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

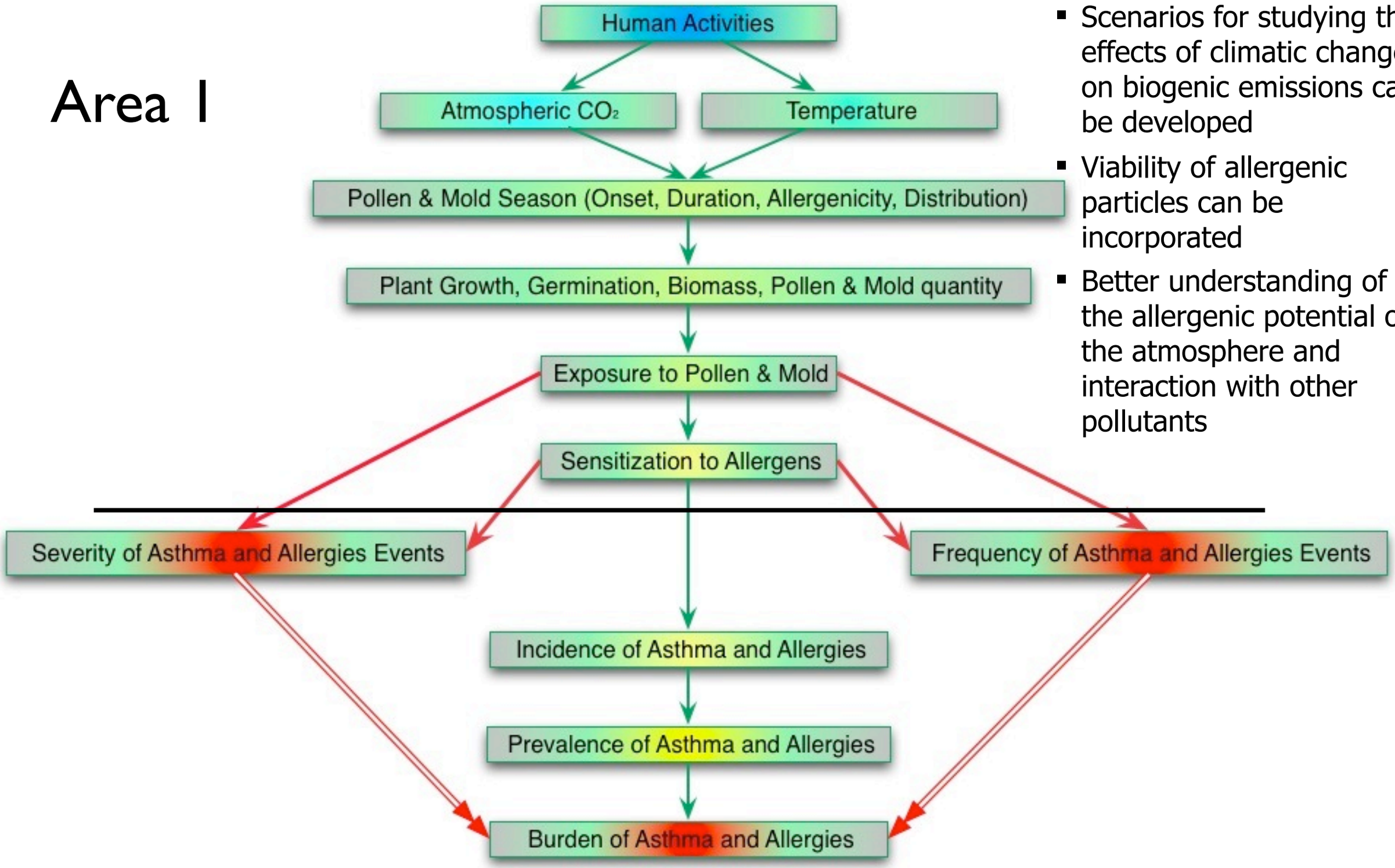
Climate Change and Health

Asthma, Allergies, Airway Diseases

US EPA STAR Program RD83454701

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

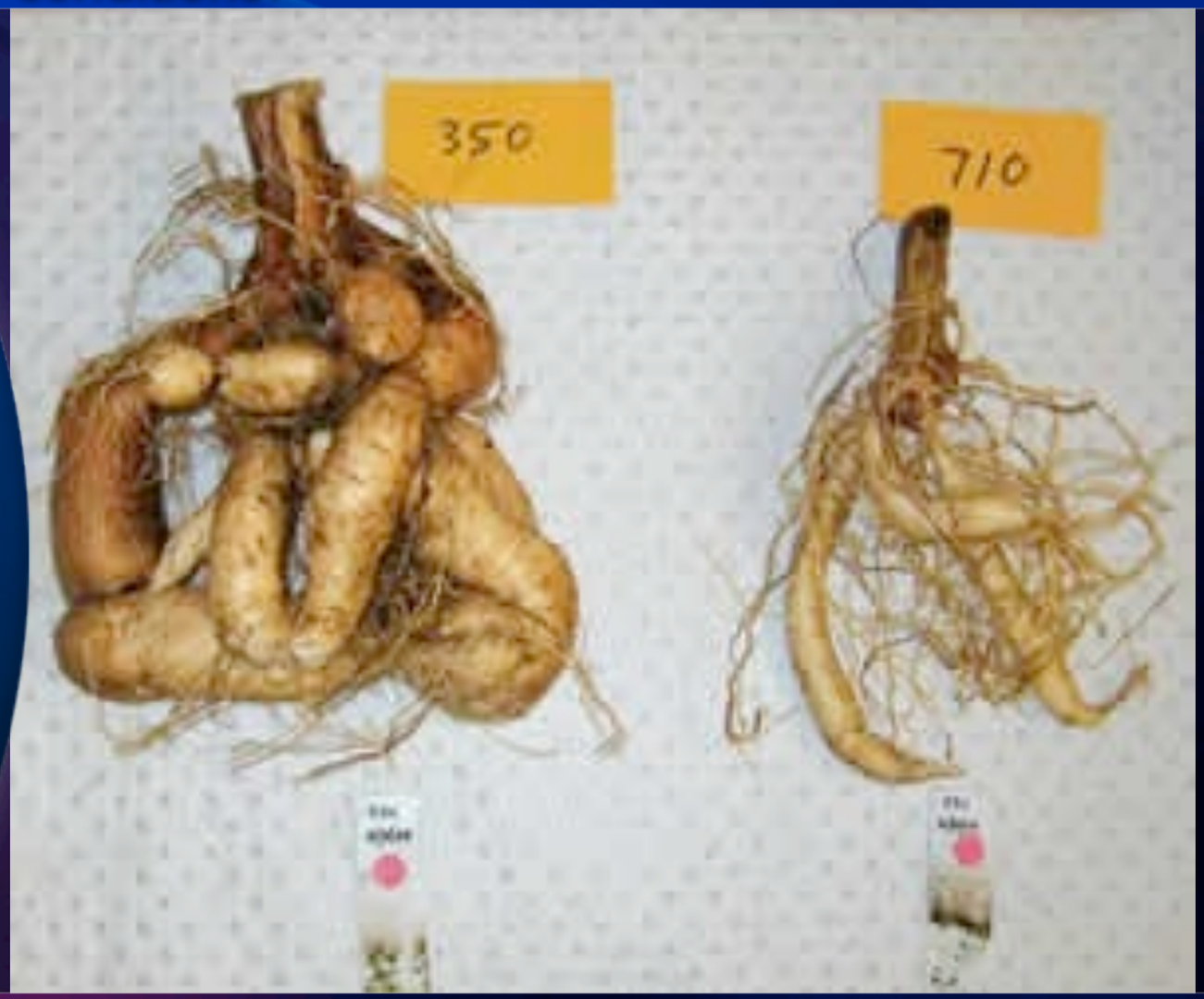
US EPA STAR Program RD83454701

Carbon Dioxide - CO_2

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

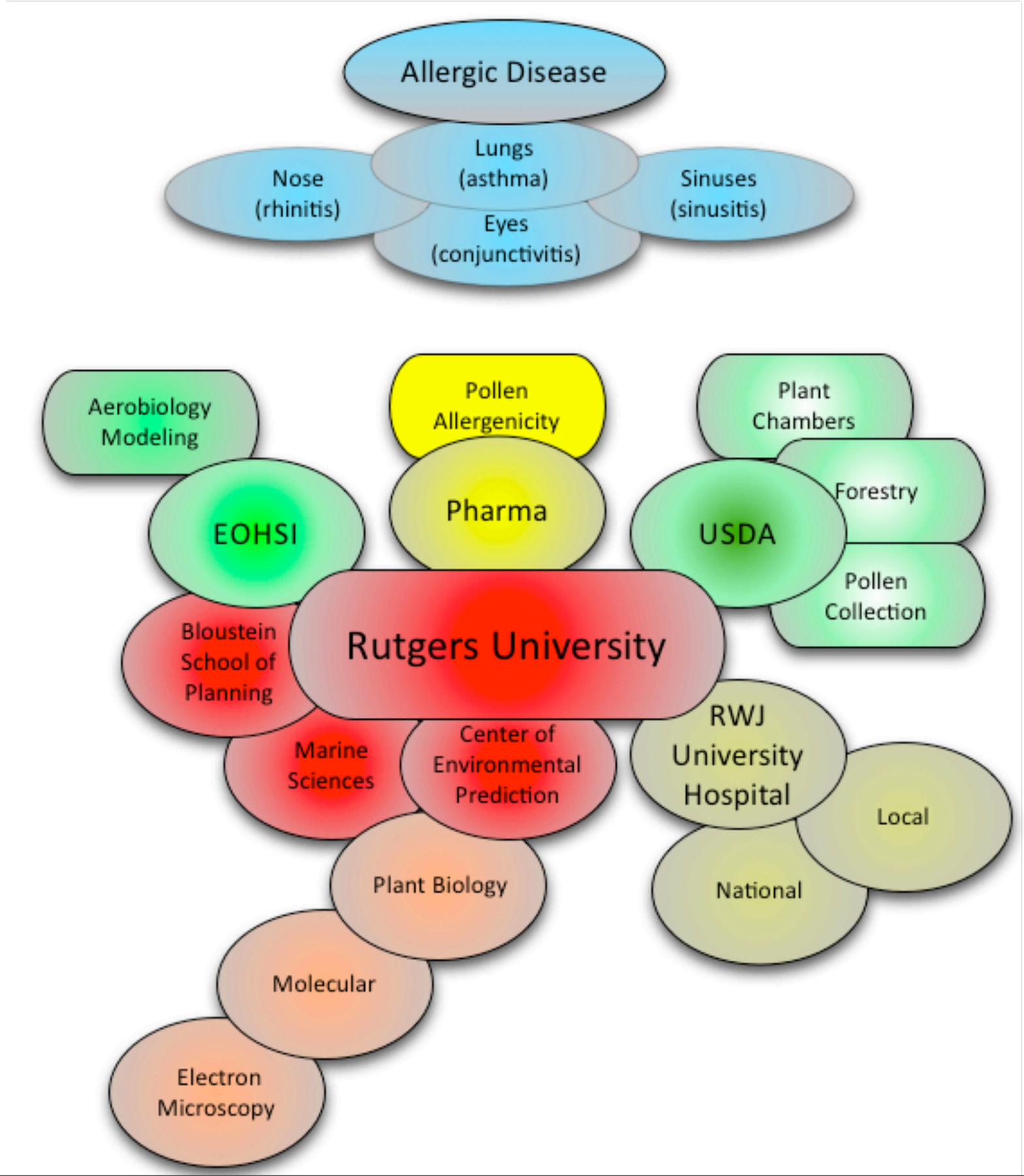
- Increased CO_2 (700 PPM)
  - C3 plants
    - rice, wheat, casava
      - taller, woodier, more stems, less leaves
      - deficits (±15%) Ca^{++}, Mg^{++}, P, “protein”
  - Casavas
    - 3rd largest source of carbohydrates in tropics
    - tubers 80% smaller
    - increased cyanogenic glycosides

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



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Climate Change and Allergic Airway Disease



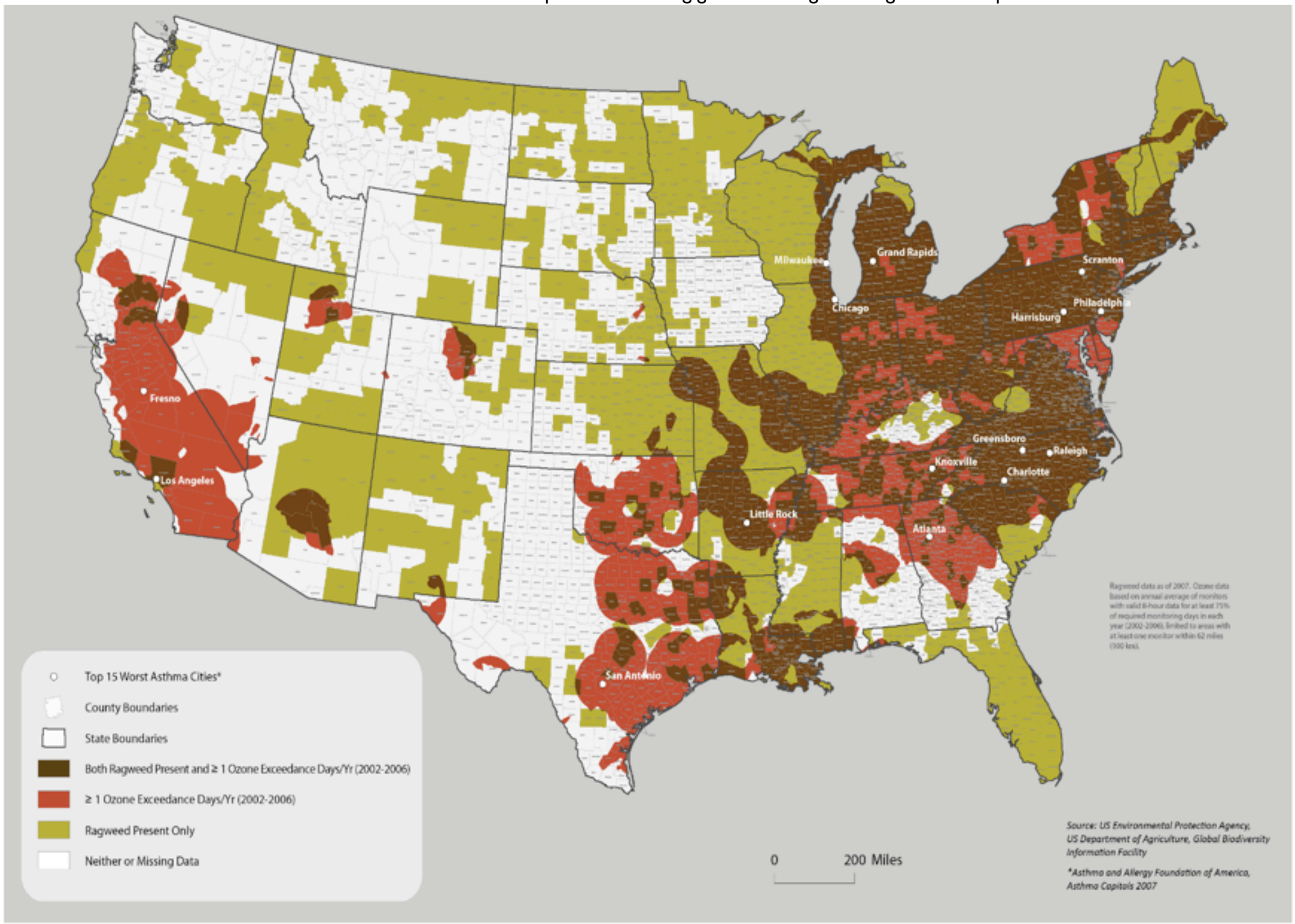


AAAAI National Allergy Bureau

n =74

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

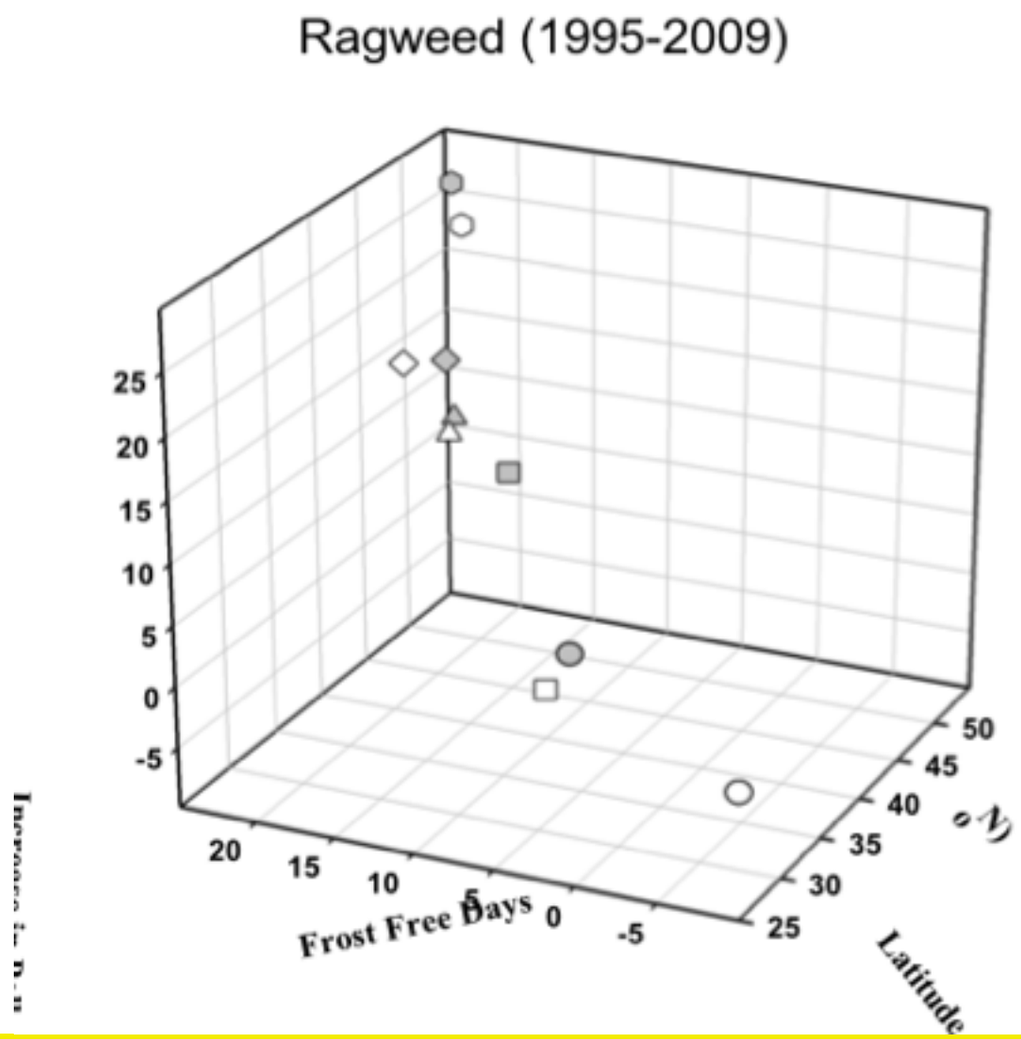
Adapted from Knowlton, et al. 2007. Sneezing and Wheezing: How Global Warming Could Increase Ragweed Allergies, Air Pollution, and Asthma. Natural Resources Defense Council. http://www.nrdc.org/globalwarming/sneezing/contents.asp



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Frost Free Days, Pollen Season and Latitude





Scaling Up: Warming should increase with increasing latitude.

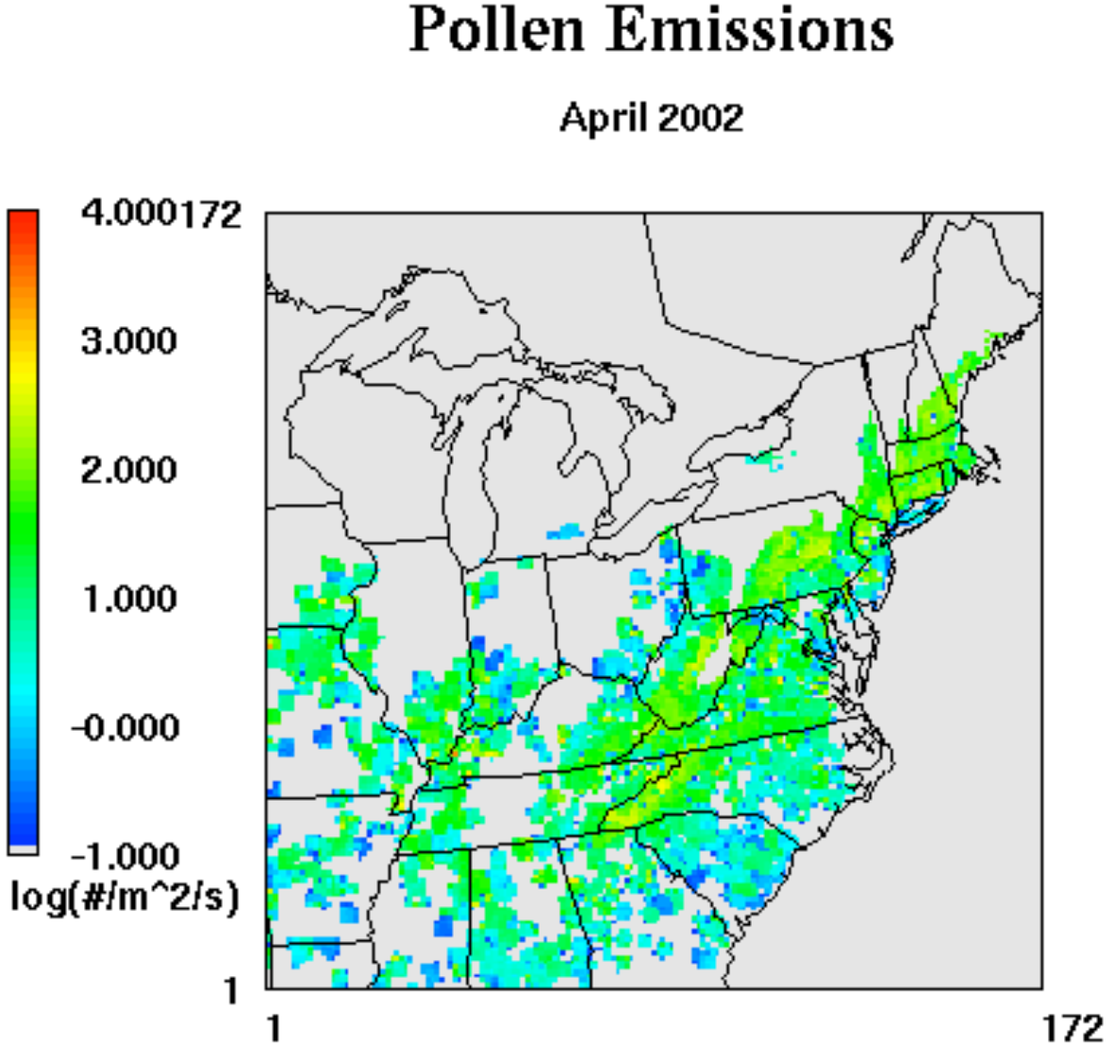
Is a climate signal apparent with respect to length of ragweed pollen season?

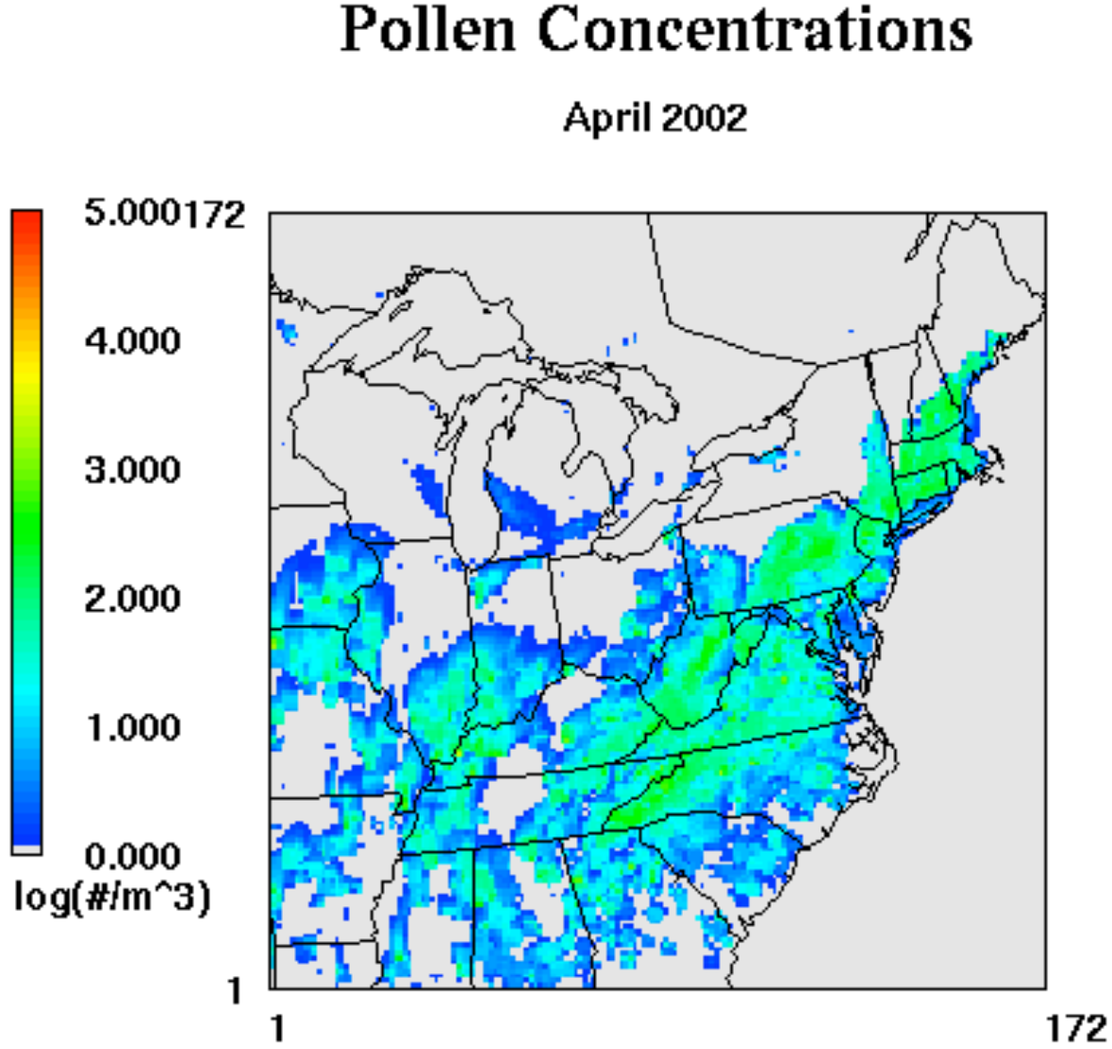
Climate signal: From June 21st to first frost.

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

PNAS, March 20111108: 4248-4251

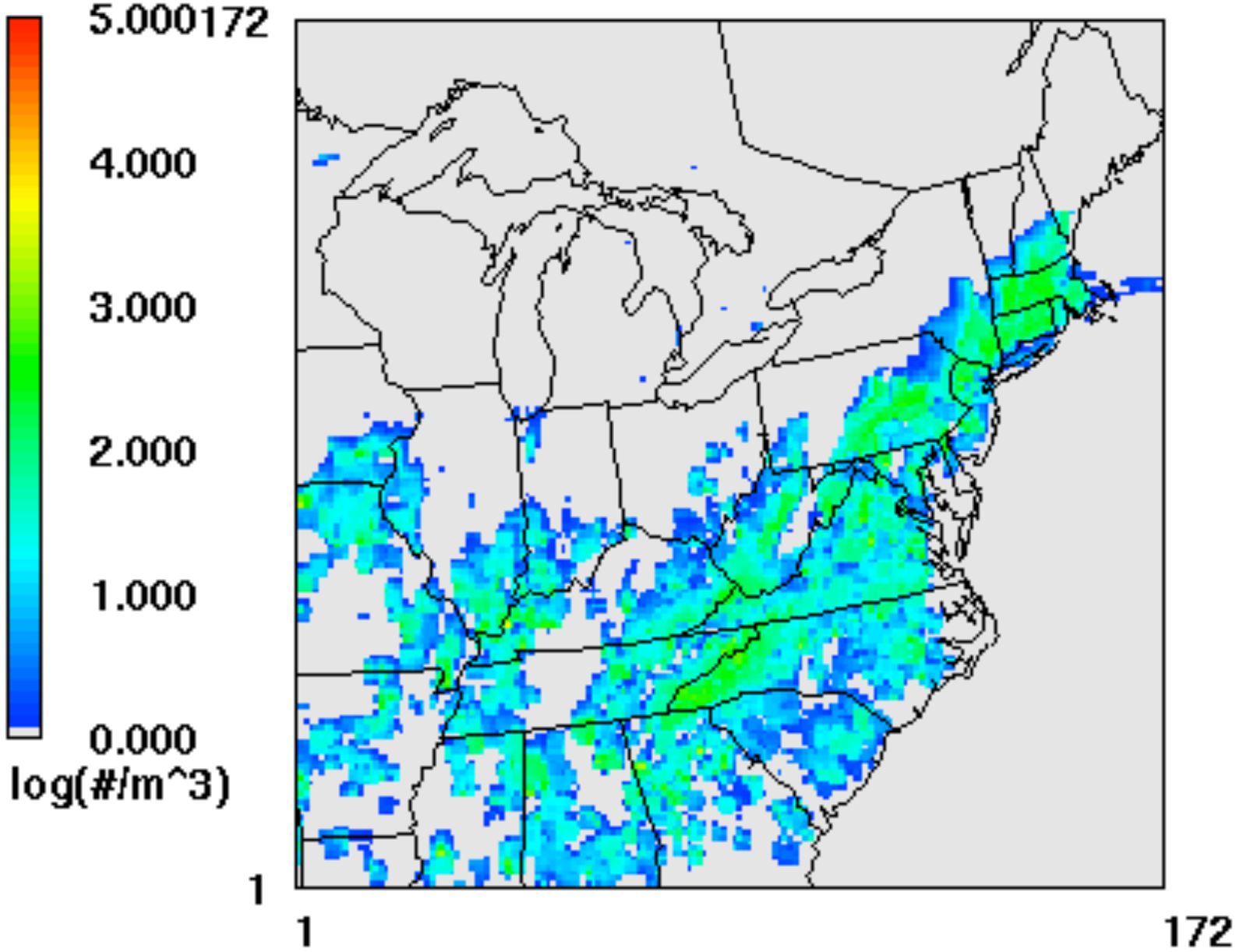
Pollen model results:
Birch emission flux and airborne concentrations





Pollen Concentrations

April 2002

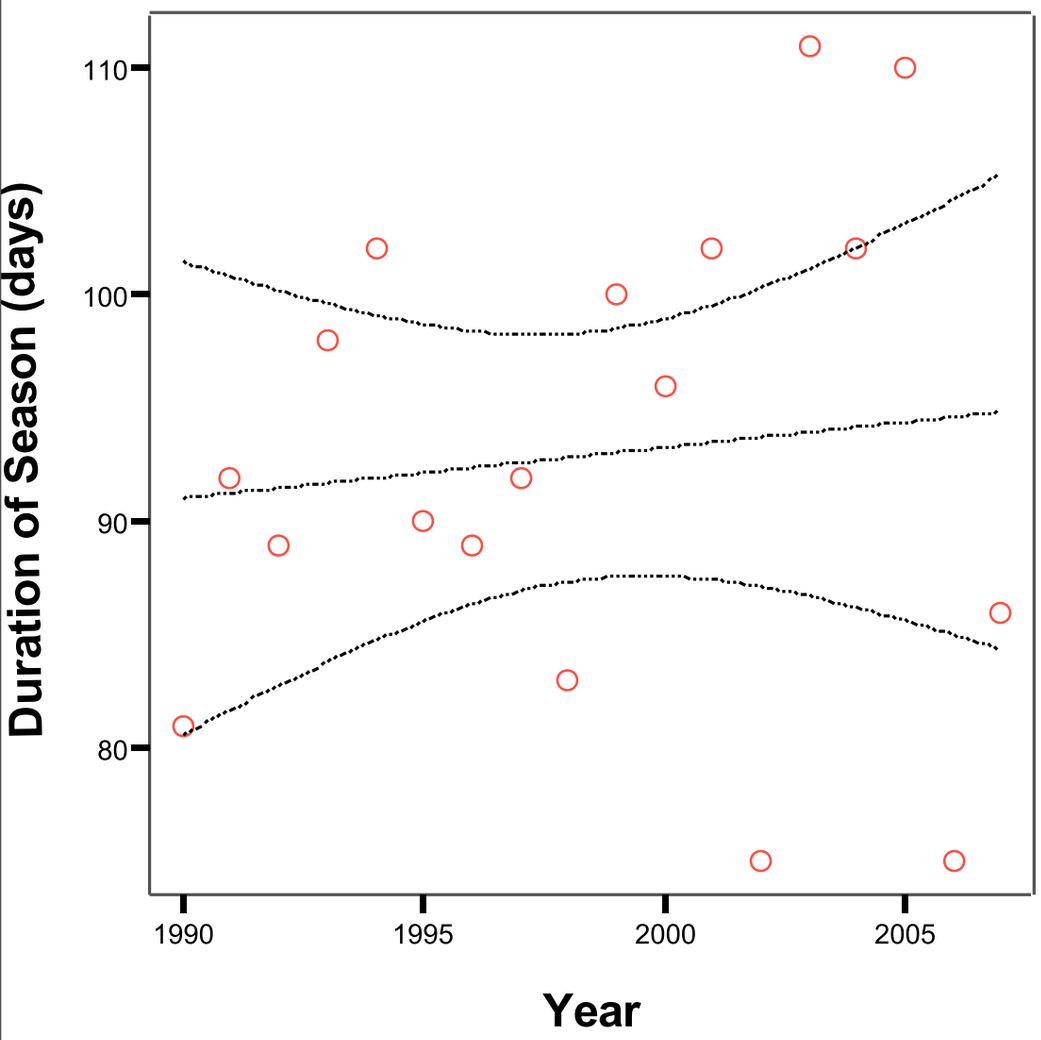


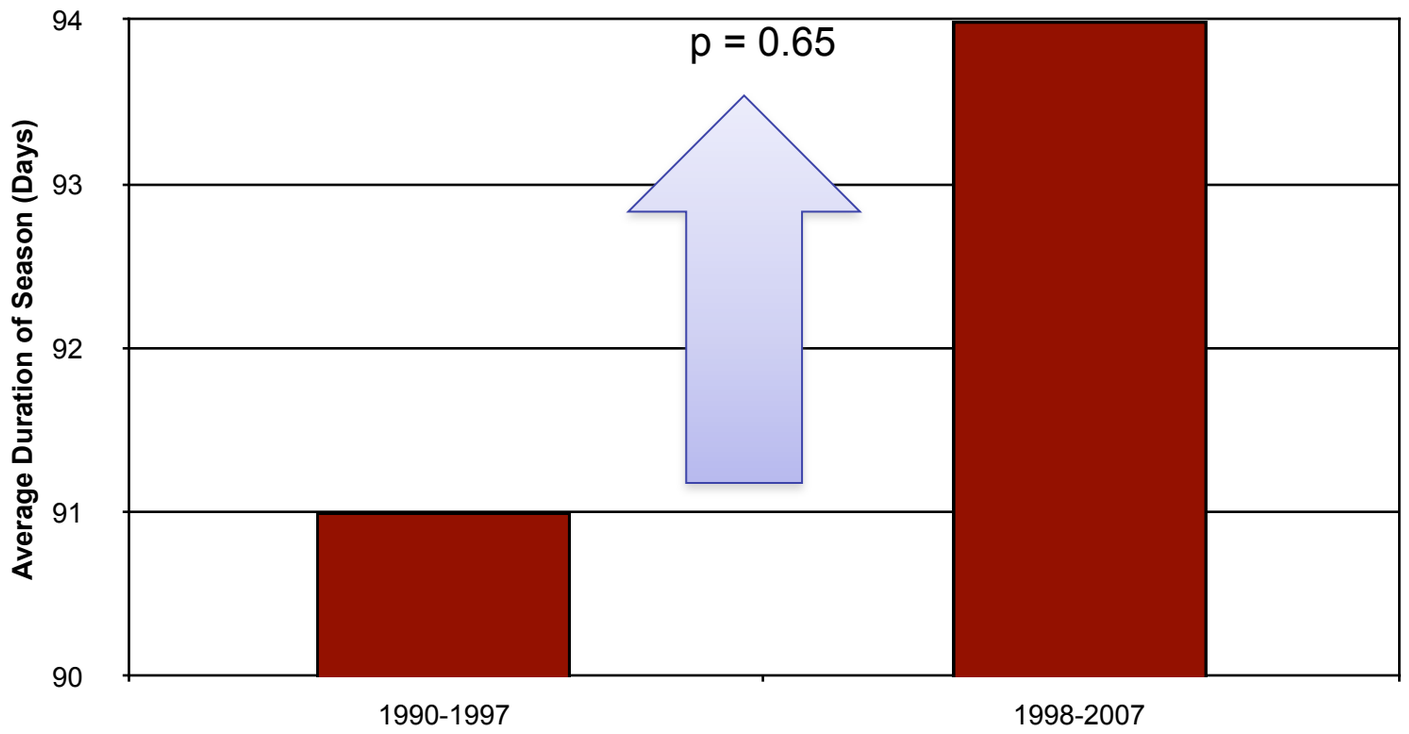
April 15,2002 0:00:00
Min= -9.000 at (114,11), Max= 3.586 at (43,52)

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Pollen Trends in New Jersey: Duration

AAAAI 2009

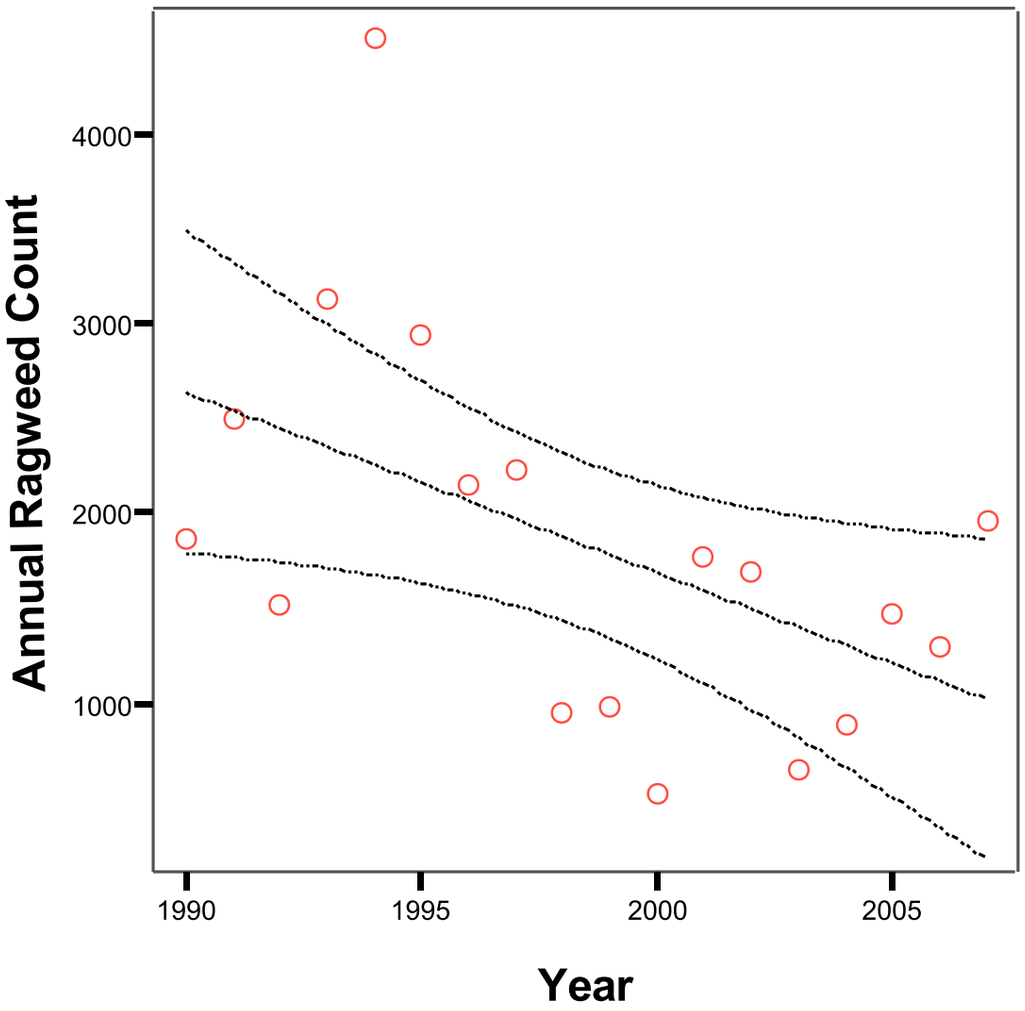




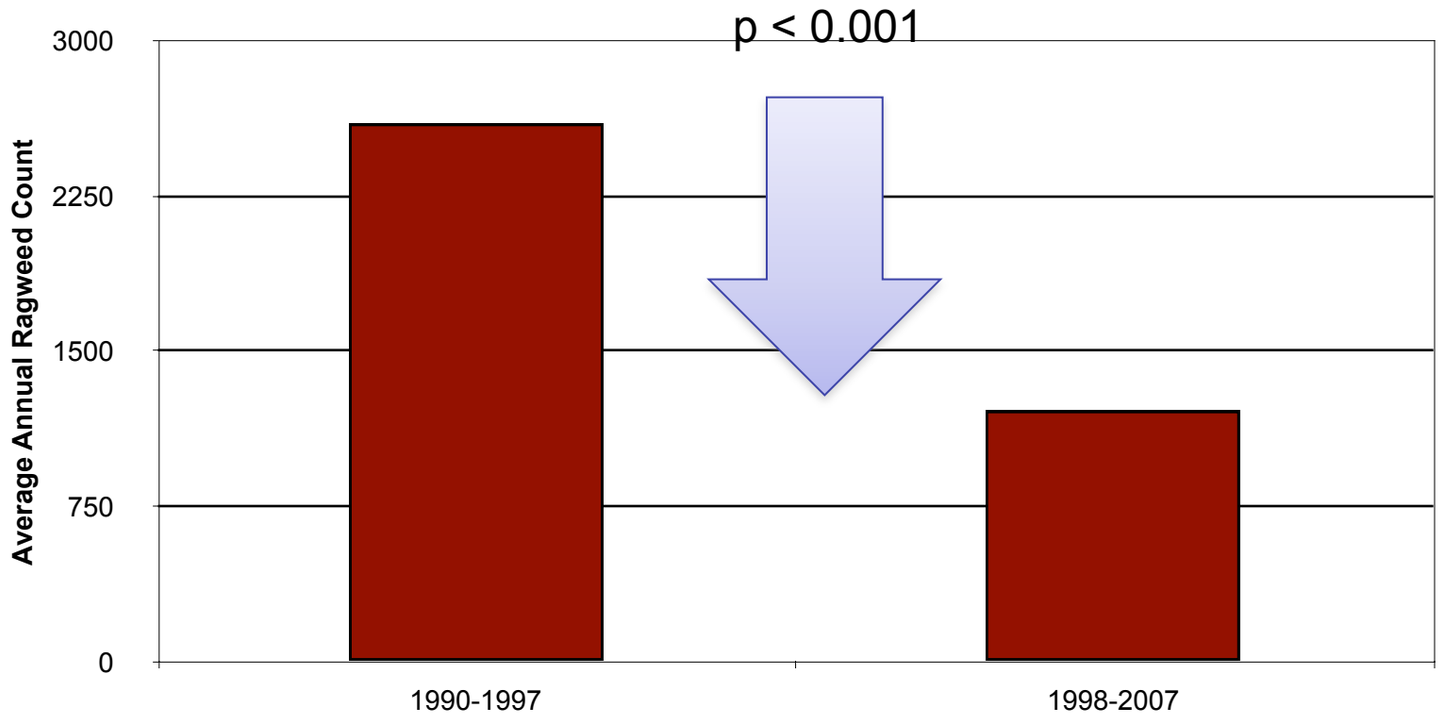
The average duration of Ragweed season has increased from 90 days to 94 days over the last 18 years

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

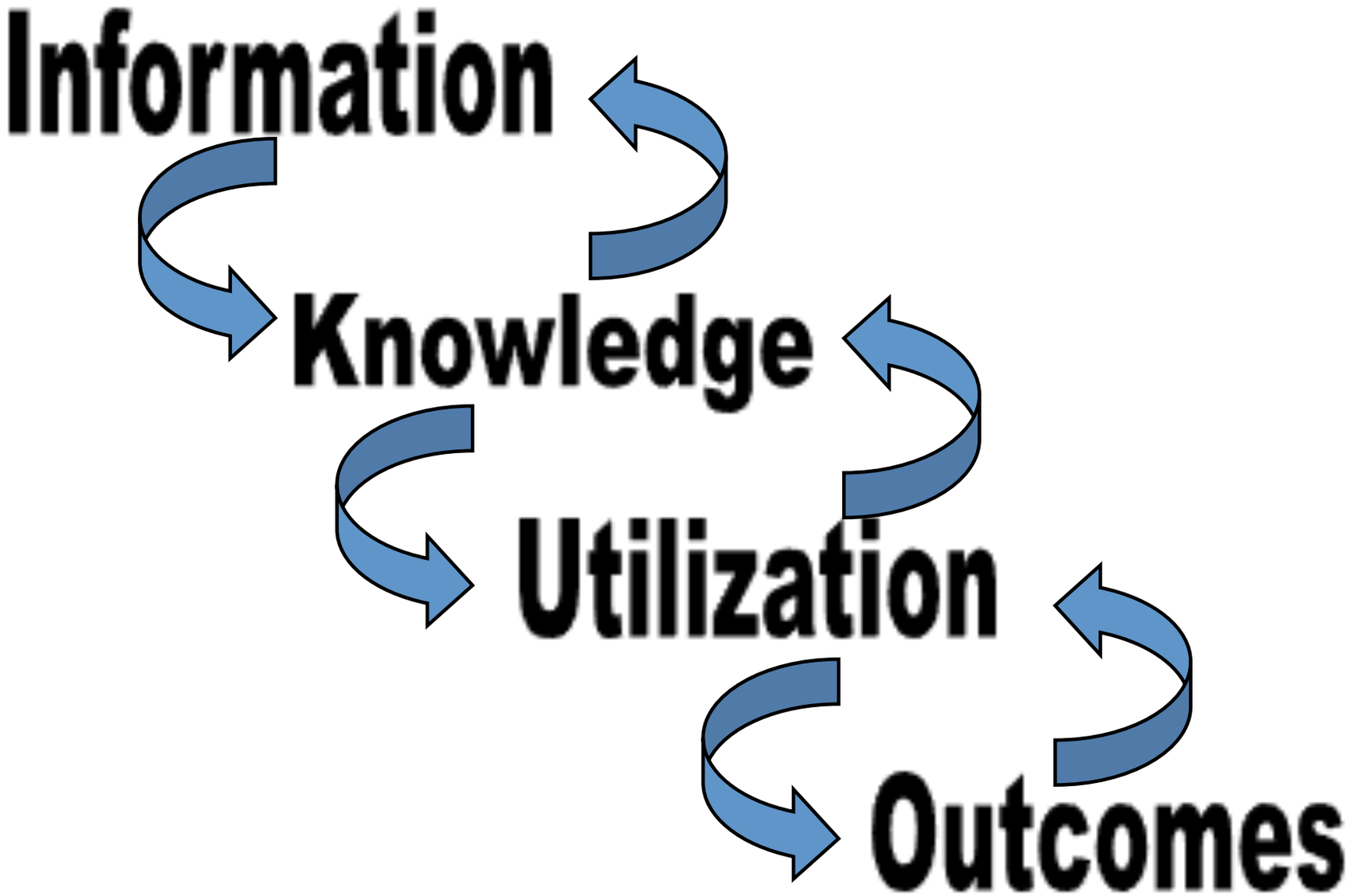
Requires Awareness/Knowledge

- 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



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Adaptation = Preparedness

Community Awareness

NJDEP & NJDHSS

Allergy Alerts

Asthma Alerts

Ozone Alerts

UV Alerts

