

Gardening and Water Quality "The Stormwater Connection"



Smart Gardening Conference
February 25- 2010



Fresno
Metropolitan
Flood Control District

Before FMFCD

Flood of 1925

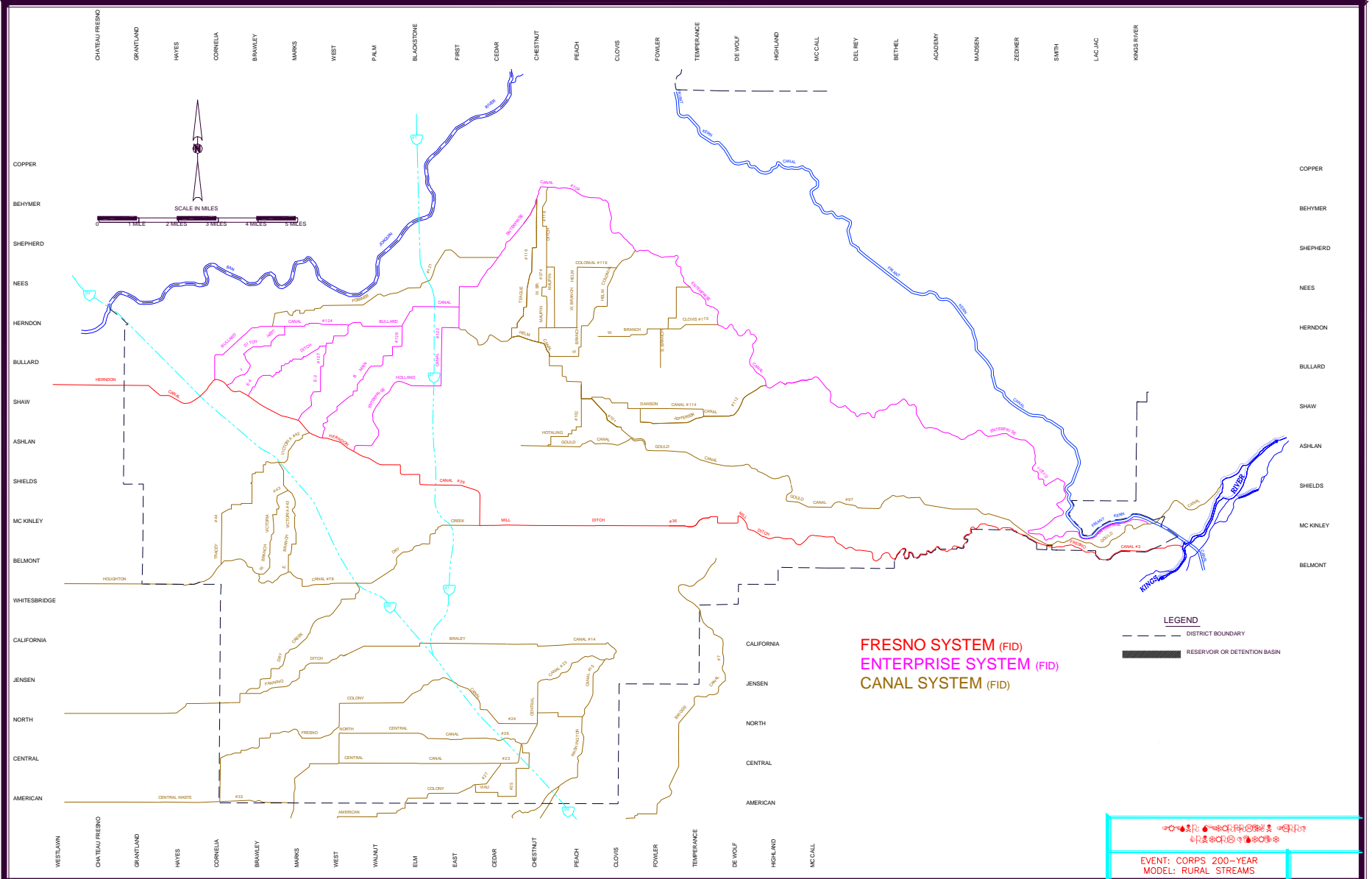
BIG
PRICE
REDUCTION
ON
HUDSON
AND
ESSEX
CARS

ESSEX COACH
\$950
HUDSON
COACH \$1415
BROUGHAM \$1740
SEDAN \$1945
DELIVERED

758
RING-BELL
NIGHT SERVICE



Created in 1956 by the Voters of
Fresno to Protect Our
Community From Flooding



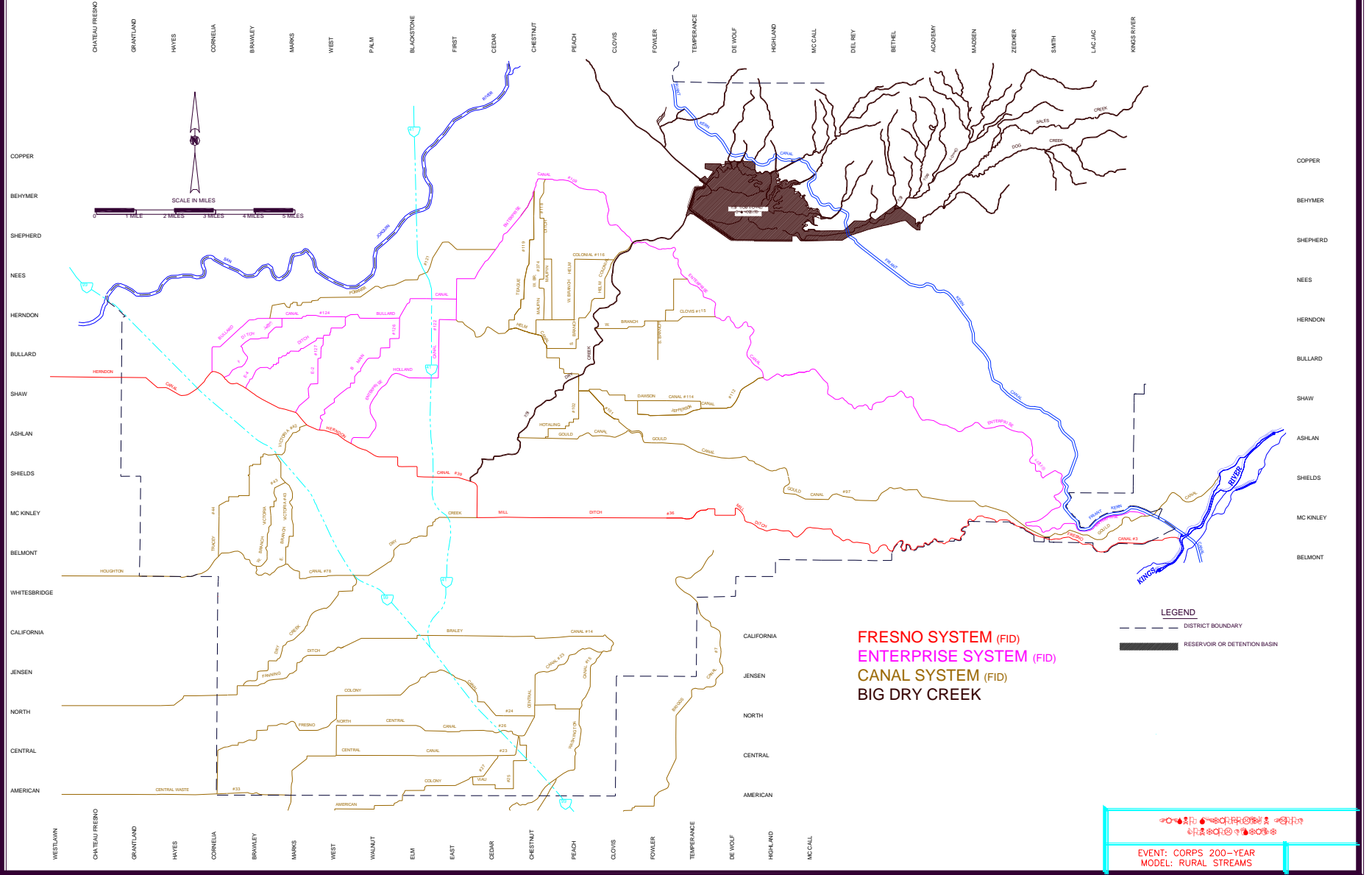
CHATEAU/FRESNO
 GRANTLAND
 HAYES
 CORNELIA
 BRAWLEY
 MARKS
 WEST
 PALM
 BLACKSTONE
 FIRST
 CEDAR
 CHESTNUT
 PEACH
 CLOVIS
 FOWLER
 TEMPERANCE
 DE WOLF
 HIGHLAND
 MCCALL
 DELIBRY
 BETHEL
 ACADEMY
 MAIDEN
 ZENKER
 SMITH
 LAGJAC
 KINGS RIVER

COPPER
 BEHYMER
 SHEPHERD
 NEES
 HERNDON
 BULLARD
 SHAW
 ASHLAN
 SHIELDS
 MCKINLEY
 BELMONT
 WHITESBRIDGE
 CALIFORNIA
 JENSEN
 NORTH
 CENTRAL
 AMERICAN

COPPER
 BEHYMER
 SHEPHERD
 NEES
 HERNDON
 BULLARD
 SHAW
 ASHLAN
 SHIELDS
 MCKINLEY
 BELMONT

WESTLAWN
 CHATEAU/FRESNO
 GRANTLAND
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 BRAWLEY
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 WALNUT
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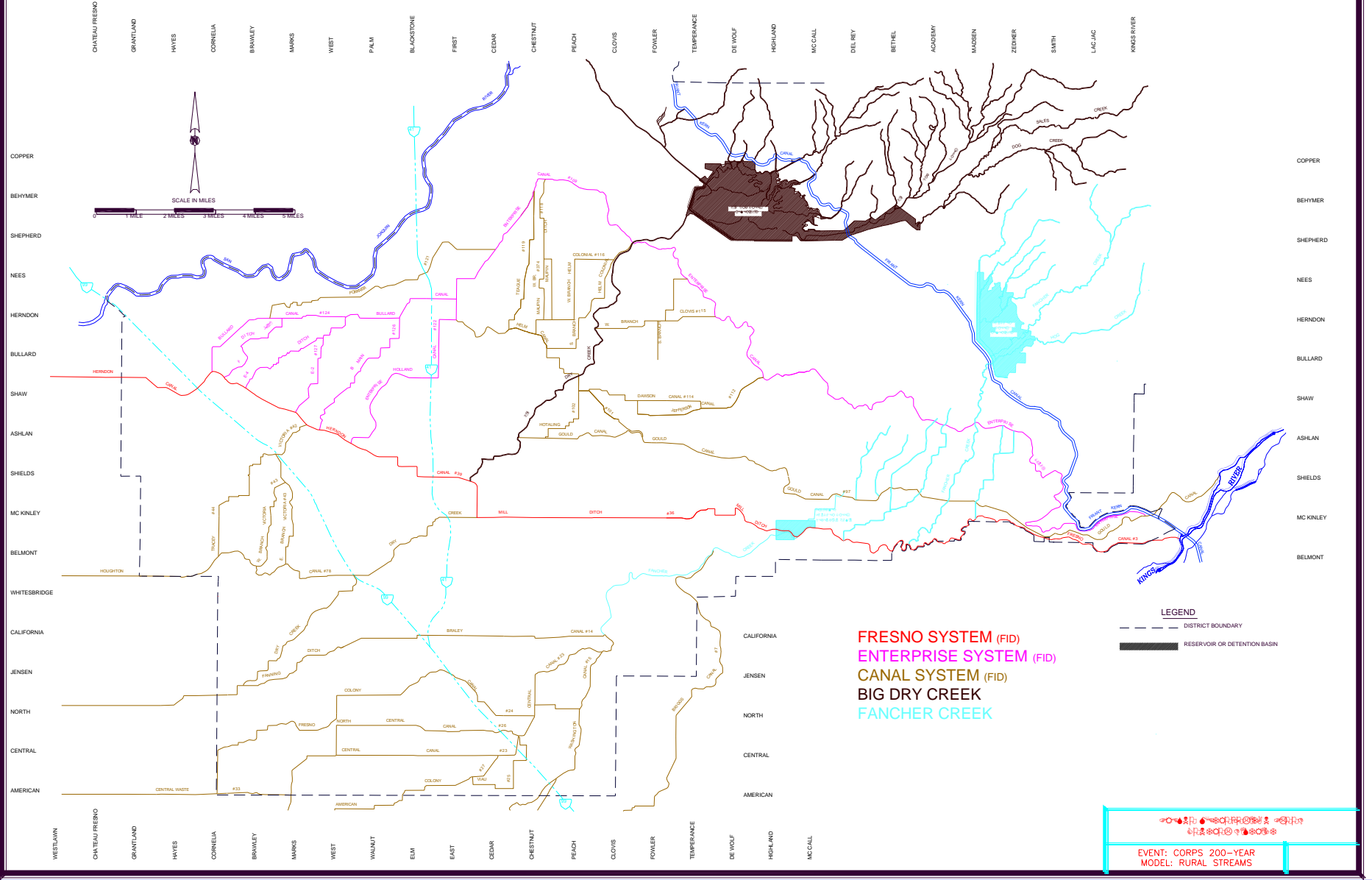
LEGEND

- - - DISTRICT BOUNDARY
- RESERVOIR OR DETENTION BASIN

FRESNO SYSTEM (FID)
ENTERPRISE SYSTEM (FID)
CANAL SYSTEM (FID)
BIG DRY CREEK

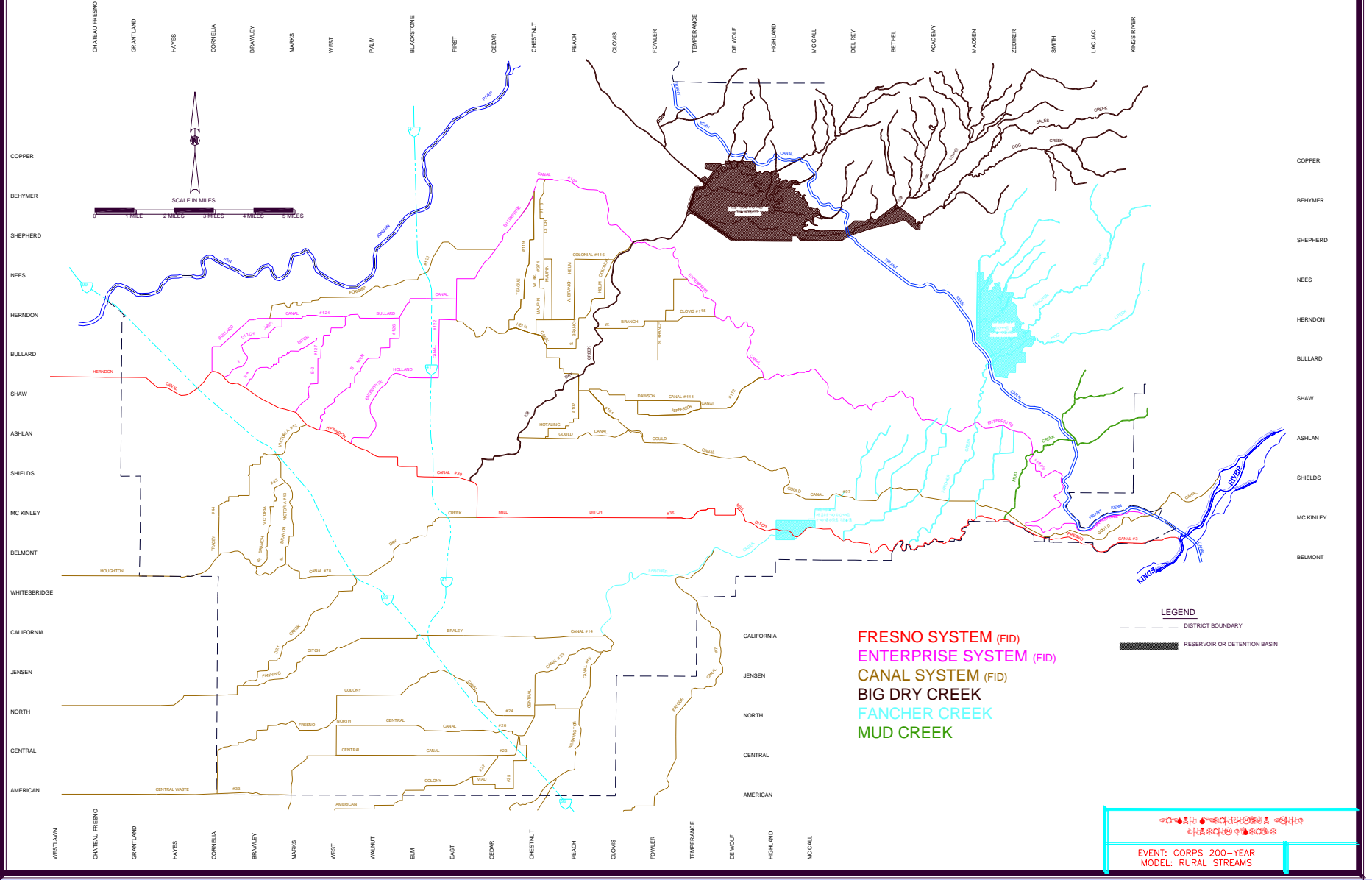
2024年10月24日 10:00:00

EVENT: CORPS 200-YEAR
 MODEL: RURAL STREAMS



2025-01-15 10:00 AM

EVENT: CORPS 200-YEAR MODEL: RURAL STREAMS



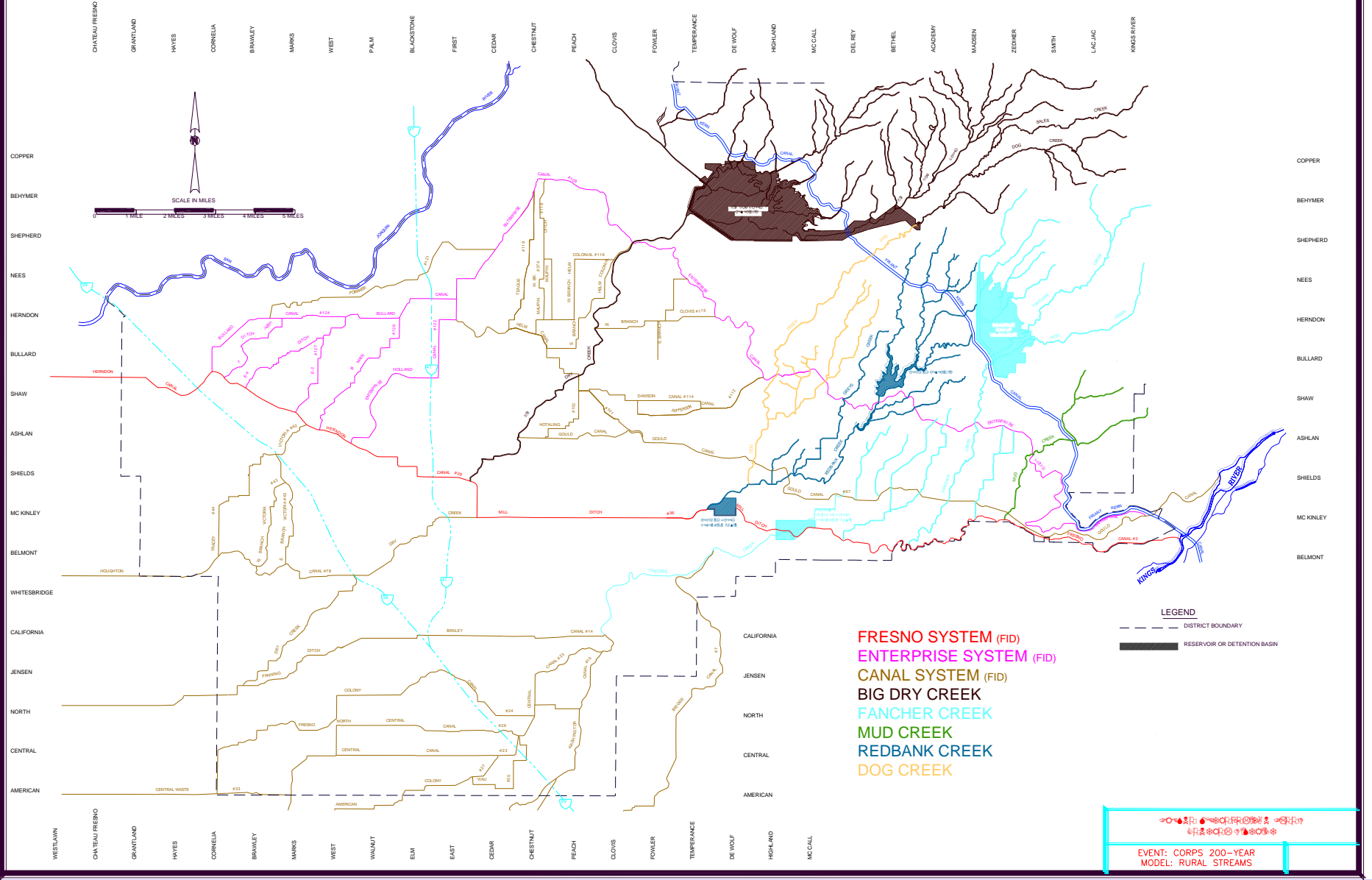
LEGEND

- - - DISTRICT BOUNDARY
- RESERVOIR OR DETENTION BASIN

FRESNO SYSTEM (FID)
ENTERPRISE SYSTEM (FID)
CANAL SYSTEM (FID)
BIG DRY CREEK
FANCHER CREEK
MUD CREEK

2025年10月20日
 2025年10月20日

EVENT: CORPS 200-YEAR
 MODEL: RURAL STREAMS

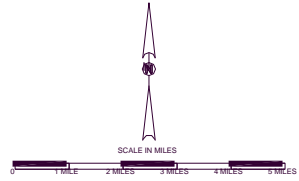
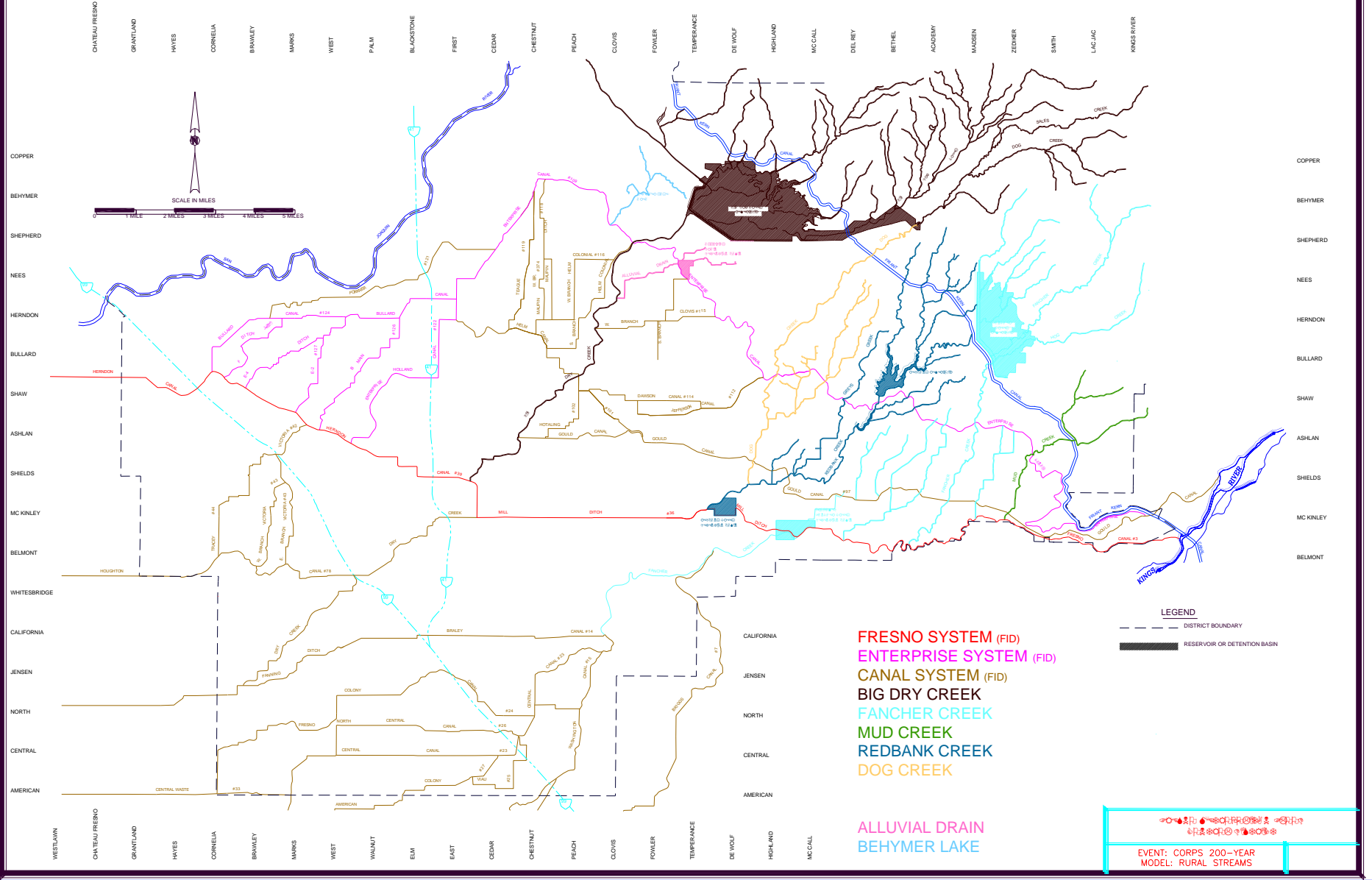


FRESNO SYSTEM (FID)
ENTERPRISE SYSTEM (FID)
CANAL SYSTEM (FID)
BIG DRY CREEK
FANCHER CREEK
MUD CREEK
REDBANK CREEK
DOG CREEK

LEGEND
 - - - DISTRICT BOUNDARY
 RESERVOIR OR DETENTION BASIN

2024年10月15日
 2024年10月15日

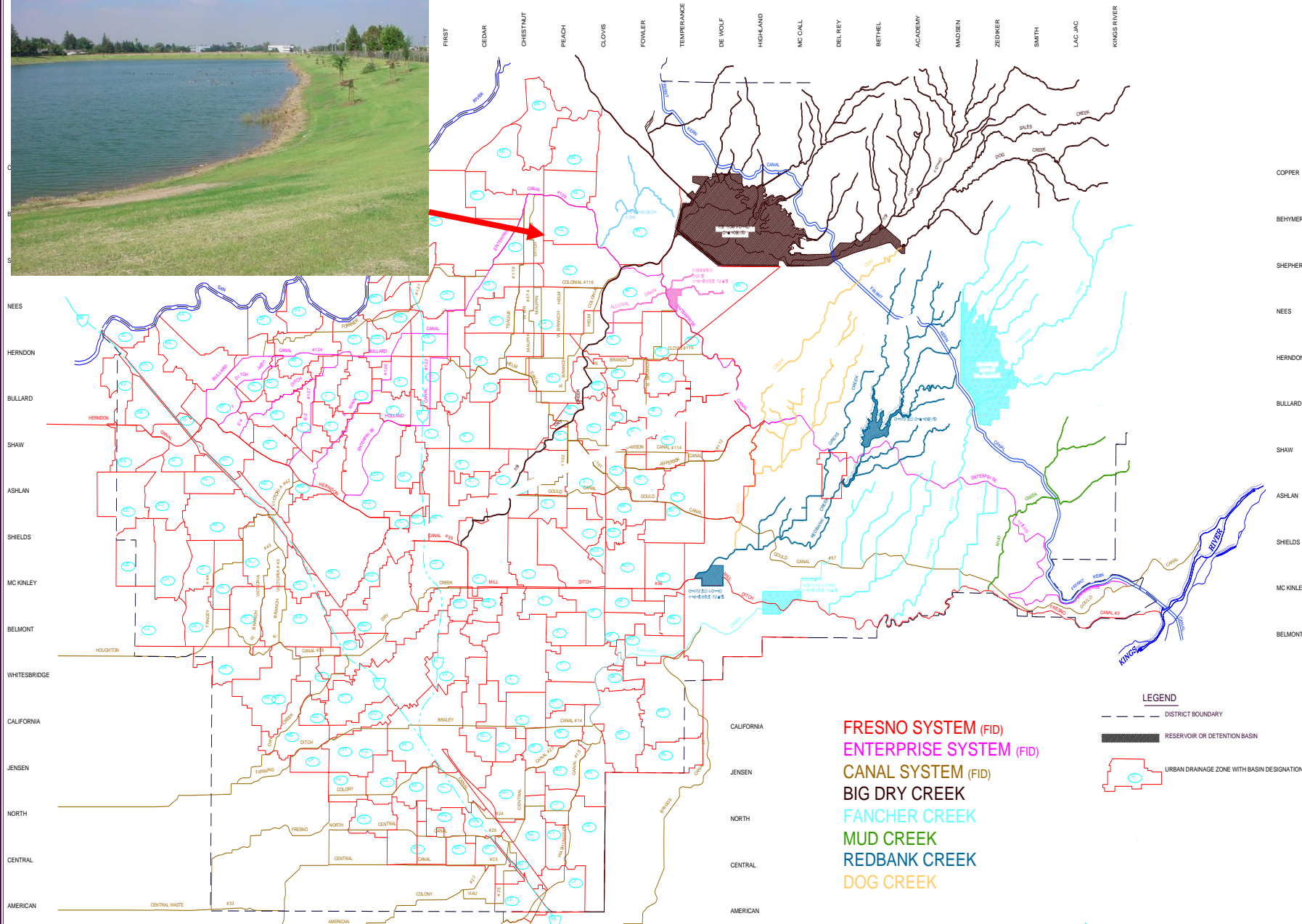
EVENT: CORPS 200-YEAR
 MODEL: RURAL STREAMS



- FRESNO SYSTEM (FID)**
ENTERPRISE SYSTEM (FID)
CANAL SYSTEM (FID)
BIG DRY CREEK
FANCHER CREEK
MUD CREEK
REDBANK CREEK
DOG CREEK
- ALLUVIAL DRAIN**
BEHYMER LAKE

LEGEND
 - - - DISTRICT BOUNDARY
 ■ RESERVOIR OR DETENTION BASIN

EVENT: CORPS 200-YEAR MODEL: RURAL STREAMS



LEGEND

- DISTRICT BOUNDARY
- RESERVOIR OR DETENTION BASIN
- URBAN DRAINAGE ZONE WITH BASIN DESIGNATION

FRESNO SYSTEM (FID)
ENTERPRISE SYSTEM (FID)
CANAL SYSTEM (FID)
BIG DRY CREEK
FANCHER CREEK
MUD CREEK
REDBANK CREEK
DOG CREEK

ALLUVIAL DRAIN
BEHYMER LAKE

EVENT: CORPS 200-YEAR
 MODEL: RURAL STREAMS

Storm Water Flows Into

Streets and Gutters...



Then

Into a Storm Drain Inlet







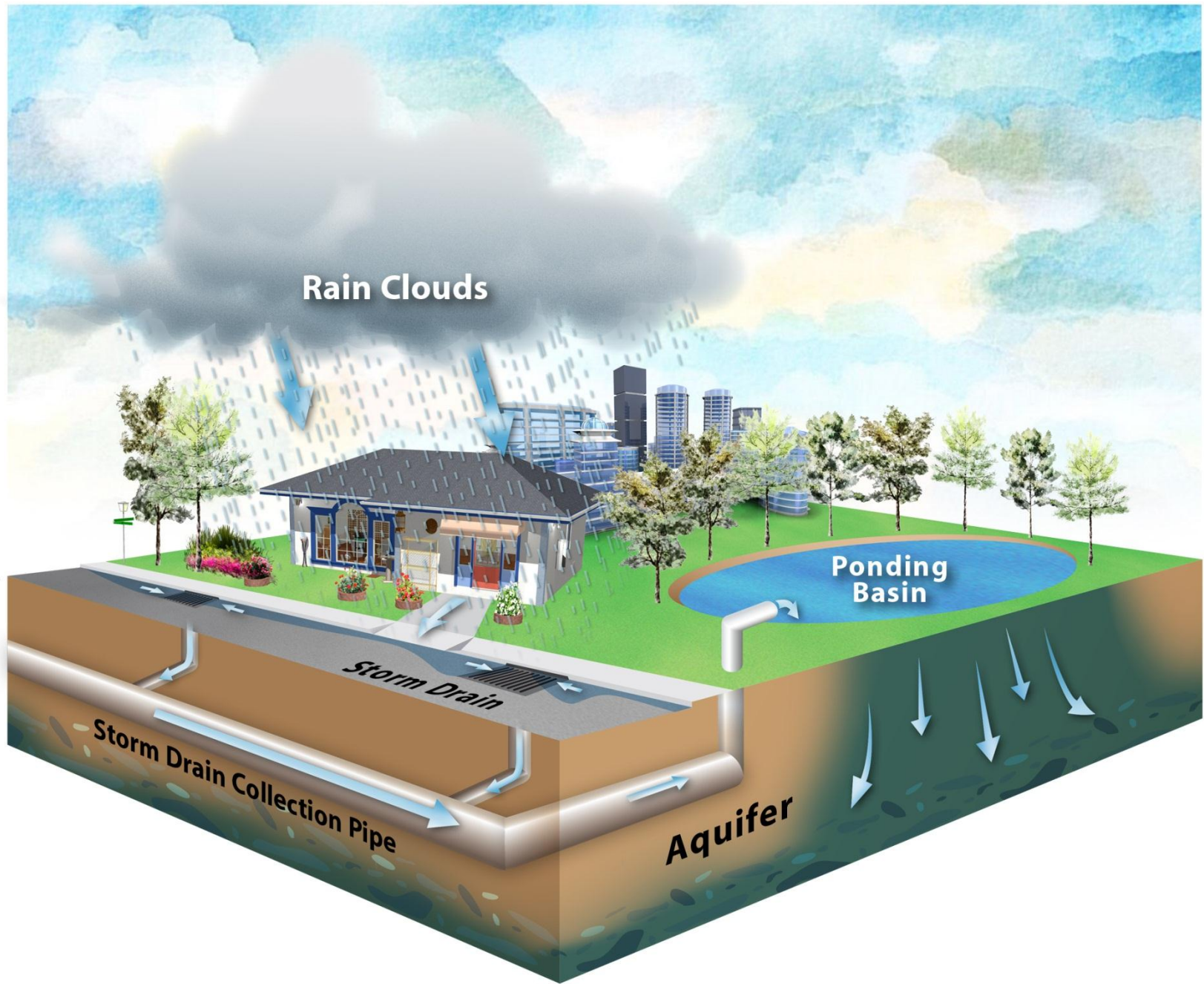
San Joaquin River

Big Dry

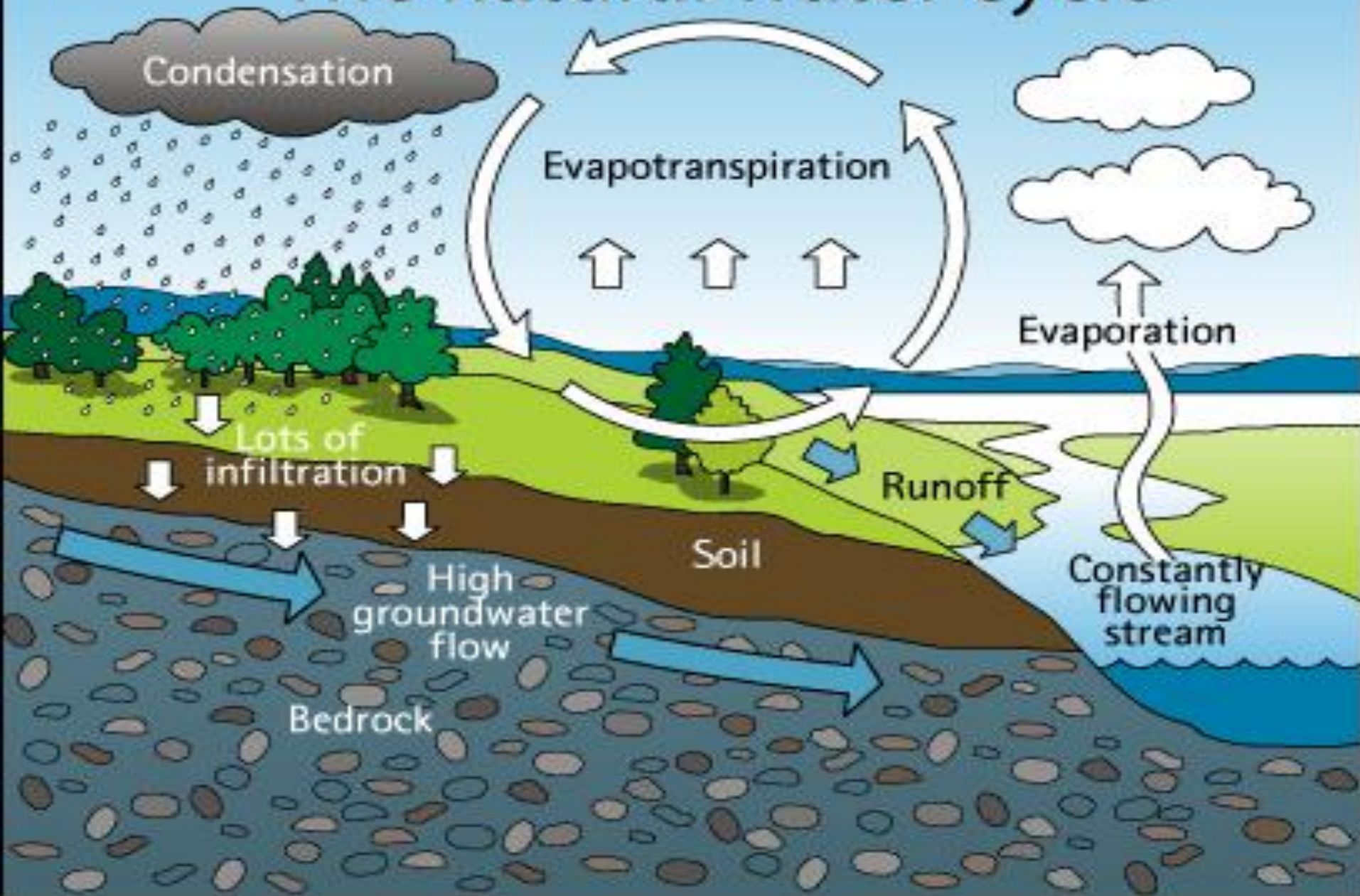
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Drainage Direction

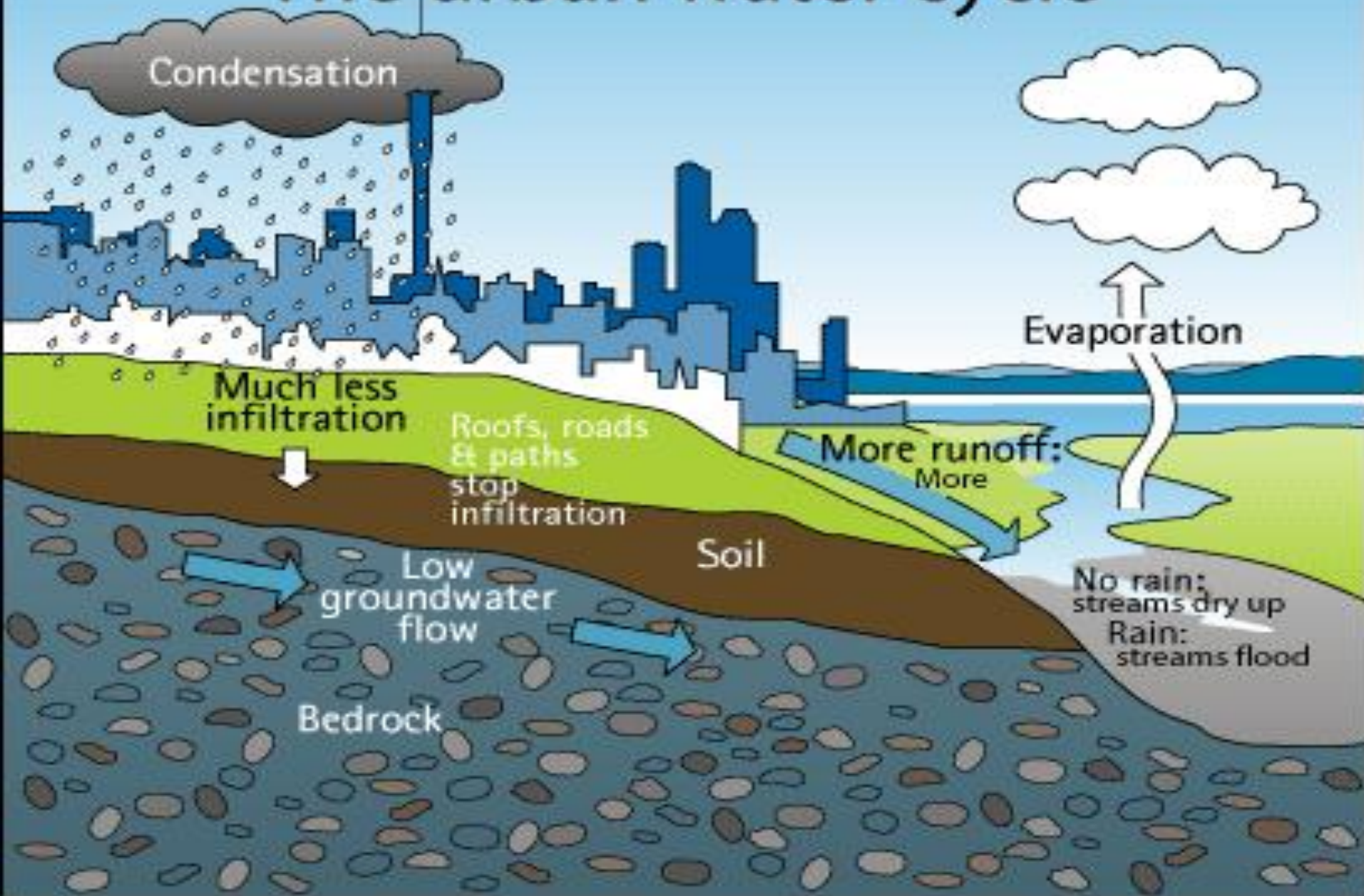
Kings River



The natural water cycle



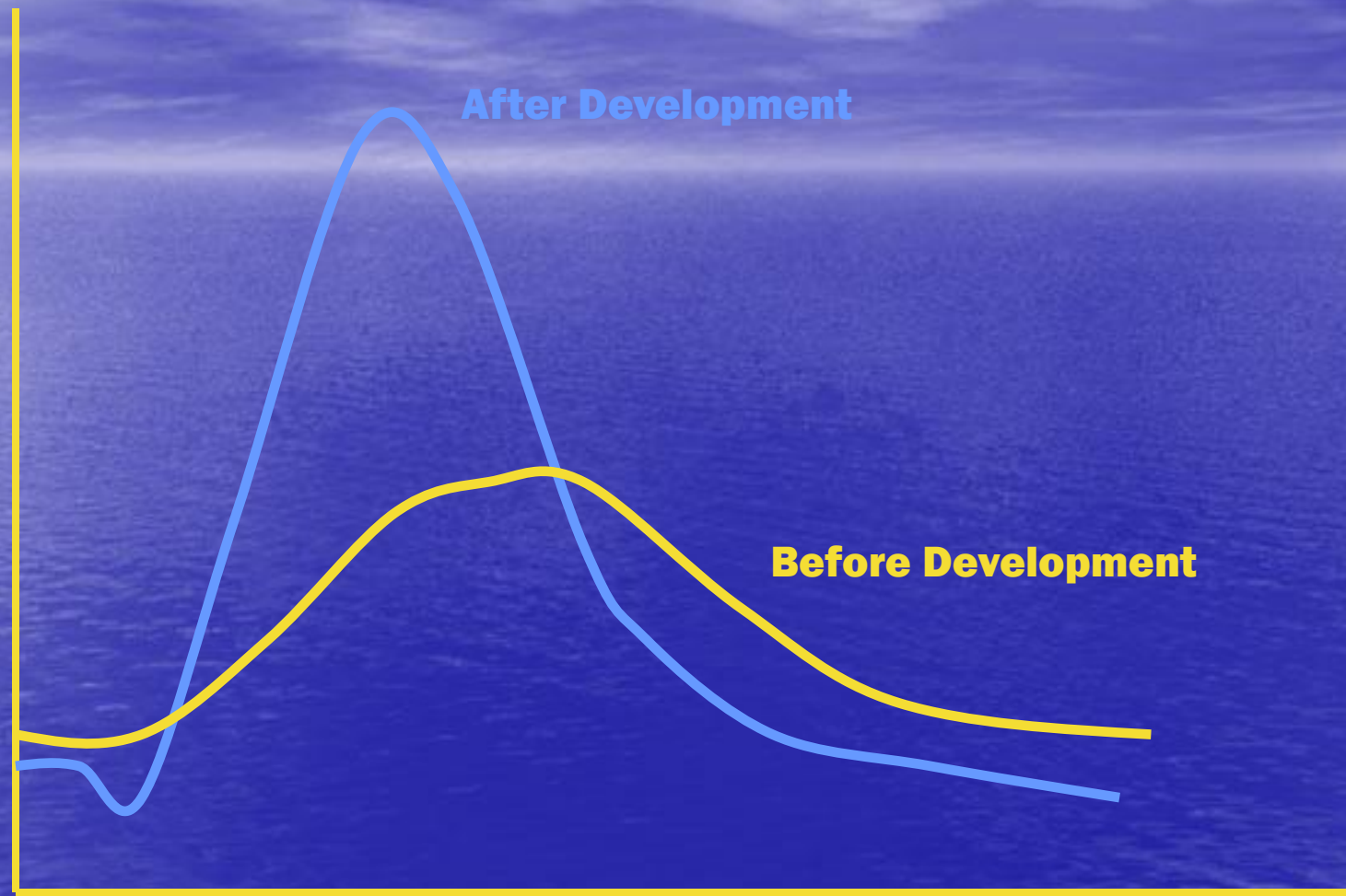
The urban water cycle



Towards a more sustainable urban water cycle



Volume



After Development

Before Development

Time 

What are the problems
caused by
urbanization/development?

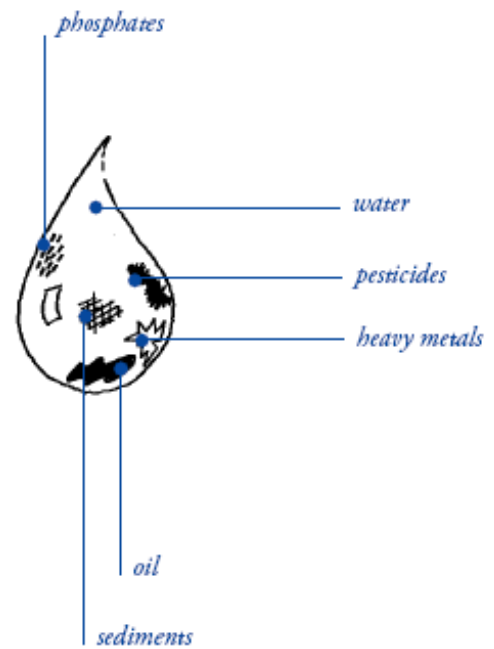
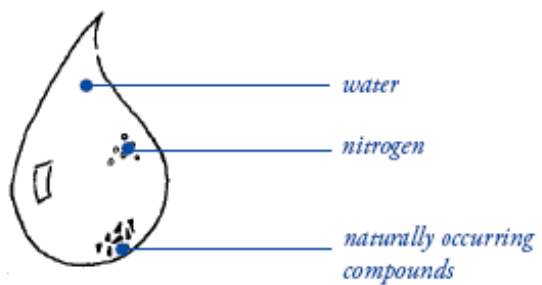
Runoff Volumes
Increase

Pollutants Increase

Bank scouring



MAY 21 2004



Fires erupted on the river several more times before [June 22, 1969](#), when a river fire captured the attention of [Time](#) magazine, which described the Cuyahoga as the river that "oozes rather than flows" and in which a person "does not drown but decays." [3]

Regulations



This event helped spur an avalanche of pollution control activities resulting in the [Clean Water Act](#), [Great Lakes Water Quality Agreement](#), and the creation of the federal and state [Environmental Protection Agency](#).

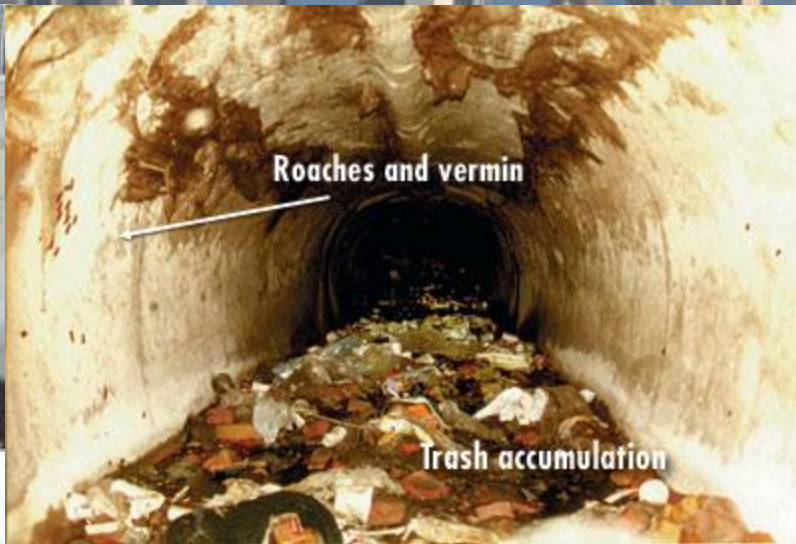


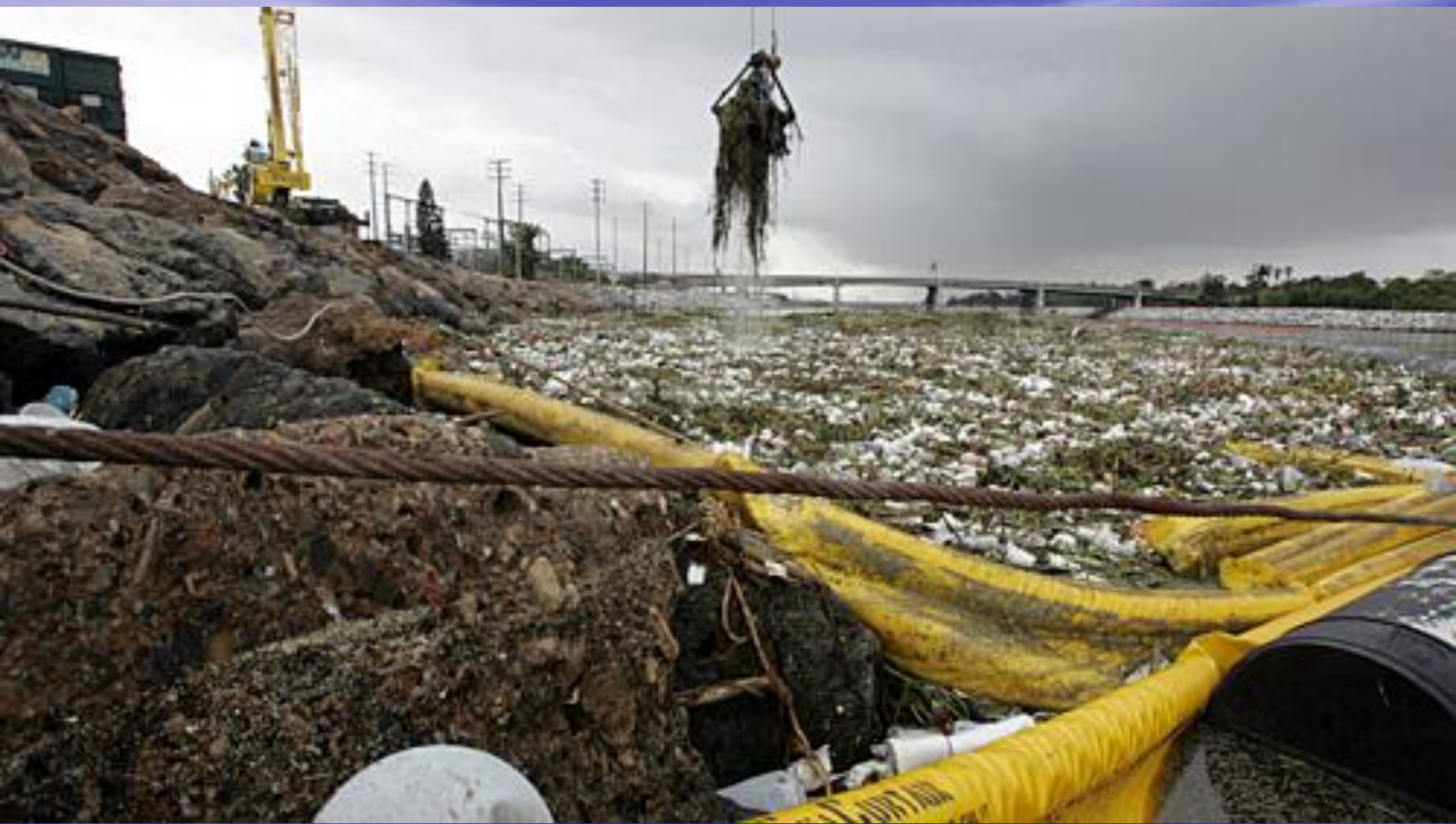
In 1969, the Cuyahoga River, Ohio caught on fire due to flammable discharge

Clean Water Act

- Prohibits certain discharges of stormwater containing pollutants except in compliance with a National Pollutant Discharge Elimination System (NPDES) permit
- Clean Water Act authority delegated to the State of California through the Construction General Permit (CGP)- (umbrella coverage)
- Must have a permit or a waiver to discharge any water with contaminants into any "Waters of the US"

Pollution





Out of sight, out of mind

The continent-sized vortex of plastic waste blighting the Pacific

Approximate areas of
'rubbish soup'



Translucent soup
of degrading
plastic waste

Depth
to 10 metres



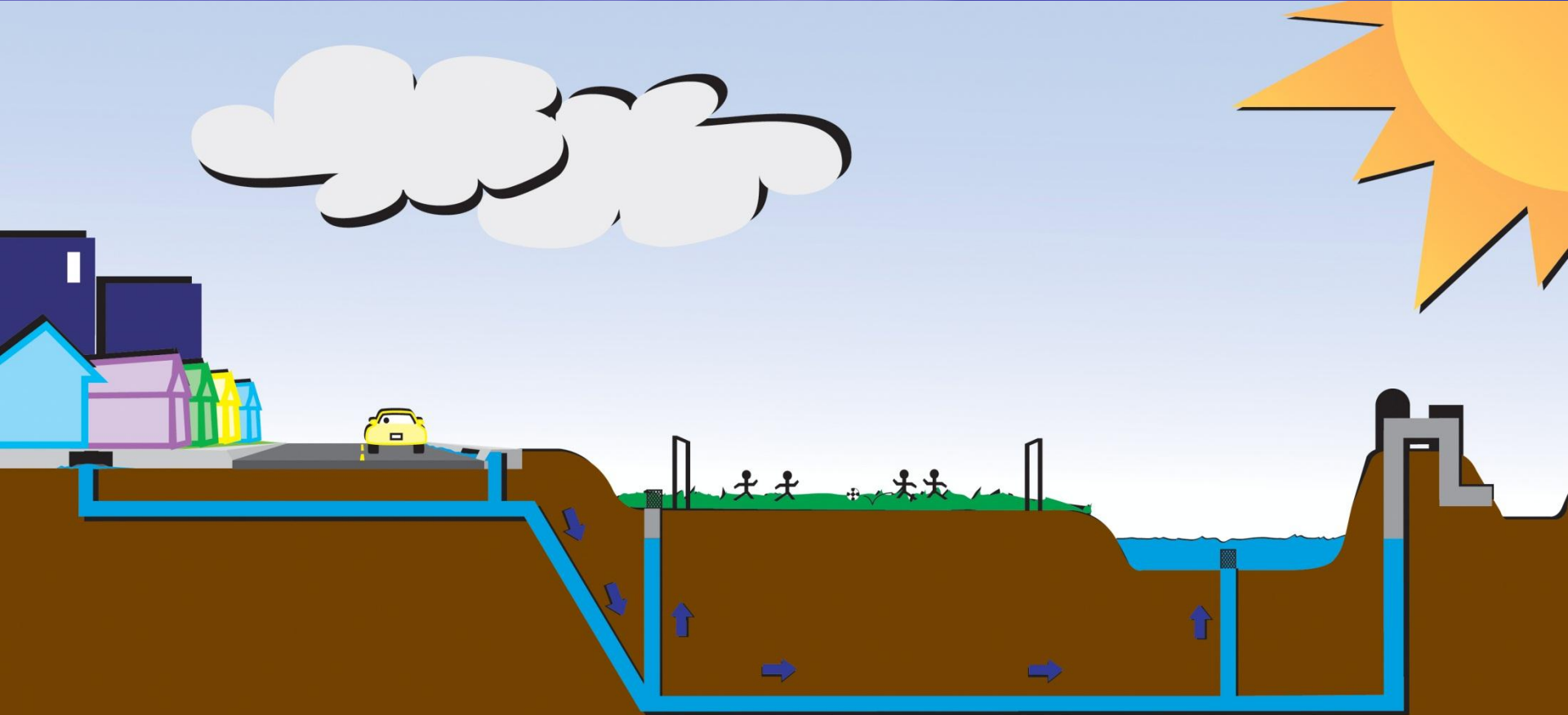
SECTION OF
GARBAGE
PATCH

North Pacific
Gyre currents
keeps soup in
constant movement

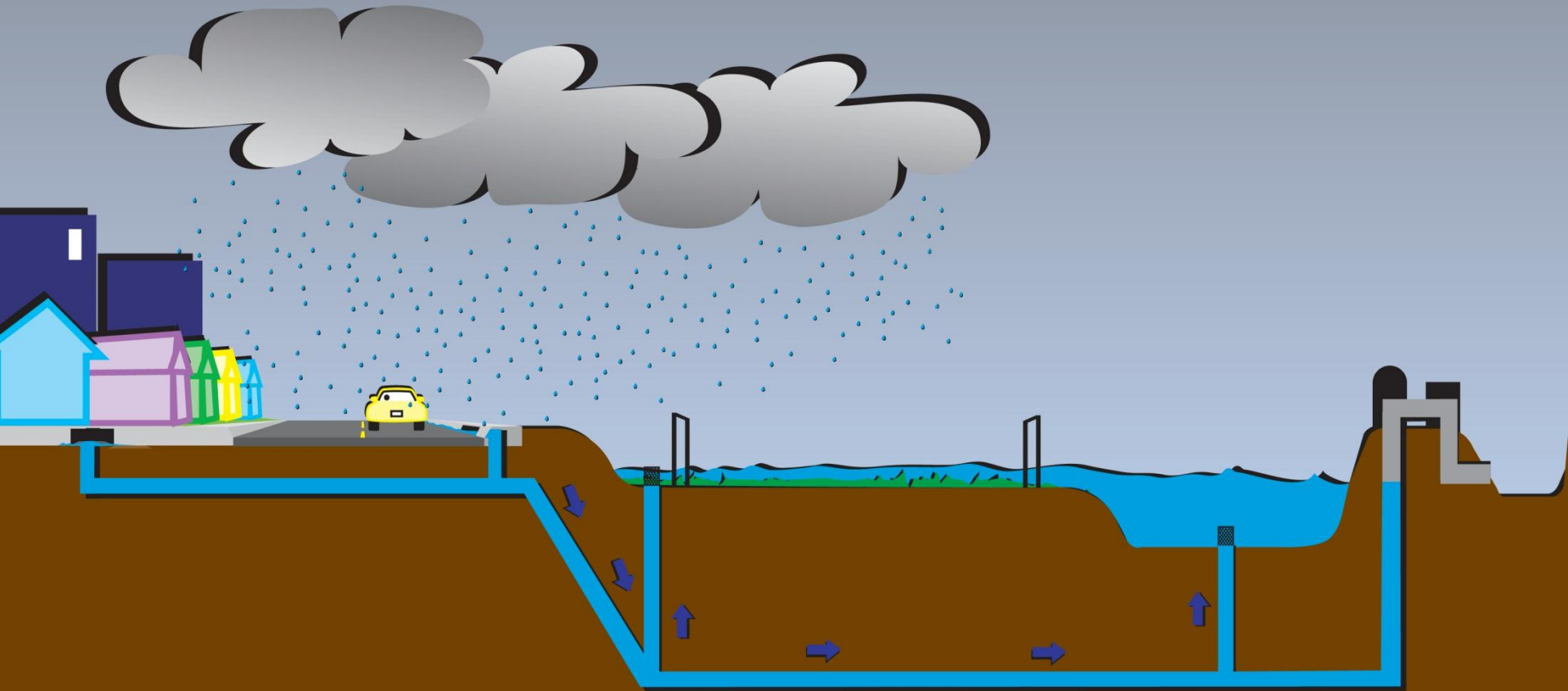


North Pacific Gyre

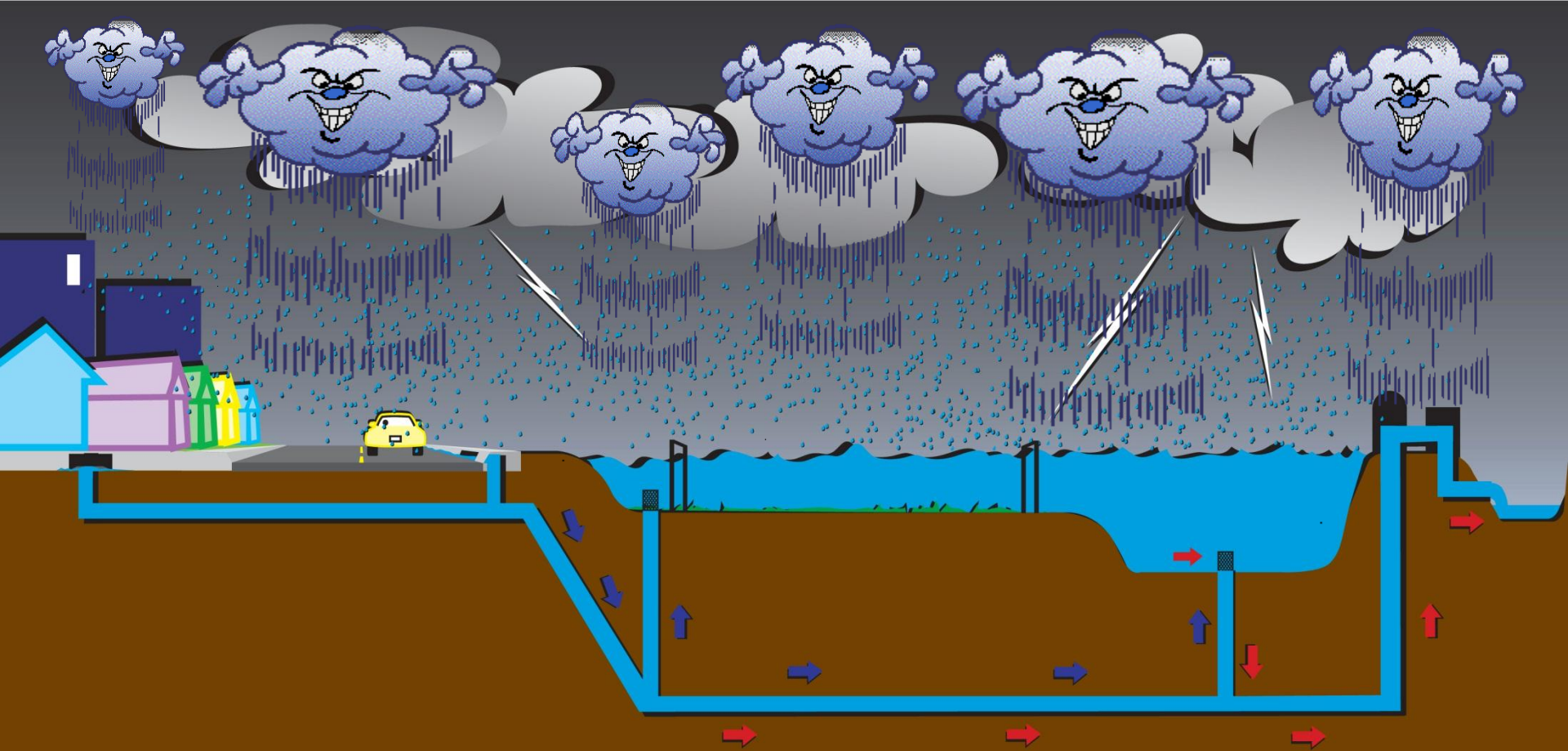




During the summer months, water from urban runoff (landscape irrigation, car washing or swimming pools) runs into the street flows into storm drain inlets, through underground pipes and into a storm water ponding basin.



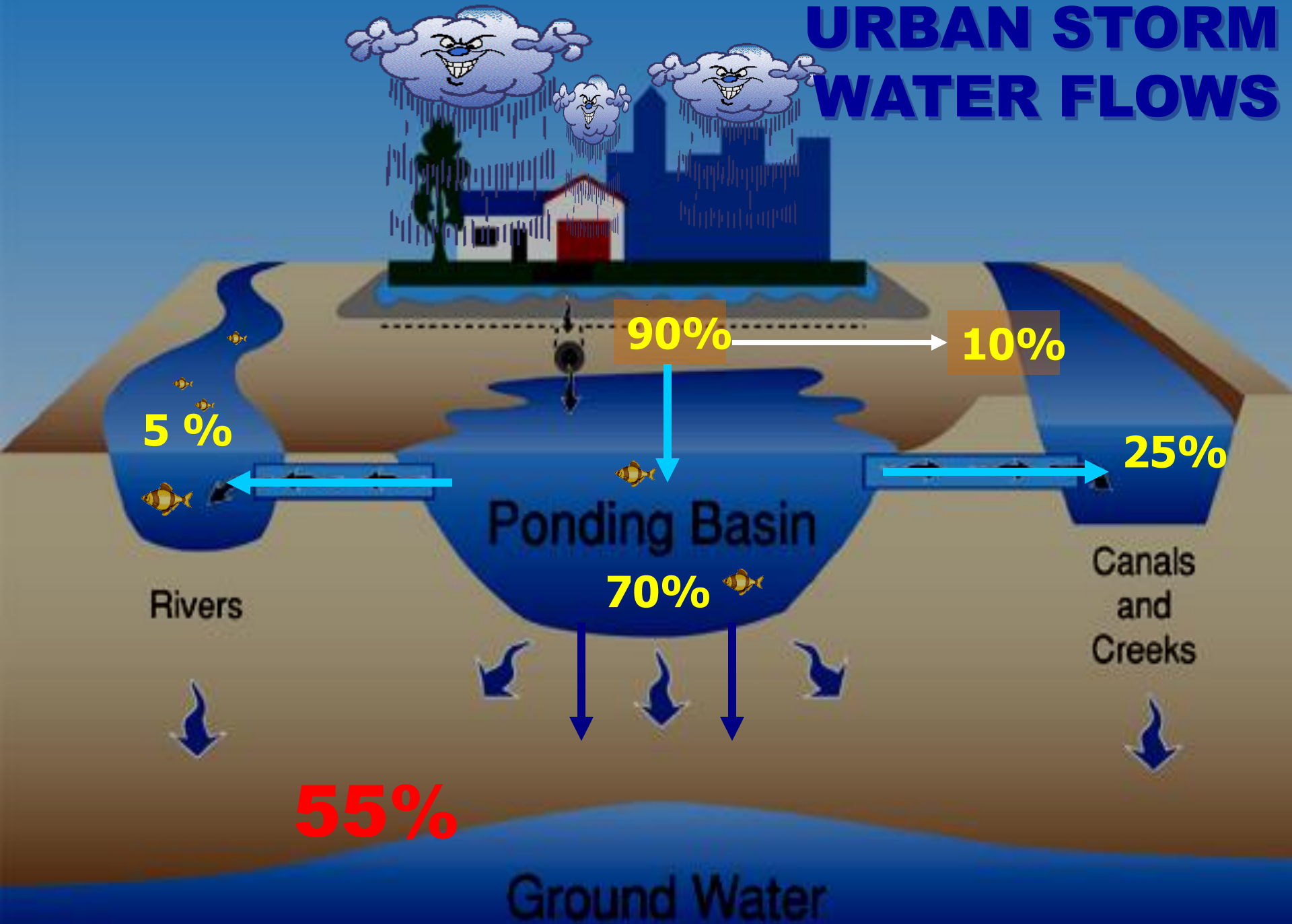
When it rains, storm water from streets, parking lots and other impervious surfaces flows into the storm drain system to ponding basins.



Water can be pumped out of ponding basins and into canals to maintain storm water capacity.

17,000 acre feet per year = 5.5 billion gallons

URBAN STORM WATER FLOWS



Dual Use – Recreation Basin Play Ground Upper Floor Stormwater Storage Lower Floor

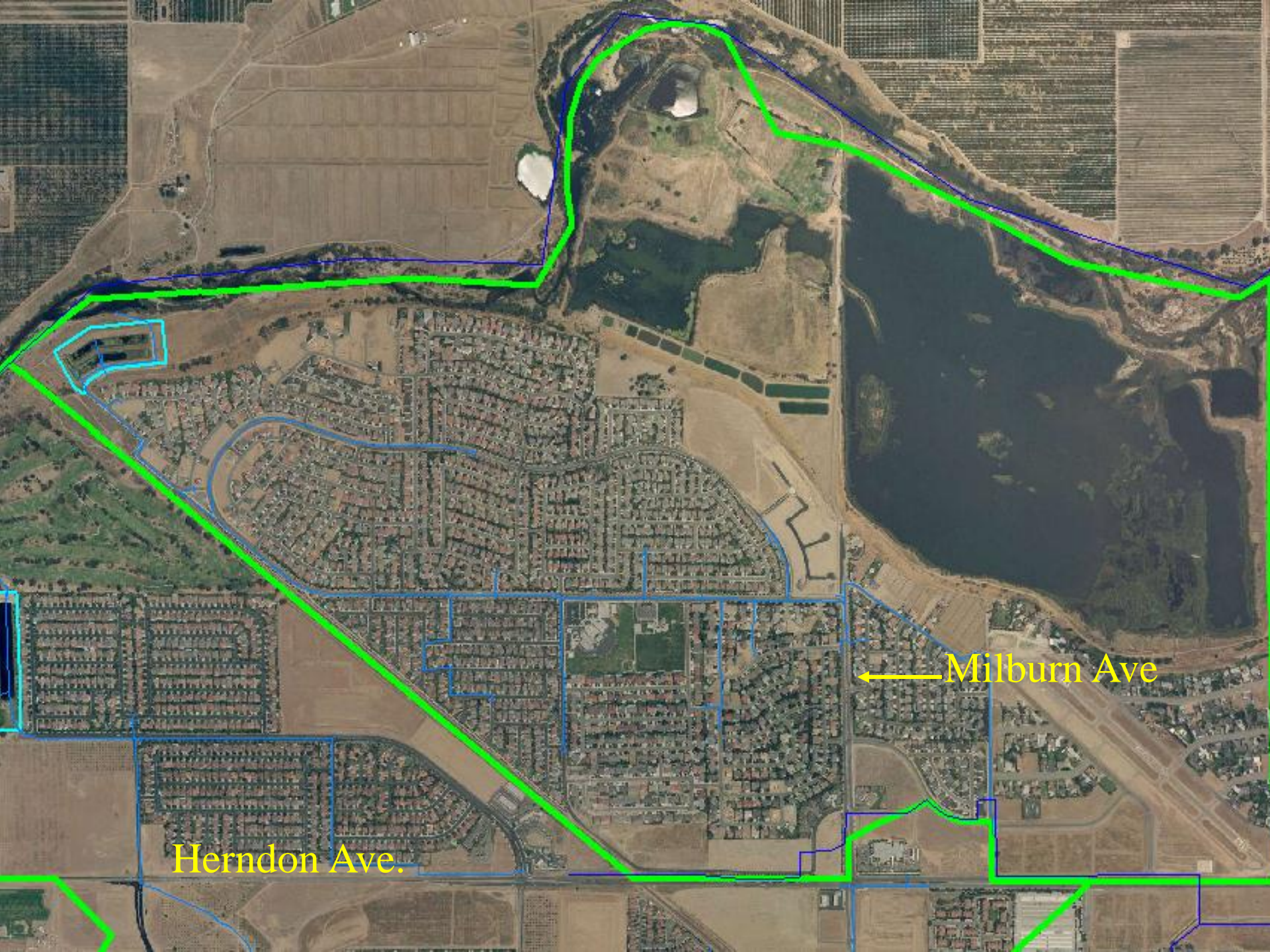


CN

Dual Use Recreation Basin Baseball Upper Floor Stormwater Storage and Recharge Lower Floor







Herndon Ave.

← Milburn Ave

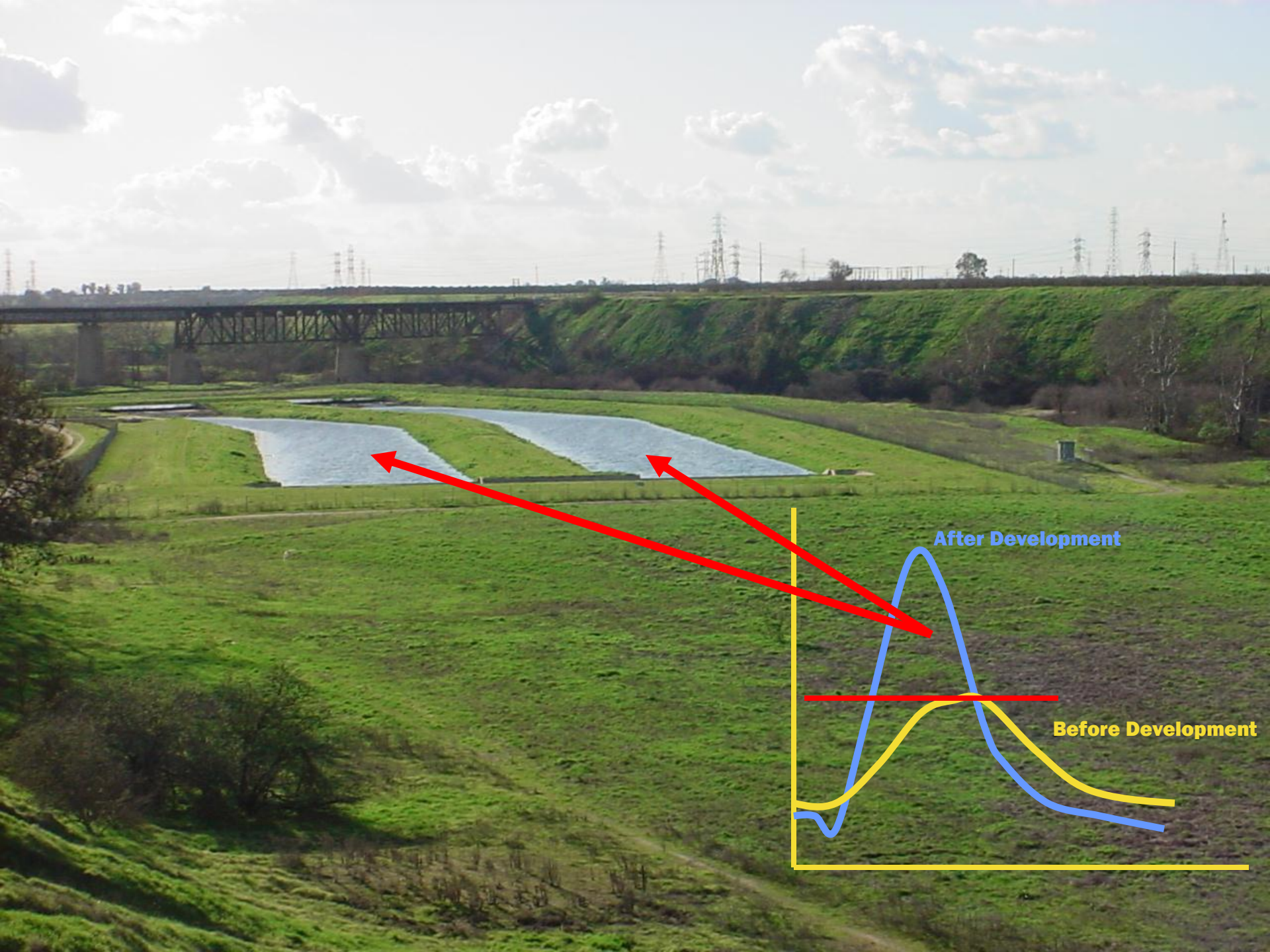
San Joaquin River



Basin EK







After Development

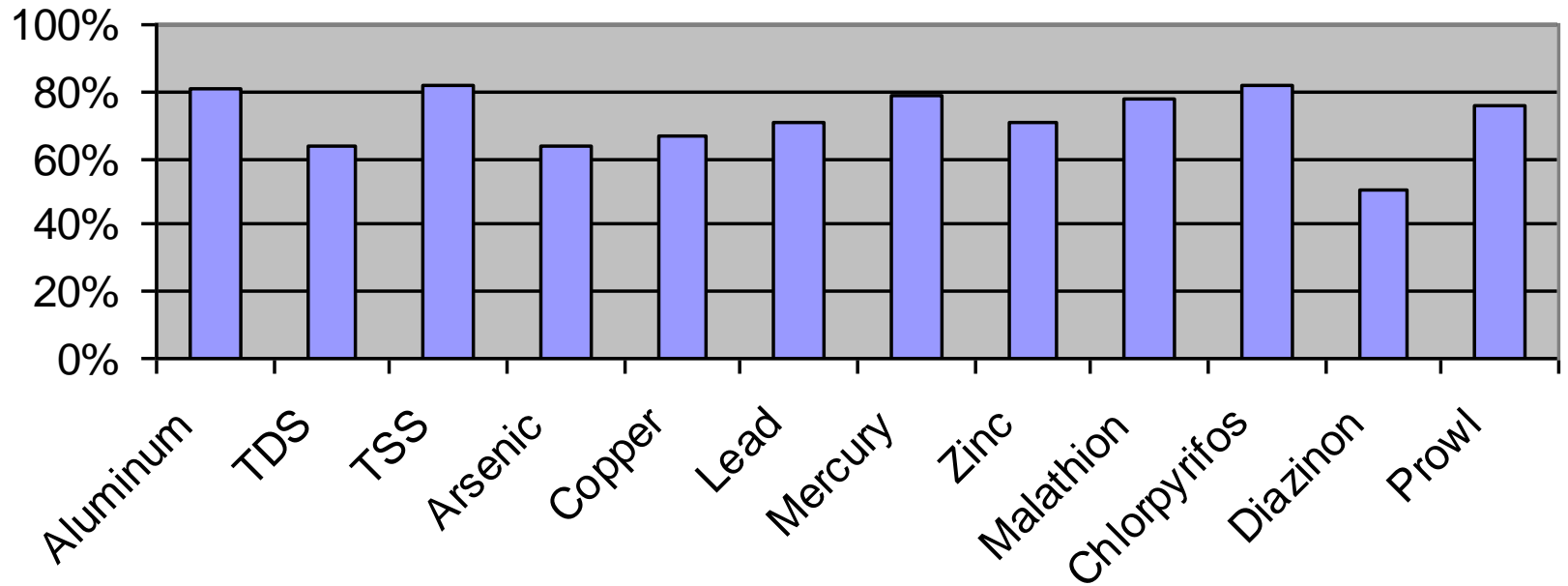
Before Development



Sediment Accumulation in Basins



Basin EK - Mass Pollutant Removal Percentage 4-year Total 2003-2006



Water Year	Al	TDS	TSS	As	Copper	Lead	Hg	Zn	Malathion	Chlorpyrifos	Diazinon	Prowl
2002-03	71%	48%	71%	58%	55%	73%	77%	59%	47%	68%	52%	59%
2003-04	72%	54%	61%	54%	57%	58%	90%	57%	78%	41%	57%	53%
2004-05	92%	72%	90%	72%	75%	84%	77%	82%	80%	67%	13%	77%
2005-06	77%	71%	84%	62%	69%	53%	67%	67%	89%	99%	100%	85%
Average	81%	64%	82%	63%	67%	71%	78%	70%	78%	82%	51%	75%

Basin Cleaning and Maintenance

- 1) \$ 100 an acre/yr for undeveloped basins
 - Fire suppression and weekly inspections, vector control
- 2) \$ 1,000 an acre/yr for developed basins
 - Mowing, irrigation costs, weekly inspections, vector control
- 3) Basin Cleanings - \$ 6,000 - \$ 7,000 per basin (5-6 year frequency)



JUN 20 2002

Stormwater and Snowmelt Recharge Program



Dual Use - Recharge Basin
(1 of 84 Recharge Basins with Canal Interties)

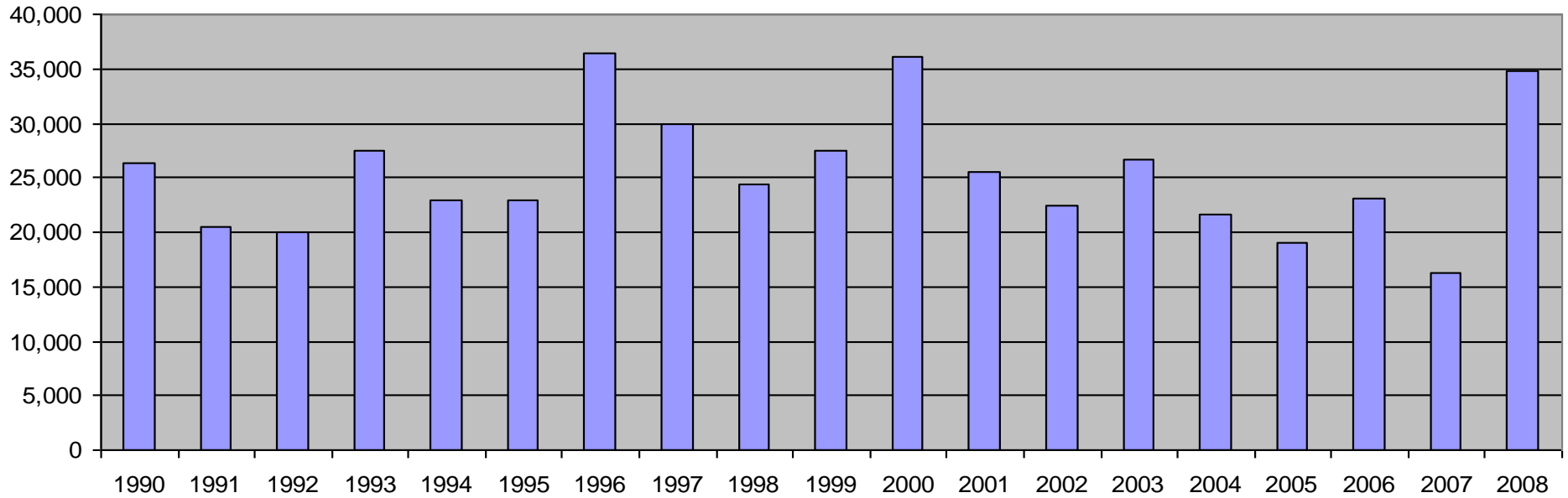


Snowmelt In

Stormwater Out

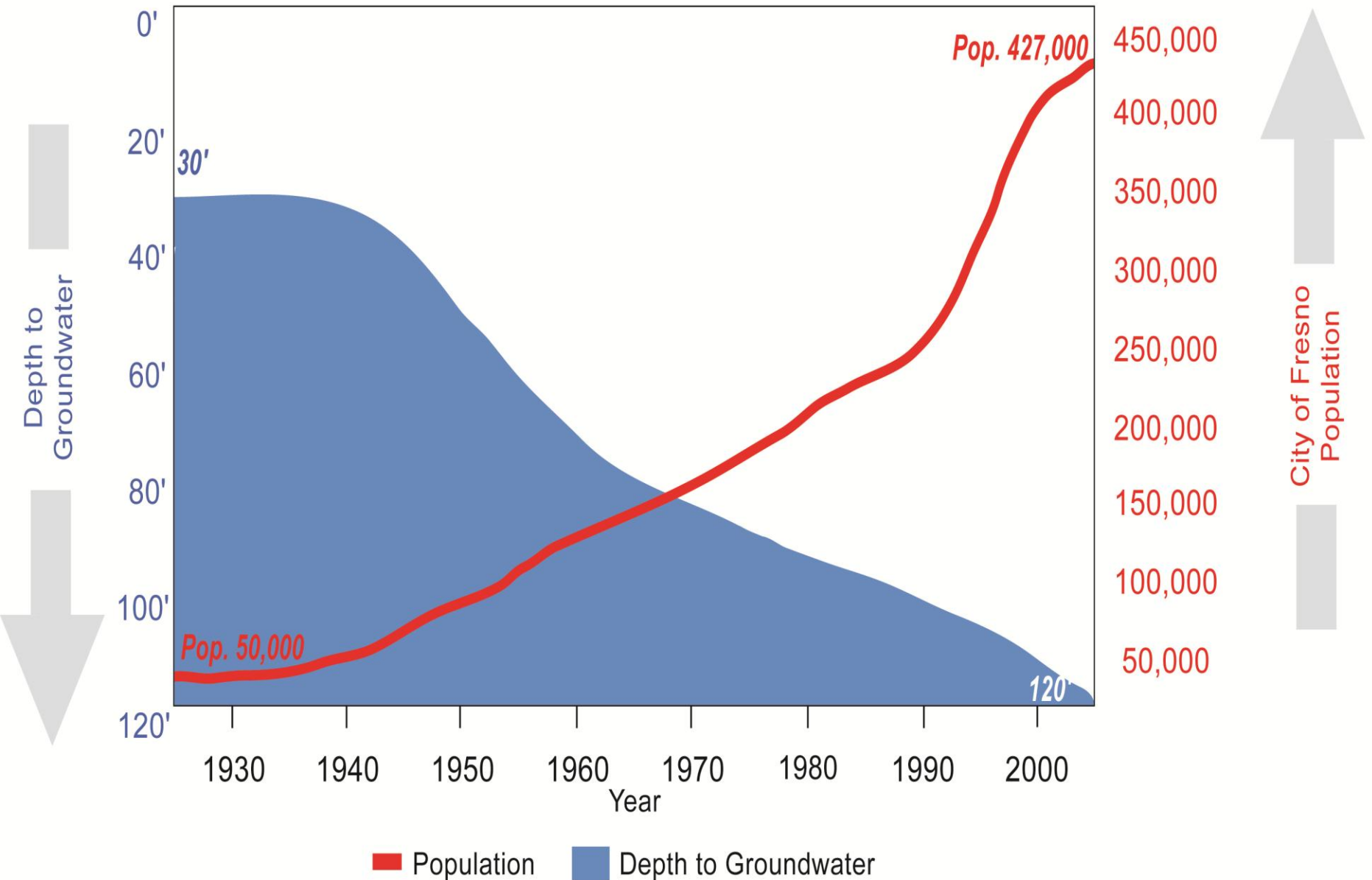


Snowmelt Harvest - 1990 to 2008
Acre feet



Population Growth vs. Depth to Groundwater

As our population grows, the demand on groundwater supplies has increased.
Since 1930 the average depth to groundwater has dropped dramatically.





Too Full To Fly





12 in



**Please
Do Not Feed
Waterfowl**

18 in

Too Full

To Fly




(UCCE) Master Gardeners of Fresno County






Safe Use & Disposal of Pesticides






Avoid applying pesticides to paved areas



Pesticides should be stored in a locked cabinet.

- Read pesticide labels 3 times-when buying, when using and when disposing of the container. Product labels provide information on safe use, application rates, ingredients and first aid instructions in the case of accidental poisoning.
- Identify the problem pest, then choose the least toxic method of control. Determine the right amount of pesticide to buy in order to eliminate the need for storing unused pesticides. Treat only plants infested with the target pest.
- Store pesticides in a well-ventilated, locked cabinet out of reach of children and pets. Never transfer pesticides to other containers or reuse pesticide containers.
- Do not apply pesticides when rain is forecast or on windy days. Avoid applying pesticides on paved areas. Protect our water supply and rivers from pesticide residue. Never allow pesticides to run off into storm drains or pour leftover pesticides down toilets, sinks or stormdrains.
- Unused pesticides must be disposed of through a household hazardous waste collection site.

Clear Storm Water
(and keep it there)

PROTECT YOUR WATER
 Runoff in the Fresno-Clovis area drains to ponding basins and replenishes our groundwater, the source of our drinking water. Protect your water by minimizing the use of pesticides and choosing less toxic products. To dispose of household hazardous waste, call the County of Fresno at (559) 282-4259 for a site nearest you.

For more information contact the UCC Cooperative Extension Master Gardeners in Fresno at (559) 456-7544 or email them at mgfresno@ucdavis.edu or visit our website at <http://mgfresno.ucdavis.edu>. You can also contact the Fresno Metropolitan Flood Control District at (559) 464-3392 or email them at fohdic@metfresno.net or visit their website at www.fresnofloodcontrol.org. For more information about managing pests, visit the UCCPM web site at www.ipm.ucdavis.edu.

What you use in your garden affects our drinking water, creeks, canals and rivers!







POISON FREE
FLYING INSECT
4.99 EACH
0-72868-13603-0 268-5023
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Victor Poison Free
Flying Insect Killer

Choose less toxic products!

ANT & ROACH
FLORAL 17.5OZ
4.49 EACH
0-42180-04485-7 270-9099
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1



OSVA
HEALTHY GARDEN
TO MANAGE PESTS NATURALLY

Got Bugs?
Get Answers!
Choose less toxic products
for a healthy home.

ANSWERS TO YOUR PEST PROBLEMS

- ANTS
- APHIDS
- COCKROACHES
OUT OF YOUR HOME
- FLEAS
- HEALTHY GARDEN
TO MANAGE PESTS NATURALLY
- BEAUTIFUL LAWN
- MOSQUITOES
AWAY FROM YOU AND YOUR YARD
- WONDERFUL ROSES!
- SNAILS AND SLUGS
- SPIDERS
THE HEAVY HITTER
- USE AND DISPOSAL OF
PESTICIDES

Sale!





SMART
TRAPS
\$4.99

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ORTHO
HOME DEFENSE MAX
 SECURE-KILL™ RAT TRAP
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V
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VICTOR
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Souricière
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 0 77668 00201 4
 EC1000-3

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OG 141

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0 72868 00201 4

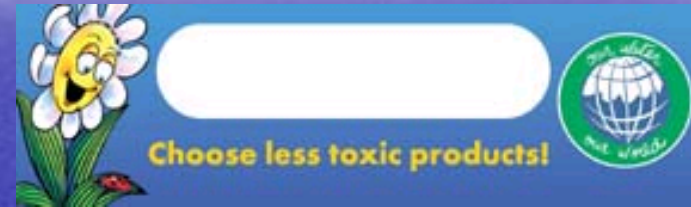
EC1000.3

KILLS
RATS & MICE

KILLS
RATS & MICE

Examples of IPM Partnership Projects Between FMFCD and UC Master Gardeners

Less toxic shelf talkers and promotion material at all 4 Fresno/Clovis OSH stores
(all stores reporting increased sales in less toxic gardening products)



- **IPM Kiosks at over 5 local nurseries**
- **Dozens of Master Gardeners trained in IPM**
- **Master Gardeners have given over 1500 IPM presentations to the community groups.**
- **Over 60,000 residents directly talked with or heard an IPM message from a Master Gardener**
- **Over 56,000 IPM pest guides distributed to citizens**
- **Gardening workshops (7 over the past 6 years)**

CLOVIS BOTANICAL GARDEN



Thank you for your
hard work and
continued support!

Urban Runoff



Partners for a Clean Community

Outside Vehicle and Equipment Maintenance...

...can create stormwater pollution that is carried to our stormwater basins that replenish our groundwater. Join other community partners to reduce stormwater pollutants by properly disposing of vehicle fluids and conducting maintenance under cover.

- Jefferson Smurfit Corp
- All Engine Distributing
- Betts Spring Co.
- Quali-T-Ruck Service, Inc.
- Sebring West Automotive Ctr.
- Mid-State Metal Casting

Visit CleanOurCommunity.org for more information and to become a community partner.



www.cityofclovis.com



www.co.fresno.ca.us



www.donttrashcalifornia.info

Urban Runoff



Partners for a Clean Community

Stormwater Pollution Prevention...

...is practiced by these community business partners who prevent stormwater pollutants from entering the gutter and our stormwater basins by:

- **Cleaning up Leaks and Spills**
- **Covering Raw Materials and Wastes**
- **Training Employees on Stormwater Pollution Prevention**
- Monterey Ag Resources
- Corn Nuts (Kraft Foods)
- Anlin Industries
- Valley Fleet Clean
- S.C. Johnson and Sons, Inc.
- Terminix Commercial
- Duncan Enterprise

Visit CleanOurCommunity.org for more information and to become a community partner.



www.cityofclovis.com



www.co.fresno.ca.us



www.donttrashcalifornia.info

Small Action....

Conserve Water - Do not Over Water

Over watering creates runoff that carries lawn chemicals into ponding basins and also wastes water.

Only water what your plants need, set your irrigation timers at the beginning of each month according to the season.

Adjust your sprinklers to water only plants and lawn, not sidewalks and the street.



Call: City of Fresno – 621-5480
City of Clovis – 324-2340



Small Action.....

Properly Use all Garden Chemicals

Choose less toxic garden products

Ask at your local nursery

Read the label at least three times.....

When you buy, use and
dispose of the product

Mix and use only what you need for
each application.....

Visit these web sites for information...

www.ipm.ucdavis.edu

mgfresno.ucdavis.edu

www.fresnofloodcontrol.org



Reduce Nitrogen Input

- Slow Release fertilizers
- Grass Clippings
- Don't fertilize the Sidewalk and Street
- Don't fertilize before a rain
- Don't over fertilize
- Use Iron to green up in summer time
- Raise the height of the grass (reduced mowing)

Slow Release Fertilizers

Reduce Nitrogen Input

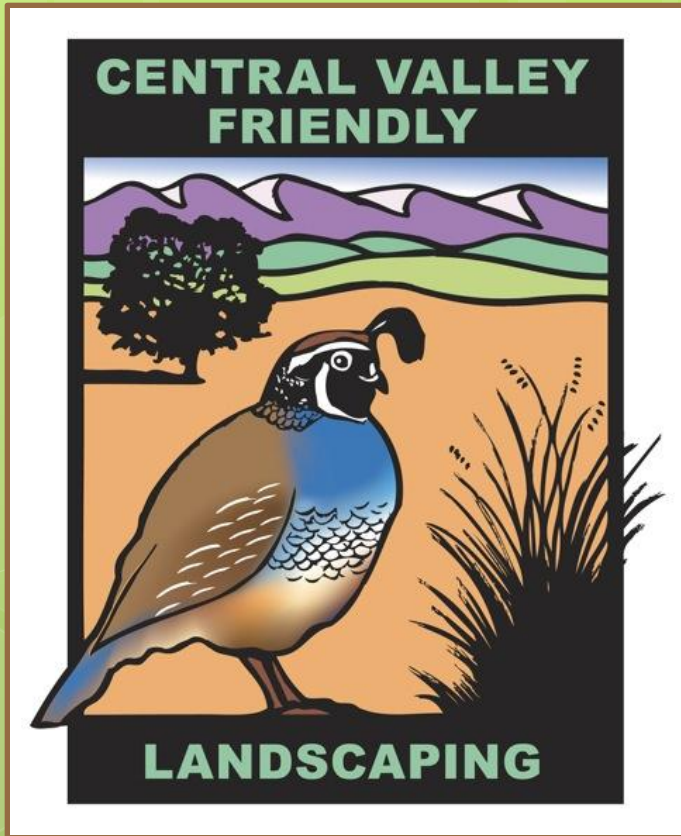
- Advantages
 - slow release fertilizer is that the nutrients are available gradually over an extended period of time.
 - the gardener can fertilize less often, and the nutrients are provided gradually (at lower rate but consistently).
 - Most slow release fertilizers (organic and synthetic) release at specific (warm) soil temperatures. The benefit of this is that plant roots generally are most active in warm soil and therefore the slow release fertilizer will start to make fertilizer available as soon as the plants actually needs them. As the plant roots become more active (in warmer soil) more fertilizer will automatically be released.
- Disadvantage
 - The draw back is when certain plants prefer to take up fertilizer nutrients from cold soil (some slow release fertilizers can release nutrients in cold soil).
- Additional Discussion
 - Fast release fertilizer is often cheaper than slow release fertilizers.
 - They can burn plant roots if provided in too big quantities, and even when they are dosed correctly,
 - They will have to be reapplied more frequently as they dissolve quickly and disappear from the root zone sooner.
 - They can be excellent for plants which require higher amounts of nutrients, and/or for plants which require a quick supply of nutrients (e.g. if a nutrient deficiency is noted).
 - They are also favorable for plants which take up nutrients at specific times.



- 1) Adjust Timers and Sprinklers**
- 2) Read the Label**
- 3) Buy Less Toxic**
- 4) Tell Your Neighbor**

Low Impact Development for Stormwater includes:

- Incorporating features into the design and operation of urban structures that **reduce the volume** of runoff leaving a site.
- Incorporating features into the design and operation of urban structures that **reduce the pollutant loading** of runoff leaving a site.



Central Valley Friendly Landscaping Award Program

Residential landscaping
award program and public
education web site

Seven Guiding Principles Modeled after established Bay Area and Florida programs

1. Conserve water and ensure water quality
2. Conserve energy and protect air quality
3. Nurture the soil
4. Reduce garden waste, send less to the landfill
5. Practice Integrated Pest Management
6. Select appropriate plants
7. Create and protect wildlife habitat

Sampling of 2011 Winning Landscapes



The 6 chosen best exemplified the
Seven Guiding Principles

Applications Accepted Through June 1, 2012

- Applications available on web site
- Application review and site visits done by committee members June 2-September 1
- Notifications made to winners in September
- Awards event hosted by Clovis Botanical Garden in October

Storm Water Pollution Prevention Quiz

1. What is the best pollution prevention solution for leaking equipment?

- a. clean up spills with rags**
- b. use drip pans**
- c. fix leaks**



Storm Water Pollution Prevention Quiz

1. What is the best pollution prevention solution for lawn and garden chemicals?

- a. Buy less toxic products**
- b. Water properly**
- c. Read and follow the label**





Daniel Rourke - 456-3292

DanielR@fresnofloodcontrol.org

Low Impact Development for Stormwater includes:

- Incorporating features into the design and operation of urban structures that **reduce the volume** of runoff leaving a site.
- Incorporating features into the design and operation of urban structures that **reduce the pollutant loading** of runoff leaving a site.

Case Study

Chapel Run

Conventional Development

Total size of site: 96 acres
Total number of lots: 142
Average size of lots: 1/2 acre
Percent undisturbed: 0%
Percent impervious: 29%



Delaware Dept. of Natural Resources and Environmental Control
Environmental Management Center
Brandywine Conservancy

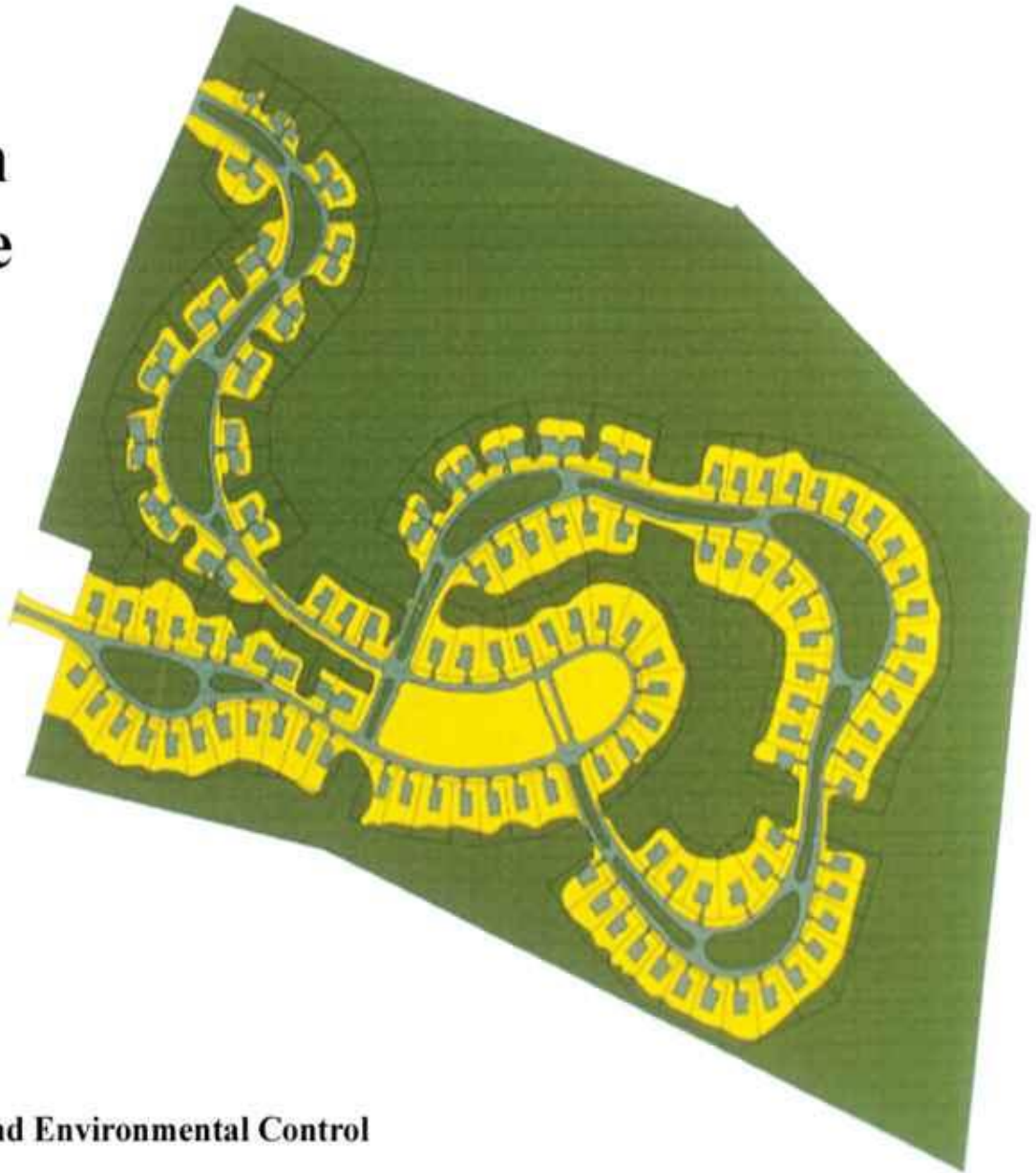
Case Study

Chapel Run

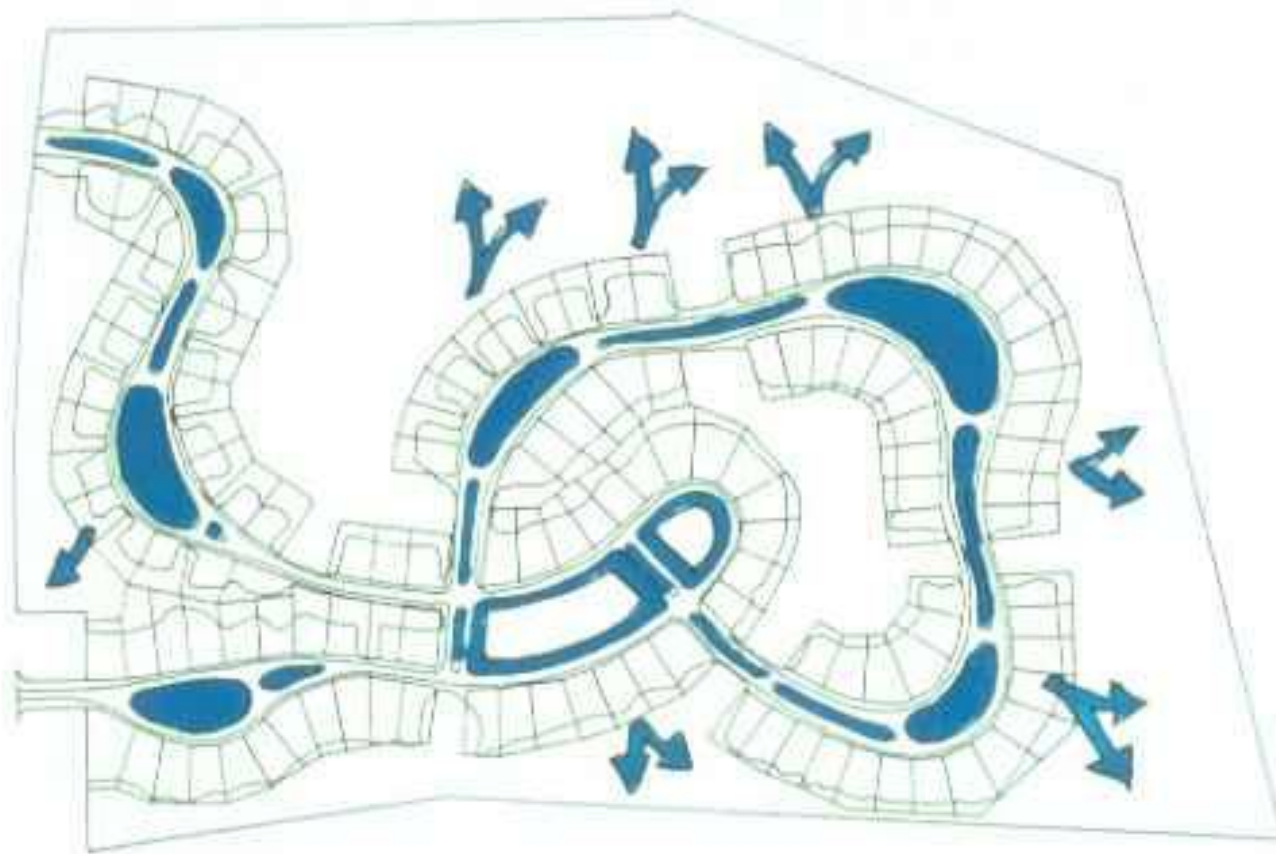
Conservation Design

Parkway Alternative

Total size of site: 96 acres
Total number of lots: 142
Average size of lots: 1/4 acre
Percent undisturbed: 59.6%
Percent impervious: 14.9%



Delaware Dept. of Natural Resources and Environmental Control
Environmental Management Center
Brandywine Conservancy



**DNREC
Environmental Management Center
Brandywine Conservancy**

**Conservation Design
Stormwater Management**

Imperviousness Disconnection



Santa Fe, New Mexico

Imperviousness Disconnection

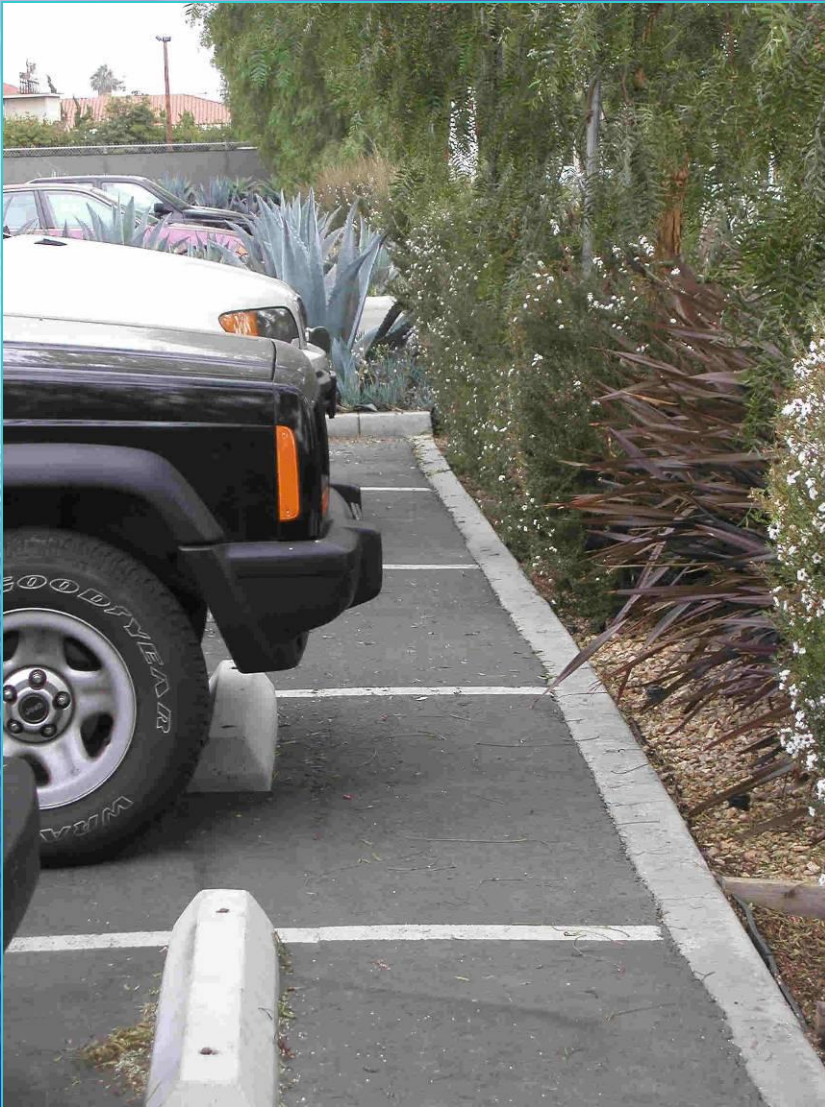


Chincoteague, Virginia

CH2MHILL

Commercial Monitoring Site

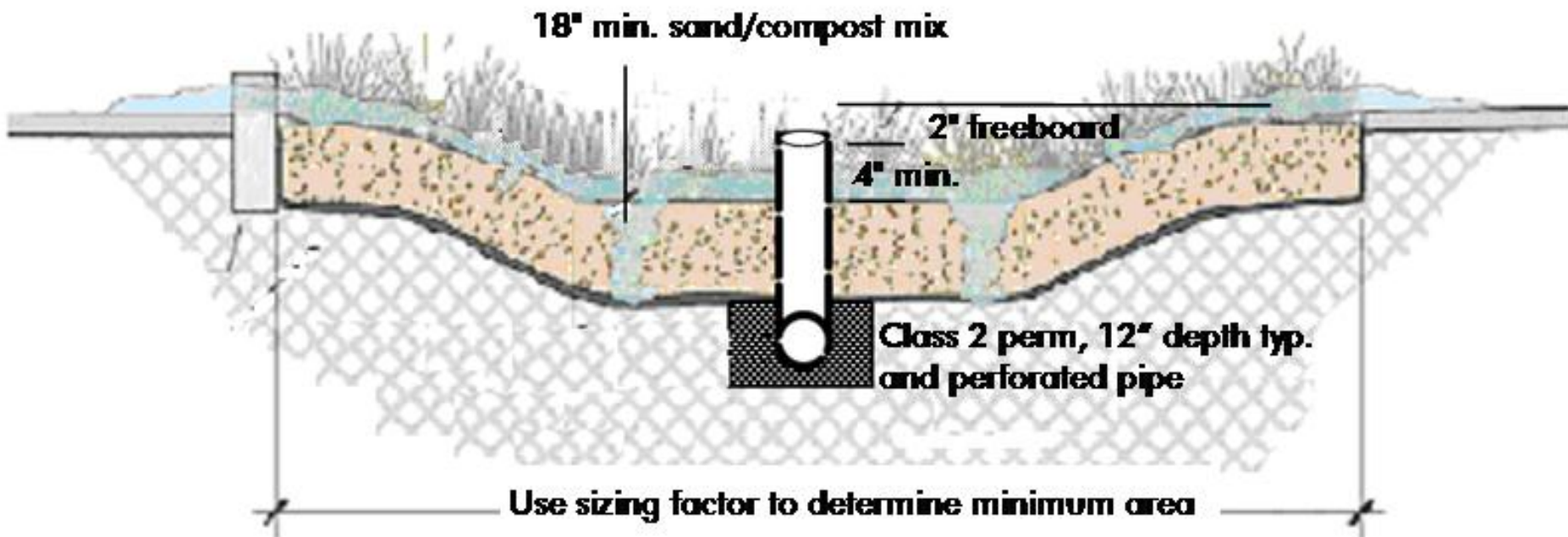
Parking lot drains into landscape strip



Roof drain into drywell



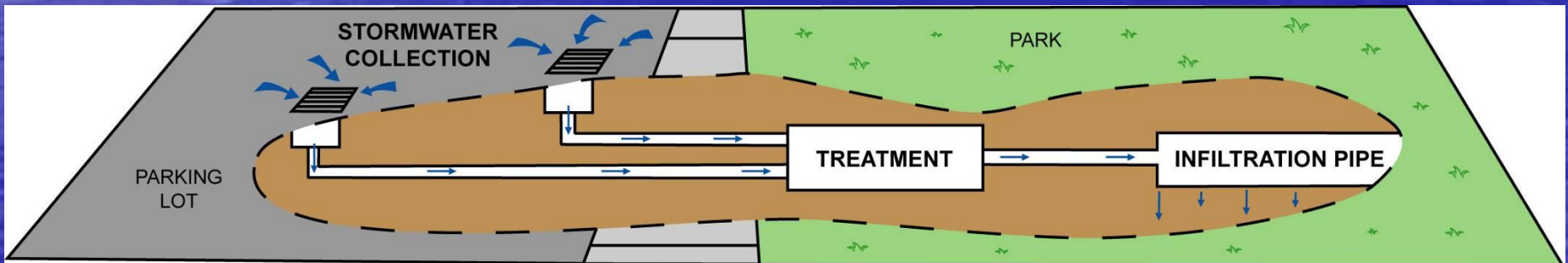
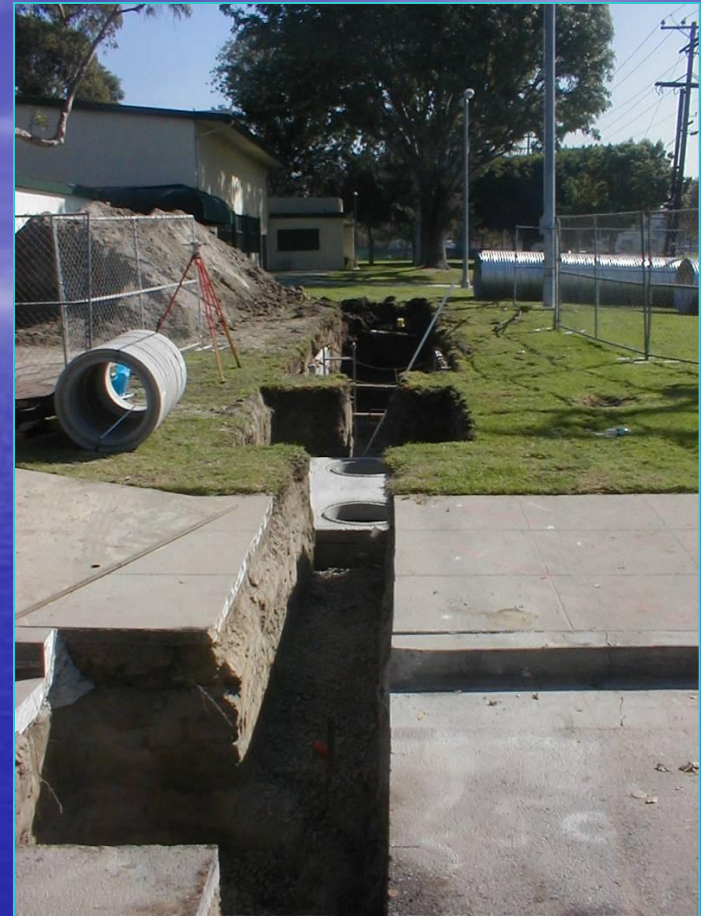
Swale



Instead of underground pipes, the developer here integrated a grassy swale into site landscaping to treat runoff



City Park BMP Installation



Private Property Options

- Drain at the end of the driveway
- Native and drought-tolerant plants
- Rain gardens to catch roof runoff
- Mulch

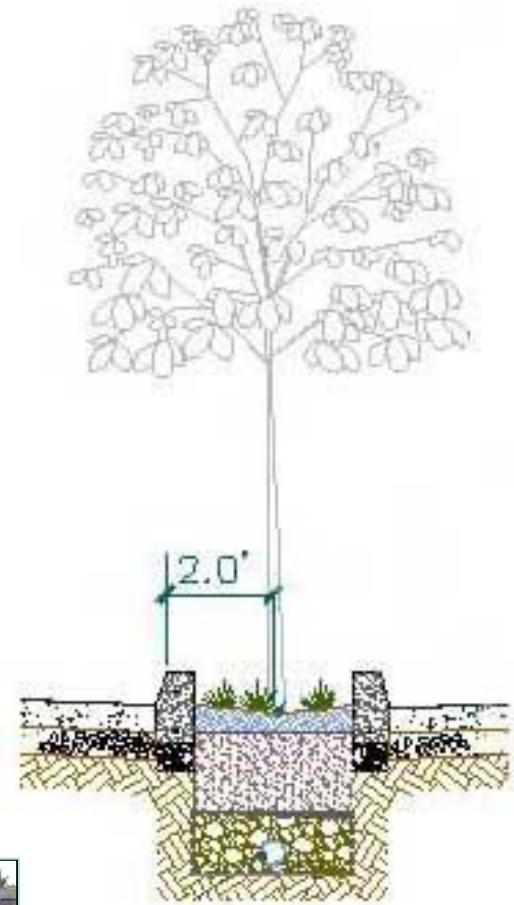


Seattle Public Utilities' Natural Drainage Projects



ROW and Street Options

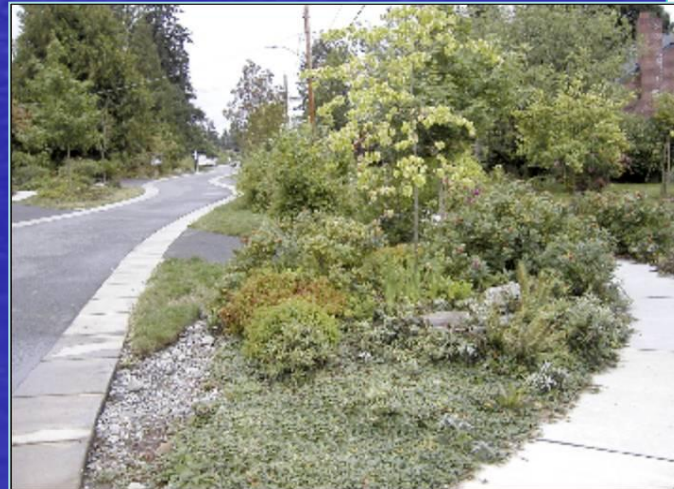
- Catch basins to direct runoff for detention/infiltration under street
- More street trees
- Rain Gardens and bioswales
- “Bumpouts” at ends of streets
- Sidewalks
- Permeable paving



8" soil

16" sand

2.5 - 5.0'
crushed rock



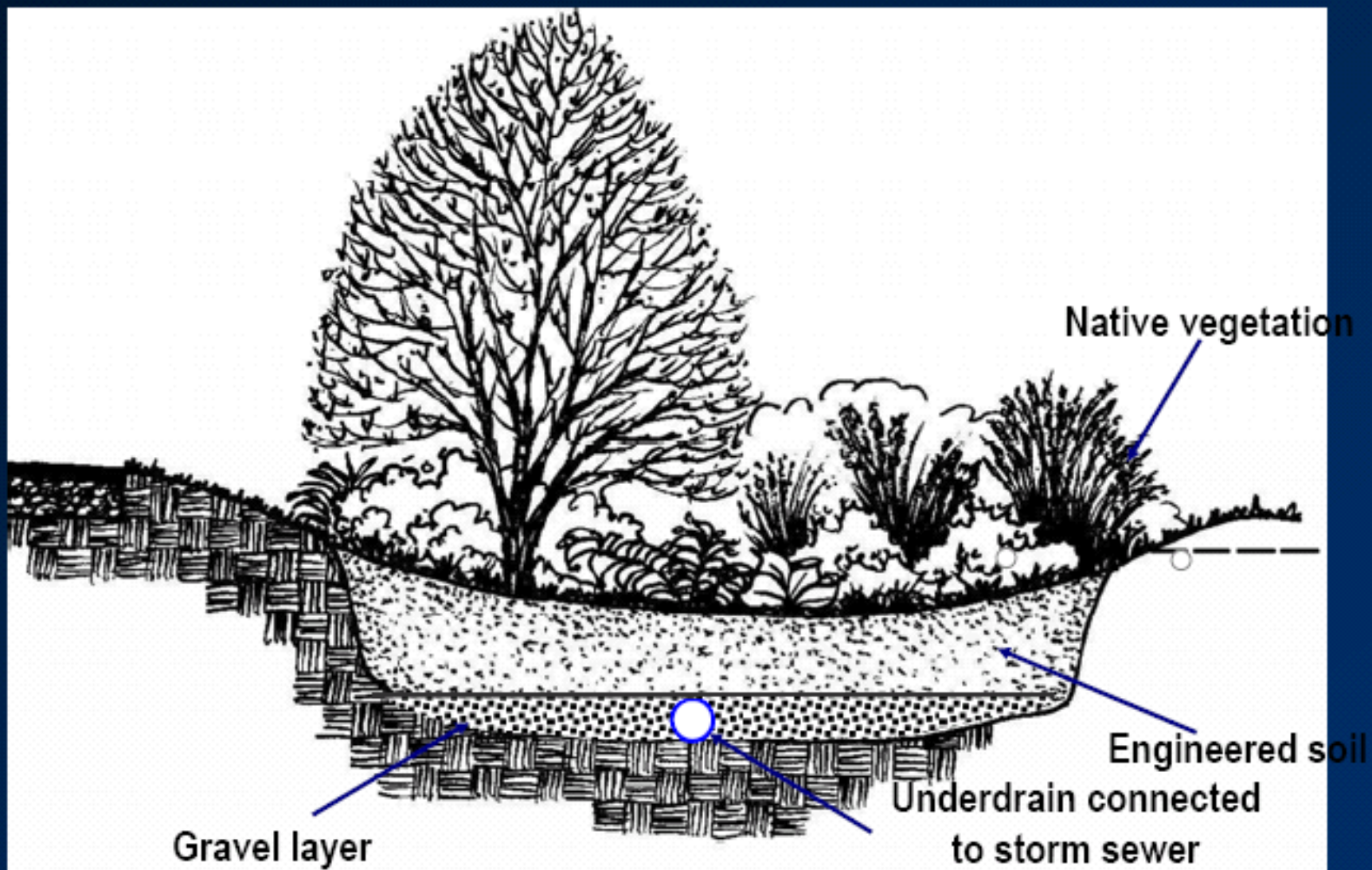
Rain Gardens (Bioretention)



Maryland Department of the Environment,
Baltimore, Maryland

CH2MHILL

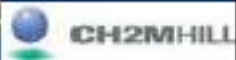
Rain Gardens (Bioretention)



Permeable Pavement



Source: <http://www.uni-groupusa.org/>



Permeable Pavement



Homeland Hotel, Chengdu, China

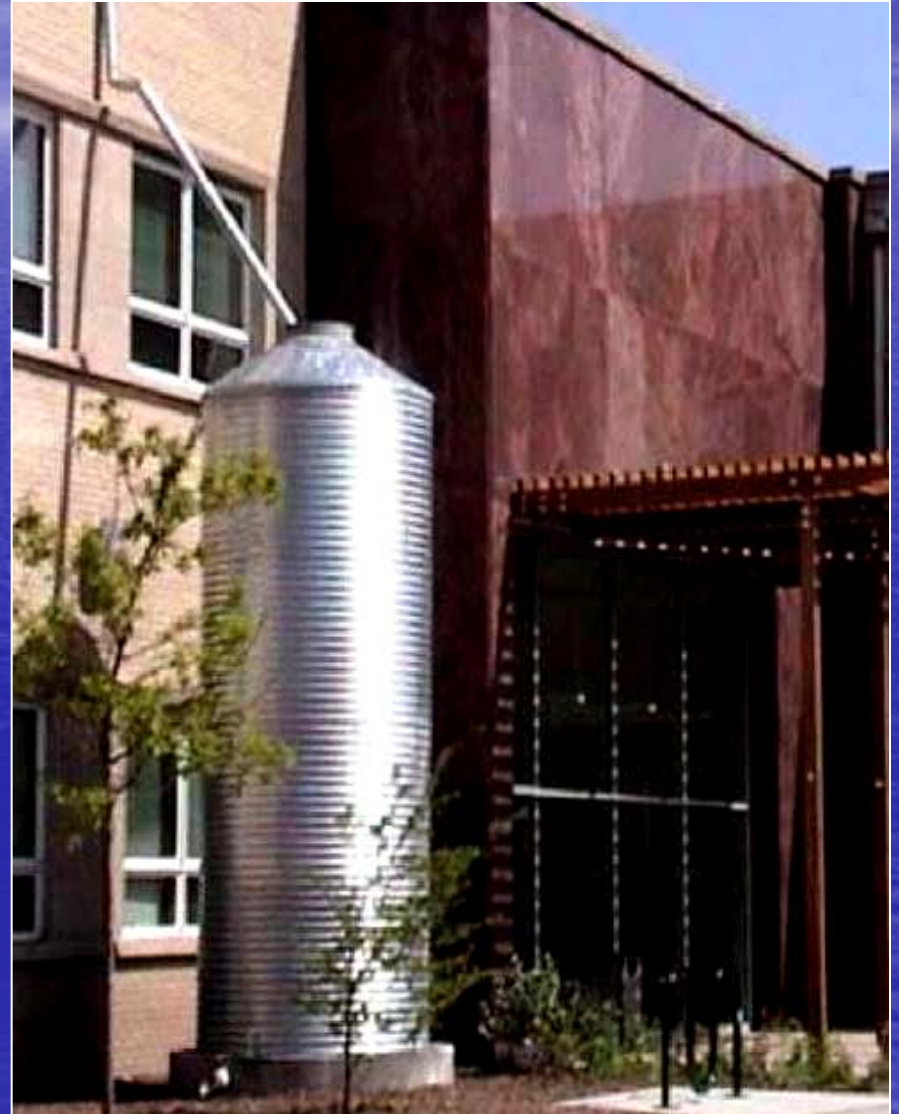


Key Factors

- Tag onto other initiatives
- Incorporate stakeholder ideas

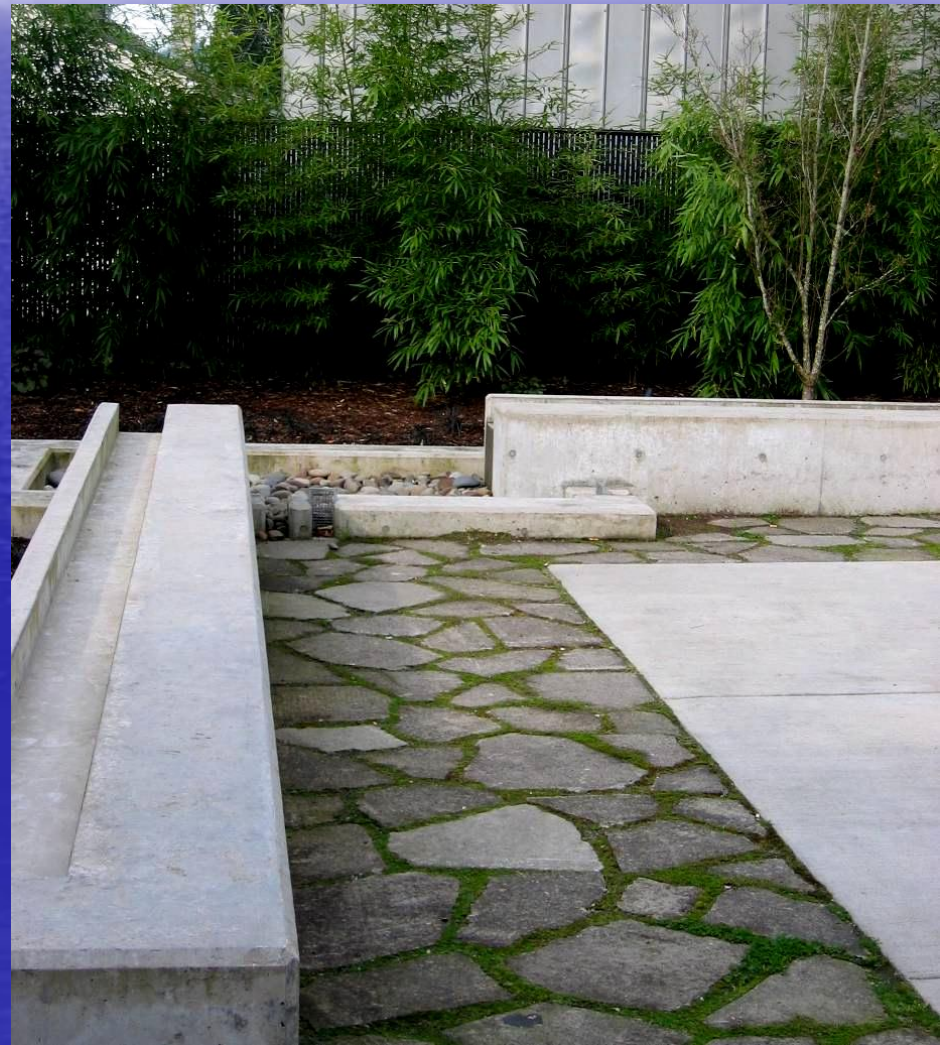


Simple Structural BMPs

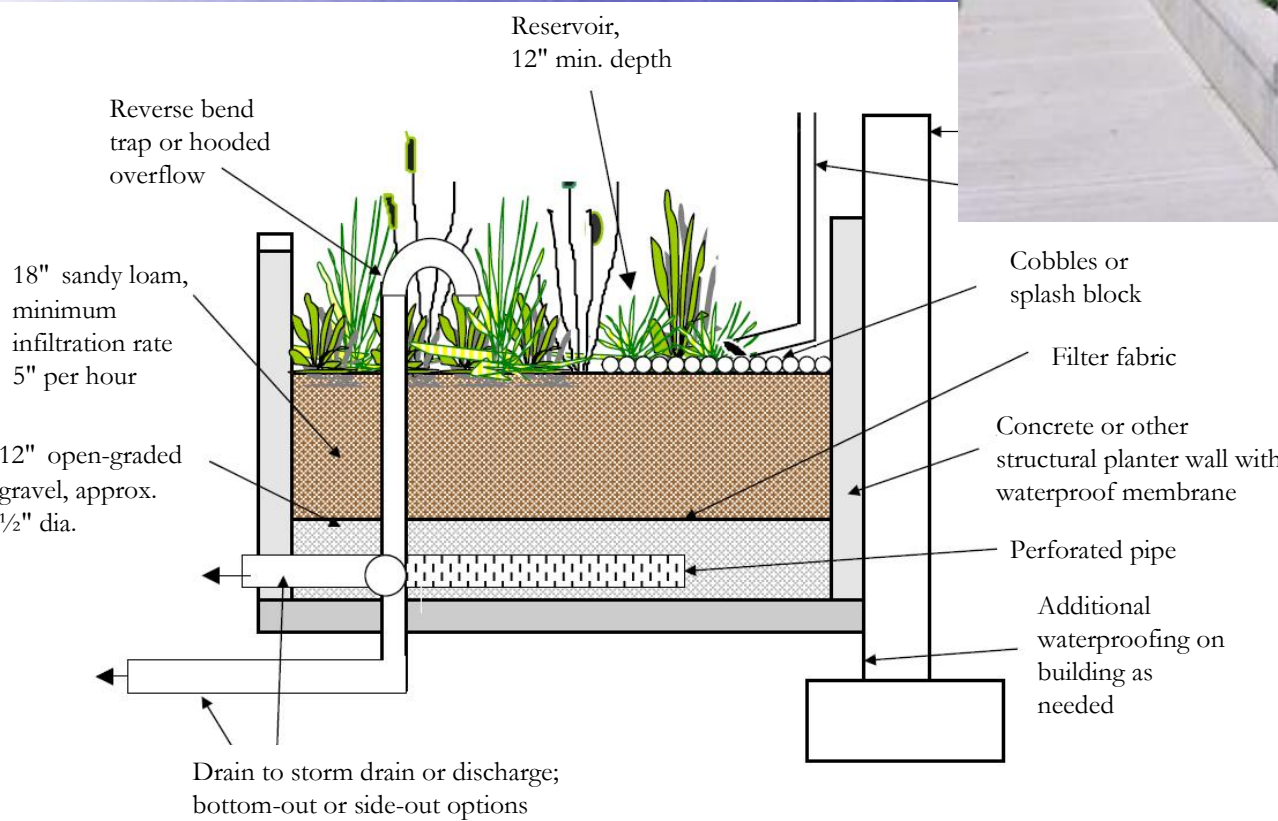


Source: Martina Keefe, Tetra Tech and WERF

Using Rainwater to Grow Livable Communities



Planter Box



Source: Dan Cloak Consulting and Contra Costa Clean Water Program



Green Roofs

Fencing Academy of Philadelphia Roofmeadow™

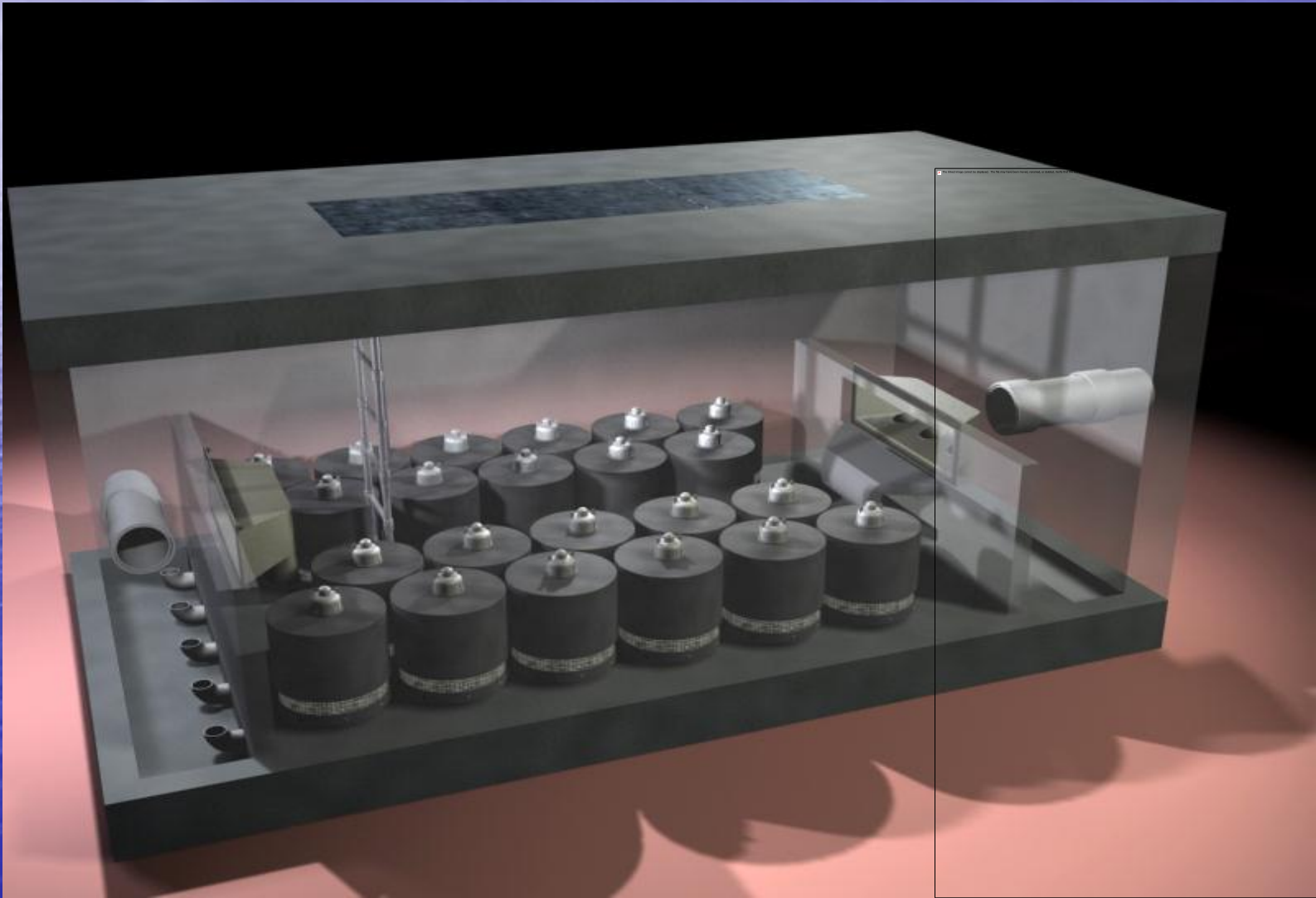


Before

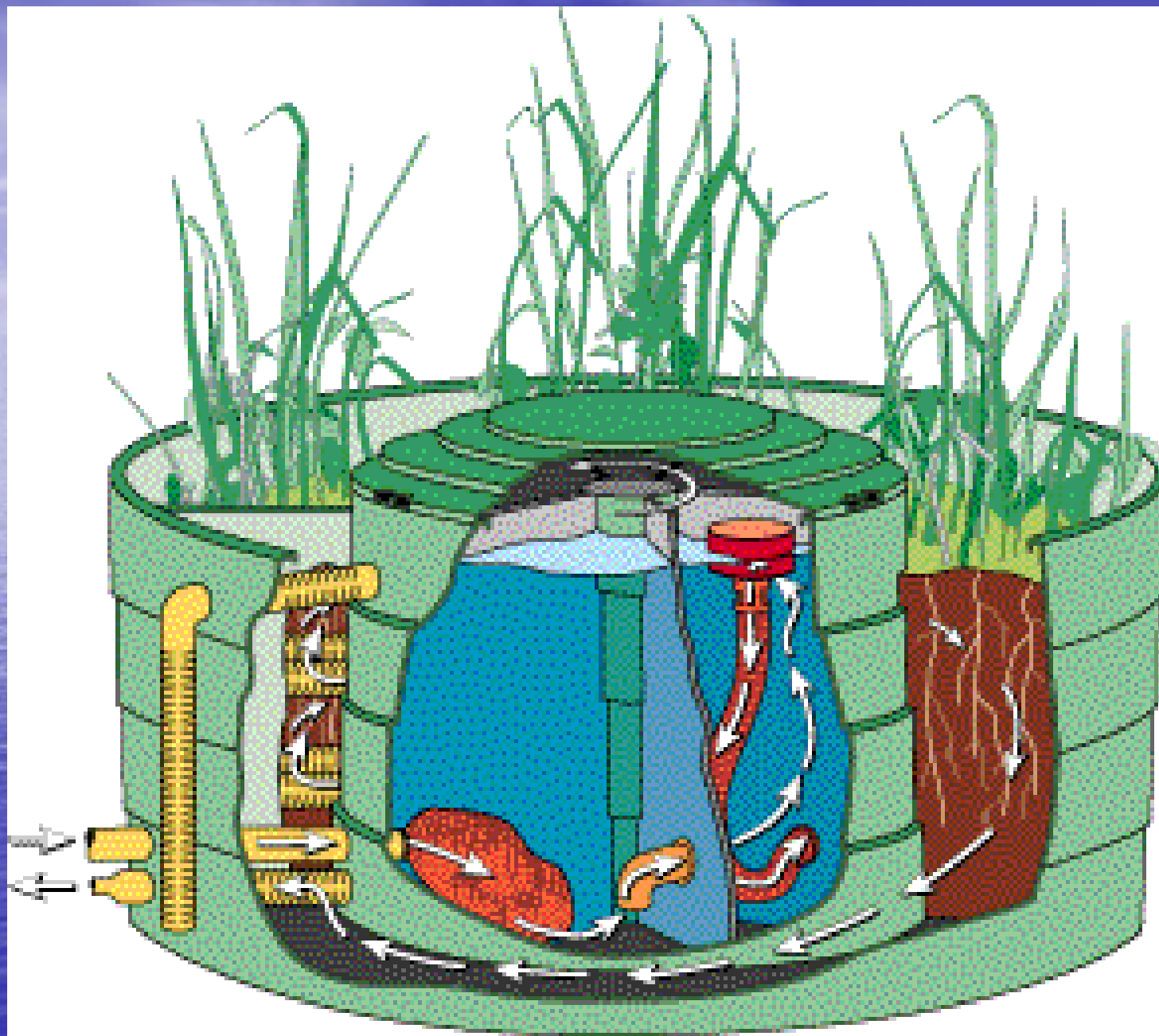


After

Stormwater Management StormFilter[®]







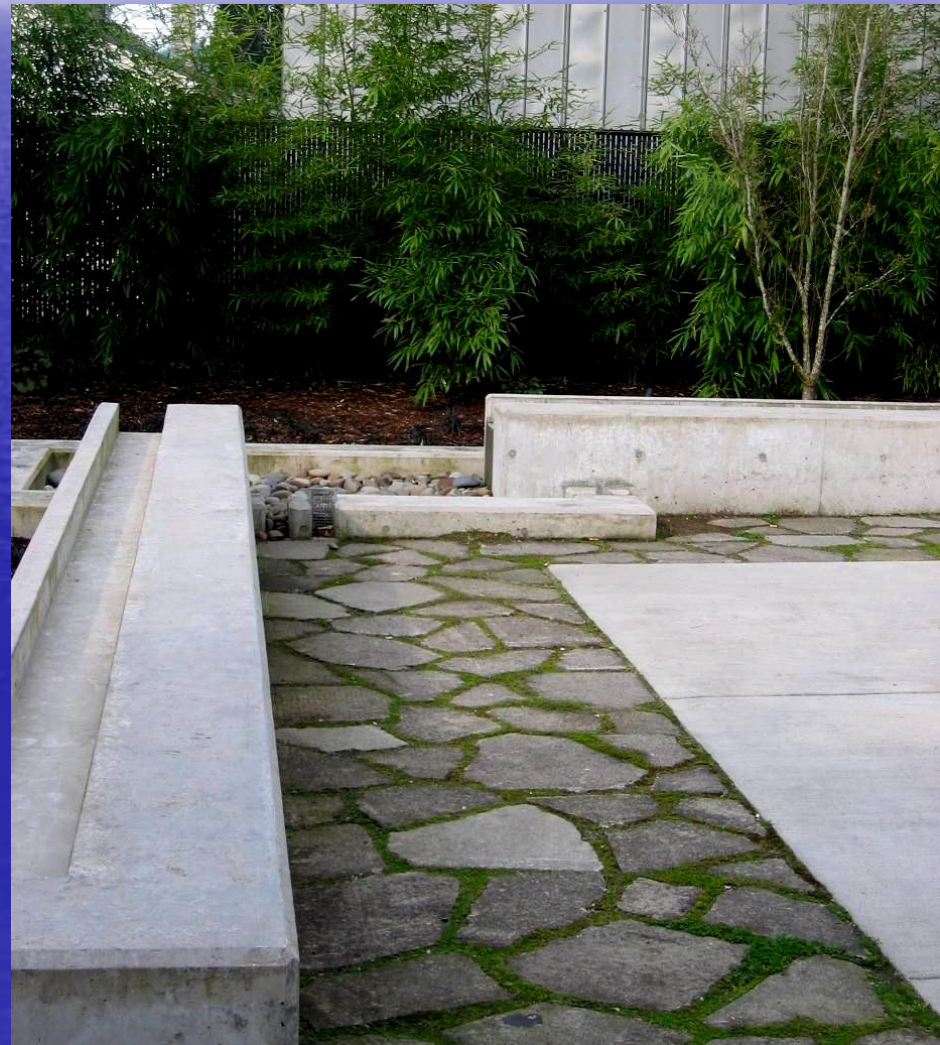
Everyone Wants Better BMPs

Want to get more people excited about stormwater?



Source: Martina Keefe, Tetra Tech and WERF

Using Rainwater to Grow Livable Communities





Green Roofs



Storm Water Pollution Prevention Quiz

1. What is the best pollution prevention solution for leaking equipment?

- a. clean up spills with rags**
- b. use drip pans**
- c. fix leaks**



Storm Water Pollution Prevention Quiz

1. What is the best pollution prevention solution for lawn and garden chemicals?

- a. Buy less toxic products**
- b. Water properly**
- c. Read and follow the label**





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