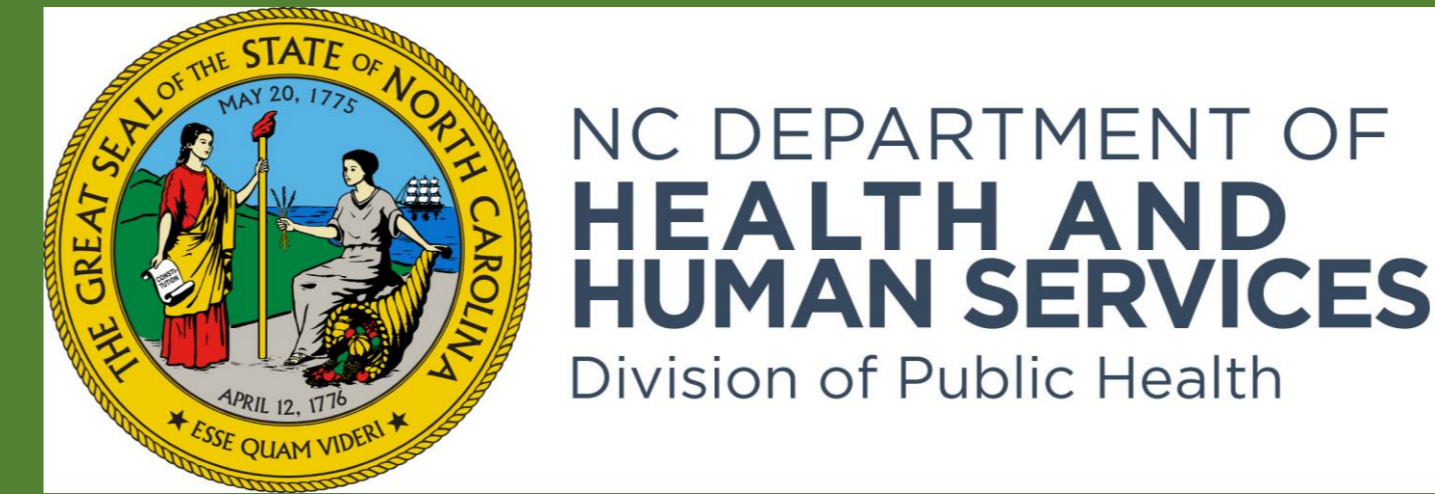
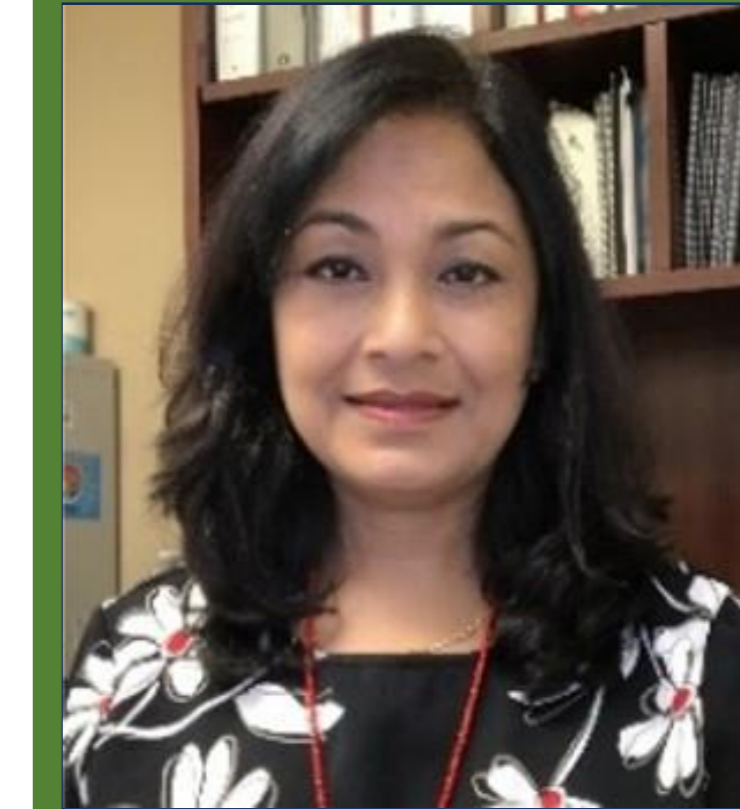


# Buried Sanitation Infrastructures: The Importance of System Geolocation Pre- and Post-Disaster

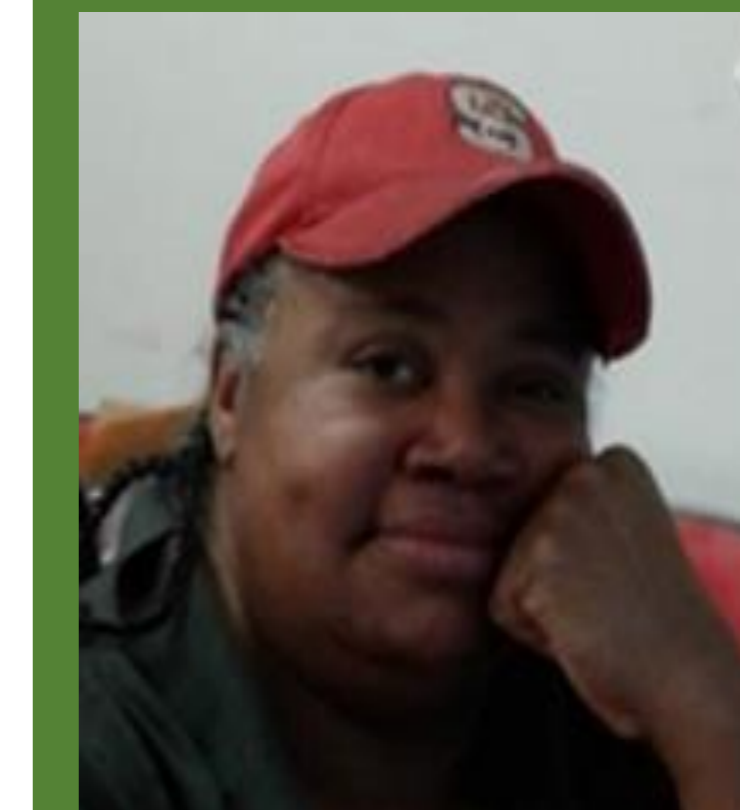
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On-Site Water Protection Branch, NC Department of Health and Human Services



## Meet the Authors



**Sushama Pradhan, PhD**  
Sushama Pradhan is the Non-Point Source Pollution Management Program Coordinator for the On-Site Water Protection Branch of DPH. She specifically engages in impact assessments of onsite subsurface wastewater systems and prevention of surface and ground water quality degradation from such systems.



**Lorna Withrow, PE**  
Lorna Withrow is an environmental engineer in the On-Site Water Protection Branch of DPH. She has experience in numerous areas of environmental concern including radiological waste disposal; regulatory compliance; assessment and analysis; enforcement; and guidance generation.



**Wilson Mize, REHS**  
Wilson Mize is Head of the On-Site Water Protection Branch of DPH. He has been involved with the State of North Carolina's well program since its 2008 inception, assisting in the state-wide implementation of the private well program. He also has experience with wastewater treatment plant inspections and ambient monitoring program management.

## Background

Nearly 2.2 million septic systems serve approximately 50% of North Carolina's population. However, there is a significant gap in our knowledge regarding the number and physical locations of these systems across the state. Identifying and documenting the locations of septic systems is crucial not only for post-disaster appropriate responses including timely repairs, but also for disaster planning, risk assessments, protection of water sources, septic system-derived pollution reduction, property and land management, and infrastructure investment enhancement of opportunities in vulnerable communities.

The locations of decentralized systems in many of the state's one hundred (100) counties are recorded on paper copies of permits issued by local health departments. Knowledge of these system locations grows exponentially in importance when areas are subject to the devastating onslaught of natural disasters.

The increasing frequencies of severe storms, tornadoes, hurricanes, and flooding can result in numerous adverse impacts to a community's environmental and public health. Environmental health impacts may include improper/inadequate wastewater disposal, contaminated water sources, polluted air, as well as the introduction of toxic metals and/or hazardous chemicals to areas where we live, work or recreate.

Mapping these systems will bolster efforts to make informed decisions on a broad range of issues, such as identifying systems in need of evaluation, repair, improvement or expansion, by providing a spatial context for analyzing and visualizing information pre- and post-disaster.

Knowing the locations of decentralized systems is a critical aspect of being able to address the needs of North Carolinians.

**Especially those in underserved communities and disaster-impacted areas.**

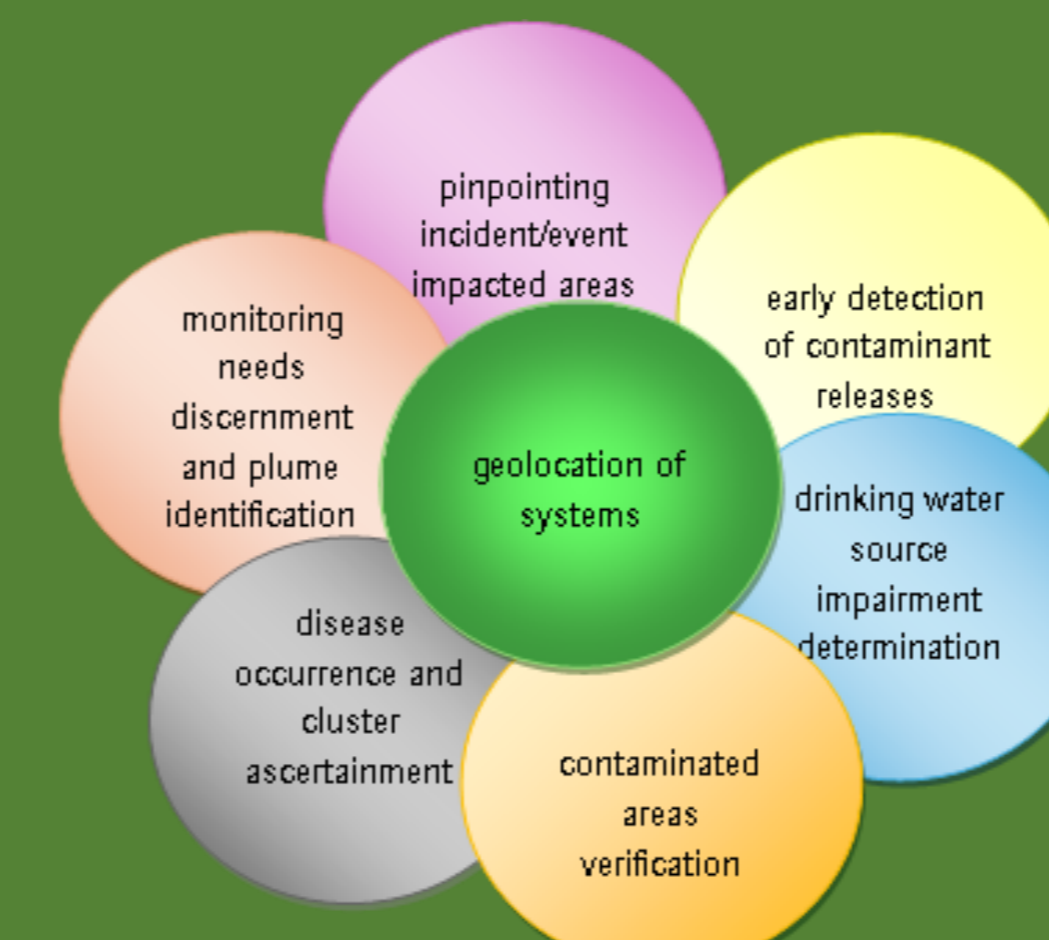
COUNTY	NO. of SEPTIC REPAIR/REPLACE	SEPTIC REPAIR/REPLACE AMOUNT PAID	AVERAGE SEPTIC AMOUNT PAID
ALEXANDER	3	\$7,313.00	2437.67
ALLEGHANY	6	\$2,762.00	460.33
ASHE	51	\$70,929.00	1390.76
AVERY	37	\$58,553.00	1582.51
BUNCOMBE	187	\$304,452.00	1628.09
BURKE	20	\$32,933.00	1646.65
CABARRUS	1	\$470.25	470.25
CALDWELL	28	\$18,821.00	672.18
CATAWBA	10	\$16,467.00	1646.70
CLEVELAND	16	\$7,524.00	470.25
EASTERN BAND OF CHEROKEE INDIANS	2	\$917.00	458.50
Forsyth	1	\$468.00	468.00
GASTON	6	\$2,822.00	470.33
HAYWOOD	50	\$58,396.00	1167.92
HENDERSON	118	\$195,970.00	1660.76
IREDELL	3	\$1381.05	460.35
JACKSON		Information not available	
LEE	1	\$468.05	468.05
LINCOLN	2	\$6999.00	3499.50
MACON	2	\$6,827.55	3413.78
MADISON	8	\$9,580.00	1197.50
MCDOWELL	65	\$136,198.00	2095.35
MECKLENBURG	7	\$9,580.38	1368.63
MITCHELL	40	\$71,540.00	1788.50
POLK	9	\$27,769.00	3085.44
RUTHERFORD	43	\$50,516.00	1174.79
Surry	1	\$460.00	460.00
SWAIN	1	\$459.00	459.00
TRANSYLVANIA	15	\$24,611.00	1640.73
WATAUGA	50	\$70,469.00	1409.38
WILKES	3	\$1381.00	460.33
YANCEY	96	\$197,699.00	2059.36
TOTAL	786	1197036	1522.95

Table courtesy of FEMA – septic system repair/replace in hurricane Helene impacted counties.

## Methods:

A novel machine learning model (random forest classifier) from the University of Massachusetts Amherst will be trained/adapted using data from North Carolina. The predictive model will be tested in two piloting counties (Bladen and Robeson) which have approximately 13,000 and 39,000 permitted septic systems, respectively, according to information provided by the counties. The geocoded septic system database developed by using septic system permits in the pilot counties will be used to ground truth the model prediction. This allows for the potential to map the septic system locations across the state utilizing the predictive model developed through this project.

## Project ongoing.



System geolocation and the public health connections.



An aerial view of destroyed and damaged buildings in the aftermath of Hurricane Helene flooding on Oct. 8 in Bat Cave, N.C. (Mario Tama/Getty Images)