

Rural Coastal Community Resilience: Adapting to Rising Seas and Salinization on the Albemarle Pamlico Peninsula



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Research Overview



- 1. RURAL COASTAL RESILIENCE FRAMEWORK**
- 2. TOURISM PERCEPTION ASSESSMENT**
- 3. RESIDENTIAL ASSESSMENT**
- 4. RESILIENCE AS ENVIRONMENTAL JUSTICE**



Literature Review

Resilience

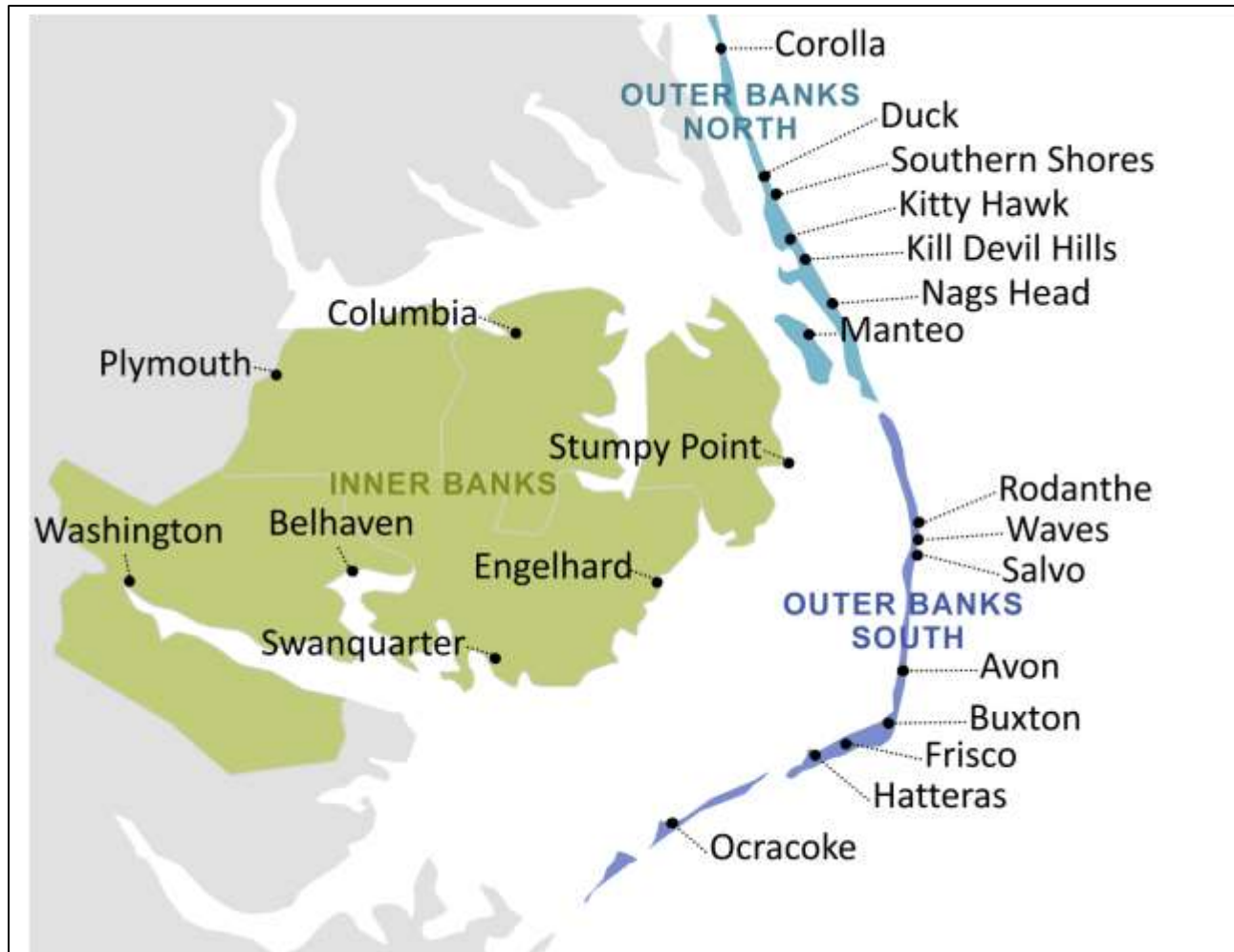
Risk

Vulnerability

Adaptive Capacity



The Banks of North Carolina



Coastal Hazards



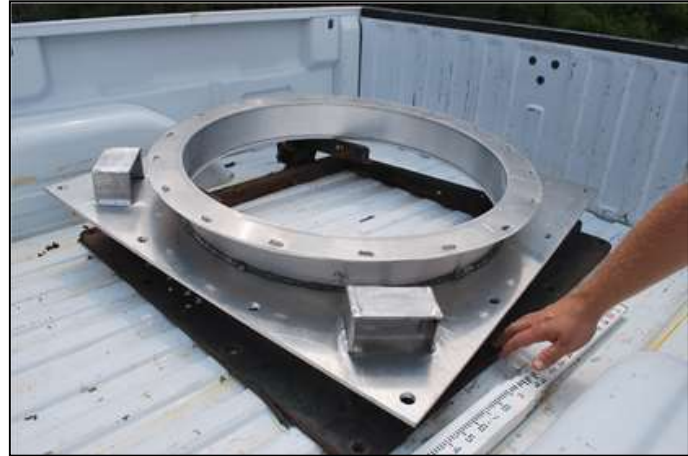
Sea Level Rise

Salt Water Intrusion

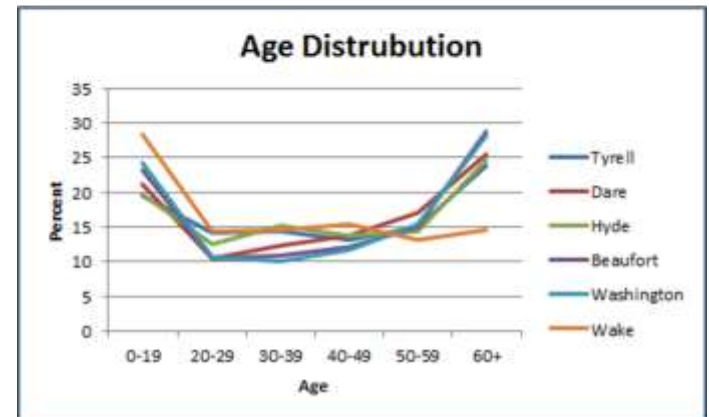
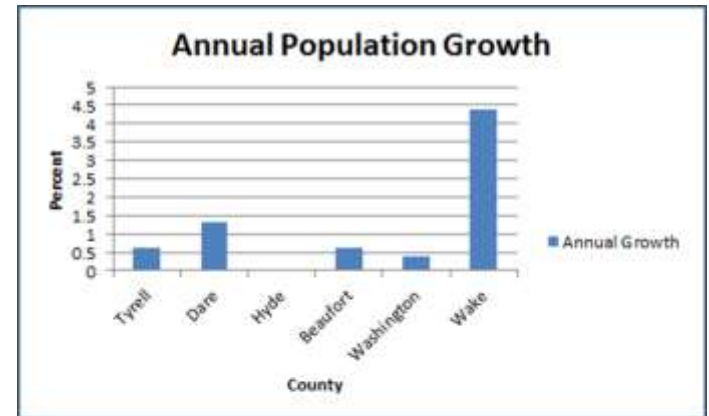
Flooding



Adaptations



The Albemarle Pamlico Peninsula



Rural Coastal Community Resilience Framework



Physical Exposure

At Risk

Resilient

Vulnerability

Adaptive Capacity

Stressor	Indicator
Natural Resource Dependency	Livelihood Diversity
Inequality	Prosperity
Unsustainable Development	Ecosystem Services
Community Disengagement	Community Cohesion
Rigidity	Agency

TOO MUCH INFORMATION

Stressor	Definition	Indicator	Definition
Risk	Your community's assets (infrastructure, population, businesses, land, natural resources) are likely to be negatively impacted from hazardous events and over extended periods of time.	Resilience	Your community is well prepared for hazardous events, and can recover from hazardous events in a timely and efficient manner.
Livelihood Dependency	Your community relies on a single resource or industry to generate most jobs.	Livelihood Diversity	Your community has many different industries that provide jobs for its residents.
Inequality	Your community has groups of individuals (subpopulations) who are more at risk to natural hazards, experience economic strain, or are leaving the area to seek jobs elsewhere (rural flight).	Prosperity	Your community is successful in terms of its employment rates, job opportunities, and tax base, and has affordable education, health care, and housing.
Unsustainable Development	Your community <u>does not have</u> land use policies, has policies that <u>do not</u> promote well-being or natural resource conservation, or allows development to occur anywhere, including high risk areas.	Ecosystems Services	Your community has land use policies that promote well-being, such as conserving wetlands for clean water and storm surge protection or providing natural areas for recreational and spiritual enjoyment.
Community Disengagement	Your community is experiencing reduced participation in local government, churches, schools, and community social events.	Community Cohesion	Your community values people from different backgrounds, is quick to lend a helping hand, and has a shared vision for the future.
Rigidity	Your community lacks trust in its leaders or has regulations that limit the ability of the community to change or adapt to new situations.	Agency	Your community has leaders with the power or ability to manage problems or situations and effectively plan for the future.



Focus Groups: Nominal Group Process

Livelihoods

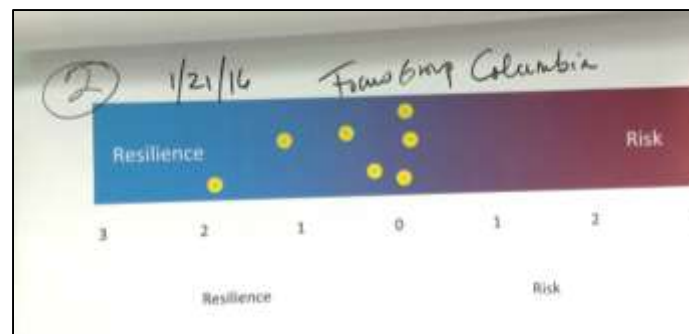
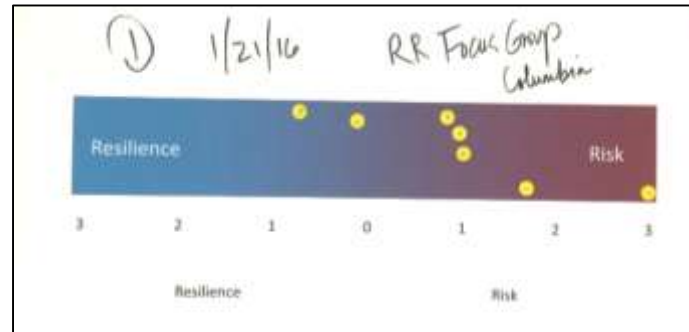
Inequality

Ecosystem Services

Strong Community
Cohesion

Strong Rigidity

Improved Resilience



Pre and Post Survey Results



Questionnaire Item*	Pre-survey	Post-Survey	Test Statistic	p-value	Cohen's D
	Mean (SD)	Mean (SD)			
_____ is a threat to my community					
Sea level rise	3.31 (1.32)	4.00 (1.08)	t(12)= 2.92	.013	.81
Flooding	3.75 (.97)	4.31 (.65)	t(11)= 1.87	.089	.54
Salt water intrusion	3.08 (.79)	3.67 (1.16)	t(11)= 2.55	.027	.73
My community is vulnerable to _____					
Sea level rise	4.08 (.86)	4.08 (.86)	t(12)= 0	1	0
Flooding	4.31 (.63)	4.31 (.63)	t(12)= 0	1	0
Salt water intrusion	3.92 (.76)	3.92 (.76)	t(12)= 0	1	0
My community is prepared for _____					
Sea level rise	2.25 (1.06)	2.33 (.78)	t(11)= .56	.586	.16
Flooding	2.75 (1.22)	2.43 (.89)	t(11)= 1.6	.137	.46
Salt water intrusion	2.42 (.67)	2.67 (1.16)	t(11)= .9	.389	.26
My community has access to the resources need to plan for climate change impacts.	2.83 (1.03)	2.25 (.87)	t(11)= 1.9	.89	.54
My community would benefit from adaptation planning workshops.	4.31 (.75)	4.31 (.63)	t(12)= 0	1	0

Focus Group



- *We have always been adapting here.*
- *There are trees in the sounds that only germinate on land. They are under out there underwater.*
- *We help each other out.*
- *We have strong communities and love the way of life.*



Tourism Survey

400 responses

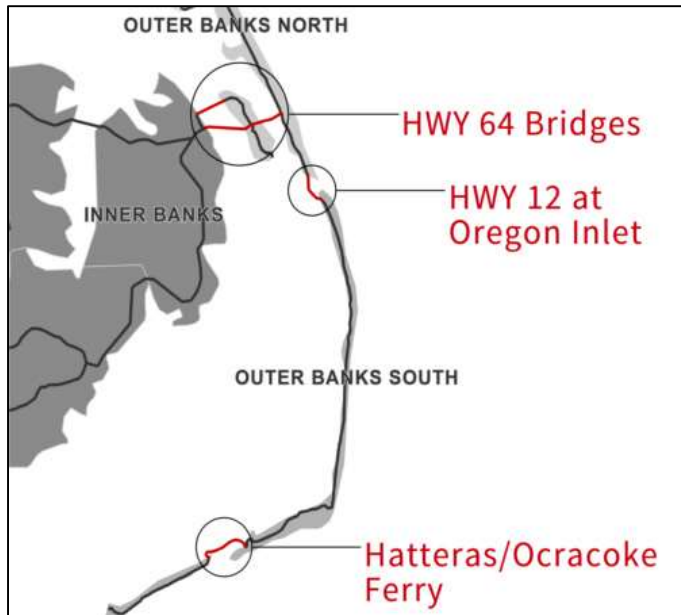
Swan Quarter
Ferry

Pea Island

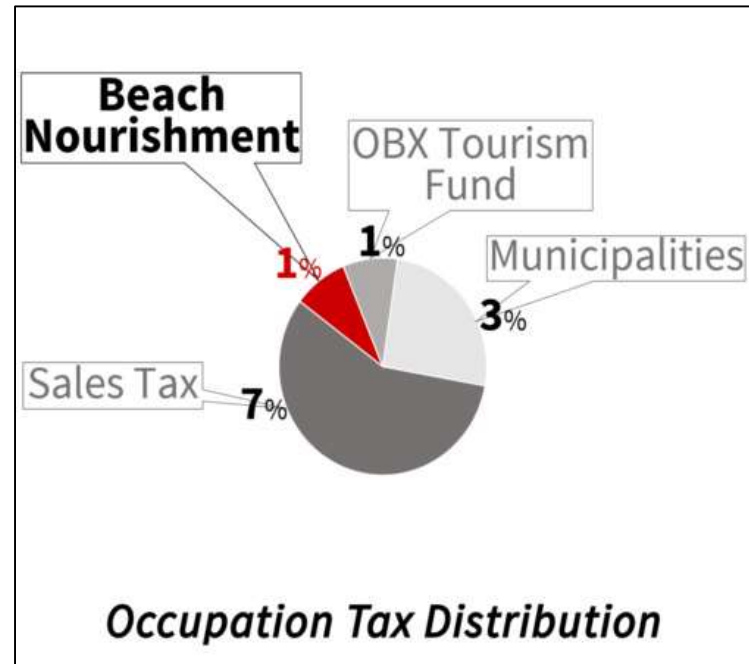
Manteo



Tourism Survey



Tourist Survey



Tourism Survey



- Die hard outer banks visitors
- Lack of awareness of inner banks tourism opportunities
- “Would probably go to the beach somewhere else if we couldn’t go to the outer banks”





Residential Survey

1000 address

Pick up and drop off

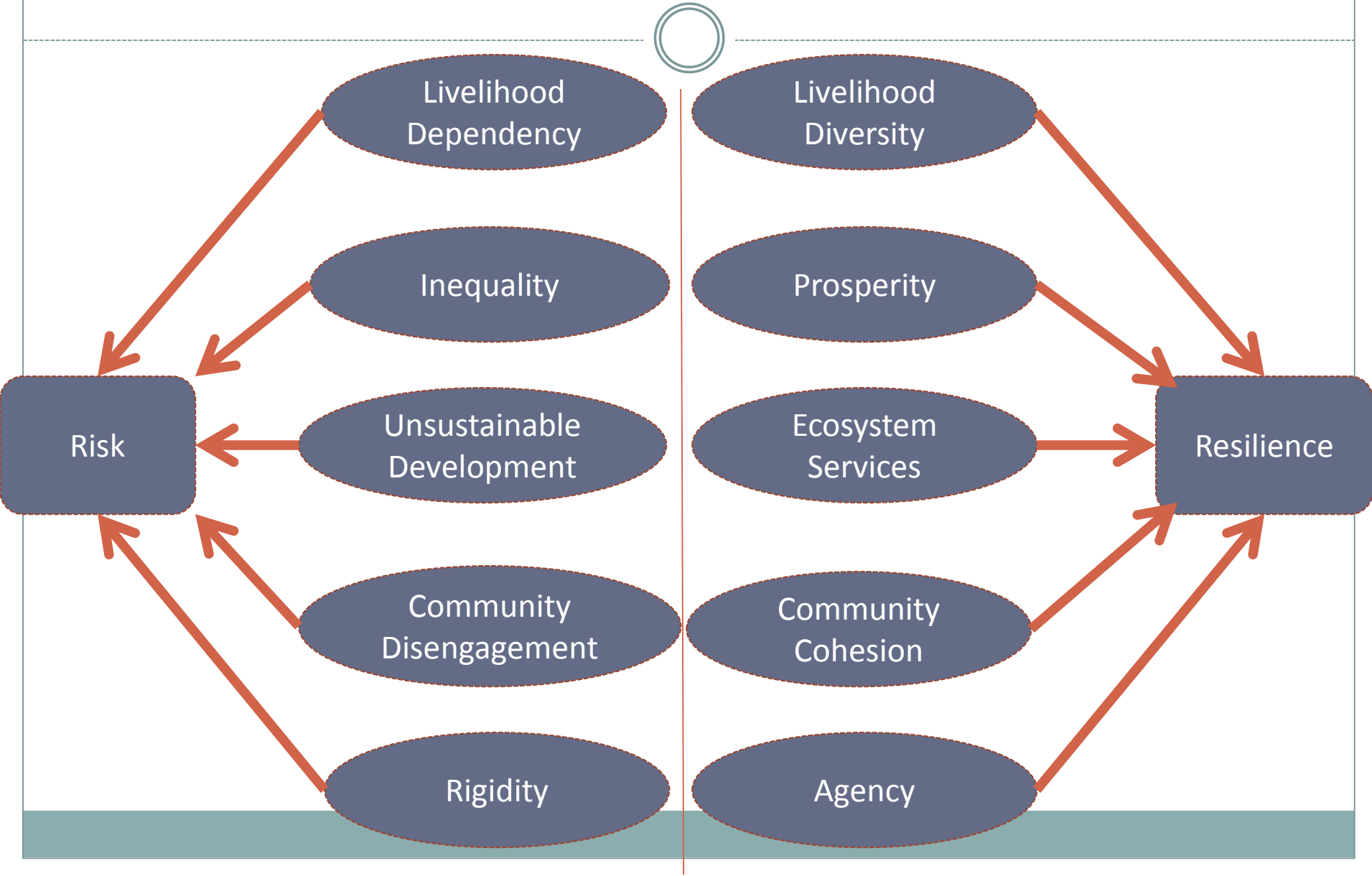
3 visits

Structural equation
modeling

Path analysis



Residential Survey





Resilience as Environmental Justice

Louisiana Analogies:

Renters

Low income
communities

Historical context

Experiences with:

Sea level rise

Salt water intrusion

Flooding

Resilience planning





Resilience as Environmental Justice

Focus Groups

Semi-structured
interviews

NC Sea Grant

NC Cooperative
Extension



Thank you!!!

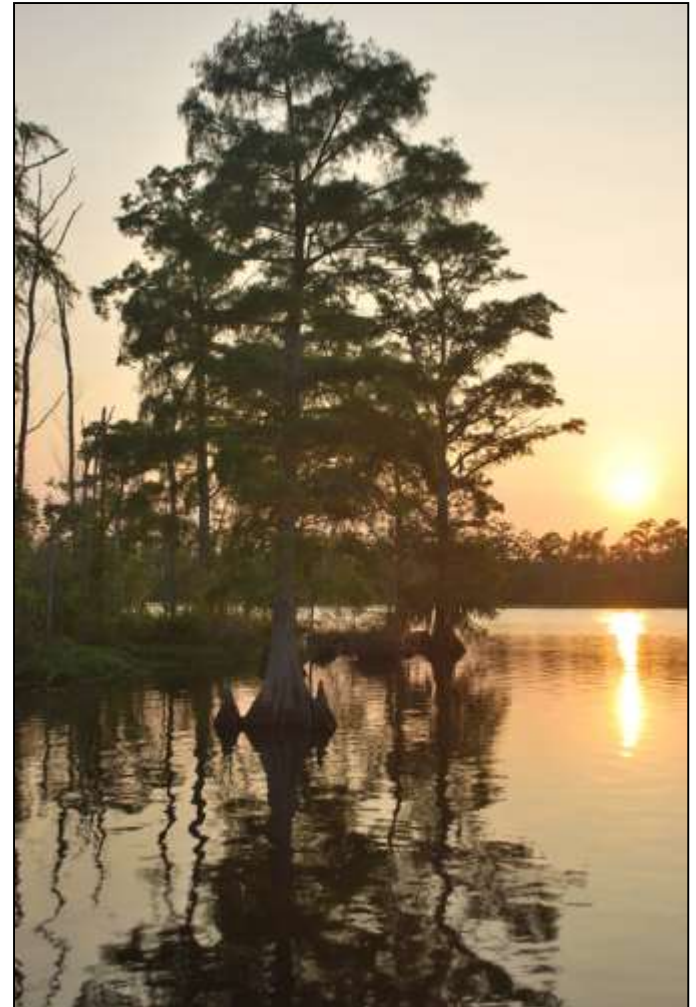


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References



Berkes, F., and C. Folke, editors. 1998. *Linking sociological and ecological systems: management practices and social mechanisms for building resilience*. Cambridge University Press, New York, New York, USA.

Carpenter, S. R., & Brock, W. A. (2008). Adaptive capacity and traps. *Ecology and Society*, 13(2), 40.

Davies, M., Guenther, B., Leavy, J., Mitchell, T., & Tanner, T. (2009). Climate change adaptation, disaster risk reduction and social protection: complementary roles in agriculture and rural growth? *IDS Working Papers*, 2009(320), 01–37.

Donner, W., & Rodriguez, H. (2008). Population Composition, Migration and Inequality: The Influence of Demographic Changes on Disaster Risk and Vulnerability. *Social Forces*, 87(2), 1089–1114. <http://doi.org/10.1353/sof.0.0141>

Douglas, E. M., Kirshen, P. H., Paolisso, M., Watson, C., Wiggin, J., Enrici, A., & Ruth, M. (2012). Coastal flooding, climate change and environmental justice: identifying obstacles and incentives for adaptation in two metropolitan Boston Massachusetts communities. *Mitigation and Adaptation Strategies for Global Change*, 17(5), 537–562. <http://doi.org/10.1007/s11027-011-9340-8>

Engle, N. L., de Bremond, A., Malone, E. L., & Moss, R. H. (2014). Towards a resilience indicator framework for making climate-change adaptation decisions. *Mitigation and Adaptation Strategies for Global Change*, 19(8), 1295–1312. <http://doi.org/10.1007/s11027-013-9475-x>

Ho Oh, E., Deshmukh, A., & Hastak, M. (2010). Disaster impact analysis based on inter-relationship of critical infrastructure and associated industries: A winter flood disaster event. *International Journal of Disaster Resilience in the Built Environment*, 1(1), 25–49. <http://doi.org/10.1108/17595901011026463>

IPCC (2014) Fifth assessment report (ar5). Cambridge University Press, Cambridge

Ostrom, E., 2009. A General Framework for Analyzing Sustainability of Social-Ecological Systems. *Science*, 325 (5939), 419–422.

Tang, Z. (2008). Evaluating local coastal zone land use planning capacities in California. *Ocean & Coastal Management*, 51(7), 544–555. <http://doi.org/10.1016/j.ocecoaman.2008.06.001>