The Onslaught of Exotic Terrestrial Invertebrates in Oregon

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Non-Crop Vegetation Management Course
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The Result: A Tsunamai of Exotic Species

- ~ 25,000 terrestrial invertebrate species in Oregon
- ~ 1,000 species of exotic terrestrial invertebrates in Oregon, so…

~ 5% of terrestrial invertebrate species in Oregon are exotic

Exotic Ladybird Beetles

Coccinella septempunctata

Harmonia axyridis

A root weevil in the genus *Otiorhynchus*

Slugs

Arion ater

Derocerus reticulatum

Exotic earthworms

Carabus nemoralis

Praying mantis

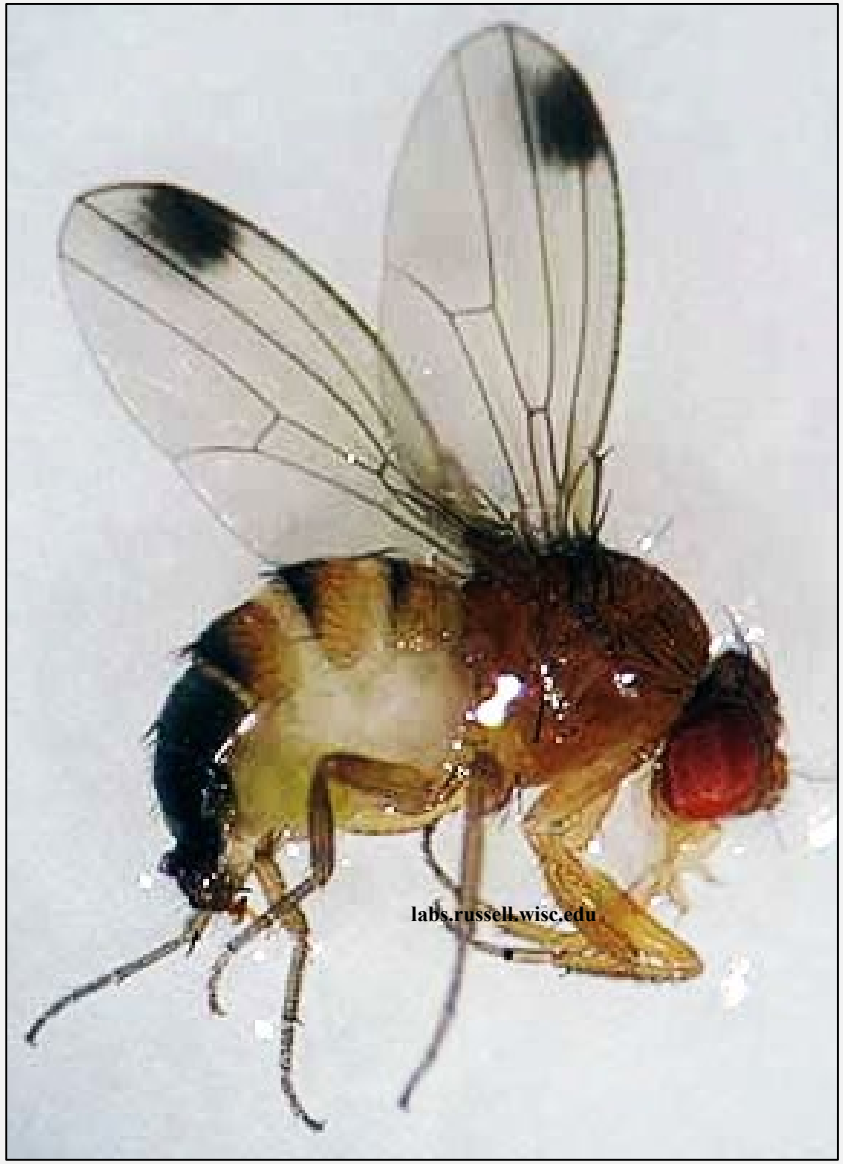
New Exotic Invertebrate Species Found Established in Oregon 2007-2016

Scientific name	Common name
Acanthocinus leechi	a longhorned beetle
Aceria spartii	bud mite
Acleris forsskaleana	maple leaftier or maple button
Aculops cannabicola	hemp russet mite
Aculus ballei	linden mite
Aelothrips albicinctus	a thrips
Aleyrodes proletella	cabbage whitefly
Amphimallon majale	European chafer
Amynthas gracilis	Asian jumping worm
Anoscopus serratulae	leafhopper
Arion hortensis	garden slug
Arocatus melanocephalus	elm seed bug
Ataenius abditus	a small scarab
Athysanus argentarius	leafhopper
Bactericera maculipennis	a jumping louse
Balanococcus diminutus	Phormium mealybug
Balanococcus dimunutus	New Zealand Flax mealybug
Blaniulus guttulatus	Spotted snake millipede
Boettgerilla pallens	wormslug
Cacopsylla fatsiae	Fatsia psyllid
Caliscelis bonelli	piglet bug
Carabus granulatus	a ground beetle
Cartodere bifasciata	a minute brown fungus beetle
Catocala amatrix	sweetheart underwing
Catocala neogama	bride underwing
Cepaea nemoralis	Banded wood snail
Cephalonomia gallicola	bethylid wasp
Ceresa festina	three-cornered leafhopper
Chaetophora spinosa	a moss beetle
Clitostethus arcuatus	ash whitefly ladybird beetle
Corythucha arcuata	oak lace bug
Crisicoccus probably *azaleae*	Azalea mealybug
Cydia coniferana	Conifer bark-feedng tortrix
Diaphnocoris chlorionis	Honeylocust plant bug
Diptacus mazuriensis	rust mite
Drepanothrips reuteri	grape thrips
Drosophila hydei	a vinegar fly
Drosophila suzukii	spotted wing drosophila
Encarsia inaron	ash whitefly parasioid wasp
Epitrix sp. (ID pending)	a leaf beetle
Eriopeltis lichtensteini	scale
Eriophyes canestrini	boxwood bud mite
Ferrisia gilli	Gill's mealybug
Geomyza tripunctata	cereal fly
Glycaspis brimblecombei	Eucalyptus redgum lerp psyllid
Hemiberlesia lataniae	An undescribed scale
Hexacola neoscatellae	a parasitoid wasp
Holoparamecus caularum	handsome fungus beetle
Homadaula anisocentra	mimosa webworm
Humerobates rostrolamellatus	a moss mite
Hylotrupes bajulus	old house borer
Labarrus pseudolividus	an exotic dung beetle
Laruia cylindracea	moss snail
Limonia distans	crane fly
Meconema thalassinum	drumming katydid
Monosoma pulveratum	green alder sawfly
Muriodelphax arvensis	Delphacid planthopper
Myrmica speciodes	ant
Nebria brevicollis	European gazelle beetle
Nematus lipovskyi	azalea sawfly
Neoclytus caprea	banded ash borer
Neodiprion sertifer	European pine sawfly
Neohydatothrips setosus	thrips
Onthophagus taurus	bullhorned dung beetle
Orchestes alni	European elm flea weevil
Pandemis cerasana	barred fruit-tree tortrix
Pasiphila retangulata	green pug moth
Phenacoccus nr. *gossypii*	undescribed species
Philopedon plagiatum	weevil
Phyllocoptes compressus	rust mite
Phymatodes lividus	longhorned beetle
Phytomyza hellebori	hellebore leafminer
Pityophthorus juglandis	Walnut twig beetle
Planococcus citri	Citrus mealybug
Platycleis tessellata	tessellated shieldback
Ponera testacea	ant
Pseudaulacaspis cockerelli	False oleander scale
Psylliodes affinis	Bittersweet flea beetle
Psyllopsis fraxinicola	psyllid
Rhyncophytoptus new sp. 1	Eriophyidae
Rhyncophytoptus new sp. 2	Eriophyidae
Schevtchenkella dentata	rust mite
Scolytus schevyrewi	Banded elm bark beetle
Scythris limbella	a Eurasian moth
Simplocaria semistriata	moss beetle
Siphoninus phillyreae	ash whitefly
Smynthurodes betae	bean root aphid
Stephanitis pyriodes	Azalea lace bug
Stigmaeopsis sp.	Bamboo spider mite
Succinea concordialis	Amber snail
Syricoris lacunana	dark strawberry totrix
Tinocallis kawaluokalani	Crape myrtle aphid
Tremex columba	pigeon tremex
Trialeurodes abutiloneus	banded-wing whitefly
Trioza alacris	jumping louse
Trissolcus japonicus	brown maramorated stinkbug parasitoid
Xiphydria maculata	small wood wasps
Zygina flammigera	leafhopper

Legacy Species: A "Gift" From One Generation To The Next

Undeniable “New Kids On The Block”

Spotted wing Drosophila



Azalea lace bug

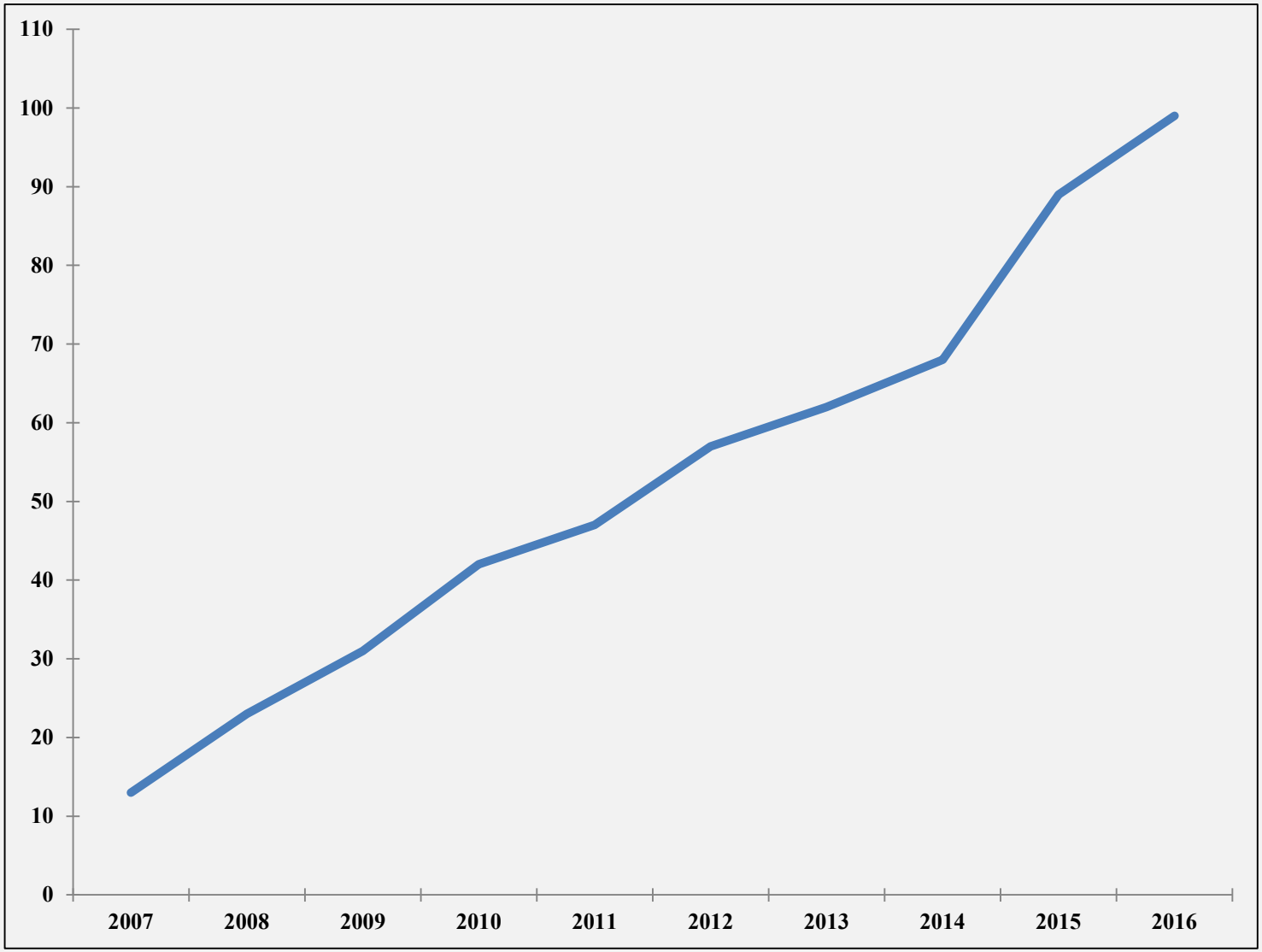
New Exotic Invertebrate Species Found Established in Oregon 2007 - 2016

An average of
9.9 species/year
or
> 1 every two months!

Year	No. Species
2007	13
2008	10
2009	8
2010	11
2011	5
2012	10
2013	5
2014	6
2015	21
2016	10

	99

Rate of Detection of New Oregon Exotics



Significant Exotic Pests Detected 2007-2016

Average detection rate: 9.9 species/year

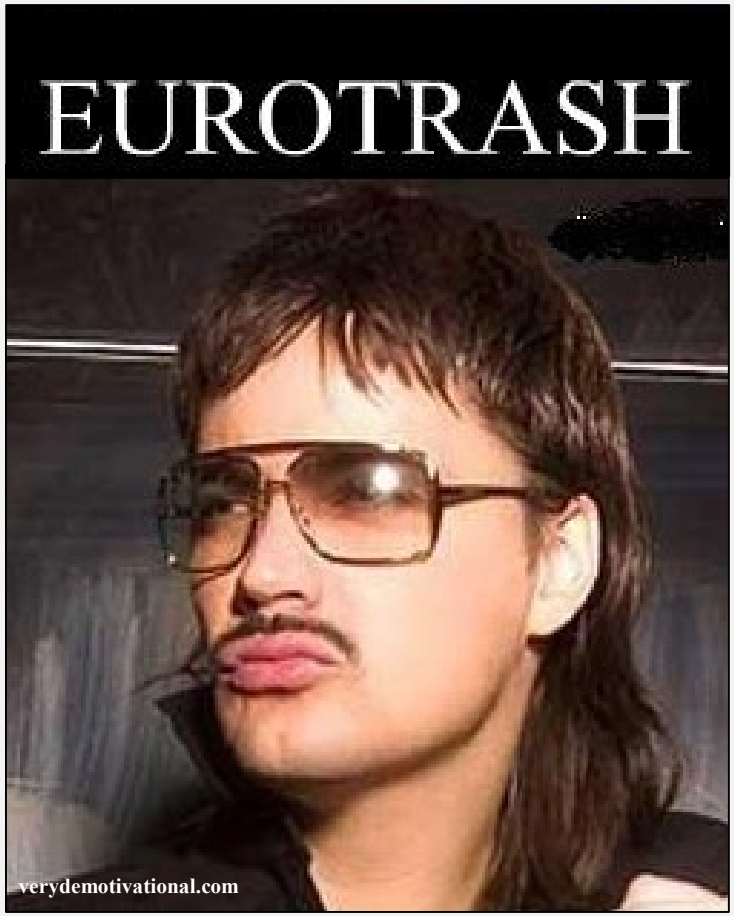
Proportion significant pests detected: 1 in 6

On average, every year Oregon could have at least one SIGNIFICANT pest detected…

Aculops cannabicola	Hemp russet mite
Aleyrodes protella	Cabbage whitefly
Amphimallon majale	European chafer
Amynthas gracilis	Asian jumping worm
Arion hortensis	Garden slug
Brachypeplus basalis	Honeybee hive sap beetle
Ceresa festina	3-cornered alfalfa hoppr
Corythucha arcuata	Oak lace bug
Drepanothrips reuteri	Grape thrips
Drosophila suzukii	Spotted wing Drosophila
Ferrisia gilli	Gill's mealybug
Hylotrupes bajulus	Old-house borer
Nematus lipovsyi	Azalea sawfly
Neodiprion sertifer	European pine sawfly
Pandemis cerasana	Barred fruit-tree tortrix
Pityophthorus juglandis	Walnut twig beetle
Scolytus schevyrewi	Banded elm bark beetle
Siphoninus phillyreae	Ash whitefly
Stephanitis pyrioides	Azalea lace bug

Where Do They Come From?

Origins	%
Europe	49
Asia	19
Other U.S. Regions	19
Australia/New Zealand	6
Other or Unknown	7

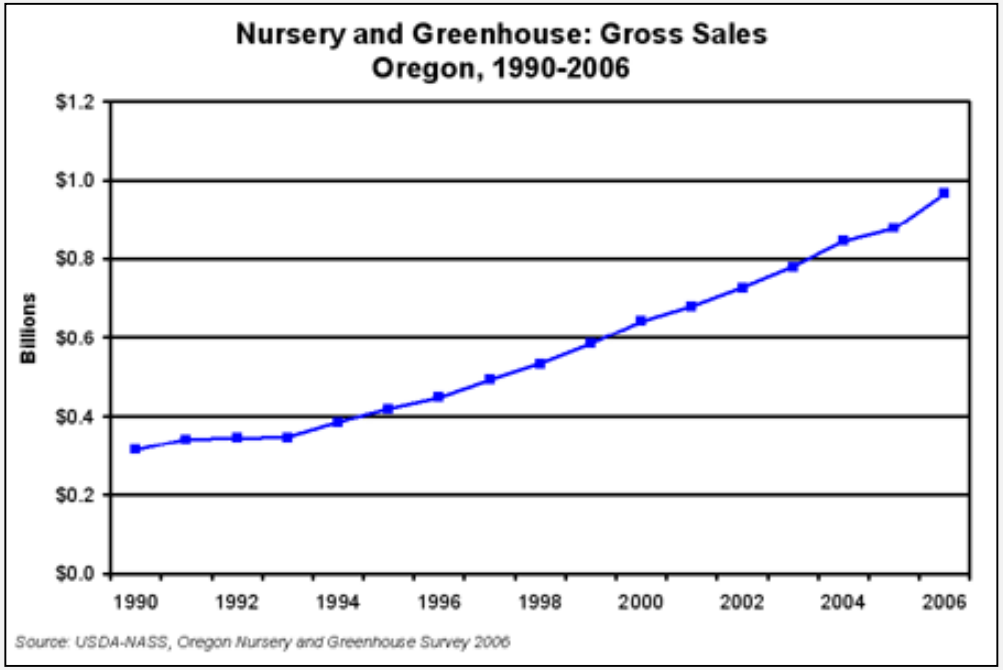


Where Are They New To?

Region	%
North America	9
Western North America/U.S.	16
United States	1
Pacific Northwest	14
Oregon	58
Western Oregon	2

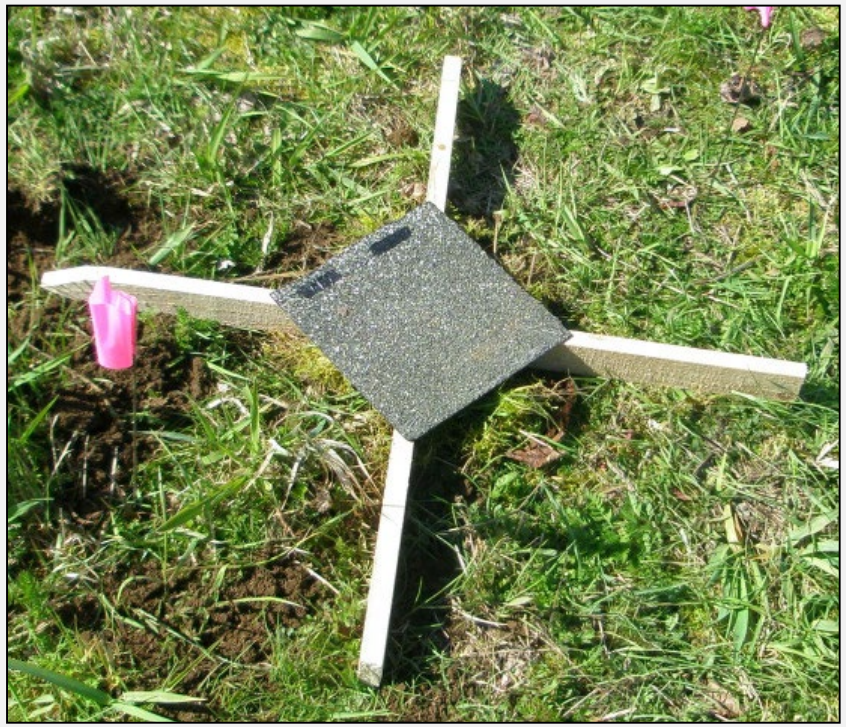
How Did Oregon's Exotics Get Here?

Pathway	%	
Associated With Live Plants	63	79%
Soil or Soil With Plants	16	
Hitchhikers/Cargo/Misc.	12	
Raw Wood	9	



How Are They Found?

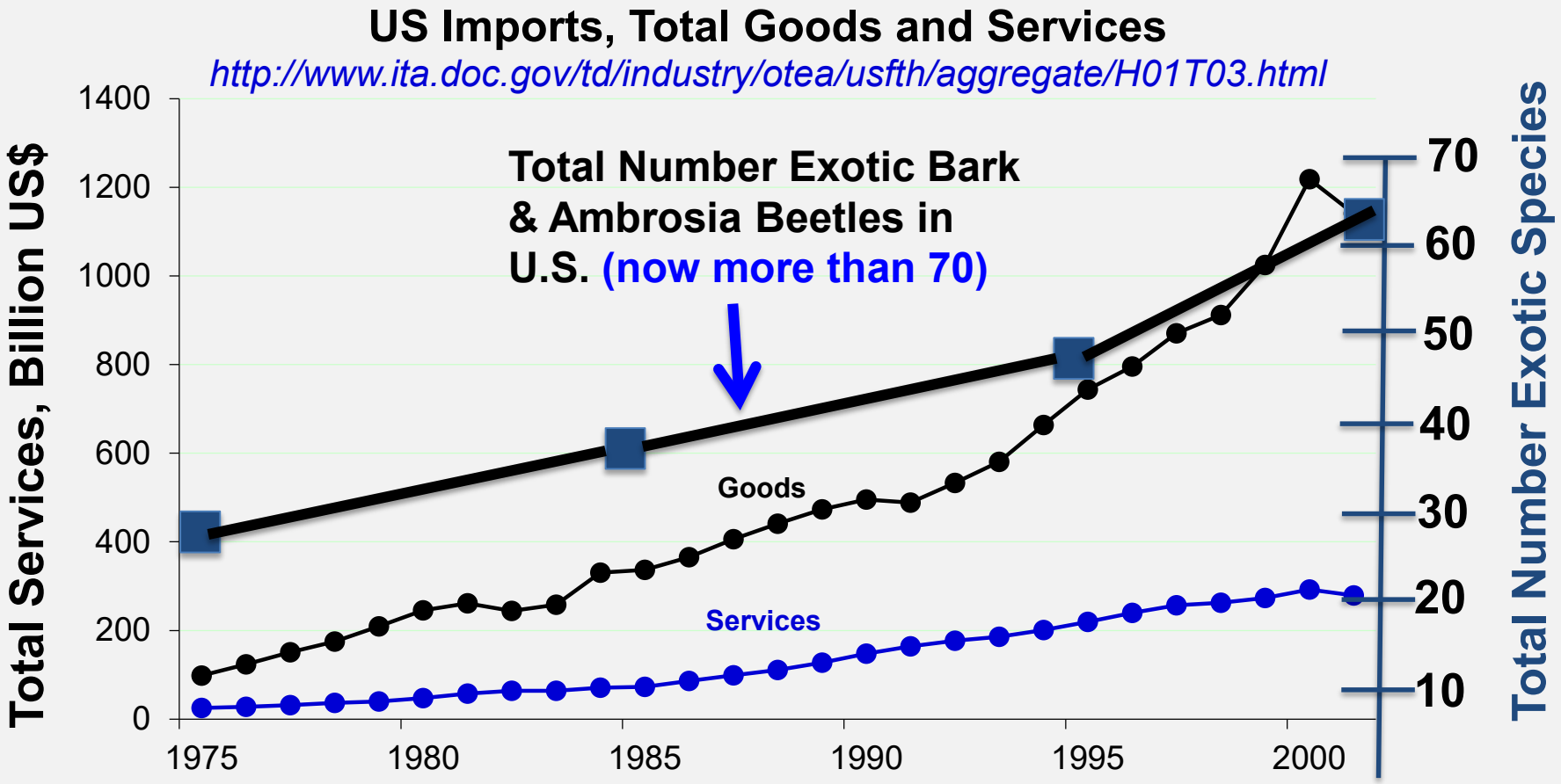
Detection Method	%
Survey	67
Submitted Sample	30
Public Detection	3



When in doubt, keep them out!

Why Do They Get Here?

Global (and domestic) Trade



Pathway: Live Plants From All Over!

Pathway: Solid wood packing

Strong Regulations

Strong Enforcement

Live Plant Imports: #1 Pathway

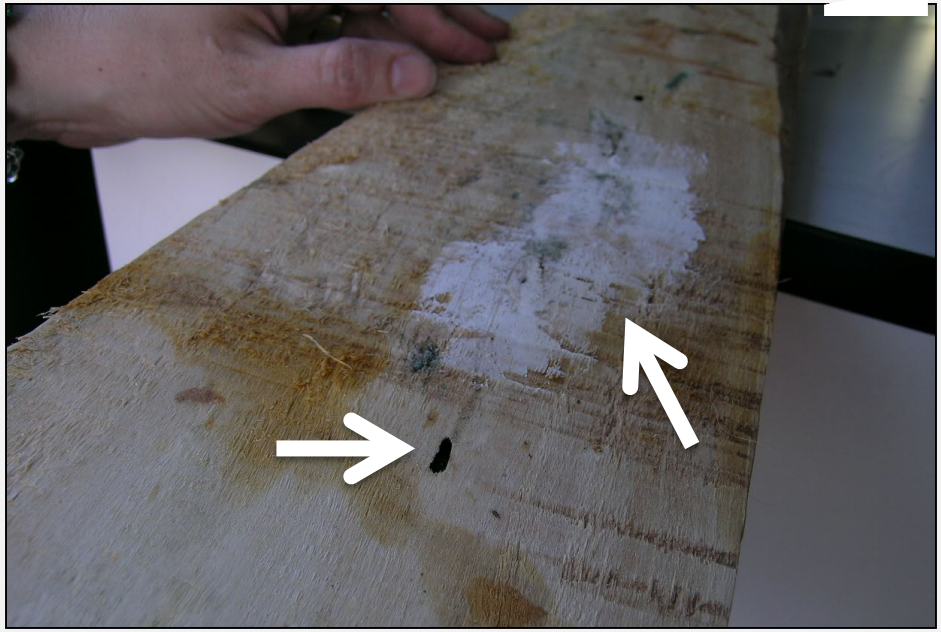
In 2007, the U.S. imported over 3 BILLION live plants!

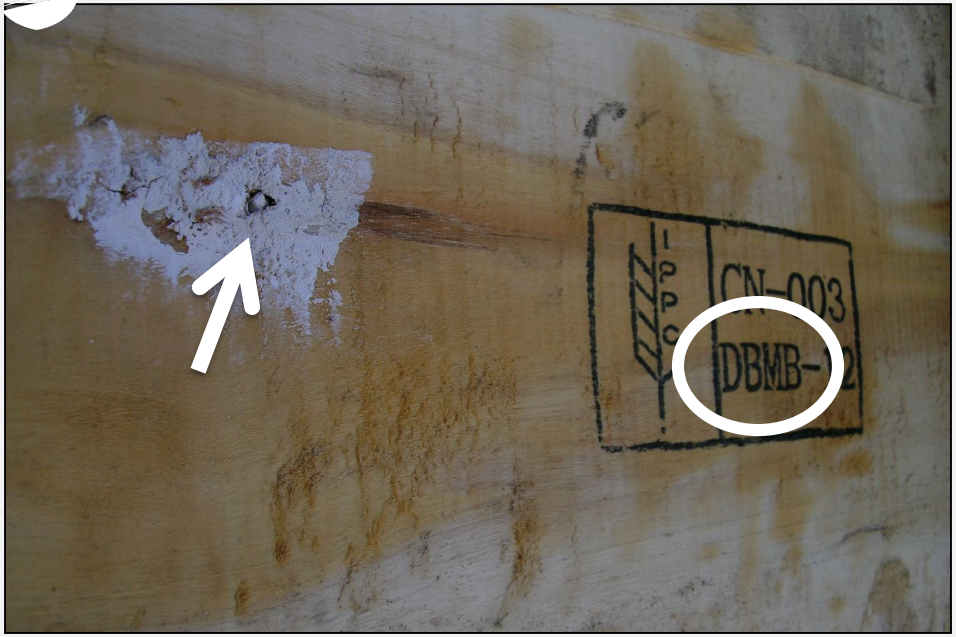
In 2010, USDA live plant inspectors had an average workload of 43,000,000 (milion) plants per inspector!!!!!!!!!!!!!

Citrus longhorned beetle

*Above information from Liebhold et al. 2012. Live plant imports: the major pathway for forest insect and pathogen invasions of the US. Front. Ecol. Eviron. 10(3): 135-143.

ISPM-15 “treated” crates of Chinese iron castings, at receiving business, Portland, September 2006



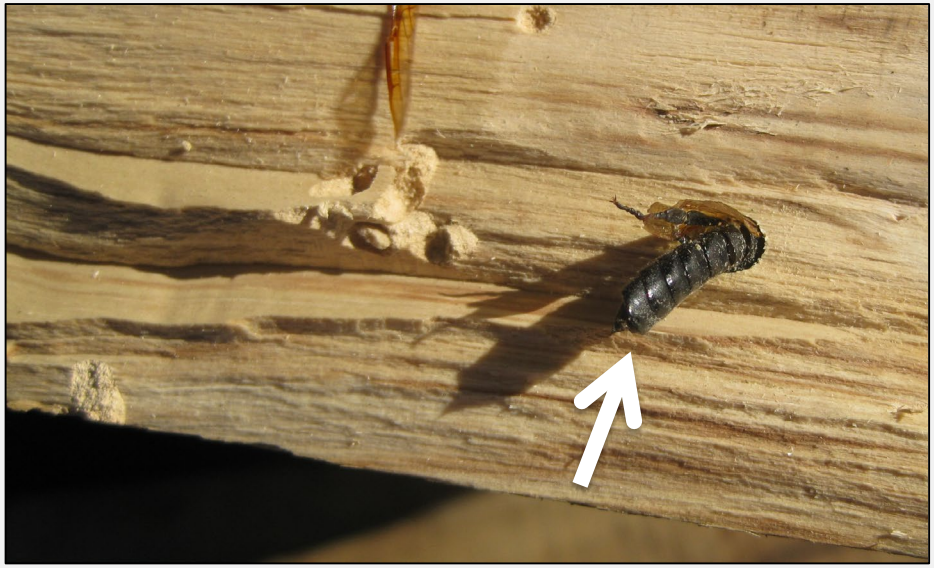


Live pupa of horn-tail wasp

Live larva of clear-wing moth

Adult, found alive,
of horn-tail wasp,
Tremex fuscicornis

…A Reprise…Portland, September 2011



When Regulations and Enforcement (Proactive!) Fail…

You are left with (Reactive!):

- **Surveillance**

  Seek and hopefully you will find soon enough for

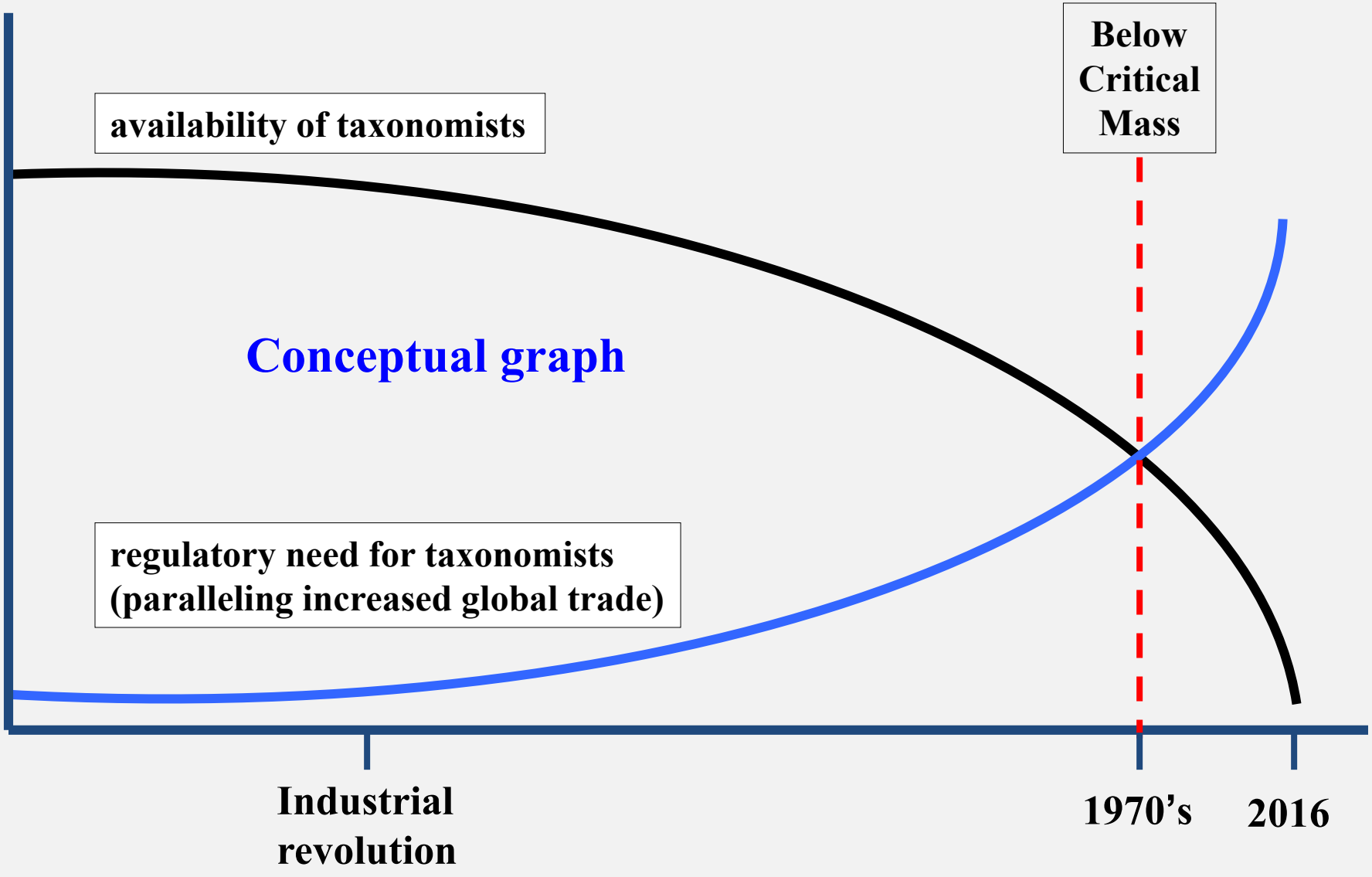
- **Eradication**

  if you got lucky and found the vermin soon enough

- **Control**

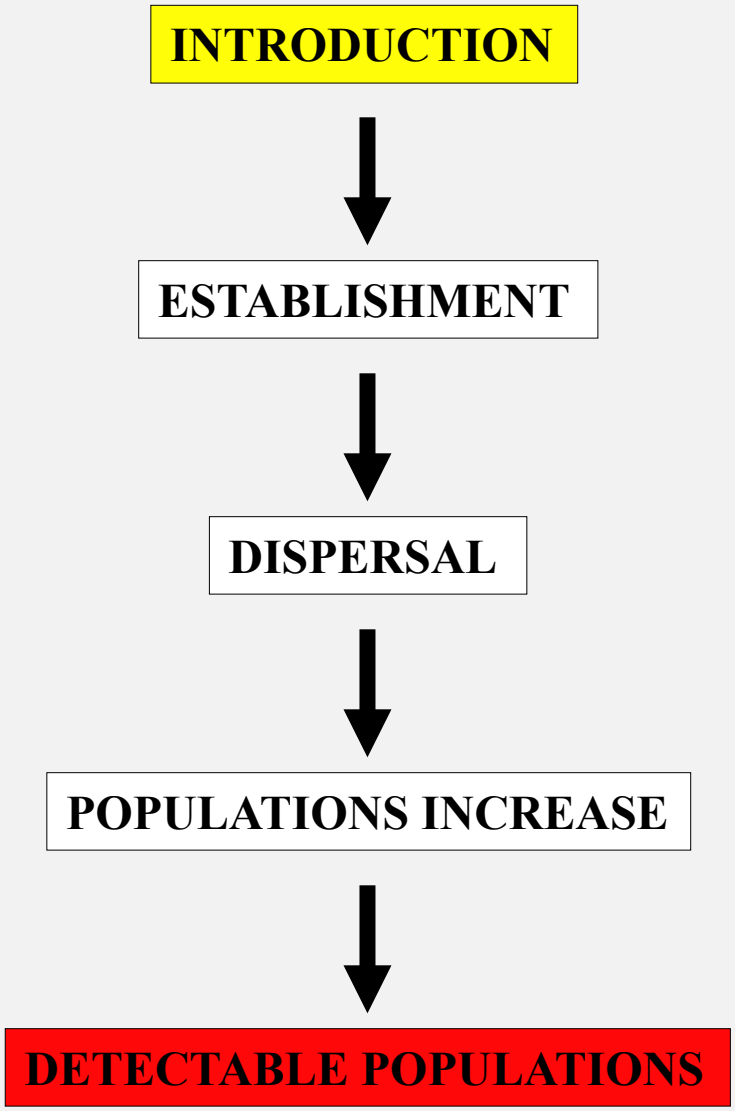
  living with the consequences

U.S. identification capabilities are inadequate




Many targets are not identifiable except by experts!

Lag time between introduction and detection



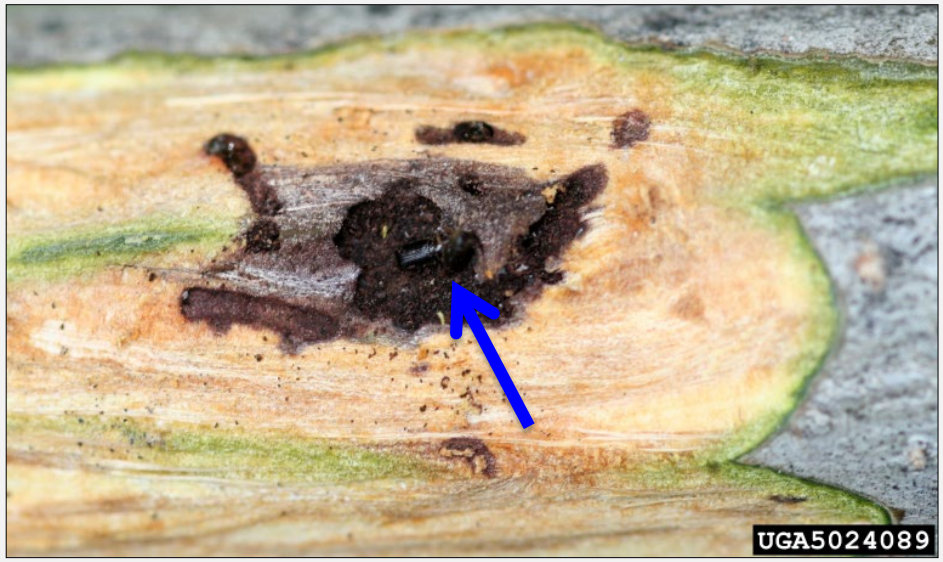
Technology for surveillance and detection of exotic species is primitive

Surveillance for and Detection of Exotic Species is Costly

A Single Year's Catch for a Single Survey!!!

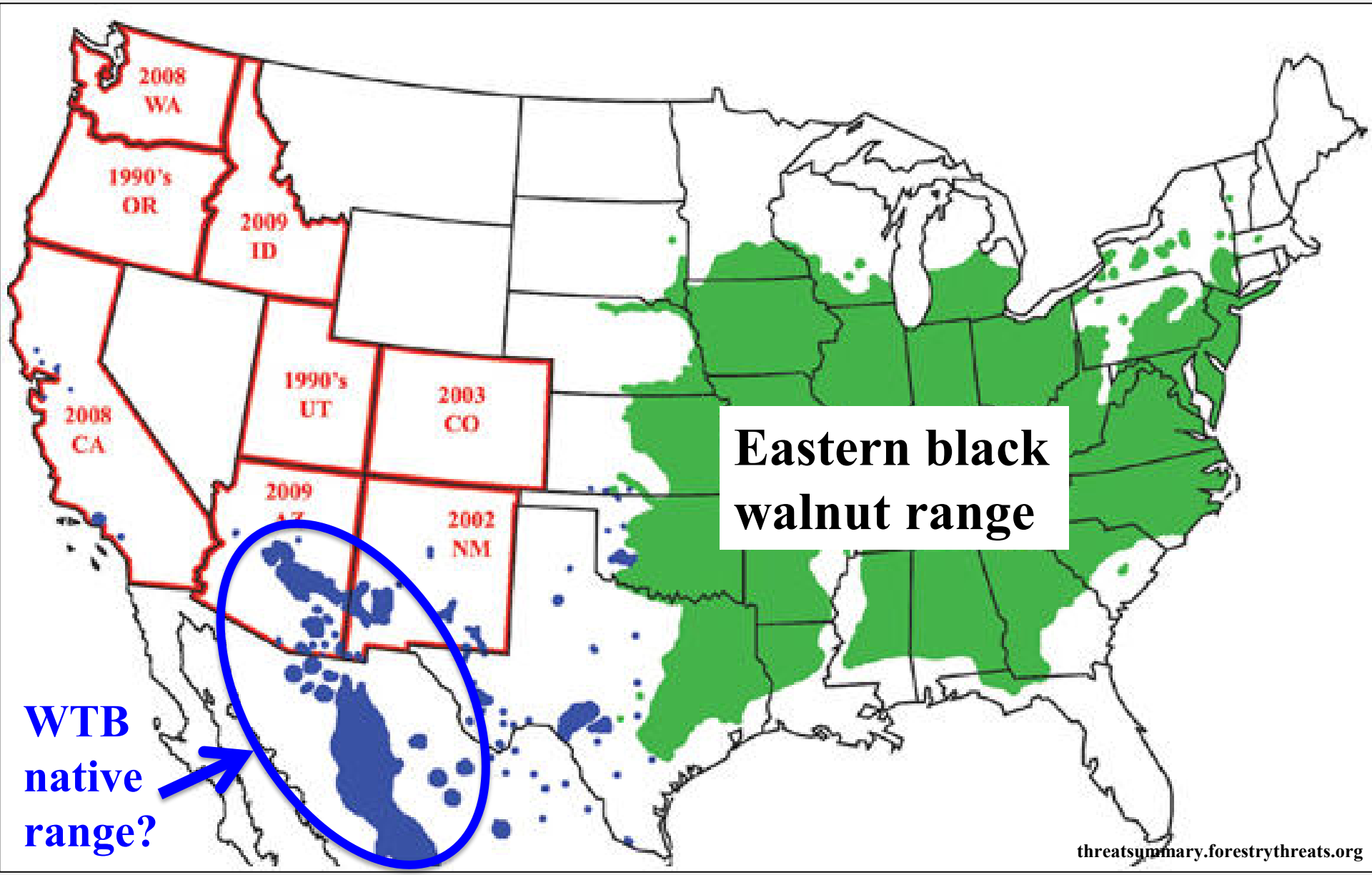
Walnut Twig Beetle: *Pityophthorus juglandis*

Thousand Cankers Disease



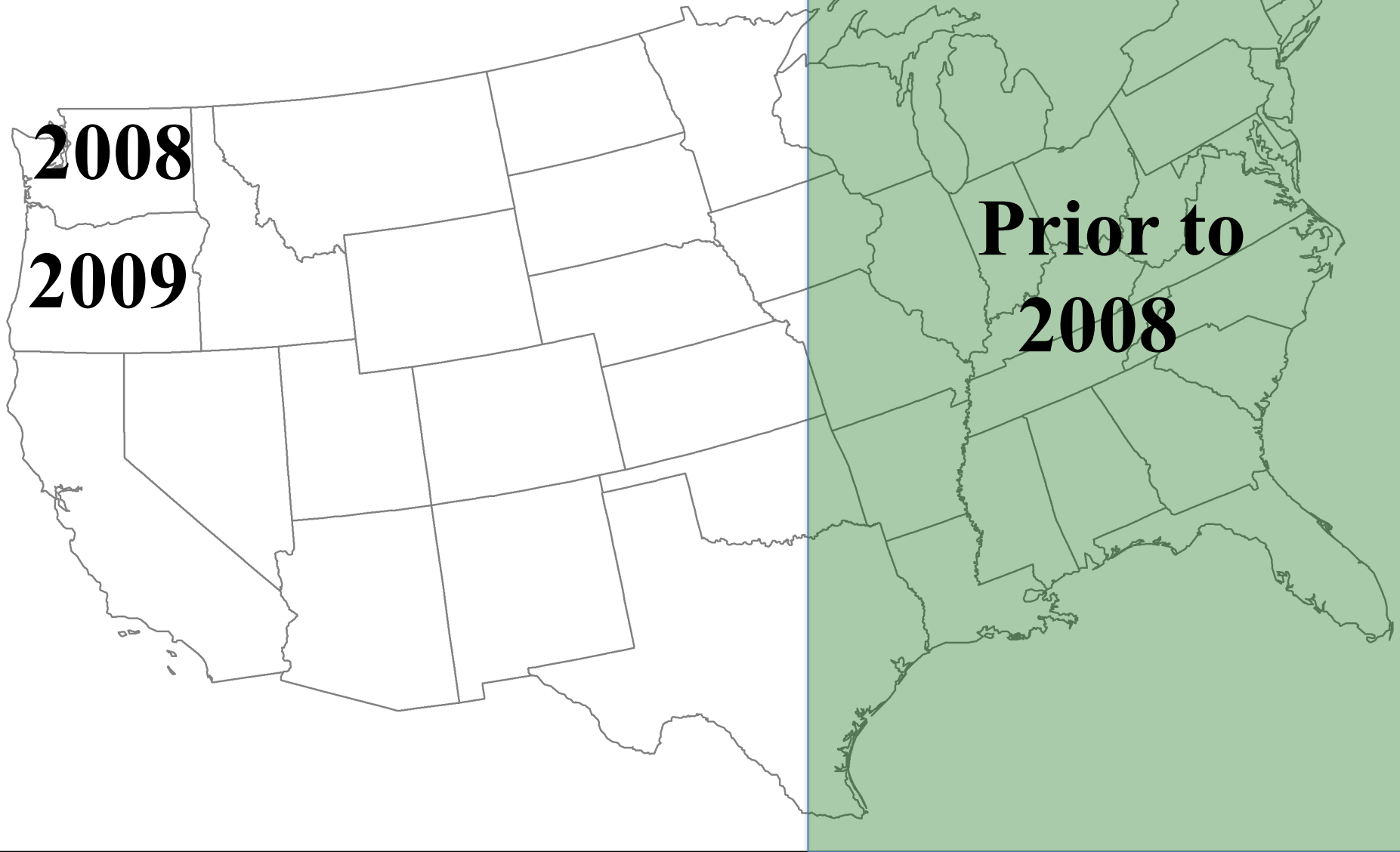
Thousand Cankers Disease

Distribution of WTB/TCD



Azalea Lace Bug (*Stephanitis pyriodes*)

Distribution of Azalea Lace Bug in the Continental U.S.




I vant to suck your chlorophyll!

Hendrick's Park in Eugene, OR: a native forest analogue?

Novel Hosts

Based on Garden & Nursery Observations and Host Plant Trials (ODA)

3 New Host Families:

Betulaceae
Caprifoliaceae
Rosaceae

Formerly only known from the Ericaceae

14 New Host Genera

Agapetes	*Epigaea*
Andromeda	*Gaultheria*
Chamaedaphne	*Kalmiopsis*
Corylus	*Phylliopsis*
Cotoneaster	*Prunus*
Crategus	*Vaccinium*
Daboecia	*Viburnum*

30 New Host Species

Kalmiopsis fragrans & leachiania

from ornamental plantings

killed during ODA host plant trials

And, Now…

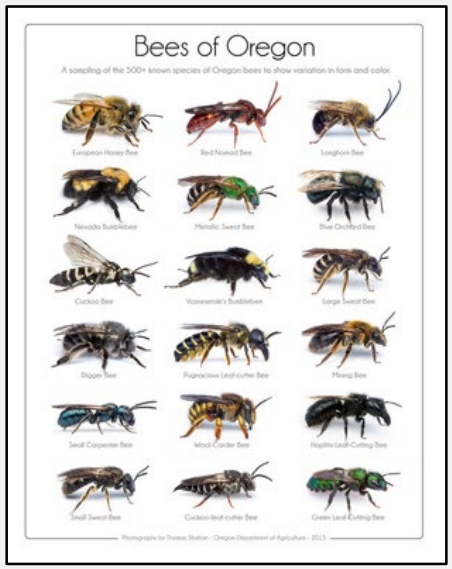
Causing salal chlorosis in the woodlands of the Willamette Valley

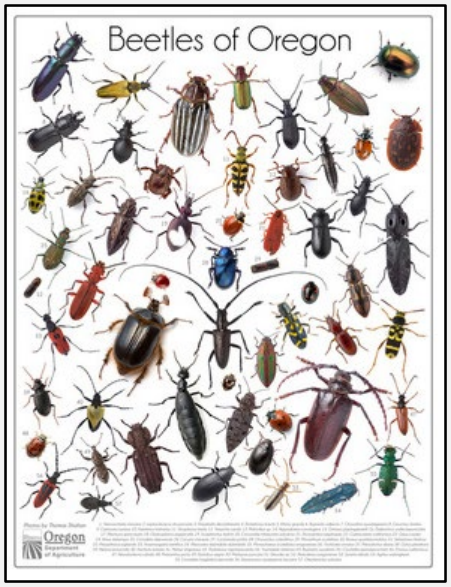
If that wasn’t enough…

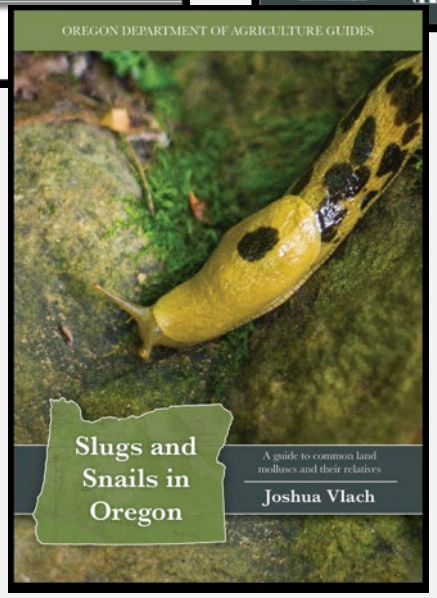
Greenhouse thrips (*Heliothrips haemorrhoidalis*) causing salal chlorosis on the southern Oregon coast

What's next?

Visit http://www.odaguides.us







My thanks to:

- **The ODA insect and invertebrate identification team members. They process thousands of samples and millions of specimens per year. ODA's invasive species surveillance programs would not be possible without their dedication to the ODA mission and their incredible skills and knowledge.**
- **ODA's imaging technicians for many of the images.**
- **Kimberly Brown, Integrated Plant Protection Center, OSU, for inviting me to present today.**
- **The audience, for your attention and consideration.**