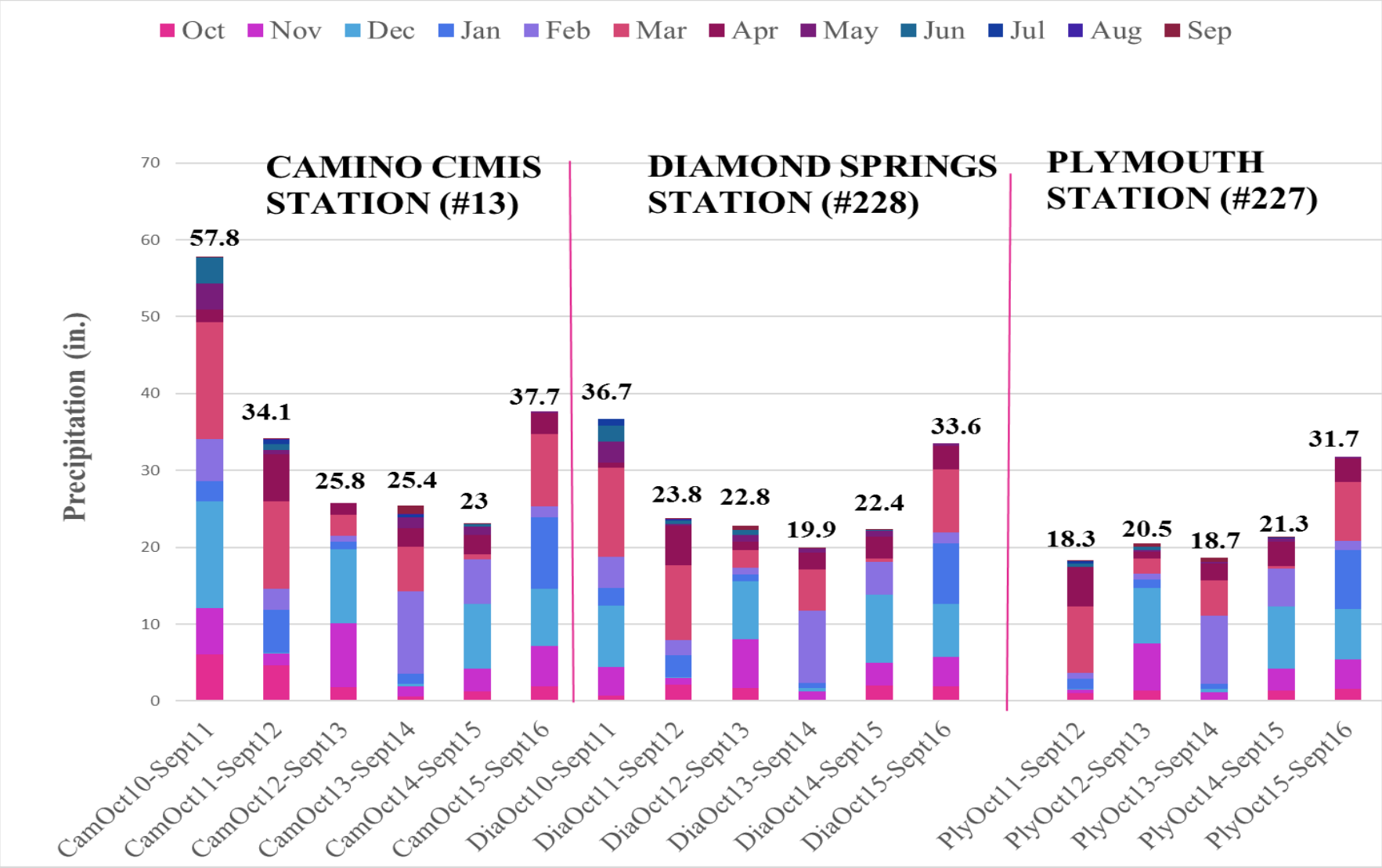




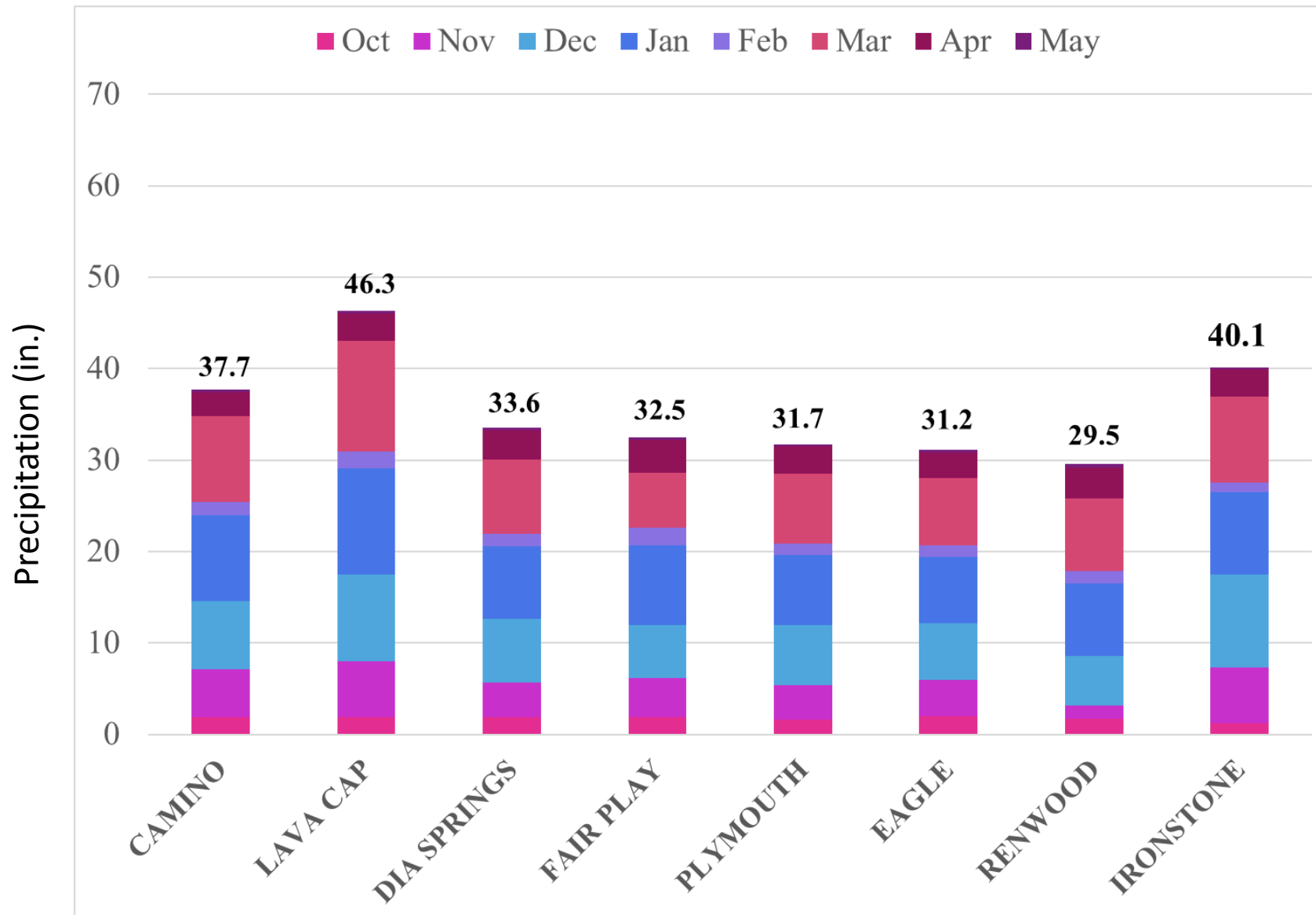
**Welcome to Foothill Grape Day 2016!**  
**“Healthy Vines, Fine Wines”**

# CIMIS station recorded precipitation by month for the hydro year (Oct to Sept).

Updated May 9, 2016.



# Foothill station recorded precipitation, by month, Oct. 1-May 8, 2016.




← → ↻ | cecentralsierra.ucanr.edu/Agriculture/Viticulture/Grape\_Powdery\_Mildew\_Stations\_UP/ | 🔍 ☆ ☰

Apps | Getting Started | ANR | ANR Portal | UC | Welcome to UCCE | WxCoder III | Home Page - UC State | National Weather Ser | Crop Data Manage | MyPest Page | Interfaces to SoilWeb | UC Davis CAS - Centr | CIMIS - [ Welcome ] | ANR - UC Integrated Viticu | addVANTAGE Pro 6.4

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  - Growing Wine Grapes
  - Cover Cropping
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  - Grapevine Nutrition
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  - **Powdery Mildew Stations**
    - Spring 2016 Index
  - History of Wine Grapes in the Foothills

## Grape Powdery Mildew Stations

As of Spring 2016, we now have six grape powdery mildew stations running in the foothills!

View the current index for the foothill stations now at the [UC IPM website Grape Powdery Mildew Risk Assessment Index](#). View directions to get the powdery mildew index online [4 steps to pm online](#).

You can also access the guidelines for grape powdery mildew, including the index table at the [UC IPM Grape Pest Management web page](#).

- For more information on the powdery mildew index view the [Using the Powdery Mildew Index Presentation](#).
- Need more information on management and control? See the [Powdery mildew webpage](#).
- The [Annual Efficacy Bulletin](#) has up-to-date information: Efficacy and timing of fungicides, bactericides, and biologicals for deciduous tree fruit, nut, strawberry and vine crops.

Note: the El Dorado Gold Hill station sensor is not yet placed in the grape canopy. The temperature is "ambient" until the vineyard is planted and the sensor can be moved.

Thank you to the following station sponsors:  
Calaveras Wine Alliance-Ca. Specialty Crop grant  
El Dorado Wine Grape Growers Association  
Fish Friendly Farming-Sierra Conservancy grant  
Pat Rohan-Screaming Eagle  
Renwood Winery  
Saureel Vineyards

Station website is supported by UCCE and UCIPM. Stations are managed via Western Weather.



Amador Eagle



Amador Renwood



El Dorado Lava Cap



The screenshot shows the UC Central Sierra website. At the top, there is a navigation bar with links for 'SHARE', 'EMAIL', 'PRINT', and 'SITE MAP', along with a search box. Below this is the UC Central Sierra logo and a large landscape image of a vineyard. A secondary navigation bar contains links for 'About Us', 'Staff', 'Room Reservation', 'Calendar', 'Join our Mailing List', 'ANR Publications', 'Jobs', and 'Newsletters'. On the left side, there is a sidebar menu with a 'Home' button and a list of categories under 'Agriculture', with 'Foothill Fodder' selected. The main content area is titled 'Foothill Fodder' and features five article teasers, each with a title, a short paragraph of text, a small image, and a 'Continue Reading' link.

**UC Central Sierra**  
University of California Cooperative Extension

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## Foothill Fodder

### To Spray or Not to Spray: Using the Powdery Mildew Index


Hi Fodder Family! What a busy spring, heh? For those at the trough who are of the grape grower kind, this spring has brought questions concerning what the heck is going on with powdery mildew. To assist vineyard managers, I took a look at each of the 5 foothill mildew station's data and discuss it in a paper you will find linked here. Recent rains, followed by fluctuating cool and warm temperatures, have got some managers spraying while others are waiting anxiously. Powdery...



[Continue Reading](#)

### Maintain Your Irrigation System to Improve Performance


Greetings Fodder Followers! It won't be long before our foothill soil profile dries up and we start to irrigate. Are you ready for the season? Because when it comes to foothill water-and the irrigation systems that transport it-a little flushing can go a long way. Iron, bacteria, sediment, and precipitates can cause irrigation systems to become clogged-leading to major headaches when it's time to turn on your system. Routine irrigation system maintenance, including flushing, can...



[Continue Reading](#)

### Managing Your Cover Crop Now to Prevent Frost Injury, Soil Water Loss


Hi Fodder Followers! Spring has sprung! And as many of you know, cover crops provide a wealth of benefits for foothill farms- having some type of "cover" is essential to prevent soil erosion on our foothill slopes as we discussed in the last post. The most important thing to consider NOW about your cover crop is managing it in a timely manner-either by disking it in or mowing it down (made difficult with wet soils, I know)-as soon as possible. Why the rush? You might ask. When...



[Continue Reading](#)

### Tips to Conserve a Valuable Resource: Your Soil


Greetings Fodder Folks! With the heavy deluge of rain we've been experiencing, some of you may have noticed signs of soil erosion from our precious foothill slopes. While some conservation techniques require pre-planning and assistance, it is not too late to implement some of these soil conservation practices. The first step is to understand your soil and it's erodibility, described here by UC Soil Scientist Toby O'Geen. Here are some tips for preventing the loss of soil,...



[Continue Reading](#)

### How a Bag of Red Leaves Led to the Red Blotch Scoop.

The Red Blotch webinar is available for viewing now on YouTube. Hello Fodder Followers! My "Bahder Discovers Red Blotch Vector!" post has





# SAVE the DATES: Prof. Vittorino Novello visits Aug. 1-4



President of the Master ‘Viticulture and Enology Sciences’, University of Turin, ITALY;

Member of the European Consortium EMaVE (European Master of Viticulture and Enology)

President of the OIV Working Group “Management and innovation of viticultural techniques”

Author or co-Author of 191 viticulture publications

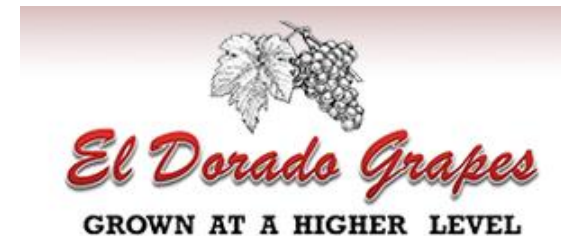
**EVENING ARRIVAL RECEPTION: Monday, Aug. 1, location TBD**

**MORNING VINEYARD TOURS: Aug. 2: El Dorado County; Aug. 3: Amador County**

**EVENING SEMINAR and FAREWELL RECEPTION: Aug. 4, Terra D’Oro** (all wineries invited to bring Italian wines to taste)



Organized and Sponsored by UCCE,  
the Amador Winegrowers Association and the  
El Dorado Wine Grape Growers Association



# Effect of slope and aspect on vine water use and stress: **How much water do vines REALLY use?**



Lynn Wunderlich, Daniele Zaccaria, Ken Shackel and Rick Snyder

# Vine water use factors

## ➤ Available water

- Precipitation
- Irrigation
- Deep soil water storage

## ➤ Soil features

- ✓ texture, depth,  
rock –Plant Avail. Water

## ➤ Microclimate

- ✓ Temp, RH, Wind
- ✓ **Net radiation**

## ➤ Root growth and Rootstock

## ➤ Age

## ➤ Variety

## ➤ Canopy size (canopy management)

## ➤ Cover crop

## ➤ Vine health

***Know Your Site!!***



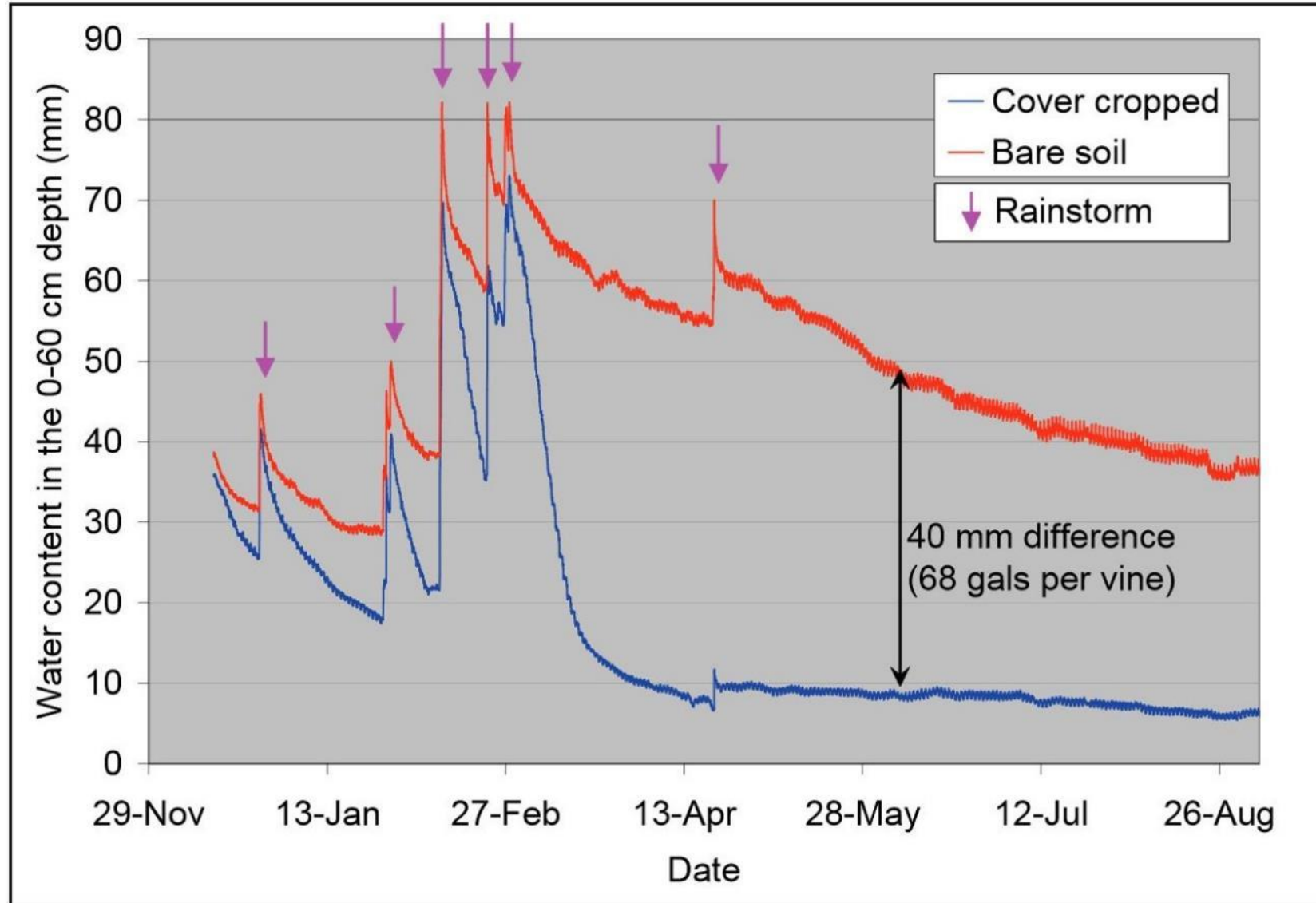
Degree of  
slope and  
aspect?



## How much water do cover crops use?

Soil water content (mm) at 0-60 cm. deep: Cover cropped vs. Bare soil.

Courtesy of Mark Battany, UCCE San Luis Obispo/Santa Barbara Counties.



# Tools growers have to make irrigation decisions

- **Measure soil**

- Tensiometers
- Electrical resistance blocks
- Neutron probe
- Di-electric sensors
- Shovel

- **Measure (or observe) plant**

- Tendrils, shoot tip growth
- Leaf water potential  $\Psi_{\text{leaf}}$
- **Stem water potential  $\Psi_{\text{stem}}$**
- Stomatal conductance
- Sap flow-Dendrometers
- Infrared (IR) canopy measurements

- **Measure climate in order to estimate evapotranspiration (ET)**

-ET<sub>c</sub> (winegrapes, RDI) calculated from ET<sub>o</sub> and a K<sub>c</sub>, with estimated shade factor and RDI factor

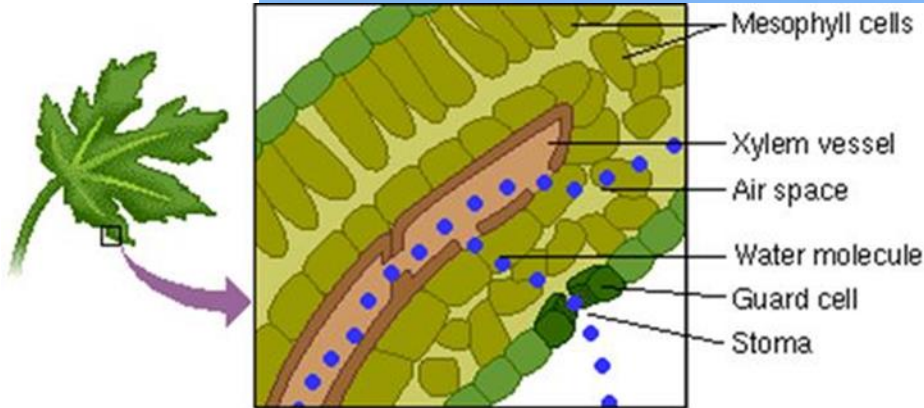
- **Measure radiation and calculate ET by energy-balance:**

- **Eddy covariance**

- Surface renewal

- “modified” surface renewal (TULE TECH)

# Evapotranspiration (ET): Evaporation + Transpiration



ET: how much water a parcel of land  
“uses”

**Crop transpiration**

Soil evaporation

Weedy groundcover/cover  
crop transpiration



# Our premise: Radiant energy is the *driving force* of ET (when water not limited)



Radiation sinks we can measure:

$R_n$  net radiation

$G$  ground radiation

$H$  sensible heat flux



**Energy balance equation for actual ET:**

Latent heat =  $R_n - G - H$

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

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

**Eddy covariance method** uses sonic anemometer to measure  $H$ , gold standard, requires fairly large uniform fields, \$\$\$, complex.

**Surface renewal method** uses a fine wire thermocouple to measure  $H$ , and a calibration factor, more affordable.

# Shapland et. al. (2012) published research measuring greater $ET_a$ on South facing slopes

Irrig Sci (2012) 30:471–484  
DOI 10.1007/s00271-012-0377-6

---

ORIGINAL PAPER

## **Estimation of actual evapotranspiration in winegrape vineyards located on hillside terrain using surface renewal analysis**

**T. M. Shapland · R. L. Snyder · D. R. Smart ·  
L. E. Williams**

Received: 29 July 2011 / Accepted: 2 July 2012 / Published online: 1 September 2012  
© Springer-Verlag 2012

IRRIGATION MANAGEMENT  
FOR THE  
SIERRA NEVADA FOOTHILLS  
OF CALIFORNIA

by

Dick Bethell, Elias Ferreres, Richard Buchner and Ronald Mansfield

PREPARED FOR  
UNITED STATES BUREAU OF RECLAMATION

JUNE 1981

Elevation	Inches of Water Required Per Season			
	South Slope		North Slope	
	Covercrop	No Cover	Covercrop	No Cover
500-1000	----- No Data Collected -----			
1000-1500	31	22	26	19
1500-2000	26	18	21	14
2000-2500	22	15	17	12
2500-3000	20	13	15	10
3000-3500	15	10	12	7
3500-4000	----- No Data Collected -----			

Table 6. Estimates of vineyard water use as they relate to the site factors of elevation, slope direction and covercrop practice.

# Foothill Studies 2013-present

**Objective: to measure  $ET_a$  and  $\Psi_{stem}$  in north (N) and south (S) facing sloped vineyards to evaluate differences in vine water use and vine stress.**





Installed ET stations on N and S facing slopes where:

- ✓ clone
  - ✓ rootstock
  - ✓ spacing
  - ✓ planting date
  - ✓ trellis system
  - ✓ cover crop
- was the same.

Irrigations were left to grower-cooperators.  
Water meters were installed (2015) to track.

Nearest CIMIS station provided precip.,  $ET_o$ .

$\Psi_{stem}$  were taken periodically.



# Using a pressure chamber to measure vine stress (Stem Water Potential)





# Are the vines stressed?

**2013-2015: Mid-day stem water potential measurements.**

**2015: Shoot tip ratings and shoot length measurements.**

Mid-day <b>LEAF</b> water potential	
less than -10 bars	no stress
-10 to -12 bars	mild stress
-12 to -14 bars	moderate stress
-14 to -16 bars	high stress
above -16 bars	severe stress



Mid-day <b>STEM</b> 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



$\Psi = -12.0$ , North slope

08/13/2015



$\Psi = -16.1$  North slope

08/13/2015

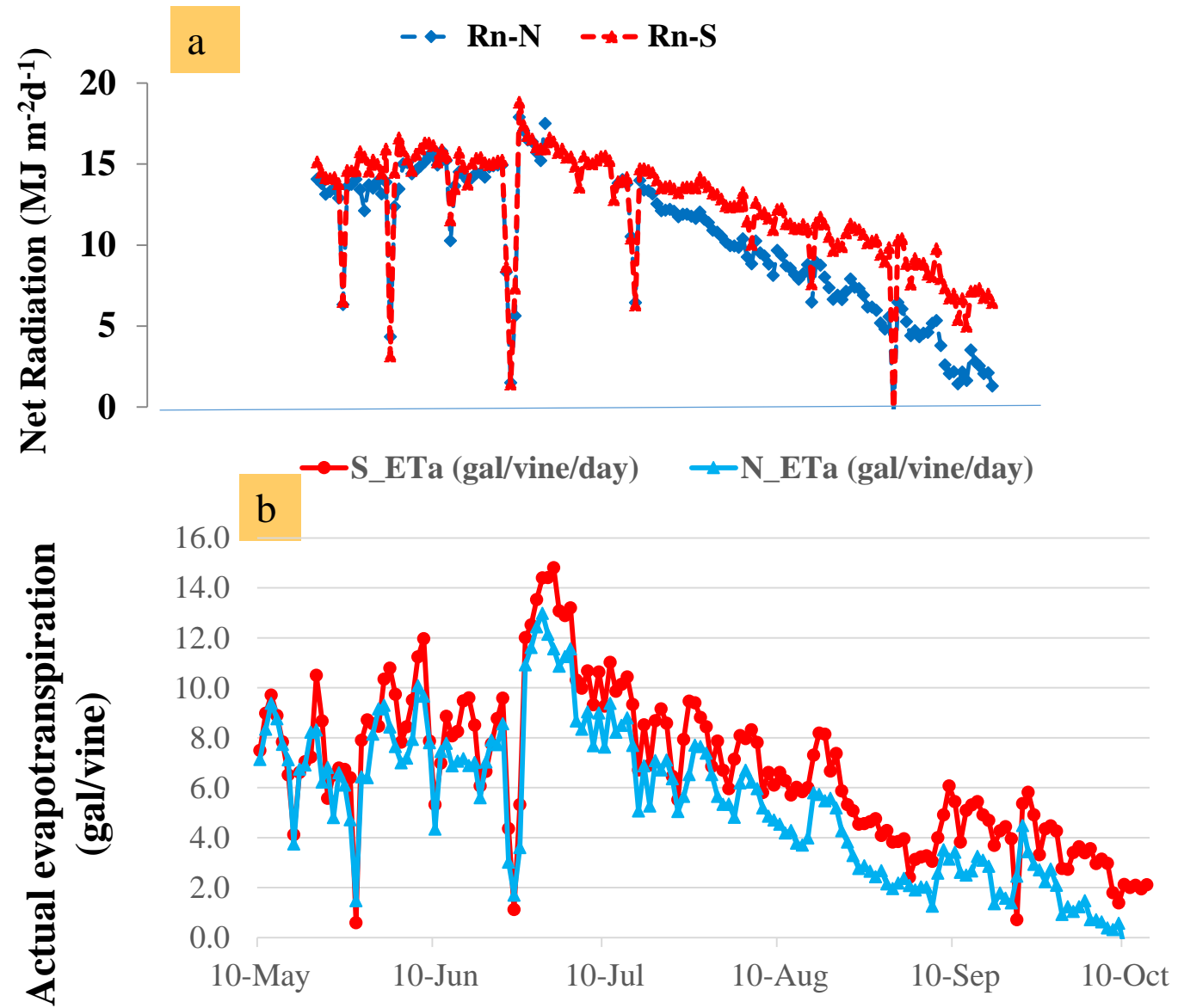
# 2013 Vineyard: Site A

- Merlot on Chenin blanc root, 8 x 12 spacing (454 vines/ac), bilateral cordon
  - Planted in 1973; vine health?
  - Slope approx. N 8% and S 14.4%
  - Auberry soil series-Granitic, typically deep
  - CIMIS station Diamond Springs # 228 on site
- 6 irrigations applied: 179 gallons per vine for the season (2.99 ac-in). 6/19-8/15
- Neutron probe on site.
  - 1.6 inch precip. May 10 – Oct 13

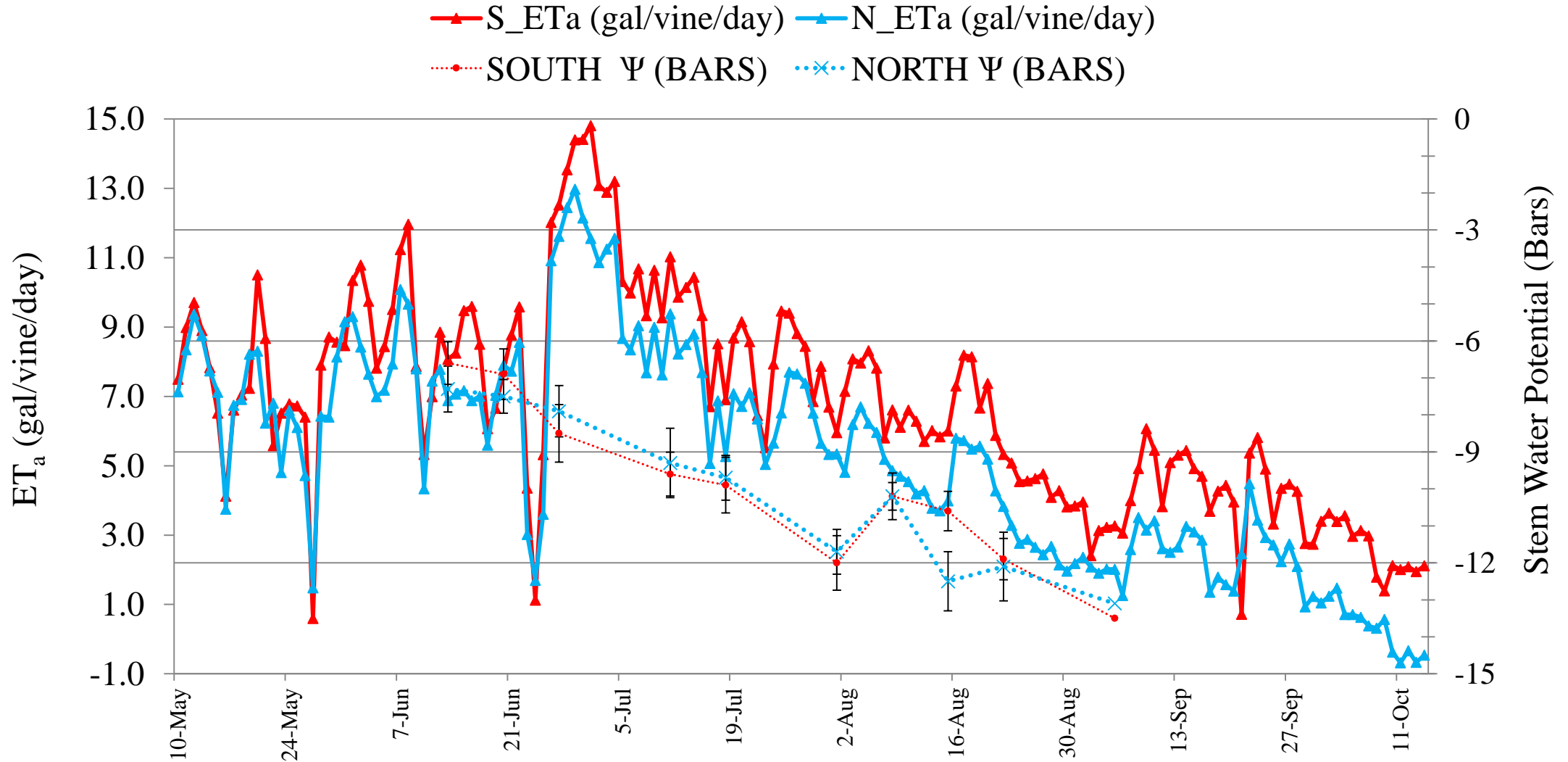


**THANK YOU To Our GROWER-COOPERATORS**

# Net radiation (a) and actual evapotranspiration (b) on North (N) and South (S) facing slopes: site A (2013).

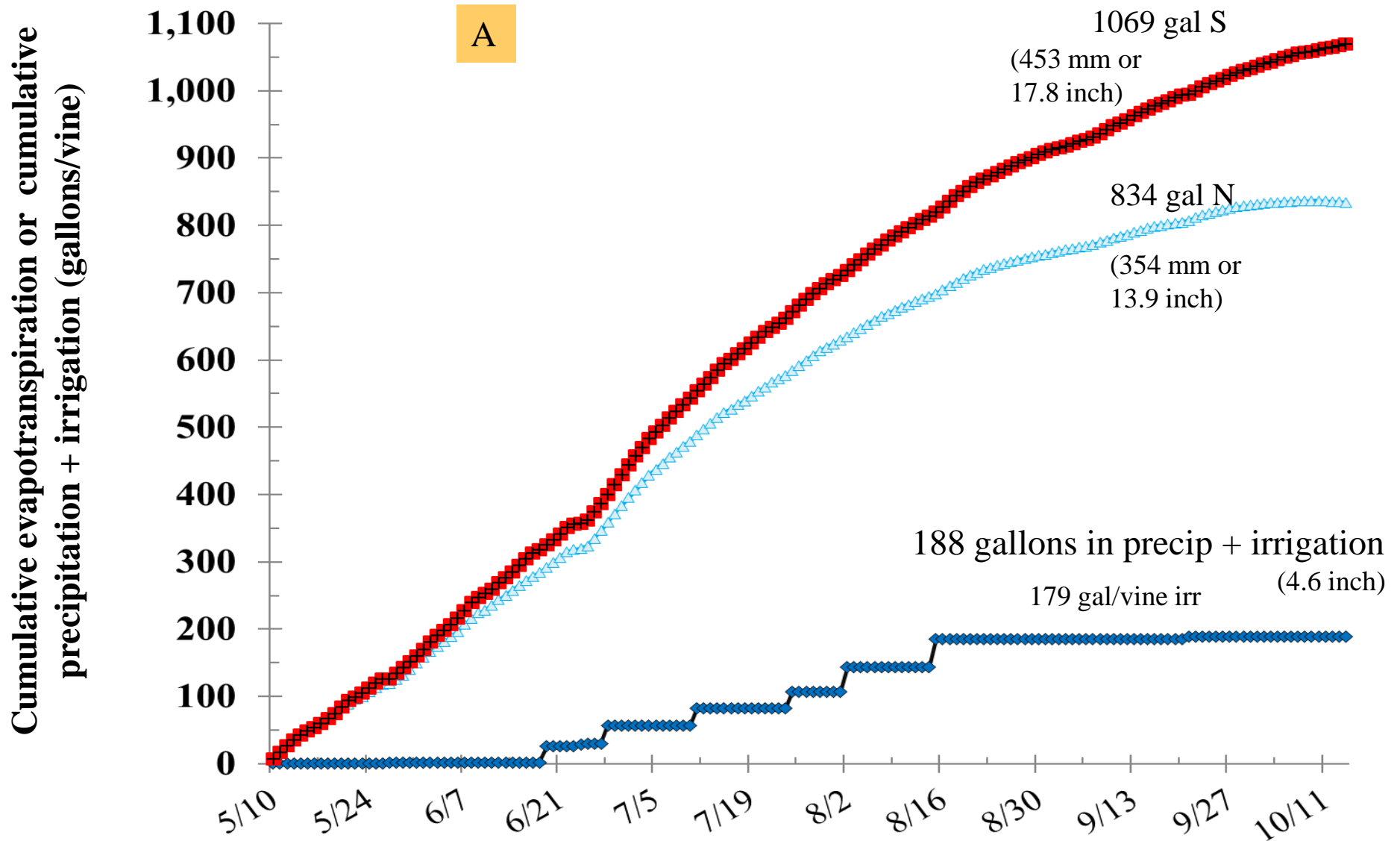


# Actual vine water use, ET a (gal/vine/day) and average vine stress (bars). Vineyard A, 2013.





## 2013 Vineyard A: Cumulative evapotranspiration (C-ET) per vine on North (N) and South (S) facing slopes, compared to cumulative precipitation + applied irrigation (CPI) per vine.



http://casoilresource.lawr.ucdavis.edu/soilweb-apps

SoilWeb: An Online Soil S... x

casoilresource.lawr.ucdavis.edu/gmap/

Apps Getting Started ANR Portal Welcome to UCCE Ce... WxCoder III Home Page - UC Stat... National Weather Ser... Crop Data Managem... MyPest Page Interfaces to SoilWeb UC Davis CAS - Centr...

SoilWeb

Map Unit Name: **Auberry rocky coarse sandy loam, 5 to 15 percent slopes** Symbol: **AsC**  
Component Name: **Auberry**  
Component Key: 10790020  
[Soil Data Explorer](#) | [Series Extent Explorer](#)  
[Official Series Description](#)

Soil Profiles

Typical Profile >

Org. Matter Clay  
Sand K<sub>sat</sub>  
pH K<sub>r</sub> Factor  
EC SAR  
CaCO<sub>3</sub> Gypsum  
CEC @ pH7  
Linear Ext.

A1	0 cm
A3	18 cm
B1t	30 cm
B2t	41 cm
B3	89 cm
Cr	107 cm
	152 cm

Soil Taxonomy  
Land Classification  
Hydraulic and Erosion Ratings  
Soil Suitability Ratings

# 2014 and 2015 Vineyard: Site B

- Cabernet sauvignon on 3309, 5 x 6 spacing (1452 vines/ac), VSP trellis
- Planted in 2000
- Slope approx. 18%
- Auburn soil series-Metasedimentary, typically variable in depth
- CIMIS station Auburn #195

2015: April 8 ET stations installed.

Water meters installed in irrigation lines on each slope.

14 irrigations applied (April 11- Sept. 14):

North: ave. 99 gal/vine

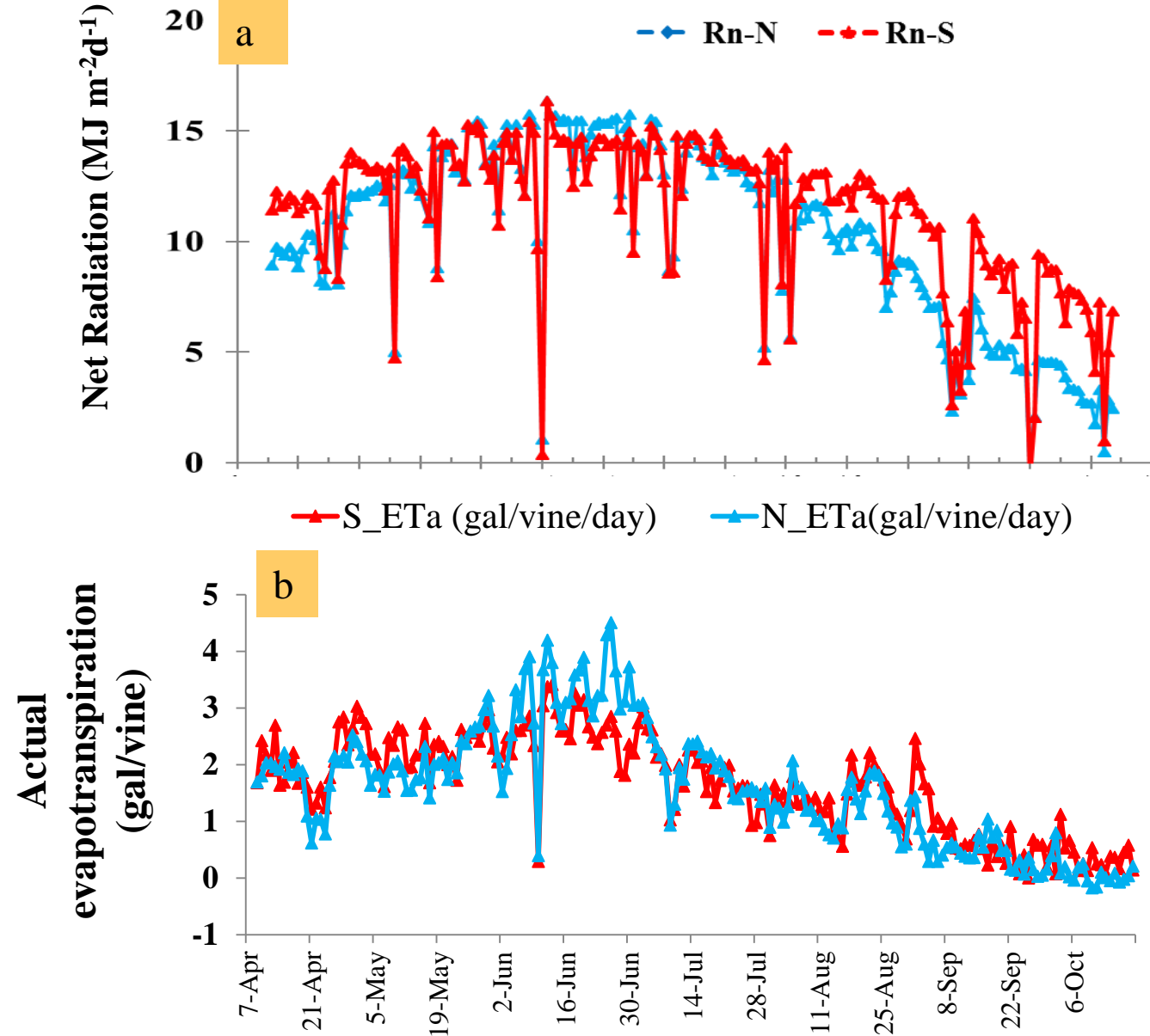
South: ave.76 gallons/vine

3.57 in precip. April 1-Oct. 19.

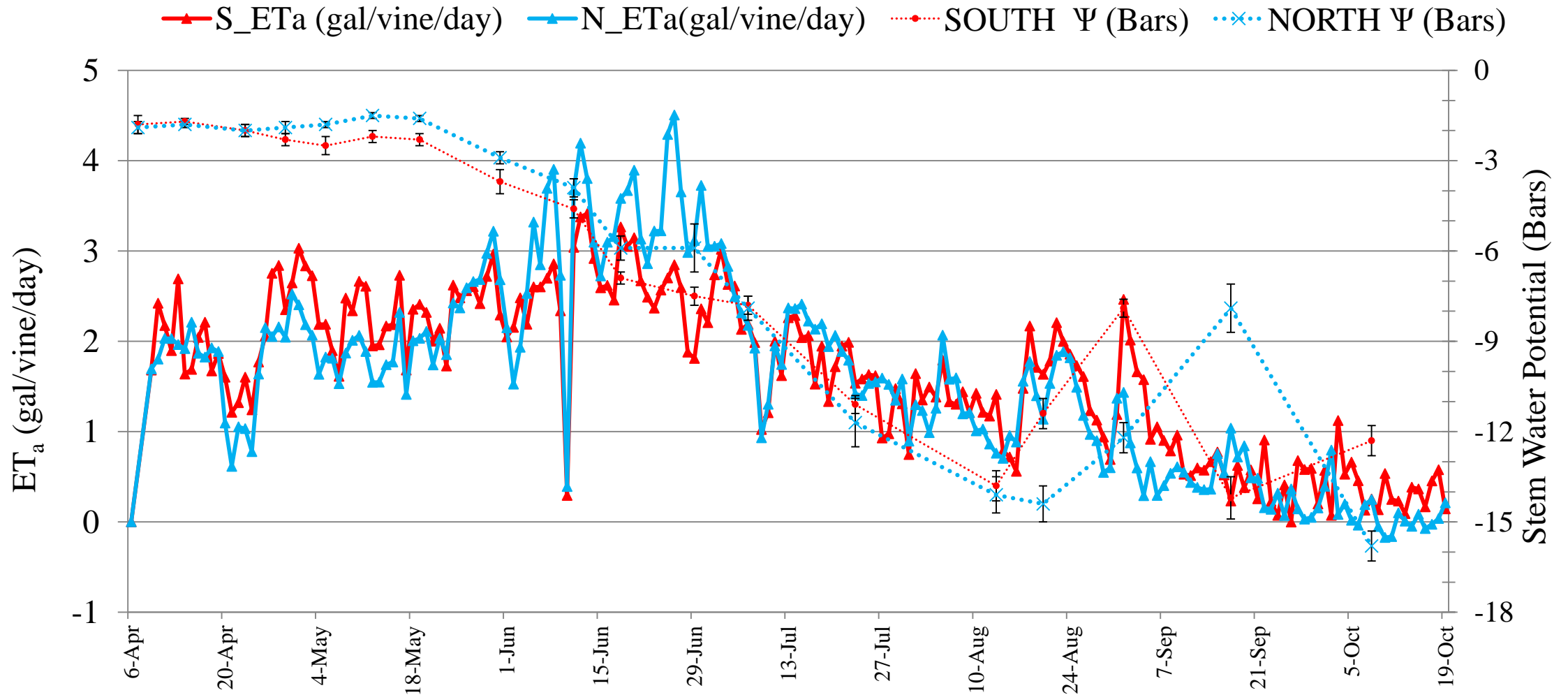


**THANK YOU To Our GROWER-COOPERATORS**

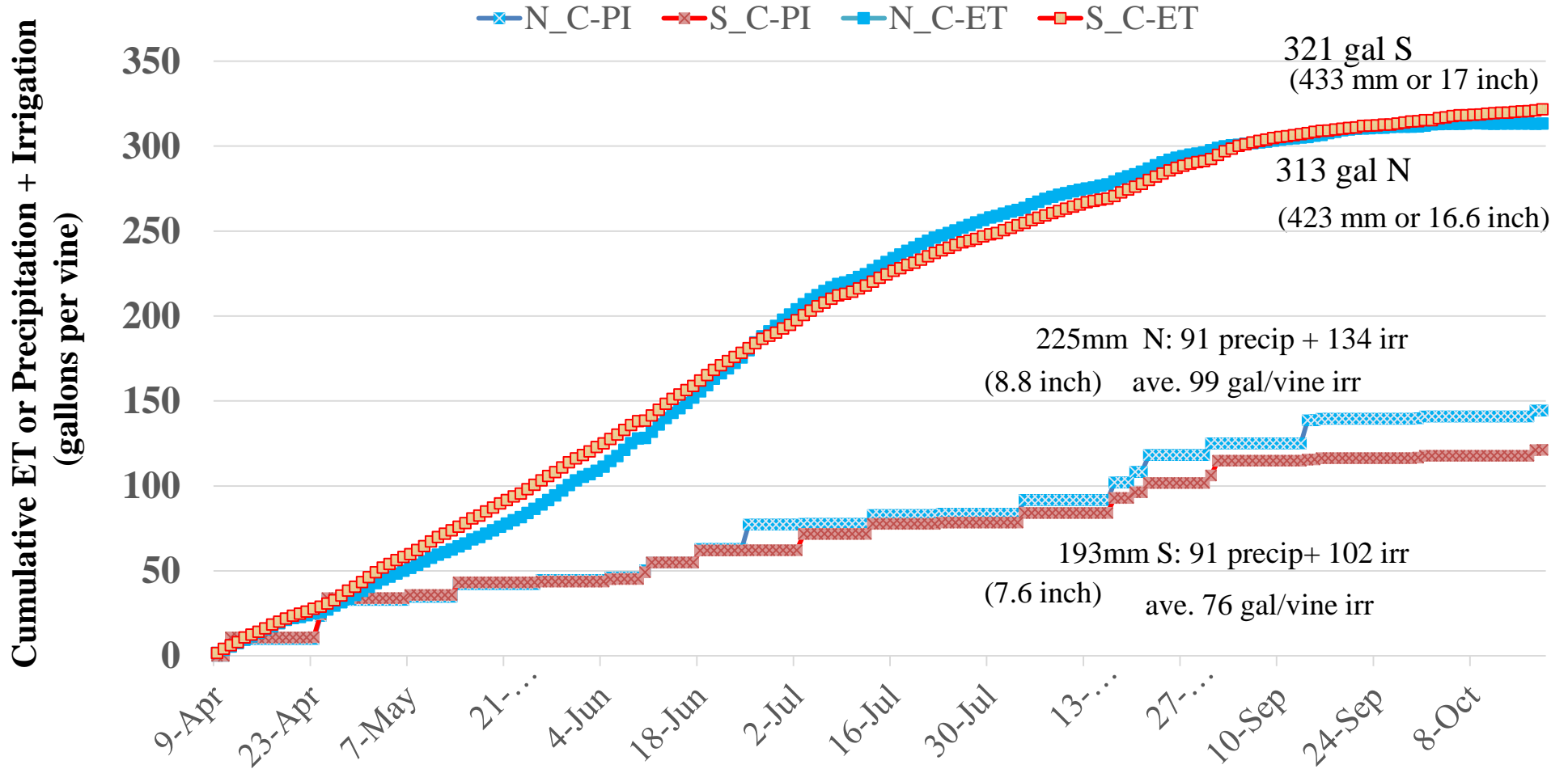
Net radiation (a) and actual evapotranspiration (b) on North (N) and South (S) facing slopes: site B (2015).



# Actual vine water use, $ET_a$ (gal/vine/day) and average vine stress (bars). Vineyard B, 2015.



## 2015 Vineyard B: Cumulative evapotranspiration (C-ET) per vine on North (N) and South (S) facing slopes, compared to cumulative precipitation and applied irrigation (C-PI), April 8-Oct 18.



Map Unit Name: **Auburn very rocky silt loam, 2 to 30 percent slopes** Symbol: **AxD**  
Component Name: **Auburn**  
Component Key: 10789622  
[Soil Data Explorer](#) | [Series Extent Explorer](#)  
[Official Series Description](#)

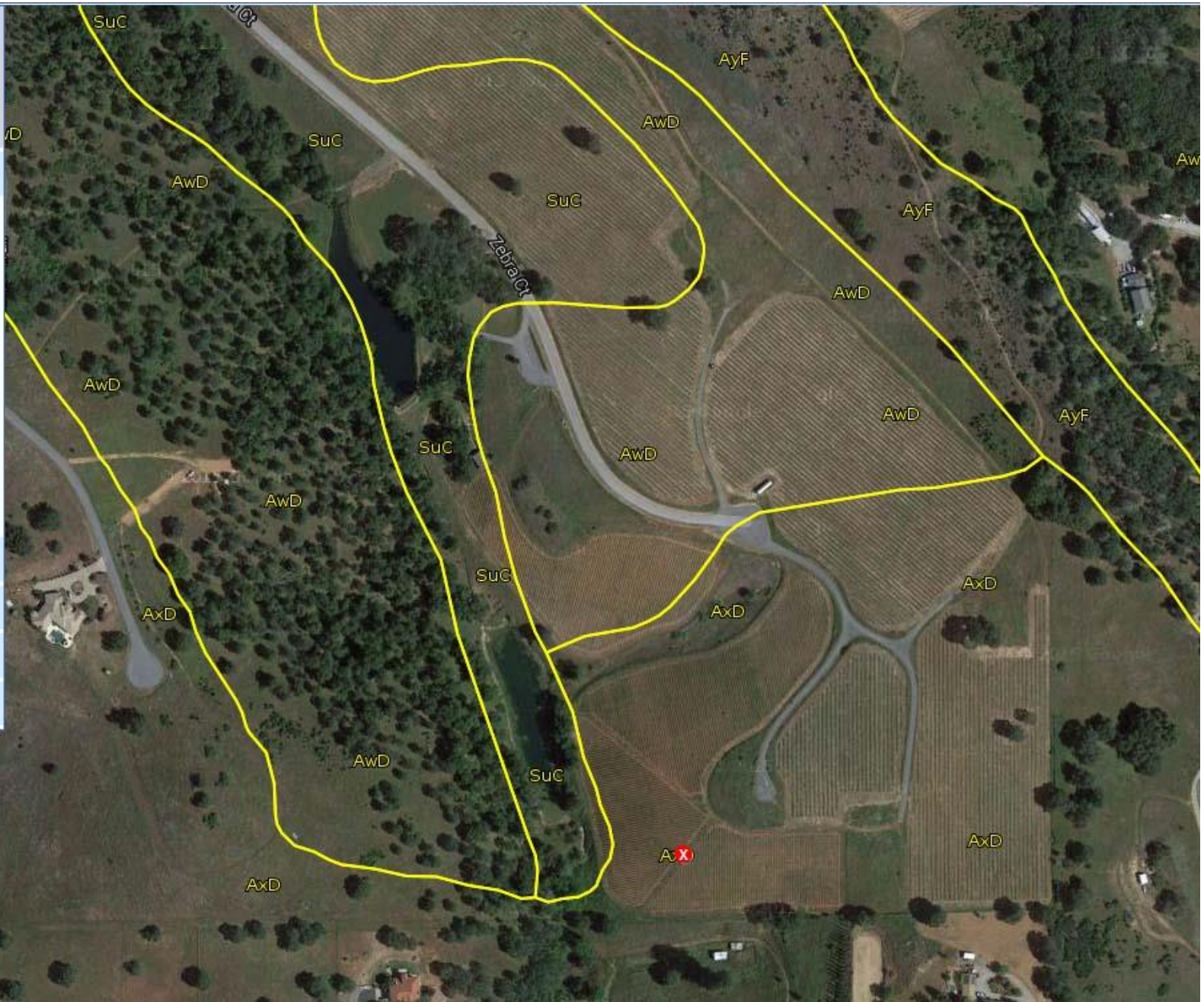
▲ **Soil Profiles**

Typical Profile >

Org. Matter	Clay
Sand	Ksat
pH	Kf Factor
EC	SAR
CaCO <sub>3</sub>	Gypsum
CEC @ pH7	
Linear Ext.	

0 cm  
4 cm  
23 cm  
36 cm  
61 cm

- ▼ **Soil Taxonomy**
- ▼ **Land Classification**
- ▼ **Hydraulic and Erosion Ratings**
- ▼ **Soil Suitability Ratings**



Soil excavation May 14 with Stewart Wilson (O'Geen lab). Soil maps to Auburn series-typical depth 24 in.

South slope: some oxidation features and clay films at 29 in.  
(fluctuating water table?). Grape roots at 33 in.  
Hit rock at 45 inches (fractures deeper).







N slope. Less gravel content, finer (clay) texture visibly moister, but shallower. Rock at 34.5 inches.



# Effect of slope and aspect on vine water use and stress: what we've learned so far.

In vineyard A:

- Greater daily net rad and  $ET_a$  was observed on the **S** slope.
- Stem water potential was similar on N and S slopes.

In vineyard B:

- Greater daily net rad and ET was observed on the **S** facing slope in spring and fall; but
  - Greater daily net rad and ET was observed on the **N** facing slope in mid-summer.
  - $\Psi$  measurements indicated greater vine stress on the N slope in late summer, even though demand (net rad) was lower and applied irrigation water was greater there than on the S slope, giving us a clue to soil and groundwater differences between slopes.
- In both vineyards, vine water use (C-ET) was greater on the S slope.
- In both vineyards, vine water use (C-ET) on both slopes was much greater than water we can account for (precip. + irrigation).



**Thank you.**

**University of California**  
Agriculture and Natural Resources



06/11/2015