Water Efficient Drip Irrigation Class

Regan's Nursery, Fremont
Sponsor: Alameda County Water District
August 21, 2010

Learning Objectives

1) Why drip irrigation is considered the most efficient method of watering landscape plants
2) The benefits and disadvantages of drip irrigation
3) When to use drip, and when to use sprinklers
4) The two methods of drip application: line source and point source
5) How soil type affects drip design and placement of emitters
6) How to decide how many emitters to assign to each plant
7) How to divide the garden into hydrozones
8) Scheduling the frequency of days to water
9) Designing and installing the most efficient system tailored to any garden
10) Convert existing sprinklers to drip

What is Drip?

Drip is low-pressure, low-volume irrigation. The water is usually carried through polyethylene tubing, and is applied directly to the root zone of the plants.

Methods of Drip

a. Point source (plant to plant) for sparse plantings
b. Line source (grid) for dense plantings (this is the same as sprinklers, in that the irrigation covers 100% of the soil). This method incorporates a grid.
c. Drip for containers
d. Microsprays?
e. Do not mix microsprays and drip emitters on the same zone!

Soil

a. How to determine soil texture. Is it sand, or loam, or clay?
b. How infiltration rate of the soil affects emitter design decisions

Designing the Drip System

How Many Zones?

a. Groupings by plant types, or hydrozones
    1. Turf
    2. Trees (circle ¾ of the drip line of the tree)
    3. Groundcover (grid for line source)

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a. Groupings by plant types, or hydrozones (cont.)
    4. Annuals
    5. Veggies
b. Groupings by similar microclimate
    1. Sun/shade
    2. Wind
    3. Near concrete or asphalt
c. Groupings by water needs (consult WUCOLS list online)
    1. Native or Mediterranean plants
    2. Tropical plants
    3. Succulents and cactus
    4. Plants in pots
    5. Trees
    6. Groupings by precipitation rate: don't mix drip emitters and microsprays

- **Call USA Dig before doing any digging in front yard: 1-800-227-2600**

Design Capacity of System

1. ½-inch pipe feed capacity of 4 gpm (gallons/minute) per zone (especially if using hose bib on house). This equals 240 gph (gallons/hour).
2. ¾-inch pipe feed capacity of 6 gpm per zone. This equals 360 gph.

Backflow Protection

1. RP (reduced pressure) backflow prevention
2. Anti-siphon valves
3. AVB (atmospheric-vacuum breaker) for high spots
4. Hose bib backflow protection

Drip System Components

1. Automatic irrigation valve (low minimum flow is best)
2. 200 mesh filter: check filter once per year
3. Pressure regulator, 30 psi (assure it is rated for the flow rate of the zone)
4. Pressure-compensating emitters
5. Polyethylene tubing with or without built-in emitters
6. Fittings: crosses, tees, elbows, couplers, figure 8 line end, dripper plug ring
7. Metal jute stakes
8. Flushing end cap: flush system at time of installation and twice per year
9. ¼-inch tubing for containers

Convert Existing Sprinkler System: To convert an existing sprinkler system to drip, there are two methods:

1. Abandon the underground pipes, and install filter and pressure regulator starting at the valve.
2. Or cap off all but one sprinkler in the zone, and convert that zone with a filter and pressure regulator.

Drip Design Worksheet: Dense Hydrozone - Line Source

Species Factor: Ks = Very low .1 Low .1-.3 Mod. .4-.6 High .7-.9

Site Information

Name _____ Date _____

Address _____

City Union City State CA Zip _____

Contact _____

Day Phone _____ Eve. Phone _____

Weekly **Peak ET** (inches) 1.47 June

Soil Type: ____ Sand ____ Loam

____ Sandy Loam _____ Clay Loam ____ Clay

Estimated Microclimate Factors

Plant Type	*Low*	*Average*	*High*
Trees	0.5	1	1.4
Shrubs	0.5	1	1.3
Ground Covers	0.5	1	1.2
Mixed	0.5	1	1.4

Percent Adjust

Jan. 17%	Feb. 31%	March 56%	April 74%	May 77%
June 100%	July 97%	August 88%	Sept. 71%	Oct. 51%
Nov. 24%	Dec. 19%			

Plants			Plant ET Factors			Emission Devices			
Hydrozone or Bed	**Plant Type**	**Bed Area (sq. ft.)**	**Species Factor Ks**	**PET In./week**	**ET_P**	**Flow per Emitter (gph)**	**Emitter and Row Spacing**	**Application Rate (in./hr.)**	**Runtime Min./week**
Sedum	Low Water Use	100	0.2	1.47	0.29	0.5	12	0.80	22
Dymondia	Low Water Use	100	0.2	1.47	0.29	0.5	18	0.36	49
Manzanita	Low Water Use	100	0.2	1.47	0.29	1	12	1.60	11
Lamb's Ear	Low Water Use	100	0.2	1.47	0.29	1	18	0.71	25
St John's Wort	Moderate Water Use	100	0.5	1.47	0.735	0.5	12	0.80	55
Creeping Thyme	Moderate Water Use	100	0.5	1.47	0.74	0.5	18	0.36	124
Blue Star Creeper	Moderate Water Use	100	0.5	1.47	0.735	1	12	1.60	27
Star Jasmine	Moderate Water Use	100	0.5	1.47	0.735	1	18	0.71	62
Baby Tears	High Water Use	100	0.8	1.47	1.18	1	12	1.60	44
Moneywort	High Water Use	100	0.8	1.47	1.18	1	18	0.71	99

		Clay soil	Loam Soil	Sandy Soil	Sandy Soil
	Emitter Flow	0.26 GPH	0.4 GPH	0.6 GPH	0.9 GPH
	Emitter Interval	18"	18"	12"	12"
	Row Spacings	18" - 24"	18"- 24"	16"-20"	16" - 20"
	Application Rate	.19" - .14"	.29" - .21"	.72" - .58"	1.08" - .87"

Drip Design Worksheet: Sparse Hydrozone - Point Source

Species Factor: Ks = Very low .1 Low .1-.3 Mod. .4-.6 High .7-.9

Site Information

Name _____ Date _____

Address _____

City **Union City** State CA Zip _____

Contact _____

Day Phone _____ Eve. Phone _____

Weekly **Peak ET** (in. /week) 1.47 June

Established Plants!

Soil Type: ____ Sand _____ Loam

____ Sandy Loam _____ Clay Loam ____ Clay

Estimated Microclimate Factors

Plant Type	*Low*	*Average*	*High*
Trees	0.5	1	1.4
Shrubs	0.5	1	1.3
Ground Covers	0.5	1	1.2
Mixed	0.5	1	1.4

Percent Adjust

Jan. 17%	Feb. 31%	Mar. 56%	April 74%	May 77%
June 100%	July 97%	Aug. 88%	Sept. 71%	Oct. 51%
Nov. 24%	Dec. 19%			

	Plant ET Factors			Plant Size		Emission Devices				
Plant Type	**Species Factor Ks (WUCOLS)**	**Microclimate Factor Kmc**	**Peak ET (in./week)**	**Plant Canopy Diameter (ft)**	**Canopy Area (sq. ft.)**	**Water Req. (Gallons per week)**	**Emitter Flow Rate**	**Emitters Per Plant**	**Total gph per Plant**	**Runtime minutes per week**
Very Low Water Use	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**
Linum spp.	0.1	1	1.47	1.0	0.79	0.07	0.5	2	1.0	4
Narcissus spp.	0.1	1	1.47	2.00	3.14	0.29	0.5	2	1.0	17
Ribes malvaceum	0.1	1	1.47	3.00	7.07	0.65	0.5	4	2.0	19
Heteromeles arbutifolia	0.1	1	1.47	4.00	12.57	1.15	0.5	8	4.0	17
Quercus agrifolia	0.1	1	1.47	5.00	19.64	1.80	0.5	12	6.0	18
Olea europaea	0.1	1	1.47	6.00	28.27	2.59	0.5	18	9.0	17
Low Water Use										
Achillea tomentosa	0.2	1	1.47	1.00	0.79	0.14	0.5	2	1.0	9
Arctostaphylos spp.	0.2	1	1.47	2.00	3.14	0.58	0.5	4	2.0	17
Rhamnus californicus	0.2	1	1.47	3.00	7.07	1.29	0.5	9	4.5	17
Rosa 'Cecile Brunner'	0.2	1	1.47	4.00	12.57	2.30	0.5	16	8.0	17
Ceanothus spp.	0.2	1	1.47	5.00	19.64	3.60	0.5	25	12.5	17
Pistacia chinensis	0.2	1	1.47	6.00	28.27	5.18	0.5	36	18.0	17
Moderate Water Use										
Thymus spp. (Thyme)	0.5	1	1.47	1.00	0.79	0.36	0.5	3	1.5	14
Rosa hybrids	0.5	1	1.47	2.00	3.14	1.44	0.5	10	5.0	17
Azalea and Rhododendron	0.5	1	1.47	3.00	7.07	3.24	0.5	23	11.5	17
Camellia spp.	0.5	1	1.47	4.00	12.57	5.75	0.5	40	20.0	17
	Wucols	**Above**	**Above**		**.7854 x D^2**	**.623 x ABCE**			**G x H**	**F ÷ I x 60**

Irrigation Resources, Information Sources, Stores – Fremont Area

Irrigation Resources — Compiled by Lori Palmquist

August 2010

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EPA WaterSense Partner
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Irrigation Association Certifications:
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Alameda County Water District
(510) 668-4200 www.acwd.org

- Approved Plant List
- Drought-Tolerant Garden at **43885 S. Grimmer Blvd., Fremont**
- Free Green house calls
- Free drip irrigation classes
- Free Bay-Friendly classes

BAWSCA – Bay Area Water Supply and Conservation Agency (San Mateo)
(650) 349-3000 http://bawsca.org/

Bay-Friendly Qualified Design and Maintenance Professionals
http://www.bayfriendlycoalition.org/landscapeprofessional.shtml

Department of Water Resources
Office of Water Use Efficiency
Julie Saare-Edmonds
(916) 651-9676
Water Use Classifications of Landscape Species – **WUCOLS** list available free online:
www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf

EPA WaterSense Program
(Environmental Protection Agency)
Toll-free 1-866-WTR-SENS
www.epa.gov/watersense

Scheduling & Design Guides, Tools

Jess Stryker's Irrigation Tutorials Online (Free)
www.irrigationtutorials.com

Rain Bird Corporation
www.rainbird.com
Irrigation Manufacturer
Free design publications, tutorials (including drip system design)
Free sprinkler system design
All products available for purchase through Rain Bird's website

UC Guide to Healthy Lawns www.ipm.ucdavis.edu/TOOLS/TURF/MAINTAIN/irrsched.html

Irrigation Manufacturers

www.hunterindustries.com	Hunter - Full array of professional irrigation products (MP Rotators 10'-30' radius)
www.irritrolsystems.com	Irritrol - Full array of professional irrigation products
www.netafimusa.com	**Netafim - Drip tubing and other products**
www.rainbird.com	**Rain Bird - Full array of professional irrigation products**
www.toro.com	Toro - Full array of professional irrigation products (Precision nozzles 5'-15' radius)

Local Irrigation Houses (retail and wholesale)

The Urban Farmer Store
Professional irrigation and landscaping materials.
Free classes, consultations, and free design of
irrigation systems with expectation of parts purchase.
Richmond, CA (510) 524-1604
www.urbanfarmerstore.com

Dublin

Ewing Irrigation & Industrial Products
6640 Sierra Ln. (925) 828-5618
www.ewing1.com

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San Jose

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