Texas A&M AgriLife Research
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. 7 From 4/15/09 Through 7/15/09

I. Abstract

Work this quarter has focused on the collection of fecal samples and the identification of bacteria sources in the watershed. Samples were collected from feral hog by means of hunters as well as the euthanizing of feral hogs by the landowners. Cameras are currently in the field and will but pulled after 20 days for data collection. 15 consecutive days of meso-mammal trapping occurred and the data has been logged. One of the two landowners has withdrawn from the project on good terms and contact has been made with the Texas Parks and Wildlife Department for help in finding properties for hog and deer trapping. Ambient samples, water samples after bed disturbance, and bed sediment samples were collected at Resley Creek, all under baseflow conditions.

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 3 report was completed and sent to the TSSWCB on July 15, 2009.

58% 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. Project leads and TWRI project manager held a brief meeting to discuss the progression of the project and future activities.

58% 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:

b. Project leads and TWRI project manager held a brief meeting to discuss the progression of the project and future activities.

58% 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 May 31, 2009, a total of $96,719.28 or 32.2% of total project funding has been expended.

32% 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.

96% 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. Scouting for appropriate locations to place traps for hogs and deer have occurred on several properties in Brazos and Robertson counties.

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. 30 game cameras were placed on the remaining property. These cameras are currently in the field but will be pulled after 20 days.

100% Complete

Subtask 3.4: Conduct a thorough 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. Information on poultry litter application has been requested from TSSWCB's Centerville Field Office; but has not been received as of yet. Contact will be made again this quarter in an effort to retrieve the information.

25% 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. Contact has been made with the Texas Parks and Wildlife Department for help in finding properties for hog and deer trapping.

15% 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. No activity to report this quarter.

75% Complete

Subtask 3.7: Conduct a thorough 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:

b. Information on poultry litter application has been requested from TSSWCB's Centerville Field Office; but has not been received as of yet.

20% 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 this quarter.

15% 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. White tail deer trapping has been used and will be continuing into the next quarter.
b. Fecal samples have been collected from feral hogs.

86% 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. Samples collected this quarter have not been extracted yet.

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. Samples collected this quarter have not yet been analyzed.

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:

a. 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. No activity to report this quarter.

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 are selected for the monitoring study.

40% 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 2 species (taking 3 sub-samples and 3 replicates of each sub-sample) was measured under four different temperature conditions (0°, 10°, 20°, 50°)
b. The growth of E. coli for 2 species (taking 3 sub-samples and 3 replicates of each sub-sample) is being measured under four different moisture conditions (0%, 20%, 50% and 75%)

40% 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 growth of E. coli for 2 species (taking 3 sub-samples and 3 replicates of each sub-samples) was measured under four different temperature conditions (0°, 10°, 20°, 50°).
b. The growth of E. coli for 2 species (taking 3 sub-samples and 3 replicates of each sub-sample) is being measured under four different moisture conditions (0%, 20%, 50% and 75%)

40% 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. No activity to report at this time.

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 at this time.

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:

b. No activity to report at this time.

35% 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:

c. No activity to report at this time.

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. Collected ambient water samples, water samples after bed disturbance, and bed sediment samples all under baseflow conditions at Resley Creek on April 20, 2009 and May 1, 2009.

25% Complete

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

a. One of the landowners has left the project, but on good terms.
b. Runoff producing rainfall events continue to elude the monitoring area; as a result runoff sample collection is lagging behind.

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.
- Conduct White-tailed Deer and feral hog trapping to collect further fecal samples and estimate watershed populations.