

# Diagnosing Tree Diseases: The Good, The Bad, and the Ugly!

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# Disease

- Any deviation from the normal function of a plant . . .

# Disease

- Any deviation from the **NORMAL** function of a plant . . .

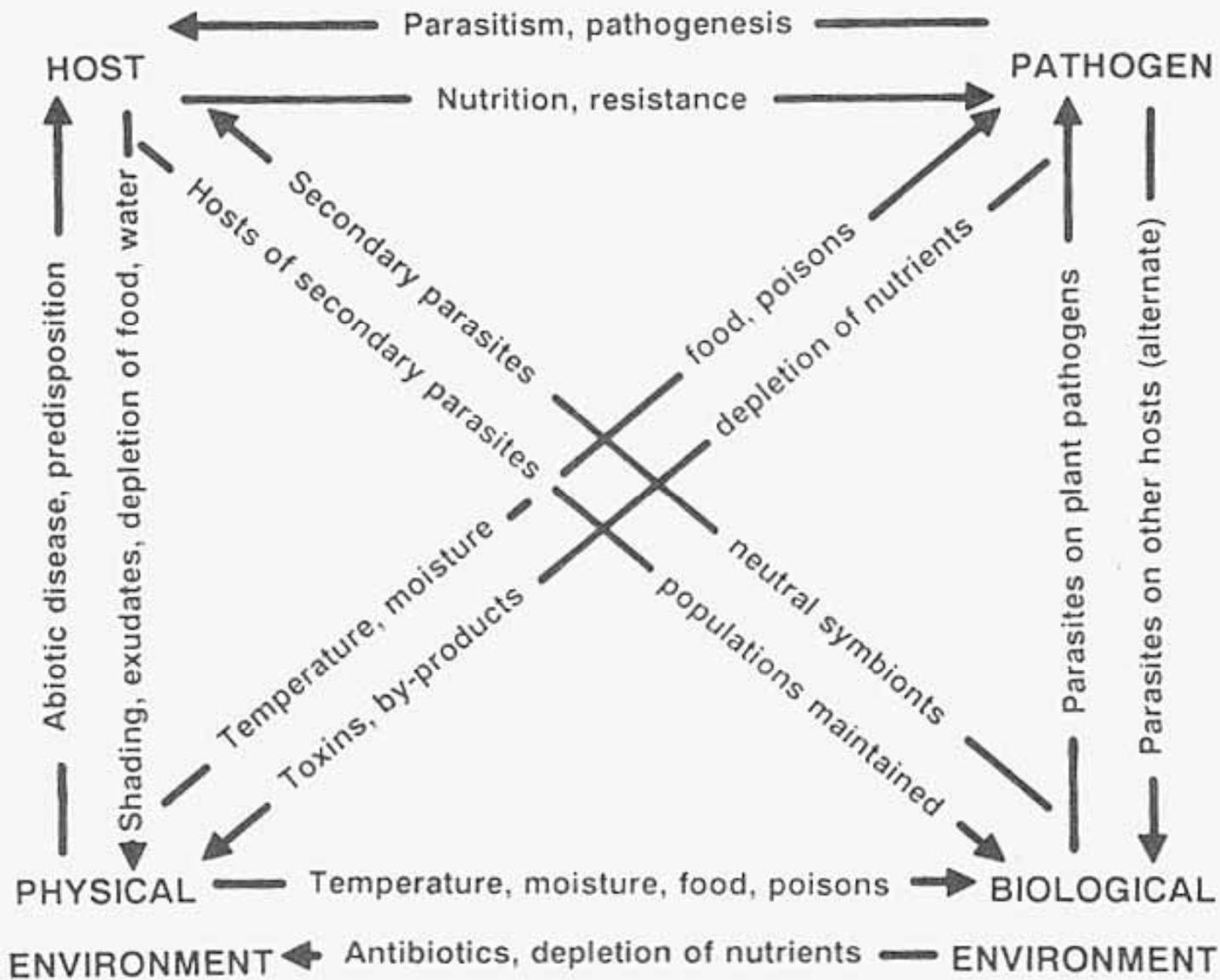


FIGURE 2.2 The disease square, showing the principal possible interactions of the four groups of variables that contribute to the occurrence and intensity of plant disease. This is a qualitative diagram; it does not include any quantitative information such as amount of inoculum, temperature, and moisture.

# Foliage

- Color
- Density
- Leaf size and shape
- Wilting?
- Retention

# Twigs

- Annual Twig Growth (3-5 yrs)
- Abnormal buds – color, number
- Retention
- Sapwood discoloration
- Evidence of pests

# Large Branches

- Amount of dead wood
- Excessive pruning
- Wound closure rate
- Cankers
- Bacterial wetwood

# Trunk

- Cavities
- Cankers
- Frost Cracks
- Lightning
- Mechanical injury

# Roots

- Color
- Evidence of pests
- Abundance
- Mechanical Injury

# Roots

- Rooting Area
  - Pavement
  - Disturbance
  - Soil Type

# Soil

- Drainage
- Watering
- pH
- Type
- Pesticides
- Ground cover

# Root Diseases

- Kill trees by:
  - Killing cambial tissue
  - Weakening support and trees windthrow
  - Stressing trees and bark beetles attack

# Root disease symptoms

- Reduced leader growth
- Off-color foliage
- Less foliage
- Swollen butts
- Pitch flow at butt and on roots
- Bark beetle attack
- “Stress Cone Crop”

# Root diseases:

- Spread along roots slowly
- Cause symptoms in a patch or center
- Persist on the site in root biomass

















EXPERIMENTAL AREA  
**-KEEP OUT-**

# Root Disease complexes

- Root pathogens often occur together!





















UGA4215015b





# Ash yellows: a slow-decline disease caused by '*Candidatus Phytoplasma fraxini*'



# Ash yellows in white ash

Incurable, perennial, often debilitating

Symptoms: combinations of

- slow growth

- subnormal greenness or chlorosis

- diminished or lost apical dominance

- reduced fruit & seed set & viability

- witches'-brooms

- rootlet necrosis

- decline ending in death



# Symptoms of ash yellows conditioned by

- tolerance or resistance of hosts
- aggressiveness of pathogen
- environmental influences. Phytoplasmal diseases most common & severe in areas of warm to tropical climate; cold winters can cure some plants, kill vectors

Drought stress can trigger dieback and decline in trees that are otherwise able to tolerate phytoplasmal infection



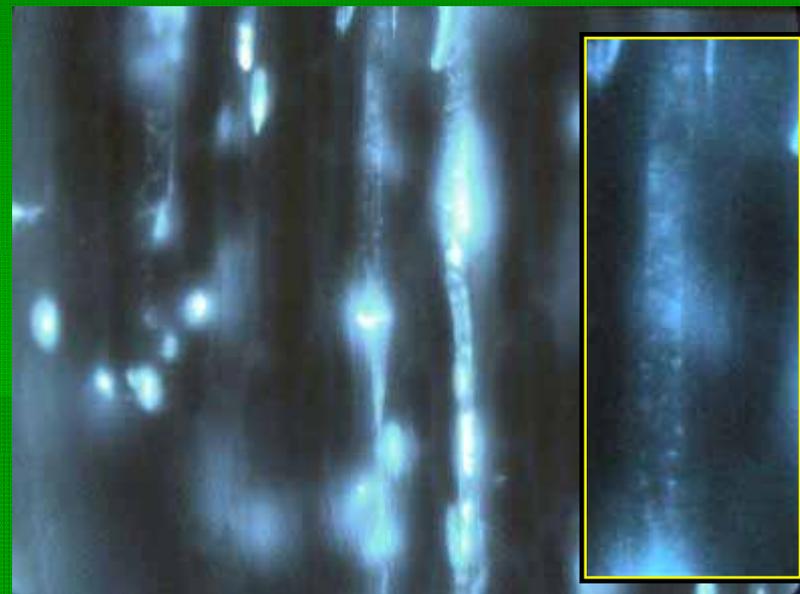
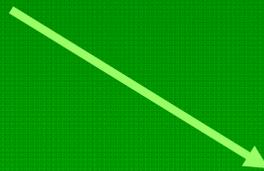
Drought-triggered dieback in white ash affected by ash yellows

## Interspecific differences in apparent tolerance (natural stands studied)

Species & place	Average radial growth (diseased / healthy)
<i>Fraxinus velutina</i> , Utah several sites in Zion Canyon	1.0
<i>F. pennsylvanica</i> , 2 sites, NYS, 5 yr after growth of healthy and diseased groups diverged	0.70
<i>F. americana</i> , 2 sites, NYS 5 yr after growth of healthy and diseased groups diverged	0.61

# Phytoplasma detection

- microscopic
  - transmission EM  
(little used now)
  - DAPI fluorescence  
(obsolete)



- immunological (little used)
- recombinant DNA-based techniques  
PCR + product analysis

DAPI: a DNA-binding fluorochrome (4',6-diamidino-2-phenylindole.2HCl)

# Ash yellows



deliquescent  
branching

Rootlet necrosis in  
highly suscept.  
spp.



# Importance of rootstock tolerance

Velvet ash on  
its own or on  
white ash  
roots



V / V - healthy

V / W - AshY

V / V - AshY

- Special Thanks to Wayne Sinclair for his info on Ash Yellows

# Hazard Trees

- A tree at risk of failure
- A target of value













# Swollen branch stubs



# Fruiting bodies





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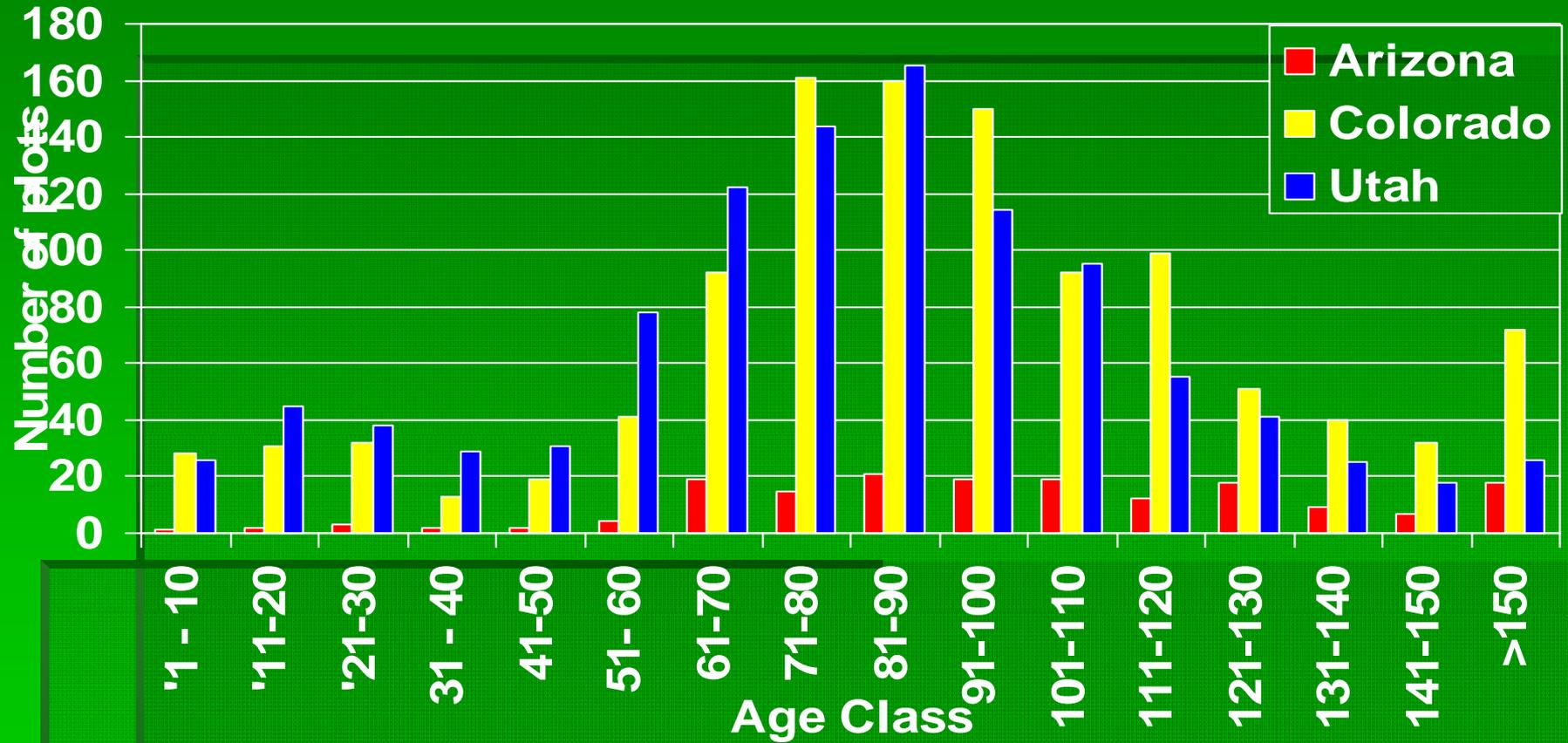
# Cankers



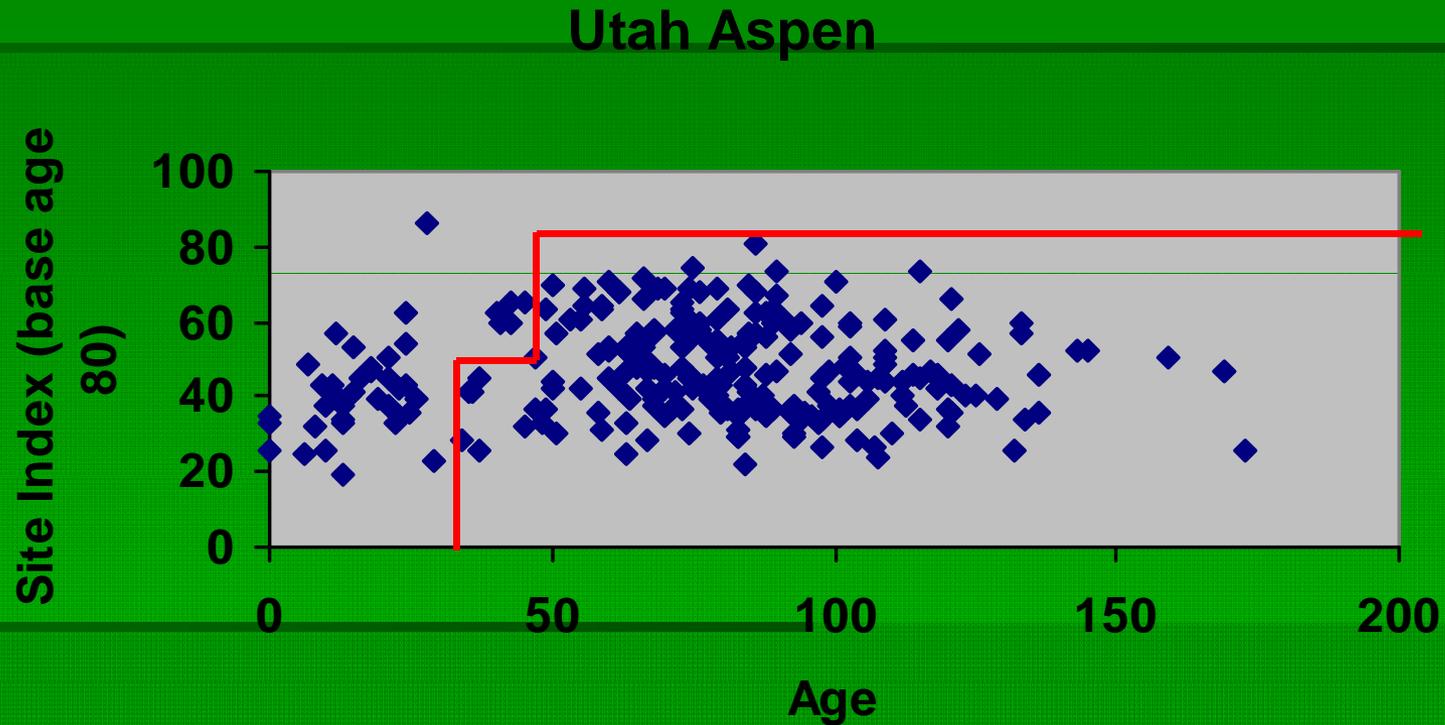
# Cavities

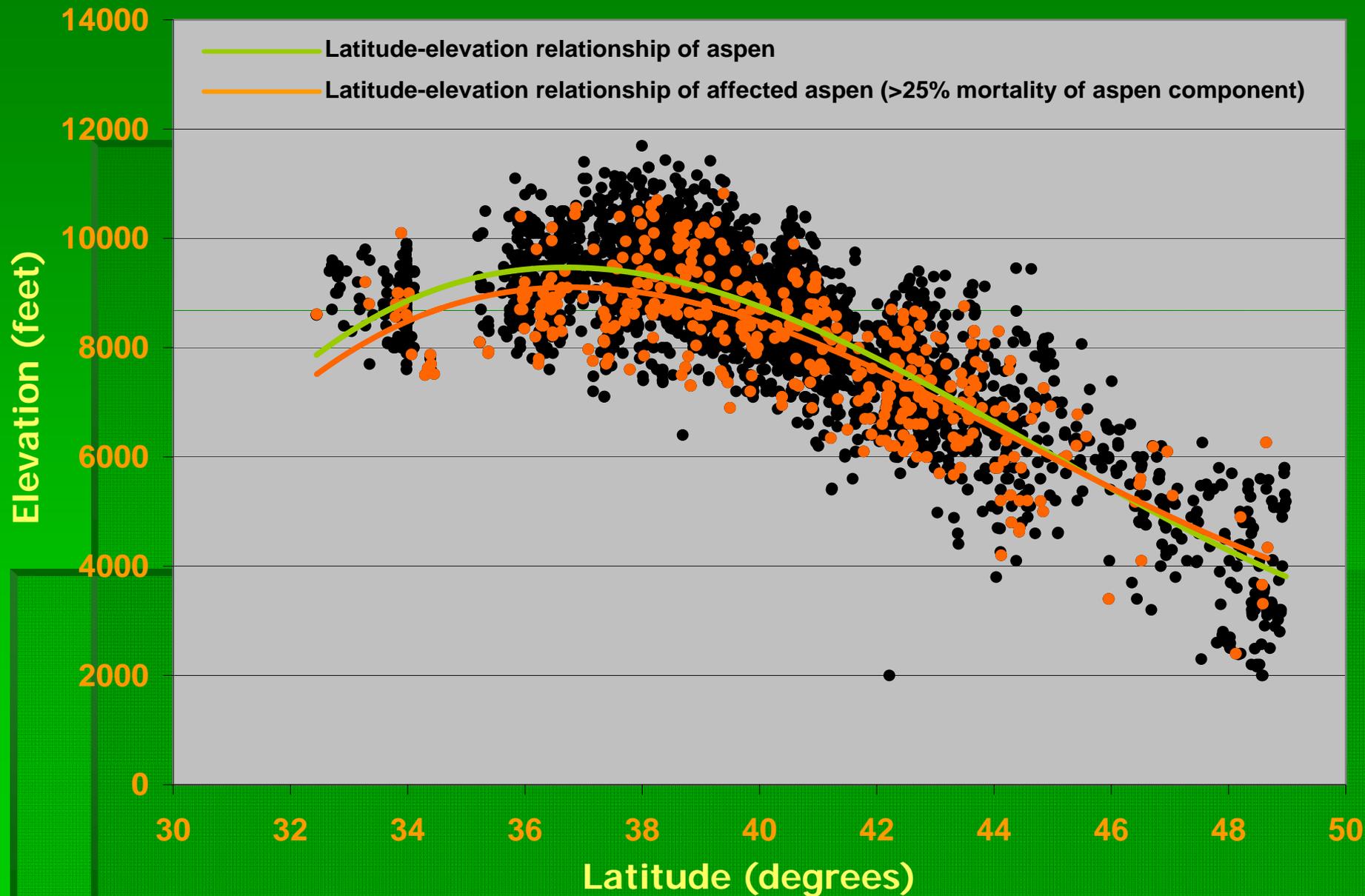


# Aspen Decline



# Too Old for the site. .





# Aspen Decline

- Too Old
- On Marginal sites
- At lower elevations
- Drought

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**The FIX: DISTURB ASPEN!!!**

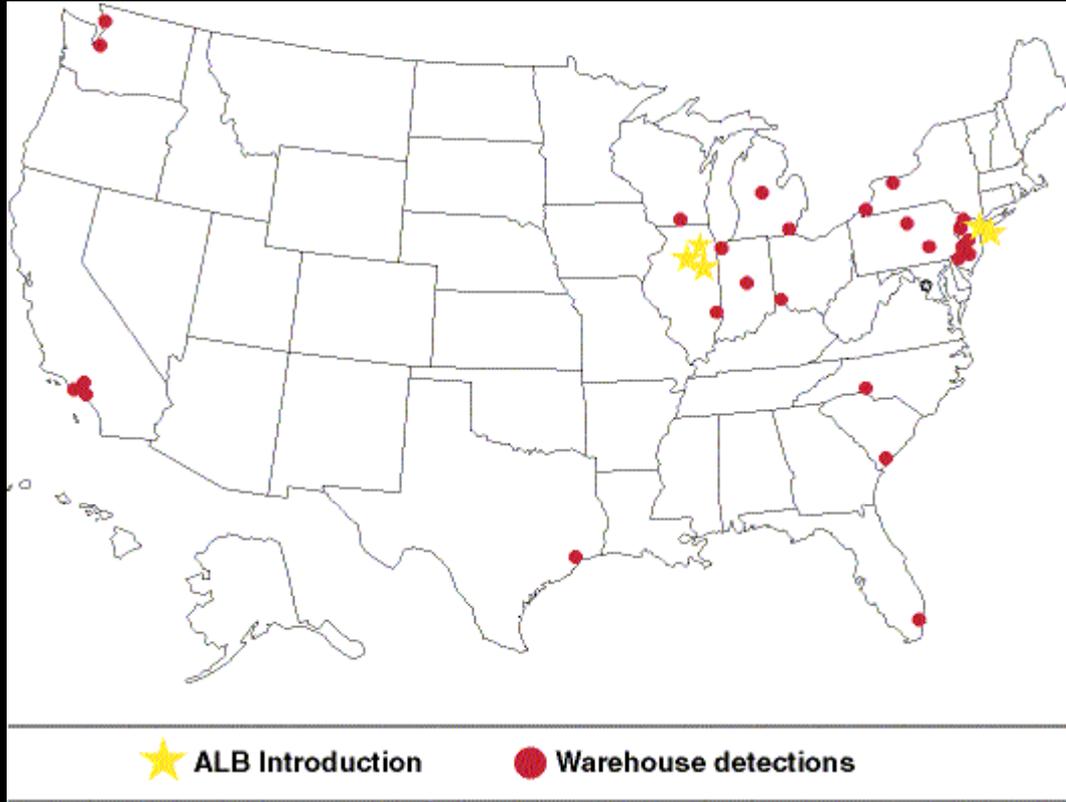
# Global Trade

- So what?









# Pitch Canker



# What you can do:

- Know what is normal!
- Know your plants
- Know your insects and diseases
- Know your plant sources
- Know your I&D man:
  - County Extension Agent
  - State Department of Agriculture
  - USDA Forest Service Forest Health Mgmt