Laundry-to-Landscape Greywater

Design and Installation

Presentation for West Basin greywater incentive program by:

Laura Maher and Sergio Scabuzzo

Welcome!

- Video from “Ask This Old House”
- Greywater Overview
- Laundry to landscape overview
- Step-by-step how to build an L2L
- Mock-up L2L system with real parts
- Design your system
- Next steps: Purchase materials and start building the system or find an installer

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?)

Greywater is

Water from

- Showers/baths
- Washing machines
- Sinks (lavatory or bathroom sinks)
- Kitchen sinks (not considered greywater in CA)

Not from

- Toilets or diaper wash water

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

Ecological products are healthier for you and the earth!

Things to avoid for happy plants:

- Salt *(sodium compounds)*
- 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

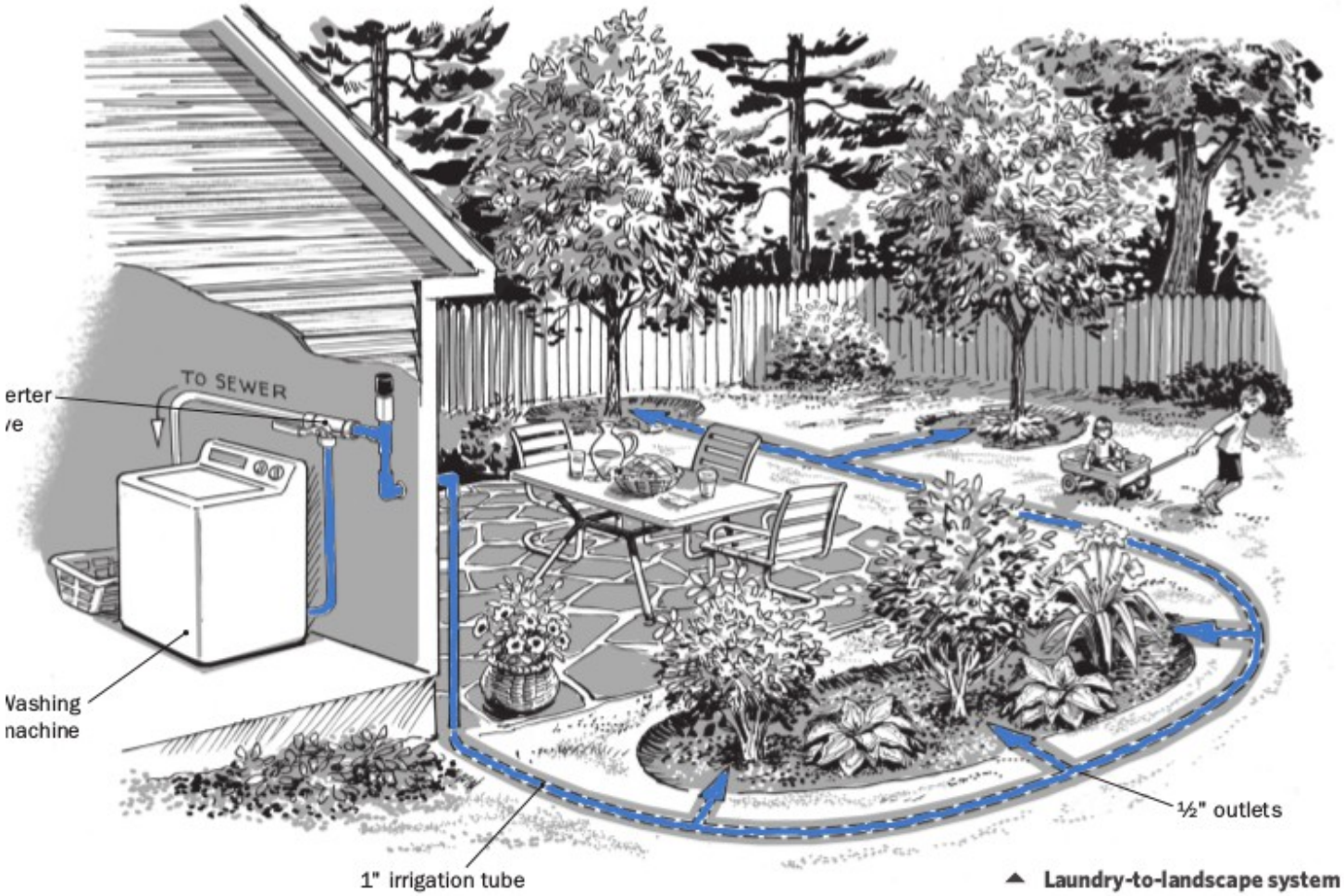
Shallow basin dug near the plant.

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).



▲ 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

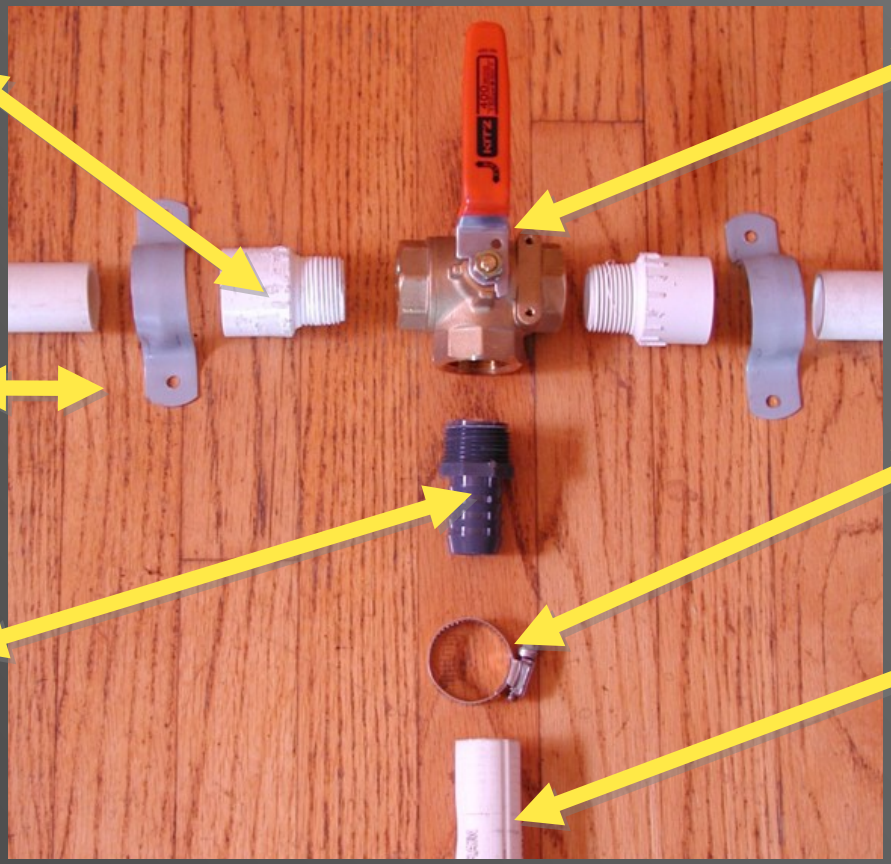
Pump filter

Connect the 3-way Valve

1” PVC
male adapter

1”schedule
40 PVC pipe

1”PVC barbed
male adapter



1”-brass 3-way
valve

Hose clamp

Washer hose
(from machine)

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

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”

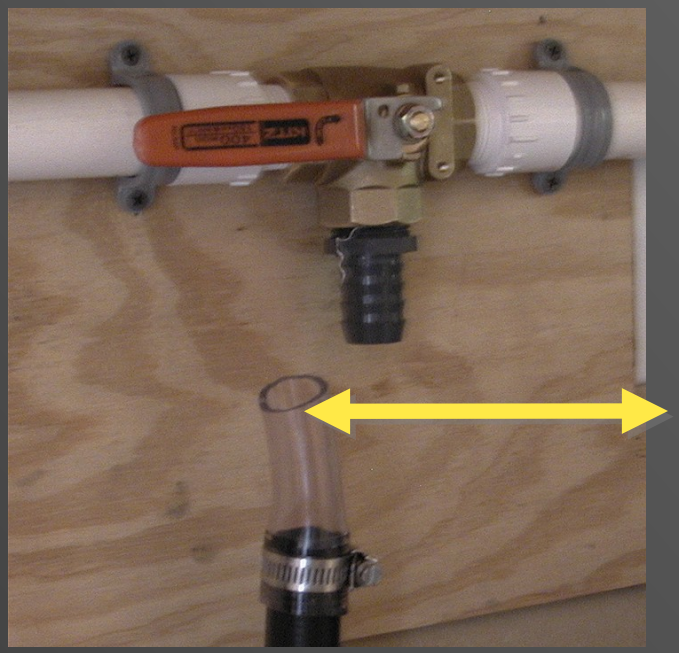
2. If its difficult to slip hose over barb, soften hose with hot water, then forcefully push it on barb

3. Secure with hose clamp

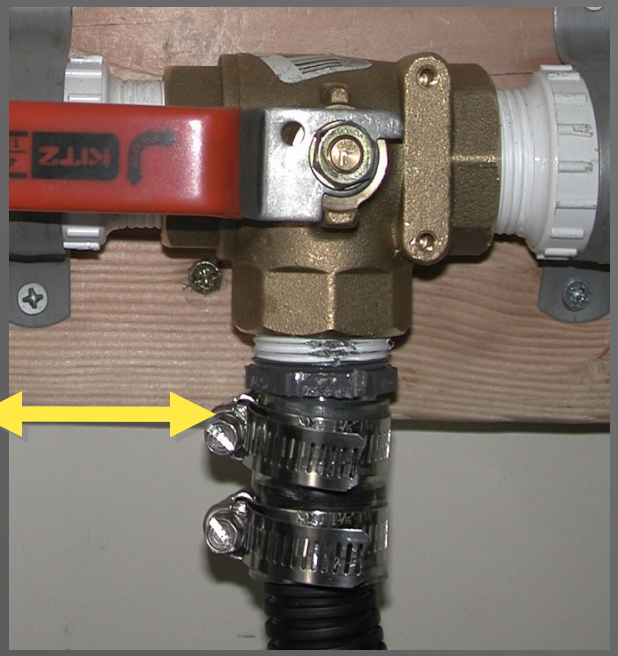
Troubleshooting Tips

If washer hose connection leaks:

- ✓ **1st** Tighten hose clamps, add 2nd hose clamp
- ✓ **2nd** Connect with piece of vinyl tubing



Vinyl bridge between barb and washer hose



Drill Hole for Pipe
(through the wall/floor)

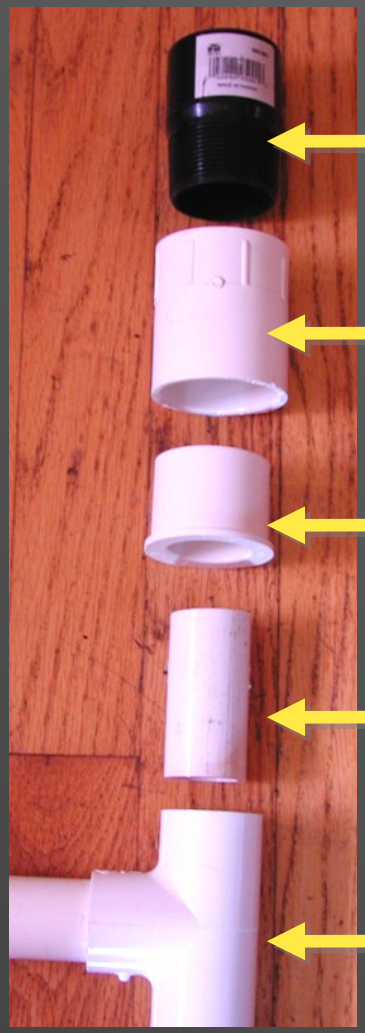
- Look for potential issues (electrical lines, gas pipes, etc.)
- Drill a 1/4” pilot hole
- If no obstructions, drill hole for 1” PVC with 1½” holesaw (Drill from outside in, and inside out for a clean looking hole)
- Use proper bit for your wall/floor (wood bit, stucco bit, etc.)

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)

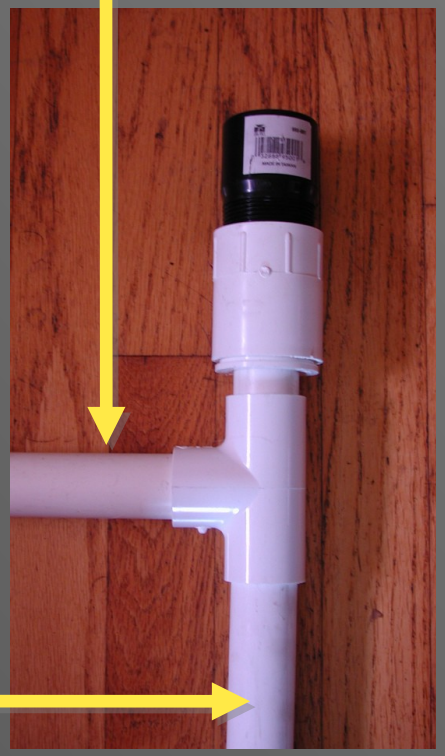
1 ½” FPT (female pipe threads) by slip coupling

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 <u>high point</u> 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

1) Sketch the inside portion of your L2L system.

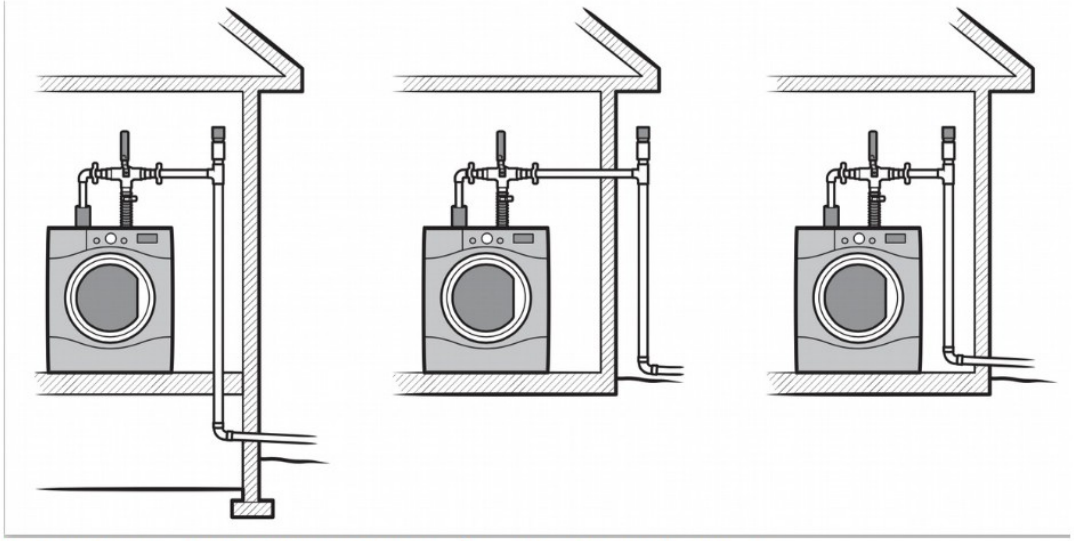
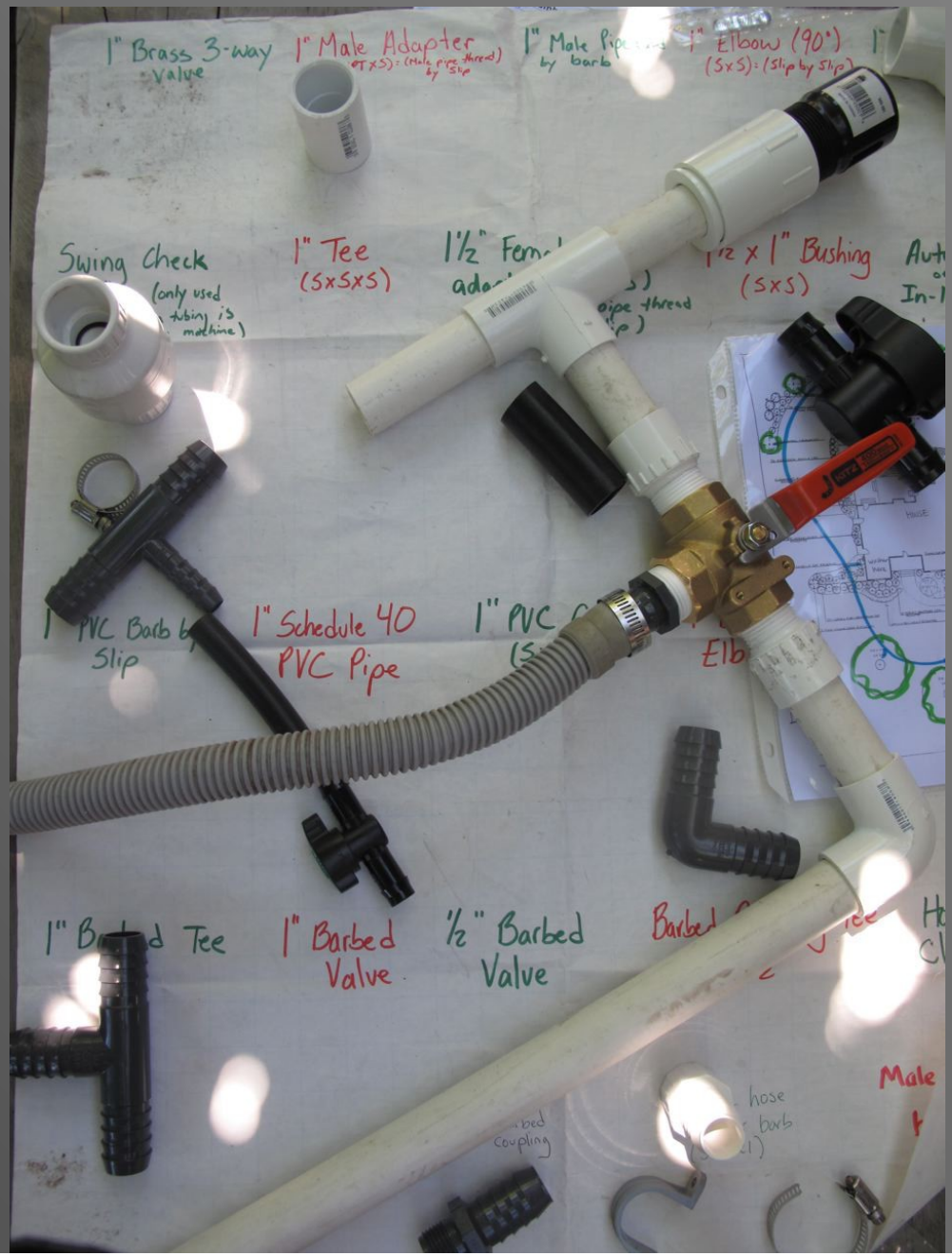


Illustration 1: © James Provost, 8714789 Canada, Inc., from The Water-Wise Home

L2L Mock-Up Activity

- ✓ What is the part called?
- ✓ How is it used in an L2L system?
- ✓ As a group, put a system together



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

2) Calculate how much greywater your home produces from the washing machine. This is how much weekly irrigation water you have available from the washer.

- Top loading machine ~ 40 gallons/load
- Front loading machine ~ 15 gallons/load
- Top-efficient machine (no agitator) ~ 25 gallons/load

_____ X _____ = _____ gallons/week
gallons/load loads/week

3) Calculate your daily maximum gallons/day. This number determines how large to make your mulch basins.

_____ X _____ = _____ maximum gallons/day
gallons/load max load/day

Choosing Plants for L2L Greywater Irrigation

Good options:

- ✓ 1st Trees (fruit trees are nice!)
- ✓ 2nd Shrubs/bushes
- ✓ 3rd Perennials and large annuals
- ✓ 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:

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

What would you water here?

Rank that Plant

Good choice for a L2L system

Might be okay

Bad idea

Potted Plants

Raised Beds

Salad greens?

Raised Beds

Squash?

Another Option

Photos by: City of Santa Rosa

Fruit Trees?

Edible in the Ground?

Tomatoes?

Edible in the Ground?

Onions?

Very General Plant Water Requirements

In the south bay

- A small-medium sized tree needs about 20-40 gallons per week
- A small-medium sized shrub needs about 10-20 gallons per week
- A drought tolerant shrub needs about 2-6 gallons per week

Note:
These are very rough estimates!

Plant water requirements are affected by microclimate, sun and wind exposure, size and type of plant, ground water depth, etc.

Plant Water Requirements

Peak irrigation in south bay

- Water ½ a gallon per week, per square foot of planted area

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

Example:
How much should you water a hedge each week that is 20 square feet in area?

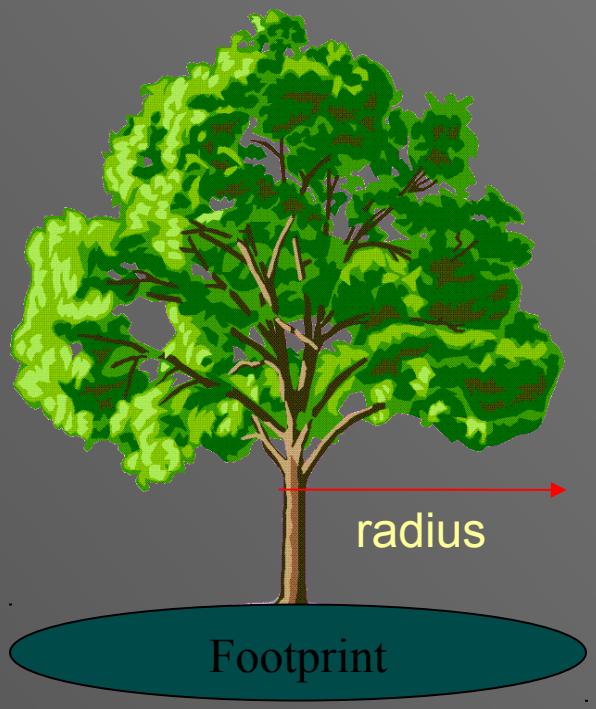
½ gallon x 20 square feet
=
10 gallons/week

Area of Planted Area

Rectangle or Square

Area = length x width

Circle



Area = πr^2

= 3 x radius x radius

In South Bay

How many gallons per week would a tree with a 20 square foot area require?

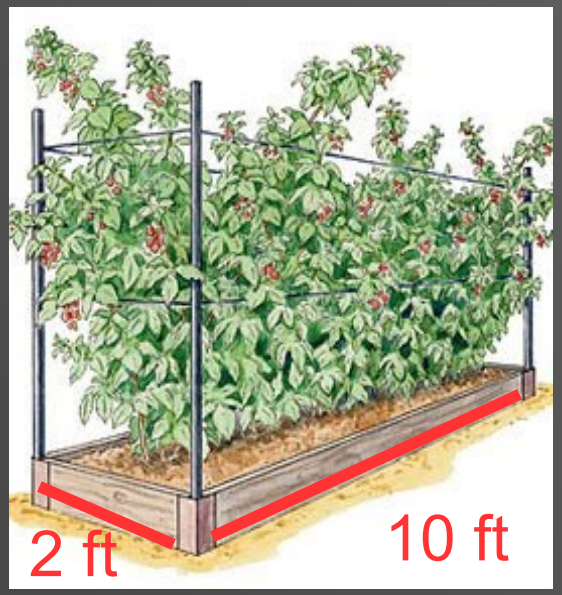
20 x 1/2 gallon = 10 gallons/week

- (This is for peak irrigation)

How many gallons per week would a hedge covering 30 square feet require?

Practice:
Finding Plant Water Requirements

How many gallons a week would this raspberry bush require during the peak irrigation season?



Example
Footprint= length x width
- 2 x 10 = 20 square feet
- 20 ÷ 2 = 10 gallons/week during the irrigation season

If this was a drought tolerant plant, irrigate half as much.
For example,
10 gallons ÷ 2 = 5 gallons/week

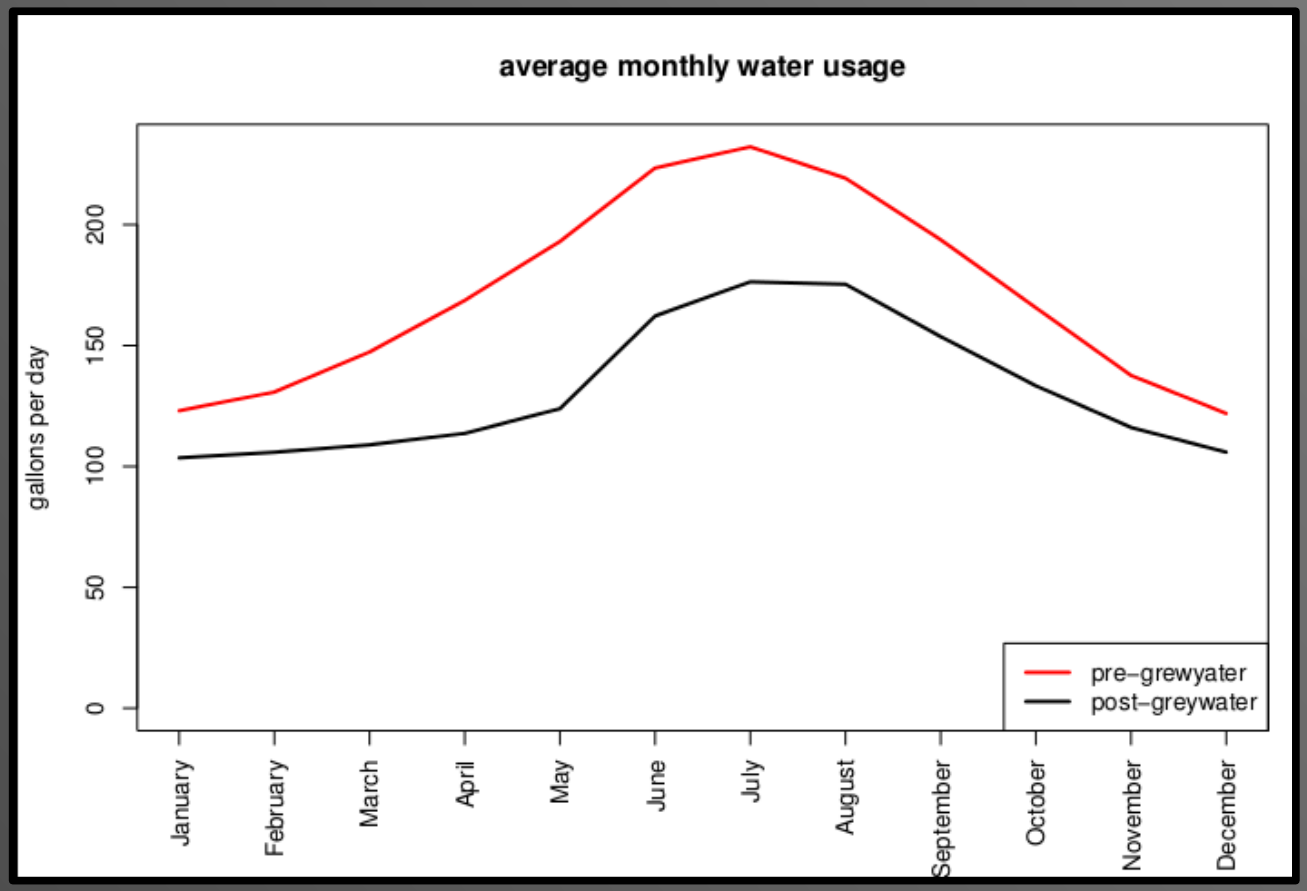
Improper Designs Won't Save Water

GW outlets planted in the middle of turf grass

Image credit City of Long Beach office of Sustainability

Adequately Designed Systems Do Save Water

Average savings: **14,565** gallons/year (~10,000 summer, ~5,000 winter)



www.greywateraction.org/greywater-study-0

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

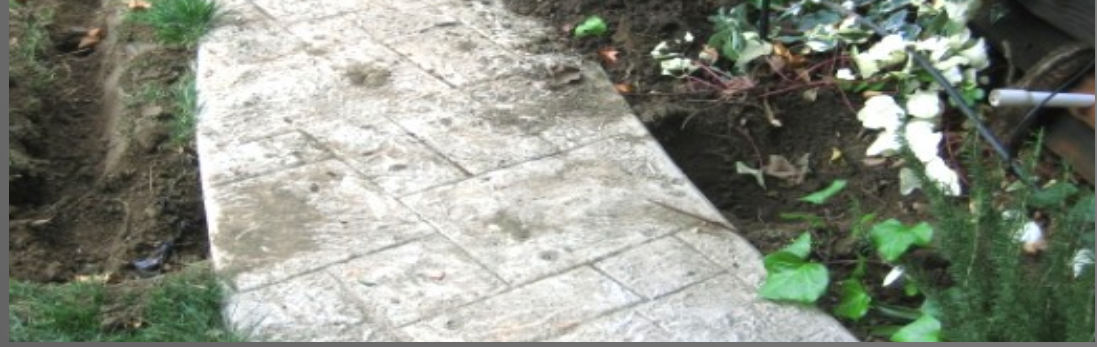
- 2 ft from buildings
- 1.5 ft from property lines
- 100 ft from wells or creeks
- 3 ft above groundwater table

Piping to Landscape

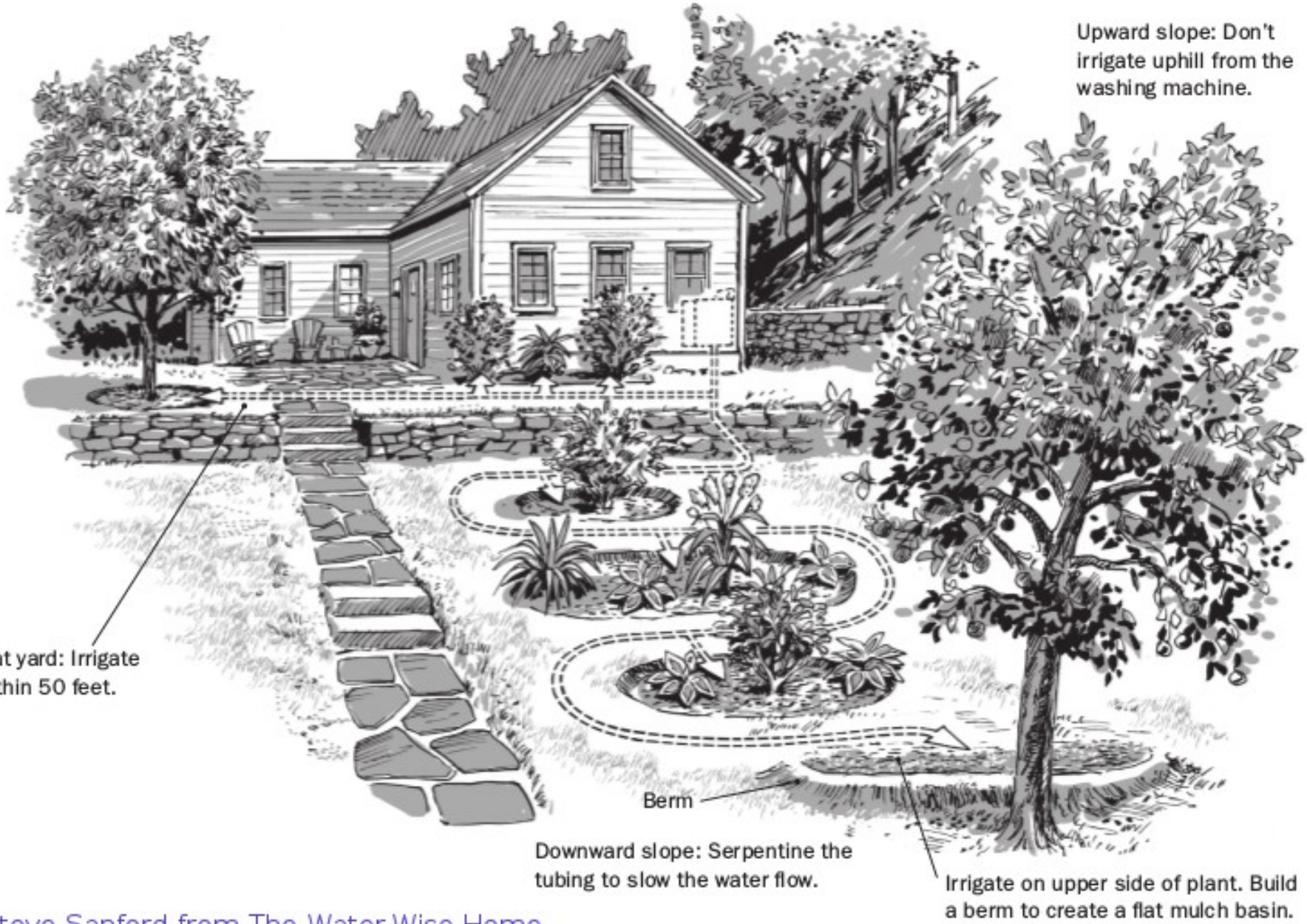
- Pipe around obstacles
- Try to maintain a downwards slope when ever possible

Hardscape

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



DISTRIBUTING WATER WITH AN L2L SYSTEM



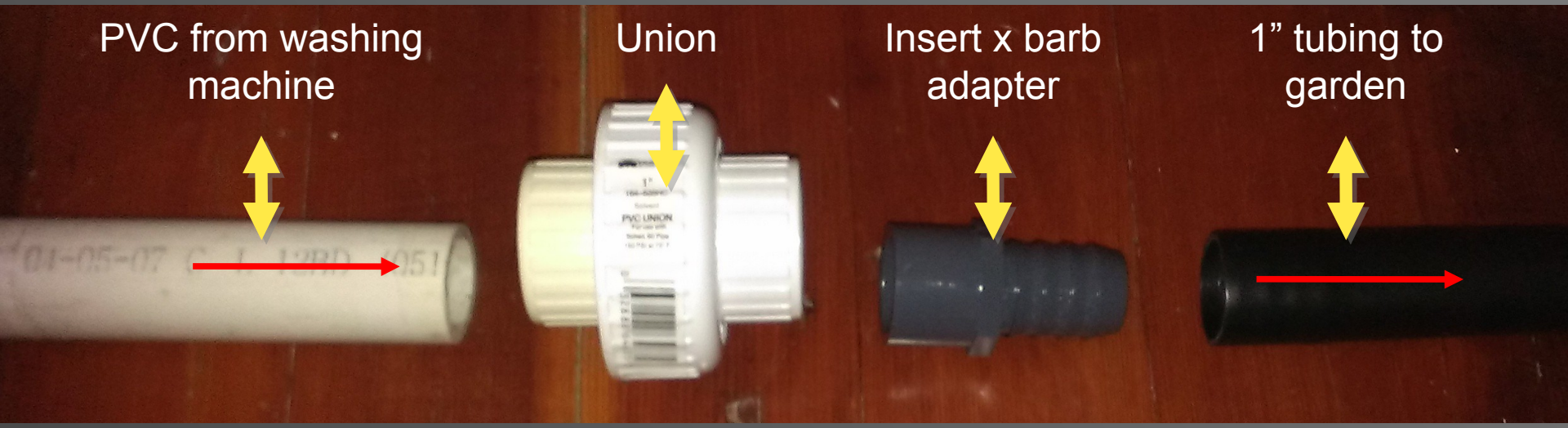
Slope Considerations

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.

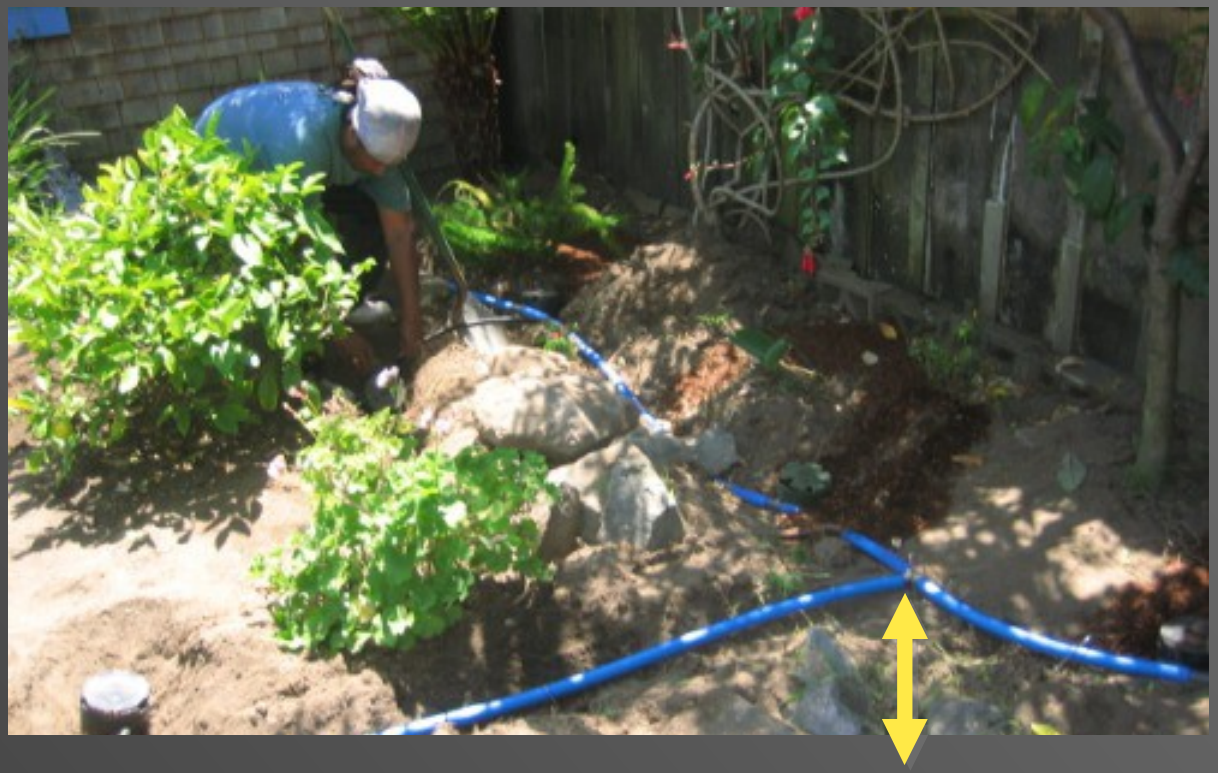
Note: *If the distribution points are uphill a L2L system is not recommended.*

Transition from PVC pipe to HDPE tubing



Connection completed

Trench and Install Tubing to Basins



Keep tubing out of the way, and out of sunlight. Stake down as needed

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

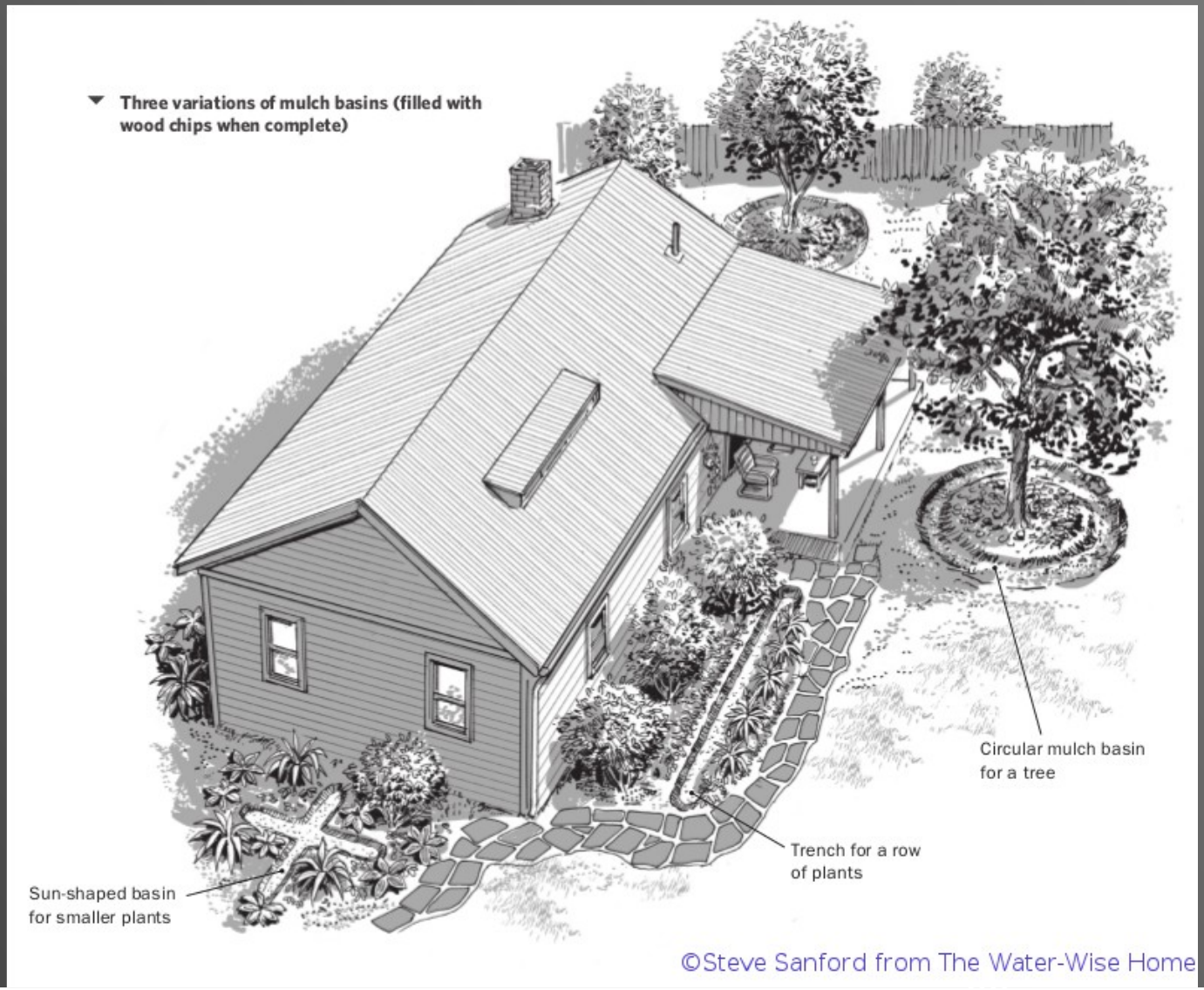
Trench and Install Tubing to Basins

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



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

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

Mulch Basin Construction

Example: (Clay soil)
3 loads of laundry (on Saturdays)
at 20 gallons/load to water 6 trees.

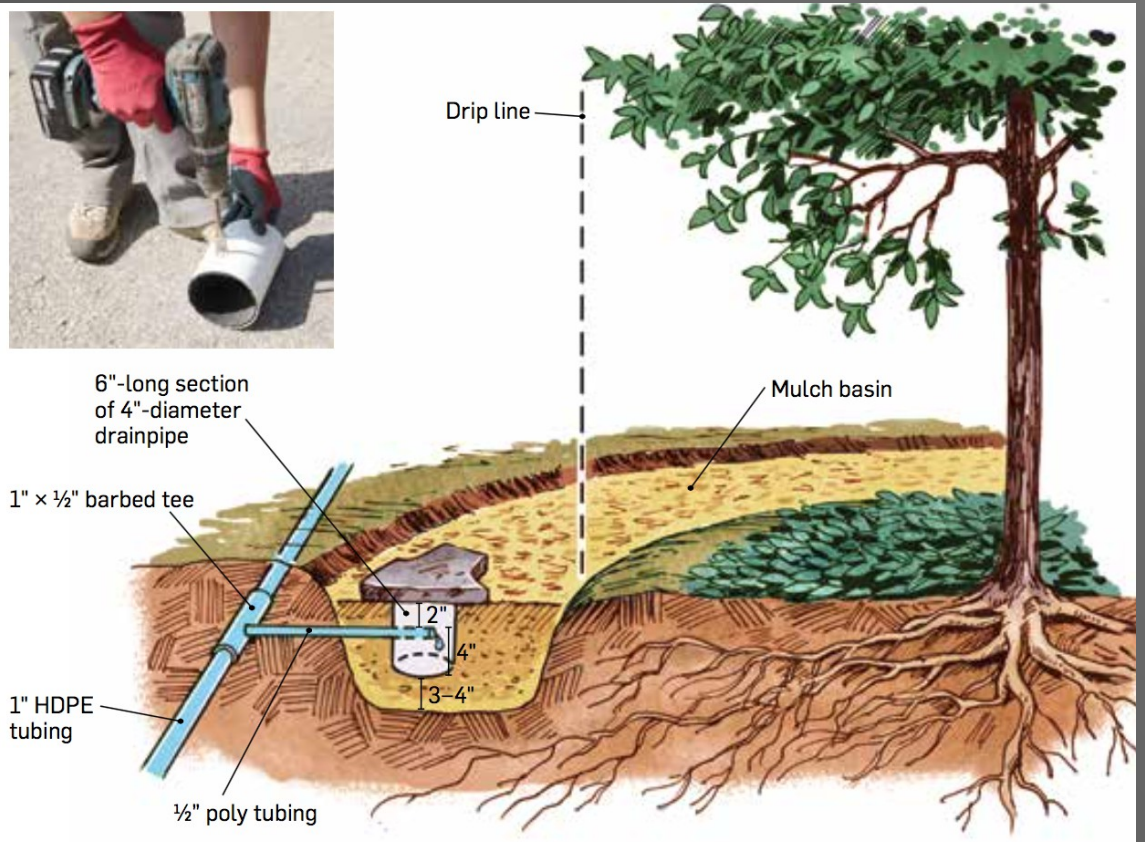
3 x 20= 60 gallons.
60/6= 10 gallons per tree.

Each tree needs at least 10 sq. ft. of basin.

This basin is 24
square feet.

Mulch Shield- Irrigation Valve Box

Mulch Shield-
prevents roots from clogging outlet



MAKING A MULCH SHIELD FROM 4" DRAINPIPE. *Cut the pipe into 6" lengths, then drill a hole 2" down (see photo) just large enough to insert the greywater tubing. Put something on top to cover it, like a flat rock. This can be used with water-efficient machines or pumped systems.*

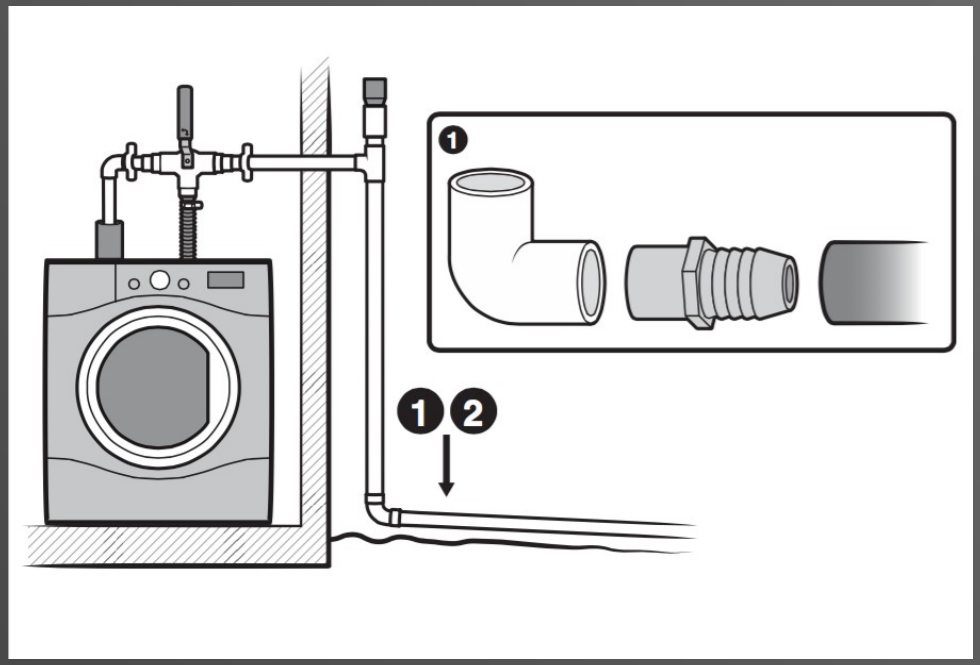
Piece of 4" drainpipe

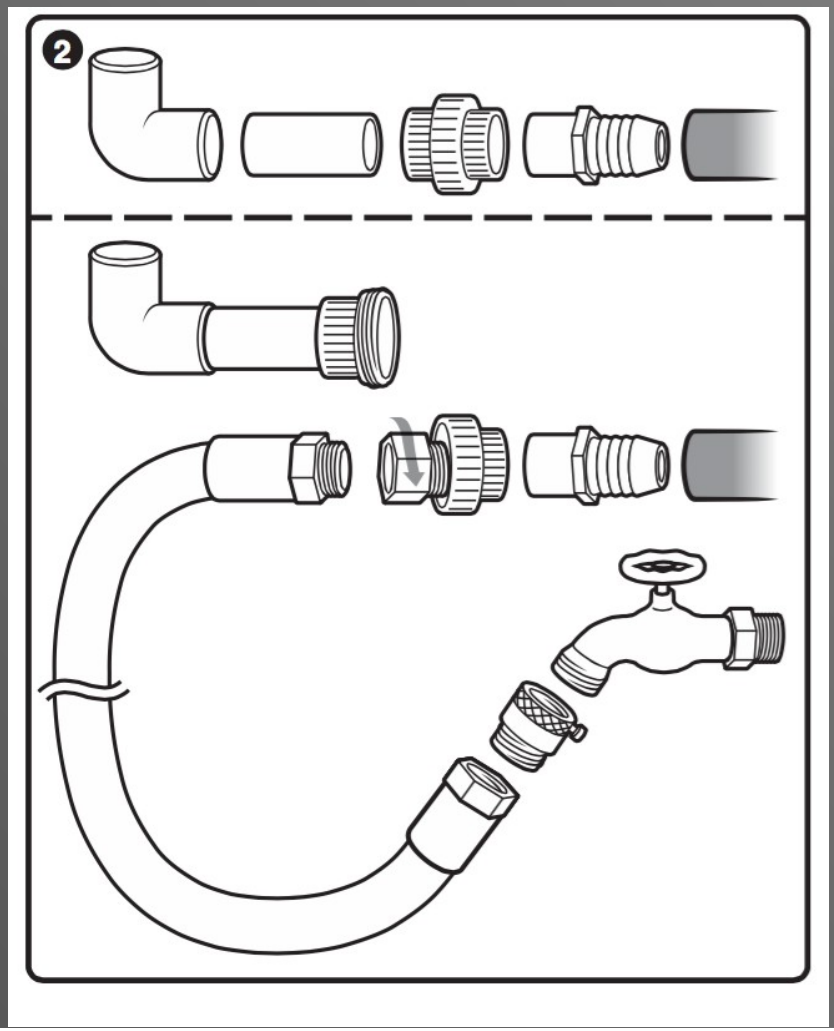
End of the Line- Overflow Options

ONE OPTION FOR END OF MAIN LINE
Open 1" line in a mulch shield.

SECOND OPTION FOR OPEN END OF 1" LINE

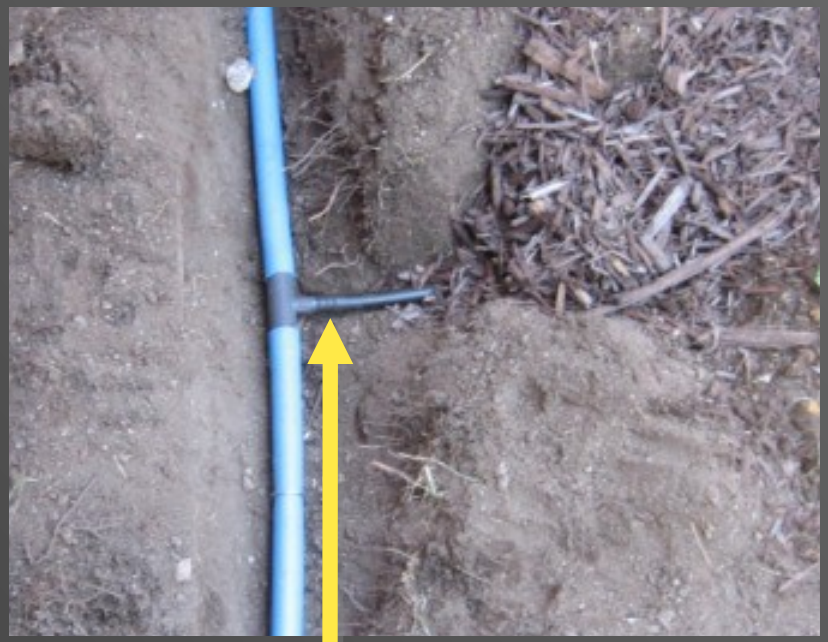
Test and "Tune" System





Images: ©James Provost from The Water-Wise Home

Balance Flows

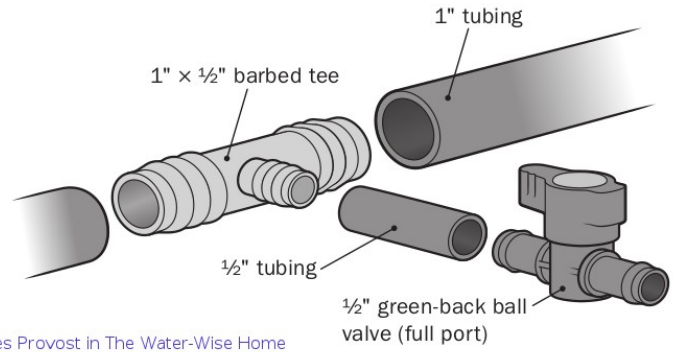


1st- Adjust angle of tees

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



©James Provost in The Water-Wise Home

▲ **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

Paint plastic pipe
to protect from UV Seal hole with **Sikaflex**

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)

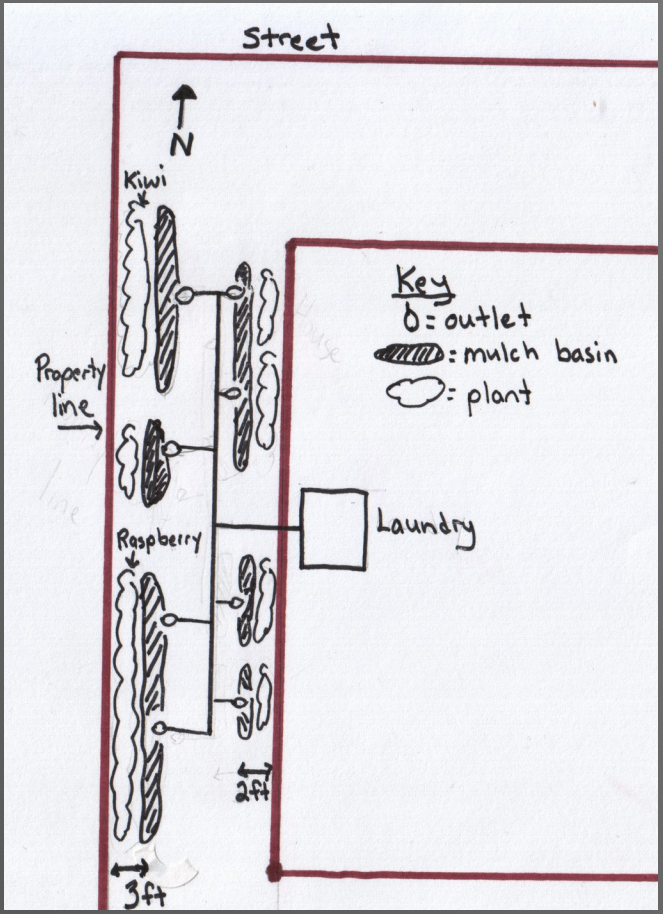
What plants will you irrigate?

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

Sketch the outside portion of your system

- ✓ (write down materials you'll need and lengths of pipe and tubing)
- ✓ Will you need any 1”x1”x1” tees?
- ✓ How many 1” x 1/2” tees will you need?
- ✓ Remember, the end of the tubing will be fully open and located in a mulch basin to irrigate a plant



Next Steps

1. Schedule your free “In-home” Consultation
2. Design your system
3. Purchase your parts (and receive the $100 discount)
4. Install Your System
5. Contact West Basin for a final inspection

Need extra help?
Visit greywateraction.org

Code Summary
(chap. 15 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. 15 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.)