Laundry-to-Landscape Greywater

Design and Installation

Presentation by
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Guiding Questions for your Design

How can you maximize water savings with your greywater system?

How can you increase the ecological productivity of your landscape?
(What will you irrigate?)

Other Greywater Systems

There are many other types of systems besides the L2L

They require permits and

- Can be simple and gravity based
- Can incorporate pumps
- With proper filtration, can use greywater compatible drip irrigation tubing

We will not be discussing these systems today.

Soaps and Products

Things to avoid for happy plants:

- Salt *(sodium compounds, sodium based water softeners)*
- Boron *(borate)*
- Chlorine bleach *(hydrogen peroxide bleach okay)*

Recommended products: Low salt/boron free

- Liquid laundry detergent
  - Oasis, ECOS, Trader Joes' liquid detergent, Biopac, Vaska, Puretergent, and more
- Soap alternatives
  - Soap nuts, “wonder balls”

Mulch

Pieces of wood chips, or other organic matter, like straw.

Mulch Basin

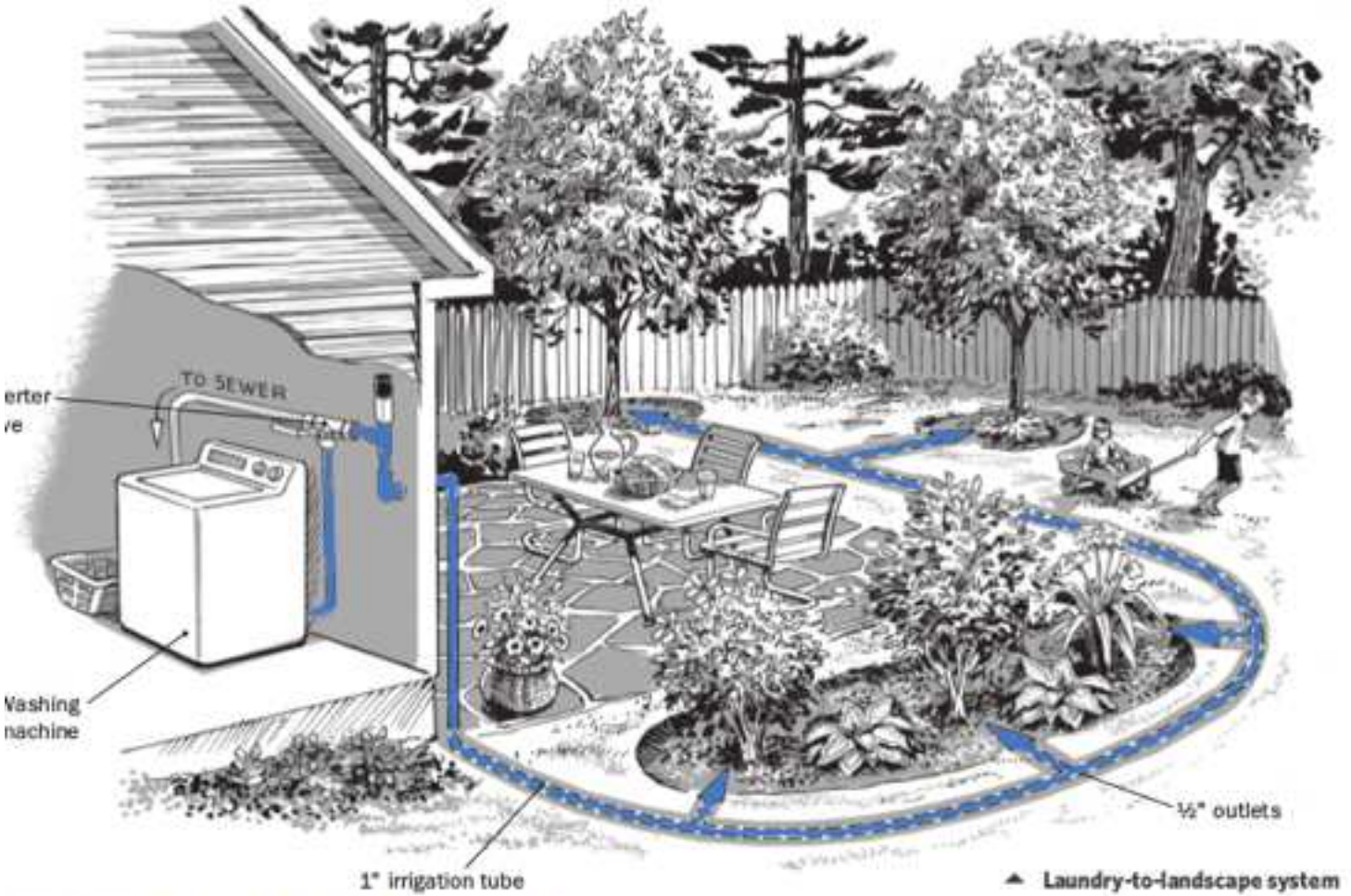
Shallow basin dug near the plant.

This is where we discharge greywater so the mulch can soak it up and filter out the particles.

This man is filling the basin with woodchips.

Laundry-to-Landscape (L2L)

A washing machine system that doesn't alter the plumbing and doesn't require a permit (if basic guidelines are followed, in a 1 or 2 family home).



▲ Laundry-to-landscape system

Steve Sanford from The Water-Wise Home

Connections Inside the House

Loose fitting connection to the sewer/septic

Diverter valve

Washer drain hose

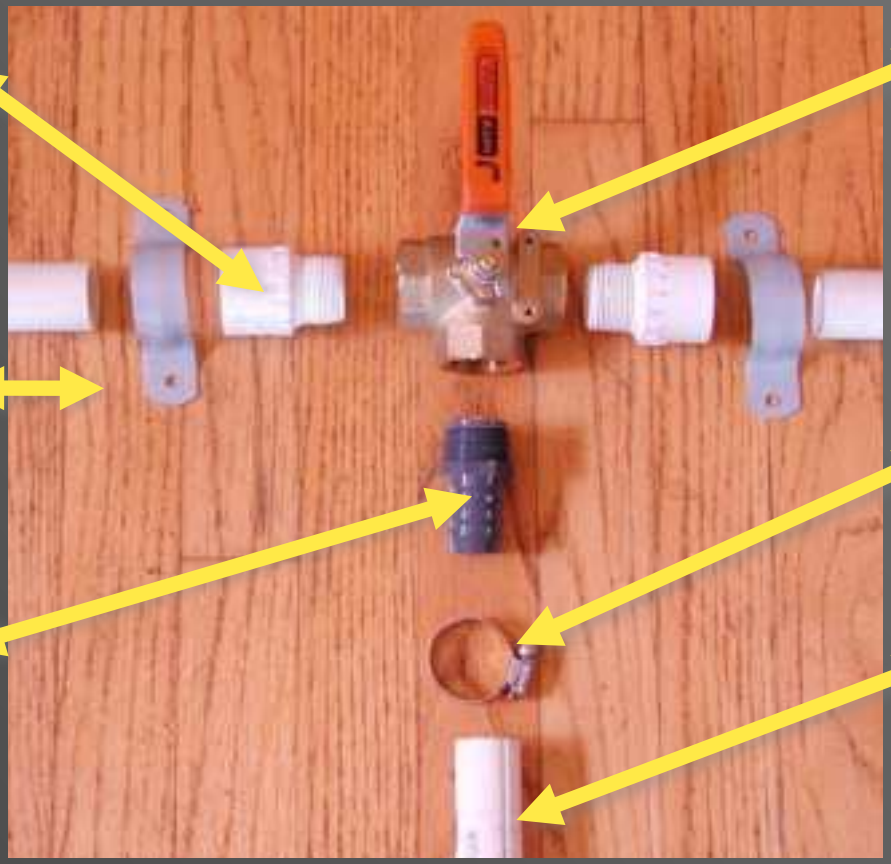
Anti-siphon vent installed on the landscape side of the valve

Greywater goes to landscape

Before You Start- Clean the Pump Filter

Pump filter

Connect the 3-way Valve



Teflon Tape Threaded Fittings

Teflon tape helps prevent leaks.

✓Wrap tape CLOCKWISE around threads.

✓Wrap several times over threads.

✓Don't "cross-thread" when screwing fitting into 3-way valve.

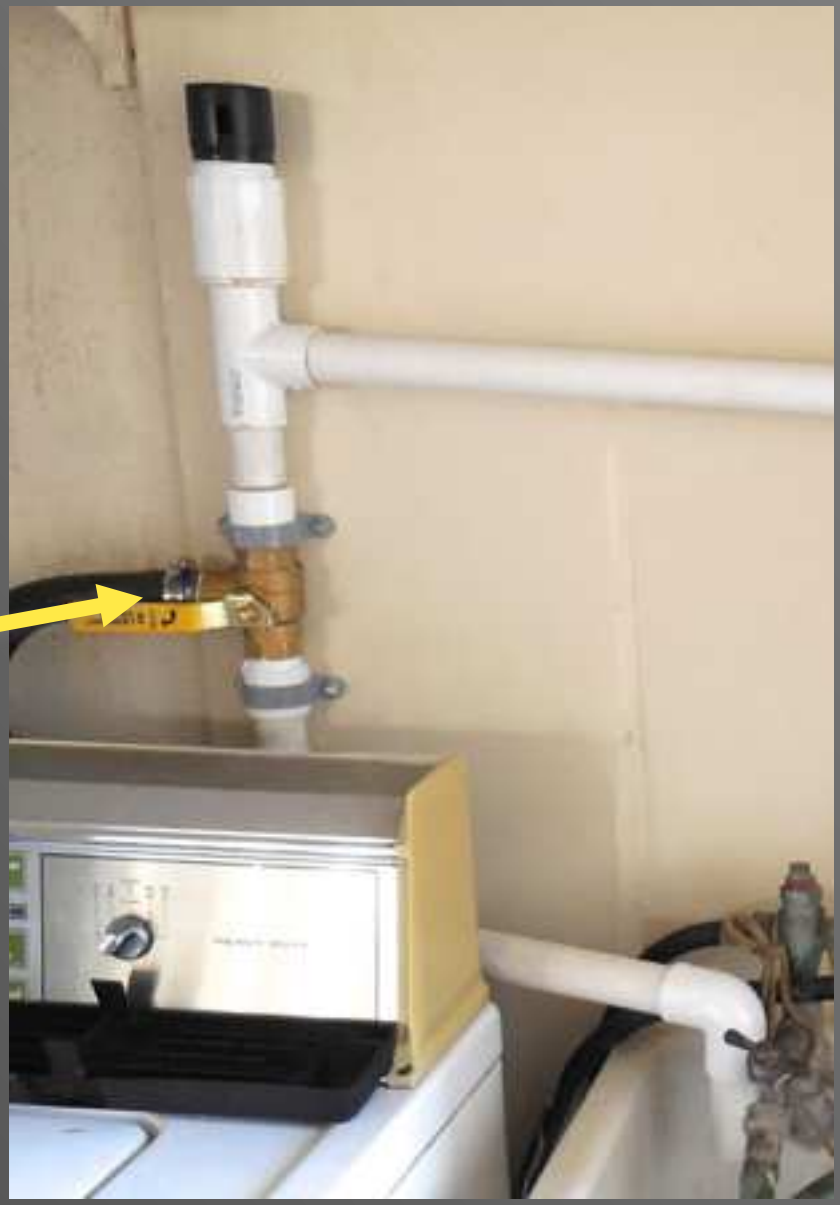
✓Tighten with channel locks.

3-way Valve Configurations

1. Valve must be above **“flood rim”** of machine.
2. Washer hose must connect to middle port

3-way Valve Configurations

Washer hose connected to middle port



3-way Valve Configurations

Second washer hose used for sewer connection

PVC-Free Version : BluLock

Image credit Leonard Edmonson

Tips for Connecting Washer Hose

1. Select correct size adapter to fit the washer's hose
   - Usually 1”, sometimes ¾” and very rarely 1 ¼”

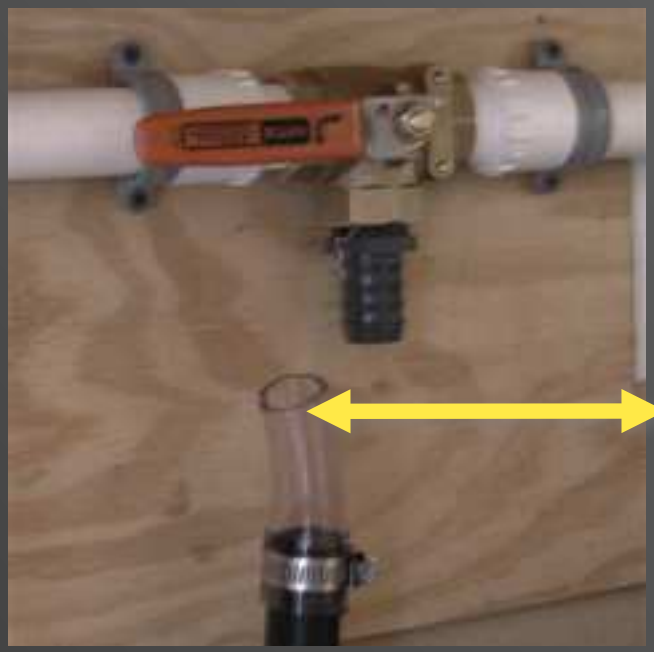
2. If its difficult to slip hose over barb, soften hose with hot water, then forcefully push it on barb

3. Secure with hose clamp

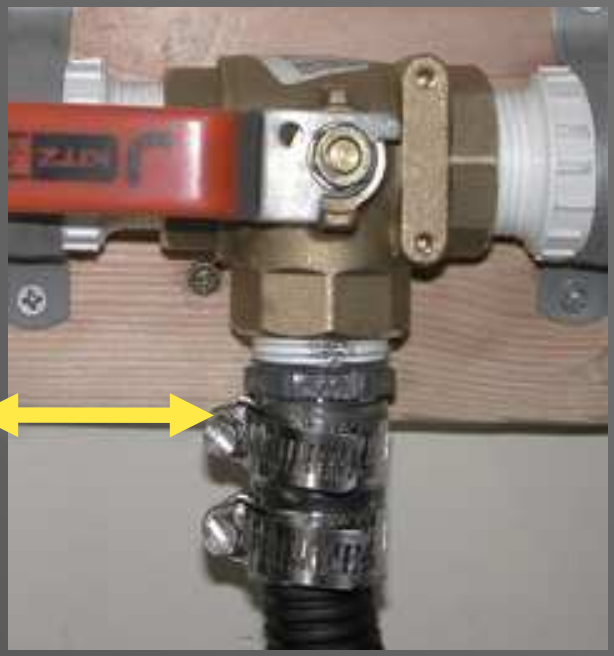
Troubleshooting Tips

If washer hose connection leaks:

3. **1st** Tighten hose clamps, add 2nd hose clamp
4. **2nd** Connect with piece of vinyl tubing



Vinyl bridge between barb and washer hose



Drill Hole for Pipe
(through the wall/floor)

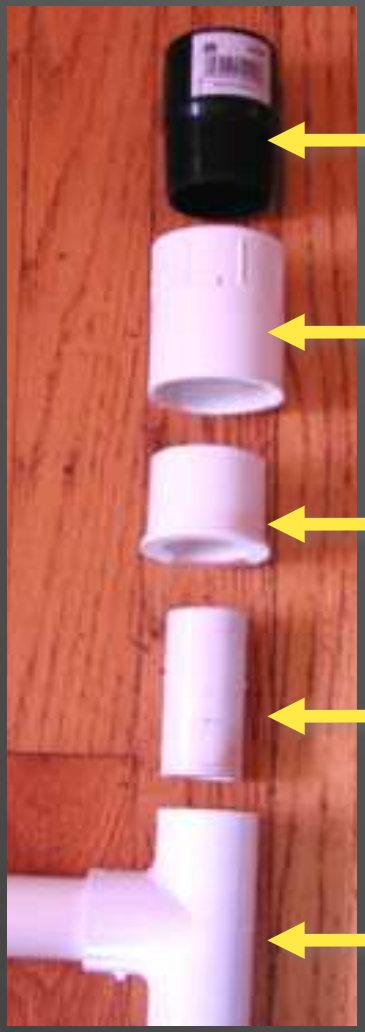
- Look for potential issues (electrical lines, gas pipes, etc.)
- Drill a 1/4” pilot hole
- If no obstructions, drill hole for 1” PVC with 1½” holesaw (Drill from outside in, and inside out for a clean looking hole)
- Use proper bit for your wall/floor (wood bit, stucco bit, etc.)

Anti-siphon Component

This piece is called an Auto-Vent, in-line vent or AAV)

It's function is to prevent a siphon from forming and sucking water out of the machine when it tries to refill.

Assemble the Anti-siphon Component



Autovent (1 ½” threads)

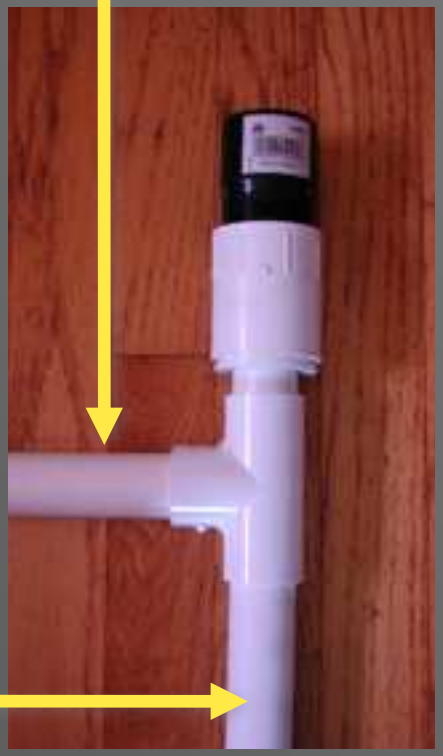
1 ½” FPT (female pipe threads) by slip coupling

Reducing bushing 1 ½” x 1” slip

1” schedule 40 PVC pipe

1” PVC tee

Flow from 3-way valve



Going to the landscape

Placement of Anti-siphon

- Can be inside or outside (may need freeze protection)
- Must be at the high point of the system
- Must be accessible/ visible in case of future leaks (e.g. not behind a wall)

Plumb from Valve to Hole

Cutting PVC pipe:

- ✓ Use PVC cutters or handsaw
- ✓ Remember to calculate the length of pipe that will “slip” into the fitting when figuring your measurements
- ✓ Use as few fittings as possible to minimize friction

Plumb from Valve to Sewer Connection

Gluing PVC

Clean and dry pipe

- ✓ Apply glue to the inside of the fitting “hub” first
- ✓ Then apply glue to the outside of the pipe
- ✓ Push together quickly, inserting all the way and hold a second as it will try to push out

Strap Valve and/or Pipe

- ✓ Use 2-hole straps or plumbers tape
- ✓ Add wood blocking as necessary
- ✓ Strap so valve is secure

Label Pipe and 3-way Valve

Label above ground pipe:
"CAUTION: Non-potable graywater, do not drink"

Label valve: show direction of greywater

Stacked washer in closet- limited space

Atypical valve installation due to site constraints

Image: Ty Teissere

Estimate Greywater Production

1. Number of loads of laundry done each week?
2. Number of gallons per load?
   - Top loading machine uses ≈ 40 gallons/load
   - Front loading machine uses ≈ 15 gallons/load
   - Top efficient machines uses ≈ 25 gallons/load
3. Future changes?
   - New machine? Change in usage?

Estimate Greywater Production

Formula:

# of loads per week x gallons per load = gallons/ week of greywater

Example:

4 loads/week X 25 gallons/load = 100 gallons/ week of greywater

Choosing Plants for L2L Greywater Irrigation

Good options:

1. 1st Trees (fruit trees are nice!)
2. 2nd Shrubs/bushes
3. 3rd Perennials and large annuals
4. Food crops are fine as long as greywater doesn't touch the edible portion

Plants with larger root zones thrive with laundry watering patterns.

Choosing Plants
for L2L Greywater Irrigation

Not as good options:

1. Lawns
2. Drought established (eg. never irrigated)
3. Small plants or in pots
4. Sensitive plants
5. Root crops (not allowed by code)
6. Raised beds- depending on the situation

What would you water here?

Plant Water Requirements

How much should you water?

Do you live in a cool, warm, or hot place?

Cool= San Francisco (foggy summers)

Warm= Oakland or Los Angeles type climate

Hot= Imperial Valley, most summer days over 100

Plant Water Requirements

Weekly peak irrigation needs (per square foot of planted area):

Cool climate (e.g. San Francisco)

- Water 1/4 gallon

Warm climate (e.g. Oakland or Los Angeles)

- Water 1/2 gallon

Hot climate (e.g. Imperial Valley)

- Water 1 gallon

1 foot x 8 feet = 8 sq.ft

Note: For low-water use plants cut this estimate in half.

Finding Peak Plant Water Requirements

Example: Raspberry plant

San Francisco:
1/4 gallon x 8 square feet = 2 gallons/week

Los Angeles:
1/2 gallon x 8 square feet = 4 gallons/week

Imperial Valley
1 gallon x 8 square feet = 8 gallons/week

1 foot x 8 feet = 8 sq.ft

Note: For low-water use plants cut this estimate in half.

Improper Designs Won't Save Water

GW outlets planted in the middle of turf grass

Image credit City of Long Beach office of Sustainability

Number of Outlets

No more than 20 distribution points (Reduce to 10 for top-efficient machine)

No more than 8 distribution points (reduce to 4 for ultra-efficient machines)

Setbacks for Irrigation Fields

Example from CA Plumbing Code

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

Piping to Landscape

- Pipe around obstacles
- Try to maintain a downwards slope when ever possible

Hardscape

- Go under it
- Go around it
- Remove it
- Cut a strip of it

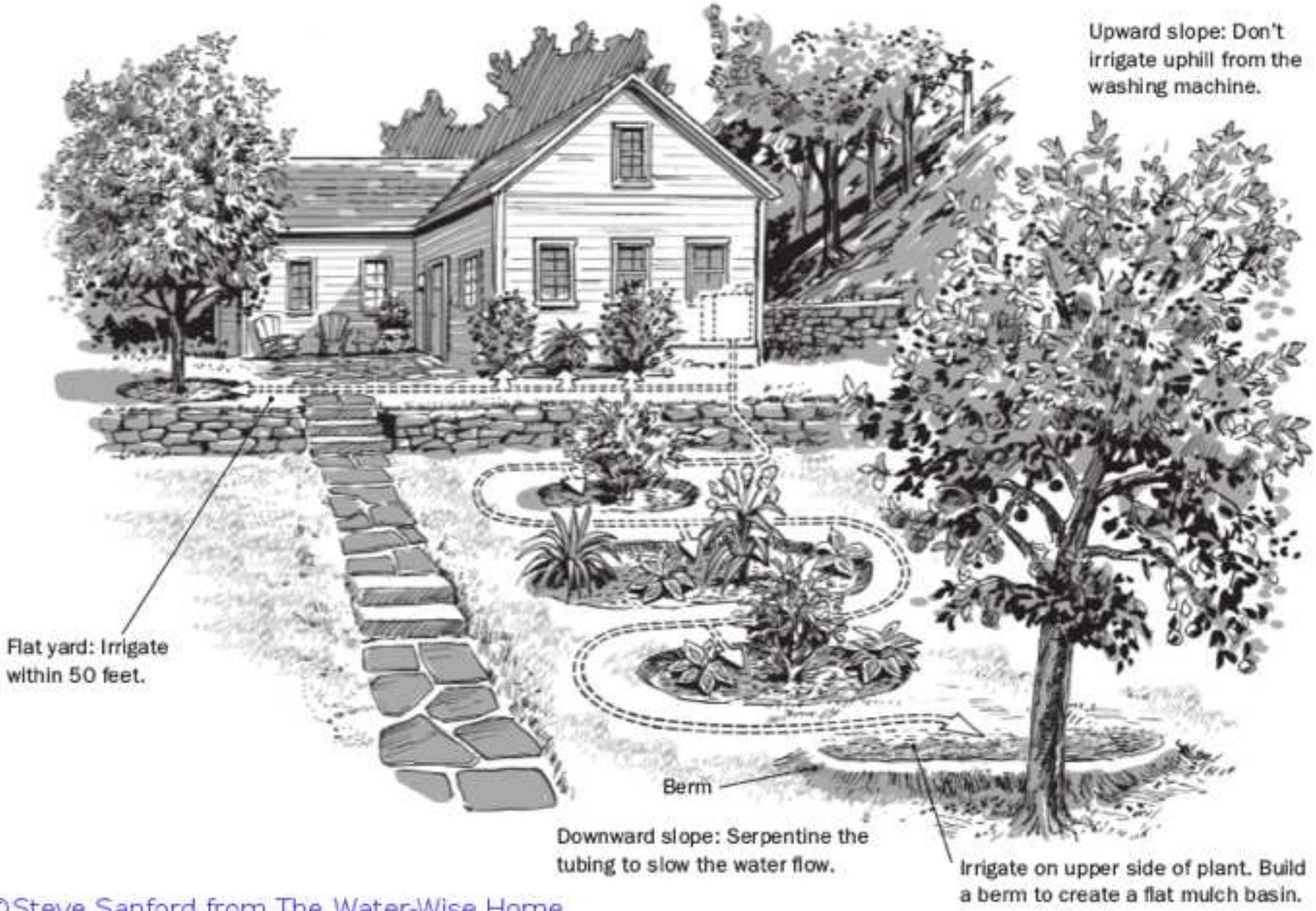
Slope Considerations

Be mindful of the washing machine pump!

- In a flat yard, distribution should be within 50 feet
- If site slopes downward to distribution points no rule on distance
  - Serpentine tubing to slow greywater flow on downhill slopes
- Leave a 1” open end to protect the machine's pump. This can be an irrigation point and should be located in a mulch shield in a mulch basin.

Note: *If the distribution points are uphill a L2L system is not recommended.*

DISTRIBUTING WATER WITH AN L2L SYSTEM



Trench and Install Tubing to Basins

Stake tubing

Open 1” end of line

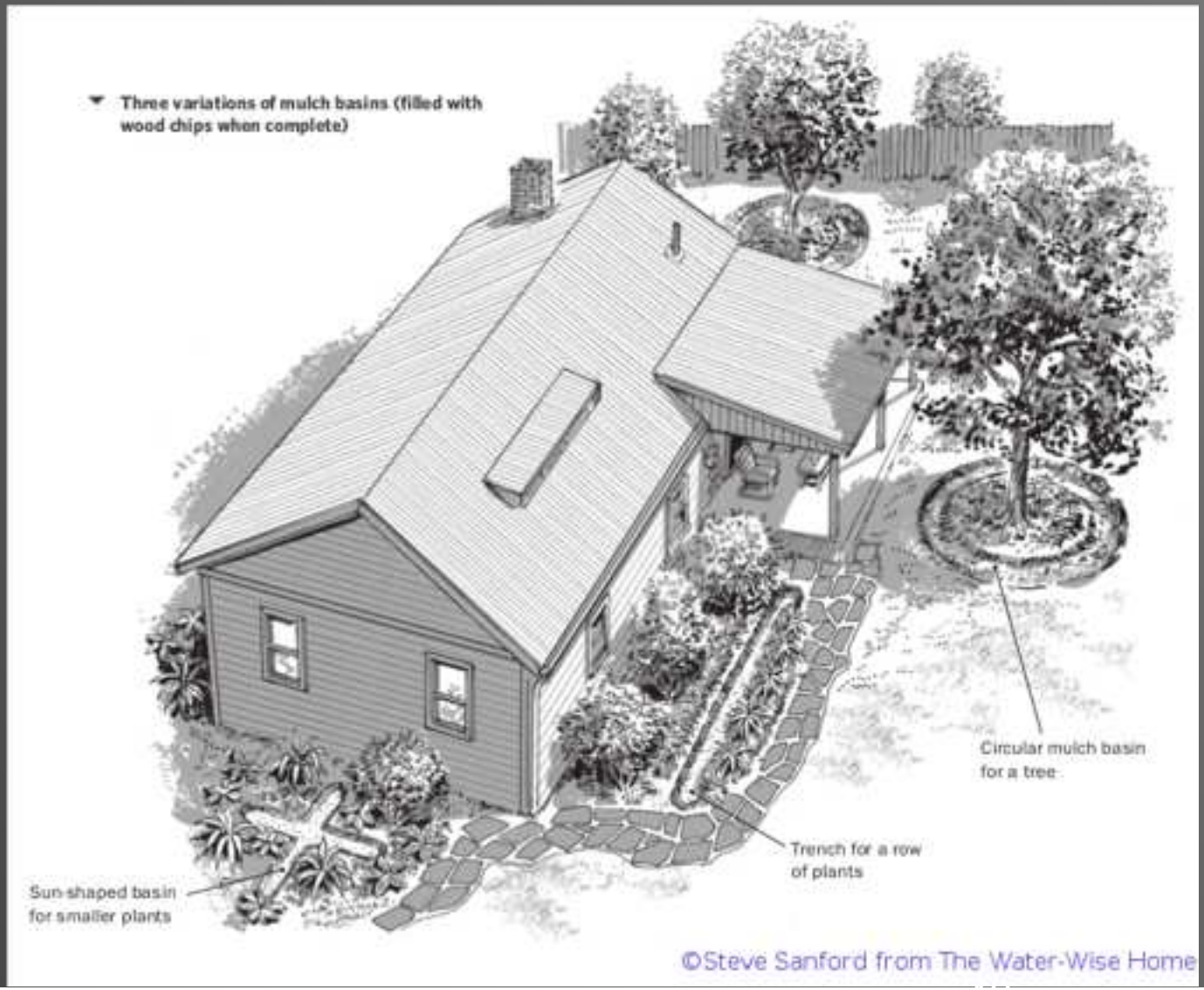
Note: *If there are any elevation changes between basins, run the tubing to the highest point and then come down.*

Cut in 1x ½” tees, Add ½” tubing as needed

Tips for working with tubing:

- No kinks (cut them out)
- Dip end of tube in hot water to soften plastic
- Minimize 1/2” tubing

Locate Basins in “Drip Line” of Plants



How to Size a Mulch Basin

Make each basin large enough to soak up greywater without ponding or runoff.

Clay soils need larger basins.

Image credit: Ty Teissere

A point of clarification:

Use WEEKLY greywater production to decide how many plants to water.

Use DAILY MAXIMUM FLOW to determine size of mulch basins.

Sizing Mulch Basins

Clay soil (slow drainage)

- 1 square foot per gallon
- 6 gallons to a tree, 6 square feet of basin

Sandy clay

- 1/2 square foot per gallon
- 6 gallons to a tree, 3 square feet of basin

Mulch Shield-
prevents roots from clogging outlet

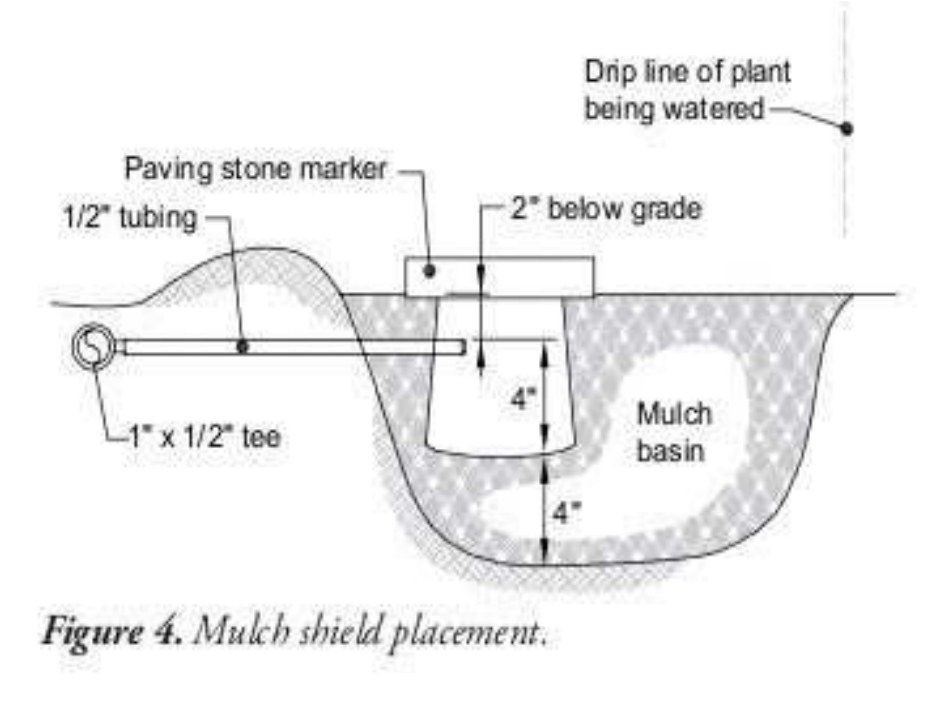


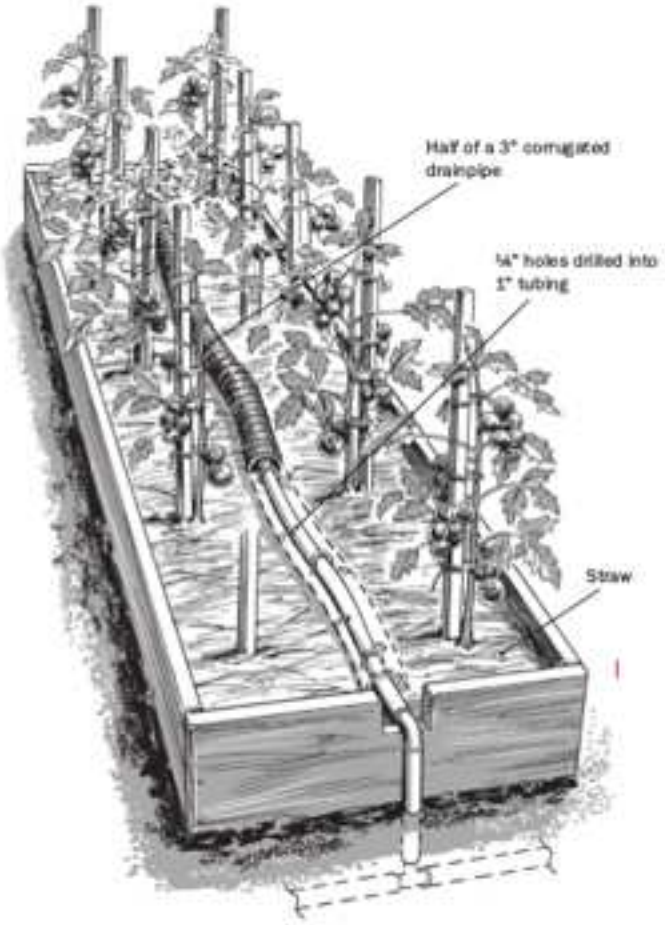
Figure 4. Mulch shield placement.

Image from SFPUC manual on greywater

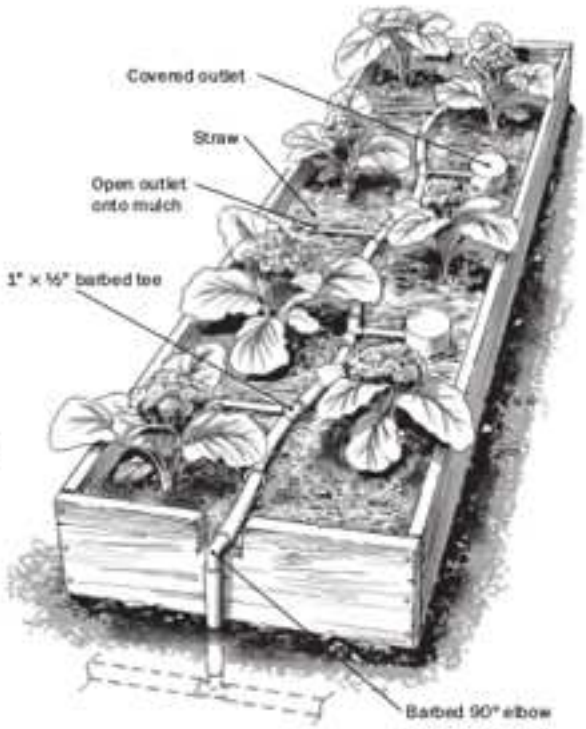
Mulch Shield- Irrigation Valve Box

Mulch Shield- Piece of 4” Drain Pipe

Raised Beds



▲ Maintenance-intensive option. Drill ¼" holes into 1" tubing. Holes clog over time and require manual declogging. Cover



▲ Mini-mulch basins inside raised bed. Greywater outlet can be covered with a mulch shield for code compliance.

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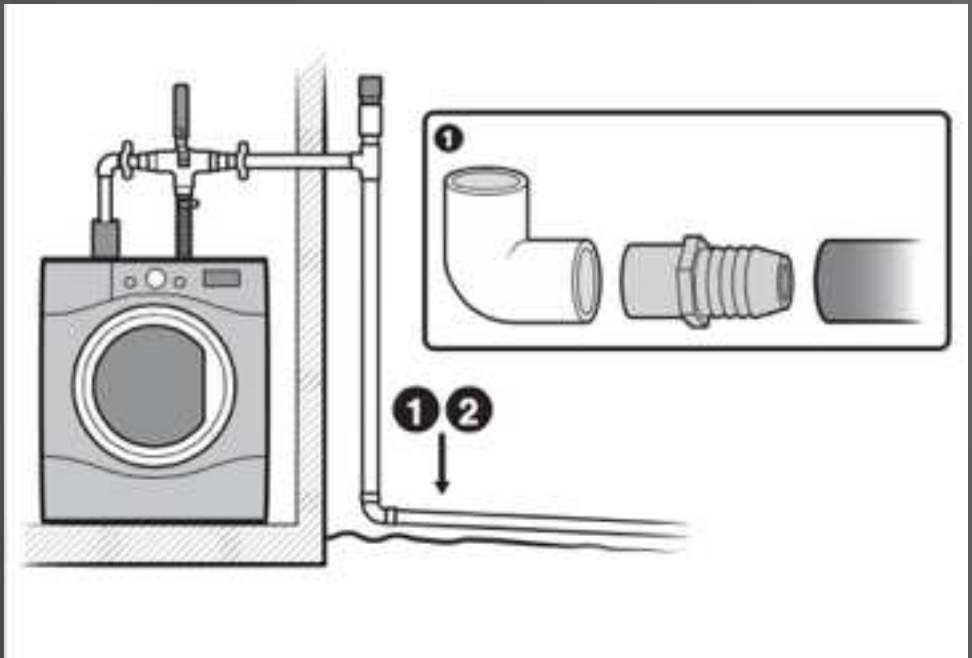
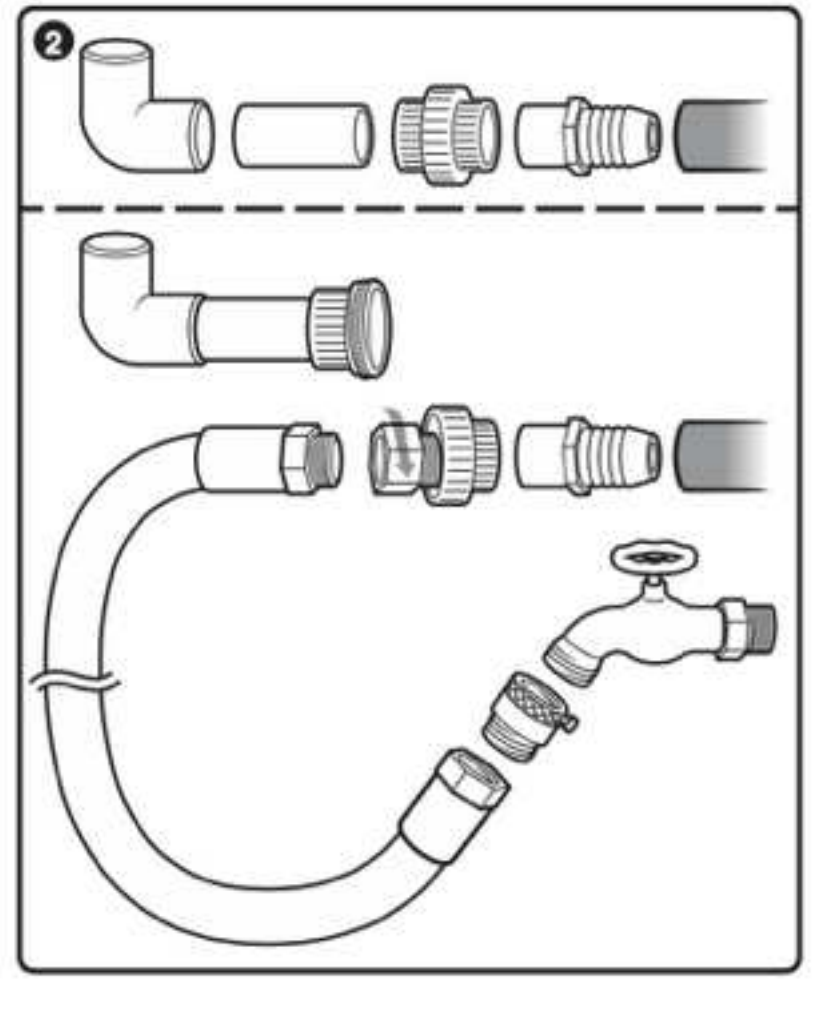
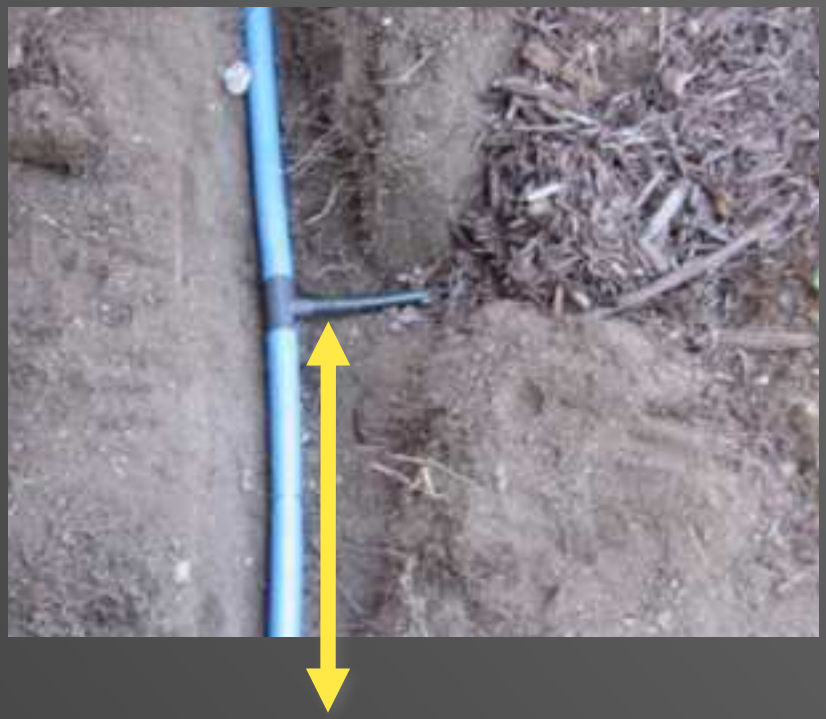
Test and "Tune" System





Images: ©James Provost from The Water-Wise Home

Balance Flows

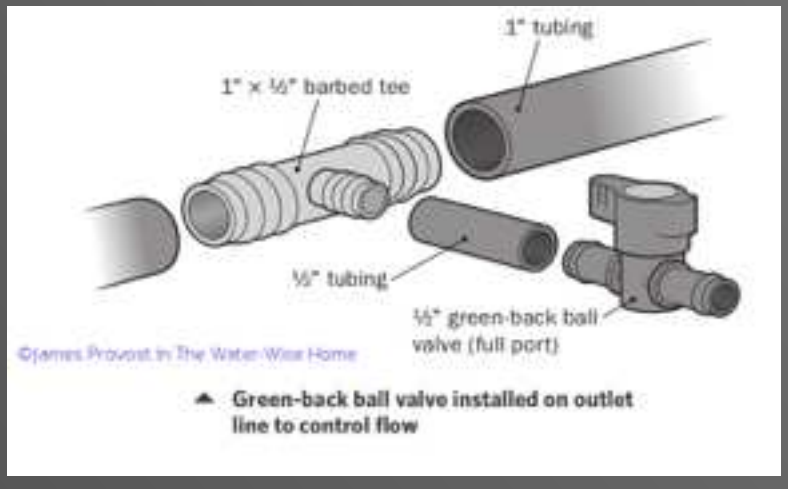


1st- Adjust angle of tees

2nd- Add one or two ball valves to restrict flow from outlets with too much flow

Avoid Clogs

- ✓ Minimize use of ball valves
- ✓ Use full port valves (that have large orifice inside)
- ✓ Open outlet is best!!!!!
- ✓ Check for clogs when valves are used



▲ Green-back ball valve installed on outlet line to control flow

Follow Up

- ✓ Bury tubing
- ✓ Check for leaks inside
- ✓ Paint exposed PVC pipe
- ✓ Caulk holes
- ✓ Post signs
- ✓ Post maintenance manual
- ✓ Get greywater friendly soap
- ✓ Do laundry.. and water plants

Code Summary
(chap. 16 in CA plumbing code)

Do's

- ✓ Have 3-way valve
- ✓ Label system
- ✓ Discharge under 2" mulch/rock/cover
- ✓ Direct water to irrigation or disposal field
- ✓ Minimize contact
- ✓ Have a maintenance manual

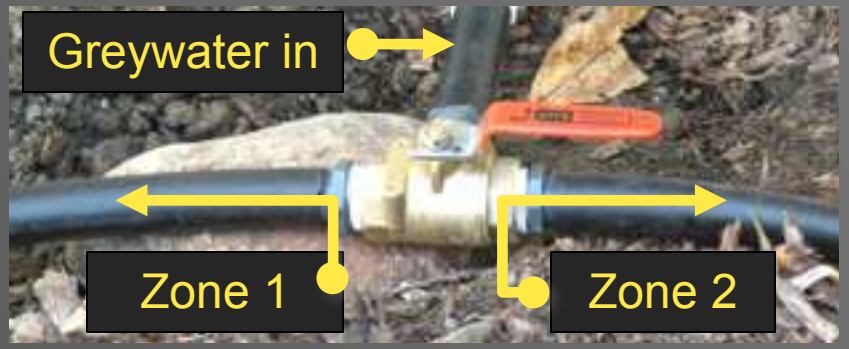
Code Summary
(chap. 16 in CA plumbing code)

Don'ts

- ✓ Have ponding or runoff
- ✓ Discharge into neighbor's yard (must follow setbacks)
- ✓ Connect to potable water supply
- ✓ Include a pump
- ✓ Violate other codes/laws
- ✓ Damage building
- ✓ Alter existing plumbing
- ✓ Use diaper wash water or hazardous chemicals (oily rags, etc.)

2-zone system for house producing lots of greywater

2nd 3-way valve in landscape creates zones. Must be switched manually.



Additional 1” line can be controlled with 1” ball valve to shut off or reduce flow.

What plants will you irrigate?

Use:

- ✓ Gallons per week of greywater
- ✓ Plant water requirements
- ✓ Choose what plants you'll irrigate
- ✓ (for those with existing irrigation systems) try and find a zone you can shut off and replace with greywater

Annual Maintenance

- ✓ Visually inspect valve and anti-siphon for leaks
- ✓ Check mulch basins. Dig out and replace composted mulch with fresh woodchips
- ✓ Check valves for clogs (unclog if necessary)

For more information visit

greywateraction.org

Resources:

- *San Francisco Graywater Design Guidelines for Outdoor Irrigation* (downloadable manual- sfwater.org/graywater)
- *The Water-Wise Home* by Laura Allen. How-to book with instructions for greywater irrigation systems.
- Ask This Old House episode *"Graywater, Small Engines"*
- Kit for L2L www.cleanwatercomponents.com
- L2L DVD from Oasisdesign.net (originators of L2L and Branched drain systems)
- Greywater Action's Q&A forum