

A photograph of a park with a pond, trees, and a playground in the background. The text is overlaid on the image.

# Climate change is challenging our waste treatment infrastructure

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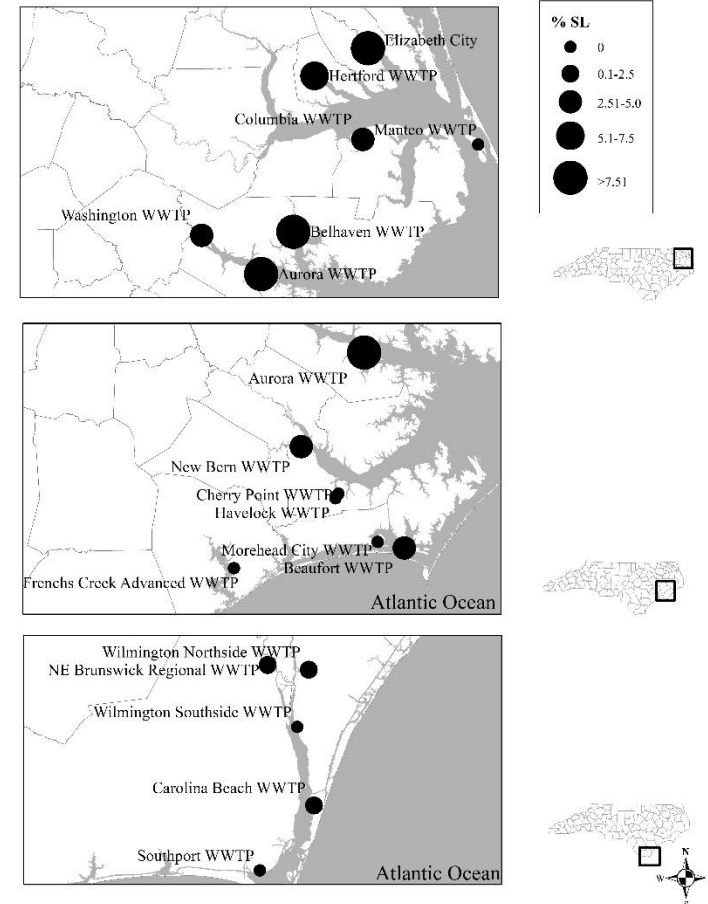
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# Challenge: Integrity of waste treatment systems

- Central and on-site systems – below ground.
- Vital, expensive, but almost invisible.
- Extraneous flows: Inflow and infiltration (I&I) in central WWT systems.
- I&I can cause SSOs → harms to water quality and human health.

# Combined effects of rainfall, temperature and sea level on flows

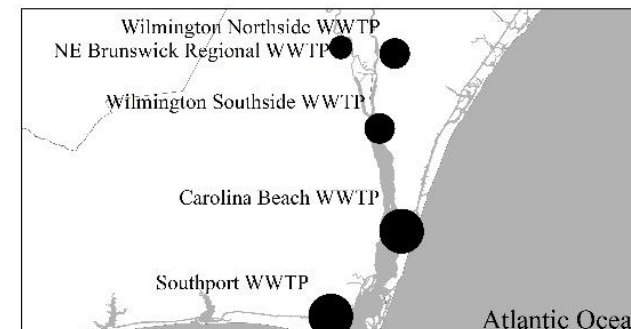
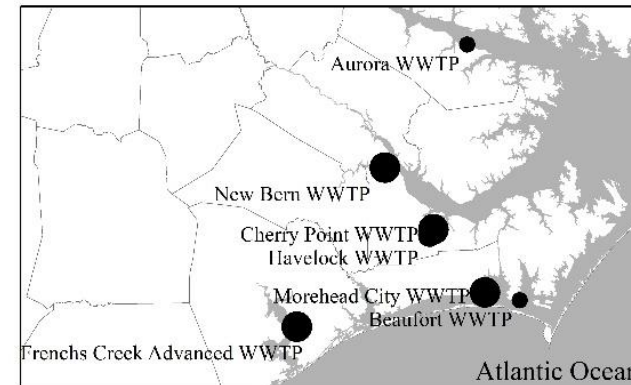
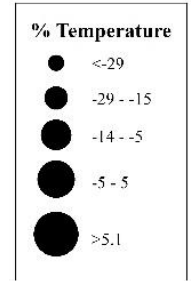
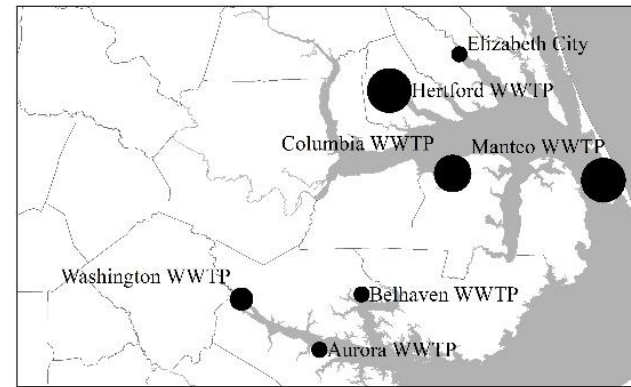
- Significant lunar cycle sea level effects
- Salt water effects on systems and treatment
- SLR: slow but deadly





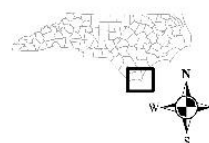
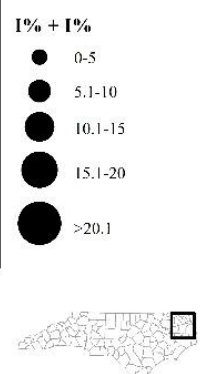
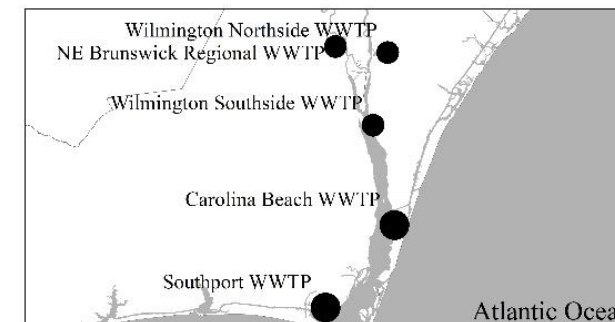
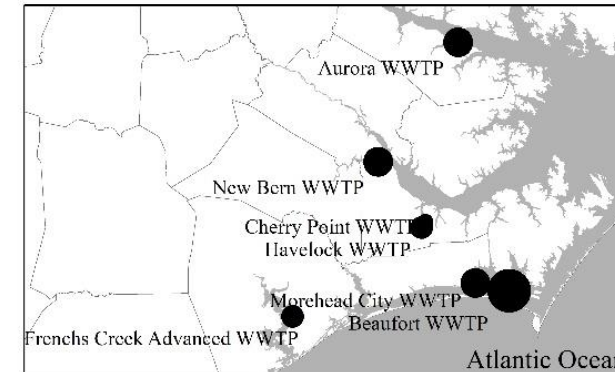
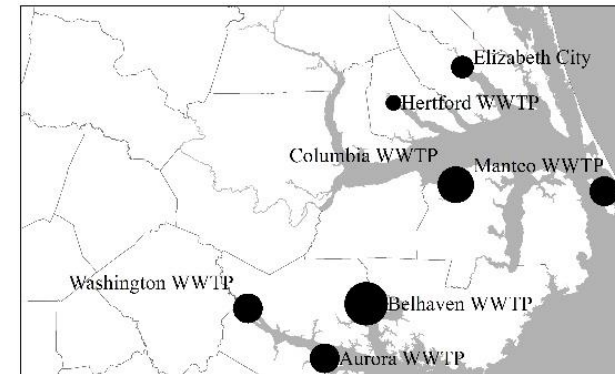
# Combined effects of rainfall, temperature and sea level on flows

- Temperature = seasonality
- Tourist season visitation (+)
- Evapotranspiration effect (-)
- Warmer = lower water table (unless it rains.....)



Combined effects of rainfall, temperature and sea level on flows

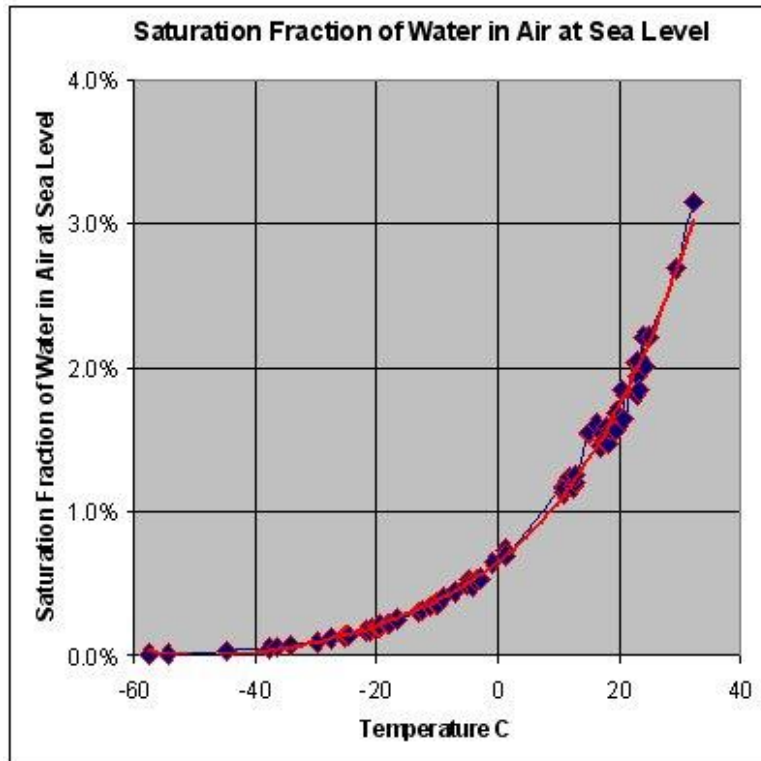
- Rainfall: frontal and convective systems
- Winter rains vs. groundwater levels
- Rainfall: the premier effect of climate change





# What goes up must come down

## Water vapor vs. Temperature



## Messages

- [Water vapor] in air rises exponentially with temperature.
- Water vapor is NOT infinitely soluble in air.
- More extreme rain events are happening and will get worse.

# Some take-home messages:

- Heavier rains, shifting climate patterns, more and nastier hurricanes, and sea level rising, so I&I-driven SSOs will be more frequent.
- Maintaining high quality waste treatment infrastructure will be expensive!
- It's time to develop and permit better waste treatment technology.