Can we slow the invasion of insect pests?

Josh Vlach
Entomologist

Oregon Department of Agriculture
Spring into Gardening
April 4, 2019; 10:45-11:45am
Hegewald Center

Oregon Department of Agriculture

IPPM
Insect Pest Prevention & Management

Outline

- Invasive Species situation in Oregon
- Pest issues on the horizon
  - Allium leafminer
- Regulated pests
  - International trade issue
- More Pests on the Horizon
  - European cherry fruit fly
  - lanternfly
  - Biting mites!
- Notifying the ODA
- How we slow the invasion
- “My” problems
- How do I help make change?

Think about the last pest problem you dealt with . . .

- **was it:**
  - **a lawn?** weeds mostly exotic, insect damage mostly exotic
  - **Slugs or snails?** all the pests are exotic
  - **Your garden?** Most of the aphids, whiteflies, scales and mealybugs are exotic; most of the weeds are exotic
  - **Your fruit trees and bushes?** Mostly exotic!
  - **Honey bee problems** (like them, all exotic)
- **What would life have been like if we'd been more careful?**

I'll tell you!

- **There would be less pesticides used**
- **It would require less soil disturbance (weed control)**
- **Organic gardening and farming would be easier**
- **Our native bees would be less at risk**

Why do we have all of these exotic species?

- Agricultural and ornamental plants brought to the New World
- Movement of raw wood products
- Mail ordering bees; migratory beekeeping

https://lebeaubamboo.com/ordering.php

It is too bad, but what is done is done, right?

- No! We keep doing it!
- There are plenty of pests in the world!

http://cryptotimes.org/bitcoin/cryptocurrency-hits-high-seas-ukrainian-shipping-company-accepts-bitcoin/

Douglas fir

1/12= 8%

- **Giant conifer aphid, *Cinara* spp.**
- **Brown soft scale, *Coccus hesperidum***
- **Coneworm, *Dioryctria* spp.**
- **Cooley spruce gall adelgid, *Adelges cooleyi***
- **Douglas fir needle midge, *Contarinia pseudotsugae* and *C. cuniculator***
- **Douglas fir tussock moth, *Orgyia pseudotsugata***
- **Douglas fir twig weevil, *Cylindrocopturus furnissi***
- **Pine needle scale, *Chionaspis pinifoliae* and *Matsucoccus* spp.**
- **Douglas fir pitch moth, *Synanthedon navaroensis***
- **Sequoia pitch moth, *Synanthedon sequoia***
- **Silver spotted tiger moth, *Lophocampa argentata***
- **Spruce spider mite, *Oligonychus ununguis***

Maple

7/13= 54%

- **Norway maple aphid, *Periphyllus lyropictus***
- **Western boxelder bug, *Boisea rubrolineata***
- **Carpenterworm, *Prionoxystus robiniae***
- **Cottony maple scale, *Neopulvinaria innumerabilis***
- **Leafcutting bee, Megachilidae**
- **Maple bladder gall mite, *Vasates quadripedes***
- **Maple shoot moth, *Proteoteras aesculana***
- **Maple tip moth, *Proteoteras* spp.**
- **Oystershell scale, *Lepidosaphes ulmi***
- **Root weevil (mixed, mostly European)**
- **Rose leafhopper, *Edwardsiana rosae***
- **Satin moth, *Leucoma salicis***
- **Western flower thrips, *Frankliniella occcidentalis***

Many agricultural pests are exotic

Blueberry

9 Exotic
10 Native

Aphids

Green peach aphid, *Myzus persicae*, EXOTIC
Ericaphis fimbriata, NATIVE?

Caterpillars

Cherry fruitworm, *Grapholita packardi*, NATIVE
Obliquebanded leafroller, *Choristoneura rosaceana*, NATIVE
Orange tortrix, *Argyrotaenia franciscana*, NATIVE
Winter moth, *Operophtera brumata*, NATIVE

Beetles

Obscure root weevil, *Sciopithes obscurus*, NATIVE
Black vine weevil, *Otiorhynchus sulcatus*, EXOTIC
Rough strawberry root weevil, *O. rugosostriatus*, EXOTIC
Strawberry root weevil, *O. ovatus*, EXOTIC

Flies

Blueberry gall midge, *Dasineura oxycoccana*, regional EXOTIC
Spotted wing Drosophila, *Drosophila suzukii*, EXOTIC

True bugs

Brown marmorated stinkbug, *Halyomorpha halys*, EXOTIC
Azalea bark scale, *Acanthococcus azalea*, NATIVE?
Lecanium scale, *Parthenolecanium* spp., EXOTIC

Hymenoptera

Western yellowjacket, *Vespula pensylvanica*, NATIVE
Common yellowjacket, *V. vulgaris*, NATIVE
German yellowjacket, *V. germanica*, EXOTIC
Aerial yellowjacket, *Dolichovespula arenaria*, NATIVE

https://www.healthline.com/nutrition/foods/blueberries

Inundation by Exotic Species

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

~ 4% of terrestrial invertebrate species in Oregon are exotic

New Exotic Invertebrate Species Found Established in Oregon 2007-2018

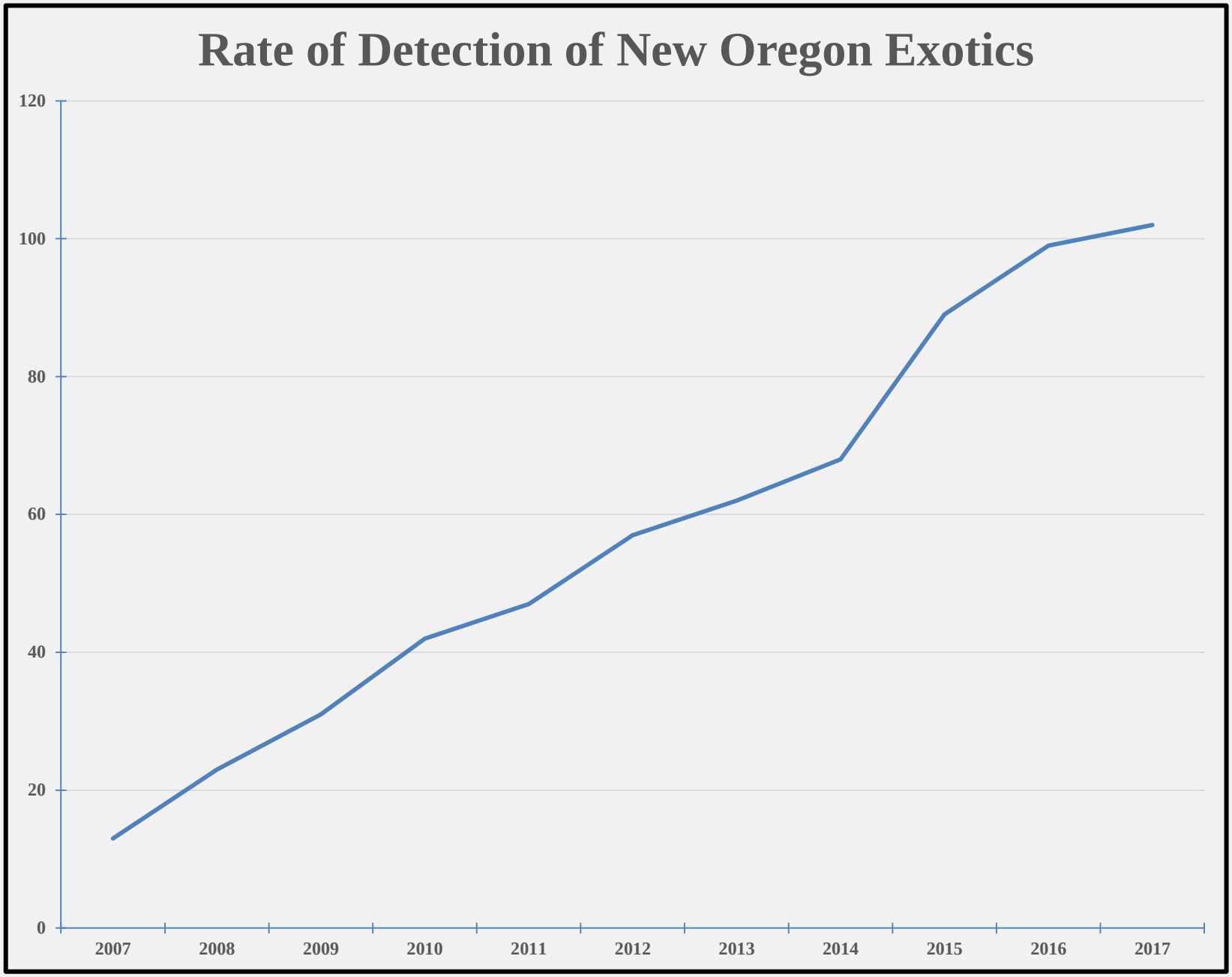
Scientific name	Common name
Acanthocinus leechi	a longhorned beetle
Aceria caliberberis	gall mite
Aceria spartii	bud mite
Acleris forsskaleana	Maple leaftier or Maple button
Aculops cannabicola	hemp russet mite
Aculus ballei	linden mite
Aculus gleditsiae	rust mite
Aeolothrips albicinctus	a thrips
Agrilus cuprescens	Rose stem girdler
Aleyrodes proletella	cabbage whitefly
Amphimallon majale	European chafer
Amynthas gracilis	Asian jumping worm
Anoscopus serratulae	leafhopper
Aphomia sociella	bee moth
Arion hortensis	garden slug
Arocatus melanocephalus	elm seed bug
Ataenius abditus	a small scarab
Athysanus argentarius	leafhopper
Bactericera maculipennis	a jumping louse
Badumna longinqua	
Balanococcus diminutus	Phormium mealybug
Balanococcus diminutus	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
Chaetophora spinosa	a moss beetle
Clitostethus arcuatus	ash whitefly ladybird beetle
Compsothrips jacksoni	
Corythucha arcuata	oak lace bug
Crisicoccus probably azaleae	Azalea mealybug
Cyclorhipidion pelliculosum	ambrosia beetle
Cydia coniferana	Conifer bark-feedng tortrix
Diabrotica virgifera virgifera	Western corn rootworm
Diaphnocoris chlorionis	Honeylocust plant bug
Diptacus mazuriensis	rust mite
Drepanothrips reuteri	vine or grape thrips
Drosophila hydei	a vinegar fly
Drosophila suzukii	spotted wing drosophila
Encarsia inaron	ash whitefly parasitoid wasp
Epiphyas postvittana	light brown apple moth
Epitrix sp. (determination forthcoming)	a flea 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	Latania scale
Hexacola neoscatellae	a parasitoid wasp
Holoparamecus caularum	handsome fungus beetle
Homadaula anisocentra	mimosa webworm
Hoplocampa chrysorrhoea	sawfly
Humerobates rostrolamellatus	a moss mite
Hylotrupes bajulus	old house borer
Labarrus pseudolividus	an exotic dung beetle
Latrodectus geometricus	brown widow
Lauria cylindracea	moss snail
Limonia distans	crane fly
Macrosiphum hellebori	Hellebore aphid
Meconema thalassinum	drumming katydid
Monosoma pulveratum	green alder sawfly
Muriodelphax arvensis	Delphacid planthopper
Myrmica speciodes	ant
Nebria brevicollis	European gazelle beetle
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 rectangulata	green pug moth
Phenacoccus nr. gossypii	undescribed species
Philopedon plagiatum	weevil
Phorodon cannabis	cannabis, hemp, or bhang aphid
Phyllocoptes compressus	rust mite
Phylloxera quercus group	oak phylloxera
Phymatodes lividus	longhorned beetle
Phytomyza hellebori	hellebore leafminer
Pityophthorus juglandis	Walnut twig beetle
Planococcus citri	Citrus mealybug
Platycleis tessellata	tessellated shieldback
Pomacea maculata	
Ponera testacea	ant
Propsocus pulchripennis	bark louse
Pseudaulacaspis cockerelli	False oleander scale
Psylliodes affinis	Bittersweet flea beetle
Psyllopsis fraxinicola	psyllid
Rhyncophytoptus new sp. 1	Eriophyidae
Rhyncophytoptus new sp. 2	Eriophyidae
Ribautiana tenerrima	bramble leafhopper
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
Spissistilus festinus or Ceresa festina	three cornered alfalfa treehopper
Stephanitis pyriodes	Azalea lace bug
Stigmaeopsis sp.	Bamboo spider mite
Succinea concordialis	Amber snail
Syricoris lacunana	dark strawberry tortrix
Tinocallis kawaluokalani	Crape myrtle aphid
Tremex columba	pigeon tremex
Trialeurodes abutiloneus	banded-wing whitefly
Trioza alacris	jumping louse
Trissolcus japonicus	Brown marmorated stink bug parasitoid
Trypodendron domesticum	ambrosia beetle
Xiphydria maculata	small wood wasps
Xyleborus monographus	ambrosia beetle

New Exotic Invertebrate Species Found Established in Oregon 2007 - 2018

An average of
9.3 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
2017	3
2018	10

	112


Rate of Detection of New Oregon Exotics
Number Of New Exotic Species
120
100
80
60
40
20
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Year

Significant Exotic Pests Detected 2007-2017

Average detection rate: 9.3 species/year

Proportion significant pests detected: 1 in 7

On average, every year Oregon could have at least one SIGNIFICANT exotic 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

CBP and Port inspections

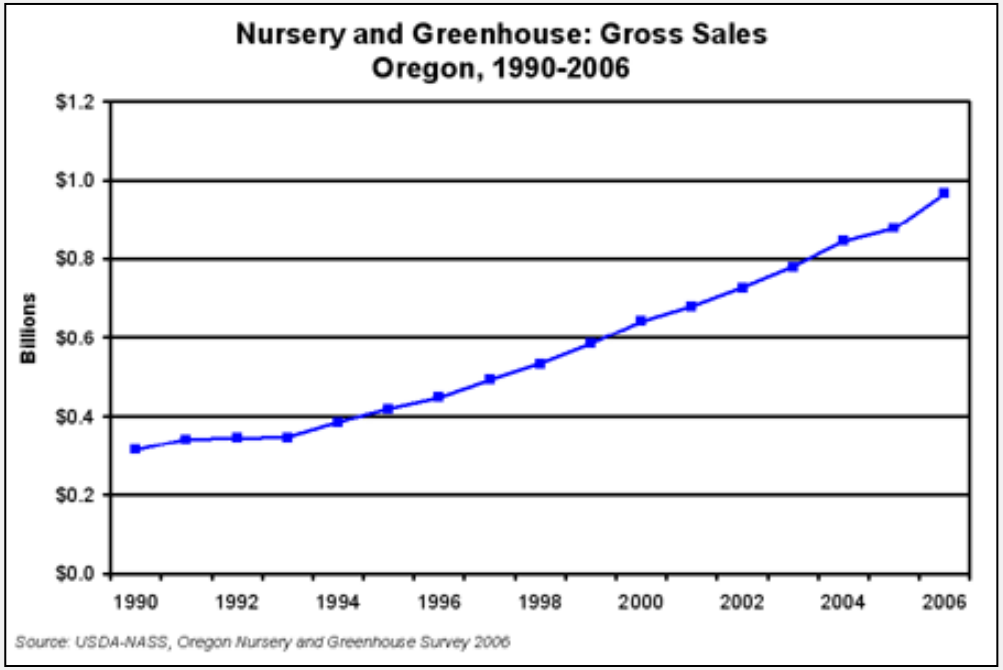
- Sheer volume- less than 2% of containers inspected

U.S. Customs and Border Protection

From http://www.dpworldmaputo.com/Media-Center2/Image-Gallery/Our-Container-Yard

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	



Pathway: Live Plants From All Over!

Live Plant Imports: #1 Pathway

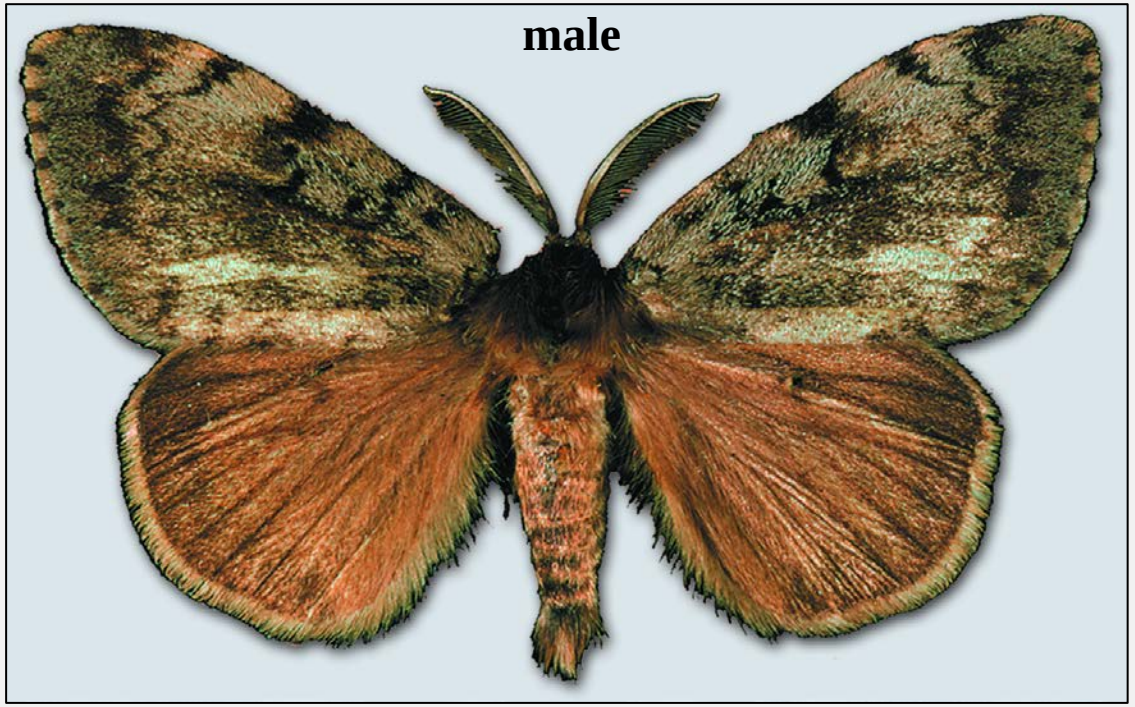
In 2007, the U.S. imported over 3 BILLION live plants!

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

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

We do have successes!

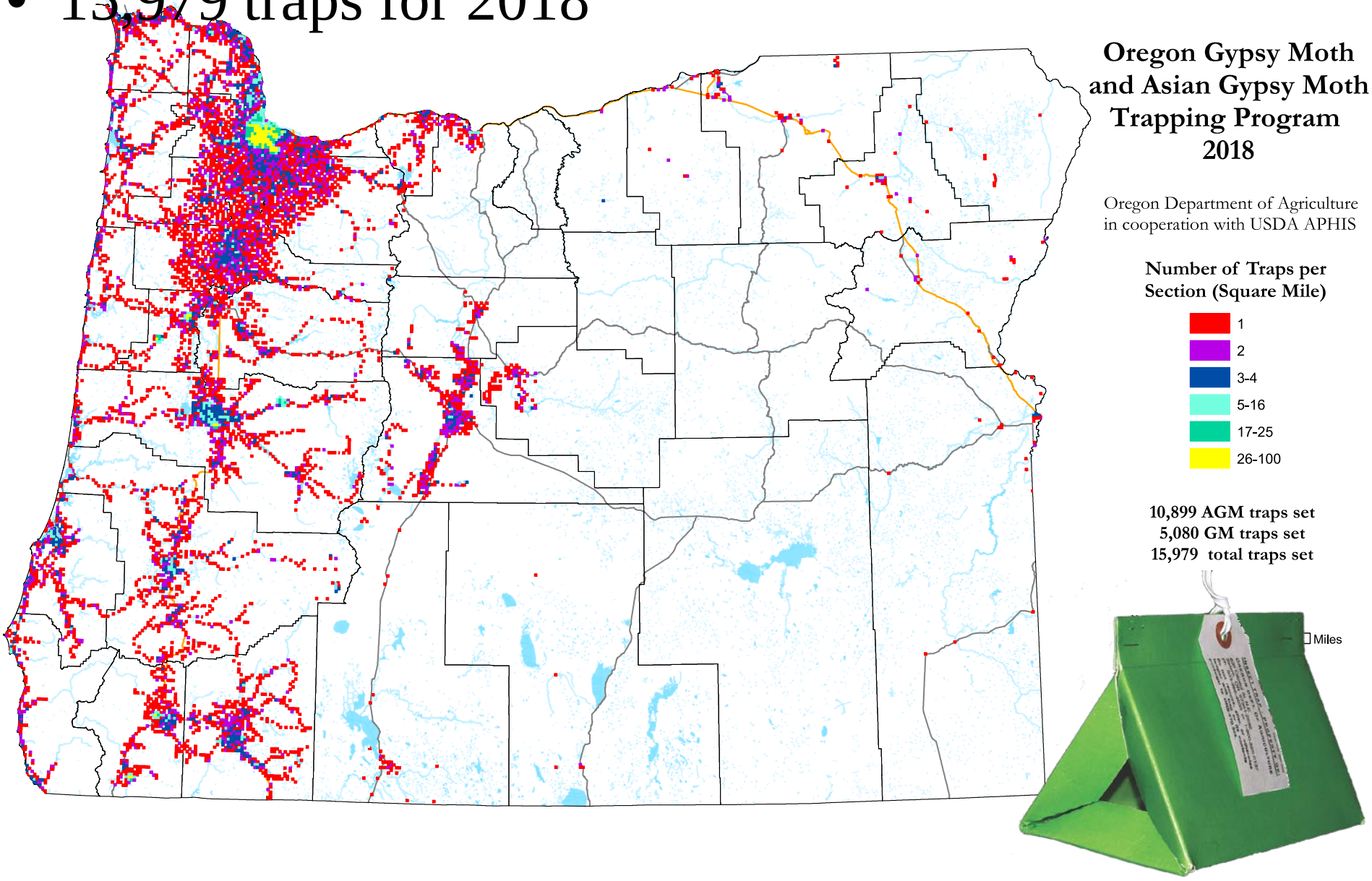
European gypsy moth AND Asian gypsy moth



Gypsy Moth and Asian Gypsy Moth

C

- 15,979 traps for 2018



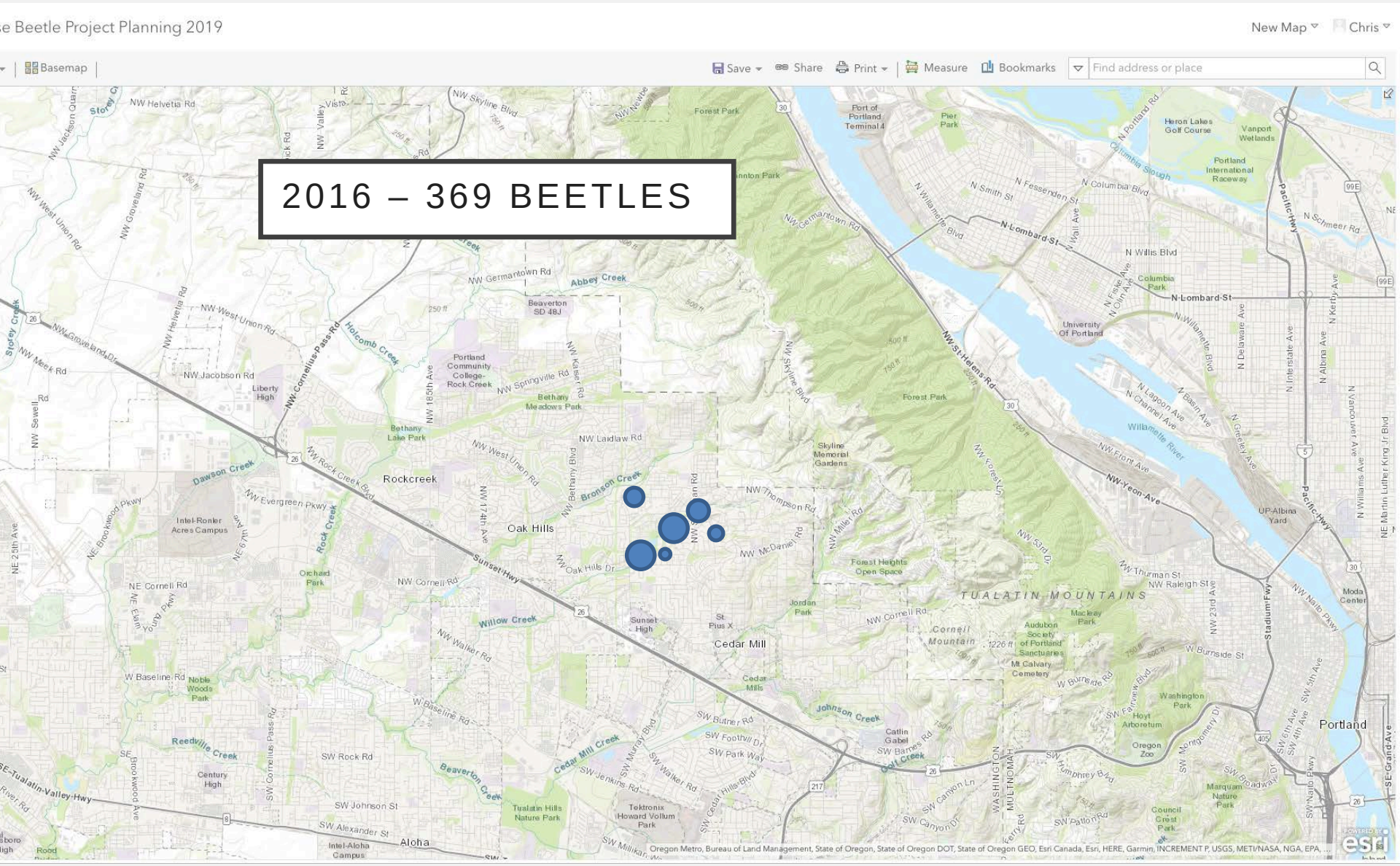
The Pesticide story

- **New exotic pests will increase pesticide use**
- **The public wants to restrict pesticide use**
- **We NEED pesticides for eradication**
  - **Short term, targeted use**
  - **To prevent, long term widespread use**
- **Support!**
- ***The myth of the like minded neighbor***

Japanese beetle story

- **Kept out of Oregon for over 80 years**
- **Primary reason for turf treatments**
- **Airport**
- **Recession funding cuts**
- **Reduced trapping**
- **SW Portland metro area**


Japanese Beetle


e Beetle Project Planning 2019
New Map
Chris
Basemap
Save
Share
Print
Measure
Bookmarks
Find address or place
2016 – 369 BEETLES
Rockcreek
Oak Hills
Cedar Mill
Aloha
Portland
TUALATIN MOUNTAINS
Forest Park
Willamette River
Dawson Creek
Bronson Creek
Willow Creek
Abbey Creek
Holcomb Creek
Rock Creek
Reedville Creek
Cedar Mill Creek
Beaverton Creek
Johnson Creek
Golf Creek
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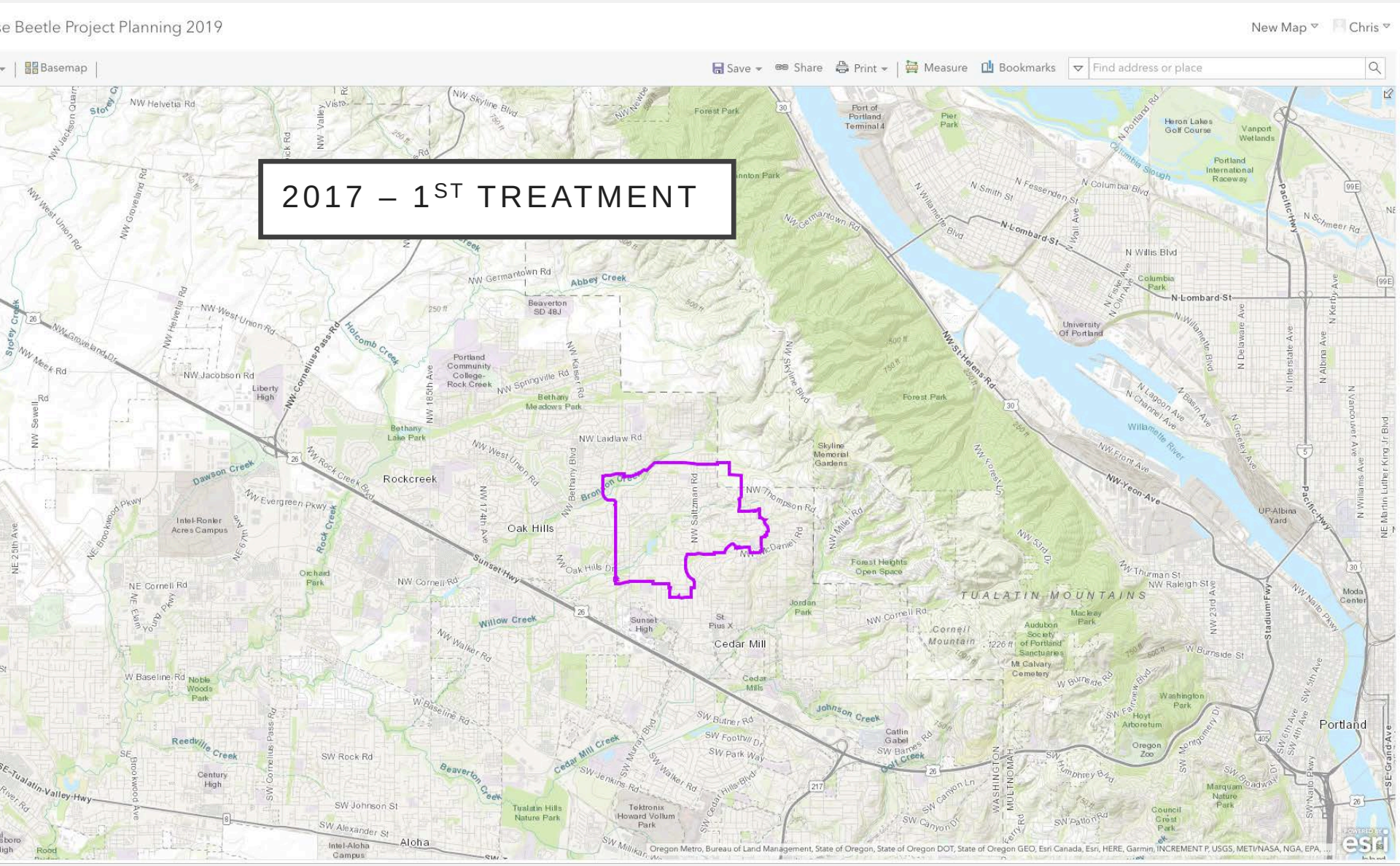
Oregon Metro, Bureau of Land Management, State of Oregon, State of Oregon DOT, State of Oregon GEO, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, ...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N Portland Rd
N Fessenden St
N Columbia Blvd
N Willamette Blvd
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Columbia Park
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NW Jacobson Rd
Liberty High
NW Helvetia Rd
NW Sewell Rd
Portland Community College-Rock Creek
NW Springville Rd
NW Kaiser Rd
NW 185th Ave
Bethany Meadows Park
Bethany Lake Park
NW Laidlaw Rd
NW Bethany Blvd
Bronson Creek
NW Saltzman Rd
NW Thompson Rd
NW Miller Rd
NW McDaniel Rd
Skyline Memorial Gardens
Forest Park
NW Skyline Blvd
NW Forest Ln
NW St Helens Rd
University Of Portland
N Lagoon Ave
N Channel Ave
N Basin Ave
N Delaware Ave
N Interstate Ave
N Albina Ave
N Kerby Ave
N Willamette Blvd
Willamette River
NW Front Ave
NW Yeon Ave
UP-Albina Yard
N Greeley Ave
N Vancouver Ave
N Williams Ave
NE Martin Luther King Jr Blvd
Pacific Hwy
Dawson Creek
NW Rock Creek Blvd
Rockcreek
NW Evergreen Pkwy
Intel-Ronler Acres Campus
NE Brookwood Pkwy
NE 6th Ave
NW 17th Ave
Oak Hills
NW Oak Hills Dr
Rock Creek
Orchard Park
NE Cornell Rd
NW Cornell Rd
Sunset Hwy
Willow Creek
NW Walker Rd
Sunset High
St Pius X
Cedar Mill
Forest Heights Open Space
TUALATIN MOUNTAINS
Jordan Park
Cornell Mountain
1226 ft
Audubon Society of Portland Sanctuaries
Mt Calvary Cemetery
Macleay Park
NW Thurman St
NW Raleigh St
NW 23rd Ave
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Moda Center
W Burnside St
NW 53rd Dr
Washington Park
Hoyt Arboretum
Portland
Oregon Zoo
Marquam Nature Park
Council Crest Park
SW Fairview Blvd
SW Montgomery Dr
SW Broadway Dr
SW 6th Ave
SW 4th Ave
SW 5th Ave
SE Grand Ave
SW Naito Pkwy
405
W Baseline Rd
Noble Woods Park
Reedville Creek
Cedar Mill Creek
Beaverton Creek
Johnson Creek
Golf Creek
SW Butner Rd
SW Foothill Dr
SW Park Way
SW Jenkins Rd
SW Murray Blvd
SW Walker Rd
SW Cedar Hills Blvd
Catlin Gabel
SW Barnes Rd
SW Humphrey Blvd
SW Canyon Ln
SW Canyon Dr
SW Patton Rd
WASHINGTON
MULTNOMAH
Tualatin Hills Nature Park
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SW Rock Rd
SW Johnson St
SW Alexander St
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SW Millikan
SE Brookwood Ave
SW Cornelius Pass Rd
SE Tualatin-Valley Hwy
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Rood
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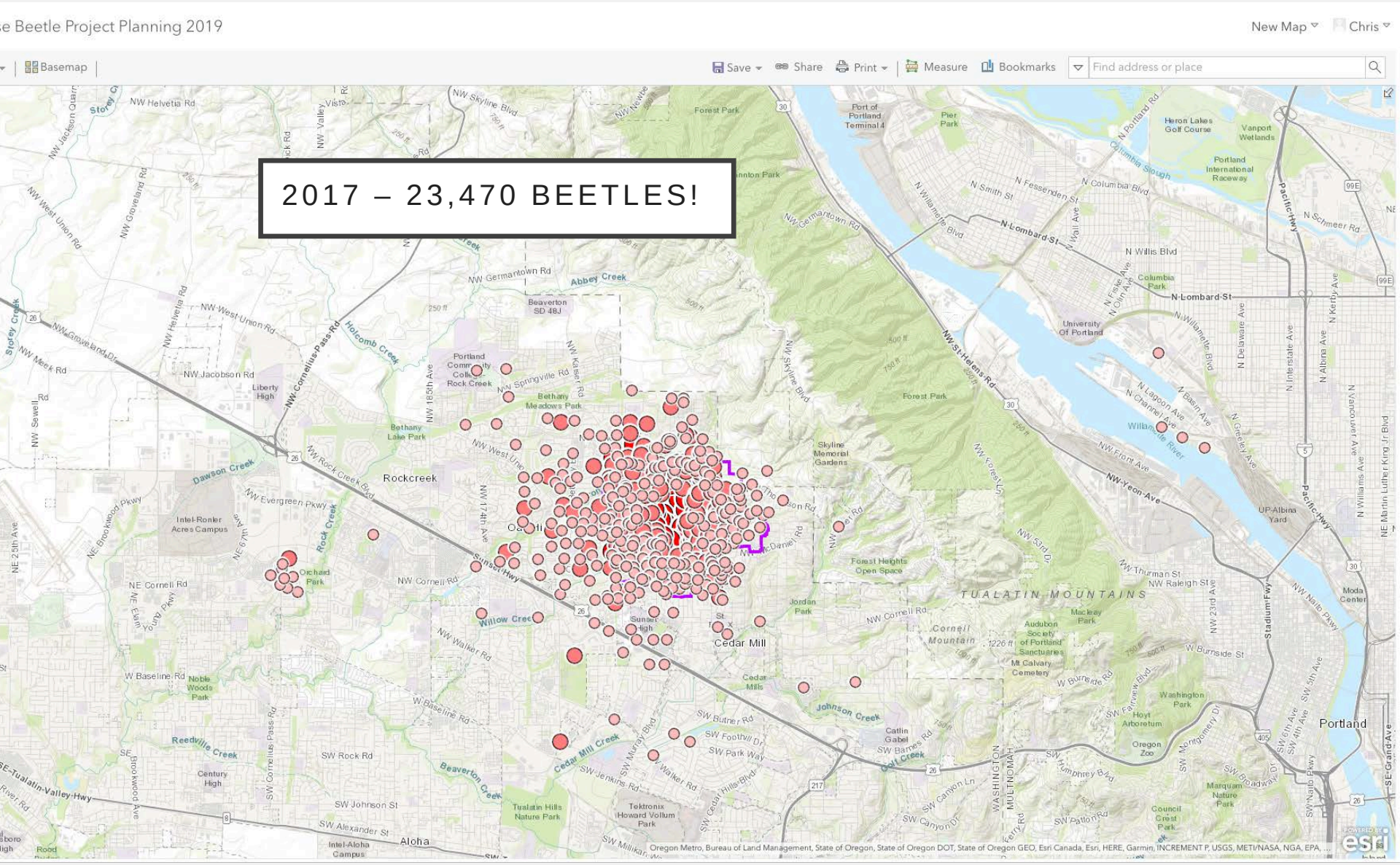
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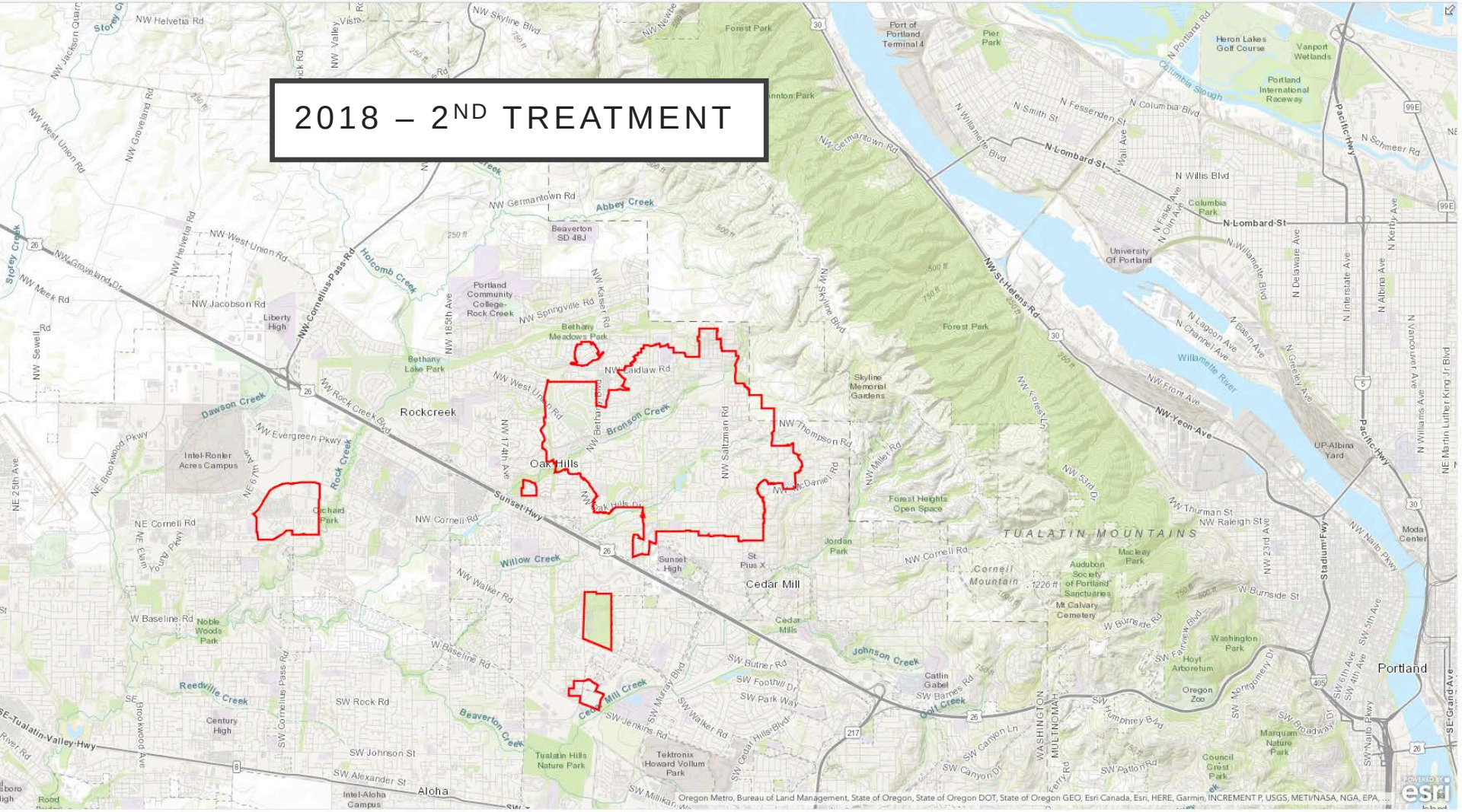
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Heron Lakes Golf Course
Vanport Wetlands
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Portland International Raceway
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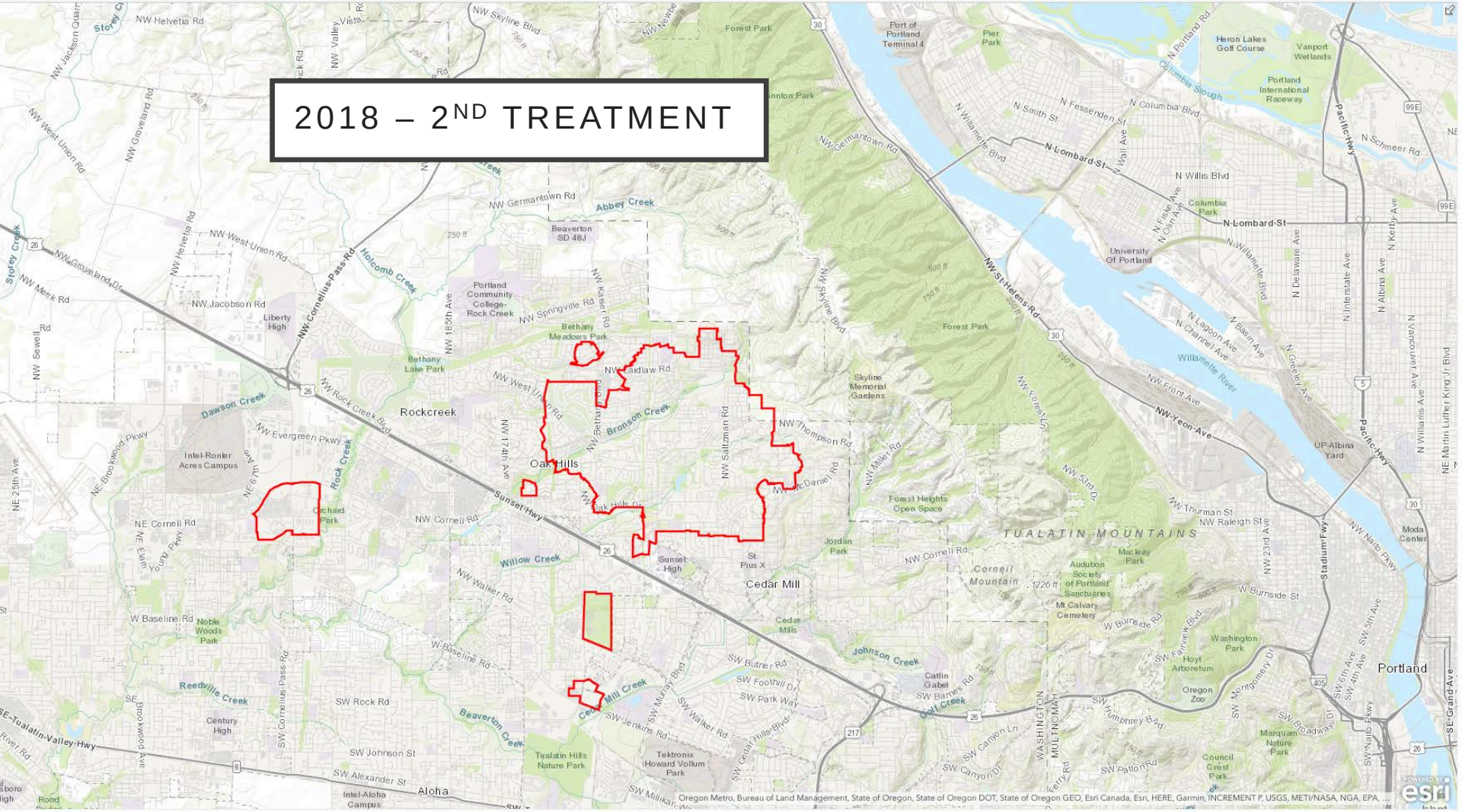
esri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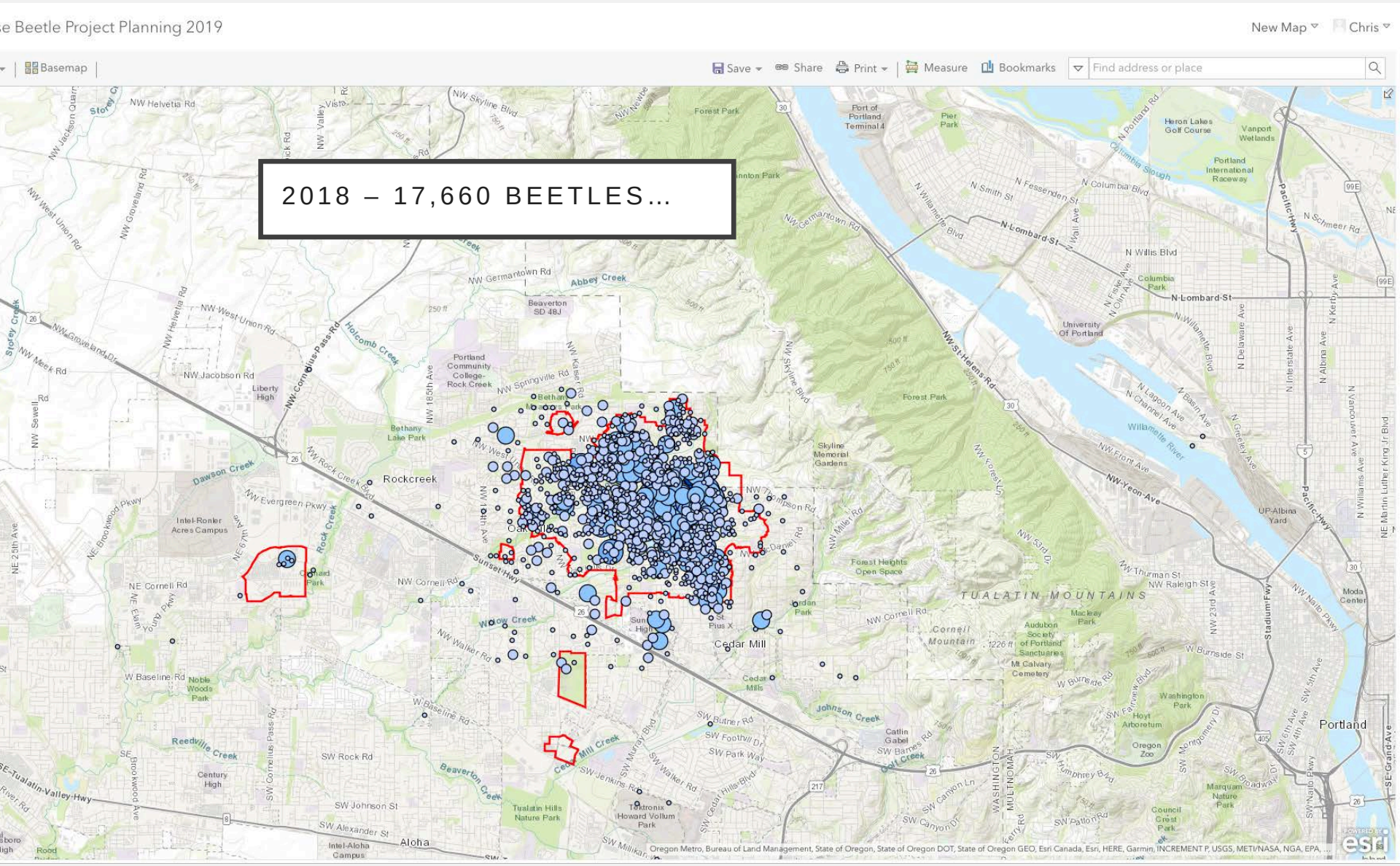
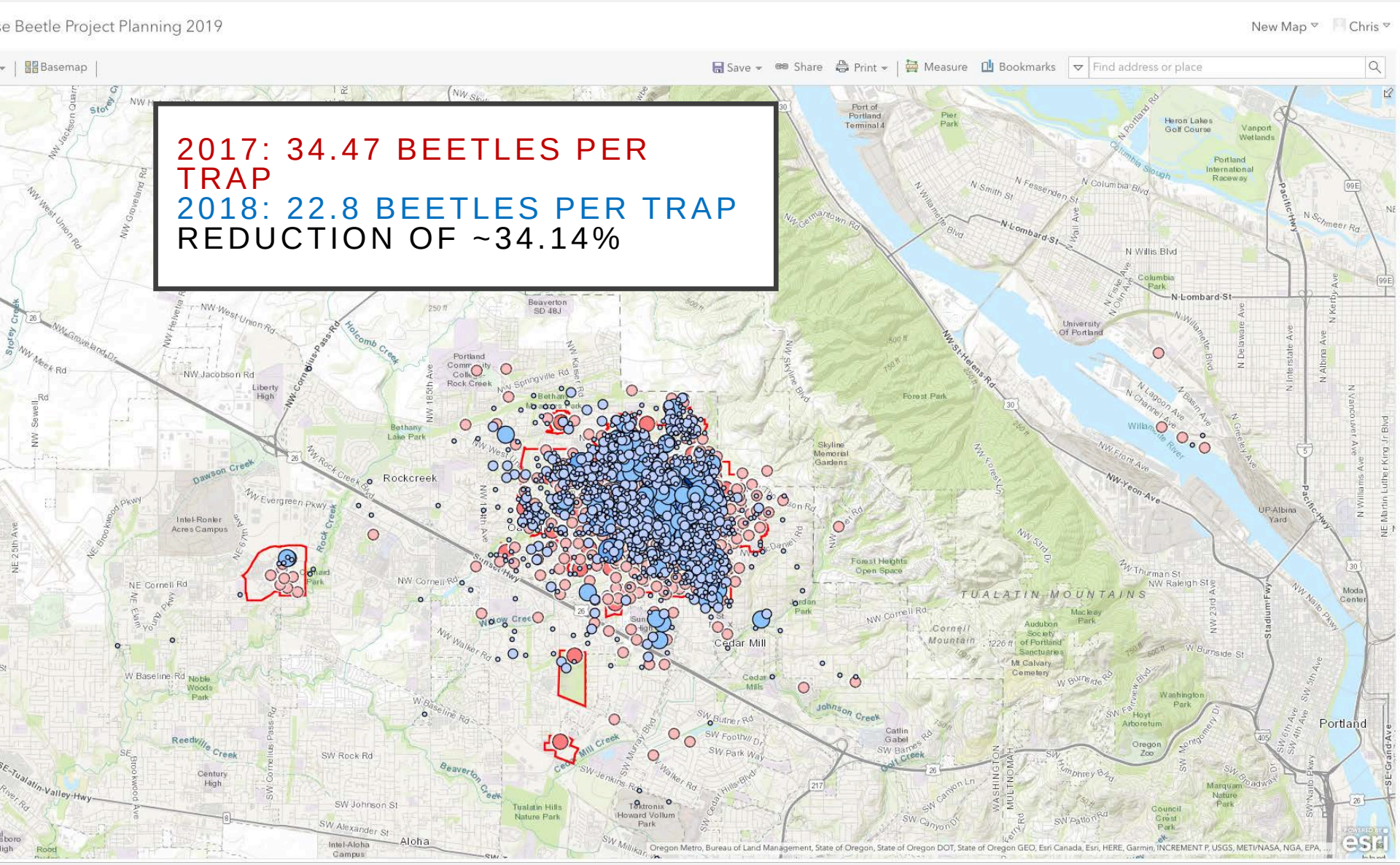
N Greeley Ave
N Willamette Blvd
UP-Albina Yard
Pacific Hwy
N Martin Luther King Jr Blvd
NW Evergreen Pkwy
Intel-Ronler Acres Campus
NE Brookwood Pkwy
NE 6th Ave
NE 25th Ave
Rock Creek
Orchard Park
NE Cornell Rd
NE Elam Young Pkwy
Sunset Hwy
NW Cornell Rd
Willow Creek
NW Walker Rd
Sunset High
St Pius X
Cedar Mill
Jordan Park
Forest Heights Open Space
TUALATIN MOUNTAINS
Cornell Mountain
1226 ft
Macleay Park
Audubon Society of Portland Sanctuaries
Mt Calvary Cemetery
NW Thurman St
NW Raleigh St
NW 23rd Ave
Stadium Fwy
NW Naito Pkwy
Moda Center
W Burnside St
W Burnside Rd
Washington Park
Hoyt Arboretum
Portland
SW 6th Ave
SW 4th Ave
SW 5th Ave
SW Montgomery Dr
SW Broadway Dr
Marquam Nature Park
Council Crest Park
SW Patton Rd
SW Canyon Dr
SW Canyon Ln
SW Humphrey Blvd
Oregon Zoo
WASHINGTON
MULTNOMAH
Johnson Creek
Golf Creek
Catlin Gabel
SW Barnes Rd
SW Fairview Blvd
SW Butner Rd
SW Foothill Dr
SW Park Way
SW Murray Blvd
SW Walker Rd
SW Cedar Hills Blvd
Cedar Mill Creek
SW Jenkins Rd
Beaverton Creek
Tualatin Hills Nature Park
Tektronix Howard Vollum Park
SW Millikan Way
Cedar Mills
W Baseline Rd
Noble Woods Park
Reedville Creek
SW Rock Rd
SW Cornelius Pass Rd
SE Brookwood Ave
Century High
SE Tualatin Valley Hwy
SW Johnson St
SW Alexander St
Intel-Aloha Campus
Aloha
Rood
SE Grand Ave
Oregon Metro, Bureau of Land Management, State of Oregon, State of Oregon DOT, State of Oregon GEO, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, ...
esri


e Beetle Project Planning 2019
New Map
Chris
Basemap
Save
Share
Print
Measure
Bookmarks
Find address or place
2018 – 17,660 BEETLES…
Rockcreek
Cedar Mill
Aloha
Portland
TUALATIN MOUNTAINS
Oregon Metro, Bureau of Land Management, State of Oregon, State of Oregon DOT, State of Oregon GEO, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, ...


e Beetle Project Planning 2019
New Map
Chris
Basemap
Save
Share
Print
Measure
Bookmarks
Find address or place
2017: 34.47 BEETLES PER TRAP
2018: 22.8 BEETLES PER TRAP
REDUCTION OF ~34.14%
Rockcreek
Cedar Mill
Aloha
Portland
TUALATIN MOUNTAINS
Oregon Metro, Bureau of Land Management, State of Oregon, State of Oregon DOT, State of Oregon GEO, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, ...


In 2018 we treated:
5,800 households
6 schools
4 parks
1 golf course
2019 –
8,300 HOUSEHOLDS?

Treatment: What might not be working?

- **Application strategy needs careful consideration**
  - **Year 1: Lawns only**
  - **Year 2: Lawns and planting beds**
  - **Year 3: Lawns, beds, more applications, other products?**
- **Degree day modeling and application timing**
  - **2017 – emerged 325 degree days before prediction (>18 calendar days)**
  - **2018 – emerged 221 degree days before prediction (>13 calendar days)**
- **Natural areas acting as refugia?**
  - **Can’t treat with Acelepryn G – specifically labeled for turf and ornamental areas**

Think about the future

- **- What if we cannot eradicate?**
  - **Inform susceptible industries so they can start to prepare**
    - **Restrictions on exports**
    - **Management strategies**
  - **Discuss plans with neighboring states and provinces**
  - **Reinvestigating biological control**

Keeping pests out is the only sure way to keep them from becoming established!

When in doubt, keep it out!

In Oregon

- **No border stations**
  - **Constitution**

- **Some items are required to be reported (nursery stock, livestock, boats, etc.)**
- **Some items are prohibited (snails, untreated firewood)**

- **Rely on survey and other reporting**

Approved Invertebrate List

- http://www.oregon.gov/ODA/shared/Documents/Publications/IPPM/OregonApprovedInvertebrateList.pdf

Oregon Approved Invertebrate List

The following insects and other invertebrates are approved for use as pets, pet food, biological control agents, educational displays, and release in Oregon. Note that shipment of some plant pests and some biological control agents across state lines requires a U.S. Department of Agriculture permit (form 526). If you have questions about invertebrates not on this list, permits, releases, etc., check with the Oregon Department of Agriculture (Plant Programs), 635 Capitol Street N.E., Salem, OR 97301-2532, (503) 986-4636. You may view the Oregon Administrative Rules at http://arcweb.sos.state.or.us/pages/rules/oars_600/oar_603/603_052.html.

Key for common usage codes: BC=biological control; ED=education; R=research; H=honey production; C=composter; P=pets; PF=pet food; PL=pollination; RL=releases; B=bait; O=Other.

Snails (Gastropoda)		**Use**
Spike-topped apple snail	*Pomacea diffusa*	P

Scorpions		**Use**
Emperor scorpion	*Pandinus imperator*	ED,P

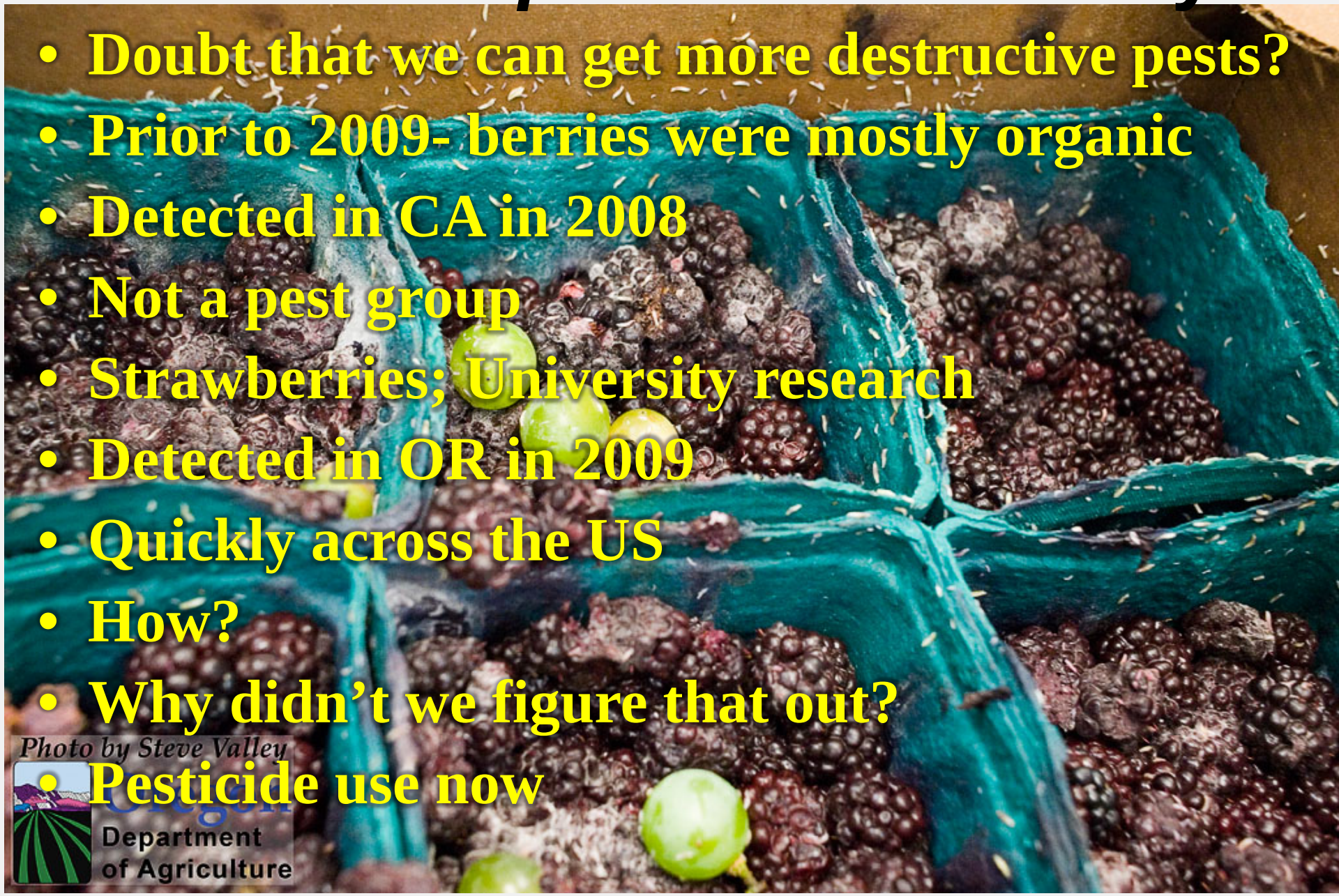
Crustacea		**Use**
Pillbug	*Armadillium spp.*	ED
Land hermit crab	*Coenobita clypeatus*	P
Sowbug	*Oniscus spp.*	ED

Earthworms (Annelida)		**Use**
Compost earthworm	*Eisenia veneta*	PF, B, C
Earthworm	*Lumbricus variegatus*	PF, B, C

Millipedes (Diplopoda)		**Use**
Desert millipede	*Orthoporus ornatus, O. texicolens*	P
Giant African black millipede	*Lophostreptus (=Scaphiostreptus) rutilans*	ED,P
Giant African millipede	*Archispirostreptus gigas*	P
Giant millipede	*Thyrophygus spp.*	ED,P
Millipede	*Spirobolus spp.*	ED

Mites (Acari)		**Use**
Bindweed gall mite	*Aceria malherbae*	BC
Cyclamen mite	*Phytonemus pallidus*	R
Dried fruit mite	*Carpoglyphus lactis*	predator mite food
Dust mite	*Lepidoglyphus destructor*	predator mite food

The *Drosophila suzukii* story



- Doubt that we can get more destructive pests?
- Prior to 2009- berries were mostly organic
- Detected in CA in 2008
- Not a pest group
- Strawberries; University research
- Detected in OR in 2009
- Quickly across the US
- How?
- Why didn’t we figure that out?
- Pesticide use now

Photo by Steve Valley

Oregon Department of Agriculture

What's next?

The Allium leafminer story

- *Allium* in Oregon
  - For seed
  - Sweet onions (and others) in Eastern OR
    - $194 million in 2016, 3rd in the nation
- *Phytomyza gymnostoma* was detected in PA in 2016
  - 16 counties by the end of the year
  - Worst *Allium* pest in Europe
- Now in NJ and maybe NY
- Deregulated 2017
- Quarantine?

The NPAG story

- **The rules have changed. It isn't as flexible as it used to be.**
- **National Pest Advisory Group**
- **Reports on new pests (interceptions or detections)**
- **Regulated or not**
- **States submit comments**

The NPAG story

Why is this important?

- **Deregulated pests aren't required to be stopped at ports**
  - **The requirements for continued regulation of a new, introduced population are simple:**
    - **There must be an effort to control or eradicate**
    - **Survey**
  - **This means: Even though it was only established in FL, now CA has to let it in.**

The NPAG story

That's fair, all countries are subject to the same rules

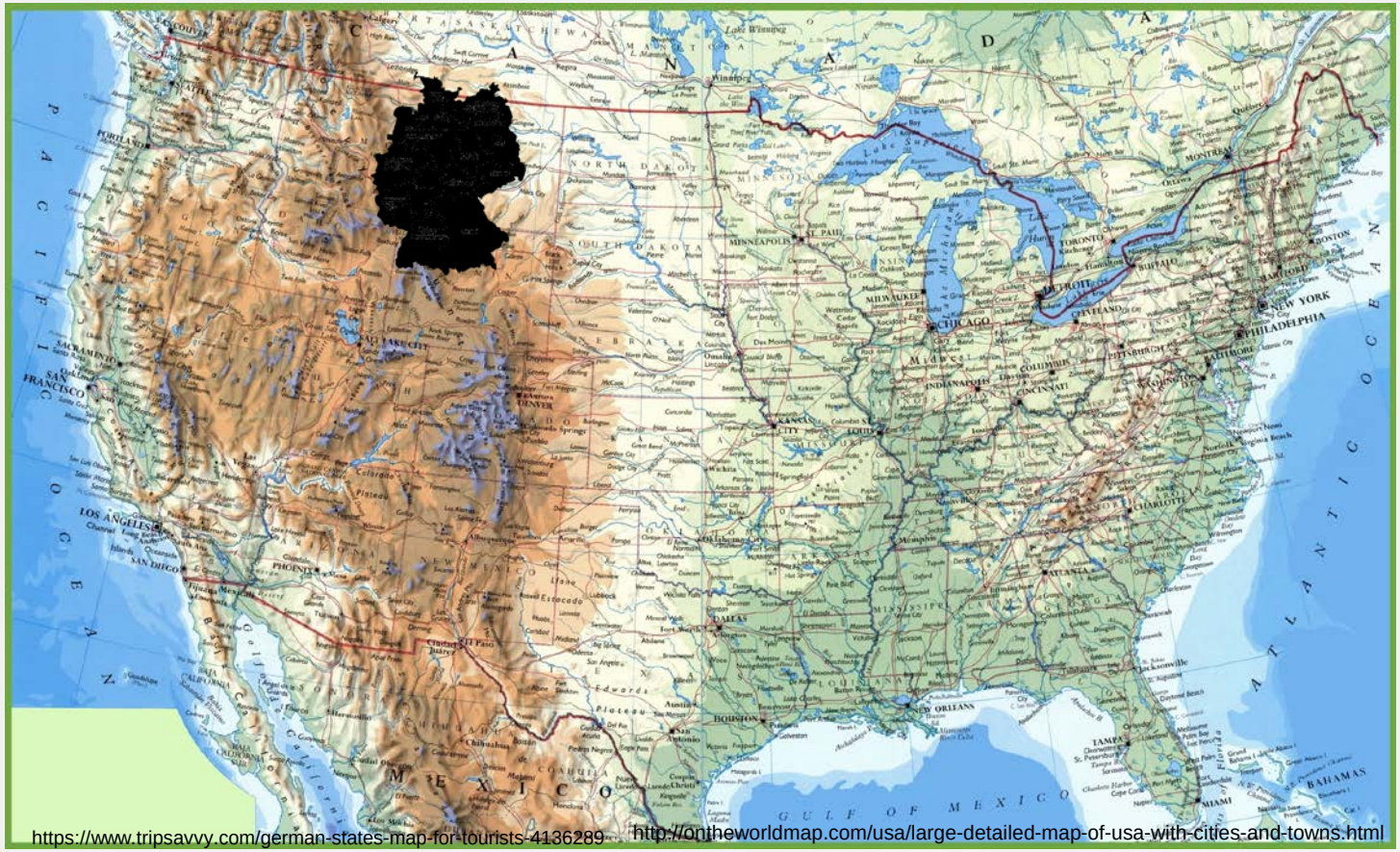
- **Actually, no.**

https://www.mapsinternational.co.uk/blue-children-s-world-map-wallpaper.html

The NPAG story

The rules are stacked against the US

Not all countries are created equal.



By state?
By region?

The NPAG story

How many species were deregulated although only known from a few counties in one state?

- **Flea beetle, *Phyllotreta ochripes*, 22 acres in MI, 2018**
- **Japanese flower thrips, *Thrips setosus*, 1 county in MI, 2017**
- **Bronze bug, *Thaumastocoris peregrinus*, 3 counties in CA, 2017**
- **Flat grass scale, *Aclerda takahashii*, 2 counties FL, 2017**
- **Curtain fig psyllid, *Macrohomata gladiata*, 2 counties in CA, 2017**
- **Whitefly, *Asiothrixus antidesmae*, 1 county FL, 2016**
- **Hawthorne Ermel, *Paraswammerdamia nebulella*, 1 county in WA, 2013**
- **Ambrosia beetle, *Coptoborus pseudotenuis*, 2 counties FL, 2011**
- **Ambrosia beetle, *Cryptocarenus diadematus*, 1 county FL, 2011**
- **Negro bug, *Corimelaena minuta*, 1 county FL, 2011**
- **Palm seed borer, *Dactylotrypes longicollis*, 2 counties CA, 2011**
- **Passionvine mealybug, *Planococcus minor*, 2 counties FL, 2011**

In groups that are often discounted as invasive pests

- Here forever
- Additive
- Drought effects
- Pathogens

The NPAG story

What we need to do

- **Pay attention to NPAG**

- **Make sure agencies in the US understand the rules and risks of their action or inaction**

The NPAG story

What we need to do

- **International Trade Agreements (WTO, IPPC)**
  - **Change the rules so large countries aren't disadvantaged!**

Canadian User Fee Rule

- Fruits and vegetables

The European cherry fruit fly story

- *Rhagoletis cerasi* was found in Ontario, Canada in 2016
- Found in NY in 2017
- One of the most important cherry pests in Europe
- Also uses honeysuckle berries
- Oregon is 3rd in the nation with sales of $70 million
- Still under quarantine (a regulated pest)
- Control area, not eradication

The European cherry fruit fly story

- *Rhagoletis cerasi* behaves similarly to Western cherry fruit fly, *Rhagoletis indifferens*
- Larvae- see alert

R. indifferens

R. indifferens

Spotted lanternfly

- *Lycorma delicatula*

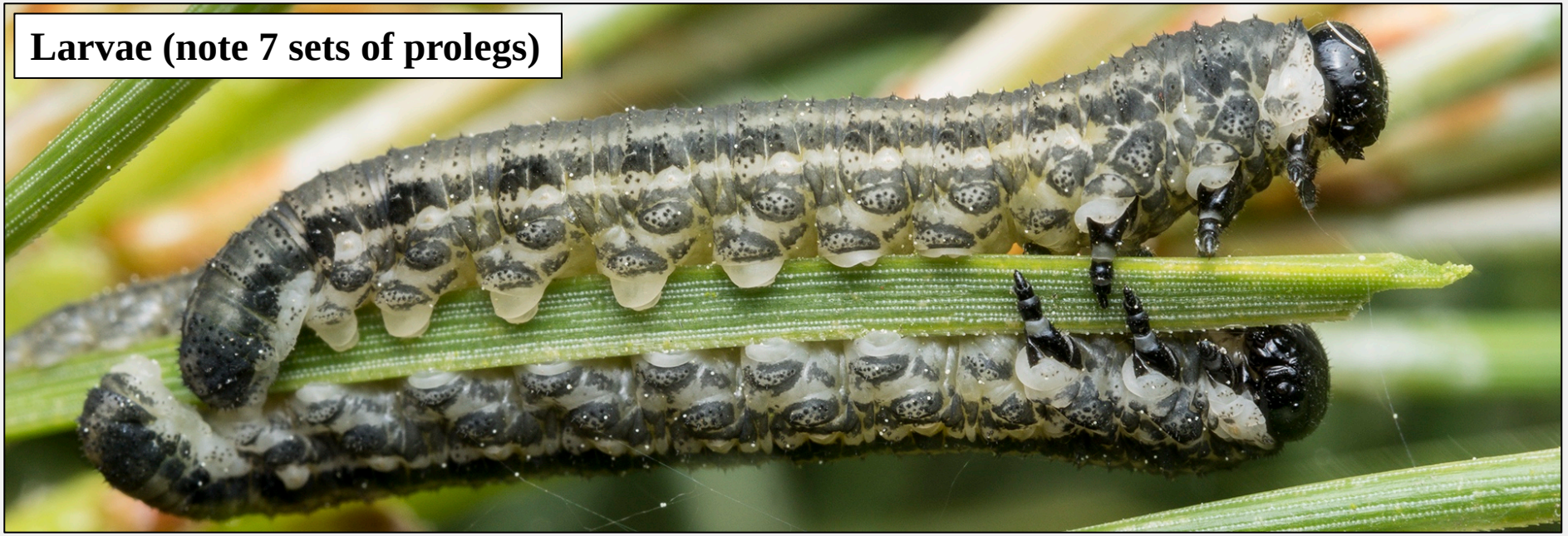
https://ag.umass.edu/landscape/fact-sheets/spotted-lanternfly

Spotted lanternfly

- **Found in PA in 2014**
- **USDA didn’t jump in until 2017**
- **Likes tree of heaven**
- **Attacks grapes and many types of tree**
- **2018 added Connecticut, Delaware, New Jersey, New York, Virginia,and Maryland**
- **Eggs move on any smooth, hard surface**

European pine sawfly, *Neodiprion sertifer*

European pine sawfly feeding damage

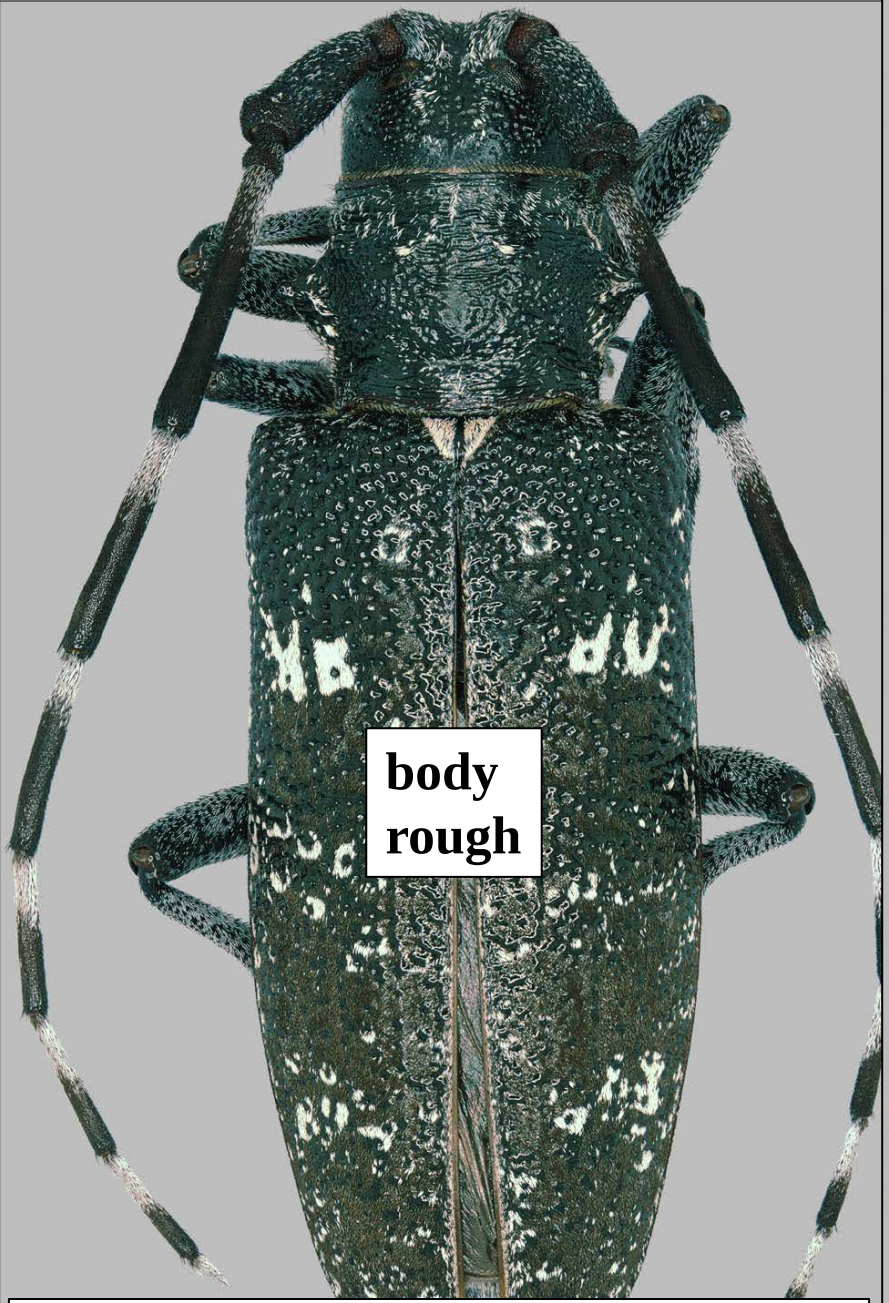

Larvae (note 7 sets of prolegs)


Eggs
plant.path.cornell.edu

European pine sawfly feeding aggregation

European pine sawfly defensive posture

Asian longhorned beetle, *Anoplophora glabripennis*



Oregon fir sawyer (female)
(*Monochamus scutellatus oregonensis*)

Asian long-horned beetle

Hosts

Preferred

- Maple
- Birch
- Willow
- Elm
- Horsechestnut
- Buckeye

- Alder
- Apple
- Ash
- Cherry
- Mountain ash
- Oak
- Pear
- Plane tree
- Plum
- Poplar, Cottonwood


This was a healthy tree!
James Appleby
Univ. of Illinois

Larvae: 1 – 2 years to mature

Adults emerge May through November.

Cut It

Chip It

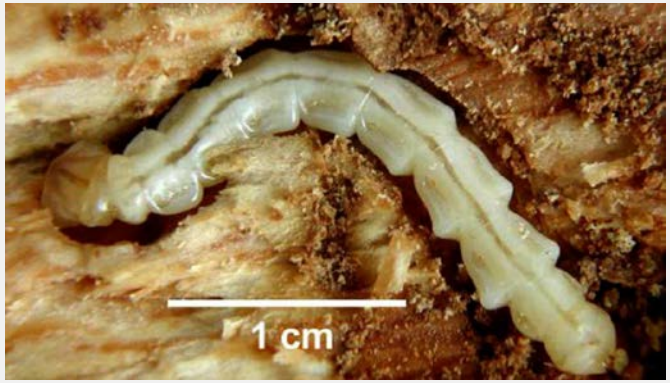
Burn It

Wood borers attacking deciduous trees

Emerald ash borer (Buprestidae: *Agrilus planipennis*)

Adult

- **Attacks ash.**
- **Has killed more than 6 million trees in Michigan alone.**



Mature larvae in gallery.
Larvae are extremely flattened.

Distinctive D-shaped adult emergence holes.

Serpentine larval galleries just under bark.

- **Adults are rarely seen. Damage is more useful for survey.**

The Swede midge story

- *Contarinia nasturtii*

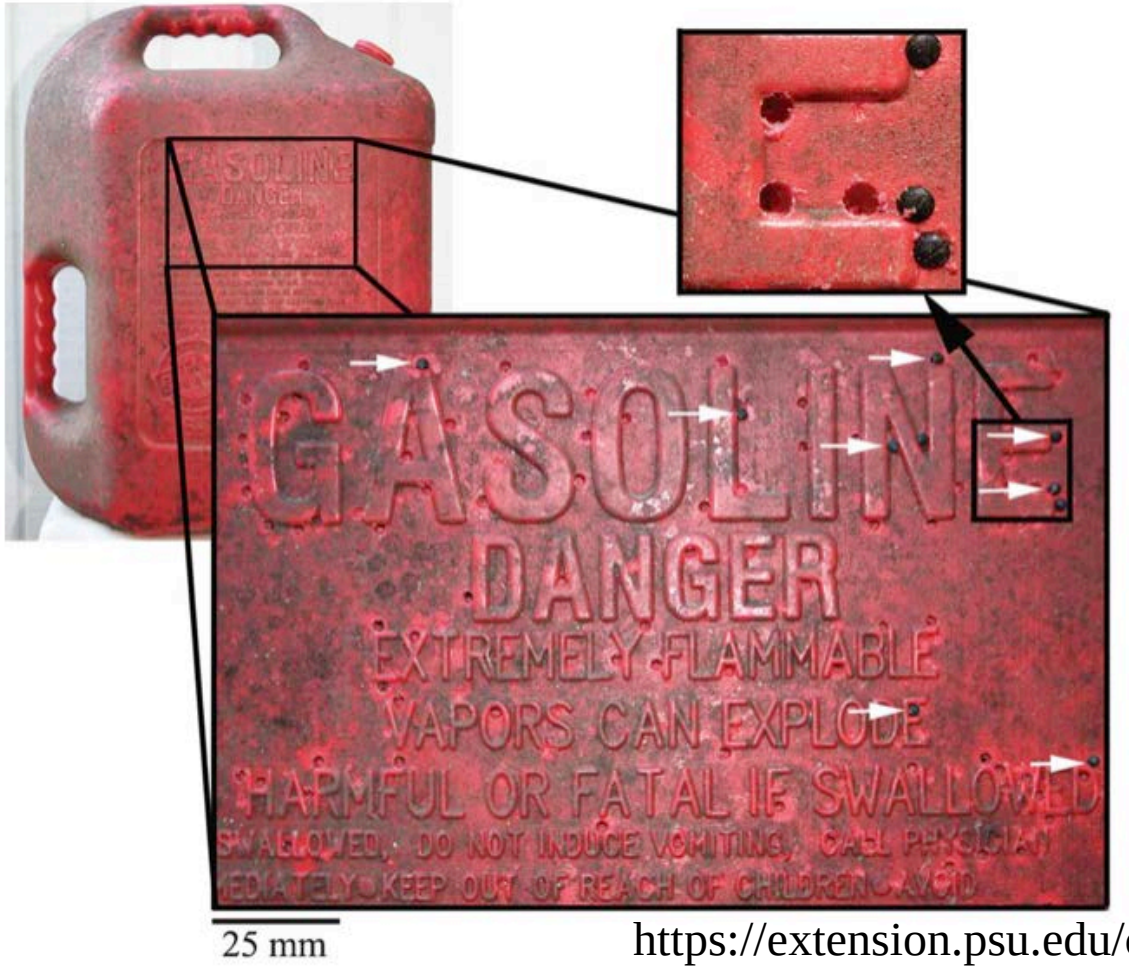
http://nyis.info/invasive_species/swede-midge/

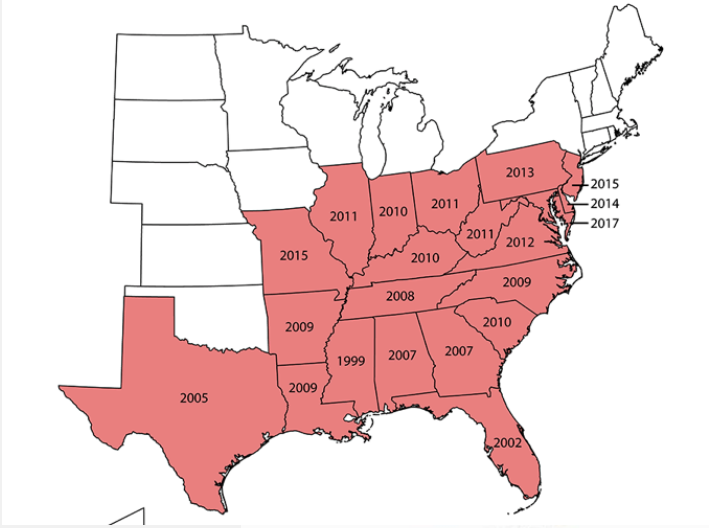
https://www.canolacouncil.org/canola-encyclopedia/insects/swede-midge/

http://prairiepestmonitoring.blogspot.com/2016/06/weekly-update-june-22-2016-wk-08-swede.html

Cnestus mutilatus and other ambrosia beetles

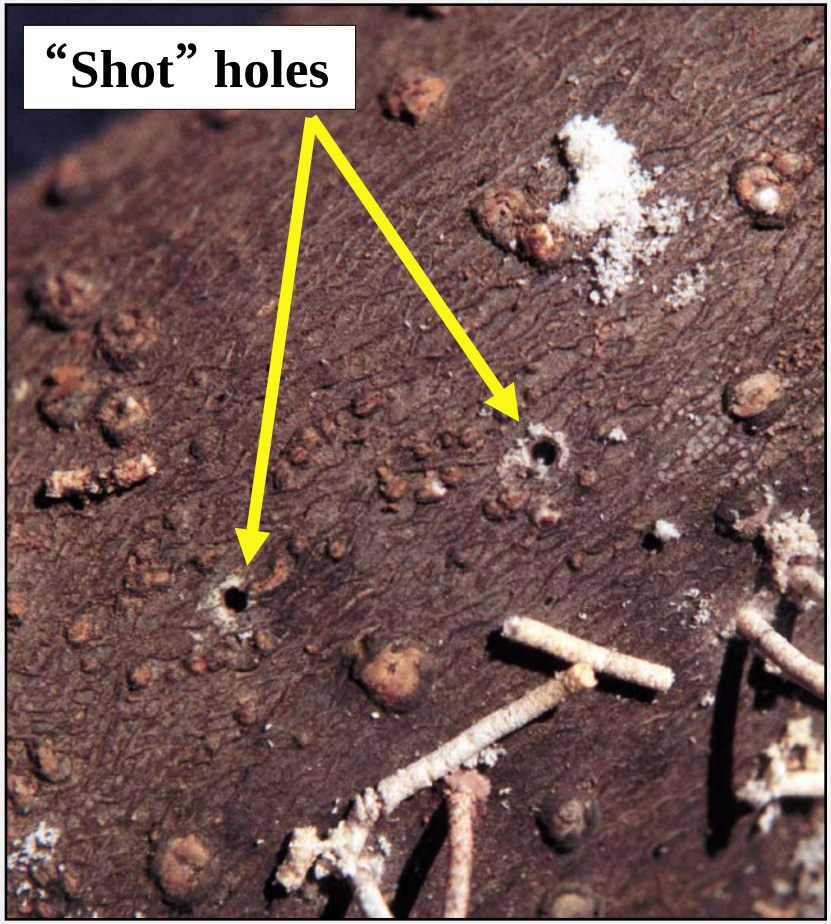
- Camphor beetle

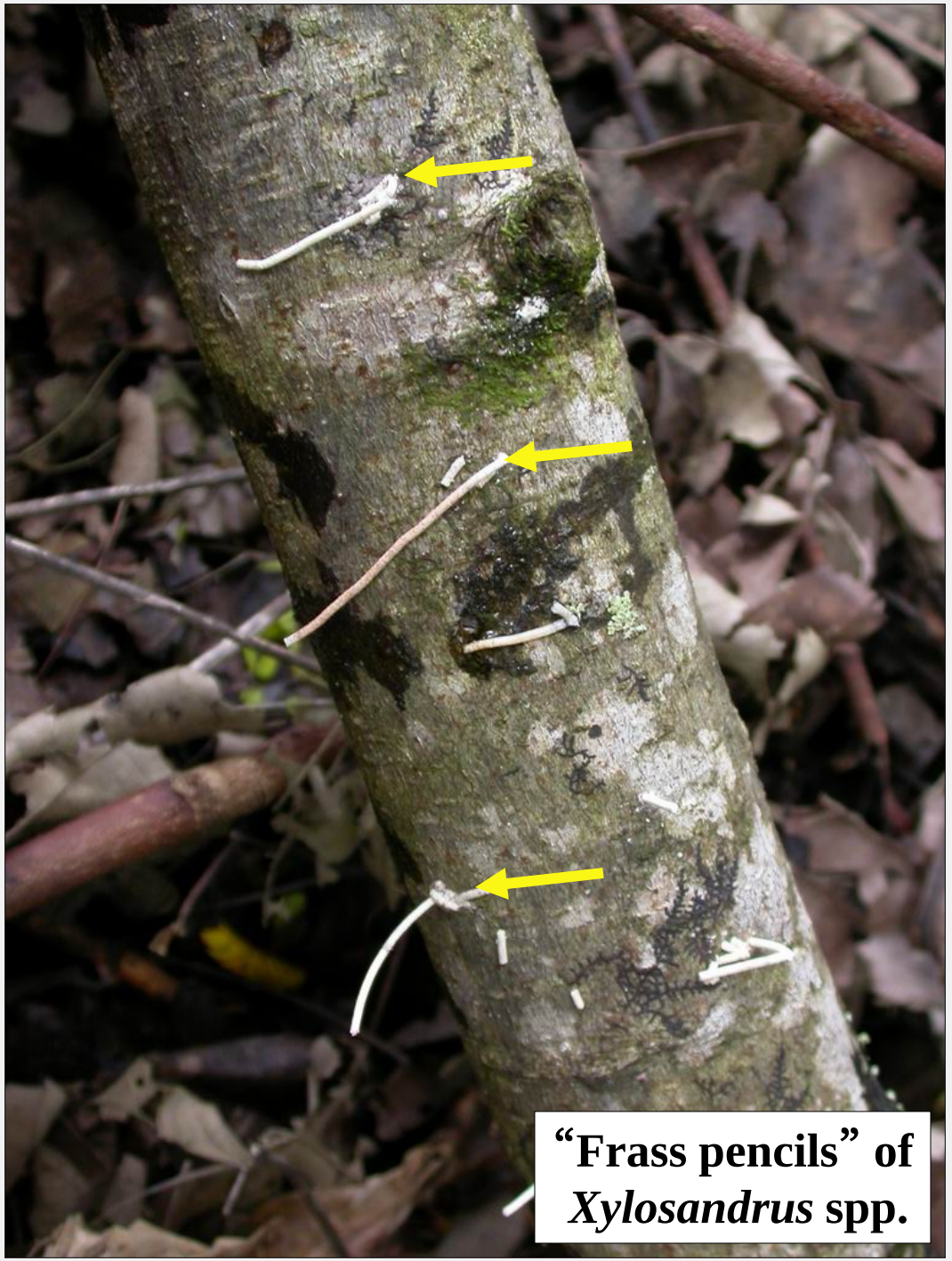




https://extension.psu.edu/camphor-shoot-borer-cnestus-mutilatus

Black Stem Borer





Photos courtesy of Jason Oliver
Tennessee State University

80 years after introduction in the eastern U.S.

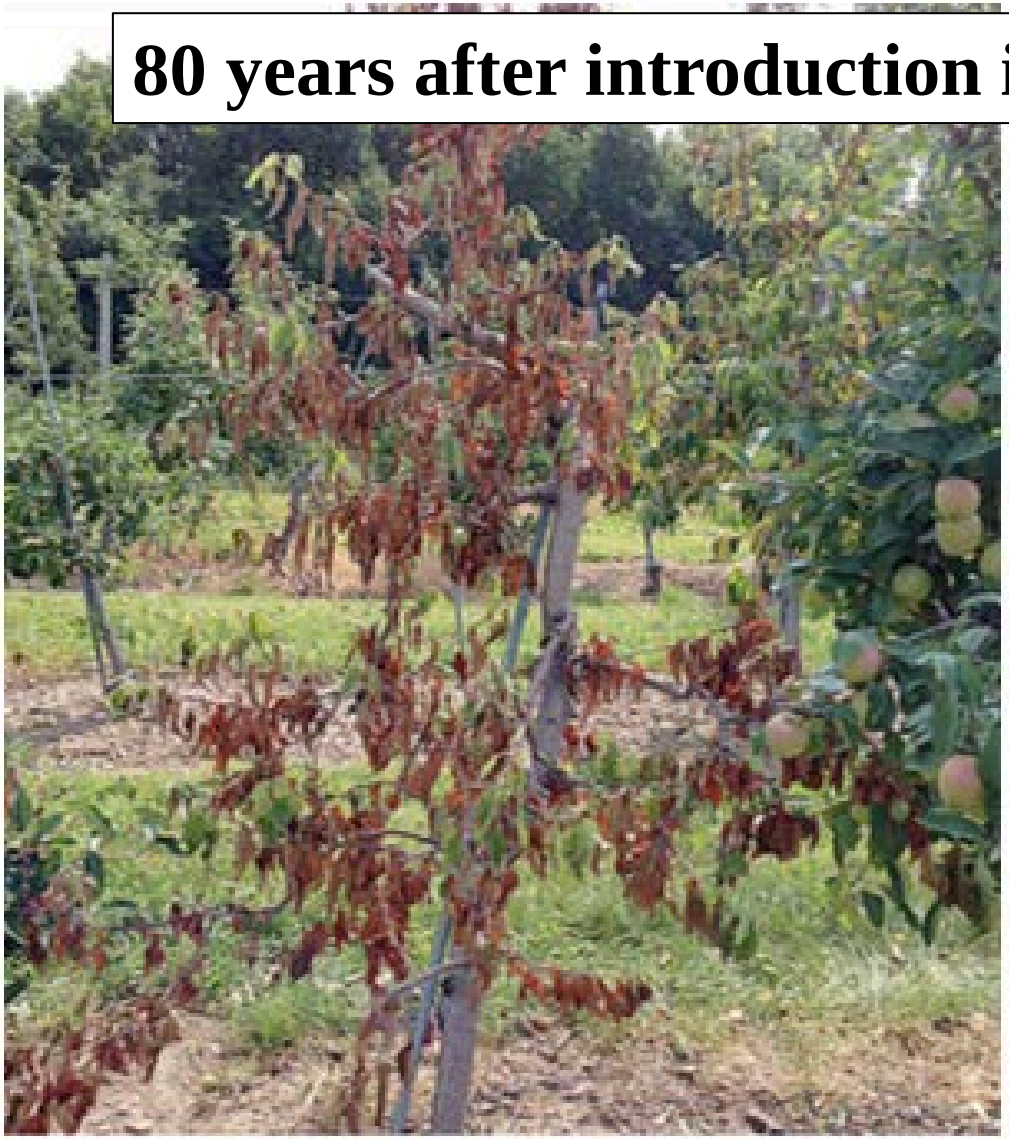


Figure 5. Infested NY-2 tree in midsummer, showing severe symptoms of wilt and decline. (photo: Art Agnello)

Figure 6. Infested Fuji tree in early May, exhibiting fire blight-like ooze from borer entry sites. (photo: Liz Tee)

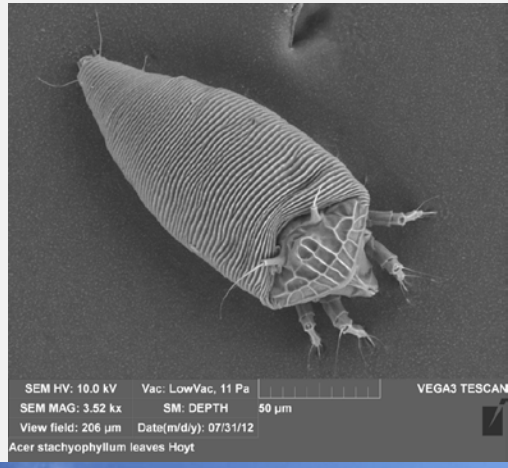
Agnello et al. 2015

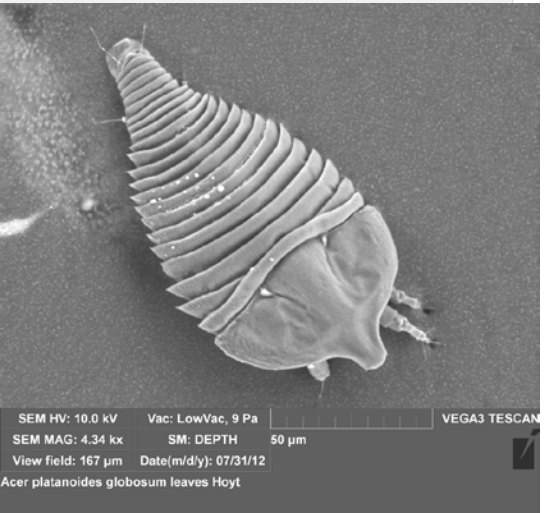
Scales

- On imported Frasier fir
- Cryptomeria scale, *Aspidiotus cryptomeriae*
- Elongate hemlock scale, *Fiornia externa*

Rust mites

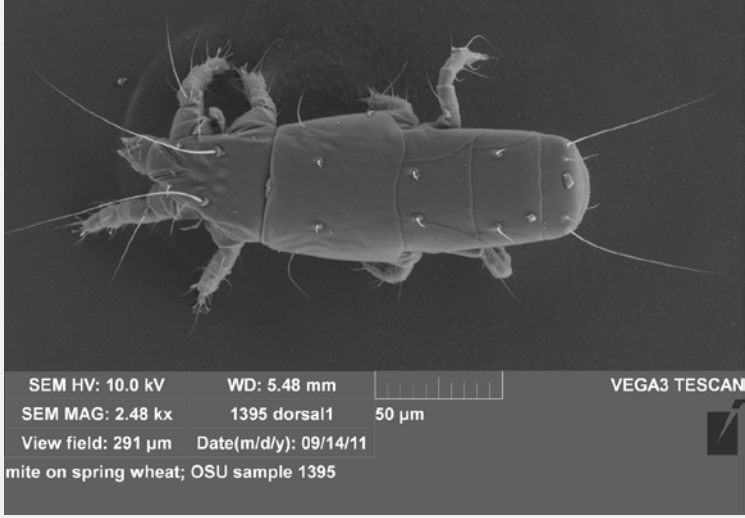
- Nearly microscopic
- Cause galls, stippling, leaf deformation, bud enlargement, brooming, and other plant deformation.

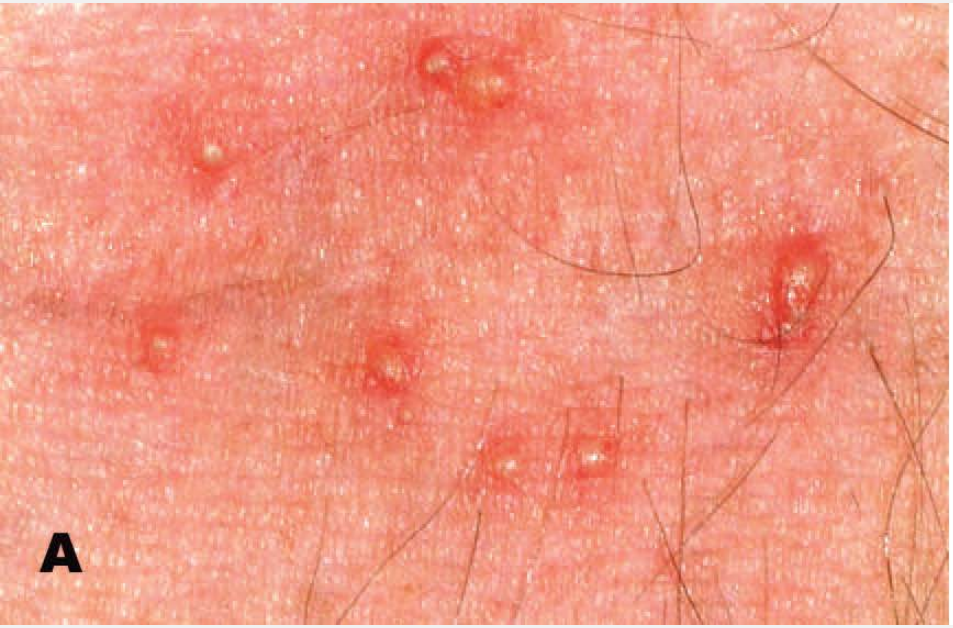




Mites falling out of oak trees

- *Pyemotes herfsi*





From Broce *et al* 2006

When to report something

- There is an endless supply of new pests
- If you see:
  - New type of damage
  - Damage associated with recent plant purchases
  - Especially if you've been looking at ___ for years

Oregon
Department
of Agriculture

- Take pictures
- If you see the critter that may be the cause, **grab it**

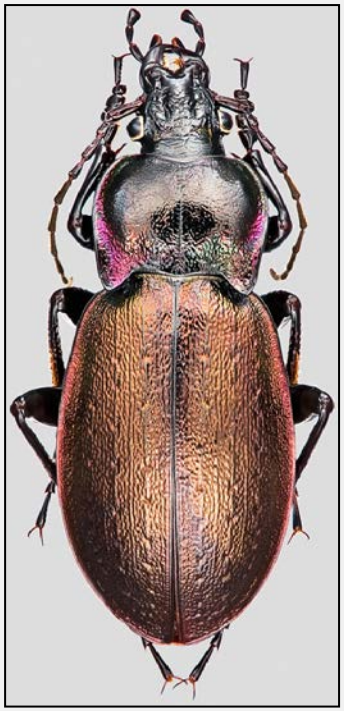
- https://www.oregon.gov/ODA/programs/IPPM/InsectsSpiders/Pages/IdentifyInsect.aspx
- 503-986-4636
- **Oregon Invasive species hotline**

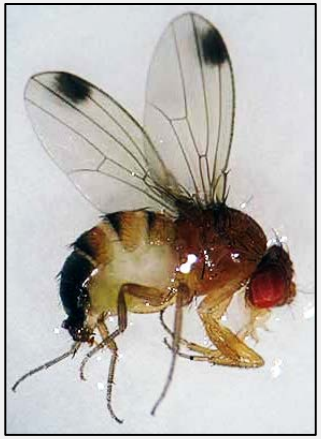
IPPM
Insect Pest Prevention & Management

Educate!

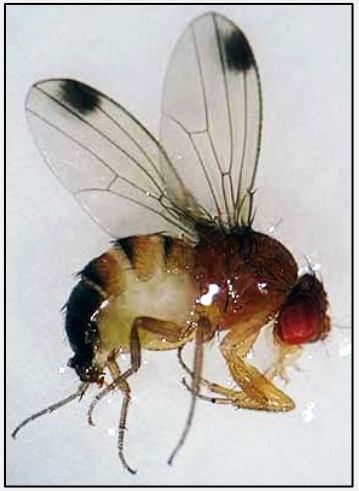
- **Use extreme care when acquiring plants grown outside of Oregon**
- **Many pests and most pathogens are nearly impossible to find and see**
  - **Look for disfigured leaves**
  - **Damage**
  - **Exuviae**
  - **Slime trails**
  - **Reject and demand better!!!**

Exotic Pest Pathways: Sharing can be bad!





Exotic Pest Pathways: Sharing can be bad!



So, What Can We Do?

1. Political/national**:**
    1. **Better inspect plant imports**
    2. **Inspect containers**
    3. **Trade rules! IPPC, Canada**

2. Political/regional**: Funding**
    1. **Surveillance for those that slip through**

3. Political/regional**: support eradication efforts**

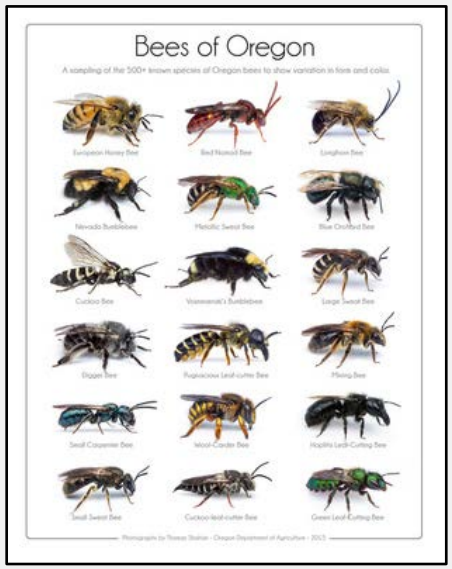
4. **Educate** those involved in the movement of plants
    a. **How to have “clean” plants**
    b. **Reduce the movement of plants (don’t trade)**
    c. **Report unusual plant damage**

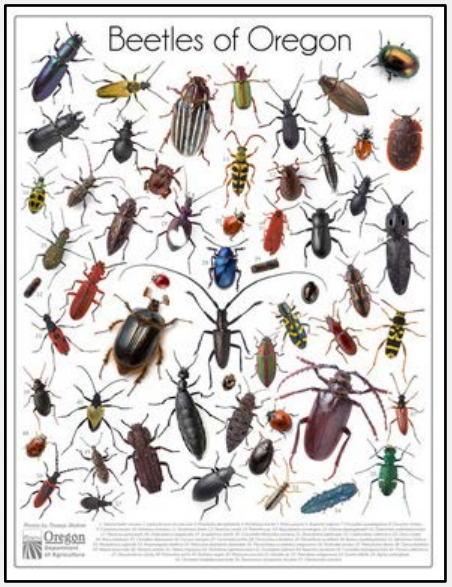
Make some noise?

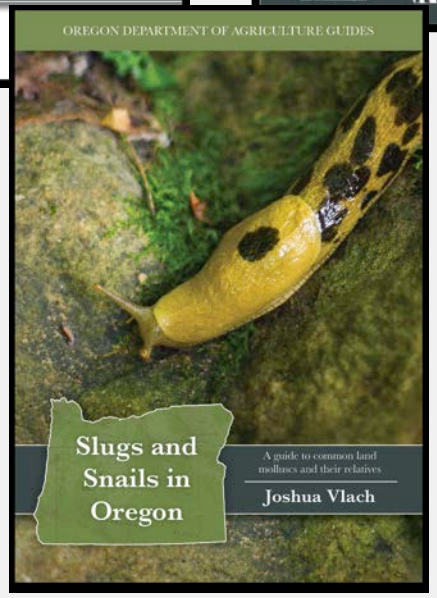
- **How can I get folks active on these issues?**

- **How do we get the attention of lawmakers?**

Visit http://www.odaguides.us







New Detection:

Oriental Beetle

Anomala orientalis

Oriental Beetle

- Pest of turf and sometimes nursery stock
- Grubs feed on turfgrass
- 2 detected in 2018 – PDX airport and in NE Portland
- Will continue to monitor in 2019

The brown marmorated stink bug story

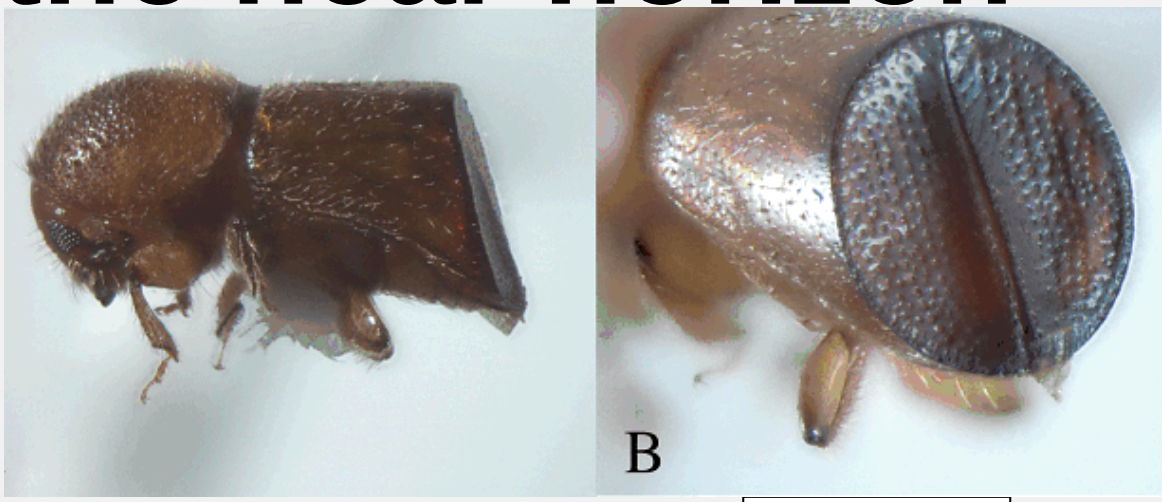
Pests on the near horizon

Woodborers

- Metallic woodborers
  - *Agrilus planipennis*
  - Spotted oak borer
-

Foliar

- Gypsy moth
- Scales and other suckers, pathogens
  - Cryptomeria scale, elongate scale
- Mite in oak trees that bites (oak gall mite)
- Spotted lanternfly



Gold-spotted oak borer
Agrilus auroguttatus

Velvet longhorned beetle
Trichoferus campestris

Xyleborus glabratus

Redbay ambrosia beetle

Oregon myrtle

Established and widespread pests

- Seemingly endless

- Woodborers
  - Ambrosia beetles (many)
  - Bark beetles (several)
  - Metallic woodborer (Bronze birch borer)
  - Longhorned beetles (many)
  - Wood wasps (a couple)

- Bark
  - Moths, bark feeding (many)
  - Scales (many)
  - Mealybugs (many)
  - Aphids (many)

- Foliar
  - Aphids (many!)
  - Whitefly (many!)
  - Rust mites (many!)
  - Caterpillars (many!)
  - Gall midges (many)
  - Jumping lice (a few)
  - Lace bugs (Oak and azalea lace bug)
  - Leafhoppers, froghoppers, treehoppers (many)
  - Leafminers (many)
  - Spider mites (many)
  - Flat mites (several)
  - Sawflies (Many)
  - Thrips (many)

- Root
  - Root weevils (many)
  - Adelgids (several)
  - Aphids/Phylloxera (several)
  - Scarab beetles (several)

Wood borers attacking deciduous trees

Shothole borer (Scolytidae: *Scolytus rugulosus*)

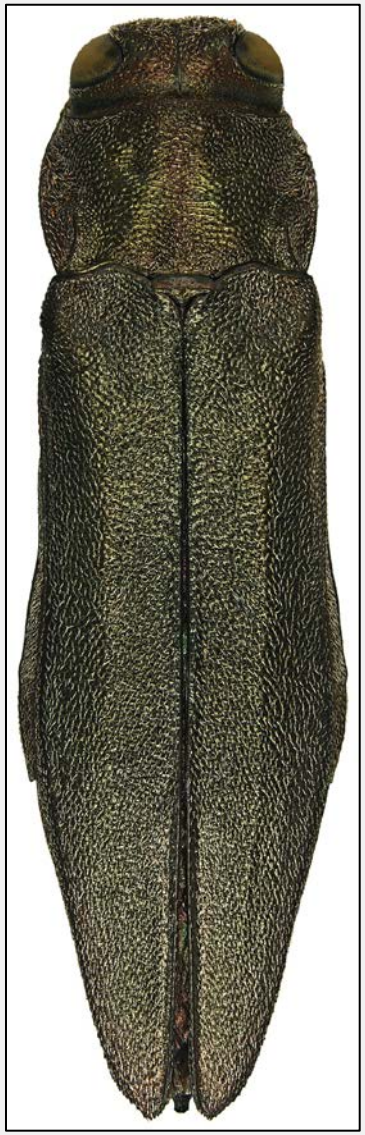
- **Established throughout the U.S. Common in Oregon.**
- **Favors cultivated fruit trees, elm, and mountain ash.**
- **Overwinter as larvae under bark.**
- **Adults emerge March through June.**

Adult shothole borer

"Shotholes" in host tree

- **Attacks twigs, branches, trunks (especially of stressed hosts).**

Bronze birch borer, *Agrilus anxius* a regional exotic



Birch dying from bronze birch borer attack

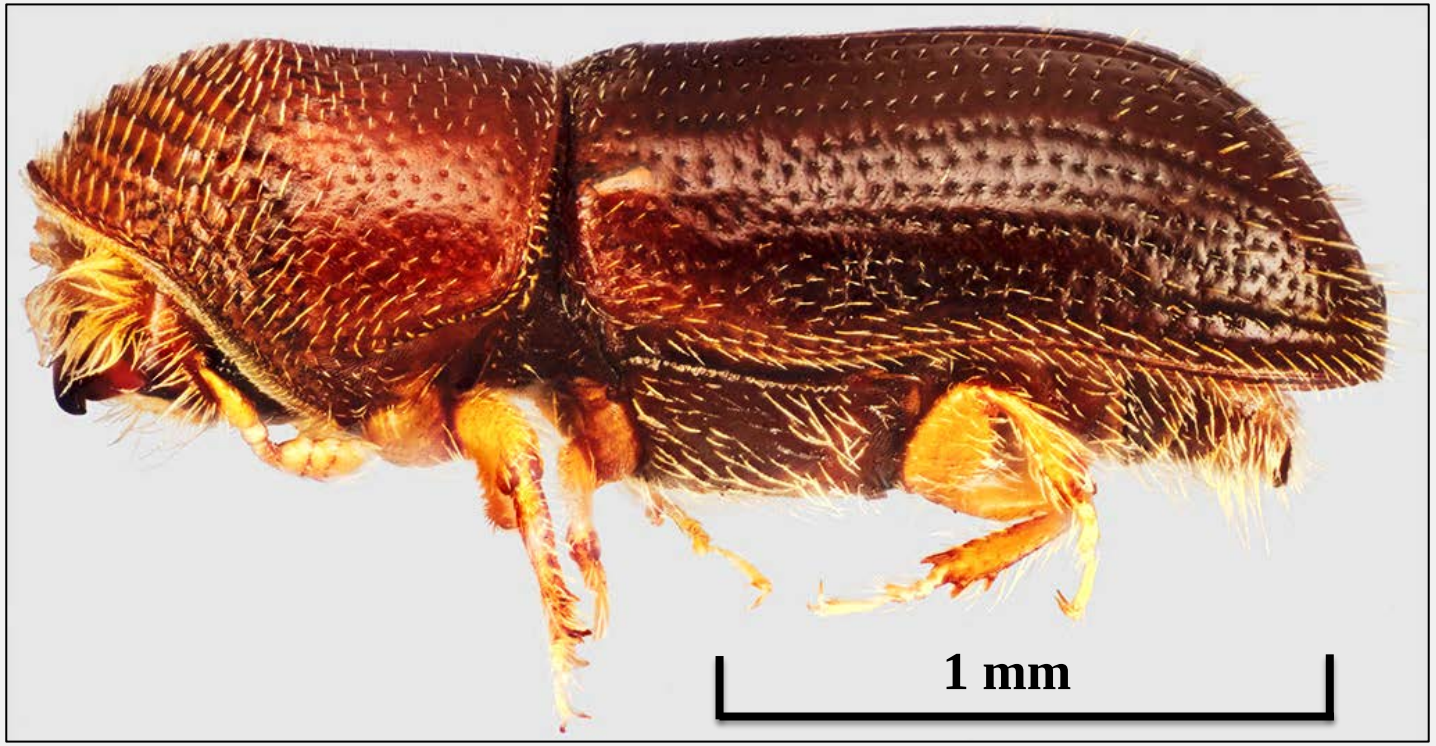
Signs of bronze birch borer

D-shaped adult exit holes

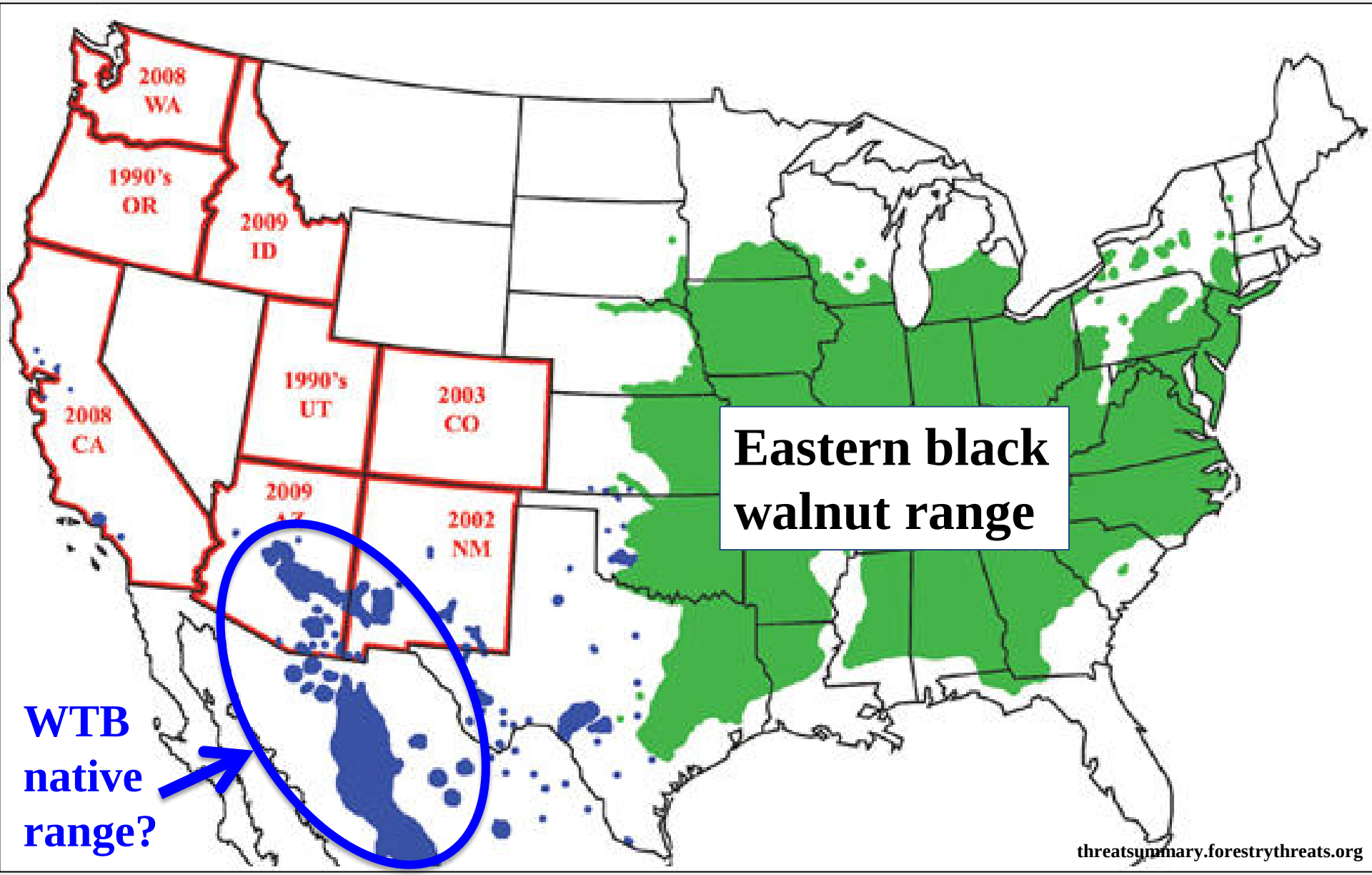
Sinuous bark swellings from larval galleries

Sinous, shallow galleries under bark

Walnut Twig Beetle: *Pityophthorus juglandis*



Distribution of WTB/TCD



Signs of walnut twig beetle

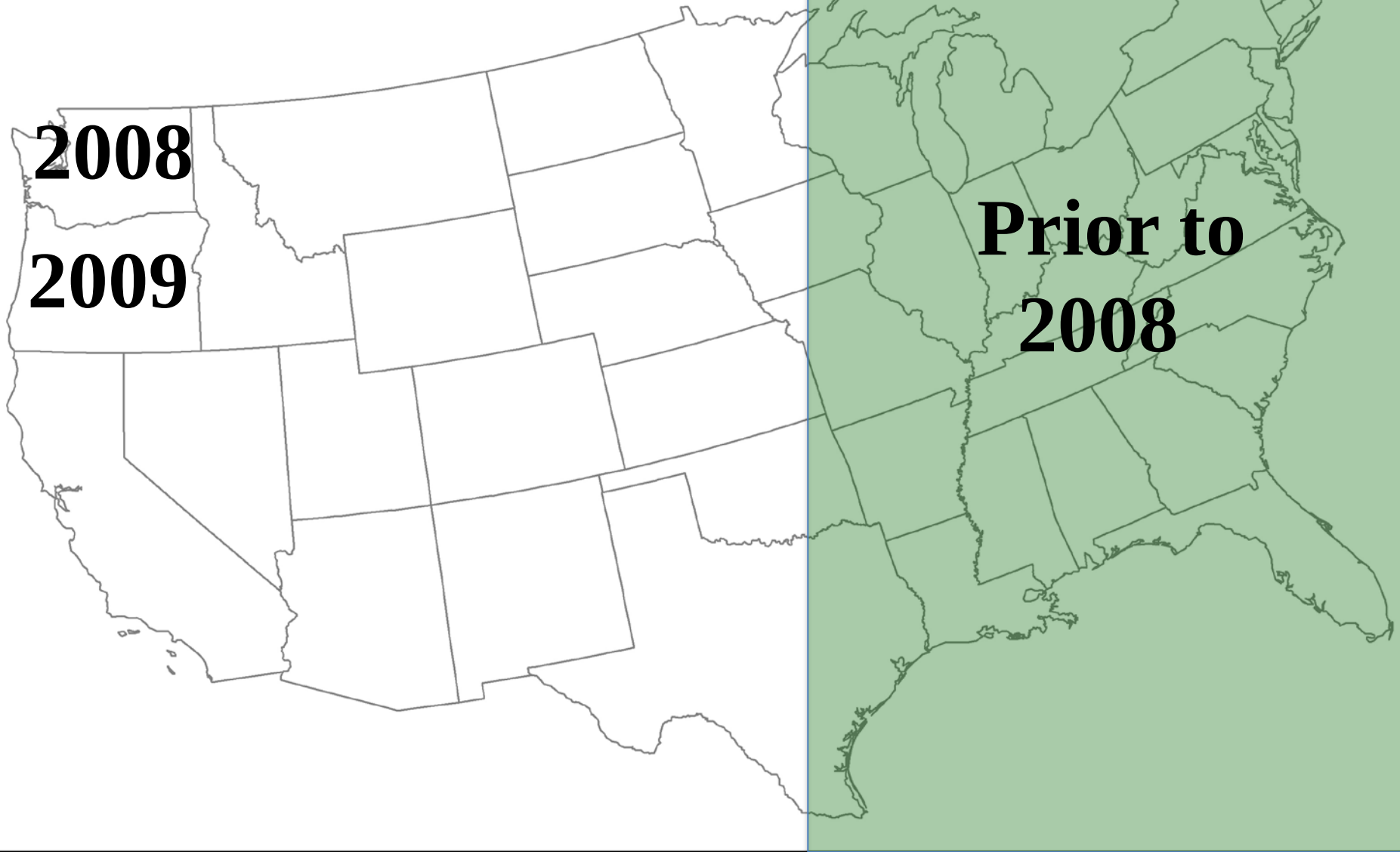
Thousand Cankers Disease

Thousand Cankers Disease

Azalea Lace Bug

(*Stephanitis pyriodes*)

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



Typical heavy azalea lace bug damage (on deciduous azalea)

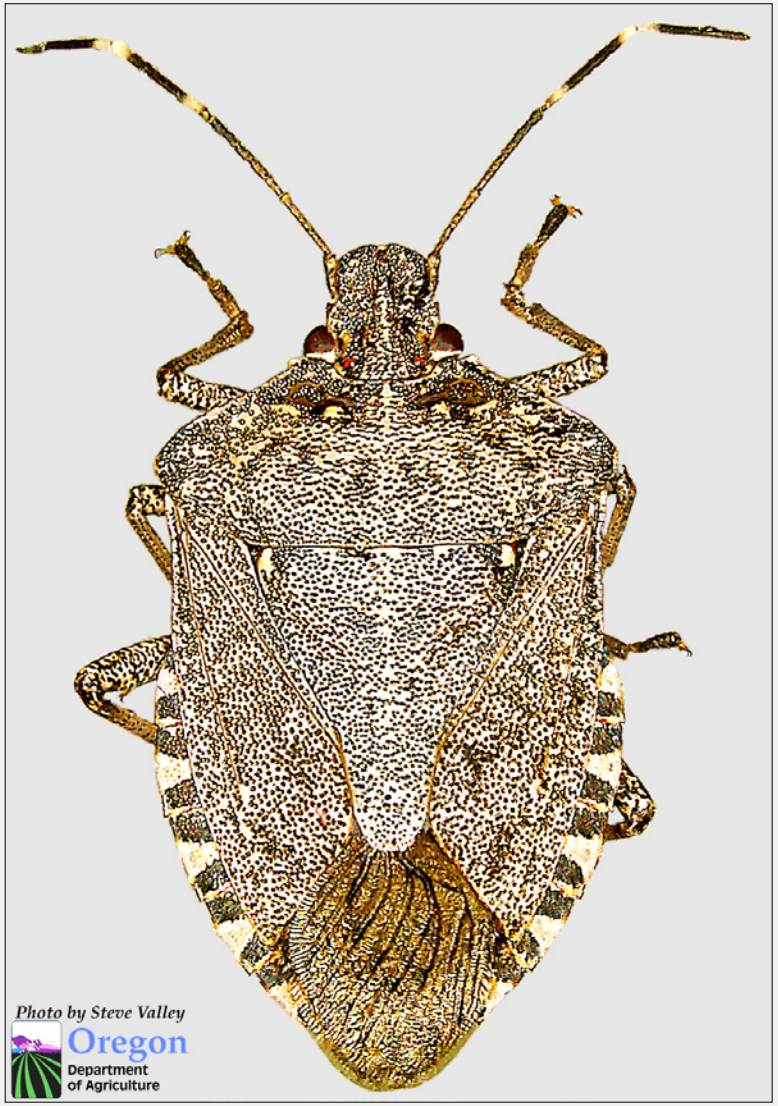
Exotic earthworms

“Evil” eco-engineers!

Amynthas gracilis

Brown marmorated stink bug
Halyomorpha halys

- **Found in Oregon 2004**
- **Attacks hundreds of plants, including conifers**
- **Currently no good traps or controls**



Peaches


Courtesy of P. Shearer, OSU Extension


Courtesy of P. Shearer, OSU Extension

Apples

Slide courtesy Tracy C. Leskey, USDA-ARS

Feeding on hazelnuts through the shell

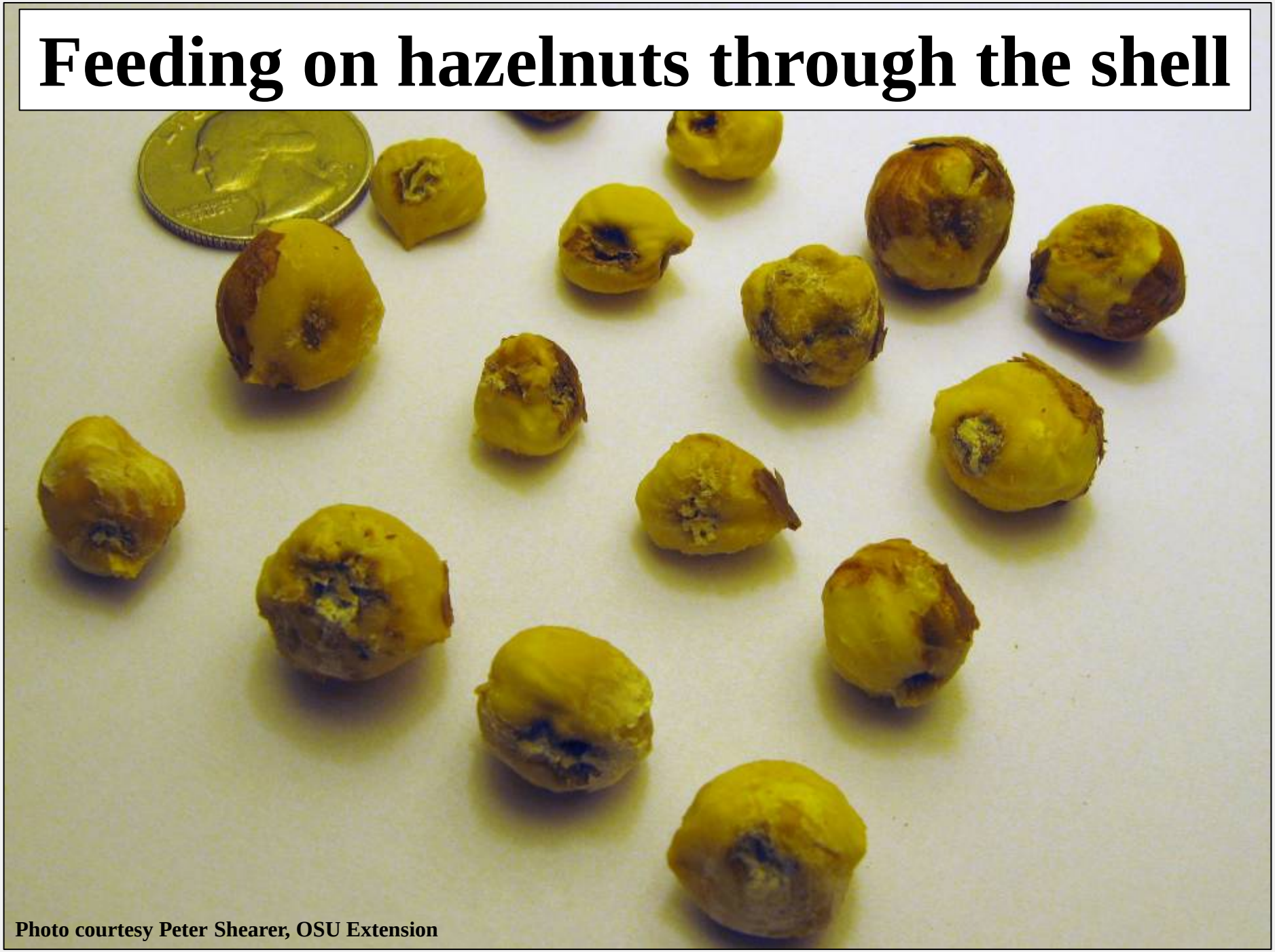


Photo courtesy Peter Shearer, OSU Extension

Sugar maples: through the bark!

BMSB: aggregative pest

Root weevils in the genus *Otiorhynchus*

Otiorhynchus adult root weevil foliage damage

Otiorhynchus larvae and larval damage

Recently established pests

Longhorned beetles:
- Cherry bark tortrix, Woodwasps (Pigeon tremex and Xiphydria maculata (maples)
- Rose stem girdler, Agrilus cuprescens

Foliar
- Greenhouse thrips, new pine plantings
- Ash whitefly, psyllid
- Bay jumping louse
- Oak lace bug, Corythucha arcuata
- Sawflies (pine and prunus)

rust mites
- maple- Rhyncophytoptus 2 sp.,
- Carpinus, undescribed,
- boxwood bud mite,
- Linden mite,
- Oregon grape gall mite

Other
Asian jumping worm

Wood borers attacking deciduous trees

Cherry bark tortrix (CBT) (Tortricidae: *Enarmonia formosana*)

- **Attack various woody rosaceous plants, especially *Prunus* spp. (also apples, pears, etc.).**

Adult CBT

CBT pupal skin protruding from bark

CBT larva

CBT larva in gallery

- **Established in British Columbia, Washington state, and the northern Willamette Valley.**

- Larvae form galleries under bark, girdling and killing trees. Also cause sap flows from bark.

Frass tube