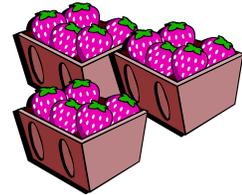


WATER MANAGEMENT For Fruit Trees and Other Plants

By Paul Vossen



Did you know that a large apple tree, on a hot summer day, would use about 50 gallons of water?

To water optimally you should know:

1. **Daily water use:** called ET (Evapo-Transpiration) in inches per day.
2. **Soil type:** to estimate water holding capacity (inches of water available to plants).
 - A. Clay: one foot of soil depth holds 2.0 to 2.5 inches of water.
 - B. Loam: one foot of soil depth holds 1.5 to 2.0 inches of water.
 - C. Sand: one foot of soil depth holds 1.0 to 1.5 inches of water.
3. **Amount of water applied:**
 - A. Drip irrigation: gallon/hour (measure emitter output).
 - B. Sprinkler irrigation: inches/foot². Place several "tin" cans in the sprinkler pattern and measure inches of water/time.
4. **The area a plant covers:** in square feet (foot²) to the drip line. (% canopy).
5. **Rooting depth:** soil depth down to an impermeable layer, usually.
6. **Statistics:**
 - A. 1 acre inch = 27,154 gallons
 - B. 1 acre = 43,560 feet²
7. **Efficiency adjustments:** must be made for young trees under drip irrigation. Two to 3 times more water should be applied to small trees less than 20% full size, gradually reducing the adjustment until trees reach 70% full cover.

For drip irrigation: water is applied on a daily basis to supply just what the tree is using everyday without providing excess for storage. Start irrigating in early spring before much soil moisture has been used, because this stored water may be needed later in case the system is accidentally shut down. Soil type or depth is inconsequential, and only 25 - 40% of the rooting area need be wetted for good tree performance.

Example: a young semi-dwarf fruit tree, two years old, and occupying a space of 10 feet². It has two 1 gallon/hour emitters and on a warm spring day the water use rate is about 0.20 inches/day.

How much: 1.25 gallon/day (TABLE) times a factor of about 2.5 for an efficiency adjustment on young trees (10-15% canopy) = 3.13 gallons/day.

How often: 3.13 gallon/day divided by 2 emitters = 1.56 hours everyday.

Example: a mature standard size (large) fruit tree occupying an area of 300 feet² with four, one gallon/hour emitters per tree. A hot summer day uses 0.25 inches of water per day (ET).

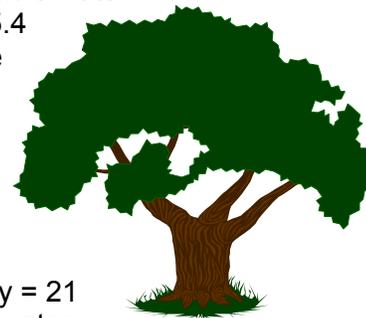
How much: 0.156 gallon/day (TABLE) X 300 feet² = 46.8 gallons/day.

How often: everyday, 46.8 divided by 4 emitters = 11.7 hours. Every other day = 23.4 hours.

For sprinkler irrigation: water is not applied daily, but on a periodic basis to fill the soil, which acts as a storage reservoir for water available to the plant. Soil type and rooting characteristics are very important. Recent research shows beneficial results from irrigating at or before 50-75% depletion of the (soil-stored) available water, then applying what has been used + 20% for efficiency loss.

Example: a mature standard size (large) fruit tree occupying an area of 300 feet². A rooting depth of 3 feet, loam soil, and a daily water use (ET) of 0.25 inches/day in July.

How much: 3 feet rooting depth x 2" of available water per foot = 6" of available water.
 6" x 75% depletion = 4.5" = amount of water to apply + 20% = 5.4 inches. 300 feet² divided by 43,560 feet² x 27,154 gallons/acre inches X 5.4 inches = 1,010 gallons/300 feet² (for that tree) or 146,360 gallons per acre.



How long: Set open "tin" cans under sprinklers and measure how long it takes to apply 1 inch of water x 5.4 inches = the duration of set.

How often: 5.4 inches of water divided by 0.25 inches of water used per day = 21 days. 1,010 gallons of water per tree divided by 46.8 gallons of water used per day = 21 days.

Daily Water Use in gallons per day (ET)

Plant or feet. to cover	ET in. Per day	0.10 in/day Cool day Early spring Late fall	0.20 in/day Warm day Spring or fall Some fog	0.25 in/day Hot day Mid-summer No fog	0.30 in/day Very hot (100° F) Mid-summer Windy
1 foot ²		0.062	0.125	0.156	0.187
4 feet ² 1 year old Fruit tree		0.25	0.50	0.62	0.75
10 feet ² 2 year old Fruit tree		0.62	1.25	1.56	1.87
36 feet ² 3 year old Fruit tree		2.25	4.5	5.61	6.73
75 feet ² Grapevine Mature		4.65	9.4	11.7	14.0
100 feet ² Semi-Dwarf mature or 4 year old		6.2	12.5	15.6	18.7
200 feet ² 2 feet wide 100 feet row Raspberry		12.4	25.0	31.2	37.4
300 feet ² Large standard. Mature tree		18.6	37.5	46.8	56.1
400 feet ² 4 feet wide 100 foot row Strawberry		24.8	50.0	62.4	74.8
1 acre Solid cover		2715	5431	6788	8146