The Powdery Mildew Index (PMI) Stations: How do we learn to use the index?

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Foothill Grape Day 6/5/14

UC CE
University of California
Agriculture and Natural Resources
Cooperative Extension

Why powdery mildew stations?

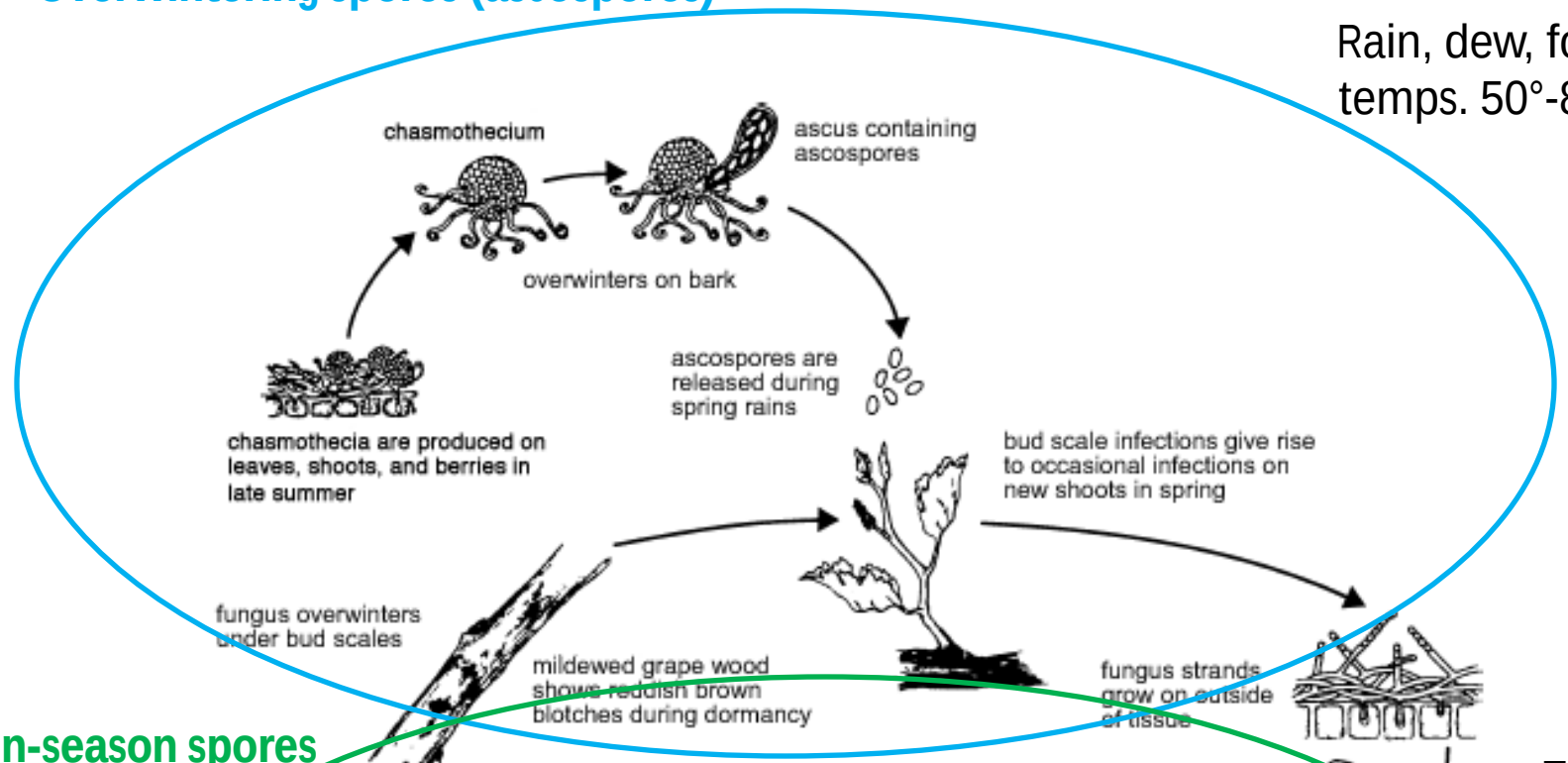
- $$ to control the disease
- Requires attention every year (some years worse than others)
- If not controlled losses can be severe:
  - Reduced wine quality at 3% infected berries
  - Cracking allows rot organisms to enter
  - Lower Brix
  - “Red flag” for winery: basic for quality

Goal: Minimize unnecessary mildew sprays while maintaining quality (no disease).

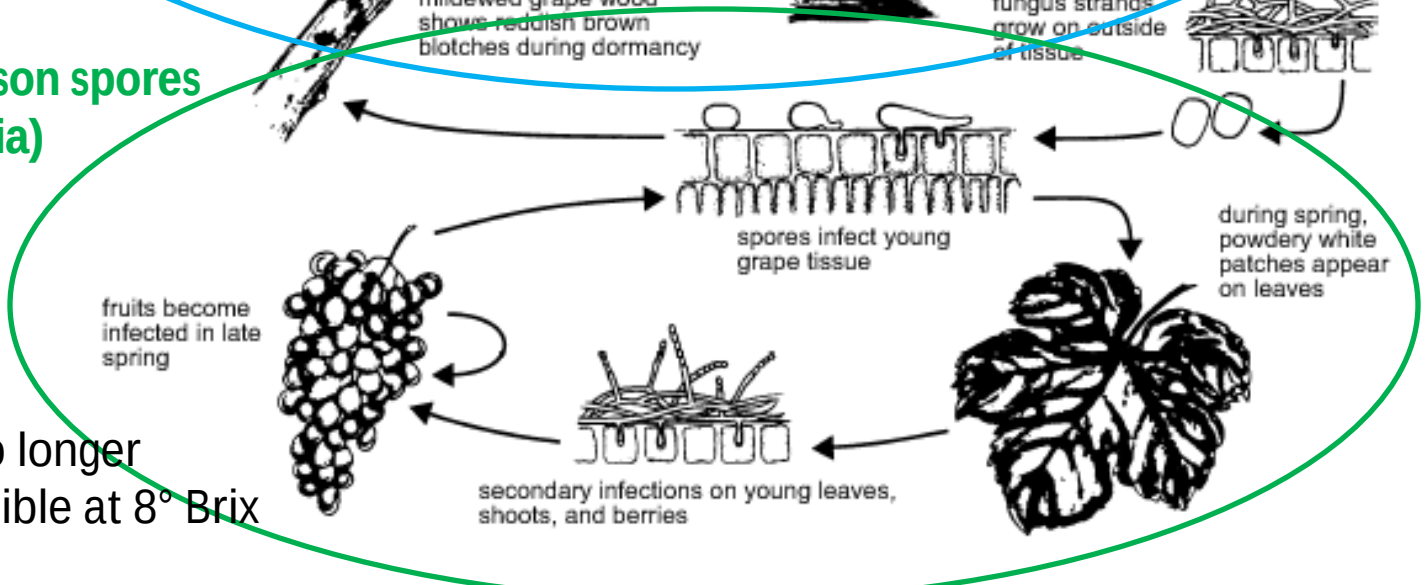
Powdery mildew (*Eryisphe necator*) disease cycle

Overwintering spores (ascospores)

Rain, dew, fog, and temps. 50°-80°F



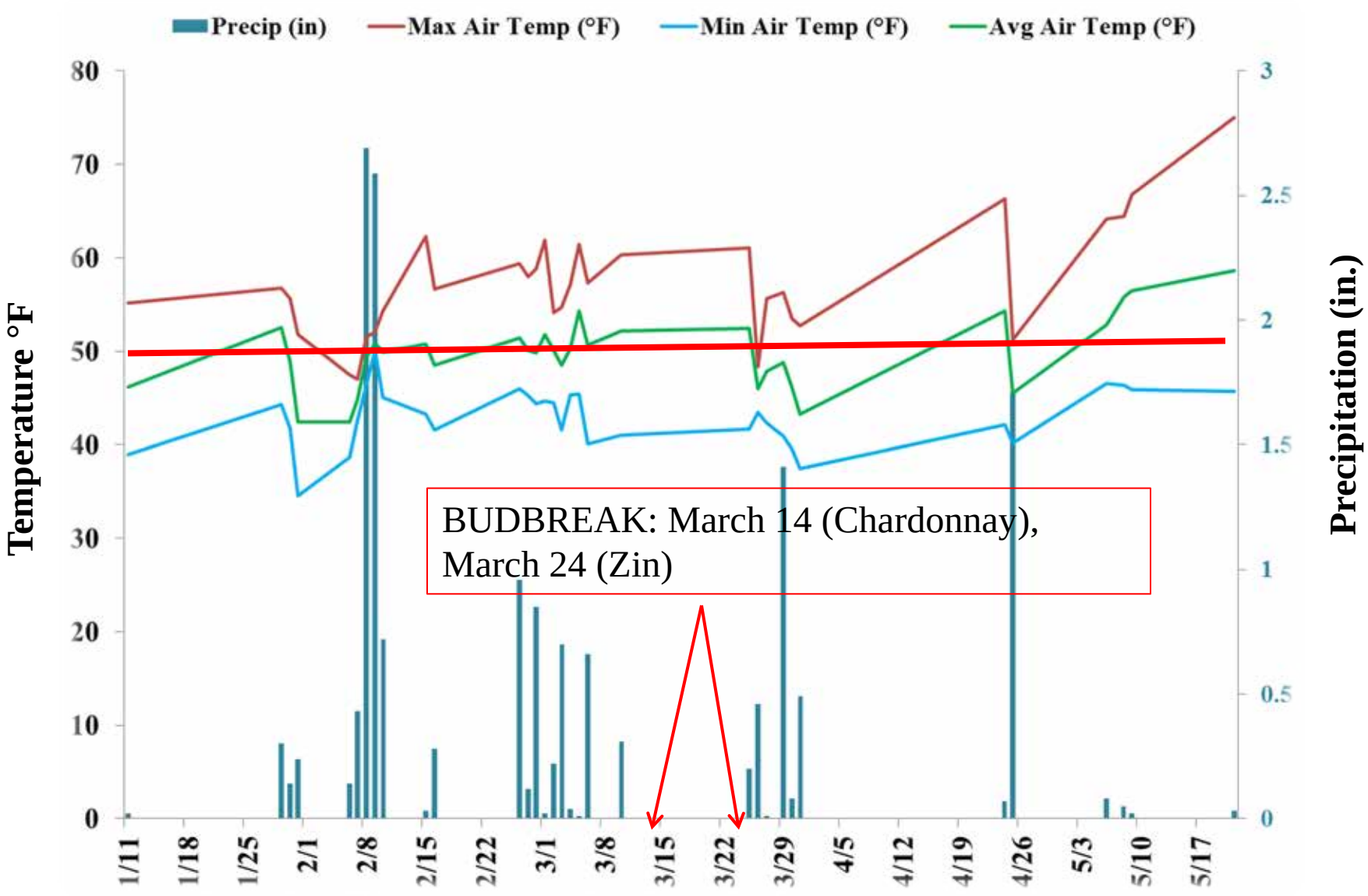
In-season spores (conidia)



Temps (at leaf surface) 43°-90°F, optimal is 70°-86°F

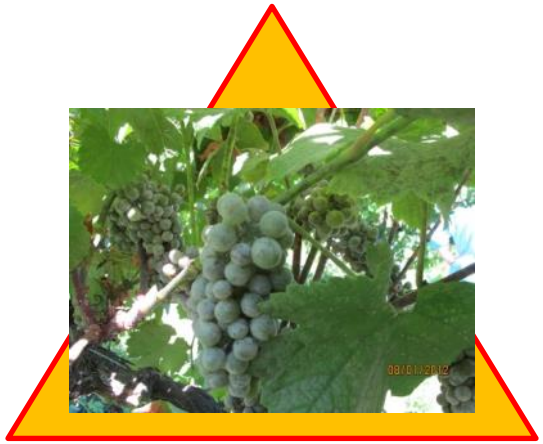
Fruit no longer susceptible at 8° Brix

Periods of precipitation with corresponding max., min., and average temperatures January-June 1, 2014: Plymouth CIMIS #227



What makes a “bad” disease year?

Host-*green tissue present; variety susceptibility*



Pathogen-*sources of inoculum; site history, neighbors, resistance*

Environmental conditions-that are right for the pathogen to develop. *Canopy temperature monitoring, manipulation. Effect of air and light.*

How do we know mildew is present?

Look for it!


05/27/2014


05/27/2014


05/27/2014


05/27/2014


05/08/2014


05/08/2014

How do we know mildew is present?

Look for it!

(Time consuming $, difficult to see, requires training)

How do we know mildew is present?

Research: Spore trapping (not there yet)

How do we know mildew is present?

ASSUME it is there

(RISK factor)

What makes a “bad” disease year?

Host-*susceptible tissue present*

Pathogen-*sources of inoculum*

Environmental

conditions-*that are right for the pathogen to develop*

70-85°F optimum

Effect of UV light, air.

Canopy manipulation, trellis, station monitoring

California Agriculture 1990

Extension Plant Pathologist Doug Gubler demonstrates the leaf-thinning technique he helped to develop. Thinning reduces the incidence of leafhoppers and various rots.

IPM

Leaf removal for pest management in wine grapes

James J. Stapleton ❑ *William W. Barnett* ❑ *James J. Marois*
W. Douglas Gubler

Leaf removal can effectively manage Botrytis bunch rot and the "summer bunch rot complex" of wine grapes in the San Joaquin Valley and coastal growing areas. The practice may help manage such insect pests as leafhoppers. Producers have adopted leaf removal as a routine cultural practice, especially where high-value, premium varietals are grown.

Grapevine canopy management by leaf removal has been shown to be of significant value for integrated pest management (IPM)

wine grape acreage is located inland, in the San Joaquin Valley. This latter production area is characterized by relatively hot and dry climatic conditions during much of the growing season. A complex of diseases including sour bunch rot, Aspergillus bunch rot, Botrytis bunch rot, and powdery mildew, and arthropod pests such as omnivorous leafroller are responsible for causing bunch rots, resulting in yield and quality losses in Valley growing areas.

Before promoting leaf removal as a standard IPM practice, we needed to test its effects on incidence and severity of bunch rots under the different climatic conditions. Objectives of this research also included determining the effects of leaf removal on a

CIMIS 227 is at Terra d'Oro (no mildew index)

2013: 2 powdery mildew stations in Shenandoah Valley, Amador County. Data online at UCIPM

AMADOR WINEGROWERS

UNIVERSITY OF CALIFORNIA AGRICULTURE & NATURAL RESOURCES
UC IPM Online
Statewide Integrated Pest Management Program

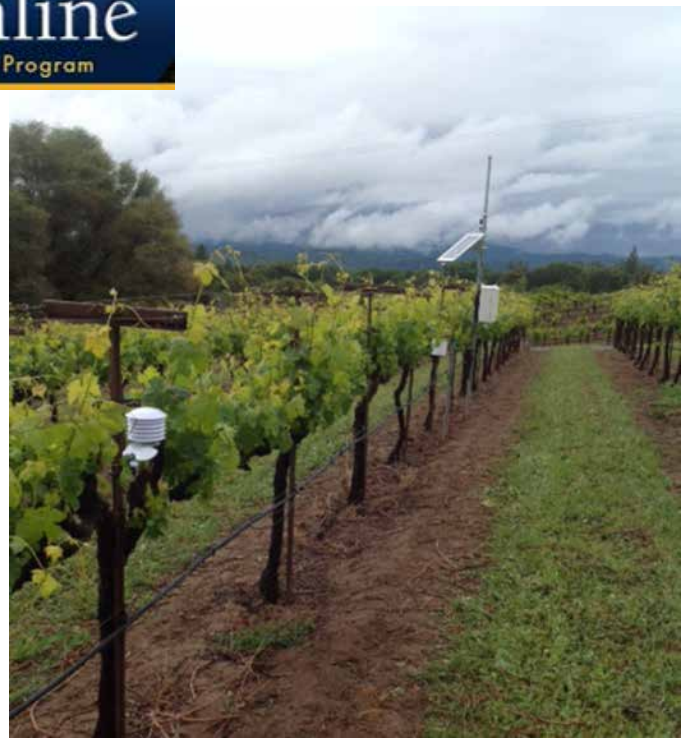
Amador-Eagle
Up March 11, 2013
Distacio Ranch, 1470 feet
Head trained zinfandel
Budbreak March 24, 2014

Amador-Renwood
Up March 6, 2013
Renwood, 1580 feet
Bilateral trained zinfandel

RENWOOD WINERY

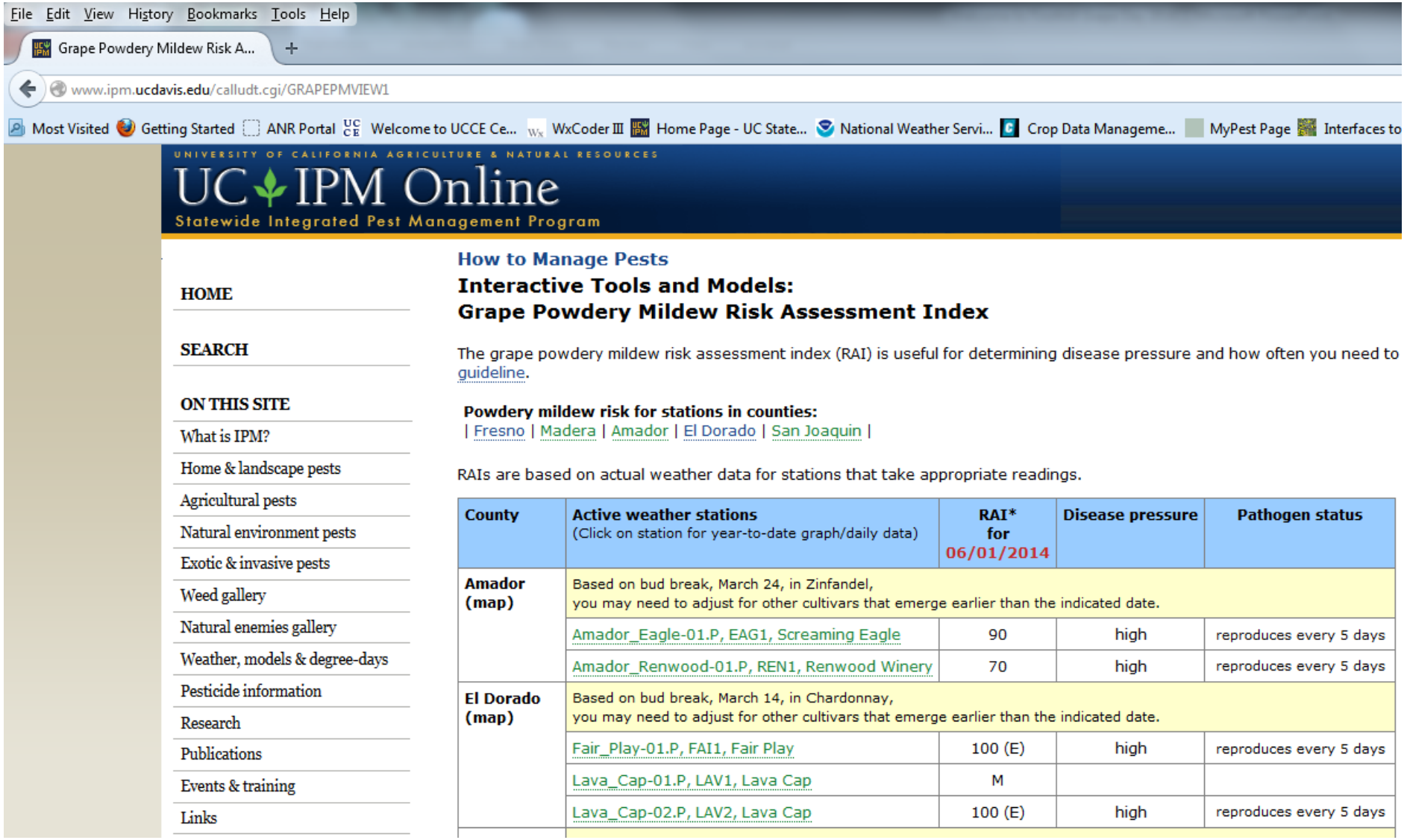
2014: 2 powdery mildew stations in El Dorado County, data online at UCIPM

Camino-Lava Cap
Up March 26, 2014
2730 feet
Bilateral Chardonnay
Budbreak March 14, 2014



Fair Play-Naylor Ranch
Up April 25, 2014
2740 feet
Bilateral Barbera

How to access station information?
See “4 STEPS” handout



HOME

SEARCH

ON THIS SITE

- What is IPM?
- Home & landscape pests
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- About us
- Contact us

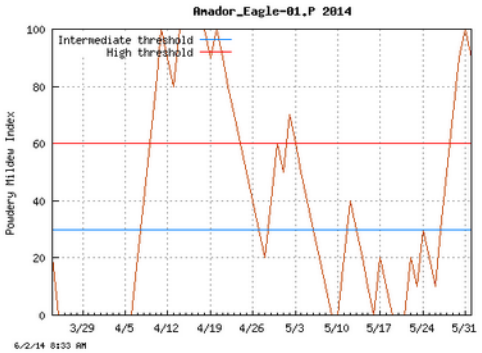
How to Manage Pests

Interactive Tools and Models:
Grape Powdery Mildew Risk Assessment Index

RAI report for Amador_Eagle-01.P (EAG1, Screaming Eagle)

| Station descr

Time period: March 24, 2014, to June 1, 2014, retrieved on June 2, 2014.



Jump to last day in: May, April, March

Date	RAI	Disease pressure	Pathogen status	Hours 70° ≤ Temp ≤ 85°	Hours Temp > 95°	Notes
03/24/2014	20	n/a	no infection	7.5	0.00	
03/25/2014	0	n/a	no infection	0.0	0.00	
03/26/2014	0	n/a	no infection	0.0	0.00	
03/27/2014	0	n/a	no infection	0.0	0.00	
03/28/2014	0	n/a	no infection	0.0	0.00	
03/29/2014	0	n/a	no infection	0.0	0.00	
03/30/2014	0	n/a	no infection	0.0	0.00	
03/31/2014	0	n/a	no infection	0.0	0.00	
04/01/2014	0	n/a	no infection	0.0	0.00	
04/02/2014	0	n/a	no infection	0.0	0.00	
04/03/2014	0	n/a	no infection	0.0	0.00	
04/04/2014	0	n/a	no infection	0.0	0.00	
04/05/2014	0	n/a	no infection	0.0	0.00	
04/06/2014	0	n/a	no infection	3.3	0.00	
04/07/2014	20	n/a	no infection	8.3	0.00	
04/08/2014	40	n/a	no infection	10.2	0.00	

How the mildew index accumulates points.

Once wetness and initial ascospore infection occurs, rest of the season is conidial infection.

Based on temperature (canopy), and to a lesser degree RH. Scale is 0-100.

- 6 or more **continuous** hours between 70°F-85°F:

  Add 20 points

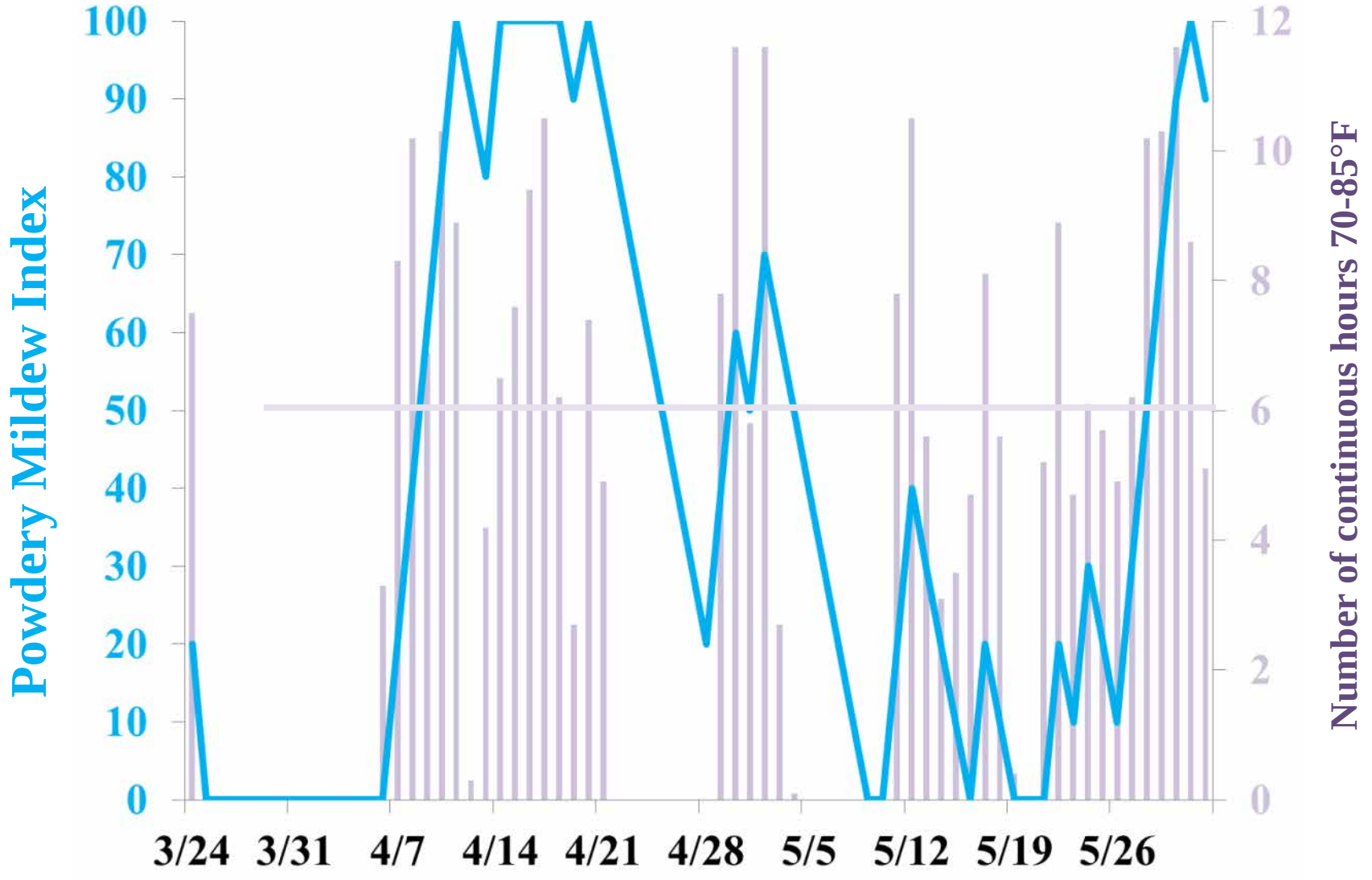
- Less than 6 continuous hours between 70°F-85°F:

  Subtract 10 points

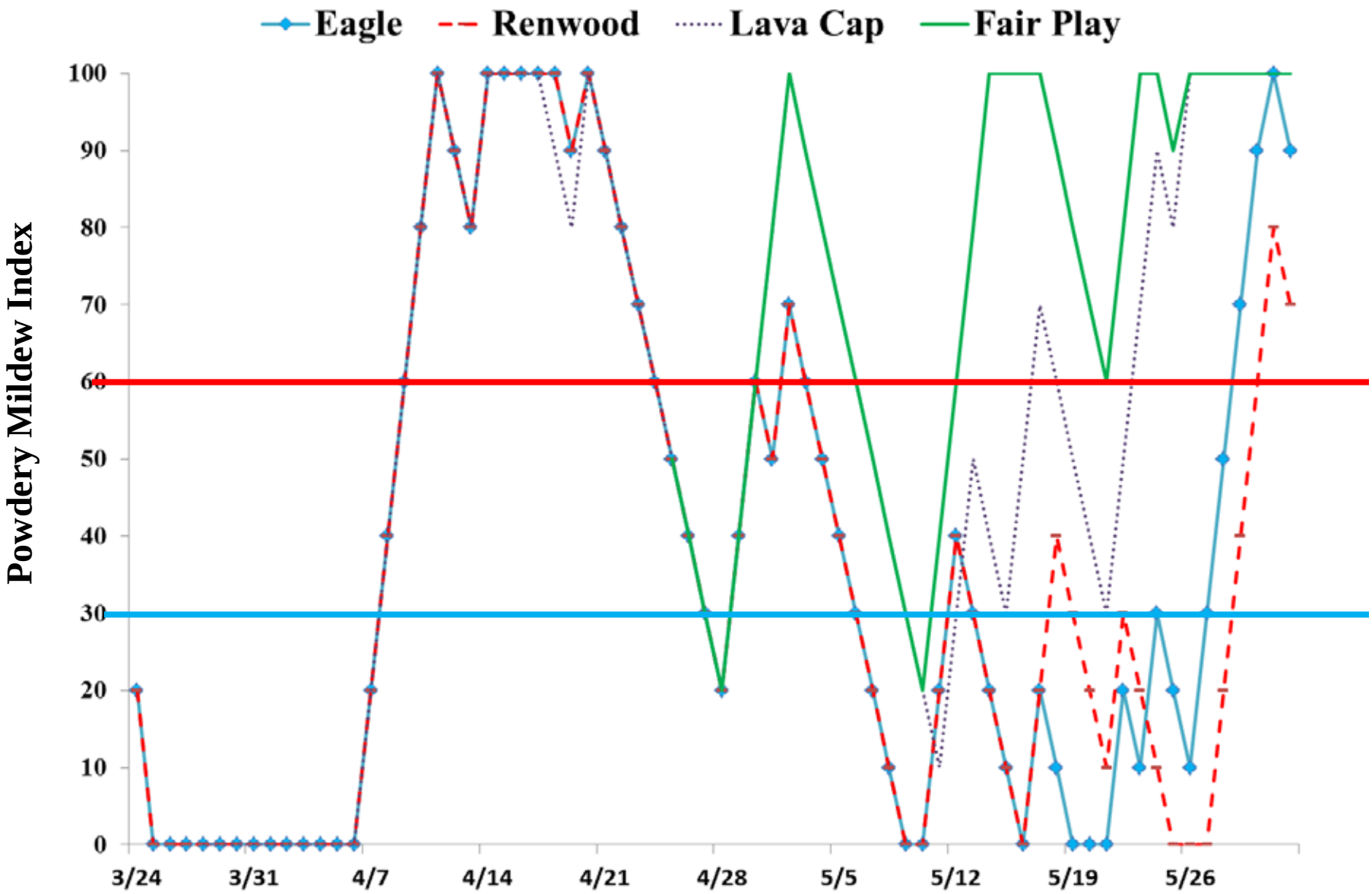
- If 95°F or higher for 15 minutes or more:

  Subtract 10 points

Powdery mildew index and number of continuous hours of temperatures 70-85°F for Amador Eagle, to June 1, 2014

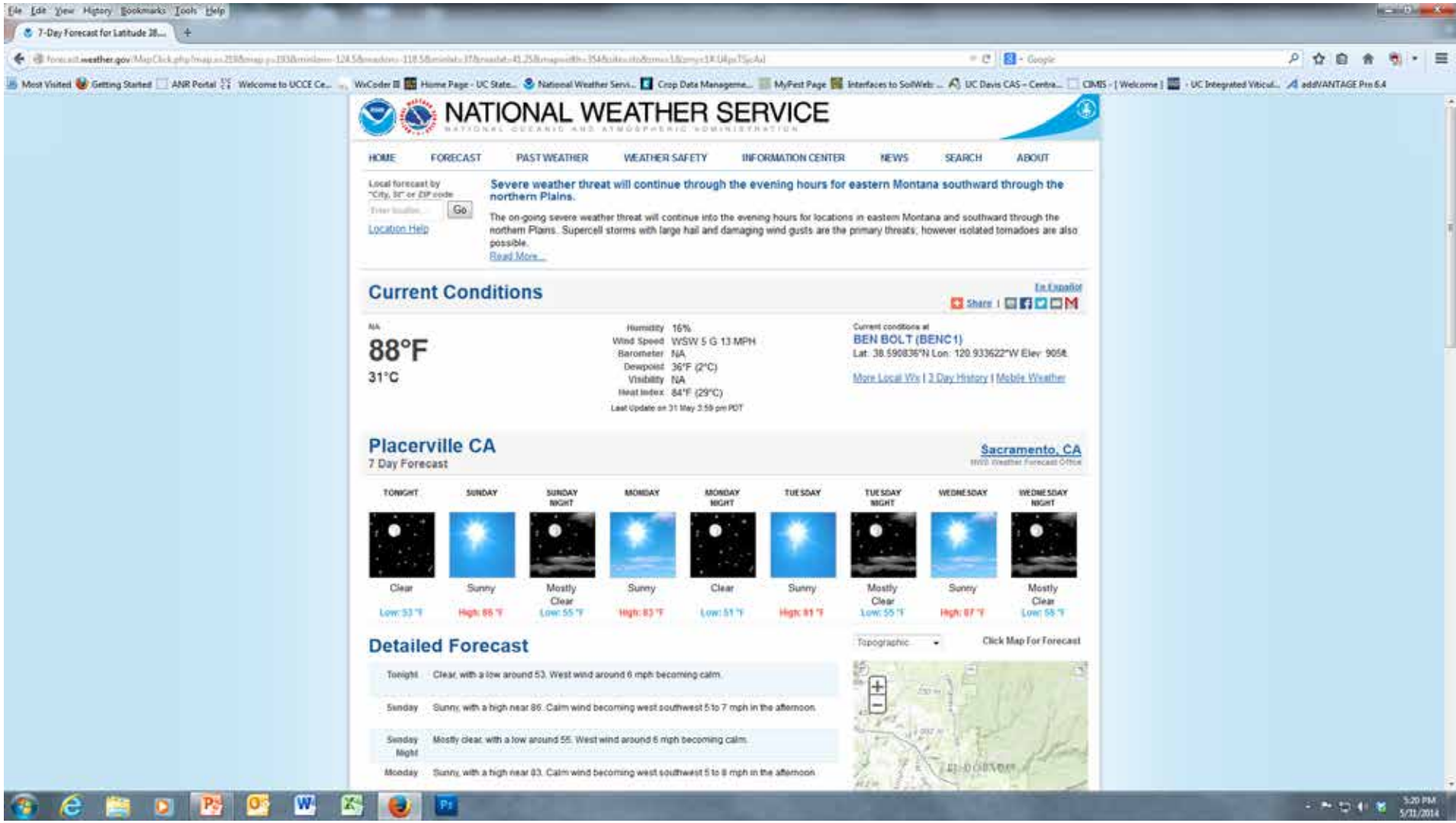


Comparison of the Powdery Mildew Index for 4 Foothill Stations- June 1, 2014



SPRAY INTERVALS BASED ON DISEASE PRESSURE USING THE POWDERY MILDEW INDEX

			Suggested spray schedule			
Index	Disease pressure	Pathogen status	Biologicals and SARs (i.e. Serenade, Messenger, etc.)	Sulfur	Sterol-inhibitors (i.e. Rally, etc.)	Strobilurins (i.e. Pristine, etc.)
0-30	low	present	7- to 14-day interval	14- to 21-day interval	21-day interval or label interval	21-day interval or label interval
30-50	intermediate	reproduces every 15 days	7-day interval	10- to 17-day interval	21-day interval	21-day interval
60 or above	high	reproduces every 5 days	use not recommended	7-day interval	10- to 14-day interval	14-day interval



Predict 50 more points by next Thursday (Grape Day), all PMI stations will be “high”.

2014 Powdery Mildew Trial : Distacio Ranch-Amador Eagle.

Pat Rohan, Collaborator.

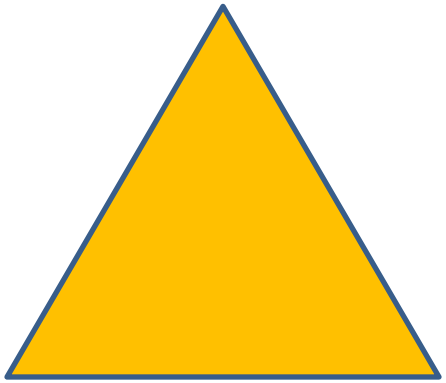
Date	Grower Std.	Station	PMI	Time post-treat	Scouted (645 leaves)	Spore trap
3/24/2014	**BUDBREAK**	**BUDBREAK**	**0**			
3/31/2014			**0**			2 out
4/7/2014			**20**			changed
4/21/14			**90**		No mildew found	changed
4/22/14	5 lb sulfur 2 2/3 pint Champ 4 oz/50 gal Nu film	5 lb sulfur 2 2/3 pint Champ 4 oz/50 gal Nu film	**80**			
4/29/14			**40**	**1 week later**		
4/30/14			**60**		No mildew found	
5/1/14			**50**			changed
5/6/14	4 oz. Sovran 5 lb. Microthiol 4 oz. Nu film	4 oz. Rally 5 lb. Microthiol 4 oz Nu film	**30**	**2 week interval**		
5/8/14			**10**			changed
5/13/14			**30**	**1 week later**	No mildew found	
5/20/14			**0**	**2 weeks later**		
5/27/14			**30**	**3 weeks later**	No mildew found	NO SPORES TRAPPED YET
6/5/14	4 oz. Rally 5 lb. Microthiol 4 oz Nu film	4 oz. Sovran 5 lb. Microthiol 4 oz. Nu film	**90**	**30 days later**		

But is that really all there is to it?

What makes a bad disease year?

Fungicide/Management choice: timing, chemistry, application

Host-*susceptible tissue present*



Fungicide class rotation to avoid resistant individuals

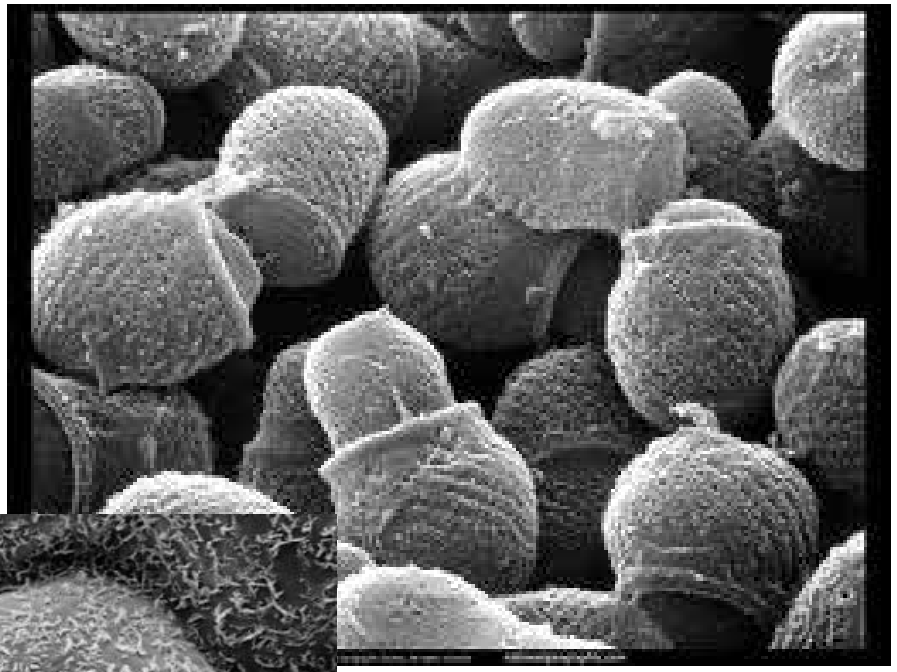
Pathogen-*sources of inoculum, strain, etc.*

Environmental *conditions-that are right for the pathogen to develop*

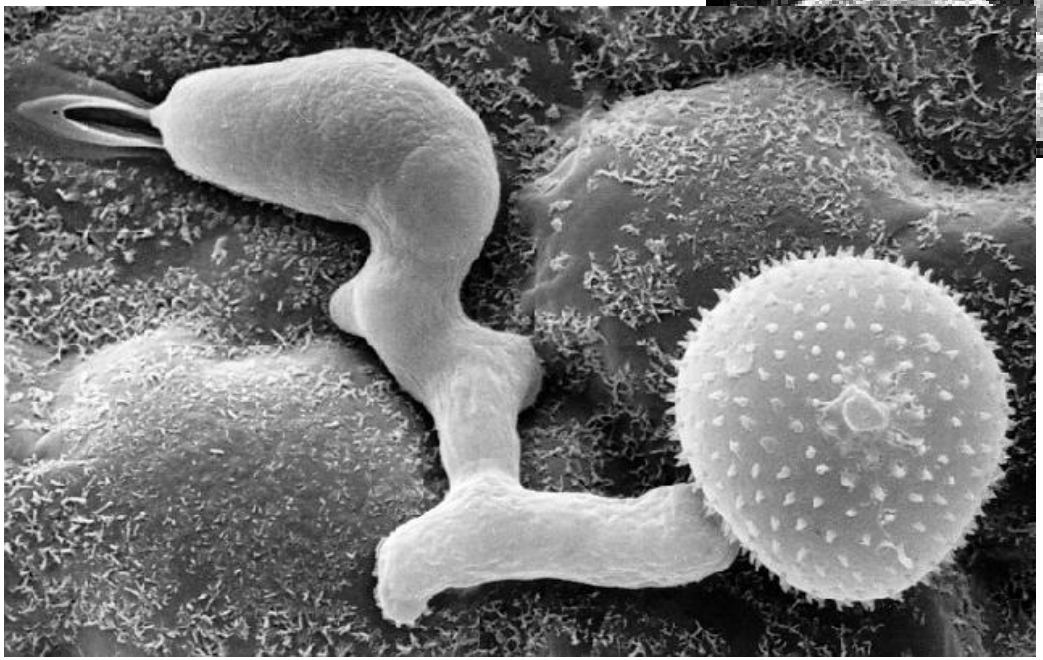
Manipulating canopy environment: leaf pulling, shoot thinning

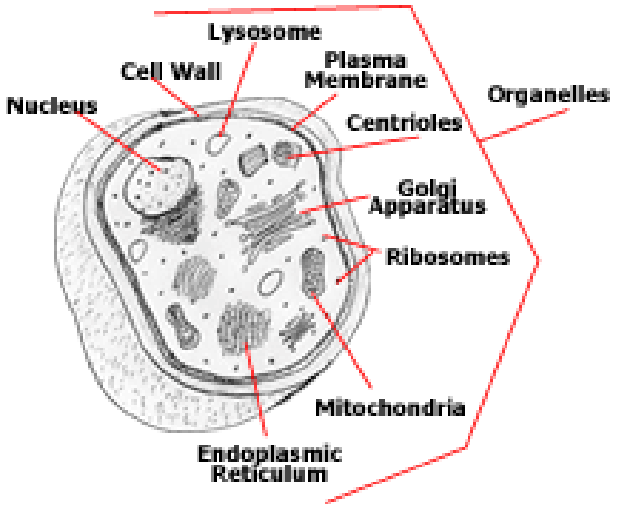
How fungicides work: “mode of action”

<u>Disruption of:</u>
Cell division
Cellular respiration
Cell wall synthesis
Cell membranes
Enzymes



Ø Single site and multiple site





Specimen Label

Dow AgroSciences™

Rally® 40WSP

Fungicide

®Trademark of Dow AgroSciences LLC

Group	3	FUNGICIDE

Active Ingredient	
myclobutanil: a-butyl-a-(4-chlorophenyl)-1H-1,2,4,triazole-1-propanenitrile	40%
Other Ingredients	60%
Total	100%

EPA Reg. No. 62719-410

Keep Out of Reach of Children

CAUTION

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. Refer to the label booklet under "Agricultural Use Requirements" in the Directions for Use section for information about this standard.

Refer to inside of label booklet for additional precautionary information including Directions for Use.

Notice: Read the entire label. Use only according to label directions. **Before using this product, read Warranty Disclaimer, Inherent Risks of Use, and Limitation of Remedies at end of label booklet. If terms are unacceptable, return at once unopened.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

Precautionary Statements

Hazards to Humans and Domestic Animals

CAUTION

Harmful If Swallowed • Causes Moderate Eye Irritation • Harmful If Absorbed Through Skin

Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves (Category A in EPA's Chemical-Resistant Category Selection Chart)
- Shoes plus socks

User Safety Requirements

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

Engineering Controls

When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d) (4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

Environmental Hazards

For terrestrial uses, do not apply directly to water or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters or rinsate. Do not apply when weather conditions favor drift or runoff from areas treated.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read all Directions for Use carefully before applying.

Do not apply this product in a way that will contact workers or other persons, either directly or through drift. Only protected handlers may be in the area during application. For any requirements specific to your state or tribe, consult the agency responsible for pesticide regulation.

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR Part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE)and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil or water, is:

- Coveralls
- Chemical-resistant gloves (Category A in EPA's chemical-Resistant Category Selection Chart)
- Shoes plus socks

Storage and Disposal

How do we check for coverage?


Water sensitive paper to check for coverage
06/09/2010 11:10

Summary

- Mildew disease requires 3 things to occur: host, pathogen and environmental conditions (70-85°F) for the pathogen to grow.
- PMI stations monitor the canopy temperature and calculate the risk of disease development, assuming the pathogen is present.
- Index is now available via UCIPM for 4 foothill sites: real time data publicly available for everyone. We can now see how PMI differs among those sites.
- Saving money: The index can be used by growers to adjust interval lengths and fungicide category choices. This may result in fewer sprays while maintaining quality.
- Rotation of FRAC number on fungicide (mode of action) is important to avoid resistance development.
- Experiments underway to develop new techniques to detect mildew (spore trapping) and to compare typical grower standard and station spray schedules, AND virtual networks (McGuire and Gubler).
- Based on my observations so far, 2014 may not be a big mildew year.

Acknowledgements

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