El Dorado County Master Gardeners Present

Towards Sustainable Gardening: Rainwater Harvesting and Greywater Use

March 22, 2014

Alice Cantelow

HEALTHY ENVIRON

University of California
Agriculture and Natural Resources
California Master Gardener
Cooperative Extension
El Dorado County

Making a Difference for California

Alternate Water Sources for our Gardens-

- Rain
- Greywater
- Why bother?

The California Water Story

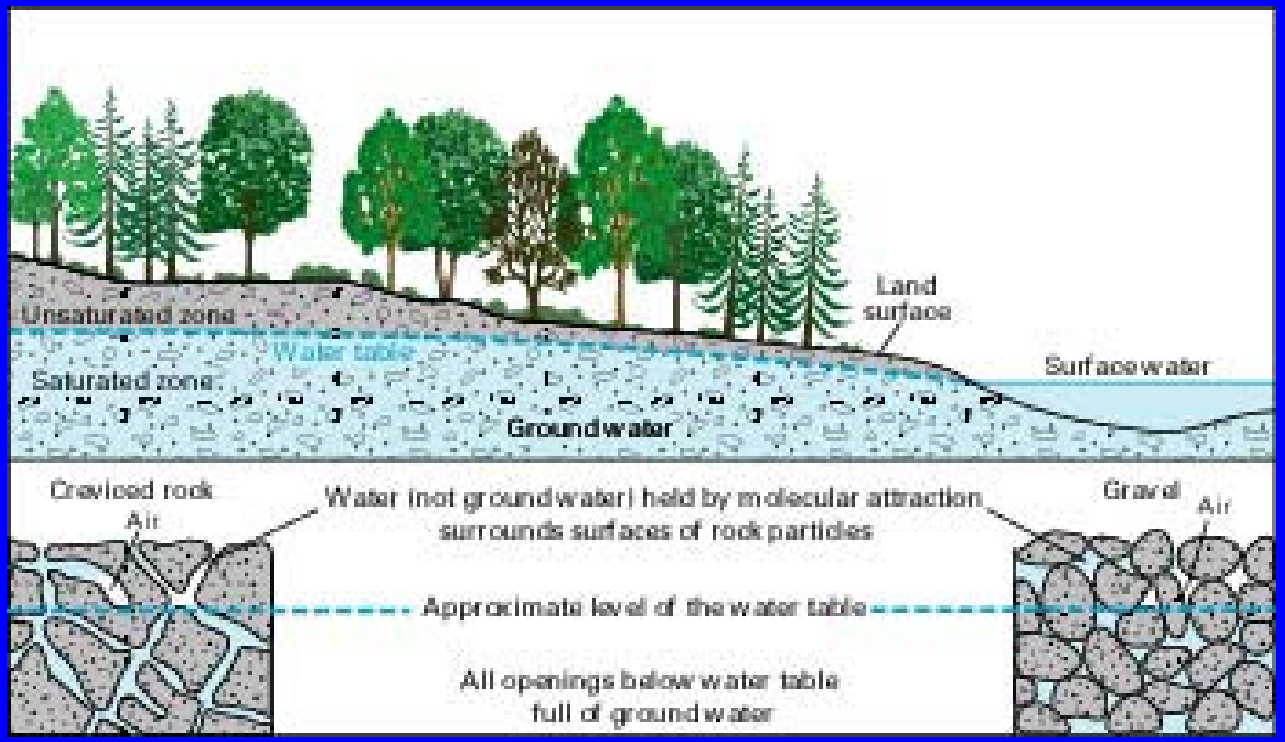
Water Conservation-

Important for all Californians

All the time

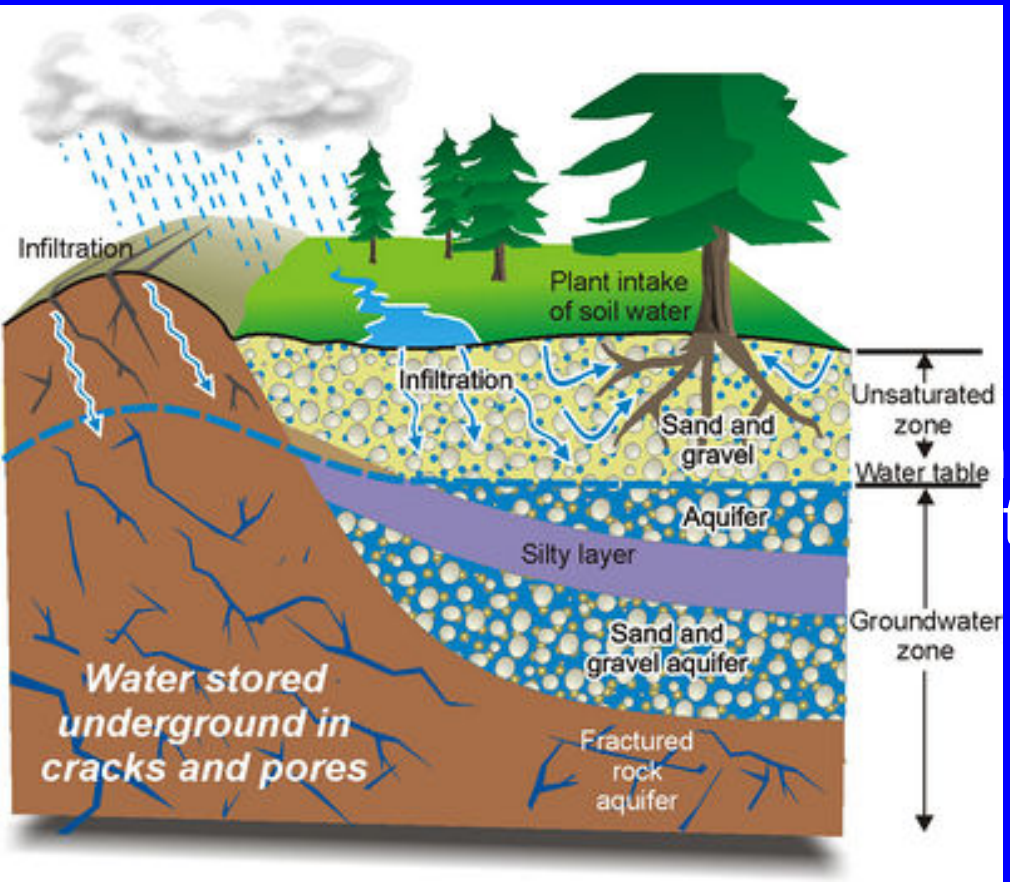
“But I’m on a well …!”

- Groundwater + Surface water-
  - – a connected system that feeds creeks



Sierra foothill groundwater

– stored in cracks- unpredictable, localized, and not well studied

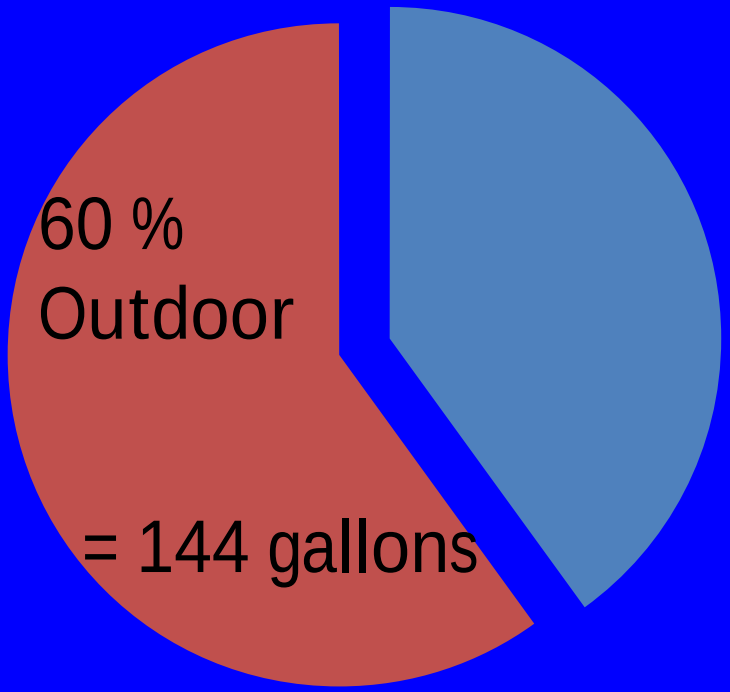


- generally only a few hundred feet deep.

terconditions/docs/water

So, we all need to conserve water

Gardens= A big piece of the pie



On most of West Slope,

water used per day
per person =

240 gallons

Source: EID Feb 2014

Goal: Sustainable Gardens that can handle drought

1. Lower our water demand:
   - Plant selection
   - Garden layout
   - Irrigation methods, timing
   - Mulch

Goal: Sustainable Gardens that can handle drought

1. Lower our water demand:
   - Plant selection
   - Garden layout
   - Irrigation methods, timing
   - Mulch
2. **Alternative water supply-**
   - **Rain**
   - **Greywater**

Rain

Legal to collect/use

New California Plumbing Code

- Rainwater tanks now regulated in California
- Permit not required if
  - Storage < 5,000 gallons
  - Tank directly on grade
  - Height: diameter or width < 2:1
  - Non-spray irrigation
    - » Surface, subsurface, drip

Rain

Water quality:

Good soft water- plants love it

Prevent contamination-

from roof itself

from critters

Rain

Challenges to address:

- Timing of rain (winter) vs need (summer)
- Avoiding contaminants
- Mosquitos/critters- exclude
- Drowning hazard to children
- Algae- keep in shade

Rain

Just how many inches of rain do we get a year?

Annual Rainfall	Average	Lowest
El Dorado Hills	25	
Placerville	39	15
Camino	45	

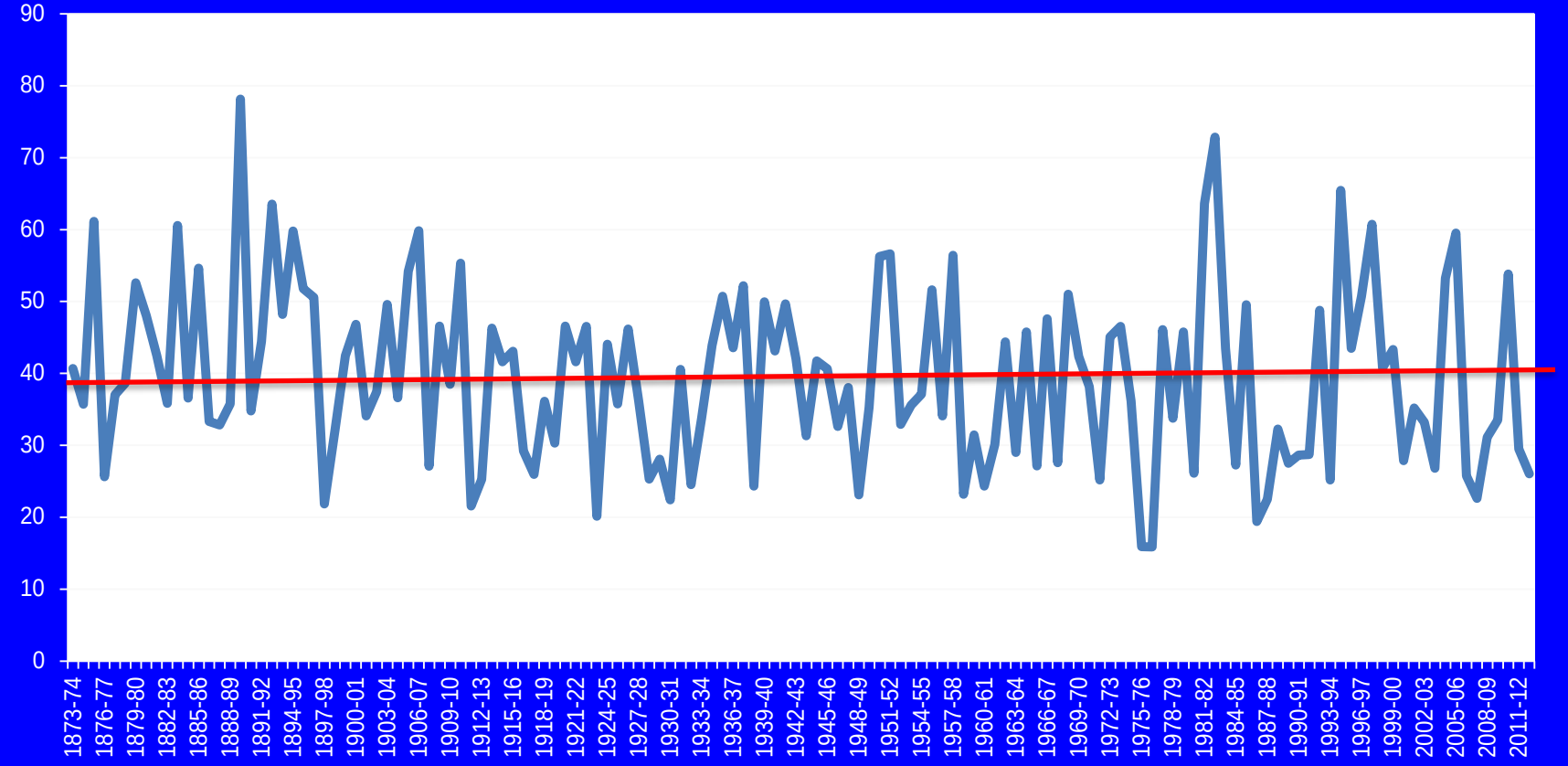
Rain

How much rain can I collect then?

square footage of building	X	inches of rain/12	X	7.48	X	.9	=	Gallons of rain that can be collected each year
ft^2		ft		convert cu. Ft. to gallons		efficiency factor		

120 ft^2 x 39/12 x 7.48 X .9 = 2,625 gallons

Behind the Averages



It may make more sense to focus on lows...

Rain

What size shed would be needed for lowest rainfall years?

square footage of building	X	inches of rain/12	X	7.48	X	.9	=	Gallons of rain that can be collected each year
ft^2		ft		convert cu. Ft. to gallons		efficiency factor		

300 ft^2	x	15/12	x	7.48	X	.9	=	2, 525 gallons

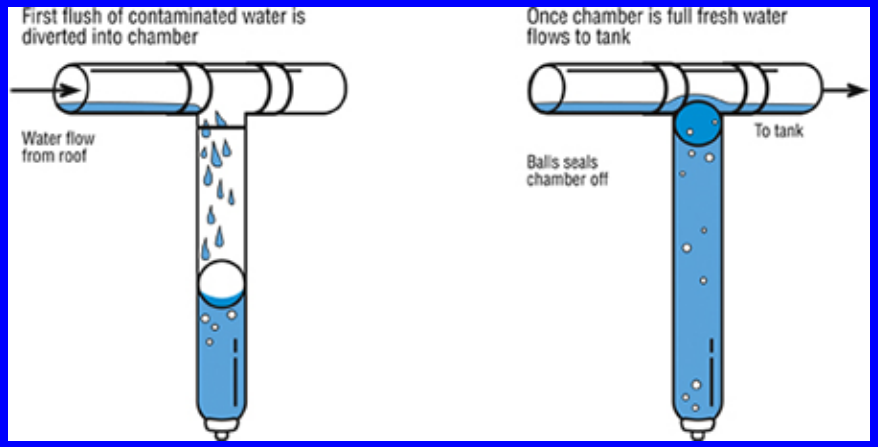
Rain System parts

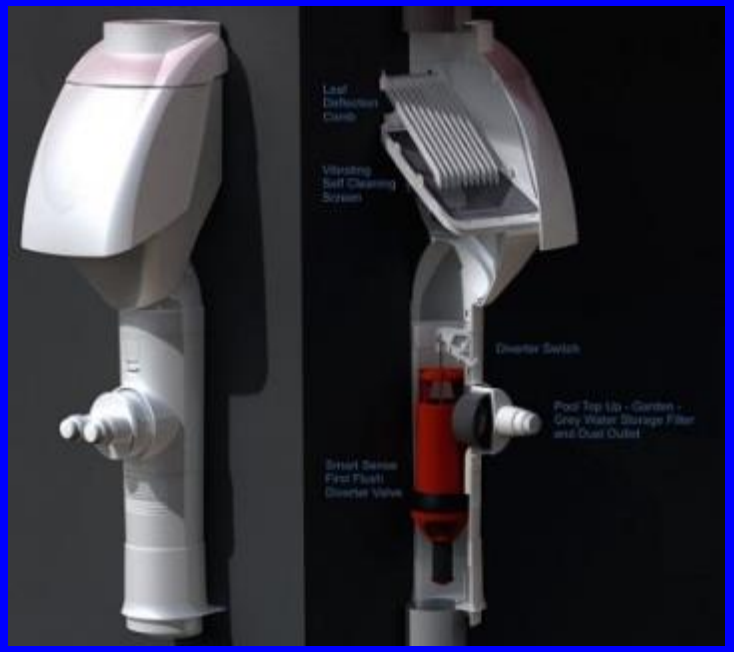
- Screening of roof:
  - big debris

A homemade first flush diverter

Rain System parts

- First flush diverter is nice





Rain System parts

- Overflow –
  - Size it big enough

Rain System parts

- Mosquito/critter/child protection

Rain System parts

- Way to get water out- spigot is nice

Rain System parts

Way to clean barrel- every two to three years

Rain System parts

- “Do not drink” signage

Rain Some rainwater systems

Surge tanks

Rain Large tanks

Rain Multiple barrels connected

Rain

Mosquitos

- Carry diseases-
  West Nile Virus

pupae

larvae

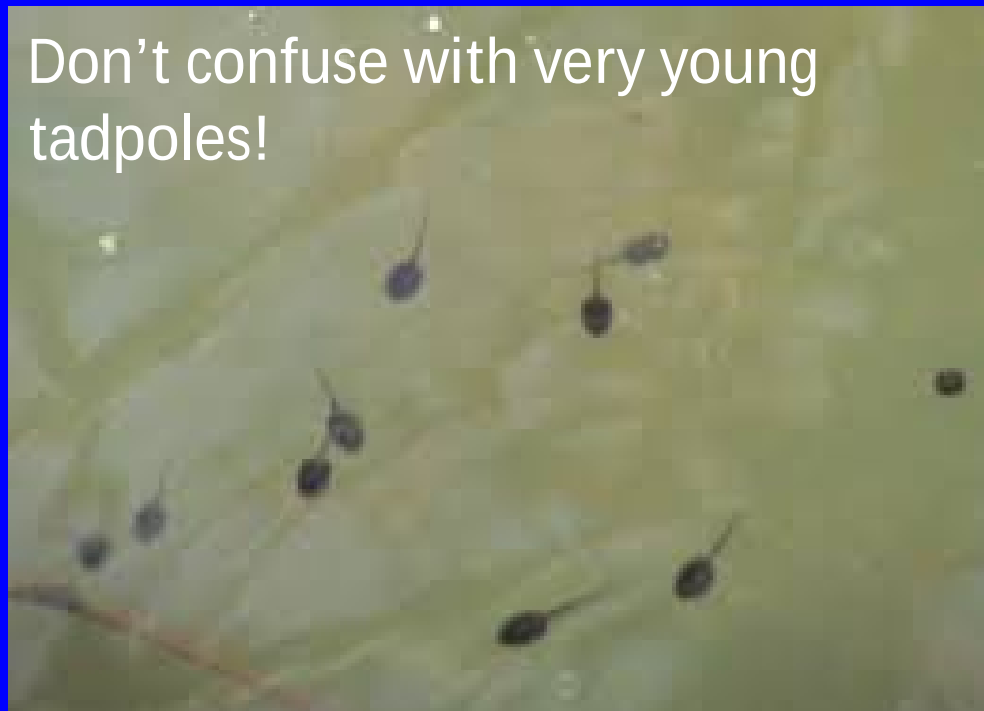
emerging adult

Mosquitos

- Carry diseases-
  West Nile Virus

pupae

larvae



Rain

A Different Approach- Store rainwater in the soil

- Rain gardens

- Earthwork diversions and basins

Rain Gardens

Rain

- “Sunken” into ground
- Low water use plants
- Seasonally inundated
- Onsite stormwater

Rain Gardens

- Must plan for overflow
- Water should not stand > 24 hours
- Do not site in naturally wet area

Rain

EID Rain Garden

Rain Elk Grove Rain Garden

Rain

Advantages of Rain Gardens

- Inexpensive
- Accumulate resources like leaves along with the water
- Reduce runoff

Rain Expanding: Earthworks

- Typical garden-
  - Sunken paths
  - Raised mounds

Rain

What if instead, we raise the paths?

Rain

Raised paths, “sunken” gardens

Rain

Trying it out in Diamond Springs

Rain

Earthworks

- Build berms/basins, trenches, canals
- Divert rain water to plants
- Slow water for better infiltration

Tools Needed

Rain

- Careful observation
- Creativity
- Shovel

Rain

Orchard berms

Rain

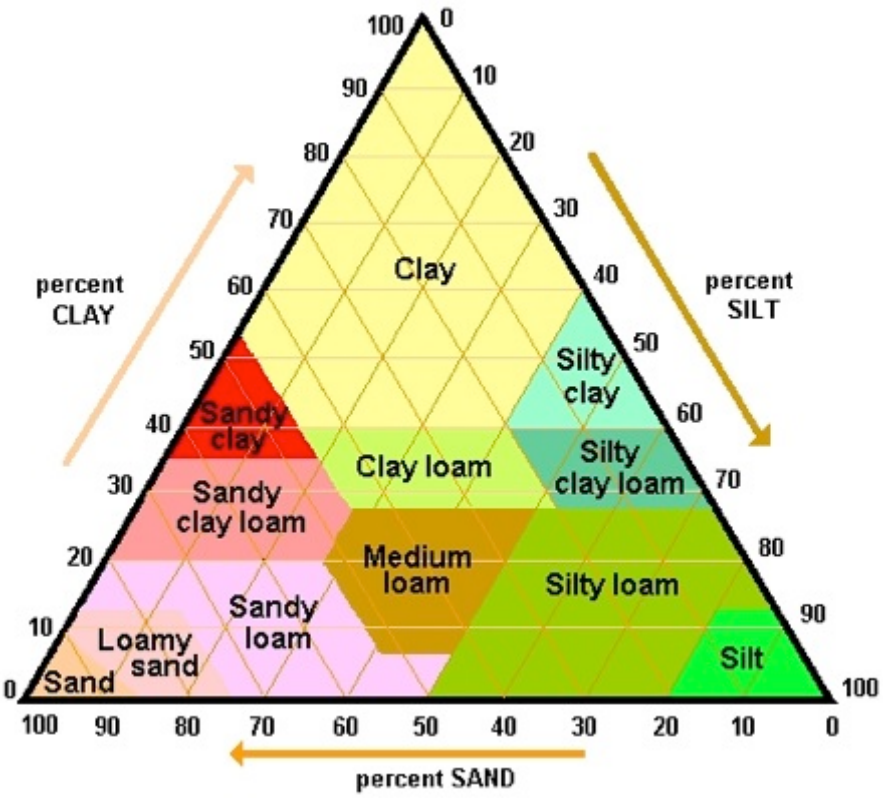
Water diversion “canals”

Rain

What about oil from driveways?

Bioswales

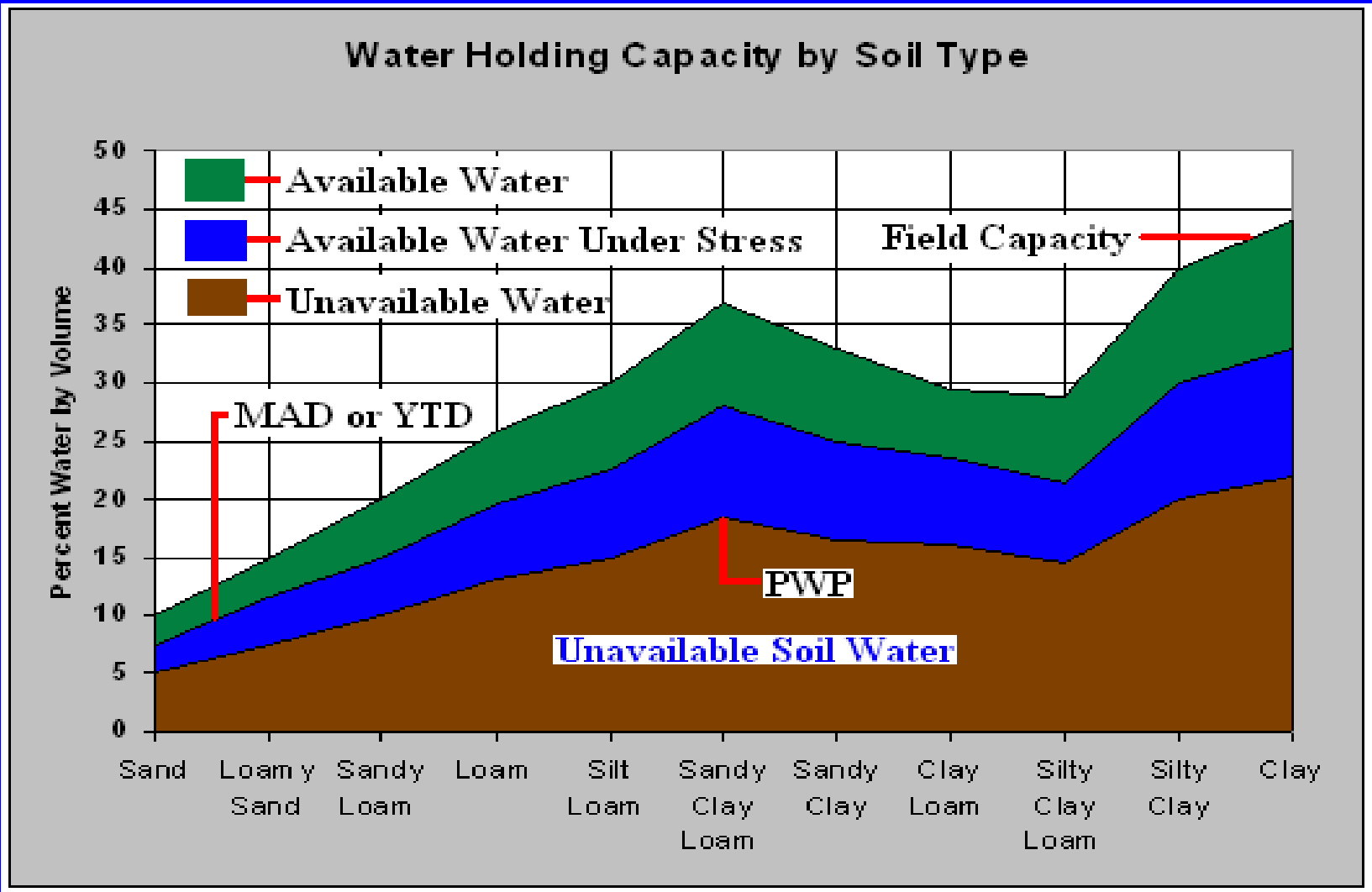
Rain Soil Intake of Water



Basic Intake Rates for Bare Soils*	
Sand	0.6
Loamy Sand	0.5
Sandy Loam	0.4
Loam	0.35
Clay Loam	0.2
Silty Clay	0.15
Clay	0.1
* Units are inches per hour	

Source: EID website

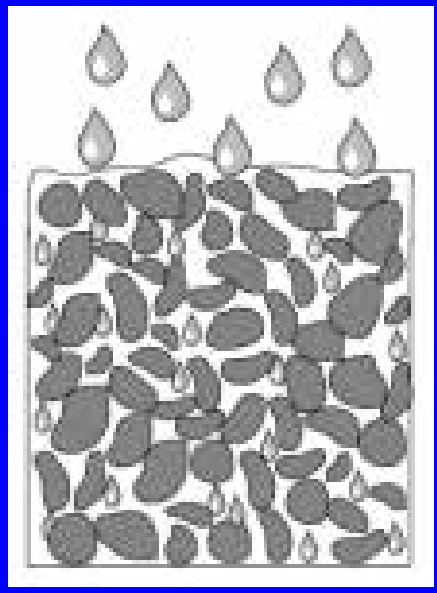
Rain Water in Soils



Source: EID website

Rain Earthworks increase infiltration

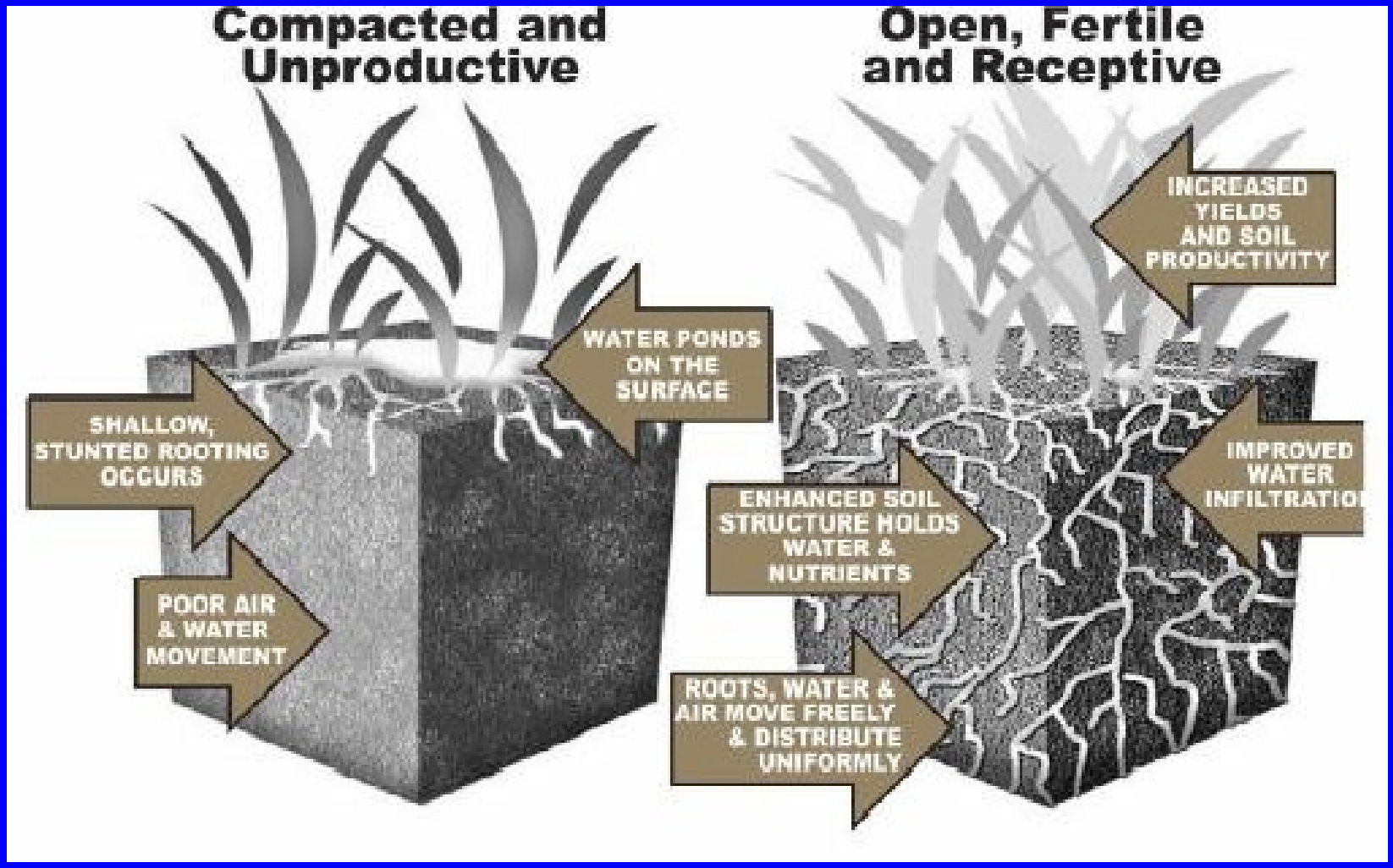
Act as porous sponges-
water is pulled into soil quickly



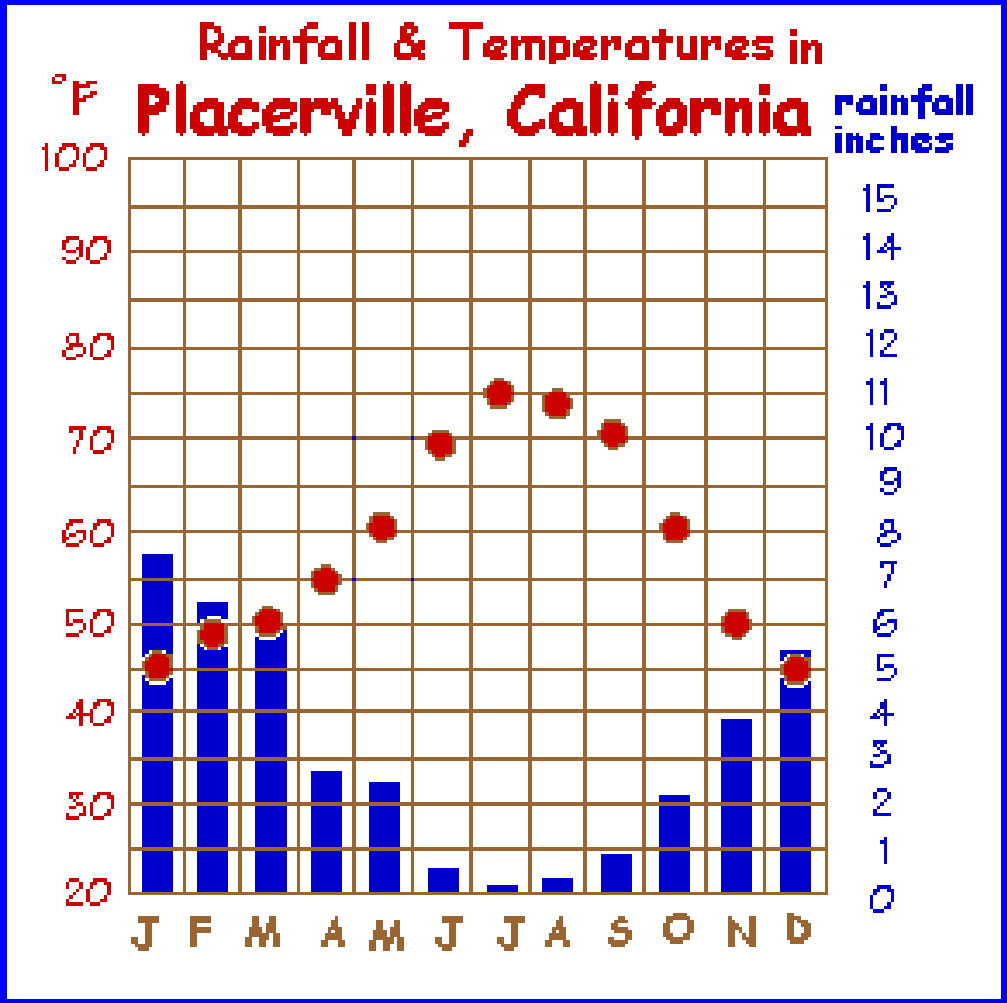
Helping them act as sponges:
* Mulches
* Vegetation-
roots make microchannels
facilitates other soil life that improves infiltration

Rain

Soil infiltration



Challenge: Our hot, dry summers

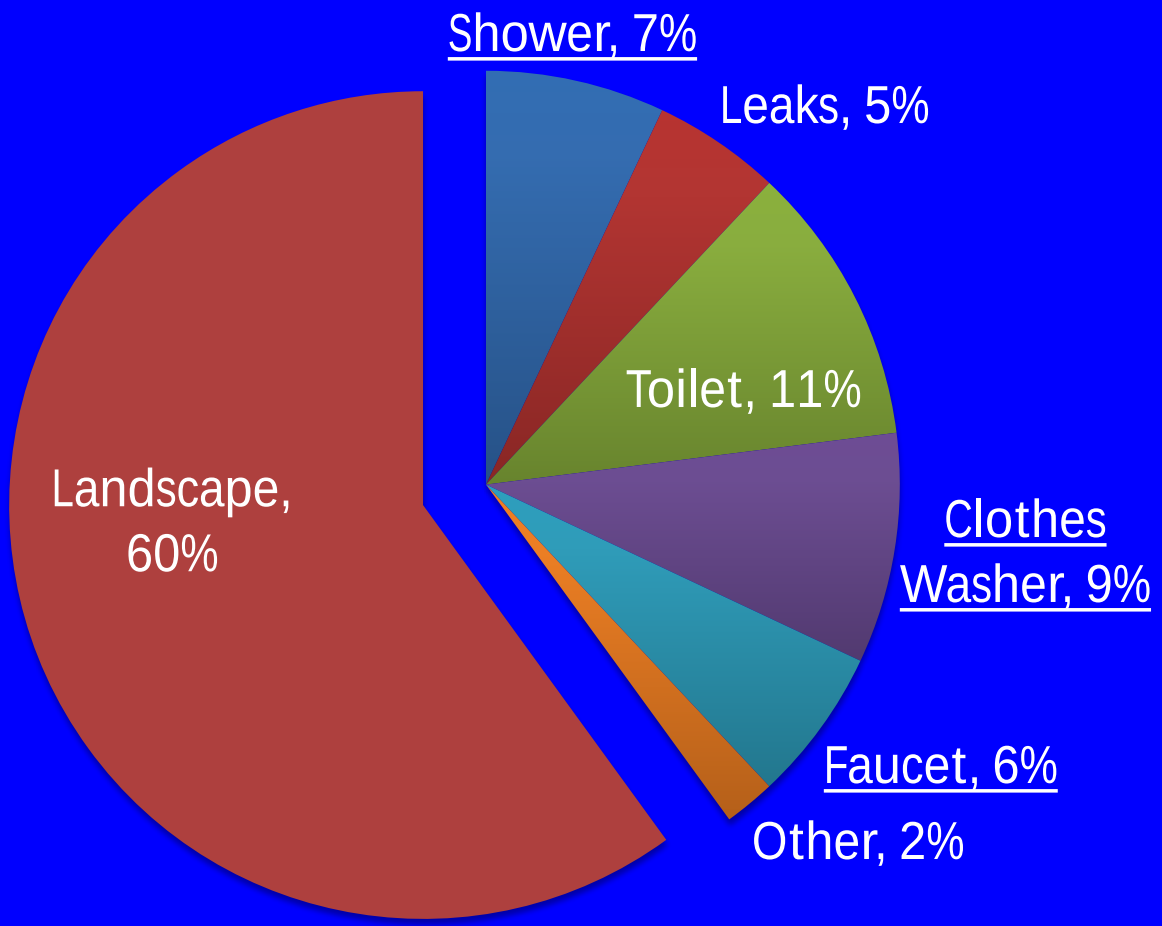


http://www.backyardnature.net/sierras/wx-place.gif

Greywater

Enter: Greywater

Continued supply in dry hot season-



Greywater

What it is (and isn't)

Legality of using it

What's in it

Where to use it

How to use it

Definitions

Potable Water- safe to drink

Nonpotable water-

- Greywater- wastewater from clothes washers, showers/baths, bathroom faucets

- Blackwater- wastewater from toilets, kitchen sinks, dishwashers, anything contaminated like diapers

Greywater A long history of use- and also a history of being illegal to use

Regulations vary state to state,
- And even year to year

Became more widely legal in 2009 in California

On January 1, 2014, became much more regulated:
New California Plumbing Code of 2013

Be careful what you read online or hear locally!

Greywater

History of Use

In Calif: used in 1970's, early 1990's, since 2009

Also used- Australia
Arizona,
New Mexico
Texas

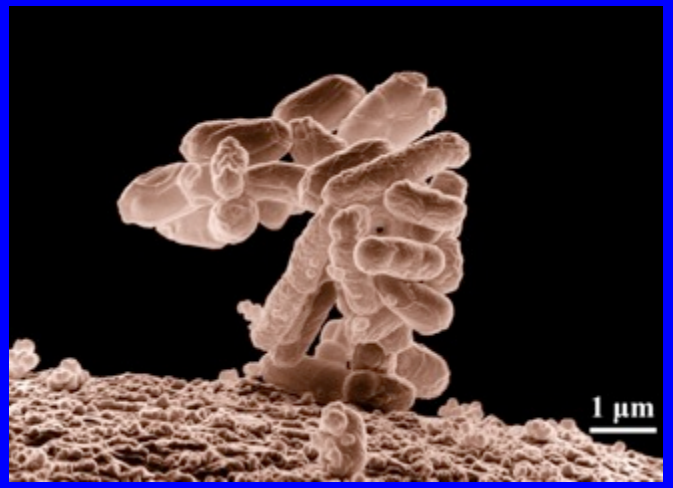
Greywater Intro to current CA law:

Intent is to facilitate : “greater reuse of laundry, shower, lavatory and similar sources of discharge for irrigation and/or indoor use.”

Careful though...

Greywater can have pathogens-

- E. coli,
- salmonella,
- giardia,
- etc.-



Prevent all direct human contact

Chemicals in Greywater

- Good:

  Phosphorus

- Bad:

  Chlorine bleach

  Boron

  Sodium/ salts-

  * toxic
  * interferes with ability to take up water

Soaps:

- want biocompatible, not just biodegradable
  - No bleach
  - No boron
  - No sodium, salts
  - Or: Use less soap

<u>Some safe laundry detergents:</u>

ECOS, Trader Joe's, Vasca, Dr. Bonner's…

Look for "safe for greywater" label

Prevent Salt Built Up in Soil

1. Divert greywater to sewer during rainy season
2. Let the rain leach salts out
3. Enhance leaching of salts by diverting extra rain (e.g., earthworks)
4. Use low sodium soaps only

Where to Use

Greywater

Don’t use:

lawns

root crops

where edible plant parts touch ground

To be safe, UCCE recommends only ornamentals

Greywater

Where to Use

But not on acid loving plants:

Azaleas
Camelia
Gardenia
Rhododendron
Begonia
Hydrangea
Fern
Philodendron
Xylosma
Bleeding Heart
Foxglove
Impatiens
Primrose
Violet

How to Use Greywater

Best use:

trees and shrubs

Best way to deliver:

under at least 2” of mulch

Greywater

Why under mulch?

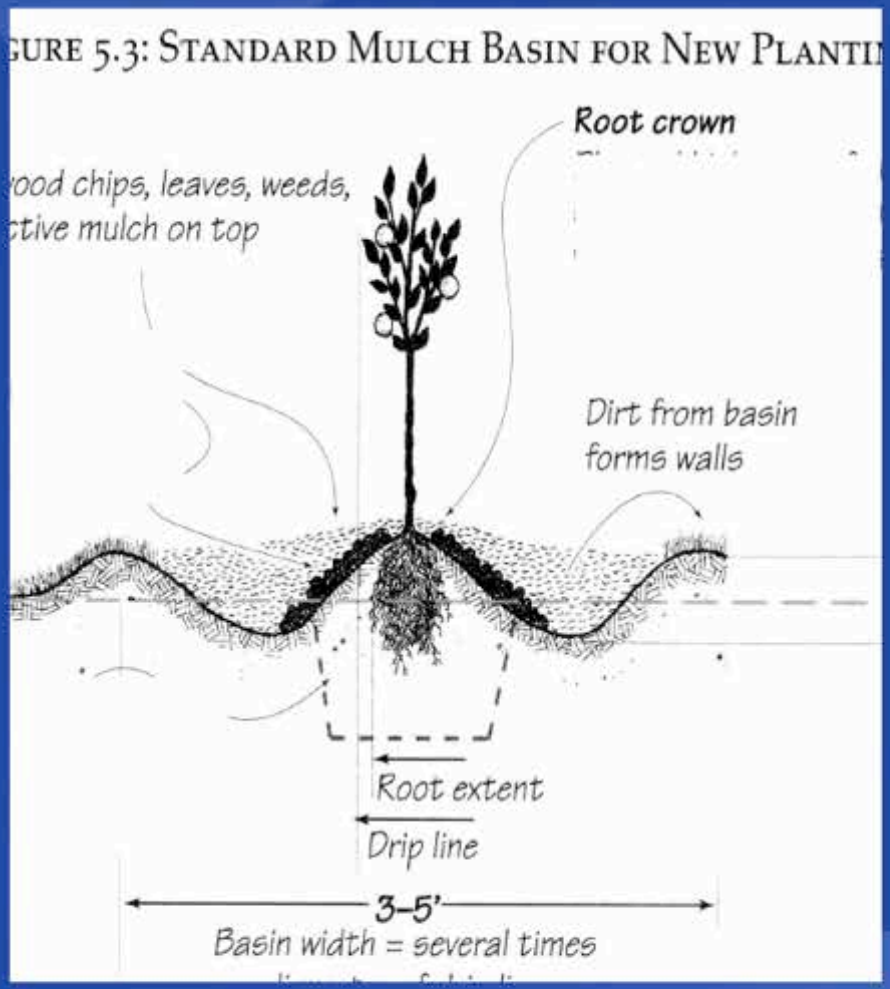
Soil is alive!

One teaspoon =
One billion living microbes!

Mulch: air, organic material = good home for the rich soil biology to break down hair, lint, etc.

Mulch = mini-treatment plant for greywater

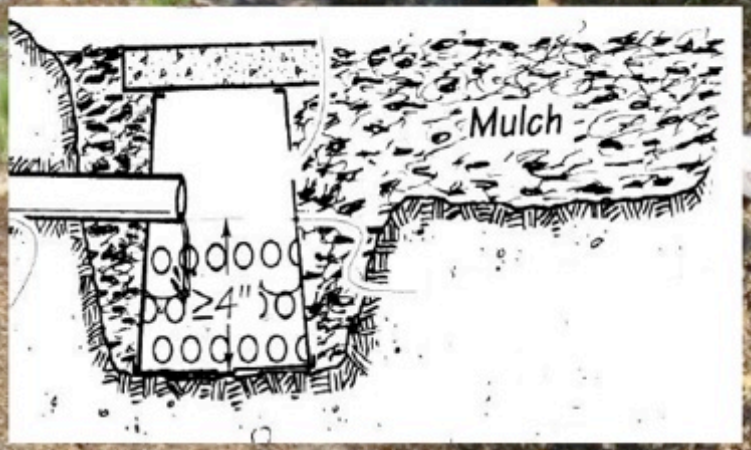
Mulch basin



Slide from Laura Allen, www.greywateraction.org
Image from "Create an Oasis with Greywater" by Art Ludwig

About mulch

- Add to top of ground- don’t mix in
- Keep several inches away from trunks of trees
- For greywater mulch basins, **large wood chips are best**- also small wood chips, bark, even gravel



Greywater outlet, irrigates drip line of tree.
Mulch basin will be filled to top when complete.

Image from Create an Oasis with Greywater

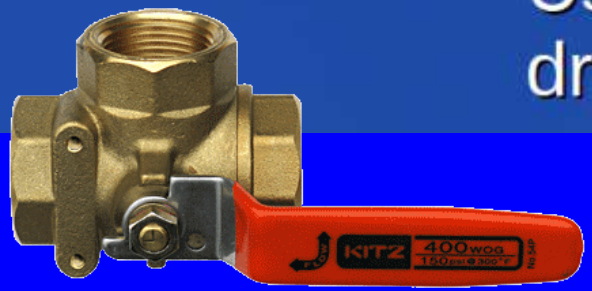
Greywater Basics Outdoors

Do's

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

Don'ts

- 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



Slide from Laura Allen, www.greywateraction.org

Greywater

County Bldg Permits

Not needed: Laundry-to-landscape

Yes: All other greywater systems

A small and simple start...

Mistakes:

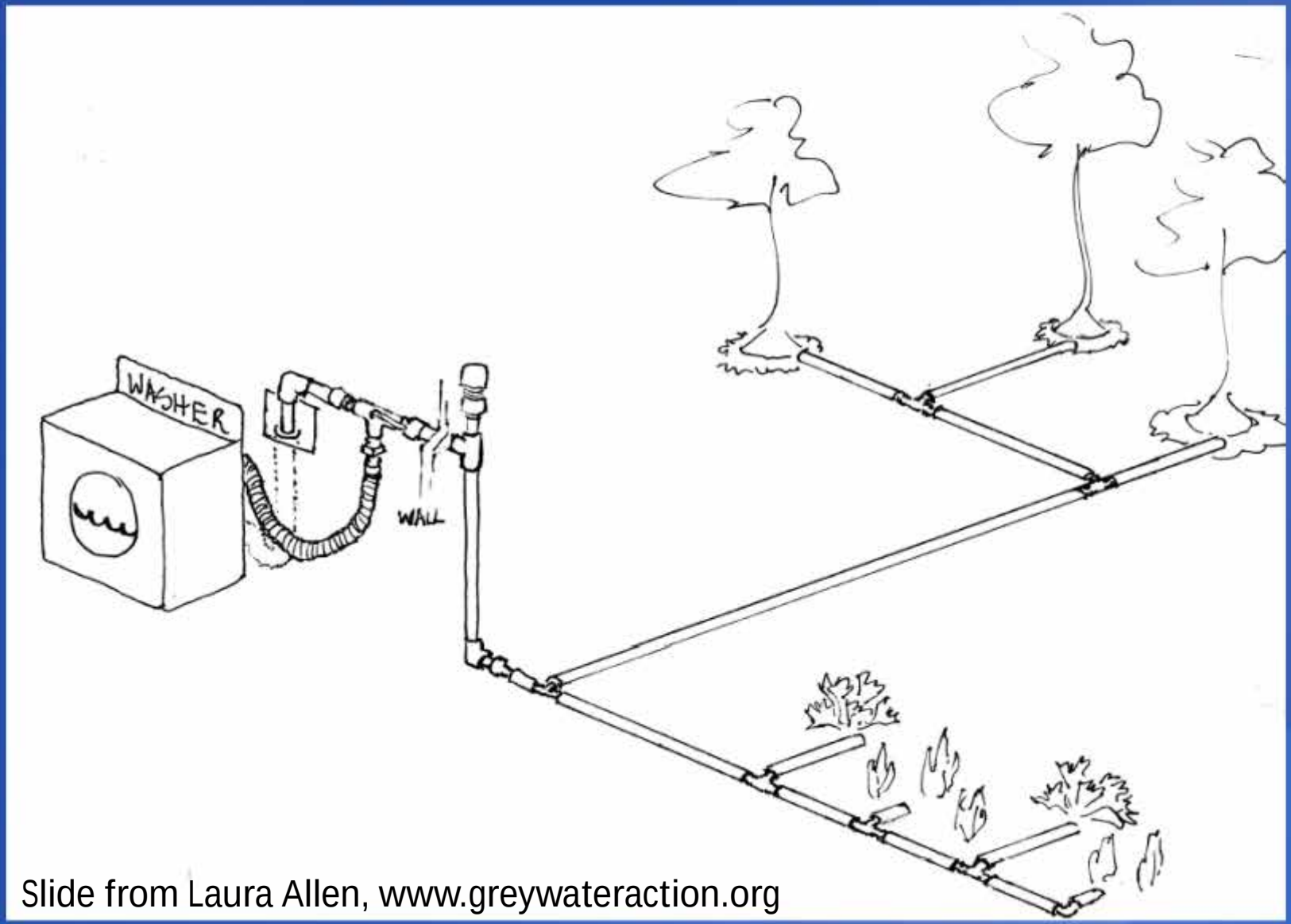
Hoses too small for outlet

Connection was too low and machine siphoned water out

Have to protect machine from weather

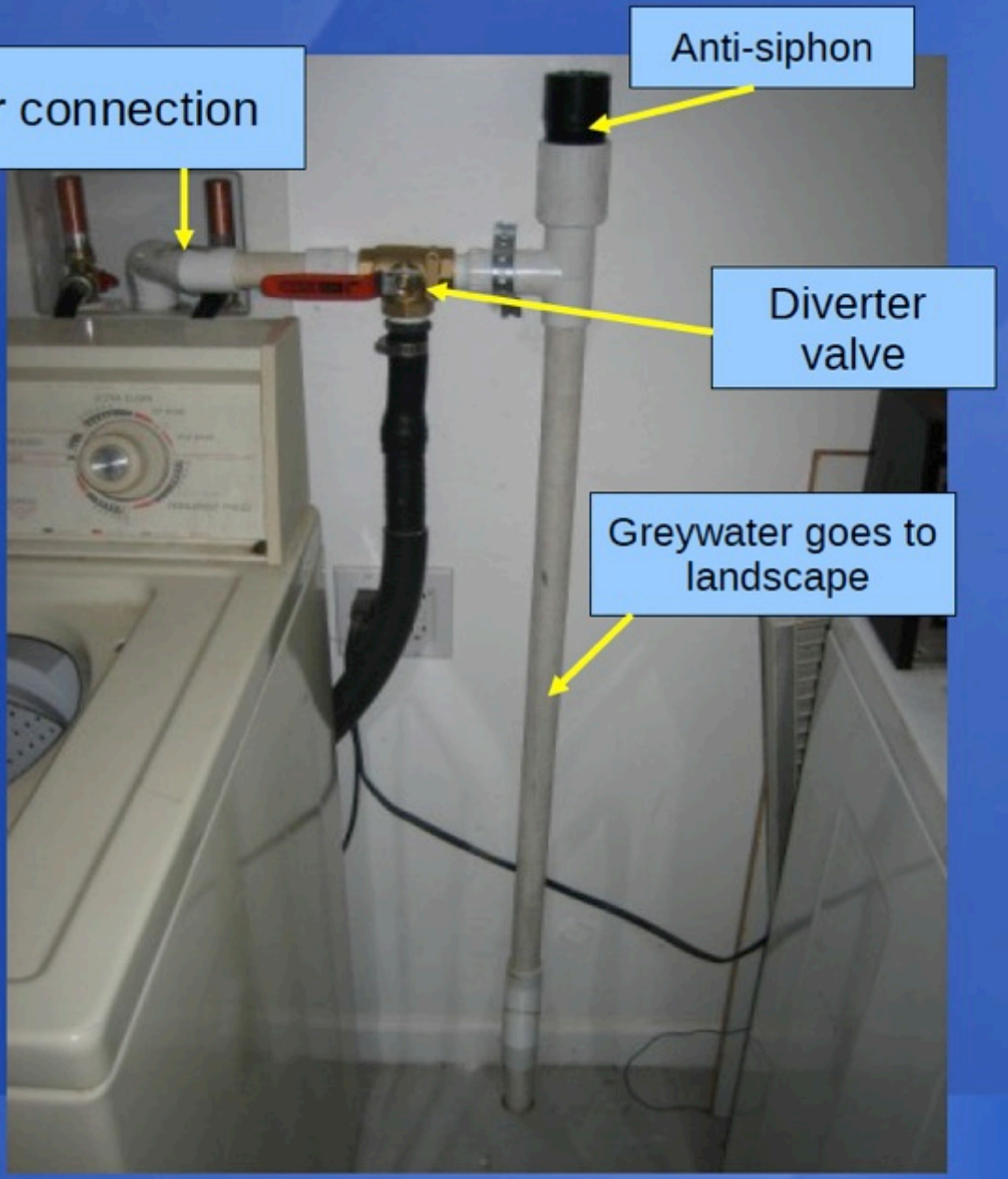
Laundry to landscape- permit exempt system

(Materials only: $100-$250 Full installation:$700-$2000)



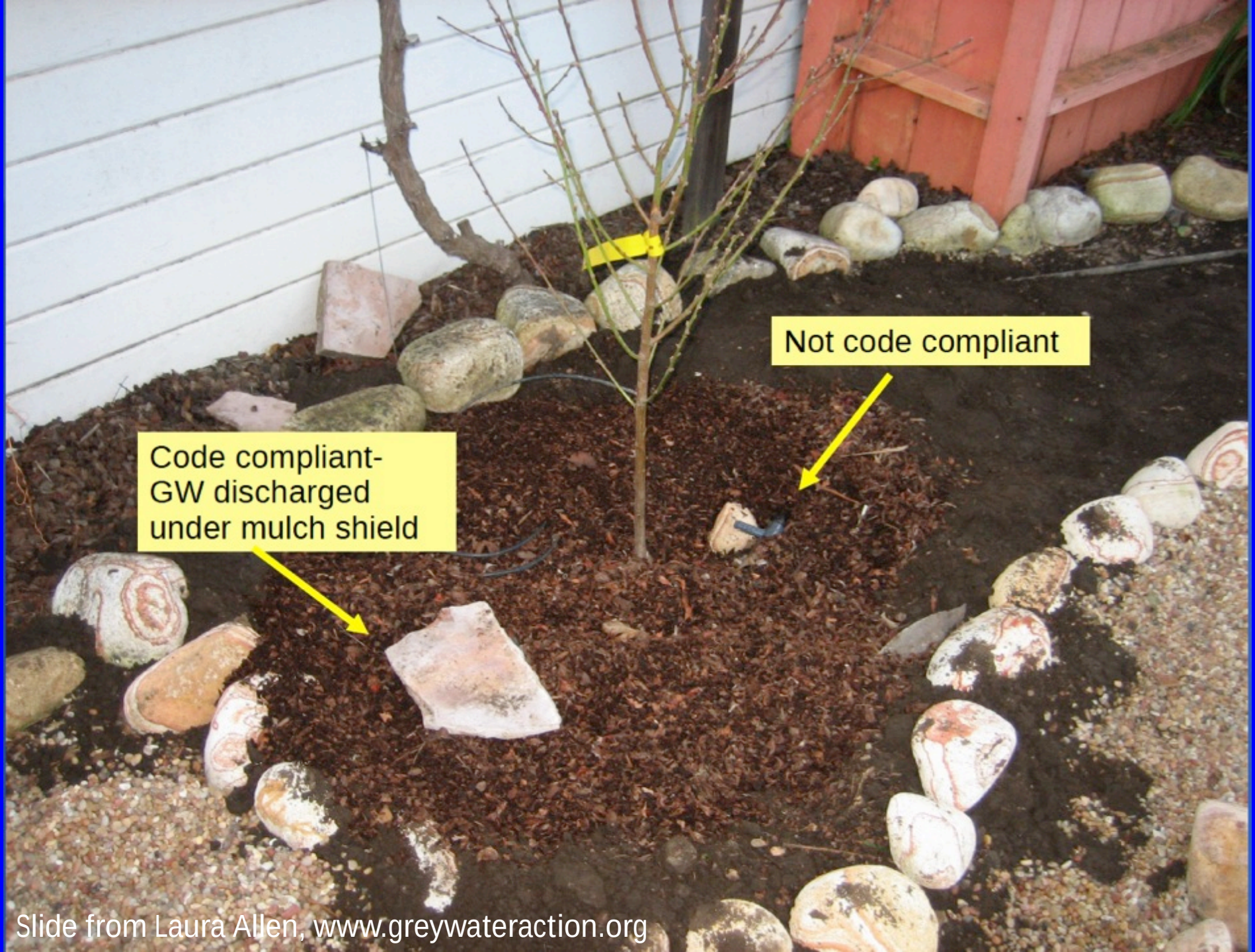
Slide from Laura Allen, www.greywateraction.org

- 3-way diverter valve
- "auto" vent (prevents a siphon from draining machine as it tries to fill)
- 1" pipe



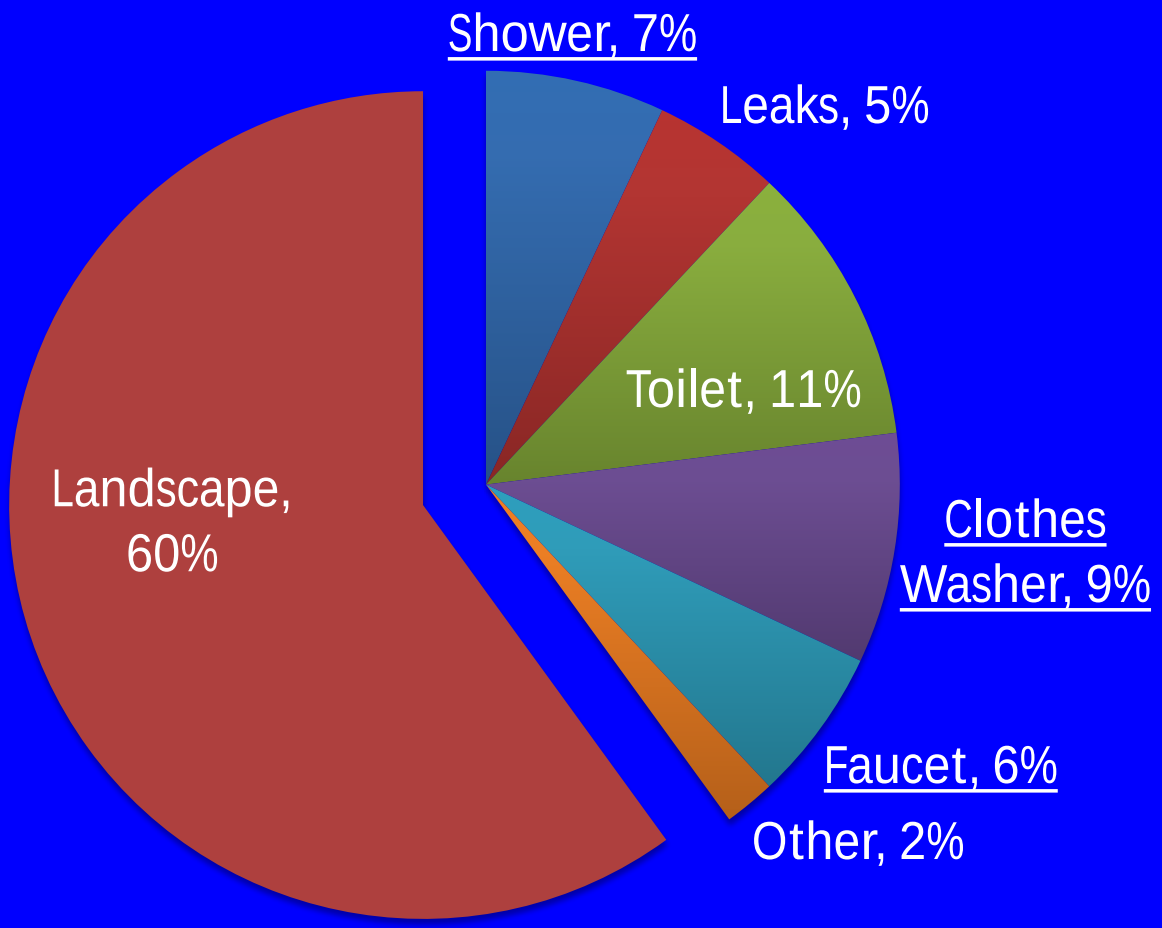
Slide from Laura Allen, www.greywateraction.org

Slide from Laura Allen, www.greywateraction.org



Slide from Laura Allen, www.greywateraction.org

Greywater


Shower, 7%
Leaks, 5%
Toilet, 11%
Clothes Washer, 9%
Faucet, 6%
Other, 2%
Landscape, 60%

Shower and Sink Systems

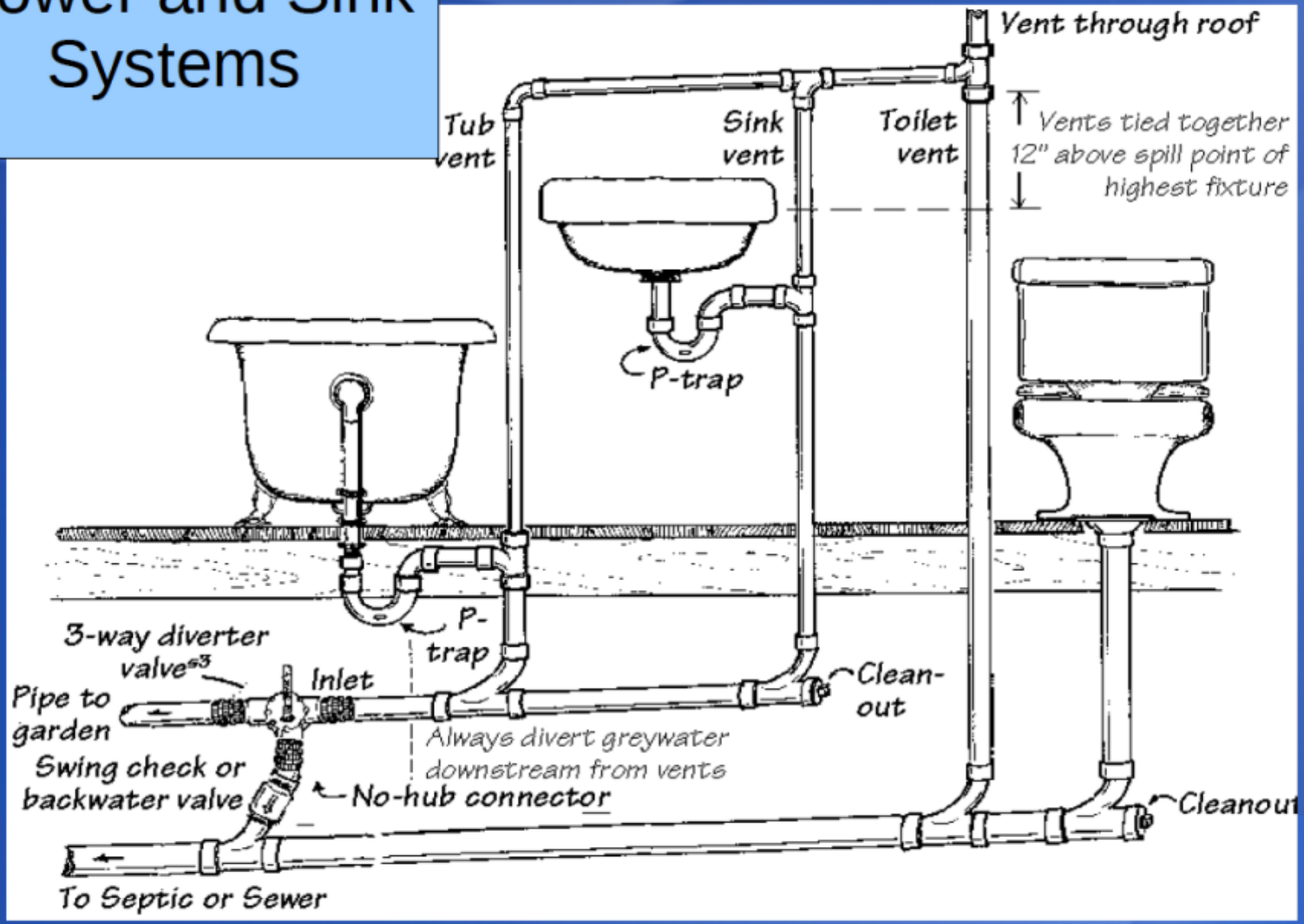


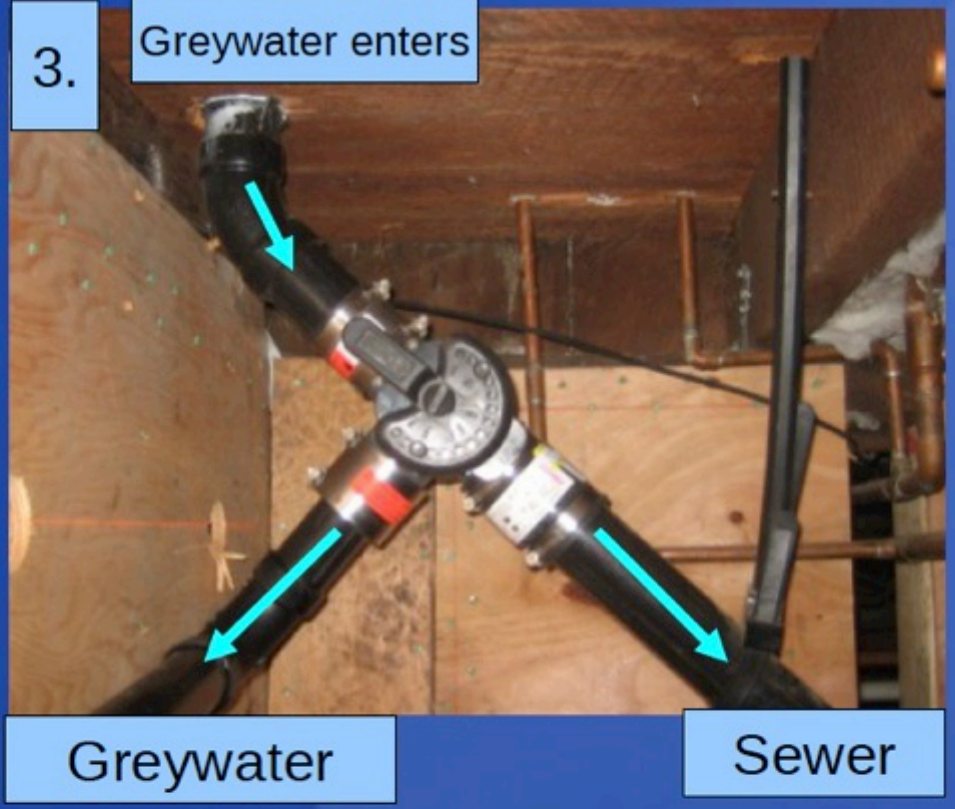
Image from "Create an Oasis with Greywater" by Art Ludwig

Installing a 3-way valve
(requires a permit)

1.

2.

3.



Slide from Laura Allen, www.greywateraction.org

Remote 3 way diverter valve

Diverts greywater to sewer

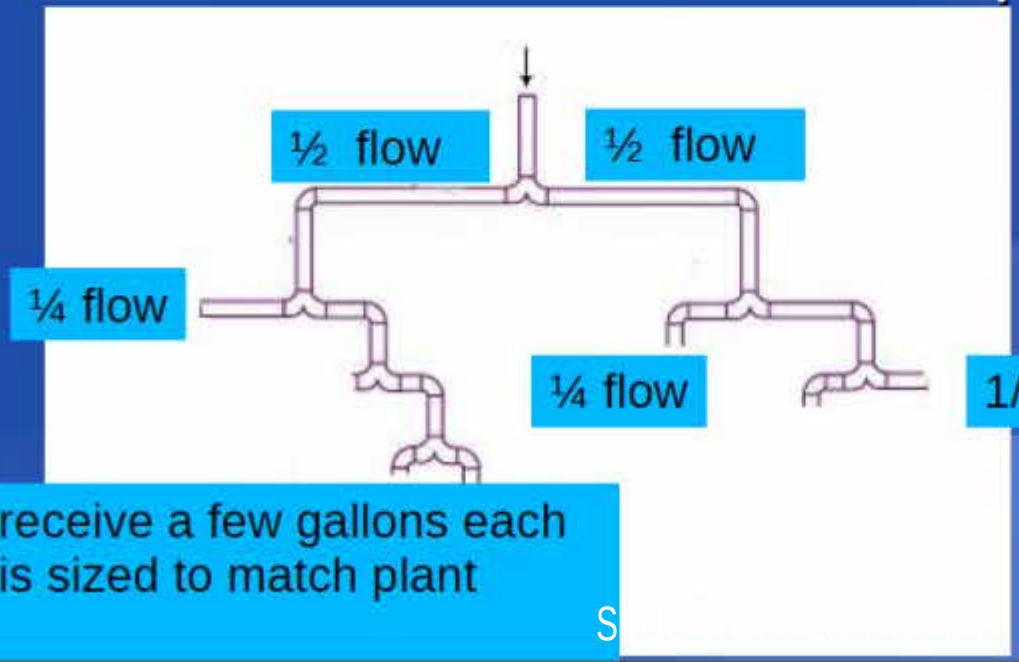
Comes in different sizes

Branched Drain System-

$150-300 materials only, $1,000-3,000 complete installation

- Flows by gravity

- No moving parts
- No external filters
- Flow is divided using flow splitters



Final outlets receive a few gallons each use- system is sized to match plant needs.

Slide from Laura Allen, www.greywateraction.org

Branched drain- one shower

subsurface, gravity, no storage

Newly planted trees and shrubs- 2 weeks after greywater install and planting

Laura Allen, www.greywateraction.org

Can be simplified- move the shower outdoors….

Or Simplest of all…

Common errors

- storage tank
- pump zealous
- filters that need changing

"I'm going to pump my greywater to the top of my property and store it in two 500 gallon tanks, then gravity flow it down the hill to irrigate through a soaker hose"

"I put a 80 gallon tank in my laundry room that collects the laundry water. Then I pump it outside into a sprinkler to water the lawn. At first the sprinkler clogged, so I added a sock filter to the inflow of the tank."

Laura Allen, www.greywateraction.org

Greywater is a Resource

Saves water

Saves energy

Saves water/energy/chemicals at treatment plant

Encourages healthy product use

Connects people to their yards

Protects rivers

Redefines our relationship to water

Creates green jobs


We are in a drought
Water is a limited resource even in good years

We’re not the only ones that need water

Treat Water Resources with Care

Don’t forget:

plant selection, garden design, and irrigation methods

* Rainwater and greywater can save water and lead to more sustainable gardens

* Be creative and thoughtful-

Find what works in your unique yard

Thank you

Laura Allen, Greywater Action

Art Ludwig, Create an Oasis with greywater, 2009

Brad Lancaster, Rainwater Harvesting for Drylands and Beyond, 2009

UCCE greywater fact sheet, https://ucanr.edu/mg/users/Documents/5758Dealing%5Fwith%5FDrought50709.pdf

Full text of new Calif. Plumbing Code (see ch 16, 17 especially) https://law.resource.org/pub/us/code/bsc.ca.gov/gov.ca.bsc.ca.gov.bsc.2013.05.pdf

San Francisco Greywater Design Manual for Outdoor Irrigation http://sfwater.org/modules/showdocument.aspx?documentid=55