

# Irrigating Prunes: What is known and unknown

*Richard Buchner*  
*UCCE Tehama*

Since 1986 we have information for  
five irrigation research projects in  
California

*(Prune Research Reports)*

# The Effects of Four Years of Variable Preharvest Irrigation Cutoff Periods on Prune Tree Performance

*Dave Goldhamer, Steve Sibbett and Don Katayama  
1986-1989 • Tulare Co.*

- Preharvest Fruit Drop
- Fruit Load and Development
- Yield

Treatment No.	Date of Last Irrigation	Days Prior to Harvest
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1	Jul 3	44
2	Jul 10	37
3	Jul 17	30
4	Jul 24	23
5	Jul 31	16
6	Aug 7	9

## Fruit Load, Seasonal Fruit Drop and Harvest Parameters for 1989 after 4 Years of Deficit Irrigation

Date of Last Irrigation	Fruit load (#/tree)	Total fruit drop (%)	Harvest weight (dry lbs/tree)	Dryer dry ratio	Fruit count (dry fruit/lb)
Jul 3 (44)	2199 a	<b>23.3 a</b>	34.8 a	<b>2.77 a</b>	51.8 a
Jul 10 (40)	4075 b	<b>16.6 a</b>	62.5 b	<b>2.87 b</b>	55.6 a
Jul 17 (30)	3934 ab	<b>15.9 a</b>	61.8 b	<b>2.91 bc</b>	53.8 a
Jul 24 (23)	3508 ab	<b>19.2 a</b>	53.2 ab	<b>2.96 c</b>	53.9 a
Jul 31 (16)	3551 ab	<b>19.4 a</b>	54.7 ab	<b>2.98 c</b>	52.7 a
Aug 7 (9)	3268 ab	<b>19.9 a</b>	52.1 ab	<b>2.97 c</b>	50.9 a

## Individual Fruit Characteristics for 1989 after 4 Years of Deficit Irrigation

Date of Last Irrigation	Fresh weight (gms/fruit)	Post dryer wt. (gms/fruit)	Soluble Solids (°Brix)	Flesh pressure (lbs/in <sup>2</sup> )
Jul 3 (44)	24.5 ab	8.76 a	23.9 c	1.93 a
Jul 10 (37)	23.8 a	8.17 a	22.7 ab	2.55 a
Jul 17 (30)	24.8 ab	8.44 a	22.3 ab	2.46 a
Jul 24 (23)	25.6 ab	8.42 a	23.0 bc	2.32 a
Jul 31 (16)	25.5 ab	8.61 a	21.8 a	2.46 a
Aug 7 (9)	26.8 b	8.92 bc	23.0 bc	2.05 a

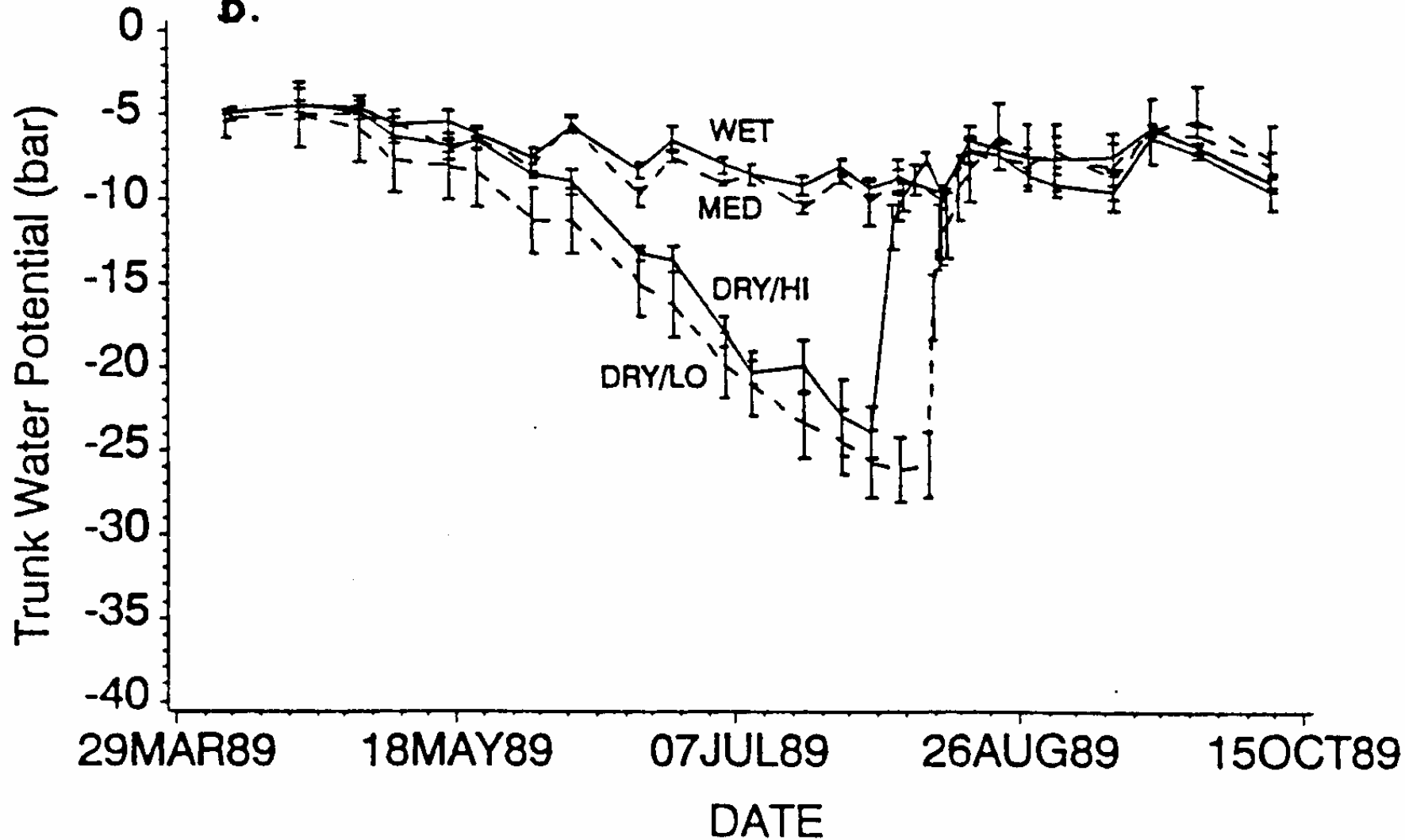
# Plant-based Prune Tree Water Stress Measurement

*Ken Shackel – 1989*

Could leaf water potential detect irrigation treatment differences?

# UCD Prune Water Relations, 1988

b.



# Sensitivity of French Prune Seasonal Growth Stages to Water Deprivation

*Dave Goldhamer, Steve Southwick, Ken Shackel, Bill Olson and Bruce Lampinen – 1989-1992*

Water deprivation at different seasonal prune growth stages.



# Description of Irrigation Treatments

Treatment	Growth stage of water deprivation	Dates of Cutoff
1	None (control)	
2	1 (early growth phase)	Through May 4
3	1 <sup>st</sup> half II (lag phase)	May 5 – Jun 6
4	2 <sup>nd</sup> half II (lag phase)	Jun 7 – Jul 18
5	Entire II (lag phase)	May 5 – Jul 18
6	III (late growth phase)	Jul 19 – harvest
7	Post harvest	Harvest – season end

# FRUIT DIAMETER SEASONAL PATTERNS

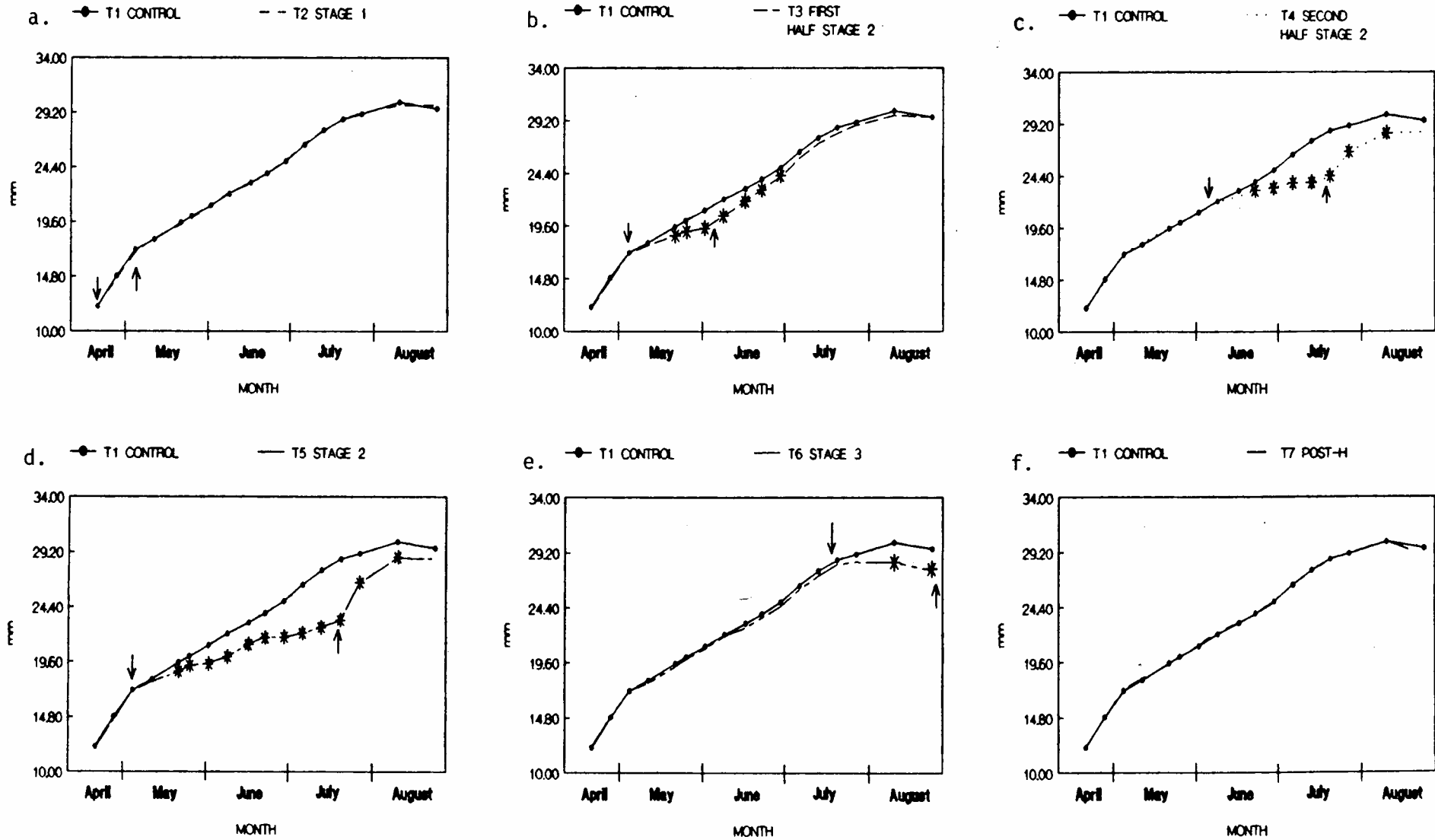


Figure 1. Fruit growth with time over the season.

## Fruit Load, seasonal fruit drop, and harvest parameters

Treatment	Fruit load (#/tree)	Total fruit drop (%)	Fruit yield (lb/tree)	Dry fruit yield (lb/tree)
Control	1417 d	28.2 a	69.9 d	24.5 d
to 5/4	1963 c	29.2 a	91.5 bc	31.3 bc
5/5 – 6/6	2547 b	24.2 a	113.5 a	38.8 a
6/7 – 7/18	1753 cd	24.2 a	74.5 cd	27.3 cd
5/5 – 7/18	3194 a	30.0 a	102.0 ab	36.7 ab
7/19 – H	1618 cd	30.0 a	72.8 d	27.5 cd
Post H	1599 cd	19.2 a	84.7 bcd	29.1 cd

## Individual fruit characteristics at harvest

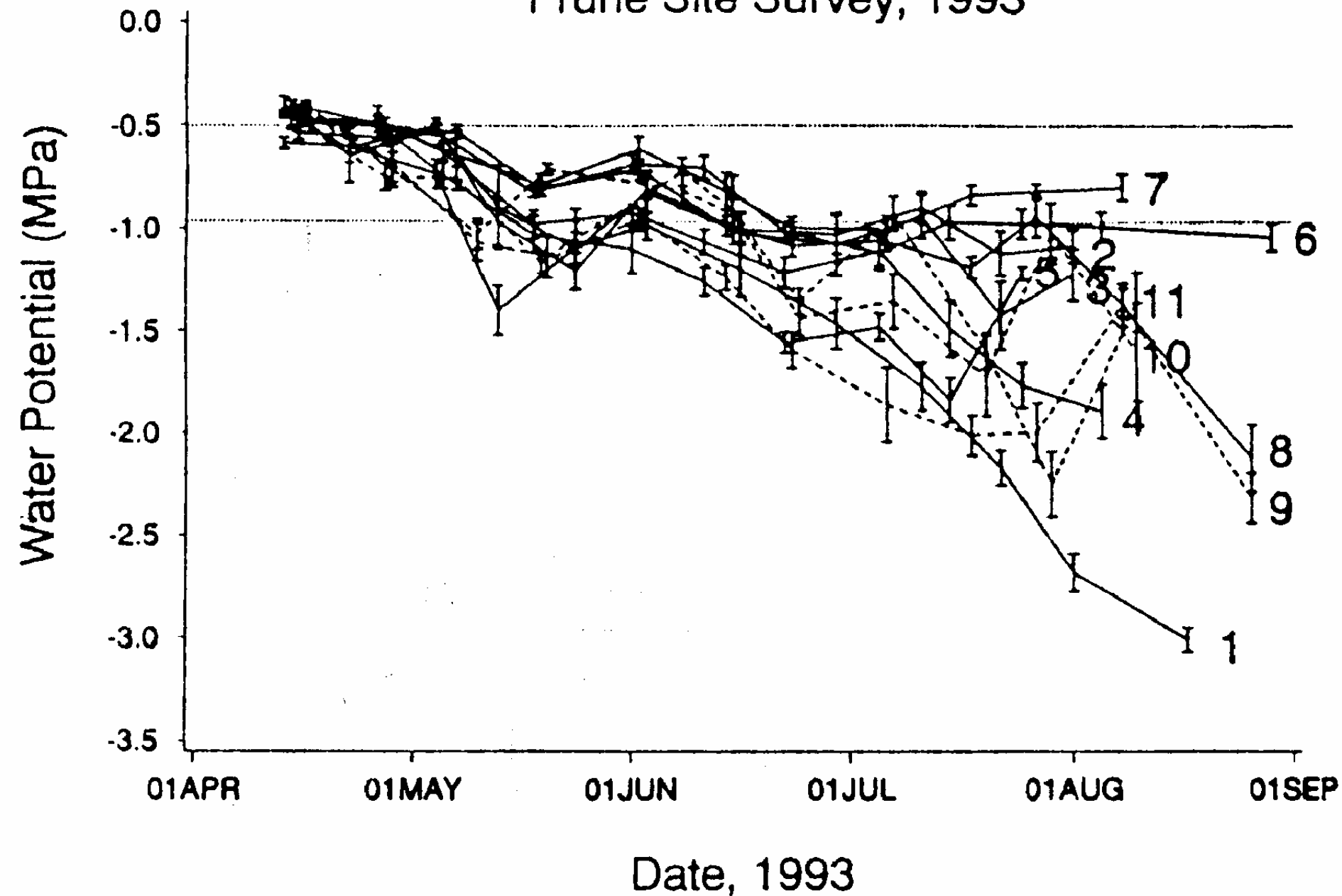
Treatment	Fresh weight (gm/fruit)	Post dryer weight (gm/fruit)	Fruit count (dry fruit/lb)
Control	28.4 a	9.91 a	46.1 c
To 5/4	27.9 a	9.49 ab	48.1 bc
5/5 – 6/6	27.2 ab	9.06 b	50.9 b
<b>6/7 – 7/18</b>	<b>24.6 c</b>	<b>9.05 b</b>	<b>50.3 b</b>
<b>5/6 – 7/18</b>	<b>21.1 d</b>	<b>7.65 c</b>	<b>61.3 a</b>
7/19 – H	25.6 bc	9.71 a	47.2 c
Post H	28.7 a	9.79 a	46.4 c

# Prune Orchard Water Status in Contrasting Prune Growing Areas of California

*Bruce Lampinen, Ken Shackel, Steve Southwick,  
Dave Goldhamer, Jim Yeager, Rick Buchner, Bill  
Krueger, Bill Olson, Steve Sibbett, Frank  
Yoshikawa – 1993*

Assess the range of midday stem water potentials.

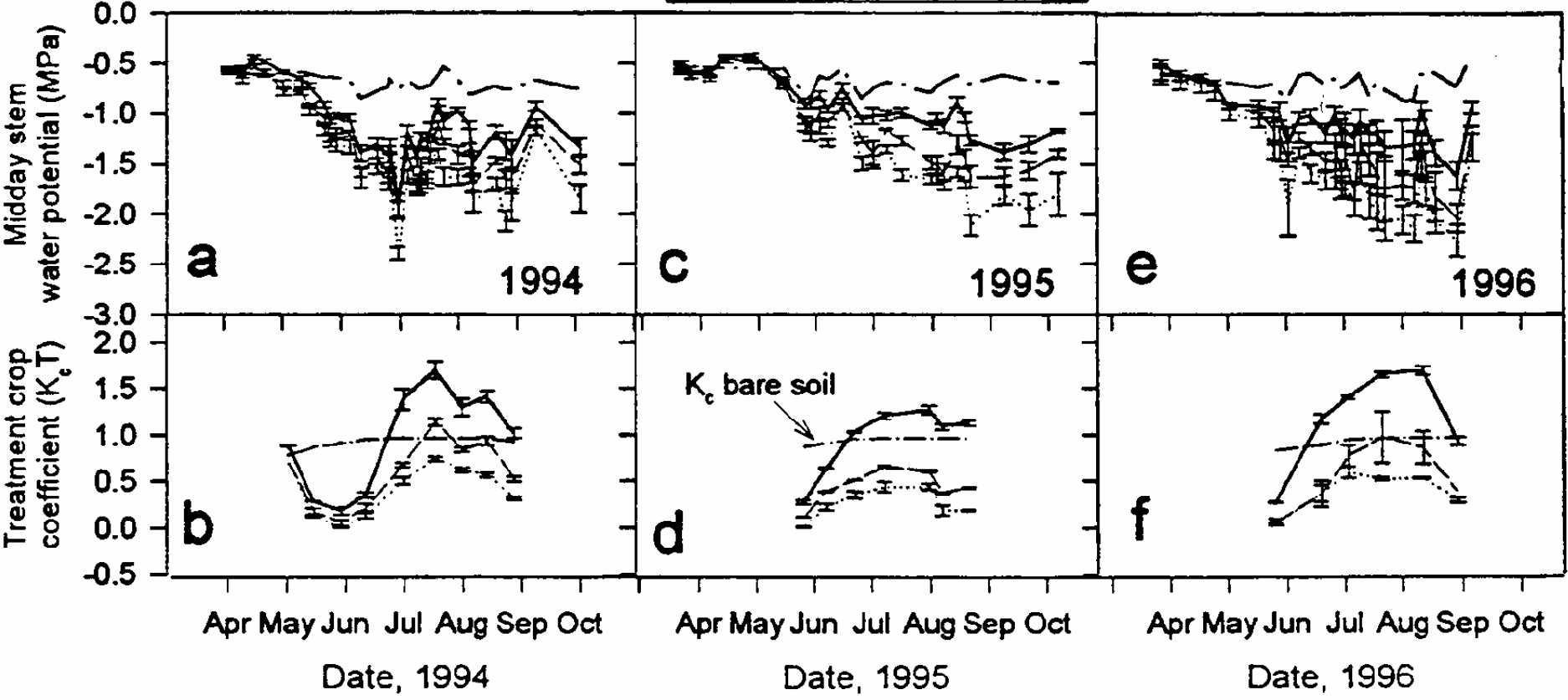
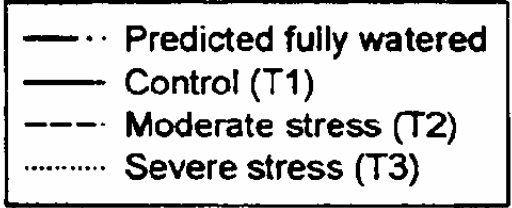
# Prune Site Survey, 1993



# Physiological Responses of Prune Trees to Moderate and Severe Water Stress: Three Year Summary

*Bruce Lampinen, Ken Shackel, Steve Southwick, Dave Goldhamer, Steve Sibbett, Bill Olson, Jim Yeager – 1994-1996*

Tried to achieve gradually increasing stress.





# Yield characteristics, relative money return, applied water and seasonal average stem water potential for Tulare County site 1996

Treatment	Fresh fruit yield (ton/acre)	Dry fruit yield (ton/acre)	Fruit load (#fruit/acre x 1000)	Count per pound	Drying ratio	Relative dollars per acre return	Applied water (%ET <sub>c</sub> )	Average stem water potential (MPa)
1996								
1	16.7 a	6.13 a	670.6 b	56 c	2.77 a	5017 c	109 c	-1.05 a
2	17.5 a	6.09 a	827.1 a	72 b	2.88 a	3662 b	95 b	-1.17 b
3	14.3 b	5.08 a	934.3 a	93 a	2.82 a	1558 a	67 a	-1.45 c

# **What about Irrigation Effects on Fruit Defects?**

# Cracking in 'French' Prune in 1999: Field Trial and Definition of Defects

*Steve Southwick, Bill Olson, Jim Yeager, Nadeem Shawareb, Kitren Glozer – 1999*

Evaluated irrigation and fruit load.

## Results of thinning and irrigation regimes on harvest and defect indices in 'French' prune; harvested 27 August, 1999.

Treatment		Drying ratio	Dry yield (lb/tree)	%Good fruit	%Side cracks	%End cracks	%Gum pockets	
	Thinning/crop load	Irrigation regime						
1	No thinning/high	Normal	2.88 a	66.6 a	87.6 a	0.33 a	10.1 ab	1.2 c
2	No thinning/high	Dry to -20 bars/irrigate	2.84 a	86.2 a	74.4 a	1.2 a	18.5 a	5.5 bc
3	'Normal' thinning/medium	Normal	2.48 b	44.7 b	78.5 a	1.8 a	4.9 bc	13.5 ab
4	'normal' thinning/medium	Dry to -20 bars/irrigate	2.50 b	29.6 bc	76.3 a	0.7 a	2.4 bc	18.9 a
5	Shake twice to 100-500 fruit per tree/low	Normal	2.31 b	10.0 d	74.0 a	1.8 a	3.5 bc	16.8 ab
6	Shake twice/low	Dry to -20 bars/irrigate	2.32 b	11.0 cd	83.6 a	0.8 a	1.4 c	13.1 ab

# Effect of Irrigation on Fruit Cracking for 'French' Prune

*Richard Buchner and Cyndi Gilles  
– Tehama 2000*

## Percent fruit cracking and stem water potential before and after irrigation on 8/17/2000.

Tree #	Stem water Potential 8/7 (Bars)	Side Cracks	% End Cracks	% Suture Cracks	% Stem water potential 8/17 (Bars)
1	-12.6	0.0	4.0	4.0	-9.3
16	-14.0	0.0	2.0	5.0	-9.9
17	-15.7	0.0	2.0	2.0	-11.5
5	-17.1	0.0	4.0	3.0	-14.0
12	-18.6	0.0	4.0	7.0	-14.4
19	-19.7	0.0	1.0	1.0	-14.0
8	-23.2	1.0	3.0	5.0	-14.2
9	-26.3	0.0	3.0	5.0	-17.5
Baseline	-8.6				-10.8

# Summary

- Limited experimental information for prune irrigation
- Prune response to water stress is not completely understood
- Midday stem water potential can indicate tree stress
- Irrigation deficit does not appear to affect fruit drop
- Irrigation deficit appears to affect fruit size
- Irrigation deficit appears to affect dry ratio
- Early season stress plus irrigation appears to aggravate end cracks
- Late season stress plus irrigation may not affect fruit cracking