Thank you to Sacramento Suburban Water District for the use of these presentation space!
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“Impact Builders is a full-service contractor born out of the philosophy that our impact on the Earth and our ecological footprint should be examined and considered at every step, including when we renovate and remodel our home.”
The hidden costs of water...
How much water do you use each day?

- US: 150 gal/person
- France: 76 gal/person
- UK: 40 gal/person
- Mozambique: 1 gal/person

Source: UNDP Human Dev. Report 2006
Most homes drain-away and pollute rainwater, and waste greywater to the sewer system.

Instead, our homes can conserve, reuse, and protect water, while creating a productive and beneficial landscape.
Risk of Water Scarcity

Water Supply Sustainability Index (2050) With Climate Change Impacts

Source: Natural Resources Defense Council (NRDC)
• Greywater is water from sinks, showers, baths, and washing machines.
• Never from the toilet!
• Kitchen sink is “dark grey” water
• Greywater systems direct greywater from the house to landscapes for irrigation.
• Complexity of system depends on site requirements and budget
• Complex Systems collect, filter, and disinfect greywater and use it for toilet flushing—require permits and an investment
Greywater Benefits

• Saves water (with proper design) 16%-40% of water use.
• Saves energy used to transport, clean, and treat water to potable quality
• Reduces demand on septic systems and sewage treatment plants- protects rivers, bays, and oceans
• Saves energy and chemicals needed to treat wastewater (around 2 watt-hours per gallon of water)
• Encourages healthy product choices
• Connects people to their backyards
• Facilitates local food production
People and Planet Health

• Greywater is not potable- do not ingest it or let it touch the edible portion of plants (example: no carrots or potatoes)
• Greywater contains nutrients which can pollute water- do not let it enter a waterway.
• Do not let greywater pool up or runoff.
• Only use certain soaps (no chlorine bleach, low boron, low sodium)
Health and Safety Considerations

Plant Health

- Use “plant friendly” products; those without salts and boron. No chlorine bleach, no sodium water softeners.
  - Examples: ECOS, Biopac, Oasis, Vaska, Aubrey Organics, hydrogen peroxide bleach
- Deliver proper amount of water to each plant (not too much or too little).
- Avoid acid loving plants unless you use pH neutral products.
Greywater regulations vary state by state and county by county.

Greywater legal is in CA

CA Plumbing code Chapter 16 (Section 1603A.1.1)

No permit required for laundry-to-landscape system (must follow 12 guidelines)

Permits required for other systems
Greywater Basics

Do

• Use mulch
• Use a diverter valve
• Use plant friendly products
  • Low in sodium low in boron
• Use a "proven" design

Don’t

• Store greywater
• Use a filter that you won't clean for the next 10 years
• Use if you're near a creek or river (100 ft. setback)
• Spray above ground
• Use if water doesn't drain on the site
Greywater Irrigation Basic

The Mulch Basin

Basins around each plant with a greywater connection filled with mulch

- Helps to filter greywater
- Limits potential for greywater to pool
- Limits contact with greywater
- Required by California Code
- Consider soil type when building mulch basins
- Uses a solid shield to protect outlet
- Low in sodium low in boran
Think about how you are using water and actively conserve

- Collect cold water as shower heats up
- Dishpan in sink to collect wash water
- Use for irrigation
- Use “bucket” flush toilet (pour into toilet bowl)
Laundry to Landscape

- A washing machine system
- Doesn't alter the plumbing
- Doesn’t require a permit (if basic guidelines are followed).
Legal Requirements, Section 1603A.1.1

- The design shall allow the user to direct the flow to the irrigation or disposal field or the building sewer. The direction control of the greywater shall be clearly labeled and readily accessible to the user.
- The installation does not affect a potable water connection.
- The greywater must be contained on the site.
- Greywater must be directed to an irrigation or disposal field.
- Ponding of grey water must be avoided.
- Greywater may be released above the ground surface provided at least two (2) inches (51 mm) of mulch, rock, or soil, or a solid shield covers the release point. Other methods which provide equivalent separation are also acceptable.
Legal Requirements, Section 1603A.1.1

• Greywater systems shall be designed to minimize contact with humans and domestic pets.
• Water used to wash diapers or similarly soiled shall not be used and shall be diverted to the building sewer.
• Greywater shall not contain hazardous chemicals
• The system can not violate other laws or ordinances.
• System should have a manual describing use and maintenance of the system that stays with the building
Laundry to Landscape

Sewer connection

Anti Siphon-Vacuum Break

Diverter valve

Greywater goes to landscape

Top loading machine:
Able to distribute water up to 20 places

Front loading machine:
Able to distribute water up to 8 places

(depends on machine and landscape)
CA code requires greywater outlet to be covered by 2”
Landry to Landscape
Materials $100-$250, Professional install $700-$2,000

**Pros**

- No permit required. Easy to install for handy do-it-yourselfer
- Able to travel slightly uphill and flat across the yard
- Easy switching between greywater and sewer with 3-way valve
- Very little maintenance
- Easy to distribute water to the plants
- Easy to change after installation

**Cons**

- Requires a hole in house
- Could add strain on washer pump and potentially shorten its life, especially if improperly designed.
- Some Parts must be ordered
- Limited distribution
Branched Drain: A Gravity System

- To install this system you must be able to access the drainage plumbing
- Requires a permit
- The landscape must be lower than the greywater pipes

Image: Cleanwater Components

Diagram:

This gravity-based system drains greywater to the landscape using standard 1 1/2" or 2" drain pipe. The irrigated area must be lower in elevation than the greywater source. The greywater is divided, or "branched" and the final outlet of each "branch" irrigates the root zone of a plant inside a mulch basin. Branched drain systems are best suited for trees or other large shrubs. This system was first developed by Art Ludwig of Oasis Design.

Click to buy!

(1) 3-way diverter valve
(2) 2" round valve box
(3) ABS 1.5" or 2" Double ell (aka twin 90)
(4) ABS 1.5" or 2" Double ell (aka twin 90) w/ inspection/cleanout port.
(5) Optional 3-way valve actuator
A motor (called an actuator) can be added, enabling the valve to be controlled by a switch inside the house.
Greywater outlet is under a solid shield and flows into a mulch basin. Size of basin depends on soil type and amount of water.
Completed System

1 Year Later

Images: Josh Lowe
Branched Drain System
Materials $150-300, Professional install $1000-4000

Pros
• Once built, very low maintenance
• Simple and robust, noting to break
• Uses gravity, no electricity
• Relatively inexpensive

Cons
• Involved some plumbing re-routing, which can add significant cost to system.
• Can not travel uphill.
• Works best for trees and larger plants, difficult to irrigate small plants.
• Once built, difficult to alter (you’ll have to dig up the yard.)
Pumped System

- A diverter valve directs GW to a tank
- Unfiltered GW is pumped out to the landscape with 1” tubing and ½” outlets
- System requires an outlet and uses electricity
- Requires a rigorous permitting process

Image: Art Ludwig - Oasis Design
Filtering greywater for drip irrigation

Manually cleaned filters require frequent maintenance

Filtered greywater requires special drip tubing and is not compatible with most standard drip systems.

Images: Leigh Jerrard
Pumped System
Materials $400-$1,000, Professional install $1,000-$5,000

Pros
- Able to send water uphill and across long distances
- Able to spread water out and irrigate large and small plants

Cons
- Pump relies on energy/electricity
- Pump needs a nearby outlet
- Pump will break with time or is improperly sized or installed
- Unfiltered GW will clog drop emitters
- Manually cleaned filters require frequent maintenance for the duration of the system’s life
Automatically Cleaned Filters and Multiple Irrigation Zones

- A sump basin collects greywater from the house
- A pump pushes water through a filter which removes particles. Filter is automatically flushed (this requires special “backflow prevention” and permits are much more complicated)
- Filtered greywater is distributed through drip irrigation tubing to plants
- Cost: $10,000 - $20,000
Design Considerations

● What sources of greywater can you access?
  ● Using the washing machine is typically the easiest place to begin.

● How much greywater does your home produce?
  ● Washer: top loader 40-50gal/load Front loader: 12-20 gal/load
  ● Shower: flow rate (2.5 gpm or 1.5gpm) x min. of shower
  ● Baths: Full tub- 50 gallons, ½ full 25 gallons

● What plants will you irrigate?
  ● Match the amount of GW with their weekly irrigation needs. Remember to “hydro-zone”! (Keep plants with similar water needs together.)
  ● Estimate ½ gal/week per square foot of planted area (100 sq. ft. garden needs around 50 gallons/week)

● Choose a system to meet your needs.
1) I have a large yard sloping down away from my house. All the plumbing is accessible in my 3 foot tall crawl space. I have 10 fruit trees in my yard that I water with a hose weekly. I want to use my greywater to water the trees and reduce my fresh water consumption.

2) My single story house has a small crawl space but the shower pipes are accessible and located near the backside of the house. The yard slopes slightly uphill from the house. The side yard is flat. Our laundry room is adjacent to the side yard. We have a mix of trees and shrubs in the back and side yards. There is a small vegetable garden in the backyard as well.
What would you water here?

Would you make any landscaping changes?
Laura’s House in Oakland: 10 gallons/person/day

Watering
- 15 fruit trees
- Vegetable garden
- Herbs and flowers

With no runoff
- Landscape infiltrated 20,000 gal/year of rainwater.
- Reused 17,000 gal/year of GW
What will you do?

Start Conserving, assess your site, attend an installation workshop, install a system, find an installer

greywateraction.org
Rebates

- Water Efficiency on Large Landscapes
- Many water districts and agencies provide rebates and incentives for indoor and outdoor water efficiency practices.

Contact your water district!

www.bewatersmart.info

www.ElkGroveGreenerGardens.org/WELL
Elk Grove greener Gardens Project
Showcasing water-wise and eco-friendly landscapes
Festival & Garden Tour
**Resources**

- San Francisco Graywater Design Guidelines for Outdoor Irrigation (downloadable manual - sfwater.org/graywater)
- Create an Oasis with Greywater by Art Ludwig (book) www.oasisdesign.net
- Ask This Old House episode “Graywater, Small Engines”
- Kit for L2L www.gray-2-green.com
- Greywater Action (greywateraction.org) General info, home-owner trainings, installer’s training, list of installers
- www.ElkGroveGreenerGardens.org
- www.bewatersmart.info