

Getting it Right! Drip Irrigation, Plant Selection and Lowering Water Use

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Water-Efficient Landscape Gardens, Fair Oaks Horticulture Center (<http://cesacramento.ucanr.edu>)
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Common Variety Garden

- 1,900 sq. ft. planting area
- Initial irrigation
 - 3/4" valve, fed by 3/4" pipes (under sidewalk)
 - 17 mm in-line drip tubing, snaked beside plants
 - 0.6 gph, 18" emitter spacing
 - Drip tube row spacing = 18" to 48" apart
 - Drip tubes ended randomly with end closures
- Retrofit
 - Drip tubes fed by 3/4" PVC header, 35' long
 - 17 mm in-line drip tubing, line source
 - 0.6 gph, 18" emitter spacing
 - Drip tube row spacing = 18"
 - Drip tubing looped together, two ends with end caps in box for flushing
 - Measured flow rate = 8.85 gpm (nearly maximum for 3/4" pipes; flow is 5.6 ft./sec.)

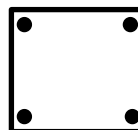
FOHC Soil
Sandy loam

Ultra Water-Efficient Landscape garden (Ultra WEL)

Intro – Past Study

2010 Water Audit – Alternative Turf Study, Florin Park

- Square plots 12' x 12', pop-up sprinkler in each corner
- 90° Hunter MP-1000 rotary stream nozzle
- 12 water catch cups, run time 7 min.
- DU_{LQ} of three plots: 0.83, 0.68, 0.71 (**Avg. = 0.74**) – ideal is 0.80+
- PR_{net} of three plots: 0.60, 0.59, 0.61 (**Avg. = 0.60**) – about right



Ultra-WEL Sprinklers

- Installed Nov. 2015, 1" valve
- Soil prep – excavator to 2' depth, then incorporated compost and lava fines
- Initial irrigation = 12" pop-up heads, MP-1000 rotator sprinklers. Total flow 11.5 gal./min.
- Water audit – 24 water catch cups, run time 7-8 min.

Formulas

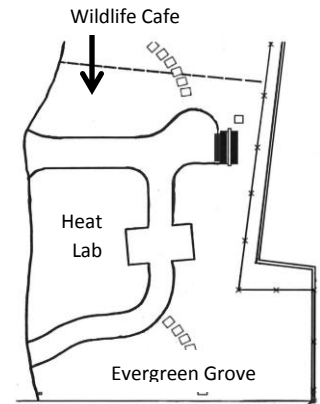
- Distribution uniformity (DU_{LQ}) = Avg. low quarter / Avg. volume
- Net precipitation rate (PR_{net}) = 3.66 x avg. volume / (run time x area of catch device)

	Ever-green	Heat Lab	Wildlife Café	AVG
Feb. 5, 2016				
DU_{LQ}	0.63	0.63	0.47	0.58
PR_{net} (in./hr.)	0.86	0.98	0.91	0.92
July 29, 2016				
DU_{LQ}	0.66	0.58	0.58	0.61
PR_{net} (in./hr.)	0.66	0.76	0.74	0.72



Ultra-WEL Irrigation Retrofit (sprinklers to line source drip), Sept. 2016

- 17 mm in-line tubing (1.0 gph, 12" emitter x 15" row spacing)
- Looped in each of 4 sections
 - 3 supply headers (ends and center) of 17 mm tubing
- Tubing connected to four Rainbird retrofit heads per section
- All other pop-up heads capped (sprinkler shutoff cap)
- Total of 6 end caps (flush valves), each in a box, 31-35 psi



Hydraulics – Zone Flow by Area (gpm):

Formula

$$\frac{\text{Irrigated Area (sq ft)} \times 144}{(\text{Emitter Spacing} \times \text{Line Spacing}) \times \text{Emitter Flow Rate (gal./hr.)} / 60 \text{ min./hr.}}$$

$$\frac{1320 \times 144}{(12 \times 15) \times 1.0 / 60}$$

Predicted zone flow = 17.6 gpm

Measured zone flow = 17.5 gpm

(much more than the sprinklers in table on P. 1)

****1,320 sq. ft. planting area, 1" valve, 1" pipes 10' to split to 10' beyond, then 3/4" pipe****

Ultra WEL Drip Irrigation Scheduling

Application Rate or Precipitation Rate (in./hr.):

Formula

$$\frac{231 \times \text{Emitter Flow Rate (gal./hr.)}}{\text{Emitter Spacing (in.)} \times \text{Line Spacing (in.)}} \rightarrow \frac{231 \times 1.0}{12 \times 15}$$

Application Rate = **1.3 in./hr.** (0.108 ft./hr.)

Expressed in gal./min.:

$$1320 \text{ sq. ft.} \times 0.108 \text{ ft./hr.} \times 7.48 \text{ gal./cu. ft.} = 1,066 \text{ gal./hr.} = \mathbf{17.8 \text{ gal./min.}}$$

Plant Water Requirement (in./day)

Formula

$$\text{Species factor} \times \text{ET}_o$$

(Species factor for highly drought tolerant plants ≈ 0.20 to 0.30)

Daily ETo (in.) for late July and mid-September, 2016

Last week in July		1 week in mid-Sept.	
AVG	0.28	AVG	0.18
WEEK	1.93	WEEK	1.24

Run Time (hrs./week)

Formula

$$\frac{\text{Plant water requirement (in./week)}}{\text{Application rate (in./hr.)}}$$

Late July 2016: 0.20 x 1.93 / 1.3 = 0.30 hr./week (cycle & soak)

Mid Sept. 2016: 0.20 x 1.24 / 1.3 = 0.19 hr./week