

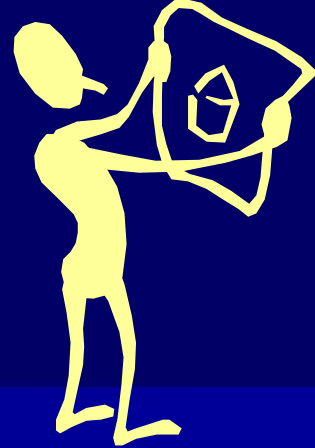
Watershed Management Modeling System: an integrated watershed-based approach for urban runoff and stormwater quality

Youn Sim, Ph.D., P.E.
Los Angeles County Flood Control District
Department of Public Works, County of Los Angeles

June 2, 2010
Gateway COG



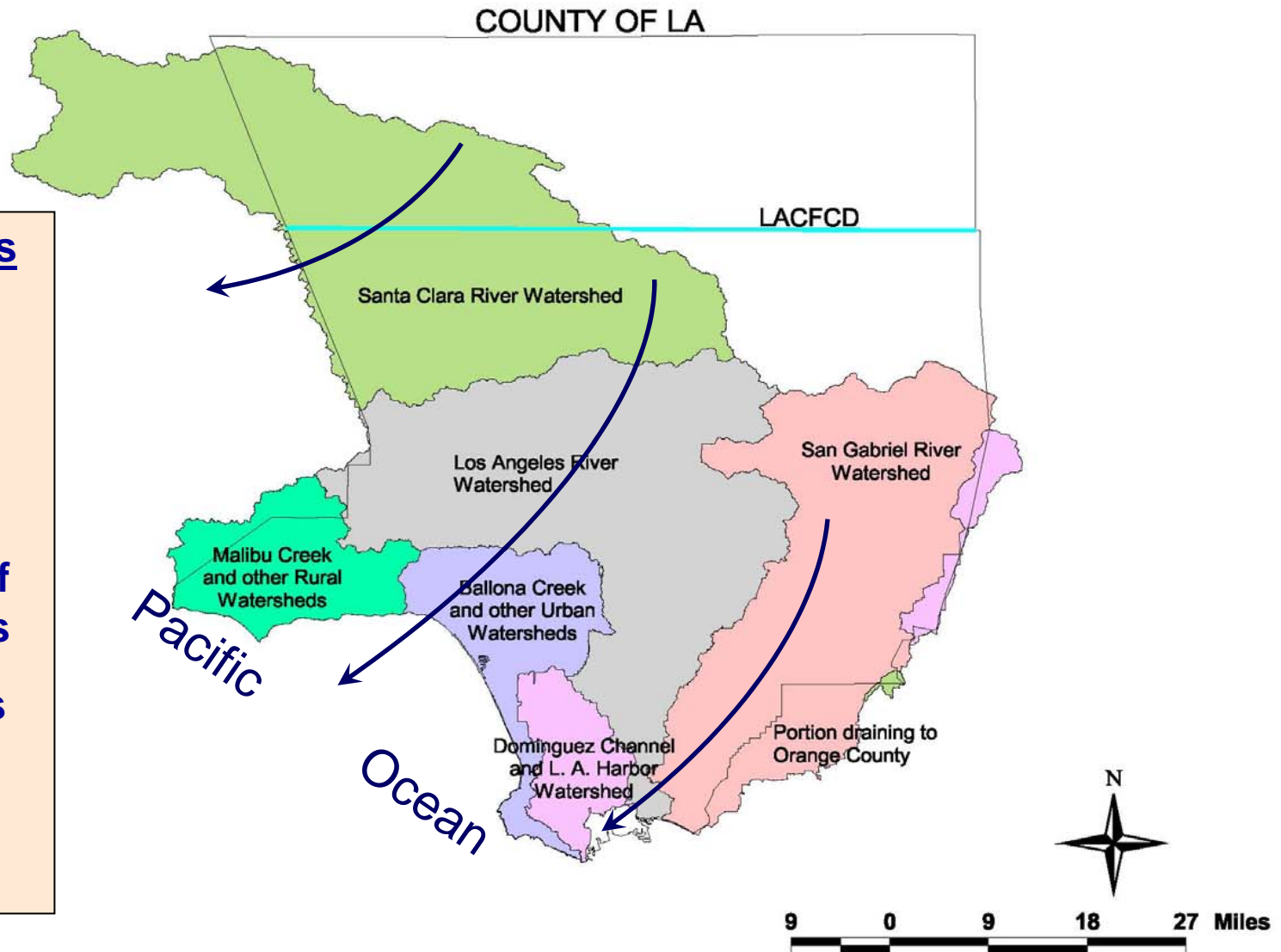
Outline



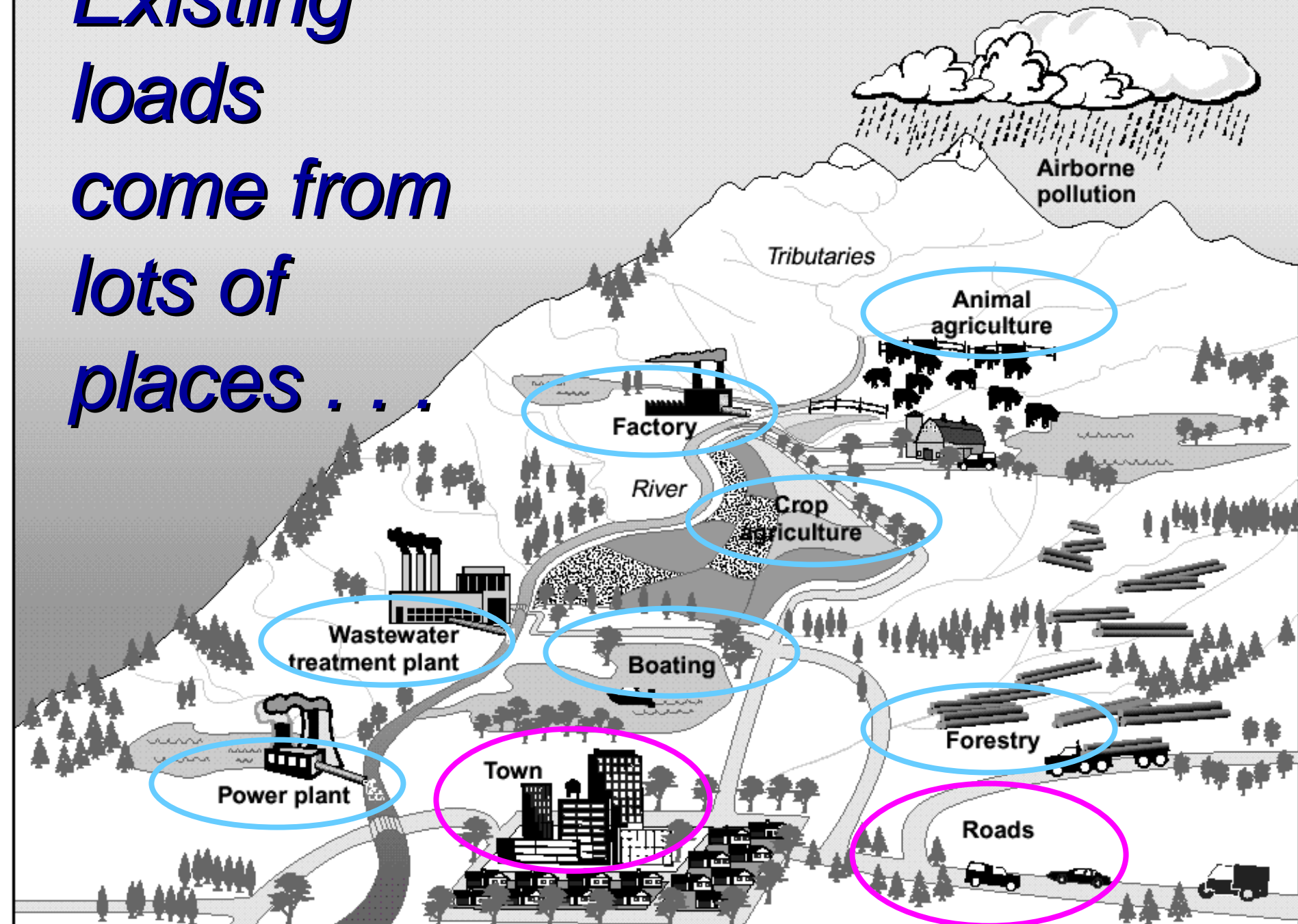
- Coastal watersheds of the Los Angeles County
- Background & challenges in water quality issues
- Need for manager's decision support system
- Watershed Management Modeling System (WMMS)
- Facts and benefits of WMMS
- Demonstration

Watershed Facts

- 487 Miles of open channel
- 2,800 miles of storm drain
- 3,100 sq-mile of watershed areas
- Total 23 TMDLs developed
- Total 5,600 NPDES permits



*Existing
loads
come from
lots of
places . . .*



Why “Integrated watershed-based” approach?

- Challenges in WQ of the County's watersheds
 - A. Thousands of discharges into the County's water bodies
 - B. TMDLs are allocated to MS4 at a system of 1000s of storm drain outlets:
 - Individual actions at outlets are not efficient
 - C. Multiple TMDLs are simultaneously in effect
 - Robust solutions are needed
 - D. Effective stormwater management should consider collective impact of all these aspects simultaneously



Need for decision support system

1. Projects needed to meet specific goals (e.g., water quality)
2. Limited budget
3. Business planning

Watershed Management Modeling System (WMMS)

Countywide watershed management
planning tool
&
Decision support system



Stakeholder input

- Technical Advisory Committee
 - Representative from Watershed Management Committees
 - Regulators (EPA, Regional Board)
 - NGOs
 - Researchers (SCCWRP)



LACFCD Objectives for WMMS Development

1. Develop a technical framework for a Water Quality Funding Initiative
 - Regional funding development
2. Provide a tool for urban runoff and stormwater quality management that allows for:
 - A. BMP implementation at local scale
 - B. Watershed management at regional scale



Facts of WMMS

- Developed based on USEPA's original watershed models and BMP selection system
- Partnership with USEPA
 - Technical support
 - Joint funding
- Identifies the most cost effective set of parcel scale BMPs supporting the watershed scale goal

Benefits of WMMS

1. Helps make decisions with the FIVE elements in watershed planning
 - 1) How polluted is your watershed?
 - 2) How much cleanup do we need?
 - 3) How many BMPs are needed?
 - 4) How much \$\$?
 - 5) Time frame?



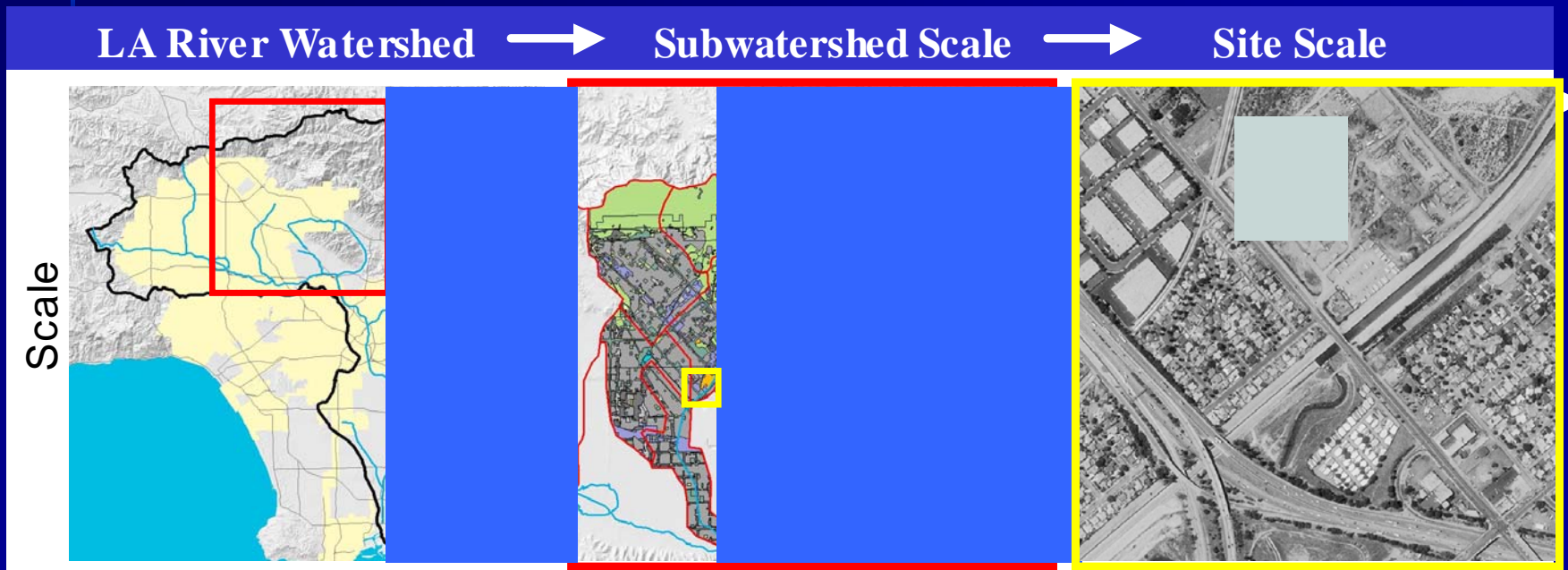
Benefits of WMMS

(cont.)

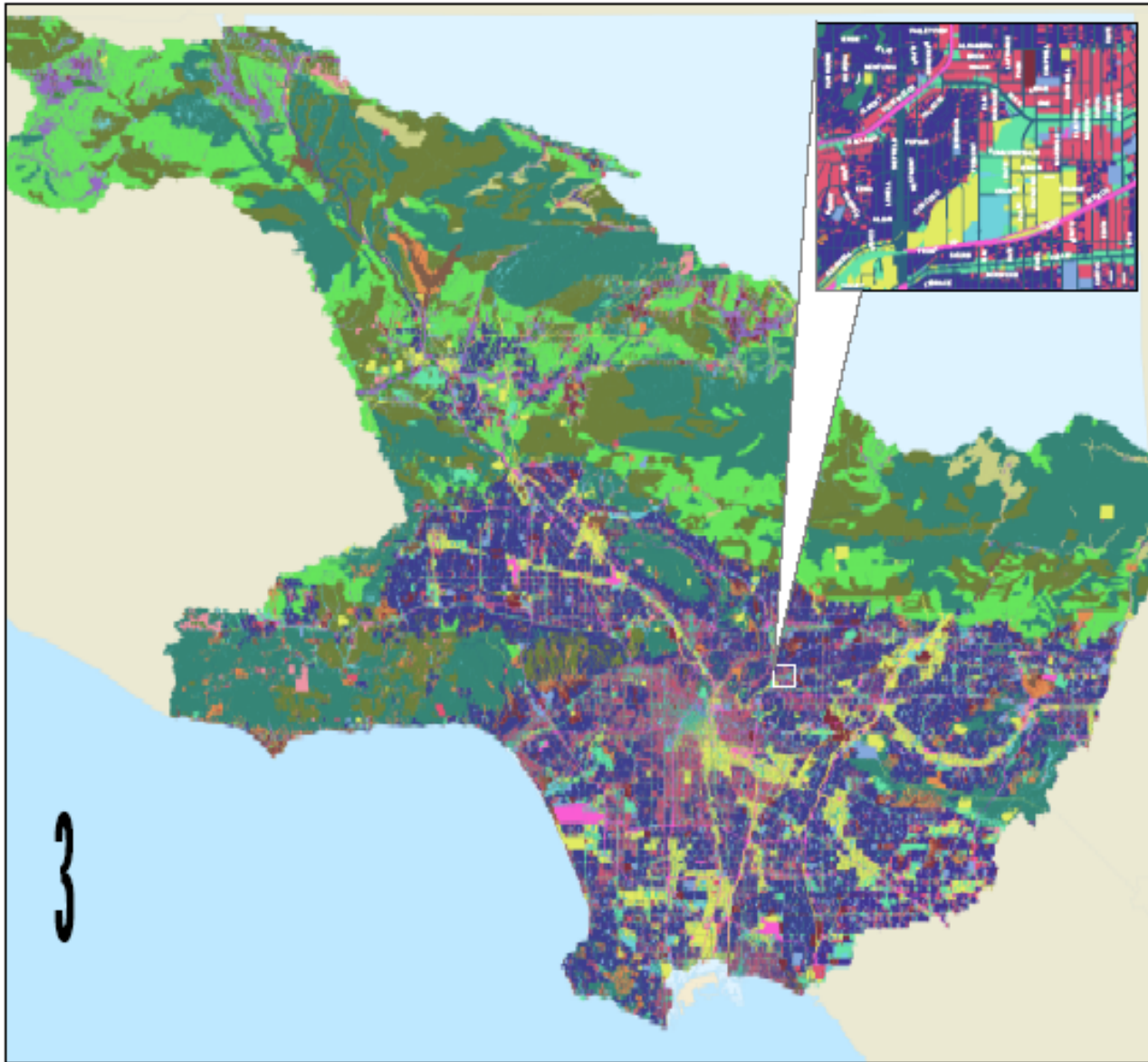
2. Helps develop Watershed based Water Quality Improvement Plan
 - Supports watershed groups for long-term WQ improvement planning
 - Develops TMDL compliance measures for multi-pollutants
 - Estimates Capital and O&M costs needed
 - Helps develop a long term schedule with milestones
 - Considers a diversity within a watershed or among cities
3. Provide s a key framework for regional funding development
4. Helps develop Water Quality Design Storm
5. Water infrastructure planning & management



Scale Covered

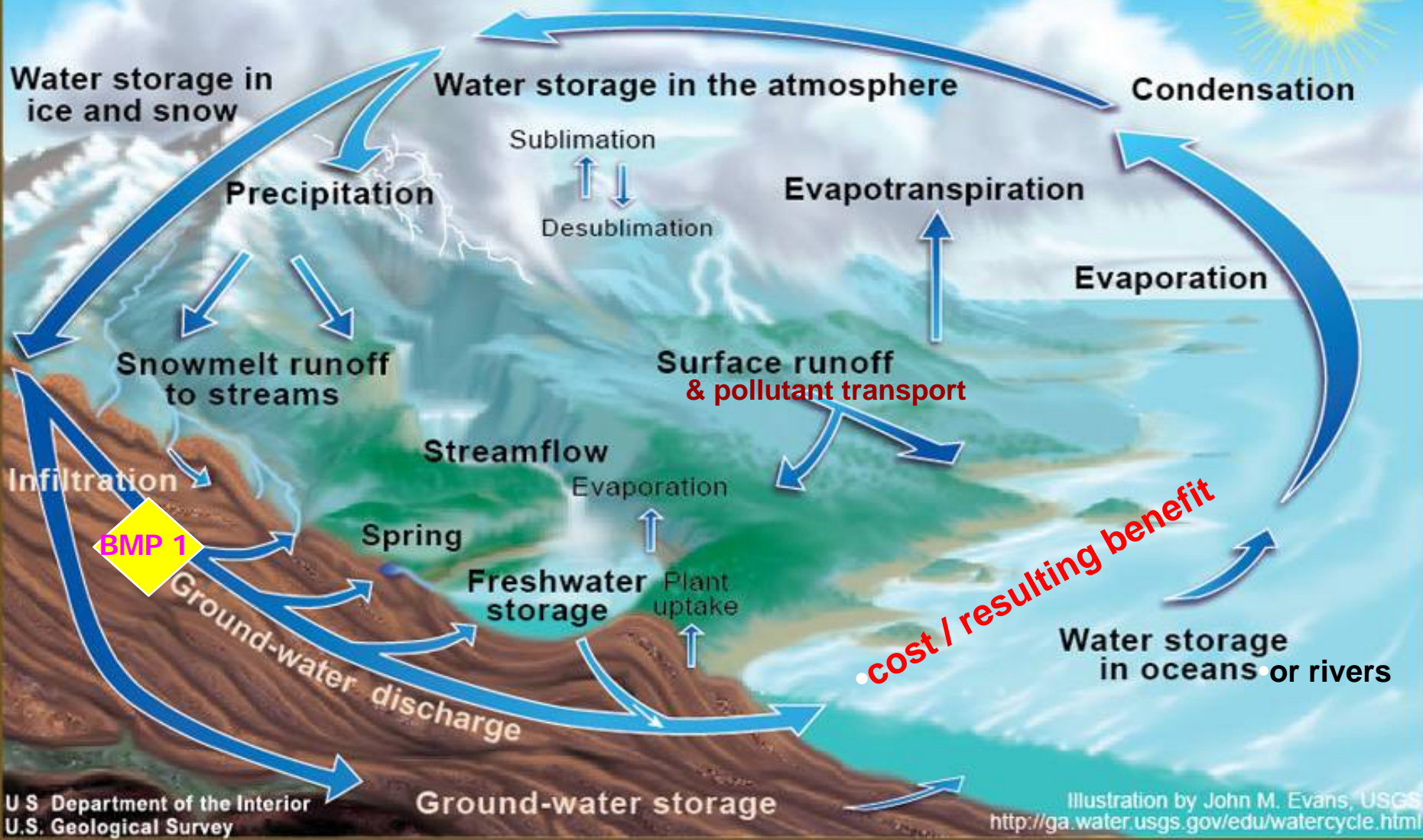


WATERSHED MODEL RESOLUTION



- **LOS ANGELES COUNTY FLOOD CONTROL DISTRICT**

The Water Cycle



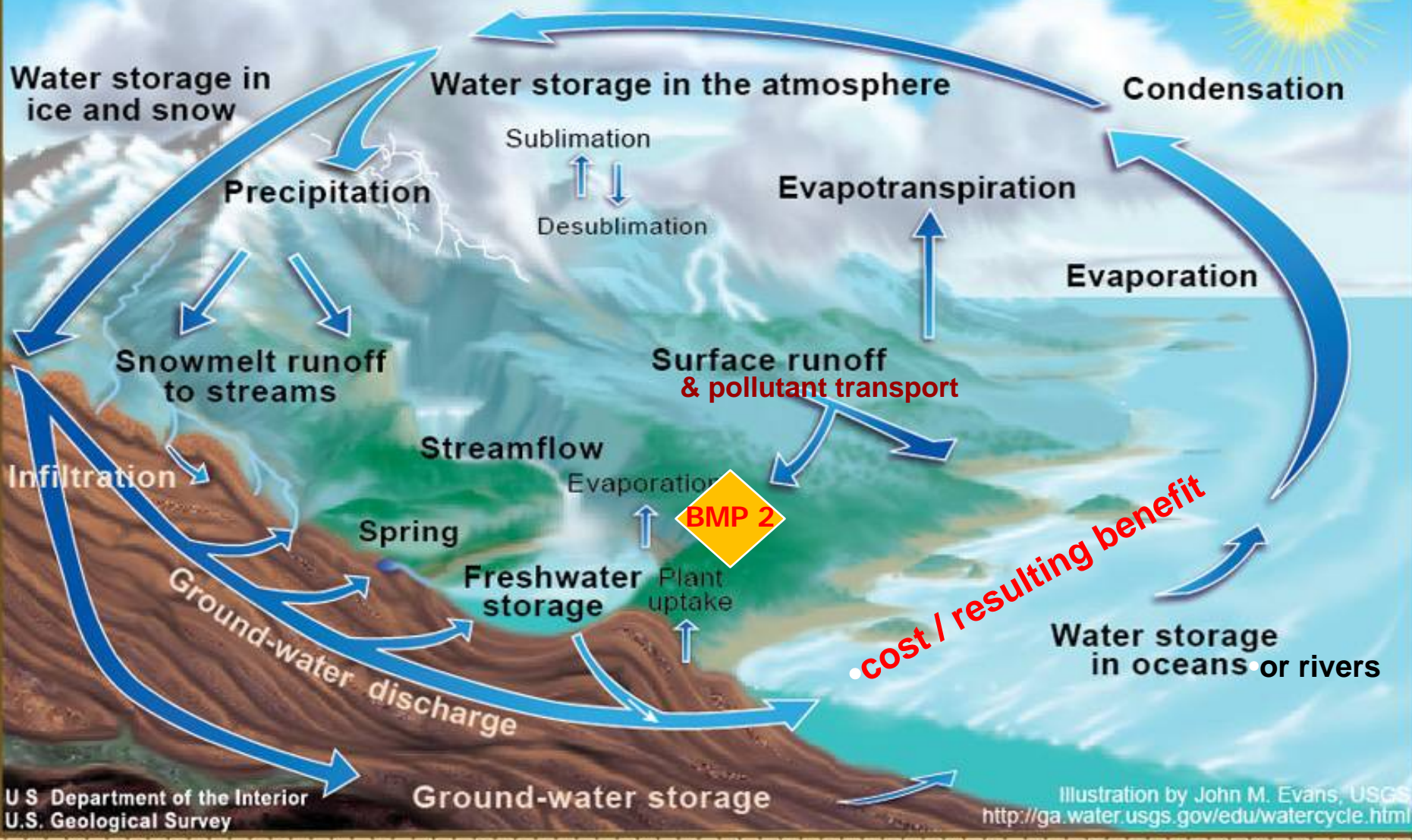
U.S. Department of the Interior
U.S. Geological Survey

Illustration by John M. Evans, USGS
<http://ga.water.usgs.gov/edu/watercycle.html>

Infiltration Basin



The Water Cycle



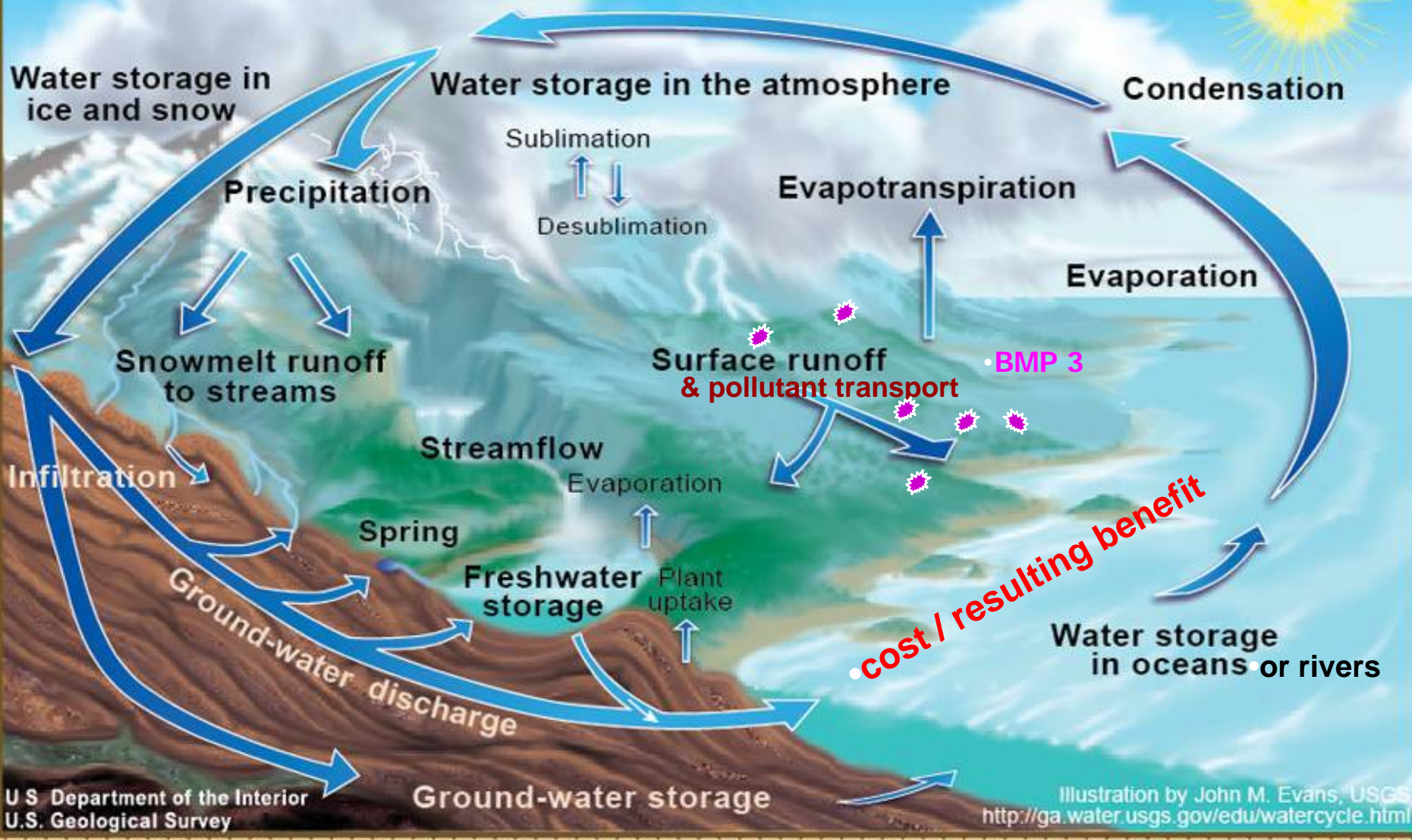
Constructed Wetlands



• **LOS ANGELES COUNTY FLOOD CONTROL DISTRICT**



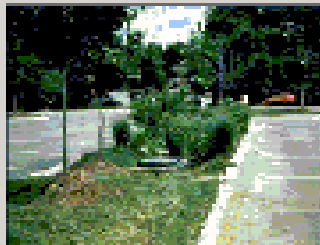



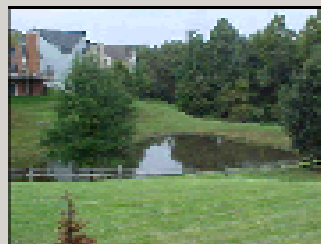
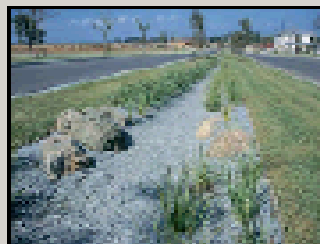

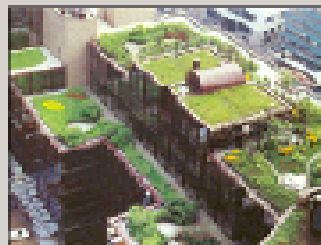
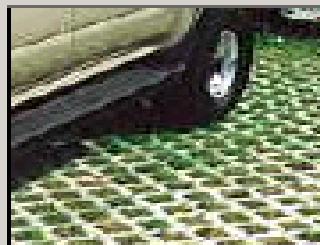
The Water Cycle



Distributed
(LID type)
BMPs

Define BMP Templates

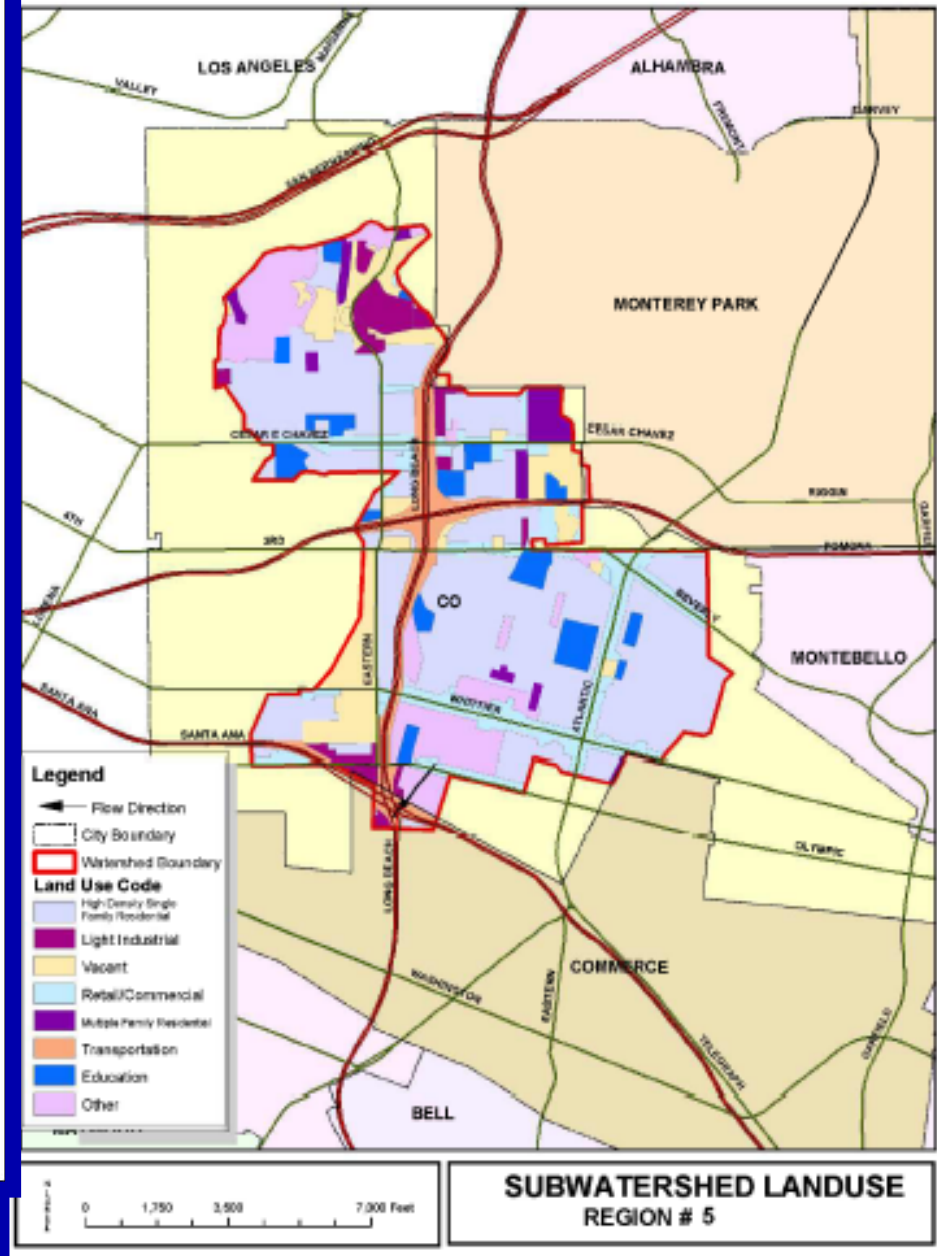
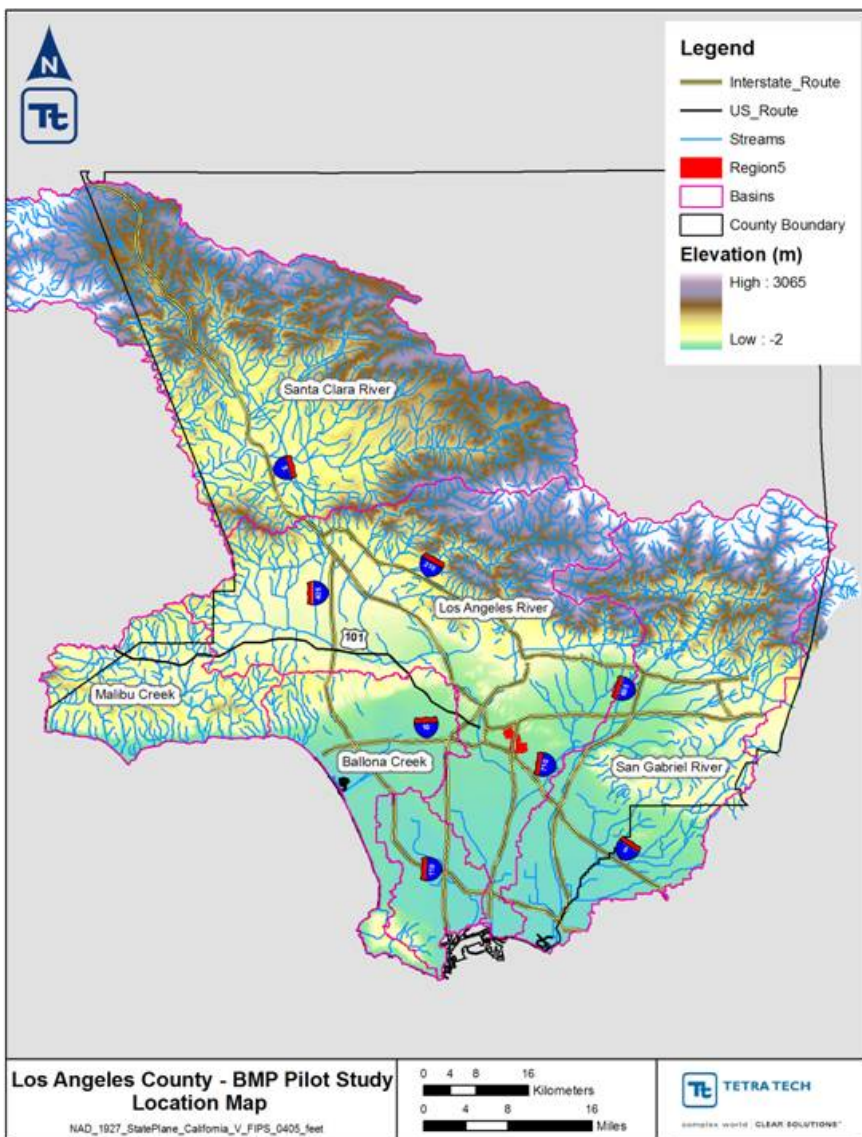
BMP Templates

<input checked="" type="radio"/> Bioretention Basin 	<input type="radio"/> Dry Pond 	<input type="radio"/> Rain Barrels 
<input type="radio"/> Cistern 	<input type="radio"/> Wet Pond / Wet Land 	<input type="radio"/> Infiltration Trench 
<input type="radio"/> Vegetative Swale 	<input type="radio"/> Green Roof 	<input type="radio"/> Porous Pavement 

Set Dimensions Cancel

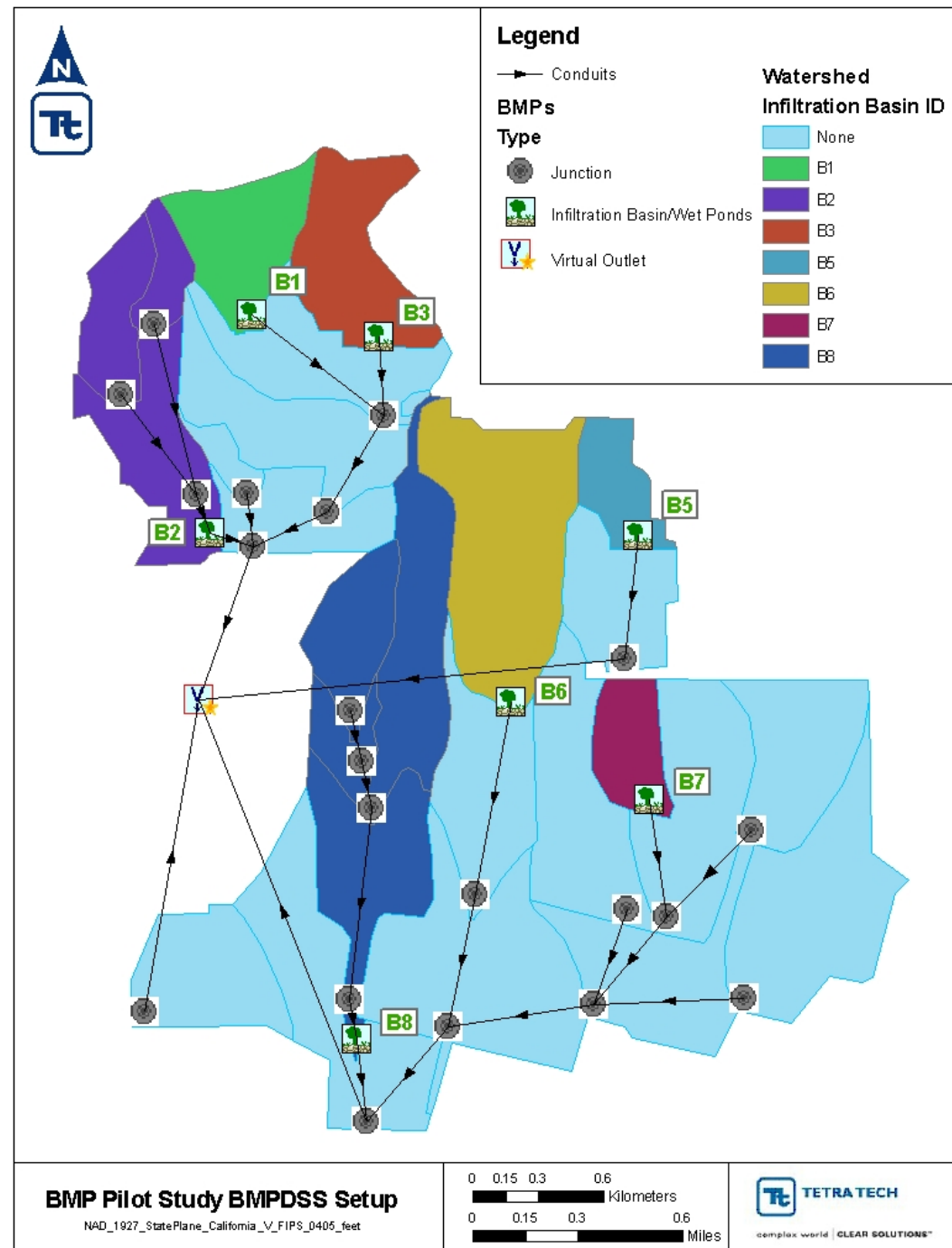
Pilot Study

- Location:
 - Unincorporated county area
 - Approx. 3 sq mi
 - A representative of County watersheds based on
 - Land use distribution
 - Slope
 - Imperviousness
 - Average rainfall
 - Relative location within the County



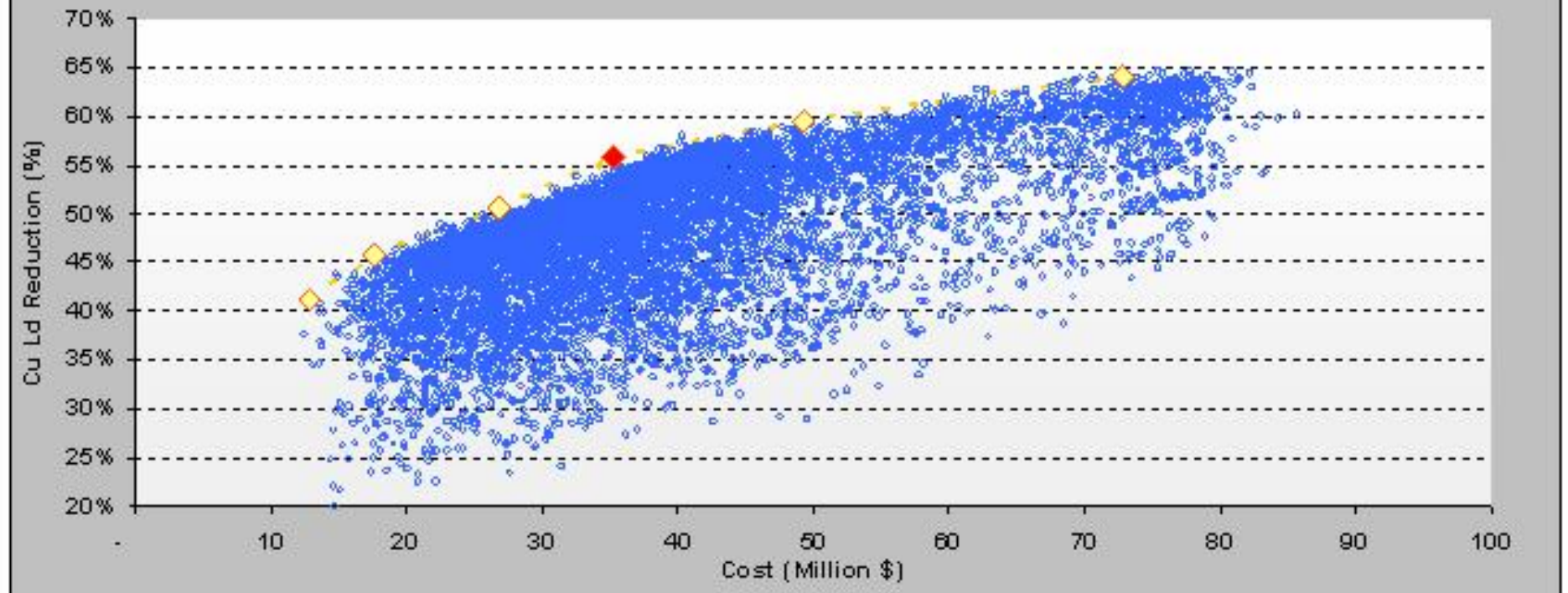
BMP selection

- Subwatershed breakdowns
- Determine the size and quantity of
 - distributed BMPs
 - Centralized BMP



Optimization results

Step Two Search Solutions



Optimization results

TMDL Target: 76.5% Copper Load Reduction



Final results

(Distributed BMPs)

[illegible]

Final results

(Centralized BMPs)

Centralized BMP	Type		
		Size (ac.)	Cost (\$)
B1	Infil Basin	3.44	\$ 338,518.17
B2	Infil Basin	0.41	\$ 78,382.13
B3	Infil Basin	3.67	\$ 353,933.61
B5	Infil Basin	2.75	\$ 290,211.14
B6	Infil Basin	0.73	\$ 116,582.27
B7	Infil Basin	2.07	\$ 237,961.31
B8	Infil Basin	0.37	\$ 72,263.97

Final results (summary)

Total Cost* (\$million)	Distributed BMPS Cost (\$million)	Centralized BMPS Cost (\$million)	Cu Load Reduction (%)	Pb Ld Redn (%)	Zn Ld Redn (%)	f.c. load Redn (%)	f.c. exc freq redn (%)
35.20	33.71	1.49	56%	54%	60%	75%	7%

Distributed BMPs	\$ 33.71 M
HIGH DEN RES	\$ 19.98 M
MULTI FAM RES	\$ 2.94 M
INDUSTRIAL	\$ 1.07 M
COMMERCIAL	\$ 5.71 M
INSTITUTIONAL	\$ 1.35 M
TRANSPORTATION	\$ 2.65 M
Centralized BMPs	\$ 1.49 M
Total (for 3 Sq. Mil watershed)	\$ 35.20 M

Note: Numbers are for
demonstration purpose only.
Actual numbers may change

Bridging the Gap



• Watershed Improvement

• Dischargers

• Regulators

Questions?

Contact

Youn Sim

Los Angeles County Flood Control District

ysim@dpw.lacounty.gov

626-458-4314

