# Pimples to Dimples

A regulatory perspective on sustainability, storm water, water quality, and small communities in CA.

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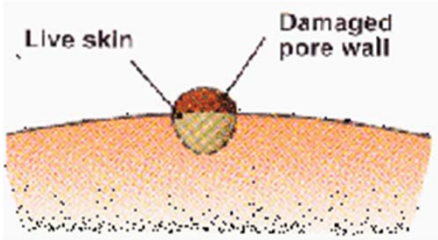

Live skin
Damaged
pore wall

Dimples

# Sustainability Tests

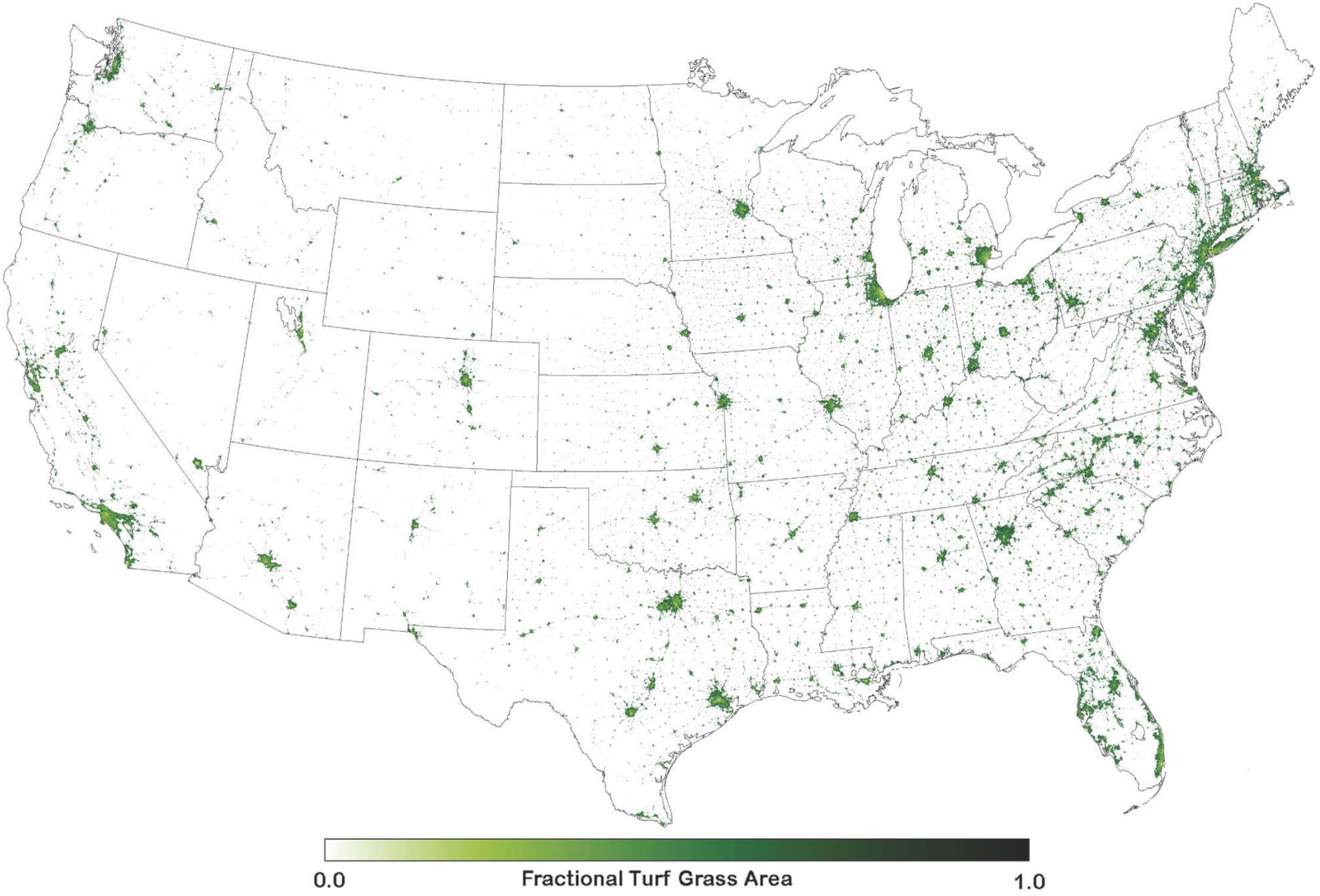
- **Resource** – protection to enhancement and reuse (“runoff is a resource”)
- **Technical** – complex, technological standard-based to simple, natural, performance-based solutions
- **Institutional** – centralized, subsidized approaches to decentralized, self-supporting approaches
- **Community** – healthy individual, societal cost driven equations to healthy community, community opportunity equations

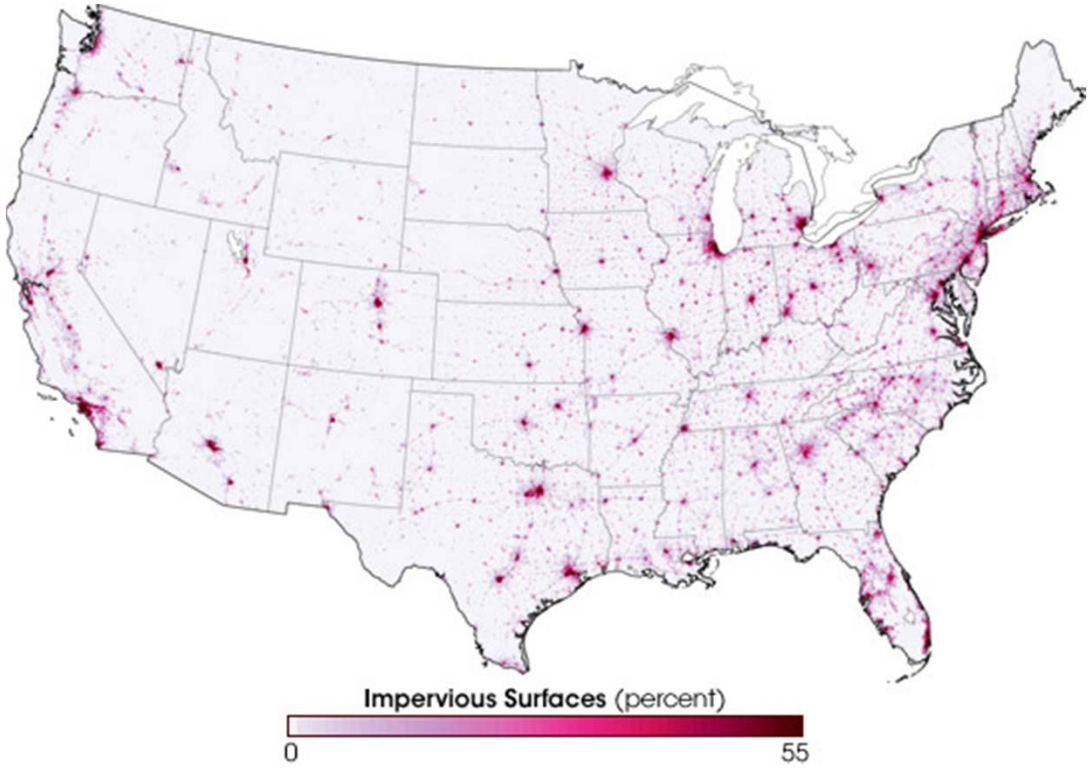
# Sustainability, storm water, water quality, and small communities...

- “Storm water is a resource” concept
- Shift towards an approach that mimics nature (LID, GI, etc.)
- Multiple benefits, better community integration, some economic issues
- Important to understand regulatory framework driving this, though

# Regulating Symptoms vs. Causes

(but first, some continental context)


0.0
Fractional Turf Grass Area
1.0



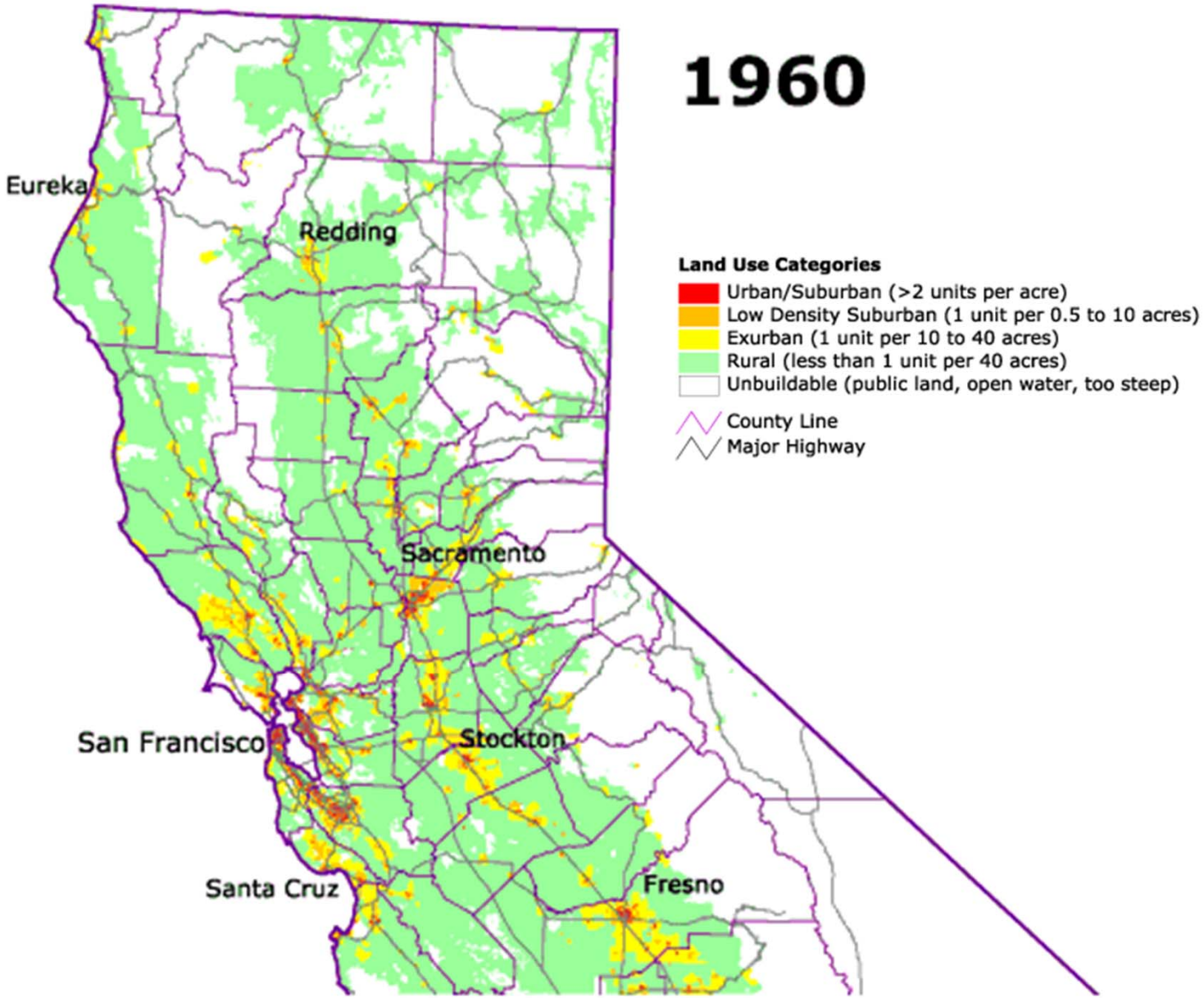

http://earthobservatory.nasa.gov/Features/Lawn/lawn.php

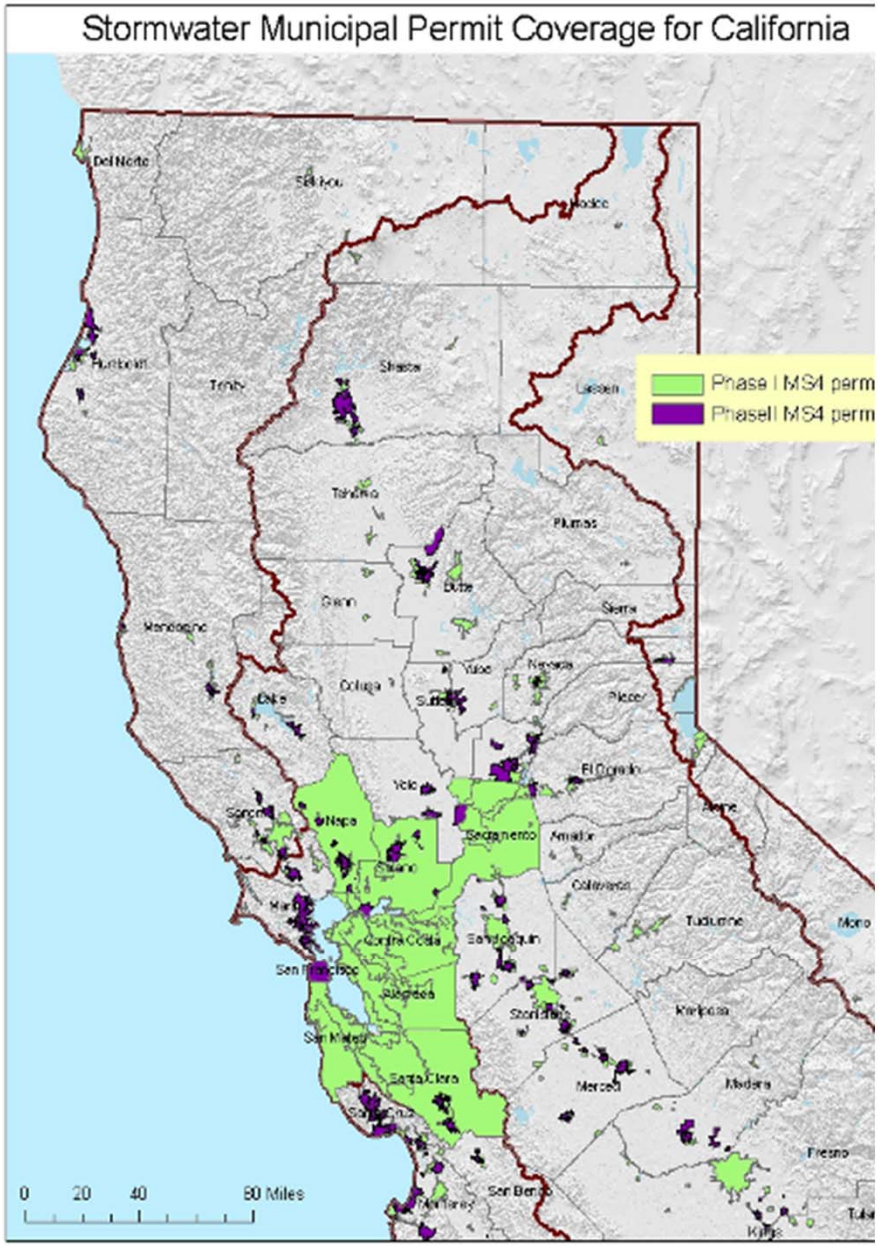
# The Tail (of the Dragon)

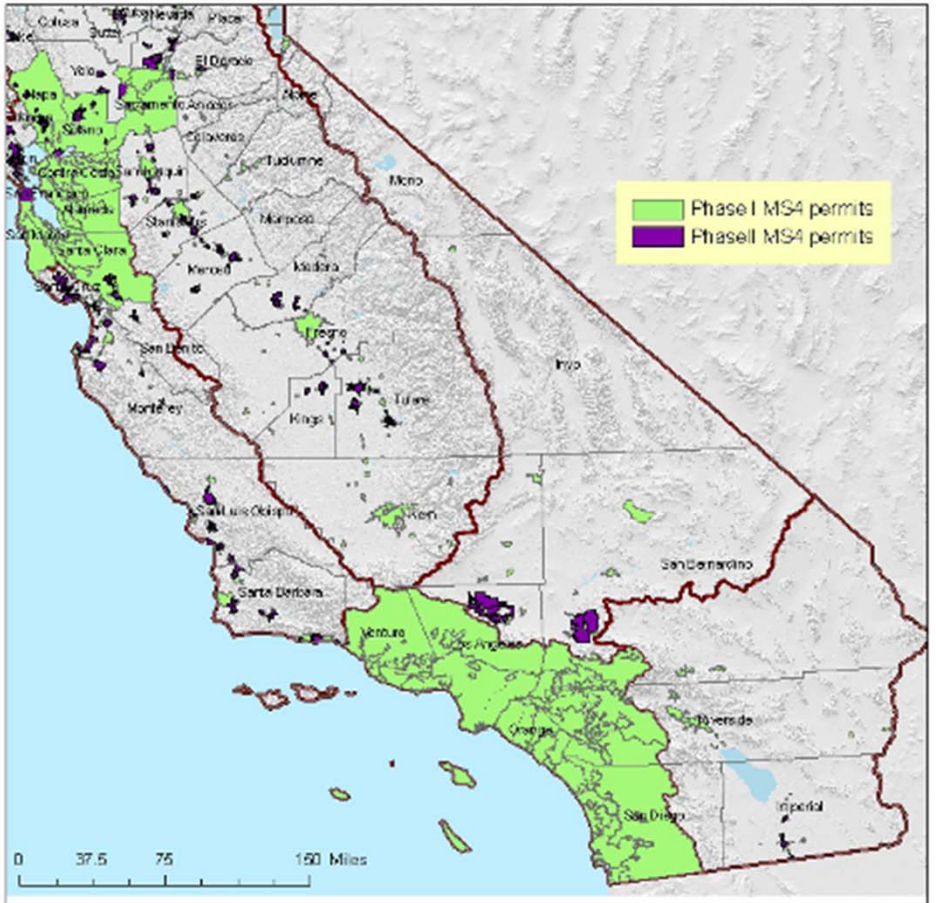
- The mission of the Water Boards is to preserve and enhance the quality of CA's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations.

# Millions of Californians

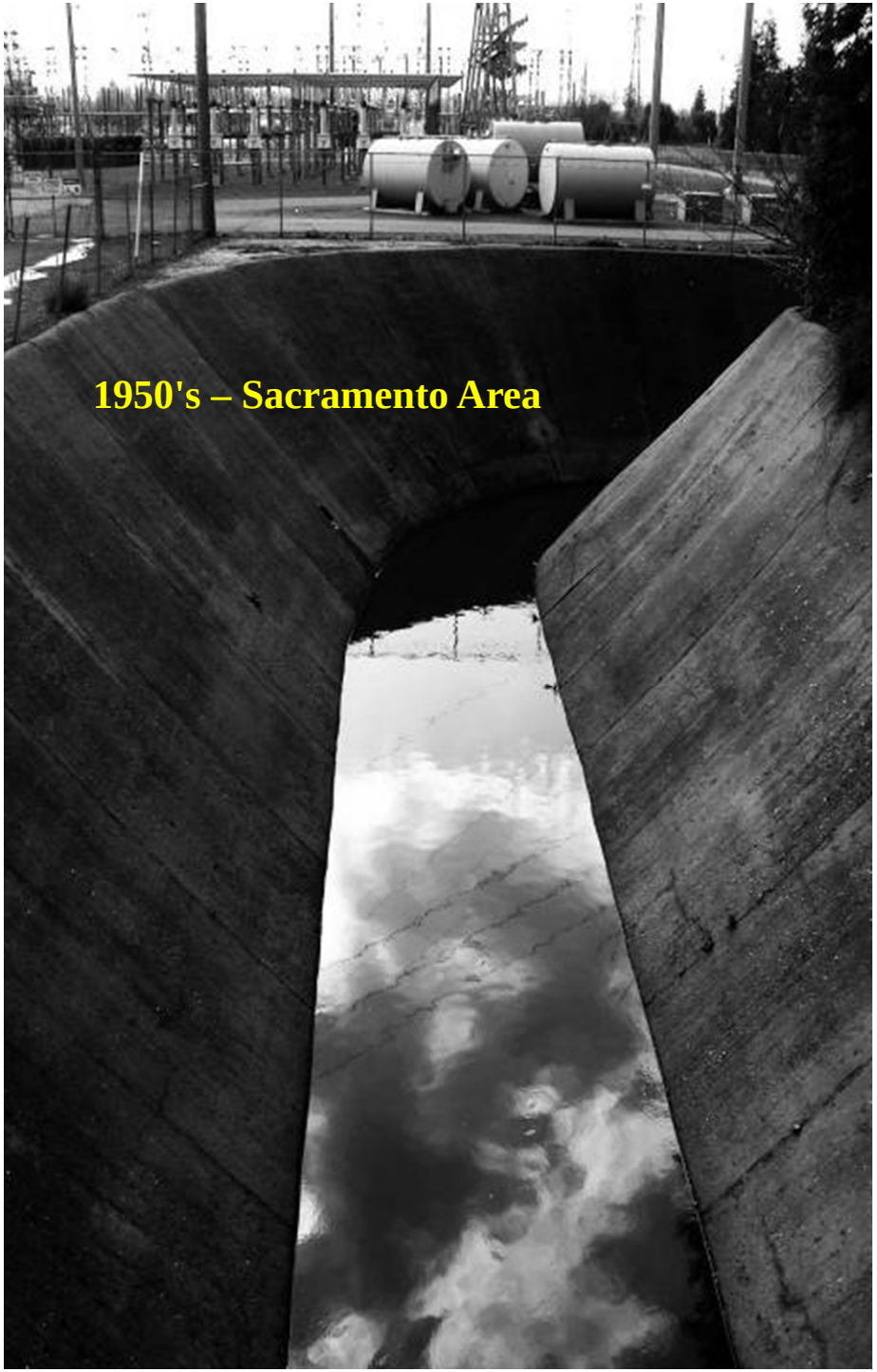
- **1980** – 23.7 million
- **2005** – 37 million
- **2030** – 48 million (projected)
- where?

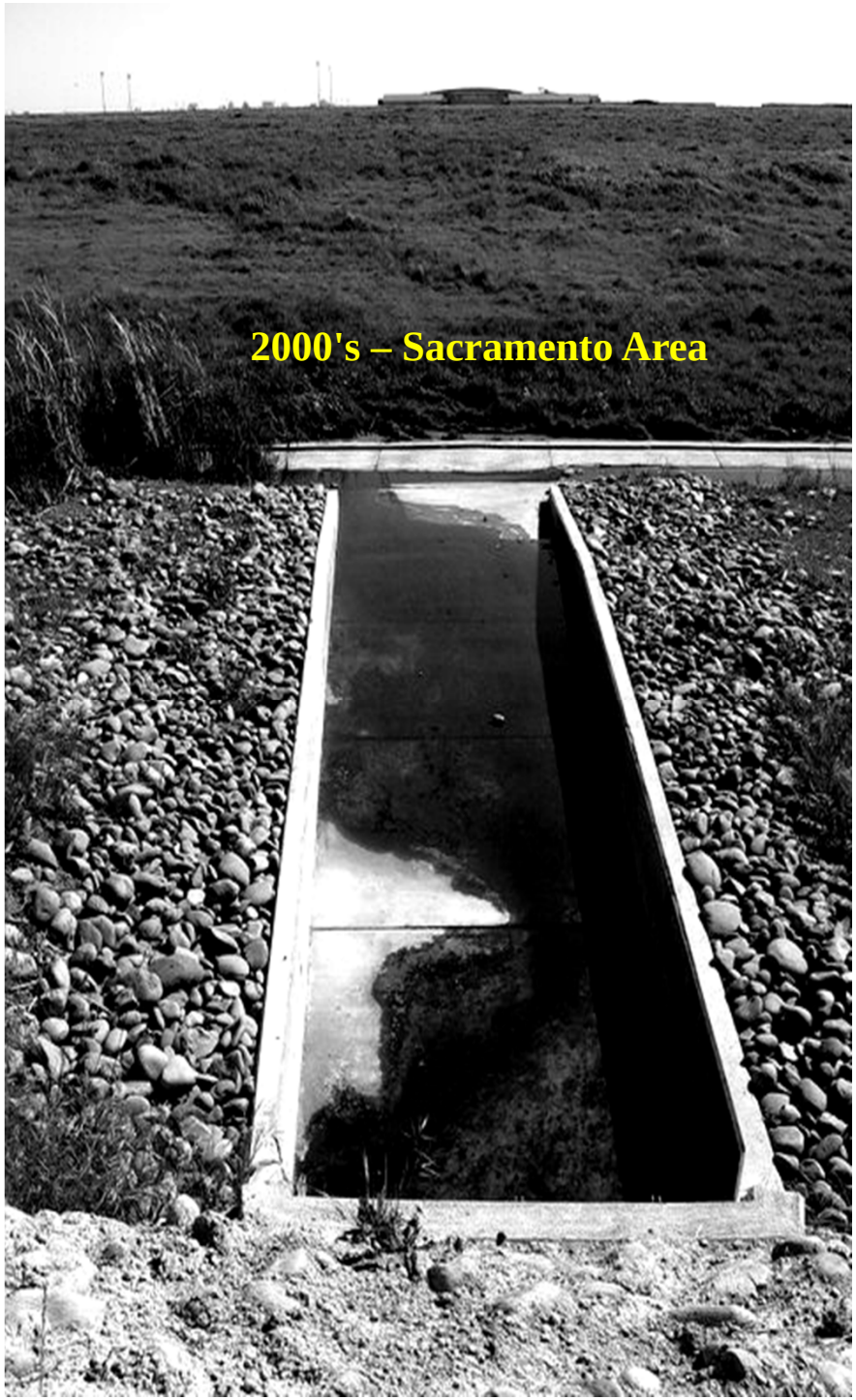

1960
Eureka
Redding
Sacramento
San Francisco
Stockton
Santa Cruz
Fresno
Land Use Categories
Urban/Suburban (>2 units per acre)
Low Density Suburban (1 unit per 0.5 to 10 acres)
Exurban (1 unit per 10 to 40 acres)
Rural (less than 1 unit per 40 acres)
Unbuildable (public land, open water, too steep)
County Line
Major Highway



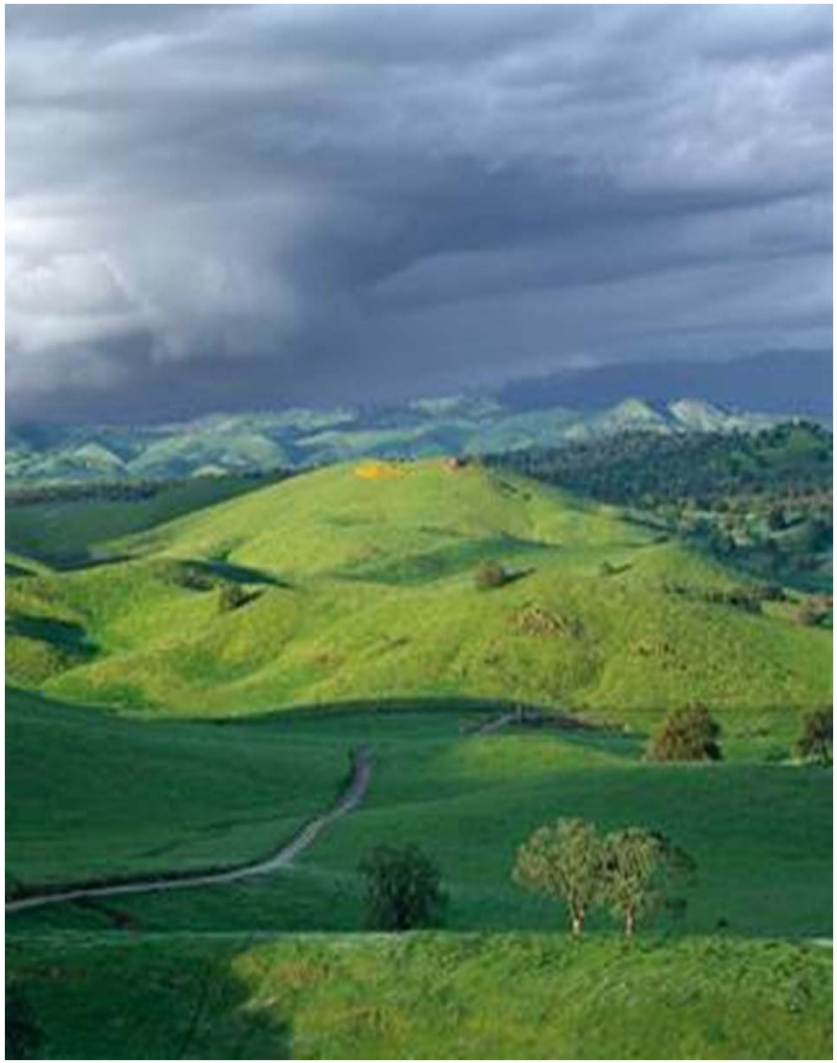




Stormwater Municipal Permit Coverage for California


1950's – Sacramento Area


2000's – Sacramento Area

# Driven by maintenance interests...



# Water Boards nuts and bolts

Our regulatory actions (e.g., CWA401 Certs, WDRs, NPDES Permits, enforcement, etc.) require discharges to be protective of our water quality standards (WQS):

- Water quality standard = beneficial uses + objectives
- Water Boards may “choose to prevent any degradation”

# CWA - Water Quality Standards

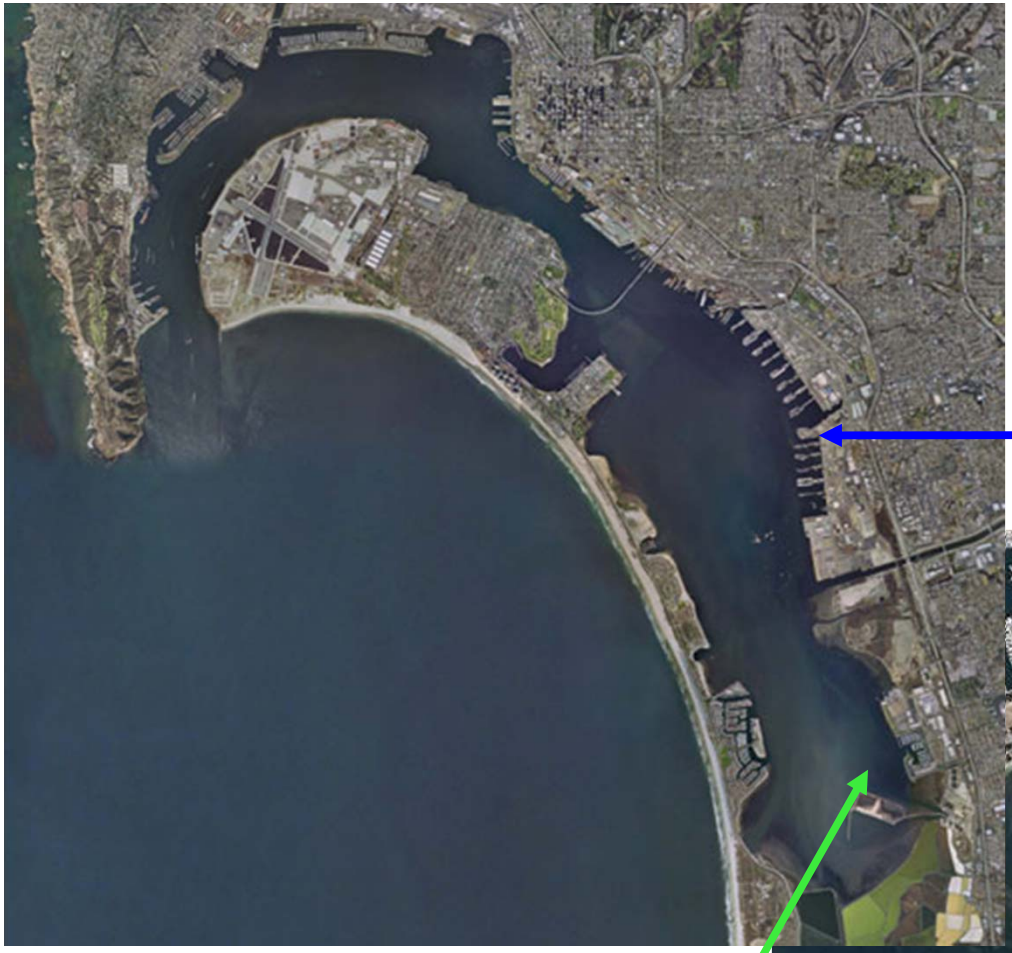
- Water Quality Standards are made up of:
  - Beneficial Uses (designated to specific waterbodies), plus
  - water quality criteria; and
  - an antidegradation policy.
- Beneficial Uses (BUs) are:
  - often not directly related to key water resource uses valued by communities (it might take a suite of them to protect wetlands and streams, for example)

# Beneficial Uses Used to Protect California Wetlands & Streams

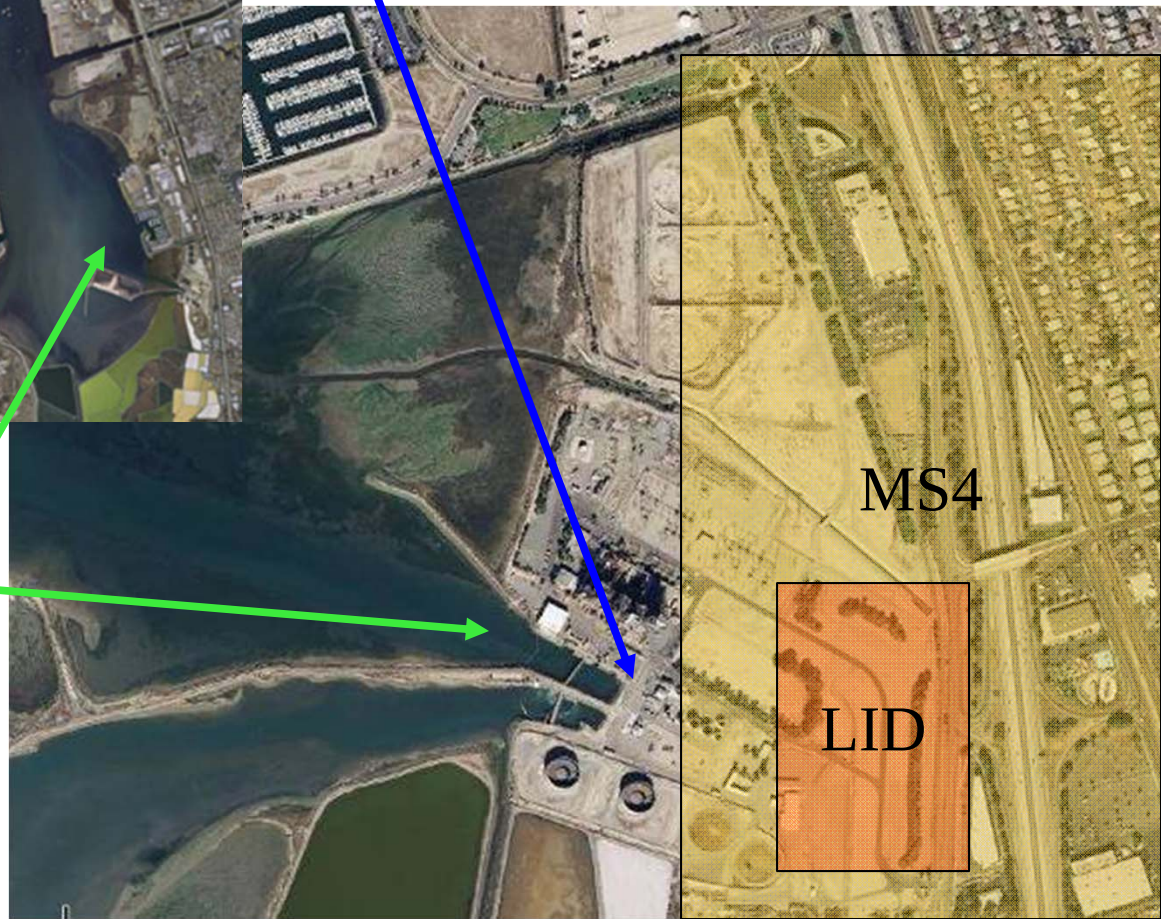
- **AGR** – Agricultural Supply
- **FLD** – Flood Peak Attenuation/Flood Water Storage
- **FRSH** – Freshwater Replenishment
- **GWR** – Groundwater Recharge
- **MAR** – Marine Habitat
- **MUN** – Municipal and Domestic Supply
- **RARE** – Preservation of Rare and Endangered Species
- **REC-1** – Water Contact Recreation
- **REC-2** – Non-Water Contact Recreation
- **SHELL** – Shellfish Harvesting
- **SPAWN** – Fish Spawning
- **WARM** – Warm Freshwater Habitat
- **WILD** – Wildlife Habitat
- **WQE** – Water Quality Enhancement

# MS4s and MEP

- Municipal Separate Storm Sewer System (MS4)
  - Local governments, Caltrans, and some “non-traditionals” in Phase II
- Maximum Extent Practicable (MEP)
  - MS4s must reduce pollutants in their effluent to the MEP
  - A hybrid standard – part performance-based and level of effort ($)

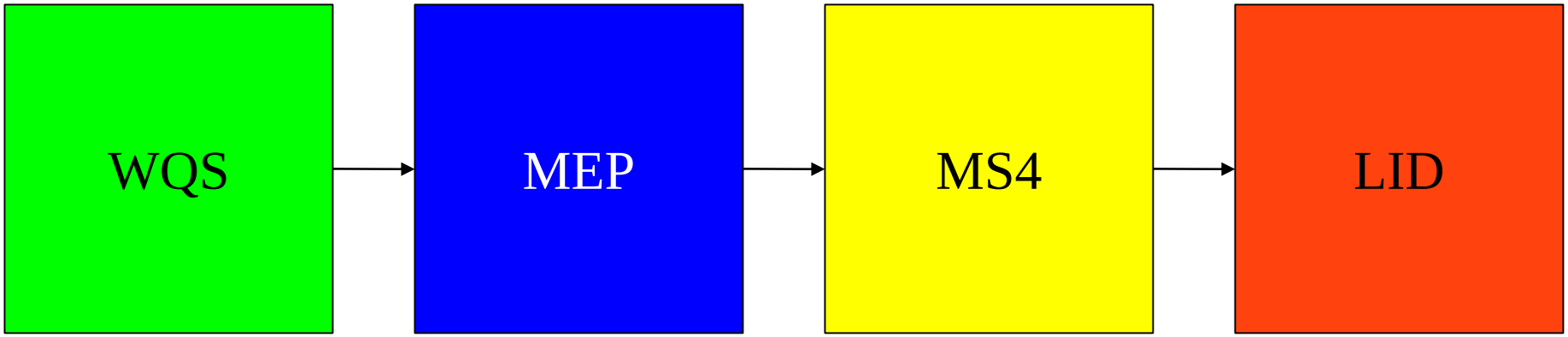


MS4 Permits are supposed to ensure WQS are met via **MEP** standard applied at "ends of pipes."




Water Quality Standards (**WQS**) apply to receiving waters.

# MS4 requires project to use LID to reduce pollutants to MEP to protect WQS



# NPDES Permit Drivers towards LID

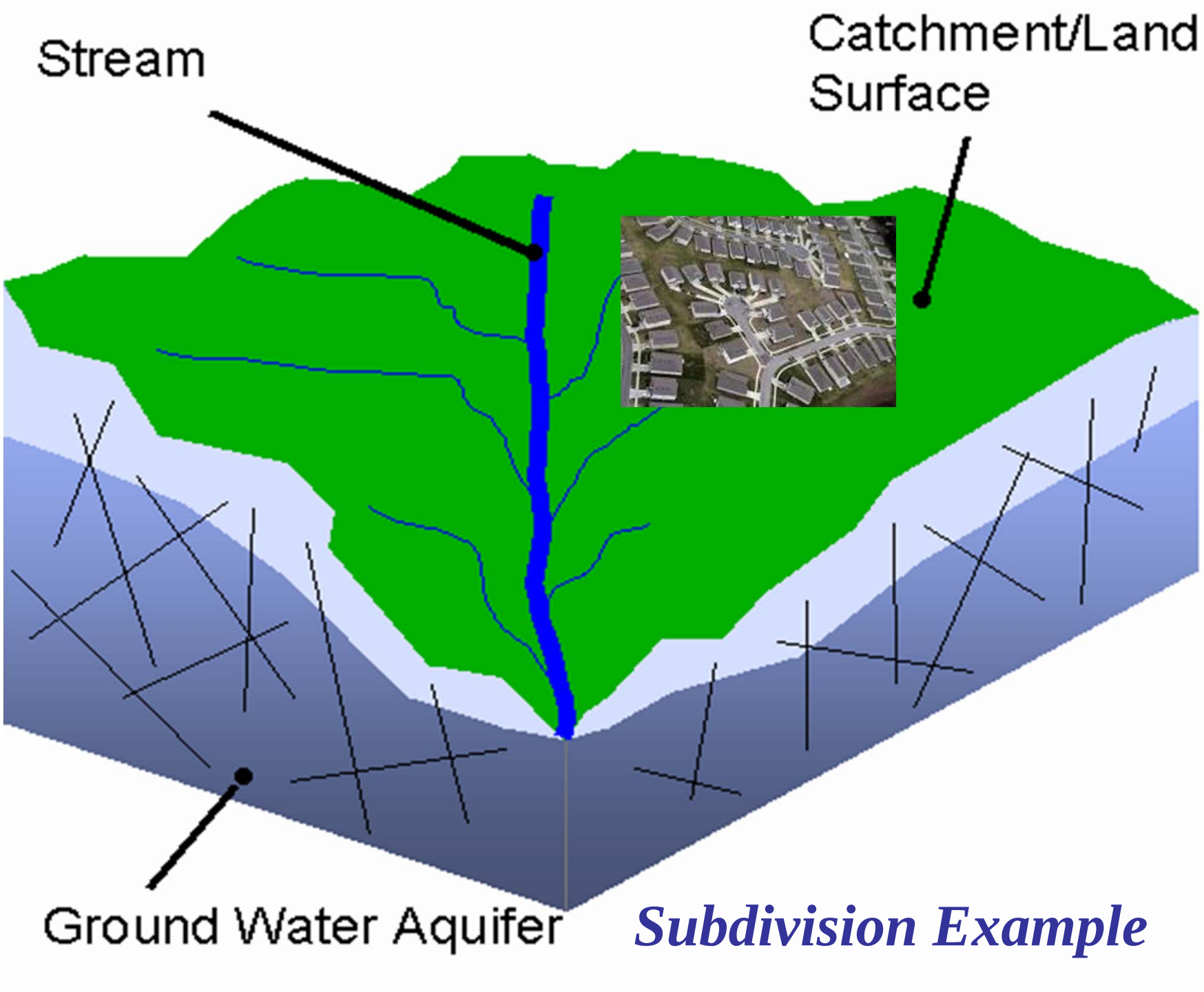
- **1990's** – MS4s had to have post-construction elements in their plans
- **~2000** – MS4s had to have Standard Urban Stormwater Management Plans (SUSMPs)
  - capture/treat 85 %ile, 24-hr runoff event
  - often resulted in regional basins
  - difficult to enforce

# Modern MS4 Tools

- SUSMPs (the plan, not necessarily the standard)
- Hydromodification Management Plans (HMPs)
- Low Impact Development / Green Infrastructure
- Additional post-construction elements (e.g., water quality BMPs)

# Effective Impervious Area (EIA)

- Concerns over using EIA as a surrogate for hydrologic performance
- Treats the symptom (surface), not the cause (hydrology) of WQS impacts
- Could be gamed (the “grassy moat” scenario)
- Should use Runoff Volume, Time of Concentration, and other appropriate hydrologic metrics instead




***Subdivision Example***

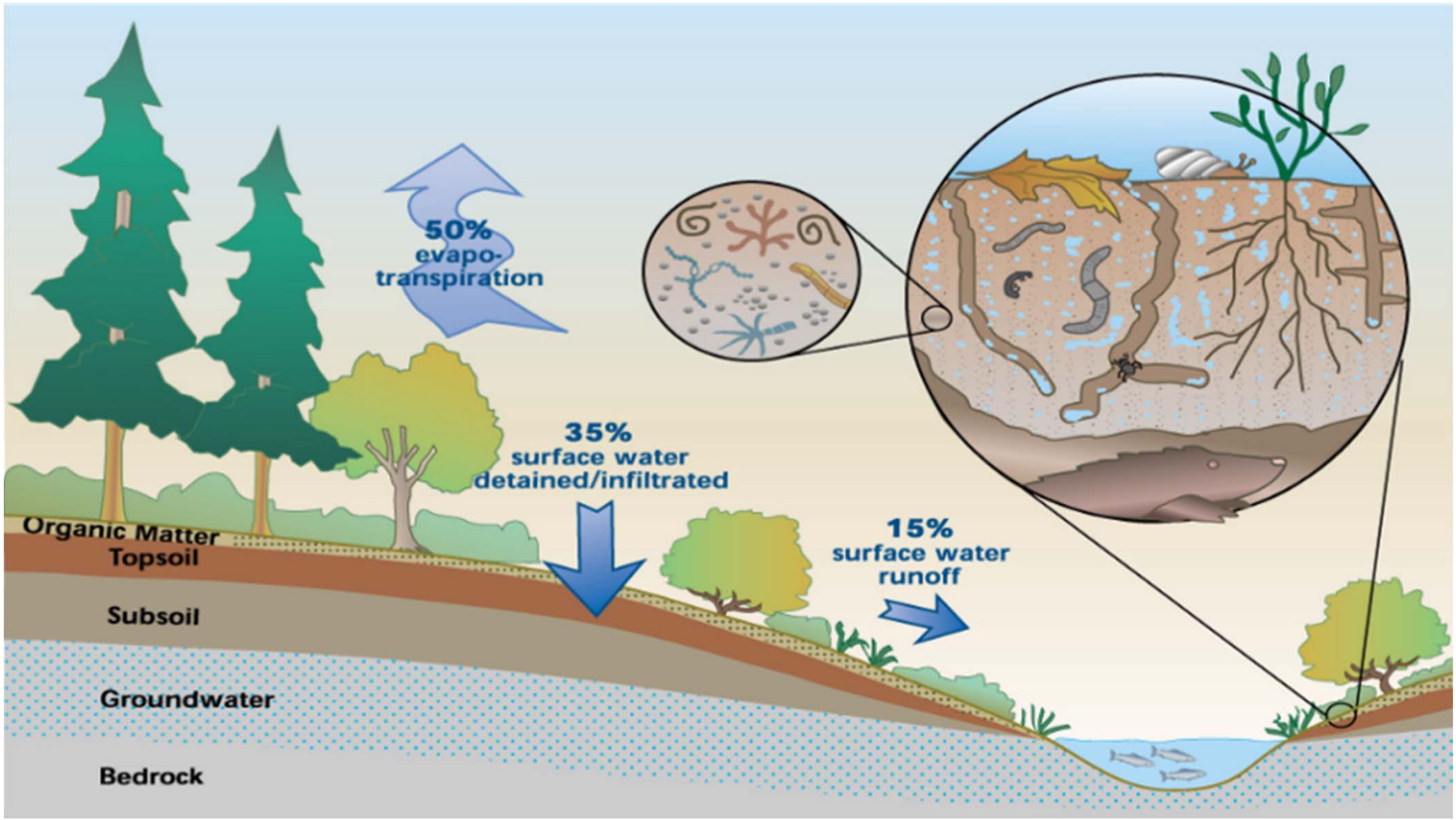
# Subdivision Example

| | Pre-Development (Pre-Project) | Post-Development (5% EIA) | Post-Development (1% EIA) |
|---|---|---|---|
| Percent EIA | 0 | 5 | 1 |
| Precipitation (inch) | 0.75 | 0.75 | 0.75 |
| Runoff (inch) | 0.002 | 0.04 | 0.007 |
| Project Area (acres) | 10 | 10 | 10 |
| Runoff (acre-ft) | 0.002 | 0.03 | 0.006 |
| % Increase over Pre-Development | N/A | 1,500 | 300 |

# The importance of soil

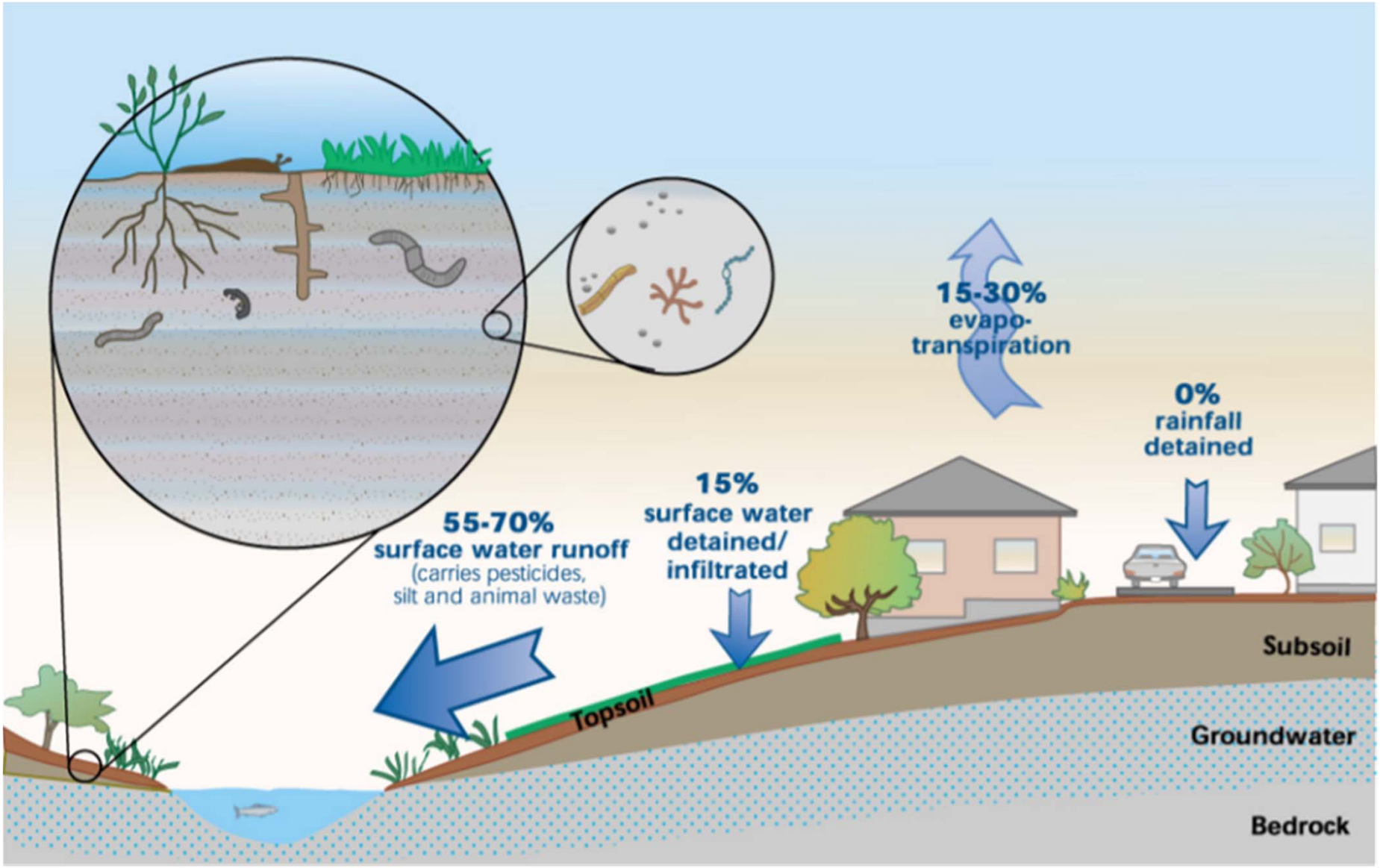
- Healthy soils are critical to watershed health and function
- Engineers tend to focus on the plumbing more than the soils and biotic features
- Infiltration and recharge do not always work – LID is flexible, why aren't we?

# Native Soil




*From King County*

# Disturbed Soil




*From King County*

# Risks of over-engineered LID

- Engineered boxes often require engineered soils
- Devices buried in corners of commercial lots
- Site runoff performance may meet goals, but overall watershed goals and sustainability of project is questionable

# Challenges Ahead for LID/GI

- Regulating LID/GI
  - Retrofits, hydrologic criteria, performance measurement, over-engineering, enforcement, linking to WQS and outcomes
- Legislating LID/GI
  - Diverse interests, oversimplification of CA hydrology, promises of global savior
- Mother Nature

# My Recommendations

- Water Board/USEPA should develop numeric criteria and objectives that address hydromod impacts using LID, instream, and other techniques – in support of beneficial uses and WQS
- Wherever feasible, directly regulate those responsible for constructing projects (and maintaining BMPs), discharging storm water
- Open source model → performance-based standards with flexibility to adapt/learn
- Promote sustainable approaches to water management wherever feasible (soils, irrigation, gray water, everything)
- More academic programs on small system, urban hydrology and water quality impacts associated with storm water

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