



**Texas State Soil and Water Conservation Board
 State General Revenue Nonpoint Source Grant Program
 FY2010 Workplan 10-52**

PROJECT SUMMARY PAGE			
Title of Project	Evaluation and Demonstration of BMPs for Cattle on Grazing Lands for the Lone Star Healthy Streams Program [Short Title: LSHS V – BMP Demo]		
Project Goals/Objectives	To reduce bacteria contamination caused by grazing livestock in Texas waterbodies through evaluation and demonstration of BMP effectiveness in reducing bacteria runoff from grazing lands. To utilize BMP effectiveness data as the scientific-basis for the Lone Star Healthy Streams (grazing cattle component) education program.		
Project Tasks	(1) Project Administration and Coordination; (2) Quality Assurance; and (3) Evaluate and Demonstrate BMPs To Reduce Fecal and Bacterial Loading From Cattle on Grazing Lands		
Measures of Success	<ul style="list-style-type: none"> Evaluate the effectiveness of grazing management treatments in reducing bacteria runoff on at least 3 demonstration sites Evaluate the effectiveness of certain structural BMPs (e.g., alternative water supplies, shade structures, rip-rap, stream crossings) in modifying cattle movement to change fecal deposition patterns and ultimately reducing bacteria contributions to adjacent waterbodies Transfer results from BMP effectiveness studies to landowners, natural resource agencies, and others through the LSHS program and other publications. At least 1 field day will be held at a demonstration site to highlight the BMP effectiveness studies. Ensure data of known and acceptable quality is collected utilizing established methods 		
Project Type	Implementation (X); Education (); Planning (); Assessment ()		
Status of Waterbody on 2008 Texas Water Quality Inventory and 303(d) List	<u>Segment ID</u> Brazos River abv Navasota (1242) Aransas River Tidal (2003)	<u>Parameter</u> Deminalization Costs; Bacteria Bacteria	<u>Category</u> Concerns 5a
Project Location (Statewide or Watershed and County)	<ul style="list-style-type: none"> USDA-ARS Research Station, Riesel, Brazos River Above Navasota River watershed, McLennan County TAMU Beef Cattle Systems Center, College Station, Brazos River Above Navasota River watershed, Burleson County Welder Wildlife Refuge, Sinton, Aransas River Tidal watershed, San Patricio County Cooperator ranch(es), TBD 		
Key Project Activities	Hire Staff (X); Surface Water Quality Monitoring (); Technical Assistance (); Education (); Implementation (); BMP Effectiveness Monitoring (X); Demonstration (X); Planning (); Modeling (); Bacterial Source Tracking (); Other ()		
Texas NPS Management Program Elements	<ul style="list-style-type: none"> Element 1 (LTG Objective B; STGs 1B, 1E, 2B, 3C, 3D) Elements 2, 3, 4, 6 		
Project Costs	\$162,364		
Project Management	<ul style="list-style-type: none"> Texas Water Resources Institute Texas AgriLife Extension Service Texas AgriLife Research 		
Project Period	June 1, 2010 – May 31, 2012		

Part I – Applicant Information

Applicant							
Project Lead	B.L. Harris						
Title	Acting Director						
Organization	Texas A&M AgriLife, Texas Water Resources Institute						
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Co-Applicant							
Project Lead	Larry A. Redmon						
Title	Professor and State Forage Specialist						
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Co-Applicant							
Project Lead	Terry Gentry						
Title	Assistant Professor of Soil & Aquatic Microbiology						
Organization	Texas AgriLife Research, Department of Soil and Crop Sciences						
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City	College Station	County	Brazos	State	Texas	Zip Code	77843-2474
Telephone Number	979.845.5323			Fax Number	979.845.0456		

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 related projects.
Texas A&M AgriLife, Texas Water Resources Institute (TWRI)	Project coordination and administration (Task 1); quality assurance (Task 2); and assist with BMP demonstration and evaluation (Task 3)
Texas AgriLife Extension Service, Department of Soil and Crop Sciences (SCSC) [Redmon]	Assist with project coordination (Task 1); and demonstrating and evaluating BMPs (Task 3)
Texas AgriLife Research, Department of Soil and Crop Sciences, Soil and Aquatic Microbiology Lab (SAML) [Gentry]	Implement Lab Quality Assurance Procedures as described in QAPP (Task 2); Perform lab analysis of bacteria (Subtask 3.1); and assist in designing a WQMP monitoring plan (Subtask 3.7)
Texas AgriLife Extension Service, Department of Ecosystems Science and Management, Uvalde AREC (ESSM) [Lyons]	Assist with GPS monitoring of cattle (Subtask 3.5)
United States Department of Agriculture – Agricultural Research Service (USDA-ARS) [Harmel]	Provide study site for Subtask 3.1, assist in designing a WQMP monitoring plan (Subtask 3.7) and incorporate findings from the BMP evaluations into TBET (Subtask 3.8)
Welder Wildlife Foundation	Provide study site
Cooperating ranch(es)	Cooperator site for demonstrations
United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS)	Assist with identifying cooperator sites and developing standards and specifications for shade
SWCDs, USDA-NRCS, Texas Department of Agriculture (TDA), Grazing Lands Conservation Initiative (GLCI), Texas Farm Bureau (TFB), Texas and Southwestern Cattle Raisers Association (TSCRA), Independent Cattlemen’s Association of Texas (ICA), Texas Cattle Feeders Association (TCFA)	Compose Project Steering Committee, in addition to other project partners, and assist with identifying cooperator sites for demonstrations.

Part II – Project Information

Watershed Information

Watershed Name	Hydrologic Unit Code (8 Digit)	Segment ID	305(b) Category	Size (Acres)
Brazos River abv Navasota	12070101	1242	CS	1,744,432
Aransas River Tidal	12100406	2003	5a	656,268
Cooperator Ranch(es) TBD	TBD	TBD	TBD	TBD

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.

The 2008 303(d) List identifies 379 impairments (waterbody-pollutant combinations) for contact recreation use and 26 impairments for oyster water use. These impairments are due to excessive bacteria (*E. coli*, *Enterococcus spp.*, or fecal coliform). These 405 total bacteria impairments account for more than 48% of all waterbody-pollutant combinations on the 2008 List. Livestock are a known or attributed source of fecal NPS pollution and bacteria loading in most of these watersheds.

<u>Waterbody (Segment)</u>	<u>2008 Impairments (parameter)</u>	<u>2008 Concerns (parameter)</u>
Brazos River abv Navasota (1242)	NA	Demineralization Costs Bacteria
Aransas River Tidal (2003)	Contact Recreation (Enterococcus)	Orthophosphorus
Cooperator Ranch watershed	TBD	TBD

Project Narrative

Problem/Need Statement

According to the *2008 Texas Water Quality Inventory and 303(d) List*, recreation is impaired in 274 waterbody segments and oyster harvest is impaired in another 21 due to bacteria. To address the bacteria impaired waterbodies, Texas is developing and implementing total maximum daily loads (TMDLs), TMDL Implementation Plans (I-Plan), and Watershed Protection Plans (WPPs). One of the primary strategies for reducing bacteria in many of these waterbodies is to provide technical and financial assistance to implement best management practices (BMPs) to reduce bacteria runoff from cattle on grazing lands. Because grazing land is the dominant land use in the state, there is a statewide need for BMPs targeted to this land use and livestock category. However, in order inspire behavior change, evaluations and demonstrations of BMP effectiveness are needed to encourage voluntary implementation of BMPs and participation in federal and state technical and financial assistance programs to reduce the runoff of bacteria which will ultimately lead to improved water quality.

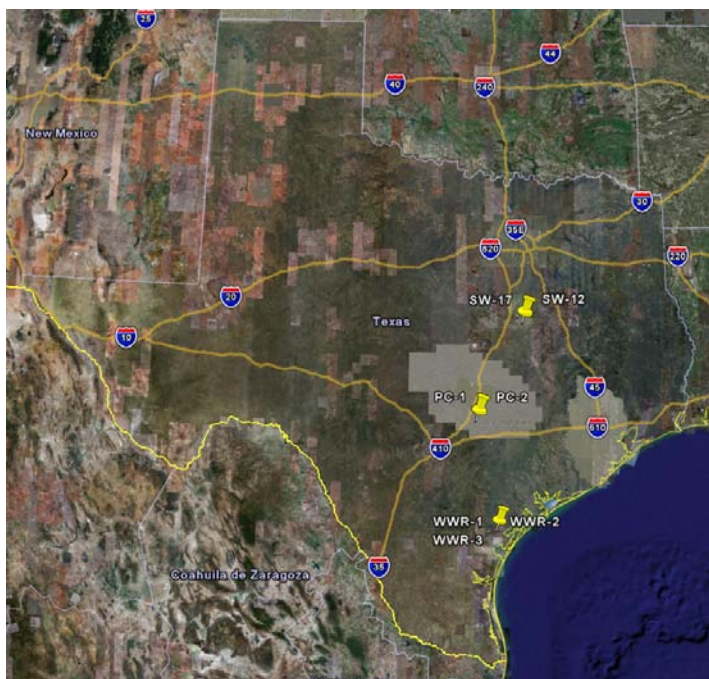
The evaluation of BMPs for cattle on grazing lands was initiated with Grassland Reserve Program (GRP) funds made available by the TSSWCB through the USDA-NRCS *Environmental Management of Grazing Lands* (TSSWCB Project 06-14), Clean Water Act §319(h) grant funds made available by the TSSWCB through the U.S. Environmental Protection Agency (EPA) *Lone Star Healthy Streams* (TSSWCB Project 06-5), and Conservation Innovation Grant (CIG) funds provided by USDA-NRCS *Bacteria Runoff BMPs for Intensive Beef Cattle Operations*. The development of a comprehensive education program founded on the evaluation of BMPs in those projects is being supported with CWA §319(h) grant funds made available by the TSSWCB through EPA *Development of a Synergistic, Comprehensive Statewide Lone Star Healthy Streams Program* (TSSWCB Project 09-06).

Continued support is needed to advance work to evaluate BMPs and verify their beneficial impacts to provide the scientific backbone of AgriLife Extension educational programs (i.e., *Lone Star Healthy Streams*). Both continued evaluation of new publications/articles/research and field evaluation and demonstration of BMPs is needed to ensure the most up-to-date and relevant information is available for Texas ranchers, as well as, decision-makers at the TSSWCB, USDA-NRCS and livestock groups in the state. Only through continued demonstration of BMPs, educational programs, and landowner assistance for implementing effective BMPs will significant progress be made to restore water quality across the state.

Project Narrative

General Project Description (Include Project Location Map)

This project will continue and further the work begun by previous projects as described above. The *Lone Star Healthy Streams* (LSHS) Project Steering Committee, originally organized through TSSWCB project 06-05, will continue to provide guidance and oversight for this project. This Steering Committee is a partnership of the primary federal and state agencies that interface with beef cattle producers and cattle industry organizations. The Steering Committee is facilitated by TWRI and SCSC and includes ranchers and representatives from the TSSWCB, Soil and Water Conservation Districts (SWCDs), USDA-NRCS, USDA-ARS, TWRI, Texas AgriLife Extension Service, Texas AgriLife Research, Texas Department of Agriculture (TDA), Grazing Lands Conservation Initiative (GLCI), Texas Farm Bureau (TFB), Texas and Southwestern Cattle Raisers Association (TSCRA), Independent Cattlemen's Association of Texas (ICA), Texas Cattle Feeders Association (TCFA), and the Welder Wildlife Foundation (WWF). This LSHS Project Steering Committee will provide input on the evaluation of BMP effectiveness, identification of demonstration sites, modifications to the LSHS curriculum, and general project coordination. This LSHS Project Steering Committee will meet as frequently as needed, likely annually.



SCSC, in coordination with TWRI and SAML, will continue to assess and demonstrate the efficacy and impacts of BMPs identified by the LSHS Project Steering Committee. Because of low rainfall, additional time for evaluation of grazing management and stocking rates/densities is needed. Three grazing treatments will be evaluated – no grazing, moderate grazing, and heavy grazing at the Brazos Bottom, Welder Wildlife Refuge, and Riesel demonstration sites. SAML will continue to analyze the water samples from the grazing management areas for *E. coli* using EPA approved methods. Additionally, *Enterococcus* and fecal coliform will be assessed at these sites.

SCSC, with assistance from TWRI and ESSM, will evaluate the effectiveness of certain structural BMPs in modifying cattle movement to change fecal deposition patterns and reducing bacteria runoff. BMPs that have been identified as needing evaluation include (1) portable shade facilities, (2) protected stream access points or stream crossing, (3) rip-rap application designed to limit/block cattle access to riparian areas, and (4) additional evaluation of the impacts of alternative water supplies designed to draw cattle away from waterbodies. Evaluation of protected stream access points or stream crossings will be dependent on finding a cooperator where USDA-NRCS is designing and constructing this practice. Effects of these BMPs on cattle behavior and bacteria levels will be evaluated and demonstrated to beef cattle producers. The effect of portable shade facilities on cattle behavior was evaluated at a private ranch in the Plum Creek watershed through TSSWCB project 06-05; however, evaluation of a different configuration of the shade structure is needed. Additionally, at the same private ranch in the Plum Creek watershed, alternative water supplies were evaluated, but little riparian vegetation was present. Thus, additional monitoring will be needed to fully evaluate this practice in an area where there is extensive riparian vegetation. Cooperating ranch(es) will be identified for this demonstration and the other practices. USDA-NRCS will assist with identifying cooperating ranches, especially for protected stream access points or stream crossings. These are engineering-intensive practices and as such, SCSC will work with USDA-NRCS to identify where such practices are being designed and installed. USDA-NRCS may also assist in identifying ranches for evaluation of alternative water supplies.

SCSC will hire a graduate student to execute the BMP effectiveness studies and other project tasks. SCSC will work closely with SAML, ESSM, TWRI and staff from TSSWCB project 09-06.

Project Narrative

General Project Description (Include Project Location Map)

TWRI and SCSC will attend and participate in public meetings in order to communicate project goals, activities and accomplishments to affected parties. Such meetings may include the Annual Meeting of Texas SWCD Directors, the TSCRA Annual Convention, the TFB Annual Convention, Clean Rivers Program Basin Steering Committee meetings, and watershed stakeholder meetings for certain TMDLs and WPPs. TWRI and SCSC will develop and disseminate project informational materials, including, flyers, brochures, letters, and news releases. TWRI will continue to host and maintain an internet website <http://grazinglands-wq.tamu.edu/> for the dissemination of information.

SCSC will continue to gather information from the growing body of literature on 1) bacteria fate and transport, 2) effects of grazing cattle on bacterial levels in waterbodies, and 3) effect of BMPs designed to minimize grazing cattle impacts on riparian areas and bacteria loading. A compendium of this literature will be posted on the project website.

SCSC, with assistance from TWRI and USDA-ARS and in cooperation with SWCDs and local Extension and USDA-NRCS staff, will conduct at least 1 field day at a demonstration site to highlight the BMP effectiveness studies and promote adoption of BMPs by ranchers.

SCSC, with assistance from TWRI, will develop technical reports, refereed journal articles, Extension Fact Sheets, and other publications, summarizing the results of the demonstrations (grazing management treatments and structural BMP evaluation) and the analysis of the impacts of BMPs on bacteria runoff. Based on the findings of these demonstrations and BMP evaluations, the LSHS program curriculum will be modified and updated to highlight BMP effectiveness studies and promote adoption of BMPs by ranchers.

Project Goals (Expand from Summary Page)

To reduce bacteria contamination caused by grazing livestock in Texas waterbodies through evaluation and demonstration of BMP effectiveness in reducing bacteria runoff from grazing lands. To utilize BMP effectiveness data as the scientific-basis for the Lone Star Healthy Streams (grazing cattle component) education program. Bacteria is the number one cause of water quality impairment in the state and grazing livestock has been identified as a pollutant contributor in a number of waterbodies around the state. In order to provide landowners with feasible options for addressing this source of bacteria, education programs based on the evaluation and demonstration of BMP effectiveness are needed to increase voluntary implementation of BMPs and participation in federal and state technical and financial assistance programs. Reducing the runoff of bacteria from grazing lands, in combination with other BMPs for other sources, will ultimately lead to improved water quality across the state.

Measures of Success (Expand from Summary Page)

- Evaluate the effectiveness of grazing management treatments (no grazing, moderate grazing, and heavy grazing) in reducing bacteria runoff on at least three demonstration sites.
- Evaluate the effectiveness of certain structural BMPs (e.g., alternative water supplies, shade structures, rip-rap, and stream crossings) in modifying cattle movement to change fecal deposition patterns and ultimately reducing bacteria contributions to adjacent waterbodies at the demonstration sites.
- Transfer results from BMP effectiveness studies to landowners, natural resource agencies, and others through the LSHS program and other publications in order to increase BMP adoption rates and participation in federal and state technical and financial assistance programs.
- At least 1 field day will be held at a demonstration site to highlight the BMP effectiveness studies.
- Ensure data of known and acceptable quality is collected utilizing established methods.

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

- Element 1 – Explicit short- and long-term goals, objectives and strategies that protect surface and ground water.
 - Long-Term Goal – Objective B – Support the implementation of state[wide]... programs to prevent NPS pollution through assessment, implementation, and education.
 - Short-Term Goal One –Assessment – Objective B – Ensure that monitoring procedures meet quality assurance requirements and are in compliance with EPA-approved... TSSWCB Quality Management Plan.
 - Short-Term Goal One –Assessment – Objective E – Conduct monitoring to determine effectiveness of... BMP implementation as appropriate.
 - Short-Term Goal Two – Implementation – Objective B – Develop and implement BMPs to address constituents of concern... in watersheds identified as impacted by NPS pollution.
 - Short-Term Goal Three – Education – Objective C – ...expedite development of technology transfer activities...
 - Short-Term Goal Three – Education – Objective D – Conduct outreach through the... Texas [AgriLife] Extension [Service]... to facilitate broader participation and... enable stakeholders and the public to... [obtain] a more complete understanding of water quality issues and how they relate to each citizen.
- Element 2 – Working partnerships...[with] appropriate state, ...regional, and local entities, private sector groups, and federal agencies.
- Element 3 – Balanced approach that emphasizes both statewide NPS programs and on-the-ground management of individual watersheds.
- Element 4 – Abatement of water quality impairments from NPS pollution... [through] projects which address the most significant threats to water quality and have the best potential to... reduce NPS pollution...
- Element 6 – The State... establishes flexible, targeted, and iterative approaches to achieve and maintain beneficial uses of water... [including] a mix of water quality-based and technology-based programs...

Tasks, Objectives and Schedules			
Task 1	Project Administration and Coordination		
Costs	\$10,000		
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	TWRI 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. QPRs shall be posted to the project website and distributed to all project partners.		
	Start Date	Month 1	Completion Date Month 24
Subtask 1.2	TWRI 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	TWRI will host coordination meetings, conference calls, or TTVN meetings with the TSSWCB and SCSC, and include as appropriate SAML, ESSM, and USDA-ARS, approximately quarterly to discuss project activities, project schedule, communication needs, deliverables, and other requirements. TWRI will develop lists of action items needed following each project coordination meeting and distribute to project personnel. These coordination meetings may be held concurrently with TSSWCB project 09-06 coordination meetings.		
	Start Date	Month 1	Completion Date Month 24
Subtask 1.4	TWRI and/or SCSC will attend and participate in public meetings as appropriate in order to communicate project goals, activities and accomplishments to affected parties. Such meetings may include, but are not limited to, the Annual Meeting of Texas SWCD Directors, the TSCRA Annual Convention and various leadership meetings, the TFB Annual Convention and various leadership meetings, Clean Rivers Program Basin Steering Committee meetings, and watershed stakeholder meetings for certain TMDLs and WPPs.		
	Start Date	Month 1	Completion Date Month 24
Subtask 1.5	TWRI and SCSC will develop and disseminate project informational materials, including, but not limited to flyers, brochures, news releases, and other appropriate promotional publications. As appropriate, TWRI will include information about the project, as appropriate, in the <i>tx H₂O</i> , <i>New Waves</i> e-letter, AgriLife News, USDA-ARS News, and livestock industry trade publications. TSSWCB will be provided such informational materials and publications developed by TWRI and SCSC for review prior to distribution.		
	Start Date	Month 1	Completion Date Month 24
Subtask 1.6	TWRI will continue to host and maintain an internet website http://grazinglands-wq.tamu.edu/ for the dissemination of information.		
	Start Date	Month 1	Completion Date Month 24
Subtask 1.7	TWRI and SCSC will continue to utilize the LSHS Project Steering Committee organized through TSSWCB project 06-05. At a minimum, membership shall be composed of TSSWCB, certain SWCDs, AgriLife Extension, AgriLife Research, TWRI, USDA-NRCS, USDA-ARS, TDA, GLCI, TFB, TSCRA, ICA, and TCFA. This LSHS Project Steering Committee will provide input on the evaluation of BMP effectiveness, identification of demonstration sites, modifications to the LSHS curriculum, and general project coordination. This LSHS Project Steering Committee will meet as frequently as needed, likely annually. This <i>Project</i> Steering Committee may meet concurrently with the <i>Program</i> Steering Committee established through TSSWCB project 09-06.		
	Start Date	Month 1	Completion Date Month 24
Subtask 1.8	TWRI, in collaboration with SCSC and SAML, will develop and submit a Final Report at the culmination of the project. This Final Report will document project performance related to each project goal, measure of success, and task. A draft of this Final Report will be submitted to TSSWCB for review prior to finalizing the document. This Final Report, and any associated project Technical Reports, will be permanently housed in the TWRI online Reports Database.		
	Start Date	Month 22	Completion Date Month 24

Tasks, Objectives and Schedules	
Task 1	Project Administration and Coordination
Deliverables	<ul style="list-style-type: none"> • Quarterly progress reports in electronic format • Reimbursement Forms and necessary documentation in hard copy format • Lists of action items needed from project coordination meetings • Promotional materials, as developed and disseminated • Project website • Steering Committee materials including meeting notices, agendas, attendance lists • Final Report (electronic format and 3 hard copies) and associated Technical Report(s)

Tasks, Objectives and Schedules							
Task 2	Quality Assurance						
Costs	\$1,529						
Objective	To develop data quality objectives (DQOs) and quality assurance/quality control (QA/QC) activities to ensure data of known and acceptable quality are generated through this project.						
Subtask 2.1	<p>TWRI will develop a QAPP for activities in Task 3 consistent with <i>EPA Requirements for Quality Assurance Project Plans (QA/R-5)</i> and the <i>TSSWCB Environmental Data Quality Management Plan</i>.</p> <p>All monitoring procedures and methods prescribed in the QAPP shall be consistent with the guidelines detailed in the <i>TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415)</i> and <i>Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG-416)</i>.</p> <table border="1" data-bbox="261 1045 1521 1083"> <tr> <td>Start Date</td> <td>Month 1</td> <td>Completion Date</td> <td>Month 3</td> </tr> </table>			Start Date	Month 1	Completion Date	Month 3
Start Date	Month 1	Completion Date	Month 3				
Subtask 2.2	TWRI will submit revisions and necessary amendments to the QAPP as needed.						
	Start Date	Month 4	Completion Date Month 24				
Deliverables	<ul style="list-style-type: none"> • QAPP approved by TSSWCB in both electronic and hard copy formats • Approved revisions and amendments to QAPP, as needed • Data of known and acceptable quality as reported through Task 3 						

Tasks, Objectives and Schedules			
Task 3	Evaluate and Demonstrate BMPs To Reduce Fecal and Bacteria Loading From Cattle on Grazing Lands		
Costs	\$150,835		
Objective	To evaluate and demonstrate the effectiveness of BMPs in reducing bacteria runoff from grazing lands and verify the water quality impacts on receiving waterbodies. Grazing management and several structural BMPs will be evaluated. The LSHS Program, a field day, and various types of publication will be utilized to transfer knowledge and support increased adoption of BMPs by ranchers.		
Subtask 3.1	SCSC, with assistance from TWRI, will continue the evaluation of grazing management and stocking rates/densities at the Brazos Bottom (BB1, BB2, BB3), Welder Wildlife Refuge (WWR1, WWR2, WWR3) and Riesel (SW12, W10) demonstration sites. Runoff samples from three grazing treatments [no grazing, moderate grazing, and heavy grazing (2 x moderate grazing)] will be evaluated at the Brazos Bottom and Welder Wildlife Refuge and from two grazing treatments [no grazing and moderate grazing] will be evaluated at Riesel.		
	ISCO automated samplers will be used to collect flow integrated samples and data on runoff quality and quantity and rainfall amounts and intensity. <i>E. coli</i> and other bacteria (i.e., <i>Enterococcus</i> , fecal coliform) levels in runoff will be measured and bacteria loadings will be determined.		
	SAML will analyze all samples using EPA-approved methods as outlined in the QAPP. SAML is NELAC certified for <i>E. coli</i> and will use EPA-approved methods for analysis of all samples.		
	Start Date	Month 4	Completion Date
			Month 21
Subtask 3.2	SCSC, with assistance from TWRI and ESSM, will evaluate the effectiveness of certain structural BMPs in modifying cattle movement to change fecal deposition patterns and reducing bacteria runoff. BMPs that have been identified as needing evaluation include (1) portable shade facilities/structures, (2) protected stream access points or stream crossing, (3) rip-rap application designed to limit cattle access to riparian areas, and (4) alternative water supplies designed to draw cattle away from waterbodies. Changes in cattle movement will be evaluated using GPS collars as described in Subtask 3.5. Reductions in bacteria contributions will be calculated based on the reduced time cattle spend in the stream and riparian area. Evaluation of protected stream access points or stream crossings will be dependent on finding a suitable cooperator where USDA-NRCS is designing and constructing this practice.		
	Start Date		
	Month 4		
	Start Date	Month 4	Completion Date
			Month 21
Subtask 3.3	SCSC will continue to gather information from the growing body of literature on 1) bacteria fate and transport, 2) effects of grazing cattle on bacterial levels in waterbodies, and 3) effect of BMPs designed to minimize grazing cattle impacts on riparian areas and bacteria loading. A compendium of this literature will be posted on the project website.		
	Start Date		
	Month 1		
	Start Date	Month 1	Completion Date
			Month 24
Subtask 3.4	SCSC will identify cooperator(s) to conduct the BMP demonstration and evaluation with assistance of the LSHS Project Steering Committee, local SWCDs, USDA-NRCS, TWRI, and local AgriLife Extension agents. For the evaluation of protected stream access points or stream crossings, and possibly alternative water supplies, SCSC and TWRI will work closely with USDA-NRCS and local SWCDs to identify potential cooperators where these practices are being planned. Funding will be provided to the cooperator(s) as needed to implement BMPs and participate in the BMP demonstration and evaluation. SCSC and TWRI will encourage the cooperator(s) to obtain a certified WQMP from the TSSWCB.		
	Start Date		
	Month 1		
	Start Date	Month 1	Completion Date
			Month 3
Subtask 3.5	SCSC and ESSM will assess cattle behavior in response to BMPs to be evaluated in Subtask 3.2 utilizing Lotek GPS collars to determine the amount of time cattle spend in the stream and riparian areas before and after BMP implementation. TWRI will assist with GPS collar data analysis.		
	Start Date		
	Month 4		
	Start Date	Month 4	Completion Date
			Month 21

Tasks, Objectives and Schedules			
Task 3	Evaluate and Demonstrate BMPs To Reduce Fecal and Bacteria Loading From Cattle on Grazing Lands		
Subtask 3.6	SCSC will transfer results from BMP effectiveness studies to landowners, natural resource agencies, and others through the LSHS Program and other publications in order to increase BMP adoption rates and participation in federal and state technical and financial assistance programs.		
	SCSC, with assistance from TWRI and USDA-ARS and in cooperation with local SWCDs and local Extension and USDA-NRCS staff, will conduct at least 1 field day at a demonstration sites to highlight the BMP effectiveness studies and promote adoption of BMPs by ranchers.		
	Start Date	Month 4	Completion Date
			Month 21
Subtask 3.7	In order to determine and document the synergistic effectiveness of BMPs prescribed in a WQMP in reducing bacteria loading from grazing cattle, a team consisting of SAML, USDA-ARS, SCSC TWRI, and others as appropriate, will design a water quality monitoring regime for evaluating whole-farm effect of implementing WQMPs on livestock operations. This team will work with the LSHS Project Steering Committee and other project partners to identify prospective cooperating ranches across an array of ecoregions and climatic zones. To the extent possible, the monitoring regime will be designed for watersheds with on-going WPP or TMDL development or implementation. The monitoring regime will be designed such that results are transferable to other watersheds. The monitoring regime will take advantage of all available and suitable methodologies, including Bacterial Source Tracking (BST). The monitoring regime will be incorporated into a proposed scope of work and budget.		
	Start Date	Month 1	Completion Date
			Month 24
Subtask 3.8	Through TSSWCB project 09-50, USDA-ARS is developing an easy-to-use Texas BMP Evaluation Tool (TBET) to aid in science-based BMP selection on-farm and cost-effective conservation spending. Specifically, TBET is being 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. SCSC and TWRI will work with USDA-ARS to incorporate findings from the BMP evaluations in this project into TBET, to the extent practical.		
	Start Date	Month 1	Completion Date
			Month 24
Subtask 3.9	SCSC, with assistance from TWRI and TSSWCB, will work very closely with the USDA-NRCS to provide USDA-NRCS with the information they need to establish a practice standard for Livestock Shade Structure as a BMP to effect cattle movement and fecal deposition patterns and impact pollutant loading and water quality. Examples of this practice standard (717) exist in South Carolina, Georgia, Florida, and Virginia.		
	Start Date	Month 1	Completion Date
			Month 24
Subtask 3.10	SCSC, with assistance from TWRI, will develop technical reports, refereed journal articles, Extension Fact Sheets, and other publications as appropriate, summarizing the results of the demonstrations (grazing management treatments and structural BMP evaluation) and the analysis of the impacts of BMPs on bacteria runoff.		
	Start Date	Month 22	Completion Date
			Month 24
Deliverables	<ul style="list-style-type: none"> • Technical Report(s) describing demonstration results from grazing management treatments and structural BMPs evaluation • Water quality data of known and acceptable quality in electronic format • Compendium of literature reviewed, as published on website • Promotional materials, notices, agenda and attendance list for Field Day • Modified LSHS Program materials, Extension Fact Sheets, and other publications summarizing the results of the demonstrations • Draft USDA-NRCS Practice Standard for Livestock Shade Structure • Monitoring regime for WQMP study, including scope of work and budget 		

Part III – Financial Information

Budget Summary	
Category	Costs
Personnel	\$ 67,876
Fringe Benefits	\$ 15,183
Travel	\$ 12,997
Equipment	\$ 0
Supplies	\$ 10,830
Contractual	\$ 0
Construction	\$ 0
Other	\$ 34,300
Total Direct Costs	\$ 141,186
Indirect Costs (≤15%)	\$ 21,178
Total Project Costs	\$ 162,364

Budget Justification		
Category	Costs	Justification
Personnel	\$ 67,876	TWRI Project Manager = \$9,206 Prof & Ext State Forage Specialist (SCSC) = \$18,670 Graduate Assistant (SCSC) = \$40,000
Fringe Benefits	\$ 15,183	TWRI Project Manager = \$2,297 Prof & Ext State Forage Specialist (SCSC) = \$4,230 Graduate Assistant (SCSC) = \$8,656
Travel	\$ 12,997	TWRI Project Manager = \$1200 Graduate Assistant (SCSC) = \$7,342 Assoc Prof & Ext Range Specialist (ESSM) = \$4,455
Equipment	\$ 0	
Supplies	\$ 10,830	TWRI Supplies = \$430 SCSC Supplies (troughs, pumps, shade) = \$10,400
Contractual	\$ 0	
Construction	\$ 0	
Other	\$ 34,300	Graduate Assistant Tuition (SCSC) = \$16,000 Rip Rap = \$3,300 Costs & incentive for demonstrations = \$5,200 GPS Collar Maintenance (ESSM) = \$1,600 Consumables for Sample Analysis (SAML) = \$8,200
Indirect	\$ 21,178	15% of Total Direct Costs
SOURCE	TSSWCB will provide \$162,364 in non-federal funds sourced from state appropriations (FY2010 General Revenue) through the Nonpoint Source Grant Program to TWRI.	