

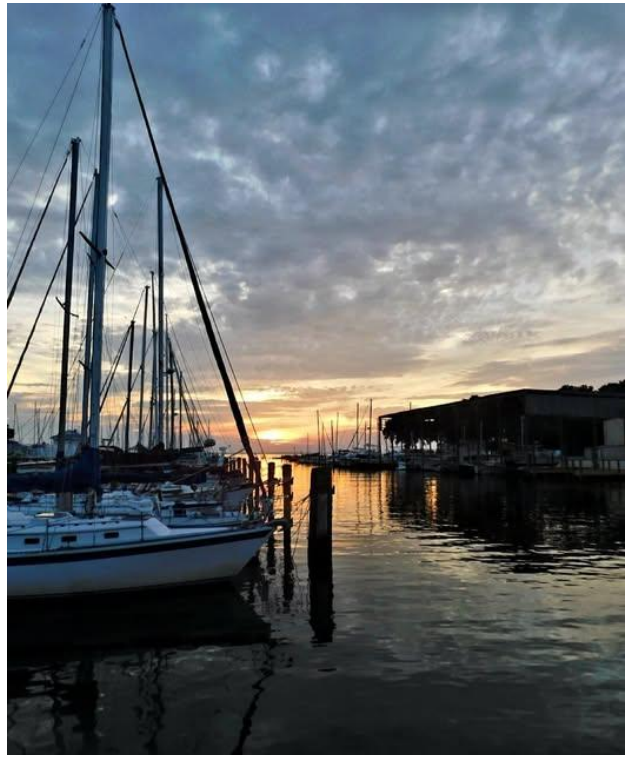
Mobile Bay National Estuary Program

Wastewater Detection Canine Program

Dauphin Island Sea Lab
Alabama Center for Marine Education and Research

Purpose

Assess the presence of human-associated wastewater contamination and to evaluate the operational performance of a trained wastewater-detection canine.







Goals

- Reduce the **time** and **cost** associated with traditional point and nonpoint source tracking methods

- Improve **efficiency** in identifying human-source wastewater pollution, enabling quicker response and mitigation

- Provide a **tool** for municipalities and organizations

Overview

- Train a canine to identify sources of sewage in our waterways
- Use the canine as a screening tool to detect regulatory levels of wastewater
- Facilitate better environmental management initiatives

Partners


Dauphin Island Sea Lab
Alabama Center for
Marine Education and Research


ADEM
Alabama Department of Environmental Management
adem.alabama.gov


USA
TM


FDA


ESA


XanO


MOBILE
ALABAMA


MOBILE COUNTY ALABAMA
ESTABLISHED 1812


ALABAMA DEPARTMENT OF PUBLIC HEALTH
1875


CITY OF FAIRHOPE
ALABAMA


UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

Veteran Led

Cody Aloi (Program Manager, MBNEP)

- United States Navy Veteran
- 15 years of canine experience



Canines on the Battlefield





Historical Uses





K-9 Utilization

- Police Work (Narcotics/Tracking)
- Search and Rescue
- Service Animals for Disabilities
- Virus Detection (Agriculture)
- Mental/Medical Health Assistance
- Emotional Support
- Messengers
- Sentry
- Wastewater Detection



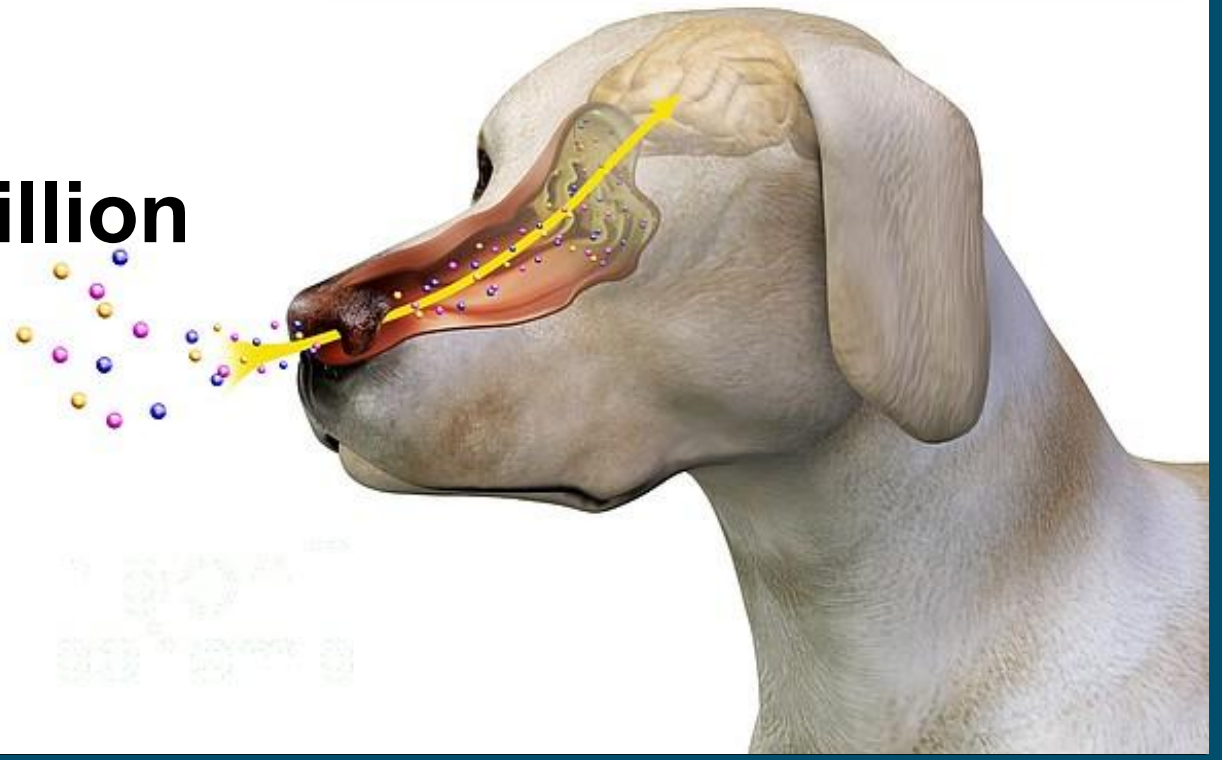




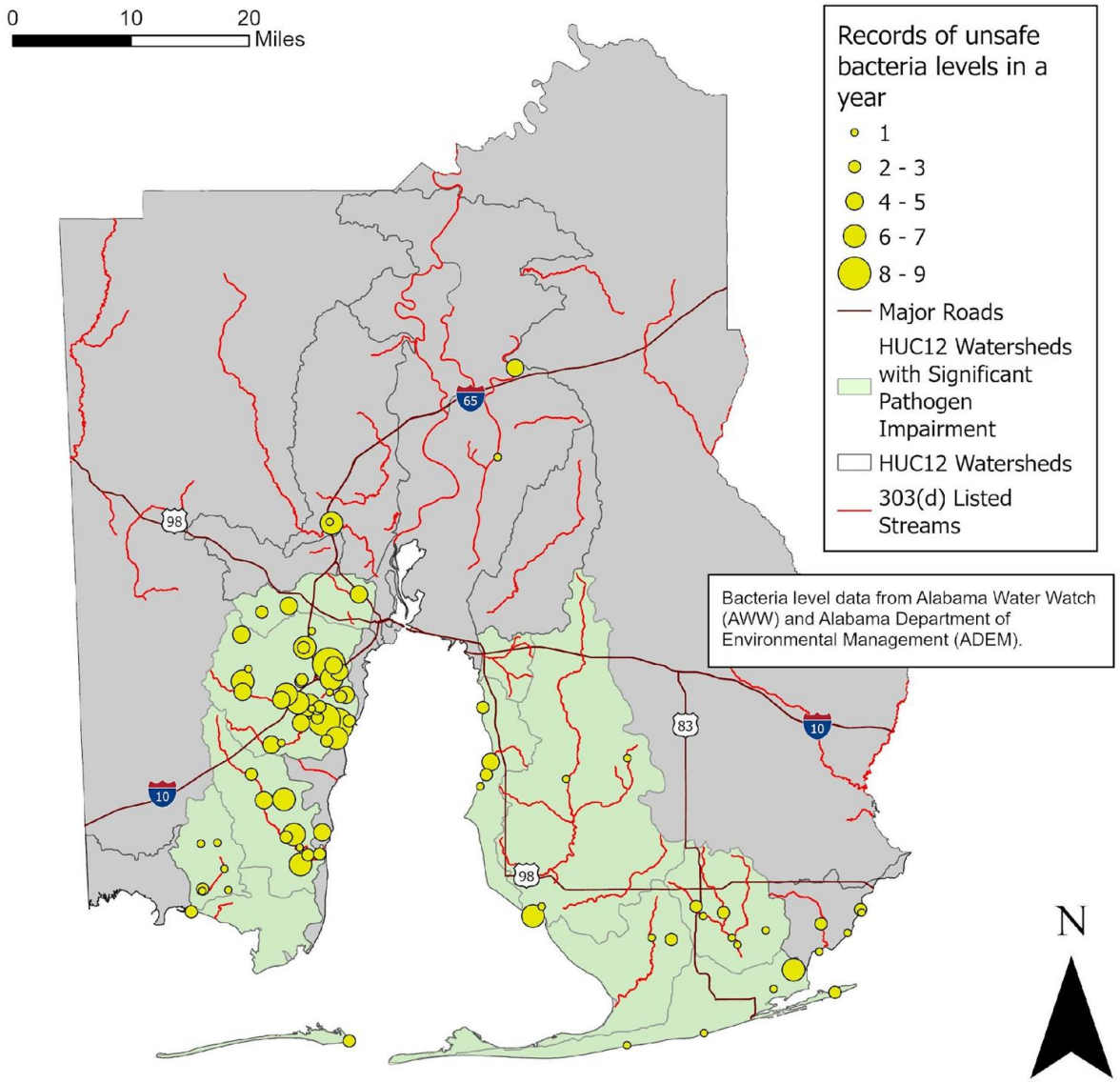
Canine Olfactory System

- 300 million olfactory receptors
- Olfactory region is 40 times greater than humans
- Scent detection parts-per-trillion
- Discrimination ability





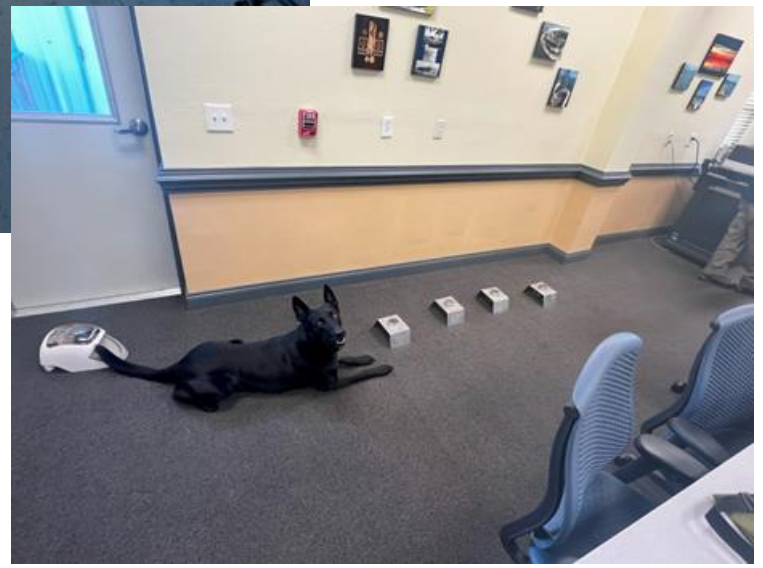
The Problem


0
10
20
Miles
Records of unsafe bacteria levels in a year
1
2 - 3
4 - 5
6 - 7
8 - 9
Major Roads
HUC12 Watersheds with Significant Pathogen Impairment
HUC12 Watersheds
303(d) Listed Streams
Bacteria level data from Alabama Water Watch (AWW) and Alabama Department of Environmental Management (ADEM).
65
98
10
83
10
98
N

Our Solution

Use the canine to screen samples, reducing excessive and expensive laboratory analysis





Accomplishments





- Double Blind Study – 99.4%
- Lower limit of detection: Nine orders of magnitude lower than current methods
- Operational Testing – 100% Accuracy (Fly Creek, Fairhope)
- Independent Certification – United Police Working Dog Association

UPWDA
UNITED POLICE WORK DOG ASSOCIATION

Methodology

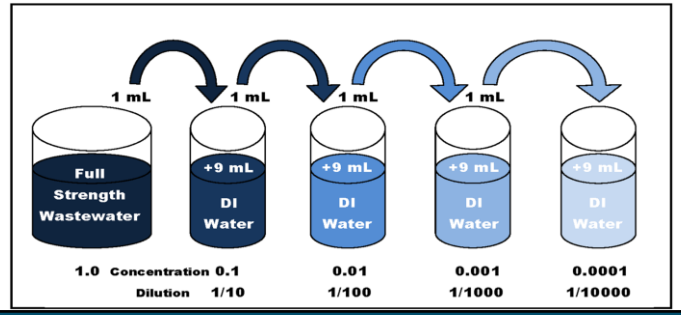
Raw wastewater samples collected from local municipal wastewater treatment plants

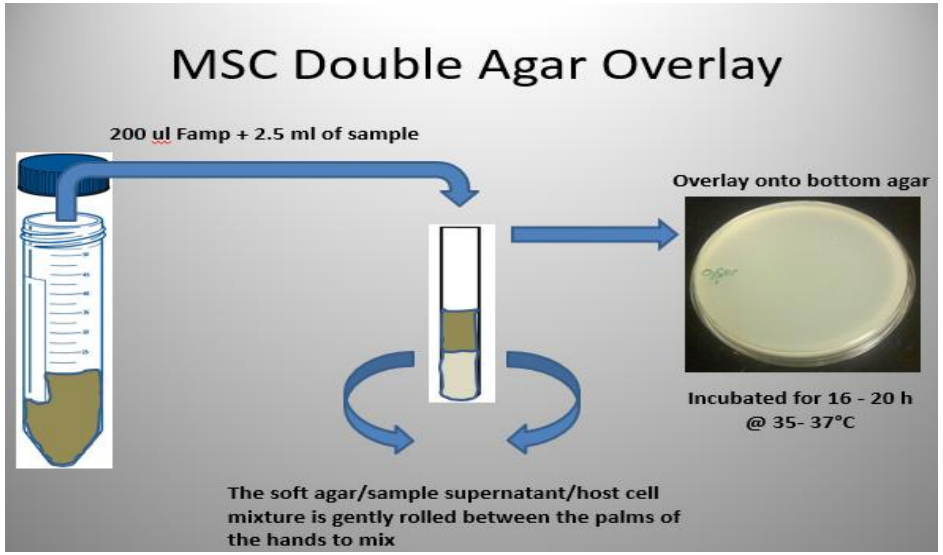
Samples combined and mixed

Microbiological analysis will be conducted for the enumeration of Fecal Coliforms (FC), *Escherichia coli* (EC) and Male-specific coliphage (MSC)

Impregnate raw wastewater scent into GETXENT tubes utilizing the SciK9 Impregnation Kit

Canine trained to detect raw wastewater







getxent



Quanti-Tray System

Canine Source Tracking Project Workflow



1 Site Selection

Identify priority locations throughout the Fly Creek watershed.

2 Review Existing Data

Evaluate existing water quality data, sewer maps, and previous reports to guide sampling strategy.

3 Field Collection

Collect water samples from targeted locations in Fly Creek.

4 Canine Screening

Screen samples using a trained wastewater-detection canine.

5 Laboratory Analysis

Analyze samples in the laboratory to detect wastewater markers.

6 Results & Comparison

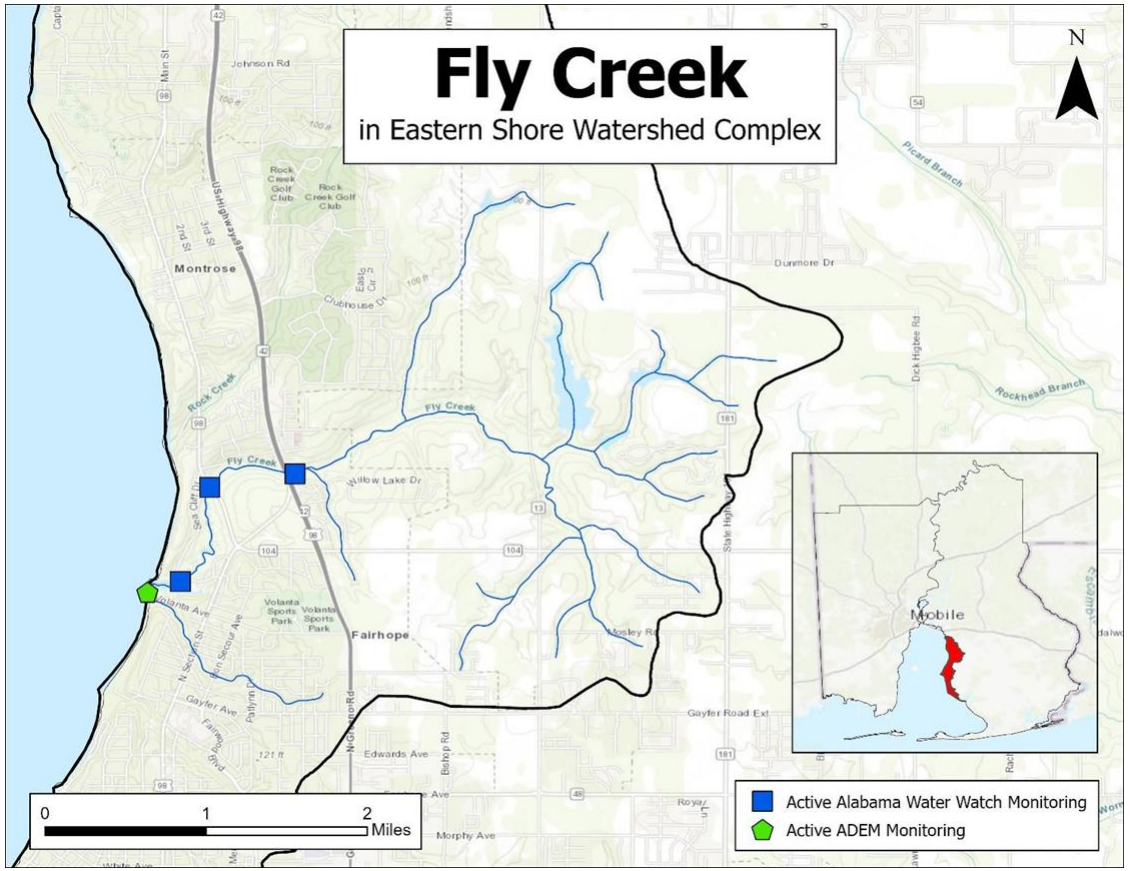
Compare canine results with lab results to evaluate accuracy and performance.

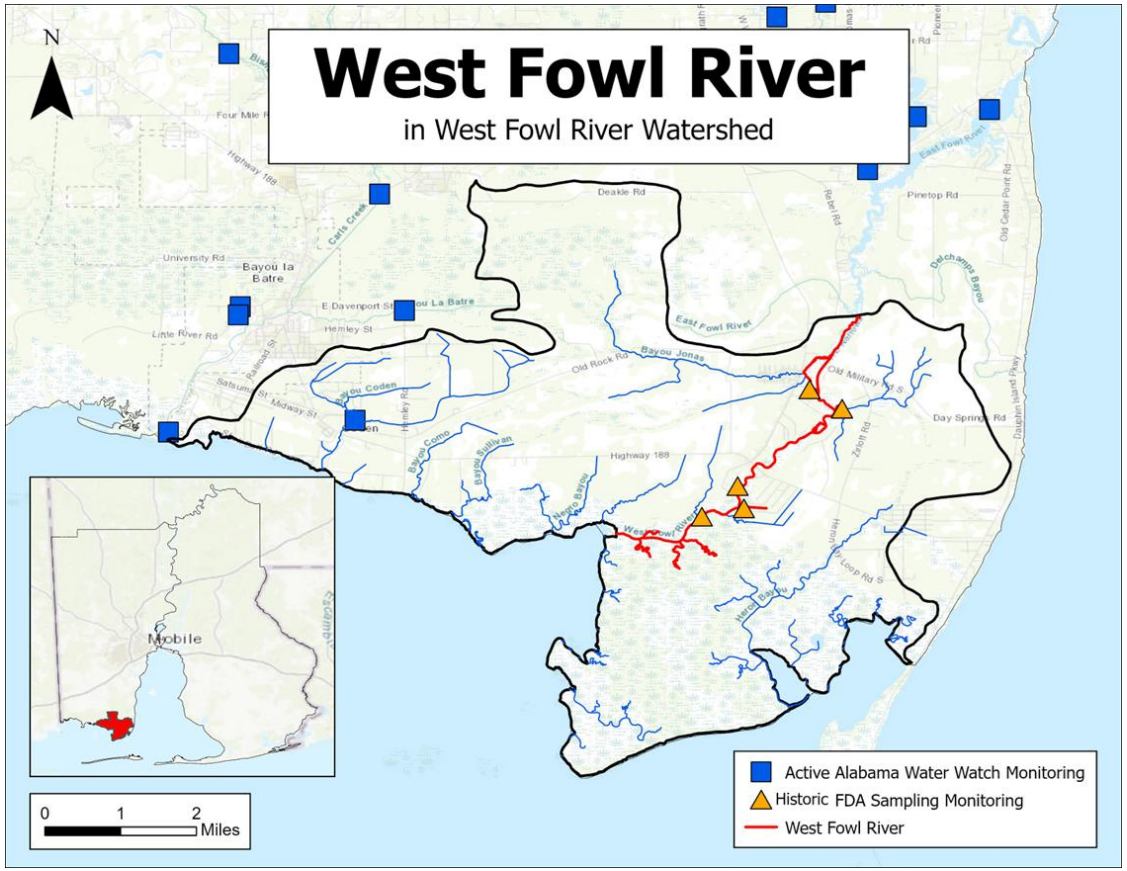
7 Interpretation & Next Steps

Interpret findings and recommend next steps for future wastewater source tracking efforts.

Use results to refine strategy and guide future monitoring.

Where?


Fly Creek
in Eastern Shore Watershed Complex
N
Montrose
Fairhope
Fly Creek
Rock Creek
Rockhead Branch
Picard Branch
Dunmore Dr
Willow Lake Dr
Gayfer Road Ext
Edwards Ave
Morphy Ave
Mobile
0 1 2 Miles
Active Alabama Water Watch Monitoring
Active ADEM Monitoring


West Fowl River
in West Fowl River Watershed
N
Bayou la Batre
East Fowl River
Bayou Jonas
Bayou Coden
Highway 188
Deakle Rd
Pinetop Rd
Mobile
0 1 2 Miles
Active Alabama Water Watch Monitoring
Historic FDA Sampling Monitoring
West Fowl River

Site Selection/Existing Data Review

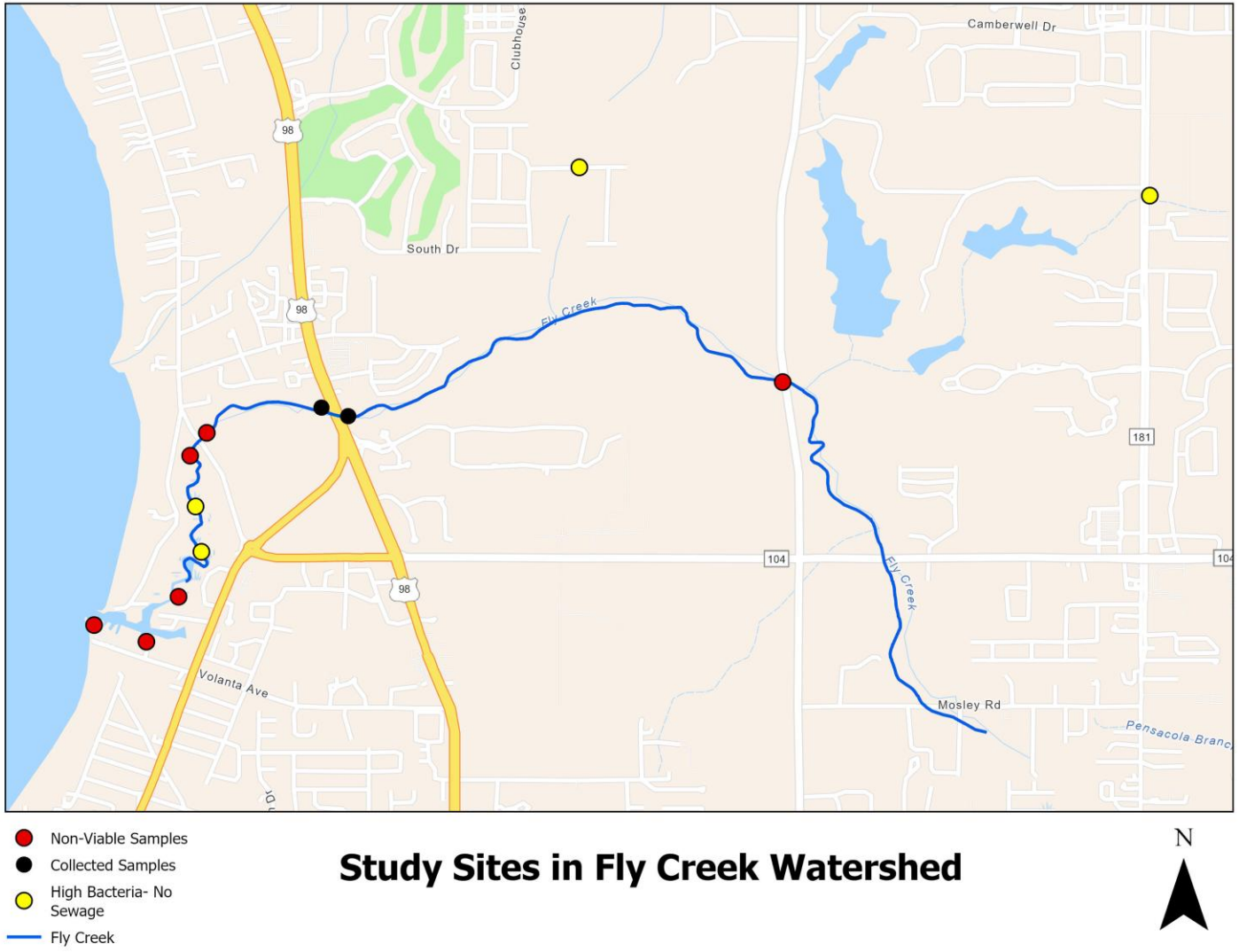
Sites were selected using existing water quality information from:

- Mobile Baykeeper Swim Report data
- Alabama Water Watch data
- ADEM data
- Satellite data
- Walk through



These sources helped identify areas with recurring bacteria concerns and public-use relevance.

Field Collection



Canine Screening

- Samples were screened using a single-blind process.
- The handler did not know which samples contained wastewater.
- This ensured the canine results were based on odor detection, not handler influence.



Laboratory Analysis

E. coli Testing
Shows when bacteria levels are elevated.

MSC Virus Testing
Helps identify whether human wastewater may be present.



Why It Matters: Bacteria test shows possible problem areas MSC indicates whether the problem is likely human-derived.

Together, the lab results validated the canine results

Laboratory Results

Note: the four locations with the highest bacteria counts also had the lowest values for the coliphage viruses

Sample Location	*E. coli* (MPN/100 mL)	Male-specific Coliphage (PFU/100 mL)
FCMO	360.9	<5
FCSP	721.5	TNTC
FCDH	25.4	TNTC
FCDT	**2,419.6**	**<5**
FCBA	**2,419.6**	**<5**
FCSW	123.4	TNTC
FCSE	133.4	TNTC
FCCS	533.5	<5
FCHN	516.3	<5
UTHR	**2,419.6**	**<5**
FCCT	8.4	TNTC
FCHO	**2,419.6**	**<5**

Canine Results

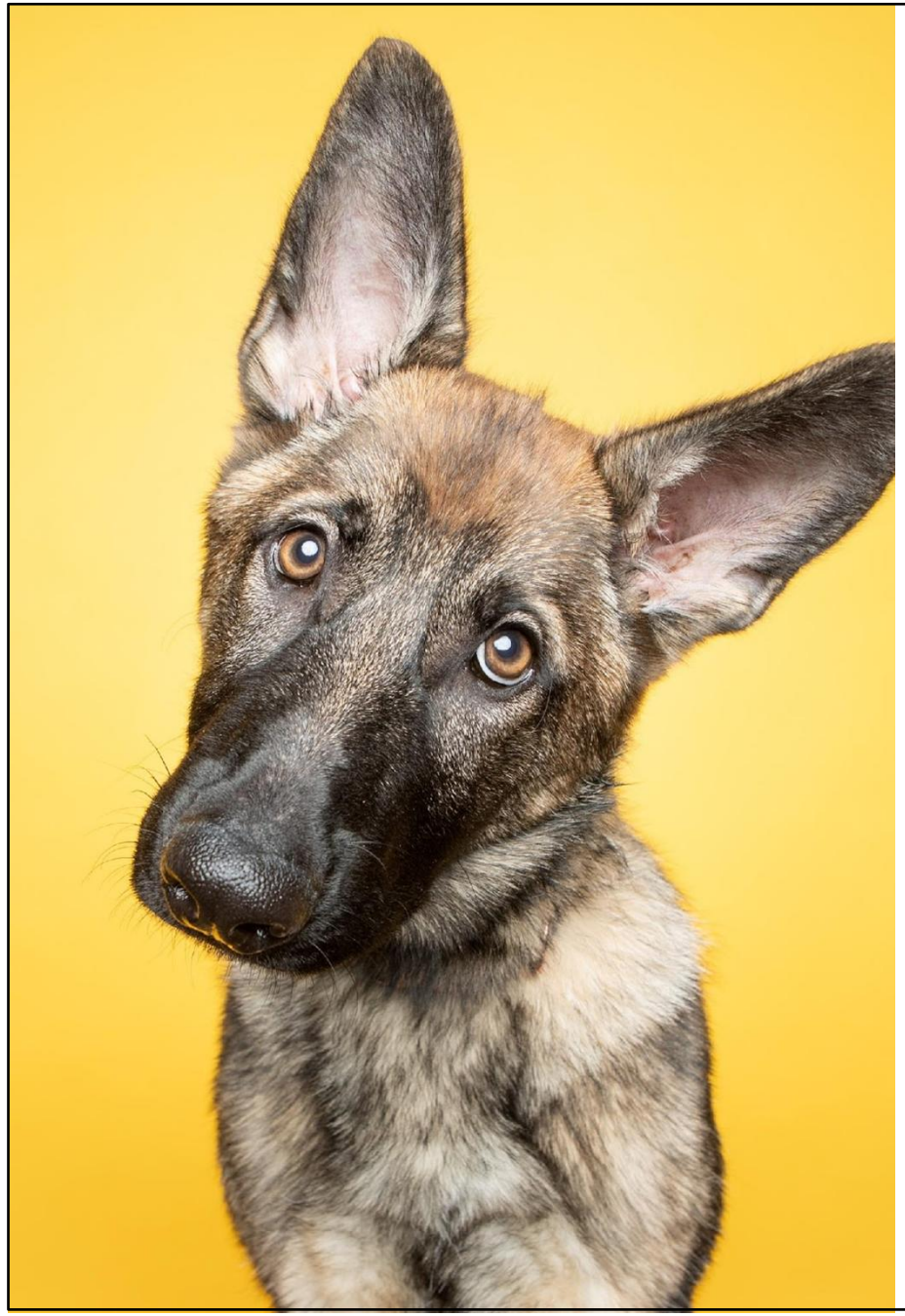
Note that the canine did not respond to the four locations with high bacteria
FCDT, FCBA, UTHR, FCHO

But…the canine DID respond to spiked samples
SHS2 & SHS1

Sample	Canine Response	Response Type
Blank	Neg	NA
FCDT	Neg	NA
FCHO	Neg	NA
Blank	Neg	NA
FCCS	Neg	NA
SHS2 (Spiked)	Pos	Strong
FCMO	Neg	NA
FCBA	Neg	NA
SHS1 (Spiked)	Pos	Strong
Blank	Neg	NA
FCHN	Neg	NA
Blank	Neg	NA
UTHR	Neg	NA

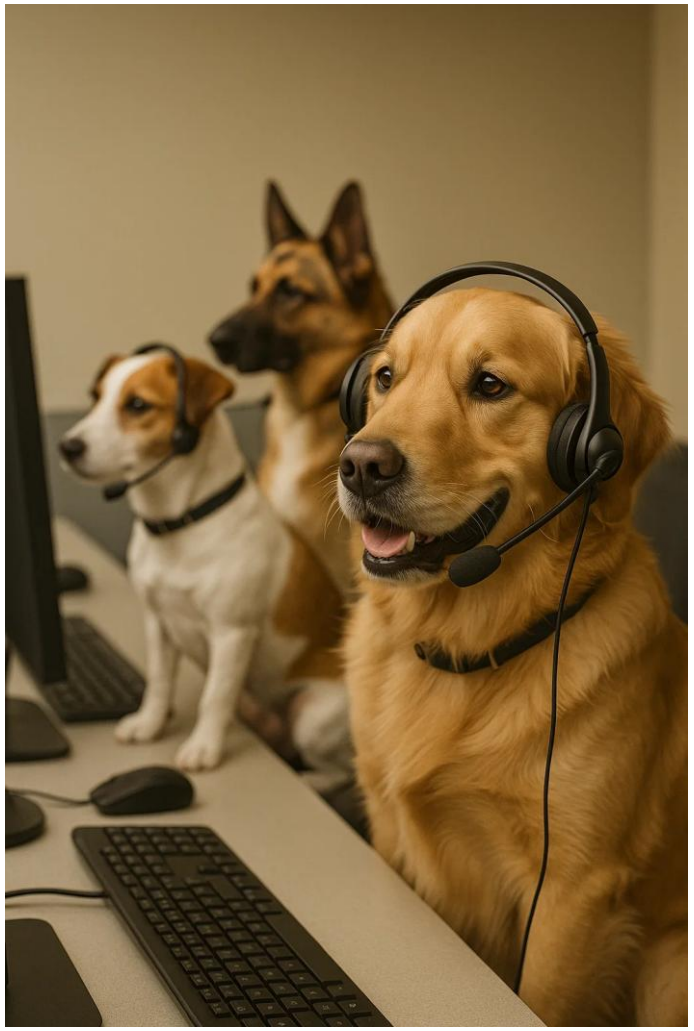
Next Steps

- **Now:** Collect Additional Data
- **Next:** Validate for Municipality Use
- **Later:** Scale and Operationalize



QUESTIONS?

Contact Information



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