

From [www.dripirrigation.com](http://www.dripirrigation.com)



From [www.rainbird.com](http://www.rainbird.com)



# Drip Irrigation

Lori Palmquist  
Irrigation Designer & Consultant

# Challenge of landscape irrigation



## Landscape irrigation

- Different types of plants
- Different ages
- Different sizes/heights
- Varying planting density
- Varying slopes
- Varying soil types



## Agricultural irrigation

- One type of plant (crop)
- Same age
- Same size
- Same planting density
- Grown on level ground
- Same soil type

# Cash crops = monoculture



# Monoculture



Photo from [www.perfectgardeningtips.com](http://www.perfectgardeningtips.com)

# Typical Garden



# Water-Use Values

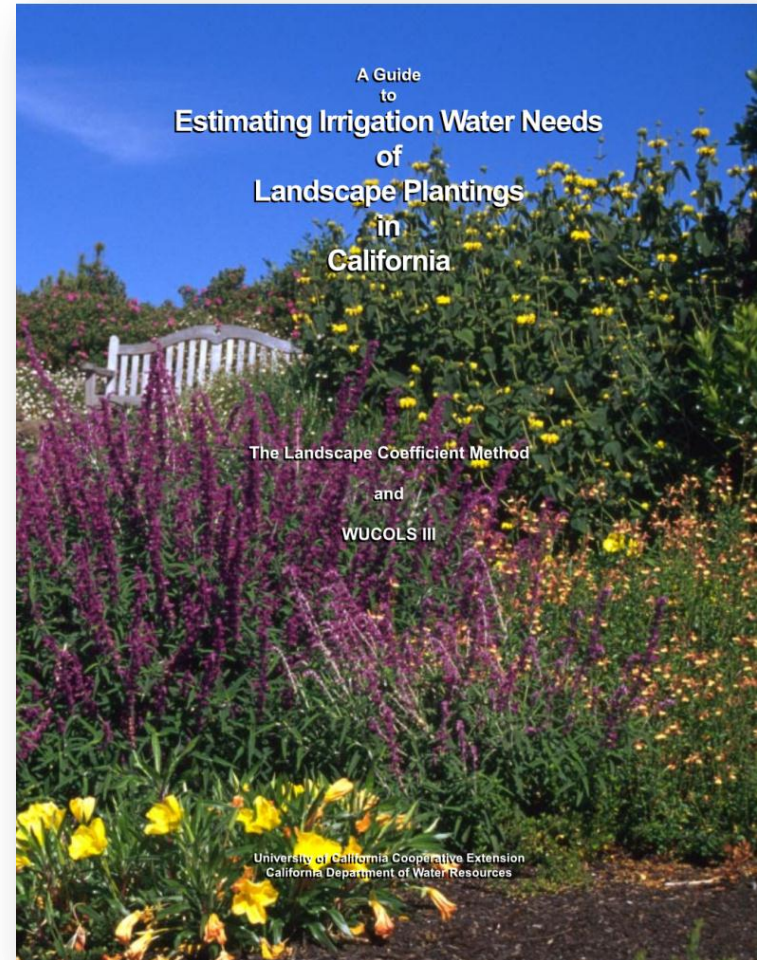


# Water needs in September



# Where to find plant factors

Bay area is region 1



WUCOLS List

[www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf](http://www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf)



# Benefits and drawbacks of drip

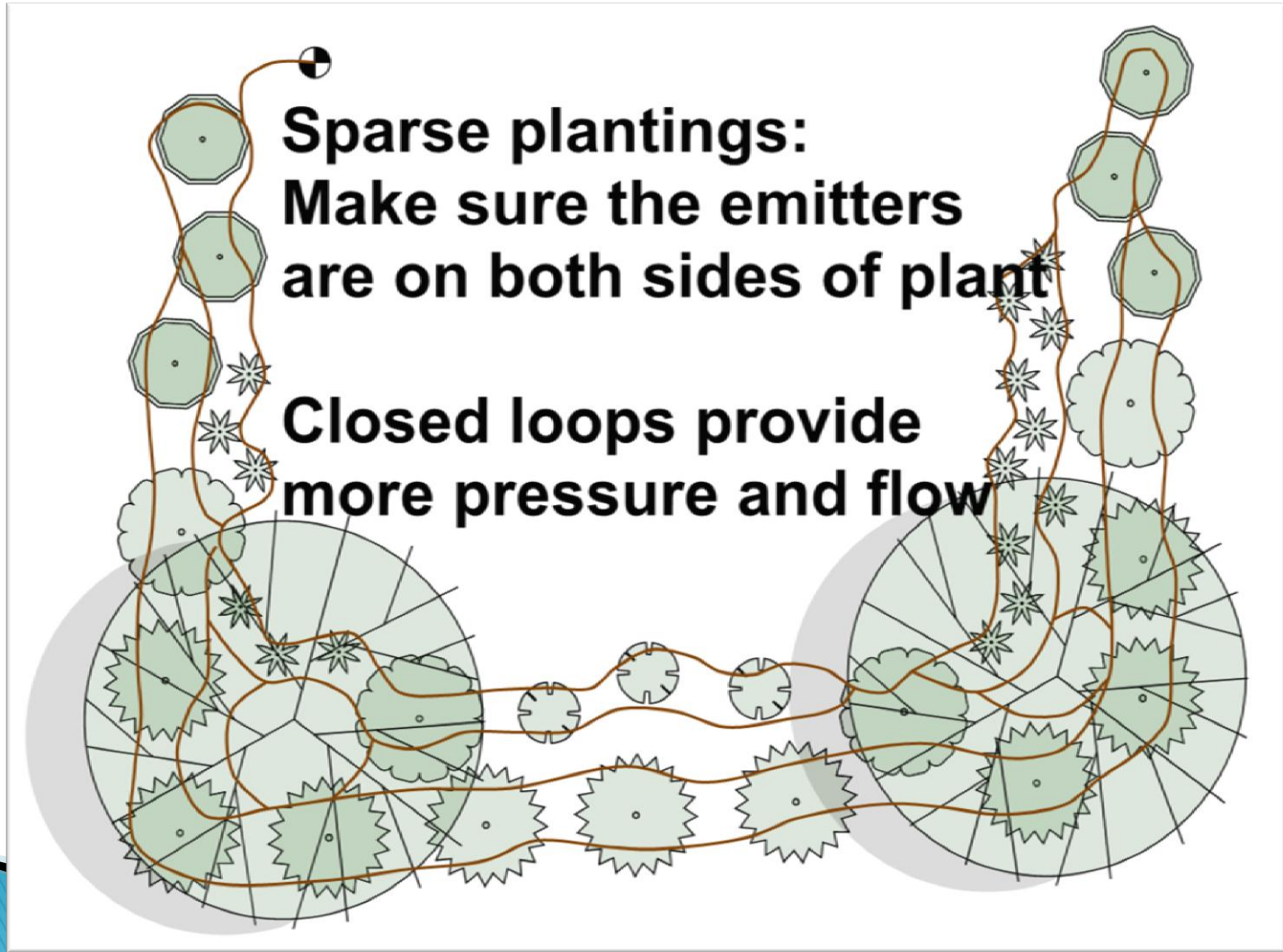
Discussion:

Benefits of drip

Drawbacks of drip



# Point-source drip



# Example of sparse plantings



# Point-source drip



# Wetted area of drip emitters

Soil Type	Dripper flow	Diameter (ft)
Clay	.5 gph	3 – 3.5 feet
	1.0 gph	5 – 7 feet
Loam	.5 gph	3 – 5 feet
	1.0 gph	5 – 6 feet
	2.0 gph	6 – 7 feet
Sandy	1.0 gph	3 – 3.5 feet
	2.0 gph	3.5 – 4 feet

# Line-source drip



Highest efficiency rating of all irrigation types

From [david-garrison.blogspot.com](http://david-garrison.blogspot.com)

# Drip for dense plantings

Clay soil:

.4 gph

24 inch spacing

Loam soil:

.6 gph

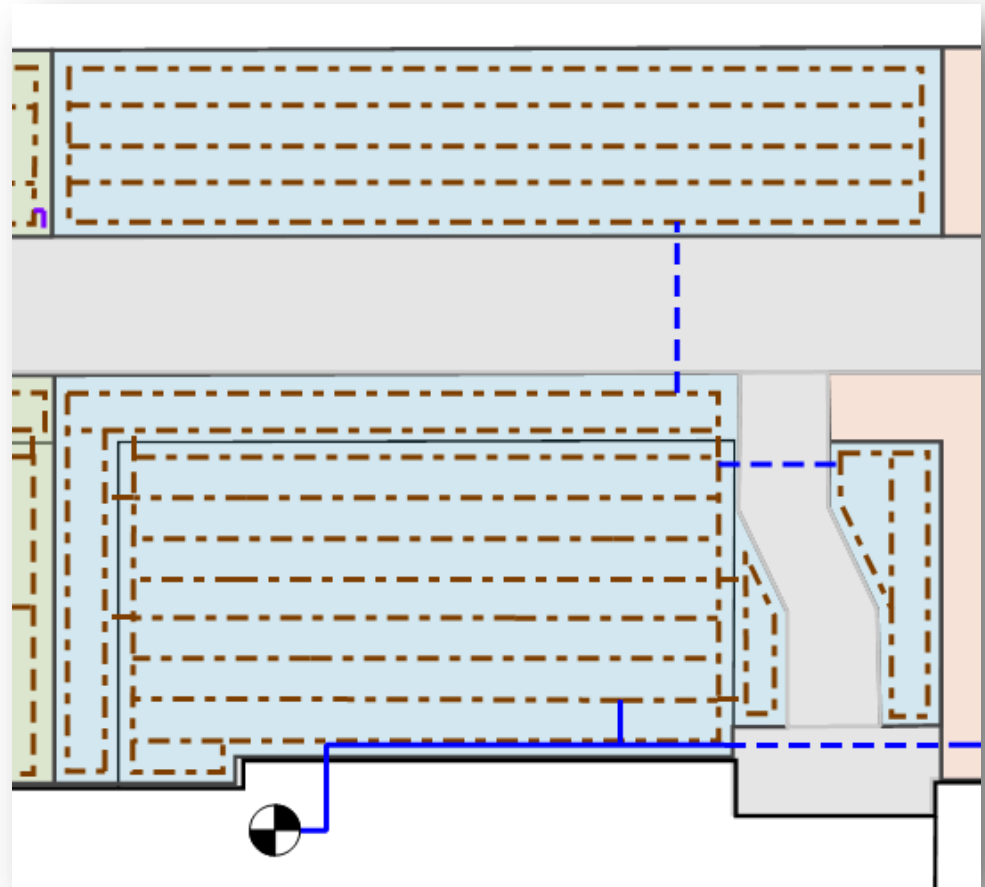
18 inch spacing

Sandy soil:

.9 gph

12 inch spacing

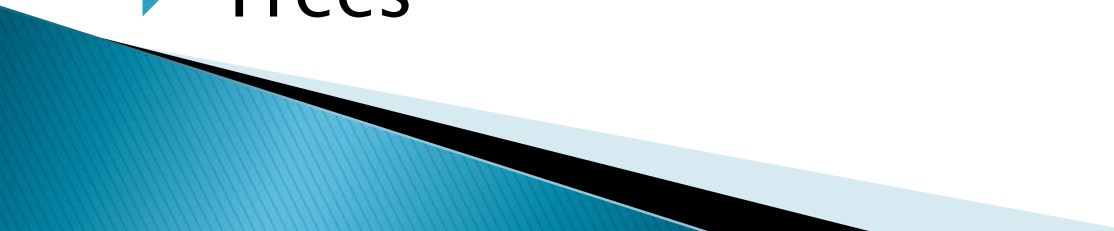
gph= gallons per hour  
Spacing = emitters and  
lines of the grid



# How many zones?

## Create hydrozones:

Groupings of plants with similar water needs

- ▶ Group by plant types
  - ▶ Group by sun or shade or wind
  - ▶ Plants in pots
  - ▶ Veggie beds
  - ▶ Established planted area
  - ▶ Trees
- 



# General rule of thumb



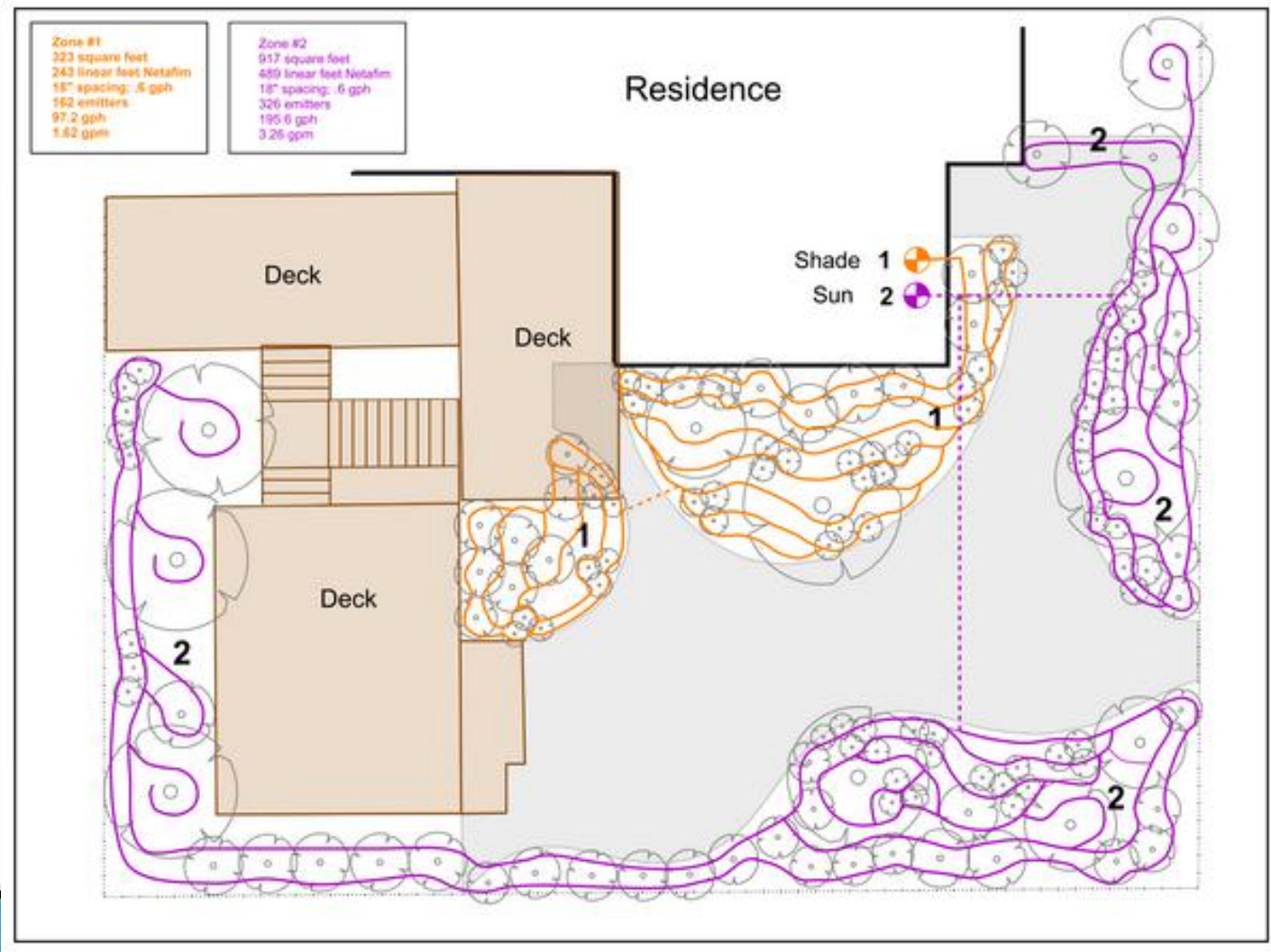
- ▶ Plants 1 – 2 feet in diameter: 2 emitters
- ▶ Plants 3 – 4 feet in diameter: 4 emitters
- ▶ Plants 5 – 6 feet in diameter: 6 emitters
  
- ▶ Use .5 gph emitters in clay or clay loam
  
- ▶ 240 gph capacity per valve zone (4 gpm)
  
- ▶ 480 emitters capacity per valve zone

# Another rule of thumb

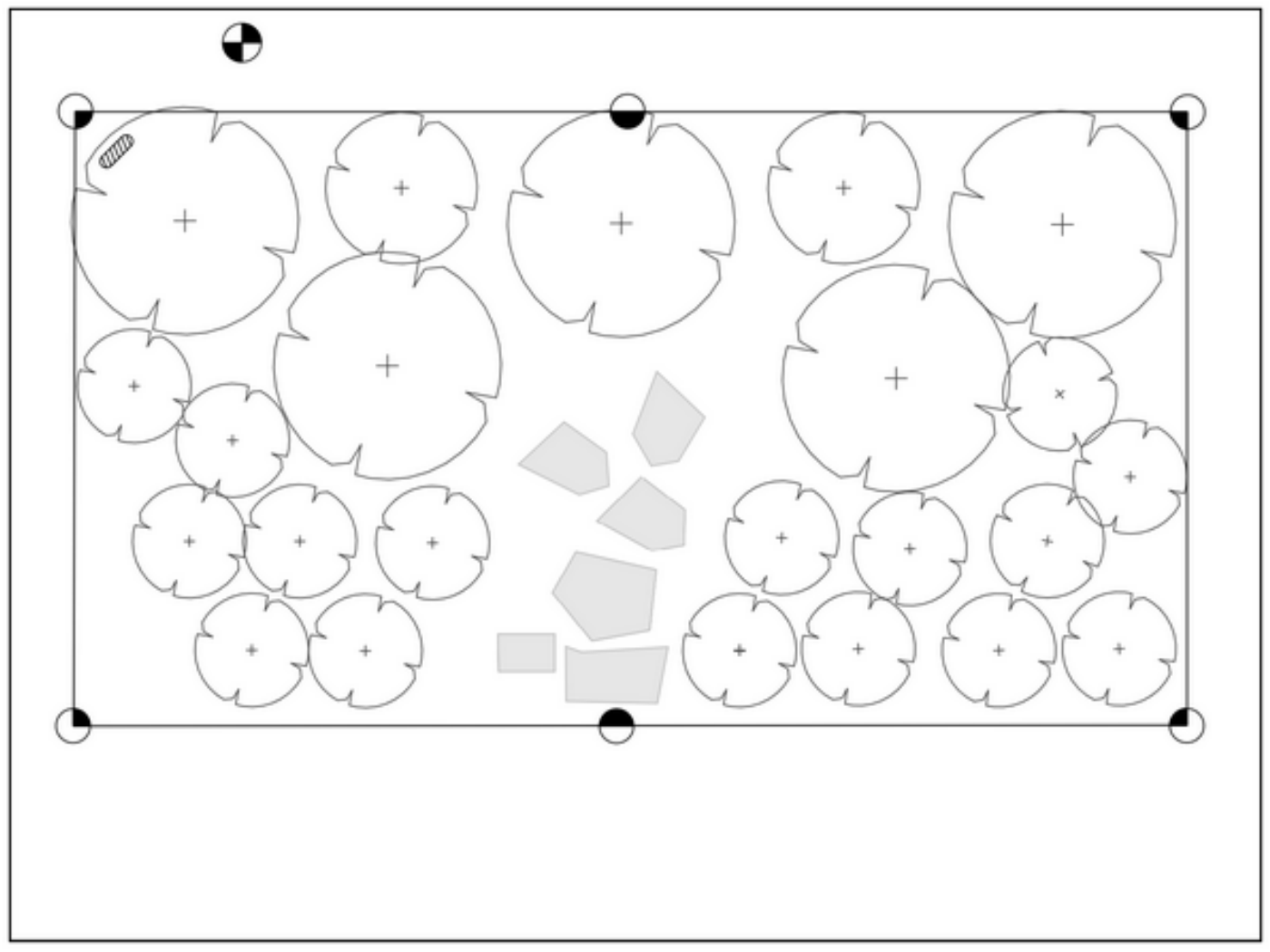


- ▶ Moderate–water–use plants need double the amount of water as low–water–use
- ▶ High–water–use plants need double the amount of water as moderate, and four times as much water as low–water–use
- ▶ Use plant sizes to determine number of emitters, and add more if plants appear to need more water

# Drip design



# Let's practice

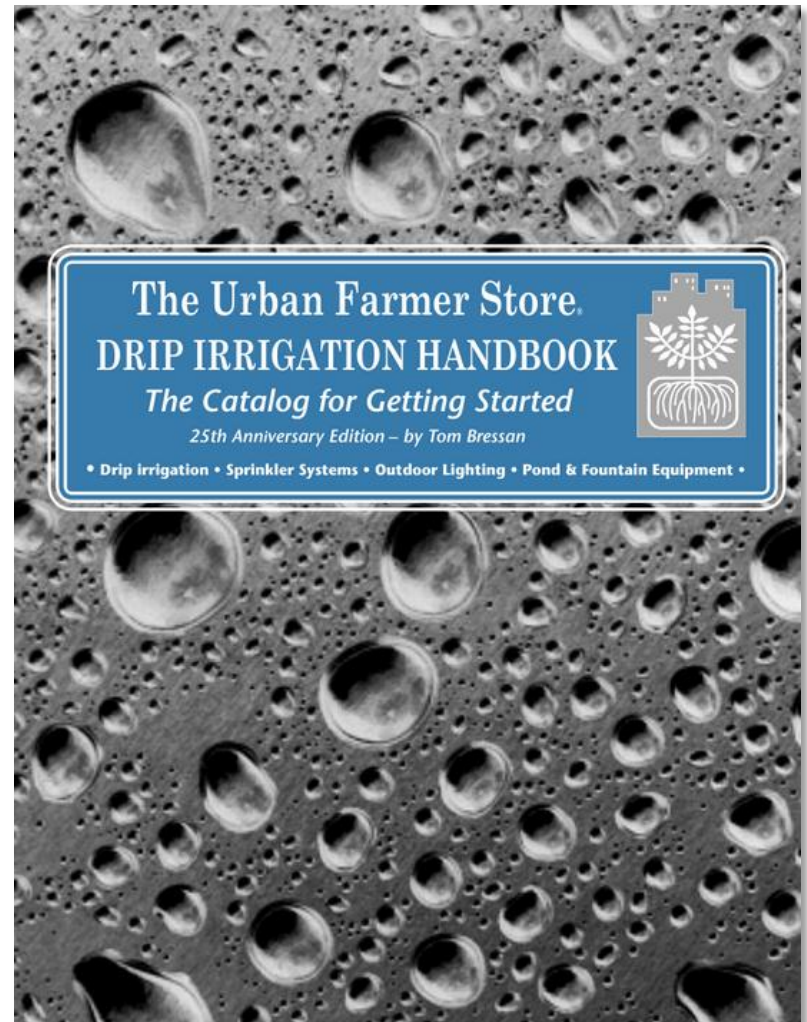


# Where to buy drip parts

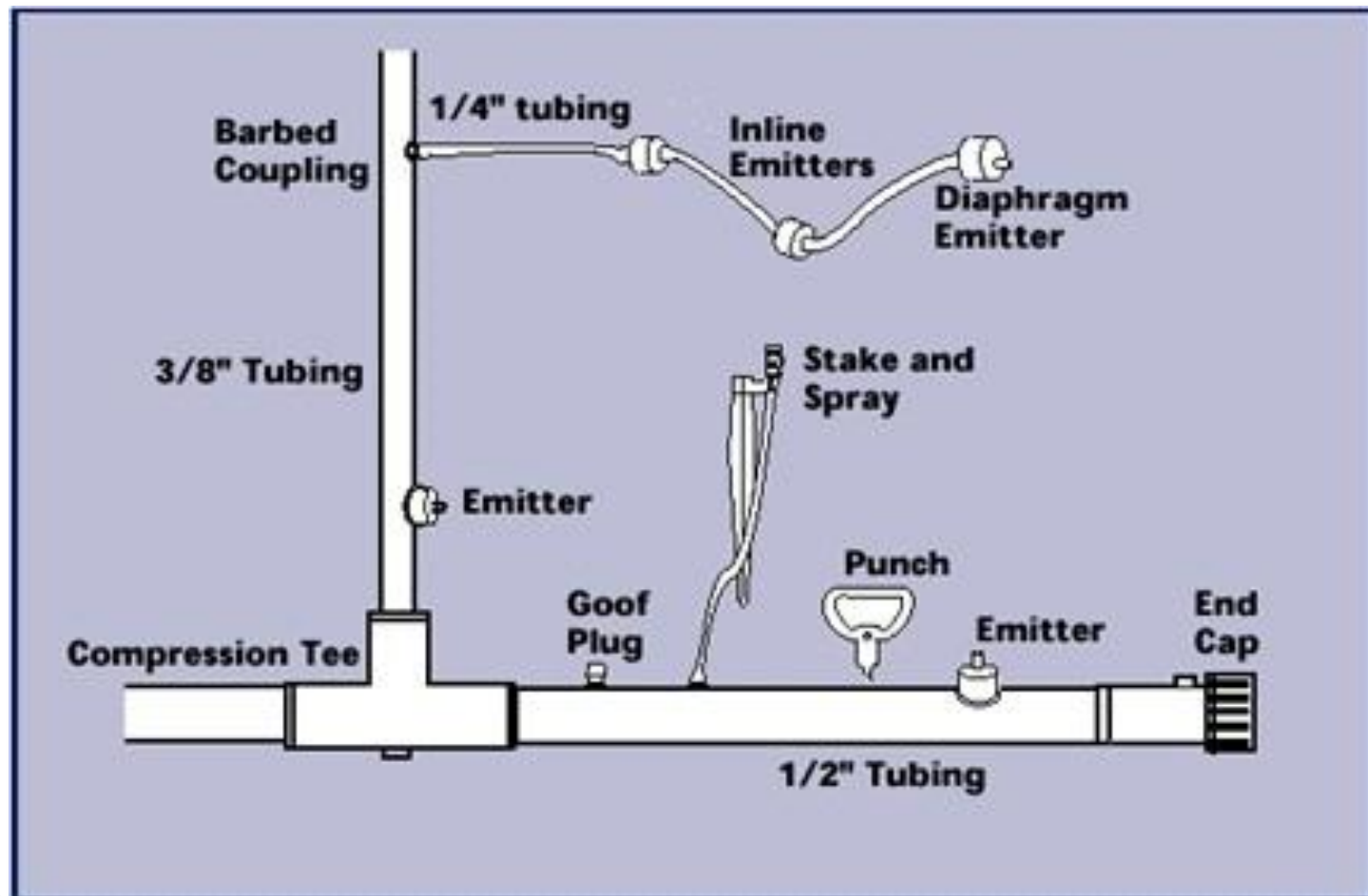
The Urban Farmer  
Store

San Francisco  
Mill Valley  
Richmond

[www.urbanfarmerstore.com](http://www.urbanfarmerstore.com)



# Drip parts



# Drip parts



# Remember:



- ▶ Make sure to install pressure reg. and filter
- ▶ Make sure to flush system regularly
- ▶ Make sure the application rate of the emitters matches infiltration rate of soil
- ▶ Do not mix different application rates on same zone (microsprays and emitters)
- ▶ Use tubing with check valves on slopes to deter runoff
- ▶ Make sure to match fitting sizes with tubing



# Do not mix these on same zone

Microsprays



Drip  
emitters



# Do mix these on one zone

Okay to mix these:

Drip emitters

Emitterline

SQ nozzle sprays



# Spray to drip conversion

## Spray-to-Drip Retrofit Kits

### Convert Any Spray Zone to a Drip Zone!

*The easiest and fastest way to convert a conventional spray zone to a low-volume irrigation zone.*

#### 1800-Retro

*1800 Series Spray Body that contains a filter, pressure regulator, and 1/2" male threaded outlet*

1/2" MPT  
Swivel Outlet



30 PSI Pressure  
Regulator

200 Mesh Filter

Rugged, UV  
Resistant  
1800 Body

#### Installation

- Simply remove the top of any 1800 and remove the internal assembly (On the 1806 and 1812 leave the spring in the body)
- Remove the internal assembly of the retro kit and drop into the existing body
- Tighten the cap
- Use Easy Fit Fittings or a female adapter to connect to drip tubing or other 1/2" FPT devices

#### Features

- Can be installed above or below grade
- Provides 30 psi (2,1 bar) pressure regulation and 200-mesh (75 micron) screen
- Flow rate 0.50 to 4.00 GPM (1.9 to 15.1 l/m)



# Spray to drip conversion

## RBY Pressure-Regulating Filter

*Unique, compact unit that combines filtration and pressure regulation in one compact piece for protection of downstream components*



### Installation

- Simply connect the RBY Pressure-Regulating Filter into the water line
- Use Easy Fit Fittings or a female adapter to connect to drip tubing
- Install a valve or emitter box over the filter for easy access during cleaning

### Features

- Comes in 3/4" MPT (model PRF-075-RBY, not shown) or 1" versions (model PRF-100-RBY)
- 3/4" MPT (PRF-075-RBY) regulates pressure at 30 psi (2,1 bar) and flows 0.20 to 5.0 GPM (0.8 to 18.9 l/m)
- 1" MPT (PRF-100-RBY) regulates pressure at 40 psi (2,8 bar) and flows 3.0 to 15.0 GPM (11.4 to 56.8 l/m)
- Can be installed above or below grade
- Robust body and cap are made of glass-filled polypropylene and provide 150 psi (10,3 bar) pressure rating
- 200 mesh stainless steel filter (75 micron)



# Drip emitters and scheduling



## Point Source Emitter Calculation Tool

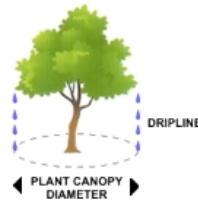
Welcome to the Rain Bird online Point Source Emitter Calculation Tool. By answering the following questions, this tool will calculate the Daily Plant Water Requirement (PWR), provide you with the number of emitters required to irrigate each individual plant, and the suggest the run time for your point source drip irrigation project.

Before you begin, please choose the desired units of measurement.

### Questions

1. What is the diameter of the plant canopy?

(feet)



2. What is the type of environment (climate)?

[? View Help](#)

3. What is the plant water use factor?

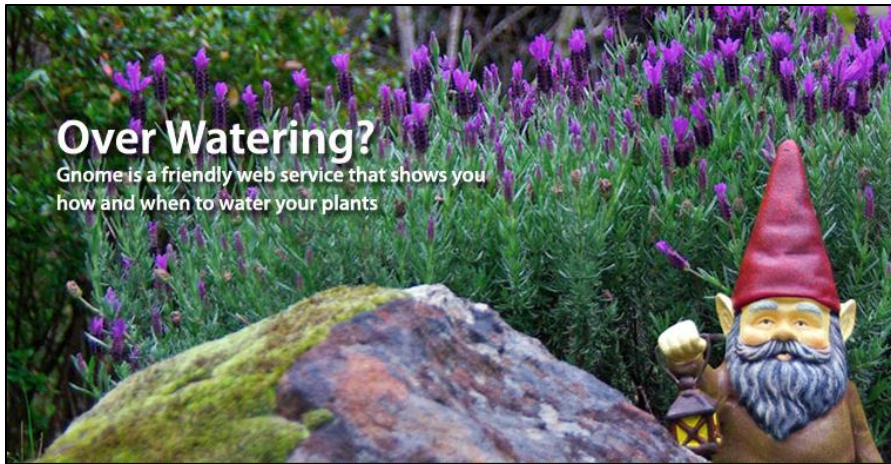
[? View Help](#)

4. What is the estimated system efficiency?

[? View Help](#)




5. What is your preferred run time in Minutes per Day?

# ET Water Gnome



**Front timer**  
Hunter PRO-C Edit

[Program my controller](#)

FRONT LAWN	PERENNIAL BED	BACKYARD DRIP
Water <b>34 min, 4x per week</b> applied in <b>1 cycle of 34 min</b>	Water <b>148 min, 1x per week</b> applied in <b>2 cycles of 74 min</b>	Water <b>87 min, 2x per week</b> applied in <b>1 cycle of 87 min</b>
		
[+]	[+]	[+]

[www.etwatergnome.com](http://www.etwatergnome.com)



# That's all folks!







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lpalmquist@sbcglobal.net



## Drip Irrigation

Mountain View

September 29, 2012

### Learning Objectives

- Why drip irrigation is considered the most efficient method of watering landscape plants
- The benefits and disadvantages of drip irrigation
- When to use drip, and when to use sprinklers
- The two methods of drip application: line source and point source
- How soil type affects drip design and placement of emitters
- How to decide how many emitters to assign to each plant (web app)
- How to divide the garden into hydrozones
- Scheduling the frequency of days to water (web app)
- Convert existing sprinklers to drip (see Sprinkler Conversion handout)

### 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

- Point source (plant to plant) for sparse plantings
- 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.
- Drip for containers
- Microsprays?
- Do not mix microsprays and drip emitters on the same zone!

### Designing the Drip System

#### How Many Zones?

1. Groupings by plant types, or hydrozones
  - Turf
  - Trees (circle  $\frac{3}{4}$  of the drip line of the tree)
  - Groundcover (grid for line source)
  - Annuals
  - Veggies
2. Groupings by similar microclimate
  - Sun/shade
  - Wind
  - Near concrete or asphalt

3. Groupings by water needs (consult WUCOLS list online)  
[www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf](http://www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf)

- Native or Mediterranean plants
- Tropical plants
- Succulents and cactus
- Plants in pots
- Trees
- Groupings by precipitation rate: don't mix drip emitters and microsprays!

### Design Capacity of System

- 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).

### Where and how to buy parts

- Urban Farmer Store (catalog and tutorials) [www.urbanfarmerstore.com](http://www.urbanfarmerstore.com)
- Professional irrigation store (see Irrigation Resources handout for locations)
- [www.rainbird.com](http://www.rainbird.com) mail order parts online

### Positioning of Emitters for Plants

- For new plantings, place 1 emitter on top of the actual root ball of the plant. The soil in the root ball is different than the surrounding soil environment, and water will not enter readily into the root ball soil if emitters are placed outside root ball area.
- For established plantings, place emitters in a circle ¾ the size of the plant's canopy.

### Emitters? Inline Tubing? Microsprays?

- Use plug-in emitters for sparse plantings
- Use inline tubing for dense plantings, or lines of shrubs
- Use microsprays for groundcovers
- These three types of emission devices may be combined in one zone if the microsprays are RainBird SQ's.



# Irrigation Resources, Information Sources, Stores

## Irrigation Resources

Compiled by Lori D. Palmquist

September 2012

**Lori D. Palmquist**, CID, CIC, CLIA, CLWM  
Irrigation Association Certifications:  
Irrigation Designer, Irrigation Contractor,  
Irrigation Auditor, Landscape Water Mgr.  
**EPA WaterSense Partner**  
(510) 374-6360, Richmond, CA  
[loripalmquist@gmail.com](mailto:loripalmquist@gmail.com)  
[www.loripalmquist.blogspot.com](http://www.loripalmquist.blogspot.com)

**BAWSCA – Bay Area Water Supply & Conservation Agency**  
Water Wise Gardening in the Bay Area –  
Plant list, virtual garden tours, watering tips  
[www.bawasca.watersavingplants.com/bawasca.php](http://www.bawasca.watersavingplants.com/bawasca.php)

**California Irrigation Management Information System (CIMIS)**  
Current daily, weekly, monthly ET values  
[www.cimis.water.ca.gov](http://www.cimis.water.ca.gov)

**Canopy**, nonprofit tree group in Palo Alto  
(650) 964-6110  
[www.canopy.org](http://www.canopy.org)

**City of Mountain View**  
Public Works Dept. | Free landscape surveys  
to increase irrigation efficiency. Call (650)

903-6311 to schedule. *San Jose Water Company customers should call (408) 279-7900.*  
[www.ci.mtnview.ca.us/city\\_hall/public\\_works/water\\_conservation/landscape.asp](http://www.ci.mtnview.ca.us/city_hall/public_works/water_conservation/landscape.asp)

**Landscape Rebates** (Santa Clara Valley Water District) – Pre-inspection survey needed. Call 1-800-548-1882 to schedule a Water-Wise House Call. For details, visit:  
[www.valleywater.org/Programs/LandscapeRebateProgram.aspx](http://www.valleywater.org/Programs/LandscapeRebateProgram.aspx)

**Department of Water Resources**  
Office of Water Use Efficiency  
Water Use Classifications of Landscape Species – **WUCOLS** list available free online:  
[www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf](http://www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf)  
Plant listings on pages 63-99 (**Note: This is a 160-page document**)

**EPA WaterSense Program**  
Environmental Protection Agency – Water-efficient products, services and partners  
Toll-free 1-866-WTR-SENS (987-7367)  
[www.epa.gov/watersense](http://www.epa.gov/watersense)

## Scheduling & Design Guides, Tools

**Sprinkler and Drip Scheduling App** (\$5.99 per controller, per year) [www.sprinklertimes.com](http://www.sprinklertimes.com)

**Jess Stryker's Irrigation Tutorials Online (free)** [www.irrigationtutorials.com](http://www.irrigationtutorials.com)

**RainBird Drip Design and Scheduling Apps**  
Point Source: <http://softwarerepublic.com/rainbirdps/index.aspx>  
Emitterline: <http://softwarerepublic.com/rainbird/>

**Rain Bird Corporation**, Irrigation Manufacturer [www.rainbird.com](http://www.rainbird.com)  
Free design publications, tutorials, sprinkler system design service for homeowners  
Design guides: [www.rainbird.com/drip/literature/dripline.htm](http://www.rainbird.com/drip/literature/dripline.htm)

**ET Water** – Gnome is a free web service that shows you how and when to water your plants.  
<http://etwatergnome.com/>

## Landscape Designers / Irrigation Contractors

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### **APLD – Association of Professional Landscape Designers**

California Landscape Designer Directory:  
[www.apldca.org/FindADesigner.aspx](http://www.apldca.org/FindADesigner.aspx)

### **CLCA – California Landscape Contractors' Association**

Nonprofit trade organization of licensed landscape and landscape-related contractors  
[www.clca.org/](http://www.clca.org/)  
Contractor Search:  
[www.clca.org/index.php?v=cs&p=csf](http://www.clca.org/index.php?v=cs&p=csf)

### **Master Gardeners of Santa Clara County**

Trained volunteers with University of California Cooperative Extension Master Gardener Program. Their mission is to extend the ability of the local Cooperative Extension office to provide practical, scientific horticulture and gardening information to citizens of Santa Clara County.  
<http://mastergardeners.org/scc.html>

## Irrigation Manufacturers

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[www.hunterindustries.com](http://www.hunterindustries.com)

**Hunter Industries** - Full array of professional irrigation products (MP Rotators 10'-30' radius)

[www.netafimusa.com](http://www.netafimusa.com)

**Netafim** - Drip tubing and other products

[www.rainbird.com](http://www.rainbird.com)

**Rain Bird** - Full array of professional irrigation products

[www.toro.com](http://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 design of irrigation systems (buy parts there)

**San Francisco, Richmond, Mill Valley**

[www.urbanfarmerstore.com](http://www.urbanfarmerstore.com)

### Palo Alto

**Peninsula Hardware** (in business 50 years)  
2676 Middlefield Rd. (650) 325-3491

### Redwood City

#### **Alfred Joseph Garden Service**

1011 Taft St. (650) 366-3833

#### **R & B Co.**

939 Broadway St. (650) 366-3833

### Los Altos

#### **Los Altos Supply & Garden Center**

4730 El Camino Real (650) 948-2218

### Menlo Park

#### **Horizon**

4060 Campbell Ave. (650) 323-5161

### Mountain View

#### **Barron Park Plumbing Supply**

377 San Antonio Road (650) 948-7160

### San Carlos

#### **Ewing**

900 Industrial Rd., Ste. C (650) 591-2618

#### **John Deere**

815 American St. (650) 591-5163



Rain Bird globe valve with filter/pressure regulator



RainBird Xeri-Cap for Spray Heads



Plumber's Pressure Regulator



Rain Bird Anti-Syphon Valve with pressure regulating filter



Easy Fit Compression Fittings



Pressure regulators



Hunter Rain Klik



Rain Bird Retro-1800 for Converting sprinklers to drip



Goof Plug



1/4" Fittings



Rain Bird Xeri-Bug Emitters



Rain Bird Drip Fittings



Rain Bird XF Series Emitterline

**One Nozzle...Two Throws**  
 With a simple turn of the nozzle to the next preset stop, the Rain Bird SQ Nozzle adjusts from a 2.5' (0.8 m) throw to a 4' (1.2 m) throw. It's like having two nozzles in one.

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**One Nozzle...Two Throws**  
 The SQ Nozzle is an ideal solution for a wide range of difficult-to-design areas, thanks to its compatibility with popular irrigation products.

# Spray-to-Drip Retrofit Kits

## Convert Any Spray Zone to a Drip Zone!

The easiest and fastest way to convert a conventional spray zone to a low-volume irrigation zone.

### 1800-Retro

1800 Series Spray Body that contains a filter, pressure regulator, and 1/2" male threaded outlet



#### Installation

- Simply remove the top of any 1800 and remove the internal assembly (On the 1806 and 1812 leave the spring in the body)
- Remove the internal assembly of the retro kit and drop into the existing body
- Tighten the cap
- Use Easy Fit Fittings or a female adapter to connect to drip tubing or other 1/2" FPT devices

#### Features

- Can be installed above or below grade
- Provides 30 psi (2,1 bar) pressure regulation and 200-mesh (75 micron) screen
- Flow rate 0.50 to 4.00 GPM (1.9 to 15.1 l/m)



### RBV Pressure-Regulating Filter

Unique, compact unit that combines filtration and pressure regulation in one compact piece for protection of downstream components



#### Installation

- Simply connect the RBV Pressure-Regulating Filter into the water line
- Use Easy Fit Fittings or a female adapter to connect to drip tubing
- Install a valve or emitter box over the filter for easy access during cleaning

#### Features

- Comes in 3/4" MPT (model PRF-075-RBY, not shown) or 1" versions (model PRF-100-RBY)
- 3/4" MPT (PRF-075-RBY) regulates pressure at 30 psi (2,1 bar) and flows 0.20 to 5.0 GPM (0.8 to 18.9 l/m)
- 1" MPT (PRF-100-RBY) regulates pressure at 40 psi (2,8 bar) and flows 3.0 to 15.0 GPM (11.4 to 56.8 l/m)
- Can be installed above or below grade
- Robust body and cap are made of glass-filled polypropylene and provide 150 psi (10,3 bar) pressure rating
- 200 mesh stainless steel filter (75 micron)



**Zone #1**

323 square feet  
243 linear feet Netafim  
18" spacing; .6 gph  
162 emitters  
97.2 gph  
1.62 gpm

**Zone #2**

917 square feet  
489 linear feet Netafim  
18" spacing; .6 gph  
326 emitters  
195.6 gph  
3.26 gpm

# Residence

Shade 1  
Sun 2

