



# Grape Insects and Management

- Primary Insect Pests
- Primary Fruit Pests
- Secondary Insect Pests



# Grape Insects and Management

- Primary Foliar Pests

- Grape Flea Beetle
- Cutworm spp.
- Rose chafer
- Leafhopper spp.
- Japanese beetle
- Grape berry moth

- Primary Fruit Pests

- Grape berry moth
- Multicolored Asian Lady beetle
- Yellow jackets

- Sporadic Pests

- Phylloxera
- Gallmakers
- Mites

# Grape Flea Beetle

- Emerge in Spring
  - Adults feed on swelling buds
- Lay eggs on emerging leaves
- Hatching larvae feed on leaves
- Monitor on warm spring days
  - Can cause significant damage



# Grape Flea Beetle

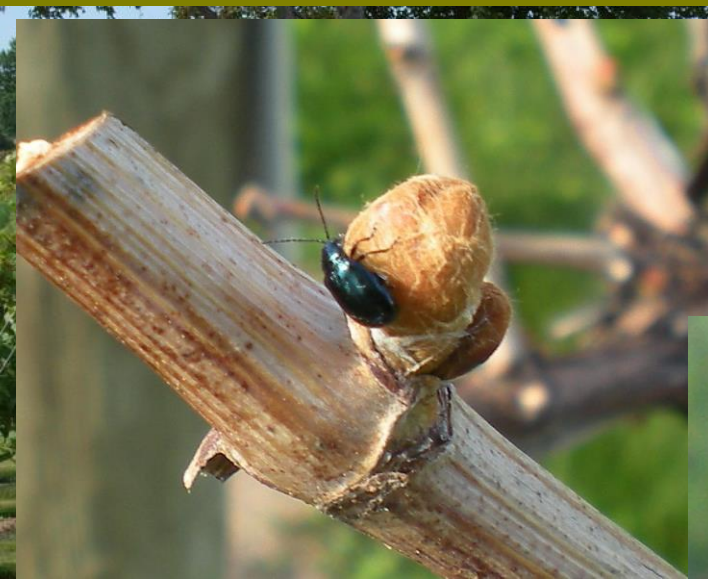
Adult Damage



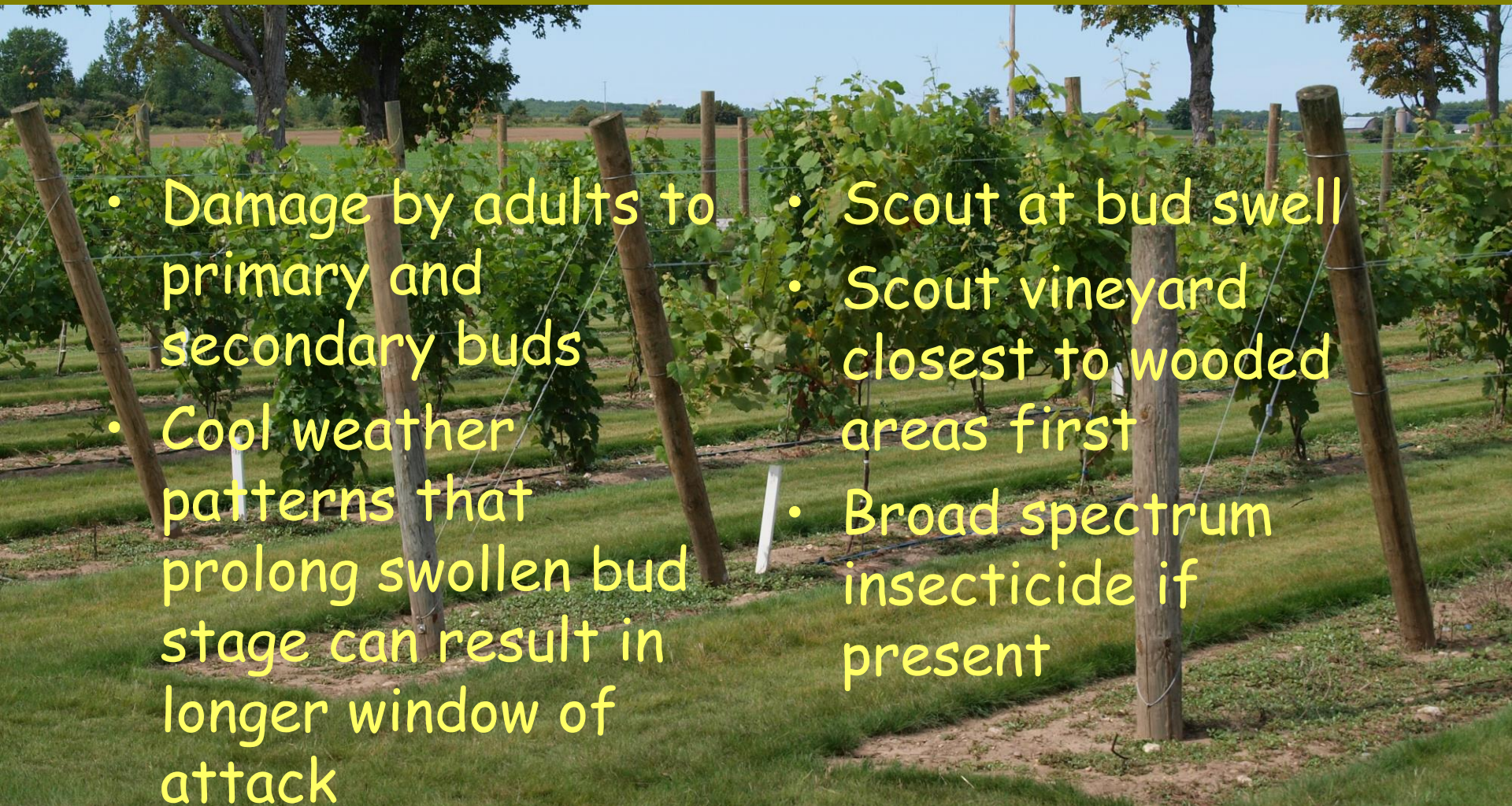
Larva Damage



# Grape Flea Beetle



# Grape Flea Beetle

- 
- Damage by adults to primary and secondary buds
  - Cool weather patterns that prolong swollen bud stage can result in longer window of attack
  - Scout at bud swell
  - Scout vineyard closest to wooded areas first
  - Broad spectrum insecticide if present

# Cutworm spp.

- Emerge in spring
  - Larvae feed on swollen buds
- Present throughout growing season
- Injury similar to grape flea beetle



Spotted cutworm larva

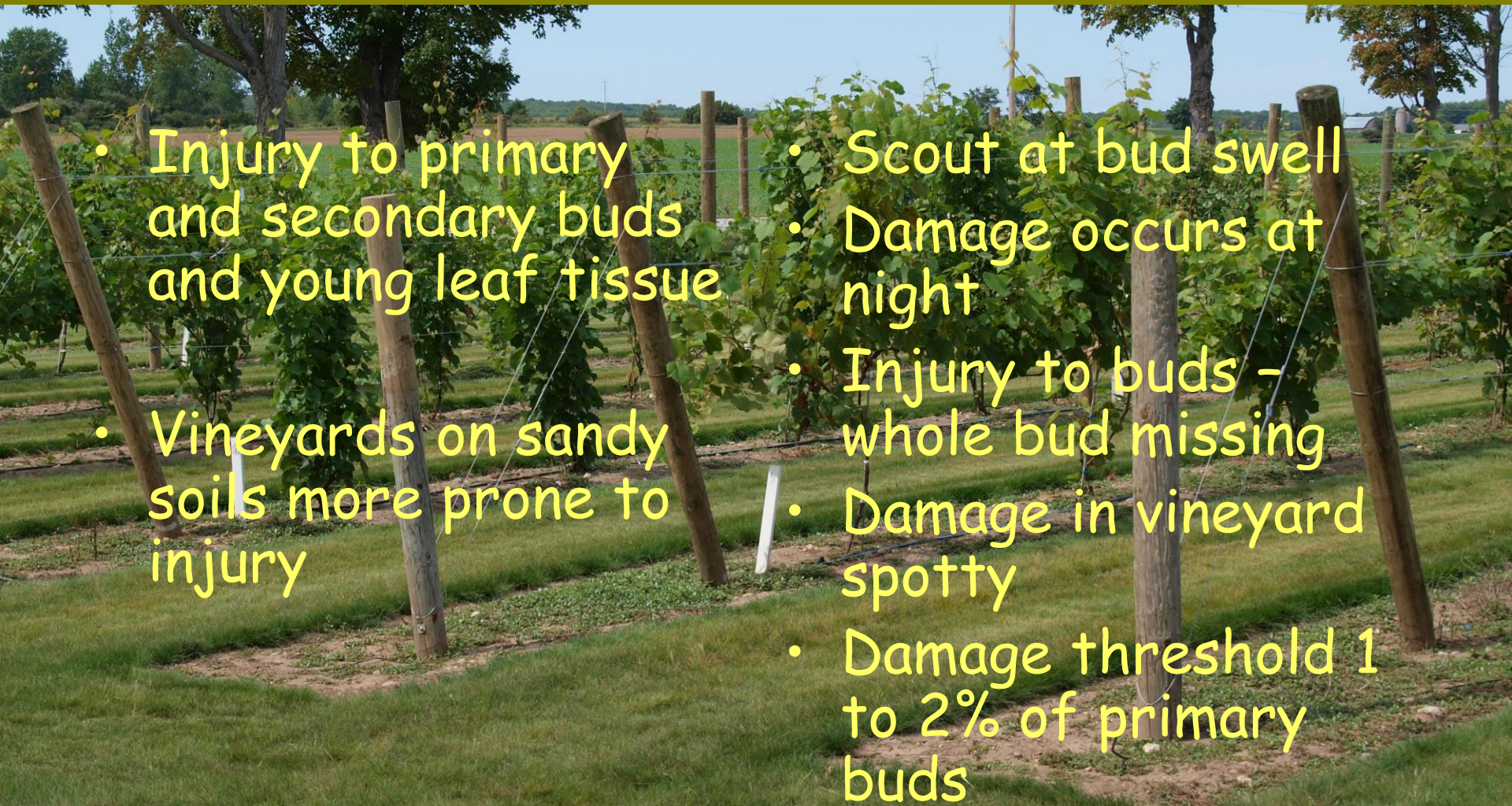


# Cutworm spp.





# Cutworm spp.

- 
- Injury to primary and secondary buds and young leaf tissue
  - Vineyards on sandy soils more prone to injury
  - Scout at bud swell
  - Damage occurs at night
  - Injury to buds - whole bud missing
  - Damage in vineyard spotty
  - Damage threshold 1 to 2% of primary buds

# Rose Chafer

- Larvae overwinter in soil
- Adults emerge at bloom
- Adults feed on blossoms developing, fruit, and leaves
- Common pest in light sandy soils



# Rose Chafer





# Rose Chafer

- 
- Damage to young non-bearing vines can set back vines
  - Vineyards on sandy soils more prone to damage
  - Scout late May through flowering
  - Threshold 2 per vine
  - Monitoring 125 vines
    - 25 @ each corner
    - 25 in center
  - Rose Chafer traps may be alternative to insecticide

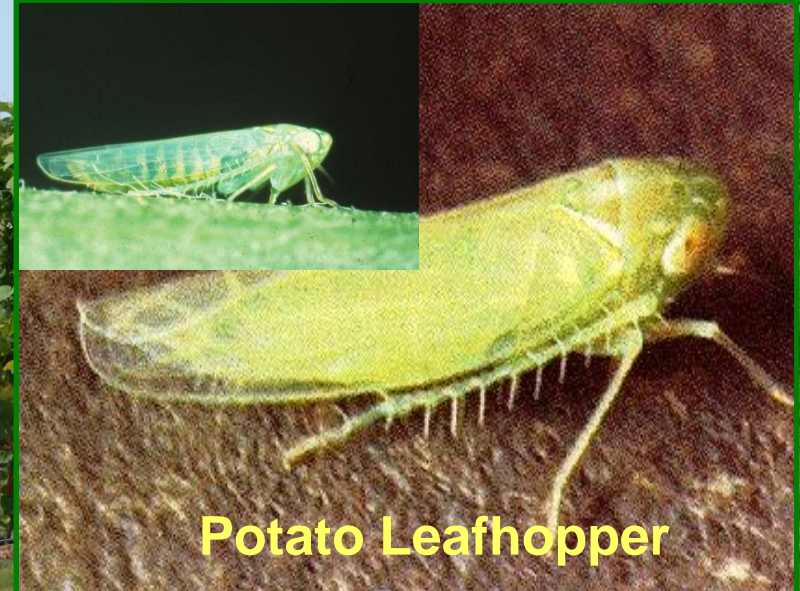
# Leafhoppers



**Grape Leafhopper**

Overwinters near vineyards and moves to grapes in late May-June.

Affects labrusca vineyards more



**Potato Leafhopper**

Comes with the wind in spring, washed onto crops by rain showers. Probably dies in winter.

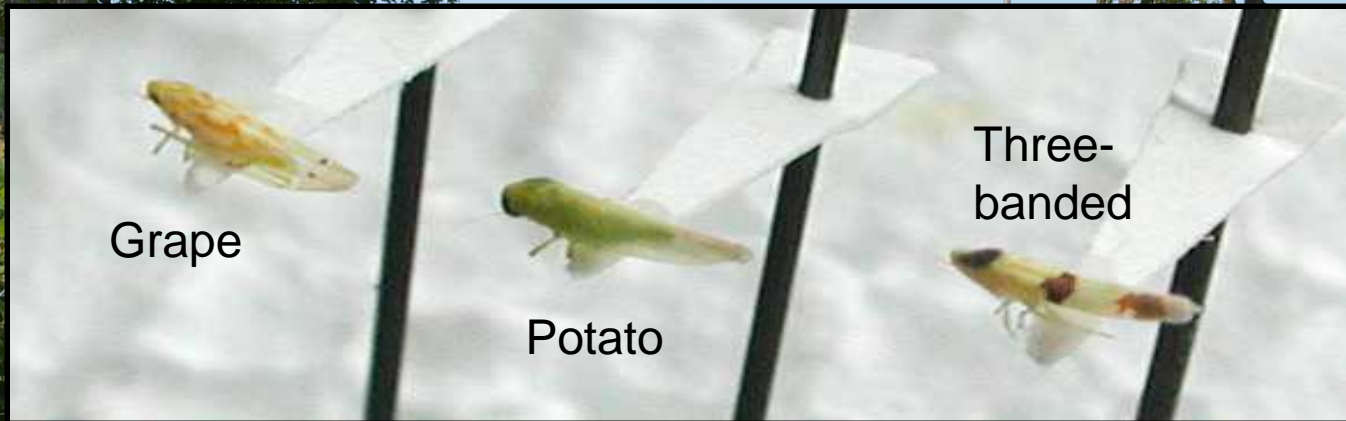
Affects vinifera and hybrids more

# Leafhoppers

- Grape and Potato LH
- Feeding speckles leaves
- Examine leaf undersides
- High populations
  - Can Stunt Vines
  - Fruit Quality Affected



# Leafhoppers

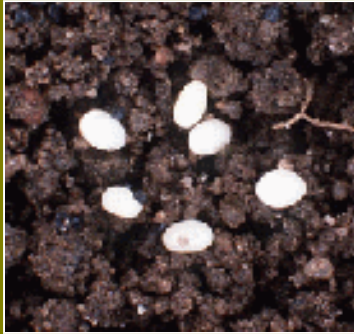




# Leafhoppers

- 
- GLH overwinters in non-cultivated areas
  - GLH prefers sheltered area with plant debris
  - GLH will feed on alternative hosts Virginia creeper, burdock, sugar maple
  - Yellow sticky cards to monitor LH
  - LH populations fluctuate May through July - migration into vineyard
  - 15 LH per leaf without injury (Cornell)
  - Honeydew can result in sooty mold on grape clusters

# Japanese Beetle



## EGGS

1-2 mm eggs laid in grassy areas  
Eggs laid in batches of ~5  
Require moisture to hatch



## LARVAE

White and C-shaped  
Develop in moist soil  
Feed on roots, organic matter  
Overwintering stage



## PUPAE

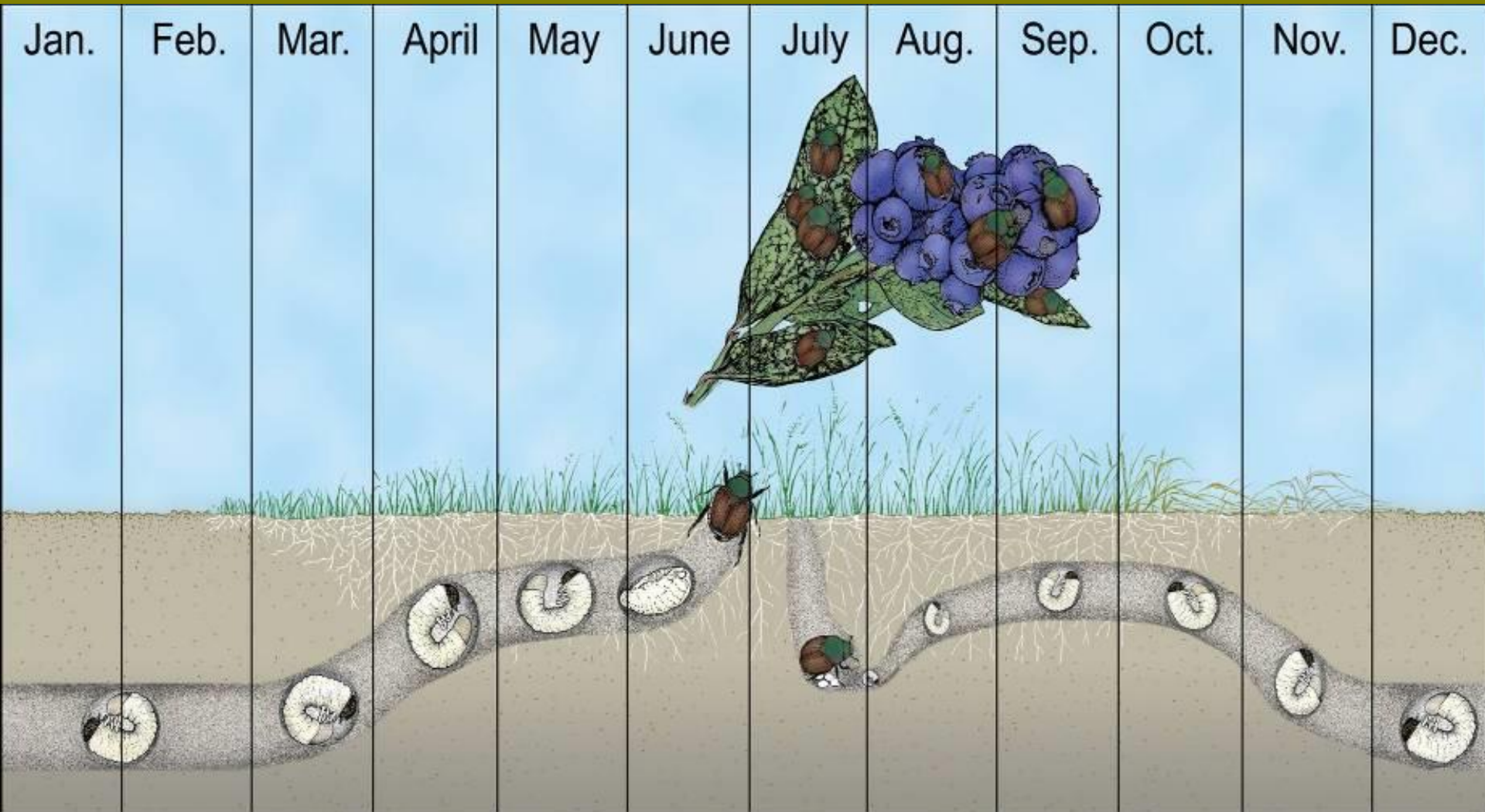
Develop in soil in late spring



## ADULTS

Adult beetles emerge in mid-summer  
Highly mobile  
Females lay ~50 eggs

# Japanese Beetle Lifecycle<sup>1</sup>

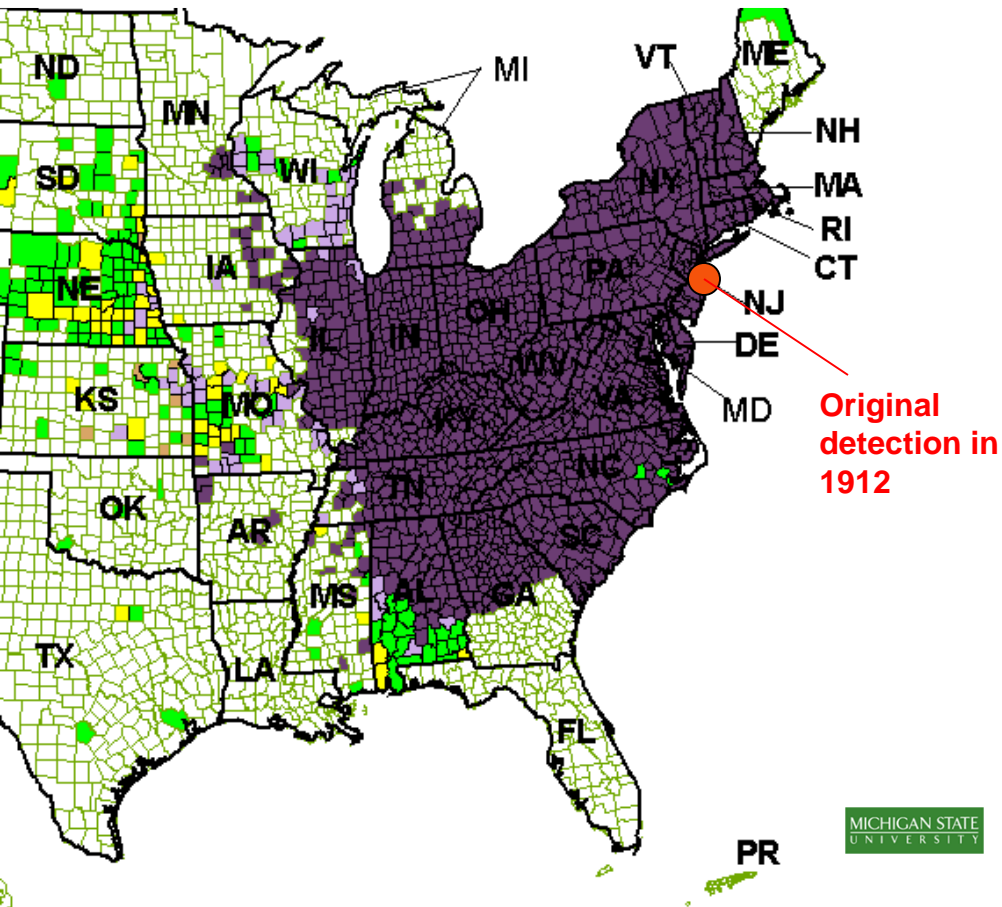


<sup>1</sup>In Michigan

# Japanese Beetle

## Official distribution in the United States

USDA Report, 2008



# Japanese Beetle

Larval density maps from blueberry

80 soil samples per field and per perimeter

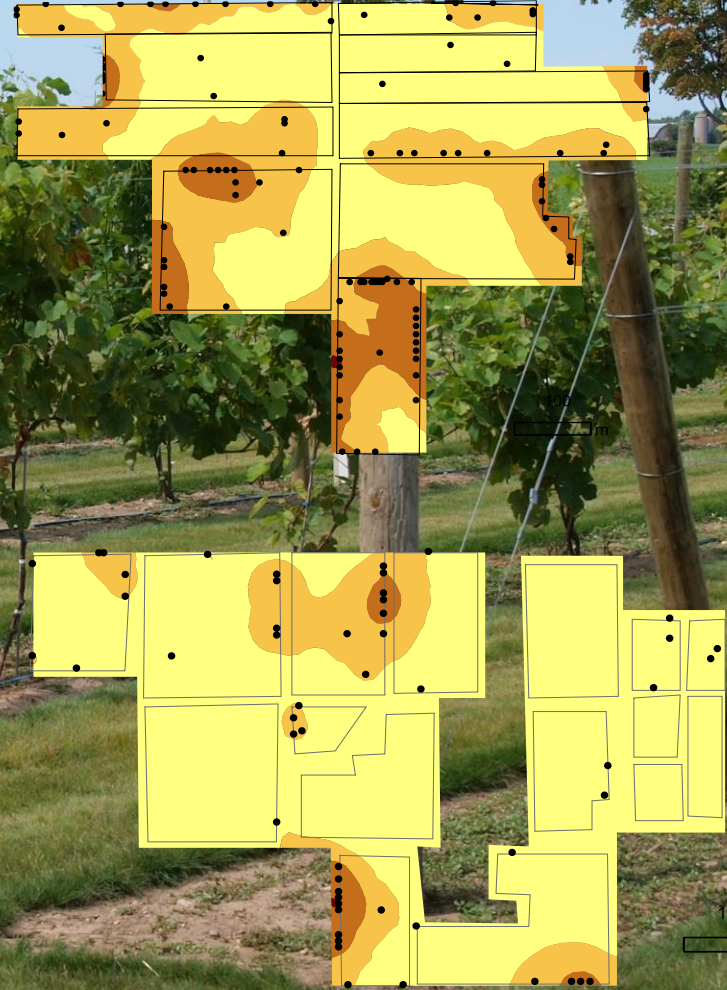
Dot = 1 or more beetles

Darker brown = more beetles

Similar for vineyards

More abundant in grass around fields

Neighboring land can harbor populations



# Japanese Beetle

- **Preferred plants**

- Grape, linden, Japanese / Norway maple, birch, pin oak, horse chestnut, Rose-of-Sharon, ornament. apple, plum, cherry, rose, mountain ash, willow, elm, Virginia creeper

- **Rarely attacked plants**

- Red / silver maple, tuliptree, magnolias, red mulberry, forsythia, ash, privet, lilac, spruce, hydrangea, taxus (yew)

- **Remove attractive non-crop host plants to reduce beetle attraction to vineyards**



# Japanese Beetle



## SCOUTING

- Beetles and their damage are easy to see
- Look on upper canopy

## MONITORING TRAPS

- Baited with floral lure (for female) and sex pheromone (for male)
- Highly efficient at attracting beetles, and may be effective in reducing isolated populations
- But, these will attract beetles to your vines, so do not place in vineyards.

# Japanese Beetle

How much leaf injury can vines tolerate?

*Tolerance = Ability to withstand a certain level of injury without a reduction in fruit quality and vine productivity*

## Virginia study

In mature Seyval vines, natural levels of Japanese beetle feeding (6.5% leaf area loss) had no effect on vine growth or fruit quality.

Intensive feeding after veraison inside cages (11% leaf area loss) reduced fruit quality (Boucher & Pfeiffer, 1988)

## Michigan study

In young Niagara vines without crop, 30% leaf area loss affected vines only when they were damaged at bloom and veraison (Mercader & Isaacs, 2004)



# Japanese Beetle

Table 1. Foliage feeding incidence and severity\* of Japanese beetles to grapes in cages.

Cultivar	Vitis <sup>†</sup> group	Incidence (% leaves damaged)	Leaf area loss <sup>‡</sup> (1-10)
Mars	AL	42 d <sup>¶</sup>	0.5
Marquis	HL	61 cd	1.1
Reliance	AL	64 bcd	1.1
Catawba (At <sup>§</sup> )	AL	64 bcd	1.1
Concord Seedless	AL	64 bcd	1.2
Concord	AL	66 bcd	1.2
Edehweiss	A	66 bcd	1.6
3309 Conadere	A	67 bcd	1.7
Einset	HL	69 bcd	1.6
Cabernet Sauvignon (Pr)	E	72 bc	1.6
Cabernet Franc	E	72 bc	1.8
Vanessa	A	74 bc	1.7
Jupiter	H	74 bc	2.0
Rougeon	AM	75 abc	1.7
St. Croix	H	77 abc	1.5
St. Vincent	H	78 abc	2.5
Vignoles	H	79 abc	1.5
Lemberger	E	79 abc	2.0
Chambourcin	H	80 abc	2.3
Glenora	HL	81 abc	2.6
DeChaunac	H	84 abc	1.9
Marshall Foch	H	84 abc	2.0
Himrod	AL	84 abc	2.7
Charlone	H	84 abc	3.0
Delaware (Pr)	H	85 abc	2.3
Cayuga White	H	87 abc	2.4
Chardonnay (Pr)	E	87 abc	2.9
Chancellor	H	87 abc	2.9
Frantenac	H	87 abc	2.5
Lacrosse	H	89 abc	2.9
Seyval	H	91 ab	2.5
Vidal Blanc	H	94 a	3.4

\*Incidence data are reported as percent leaves damaged; however, mean separation was performed on data that was subjected to arcsine square root transformation. Severity of leaf damage was rated as 0 pt, 0%; 1 pt, 1% to 10%; 2 pt, 11% to 20%; 3 pt, 21% to 30%; 4 pt, 31% to 40%; 5 pt, 41% to 50%; 6 pt, 51% to 60%; and 7 pt, more than 60% of estimated leaf area loss (Boucher and Pfeiffer, 1989).

<sup>†</sup>A, American cultivar; AL, American cultivar with *Vitis labrusca* background; AM, American cultivar with Muscadine background; E, European cultivar; H, French hybrid cultivar; HL, French hybrid with *V. labrusca* background.

<sup>‡</sup>Denotation of 1 to 10 refers to the leaf number on a shoot, with 1 being the youngest and 10 being the oldest.

<sup>¶</sup>Any two means of incidence not followed by a same letter are significantly different at  $P \leq 0.05$ .

<sup>§</sup>Pr, classified as preferred by Langford and Cory (1948); At, classified as attractive by Langford and Cory (1948).

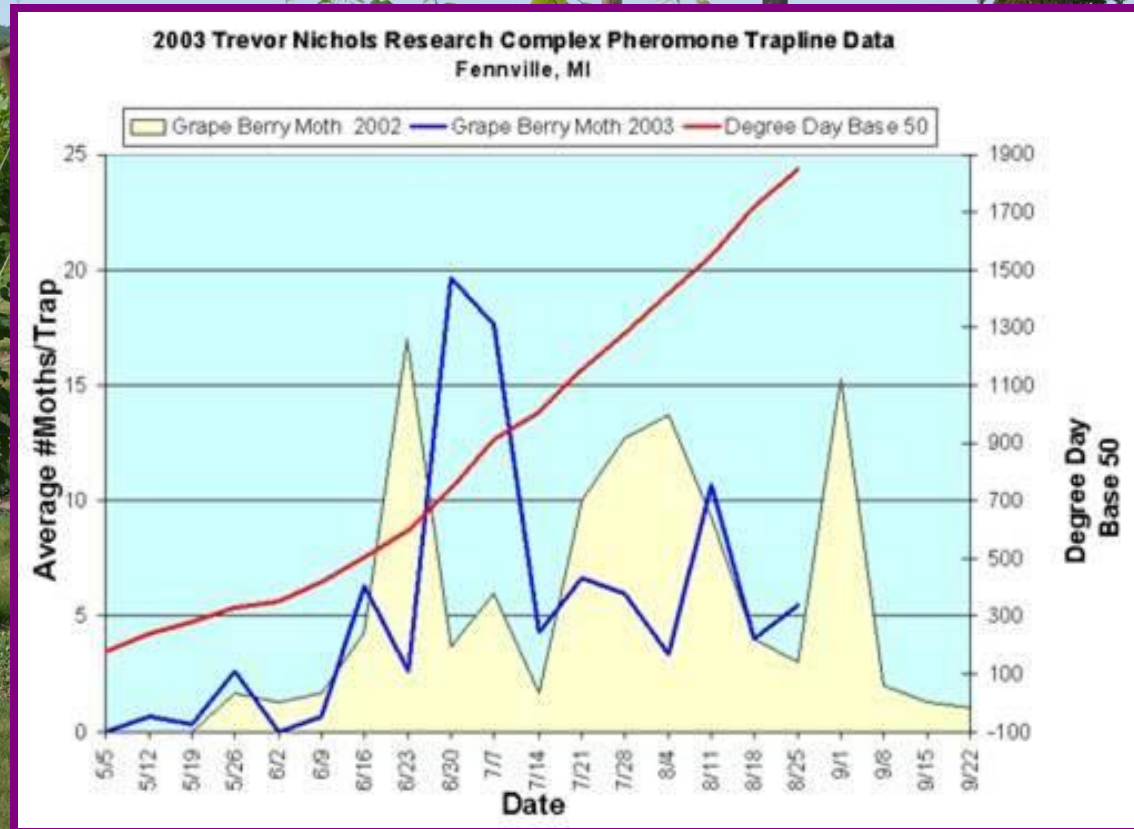


# Grape Berry Moth

- Overwinters in cocoon on ground
- Adults emerge May 15-June 15
- Eggs laid near/On grape clusters
- Look for webs on clusters
- 1<sup>st</sup> Generation pupate in leaf
- 2<sup>nd</sup> Generation larva enter fruit
- Larvae leave fruit to pupate in leaves and debris on ground



# Grape Berry Moth



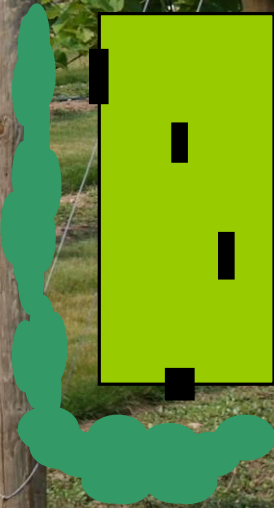
# Grape Berry Moth



# Grape Berry Moth

## Monitoring and scouting for grape berry moth

- Use trap with insect sex pheromone lure
- Place at vineyard borders and interiors
- Include borders with wooded edges
- Check traps weekly or more often
- Check clusters for eggs, larvae, and webbing
- Check 100 clusters to calculate % infestation
- Track infestation over time



# Sporadic Pests

- Phylloxera
  - Aphid-like insect
  - Foliar most important to Midwest
  - Root feeding important to *Vinifera* hybrids
  - Produces galls on leaves
  - French Hybrid varietal differences



# Phylloxera

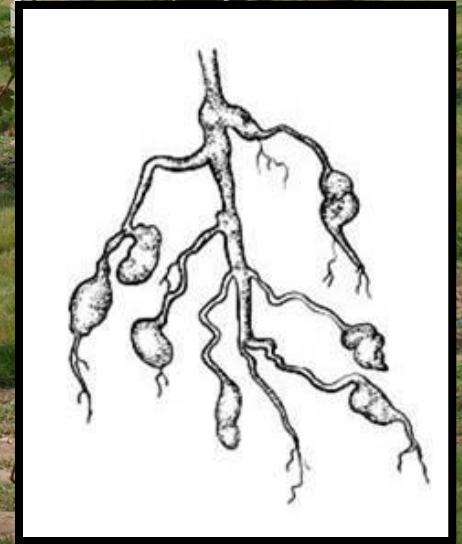


leaf galls

# Phylloxera



root galls





# Phylloxera



**Mature galls contain a female and eggs.**



**Inside a mature gall with eggs.**

# Phylloxera



**When eggs begin to hatch, gall splits open so young can emerge.**



**Inside a mature gall with dead female and live young.**

# Phylloxera



**Young phylloxera settle on upper leaf surface...**



**... and inject saliva that starts gall formation.**

# Phylloxera



**Young galls start to become apparent on lower leaf surface.**

# Phylloxera



**Light leaf infestations do not cause economic injury.**



**Heavy infestations can stunt foliage and reduce plant vigor, hardiness, and yield.**

# Phylloxera

## Life Cycle Summary



Sap-sucking insects related to aphids.

Leaf galls are not damaging unless they reduce leaf size. Young plants may be stressed.

- ✓ Exceptions are some French-American hybrids, which are highly susceptible to the leaf form.



Root form not damaging to labrusca grapes.

- ✓ French-American hybrids tend to be resistant.



Overwinters as eggs on stems and immatures on roots.



Go through multiple generations both above and below ground.

# Phylloxera

## Control

- ☞ Leaf galls are usually not damaging.
  - ✓ Except hybrids.
  - ✓ Young plants should be protected.
- ☞ Vinifera varieties should be grafted onto labrusca root stock for resistance to root form.
- ☞ If necessary, monitor early and spray at first sign of gall formation; again if necessary.
- ☞ No chemical controls for root infestations.

# Correctly Identify Pests





# Correctly Identify Pests



# Correctly Identify Pests



5/26/2009



7/6/2009

# Correctly Identify Pests



# Correctly Identify Pests

Grape Tumid Gallmaker



5/26/2009

Grape Phylloxera



7/6/2009

# Grape Gallmakers



## Grape Tumid Gall

Also called grape tomato gall. The gall is caused by the fly *Janetiella brevicauda*.



## Midge galls

These galls are caused by a small fly. These galls were found on Foch and La Crosse grape leaves in early June, 2010 in Northeastern Wisconsin.

# Grape Gallmakers

- Galls formed by larvae of cecidomyiid flies
- Galls can occur on leaves, tendrils, blossoms, buds, and shoots.
- Rarely cause economic damage



## Grape Filbert Gall

Is a rarely seen gall caused by the gall maker midge *Schizomyia coryloides*.

# Primary Fruit Pests

Grape berry  
moth

Multicolored  
Asian Lady bug

Yellow jackets



# Multicolored Asian Lady Beetle



Attracted to ripe fruit and other sugar sources.



Gives off-flavor to wine.



Physically remove as many as possible at harvest.



Insecticides near harvest if needed, but observe PHI.





# Multicolored Asian Lady Beetle

- Friend
  - Generalist feeder
  - Multiple plant hosts
    - soybean
- Foe
  - 0.27 beetles/Frontenac cluster = LBT
  - Negatively impacts grape quality



# Multicolored Asian Lady Beetle

- Harvest pests are easy to see, but only if you keep scouting
- Harvest insect pests are the result of berry damage from..
  - Birds
  - Hail
  - Mechanical damage



# Yellow jackets



Attracted to ripe fruit and other food odors.



Remove colonies early in year if possible.



Use vineyard sanitation near harvest.



Trapping may lower numbers.

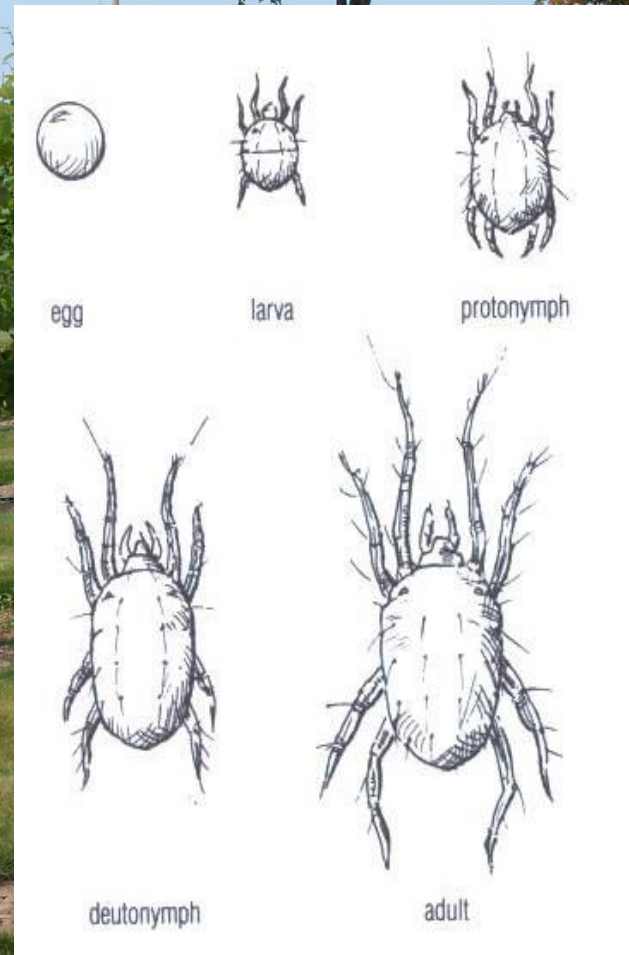


Wear protective clothing.



# Mite pests in vineyards

- Two-spotted spider mite
- European red mite
- overwinter as eggs
- High reproductive potential
- Feed on leaf tissues
- Cause webbing on underside of leaf



# Mite pests in vineyards

Two-spotted spider mite (rare)  
European red mite (very rare)

Symptoms start as light bronzing

Need a hand lens to see mites

Include in your regular scouting,  
and look for predatory mites

Rarely an issue in  
IPM-managed vineyards



# Mite pests in vineyards

Predatory mites usually keep plant-feeding mites in check, if they are not disrupted

Two spotted spider mite



Predatory mite

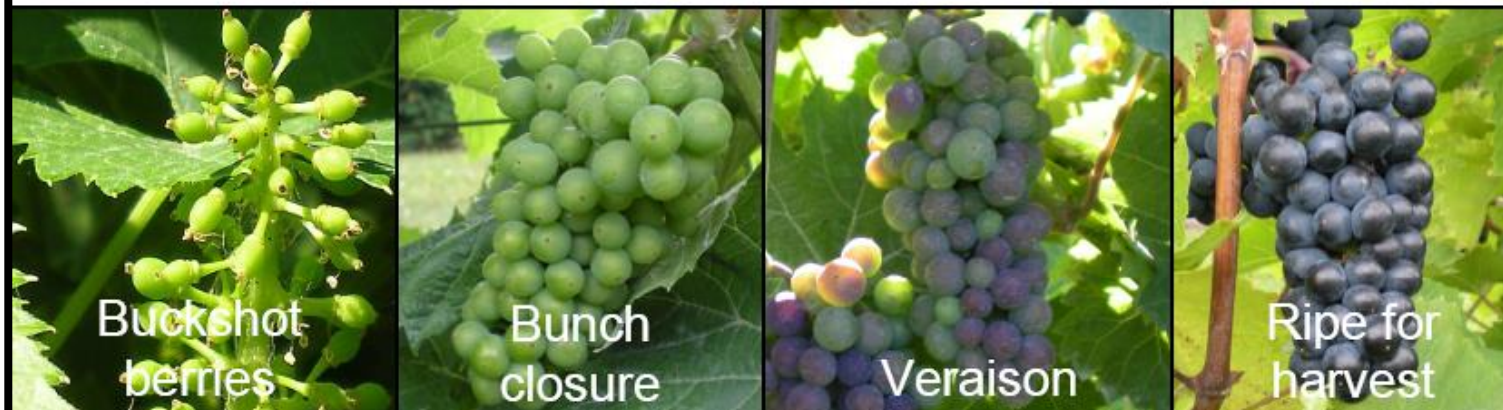
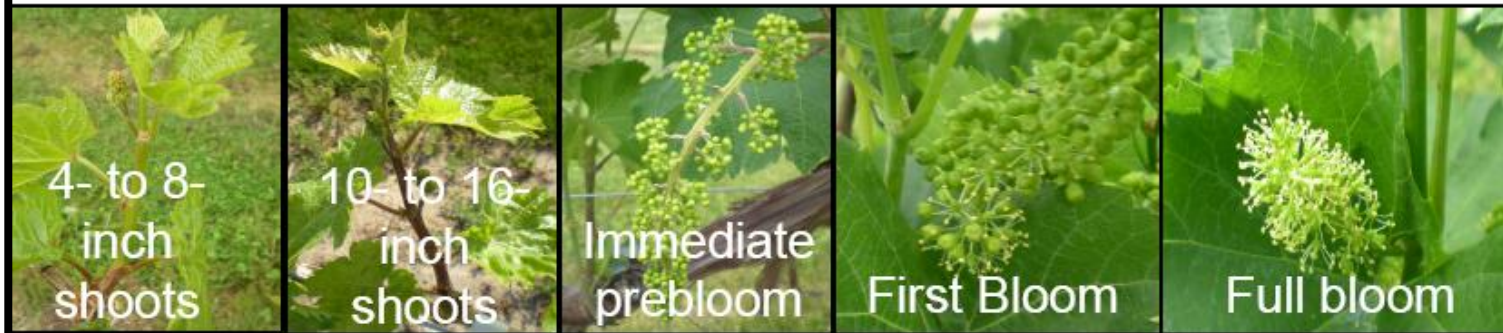


10:1 ratio of pest to predator mites provides effective biological control

# Grape Pests and Phenology

Growth stage Visual	Bud swell	Shoot 1-5"	Shoot 8-12"	Pre- bloom	Bloom	Pea- sized	Berry touch	Bunch closin g	Verais on	Pre- harvest	Harves t	Post- Harves t
Growth stage Modified Eichhorn-Lorenz	2-3	7-13	14-18	19-22	23	31	32	33-34	35	36-37	38	39-47
<b>Insects</b>												
Cutworm	+	+										
Grape Flea beetle	+											
Rose Chafer				+	+	+						
Grape Berry Moth				+	+	+	+	+	+	+	+	+
Grape Leafhopper				+	+		+	+	+	+	+	
Potato Leafhopper			+	+	+		+	+	+			
Japanese beetle								+	+	+		
<b>Diseases</b>												
Phomopsis		+	+	+	+	+	+	+	+	+	+	
Black rot		+	+	+	+	+	+	+	+			
Downy mildew			+	+	+	+	+	+	+	+	+	+
Powdery mildew		+	+	+	+	+	+	+	+	+	+	+
Botrytis bunch rot					+			+	+	+	+	

# Grape Pests and Phenology





# Questions

