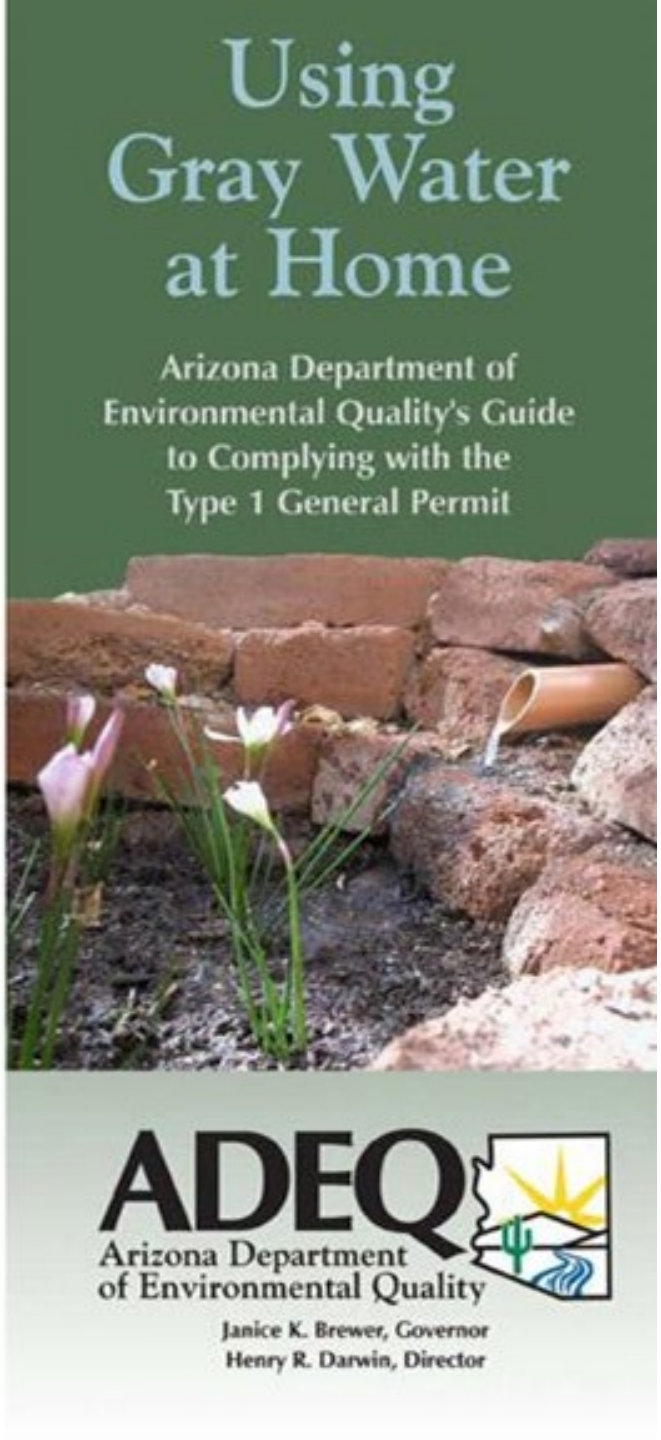
Irrigating With Greywater:

Harvest greywater to complete your backyard oasis



Learning Objectives

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

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.

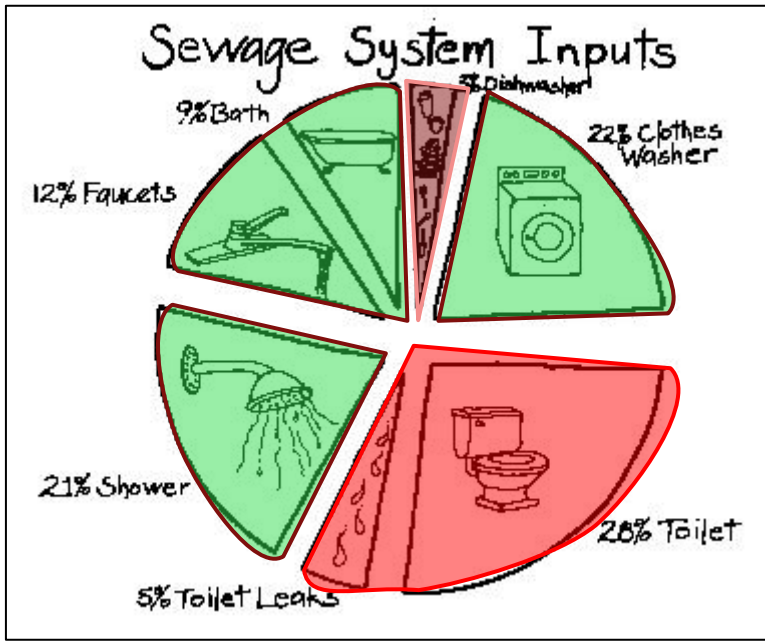
What is greywater?

Greywater definition

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?

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?

How much water does it need?

Calculate canopy area, planning for mature size

- Formula: pi * radius squared
- Example: 10 ft radius 10 * 10 * 3.14 = 314 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 ft * 10 ft * 3.14 = 314 sq ft
- 314 sq ft * 28 (high-water use conversion factor) = 8,792 gal/yr

Peach tree, 5 foot radius

- Canopy: 5 ft * 5 ft * 3.14 = 78.5 sq ft
- 78.5 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.

ADEQ Arizona Department of Environmental Quality

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

Southern Regional Office - Tucson
Serving Cochise, Graham, Greenlee, Pima and Santa Cruz Counties

(520) 628-6733
Toll Free (888) 271-9302
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

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Updated 02/11

Using Gray Water at Home

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

ADEQ Arizona Department of Environmental Quality

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

HTTP://WWW.HARVESTINGRAINWATER.COM/GREYWATER-HARVESTING/

HTTP://ECOLOGYCENTER.ORG/FACTSHEETS/

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

Simple greywater systems

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

Source: Brad Lancaster, Rainwater Harvesting for Drylands & Beyond

Greywater Systems

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

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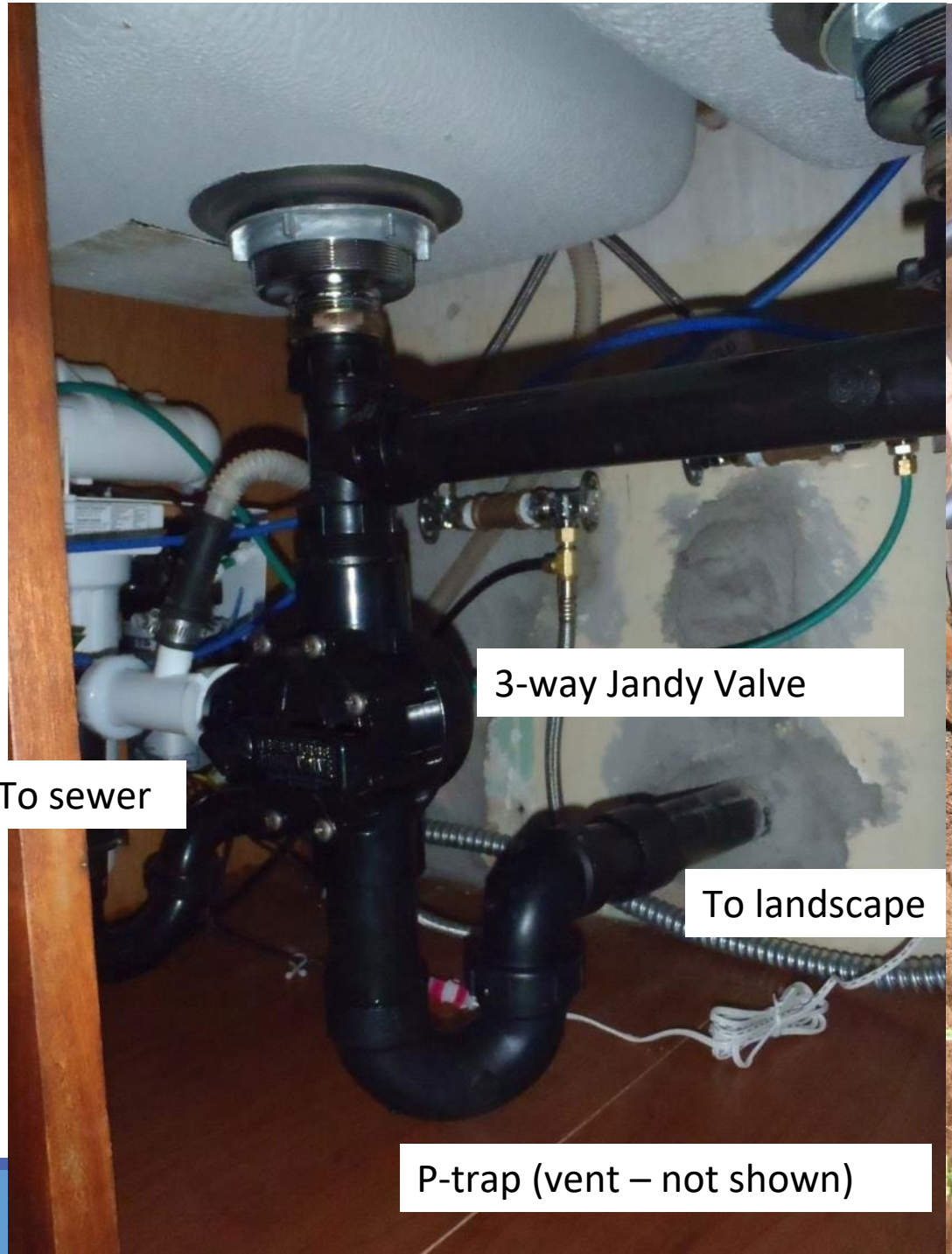
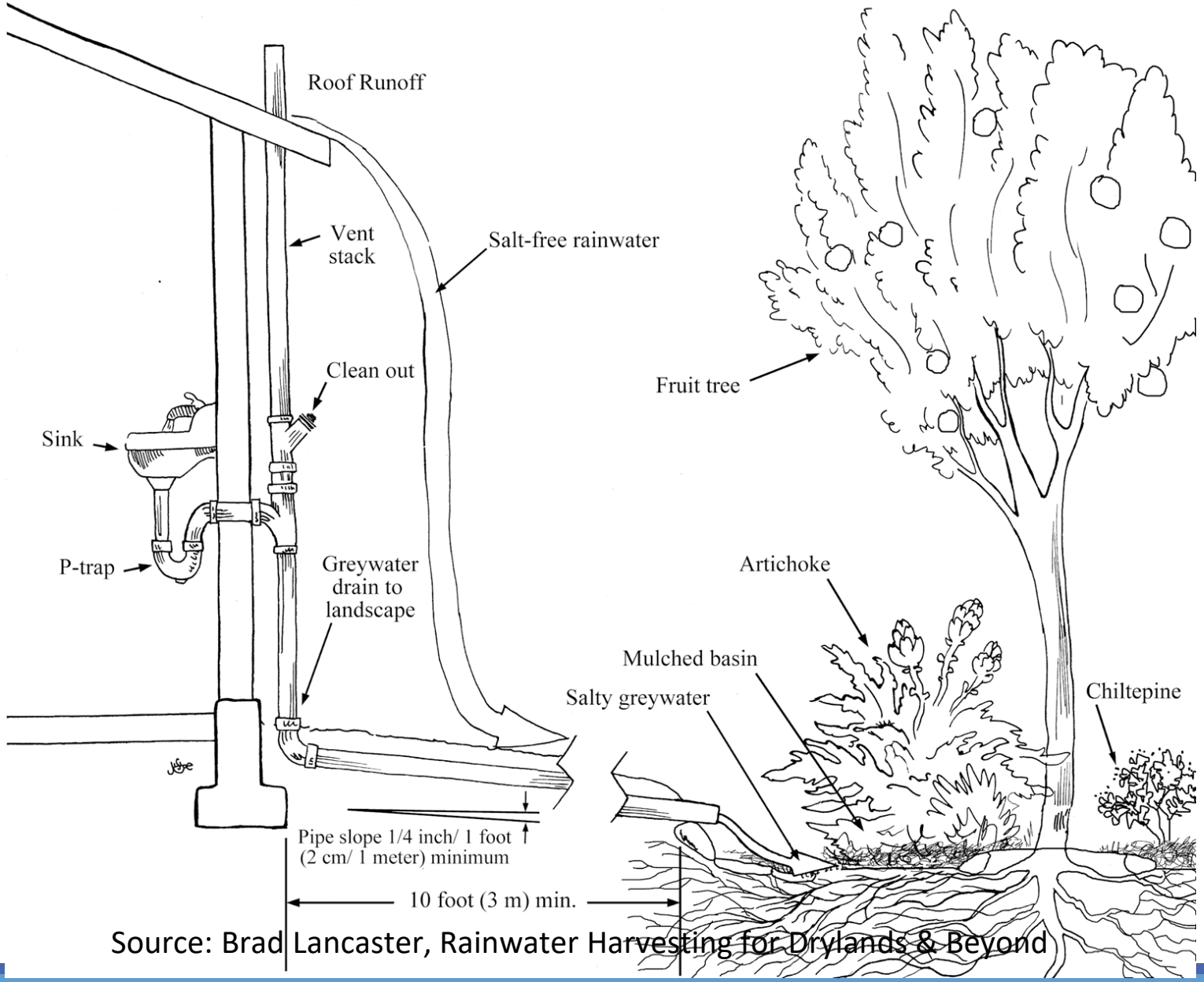
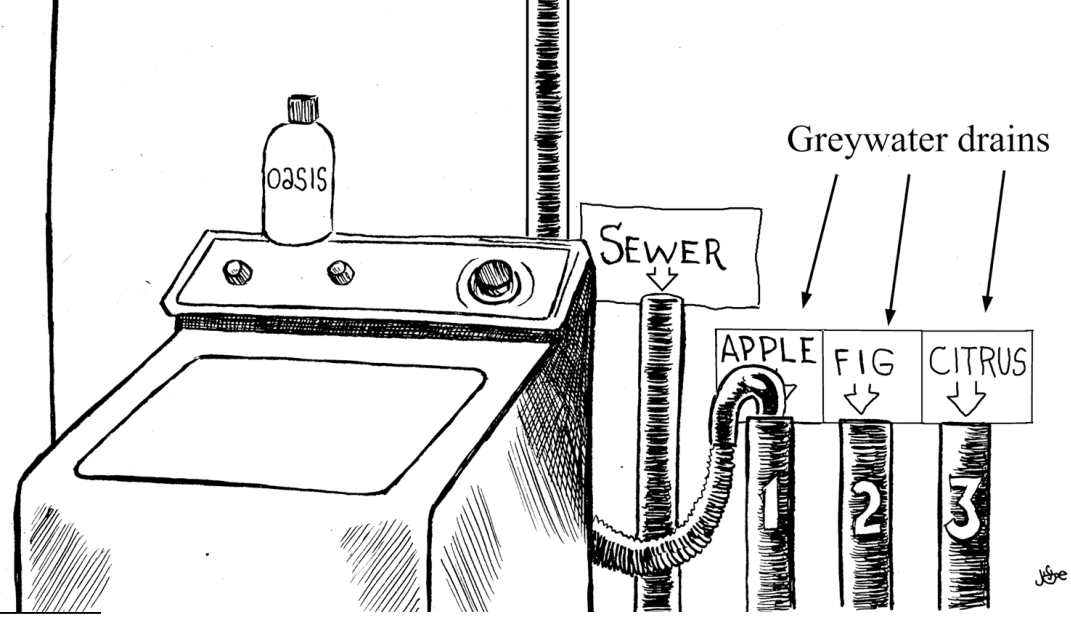

3-way Jandy Valve
To sewer
To landscape
P-trap (vent – not shown)


Flow splitter


Infiltration chamber

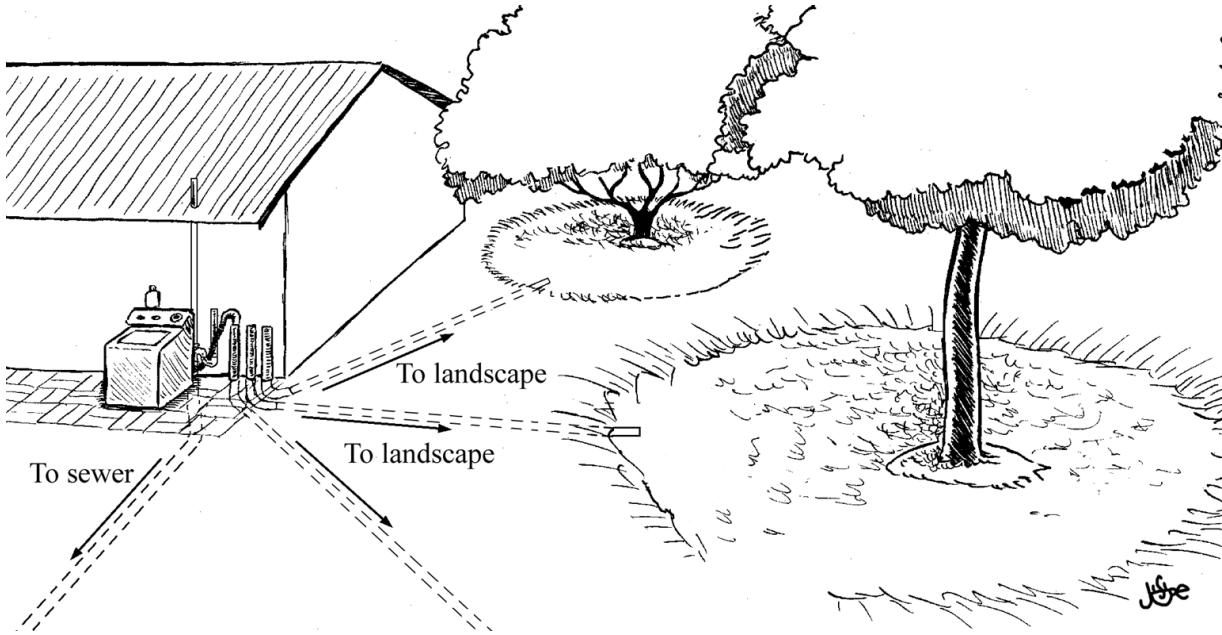


Source: Brad Lancaster, Rainwater Harvesting for Drylands & Beyond



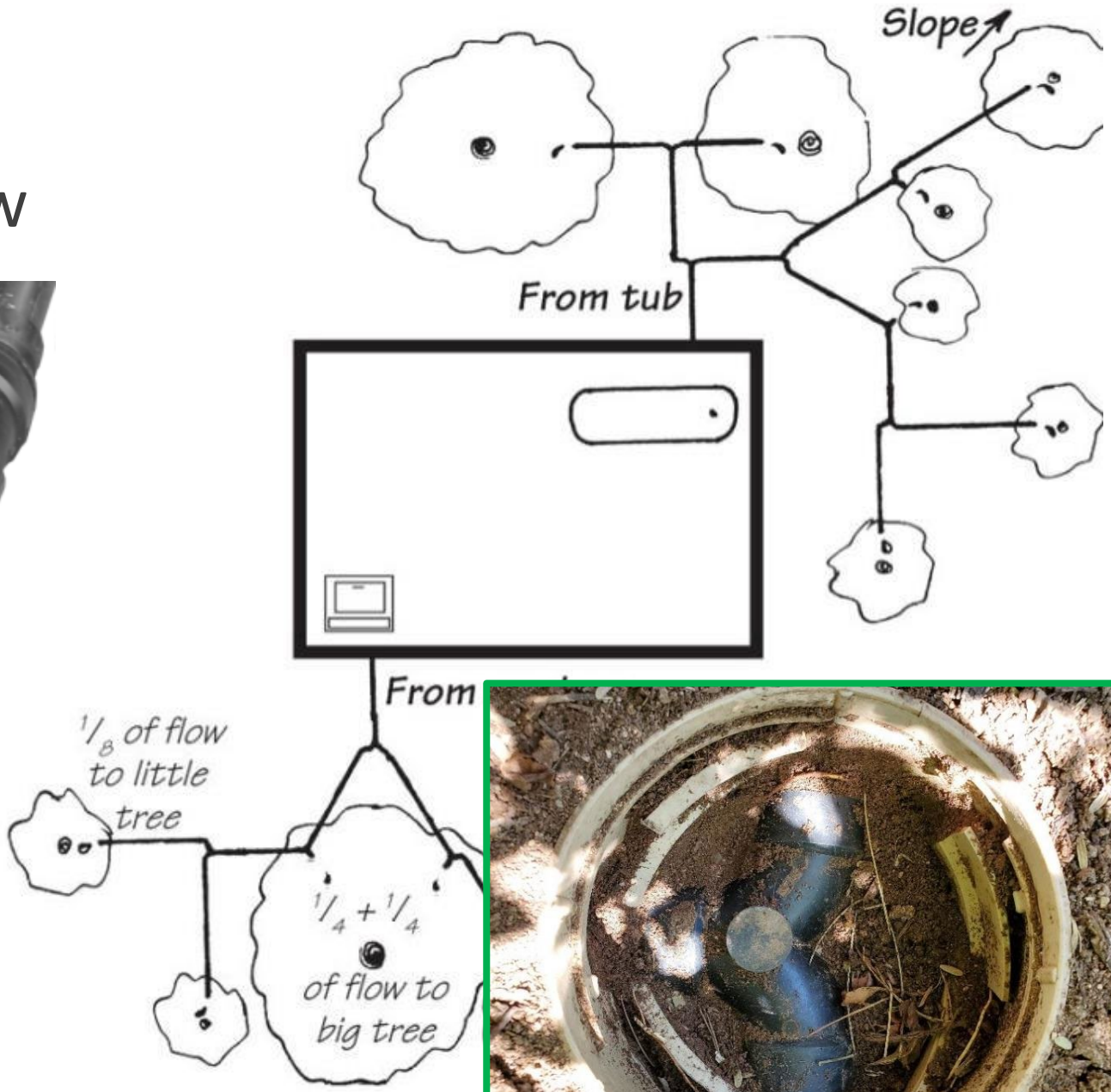
Outdoor, simplified version

Multi-pipe laundry greywater system

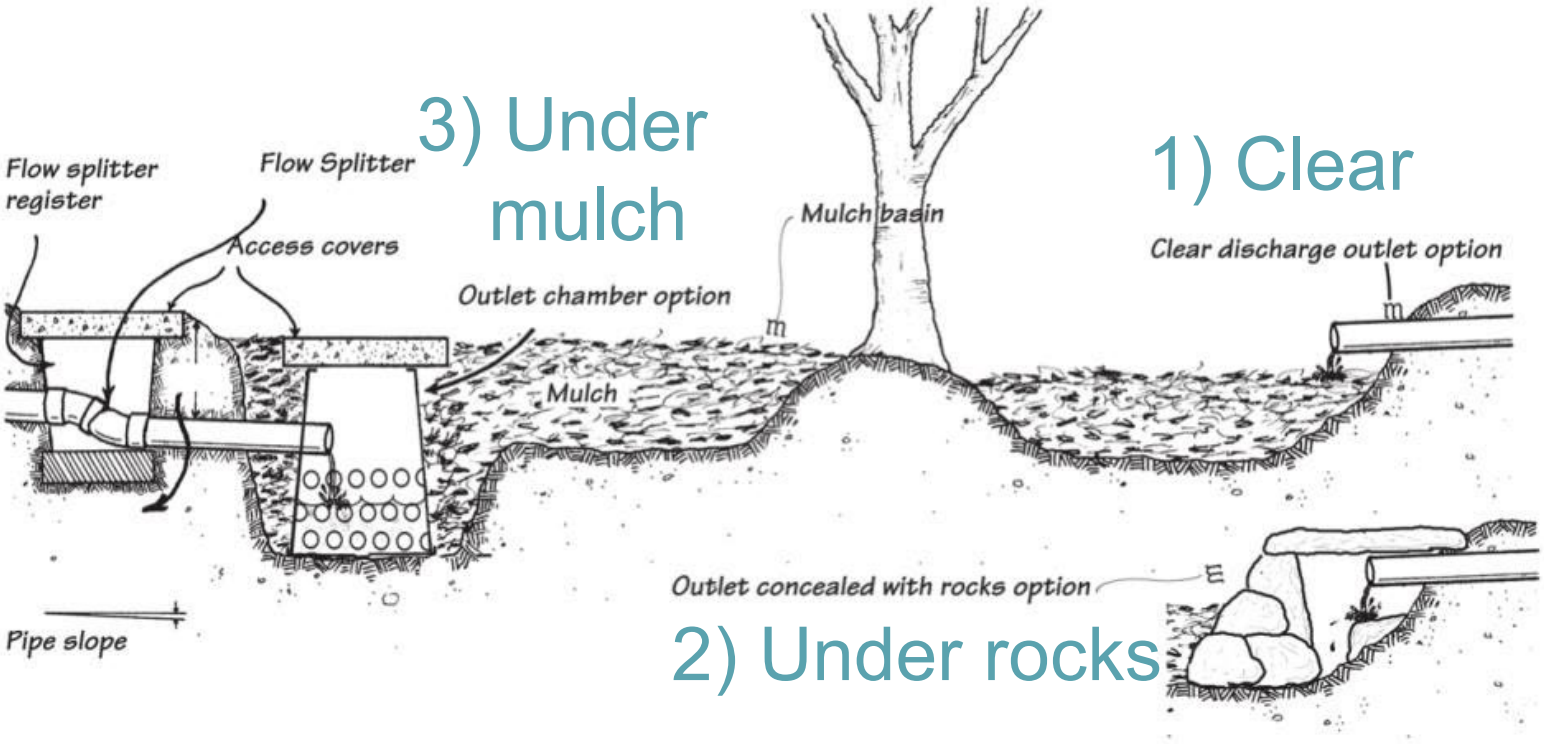


Source: Brad Lancaster, Rainwater Harvesting for Drylands & Beyond

Split the flow



Outlet Options



3) Under mulch

1) Clear

2) Under rocks

4) Under soil (not shown)

Overcoming Gravity

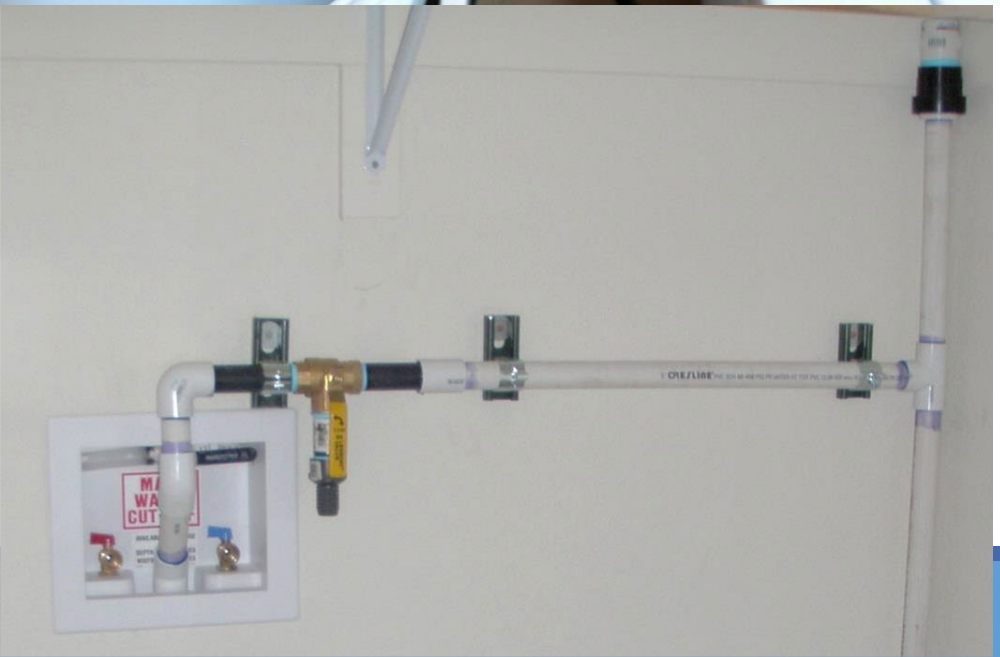

GREYWATER
SURGE
TANK

Laundry to Landscape


GREYWATER
FABRIC
SIGNAL
PUSH TO START
COTTON
HIGH
Kenmore

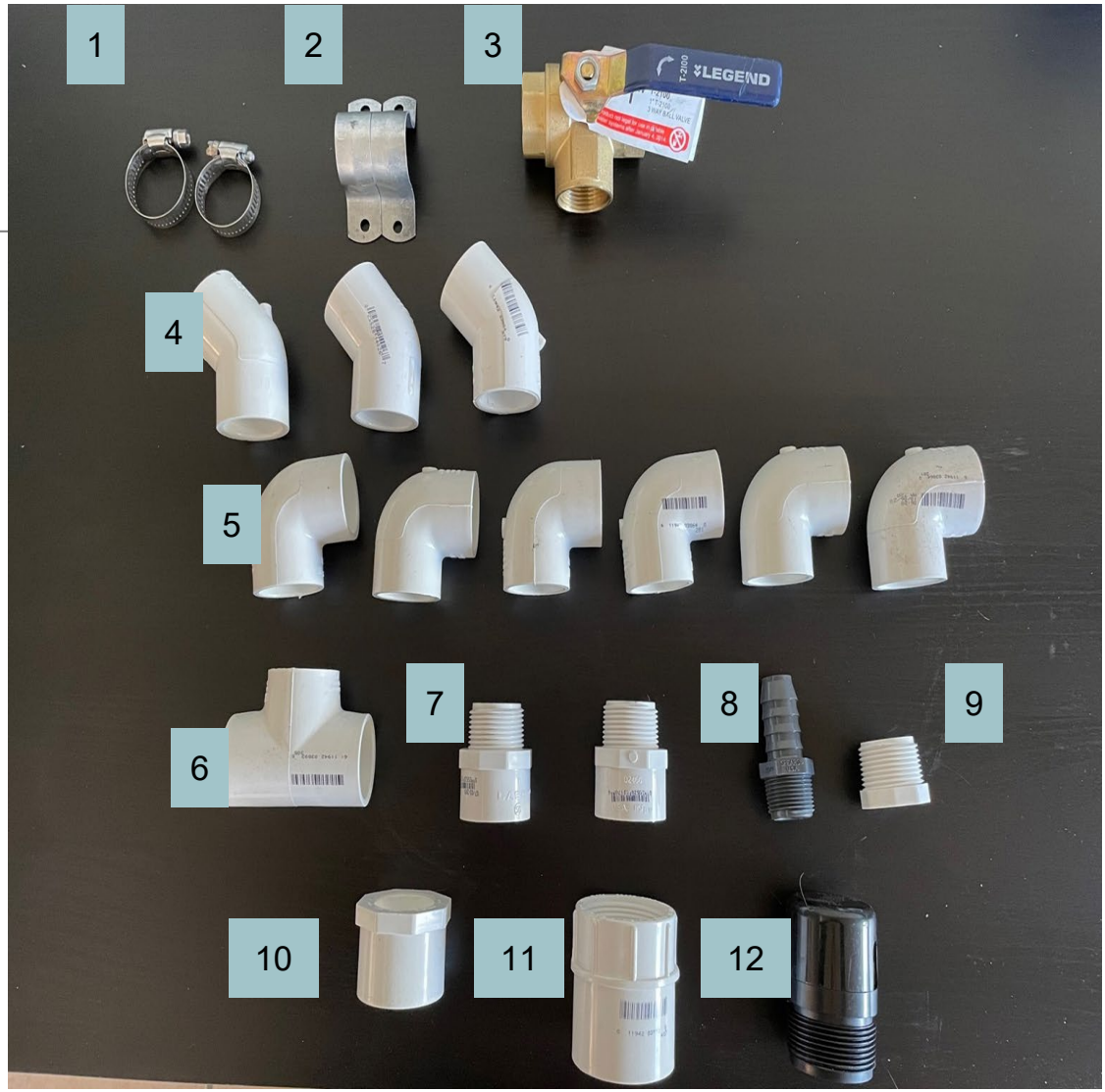

HEAVY DUTY


SEWER
LAND-
SCAPE



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


AVENTURIER


System complexity may lead to more complex problems & troubleshooting
IrriGRAY - www.waterrenu.com
Aqua2use - 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

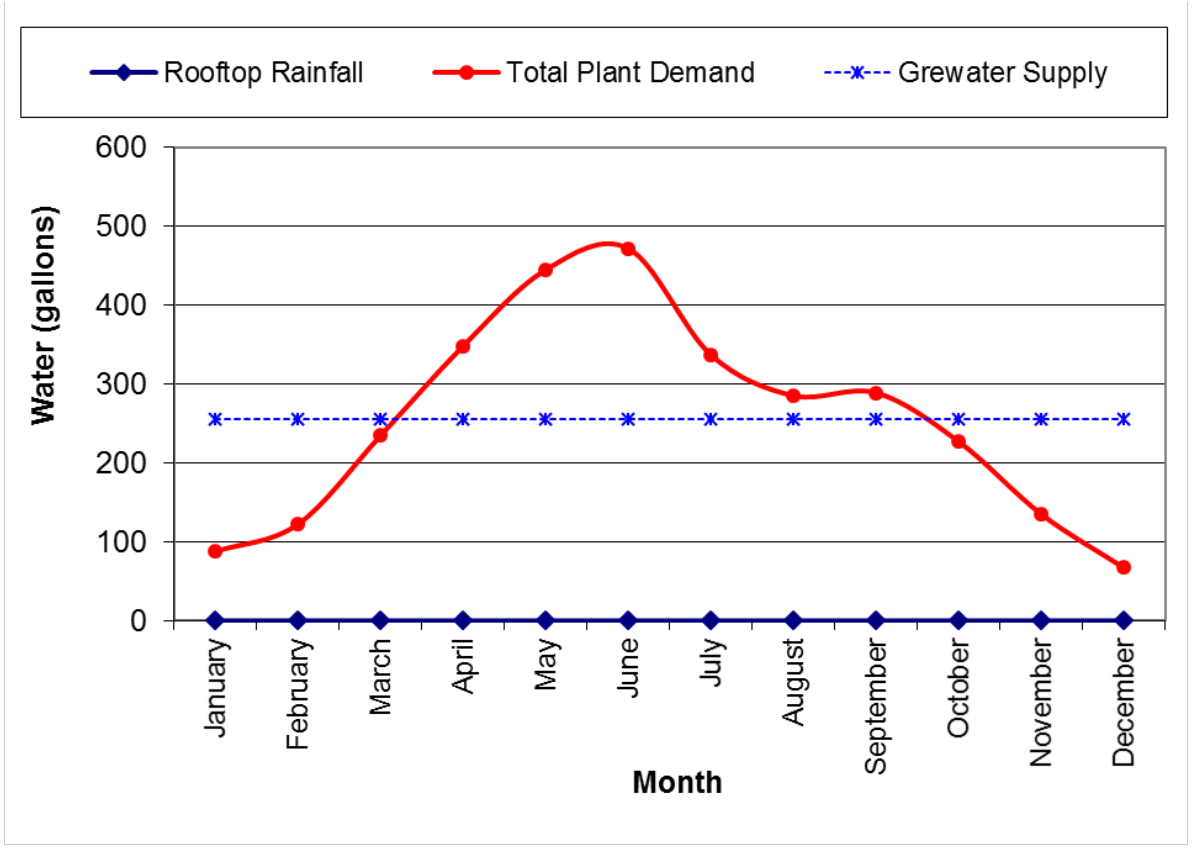
Front loading = ~15-25 gallons/load

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

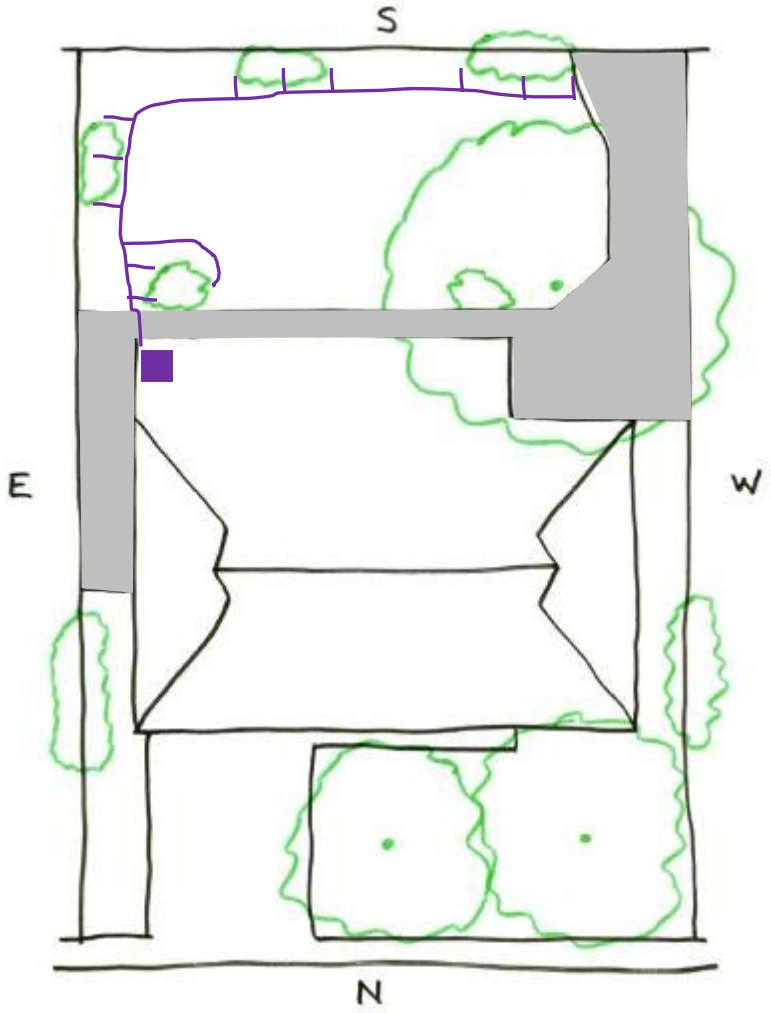
House

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 ft2/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^2 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 out lets and ensure out letting 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.

Greywater resources

Grey Water (also spelled greywater, graywater, gray water)

http://oasisdesign.net/greywater/

resource institute for low e

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

- 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)

Grey water books

- Create an Oasis w
- Branched Drain (
  (book)
- Builder's Grey W

System examples

- System selection ch
- Branched drain sys
- Branched drain sys
- Branched drain in i
- Manual grey water
- Gravity drum

Grey water regulation

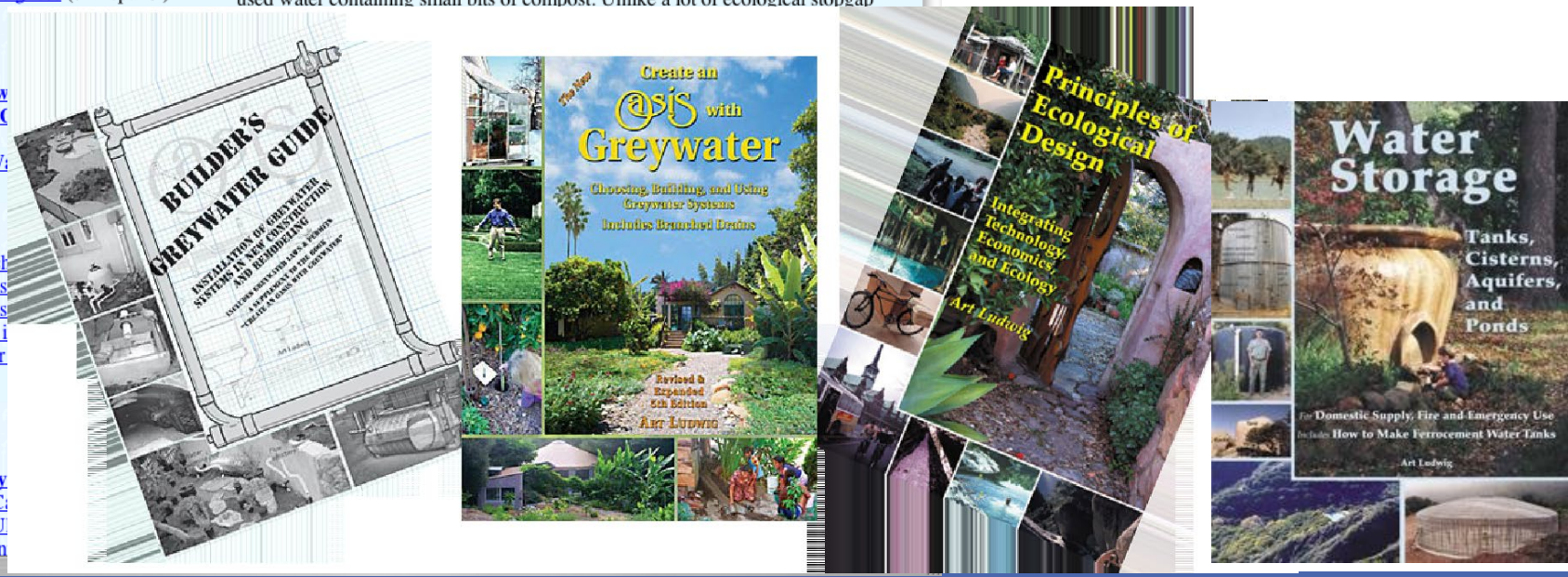
- Grey water policy
- How to improve Ca
  Plumbing Code (U
- How to improve In

What is grey water?

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



Questions?

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Cell: (602) 739-2131

Thank You!!!