Fate and Transport of *E. coli* in Rural Texas Landscapes and Streams

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Where do bacteria come from and how do they get into water bodies?

What happens next?
What are the potential sources?
How do bacteria get to the water body?

Do Knowledge Gaps Exist?
Bacteria TMDL Task Force

- Charged by TCEQ and TSSWCB to:
  - evaluate current bacteria assessment methods
  - recommend cost and time efficient methods for developing TMDLs and their implementation plans
  - evaluating current assessment methods and identifying when they are most applicable
  - identify needed areas of research so uncertainty in these efforts can be minimized

http://twri.tamu.edu/bacteriatmdl/
Relevant Task Force Recommendations

- Models still have many shortfalls
  - Sediment settling and re-suspension processes
  - Bacteria regrowth and decay

- Sources should be better characterized
  - How much bacteria are produced by a species?
  - What are differences in behavioral patterns between species?
  - How can an accurate animal density be estimated?

- Bacteria behavior are not well understood
  - How do environmental factors influence bacteria mobilization in the watershed?
  - How long do bacteria persist in the environment?
  - How do bacteria die-off outside of the host?
  - Do bacteria regenerate outside of the host?
  - Do environmental conditions in the waterbody influence bacteria transport and/or regrowth?
Importance of Bacteria Concerns

2008 303(d) list

- 827 total impairments
- 295 due to bacteria
  - 79 in the Brazos River Basin
  - 13 in Navasota watershed
  - Cedar Creek is one of them
Cedar Creek - 319(h) Project

- Perennial stream
  - Robertson and Brazos county
  - Rural watershed, no urban influence
  - Cattle, wildlife, and agricultural runoff
- Follows selected TMDL taskforce recommendations
- Monitoring and demonstration project
- Stakeholder education
Cedar Creek - Objectives

- Identify, characterize, and quantify *E. coli* loads
  - Sanitary survey
  - Collection of fecal samples from sources

- Survival, growth, re-growth, and die-off of *E. coli*
  - Different environmental conditions
    - moisture, temperature, pH
Resley Creek - Objectives

- **Continuous monitoring**
  - Collects samples from natural rainfall events

- **Re-suspension demonstration**
  - A natural stream disturbance will be created
  - Water samples will be collected before and after disturbance and the presence of bacteria will be compared
Project Outcomes

- Identification of dominant sources
- Quantification of *E. coli* loads from sources
- Influence of environmental factors
- Fate and transport processes
  - Growth
  - Re-growth
  - Die-off
  - Re-suspension
- Stakeholder education
Project Personnel

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  - Bio. & Ag. Engineering Dept, TAMU
  - Project PI

- Dr. Lopez
  - Wildlife and Fisheries Science Dept, TAMU’
  - Project PI

- Dr. Mukhtar
  - Bio. & Ag. Engineering Dept, TAMU
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- Dr. Harmel
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