Sediment & Bacteria TMDL Technical Advisory Groups in Georgia

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Outline

- Short history of TAG
- Bacteria white paper draft
  - Bacteria standard
  - Identification of bacteria sources
  - TMDL implementation
  - Recommendations

TAG History

- TMDL forum
  - Sponsored by UGA & Georgia Conservancy in 2000 after first Georgia TMDLs released
- Technical Advisory Group (TAG)
  - Explore scientific needs for sediment TMDLs improvement
  - Representatives from universities, state and federal agencies, and environmental groups
  - 25 participants met monthly for 2 years
    - Invited presentations from “experts”
  - Released white paper “A Protocol for Establishing Sediment TMDLs” in 2002
    - www.georgiaconservancy.org/WaterQuality/GA_CON%20QXD.pdf

TAG History

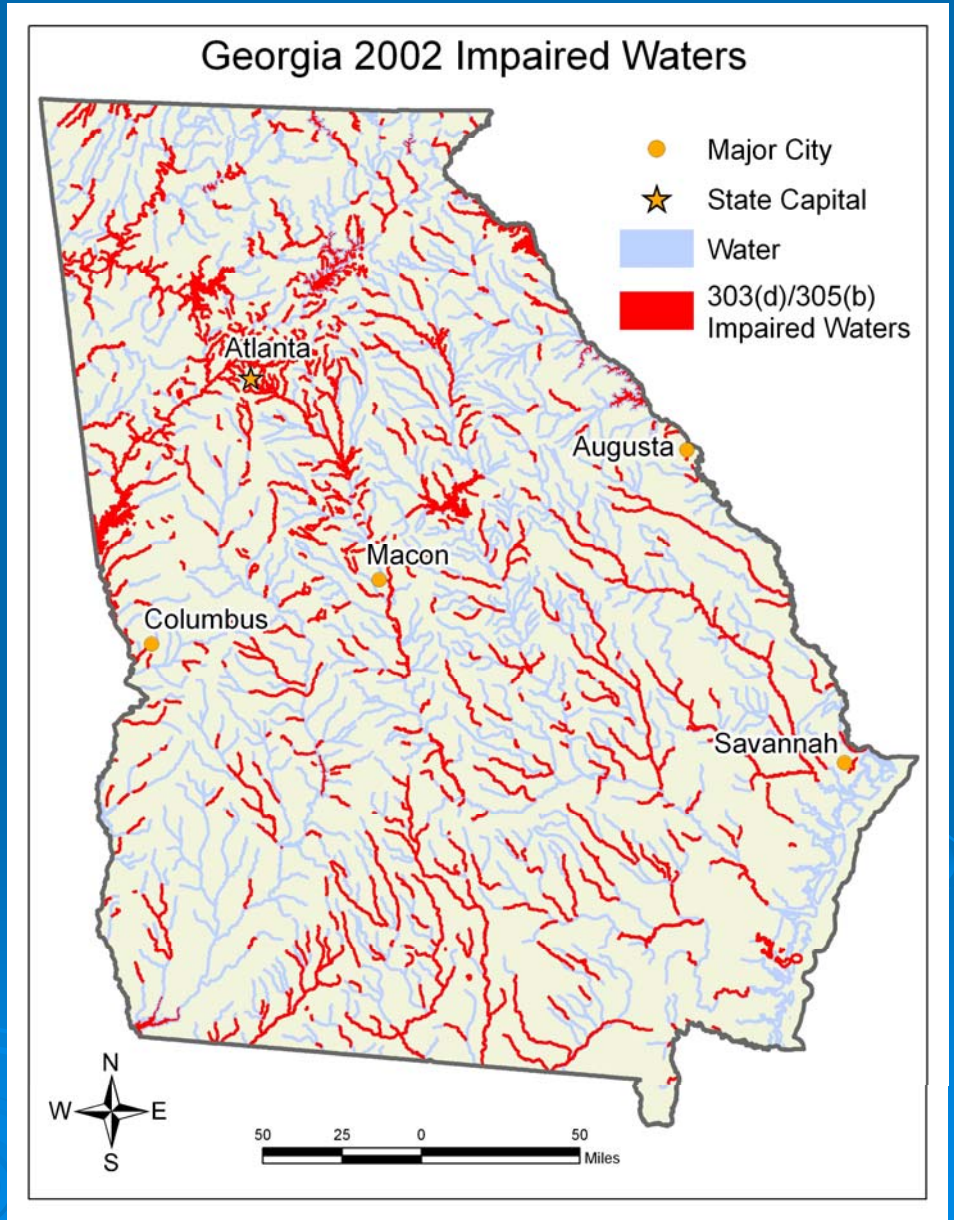
- Sediment TMDL recommendations
  - Use a “reference stream” approach when available to determine target sediment load
  - If reference stream not available, target mean suspended sediment concentration should be 20-30 mg/L
  - Margin of safety should be explicit
  - Follow-up monitoring is essential
  - TMDL implementation needs to be focus of another TAG

TAG History

- Second forum held in 2002
  - Presented the sediment white paper
  - Decided to form a new TAG to address bacteria TMDLs and TMDL implementation

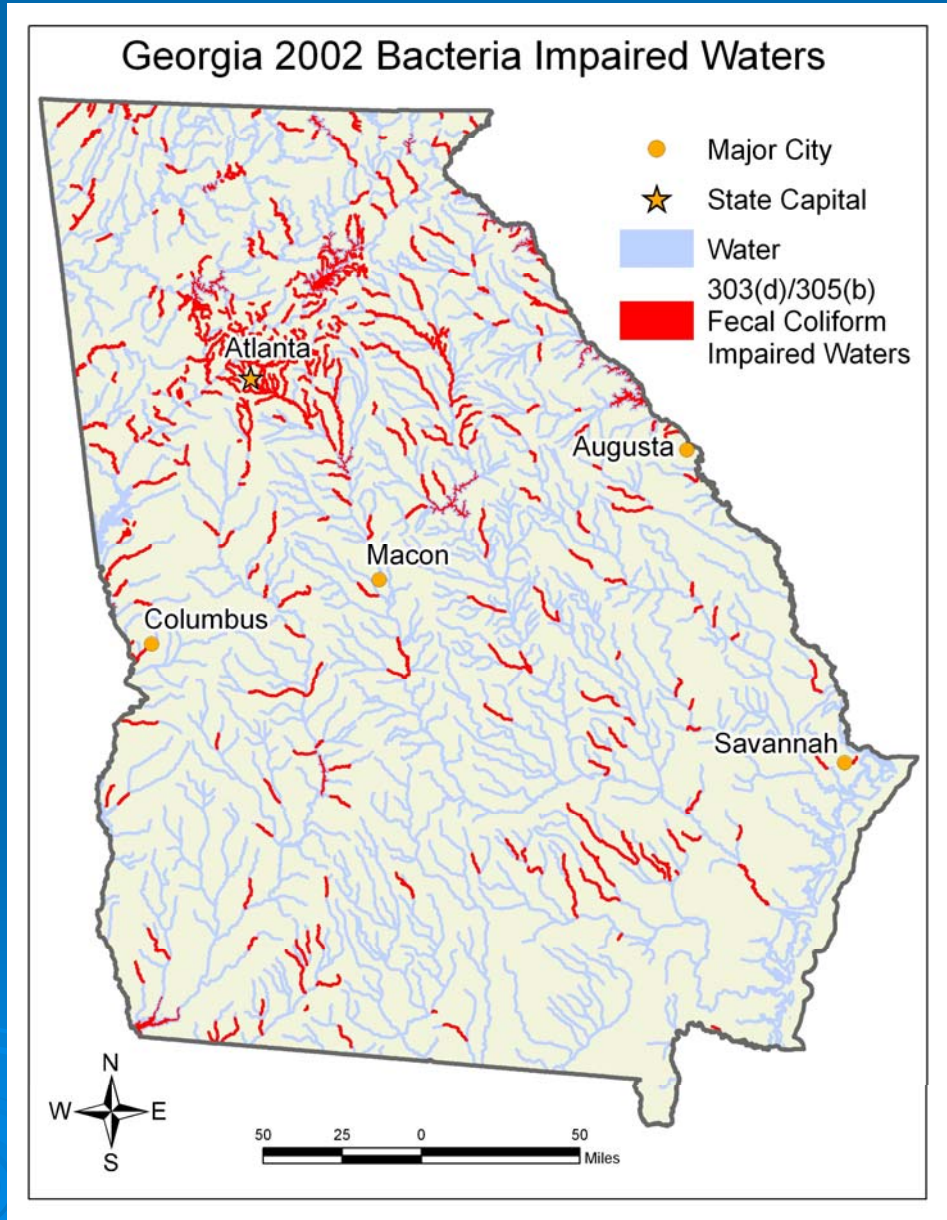
TAG History

- Georgia has over 800 impaired water segments
  - 6,500 mi. streams
  - 3 major reservoirs
  - 349 estuary acres



TAG History

- Georgia has over 435 Fecal Coliform impaired water segments
  - 3,200 mi. streams
  - 2 lakes
    - Plus 3 embayments on Lake Allatoona
  - 1 Estuary



TAG History

- TAG met 6 - 8 times a year 2003 – 2004
- Draft white paper is nearly complete

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Bacteria Standard

- Fecal coliform (FC) used as indicator of mammalian fecal sources
  - Current limit for most GA waters = geometric mean of 200 FC colony forming units per 100 milliliter (cfu/100mL)
- EPA recommends changing to different indicator bacteria
  - Freshwater
    - *Escherichia coli* (*E. coli*)
  - Marine waters
    - Enterococci
  - Better correlated with human illnesses than FC

Bacteria Standard

- Change in indicator organism raises a number of questions (we focus on the freshwater standard)
  - What should limit be for *E. coli*?
  - What are background levels of *E. coli* in Georgia streams?
  - What have other states done?

Bacteria Standard

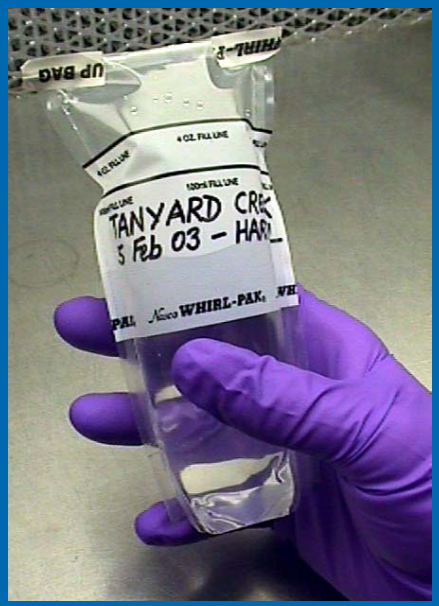
- What should limit be for *E. coli*?
  - Original FC standard of 200 cfu/100mL associated with risk of 8 illnesses per 1,000 swimmers in EPA epidemiological studies
  - *E. coli* concentration associated with 8 illnesses per thousand is 126 cfu/100mL
    - *E. coli* is a subset of FC so makes sense that *E. coli* < FC

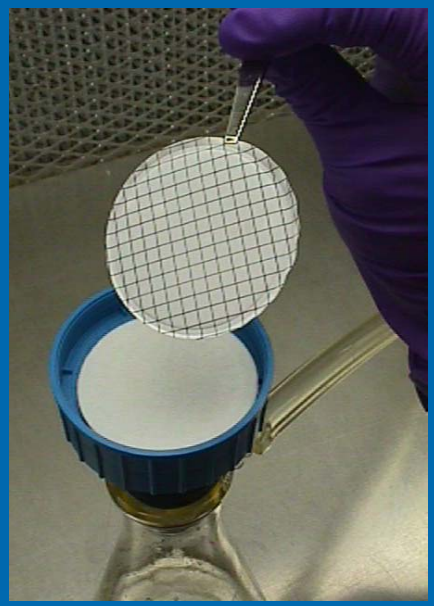
E. Coli vs. FC

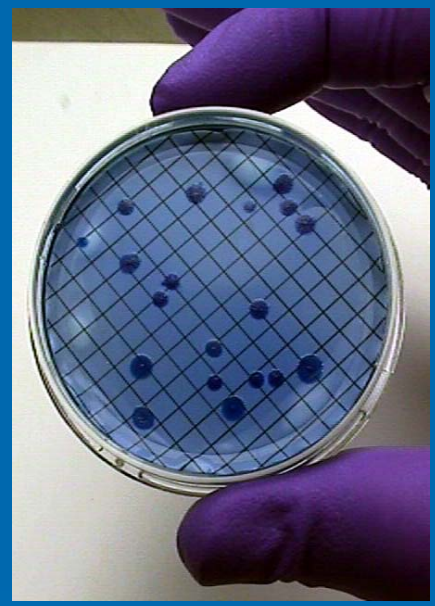
- How *E. coli* Is measured is important

- On 250 stream samples we measured
  - FC by membrane filtration
  - *E. coli* by 2 methods
    - Membrane filtration
    - Commercial most probable number method (IDEXX)

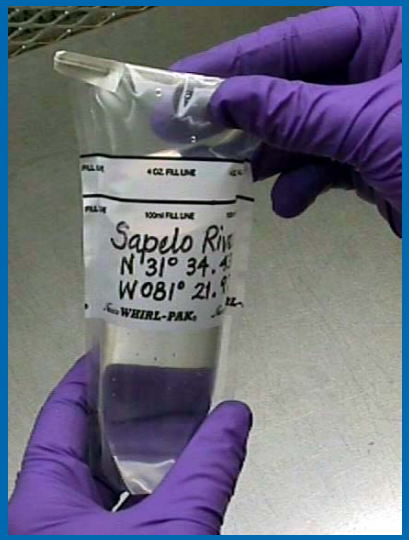
Membrane Filtration

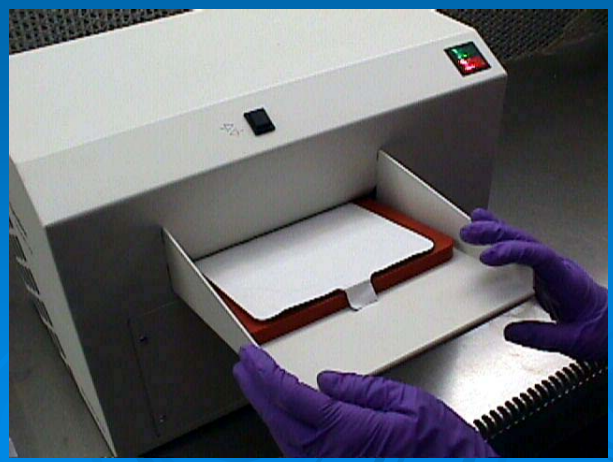




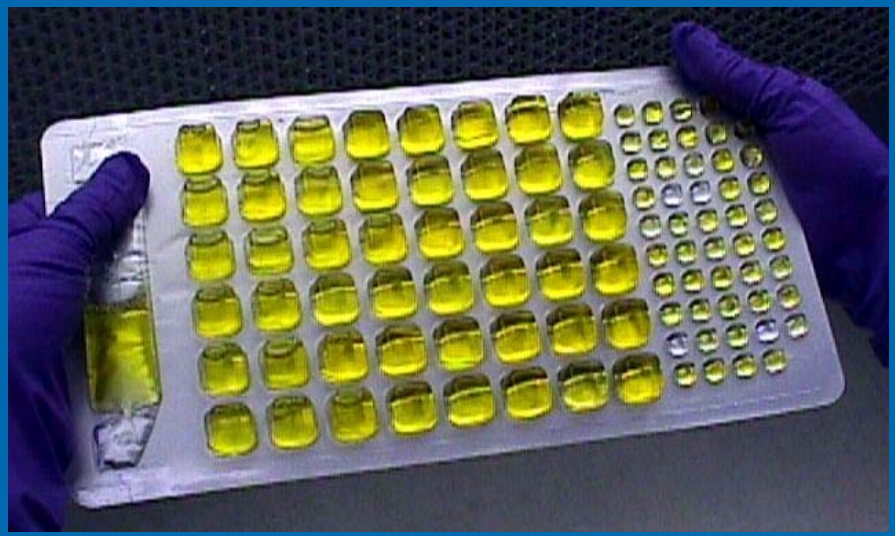


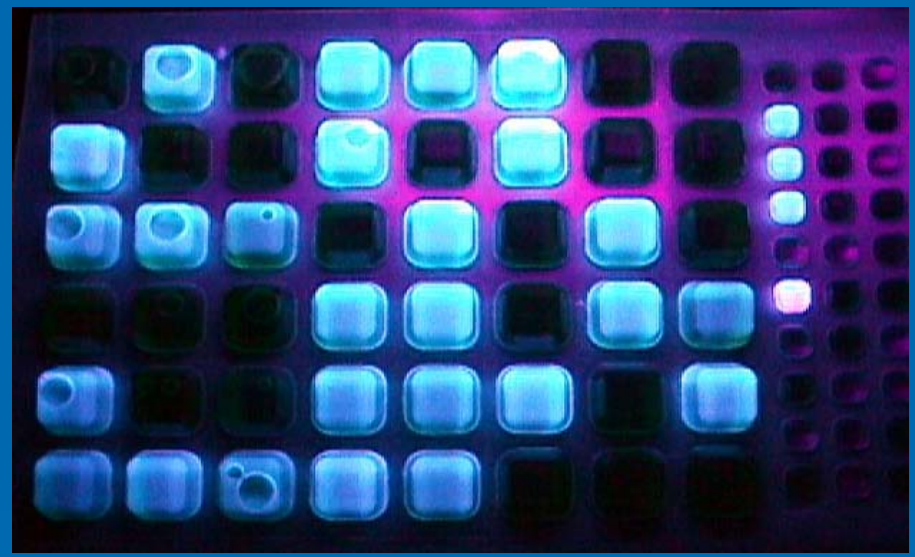
Most Probable Number (IDEXX System)





Most Probable Number (cont'd)
IDEXX System–24 hours later





IDEXX method is very popular because it is quick and easy compared to traditional (membrane filtration) method

= 26 large wells
4 small wells
= 44 fecal bacteria per 100 mL

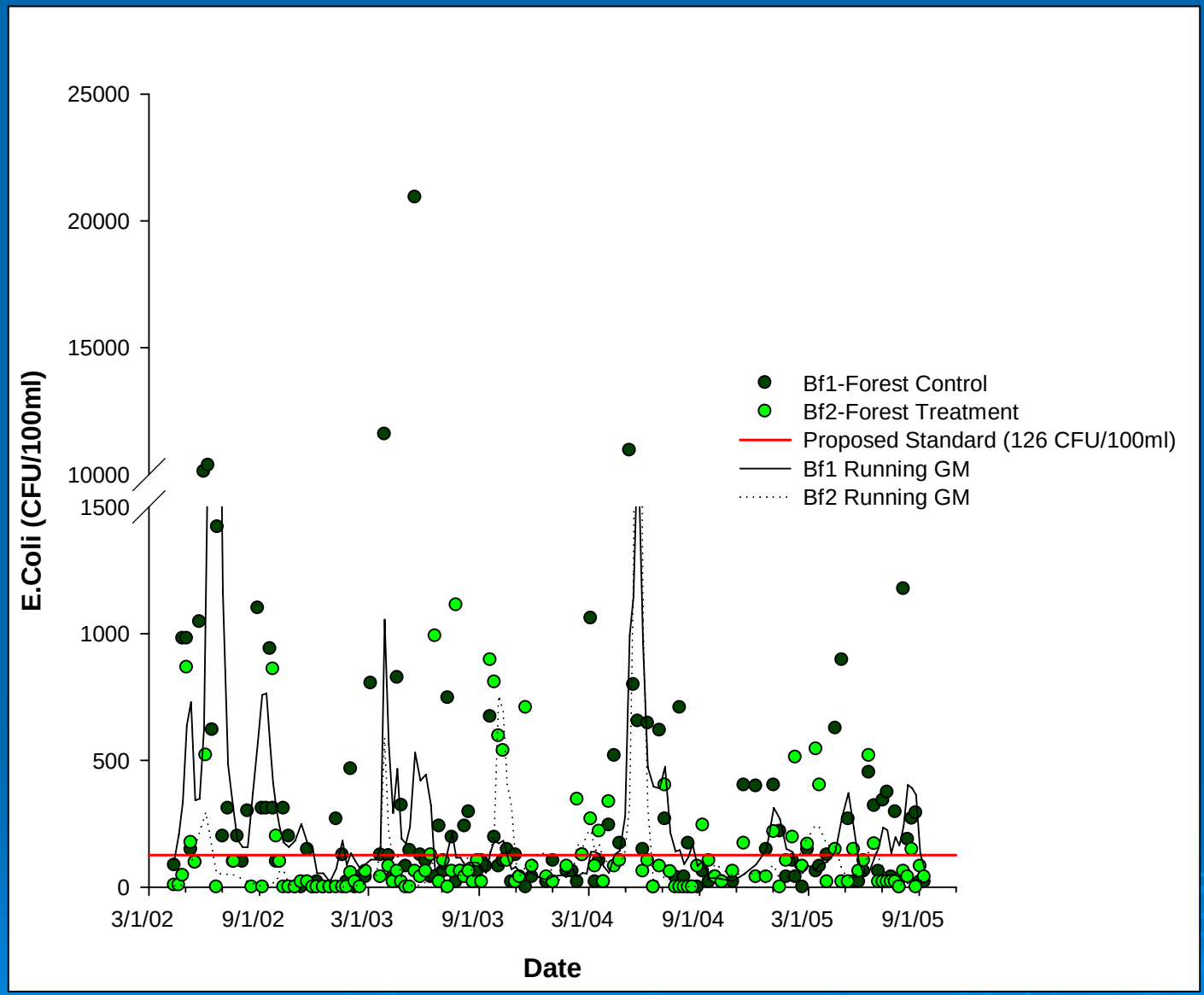
Bacteria Standard

- IDEXX method produced higher *E. coli* counts compared to membrane filtration (MF)
  - Appears that IDEXX method is “gentler” and counts “viable but not culturable” bacteria
- *E. coli* standard of 126 cfu/100mL is based on membrane filtration method
  - *E. coli* standards means states need to:
    - Specify that IDEXX method not be used
    - Develop a correction factor for IDEXX *E. coli*

What are Background Levels?

- Looked at studies that measured *E. coli* and/or FC in undeveloped (reference) streams

- *E. coli* exceeded standard for significant periods of time but were usually < 350-400 cfu/100mL



E. Coli concentrations in 2 forested (reference) streams

What Are Others States Doing?

- Most states in Southern Region still use FC standard
- Only 2 states have adopted *E. coli* standard
  - Tennessee
    - 126 cfu/100mL for recreation waters
  - Texas –
    - 126 cfu/100mL for contact recreation waters
    - 605 cfu/100mL for non-contact recreation waters

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Bacterial Source Tracking

- Bacteria source tracking (BST) assumes:
  - assumes sources have different bacteria subspecies
  - Intestinal conditions differ among animals and humans
  - Bacteria adapt to unique conditions

- BST Uses DNA analysis or antibiotic resistance to identify unique groups of bacteria from different sources

Bacterial Source Tracking

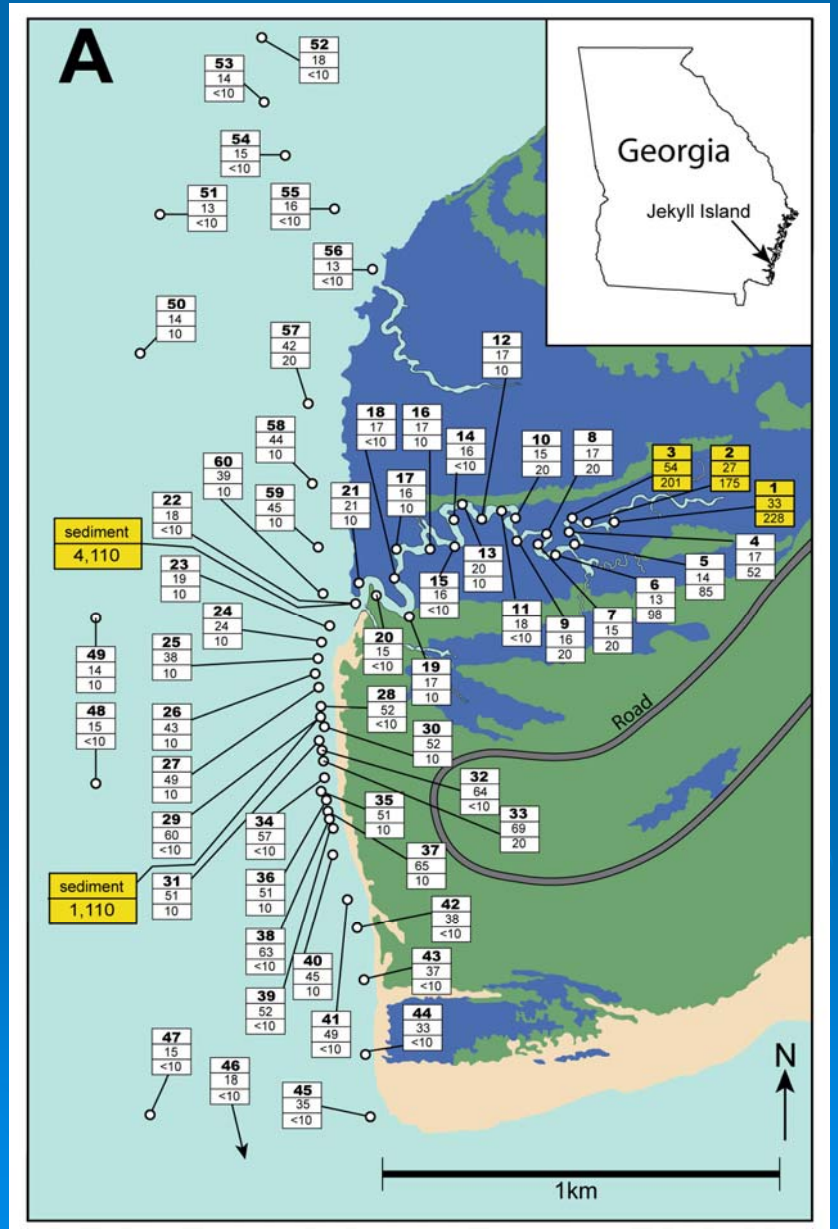
- BST database (“library”) must be developed
  - Sampling bacteria from feces of different animals and humans
- Sample can be taken from stream and identified with a source
- Problem is libraries developed in one region do not seem to work in other regions
  - Appears that each watershed will need to develop library
  - BST too expensive for most TMDLs

Targeted Sampling

- More practical approach is “targeted sampling”
  - Like children’s game of “hot” and “cold”
- Develop 50-100 sampling sites on stream
  - Sites above & below potential sources
  - Sites above & below confluences
- Sample all sites on same day

Targeted Sampling

- Targeted sampling
  - Peter Hartel, UGA
  - Jekyll Island, GA
    - near St. Andrews Park
      - beach closings are common
- Fecal enterococci (FE) as indicator
- Each location shows
  - site # (bold)
  - Turbidity
  - FE concentration
- Yellow indicates FE > 104 cfu/100mL
  - Source identified in tidal creek north of beach
- Sediment samples also high (yellow)



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TMDL Implementation

- GA EPD developed TMDLs
  - No implementation plan or identification of bacteria sources
  - Large load reductions called for
    - typically 50-90%
    - typically from non-point sources
- Regional planning agencies tasked with developing implementation plans & identification of sources
  - Atlanta Regional Commission (ARC)
    - metro Altanta region
  - Regional Development Centers (RDCs)
    - most other places
  - Private contractor
    - southwest Georgia
- Local governments to implement

TMDL Implementation

- ARC and RDCs have very limited resources (time and money) for developing plans
  - Plans developed so far do not identify sources
    - Call for detailed monitoring “specific sources of fecal coliform must be identified before action is required.”
  - Mainly rely on current programs encouraging voluntary use of BMPs to achieve target load
  - Nonspecific actions dependant upon monitoring results
- RDCs vary widely in effort and rate of success in implementing TMDLs
- TAG white paper
  - Highlights success stories
  - Identifies resource needs

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TAG Recommendations

- Adopt new bacteria standards
  - *E. coli* for freshwater
  - Fecal enterococci marine waters

- Divide current recreational waters into primary and secondary contact recreation waters
  - Primary contact waters:
    - High-use recreational waters such as beaches and parks
      - Most stringent standard *(E. coli* of 126 cfu/100mL*)*
  - Secondary contact:
    - Other recreational waters
    - Less stringent standard could apply

TAG Recommendations

- Change hold-times for bacteria samples
  - Allow 24 hours instead of current 6-hour limit
- Use single maximum standard & geometric mean standard
  - Represent storm flow conditions
- Consider EPA provision that allows designation of some waters as "Wildlife Impacted Recreation" and submit site-specific supporting data
  - Background levels due to wildlife in some primary recreational waters may exceed level associated with 8 illnesses per thousand swimmers

TAG Recommendations

- Specify IDEXX method cannot be used for enforcement monitoring, or develop correction factor
  - Yields different results from MF
- Reduce time that livestock spend in streams
  - Provide off-stream water sources, shade, and fence out streams
- Use targeted sampling to identify sources
  - Less expensive than BST

TAG Recommendations

- TMDL implementation process needs to be improved
  - Develop specific plans that will achieve large reductions called for in bacteria TMDLs
    - Much can be done by identifying potential sources
      - Focus on education
      - Require broad BMP implementation by land use activity
  - Identify specific sources
    - Over time with monitoring
  - Direct resources to local level
    - Funding
    - Technical support