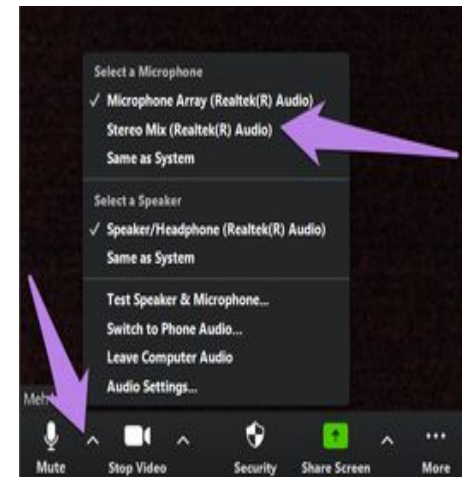


# Welcome to Hydrate Phoenix: Hydrate with Greywater!

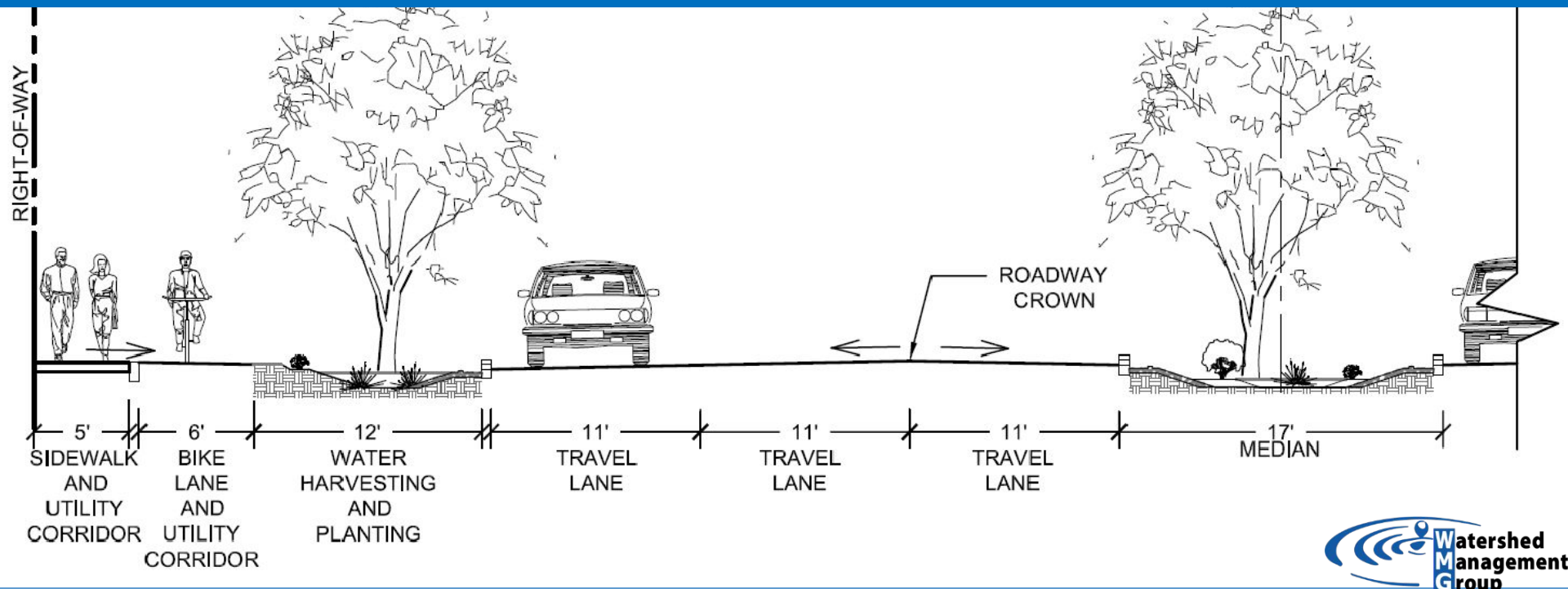
## To connect with us best here on Zoom:

- Please keep yourself muted when not speaking.
- Please use the chat feature to ask questions. There will be time at the end of class where the moderator will share these questions with the presenter
- If you have technical difficulties with Zoom please visit: [support.zoom.us/hc/en-us](https://support.zoom.us/hc/en-us)





**Watershed Management Group** develops and implements community-based solutions to ensure the long-term **prosperity of people** and **health of the environment**. We provide people with the knowledge, skills, and resources for sustainable livelihoods.





An aerial photograph of a single-story house in a desert setting. The house has a tan exterior and a brown roof with several solar panels installed. In the foreground, there are two large, cylindrical, corrugated metal water storage tanks. To the left of the house, there are several raised garden beds filled with green plants. The background shows a desert landscape with various cacti, shrubs, and a range of blue mountains under a clear sky.

# Desert Living Home Tour!

Saturday, October 23rd 10a.m. - 3p.m.

Virtual and In-Person

Registration Open  
[watershedmg.org/hometour](https://watershedmg.org/hometour)





# Hydrate With Greywater:

Harvest greywater to complete your backyard oasis



# Using Gray Water at Home

Arizona Department of  
Environmental Quality's Guide  
to Complying with the  
Type 1 General Permit



Arizona Department  
of Environmental Quality

Janice K. Brewer, Governor  
Henry R. Darwin, Director

## Learning Objectives

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1. Define greywater
2. Identify sources of greywater
  - Calculate amount of available greywater
  - Match greywater to plant needs
3. Determine location and type of greywater system and integrate into site plan





# Passive vs. Active Water Harvesting

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Passive: land contouring (basins, swales, berms). Requires little maintenance but cannot store water long-term.

Active: greywater, rain tanks. Requires active use of system but gives more control.

- Tanks allow collection across many rain events and storage during dry months.



# What is greywater?

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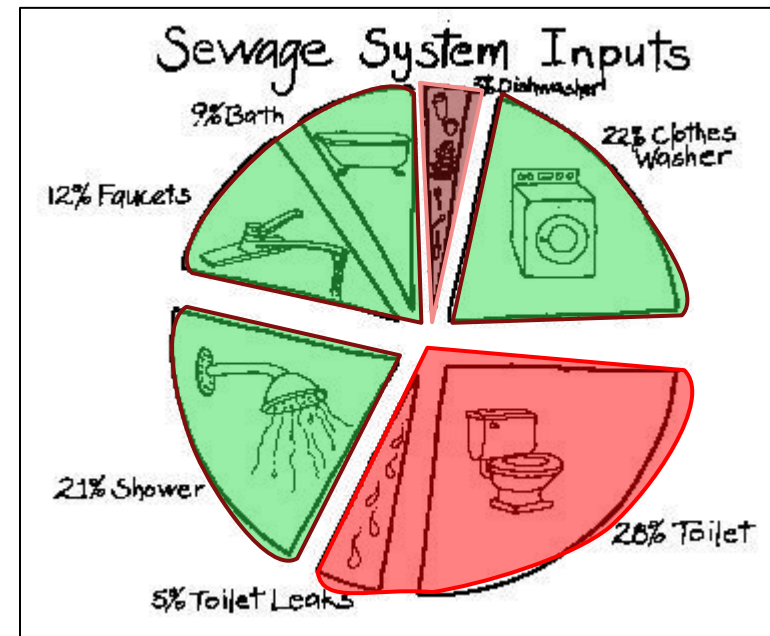
# Greywater definition

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Reusing water from household for other purposes.

Greywater sources:

- Shower
- Sinks (kitchen?)
- Laundry
- Greywater does not include toilet water (blackwater).



# How much are you producing?

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## Step 1: How much greywater does your home produce?

Laundry: \_\_\_gal/use \* \_\_\_ uses/week \* 52 weeks

Top loading = ~30-40 gallons/load

Front loading = ~15-25 gallons/load

Shower: \_\_\_gal/min \* \_\_\_ min \* \_\_\_ uses/week \* 52 weeks



# What's in your yard?

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# How much water does it need?

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Calculate canopy area, planning for mature size

- Formula:  $\pi * \text{radius squared}$
- Example: 10 ft radius  $\square 10 * 10 * 3.14 = 314 \text{ sq ft canopy}$

Use conversion factor \* canopy size to calculate how many gallons of water per year are needed

Conversion factors:

- Low water use: 10
- Moderate water use: 19
- High water use: 28

Water need = area \* conversion factor



# Example: Calculating water demand of plants and trees

---

Citrus tree, 10 foot radius

- Canopy:  $10 \text{ ft} * 10 \text{ ft} * 3.14 = 314 \text{ sq ft}$
- $314 \text{ sq ft} * 28$  (high-water use conversion factor) = 8,792 gal/yr

Peach tree, 5 foot radius

- Canopy:  $5 \text{ ft} * 5 \text{ ft} * 3.14 = 78.5 \text{ sq ft}$
- $78.5 \text{ sq ft} * 19$  (moderate-use conversion factor) = 1,492 gal/yr

Conversion factors:

- Low water use: 10
- Moderate water use: 19
- High water use: 28

## General Permit BMPs

Follow these best management practices to comply with Arizona's rules for gray water use

- First and foremost, avoid human contact with gray water, or soil irrigated with gray water.
- You may use gray water for household gardening, composting, and lawn and landscape irrigation, but use it in a way that it does not run off your own property.
- Do not surface irrigate any plants that produce food, except for citrus and nut trees.
- Use only flood or drip irrigation to water lawns and landscaping. Spraying gray water is prohibited.
- When determining the location for your gray water irrigation, remember that it cannot be in a wash or drainage carrying runoff.
- Gray water may only be used in locations where groundwater is at least five feet below the surface.
- Label pipes carrying gray water under pressure to eliminate confusion between gray water and drinking water pipes.
- Cover, seal and secure storage tanks to restrict access by small rodents and to control disease carrying insects such as mosquitoes.
- Gray water cannot contain hazardous chemicals such as antifreeze, mothballs and solvents. Do not include wash water from greasy or oily rags in your gray water.
- Gray water from washing diapers or other infectious garments must be discharged to a residential sewer or other wastewater facility, unless the gray water is disinfected prior to its use.
- Minimize surface accumulation of gray water to promote drying of soil.
- Filters may be used to reduce plugging and extend the gray water system's lifetime. If the gray water system becomes plugged or blocked, the gray water must be directed into your normal wastewater drain system.
- You may not reduce the capacity or reserve area requirements of your septic tank or other on-site wastewater disposal system because you are using gray water.



## Contacts for Gray Water Information

### Phoenix Main Office

Serving Gila, La Paz, Maricopa, Pinal and Yuma Counties  
1110 W. Washington St., Phoenix, AZ 85007

(602) 771-2300

Toll Free (800) 234-5677

TDD (602) 771-4829

[pmo@azdeq.gov](mailto:pmo@azdeq.gov)

### Southern Regional Office - Tucson

Serving Cochise, Graham, Greenlee, Pima  
and Santa Cruz Counties

(520) 628-6733

Toll Free (888) 271-9302

[sro@azdeq.gov](mailto:sro@azdeq.gov)

### Community Liaisons

ADEQ has community liaisons located throughout the state to assist residents in rural communities. In addition to providing ADEQ specific information, your community liaison can suggest a specific person in your county government to contact about gray water.

NW Arizona – (928) 679-7307

NE Arizona – (928) 337-3565

SE Arizona – (928) 348-3040

SW Arizona – (520) 770-3309

This brochure is available at

[azdeq.gov/environ/water/permits/download/graybro.pdf](http://azdeq.gov/environ/water/permits/download/graybro.pdf)

Publication No. C 10-04  
Updated 02/11

# Using Gray Water at Home

Arizona Department of  
Environmental Quality's Guide  
to Complying with the  
Type 1 General Permit



Janice K. Brewer, Governor  
Henry R. Darwin, Director



# What can you NOT do with greywater?

- Vegetable gardens
- Irrigating lawns
- Places people and animals play
- Water features
- Don't store



# Products / items to avoid

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[HTTP://WWW.HARVESTINGRAINWATER.COM/GREYWATER-HARVESTING/](http://www.harvestingrainwater.com/greywater-harvesting/)

[HTTP://ECOLOGYCENTER.ORG/FACTSHEETS/](http://ecologycenter.org/factsheets/)

- chlorine or bleach
- Peroxygen
- Salts (sodium)
- sodium perborate
- sodium tryptochlorite
- boron
- borax
- petroleum distillate
- alkylbenzene
- “whiteners”
- “softeners”
- “enzymatic” components





# Simple greywater systems

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Source: Brad Lancaster, Rainwater  
Harvesting for Drylands & Beyond



Source: Brad Lancaster, Rainwater Harvesting for Drylands & Beyond





Source: Brad Lancaster, Rainwater Harvesting for Drylands & Beyond









# Kitchen Resource Drain

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Source: Brad Lancaster, Rainwater Harvesting for Drylands & Beyond



# Greywater Systems

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## DISTRIBUTION

- ✓ Single outlet
- ✓ Multi-stack outlets
- ✓ Branched Drain
- ✓ Laundry to Landscape (L2L)
- ✓ Collection & Pump systems

## OUTLETS

- ✓ Surface outlets
- ✓ Mulched outlets
- ✓ Infiltrator chambers
- ✓ Emitters – L2L
- ✓ Emitters – pump systems

# Greywater Systems

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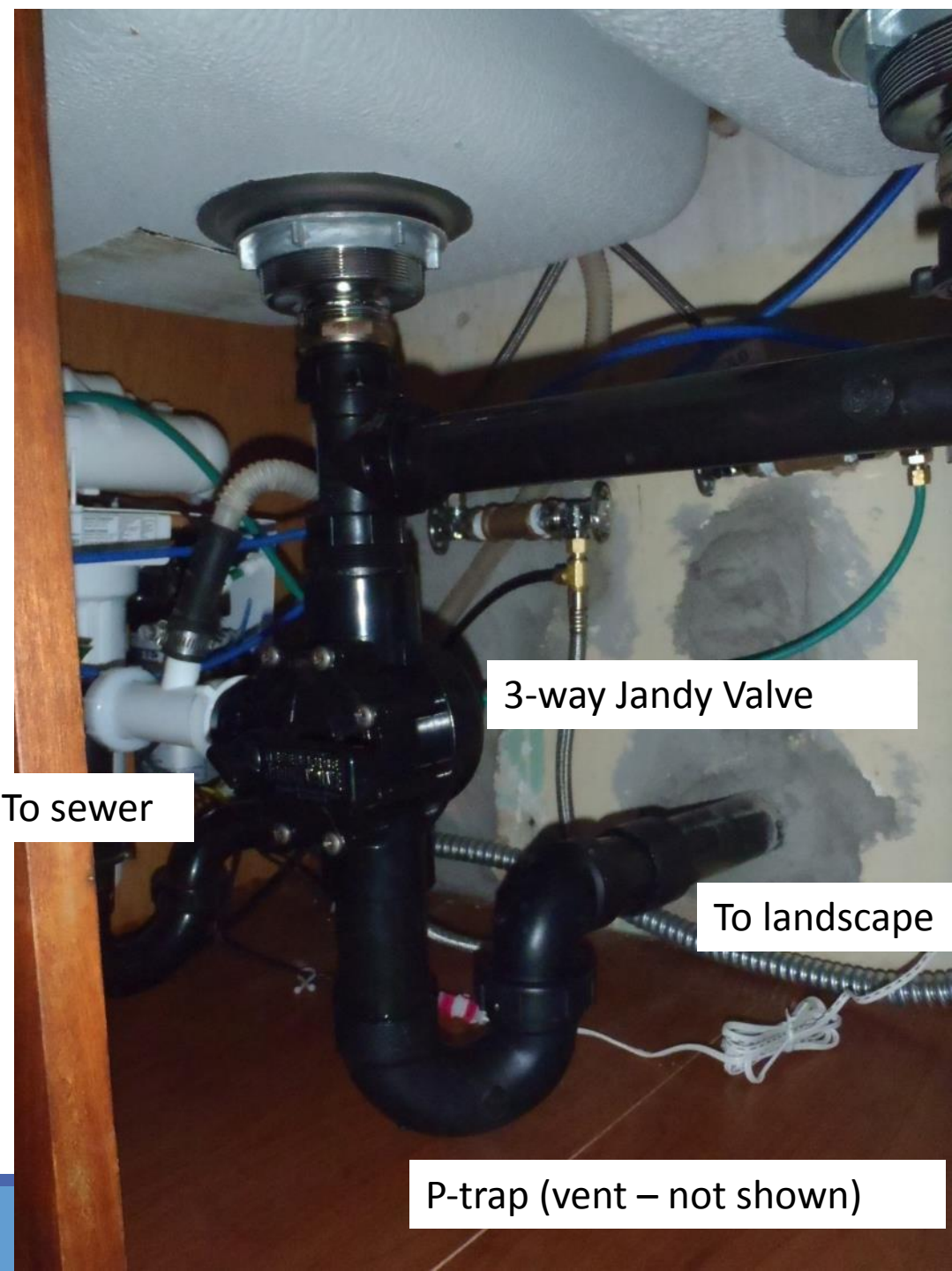
## DISTRIBUTION

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- ✓ Collection & Pump systems

## OUTLETS

- ✓ Surface outlets
- ✓ Mulched outlets
- ✓ Infiltrator chambers
- ✓ Emitters – L2L
- ✓ Emitters – pump systems





3-way Jandy Valve

To sewer

To landscape

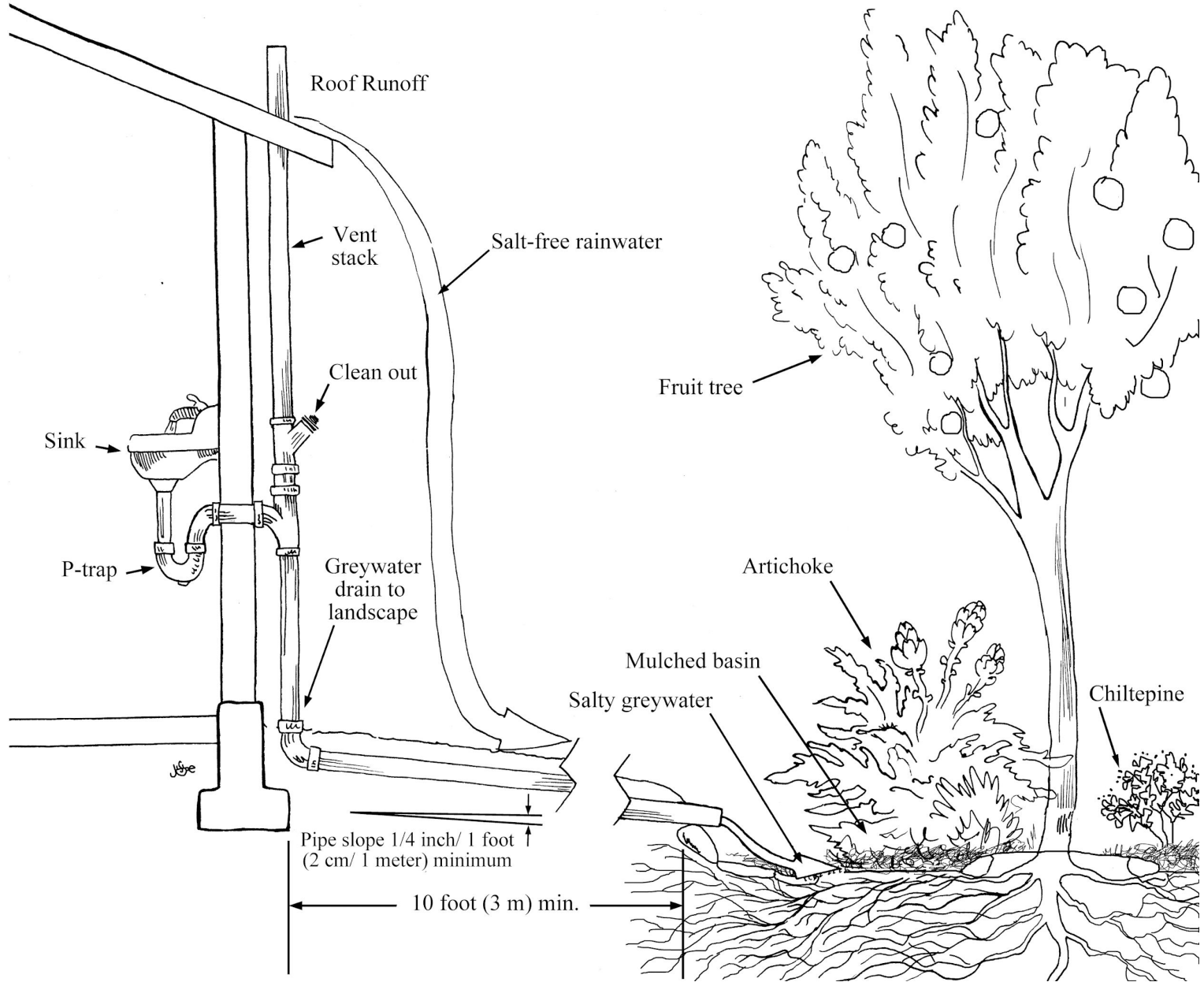
P-trap (vent – not shown)



Flow splitter

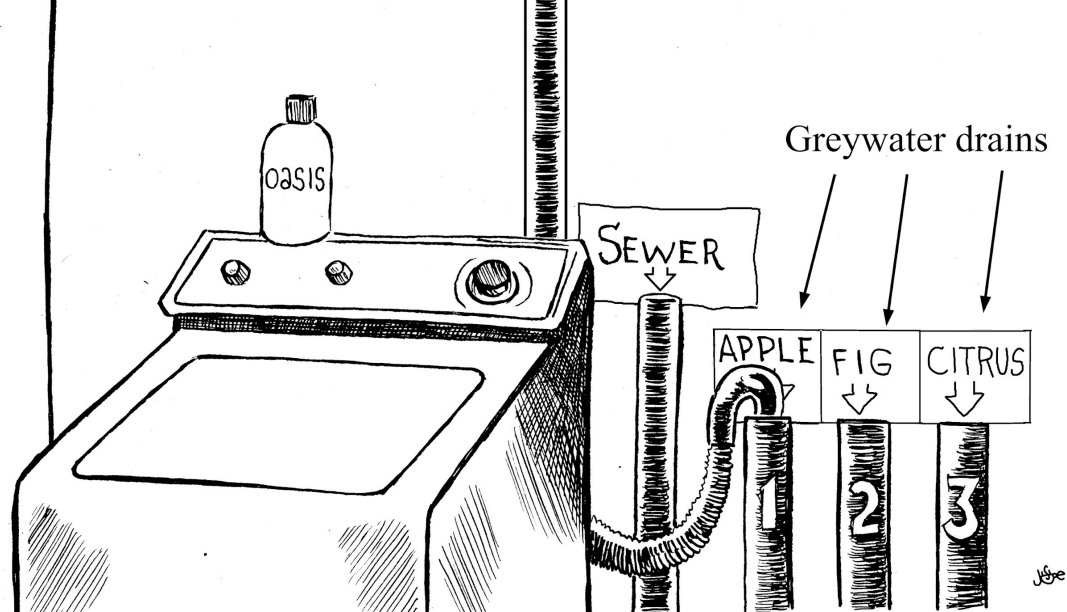


Infiltration chamber



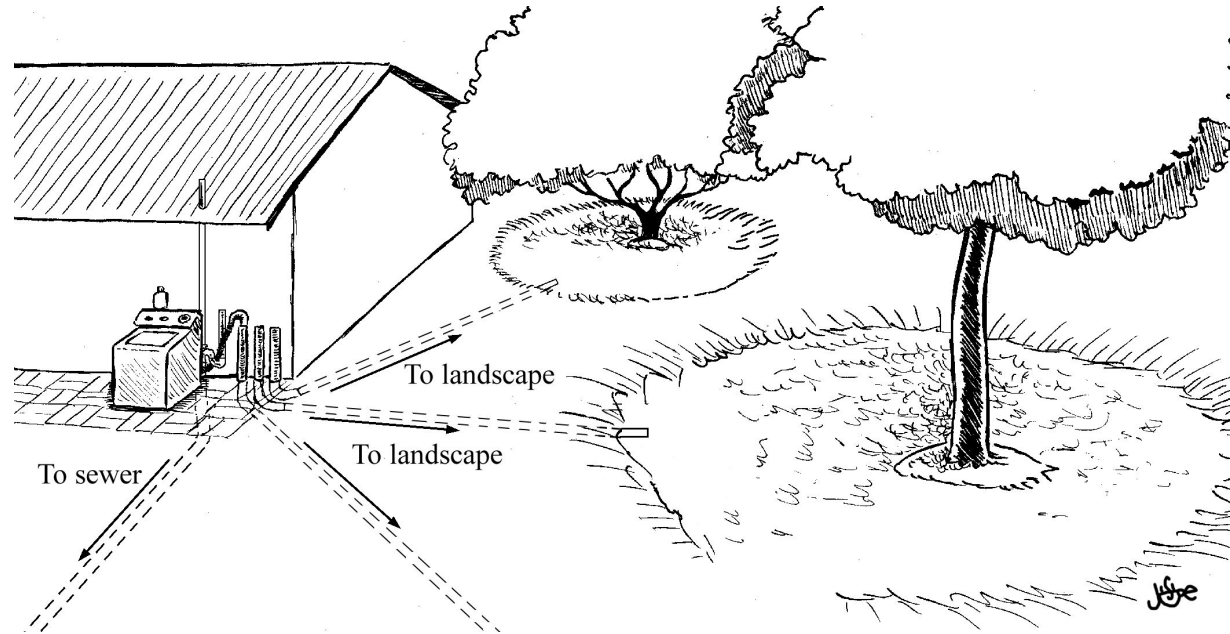
Source: Brad Lancaster, Rainwater Harvesting for Drylands & Beyond





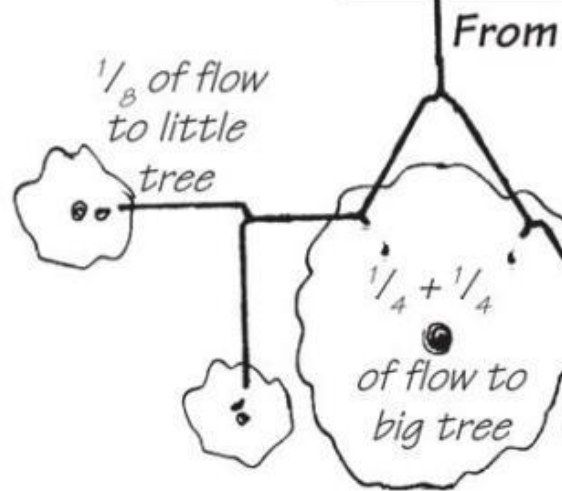
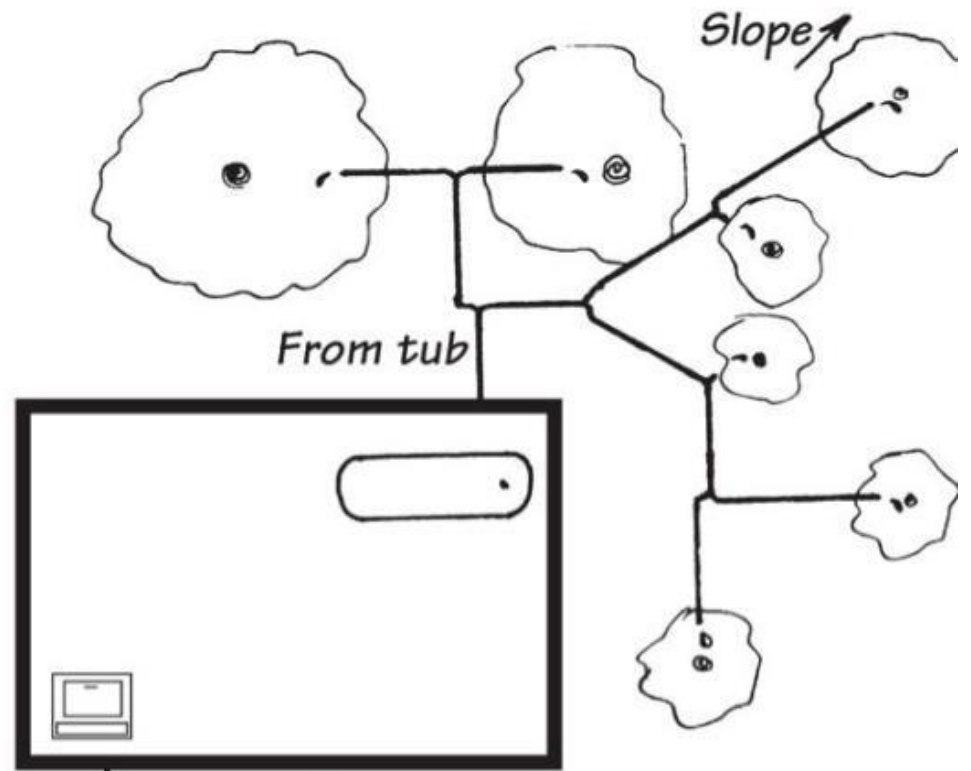
Outdoor, simplified version

# Multi-pipe laundry greywater system

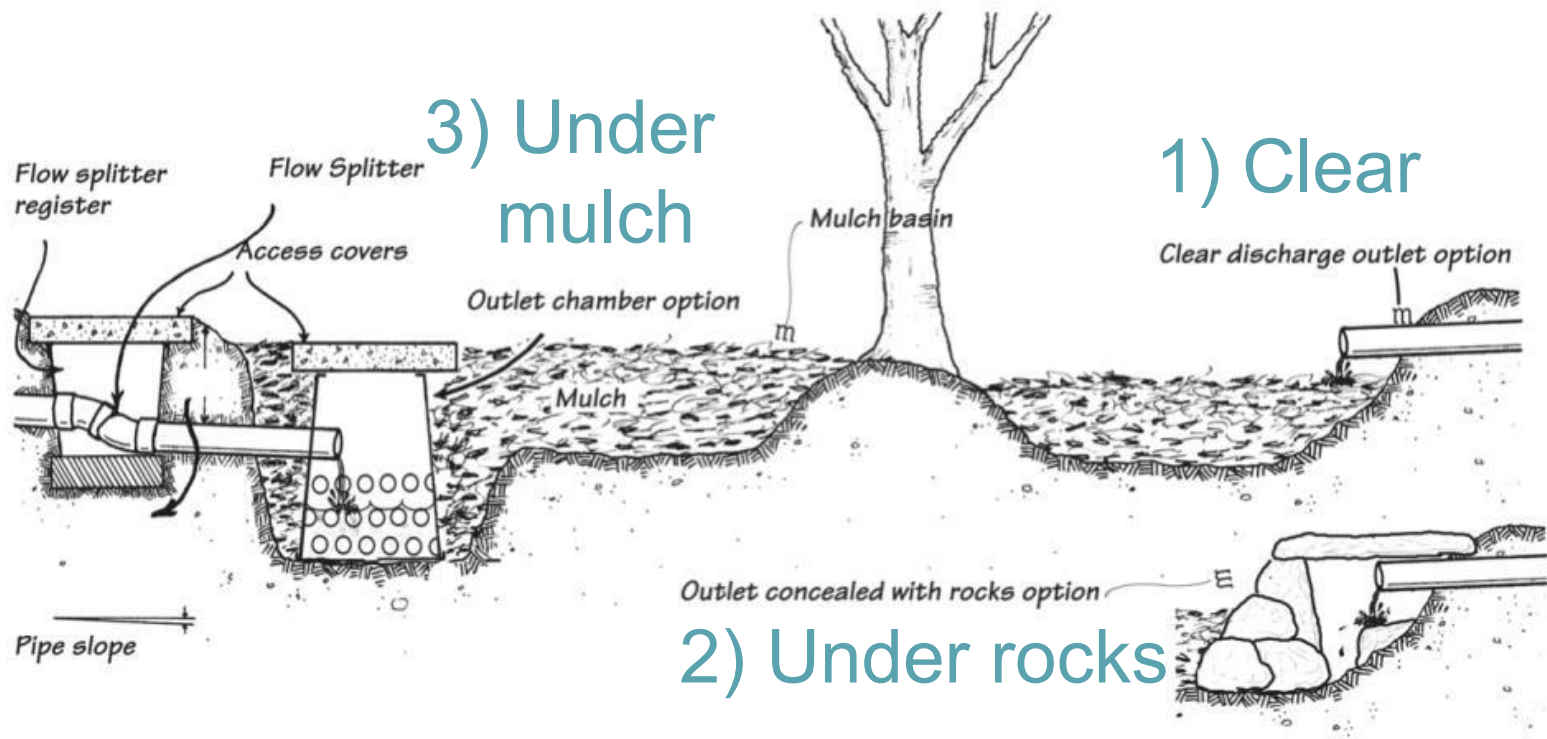




# Split the flow



# Outlet Options



3) Under mulch

1) Clear

2) Under rocks

4) Under soil (not shown)











# Overcoming Gravity

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OPIS

GREYWATER  
SURGE  
TANK

IN HOT TEMPS  
HOSE

# Laundry to Landscape

---







GREEN WATER  
2014

WARNING  
DO NOT OPERATE THIS  
WASHER WITHOUT THE  
WATER SUPPLY VALVE  
BEING OPEN AND THE  
WATER SUPPLY HOSE  
BEING CONNECTED TO  
THE WATER SUPPLY  
VALVE.

WARNING  
DO NOT OPERATE THIS  
WASHER WITHOUT THE  
WATER SUPPLY VALVE  
BEING OPEN AND THE  
WATER SUPPLY HOSE  
BEING CONNECTED TO  
THE WATER SUPPLY  
VALVE.

GREEN WATER  
↓

2014

FABRIC  
TEMPERATURE

SIGNAL  
END OF CYCLE

PUSH TO START

KINT /  
CASUAL

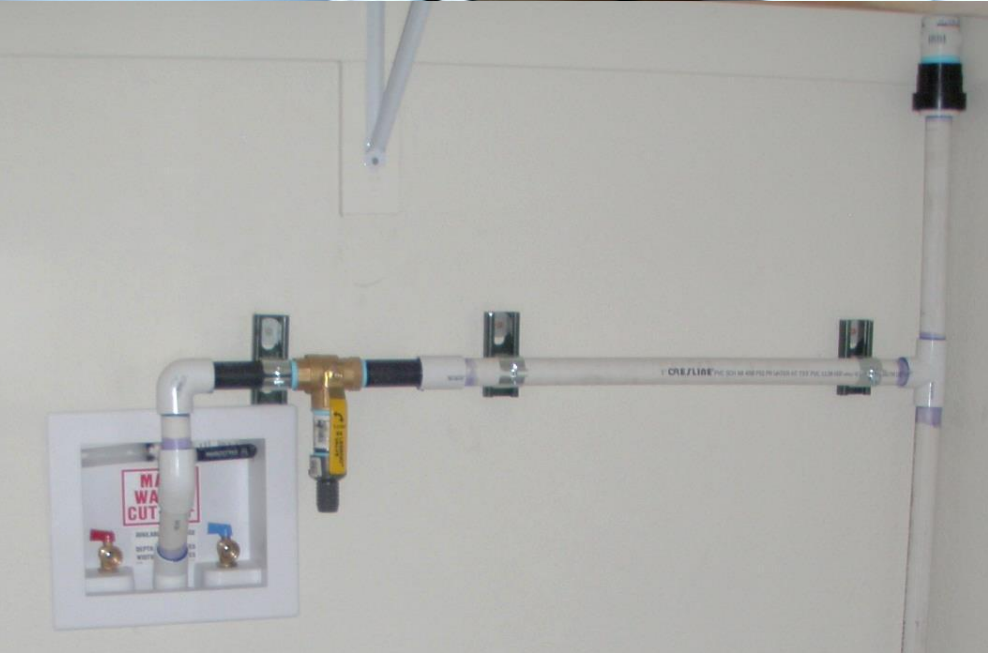
NORMAL /  
PERM PRESS

LOW

HIGH

COTTON

Kenmore  
80 Series





# Indoor/Diversion Kit Parts

1. 1 1/2in hose clamps
2. 1in two whole straps
3. 1in 3-way Brass Diversion Valve
4. 1in PVC 45s
5. 1in PVC 90s
6. 1in PVC Tee
7. 1in SxT Male Adaptor
8. 3/4in Sch 80 Male Barbed Insert Adaptor(Inst x MPT)
9. 3/4in TxT Adaptor
10. 1 1/2in x 1in SxS PVC Bushing
11. 1 1/2in SxT Female Adaptor
12. 1 1/2in Air Admittance Valve





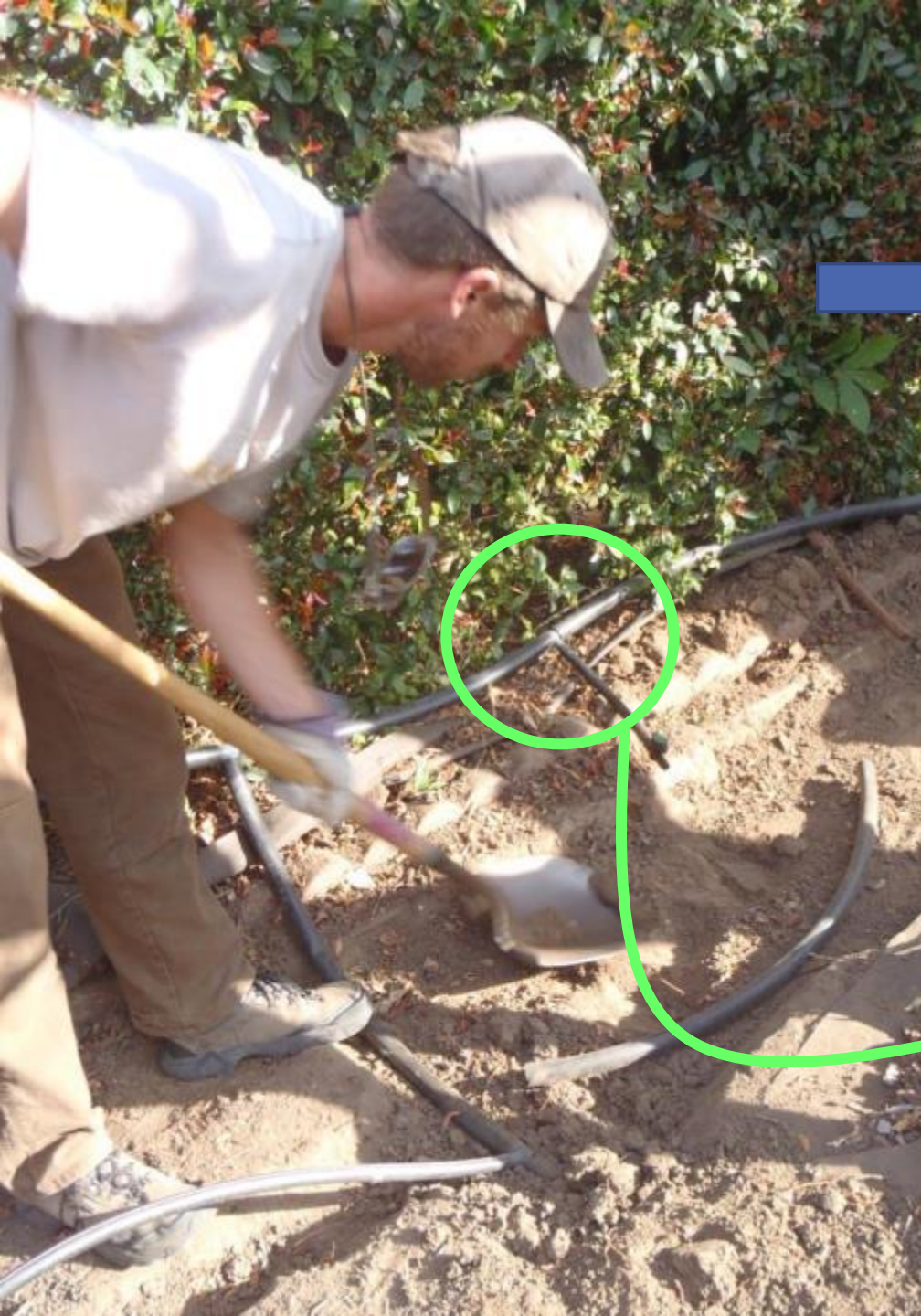


# Outside Irrigation

1. 1/2in Purpleback Valve
2. 1/2in Stake
3. 3/4in PVC HTxIPT Male Adaptor
4. 3/4in PVC Hose Cap
5. 1in 2-Hole Strap
6. 1in PVC 90
7. 1in Stainless Hose Clamp
8. 1in Stake
9. 1in SxT Female Adaptor
10. 1" Sch 80 Male Barbed Insert Adaptor (Inst x MPT)
11. 1in x 1in x 3/4in PVC SxSxT Tee
12. 1in x 1in x 1/2in Barbed Tee




























**System complexity may lead to  
more complex problems &  
troubleshooting**

**IrrigRAY - [www.waterrenu.com](http://www.waterrenu.com)**

**Aqua2use - [www.aqua2use.com](http://www.aqua2use.com)**

# Home action plan: Design your Greywater system

---

Greywater is best for moderate to high water use vegetation.

Greywater can be used for low water vegetation but would need to be widely dispersed which can be achieved with additional outlets.

Use as supplement irrigation demand for your tree

- Greywater: excess production in cool season; deficit in warm season
- Make up remaining warm season demand with stored rainwater, AC condensate, evaporative cooler bleed-off



# How much are you producing?

---

## Step 1: How much greywater does your home produce?

Laundry: \_\_\_gal/use \* \_\_\_ uses/week \* 52 weeks

Top loading = ~30-40 gallons/load

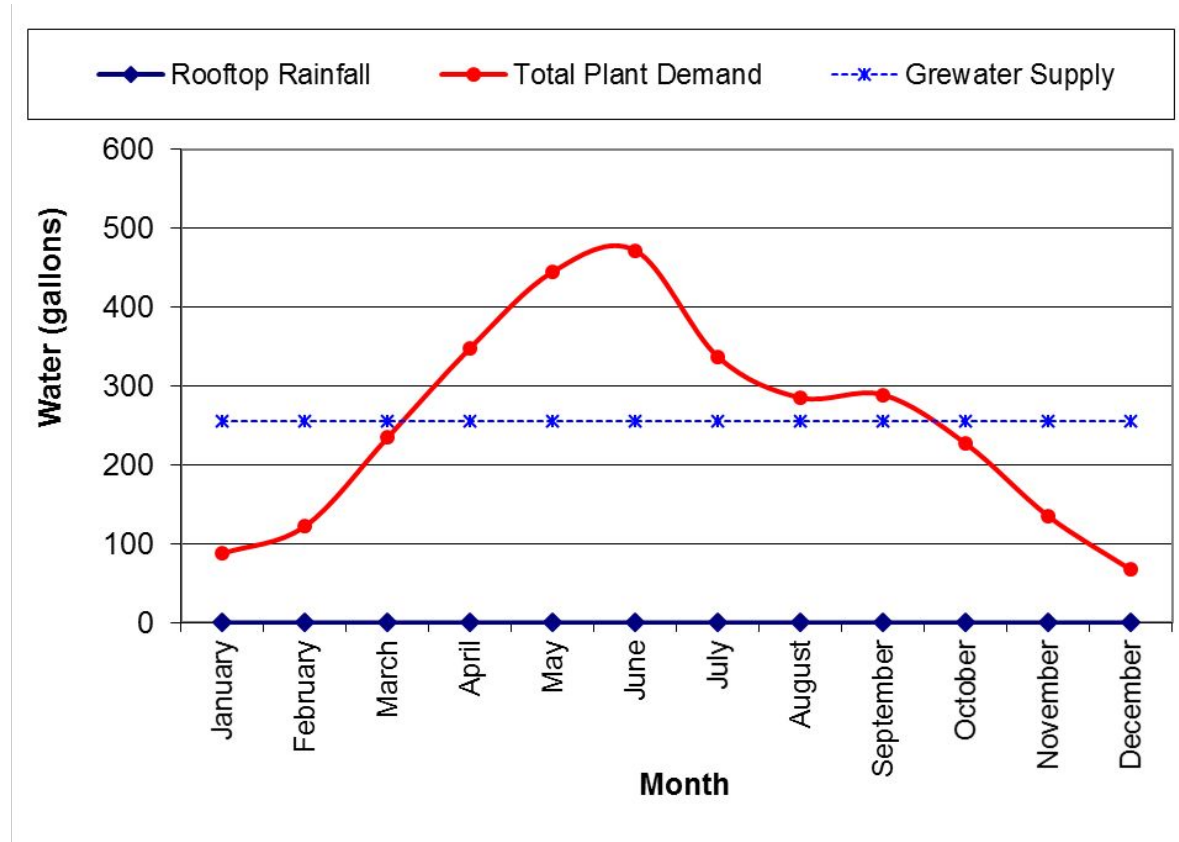
Front loading = ~15-25 gallons/load

Shower: \_\_\_gal/min \* \_\_\_ min \* \_\_\_ uses/week \* 52 weeks

# Pairing Your Supply and Demand

Greywater = 3000gal/yr

10 ft diameter Citrus  
Demand = 3000gal/yr





# Home action plan: Design your Greywater system

---

## Step 2: How much water do your plants need?

Choose the type of tree you want to use

Is it low, moderate, or high water use?

- What is conversion factor?

Calculate annual water need:

- What is radius & canopy area?
- Multiply by conversion factor

Conversion factors:

- Low water use: 10
- Moderate water use: 19
- High water use: 28

# Site Plan (from previous weeks)

Property lines

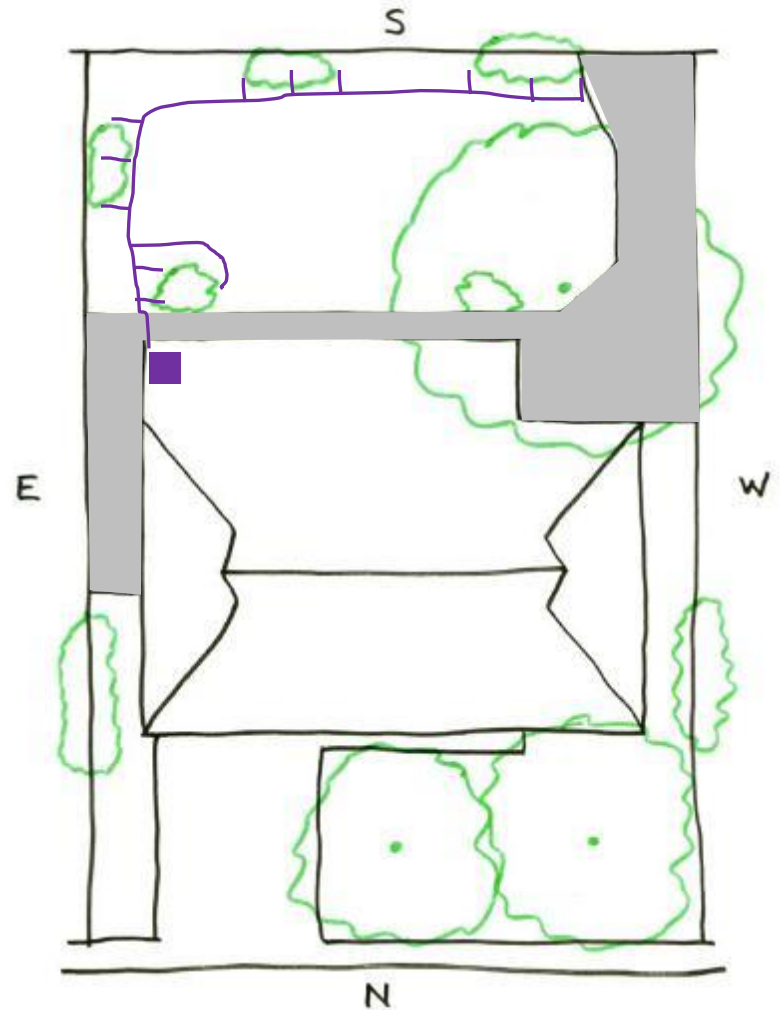
House

Other permanent structures  
(storage sheds, pool, driveway,  
sidewalks, etc.)

Existing trees and shrubs

Mark direction – North

Draw in location of washing  
machine, bathtubs/showers, sinks  
(including kitchen sink)





# Home action plan: Design your Greywater system

---

## Step 3: Designing your home greywater system

Are either your shower or washing machine easily accessible to exterior wall?

What kind of greywater system will you use? (outdoor shower, laundry-to-landscape, simple/complex...)

Choose location for system and draw into site plan

What plants will the greywater support? Draw vegetation into plan and label.

# Advanced: percolation test + basin sizing for greywater

---

## Greywater Disposal Loading Rates

Soil Infiltration rate, min/in	Area needed ft <sup>2</sup> /gal/day
0-30	0.4
40-45	0.7
45-60	1.0
60-120	2.0

Chart adapted from Art Ludwig – *Greywater Sources, Qualities, and Quantities*, from *Create an Oasis with Greywater*

Example: 3 loads for peak x 20 gallons per load x 0.4 Disposal Loading Rate = 24 ft<sup>2</sup> area needed



Image: Brad Lancaster, *Rainwater Harvesting for Drylands & Beyond*



# Maintenance

---

## **Laundry to Landscape (L2L):**

Monthly:

- Check emitters during a wash cycle. Ensure flow is correctly portioned among the emitters. Adjust emitter valves as needed for desired flow rates.

Seasonally:

- Flush out the distribution line. Disconnect distribution line at hose-port coupling. Connect a hose. Turn faucet on high for 1 minute to flush accumulated particles and lint in distribution lines.

## **Branched Drain (BD):**

Seasonally:

- Check distribution piping, cleanout ports, and outlets for blockages or changes in flow output. All outlets should be free and clear of any debris, mulch, soil, particles, or lint.
- Remove plug and inspect cleanout port at double-ell (flow splitter) fitting. Run water through fixture and observe flow through double-ell. Check pipe outlets and ensure outletting water appears to be correctly portioned. If system has multiple flow splits, check the highest split first and work down.

# Maintenance

---

## **Surge Tank & Pump Systems**

\*Follow manufacturer's recommendations

- Check and clean filter on a regular basis.
- Check and maintain pump to ensure longevity.
- Check and flush distribution tubing and emitters.

## **Infiltration Basins/Chambers/Areas**

Seasonally:

- Ensure infiltration areas are flushed with rain water during rainy season to remove any accumulated salts in the upper soil profile.
- Check infiltration areas to ensure water is not ponding on surface. Incorporate organic mulch, deep rooted plantings, or other action if needed.

Annually (or when required):

- Replenish organic mulch in infiltration areas.
- Check infiltration chambers to ensure sufficient capacity is maintained and not limited due to root intrusion, accumulation of earthworm castings or organic material.



[Products](#) | [Ecological systems design](#) | [Water central](#) | [Grey water central](#) | [Shopping cart](#)

[Grey water central](#) | [Common grey water mistakes](#) | [Grey water Q&A](#) | [Indoor grey water reuse](#) | [Create an Oasis with Grey Water](#) | [Branched Drain Grey Water Systems](#) | [Builder's Grey Water Guide](#) | [Clean, Green and Wild](#) | [System selection chart](#) (PDF) | [Grey water policy center](#)

You are here: [Home](#) > Grey Water Central

## Grey Water Central

**Summary:** All about all aspects of grey water systems. Why to use them, how to choose, build and use them, regulations, studies, and examples. Includes grey water irrigation, grey water treatment, grey water filters, and indoor grey water reuse.

### Grey water information

### What is grey water?

- [Common mistakes & preferred practices](#)
- [Grey water Q&A](#)
- [Grey water links](#)
- [Grey water system design consulting](#)
- [Understanding Wild Water](#) (article)
- [Indoor grey water reuse](#)
- [Builder's action summary](#)
- [Gray water workshop](#)
- [Sistimas para aguas grises](#) (en Español)

Any water that has been used in the home, except water from toilets, is called grey water. Dish, shower, sink, and laundry water comprise 50-80% of residential "waste" water. This may be reused for other purposes, especially landscape irrigation.

### Why use grey water?

It's a waste to irrigate with great quantities of drinking water when plants thrive on used water containing small bits of compost. Unlike a lot of ecological stopgap

### Grey water books

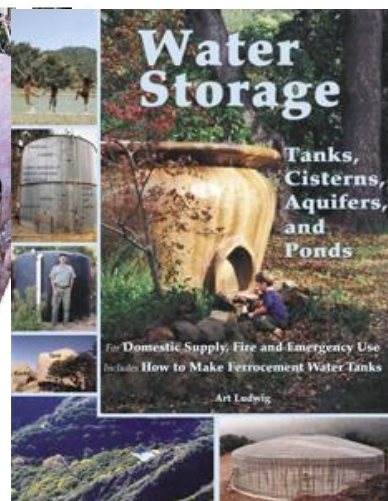
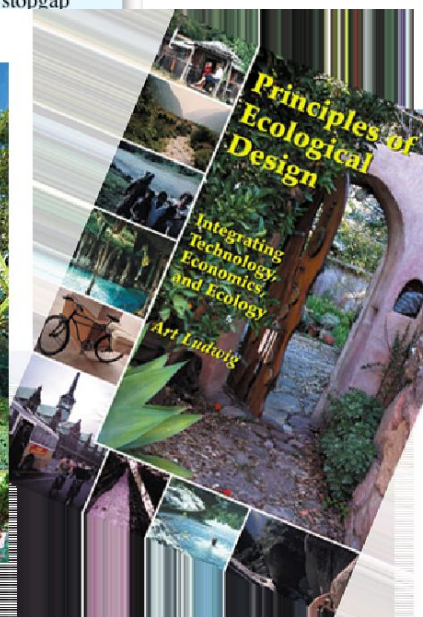
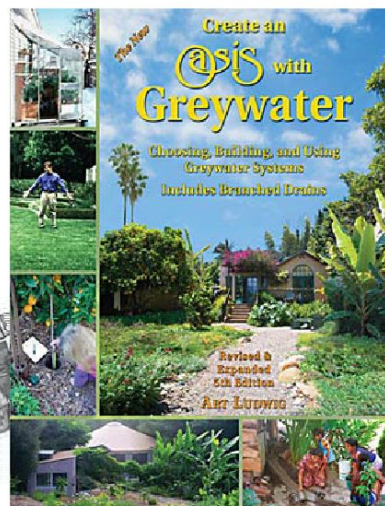
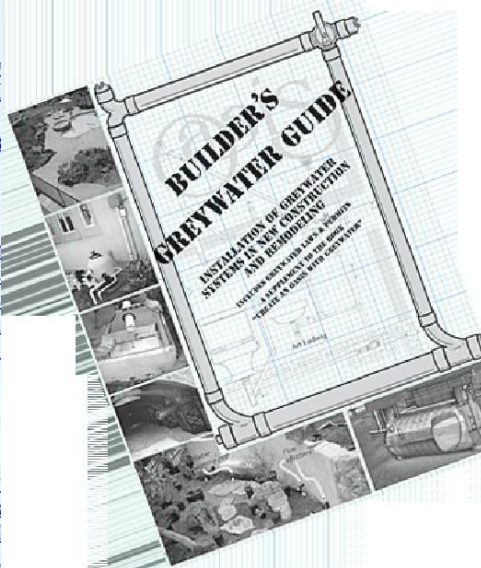
- [Create an Oasis with Greywater](#)
- [Branched Drain Cisterns](#) (book)
- [Builder's Grey Water Guide](#)

### System examples

- [System selection chart](#)
- [Branched drain systems](#)
- [Branched drain systems](#)
- [Branched drain in irrigation](#)
- [Manual grey water systems](#)
- [Gravity drum](#)

### Grey water regulation

- [Grey water policy](#)
- [How to improve CUPC Plumbing Code \(USA\)](#)
- [How to improve IN](#)



# Greywater resources

# Questions?

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Charlie Alcorn | Watershed Management Group

calcorn@watershedmg.org

Cell: 520.396.3266 x3

[watershedmg.org](http://watershedmg.org)



# Thank You!!!



Phoenix Green Living Co-op Project 10/12/2013