RAINWATER

HARVESTING

Deva Luna EarthCare Landscaping 408-871-2792

Sources of water

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

Don’t confuse graywater with rainwater

Graywater

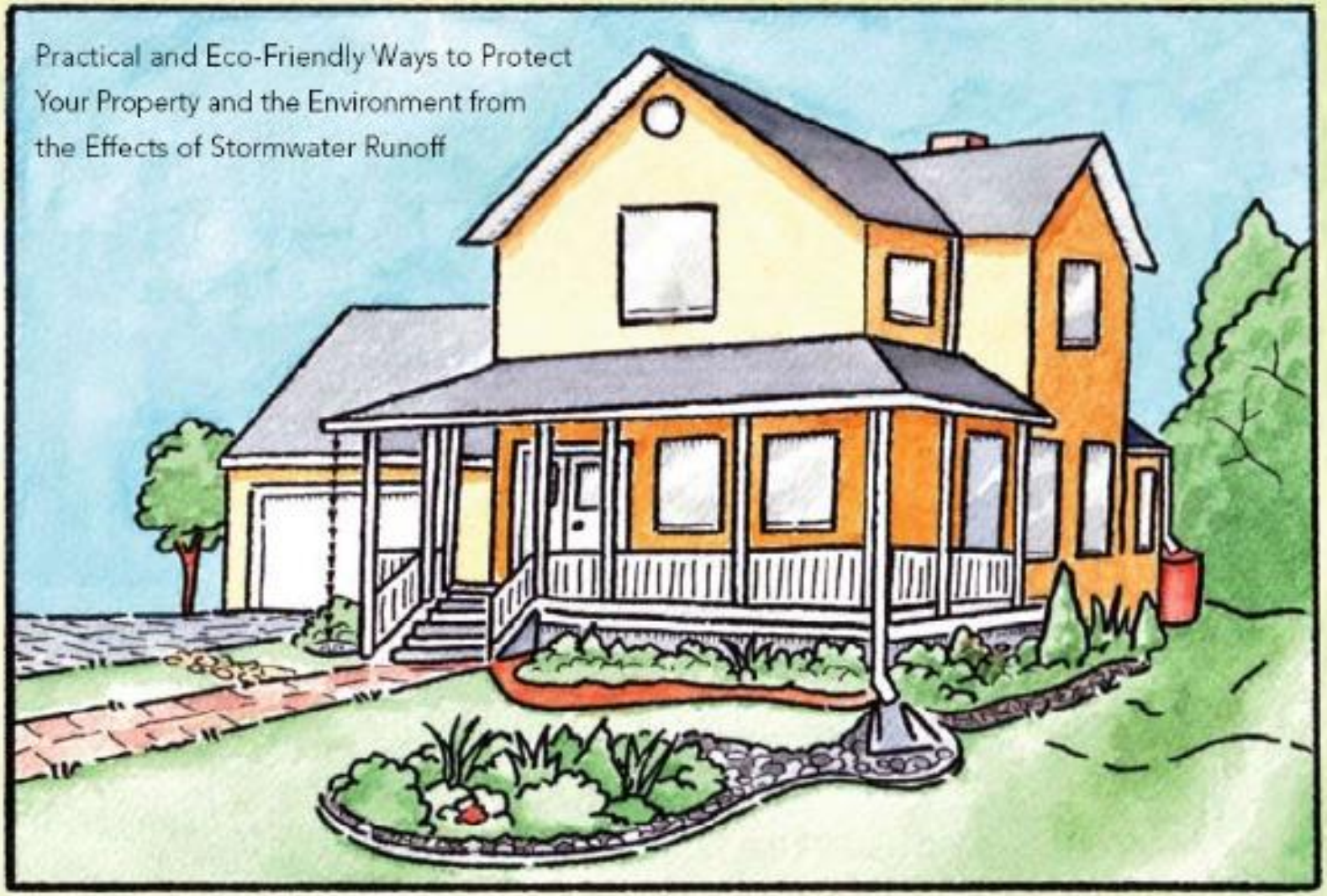
- Produced all year long
- Small tanks, if any
- Only hold < 24 hours
- Not for some vegetables
- Salts can build up from soaps unless flushed
- 29,000 gallons / six months for four people and all hookups
- Permits required for larger systems

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

Slow it. Spread it. Sink it!

A Homeowner's Guide to Greening Stormwater Runoff



RESOURCE
CONSERVATION DISTRICT
OF SANTA CRUZ COUNTY

Rainwater harvesting

- Passive systems including swales, rain gardens, and percolation ponds

- Simple catchment & gravity feed

- Above or underground tanks with filters, pumps, etc.

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

Rain Gardens, Bioswales, Bioretention, Dry Streams, etc.

Parking lot near Diridon CalTrain Station in San Jose


NO PARKING

Dry Streams

Dry Creek in a parking strip

Dry Creek with native plants

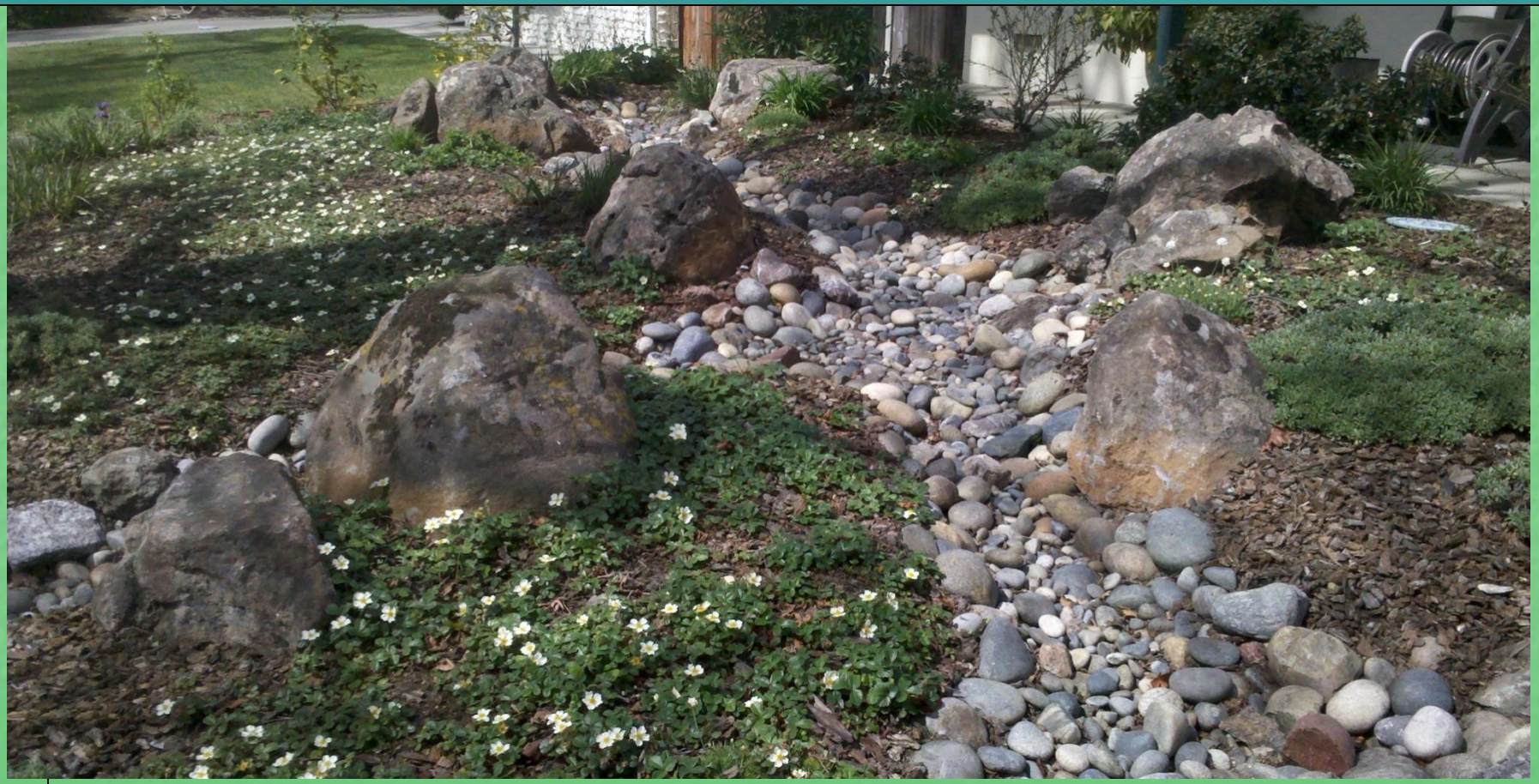
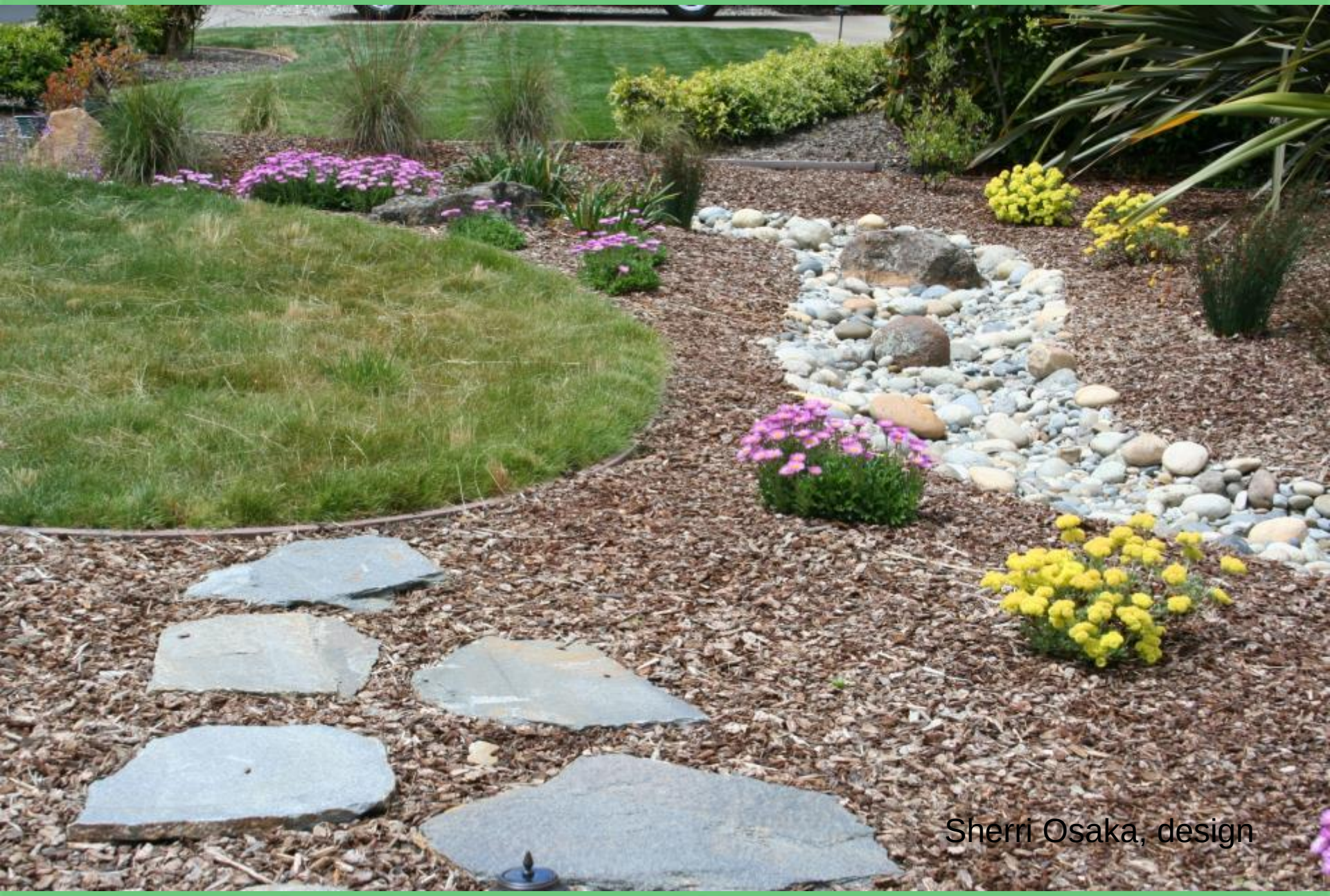


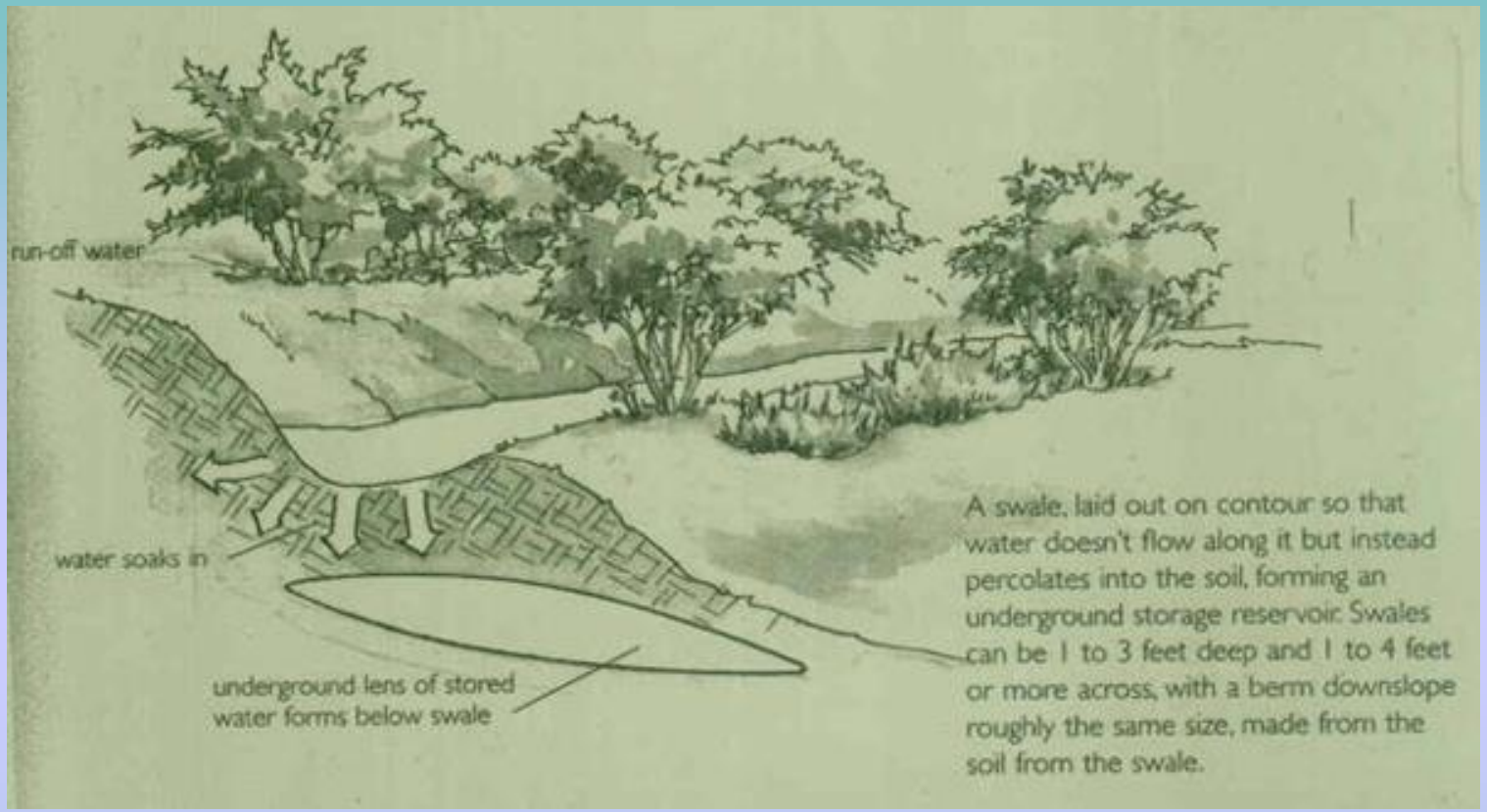
Photo and installation: EarthCare Landscaping


Alan Hackler design and installation


Sherri Osaka, design


Alan Hackler design and installation

Alan Hackler design and installation



A swale, laid out on contour so that water doesn't flow along it but instead percolates into the soil, forming an underground storage reservoir. Swales can be 1 to 3 feet deep and 1 to 4 feet or more across, with a berm downslope roughly the same size, made from the soil from the swale.

Swales slow and capture water

Swale examples

Swale to protect house

Urban swales

Portland,Oregon

Grassy swale drains parking lot runoff

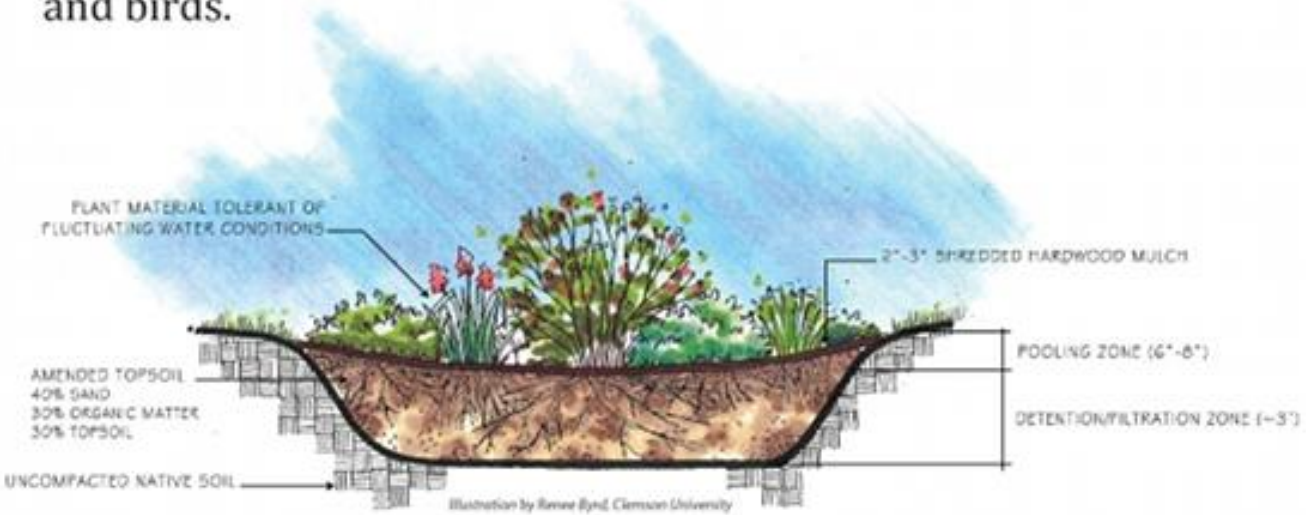
Urban Swale in Palo Alto

Taking matters into your own hands

Rain Gardens

Carolina CLEAR
A Public Service of Clemson University

Rain gardens are landscaped depressions that receive stormwater runoff and allow the runoff to slowly infiltrate to the groundwater table. As well as intercepting stormwater runoff that could have added to potential flooding problems, the rain garden allows nature to play a role, removing some of the pollutants that would have otherwise affected downstream water quality. During infiltration, plants use excess nutrients for growth, sediment is trapped in the garden and biological and physical processes remove pathogens. Dissolved metals and nutrients bind or adsorb to soil particles and are removed temporarily out of the system. Rain gardens also create important habitat for bees, butterflies and birds.




Coastal Carolina University, SC. Photo credit: Dan Hitchcock


Sumter County Public Works, SC. Planted April 20, 2009


Portland, OR. Photo credit: Center for Watershed Protection

Rain gardens are a GREEN SOLUTION to STORMWATER POLLUTION. Any home or business can install one to help reduce their impact on the environment.
Find out how at WWW.CLEMSON.EDU/CAROLINACLEAR (or keyword search Carolina Clear)

Why create a rain garden?

- Saves water
- Reduces water pollution
- 15-20% of total energy usage in California comes from pumping, cleaning & heating water
- Good for wildlife and biodiversity
- Replenish local ground aquifers
- Reduces heat island effect
- Saves money, reduces waste

"Water brings our gardens and landscapes to life. It is multifaceted, with the potential to bring many different layers and meanings" –Dunnett and Clayden

Additional Benefits

- Keeps water away from the foundation of the house
- Rain gardens provide visual and sensory pleasure
- Rain gardens are good for play
- Good for the garden microclimate
- Improves local water cycle

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

Where not to install a rain garden

- Within 10’ of a building foundation
- Near a septic drain field or tank
- Near buried utility lines
- Near the edge of steep slope, extra water could erode hillside & cause landslide

*Consult expert if slope is greater than 15%

Define challenges, resources

- Concrete or impermeable surfaces?
- Soil type and condition
- Percolation test & soil test
- Roots from large trees
- Foundations of buildings, concrete surfaces, property lines
- Make sure enough space to absorb water flow

Sizing basin

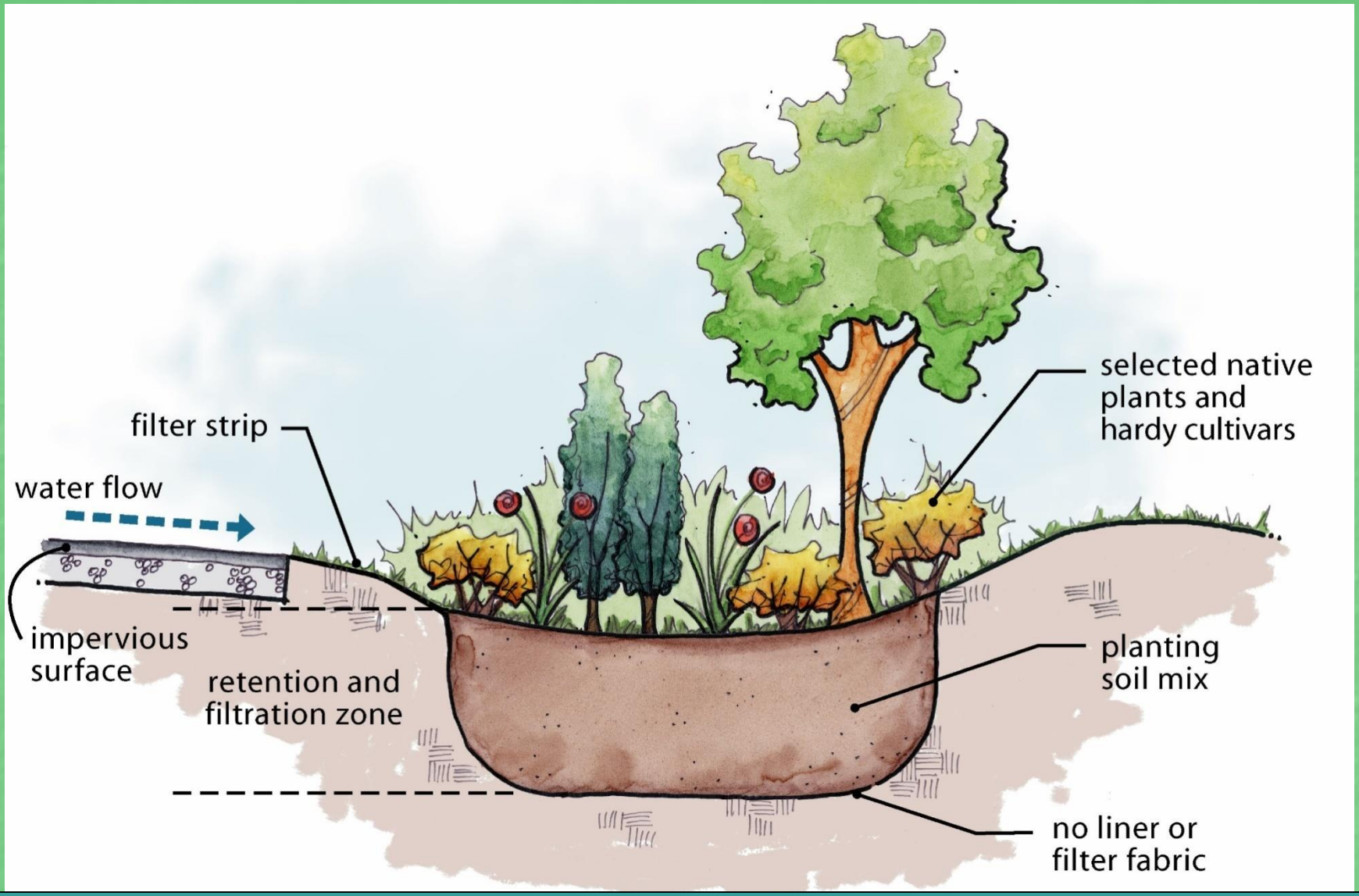
- If rain garden has 6” ponding depth and good drainage (5” per hour):

  -Surface area of rain garden can be 4% of the roof or pavement draining to it

  -Multiply area contributing roofs by .04

  -If infiltration is slow, then increase size of basin appropriately or make basin deeper

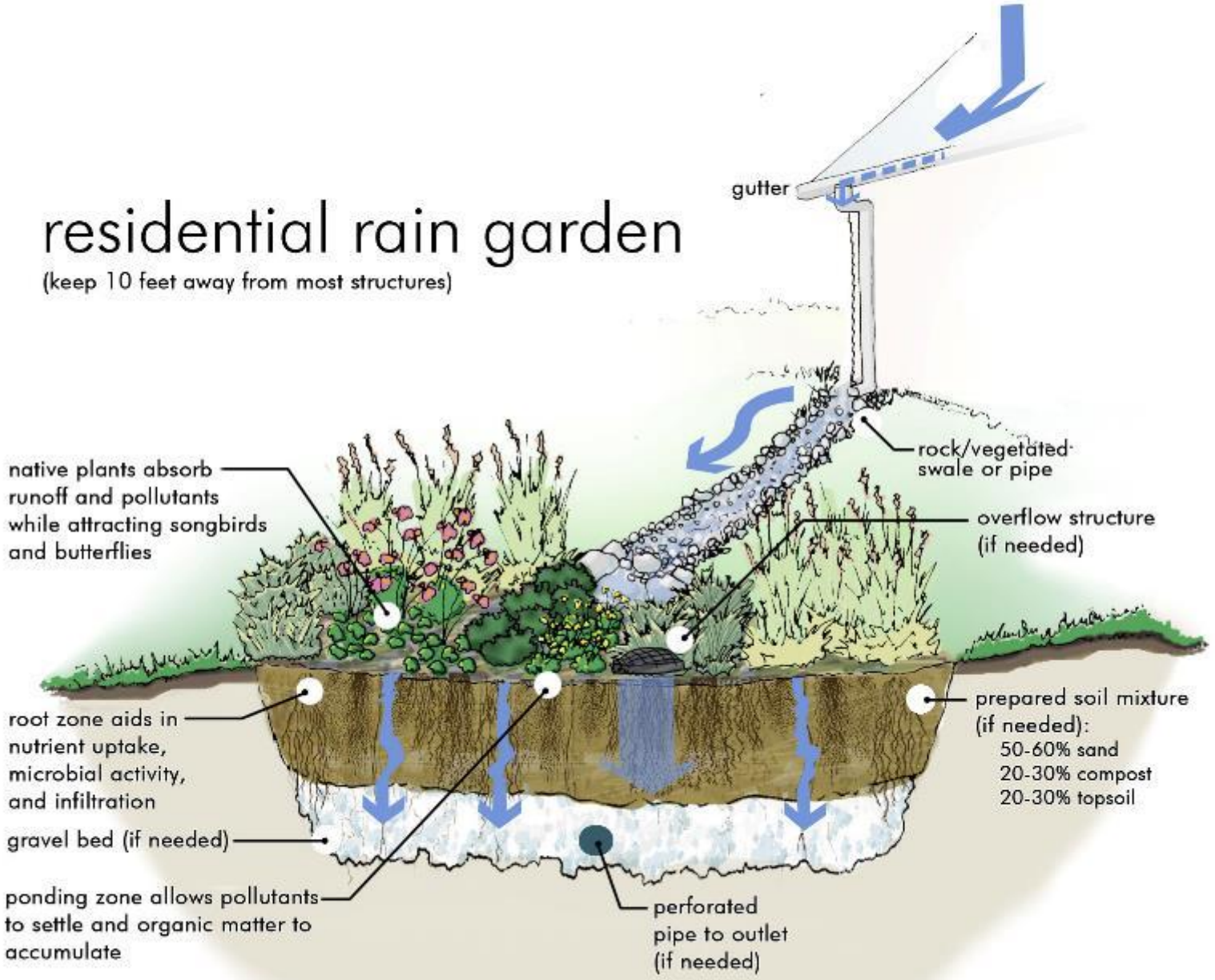
If infiltration is less than 1” per hour, the rain garden should be 50% of contributing area



Simple Rain Garden

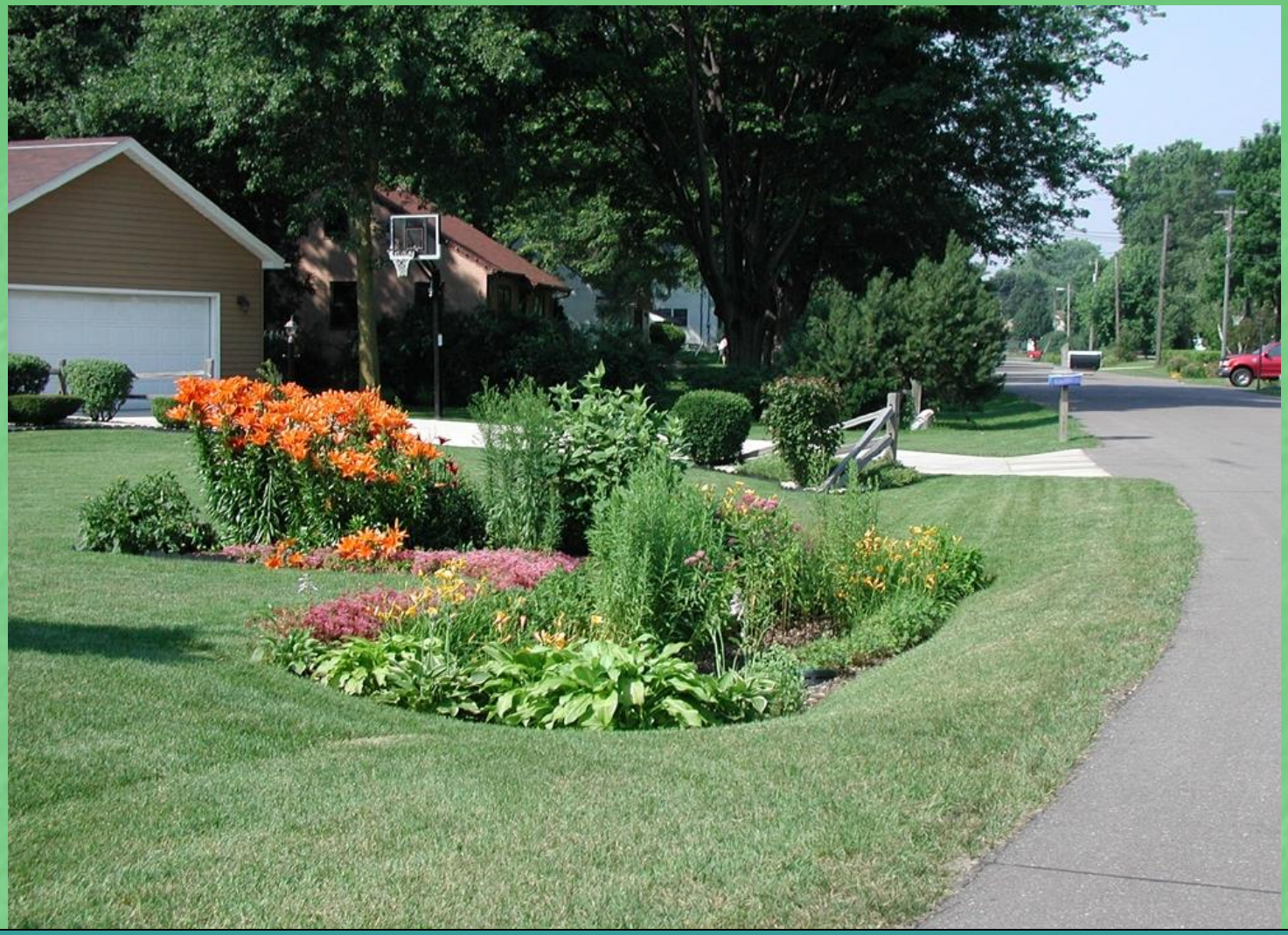
residential rain garden

(keep 10 feet away from most structures)



Rain Garden

www.treepeople.com



Rain Garden for summer rains

Rain Barrels

Rain Barrels

- Usually about 55 gallons
- Great source of water during an emergency – must be cleaned before drinking!
- Pure water great for plants that are sensitive to chemicals/ hard water

Rain Barrels

- Great for watering plants under an overhang that don't get rain water
- Can be refilled over and over again
- Gateway "drug" to cisterns


Don't drink water
No beber agua
Ne buvez pas l'eau

Rain Barrels

- Available at hardware stores, online, etc.
- Food grade plastic is best in case you need to clean the water for drinking
- EarthMinded DIY Rain Barrel Diverter and Parts Kit ~ $40 is idea as it does not require overflow for barrel, once barrel is full, extra water goes to down spout
- Urban Farmer Store has parts for EarthMinded Diverter
- Raise the barrel up on blocks

Rebates Rainbarrels

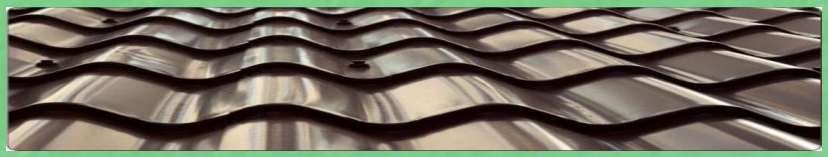
- $35 per rain barrel through ValleyWater.org
- $50 per rain barrel through BAWSCA in some cities (Sunnyvale)

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

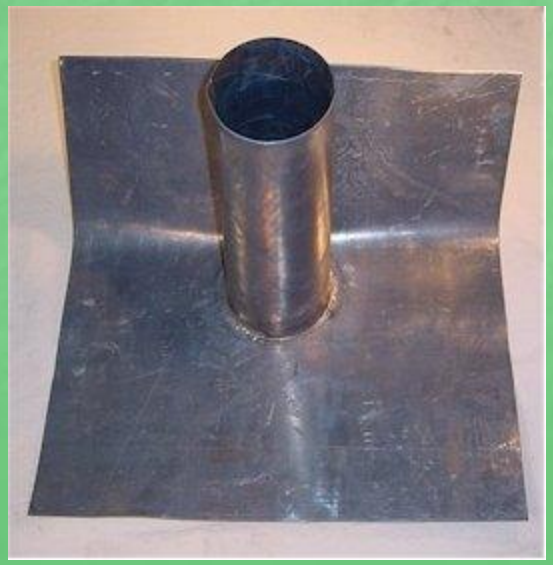


Slide courtesy of EarthCraft Design

Roof materials to avoid

Composition – petroleum

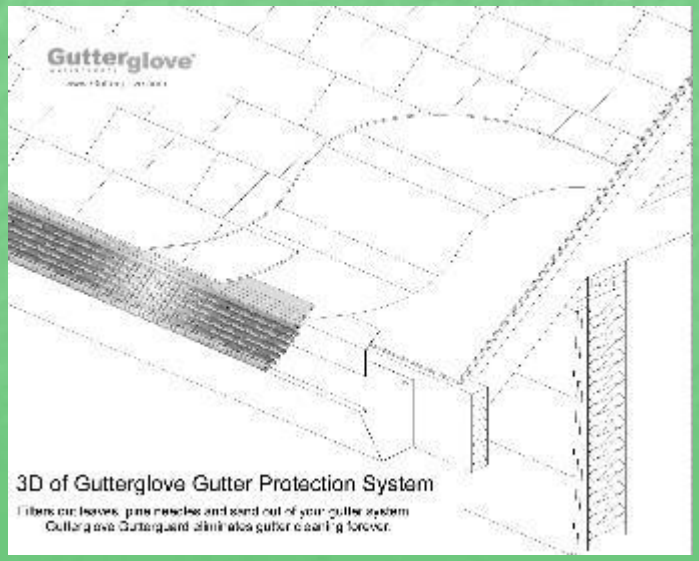
Wood shake with fire retardants



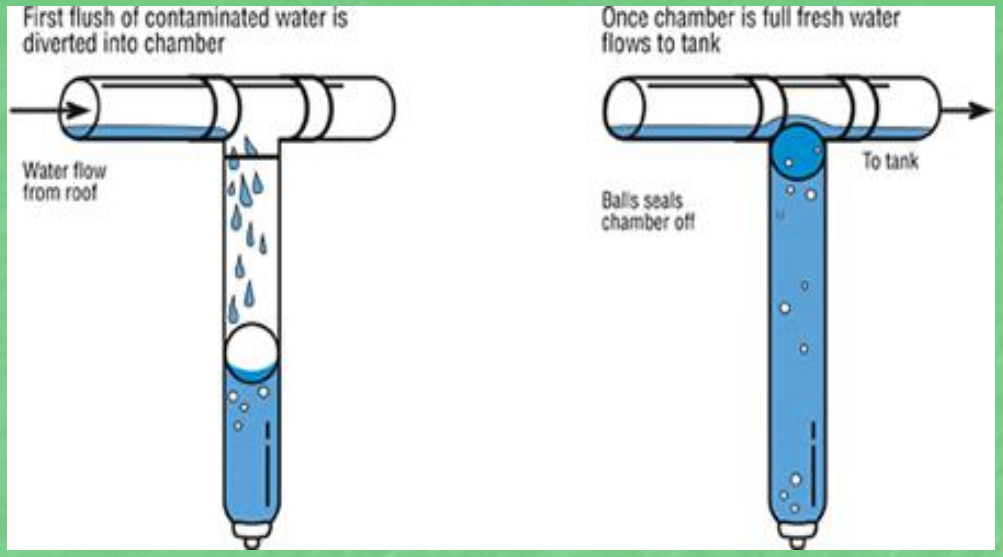
Lead flashings and solder

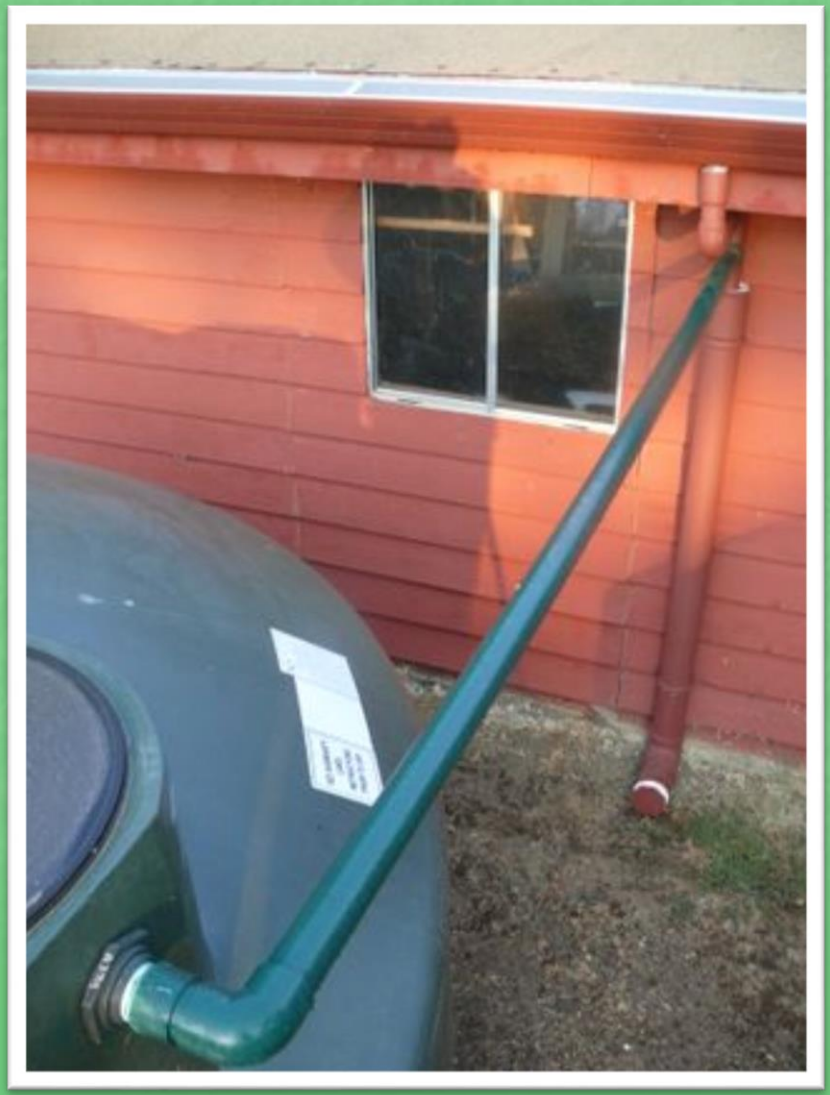
Leaf Screens

RainTube: Installed, Upclose



First Flush



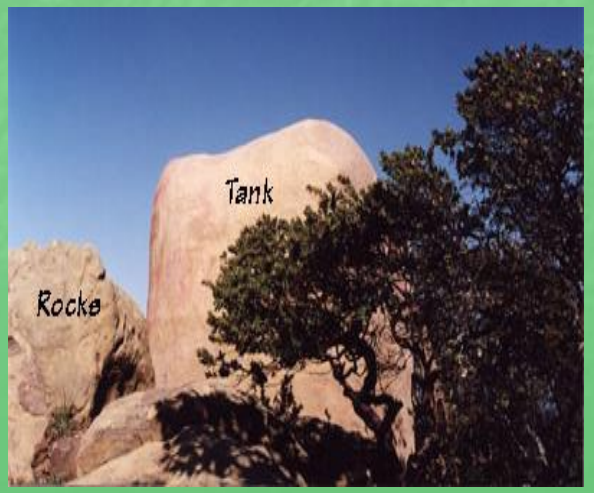


Remove at least ten gallons for every 1,000 square feet of collection

Other safety precautions

- Mosquitos – screens on all tank intakes
- Earthquake – secure barrels, water is very heavy!
- Secure lids – childproof
- Overflow directed away from the house to a pervious area

Above ground storage



Images courtesy of EarthCraft Design & Greywater Action

Below ground storage

Slide courtesy of EarthCraft Design

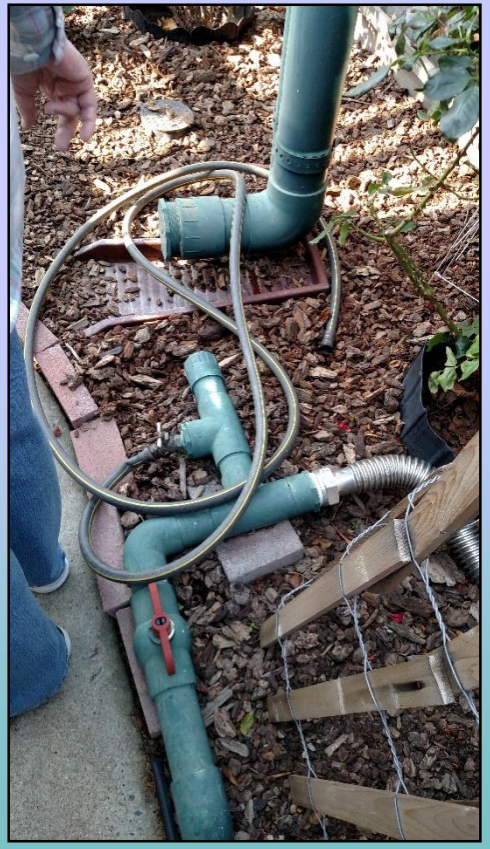
Tanks - Crawlspace

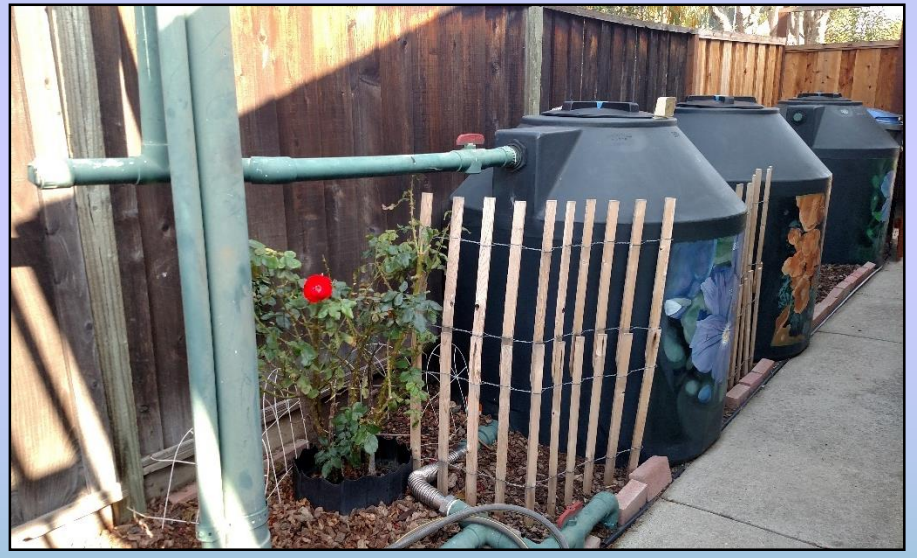
Single barrel catchment

“Daisy chain catchment”

Photos and projects courtesy of Greywater Action

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

Statistics courtesy of EarthCraft Design

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

Slide courtesy of EarthCraft Design

Planning

Clean & fix your gutters!

- Do they even work still (did they ever?)

Observe water flow during rain

- Where does the flow come from & go
- What gutter gets most flow?
- City inlets?

Observe Site

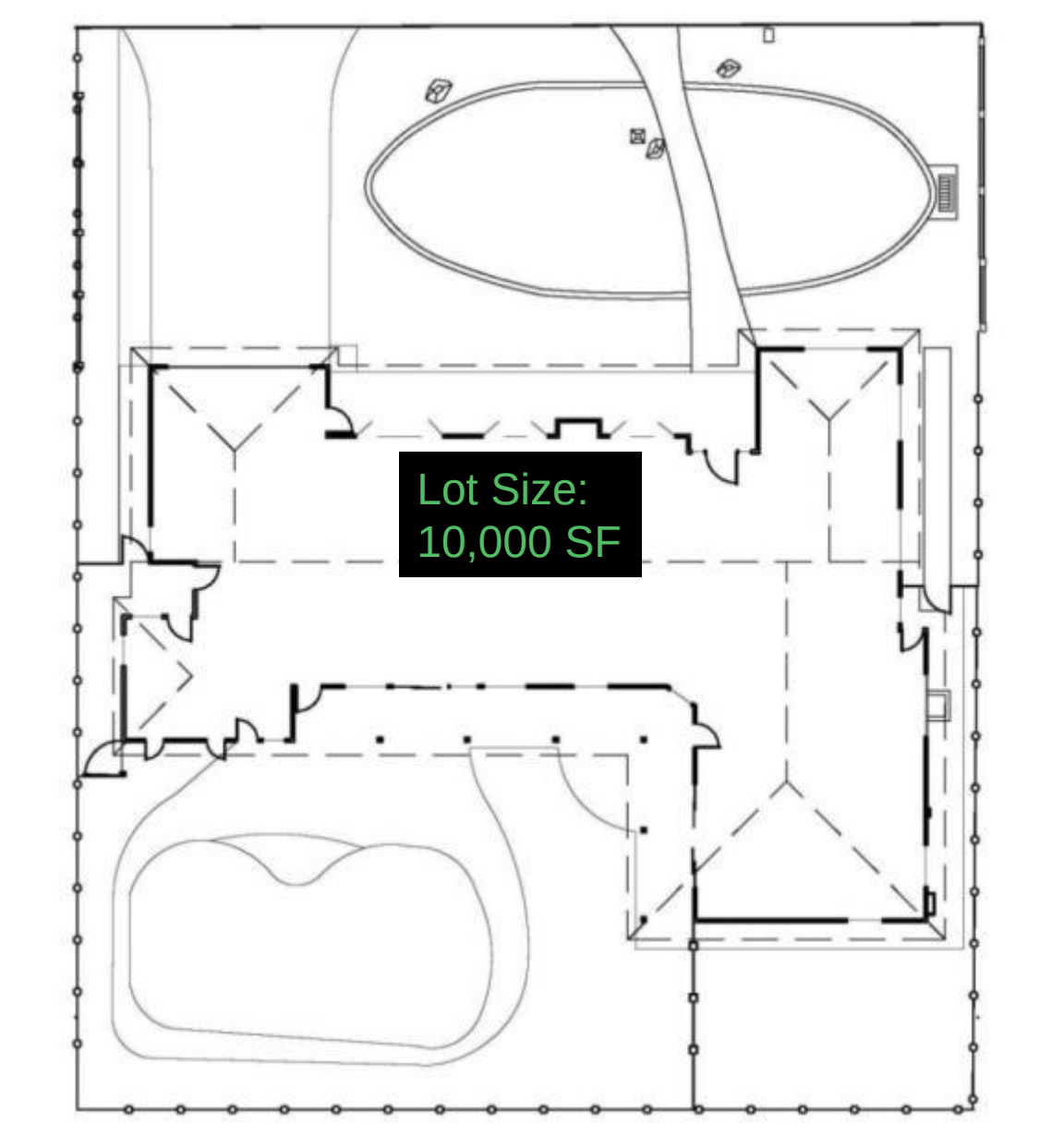
- Watch how water flows through site for one year/season or at least one heavy rain.
- Understand water will always take path of least resistance
- Steepness & condition of slope affects speed & volume of runoff: steeper & more bare the slope, faster & more erosive the runoff
- Make slope gradual & add plants to control flow

Source: Okanagan Basin Waterscape
Wise water use outdoors - Natural Resources Canada

click to enlarge

Calculating rainwater amounts

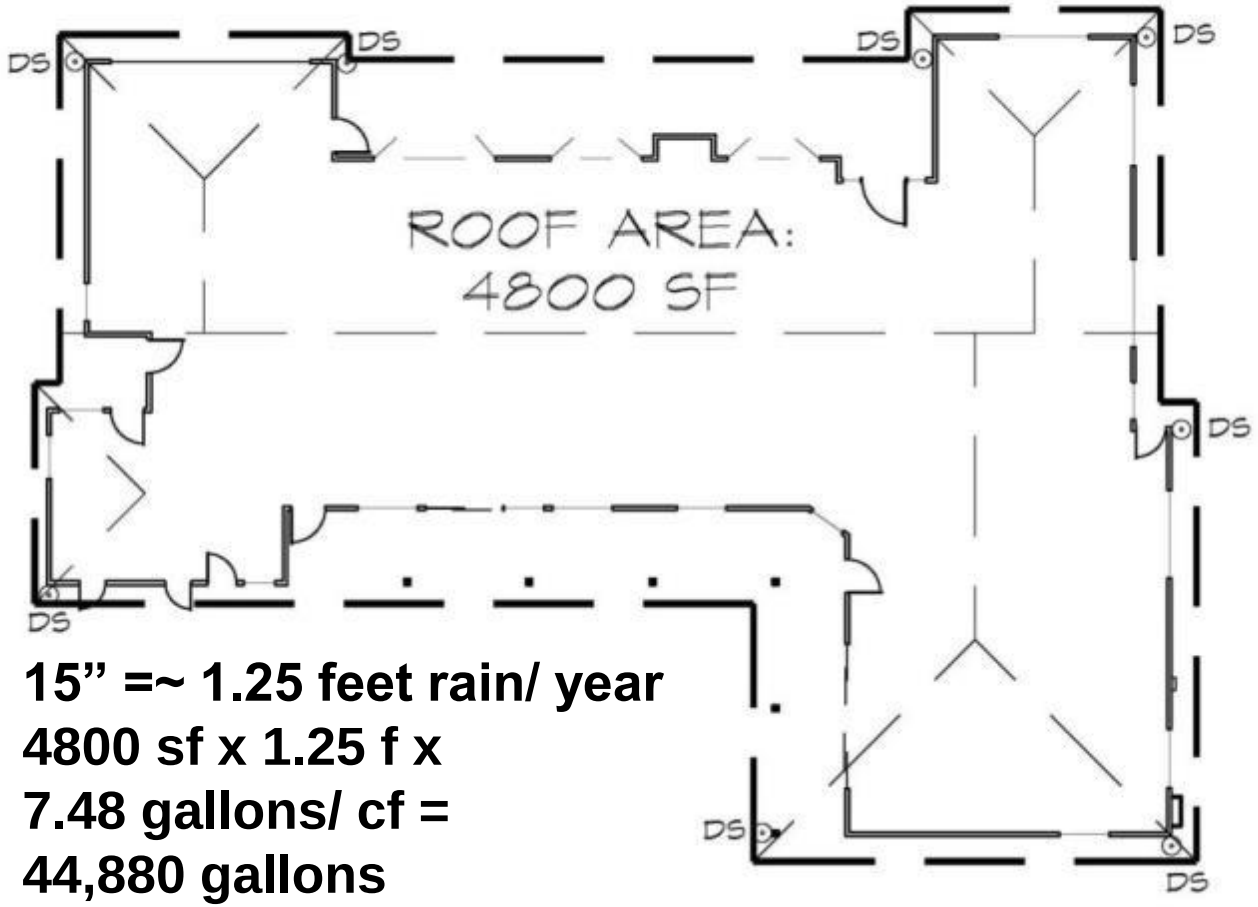
10,000 sf x 1.25 f
X 7.48 gallons/ cf
= 93,500 gallons



sf = square feet
f = feet
cf = cubic feet

Calculating rainwater amount on your roof

sf = square feet, f = feet, cf = cubic feet



15” =~ 1.25 feet rain/ year
4800 sf x 1.25 f x
7.48 gallons/ cf =
44,880 gallons

Check and test

- After doing initial earthworks, check slope and layout of garden
- Test flow with garden hose or if weather and time provides, during a rain storm
- Observe garden closely through first season & note how water flows during heavy storms
- Check and test again if need.

Cheats if your rain garden isn't big enough

- Use a garden fork to create more aeration in the bottom
- Add sand and compost to the soil
- Add a rain barrel
- Dig it larger

Plants

Plants

- Key characteristics:
  - Plants that grow in the winter and early spring then go summer dormant
  - Plants that naturally like wet winters and dry summers
  - Bulbs that like dry summers
  - Water-loving annuals
  - Plants from vernal pools

Native plants for dry creeks & rain gardens

- Maidenhair fern — *Adiantum spp.*
- *Yerba mansa* — *Anemopsis californica*
- Western Columbine — *Aquilegia formosa* Summer dormant
- Mugwort — *Artemisia douglasiana*
- Sea thrift — *Armeria maritima*
- Wild Ginger — *Asarum caudatum*
- Sedge — *Carex* (invasive)
- Stream Orchid — *Epipactis gigantea* Summer dormant
- Horsetail — *Equisetum (invasive)*
- *California fuchsia* — *Epilobium septentrionalis 'Select Mattole*
- Wire Grass, Rush — *Juncus* (all)
- Iris — *Iris douglasiana, I. PCH*
- Leopard lily — *Lilium pardalinum*
- Scarlet Monkeyflower — *Mimulus cardinalis*
- Seep Monkeyflower — *Mimulus guttatus*
- Hooker Evening Primrose — *Oenothera elata*
- Redwood Sorrel — *Oxalis oregana*
- Monkeyflower Savory — *Satureja mimuloides*
- Checkerbloom — *Sidalcea spp Summer decidous*
- Blue-eyed Grass — *Sisyrinchium bellum – summer dormant*
- Yellow-eyed grass — *Sisyrinchium californica*
- Goldenrod — *Solidago* (all except *Californica, invasive)*

Western columbine
Aquilegia formosa

Stream orchid
Epipactis gigantea

California fuchsia
Epilobium septentrionalis

Iris
Iris douglasiana

Common Rush
Juncus patens

Leopard lily – Lilium pardalinum

Checkerbloom
Sidalcea malvaeflora

California Goldenrod

Solidago velutina ssp californica

Rainwater Resources

- *Rainwater Harvesting for the Mechanically Challenged*
  Author: Richard Heinichen

- Greywater Action in Oakland -www.greywateraction.org

- www.whollyH2O.org

- Bobby Markowitz, EarthCraft Landscape Design
  www.earthcraftdesign.com

Slow it. Spread it. Sink it – Sonoma Valley Groundwater Management

Soak It Up! – Santa Clara Valley Urban Runoff
Pollution Preventions Program (scvurppp)

- John Russell, Water Sprout www.watersprout.org

- Many slides thanks to Sherri Osaka, Sustainable Landscape Designs and to Alan Hackler of Bay Maples

The End . . .

. . . or is it just the beginning?