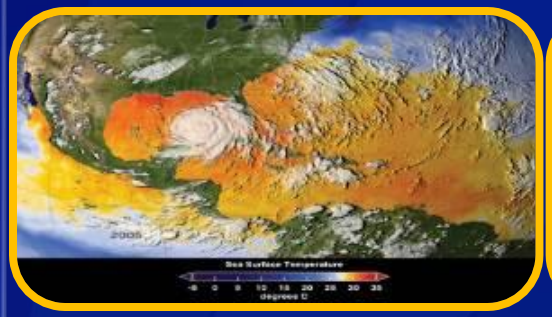
Climate Change and Human Health

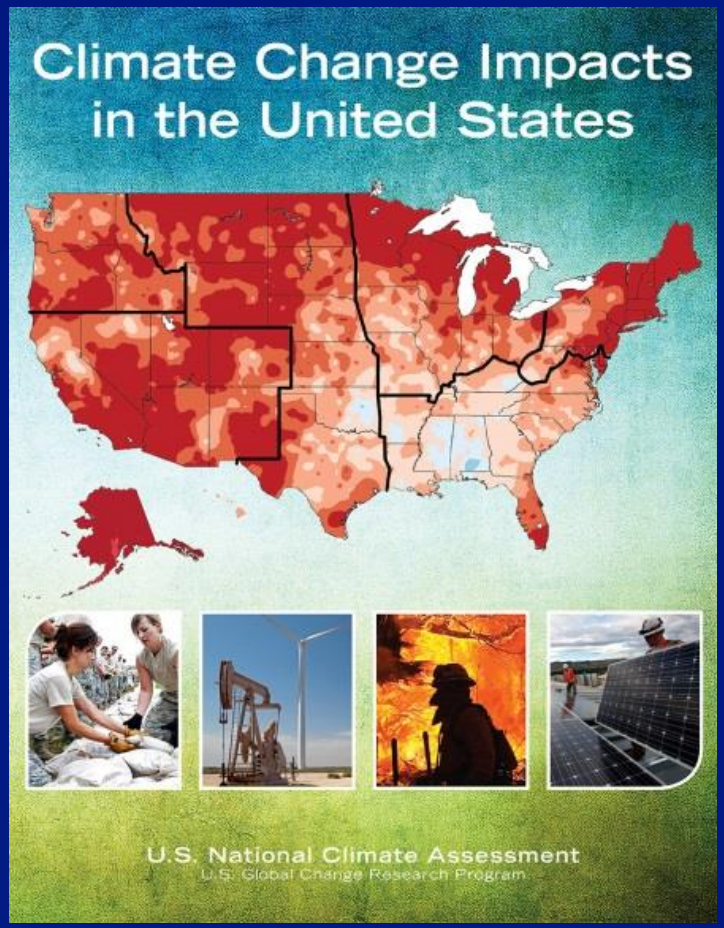


Paul Schramm, MS, MPH
Climate and Health Program
National Center for Environmental Health
Centers for Disease Control and Prevention

ARC/FHWA Climate Resilience Peer Exchange

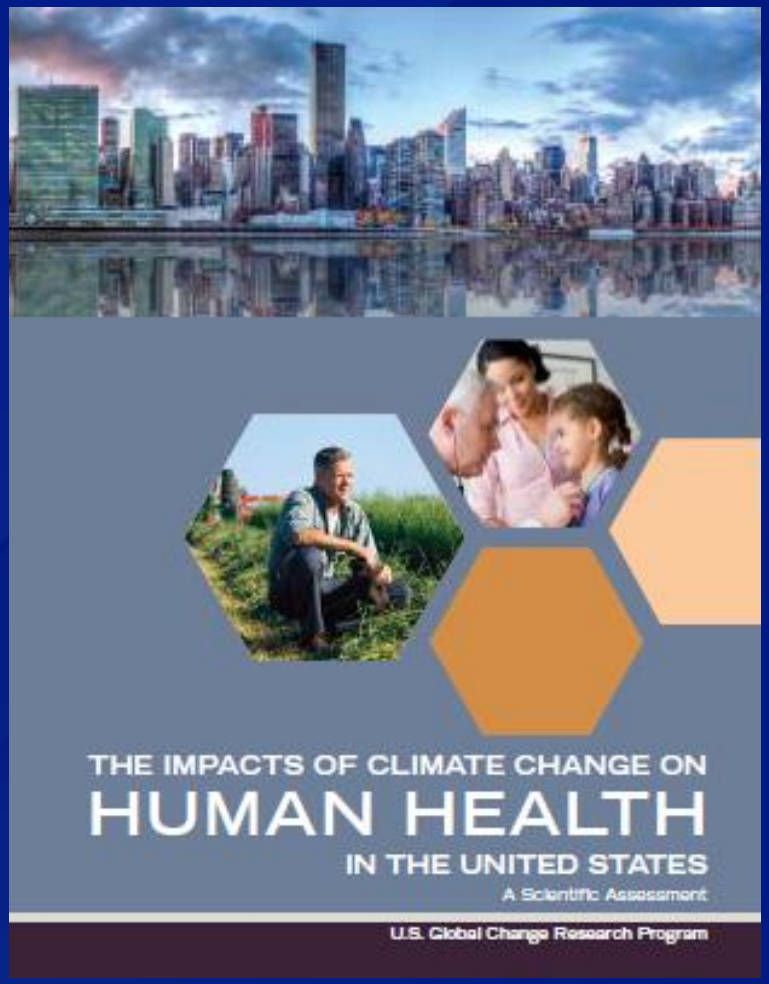
3rd National Climate Assessment: Health Key Messages

- Climate change threatens human health and well-being
- Will amplify some existing health threats
- Preparedness and prevention can protect people from some of the impacts of climate change
- Responding to climate change presents opportunities



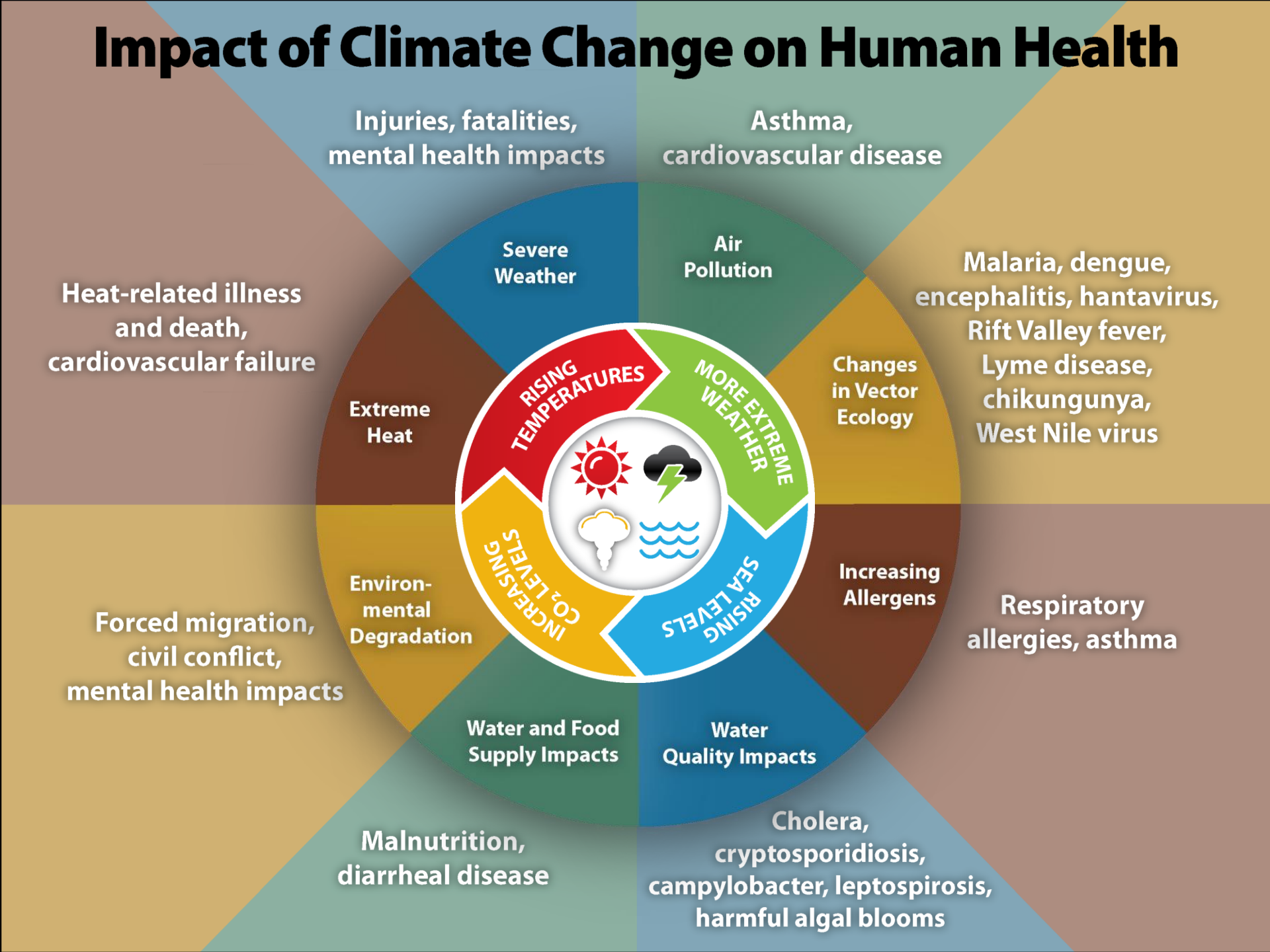
Source: *Third National Climate Assessment Report*, http://nca2014.globalchange.gov

2016 Human Health Assessment

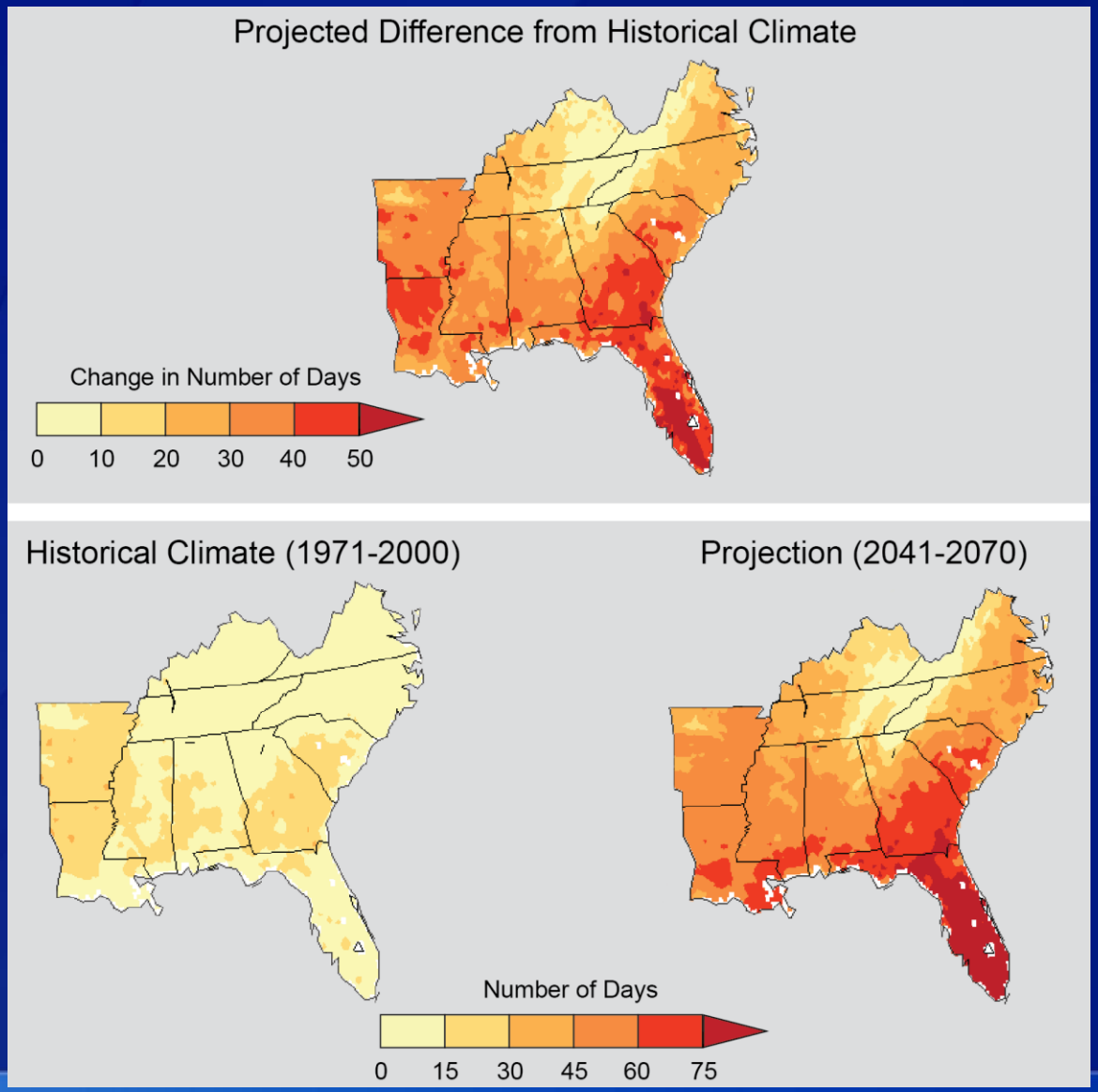


http://health2016.globalchange.gov/

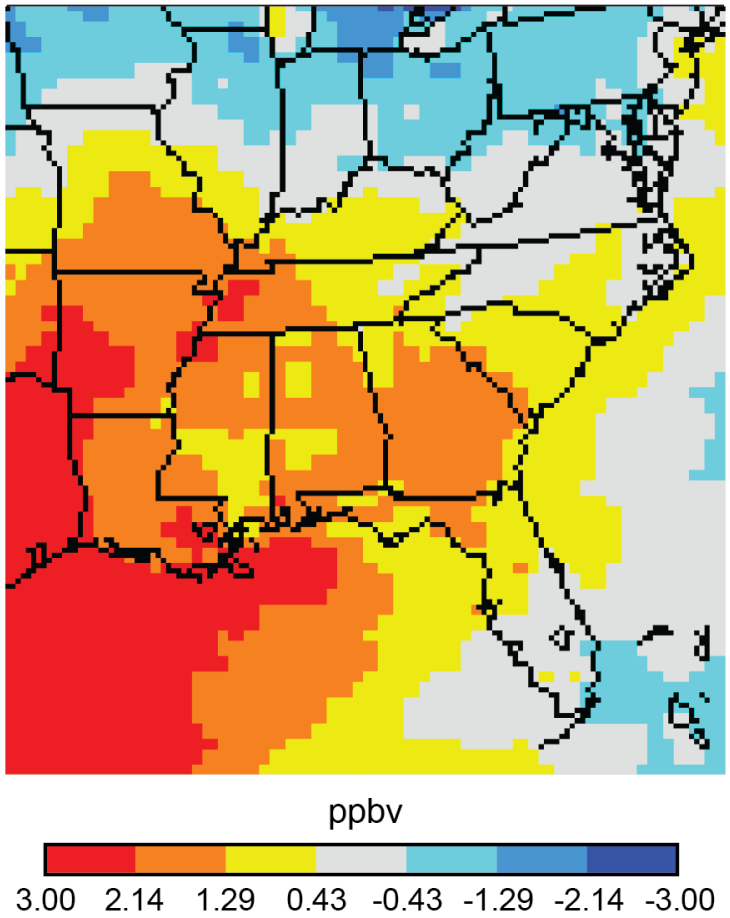
Impact of Climate Change on Human Health



Projected Change in Number of Days Over 95º F

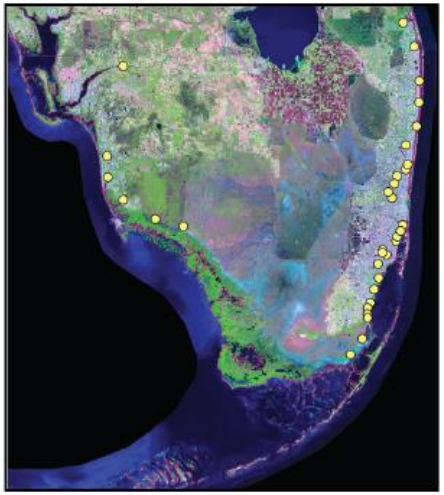


Ground-level Ozone

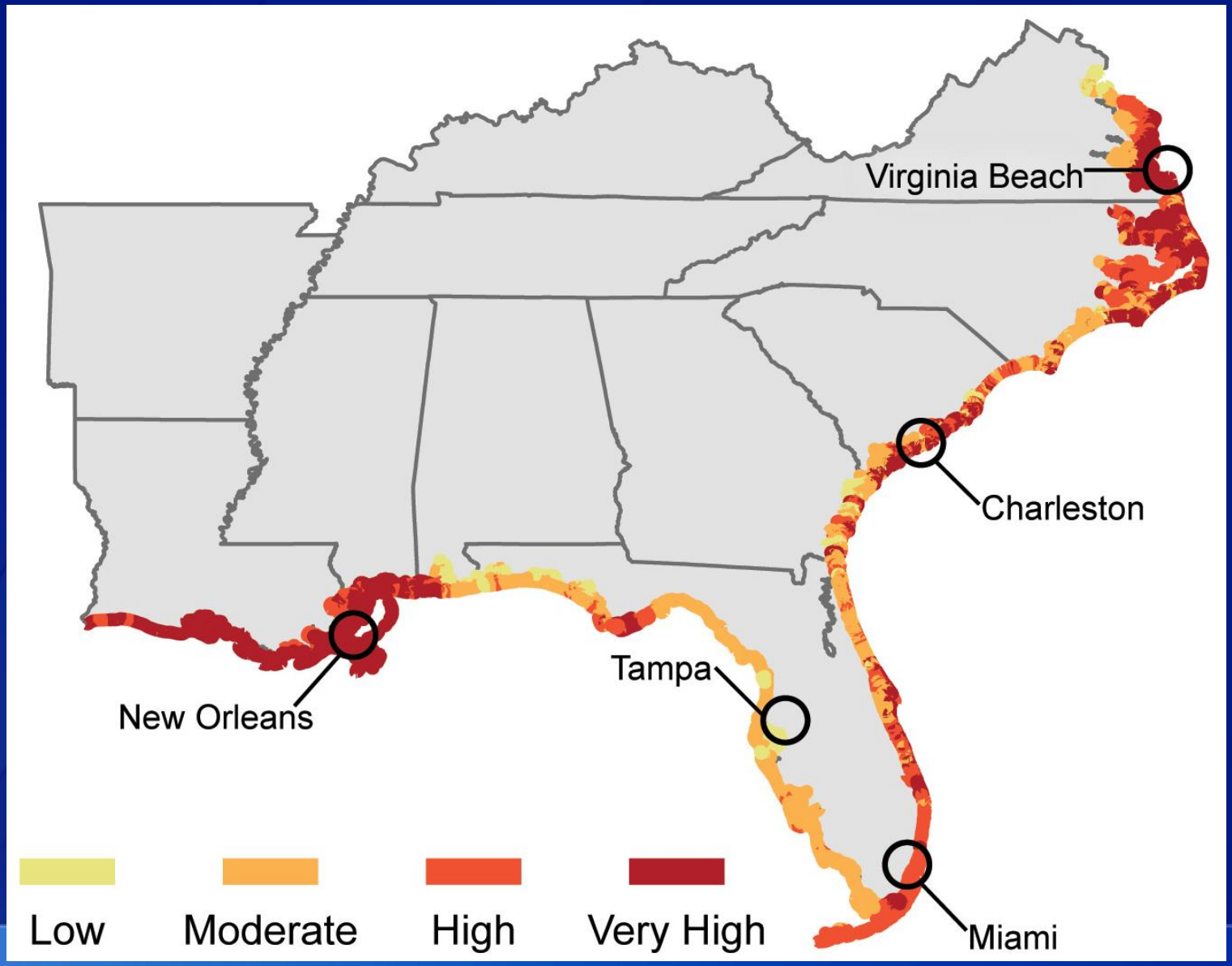


Increase if 2050 temperatures occurred today (adapted from Tagaris et al)

South Florida:
Uniquely Vulnerable to Sea Level Rise



Vulnerability to Sea Level



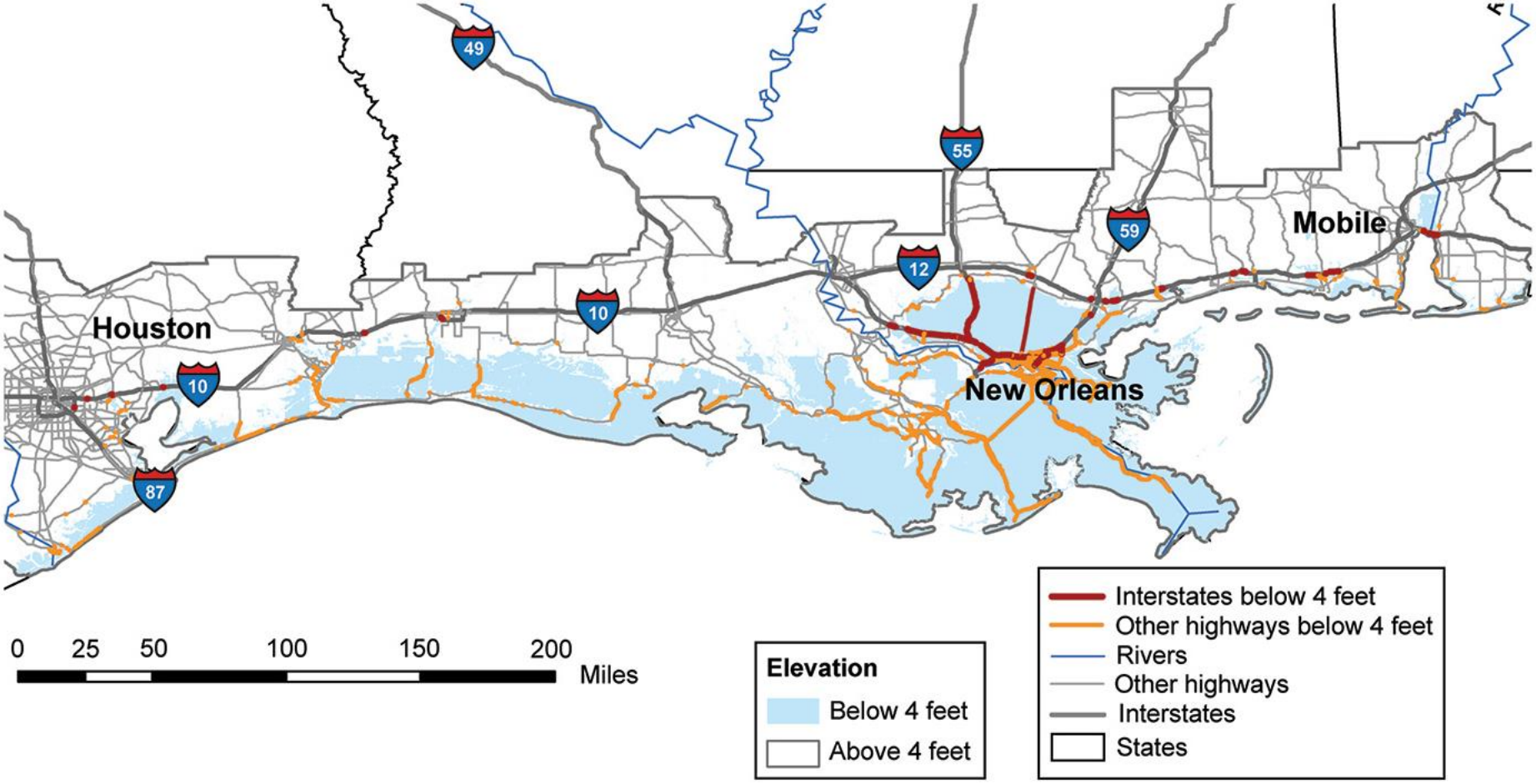
A Southeast River Basin Under Stress

Apalachicola-Chattahoochee-Flint River Basin

Under future climate change, this basin is likely to experience:

- more severe water supply shortages
- more frequent emptying of reservoirs
- violation of environmental flow requirements
- less energy generation

Gulf Coast Transportation Hubs at Risk

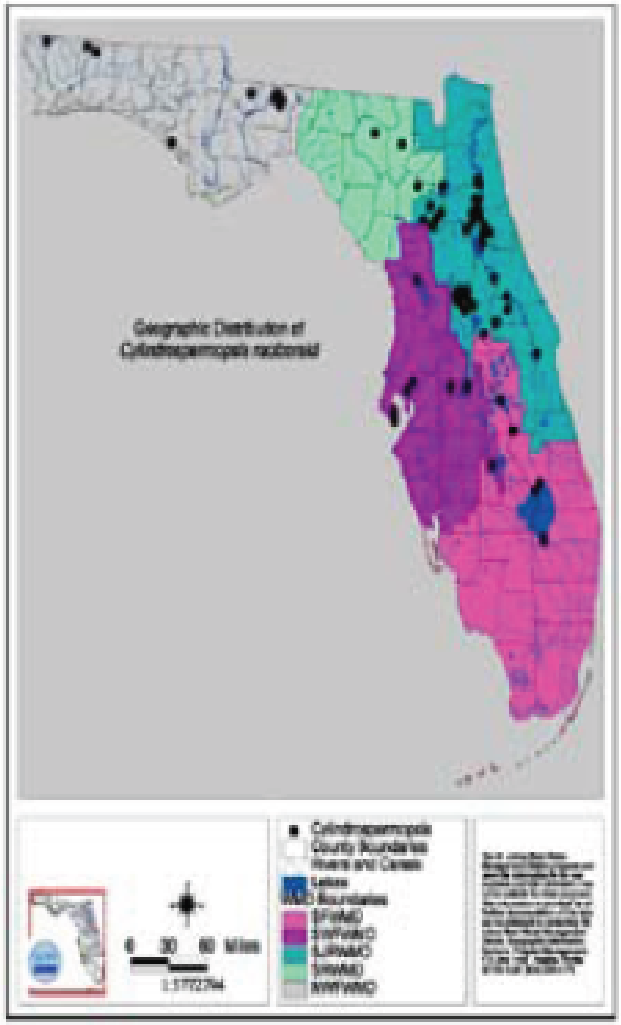


Harmful Algal Blooms (Red-tides)

Enhanced by:

- Increased water temps
- Nutrient runoff
- Upwelling events

Figure 2. Distribution of the CyanoHAB, *Cylindrospermopsis raciborskii,* in Florida (Williams 2001, Fristachi et al. 2007). *C. raciborskii,* which produces potent hepatotoxins (Table 2), was originally found only in tropical areas but has recently spread to cooler regions.



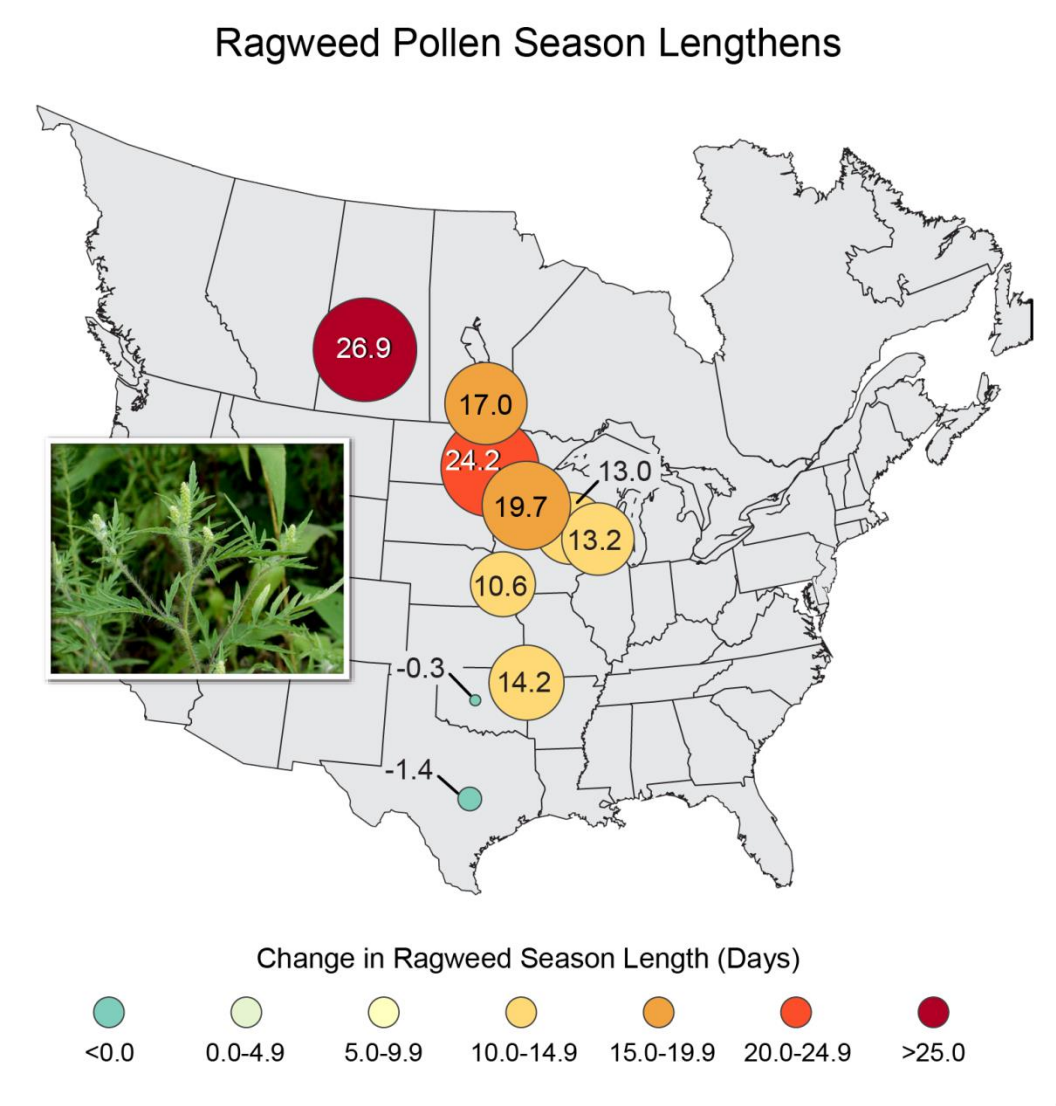
Hydrologic Extremes and Water-borne Disease:

Milwaukee 1993 outbreak

- Cryptosporidiosis epidemic
- 405,000 cases, 54 deaths
- Preceded by heaviest rainfall in 50 years *(Curriero et al., 2001)*
- $31.7 million in medical costs
- $64.6 million in lost productivity

(Corso et al., 2003)

Shifts in Pollen Production



Luber et al, National Climate Assessment, Health Chapter, 2014; Ziska et al., 2012

Some surprises are in store

1999-2008:

- C. gattii infection on Vancouver Island
- 216 cases, 8 deaths

A rare genotype of *Cryptococcus gattii* caused the cryptococcosis outbreak on Vancouver Island (British Columbia, Canada)

S. E. Kidd*†‡, F. Hagen§, R. L. Tscharke¶, M. Huynh†, K. H. Bartlett‡, M. Fyfe‖, L. MacDougall‖, T. Boekhout§**, K. J. Kwon-Chung¶, and W. Meyer*†,††

Discussion

Until the recent emergence of cryptococcal infection on Vancouver Island, *C. gattii* had been considered to be restricted to areas with tropical and subtropical climates (2). The identification of large-scale colonization of *C. gattii* in the environment occurring in a temperate climate zone indicates a striking change in the distribution of this species. Furthermore, the identification of the *C. gattii*

Global Change Biology (2008) 14, 565–575, doi: 10.1111/j.1365-2486.2007.01511.x

Effects of elevated CO_2 on the protein concentration of food crops: a meta-analysis

DANIEL R. TAUB*†, BRIAN MILLER* and HOLLY ALLEN†

*Biology Department, Southwestern University, 1001 East University Avenue, Georgetown, TX 78626, USA, †Environmental Studies Program, Southwestern University, 1001 East University Avenue, Georgetown, TX 78626, USA

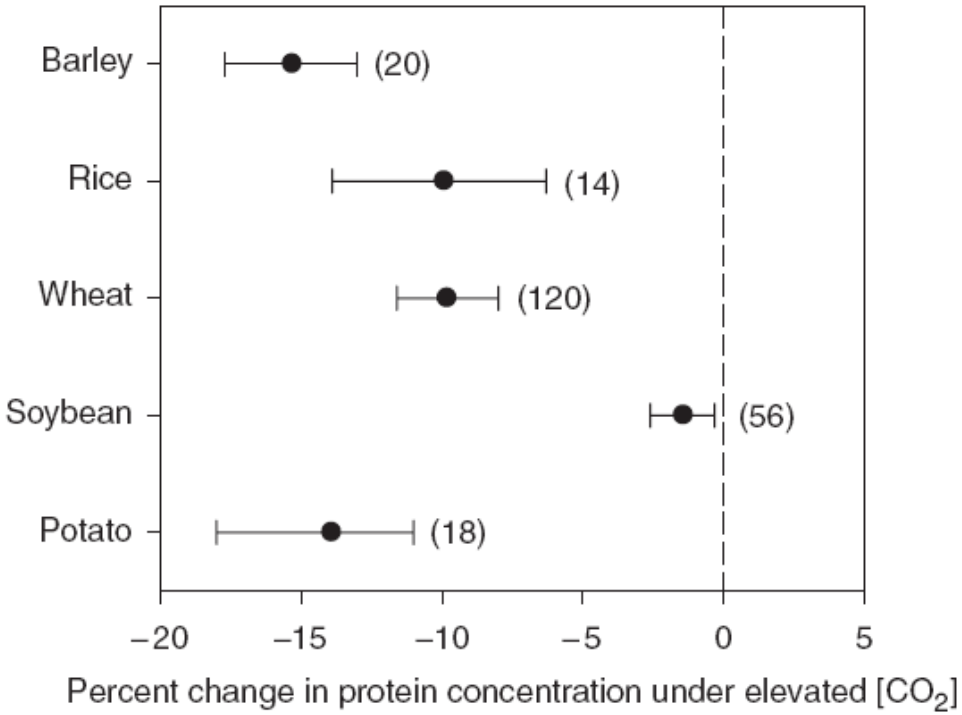


Fig. 1 Response of crop protein concentrations to growth at elevated CO_2 for five major crops. Means and 95% confidence limits are depicted. Numbers of experimental observations for each species are in parentheses.

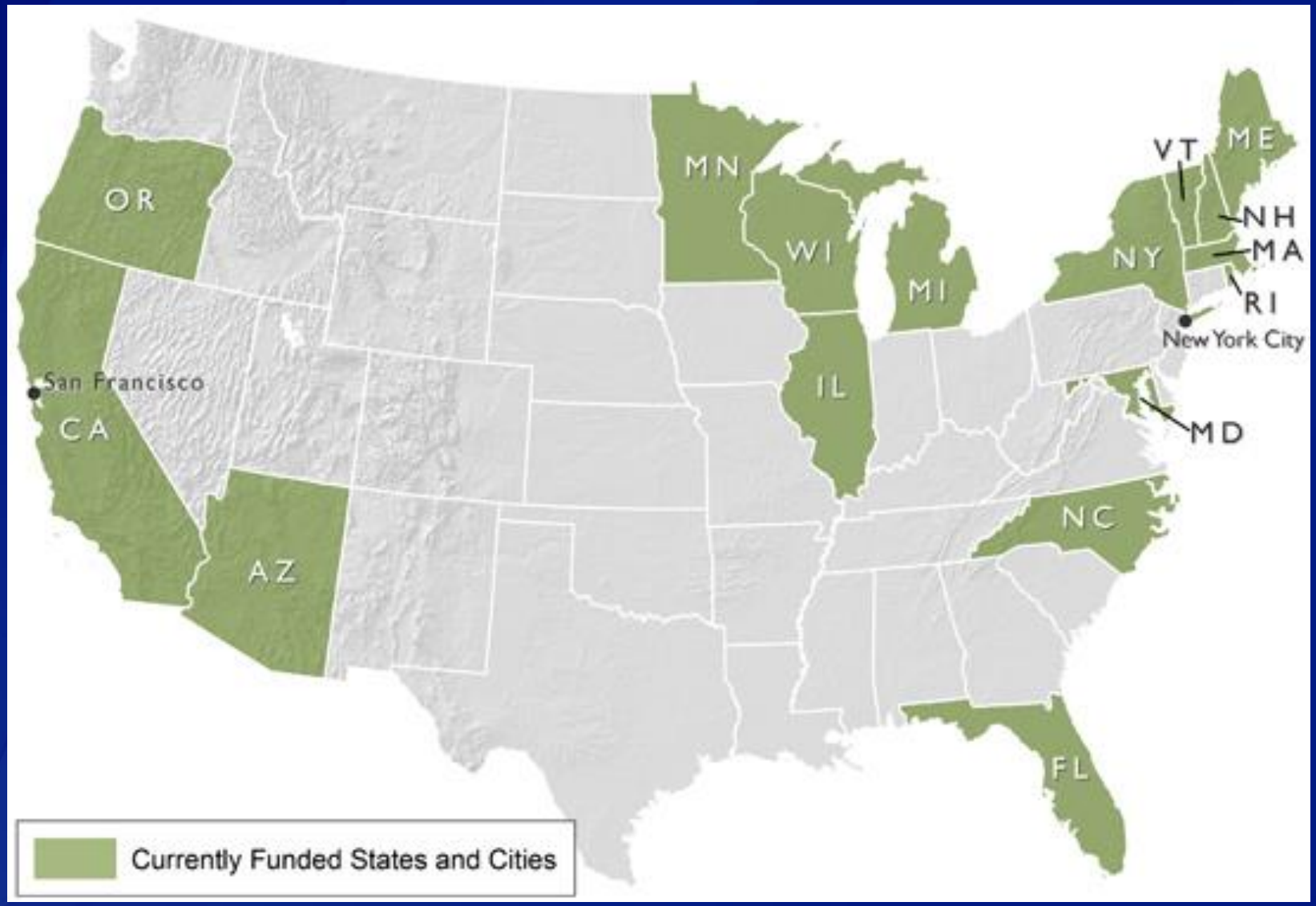
Re-Framing the Climate Change Dialogue

CDC Climate & Health Program

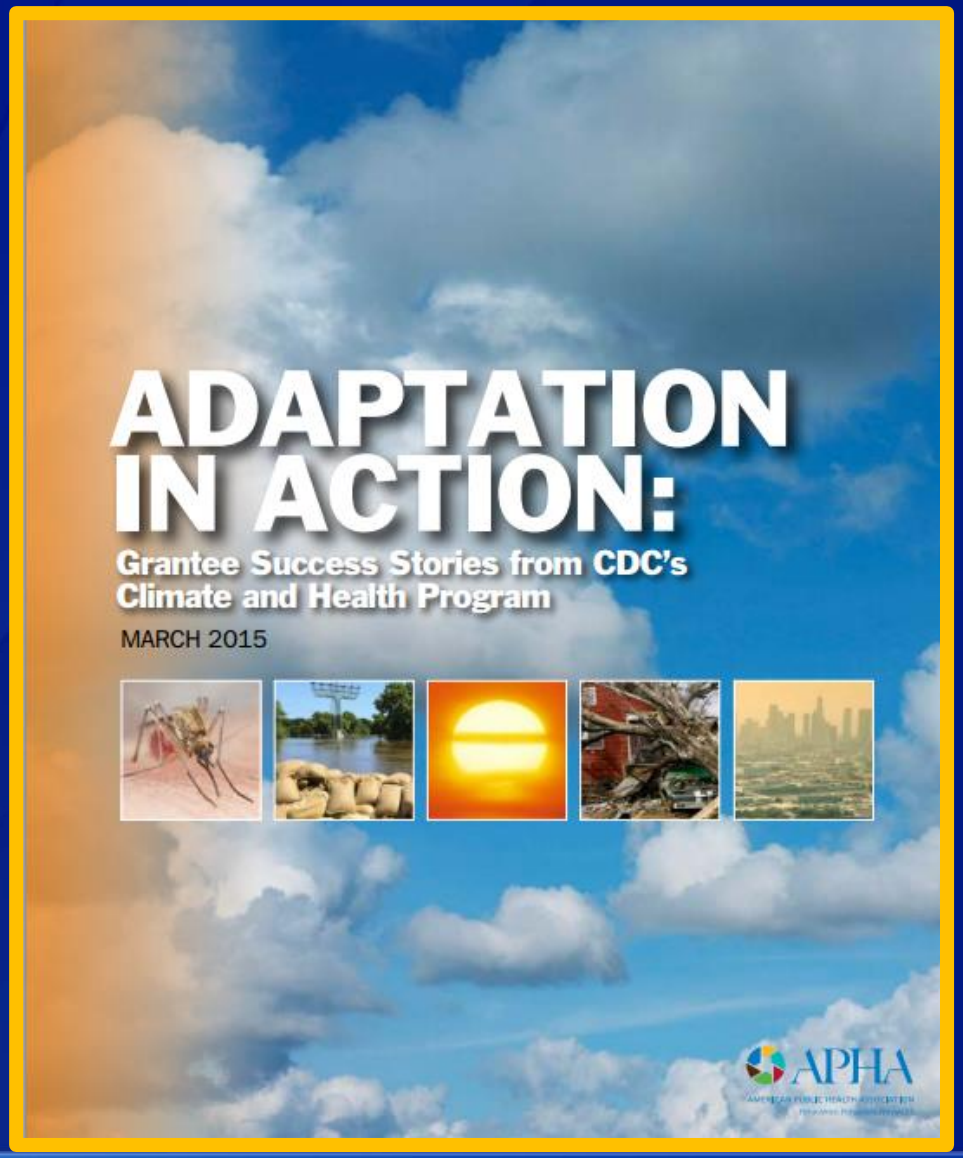
- Framework established in 2006
- Formally constituted as a Program in March 2009 with congressional appropriation

What is CDC doing to prepare for health effects of climate change?

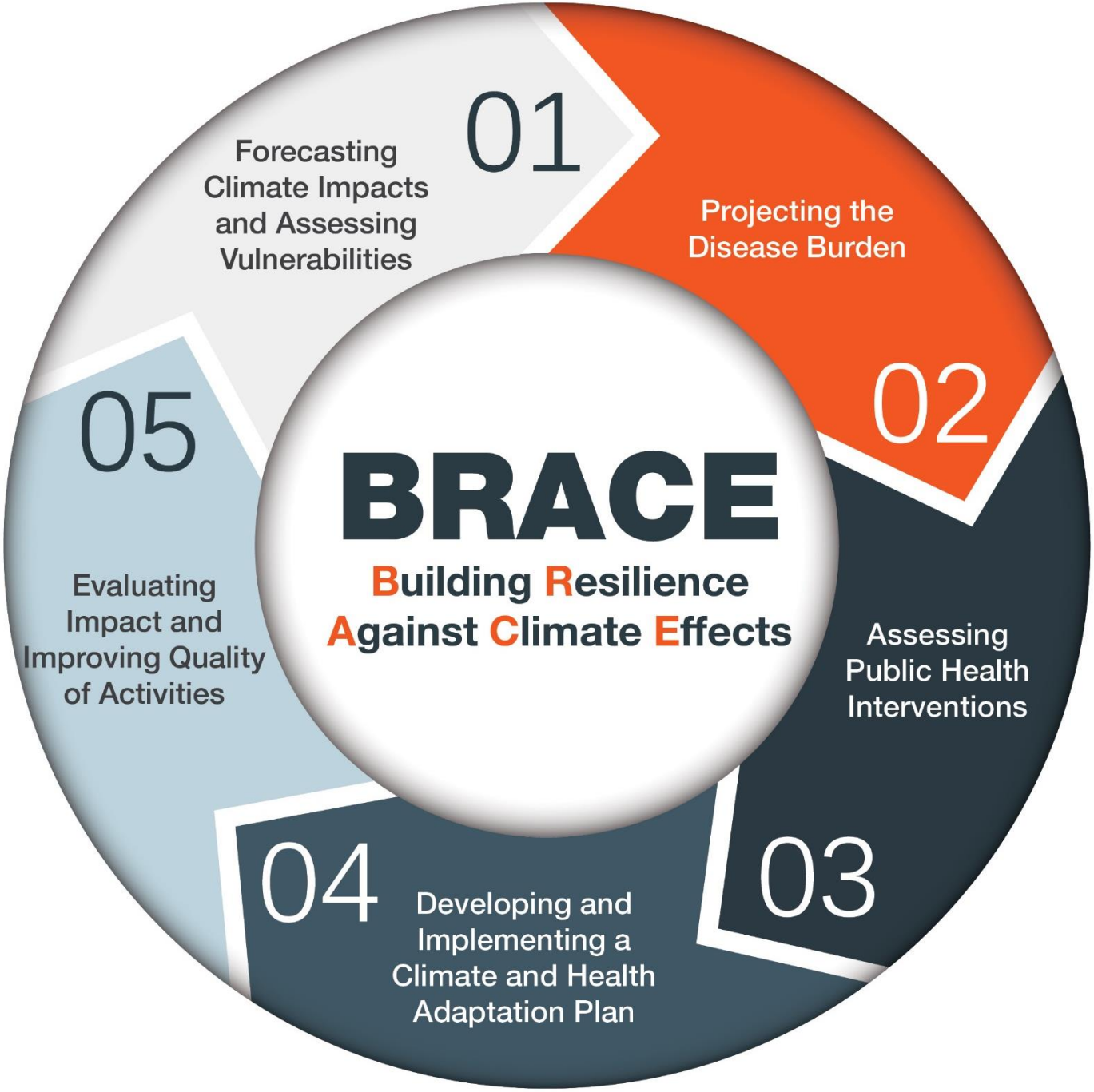
- **CDC helps states and cities prepare by:**
  - Providing scientific guidance
  - Developing decision support tools
  - Ensuring public health concerns are considered in climate change adaptation and mitigation strategies
  - Creating partnerships between public health and other sectors
- **Only Federal investment in climate change preparedness for public health sector**


OR
MN
WI
MI
VT
ME
NH
MA
NY
RI
New York City
San Francisco
CA
IL
MD
NC
AZ
FL
Currently Funded States and Cities

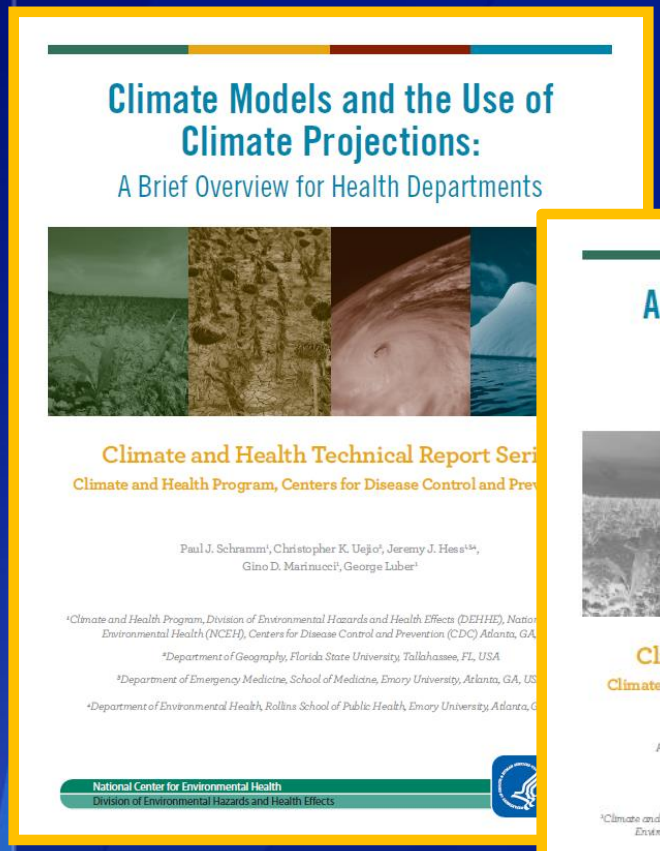
Adaptation in Action

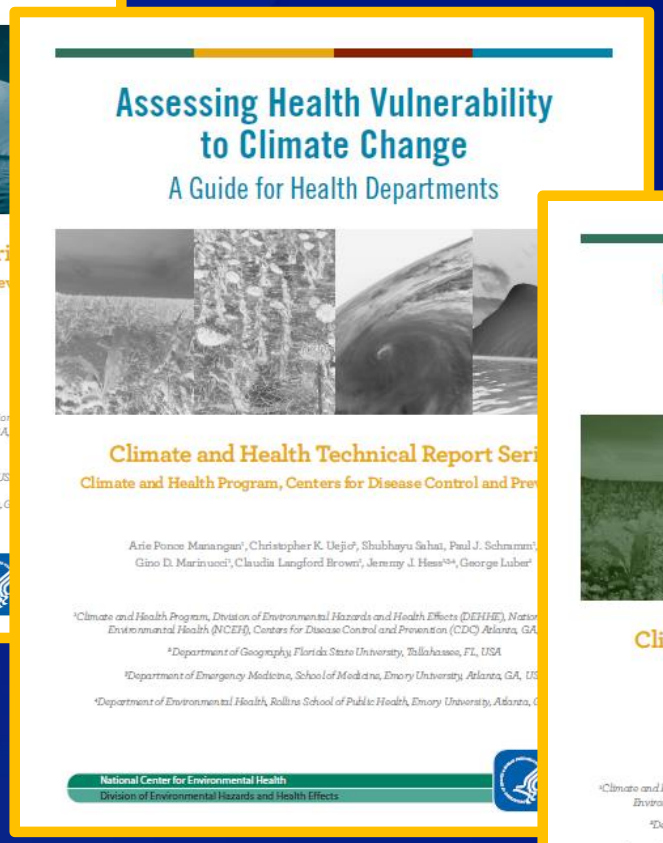


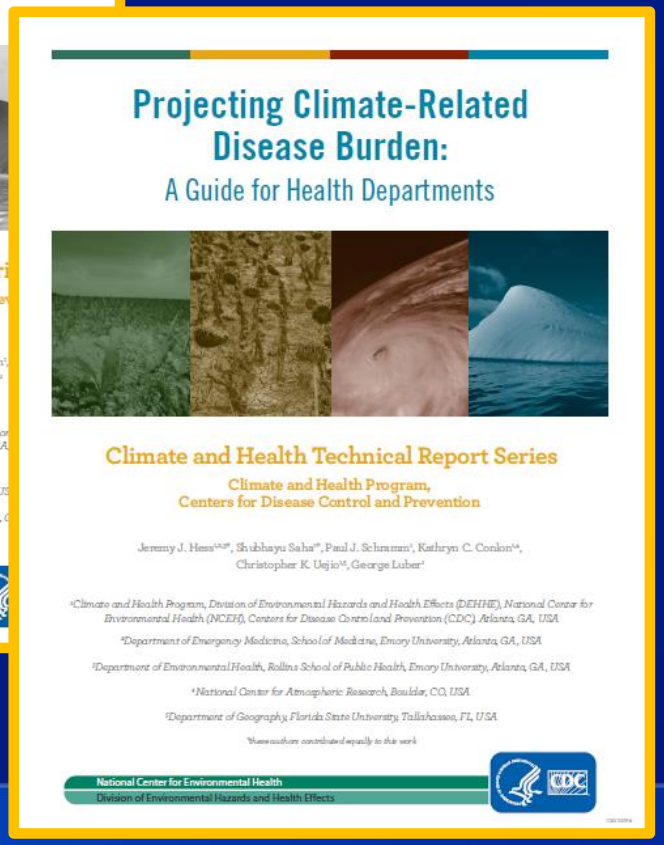
cdc.gov/climateandhealth


01
Forecasting Climate Impacts and Assessing Vulnerabilities
02
Projecting the Disease Burden
03
Assessing Public Health Interventions
04
Developing and Implementing a Climate and Health Adaptation Plan
05
Evaluating Impact and Improving Quality of Activities
BRACE
Building Resilience Against Climate Effects

BRACE Technical Guidance







CDC-APHA Fact Sheets

EXTREME RAINFALL AND DROUGHT

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States. We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.

BACKGROUND

THE CLIMATE-HEAL CONNECTION

EXTREME HEAT CAN IMPACT OUR HEALTH IN MANY WAYS

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States.

We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.

BACKGROUND

THE CLIMATE-CONNECTION

CLIMATE CHANGE DECREASES THE QUALITY OF THE AIR WE BREATHE

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States. We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.

BACKGROUND

THE CLIMATE-HEALTH CONNECTION

WARMER WATER AND FLOODING INCREASE THE RISK OF ILLNESS

BACKGROUND

THE CLIMATE-HEALTH CONNECTION

CLIMATE CHANGE INCREASES THE NUMBER AND GEOGRAPHIC RANGE OF DISEASE-CARRYING INSECTS AND TICKS

Climate change poses many risks to human health. Some health impacts of climate change are already being felt in the United States. We need to safeguard our communities by protecting people's health, wellbeing, and quality of life from climate change impacts. Many communities are already taking steps to address these public health issues and reduce the risk of harm.

BACKGROUND

When we burn fossil fuels, such as coal and gas, we release carbon dioxide (CO_2). CO_2 builds up in the atmosphere and causes Earth's temperature to rise, much like a blanket traps in heat. This extra trapped heat disrupts many of the interconnected systems in our environment.

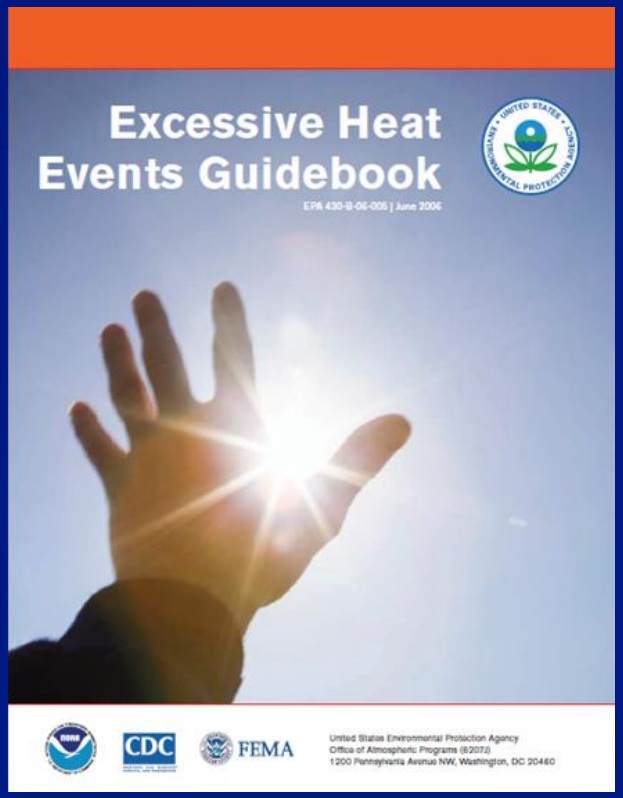
One way climate change might affect human health is by increasing the risk of vector-borne diseases. A vector is any organism – such as fleas, ticks, or mosquitoes – that can transmit a pathogen, or infectious agent, from one host to another. Because warmer average temperatures can mean longer warm seasons, earlier spring seasons, shorter and milder winters, and hotter summers, conditions might become more hospitable for many carriers of vector-borne diseases.

THE CLIMATE-HEALTH CONNECTION

The potential increase of harmful vectors is related to a number of health risks:

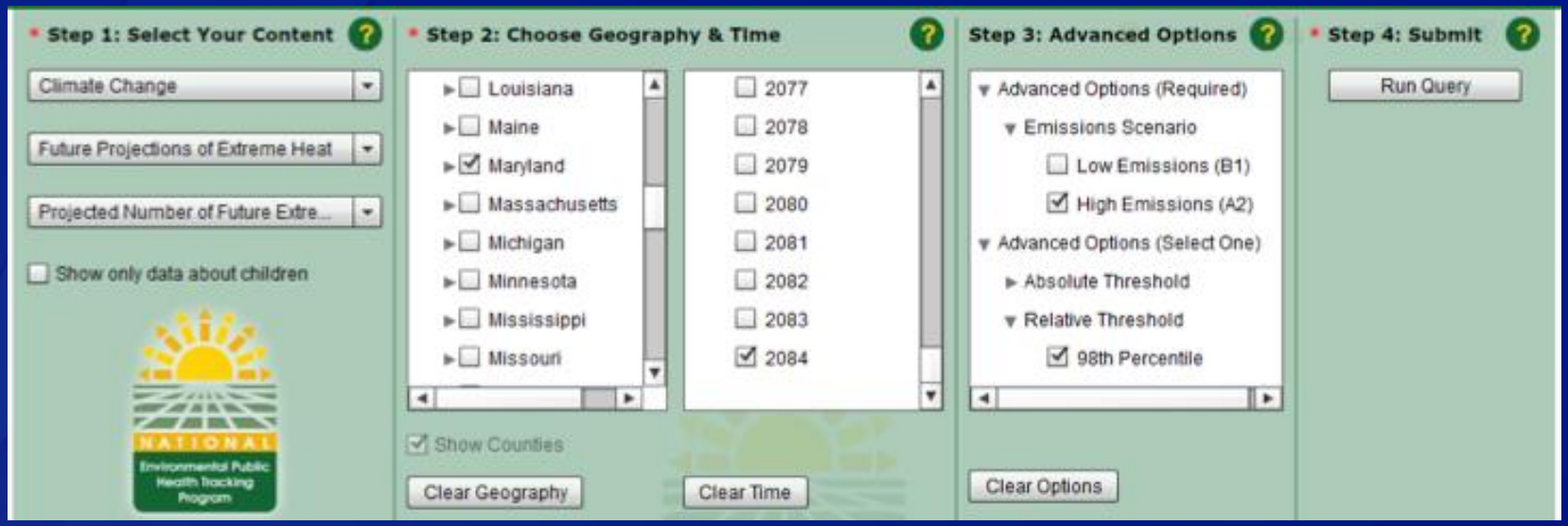
- The development and survival of ticks, their animal hosts (such as deer), and the bacterium that causes Lyme disease are all strongly influenced by climatic factors, especially temperature, precipitation, and humidity. Most occurrences of Lyme disease in the U.S. are in the Northeast, particularly Connecticut. An expansion of the geographic area in which ticks can survive may lead to more people having contact with infected ticks. In regions where Lyme disease already exists, milder winters result in fewer disease-carrying ticks dying during winter. This can increase the overall tick population, which increases the risk of contracting Lyme disease in those areas.
- West Nile virus is another example of a vector-borne disease that may be influenced by climate change. Preventing people from contracting West Nile virus is important, because there are no medications to treat or vaccines to prevent this virus in humans, and recovery from severe disease may take several weeks or months.

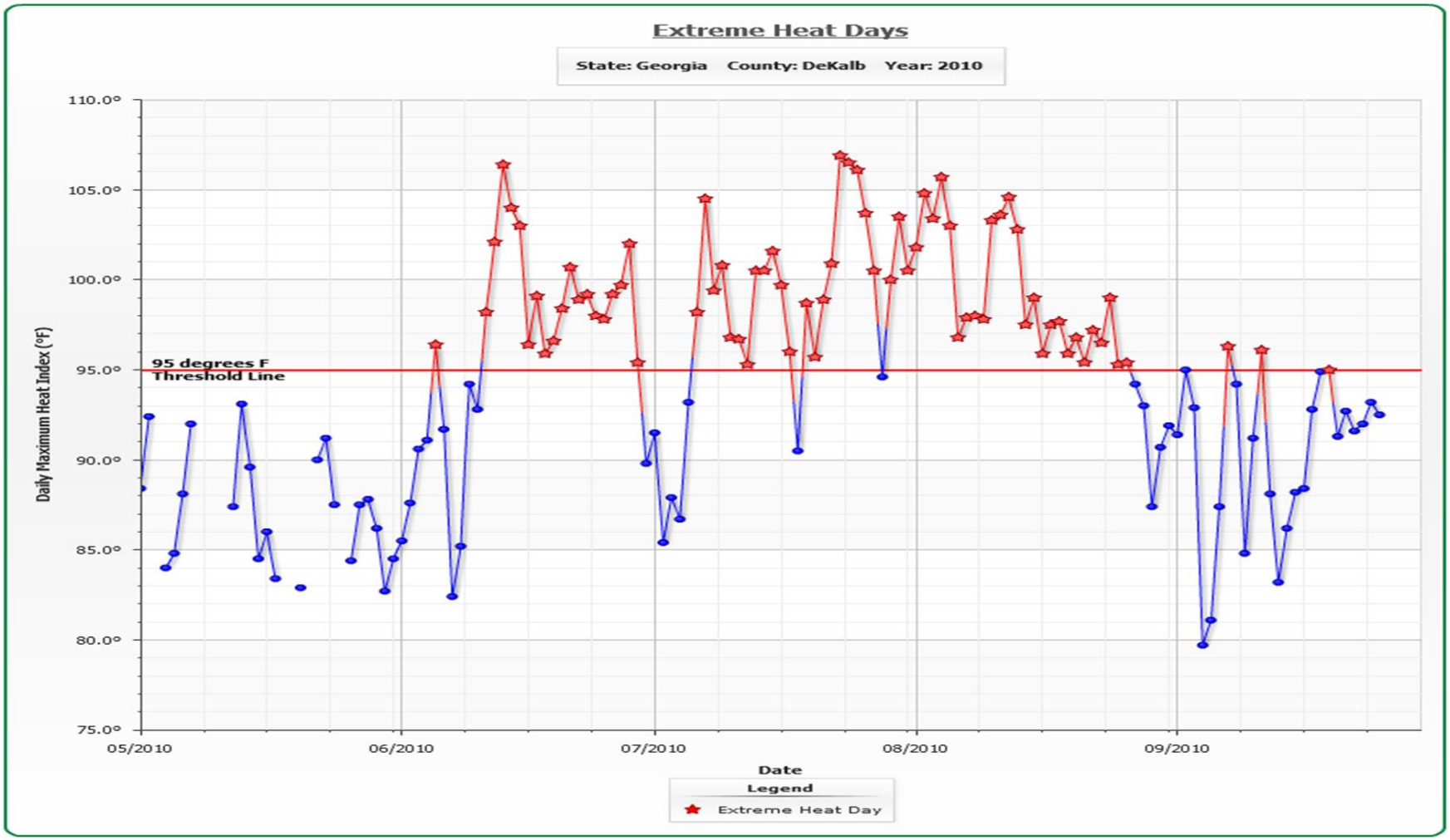
Guidance for preventing heat-related illness

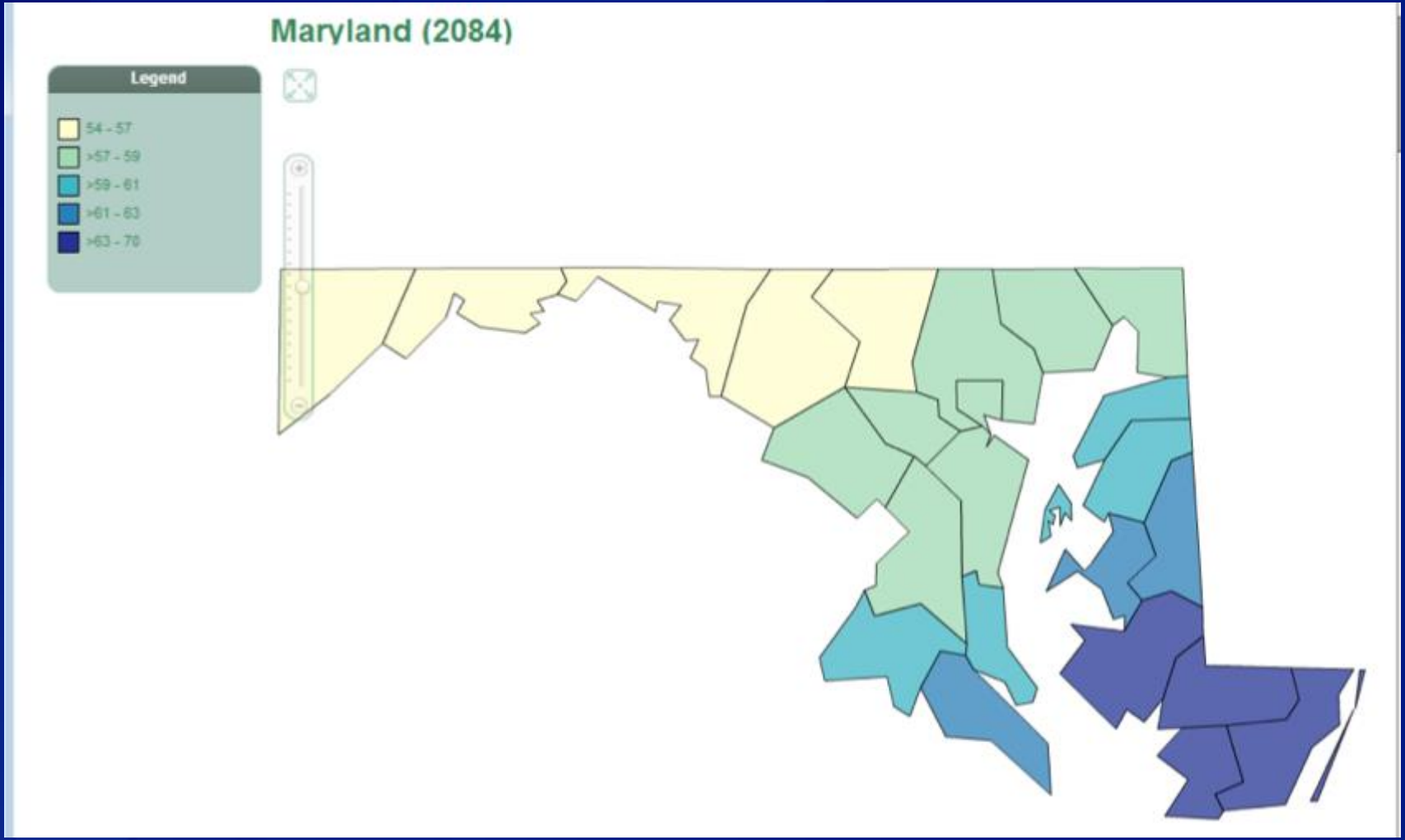


CDC's National Environmental Public Health Tracking Network

- Includes data on climate change and heat:
  - Historic temperature distribution and extreme heat days
  - Projected extreme heat days
  - Heat vulnerability
  - Heat ER visits, hospitalizations and deaths



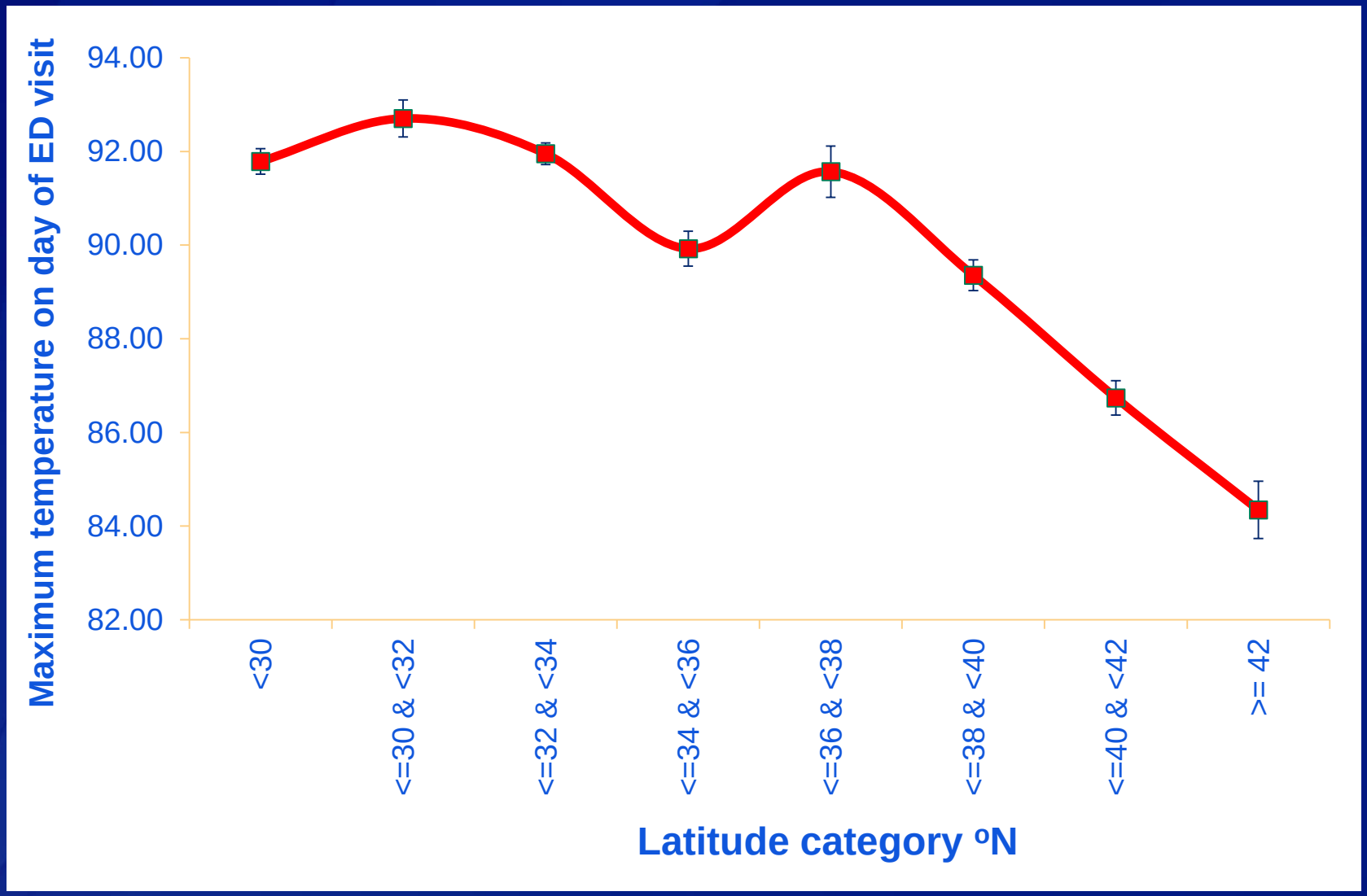

Extreme Heat Days
State: Georgia County: DeKalb Year: 2010
110.0°
105.0°
100.0°
95.0°
90.0°
85.0°
80.0°
75.0°
Daily Maximum Heat Index (°F)
95 degrees F
Threshold Line
05/2010
06/2010
07/2010
08/2010
09/2010
Date
Legend
Extreme Heat Day



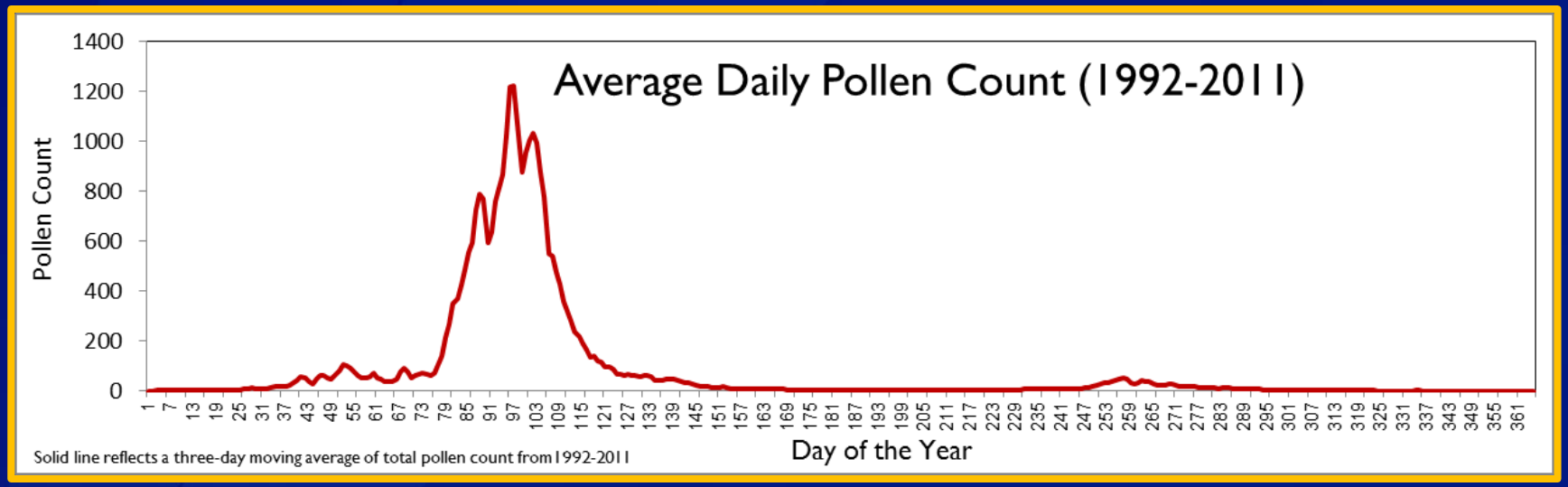
Projected number of extreme heat days (>98 percentile) in 2084 in Maryland. A2 (high emissions) scenario.

CDC Climate and Health Research

Temperature profile on ED visit days change by place



Atlanta pollen study (1992-2011)



Pollen Type	Spring Season	Fall Season
Oak	39.2%	0.2%
Pine	29.7%	2.2%
Juniper	3.4%	1.5%
Elm	1.8%	4.8%
Grasses	1.7%	5.9%
Ragweed	0.1%	55.9%

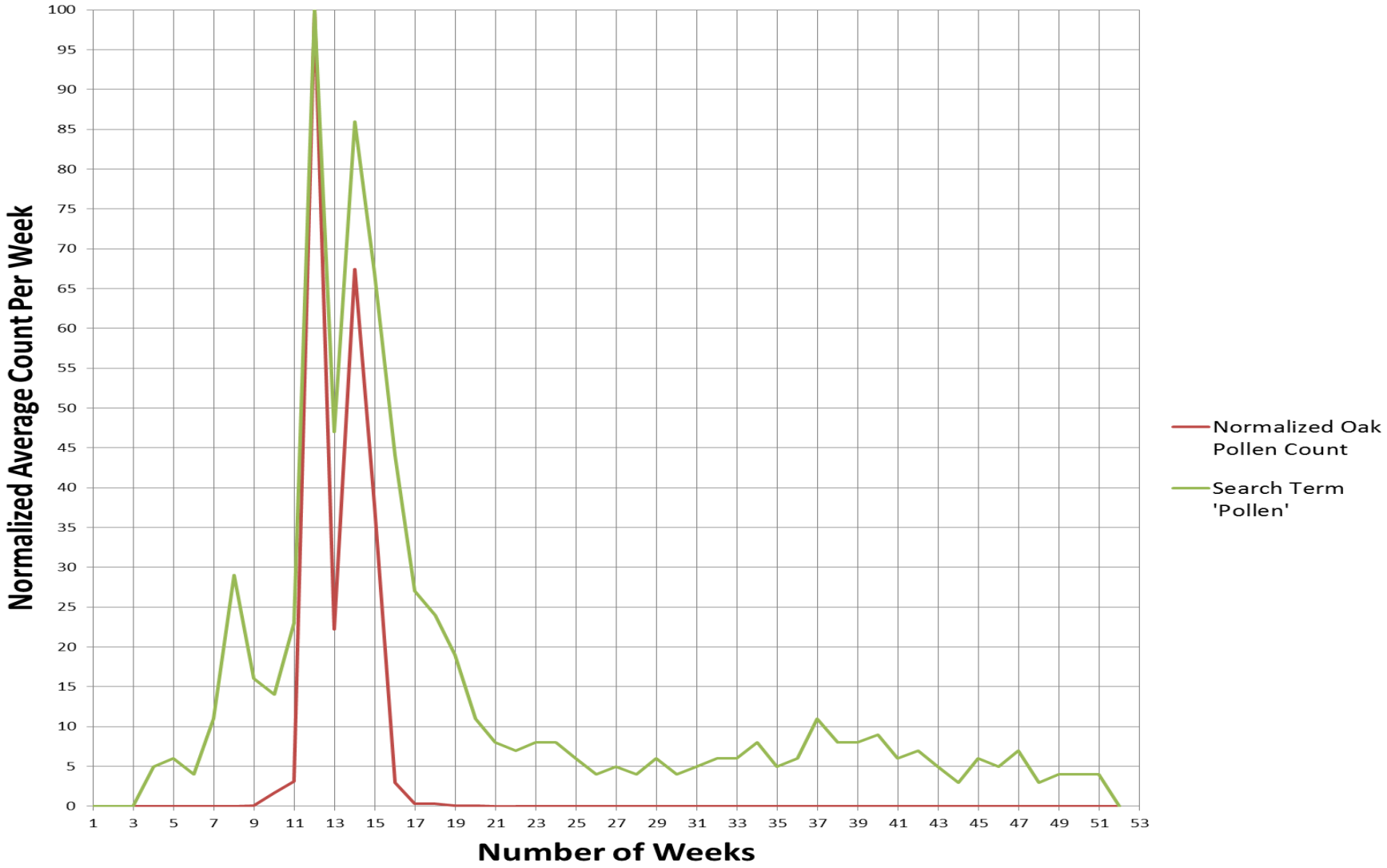
Percentage of Total Pollen for the Spring and Fall Pollen Seasons

Atlanta Pollen Season Timing

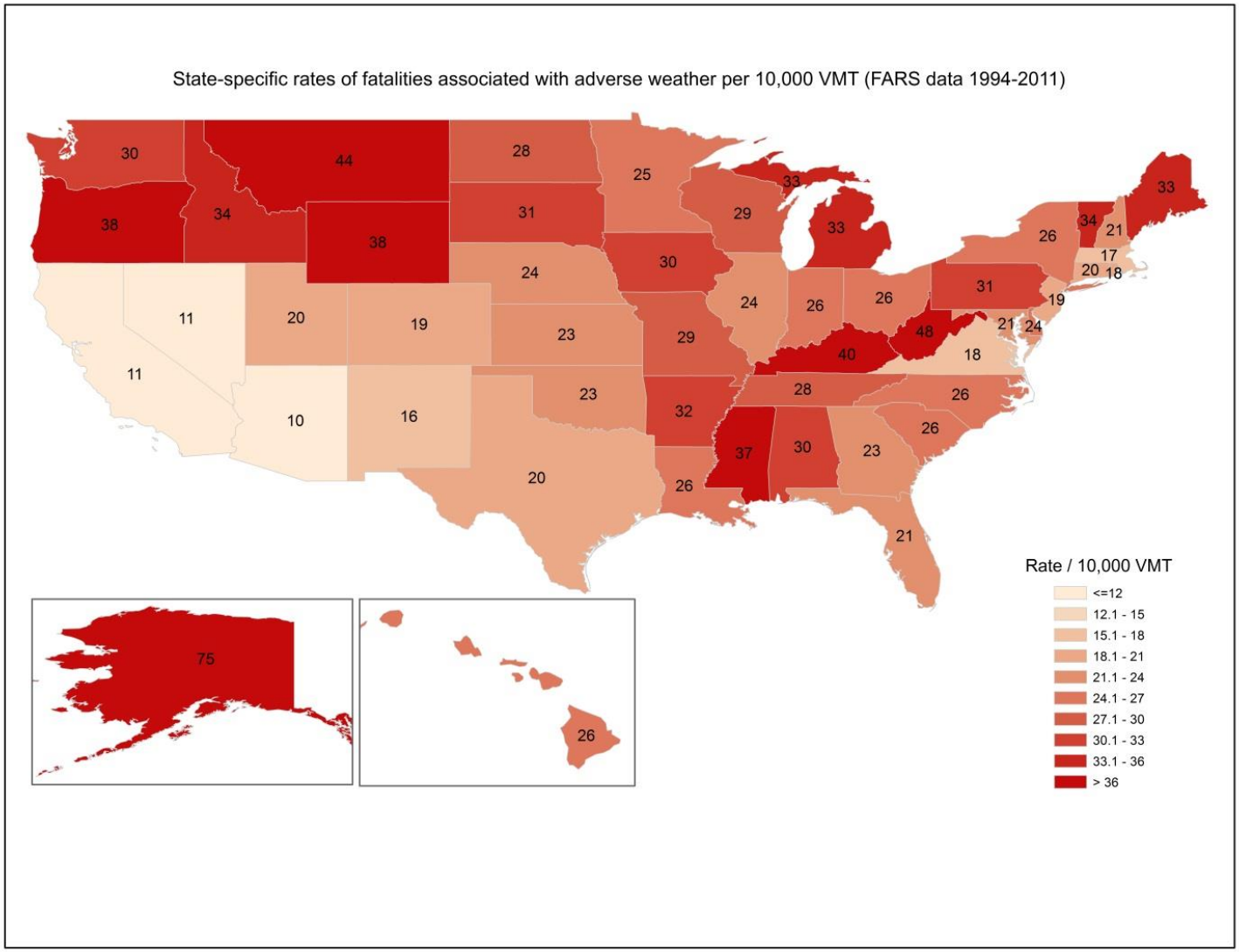
Increase in pollen season length for 4 species

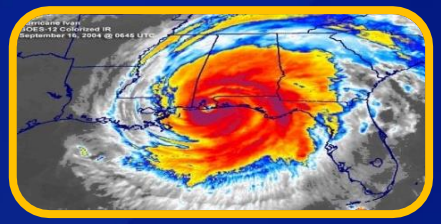
Pollen Group	Trend	p-value	R^2
Ash	4.3 days	0.015	0.287
Beech	4.1 days	<0.001	0.67
Sycamore	1.3 days	.048	0.1997
Willow	6.3 days	<0.001	0.51

Normalized Oak Pollen Counts Compared to Google Trends Search Term “Pollen” (2011)



State-specific rates of fatal crashes associated with adverse weather conditions per 10,000 Vehicle Miles Traveled, 1994-2011





Questions?

Paul Schramm

PSchramm@cdc.gov

www.cdc.gov/climateandhealth

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333

Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov Web: http://www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.