Thinking Adaptation?

Some of the things you might want to think about.

Lynne M Carter, Ph.D., Associate Director,
Southern Climate Impacts Planning Program, LSU

Adaptation: Things to think about

- There is no “one-size fits all” adaptation.
- Adaptations can also be accomplished thru disaster risk reduction, sustainable development, *just better planning*.
- What are some of the barriers to action?
- There are multiple stresses at work – climate is NOT the main issue for most regions.
- There are numerous planning efforts being initiated at many levels.
- Many adaptation actions have yet to be evaluated.

Adaptation: Things to think about

- There is no “one-size fits all” adaptation.
  - no “top 10” Adaptation Actions - adaptations are location and issue specific
- Adaptations can also be disaster risk reduction, sustainable development, *just better planning*.
- What are some of the barriers to action?
- There are multiple stresses at work – climate is NOT the main issue for most regions.
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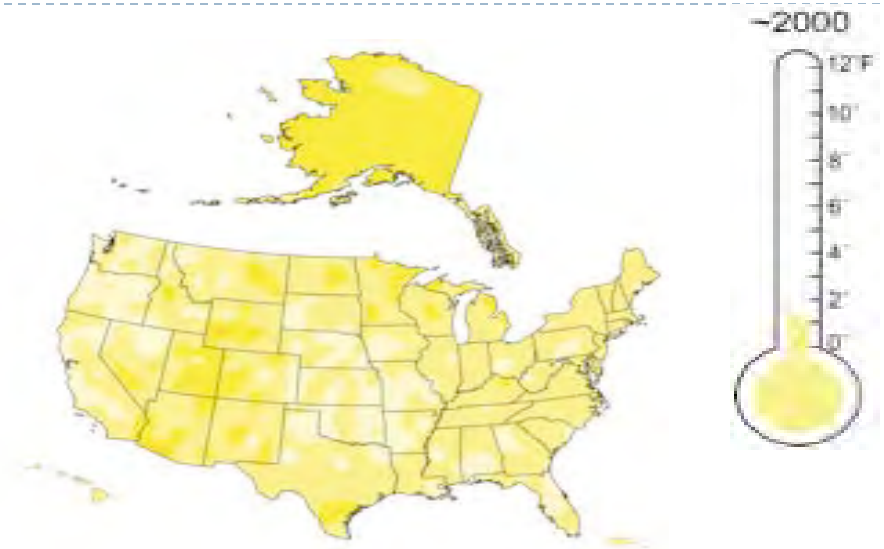
Local Changes to Temperature

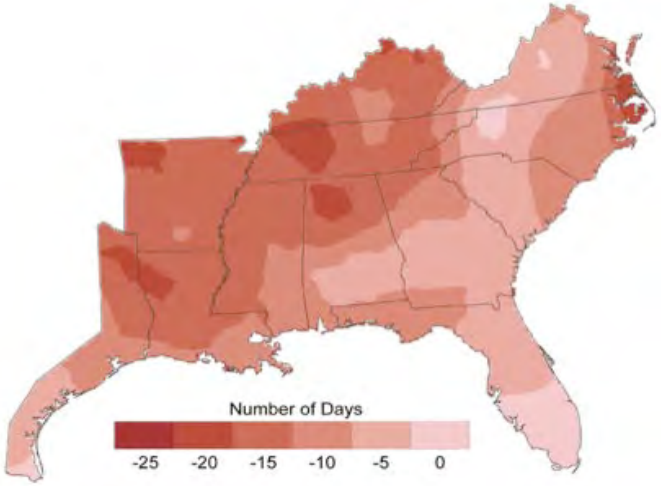
Present-Day (1993-2008) Average Change from 1961-1979 Baseline
Change in Freezing days per year: since mid 1970s

- This region: temp declines from 1901 to 1970

- Since 1970 average SE temps increased + 1.6˚F and winter temps up + 2.7˚F

- Freezing days have declined by 4-7 days/yr for most of the region since mid-1970s: 20 fewer west LA; 5 fewer mid FL





From: Global Climate Change Impacts in the US, 2009, pgs 28, 112

Climate Change Impacts Are Not Distributed Evenly

For example…

Western drought, CA Dept. of Water Resources

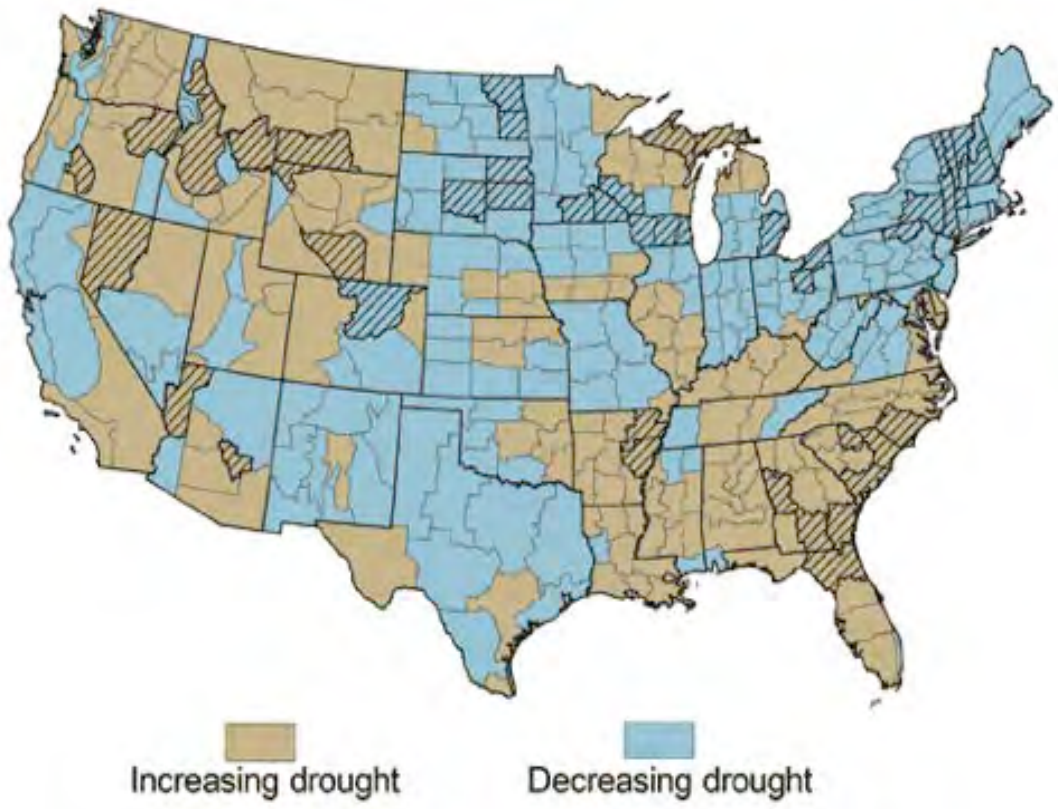
Midwestern flooding, NRCS

- Drought frequency has increased in the Southeast and much of the West
- Heavy precipitation has increased most in the Midwest and Northeast

Changes Observed: precipitation

Drought trends: 1958-2007

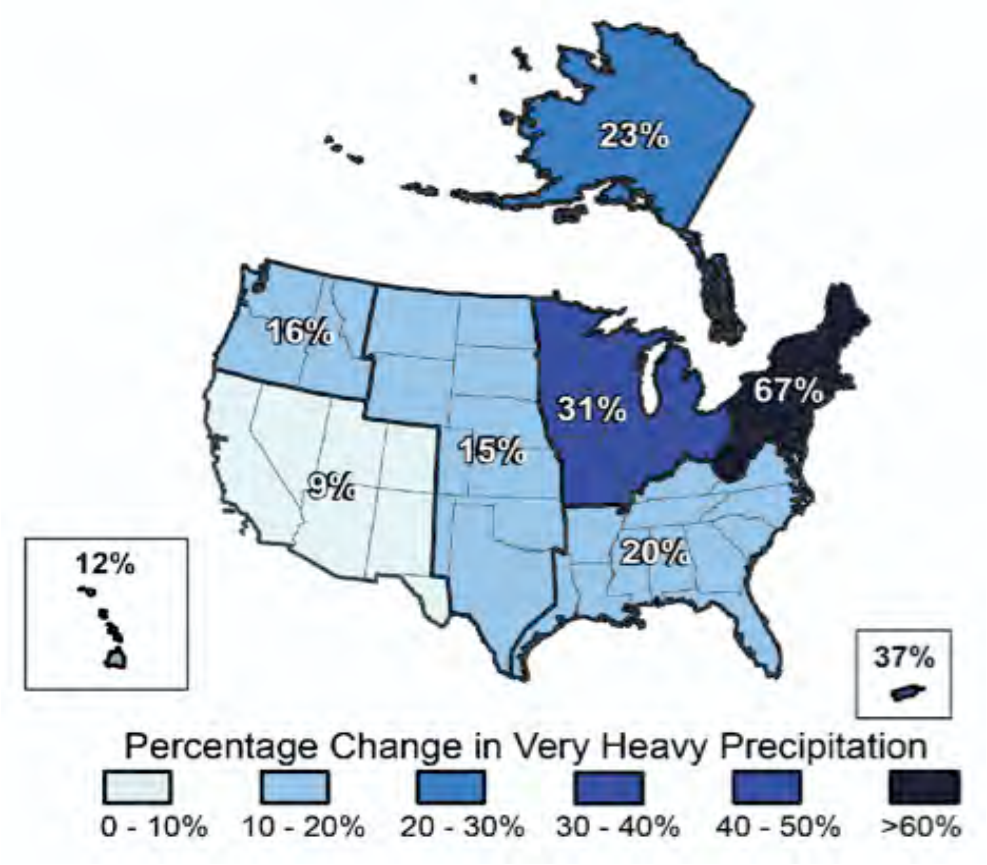
End-of-summer drought trends as measured by the Palmer Drought Severity Index in each of 344 U.S. climate divisions.[144] Hatching indicates significant trends.



From: Global Climate Change Impacts In the US, 2009 pg 43

Changes Observed: precipitation intensity and amounts

- Heavy downpours + 20% average in US over past 50 yrs
- Northeast and Midwest highest
- Precipitation + 5% average
- Shifting patterns show wet areas wetter, dry areas drier
- Trend likely to continue



Increases in Very Heavy Precipitation: the heaviest 1% of all daily events from 1958-2007

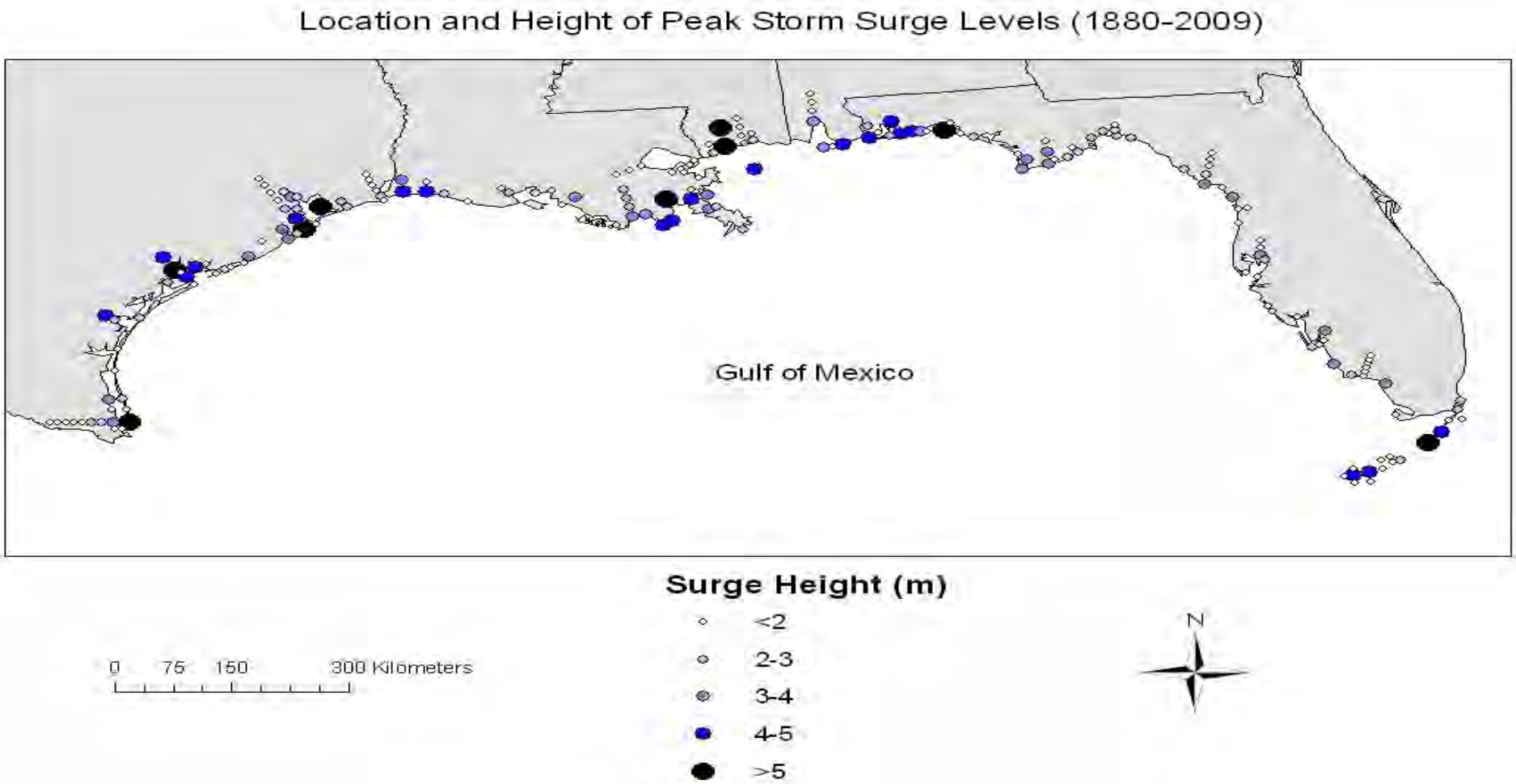
From: Global Climate Change Impacts in the US, 2009 pg 32

Changes Observed – Relative Sea level

Some areas along the Atlantic and Gulf coasts - increases greater than 8 inches over the past 50 years.

Data Source: http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

Gulf Coast Storm Surges

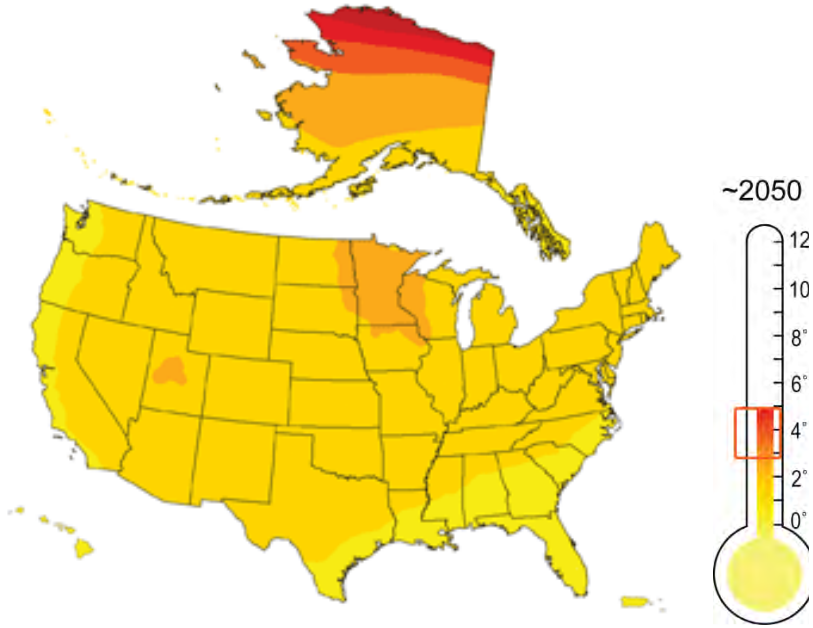


From: Hal Needham, 2010

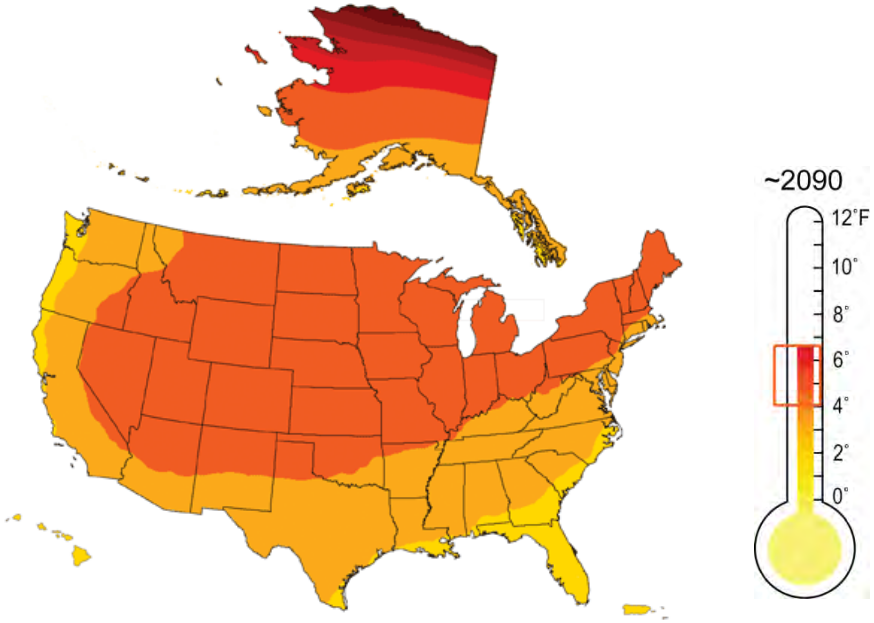
Projected U.S. Temperature Change (°F) under a Low Emissions Scenario

(compared to 1961-1979 Baseline)

Mid-Century
(2041-2059 average)

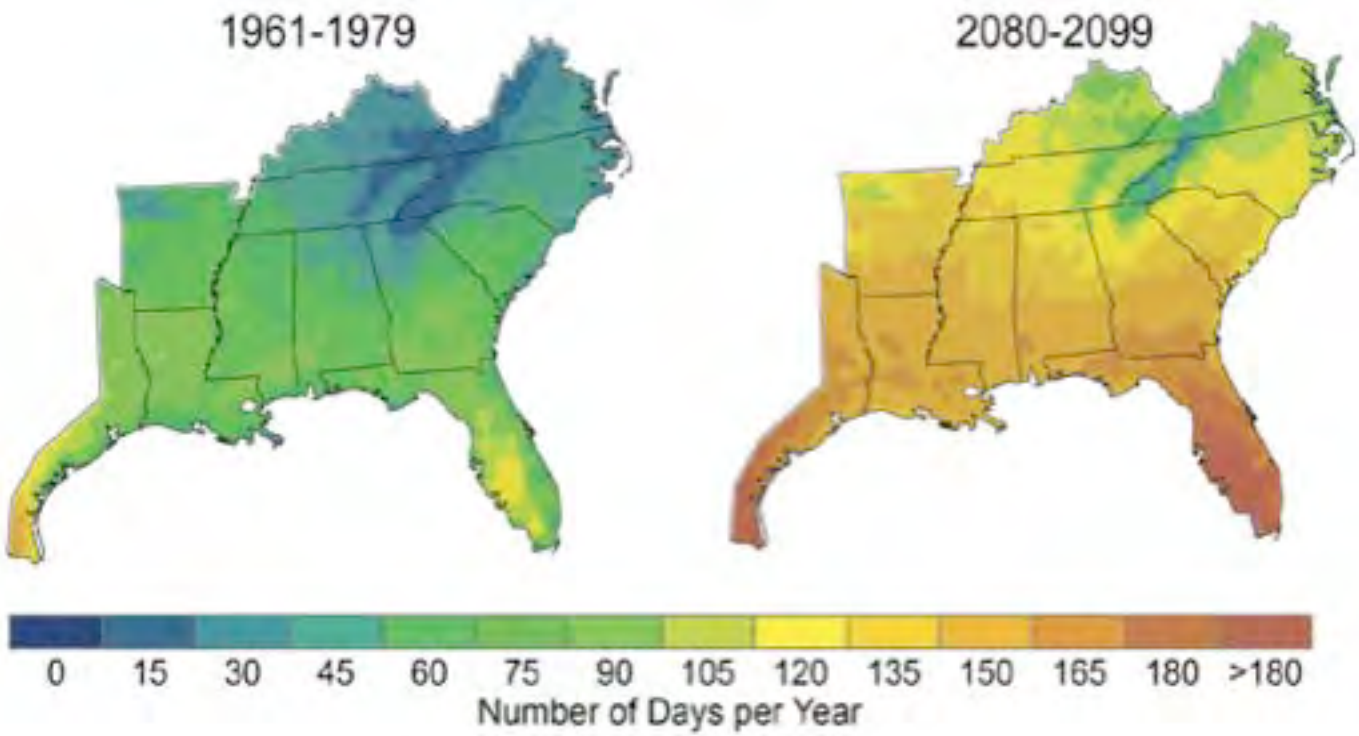


End-of-Century
(2080-2099 average)



(USGCRP 2009)

Projected Number of Days per Year with Peak Temperatures over 90°F (high emissions)



The number of days per year with peak temperature over 90°F is expected to rise significantly, especially under a higher emissions scenario[91]. By the end of the century, projections indicate that North Florida will have more than 165 days (nearly six months) per year over 90°F, up from roughly 60 days in the 1960s and 1970s. The increase in very hot days will have consequences for human health, drought, and wildfires.

From: Global Climate Change Impacts in the US, 2009, pg 112

Adaptation: Things to Think About

- There is no “one-size fits all” adaptation.
- Adaptations can also be accomplished thru disaster risk reduction, sustainable development, restoration, *just better planning* so can be incorporated into existing decision-making processes.
- What are some of the barriers to action?
- There are multiple stresses at work – climate is NOT the main issue for most regions.
- There are numerous planning efforts being initiated at many levels.
- Many adaptation actions have yet to be evaluated.

No Need for Special Authority to Act

- Already have many relevant authorities:
  - comprehensive plans (influence land use)
  - zoning/subdivision ordinances (types of uses and density)
  - blgd and dev permits (what, where, how), building codes (specific req)
  - spending powers (strategic placement of infrastructure, maintenance budgets)
  - incentives (smart growth/bonuses/preservation)

Disaster risk reduction: Rapid City, SD

Omaha St: before the June 9, 1972 flood – residential and commercial

Omaha St. after the flood – parks and golf courses

Photos from Digital Library of S. Dakota

Flooding: Sea-Level Rise/Fresh Water

- Accommodate rising water: elevate roads, buildings, and facilities; improve flood control structure design (e.g. larger culverts) [sustainable development]; enhance wetlands [restoration]

http://www.lumcon.edu/facilities/fourchon/
House in Cocodrie, LA

Deer Island Restoration Project

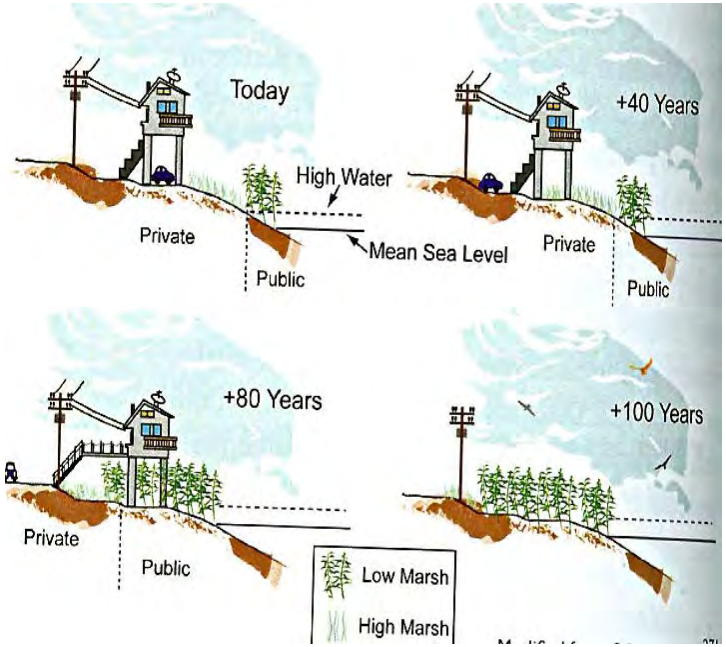
- Protect 800 linear feet on NE corner from erosion
- Build a breakwater berm using bags of oyster shells just below high tide to break wave action
- Plant live oysters on berm to create living reef and habitat for fish and small marine plants and animals
- Required to restore island size after Katrina destruction

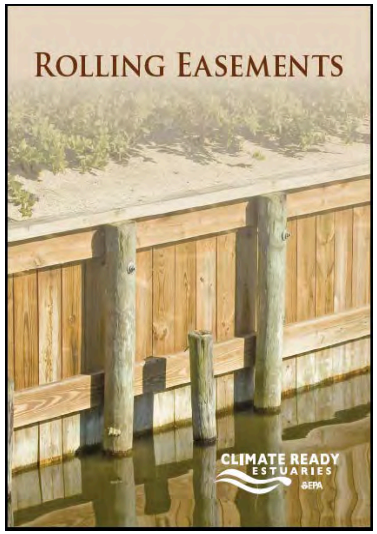
Accommodate rising water: elevate roads, buildings, and facilities; improve flood control structure design; enhance wetlands (Restoration: important for natural areas)

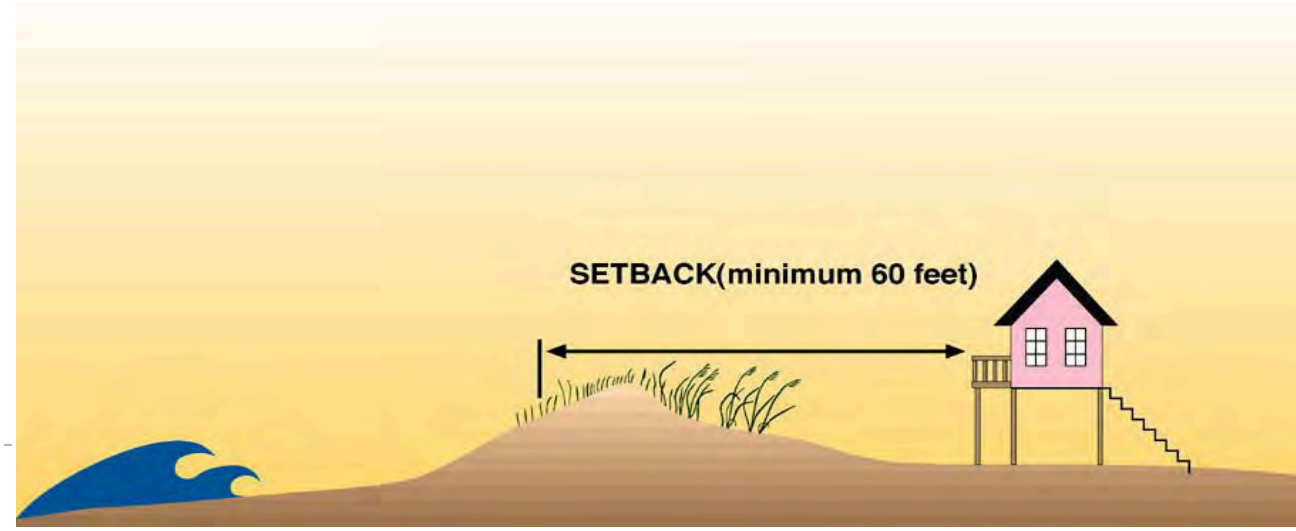
Near Biloxi, MS

Responding to Sea-Level Rise and Storm Surge

Retreat: accommodate inland movement through planned retreat; setbacks for construction based on erosion rates; no armoring; small structures; clear expectations for development; rolling easements; improve evacuation planning; restore wetlands: for fresh water – establish/maintain fresh water buffer areas [just better planning]







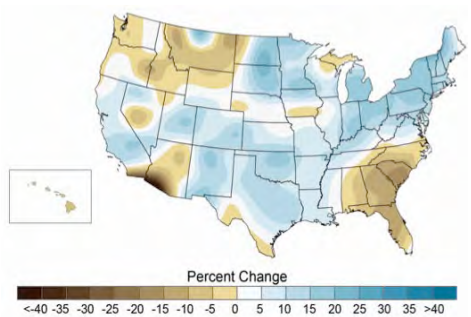
USGCRP 2009 and US EPA

Adaptation: Things to think about

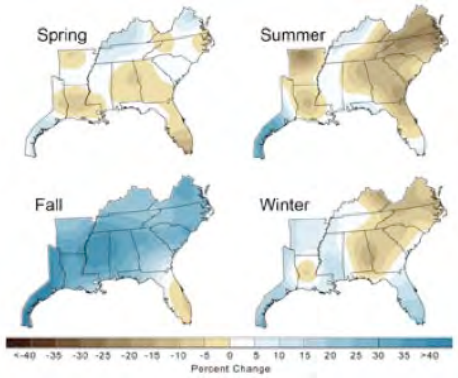
- There is no “one-size fits all” adaptation.
- Adaptations can also be disaster risk reduction, sustainable development, *just better planning*.
- What are some of the barriers to action? Adaptive capacity, resources, laws and policies, uncertainty around local impacts, timing . . .
- There are multiple stresses at work – climate is NOT the main issue for most regions.
- There are numerous planning efforts being initiated at many levels.
- Many adaptation actions have yet to be evaluated.

Adaptation: some barriers to action

- Adaptive capacity is uneven w/in & across society: resources ($, info., expertise); political will; stringent policies and regulations; cultural acceptability of options; what do people know and understand; willingness to implement
- Climate change - a moving target: requires continuous reassessment
- Scale of info must match scale of issue



5% annual increase over US



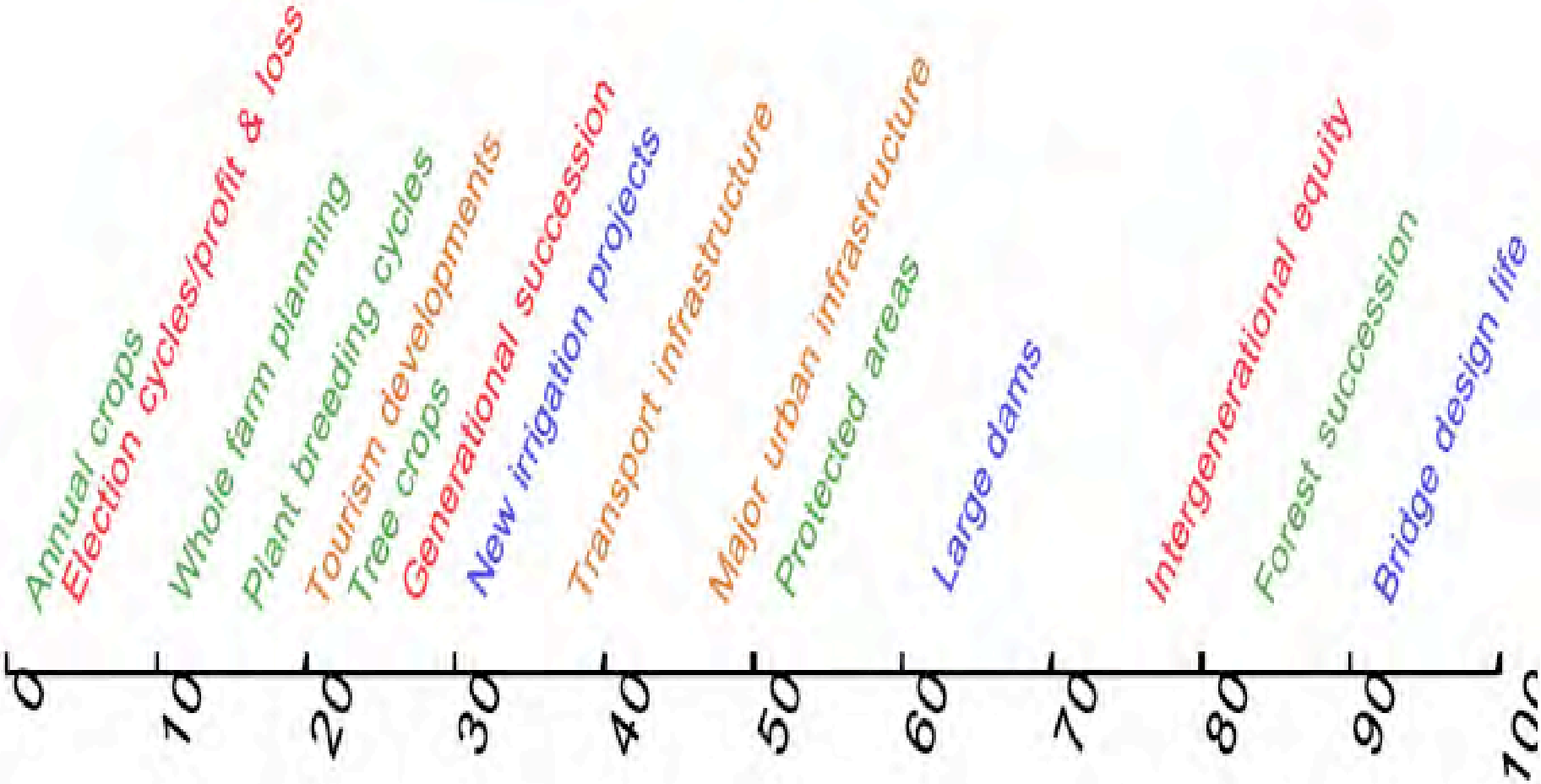
regional/ seasonal changes

Infrastructure in disrepair…

…to be repaired for a different climate future

From: Jim Buizer

Adaptation Planning: Many Timeframes

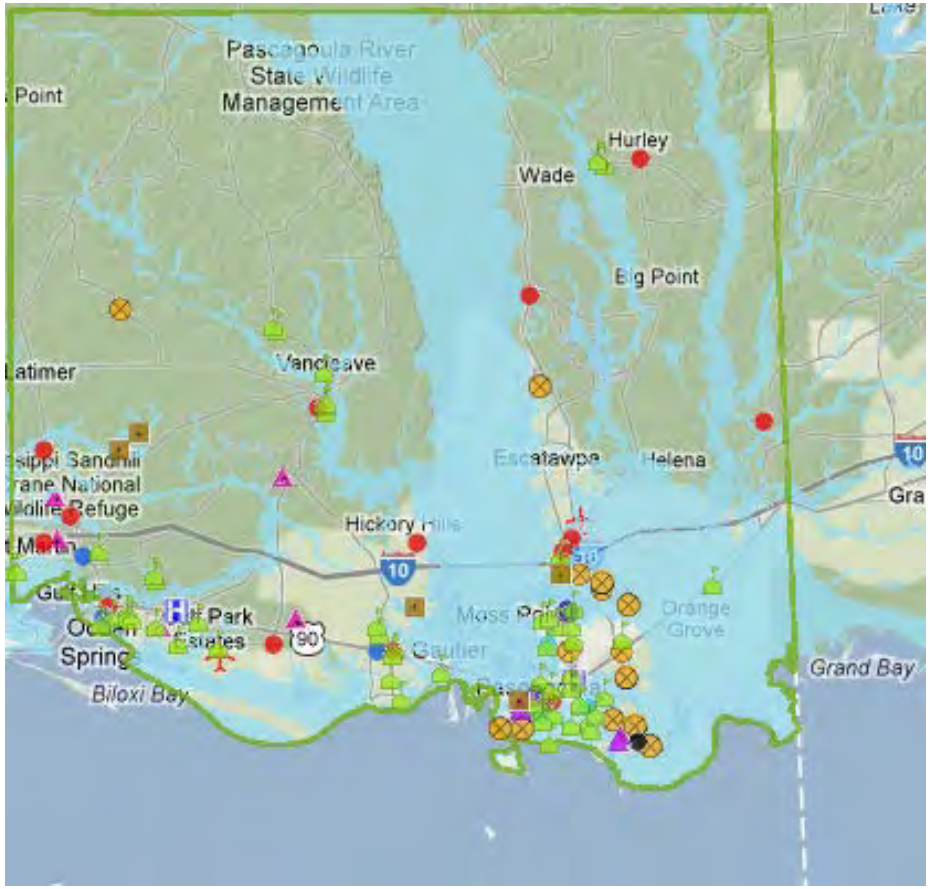


Source: Linda Mearns, UCAR

Coastal Resilience Index: Critical Facilities Tools

Jackson County, MS Critical Facilities: In FEMA Flood Zone

- **Roads** 24% or 512 out of 2103 road miles* Based on 2005 ESRI/TeleAtlas Roads data
- **Critical Facilities**
- 2 fire stations
- 11 hazardous materials sites
- 2 potable water treatment plants
- 1 oil facility
- 3 police stations
- 5 rail facilities
- 23 schools
- 5 waste water facilities



Mississippi Coast: Jackson County

http://www.csc.noaa.gov/criticalfacilities/

When To Act?

Pro-action or Reaction
Inaction or Action
all have consequences/costs

- Road Crossing Upgrade estimate $56,000
- Engineer's estimate to Repair Road $93,000

Whitcomb Mill Road, NH

From M. Simpson, Antioch University

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- What are some of the barriers to action?
- There are multiple stresses at work – climate is NOT the main issue for most regions. Some responses can have long-term benefits.
- There are numerous planning efforts being initiated at many levels.
- Many adaptation actions have yet to be evaluated.

Mississippi is NOT the canary in the coal mine!

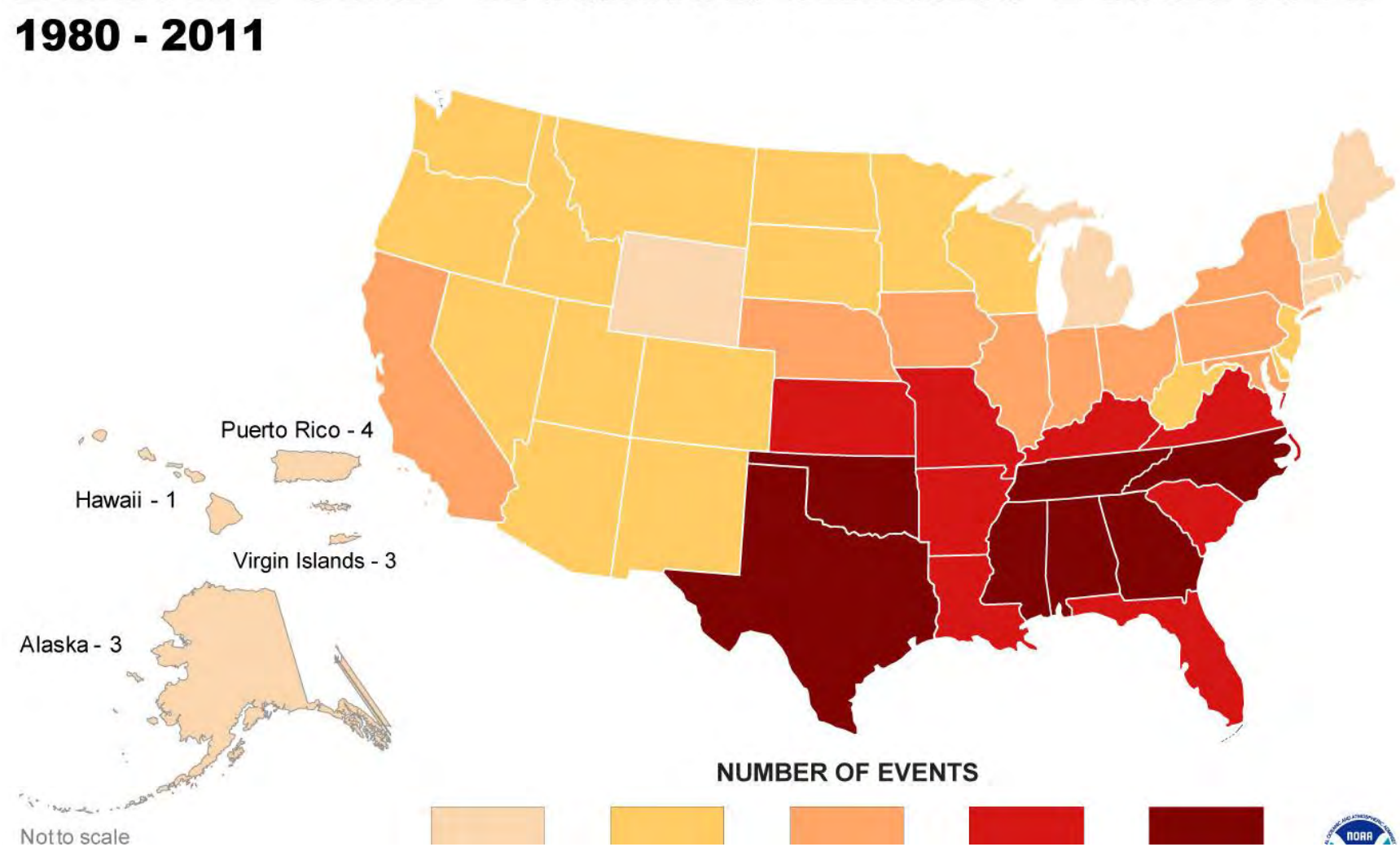
From: Gary McManus

Context

Climate Change
not the only challenge
to be juggled

Rarely *only* because of climate change: multiple stressors (e.g. growing populations in harms' way); Hazard/emergency management

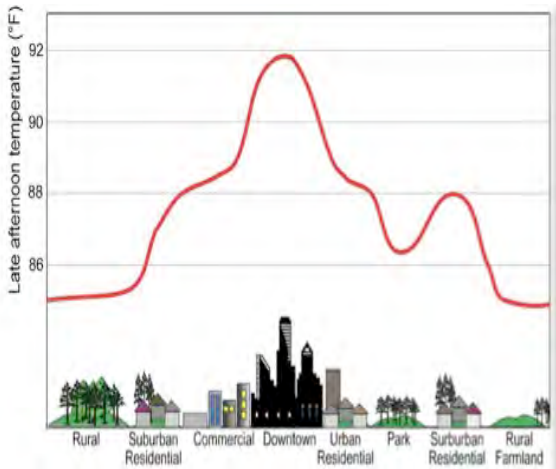
Billion Dollar Weather/Climate Disasters

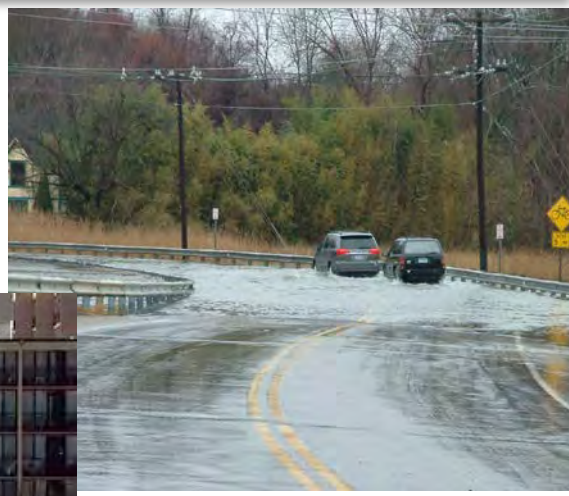


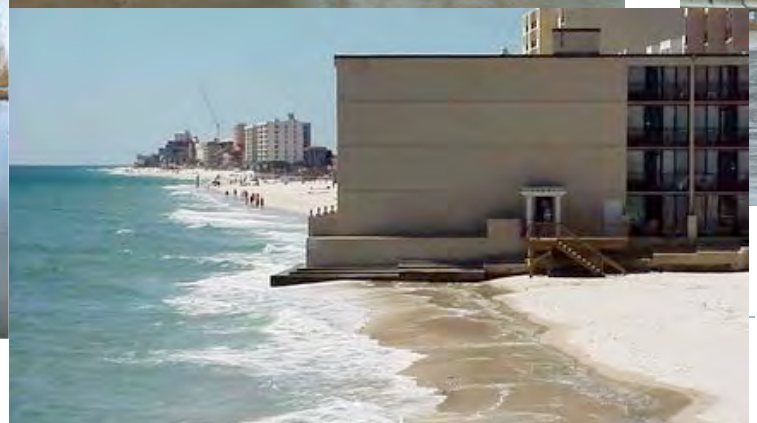
NOAA, NCDC from web

Present Problems Likely to Get Worse

- Urban Air Quality
- Urban Heat Island
- Sea-level Rise Impacts
  - Wetland loss, erosion
  - Salt water intrusion
  - Flooding
- Water Quantity and Quality
- Rainfall Flooding





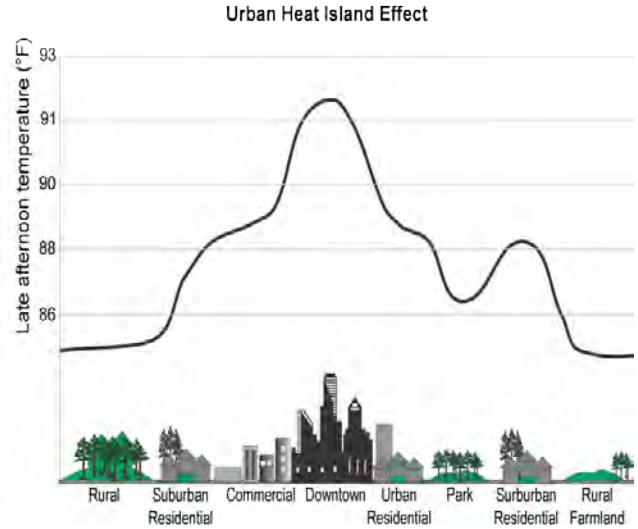


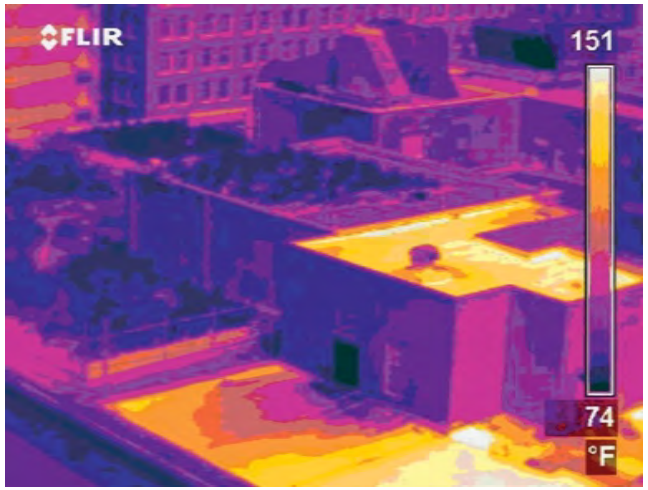
From: Global Climate Impacts in the US, 2009 and Joel Scheraga, EPA

Responding to Heat Waves

- Local weather service issues heat alerts
- Provide tips on how vulnerable people can protect themselves
- Use buddy system to check on elderly residents
- Public utilities voluntarily refrain from shutting off services for non-payment
- Extend hours for public cooling places

- Install reflective or green roofing and plant trees in urban areas to help cool urban heat island



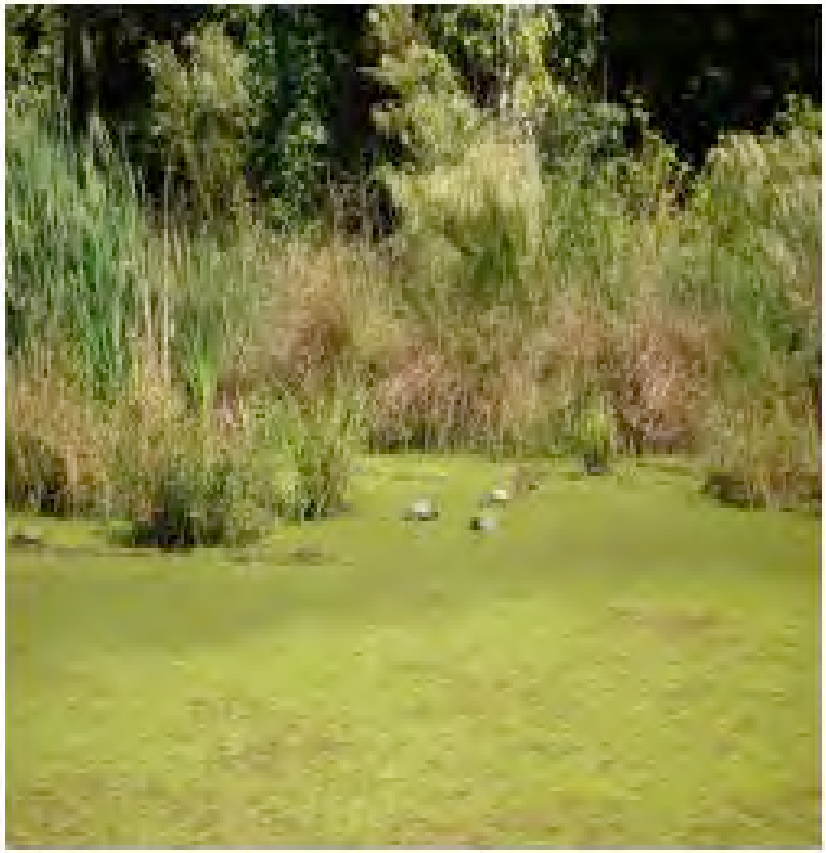


"Green roofs" are cooler than the surrounding conventional roofs.

From: Global Climate Change Impacts In the US, 2009

Clayton County, GA – sustainable water

- Clayton County -south of Atlanta - one of the smallest counties but most densely populated.
- Despite limited water availability, have developed a sustainable water supply through utilization of constructed wetlands for recycling of treated wastewater.
- During drought of 2007 when many in danger of running out of water, Clayton County produced 10 million gallons per day of reuse water.



Source: http://www.ccwa.us/about-us

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- What are some of the barriers to action?
- There are multiple stresses at work – climate is NOT the main issue for most regions.
- There are numerous planning efforts being initiated at many levels. There are similar approaches, sharing lessons, learning by doing, collaborating that benefit all.
- Many adaptation actions have yet to be evaluated.

State Adaptation Plans

*C.A.P. stands forClimate Action Plan

Source: Center for Climate and Energy Solutions http://www.c2es.org/us-states-regions/policy-maps/adaptation

Tribal, Regional, Local Planning efforts

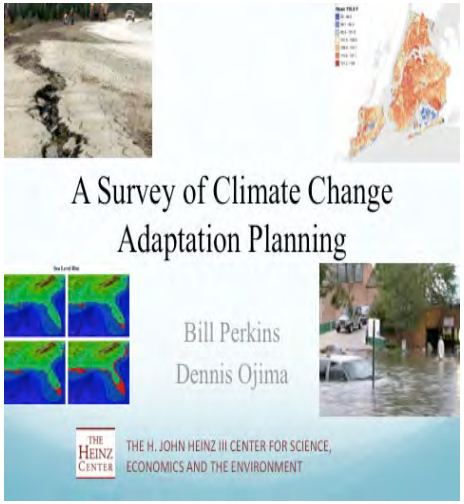
- Swinomish Indian Tribal Community
- King County and Seattle, Washington
- New York City, PLANNYC
- Chicago, IL
- Los Angeles, CA
- SE Florida Compact
- Milwaukee, WI
- Nassau County, NY
- Phoenix, AZ
- San Francisco, CA
- Albany, NY
- Alexandria, VA
- Austin, TX
- Fairbanks, AK
- Grand Forks, ND
- Keene, NH
- Savannah, GA
- And many more!

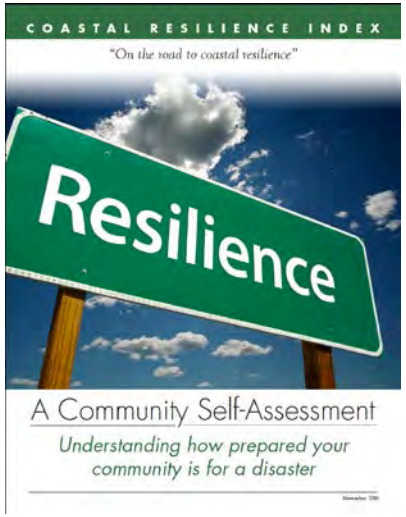
Even more

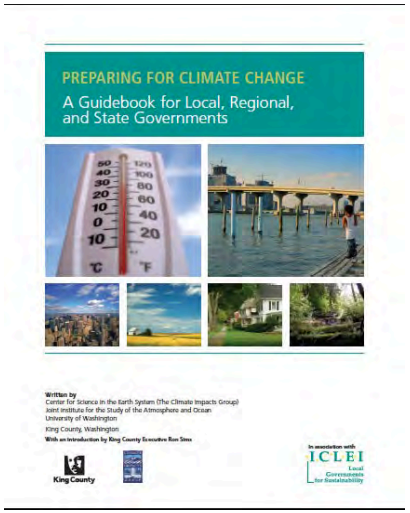
- Issues specific
  - Drought
  - Sea Level Rise
- Federal Government:
  - Executive order, interagency climate change task force, 3 cross cutting strategies, new USGCRP plan, agency specific, etc.
- Businesses: Entergy, Dell
- Individual Infrastructure Plans:
  - Boston sewage treatment plant
- Individual Farm or location plans
- NGOs – many assisting communities

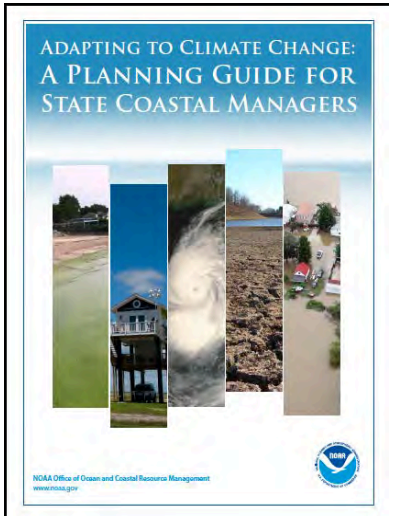
Learn from Others:

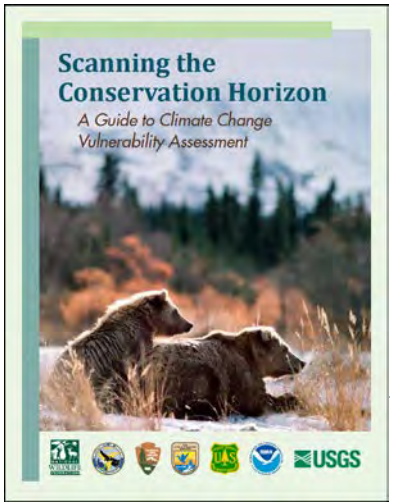
Guidebooks and Specific Projects

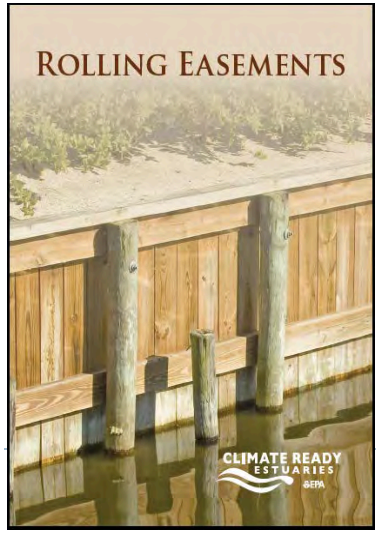


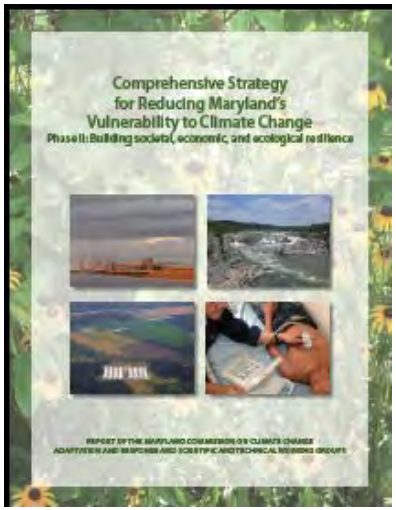






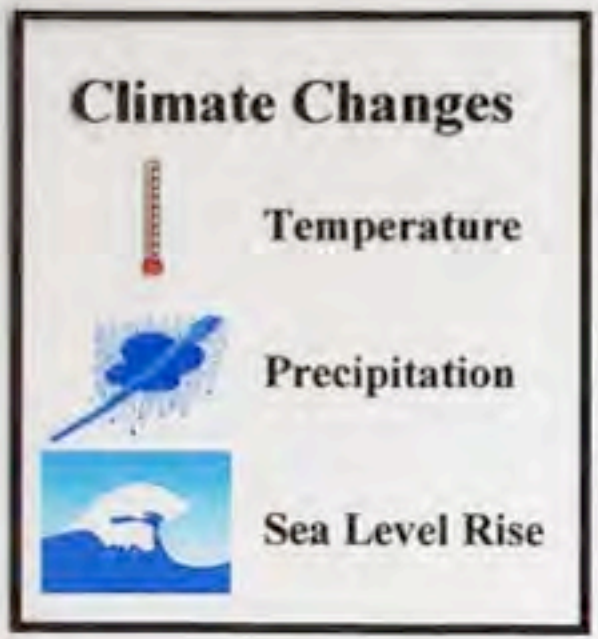






Potential Climate Change Impacts

Insurance
Tourism
Infrastructure
Legal considerations



Health Impacts
Weather-related Mortality
Infectious Diseases
Air Quality-Respiratory Illnesses

Agriculture Impacts
Crop yields
Irrigation demands

Forest Impacts
Change in forest composition
Shift geographic range of forests
Forest Health and Productivity

Water Resource Impacts
Changes in water supply
Water quality
Increased competition for water

Impacts on Coastal Areas
Erosion of beaches
Inundate coastal lands
Costs to defend coastal communities

Species and Natural Areas
Shift in ecological zones
Loss of habitat and species

EPA

(Grambsch 1998)

Resources: Examples only

- Federal Government:
  - NOAA RISA programs: http://www.climate.noaa.gov/cpo_pa/risa/
  - Sea Grant Programs: http://www.seagrant.noaa.gov/
  - NOAA Coastal Services Center: www.csc.noaa.gov/
  - USEPA: http://www.epa.gov/climatechange/effects/adaptation.html
  - USDOI: http://www.doi.gov/whatwedo/climate/adaptation.cfm

- NGOs
  - Georgetown Climate Center Adaptation Clearinghouse: key words, locations

    http://www.georgetownclimate.org/adaptation/clearinghouse
  - Ecosystem-based Management Tools network
    - Search by tool type: process tools, analytical tools, visualization tools, natural resource tools, etc.
  - CAKE database (Climate Adaptation Knowledge Exchange): www.cakex.org/

Adaptation: Things to think about

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- Adaptations can also be disaster risk reduction, sustainable development, *just better planning*.
- What are some of the barriers to action?
- There are multiple stresses at work – climate is NOT the main issue for most regions.
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- Many adaptation actions have yet to be evaluated.

Evaluating a personal adaptation: Cool Enough?

Evaluation Literature

- Early-on in the process – most are planning efforts, adaptations mostly incremental
- Process-based more common than outcome-based indicators
- Developing indicators for adaptation underway by a number of groups including: National Climate Assessment Indicators Working Group and EPA
- Specific focused actions easier to evaluate effectiveness – e.g. cover crops to lessen erosion

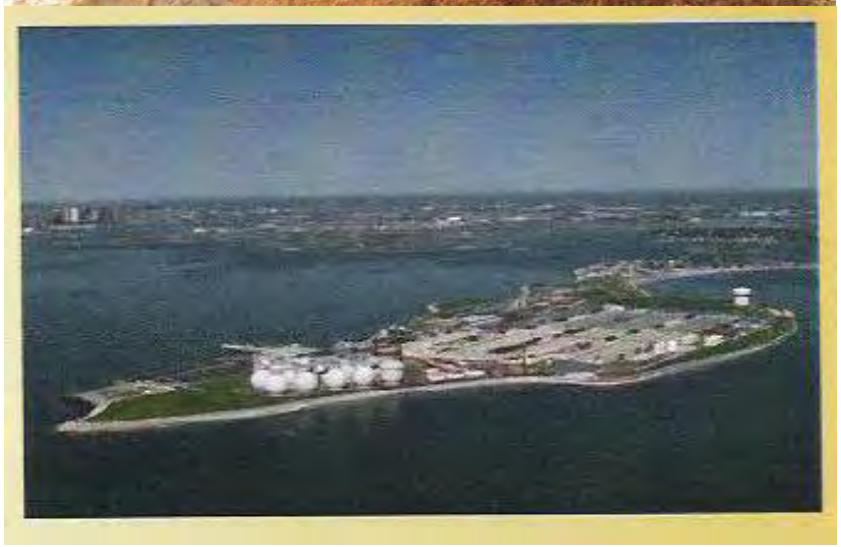
Concluding thoughts . . . We all have:

- A lot to lose from climate impacts: storms, water issues, health impacts, forest fires, etc.
- Limited resources and tight budgets: competition – economy, energy, environment, education requirements
- Much to gain from opportunities: economic dev., energy savings, avoided costs, green jobs, relevant teaching
- Opportunity to learn from/work w/ others
- Opportunity to think long-term

Adaptation:
Reframing the things we do every day

- Managers make decisions with imperfect information all the time – why is climate change different?
- Adaptive management – deliberate learning by doing
- Co-benefits – justify action by addressing other priorities (e.g. use adapting to a changing climate as one more reason)
- Small institutional and legal changes can make a big difference (eg eliminating conflicting mandates)
- Consider potential for partnerships and economic opportunity
- An excuse to do things that make sense anyway, integrated planning, changes to the National Flood Insurance program, etc.
- Not necessarily going to be easy – but it is critical to start now.

We can anticipate, plan ahead, act …



OR we can react.

SCIPP

Southern Climate Impacts Planning Program

- **Southern Climate Impacts Planning Program**: NOAA/RISA, LSU and OU, State Climatologists, Southern Regional Climate Center (website: www.southernclimate.org)

- Stakeholder-driven research: regionally relevant scientific research that results in critical information, products, tools, and education

- Engagement: partners, decision makers, and other stakeholders

- Southern U.S.: TX, OK, MS, LA, AR, TN

- Focus multi-hazard preparedness: severe storms, droughts, floods, hurricanes, extreme temperatures, etc., and coastal impacts of climate change and variability.

Questions?

Contact

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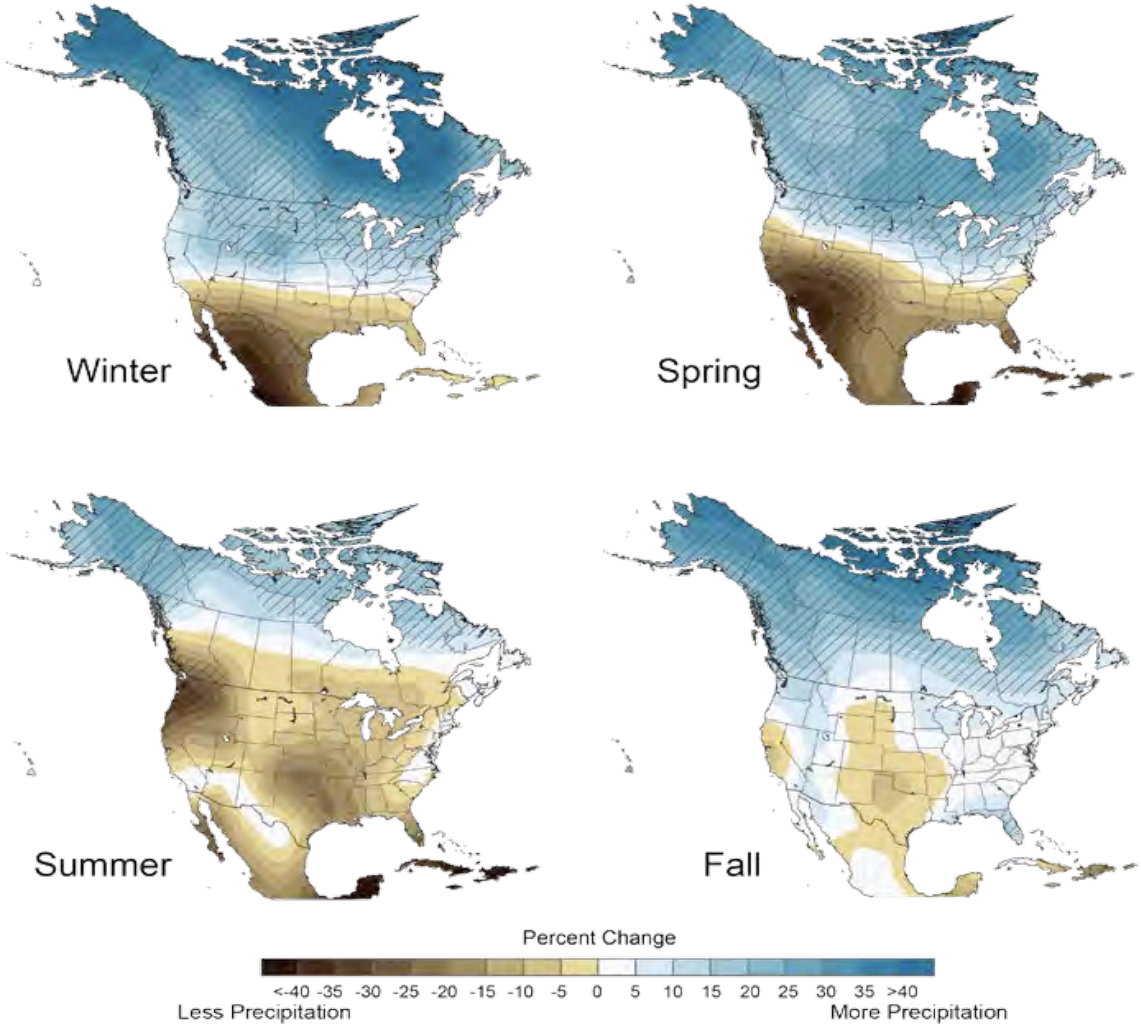
lynne@srcc.lsu.edu
225 578-8374

Projected Change: N. American Precipitation

Uncertainty around local impacts



Late Century (2080-2099): higher emissions scenario.

For spring, climate models agree that northern areas are likely to get wetter, and southern areas drier.

There is less confidence in exactly where the transition between wetter and drier areas will occur.

Highest confidence in the hatched areas.

From: Global Climate Change Impacts In the US, 2009 pg 31