Urban Rain Gardens: Capturing our local water

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The Watershed Project

www.thewatershedproject.org

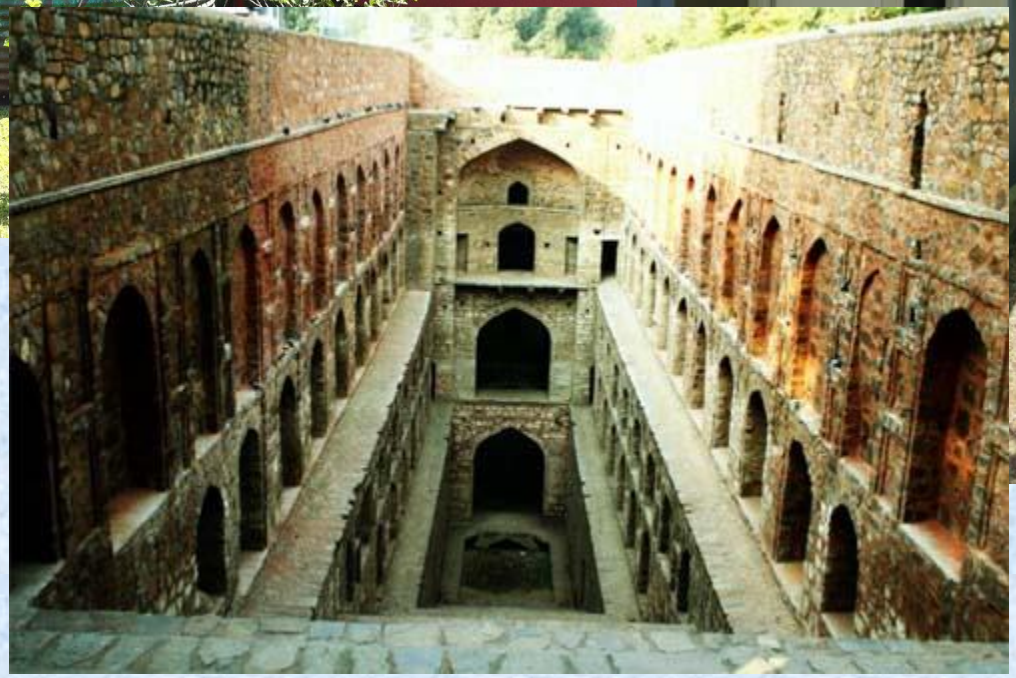
the watershed project

The Watershed Project's mission is to inspire Bay Area communities to understand, appreciate, and protect our local watersheds.

We educate students and adults and engage them to

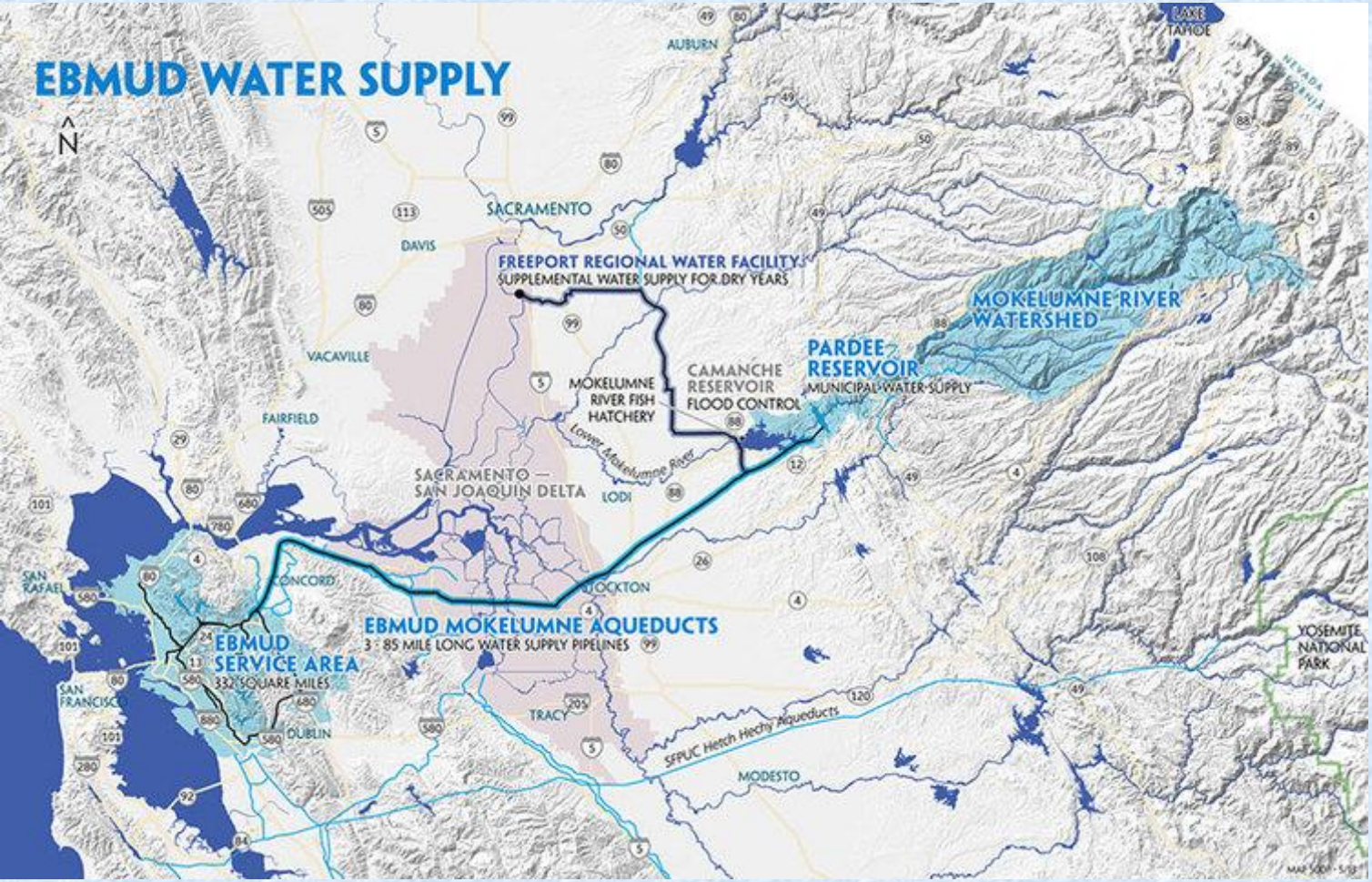
- Restore habitat and natural landscapes
- Clean creeks and shoreline
- Conserve water and other resources
- Prevent pollution of creeks and the bay

Residential water supply from the sky



We all depend on a reliable supply of clean water - and most of us take it for granted.

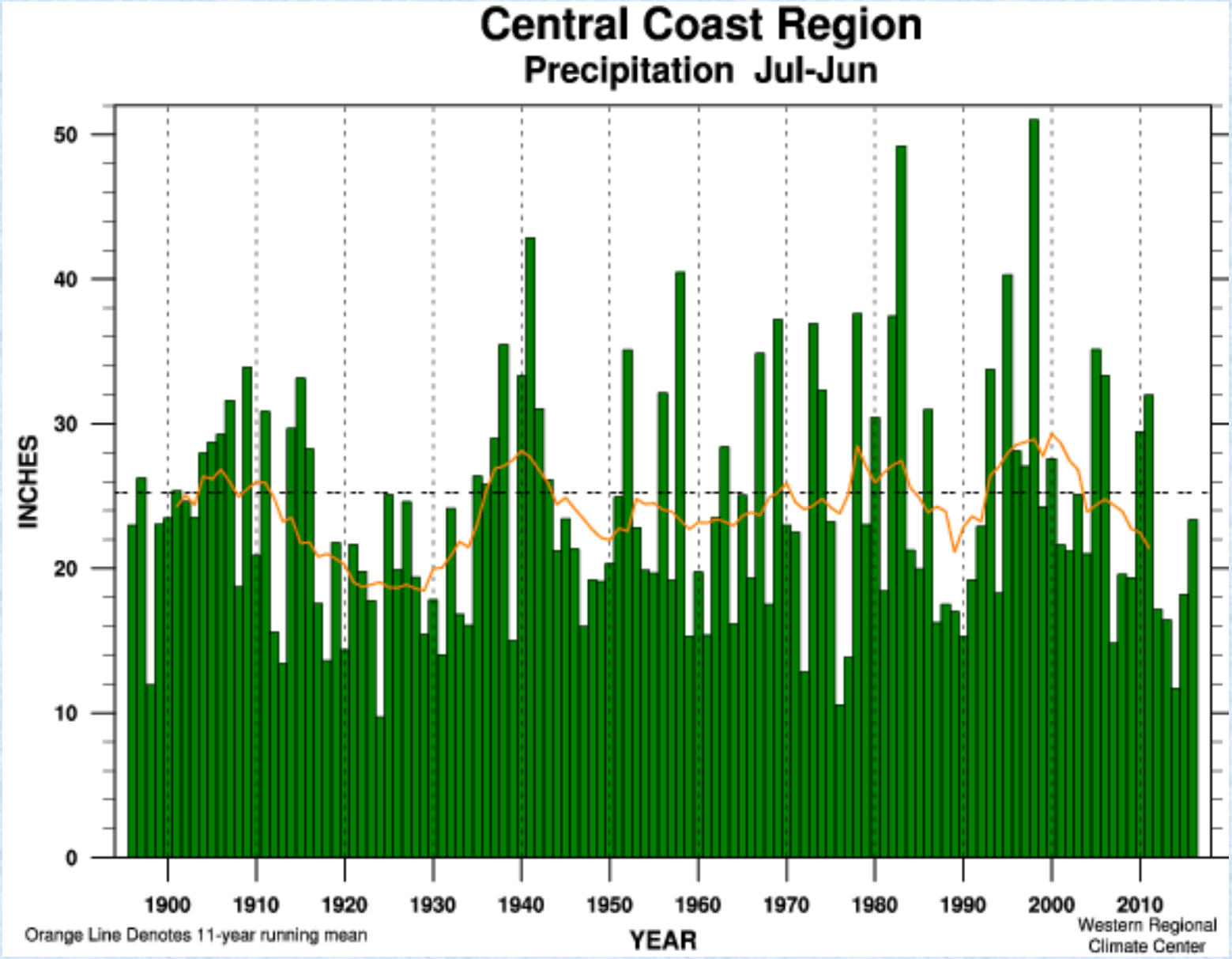
Where does our water come from?



Economic cost ?

Ecological cost ?

Water scarcity - the drought is over, right ?



Conservation 3 ways

Conserve by using less

Conserve by reuse

Conserve by capturing and using local rain water supply

Often it goes down the drain -

What is the economic cost ?

- ecological cost ?

Local rain water supply

Harvest for use by utilizing nature's methods -

What is a Rain Garden?

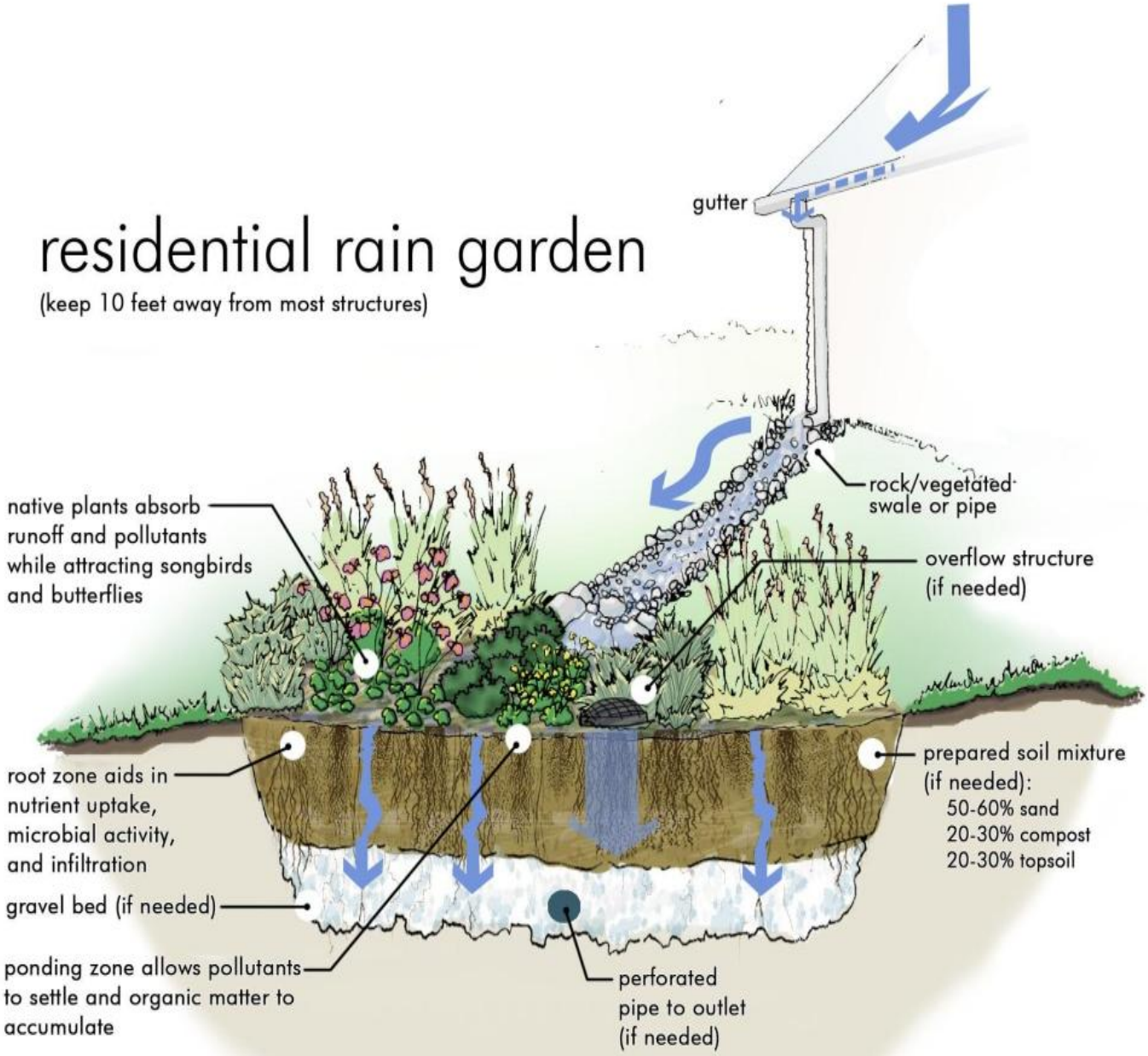
An excavated area that receives water,
with well-draining soil,
and planted with flood and
drought tolerant vegetation.

Benefits of rain gardens and swales

- Slow the flow to creeks and storm drains
- Infiltrate and recharge groundwater
- Filter out pollutants through soil
- Trap trash and sediment
- Water for use by plants
- Attractive landscape feature
- Provide habitat for pollinators, beneficial insects and birds
- Green the urban environment
- Satisfy C.3 permit requirements

residential rain garden

(keep 10 feet away from most structures)



Steps to building a rain garden

Assess your site:

- Drainage patterns
- Impervious surfaces
- Low points that collect water

Choosing a site for a rain garden

Site considerations:

- gentle slope – ideally greater than 2%, less than 15%
- water flow away from buildings
- 10 feet from bldg foundations
- 5 feet from property lines
- 3 feet from sidewalks
- avoid utilities
- avoid tree roots

Test the Drainage and Soil

- Conduct an infiltration test
  - Dig a hole 18 – 24” deep, at least 6“ across
  - Insert a stake with a yardstick so that yardstick is at bottom of the hole
  - Fill and let drain completely twice to saturate soil
  - Fill to at least 12” and measure the water level drop every hour
  - Calculate drainage rate in inches per hour
  - If drainage is less than ¼ inch/hour, not a good site!
- Determine Soil texture, i.e. clay loam

Seattle Public Utilities RainWise program

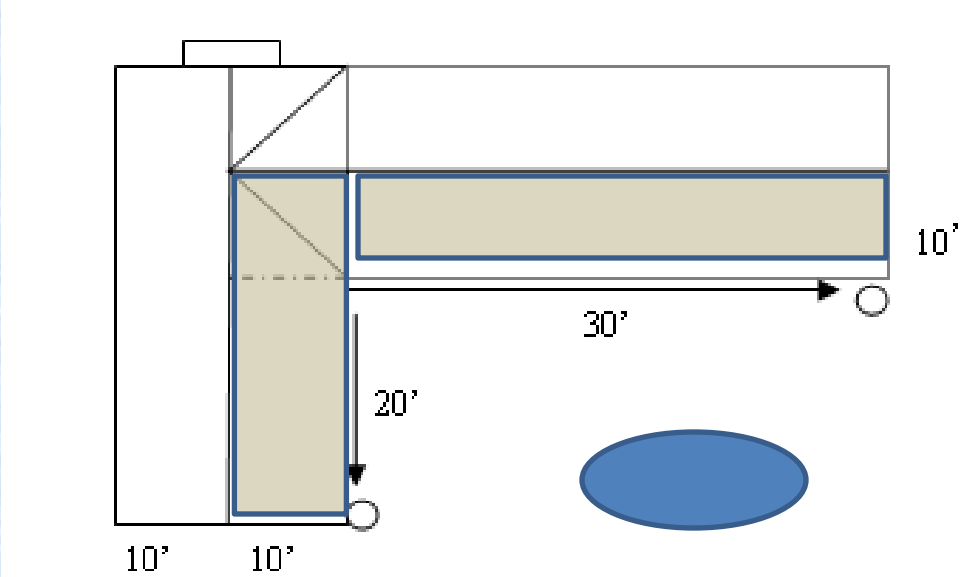
Size of rain garden

Ideal size –

- Captures 80% of annual runoff
- Retains water up to 48 hours, but no longer than 72 hours

  (per Contra Costa Clean Water BMP Basin Sizing Memo 2005)
- Or may depend on space available

What is the impervious area draining to the garden?
- measure footprint of roof area



Calculating roof runoff and rain garden size

From the ground, measure or estimate the length and width of the roof section(s) and/or paved area that will drain to the proposed rain garden. Multiply to get area.

Section A _____ ft. (length) X _____ ft. (width) = _____ sq. ft.

Section B _____ ft. (length) X _____ ft. (width) = _____ sq. ft.

Total catchment area _____ sq. ft.

Multiply by the runoff coefficient for your type of roof or other impervious surface.

Total **roof** catchment area _____ sq. ft. X Runoff coefficient _____ = effective area

Total **pavement** catchment area _____ sq. ft. X Runoff coefficient _____ = effective area

Total effective catchment area _____

Surface type	Runoff coefficient
Metal roof	0.95
Asphalt shingled roof	0.90
Tar/gravel roof	0.80
Pavement concrete/asphalt	0.90
Pavement brick	0.80
Gravel driveway	0.50

Estimating residential rain garden size by soil type

Soil type	Area of Rain Garden	Depth to excavate
Sandy loam	10% of catchment area	6 – 12 inches
Silty loam	20% of catchment area	12 – 18 inches
Clay loam	30% of catchment area	18 – 24 inches

Amend and replace soil as needed, to a finished depth of about 9 inches.

Add 3 – 4 inches of wood chip or bark mulch on top. The finished depth should be about 6 inches.

Use these guidelines where no gravel layer or underdrain needed.

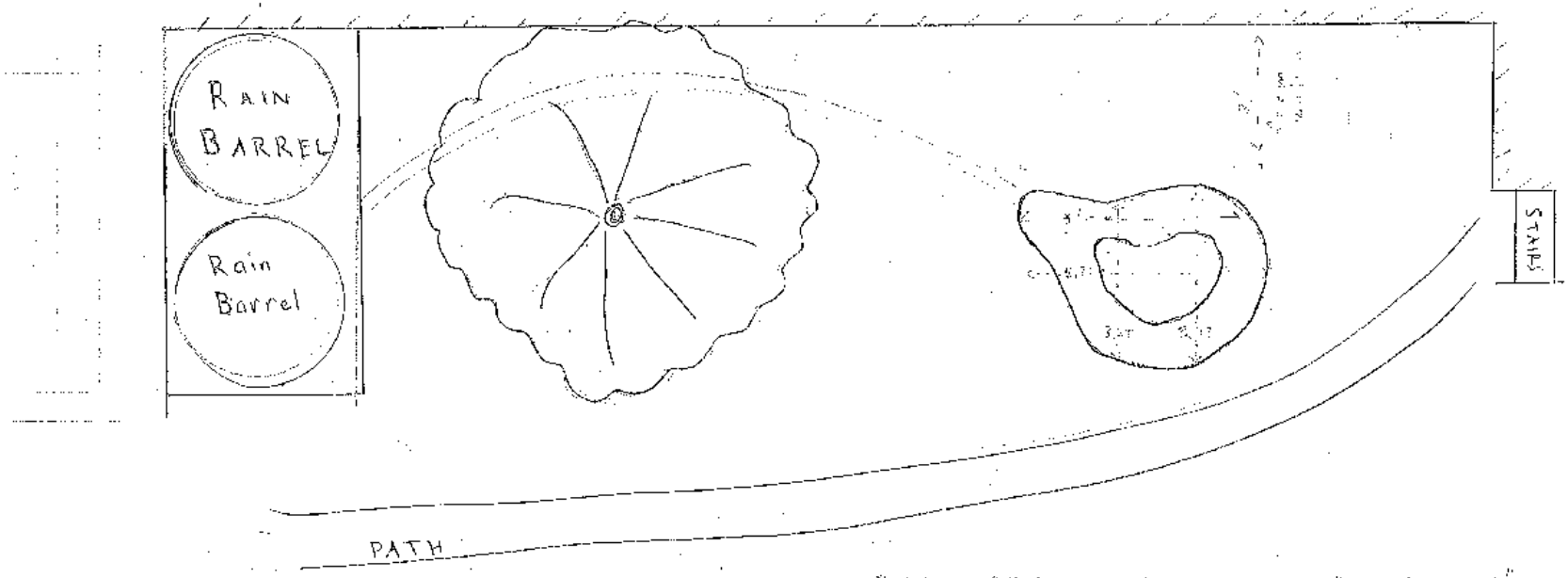
Reference: Creating Rain Gardens by Apryl Uncapher and Cleo Woefle-Erskine

- Sandy or sandy loam soil: add 3 – 6 inches of compost to the bottom of the rain garden, and mix it into the native soil to a depth of 4 – 6 inches.

- Clay soils: dig out to the target depth, refill the rain garden with a well-draining soil mix (40% compost and 60% sand). Mix into the bottom 3 inches of native soil, then fill to within 9 inches of the top.

Example 1: Simple system, A. P. Giannini School

- Small rain garden to take overflow from cisterns
- Well draining soil (San Francisco location)
- Limited space available
- Constructed by hand in less than a day


RAIN BARREL
Rain Barrel
STAIRS
PATH

Hose used to outline shape of garden per plan

Dig out center (deepest)

Slope sides 2:1

Loosen soil at bottom, mix in 3 inches of compost

Inlet from rain cistern overflow

Example 2: Rain gardens in Richmond – 17th St. & 19th Streets

flooding issues where streets meet the Richmond Greenway

Bioretention Facility

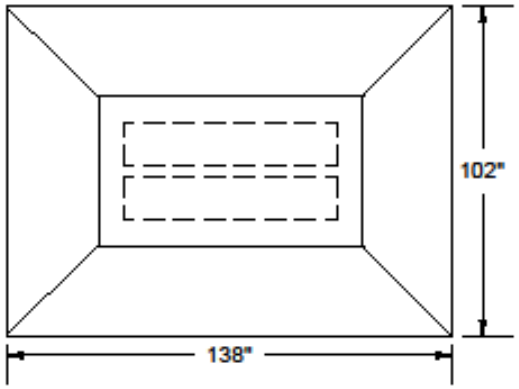
- 4 – 15 % of impervious surface area
- Bioretention soil mix depth of 18”
- Perforated pipe underdrain usually required
- Storage and drainage area below soil:
  - Class 2 permeable rock
  - Or crushed gravel with pea gravel top layer
  - Depth of gravel variable

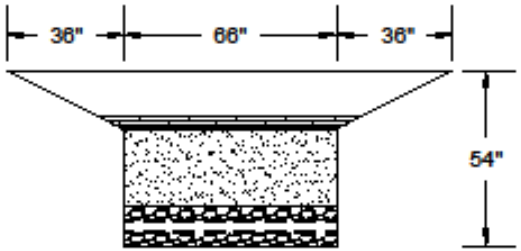
Reference: Contra Costa County Clean Water Program C.3 Guidebook

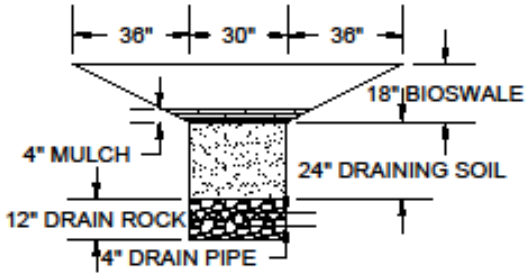
Used Google Earth and storm drain maps to estimate area of impervious surface

- space available for rain garden inadequate
- marginal infiltration rate

- designed for overflow
- even partial treatment will help
- next project will help infiltrate the overflow







UNITED STATES CUSTOMARY UNITS	UNITS: IN	SCALE: 1:50	19TH STREET RAIN GARDEN	TWP
8.5" x 11"	THIRD ANGLE PROJECTION		PAGE NO. 1	TOTAL PAGES: 1
			DRAWN BY: TKR	DATE: 8/5/15
			CHECKED BY:	DATE:
			APPROVED BY:	DATE:
			RELEASED BY:	DATE:

Constructed with hand labor and jack hammer

Gravel layer, pipe, and filter fabric installed, ready for soil

19th St. rain garden, early Nov. 2015

Newly planted Nov. 14, 2015

Jan. 2016

Plants Suitable for Rain Gardens - partial list

Species	Species common name	Rain garden zone	Growing conditions	Function
Juncus patens	Gray Rush	Low	tolerates both flooding and drought	absorbs water and some pollutants
Carex praegracilis	deer-bed sedge	Low	tolerates some flooding and drought	holds banks against erosion
Carex densa	Dense sedge	Low	tolerates some flooding and drought	holds banks against erosion
Rosa californica	Rose, California	Mid	Needs water, will grow where the water table is high	color, nectar and pollen for native bees Aggressive spreader
Heracleum maximum	Cow parsnip	Mid	Likes water, and goes dormant in summer	Large tropical-like leaves, flowers for beneficial insects
Festuca rubra	Red fescue	Mid	Small bunch grass, fairly drought tolerant	holds banks against erosion, nesting material for birds
Muhlenbergia rigens	Deer grass	Mid - high	Large bunch grass, drought tolerant	holds banks against erosion, used for basketry by Native

19th St. rain garden, Spring 2016

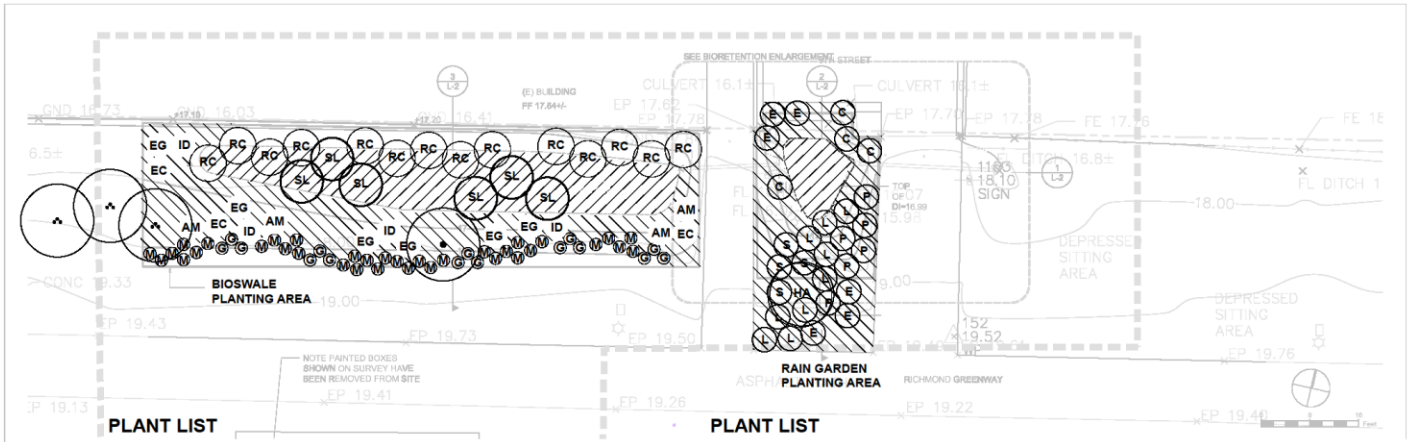
Example 3: 9th Street rain garden and swale in Richmond

Worked with existing storm drain inlet to slow the flow

Excavated with heavy equipment

Water flows in from drainage ditches on both sides

And from the street



PLANT LIST

	SCIENTIFIC NAME	COMMON NAME		
	Bioswale:			
	(Bottom of swale)			
	Juncus patens	Gray rush		D-16
SL	*Salix lasiolepis*	Arroyo willow	6	D-40
	(Side of swale)			
	Festuca rubra	Red fescue		plug
ID	*Iris douglasiana*	Douglas iris	15	1 gal
EC	*Epilobium canum*	California fuchsia	12	1 gal
AM	*Achillea millefolium*	Yarrow	18	D-16
EG	*Erigeron glaucus*	Seaside daisy	15	D-16
RC	*Rosa californica*	California wild rose	15	1 gal
	(Top edge of swale)			
M	*Muhlenbergia rigens*	Deer grass	35	D-40
G	*Grindelia hirsutula*	Grindelia (hairy gum plant)	15	D-40
•	*Aesculus californica*	California buckeye	1	TP4
∴	*Sambucus caerula*	Elderberry	3	TP4

PLANT LIST

	SCIENTIFIC NAME	COMMON NAME		
	Habitat garden:			
E	*Eriogonum sp.*	Buckwheat	6	1 gal
L	*Lupinus arboreus*	Lupine	9	1 gal
P	*Penstemon sp.*	Penstemon	6	1 gal
S	*Salvia sp.*	Sage	4	1 gal
C	*Ceanothus spp.*	California wild lilac	4	1 gal
HA	*Heteromeles arbutifolia*	Toyon	1	5 gal

REVISIONS

DATE	DESCRIPTION

HARBOUR TO 8TH
RICHMOND GREENWAY PROJECT

THE TRUST FOR PUBLIC LAND

the watershed project

DESIGN BY
DRAWN BY
CHECKED BY
SCALE 1" = 8'-0"
DATE 8 June 2016

Planting Plan

SHEET
L-3

PLOTTED ON: 6/4/2016

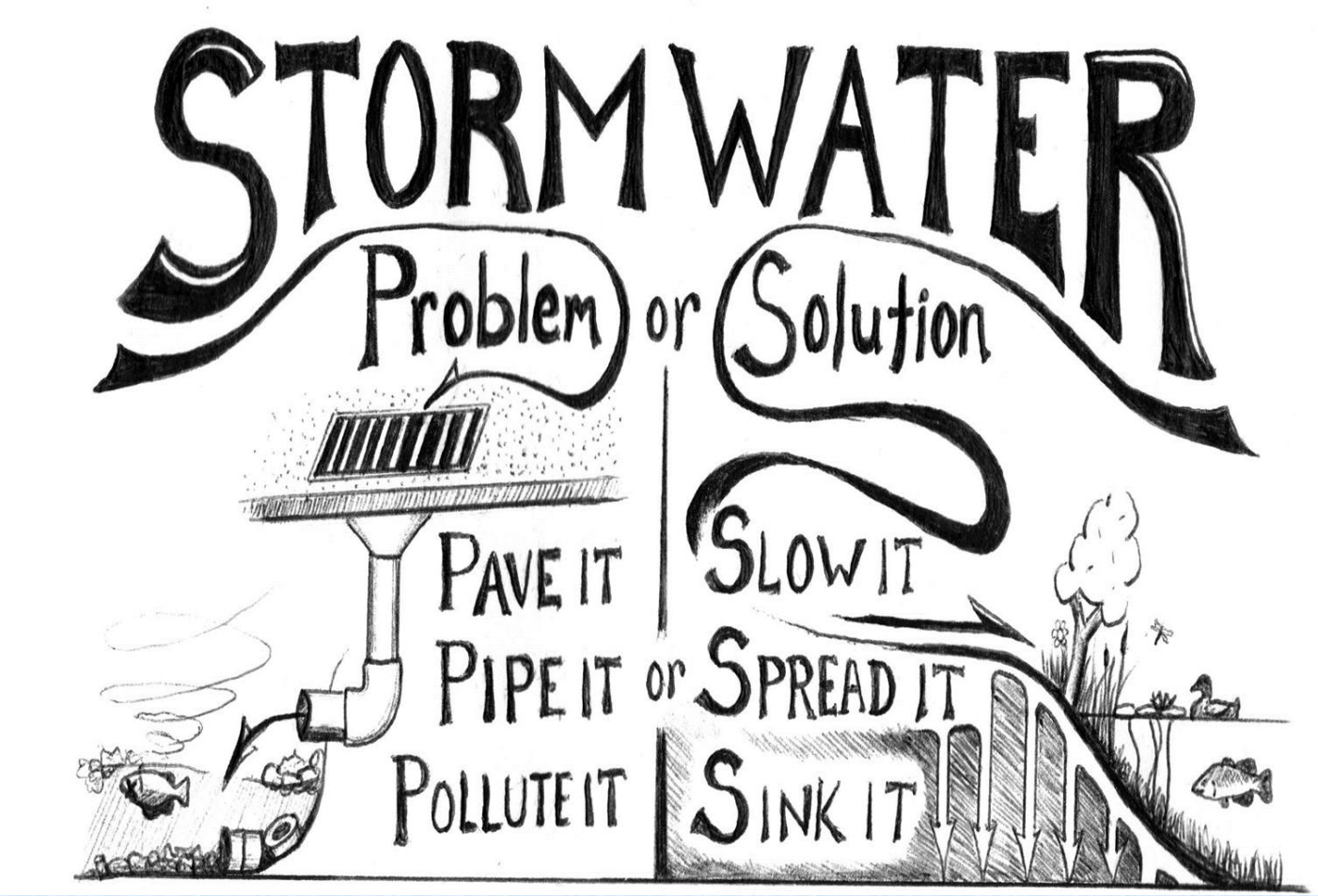
Excavated with heavy equipment

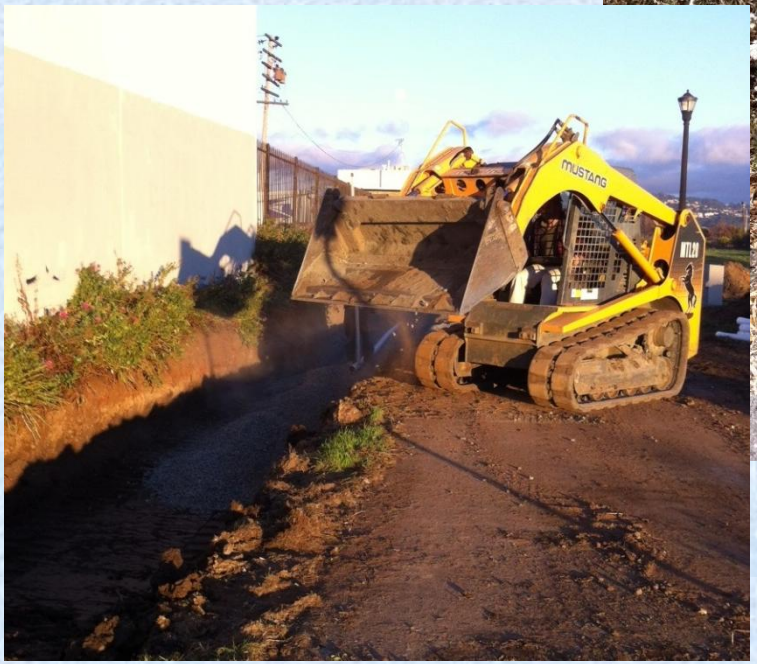
Gravel layer under bioretention soil mix

Modified drain inlet to allow ponding

Planting the swale with student volunteers

Planting the rain garden with volunteers, MLK Day 2017


STORMWATER
Problem or Solution
PAVE IT
PIPE IT
POLLUTE IT
SLOW IT
or SPREAD IT
SINK IT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References and resources

- Brad Lancaster: Rainwater Harvesting for Drylands and Beyond
- Apryl Uncapher and Cleo Woefle-Erskine:

  Creating Rain Gardens
- *http://www.cccleanwater.org/stormwater-c-3-guidebook/*
- *http://www.cleanwaterprogram.org/c3-guidance-table.html*