NPDN
National Plant Diagnostic Network

Who we are, What we have done, What we need to do

Richard Bostock
Professor and Executive Director, NPDN
Department of Plant Pathology
University of California, Davis

FADI Round Table
Washington , D.C.
June 12, 2012

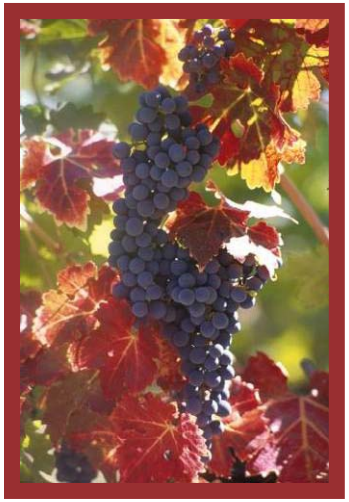
USDA NIFA

UCDAVIS
UNIVERSITY OF CALIFORNIA

NPDN
National Plant Diagnostic Network

Background and mission

What the Network provides and examples



Current issues and what we need to do

The most significant pathway for plant pathogens is live plant imports ***(Palm and Rossman, 2009)*****.**

Plant imports have increased by 51 million per year on average, for the last 43 years (*USDA-APHIS*).

In 2010, <u>2.8 billion plants</u> for planting passed through U.S. plant inspection stations. With current staffing levels, that's about <u>6 seconds</u> per plant!

South San Francisco

USDA APHIS Plant Inspection Facilities

Miami

NPDN
National Plant Diagnostic Network

The Mission

- **Diagnostics – Coordinates efforts of scientists and support staff in federal, state, and university diagnostic labs, and provides resources for salaries and laboratory infrastructure.**

- **Training & Education – Provides resources for diagnostician and first detector education through training programs, workshops, websites, and pest alerts.**

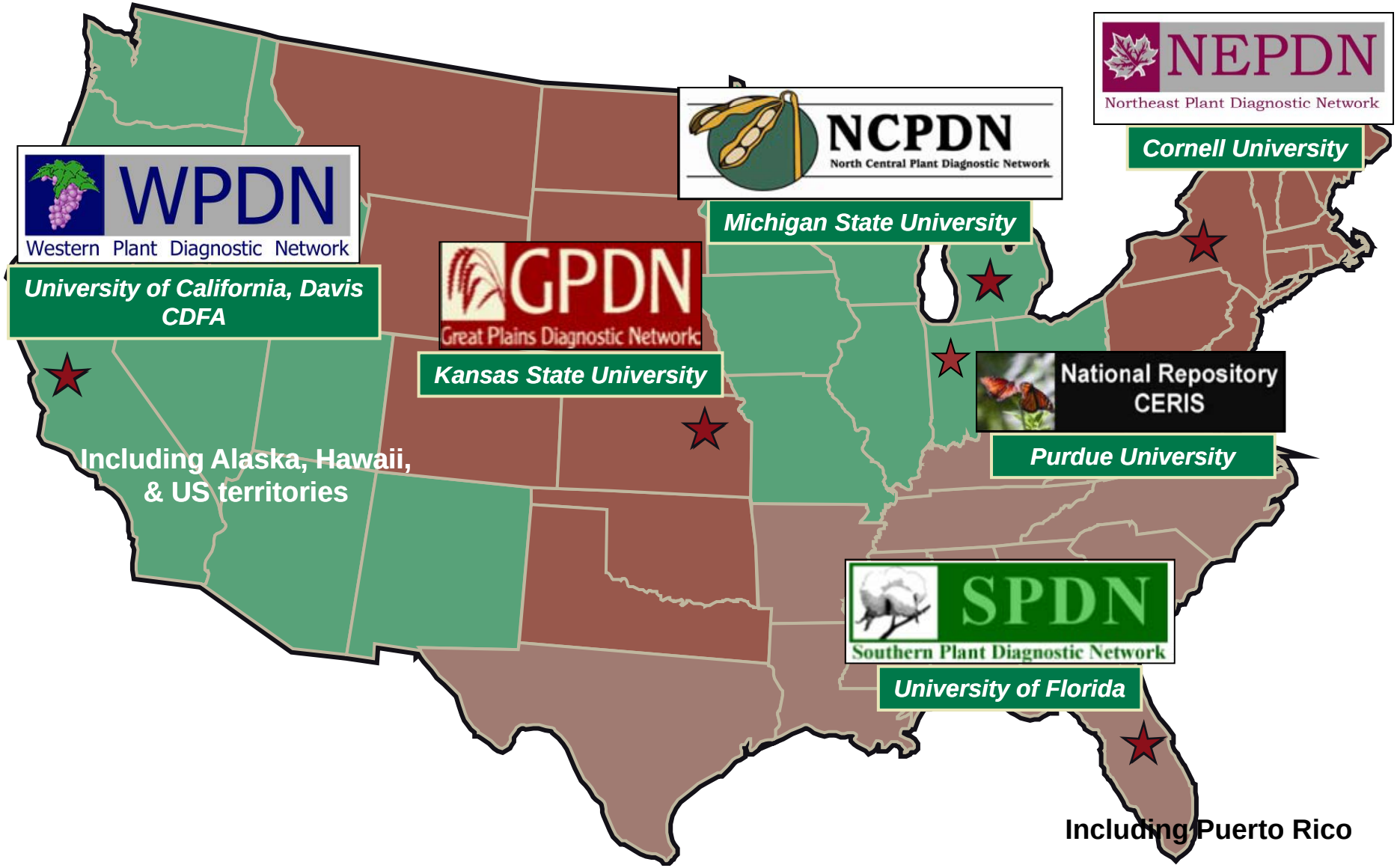
- **Communication and IT – Links "the network" of first detectors and diagnostic labs, and provides harmonized and secure protocols for rapid information exchange during "events".**

No regulatory role or authority

Funding: USDA United States Department of Agriculture National Institute of Food and Agriculture

NPDN
National Plant Diagnostic Network

A consortium of regional networks for protecting U.S. agriculture



WPDN
Western Plant Diagnostic Network

2 sentinel hubs for sub-regional surge protection

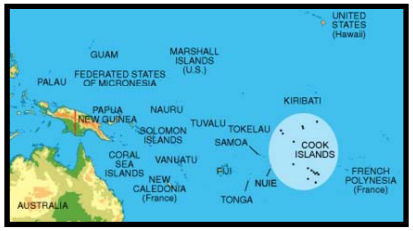
Oregon State University Sentinel Lab

University of Hawaii Sentinel Lab

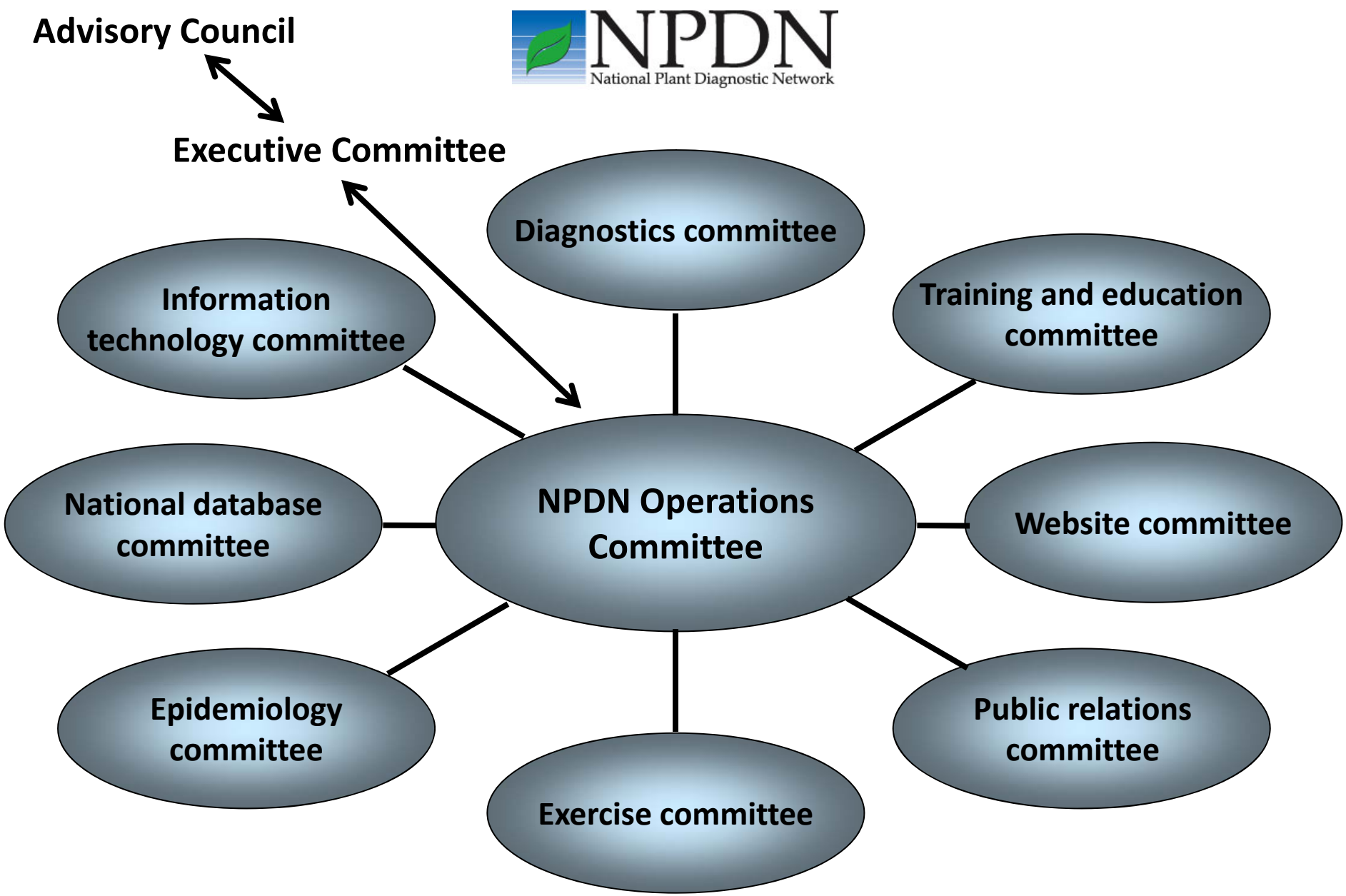
NPDN

CERIS Data Repository

WPDN Regional Center
UC Davis / CDFA



Pacific Territories


Advisory Council
NPDN
National Plant Diagnostic Network
Executive Committee
Diagnostics committee
Information technology committee
Training and education committee
National database committee
NPDN Operations Committee
Website committee
Epidemiology committee
Exercise committee
Public relations committee

NPDN Operations and IT Committees Joint Meeting
Phoenix 2010

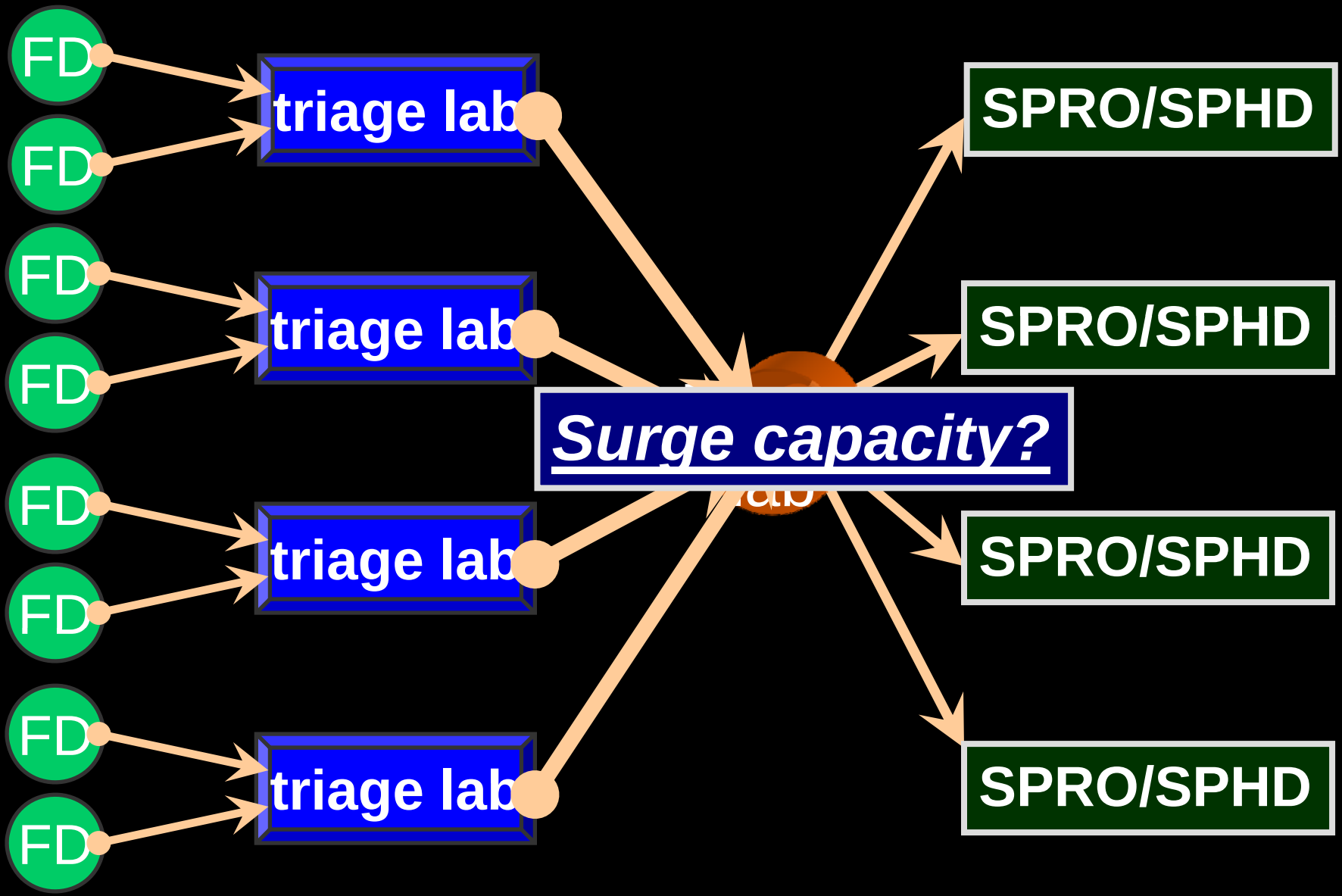
Disease & Pest Management

process

Process must be rapid and accurate to minimize impact

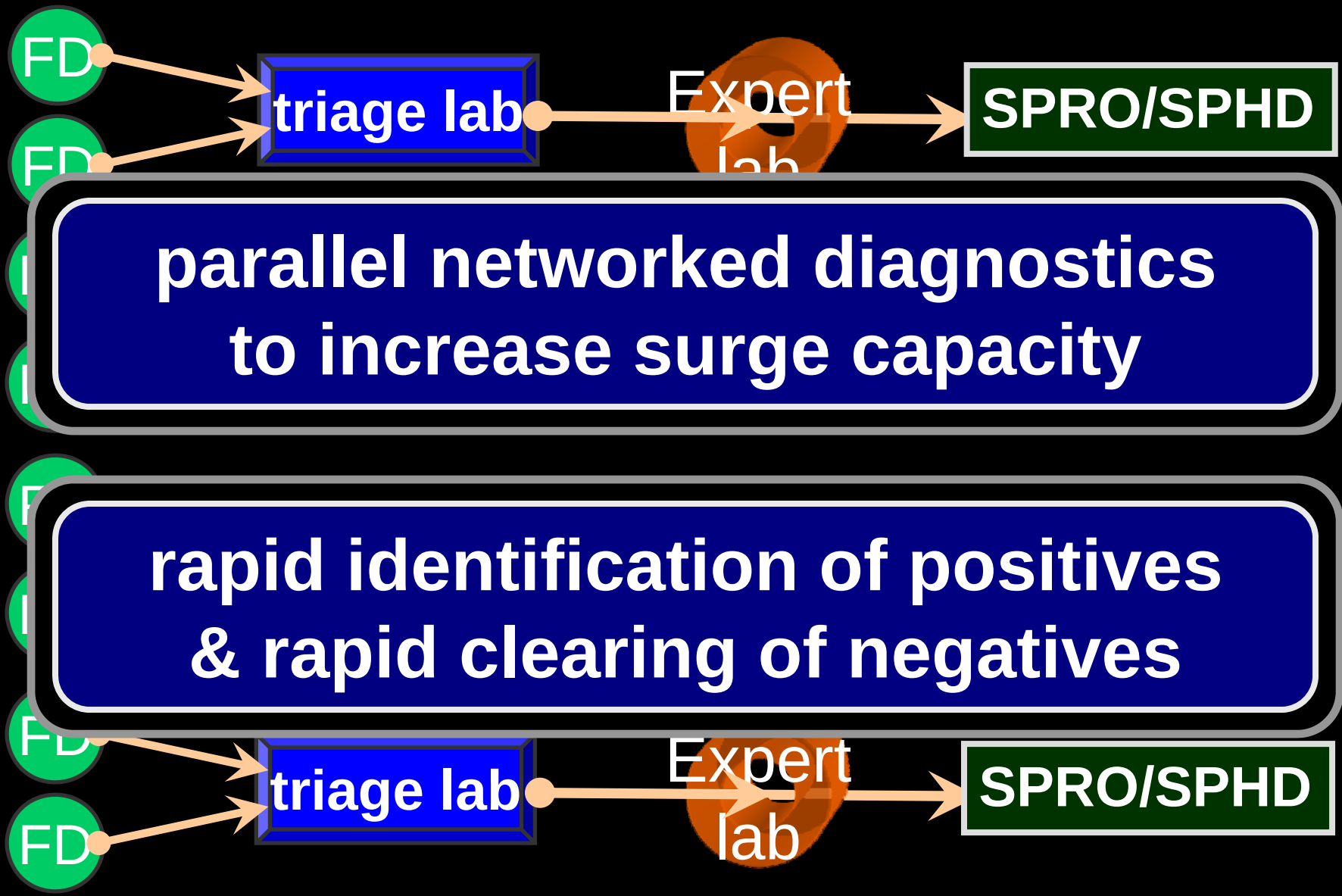
J. Stack, Kansas State Univ.

Diagnostic Process: Previous Model



J. Stack, Kansas State Univ.

Diagnostic Process: NPDN Model



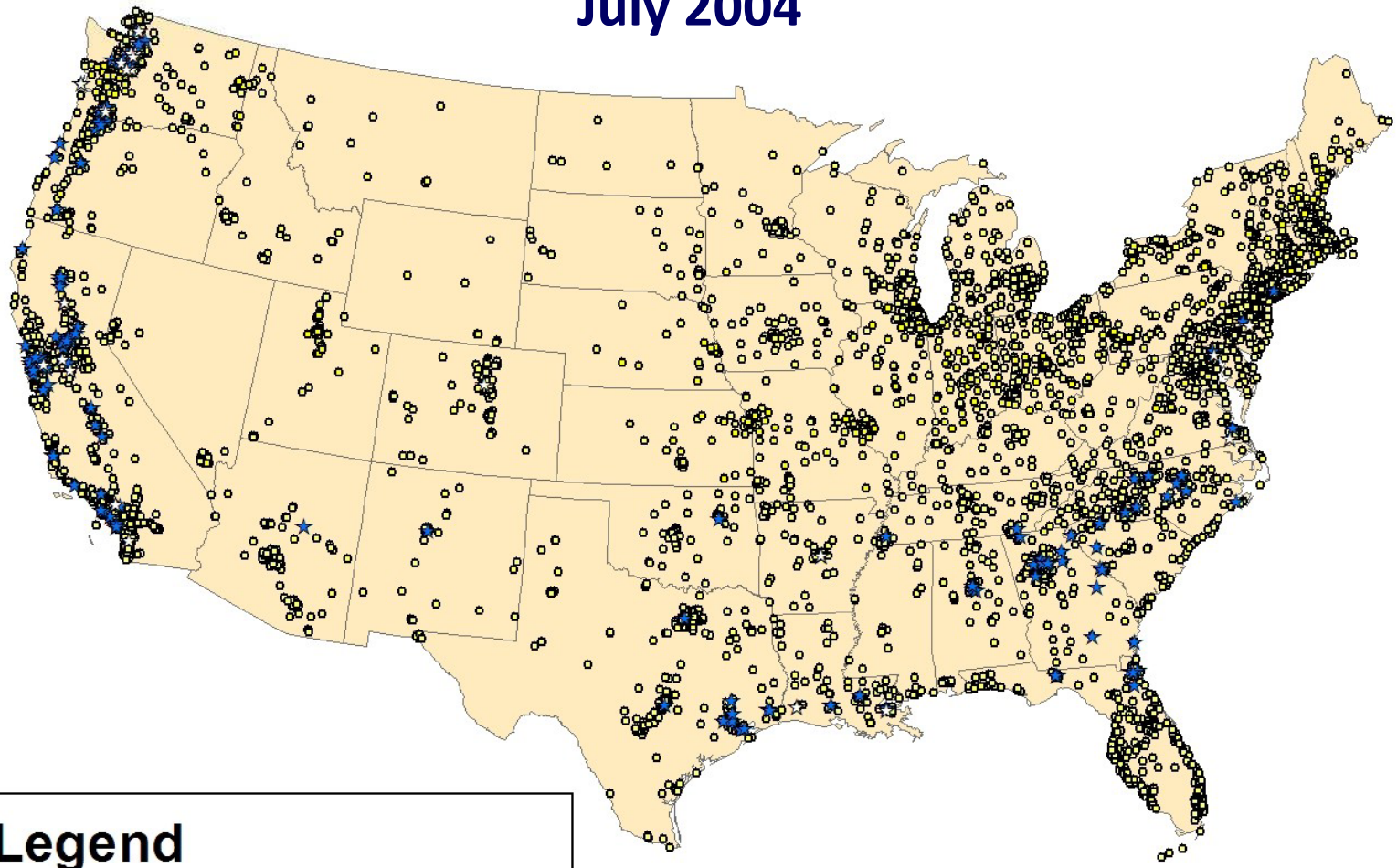
J. Stack, Kansas State Univ.

Sudden Oak Death
Ramorum Blight

Southern California nurseries in 2004

Photos: Jonathan Jones, APHIS-PPQ;
Jennifer Parke, Oregon State Univ.

SOD/*Ramorum* blight trace-forwards and positive detections July 2004



Legend

- ★ Positive Site
- ☆ Hold released
- ∘ Trace forward/back zipcode

- **Infected plants from several California nurseries distributed throughout the U.S.**
- **Hundreds of thousands of samples processed by NPDN labs**

Map: USDA, APHIS, PPQ

Recent Events in CA Nurseries

Rapid communication among multiple NPDN labs enabled response and mitigation

first North American occurrence

The Network Works!

anthracnose on *Phormium*
March 2012

Helleborus

false positive for
Ralstonia solanacearum

NPDN: Diagnostics

Diagnostic resources and support

Web-enabled microscopy

Real-time PCR

And training with APHIS PPQ CPHST on SOD/*ramorum* blight, citrus greening agent, and other high consequence agents

Collaborative diagnostics

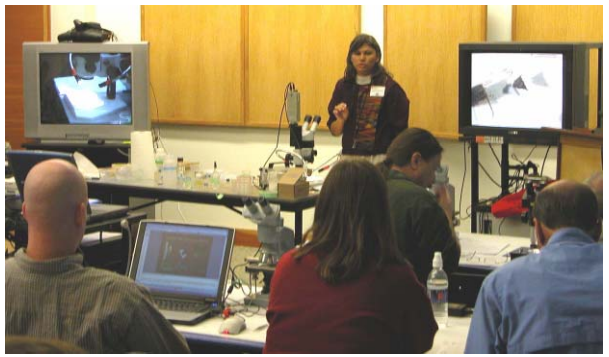
Lab Management Systems and Distance Diagnostics

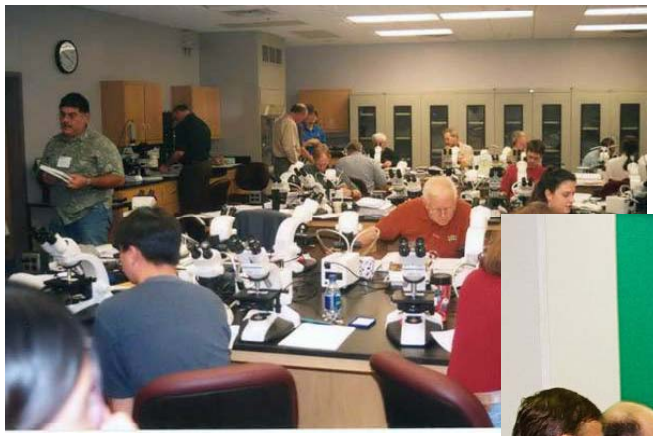
PDIS
Kansas State University

DDDI
University of Georgia

NPDN: Training and Education

Entomology and Insect Vector workshops



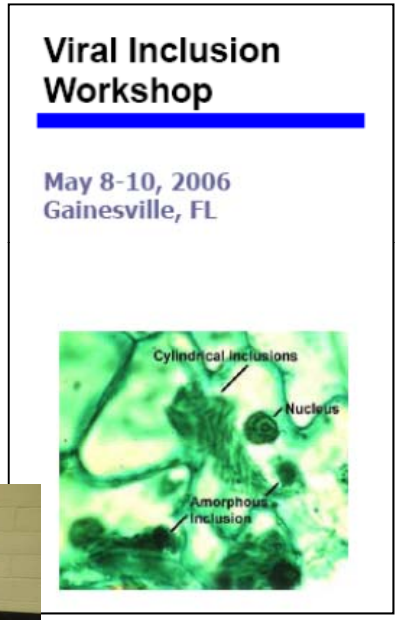


***Coleoptera*, *Homoptera*, thrips, pink hibiscus mealybug**

NPDN: Training and Education

Specialized training for diagnosticians by LGUs and APHIS-PPQ-CPHST

Phytophthora ramorum workshops
USDA-Beltsville



PCR workshop in Amarillo

Techniques workshop – Penn State Univ.

Bioinformatics workshops

NPDN: Training and Education

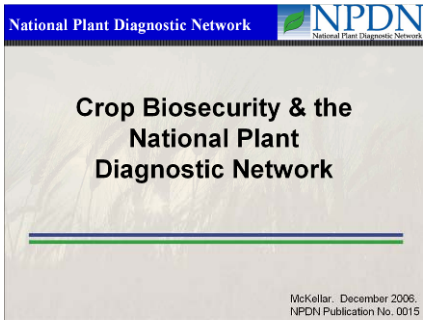
- Diagnosticians
- County Extension Educators/Agents
- Ag Commissioners and staff
- Farm Advisors
- First Detectors

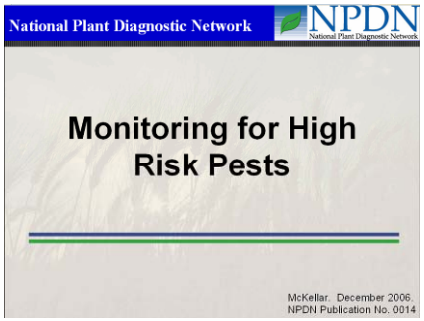
  - Growers
  - Nursery Producers
  - Crop Consultants
  - Ag Biologists
  - Cooperative extension personnel
  - Pesticide applicators
  - Master Gardeners
  - Commercial seed representatives
  - Conservation biologists

A registry of >11,000 first detectors nationally, over 4,700 in the western U.S.

NPDN: Training and Education

First Detector and FD Educators: modules and manuals



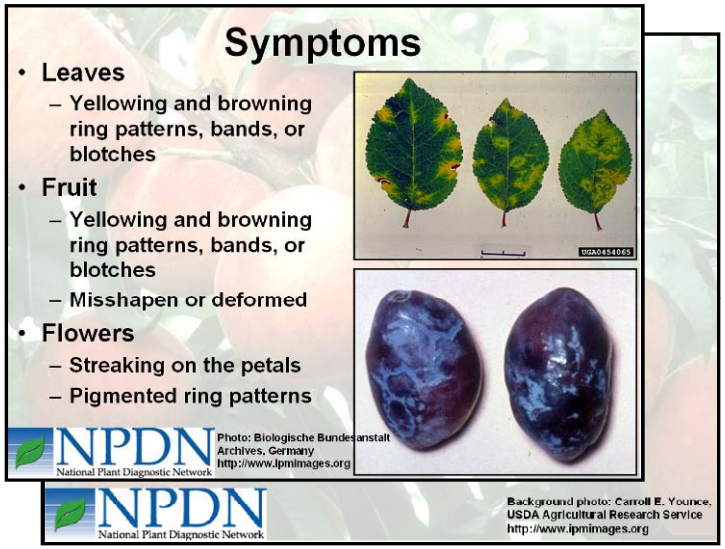


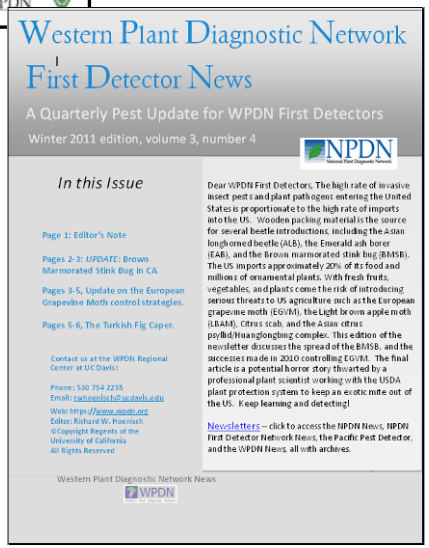
First Detector Certification

Module 1: The Mission of the NPDN and Agricultural Biosecurity
Module 2: Monitoring for High Risk Pests
Module 3: Quality and Secure Sample Submission
Module 4: The Art and Science of Diagnosis: Plant Pathogens and Arthropods
Module 5: First Detector Exercises
Module 6: Effective Photography for Digital Sample Submission

NPDN: Training and Education

Regional Pest Alerts in collaboration with national IPM centers and newsletters





Mil Ulceras Enfermedad de Nogales

Una Enfermedad nueva en California

Por Ricardo Hoenisch, Departamento de Fitopatología, UC Davis

cdfa
CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

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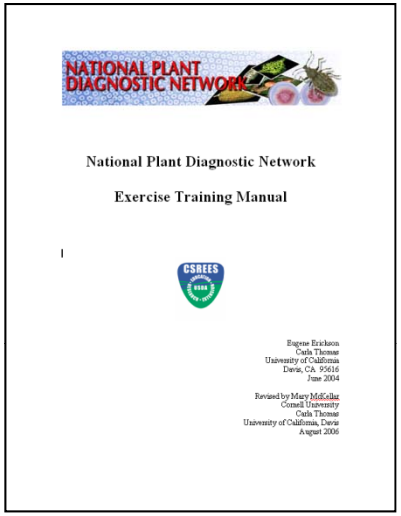
NPDN Scenario Exercises

- **Scenario: A possible high risk pathogen or insect is found by a "first detector"**
- **Several county, state, and federal agencies and labs participate**
- **Practice the protocols for the proper handling of samples in the field and lab**
- **Practice strengthens communication and cooperation for rapid detection and diagnosis**

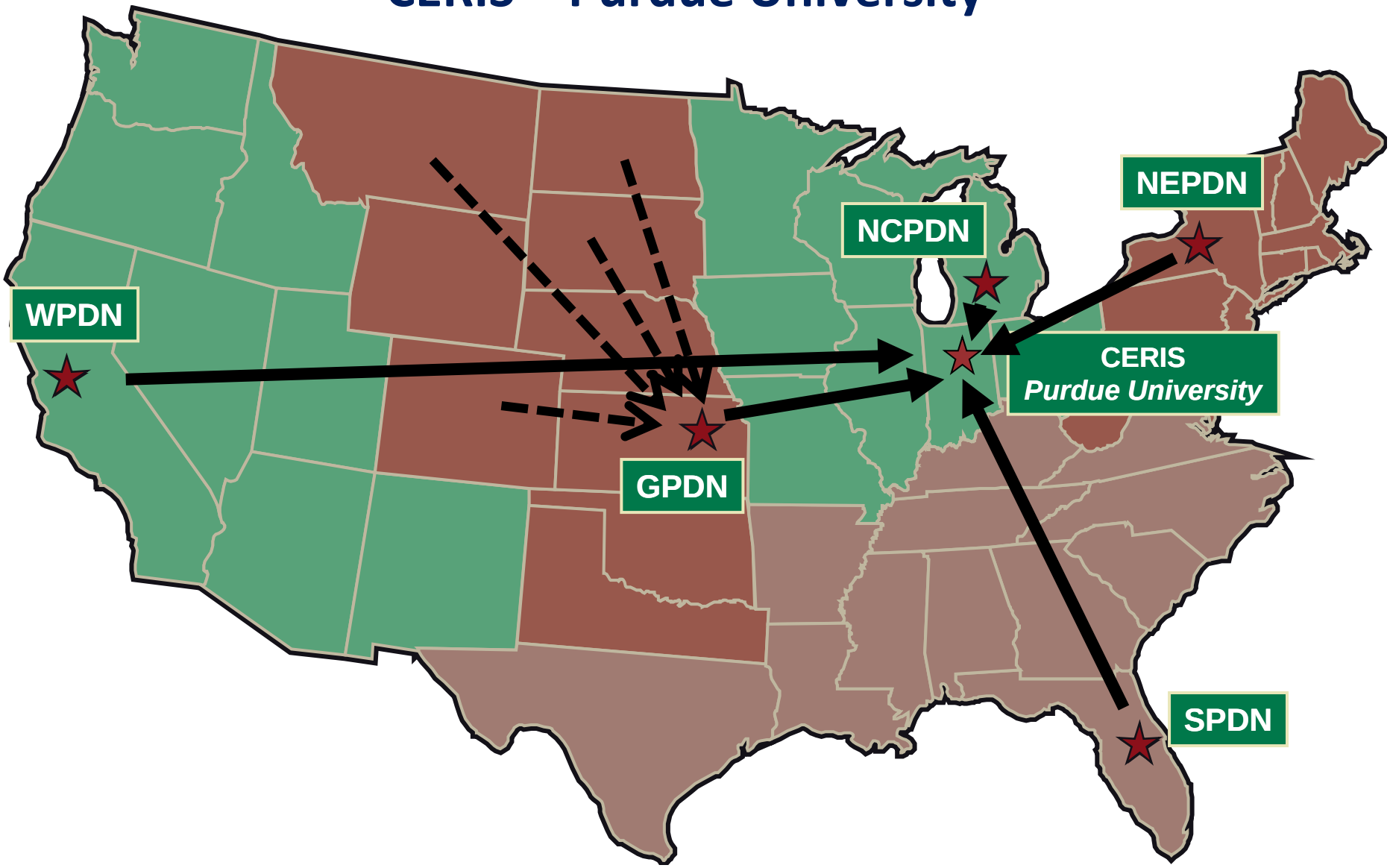


Ralstonia **on geranium**

NPDN - APHIS full-scale exercises

The NPDN National Data Repository

CERIS – Purdue University



- **A secure, searchable database with over 750,000 diagnostic records from NPDN labs throughout the U.S. (soon ~ 1 million)**
- **First occurrence reports available to NPDN diagnosticians**
- **Tools for epidemiological and outbreak analyses for research and regulatory communities**
- **Integrated with weather, land use and other data sets**

http://ceris.purdue.edu/npdn/

Soybean Rust

IpmPIPE

Integrated Pest Management - Pest Information Platform for Extension and Education

Sign Up For Alerts

Getting Started

Prev Next

March - 2011

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

April - 2011

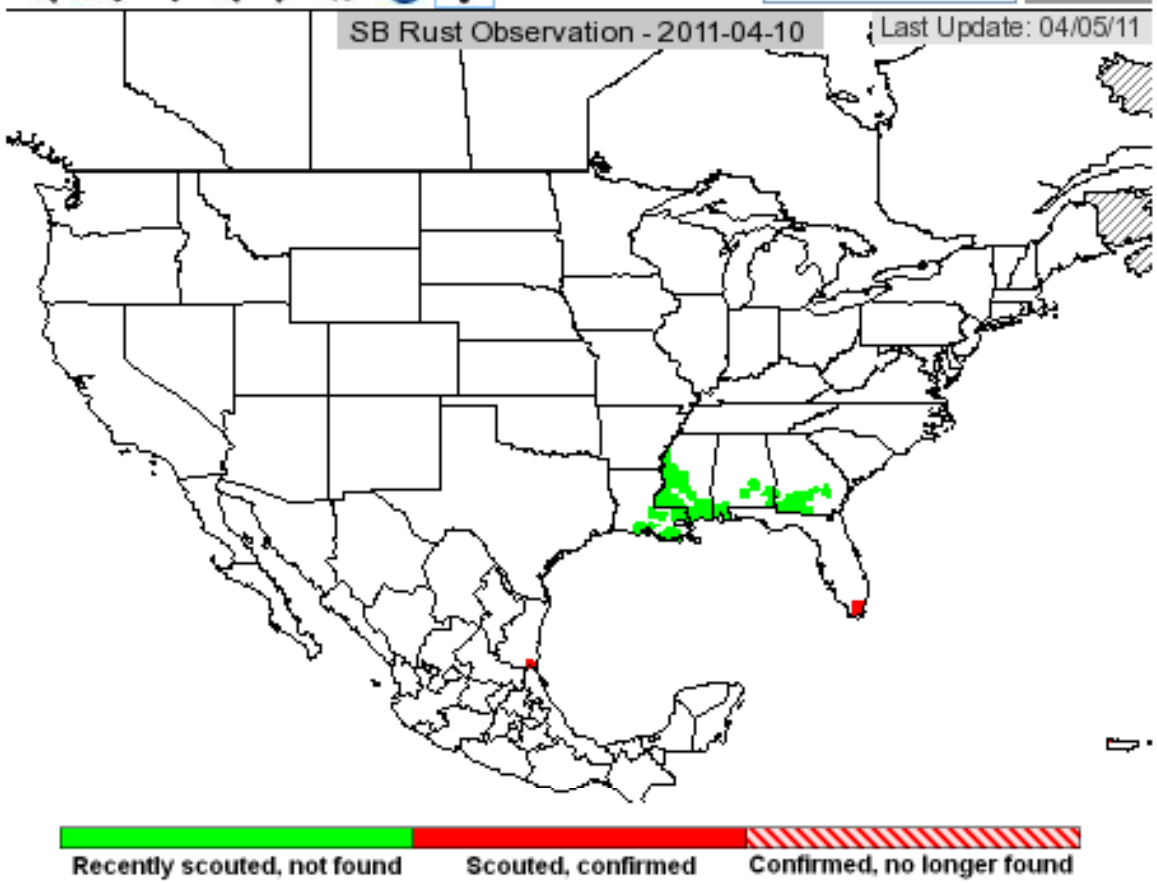
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

May - 2011

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

- Overlay - Load

SB Rust Observation - 2011-04-10 Last Update: 04/05/11

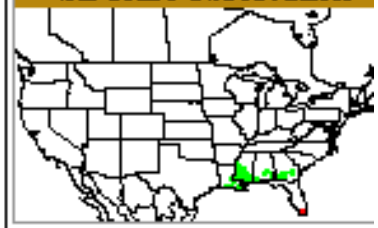


Apr 10, 2011

All Legumes/Kudzu

Soybean Rust

SB Rust Observation



SB Rust State Update

Chronology of Positive Detections

SBR Forecast Click For Details...

- **United States Commentary**
- ID/Scouting Tools
- Not sure if it is Rust?
- Other SBR Sites
- Hurricane Animations
- Observation Animations

Printable Map Larger Map Legend

United States Soybean Rust Commentary (updated: 03/15/11)

On March 15th, soybean rust was reported from Florida for the first time in 2011 on kudzu in Miami-Dade County. Soybean rust has been confirmed from a February 12, 2011, collection from research station in Isabela, Puerto Rico. This is the first confirmed case of Phakopsora pachyrhizi in Puerto Rico; to view more detailed

Management Toolbox

- Tactics - USA
- Guidelines - USA
- GFP Tool
- Insurance Docs
- Commentary Chron

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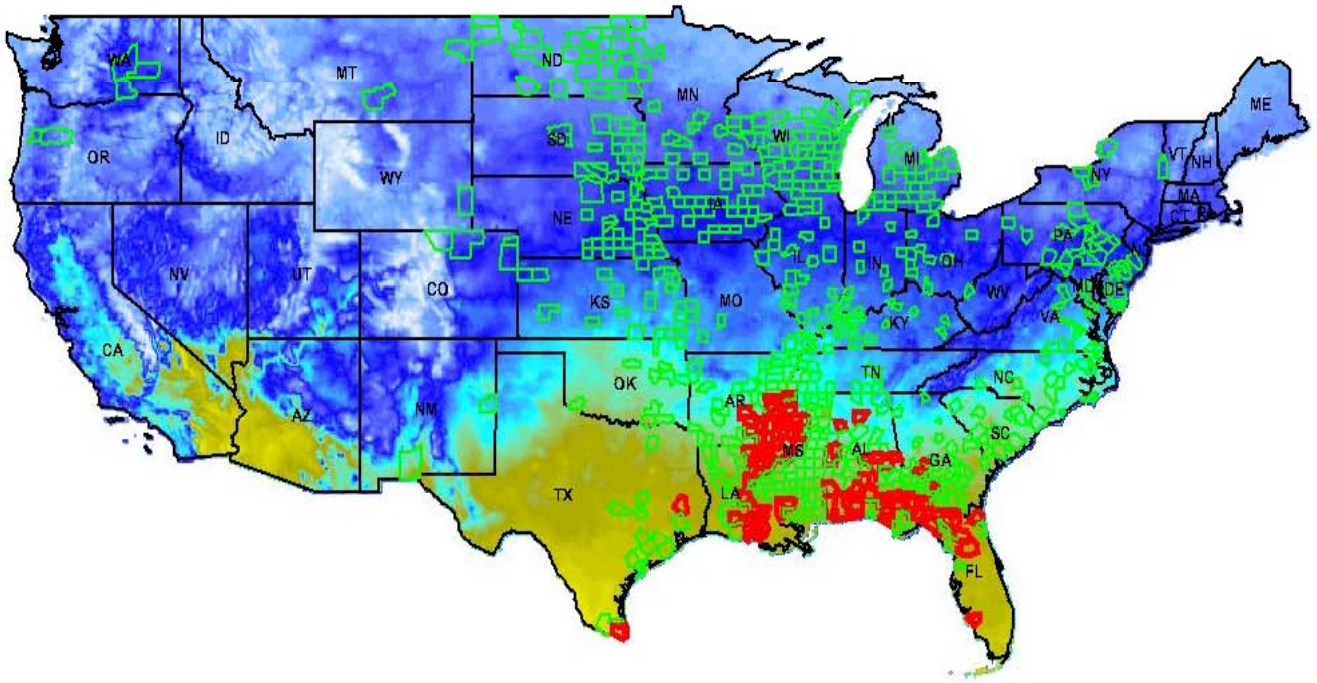
NPDN National Repository

National Repository CERIS



Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution
Sample Dates: 01/01/2009-09/01/2009
Degree Day Layer: 09/01/09 (50F)

Legend

Australasian Soybean Rust [Phakopsora pachyrhizi]

- NPDN Confirmed
- NAPIS Found
- ipmPIPE Presence
- NPDN Not Detected
- NAPIS Not Found
- ipmPIPE Absence

DD09_01_09

- Low : 0.0
- 130-217
- 217-348
- 348-435
- 435-565
- 565-652
- 652-783
- 783-870
- 870-1000
- 1000-1131
- 1131-1218
- 1218-1348
- 1348-1435
- 1435-1566
- 1566-1653
- 1653-1783
- 1783-1914
- 1914-2001
- 2001-2131
- 2131-2218
- 2218-2349
- 2349-2436
- 2436-2566
- 2566-2653
- 2653-2784
- 2784-2914
- 2914-3001
- 3001-3132
- 3132-3219
- 3219-3349
- 3349-3436
- 3436-3567
- 3567-3654
- 3654-3784

Zoom In

Done

Internet

100%

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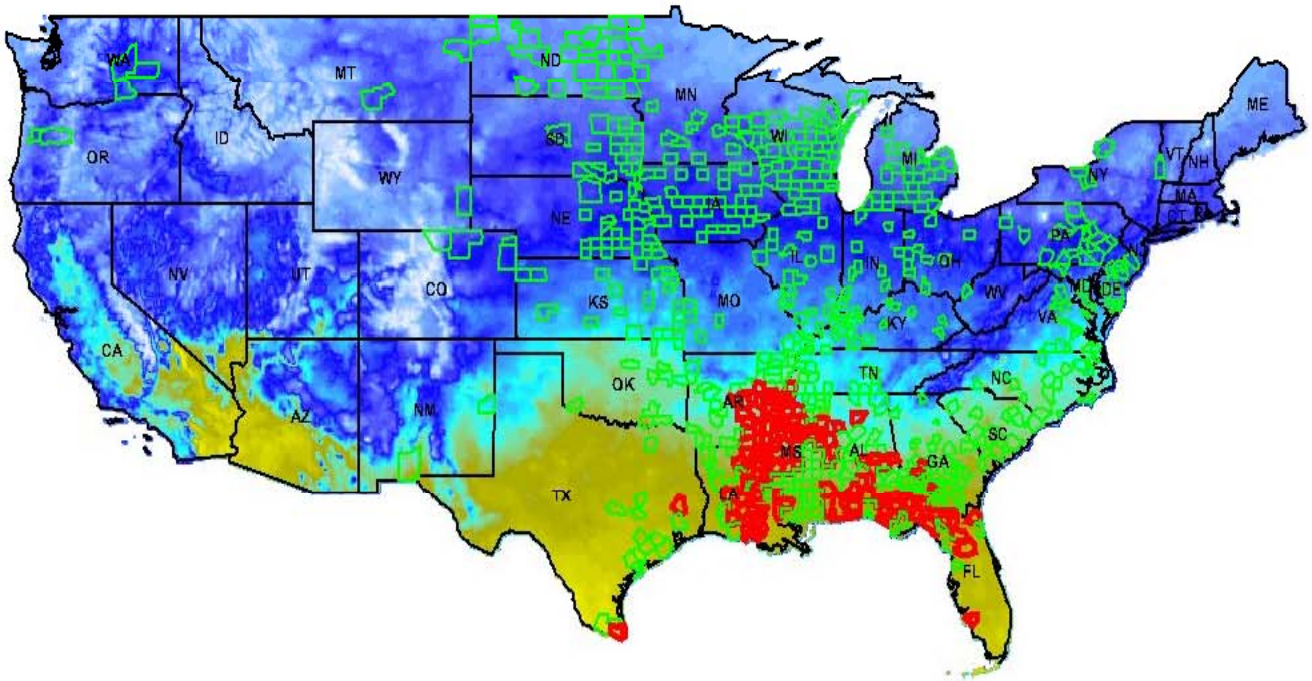
National Plant Diagnostic Network

NPDN National Repository

National Repository
CERIS



Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution
Sample Dates: 01/01/2009-09/07/2009
Degree Day Layer: 09/07/09 (50F)

Legend
Australasian Soybean Rust [Phakopsora pachyrhizi]

- NPDN Confirmed
- NAPIS Found
- ipmPIPE Presence
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DD09_07_09

- Low : 0.0
- 130-217
- 217-348
- 348-435
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Zoom In

Done

Internet

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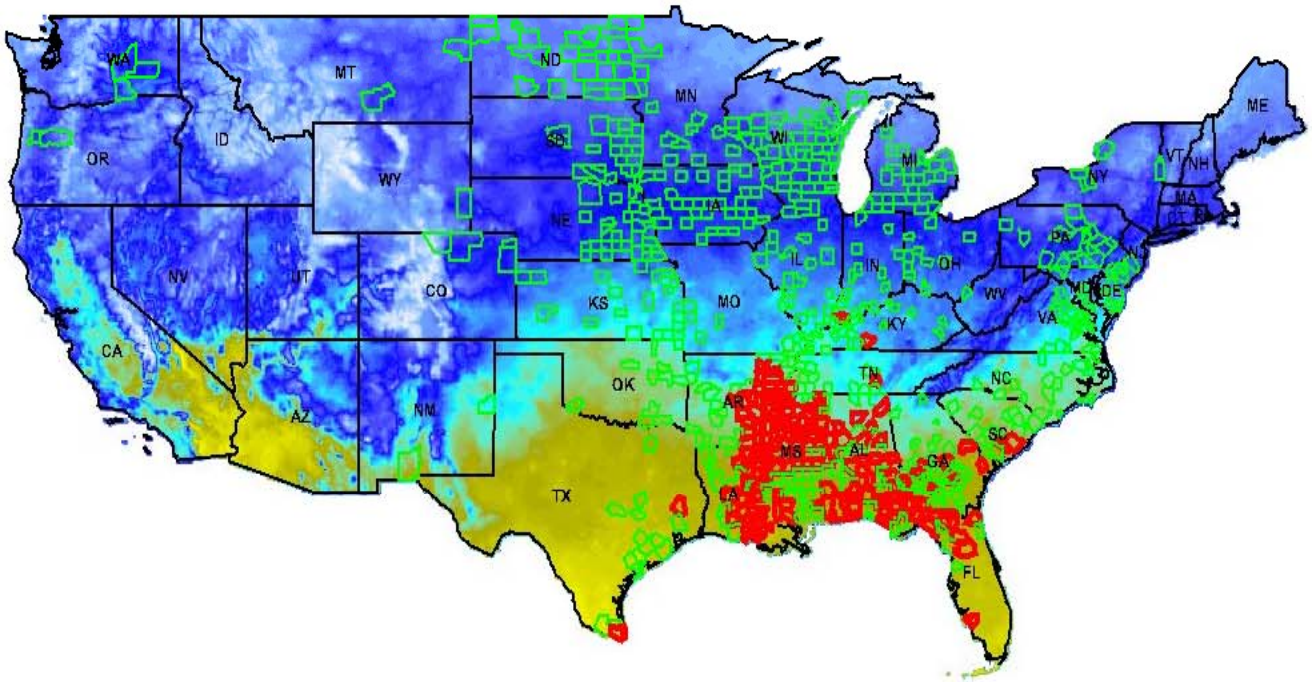

Legend

Australasian Soybean Rust [Phakopsora pachyrhizi]

- NPDN Confirmed
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DD09_14_09

- Low : 0.0
- 130-217
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Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution
Sample Dates: 01/01/2009-09/14/2009
Degree Day Layer: 09/14/09 (50F)

Zoom In

Done
Internet
100%

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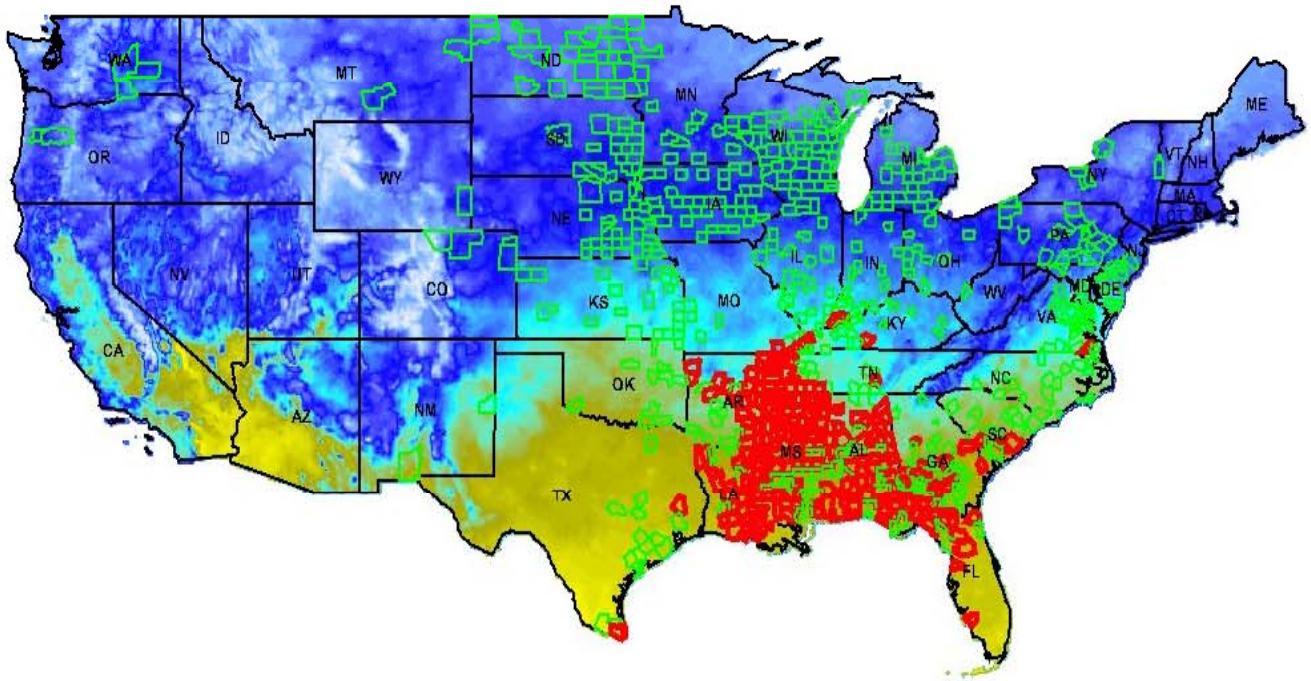
National Repository
CERIS



Legend

Australasian Soybean Rust [Phakopsora pachyrhizi]

- NPDN Confirmed
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DD09_21_09

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Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution
Sample Dates: 01/01/2009-09/21/2009
Degree Day Layer: 09/21/09 (50F)

Zoom In

Internet 100%

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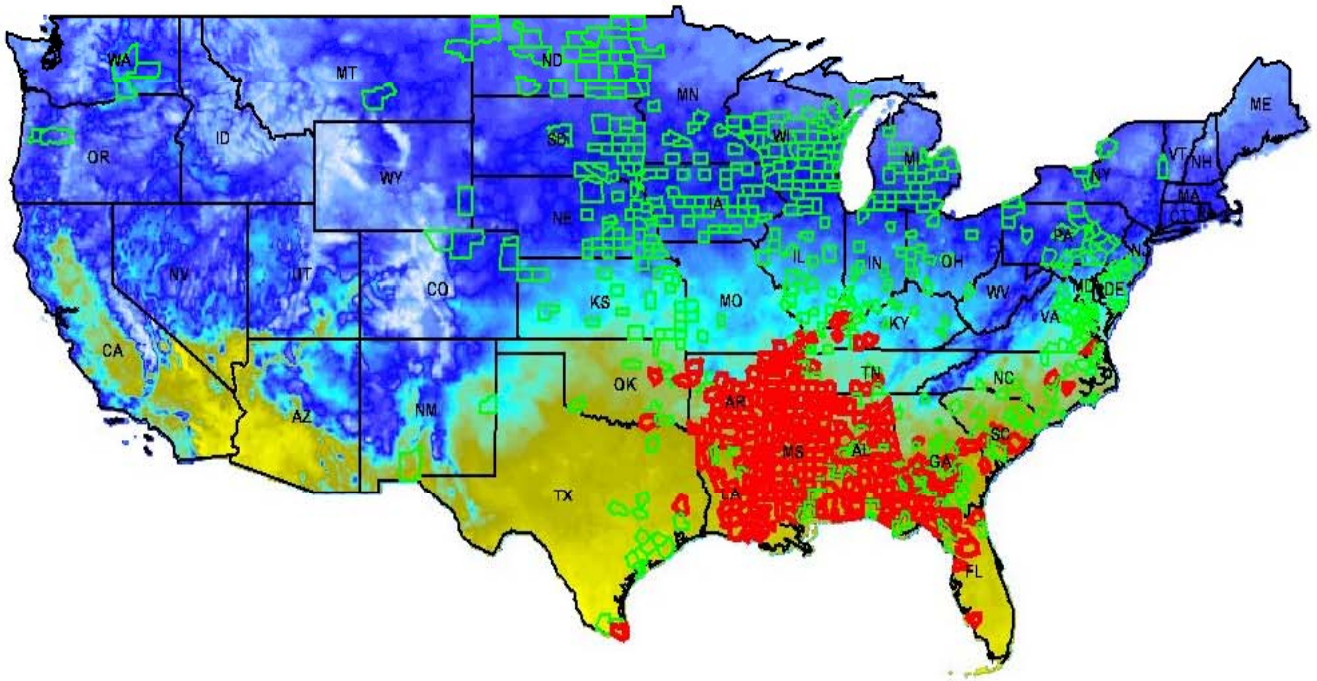

Legend

Australasian Soybean Rust [Phakopsora pachyrhizi]

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DD09_28_09

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Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution

Sample Dates: 01/01/2009-09/28/2009

Degree Day Layer: 09/28/09 (50F)

Zoom In

Done

Internet

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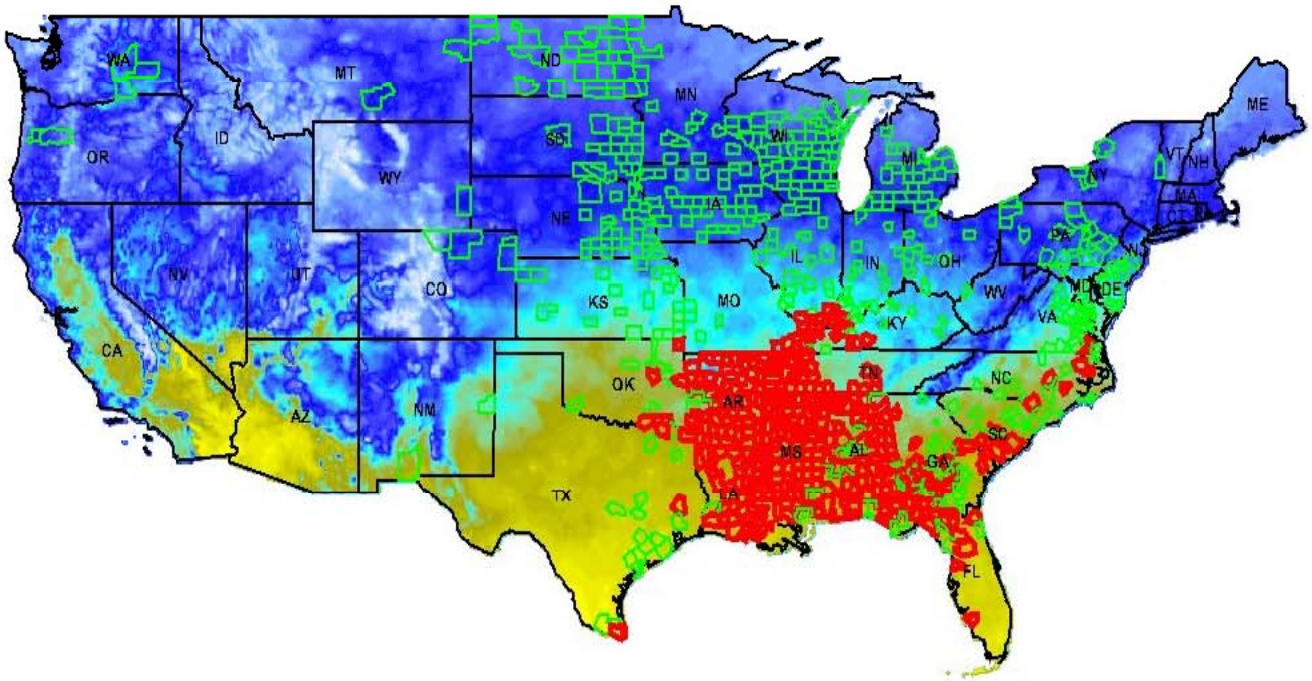

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DD10_05_09

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Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution

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Zoom In

Done

Internet

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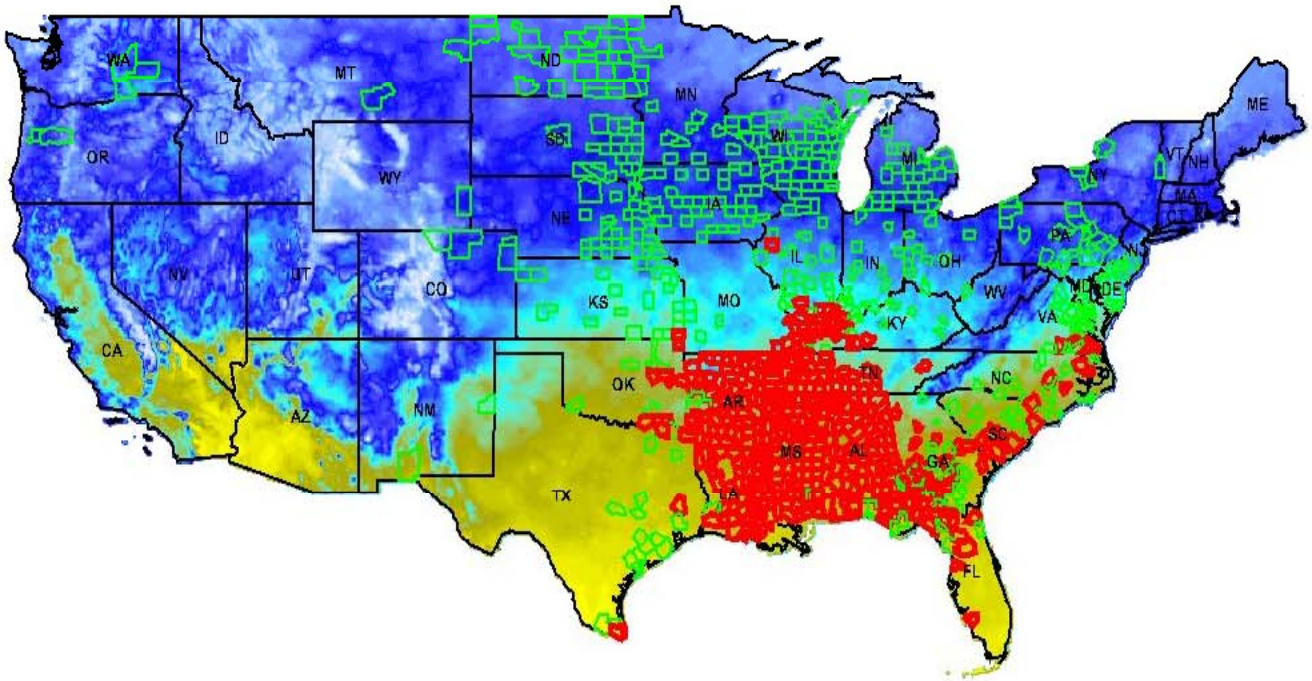

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DD10_12_09

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- 870-1000
- 1000-1131
- 1131-1218
- 1218-1348
- 1348-1435
- 1435-1566
- 1566-1653
- 1653-1783
- 1783-1914
- 1914-2001
- 2001-2131
- 2131-2218
- 2218-2349
- 2349-2436
- 2436-2566
- 2566-2653
- 2653-2784
- 2784-2914
- 2914-3001
- 3001-3132
- 3132-3219
- 3219-3349
- 3349-3436
- 3436-3567
- 3567-3654
- 3654-3784

Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution

Sample Dates: 01/01/2009-10/12/2009

Degree Day Layer: 10/12/09 (50F)

Zoom In

Done

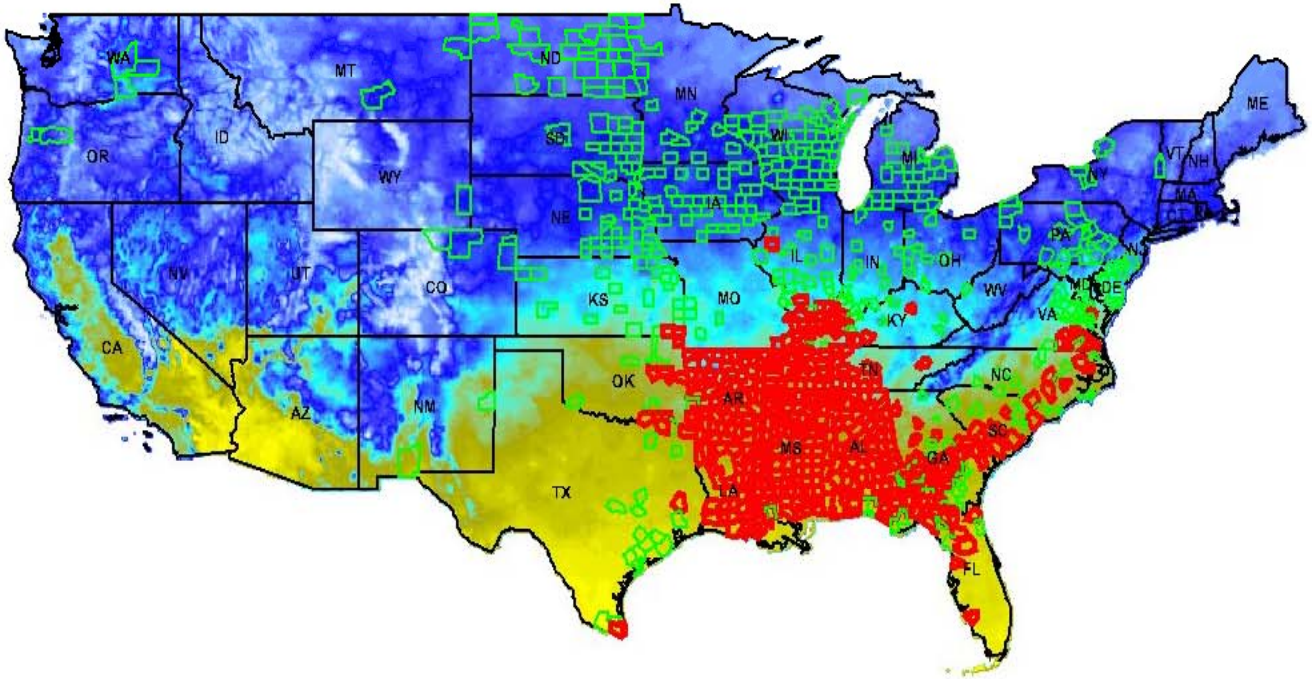
Internet

100%

NPDN National Plant Diagnostic Network

NPDN National Repository

National Repository CERIS



Legend

Australasian Soybean Rust [Phakopsora pachyrhizi]

- NPDN Confirmed
- NAPIS Found
- ipmPIPE Presence
- NPDN Not Detected
- NAPIS Not Found
- ipmPIPE Absence

DD10_19_09

- Low : 0.0
- 130-217
- 217-348
- 348-435
- 435-565
- 565-652
- 652-783
- 783-870
- 870-1000
- 1000-1131
- 1131-1218
- 1218-1348
- 1348-1435
- 1435-1566
- 1566-1653
- 1653-1783
- 1783-1914
- 1914-2001
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- 2131-2218
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- 2349-2436
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- 2566-2653
- 2653-2784
- 2784-2914
- 2914-3001
- 3001-3132
- 3132-3219
- 3219-3349
- 3349-3436
- 3436-3567
- 3567-3654
- 3654-3784

Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution

Sample Dates: 01/01/2009-10/19/2009

Degree Day Layer: 10/19/09 (50F)

Zoom In

Done

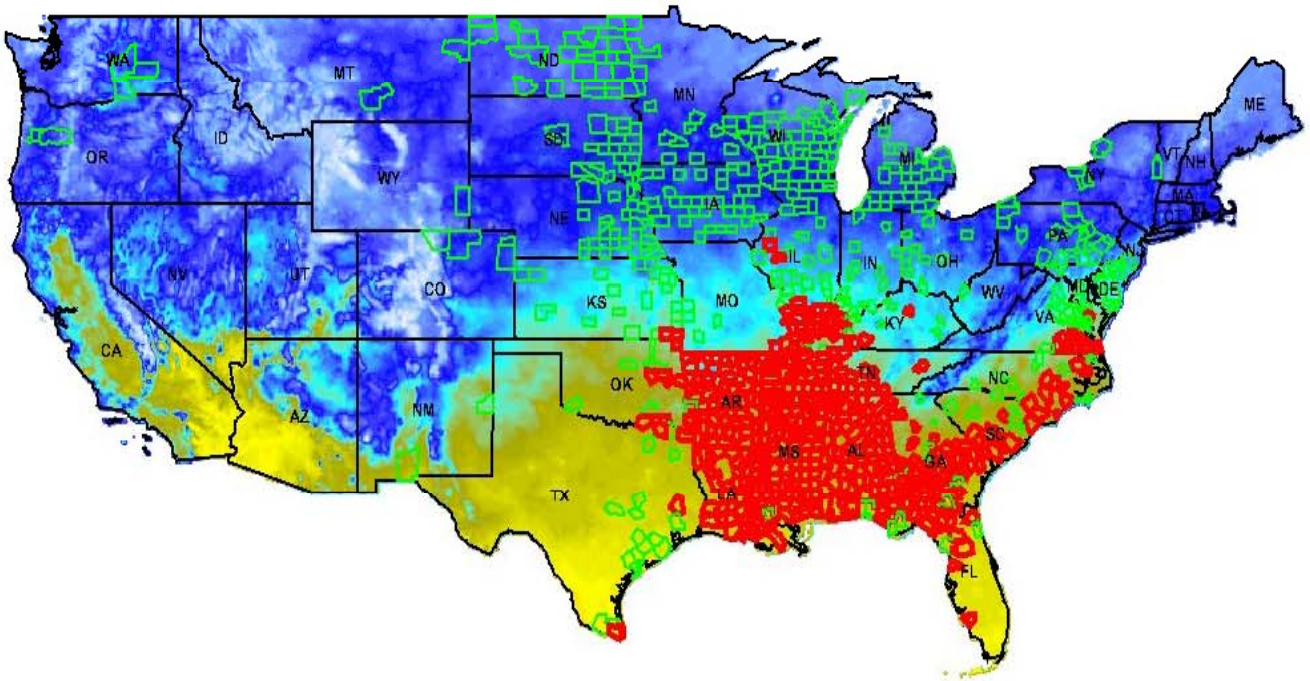
Internet

100%

NPDN National Plant Diagnostic Network

NPDN National Repository

National Repository CERIS



Legend

Australasian Soybean Rust [Phakopsora pachyrhizi]

- NPDN Confirmed
- NAPIS Found
- ipmPIPE Presence
- NPDN Not Detected
- NAPIS Not Found
- ipmPIPE Absence

DD10_26_09

- Low : 0.0
- 130-217
- 217-348
- 348-435
- 435-565
- 565-652
- 652-783
- 783-870
- 870-1000
- 1000-1131
- 1131-1218
- 1218-1348
- 1348-1435
- 1435-1566
- 1566-1653
- 1653-1783
- 1783-1914
- 1914-2001
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- 2131-2218
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- 2349-2436
- 2436-2566
- 2566-2653
- 2653-2784
- 2784-2914
- 2914-3001
- 3001-3132
- 3132-3219
- 3219-3349
- 3349-3436
- 3436-3567
- 3567-3654
- 3654-3784

Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution

Sample Dates: 01/01/2009-10/26/2009

Degree Day Layer: 10/26/09 (50F)

Zoom In

Done

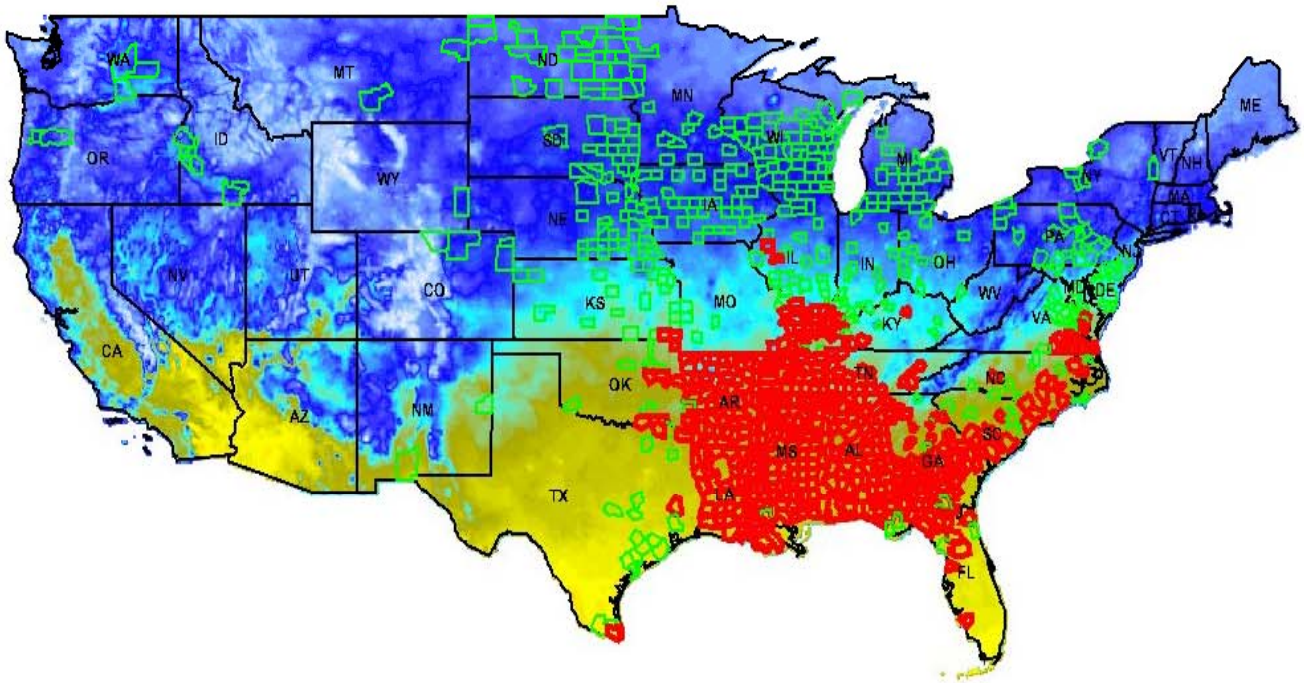
Internet

100%

NPDN National Plant Diagnostic Network

NPDN National Repository

National Repository CERIS



Australasian Soybean Rust [Phakopsora pachyrhizi] Distribution
Sample Dates: 01/01/2009-11/02/2009
Degree Day Layer: 11/02/09 (50F)

Legend
Australasian Soybean Rust [Phakopsora pachyrhizi]

- NPDN Confirmed
- NAPIS Found
- ipmPIPE Presence
- NPDN Not Detected
- NAPIS Not Found
- ipmPIPE Absence

DD11_02_09

- Low : 0.0
- 130-217
- 217-348
- 348-435
- 435-565
- 565-652
- 652-783
- 783-870
- 870-1000
- 1000-1131
- 1131-1218
- 1218-1348
- 1348-1435
- 1435-1566
- 1566-1653
- 1653-1783
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- 1914-2001
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- 2653-2784
- 2784-2914
- 2914-3001
- 3001-3132
- 3132-3219
- 3219-3349
- 3349-3436
- 3436-3567
- 3567-3654
- 3654-3784

Zoom In

Done

Internet

100%

Policy and programmatic issues

1. **Land Grant Universities – no regulatory role or authority nor do we want this.**

2. **Differences in cultures among agencies/concerns of blurring boundaries, roles, responsibilities.**

3. **Information sharing across state and regional lines.**

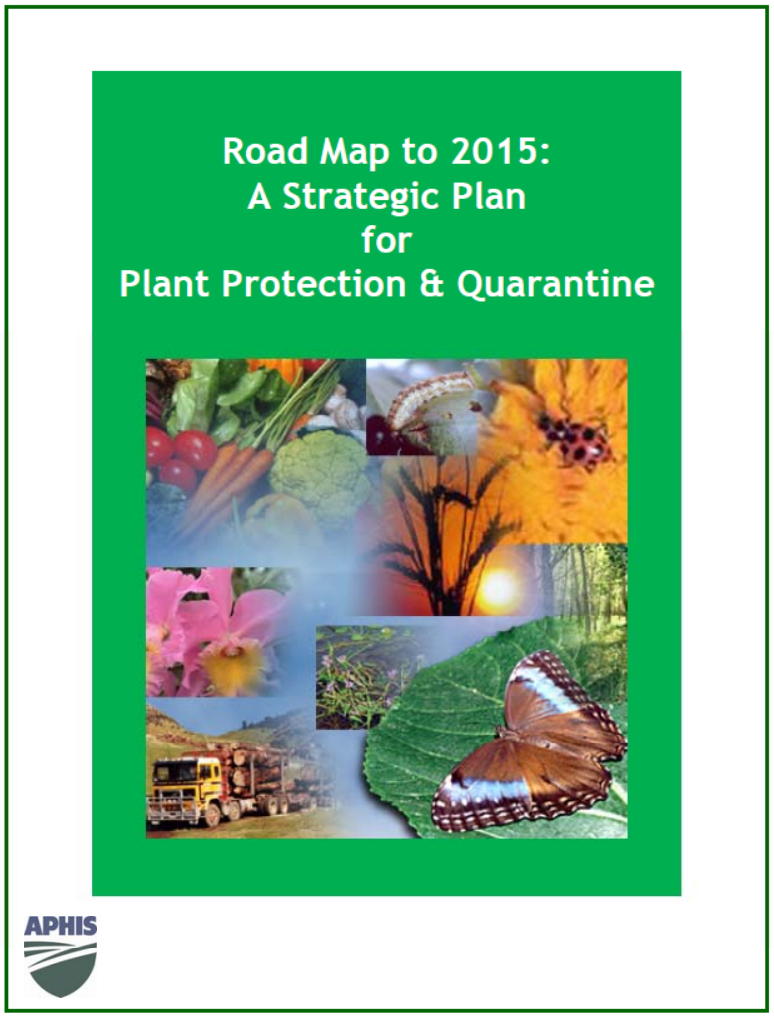
4. **Cooperative Extension active in the program in many states, but not all because…**
   - **Extension and outreach programs already stretched**
   - **Unclear about scope and mission**
   - **Limited funding**
   - **Client/stakeholder relationships**

2010 USDA-NIFA Partnership Award for Innovative Program Models

Impacts of funding crisis

- Split appointments and/or loss of key personnel at regional centers and diagnostic labs
- Aging equipment for labs – no funds for replacement
- Difficulty in maintenance/certification/service contracts
- Prioritization of efforts and shift of some programs to a more competitive funding model
- Increased emphasis on leveraging resources

Shared goals of Networks and APHIS



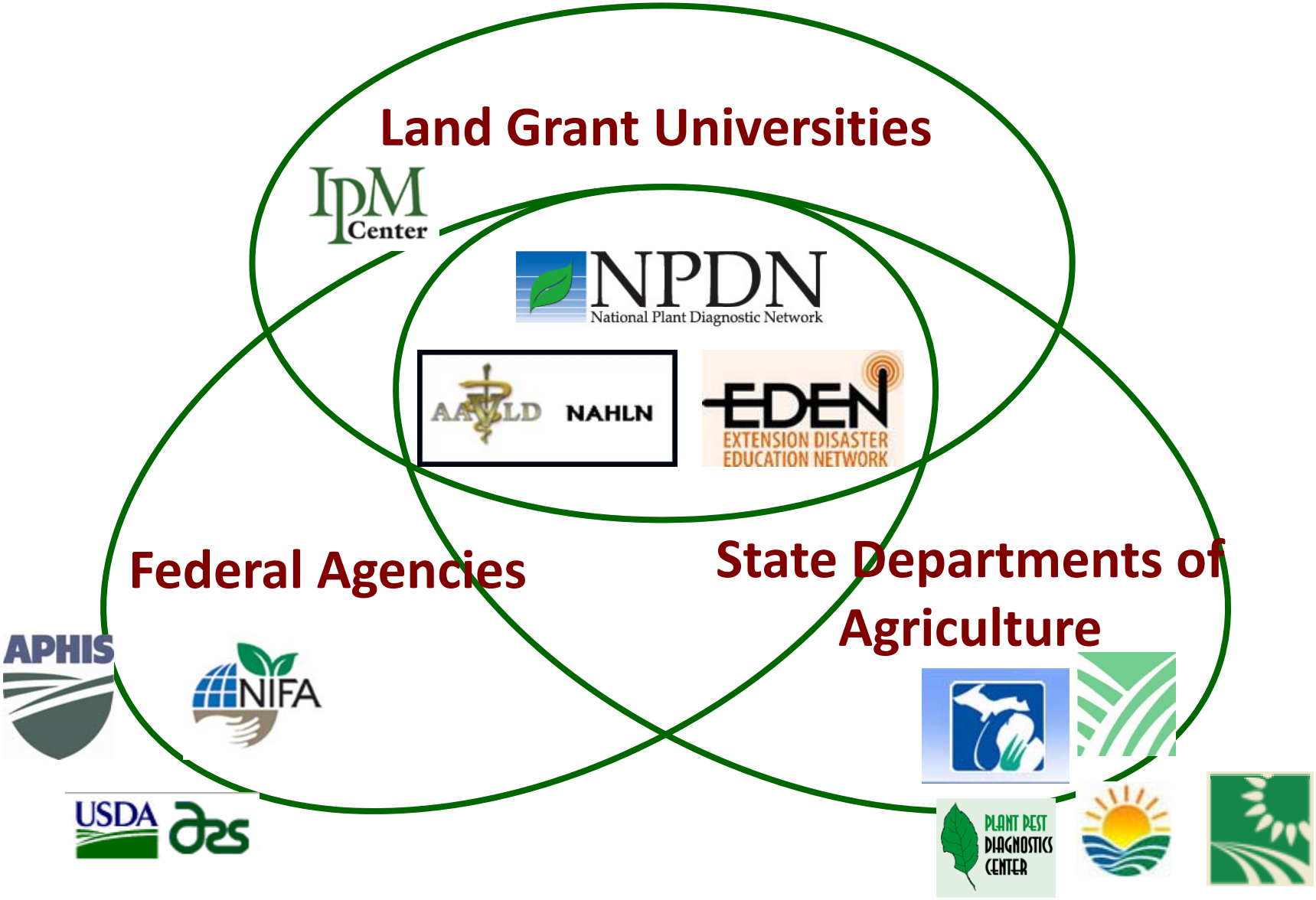
from PPQ 2015 Strategic Plan

Overarching Goal 1: Strengthen Outreach (and education)

Overarching Goal 2: Expand and build partnerships and coalitions

Overarching Goal 3: Enhance PPQ's Science and Technology foundation

Interagency Partnerships



NPDN
National Plant Diagnostic Network

Kitty Cardwell and Marty Draper

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National Institute of Food and Agriculture

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