Improving Understanding of Drought Impacts in Coastal Ecosystems

North Carolina Water Resources Research Institute Annual Meeting
March 20, 2014

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Carolinas Integrated Sciences & Assessments
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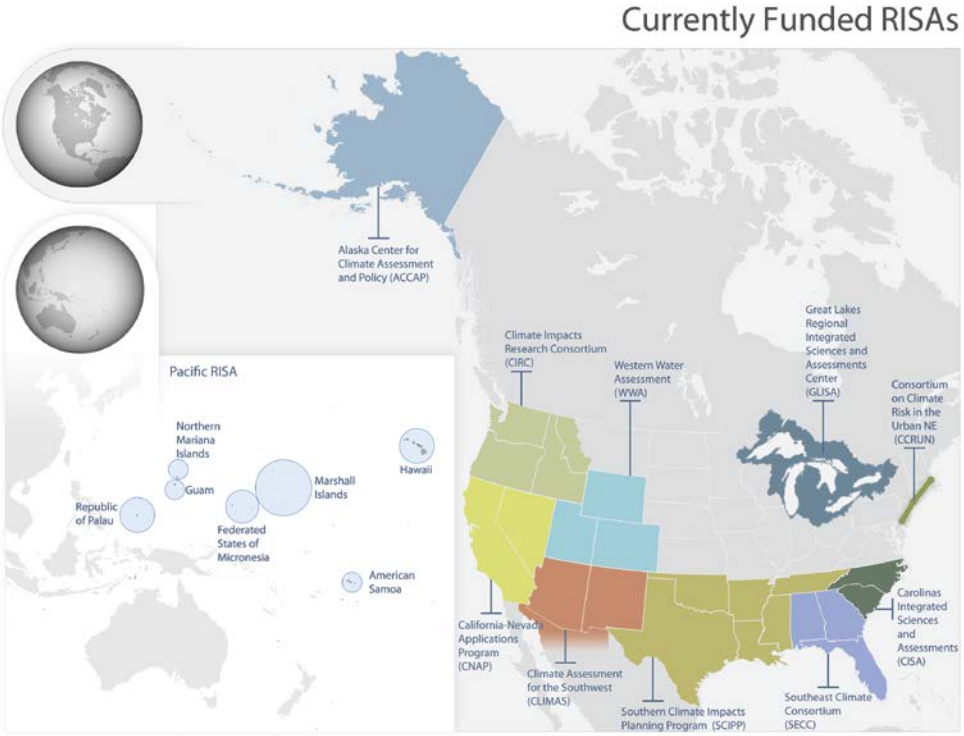
Regional Integrated Sciences & Assessments

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.

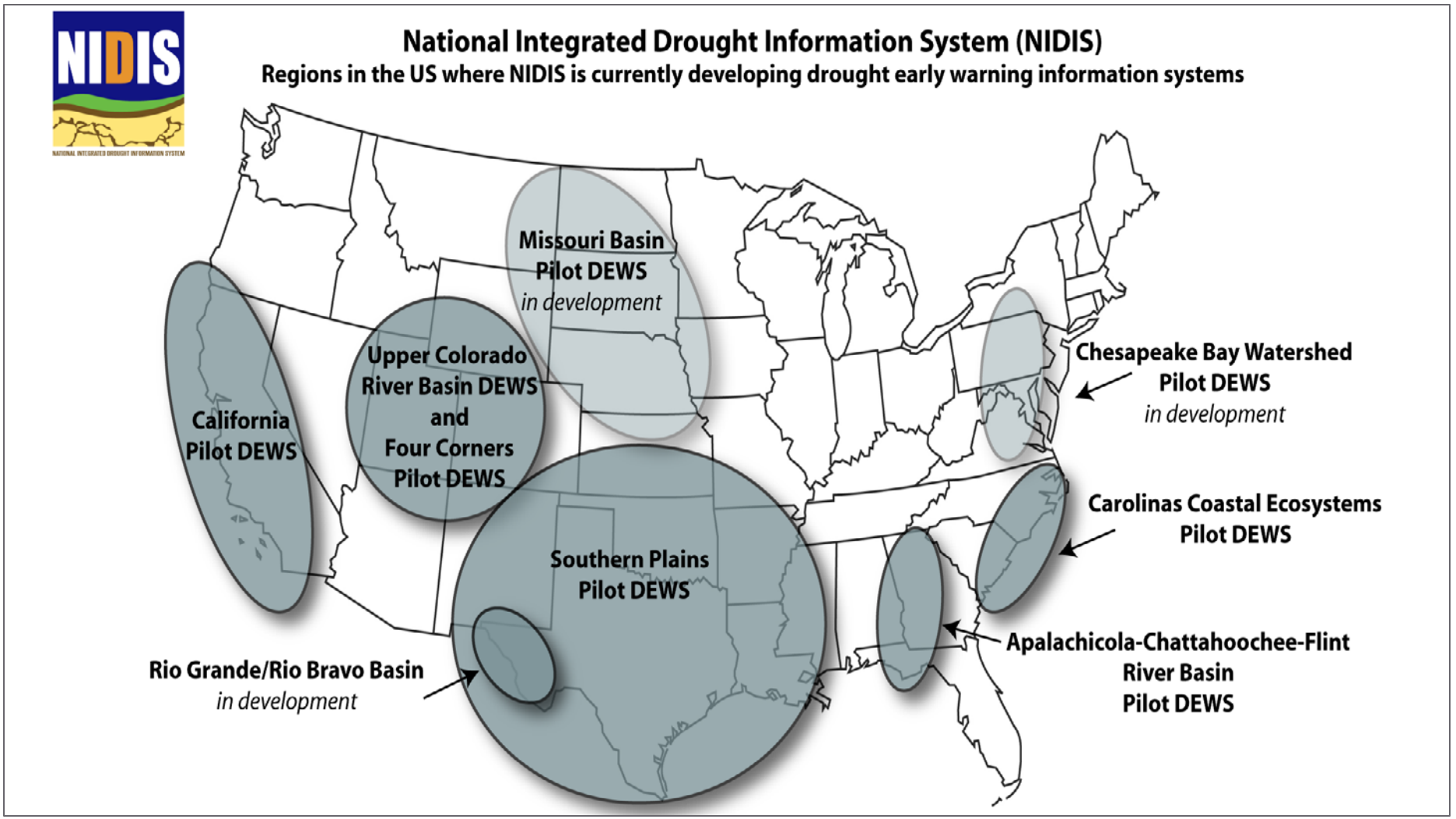
CISA's Core Focus Areas:

- 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

Context

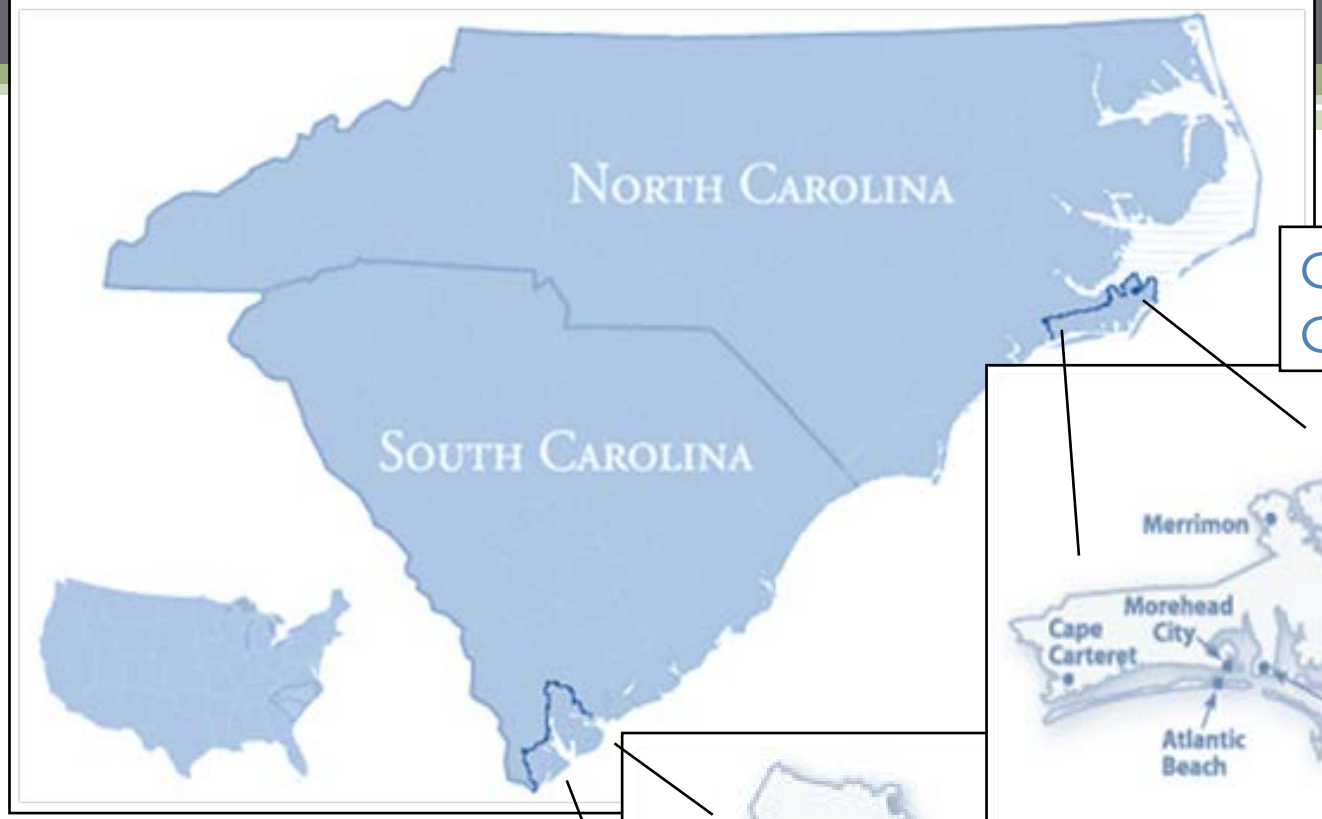

National Integrated Drought Information System (NIDIS)
Regions in the US where NIDIS is currently developing drought early warning information systems
Missouri Basin Pilot DEWS
in development
Upper Colorado River Basin DEWS and Four Corners Pilot DEWS
California Pilot DEWS
Southern Plains Pilot DEWS
Rio Grande/Rio Bravo Basin
in development
Chesapeake Bay Watershed Pilot DEWS
in development
Carolinas Coastal Ecosystems Pilot DEWS
Apalachicola-Chattahoochee-Flint River Basin Pilot DEWS

Ecological impacts

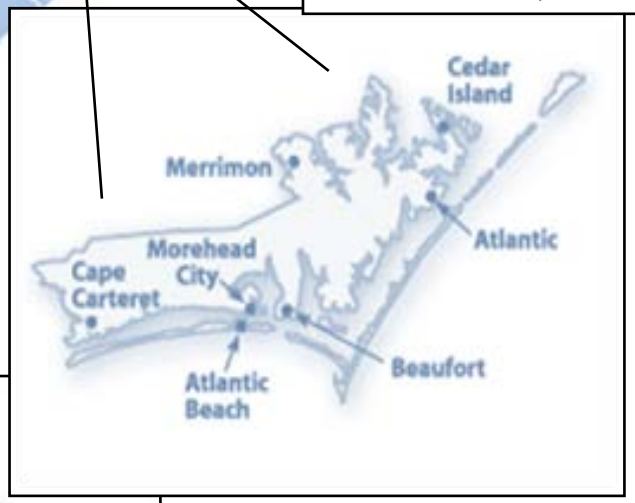
Drought impacts interviews

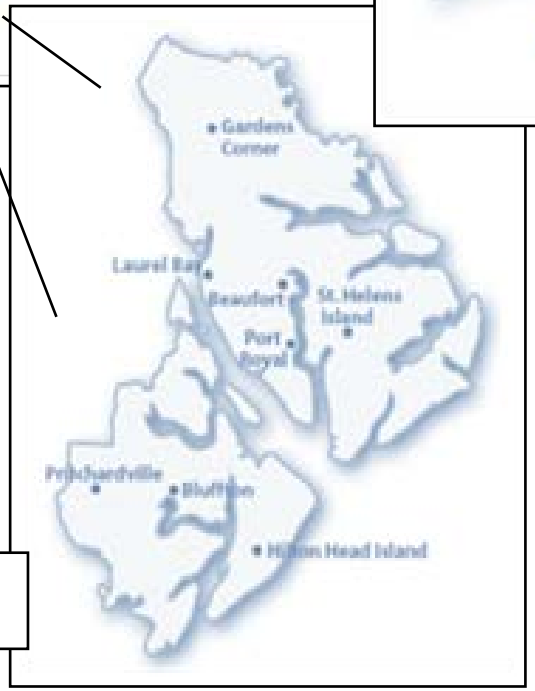
- Purpose: to learn first-hand about
  - On-the-ground drought impacts in coastal regions of the Carolinas
  - Mechanisms for coping with drought impacts
  - Drought information use and needs
  - Other stressors

- Locations
  - Beaufort County, SC
  - Carteret County, NC



Carteret County, NC





Beaufort County, SC

Who we interviewed

- Commercial fisheries businesses (n=14)
  - Shrimpers, crabbers, other commercial fishermen
  - Seafood houses
  - Researchers/regulators of commercial industry
- Recreational fishing (n=11)
  - Outfitters, charter boats
- Outdoor recreational businesses (n=11)
  - Kayakers, ecotourism companies
- Land/resource managers (n=14)
  - National Wildlife Refuges
  - Public and private parks and preserves
  - National Estuarine Research Reserves

Documenting drought impacts: What are we looking at/for?

Direct physical impacts

Interactions with other climate, biological, and human stressors

Indirect impacts on individuals, business, and communities

Responses & adaptations by affected groups

Secondary, indirect impacts

Ecological Impacts	Outdoor Recreation (n=11)	Natural Resource Management (n=14)	Recreational Fishing (n=11)	Commercial Fishing (n=14)
Aquatic				
Declines/Movement of Brackish Water Species				
Saltwater Species Moving Inland				
Decline of Freshwater Species				
Terrestrial & Aquatic				
Abnormal Conditions, Ecological Stress, Disease				
Species Composition Changes				

1-20% 21-40% 41-60% 61-80% 81-100%

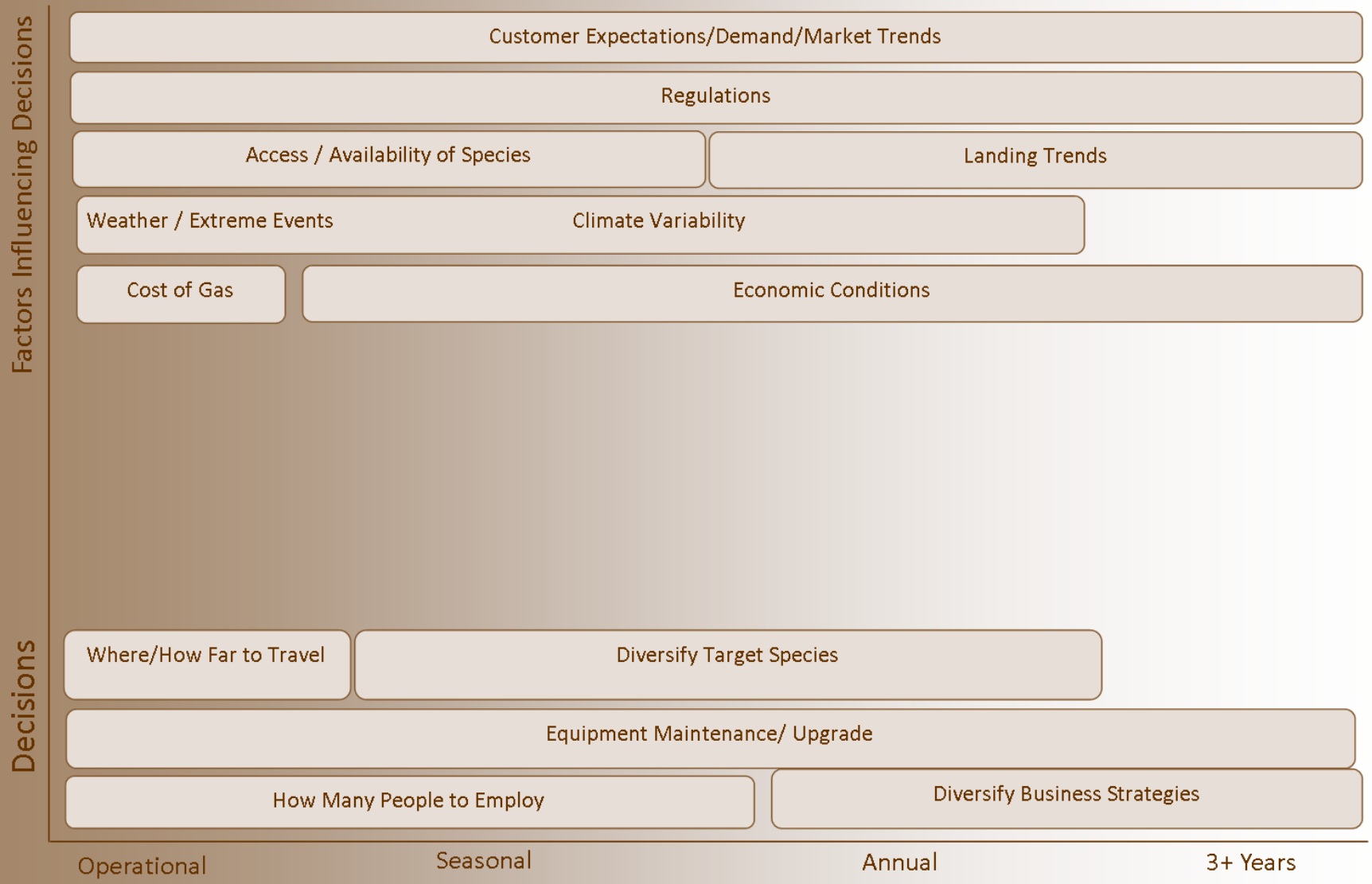
Interacting Stressors	Outdoor Recreation (n=11)	Natural Resource Management (n=14)	Recreational Fishing (n=11)	Commercial Fishing (n=14)
Human/Social-Cultural				
Runoff, Pollution, Toxins				
Habitat, Resource Loss				
Economic Pressures	--			
Policies, Regulations	--			
Weather/Climate				
Temperature Change			--	
Severe Weather Events		--		
Species Phenological/ Range Shifts			--	--
Sea Level Rise			--	--
Biological			--	

1-20% 21-40% 41-60% 61-80% 81-100%

Responses	Outdoor Recreation (n=11)	Natural Resource Management (n=14)	Recreational Fishing (n=11)	Commercial Fishing (n=14)
Diversification			--	
Follow The Catch or Import From Other Areas	--	--		
Shift Resource Management Practices	--		--	
Increase Monitoring	--		--	--

1-20% 21-40% 41-60% 61-80% 81-100%

Decision-Making Continuum for N.C. & S.C. Fishing Industries



Information

Information Variable of Interest (all interviewees)	% of Total Respondents Reporting Use
Salinity levels (amount, location)	29%
Hydrology (discharge, flows, groundwater)	12%
Precipitation	10%
Vegetation and soil conditions (general health, soil chemistry)	10%
Water temperature	10%
Contaminants	7%
Fish biology (health, abundance, class impacts)	7%
Phenology	5%

Information Use & Sources

- **Fishing and recreation**
  - Short time frames
  - Local knowledge, observations
- **Natural resource/land managers**
  - Greater use of external information
  - Independent monitoring

What we are learning: needs for a drought early warning system

- **Impacts matter**
  - Limited use of existing drought information and tools (all groups), yet concerned about impacts
  - Industry- and sector-specific
  - Context-dependent: local variability and diversity, micro-climates
- **Fishing and recreation**
  - Short time frames
  - Local knowledge, observations
  - Lack of trust in state, federal agencies and information
- **Natural resource/land managers**
  - Longer time frames
  - Independent monitoring
  - Greater use of external information, partnerships with peer groups
- **Drought is one component of a broader weather-climate continuum**
  - Timing of precipitation (including drought busters), duration, seasonality matters
  - Flooding is just as significant for many industries, decisions

What we are learning: possible components of a drought early warning system

- **Natural Resource Managers**
  - Biological impacts, thresholds, and responses to extreme events
  - Adaptive and scenario-based planning, ecological indicators
  - Baseline data
    - What is “normal” (e.g. frequency of drought events, recovery periods, groundwater recharge rates)
  - Early warning , seasonal forecasts might be useful

- **Fisheries**
  - Attention to communication channels and messengers
  - Incorporate secondary, indirect impacts into information provision and communications

Next steps

- **Connections to other NIDIS-Carolinas pilot projects**
  - Development of a real-time salinity index (USGS-led)
  - Assessment of ecological indicators
- **Connections to drought decision making**
  - State climatology offices
  - State drought response committees
  - Local water and resource managers and planners
  - National Weather Service offices
  - National partners
    - NIDIS, National Drought Mitigation Center

carolinas climate resilience conference

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

Thank you!

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