

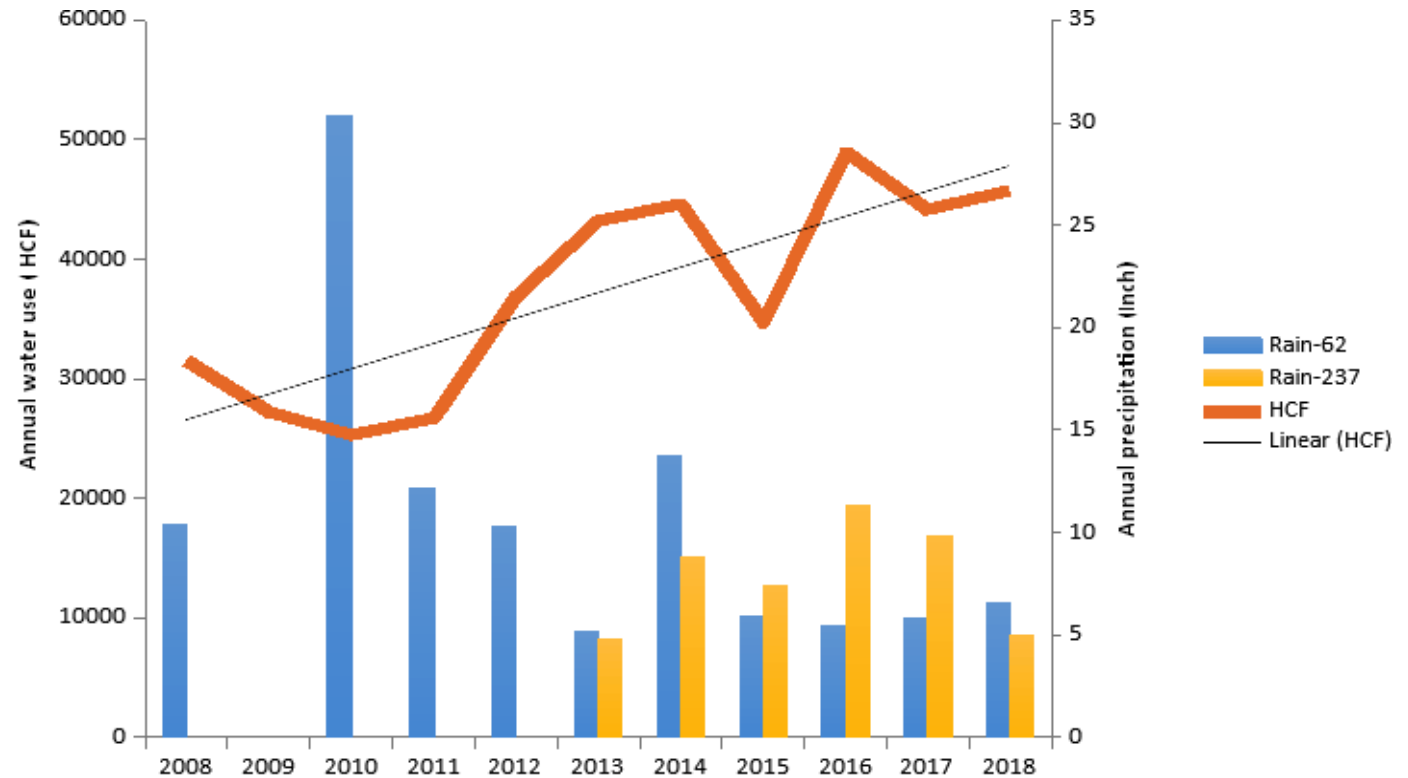


**“Precision Irrigation for Wine Grapes,  
a 5-year Experience Story”**

**Reinier van der Lee  
Temecula winegrower**

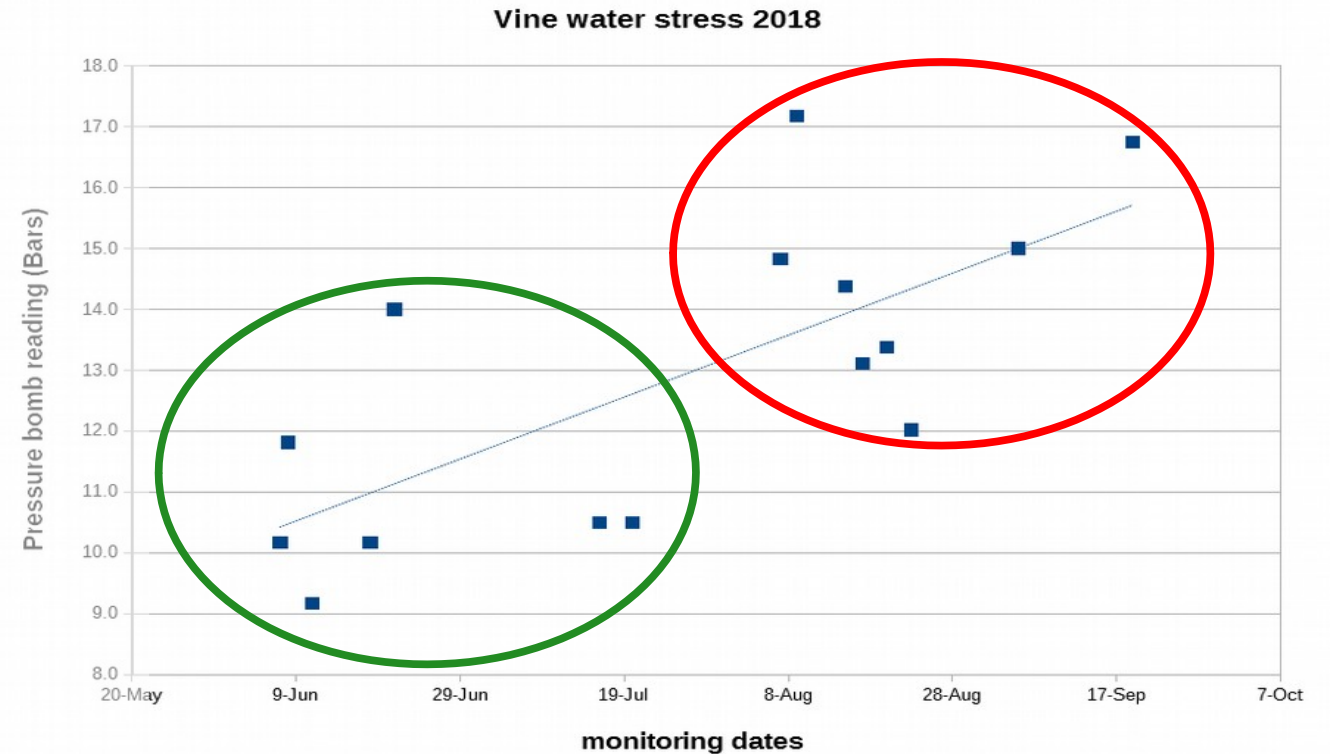
# 10-YEAR WATER USE TREND TEMECULA

- RCWD data 8 wineries
- 5% annual increase
- 50% industry growth
- 50% climate change



# TEMECULA SEASON 2018

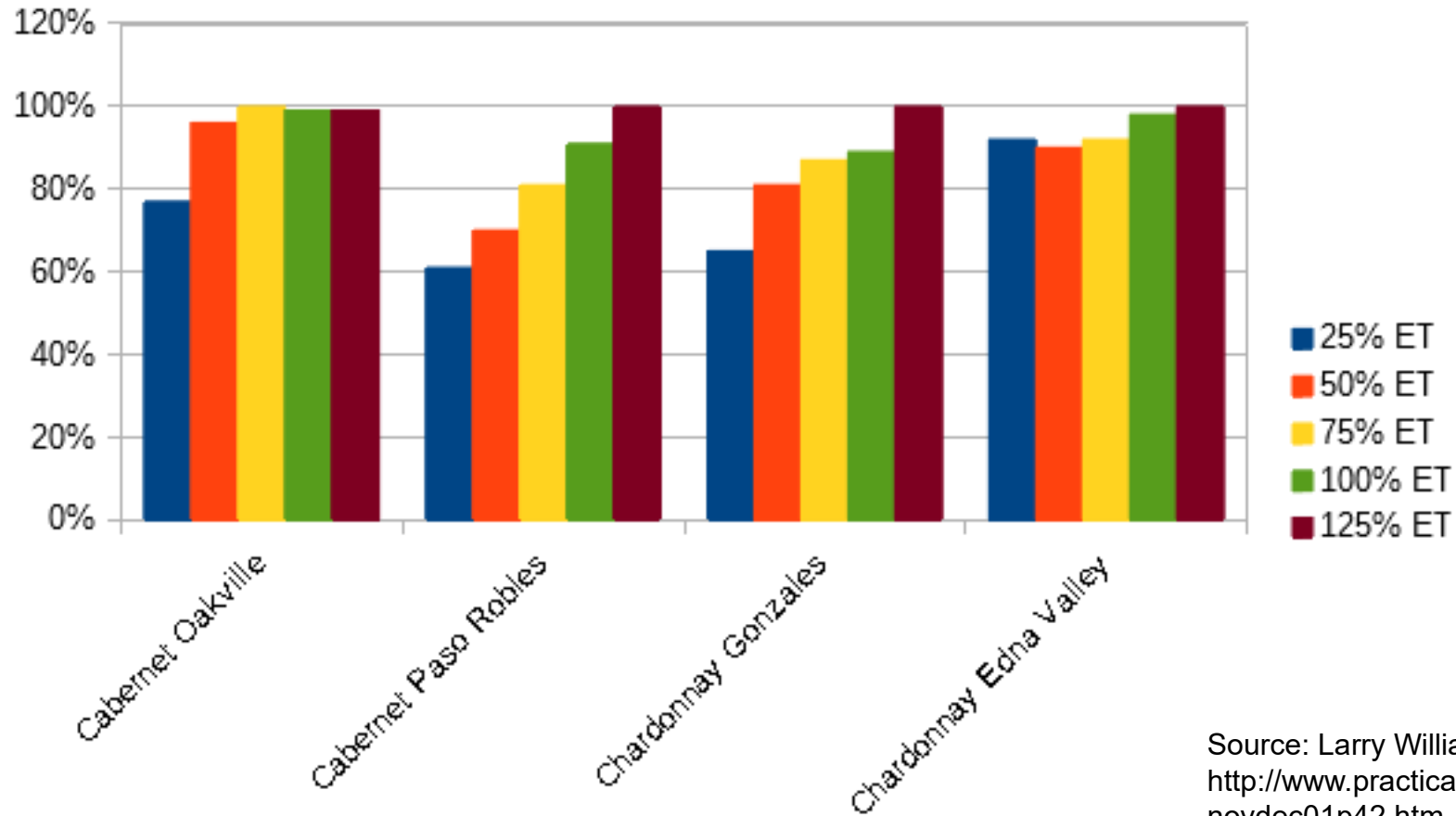
- Pressure bomb tests
- < 10 Bars: no stress
- > 14 Bars: high stress
- Late deficit irrigation



# IRRIGATION POTENTIAL ECONOMIC IMPACT

Estimation for average winery size /acre/yr	WATER & LABOR SAVING	CLIMATE & IRRIGATION YIELD	IMPROVE WINE QUALITY (WINERY)
NAPA	\$ 487	\$ 6,431	\$ 20,840
MONTEREY	\$ 535	\$ 2,772	\$ 16,894
SAN LOUIS OBISPO	\$ 664	\$ 3,302	\$17,043
TEMECULA	\$ 712	\$ 2,004	\$ 12,600

# IRRIGATION AND YIELD

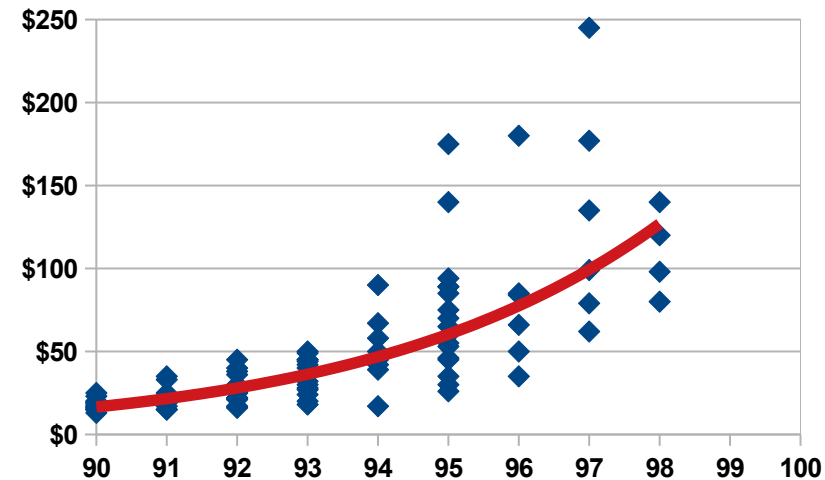


Source: Larry Williams , UC Davis 2001  
<http://www.practicalwinery.com/novdec01p42.htm>

# IMPROVE WINE QUALITY

- > \$ 12k/acre potential
- Repeatable results consistent quality

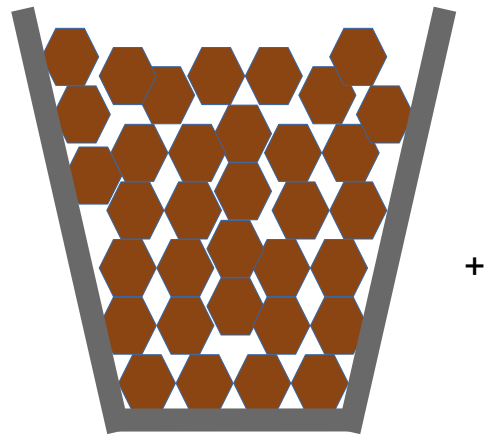
Wine Spectator Top-100 points	Trended Price	Point value
90	\$16	
91	\$21	\$5
92	\$27	\$6
93	\$35	\$8
94	\$45	\$10
95	\$58	\$13
96	\$75	\$17
97	\$96	\$21
98	\$123	\$27





# VOLUMETRIC SOIL MOISTURE EXPLAINED

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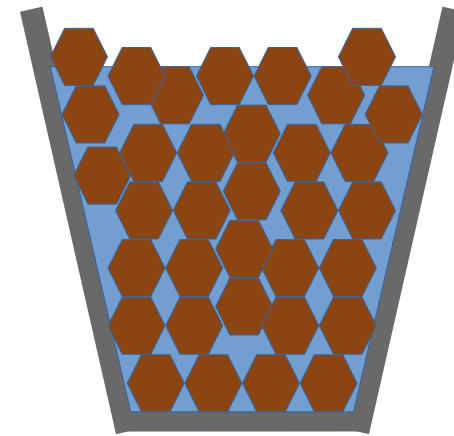
one gallon of dry soil

+



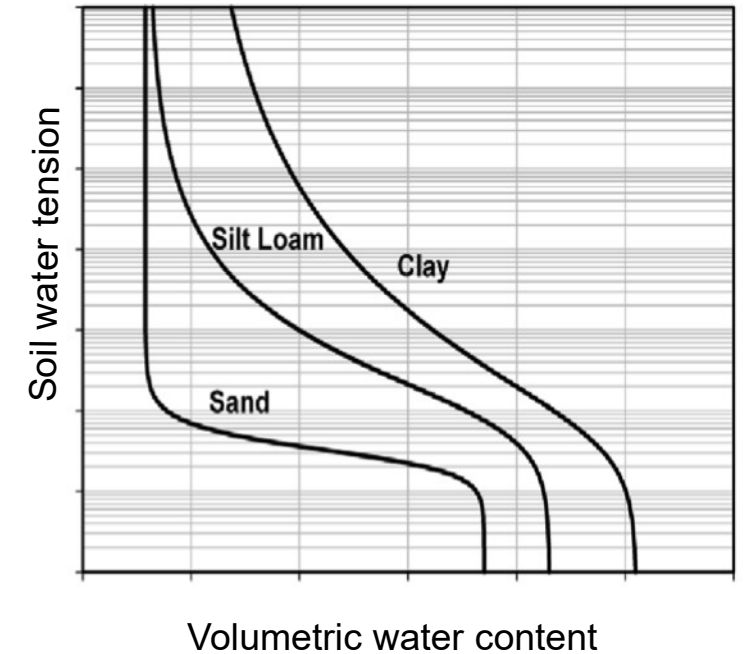
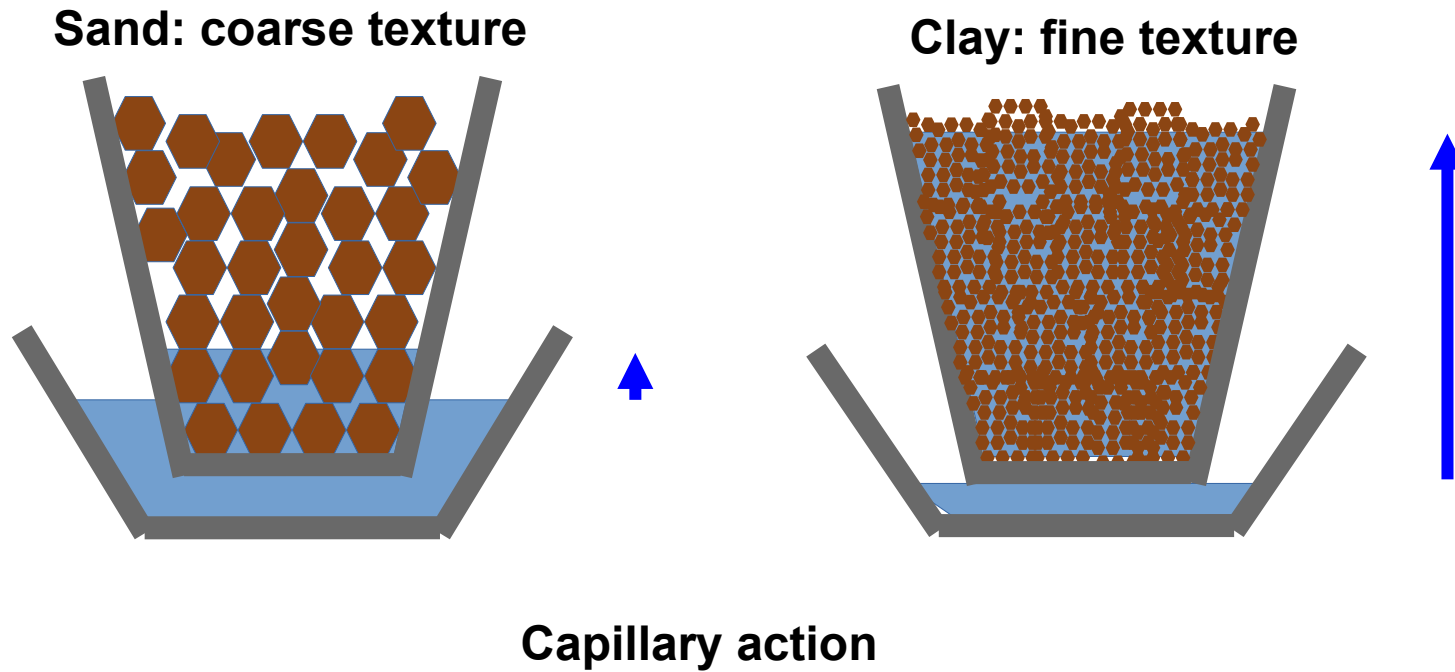
0.3 gallon of water

=



30% volumetric water content

# SOIL WATER TENSION

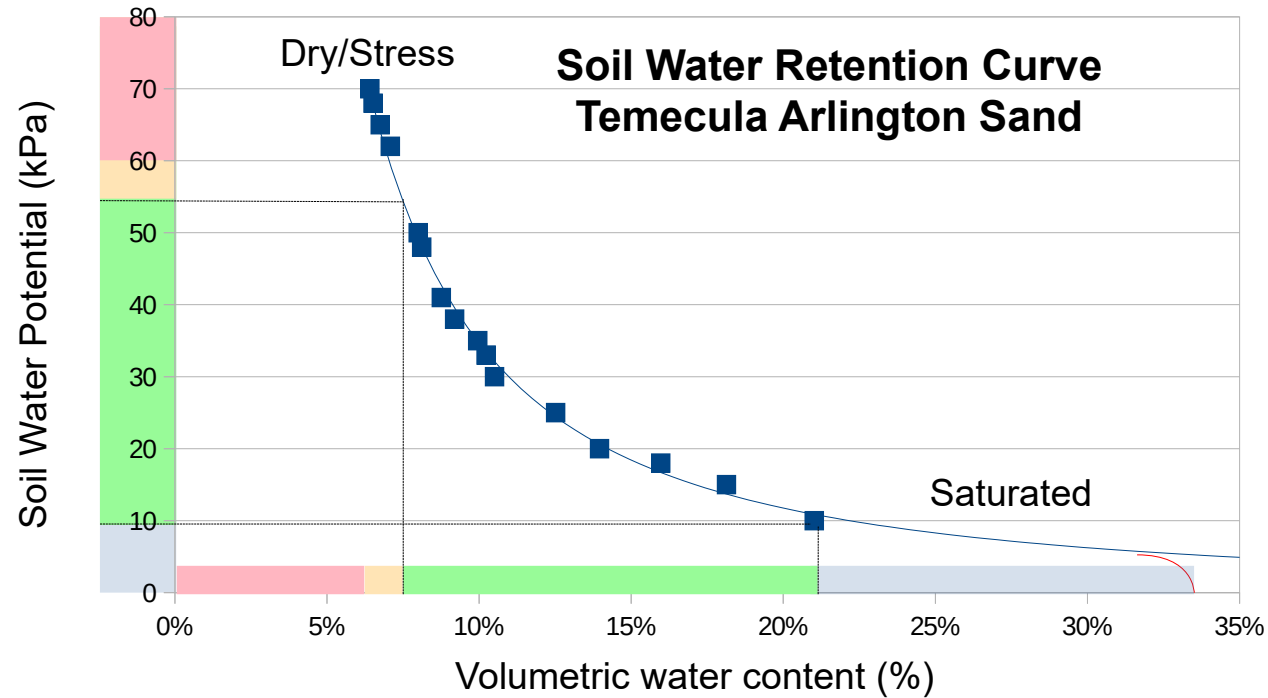




# INTERPRETING SOIL MOISTURE DATA

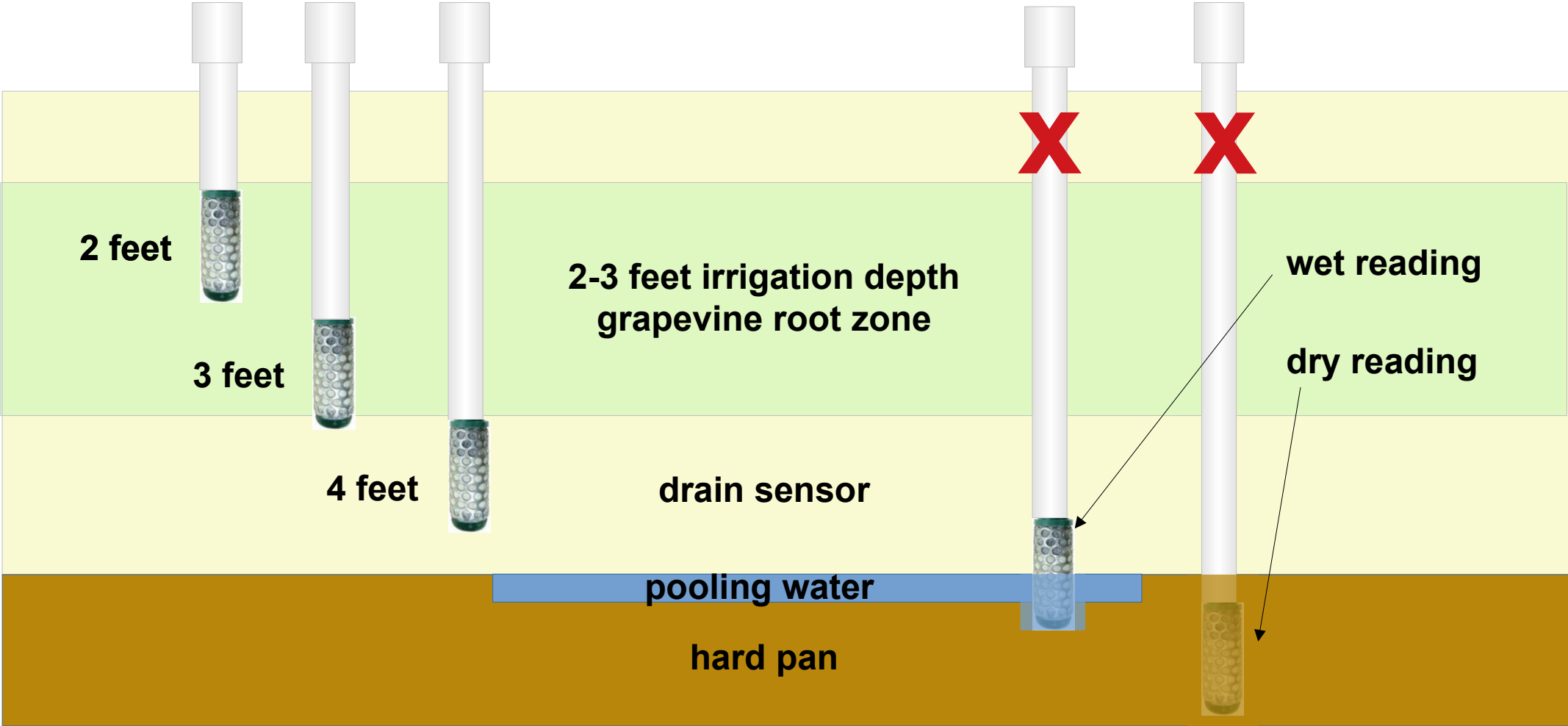


**Tensiometer and Watermark**  
Measure soil water tension (kPa)  
Same for every soil type

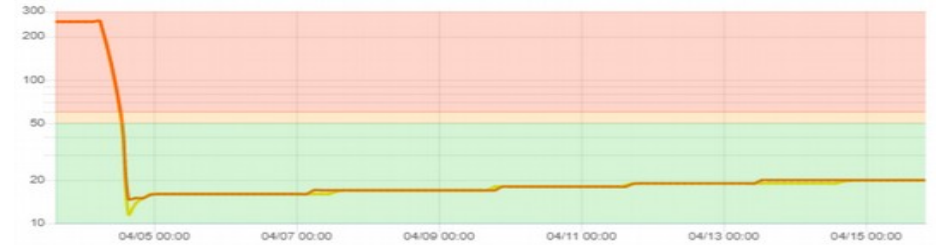
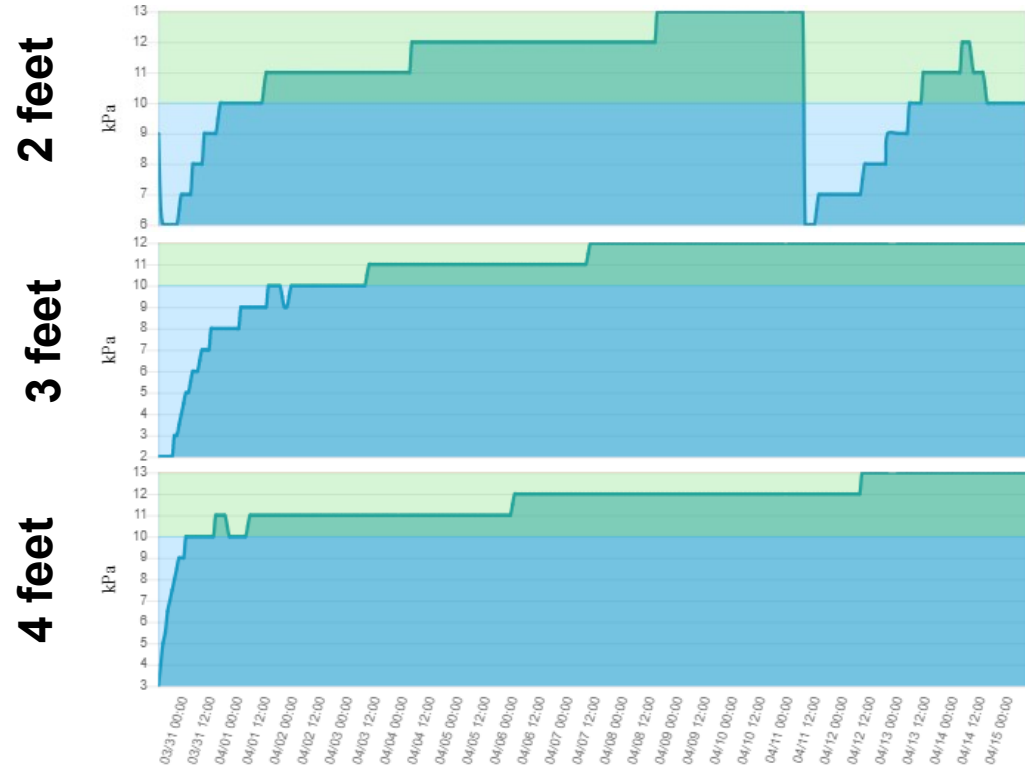


**Capacitive (FDR) sensors**  
Measure soil water content (%)  
Soil type dependent

# INSTALLATION CONSIDERATIONS



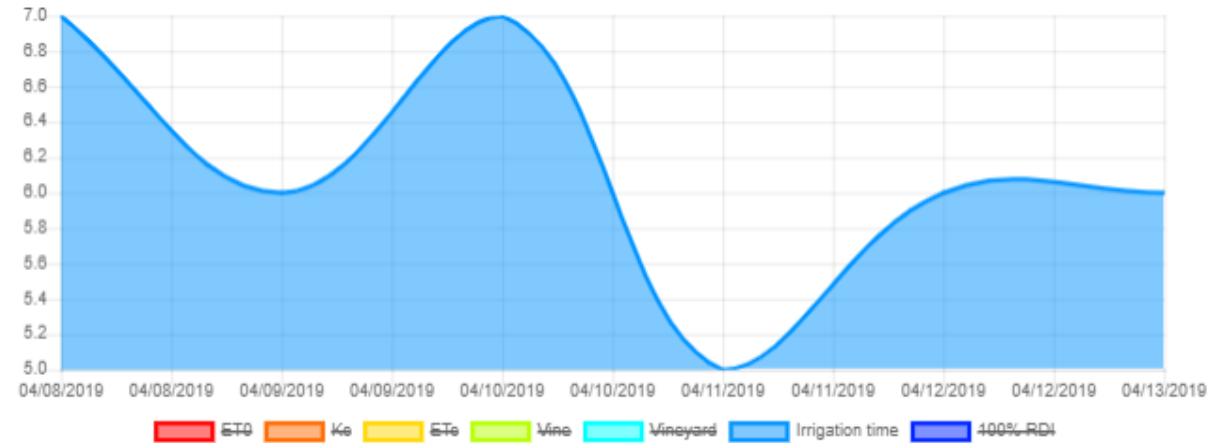
# WHEN TO IRRIGATE: SOIL MOISTURE



# HOW MUCH IRRIGATION

- CIMIS weather data (ET<sub>o</sub>)
- Crop coefficient (K<sub>c</sub>)  
(canopy shade area/area per vine) x 0.17\*
- $ET_c = ET_o \times K_c$

- Soil moisture feedback
- Automate irrigation times
- EQIP = generous NRCS subsidy program!!



Search   

ET <sub>0</sub>	K <sub>c</sub>	ET <sub>c</sub>	Vine	Vineyard	Irrigation time	100% RDI	Date
0.2067 inch	0.028	0.0059 inch	0.13 gal	15.06 gal	6 min	6 min	04/13/2019

\* Williams and Ayars, 2005

# IRRIGATION WATER DELIVERY

## SOIL MOISTURE SENSING

COMMON SENSOR TYPES  
ARE EQUALLY INACCURATE

ERROR **25%**

100% ET



- 25% = 0.75% ET

## SOLUTION

ADDITIONAL DATA:  
EVAPOTRANSPIRATION

## VALVE OPERATION

DETERMINE IRRIGATION TIME,  
TIMELY OPEN/CLOSE

ERROR **50%**



- 50% = 38% ET

## SOLUTION

AUTOMATED IRRIGATION TIMING  
AND VALVE CONTROL

## WATER DELIVERY

EMITTER INACCURACY, DISTR.  
UNIFORMITY, CLOGGING, LEAKS

ERROR **25%**



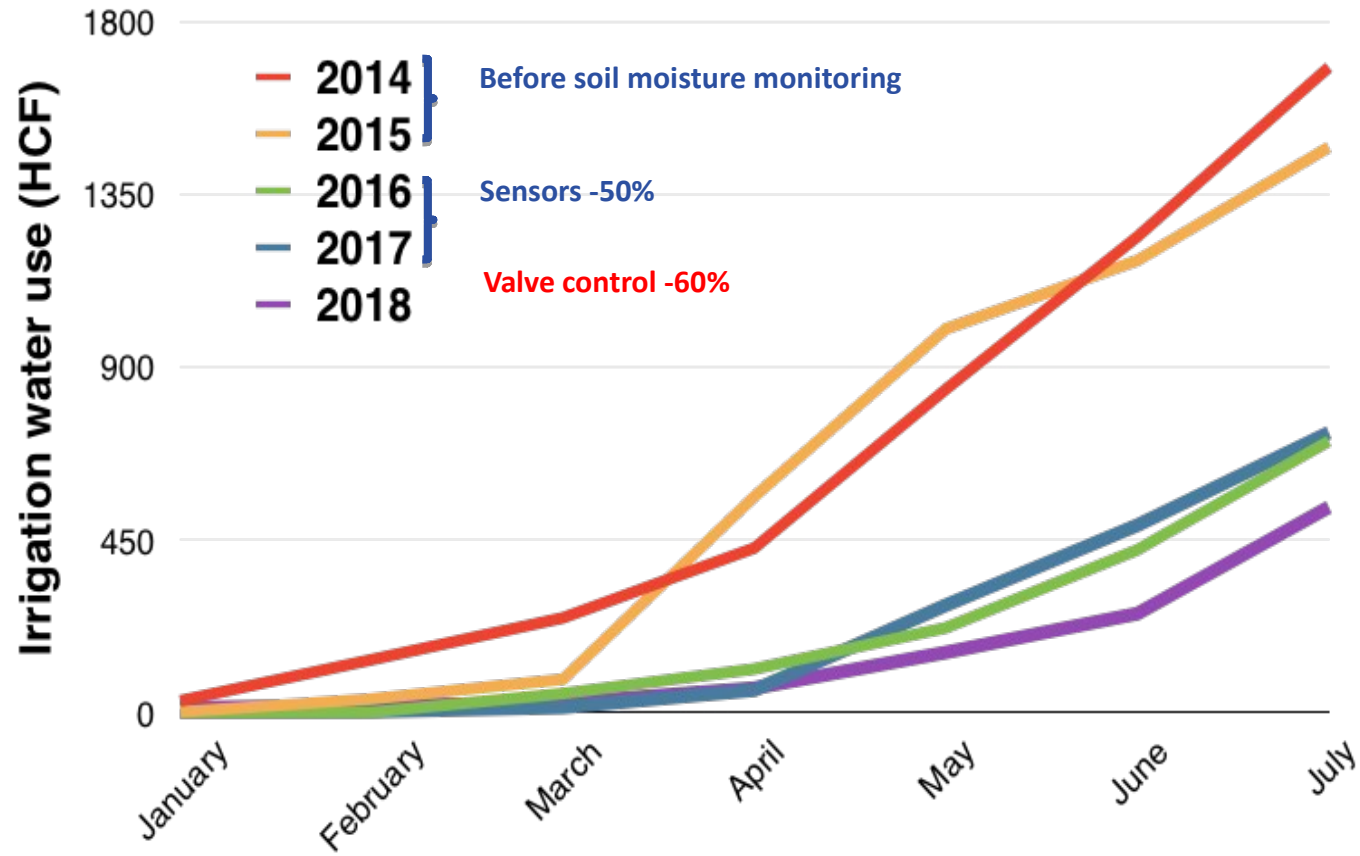
- 25% = **28% ET**  
**UP TO 40%**  
**YIELD LOSS\***

## SOLUTION

WATER METERING, VOLUMETRIC  
IRRIGATION CONTROL

\* Larry Williams , UC Davis 2001

# 5-YEAR WATER USE



# KEY TAKEAWAYS

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- **Wine industry growth and climate increase water use**
- **At high stress levels, water saving not possible**
- **Irrigation economic impact:**
  - 1 Wine quality
  - 2 Yield
  - 3 Water & Labor
- **Soil moisture: when to irrigate**
- **ET: how much to irrigate**
- **Irrigation automation, volumetric feedback**
- **There's still time to install before Summer**





**Thank You**

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