



Hurricane Flood Inundation Assessment

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Background



- ▶ The Atlantic hurricane season typically runs from June through November
- ▶ 2020 was the most active Atlantic hurricane season on record
 - ▶ 30 systems became named storms (previous record of 28 was set in 2005)
 - ▶ The strongest storm of the season, Iota, formed in November
- ▶ On top of heavy rain and high winds, hurricanes also bring storm surge and extensive flooding
- ▶ Storm surge has the potential to reach more than 10 feet
 - ▶ Katrina set the record at 28ft in some parts of southern MS

What is Storm Surge?: <https://www.youtube.com/watch?v=txt8wUznyJM>
Hurricane Laura's Potential Storm Surge: <https://www.youtube.com/watch?v=CU0hsC8f1jo>

Hurricane Classification

Categories of Hurricanes					
	Category 1	Category 2	Category 3	Category 4	Category 5
Wind	74-95mph	96-110mph	111-130mph	131-155mph	Over 155mph
Storm surge	4-5ft	6-8ft	9-12ft	13-16ft	Over 18ft
					
	Minimal: No real structural damage; some flooding	Moderate: Material damage to buildings; small craft break moorings	Extensive: Structural damage to small houses; inland flooding	Extreme: Major structural damage & heavy flooding; evacuation necessary	Catastrophic: Massive damage to buildings; small structures blown over or away
Source: Saffir-Simpson scale 					

Coastal Population Growth

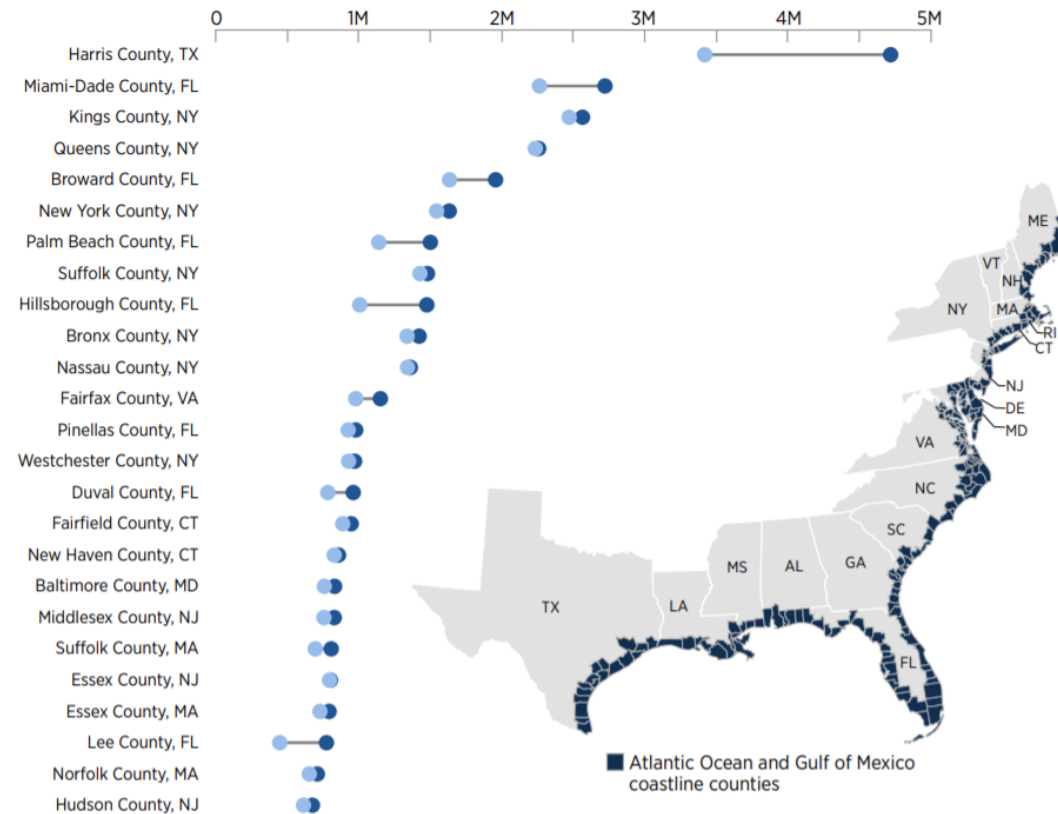
Growth on the Coast

Changes in Population of the 25 Most Populous Atlantic and Gulf Coastline Counties: 2000 to 2019

Total Coastline Counties
129 Atlantic, 56 Gulf Coast

2000: 51.9 million

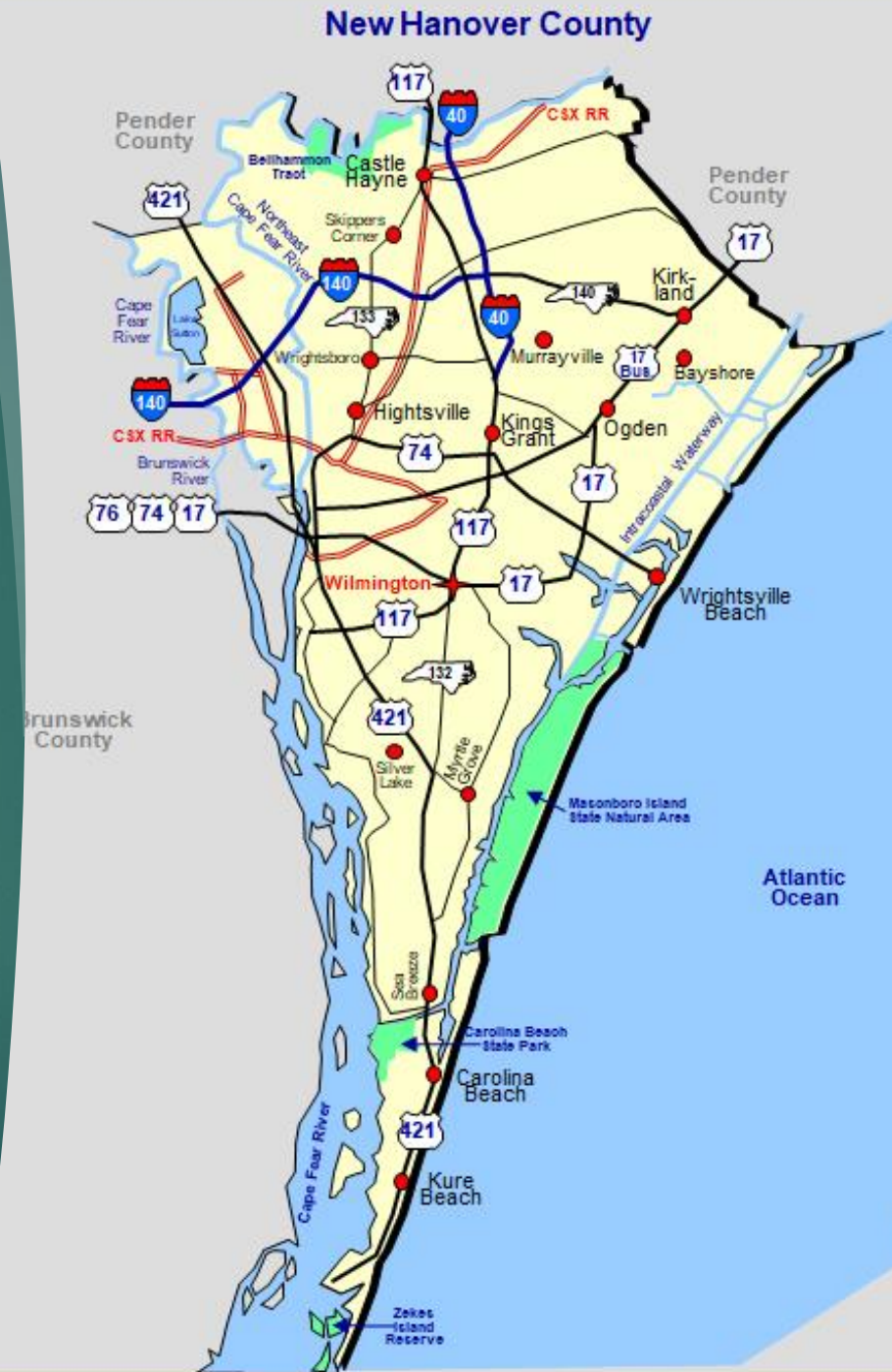
2019: 60.3 million



Research Question

Are the impacts of storm surge inundation evenly felt by all members of the community?

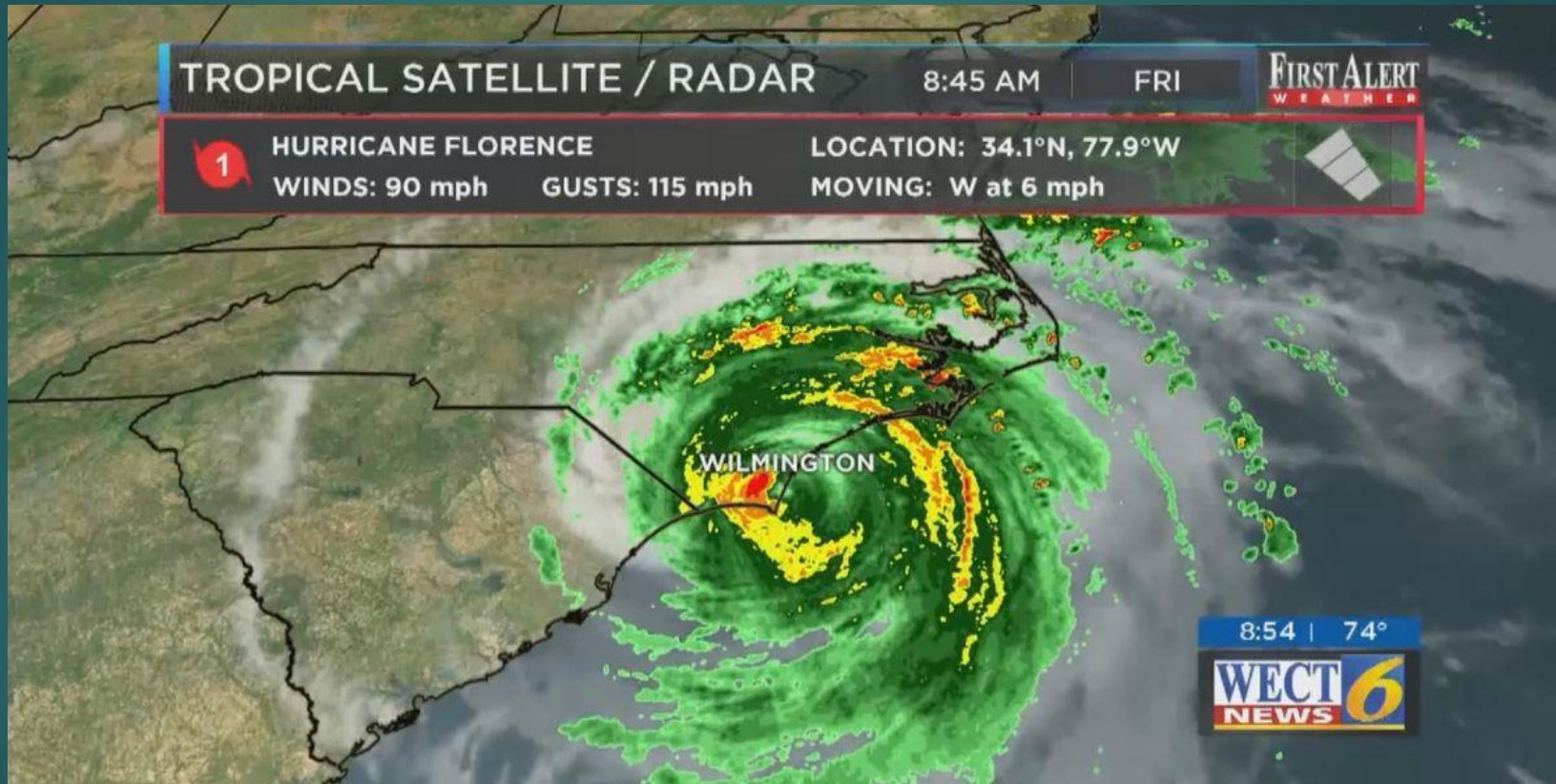
- ▶ New Hanover County (NHC) is the political and economic heart of Coastal NC
- ▶ Due to the flatness and even terrain of the county, there is high potential for storm surge to impact the population regardless of socioeconomic status
- ▶ If more intense hurricanes make landfall at increasing frequency, local governments will have to plan for mass migration/evacuation from high-risk areas

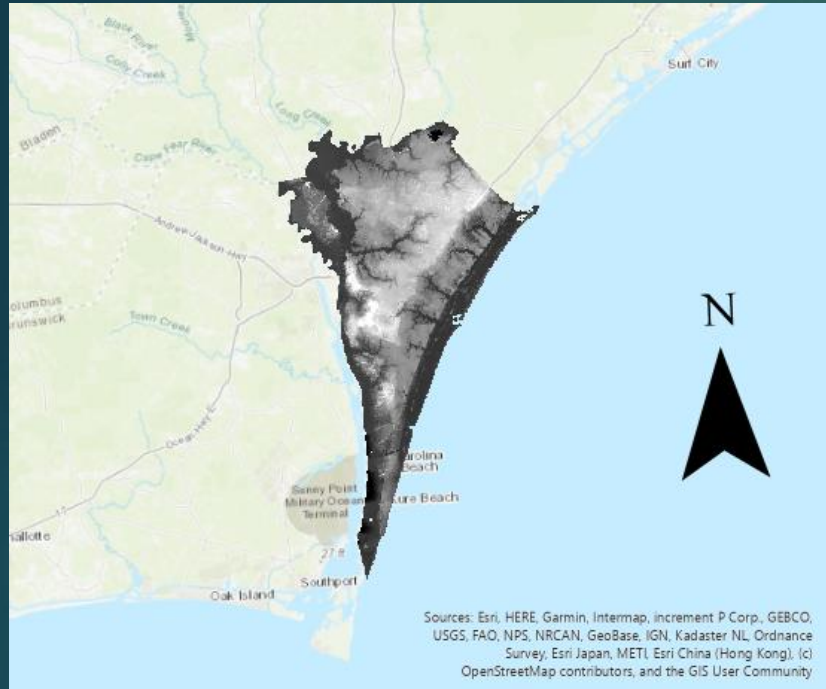


Methodology

- ▶ Used 20-ft resolution DEM to delineate different watersheds in the county to serve as distinct “geographic regions”
- ▶ From NOAA collected inundation raster data for Hurricane Florence and Category 5 projections
- ▶ Overlaid inundation data on the delineated regions and extracted resulting polygons
- ▶ Imported intersected polygons into the Community Analyst tool to gather socioeconomic data from census tracts in these intersected regions
- ▶ Compared data across the two storm systems to understand how different populations are impacted by storms of varying magnitudes

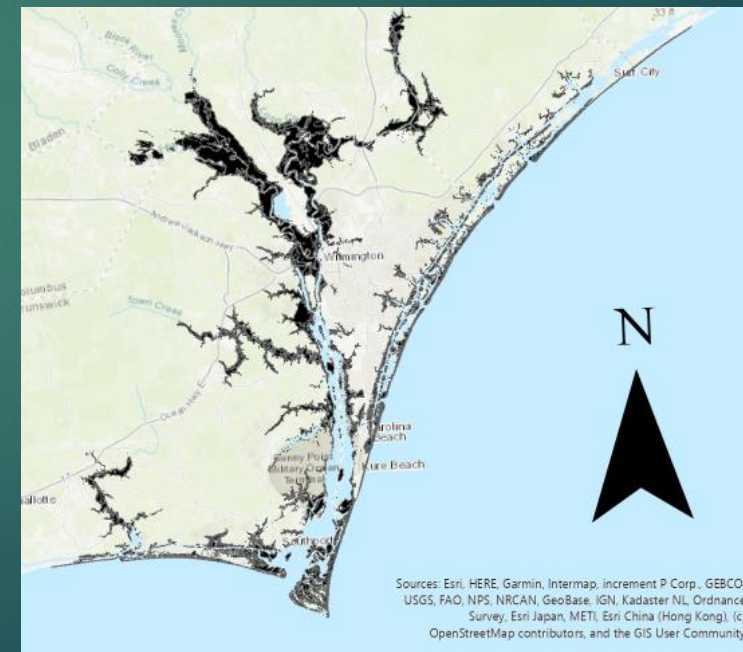
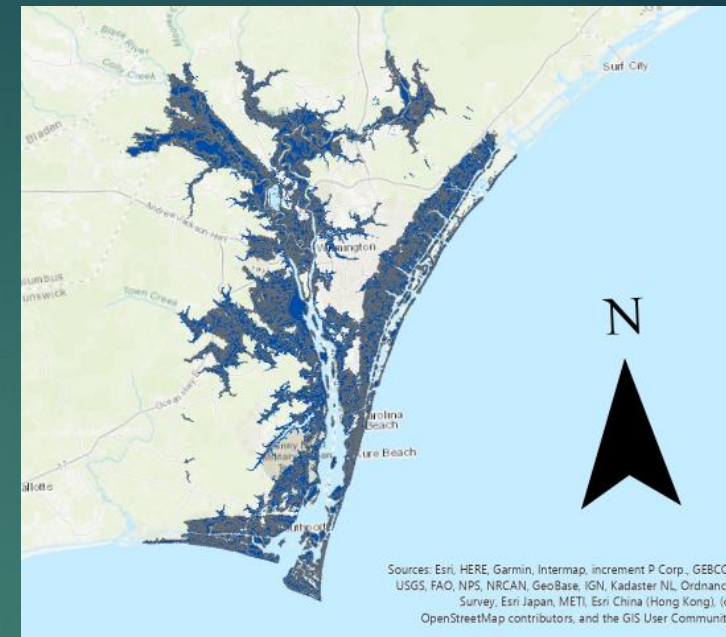
Hurricane Florence – Category 4 September 2018





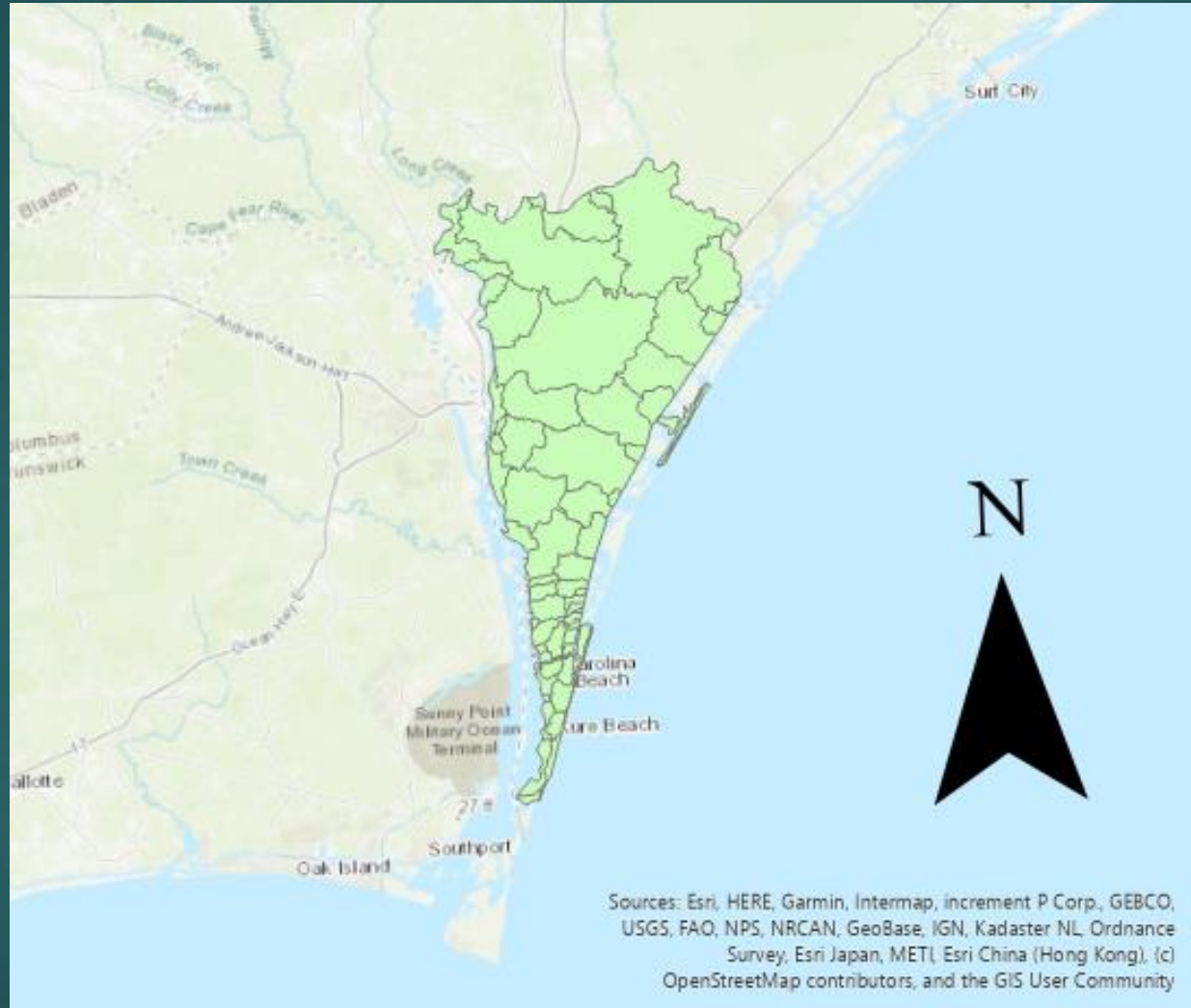
20-ft DEM of New Hanover County

Category 5 Hurricane Max Inundation Extent

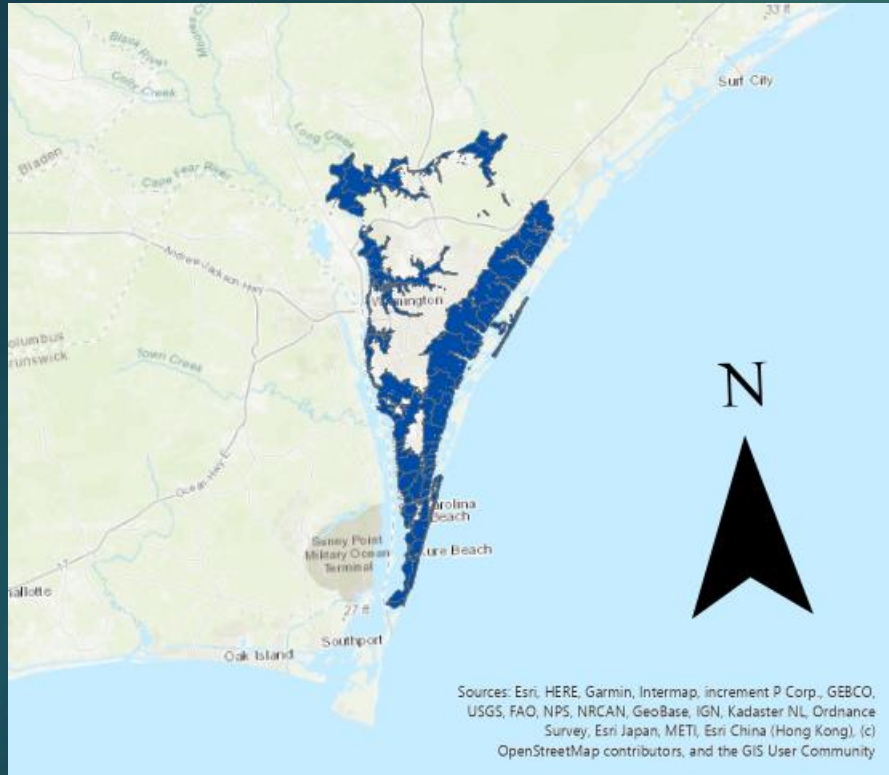


Hurricane Florence Max Inundation Extent

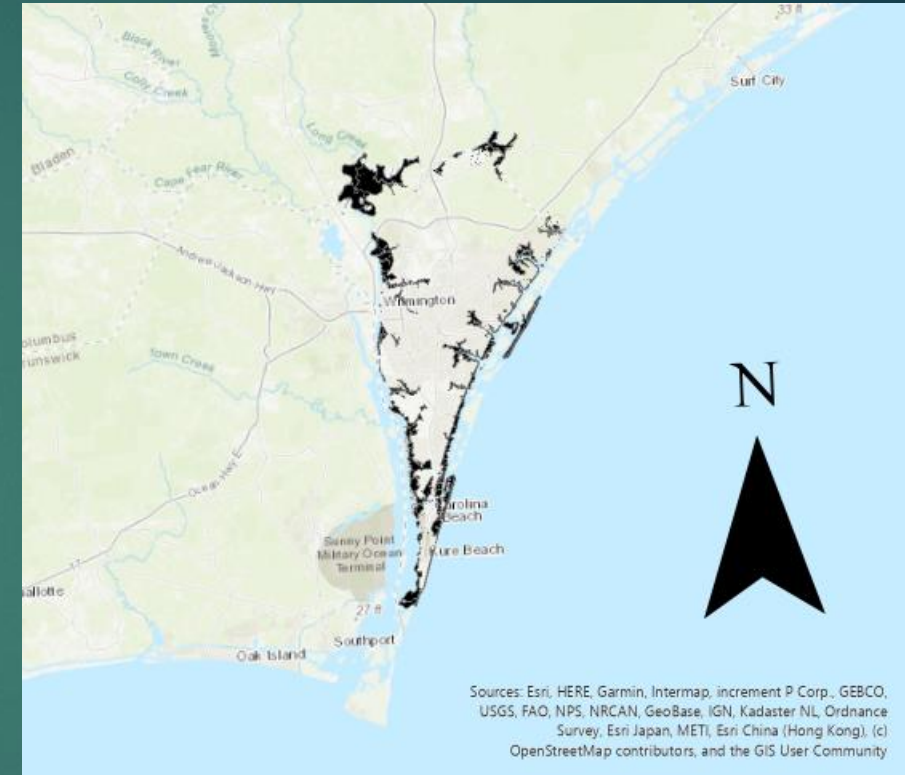
Delineated Regions in NH County



Inundation Polygons



Category 5 Hurricane Inundation
overlayed on Delineated Regions



Hurricane Florence Inundation
overlayed on Delineated Regions

Summary of Event Impacts

	Hurricane Florence	Category 5 Projection
Total Impacted Pop.	15,661	111,530
% of Pop. Impacted	7%	47%
Total Housing Units	10,154	56,312
Average Home Value	\$386,073	\$420,791
Med. Household Income	\$62,099	\$67,622
Total Businesses	589	4,235
% of Impacted Pop. Below Poverty Line	3.89%	4.40%
Total SNAP Recipients	374	2,815

Conclusions: The impacts of a Category 5 are more widespread thus the storm is more likely to be equally felt by all socioeconomic groups. A weaker storm will impact areas closer to water bodies. If impacts are near major beaches, then residents tend to have higher disposable incomes.

Possible Research Extensions

- ▶ FEMA offers a tool called Hazus that takes a DEM and makes projections on the outcomes of a major disaster on that DEM
 - ▶ Can test earthquakes, tsunamis, hurricanes, and flooding
 - ▶ Need ArcGIS 10.5 to run (older version)
- ▶ Expand the research area to the entire coastal region of NC, and with more time and greater computing power perhaps the entire Eastern seaboard

Additional Resources

- ▶ <https://www.census.gov/content/dam/Census/library/visualizations/2020/comm/coastline-growth.pdf>
- ▶ https://www.carolana.com/NC/Counties/new_hanover_county_nc.html
- ▶ https://en.wikipedia.org/wiki/Carolina_Hurricanes
- ▶ <https://www.wect.com/2019/09/17/hurricane-florence-packed-punch-cape-fear-it-could-have-been-worse/>
- ▶ <https://www.slideshare.net/HammadAhmad14/hurricanes-ppt>