

# Continued Statewide Delivery of the Lone Star Healthy Streams Program



Prepared for:

**Texas State Soil and Water Conservation Board**

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**-Final Report TSSWCB Project 17-11**

FUNDING PROVIDED THROUGH A CLEAN WATER ACT §319(h) NONPOINT SOURCE GRANT FROM THE TEXAS STATE SOIL AND WATER CONSERVATION BOARD AND THE U.S. ENVIRONMENTAL PROTECTION AGENCY

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## List of Acronyms and Abbreviations

Ac – acre

AgriLife – Texas A&M AgriLife

ALEC – Department of Agricultural Leadership  
Education and Communication

AU – Animal Unit, 1000 pounds live weight

AUD – Animal Unit Day

AUM – Animal Unit Month

AUY – Animal Unit Year

BMP – Best Management Practice

BST – Bacterial Source Tracking

Conc. – Concentration

CWA – Clean Water Act

*E. coli* – *Escherichia coli*

EPA – Environmental Protection Agency

EQIP – Environmental Quality Incentives  
Program

Extension – Texas A&M AgriLife Extension  
Service

FSA – Farm Services Agency

FY – Fiscal Year

GI – gastrointestinal

Ha – hectare

Hvy – Heavy

LSHS – Lone Star Healthy Streams

NRCS – USDA Natural Resources Conservation  
Service

PI – Principal Investigator

QPR – Quarterly Progress Report

SWCD – Soil and Water Conservation District

TMDL – Total Maximum Daily Load

TSSWCB – Texas State Soil and Water  
Conservation Board

TWRI – Texas Water Resources Institute

USDA – United States Department of  
Agriculture

WPP – Watershed Protection Plan

## Introduction

### Problem/Need Statement

Excessive levels of fecal indicator bacteria (e.g. *E. coli*) remain a major cause of water quality impairment throughout Texas. According to the 2012 Texas Integrated Report for Clean Water Act Sections 305(b) and 303(d), a total of 568 impairments are included in Category 5 with impairments due to elevated bacteria representing the highest percentage (45%). Total Maximum Daily Loads (TMDLs), TMDL Implementation Plans (I-Plans), and watershed protection plans (WPPs) continue to be developed to address these impairments.

Fecal indicator bacteria are common inhabitants of the intestines of all warm-blooded animals, including livestock. Although watersheds can be affected by microbial pollution from a wide variety of sources, livestock are increasingly under scrutiny. For example, bacterial source tracking (BST) results in the Lampasas River Watershed revealed livestock (cattle, avian livestock, and other non-avian livestock) accounted for a total of 22% of the *E. coli* identified while in the Leon River Watershed, livestock accounted for a total of 19%. One mechanism for reducing bacterial contamination from livestock species is to promote greater adoption, implementation, and maintenance of best management practices (BMPs) by livestock producers and landowners across the state. However, to accomplish this, significant resources are needed to educate and inform livestock producers and landowners about bacteria impairments, their causes, and most importantly, BMPs that can be implemented to help reduce bacterial contamination.

Surface water contamination by bacteria is not isolated to one watershed or region, but is instead a significant statewide issue. Through, TSSWCB project 17-11, *Statewide Delivery of the Beef Cattle, Dairy Cattle, Poultry and Horse Components of the Lone Star Healthy Streams Program*, over 40 education and training events have been conducted to date reaching over 30 counties and over 2,900 citizens with demand for the program increasing. Through both of these projects, presentations were developed, manuals were published, and other resources made available for online delivery. It is estimated that for every \$1 spent on water-related conservation programs in Texas, \$4-\$7 are saved, yielding a potential economic impact of the Lone Star Healthy Streams program to be \$1.26 to \$2.2 million.

The LSHS program is an important water quality education initiative in Texas. To help meet increasing demands for the program, this project provided continued statewide implementation to support and enhance current and future watershed protection efforts in Texas and provide a basis for gaining landowner participation and adoption of BMPs.

The LSHS program is an important water quality education initiative in Texas. This project has provided implementation of the LSHS program to support and enhance current and future watershed protection efforts in Texas.

## General Project Description

This project delivered the Lone Star Healthy Streams program through local and distance education events in targeted watersheds across Texas.

**Local Watershed and Distance Education.** Extension worked with Extension Regional Program Leaders, County Extension Agents, and Extension Specialists around the state to deliver this program in bacteria impaired watersheds through local or distance education which uses WebEx, Centra Symposium or Lync software. The delivery took place in conjunction with County Extension Agents and their program planning committees; continued use of the LSHS website, and additional written materials as needed. The LSHS website and resource manuals continued to be used for program implementation. Locations for training programs were selected in concert with the TSSWCB and targeted bacteria impaired watersheds where livestock and poultry have been identified as potential contributors, as well as those watersheds currently undergoing development and/or implementation of a WPP, TMDL, or I-Plan. Training programs were conducted at field days, conferences, and other county extension events. LSHS was incorporated into other events to enhance various state projects and maximize contact with producers.

Both local and distance education programs varied in length and topic depending on the audience or location of the program. Distance education events were delivered using software such as WebEx, Centra Symposium, and/or Lync. These software programs allowed a presenter to load materials onto a platform while interested participants logged in from a remote site to listen and view the presentation live. Presentations were recorded so that participants who missed the live presentation could log on at a later time to listen to the presentation and view the presentation materials. A minimum of 10 local events and 3 distance education events were conducted each year. Curriculum and training materials have been developed to address topics and BMPs related to beef cattle, dairy cattle, poultry, and horses. As part of each training program, participants will learn about water quality law and policy, sources of bacteria in Texas waterways, bacteria fate and transport, benefits of voluntary conservation practices, sources of financial and technical assistance, and livestock- specific BMPs that are designed to reduce bacterial contamination of runoff.

**Evaluation and Assessment.** The impacts and effectiveness of the LSHS program were assessed using a multi- stage evaluation approach. The first stage used a pre-test/post-test evaluation strategy which was utilized at the beginning and end of both watershed and computer-based training programs. The pre-test asked knowledge-based questions that included a combination of multiple choice and true/false questions. The post-test measured the same knowledge-based questions to determine the knowledge change of participants. In addition, the post-test included 'satisfaction' questions and 'intentions to adopt' questions. The 'intentions to adopt' questions focused on BMPs that participants should adopt based on what they have learned and the practice's ability to reduce bacterial contamination.

## **Project Goals**

The goal of this project was to promote healthy watersheds and improve water quality through continued delivery of the LSHS program by educating Texas livestock producers and landowners. This goal was accomplished by meeting the objectives of:

- 1) Facilitating continued and enhanced statewide implementation of the Lone Star Healthy Streams (LSHS) program through local and distance educational events to help reduce bacterial contamination originating from grazing and dairy cattle, poultry, and horses in Texas surface waters.
- 2) Evaluating program success by measuring changes in producer knowledge and understanding regarding bacteria pollution and BMPs to minimize bacterial contamination as well as intentions to adopt recommended BMPs

## **Measures of Success**

- Delivery of a minimum of 10 LSHS local and 3 distance educational trainings per year.
- Number of livestock producers and landowners participating in educational events delivered locally or through distance education.
- Number of unique visitors to the LSHS project website.
- Number of factsheets, publications, and other educational materials distributed regarding the LSHS program and BMPs to reduce bacterial contamination.
- Increased knowledge and understanding of livestock producers and landowners on bacteria pollution and BMPs to reduce bacteria runoff and increased understanding of the expected adoption of BMPs.

## **Methods and Results**

### **Task 1: Project Administration**

Objectives: Administer, coordinate, and monitor all work performed under the project including technical and financial supervision and preparation of quarterly progress and final reports.

#### **Subtask 1.1: Preparation of Quarterly Reports**

Extension prepared QPRs for submission to the TSSWCB. QPRs documented all activities performed within a quarter and were then submitted by the 15th of January, April, July and October to the TSSWCB. QPRs were also distributed to all project partners.

### **Subtask 1.2: Perform Accounting Functions**

Extension performed accounting functions for project funds and submitted appropriate reimbursement Forms to TSSWCB at least quarterly. These forms are routed through Texas A&M Sponsored Research Services and then submitted to TSSWCB.

### **Subtask 1.3: Coordination of Project Meetings**

Extension hosted coordination meetings or conference calls, at least quarterly, with project partners to discuss project activities, project schedule, communication needs, deliverables, and other requirements. Extension developed lists of action items needed following each project coordination meeting and distributed to project personnel. Numerous meetings and phone calls were held each quarter throughout the project time period.

### **Subtask 1.4: Final Report**

Extension, with assistance from project partners, developed the final report assessing the effectiveness of the LSHS program, including the local and distance education events.

## **Task 2: Coordinate and Deliver LSHS**

Objective: Continue delivery of a statewide educational program that provides livestock producers and landowners applicable information on water quality law and policy, sources of bacteria in Texas waterways, bacteria fate and transport, benefits of voluntary conservation practices, sources of technical assistance and financial incentives, and livestock-specific BMPs that are designed to reduce bacterial contamination of runoff. Extension will work in cooperation with the TSSWCB and other agencies and organizations as appropriate to guide program delivery and selection of training locations.

### **Subtask 2.1: Employ a Program Specialist**

Extension employed a Program Specialist that served under the leadership of the Extension State Forage Specialist as the full-time LSHS Program Coordinator and was responsible for promoting, coordinating, and delivering local and distance education LSHS training events.

### **Subtask 2.2: Educational Program Location Selection**

Extension worked in concert with TSSWCB and state and local organizations to select locations for the LSHS training events. Extension coordinated efforts with state agencies, county extension agents, and organizations already involved in WPP/TMDL processes in specific watersheds.

### **Subtask 2.3: LSHS Marketing**

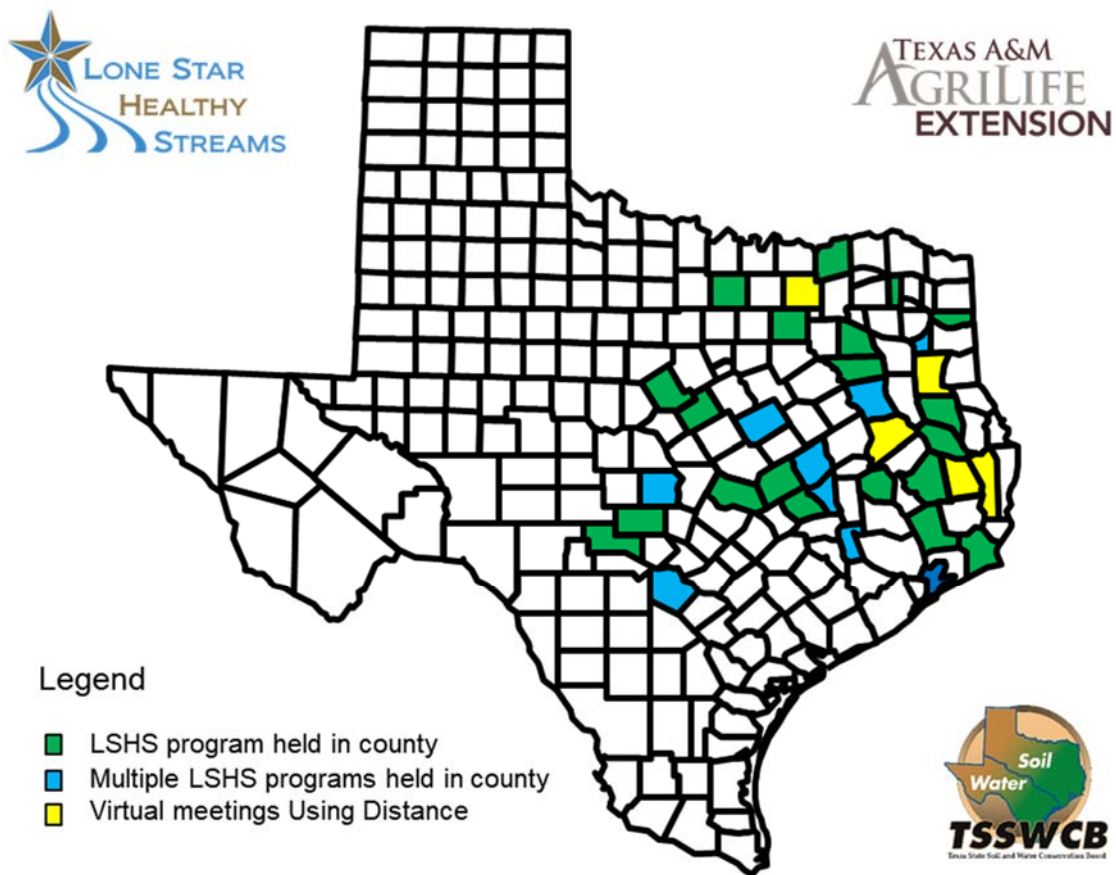
Extension actively marketed the LSHS programs through news releases (AgriLife News and local media outlets), internet postings, newsletter announcements, public/conference presentations, flyers, etc., to enhance awareness and utilization. TSSWCB was provided all promotional materials for review and approval prior to distribution.

### **Subtask 2.4: LSHS Program Coordination and Planning**

Extension coordinated with Extension Regional Program Leaders, County Extension Agents, local SWCDs, NRCS, TSSWCB, and others to deliver the LSHS educational program to bacteria-impaired or threatened watersheds throughout the state.

During the project time period, over 45 LSHS programs were held, 37 face to face and 8 distance programs. As the project progressed, word spread about the usefulness of the information being presented and in many cases county extension agents outside of targeted watersheds were asking for the program or portions of the program to be brought to their county. LSHS was delivered in numerous watersheds including but not limited to: the Lampasas River, Leon River, Adams and Cow Bayou, Upper Angelina, Atascosa River, Navasota River, Upper Llano River, Mid and Lower Cibolo, Lavon Lake, Double Bayou, Cedar Bayou, Attoyac Bayou and Carters Creek.

Figure 1: Map of LSHS program locations





### Subtask 2.5: Meeting Participation and Meeting Delivery

Extension participated in meetings as appropriate in order to efficiently and effectively achieve project goals and summarize activities and achievements made throughout the course of this project. Such meetings included, but were not limited to, local soil and water conservation districts (SWCDs), TSSWCB board meetings, Texas Watershed Coordinator Roundtables, the TSSWCB Regional Watershed Coordination Steering Committee, the annual meetings of Texas Soil and Water Conservation District Directors, Extension regional planning meetings, the American Society of Agronomy annual meetings, and the Society for Range Management annual meeting. Additionally, program goals for educational meetings with landowners and managers were met for the 3-year project period (Table 1). Due to the Covid 19 pandemic, face-to-face meetings were prohibited beginning March 2020 and we were forced to adopt distance technology for LSHS virtual meeting delivery but had good acceptance for this delivery method. We anticipate an increased interest in and adoption of the use of virtual meetings across the State beginning in 2021.

Table 1. Educational event dates, number of participants, and location of Lone Star Healthy Streams programs 2018-2020.

Date	# People	Location
22-Feb-2018	35	Comanche County
28-Mar-2018	45	Kaufman County
5-Apr-2018	52	Brazos County
6-Apr-2018	48	Brazos County
6-Apr-2018	15	Waller County
26-Apr-2018	67	Kerr County
1-May-2018	10	Marion County
9-May-2018	45	Anderson County
10-May-2018	58	Hamilton County
18-May-2018	166	Robertson County
29-May-2018	375	Llano County
22-Jun-2018	13	Houston County
14-Aug-2018	35	Angelina County
30-Aug-2018	62	Bexar County
6-Sep-2018	35	Wise County
6-Sep-2018	88	Williamson County
8-Sep-2018	126	Brazos County
21-Sep-2018	100	Franklin County
1-Oct-2018	64	Gillespie County
19-Oct-2018	52	Brazos County
30-Oct-2018	45	Jefferson County
9-Nov-2018	15	McLennan County
3-Jan-2019	42	Milam County
21-Feb-2019	50	Brazos County
22-Feb-2019	60	Rusk County
22-Mar-2019	78	Van Zandt County
26-Mar-2019	65	Anderson County
17-Apr-2019	36	Henderson County

17-May-2019	179	Robertson County
24-May-2019	47	McLennan County
28-May-2019	368	Llano County
31-May-2019	54	Burleson County
7-July-2019	9	Bexar County
22-Aug-2019	16	Waller County
30-Sep-2019	25	Fannin County
29-Oct-2019	45	Liberty County
6-Nov-2019	85	Nacogdoches County
21-Jan-2020	45	Anderson County
20-Feb-2020	48	Brazos County
28-Feb-2020	17	Polk County
16-Apr-2020	30	Tyler, Gregg, Houston counties
28-Apr-2020	30	Jasper County
4-Sep-2020	30	Rusk County
22-Oct-2020	45	Tyler, Gregg, Houston counties
13-Nov-2020	35	Collin County
<b>45 Events</b>	<b>2,990</b>	

### Subtask 2.6: LSHS Website

Extension, with assistance from TWRI, continued to host and maintain a LSHS program website (<http://lshs.tamu.edu/>) to serve as a public clearinghouse for all project related information. All workshop information, the LSHS BMP manuals, as well as other material have been available at this website. The number of unique visitors to the website and the distribution of Lone Star Healthy Streams educational materials was tracked to assess its impact and reported each quarter. Throughout the course of this project the LSHS website was visited 2,715 times by 2,371 unique visitors and involved 4,416 page views.

### Task 3: LSHS Effectiveness

Objective: To measure both knowledge and behavior changes of individuals participating in the LSHS program using a staged evaluation approach.

#### Subtask 3.1:

Extension utilized pre-test/post-test evaluations (for both local and distance education events) to measure changes in knowledge of participants regarding water quality law and policy, sources of bacteria in Texas waterways, bacteria fate and transport, benefits of voluntary conservation practices, sources of financial and technical assistance, and livestock-specific BMPs that are designed to reduce bacterial contamination of runoff; to evaluate participant satisfaction with the program; and to evaluate participant's intentions to change their behavior as a result of the program.

Overall satisfaction of the LSHS program by all participants to date (all years) was 98% mostly to completely satisfied with the program presentations. Program participants indicated that their understanding of the topics discussed improved and 99% would recommend the LSHS program to

others. Of the program participants that answered the evaluation question, more than 50% indicated that they were likely to adopt one or more BMPs.

### **Subtask 3.2:**

With assistance from ALEC, analyze test results using descriptive, correlational, and analysis of variance statistical procedures. Results will be used to periodically evaluate and modify LSHS program materials and incorporated into the final report.

### **Conclusion**

The goal of this project was to promote healthy watersheds and improve water quality through delivery of the Lone Star Healthy Streams program, using both local and distance education in targeted watersheds across the state. This was accomplished through the education of Texas livestock and poultry producers and landowners on how to best protect Texas waterways from bacterial contributions associated with the production of livestock and poultry utilizing best management practices. In addition, this project also aimed to better understand the barriers and factors associated with the adoption and implementation of BMPs known to reduce bacterial contamination in waterways and develop recommendations for enhanced landowner participation.

The LSHS program or portions of this program were delivered to audiences at over 40 events throughout the state, reaching over 2,900 participants. Landowners and livestock producers were eager to come to an extension managed program and adaptation of practices were as high as 80% depending on the particular practice. Attendees were not only interested in how to improve the efficiency of their land but had great interest in land stewardship and the contribution their land has to water quality. In addition, unique visitors to the LSHS website exceeded 2,300. This highly beneficial program will continue to be carried out throughout the state in coordination with the TSSWCB, Extension, and other project partners.