Vine Mealybug: A new era in Oregon winemaking

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Entomologist

February 14, 2023

OREGON DEPARTMENT OF AGRICULTURE

Protect. Promote. Prosper.

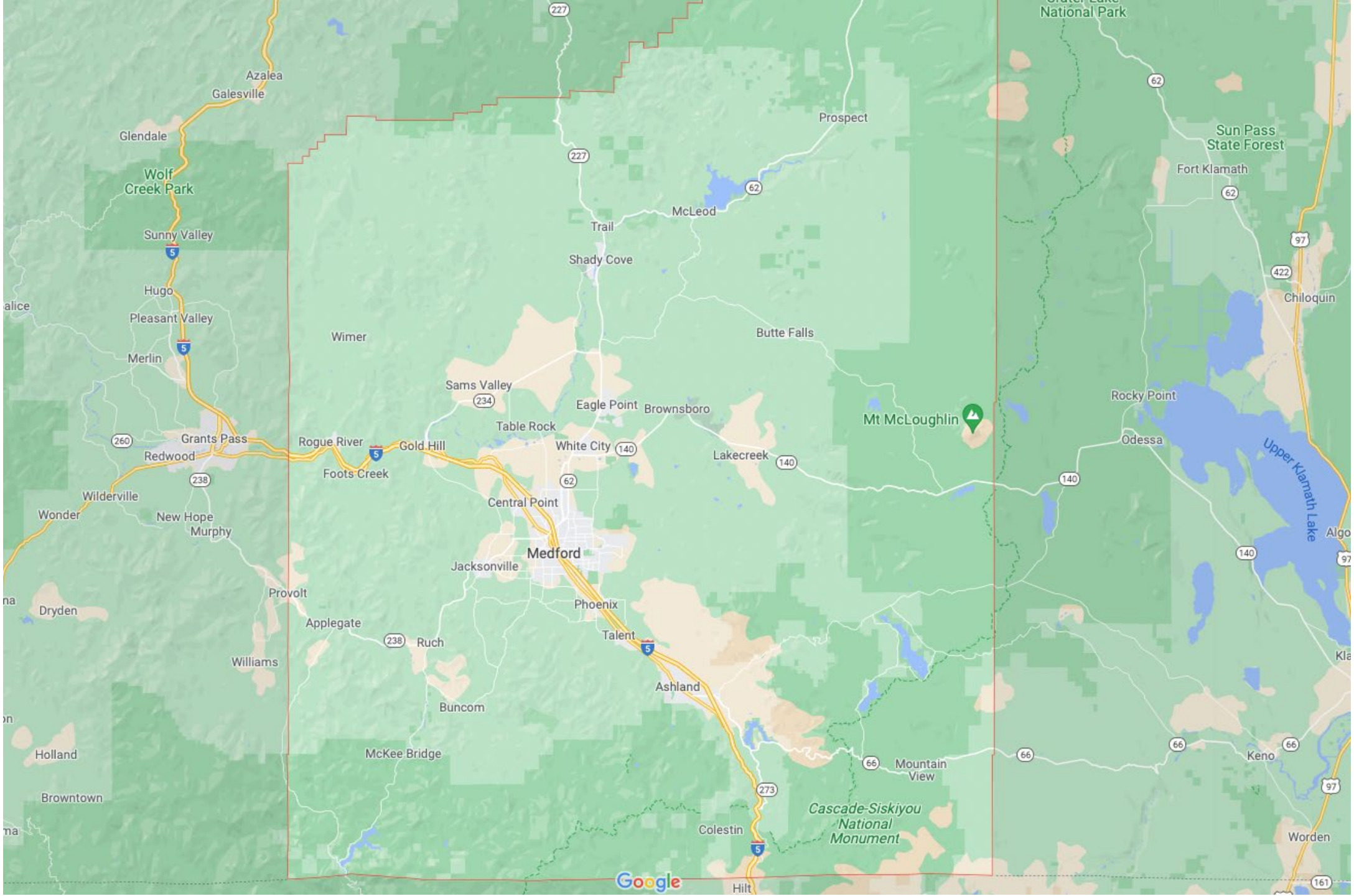
Topics

- **What mealybug?**
- **Where the mealybug is**
- **What has been done so far**
- **Costs and impacts**
- **What should be done**

“I already have the mealybug”

Vine mealybug

- One of the most significant grape pests in the world
- Reduces quality by feeding, sooty mold growth, and contamination of bunches
- **Excellent vector for leafroll viruses**
- At least annual pesticide treatments appear to be necessary


Azalea
Galesville
Glendale
Wolf Creek Park
Sunny Valley
Hugo
Pleasant Valley
Merlin
Grants Pass
Redwood
Rogue River
Gold Hill
Foots Creek
Wilderville
Wonder
New Hope
Murphy
Dryden
Provolt
Applegate
Ruch
Williams
Buncom
McKee Bridge
Holland
Browntown
Wimer
Sams Valley
Eagle Point
Brownsboro
Table Rock
White City
Central Point
Medford
Jacksonville
Phoenix
Talent
Ashland
Prospect
Trail
McLeod
Shady Cove
Butte Falls
Lakecreek
Mt McLoughlin
Rocky Point
Odessa
Upper Klamath Lake
Sun Pass State Forest
Fort Klamath
Chiloquin
Mountain View
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Vine mealybug in Oregon

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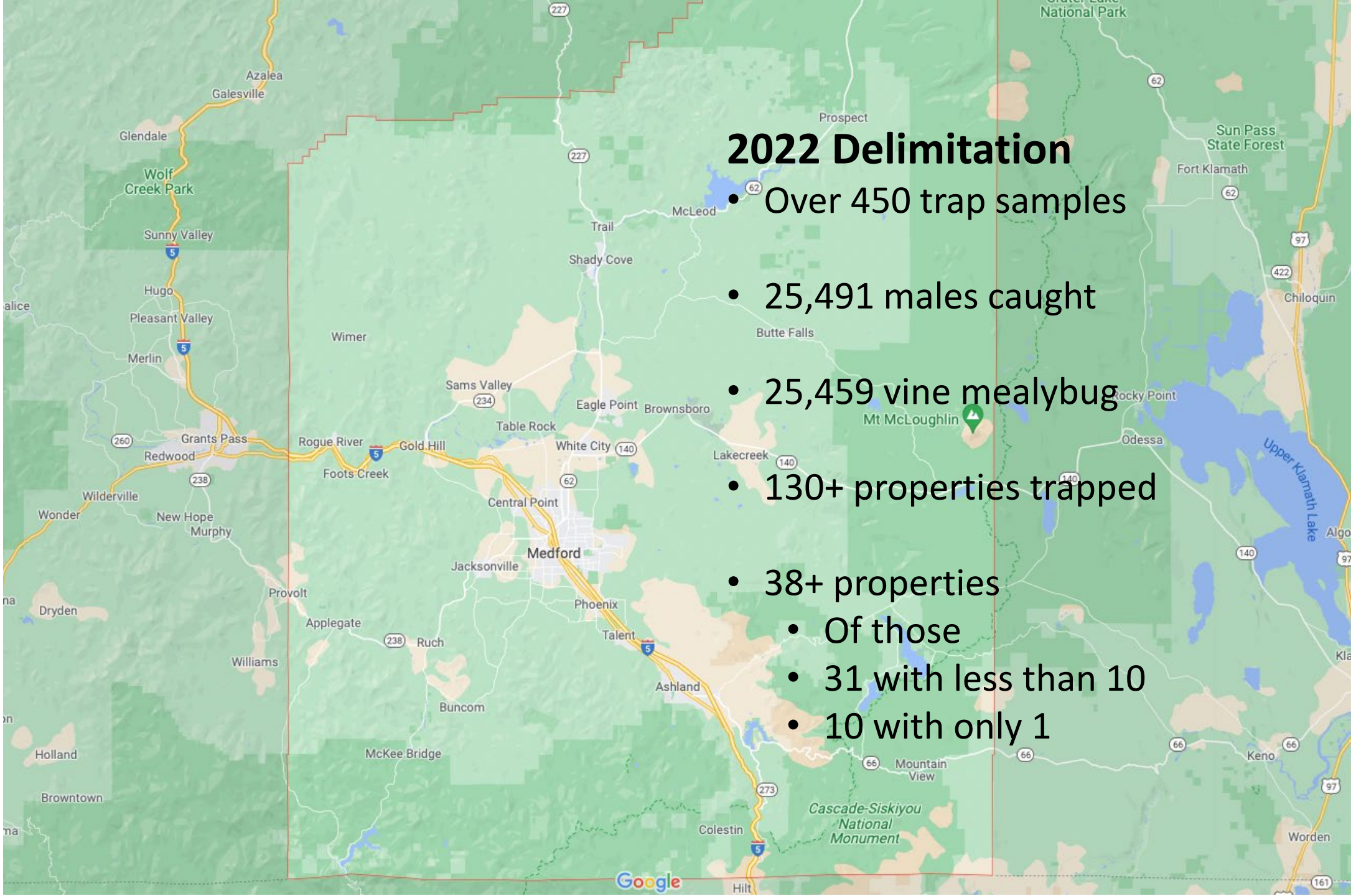
https://cisr.ucr.edu/invasive-species/vine-mealybug


2022 Delimitation
• Over 450 trap samples
• 25,491 males caught
• 25,459 vine mealybug
• 130+ properties trapped
• 38+ properties
• Of those
• 31 with less than 10
• 10 with only 1
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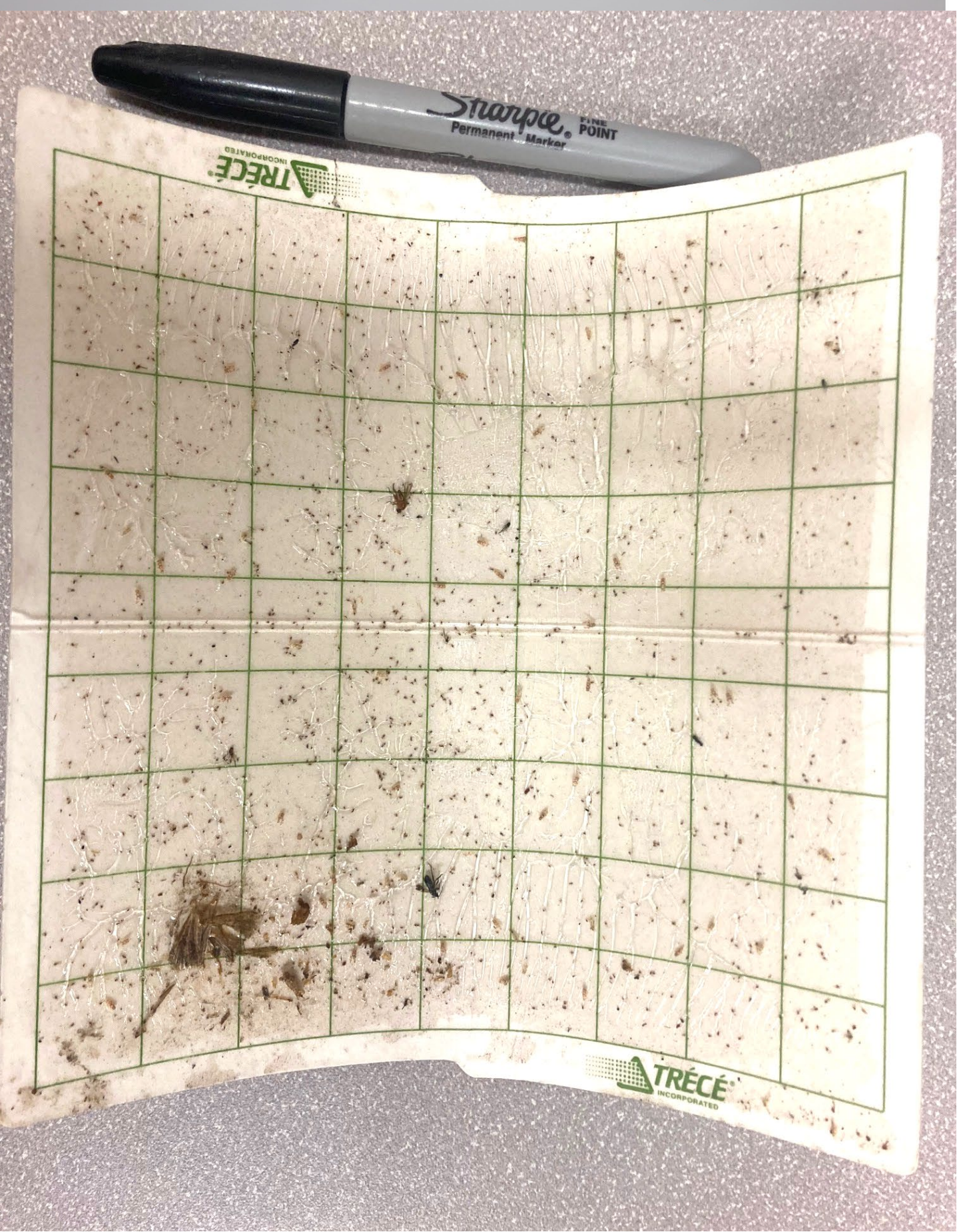
Note on traps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Quarantine

- VMB is a quarantine pest per OAR 603-052-0051, the Grape Pests and Diseases quarantine

- Requires specific treatment and/or production requirements for import of grape stock from infested areas (like CA)

Quarantine

- VMB is a quarantine pest per OAR 603-052-0051, the Grape Pests and Diseases quarantine

- **For Oregon properties where it is detected:**

- Automatically in effect
- Property becomes regulated when detected
- Will apply to properties with grapes growing

What does a positive catch mean?

- Trap uses a pheromone for males
- Females are difficult to find until trap catches are high
- How far do males fly?

Vine mealybug found under bark. From the UC Riverside Center for Invasive Species Research. *https://cisr.ucr.edu/invasive-species/vine-mealybug*

Vine mealybug female. Note the wax tails (filaments) are not more than ½ the width of the body.
From California Dept. of Agriculture, https://oda.fyi/jqb

How are we implementing quarantine?

- **How many males = infested property?**
- **If we ignore trap counts of 10 or less, we are still looking at the original area**
- **Use survey for females to remove quarantine?**

Quarantine requirements

- **Do not move potentially infested material off site**. Leaves, stems and other plant parts should be buried or burned. Another option may be covering with black plastic for 4 weeks.

- **Clean tools and equipment**. Equipment used in the field should be pressure washed before moving to the next vineyard. Examples include:
  - Vehicles
  - Harvesters
  - Trailers
  - Tractors
  - Sprayers
  - Hand tools including clippers and hedgers

- **Ensure workers are sanitized**:
  - Use disposable protective clothing in the field. Dispose before moving to next vineyard.
  - If disposable outerwear cannot be used. At the least, outer clothing layers should be changed and placed in plastic bags after working in vineyards.
  - Shoes and gloves should be cleaned, ideally before and after entering a vineyard.
  - Hands should be washed with soap and water, ideally before and after entering a vineyard.

- **Avoid moving bins between vineyards**. Wash with soap and water if movement between vineyards is necessary.

- **Notify facilities accepting grapes**. Grapes from infested sites should be moved in enclosed or covered trucks and the facility receiving the grapes should be notified so that the grapes will be processed rapidly and the pomace treated.

- **Treat unfermented pomace**. Pomace from grapes harvested at infested sites should be covered with black plastic for at least 4 weeks. Composting is not adequate to ensure that all life stages are killed.

Even if you're not under quarantine

- Take precautions now!
- Make sure the people, plant material and machinery that enter your facility are clean.
- VMB has hundreds of hosts- it could arrive on plants other than grape
- Be aware that these can move on grape clusters and possibly survive crushing if unfermented
- For the community's sake, report it if you find it!

EM 8990 • October 2009

Grapevine Leafroll Virus and Mealybug Prevention and Management in Oregon Vineyards

V. Walton, A.J. Dreves, P. Skinkis, C. Kaiser, M. Buchanan, R. Hilton, B.R. Martin, S. Castagnoli and S. Renquist

Grapevine Leafroll associated Viruses (GLRaVs) cause disease in grapevines worldwide. In some regions, the viruses have reached epidemic levels. Recently, they have been identified in vineyards in Oregon, which has led to concern. The disease is caused by a complex of ten species of viruses that may produce a wide variety of symptoms including: leaf chlorosis and discoloration; downward rolling of leaves; fruit yield reductions of up to 40%; and lower berry quality from a lack of ripening, reduced sugar content and poor pigmentation. The viruses have also been associated with poor graft union development and young vine failure.

Mealybugs (Homoptera: *Pseudococcidae*) are known transmitters, or "vectors," of GLRaVs. Virus-infected vines often mirror patterns of mealybug infestations in a vineyard. Prominent examples of mealybugs found in Oregon include grape mealybug (*Pseudococcus maritimus*), obscure mealybug (*Pseudococcus viburni*) and longtailed mealybug (*Pseudococcus longispinus*). Grape mealybug is the only mealybug found in vineyards in the state. Vine mealybug (*Planococcus ficus*), an invasive species, is also believed to be a vector of viruses in California. It has not been reported in Oregon to date.

Viruses and their insect vectors, including mealybugs, can be mitigated by implementing safe practices, first by prevention and second by management. Prevention measures should be used to keep insect vectors and viruses out of vineyards. Management of GLRaVs and quarantine of mealybug vectors are required to prevent further spread if a vineyard site is already infected.

Figure 1: Honeydew, ants and sooty mold are often found on grape clusters infested with mealybugs.

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Oregon State University | Extension Service

Quarantine

Quarantine:

- Fear of stigma = low level of cooperation
- Everyone's problem

Additional costs/activities

- Quarantine costs are moderate vs. VMB and leafroll virus

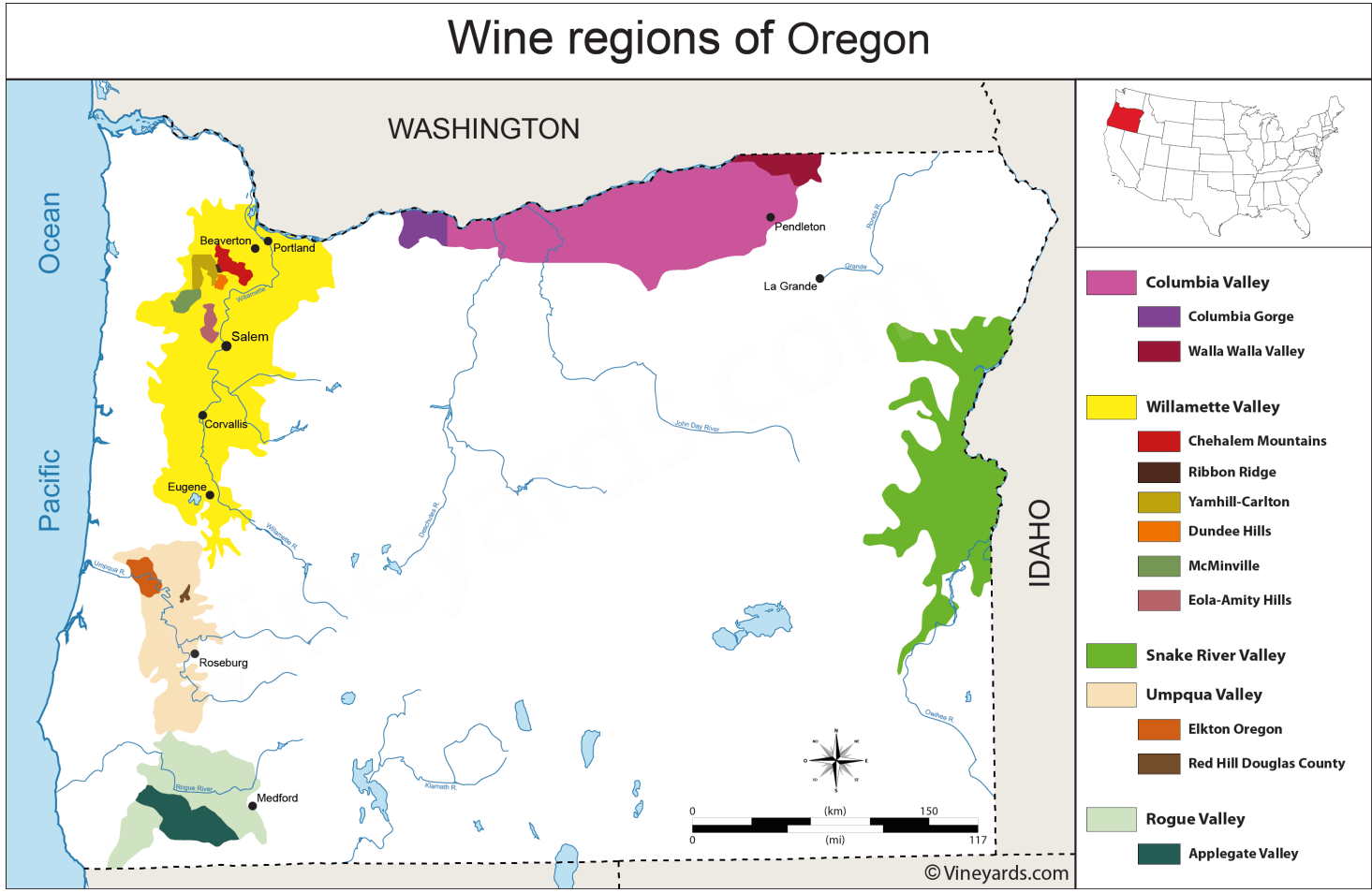
Enforcement?

- You are a community

Image adapted from https://publichealth.jhu.edu/2021/covid-19-and-stigma

What is missing?

- **Statewide survey.**
  - **Oregon has applied for funding**
  - **Survey is needed to ensure that introduction hasn't occurred at other locations**
- **Infested Area suppression effort**



https://vineyards.com/wine-map/united-states/oregon

This year

- **We have funding delimitation trapping in the spring**

- **I have applied for funding to trap the rest of the season**

What outcomes should we aim for?

- **Eradication?-**
  - **Never* been done,**
  - **large up-front investment**
  - **Could be worth trying**
    - consider statewide infestation costs

What what would eradication involve?

- **If the industry is serious**
  - **Help pay for pesticides**
  - **Help pay for mating disruption**
  - **Help pay for monitoring**
  - **Incentivize (Pay) growers to destroy infested vines and not replant with grape**

What are the costs of VMB to the industry?

- **Leafroll virus:**
  - **Kills vines (years after infection?)**
  - **Reduces grape quality**

- **Mealybug:**
  - **Contaminating bunches**
  - **Increased pesticide use**
    - **= outbreaks of secondary pests**
    - **= increase presence in wines**

Impacts

- Export of vines, no impact
- Export of grapes, possible impact
  - Pomace
- Ability to grow organically: large impact
- Ability to obtain other certifications: ?

Estimates of costs

Take a look at Ricketts, et al from 2015

- **Reducing the Economic Impact of Grapevine Leafroll Disease in California: Identifying Optimal Disease Management Strategies**

- **Costs estimates ranged from $12,000 to $92,000**
- Per acre!
- Per Year!
  - (published as $29,000 per hectare to $226,000 per hectare)
- This is largely the cost of managing leafroll virus, but vector management (VMB) is part of it.

Is there a lower level of commitment?

- **Containment and slow the spread**
  - **Statewide trapping program**
  - **Area wide pesticide and mating disruption treatments**
  - **Trapping in infested area**
  - **Grower and winery education**
  - **I have put forth such a proposal**

Is there a lower level of commitment?

- **Containment and slow the spread**
  - **To be effective the program will have to:**
    - **Help pay for pesticides**
    - **Help pay for mating disruption**
    - **Help pay for monitoring**
- **Why should we give other growers support (= money)?**
  - **Individual growers can’t do this alone**
  - **If a grower refuses to participate, they will be a reservoir for VMB**

What should be done?

- **Not only can individual growers not do this alone, ODA can’t do this alone**

170 New Exotic Invertebrate Species Found Established in Oregon 2007-2022

Scientific name	Common name
Trionymus diminutus	Phormium mealybug
Cacopsylla fatsiae	Fatsia psyllid
Catocala neogama	bride underwing
Crisicoccus probably *azaleae*	Azalea mealybug
Cydia coniferana	Conifer bark-feedng tortrix
Hemiberlesia lataniae	Latania scale
Pityophthorus juglandis	Walnut twig beetle
Pseudaulacaspis cockerelli	False oleander scale
Scolytus schevyrewi	Banded elm bark beetle
Stigmaeopsis sp.	Bamboo spider mite
Xiphydria maculata	small wood wasps
Athysanus argentarius	leafhopper
Caliscelis bonelli	piglet bug
Cepaea nemoralis	Banded wood snail
Diaphnocoris chlorionis	Honeylocust plant bug
Glycaspis brimblecombei	Eucalyptus redgum lerp psyllid
Nebria brevicollis	European gazelle beetle
Philopedon plagiatum	weevil
Psylliodes affinis	Bittersweet flea beetle
Psyllopsis fraxinicola	psyllid
Simplocaria semistriata	moss beetle
Cephalonomia gallicola	bethylid wasp
Catocala amatrix	sweetheart underwing
Compsothrips jacksoni (Hood)	a vinegar fly
Drosophila hydei	spotted wing drosophila
Drosophila suzukii	scale
Eriopeltis lichtensteini	thrips
Limothrips angulicornis Jablonowski	tessellated shieldback
Platycleis tessellata	Azalea lace bug
Stephanitis pyriodes	

Badumna longinqua (Koch)	jumping louse
Trioza alacris	Broom lace bug
Dictyonota fuliginosa Costa	wool carder bee
Anthidium manicatum	bud mite
Aceria spartii	linden mite
Aculus ballei (Nalepa)	a thrips
Aeolothrips albicinctus	a jumping louse
Bactericera maculipennis	a ground beetle
Carabus granulatus	mimosa webworm
Homadaula anisocentra	green alder sawfly
Monosoma pulveratum	drumming katydid
Meconema thalassinum	ant
Myrmica speciodes	bullhorned dung beetle
Onthophagus taurus	ant
Ponera testacea	a moss mite
Humerobates rostrolamellatus	crane fly
Limonia distans	European elm flea weevil
Orchestes alni	bean root aphid
Smynthurodes betae	Southern purple mint moth
Pyrausta laticlavia	elm seed bug
Arocatus melanocephalus	Spotted snake millipede
Blaniulus guttulatus	a minute brown fungus beetle
Cartodere bifasciata	boxwood bud mite
Eriophyes canestrini	handsome fungus beetle
Holoparamecus caularum	Eriophyidae
Rhyncophytoptus new sp. 1	Eriophyidae
Rhyncophytoptus new sp. 2	rust mite
Schevtchenkella dentata	a Eurasian moth
Scythris limbella	dark strawberry tortrix
Syricoris lacunana	Maple leaftier or Maple button
Acleris forsskaleana	a moss beetle
Chaetophora spinosa	barred fruit-tree tortrix
Pandemis cerasana	pigeon tremex
Tremex columba	

Aleyrodes proletella	cabbage whitefly
Ferrisia gilli	Gill's mealybug
Hexacola neoscatellae Beardsley	a parasitoid wasp
Pasiphila rectangulata	green pug moth
Siphoninus phillyreae	ash whitefly
Succinea concordialis Gould	Amber snail
Diabrotica virgifera virgifera LeConte	Western corn rootworm
Aculops cannabicola (Farkos)	hemp russet mite
Amphimallon majale (Razoumowsky)	European chafer
Agrilus cuprescens	Rose stem girdler
Anoscopus serratulae (Fabricius)	leafhopper
Arion hortensis (Ferrusac)	garden slug
Ataenius abditus (Haldeman)	a small scarab
Balanococcus diminutus (Leonardi)	New Zealand Flax mealybug
Boettgerilla pallens (Simroth)	wormslug
Clitostethus arcuatus (Rossi)	ash whitefly ladybird beetle
Corythucha arcuata (Say)	oak lace bug
Diptacus mazuriensis Boczek	rust mite
Encarsia inaron (Walker)	ash whitefly parasitoid wasp
Labarrus pseudolividus (Balthasar)	an exotic dung beetle
Muirodelphax arvensis (Fitch)	Delphacid planthopper
Neoclytus caprea (Say)	banded ash borer
Neohydatothrips setosus Hood	thrips
Phenacoccus nr. gossypii	undescribed species
Phyllocoptes compressus Nalepa	rust mite
Phymatodes lividus (Rossi)	longhorned beetle
Trialeurodes abutiloneus (Haldeman)	banded-wing whitefly
Zygina flammigera (Geoffrey in Fourcroy)	leafhopper
Ceresa festina	three cornered alfalfa treehopper
Heliothrips haemorrhoidalis (Bouche)	greenhouse thrips
Brachypeplus basalis Erichson	Australian sap beetle
Callipterinella minutissima (Stroyan)	aphid
Lauria cylindracea (DaCosta)	moss snail
Geomyza tripunctata Fallen	Cereal fly

Neodiprion sertifer (Geoffroy)	European pine sawfly
Drepanothrips reuteri Uzel	vine or grape thrips
Trissolcus japonicus (Ashmead)	Brown marmorated stink bug parasitoid
Amynthas gracilis (Kinberg)	Asian jumping worm
Acanthocinus leechi (Dillon)	a longhorned beetle
Nematus lipovsky Smith	azalea sawfly
Epitrix pubescens (Koch)	a flea beetle
Peponapis pruinosa (Say)	squash bee
Aculus gleditsiae (Keifer)	rust mite
Phorodon cannabis Passerini	cannabis, hemp, or bhang aphid
Cyclorhipidion pelliculosum (Eichhoff)	ambrosia beetle
Anthidium oblongatum	oblong wood carder
Ribautiana tenerrima (Herrich-Schaffer)	bramble leafhopper
Hoplocampa chrysorrhoea (Klug)	sawfly
Macrosiphum hellebori Theobald and Walton	Hellebore aphid
Aceria caliberberis Keifer	gall mite
Hippodamia variegata (Goeze)	ladybird beetle
Latrodectus geometricus Koch	brown widow
Phylloxera quercus	oak phylloxera
Propsocus pulchripennis (Perkins)	bark louse
Aphomia sociella	bee moth
Trypodendron domesticum	ambrosia beetle
Agrilus cyanescens	metallic wood boring beetle
Cyclocephala borealis Arrow	northern masked chafer
Cyclocephala hirta pilosicollis Saylor	a masked chafer
Cyclocephala melanocephala (Fabricius)	a masked chafer
Mesocoelopus collaris (Mulsant & Rey)	a death watch beetle
Ctenarytaina eucalypti	blue gum psyllid
Physocyclus aff. tanneri	cellar spider
Astyleiopus variegatus	a longhorned beetle
Trichoferus campestris	velvet longhorned beetle
Ponera pennsylvanica	an ant
Onthophagus hecate	a dung beetle
Thelia bimaculata (Fabricius)	locust treehopper
Sternidius alpha	a longhorned beetle
Stragania apicalis (Osborne and Ball)	leafhopper
Hoplothrips semicaecus (Uzel)	thrips
Aleyrodes pruinosus Bemis	whitefly
Encarsia peltata (Cockerell)	parasitoid
Pseudoanthidium nanum (Mocsáry)	Megachilid bee
Pyrausta inornatalis (Fernald)	Southern pink moth
Eupteryx decemnotata	Ligurian leafhopper
Acalitus phloeocoptes	Plum bud gall mite
Esperia sulphurella (Fabricius)	Sulphur esperia moth
Trachymela sloanei	Australian Tortoise beetle

Intercepted or eradicated species in OR

Scientific name	Common name	When Found in Oregon	Origins
Popillia japonica	Japanese Beetle	2016	eastern U.S., Asia
Epiphyas postvittana	light brown apple moth	2010	CA, Australia
Thrips setosus	Japanese flower thrips	2016	Japan
Lycorma delicatula	spotted lanternfly	2020	Eastern US, Asia
Ceroplastes spp.	wax scale	2021	CA

- **If the industry doesn’t approach this as a united group, Oregon will suffer the same fate as California**
  - **Complete and widespread infestation**

Links

- Gill's mealybug survey protocol
- https://www.oregon.gov/oda/shared/Documents/Publications/IPPM/GillsMealybugSampling.pdf

- Gill's mealybug survey protocol in Spanish
- https://www.oregon.gov/oda/shared/Documents/Publications/IPPM/GillsMealybugSamplingSpanish.pdf

- Vine mealybug pest alert
- https://www.oregon.gov/oda/shared/Documents/Publications/IPPM/VineMealybugAlert.pdf

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Questions? Comments?

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