University of California-Cooperative Extension Agriculture Program Update

Lynn Wunderlich, UCCE Farm Advisor
Central Sierra Multi-County Partnership

El Dorado Board of Supervisors
October 20, 2015

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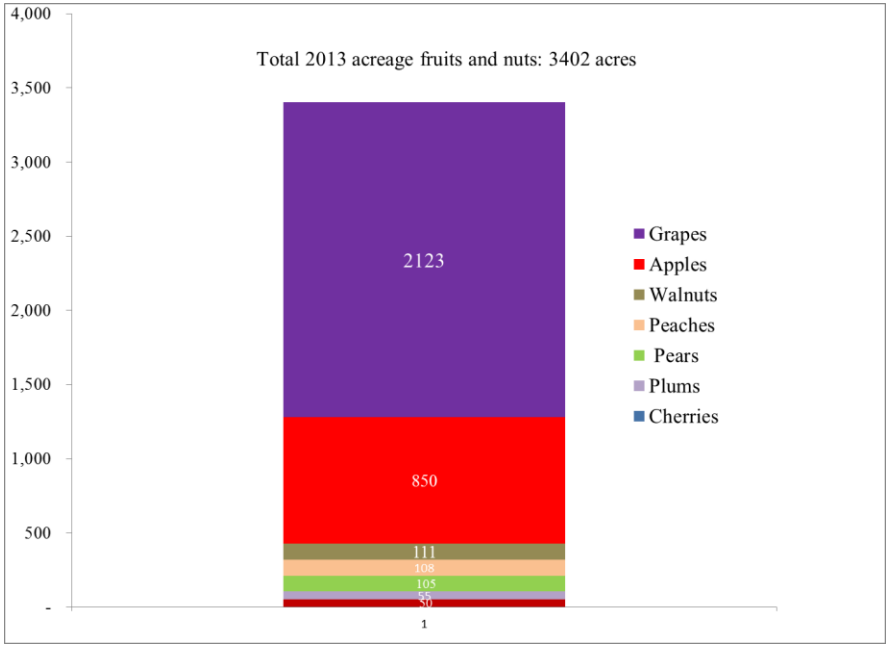
Agriculture and Natural Resources

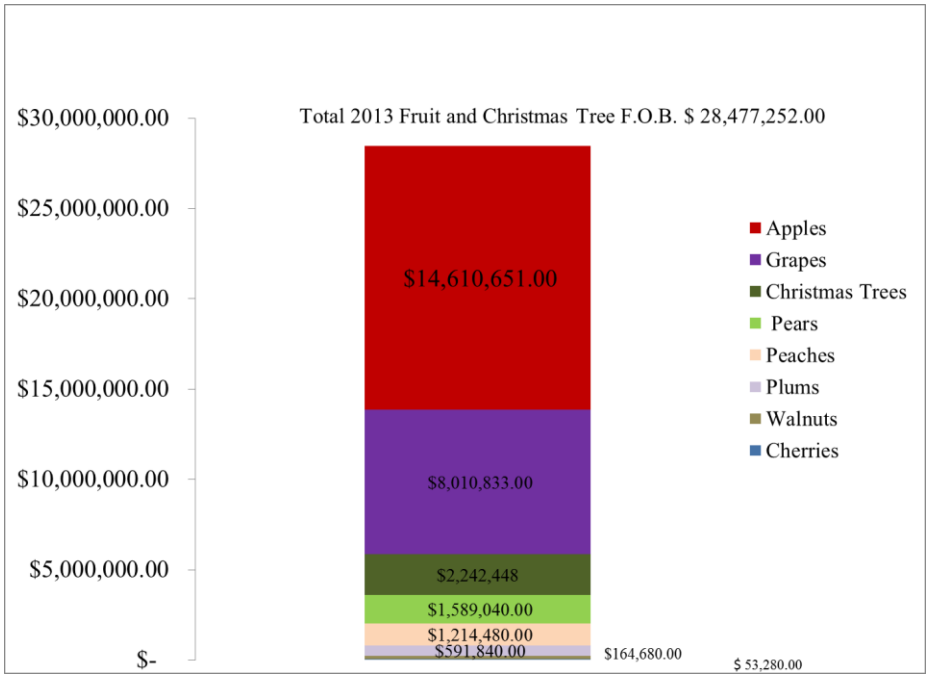
Agriculture in El Dorado County

source: 2013 EDC Agriculture Department Crop Report

Number of acres of EDC tree fruit and nut crops, 2013.



F.O.B. 2013 Value of EDC Fruit and Christmas Trees



Estimated number of growers I serve in El Dorado County:

368 Grape growers
168 Tree fruit growers
111 Christmas Tree growers

UC in El Dorado County

My program purpose

To meet the anticipated 21st century needs for enhancing **competitive and sustainable** farming systems in wine grape and tree fruit production in the Central Sierra multi-county partnership.

- Conduct and deliver relevant research information
  - Irrigation
  - Pests and Diseases
  - Economics and sustainability
  - Spray technology and pesticide safety
  - General Production practices
  - Diagnose problems
- Extend outreach broadly
  - Field days and annual meetings
  - Newsletters
  - Website http://cecentralsierra.ucanr.edu/
  - Face to face farm calls.
- Foster dialog with growers on current and future needs.
- Public service at National, State and Local levels.

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Issue: Water Security

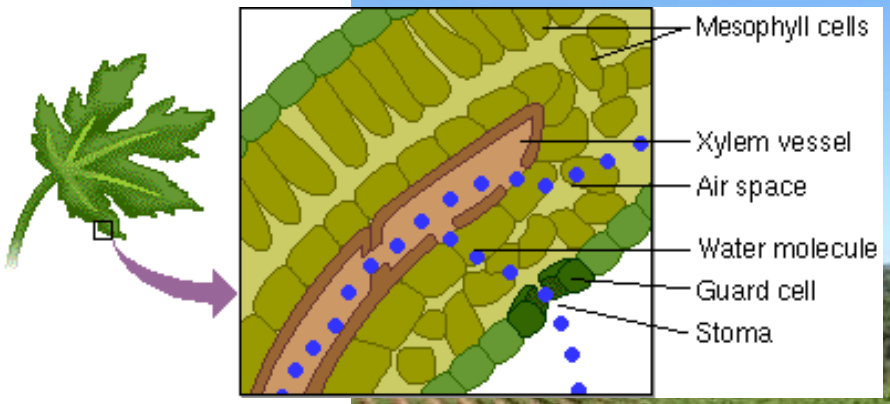
Research: Effect of slope and aspect on vine water use and stress

Collaborators: Growers, Daniele Zaccaria, UC Davis Irrigation Specialist, Ken Shackle, UC Plant Science Professor, Rick Snyder, UC Biometeorologist (Emeritus)

Goal: Improve irrigation management in sloped vineyards.


08/13/2015

Evapotranspiration (ET): Evaporation + Transpiration



Radiant energy is the *driving force* of ET

Radiation sinks:

R_n net radiation
G ground radiation
H sensible heat flux
Latent heat

Energy balance equation for actual ET:

$ET_a=(R_n-G-H)/2.45$

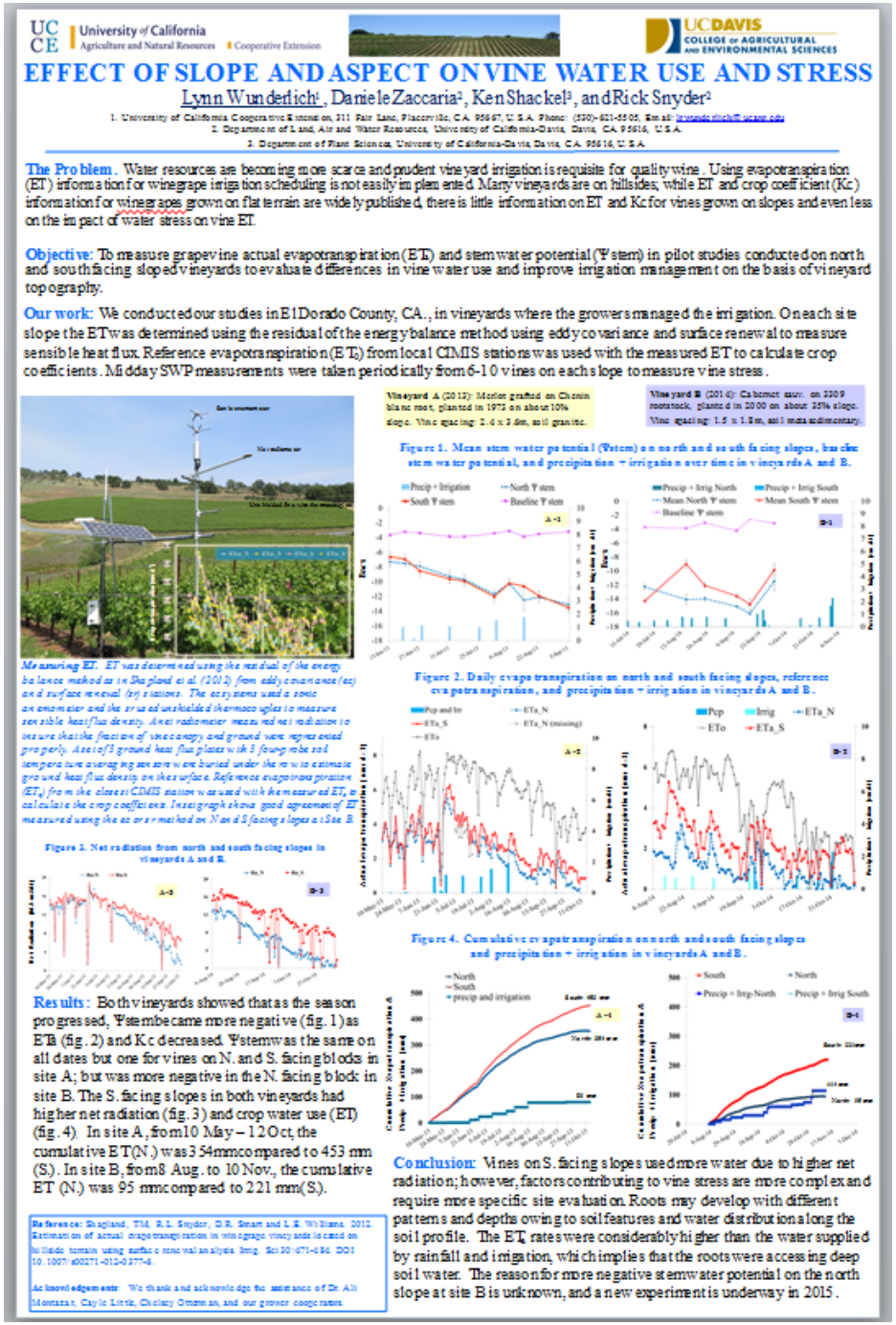
2.45 converts from energy flux in MJ $m^{-2}d^{-1}$ to mm d^{-1}

Mid-day pressure chamber measurements: the vine tells you if it is stressed for water.

Mid-day **STEM** water potential	
less than -7 bars	no stress
-7 to -9 bars	mild stress
-9 to -11 bars	moderate stress
-11 to -13 bars	high stress
above –13 bars	severe stress

Our conclusions

- The vines on the south facing slopes used more water due to higher net radiation than vines on the north facing slopes.
- STRESS is more complicated: need to investigate the site specific conditions.
- 2015 research results being evaluated.



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UCDAVIS COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

EFFECT OF SLOPE AND ASPECT ON VINE WATER USE AND STRESS

Lynn Wunderlich[1], Daniele Zaccaria[2], Ken Shackel[3], and Rick Snyder[2]

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The Problem. Water resources are becoming more scarce and prudent vineyard irrigation is requisite for quality wine. Using evapotranspiration (ET) information for winegrape irrigation scheduling is not easily implemented. Many vineyards are on hillsides, while ET and crop coefficient (Kc) information for winegrapes grown on flat terrain are widely published, there is little information on ET and Kc for vines grown on slopes and even less on the impact of water stress on vine ET.

Objective: To measure grapevine actual evapotranspiration (ET) and stem water potential (Ψstem) in pilot studies conducted on north and south facing sloped vineyards to evaluate differences in vine water use and improve irrigation management on the basis of vineyard topography.

Our work: We conducted our studies in El Dorado County, CA., in vineyards where the growers managed the irrigation. On each site slope the ET was determined using the residual of the energy balance method using eddy covariance and surface renewal to measure sensible heat flux. Reference evapotranspiration (ET_o) from local CIMIS stations was used with the measured ET to calculate crop coefficients. Midday SWP measurements were taken periodically from 6-10 vines on each slope to measure vine stress.

Measuring ET. ET was determined using the residual of the energy balance method as in Shapland et al. (2012) from eddy covariance (ec) and surface renewal (sr) stations. The ec system used a sonic anemometer and the sr used unshielded thermocouples to measure sensible heat flux density. A net radiometer measured net radiation to ensure that the fraction of vine canopy and ground were represented properly. A set of 3 ground heat flux plates with 5 found to be a good temperature averaging array were buried under the row to estimate ground heat flux density at the surface. Reference evapotranspiration (ET_o) from the closest CIMIS station was used with the measured ET_c to calculate the crop coefficients. The graph shows good agreement of ET measured using the ec or sr method on North/East facing slopes at site B.

Vineyard A (2012): Merlot grafted on Chenin blanc root, planted in 1972 on about 10% slope. Vine spacing: 2.4 x 3.6m, soil granitic.

Vineyard B (2014): Cabernet sauv. on 3309 rootstock, planted in 2000 on about 35% slope. Vine spacing: 1.5 x 1.8m, soil meta-sedimentary.

Figure 1. Mean stem water potential (Ψstem) on north and south facing slopes, baseline stem water potential, and precipitation + irrigation over time in vineyards A and B.

Figure 2. Daily evapotranspiration on north and south facing slopes, reference evapotranspiration, and precipitation + irrigation in vineyards A and B.

Figure 3. Net radiation from north and south facing slopes in vineyards A and B.

Figure 4. Cumulative evapotranspiration on north and south facing slopes and precipitation + irrigation in vineyards A and B.

Results: Both vineyards showed that as the season progressed, Ψstem became more negative (fig. 1) as ETa (fig. 2) and Kc decreased. Ψstem was the same on all dates but one for vines on N. and S. facing blocks in site A; but was more negative in the N. facing block in site B. The S. facing slopes in both vineyards had higher net radiation (fig. 3) and crop water use (ET) (fig. 4). In site A, from 10 May – 12 Oct, the cumulative ET (N.) was 354 mm compared to 453 mm (S.). In site B, from 8 Aug. to 10 Nov., the cumulative ET (N.) was 95 mm compared to 221 mm (S.).

Conclusion: Vines on S. facing slopes used more water due to higher net radiation; however, factors contributing to vine stress are more complex and require more specific site evaluation. Roots may develop with different patterns and depths owing to soil features and water distribution along the soil profile. The ET rates were considerably higher than the water supplied by rainfall and irrigation, which implies that the roots were accessing deep soil water. The reason for more negative stem water potential on the north slope at site B is unknown, and a new experiment is underway in 2015.

References: Shapland, T.M., R.L. Snyder, D.R. Smart and L.E. Williams. 2012. Estimation of actual evapotranspiration in winegrape vineyards located on hillside terrains using surface renewal analysis. Irrig. Sci 30:471-484. DOI 10.1007/s00271-012-0377-6.

Acknowledgements: We thank and acknowledge the assistance of Dr. Ali Montazar, Gayle Little, Chelsey Ortmann, and our grower cooperators.

Results selected for presentation at the "Group of International Experts for Viticulture Cooperation" meeting in Gruissan, France. June 2015.

Travel award from Sustainable Agriculture Research and Education Program.

Issue: Endemic and Invasive Pests and Diseases

Research/Outreach: Powdery mildew index stations for the foothills.

Collaborators: Grape grower groups, FFF, UCIPM, Dr. Doug Gubler, UCD Plant Pathologist

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

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

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

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

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

2015: Calaveras County powdery mildew station. Data online at UCIPM

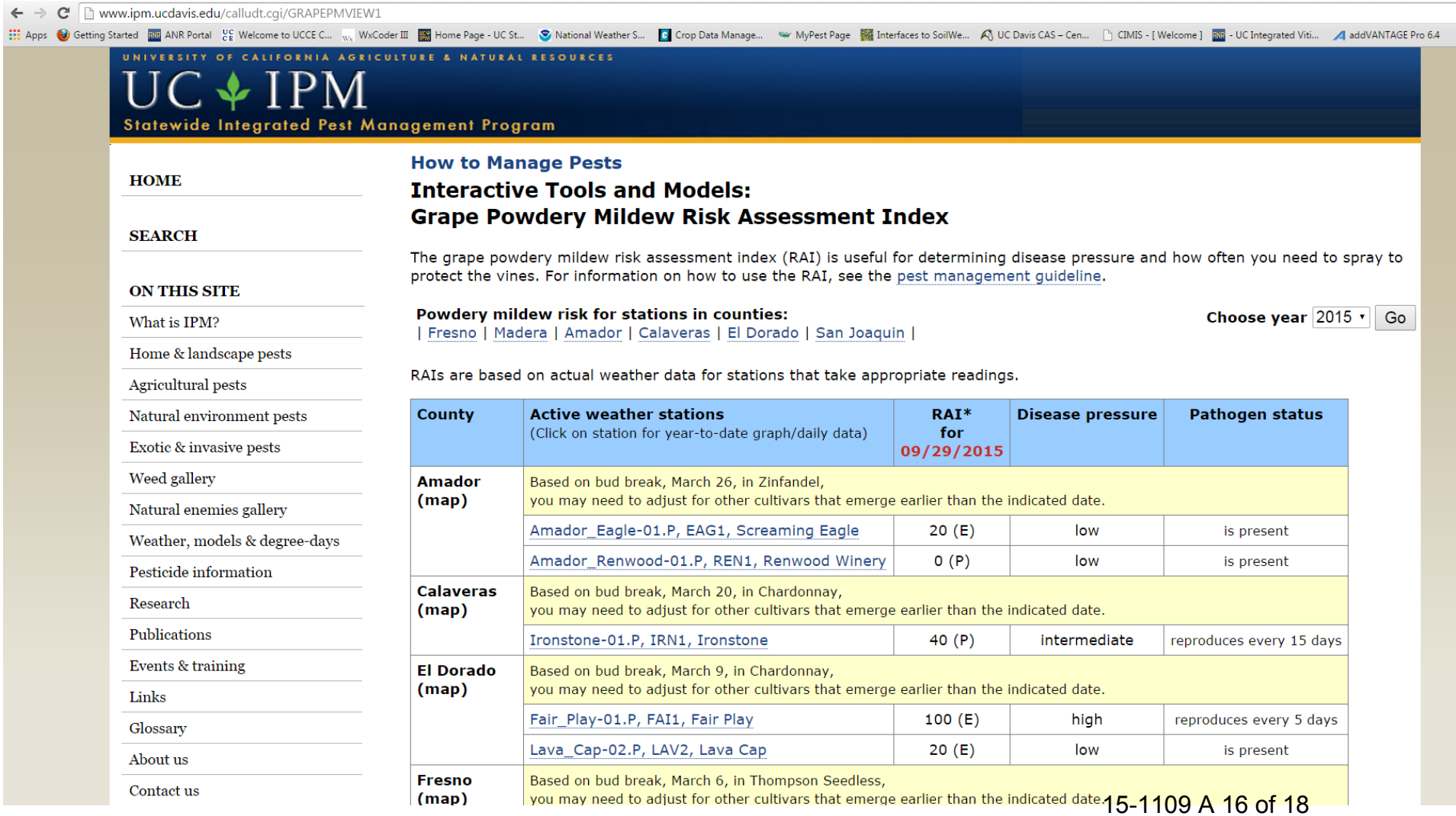
UNIVERSITY OF CALIFORNIA AGRICULTURE & NATURAL RESOURCES
UC IPM Online
Statewide Integrated Pest Management Program

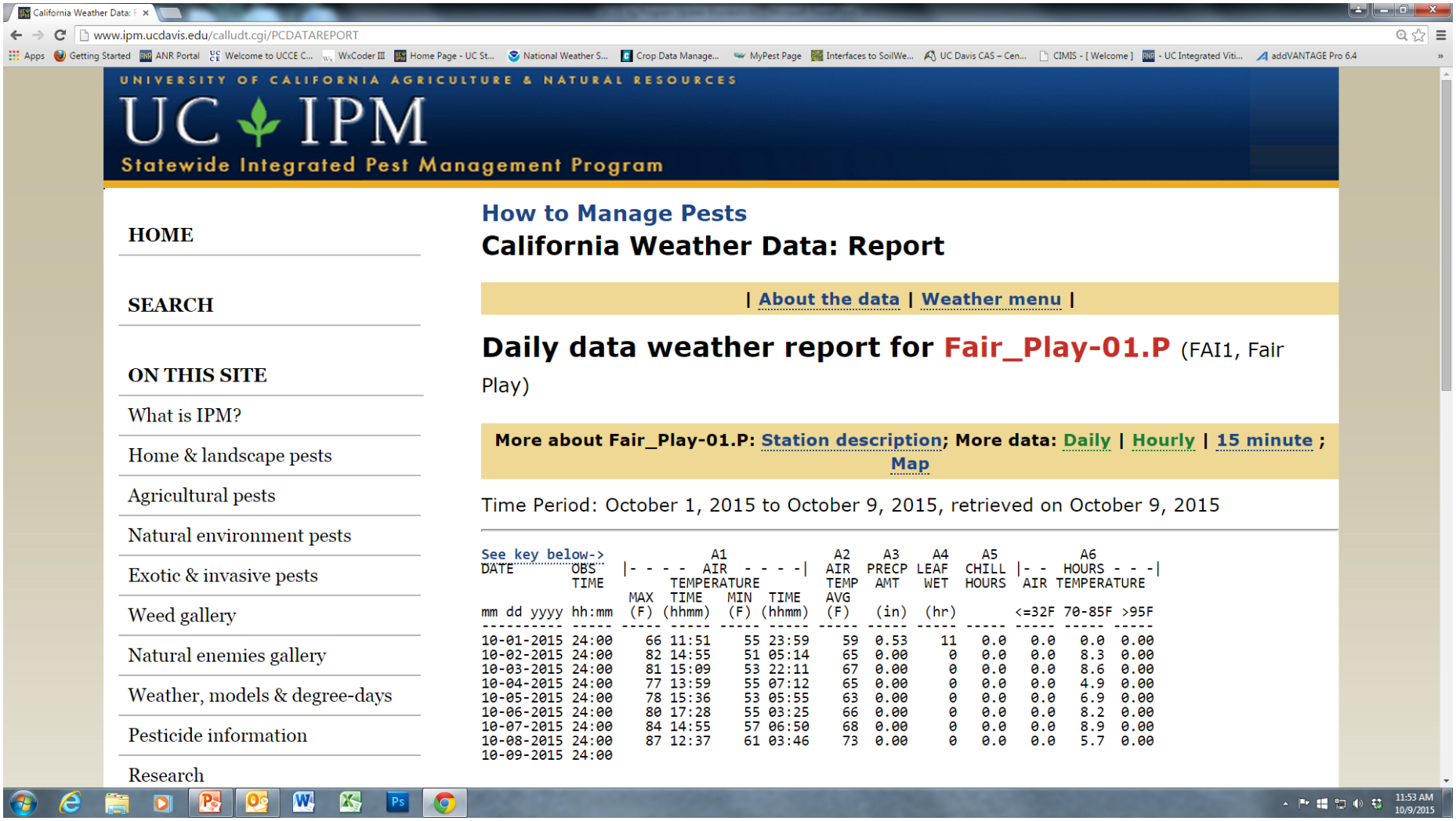
Calaveras Wine Alliance

How to access station information?

http://www.ipm.ucdavis.edu/

Available free of charge to everyone.




California Weather Data:
www.ipm.ucdavis.edu/calludt.cgi/PCDATAREPORT
UNIVERSITY OF CALIFORNIA AGRICULTURE & NATURAL RESOURCES
UC IPM
Statewide Integrated Pest Management Program
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What is IPM?
Home & landscape pests
Agricultural pests
Natural environment pests
Exotic & invasive pests
Weed gallery
Natural enemies gallery
Weather, models & degree-days
Pesticide information
Research
How to Manage Pests
California Weather Data: Report
| About the data | Weather menu |
Daily data weather report for Fair_Play-01.P (FAI1, Fair Play)
More about Fair_Play-01.P: Station description; More data: Daily | Hourly | 15 minute ; Map
Time Period: October 1, 2015 to October 9, 2015, retrieved on October 9, 2015
See key below->
DATE OBS TIME
A1 AIR TEMPERATURE MAX (F) TIME (hhmm) MIN (F) TIME (hhmm)
A2 AIR TEMP AVG (F)
A3 PRECP AMT (in)
A4 LEAF WET (hr)
A5 CHILL HOURS
A6 HOURS AIR TEMPERATURE <=32F 70-85F >95F
mm dd yyyy hh:mm
10-01-2015 24:00 66 11:51 55 23:59 59 0.53 11 0.0 0.0 0.0 0.00
10-02-2015 24:00 82 14:55 51 05:14 65 0.00 0 0.0 0.0 8.3 0.00
10-03-2015 24:00 81 15:09 53 22:11 67 0.00 0 0.0 0.0 8.6 0.00
10-04-2015 24:00 77 13:59 55 07:12 65 0.00 0 0.0 0.0 4.9 0.00
10-05-2015 24:00 78 15:36 53 05:55 63 0.00 0 0.0 0.0 6.9 0.00
10-06-2015 24:00 80 17:28 55 03:25 66 0.00 0 0.0 0.0 8.2 0.00
10-07-2015 24:00 84 14:55 57 06:50 68 0.00 0 0.0 0.0 8.9 0.00
10-08-2015 24:00 87 12:37 61 03:46 73 0.00 0 0.0 0.0 5.7 0.00
10-09-2015 24:00
11:53 AM
10/9/2015

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