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

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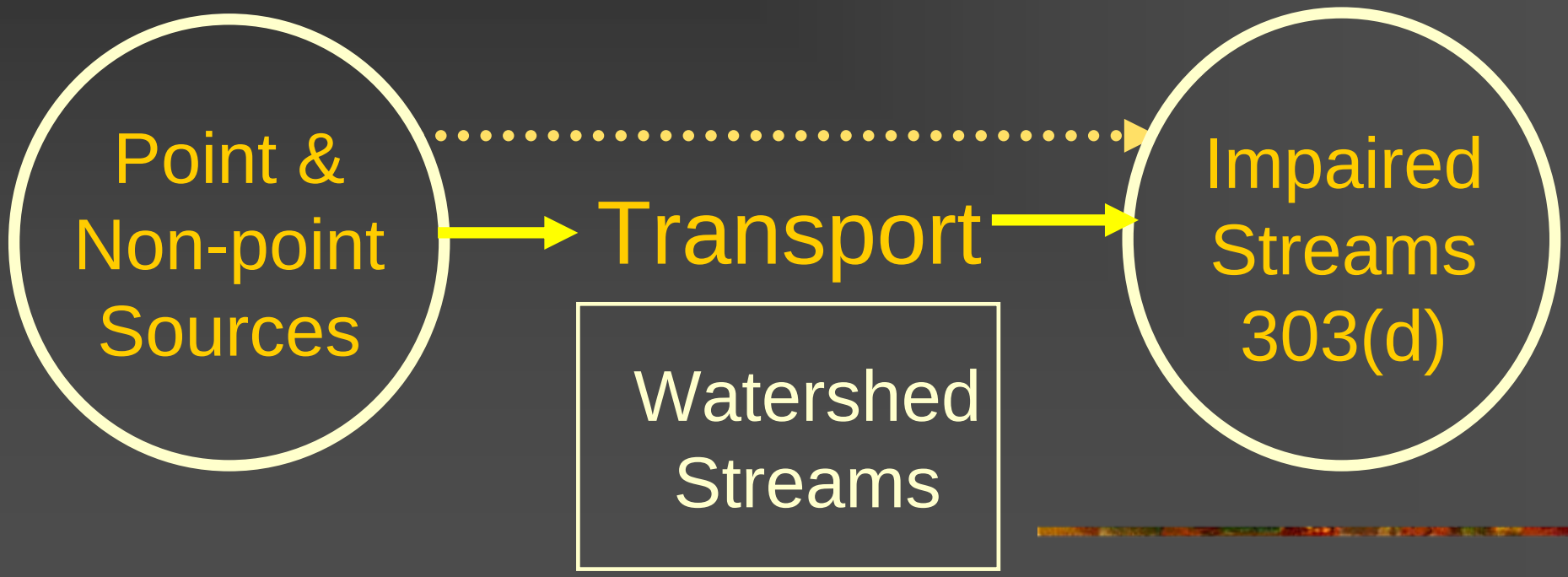
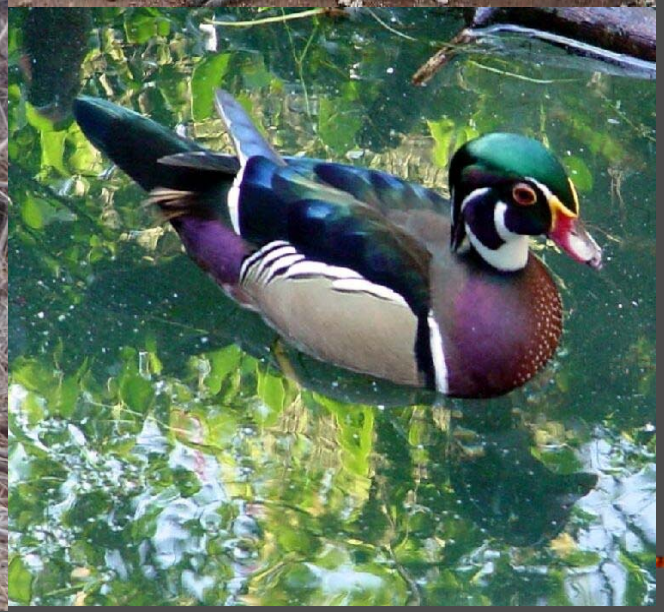
Introduction

- 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

Navasota River Watershed
FY07 Water Quality Monitoring

Bacteria
Dissolved Oxygen
Nutrients/Chlorophyll a
Total Dissolved Solids/ Chloride/Sulfate
pH
Toxicity in Sediment
Monitoring Station
Wastewater Outfall
Watershed Boundary

See Inset Map

Brazos River Authority

0 10 20 Miles

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'
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http://bft.tamu.edu

Soil Water TSSWCB Texas State Soil and Water Conservation Board

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