

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



RECLAMATION

Managing Water in the West

Stormwater Capture: A Multiple Benefit Water Source for Southern California

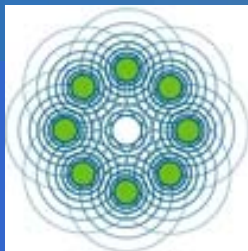
October 7, 2010

Nancy Steele

Los Angeles and San Gabriel
Rivers Watershed Council

William Steele

Southern California Area Office
Bureau of Reclamation



THE
LOS ANGELES & SAN GABRIEL RIVERS
WATERSHED COUNCIL

Los Angeles & San Gabriel Rivers Watershed Council



- Founded in 1996
- Brings together agencies, landowners, businesses, community organizations
- Mission: To facilitate an inclusive consensus process to preserve, restore, and enhance the economic, social, and ecological health of the Los Angeles & San Gabriel Rivers Watershed



Los Angeles & San Gabriel Rivers Watershed Council

Center for Watershed Research and Analysis



- Working at the intersection of research and policy.
- Driving applied research to improve policy and practice.
- Connecting diverse perspectives to address timely issues.

Watershed Council's Vision: A Sustainable Los Angeles

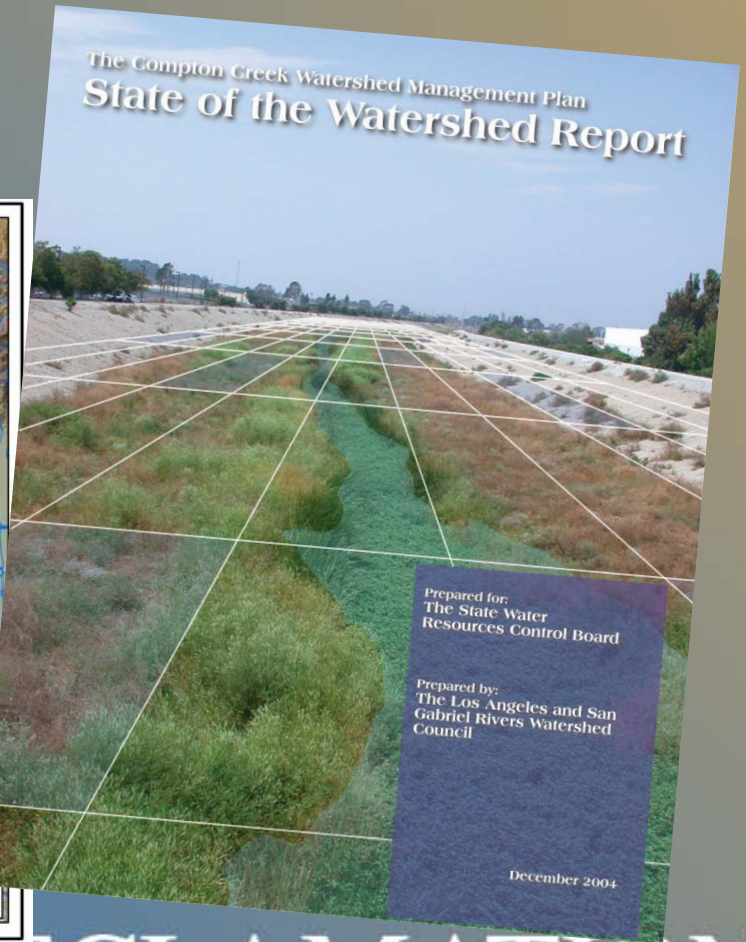
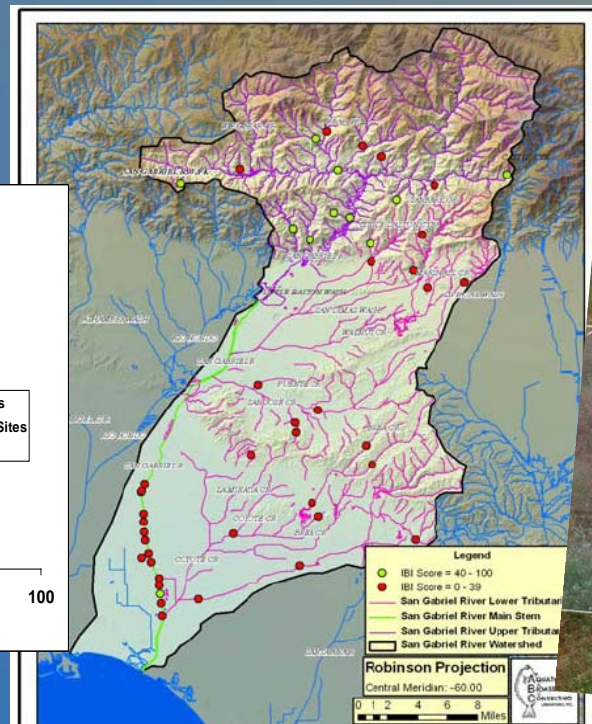
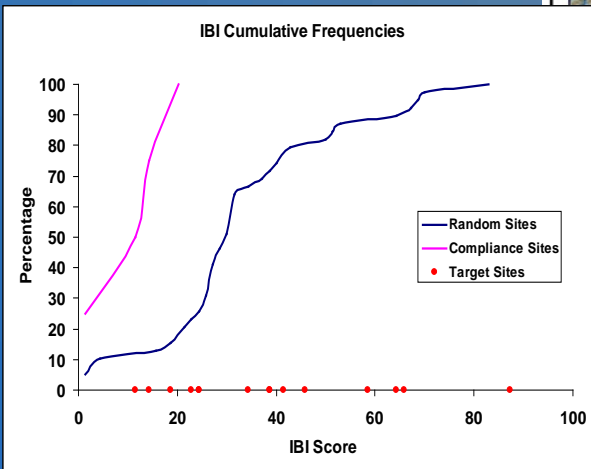
- The region's watersheds are managed for economic vitality and environmental health.
 - Clean Waters
 - Increased Local Water
 - Restored Native Habitats
 - Reduced Dependence on Imported Water
 - Revitalized Rivers & Urban Centers

By 2025



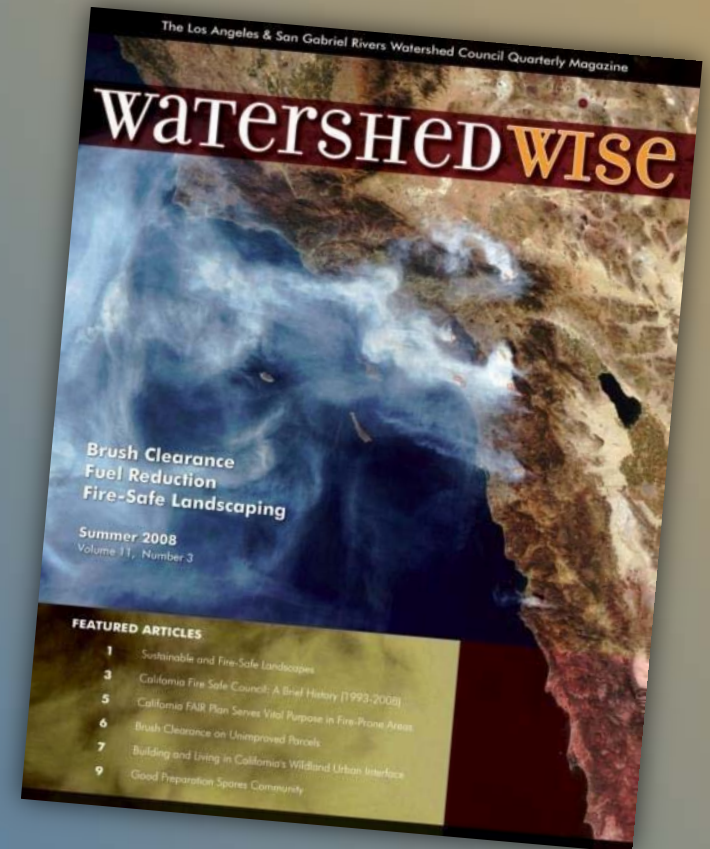
Watershed Council Programs

- Urban Stormwater Management Research
- Watershed Monitoring
- Watershed Coordination



Watershed Council Programs

- Sustainable Landscapes
- Education & Outreach
- Technical Services

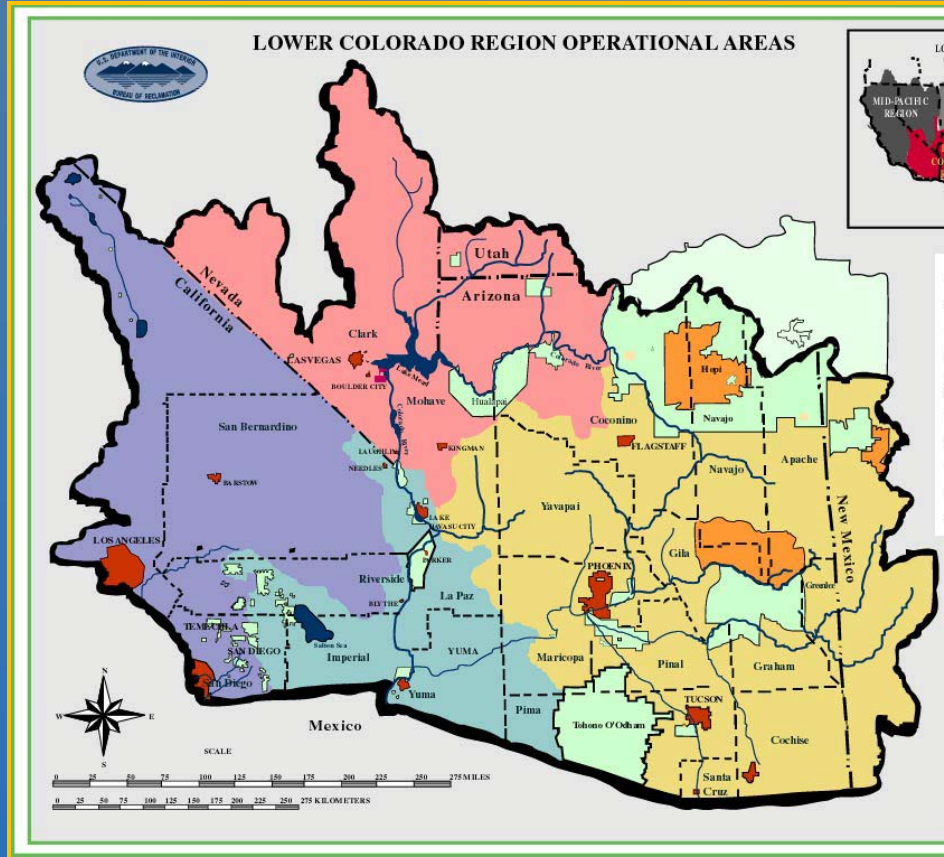


Bureau of Reclamation

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.



Lower Colorado Region



Southern California Area Office

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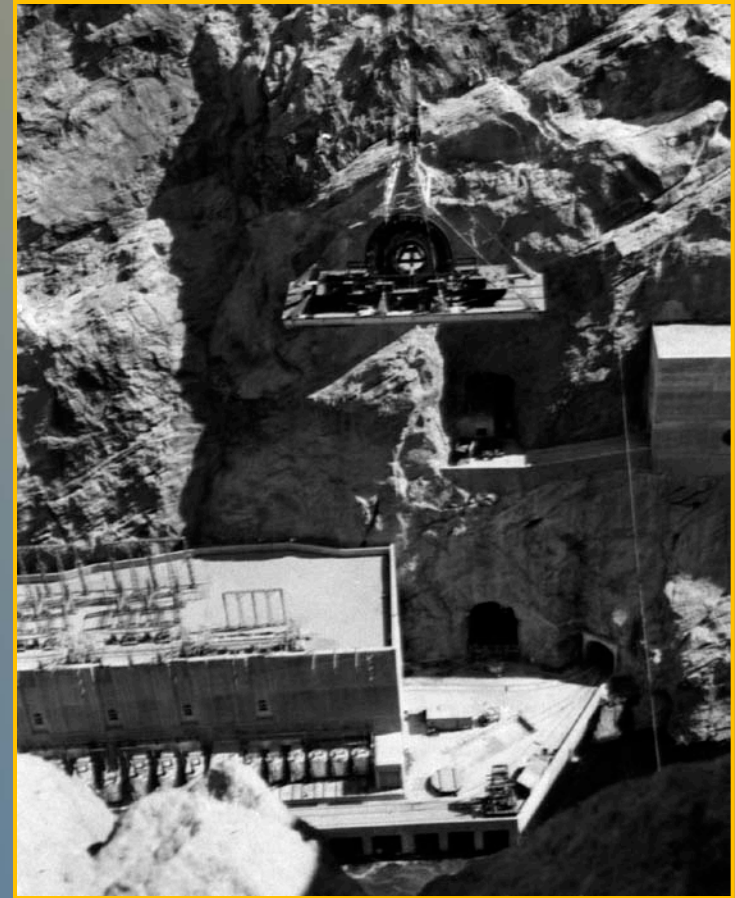
Reclamation Act of 1902



Agricultural Project, 1910



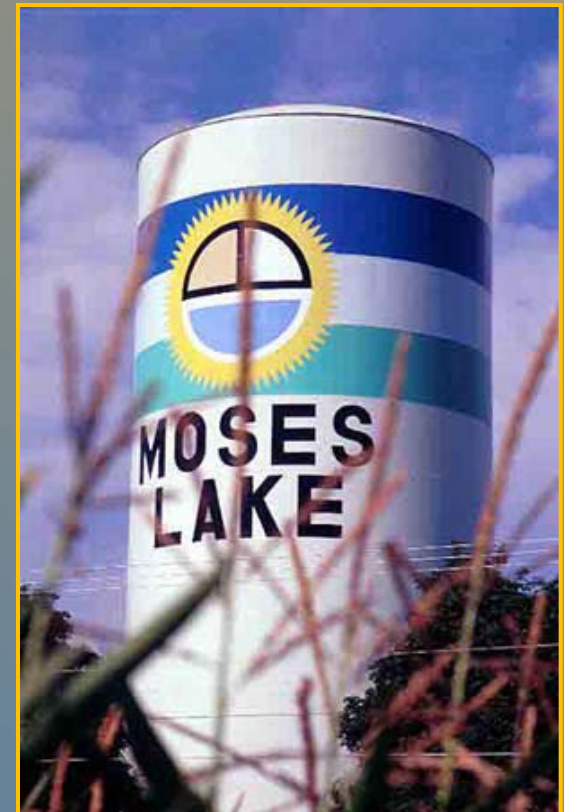
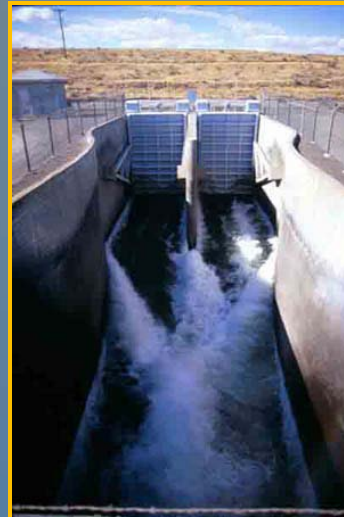
Concrete canal lining
project, 1913



Boulder Canyon Dam, 1946

Bureau of Reclamation

- 31 million people
 - municipal
 - rural
 - industrial

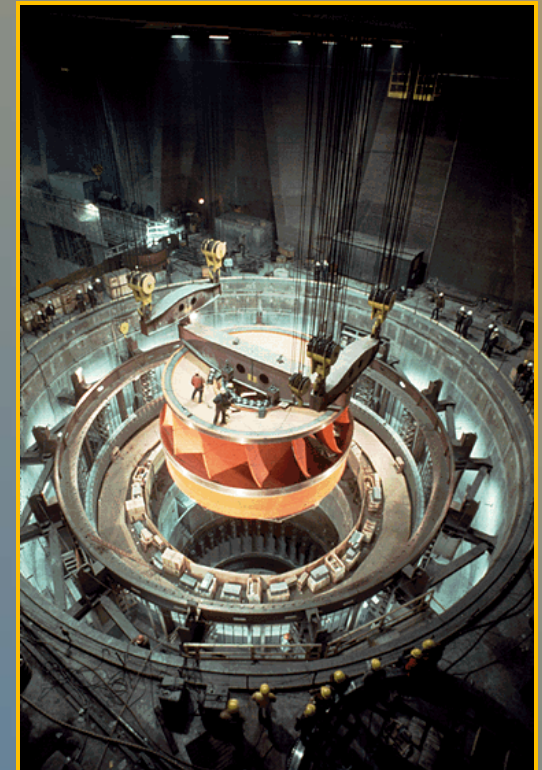
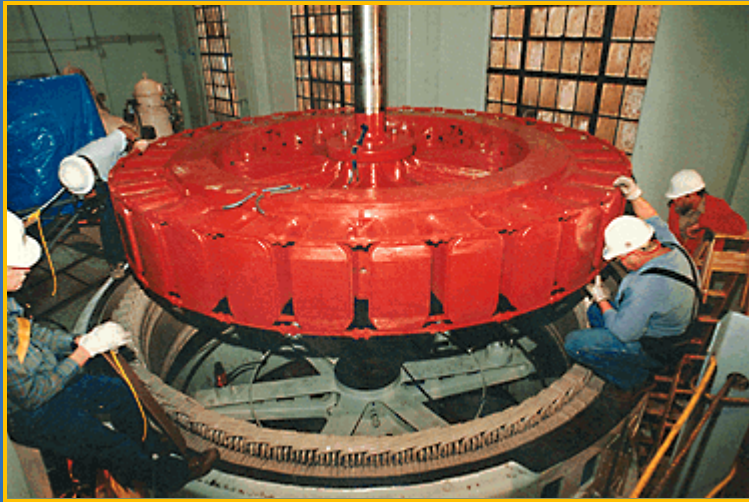


Bureau of Reclamation (Historical)

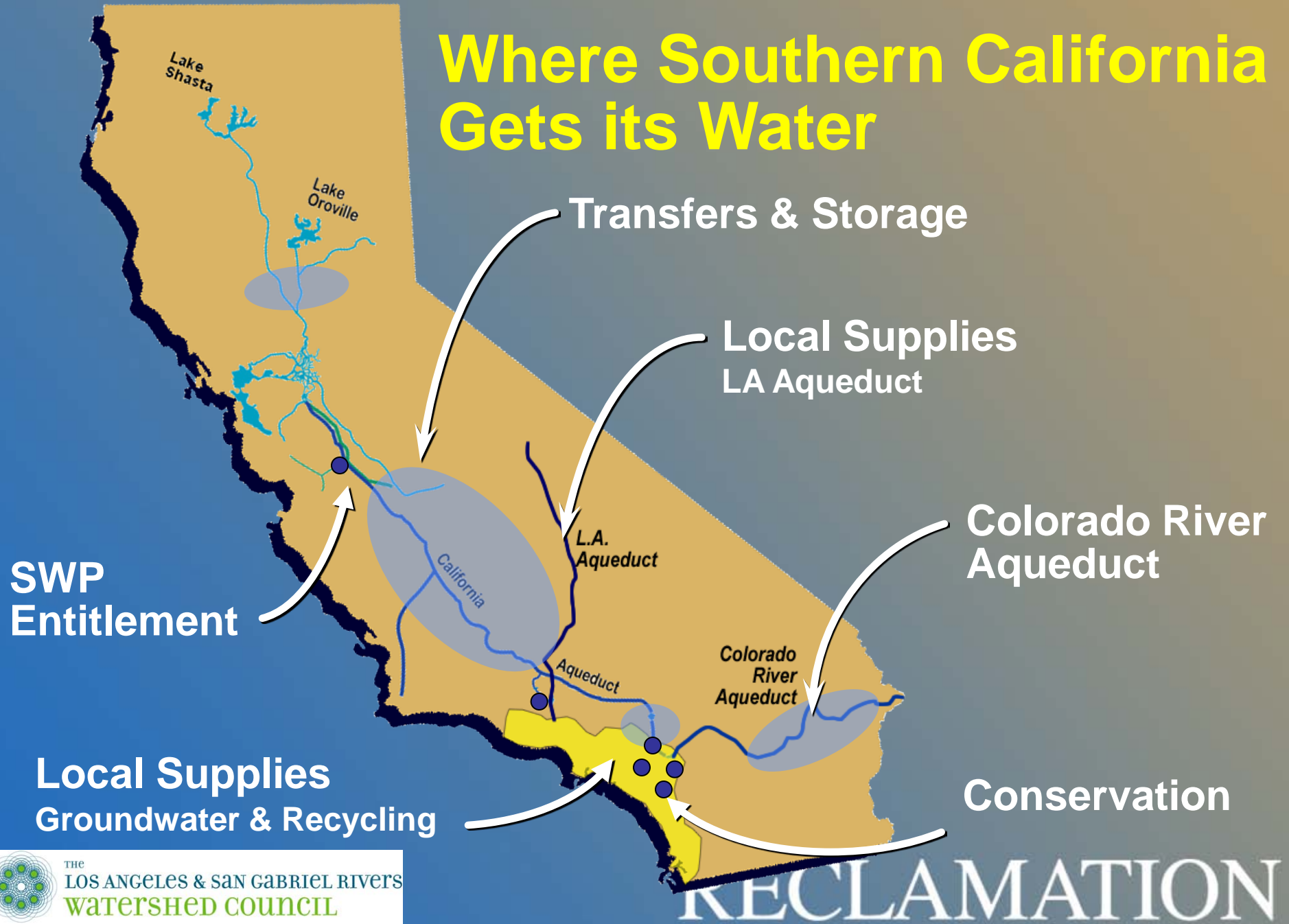
- **Produces 245 million acre-feet on water on an average year**
- **Irrigates 10 million acres per year**
 - 60% U.S. vegetables
 - 25% U.S. fruits/nuts
- **Recreation**
 - > 300 water-based recreation sites
 - 90 million visitor days per year
- **Operates 348 dams & reservoirs**
- **Serves water to 31 million people**
 - municipal
 - rural
 - industrial
- **Reclamation is**
 - the 2nd largest hydro producer
 - 5th largest electric utility
 - 58 hydropower facilities
 - 42 billion kilowatt hours

Bureau of Reclamation

- 2nd largest hydro producer, 58 hydropower facilities
- 5th largest electric utility, 42 billion kilowatt hours



Where Southern California Gets its Water



Colorado River Basin Storage

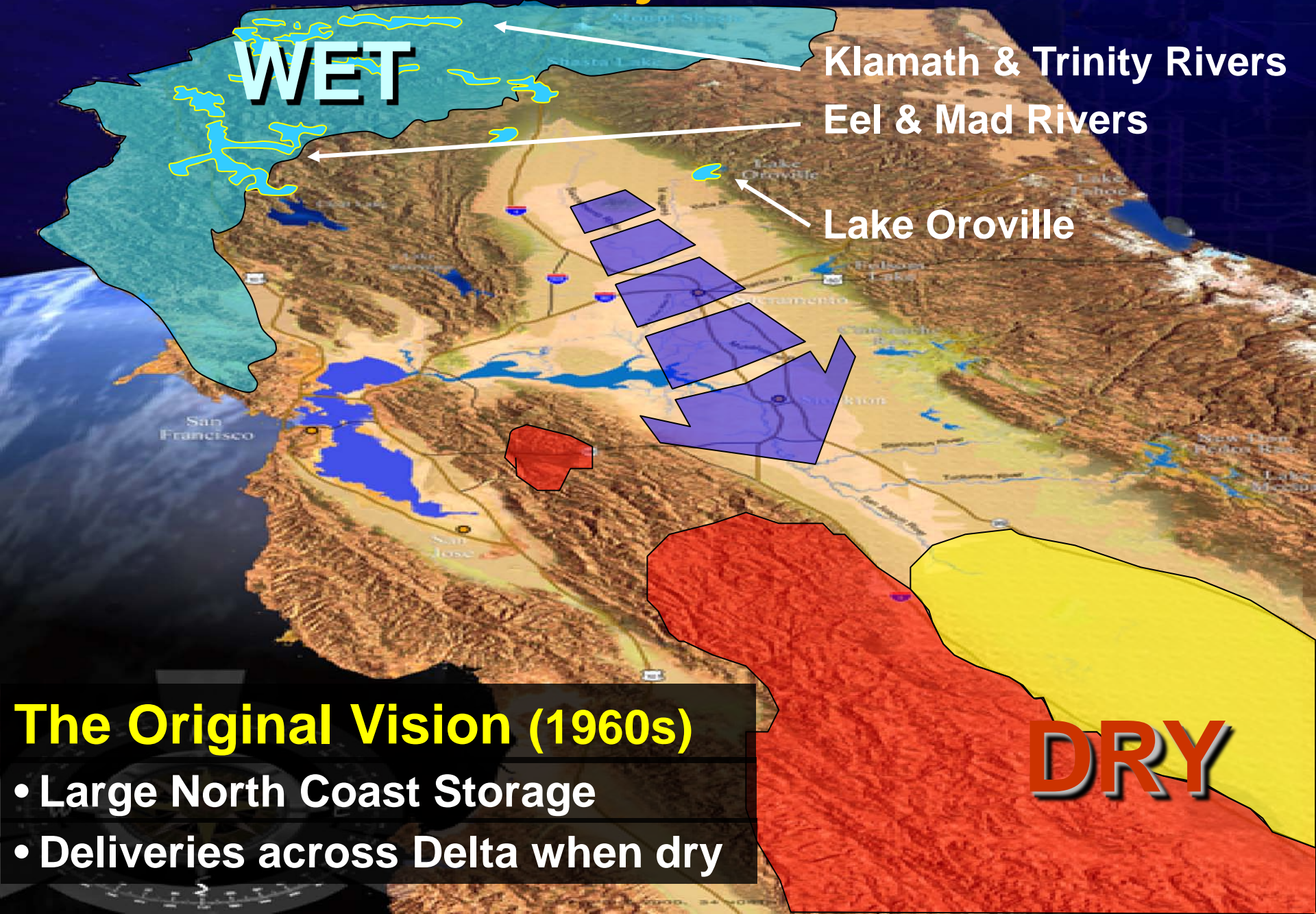
(as of October 3, 2010)

Current Storage	Percent Full	MAF	Elevation (Feet)
Lake Powell	63%	15.25	3,634
Lake Mead	39%	10.10	1,084
Total System Storage*	56%	33.23	NA

*Total system storage was 35.49 maf or 60% this time last year

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The State Water Project



WET

Klamath & Trinity Rivers

Eel & Mad Rivers

Lake Oroville

The Original Vision (1960s)

- Large North Coast Storage
- Deliveries across Delta when dry

DRY

Future Water Supply Portfolio

New Water Supplies

- Seawater/Brackish Water Desalination
- Reclaimed Water Projects
- *Stormwater Augmentation*

Improved Use of Existing Supplies

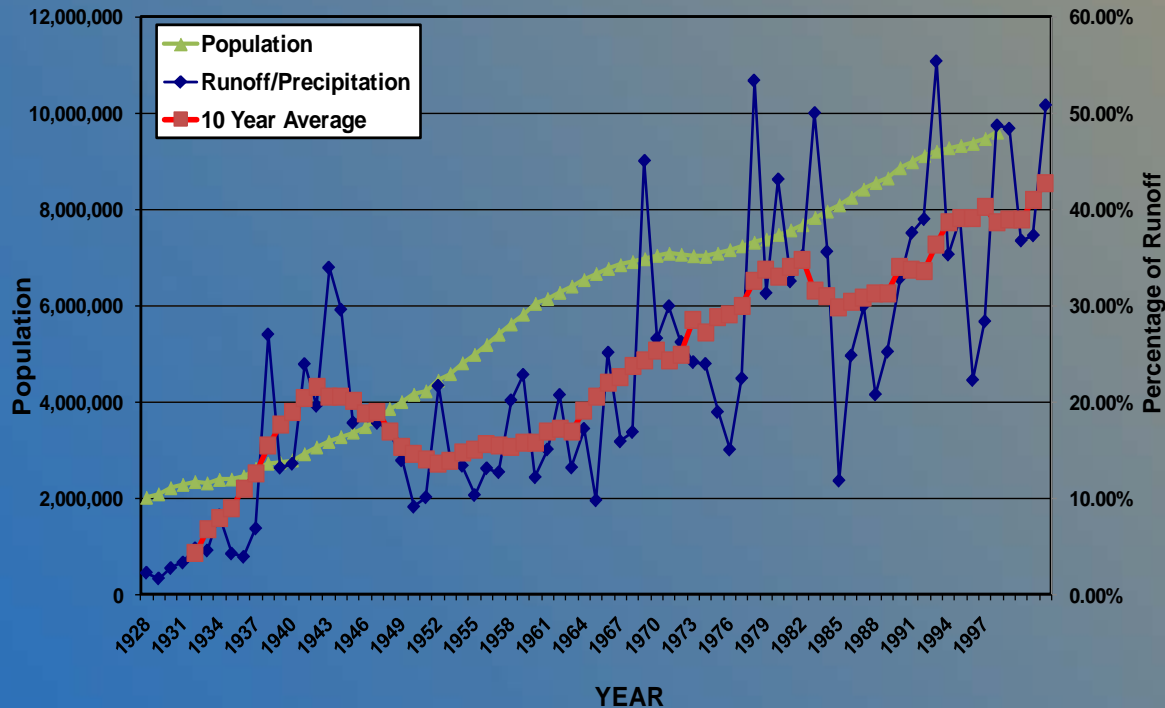
- Water Conservation
- Ground/Surface Water Conjunctive Use
- Watershed/Integrated Resources Plans

Reallocation of Existing Water

- Water Banking/Water Transfers
- Indian Water Right Settlements



Stormwater in Los Angeles



**We lose ~600,000 AF Annually
in Stormwater Runoff**



Los Angeles River at Griffith Park, 2003

http://www.you-are-here.com/location/la_river.html

Los Angeles Basin Water Augmentation Study

- Conducted study of stormwater infiltration, including development of a model, economic analysis, and site selection for a neighborhood demonstration project.
- Demonstration project constructed through Title XVI and Water Conservation Programs.



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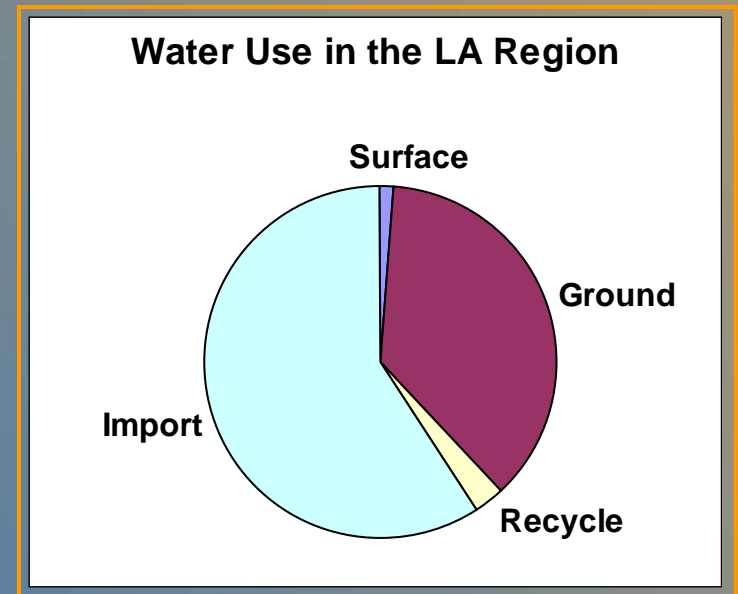
Los Angeles Basin Water Augmentation Study (WAS)

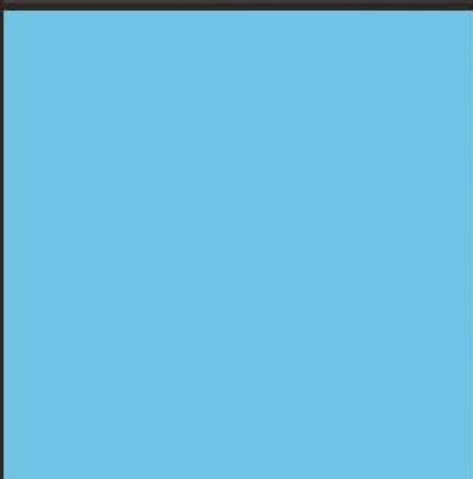
Answers the question:

Can we safely infiltrate stormwater to increase groundwater supplies?

Research questions:

- Impact on groundwater quality and quantity
- Cost effectiveness
- Other potential benefits: social, economic, environmental
- Potential for region-wide implementation

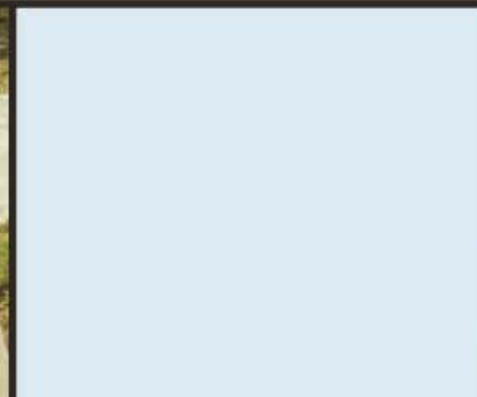
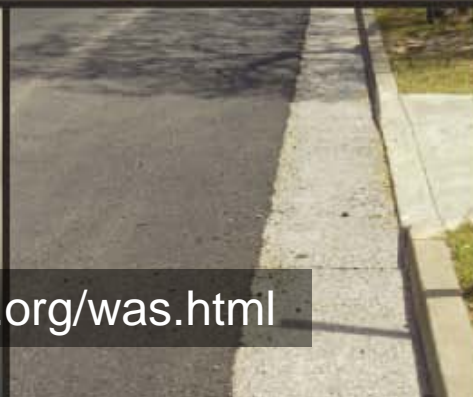




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WATER AUGMENTATION STUDY

Research, Strategy, and Implementation Report



<http://www.lasgrwc.org/was.html>

WAS and Elmer Avenue Project Partners

Bureau of Reclamation, Department of the Interior
City of Los Angeles Department of Water & Power
City of Los Angeles Watershed Protection Division
City of Santa Monica Environmental Programs
County of Los Angeles Department of Public Works
California Department of Water Resources
Los Angeles and San Gabriel Rivers Watershed Council
Metropolitan Water District of Southern California
Regional Water Quality Control Board, LA Region
TreePeople
University of California, Riverside
Water Replenishment District of Southern California
State grants: Prop 13 SWRCB, CalFed, Prop 50 DWR

Long Term Objectives

- Develop an understanding of land use, soil, and hydrogeological factors
- Assess the effectiveness of various infiltration techniques
- Quantify the amount of stormwater that can be feasibly captured and infiltrated
- Develop a framework of social, economic, and institutional challenges
- Develop a region-wide implementation plan

WAS Research Design

Phase I

Monitoring Plan
Pilot Study
Funding: Agency
Partners

Phase II

Assess Water Quality
Impacts
Funding: Agency
Partners, Prop 13,
CalFed

Phase III

Regional Assessment
Neighborhood Demo
Funding: USBR, DWR, Local Agencies

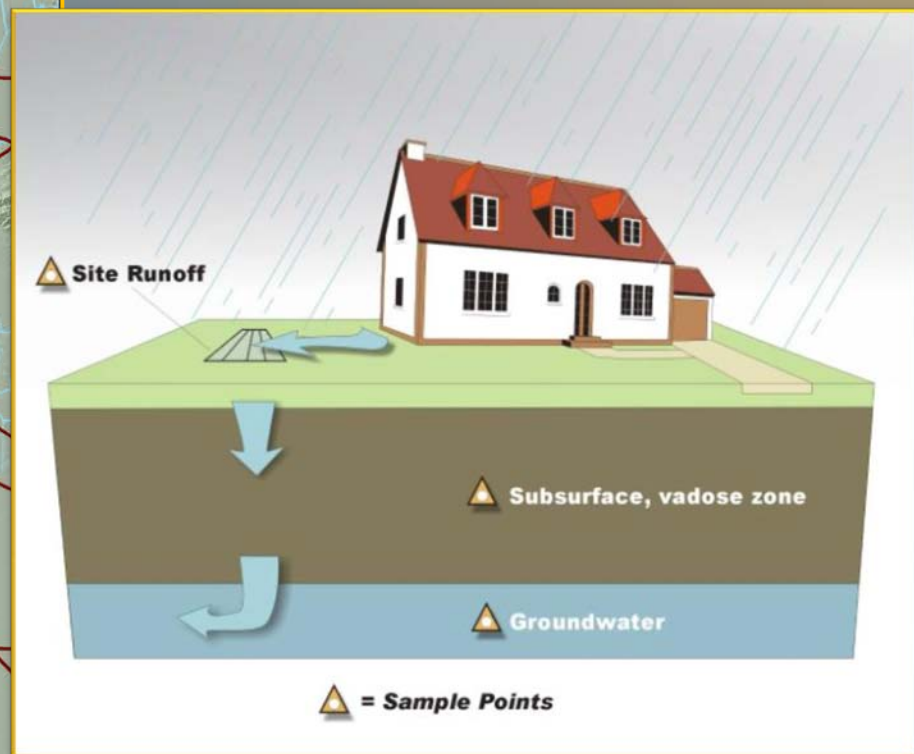
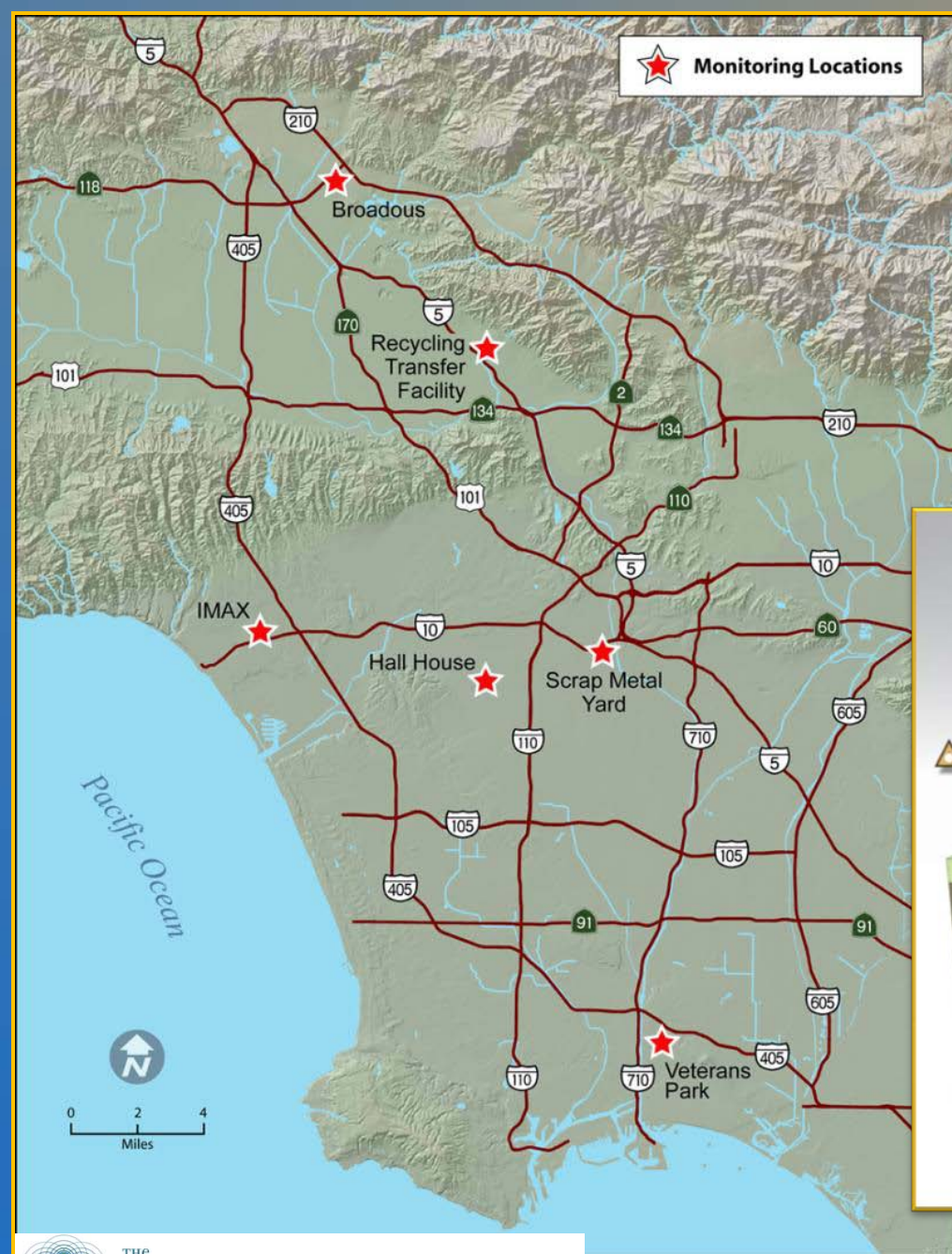
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

All WAS Phases: ~\$6,500,000

Neighborhood Demo: ~\$2,700,000



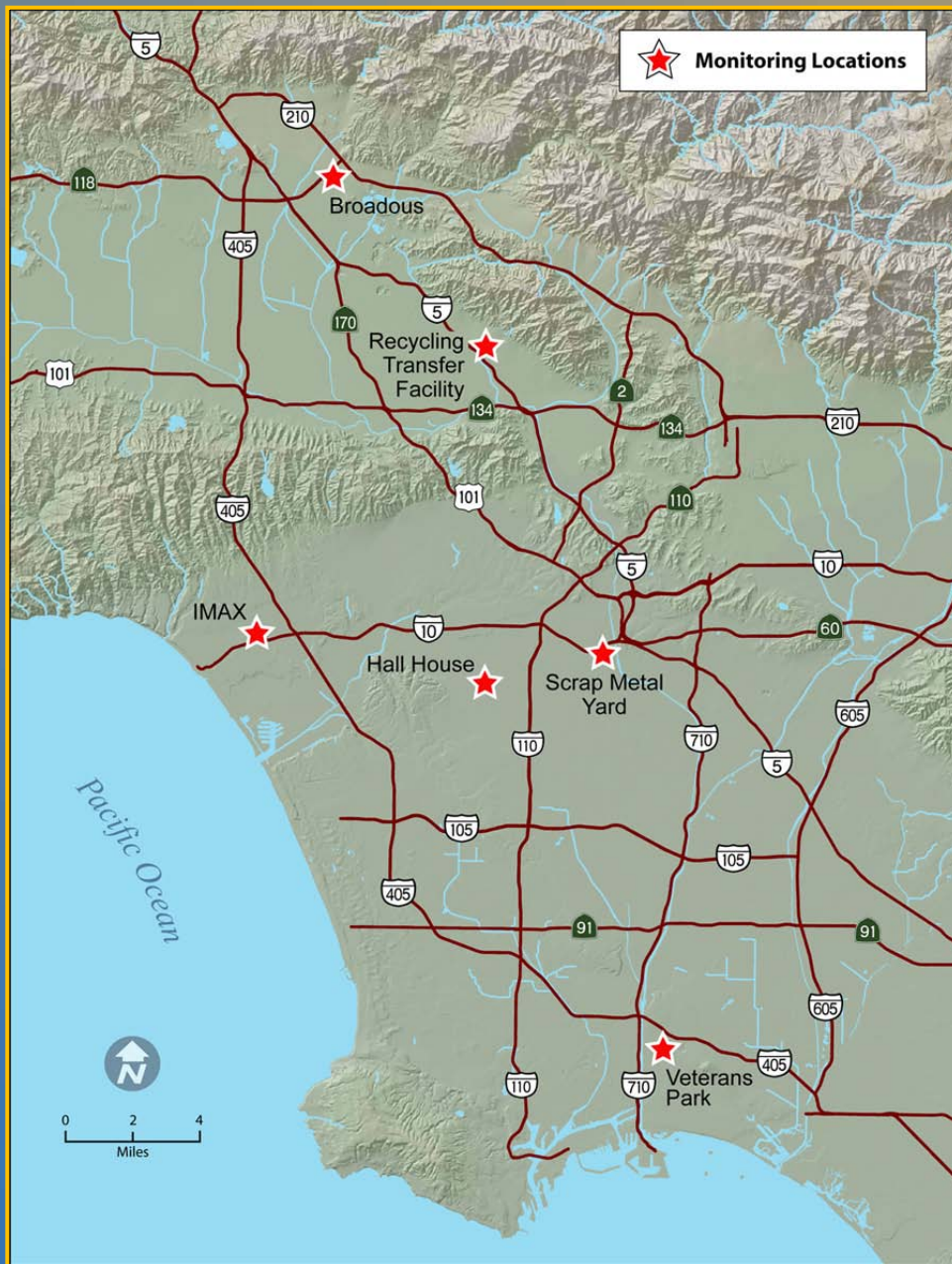
Follow the raindrop



Monitoring Program

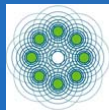
- **Constituent list included pollutants of concern for stormwater/ groundwater**
 - Trace Metals
 - Volatile Organic Compounds
 - Bacteria
- **Sampling plan:**
 - 3-4 storm events/season for 2-5 years
 - Sample site runoff during storm
 - Sample lysimeters and wells after storm
 - Monitor infiltration rates
- **Continued subsurface monitoring**
 - 2 storm events/yr for 2 years





Elementary School Site

Broadous Elementary, Pacoima

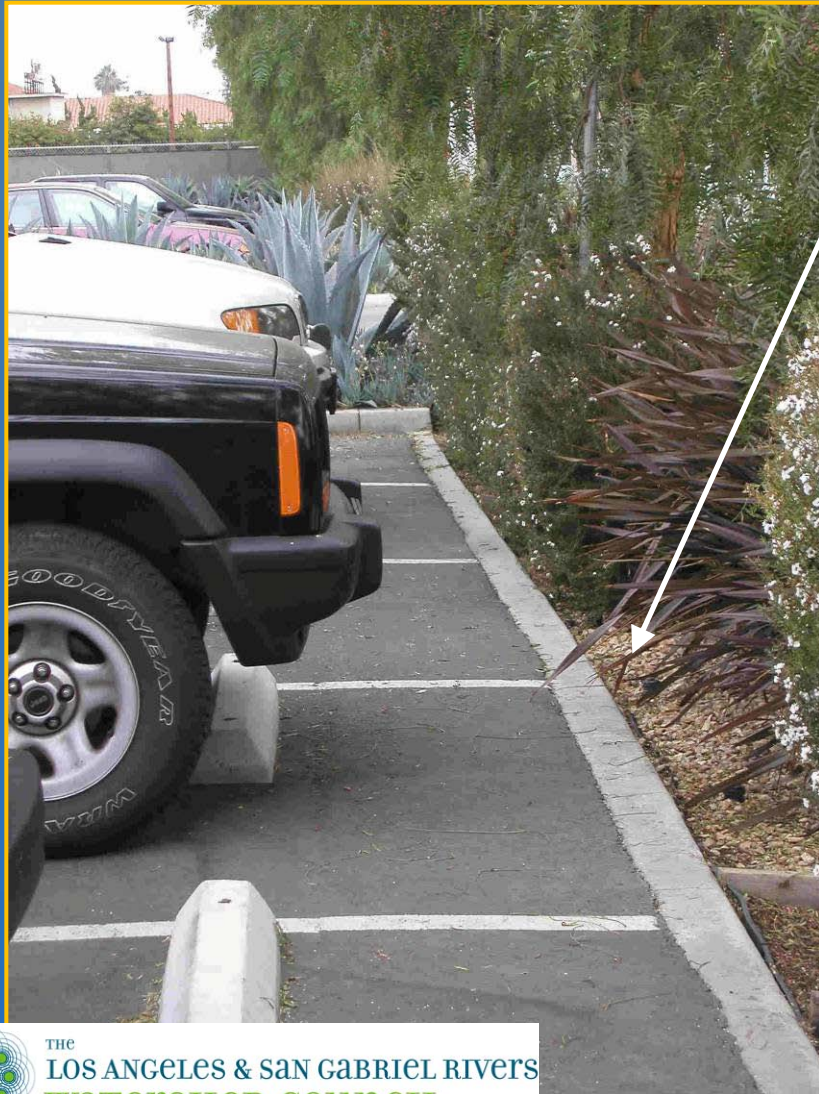


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Commercial Site

IMAX Corp, Santa Monica



Parking lot runoff into landscape strip

Roof drain into drywell



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Residential Site

Hall House, South Los Angeles



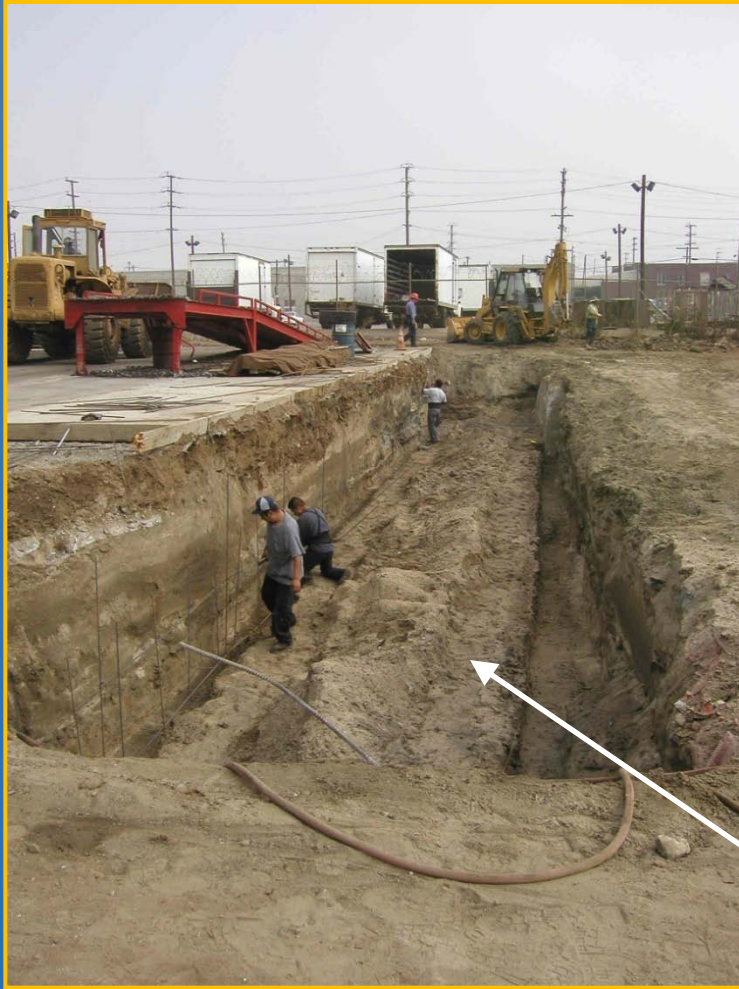
Swale in front lawn

Drywell collects
runoff conveyed
from driveway drain



Industrial Site

Metals Recycler, Downtown Los Angeles



Concrete detention/sedimentation basin;
pretreatment to reduce sediment, oil, and grease
prior to infiltration

Industrial Site

Recycled Material Sorting Facility, Sun Valley

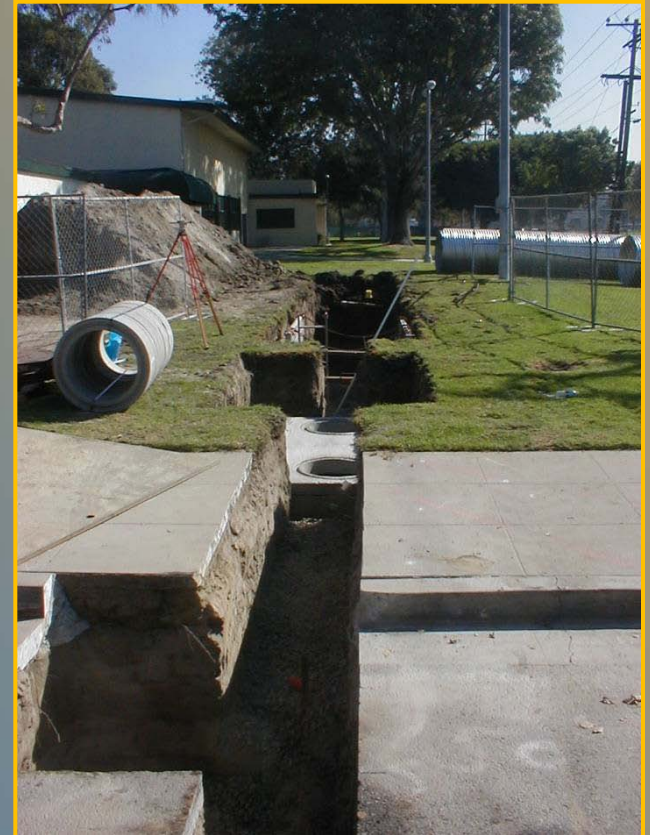


Detention basin for settling; sub-surface infiltration field captures roof and yard runoff

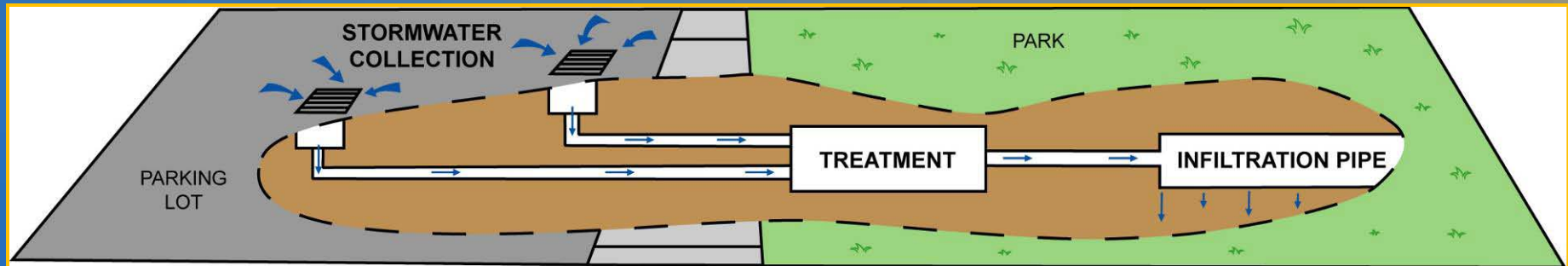


Park Site

Veterans Park, Long Beach



Sheet flow to catch basin; piped to buried sedimentation vault



Conclusions: Six Years of Data

*Stormwater Infiltration Is Safe For Groundwater**

- Concentrations in groundwater did not correspond to stormwater concentrations
- Groundwater quality is stable or improved for most constituents at sites with shallow groundwater
 - Bacteria: removed by soil
 - VOCs: no impacts detected in groundwater
 - Inorganic groundwater constituents show no or decreasing trends in concentrations



Groundwater Augmentation Model

- Developed by Bureau of Reclamation
- Estimates current conditions in an average year:
 - Runoff to the oceans: **601,000** acre-feet/year (af/y)
 - Groundwater infiltration: **194,000** af/y
- With conserving $\frac{3}{4}$ ” of runoff from each storm:
 - Runoff to the oceans: **207,000** af/y
 - Groundwater infiltration: **578,000** af/y

Economic Analysis of Multiple Benefits

Economic models to assess benefits and costs

- Cost of new water based on more than life cycle costs of BMP
- Considers indirect benefits: water supply reliability; runoff/pollutant load kept out of receiving waters (avoided costs); energy savings
- Value of a new water supply from infiltrated stormwater would be approx. \$311 million

Comparable Water Supply Values for Infiltration Projects		
Type of Estimate	Imported Water Supply Valuation	Source
Avoided cost of Full Service Tier 2 Supply Rate (as of 1/1/08)	\$606/AF	Metropolitan Water District, 2008
Risk-adjusted Unit Rate <ul style="list-style-type: none">•@1.0 MAF of GW Storage•@4.5 MAF of GW Storage	\$757/AF \$943/AF	<i>Cutter, Valuing Stormwater Infiltration, 2005</i>

Economic Analysis of Multiple Benefits

Quality of Life Enhancements are Economic Benefits

Outcomes

Clean Rivers and
Beaches

Local Water

Enhanced Ecology

Attractive Neighborhoods

Direct Benefits

Increased Visitation and
Enjoyment

Water Supply Insurance

Energy and Carbon Savings

Quality of Life

Resilience to Climate Shocks

Real-Estate Value

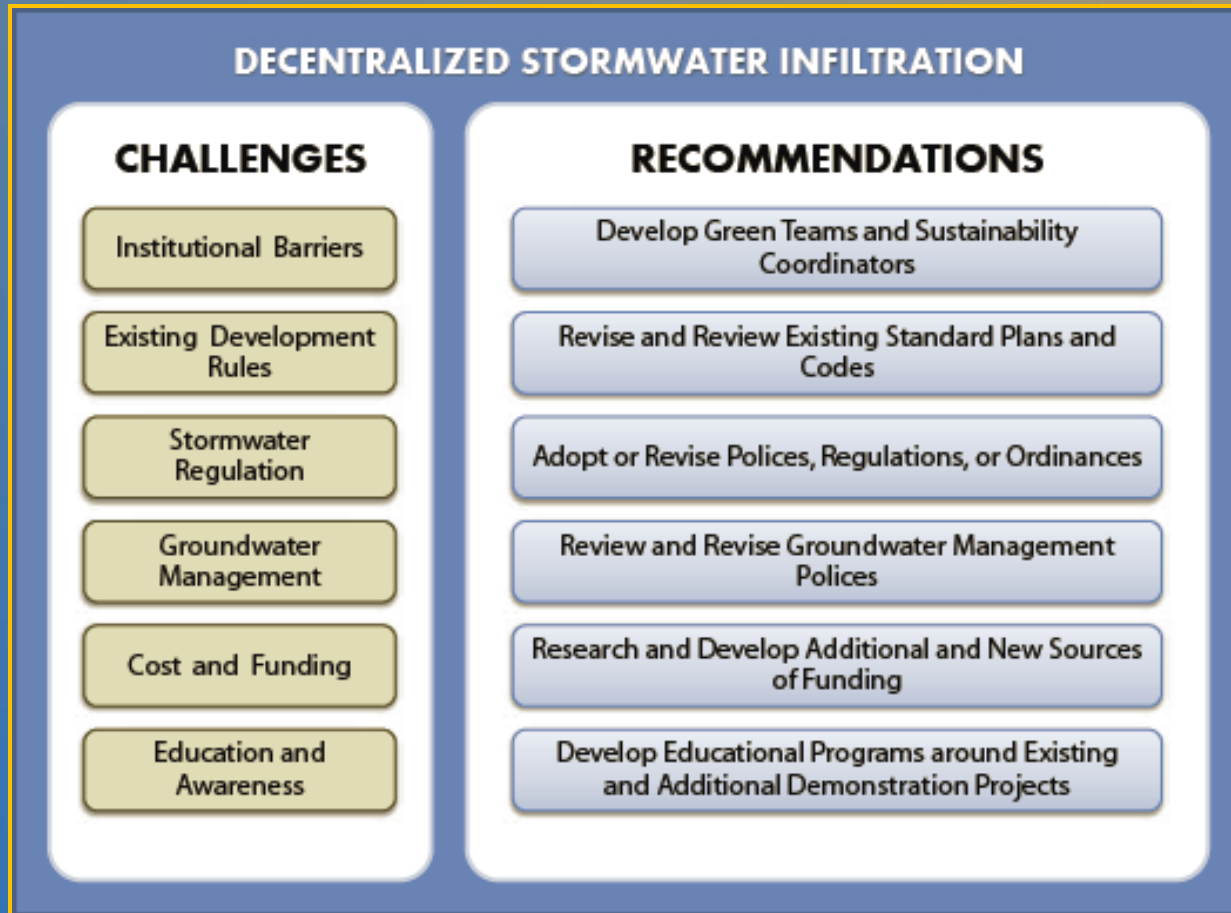
Indirect Benefits

Investment/Living Desirability

Increased Real Estate
Development

Increased Employment Cycle

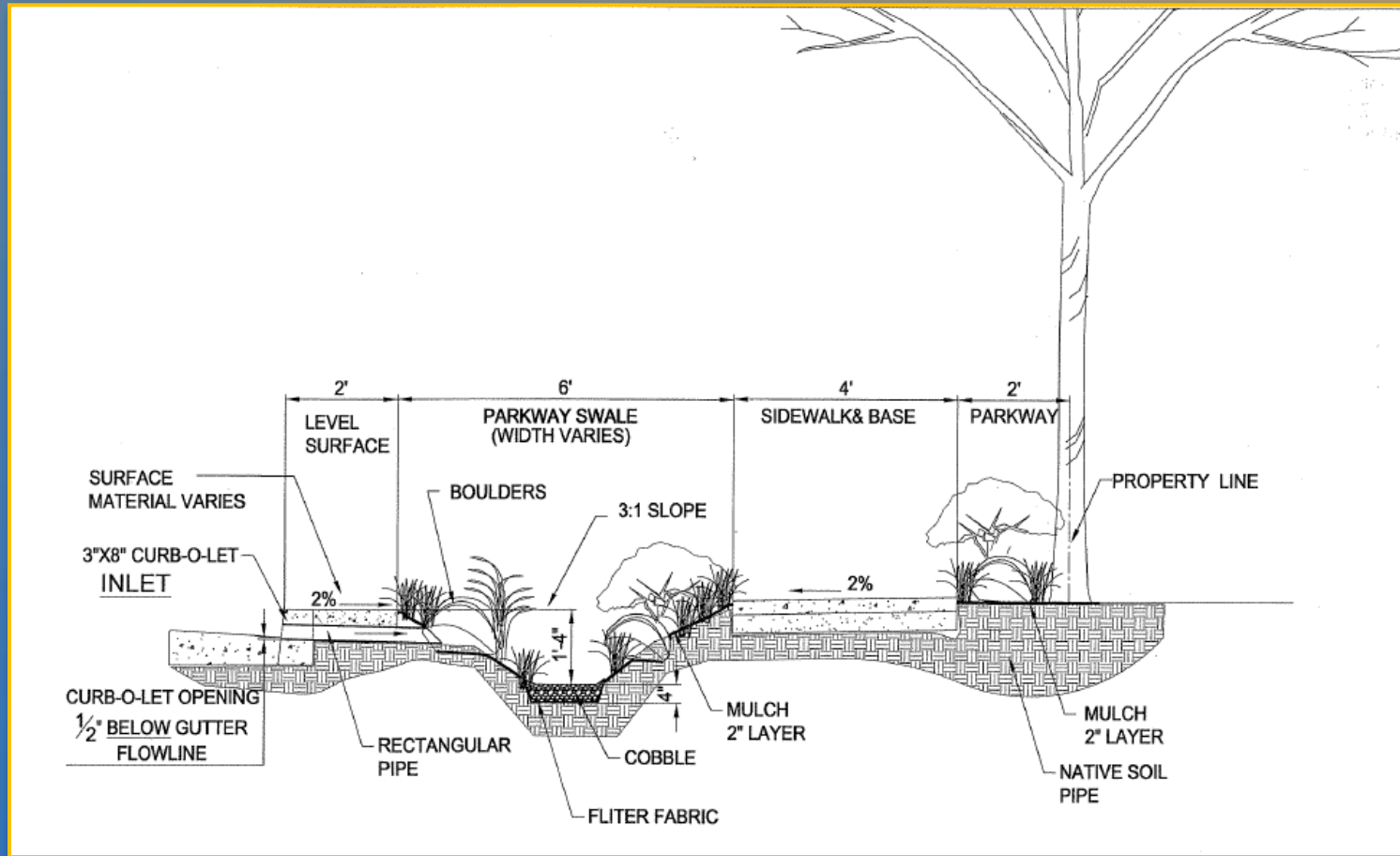
Challenges and Recommendations



Towards Regional Implementation



Vista Hermosa Park



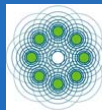
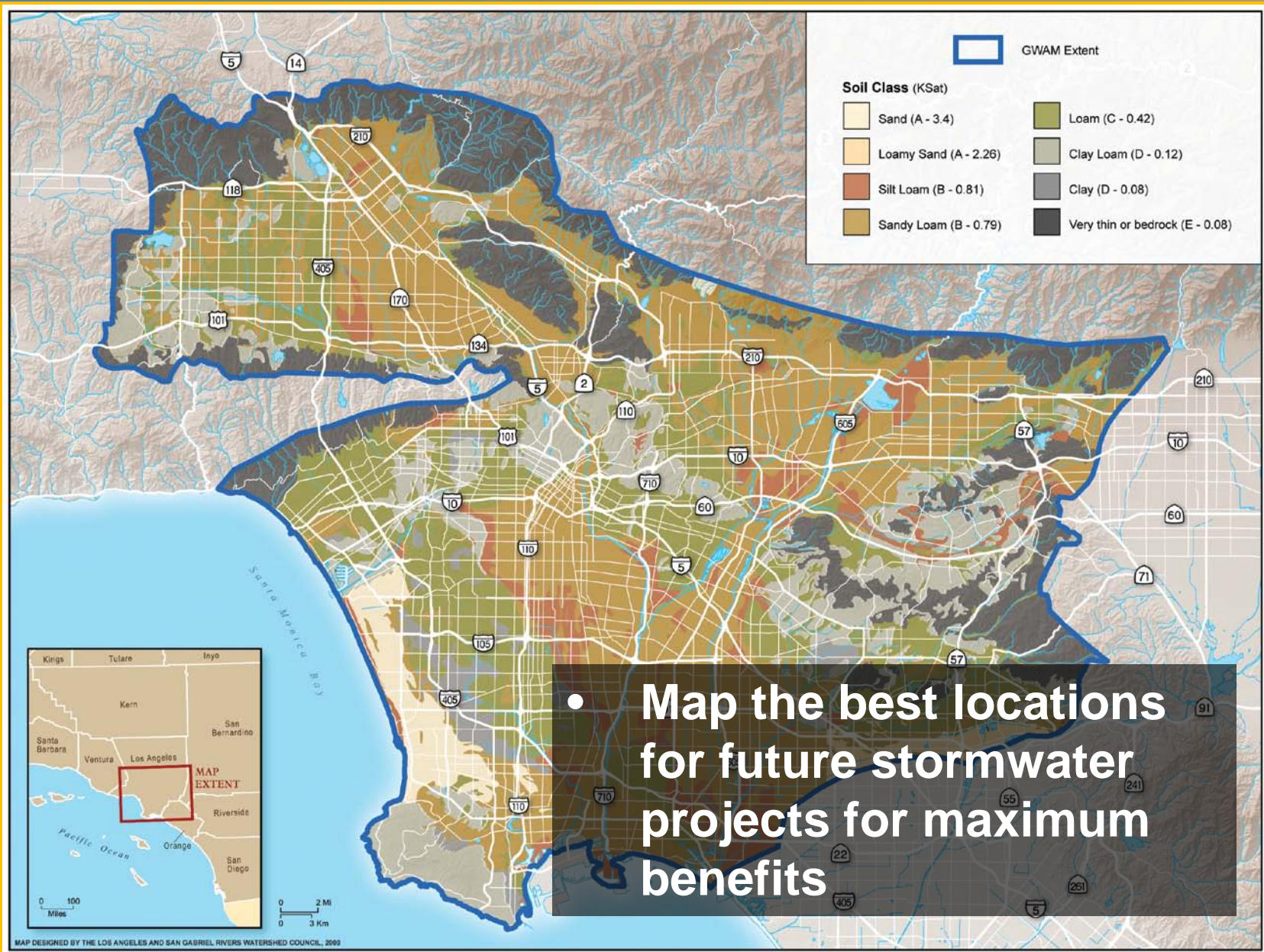
- Identify the best design, operation & maintenance procedures



- Identify and quantify the multiple benefits and beneficiaries



- Understand the ultimate fate of each contaminant of concern and identify effective mitigation measures





For more information:
Nancy L.C. Steele, Executive Director
nancy@lasgrwc.org

Bill Steele, Area Manager
wsteele@usbr.gov

<http://www.lasgrwc.org/WAS.htm>