Identification, mitigation and adaptation to soil salinization

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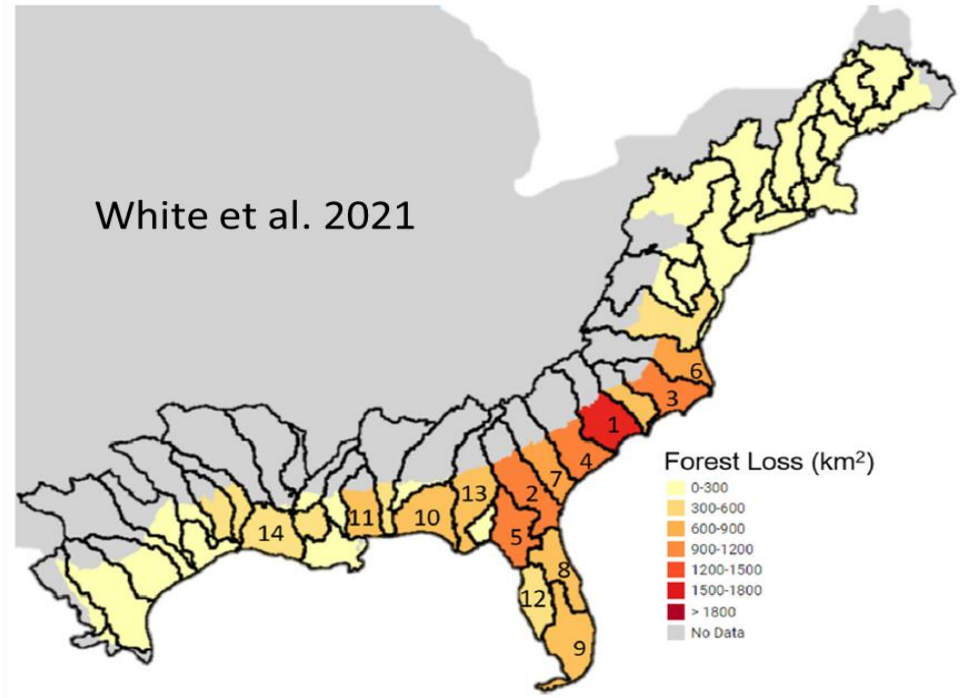
USDA Southeast Climate Hub

The mission of the Climate Hubs is to develop and deliver science-based, region-specific information and technologies, with USDA agencies and partners, to agricultural and natural resource managers that enable climate-informed decision-making, and to provide access to assistance to implement those decisions

The Issue:

- Salinity is increasing due to sea level rise, storms and tides, drought, and water management, posing a threat to agricultural production in coastal regions

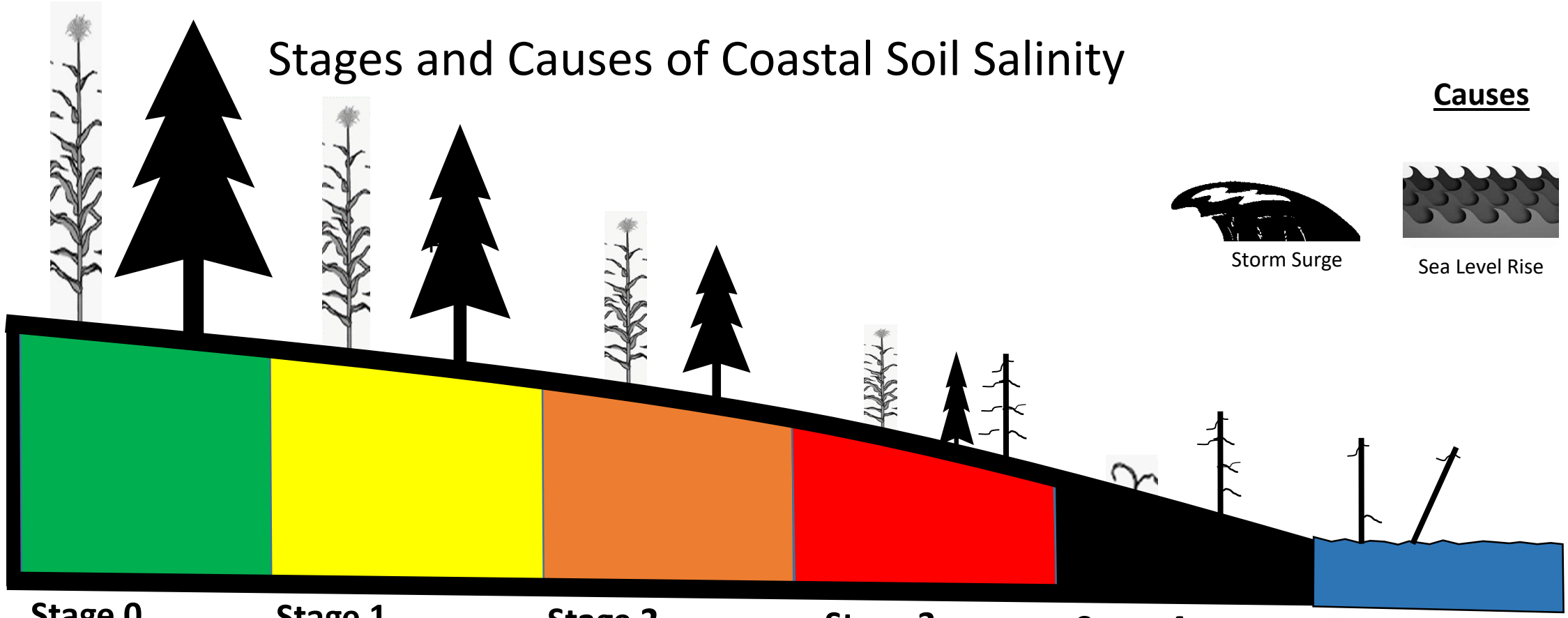
Literature Review in the Southeast USA



Salinization Manual Publication

- https://www.climatehubs.usda.gov/sites/default/files/GTR-259_revd_web.pdf
- Or, search Southeast Climate Hub, click on the “Saltwater Intrusion and Salinization on Coastal Forests and Farms” on the main page, and click on the link to download the manual

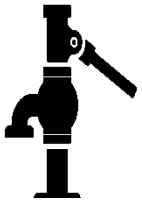
Stages and Causes of Coastal Soil Salinity



Causes

Storm Surge

Sea Level Rise



Ground water pumping

Stage 0	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Stage 5**	**Uses**
Non-Impacted	Sporadic Salinity	Reoccurring Episodic Salinity	Low Chronic Salinity	High Chronic Salinity	Chronic Surface Water	
EC = < 2 dS m^{-1}	EC = 2 < 4 dS m^{-1}	EC = 4 < 8 dS m^{-1}	EC = 8 < 16 dS m^{-1}	EC = 16 < 25 dS m^{-1}	EC = >25 dS m^{-1}	
Commercial	Commercial	Commercial	Commercial	Non-Commercial	Saltwater Marsh	
No	Yes	No	No	No	No	**Mitigation?**
No	Yes	Yes	Yes	No	No	**Adaptation?**
No	No	No	No	Yes	Yes	**Wetland Restoration/Easement?**

Stage One: Introduction of Salinity

- Low Salinity – Salt-sensitive crops are impacted, forest stands and soil are likely to recover from a single event
- Mitigation and adaptation measures – Water control structures, irrigation, soil health, conservation practice standards, change planted crops
- EC= 2 < 4 dS/m

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Table 5—Conservation practices that can be used in a soil health management system to help achieve improved soil health

Soil Health Principle	Conservation Cover (327)	Conservation Crop Rotation (328)	Cover Crop (340)	Forage & Biomass Planting (512)	Pest Mgmt. Conservation System (595)	Mulching (484)	Nutrient Mgmt. (590)	Prescribed Grazing (528)	Residue & Tillage Mgmt. (329/345)
Minimize Soil Disturbance	✓			✓	✓		✓	✓	✓
Maximize Soil Cover	✓		✓	✓		✓		✓	✓
Maximize Biodiversity	✓	✓	✓	✓				✓	
Maximize Living Roots	✓	✓	✓	✓				✓	

Source: USDA-NRCS Soil Health Technical Note 450-05.[16]

Stage Three: Well-Established, Chronic Salinization

- Strongly Saline– Moderately salt-sensitive crops are impacted, forest stands exhibit severe decrease in overall vigor
- Adaptation measures –Alternative crops, wetland conservation easements
- EC = 8 < 16 dS/m

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Stage Four: Noncommercial Upland

- Highly Saline – Moderately salt-tolerant crops are impacted, very low forest productivity
- Marginal economic benefit, seedlings unlikely to grow
- Adaptation Measures – Conservation easement will protect inland areas, provide recreational opportunities
- EC = 16 < 25 dS/m

NCwetlands.org

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Southeast Climate Hub:
www.climatehubs.usda.gov/hubsoutheast

References:

Tully, K., Gedan, K., Epanchin-Niell, R., Strong, A., Bernhardt, E., Bendor, T., Mitchell, M., Kominoski, J., Jordan, T., Neubauer, S., Weston, N. 2019. The invisible flood: the chemistry, ecology and social implications of coastal saltwater intrusion. BioScience, 69(5): 368-378.

White, E., Ury, E., Bernhardt, E., Yang, Xi. 2021. Climate change driving widespread loss of coastal forested wetlands throughout the North American coastal plain. Ecosystems, online: 1-16.

GLOBAL SYMPOSIUM ON SALT-AFFECTED SOILS

20 - 22
October, 2021
Virtual meeting