

Spatiotemporal Dynamics Of Aquatic Fecal Microbes In Subtropical Mixed-use Coastal Watersheds In Pensacola Bay System NW Florida.

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OBJECTIVES:

- To identify the impact of land use and, seasonal change on fecal bacteria
- To assess the level of fecal contamination in Pensacola and Perdido Bay watersheds using FIB enumeration and nutrient pollution.



Figure 1. Illustrates areas impaired by fecal bacteria in the Pensacola and Perdido Bay system.

INTRODUCTION:

Northwest Florida depends on its thriving coastal tourism because of its renowned recreational beaches, activities, and seafood industry. This study area is prone to frequent severe storm/ rainfall events and natural disasters. Increased rainfall and resultant runoff coupled with poor and/or outdated sewage/septic systems may lead to high runoff of these pollutants and subsequent impairment of the Perdido and Pensacola bay and estuaries. Spatial and temporal variation, LULC, and seasonal change all appear to affect the fate, transport, and delivery of these pollutants into these aquatic systems. Given the potential for illness, death, and the devastating nature of infections caused using fecal-impaired water, it is crucial to properly comprehend the cause and effect that control the dispersal of FIB pathogens and nutrients.

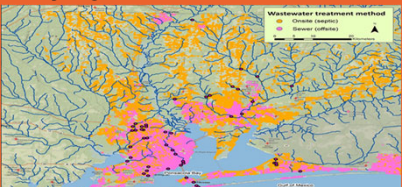


Figure 2. Illustrates study sites with sewer and septic systems nearby.

Study area: 50 sites were sampled throughout Escambia and Santa Rosa Counties in NW Florida. Grab water samples were taken in duplicates using polypropylene bottles from January 2022- December 2022.



Figure 3. Illustrates study area and sampling stations in NW Florida and their land uses.

METHODOLOGY:

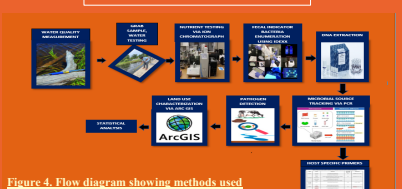


Figure 4. Flow diagram showing methods used

RESULTS:

Human Sewage Via HF183 Bacteroides Marker

49 sites (37.12%) tested positive for human sewage

Significant human sewage in open water with high to moderate development, and forested sites

Stream orders 2-3 were significantly impaired

MST To Identify Animal Fecal Inputs In A Subtropical Coastal Town

Canine feces (dogbaet) = 25 +ve

Predominantly peri-urban areas, and public beaches,

Urgent need for improved pet management practices

“ Human, canine, bird, ruminant and Rat fecal contamination found! Leptospira spp. found at few sites.”

Rat detection via Mitochondrial rodent marker

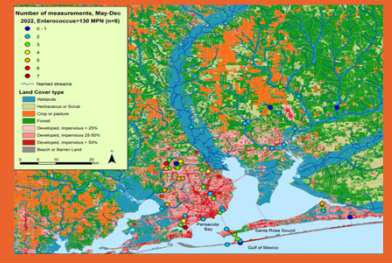
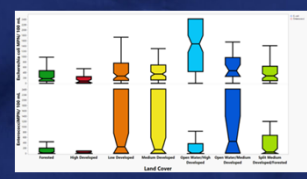
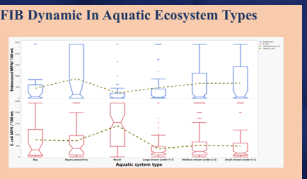
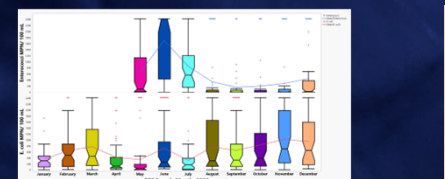
- Novel Fecal Microbial Source Tracing Marker Illuminates Rat Fecal Input in Coastal Mixed-Use Watershed
- In this investigation, 41 samples out of 132 were positive

Assessment Of Leptospira Prevalence

The lipI32 gene-targeted qPCR assay -12 positives found

open water bodies, high-level and low-level development serve as the most conducive habitats for leptospirosis.

only two sites reported positive within forested locales.



- 43.27% exceed E coli STV.
- 64% exceed Enterococci STV.



CONCLUSIONS:

- FIB Spatial-Temporal Variability:** Fecal indicator bacteria exhibit significant variability across different aquatic ecosystems, influenced by climate and land cover.
- Standard Compliance Variance:** A significant percentage of samples met the standard for enterococci but not for E. coli, suggesting a need for differentiated water quality criteria.
- Human Sewage Prevalence:** Extensive detection of human sewage in forested and developed areas points to potential issues with sewage management systems.
- Specific Ecosystem Impact:** Medium-sized streams are notably affected by human sewage, especially in the spring season.
- Domestic and Wildlife Contributions:** Canine feces in urban and beach areas indicate the necessity for improved pet waste practices, while rat feces presence across areas calls for broader ecological management.
- Seasonal Influence on FIB Levels:** Seasonal variation significantly impacts FIB concentrations, necessitating adaptive monitoring schedules.
- Monitoring Techniques:** Utilizing both enterococci and E. coli, along with advanced methods like qPCR and MST, provides a more accurate evaluation of water quality.

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