

# HARVESTING



# THE RAIN

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# Sources of water

- Municipal supply
- Reclaimed (recycled) water
- Graywater
- Rainwater harvesting

# Rainwater Harvesting Benefits



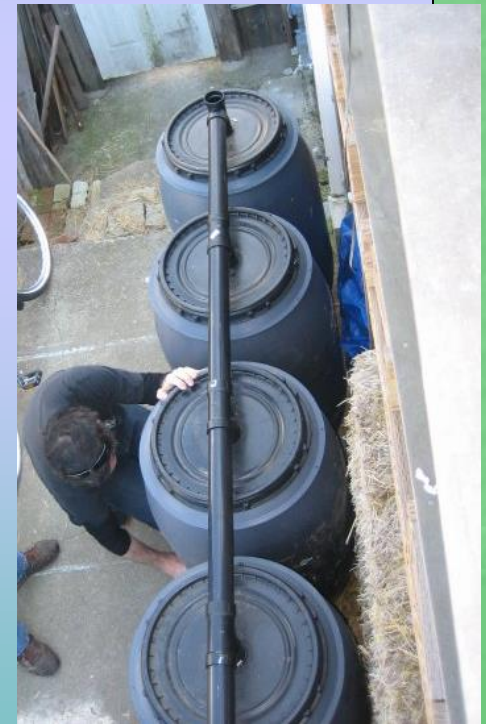
- Strategic Planning
- Drought Proofing
- Fire Protection/Emergency Water
- Stormwater Management
- Community Aquifer Recharge
- Flood Control
- Habitat Restoration
- Increased Property Values
- Reduced Water Bill
- Lower Carbon Footprint

# Local and State

- In case of drought
- Disaster preparedness
- Clients want to be:
  - Strategic
  - Water Independent
  - Secure



# Don't confuse rainwater with graywater



# What is graywater?

- Water from sinks, showers, and laundry tub
- No water from toilets (black water)
- No water from kitchen sinks (food particles)
- No water from laundry if used to clean diapers
- No water containing any harmful chemicals, including bleach

# Graywater

- Produced all year long
- Small tanks, if any
- Only hold < 24 hours
- Not for some vegetables
- Salts can build up from soaps unless flushed
- 29,000 gallons / six months for four people and all hookups
- Permits required for larger systems

# Rainwater

- Produced in wet season and held until dry season for landscapes
- Large tanks
- Pure, great for all vegetables
- 25,000 gallons for 1500 sf house and 18" of rain per year
- No permits required except for electrical & grading

**A VERY easy  
graywater system:**



# Sink Positive!



[www.sinkpositive.com](http://www.sinkpositive.com)

# Rainwater Harvesting Facts

- 15 inches per year
- 2,500 sq. ft. roof = 22,500 gallons/yr.
- 5,000 sq. ft roof = 45,000 gallon/yr.
- How much do you really need?
- 50 %+ = outdoor irrigation
- Rainwater from all roofs equals billions of gallons per year!
- Enough to irrigate thousands of acres of native/drought tolerant landscape



# Basic Elements

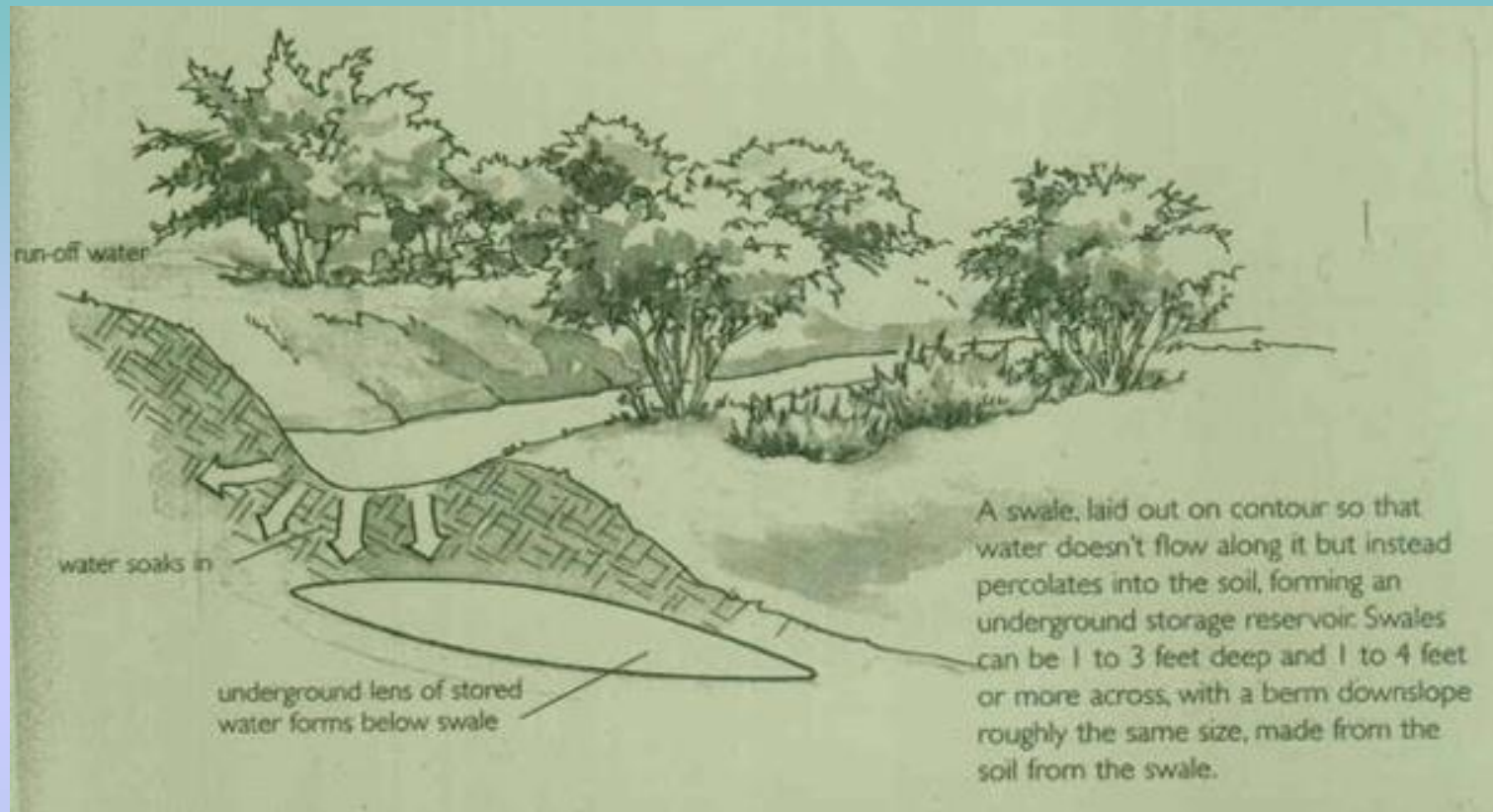
- Capture
- Pre-filtration
- First Flush
- Storage
- Pumping
- Filtration
- Distribution



Do some planning first.  
Don't let this happen to you!

# Rainwater harvesting

- Passive systems including swales and percolation ponds, dry creeks and rain gardens
- Simple catchment & gravity feed
- Above or underground tanks with filters, pumps, etc.



**Swales slow and capture water**



# Swale examples



# Grassy swale drains parking lot runoff



# Swale to protect house







# Urban swales

Portland, Oregon

# Urban Swale in Palo Alto



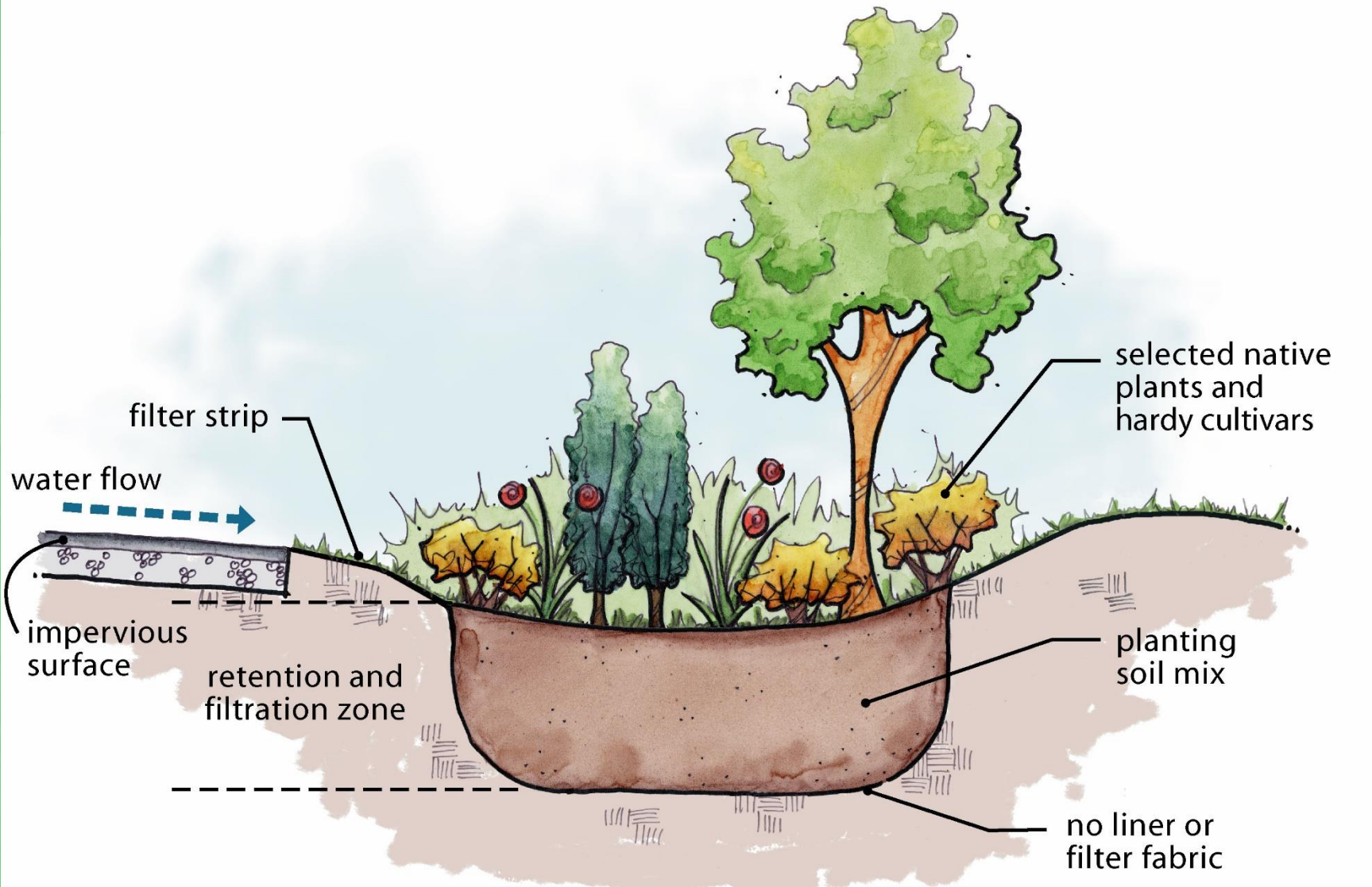


Taking matters into your own hands



# Overflow percolation area

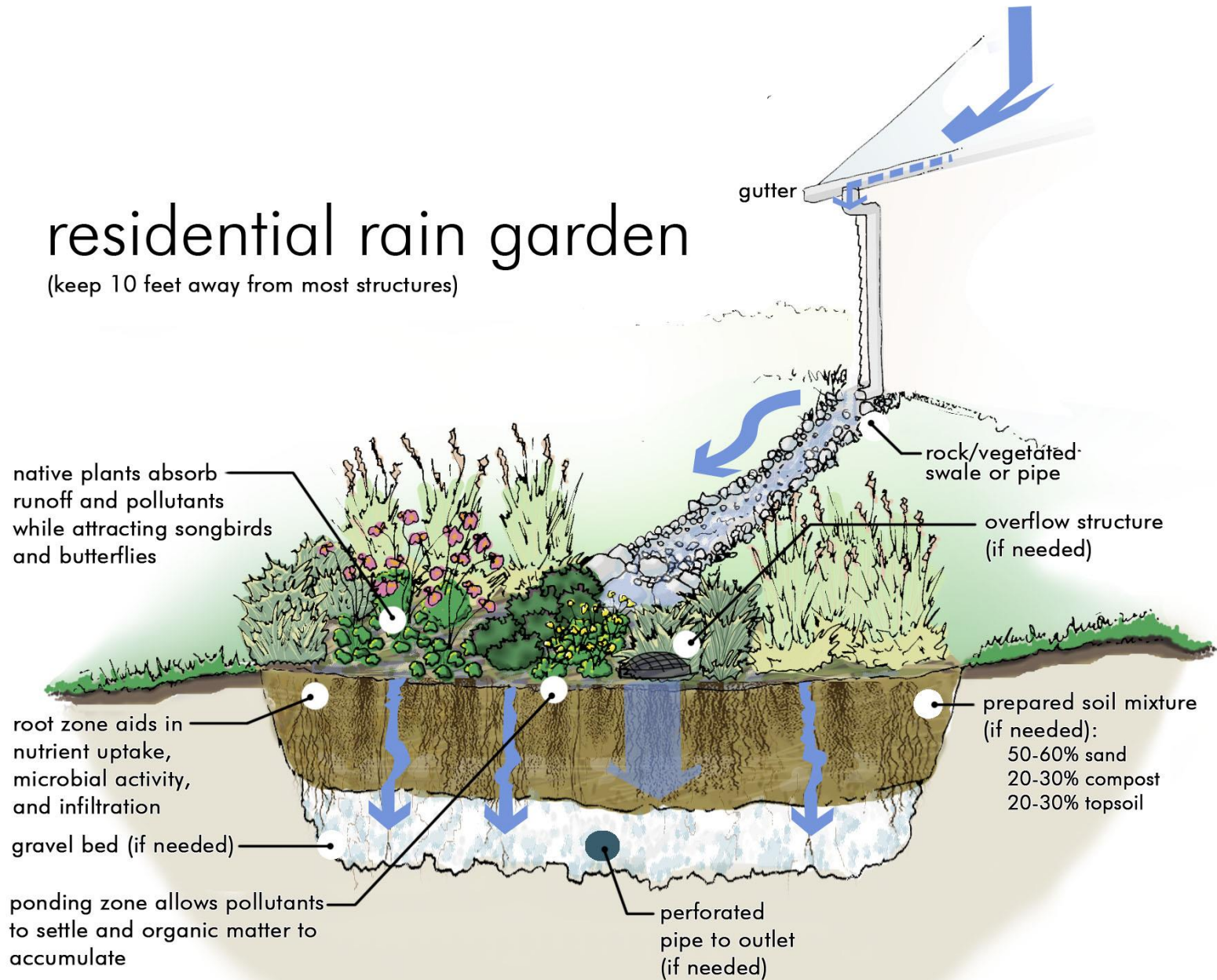
Photo and project: EarthCraft Design



# Simple Rain Garden

# residential rain garden

(keep 10 feet away from most structures)



# Make your own rain garden

- 10' away from your house foundation
- Easy access to your downspout
- Full or partial sun
- Avoid septic fields, right of ways, underground pipes, and established trees
- Don't select where water pools (poor drainage here!)
- Test your soil for type and percolation

# Percolation Test



Dig a hole and prefill it if the soil is dry



Fill your hole with water





Measure how fast it drains. Sandy 1 hour, loamy up to 8 hours, clay 24 hours.

# Design your rain garden

- Amend the soil if drainage is poor. 50% sand, 20% compost, 30% topsoil
- Size: about 20-30% of roof area being drained
- Use a hose to define the shape
- Remove the lawn and dig out the soil about 2' deep, creating a berm somewhere else
- Finished garden should be about 6-8" lower than surrounding area
- Add rocks near the entry where water enters (to prevent erosion)
- Plant native and droughty plants
- Add mulch
- Don't forget to water the first season or two.



Rain Garden for summer rains



Dry Creek in a parking strip

# Dry Creek with native plants



Photo and installation: EarthCare Landscaping

# Plants that tolerate wet or dry

Grey Rush – *Juncus patens*

Berkeley Sedge – *Carex divulsa*

Small Cape Rush - *Chondropetalum tectorum*

Native Dogwood – *Cornus sericea*

Snowberry – *Symphoricarpus albus*

Canna Lily – *Canna x generalis*

Fortnight Lily – *Dietes vegeta*



Pervious concrete



# Capture - Roofs

- Metal
- Galvalume
- Elastomeric coating
- Asphalt shingles
- Tile
- Solar Panels
- Living Roof

1 inch of rain on 1,000 sq. ft roof surface  
= 500 + gallons of rainwater



Image courtesy of Feldman Architecture



Slide courtesy of EarthCraft Design

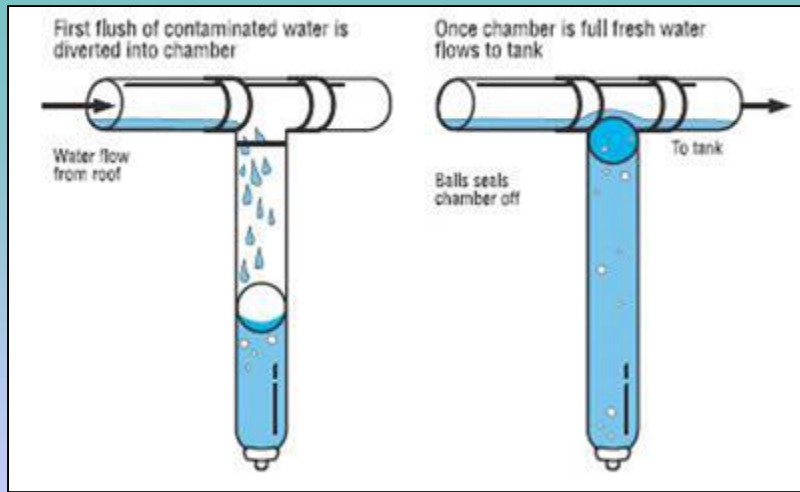
# Single barrel catchment





# “Daisy chain catchment”

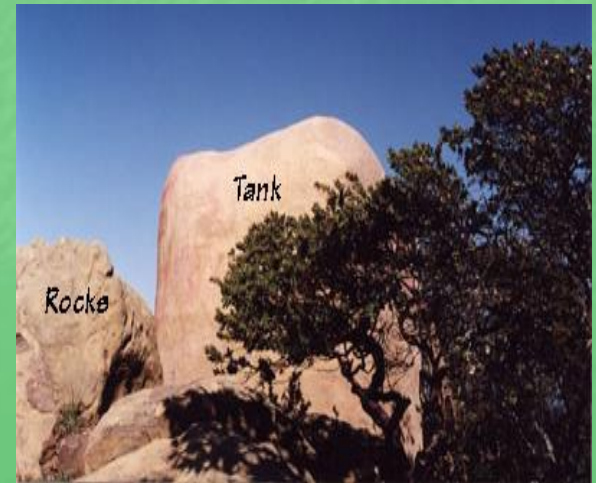
Photos and projects courtesy of Greywater Action



# First flush diverters & screens



# Above ground storage



# Rainwater Pillow



Recycled food grade  
containers



# Below ground storage

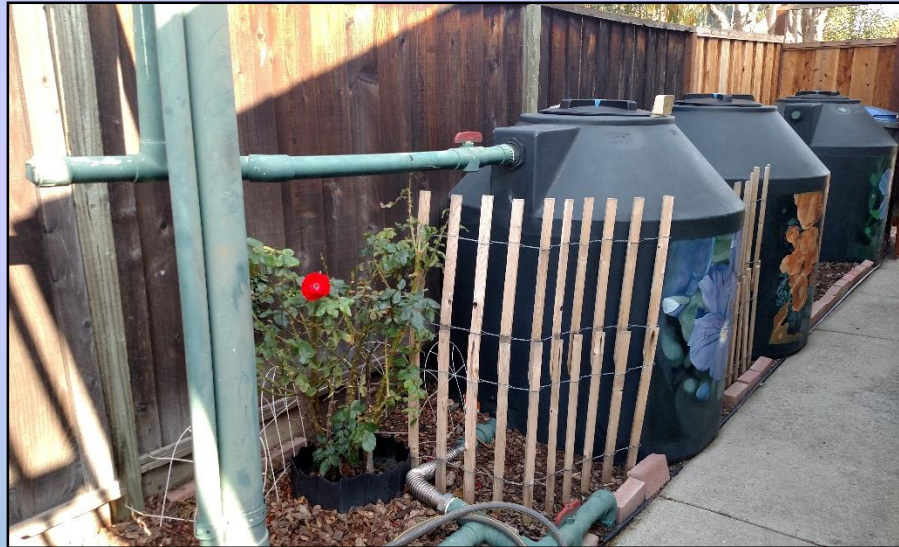
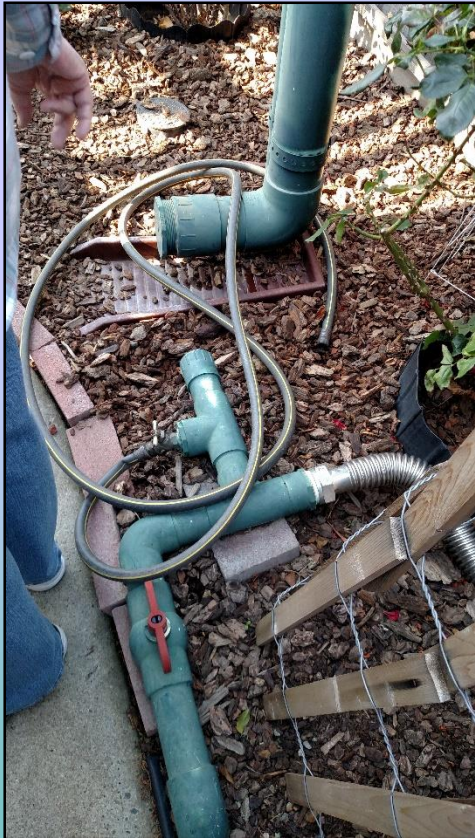


# Pratt family backyard catchment system – San Jose









# Rainwater Harvesting Costs

- Design + Installation + Maintenance
- Typical = \$20K- \$60K
- Range = \$10K - \$100K+
- Above ground= \$.80-\$3.00/ gallon
- Underground= \$2.50-\$6.00/ gallon
- Underground= \$\$ twice above ground
- Incentives, Green Loans



# SF Hospital - 90,000-gallon Rainwater Harvesting System to Irrigate several Living Roofs with Native and Drought Tolerant Plantings



Slide courtesy of EarthCraft Design

# Australia comparison

- Long-term drought
- Water restrictions enforced
- Mainstream: used in houses, commercial developments, and industrial applications
- 10 years ago rainwater used only where needed

But now. . .



Typical

Slide courtesy of EarthCraft Design

# Rainwater Resources

- *Rainwater Harvesting for Drylands and Beyond*  
Author: Brad Lancaster
- *Rainwater Harvesting for the Mechanically Challenged*  
Author: Richard Heinichen
- Greywater Action in Oakland -[www.greywateraction.org](http://www.greywateraction.org)
- [www.whollyH2O.org](http://www.whollyH2O.org)
- Bobby Markowitz, EarthCraft Landscape Design  
[www.earthcraftdesign.com](http://www.earthcraftdesign.com)
- John Russell, Water Sprout    [www.watersprout.org](http://www.watersprout.org)



The End. Thanks for coming!