



June 2001

Tree Water Use

Kevin R. Day

During the past year I have had numerous requests for information on how to better estimate orchard water use throughout the season. The total subject of irrigation and water management is exceedingly vast and of great potential complexity. In order to best address the subject it is important to have an understanding of tree water demands. To that end, table 1 illustrates tree water use on a monthly basis broken down by several categories. This information is based on historical tree water use patterns and is valid for stone and pome fruit trees growing in the southern San Joaquin Valley and without cover crops or heavy weed populations.

These figures serve as a reference or starting point to estimate and/or evaluate irrigation need and strategies. Several other points to keep in mind include:

- **Crop Presence** – Numerous studies have demonstrated that tree water needs do not appreciably increase by the presence of a crop. Consequently, the data in table 1 can be used for early-, mid-, or late-season varieties. However, water stress when fruit are on the tree will reduce fruit size, so be careful not to underirrigate in the presence of a crop. Keep in mind too that the effects of overirrigation while fruit are on the tree include reduced fruit size. For this reason soils should not be constantly saturated to the point where tree function is impaired.
- **Irrigation Efficiency** – Irrigation efficiency varies with system, soil type, length of run, and many other factors. In general, furrow/flood systems are of 60-80% efficiency, while drip/microsprinkler systems can have efficiencies greater than 85%

when properly designed and operated. In order to accurately estimate tree water need, these efficiencies must be considered. For example, an orchard with a system that is 75% efficient must receive an additional 25% of the plant water requirement in order to fully meet tree water needs.

- **Postharvest** – For those interested in saving on water costs the postharvest period represents the best opportunity. After harvest, irrigation can be reduced significantly without harm. The greatest concern here is that peach and nectarine trees **MUST NOT** suffer from water stress during the approximate period from August 20-25 to September 5-10. Stress during this time will cause or increase the number of double fruits on the tree the following year. (This, however, is not a problem with plums. Cherries should be considered in the same category as peaches and nectarines.) Also, trees should never be stressed to the point where defoliation occurs.
- **Hot/Cold** – Since these data are based on historical data, slight modifications may be necessary to adjust for unseasonably hot or cold periods.
- **Spring/Fall** – Because of the potential threat of phytophthora root rot, care should be taken not to overwater in early spring or late fall. And during these periods it is particularly important to adjust for seasonal variations and deviations in temperatures.

Finally, the data in table 2 is useful in estimating applied water. For example, a pump with an output of 452.5 gpm will pump 2 acre-feet in 24 hours (or 24 acre-inches). If this entire output is applied to a 10 acre

block, that block will receive 2.4 inches of water per acre. Conversely, if you want to apply a 4 acre-inch irrigation over a 10 acre block (40 acre-inches), the above-described pump must run for 40 hours (40 acre-inches needed ÷ 1 acre-inch per hour).

Again, the information presented here is not necessarily intended to address precisely the issue of irrigation scheduling. Rather, it is presented as general reference in exploring overall irrigation practices, strategies, and timings, and is especially useful in determining if orchard needs are adequately met.

Table 1. Historical patterns of fruit tree water use in the Southern San Joaquin Valley

Month	Tree Evapotranspiration					
	in/day	in/month	month-ly % of annual total	total cumulative inches	*gal/ac/day	gal/tree/day @ 134 tr/ac
March (16-31 only)	0.054	0.87	2.3	0.87	1465	10.9
April	0.100	2.98	7.9	3.85	2715	20.3
May	0.148	4.58	12.1	8.43	4020	30.0
June	0.217	6.49	17.1	14.92	5890	44.0
July	0.255	7.90	20.9	22.82	6925	51.7
August	0.220	6.81	18.0	29.63	5975	44.6
September	0.163	4.89	12.9	34.52	4425	33.0
October	0.090	2.76	7.3	37.28	2445	18.2
November (1-15 only)	0.033	0.52	1.4	37.80	895	6.7
Total		37.80	100	37.80		

* **Note** – Daily ET in gal/tree per day is calculated by dividing the figures in this column (gal/ac/day) by the per acre tree density.

Table 2. Units of water measurement - flow rates and volumes

- 452.5 gpm (gallons per minute) = 2 acre-feet per 24-hour period
- 452.5 gpm = 1 acre-inch per hour
- 1 cfs (cubic foot per second) = 448 gpm
- 1 acre-foot = 325,851 gallons
- 1 acre-inch = 27,154 gallons

*University of California Cooperative Extension
and the
Kearney Agricultural Center*

present

VARIETY DISPLAY AND RESEARCH UPDATE SEMINARS

Tuesday, June 12, 2001

Friday, July 13, 2001*

Tuesday, August 14, 2001

at the

**Kearney Agricultural Center
9240 S. Riverbend Avenue
Parlier, CA**

Multi-Purpose Room

- 8:00 – 9:00 a.m. Variety display by stone fruit nurseries, breeders and the USDA
- 9:00 – 10:00 a.m. Field tours to see rootstocks, irrigation, tree nutrition and tree disorders

*July 13 will be in conjunction with a group of international scientists who will be in California attending the International Peach Symposium.

For more information call Kevin R. Day, (559) 685-3309, Ext. 211.