

***By Vaughn Rinner, FASLA***

## **OVERVIEW OF CLIMATE CHANGE ISSUES**

- **Sea Level Rise in Charleston, South Carolina - Erin Stevens**
  - Sunny day flooding
  - Tidal influence
  - Saltwater inundation
  - More frequent flooding
- **Compound Flooding in Charleston, South Carolina - Erin Stevens**
  - Sea level rise
  - Intense rainfall
  - Extreme tides
  - Compound flooding – intense rain with high tide
- **Inland Flooding in Georgia - Alfie Vick**
  - Extreme wet years and extreme dry years
  - Extreme precipitation events
- **Urban Heat Island in Georgia - Alfie Vick**
  - Health consequences from warming environment
  - Exposure to intense heat
  - Heat impacts greatest in vulnerable populations
  - Air pollution increases
  - Longer pollen season
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- **Sea Level Rise in Florida - Emily O'Mahoney**
  - Sunny day flooding
- **Hurricanes in Florida and Beach Erosion - Emily O'Mahoney**
  - More frequent hurricanes
  - Slow moving
  - Beach erosion from wave action
  - Built environment preventing beach littoral drift
- **Saltwater Intrusion in Coastal Wells - Emily O'Mahoney**
  - Aquifer system under most of the state has historically provided fresh water
- **Hurricane Intensity in North Carolina - Stephanie Kelly**

- Slow movement, lingering
- Increased rain
- Increased intensity
- Roadway flooding
- Mental health issues

- **North Carolina Urbanization - Stephanie Kelly**
  - Urban growth along the coast
  - Increased urban heat island effect
  - Increasing frequency, duration, and intensity of heat waves
  - Decrease in biodiversity
  - Decrease in regulating ecosystem services
    - Stormwater interception and storage
    - Carbon sequestration
    - Extreme weather buffering
  - Economic impacts
    - Declining tourism
    - Declining forestry
    - Declining agriculture
- **Equity Issues and Migration - Erin Stevens**
  - People with less mobility and resources have difficulty getting out of harm's way
  - Vulnerable populations live in areas with greatest flooding
  - Socio-economic divide between those who can and cannot afford to live in safer places
  - Heat island effect with less trees and green among vulnerable populations
  - Indigenous populations locked into a specific land base
  - Large retirement population in coastal areas
  - Community engagement, education, and outreach important

## **POLICIES, ORDINANCES AND REGULATORY CHANGES**

### **GEORGIA**

- **Atlanta Green Infrastructure Ordinance**
  - Mandates retention of first inch of precipitation on new development sites
- **Georgia Coastal Marshlands Protection Act, 1970**
  - Georgia has 100 miles of Atlantic coast providing one third of the Atlantic's intact saltmarsh
  - Saltmarsh protects the mainland mitigating storm energy
- **Georgia Climate Project**
  - Major statewide grassroots initiatives
  - Consortiums of academic institutions and nonprofit foundations
  - Holistic approach to climate mitigation and adaptation
  - Leadership at the city level
  - Building a statewide network of climate advocates to work on solutions to address climate change

- **Drawdown Georgia**

- Mitigation effort building off of international Project Drawdown
- Identify most effective strategies for utilizing in Georgia

## **NORTH CAROLINA**

- **Executive Order Commitment to Paris Climate Agreement, 2018**

- Transition to clean energy economy
- Decrease state greenhouse gas emissions
- Increase zero emission vehicles
- Evaluate all programs for support of statewide mitigation and adaptation practices

- **Climate Change Interagency Council:**

- Spearheaded by the North Carolina Department of Environmental Quality
- High level cross-sectional approach

- **North Carolina Climate Risk Assessment and Resilience Plan and Community Engagement**

- Information on observed and projected climate change impacts for
- Information for specific regions and economic sectors
- Addresses issues around climate and environmental justice vulnerabilities
- Information on climate hazards
- Information on resilience strategies including nature-based solution
- Community engagement effort for creating synergies and actionable results

- **North Carolina Office of Recovery and Resilience**

- Division of the North Carolina Department of Safety
- Creation of Chief Resilience Officer
- Mission: Build a stronger North Carolina where communities, economies, and ecosystems rebound, adapt, and thrive amid changing climate conditions and challenges.
- Responsible for the distribution of post disaster relief funds, advising government agencies on disaster recovery and resilience, and providing technical assistance to communities seeking to implement resilience plans
- Partnership with the Division of Coastal Management

- **North Carolina Resilient Coastal Communities Program**

- Under newly created **North Carolina Rural Center**
- \$3.4 million in grant funding to work with 20 North Carolina coastal communities
- Conduct risk and vulnerability assessments
- Construction funding for resilience building projects
- Plans to expand this program to other parts of the state in the future.

## **FLORIDA**

- ***Climate Change Plan Overview***
  - There have been on six laws and policies about climate change set since 2007
  - Three state agency plans
  - Sixteen policies and plans in place at the local and regional level.
- ***Florida Energy and Climate Change Action Plan, 2008***
  - Developed by Florida Governor’s Action Team on Energy and Climate Change in 2007
    - Directed to create a comprehensive Energy and Climate Change Action Plan
    - First phase strategies to reduce greenhouse gas emissions
    - Second phase long-term strategies for reducing climate impacts
    - Adaptation Technical Work Group to develop adaptation strategies
  - Many cities have joined
  - Many resiliency directors in cities
- ***2060 Florida Transportation Plan, 2010***
- ***Climate Change Action Plan for the Florida Reef System, 2010***

## **PROJECT EXAMPLES**

### **NORTH CAROLINA**

- ***Lumberton Community Resilience Plan Implementation***
  - Coastal Dynamic Lab, College of Design at North Carolina State University
  - Led by Andy Fox
  - Initiated following flooding from Hurricanes Matthew in 2016 and Florence in 2018.
  - Interdisciplinary project won an ASLA Award of Honor for Analysis and Planning and an Award of Excellence from the ASLA Southeast Regional Conference.
  - City of Lumberton located in the Southeast region of North Carolina 70 miles inland
  - Located along the Lumber River, a vital natural resource cultural identity.
  - Watershed scale and site-specific analysis
  - Proposal of the Lumberton Loop, a greenway system
  - Eight and a half miles of trails
  - 806 acres of publicly accessible open space and vacant parcels
  - 99% located in the 100-year flood plain
  - Plan was formally adopted by the city
  - Floodprint’s proposal to adapt a former meatpacking plant as a Watershed Education Center and boat launch received a \$250,000 Environmental Enhancement Grant to support the Floodprint’s proposal

## **SOUTH CAROLINA**

- ***Charleston Comprehensive Plan:***

- Analyze water issues as they relate to land use
- Recommendations to integrate water issues into their comprehensive plan and zoning
- Anticipated three feet of sea level rise with everyday high tide floodplain on large part of land
- Focus on adaptation to rising seas
- Natural systems are reclaiming the land that was filled and barricaded
- Integrate future plans with natural processes for more resilient and adaptable solutions
- Salt marsh estuary important economically and culturally
- Estuary supports wildlife and provides protection from hurricanes and storm surge
- Recommend preserving and vegetating a buffer along the salt marsh
- Allow and manage the marsh ecosystem migration as sea levels rise
- Identify and protect emergent pockets of freshwater wetlands to prevent future flooding
- Nature based solutions instead of bulkheads
- Define coastal landscape typologies: Coastal Edge, Lowland Floodplain, Upland Ridge
- Identify plants that do well in current and future conditions
- Identify plants for urban and suburban reforestation
- Identify water management measures that mimic the natural system included amenity and habitat value
- Transects for major regions include soil types, hydrologic conditions, and systems
- Adaptable housing technologies for each major region with stormwater management tools

## **GEORGIA**

- ***Tybee Island***

- Barrier island
- 2016 sea level rise adaptation plan
- Green infrastructure dune restoration
- Reinforced dune vehicular crossings
- Inland dry day flooding due to sea level rise
- Working with the University of Georgia Marine Extension, the College of Environment & Design, and the College of Engineering
- Planning for adaptation of marsh side of island
- Extensive community engagement

- ***Atlanta Storm Intensity***

- New precipitation patterns cause extreme flooding
- Combined sewers inadequate to handle large rain events
- Under consent decree with the EPA

- City strategy to build massive underground detention vaults to store the stormwater and delay its discharge
- Alternative use of Fourth Ward Park as a massive detention pond
- Provides stormwater mitigation, recreation, and habitat benefits
- Cost savings over vault (\$25 million versus \$40 million)
- Park generated over \$1 billion dollars of private investment in the surrounding area
- City responsibility to think about issues of gentrification and displacement

## **FLORIDA**

- ***University of Miami Lakeside Village, Miami, Florida***
  - Architectonic and ArchitectonicGEO designed dormitories
  - 25 buildings with sloped green roofs designed to withstand 200 mph hurricane winds
    - Roofs designed to prevent scouring along the edges
    - Roofs not accessible to residents, support pollinators and absorb water
  - Project built using Low Impact Development principles
  - Ground plane underbuilding pedestrian activated
- ***Green vs. Gray Report, 2016, Miami Beach, Florida***
  - Designed by Savino & Miller
  - Conversion of a 19-acre golf course to a wetland
  - Serves as stormwater retention and as Bayshore Park
  - Collects runoff from 85 acres of the surrounding area
- ***Miami Baywalk & Riverwalk Design Guidelines, Miami, Florida***
  - Savino & Miller developed Baywalk and Riverwalk Design Guidelines in Miami
  - 25 foot wide path along the already hardened edge of the water
  - Considered connectivity and interpretation
  - Historic trail component
  - Much of the trail to be built by adjacent private development
  - Trail goes out into Biscayne Bay and provides access to mangrove habitat
  - Addresses regulatory issues in developing living shorelines
    - Hardening the shoreline displaces seagrass
    - New policy has been adopted to retain the seagrass
- ***Barnacle Historic State Park, Coconut Grove, Florida***
  - Example of retreat that addresses issues of sea level rise and resiliency
  - Park is a five-acre historic property given to the state to be improved as a museum
  - Historic house is the oldest in the City of Miami
  - Built by the developer of Coral Gables

- Located along Biscayne Bay
- The main structure is protected but other structures on the site built to be inundated as sea level rise occurs
- Allows seagrasses to reestablish, providing important ecosystem services