# Understanding Drought in Coastal Ecosystems

Cape Fear Arch Conservation Collaboration
Quarterly Meeting
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cisa
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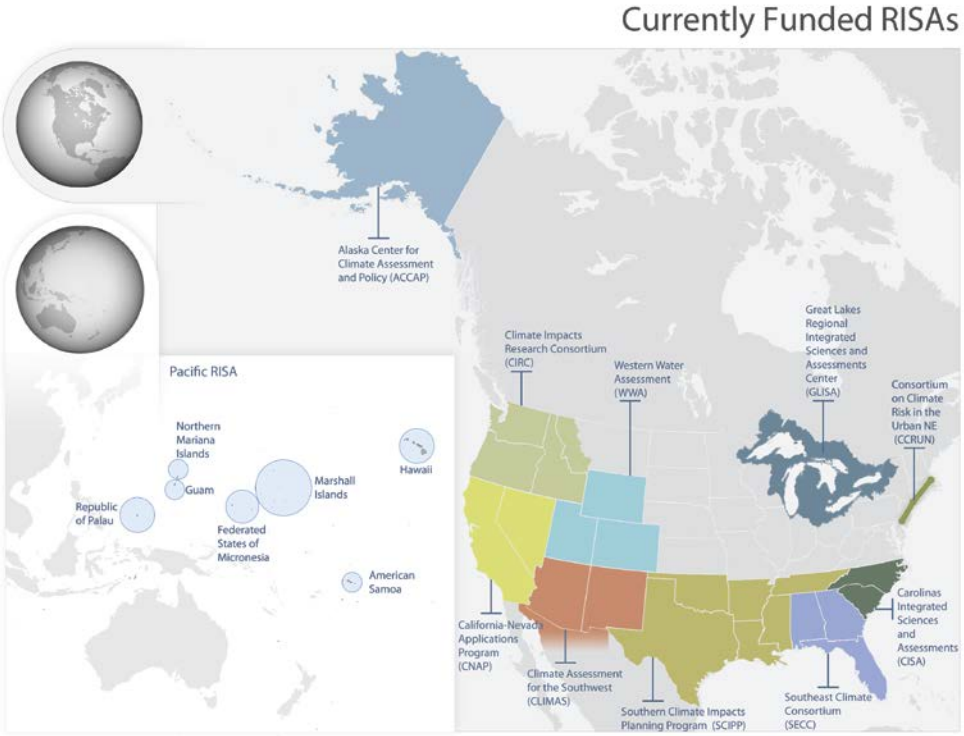
# Regional Integrated Sciences & Assessments

NOAA's RISA programs support research teams that help build the nation's capacity to prepare for and adapt to climate variability and change.

RISA teams work with public and private user communities to:

- Understand decision contexts
- Develop actionable knowledge
- Maintain diverse, flexible networks
- Innovate services to enhance the use of science in decision making



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CISA works to be a regional resource for a variety of stakeholders to incorporate climate information into water and coastal management, public health, and related decision making processes.

## CISA's Core Focus Areas:

- Drought
- Climate & Watershed Modeling
- Coastal Management
- Public Health
- Adaptation

## Partner Organizations:

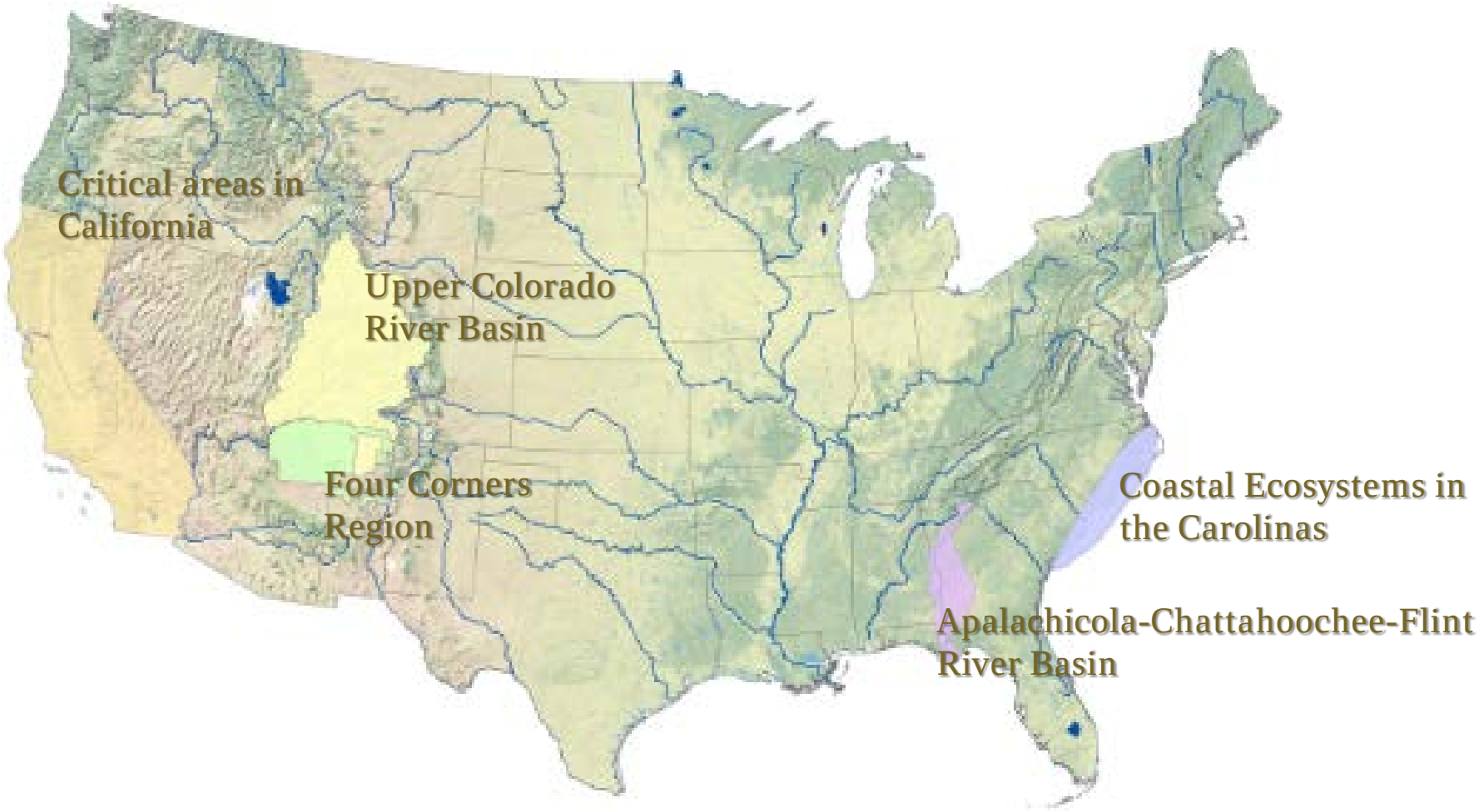
- Southeast Regional Climate Center
- NC Sea Grant
- SC Sea Grant Consortium
- NC & SC State Climate Offices
- Federal, State & Local Agencies
- Private Sector
- NGOs

# Coastal Climate Projects

- Investigated the potential for increased exposure to *Vibrio* in the Southeast under changing salinity trends
  - Public health officials, shellfish managers
- Developed the Vulnerability and Consequences Adaptation Planning Scenario (VCAPS) process – a tool to help coastal communities adapt to climate
  - McClennanville, Sullivan's Island, Beaufort County
- Assessed the impact of saltwater intrusion on water supplies in the Carolinas under future climatic and sea level conditions.
  - Water Utility Managers

# Drought Impacts in Coastal Ecosystems

# National Drought Information System Pilot Programs



# The Project

To improve understanding of drought impacts in coastal ecosystems and connect with decision makers

Project Components:

- Interviews with local business owners, commercial and recreation fishermen, and land/resource managers

- Citizen science 'condition monitoring' through the Community Collaborative Rain, Hail and Snow (CoCoRaHS) network

CoCoRaHS
Community Collaborative Rain, Hail & Snow Network

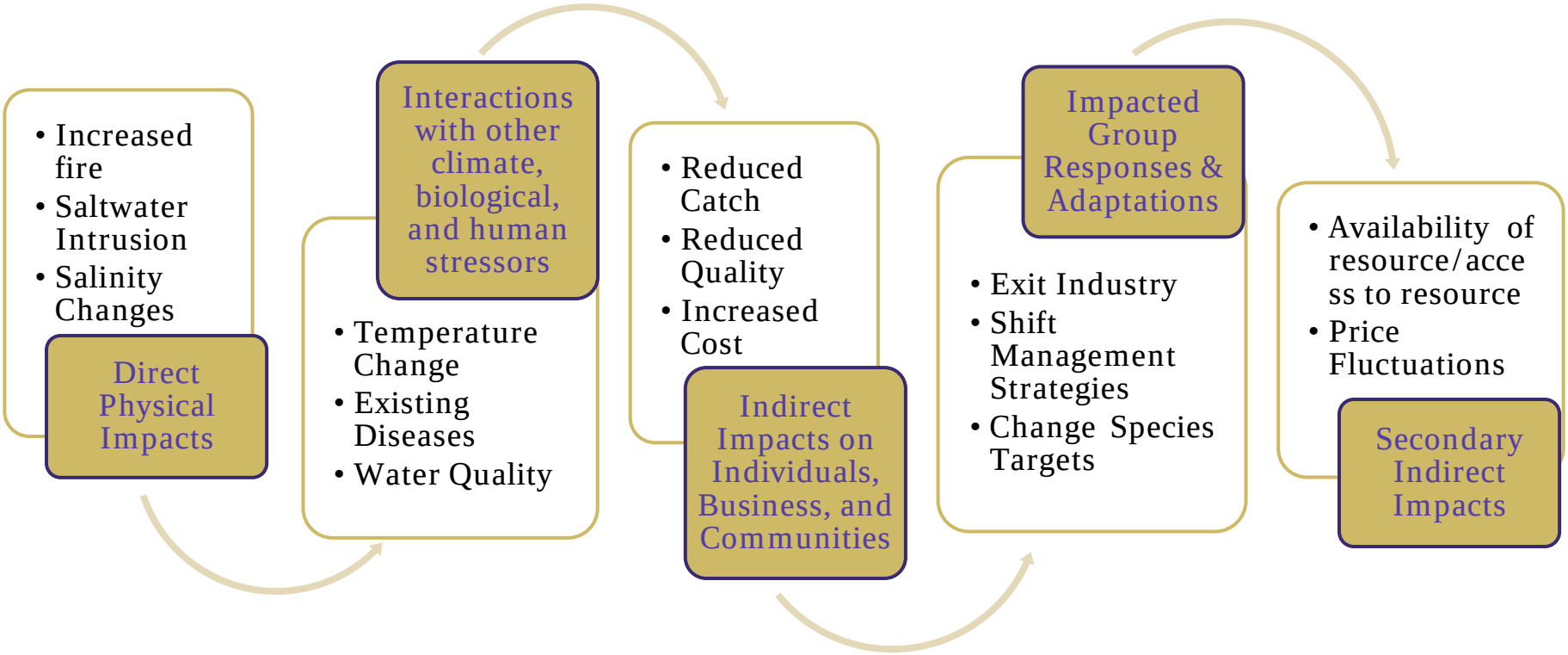
# Drought Impacts Interviews

Beaufort County, SC
Carteret County, NC

# Purpose

- To learn first-hand about:
  - On-the-ground drought impacts in coastal regions of the Carolinas
  - Mechanisms for coping with drought impacts
  - Drought information use and needs
    - Forecasts
    - Impacts information
  - Other stressors
    - Land use/development
    - Water quality issues
    - Economic concerns

# Documenting Drought Impacts: What are we looking at/for?



# Who we interviewed

- Commercial Fisheries Businesses (n=14)
  - Shrimpers, Crabbers, Other Commercial Fishermen
  - Seafood Houses
  - Researchers/regulators of commercial industry

- Outdoor Recreational Businesses (n=16)
  - Kayakers/Ecotourism Companies
  - Recreational Fishing/Charter Boats

- Land/Resource Managers (n=14)
  - National Wildlife Refuges
  - Public and Private Parks and Preserves
  - National Estuarine Research Reserves

# What we are learning:

## Drought Influences on Coastal Species & Habitats

**Direct**

- Decreased water supply – surface and groundwater
- Saltwater intrusion impacts to infrastructure and riverine systems
- Salinity changes which impact inshore estuaries and marsh systems
- Changes in fire regimes and risks to maritime forests

**Indirect**

- Reduced catch and quality of stock
- Increased business/management costs
- Broader secondary economic, social and environmental influences

# What we are learning: Compounding Impacts

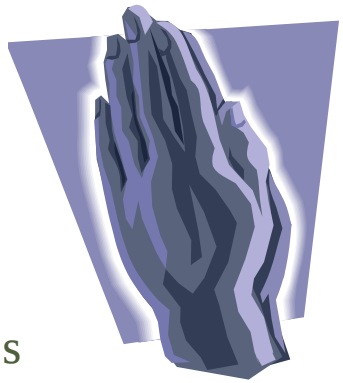
- Drought compounds other existing stressors, especially with regard to water quality
- Compared to these variables, drought alone is not a major concern among study participants
- However, given the vulnerability of these industries/areas due to other factors, the impacts of droughts may be intensified

# What we are learning: Coping with drought

Four major coping strategies emerging from interview data

- Hope & A Prayer
- (Non)Rainy Day Fund
- Redfish, Bluefish, Greenfish
- Shifting Strategy

# What we are learning: Coping with drought



- **Hope & A Prayer**
  - Adopt a wait-and-see approach, hoping for better conditions
    - Reactive Temporary Adaptations
    - Focus on reducing potential loss
    - More common when major adaptive limitations exist
    - For fisheries, may supplement income with work outside of industry

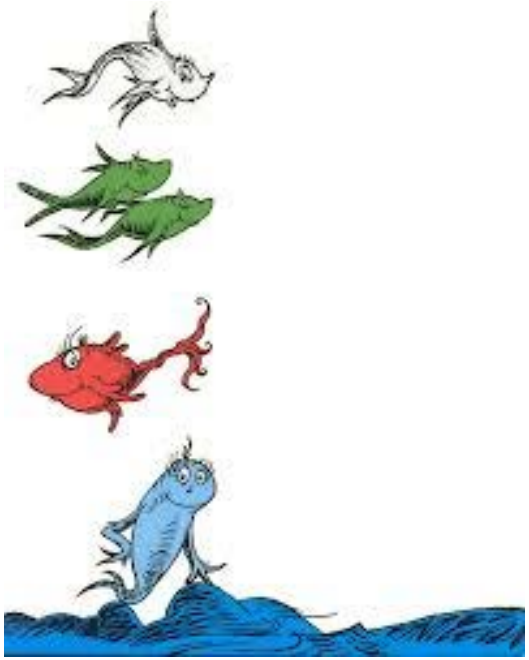
"I've learned through the years, you take what you can get and be thankful for it and hopefully you're still around the next year and maybe it'll get better. Which, I mean, I'm sure a lot of other people have that same outlook. Gotta wait on mother nature to give me something. And I'm sure she will. They'll be back." (Recreational Fisherman)

# What we are learning: Coping with drought

- **(Non)Rainy Day Fund**
  - Approaches designed in anticipation of drought to blunt degree of impact
    - Proactive Adaptations
    - For fisheries, an option only when a small "cushion" exists

"I knew in October something was going on cause my guys were like, "Woah" so I was taking everything I could get. I was even going to Charleston and getting shrimp, I was going to Brunswick and, I was getting as much as I could to help me compensate. Do my customers like it? No. But again, this is only gonna be, this is gonna be the only product you can get. And they come to me because they know when I freeze them I flash freeze them. There's no chemicals, there's no pesticides, there's not preservatives. And they're flash frozen." (Commercial Fisherman)

# What we are learning: Coping with drought



- **…Redfish, Bluefish**
  - Short or long-term adaptations
  - Shift focus from one impacted species to another less impacted species,
  - Or expand the types and diversity of species of interest

"I mean for us we've diversified what we do. For 20 years I was a shrimper and that's what I did. We went from clamming in the wintertime, we'd trawl for conch for a few winters, to full time oyster harvesting from September to May, which is the bulk of our time. So we still have shrimp boats but we have a fleet of shellfish boats and guys that work for us and with us. This is our third year of crabbing full time. We do a lot of stuff and for us it's not just one thing we do that we make a living on." (Commercial Fisherman)

# What we are learning: Coping with drought

- **Strategic Shift**
  - Shift in long-term strategies to manage under a "new normal"
    - Prescribed burning in maritime forests
    - Find new resource sources or advocate for regulatory changes
    - Adjusting infrastructure or systems to deal with drought impacts

"But the soil is not wet anymore, and the question comes up, do we allow natural fire to just progress on the islands given the fact that the islands are a lot drier. So that brings all the fuel reduction prescribed burning to it... But then again if you burn it, you're burning maritime forest on a regular schedule. And that's not natural. If you look at the literature, it says the natural fire return for coastal barrier islands in our area is somewhere around ten to thirty years, so it's a pretty wide spread." (NP Land Manager)

# Limits to Coping Strategies

- Fuel costs
- Human and financial resources
- Policies and regulations
- Available technology
- Infrastructure/equipment availability and condition

# What we are learning: Broad Themes

- **Scale Matters**
  - As scale of the activity increases (commercial fishing), the ability to cope with drought is often limited in the short term and more costly in the long term.
- **Interaction Matters**
  - Drought can facilitate greater user conflict between groups (commercial vs. recreational fishing)
- **Information Matters???**
  - Well, at least not formal drought information anyway. With the exception of land management professionals, study participants indicated little use or need for formal drought information/reports.
- **Geography Matters**
  - The impact of drought can vary greatly based on location of the land/resource/fishery of interest
- **Temporal Cycles Matter**
  - The impact of drought can vary greatly based on the time of year in which it occurs

# Citizen Science Condition Monitoring

Community Collaborative Rain, Hail & Snow (CoCoRaHS) Network

# The Community Collaborative Rain, Hail & Snow Network

- The main focus of CoCoRaHS is to provide quality precipitation data and education opportunities to help the public better understand weather and climate

# CoCoRaHS observations are used by:

- Nation Weather Service
- Other Meteorologists
- Hydrologists
- Emergency Managers
- City Utilities
  - Water Supply
  - Water Conservation
  - Stormwater Management
- Insurance Adjusters
- USDA – Crop Production
- Engineers
- Scientists studying storms
- Mosquito Control
- Farm Service Agency
- Ranchers and Farmers
- Outdoor & Recreation Businesses
- Emergency Managers
- Teachers and Students
  - Geoscience Education Tool
  - Taking Measurements
  - Analyzing Data
  - Organizing Results
  - Conducting Research
  - Helping the Community

# Precipitation Measurements

Observers use an official CoCoRaHS rain gauge to take daily precipitation measurements and log the data using the CoCoRaHS website

**My Data Entry : Daily Precipitation Report Form**

**Precipitation Report Form** Submit Data

**Station Number :** SC-RC-51

**Station Name :** Columbia 6.6 SE

* Denotes Required Field

8/19/2013 *Observation Date

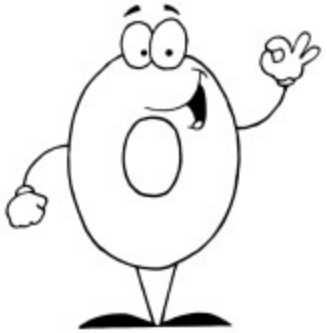
8:00 AM *Observation Time

0.38 *Rain and Melted Snow to the nearest hundredth inch that has fallen gauge during the past 24 hours

Yes No Report was taken at registered location?

# Reporting Zero's & Drought Impacts

Observers are asked to record '**zeros**' when it does not rain in addition to their precipitation measurements.



- CoCoRaHS offers a '**drought impact report**' form for observers to complete when there has been little or no precipitation for an extended period of time.

- These reports are also submitted to the **National Drought Impact Reporter**

# Weekly Condition Monitoring

**Connecting weather and climate to the environment**

- CISA is recruiting CoCoRaHS volunteers to submit weekly condition monitoring reports in addition to their daily precipitation measurements.

- Weekly condition monitoring helps to connect weather conditions to the local environment.

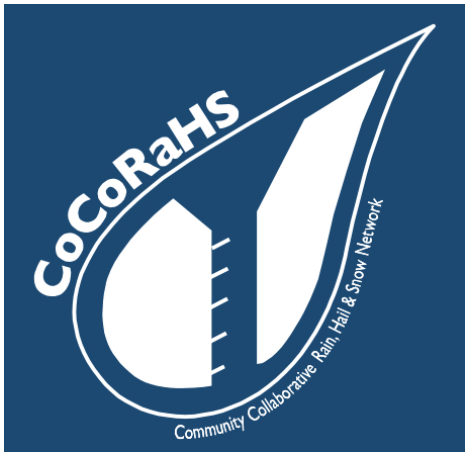
# Weekly Condition Monitoring

**Connecting weather and climate to the environment**

- Regular observations help to:
  - Identify the early signs of drought
  - Identify when conditions begin to improve
  - Identify any lingering impacts

# Participating Organizations

- Current CoCoRaHS Observers
- Master Naturalists/Master Gardeners





# Citizen Science Evaluation Component

- Are citizen scientist the best providers for this information?
- Connecting the information with decision makers

# One final note…

April 28-29, 2014
Charlotte, NC
www.cisa.sc.edu/ccrc


An interactive conference geared towards networking and information exchange.

Conference topics will include:

- climate science, research and information
- climate communications
- sector-specific projects and activities

# Thank You!

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