Where Are the Septic Systems? A Geospatial Inventory

Sushama Pradhan, PhD[1], **Wilson** Mize, REHS[1]
Lorna Withrow, PE[2]

[1]*On-Site Water Protection Branch, NC Dept. of Health and Human Services*
[2]Wake County Government – Watershed Management

Background

More than 75% of housing units in Bladen County rely on onsite wastewater treatment systems (OWTSs), making septic systems a critical component of the county's wastewater infrastructure.

Historically, septic system Operation Permits were maintained in paper files, with electronic records introduced over time. However, no comprehensive dataset linked historical permits to standardized 911 addresses and geographic locations existed for the county.

This project developed a consolidated, geospatial inventory of septic systems to support:

- Improved wastewater infrastructure management
- Identification of aging and potentially vulnerable systems
- Inspection, maintenance, and replacement planning
- Environmental and public health protection
- Integration of septic system data with other spatial datasets

Data Sources

Through 2000 - Paper permit files (scanned and digitized)
2001–2015 - AS/400 database
2016–Present - iWorQ Environmental Health database

Methodology

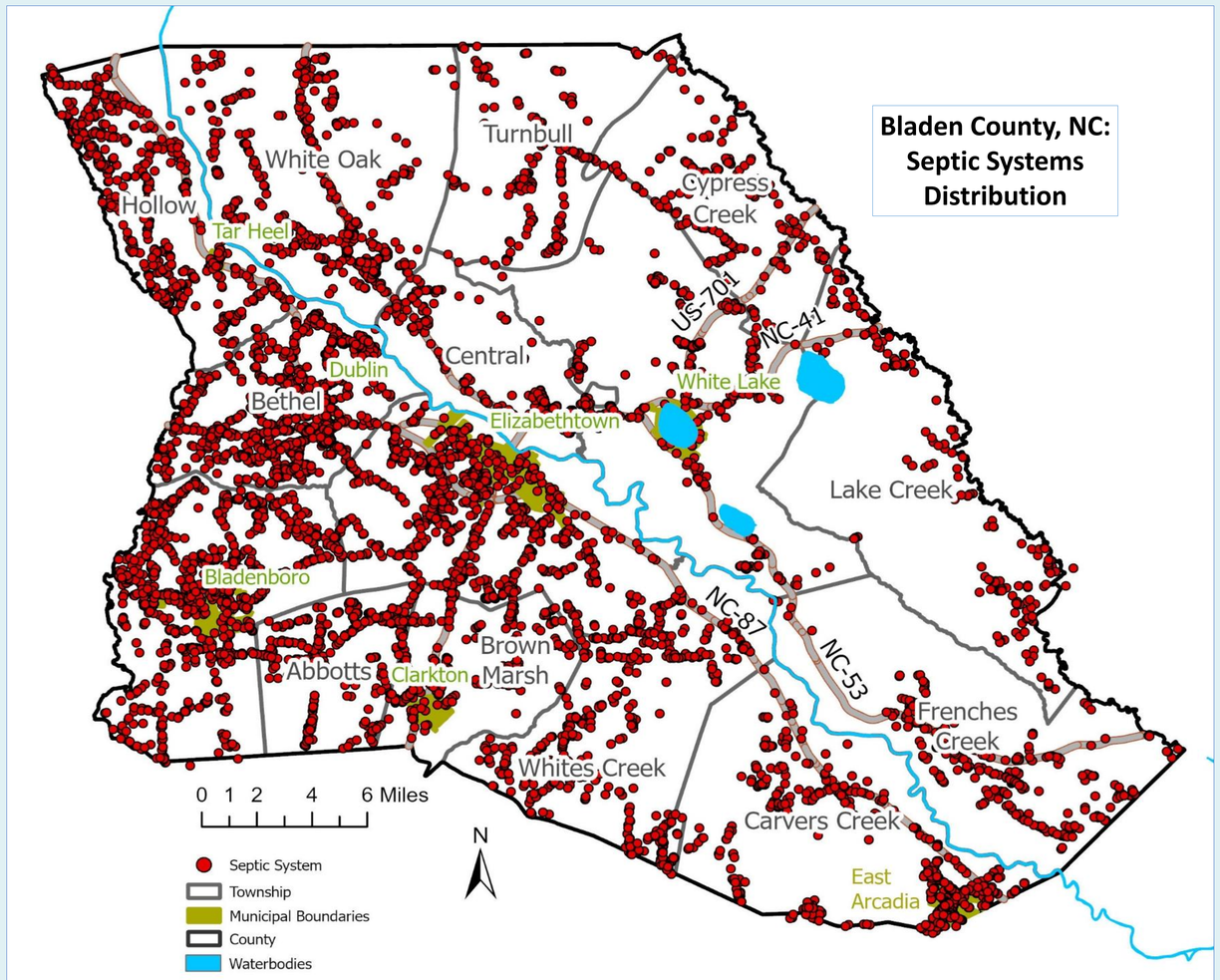
1. Records Consolidation: Permit records were obtained from the Bladen County Environmental Health Department and consolidated into a single Master Database. Information collected included permit number, 911 property address, system type, Installation year, malfunction history, and drinking water resource information.

2. Historical Address Reconciliation: More than 75% of permits contained incomplete or partial address information, particularly older records issued before implementation of the 911 addressing system. Resources used to reconstruct and verify addresses included county 911 address database, master street address guide, registered deeds, county GIS and tax parcel data, deed references, and mapping and aerial imagery.

3. Address Standardization: Addresses were standardized before geocoding by:

- Correcting spelling and typographical errors
- Standardizing street suffixes
- Correcting directional prefixes and suffixes
- Removing unnecessary spaces and punctuation
- Verifying municipalities and ZIP codes
- Identifying and removing duplicate records
- Matching historical street names to current E-911 addresses

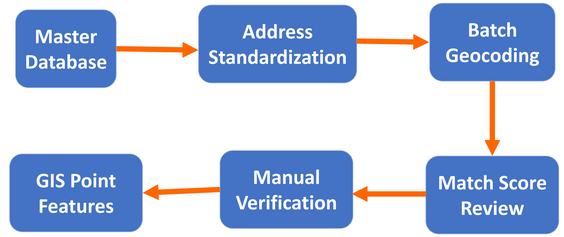
The development of a countywide geospatial septic system inventory transforms historically fragmented permit records into a usable spatial infrastructure dataset.



Age group	Septic Systems		Conventional Systems
	Number	Percentage	
1-15	1754	12	547
16-30	3832	26	3225
31-45	3501	23	3454
46-60	4111	28	4100
60+	1739	12	1739

Proactive inspections **Homeowner education** **Infrastructure planning**

Geocoding Workflow



Addresses receiving a match score of 90 or higher were accepted automatically. Lower-scoring or unmatched records were flagged for manual review.

When the exact property location could not be determined, the associated parcel centroid was used as an approximate location and documented accordingly.

Validated locations of property with septic system were incorporated into an Esri geodatabase containing both geographic and permit information.

Results and Discussion

1. Geocoding Accuracy Assessment: **P**ermits recorded 14,976
Records successfully geocoded = 68%
Average geocoding match score = 98
Unmatched (No/partial address) = 4878

2. An Infrastructure Concern: The inventory reveals a substantial population of aging septic systems:

- 88% of systems are more than 15 years old
- 63% of systems are more than 30 years old
- 1,700+ systems are more than 60 years old

Aging systems may have increased potential for component failure, reduced treatment performance, repairs, or replacement needs. Mapping the age distribution provides a practical tool for identifying areas where proactive inspection, homeowner education, maintenance programs, and long-term infrastructure planning may be most beneficial.

3. Installation Trends: 2015–2025: Recent installation data show a gradual decline in the use of both conventional septic systems and private wells over time.

Year	Installations	Conventional	Private Well
2015	97	41%	51%
2016	93	38%	45%
2017	117	23%	42%
2018	100	27%	49%
2019	106	28%	40%
2020	119	23%	40%
2021	150	17%	31%
2022	153	8%	24%
2023	120	19%	9%
2024	152	14%	20%

Additional analysis is needed to determine whether these patterns are associated with development trends, expansion of public water/sewer infrastructure, regulatory requirements, or changing water-supply preferences.

Conclusions

A consolidated GIS inventory transforms decades of septic-system records into actionable information.

Mapping where septic systems are—and understanding their age, characteristics, environmental setting, and community context—provides a foundation for proactive wastewater management, environmental protection, and public health planning.

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