



**Texas State Soil and Water Conservation Board
 Total Maximum Daily Load Program
 FY 2009 Project 09-50**

TMDL PROJECT SUMMARY PAGE			
Title of Project	Development and Testing of a Texas Best Management Practice Evaluation Tool to Aid Decision-Making in Conservation Planning on Agricultural Lands		
Project Goals/Objectives	To develop an easy-to-use Texas BMP Evaluation Tool to aid in science-based BMP selection, cost-effective conservation spending, and program benefit analysis. Specifically, this tool will be designed to (1) assist land managers and agency planners in conservation practice decision-making related to on-farm (field-scale) alternatives and effectiveness and (2) facilitate evaluation and reporting of agricultural nonpoint source load reductions from WQMP implementation.		
Project Tasks	1) Project Administration 2) Development of the Texas BMP Evaluation Tool 3) Validation of the Texas BMP Evaluation Tool 4) Training on Use of the Texas BMP Evaluation Tool		
Measures of Success	A Texas BMP Evaluation Tool that <ul style="list-style-type: none"> • effectively provides alternative BMP choices in WQMP development based on environmental impact • efficiently and accurately estimates load reductions from selected BMPs prescribed in WQMPs • is adopted for regular use by TSSWCB, SWCD, and USDA-NRCS conservation planners 		
Project Type	Implementation (X); Education (); Planning (); Assessment ()		
Status of Waterbody on 2008 Texas Water Quality Inventory and 303(d) List	<u>Segment ID</u> statewide	<u>Parameter</u> nitrogen (N), phosphorus (P), sediment, bacteria	<u>Category</u> all
Project Location (Statewide or Watershed and County)	Statewide		
Key Project Activities	Hire Staff (X); Surface Water Quality Monitoring (); Technical Assistance (X); Education (); Implementation (X); BMP Effectiveness Monitoring (); Demonstration (); Planning (); Modeling (X); Bacterial Source Tracking (); Other ()		
Texas NPS Management Program Elements	<ul style="list-style-type: none"> • Element 1 (Short Term Goals 1C, 2B, 3B, 3D) • Element 2 • Element 3 • Element 4 		
Project Costs	\$155,250 (TSSWCB TMDL GR)		
Project Management	USDA Agricultural Research Service		
Project Period	September 1, 2008 – August 31, 2010		

Part I – Applicant Information

Applicant							
Project Lead	Daren Harmel, PhD						
Title	Agricultural Engineer						
Organization	USDA Agricultural Research Service						
E-mail Address	daren.harmel@ars.usda.gov						
Street Address	808 E. Blackland Rd.						
City	Temple	County	Bell	State	Texas	Zip Code	76502
Telephone Number	254-770-6521			Fax Number	254-770-6561		

Project Partners

Names	Roles & Responsibilities
Texas State Soil and Water Conservation Board (TSSWCB)	Provide state oversight and management of all project activities. Provide input on IT compatibility and field protocols, data formats, WQMP information, etc. Conduct Lake Granger watershed field test.
United States Department of Agriculture – Agricultural Research Service (USDA-ARS)	Responsible for all project activities and tasks including 1) Project Administration, 2) Development of the Texas BMP Evaluation Tool, 3) Validation of the Texas BMP Evaluation Tool, and 4) Training on Use of the Texas BMP Evaluation Tool.
United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS)	Work with USDA-ARS to understand the capabilities of Toolkit and to explore integration of the Texas BMP Evaluation Tool. Provide input on field protocols, data formats, WQMP information, etc.
Soil and Water Conservation Districts (SWCDs)	Assist in Lake Granger watershed field test. Provide input on field protocols, data formats, WQMP information, etc.

Part II – Project Information

Watershed Information

Watershed Name	Hydrologic Unit Code (8 Digit)	Segment ID	305(b) Category	Size (Acres)
Statewide	N/A	N/A	N/A	N/A

Water Quality Impairment

Describe all known causes of water quality impairments from any of the following sources: 2008 Texas Water Quality Inventory and 303(d) List, Clean Rivers Program Basin Summary/Highlights Reports, or other documented sources.

This project will have impact on water quality impairments statewide related to agricultural nonpoint sources including N, P, sediment, and bacteria.

Project Narrative

Problem/Need Statement

The TSSWCB, SWCDs, and USDA-NRCS have been collaborating with agricultural producers [cooperators] to implement best management practices (BMPs) to protect natural resources on Texas farms and ranches for decades. Through the TSSWCB Water Quality Management Plan (WQMP) Program, technical assistance is provided by TSSWCB Regional Office staff, SWCD Technicians, and USDA-NRCS Field Office staff [planners] to assist cooperators in developing and implementing whole-farm, resource management systems (WQMPs). A WQMP is a site-specific plan which includes a suite of appropriate land treatment practices, production practices, management measures, and technologies that prevent and abate agricultural and silvicultural nonpoint source (NPS) water pollution. The BMPs prescribed in a WQMP are defined in the USDA-NRCS Field Office Technical Guide (FOTG). The FOTG represents the best available technology and is tailored to meet the needs of local SWCDs.

Toolkit, a collection of software tools developed by USDA, is used by planners to design, layout, and evaluate the BMPs for a WQMP. Designed for nation-wide use with federal Farm Bill programs, *Toolkit* interfaces with ArcGIS and accesses soil survey information, roads, water features, topography, aerial imagery and other data critical in conservation planning. *Toolkit*, however, does not provide a mechanism to evaluate the actual water quality impact (i.e., pollutant load reductions) of implementing specific BMPs and the WQMP as a whole. As such, the decision to include or not include a certain BMP in a WQMP, has been based only on best professional judgment of the planner and the preference of the cooperator rather than science-based analysis of water quality impact. TSSWCB needs a simple, yet scientifically valid, tool that will assist planners and cooperators in decision-making related to on-farm BMP alternatives and systematic impact of WQMPs on water quality.

The TSSWCB collaborates with the Texas Commission on Environmental Quality (TCEQ) and other state and federal partners to develop Total Maximum Daily Loads (TMDLs) and Watershed Protection Plans (WPPs) for waterbodies identified as impaired on the *Texas Water Quality Inventory and 303(d) List*. This process includes water quality monitoring and modeling to estimate needed pollutant load reductions to bring the waterbody into compliance with water quality standards. Additionally, modeling is used to then make decisions on what suite of BMPs would most effectively and cost-efficiently achieve those pollutant load reductions. TSSWCB utilizes the WQMP Program to implement BMPs on agricultural lands in watersheds with TMDLs or WPPs. TSSWCB has had difficulty in estimating load reductions achieved from implementing specific WQMPs and then translating those reductions to in-stream effects on the total reductions called for in the TMDL or WPP. TSSWCB needs a tool that will estimate pollutant load reductions achieved from implementing a WQMP and that aids in translating those reductions to watershed-wide effects.

Financial assistance is provided to cooperators to assist in implementing specific BMPs prescribed in a WQMP through a variety of programs, including USDA Farm Bill programs and TSSWCB cost-share programs (funded through state appropriations and federal Clean Water Act §319(h) NPS Grants from the U.S. Environmental Protection Agency [EPA]). EPA performance measures for §319(h) grants require TSSWCB to report pollutant load reductions achieved from the implementation of cost-shared BMPs. Historically, TSSWCB has reported load reductions calculated with unsophisticated software tools (STEPL) that cannot be adjusted for climatic conditions in Texas and that rely exclusively on measured BMP efficiencies from non-Texas sites. TSSWCB needs a tool that better accounts for local conditions in order to report load reductions from WQMPs and evaluate programmatic fiscal and environmental impact.

No easy-to-use, Texas-specific tool exists for TSSWCB to use in science-based BMP selection, cost-effective conservation spending, and program benefit analysis. Current modeling tools are either too basic to ensure scientific validity and landowner buy-in or are too complicated for conservation planners to use with landowners in placing conservation practices on the ground.

Project Narrative

General Project Description

Through this project, USDA-ARS will develop an easy-to-use Texas BMP Evaluation Tool to aid in science-based BMP selection, cost-effective conservation spending, and program benefit analysis focusing on the TSSWCB WQMP Program. Specifically, this software tool will be designed to (1) assist land managers and agency planners in conservation practice decision-making related to on-farm alternatives and effectiveness and (2) facilitate evaluation and reporting of agricultural nonpoint source pollutant load reductions from WQMP implementation.

The Texas BMP Evaluation Tool will be simple enough, yet scientifically valid, so that cost-effective conservation practice alternatives can be examined and appropriate options chosen based on field-specific soil, crop, livestock, and climatic information. The Tool will provide scientifically-valid estimates of the environmental effects of conservation practices, i.e., impacts on water quality. Specifically, annual soil loss and N, P, and bacteria runoff will be estimated with and without BMPs. These estimates will provide resource conservation savings (for example tons of soil saved or lbs of P kept out of streams).

The Texas BMP Evaluation Tool will be developed by modifying the recently completed Oklahoma Pasture Phosphorus Management (PPM) program (PPM Calculator and its upgraded version, PPM Plus) (Oklahoma Cooperative Extension Service Fact Sheet BAE-1522 <http://osufacts.okstate.edu/>) to apply to conditions in Texas (Task 2). The Oklahoma PPM program is based on the scientifically-rigorous SWAT model but simplifies the inputs with a customized user-interface so that extensive modeling experience is not required for application by the planner. SWAT is a product of more than 30 years of model development by USDA-ARS. Although SWAT is generally used as a basin-scale model, its basic structure and development originated from the EPIC field-scale model. Therefore, SWAT can and will continue to be suitable for field-scale modeling if appropriately applied. The Oklahoma PPM program version of SWAT was extensively tested and validated with field data, performed very well, and was deemed suitable for application across Oklahoma.

The ability of the Texas BMP Evaluation Tool to accurately predict runoff as well as soil, N, P, and bacteria loss from agricultural operations will be tested with measured data from Texas (Task 3). With USDA, TSSWCB, and EPA support, measured field-scale bacteria, nutrient, sediment, and water runoff data for numerous Texas sites have been collected. These data records for cropland and pastureland will provide the scientific basis for testing the Texas BMP Evaluation Tool under differing soil, topographic, management, and geographic conditions.

The Texas BMP Evaluation Tool will be developed in coordination with TSSWCB planners to ensure that agency needs are met to the extent possible. Regular meetings will be held between USDA-ARS scientists and TSSWCB personnel, so that the resulting Tool will meet TSSWCB needs. This coordination and communication will focus on IT compatibility, protocols, data formats, WQMP information, etc.

To accomplish project tasks, USDA-ARS will hire a model developer with extensive experience and expertise with SWAT and the Oklahoma PPM program. This modeler will develop the Tool, perform calibration and validation, assist in the field test, and provide training to TSSWCB staff on Tool use. The USDA-ARS project lead will provide oversight and project administration.

The Texas BMP Evaluation Tool will allow conservation planners and land managers to take advantage of the predictive power of a complex hydrologic water quality model to develop better WQMPs by evaluating the water quality impact arising from proposed BMPs. The Tool will allow TSSWCB to better gage the programmatic effectiveness (fiscal and environmental) of the WQMP Program and associated state and federally sponsored cost-share funding mechanisms. Thus, development and implementation of the Texas BMP Evaluation Tool will improve conservation planning, enhance soil conditions, improve water quality, and increase fiscal efficiency across Texas.

Project Goals (Expand from Summary Page)

To develop an easy-to-use Texas BMP Evaluation Tool to aid in science-based BMP selection, cost-effective conservation spending, and program benefit analysis. Specifically, the Texas BMP Evaluation Tool will:

- Assist land managers and agency planners (TSSWCB, SWCD, USDA-NRCS) in conservation practice decision-making related to on-farm (field-scale) alternatives and effectiveness of systems of practices (WQMPs). The tool will be simple enough, yet scientifically valid, so that cost-effective conservation practice alternatives can be examined and appropriate options chosen based on field-specific soil, crop, livestock, and climatic information.
- Facilitate evaluation and reporting of agricultural nonpoint source load reductions from WQMP implementation. The tool will provide scientifically-valid estimates of the environmental effects of conservation practices. Specifically, annual soil loss and N, P, and bacteria runoff will be estimated with and without best management practices. These estimates will provide resource conservation savings (for example tons of soil saved or lbs of P kept out of streams) for use in TSSWCB program justification related to state appropriations and federal grants.

Measures of Success (Expand from Summary Page)

A Texas BMP Evaluation Tool that

- effectively provides alternative BMP choices in WQMP development based on environmental impact
- efficiently and accurately estimates load reductions from selected BMPs prescribed in WQMPs
- is adopted for regular use by TSSWCB, SWCD and USDA-NRCS conservation planners

2005 Texas NPS Management Program Reference (Expand from Summary Page)

- **Element 1** – Explicit short- and long-term goals, objectives and strategies that protect surface and groundwater.
- **Short-Term Goal One – Data Collection and Assessment – Objective C** – Conduct special studies...to target...BMP implementation.
- **Short-Term Goal Two – Implementation – Objective B** – Develop and implement BMPs to address constituents of concern....
- **Short-Term Goal Three – Education – Objective B** – Administer programs to educate citizens about...their potential role in causing NPS pollution.
- **Short-Term Goal Three – Education – Objective D** – Conduct outreach through...Soil and Water Conservation Districts...to facilitate broader participation and partnerships. Enable stakeholders...to participate in decision-making and provide a more complete understanding of water quality issues and how they relate to each citizen.
- **Element 2** – Working partnerships and linkages to appropriate state,...local entities,...and federal agencies.
- **Element 3** – Balanced approach that emphasizes both state-wide nonpoint source programs and on-the-ground management of individual watersheds.
- **Element 4** – Abatement of water quality impairments from nonpoint source pollution and prevention of significant threats to water quality from present and future nonpoint source activities.

Tasks, Objectives and Schedules			
Task 1	Project Administration		
Costs	\$0		
Objective	To effectively administer, coordinate and monitor all work performed under this project including technical and financial supervision and preparation of status reports.		
Subtask 1.1	USDA-ARS will prepare electronic quarterly progress reports (QPRs) for submission to the TSSWCB. QPRs shall document all activities performed within a quarter and shall be submitted by the 15 th of December, March, June and September.		
	Start Date:	Month 1	Completion Date: Month 24
Subtask 1.2	USDA-ARS will perform accounting functions for project funds and will submit appropriate Reimbursement Forms to TSSWCB at least quarterly.		
	Start Date:	Month 1	Completion Date: Month 24
Subtask 1.3	USDA-ARS will host coordination meetings or conference calls with TSSWCB, and any project partners as appropriate, at least quarterly to discuss project activities, project schedule, communication needs, deliverables and other requirements.		
	Start Date:	Month 1	Completion Date: Month 24
Deliverables	<ul style="list-style-type: none"> • QPRs in electronic format • Reimbursement Forms and necessary documentation in either electronic or hard copy format 		

Tasks, Objectives and Schedules			
Task 2	Development of the Texas BMP Evaluation Tool		
Costs	\$83,950		
Objective	To develop a user-friendly software tool applicable to conditions in Texas for evaluation of agricultural BMPs in conservation planning.		
Subtask 2.1	USDA-ARS will modify the Oklahoma PPM program to apply to conditions in Texas. This modification will include model development with enhanced SWAT routines to represent BMP effects. The Texas BMP Evaluation Tool will estimate field-scale runoff and N, P, sediment, and bacteria loads.		
	Start Date:	Month 1	Completion Date: Month 12
Subtask 2.2	USDA-ARS will work with TSSWCB IT to ensure compatibility with agency computing resources and communicate with TSSWCB, SWCD and USDA-NRCS planners to incorporate protocols, data formats, WQMP information, etc. into the Texas BMP Evaluation Tool.		
	Start Date:	Month 1	Completion Date: Month 6
Subtask 2.3	USDA-ARS will work with USDA-NRCS to explore the feasibility of integrating the Texas BMP Evaluation Tool with <i>Toolkit</i> such that WQMP data in <i>Toolkit</i> might be routinely extracted for use with the Tool.		
		Month 1	Month 6
Deliverables	<ul style="list-style-type: none"> • Draft Beta Version of Texas BMP Evaluation Tool 		

Tasks, Objectives and Schedules			
Task 3	Validation of the Texas BMP Evaluation Tool		
Costs	\$66,125		
Objective	To test and validate the ability of the Texas BMP Evaluation Tool to accurately predict field-scale runoff and N, P, sediment, and bacteria loads.		
Subtask 3.1	USDA-ARS will compile measured data from Texas sites for use in calibration and validation.		
	Start Date:	Month 3	Completion Date: Month 9
Subtask 3.2	USDA-ARS will calibrate and validate the Texas BMP Evaluation Tool under differing soil, topographic, resource management, and geographic conditions and then make necessary modifications to the Tool based on these results.		
	Start Date:	Month 12	Completion Date: Month 18
Subtask 3.3	USDA-ARS will assist TSSWCB and SWCD personnel in conducting a Beta field test of the Tool in the Lake Granger watershed. This will include working with TSSWCB and SWCD conservation planners to test Tool functionality and usability.		
	Start Date:	Month 18	Completion Date: Month 21
Subtask 3.4	USDA-ARS will make final modifications to the Tool based on results of the Lake Granger watershed field test and TSSWCB evaluations.		
	Start Date:	Month 21	Completion Date: Month 23
Deliverables	<ul style="list-style-type: none"> Validated Beta Version of Texas BMP Evaluation Tool Lake Granger watershed field test results Refereed publication reporting calibration, validation, and field test results 		

Tasks, Objectives and Schedules			
Task 4	Training on Use of the Texas BMP Evaluation Tool		
Costs	\$5,175		
Objective	To provide training and support materials for the Texas BMP Evaluation Tool for TSSWCB personnel.		
Subtask 4.1	USDA-ARS will develop training materials and a users' manual for the Tool.		
	Start Date:	Month 21	Completion Date: Month 23
Subtask 4.2	USDA-ARS will conduct training for TSSWCB personnel on the use of the Tool.		
	Start Date:	Month 24	Completion Date: Month 24
Deliverables	<ul style="list-style-type: none"> TSSWCB training event Training materials Users' manual for Texas BMP Evaluation Tool 		

Part III – Financial Information

Budget Summary	
Category	Costs
Personnel	\$ 0
Fringe Benefits	\$ 0
Travel	\$ 0
Equipment	\$ 0
Supplies	\$ 0
Contractual	\$ 155,250
Construction	\$ 0
Other	\$ 0
Total Direct Costs	\$ 155,250
Indirect Costs (≤15%)	\$ 0
Total Project Costs	\$ 155,250

Budget Justification		
Category	Costs	Justification
Personnel & Fringe	\$ 0	
Travel	\$ 0	
Equipment	\$ 0	
Supplies	\$ 0	
Contractual	\$ 155,250	Personnel time required to develop, test, and provide training on Texas BMP Evaluation Tool; 100% in year 1 and 75% in year 2 (\$130,500); Travel to present results at scientific meetings and to coordinate with SWCD, USDA-NRCS, and TSSWCB staff (\$4,000); Printing of training materials (\$500); USDA-ARS (Temple and Headquarters) required costs to cover overhead (\$20,250)
Construction	\$ 0	
Other	\$ 0	
Indirect	\$ 0	
SOURCE	TSSWCB will provide \$155,250 in non-federal funds sourced from state appropriations (FY2009 General Revenue) through a TMDL Program Grant to USDA-ARS.	