



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 the 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) 2011. The state’s fiscal year is September 1 through August 31.

The TCEQ developed total maximum daily loads 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 absorb and still meet state standards for surface water quality. Discharges of the pollutant are then allocated among categories of sources within the watershed to stay within the overall budget—or *total load*—for the pollutant, as defined in the TMDL.

The nutrient phosphorus was chosen for 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 support adverse conditions such as excessive algal growth. The TCEQ is monitoring both phosphorus and chlorophyll *a* to evaluate changes 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 identified in the I-Plan to improve the quality of the Bosque River.

Environmental Goal

The TMDL I-Plan is designed to reduce the 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. It was therefore selected as the target pollutant. Reduction goals are site-specific, and range from 39% to 62%.

The regulated sources of phosphorus in the streams are concentrated animal feeding operations (CAFOs) and municipal wastewater treatment facilities (WWTFs). The TCEQ, TSSWCB, and project partners are monitoring conditions over time at five index sites to determine the extent of improvements in water quality.

Implementation Activities

The general approach to implementing the Bosque TMDLs is to reduce phosphorus loading from wastewater treatment facilities and animal feeding operations. The following list identifies regulatory and voluntary actions that have been implemented. Some of these activities have been completed.

- **Regulation**
 - Issuing new and amended permits for CAFOs and WWTFs that require new phosphorus effluent limits for municipal WWTFs and enhanced nutrient management plans for dairies.
 - 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



Reducing and
Preventing Pollu

Texas Commission on Environmental Quality
Surface Water Quality Monitoring Program
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Miles
Texas Statewide Mapping System (TSMS) Projection

WTP Outfall
EQ Rider 19 Sites
EQ TMDL Index Sites

- TCEQ CWWQMN Stations
- Compost Facilities
- Dairies
- U.S. Highways
- State Highways
- TMDL Project Segment

Texas Statewide

Legend

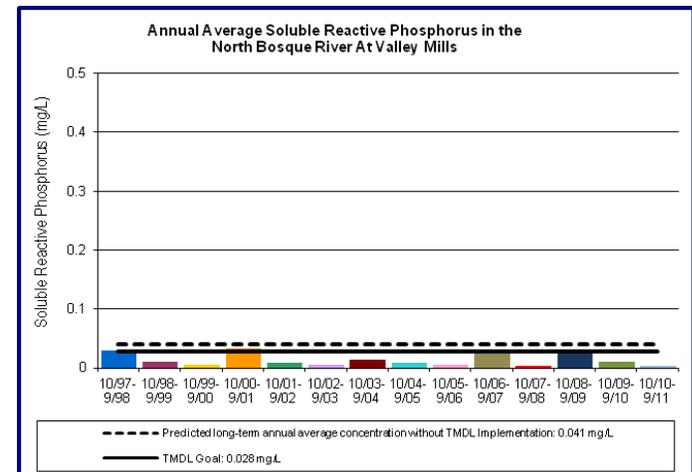
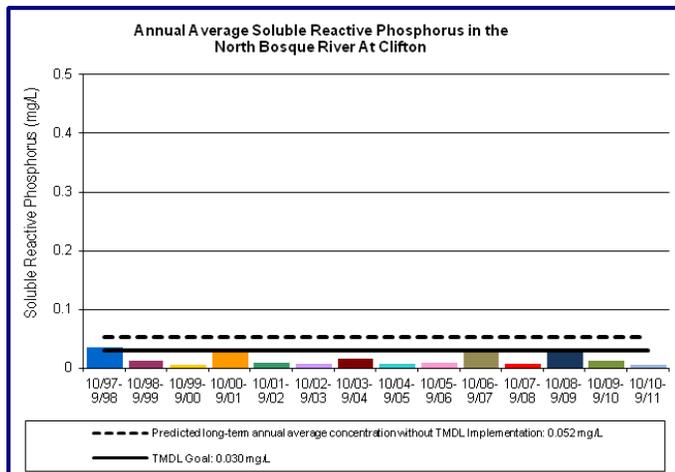
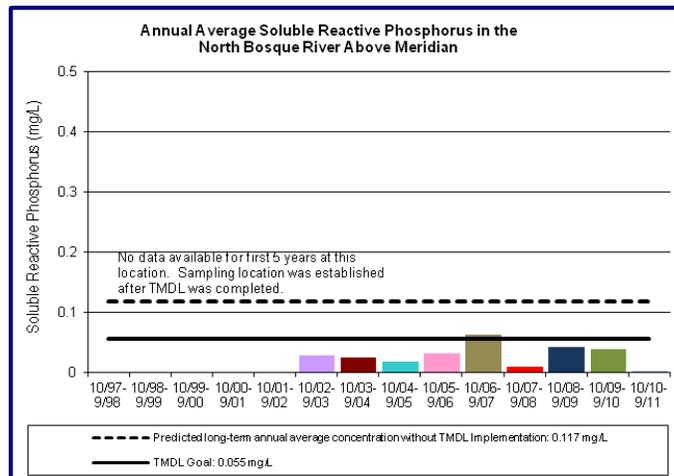
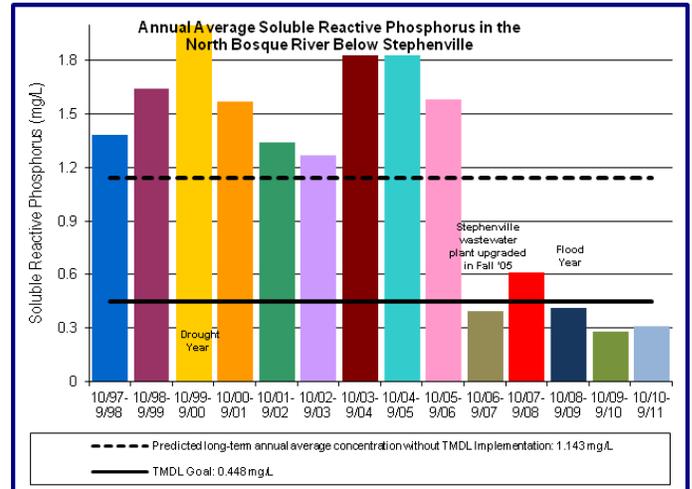
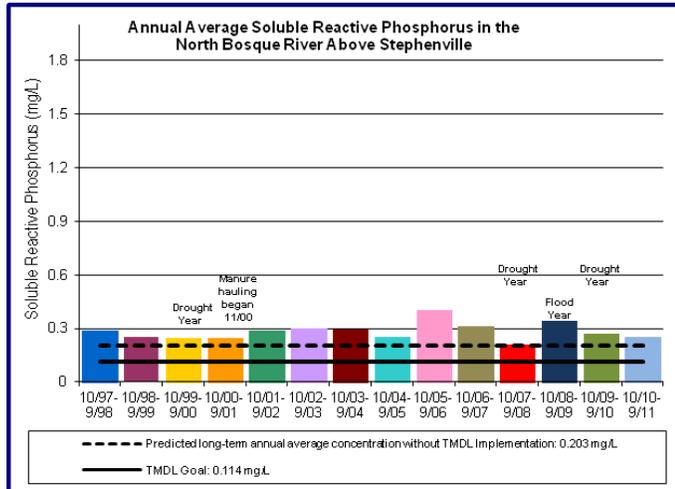
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- Surface Water Segment
- Stream Traces
- Lakes
- County Boundaries
- City Boundaries
- Watershed



Figure 2. Annual Average Concentrations of Soluble Reactive Phosphorus at the five TMDL Index Sites on the North Bosque River - October 1997 through September 2011

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. In those years shown as "Drought Year," only a few samples were taken because there was no water in the stream. This can skew the average value, so those years should not be considered representative of average conditions.



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- Developing and issuing a general permit for composting facilities.
- Voluntary Actions
 - Institutionalizing hauling and composting of 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
 - Model refinement 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 are underway. Some of the measures have reduced the amount of phosphorus available in the watershed, notably manure management, as well as effluent limits and upgrades for wastewater treatment plants. A significant decrease in phosphorus concentrations (over 50%) downstream of Stephenville can be attributed primarily to upgrades by the wastewater treatment plant.

Environmental Progress

Over the last five years, water quality has improved, as has the state's information about the natural variability of stream conditions due to rainfall and stream flow in the North Bosque River. Since 2006, the reduction targets have regularly been met at four of the five index sites. The sampling site above Stephenville is difficult to assess because stream flow is intermittent and is highly influenced by runoff.

Phosphorus concentrations downstream of Stephenville are reduced by more than 50%, meeting the target load reductions in the TMDL most of the time. Upgraded phosphorus controls installed at the Stephenville WWTF have resulted in noticeable improvements at the index site downstream of the discharge. Phosphorus control practices have also been implemented at the Clifton WWTF.

New individual permits with more stringent requirements are being implemented at Bosque dairies, 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.

Using the nutrient screening criteria established in statewide assessment guidance, there is still some concern at two of the five TMDL index sites—immediately up-stream and downstream of Stephenville—where samples continue to exceed the chlorophyll *a* criteria more than 20% of the time. The TCEQ will continue regularly collecting samples of phosphorus and chlorophyll *a* to evaluate reductions at all index sites.

Tables 1 and 2 on the following pages summarize specific activities implemented in the watershed to reach the phosphorus reductions targeted in the TMDL and I-Plan. Table 1 includes progress of activities in progress through August 2011. Table 2 is a summary of all implementation activities from January 2001 through August 2011, both completed and in progress.

For More Information

Visit the project website at: www.tceq.texas.gov/waterquality/tmdl/06-bosque.html

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Learn more about water quality standards, monitoring, TMDLs, and watershed protection plans by reading *Preserving and Improving Water Quality*, available on our website at www.tceq.texas.gov/goto/tmdl/.

Find out about the many activities to reduce bacteria from agricultural operations at www.tsswcb.texas.gov/watersheds#northbosqueriver.

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.
- All municipal WWTFs are on a compliance schedule consistent with the wasteload allocation in the TMDL. The necessary WWTF upgrades were completed in the spring and fall of 2005.
- 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 planning for remediation and prevention of sanitary sewer overflows.
- The TCEQ adopted amendments to the Subchapter B rules for CAFOs on July 15, 2004.
- The Composted Manure Incentive Project (CMIP), ended successfully on August 31, 2006, meeting its goal of removing roughly 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 issued a general permit for manure composting in October 2002, under which compost facilities may use their wastewater for irrigation.
- 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.
- The Texas Institute for Applied Environmental Research (TIAER) is currently conducting an inventory update of all CAFO and AFO operations in the watershed. TIAER will complete an assessment in September 2012 to correlate changes in land management practices to changes in water quality. This assessment will be updated annually through September 2014.

Table 1. Progress on TMDL Implementation Activities in Fiscal Year 2011

Activity	Responsible Parties	Progress of Current Activities through August 2011
<p>Update CAFO Permits</p> <ul style="list-style-type: none"> Issue individual permits for all dairy CAFOs in the watershed as their current permits expire. 	<p>TCEQ & CAFO operators</p>	<p>The TCEQ has issued new permits for CAFOs in the North Bosque watershed as existing permits expire.</p> <p>FY 11: 2 minor amendments; 1 major amendment</p>
<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 for 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>FY 11 CAFOs and AFOs were inspected as required.</p> <p><u>CAFOs and AFOs</u> 182 compliance inspections 11 complaint investigations 54 notices of violation 10 enforcement actions</p> <p><u>WWTFs</u> 3 compliance inspections 0 complaint investigations 2 notices of violation 0 enforcement action</p> <p><u>Compost Facilities</u> 0 compliance inspections 0 complaint investigations 0 notices of violation 0 enforcement action</p>
<p>Provide Continuing Education for CAFO Owners and Operators</p> <ul style="list-style-type: none"> Conduct training sessions. Update training information as needed. <p>Subchapter B of the CAFO Rules requires all dairy operators to attend continuing education training.</p>	<p>TCEQ & AgriLife</p>	<p>FY 11: Six training sessions were held in Erath and Comanche counties. Six are planned for FY12.</p>
<p>Implement Comprehensive Nutrient Management</p> <ul style="list-style-type: none"> Assist CAFO operators in developing CNMPs that are also consistent with NMP requirements in permits. Certify new or amended CNMPs. 	<p>TSSWCB</p>	<p>One new CNMP was developed during 2011.</p>

Activity	Responsible Parties	Progress of Current Activities through August 2011
<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. 	TCEQ	<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 2004 through September 2011 see (Figure 2):</p> <ul style="list-style-type: none"> Phosphorus concentrations meet the TMDL targets at all index sites except the one upstream of Stephenville. At the two index sites upstream and downstream of Stephenville, phosphorus concentrations were elevated just above the screening level (0.37 mg/L) for 22% and 34% of the time respectively, suggesting a continuing concern. At all sites <i>except</i> the site near Valley Mills, chlorophyll <i>a</i> concentrations exceeded the statewide screening criteria more than 20% of the time, suggesting a continuing concern for water quality. Because chlorophyll <i>a</i> is a measure of the green pigment contained in algae for use in photosynthesis, its concentrations are used to indicate whether a water body is likely to have high concentrations of algae.
<p>Monitor Microwatersheds</p> <ul style="list-style-type: none"> Monitor in-stream water quality of small tributaries to characterize the contribution of nutrients from waste application fields. Results are used to support decisions of the producer councils for the microwatersheds. 	TSSWCB	<p>The most recent monitoring report, <i>Microwatershed Based Approach to Monitoring and Assessing Water Quality in the North Bosque River Watershed</i> (November 2010), indicates small but measurable reductions of instream phosphorus. See the report at <http://tiaer.tarleton.edu/pdf/PR1004a.pdf>).</p> <p>These reductions in instream phosphorus are largely related to success of the completed CMIP. Reductions should continue since dairy producers still use haul-away and composting as options for manure disposal.</p> <p>TIAER is currently monitoring at 13 microwatershed sites. Monitoring will continue through October 2012. The impact of other activities, such as implementation of CNMPs, should also be observed with continued instream monitoring.</p> <p>Instream response to activities has been delayed in part because dissolved phosphorus in runoff is strongly controlled by the level of phosphorus concentrations in the soil. Appropriate land management practices are being applied, but it may take several years to remove this residual phosphorus from the soil.</p> <p>Drought conditions in recent years have also greatly limited crop production and, thus, soil phosphorus uptake. The record drought year in 2011 limited the availability of monitoring data available to assess changes in water quality at the sites.</p>

Table 2. History of Management and Improvement Activities, Fiscal Years 2002 through 2011

Activity	Responsible Agencies	Progress as of September 2011
<p>Municipal Permits</p> <ul style="list-style-type: none"> Initiate amendment actions for municipal wastewater treatment plants in order to make all the permits consistent with the TMDL. 	TCEQ	<ul style="list-style-type: none"> All seven municipal wastewater discharge permits now have a compliance schedule consistent with the wasteload allocation in the TMDL and Implementation Plan. 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. Instream concentrations of phosphorus are reduced by more than 50% at the sampling site downstream of Stephenville, meeting the TMDL target load reduction about 80% of the time.
<p>Sanitary Sewer Overflow (SSO) Outreach Program</p> <ul style="list-style-type: none"> Develop voluntary SSO plans with cities in the watershed. <p>SSO plans are designed to eliminate overflows in the shortest time possible, before they become an enforcement issue or affect human health. Participants commit to plans that remediate problems, and report annually to the TCEQ on their progress.</p>	TCEQ Field Operations	<ul style="list-style-type: none"> The cities of Stephenville, Meridian, and Valley Mills are participants. All three cities have submitted their final plans and are operating consistently with them. Personnel from the City of Hico and TCEQ are discussing the possibility of developing a plan for Hico.
<p>Amend 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 amended rules for Subchapter B. <p>The TCEQ authorizes beef cattle CAFOs under a general permit.</p>	TCEQ	<p>The TCEQ implemented an application review process for CAFO permits. The number of CAFO permits issued under the new rules for the North Bosque watershed is:</p> <p>FY 07: 2 FY 09: 24 FY 08: 10 FY 10: 14 FY 11: 3</p>
<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. 	TSSWCB	<ul style="list-style-type: none"> CNMP guidance was completed in 2003. The TSSWCB certified CNMPs for all dairy CAFOs by 2010. Most of the 55 dairy CAFOs in place in 2004 were implementing CNMPs as of August 31, 2011. Eighteen of the dairies are no longer in operation. Assuming fully compliant implementation, CNMPs should contribute substantially to phosphorus reductions in the watershed.

Activity	Responsible Agencies	Progress as of September 2011
<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>	TSSWCB	<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. There are eleven AFOs in the watershed as of August 2011; TSSWCB has certified six WQMPs and four CNMPs.
<p>Conduct Dairy Waste Management Courses</p> <ul style="list-style-type: none"> Subchapter B of the CAFO Rules requires all dairy operators to attend continuing education training to maintain knowledge of current practices. 	TCEQ & AgriLife	<p>FY 02: Four training classes were held and two special classes were offered.</p> <p>FY 03: Two training classes were held.</p> <p>FY 04: Four training classes were held.</p> <p>FY 05: Three large training classes were held, as well as three smaller training sessions.</p> <p>FY 06: Two training classes were held, one in Hico and one in Stephenville.</p> <p>FY 07: Four training sessions were held.</p> <p>FY 08: Five training sessions were held.</p> <p>FY 09: Four training sessions were held in Erath and Comanche Counties.</p> <p>Texas AgriLife Extension Service developed several online training modules that owners and operators of dairy CAFOs may complete for continuing education credits.</p> <p>FY10: Four training sessions were held in Erath and Comanche Counties.</p> <p>Throughout most of FY10, Texas AgriLife offered several online training modules that owners and operators of dairy CAFOs may complete for continuing education credits. See the training on the Internet at: <http://texasdairymatters.org/dopa-alt/></p> <p>FY 11: Six meetings in Erath and Comanche counties in FY11. Six planned for FY12.</p>
<p>Monitor Instream Water Quality</p> <ul style="list-style-type: none"> Monitor and assess instream water quality biannually to determine status and trends in concentrations of soluble reactive phosphorus. 	TCEQ, TIAER, Brazos River Authority	<ul style="list-style-type: none"> Water samples are collected routinely by staff at TIAER, TCEQ regional offices, and the Brazos River Authority.

Activity	Responsible Agencies	Progress as of September 2011
<p>Monitor the Effectiveness of Management Measures</p> <ul style="list-style-type: none"> Evaluate the effectiveness of compost program in reducing instream phosphorus 	<p>TCEQ & TIAER</p>	<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>Amend CAFO Regulations (completed)</p> <ul style="list-style-type: none"> 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>TCEQ</p>	<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>Produce Compost from Manure (completed)</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>	<p>TCEQ</p>	<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. Two composting facilities are still in full operation. Together they take in about 20,000 tons/month, and report selling about 8,000 cubic yards/month. 98% or more is exported from the watershed. One additional facility is still receiving manure sporadically.

Activity	Responsible Agencies	Progress as of September 2011
<p>Develop Regulations for Wastewater Discharges from Compost Facilities (completed)</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 facilities in the watershed may use their wastewater for irrigation under specific restrictions. The remaining two facilities may not use wastewater for irrigation.
<p>Validate and Improve the Phosphorus Index (completed)</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.
<p>Improve and Standardize the Mehlich III Soil Test Method (completed)</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>	TSSWCB & AgriLife	<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>.

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<p>Construct Lake Waco Wetland (completed) 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. 	City of Waco	<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 (completed)</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. 	Brazos River Authority	<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 (completed)</p> <ul style="list-style-type: none"> Incorporate new data and/or information related to model-simulated activities or features. Refine and validate the original model using measured streamflow and water quality data. Use the refined model to reanalyze the TMDL allocation 	TCEQ & TIAER	<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.
<p>Compliance and Enforcement Perform inspections, report permit violations, and levy fines as appropriate.</p> <p>The Dallas-Fort Worth Region 4 satellite office in Stephenville conducts investigations for all the CAFOs and AFOs in the five-county Dairy Outreach Project Area (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 wastewater treatment plants (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>	TCEQ	<p>FY 03:</p> <p><u>CAFOs and AFOs</u> 307 compliance inspections 23 complaint investigations 66 notices of violation 6 enforcement actions</p> <p><u>WWTEs</u> 1 compliance inspection 1 complaint investigation 1 notice of violation 0 enforcement actions</p> <p>FY 04:</p> <p><u>CAFOs and AFOs</u> 239 compliance inspections 37 complaint investigations 99 notices of violation 12 enforcement actions</p> <p><u>WWTEs</u> 7 compliance inspections 2 complaint investigations 5 notices of violation 1 enforcement action</p>

Activity	Responsible Agencies	Progress as of September 2011
Compliance and Enforcement (continued)	TCEQ	<p>FY 05:</p> <p><u>CAFOs and AFOs</u> 220 compliance inspection 15 complaint investigations 77 notices of violation 7 enforcement actions</p> <p><u>WWTFs</u> 6 compliance inspections 2 complaint investigations 1 notice of violation 2 enforcement actions</p> <p>FY 06:</p> <p><u>CAFOs and AFOs</u> 211 compliance inspections 18 complaint investigations 32 notices of violation 8 enforcement actions</p> <p><u>WWTFs</u> 2 compliance inspections 4 complaint investigations 4 notices of violation 1 enforcement action</p> <p>FY 07:</p> <p><u>CAFOs and AFOs</u> 200 compliance inspections 8 complaint investigations 57 notices of violation 37 enforcement actions</p> <p><u>WWTFs</u> 4 compliance inspections 1 complaint investigation 1 notice of violation 0 enforcement actions</p> <p><u>Compost Facilities</u> 1 compliance inspection 1 complaint investigation 2 notices of violation 0 enforcement actions</p> <p>FY 08:</p> <p><u>CAFOs and AFOs</u> 204 compliance inspections 18 complaint investigations 91 notices of violation 10 enforcement actions</p> <p><u>WWTFs</u> 16 compliance inspections (includes pre-treatment audit) 1 complaint investigation 10 notices of violation 0 enforcement actions</p>

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Activity	Responsible Agencies	Progress as of September 2011
Compliance and Enforcement (continued)	TCEQ	<p>FY 08, continued:</p> <p><u>Compost Facilities</u></p> <ul style="list-style-type: none"> 0 compliance inspections 2 complaint investigations (1 turkey manure) 1 notice of violation 1 enforcement action (turkey manure facility) <p>FY09:</p> <p><u>CAFOs and AFOs</u></p> <ul style="list-style-type: none"> 181 compliance inspections 18 complaint investigations 75 notices of violation 17 enforcement actions <p><u>WWTEs</u></p> <ul style="list-style-type: none"> 25 compliance inspections 0 complaint investigations 12 notices of violation 1 enforcement action <p><u>Compost Facilities</u></p> <ul style="list-style-type: none"> 5 compliance inspections 2 complaint investigations 0 notices of violation 4 enforcement actions <p>FY 10:</p> <p><u>CAFOs and AFOs</u></p> <ul style="list-style-type: none"> 182 compliance inspections 14 complaint investigations 61 notices of violation 26 enforcement actions <p><u>WWTEs</u></p> <ul style="list-style-type: none"> 13 compliance inspections 0 complaint investigations 9 notices of violation 0 enforcement action <p><u>Compost Facilities</u></p> <ul style="list-style-type: none"> 0 compliance inspections 0 complaint investigations 0 notices of violation 1 enforcement action

Activity	Responsible Agencies	Progress as of September 2011
Compliance and Enforcement (continued)	TCEQ	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