Rainwater Harvesting: Benefits and Best Practices

Jolene Bertetto
EBMUD

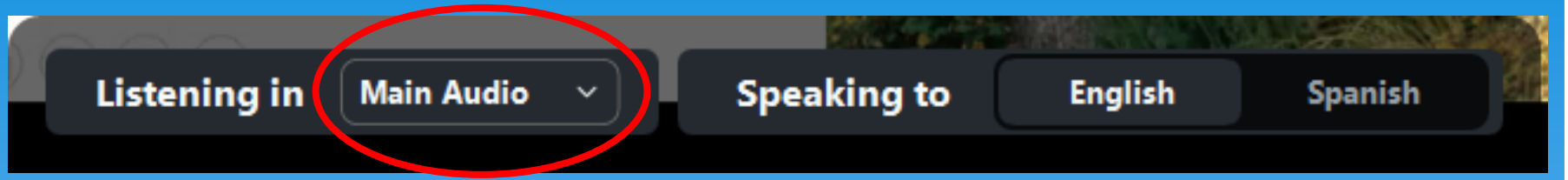
Rolando Gonzalez
EBMUD

Anya Kamenskaya
EBMUD

Stefanie Pruegel
San Leandro Resident
& Rainwater Advocate

Kat Sawyer
The Watershed Project

Español o Inglés



Si desea escuchar la presentación en español, seleccione y haga clic en el botón que dice: Listening in (Escuchando en).

- Las 2 selecciones son
  - Ingles y Español.
  - Seleccione Español si desear escuchar esta clase en ese lenguaje.

Si no elige un idioma, automáticamente se escuchara la presentación en inglés.

Si desea hacer una pregunta, escríbala en la sección Q&A (preguntas y respuestas). El traductor le hará su pregunta en Ingles a los presentadores.

EBMUD

Rainwater Harvesting: Benefits and Best Practices

Jolene Bertetto
EBMUD

Rolando Gonzalez
EBMUD

Anya Kamenskaya
EBMUD

Stefanie Pruegel
San Leandro Resident & Rainwater Advocate

Kat Sawyer
The Watershed Project

Upcoming Events

Landscape Rebate Virtual Office Hour- Lunch
Bi-weekly Tuesdays, 12 - 1 p.m.
Nov. 8, 22

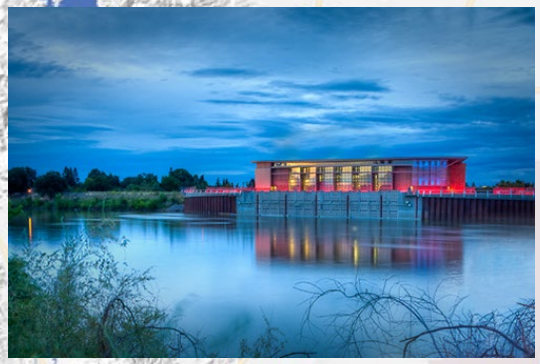
Landscape Rebate Virtual Office Hour- Evening
Bi-weekly Tuesdays, 5 - 6 p.m.
Nov. 15, 29

Sheet Mulching Webinar: Tips to Convert a Lawn into a Low-Water Use Garden, 5:30 - 7 p.m.
Nov. 3

Agenda

- EBMUD Water Supply
- Drought
- Benefits of Rainwater
- Rainwater Catchment: Overview, Components, San Leandro Example
- Rain Gardens: Overview, Design Considerations
- Green Infrastructure
- Q and A

EBMUD WATER SUPPLY



AUBURN

SACRAMENTO

FREEPORT REGIONAL WATER FACILITY
SUPPLEMENTAL WATER SUPPLY FOR DRY YEARS

MOKELUMNE RIVER WATERSHED

PARDEE RESERVOIR
MUNICIPAL WATER SUPPLY

CAMANCHE RESERVOIR
FLOOD CONTROL

MOKELUMNE RIVER FISH HATCHERY

Lower Mokelumne River

575 SQUARE MILES

FAIRFIELD

SACRAMENTO — SAN JOAQUIN DELTA

LODI

CONCORD

STOCKTON

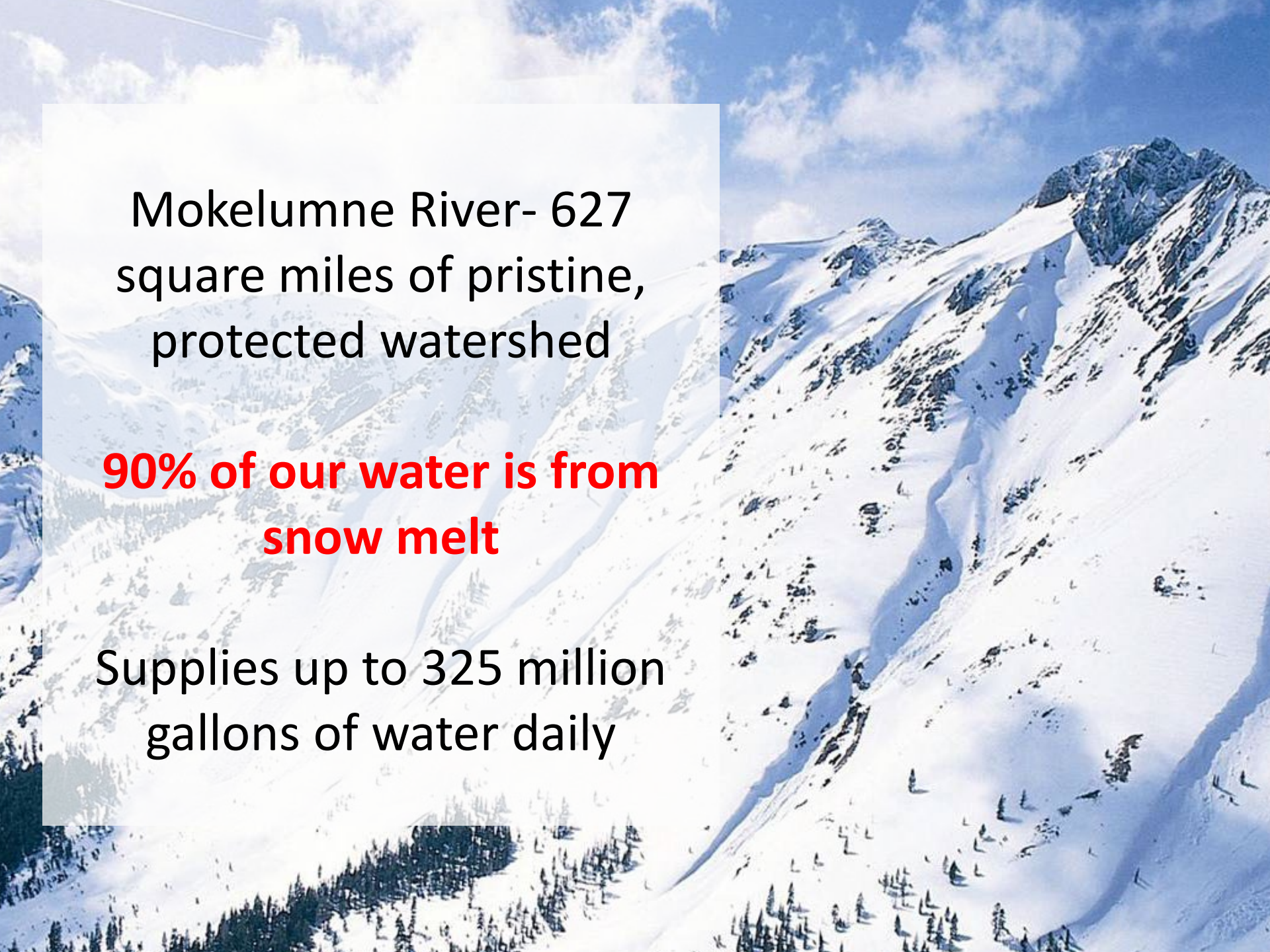
EBMUD MOKELUMNE AQUEDUCTS
3 - 85 MILE LONG WATER SUPPLY PIPELINES

EBMUD SERVICE AREA
332 SQUARE MILES

DUBLIN

TRACY

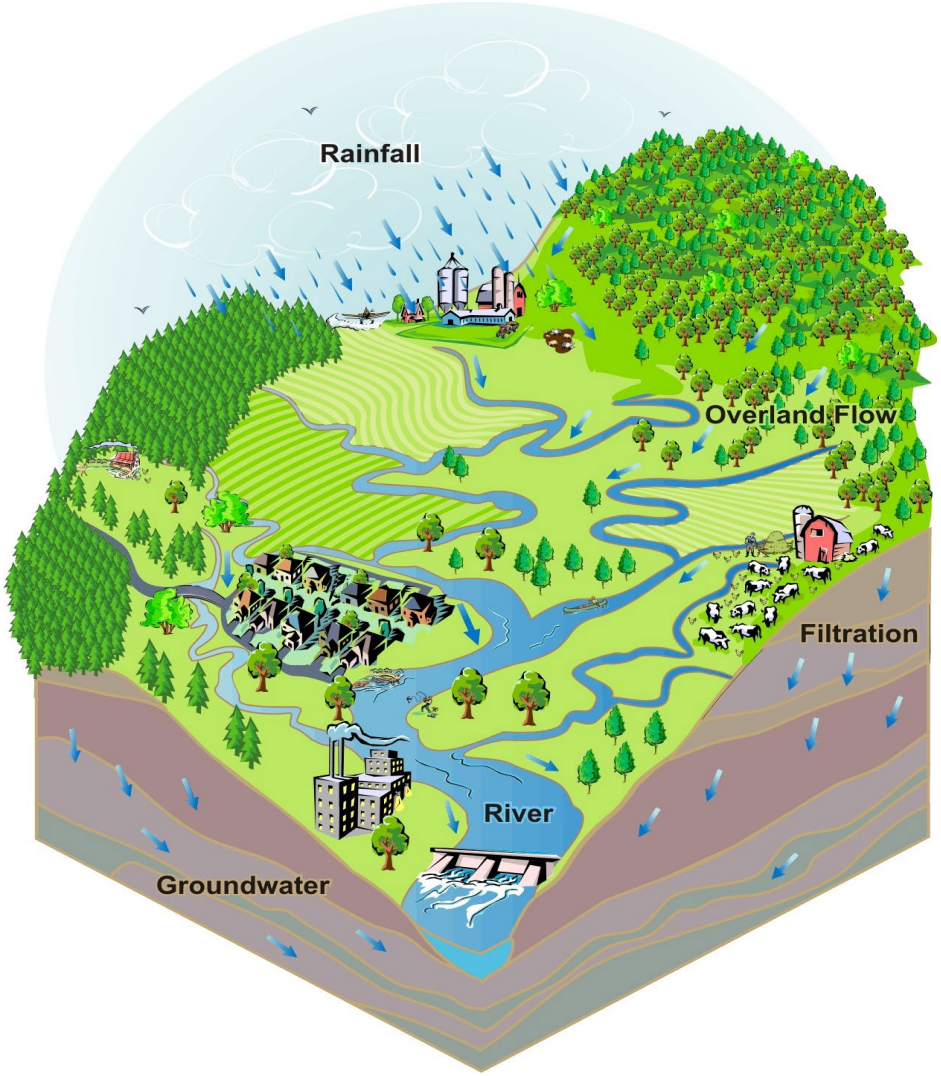
SFPUC Hetch He



Mokelumne River- 627 square miles of pristine, protected watershed

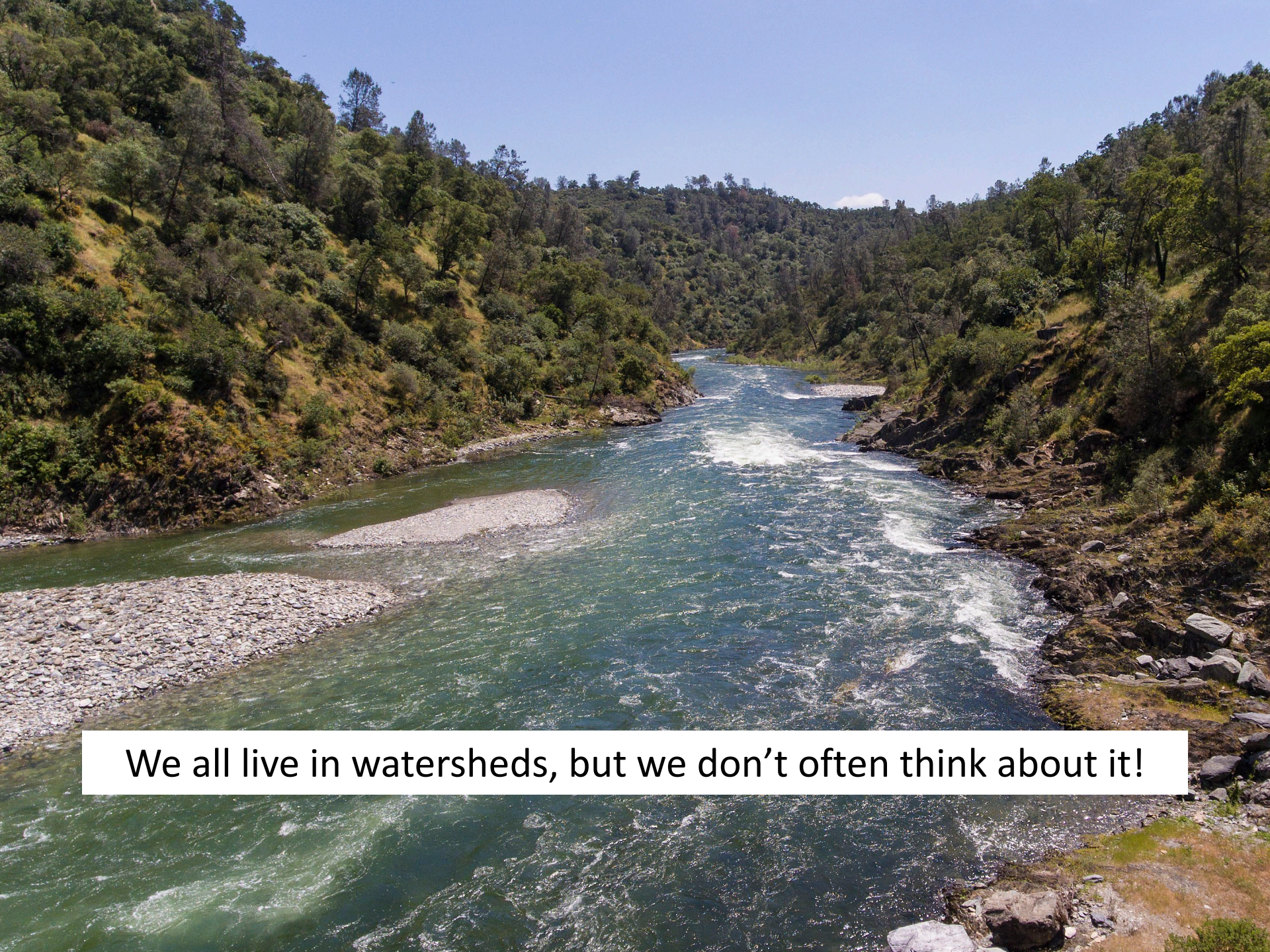
90% of our water is from snow melt

Supplies up to 325 million gallons of water daily



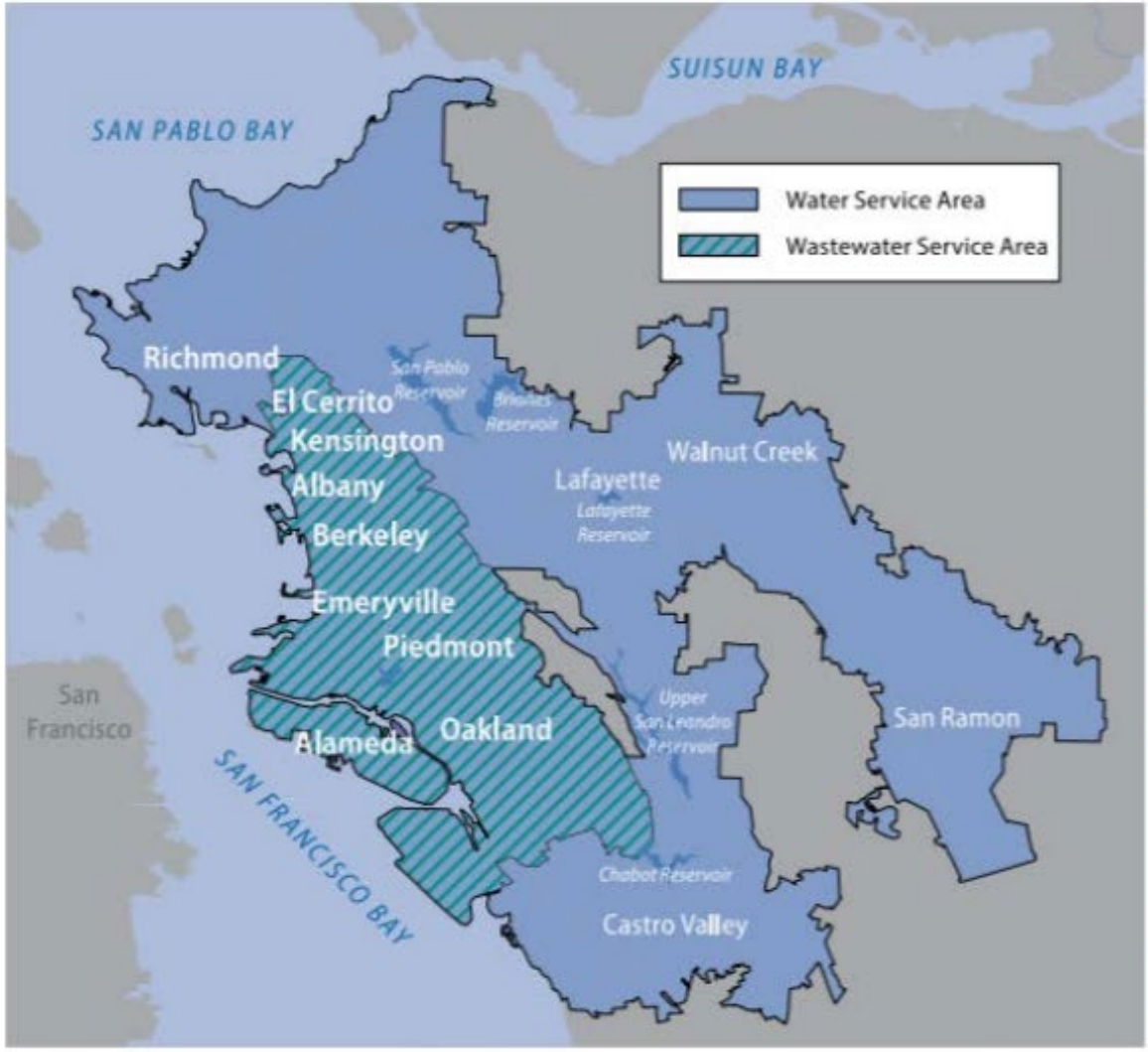
Natural Watershed

Courtesy: The Watershed Project


We all live in watersheds, but we don’t often think about it!

100 Years Serving the East Bay

EBMUD



Water: 1.4 Million Served

Raw Water System
5 Local Reservoirs

Treatment System
6 Water Treatment Plants

Distribution System
- 4,200 Miles of Pipeline
- 122 Pressure Zones
- 164 Reservoirs

Wastewater: 740,000 Served

- Wastewater Treatment Plant processes 60 million gallons per day (MGD); up to 320 MGD during rainfall
- 29 miles of sewer interceptors
- 3 Wet Weather Facilities

Current Drought Stats

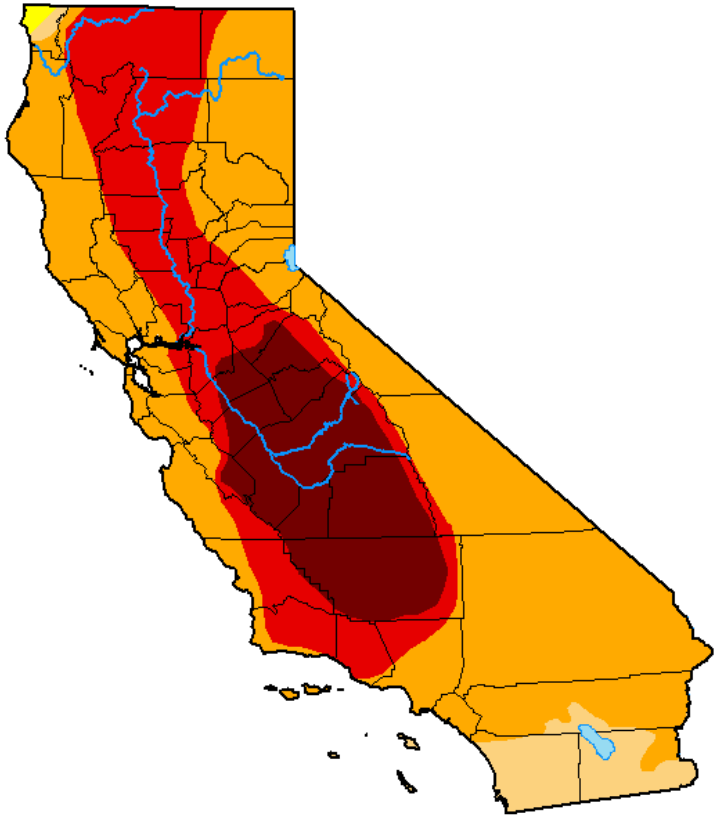
U.S. Drought Monitor

California

October 11, 2022

(Released Thursday, Oct. 13, 2022)

Valid 8 a.m. EDT



Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

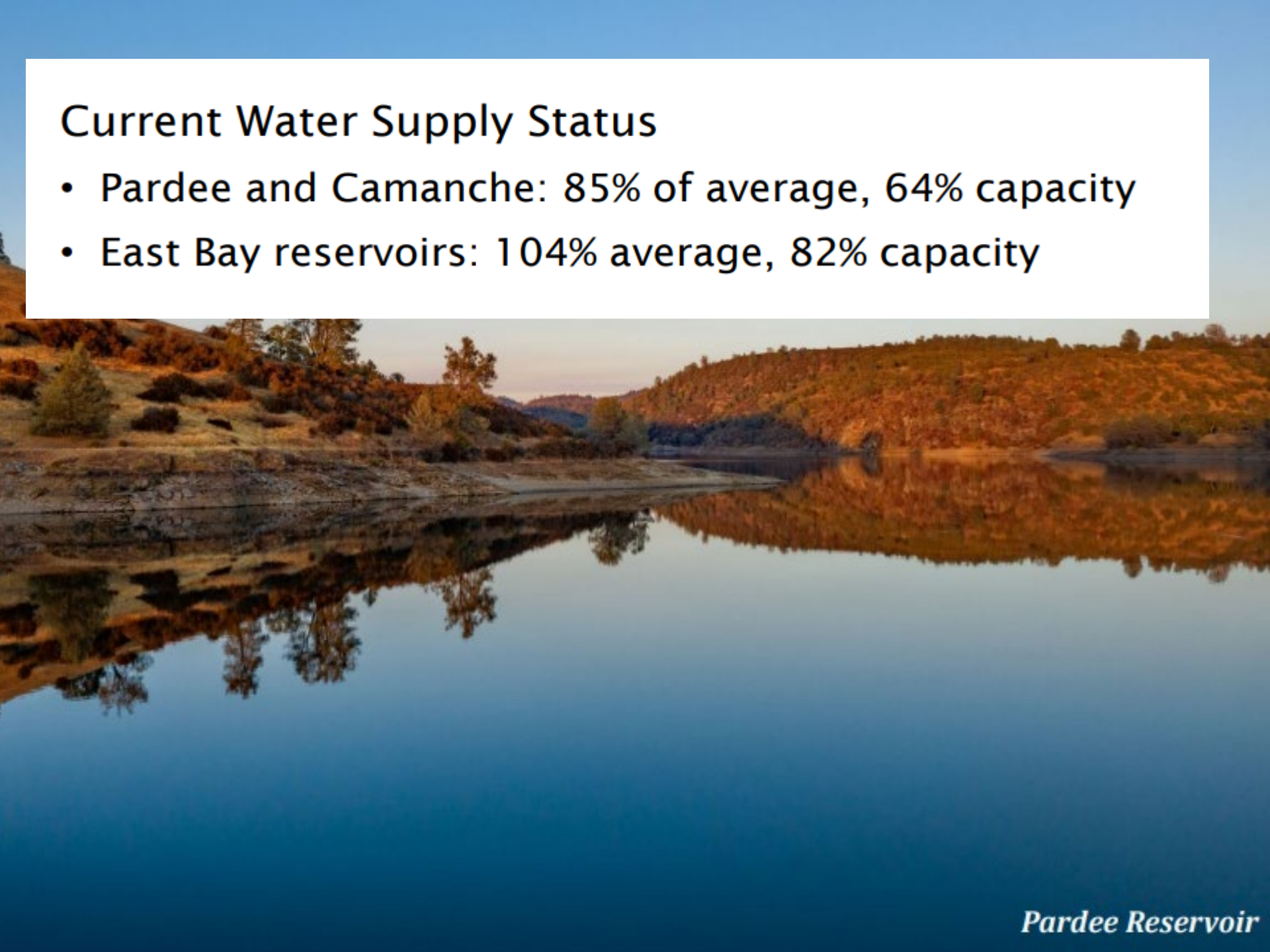
Author:

Brad Pugh
CPC/NOAA

droughtmonitor.unl.edu

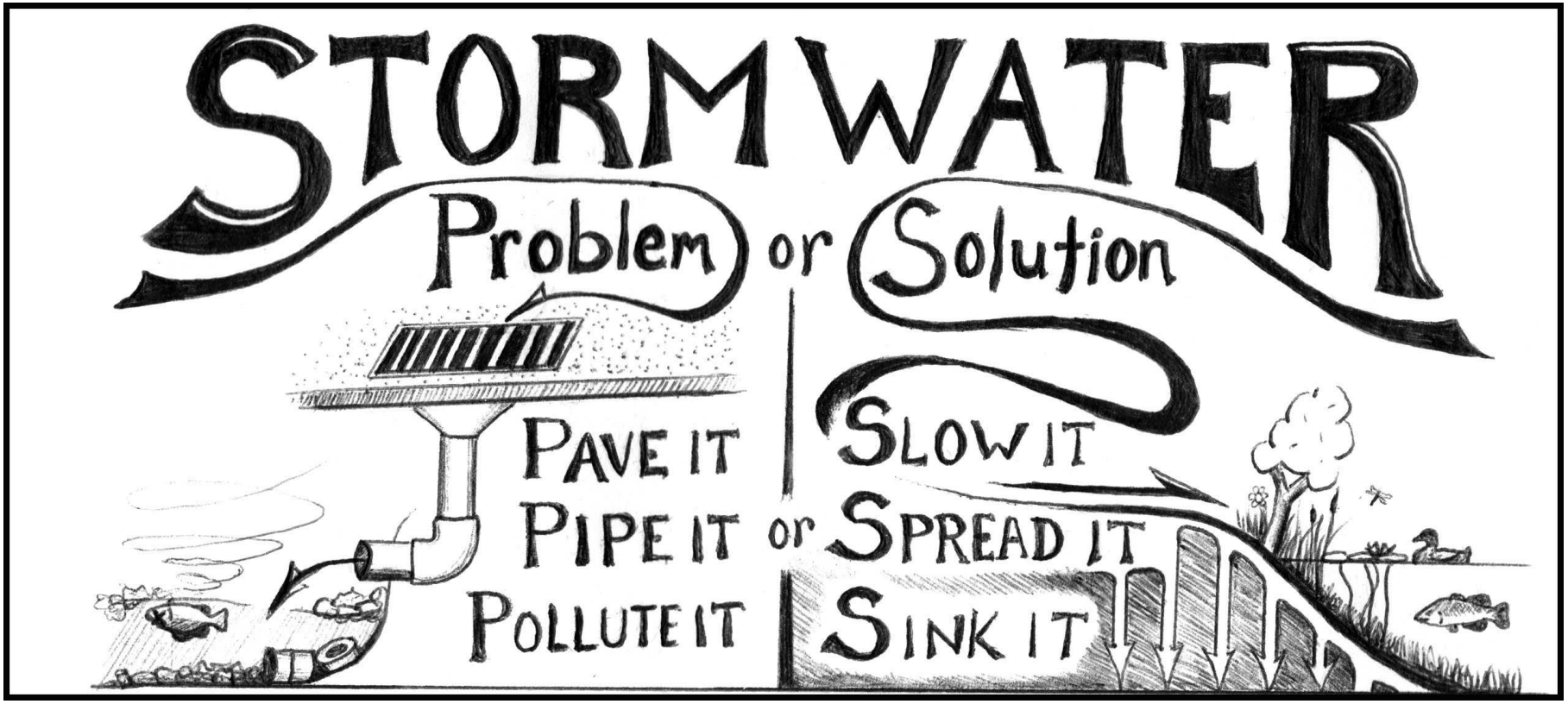
Current Water Supply Status

- Pardee and Camanche: 85% of average, 64% capacity
- East Bay reservoirs: 104% average, 82% capacity



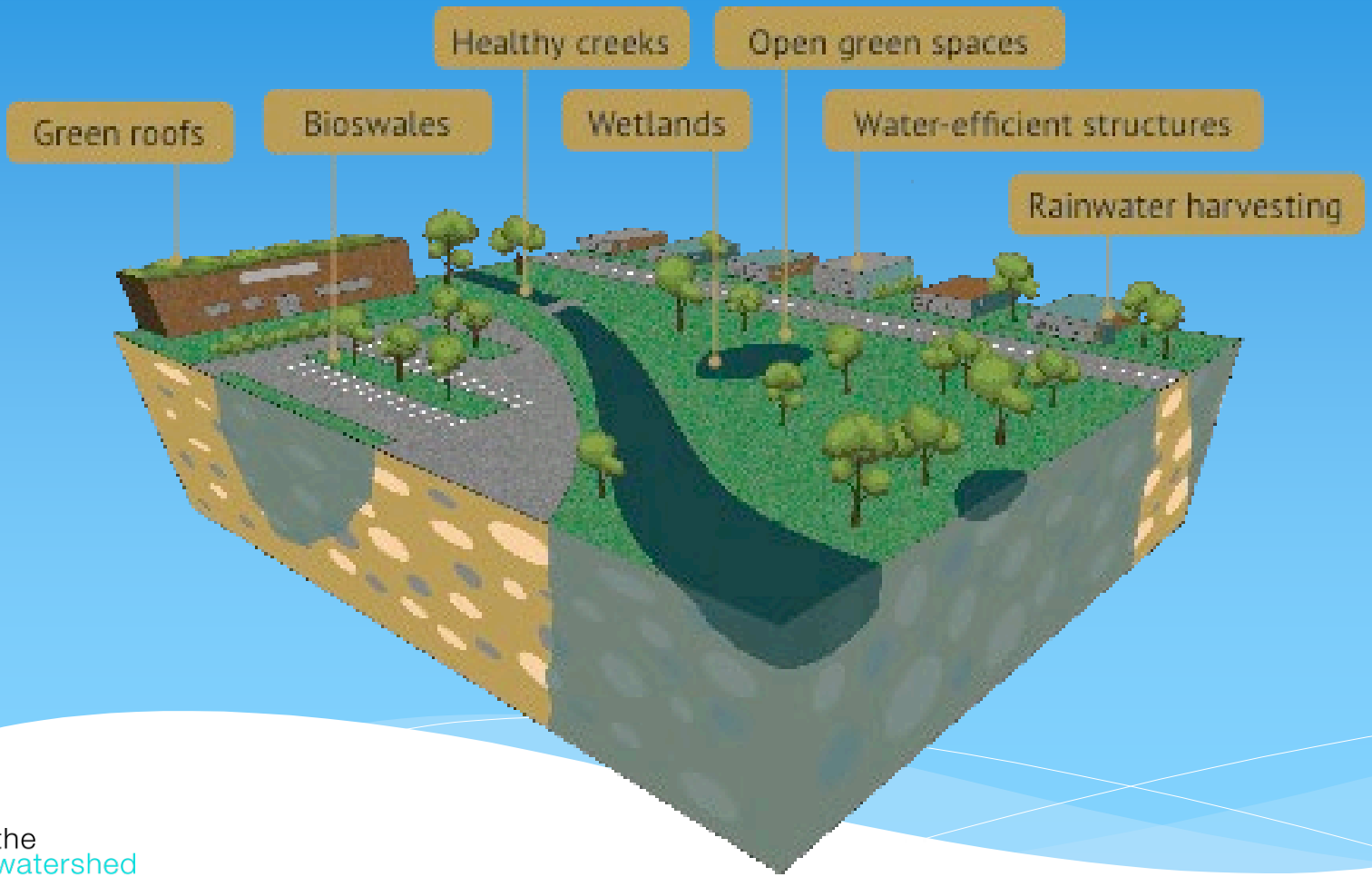
Pardee Reservoir


Urban Watershed



Courtesy: The Watershed Project

Green Infrastructure helps cities become sponges!



the watershed project

Watershed Approach

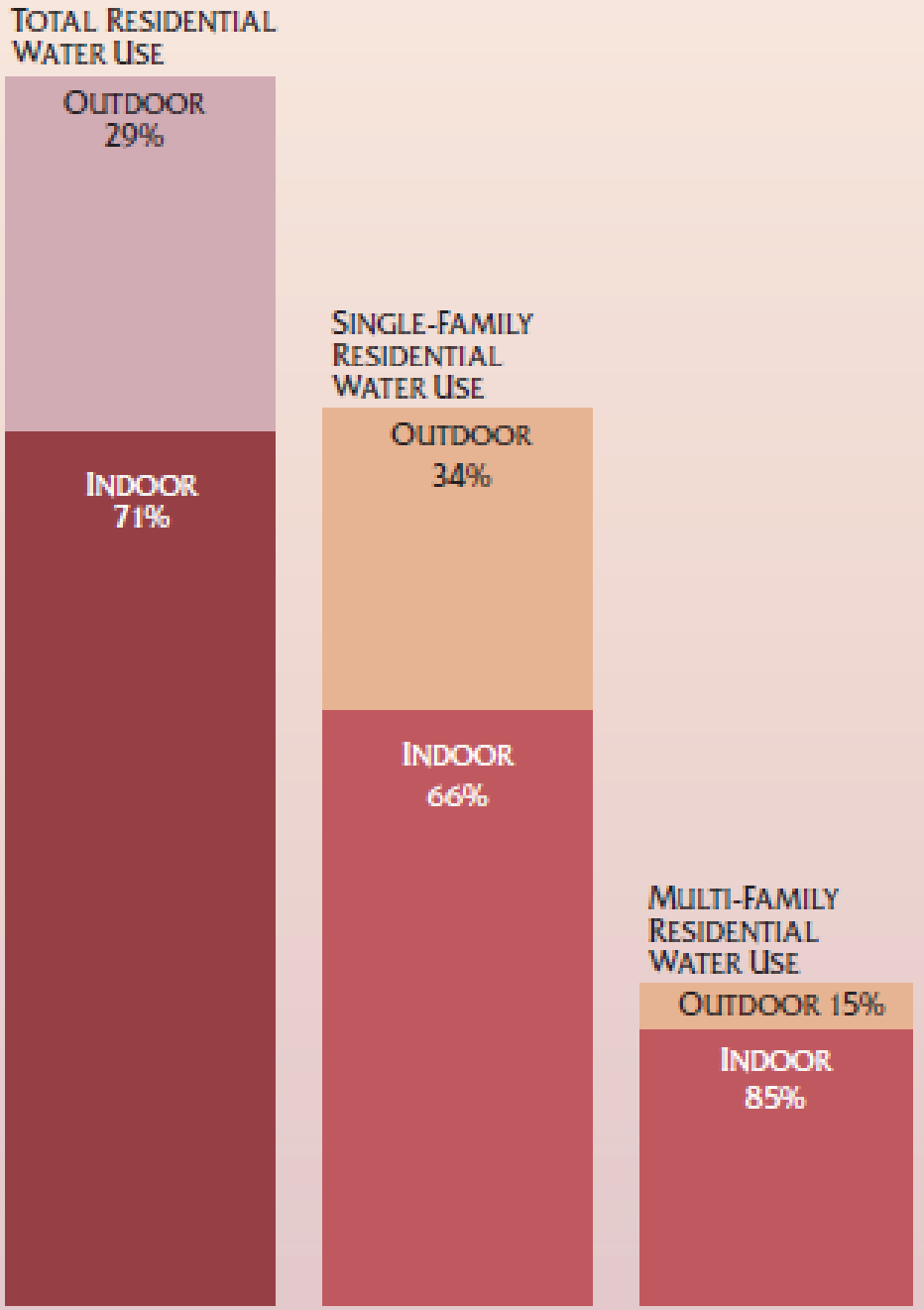
- Healthy living soil captures rainwater
- Climate-appropriate plants reduce irrigation needs
- Efficient irrigation supplements rain

Courtesy: The Watershed Project

Average EBMUD Household Water Use

Outdoor water use: 34%

Indoor water use: 66%



NOTE:
Based on Calendar Year 2005-2015 metered consumption data.

Landscape Rebates

up to $2,000 for residential properties

(up to $15,000 for commercial properties)

Lawn Conversion ($1.25-$2.50/sq. ft.)

Drip Conversion ($0.25/sq. ft.)

High-Efficiency Sprinkler Nozzles ($4 each)

Self-Adjusting Irrigation Controllers ($100-1,000)

Pressure Regulator (50% of cost, up to $125)

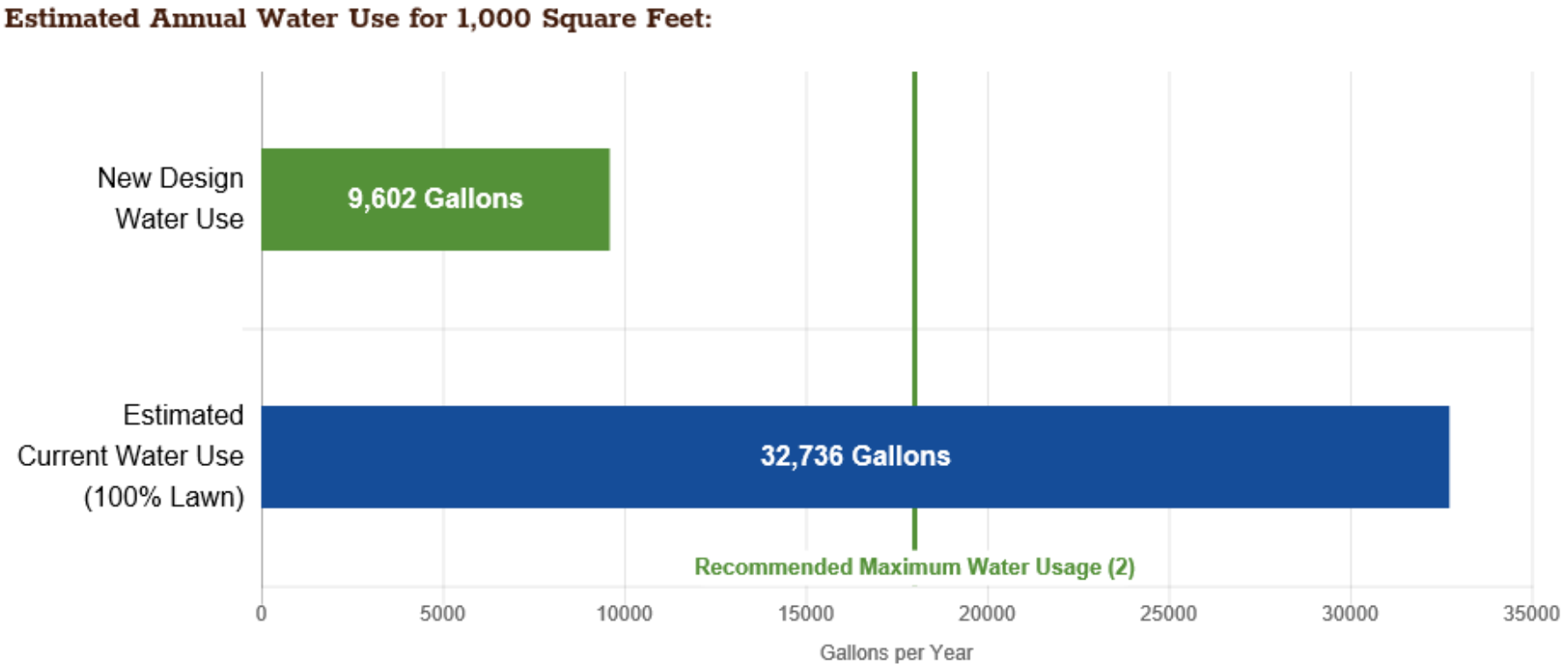
Irrigation Submeter (50% of cost, up to $200)

Flowmeter (50% of cost, up to $200)

Before and After

Lawn: **32,736 gallons** annually

Water Efficient Design: **9,602 gallons** annually



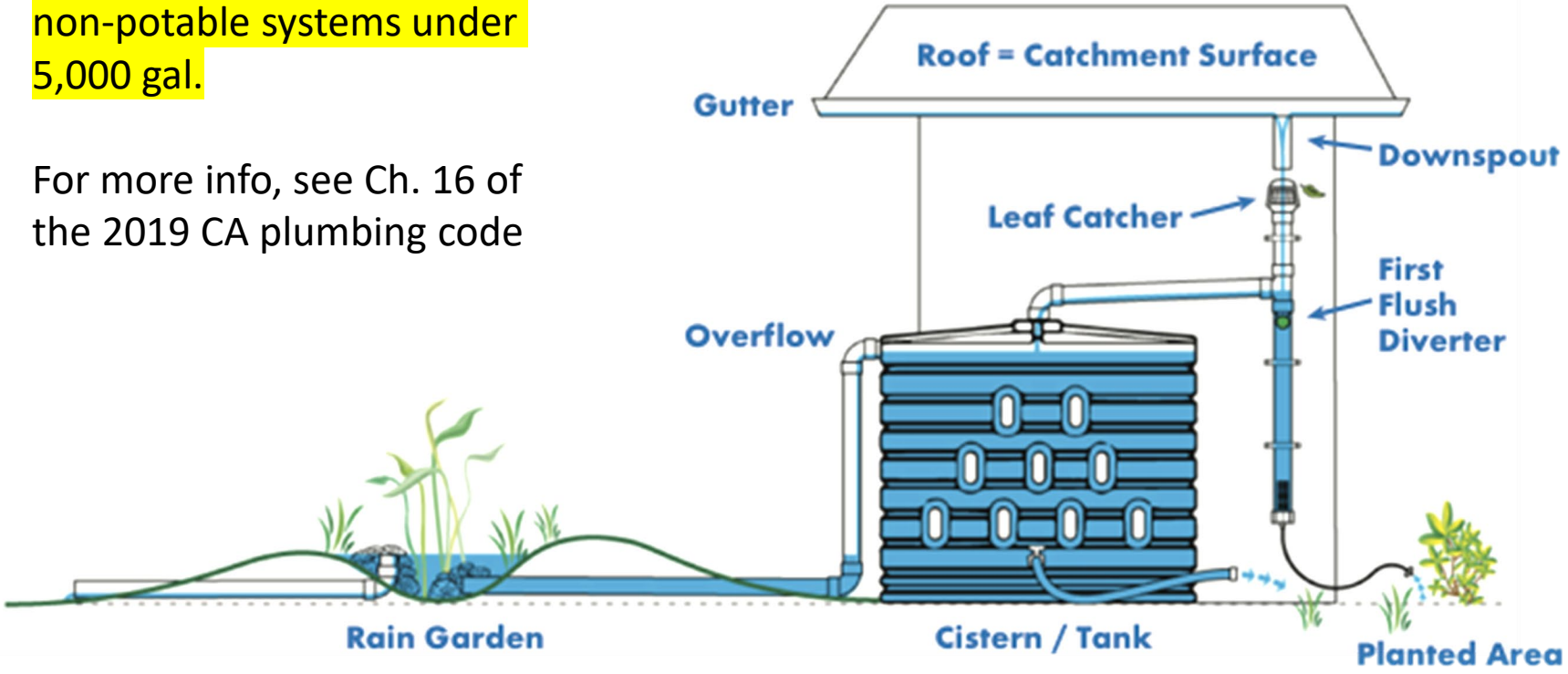
Rainwater Harvesting – slow it! (and store it)

Courtesy: The Watershed Project

Rainwater System

In CA, no permit needed for non-potable systems under 5,000 gal.

For more info, see Ch. 16 of the 2019 CA plumbing code



Courtesy: The Watershed Project

Components of Rainwater Catchment System

- **Roof** – metal or non-leaching surface
- **Conveyance** – gutter to downspout to tank
- **Cistern** – size balanced with irrigation demand (space is limiting factor). Tank location – close to downspout, easy delivery path
- **Foundation/Structural/Seismic Support**
- **First flush diverter**
- **Plumbing** – light-tight food grade pipes
- **Screens** – for debris and mosquito abatement
- **Overflow** – to pervious surface (or storm drain)

Visit https://tinyurl.com/yr566ty9 for the full Catchment Webinar

Residential Rainwater Catchment

Stefanie Pruegel
San Leandro


March 2016


October 2016


Coast Live Oak
(California Native)
October 2016


April 2018


California Lilac
California Poppies
Yarrow
Salvia “Bees Bliss”
Woolly Sunflower
Seaside Daisy

Yellow-faced Bumblebee on CA Poppy

Monarch on California Sunflower

Spotted Skipper on Native Aster

Orange-crowned Warbler just scored a juicy caterpillar

Large Cisterns & Tanks

- 500 gal or more
- Above or underground
- Main purpose: Storage

Smaller Barrels

- Typically 50-200 gal each
- Main purpose: Hold/release


“Daisy-chained” Barrels

Site Requirements

- **Level, firm surface** for above ground barrels

Site Requirements

- **Level, firm surface** for above ground barrels

Site Requirements

- Roof areas **draining to downspouts**

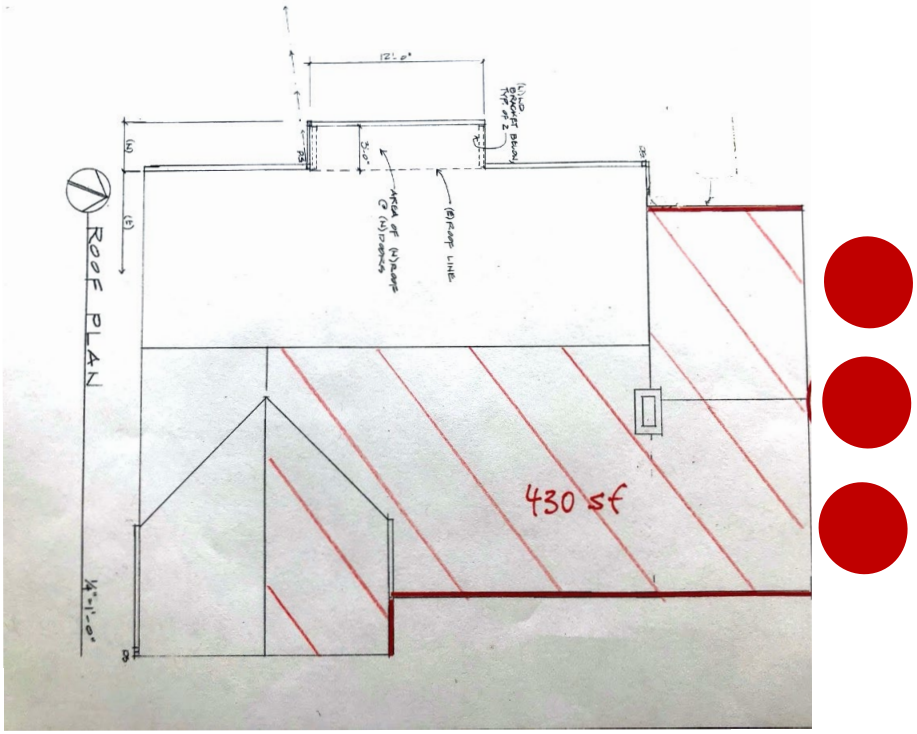

200
WARNING

Site Requirements

- **Ability to handle overflow**
  Direct water into the landscape, ideally a raingarden!

Sizing your barrels or tanks

- How much rain will we get?
- How much room do you have for barrels/tanks?
- How much roof runoff can you capture?

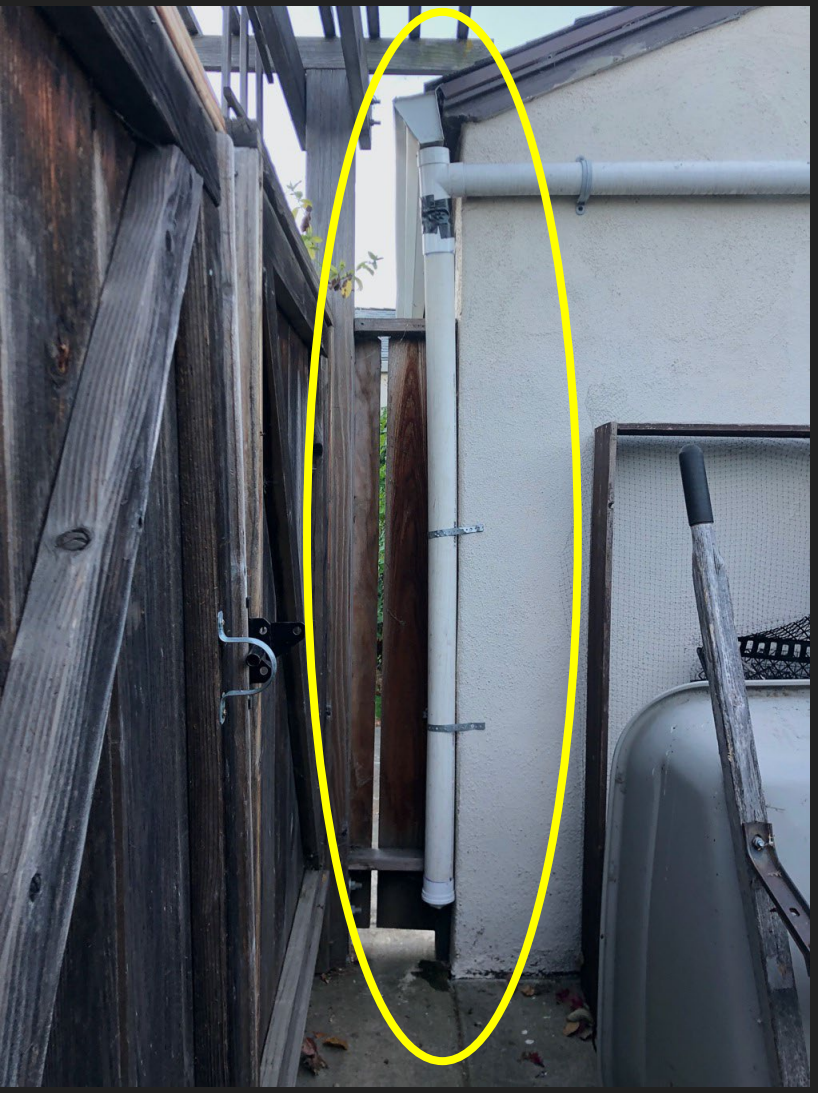


Rule of thumb:
1” of rain on 100 sq ft of roof = 60 gal

1” of rain on 430 sq ft of roof = 258 gal

<12” of rain needed to fill my 3,000-gal tanks

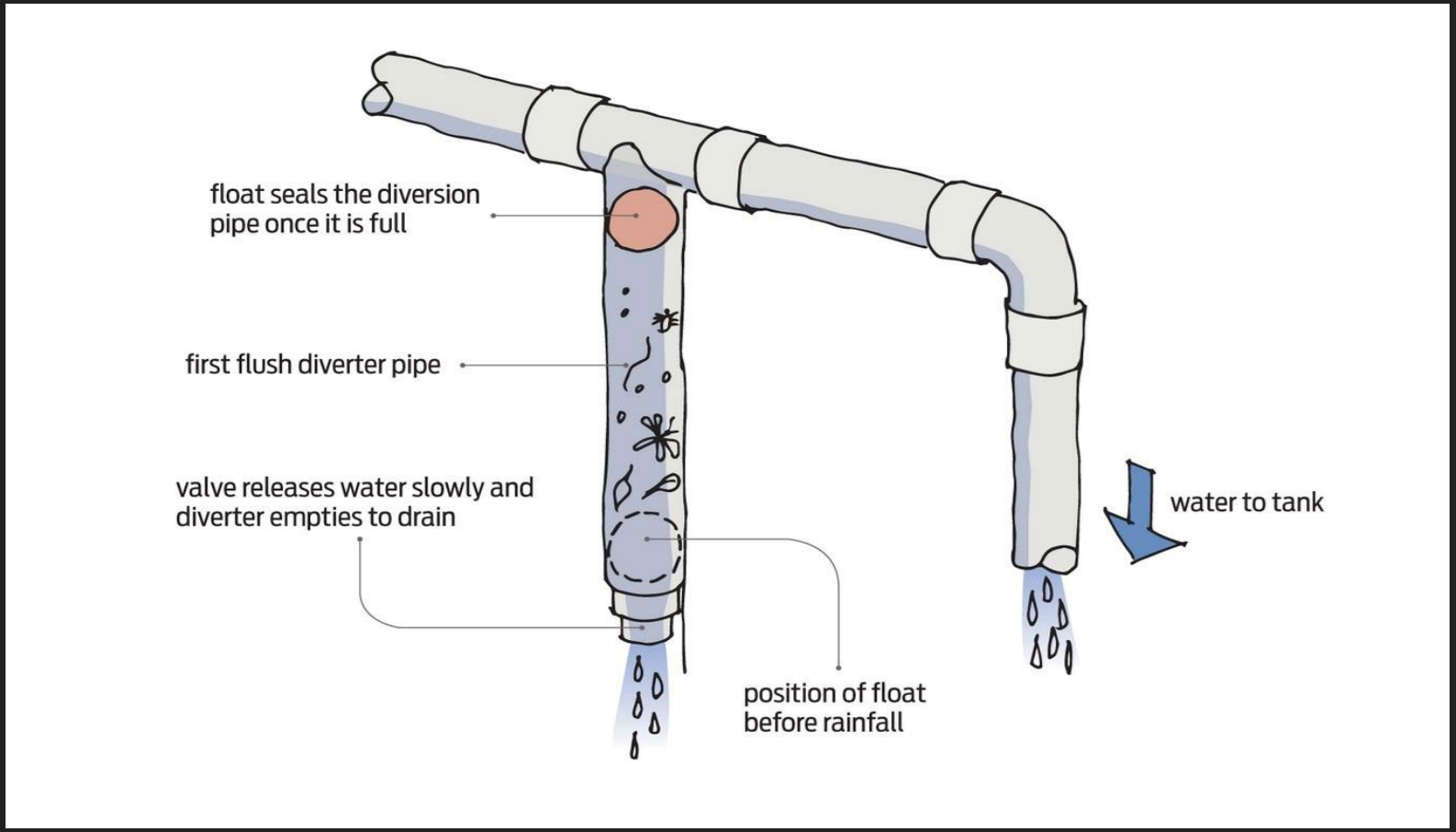
How do you keep the water clean?



Keeping it clean:

"First Flush" device

Keeping debris out: “First Flush” device



Keeping it clean:
Mosquito Screens

Design & installation

- DIY kits available for small systems
- You'll want to hire a professional for larger systems

Using the rainwater

Gravity flow or small pump

Cost Summary

- 3 x 1,000-gal Norwesco tanks, $750 - $1,000 each
- Installation, connections, etc., approx. $2,000
- Greywater Landscape Design
  www.greywaterlandscapedesign.com
- Electric pump & parts:
  Walrus HQ40, $500

Total approx. $5,500


Some Resources to find Contractors:
• https://greywateraction.org
• American Rainwater Catchment Systems Association (ARCSA) www. arcsa.org
• More resources in our follow-up!

Using the rainwater

Hand watering

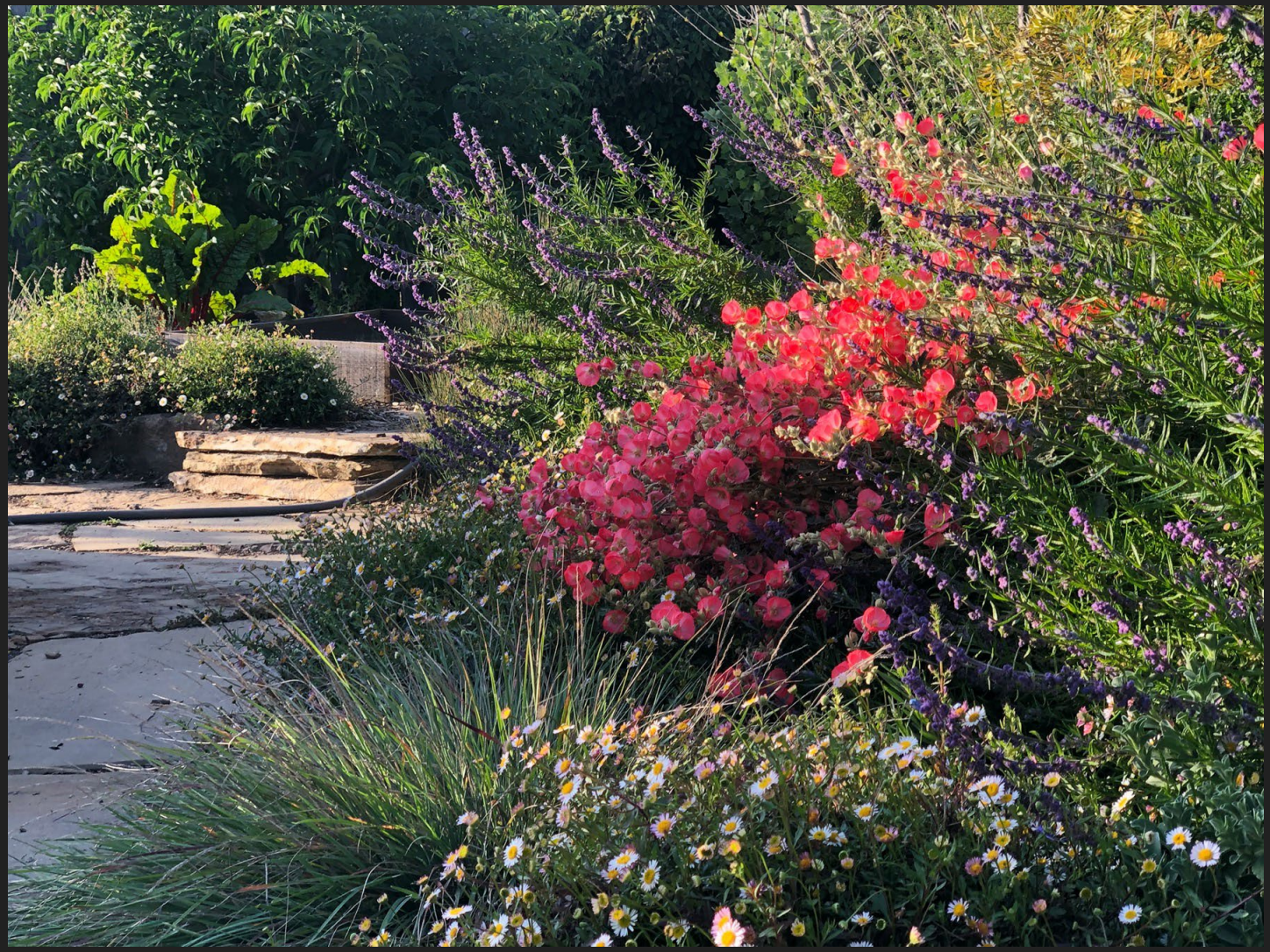
Using the rainwater

DIY “drip” system

Using the rainwater

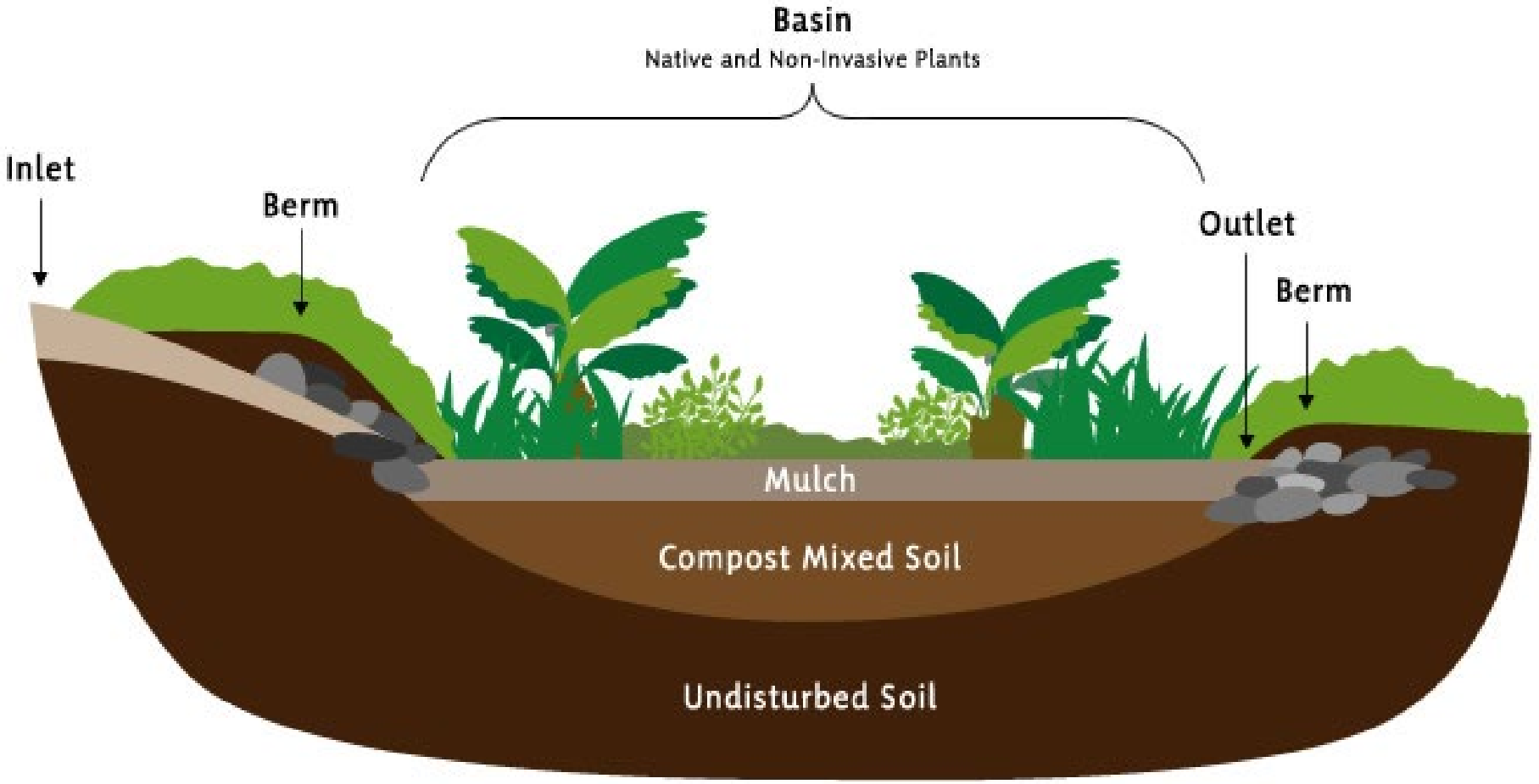
DIY “drip” system

Baby Coast Live Oak

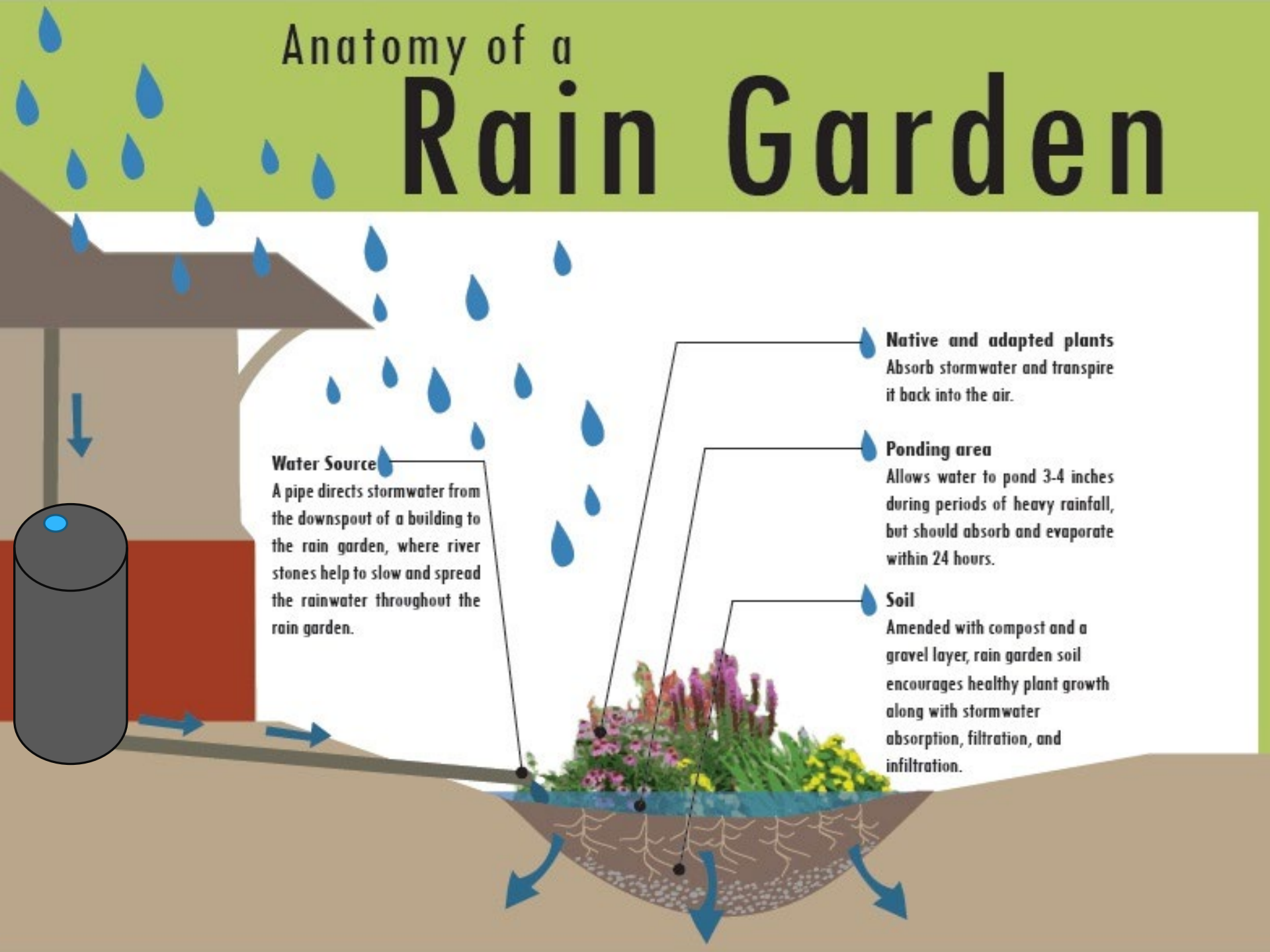



Great Resources for Native Plants:
www.BringingBacktheNatives.net
www.CalScape.org
www.cnps.org/gardening

Rain Gardens – residential scale green infrastructure



Anatomy of a Rain Garden



Native and adapted plants
Absorb stormwater and transpire it back into the air.

Ponding area
Allows water to pond 3-4 inches during periods of heavy rainfall, but should absorb and evaporate within 24 hours.

Soil
Amended with compost and a gravel layer, rain garden soil encourages healthy plant growth along with stormwater absorption, filtration, and infiltration.

Water Source
A pipe directs stormwater from the downspout of a building to the rain garden, where river stones help to slow and spread the rainwater throughout the rain garden.


Plant
the
Rain
HarvestingRainwater.com

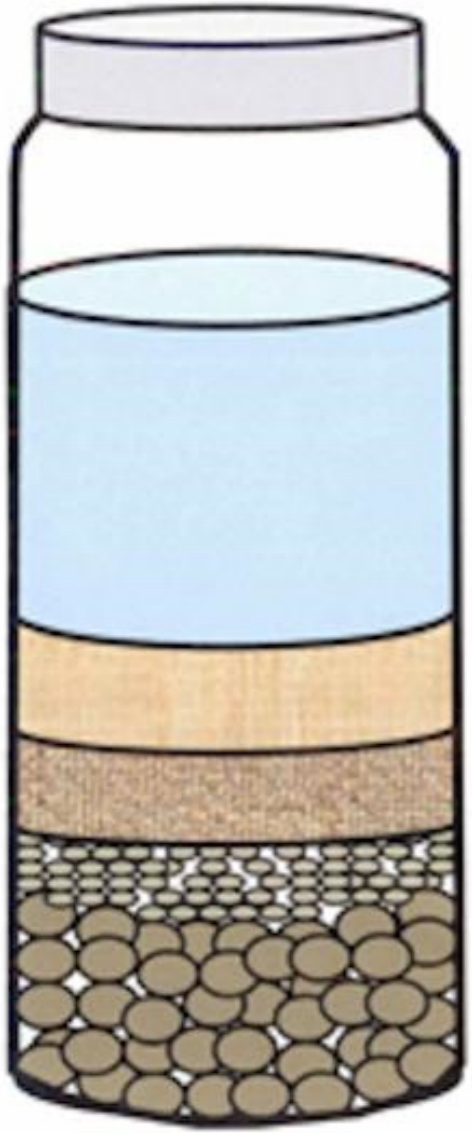
How quickly will water infiltrate your soil?

1. Dig a hole one foot deep

2. Fill hole with water and measure how much will drain in one hour (*should drain at least 1" per hour*)

3. Percolation test done after soil is saturated (not bone-dry dirt)

4. Soil can vary in different parts of your yard



Get to Know Your Soil with the jar test!

Clay layer – water clears
Silt layer – 2 hours
Sand layer – 1 minute

Setbacks and Design Considerations

10 feet away from foundations

5 feet away from property lines

3 feet away from sidewalks

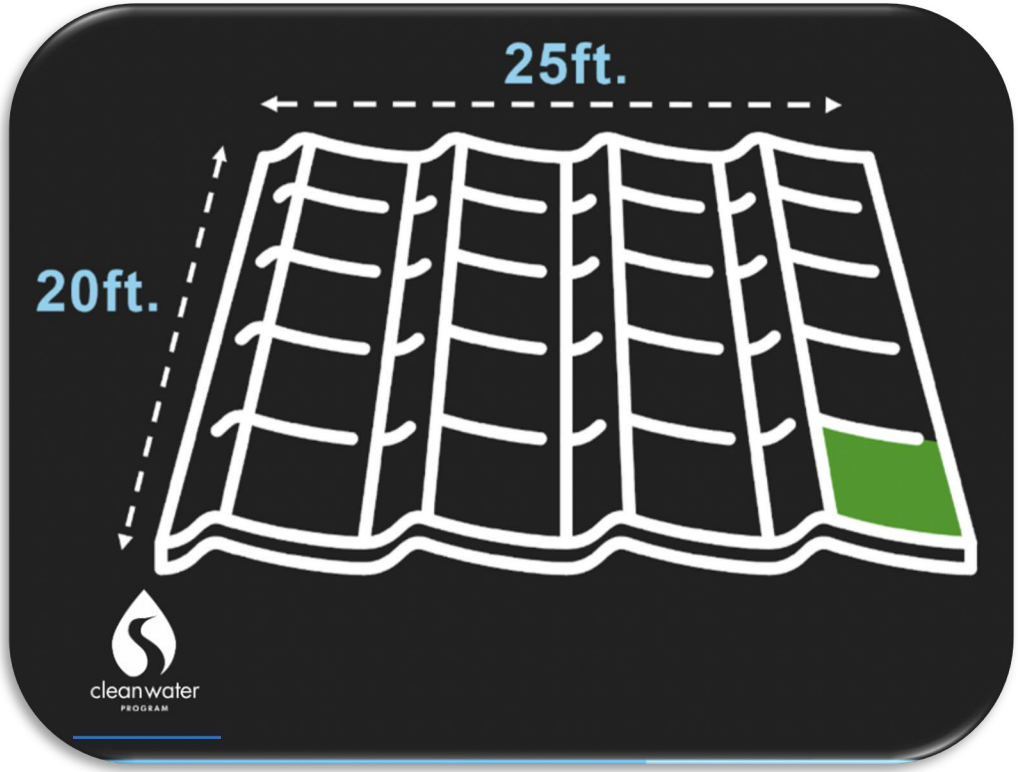
Downslope from the runoff source (downspout or rain tank)

Rain Garden site is relatively flat

Avoid Slopes

Well-draining soil

How to size your raingarden



Runoff Area e.g. roof:

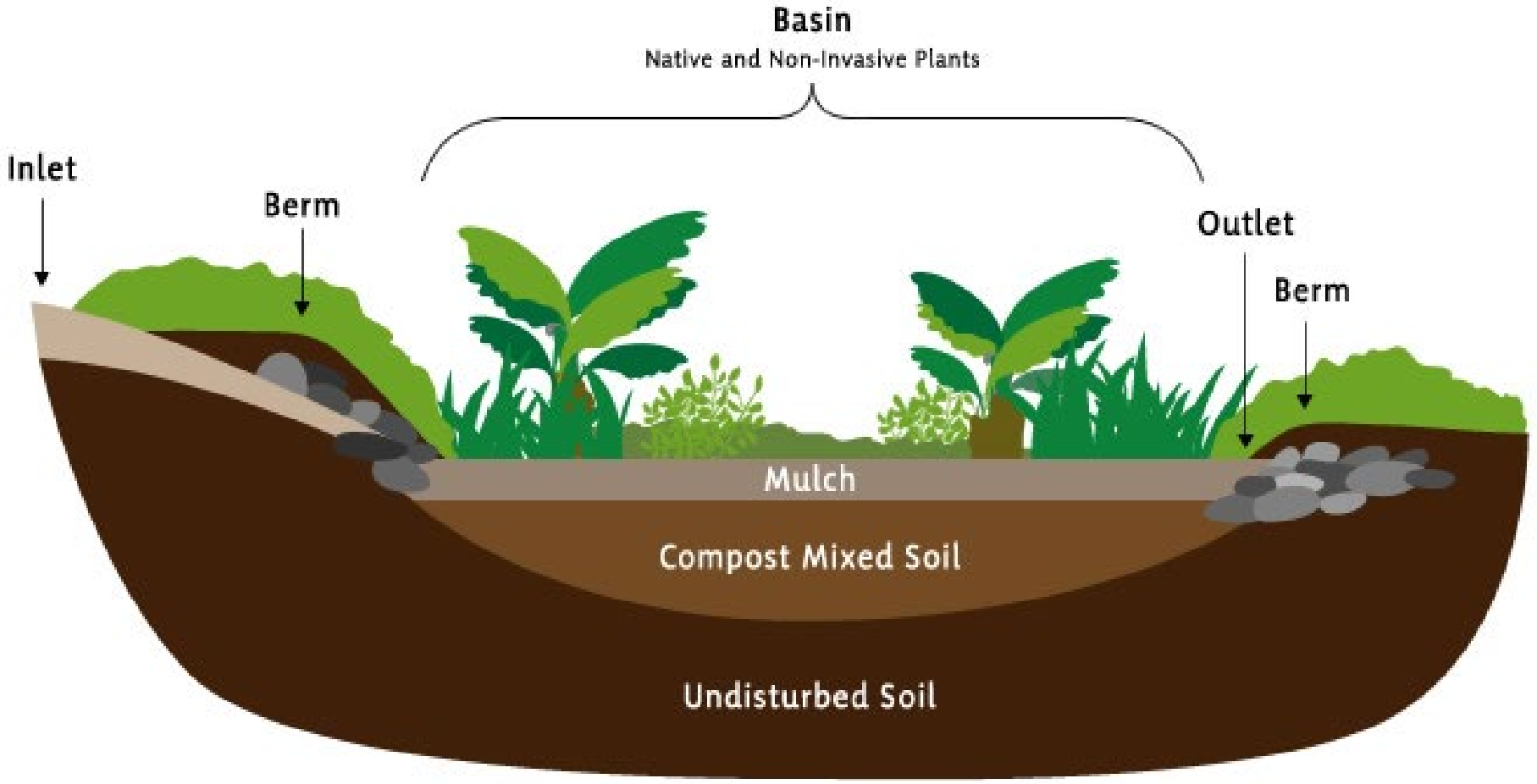
20ft. X 25ft. = 500 sq.ft.

Rain Garden:

Min 4% of 500 sq.ft.
= min 20 sq.ft.

Building your Rain Garden

1. Clear out area, remove existing plants and roots if needed.
2. Make a **reservoir** for the water to flow into, digging 6 inches down to a depth below your entry and exit points.
3. Set the overflow outlet at the same elevation as the maximum "fill" for the "pond". Pond depth should be 4" to 6".
4. Loosen bottom 12" of native soil and mix in 3" compost.
5. Set cobblestones at entry and exit points.


Basin
Native and Non-Invasive Plants
Inlet
Berm
Outlet
Berm
Mulch
Compost Mixed Soil
Undisturbed Soil

Planting your Rain Garden

1. Add compost into native soil, mix and add back into reservoir
2. Set out plants into your preferred arrangement, dig holes for plants 2x width of pot, add several handfuls of compost into hole.
3. Install the plant so the crown is about ½” or so above the soil.
4. Pack amended soil by hand around the root ball. Water thoroughly.
5. Place bark mulch carefully to cover all the exposed soil at least 2" deep, preferably 3" deep.

Native Plants for your Rain Garden

BOTTOM of Rain Garden

- *Juncus patens* - CA Gray Rush
- *Anemopsis californica - Yerba Mansa*
- *Carex nudata - California Black-flowering Sedge*

MID-SLOPE

- *Cornus sericea* - Red Twig Dogwood
- *Erythranthe cardinalis* - Scarlet Monkeyflower
- *Iris douglasiana* - Douglas Iris

TOP LEVEL (or Berm)

- *Ceanothus maritimus* - Maritime Ceanothus
- *Diplacus aurantiacus* - Bush Monkeyflower
- *Epilobium canum* - California Fuschia

Plants for Rain Gardens & Seasonal Creeks

Coordination really makes an impact!

Sponge Cities

Urban Stormwater Management with Green Infrastructure

NATURAL SYSTEM BENEFITS

- ✔ Provide Habitat
- ✔ Slowly Release Storm Flow
- ✔ Filter Pollutants
- ✔ Recharge Groundwater
- ✔ Reduce Erosion

El Cerrito Green Streets Program

Scaling UP: Swales and Bioswales

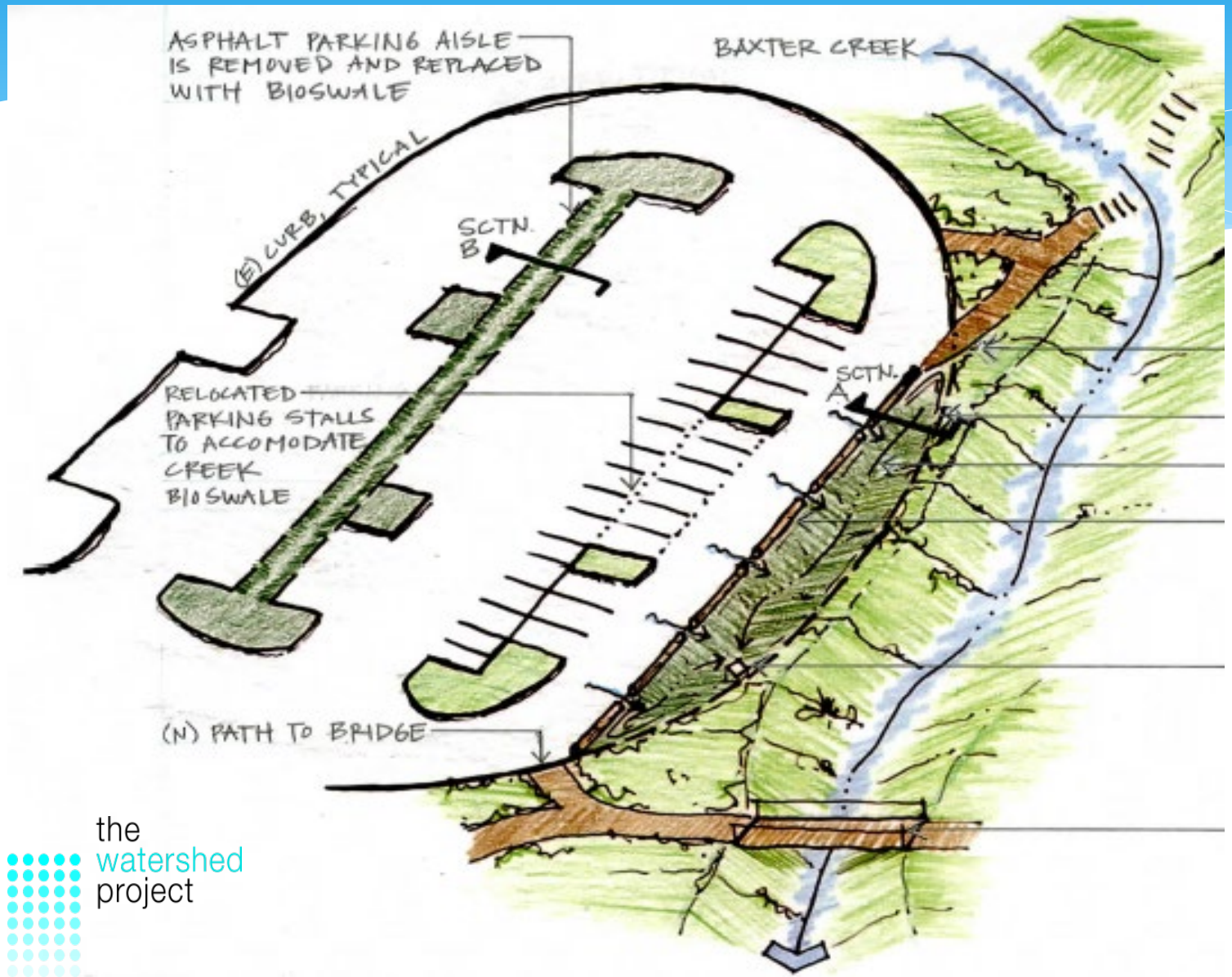
Direct urban runoff into specially designed landscapes that allow rainwater to infiltrate and percolate into the earth to be cleaned by natural systems (**Slow it! Spread it! Sink it!**)

Bioswales help cities to mimic the functions of a natural watershed. (sponges)

Examples:

- ↔ Curb Cuts on streets that direct stormwater runoff into rain gardens, swales & bioretention planters
- ↔ Bioswales – engineered swales that are connected to overflow into drains

Bioswale in parking lot next to Baxter Creek



the watershed project


Newly planted bioswale

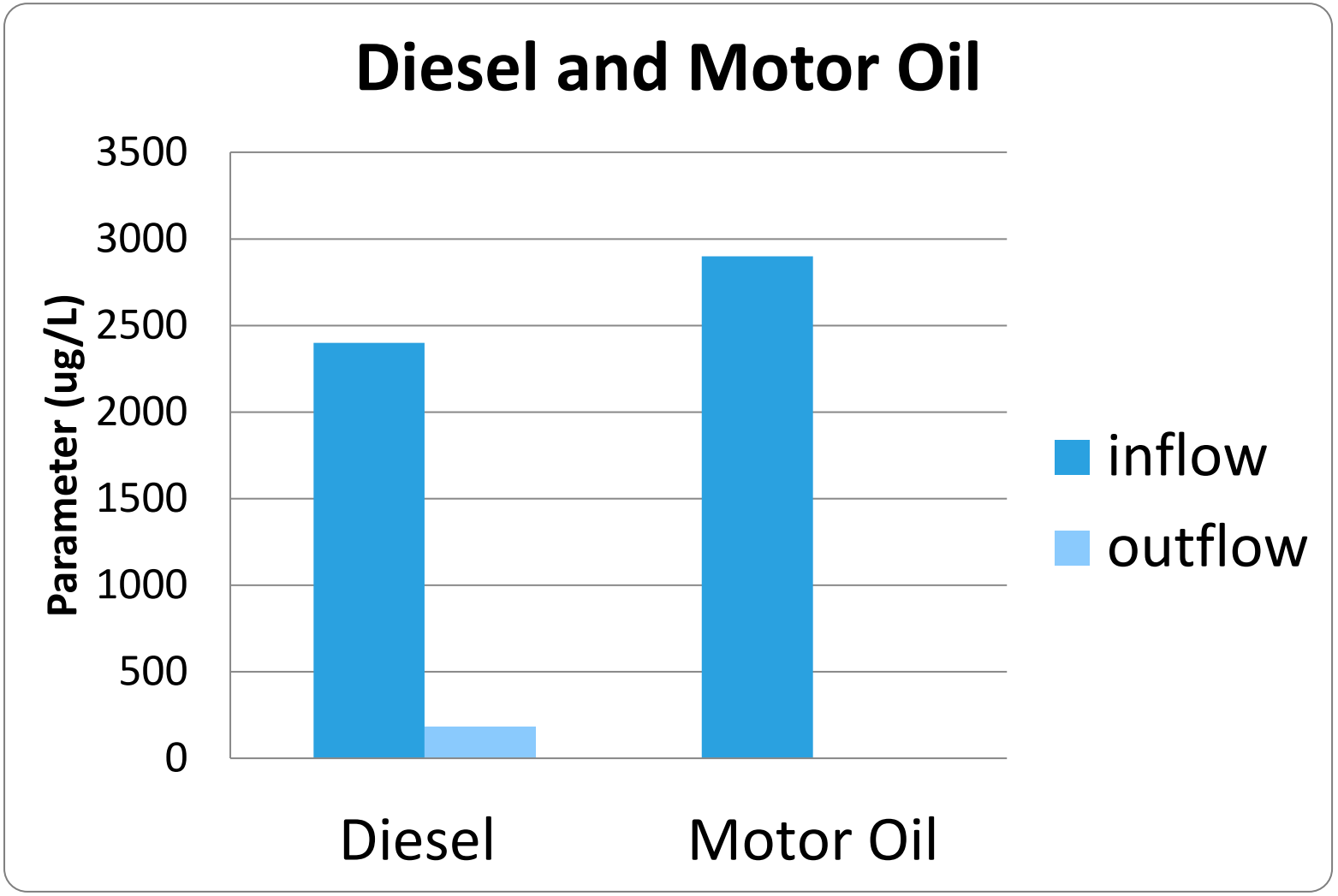

the
watershed
project


Water Quality Monitoring
Sample inflow at curb cuts

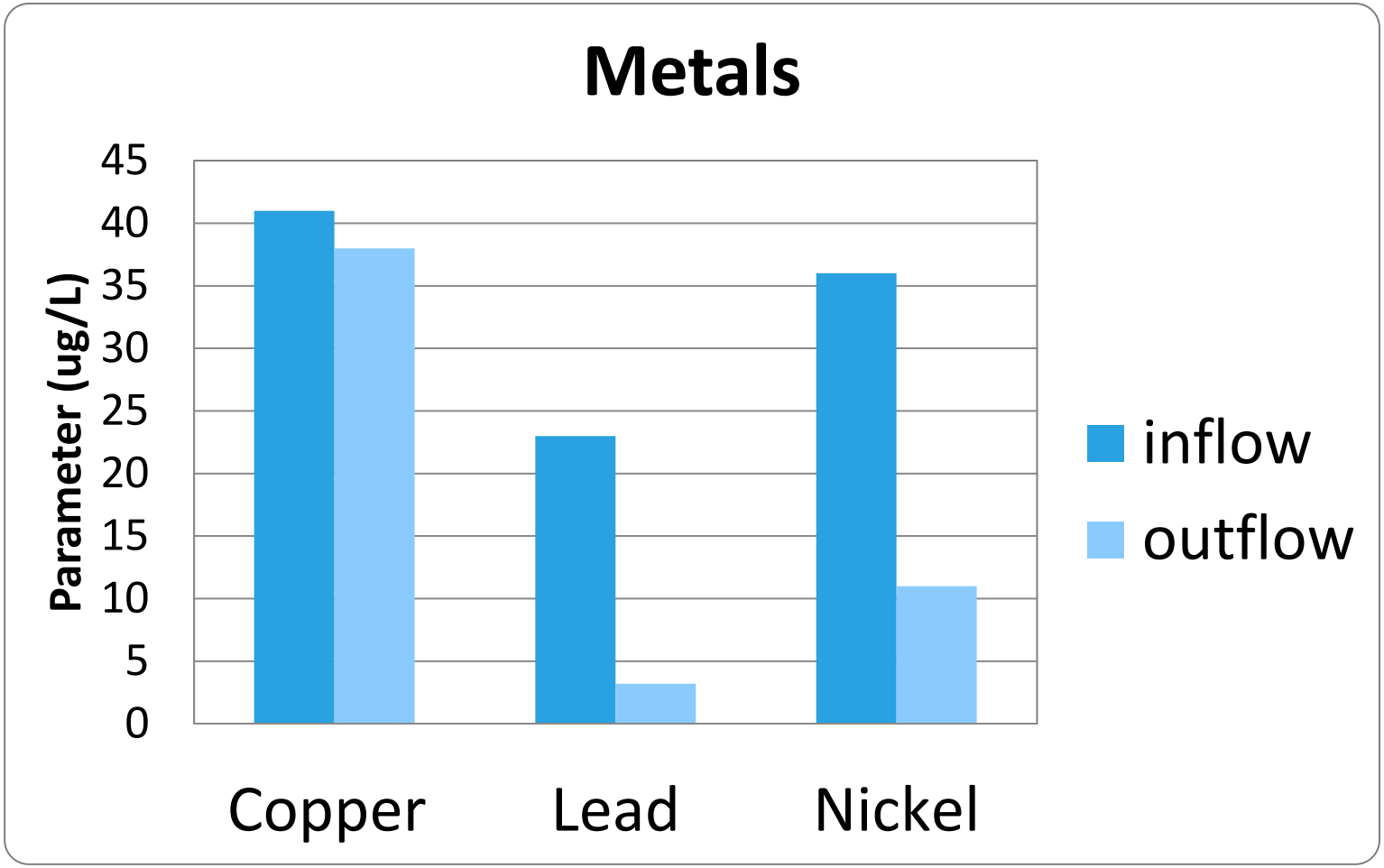
Bioswale Saturated

Storm Drain Overflow

Stormwater Monitoring at Bioswale



Stormwater Monitoring at Bioswale



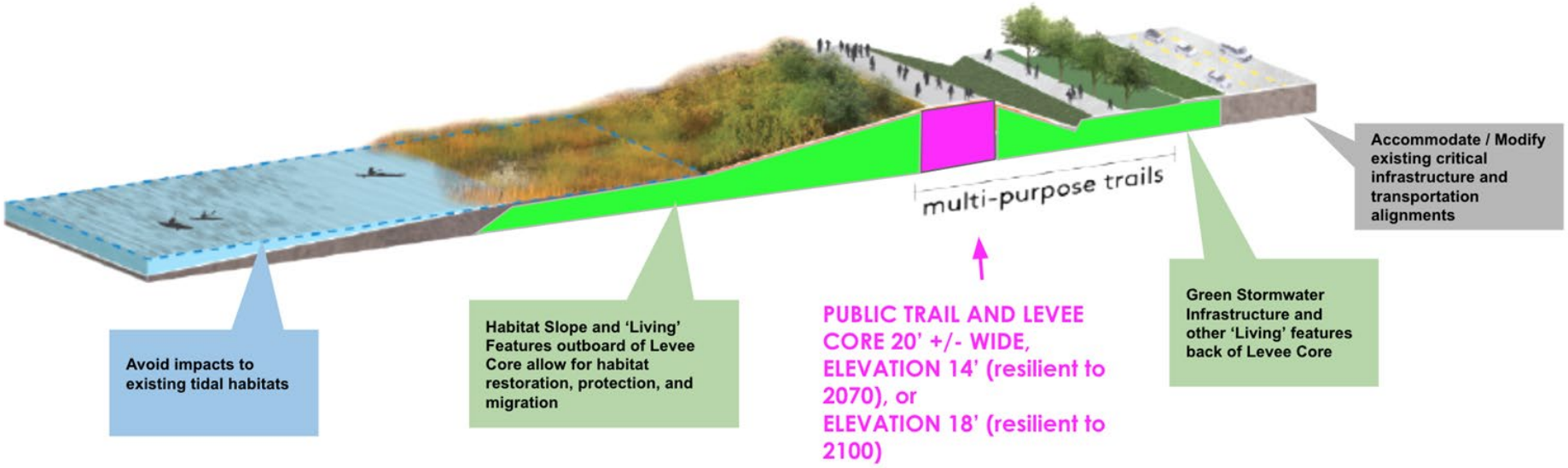
BIG VISION – North Richmond Horizontal Levee

Nature-Based Solutions with Multi-Benefits

Inviting water in…

HORIZONTAL LIVING LEVEE

Typological Design Approach



YOU can be a part of the solution!

Questions?

Anya Kamenskaya

EBMUD

Stefanie Pruegel

Rainwater Advocate

Kat Sawyer

The Watershed Project

CELEBRATING 25 YEARS the watershed project 1997-2022

EBMUD