Mobile Bay National Estuary Program
Wastewater Detection Canine (WDC) Program

Professor "X" Wastewater Detector Canine

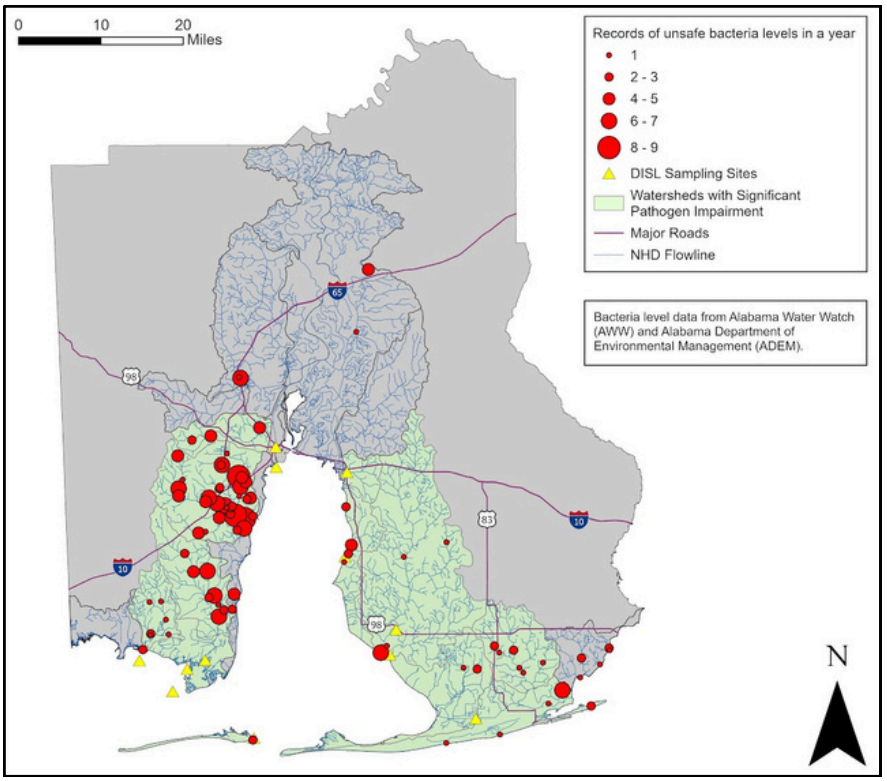
For millennia, canines have earned the moniker "man's best friend" time and time again. More recently, the U.S. Military has utilized canines to detect one of the deadliest threats faced by soldiers: improvised explosive devices (IEDs). Dogs possess roughly 300 million olfactory receptors - compared to around 5 million in humans - making them uniquely suited for sensing otherwise nearly undetectable substances, such as these deadly devices.

Building on the canine's exceptional olfactory capabilities, the Mobile Bay National Estuary Program (MBNEP) has initiated a proof-of-concept project that leverages the expertise of combat veterans employed by the MBNEP to train dogs to detect human sources of wastewater.

Wastewater contamination is a significant environmental challenge in MBNEP's service area and is a persistent global issue. Traditional methods for tracking wastewater contamination are time-consuming and costly, representing a major obstacle to achieving clean water.

Purpose and Goals

- **Reduce time and cost** associated with traditional Point and Nonpoint Source Tracking methods..
- **Improve efficiency** in identifying sources of human-source wastewater pollution, allowing for quicker response and mitigation.



Unsafe bacteria levels indicated by Alabama Water Watch and ADEM (red circles).

Experimental Design and Innovation

Raw wastewater samples from local treatment facilities were used to create a training aid for imprinting the canine. Samples were combined and homogenized to develop training aids. Combined wastewater was analyzed, diluted to relevant regulatory levels (per ADEM and EPA thresholds for swimming and full body contact), and presented to the canine.

TADD Canisters

TADD

The WDC Program has utilized TADDs (Training Aid Delivery Devices) to ensure high-fidelity training. These devices allow odor molecules to escape, providing the canines with an accurate scent picture, but do not allow outside odors to infiltrate the device.

GETXENT Tubes

GETXENT

Another innovative program design is the use of GETXENT tubes to assist with scent imprinting the canine. GETXENT tubes are made of a polymer capable of "creating a snapshot" of a target odor profile through the adsorption of volatile organic compounds. The adsorption technology prolongs the shelf-life of aromatic compounds in the wastewater training aid, enhancing cost-effectiveness and allowing for ease of scalability.

Enumeration of fecal coliforms and male-specific coliphage (MSC) has allowed us to determine concentrations of bacteria and viruses present within training aids and their associated odor profile. Fecal coliforms and MSC are an effective pairing of microbial indicators for human-sourced wastewater, based on past studies by the FDA. Enumeration steps enable the team to ensure the presence of wastewater-associated bacteria at levels relevant to regulation before presenting the training aids to the canine for imprinting.

Cost and Time Saving Measures

The operating costs for canine tracking are at least one order of magnitude lower than those for lab-based microbial source tracking initiatives. Coupled with the significant decrease in the time it takes to detect sources of human wastewater, the WDC program holds great potential for significant savings in all areas of source tracking.

Achievements

- A double-blind study in a controlled setting was conducted in early 2025. The study included 10 trials. Each trial involved three wheels of six scents, for a total of 18 odors per trial. Scents were labelled with a code identifier and included distractors (ex: coffee, lavender oil, detergent), probes (treated wastewater, skatole – a compound found in all mammal feces, cow manure), controls (ex: DI water, water wipe, nitrile glove, empty TADD, untreated GETXENT tube), blanks (empty cans), and target odors (undiluted wastewater, diluted wastewater, undiluted wastewater GETXENT tube, diluted wastewater GETXENT tube). Results from the double-blind study indicated that **the canine alerted to wastewater at 99.6% accuracy.** The canine only "false- indicated" once during the 8-hour study on 180 nose-to-odor interactions (final trial – DI water).

- A threshold test was conducted to find the lower limit of detection for the canine. Through a single blind study, we determined that **the canine is more sensitive than the lower limit of detection** of current analytical methods by 9 orders of magnitude (10 -5 : LOD for MSC test vs 10 -14 :LOD for canine).
- Another product of the canine pilot project is an independent certification program administered by the United Police Working Dog Association.
- During a Canine Environmental Assessment in August 2025, X alerted to samples with regulatory levels of raw sewage, and did not alert to any distractors. The goal of the test was to evaluate whether canine X reliably detects a positive sample collected from a contaminated waterway within a mixed-distractor wheel and confirm discrimination from blanks and non-target odors. **X's accuracy rating was 100%**

Next Steps for 2025:

- Resuming field sampling in September when temperatures are more suited for indicator microbes to be detectable.
- Seeking additional funding opportunities to determine further the fiscal and logistical feasibility of canine source-tracking studies.
- Testing the canine against septage (SME indicates the canine should be able to do this currently).
- Identifying other watersheds within the MBNEP service area to test in 2026.
- Begin preparation of manuscript on our findings.

Project Partners

This project couldn't have been possible without the support of our partners.