



Improving Understanding of Drought Impacts in Coastal Ecosystems

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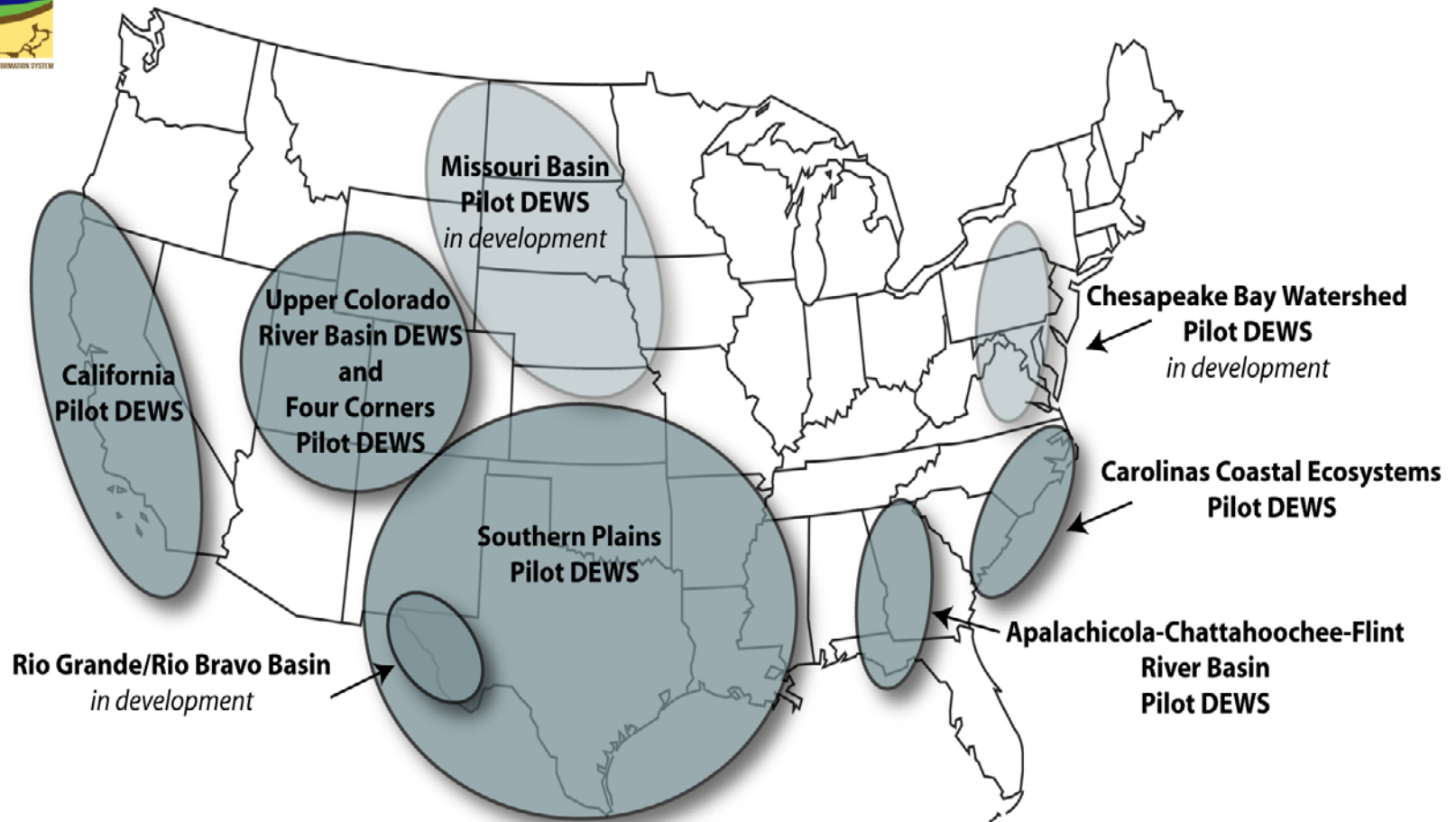
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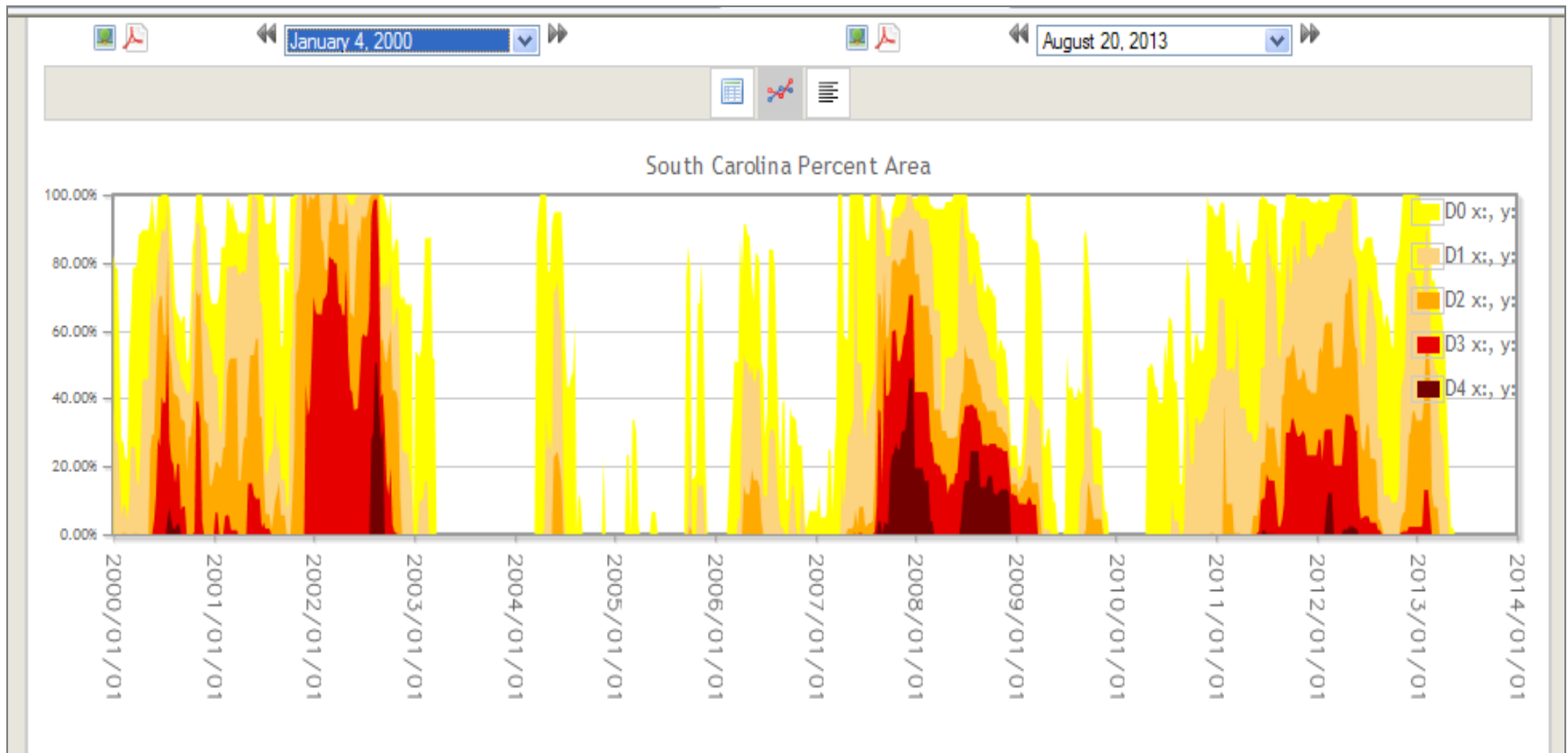
Context



National Integrated Drought Information System (NIDIS) Regions in the US where NIDIS is currently developing drought early warning information systems



Drought in South Carolina, 2000-2013



<http://droughtmonitor.unl.edu/archive.html>

Downloaded on 22 August 2013 from the Drought Monitor Archives

Ecological impacts

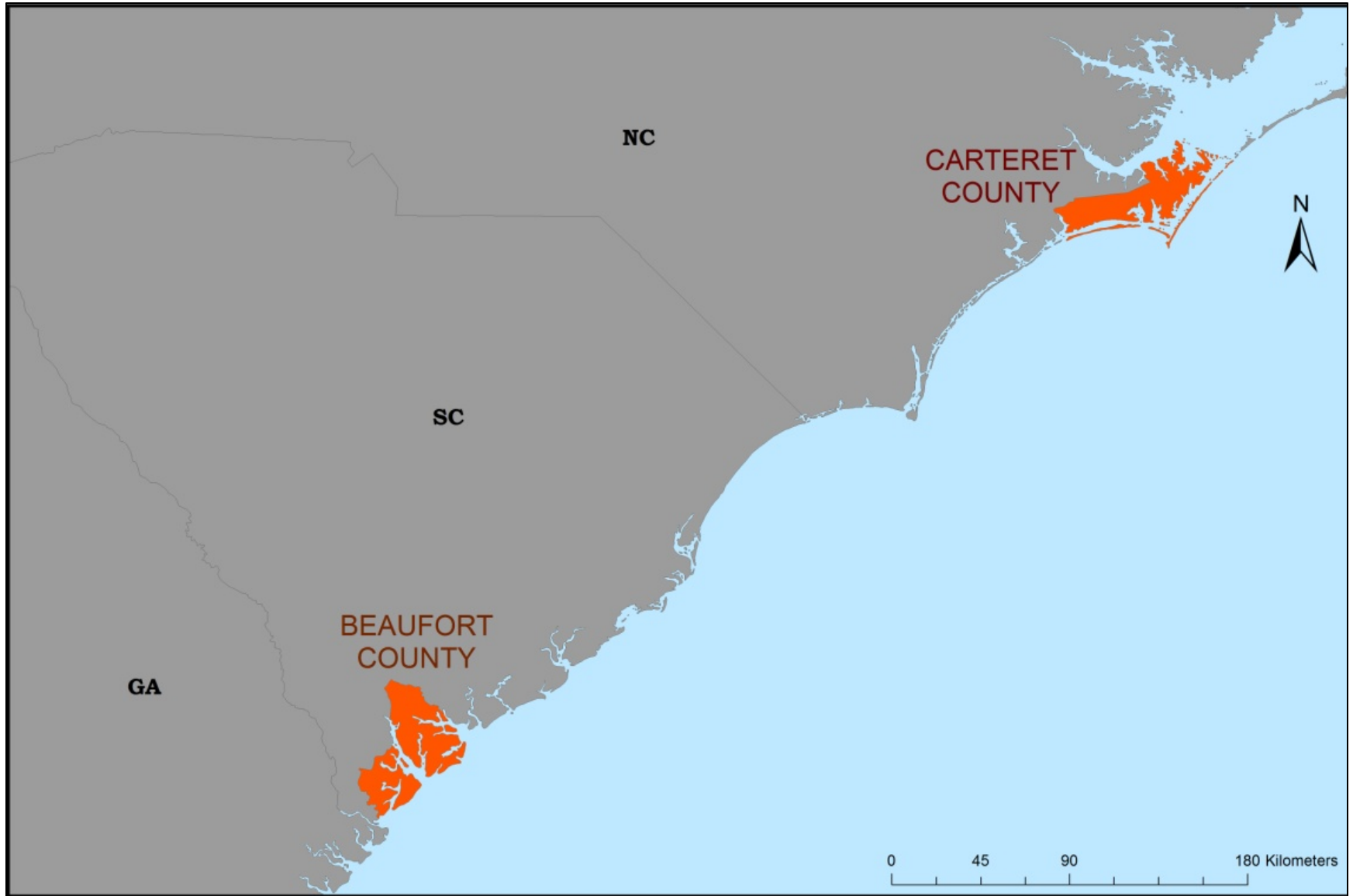


Drought impacts interviews

- 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



Study area

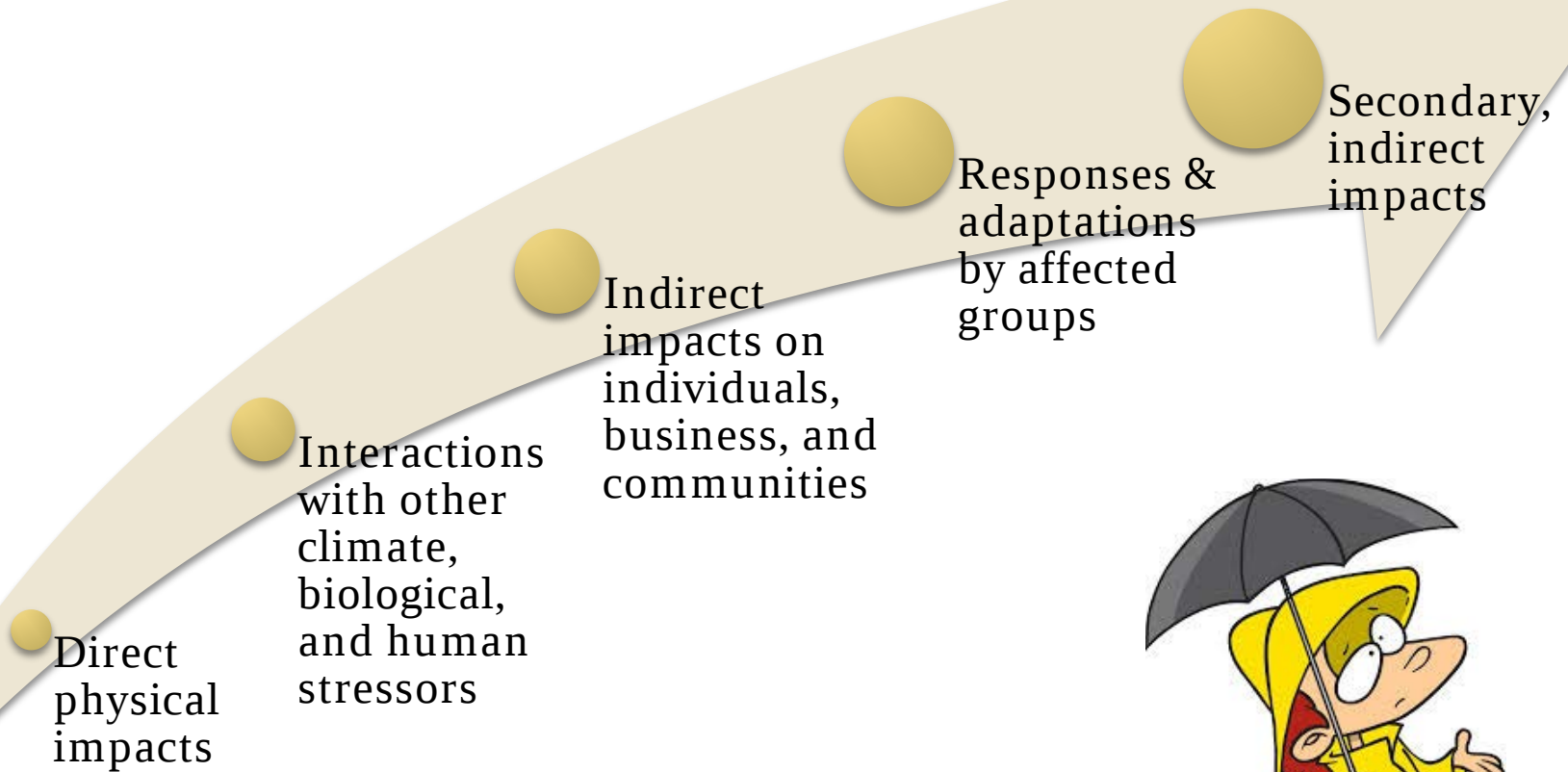


Who we interviewed

- 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



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



Impacts

Direct

- Declines/movement of brackish water species
- Ecological stress, disease
- Decline of freshwater species
- Saltwater species moving upriver
- Species composition changes

Indirect

- Resources inaccessible
- Resources unavailable
- Unable to perform routine activities, inadequate equipment
- Loss of business, clientele

Interacting stressors

Human/Social-Cultural Stressors (88%)

- Pollutants, water quality
- Habitat or resource loss (development, overuse)
- Economic pressures
- Policies, regulations

Weather/Climate Stressors (50%)

- Temperature changes (too hot, too cold)
- Severe weather events, storms
- Phenological or range shifts
- Sea level rise

Biological Stressors (26%)

- Disease
- Invasive species

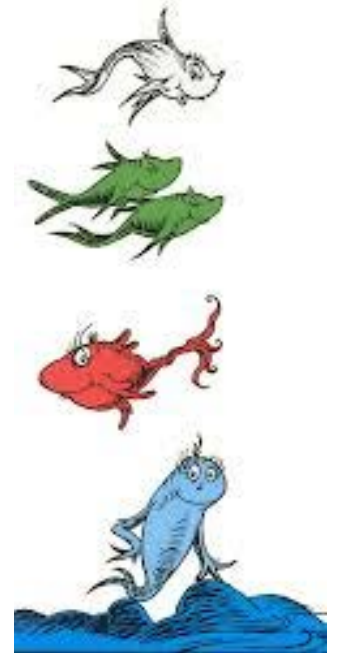
Response strategies

Response strategies	% of interviewees
Diversification	14%
Follow the catch or import from other areas	14%
Shift resource management practices	19%
Increase monitoring	10%
Mitigate secondary impacts	21%



Diversification

“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)



Information

Information of interest	% of interviewees indicating 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

- **Fishing and recreation**
 - Short time frames
 - Local knowledge, observations
- **Natural resource/land managers**
 - Greater use of external information
 - Independent monitoring
- **Needs**
 - Adaptive planning
 - Baseline data
 - Biological impacts
 - Early warning

What we are learning: broad themes and implications for a drought early warning system

- **Opportunities**
 - Drought response is currently reactive
- **Awareness of (tele)connections and context**
- **Drought is one component of a broader weather-climate continuum**
 - Timing of precipitation (including drought busters), duration, seasonality matters
- **Impacts matter**
 - Limited use of existing drought tools and information by decision makers
 - Meet decision makers where they are

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

Thank you to interviewees, NIDIS, and CISA team members Janae Davis, Aashka Patel, Kim Rodgers

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