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Development of a Guide for Assessing Fecal Contamination in Tributaries of the St. Johns River

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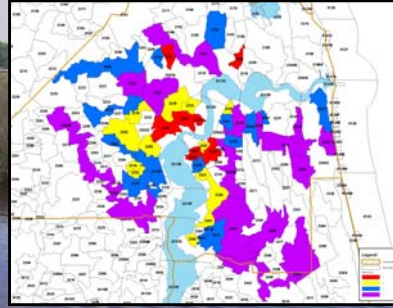


Overview

- What's the Issue in North Florida?
- TMDLs and Microbial Source Tracking
- Tributary Pollution Assessment Project
- Suggested Corrective Actions
- Lessons Learned and Closing Comments
- Questions



North Florida



194 Tributary Water Bodies
(WBIDs) identified in Duval
County, Florida

51 are listed as Impaired Waters
for fecal coliform contamination

TMDLs and MST

Total Maximum Daily Load
(TMDL)

Aim to restore tributaries for their
designated function

1. What is going into the tributary?
2. What can the receiving tributary handle?
3. What is each user's allocation and by how much/how is this going to be reduced?



TMDL Process/Goals

1. Assessment of contributing area
 - Identify sources of contaminant loading (MSTI)
2. Allocation of pollutant loadings among contributing sources
 - Determine how the loading can be reduced in order to return the water body to its designated use



Tributary Pollution Assessment Project Objectives

1. Develop and evaluate an approach for assessing the source(s) of fecal pollution in the WBIDs of Duval County
2. Provide a manual for conducting site assessments and evaluating potential sources of contamination
3. Develop potential corrective action alternatives

Methodology

Tributary Assessment Team (TAT)

- JEA
- City of Jacksonville Environmental Quality Division
- City of Jacksonville Public Works Department
- Duval County Health Department
- Florida Department of Environmental Protection
- Current and Former St. Johns Riverkeepers
- Water and Sewer Expansion Authority
- University of South Florida

Categorization of WBIDs

URBAN

SUBURBAN

RURAL

CONTROL

High Fecal Coliform,
Putative Source

High Fecal Coliform,
NO Putative Source

Low Fecal Coliform, **NO**
Putative Source

WBID Selection			
Name	Priority	Category	Reason
Miramar	1	Urban Putative	Septic Tanks
Butcher Pen	2 → 1	Urban Non-putative	
Deep Bottom	2	Suburban Putative	Septic Tanks
New Castle	2 → 1	Suburban Non-putative	
Terrapin	1 → 2	Rural Putative	Cattle Farm
Blockhouse	1 → 3	Rural Non-putative	



Tiered "Weight-of-Evidence" Approach

1. Collection and compilation of background information and historical data
2. Identification of suspected sources and sampling locations
3. Use of field reconnaissance and indicator bacteria results to guide advanced testing
4. Identification of specific advanced testing techniques to determine sources
5. Continual synthesis and dissemination of information

Tributary Pollution Assessment Manual

Final July 2006

Prepared for:



24 West Church Street
Jacksonville, Florida 32202



Prepared by:



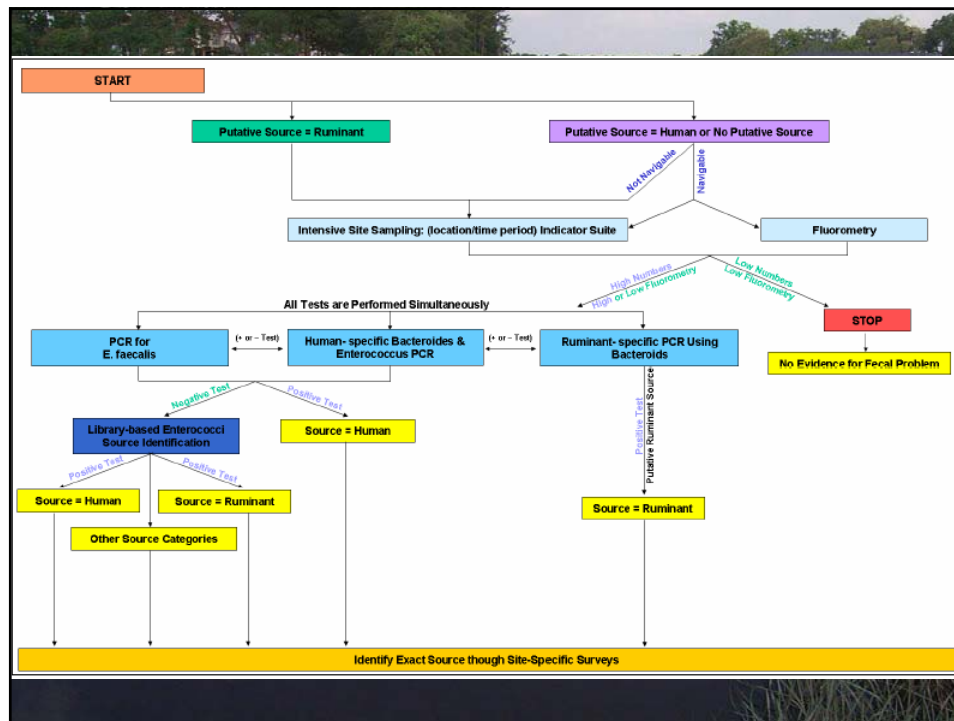
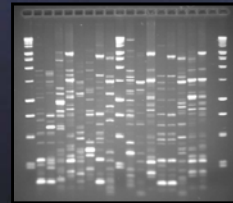
7404 Tullerton Street, Suite 350
Jacksonville, Florida 32256

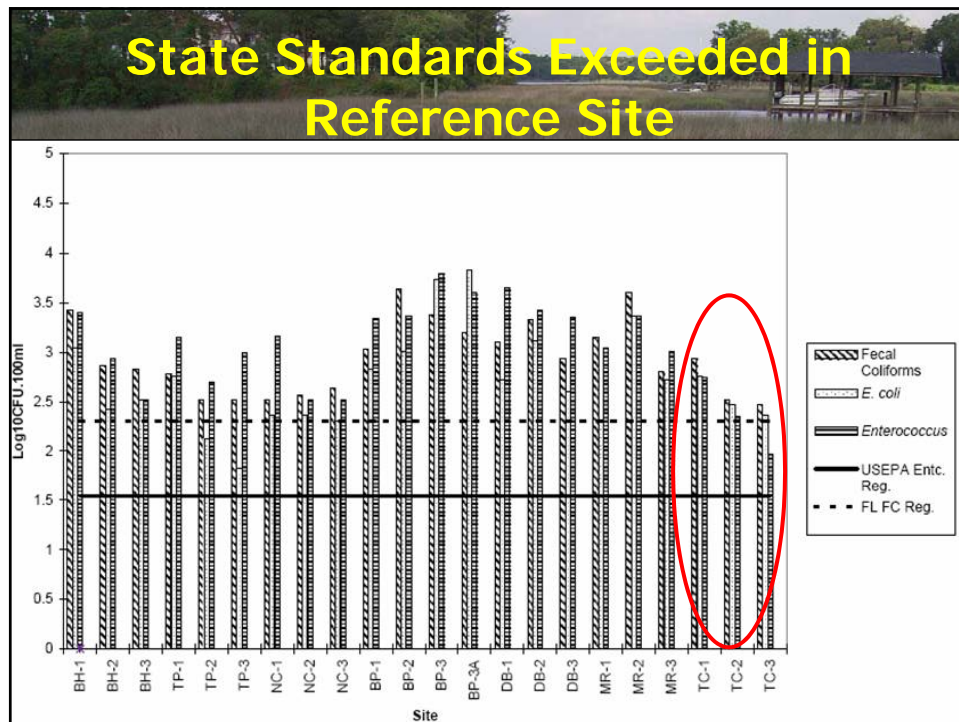
**A methodology
that can be
used to
assess WBIDs
for fecal
contamination**



MST Methods Used in This Study

- Library-Independent
- *esp* gene of *Enterococcus faecium* (human)
- *Bacteroides* (human)
- *Bacteroides* (ruminant)
- PCR for *Enterococcus faecalis* (human)
- Library-Dependent
- BOX-PCR typing of enterococci



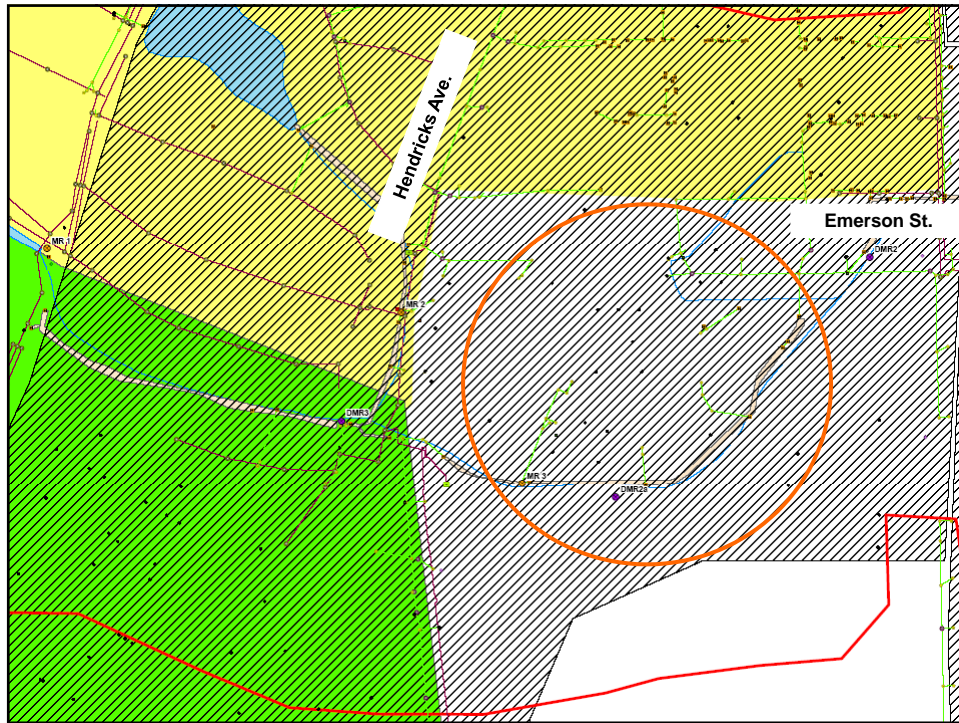


Site-Specific Results

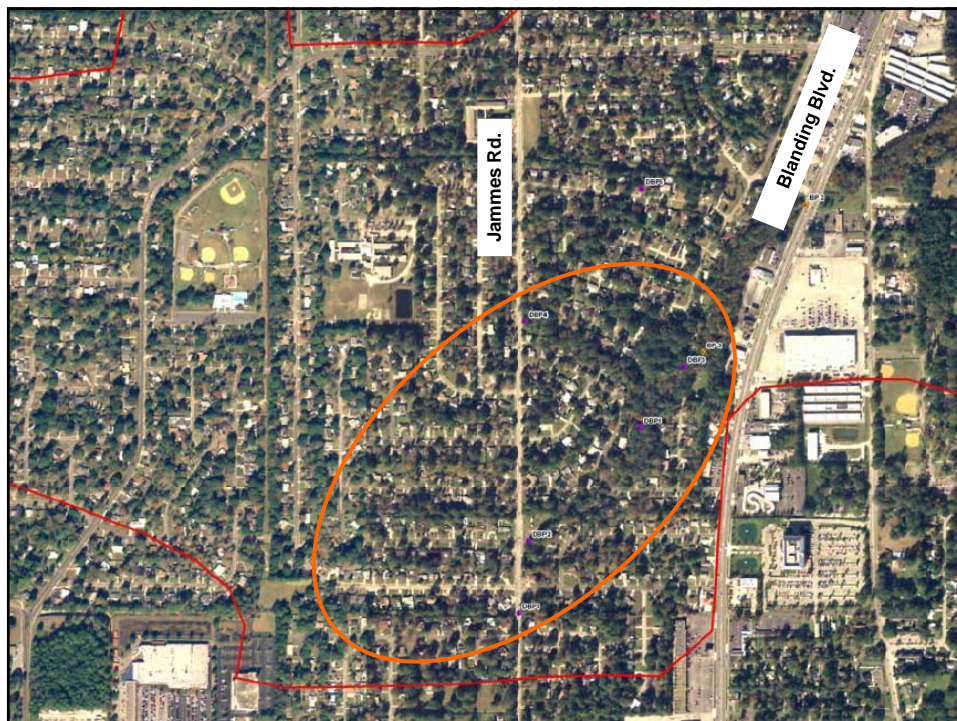
- Each of the 6 tributaries commonly exceeded both the EPA standard for Enterococcus and the State standard for fecal coliforms
- Thomas Creek regularly exceeded the State standard as well as the EPA standard, though to a lesser degree
- Sediments were often found to act as a reservoir, and possibly allow for regeneration, of microbial contamination

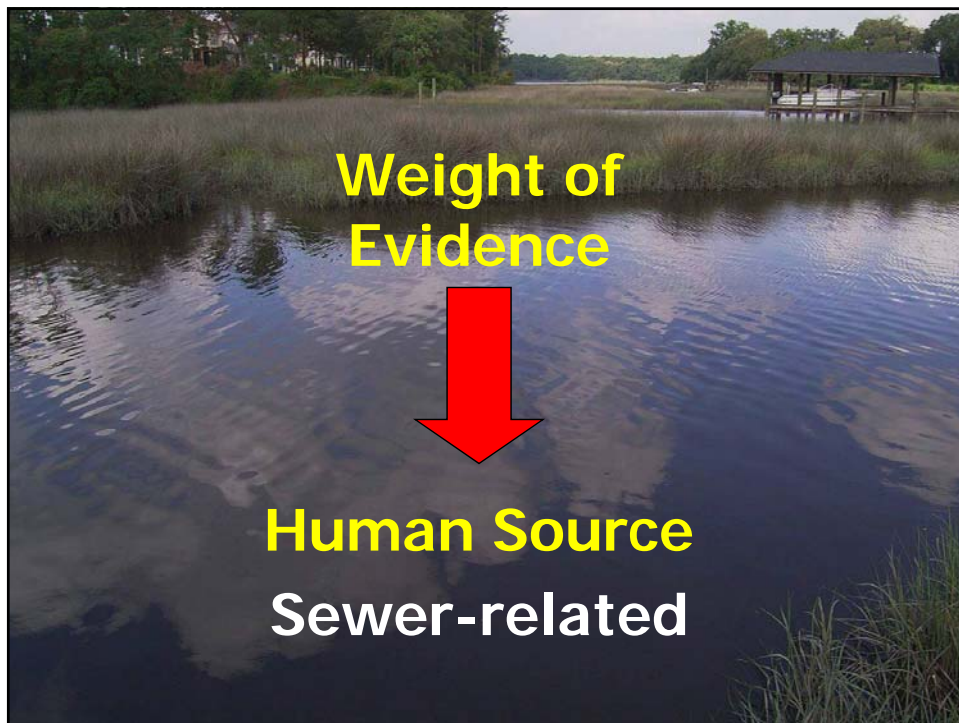
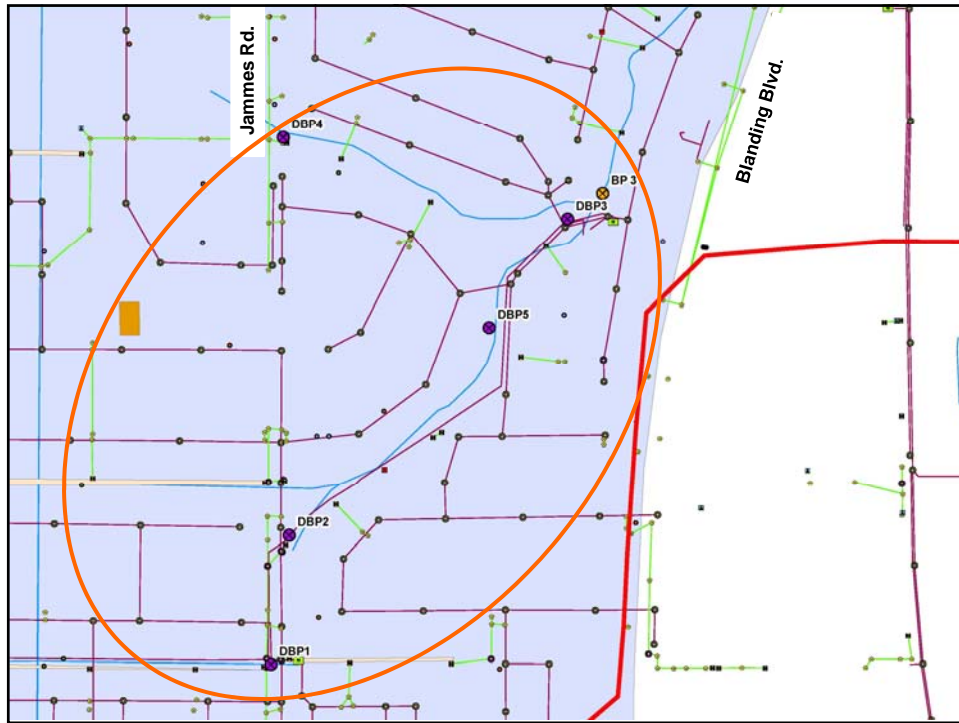
Source Tracking Summary Miramar				
Site	Bacteroides Human	Bacteroides Ruminant	ESP	<i>E. faecalis</i>
MR 1	0/2	0/1	2/2	3/10 (30%)
MR 2	1/1	0/1	0/1	NA
MR 3	1/1	0/1	1/1	0/5 (0%)





Source Tracking Summary Butcher Pen				
Site	Bacteroides Human	Bacteroides Ruminant	ESP	<i>E. faecalis</i>
BP 1	0/2	0/2	0/2	4/10 (40%)
BP 2	0/2	1/3	0/2	6/10 (60%)
BP 3	0/4	0/2	0/6	10/14 (71.4%)
BP 3A	1/1	NA	0/2	5/5 (100%)
BP 3B	NA	NA	NA	2/5 (40%)





Tributary Summary

WBID	Category	Dominant Source-Type
Miramar	Urban	Human-Septic
Butcher Pen	Urban	Human-Sewer
Deep Bottom	Suburban	Human-Local/Episodic
New Castle	Suburban	Human-Septic/Sewer?
Terrapin	Rural	Cattle
Blockhouse	Rural	Human/Animal

General Result

Dominant identified source of fecal coliform contamination in Duval County is human-related



Suggested Corrective Actions

Three Main Source-Types

1. Onsite wastewater treatment and disposal systems
2. Existing utility infrastructure
3. Stormwater (as a conveyance system)





Corrective Actions for Septic Tanks

- Add specific locations to WSEA's list of priority septic tank phase-out areas
- Implement programs to address septic systems as sources
 - DOH-sponsored certification program for haulers
 - Inspection programs
 - Subsidized pump-out programs



Corrective Actions for Sewer Infrastructure

- Intensive spatial sampling
- Further field reconnaissance of sewer infrastructure
- Sewer rehabilitation and replacement
- Preventative Maintenance



Corrective Actions for Stormwater

- Implement stormwater-associated programs
 - Active illicit discharges
 - Stormwater pond inspection
 - Construction site inspection
 - Effective street-sweeping
 - Citizen Education/Outreach
 - Pick up and properly dispose of pet waste



Lessons Learned

- Effectiveness of sampling protocol
- Utility of assessment techniques
- Ability to accurately analyze results and identify specific sources
- Need for flexible sampling strategy and collaboration



Effectiveness of Protocol

- Analysis of sediments
 - Confirmation of residual sources
 - Investigation of “old” vs. “new” inputs
- Restriction of collecting one sample/station at each WBID
- Restriction of 3 stations/WBID



Utility of Assessment Techniques

- Fluorometry
- Rep-PCR
- Aerial Infrared Thermal Imaging
- Monitoring of groundwater wells



Analysis of Results

Methods and regulatory aspects of
MST are still being developed

Controversial

Inexact and emerging area of science



Weight-of-Evidence Approach

Benefits of this Study?

1. Development of Manual for future assessments nationwide
 - Lessons learned
2. Source identification for 6 WBIDs
3. Identification of suggested corrective actions



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