Texas A&M AgriLife
Texas Water Resources Institute

Fate and Transport of Bacteria in Rural Texas Streams
FY07 CWA Section 319(h)
TSSWCB Project No. 07-06

Quarter no. 5 From 10/01/08 Through 12/31/08

I. Abstract

Work this quarter has focused on the collection of fecal samples from feral hogs and the identification of bacteria sources in the watershed. Live trapping and camera surveillance has been used to carry this task out. During the quarter, feral hog trapping was carried out for 7 consecutive days. During this time, 37 animals were captured and 25 fecal samples were collected. Camera surveillance was conducted pre and post-trapping resulting in 4,000-5,000 photos captured. Numerous wildlife, livestock and other species were identified using these cameras. Extremely dry conditions have been experienced in the Resley Creek watershed this quarter. As a result, no samples have been collected there. Work to verify livestock numbers in the watershed have begun and should be completed during this quarter.

II. Overall Progress and Results by Task

TASK 1: Project Coordination and Administration

Subtask 1.1: TWRI will prepare electronic quarterly reports for submission to the TSSWCB. All progress reports will be provided to all Project Participants. (Month 1 - 36).

The following actions have been completed during this reporting period:

a. The year 2, quarter 1 report was completed and sent to the TSSWCB on January 15, 2009.

42% Complete

Subtask 1.2: TWRI will coordinate quarterly meetings (in person or TTVN) as appropriate with project participants to discuss project activities, project schedule, lines of responsibility, communication needs, and other requirements. (Month 1 – 36).

The following actions have been completed during this reporting period:

a. No activity to report at this time.

33% Complete

Subtask 1.3: TWRI will attend meetings with the TSSWCB project manager and other meetings, as needed, to review project status, deliverables, etc. (Month 1 – 36).

The following actions have been completed during this reporting period:

a. No official meetings were held during the quarter, but multiple phone calls have transpired regarding the project.

33% Complete

Subtask 1.4: TWRI will submit appropriate Reimbursement Forms. (Month 1 – 36).

The following actions have been completed during this reporting period:

a. As of November 30, 2008, a total of $76,278 or 25% of total project funding has been expended.

25% Complete

Subtask 1.5: TWRI will develop (Months 1-3), host and maintain (Months 3-36) an internet website for the dissemination of information. (Month 1 – 36).

The following actions have been completed during this reporting period:

a. The project website has been completed and is now available online. The web address for this site is: http://bft.tamu.edu.
b. The project will be updated at least quarterly throughout the course of this project.

92% Complete

Subtask 1.6: TWRI and Texas AgriLife Extension will work together to develop the Final report. (Month 30 – 36).

The following actions have been completed during this reporting period:

a. No activity to report at this time.

0% Complete

Subtask 1.7: TWRI and Extension will work together to develop publications, brochures and reports that will be disseminated for educational purposes. (Month 1 – 36).

The following actions have been completed during this reporting period:

a. No activity to report at this time.

0% Complete

Task 2: Development of Quality Assurance Project Plan

Subtask 2.1: TWRI will develop a QAPP that will detail project goals and objectives relating to water quality monitoring activities; identify the data needed to fulfill those objectives; list field and laboratory methods; describe procedures and schedules to be followed; and specify a data management structure and the quality assurance protocols. (Month 1 – 6).

The following actions have been completed during this reporting period:

a. The QAPP has been developed and approved by TSSWCB and EPA.

100% Complete

Subtask 2.2: Provide annual revisions to the QAPP and amendments, as necessary, to the TSSWCB and EPA. (Month 6 – 36).

The following actions have been completed during this reporting period:

a. No activity to report at this time.

0% Complete

Task 3: Conducting sanitary surveys to identify potential *E. coli* contributing sources in the impaired watershed

Subtask 3.1: Choose a suitable watershed from the provided list of bacteria impaired stream segments. (Month 1 – 2).

The following actions have been completed during this reporting period:

a. This subtask is completed. Cedar Creek, Segment 1209G, in the Brazos River basin was selected for this study.

100% Complete

Subtask 3.2: Travel to the selected watershed and conduct a renaissance survey of the watershed and sources. (Month 6 – 8).

The following actions have been completed during this reporting period:

a. This subtask is completed.

100% Complete

Subtask 3.3: Conduct a thorough sanitary survey to identify various wildlife sources that contribute E. coli loads during winter. This survey will be conducted by a wildlife expert. (Month 6 – 8).

The following actions have been completed during this reporting period:

a. Work conducted thus far during the quarter has included game camera survey, field observations and live trapping.

25% Complete

Subtask 3.4: Conduct a through sanitary survey to identify various domestic livestock and poultry sources and waste streams that contribute E. coli loads during winter. This survey will be conducted by an Extension county agent and/or an animal-production agriculture expert. (Month 6 – 8).

The following actions have been completed during this reporting period:

a. No activity to report at this time.

0% Complete

Subtask 3.5: Verify and update wildlife survey with inputs from stakeholders and Texas Parks and Wildlife personnel and domestic animal survey with inputs from stakeholders, ranchers, and extension county agents. (Month 6 – 8).

The following actions have been completed during this reporting period:

a. No activity to report at this time.

0% Complete

Subtask 3.6: Conduct a thorough sanitary survey to identify various wildlife sources that contribute E. coli loads during summer. This survey will be conducted by a wildlife expert. (Month 8 – 12).

The following actions have been completed during this reporting period:

a. During this quarter wildlife experts have conducted trapping and visual surveillance using motion activated cameras to identify wildlife sources, collect fecal samples and to determine population densities of various species.
b. In total, 2,470 trap nights have been completed and 900 surveillance nights have been completed using motion activated cameras.

75% Complete

Subtask 3.7: Conduct a through sanitary survey to identify various domestic livestock and poultry sources and waste streams that contribute E. coli loads during summer. This survey will be conducted by an Extension county agent and/or an animal-production agriculture expert. (Month 8 – 12).

The following actions have been completed during this reporting period:

a. Initial inquiries have been made to gather this information. This task should be completed during the next quarter.

10% Complete

Subtask 3.8: Verify and update wildlife survey with inputs from stakeholders and Texas Parks and Wildlife personnel and domestic animal survey with inputs from stakeholders, ranchers, and county Extension agents. (Month 12 – 14).

The following actions have been completed during this reporting period:

a. No activity to report at this time.

0% Complete

Task 4: Conducting demonstration experiments to characterize and quantify *E. coli* loads from identified sources

Subtask 4.1: Collect feces samples of relevant and dominant identified sources (five maximum) and samples of waste streams (five maximum) identified in Task 4 during winter. (Month 6 – 8).

The following actions have been completed during this reporting period:

a. Winter fecal sample collection has been underway during this quarter. 25 fecal samples from feral hogs were collected this quarter.

15% Complete

Subtask 4.2: Extract feces samples and waste streams for E. coli collected during winter. (Month 6 – 8).

The following actions have been completed during this reporting period:

a. No activity to report this quarter.

0% Complete

Subtask 4.3: Analyze samples collected during winter for E. coli using EPA's approved enumeration technique. (Month 6 – 8).

The following actions have been completed during this reporting period:

a. No activity to report this quarter.

0% Complete

Subtask 4.4: Calculate the E. coli load resulting from all identified sources collected during winter. (Month 8 – 10).

The following actions have been completed during this reporting period:

a. No activity to report this quarter.

0% Complete

Subtask 4.5: Collect feces samples of relevant and dominant identified sources (five maximum) and samples of waste streams (five maximum) identified in Task 3 during summer. (Month 10 – 12).

The following actions have been completed during this reporting period:

a. Fecal material samples were collected regularly from 2 identified ranches.
b. The collected samples were delivered to the BAEN lab for analysis.

55% Complete

Subtask 4.6: Extract feces samples and waste streams for E. coli collected during summer. (Month 10 – 12).

The following actions have been completed during this reporting period:

a. *E. coli* is extracted from all the samples that gave positive results upon analysis.

50% Complete

Subtask 4.7: Analyze samples collected during summer for E. coli using EPA's approved enumeration technique. (Month 10 – 12).

The following actions have been completed during this reporting period:

b. No activity to report this quarter.

20% Complete

Subtask 4.8: Calculate the E. coli load resulting from all identified sources collected during summer. (Month 12 – 14).

The following actions have been completed during this reporting period:

a. Based on the analyses carried out in Task 4.7, E. coli loads resulting from the identified sources are calculated.

25% Complete

Task 5: Monitoring fate (survival, growth, re-growth, and die-off) of *E. coli* under different environmental conditions

Subtask 5.1: Prepare collected samples in Task 4.5 for this monitoring study. (Month 12)

The following actions have been completed during this reporting period:

a. 3 samples each from 2 species have been selected for the monitoring study.

5% Complete

Subtask 5.2: Measure growth kinetics of E. coli in different sources under varying environmental conditions. (Month 12 – 20).

The following actions have been completed during this reporting period:

a. The growth of *E. coli* for 1 species (taking 3 sub-samples and 3 replicates of each sub-sample) was measured under four different temperature conditions (0°, 10°, 20°, 50°).

10% Complete

Subtask 5.3: Measure survival of E. coli in different sources under varying environmental conditions. (Month 12 – 20).

The following actions have been completed during this reporting period:

a. The survival of *E. coli* for 1 species (taking 3 sub-samples and 3 replicates of each sub-samples) was measured under four different temperature conditions (0°, 10°, 20°, 50°).

10% Complete

Subtask 5.4: Measure re-growth of E. coli in different sources under optimum conditions. (Month 20 – 26).

The following actions have been completed during this reporting period:

a. No activity to report this quarter.

0% Complete

Task 6: Monitoring concentration of *E. coli* in the instrumented stream as a result of rainfall and runoff events

Subtask 6.1: Collect water samples during summer for two rainfall-runoff events. (Month 8 - 32).

The following actions have been completed during this reporting period:

a. Samples from one runoff event have been collected.

25% Complete

Subtask 6.2: Collect water samples during winter for two rainfall-runoff events. (Month 8 – 32).

The following actions have been completed during this reporting period:

a. No activity to report this quarter. Drought conditions continue to grip the sampling area.

0% Complete

Subtask 6.3: Collect stream bed sediments after each water sample collection periods. (Month 8 – 32).

The following actions have been completed during this reporting period:

a. Stream samples were collected for one rainfall event in summer.

25% Complete

Subtask 6.4: Analyze water and sediment for E. coli concentrations. (Month 8 – 34).

The following actions have been completed during this reporting period:

a. Water samples and streambed samples were analyzed for *E. col*i.

25% Complete

Subtask 6.5: Measure growth kinetics, survival, and re-growth E. coli in stream bed sediments under different environment conditions. (Month 9 – 32).

The following actions have been completed during this reporting period:

a. No activity to report this quarter.

0% Complete

Subtask 6.6: Mechanically disturb stream bed sediments four times; twice each during summer and winter, collect grab water samples, and analyze the samples for E. coli. (Month 9 – 32).

The following actions have been completed during this reporting period:

a. No activity to report this quarter.

0% Complete

III. Related Issues/Current Problems and Favorable or Unusual Developments

IV. Projected Work for Next Quarter

- More fecal samples are being received therefore the laboratory analysis will continue.
- Out of the samples analyzed, some samples will be selected and prepared for monitoring fate of *E. coli* under different environmental conditions. The growth kinetics and survival of *E. coli* will be measured under varying environmental conditions and its re-growth will be monitored under optimum conditions.
- Work will be conducted next quarter to develop livestock and wildlife number estimates for the watershed.