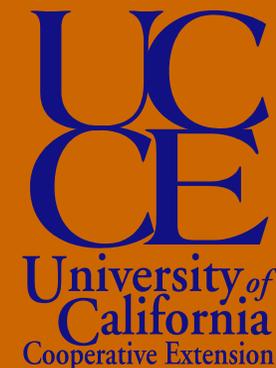




Efficient Irrigation April 2016



**Master Gardener Program of
San Mateo & San Francisco Counties**





Efficient Irrigation

For more information

- **Master Gardeners of San Mateo & San Francisco Counties**
(<http://ucanr.org/sites/MGsSMSF/>)
- **Julie Montanari** (Julie@MontanariDesigns.com)
- The Urban Farmer Store (2833 Vicente Avenue, San Francisco)
- **Books**
 - *The Water Wise Home* by Laura Allen;
 - *Rain Water Harvesting for Dry Lands and Beyond* by Brad Lancaster
- **Websites**
 - HarvestingRainWater.com (Brad Lancaster) for many useful charts, resources, instructions.
 - Urbanfarmerstore.com for on-line guides and videos.



Efficient Irrigation

Water-Efficient Landscaping

Old Idea/Wrong Idea:

Design landscape then figure out how to irrigate it

New Idea/Right idea:

Start with a Water Budget then design the landscape



Efficient Irrigation

How Much Water do Plants Need?

WUCOLS IV

Water Use Classification
of Ornamental
Landscape Species



Efficient Irrigation

WUCOLS IV

Enter city on first screen

Or

Download full database

A screenshot of the WUCOLS IV website. The header features the title "WUCOLS IV" in large white letters on a dark blue background, with the subtitle "Water Use Classification of Landscape Species" below it. The main content area is titled "Plant Search Database" and includes a section "Select a City by Region" with six dropdown menus and "Submit" buttons. The regions listed are: North Central Coastal, Central Valley, South Coastal, South Inland Valley, High and Intermediate Desert, and Low Desert. A button at the bottom of this section says "See WUCOLS List for All Regions". The footer contains logos for CCUH (California Center for Urban Horticulture), the Department of Water Resources of the State of California, and UC Davis.



Efficient Irrigation

WUCOLS IV

Search by botanical name
(preferred) or common name

Or

Search by plant type

SHARE EMAIL PRINT SITE MAP Enter Search Terms

WUCOLS IV

Water Use Classification of Landscape Species

Plant Search Database

Plant Search

Burlingame, CA [Start Over](#)

Botanical Name

Common Name

Plant Type

- Gc (Ground Cover)
- P (Perennial)
- S (Shrub)
- T (Tree)
- V (Vine)
- Ba (Bamboo)
- Bu (Bulb)
- G (Grass)
- Pm (Palm and Cycad)
- Su (Succulent)
- N (California Native)
- A (Arboretum All-star)

Water Use

- Very Low
- Low
- Moderate
- High
- Unknown
- Not Appropriate for this Region



Efficient Irrigation

WUCOLS IV Sample Search

- City of Burlingame
- Plant botanical name “Ceanothus”
- Photos for blue links

WUCOLS IV
Water Use Classification of Landscape Species

Plant Search Database

Results

Burlingame, CA

49 results Start Over Search Again Export List

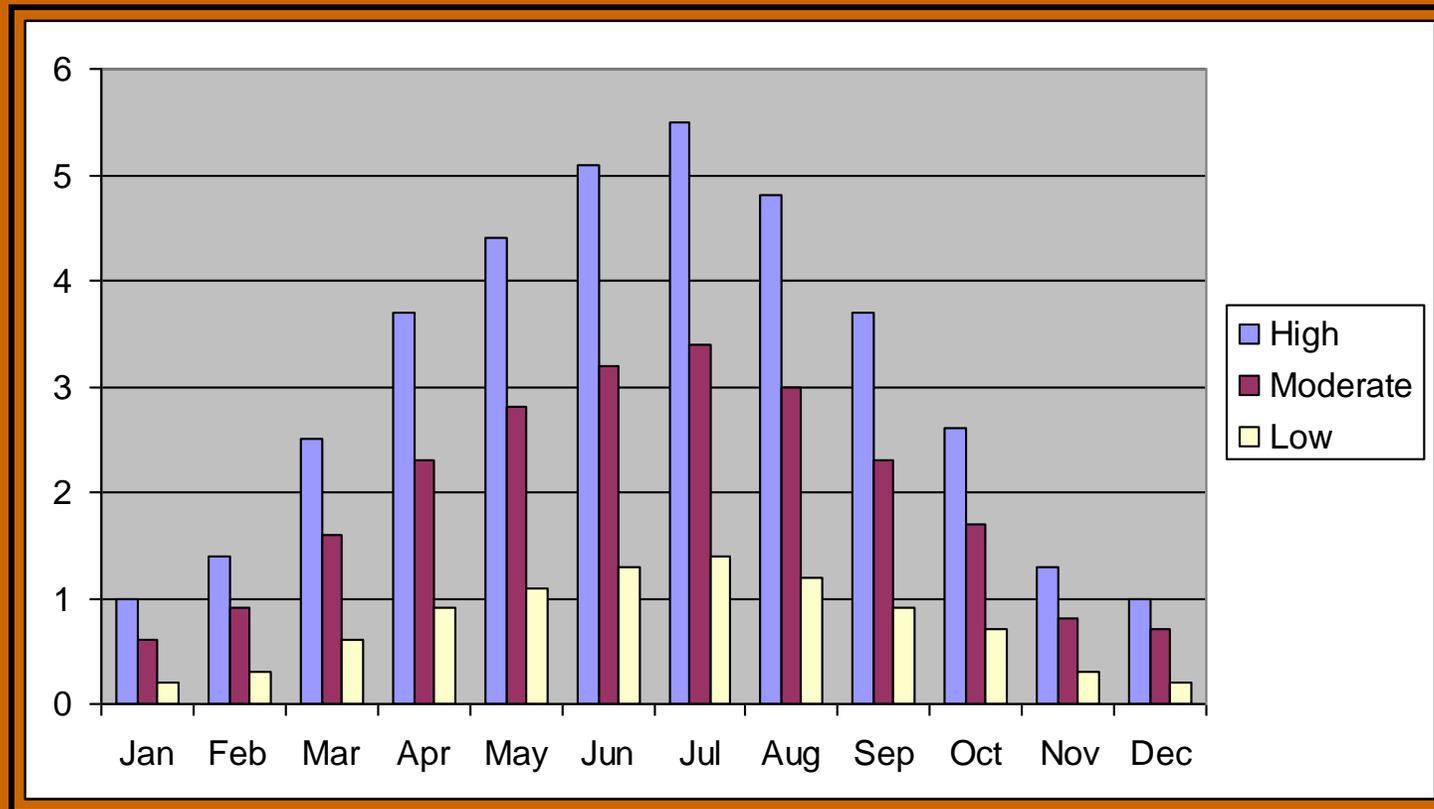
Type	Botanical Name	Common Name	Water Use	Export
S N	Ceanothus 'Alice Blue'	Alice Blue ceanothus	Unknown	<input type="checkbox"/>
S N	Ceanothus 'Blue Jeans'	Blue Jeans ceanothus	Low	<input type="checkbox"/>
Gc N	Ceanothus 'Centennial'	Centennial ceanothus	Low	<input type="checkbox"/>
S N A	Ceanothus 'Concha'		Low	<input type="checkbox"/>
S N	Ceanothus 'Cynthia Postan'		Unknown	<input type="checkbox"/>
S N	Ceanothus 'Dark Star'		Low	<input type="checkbox"/>
S N	Ceanothus 'Frosty Blue'		Low	<input type="checkbox"/>
S	Ceanothus 'Gloire de Versailles'		Moderate	<input type="checkbox"/>
S N	Ceanothus 'Joan Mirov'		Low	<input type="checkbox"/>
Gc N	Ceanothus 'Joyce Coulter'		Moderate	<input type="checkbox"/>
S N	Ceanothus 'Julia Phelps'		Low	<input type="checkbox"/>
S N	Ceanothus 'Louis Edmunds'	Louis Edmunds ceanothus	Low	<input type="checkbox"/>
S N A	Ceanothus 'Ray Hartman'	Ray Hartman ceanothus	Low	<input type="checkbox"/>
S N	Ceanothus 'Sierra Blue'	Sierra blue ceanothus	Low	<input type="checkbox"/>
S N	Ceanothus 'Tassajara Blue'	Tassajara Blue ceanothus	Low	<input type="checkbox"/>
S N	Ceanothus 'Tilden Park'	Tilden Park ceanothus	Low	<input type="checkbox"/>
S N	Ceanothus 'Wheeler Canyon'	Wheeler Canyon ceanothus	Low	<input type="checkbox"/>
S N	Ceanothus arboreus & cvs.	island ceanothus	Low	<input type="checkbox"/>
S N	Ceanothus cuneatus	buckbrush	Very Low	<input type="checkbox"/>
S N	Ceanothus cyaneus	San Diego ceanothus	Low	<input type="checkbox"/>
S N	Ceanothus foliosus and cvs.	wavy leaf mountain lilac	Very Low	<input type="checkbox"/>
Gc N	Ceanothus gloriosus 'Anchor Bay'	Anchor Bay ceanothus	Low	<input type="checkbox"/>

Ceanothus 'Concha'



Efficient Irrigation

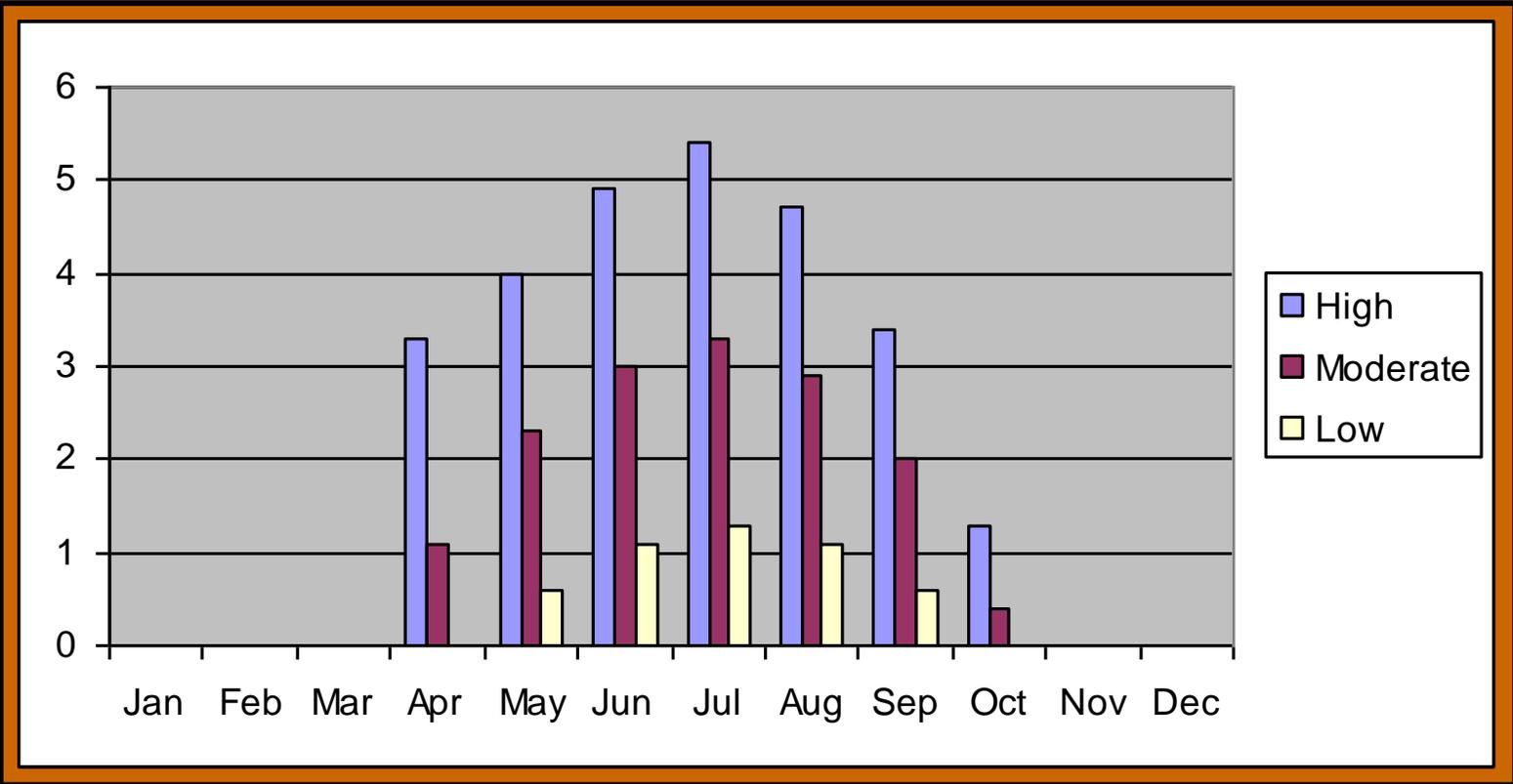
Water Needs (Inches per Month)





Efficient Irrigation

Irrigation Needs: (Inches per Month)



Efficient Irrigation

No irrigation
Patios, paths,
Play structures,
Outdoor kitchens





Efficient Irrigation

High Irrigation

Annual veggies
Citrus
Lawns



Source: Sunset.com





Efficient Irrigation

Medium Irrigation

Fruit Trees Many Shrubs



Source: davewilson.com



Source: memphisbotanicgarden.com



Source: monrovia.com



Landscapes without Lawns

Low irrigation
CA Natives
Water-wise plants
Mediterranean herbs
Succulents



Source: Sunset.com



Source: csmonitor.com

Efficient Irrigation

Annual Irrigation for Plant Types

High: Tomato

27" per year

~17 gallons per sq ft



Source: gardenharvestsupply.com

Medium: Rose

13" per year

~8 gals per sq ft



Low: Lavender

5" per year

~3 gals per sq ft



Source: anniesannuals.com



Efficient Irrigation

Sources of Water

Rain Water

Gray Water

Ground Water

Recycled Water

•

•

•

Well Water

Potable Water



Efficient Irrigation

Irrigating 100 square feet of Garden based on average rainfall

Hydrozone	low	med	high	lawn
Annual Irrigation in inches	5"/yr	13"/yr	27"/yr	40"/yr
Annual Irrigation per 100 sq ft	313 gal per year	813 gal per year	1688 gal per year	2500 gal per year
Which could be stored in...	5 wine barrels	5' diameter 6'6" tall tank	7' diameter, 6'6" tall tank	8' diameter 7'3" tall tank
Or could be irrigated by...	1.5 loads laundry per week (10 gal load)	4 loads laundry per week (10 gal load)	36 minutes shower per week (2 gal/minute)	54 minutes shower per week (2 gal/minute)



Efficient Irrigation

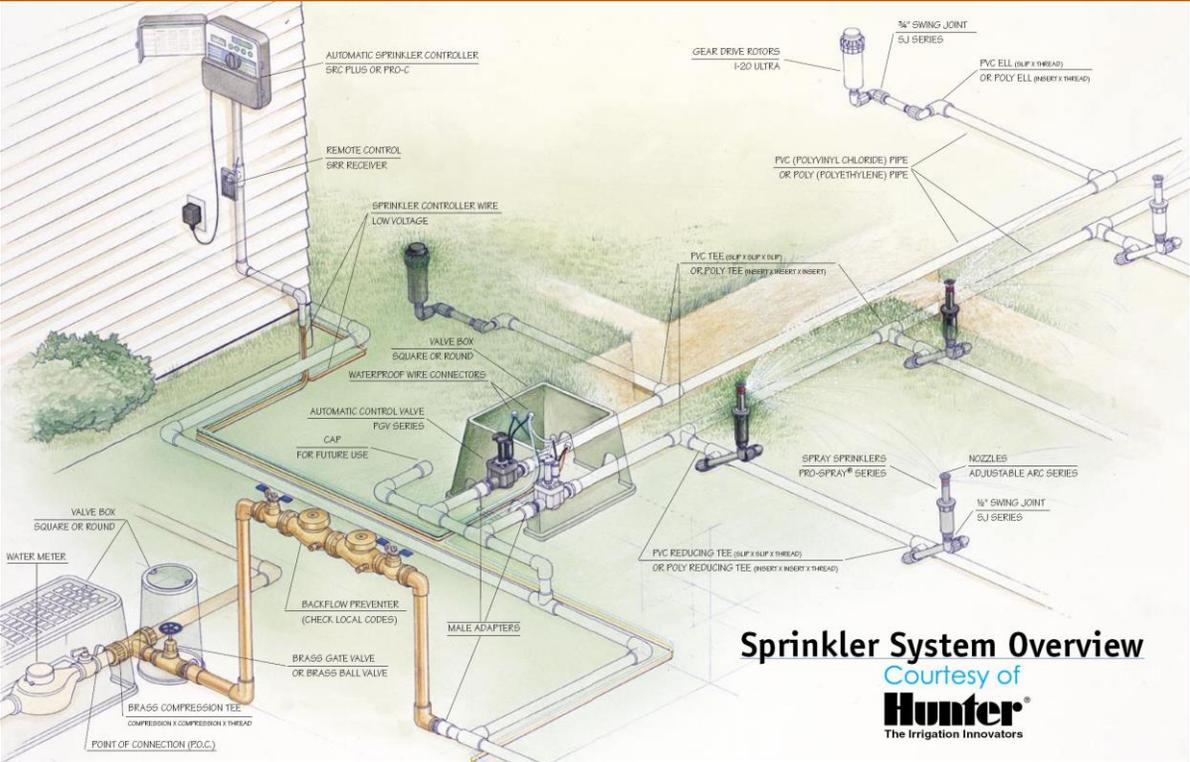
Conventional Irrigation Systems

Controller

Point of Connection

Meter (opt)

Backflow preventer



Sprinkler System Overview
 Courtesy of
Hunter®
 The Irrigation Innovators

Multiple valves/stations

Do not mix brands or types within a single station



Efficient Irrigation

Water Efficient Landscape Ordinance

- Minimal use of spray irrigation
 - Efficient sprays (MP rotators) should be used
 - No spray in areas less than 10' wide
 - No spray within 2' of hardscape
- Drip irrigation on all shrub plantings

Smart controllers should be used to match irrigation to seasonal plant needs



Efficient Irrigation

**Convert to MP rotators
to prevent misting or runoff**



Source: wateruseitwisely.com



Efficient Irrigation

Convert to Drip Irrigation For Maximum Efficiency

For each irrigation station...

- Replace one spray body with drip conversion body (contains filter and pressure reducer).
- Cap all other heads on station.
- Add drip line.



Source:
urbanfarmerstore.com



Efficient Irrigation

Wetted Area Appearing on Soil Surface

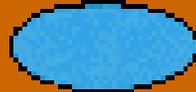
Sandy



Loam

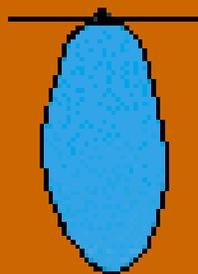


Clay



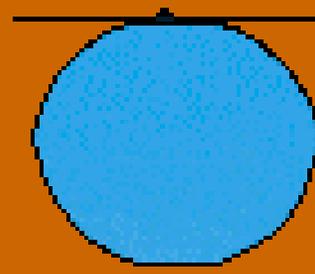
Cross Section of Wetted Area in Soil

Sandy



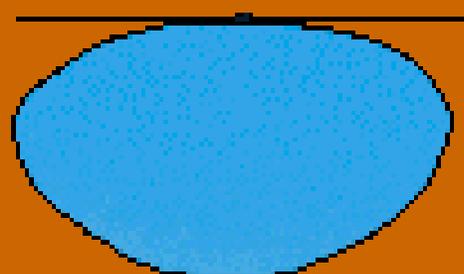
2' to 3'

Loam



3' to 5'

Clay



5' to 7'

Drip Irrigation:

Looks dry on the surface

Distributes lots of water
in the root zone



Efficient Irrigation

Use emitter line on shrubs and trees



Source: pro-sprinkler.com



Source: cityraininc.com/



Efficient Irrigation

Water the ZONE not the PLANT

Emitter line example for raised edible beds

1/4" tube with 0.5 gal/hour emitters @ 6" spacing

Lines spaced 12" apart

1 hour run = 1 gallon per square foot
= 1.6" irrigation

15 min run = 0.25 gallon per square foot
= 0.4" irrigation





Efficient Irrigation

Water the ZONE not the PLANT

Emitter line example for shrub plantings

1/2" tube with 1.0 gal/hour emitters @ 12" spacing

Lines spaced 18" apart

1 hour run = 0.67 gallon per square foot
= 1.1" irrigation

15 min run = 0.17 gallon per square foot
= 0.3" irrigation





Efficient Irrigation

Basic Controller Features

- Shuts off in the rain
- Cycle and soak to prevent runoff
- Seasonal adjust
- Remote/computer control



Source: hunterlawnsprinkler.com



Efficient Irrigation

“Smart” Controller Features



- All of the previous plus...
- Determines schedule based on programmed inputs
 - Soil type
 - Sun intensity
 - Wind conditions
 - Specific plant needs
- Adjusts based on actual weather conditions

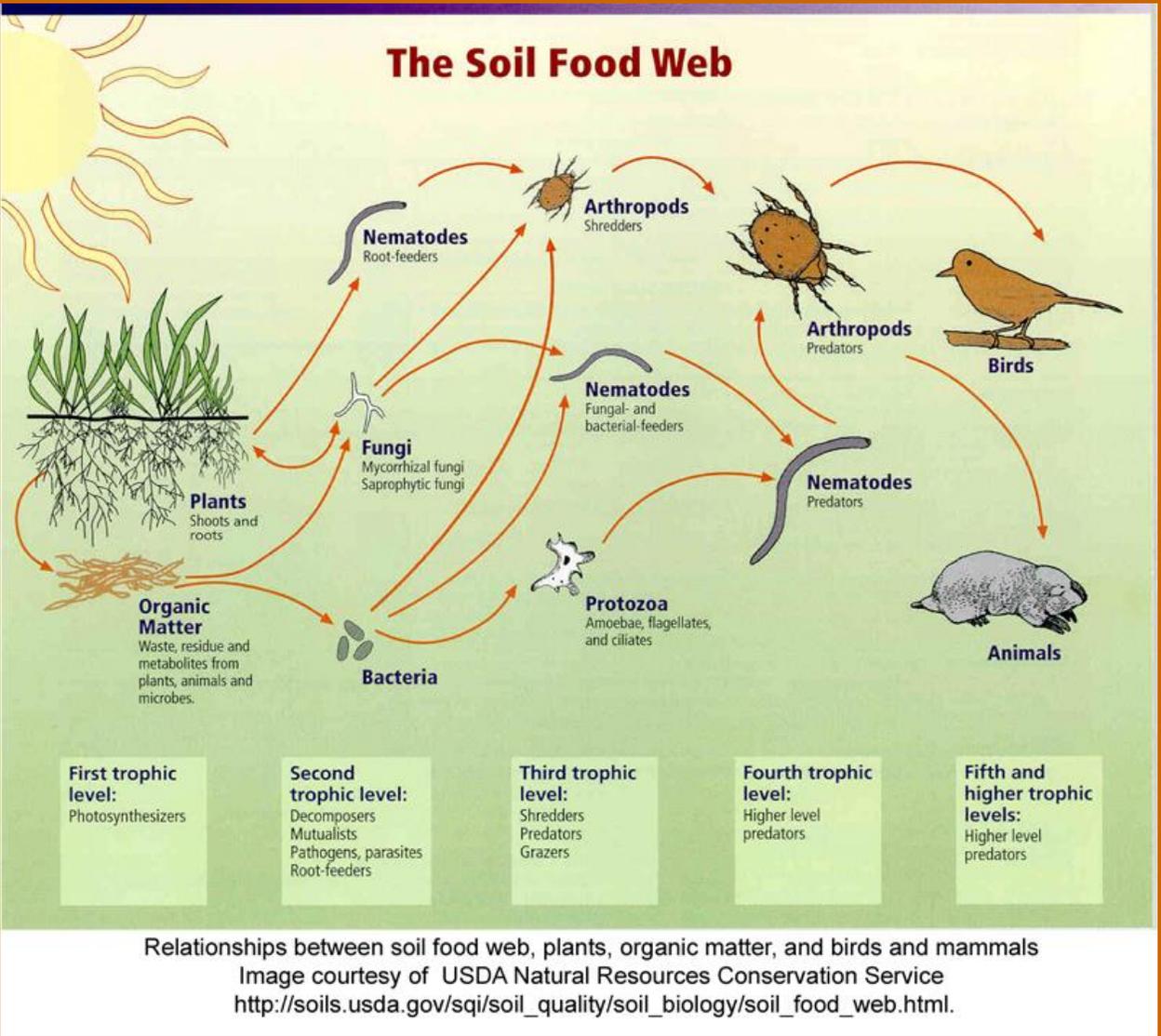
Source: landscapeonline.com

Efficient Irrigation

**Healthy soil
 retains
 more water.**

Living soil needs food
 (compost), air & water

Avoid pesticides,
 chemicals, leaf blowers,
 roto-tilling, etc.





Efficient Irrigation

Mulch all planted beds



Source: homedepot.com



Source: oakvillefarm.blogspot



Efficient Irrigation





Efficient Irrigation

Rain Water



Efficient Irrigation



Recharging Ground Water

- Grade to retain water
- Eliminate curbs



Efficient Irrigation

Recharging Ground Water Dry Creek Beds Prevent Runoff



Finegardening.com



Hardscapematerials.com



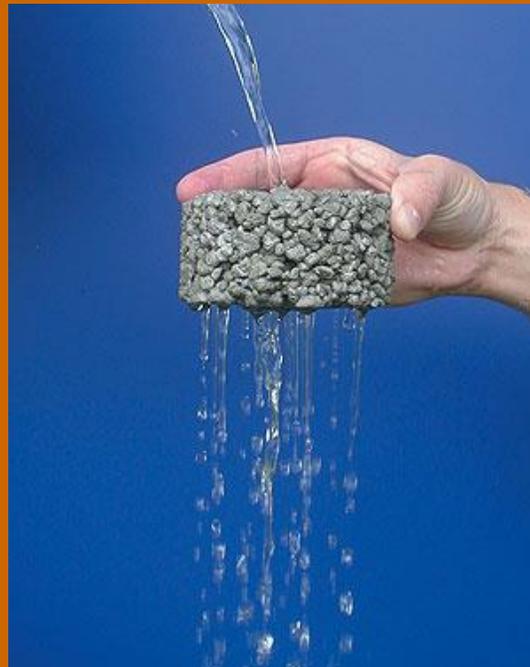
Finegardening.com

Efficient Irrigation

Recharging Ground Water Use permeable surfaces



Mytorontohomeimprovement.com



Concretedecor.org



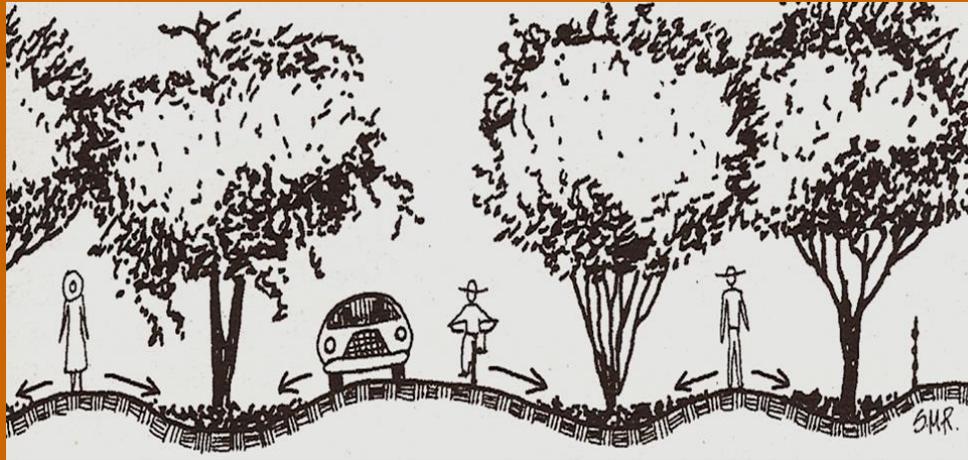
Photo: David Callan



Efficient Irrigation

Recharging Ground Water

- Grade to Retain water
- Eliminate curbs





Efficient Irrigation

Rainwater Storage



Source: bushmanusa.com

Efficient Irrigation

205 gallons
3 tomato plants
68 sq ft lavender



1320 gallons
20 tomato plants
440 sq ft lavender



5050 gallons
75 tomato plants
1680 sq ft lavender



Source: bushmanusa.com



Efficient Irrigation

**205 gallons
 12" rain over
 27 sq ft roof**



**1320 gallons
 12" rain over
 176 sq ft roof**



**5050 gallons
 12" rain over
 673 sq ft roof**



Source: bushmanusa.com

1 cubic foot = 7.5 gallons



Efficient Irrigation



Source: Waterwalltanks.com

Water Fence

- 5-7' tall, 2' deep
- Store 50-100 gals per ft of fence
- 50' fence...
 - ...stores ~3800 gals
 - ...irrigates ~225 sq ft edible garden
 - ...needs 12" rain over 530 sq ft roof to fill



Efficient Irrigation

Tanks Under Decks



Source:paton.net.au/

Source:aquabarrel.com



Source: ftaustore.com





Efficient Irrigation

Rain Water

- Easy to filter and maintain filters
- Clean—no salts, soaps, lint, etc.
- Can be pumped through drip line or run through hose
- Can be stored indefinitely & used any time
- Can act as emergency water supply



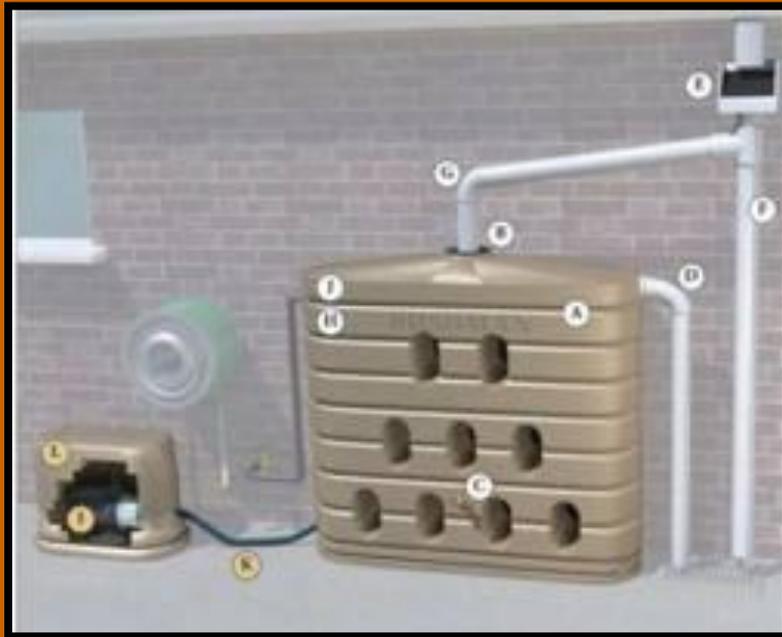
Efficient Irrigation

Rain Water Storage

- Full tanks are heavy (8.3 pounds per gal)
- Tanks take up a lot of space
- High set up cost

Efficient Irrigation

Plumbing Water Storage Tanks



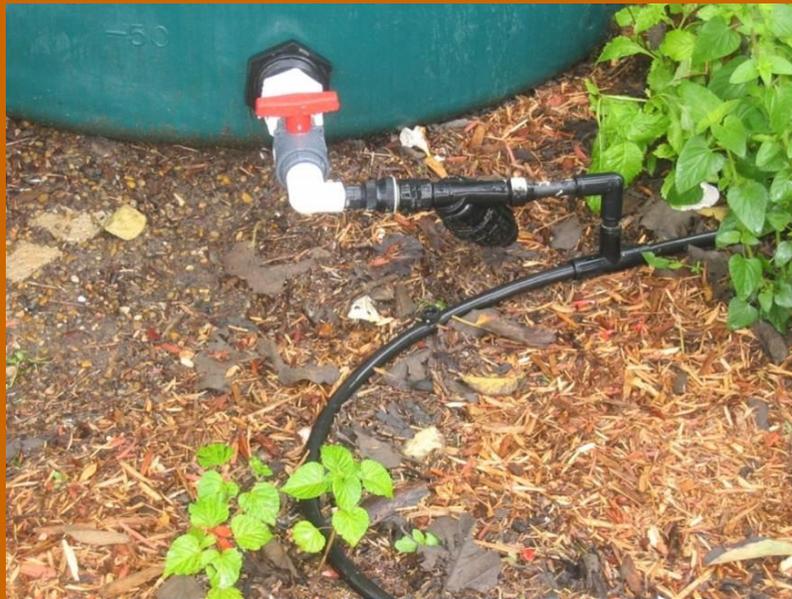
Incoming water:

- Filter
- First Flush Diverter
- Connection to downspout
- Overflow
- "Daisy Chain"
- Level Indicator



Efficient Irrigation

Plumbing Water Storage Tanks



Outgoing

- Optional Pump
- Optional timer
- Dripline/hose



Efficient Irrigation

Gray Water

Greywater is gently used water from your bathroom sinks, showers, tubs, and washing machines. It is not water that has come into contact with feces, either from the toilet or from washing diapers.

Source: Greywateraction.org

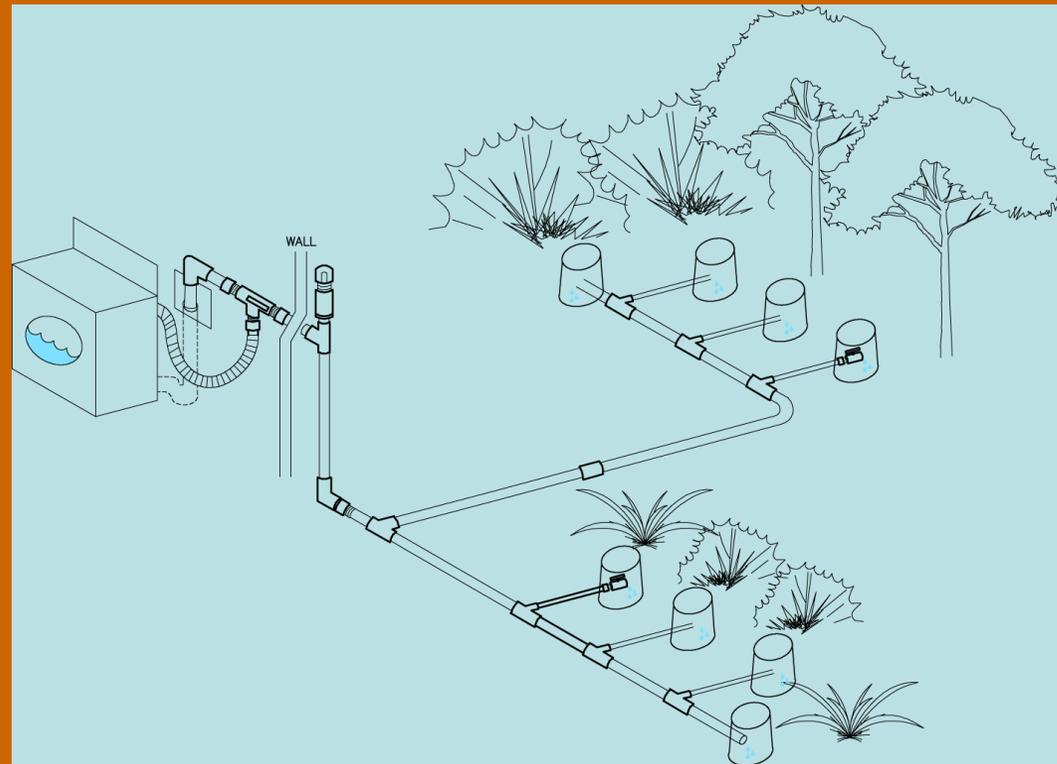


Efficient Irrigation

Laundry to Landscape

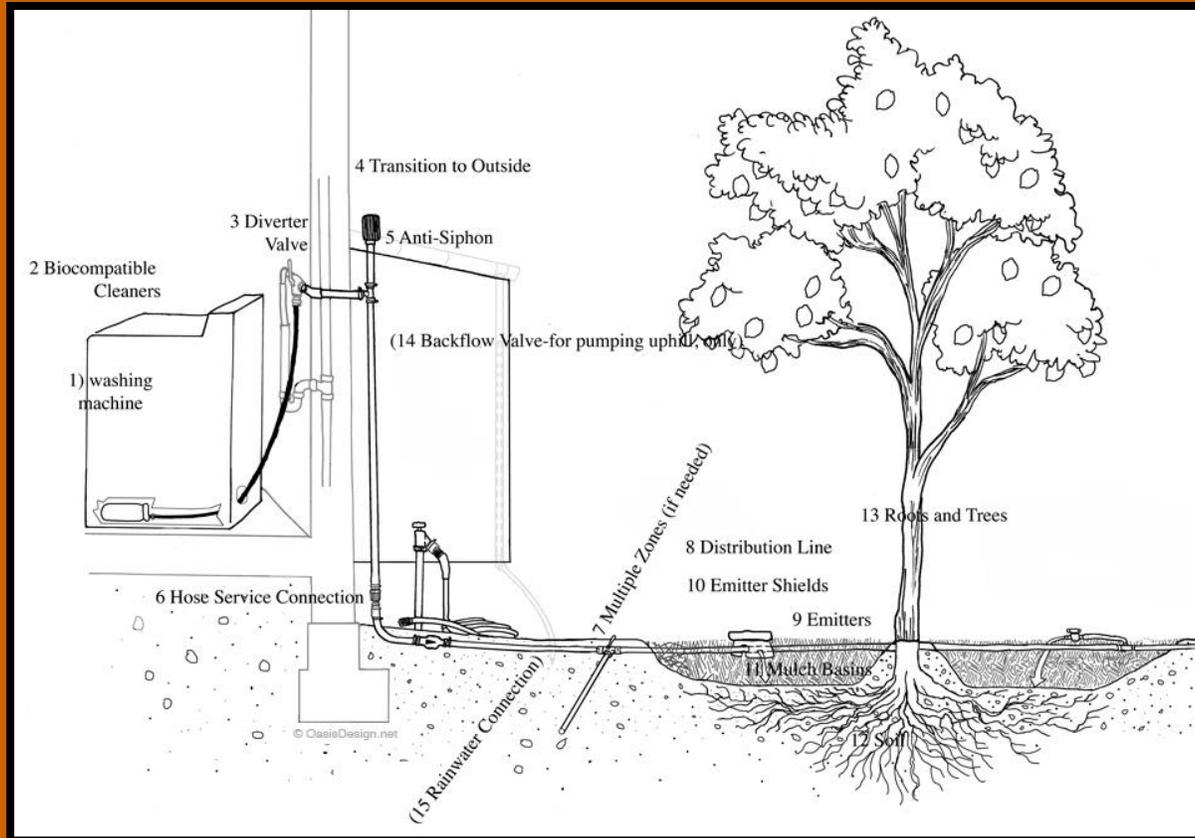
Does NOT require permit
(if you follow the rules)

Does NOT require pump



Efficient Irrigation

L2L Requires...



- **3-way valve to divert water to landscape or to sewer**
- **Anti-siphon to prevent backflow**
- **Deliver water into mulch basins**



Efficient Irrigation

Unfiltered Gray Water Systems deliver water to "mulch basins"



Source: Greywateraction.org



Efficient Irrigation

Filtered Gray Water Systems can run through drip line



Source: greyflow.net.au



Efficient Irrigation

Basic Gray Water Rules

- Include 3-way valves to divert “bad” water to sewer
- Include backflow prevention
- Keep gray water away from natural waterways
- Do not store over 24 hours
- Deliver gray water under mulch

- Use appropriate cleaning products
- Check plant compatibility



Efficient Irrigation

Gray Water

- Available year round
- Does not require storage space
- Can irrigate large areas of landscape
- Suitable for fruit trees, most shrubs



Efficient Irrigation

