Microbial Source Tracking
in Gainesville's Urban Creeks

April 2007
Results Summary

WB032007002GNV

Gainesville's Creeks

- **Three primary creek systems in Gainesville (Hogtown, Tumblin, Sweetwater Branch) are impaired by elevated levels of fecal coliform bacteria**
- **Fecal coliform are bacteria found in digestive tract of warm blooded animals (human and non-human) and used as an indicator of pathogens in water**
- **Bacteria is often elevated in urban areas (375 impaired water bodies in Florida due to high bacteria levels, USEPA)**



Gainesville's Creeks

- **Significant reductions in fecal coliform will be required to meet state water quality standards:**
  - **Hogtown Creek: 51% Reduction**
  - **Sweetwater Branch Creek: 70% Reduction**
  - **Tumblin Creek: 74% Reduction**

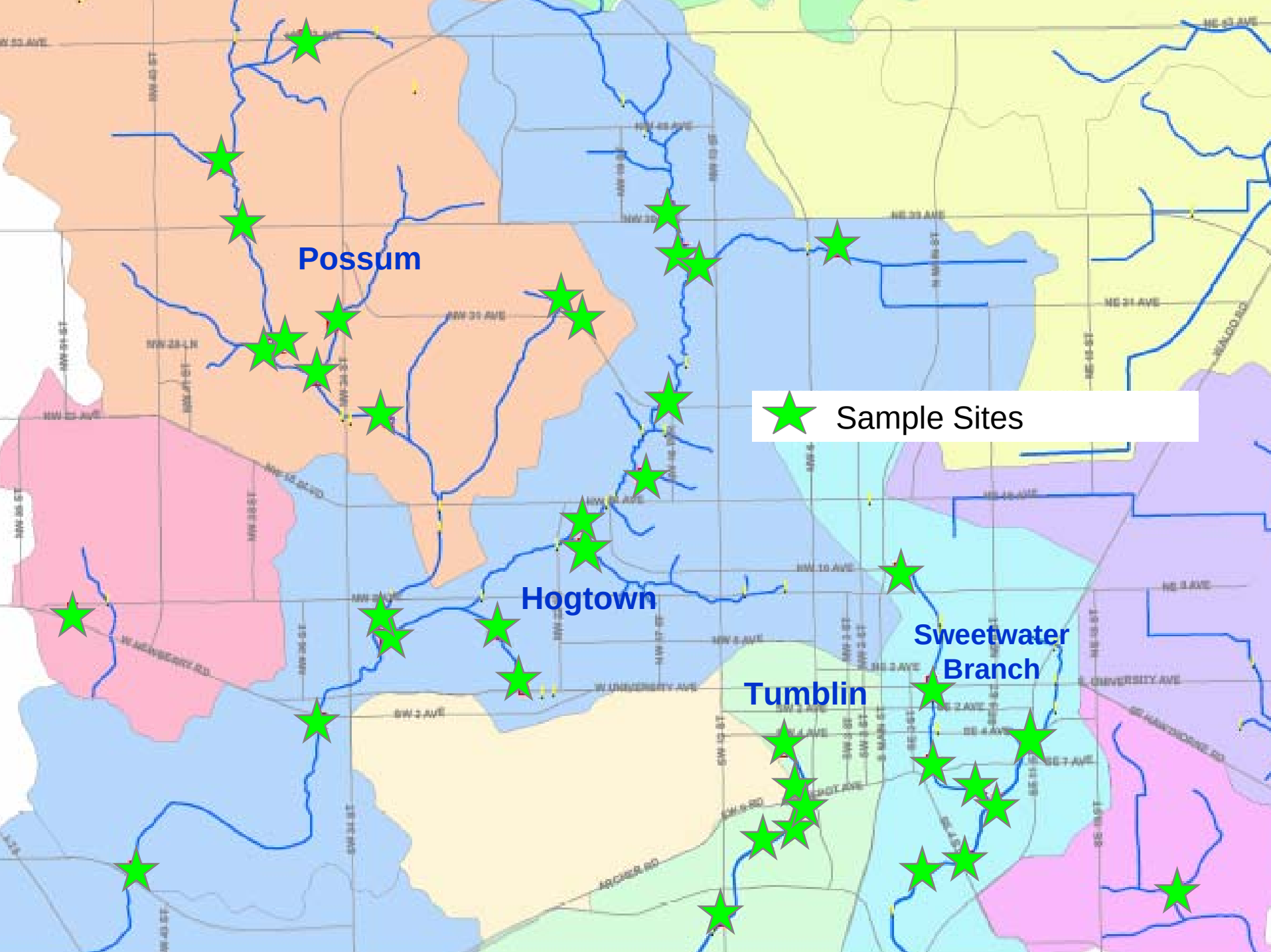
The Challenge

- **Local stakeholders have been working to eliminate sources of fecal coliform for several years**
- **Conventional testing methods don't reliably distinguish between sources**

Potential Sources

- **Exfiltration and releases from wastewater collection systems (public and private)**
- **Malfunctioning septic systems**
- **Direct human impact near creeks**
- **Domestic animals**
- **Wildlife**
- **Re-growth in a conducive environment**



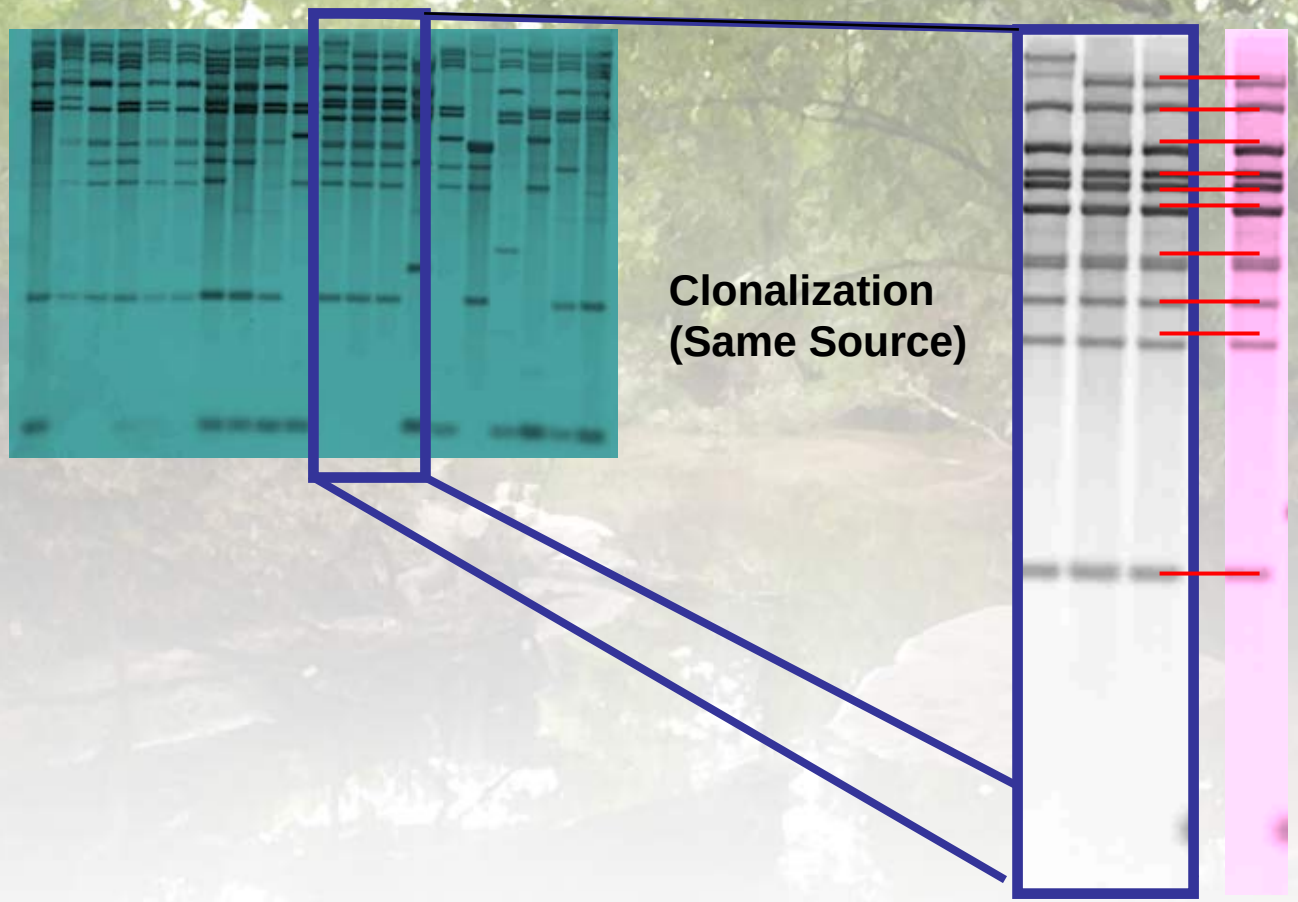

Possum
Hogtown
Tumblin
Sweetwater Branch
Sample Sites

Types of Advanced Testing Methods

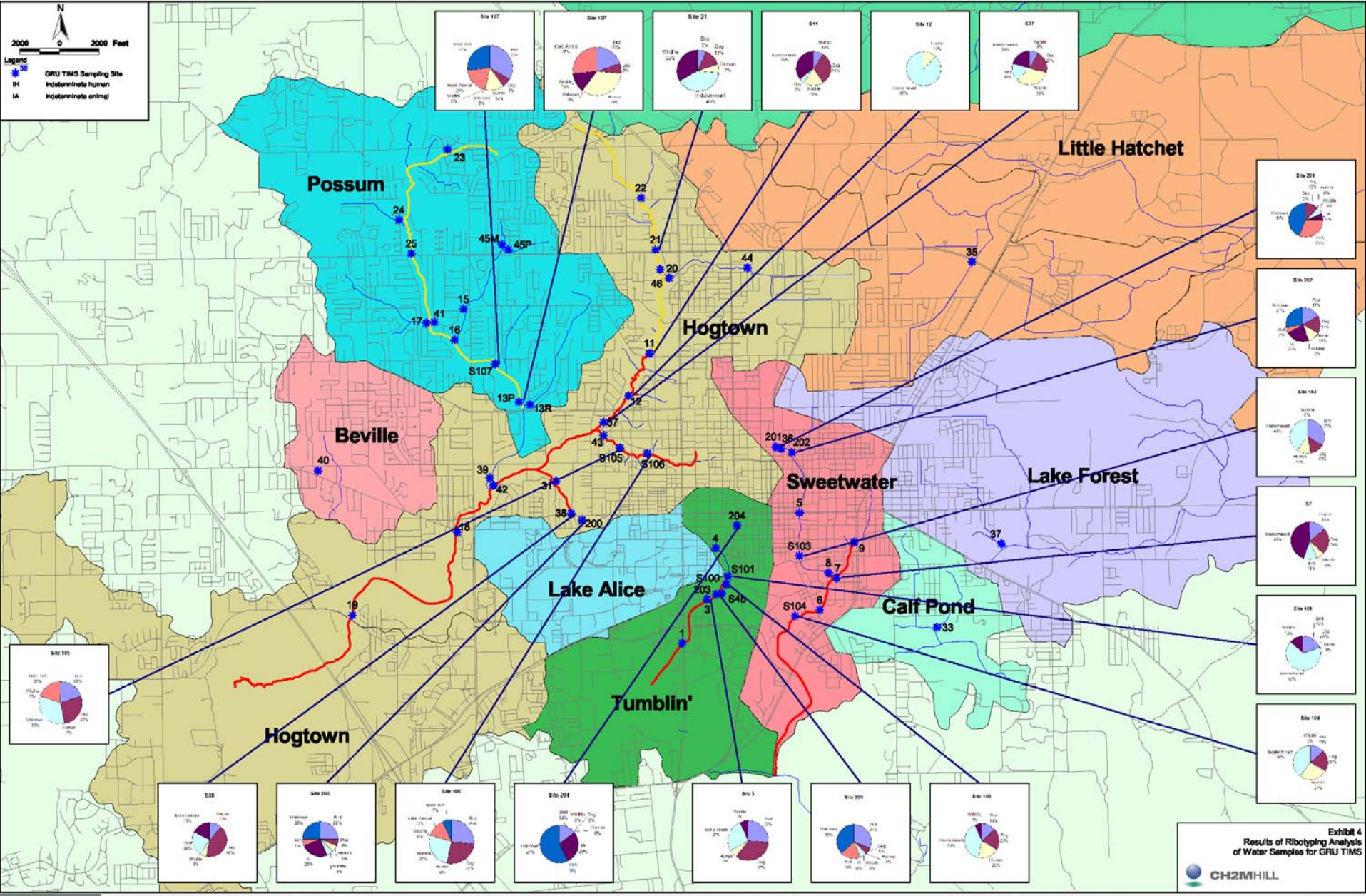
- **Ribotyping**
  - **Genetic Fingerprinting**
  - **Determines relative contribution from human and non-human sources**
- **Human Markers**
  - **Characterize human source**
  - **If present, is the source persistent (recent) or periodic (residual)**



Genetic Fingerprinting

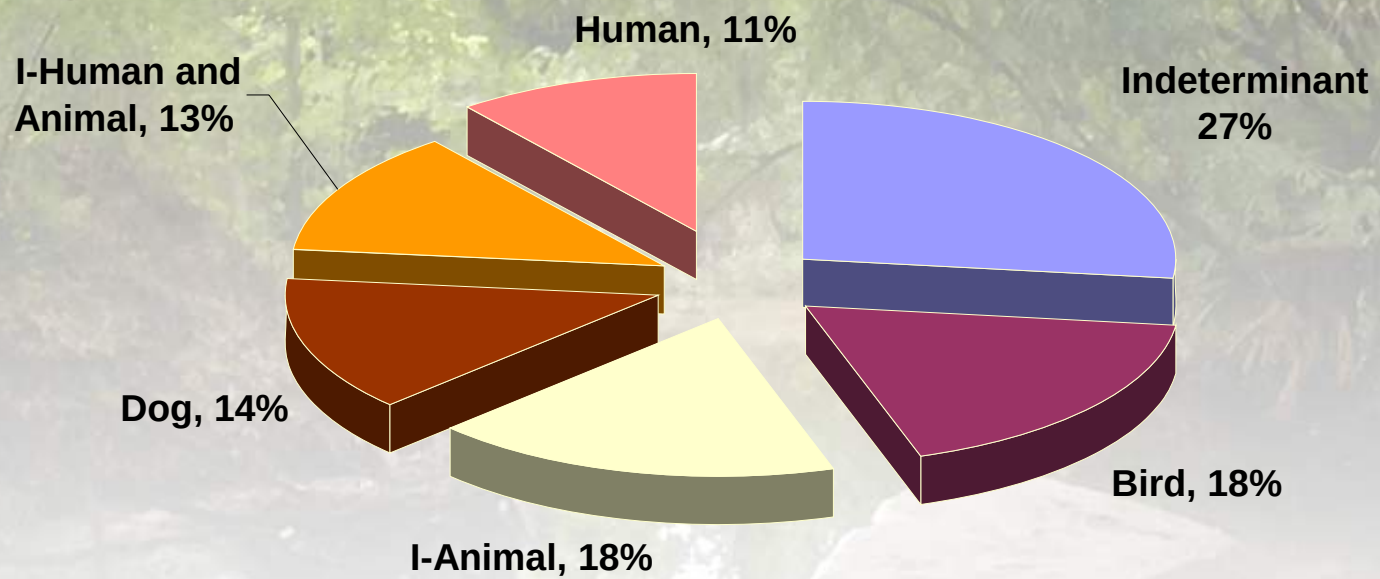


Source: Biological Consulting Services


N
2000 0 2000 Feet
Legend
GRU TIMS Sampling Site
IH Indeterminate human
IA Indeterminate animal
Possum
Beville
Hogtown
Little Hatchet
Lake Forest
Sweetwater
Lake Alice
Calf Pond
Tumblin'
Hogtown
Exhibit 4
Results of Ribotyping Analysis
of Water Samples for GRU TIMS
CH2MHILL

GRU

Summary of Coliform Sources in Gainesville's Urban Creeks



I- Human and Animal means an indeterminant mixture of these DNA species.

I-Animal similarly means only animal DNA species was in the mixture.

Toolbox Components

Exhibit 7 - Summary Characteristics of Genetic Markers Used

Type of Genetic Marker	Occurrence	Test Sensitivity	Fate in the Environment	Potential for Regrowth
Human enteric virus	Digestive system	Moderate	Persists in groundwater and surface water for 30 to 60 days	Does not re-grow in environment due to lack of host
Human Polyoma virus	Urinary tract	Moderate	Persistence in groundwater and surface water unknown	Does not re-grow in environment due to lack of host
Human Enterococcus	Digestive system	High	Can persist in surface water for 10 to 20 days	Regrowth in surface waters and sediments has been documented
Bacteroides	Digestive system	High	Rapid die-off in aerobic surface waters	Will not re-grow in aerobic environments



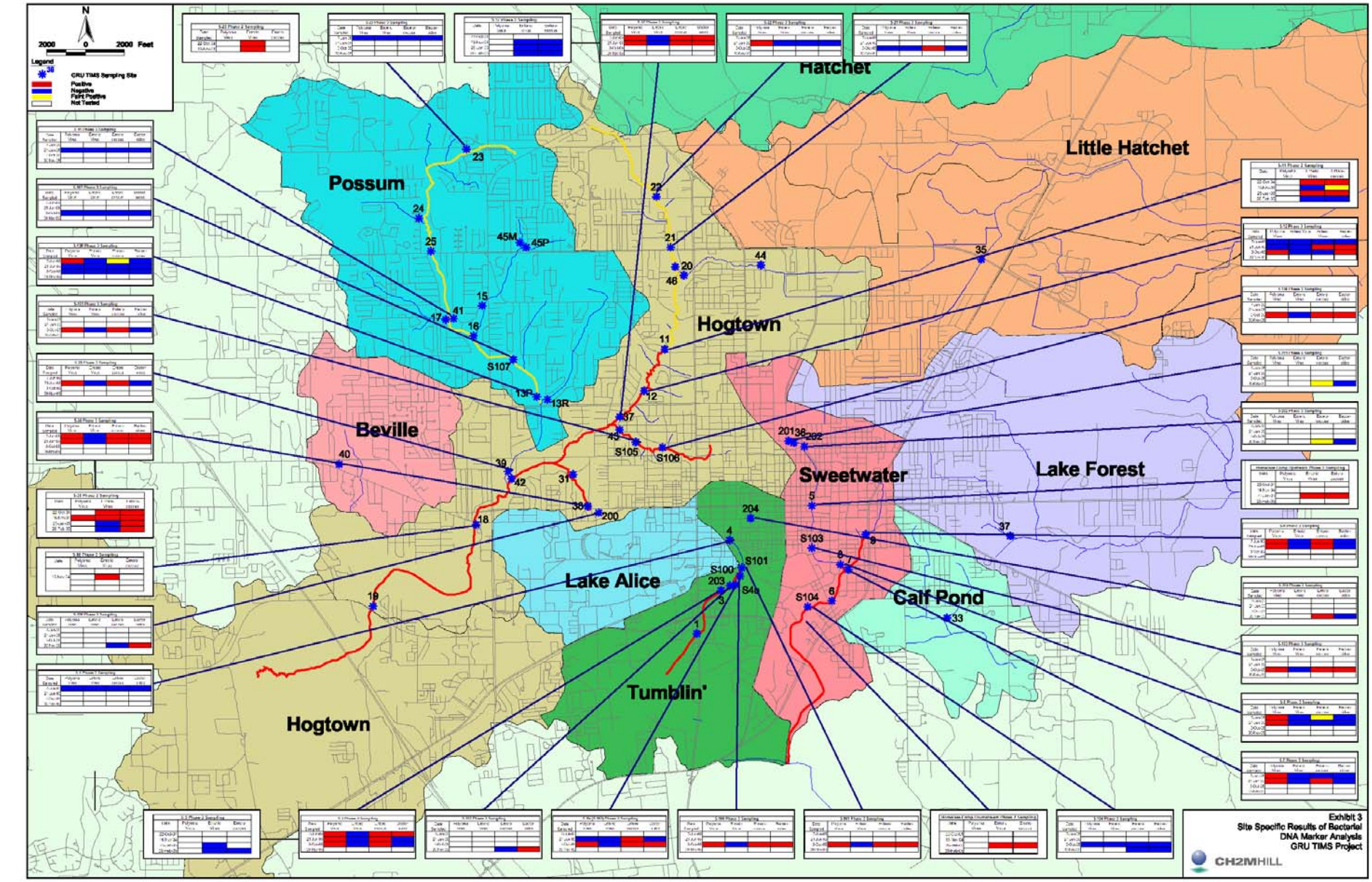
- **Toolbox to determine presence and persistence based on pattern of detected microorganisms in sample and the fate of the microorganism in the environment**

GRU

Toolbox Interpretation

Red means Positive Human Marker Result

Enteric Virus	Polyoma Virus	Enterococcus	Bacteroides	Recent or Residual Source
Positive	Positive	Positive	Positive	Recent
Negative	Positive	Positive	Positive	Recent
Positive	Negative	Positive	Positive	Recent
Positive	Positive	Negative	Positive	Recent
Negative	Negative	Positive	Positive	Recent
Positive	Negative	Negative	Positive	Recent
Negative	Positive	Negative	Positive	Recent
Negative	Negative	Negative	Positive	Recent
Positive	Positive	Positive	Negative	Residual
Negative	Positive	Positive	Negative	Residual
Positive	Negative	Positive	Negative	Residual
Positive	Positive	Negative	Negative	Residual
Positive	Negative	Negative	Negative	Residual
Negative	Positive	Negative	Negative	Residual
Negative	Negative	Positive	Negative	Residual
Negative	Negative	Negative	Negative	No human source



Red means Positive Human Markers

(not all sites tested every time, blank are no tests)

Human Markers Summary

- **Interpretive Toolbox improves search for persistent human sources**
- **Narrowed down seven locations where human markers are persistent**
- **Results paired with stakeholder knowledge of local conditions will be used to target solutions**
- **GRU is incorporating results into wastewater system integrity programs**



Leading the Way

- **Florida has taken the lead in implementing TMDLs**
- **Gainesville in one of first regions in Florida to address TMDLs**
- **Application of human marker toolbox is on the cutting edge of technology**
- **Presenting finding at National Conference this summer**



Conclusions

- **Application of advanced methods starts to break the bacteria problem in to manageable and solvable pieces**
- **Water quality standards for fecal coliform will not be met without addressing the animal contribution**
- **Human Marker Toolbox greatly improves targeting areas with human sources**
- **Stakeholder must collaborate to reduce fecal coliforms and meet TMDLs**



Path Forward

- **Stakeholders (ACDH, ACEP, CGPW, and GRU) are working together with FDEP to facilitate coordinated activities in targeted areas**
- **Results being incorporated into Basin Management Action Plans to address Total Maximum Daily Loads**
- **Incorporate advancing science into local efforts**



Questions

- **MST Project Team:**
  - **Gainesville Regional Utilities, Brett Goodman, Project Manager**
  - **Bill Dunn, Martha Klein, Mitch Griffin, and Tim Ptak, CH2M HILL**
  - **Troy Scott, Biological Consulting Services of North Florida (Gainesville)**