Little Brazos River Tributaries
Bacteria Assessment Project

Water Quality 101
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Federal Clean Water Act

• Objective is to “restore and maintain the chemical, physical and biological integrity of the Nation’s waters”
Federal Clean Water Act

- Interim goal is “water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water”
  - Commonly referred to as “fishable/swimable” goal

- Administered and implemented by the U.S. Environmental Protection Agency (USEPA)
Water Quality Standards

• Clean Water Act requires States to establish Water Quality Standards to achieve objective and goals of the Act

• Water Quality Standard is defined as the designated beneficial uses of a water segment and the water quality criteria necessary to protect those uses
Water Quality Standards

- Uses include contact recreation (swimming), aquatic life, domestic water supply, fish consumption, etc.
- Criteria for parameters include bacteria, dissolved oxygen, salts, toxic substances
Water Quality Standards

• Use = contact recreation
  – Recreational activities involving significant risk of ingestion of water, including wading by children, swimming, water skiing, diving, and surfing
  – Applied to all rivers, streams, lakes and estuaries in Texas with few exceptions (e.g., Houston Ship Channel)

• Criteria = *Escherichia coli* (*E. coli*) bacteria, for freshwater streams
  – Geometric mean (similar to the average) of samples should not exceed 126 colony-forming units of bacteria per 100 mL of water
  – Individual, single samples should not exceed 394 colony-forming units of bacteria per 100 mL of water more than 25% of the time
Why Bacteria?

- Elevated levels of bacteria (*E. coli*, *Enterococcus*, fecal coliform) indicate possible fecal contamination and the potential presence of disease-causing pathogens (*E. coli* O157:H7, *Salmonella*, *Giardia*, *Cryptosporidium*)
Why Bacteria?

• These bacteria are present in the intestinal tracts and feces of warm-blooded animals
• These bacteria are used as an indicator of the potential presence of pathogens
• Pathogens cause gastrointestinal (GI) illness
Sources of Bacteria
Sources of Bacteria

- Improperly treated human waste from malfunctioning wastewater treatment facilities or septic systems
- Buildup on the land surface and then washoff during rain events of pet, livestock and wildlife feces
- Direct deposition of feces by pets, livestock and wildlife into waterbodies
Standards Revision

• Major revisions to the *Texas Surface Water Quality Standards* are being drafted, including modifications to contact recreation use and bacteria criteria
• State adoption of any changes is not expected until mid-2009
• USEPA must then approve any changes
303(d) List

- Clean Water Act requires Texas to identify waterbodies failing to meet or not expected to meet water quality standards and not supporting their designated uses
- This list of impaired waterbodies is known as the *Texas Water Quality Inventory and 303(d) List*
- Waterbodies are broken out into categories
- Must be submitted to USEPA for review and approval every two years
303(d) List

- Category 1 – all standards are attained
- Category 2 – some standards are attained
- Category 3 – insufficient or no data to evaluate uses
- Category 4 – standard is not attained, but mechanism in place to restore water quality
- Category 5 – standard is not attained
303(d) List

- 2008 Texas 303(d) List was approved by USEPA on July 9, 2008
- Data from December 1999 to November 2006 was assessed
- 837 waterbody-pollutant combinations
- 48% of these are for elevated bacteria
Who does what?

• Texas Commission on Environmental Quality (TCEQ)
  – General jurisdiction and responsibility for water quality in Texas
  – Establish water quality standards
  – Issue permits for point sources (wastewater treatment facilities, concentrated animal feeding operations)
  – Prevent and abate urban nonpoint source pollution
  – Collect and assess data, report on water quality conditions
  – Regulatory enforcement of water quality standards and permits
Who does what?

- Texas State Soil and Water Conservation Board (TSSWCB)
  - Lead agency in Texas responsible for planning, implementing and managing programs and practices for preventing and abating agricultural and silvicultural (forestry) nonpoint sources of water pollution
  - Works in partnership with the State’s 217 local soil and water conservation districts (SWCDs)
  - Provides technical and financial assistance to landowners to develop and implement Water Quality Management Plans (WQMPs) and best management practices (BMPs)
Who does what?

- Other state and federal agencies
  - Texas Department of Agriculture
  - Texas Parks and Wildlife Department
  - U.S. Environmental Protection Agency
  - U.S. Geological Survey (USGS)
  - USDA-Natural Resources Conservation Service (NRCS)
Who does what?

- Local and regional governmental entities
  - Cities and counties
  - River authorities and Texas Clean Rivers Program
  - Soil and water conservation districts
- Citizens and landowners
Possible Outcomes

• Goal = remove from 303(d) List
  – achieving current water quality standards
  – achieving revised water quality standards
  – support a Use Attainability Analysis to change water quality standards
  – develop Watershed Protection Plan for “4b option”
  – develop Total Maximum Daily Load and Implementation Plan for adoption/approval
What is a UAA?

- Use Attainability Analysis
- Evaluation of waterbody and its ability to achieve a specific level of use
- Results in site-specific water quality standard
- No TCEQ guidance for recreational UAA methodology
What is a WPP?

- Watershed Protection Plan
- Coordinated framework for implementing water quality protection and restoration strategies
- Holistically addresses all sources and causes of impairments and threats to both surface and ground water resources
- Voluntary approach, not adopted/approved by TCEQ or USEPA
What is a TMDL?

- **Total Maximum Daily Load**
  - Like a budget for pollution in the stream
  - defines the maximum amount of a pollutant that a waterbody can assimilate on a daily basis and still meet water quality standards
  - allocates pollutant loads between point sources and nonpoint sources
  - Requires adoption by TCEQ and must be approved by USEPA

- **Implementation Plan (I-Plan)**
  - Based on environmental target of TMDL, an I-Plan is developed
  - prescribes measures necessary to mitigate anthropogenic (human-caused) sources of that pollutant in that waterbody
  - specifies limits for point source dischargers and recommends best management practices for nonpoint sources
  - Only requires State approval

- Together, the TMDL and the I-Plan serve as the mechanism to reduce the pollutant, restore the full use of the waterbody and remove it from the 303(d) List
Implementing a WPP or TMDL

- Changes to Wastewater Treatment Facility permits and possible upgrades
- Repair and replace failing septic systems
- Technical and financial assistance to landowners for voluntary implementation of BMPs on agricultural land
- Education on and Demonstration of BMPs
Task Force on Bacteria TMDLs

• TCEQ and TSSWCB established a joint technical Task Force on Bacteria TMDLs in September 2006 charged with
  – Examining approaches other states have used
  – Evaluating variety of models and bacterial source tracking (BST) methods
  – Recommending cost-effective and time-efficient methods
  – Describing a roadmap for further scientific research needed

• In June 2007 TCEQ and TSSWCB approved the recommendations from Task Force
Task Force on Bacteria TMDLs

Tier 1
- Form a stakeholder group
- Compile a GIS database
- Conduct a science survey
- Calculate a load duration curve
- Analyze results with stakeholder groups

Decision 1-A
- Are reductions statistically attainable?
  - Yes: Complete and adopt a TMDL
  - No: Yes

Decision 2-A
- Are there sufficient data for a TMDL?
  - Yes: Complete and adopt a TMDL
  - No: No

Tier 2
- Implement targeted monitoring strategy
- Analyze sources using BST methods
- Develop a simple model
- Analyze results with stakeholder group

Decision 3-A
- Are reductions statistically attainable?
  - Yes: Complete and adopt a TMDL that implements Tier 2 as the next phase.
  - No: Complete a phased TMDL that implements Tier 2 as the next phase.

Tier 3
- Conduct additional monitoring
- Perform a more extensive BST analysis
- Complete stochastic models
- Analyze results with stakeholder group
- Ensure effective stakeholder involvement

Decision 3-B
- Are reductions statistically attainable?
  - Yes: Complete and adopt a TMDL that recommends a USA
  - No: Complete and adopt a TMDL
Task Force on Bacteria TMDLs

• At each successive tier, increasingly aggressive and sophisticated levels of data collection and analysis are used to gain further technical information to support decision-making

• flexible enough to fit
  – the complexity of sources in specific watersheds
  – availability of data
  – degree of impairment
  – level of accuracy required for making sensible decisions
Summary

• Clean Water Act, Water Quality Standards, 303(d) List
• Contact Recreation, *E. coli* bacteria, GI illness, sources
• Role of agencies and stakeholders
• Task Force, tiered-process
• Possible outcomes
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