

Climate Change and Allergic Disease

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Climate Change and Allergic Airway Disease:
Observational, Laboratory, and Modeling Studies of the Impacts of Climate Change on
Allergic Airway Disease

Funded in Part
US EPA STAR Program RD83454701

2011
Rutgers
EOHSI

Zoonotic

Vectorborne

Infectious Diseases

Human Developmental

Mental Health, Stress

Heat-Related

Foodborne Diseases, Nutrition

Cancer

Neurological Disorders

Cardiovascular Disease

Waterborne

Weather Related

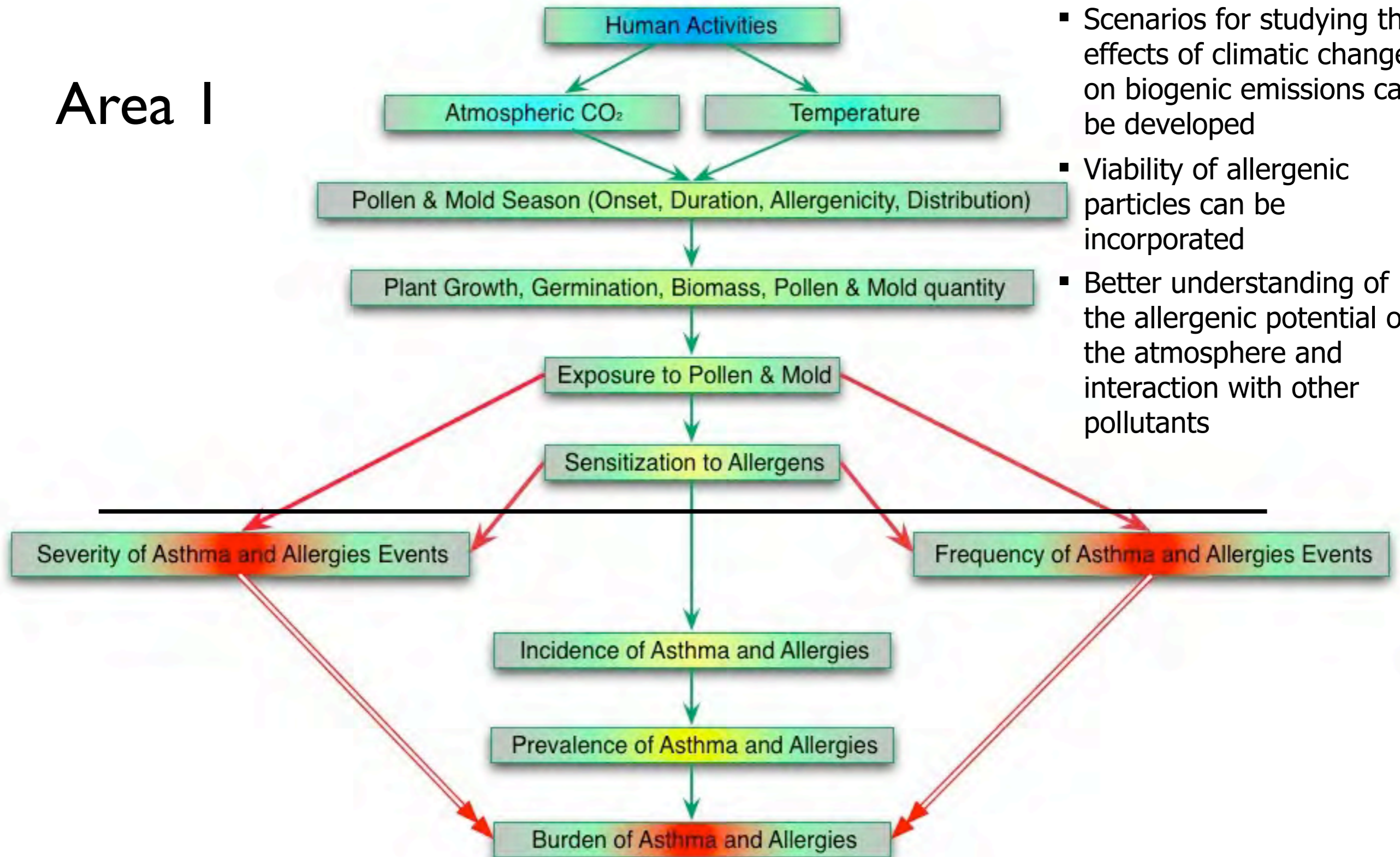
Climate Change and Health

Asthma,
Allergies,
Airway
Diseases



Climate Change and Allergic Airway Disease

Area 1



- Scenarios for studying the effects of climatic change on biogenic emissions can be developed
- Viability of allergenic particles can be incorporated
- Better understanding of the allergenic potential of the atmosphere and interaction with other pollutants

Area 2

Carbon Dioxide - CO₂

Gleadow R, Plant Biology (online) August 6, 2009

A cassava grown under CO₂ levels projected for the next century (right) yielded 80% less food than a tuber grown under current conditions.

Increased CO₂ (700 PPM)

C3 plants

rice, wheat, casava

taller, woodier, more stems, less leaves

deficits ($\pm 15\%$) Ca⁺⁺, Mg⁺⁺, P, "protein"

Casavas

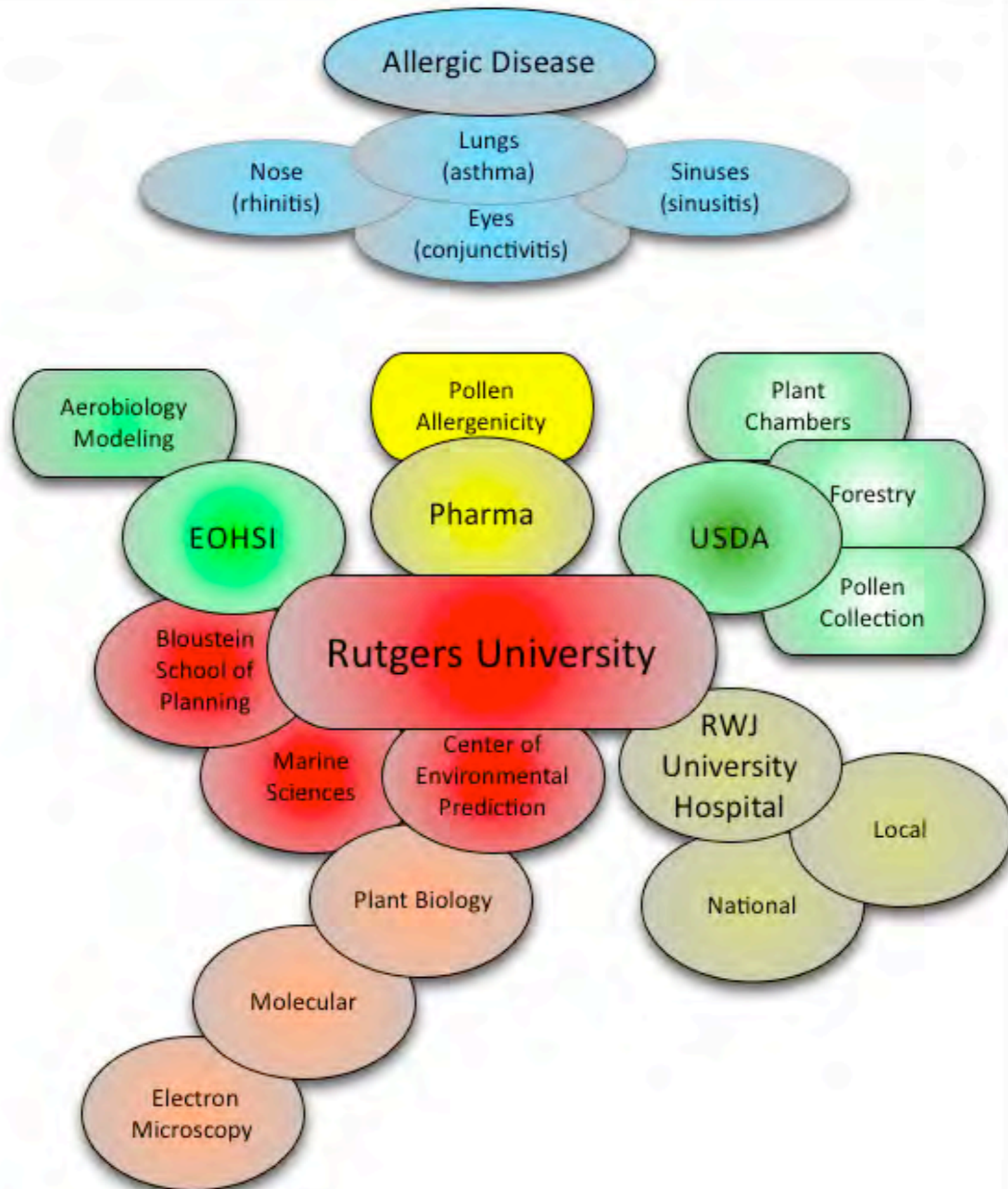
3rd largest source of carbohydrates in tropics

tubers 80% smaller

increased cyanogenic glycosides



Climate Change and Allergic Airway Disease



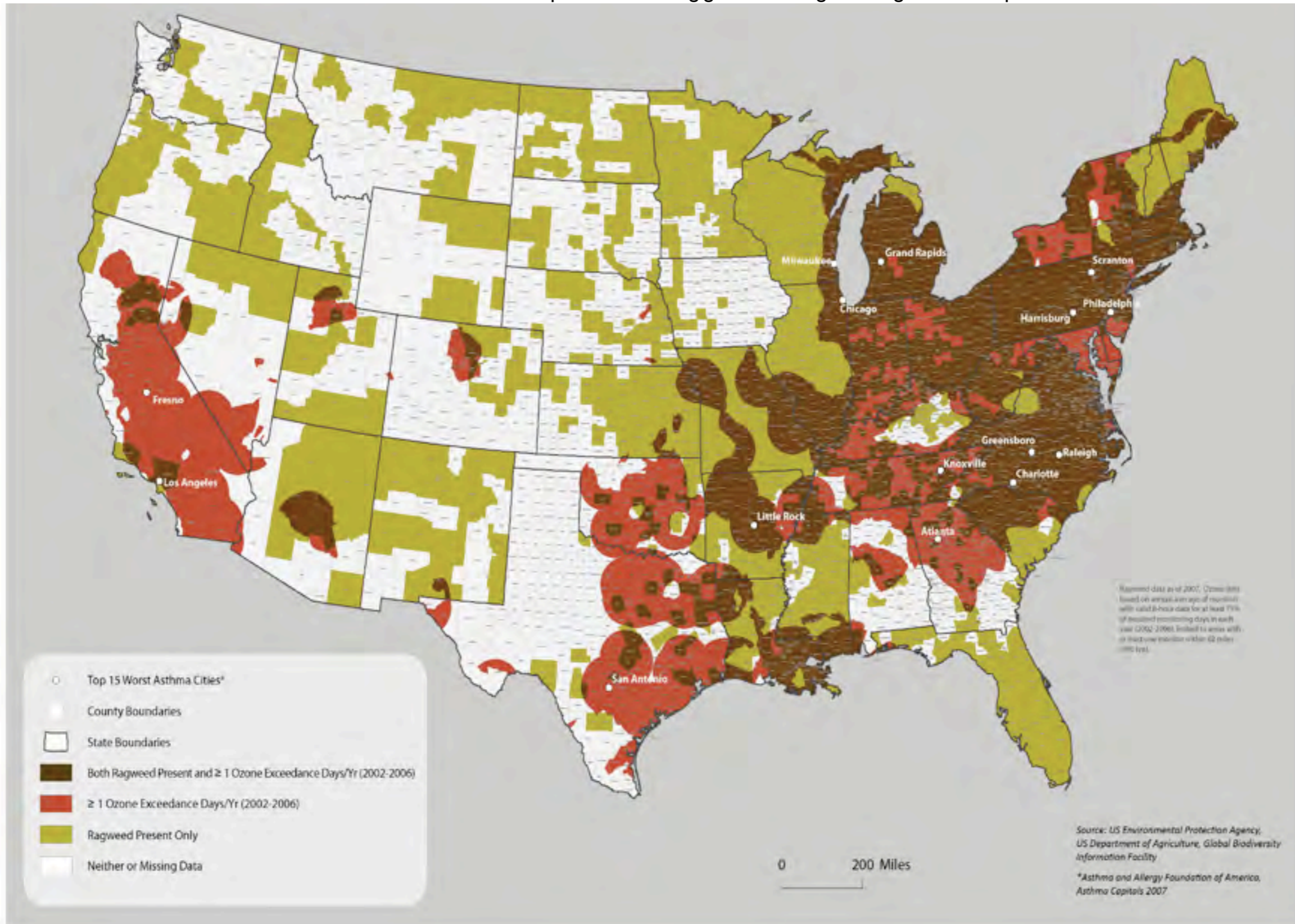


AAIAI National Allergy Bureau

n = 74

Ozone and Ragweed co-exposures in the Continental U.S.

Adapted from Knowlton, et al. 2007. Sneezing and Wheezing: How Global Warming Could Increase Ragweed Allergies, Air Pollution, and Asthma. Natural Resources Defense Council. <http://www.nrdc.org/globalwarming/sneezing/contents.asp>



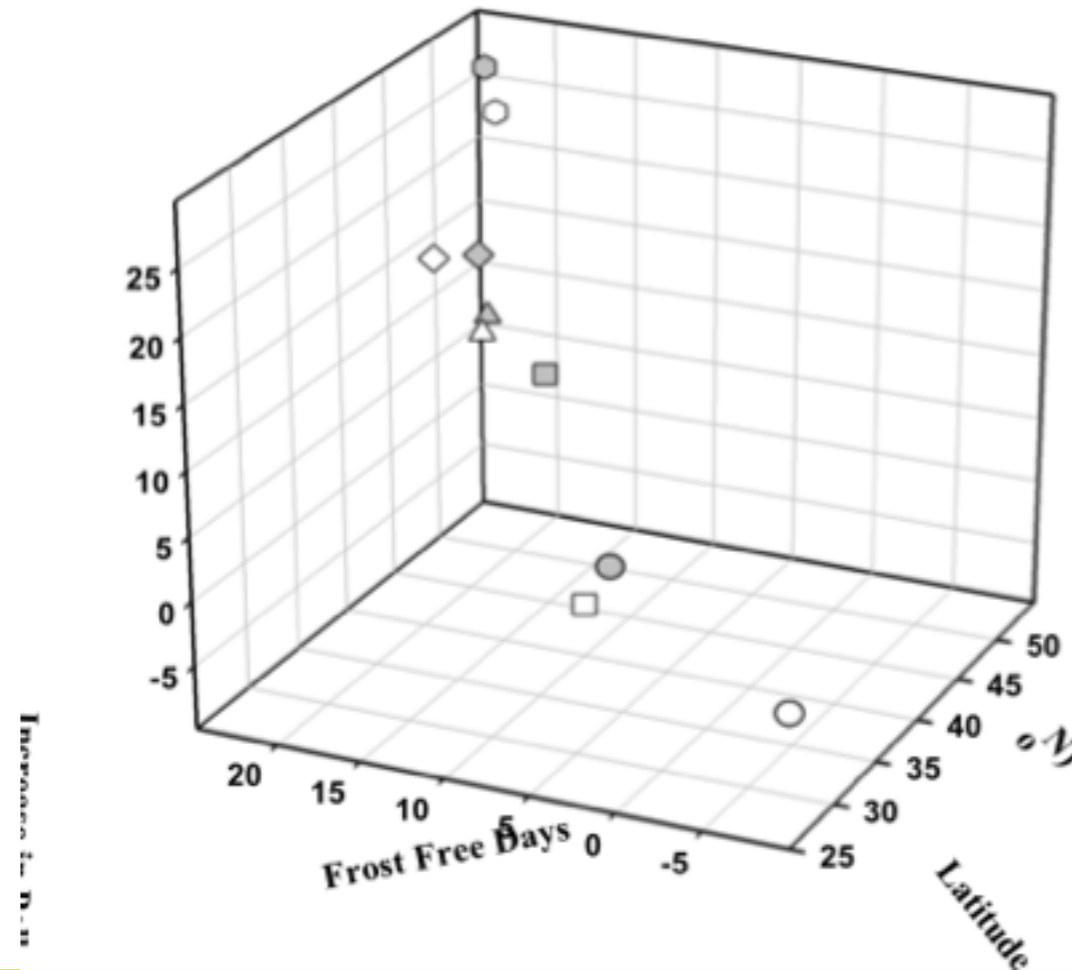
US EPA STAR Program RD83454701

Frost Free Days, Pollen Season and Latitude



- Georgetown, TX, USA
- Oklahoma City, OK, USA
- Rogers, AR, USA
- Papillion, NE, USA
- △ Madison, WI, USA
- ▲ La Crosse, WI, USA
- ◇ Minneapolis, MN, USA
- ◆ Fargo, ND, USA
- Winnipeg, MB, Canada
- ⊖ Saskatoon, SK, Canada

Ragweed (1995-2009)



Scaling Up: Warming should increase with increasing latitude.

Is a climate signal apparent with respect to length of ragweed pollen season?

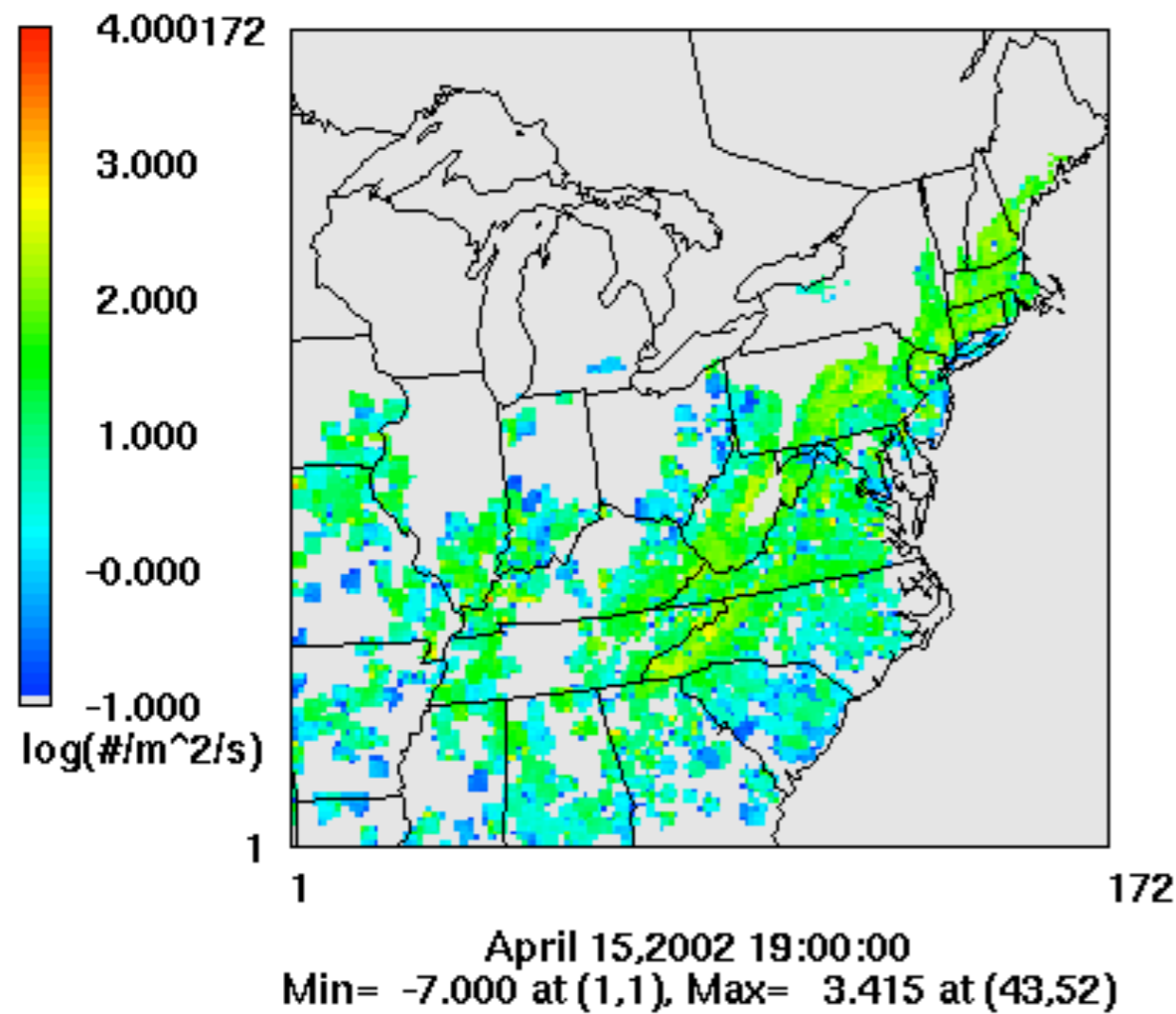
Climate signal: From June 21st to first frost.

Able to show that ragweed is responding to a climate signal as a function of latitude in real time on a continental basis.

Pollen model results: Birch emission flux and airborne concentrations

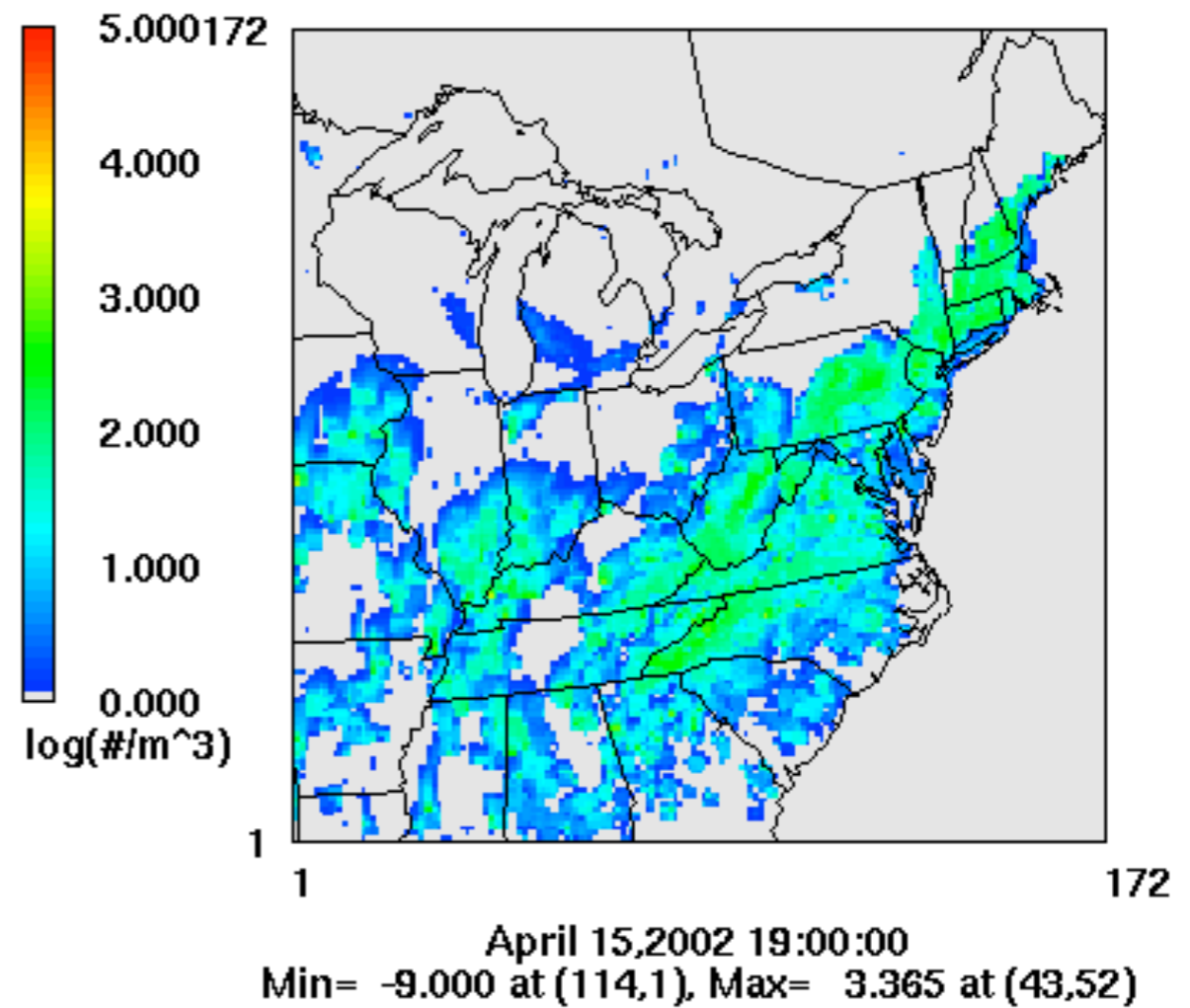
Pollen Emissions

April 2002



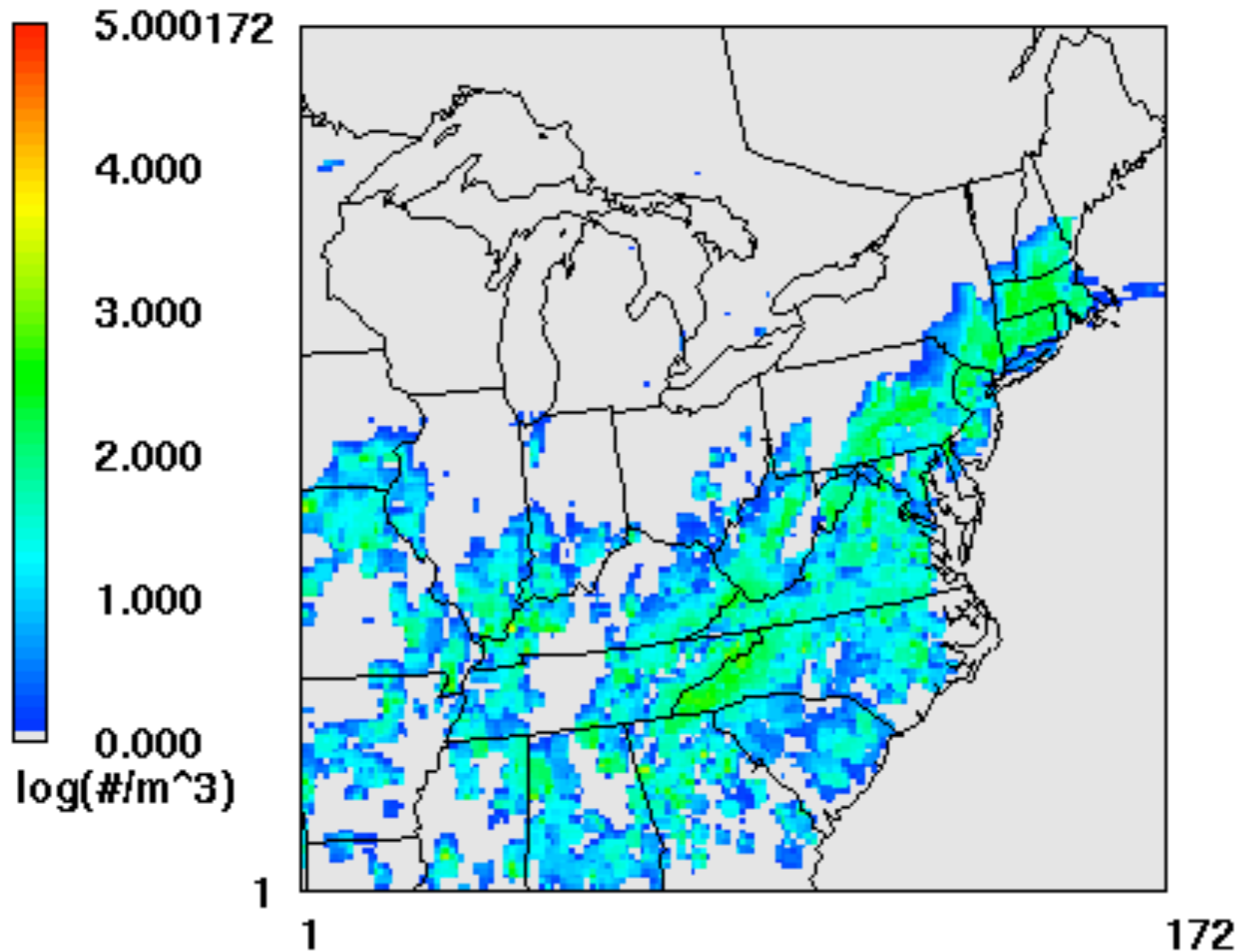
Pollen Concentrations

April 2002



Pollen Concentrations

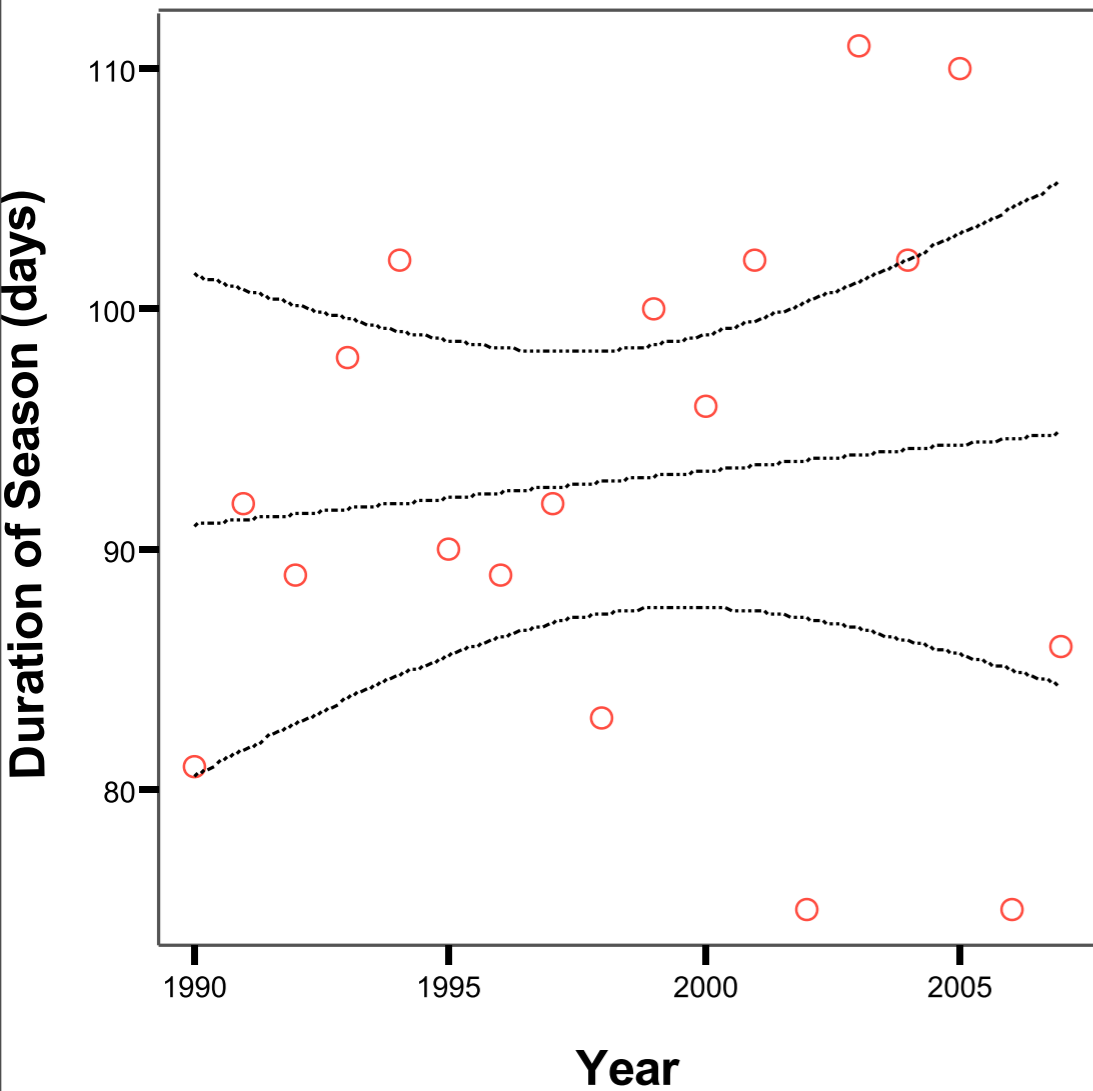
April 2002



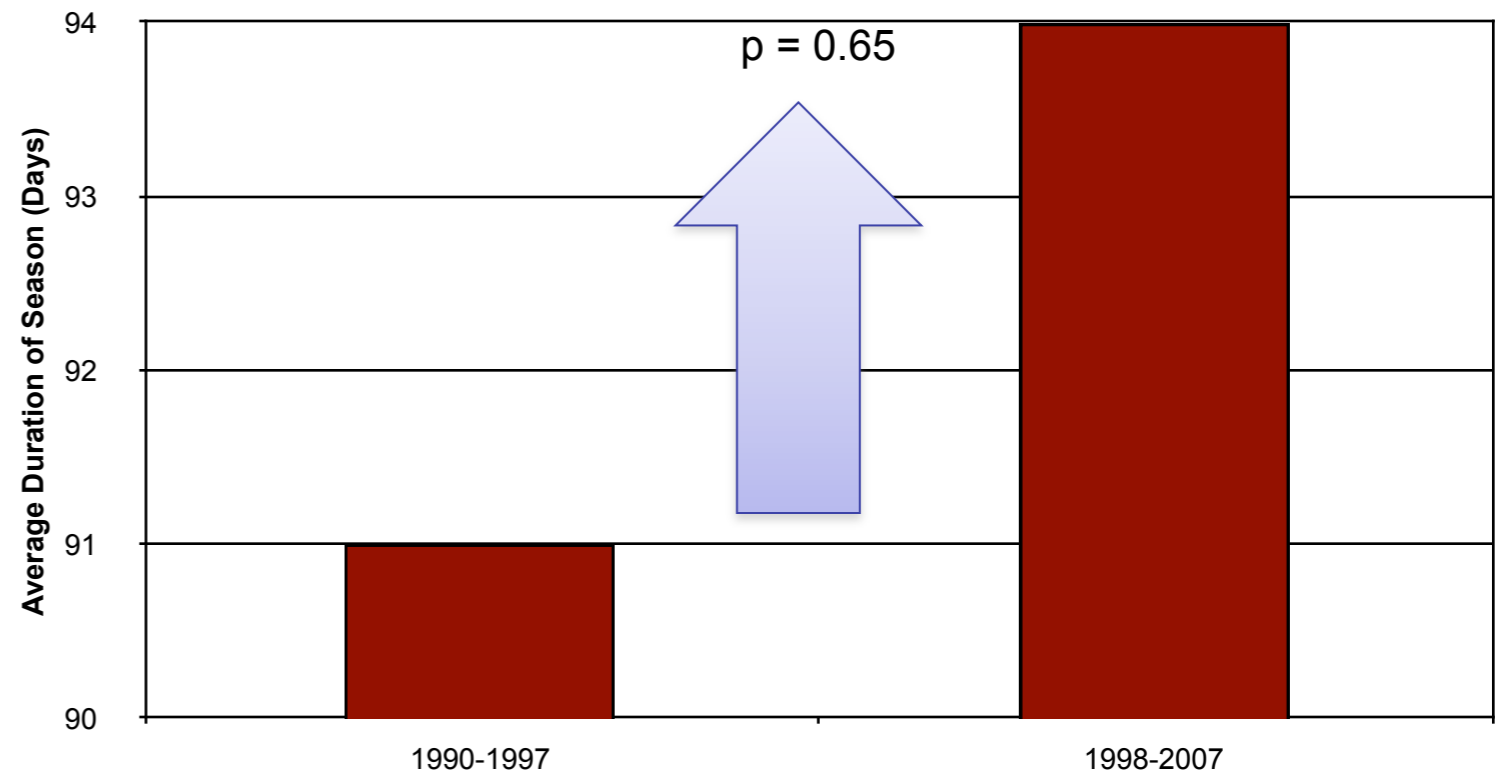
April 15, 2002 0:00:00
Min= -9.000 at (114,11), Max= 3.586 at (43,52)

Pollen Trends in New Jersey: Duration

AAAAI 2009



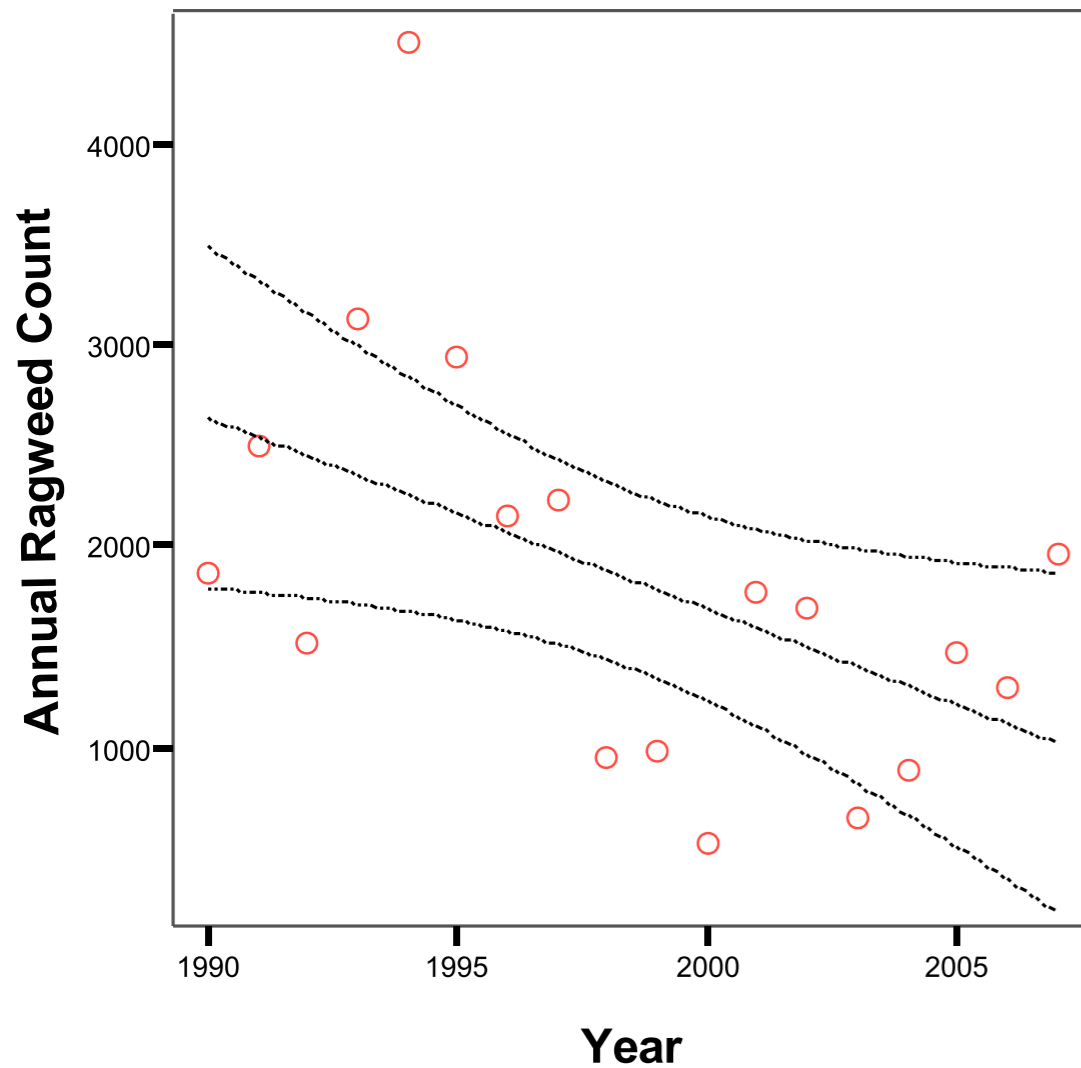
Linear Regression with
95.00% Mean Prediction Interval



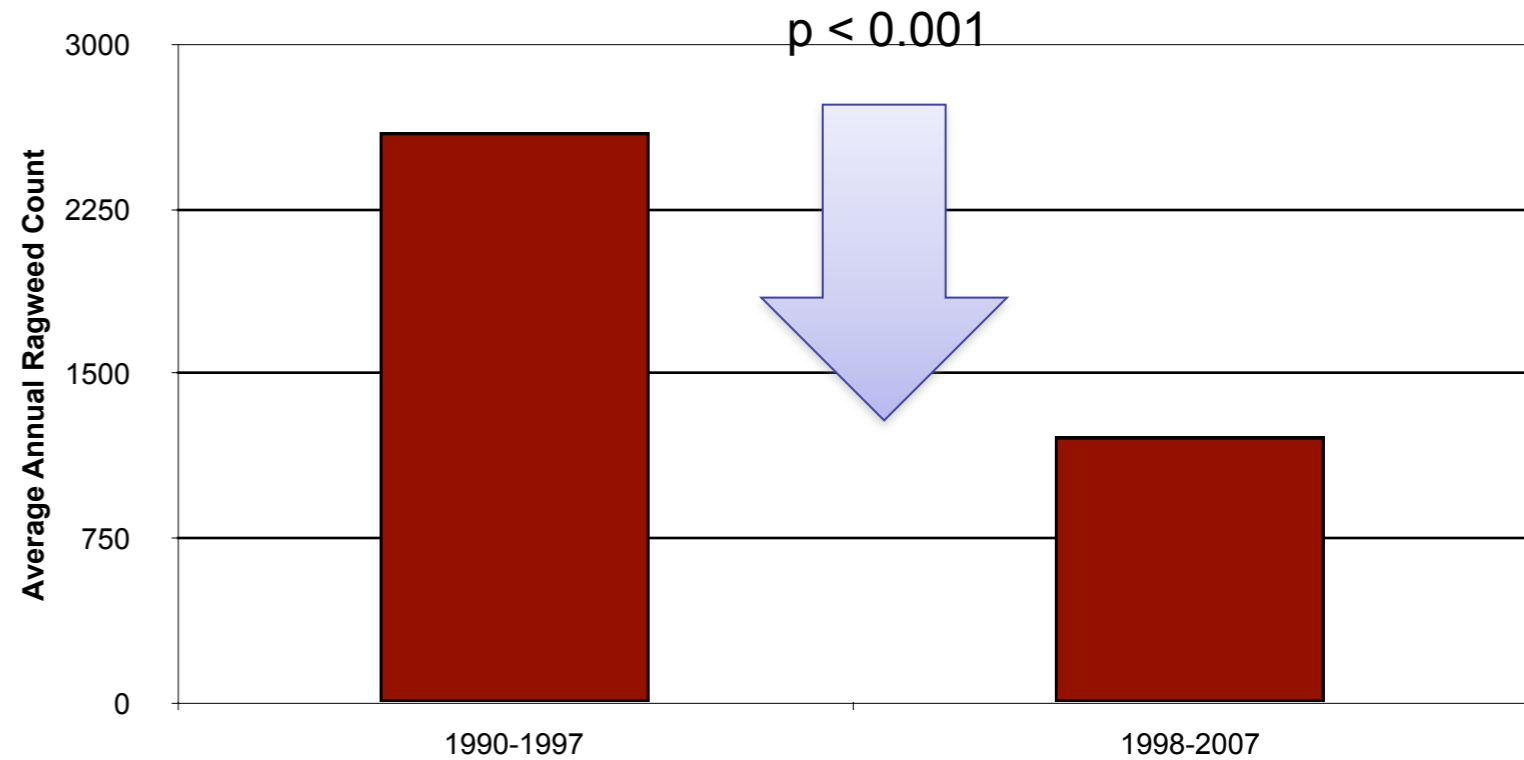
The average duration of
Ragweed season has increased
from 90 days to 94 days
over the last 18 years

Pollen Trends in New Jersey: Count

AAAAI 2009



Linear Regression with
95.00% Mean Prediction Interval



The total number of Ragweed grains counted each season has decreased over the last 18 years

Adaptation = Preparedness

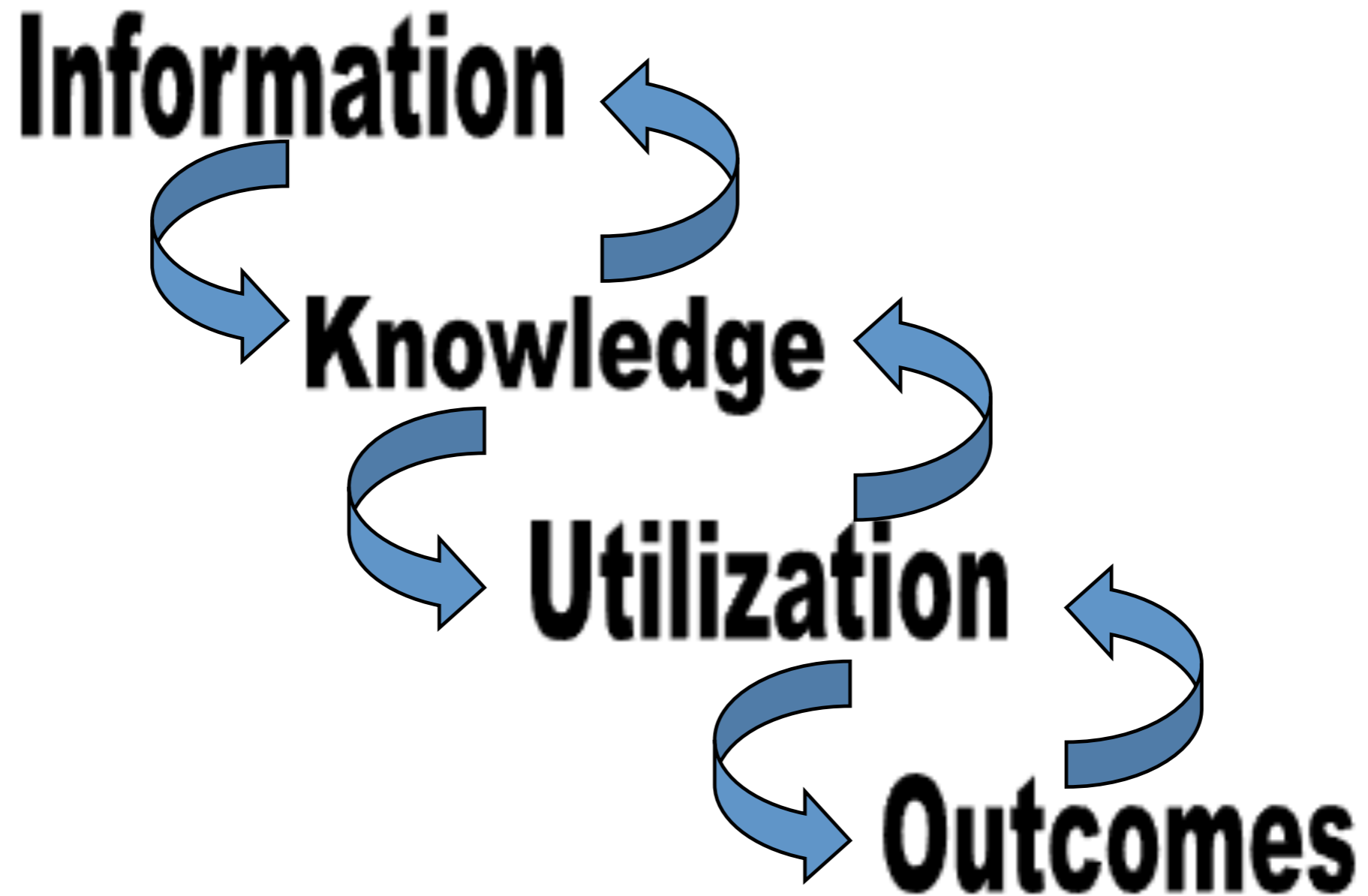
Requires Awareness/Knowledge

- Strong scientific evidence for Climate Change
 - 77% in 2006
 - 47% from human activities
 - 71% in 2008
 - 57% in 2009
 - 36% feel that human activities
- Political breakdown
 - Democrats
 - 75% believe in CC
 - 50% believe CC is serious
 - far fewer conservative and moderate see the problem as grave.
 - Republicans
 - 57% no solid evidence of global warming
 - up from 31 % in early 2007.



2009 PEW Survey on Climate Change

Educational Theory & Healthcare Outcomes



Adaptation = Preparedness

Community Awareness

NJDEP & NJDHSS

Allergy Alerts

Asthma Alerts

Ozone Alerts

UV Alerts

