

A satellite image of Earth showing a large hurricane over the Atlantic Ocean and the continent of South America. The text is overlaid on this image.

Climate Change

Environmental Health and Public Health Impacts

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Background image courtesy of <https://astronomy.com/magazine/ask-astro/2017/09/the-hidden-earth>

Climate Change

flooding

sea-level rise

extreme heat

drought

water shortages

increased
wildfire intensity
and frequency

increased air
pollution



According to a June 5, 2020 SciLine fact sheet for reporters,

Hurricanes get their energy from ocean heat; the warmer the water is, the stronger a hurricane can get. More than 90% of the excess heat trapped in the climate system due to human-caused global warming has gone into the oceans, providing the added energy driving recent hurricanes' extreme wind intensities and the increased evaporation that has resulted in associated torrential rainfall.³

³ [IPCC, 2014, Synthesis Report, Summary for Policymakers, p. 4](#)

Weather Events Impact

- Increased frequency in storms, hurricanes, flooding, extreme heat, and drought can result in numerous environmental health and public health adverse impacts
- Environmental Health
 - improper/inadequate wastewater disposal
 - contaminated water sources
 - polluted air
 - toxic metals
 - hazardous chemicals
- Public Health
 - infectious disease transmission
 - asthma
 - obesity
 - pregnancy complications
 - cancer
 - cardiovascular disease

Impact on Communities

~ 49% of North Carolinians discharge wastewater to a septic system

> 50% of North Carolinians use groundwater as their primary drinking water source.

Often marginalized communities, historically excluded from public utilities face failing on-site systems and public health concerns that arise from environmental contaminants.

- In the last several years, extreme weather events bringing heavy precipitation events, flooding, rising water tables, and increases in temperature are contributing to rising sea-levels, which have stressed the performance of septic systems and increased the risk of compromised drinking water wells in areas affected by climate change.
- Septic system effluent utilizes the soil as its final treatment by removal of pollution from wastewater, recharging groundwater, and replenishing aquifers. Saturated soils do not allow for proper treatment of effluent which may pose a risk to the waters of the State.

Impact on Communities

Runoff from storms and flooding

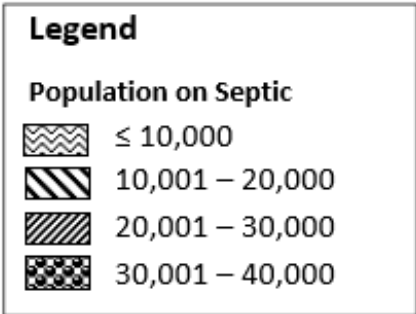
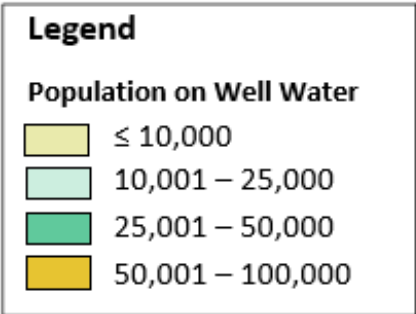
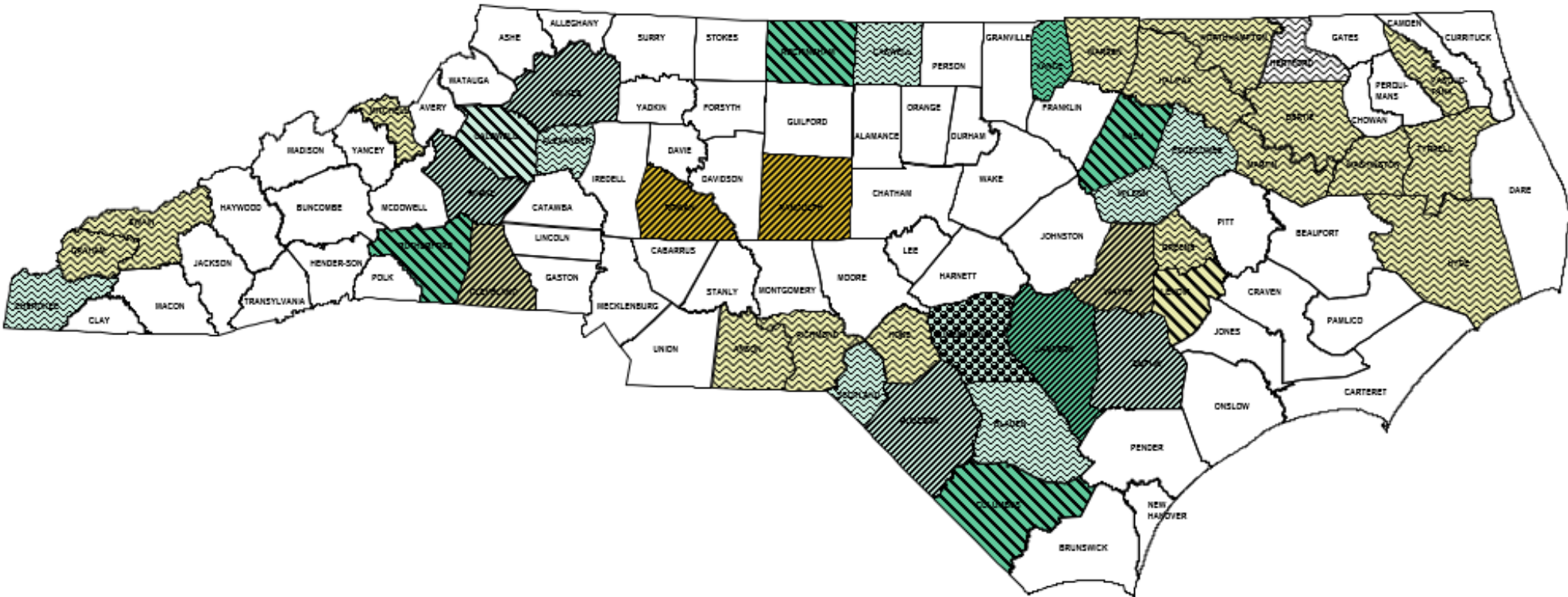
- impaired waters
- compromise coastal and freshwater seafood
- transfer toxins from landfills, waste lagoons, industrial livestock operation
- increase the threat of infectious disease transmission via insect, animal, or water.

The presence of water-borne pathogens such as E-coli, Cryptosporidium parvum and Giardia lamblia contamination in well and surface water and pose serious health risks to exposed populations.

Flooding causes displacement of communities, leading to economic and psychological burdens that only increase the strain on the public health of North Carolinians subjected to this devastation.

Tier 1 Counties

Population on Well Water and Septic, by County – USGS 2019



North Carolina Climate Risk Assessment and Resilience Plan - June 2020

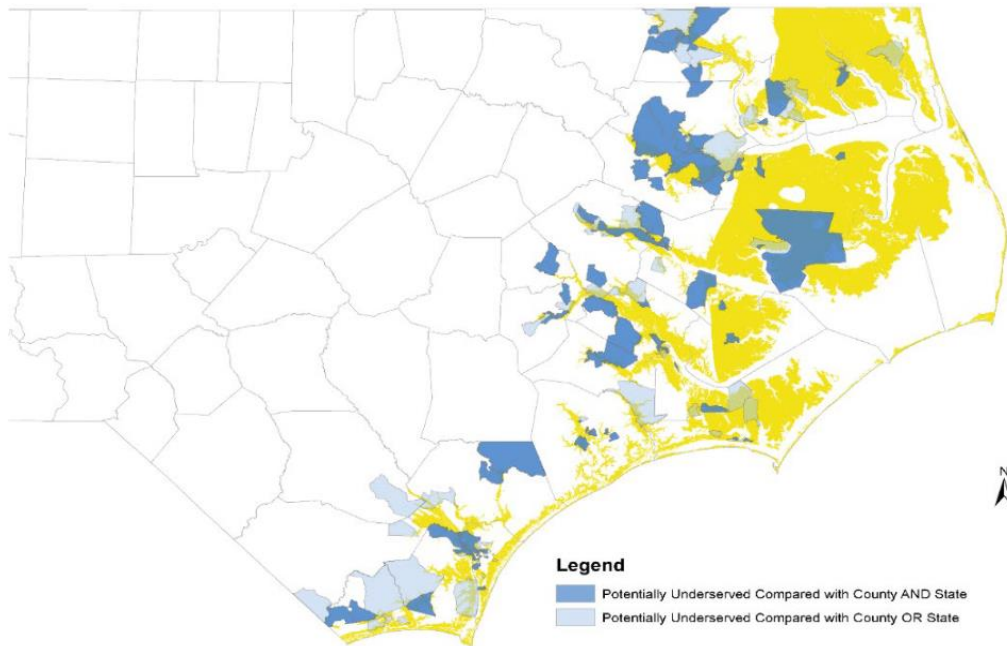


Figure 4-6: Potentially Underserved Populations in Storm Surge Areas³⁸

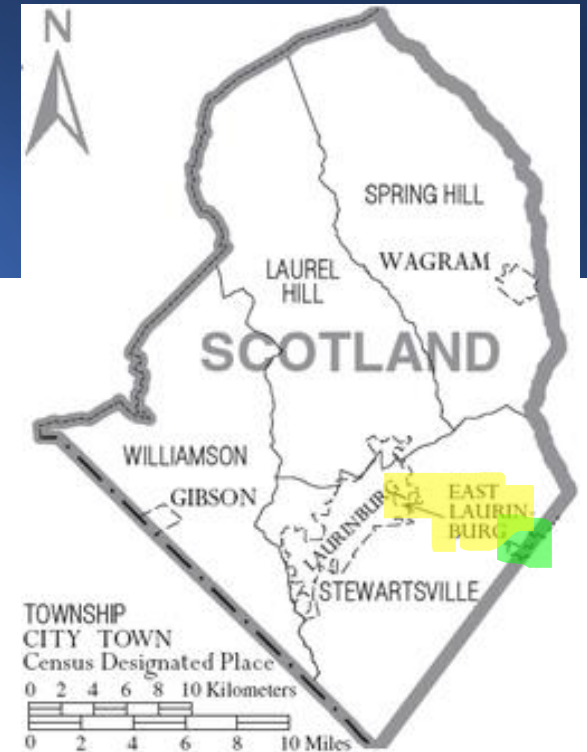
According to the North Carolina Climate Risk Assessment and Resilience Plan - June 2020,

“Following the Civil War, former slaves used this new right to build freedmen settlements across the nation. African Americans were typically limited to owning and settling land that white Americans did not want – like swamps or low-lying areas. Many of the settlements that remain today are susceptible to flooding.”

(Chapter 4: Climate and Environmental Justice: Equity, Risk, and Resilience in North Carolina, 4-17)

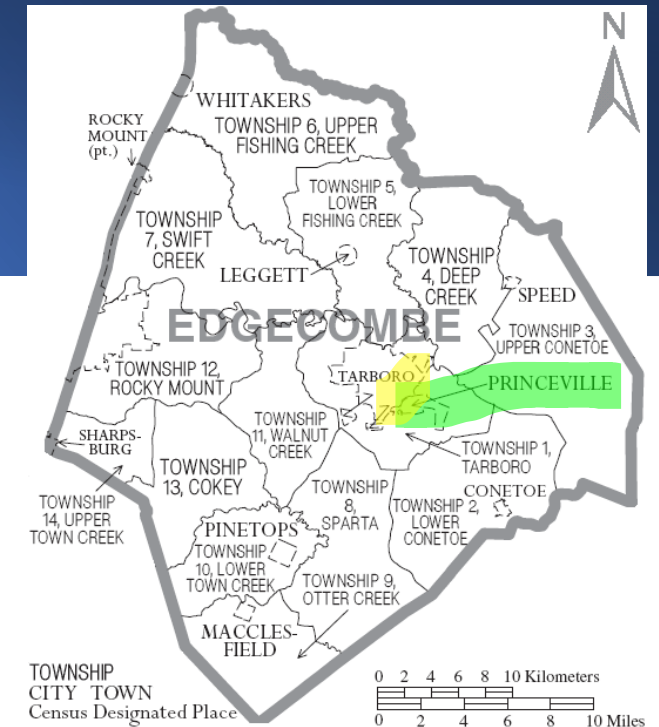
Scotland County

- 2021 Development Tier 1
- Non-white identified population: 54.9%
- Estimated # of septic systems: 10,298
- Estimated usage of groundwater as drinking water: 70.1%
- # of flooding events (1996-2021): 17
- Identified historically marginalized communities:
 - Maxton (town is in Robeson and Scotland counties) – Incorporated in 1874. Prone to flooding from overflow of the Lumber River.
 - East Laurinburg, as a town, will cease to exist at the end of June 2022



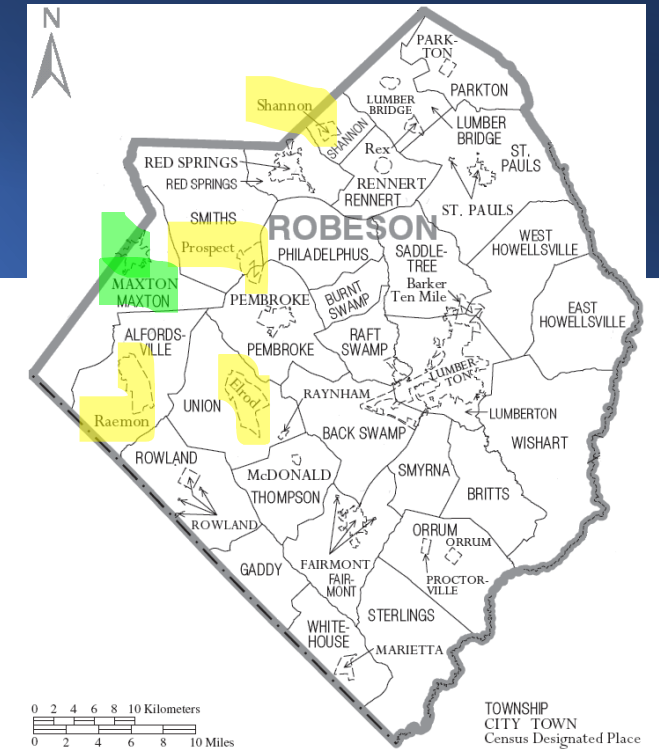
Edgecombe County

- 2021 Development Tier 1
- Non-white identified population: 60.2%
- Estimated # of septic systems: 11,113
- Estimated usage of groundwater as drinking water: 48.4%
- # of flooding events (1996-2021): 35
- Identified historically marginalized communities:
 - Freedom Hill/Princeville – Freedom Hill community established by freed African-Americans in 1865, incorporated as Princeville in 1885. Prone to flooding from overflow of the Tar River.
 - East Tarboro – Tarboro established as a town in 1760 (reportedly the 9th oldest town in NC). Prone to flooding from overflow of the Tar River.



Robeson County

- 2021 Development Tier 1
- Non-white identified population: 69.1%
- Estimated # of septic systems: 34,513
- Estimated usage of groundwater as drinking water: 61.8%
- # of flooding events (1996-2021): 19
- Identified historically marginalized communities:
 - West Lumberton – Lumberton was founded in 1781, incorporated in 1859. Prone to flooding from overflow of the Lumber River.
 - Maxton (town is in Robeson and Scotland counties) – Incorporated in 1874. Prone to flooding from overflow of the Lumber River.



Robeson County

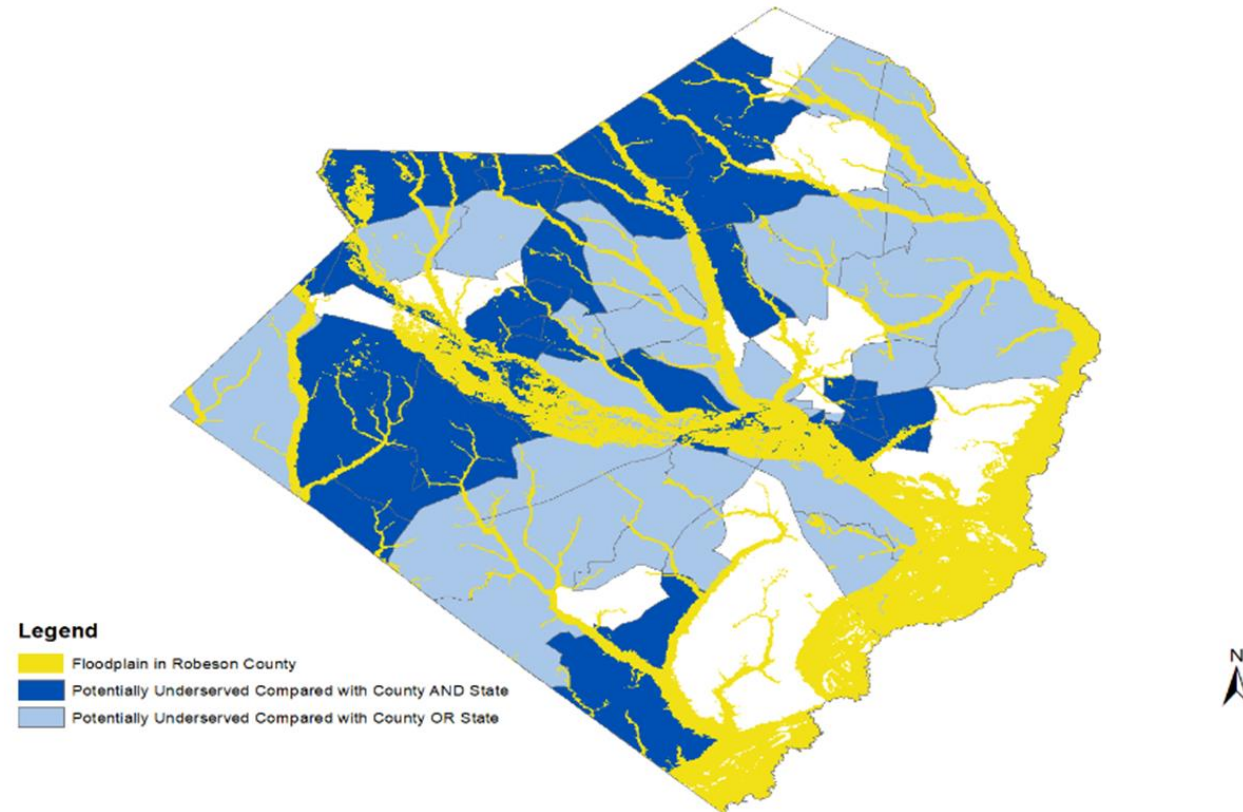
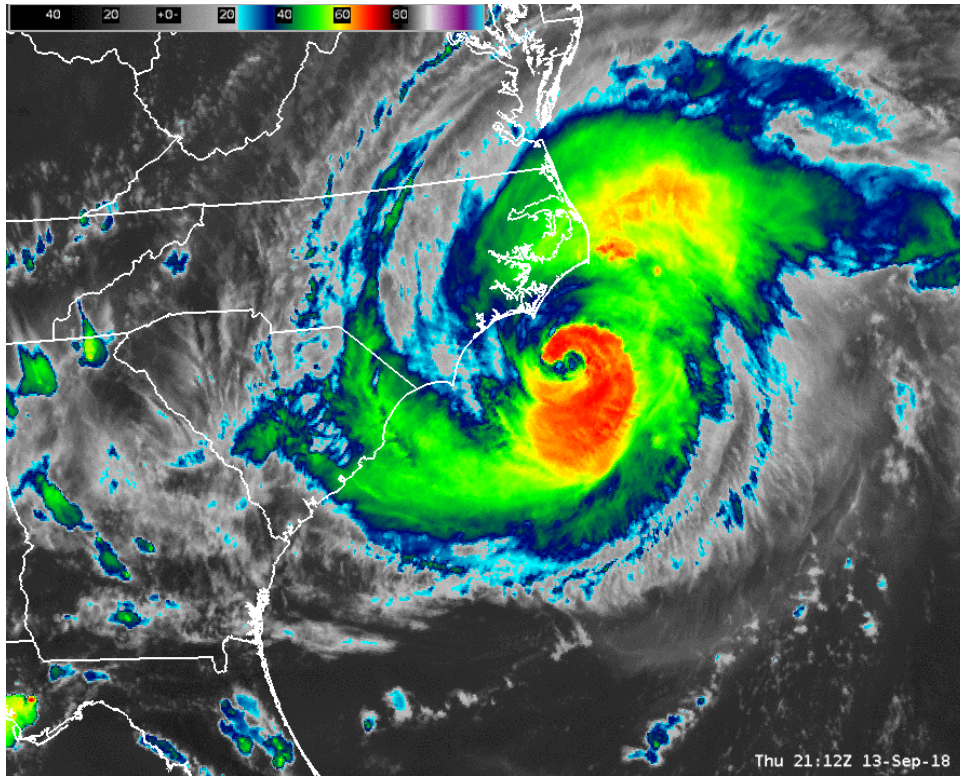


Figure 4-4: Potentially Underserved Populations and Floodplain in Robeson County, North Carolina²⁹

Image from <https://files.nc.gov/ncdeq/climate-change/resilience-plan/2020-Climate-Risk-Assessment-and-Resilience-Plan.pdf>, Chapter 4

Hurricane Florence – September 2018



Infrared satellite loop of Hurricane Florence making landfall in southeastern North Carolina. Orange and red colors indicate cold clouds tops from deep convection near the center of the storm. Loop runs from the early morning of September 13 through the afternoon of September 14, 2018

Image courtesy of <https://www.weather.gov/ilm/HurricaneFlorence>

Selected 2021 Tier 1 Counties Estimated percentage of county possibly hydraulically impacted by Hurricane Florence in September 2018*

County	Estimated % of County (NOAA map)	Estimated Number of Systems
Bladen	28.6%	1,238
Columbus	4.0%	294
Cumberland	10.5%	1,222
Duplin	15.4%	1,068
Lenoir	28.6%	1,675
Robeson	28.6%	3,056
Sampson	4.0%	265
Wayne	33.3%	3,437
	Estimated Total	12,257

*The estimated percentage of the county impacted was determined visually from an NOAA map <https://storms.ngs.noaa.gov/storms/florence/index.html#9/34.9163/-78.4918>

Climate Change and Health

- Can adversely impact the environment and as a result adversely impact human health
- Multi-faceted impacts require multi-faceted approaches
- Subject-matter experts needed at the table include environmental professionals (e.g., engineers, sanitarians, environmental health specialists), epidemiologists, sociologists, health policymakers, bio-statisticians, community engagement specialists
- Without environmental health, there is no public health.