USDA Southeast Climate Hub

Michael Gavazzi

USDA Forest Service
Southern Research Station
Eastern Forest Environmental Threat Assessment Center
USDA Southeast Climate Hub
https://www.climatehubs.usda.gov/hubs/southeast

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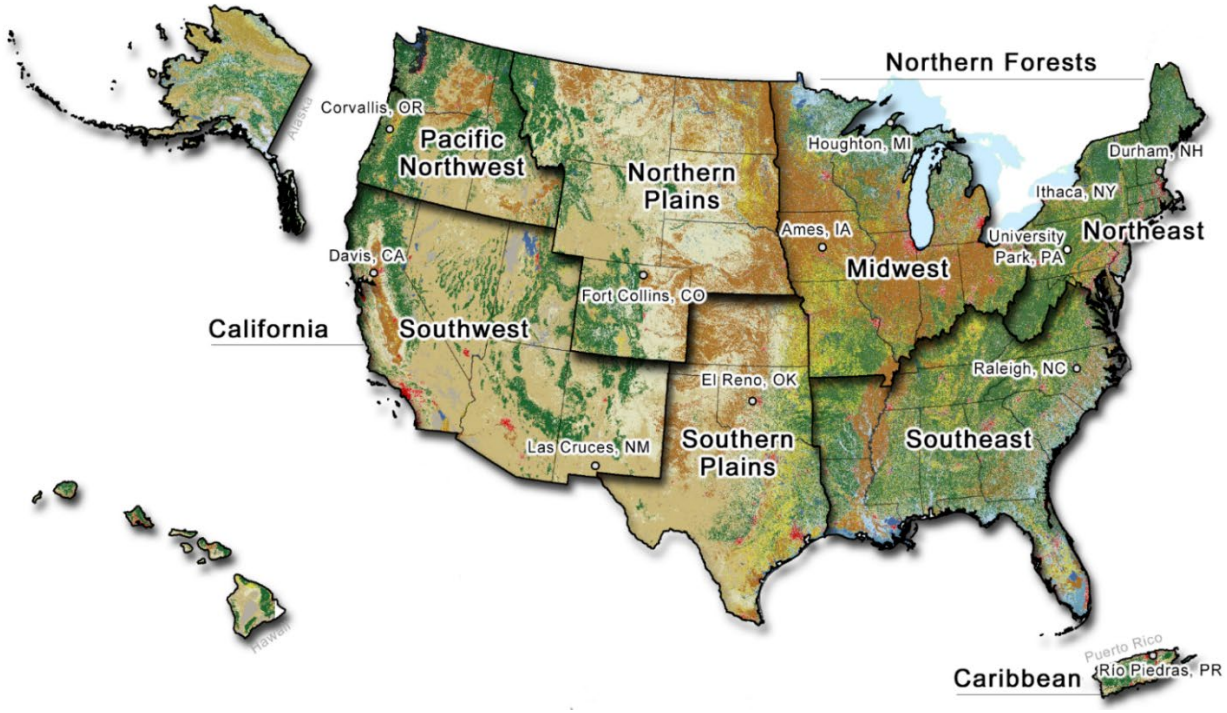
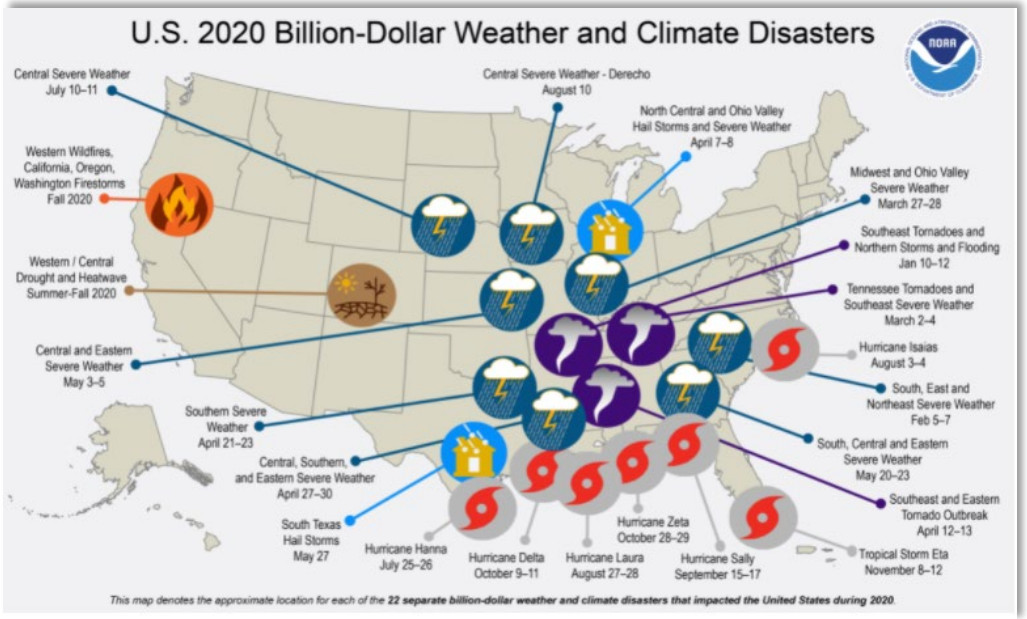
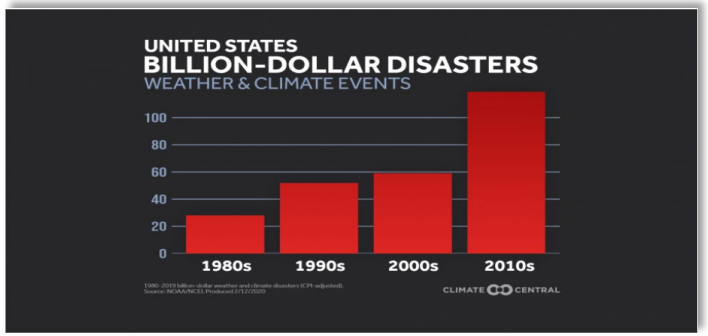
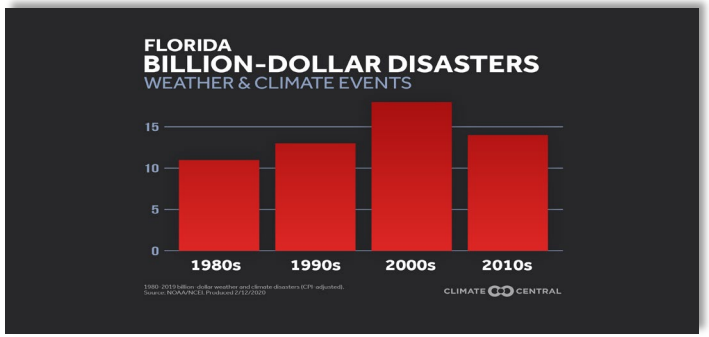
Increase resilience of working lands to climate change and climate variability through adaptive management



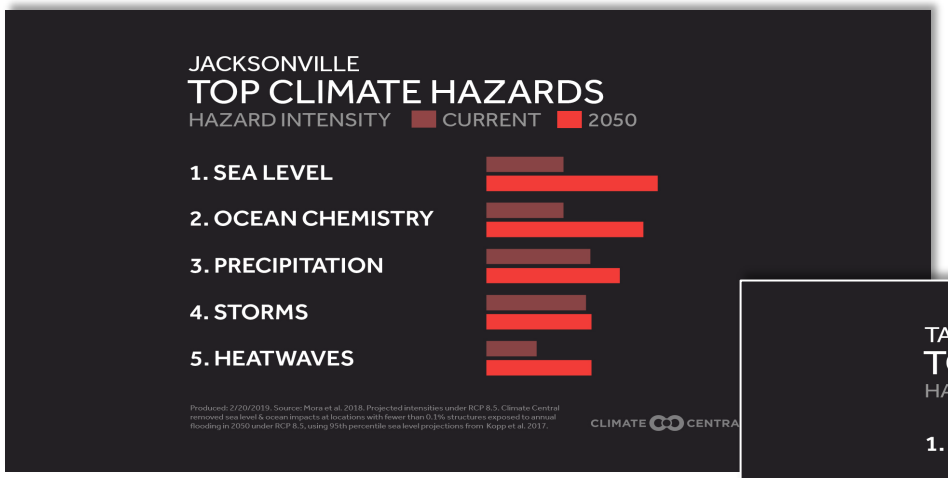
Billion Dollar Weather & Climate Disasters

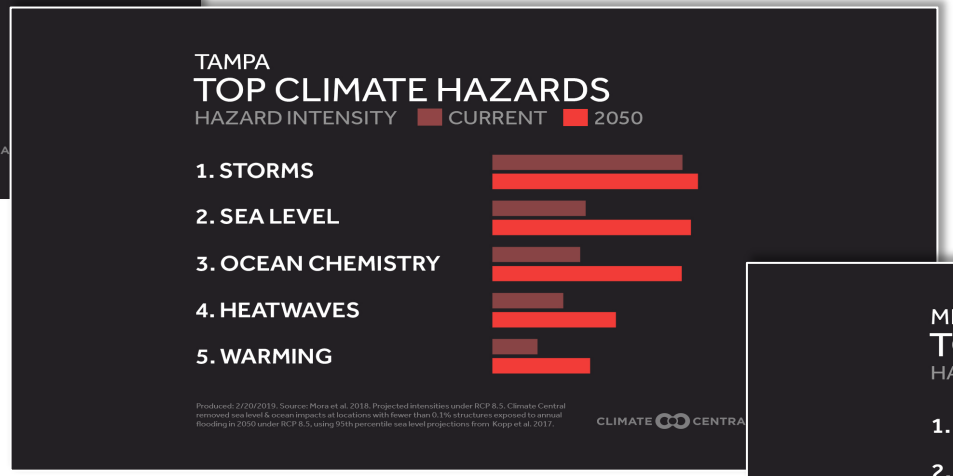


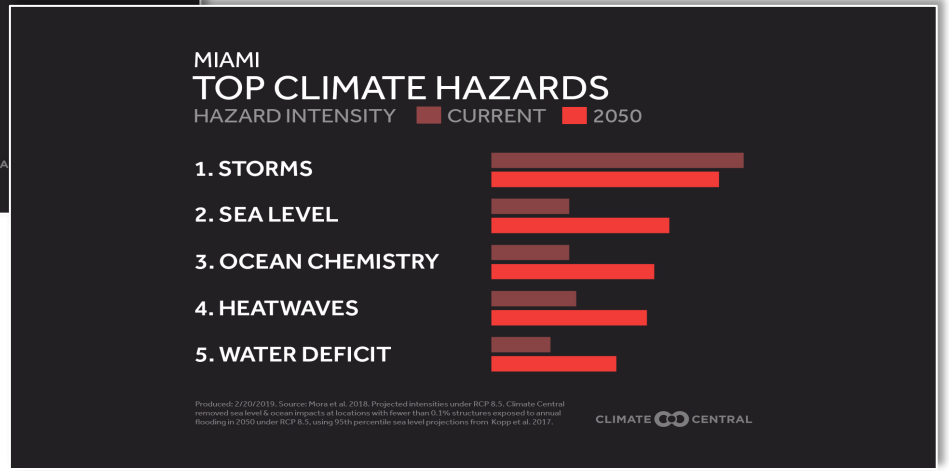




Florida Climate Hazards







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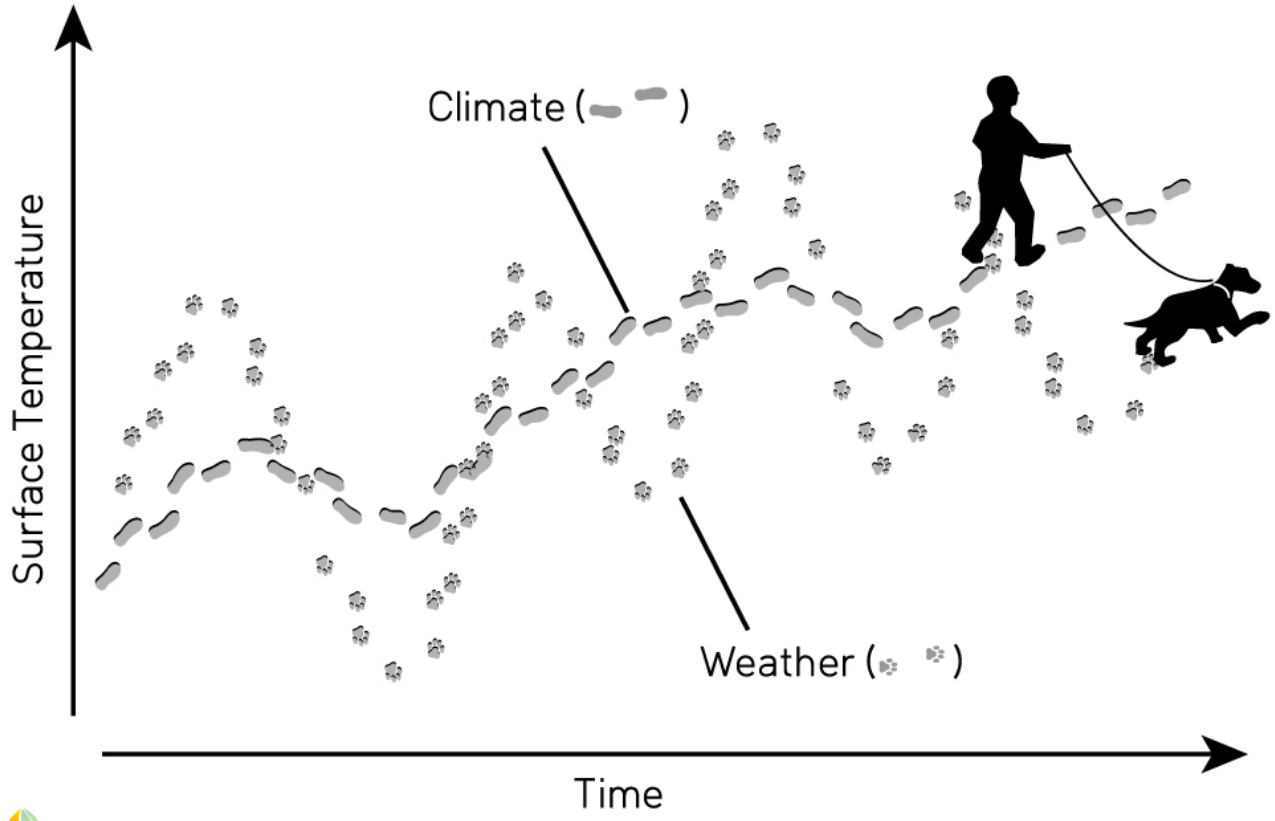
In the near term (months/years), climate variability is MUCH more important than climate change



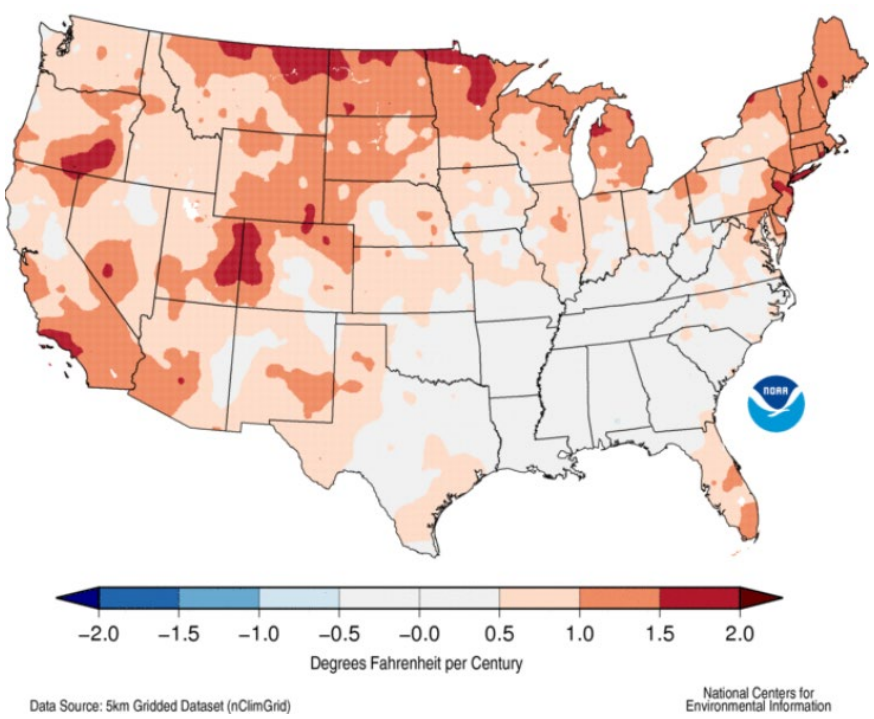
skso.to/jg Redrawn from TeddyTVNorge, https://www.youtube.com/watch?v=e0vj-0imOLw

Take home message #1

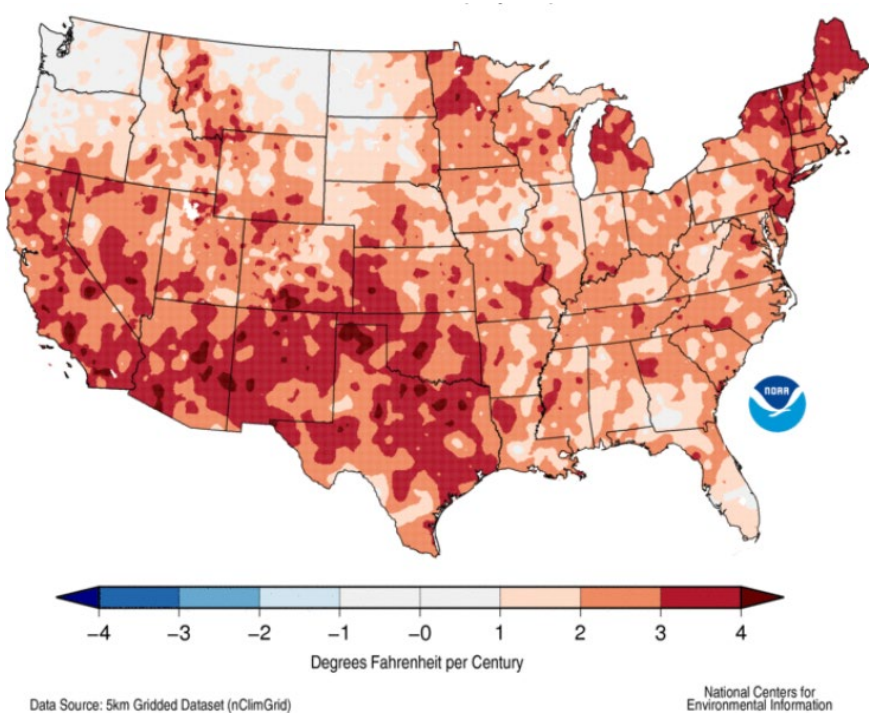
- The greatest impact of climate change will be extreme events and not slow change over time
- Changes may occur rapidly and with short notice and little lead time

Average Annual Temperature Trends

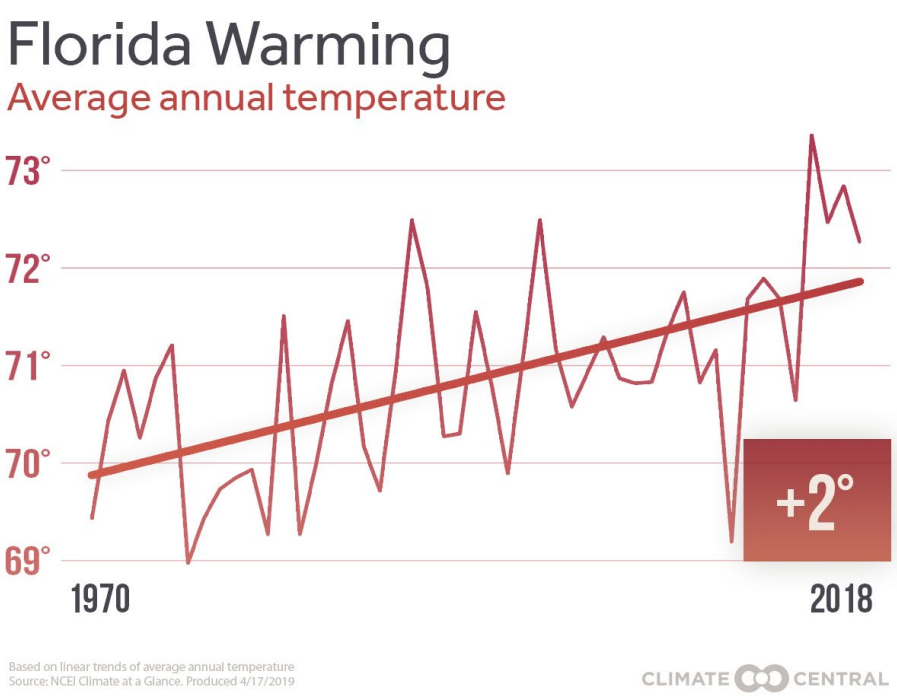
1895 - 2017

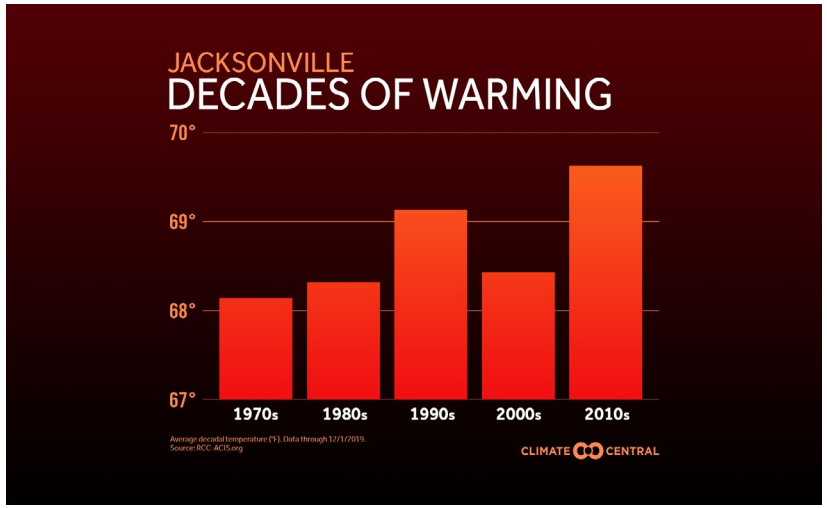


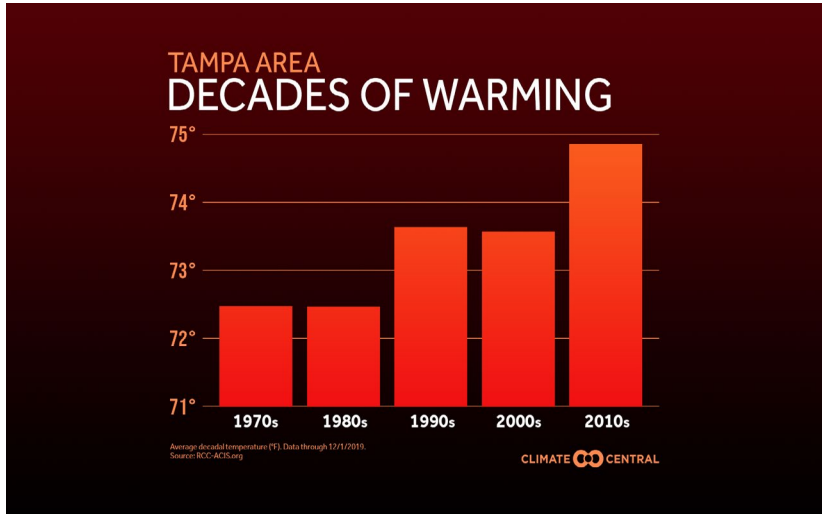
1988 - 2017



Florida Temperature Trends







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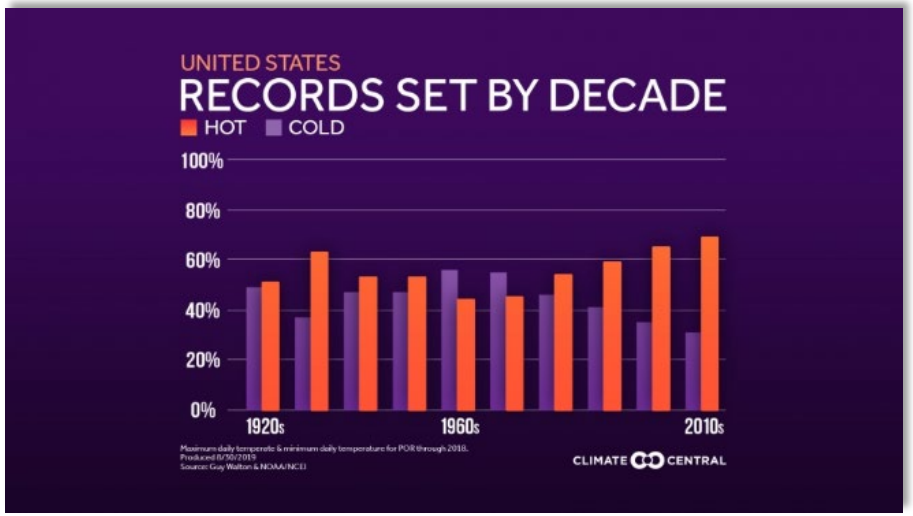
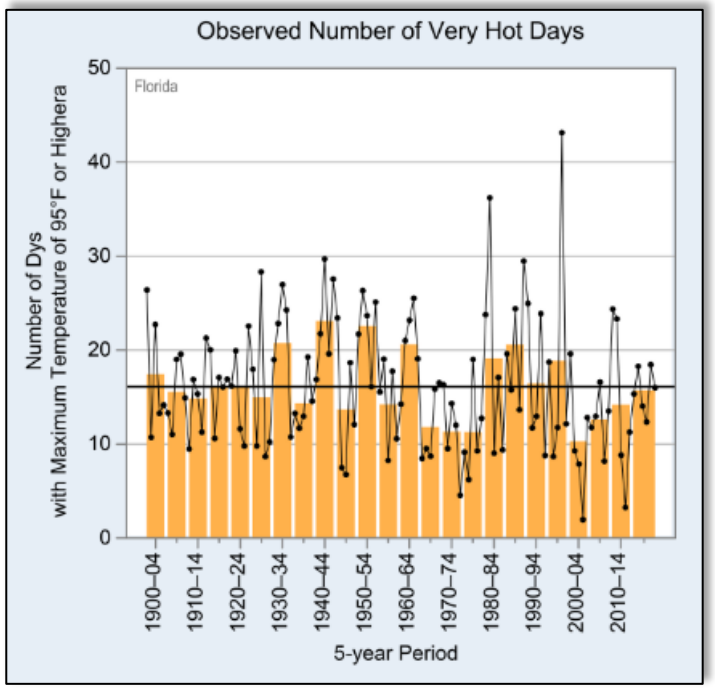
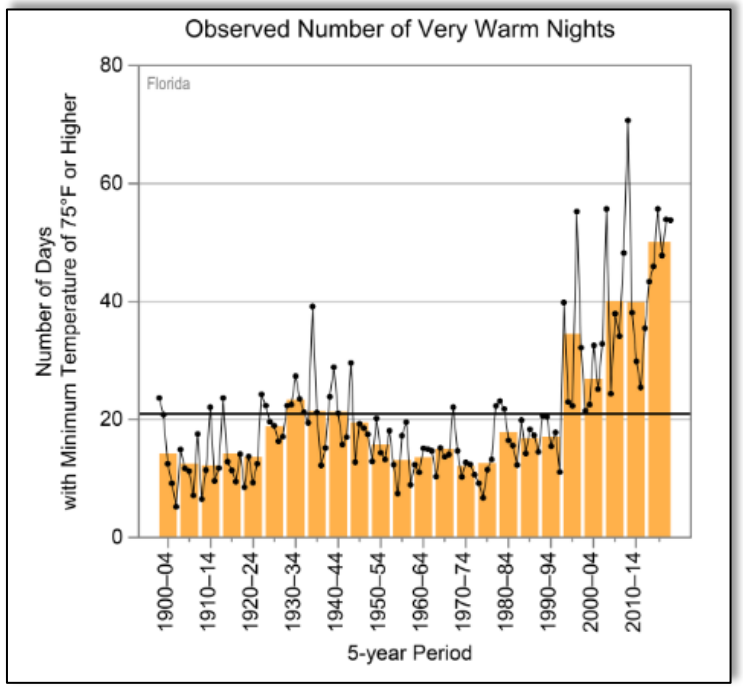
Temperature Trends – Highs and Lows



Days ≥ 95°F



Nights ≥ 75°F

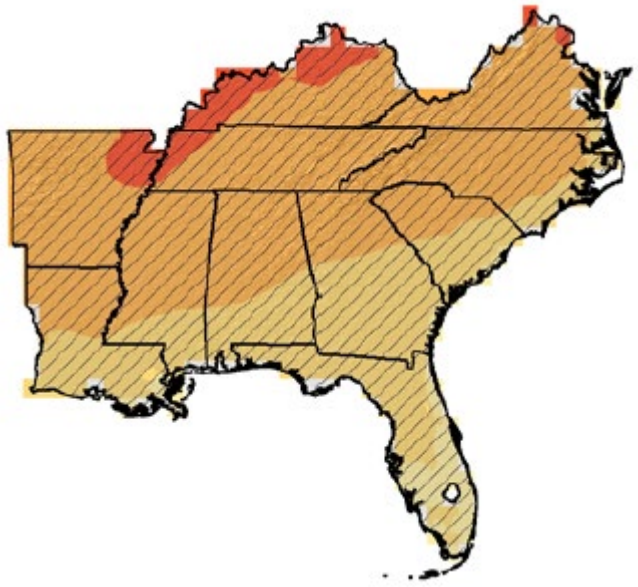


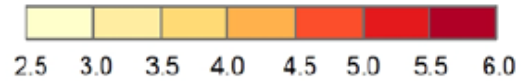
Source: NOAA State Summaries - Florida

Temperature Forecasts

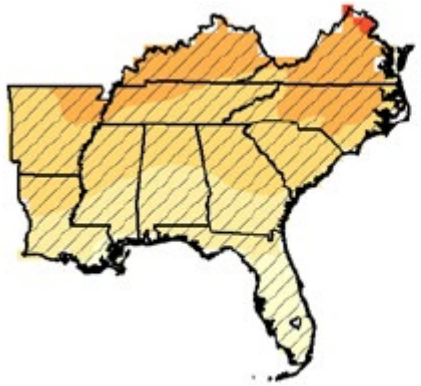
(2041-2070)

Annual



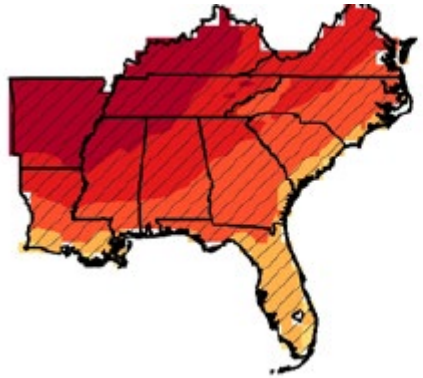


Winter

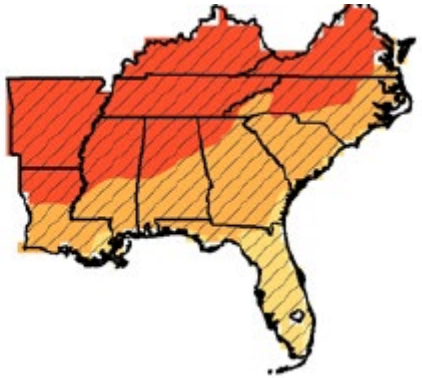


Spring

Summer



Fall



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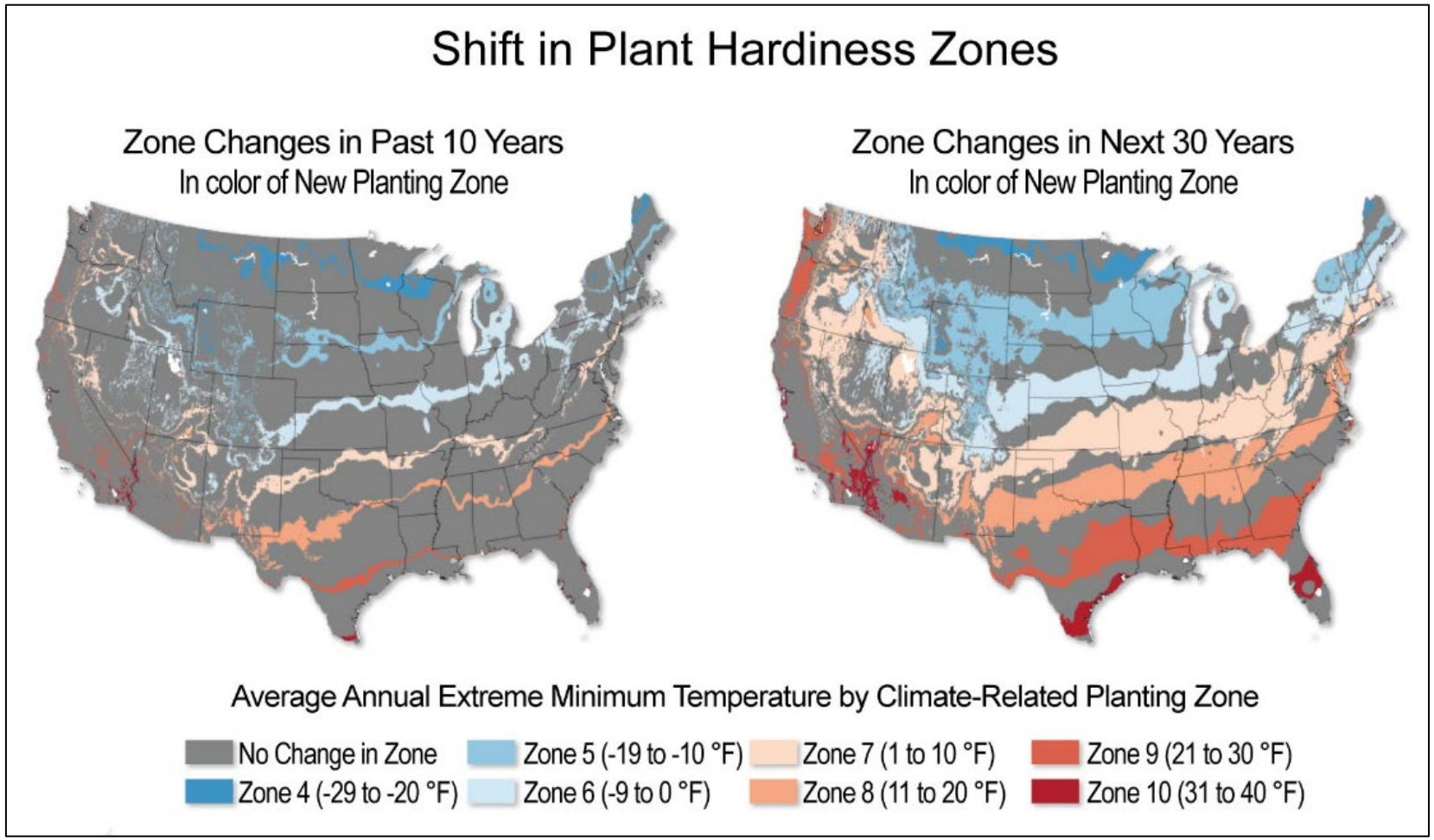
Source: NOAA Technical Report, 2013

Plant Hardiness Zones



Source: 2014 National Climate Assessment

Impacts from Increasing Temperatures

- Heat island effect
- Soil moisture stress
- Heat stress
- Weeds and pest pressure
- Species & habitat migration
- Lower yield/productivity
- Increased mortality
- Higher expenses

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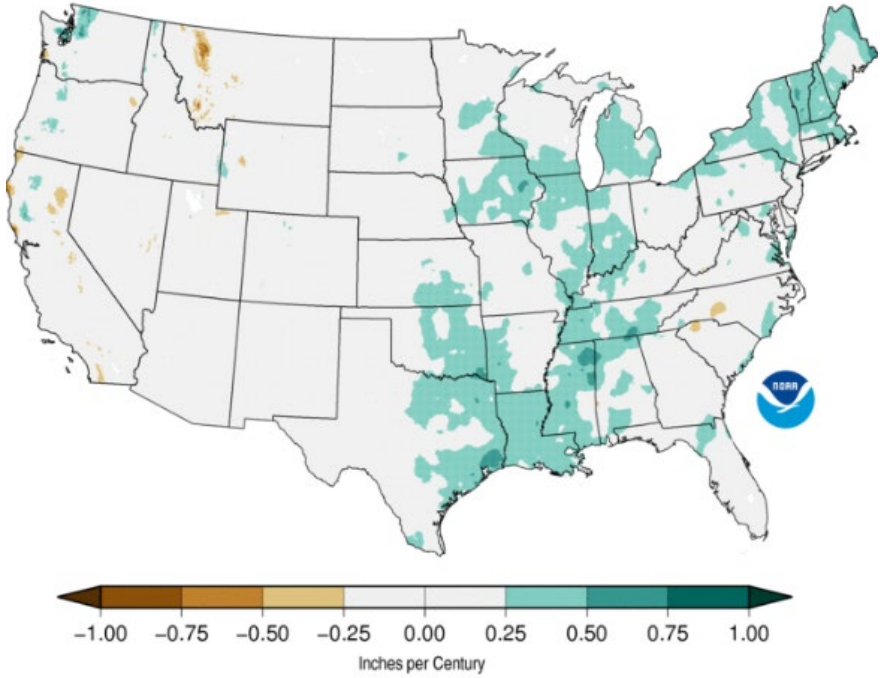
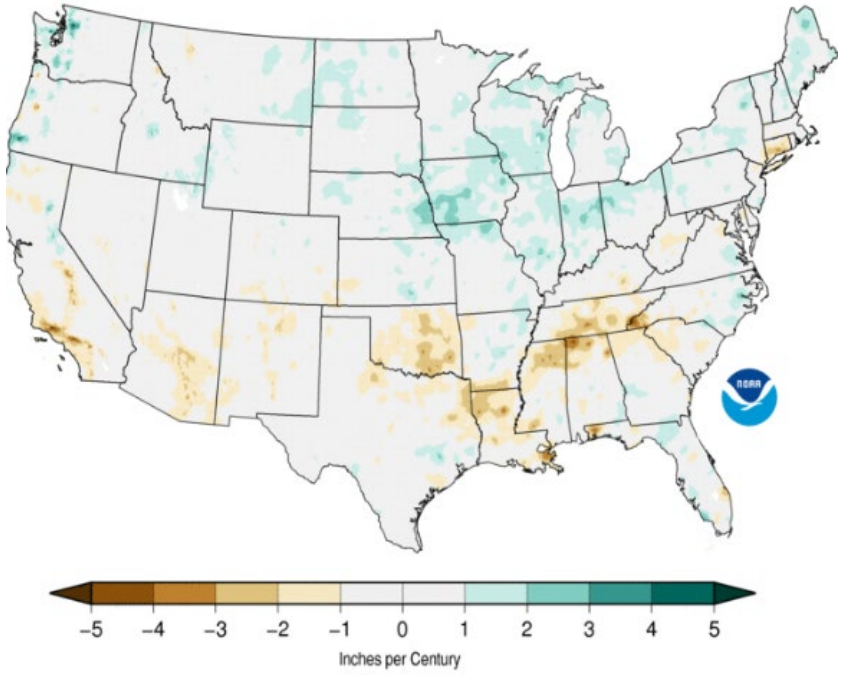
Average Annual Precipitation Trends

1895 - 2017



1988 - 2017



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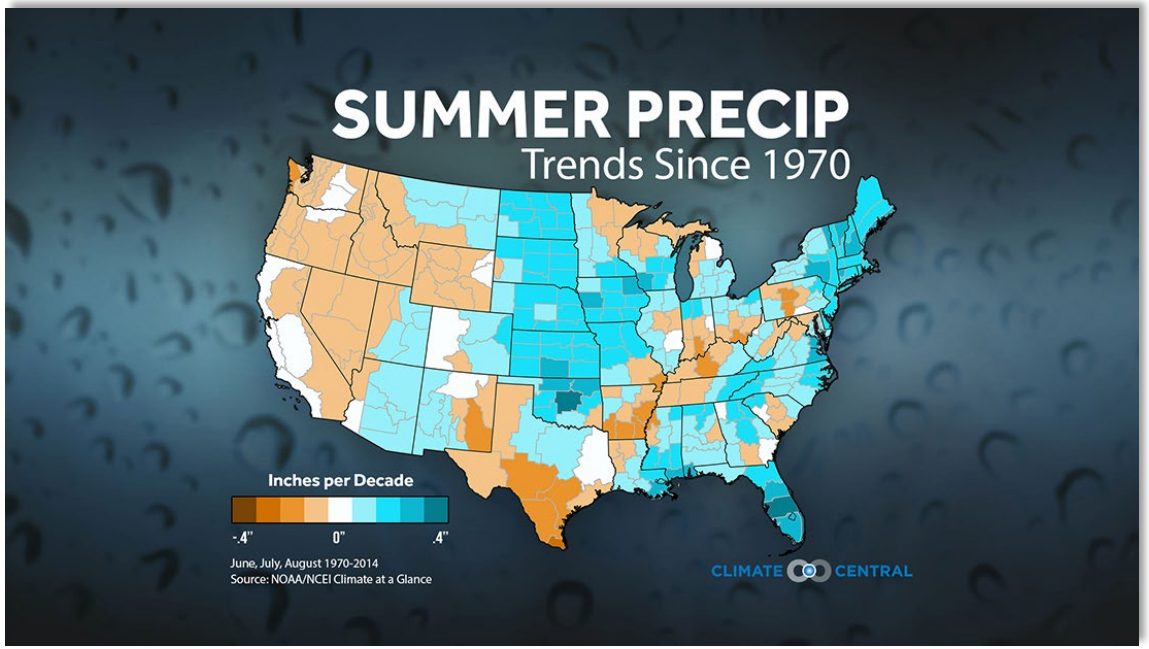
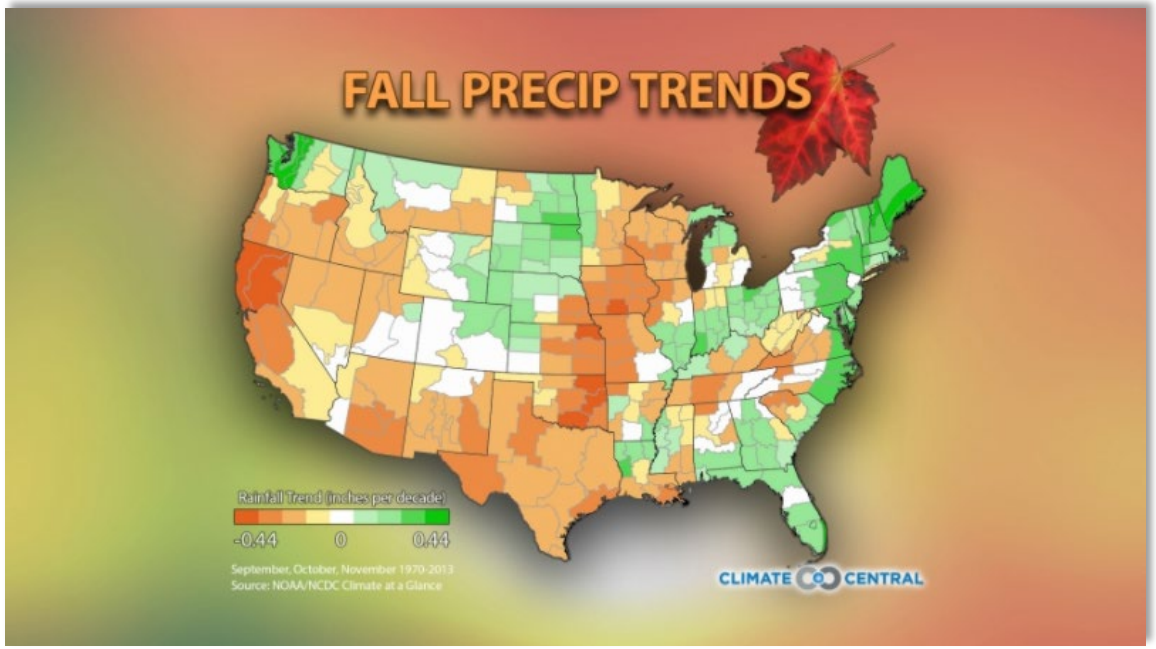
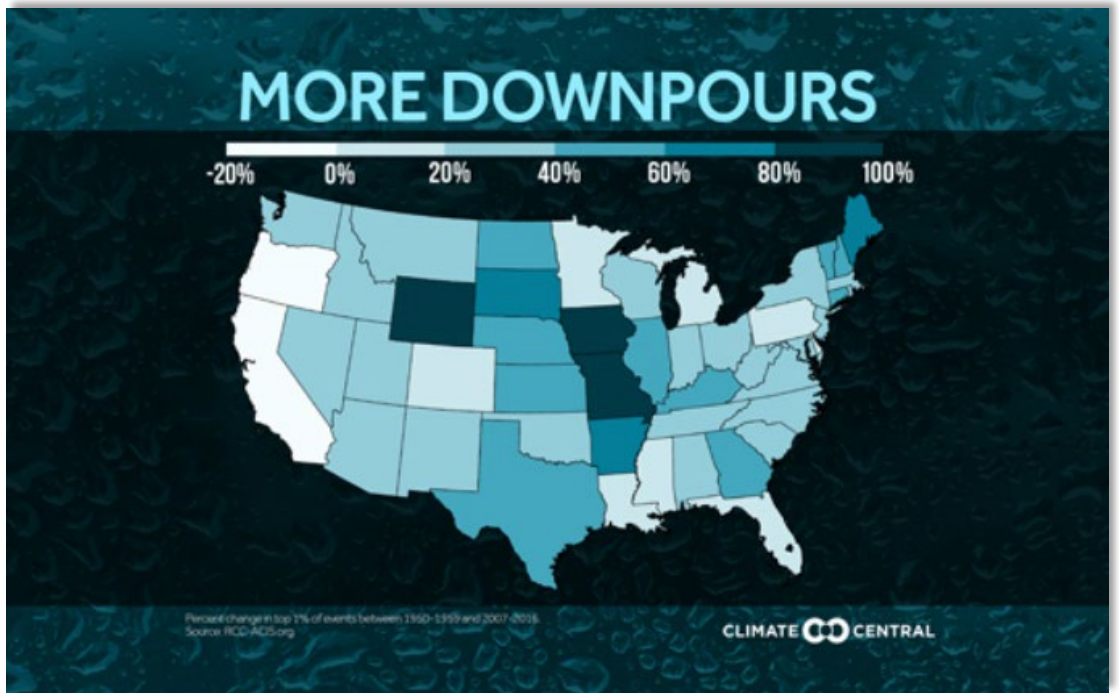
Precipitation Trends

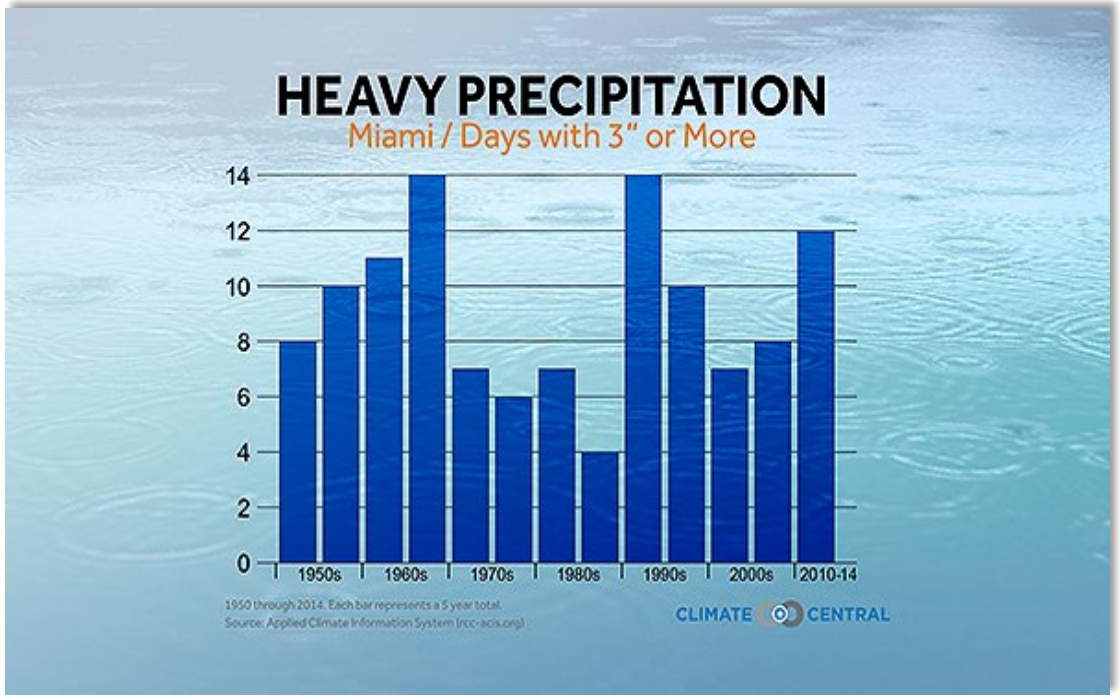




Precipitation Trends

More than 1.5 million people in Florida are living in areas at an elevated risk of inland flooding

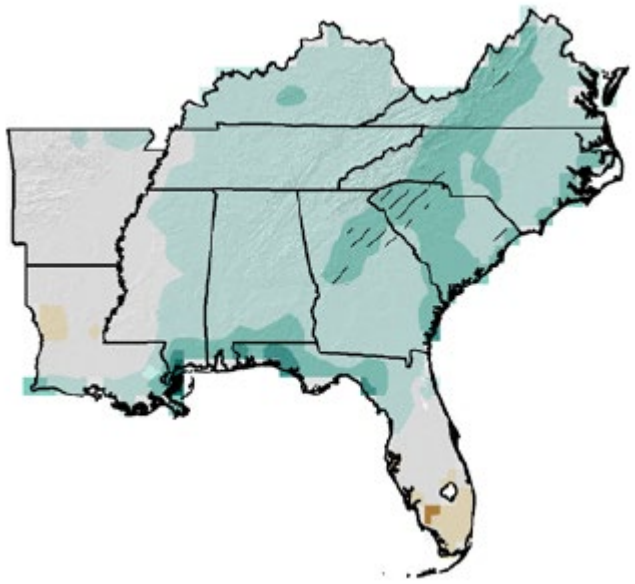




Precipitation Forecasts

(2041-2070)

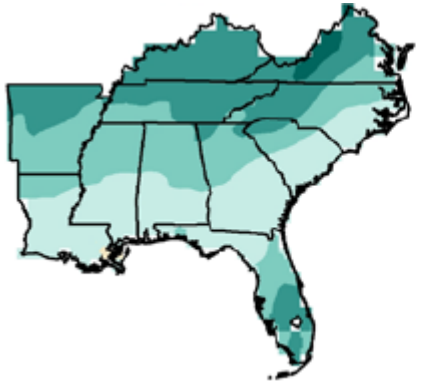
Annual



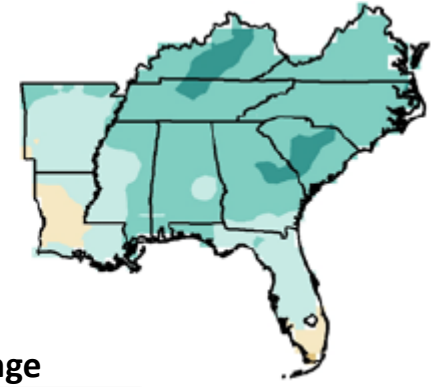
Percent Change

-6 -3 0 3 6 9 12 15

Winter



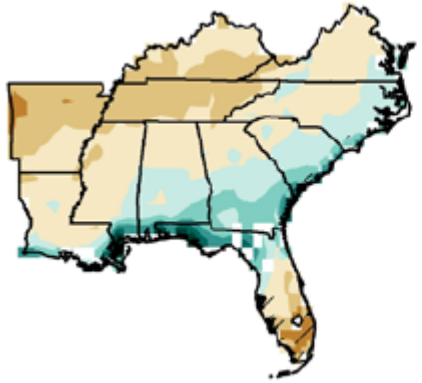
Spring



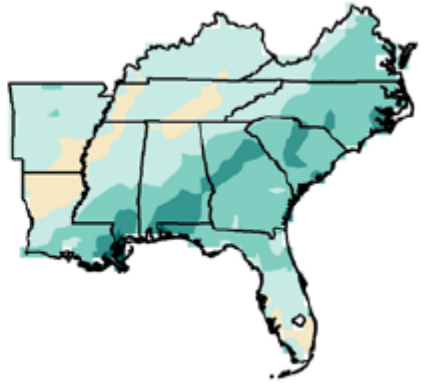
Percent Change

-15 -10 -5 0 5 10 15 20 >20

Summer



Fall



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Source: NOAA Technical Report, 2013

Precipitation Variability

Decreased Storm Frequency

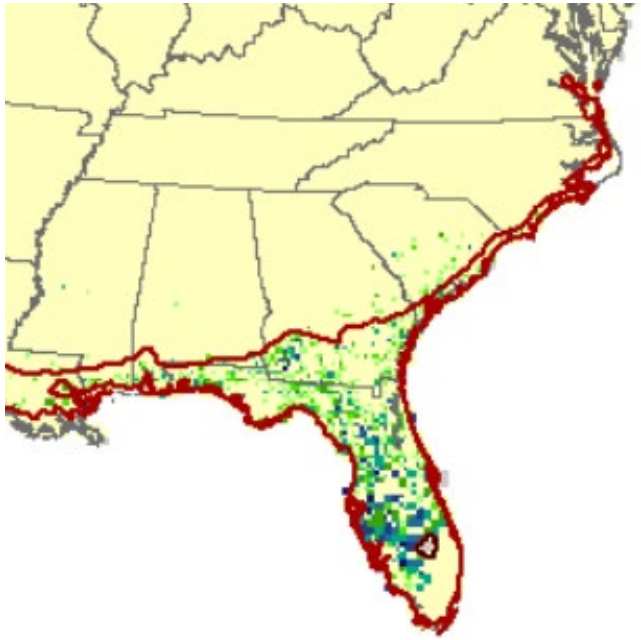
- drought
- water supply
- wildfire
- pests/disease
- more irrigation

Increased Storm Intensity

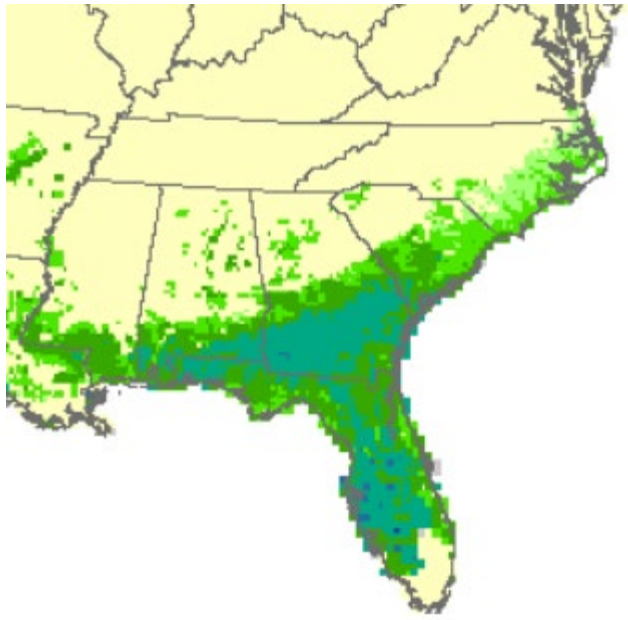
- flooding
- wind damage
- soil erosion
- damage to infrastructure
- delayed planting/harvesting

Climate Change Tree Atlas (ex. Live Oak)

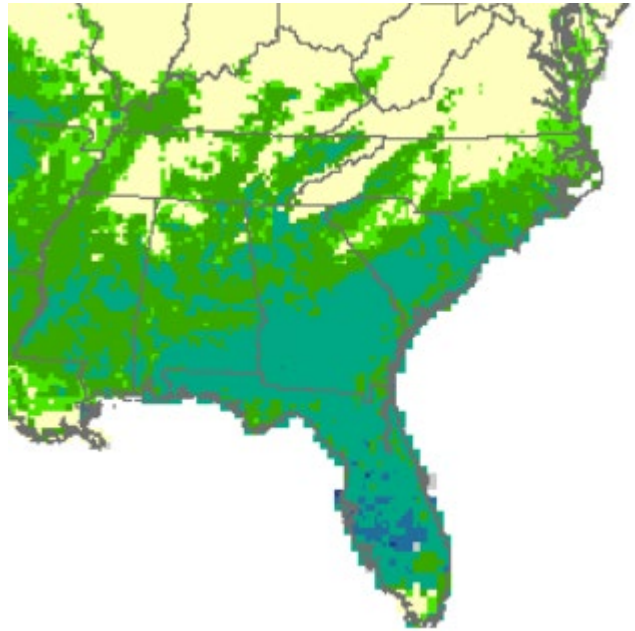
Current Range



Moderate Emissions (RCP 4.5)



High Emissions (RCP 8.5)



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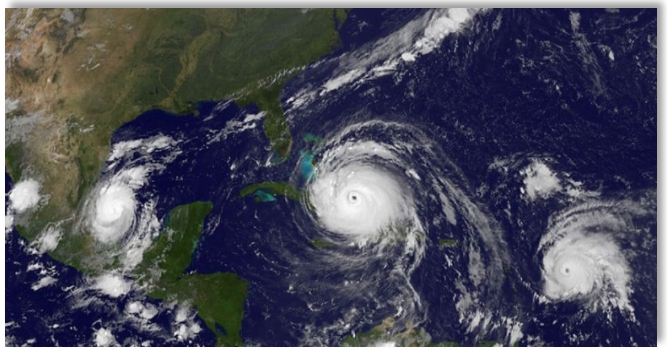
https://www.fs.usda.gov/nrs/atlas/tree/

Hurricane Risk

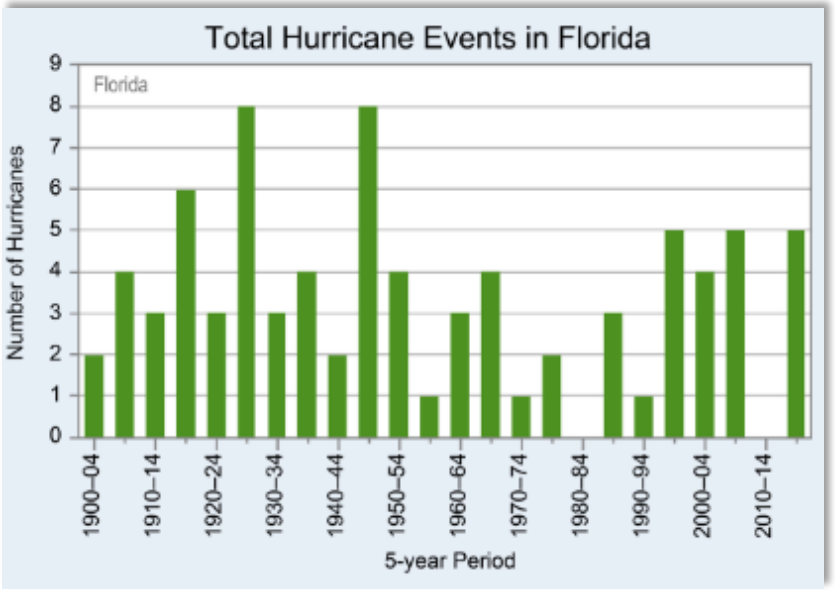
Trends and Forecasts

- Frequency may not change
- Shift toward more higher category storms (4 & 5)
- Higher rainfall/event



Impacts

- Increased fuel loading
- Increased invasives and pests
- Increased flooding
- Carbon Sequestration



Source: NOAA state climate summaries 2022

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Hurricane Preparation & Recovery

23 of the most economically important commodities in the SE US

https://www.climatehubs.usda.gov/hubs/southeast/topic/hurricane-preparation-and-recovery-southeast-us

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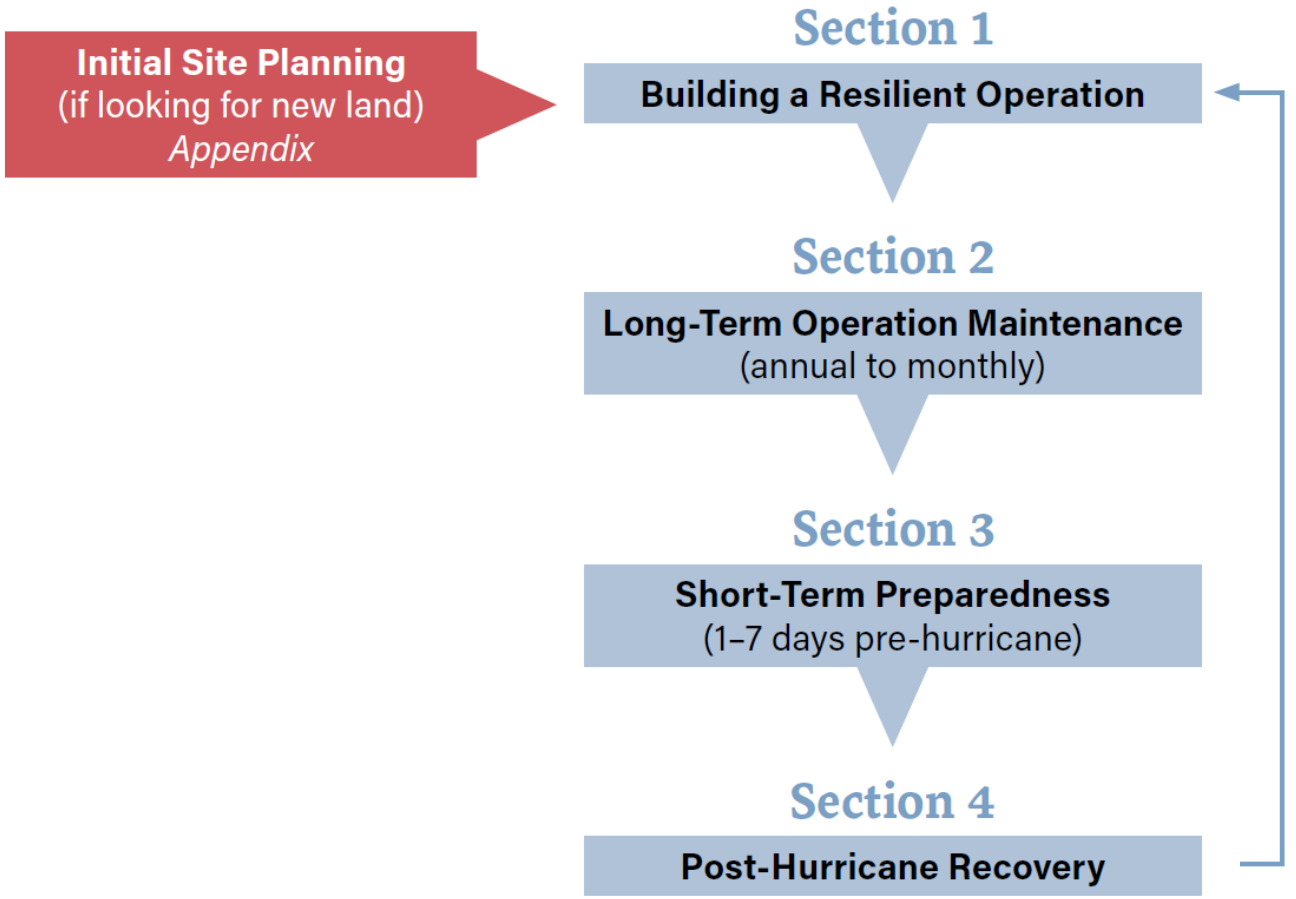
Hurricane Preparation & Recovery



Layout and use of the hurricane preparation and recovery guide.

Wildfire Risk

Cross-cutting Impacts

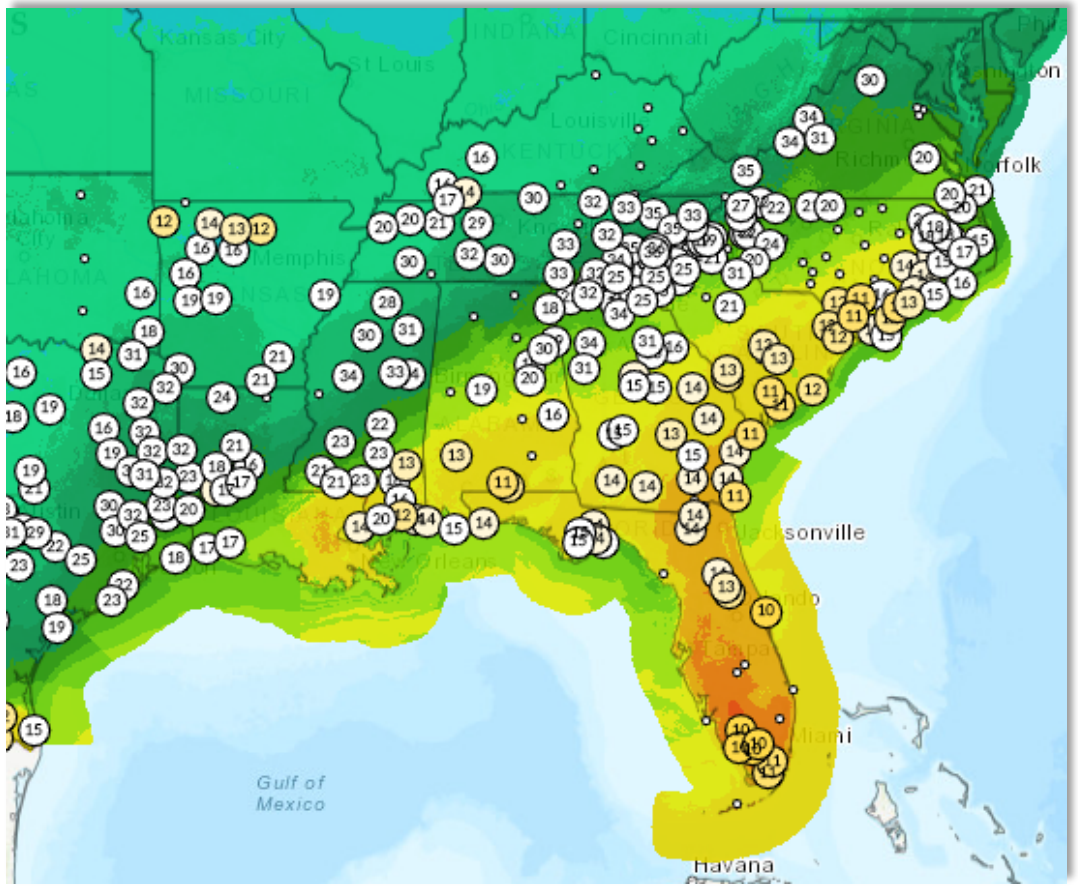
- Decreased:
  - Aesthetics
  - Productivity
  - Carbon Sequestration
  - Culturally important species
  - Traditional Ecological Knowledge
- Increased:
  - Mortality
  - Habitat destruction
  - Fragmentation

Managing to Reduce Wildfire Risk

- Reduce fuel loads through prescribed fire and periodic thinning
- Refrain from prescribed fire during high fire risk periods
- Salvage logging reduces fuel loads and risk of wildfire, pest and disease outbreak
- Incorporate fire-resistant species (yellow poplar, some oaks, etc.)
- Develop recovery plans before a fire occurs

Fire Weather Intelligence Portal

- State Climate Office of NC
- Expand out of NC
- Modified based on stakeholder feedback



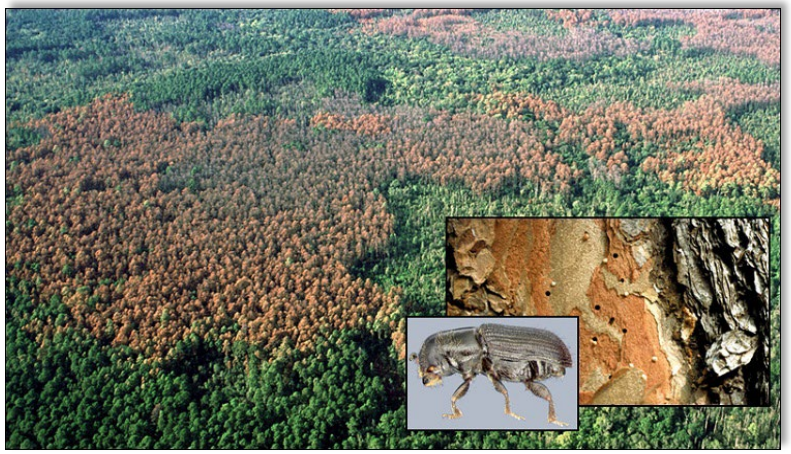
Invasive Species (Insects)

Trends and Forecasts

- Longer breeding season
- Higher winter temperatures
- Increased over-winter larva survival rate
- Northward expansion
- Drought stress
- Disturbance

Impacts

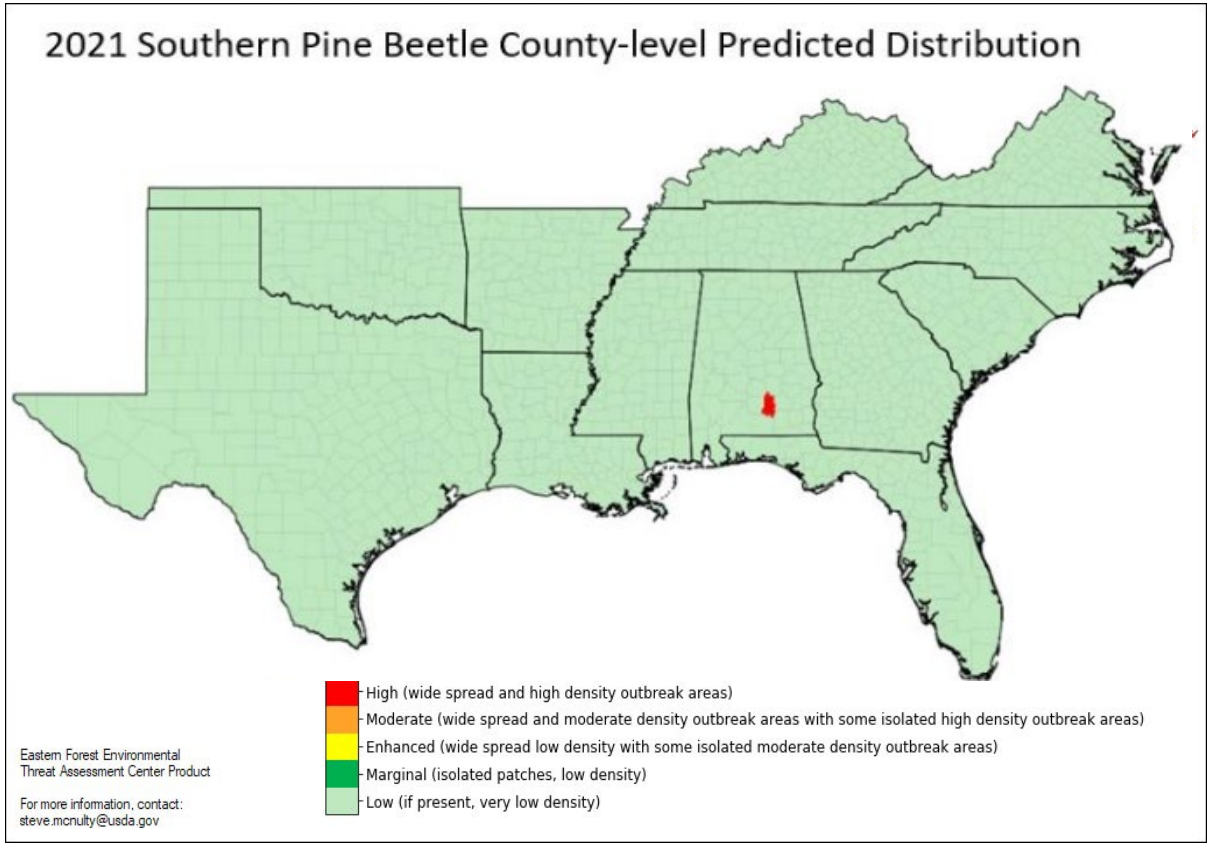
- Tree mortality
- Habitat destruction/fragmentation
- Decreased species richness
- Increased fuel loading



Southern pine beetle

Laurel wilt Disease

Southern Pine Beetle Outbreak Model (SPBOM)



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Invasive Species (trees, shrubs, vines, grasses)

Trends and Forecasts

- Increased stress
- Northward expansion
- Disturbance

Impacts

- Tree mortality
- Habitat destruction/fragmentation
- Decreased species richness
- Increased fuel loading

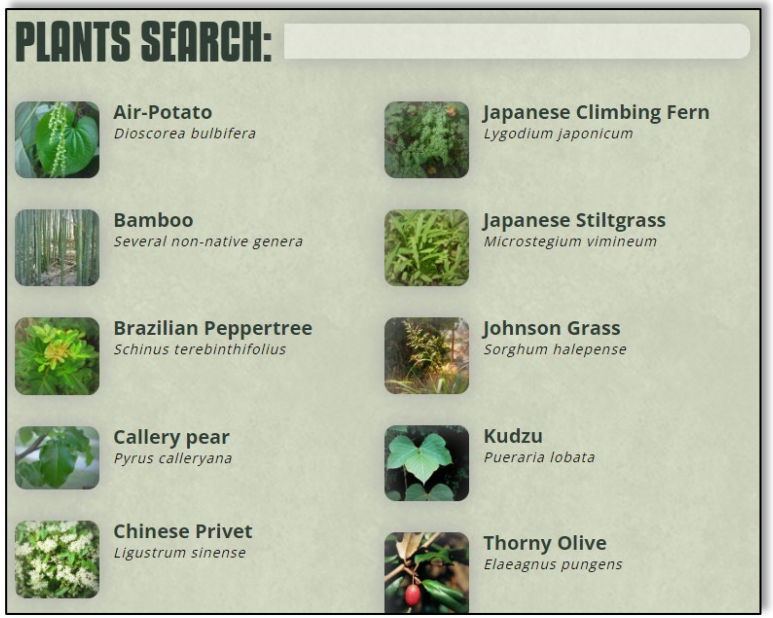
Tropical nutrush (*Scleria macrocarpa*)

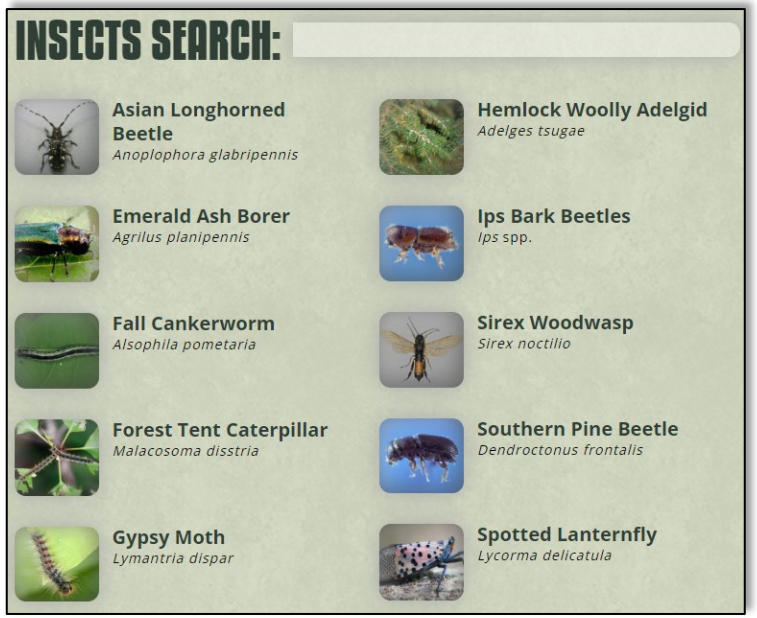
Natal grass (*Melinis repends*)

Smooth rattlebox (*Crotalaria* spp)

Source: USDA FS Climate Change Resource Center

Southern Forest Health





Southern Regional Extension Forestry

Southernforesthealth.net

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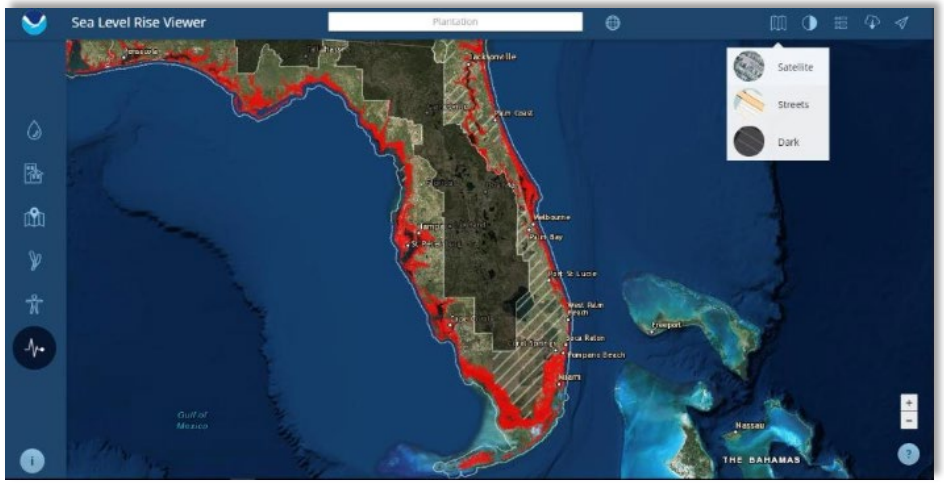
Sea Level Rise and Soil Salinization/Saltwater Intrusion

Trends and Forecasts

- SLR rate: 3.8 mm/yr (1.5 in/decade)
- High variability
- SLR in parts of Florida: 1 inch every 3 years
- Timing of salinization events depends on tropical storm occurrence and SLR

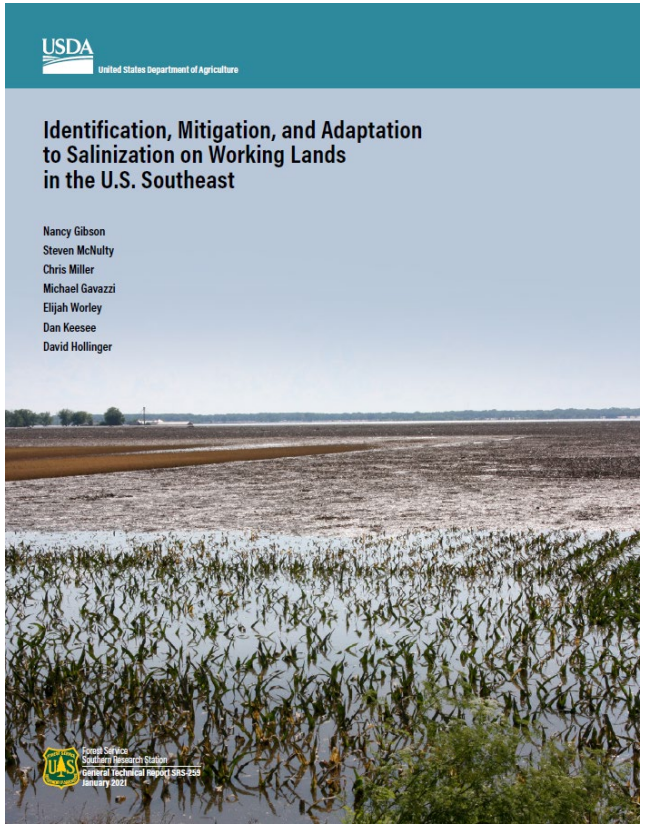
Impacts

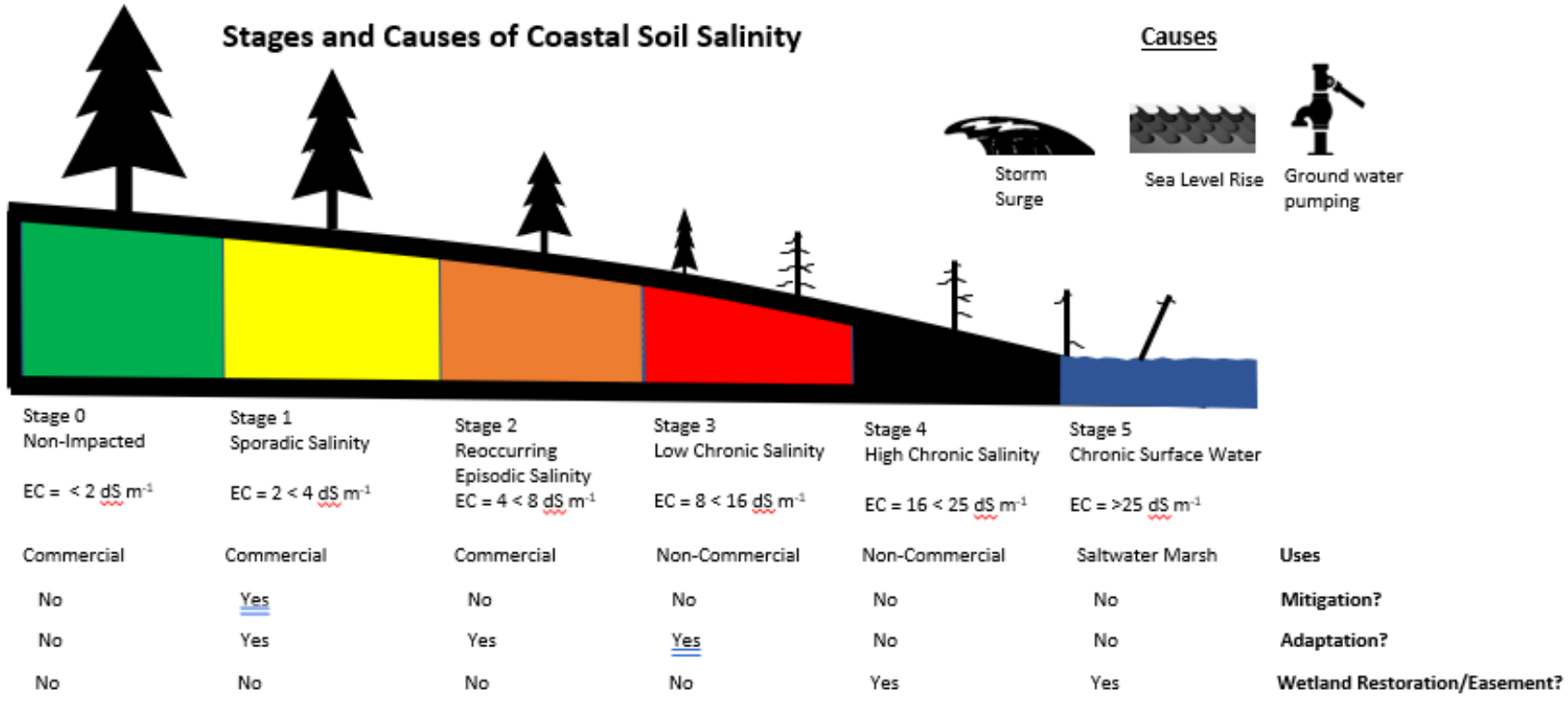
- Sparse crown
- Shorter needles/leaves
- Decreased vigor and growth
- Increased mortality and insect problems
- Ghost forest



Source: NOAA

Managing for SLR and SWI





	Stage 0 Non-Impacted	Stage 1 Sporadic Salinity	Stage 2 Reoccurring Episodic Salinity	Stage 3 Low Chronic Salinity	Stage 4 High Chronic Salinity	Stage 5 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	Non-Commercial	Non-Commercial	Saltwater Marsh	**Uses**
	No	Yes	No	No	No	No	**Mitigation?**
	No	Yes	Yes	Yes	No	No	**Adaptation?**
	No	No	No	No	Yes	Yes	**Wetland Restoration/Easement?**

TACCIMO

The results also indicate that on average mangrove forests can keep pace with current SLR [sea-level rise] but would have difficulty at higher SLR scenarios projected for 2070. We are aware that a deeper unpacking of storm surges and other forms of extreme climatic events is needed. Yet, there was significant evidence of mangrove migration into the freshwater wetlands upstream. The movement of the mangrove community into the freshwater marsh habitat, facilitated by increased freshwater inflows, tidal surge salt wedge incursion and propagule recruitment (Cahoon et al., 2006; Doyle et al., 2010; Smoak et al., 2013; Raabe and Stumpf, 2016) is a Directed adaptation that shows a great deal of promise. Increased freshwater flows could stave off projected saltwater intrusion and facilitate mangrove inland migration under less salty water conditions (Raabe et al., 2012). Thus, maintaining lower salinities could make the mangrove community more resilient.

Take home message #2

The **best** and **least expensive** response to minimize disturbances will be on **adaptive management** and not on the response to the disturbance itself

- Forest thinning to reduce drought and insect impacts
- Prescribed fire to reduce fuel loads and insects/disease

Thank you!

Michael Gavazzi
Hub Coordinator
USDA SE Climate Hub
michael.gavazzi@usda.gov