



Sustainable Pest Management

Andy Allen

Viticulture and Enology Program

Arkansas Tech University–Ozark Campus

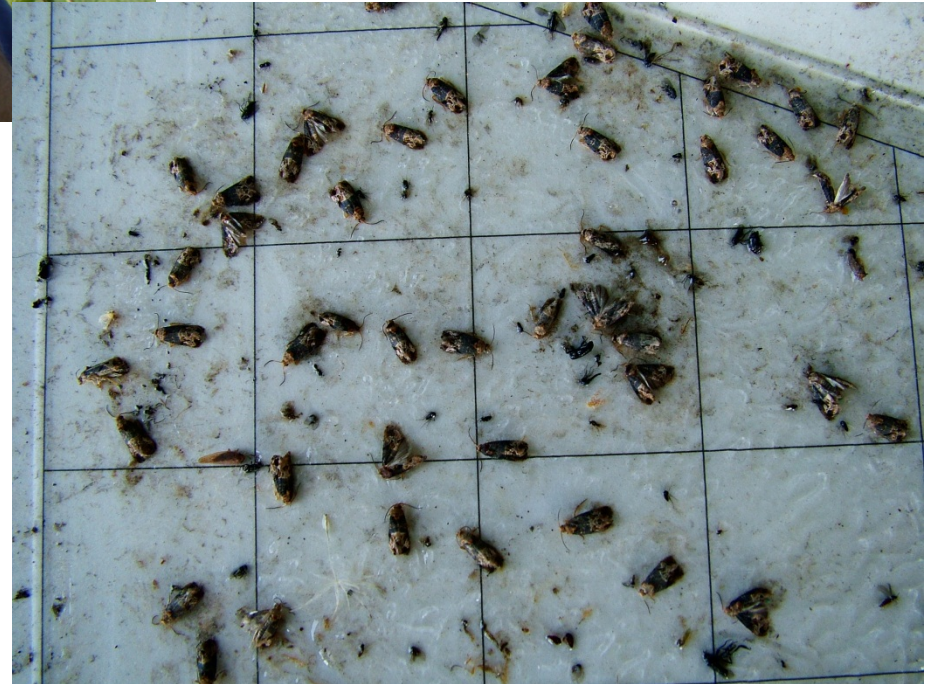
Dr. Donn T. Johnson

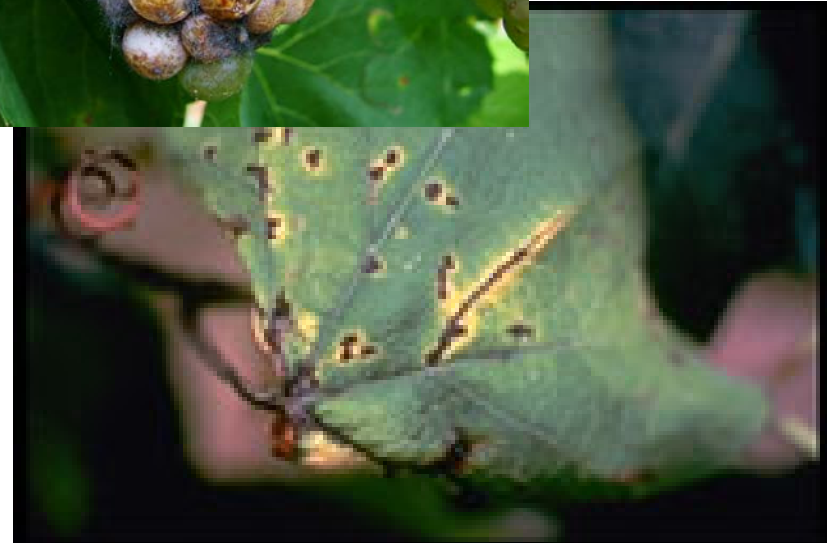
Fruit Research and Extension Entomologist

Entomology Dept., University of Arkansas

Overview of sustainable pest management practices

- Scouting as basis of pest management program
 - For insects, diseases, weeds
 - Should be able to ID common diseases, insect pests, weeds
 - No need to spray for something that isn't there
 - Is damage likely to reach economic threshold?



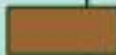
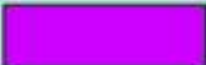


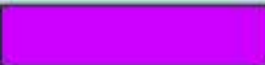



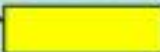
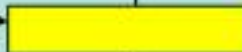






Overview of sustainable practices

- Scouting
- Spray program
 - Based on phenology of insects/diseases combined with scouting

Phenology of Pests

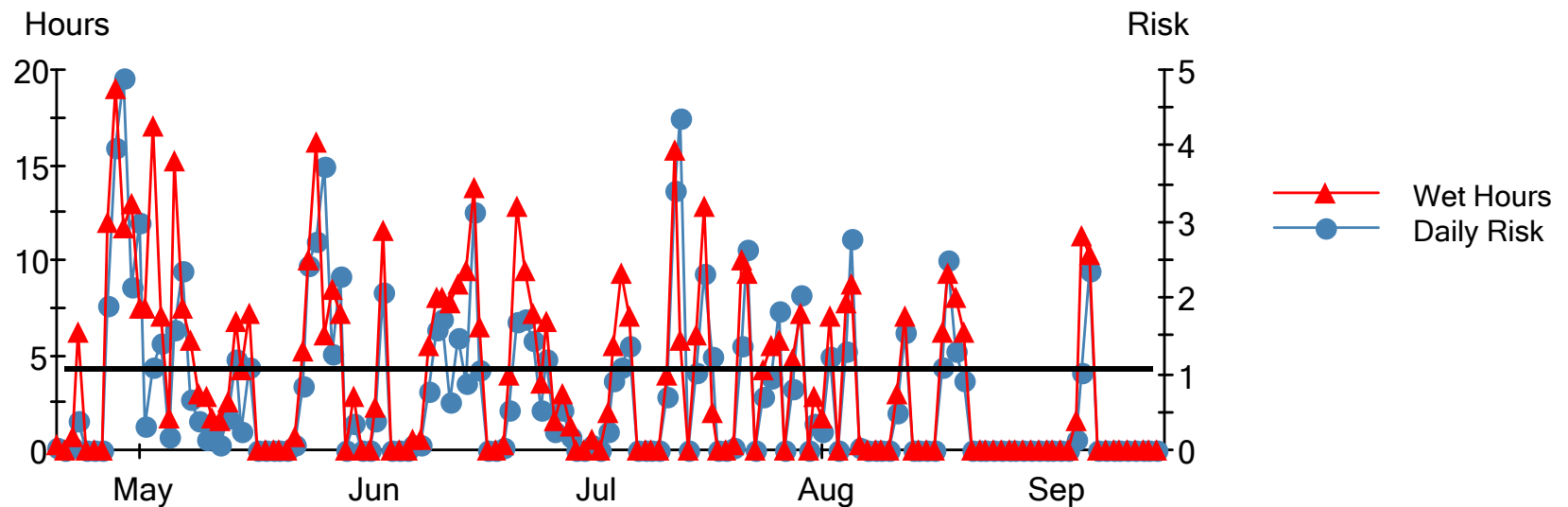
	Late March	April	May	June	July	August-September
Stage	Bud swell	Bud break	10" Shoot Bloom	Shatter	Veraison	Harvest & Post harvest
Cutworm Flea beetle						
Grape berry moth		Set trap 1 April				
Phylloxera (foliar)						
Grape Scale						
Japanese beetle			Set trap 1 June			
Grape root borer			Set trap 15 June			

Check for crawlers



Black Rot Disease Model Ste. Genevieve, MO

Ste. Genevieve, MO 2009 - Black Rot - Grape



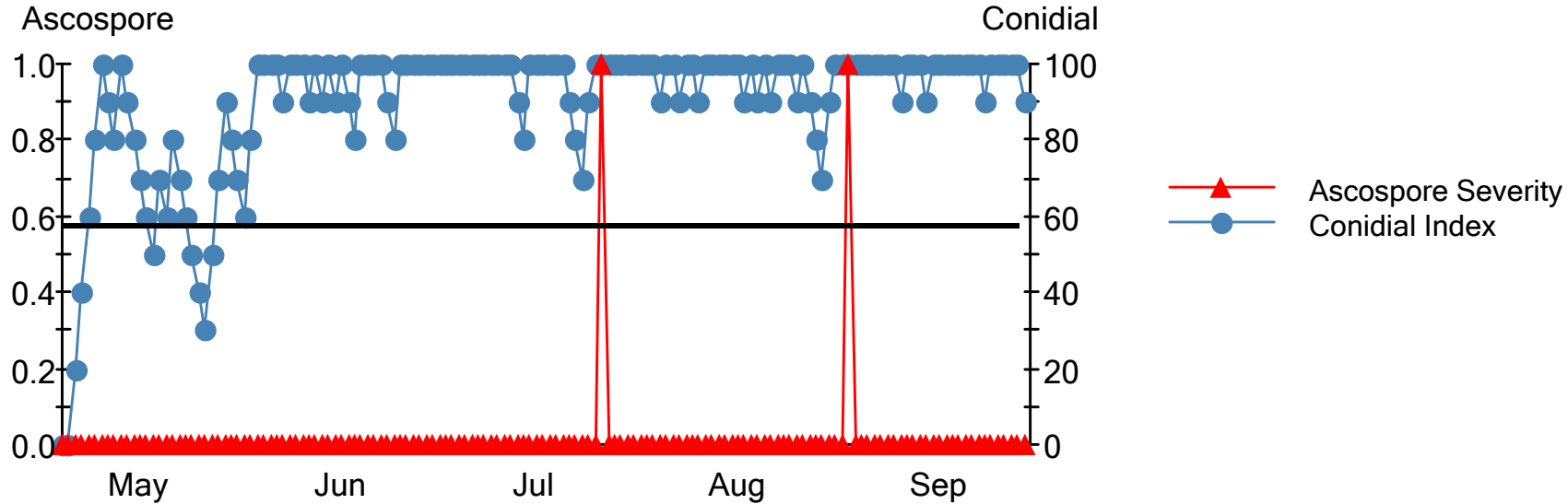
A daily risk ≥ 1 signifies a Black Rot infection period

Risk for foliar or shoot infection begins following bud burst

Risk for fruit infection is just prior to bloom to six weeks after bloom

Powdery Mildew Disease Model Ste. Genevieve, MO

Ste. Genevieve, MO 2009 - Powdery Mildew - Grape



Conidial index ≥ 60 signifies a potential Powdery Mildew infection period
Severe ascospore severity > 2

Overview of sustainable practices

- Scouting
- Spray program
 - Based on phenology of insects/diseases combined with scouting
 - Use soft/targeted materials where available/practical
 - Properly calibrate sprayers
 - Employ resistance management strategies

Sustainable weed management

Weed defined – “a plant growing where it is not wanted”

Therefore, in a vineyard a weed can be anything from a dandelion to an oak tree to even another grapevine (i.e. – seedling vine).

Problems caused by weeds

- Competition for water, nutrients, light
- Interference with harvest or other vineyard operations
- Weeds can harbor insect pests, diseases, and nematodes
- Weeds can reduce air flow in vineyard
- Weeds can provide cover for mice, voles, other pests

Weed management objectives

- Prevention – keeping a weed from being introduced
- Control – suppression of a weed that is already present to a level below its economic threshold
- Eradication – elimination of all plants and plant parts of a weed species from an area

Phases of weed management

- Pre-planting
 - Critical time to remove perennial weeds
 - Use nonselective, systemic herbicide, tillage, smother crop, or combination of tactics
- New plantings
 - Critical time to control weed establishment in vine rows
- Established vineyards
 - More tolerant of some weed competition, more herbicide choices than new plantings

Weed management

- Begins with scouting
 - Identify which weed species are present
 - Spotty – in just a few places
 - Local – found in small areas of vineyard
 - General – found throughout vineyard
 - Note weed density of each species
 - Scattered – just a few
 - Light – 1 weed per 6 ft of row
 - Moderate – 1 weed per 3 ft of row
 - Severe – more than 1 weed per 3 ft of row

Why scouting

- Grapevines are not good competitors
 - Action thresholds for weeds aren't established
- Need to know what weeds need to be control
 - Herbicides work on different weeds
 - Some weeds don't respond as well to herbicides labeled for use in vineyards
- Watch for new weed species
- Watch for herbicide-resistant weeds
- Watch for weed population shifts

Weed management

- Mechanical
 - Mowing
 - Hand-hoeing
 - Grape hoeing
 - Disking
 - In-row cultivation (i.e. – Weed Badger)
 - Heat (flamers, steamers)
- Biological – use of weed's natural enemies
 - Insects and diseases
 - Grazing



Weed management

- Cultural
 - Mulches
 - Weed barriers
 - Competition
 - Smother crops
 - Cover crops

Chemical weed management

- Pre-emergence herbicide
 - Apply prior to weed seed germination
 - Apply to bare soil
 - Good residual control under normal conditions
 - Different herbicides control different weeds – use tank mixes
 - Material used depends on age of vineyard

Chemical weed management

- Post-emergence herbicide
 - Apply to emerged weeds
 - Can be selective or non-selective
 - Contact or systemic
 - Apply when weeds are actively growing and not stressed

Chemical weed management

- Herbicide issues
 - Drift and injury
 - Site and location – avoid corn fields!!!
 - Phenoxy herbicides are most typical causes of damage
 - Resistance
 - Herbicides have different modes of action
 - Changing weed populations (escapes)

Weed distribution

Issue	Category 4	Category 3	Category 2	Category 1
47. What is the distribution of weeds in vineyard blocks?	<p data-bbox="459 494 788 665">Grower knows which rows in the vineyard contain each problem weed species.</p> <p data-bbox="459 671 788 873">And A written survey map is constructed at least every 2 years to track changes in weed populations.</p>	<p data-bbox="819 494 1147 773">Grower can categorize each known weed species present as rare or common and explain the areas of the vineyard where they are located.</p>	<p data-bbox="1178 494 1506 665">Grower can explain the areas of the vineyard where each known weed species is located.</p>	<p data-bbox="1537 494 1866 665">If a weed is present in the vineyard, grower assumes the species is widely distributed.</p>

Notes: Weed species can be introduced and spread throughout vineyards by equipment, soil and natural means (water, wind, animals). Control of new weed problems can only be effective if the weed locations are known. Land geography can result in weeds being a problem in only specific areas in a vineyard; weather patterns can lead to some weeds being widespread in some years and almost absent in others.

Weed management tactics

Issue	Category 4	Category 3	Category 2	Category 1
<p>49. Are non-chemical weed management tactics used?</p>	<p>Herbicides, mowing, mulches and cultivation are integrated into a system that rotates to maintain acceptable levels of weed control. And Hand labor or spot spraying are used to control small or isolated populations of weeds.</p>	<p>Herbicide use is carefully incorporated with mowing for weed management of undesirable species in row middles; non-selective herbicides are rotated and used underneath the vines. And Mulches or cultivation equipment is used beneath vines to control small weeds.</p>	<p>Herbicides are selected based upon the undesirable species present in the vineyard; mowing is used in row middles when vegetation reaches an undesirable height.</p>	<p>Only herbicides are applied, and the decision to apply an herbicide is made based upon the cheapest material that provides control of the widest spectrum.</p>

Notes: Although herbicide practices are an effective method of weed management, crop damage or selection of herbicide-resistant weeds is a real risk. Best management practices should include multiple approaches that are integrated into a system that is structured to control the weeds present in a vineyard.

Weed management decisions

Issue	Category 4	Category 3	Category 2	Category 1
<p>50. What determines weed control tactics and herbicide rates?</p>	<p>All available methods to learn about weed control are viewed or consulted (personnel from industry or academia). And Weeds are scouted in each vineyard at least one time per year. And Weed control tactics and herbicide rates are decided and implemented depending upon the undesirable weeds present. And The sensitivity of the grape cultivar to each herbicide and rate is known. And Herbicide programs are rotated to avoid selection of resistant weeds.</p>	<p>Grower scouts the vineyard and uses written and web-supported information to design weed control tactics. And Herbicide labels are reviewed to identify the right rates and necessary surfactants. And Continual use of the same herbicide program is avoided to prevent selection of resistant weeds.</p>	<p>Grower consults with industry or academic professionals and depends on their advice. And Herbicide labels are reviewed to identify the correct rates.</p>	<p>Someone once provided this information, and the same tactics and herbicide rates from years ago are used.</p>

Notes: Forms of equipment and herbicides (and rates) for weed control in vineyards can change frequently. It is important to keep up-to-date on recommendations. With herbicides, spray target weeds at the right size and with the right rate to optimize weed control.

Herbicide mode of action

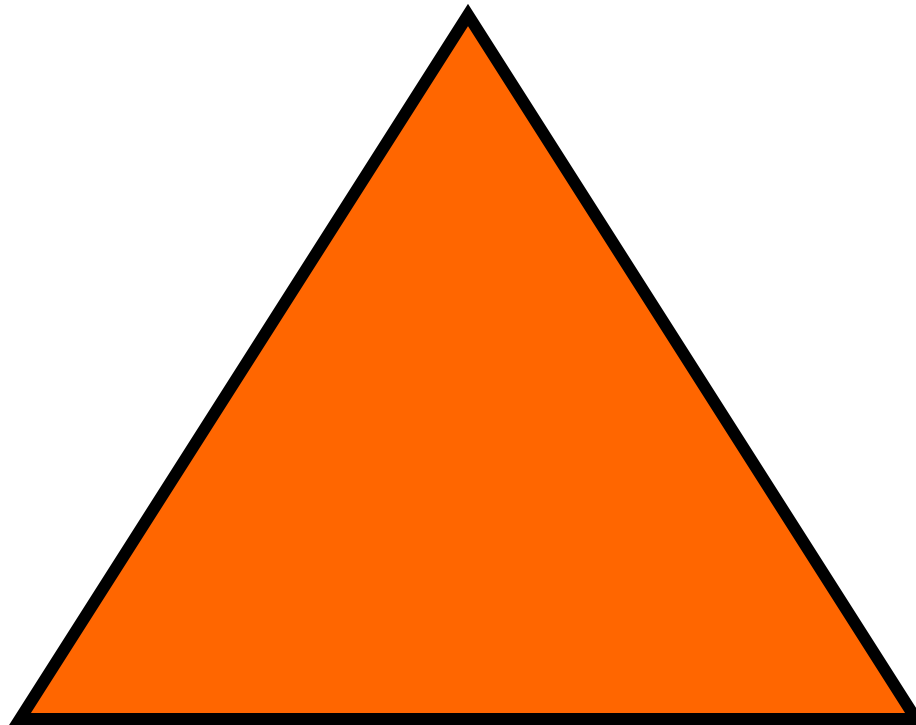
Issue	Category 4	Category 3	Category 2	Category 1
<p>52. Are herbicide formulations rotated with different modes of action to delay development of resistant weeds?</p>	<p>Grower knows the weeds in home state with known resistance to herbicides and whether or not those weed species are present in the vineyard. And Use of herbicides is consistently rotated based upon mode of action. And Non-chemical techniques are integrated with herbicide use to further minimize selection for resistant weeds.</p>	<p>For each herbicide labeled for use in vineyards, the mode of action is known. And Multiple herbicides with different modes of action are used throughout the year.</p>	<p>Grower is not aware of how herbicides work in plants, but consistently uses 2 to 4 different herbicides to control unwanted weeds.</p>	<p>Once an herbicide practice is found that works, this is used repeatedly until the program does not work anymore.</p>

Notes: Websites that describe herbicide-resistant weeds are available (<http://www.weedscience.com>) and should be consulted. The selection of herbicide-resistant weeds is a serious matter and once a grower has resistance, use of an herbicide to control that weed species is effectively lost. In some situations, an herbicide-resistant weed can move into a vineyard from a nearby field and become a major problem, even if the vineyard manager never used an herbicide that the weed species has developed resistance against.

Sustainable disease management

The “Disease Triangle”

Susceptible Host



Effective Pathogen

Favorable Conditions

Vineyard Disease Organisms

- Fungi – (i.e. – black rot, powdery mildew, *Botrytis*)
- Bacteria (Crown gall, Pierce's Disease)
- Mycoplasmas (i.e. – Flavescence dorée, grapevine yellows)
- Viruses – (i.e. – Grapevine Leafroll-associated Virus, Fanleaf)
- Nematodes

Sustainable disease control methods

1. Select sites that offer full exposure to sunlight and air movement
2. Remove alternate hosts of pathogens
3. Select cultivars that have resistance to common pathogens
4. Sanitation
5. Canopy management
6. Chemical control

Fungicide Usage Strategies

- Protectant strategies involve maintaining a constant protective coating on the vines' leaf surfaces and fruit during susceptible periods. Applications every 7-14 days are commonly required.
- Post-infection strategies involve applying a eradicator fungicide immediately after the initiation of an infection period, but before fungal colonies become established, to mitigate the threat.
 - Prevention strategies are the most common, and safest from a yield preservation standpoint. However, higher levels of chemical usage may be required with this strategy, and can give growers a false sense of security. Frequent scouting is still advised while employing this strategy.
 - Eradication strategies can be highly effective, but require excellent disease identification skills, frequent and diligent scouting by the grower, good working knowledge of disease biology/life cycles, and very rapid response if applications are needed. Many eradicator applications must be made within 72 hours after the start of an infection period.

Leaf Wetness Required for Black Rot Infection

Air Temperature (°F)

Minimum Leaf Wetness (Hrs.)

50

24

55

12

60

9

65

8

70

7

75

7

80

6

85

9

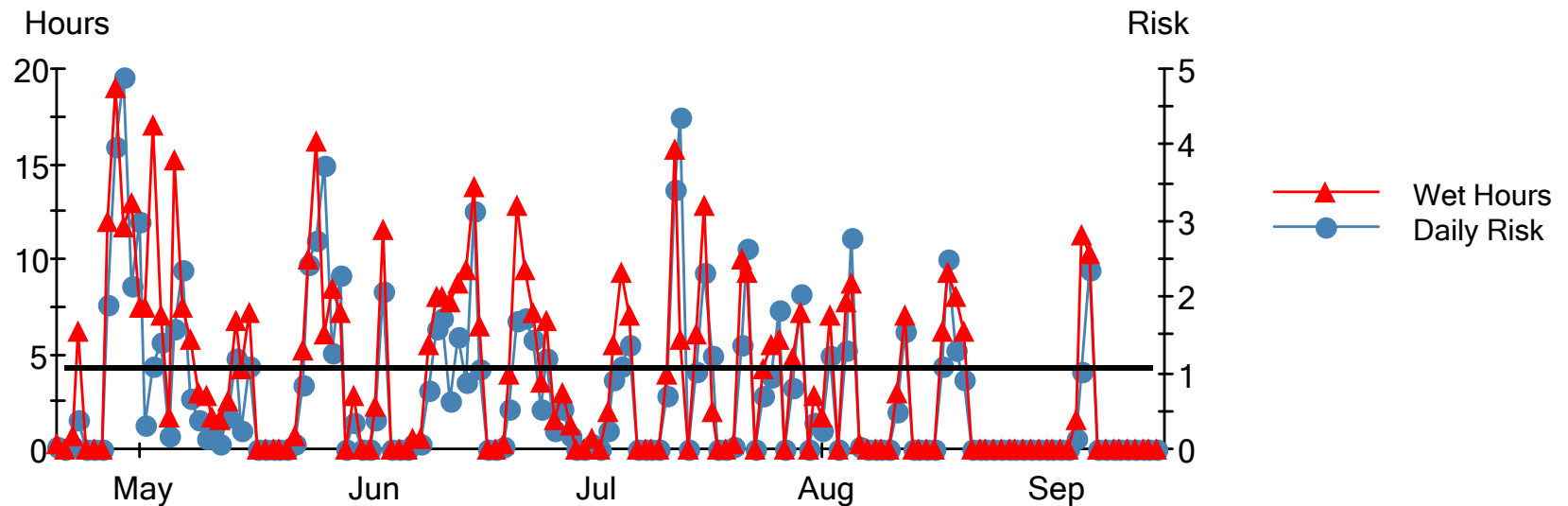
90

12

Source: R.A. Spotts; Ohio State University

Black Rot Disease Model Ste. Genevieve, MO

Ste. Genevieve, MO 2009 - Black Rot - Grape



A daily risk ≥ 1 signifies a Black Rot infection period

Risk for foliar or shoot infection begins following bud burst

Risk for fruit infection is just prior to bloom to six weeks after bloom

Resistance Management

- Due to their high number of annual generations, many plant diseases are capable of becoming resistant to a range of fungicides.
 - Rotating fungicides in a spray schedule is **critical** to maintaining the effectiveness of those products. Never make more than 2 consecutive applications of a single fungicide prone to resistance development, or use chemicals with the same mode of action in more than 2 consecutive sprays. Minimize applications of protectant fungicides to existing infections.
- Limit use of fungicides prone to resistance development.
- Consider tank-mixing fungicides to utilize multiple modes of action simultaneously.

Table 8. Fungicide Harvest Restrictions and Restricted-Entry Intervals (REI)

Trade Name	Common Name	Harvest Restrictions Pre-harvest intervals and limitations (Maximum amount/ acre/season) ^a				REI ^b	FRAC ^c Code
		Grape	Blueberry	Brambles	Strawberry		
Abound	azoxystrobin	14 ^a	0	0	0	12 hr	11
Adament	tebuconazole plus trifloxystrobin	14 ^a	-	-	-	24hr	11 3
Aliette	fosetyl-AL	15 ^a	0 ^a	60	0 (30 lb)	12 hr	33
Basic copper sulfate	copper sulfate	0	-	0	0	24 hr	M
Bayleton	triadimefon	14 (18 oz)	-	-	-	12 hr	3
Cabrio	pyraclostrobin	-	0 (56 oz)	0 (56 oz)	0 (56 oz)	24 hr	11
Captan	captan	0 (24 lb)	0 (70 lb)	3 ^d	0 (48 lb)	See note ^e	M
CaptEstate	captan plus fenhexamid	-	0 (21 lb)	0 (21 lb)	0 (21 lb)	24/72 hr ^f	M 17
Dithane M-45, others	mancozeb	66 ^a	-	-	-	24 hr	M
Elevate	fenhexamid	0 ^a	0	0	0 ^a	12 hr	17
Elite	tebuconazole	14	-	-	-	12 hr	3
Endura	boscalid	14 ^a	-	-	-	12 hr	7
Ferbam	carbamate	7	-	-	-	24 hr	M
Flint	trifloxystrobin	14 ^a	-	-	-	12 hr	11
Fontelis	penthiopyrad	-	-	-	0	12 hr	7
Forum	dimethomorph	28 ^a	-	-	-	12 hr	40
Indar	fenbuconazole	-	30	-	-	12 hr	3
Inspire Super	difenoconazole plus cyprodinil	14 ^a	-	-	-	12 hr	3 9
JMS Styler Oil	oil	0	-	-	0	12 hr	-
Merle	tetraconazole	14	-	-	-	12 hr	3
Orbit	propiconazole	-	30	30	0	12 hr	3
Presidio	fluopicolide	21	-	-	-	12 hr	43
Pristine	pyraclostrobin plus boscalid	14 ^a	0 ^a	0 ^a	0 ^a	12 hr ^a	11 7
Procure	triflumizole	7 (32 oz)	-	-	-	24 hr	3
ProPlyt, Phostrol, Agri-Fos, Topaz, Legion, Rampart	phosphorous acid	0	0	0 ^a	0	4 hr	33
Quadris Top	difenoconazole plus azoxystrobin	14 ^a	-	-	-	12 hr	3 11
Quintec	quinocyfen	14 ^a	-	-	1 ^a	12 hr	13
Rally	myclobutanil	14 (1.5 lb)	-	1 (10 oz)	1 (10 oz)	24 hr	3
Ranman	cyazofamid	30 ^a	-	-	-	12 hr	21
Revus	azoxystrobin	14	-	-	-	12 hr	40

General Recommendations to Prevent Vectoring of Viruses

1. Survey vineyards for symptoms
2. Remove infected vines
3. Fallow after removing infested vineyard for at least 3 years
4. Minimize weeds, especially weeds that encourage nematode populations
 - Mainly broadleaf weeds
5. Avoid cover crops that encourage nematode populations
 - Such as clovers

Disease identification

Issue	Category 4	Category 3	Category 2	Category 1
62. What resources are used to identify common diseases of the Ozark Region?	Vineyard manager and workers can identify diseases and damage signs and know which cultivars are susceptible to each.	Vineyard manager can identify disease and damage signs, but workers use posted color photo fact sheets.	Only the vineyard manager can identify cause of fruit or foliar disease damage.	No one can identify the major diseases.

Notes: The ability to properly identify which diseases are causing damage in the vineyard is critical in determining control measures. Not all fungicides are effective against any one disease and of those that are effective, the level of effectiveness can vary. Routinely spraying one or two fungicides for the duration of the growing season may control some diseases but not others.

Disease monitoring and records

Issue	Category 4	Category 3	Category 2	Category 1
63. How are vineyard diseases monitored?	Grower or a trained worker monitors for diseases and assesses damage weekly or at key phenological periods throughout the season, and also keeps written scouting records by block.	Grower or a trained worker monitors for diseases and assesses damage periodically, and also keeps scouting records.	Grower or a trained worker monitors for diseases and assesses damage irregularly, but does not keep records.	Grower rarely or never monitors for diseases or assesses damage.

Notes: Scouting for the presence of diseases is also an important part of a disease management program. While several diseases can potentially infect area vineyards every year, due to variations in weather conditions from season to season, infections by different disease organisms vary in the level of incidence and severity from season to season and at different times during the season. Routinely spraying for a disease that is not causing problems is a waste of chemical, a waste of money and increases environmental contamination.

Pruning and sanitation

Issue	Category 4	Category 3	Category 2	Category 1
64. How are mummified berries, dead spurs and canes removed?	Dead spurs and canes, and mummified berries are removed at pruning to reduce overwintering disease inoculums and disposed of away from the vineyard.	Dead spurs and canes, and mummified berries are removed at pruning to reduce overwintering disease inoculums, but are dropped to the ground and not disposed of.	No effort is made to identify and remove dead canes or spurs, but mummified berries are removed at pruning.	No effort is made to identify and remove dead canes or spurs or mummified berries.

Notes: Dead or scabby spurs and canes can be overwintering sites for phomopsis. Mummified berries left on the vine can harbor spores for black rot or phomopsis and can be a significant source of inoculum for disease infections the following season. Removing and disposing of dead or scabby canes and spurs and mummified berries outside of the vineyard can significantly reduce the amount of overwintering inoculum in the vineyard.

Fungicide timing

Issue	Category 4	Category 3	Category 2	Category 1
67. When are fungicides applied to the vineyard?	Grower or trained workers use weather data logger and local weather forecasts of temperature, hours of leaf wetness, inches of rain and % RH to run disease prediction models to better time fungicide applications.	Grower or trained workers apply fungicide before forecasted rains or long periods of high relative humidity and/or leaf wetness.	Grower or workers apply fungicide when signs of disease appear in the vineyard.	Fungicides are applied on a calendar-based schedule.

Notes:

Fungicide resistance management

Issue	Category 4	Category 3	Category 2	Category 1
<p>68. How is the fungicide spray program designed to reduce the risk of resistance development?</p>	<p>The fungicide spray program is designed using alternating applications of at-risk fungicides with different modes of action to reduce the buildup of fungi populations with high levels of resistance to a particular class of chemicals. Or At risk fungicides are tank mixed with materials that have a low risk of resistance development to reduce the buildup of resistant fungi populations.</p>		<p>At risk fungicides are tank mixed with materials that have a low risk of resistance development to prevent the buildup of resistant fungi populations but the same materials are used with little rotation.</p>	<p>Just a few fungicides are used repeatedly throughout the growing season.</p>

Notes: Materials such as the sterol inhibitor (SI) fungicides (i.e., Rally, Bayleton, Elite) and the strobilurins (i.e., Abound, Sovran, Flint, Cabrio) are highly at risk for the development of resistance by disease organisms and resistance by powdery mildew (SI) and downy mildew (strobilurins) have already been reported in other areas. Relying on only one material or materials with the same mode of action increases selection pressure on the disease population for resistant fungi to survive and reproduce, resulting in a disease resistance to that class of materials. Alternating sprays with materials having a different mode of action or combining them with materials that are at a low risk of resistance development can reduce the risk of resistance development by killing a larger percentage of the disease population.

Canopy management for disease management

Issue	Category 4	Category 3	Category 2	Category 1
69. How is canopy management used to reduce disease pressure?	Canopy management practices (shoot thinning, shoot positioning, leaf removal, hedging) that result in a canopy more open to light penetration and air movement within the canopy to reduce conditions that favor disease development are followed. (See section on Canopy Management .)	Some canopy management practices that can reduce disease pressure within the canopy are performed annually while others are seldom utilized.	Canopy management practices that improve the environment within the canopy are practiced only on highly disease-prone cultivars.	Canopy management practices are not utilized to modify the environment within the canopy to reduce disease pressure.

Notes:

Virus management

Issue	Category 4	Category 3	Category 2	Category 1
70. Are virus-infected vines properly identified and managed?	The vineyard manager can identify symptoms of virus and virus-infected vines are immediately removed when identified. If the vineyard block must be removed, as much root system as possible is removed and the block is left fallow for a minimum of three years or the vineyard is replanted using vines grafted to a resistant rootstock.	The vineyard manager can identify symptoms of virus and virus-infected vines are immediately removed. If the vineyard block is removed, the site is fallowed for less than three years and/or vines are replaced with ungrafted material.	The vineyard manager cannot identify virus-infected vines and dead symptomatic vines are replaced with ungrafted vines.	The vineyard manager cannot identify virus-infected vines, and therefore nothing is done even if the block performs poorly or is nonproductive.

Notes:

Sustainable insect management

Pest Identification, Scouting & Damage

Plant Symptoms	When and How to Scout	Pest Identification	Pest Name
Scale on trunk or cane	<p>Winter pruning - flag infested vines; Spray with 2% dormant oil by bud swell May - check for crawlers under scale cover or on sticky tape on infested canes; Spray vines while crawlers are present</p>	<p><u>Adult</u>, <1/16", bark color to gray; <u>Crawler</u>, <1/16", legs, yellow</p>	Grape scale
Hole chewed in swelling bud	<p>Bud swell - check 100 buds for damage by caterpillar (night) or beetle (day); Spray if > 1% bud damage</p>	<p><u>Caterpillar</u>, 1-1/4", brown, brown head <u>Beetle</u>, 1/8", shiny black</p>	Climbing cutworms Grape flea beetle
Berries with holes, skin turning purple with larva under skin	<p>April 1 hang sex pheromone trap along woods, accumulate degree days (DD) after 1st moth catch, check 300 clusters for damage; Spray if > 1% damage during 400-800 or 1300-1700 or > 2200 DD</p>	<p><u>Caterpillar</u>, ½", yellow-green to brown, amber head; <u>Moth</u>, 3/8", gray band at wing base</p>	Grape berry moth
Galls on leaves or low vine vigor or vine death	<p>Early May, look for crawlers in leaf galls on <u>Chambourcin, Chardonnay, Norton, Seyval, Vignoles & Vidal blanc</u>; Spray foliage while crawlers present in May</p>	<p><u>Adult</u> in gall or on root, 1/32", yellow, legless; <u>Crawler</u>, 1/32", yellow, 6 legs</p>	Grape phylloxera
White spots on leaves of susceptible cultivars	<p>May on - check 100 leaves for nymphs - Spray if > 10 nymphs per leaf</p>	<p><u>Adult</u>, 1/8", orange-yellow <u>Nymph</u>, no wings, white to yellow</p>	Grape leafhopper
Holes in leaves in upper 3 rd of canopy	<p>Mid June & July- watch for adults on leaves Spray only susceptible cultivars</p>	<p><u>Adult</u>, ½" long, brown wings, green head & white dots on abdomen</p>	Japanese beetle
Plant vigor declining or vine dead and roots with tunnels filled with brown/maroon frass	<p>15 June - put sex pheromone trap in vineyard to detect moths; Late July & late August check 100 vines for pupal skins on soil by trunk in each vineyard</p>	<p><u>Moth</u>, 1", tan to brown, 4 thin hairs on tip of abdomen, feathered antenna; <u>Caterpillar</u>, 1-1/2", white, legs, <u>Pupal skin</u>, 1" long & dark amber</p>	Grape root borer

Plant Growth Stage & Pests to Be Scouted

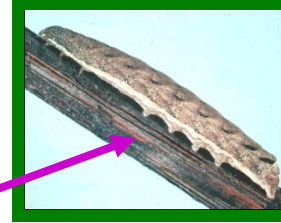


Dormant

- Flag grape scale-infested vines

Bud swell

- Check for bud damage by cutworm or grape flea beetle
 - **Spray if > 1% damaged buds**
- In edge of woods by vineyard, set grape berry moth trap
- Begin accumulating degree-days after 1st trap catch



10" shoot to bloom

- Check for yellow grape phylloxera crawlers in leaf galls



Bloom

- Check clusters for rose chafer (occasional pest)



Grape Berry Moth Risk



larva



damaged berry



adult

- **High risk** = history of high GBM injury & woods adjacent to > 25 % vineyard perimeter
- **Low-risk** = low historical incidence & < 25% of vineyard perimeter adjacent to woods

1 April - Harvest



Weekly, check grape berry moth pheromone traps in wooded edge



Accumulate DD after first trap catch

1st hatch = 400-800 DD

2nd hatch after 1300 DD

Spray insecticide to full vineyard if > 1% damaged clusters




Calculating Degree-days (DD)

Insects are cold blooded

Grape phylloxera grows if temperature > 43 °F

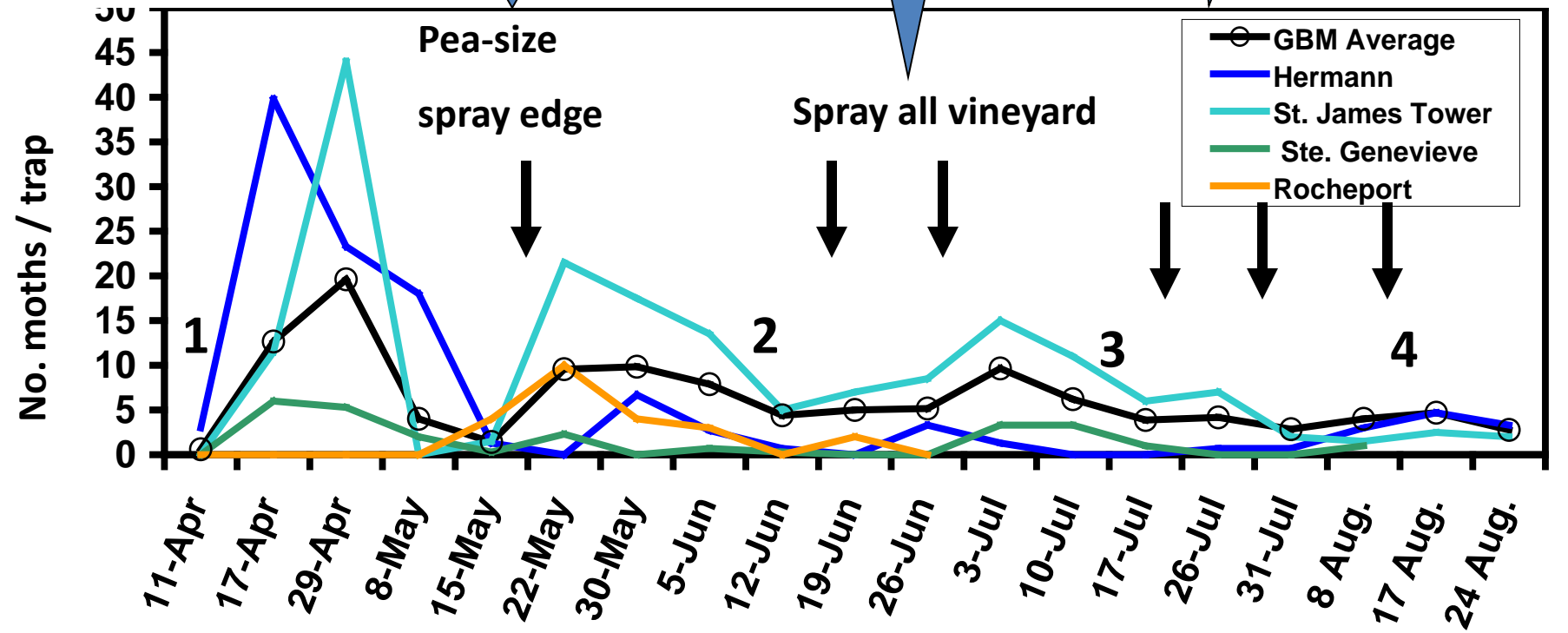
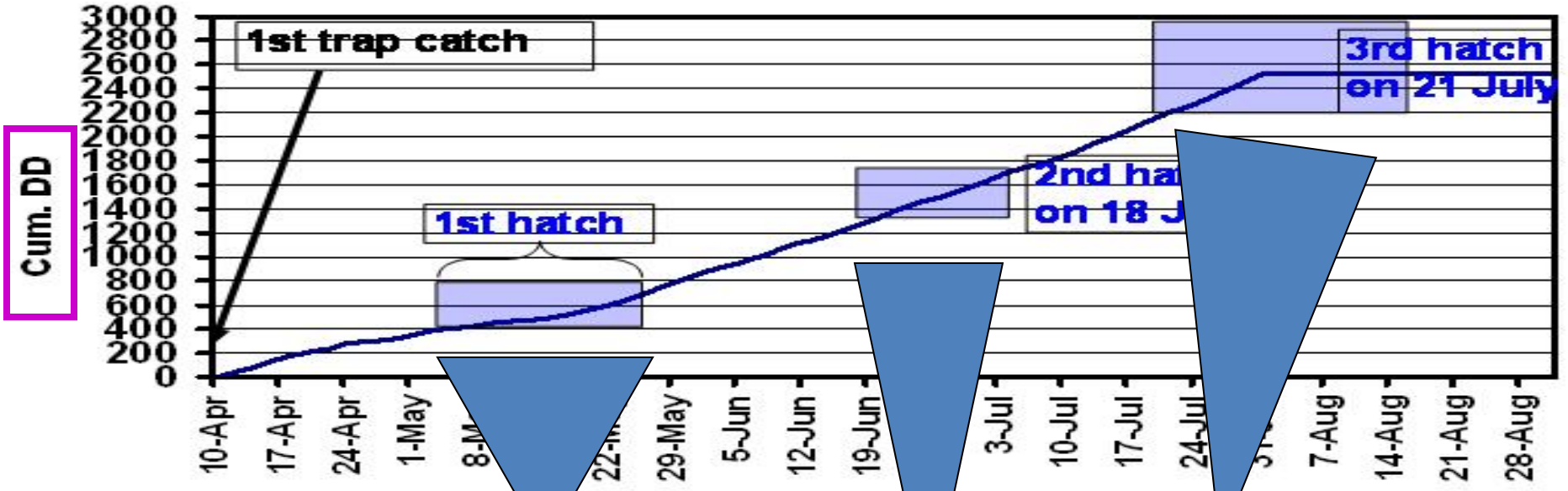
Grape berry moth grows if temperatures > 47 °F

$$\text{Daily DD} = \frac{\text{Max } ^\circ\text{F} + \text{Min. } ^\circ\text{F}}{2} - 47^\circ\text{F}$$


$$\text{Daily DD} = \frac{80 + 50}{2} - 47^\circ\text{F} = 65 - 47 = 18 \text{ DD}$$

Accumulate DD after 1st leaf gall in early April for phylloxera or
after first grape berry moth trap catch from 10-20 April

2006 Grape Berry Moth DD for Crawford Co., MO



Pest and damage identification

Issue	Category 4	Category 3	Category 2	Category 1
55. What resources are used to identify insect pests and corresponding damage in the vineyard?	Vineyard manager and workers can identify insect pests and damage symptoms and know which cultivars are susceptible to each pest.	Vineyard manager can identify insect pests and damage symptoms but workers use posted color photo fact sheets.	Only the vineyard manager can identify cause of fruit or foliar damage.	No one can identify the major insect pests or damage that each causes.

Notes: The pest management presentation and handout from the Missouri Grape Production Short Course (offered by ICCVE) is available online under "Current Information and Talks" at <http://comp.uark.edu/~dtjohnso>. These materials describe pest biology, cultivars susceptible to pest attack, sampling methods, and tactics to keep the pest population below economically damaging levels. Grape insect pest management relies on the ability of growers and workers to identify each pest species, the stage causing the damage and the symptoms of damage (see previous pages of pictures).

Pest sampling

Issue	Category 4	Category 3	Category 2	Category 1
56. Is the vineyard sampled for presence of insect pests and/or damage?	Grower or trained worker follows a season-long sampling protocol and damage assessment based on pest biology and available degree-day models and keeps written records by block/cultivar sampled.	Grower or trained worker follows a season-long sampling protocol based on grape phenology and periodically inspects grapevines for pest damage to fruit and foliage.	Grower or worker periodically inspects grapevines to assess pest damage to fruit and foliage.	No one monitors for insect pests or assesses damage of fruit or foliage.

Notes: Use the Pest Scouting Form for Arkansas/Missouri/Oklahoma/Kansas Vineyards on page 47.

Sampling and economic thresholds

Issue	Category 4	Category 3	Category 2	Category 1
57. Do sampling and economic threshold-based decision-making protocols justify insecticide applications?	Use sampling protocol and economic threshold values of 1% bud damage (climbing cutworms or adult flea beetles) or 1% cluster damage (grape berry moth larvae) to justify and improve timing of insecticide application.	Follows sampling protocol for pest insects to improve timing of insecticide applications.	Apply insecticide any time an insect is detected in the vineyard.	No sampling for insects and applies insecticides on a calendar schedule.

Notes:

Grape berry moth

Issue	Category 4	Category 3	Category 2	Category 1
60. Are grape berry moth infestations controlled with spot spray insecticides?	Vineyard is sprayed in May, only if pheromone traps catch moths and clusters in perimeter row are damaged by grape berry moth larvae; then perimeter rows are treated with insecticide spray. Sprays against later generations are applied to the full vineyard only if berry damage by grape berry moth larvae is detected.	Insecticide applications are applied to the full vineyard when grape berry moths are detected in May and during later generations.	Insecticide applications are applied to the full vineyard on calendar basis all season long, starting at bloom.	No grape berry moth sprays are applied.

Notes:

Reduced-risk pesticides

Issue	Category 4	Category 3	Category 2	Category 1
61. Are reduced-risk biopesticides or organic-approved compounds applied to manage pests?	Reduced-risk biopesticides or organic insecticides are always used to manage insect pests.	If economical or available, reduced-risk pesticides are applied to manage pests.	Only synthetic insecticides are applied to manage pests.	No insecticides are applied against pests.

Notes: The OMRI list of compounds is available on the web ATTRA – National Sustainable Agriculture Information Service at http://attra.org/attra-pub/biorationals/biorationals_main_srch.php. Bt or pheromone-based mating disruption dispensers are used against grape berry moth or Surround kaolin clay to protect against Japanese beetles or grape phylloxera.