

# Water Conservation Practices in Winery & Vineyard Operations

Jason Yeager

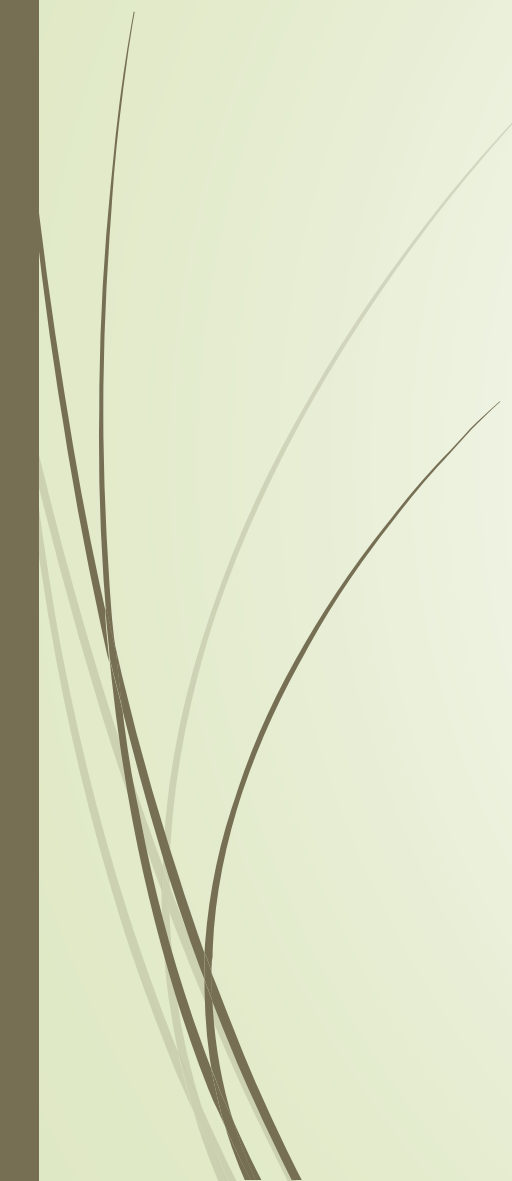
Director of Vineyards, Niner Wine Estates

Board Chair, Paso Robles Wine Country Alliance

Ag-At-Large Member, San Luis Obispo Water Resources Advisory Committee



# Facts about Niner

- ▶ The winery building was awarded LEED certification at the 'Silver' level in 2011. This was the first winery to receive this certification in San Luis Obispo County and the fourth in the state (at that time)
  - ▶ The vineyards have been SIP (Sustainable in Practice) certified since 2012
  - ▶ The vineyards are in organic transition since 2017. Looking to complete certification in 2020 through CCOF (California Certified Organic Farmers)
  - ▶ Treats and recycles all water used in the winery and repurposes it to the vineyard
  - ▶ Collects all rainfall landing on the winery roof and around the winery for future use in the vineyard
- 



# What is LEED?

- ▶ **LEED**, or **Leadership in Energy & Environmental Design**, is a globally recognized symbol of excellence in green building, under the **United States Green Building Council**.
- ▶ **LEED** certification ensures electricity cost savings, lower carbon emissions and healthier environments for the places we live, work, learn, play and worship. LEED's global sustainability agenda is designed to achieve high performance in key areas of human and environmental health, acting on the triple bottom line - putting people, planet and profit first.
- ▶ **LEED credits** are awarded by third-party technical reviewers; are applicable to all building types throughout a building's lifecycle; and are developed through several rounds of public comments and in collaboration with the U.S. Green Building Council's (USGBC) board, broader membership and staff.

# What is LEED certification?

- ▶ **LEED projects earn points by adhering to prerequisites and credits across nine measurements for building excellence from integrative process to indoor environmental quality.** Prerequisites are required elements, or green-building strategies that must be included in any LEED certified project. Credits are optional elements, or strategies that projects pursue to gain points toward LEED certification.
- ▶ **Credits are developed through several rounds of public comments and in collaboration with the USGBC board, broader membership and staff.** As market readiness increases and new technologies become widely available, credits adapt to improve the value and environmental integrity of building projects.
- ▶ **Based on the number of credits achieved, a project earns one of four LEED rating levels: LEED Certified, LEED Silver, LEED Gold or LEED Platinum.** The LEED rating systems work for all buildings at all phases of development and are meant to challenge project teams and inspire outside-the-box solutions.
- ▶ The **Green Business Certification Inc.**, or GBCI, provides third-party technicians the training and expertise necessary to review and verify building quality and integrity.
- ▶ LEED is driving international green building practices, with **more than 93,000 projects participating in LEED across 167 countries and territories**, and **a total of 19.3 billion square feet of space used worldwide**. USGBC estimates that nearly five million people experience a LEED building on a daily basis.



# What is SIP certified?

- ▶ **Sustainability in Practice (SIP) Certified** helps farmers and winemakers demonstrate their dedication to preserving and protecting natural and human resources. SIP Certified is a rigorous sustainable vineyard and winery certification with strict, non-negotiable requirements, committed to standards based on science and expert input, independent third party verification, transparency, and absence of conflict of interest.
- ▶ Considers the whole farm – verifying the farmer's commitment to environmental stewardship, equitable treatment of employees, and business sustainability
- ▶ Contains practice and performance based requirements – every Requirement and Management Enhancement is demonstrable and auditable
- ▶ Prohibits the use of high risk pesticides – (toxic air contaminants, cholinesterase inhibitors, groundwater contaminants, California and federally restricted materials)

# Ways we save water – Drop Control

**DropControl** Company DropControl Customers News

**Heart Hill Farm** Jason Yeager EXIT  
November 30, 2018 - 14:40:51 (GMT-8)

**Navigation Menu:**

- Configuration
- Docs and Manuals
- Alarms / Alerts
- Account
  - Heart Hill Farm
- Irrigation
- Weather Analysis
- Soil Moisture Analysis
- Irrigation Analysis
- Custom Chart

**Farm Information**

General  
Weather  
Soil Moisture  
Irrigation  
Network

**Weather**  
Heart Hill Farm  
United States

Temperature: 56.60 °F  
Humidity: 52.70 %  
Solar Rad.: 103.70 W/m<sup>2</sup>  
Atm Pressure: -  
Wind Speed: 5.30 mi/h  
Wind Dir.: NW  
Daily Rainfall: 0.0000 in

Updated: 11-30-2018 14:15

**Temperature + Humidity** Rainfall + ETO

24 25 26 27 28 29 30  
Nov Nov Nov Nov Nov Nov Nov

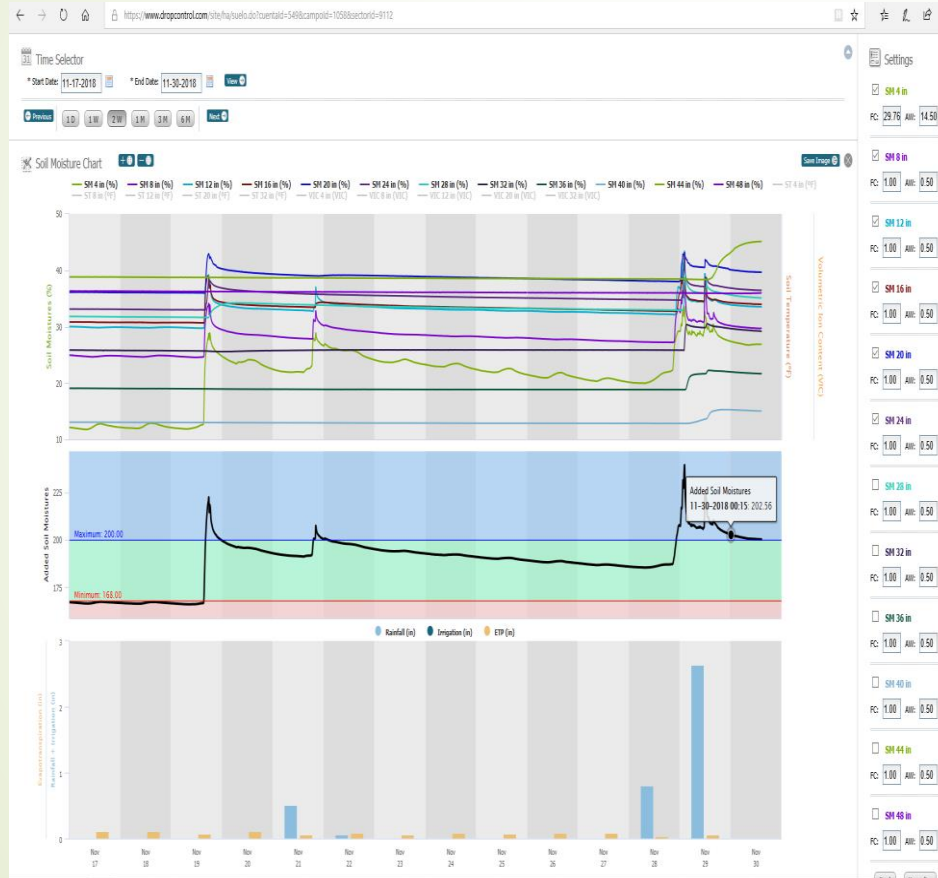
Temperature (°F) Humidity (%)

**FORECAST**

	Min	Max	
	41.0 °F	59.0 °F	☁
Sat	35.6 °F	55.4 °F	☁
Sun	32.0 °F	57.2 °F	☁
Mon	35.6 °F	53.6 °F	☁
Tue	42.8 °F	55.4 °F	☁

Source: WorldWeatherOnline

# Ways we save water – Drop Control



Time Selector: \* Start Date: 11-17-2018 \* End Date: 11-30-2018

Data Table

Date	SH 4 in	SH 8 in	SH 12 in	SH 16 in	SH 20 in	SH 24 in	SH 28 in	SH 32 in	SH 36 in	SH 40 in	SH 44 in	SH 48 in	Daily Irrigation	Accum Daily Irrigation	Rainfall	Accum Daily Rainfall	ETP	Accum ETP	Aug VCC 4 in (VCC)	Aug VCC 8 in (VCC)	Aug VCC 12 in (VCC)	Aug VCC 16 in (VCC)	Aug VCC 20 in (VCC)	Aug VCC 24 in (VCC)	Aug VCC 28 in (VCC)	Aug VCC 32 in (VCC)	Aug VCC 36 in (VCC)	Aug VCC 40 in (VCC)	Aug VCC 44 in (VCC)	Aug VCC 48 in (VCC)
11-17-2018	28.82%	34.46%	34.61%	36.58%	35.62%	36.31%	23.26%	13.20%	23.11%	38.49%	41.27%	39.82%	0.0000 in	0.0000 in	0.0000 in	0.0000 in	0.1149 in	0.1149 in	1232.9 VCC	1409.2 VCC	1305.5 VCC	1406.9 VCC	1176.0 VCC	46.81%	45.47%	51.51%	50.49%	46.37%	51.37%	52.78%
11-18-2018	28.88%	34.38%	34.55%	36.50%	35.53%	36.24%	23.29%	13.28%	23.86%	38.43%	41.22%	39.75%	0.0000 in	0.0000 in	0.0000 in	0.0000 in	0.1169 in	0.2300 in	1225.6 VCC	1409.9 VCC	1302.2 VCC	1405.7 VCC	1171.2 VCC	50.01%	47.70%	52.39%	51.81%	47.70%	51.95%	52.90%
11-19-2018	27.82%	34.26%	34.50%	36.46%	35.47%	36.19%	23.25%	13.24%	23.82%	38.40%	41.16%	39.70%	0.0000 in	0.0000 in	0.0000 in	0.0000 in	0.0730 in	0.3030 in	1221.1 VCC	1408.8 VCC	1301.1 VCC	1404.9 VCC	1176.0 VCC	48.95%	46.86%	51.85%	50.73%	46.79%	51.67%	52.82%
11-20-2018	27.67%	34.12%	34.40%	36.38%	35.40%	36.12%	23.20%	13.21%	22.88%	38.34%	41.12%	39.63%	0.0000 in	0.0000 in	0.0000 in	0.0000 in	0.1170 in	0.4200 in	1217.2 VCC	1407.1 VCC	1302.2 VCC	1404.1 VCC	1176.0 VCC	48.54%	45.47%	51.81%	50.30%	46.23%	51.13%	52.56%
11-21-2018	27.87%	34.89%	34.33%	36.30%	35.32%	36.04%	23.15%	13.20%	22.95%	38.31%	41.07%	39.59%	0.0000 in	0.0000 in	0.5300 in	0.5300 in	0.0620 in	0.4820 in	1218.8 VCC	1408.2 VCC	1301.5 VCC	1403.0 VCC	1171.3 VCC	49.88%	47.25%	52.08%	50.70%	45.93%	51.95%	52.59%
11-22-2018	29.91%	34.28%	34.37%	36.29%	35.28%	35.99%	23.11%	13.15%	22.90%	38.28%	41.02%	39.54%	0.0000 in	0.0000 in	0.6600 in	0.5700 in	0.0950 in	0.5770 in	1212.2 VCC	1411.8 VCC	1301.1 VCC	1403.0 VCC	1171.0 VCC	52.24%	50.36%	51.44%	52.31%	51.58%	51.41%	51.42%
11-23-2018	29.73%	34.28%	34.38%	36.31%	35.28%	35.95%	23.08%	13.12%	22.88%	38.25%	40.99%	39.48%	0.0000 in	0.0000 in	0.0000 in	0.5700 in	0.0650 in	0.6420 in	1208.5 VCC	1411.1 VCC	1301.4 VCC	1403.5 VCC	1171.0 VCC	50.96%	48.40%	51.55%	52.01%	51.67%	51.03%	51.67%
11-24-2018	29.84%	34.42%	34.41%	36.30%	35.27%	35.92%	23.05%	13.10%	22.86%	38.20%	40.96%	39.45%	0.0000 in	0.0000 in	0.0000 in	0.5700 in	0.0620 in	0.7240 in	1203.1 VCC	1412.2 VCC	1301.8 VCC	1403.6 VCC	1171.2 VCC	52.72%	50.77%	51.49%	52.16%	52.24%	51.93%	51.67%
11-25-2018	29.70%	34.48%	34.46%	36.32%	35.26%	35.90%	23.02%	13.08%	22.83%	38.16%	40.92%	39.41%	0.0000 in	0.0000 in	0.0000 in	0.5700 in	0.0770 in	0.8110 in	1202.6 VCC	1414.7 VCC	1304.0 VCC	1403.7 VCC	1171.0 VCC	52.63%	51.40%	51.75%	51.41%	52.95%	51.88%	51.64%
11-26-2018	29.67%	34.41%	34.47%	36.31%	35.23%	35.87%	22.99%	13.05%	22.80%	38.14%	40.88%	39.36%	0.0000 in	0.0000 in	0.0000 in	0.5700 in	0.0620 in	0.9020 in	1201.0 VCC	1412.2 VCC	1304.4 VCC	1403.9 VCC	1176.0 VCC	51.93%	49.81%	51.81%	52.89%	52.13%	51.56%	51.45%
11-27-2018	29.31%	34.38%	34.39%	36.26%	35.19%	35.83%	22.96%	13.02%	22.78%	38.12%	40.84%	39.34%	0.0000 in	0.0000 in	0.0000 in	0.5700 in	0.0650 in	0.9800 in	1201.3 VCC	1412.7 VCC	1304.2 VCC	1403.8 VCC	1176.2 VCC	51.96%	49.52%	51.79%	52.81%	51.87%	51.45%	51.36%
11-28-2018	29.93%	34.39%	34.37%	36.23%	35.16%	35.80%	22.93%	13.00%	22.76%	38.11%	40.80%	39.31%	0.0000 in	0.0000 in	0.8300 in	0.8300 in	1.0260 in	1202.6 VCC	1413.4 VCC	1304.1 VCC	1403.9 VCC	1176.0 VCC	52.07%	50.85%	51.52%	52.85%	52.24%	51.46%	51.31%	
11-29-2018	41.21%	43.82%	39.96%	41.13%	39.92%	39.79%	26.42%	15.67%	25.72%	40.17%	42.47%	41.42%	0.0000 in	0.0000 in	2.6400 in	4.8200 in	0.0610 in	1.8870 in	1400.2 VCC	1493.3 VCC	1403.7 VCC	1464.7 VCC	1163.0 VCC	52.87%	51.54%	51.49%	53.59%	53.37%	53.79%	54.64%
11-30-2018	37.88%	41.83%	39.21%	40.47%	39.41%	39.40%	26.47%	16.19%	25.96%	39.99%	42.54%	41.47%	-	0.0000 in	0.0000 in	4.8200 in	0.0000 in	1.8870 in	1375.2 VCC	1465.5 VCC	1454.9 VCC	1444.2 VCC	1163.0 VCC	50.10%	48.70%	51.31%	52.24%	51.50%	51.43%	51.35%

# Ways we save water – Drop Control

**DropControl** | Company | DropControl | Customers | News

**Weather Station Zone**  
Weather Analysis

Jason Yeager | EXIT

November 30, 2018 - 15:13:23 (GMT-8)

**Time Selector**  
\* Start Date: 11-17-2018 \* End Date: 11-30-2018

**Current Readings**  
 Temperature: 56.40 °F  
 Humidity: 55.90 %  
 Solar Rad.: 348.00 W/m<sup>2</sup>  
 Atm Pressure: -  
 Wind Speed: 6.49 mi/h  
 Wind Dir.: N  
 Daily Rainfall: 0.0000 in  
 Updated: 11-30-2018 14:45

**Weather Chart**  
 Temperature (°F) / Relative Humidity (%)  
 Rainfall (in) / ETO (in)

**Settings**  
 Name: Weather Station  
 Temp 1:   
 Temp 2:   
 Save

**Data Summary**  
 Temperature: 53.78 °F  
 Relative Humidity: 72.42 %  
 Accum Rainfall: 4.0200 in  
 Accum ETO: 1.0870 in  
 Avg Wind Speed: 3.74 mi/h  
 Prev Wind Dir: S

**Alerts**

Variable	Thresholds	Notifications	Created by	Actions

**Time Selector**  
\* Start Date: 11-17-2018 \* End Date: 11-30-2018

**Data Table**

Date	Temperature	Min Temp	Max Temp	Relative Humidity	Min RH	Max RH	Rainfall	Accum Daily Rainfall	ETO	Accum ETO	Avg Wind Speed	Prev Wind Dir	Solar Radiation
11-17-2018	52.13 °F	38.10 °F	64.80 °F	51.85 %	36.00 %	67.40 %	0.0000 in	0.1140 in	0.1140 in	3.43 mi/h	S	133.16 W/m <sup>2</sup>	
11-18-2018	53.66 °F	43.30 °F	66.40 °F	55.88 %	27.30 %	82.10 %	0.0000 in	0.1180 in	0.2320 in	2.65 mi/h	S	129.89 W/m <sup>2</sup>	
11-19-2018	52.80 °F	46.60 °F	67.30 °F	49.56 %	26.80 %	67.70 %	0.0000 in	0.0730 in	0.3050 in	0.69 mi/h	SE	91.40 W/m <sup>2</sup>	
11-20-2018	52.65 °F	38.60 °F	69.00 °F	55.24 %	25.40 %	74.90 %	0.0000 in	0.1170 in	0.4220 in	2.46 mi/h	SE	138.64 W/m <sup>2</sup>	
11-21-2018	54.77 °F	45.70 °F	62.40 °F	77.82 %	57.20 %	91.60 %	0.5100 in	0.6390 in	0.4820 in	3.99 mi/h	SE	36.21 W/m <sup>2</sup>	
11-22-2018	54.74 °F	46.10 °F	61.70 °F	78.39 %	59.50 %	91.20 %	0.0600 in	0.6990 in	0.5770 in	5.19 mi/h	S	138.51 W/m <sup>2</sup>	
11-23-2018	52.32 °F	42.20 °F	62.50 °F	86.25 %	74.20 %	92.10 %	0.0000 in	0.6930 in	0.6420 in	3.91 mi/h	S	81.91 W/m <sup>2</sup>	
11-24-2018	57.25 °F	50.40 °F	65.40 °F	82.11 %	65.00 %	92.20 %	0.0000 in	0.5700 in	0.8020 in	0.790 in	2.88 mi/h	SW	132.24 W/m <sup>2</sup>
11-25-2018	54.75 °F	47.60 °F	65.10 °F	81.15 %	59.70 %	93.00 %	0.0000 in	0.5700 in	0.6770 in	0.8110 in	1.43 mi/h	S	119.89 W/m <sup>2</sup>
11-26-2018	55.04 °F	42.20 °F	69.70 °F	73.50 %	41.40 %	93.00 %	0.0000 in	0.6020 in	0.9030 in	1.37 mi/h	SE	123.87 W/m <sup>2</sup>	
11-27-2018	54.40 °F	46.00 °F	62.90 °F	71.47 %	55.50 %	82.40 %	0.0000 in	0.5700 in	0.8650 in	0.9800 in	3.09 mi/h	S	100.57 W/m <sup>2</sup>
11-28-2018	51.16 °F	41.10 °F	56.90 °F	90.04 %	78.70 %	92.70 %	1.0200 in	1.3800 in	0.3380 in	1.0260 in	2.27 mi/h	SE	29.19 W/m <sup>2</sup>
11-29-2018	53.39 °F	46.60 °F	57.10 °F	85.72 %	76.30 %	92.00 %	2.6400 in	4.0200 in	0.6030 in	1.8870 in	15.06 mi/h	S	41.45 W/m <sup>2</sup>
11-30-2018	59.59 °F	45.20 °F	57.00 °F	76.51 %	49.00 %	89.20 %	0.0000 in	4.0200 in	0.0000 in	1.8870 in	3.92 mi/h	SW	171.32 W/m <sup>2</sup>



# Ways we save water – Drop Control

The screenshot displays the DropControl web interface for Heart Hill Farm. The main section is titled "Irrigation Schedule" and shows a calendar view for the date 11-30-2018. The schedule is organized by zones (H1 to H7) and days of the month (0 to 23). Each zone entry includes "Schd: 0.0000", "Real: 0.0000", and "Diff: 0.0000". A vertical dashed line is present at day 15. Below the calendar is a legend for irrigation types: Irrigation (blue), Irrigation Program (light blue), Fertigation (green), Manual Irrigation (yellow), Proposed by API (light green), and Confirmed (pink).

Below the calendar is the "Pump Pump System" section, titled "Irrigation Date and Type". It includes a "Start Date and Time" field set to 11-30-2018 15:29 and a "Parallel" checkbox. The configuration table below shows settings for zones H1 through H5:

Zone	Duration	Volume	Unit
H1	<input type="radio"/>	<input checked="" type="radio"/>	0.0000 in
H2	<input checked="" type="radio"/>	<input type="radio"/>	0 : 0 hour:min
H3	<input type="radio"/>	<input checked="" type="radio"/>	0.0000 in
H4	<input type="radio"/>	<input checked="" type="radio"/>	0.0000 in
H5	<input type="radio"/>	<input checked="" type="radio"/>	0.0000 in

# Monitoring stress with pressure chambers



# How we save water - Reservoirs

- Recycling of all water used in the winery
- Collection of water during rain events – better quality water than that from wells
- All reservoirs are covered

# How we save water - Reservoirs



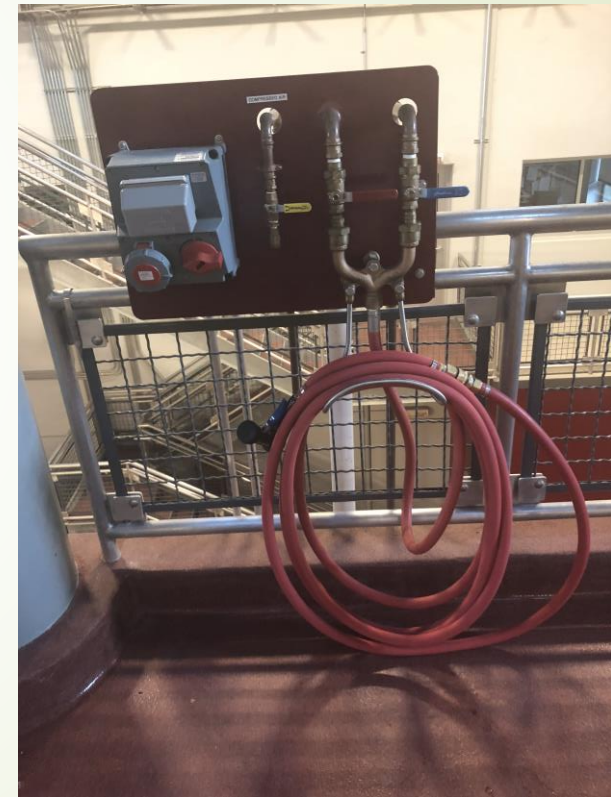
# How we save water - Reservoirs



# How we save water - Reservoirs



How we save water – 1) shut of on all hoses  
– 2) all water that hits floor is recycled



Pumps go to either water treatment pond or water collection pond





# Collection reservoirs are covered



# Other ways that save water – VFD (Variable Fluid Drive) and PSI comp emitters



# Other ways that save water – Proper rootstock selection

Rootstock	Parentage	Phylloxera	Nematodes	Lime	Drought	Vigor	Quality	Soils	Grafting	Place	Other
<b>101-14 Millardet et de Grasset</b>	riparia-rupestris hybrid	High	Moderate	Low		Low	Yes			France	Shallow roots
<b>110 R</b>	berlandieri - rupestris cross	High	Low	Moderate	High	High		Infertile		Med. Climates	
<b>1103 Paulsen</b>	berlandieri - rupestris cross	High	Moderate	Moderate	High	Mod-High			Easy		
<b>140 Ruggeri</b>	berlandieri - rupestris hybrid	?		Mod-High	High	High		Dry		Med. Climates	
<b>1613 Couderc</b>	riperia-rupestris-candicans x labrusca-riperia-vinifera	Low-Mod	Mod-High					Fertile, sandy loam		California	
<b>161-49 Couderc</b>	riperia - berlandieri hybrid	High	NO								
<b>1616 Couderc</b>	riperia-rupestris-candicans x riparia	High	High			Low		Humid			
<b>3309 Couderc</b>	riperia - rupestris cross	High		Moderate	No			Humid	Easy	widespread	
<b>333 EM</b>	vinifera (CS) - berlandieri	Sufficient		Mod-High	Moderate						
<b>41 B</b>	vinifera (Chasselas) -berlandieri hybrid	Sufficient		High	Moderate					Cognac/Champagne	
<b>420 A Millardet et de Grasset</b>	berlandieri - riparia hybrid	High	Low-Mod			Low	Yes	Chalky			
<b>5 BB Kober / Teleki</b>	berlandieri - riparia hybrid	High		Moderate		High		Humid/clay		Europe, esp. Germany & Switzld	
<b>5 C Teleki</b>	berlandieri - riparia hybrid	?		Moderate		High				Germany	
<b>99 Richter</b>	berlandieri - rupestris hybrid	High	Moderate		Moderate	High				Warm climates	
<b>AXR1</b>	vinifera-rupestris	NO				High			Easy		
<b>Dog Ridge</b>	v. champini		High			High	NO	Infertile			
<b>Fercal</b>	berlandieri x Colombard w/ 333 EM	High		Mod-High	Moderate	Moderate		Lime	Easy		
<b>Harmony</b>	champini x. 1613C	Low	High			Mod-High					
<b>Riparia Gloire de Montpellier</b>	v. riparia	High				Low	Yes			Europe	
<b>Rupestris St. George / du Lot monticola</b>	v. rupestris	High			Low	High	NO				
<b>Schwarzmann</b>	riperia-rupestris hybrid	High	High			Moderate		Deep, moist		not widely used	
<b>SO 4</b>	berlandieri - riparia hybrid	High	Moderate			Moderate		Moist			Mg deficiency

# Example of total water used for the 2018 vintage

Niner Wine Estates  
Irrigation (by location, with totals)  
1/1/2018 through 12/31/2018

Jespersen Vineyard										
Block (Subdivision)	Date	Size (acres)	Runtime (hrs)	Water Amount (gals/acre)	gals	Total gallons	Rate (G)	Fertilizer	Rate (lbs)	Rate (acre)
10B	2/9/2018	2.08	12.00	0.40	0.17	22,910	0.070			
	4/26/2018	2.08	6.00	0.17	0.17	9,776	0.030	4-13-0 w/Humic acid	8.00	gs
	5/20/2018	2.08	8.00	0.29	0.29	16,293	0.050			
	6/5/2018	2.08	6.00	0.17	0.17	9,776	0.030	N 32	4.00	gs
	6/10/2018	2.08	8.00	0.29	0.29	16,293	0.050			
	6/16/2018	2.08	8.00	0.29	0.29	16,293	0.050			
	7/16/2018	2.08	4.00	0.12	0.12	6,517	0.020	Microtite	10.00	gs
	7/22/2018	2.08	5.00	0.17	0.17	9,776	0.030			
	9/3/2018	2.08	6.00	0.17	0.17	9,776	0.030			
	10/12/2018	2.08	6.00	0.17	0.17	9,776	0.030			
	<b>10B Totals:</b>		<b>69.00</b>		<b>2.25</b>	<b>127,082</b>	<b>0.390</b>			
<b>Jespersen Vineyard Totals:</b>						<b>127,082</b>	<b>0.390</b>			

2018 PER ACRE TOTAL = 0.1875 AC/FT = 161,097 GALLONS

1 AC/FT = 325,851 GALLONS

# Other ways that save water



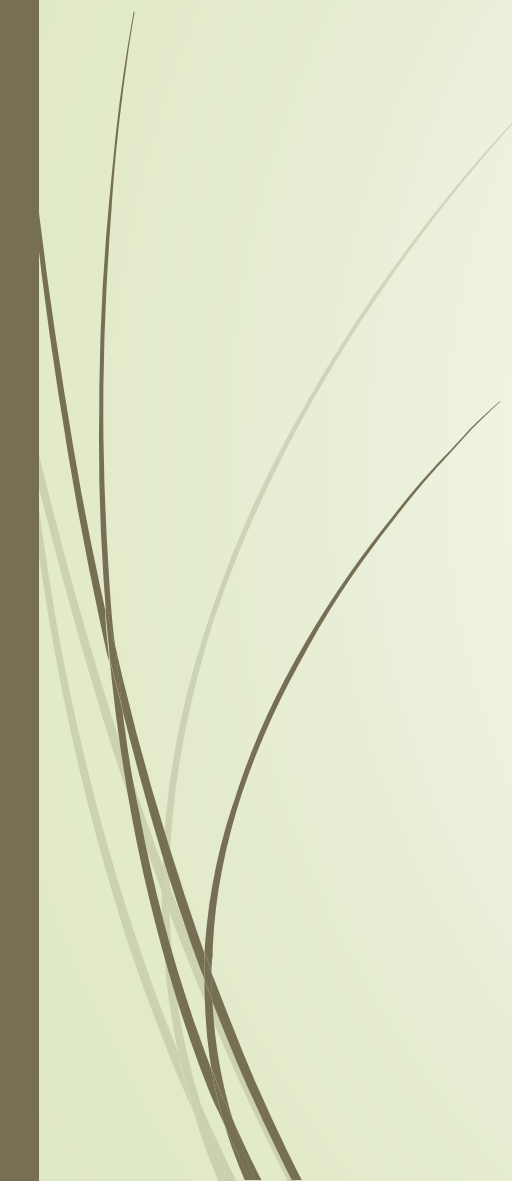


# Types of frost protection

- ▶ Water
  - ▶ Overhead impact sprinklers
    - ▶ Can protect down to 23 degrees F
    - ▶ Needs 56 gallons/minute per acre or 3360 gallons/acre per hour
  - ▶ Micro-sprinklers
    - ▶ Can protect down to 26 degrees F
    - ▶ Needs 16 gallons/minute per acre or 960 gallons/acre per hour
- ▶ Wind machines or helicopters
  - ▶ Can protect down to 28 degrees F (lower if inversion layer is strong)
- ▶ Vineyard heaters
  - ▶ Not recommended – not effective and incredibly polluting



# Final thoughts...

- ▶ Create keyways in vineyards and open areas
  - ▶ Ease restrictions on surface water collection
  - ▶ Create incentives to use alternates to using water in operations
  - ▶ Eliminate sunset clause in irrigated land ordinance in the Paso basin to encourage following of un-necessary planting of irrigated crops in order to protect irrigated land rights
  - ▶ Any future legislation that cuts water to agriculture should take into account those that are voluntarily practicing good water management with the latest technology
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# Questions??