

Irrigation Considerations in a *Dry Year*

3 April 2014

Lodi

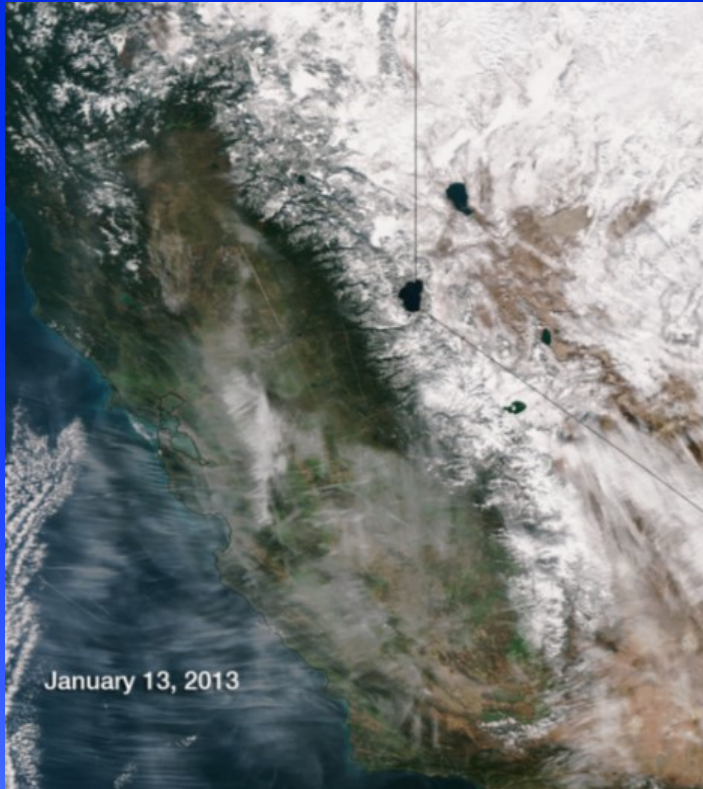


Paul Verdegaal
UC Farm Advisor
San Joaquin County



Grape Vines - Camels of Commercial Horticulture

2014 Dry Winter



January 13, 2013



January 13, 2014



Folsom Lake - July 20, 2011



Folsom Lake - January 16, 2014

Rainfall *Lodi*

			Rainfall Seasonal		2002-14					
	Total	% Avg	Lodi		inches					
			Oct	NovDec	Jan	Feb	Mar	Apr	May	Jun
2002	16.3	97	9.7	2.0	1.0	2.5	0.2	0.9	0	
2003	15.2	90	8.7	0.6	4.7	1.1	0.1	0.1	0	
2004	15.3	91	9.2	0.6	0.9	0.6	3.6	0.4	0	
2005	23.1	137	10.4	3.2	3.3	3.5	1.4	1.3	0	
2006	23.4	139	7.1	5.4	1.1	5.2	3.8	0.8	0	
2007	12.1	72	4.6	0.3	4.3	0.6	2.3	T	0	
2008	13.7	81	4.5	7.3	1.8	0.1	0	0	0	
2009	15.1	90	4.0	1.9	5.3	1.9	0.7	1.3	0	
2010	19.2	114	6.1	4.5	3.6	1.8	2.9	0.3	0	
2011	26.3	156	12.1	1.4	4.1	5.8	0.2	1.4	1.3	
2012	12.4	73	3.0	2.9	1.3	3.3	1.9	T	0	
2013	15.8	93	11.0	1.6	0.3	2.1	0.6	0.1	0.2	
2014	9.8	58	2.2	0.1	4.7	1.9	1.0			
Average	16.9		7.1	2.4	2.8	2.4	1.5	0.7	0.1	

Season Start

Average Date of Budbreak*								
Chardonnay			1986-2014					
Lodi								
Year	Date in March		Year	Date in March		Year	Date in March	
	1986	9		1996	15		2006	15
	1987	26		1997	1		2007	14
	1988	13		1998	14		2008	12
	1989	17		1999	25		2009	20
	1990	23		2000	17		2010	15
	1991	21		2001	17		2011	17
	1992	13		2002	13		2012	15
	1993	22		2003	10		2013	18
	1994	14		2004	13		2014	9
	1995	5		2005	2			
		16			13			15
* Budbreak = 10% of buds at ½ inch shoot length or first leaf unfolding								
Average Date March 15							psv	
							UCCE	

Initial To Do List

- Test well or water source
- Run water analysis
- Check irrigation system
- Auger or dig down 3 feet or more
- And/or Place soil monitoring devices
- Talk to your winery or grape buyer now

Water Use

Climate

Evapotranspiration Reference (ET_o)

Extraneous Forces

Fog

Wind

Temperature

Sun Interception

Size of Canopy (K_c)

Time of season (canopy Expansion)

Spacing

Trellis

Soil

Texture

Depth

Variety/Rootstock

Competition

Varieties

- Malbec
- Zinfandel
- Cabernet Sauvignon
- Syrah
- Sauvignon blanc
- Merlot
- Petite Sirah
- Pinot noir
- Chardonnay
- Pinot grigio
- Muscat blanc

Rootstocks

- St. George
- Ramsey (Salt Creek)
- 110R
- 1103 Paulsen
- 101-14Mgt
- Kober 5BB
- 3309C
- SO4
- Teleki 5C

Information on Scheduling & Strategies

- <http://ucmanagedrought.ucdavis.edu/>
- http://cesanjoaquin.ucanr.edu/Custom_Program/
LAWR Water Management Specialist
- <http://www.lodiwine.com/lodi-winegrowers-workbook>



Soil Water Holding Capacity WHC

Soil Texture

Available Waterholding
capacity
(in. of water/foot of soil)

Very coarse sands

0.4 - 0.75

Coarse sands, fine sands, loamy sands

0.75 - 1.25

Sandy loams, fine sandy loams

1.25 - 1.75

Very fine sandy loams, loams, silt loams

1.50 - 2.30

Clay loams, silty clay loams, sandy clay loams

1.75 - 2.50

Sandy clays, silty clays, clays

1.60 - 2.50

Irrigation Water Comparison Full/Deficit in Three Areas

	San Joaquin Valley	Lodi	North Coast
Full water use (in)	29	27	24
Soil storage (in)	4	9	10
Net irrigation requirement (in)	25	18	14
Irrigation efficiency (%)	90	90	90
Gross irrigation requirement (in)	27.8	20	15.6
<hr/>			
Deficit irrigation use (in)	22	18	16
Soil storage (in)	4	9	10
Net irrigation requirement (in)	18	9	6
Irrigation efficiency (%)	90	90	90
Gross Irrigation requirement (in)	20	10	6.7
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Deficit/Full (%)	72	50	43

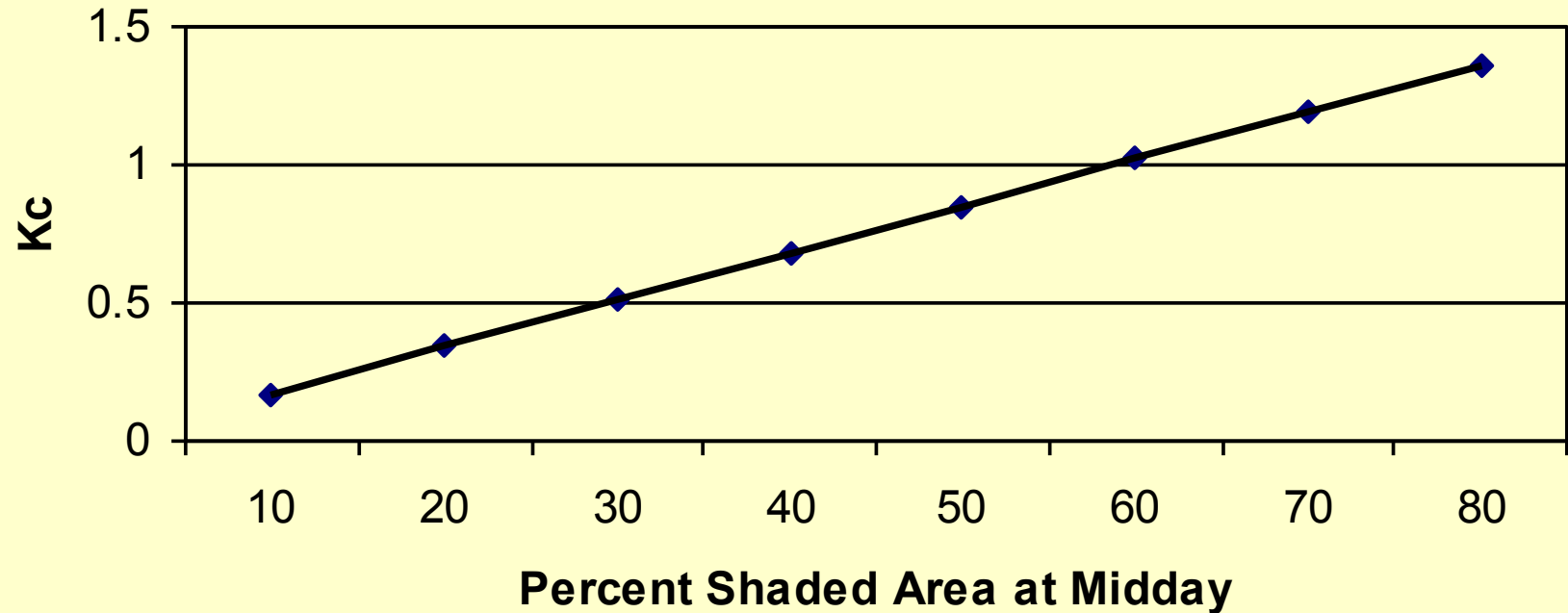


		Lodi					
		1983-2003					
				Kc	ETo	ETc	Hours
2/12	to	2/18			0.04	0.56	0.02
2/19	to	2/25			0.08	0.63	0.05
2/26	to	3/3			0.12	0.61	0.07
3/4	to	3/10			0.16	0.71	0.11
3/11	to	3/17			0.19	0.80	0.16
3/18	to	3/24			0.23	0.93	0.21
3/25	to	3/31			0.26	1.10	0.29
4/1	to	4/7			0.29	1.14	0.33
4/8	to	4/14			0.32	1.28	0.40
4/15	to	4/21			0.34	1.24	0.42
4/22	to	4/28			0.36	1.43	0.52
4/29	to	5/5			0.39	1.57	0.60
5/6	to	5/12			0.40	1.58	0.64
5/13	to	5/19			0.42	1.59	0.67
5/20	to	5/26			0.43	1.67	0.73
5/27	to	6/2			0.45	1.67	0.75
6/3	to	6/9			0.68	1.74	1.18
6/10	to	6/16			0.68	1.82	1.24
6/17	to	6/23			0.68	1.85	1.26
6/24	to	6/30			0.68	1.80	1.23
7/1	to	7/7			0.68	1.86	1.26
7/8	to	7/14			0.68	1.82	1.24
7/15	to	7/21			0.68	1.72	1.17
7/22	to	7/28			0.68	1.69	1.15
7/29	to	8/4			0.68	1.68	1.14
8/5	to	8/11			0.68	1.63	1.11
8/12	to	8/18			0.68	1.56	1.06
8/19	to	8/25			0.68	1.49	1.02
8/26	to	9/1			0.68	1.45	0.98
9/2	to	9/8			0.68	1.37	0.93
9/9	to	9/15			0.68	1.23	0.83
9/16	to	9/22			0.68	1.17	0.80
9/23	to	9/29			0.68	1.05	0.72
9/30	to	10/6			0.68	0.97	0.66
10/7	to	10/13			0.68	0.88	0.60
10/14	to	10/20			0.68	0.78	0.53
10/21	to	10/27			0.68	0.66	0.45
10/28	to	11/3			0.68	0.54	0.37
							26.88



Relationship Between Percent Land Surface Shaded and Vineyard Kc

$$Y = 0.017X + 0.002$$



LE Williams

$$30 \times 0.017 = .51 \text{ Kc}$$



Land Surface Shaded
midday

$$\text{LSS\%} = 0.30$$

$$\text{Crop Coefficient } K_c = 0.30 \times 1.7 = 0.51$$

May 10 7:30



Irrigation Application

Gallons/vine = inches water x vine spacing ft x 0.623

48 gal/vine = 1.0 in x 7 x 11 x 0.623

Acre Inches = (Gallons per vine x 1.6) / vine spacing ft

1.0 acre inch = (48 x 1.6) / 7 x 11

Acre Inches = (hours x gph x 1.6) / emitter spacing inches*

0.46 = 24 x 0.5 x 1.6 / 42

****7 x 11 @2 emitters per vine = 42 inches***

Comparison of Spacings

<u>Spacing</u>	<u>Vines / Acre</u>	<u>@10 hours</u>	<u>@1 acre inch</u>
7 x 10	660	0.24 acre inch	41 gals per vine
5 x 11	792	0.30 “	34 “



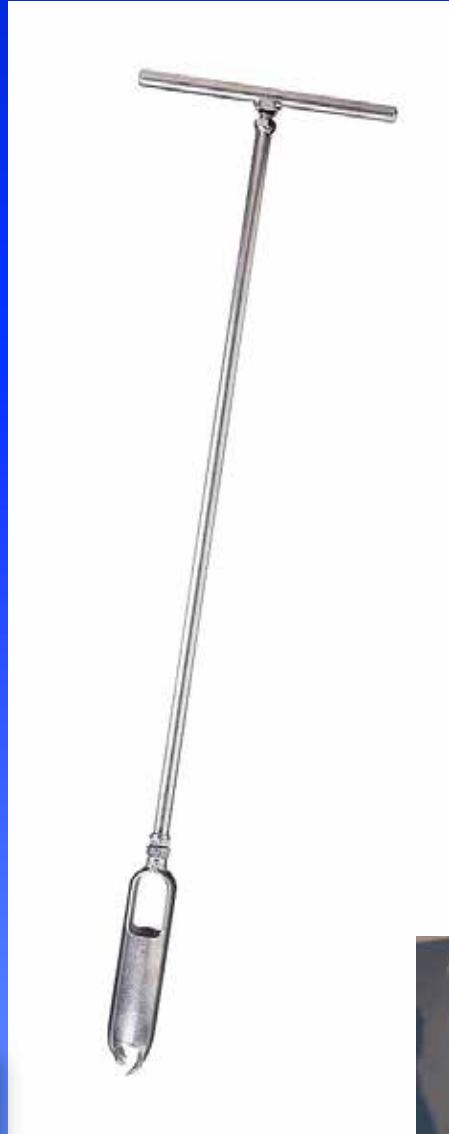
VS



Monitoring Vine stress

- Direct
 - Shoot tip Rating
 - Pressure Chamber (Bomb)
- Indirect
 - Tensiometer
 - Gypsum block/Water Mark
 - Soil Capacitance
 - Neutron Probe

Monitoring



Shoot Tip Rating



When ?

Early

Stage I

bud break to flower set

Mid

flower set to 30 days post

Stage II

30-40 days post bloom

Late

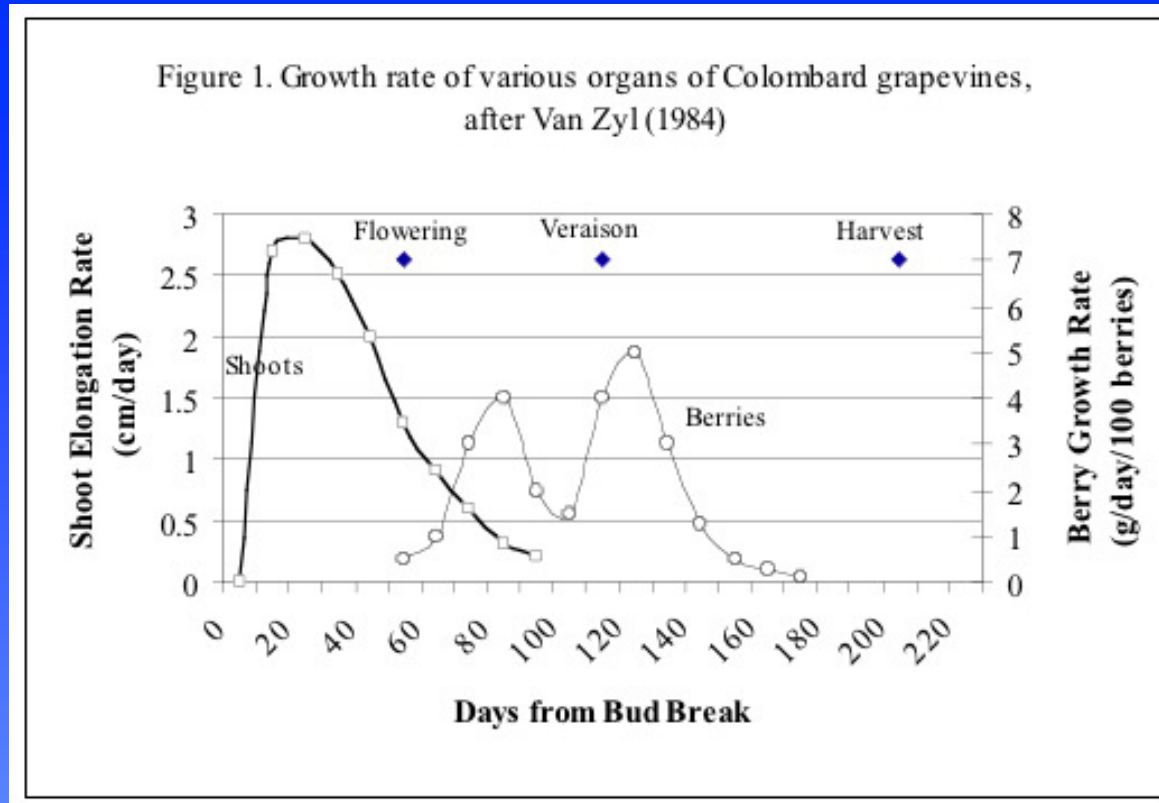
Stage III

veraison to harvest

Postharvest

Avoid defoliation of 5no stress

Vine and Fruit Growth Demand



Timing of Water Deficits

- Early season
 - bud break through set
 - Mid season
 - set through veraison
 - Late season
 - veraison through harvest
 - Postharvest
- Greatest effect
-

So When and How Much ?

- Spread available water evenly across season, but...
- Save some early; budbreak to bloom
- Apply savings during 100° F spells
- Increase stress early veraison
- After full veraison; 18° Brix apply more, if available, especially on or before 100°F
- Post Harvest; apply if available and /or attend church of choice



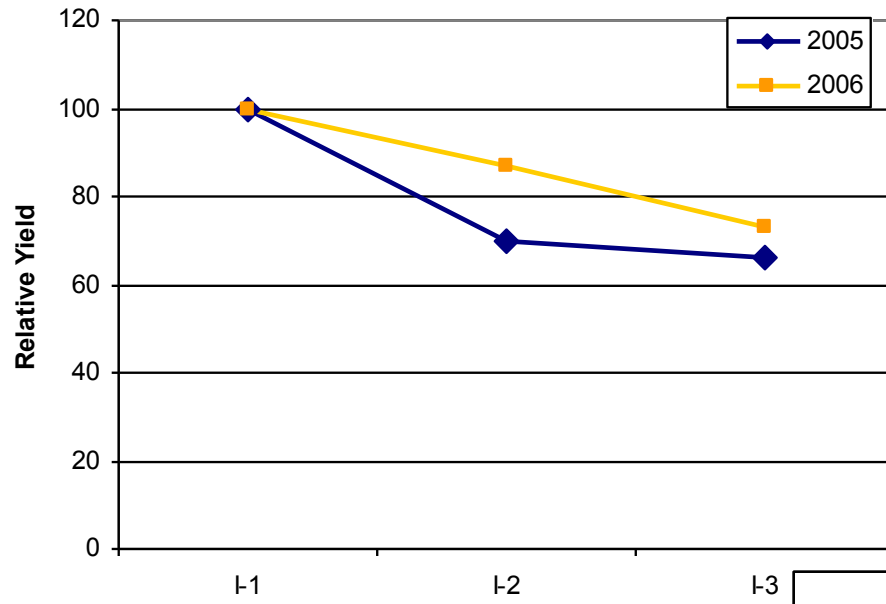
Questions: Strategy

- Should I “summer prune” to reduce canopy?
- What if I don't have excessive shoot growth?
- Can I go too far and reduce yield/ quality?
- How far can I go to reduce applied water?
- Can continued year after year water deficits harm the vine?

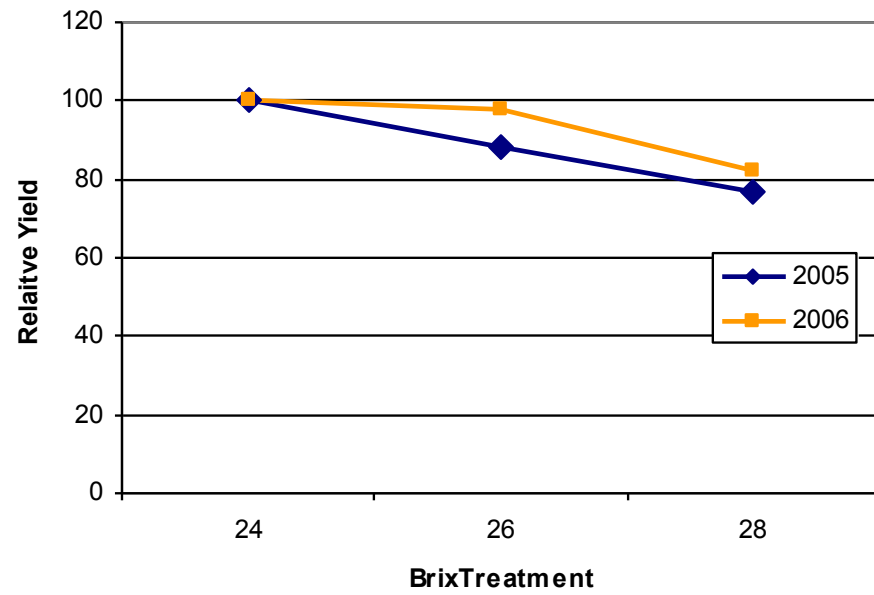
Effects of Drought Stress

- Yield loss; Expect less crop ,25 to 60%
- Nematodes (Phylloxera)
- *Eutypa* Dieback/Bot Canker
- Vine Decline/Esca/Measles/*Phomopsis* Dieback
- Nutrient Problems (K)
- Virus Problems
- Trunk and cane borers
- Soil Restrictions
- Salinity

Syrah 2005 - 2006 Yield



Syrah 2005 -2006 Yield

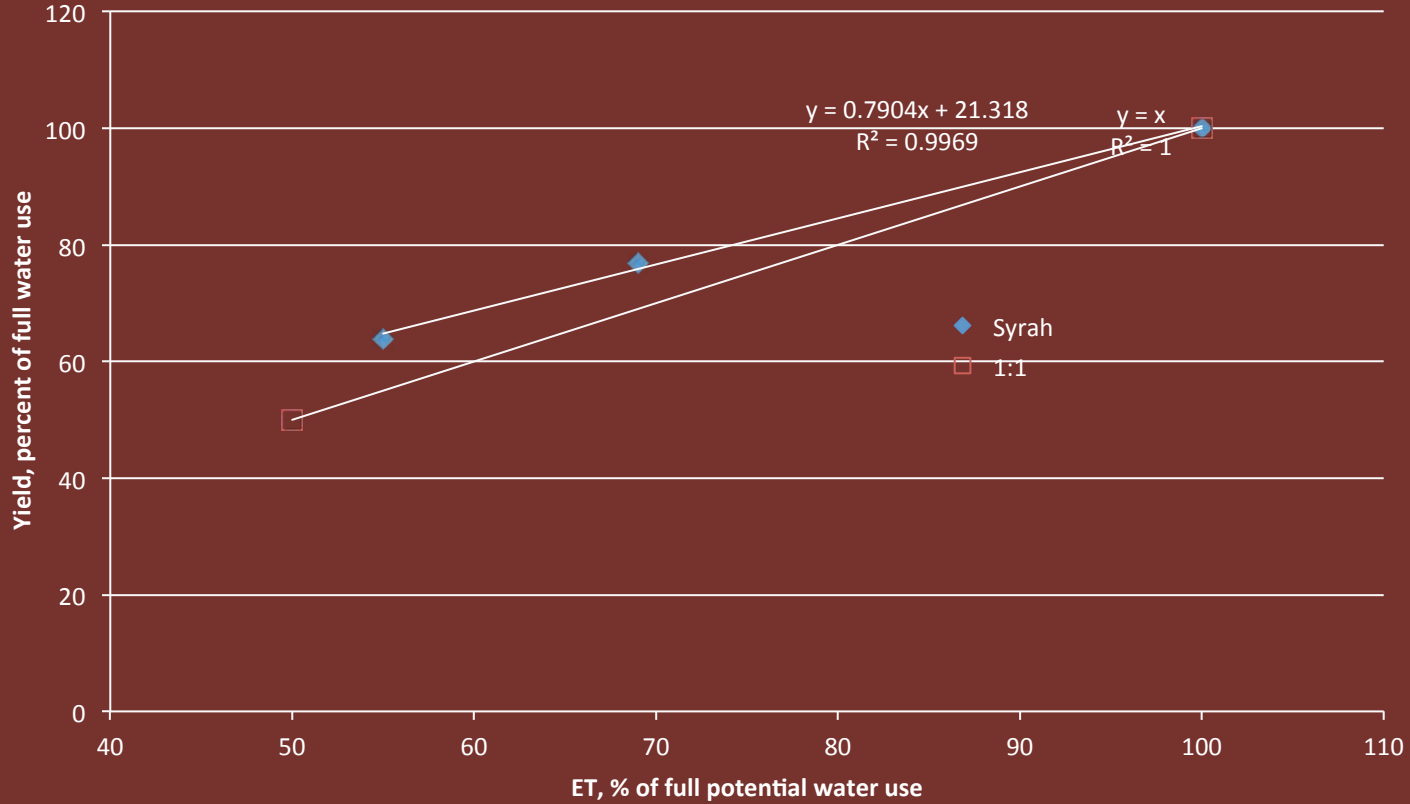


Relative Yield Treatment Effects 2006

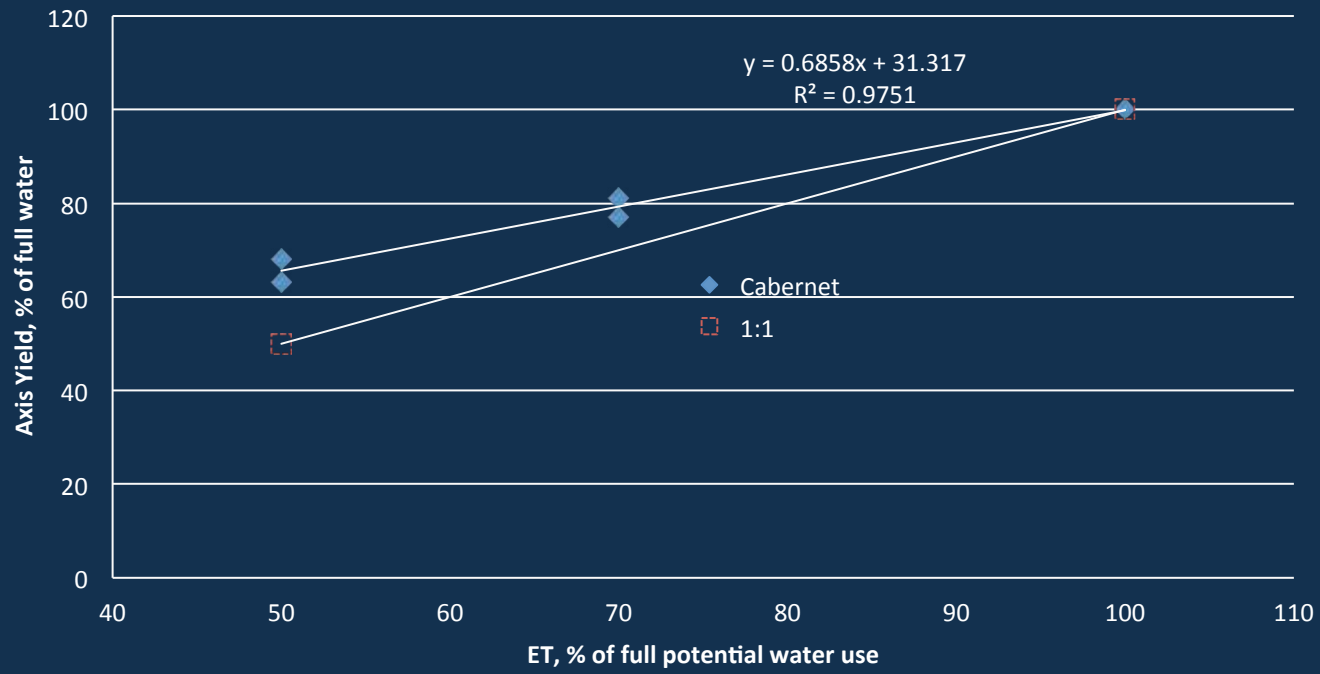
• Irrigation	<u>I-1</u>	<u>I-2</u>	<u>I-3</u>	
	0	13	27	%
• Brix	<u>24</u>	<u>26</u>	<u>28</u>	
	0	2	18	%
• Spurs	<u>14</u>	<u>18</u>		
	12	0		%

No Interaction Effect between Irrigation, Brix or Spurs

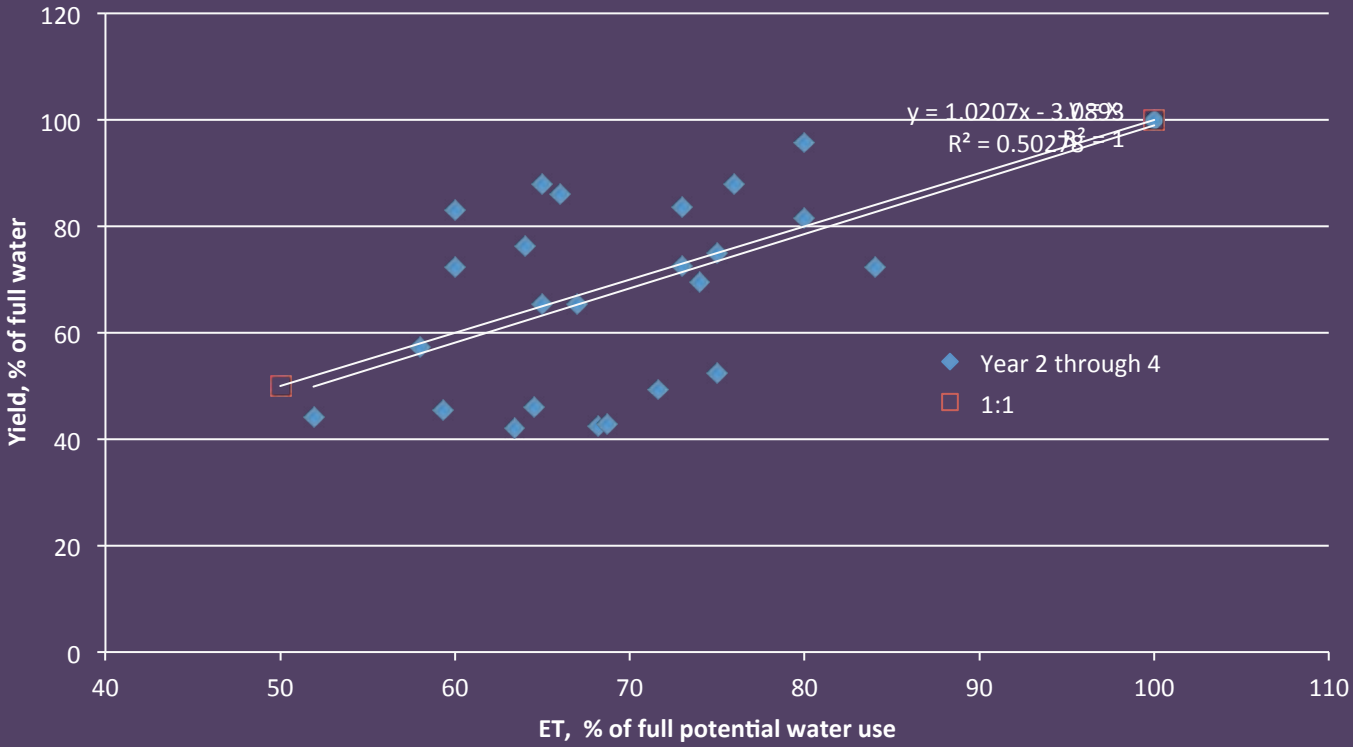
Syrah 2005 - 2008



Cabernet, Lodi 1993 - 1996



Merlot, Lodi 1998 - 2000



Summary

- Irrigate at Budbreak
 - Save some water early before bloom
 - Continue water at and after bloom
 - Irrigate evenly across the season in general
 - “Savings from earlier or “extra” during HOT spells
 - Save more water as veraison occurs
 - Apply as much as possible after full veraison (18-19°Brix)
-
- Control perennial and noxious weeds
 - Reduce N program
 - Cultivate cover crop or “chemical mow”
 - Shoot Thinning , but no Leaf Removal
 - Shoot tipping okay, but caution; no “summer pruning”
 - Harvest early rather than late; Less “hang time”

is Whiskey is for drinking, water is for fightn'

– Mark Twain?

Information on Scheduling & Strategies

- <http://ucmanagedrought.ucdavis.edu/>
- <http://www.lodiwine.com/lodi-winegrowers-workbook>
- http://cesanjoaquin.ucanr.edu/Custom_Program/
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