Texas State Soil and Water Conservation Board
CWA §319(h) Nonpoint Source Grant Program
FY 2008 Project 08-05

NONPOINT SOURCE SUMMARY PAGE			
for the CWA §319(h) Agricultural/Silvicultural Nonpoint Source Grant Program			
Title of Project:	Modeling Support for Buck Creek Watershed Protection Plan Development		
Project Goals:	(1) Develop an estimate of bacterial loading in Buck Creek using the SELECT model (2) Identify highest contributing areas and their associated sources using the SELECT model (3) Use Load Duration Curves to determine bacteria and nitrate load reductions needed to achieve water quality standards (4) Incorporate the results of this project into the Buck Creek Watershed Protection Plan, ensuring the nine elements are fully satisfied and providing adequate justification for shifting Segment 0207A to category 4B on the 303(d) List		
Project Tasks:	(1) Project Coordination and Administration (2) Modeling of Bacteria and Nitrate Loads using the LDC/SELECT approach (3) Quality Assurance		
Measures of Success:	(1) Estimation of bacterial and nitrate loads from across the watershed (2) Identification of highest contributing source areas and associated sources (3) Determination of bacteria nitrate load reductions for inclusion in Buck Creek Watershed Protection Plan		
Project Type:	Implementation ( ); Education ( ); Planning ( ); Assessment (X); Groundwater ( )		
Status of Water Body: 2004 Texas Water Quality Inventory and 303(d) List	Segment ID: Buck Creek (0207A)	Parameter: Bacteria	Category: 5c
Project Location: (Statewide or County and Watershed Name)	Buck Creek watershed from the Oklahoma State Line east of Childress in Childress County upstream through Collingsworth County to its headwaters near Hedley in Donley County.		
Key Project Activities:	Hire Staff ( ); Surface Water Quality Monitoring ( ); Technical Assistance ( ); Education ( ); Implementation ( ); BMP Effectiveness Monitoring ( ); Demonstration ( ); Planning ( ); Modeling (X); Bacterial Source Tracking ( ); Other ( )		

Texas NPS Management Program Elements:	This project assists the State in achieving the <u>Data Collection and Assessment Objective</u> by
	  (1) conducting special studies to determine sources of NPS pollution and gain information to target BMP implementation and
	  (2) develop and adopt, at the state level, WPPs to maintain and restore water quality in waterbodies identified as impacted by NPS pollution.
	The project also assists the State in meeting <u>Milestones</u> to
	  (1) Complete the assessment of pollutant problems by reviewing existing water quality data, conducting an inventory of point/nonpoint sources, land use data, and all known stressors influencing water quality and
	  (2) Develop and apply models to determine numerical load allocations and to recommend control strategies for implementation.		

Project Costs:	Federal: $42,330	Non-Federal Match: $28,602	Total: $70,932
Project Management:	• Texas AgriLife Research, Texas Water Resources Institute • Texas AgriLife Research		
Project Period:	September 1, 2008 – December 31, 2011		

Part I – Applicant Information

Applicant

Project Lead	B.L. Harris
Title	Acting Director
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Project Co-Lead	R. Karthikeyan
Title	Assistant Professor
Organization	Texas AgriLife Research, Department of Biological and Agricultural Engineering
E-mail Address	karthi@tamu.edu
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City	College Station	County	Brazos	State	TX	Zip Code	77843-2117
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Project Partners

Names	Roles & Responsibilities
Texas State Soil and Water Conservation Board (TSSWCB)	Provide state oversight and management of all project activities and ensure coordination of activities with Texas Commission on Environmental Quality (TCEQ).
Texas AgriLife Research, Texas Water Resources Institute (TWRI)	Project coordination, quality assurance, and reporting (Tasks 1 & 3) and coordination with TSSWCB CWA §319(h) project 06-11.
Texas AgriLife Research at Vernon (Research) – Dr. John Sij	Summarize results for inclusion into Buck Creek Watershed Protection Plan (Task 2)
Texas AgriLife Research Biological and Agricultural Engineering (BAEN) – Dr. R. Karthikeyan	Bacteria and nitrate load modeling and landscape analysis (Task 2)

Part II – Project Information

Project Type

Surface Water	X	Groundwater		

Does the project implement recommendations made in a Watershed Protection Plan or TMDL Report or Implementation Plan?	Yes		No	X
If yes, identify the document. (Approved or Draft)				
If yes, identify the agency/group that developed and/or approved the document.		Year Developed		

Watershed Information

Watershed Name(s)	Hydrologic Unit Code (8 Digit)	Segment ID	305 (b) Category	Size (Acres)
Buck Creek	11120105	0207A	5c	184,960

Project Narrative

Problem/Need Statement

Buck Creek is a small waterbody situated within the Red River Basin and is located in the southeastern portion of the Texas panhandle. This stream segment is located within Ecoregion 27, Central Great Plains and is situated within a predominantly rural and agricultural landscape in the panhandle region of Texas. During periods of rainfall, which averages approximately 21 inches annually, bacteria [*Escherichia coli* (*E. coli*) specifically] originating from birds and mammals, livestock, inadequately treated sewage, wildlife and/or failing septic systems may be washed into the stream and have the potential to impede recreational use of the waterbody. The State of Texas requires that water quality in Buck Creek be suitable for fishing, swimming, and wading, as well as supporting a healthy aquatic ecosystem. However, data obtained from periodic water quality monitoring indicate that bacteria and nitrate levels are sometimes elevated in the creek. These data indicate a temporal water quality problem, but do not provide conclusive evidence of persistent impairment.

In August 2001, the TCEQ proposed developing a TMDL for Buck Creek utilizing the data collected through the Clean Rivers Program. However, because the TSSWCB is the lead agency for planning, implementing, and managing programs and practices for preventing and abating agricultural and silvicultural nonpoint source pollution the TSSWCB took the lead in Buck Creek, working closely with the Hall-Childress, Donley County, and Salt Fork SWCDs; Red River Authority (RRA); Texas Water Resources Institute (TWRI), Texas AgriLife Extension Service (Extension) and Texas AgriLife Research (Research). TSSWCB's first step was to initiate a Clean Water Act §319(h) funded project, "*Bacterial Monitoring for the Buck Creek Watershed*" (TSSWCB 03-07), to verify the impairment and assess the levels of *E. coli* throughout the watershed because the existing dataset was very limited, composed of only 20 fecal coliform samples and 14 *E. coli* samples over the course of 5 years at one site. *E. coli* levels were monitored at 13 sites throughout the watershed and verified the bacterial concerns in the watershed (see map on following page). In 2006, efforts began to identify the sources of the bacteria loads and develop a Watershed Protection Plan (WPP) through the Clean Water Act §319(h) funded project, *Watershed Protection Plan Development for Buck Creek* (TSSWCB 06-11).). Nitrate levels were also listed as a water quality concern on the 2006 *Texas 303(d) List,* prompting evaluation of nitrate levels in the waterbody and including source descriptions and mitigation strategies in the WPP currently in development.

A critical component of a fully developed WPP is an estimate of needed load reduction for specific pollutants; in this case, *E. coli* and nitrates*.* The current project, *Watershed Protection Plan Development for Buck Creek* (TSSWCB 06-11) does not have a component that will enable the needed load reduction estimate to be developed. The work conducted under this workplan will provide essential information by incorporating data collected in TSSWCB projects 03-07 and 06-11 into the SELECT model and by developing Load Duration Curves (LDCs) for the creek. The SELECT model will utilize a spatially-explicit Geographic Information System (GIS) methodology to identify and rank specific areas of the watershed that likely contribute higher amounts of bacteria to the stream. This information will be used to aid in recommending management strategies to reduce bacterial loading to Buck Creek. The LDCs will be used to specifically determine what level of bacteria and nitrate load reductions will be needed to reduce pollutant levels in the creek so that State surface water quality standards are met. As mentioned above, this information will be incorporated into the WPP and stakeholders will use this information to help determine which management practices will be included in the WPP.

Understanding of what fully satisfies each of the nine elements fundamental to a potentially successful WPP continually evolves as the State works with EPA to review completed WPPs for consistency. This project provides needed modeling support to complete the development of the Buck Creek WPP (initiated through project 06-11) and to achieve full satisfaction of the nine elements, especially Elements A and C.

Additionally, in some watersheds, the development and implementation of a WPP may be a more viable approach to achieving restoration of water quality than through the establishment of a TMDL. EPA Region 6 has outlined a process by which the State may submit a WPP in lieu of a TMDL. Essentially, this "4B option" recognizes that certain WPPs may obviate the need for a TMDL. The significance and complexity of this "4B option" necessitates a greater degree of satisfaction of the nine elements as well as additional factors. The TSSWCB intends to work with the TCEQ to submit the Buck Creek WPP to EPA as justification for shifting Segment 0207A to Category 4B on a subsequent 303(d) List. This project provides needed modeling support to achieve this "4B objective".

Project Narrative

General Project Description

The current project (TSSWCB 06-11) is identifying specific sources of bacteria in the Buck Creek watershed utilizing Bacterial Source Tracking. This project will utilize the data and information from TSSWCB project 06-11, as well as monitoring data (see sample sites below) from TSSWCB project 03-07, to rank the sources of bacteria within the watershed using a spatially-explicit GIS methodology. For this approach, the watershed will be divided into sub-watersheds and pollutant loads from various sources, i.e. livestock, human, and wildlife, will be identified and quantified for each. From this information, total pollutant loading for the watershed can be calculated and contributing components will be ranked based on percentage and estimated production.

Temporal and spatial trends in observed water quality (bacteria) will be examined using LDCs. LDCs will show the flows at which exceedances occur, indicate the range of load reductions needed, differentiate between possible sources as related to different flow conditions, and identify gaps in the data record. LDCs will be developed for one or more representative index sites, per assessment unit, to accurately characterize data across all flow regimes, i.e., where a statistically valid quantity of data (bacteria and flow) exists. Historical flow data will be used, but if insufficient data are available, an appropriate method to estimate flow will be employed. Flow distribution will be divided into a number of flow regimes as appropriate to the hydrologic conditions unique to the waterbody.
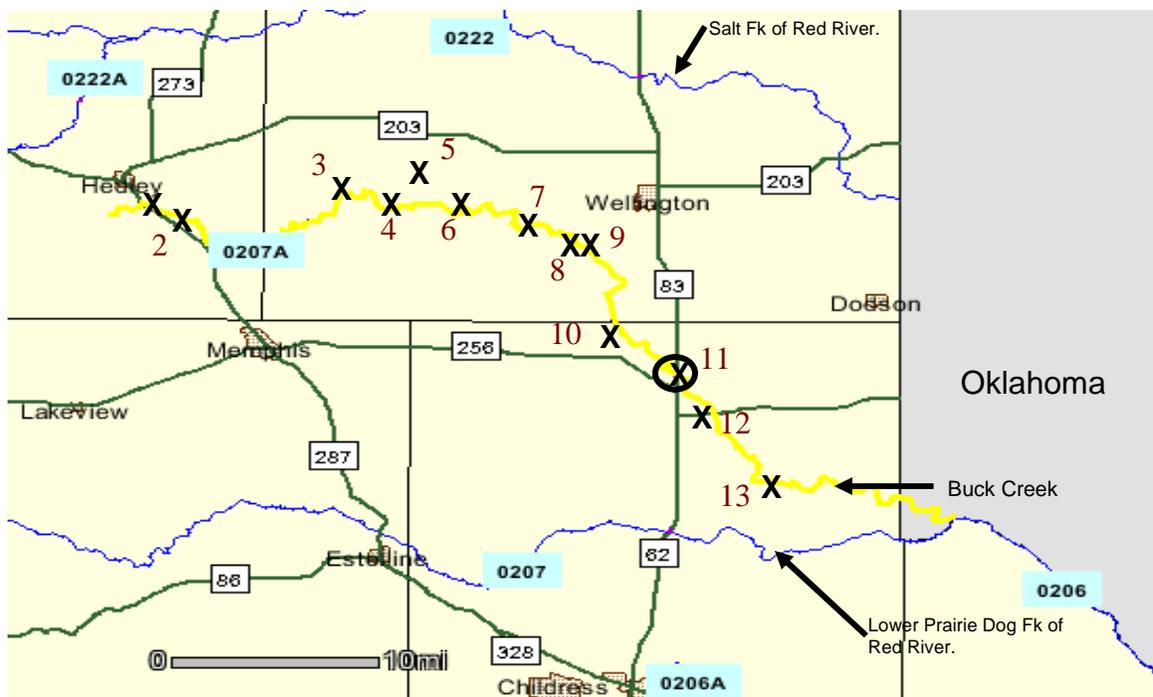
The modeling effort will be conducted by BAEN. The primary goal of this effort will be to gather basic information to facilitate and support stakeholder decision-making processes as a part of the Buck Creek WPP development process (TSSWCB Project 06-11). TSSWCB used the LDC/SELECT approach in developing the Plum Creek WPP (TSSWCB project 04-17) and will also use this approach in developing the Lampasas River WPP (TSSWCB project 07-11). This approach is also consistent with Tier 2 recommendations of the joint TSSWCB/TCEQ Task Force on Bacteria TMDLs; consistency with Task Force recommendations is important as the TSSWCB intends to submit this Buck Creek WPP to EPA in lieu of a TMDL, i.e., the "4B option".

The results of the modeling effort will be included in a technical report submitted to TSSWCB and Texas AgriLife Research for inclusion in the Buck Creek WPP (TSSWCB Project 06-11).

Water Quality Impairment

Describe all known causes (pollutants of concern) of water quality impairments from any of the following sources: 2004 Texas Water Quality Inventory and 303(d) List, Draft 2006 Texas Water Quality Inventory and 303(d) List or Other Documented Sources (ex. Clean Rivers Program Basin Summary or Basin Highlights Reports).

IMPAIRMENTS

Segment	2004 Impairments	2006 Impairments	2008 Impairments
Buck Creek (0207A)	Bacteria (5c)	Bacteria (5c)	Bacteria (5c)

CONCERNS

Segment	2004 Concerns	2006 Concerns	2008 Concerns
Buck Creek (0207A)	---	nitrate	nitrate

Tasks, Objectives and Schedules

Task 1:	Project Coordination and Administration						

Costs:	Federal:	$2,000	Non-Federal:	$1,175	Total:	$3,175

Objective:	To effectively coordinate and monitor all work performed under this project including technical and financial supervision, preparation of status reports, and maintenance of project files and data. TWRI will organize an integrated team among the multiple agencies and groups involved with the project to efficiently and effectively achieve project goals and to summarize activities and achievements made throughout the course of the project. TWRI will perform accounting functions for project funds and be responsible for developing timely and accurate reports.

Subtask 1.1:	TWRI will coordinate project efforts with all project partners, as well as with the *Watershed Protection Plan Development for Buck Creek* project (TSSWCB project 06-11). TTVN meetings or teleconferences will be held, as appropriate, with project partners to discuss project activities, project schedule, lines of responsibility, communication needs, and other requirements.
	Start Date: Month 1 Completion Date: Month 40

Subtask 1.2:	TWRI will prepare electronic quarterly progress reports (QPRs) that document all activities performed within a quarter and shall be submitted to the TSSWCB no later than the 15th of January, April, July and October. All QPRs will be provided to project partners in this project and project 06-11, including Research, Texas AgriLife Extension Service, Red River Authority, and the Hall-Childress, Salt Fork, and Donley County SWCDs and placed on the project website maintained by TWRI.
	Start Date: Month 1 Completion Date: Month 40

Subtask 1.3:	TWRI will submit appropriate Reimbursement Forms to TSSWCB.
	Start Date: Month 1 Completion Date: Month 40

Deliverables	• Quarterly Progress Reports in electronic format • Reimbursement Forms

Tasks, Objectives and Schedules					
Task 2:	Modeling of Bacteria and Nitrate Loads using the LDC/SELECT approach					
Costs:	Federal:	$36,531	Non-Federal:	$26,094	Total:	$62,625
Objective:	Develop estimate of bacteria and nitrate loading using LDCs, identify highest point and nonpoint source contributors, and determine bacteria load reductions needed to achieve water quality standards using SELECT, a spatially-explicit GIS methodology. Incorporate the results into the Buck Creek WPP.				
Subtask 2.1:	BAEN will conduct SELECT modeling analysis efforts to estimate bacteria loadings across the Buck Creek watershed and identify critical bacterial loading areas within the watershed.				
	Start Date:	Month 3	Completion Date:	Month 15		
Subtask 2.2	BAEN will examine temporal and spatial trends in observed water quality (bacteria & nitrates) by developing LDCs for one or more representative index sites which accurately characterize data across all flow regimes. The data will be characterized with a trend line based on statistical evaluation of bacteria and nitrate loads in each flow regime. The LDCs will be used to differentiate between sources of bacteria and nitrates as related to different flow conditions and to establish load reduction scenarios from the relationships between the observed data and the allowable loads expressed in the curve.				
	Start Date:	Month 3	Completion Date:	Month 15		
Subtask 2.3:	Research will incorporate the results of the modeling analysis into the Buck Creek WPP that will be developed in TSSWCB project 06-11.				
	Start Date:	Month 9	Completion Date:	Month 27		
Subtask 2.4:	BAEN and Research, with assistance from TWRI, will develop the technical report for the project for submission to TSSWCB, EPA, and project partners.				
	Start Date:	Month 9	Completion Date:	Month 40		
Deliverables	• Modeling results (LDC and SELECT) that estimate bacteria loading, identify highest point and nonpoint source contributors, and determine bacteria and nitrate load reductions needed to achieve water quality standards in the Buck Creek watershed • Technical Report detailing modeling results (LDC and SELECT) for incorporation into Buck Creek WPP				

Tasks, Objectives and Schedules					
Task 3:	Quality Assurance					
Costs:	Federal:	$3,799	Non-Federal:	$1,333	Total:	$5,132
Objective:	To develop and implement data quality objectives (DQOs) and quality assurance/control (QA/QC) activities to ensure data of known and acceptable quality are generated through this project.				
Subtask 3.1:	TWRI will develop a QAPP for activities in Task 2 consistent with *EPA Requirements for Quality Assurance Project Plans (QA/R-5)* (May 2006) and the *TSSWCB Environmental Data Quality Management Plan* (August 2007).				
	Start Date:	Month 1	Completion Date:	Month 3		
Subtask 3.2:	TWRI will submit revisions and necessary amendments to the QAPP as needed.				
	Start Date:	Month 3	Completion Date:	Month 24		
Deliverables	• QAPP for Task 2 approved by TSSWCB in both electronic and hard copy formats • Approved revisions and amendments to QAPP				

Project Goals (Expand from NPS Summary Page)

(1) Develop an estimate of bacteria loading in Buck Creek by incorporating available data into the SELECT model that will aid in establishing goals for bacteria reductions that will be included in the Buck Creek WPP (TSSWCB project 06-11).

(2) Identify and rank bacteria contributing source areas in the watershed; this information will be used in the development of the Buck Creek WPP and will aid in prioritizing implementation activities across the watershed.

(3) Determine bacteria and nitrate load reductions needed to achieve water quality standards and incorporate them into the Buck Creek WPP as a set of goals to achieve through plan implementation.

(4) Incorporate the results of this project into the Buck Creek Watershed Protection Plan, ensuring the nine elements are fully satisfied and providing adequate justification for shifting Segment 0207A to category 4B on the 303(d) List.

Measures of Success (Expand from NPS Summary Page)

(1) Estimation of bacteria loads entering Buck Creek and an estimation of the respective loading from each identified source.

(2) Identification of highest contributing sources and the respective areas of the watershed where they likely originate based upon land use.

(3) Determination of estimated bacteria and nitrate loading reductions for inclusion in Buck Creek WPP. These estimates will set a threshold level for needed reduction that will lead to Buck Creek meeting applicable surface water quality standards.

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

Goals &/or Milestone(s)

This project assists the State in achieving the Data Collection and Assessment Objective by conducting special studies to determine sources of NPS pollution and gain information to target BMP implementation.

This project assists the State in achieving the Data Collection and Assessment Objective by helping develop and adopt, at the state level, WPPs to maintain and restore water quality in waterbodies identified as impacted by NPS pollution.

The project assists the State in meeting the Milestone to complete the assessment of pollutant problems by reviewing existing water quality data, conducting an inventory of point/nonpoint sources, land use data, and all known stressors influencing water quality.

The project assists the State in meeting the Milestone to develop and apply models to determine numerical load allocations, and to recommend control strategies for implementation.

Part III – Financial Information

Budget Summary

Federal 319(h)	$42,330	% of total project	60%
Non-Federal Match	$28,602	% of total project (at least 40%)	40%
Total Cost	$70,932	Total project %	100%

Category	Federal	Non-Federal Match	Total
Personnel	$ 25,310	$ 9,468	$ 34,778
Fringe Benefits	$ 7,999	$ 2,141	$ 10,140
Subtotal	$ 33,309	$ 11,609	$ 44,918
Travel	$ 1,000	$ 0	$ 1,000
Equipment	$ 0	$ 0	$ 0
Supplies	$ 2,500	$ 0	$ 2,500
Contractual	$ 0	$ 0	$ 0
Construction	$ 0	$ 0	$ 0
Other	$ 0	$ 0	$ 0
Subtotal	$ 3,500	$ 0	$ 3,500
Total Direct Costs	$ 36,809	$ 11,609	$ 48,418
Indirect Costs (≤15%)	$ 5,521	$ 16,993	$ 22,514
Total Project Costs	$ 42,330	$ 28,602	$ 70,932

Budget Justification (Federal)

Category	Total Amount	Justification
Personnel & Fringe Benefits	$ 33,309	TWRI Project Manager @ 7% Effort BAEN Research Associate @ 55% Effort
Travel	$ 1,000	2 trips for TWRI Project Manager and BAEN Research Associate @ $500
Equipment	$ 0	
Supplies	$ 2,500	BAEN Miscellaneous Supplies: $1,500 Vernon Center Supplies: $1,000
Contractual	$ 0	
Construction	$ 0	
Other	$ 0	
Indirect	$ 5,521	15% of Total Direct Federal

Budget Justification (Non-Federal)

Category	Total Amount	Justification
Personnel & Fringe Benefits	$ 11,609	Texas AgriLife Research Professor of Agronomy (Vernon) @ 11% Effort
Travel	$ 0	
Equipment	$ 0	
Supplies	$ 0	
Contractual	$ 0	
Construction	$ 0	
Other	$ 0	
Indirect	$ 16,993	46.5% of Total Direct Non-Federal and 31.5% of Total Direct Federal