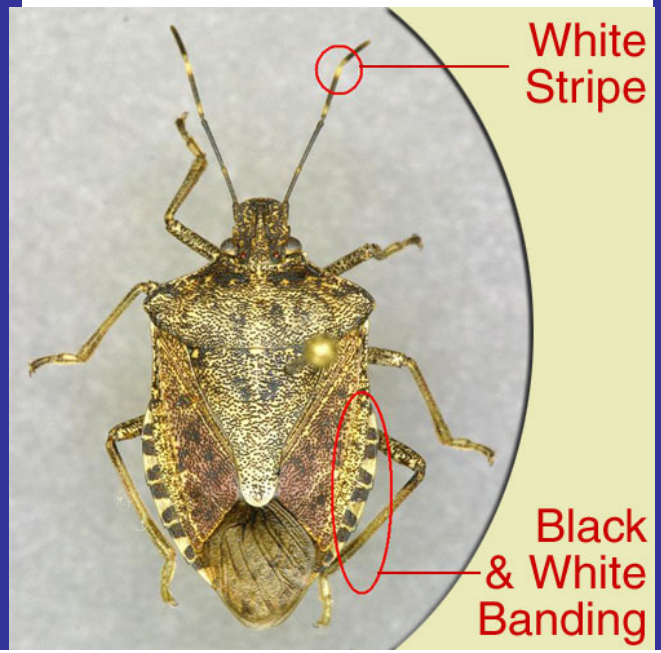
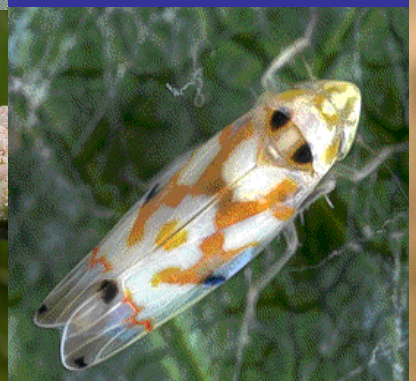
Pest Management: Successes & New Challenges

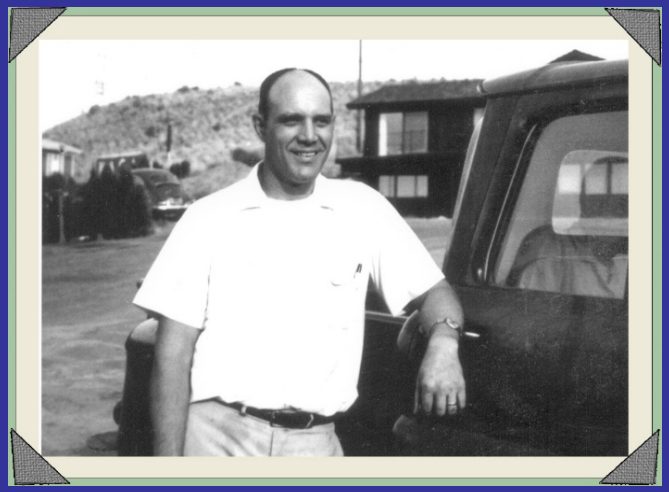
Doug Walsh
WSU Prosser

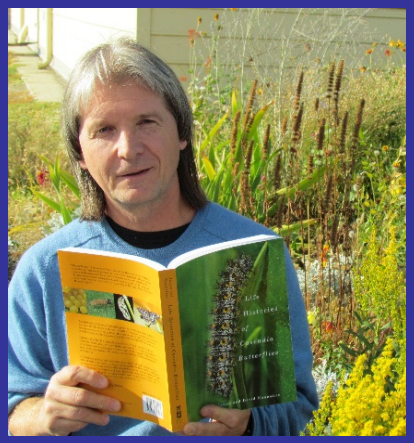




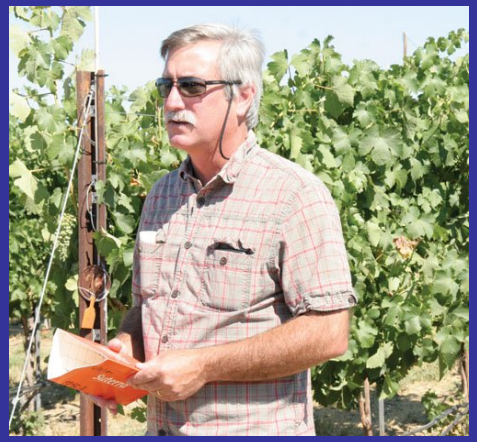
Entomology projects supported by the Wine Advisory Committee

Dr. Wyatt Cone pioneered vineyard entomology from the 1960s through the 1990's.





Since 1999



Dr. David James has focused on conservation biological control and habitat restoration. "Beauty with Benefits"

Dr. Doug Walsh has focused on Integrated Pest Management of pests of wine grapes.

The Integrated Pest Management Continuum

Chemically-intensive systems

Selective or spot treatments

Scouting and monitoring

JMS Stylet Oil

Reduced-risk pesticides

Viticultural controls

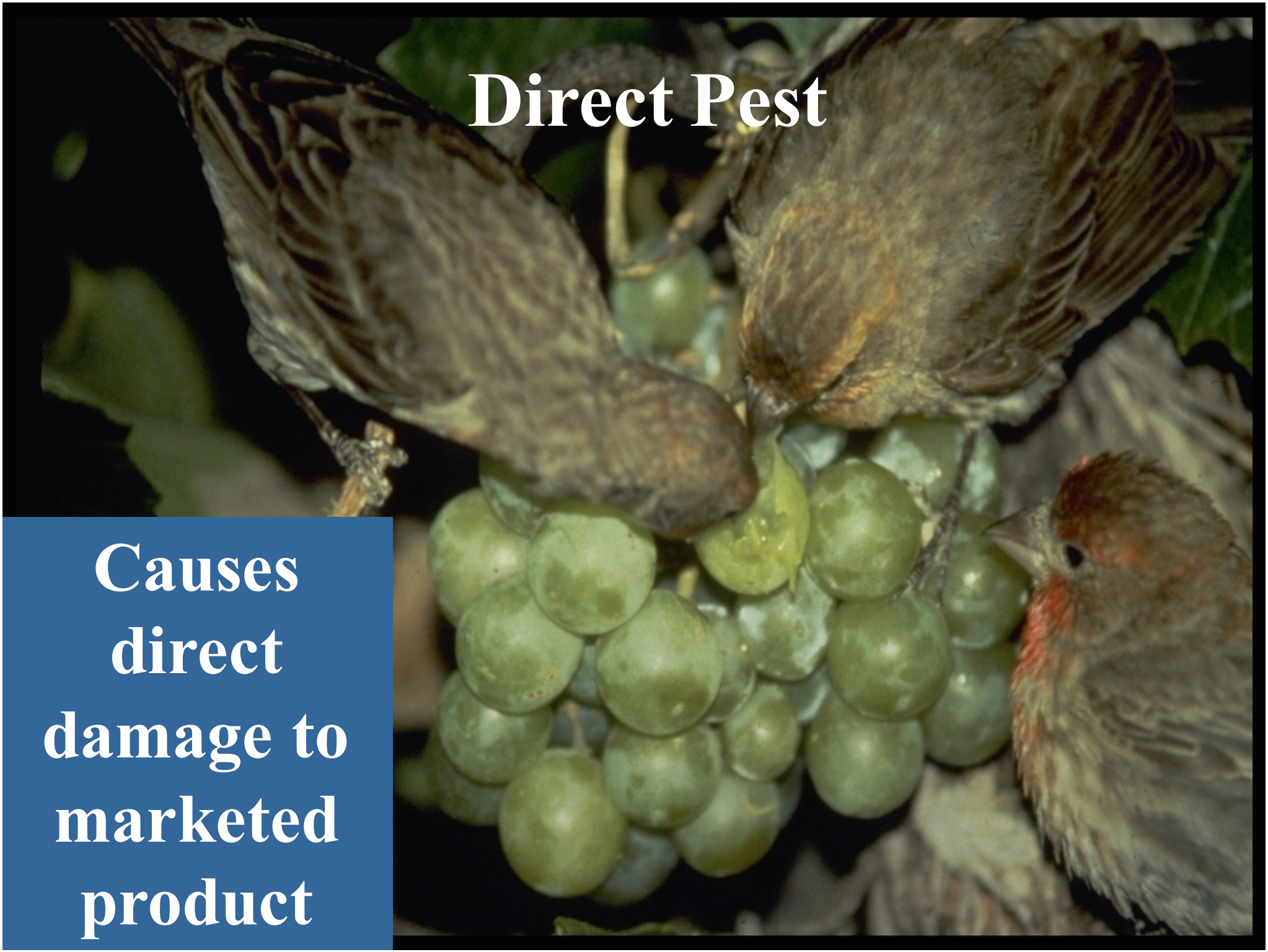
Biologically- intensive systems

Key Pests

Typically have a low economic threshold

Secondary Pests

Often the result of biological disruption


Direct Pest
Causes direct damage to marketed product

Indirect pests
Reduce plant fitness
UC Statewide IPM Project
© Regents, University of California

Several species of cutworms are direct key pest of grapes
Statewide IPM Project
© Regents, University of California

The grape leafhopper is a indirect key pest of wine grapes
UC Statewide IPM Project
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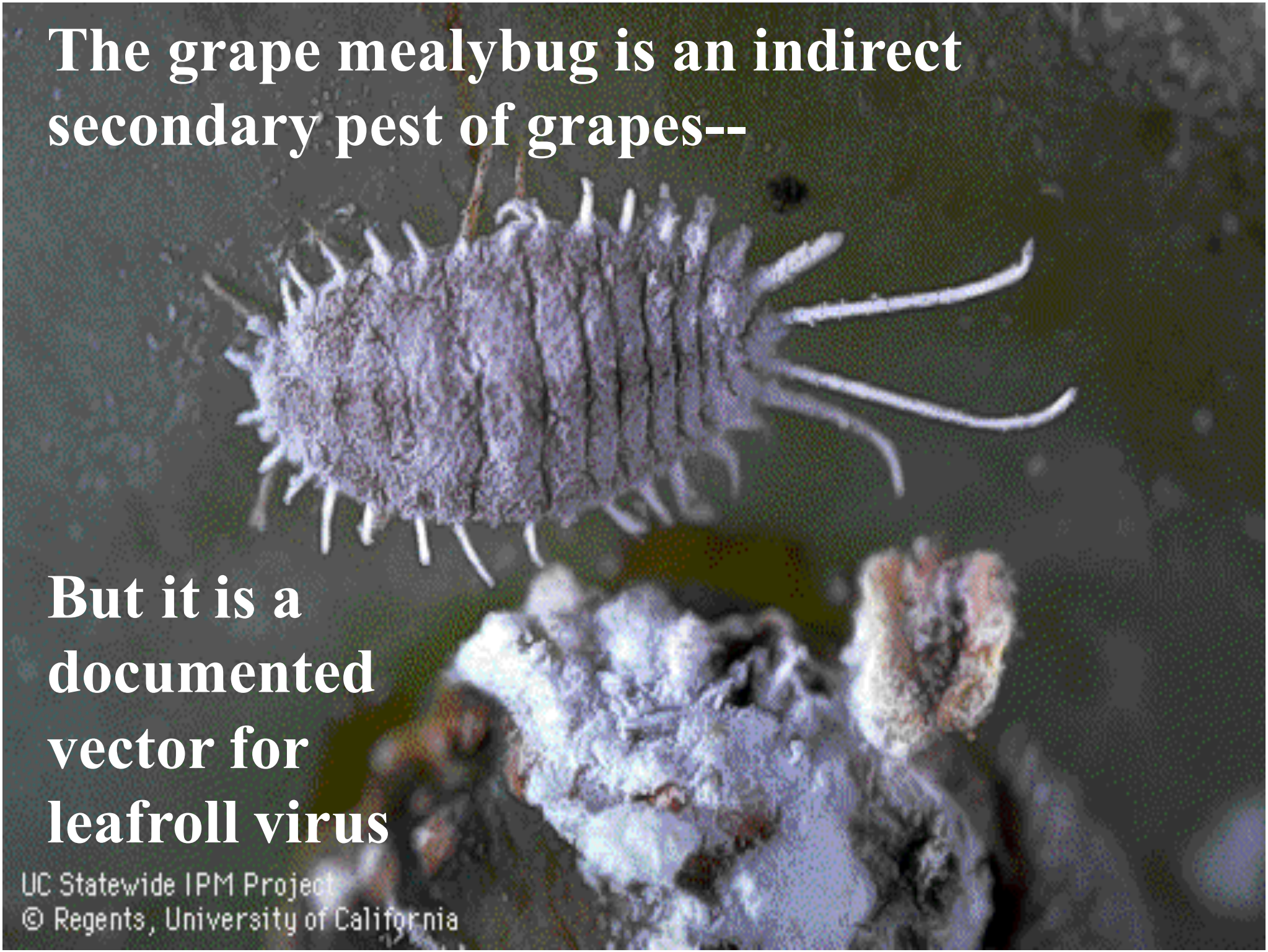
The grape mealybug is an indirect secondary pest of grapes--
But it is a documented vector for leafroll virus
UC Statewide IPM Project
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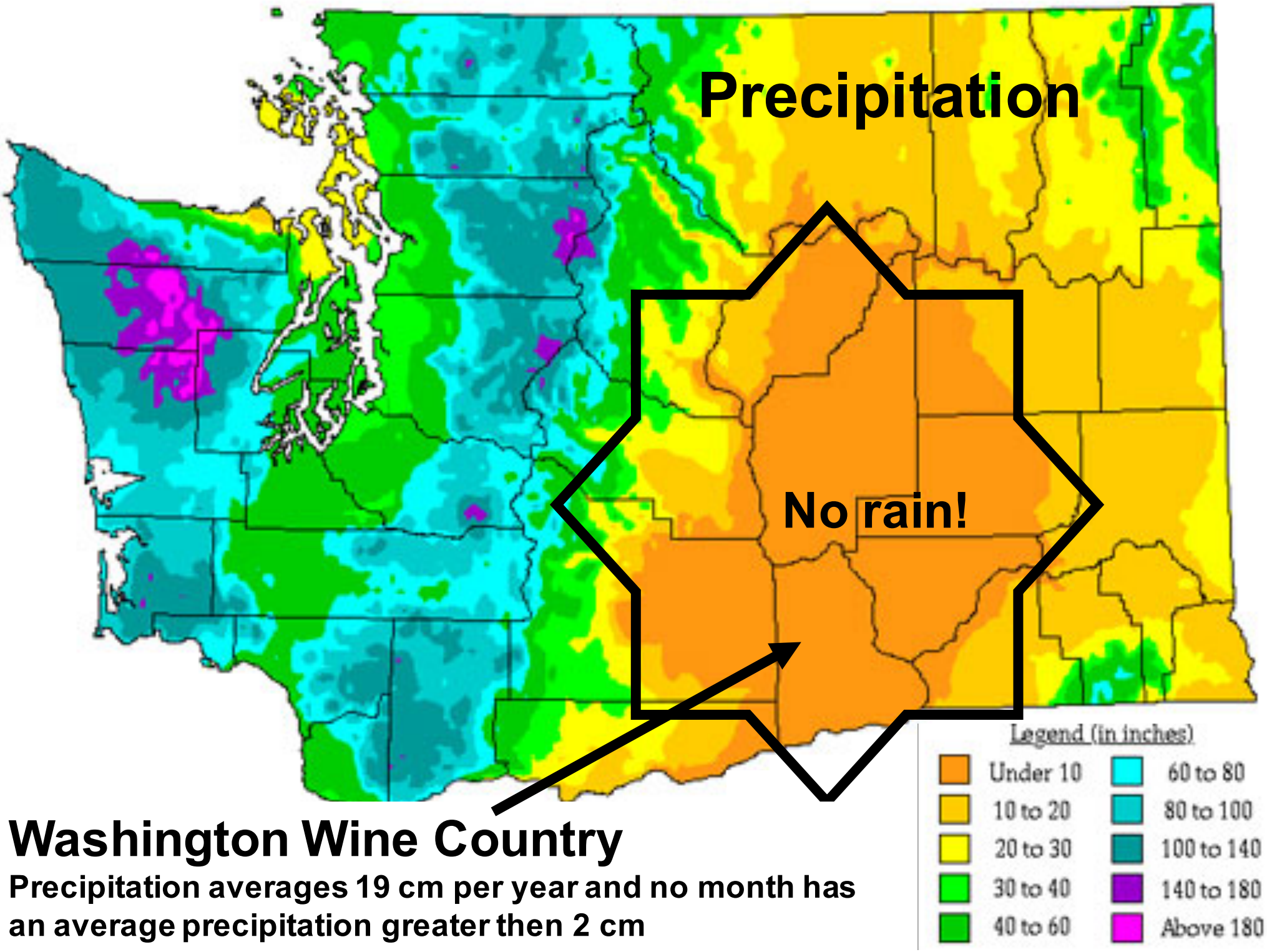
No Rain, Cold Winter

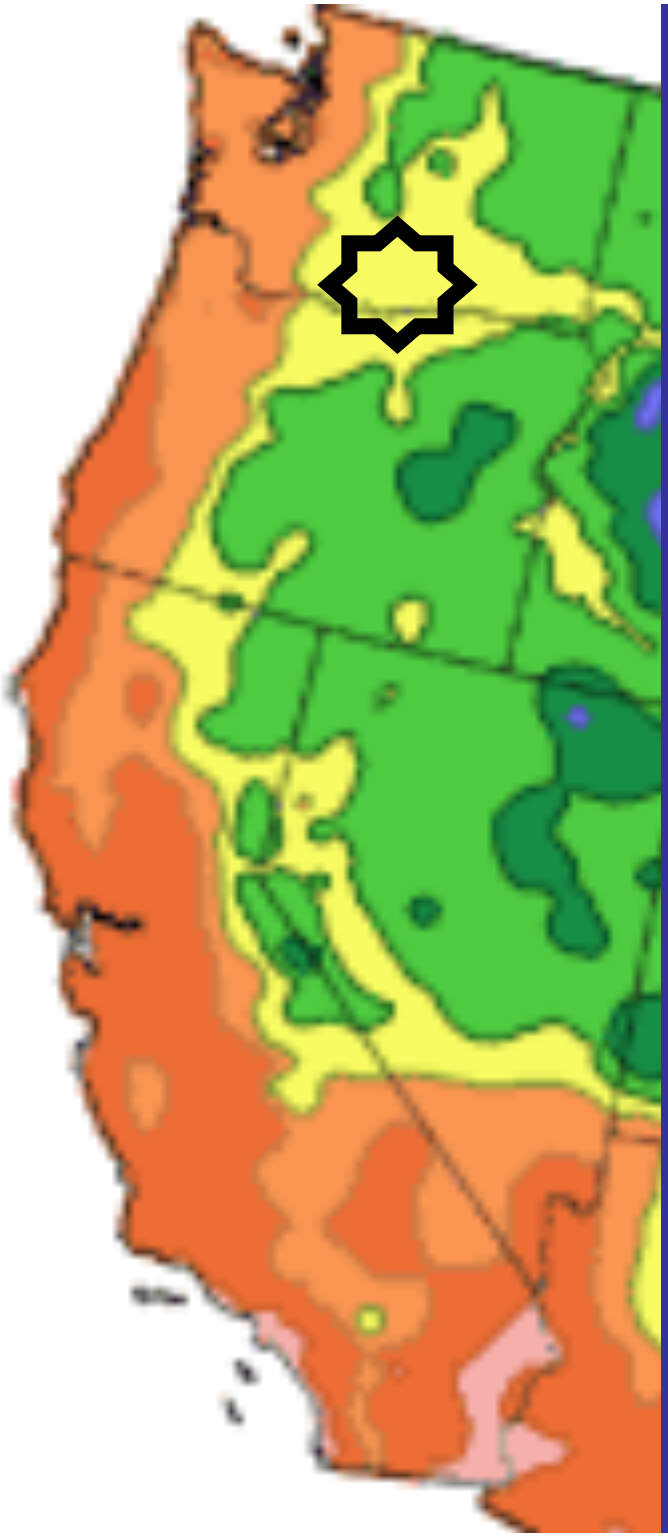
THE TERROIR OF SUCCESSFUL IPM IN WASHINGTON VINEYARDS

Our climate is conducive for successful IPM



Washington Wine Country

Precipitation averages 19 cm per year and no month has an average precipitation greater then 2 cm



Cold Winter

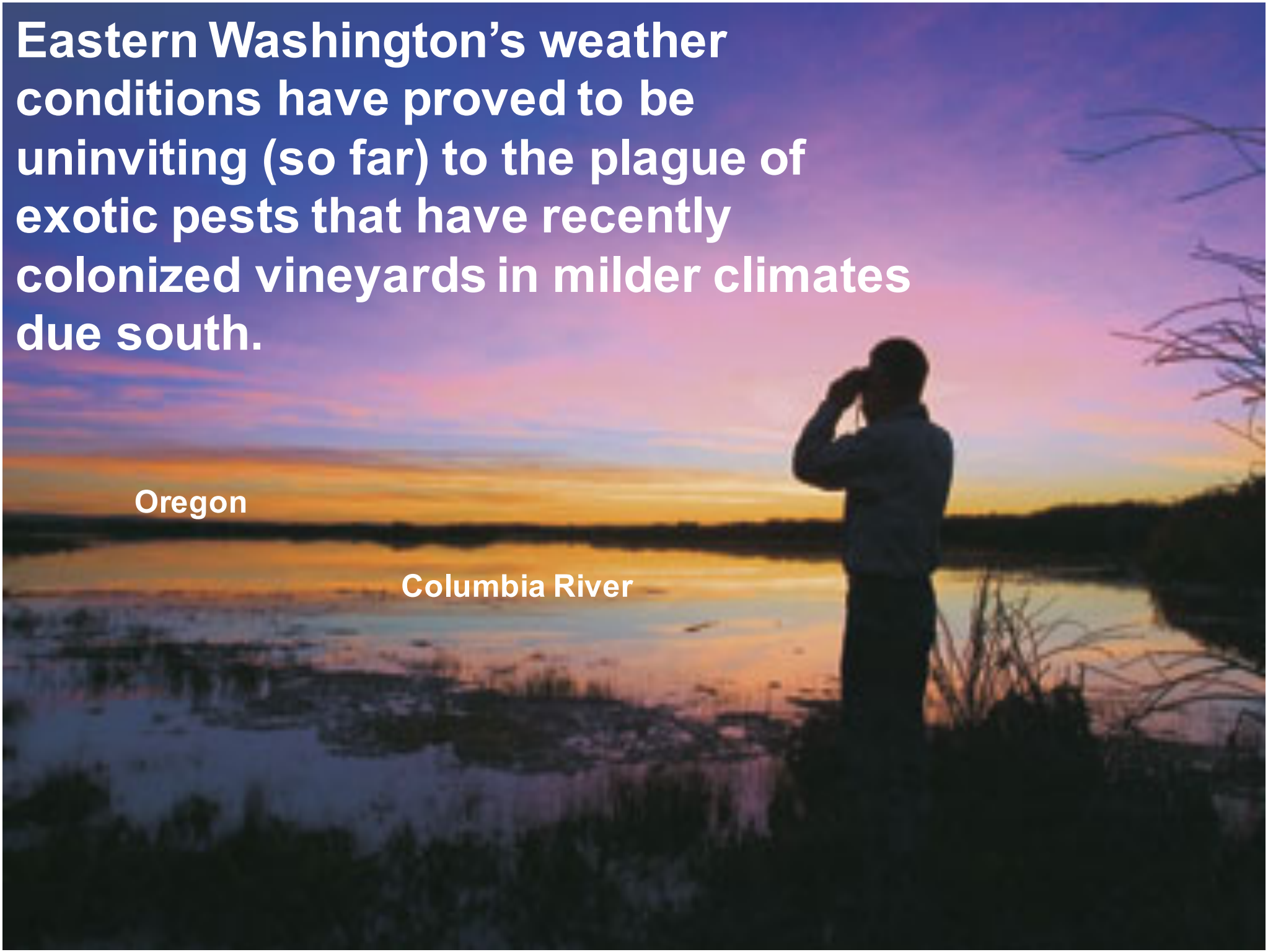
Average winter low temperature

-12.2º to -17.8º C

-1.1º to -6.7º C

In Prosser, WA December, January, and February average low temperatures are -3º, -4º, and -2º C, respectively.

Over 90% of the wine grapes are deficit drip irrigated during the growing season.


Eastern Washington's weather conditions have proved to be uninviting (so far) to the plague of exotic pests that have recently colonized vineyards in milder climates due south.
Oregon
Columbia River

Cutworms Climb No More
A Success Story

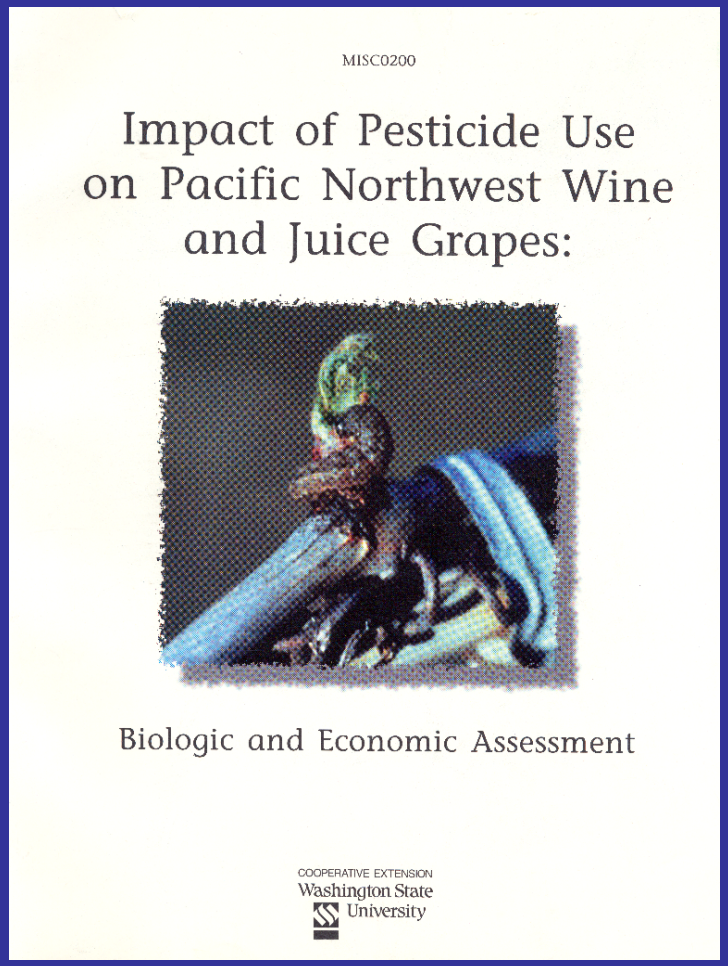
When David James and I started with WSU in the late 1990s the standard practice in vineyards was to apply a “delayed dormant” application of chlorpyrifos (Lorsban 4E). This spray targeted cutworms and mealybugs. The net result was that this spray was biologically disruptive and put growers on “the pesticide treadmill” right at the beginning of the season.

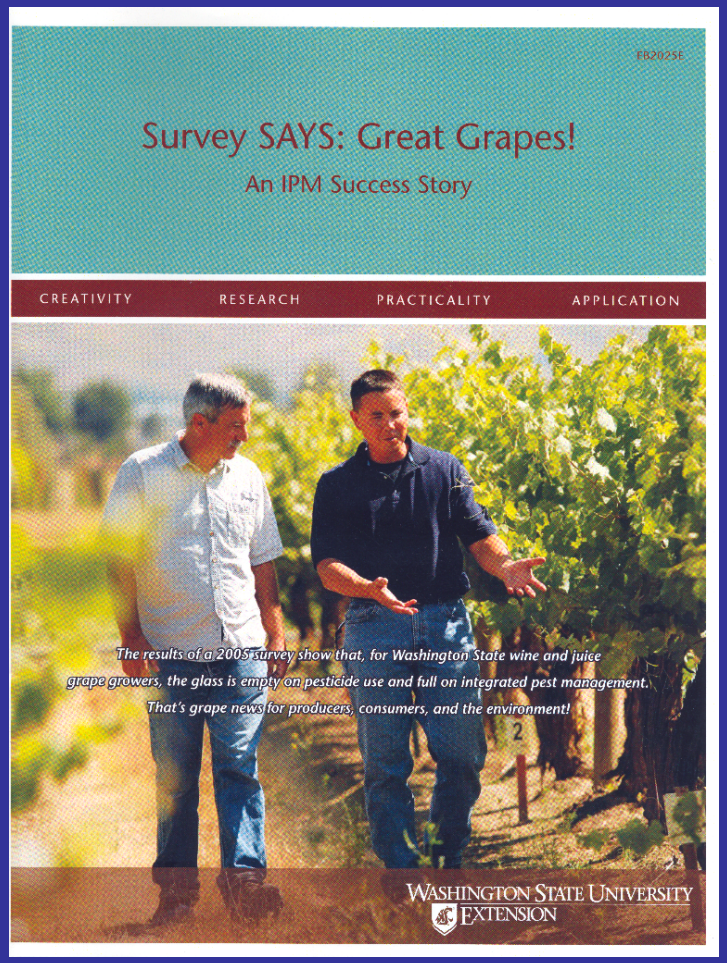
At budswell in early spring cutworms emerge and feed on primary buds.

The WAC supported our research that developed a targeted barrier spray program.

This has become the industry standard for cutworm control.

As a result of grower adoption of the cutworm barrier spray program we documented that Insecticide/ miticide use dropped by 84% between 1995 and 2005





The Grape Leafhopper
Erythroneura elegantula

Virginia Creeper leafhopper

Erythroneura ziczac

Insecticides- Leafhoppers

- **Broadcast sprays**
- **SPIROTETRAMAT Movento™**

- **ACETAMIPRID Assail™**
- **DINOTEFURAN Venom™**
- **THIAMETHOXAM Actara™**
- **CLOTHIANIDIN Clutch™**
- **IMIDACLOPRID Pravado™**
- **All 5 are effective neonicotinyl sprays**

- **BUPROFEZIN Applaud™**
- **Time against early nymphs**

- **BIFENTHRIN Capture**
- **FENPROPATHRIN Danitol™**
- **CYFLUTHRIN Baythroid™**
- **CYPERMETHRIN Mustang™**
- **Pyrethroids- Don't use 'em!**

- **Chemigation**
- **Water solubility make a huge difference in product performance**

- **DINOTEFURAN- Venom™ (very water soluble)**
- **THIAMETHOXAM- Platinum™ Intermediate solubility**
- **IMIDACLOPRID- Admire™ among many generics Not especially water soluble**

- **Consideration has to be made for soil moisture content and how much irrigation water you want to apply**

Scales

European Fruit Lecanium Scale

Cottony maple scale

Cottony Maple Scale

- **Control.** A dormant or delayed dormant application of a superior-type oil is the most effective treatment for scale.
- Scales are likely susceptible to most of the insecticides that are effective on mealybugs? Maybe require higher doses?

The only mealybug we have detected in WA Vineyards is grape mealybug.

Grape Mealybug

We have effective pheromones for monitoring mealybug populations.

1 trap per 30 to 40 acres.

CHEMIGATION

About as convenient a way to deliver a pesticide as possible.

DINOTEFURAN- Venom™
(very water soluble)

THIAMETHOXAM- Platinum™
Intermediate solubility

IMIDACLOPRID- Admire™
among many generics
Not especially water soluble

Thiamethoxam and dinotefuron have provided superior control compared to imidacloprid under deficient irrigation conditions

Broadcast mealybug sprays

SPIROTETRAMAT Movento™

ACETAMIPRID Assail™
DINOTEFURAN Venom™
THIAMETHOXAM Actara™
CLOTHIANIDIN Clutch™
All 4 are effective neonicotinyl sprays

IMIDACLOPRID Pravado™
Has never worked very well in my trials

BUPROFEZIN Applaud™
Time against early instar crawlers

CHLORPYRIFOS Lorsban™
Oragonophosphate

AZADIRACHTIN
PETROLEUM SPRAY OIL
Questionable efficacy as stand alone products but will boost effectiveness of products named above

Grape Flea Beetle

- Any of the neonics; imidacloprid, thiamethoxam, etc.
- Spinetoram (Delegate™)
- Chlorantraniprole (Altacor™)

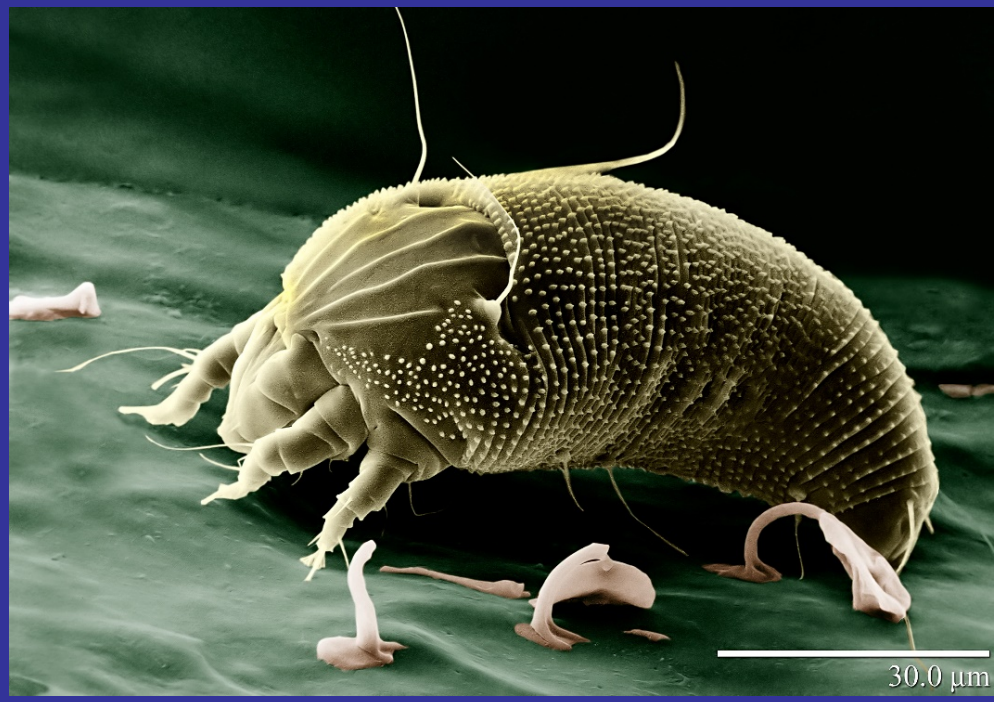
Spider mites- Willamette, McDaniel, & Two-spot

- Bifenazate (Acramite™)
- Agri-Mek (Abamectin)
- Spiromesafin (Envidor)

- Etoxazole (Zeal™)
- Hexythiozox (Onanger™)

Rust and bud mites

- Properly timed sulfur applications.
- Check PNW & Washington spray guides for monitoring, rates and timings.



New Challenges-

Emerging pests from that are now on the horizon

Red Blotch Disease

A "*new*" circular DNA virus – later named GRBaV has been identified by virologists at UC Davis and Cornell University. Similar viruses are vectored by leafhopper.

A vector has been identified in California.

Grapevine red blotch associated virus (GRBaV) has been confirmed in both red and white wine grape varieties.

In wine grapes red blotch causes dramatic drop in the Brix (sugar content) of ripened fruit.

Threecornered Alfalfa Hopper *Spissistilus festinus* is a Proven Vector for *Grapevine Red Blotch-associated Virus* (GRBaV)

- Dr. Brian Bahder (WSU PhD in Entomology, 2013) at UC Davis has proved that the three-cornered alfalfa treehopper is a vector for GRBaV.
- Al Rwahnih et al (2014). "It is now certain that both table and wine grapes are susceptible to GRBaV infection."

Nymphs are lime green with obvious spines along the back

Adult male threecornered alfalfa hopper.

Adult female threecornered alfalfa hopper.

Threecornered alfalfa treehopper?

- I am also the alfalfa (mostly seed) entomologist for the PNW and I have never seen one in Washington State.
- Native to Southern US. They are in California and are found in the Rogue river Valley of Oregon.
- Rich Zack (WSU Insect Museum Curator) has confirmed that there are no state records in WA for the threecornered alfalfa treehopper.

It's bad

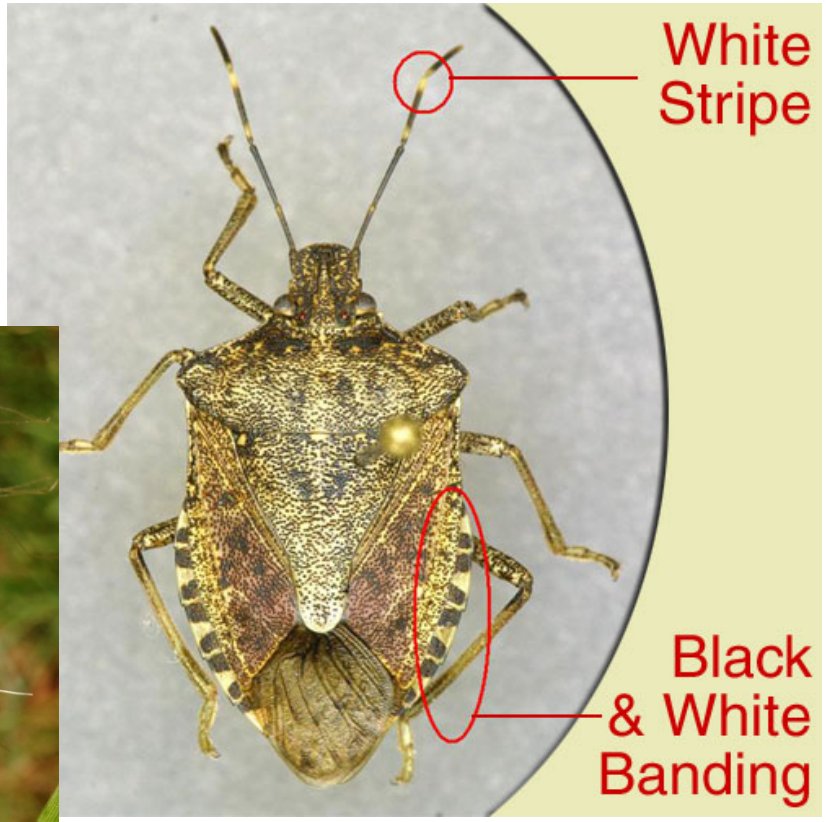
- A virus free research vineyard was planted at a UC Research site in Napa.
- Virus expression in vines was observed in year 3.
- Thirty percent of the vineyard tested positive in year 4.
- The vineyard was not salvageable by year 5.
- As the name implies grapes are not the preferred host for the threecornered alfalfa tree hopper. Legumes and forbs are.
- Threecornered alfalfa treehoppers are ubiquitous in California.
- Wild grapes *Vitus califonica* have tested positive in the Napa Valley.

Vine Mealybug

- Established as dominant mealybug species in California in vineyards south of Sacramento.
- Effective vector of GVLRD.
- Could have 4 to 5 generations per year in WA.
- Root feeding morphs make eradication/ control difficult.
- Quarantine efforts are critical!

Brown Marmorated Stink Bug

- Established in Portland, OR
- Multiple detections in the Columbia Gorge, Bend, OR and now Yakima, Benton, & Walla Walla Counties.
- Piercing sucking mouth parts that release digestive enzymes.
- Aggregate in structures
- Impervious to insecticides



Potential host plants

There are over 70 suspected host plants, including:

Agricultural Crops

Apple, Asian Pear

Apricot, Cherry, Peach

Asparagus

Citrus

Corn

Cucurbits

Filbert

Fig

Grape

Persimmon

Raspberry

Snap/Green Beans

Soybean

Peppers, Tomatoes

Ornamentals

Acer sp. (Maple)

Crab Apple

Holly

Juneberry

Mulberry

Pyracantha

Rose

Butterfly Bush

Honeysuckle

Damage to grapes?

Infestations in buildings?

Feeding creates pitted and discolored surfaces on fruits and vegetables,
G Hamilton

Aggregation Behavior

Homeowners in Pennsylvania

BMSB egg parasitoid

- *Trissolcus halyomorphae* is a parasitoid wasp found in the native regions of BMSB (China, Korea, and Japan).
- It deposits eggs into the eggs of BMSB, where its larvae develop and kill the BMSB egg.
- A single adult wasp then emerges.
- This parasitoid has been discovered in Vancouver, WA.
- Movement and release is now “legal” in Washington State.