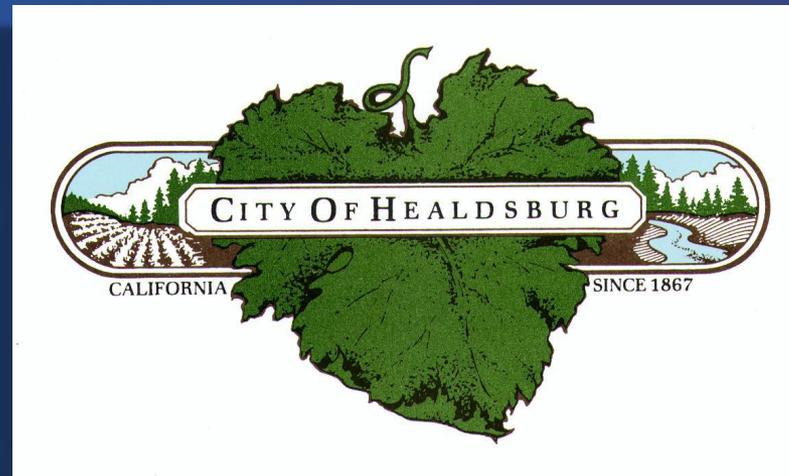


Welcome to Greywater 101





Mission: To transform our communities through inspired action & education which builds leadership and local self reliance.

Inspiration | Education | Application | Transformation



Overview



- What is Greywater?
- Laundry-to-Landscape
- Plant Selection & Landscape Considerations
- Soap Selection and Behavior Change
- Is my Site Suitable?
- Shower-to-Flowers
- Pathways to Greywater Installation
- Questions?

What is Greywater?

As defined by 2009 California Plumbing Code

“.....untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes”

-Chapter 16A California Plumbing Code 1602A.0 Definitions

What is Greywater?

Water from...

- **Laundry Machines**
- **Showers and Bathtubs**
- **Bathroom Sinks**



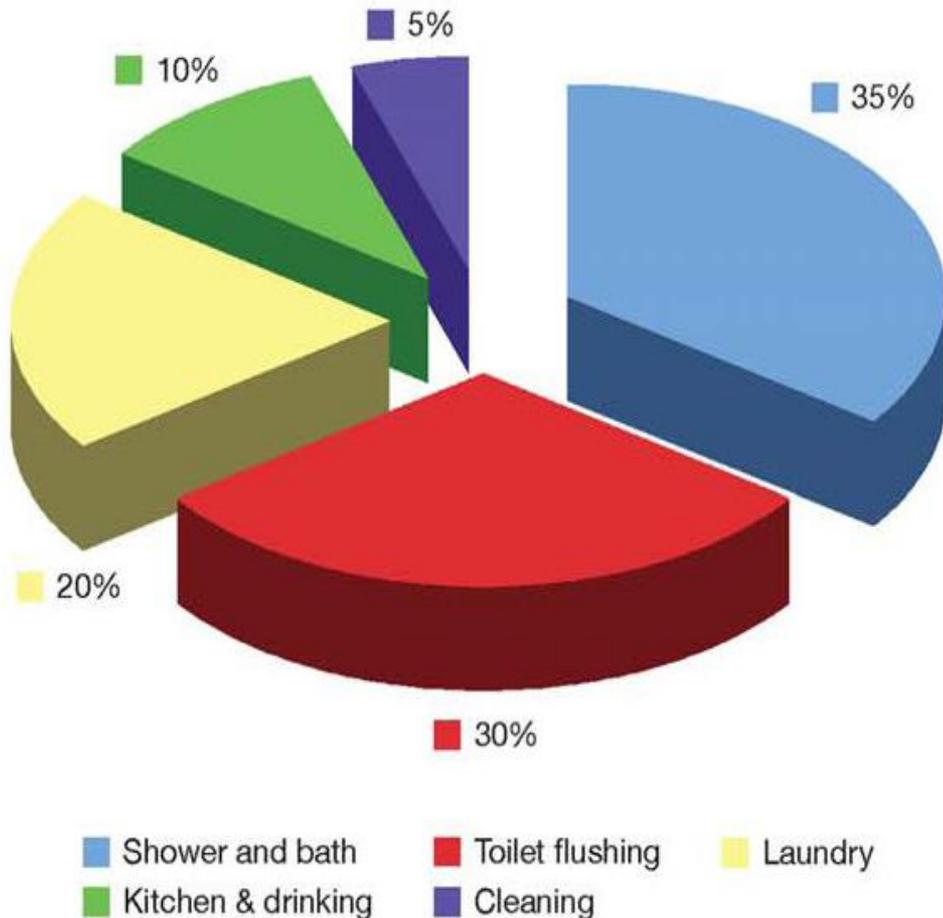
Greywater is not

Water from...

- Toilets
- Kitchen Sinks
- Dishwashers
- Wash water contaminated by dirty diapers or chemicals



How do we use our water?



Estimated Average Household Water Usage

Shower/Bath	35%
Toilet	30%
Laundry	20%
Kitchen/Drinking	10%
Cleaning	5%

Benefits of Irrigating with Greywater

- Saves potable water
- Conserves energy (19% of all energy used in CA is related to water)
- Reduces demand on septic systems and wastewater treatment plants
- Encourages healthy product choices
- Facilitates home-grown food production

CONSERVATION HYDROLOGY:
ADAPTING OUR WATER FOOTPRINT
TOWARDS REGENERATIVE REHYDRATION

CONDENSATION

WATERSHED
AWARENESS
DON'T LIVE WITHOUT IT!

RELEASE

RECEIVE

TRANSPIRATION

EVAPORATION

NOW ENTERING
YOUR
WATERSHED

BIOSWALE

GREYWATER

ROOF
WATER
TANK

RUN IN

RAIN GARDEN

RECHARGE

INFILTRATION

UNDERFLOW

SLOW IT
SPREAD IT
SINK IT

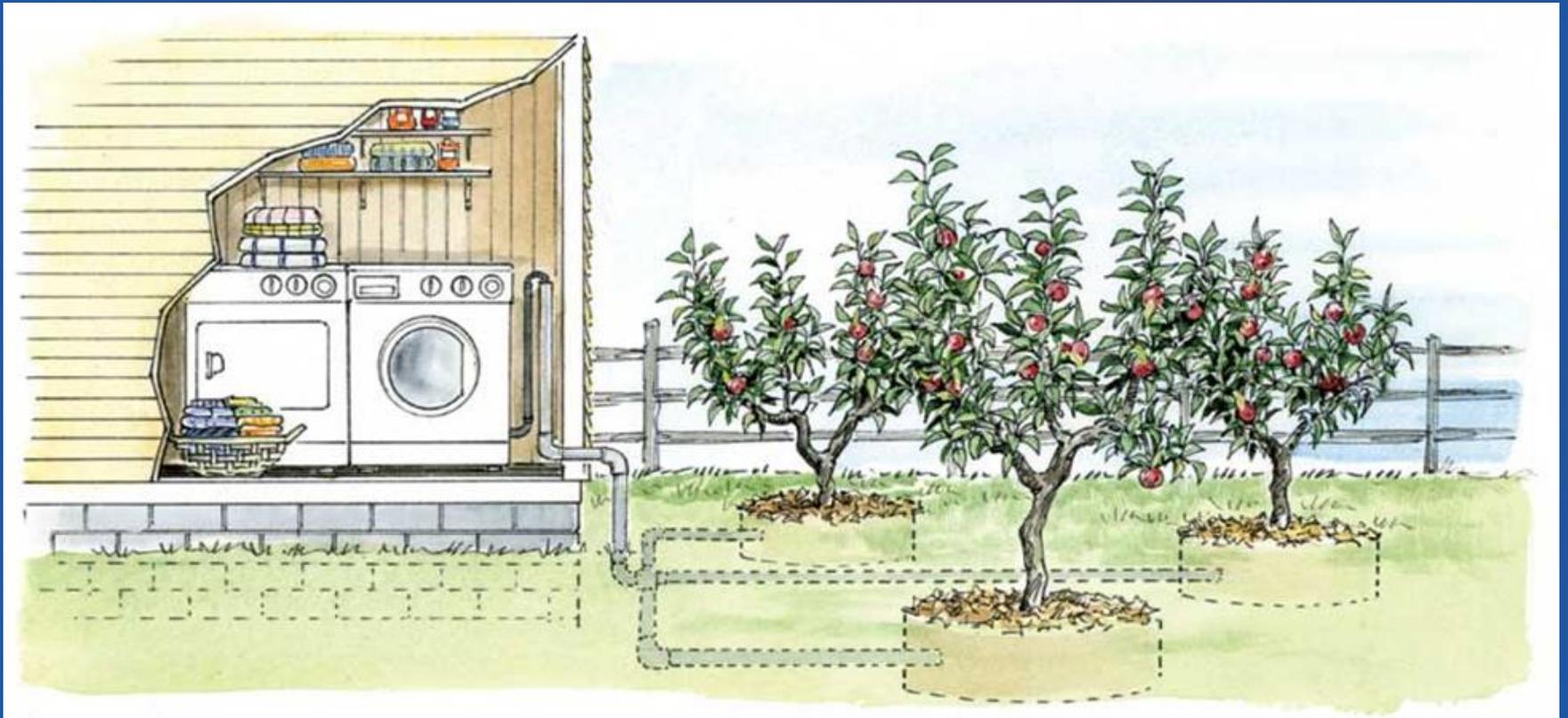
PERCOLATION

RETAIN

LET'S KEEP THE CREEK
CLEAR, COLD AND COPIOUS...DUDE



Laundry-to-Landscape



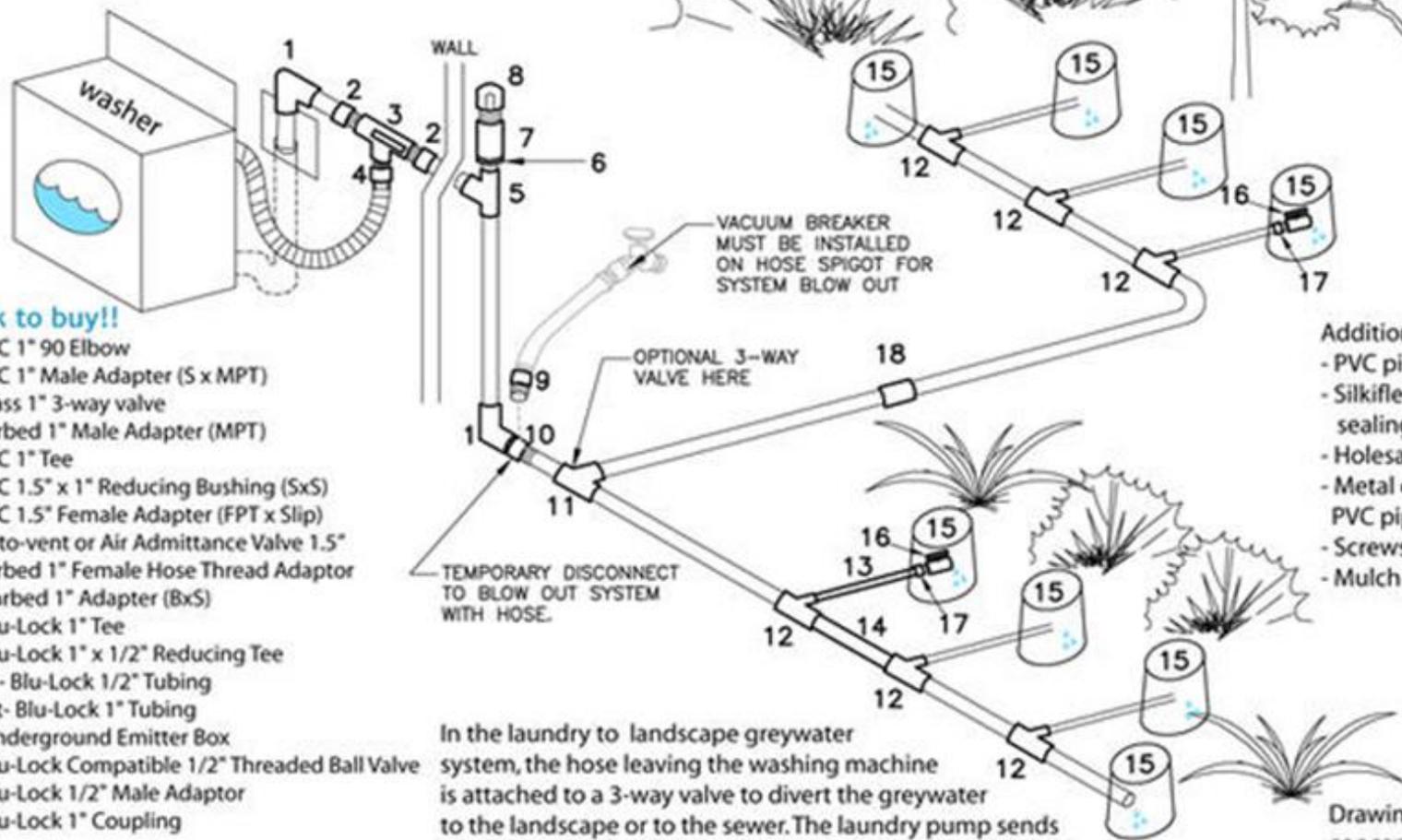
Laundry-to-Landscape

Legal System Guidelines

1. Notification of installation of the system to Enforcing Agency
2. User can easily redirect flow to sewer
3. No potable water connection
4. The greywater shall be contained on site where it is generated
5. Greywater shall be directed to and contained within an irrigation or disposal field
6. Ponding or runoff is prohibited and shall be considered a nuisance
7. At least two inches of mulch, rock, soil or a solid shield covers the release point.
8. Minimize contact with humans and domestic pets.
9. Water used for diaper washing and similarly soiled or infectious garments shall be diverted to the building sewer.
10. Graywater shall not contain hazardous chemicals derived from activities such as cleaning car parts, washing greasy or oily rags, or disposing of waste solutions from home photo labs or similar hobbyist or home occupational activities.
11. Exemption from construction permit requirements of this code shall not be deemed to grant authorization for any grey water system to be installed in a manner that violates other provisions of this code or any other law ordinances of the enforcing agency.
12. An operation and maintenance manual shall be provided.

Laundry to Landscape Greywater System Kit

Blu-Lock fittings



Click to buy!!

- (1) 2- 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- Blu-Lock 1" Tee
- (12) 6- Blu-Lock 1" x 1/2" Reducing Tee
- (13) 10 ft- Blu-Lock 1/2" Tubing
- (14) 50 ft- Blu-Lock 1" Tubing
- (15) 8- Underground Emitter Box
- (16) 2- Blu-Lock Compatible 1/2" Threaded Ball Valve
- (17) 2- Blu-Lock 1/2" Male Adaptor
- (18) 1- Blu-Lock 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

VACUUM BREAKER
 MUST BE INSTALLED
 ON HOSE SPIGOT FOR
 SYSTEM BLOW OUT

OPTIONAL 3-WAY
 VALVE HERE

TEMPORARY DISCONNECT
 TO BLOW OUT SYSTEM
 WITH HOSE.

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

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.

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

Laundry-to-Landscape Indoor Components

Sewer Connection

Anti-siphon

Diverter Valve

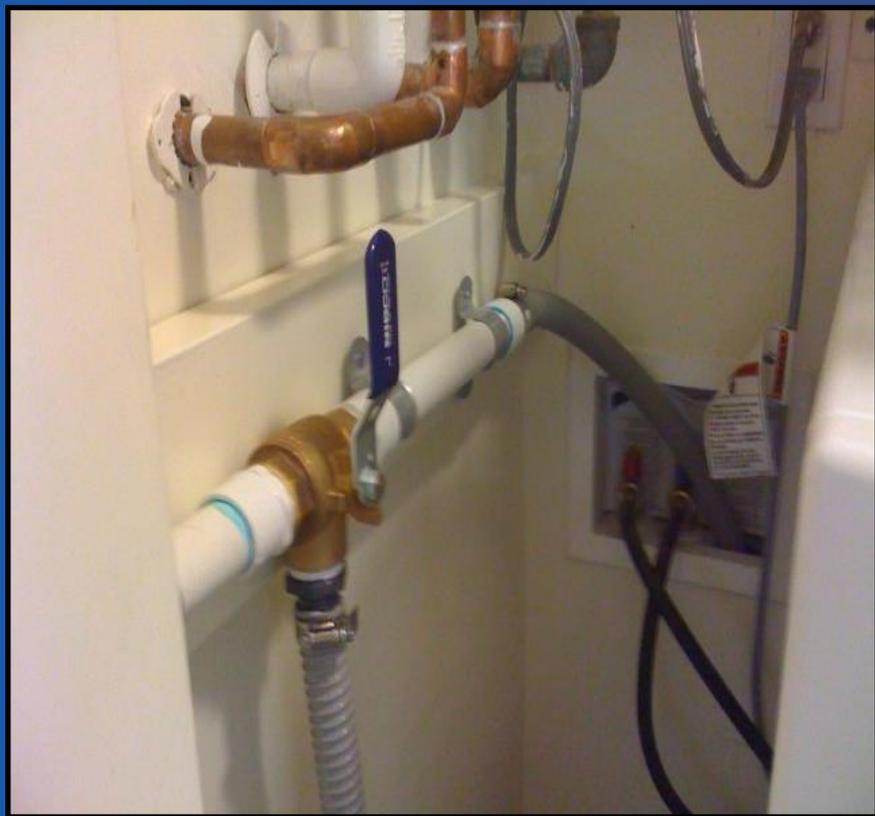
To Landscape



Laundry-to-Landscape Indoor Components



Laundry-to-Landscape Indoor Components



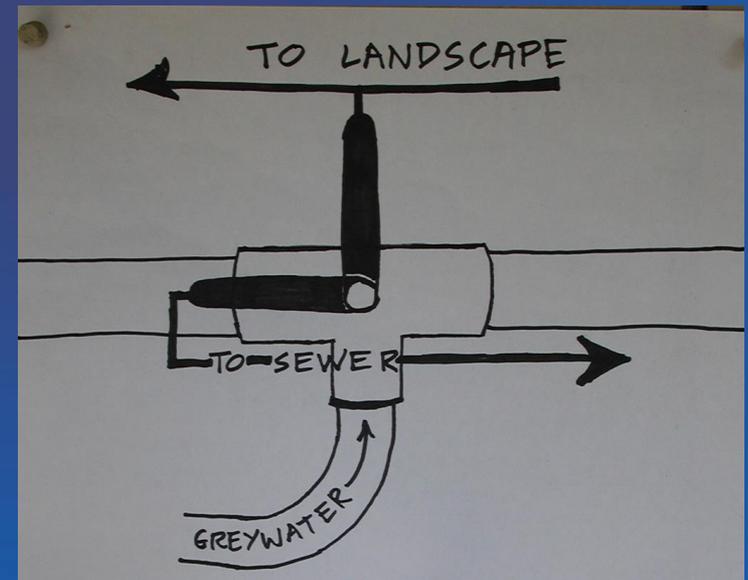
Laundry-to-Landscape Indoor Components



Irrigated with
graywater

Irrigado con aguas grises

Not for drinking
No es para beber



Laundry-to-Landscape

Indoor Components

- User can easily redirect flow to sewer
- No potable water connection
- Water used for diaper washing and similarly soiled or infectious garments shall be diverted to the sewer
- Greywater shall not contain hazardous chemicals
- An operation and maintenance manual shall be provided

Laundry-to-Landscape

Estimating Greywater Production

Gallons per week = (gallons/load) x (loads/week)

- Top loader: 40 gallons/load
- Front loader: 15 gallons/load

Annual water reuse = (gallons/week) x (52 weeks)

Laundry-to-Landscape

Drill the Hole to Exit the House

Drill a pilot hole

- Use a long 1/4" or smaller bit for the pilot hole
- Use correct bit for your wall/floor (wood hole saw bit, stucco bit, etc.)

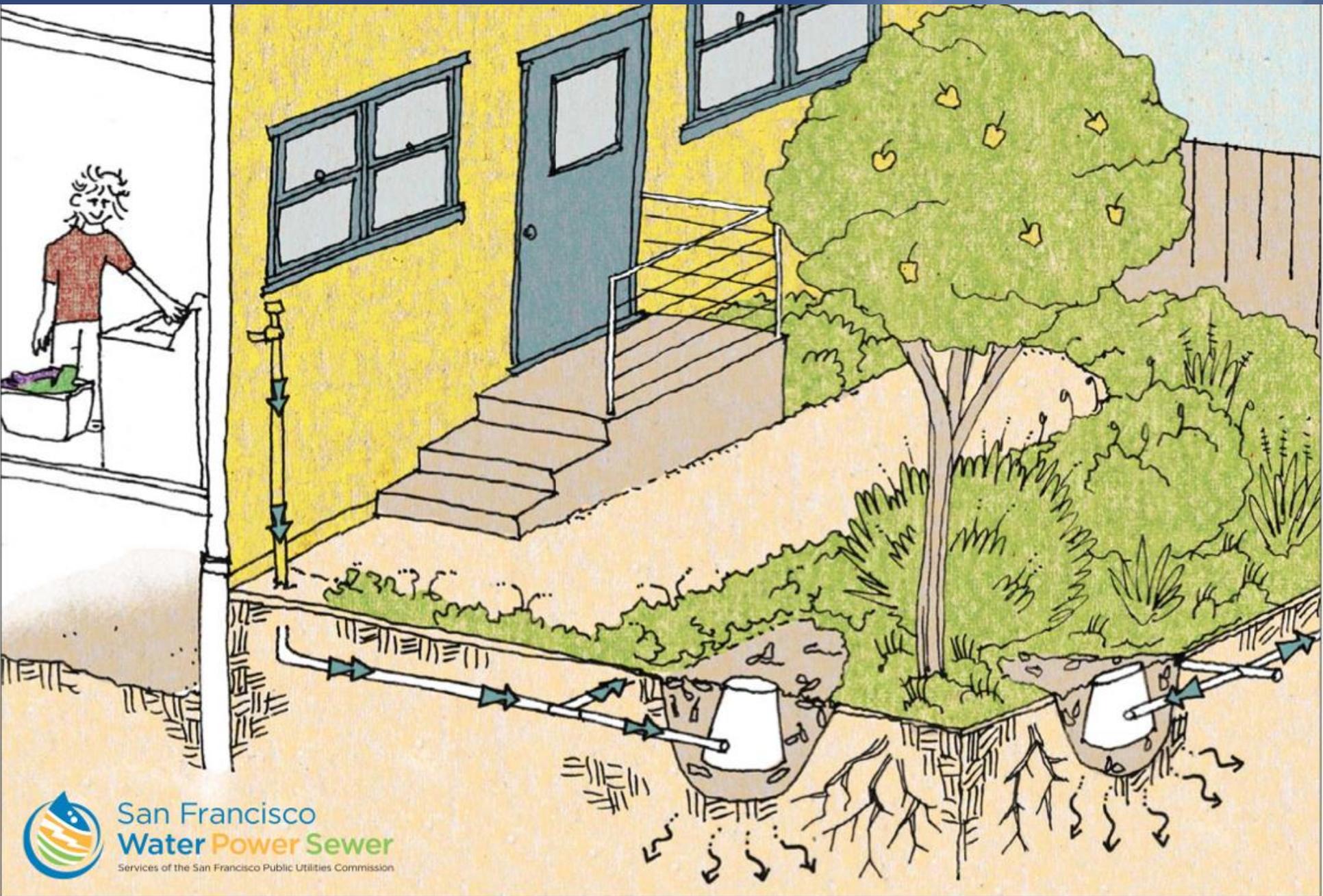
After confirming there are no obstructions:

- Drill hole for 1" PVC using a 1 1/2" bit
- A circle of small holes may be drilled in stucco then the stucco chipped out of the center
- Drill from outside in and inside out for clean edges

Laundry-to-Landscape

Outdoor Design Guidelines

- Greywater shall be contained on site where it is generated
- Greywater shall be directed to and contained within an irrigation or disposal field
- Ponding or runoff is prohibited
- At least two inches of mulch, rock, soil or a solid shield covers the release point
- Minimize contact with humans and domestic pets



San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission

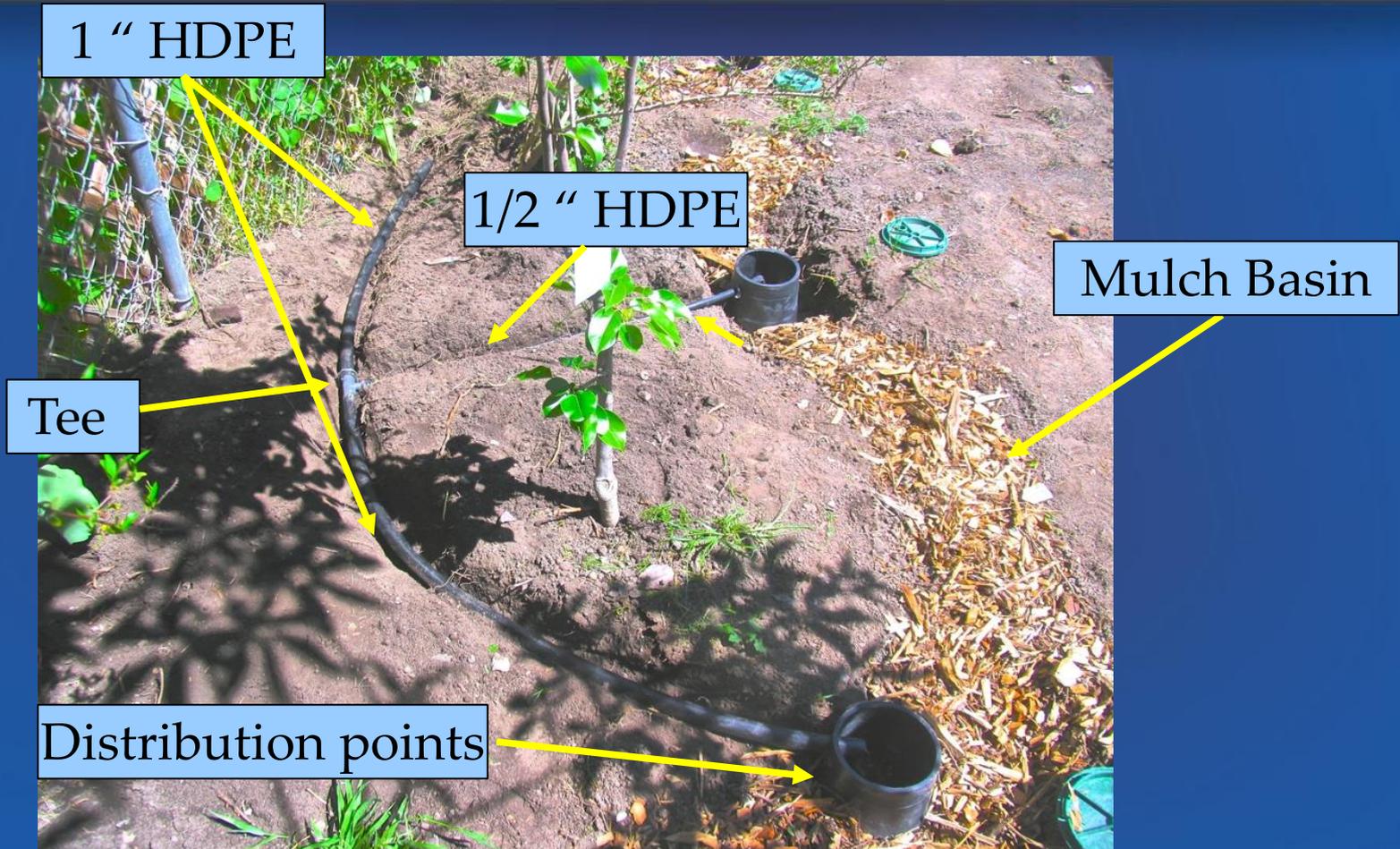


American
FARMLAND
CORPORATION

Laundry-to-Landscape Outdoor Components



Laundry-to-Landscape Outdoor Components



Laundry-to-Landscape Outdoor Components

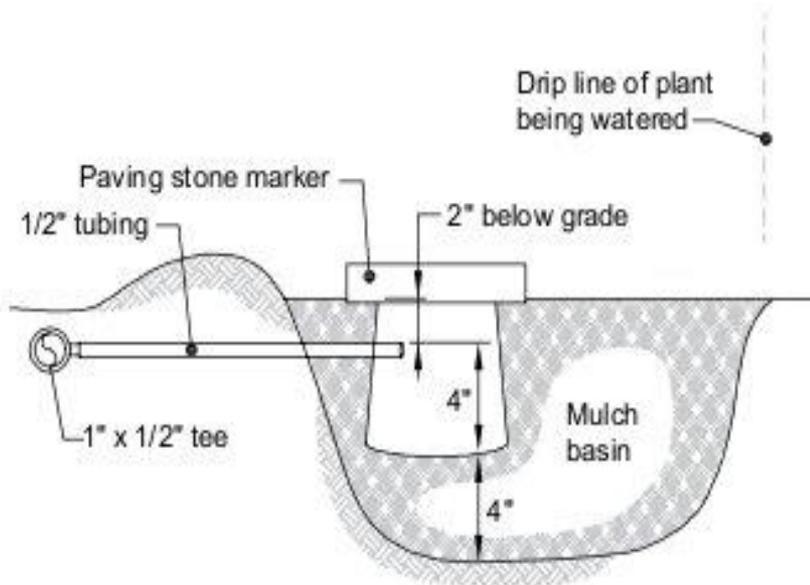
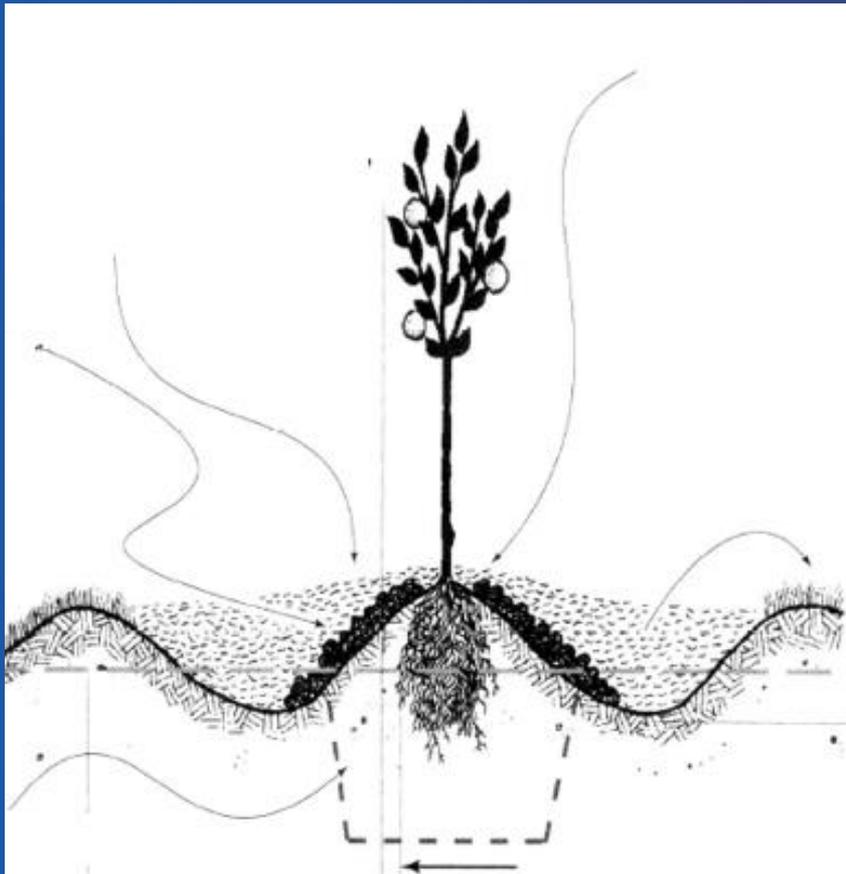


Figure 4. Mulch shield placement.



Laundry-to-Landscape Outdoor Components



Laundry-to-Landscape Outdoor Components



Laundry-to-Landscape Irrigation Field Setbacks

- 2 feet from buildings
- 1.5 feet from property lines
- 100 feet from wells or creeks
- 5 feet from septic tank
- 4 feet from leach field
- 3 feet above groundwater table

Laundry-to-Landscape Outdoor Components



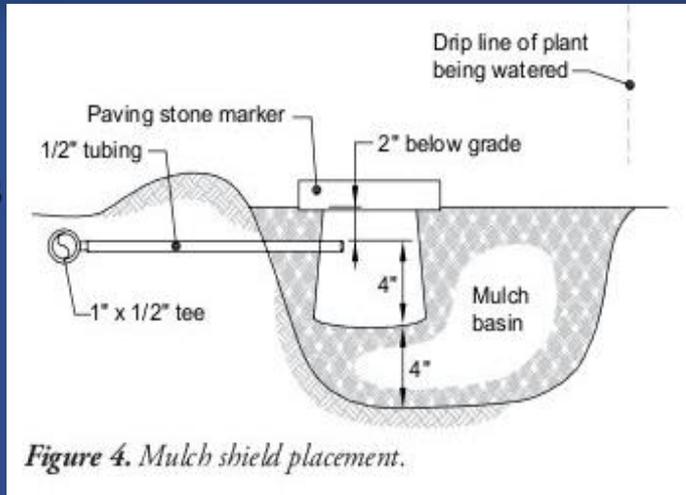
Laundry-to-Landscape Outdoor Components



Laundry-to-Landscape

Sizing your Irrigation Field

If 120 gal/week is produced and the soil is **clay w/ small amounts of sand**, How big is the irrigation field required to be?



$(\text{gallons/day}) / (\text{gallon/sq ft/day}) = \text{Irrigation field size sq ft}$

$(120 \text{ gallons} / 7 \text{ days}) / (.8 \text{ gallon/sq ft/day}) = 21.42 \text{ sq ft}$

1 ft. wide basin for tree with 4 ft. radius has
(Using circumference = $2\pi r$)
 $2 \times 3.14 \times 4 = 24 \text{ sq. ft}$

Laundry-to-Landscape

Plant water budget requirement

How many gallons/week would a fruit tree with a 4 foot radius need during the peak irrigation season?

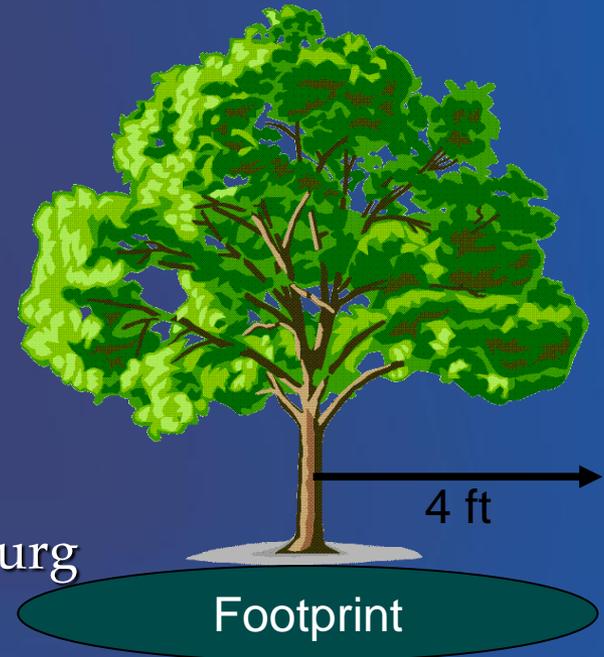
$$\text{Water budget} = .62 \times \text{Area} \times \text{Eto} \times \text{Pf}$$

$$\text{Area} = \pi r^2 = 3.14 \times 4' \times 4'$$

$$\text{Eto(July)} = 7.44''/\text{month} \times \text{ETo rate of Healdsburg}$$

$$\text{Pf} = \text{Plant factor} = 0.5(\text{medium water use})$$

$$\text{Water budget} = .62 \times \text{Area} \times \text{Eto} \times \text{Pf} = 186 \text{ gal/month or } 6.2 \text{ gal/day}$$



Tool List

Suggested Tool List:

- Corded or cordless drill (with a long pilot bit to drill through wall)
- 1.5" hole saw
- Extension cord
- Mattock and shovel (narrow trench shovel recommended)
- PVC cutters or hacksaw
- Bubble level
- Phillips head screwdriver or drill bit
- 1/8" drill bit (to pre-drill screw holes)
- Channel locks, vice grips or crescent wrench
- Hammer
- Tape measure

Additional items needed:

- Teflon tape
- PVC glue (Gorilla PVC glue recommended – does not require primer)
- U-stakes (to hold HDPE pipe in place)
- Mulch (large chunks recommended)

Soap Selection & Behavioral Changes

No Sodium, Chlorine or Boron!

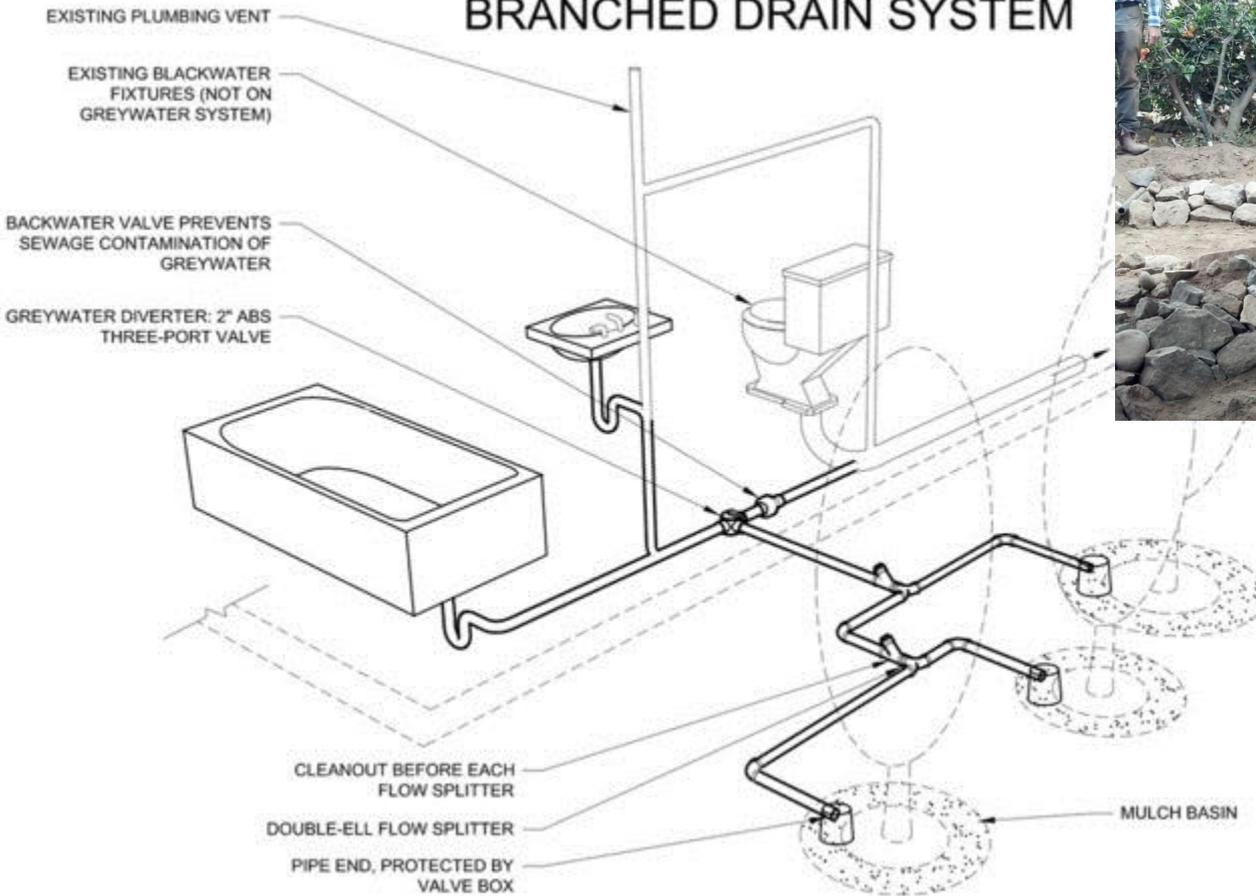
Recommendations:

- Oasis
- Ecos
- Biopac liquid detergent
- Vaska
- Soap alternatives like soap nuts and "wonder balls"
- Ozone laundry systems



Shower-to-Flowers

BRANCHED DRAIN SYSTEM



Plant Selection

Best choices:

- Trees
- Shrubs & Bushes
- Vines
- Perennials
- Large Annuals
- Food crops
(greywater cannot touch the edible portion)

Not Suitable:

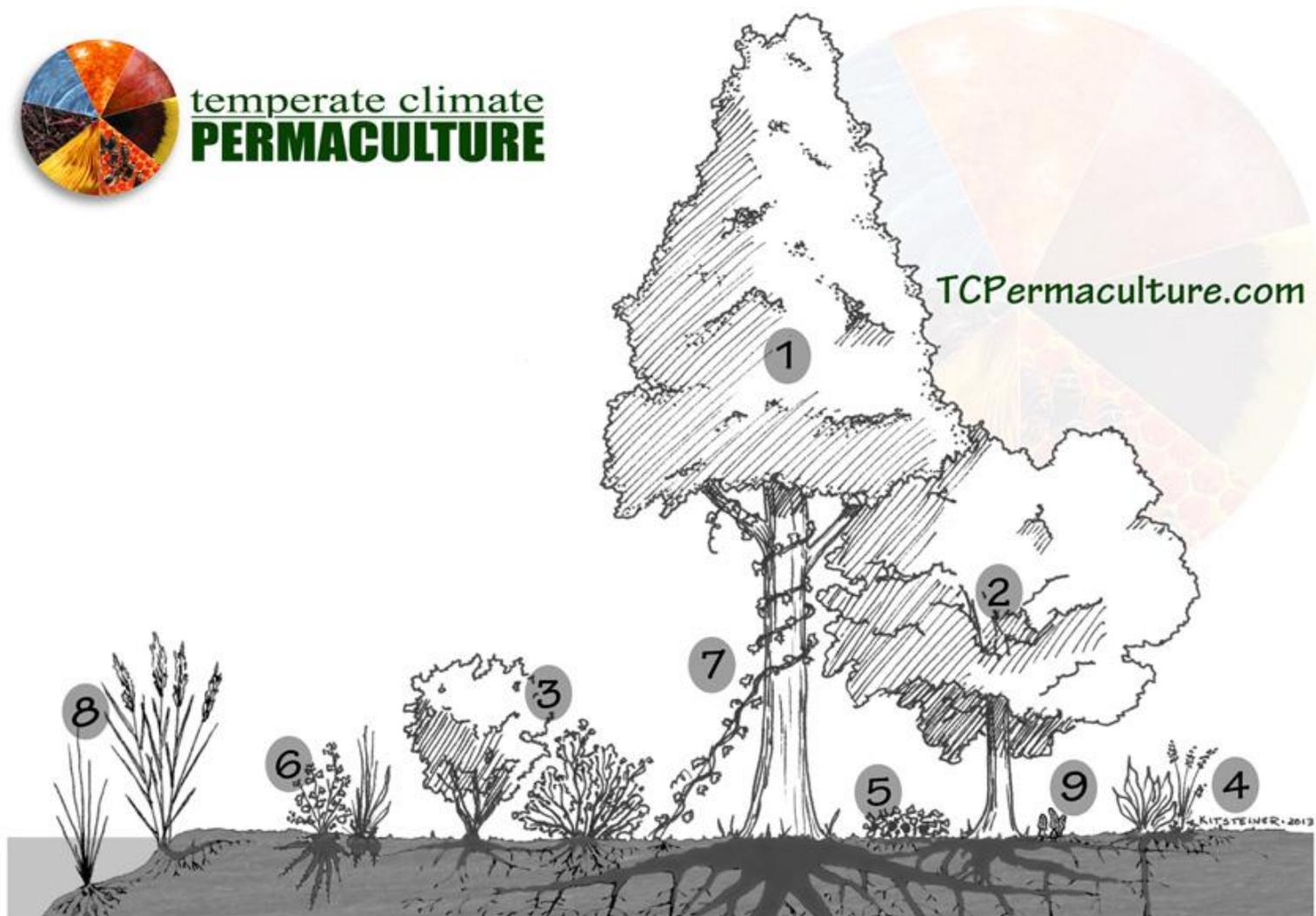
- Lawns
- Small or potted plants
- Raised beds
- PH Sensitive plants
- Established--never irrigated
- Drought tolerant

Plant Selection





temperate climate
PERMACULTURE



Nine Layers of the Edible Forest Garden

- | | |
|---------------------------------|---------------------------|
| 1. Canopy/Tall Tree Layer | 6. Underground Layer |
| 2. Sub-Canopy/Large Shrub Layer | 7. Vertical/Climber Layer |
| 3. Shrub Layer | 8. Aquatic/Wetland Layer |
| 4. Herbaceous Layer | 9. Mycelial/Fungal Layer |
| 5. Groundcover/Creeper Layer | |





Greywater may not be for you if...

- Your washing machine is on a slab or on the second story in the center of the house
- You have a sodium-based water softener
- You intend to irrigate lawn
- Your garden is uphill from your greywater source or more than 50 feet from the house on flat ground

Pathways to Greywater Installation

Come to a DIY workshop

- June 28th in Healdsburg
- July 26th in Petaluma

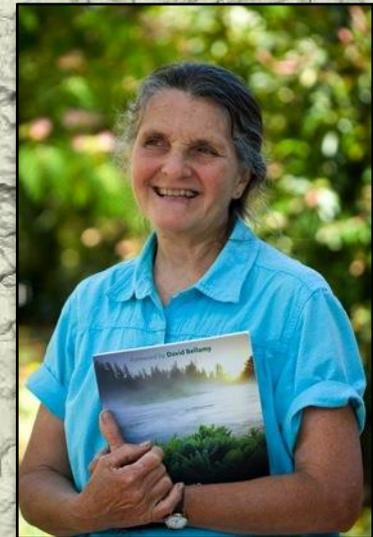
Hire a qualified greywater landscape installer

- Ask about our list of qualified installers

Greywater Installations 2010



Greywater Installations 2011



100 Greywater Challenge 2012





Questions?

Thank You!

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