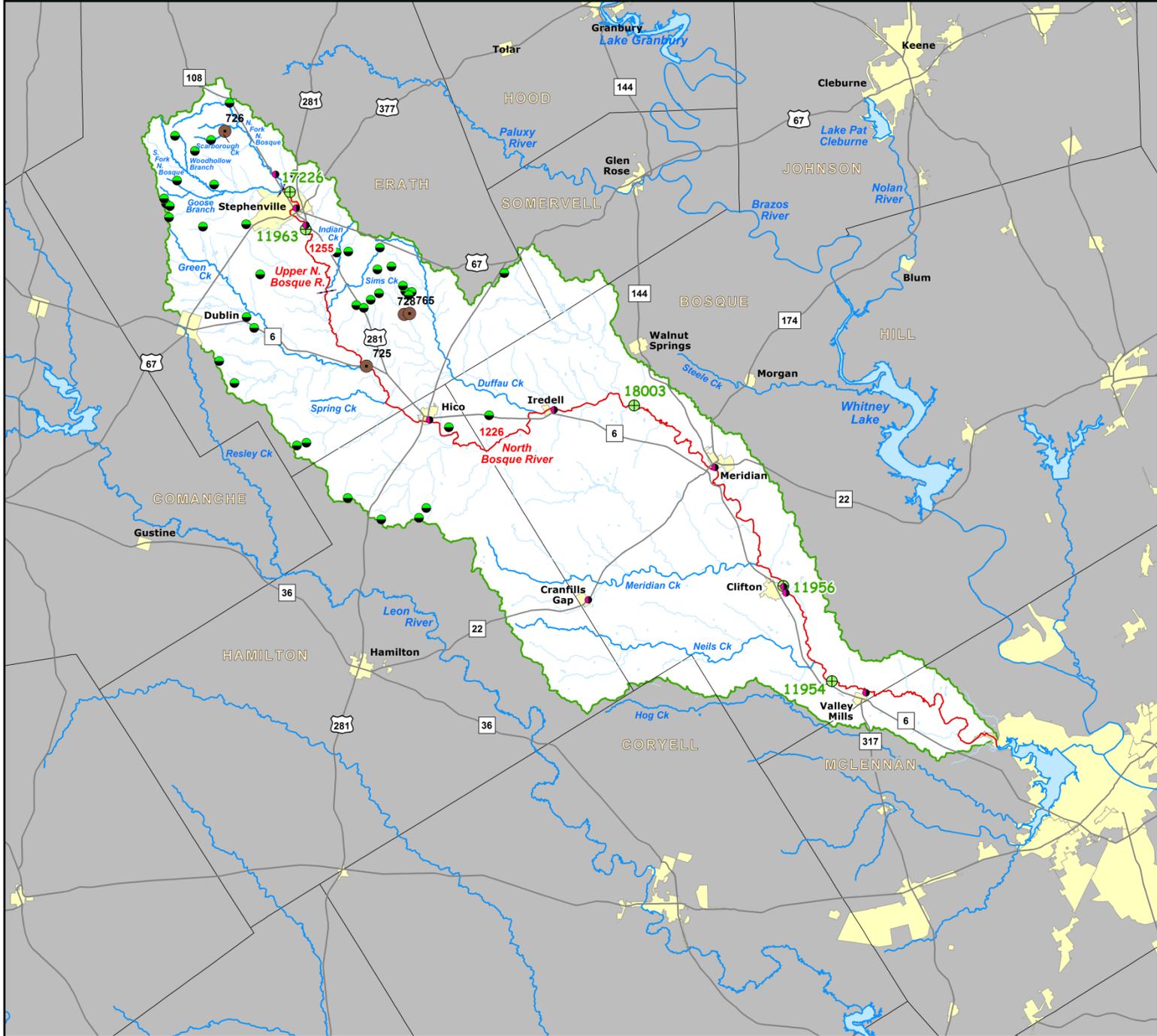
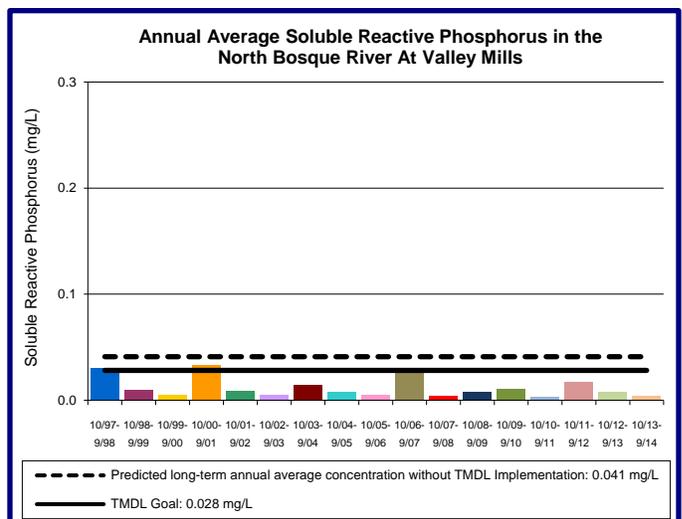
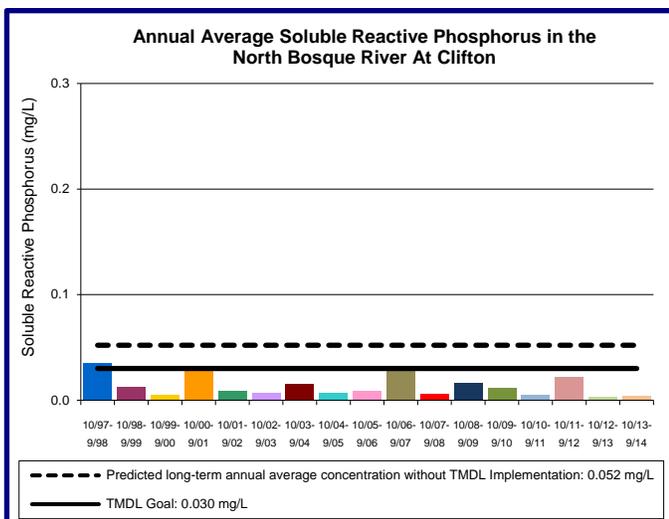
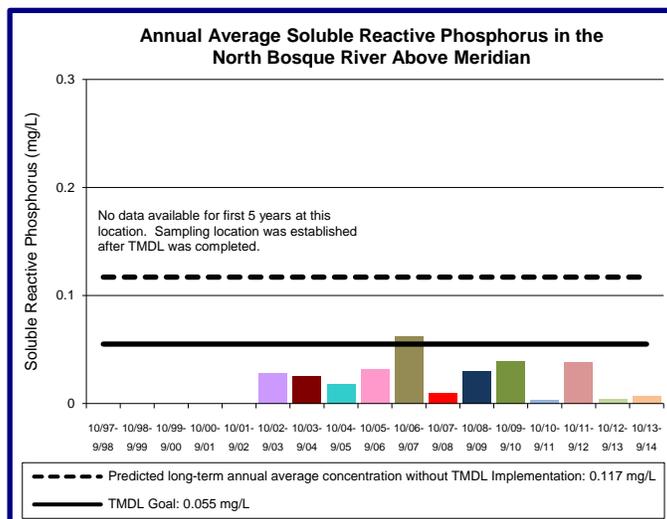
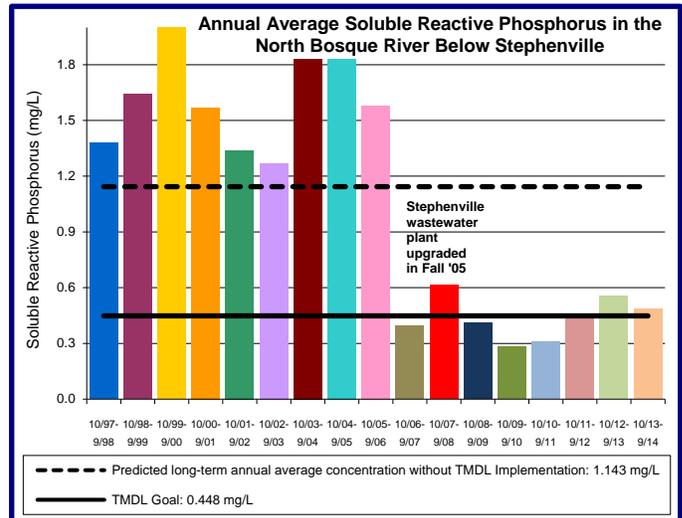
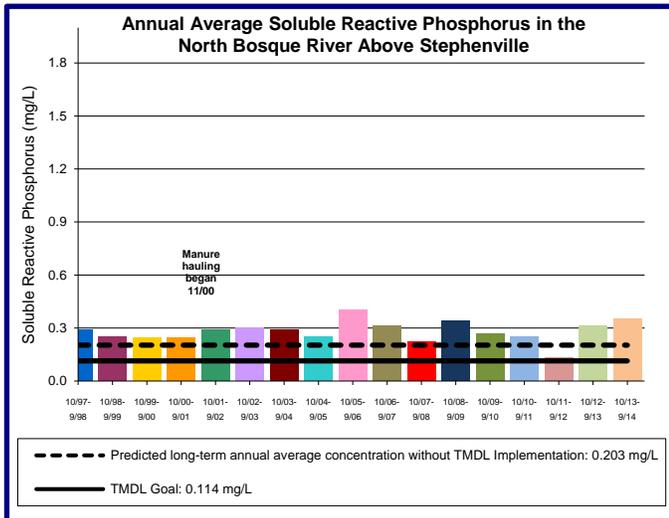


Figure 2. Annual Average Concentrations of Soluble Reactive Phosphorus at the five TMDL Index Sites on the North Bosque River - October 1997 through September 2014

As indicated in the TMDL Implementation Plan, the TCEQ needs at least five years of water quality data after on-the-ground implementation measures are completed to adequately compare stream conditions to predictions. The timing for implementation of some of the measures is shown on the graphs below.



- Developing and issuing a general permit for composting facilities.
- *Voluntary Actions*
 - Institutionalizing hauling and composting dairy manure for use in areas outside the watershed.
 - Applying improved land management practices through education, outreach, and implementation of comprehensive nutrient management plans (CNMPs) at all AFOs and CAFOs.
- *Tracking Results and Refining Plans*
 - Refining the model to verify target reductions.
 - Monitoring the rate of decline in phosphorus concentrations until quality standards are met.
 - Inspecting regulated facilities and enforcing compliance as necessary.

Status of Implementation

Many regulatory and locally initiated phosphorus control measures have been implemented. Some of the measures have reduced the amount of phosphorus available in the watershed, notably manure management at CAFOs and AFOs, and effluent limits and upgrades for WWTFs.

On July 2, 2014, the TCEQ adopted a revised CAFO rule to incorporate changes to federal regulations. The rule changes imposed additional requirements in nutrient management plans for CAFOs in the watershed.

Environmental Progress

Over the last eight years, water quality has improved overall and phosphorus levels at all four stations below Stephenville have remained significantly lower than pre-improvement levels. In 2014, phosphorus concentrations met the TMDL target at the three downstream index sites. TMDL targets were not met at the two upstream stations.

Due to drought, the river had little to no flow at the station above Stephenville most of 2013 and 2014. Downstream of Stephenville, flows were lower than usual, but more constant due to discharges from the municipal WWTF. Phosphorus concentrations increased slightly at the two index sites above and below Stephenville in 2013. In 2014, concentrations increased again at the site above Stephenville but decreased at the site below. Drought conditions have been extreme above Stephenville for the last two years, affecting the number of samples collected. Only five samples were collected in 2013, and only eight in 2014; normally, 26 samples are collected each year on a biweekly schedule. Consequently, results at the two upstream stations represent lower than average flow conditions and do not necessarily reflect increased nutrient contributions from the watershed.

Overall, phosphorus concentrations downstream of Stephenville have been reduced by more than 50% due to

upgraded phosphorus controls installed at the Stephenville WWTF in 2005 (Fig. 2). The Clifton WWTF was also upgraded to include better phosphorous control practices.

Individual permits with more stringent requirements were implemented at dairies beginning in 2004, along with voluntary and regulatory nutrient management practices. The increased focus on preventing discharges and managing nutrients has also been an important factor in improving water quality.

Tables 1 and 2 on the following pages summarize specific activities implemented to reach the phosphorus reduction targets in the TMDL and I-Plan. Table 1 summarizes activities still in progress through August 2014. Table 2 is a summary of all completed activities.

Continuous Stream Monitoring

In addition to the five index sites where compliance with the TMDL is monitored, the TCEQ maintained four Continuous Water Quality Monitoring Network (CWQMN) stations in the watershed (Figure 1) in 2014. These four sites are part of the Environmental Monitoring and Response System (EMRS) project that notifies TCEQ Stephenville Field Office staff when nutrient concentrations exceed trigger levels. Since its inception in 2004, EMRS has resulted in numerous investigations by staff of the TCEQ Stephenville Field Office.

For More Information

Visit the TCEQ's project Web page at: <www.tceq.texas.gov/waterquality/tmdl/06-bosque.html>. Learn more about the activities to reduce bacteria from agricultural operations at <www.tsswcb.texas.gov/watersheds/>. Learn more about water quality standards, monitoring, TMDLs, and watershed-based plans by reading *Preserving and Improving Water Quality*, available on the TCEQ's website at <www.tceq.texas.gov/waterquality/tmdl/tmdlprogram.html>. Or contact:

TCEQ

Louanne Jones
Senior Technical Writer
TMDL Program
(512) 239-2310
louanne.jones@tceq.texas.gov

TSSWCB

T.J. Helton
NPS Program Coordinator
(254) 773-2250 ext. 234
thelton@tsswcb.texas.gov

Project Highlights

- The TCEQ and EPA approved the TMDLs in February and December of 2001, respectively. The TCEQ and the TSSWCB approved the Implementation Plan in December 2002 and January 2003, respectively.
- By the beginning of 2006, all municipal WWTFs were on a compliance schedule consistent with the wasteload allocation in the TMDL. Permits continue to be issued, renewed, or amended consistent with agency policies and rules.
- TCEQ Regional Offices developed and implemented regular schedules for compliance inspections of CAFOs, WWTFs, and composting facilities.
- The TCEQ implemented an initiative to assist WWTFs with plans for remediation and prevention of sanitary sewer overflows.
- The TCEQ adopted amendments to the Subchapter B rules for CAFOs on July 15, 2004.
- On July 2, 2014, the TCEQ adopted a revised CAFO rule to incorporate changes in federal regulations. The primary effect of the rule changes for Bosque dairies is additional requirements related to nutrient management plans.
- The Composted Manure Incentive Project (CMIP), ended successfully on August 31, 2006, meeting its goal of removing approximately 50% of solid cattle manure from CAFOs from fiscal years 2003 through 2006. Performance monitoring indicated a positive correlation between participation in the compost program and reductions in phosphorus in the river.
- The TCEQ developed and issued a general permit for manure composting in October 2002, under which compost facilities may use their wastewater for irrigation. Permits continue to be renewed or amended consistent with agency policies and rules.
- The TCEQ developed markets for use of composted manure, particularly by the Texas Department of Transportation for maintaining healthy vegetation along roadsides. Vegetative cover reduces the speed of storm water runoff from roadways and acts as a filtering agent for suspended pollutants.
- The TSSWCB assisted each of the 55 dairy CAFOs that were operating in the watershed in 2004 to develop and obtain certification for CNMPs by August 2010, adding substantive nutrient management practices at all the operations. New or amended plans are reviewed and certified annually, as appropriate.
- The Texas Institute for Applied Environmental Research (TIAER) completed an inventory update of all CAFO and AFO operations in the watershed. TIAER also completed an assessment in July 2014 to correlate changes in land management practices to changes in water quality. This assessment will be updated annually through September 2016.

Table 1. Progress on TMDL Implementation Activities in Fiscal Year 2013

Activity	Responsible Parties	Progress of Current Activities through August 2013
<p>Inspect and Enforce Compliance</p> <ul style="list-style-type: none"> Perform inspections of CAFOs and AFOs. Report permit violations and levy fines as appropriate. <p>The Region 4 satellite office in Stephenville conducts investigations of all the CAFOs and AFOs in the five-county Dairy Outreach Project Area (DOPA).</p> <p>The Region 4 main office conducts biannual inspections at the Stephenville WWTF.</p> <p>The Region 9 office conducts inspections at the six WWTFs in Hico, Iredell, Meridian, Cranfills Gap, Clifton, and Valley Mills, using a risk-based approach when scheduling compliance inspections.</p>	<p>TCEQ Regional Offices 4 and 9</p>	<p>Field Office personnel continue to follow regular schedules for compliance inspections of CAFOs, WWTFs, and composting facilities.</p> <p>FY 14 CAFOs and AFOs were inspected as required.</p> <p>CAFOs and AFOs</p> <ul style="list-style-type: none"> 72 compliance inspections 13 complaint investigations 33 notices of violation 4 enforcement actions <p>WWTFs</p> <ul style="list-style-type: none"> 5 compliance inspections 0 complaint investigations 3 notices of violation 0 enforcement actions
<p>Monitor Microwatersheds</p> <p>Monitor in-stream water quality of small tributaries to characterize the contribution of nutrients from waste application fields.</p>	<p>TSSWCB</p>	<p>The most recent monitoring report, <i>Monitoring Effectiveness of Nonpoint Source Nutrient Management in the North Bosque River Watershed</i> (September 2014), indicates small but measurable reductions of instream phosphorus. See the report at <http://tiaer.tarleton.edu/pdf/PR1403.pdf>.</p> <p>Past reports have associated reductions in instream phosphorus largely to the success of the completed CMIP (see <i>Microwatershed-Based Approach to Monitoring and Assessing Water Quality in the North Bosque River Watershed</i> <http://tiaer.tarleton.edu/pdf/PR1004a.pdf>).</p> <p>More recent phosphorus reductions appear to be related to a shift in land use, as less land area is used for manure waste application. The implementation of CNMPs plays an important role in facilitating this shift in land use, as fields high in soil phosphorus are no longer used for waste application.</p> <p>Monitoring at 13 microwatershed sites ended in July 2014. Although this monitoring has ended, improvements in water quality are expected to continue as long as producers continue to implement good land management practices.</p>

Activity	Responsible Parties	Progress of Current Activities through August 2013
<p>Monitor Instream Water Quality</p> <ul style="list-style-type: none"> Monitor and assess instream water quality to determine status and trends in concentrations of soluble reactive phosphorus. 	<p>TCEQ</p>	<p>The TCEQ and its partners monitor several sites each year under the state's coordinated monitoring schedule, including the five index sites identified in the TMDL. Based on samples collected from October 2005 through September 2014:</p> <ul style="list-style-type: none"> Phosphorus concentrations met the TMDL targets at the three index sites along the lower half of the river. In 2014, at the two most upstream stations, phosphorus concentrations exceeded the target. At the station above Stephenville, very few samples were taken because there was very little to no water in the stream much of the time. Consequently, results at that station are not representative of average conditions and do not necessarily reflect increased nutrient loads. At the two index sites upstream and downstream of Stephenville, phosphorus concentrations were elevated just above the statewide screening level (0.37 mg/L) for 22% and 48% of the time respectively. At all sites, chlorophyll <i>a</i> concentrations exceeded the statewide screening criteria from 20% to 47% of the time. Because chlorophyll <i>a</i> is a measure of the green pigment contained in algae for use in photosynthesis, its concentrations may be used to indicate whether a water body is likely to have high concentrations of algae.

Table 2. History of Completed Management and Improvement Activities

Completed Activity	Responsible Parties	Summary
<p>Municipal Permits</p> <ul style="list-style-type: none"> Initiate amendment actions for municipal wastewater treatment plants located in the watershed as of 2002, in order to make all the permits consistent with the TMDL. 	<p>TCEQ</p>	<ul style="list-style-type: none"> All municipal wastewater discharge permits were revised to a compliance schedule consistent with the wasteload allocation in the TMDL and Implementation Plan. Permits continue to be issued, renewed, or amended consistent with agency policies and rules. The TCEQ issued amended permits to Stephenville and Clifton in mid-July 2003. The cities of Clifton and Stephenville completed facility upgrades in spring 2005 and fall 2005. The Texas Water Development Board supplied grants to assist in the upgrades. Through August 2012, instream concentrations of phosphorus were reduced by more than 50% at the sampling site downstream of Stephenville after the 2005 facility upgrade, meeting the TMDL target load reduction more than 80% of the time.
<p>Sanitary Sewer Overflow (SSO) Initiative</p> <ul style="list-style-type: none"> Develop voluntary SSO plans with cities in the watershed. <p>SSO plans are designed to reduce the number of SSOs that occur each year and to address them before they harm human health, safety, or the environment and before they become enforcement issues. Participants commit to a plan and schedule for rehabilitation of the collection system; development and implementation or improvements to operation and maintenance practices; and budgetary allocation of funding. Annual progress reports are required.</p>	<p>TCEQ Field Operations</p>	<p>The cities of Stephenville, Meridian, and Valley Mills are participants. All three cities submitted their SSO plans to the TCEQ and are meeting the requirements of the initiative.</p>
<p>Develop and Implement Water Quality Management Plan for AFOs</p> <ul style="list-style-type: none"> Assist AFOs with the development of voluntary Water Quality Management Plans (WQMPs) and CNMPs, both of which help AFOs operate in a way that supports instream water quality. <p>Dairy operations that run less than 200 cattle are called AFOs (animal feeding operations). They operate under authorizations set out in TCEQ rules.</p>	<p>TSSWCB</p>	<ul style="list-style-type: none"> The TSSWCB annually reviews the status of at least 40% of AFOs that operate under certified WQMPs in the North Bosque watershed. New or amended plans are reviewed and certified annually, as appropriate.
<p>Implement Comprehensive Nutrient Management Plans for CAFOs</p> <ul style="list-style-type: none"> Complete guidance for CNMPs. Assist CAFO operators in developing CNMPs that are consistent with NMP requirements in permits. Certify new or amended plans as appropriate. 	<p>TSSWCB</p>	<ul style="list-style-type: none"> CNMP guidance was completed in 2003. The TSSWCB certified CNMPs for all dairy CAFOs in the watershed by 2010. New or amended plans are reviewed and certified annually, as appropriate. Assuming fully compliant implementation, CNMPs should contribute substantially to phosphorus reductions in the watershed.

Completed Activity	Responsible Parties	Summary
<p>Amend CAFO Regulations Amend rules for Chapter 321, Subchapter B as needed during 2004 to implement 2003 changes in federal regulations and to support implementation of the North Bosque River TMDL.</p> <p>Amend rules for Chapter 321, Subchapter B in 2014 to incorporate changes to the federal CAFO regulations that were finalized in July 2012.</p>	TCEQ	<p>Amendments to the Subchapter B regulations were adopted on July 15, 2004. Requirements of the amended rules become effective for each CAFO upon the issuance of its new or amended permit.</p> <p>The revised rules require Nutrient Management Plans (NMPs) and enhanced inspection, testing, and record-keeping elements. In addition, requirements specific to dairy CAFOs in the Bosque watershed include:</p> <ul style="list-style-type: none"> · obtaining individual permits · managing retention control structures to: <ul style="list-style-type: none"> ○ increase the design margin of safety to 25-year/10-day rainfall event ○ document when wet-weather overflows are beyond control · implementing Comprehensive Nutrient Management Plans (CNMPs) · specifying land application practices for contractors · installing automatic emergency shutdown or alarm system if required for pond pumps · adhering to vegetative buffer requirements · installing additional filter/buffer strip between vegetative buffer and land application area <p>On July 2, 2014, the TCEQ adopted additional amendments to the CAFO rule to incorporate changes in the federal CAFO regulations. The primary effect of the rule changes for Bosque dairies is additional requirements related to nutrient management plans.</p>
<p>CAFO Permits</p> <ul style="list-style-type: none"> · Require all dairy CAFOs in the North Bosque River watershed to acquire an individual permit consistent with the 2005 amended rules for Subchapter B. <p>The TCEQ authorizes beef cattle CAFOs under a general permit, which was renewed on July 20, 2014, and incorporated the rule changes adopted on July 2, 2014.</p>	TCEQ & CAFO operators	In 2005, the TCEQ implemented an application review process for CAFO permits. All new and renewed CAFO permits issued since 2005 comply with the more stringent operating requirements set forth in the 2005 rule amendment and the TMDL load allocations.
<p>Update CAFO Permits Issue individual permits for all dairy CAFOs in the watershed as their current permits expire.</p>	TCEQ	The TCEQ issued new permits for CAFOs in the North Bosque watershed as existing permits expired.
<p>Conduct Dairy Waste Management Courses Subchapter B of the CAFO Rules requires all dairy operators to attend continuing education training to maintain knowledge of current practices.</p>	TCEQ & AgriLife	<p>In the first year of implementation, four training classes were held and two special classes were offered.</p> <p>Continuing education classes have been institutionalized for this and other watersheds with numerous dairy operations. Texas AgriLife provides this training.</p>

Completed Activity	Responsible Parties	Summary
<p>Produce Compost from Manure</p> <ul style="list-style-type: none"> Annually remove 50% of collectable manure from dairy CAFOs and AFOs in the North Bosque River watershed from 2001 through 2006. <p>The amount of manure targeted for removal was based on the TMDL model, which estimated an average dairy cattle population of 40,450 head (and by extension, the associated manure) for the entire North Bosque River watershed.</p>	TCEQ	<ul style="list-style-type: none"> The Composted Manure Incentive Project (CMIP) ended successfully on August 31, 2006. At its conclusion, the CMIP had collected more than 650,000 tons of dairy manure at participating compost facilities and exported the equivalent of more than 329,000 tons of it in the form of compost, thus removing more than 1.48 million pounds of phosphorus from the watershed.
<p>Develop Regulations for Wastewater Discharges from Compost Facilities</p> <ul style="list-style-type: none"> Develop requirements for the design, construction, and management of manure composting facilities. Develop a permit to govern wastewater discharges from compost facilities. 	TCEQ	<ul style="list-style-type: none"> The TCEQ issued a general permit for manure composting in October 2002. Three of the original facilities were allowed to use their wastewater for irrigation under specific restrictions. The remaining two facilities could not use wastewater for irrigation.
<p>Monitor the Effectiveness of Management Measures</p> <ul style="list-style-type: none"> Evaluate the effectiveness of compost program in reducing instream phosphorus 	TCEQ & TIAER	<ul style="list-style-type: none"> Information presented in the TIAER report, "Extending TMDL Efforts in the North Bosque River Watershed: Assessment Data through 2007," indicated a positive correlation between participation in the compost program and reductions in phosphorus in the stream through December 2007. In 2007, data continued to support a positive impact from the compost program. The three sites associated with the highest participation rate showed decreases in soluble phosphorus of 7 to 26 percent. See the report at <http://www.tiaer.tarleton.edu/pdf/PR0802.pdf>.
<p>Validate and Improve the Phosphorus Index</p> <ul style="list-style-type: none"> Conduct field studies to quantify the effectiveness of the Phosphorus Index (PI) for predicting site vulnerability. <p>The PI is a reasonably rapid approach for identifying sites with the greatest potential to contribute to nonpoint source pollution. In addition, the PI enables comparison of alternative management practices used to reduce phosphorus losses.</p>	TSSWCB & AgriLife	<ul style="list-style-type: none"> In 2004, the TSSWCB contracted with Texas AgriLife to validate and/or modify the Texas PI as a predictive tool by conducting field studies in the dairy and poultry areas of Texas. All field and laboratory work for this project has been completed. Based on the project results and on research conducted by the USDA Agriculture Research Service, modifications will be developed to the Texas PI and submitted to the USDA Natural Resources Conservation Service. The final project report is available online at <http://www.tsswcb.texas.gov/files/docs/nps-319/projects/02-11-FR-PINDEX-07-30-09.pdf>. Texas AgriLife Extension Service recommended modifications to TCEQ's regulatory guidance based on results of the project, which the TCEQ accepted. The TCEQ published the revised guidance, <i>Soil Sampling for Concentrated Animal-Feeding Operations (CAFOs)</i>, RG-408, in 2009.

Completed Activity	Responsible Parties	Summary
<p>Improve and Standardize the Mehlich III Soil Test Method</p> <ul style="list-style-type: none"> Protect surface- and ground-water quality through the practice of soil testing. <p>Nutrient recommendations based on soil tests are a best practice for ensuring that nutrients are applied at agronomic rates. Soil testing is a prerequisite for participation in both state and federal regulatory cost sharing programs, issuance of land use permits, and compliance monitoring.</p>	<p>TSSWCB & AgriLife</p>	<ul style="list-style-type: none"> The TSSWCB contracted with Texas AgriLife to develop appropriate, standardized quality assurance, quality control, and standard operating procedures to provide a defined level of analytical assurance when using the Mehlich III soil test. The analysis of possible intra-laboratory methodology differences indicated a number of identification practices that could skew laboratory data for the Mehlich III P determination. The analysis also confirmed the relative robustness of the method to provide acceptably uniform results despite modest or even extreme changes in laboratory procedures or extraction conditions. An overarching assessment of the methods indicates that much of the reported variability between laboratories using the Mehlich III method are likely caused by non-homogenous samples submitted to two or more different laboratories. The final report from the study is available online at <www.tsswcb.texas.gov/files/docs/01-22--06-04-FR-MELICH3PH2.pdf>.
<p>Construct Lake Waco Wetland</p> <p>In 1998, the City of Waco City Council voted to raise the level of Lake Waco by seven feet, increasing the yield of the reservoir by over 20,000 acre/feet.</p> <ul style="list-style-type: none"> In order to provide habitat mitigation for the newly inundated land, the city constructed a 180-acre freshwater marsh, or wetland. 	<p>City of Waco</p>	<ul style="list-style-type: none"> The Lake Waco Wetland was completed in 2003 by the City of Waco, with help from the U.S. Army Corps of Engineers, Baylor University, and the U.S. Fish and Wildlife Service. The wetland is large enough to retain 11 million gallons of water for 7 - 10 days before returning it to the river, filtering out some of the nutrients and sediment in water that flows through it.
<p>Conduct an Aerial Survey of the Watershed</p> <ul style="list-style-type: none"> Conduct an aerial survey to document land uses that may be affecting water quality in the Bosque watershed. 	<p>Brazos River Authority</p>	<ul style="list-style-type: none"> The Brazos River Authority conducted an aerial survey of the watershed to obtain photographic and video-graphic records of land uses and of the riparian zones along the river. Interactive DVDs and an atlas were produced for each county in the watershed showing the flight path and points of interest.
<p>Apply and Refine the Bosque Model. Incorporate new data and/or information related to model-simulated activities or features.</p> <ul style="list-style-type: none"> Refine and validate the original model using measured streamflow and water quality data. Use the refined model to reanalyze the TMDL allocation 	<p>TCEQ & TIAER</p>	<ul style="list-style-type: none"> The updated model supports the validity of the original TMDL report and its load allocations. No midcourse correction in the plan is needed. The reassessment showed similar levels of reduction to those predicted at all five index stations. The updated model also indicated that the proposed control practices are sufficient, and might create even more reduction in phosphorus than predicted in the TMDL report.

Completed Activity	Responsible Parties	Summary
<p>Compliance and Enforcement</p> <ul style="list-style-type: none"> Perform inspections, report permit violations, and levy fines as appropriate. <p>The Dallas-Fort Worth Region 4 satellite office in Stephenville conducts investigations for all the CAFOs and AFOs in the five-county DOPA on an annual basis. The Region 4 Dallas/Fort Worth office conducts investigations at the Stephenville wastewater treatment plant on a bi-annually.</p> <p>The Region 9 Waco office conducts investigations at the other six WWTFs (Hico, Iredell, Meridian, Cranfills Gap, Clifton, and Valley Mills) in the North Bosque River watershed using a risk-based approach when targeting scheduled inspections.</p>	<p>TCEQ</p>	<p>FY 03:</p> <p><u>CAFOs and AFOs</u></p> <ul style="list-style-type: none"> 307 compliance inspections 23 complaint investigations 66 notices of violation 6 enforcement actions <p><u>WWTFs</u></p> <ul style="list-style-type: none"> 1 compliance inspection 1 complaint investigation 1 notice of violation 0 enforcement actions <p>FY 04:</p> <p><u>CAFOs and AFOs</u></p> <ul style="list-style-type: none"> 239 compliance inspections 37 complaint investigations 99 notices of violation 12 enforcement actions <p><u>WWTFs</u></p> <ul style="list-style-type: none"> 7 compliance inspections 2 complaint investigations 5 notices of violation 1 enforcement action <p>FY 05:</p> <p><u>CAFOs and AFOs</u></p> <ul style="list-style-type: none"> 220 compliance inspection 15 complaint investigations 77 notices of violation 7 enforcement actions <p><u>WWTFs</u></p> <ul style="list-style-type: none"> 6 compliance inspections 2 complaint investigations 1 notice of violation 2 enforcement actions <p>FY 06:</p> <p><u>CAFOs and AFOs</u></p> <ul style="list-style-type: none"> 211 compliance inspections 18 complaint investigations 32 notices of violation 8 enforcement actions <p><u>WWTFs</u></p> <ul style="list-style-type: none"> 2 compliance inspections 4 complaint investigations 4 notices of violation 1 enforcement action

Completed Activity	Responsible Parties	Summary
<p>Compliance and Enforcement (continued)</p>	<p>TCEQ</p>	<p>FY 07:</p> <p><u>CAFOs and AFOs</u></p> <p>200 compliance inspections 8 complaint investigations 57 notices of violation 37 enforcement actions</p> <p><u>WWTFs</u></p> <p>4 compliance inspections 1 complaint investigation 1 notice of violation 0 enforcement actions</p> <p><u>Compost Facilities</u></p> <p>1 compliance inspection 1 complaint investigation 2 notices of violation 0 enforcement actions</p> <p>FY 08:</p> <p><u>CAFOs and AFOs</u></p> <p>204 compliance inspections 18 complaint investigations 91 notices of violation 10 enforcement actions</p> <p><u>WWTFs</u></p> <p>16 compliance inspections (includes pre-treatment audit) 1 complaint investigation 10 notices of violation 0 enforcement actions</p> <p><u>Compost Facilities</u></p> <p>0 compliance inspections 2 complaint investigations (1 turkey manure) 1 notice of violation 1 enforcement action (turkey manure facility)</p> <p>FY09:</p> <p><u>CAFOs and AFOs</u></p> <p>181 compliance inspections 18 complaint investigations 75 notices of violation 17 enforcement actions</p> <p><u>WWTFs</u></p> <p>25 compliance inspections 0 complaint investigations 12 notices of violation 1 enforcement action</p>

Completed Activity	Responsible Parties	Summary
<p>Compliance and Enforcement (continued)</p>	<p>TCEQ</p>	<p>FY09, continued: <u>Compost Facilities</u> 5 compliance inspections 2 complaint investigations 0 notices of violation 4 enforcement actions</p> <p>FY 10: <u>CAFOs and AFOs</u> 182 compliance inspections 14 complaint investigations 61 notices of violation 26 enforcement actions <u>WWTFs</u> 13 compliance inspections 0 complaint investigations 9 notices of violation 0 enforcement action <u>Compost Facilities</u> 0 compliance inspections 0 complaint investigations 0 notices of violation 1 enforcement action</p> <p>FY 11 <u>CAFOs and AFOs</u> 182 compliance inspections 11 complaint investigations 54 notices of violation 10 enforcement actions <u>WWTFs</u> 3 compliance inspections 0 complaint investigations 2 notices of violation 0 enforcement action <u>Compost Facilities</u> 0 compliance inspections 0 complaint investigations 0 notices of violation 0 enforcement action</p> <p>FY 12 <u>CAFOs and AFOs</u> 98 compliance inspections 0 complaint investigations 49 notices of violation 13 enforcement actions <u>WWTFs</u> 2 compliance inspections 0 complaint investigations 1 notices of violation 0 enforcement actions</p>

Completed Activity	Responsible Parties	Summary
<p>Compliance and Enforcement (continued)</p>	<p>TCEQ</p>	<p>FY 13 <u>CAFOs and AFOs</u> 69 compliance inspections 4 complaint investigations 53 notices of violation 1 enforcement actions <u>WWTEs</u> 4 compliance inspections 1 complaint investigations 3 notices of violation 0 enforcement actions</p>