



**Integration of Airborne Aerosol Prediction Systems and
Vegetation Phenology to Track Pollen for Asthma Alerts in
Public Health Decision Support Systems**

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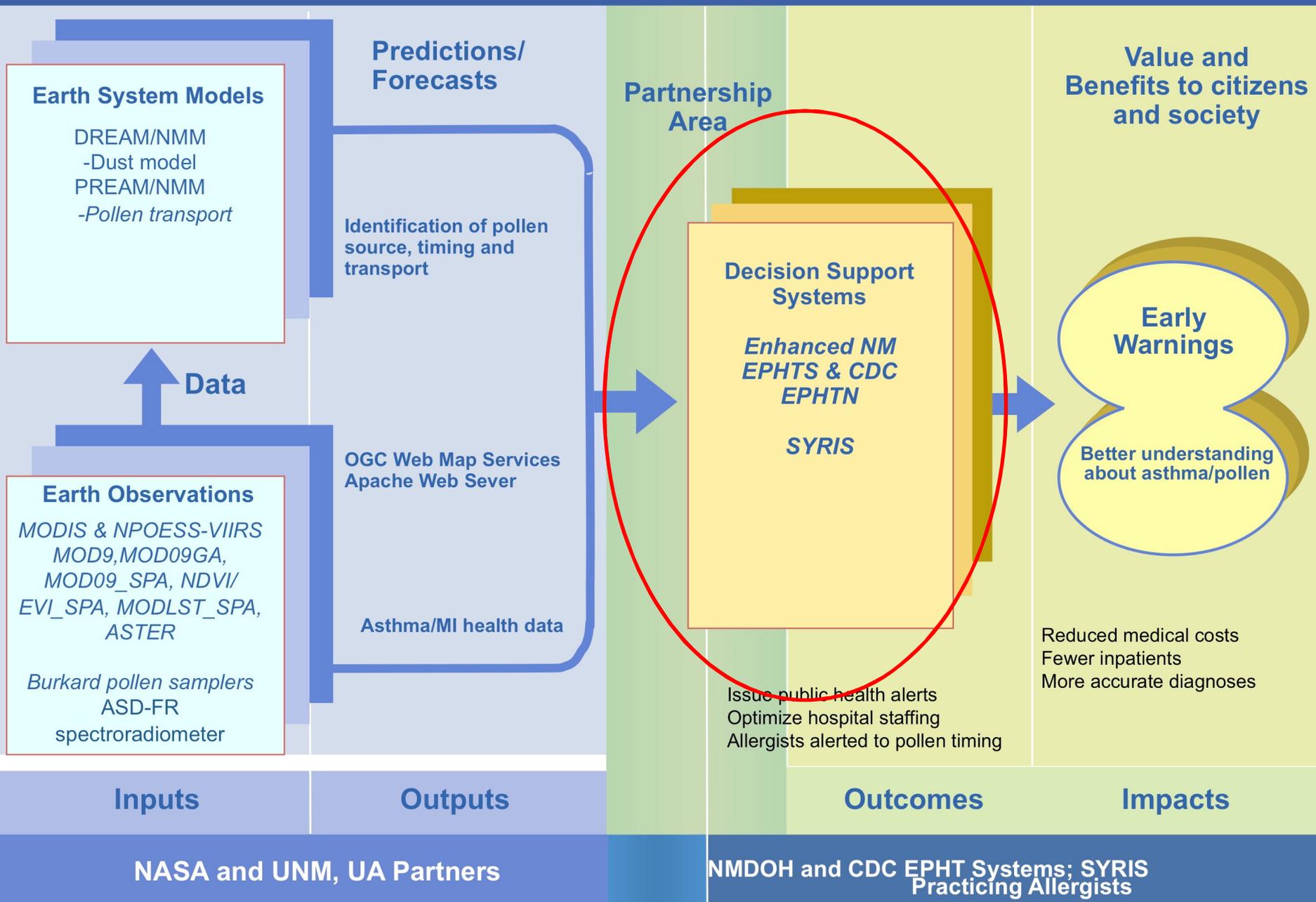
ARES Corporation

Peter K. Van de water California State University, Fresno

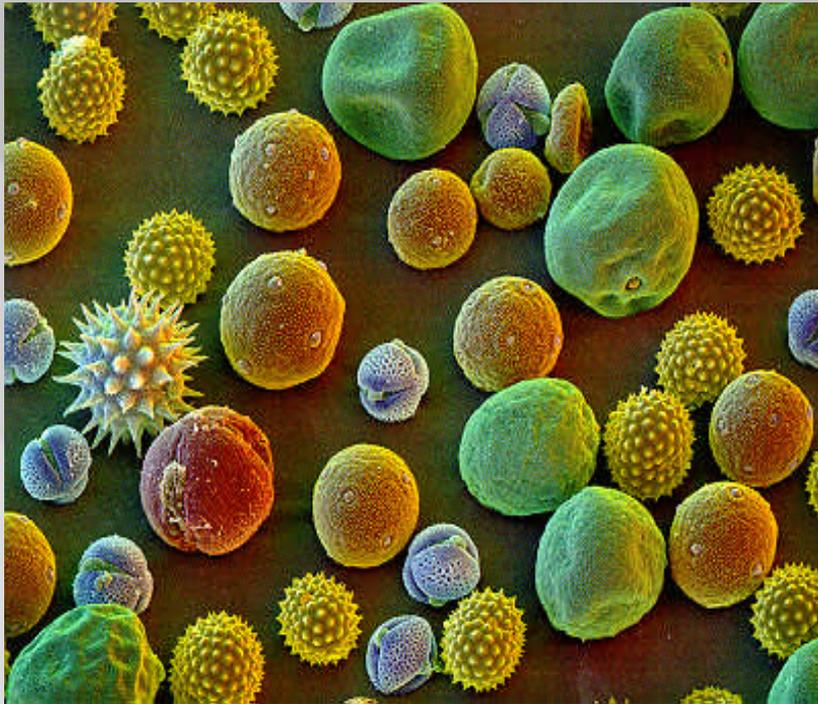
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Theresa Crimmins & Jake Weltzin USGS National Phenology Network

Tracking Pollen for Asthma Alerts in Public Health DSS (Luvall)



Top pollen-producing species



Los Alamos

juniper
sagebrush
pine
Alternaria*
oak
grass
ragweed
goosefoot
Cladosporium*
Myxomycete*
cottonwood
mulberry
aster
elm

Albuquerque

mulberry
juniper
ash
goosefoot
cottonwood
grass
sagebrush
pine
elm
aster
ragweed
sycamore
oak
willow

*fungal / slime mold spores



Burkard Spore Trap





PollenCast for Tucson, Arizona



Tree

Grass

Weed

Reported Levels

Tree pollen count for today, 03/31/08:

Moderate

[See past pollen counts for Tucson, Arizona](#)

Forecasted Levels

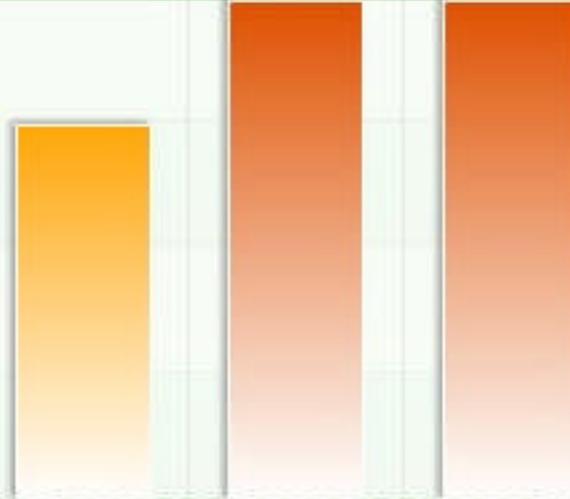
VERY HIGH

HIGH

MEDIUM

LOW

NO ACTIVITY



Forecast not available



Limitations of Pollen Sampling

- Lack of stations
- Count frequency & reporting lag time
- Different sampling instruments Rotorod Sampler/Burkard Spore Trap
- Only indentifiable pollen “grains”
- Expertise in counting/indentification
- Refusal to release sampling information-*“We do not reveal the sources for our data for privacy and proprietary, competitive reasons. Some pollen counts are conducted privately, and are not meant to be broadcast to the public”*



Pollen Timing

- *Growing Degree Days* - the average of the daily maximum and minimum temperatures compared to a base temperature, T_{base} , (usually 10 °C)
- Response to length of day
- Species differences
- Climate – Variability in Precipitation
- Weather



Airborne Dust Simulations and Forecasts

University of Arizona

With NASA Earth System Science & University of New Mexico

Department of Atmospheric
Sciences

Phoenix dust storm – 7 June 2006

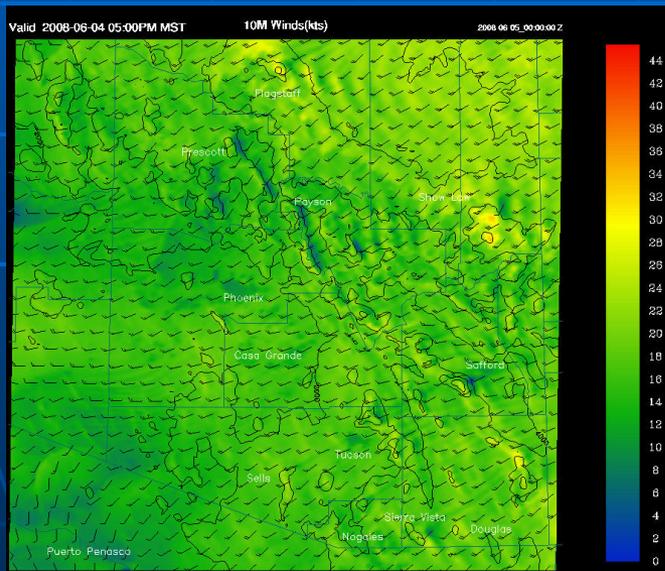
Photo by Robb Schumacher Arizona Republic



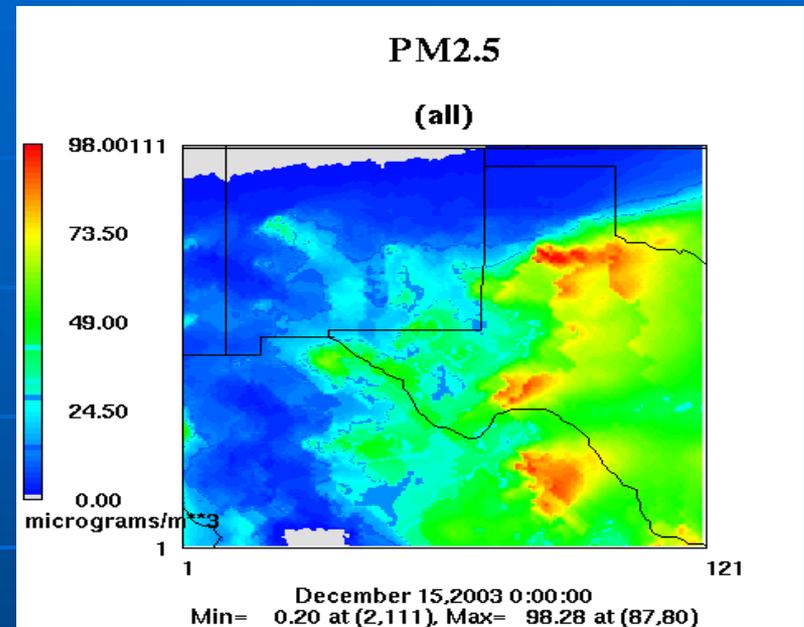
Weather - DREAM

Dust REgional Atmospheric Modeling (DREAM) system

- MM5
- WRF



UA WRF 10-m wind forecast



S. Nickovic et al., A model for prediction of desert dust cycle in the atmosphere, *JGR* **106**, 18113–18129 (2001) .

Yin et al., Modeling wind-blown desert dust in the southwestern United States for public health warning: A case study, *Atmos. Environ.* **39**, 6243-6254 (2005).

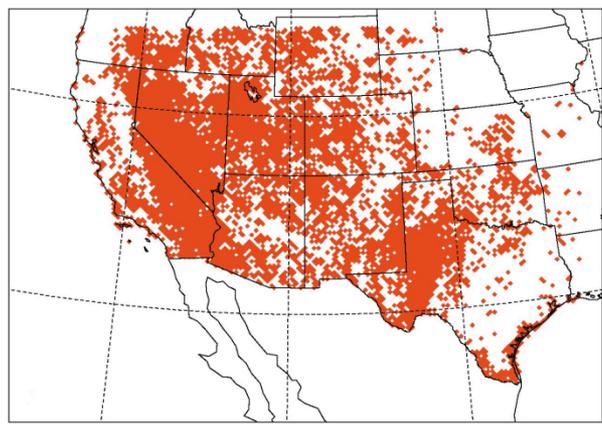
Yin et al., The impact of using different land cover data on wind-blown desert dust modeling results in the southwestern United States *Atmos. Environ.*, **41**, 2214-2224 (2007).

Adapted from Betterton ppt



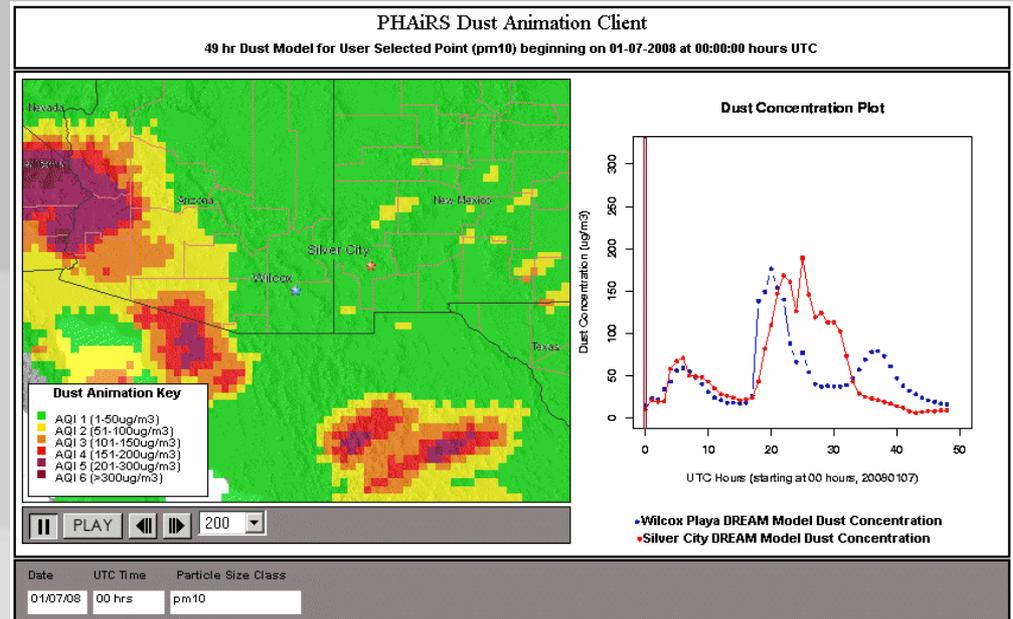
Phenology and Pollen Transport

NASA MODIS data



DREAM - UofA numerical meteorological particulate transport model

Pollen sources derived from **phenological** maps

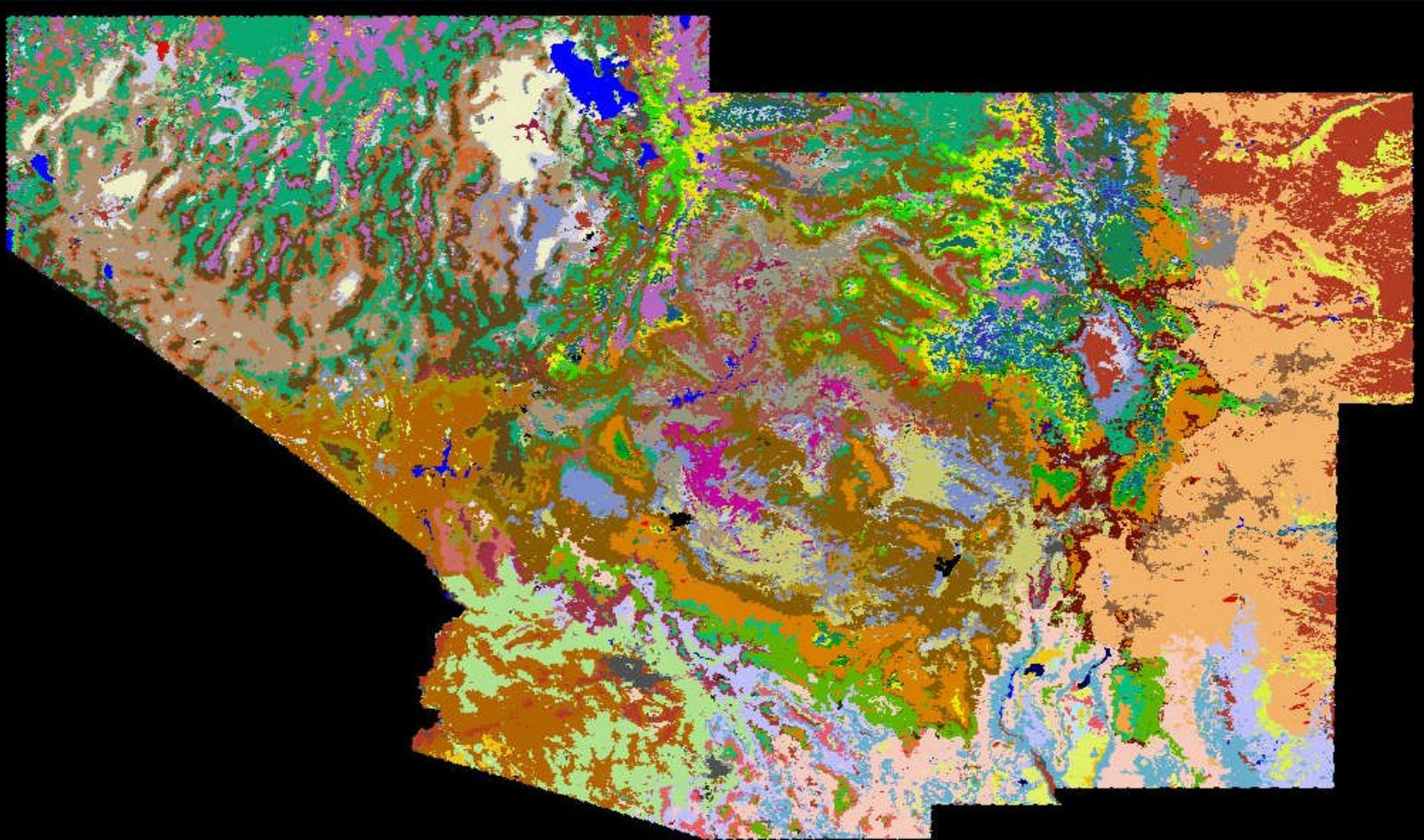


Final Product - predicted concentrations of pollen in time and space



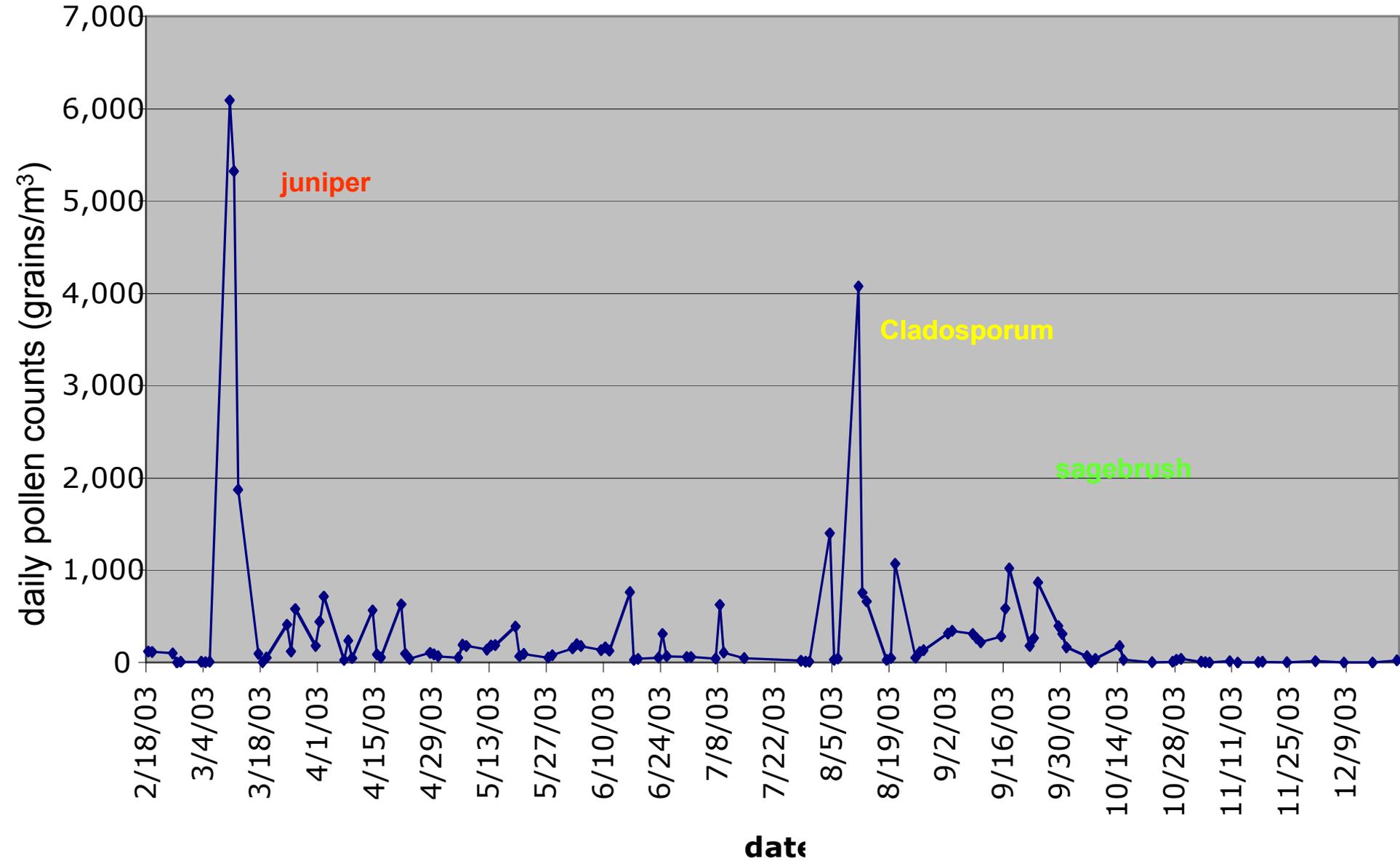
LAND COVER SOURCE

Southwest Regional Gap Analysis Project

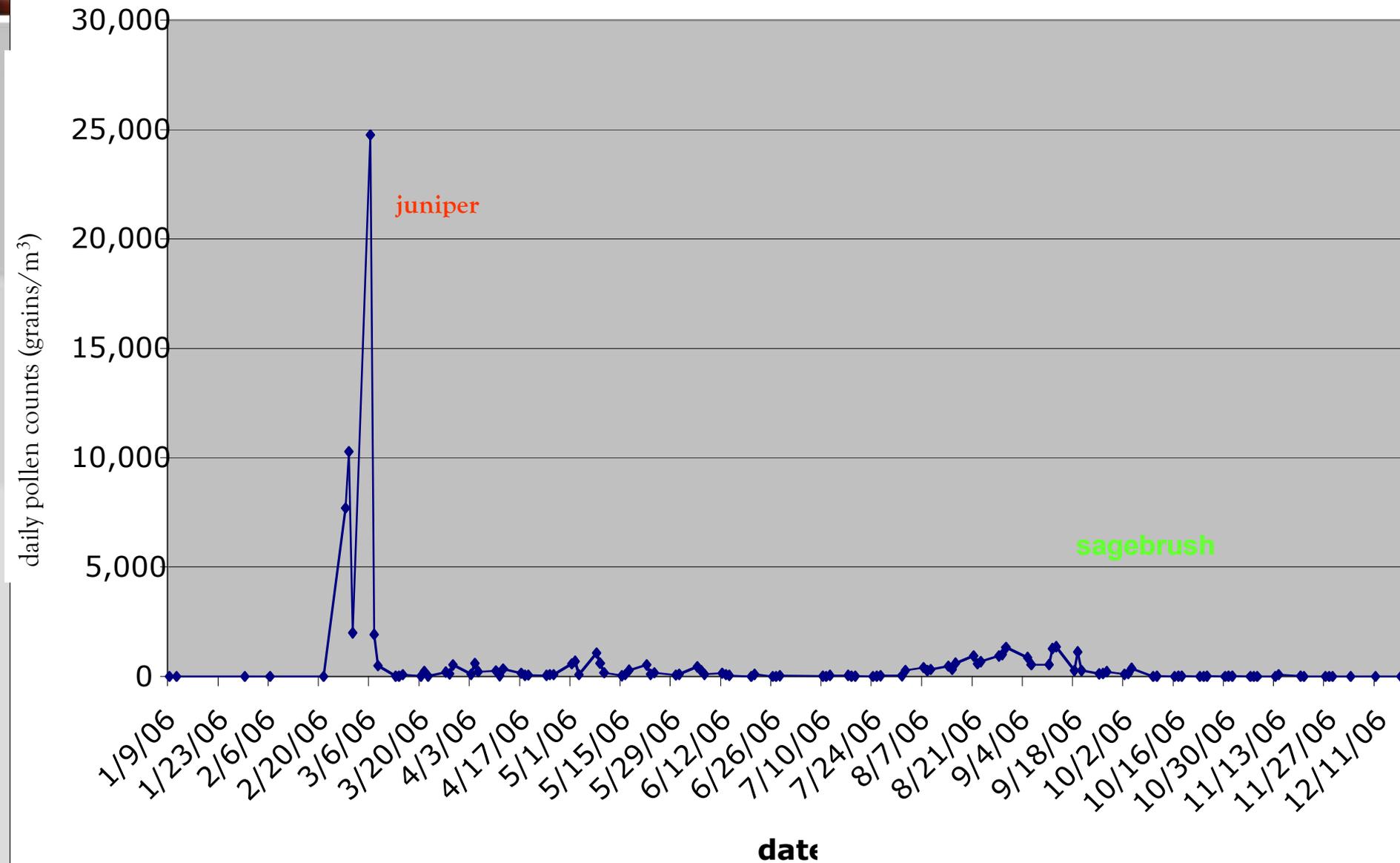


Biodiversity for AZ, CO, NV, NM, UT

2003 Los Alamos daily pollen



2006 Los Alamos daily pollen



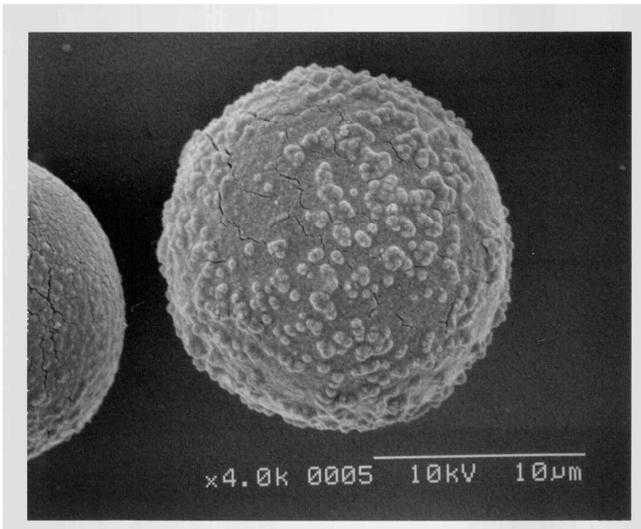
Pollen Strategy

- Select *Juniperus* spp. of Interest
- Map Pollen Source
- Estimate Emission on Test Date
- Prepare Model
 - Insert Terrain & Pollen Aerodynamic Characteristics
 - Insert Source Emission
 - Insert Meteorology
- Simulate Downwind Pollen Dispersal
- Evaluate

Juniper Pollen

Good News for Modeling

- Pollination Dec-March, little confusion with other pollinating plants
- *Juniperus* pollens are (mostly) spherical, 20 μ m size



Juniperus virginiana













04/13/2009 14:11



04/13/2009 15:05

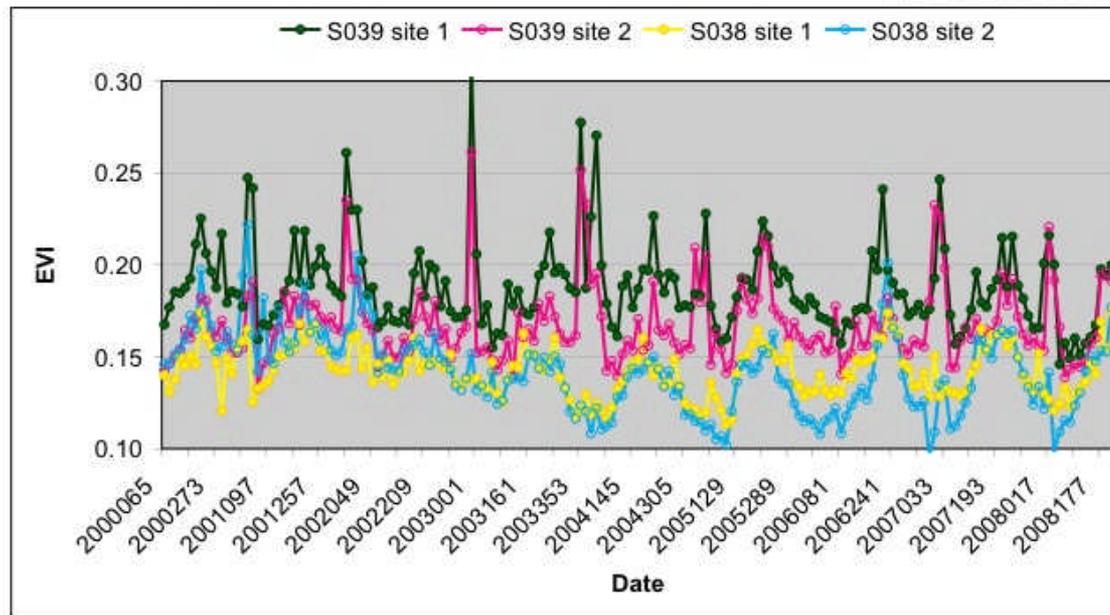


Spectral characteristics of male juniper canopies at different bud density levels



Density level	Bud density (g/m ²)
1	204.2
2	190.0
3	176.9
4	164.9
5	151.1
6	136.2
7	115.8
8	92.9
9	45.9
10	0.0

MODIS Juniper Time Series



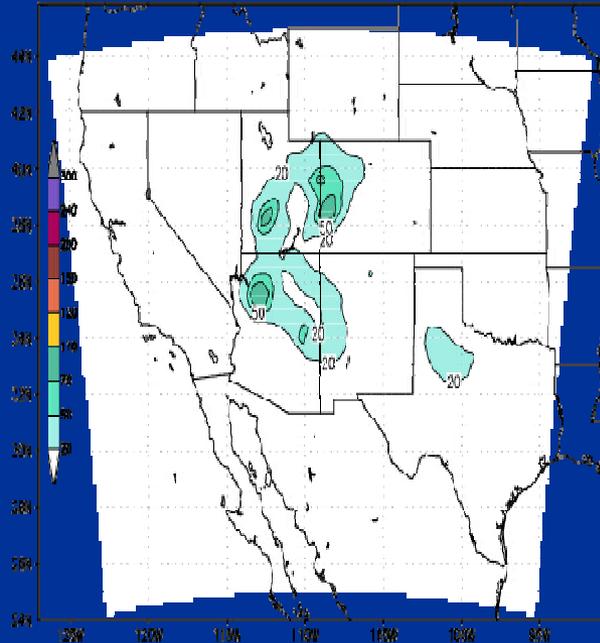
Enhanced Vegetation

70-90% density

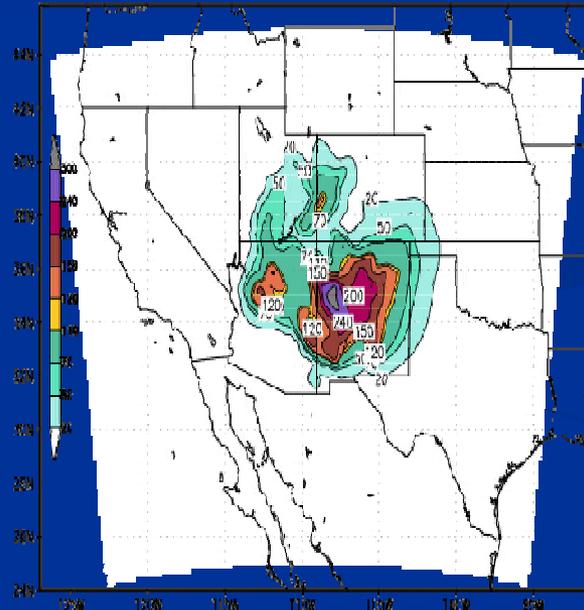
Juniper Pollen

Near-surface concentration (Nm³)

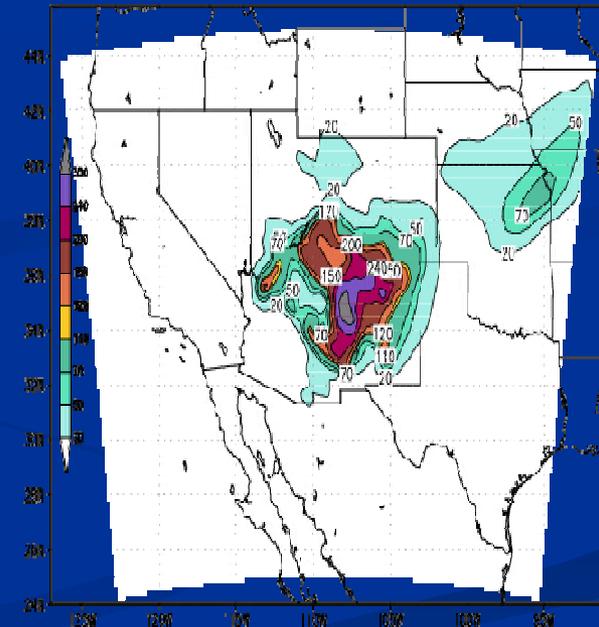
PREAM



6 March 2006



9 March 2006



11 March 2006

Welcome to the New Mexico EPHT Mapping Applications Page

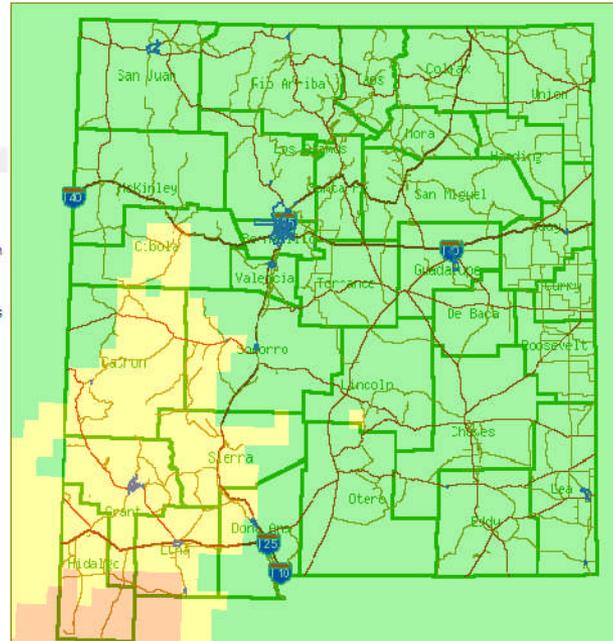


How to use this map

The layers that you have requested to map are listed below. To add them to the map click 'add to map'. When you first add your EPHT query layer it will appear above the other layers in your map. You can use the arrowed buttons beside each layer in the table of contents to move layers up and down in the list for viewing. Navigation controls for the map are just below the map. Hovering over any of the controls gives you directions for their use. You must have popups enabled in your web browser in order to be able to query features in the map. You can use the small locator map above to zoom on the map in addition to using the zoom button below the map, just click and drag.

Map Layers from: your EPHT data search

DREAM dust output PM2.5 -
Classified 24-Hr Mean 2009-04-11T00:00:00Z **add to map**



lon: lat:

Table of Contents

1	<input checked="" type="checkbox"/>		DREAM dust output PM2.5 - Classified 24-Hr Mean 2009-04-11T00:00:00Z
		<ul style="list-style-type: none"> Excellent Good Moderate Unhealthy for Sensitive Groups Unhealthy Very Unhealthy Hazardous 	
2	<input checked="" type="checkbox"/>		Water System Boundaries
			Water System Boundaries



ephtracking.cdc.gov

National Environmental Public Health Tracking Network - Windows Internet Explorer

http://ephtracking.cdc.gov/showHome.action

File Edit View Favorites Tools Help

Convert Select

National Environmental Public Health Tracking N...

Page Tools

CDC Home



Centers for Disease Control and Prevention
Your Online Source for Credible Health Information

National Environmental Public Health Tracking Network

Home About Tracking Program State & Local Tracking Portals Indicators & Data Secure Portal

Tracking A-Z Index A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

GLOSSARY CDC A-Z TRACKING A-Z



Environmental causes of chronic diseases are hard to identify. Measuring amounts of hazardous substances in our environment in a standard way, tracing the spread of these over time and area, seeing how they show up in human tissues, and understanding how they may cause illness is critical. The National Environmental Public Health Tracking Network is the start of that system.

The National Environmental Public Health Tracking Network is a system of integrated health, exposure, and hazard information and data from a variety of national, state, and city sources. On the Tracking Network, you can explore information and view maps, tables, and charts about health and environment across the country. [Learn more about tracking.](#)

Page Options

Text Size: - +

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Tracking Hot Topics

- Healthy Homes
- National Environmental Public Health Conference: Oct 26-28, Atlanta

Resources

- Communication Features
- Document Library
- Quick Reports
- Technical Notes

Contact Us

Environments



Health Effects



Info by Location



Internet | Protected Mode: On

100%

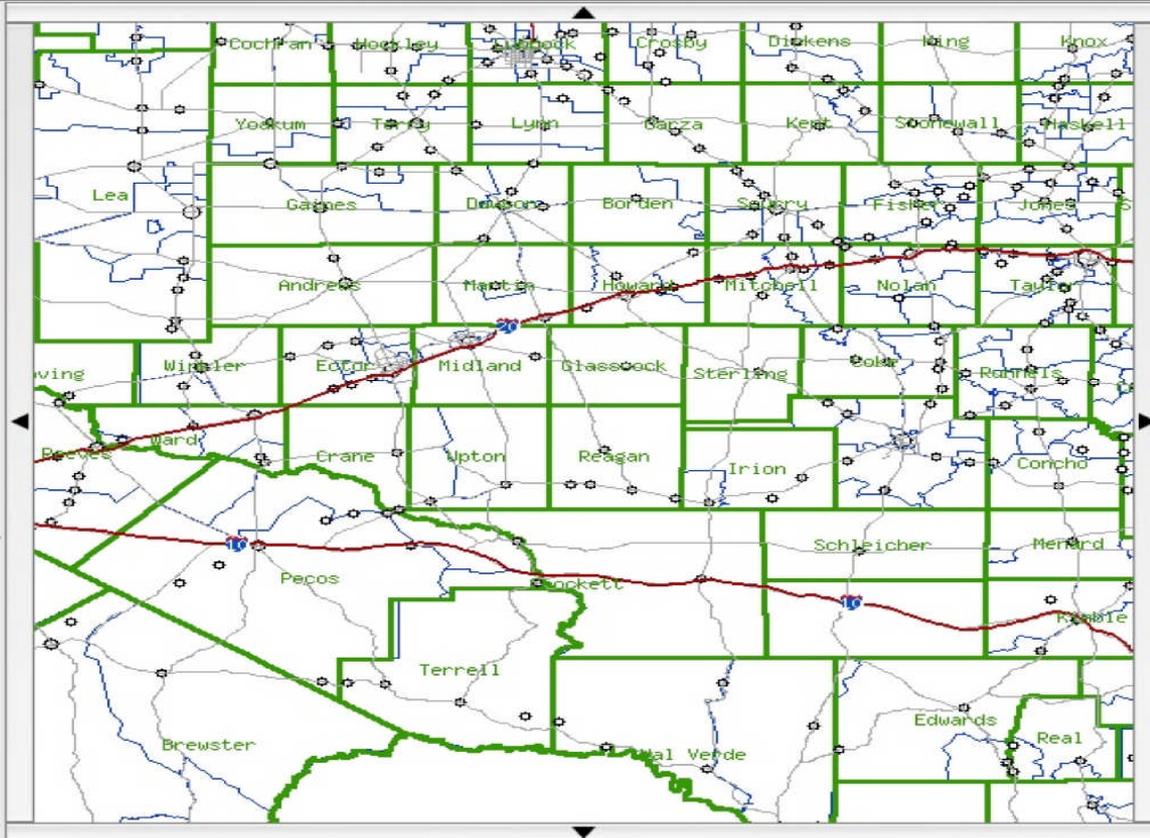
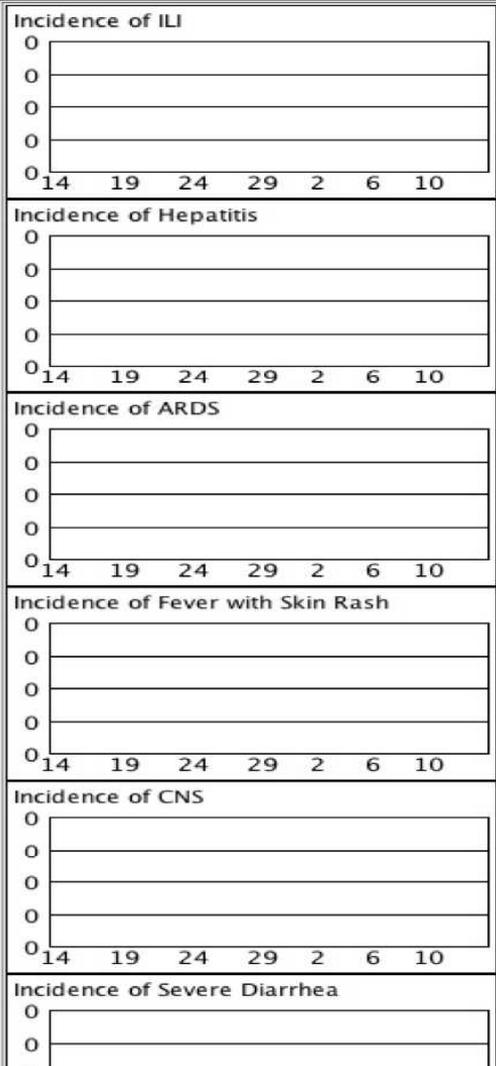
Syndrome Reporting Information System™



The SYRIS system provides:

- Real-time, Syndrome-Based Reporting Tool
- 2-Way Real-time Communication System - 24/7
- Automated, Immediate 'Alerts' to Public Health Officials (PHO's)
- Health 'Alerts' to Vets, Doctors, Hospitals, & Schools
- Web-Based Tool for Easy Syndrome Entry and Communication
- Geographic Mapping of Disease Outbreaks
- Connects All Health Care Providers to a Common Database
- Instantaneous Geographic Mapping of Disease Outbreaks
- Full compliance with the requirements of Public Law 109-417 (the Pandemic and All-Hazards Preparedness Act)





Map Human Veterinary EMS AC

Export Raw Data

Aug 12, 2008 11:18:39 AM

Log Out

GIS will be used by Public Health Officials for interactive display of PREAM pollen maps, syndrome reporting and alerts

Conclusions

- ✓ The residual signal indicates that the pollen event may influence the seasonal signal to an extent that would allow detection, given accurate QA filtering and BRDF corrections. MODIS daily reflectances increased during the pollen season.
- ✓ The DREAM model (PREAM) was successfully modified for use with pollen and may provide 24-36 hour running pollen forecasts.
- ✓ Publicly available pollen forecasts are linked to general weather patterns and roughly-known species' phenologies. These are too coarse for timely health interventions. PREAM addresses this key data gap so that targeting intervention measures can be determined temporally and geospatially.
- ✓ The New Mexico Department of Health (NMDOH) as part of its Environmental Public Health Tracking Network (EPHTN) would use PREAM a tool for alerting the public in advance of pollen bursts to intervene and reduce the health impact on asthma populations at risk.
- ✓ SYRIS provides direct feedback *from* and *to* the health community.

