Project Description:

Project Background:

According to the 2004 Water Quality Inventory and 303(d) List, 306 waterbodies are impaired in Texas with a total of 419 impairments. Of these, approximately half of the impairments are the result of excessive bacteria. Bacteria source tracking completed in a number of TMDLs completed to date has identified grazing cattle as a significant source of bacteria loading. Grazing lands, which represent the dominant land use in the majority of watersheds in Texas, have received little attention until now regarding the effect of grazing livestock on water quality. Implementation of watershed management principles and practices on grazing lands will be critical to the success of water resource restoration and protection efforts in the state for years to come.

Education of landowners and voluntary adoption of BMPs is needed to reduce bacteria contamination of streams and waterbodies as well as reduce the likelihood of increased regulatory oversight of production practices and systems. The TSSWCB, local SWCDs and the USDA-NRCS support producers through technical assistance and cost-share programs that enable the implementation of BMPs. For such measures to be effective, however, education programs are needed to ensure the practices are accepted, properly implemented and managed, compatible with the overall management system, and result in limited additional economic burden to agricultural producers.

Evaluation of bacteria runoff from a variety of grazing management scenarios is needed to develop science-based Extension education programs and provide producers with necessary information for making management decisions. Much work is already being completed on unmanaged rangeland and pasture through the *Lone Star Healthy Streams* project and Education Program for Improved Water Quality in Copano Bay project funded by the TSSWCB and EPA with CWA 319(h) funds, as well as the Environmental Management of Grazing Lands project funded by the TSSWCB and USDA-NRCS. This proposed project will be coordinated with these ongoing projects and expand

the scenarios being evaluated intensively managed forages (i.e. irrigated bermudagrass pastures). The data developed through this proposed project will be used to develop educational material for disbursement through the Lone Star Healthy Streams program. In addition, the data generated will be provided to the TSSWCB, TCEQ, researchers, and those developing bacteria TMDLs to ensure the most accurate loading data for grazing lands are used in the models being developed.

Project Objectives:

The goal of this project is to reduce the levels of bacterial contamination of Texas watersheds from grazing beef cattle. This goal will be accomplished by:

1. quantifying bacteria runoff from intensively managed beef cattle operations on intensively managed bermudagrass pastures under irrigation,

2. developing educational materials and programs for stakeholders,

3. delivering management guidelines through the *Lone Star Healthy Streams* program, field days and other education programs, and

4. providing bacteria data to the TSSWCB and TCEQ to refine models for developing TMDLs in Texas as well as other states.

5. evaluating changes in producer knowledge regarding stocking rates and bacteria contamination of runoff water from grazing sites.

Project Methods:

This project will assess and compile current scientific knowledge regarding bacteria runoff from intensively managed grazing lands through an extensive literature search and collection of runoff data from sites established in Brazos County. TWRI and TCE personnel from the Department of Soil and Crop Sciences will initiate an irrigated forage/grazing study site at the Texas A&M University Farm, located in the Brazos River bottom along FM 50. The site is comprised of heavier-textured alluvial soils along the Brazos River. The site will be under a ½-mile center pivot system, which will

afford the opportunity to determine the levels of bacteria in runoff water under very intensive management scenarios involving irrigated forages.

This grazing demonstration will be used to determine bacteria runoff from intensively managed beef cattle operations on bermudagrass pastures under irrigated scenarios. Along with the Welder Wildlife Refuge evaluation and demonstration work that TCE is conducting, Texas will have a broad-based database from extensively managed rangeland to intensively managed pastures. Stocking rate treatments to be evaluated will be non-grazed, moderately stocked, and heavily stocked. Data from these evaluations and demonstrations will be:

- used to develop educational materials and programs for stakeholders,

- delivered to producers statewide through the Lone Star Healthy Streams program, and

- provided to TSSWCB, TCEQ, and others to refine the models used to develop TMDLs in Texas.

This proposed project will bring heightened awareness of the issue regarding bacteria contamination of watersheds by grazing animals and encourage adoption of BMPs designed to reduce bacterial loading to Texas streams and water ways. The TWRI and TCE Extension Assistant employed by TCE will be responsible for helping conducting these demonstrations, developing educational materials and coordinating with various specialists within TCE as needed.

Location and Size of the Project Area:

Demonstration and evaluation will take place at the Texas A&M University Farm in Brazos County.

Producer Participation:

Producer participation will take place as a result of field days conducted at the demonstration site and educational programs held in Brazos County and throughout the state. These field days will allow livestock producers from the area to see the effectiveness of various levels of stocking rate and grazing management in reducing bacteria runoff. Through the statewide *Lone Star Healthy Streams* educational effort, information gathered through this demonstration and evaluation will be provided to livestock producers statewide.

Project Action Plan and Timeline:

The project will consist of three tasks: (1) Project Coordination and Administration, (2) Assess Bacteria Runoff from Intensively Managed Beef Cattle Operations, and (3) Technical Transfer. All three tasks will be conducted concurrently throughout the entire two year project.

The objective of Task 1 will be 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 perform accounting functions for project funds and be responsible for developing timely and accurate reports. Subtasks to be completed by TWRI will include (1) preparation of bi-annual progress reports; (2) coordination of meetings as appropriate with project participants to discuss project activities, project schedule, lines of responsibility, communication needs, and other requirements; (3) submitting required financial forms every quarter (SF-272 and SF-269); and (4) working with TCE to develop the final project report within 90 days of project completion.

The objective of Task 2 will be to evaluate bacteria runoff from intensively managed beef cattle operations in Brazos County. The first subtask will be to install three (3) watershed sites at the Texas A&M University Farm in Brazos County to evaluate un-grazed, moderately stocked, and heavily stocked irrigated pasture conditions. Equipment to be installed includes dikes and weirs, ISCO

samplers with bubble flow meters and rain gages. TCE will maintain the three watershed sites and assess bacteria concentrations, runoff volume, and precipitation from each of the three (3) sites for a period of two (2) years. TCE will evaluate the water quality data collected throughout the project in order to develop timely and up-to-date information for presentation to producers. The grazing work will be implemented in the spring of 2008 and run through the spring of 2010. Runoff will be collected from the bermudagrass during the growing season and from bermudagrass overseeded with winter annuals during the late fall-early spring. A technical report describing all the data collected will be developed at the end of the project for submission to the NRCS as part of the final report. In addition, fact sheets will be developed as appropriate to describe the findings and their implications to producers. All data collected throughout the project will be provided to the NRCS.

The objective of Task 3 will be to develop and deliver educational materials regarding bacteria runoff and BMPs for reducing it to agricultural producers. Results from task 2 will form the basis of the educational materials. The primary delivery mechanism will be the *Lone Star Healthy Streams* program, field days, and linkages with other educational programs.

Project Management:

This project will be led by Dr. Allan Jones of the Texas Water Resources Institute (TWRI). Overall project management will also be conducted by TWRI and will be assigned to one of their five project managers. TWRI will be responsible for financial reporting requirements and will assist project personnel with compiling and submitting bi-annual and final project reports. TWRI specializes in project management and is currently involved in managing and cooperating in over 70 water related projects around the state.

Dr. Larry Redmon, professor at Texas A&M in the Soil and Crop Science (SCSC) Department, will be responsible for establishment of the Brazos County Texas A&M University Farm site that will implement three difference grazing stocking rate scenarios. Dr. Redmon will likewise be

responsible for monitoring the sites, water collection, and analyses of the runoff water for *E. coli* bacteria. Dr. Redmon will also work to summarize the data and make the data available via educational materials and programs delivered on a state-wide basis.

Key Project Personnel:

Dr. Allan Jones

Director, Texas Water Resources Institute

Provides overall leadership for TWRI.

Dr. Larry Redmon

Professor & Forage Specialist, SCSC Dept. at Texas A&M

Provides leadership, delivery and support for extension and research programming in forage systems in Texas.

Benefits or Results Expected and Transferability:

The primary benefits of this project will be the collection of data that leads to the development of Best Management Practices regarding appropriate stocking rates for intensively managed warm-season perennial grasses under irrigation that minimize bacteria runoff into surface waters of Texas. The results of this project will benefit all beef cattle producers in Texas and will be disseminated via the World Wide Web, fact sheets, and face-to-face educational programs state-wise.

Project Evaluation:

The project will be evaluated with beef cattle producers by the use of a retrospective post evaluation survey instrument that analyzes a) mean scores of pre- versus post-presentation results using a Likert scale, and b) percent change of knowledge prior to and following an

educational program where the project results are presented. Technical feasibility will be determined by an internal steering committee established at the initiation of the project. Results will be analyzed and submitted to NRCS via bi-annual and the final reports.

Environmental Impacts:

No adverse environmental effects are anticipated by the proposed project. Identification of appropriate stocking rates for beef cattle producers under irrigation, however, has tremendous potential to reduce bacterial contamination of state surface waters, thus mitigating potentially negative environmental impacts.