Forest Health Protection

"Setting management context to define the research needs…"

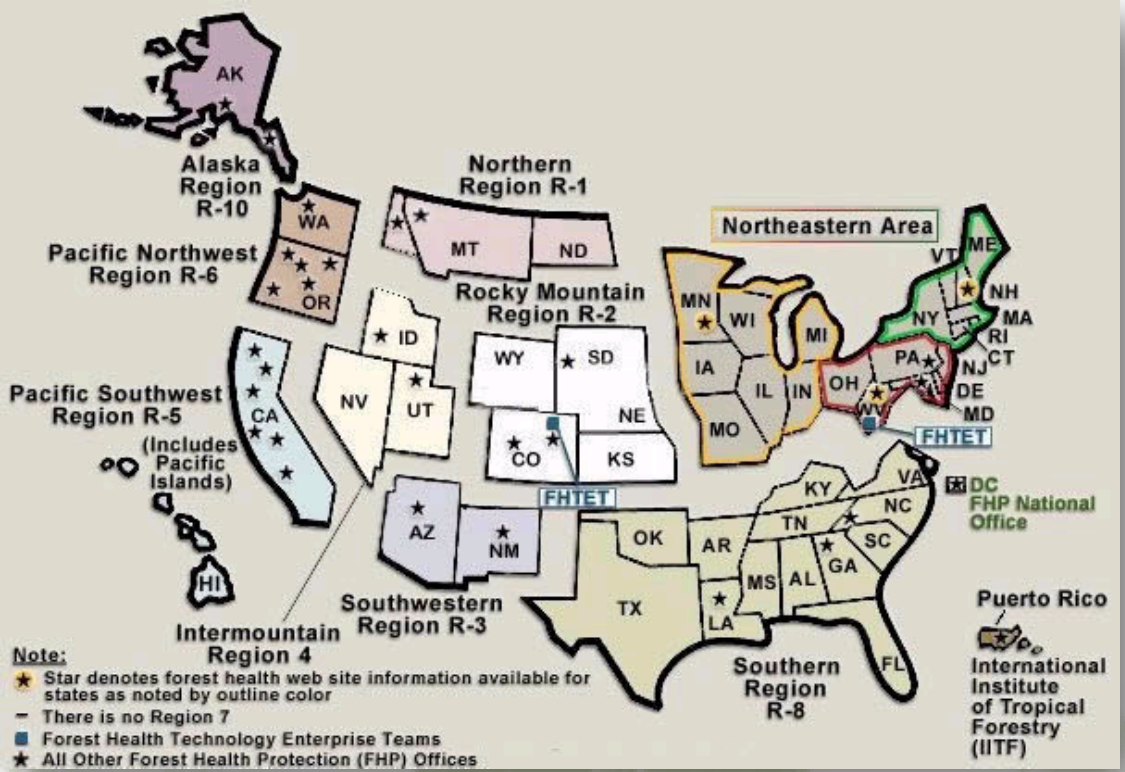
Dr. Robert Mangold; Dr. Bruce Moltzan; Dr. Bob Rabaglia; Mr. Borys Tkacz; Mr. Stephen Covell ; US Forest Service; Forest Health Protection Staff

Forest Health Protection Programs

- Prevention
- Suppression
- Restoration
- Survey & Monitoring
- Technology Development
- Pesticide Use

FHP Staffing: Overview

- FHP has Forest Health Specialists in 23 field offices
- Support and complement State Forest Health



Forest Health Monitoring

Objectives

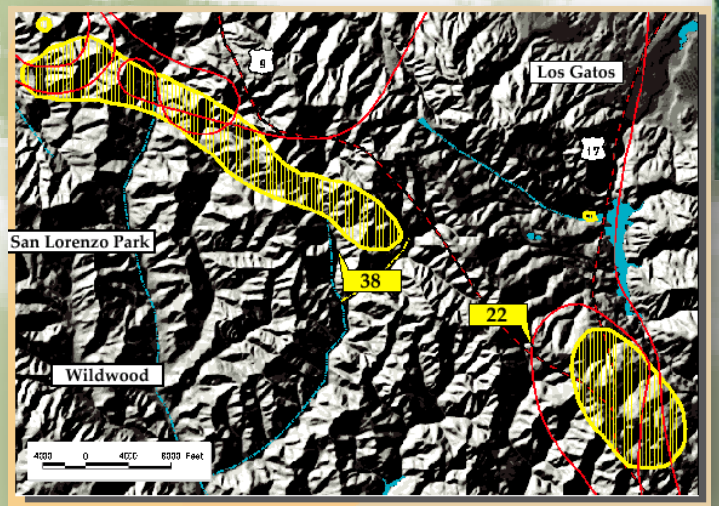
- Determine change over time
- Provide baseline and health trends statistically validated
- Report annually on the status of changes to forest health

Detection Monitoring

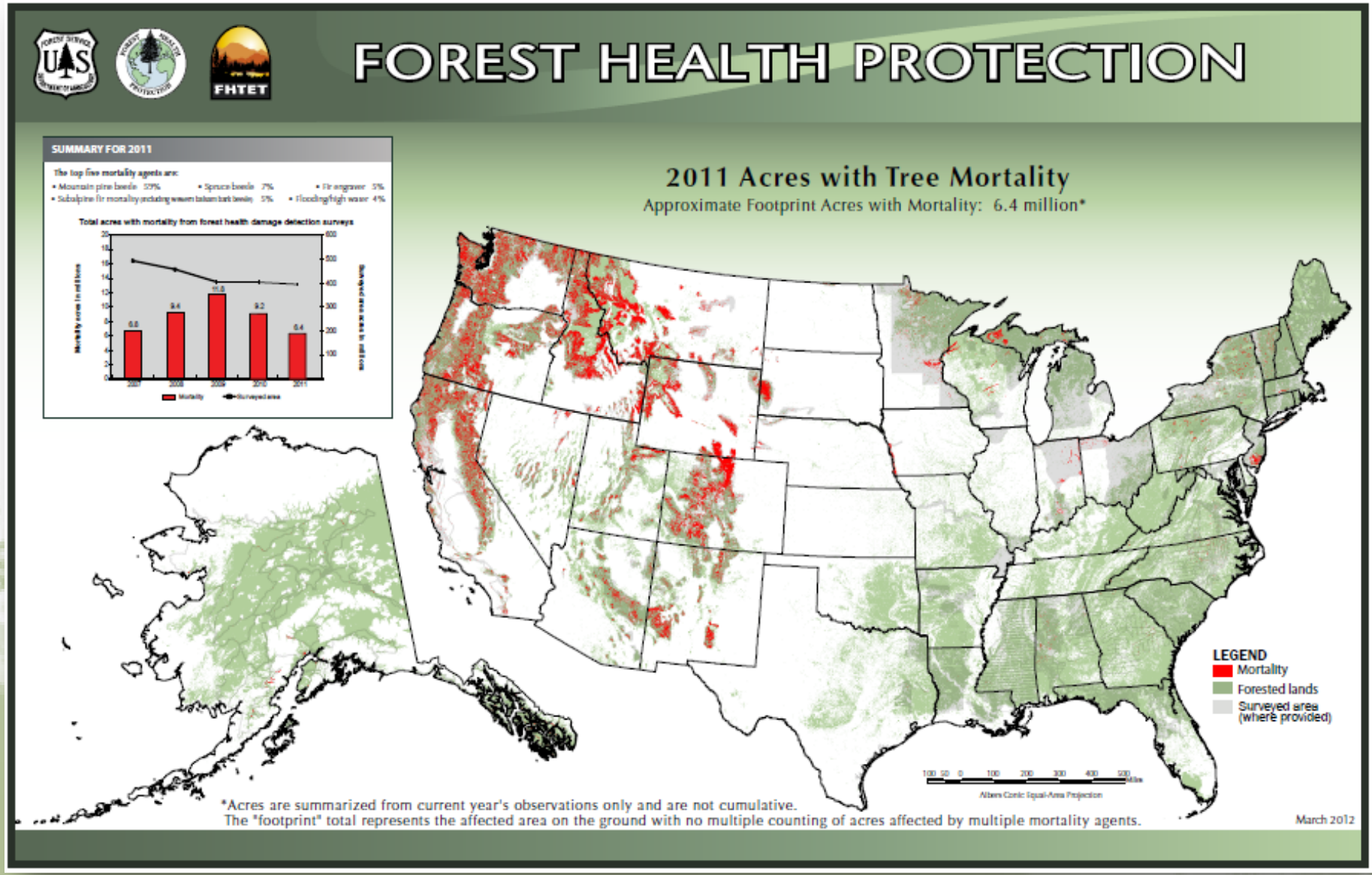
- Nationwide grid of permanent sample plots
- Aerial damage detection surveys
- Special ground surveys

Detection Monitoring

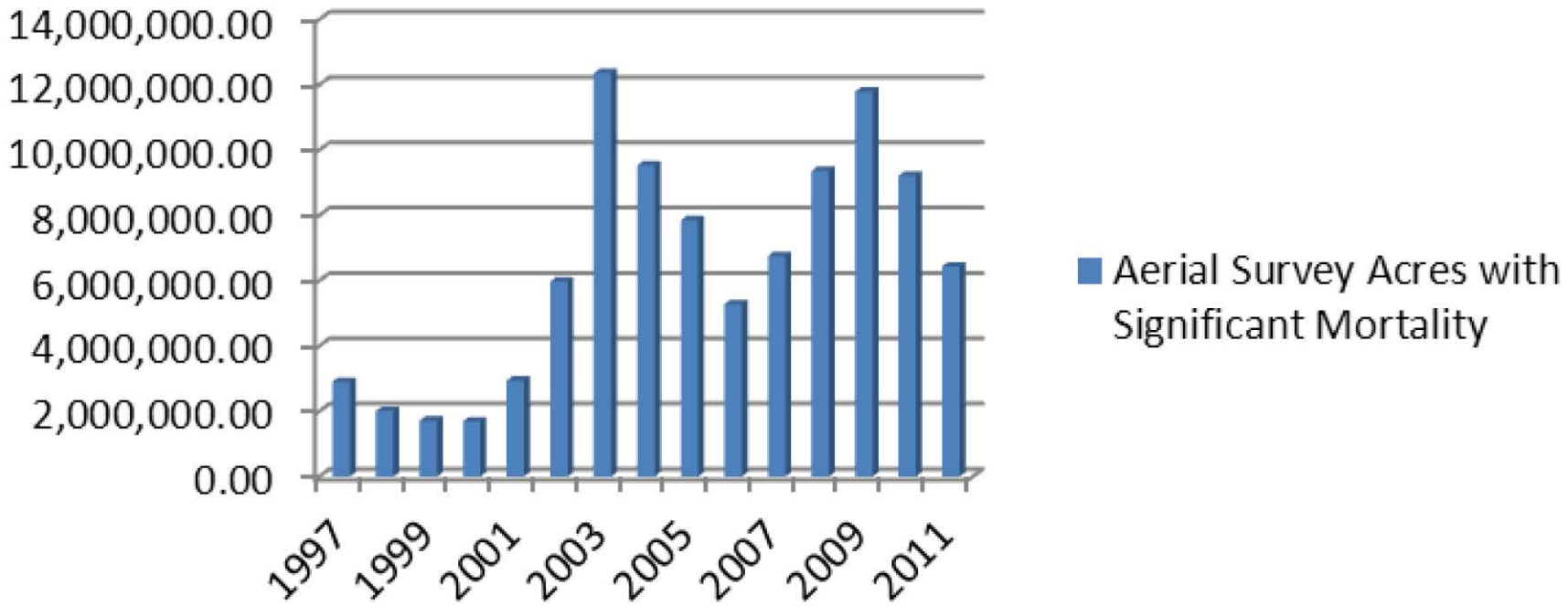
- Aerial Detection
- Aircraft at 1,000 to 2,000 ft. elevation
- Create maps of visible damage



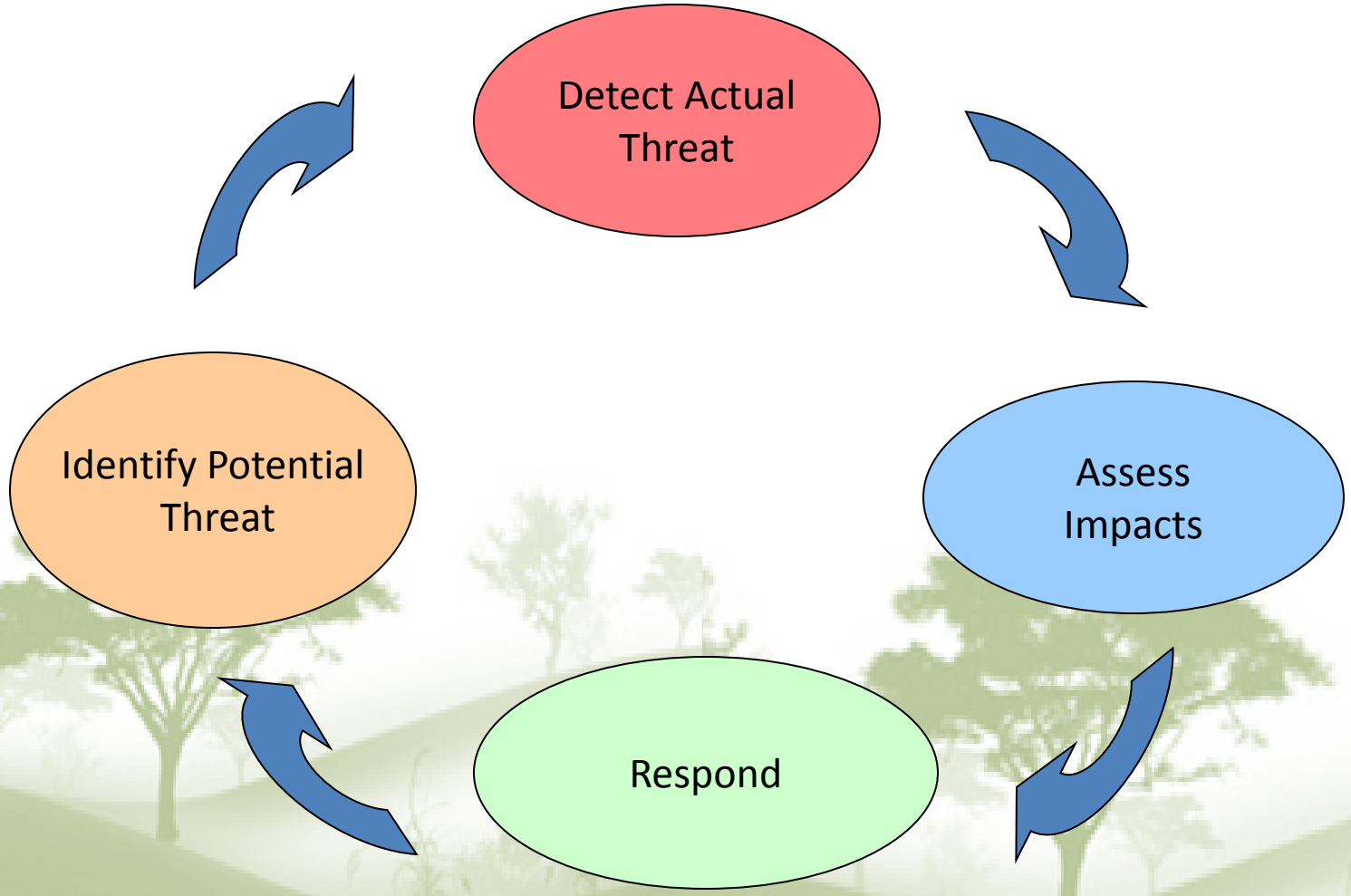
2011 Acres with Tree Morality



Aerial Survey Acres with Significant Mortality



USDA Forest Service
Early Warning System for Forest Health Threats
Component Model



Early Warning System (EWS)

Sequence of Events

Identify Potential Threats	*Detect Actual Threats*	*Assess Impacts*	*Respond*
Identify Nature of Specific Threat	**Surveillance and Reporting**	**Evaluate Extent, Severity, Potential Impact**	**Consult and Coordinate Actions**
Identify Mode of Spread	**Systematic Detection Surveys**	**Conduct Regulatory And Quarantine Assessments**	**Implement Appropriate Treatments**
Identify Environmental Influences	**Special Detection Surveys**	**Evaluate and Develop Treatment Options**	**Monitor Treatment Effectiveness**
Identify Vulnerable Ecosystems	**Verification and Notification**	**Assess Potential Response Actions**	**Restore Affected Areas**

EWS: Flow of Detection & Response to SPB

(1) Identify Nature of Specific Threat → (2) Identify Vulnerable Ecosystems → (3) Evaluate Extent, Severity, Potential Impact → (4) Evaluate and Develop Treatment Options → (5) Assess Potential Response Actions → (6) Special Detection Surveys → (7) Verification and Notification → (8) Implement Appropriate Treatments → (9) Monitor Treatment Effectiveness

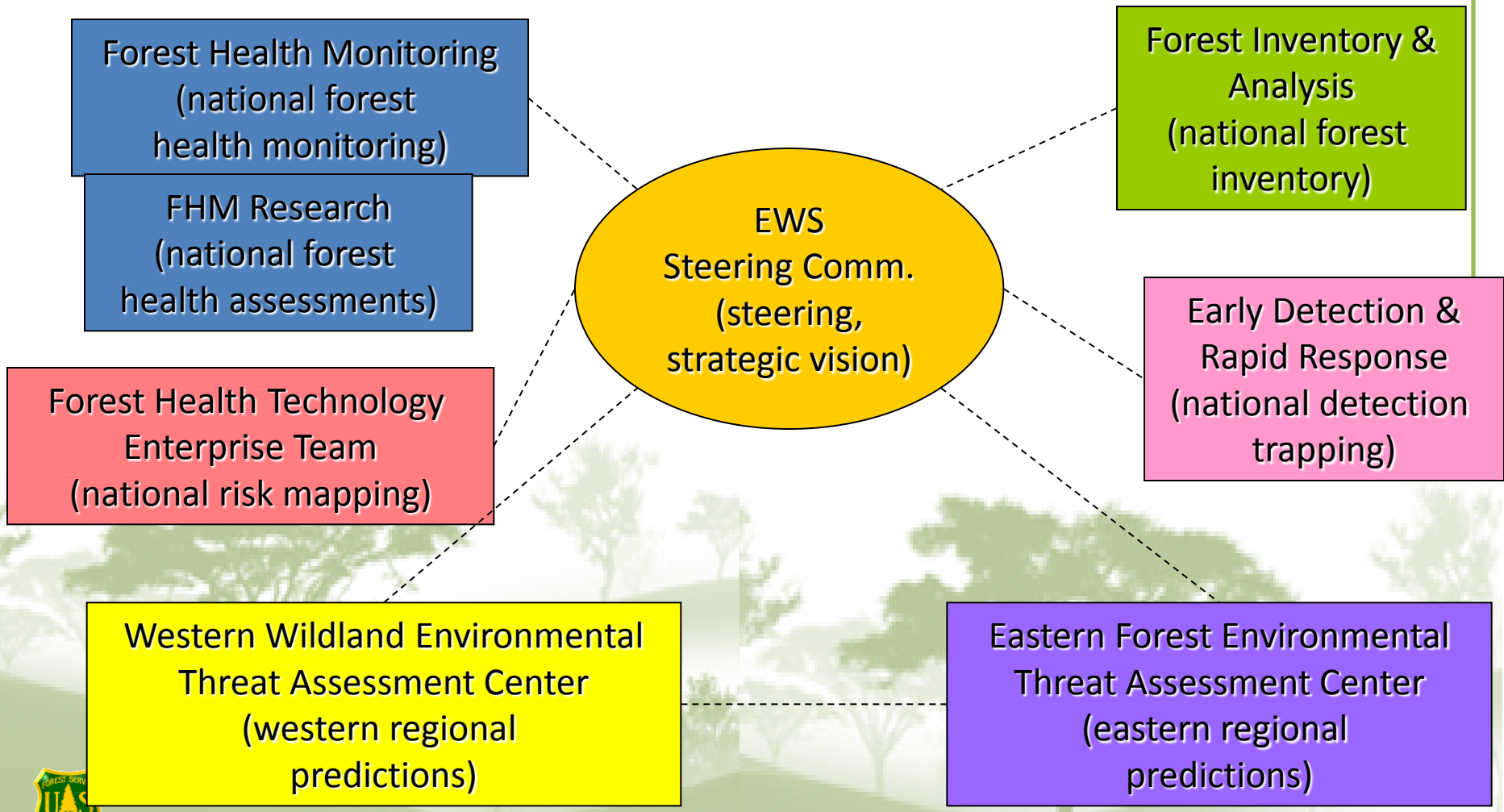
USDA Forest Service Early Warning System for Insect and Disease Threats Component Model

Sequence of Events

Identify Potential Threats	*Detect Actual Threats*	*Assess Impacts*	*Respond*
Identify Nature of Specific Threat •Invasive Species Databases •Pest Risk Assessments (PRA) •International Activities •Native Pest Databases •Other 1	**Surveillance and Reporting** •Network of Forest Health specialists - *FHP, States, Univ.* •Forest managers/specialists •Arborists •Port Inspectors •Public •Others	**Evaluate Extent, Severity, Potential Impact** •Damage and impact s •Forest Health Speciali •FHM Evaluation Monit •Research and evaluat and assessment tools •Other 3	**Consult and Coordinate Actions** •Federal, State, Tribal consultation to assign lead responsibility and coordinate actions •NPAG •Science Panels •Regional, State, and/or local Coordinating Committees •Other
Identify Mode of Spread •Wood Import PRAs •Import Regulations and Inspections •Live Plants •Bioterrorism •Range expansion •Other	**Systematic Detection Surveys** •Forest Health Monitoring (FHM) and Forest Health Protection (FHP) Aerial and Ground Surveys •Forest Inventory & Analysis (FIA) Ground Plots •Other Inventories	**Conduct Regulatory And Quarantine Assessments** •APHIS New Pest Advisory Group (NPAG) •State Depts. of Agriculture •Other	**Implement Appropriate Treatments** • Cooperative proje *Federal, State, Tri* •Quarantines - *Stat* •FHP contingency f •Other 8
Identify Environmental Influences •Fire •Weather Events •Drought •Air Pollution	**Special Detection Surveys** •Particular Species Survey *SOD, EAB, HWA, SPB* •APHIS CAP Surveys •Research on detection tec •Other 6	**Evaluate and Develop Treatment Options** •Operational evaluatior development •Conduct research on t methods and technolo 4	**Monitor Treatm Effectiveness** •Cooperative post-tr evaluations- *FHP, I NFS, BLM, States,* •Other 9
Identify Vulnerable Ecosystems •Insect & Disease Risk •Invasive Species Risk •Fire Risk Maps •Risk and Hazard Ratin 2	**Verification and Notification** •Taxonomic verification •Pest Alerts •Communication networks •Press releases, educatior literature and websites •Others 7	**Assess Potential Response Actions** •NEPA alternative deve and documentation - C •Consultation with other agencies - *FWS, NMF* •Other 5	**Restore Affected Areas** •Cooperative restoration efforts - *Federal, State, Tribal, private land managers* •Collaborate with local and non-profit groups

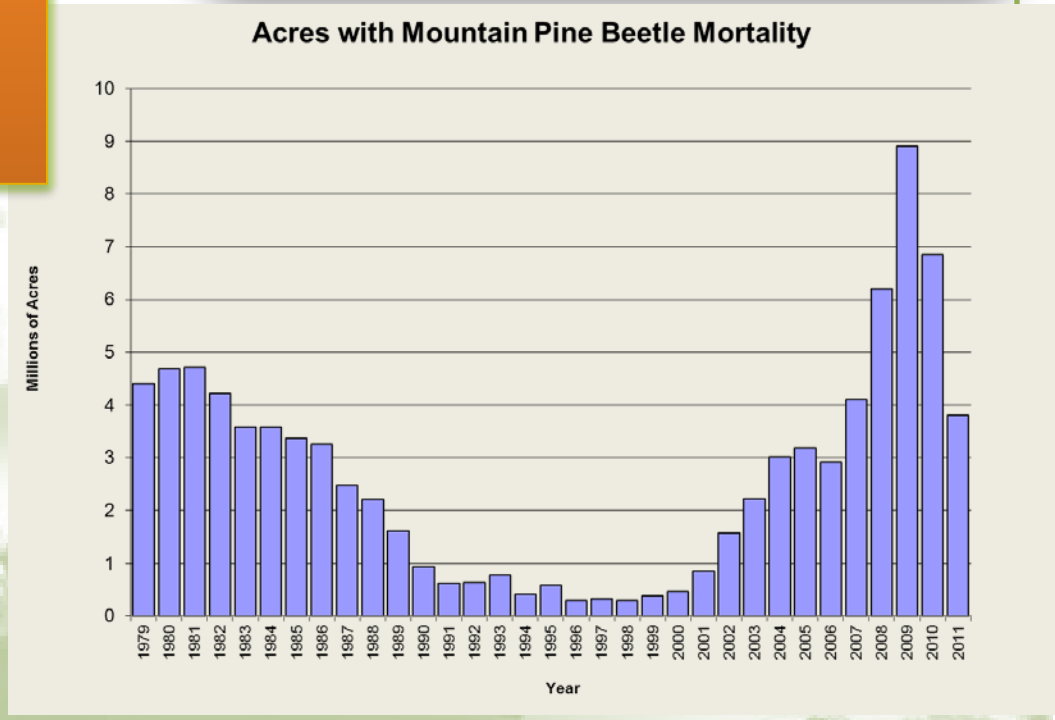
Forest Service-Early Warning System

Linkages among existing FS programs

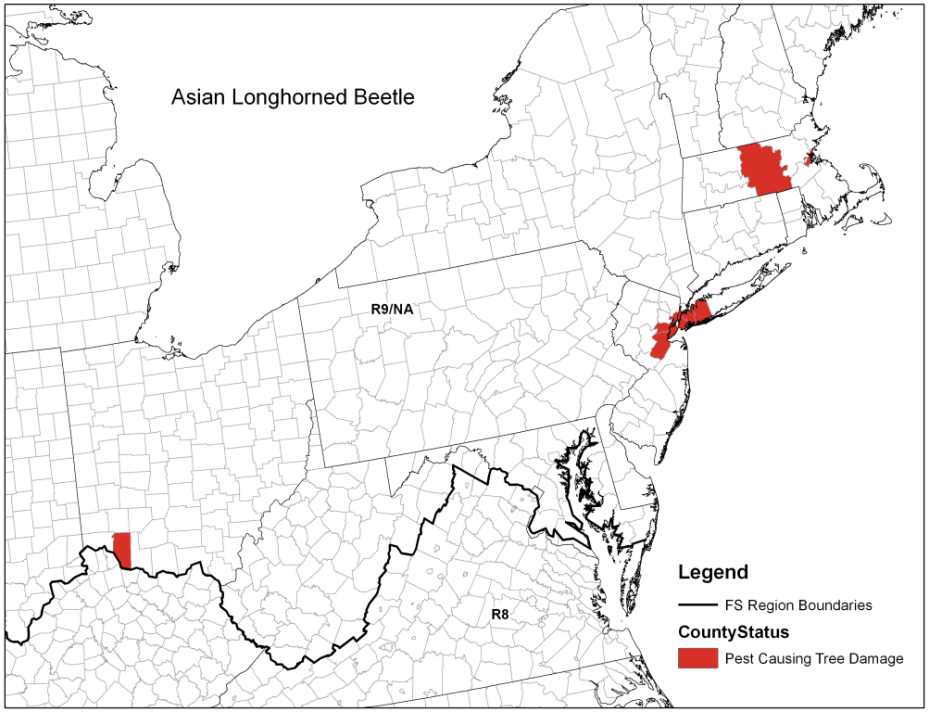


Mountain Pine Beetle

- Outbreaks throughout the Western US
- Lodgepole pine forests hardest hit
- Killing trees at higher elevations (e.g. white bark pine)

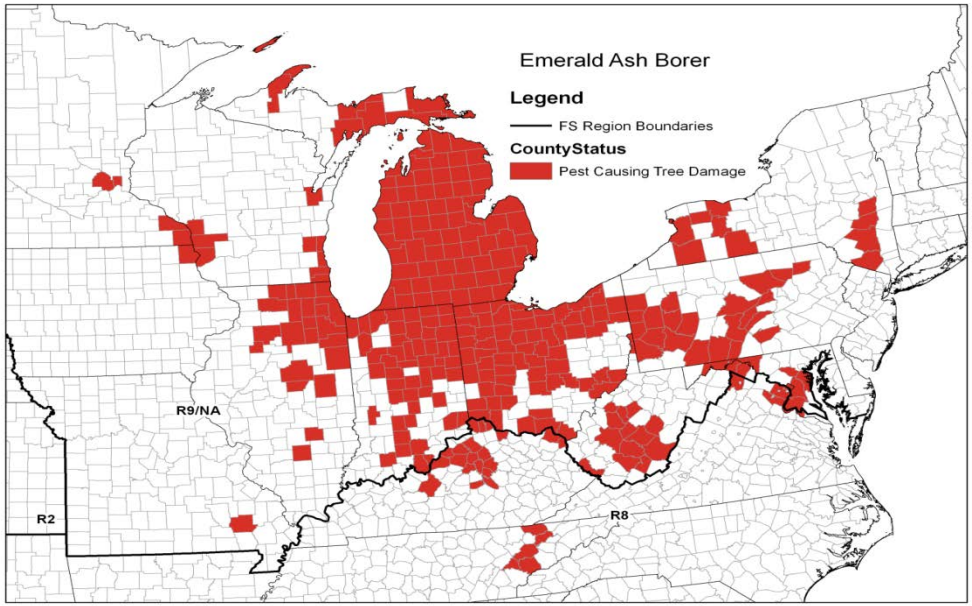


Asian Longhorned Beetle



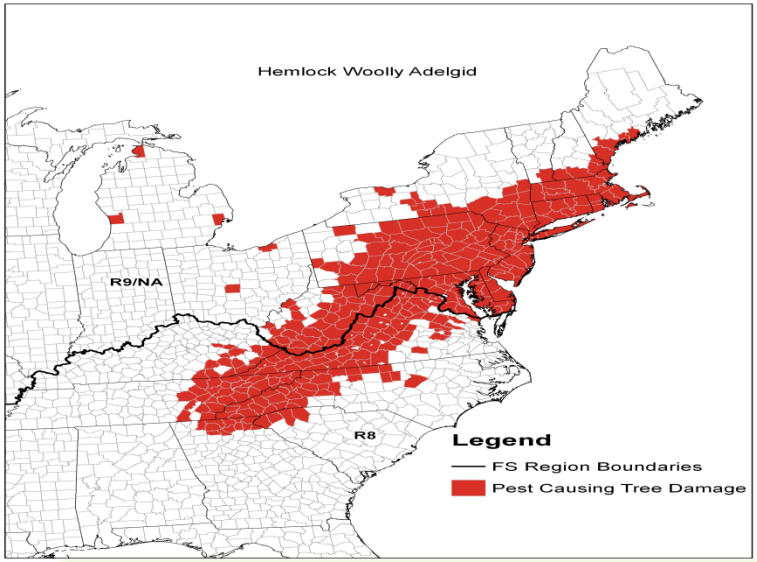
- First reported in NY in 1996
- Eradicated from Chicago, parts of NY and NJ
- Currently present in NY, NJ, MA and OH
- FS provides assistance to APHIS and states to detect, contain and eradicate ALB

Emerald Ash Borer



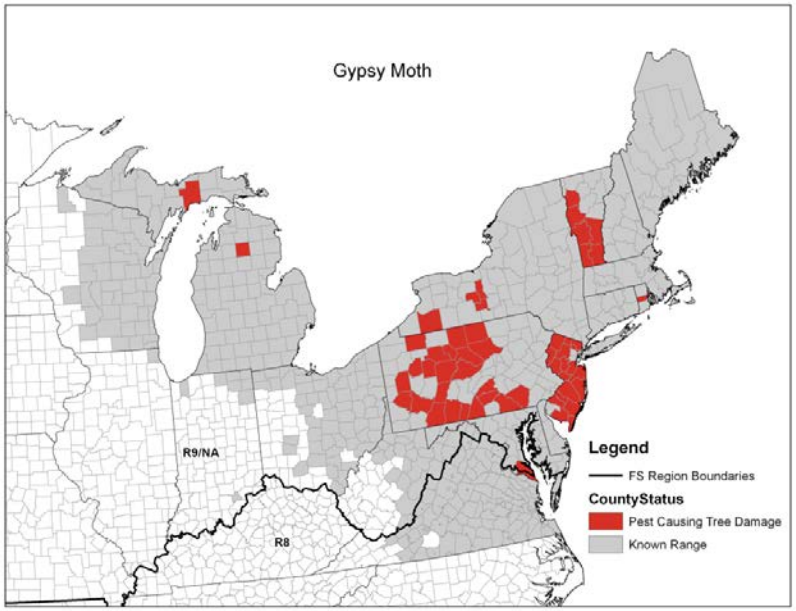
- First reported in Detroit area in 2002
- Currently present in 15 states
- APHIS is lead agency for quarantine and surveying
- FS & APHIS working on biocontrol
- FS also provides technical assistance to states, developed recommendations for insecticides, testing a SLAM approach and provides public information

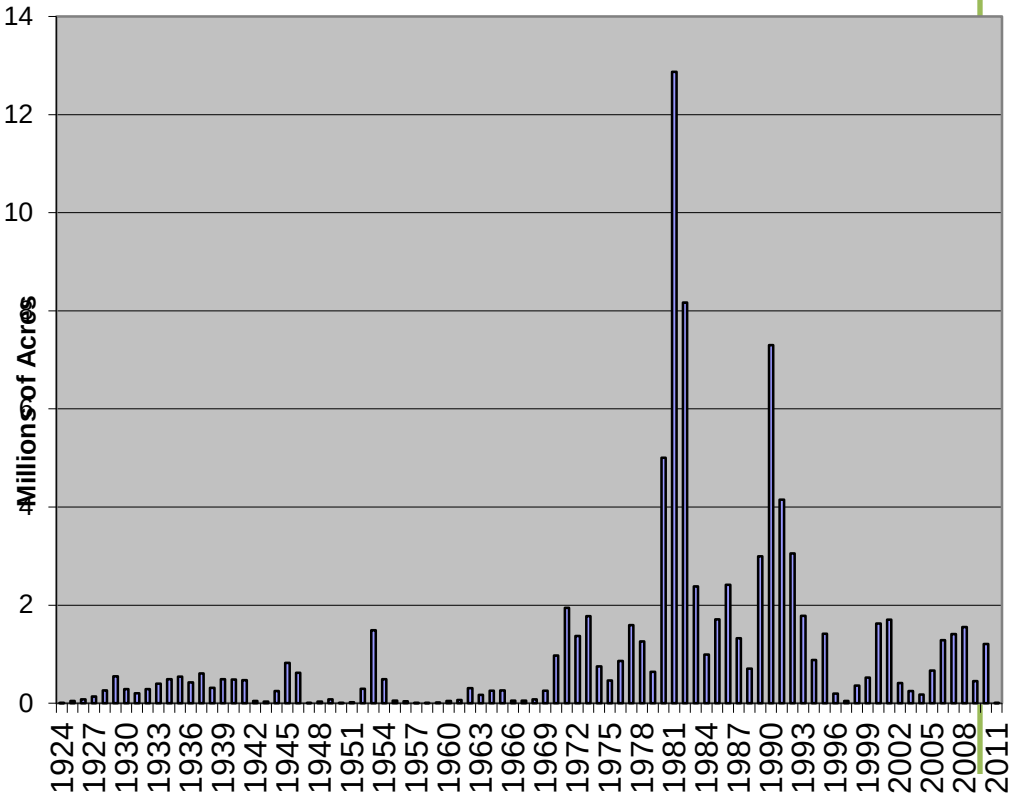
Hemlock Woolly Adelgid



- Poses the greatest risk to health of hemlock forests
- Currently present in 17 states from Maine to Georgia
- FS is implementing an HWA strategy focuing on expanded management, research and tech devlopment
- Management includes insecticide treatment of high value hemlock, release of biocontrol organisms . Treated > 6,000 ac in 2011.
- Long-term use of biocontrol is most promising.

Gypsy Moth



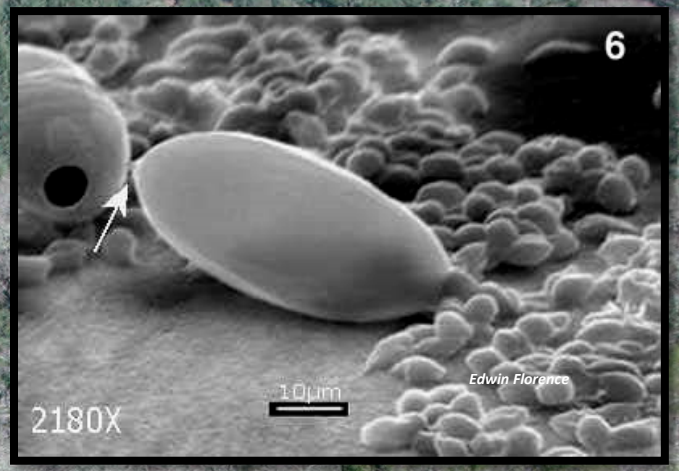


- Defoliation decreased in 2011 to 4,827 ac from > 1 million ac in 2010 (mostlof which was in Michigan)
- FS funded treatments on > 530,000 ac in both 2011 and 2012
- Three components of the FS program are: suppression, eradication and slow-the-spread (most of ac treated)
- STS has benefit:cost of 3:1, is a model for cooperation with states and has protected ~50 million acres from infestation

Sudden Oak Death

Phytophthora ramorum

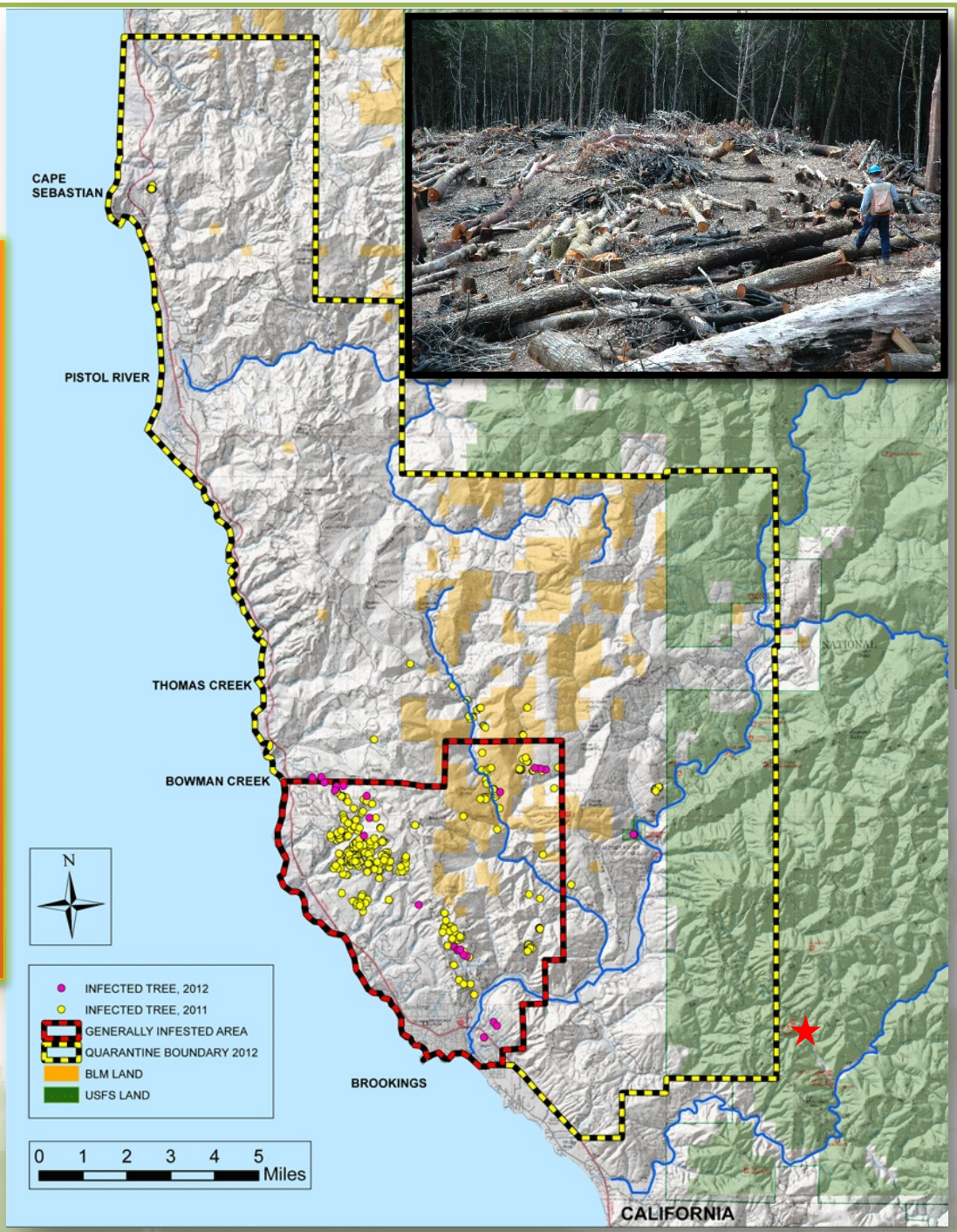
- Invasive pathogen found in 15 counties along the coast in CA and OR
- Extensive mortality of tanoak, coast live oak, and CA black oak since 1995
- National surveys of forests have **not** found infestations outside CA and OR
- Eastern Oaks may be at risk



Oregon SOD

March 2012

- Containment started 2001 after 1st detection
- Early detection & rapid response keys to successful containment
- New find on FS Land outside quarantine boundary May 2012
- Containment effort underway and on-going

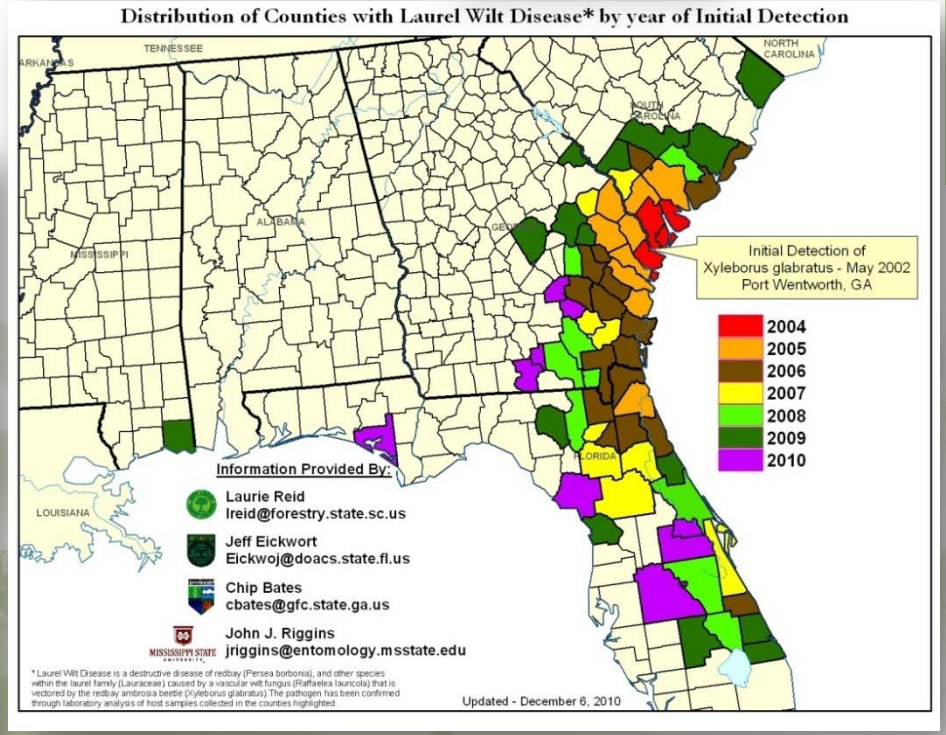


White Pine Blister Rust

- Introduced early 1900's
- Screening has identified sources of resistance
- Seed transfer zones established to ensure adapted to local conditions
- Proactive regeneration using resistance in advance of WPBR is being developed
- Genetic conservation offers hope to restoration

Laurel Wilt

- *Xyleborus glabratus* carries an invasive wilt fungus of Redbay
- *Raffaelea lauricola* is similar to Dutch Elm Disease fungus
- Firewood may be a potential pathway

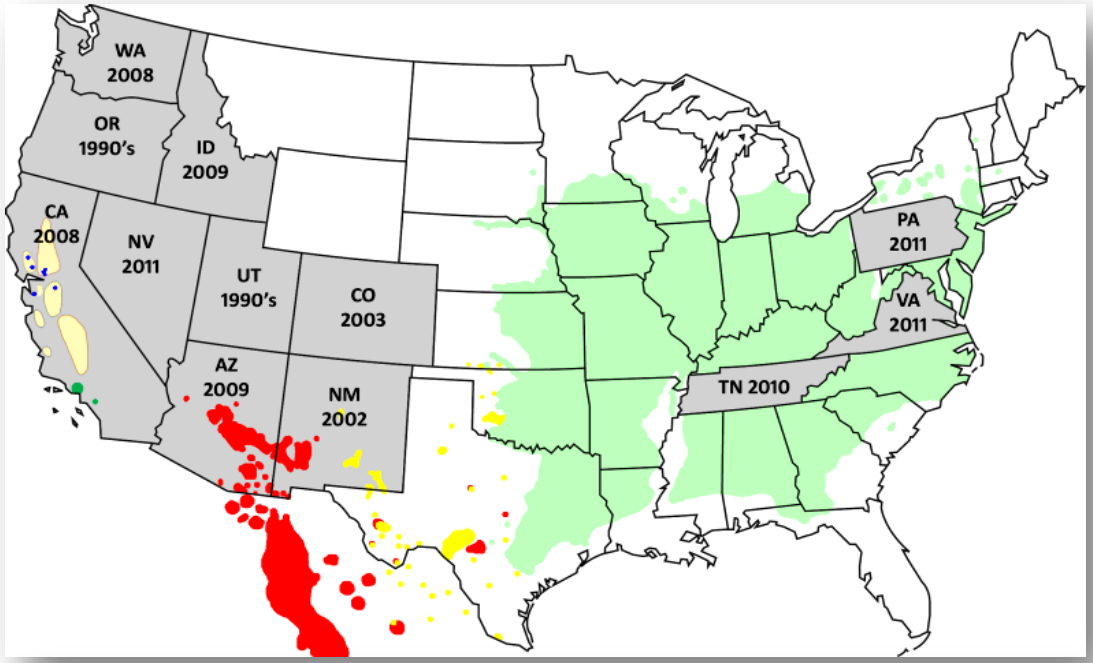


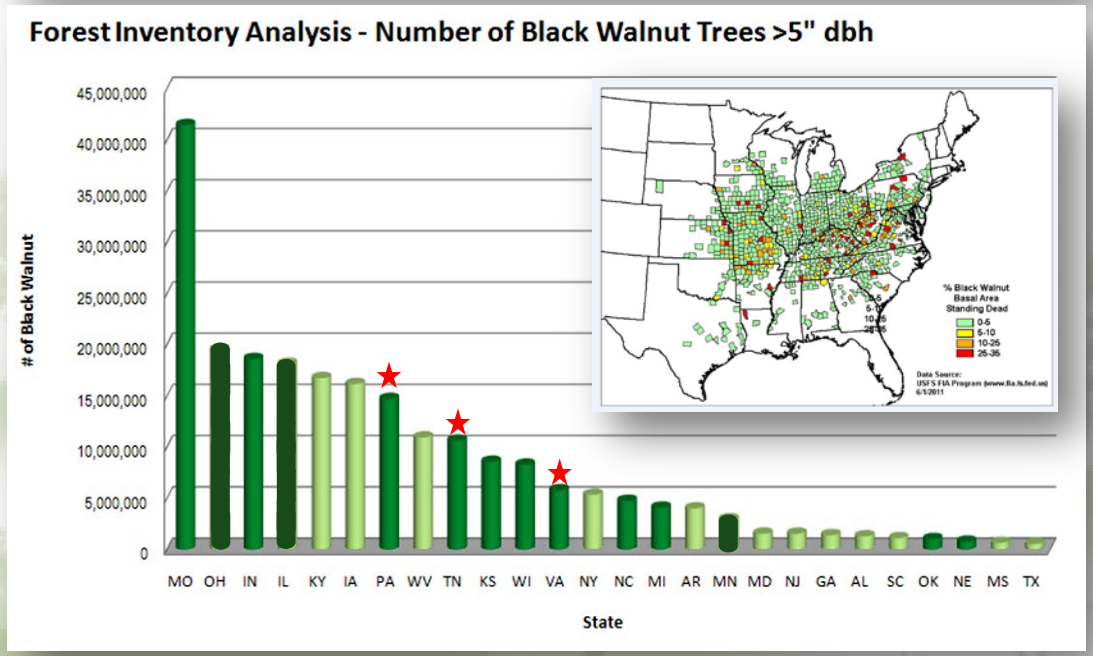
Thousand Cankers Disease

- Walnut Twig Beetle introduces canker causing fungus
- Native insect /disease complex acting like invasive on eastern black walnut
- Now occurs in 12 states, most recently found in PA

TCD (cont.)

- First identified 2008 in Colorado
- 2012 Intensive survey using lure/trap
- Developing silvicultural prescriptions and heat treatment suggestions for control



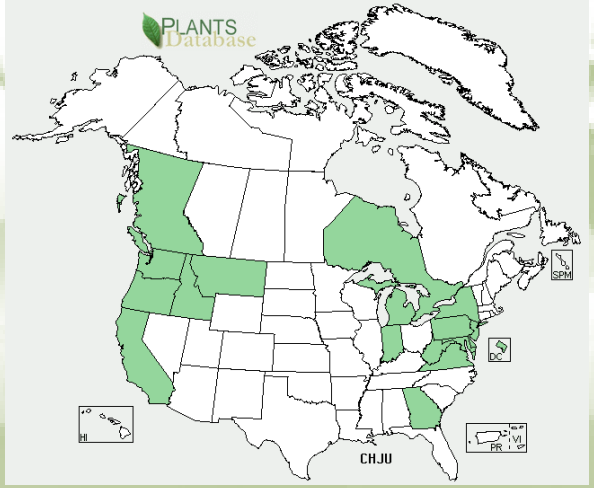


Rush Skeletonweed: *Chondrilla juncea* *(R1/R4)*

Species Description: perennial forb; member of the sunflower family; native to Eurasia and northern Africa

Current Management Strategy:

- Prevention is key
- Small infestations physical removal or herbicides
- Large infestations- need biological control



Research Needs:
Rush Skeletonweed: *Chondrilla juncea*

Approved biocontrol agents for rush skeletonweed include a midge, a mite, a pathogen (rust), and a root moth; available biocontrol agents do not provide adequate, consistent levels of control in all areas

Research Needs:

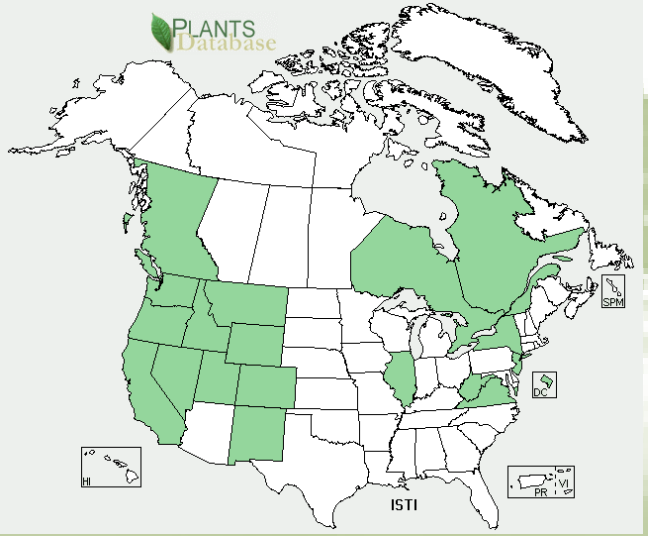
- Determine where existing biocontrol agents are most effective
- Identify new biocontrol agents with greater potential to impact skeletonweed and reduce its competitive advantage
- Develop/ improve methods for detecting small and/or isolated populations

Dyer's Woad: *Isatis tinctoria* *(R1/R4)*

Species Description: winter annual, biennial, or short-lived perennial; member of the mustard family; native to Europe

Current Management Strategy:

- Prevention is key
- Small infestations- hand pulling or herbicides
- Large infestations- need biological control



Research Needs:
Dyer's Woad: *Isatis tinctoria*

No biocontrol agents currently available for release against dyer's woad; one candidate biocontrol agent is in the permitting process, and a native pathogen (rust) has been found that reduces dyer's woad seed production

Research Needs:

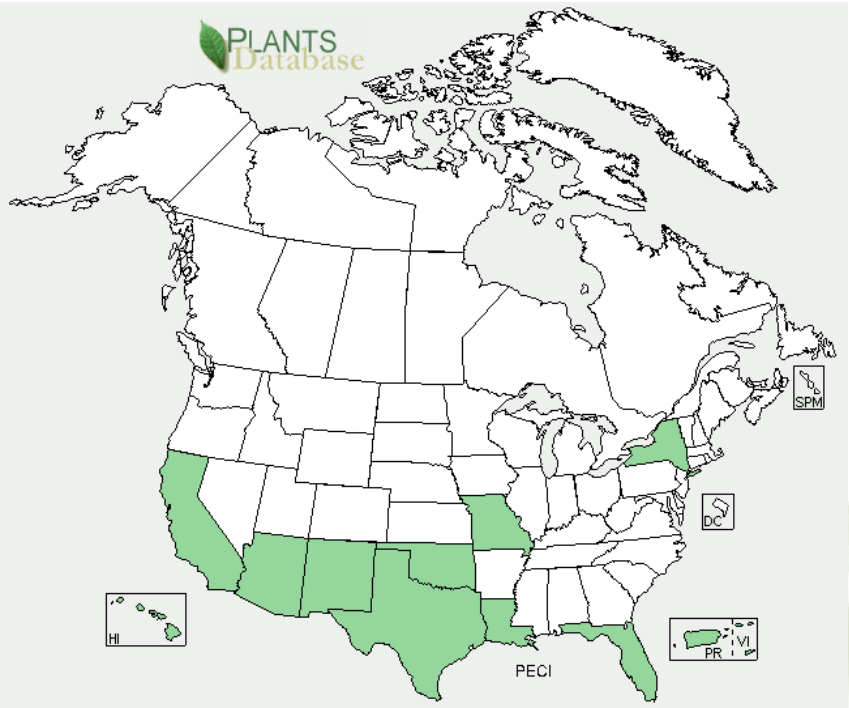
- Continued work identifying new and obtaining approval to release candidate biocontrol agents
- Characterize dyer's woad populations in its invaded range in preparation for assessments post biocontrol release
- Detection methods to help identify small, isolated weed populations

Buffelgrass (R3)
(*Pennisetum ciliare*)

- Perennial grass that was originally introduced as a forage grass in Mexico and has since moved throughout the Sonoran Desert.
- Buffelgrass can grow densely and crowd out native plants of similar size. Competition for water can weaken and kill larger desert plants. Dense roots and ground shading prevent germination of seeds.
- Creates a fire hazard for plant communities of the Sonoran Desert that are non-adapted to fire.

Buffelgrass
(*Pennisetum ciliare*)

Buffelgrass
(*Pennisetum ciliare*)



- Mainly controlled by manual pulling and herbicides, especially glyphosate which is non-selective.
- **Research needs** include biocontrol agent alternatives and herbicides that can act selectively against buffelgrass on a long-term basis without harming native vegetation.

- Guidelines for regulatory treatment of solid wood packing and understanding the role of firewood in movement of insect pests.
- NCEAS Workshops on impacts of invasive species.

- Recommendations for use of insecticides to protect landscape trees from emerald ash borer, southern pine beetle and other insects.
- Slowing Ash Mortality (SLAM) Project designed to manage EAB infestations and slow their natural spread -- Part of team pilot testing.

- **Development of transgenic methods for engineering resistant ash and elm trees.**