Designing Water-Wise Irrigation Systems

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Irrigating thriving gardens correctly is difficult, whether they look like this...
Or this.
IrrigationTutorials.com:

• 30 different DIY tutorials for designing, installing, and maintaining irrigation systems

• 112 articles on DIY irrigation subjects
So what CAN we learn today?

1. Some basics
2. Who and what can help
Show of hands -
What is your starting point?
Most common irrigation mistakes

1. Too much flow on a zone (hydraulics)
2. Mixing different types of emission devices on a zone
3. For drip: incorrect emitter flow and spacing for the soil type
Designing Irrigation

Determining the health of your current irrigation system
We’ll skip the standard flow test

- Use maximum flow of 4 gpm if using a hose bib as your water source for the irrigation

Ewing Irrigation YouTube video
Test to determine zone flow

1. Make sure everything is turned off, then turn on zone and let it charge up. Then turn it off.

2. Take a reading on the meter at the street. (This meter reads 24.65 cubic feet)

3. Turn the zone back on, and run for 1 minute.

4. Turn off zone, and take another reading.

5. If meter is in cubic feet, multiply the result by 7.48 to convert to gallons per minute.
Look at pipe size coming out of the valve
Don’t Know the Pipe Sizes?
Google “determine pipe size based on string length”

Source: www.design.orbitonline.com
Zone Flow Precaution
Try not to exceed 4 gpm for any zone

**Schedule 40 PVC**

<table>
<thead>
<tr>
<th>Flow</th>
<th>Size of PVC Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 gpm - 7 gpm</td>
<td>¾”</td>
</tr>
<tr>
<td>7.1 gpm - 12 gpm</td>
<td>1”</td>
</tr>
<tr>
<td>12.1 gpm - 22 gpm</td>
<td>1 ¼”</td>
</tr>
</tbody>
</table>

**Polyethylene Tubing or Blu-Lock**

<table>
<thead>
<tr>
<th>Flow</th>
<th>Size of Tubing</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 gpm - 4 gpm</td>
<td>½”</td>
</tr>
<tr>
<td>4.1 gpm - 8 gpm</td>
<td>¾”</td>
</tr>
<tr>
<td>8.1 gpm - 12 gpm</td>
<td>1”</td>
</tr>
</tbody>
</table>
Designing Irrigation
Basic steps of irrigation design

1. Determine the soil type
2. Divide landscape into hydrozones, and create map
3. Decide on the irrigation type for each zone
4. Create valve zones by adding up each zone’s flow and staying under the maximum allowable flow
Designing Irrigation

Step 1: Determine the soil type
Know Your Soil Type

- Soil probe
- Hand test
- Jar test
- Percolation test
- Soil lab for analysis
Know Your Soil Type

**Coarse (Sand):** Soil particles are loose. Squeezed in hand when dry, it falls apart when pressure is released.

Squeezed when moist, it will form a cast, but will crumble easily when touched.
Know Your Soil Type

Medium (Loam): Has a moderate amount of fine grains of sand and very little clay. When dry, it can be readily broken.

Squeezed when wet, it will form a cast that can be easily handled.
Know Your Soil Type

**Fine (Clay):** When dry, may form hard lumps or clods.

When wet, the soil is quite plastic and flexible. When squeezed between the thumb and forefinger the soil will form a ribbon that will not crack.
Be careful of the “Sandy Realm” if you use drip
How Water Moves Through Different Soil Types

Figure 1. Comparative movement of water in sandy and clayey soils
Designing Irrigation

Step 2: Divide landscape into hydrozones, and create map
What Is a Hydrozone?
Learn From Nature
How Many Hydrozones?

• Group by water needs
• Group by sun or shade or wind
• Plants in pots
• Veggie beds
• Fruit trees
• Established planted area
• Trees
This Is a Hydrozone
Water-Use Values
How do I know the water needs?

- Very Low
- Low
- Moderate
- High
WUCOLS IV

Water Use Classification of Landscape Species

Plant Search Database

Results

American Canyon, CA

34 results. (Start Over | Search Again)

<table>
<thead>
<tr>
<th>Type</th>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Water Use</th>
<th>Select for my List</th>
</tr>
</thead>
<tbody>
<tr>
<td>GN</td>
<td>Aristida purpurea</td>
<td>purple three-awn</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Arundinaria gigantea</td>
<td>cane reed</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>GN</td>
<td>Bothriochloa barbinodis</td>
<td>cane bluestem</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>GN</td>
<td>Bouteloua gracilis and cvs.</td>
<td>blue grama</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Briza media</td>
<td>quaking grass</td>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

http://ucanr.edu/sites/WUCOLS
Flickr Plant Search
Mapping Your Site
Source: sprinklerwarehouse.com
Use Google Maps to see, outline, and measure areas of the landscape.
What if you can’t see the landscape areas?
Go to map view!
Irrigation Design

Step 3: Decide on the irrigation type for each zone
Drip the plants, spray the lawn with efficient sprinklers
Help with Sprinkler Design

Planning a sprinkler system?

Orbit’s easy-to-use sprinkler design tool allows you to create a custom sprinkler design plan and parts list instantly - online, real-time, free.

Welcome to the Orbit Sprinkler System Designer™

Create a FREE custom design in three simple steps:

1. Download the Free Preparation Guide to get started!

   The preparation guide will assist you in gathering all of the information needed to complete your online design.

   Click the button below to download the Preparation Guide.

Forgot your password?
Efficient Sprinkler Nozzles

20% higher efficiency!
Remember:

• Install pressure regulator after the valve, or sprinklers with pressure regulation built in
• Flush system after installing
• Match application rate of nozzles to infiltration rate of soil
• Avoid runoff by using proper scheduling techniques
Two Types of Drip

Emitters placed at the plants – **Point Source Waters** plants

Built-in emitters in a grid formation – **Line Source Waters** areas
Point-Source Drip for Sparse Plantings
Drip Grid for Dense Plantings
Convert Sprinklers to Drip Grid
Help with drip design
Don’t Mix These on the Same Zone

Sprinklers

Drip emitters
We don’t Recommend Using...

Microsprays

Soaker hoses
Irrigation Design

Step 4: Create valve zones by adding up each zone’s flow and staying under the maximum allowable flow
Drip Guidelines

• Use .25 or .4, or .5 gph emitters in clay soil
• Use .4, .5, or .6 gph emitters in loam soil
• Use .9 or 1.0 gph emitters in sandy soil
  • 240 gph capacity per valve zone (4 gpm)
  • Use plant sizes to determine number of emitters, and add more emitters if plants appear to need more water
Number of Emitters:
Plants with Same Water Needs

- Plants less than 1 foot in diameter: 1 emitter
- Plants 1 - 2 feet in diameter: 2 emitters
- Plants 3 – 4 feet in diameter: 4 emitters
- Plants 5 – 6 feet in diameter: 8 emitters
Remember:

- Install pressure regulator and filter
- Flush system regularly
- Match application rate of emitters to infiltration rate of soil
- Avoid runoff by using tubing with check valves on slopes
2 – 3 inches of mulch for soil water retention
Irrigation Scheduling
How Long and How Often to Water the Landscape?
Sacramento Region Smart Irrigation Scheduler

Welcome to the Sacramento Region Smart Irrigation Scheduler

Based on current weather

Calculates run-time minutes per week for a single sprinkler or drip zone. See videos

NEW
- Scheduling for drip zones is included.
- Register to save multiple zones & controllers.

City: Sacramento  edit
Zip: 95816  edit
Days per week allowed: 2  edit

What are my city's restrictions?

Set up Zone

Plant Material  Choose one
- Low Water Use
- Moderate Water Use
- Mixed Plants
- Warm Season Turf
- Cool Season Turf

Exposure  Choose one
- Shade
- Part Sun
- Full Sun

Wind  Choose one
- Very Little
- Moderate
- High

Provided with the generous support of Water Forum

www.beyondthedrought.com
Hunter Run Time Time Calculator

What's growing in this station's area?

- Turfgrass
- Trees/Shrubs/Mixed
- Other

How dense are the plants in this area?

- Packed In
  - More than three quarters of the ground area shaded
- Some Breathing Room
  - One half to two-thirds of the ground area shaded
- Wide Open
  - One-quarter to one-half of the ground area shaded

If you know the general category of your plant type, enter it here:

Drought Resistant Plants
You don’t have to do this alone

Help is available
What free tools are available?
Netafim app
Rain Bird point source calculator

**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. **English (Imperial)**

**Questions**

1. What is the diameter of the plant canopy?  
   
   (feet)

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

3. What is the plant water use factor?  
   
   Please Select

4. What is the estimated system efficiency?  
   
   90%

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

[Calculate Recommendations] [Reset]
Rain Bird line source calculator

Welcome to the Rain Bird online Landscape Drip Zone Calculator. By simply answering a few questions, this tool will provide you with the correct product necessary to install your next drip line irrigation project.

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

Questions

1. What type of area are you trying to irrigate?
   Please Select

2. What is the type of soil within the irrigated area?
   Please Select

3. Is this a sloped installation?
   Please Select

4. How much area will be irrigated (sq ft)?
   [Input]
   Calculate Area

5. What is the outlet pressure after the pressure regulator?
   Please Select

[Calculate Recommendations] [Reset]
DIY - friendly irrigation store

The Urban Farmer Store

San Francisco
Mill Valley
Richmond

www.UrbanFarmerStore.com
Who Can Assist You?

Irrigation stores and manufacturers
Some examples:

- Irrigation Tutorials www.irrigationtutorials.com
- Green Acres Nursery & Supply
- Sprinkler Service & Supply in Carmichael
- The Urban Farmer Store www.UrbanFarmer.com
- Rain Bird Corporation www.RainBird.com
- Professional irrigation stores (Ewing, Horizon, Normac)
Who Can Assist You?

- EcoLandscapers & Green Gardeners [http://rescapeca.org](http://rescapeca.org)
- Landscape Designers [www.apldca.org](http://www.apldca.org)
- CLCA Water Managers [www.CLCA.org](http://www.CLCA.org)
- CA Turf Replacement Rebates [www.saveourwaterrerebates.com](http://www.saveourwaterrerebates.com)
- Your water provider!
Let’s practice!
How much water:

- Any incorporated CA city
- Any time frame
- Any plant material
- Various sizes of plants and planted areas
Dense Zone Line Source (dashed)
1 - Arbutus 'Marina' AM 10 ft. - Low
12 - Arctostaphylos uva-ursi AU 2 ft. - Low
8 - Calamagrostis foliosa CF 2 ft. - Mod.
1 - Callistemon 'Little John' CLJ 6 ft. - Low
1 - Cercis canadensis CC 18 ft. - Mod.
1 - Cistus ladanifer CL 6 ft. - Low
6 - Helictotrichon sempervirens HS 4 ft. - Low
4 - Helleborus orientalis HO 4 ft. - Mod.
7 - Lavandula 'Otto Quast' LO 4 ft. - Low
3 - Muhlenbergia rigens MR 4 ft. - Low
5 - Penstemon heterophyllus PH 2 ft. - Low
1 - Ribes sanguineum RS 8 ft. - Low
1 - Rosmarinus officinalis RO 6 ft. - Low
3 - Salvia 'Bee's Bliss' SBB 6 ft. - Low
15 - Stachys byzantina SB 2 ft. - Low

Sparse Zone - Point Source (solid)
1 - Frangula californica FC 4 ft. - Low
3 - Mimulus aurantiacus MA 3 ft. - Low
9 - Iris douglasiana 'Canyon Snow' ID 2 ft. - Low
3 - Ceanothus 'Marie Simon' CMS 6 ft. - Low

378 sq. ft.

653 sq. ft.

Soil type: Clay Loam

North
Call to action!

What can you do now?
Things you can do now

1. Check the health of your irrigation system as described

2. If you use point source, look up in the How Much Water app how much water they require at this time of year, and make sure they are getting that.

3. If you don’t have a landscape as of yet, or don’t have irrigation, make a map of your yards.
That’s all, folks!