

# “FOUND” WATER



## FROM INSIDE & OUTSIDE

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EarthCare Landscaping

# Sources of water

- Municipal supply
- Reclaimed (recycled) water
- Graywater
- Rainwater harvesting

# Rainwater Harvesting Benefits



- Strategic Planning
- Drought Proofing
- Fire Protection/Emergency Water
- Stormwater Management
- Community Aquifer Recharge
- Flood Control
- Habitat Restoration
- Increased Property Values
- Reduced Water Bill
- Lower Carbon Footprint

# Local and State

- In case of drought
- Disaster preparedness
- Clients want to be:
  - Strategic
  - Water Independent
  - Secure



# Don't confuse rainwater with graywater



# What is Graywater?

- Water from sinks, shower/tub, washing machine

- No water from toilets (black water)
- No water from kitchen sinks (food particles)
- No water from laundry if used to clean diapers
- No water containing any harmful chemicals, including bleach

# Graywater

- Produced all year long
- Small tanks, if any
- Only hold < 24 hours
- Not for some vegetables
- Salts can build up from soaps unless flushed
- 29,000 gallons / six months for four people and all hookups
- Permits required for larger systems

# Rainwater

- Produced in wet season and held until dry season for landscapes
- Large tanks
- Pure, great for all vegetables
- 25,000 gallons for 1500 sf house and 18" of rain per year
- No permits required except for electrical & grading

**A VERY easy  
graywater system:**

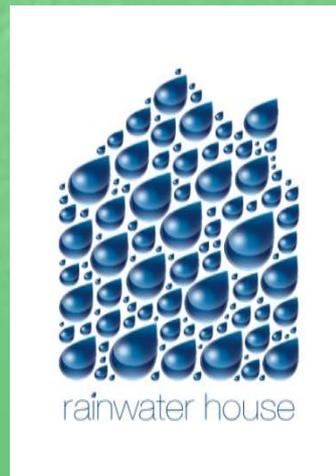
# Sink Positive!



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

# Rainwater Harvesting Facts

- 15 inches per year
- 2,500 sq. ft. roof = 22,500 gallons/yr.
- 5,000 sq. ft roof = 45,000 gallon/yr.
- How much do you really need?
- 50 %+ = outdoor irrigation
- Rainwater from all roofs equals billions of gallons per year!
- Enough to irrigate thousands of acres of native/drought tolerant landscape



# Basic Elements

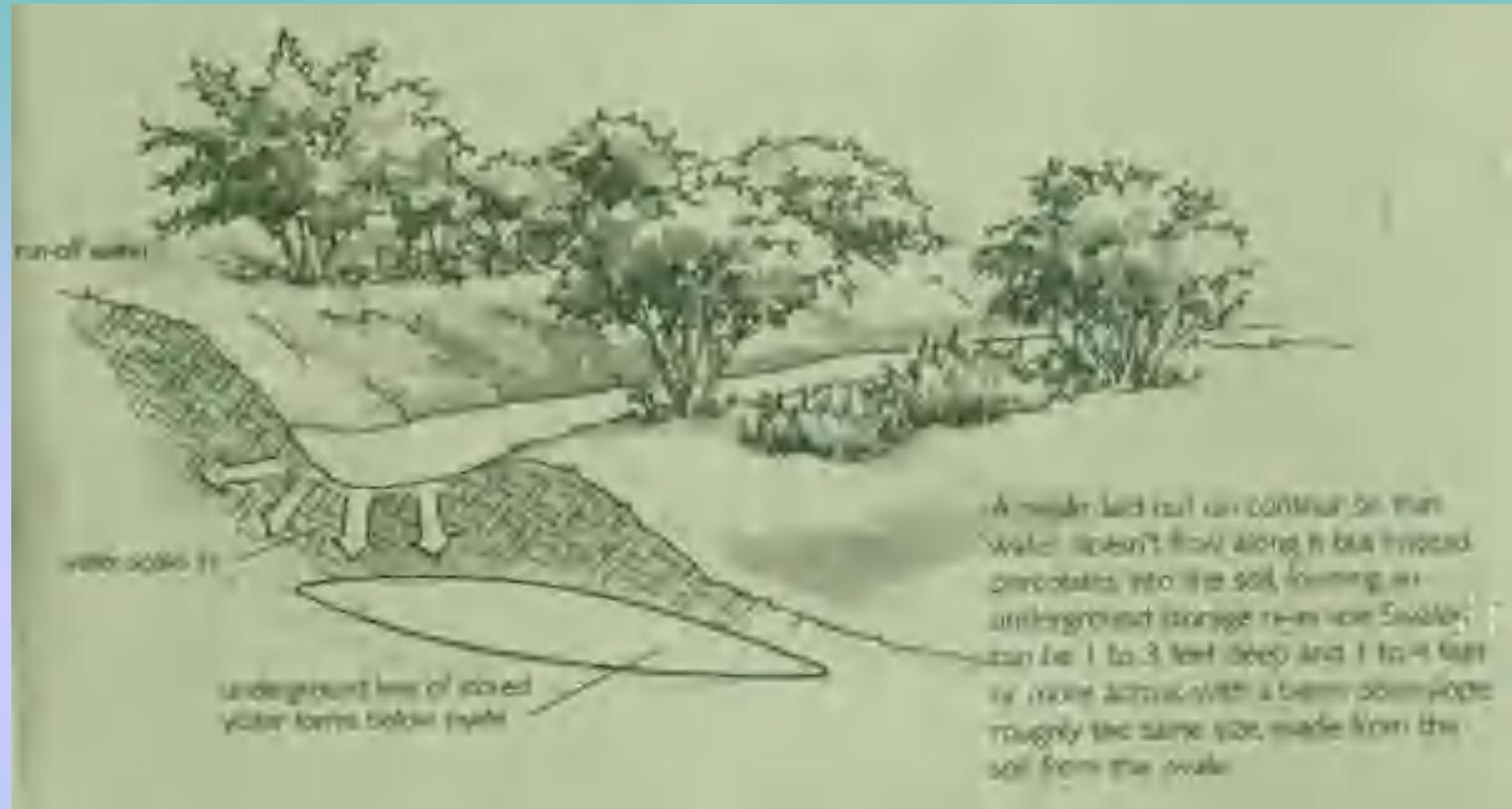
- Capture
- Pre-filtration
- First Flush
- Storage
- Pumping
- Filtration
- Distribution



Do some planning first.  
Don't let this happen to you!

# Rainwater harvesting

- Passive systems including swales and percolation ponds, dry creeks and rain gardens
- Simple catchment & gravity feed
- Above or underground tanks with filters, pumps, etc.

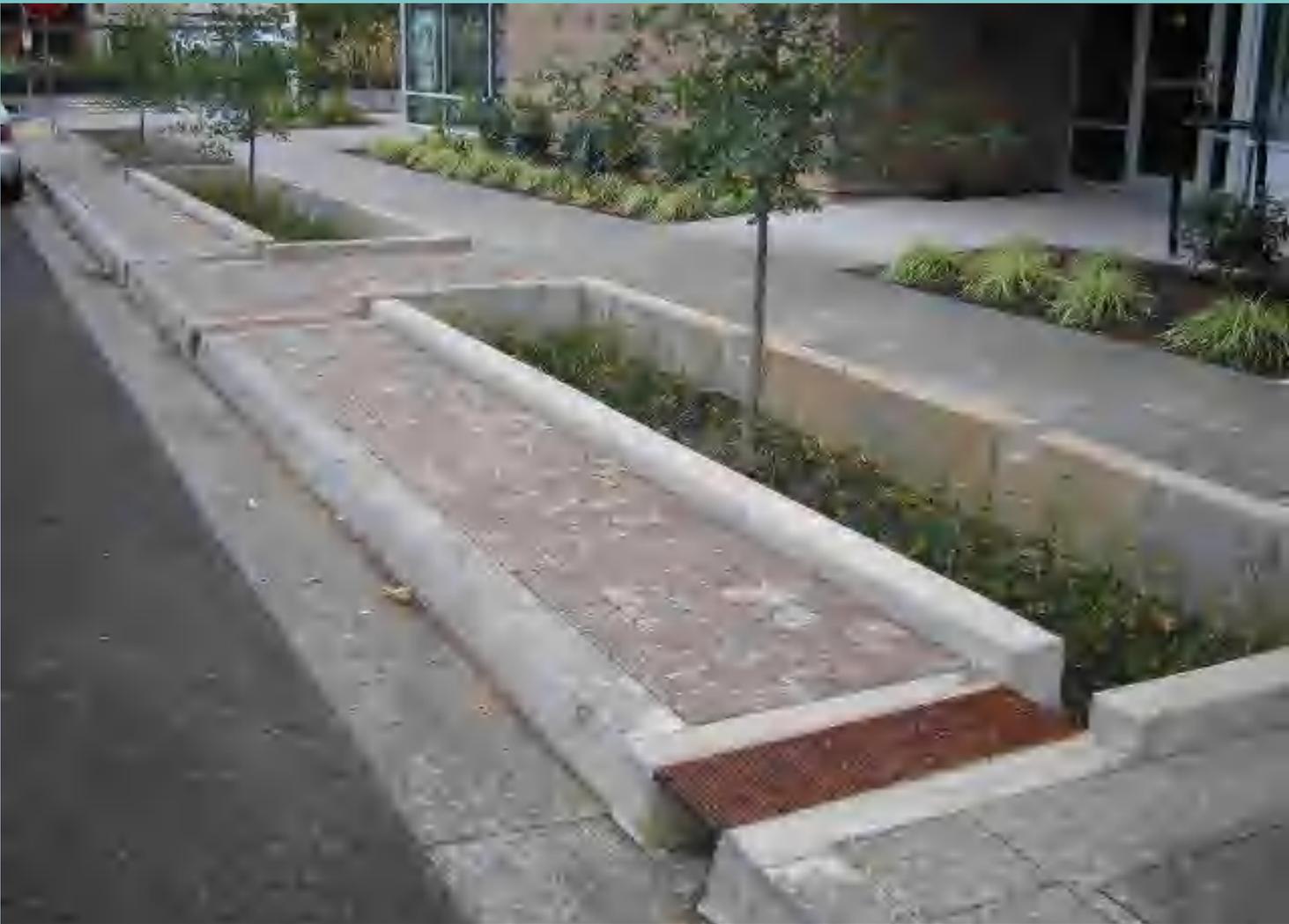


**Swales slow and capture water**



# Swale examples





# Urban swales

Portland, Oregon

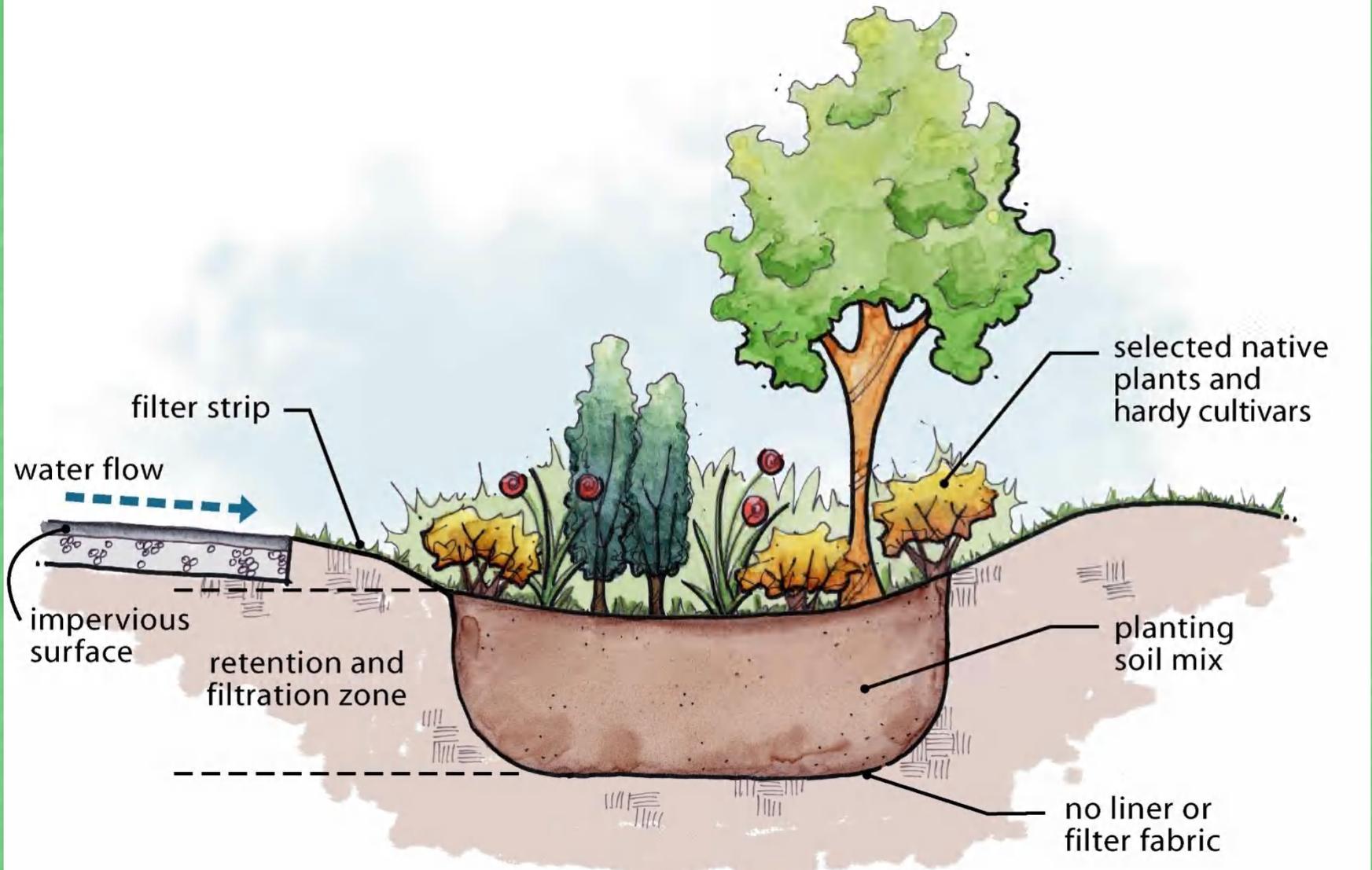


Taking matters into your own hands



# Overflow percolation area

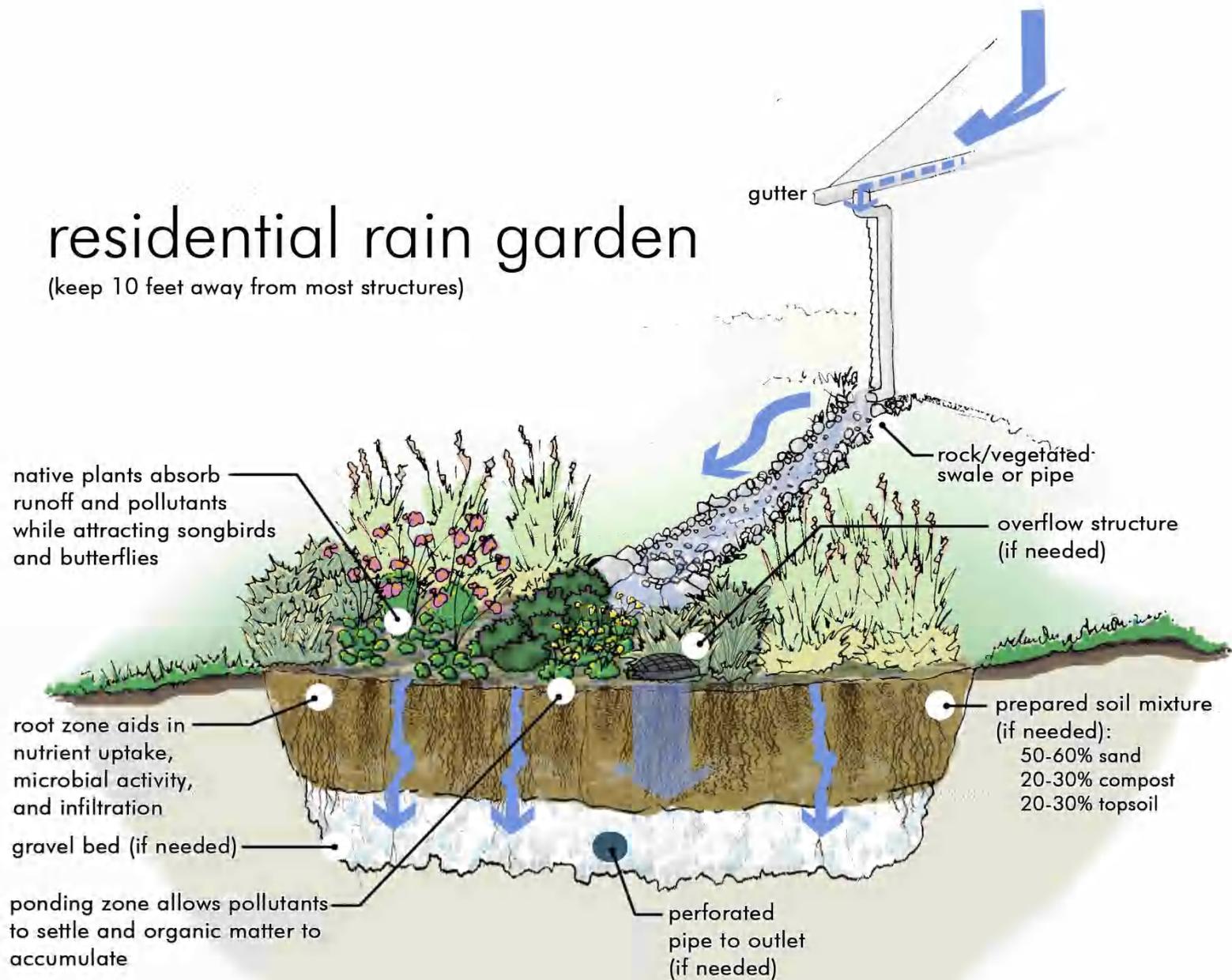
Photo and project: EarthCraft Design



# Simple Rain Garden

# residential rain garden

(keep 10 feet away from most structures)



# Make your own rain garden

- 10' away from your house foundation
- Easy access to your downspout
- Full or partial sun
- Avoid septic fields, right of ways, underground pipes, and established trees
- Don't select where water pools (poor drainage here!)
- Test your soil for type and percolation

# Percolation Test



Dig a hole and prefill it if the soil is dry

Fill your hole with water





Measure how fast it drains. Sandy 1 hour, loamy up to 8 hours, clay 24 hours.

# Design your rain garden

- Amend the soil if drainage is poor. 50% sand, 20% compost, 30% topsoil
- Size: about 20-30% of roof area being drained
- Use a hose to define the shape
- Remove the lawn and dig out the soil about 2' deep, creating a berm somewhere else
- Finished garden should be about 6-8" lower than surrounding area
- Add rocks near the entry where water enters (to prevent erosion)
- Plant native and droughty plants
- Add mulch
- Don't forget to water the first season or two.



Rain Garden for summer rains



Dry Creek in a parking strip

# Dry Creek with native plants

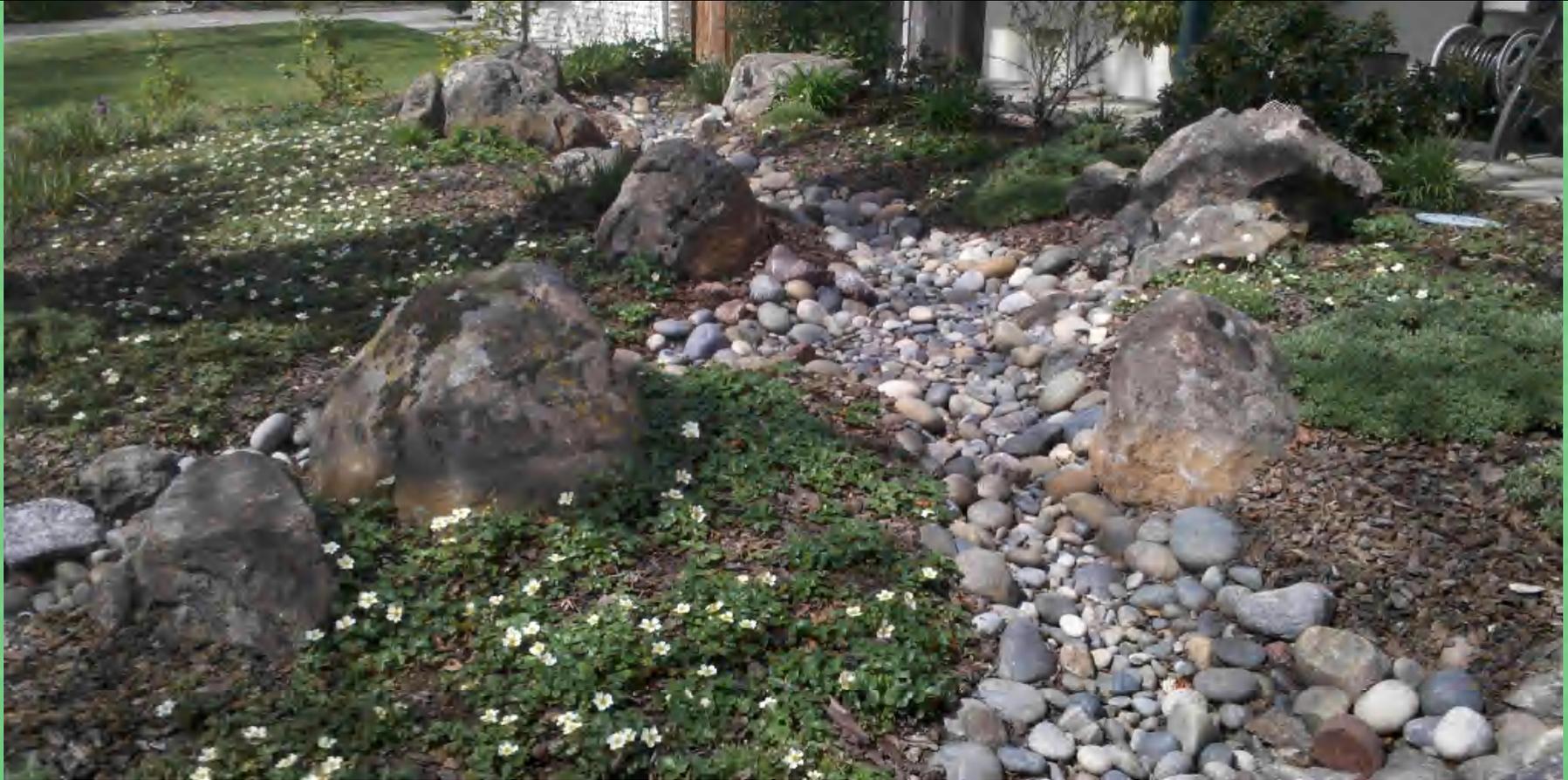


Photo and installation: EarthCare Landscaping

# Plants that tolerate wet or dry

Grey Rush – *Juncus patens*

Berkeley Sedge – *Carex divulsa*

Small Cape Rush - *Chondropetalum tectorum*

Native Dogwood – *Cornus sericea*

Snowberry – *Symphoricarpus albus*

Canna Lily – *Canna x generalis*

Fortnight Lily – *Dietes vegeta*



Pervious concrete

# Capture - Roofs

- Metal
- Galvalume
- Elastomeric coating
- Asphalt shingles
- Tile
- Solar Panels
- Living Roof

1 inch of rain on 1,000 sq. ft roof surface  
= 500 + gallons of rainwater



Image courtesy of Feldman Architecture



Slide courtesy of EarthCraft Design

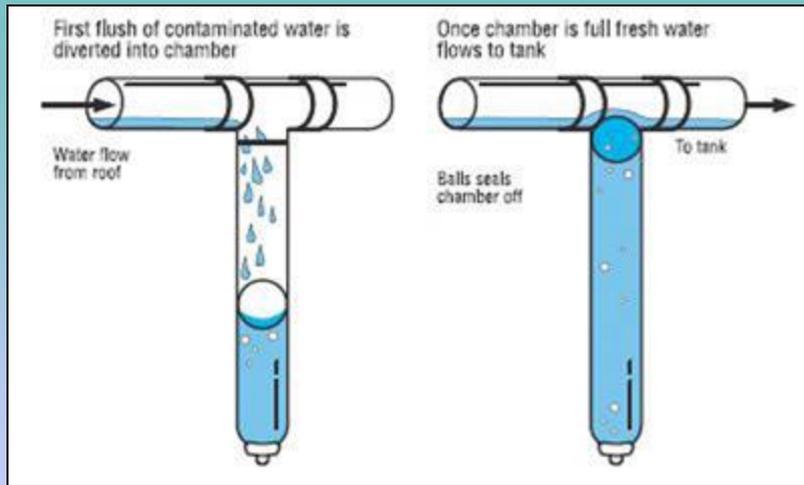
# Single barrel catchment





## “Daisy chain catchment”

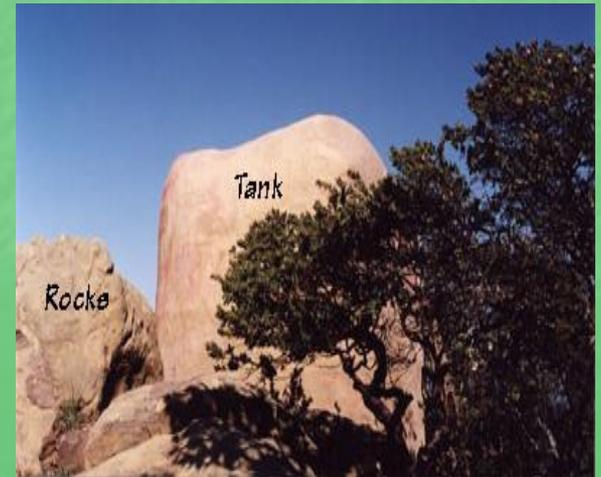
Photos and projects courtesy of Greywater Action



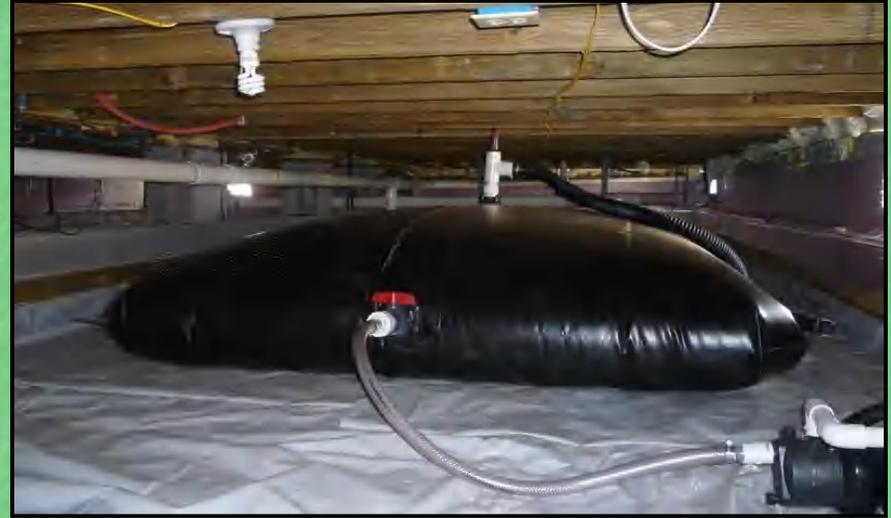
# First flush diverters & screens



# Above ground storage



# Rainwater Pillow



Recycled food grade  
containers



# Below ground storage



# Rainwater Harvesting Costs

- Design + Installation + Maintenance
- Typical = \$20K- \$60K
- Range = \$10K - \$100K+
- Above ground= \$.80-\$3.00/ gallon
- Underground= \$2.50-\$6.00/ gallon
- Underground= \$\$ twice above ground
- Incentives, Green Loans



# SF Hospital - 90,000-gallon Rainwater Harvesting System to Irrigate several Living Roofs with Native and Drought Tolerant Plantings



Slide courtesy of EarthCraft Design

# Australia comparison

- Long-term drought
- Water restrictions enforced
- Mainstream: used in houses, commercial developments, and industrial applications
- 10 years ago rainwater used only where needed

But now. . .



Typical

Slide courtesy of EarthCraft Design

# GRAYWATER

Complex Systems &  
Simple Ones

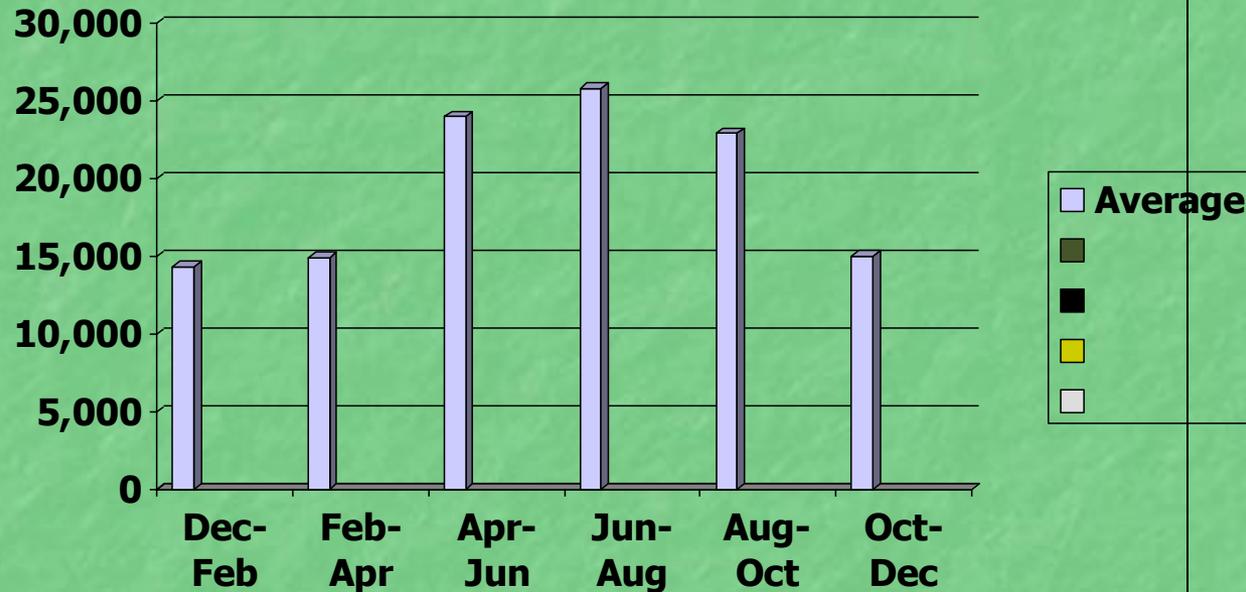
# How much GW do you have?

- Compare your winter and summer water bills – the difference is your outdoor water use.
- Analyze your use:
  - Amount of showers and length
    - Low flow shower head – 2.5 gal/min 10 minute shower= 25 gallons
  - Type of washer and # of loads
    - Top loaders:40 gal, front loaders: 10-20 gallons each time

# Water Use in Typical Bay Area Home

Water use in dry summers almost twice that of wet winter months

- Estimate of 40 gallons of gray water produced per day per person
- Family of four can produce about 9,600 gallons per two month water billing period
- Just about the water required for "typical" Bay Area landscape



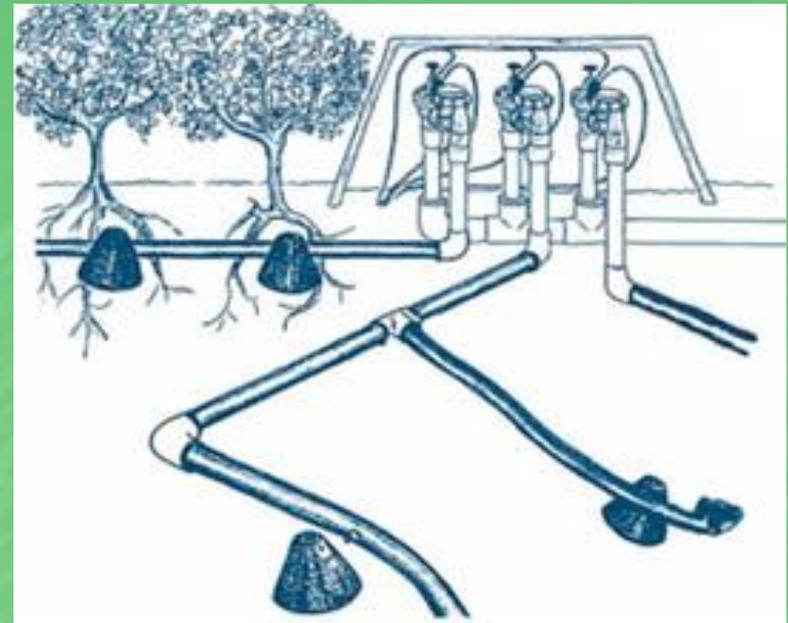
# Graywater costs

- **Laundry to landscape**
  - \$150-\$250 materials only
  - \$1500-\$3,000 full installation
- **Single fixture branched drain system**
  - \$250-\$500 materials only
  - \$2,000-\$4,000 full installation
- **Complex systems with tanks & pumps**
  - \$8,000-\$20,000 full installation



# Complex Systems parts

- Special Emitters
- Complex controllers
- Automatic filter backwash
- Fresh water supplementation (when out of town)



ReWater, Inc. Cone drip emitters



Techline purple for recycled water



ReWater's Complete Control  
irrigation controller

# Complex systems

- Are pumped and filtered
- Have small surge tanks
  
- Advantages
  - Most flexible
  - Good for most types of vegetation
  - Similar to modern irrigation systems
  - Good for most topographies
  - Good for multi-unit and commercial sites
  
- Disadvantages
  - Most expensive – about \$6,000 extra
  - Most complicated – must be installed by professionals

# Lawn irrigation installation



Photos from ReWater, Inc.



Lawn five years after installation

# Sunnyvale Home – Installed 2006

Sand filter from ReWater



Surge tank in vault



Lawn with subsurface drip tubing from Netafim, installed by EarthCare Landscaping, plumbing by Hal Branges

The simplest system is the best

Fewer parts  
Least maintenance

This is the only system that  
doesn't require a permit

Laundry  
to  
Landscape

# Will a L to L system work for you?

- Type of washing machine
- Location of washer within house
- How many loads/week
- Willingness to change laundry products
- Lifestyle – take long summer vacations???

# Assess the outside landscape

- Hardscape around the house –
  - go over or under it, or cut it
- Type of plants to be irrigated
- Number of plants to be irrigated
- Location/distance of plants from washer
  - 50' on level. Further if downhill

# What to irrigate using mulch basins?

- Fruit trees
- Cane berries & grapes
- Vines
- Trees & shrubs
- Perennials & bunch grasses
- Natives – use water-loving, riparian plants

Each laundry system is going to have a max of 8 outlets (can be doubled with an additional 3-way valve)

# What plants to avoid?

- Root or low edibles (radish, strawberry)
- Annuals
- Groundcovers
- Lawns!
- Salt sensitive plants
- Acid loving plants (unless pH is balanced)
- Droughty plants that don't GET irrigated

# Laundry to Landscape

- The only greywater that doesn't require a permit.
- Rebate (\$200) available from SCVWD
- Follow code guidelines
- Don't cut into any house plumbing
- Simplest system is least likely to fail
- Low tech: no pumps, filters or make-up water
- Washing machine already HAS a pump

# Greywater Basics for Irrigation

## DO

- Use mulch
- Use a 3-way valve
- Use plant friendly products
- Use a "proven" design

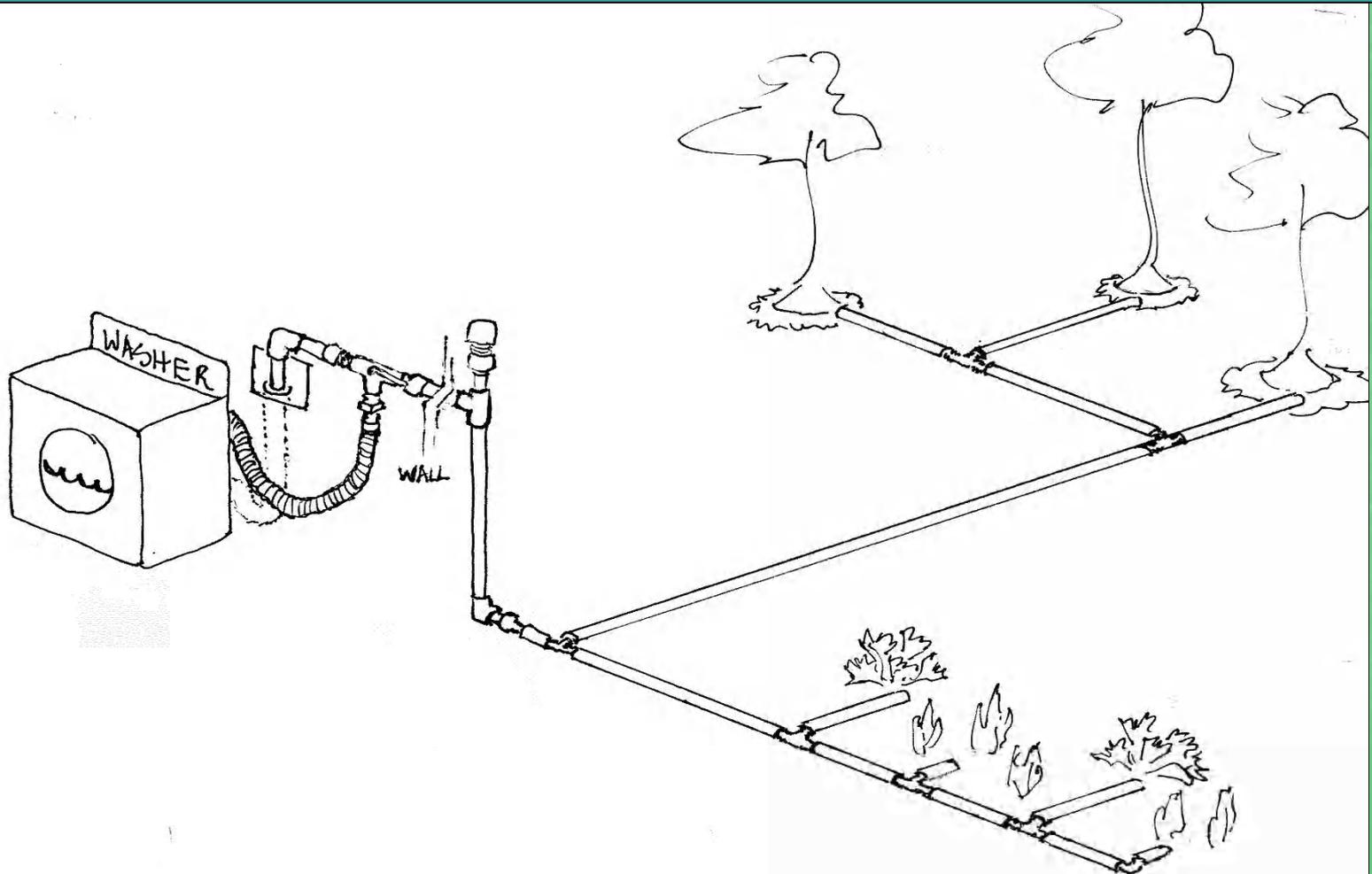
## DON'T

- Store greywater
- Use a filter that needs cleaning
- Use if you're near a creek or river
- Use if water doesn't drain on the site
- Use if ground water table is less than 3' deep

# Laundry to Landscape

DIY materials \$150-\$300

Installation: \$1,500-\$2,500



# “Do’s”

- Be able to easily switch back to sewer
- Discharge under 2" mulch/rock/cover
- Direct water to irrigation field (no storing more than 24 hours)
- Label your system
- Have a maintenance manual
- Minimize contact with humans and pets

# “Don’ts”

- Have ponding, spray or runoff
- Discharge into neighbor’s yard
- Connect to potable water supply
- Include a pump (more room for error)
- Violate other codes/laws
- Damage building
- Discharge closer than 18” prop. line/24” house
- Use diaper wash water or hazardous chemicals (oily rags, etc.)

# This is what it looks like





Stacking washer - inside

Air gap at highest point - outside



# Tighten all connections



Leaks are not good.

# Decide where the 3-way goes



# Cut the PVC pipe



# Cut a hole in the exterior wall

Seal it with silicone later



Because this is the highest point, put the air gap assembly here.

# Run a PVC line out of the house



This is from the 2<sup>nd</sup> story

# Connect the PVC to 1" black (or blue) poly tubing



Flexible polyethylene irrigation tubing is a better environmental choice  
Than PVC. Blu-lock is even better.

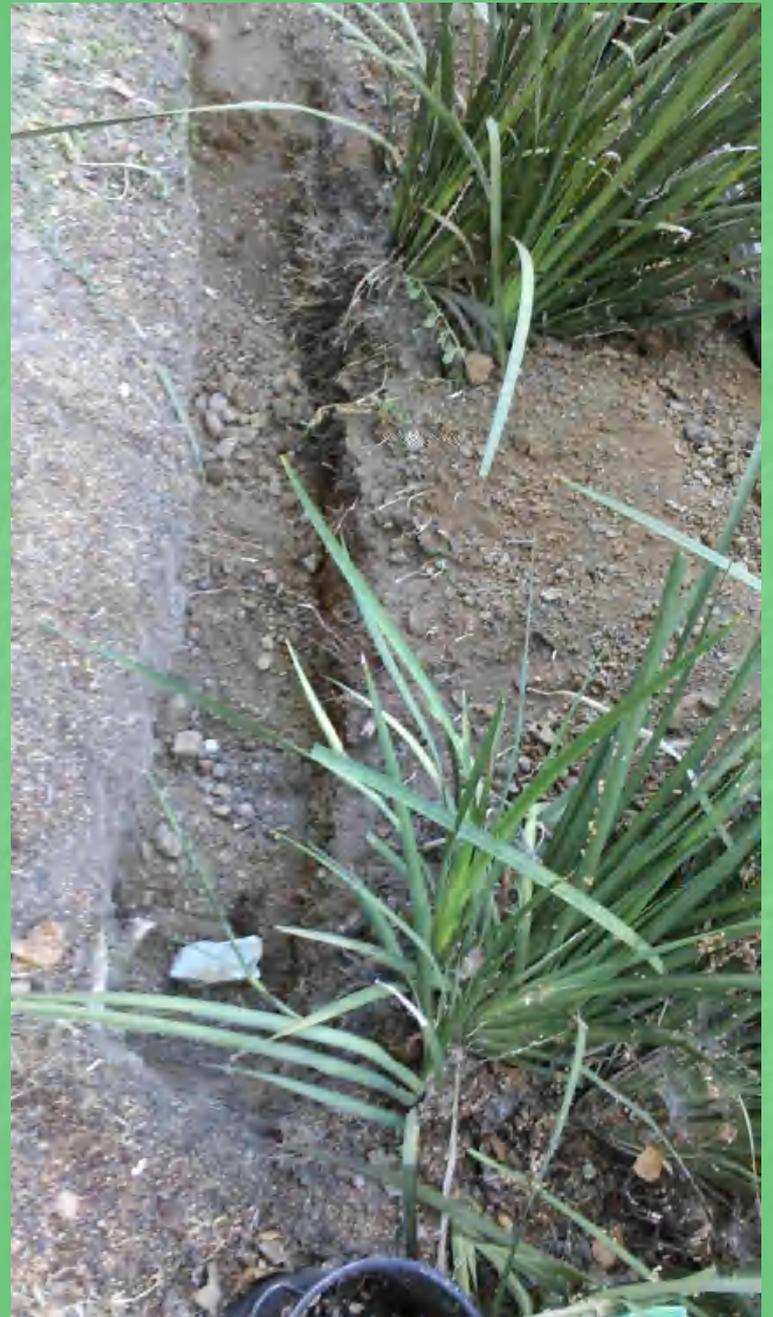
# Dig trenches for the pipes



They don't have to be deep; you just don't want anyone to trip over them.

Dig mulch basins about 12" deep.  
If your soil percolates slowly, make them wider.

This is a basin to hold the surge of water and sink it into the ground.



# Laying pipe

Ornamental bed  
With mulch basin  
shields



Use 1" x 1/2" barbed tee emitters.  
Don't cap the end.



This prevents clogging by lint . . .or pennies

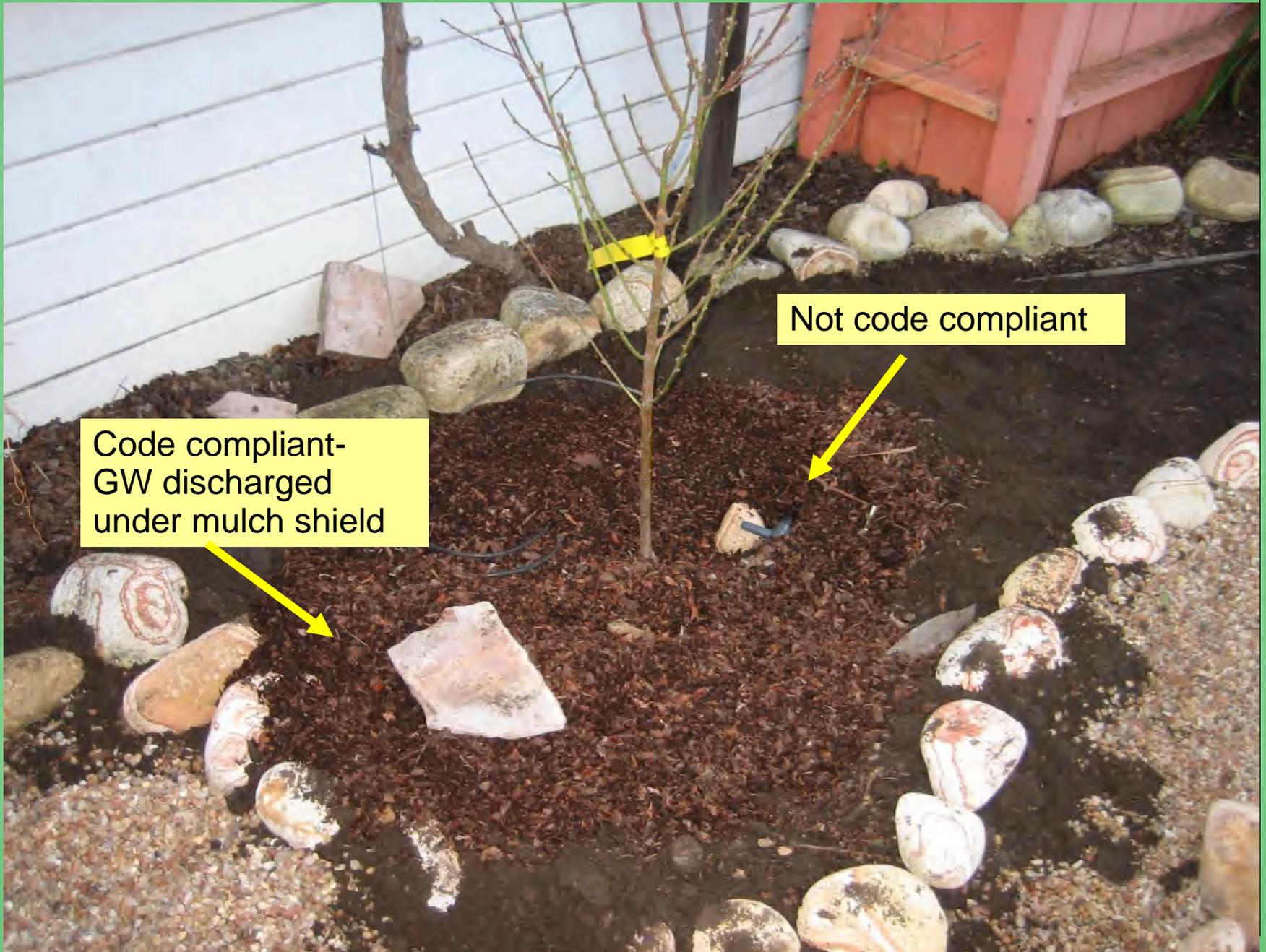
# Send emitters to mulch basins



Check the flow rates. Add little ball valves on some emitters to adjust the rates.

You can also use Blu-lock pipe and fittings





Code compliant-  
GW discharged  
under mulch shield

Not code compliant

# Mulch basins

## Flow splitter register

empty 1 gal plastic pot covered with stepping stones allows access to double end for cleaning without knocking dirt or leaves in (the most common way to disturb the flow)

Flow Splitter should sit on brick for easy leveling

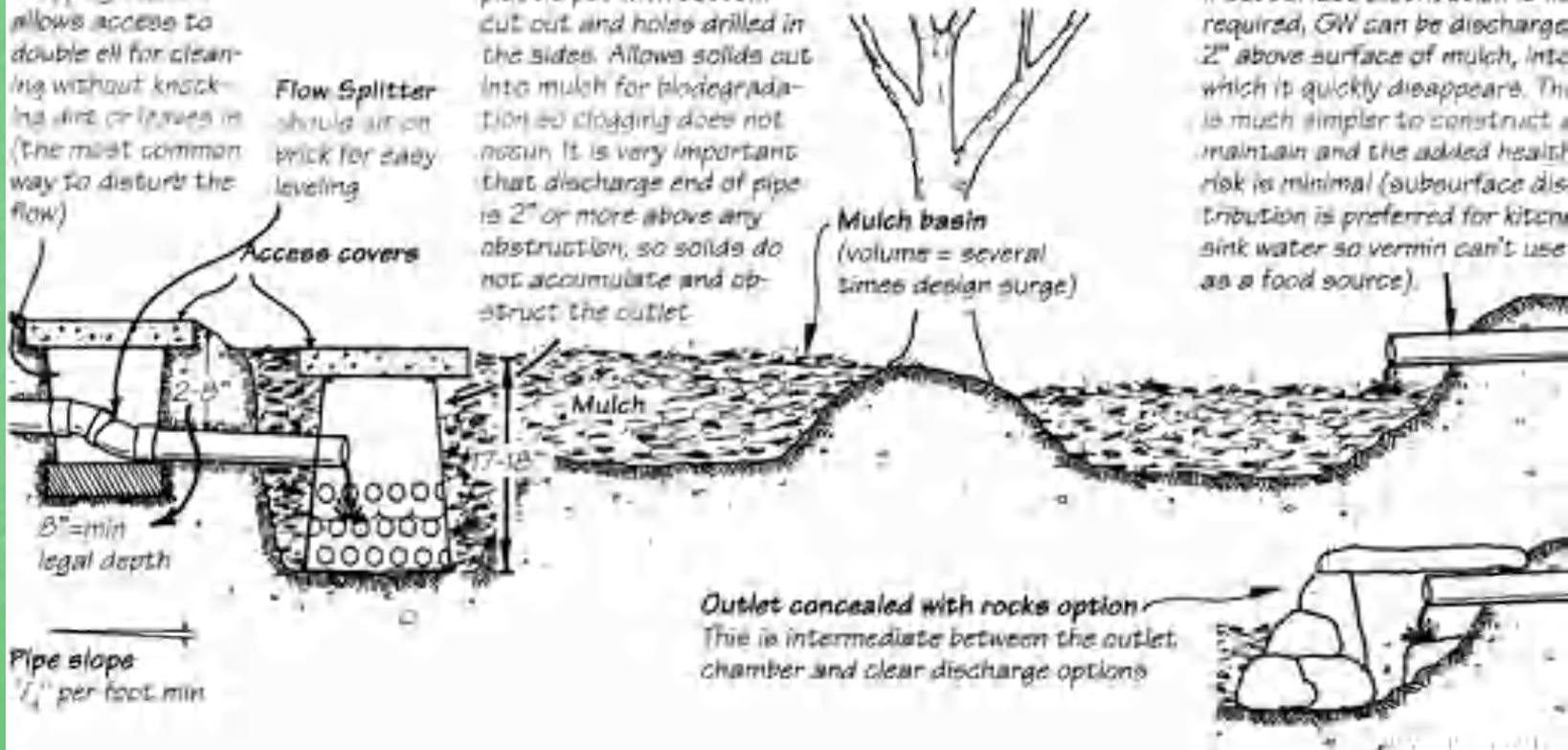
Access covers

## Outlet chamber option

upside-down, empty 5 gal plastic pot with bottom cut out and holes drilled in the sides. Allows solids out into mulch for biodegradation so clogging does not occur. It is very important that discharge end of pipe is 2" or more above any obstruction, so solids do not accumulate and obstruct the outlet.

## Clear discharge outlet option

If subsurface distribution is not required, GW can be discharge 2" above surface of mulch, into which it quickly disappears. This is much simpler to construct & maintain and the added health risk is minimal (subsurface distribution is preferred for kitchen sink water so vermin can't use as a food source).



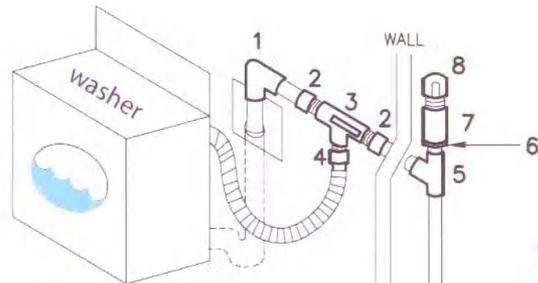
# Where do you get the parts?

- [www.cleanwatercomponents.com](http://www.cleanwatercomponents.com)
- [www.oasisdesign.net](http://www.oasisdesign.net)
- Plumbing, irrigation and hardware stores carry *some* of the parts, but not all

You can purchase all parts online  
from [cleanwatercomponents.com](http://cleanwatercomponents.com)

## Laundry to Landscape Greywater System Kit

\*barbed fittings\*

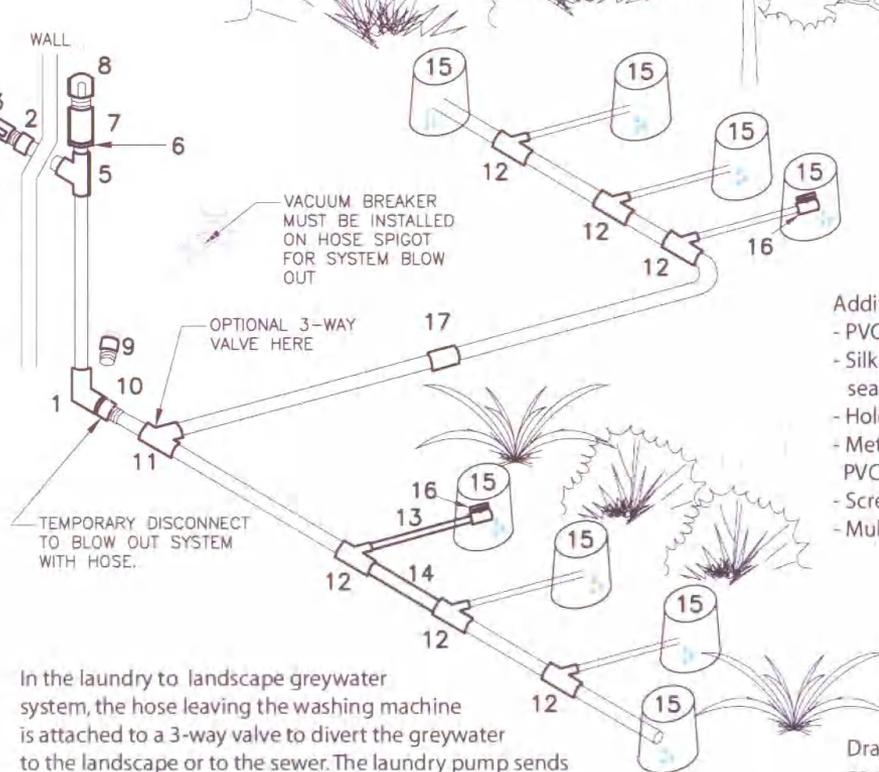


Click to buy!!

- (1) 4- PVC 1" 90 Elbow
- (2) 2- PVC 1" Male Adapter (S x MPT)
- (3) 1- Brass 1" 3-way valve
- (4) 1- Barbed 1" Male Adapter (MPT)
- (5) 1- PVC 1" Tee
- (6) 1- PVC 1.5" x 1" Reducing Bushing (SxS)
- (7) 1- PVC 1.5" Female Adapter (FPT x Slip)
- (8) 1- Auto-vent or Air Admittance Valve 1.5"
- (9) 1- Barbed 1" Female Hose Thread Adaptor
- (10) 1- Barbed 1" Adapter (BxS)
- (11) 1- Barbed 1" Tee
- (12) 6- Barbed 1" x 1/2" Reducing Tee
- (13) 10 ft- Poly 1/2" Tubing
- (14) 50 ft- Poly 1" Tubing
- (15) 8- 7" round valve box
- (16) 2- Green Back Valve Barbed 1/2"
- (17) 1- Barbed 1" Coupling

Included in kit but not shown:  
20- U-shaped wire hold-downs (stakes)  
1- PVC Cement - Gorilla 4 ounce  
1- Teflon tape 1/2"

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



In the laundry to landscape greywater system, the hose leaving the washing machine is attached to a 3-way valve to divert the greywater to the landscape or to the sewer. The laundry pump sends greywater to valve box outlets in the landscape where adjacent plants are watered. This system is low cost, easy to install, and gives great flexibility for irrigation. In most situations this is the number one place to start when choosing a greywater system! Read more here.

Additional items needed:

- PVC pipe 1" - variable length
- Silkiflex adhesive sealant for sealing hole in wall
- Holesaw for 1" pipe
- Metal or plastic strap to secure PVC pipe
- Screws for strap
- Mulch

Drawing not to scale. This is a conceptual drawing only and not to be used for construction

  
**clean water components**  
YOUR SOURCE FOR WATER-WISE SUPPLIES

# What soaps to use?

Not all biodegradable products  
are good for plants. . .

. . .think biocompatible!

# Ingredients to avoid

Read the labels

- Salt, sodium compounds  
damages soil
- Boron, borax (Bon Ami)  
micronutrient turns into a microtoxin
- Chlorine  
kills bacteria/life (hydrogen peroxide better)

# Use these laundry products

- Oasis
- ECOS (available at Costco and Whole Foods)
- Bio pac liquid detergent
- Wonder balls or Soap nuts



- **No** powdered detergents, salt, borax, bleach, water softener

# Shower and sink products

- Aubrey Organics shampoo and conditioner
  - Dr. Bronner's
  - Trader Joe's Tea Tree Tingle
  - Oasis all purpose cleaner
- 
- **No** bleach, hair dye, harsh cleaners, salt baths, epon salts



# Cleaning products

- Vinegar based cleaners
- Liquid soap based cleaners
- Dr. Bronner's
- Dish It Out (Whole Foods)
- **No** high salt products, bleach, harsh cleaners



# Graywater references

- *Create an Oasis with Greywater* by Art Ludwig  
<http://oasisdesign.net>
- Greywater Guerrillas, authors of *Dam Nation*  
[www.greywateraction.org](http://www.greywateraction.org)
- Complete graywater system: Rewater, Inc.  
[www.rewater.com](http://www.rewater.com)
- Many slides courtesy of Sherri Osaka  
of Sustainable Landscape Designs  
and Laura Allen of Greywater Action

# Rainwater Resources

- *Rainwater Harvesting for Drylands and Beyond*  
Author: Brad Lancaster
- *Rainwater Harvesting for the Mechanically Challenged*  
Author: Richard Heinichen
- Greywater Action in Oakland -[www.greywateraction.org](http://www.greywateraction.org)
- [www.whollyH2O.org](http://www.whollyH2O.org)
- Bobby Markowitz, EarthCraft Landscape Design  
[www.earthcraftdesign.com](http://www.earthcraftdesign.com)
- John Russell, Water Sprout    [www.watersprout.org](http://www.watersprout.org)



The End. Thanks for coming!