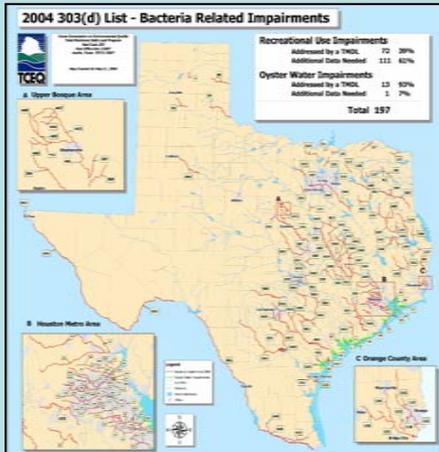


# Reducing Bacterial Contamination in Texas Watersheds

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## Bacteria – Texas #1 Water Quality Issue

The leading cause of water quality impairment in Texas and much of the nation is contamination with fecal bacteria from human and animal sources. Currently, 197 Texas waterbodies do not meet bacterial standards established by the state.



## Bacteria TMDL Task Force

To address bacterial impairments, Texas is completing TMDLs to restore these waterbodies. To provide guidance to the state on establishment of bacteria TMDLs and implementation plans (I-plans), the Texas State Soil and Water Conservation Board (TSSWCB) and Texas Commission on Environmental Quality (TCEQ) established a seven-member Bacteria TMDL Task Force. This Task Force, was led by Dr. Allan Jones and assisted by an Expert Advisory Group of approximately 50 stakeholders.

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## Task Force Recommendations

The Bacteria TMDL Task Force outlined the following recommendations for development of bacteria TMDLs and guide future research. All Task Force documents are available at: <http://twri.tamu.edu/bacteriatmdl/>.

**Proposed Three-Tier Approach for Bacteria TMDL Development**

**Year 1 - Required for all bacteria TMDLs.**

**Tier 1 Analysis (T1)**

1. Form TMDL stakeholder advisory group.
2. Develop comprehensive GIS inventory for watershed.
3. Implement source survey for watershed.
4. Calculate load duration curves.
5. Analyze Tier 1 data with stakeholder advisory group.

**Decision 1 (D1) Are data and analysis adequate?**

- Yes → Go to D2.
- No → Go to T2.

**Decision 2 (D2) Are needed load reductions socially and economically attainable?**

- Yes → Complete and submit draft TMDL for agency approval.
- No → Request evaluation of designated use (i.e. Use Attainability Analysis).

**Tier 2 Analysis (T2)**

**Year 2 - Implemented for most bacteria TMDLs. May be adequate for I-Plan development for non-controversial TMDLs.**

1. Implement targeted monitoring to fill data gaps.
2. Perform library-independent BST and limited library-dependent BST analysis.
3. Develop simple GIS and/or Mass Balance Models.
4. Analyze Tier 2 data with stakeholder advisory group.

**Decision 3 (D3) Are data and analysis adequate?**

- Yes → Go to D4.
- No → Initiate a "phased TMDL" and go to T3.

**Decision 4 (D4) Are needed load reductions socially and economically attainable?**

- Yes → Complete and submit draft TMDL (or I-Plan) for agency approval.
- No → Request evaluation of designated use (i.e. Use Attainability Analysis).

**Tier 3 Analysis (T3)**

**Years 3 and 4 - Normally used for I-Plan development. May be required for development of complex "phased TMDLs."**

1. Assure extensive stakeholder involvement.
2. Implement extensive targeted monitoring.
3. Perform extensive library-dependent BST analysis.
4. Complete mechanistic modeling.
5. Analyze Tier 3 data with stakeholder advisory group.

**Decision 5 (D5) Are needed load reductions socially and economically attainable?**

- Yes → Complete and submit draft I-Plan (or revise "phased TMDL") for agency approval.
- No → Request evaluation of designated use (i.e. Use Attainability Analysis).

## Overview of Identified Research Needs

1. **Quantify bacteria loads from animal / non-animal sources and major land uses**
2. Characterize fate & transport mechanisms (e.g. buildup & mobilization of fecal bacteria from the landscape, dominant environmental factors affecting transport, and effect of sedimentation and resuspension)
3. Enhance bacteria models by improving linkages of BST and modeling and develop spatially-explicit tools to assess bacterial sources, distribute estimated loads, and generate bacterial load input parameters for watershed-scale simulation
4. Investigate & refine library-dependent & independent BST & define appropriate sampling protocols & watershed size for its use
5. **Determine effectiveness of agricultural & urban control measures & BMPs**
6. Quantify uncertainty & develop means to communicate uncertainty to stakeholders

## Addressing Bacteria From Grazing Lands

Bacteria source tracking completed in conjunction with several TMDLs has identified grazing cattle as a significant source of bacteria loading. Grazing lands, which represent the dominant land use in the majority of watersheds in Texas, have received little attention until now regarding the effect of grazing livestock on water quality. Implementation of watershed management principles and practices on grazing lands will be critical to the success of water resource restoration and protection efforts.



## Education and Assessment of BMPs

Landowner education and voluntary adoption of BMPs are needed to reduce bacteria contamination of waterbodies as well as the likelihood of increased regulatory oversight of production. To develop science-based Extension education programs, evaluation of the effectiveness of grazing management and complimentary practices such as providing alternative water supplies and fencing is needed to provide producers the information necessary for making sound management decisions.

## Projects Addressing Grazing Lands



Studies at USDA-ARS, Riesel (above); Welder Wildlife Refuge; and private ranches will evaluate bacteria loading from ungrazed, moderately stocked, and heavily stocked range and pasture. Effectiveness of alternative water supplies and fencing as BMPs will also be evaluated.

Three projects are being implemented to evaluate the effectiveness of BMPs in reducing bacteria runoff and to develop and deliver education programs to cattle producers and other livestock owners. Initial funding for these activities was provided by the TSSWCB and USDA-NRCS through the (1) *Environmental Management of Grazing Lands* project. The bulk of the funding is provided by the TSSWCB and EPA with CWA 319(h) funds. The (2) *Lone Star Healthy Streams* program and (3) *Education Program for Improved Water Quality in Copano Bay* are currently being initiated and expected to be completed in 2009.