Beaufort Flood Vulnerability Assessment

Briefing for Beaufort City Council

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Kirstin Dow, PhD, Lead PI and Professor, CISA and University of South Carolina

Presentation for Beaufort City Council Work Session
January 28, 2020

Sea Grant
S.C. Sea Grant Consortium

CISA
A NOAA RISA TEAM

Sea Grant

S.C. Sea Grant Consortium

- One of 33 state Sea Grant programs
- Primarily funded by NOAA
- 7 Member Institutions
- Independent State Agency
- Supports integrated research and extension programs to generate and apply science-based information on coastal and marine issues.

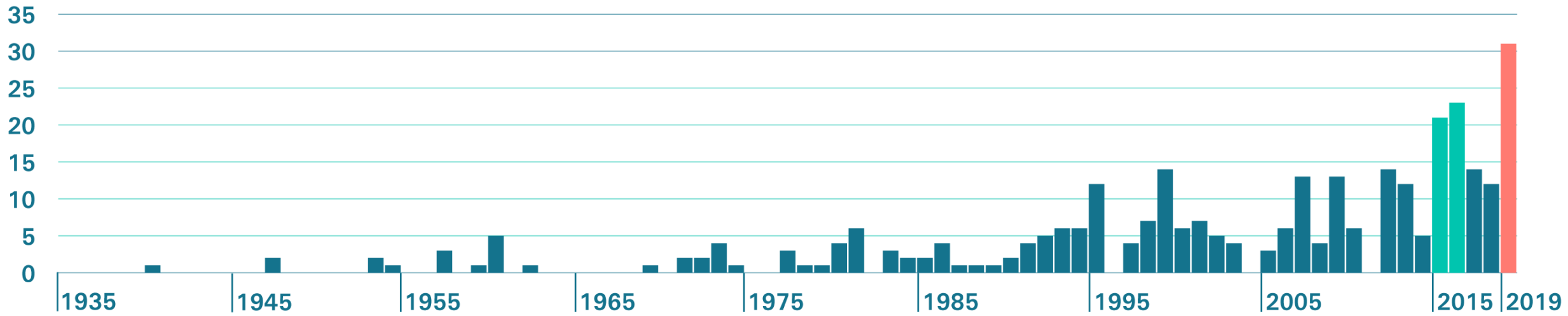
CISA

A NOAA RISA TEAM

- One of 11 RISA programs
- Primarily funded by NOAA
- Housed at University of South Carolina
- Serves North and South Carolina
- Conducts applied research that incorporates climate information into water, health, and coastal management and decision-making.

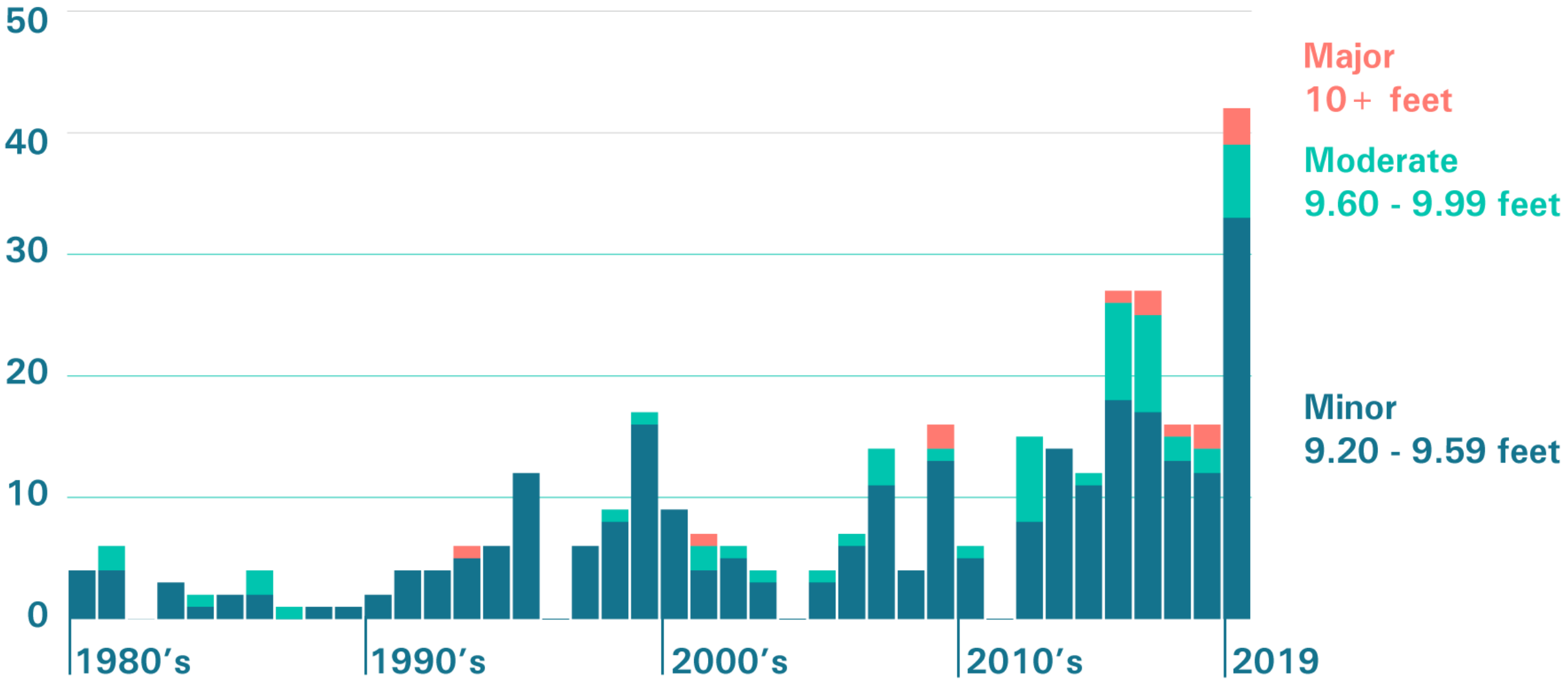
Increasing Tidal Flooding

Total number of flood days at Ft. Pulaski gauge

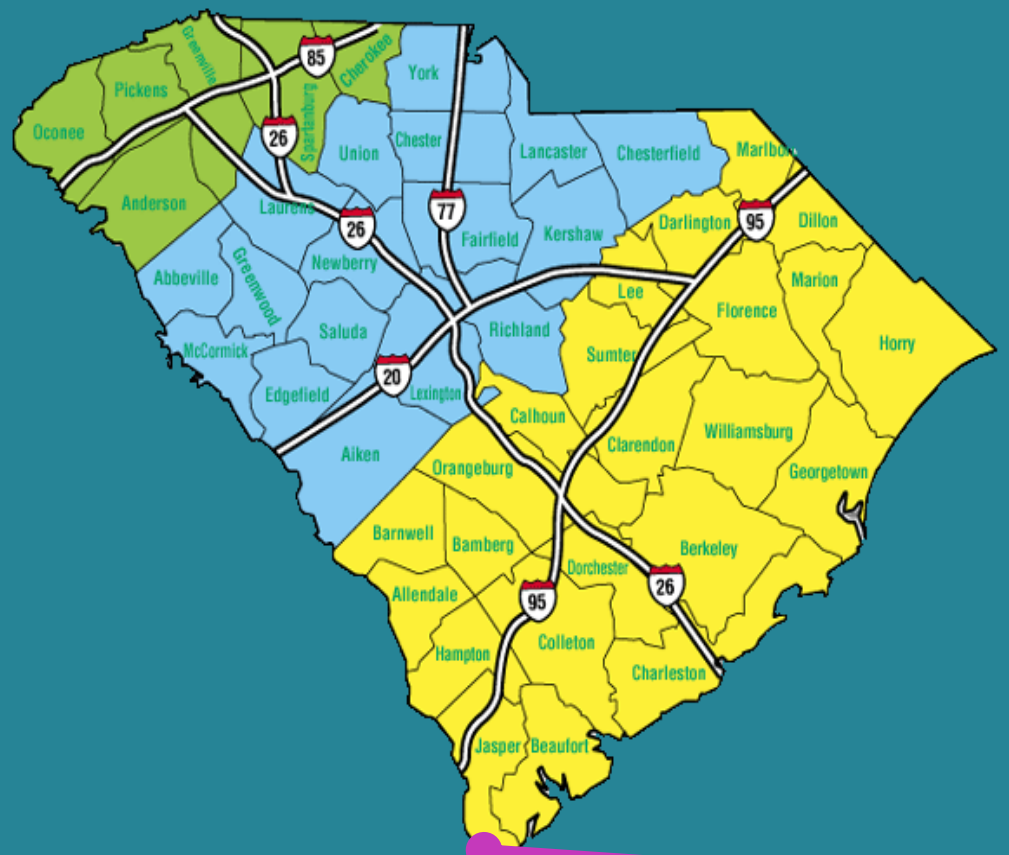


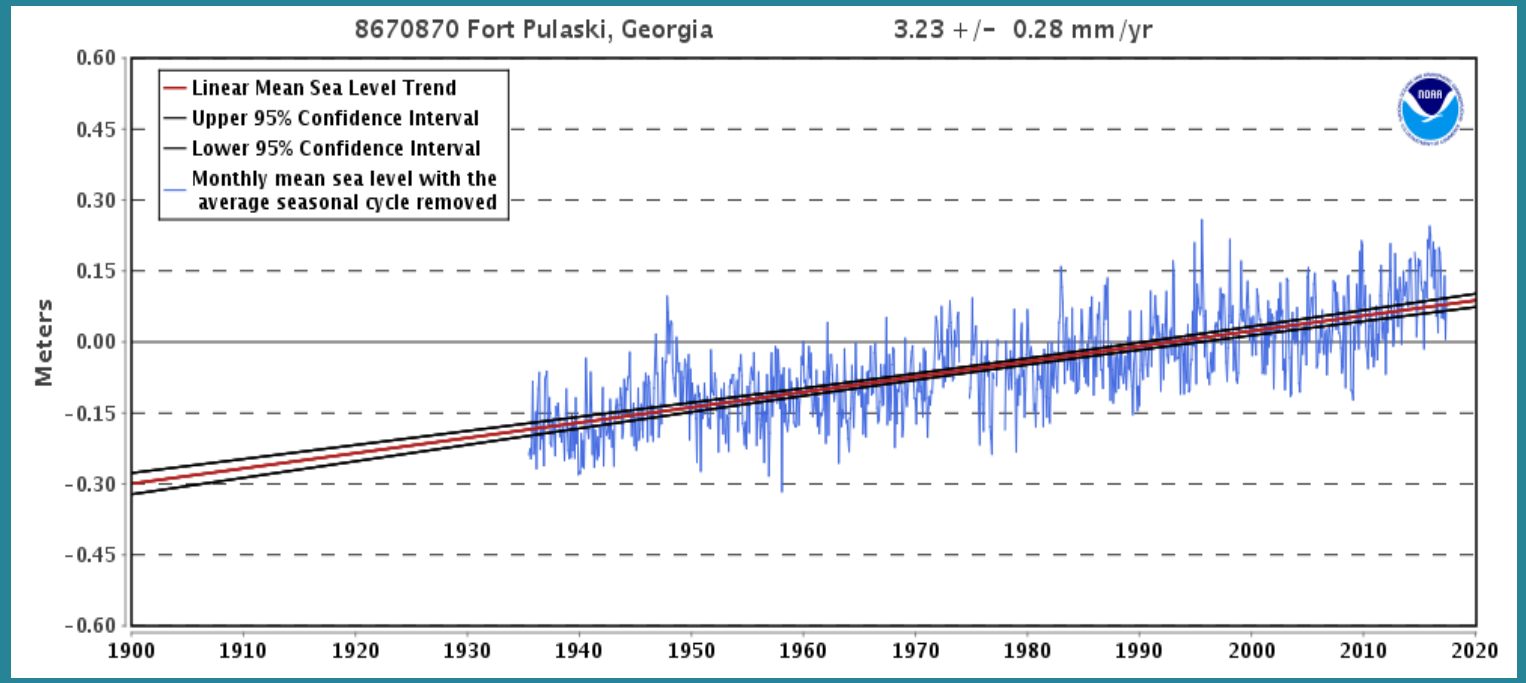
Source: NOAA NOS; SC Sea Grant, SCDHEC/MyCoast

Total number of flood events at Ft. Pulaski gauge



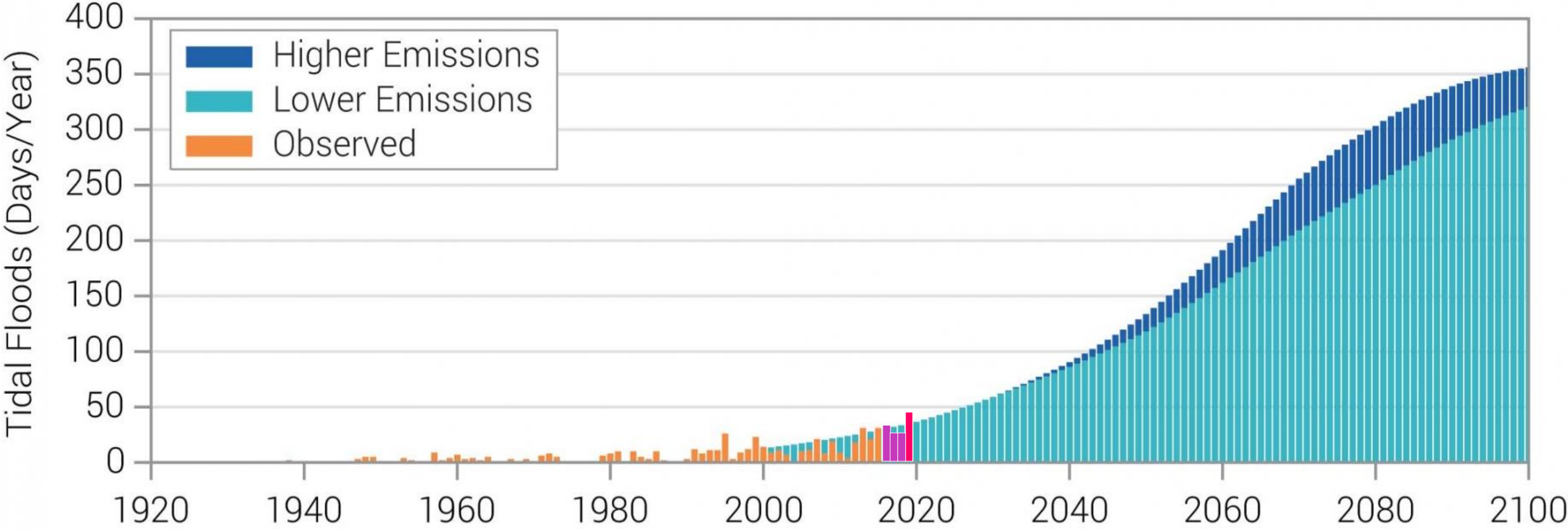
Source: National Ocean Service/NOAA; S.C. Sea Grant Consortium





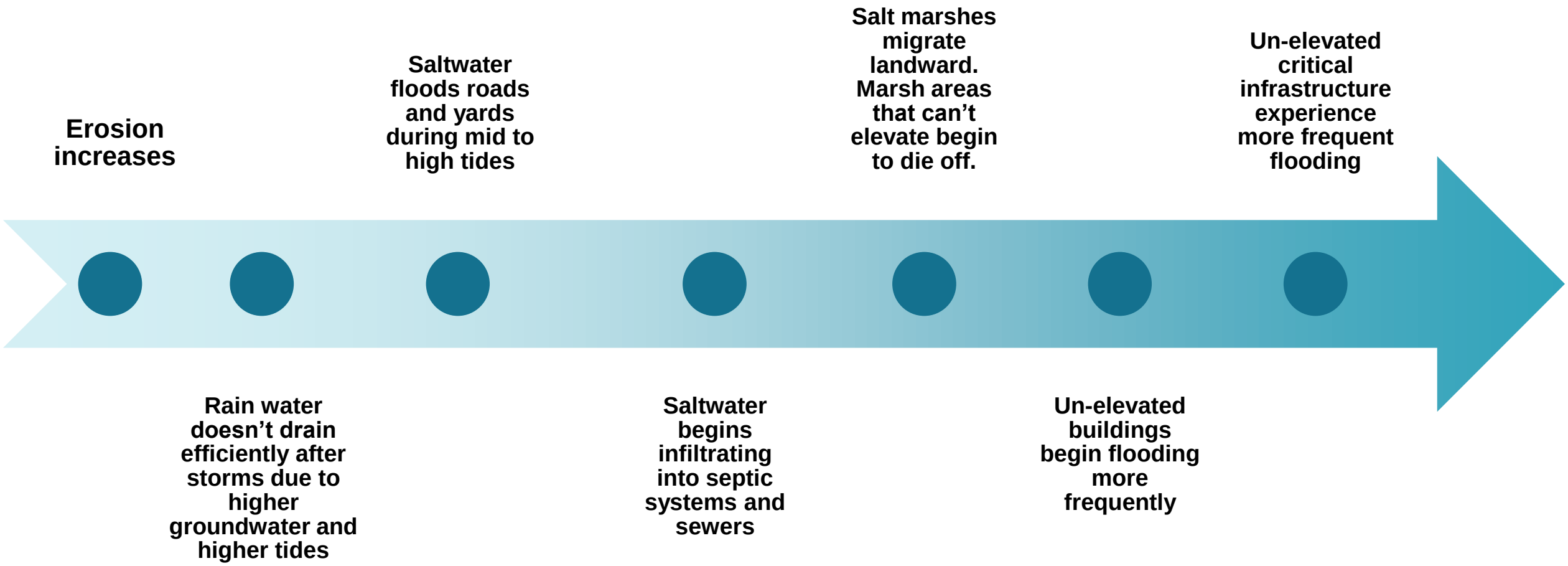
Credits: NOAA/NOS

Observed and Projected Annual Number of Tidal Floods for Fort Pulaski, GA

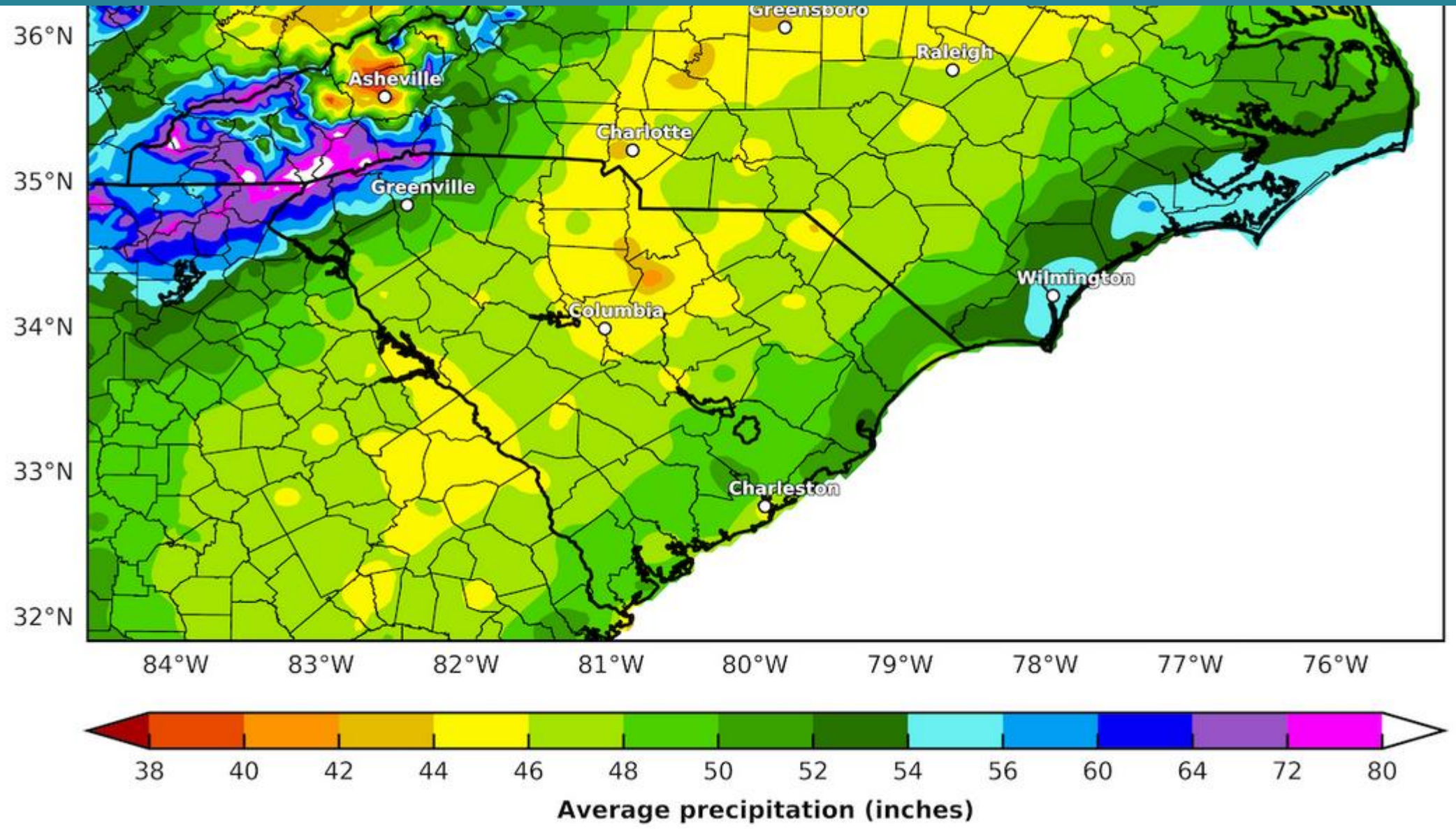


Source: NOS/NOAA

How Sea Level Rise Affects Communities

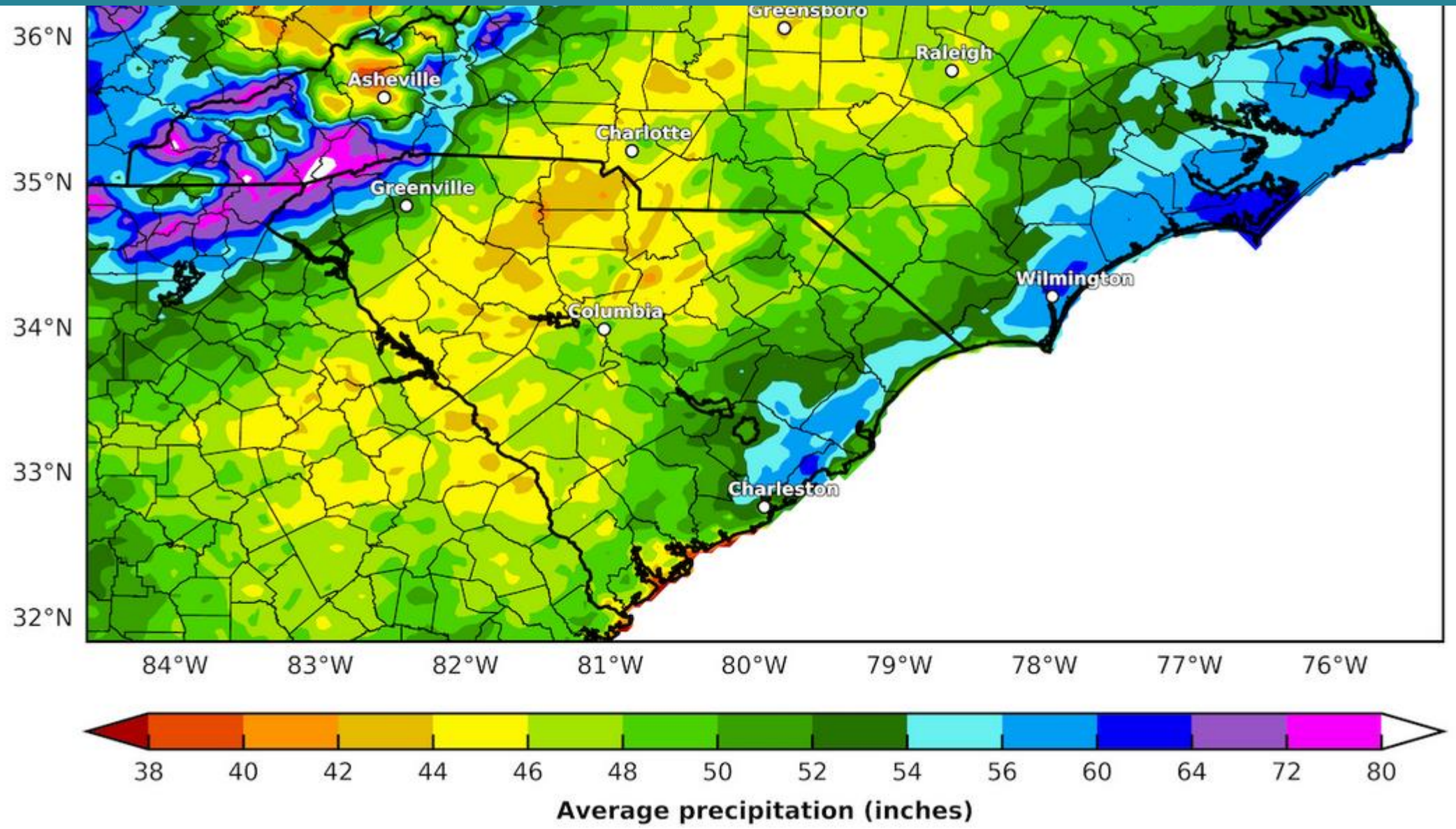


Annual Average Precipitation 1895-2016



Source: Southeast Regional Climate Center/PRISM/CISA Carolinas Precipitation Atlas

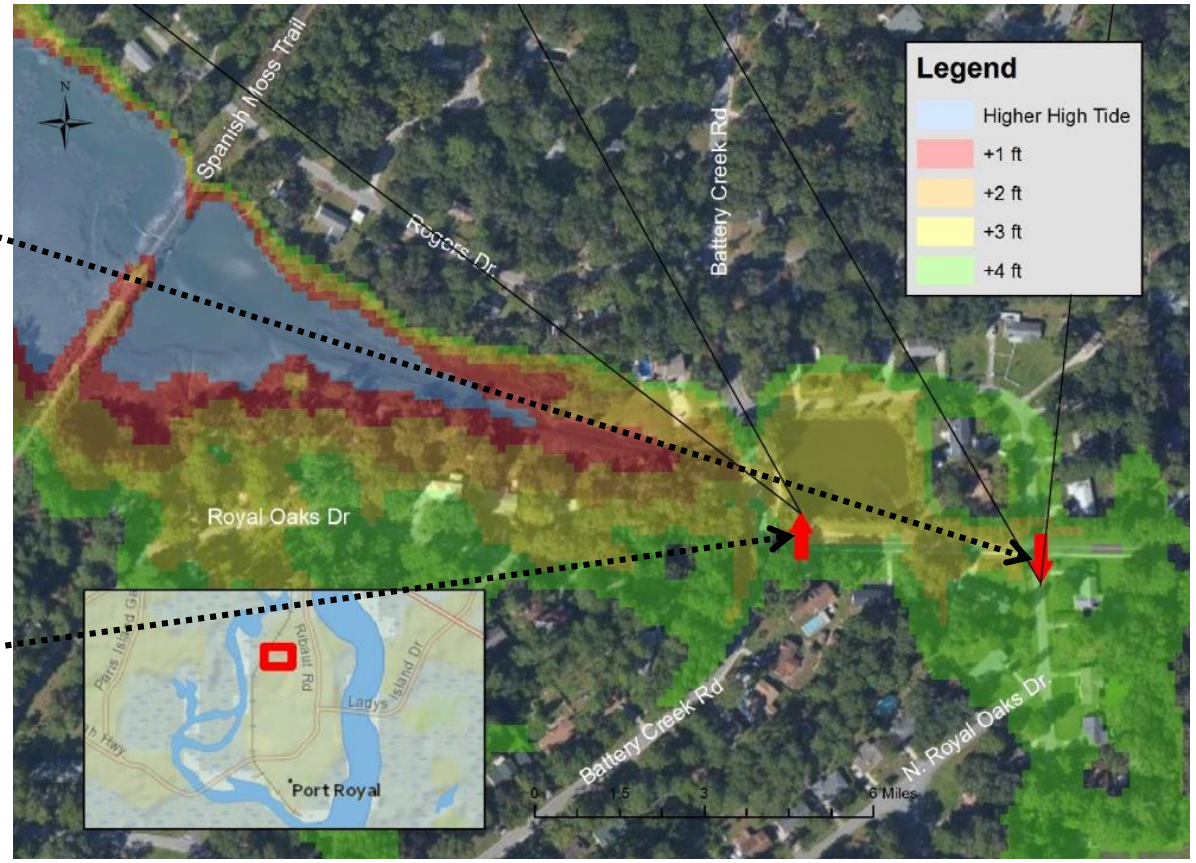
Annual Average Precipitation 2002-2016



Source: Southeast Regional Climate Center/PRISM/CISA Carolinas Precipitation Atlas

Compounded Flooding

Mossy Oaks Neighborhood, August 10, 2014



Top 5 Heights at Ft. Pulaski Gauge

Date	Event	Above MHHW
10.8.2016	Hurricane Matthew	4.95 ft
9.11.2017	Tropical Storm Irma	4.63 ft
10.15.1947	Hurricane King/Cape Sable Hurricane	3.25 ft
10.27.2015	King Tide	2.82 ft
11.23.2018	King Tide	2.64 ft

1 ft above MHHW = Full or New Moon High Tide

2 ft above MHHW = King Tide

3 ft above MHHW = Hurricane King or King Tide + 1ft SLR

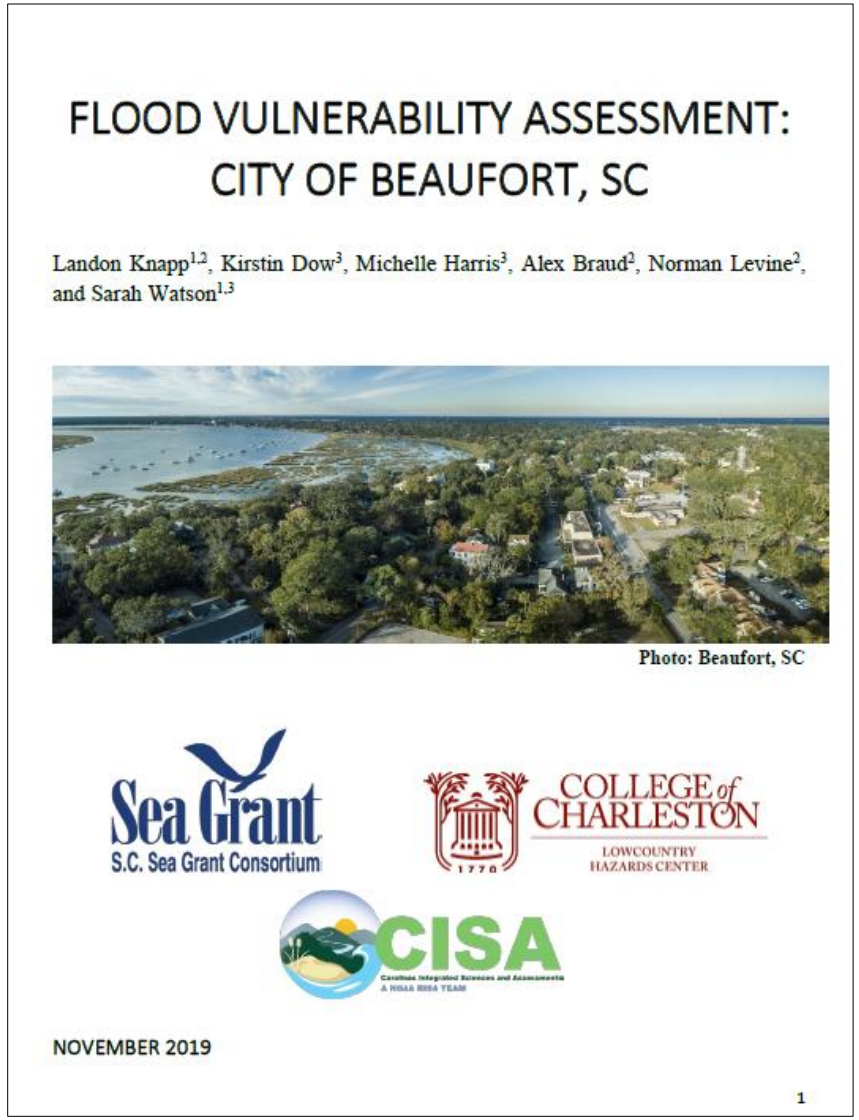
4 ft above MHHW = 1ft of SLR + Hurricane King

5 ft above MHHW = Irma

6 ft above MHHW = Irma + 1ft of SLR

Study Background

- Provide an overview vulnerability assessment involving flooding from tides and rain
- Generate a report that can be used to justify the need for funding to mitigate impacts of flood hazards
- Compare “Challenged Areas” for their relative vulnerability to assist prioritization



FLOOD VULNERABILITY ASSESSMENT:
CITY OF BEAUFORT, SC

Landon Knapp[1,2], Kirstin Dow[3], Michelle Harris[3], Alex Braud[2], Norman Levine[2], and Sarah Watson[1,3]

Photo: Beaufort, SC

Sea Grant
S.C. Sea Grant Consortium

COLLEGE of CHARLESTON
LOWCOUNTRY HAZARDS CENTER

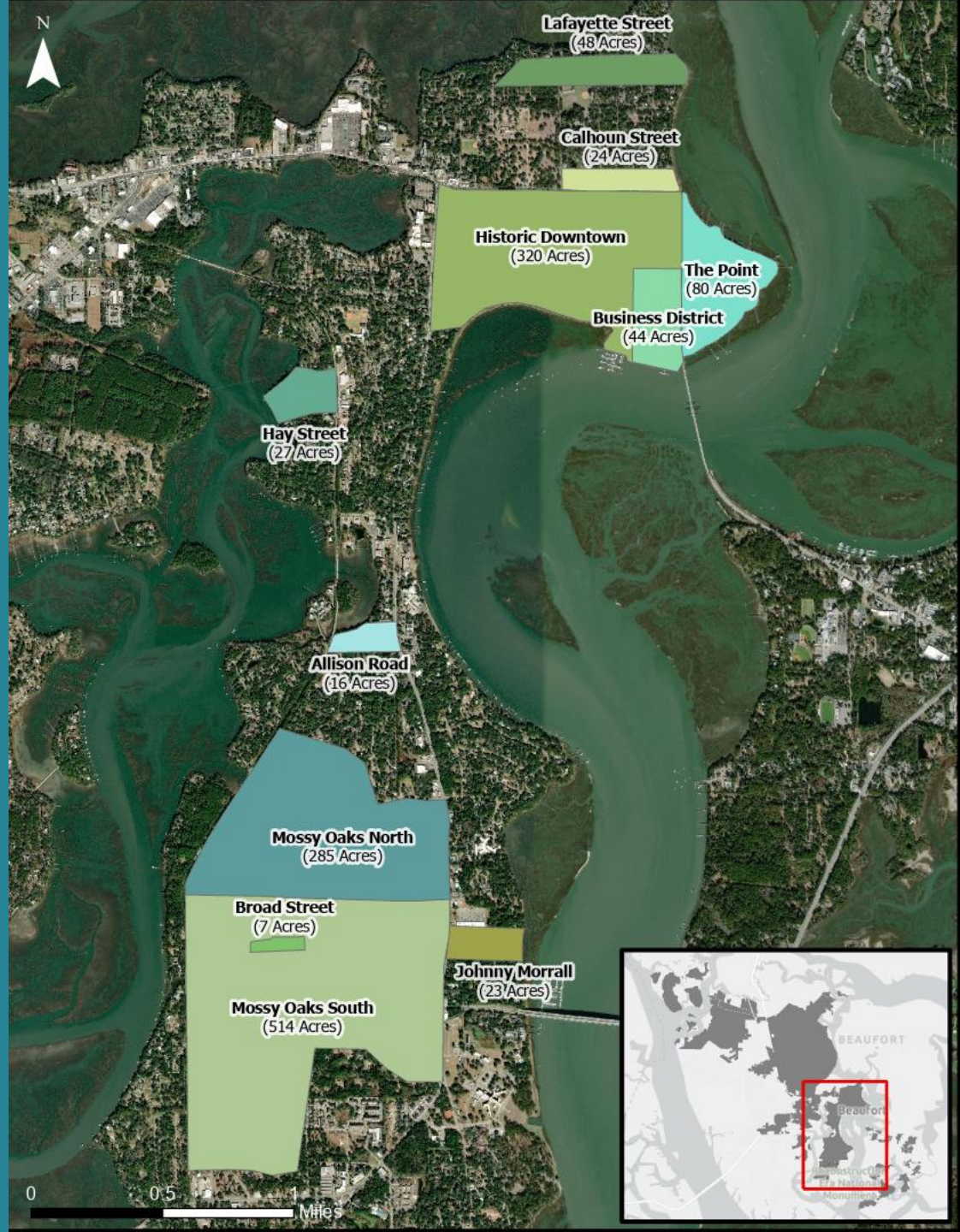
CISA

NOVEMBER 2019

1

Challenged Areas

- Lafayette Street
- Calhoun Street
- Historic Downtown
- Business District
- The Point
- Hay Street
- Allison Road
- Mossy Oaks North
- Broad Street
  Mossy Oaks South
- Johnny Morrall



Report Findings

- With each additional foot of water, +2-4% of the City will be persistently inundated
- 30% of the City persistently inundated with 6-ft of water above current MHHW
- Most impacts occur outside of Challenged Areas (~70%)
- The Point most at-risk area for near-term and long-term SLR
  - 32% inundation at 3-ft; 83% at 6-ft

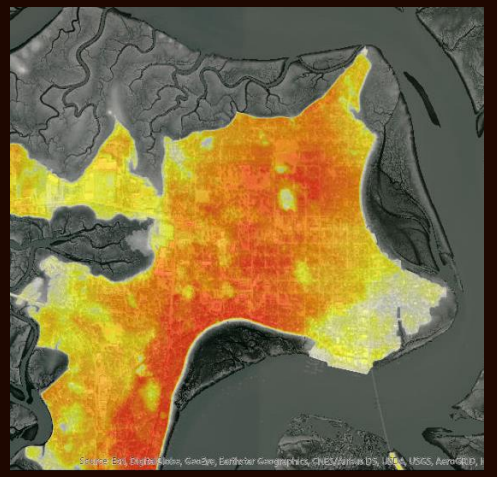
Report Findings

- Business impacts at 6-ft above MHHW:
  - 99 businesses, 1,395 employees, $155.7 mil total sales volume
- 14% of City vulnerable to modeled 6” rain event
- Historic Downtown most vulnerable to impacts of 6” rainfall
  - 451 parcels, 323 structures
  - 49 businesses, 388 employees, $28.8 mil total sales volume

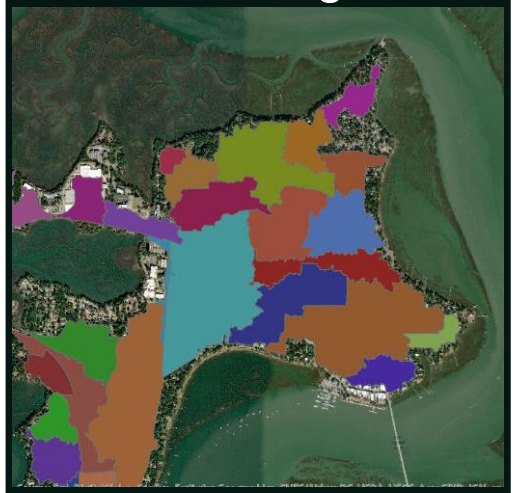
Behind the Data

- Models powered by newly created 1-meter resolution data sets
- Composite DEM from 2013+2016 LiDAR flights
- Mean higher high water surface generated and elevated in 1-ft increments (SLR)
- Hydro Tools used in ArcGIS to create urban watersheds and stream network
- Stormwater runoff calculated for each watershed based on land cover and soil type
- Assets obtained from City and ESRI Business Analyst; intersected with flood maps

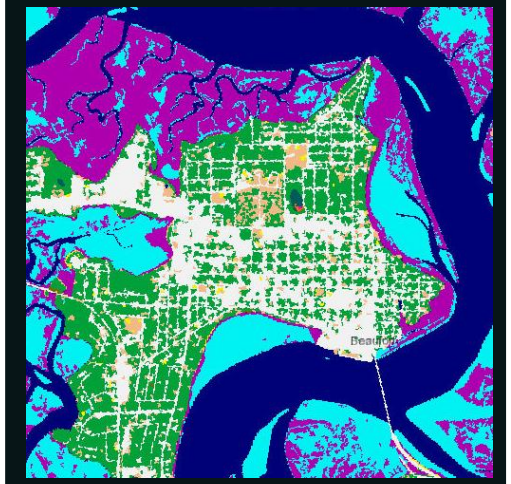
Digital Elevation Model



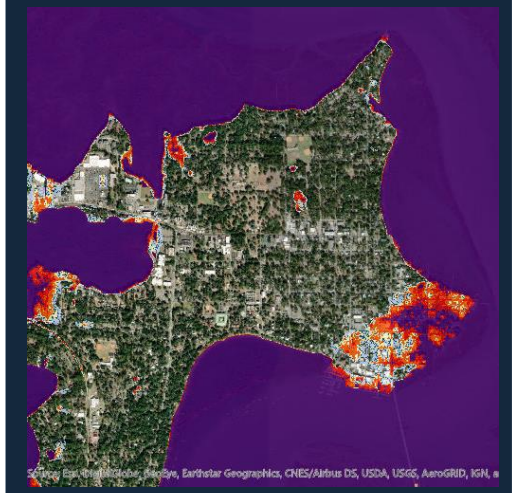
Watershed Routing



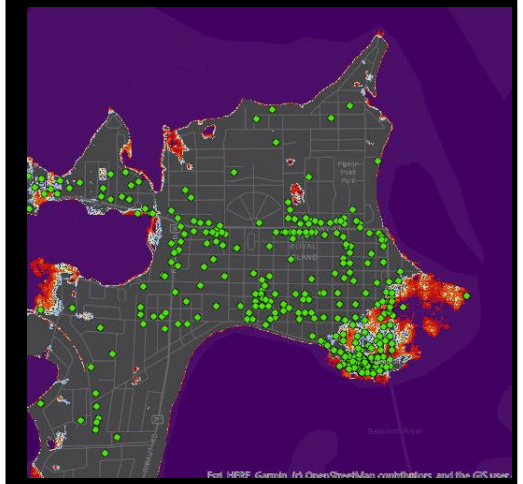
Land Cover



Flood Maps



Asset Vulnerabilities



Potential Next Steps

Evaluate flood mitigation construction projects to ensure they are designed and built to account for future conditions

Ensure drainage projects incorporate SLR into design

Analyze existing construction studies and plans for 9 challenge areas to see if this report may alter designs/plans

Coordinate policies and planning with neighbors

Potential Next Steps

Review what other municipalities in S.C. are doing to see if there is anything applicable for Beaufort

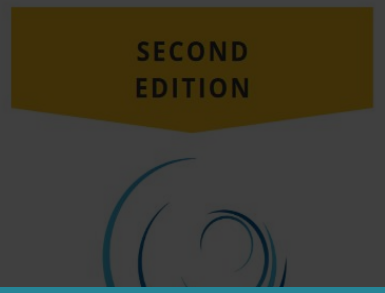
Examine codes and policies in other parts of the Southeast with a comparable future climate

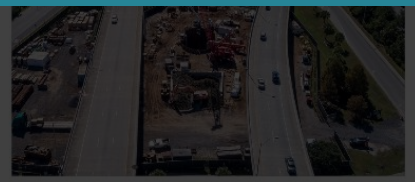
Think through how you can shift city policy to incorporate report findings

Consider designs that can be revised in the future

What Others Have Done

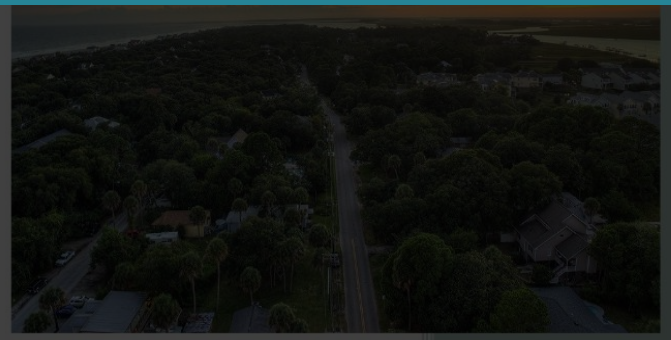
City of Charleston





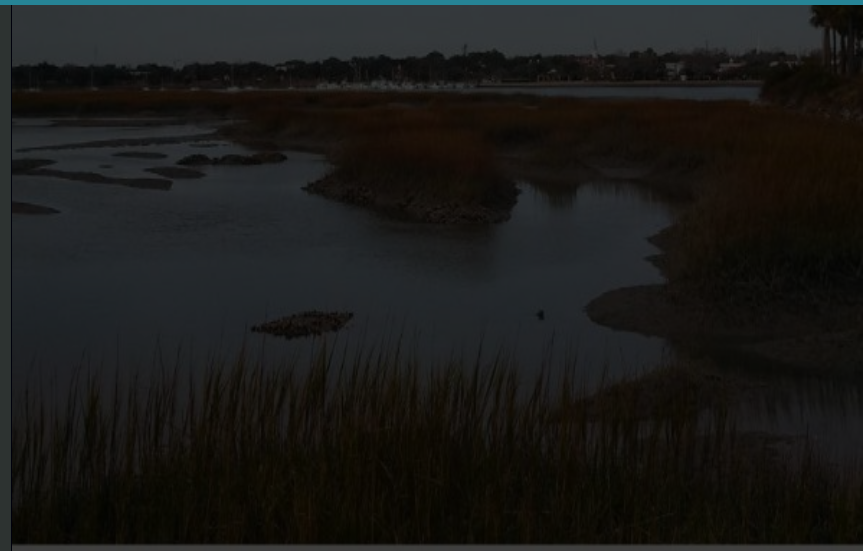
City of Folly Beach

2017



Final report
5/18/2017

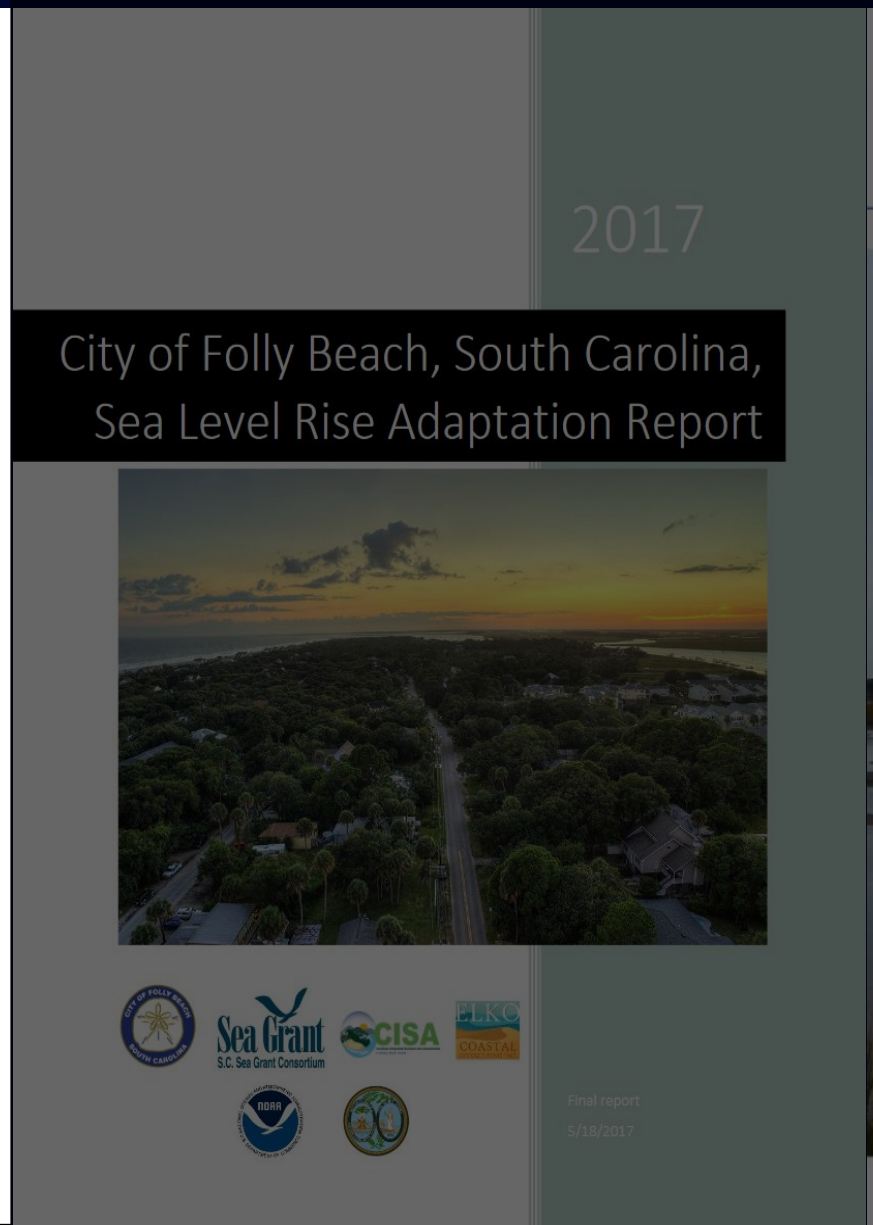
Beaufort County



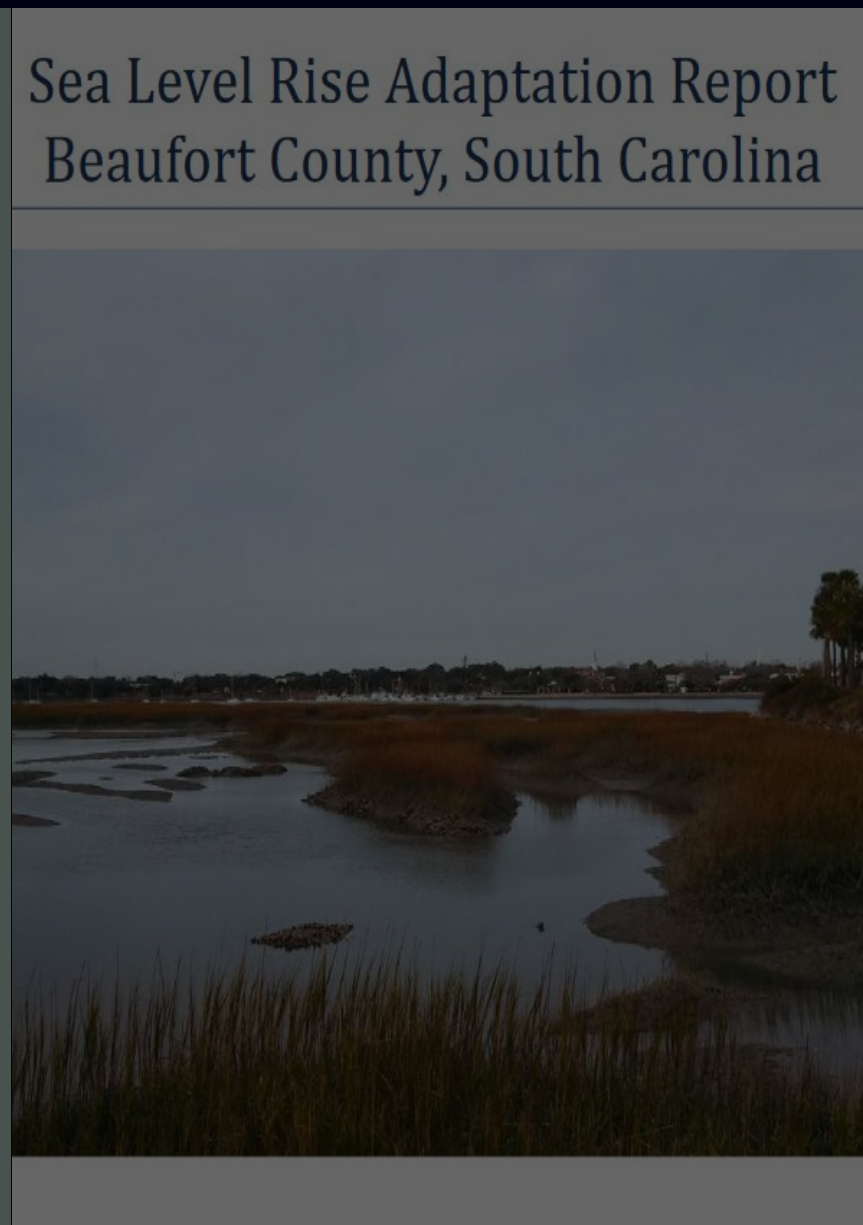
Sea Level Rise Adaptation Report
Beaufort County, South Carolina

City of Charleston

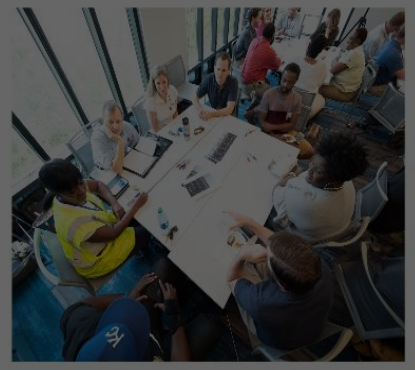
City of Folly Beach



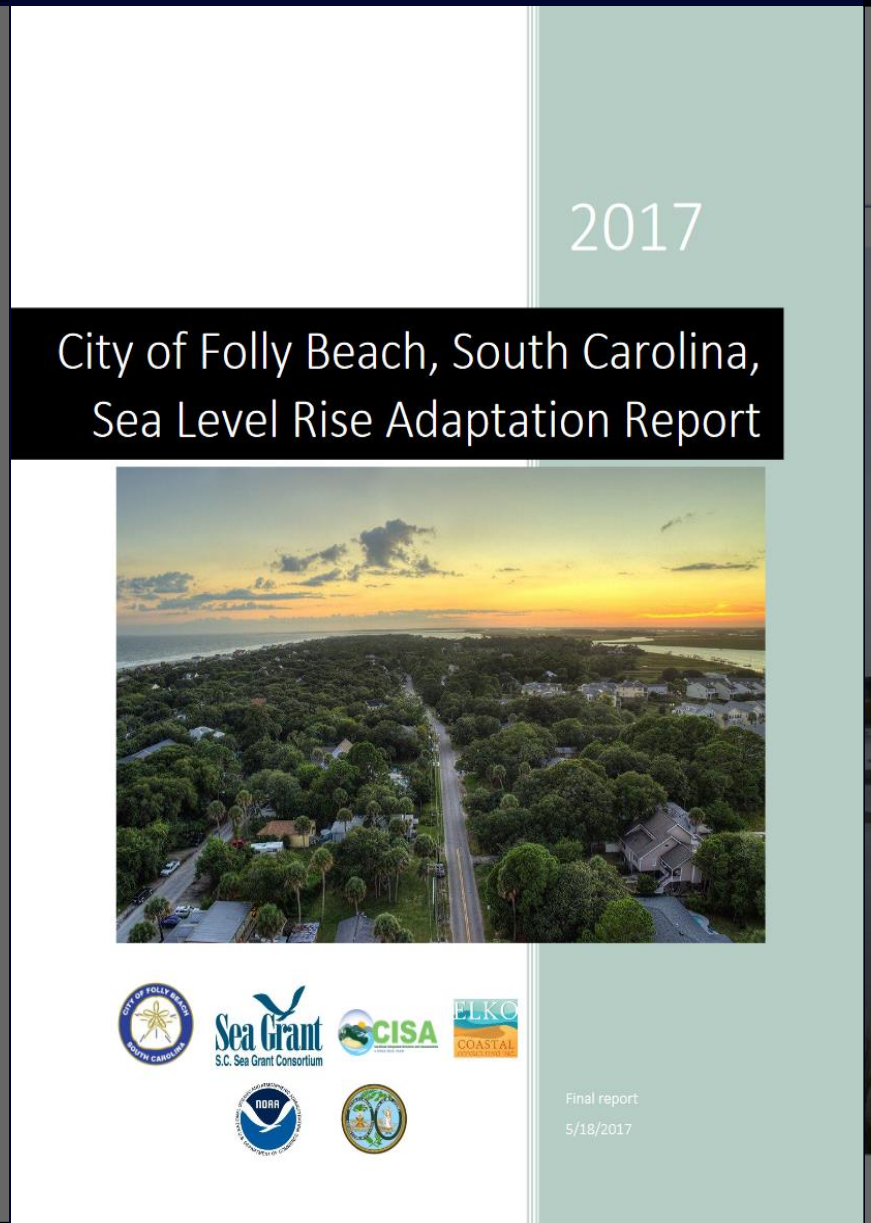
Beaufort County



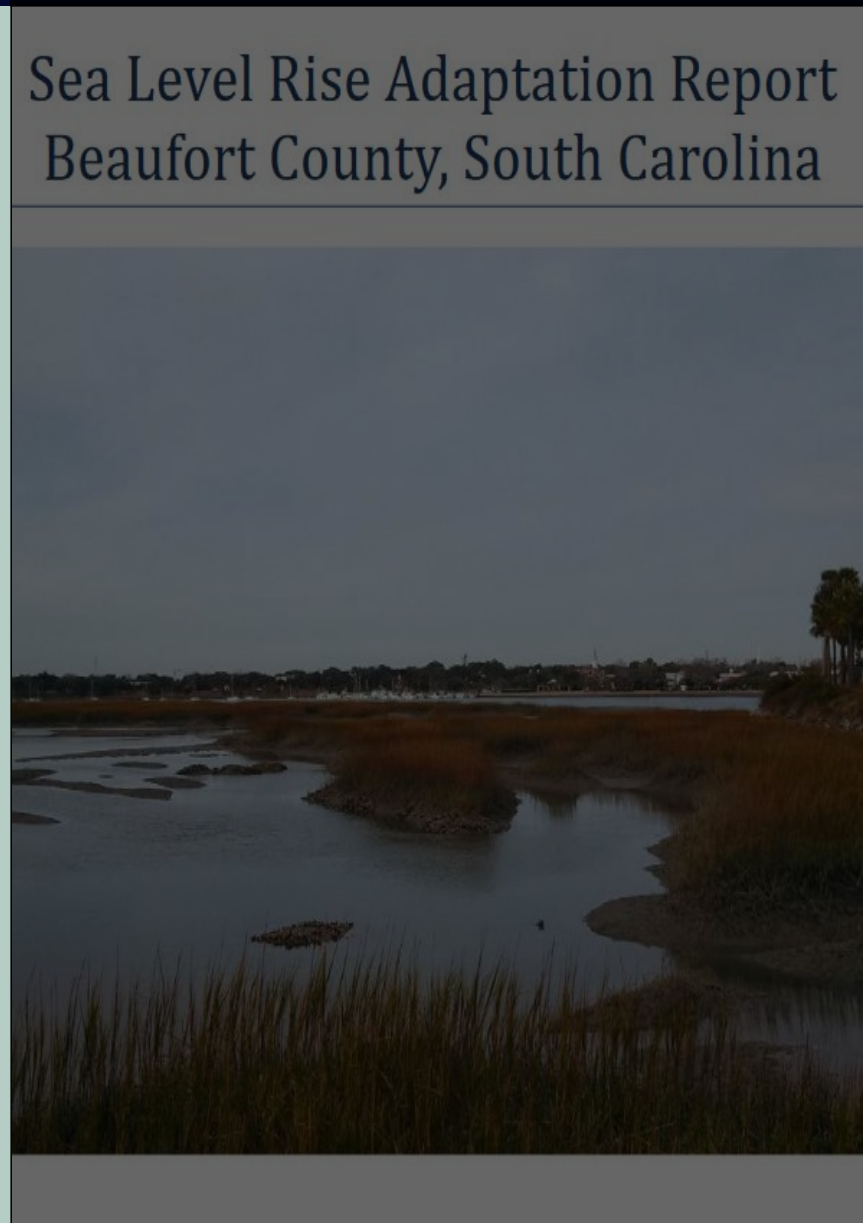
City of Charleston



City of Folly Beach



Beaufort County



City of Charleston

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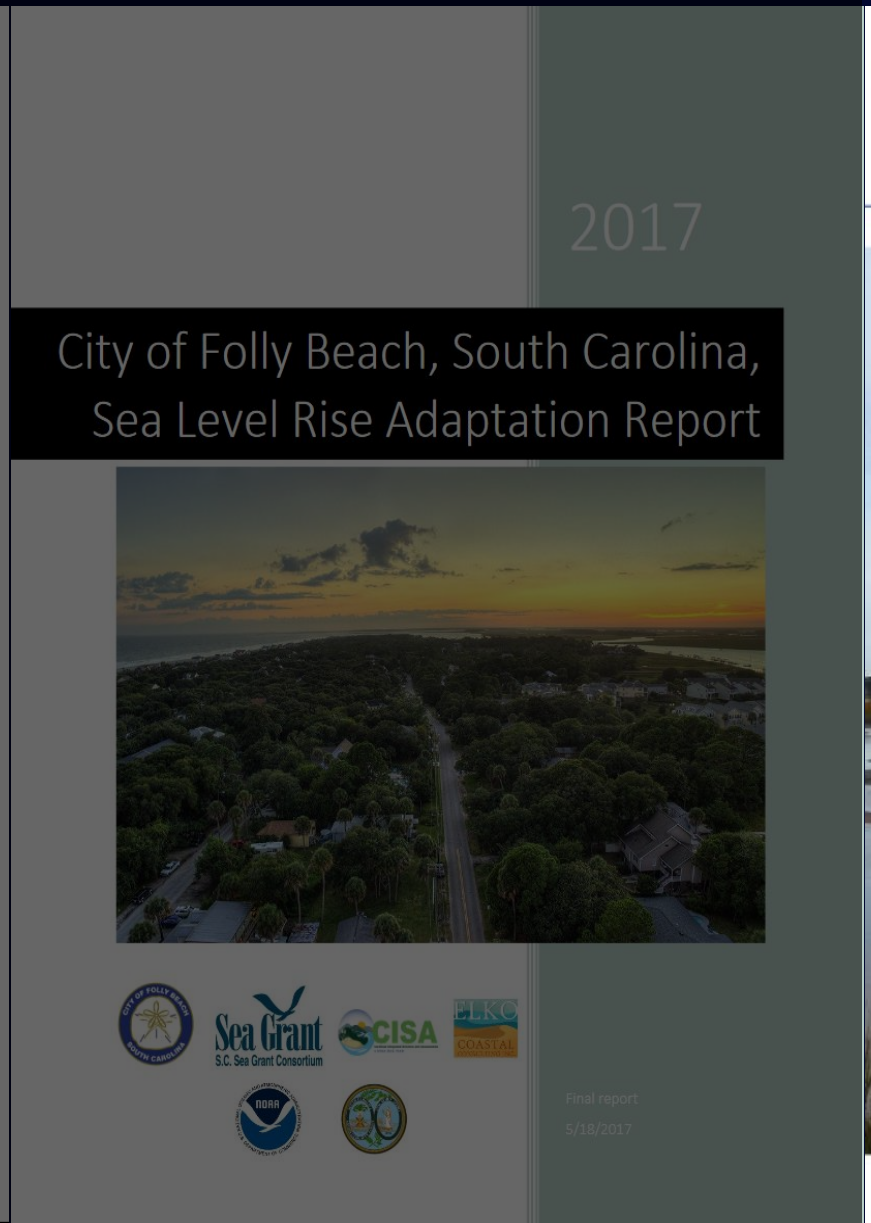
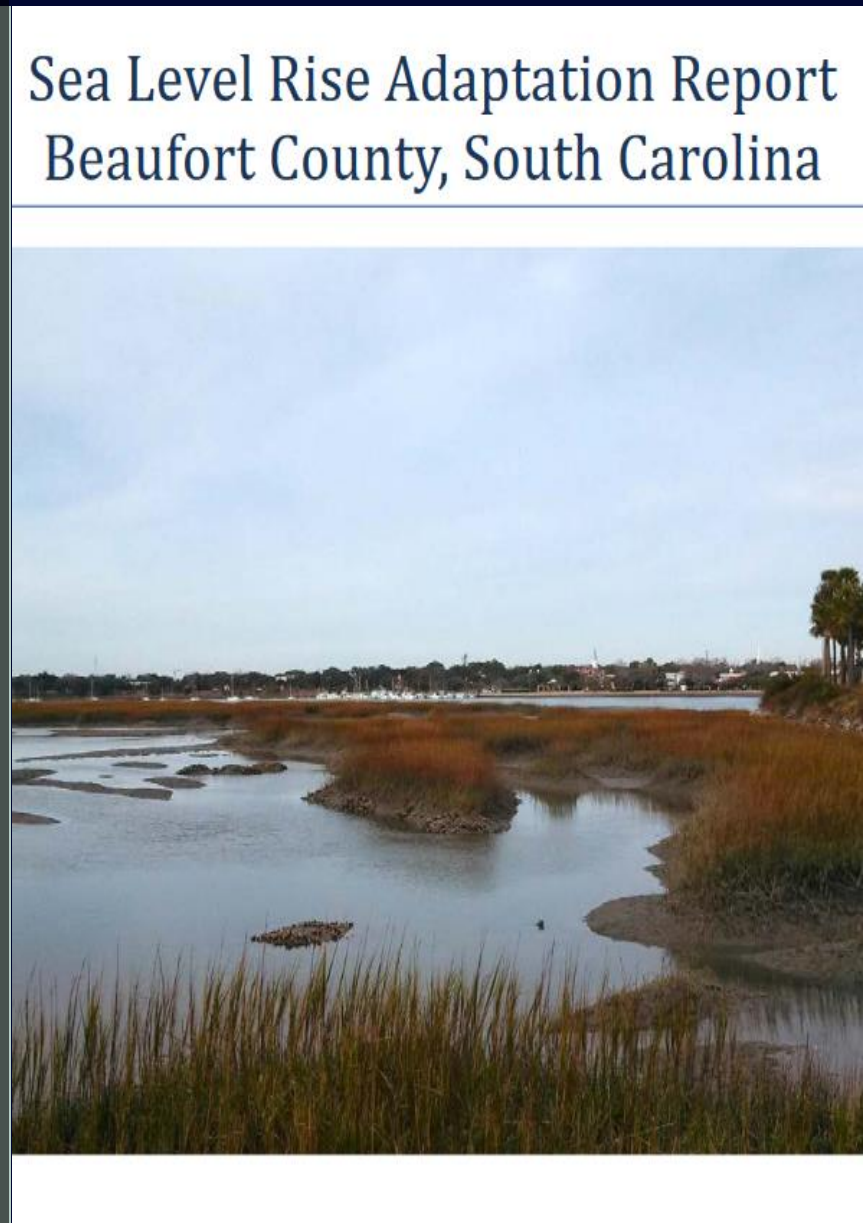


Beaufort County



Finding Funding

Economic Development Administration

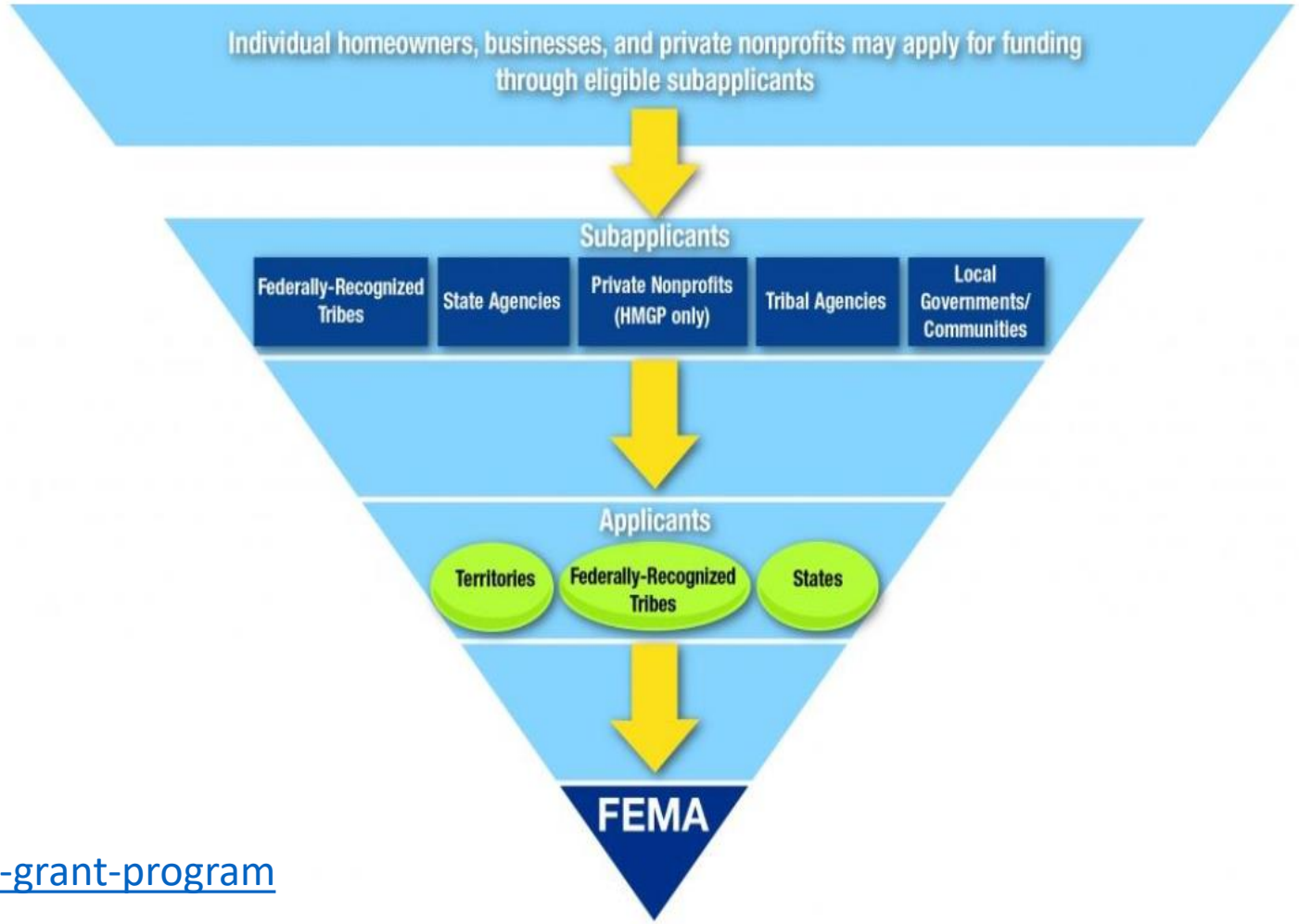
- Offer competitive grants to public entities
- Usually to create or retain jobs
- For technical assistance
- Want to know that the organization will have the capacity to use the information
- How the investment will support economic development or economic resilience
- May have a regional angle
- Recommendation to contact the state representative Robin Cooley with a list of potential project to see what is most competitive

  - Elevate pump station
  - Water and sewer mapping
  - Storm water mapping
  - Elevate a generator

Robin Cooley
1835 Assembly Street
Suite 1075
Columbia, SC 29201
P: (803) 253-3640
E: rcooley@eda.gov

FEMA Pre-Disaster Mitigation Grants

- Local entity can apply through the State Hazard Mitigation Officer
- Elizabeth Roberts (formerly Melton), State Hazard Mitigation Officer
- 803-737-8500
- SC Emergency Management Division



https://www.fema.gov/pre-disaster-mitigation-grant-program

State Historic Preservation Office administers Certified Local Government (CLG) Program

The Certified Local Government program is a federal, state, and local partnership that recognizes local governments that have established preservation programs and that helps communities save the irreplaceable historic character of places.

- **Beaufort is an CLG**
- Apply for federal grant funds set aside just for CLGs.
  - Usually amounts to a minimum of $75,000 each year that only CLGs may apply to use.
- These matching grants can fund a wide variety of projects such as
  - Structural assessments
  - Feasibility studies
  - Stabilization projects for historic buildings
  - Surveys
  - National Register nominations
  - Design guidelines
  - Educational programs
  - Training

Grants.gov

- You can set up an email alert on Grants.gov to be notified automatically when a grant featuring a search term, such as "community revitalization" or "smart growth," is posted.

Questions?

Kirstin Dow: KDow@sc.edu

Landon Knapp: landon.knapp@scseagrant.org

Sarah Watson: sarah.watson@scseagrant.org

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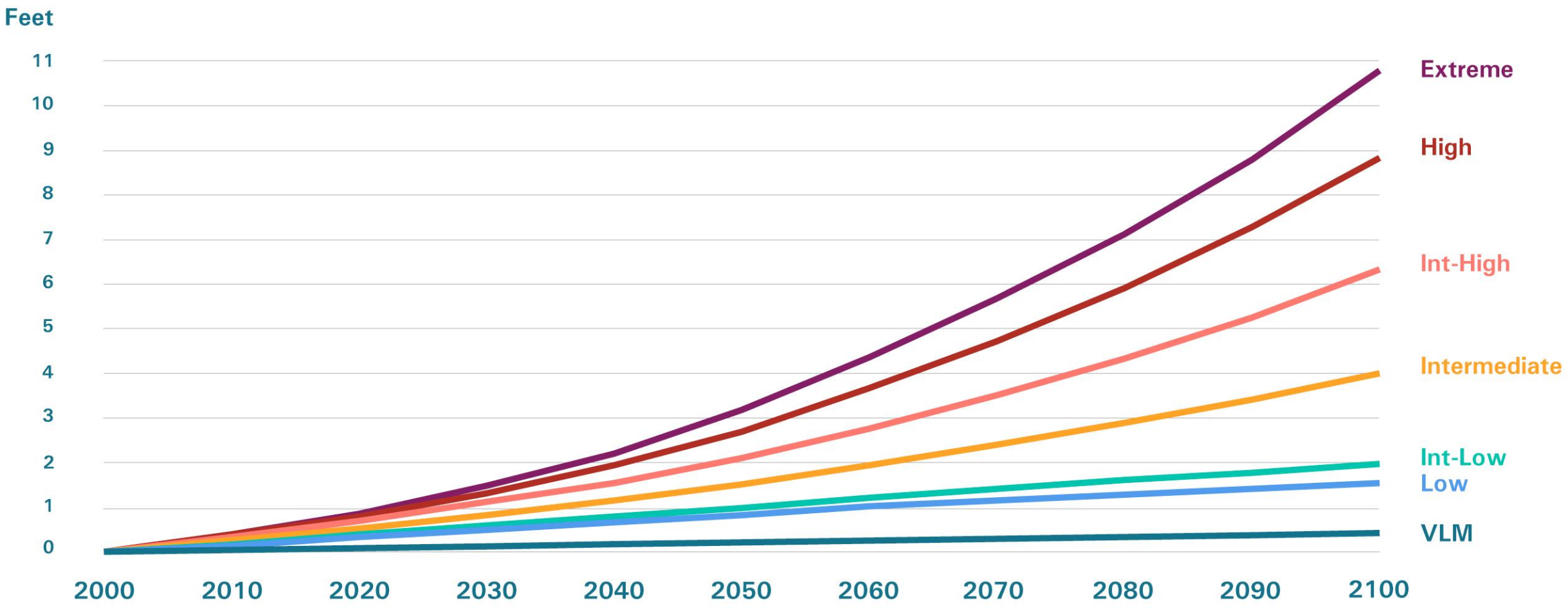
NOAA 2017 Sea Level Rise Scenarios for South Carolina



Scenarios for FORT PULASKI
NOAA2017 VLM: 0.00440 feet/yr Output data are NAVD88
All values are expressed in feet

Table 7: NOAA 2017 Sea Level Rise Scenarios for Fort Pulaski, GA (USACE, 2017)

Year	NOAA2017 VLM	NOAA2017 Low	NOAA2017 Int-Low	NOAA2017 Intermediate	NOAA2017 Int-High	NOAA2017 High	NOAA2017 Extreme
2000	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16
2010	-0.12	-0.03	0.00	0.10	0.16	0.20	0.23
2020	-0.08	0.16	0.23	0.36	0.53	0.62	0.69
2030	-0.03	0.33	0.43	0.66	0.95	1.15	1.31
2040	0.01	0.49	0.62	0.99	1.38	1.74	2.00
2050	0.06	0.69	0.85	1.38	1.94	2.53	3.02
2060	0.10	0.85	1.05	1.77	2.59	3.48	4.17
2070	0.14	0.99	1.25	2.23	3.31	4.50	5.48
2080	0.19	1.15	1.48	2.76	4.20	5.74	6.96
2090	0.23	1.28	1.64	3.28	5.12	7.12	8.63
2100	0.28	1.38	1.81	3.84	6.17	8.63	10.57