The Construction Stormwater Program

Construction Activity Threats

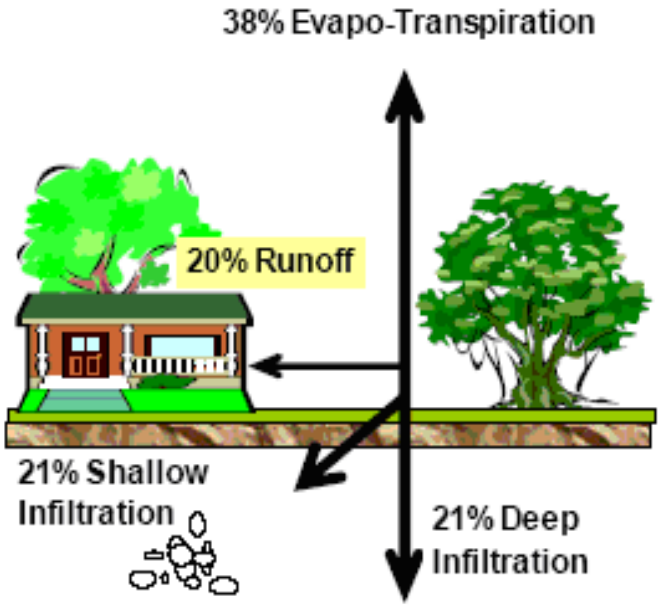
- Two-fold – construction projects have the potential to cause impacts to our beneficial uses of water both **during** and **after** the project.
- During – potential for sediment erosion discharges.
- After – potential for pollutant export and hydromodification impacts as a result of how the new landscape functions.

Who needs coverage

1) All sites that disturb more than one acre
2) All sites that are less than one acre but part of a "larger plan of development"
3) All sites that are thought to be a threat to water quality, as deemed by the appropriate RWQCB

Construction WQ threats =

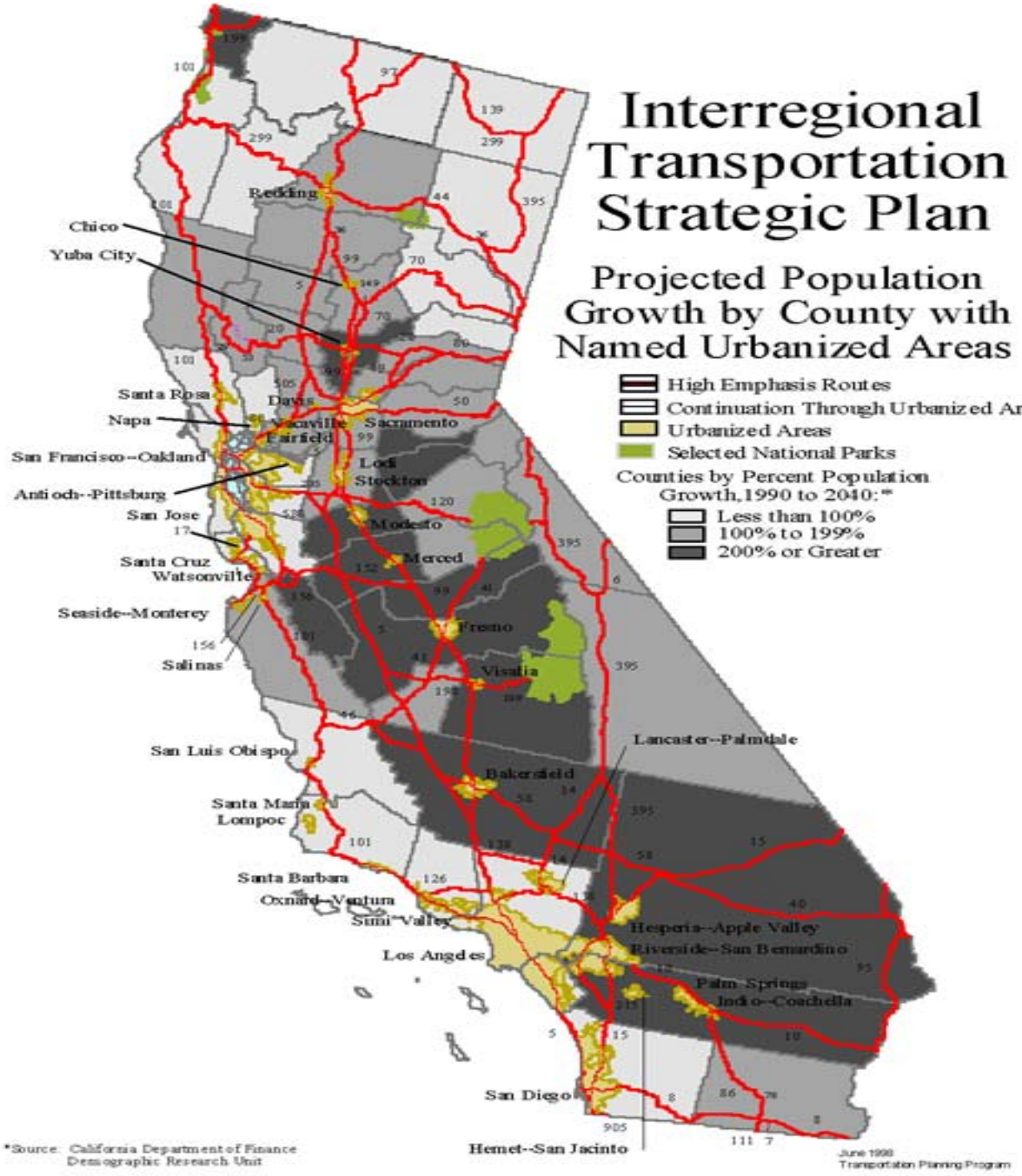
+



Permit Reissuance Goals

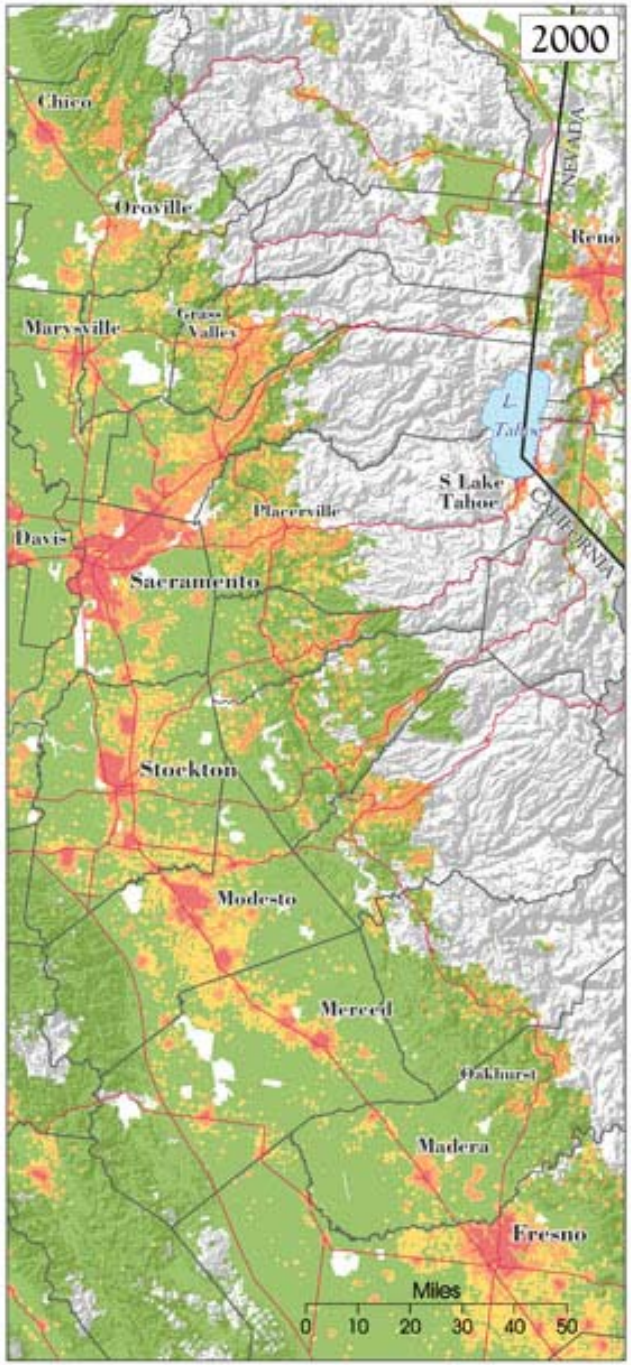
1) Adopt a **risk-based** permit approach- "not all sites are created equal"
2) Improve "**performance" measurement** of program
3) Establish standards to avoid, minimize and mitigate **post-construction** impacts associated with all new and re-development projects triggering the construction activity permit

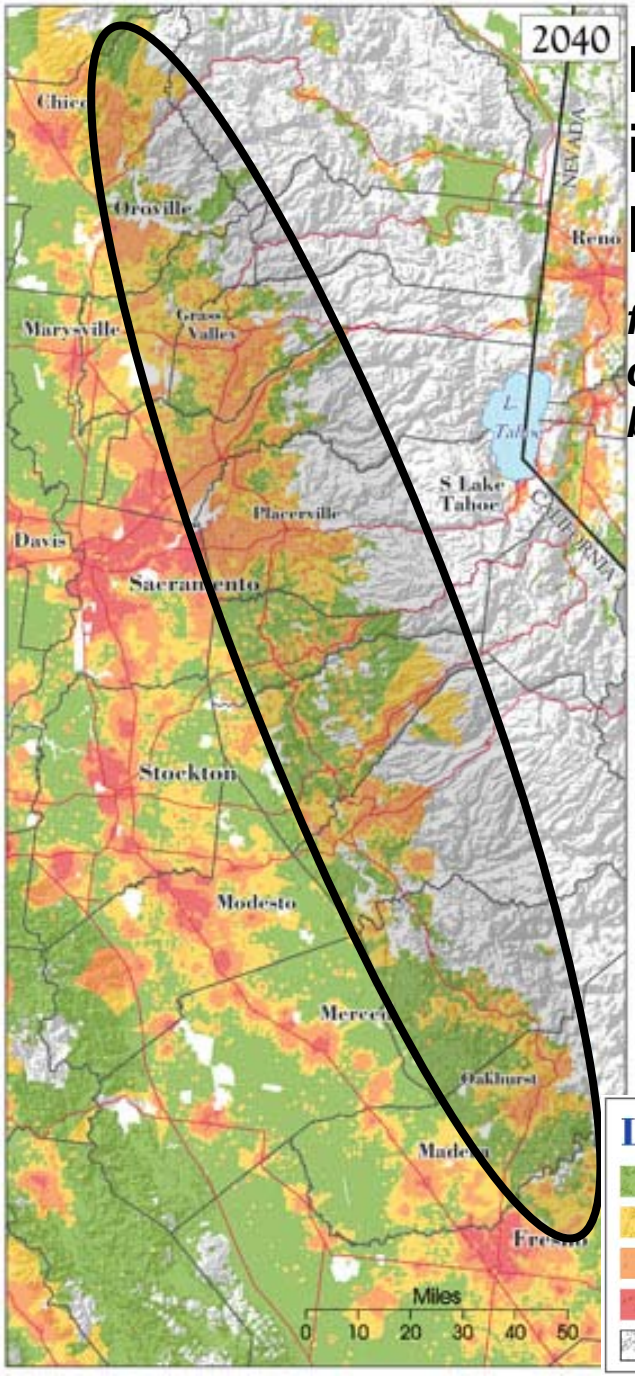
Population and New Development Pressure – Projected for CA between 1990 and 2040


Interregional Transportation Strategic Plan
Projected Population Growth by County with Named Urbanized Areas
High Emphasis Routes
Continuation Through Urbanized Areas
Urbanized Areas
Selected National Parks
Counties by Percent Population Growth,1990 to 2040:*
Less than 100%
100% to 199%
200% or Greater
Redding
Chico
Yuba City
Santa Rosa
Napa
Davis
Vacaville
Fairfield
Sacramento
San Francisco--Oakland
Lodi
Stockton
Antioch--Pittsburg
San Jose
Modesto
Merced
Santa Cruz
Watsonville
Seaside--Monterey
Fresno
Salinas
Visalia
Lancaster--Palmdale
San Luis Obispo
Bakersfield
Santa Maria
Lompoc
Santa Barbara
Oxnard--Ventura
Simi Valley
Los Angeles
Hesperia--Apple Valley
Riverside--San Bernardino
Palm Springs
Indio--Coachella
San Diego
Hemet--San Jacinto
*Source: California Department of Finance
Demographic Research Unit
June 1998
Transportation Planning Program

Exurbanization in the Sierra Foothills

from "New Geographies of the American West" by William Travis





Land Use Categories

- Rural (<1 unit per 40 acres)
- Exurban (1 unit per 10 to 40 acres)
- Low Density Suburban (1 unit per 0.5 to 10 acres)
- Urban/Suburban (>2 units per acre)
- Not Buildable

Sediment Discharges


TSM

Risk Approach

- Three risk categories
- Aimed at sediment transport and receiving water risk of construction activities "normal distribution" assumption (most projects should not be high risk)
- Incentives/requirements linked to risk.

Direct Erosion / Sediment Control Requirements

- Old model used SWPPP as main vehicle
- New approach to use Rain Event Action Plan (REAP) as primary tool (SWPPP becomes more a master document/library)
- Requirements based on risk
- Prevention and planning incentives

Performance Measurement for Storm Water Program

Possible Measures

MS4s monitor receiving water outcomes

MS4s measure pollution prevention

MS4s generate new financial mechanisms

Dischargers monitor effluent quality

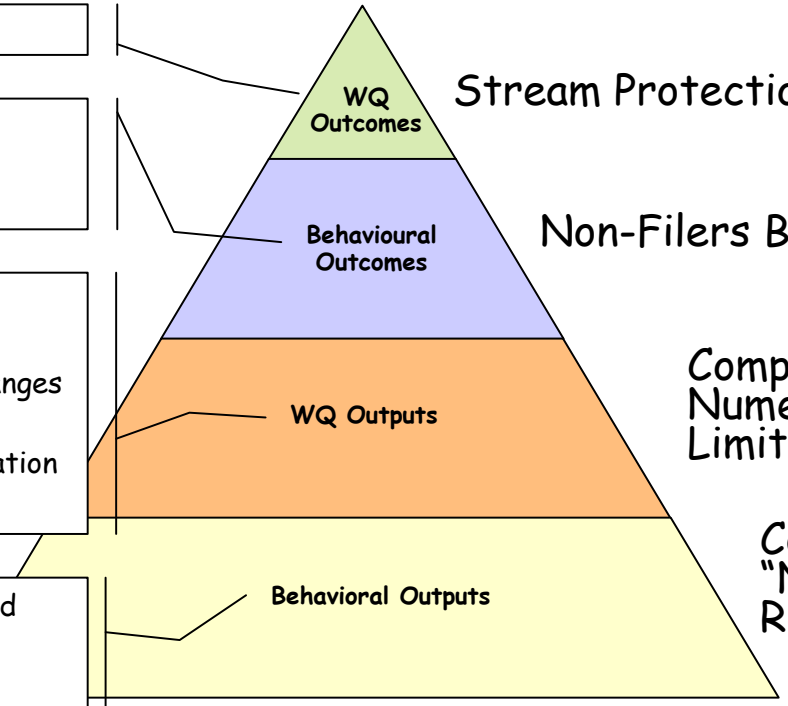
Dischargers monitor hydromodification changes

Water Boards to compile and share information with all (e.g., CIWQS, SWAMP, etc.)

MS4s and Water Boards conduct and record inspections / audits

MS4s and WBs record violations

Desired Outcomes



Stream Protection

Non-Filers Become Filers

Compliance w/ Numeric Effluent Limits

Compliance w/ "Narrative" Requirements

Program "Performance" Elements

- Certification and training expectations
- Effluent monitoring = feedback for site amd program
- Receiving water monitoring = feedback for "water quality outcome" goals/objectives

Traditional Role of Monitoring in NPDES Construction Permits

- to determine discharger compliance with effluent limitations
- to determine discharger compliance with receiving water standards; and
- to inform the community regarding overall permit and program effectiveness

Performance Measurement for Storm Water Program (cont'd)

In order to become performance based, we need to:

- evaluate site-specific performance (feedback for site "operators");
- determining compliance with permit requirements;

Performance Measurement for Storm Water Program (cont'd)

- characterize construction site effluent, regionally and statewide; and

- characterize the relationship between construction site runoff and receiving water impacts (or beneficial use support).

Performance Measurement for Storm Water Program (cont'd)

- Bottom line: we need good data to move the program forward

- We'll need to rely on site operators, monitoring coalitions, contracted monitoring efforts to gather the data necessary to measure performance

Performance Measurement for Storm Water Program (cont'd)

- FYI-If we don't do it, USEPA Effluent Limit Guidelines (ELGs) may take precedence
- USEPA ordered to promulgate Construction and Development ELGs
  - Proposed rule-12/08
  - Final rule-12/09

Evaluating Site-Specific Performance

- Propose using Action Levels and Numeric Effluent Limits

- Modified Universal Soil Loss Equation (MUSLE) used to calculate site-specific turbidity Action Levels

Evaluating Site-Specific Performance (cont'd)

- Action Levels are less than Numeric Effluent Limits

- Numeric Effluent Limits will represent the point at which there is consensus that the site is not doing what it should to comply

Evaluating Site-Specific Performance (cont'd)

- Discharger can and should evaluate site performance
- It's up to the State Water Board to provide tools to do this

Determining Permit Compliance

- Site operators, regulators or third parties can monitor for permit compliance

- Compliance dictated by exceedances of Numeric Effluent Limits

Characterizing Effluent from Construction Sites (Regionally and Statewide)

- Need to fund major data-gathering efforts

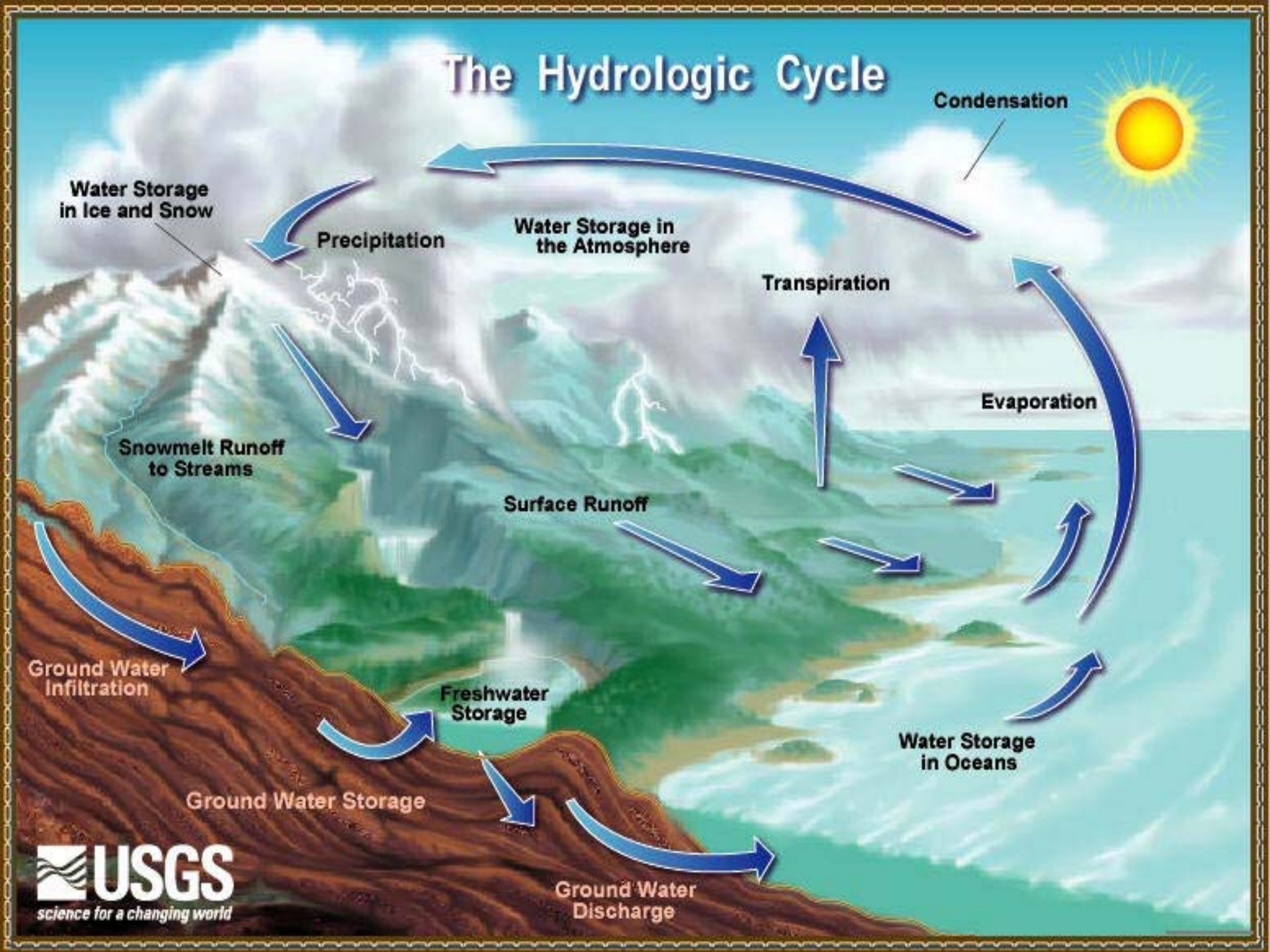
- Need to bring together monitoring coalitions, regional monitoring efforts, etc.

Linking Construction Site Runoff to Receiving Water Quality and Beneficial Uses

- Crucial if we are to reach the "top of the pyramid"

- Need to bring together monitoring coalitions, regional monitoring efforts, etc.

Post-Construction Impacts


The Hydrologic Cycle
Condensation
Water Storage in Ice and Snow
Precipitation
Water Storage in the Atmosphere
Transpiration
Evaporation
Snowmelt Runoff to Streams
Surface Runoff
Ground Water Infiltration
Freshwater Storage
Water Storage in Oceans
Ground Water Storage
Ground Water Discharge
USGS
science for a changing world

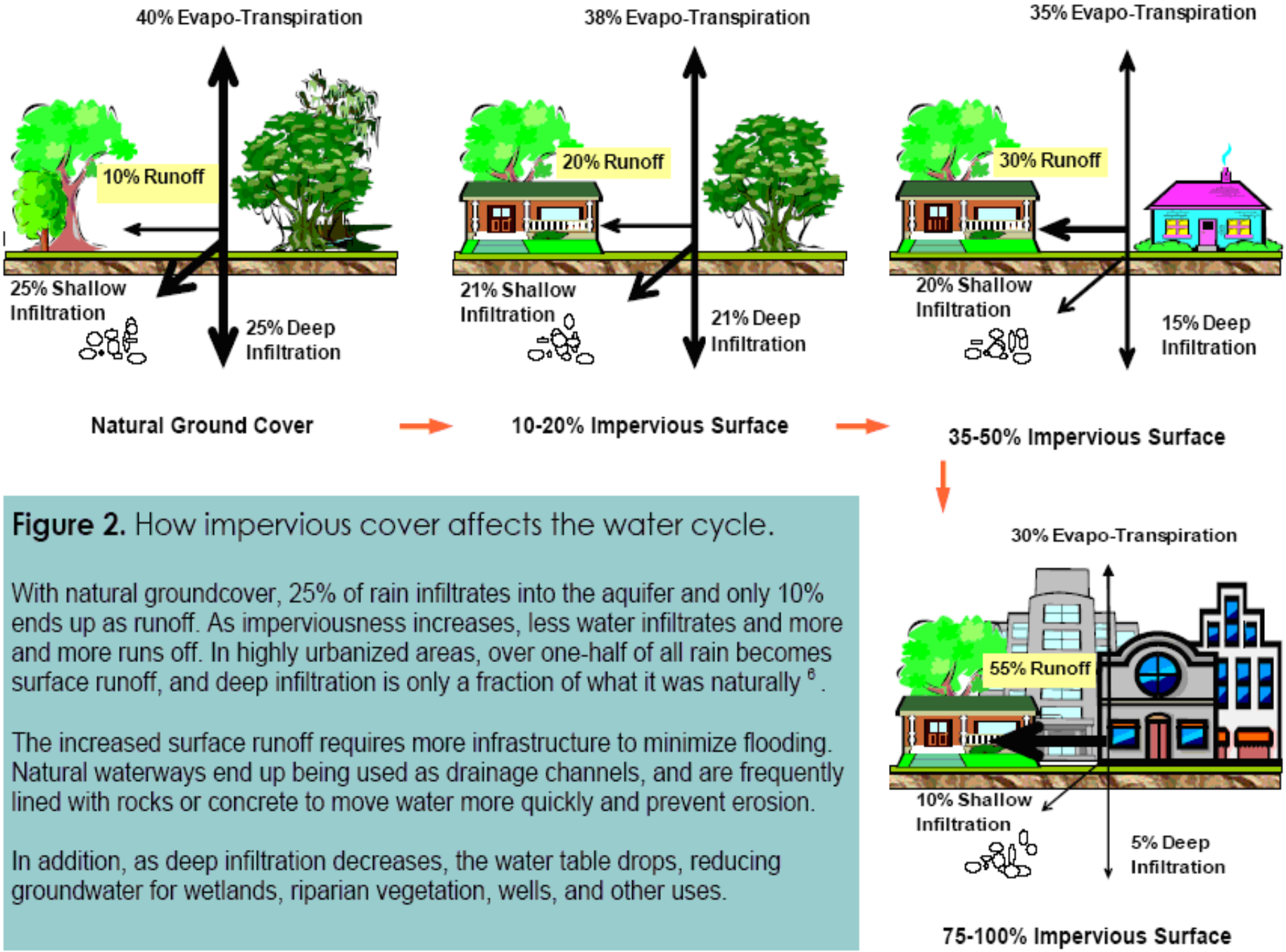


Figure 2. How impervious cover affects the water cycle.

With natural groundcover, 25% of rain infiltrates into the aquifer and only 10% ends up as runoff. As imperviousness increases, less water infiltrates and more and more runs off. In highly urbanized areas, over one-half of all rain becomes surface runoff, and deep infiltration is only a fraction of what it was naturally [6].

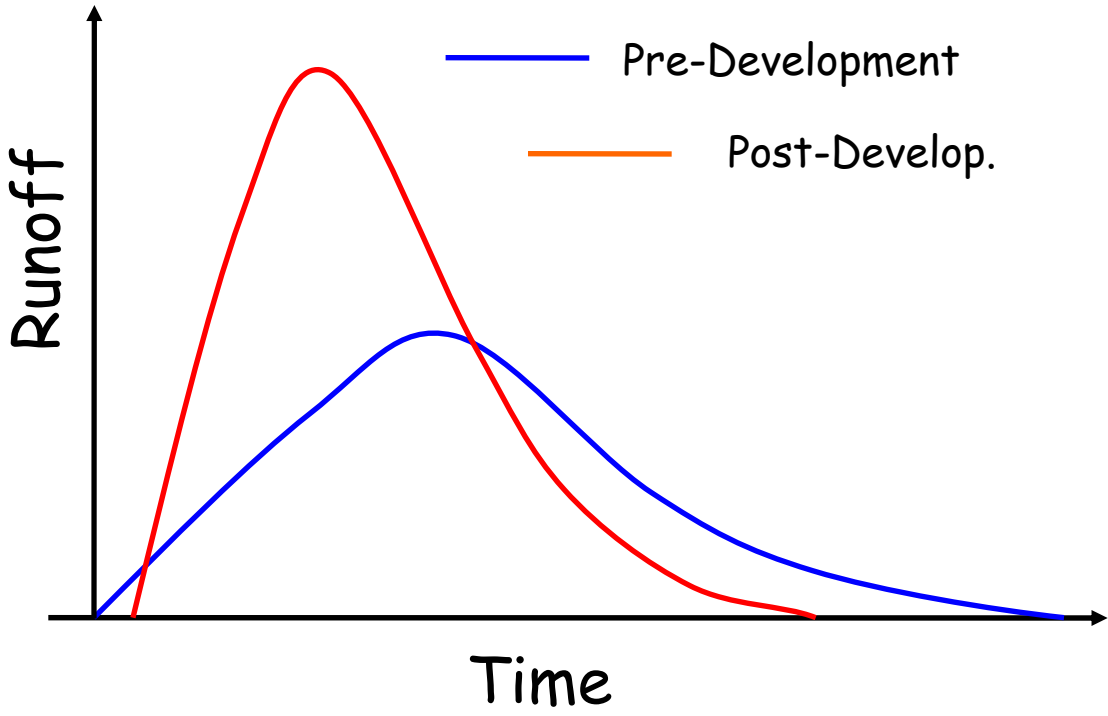
The increased surface runoff requires more infrastructure to minimize flooding. Natural waterways end up being used as drainage channels, and are frequently lined with rocks or concrete to move water more quickly and prevent erosion.

In addition, as deep infiltration decreases, the water table drops, reducing groundwater for wetlands, riparian vegetation, wells, and other uses.

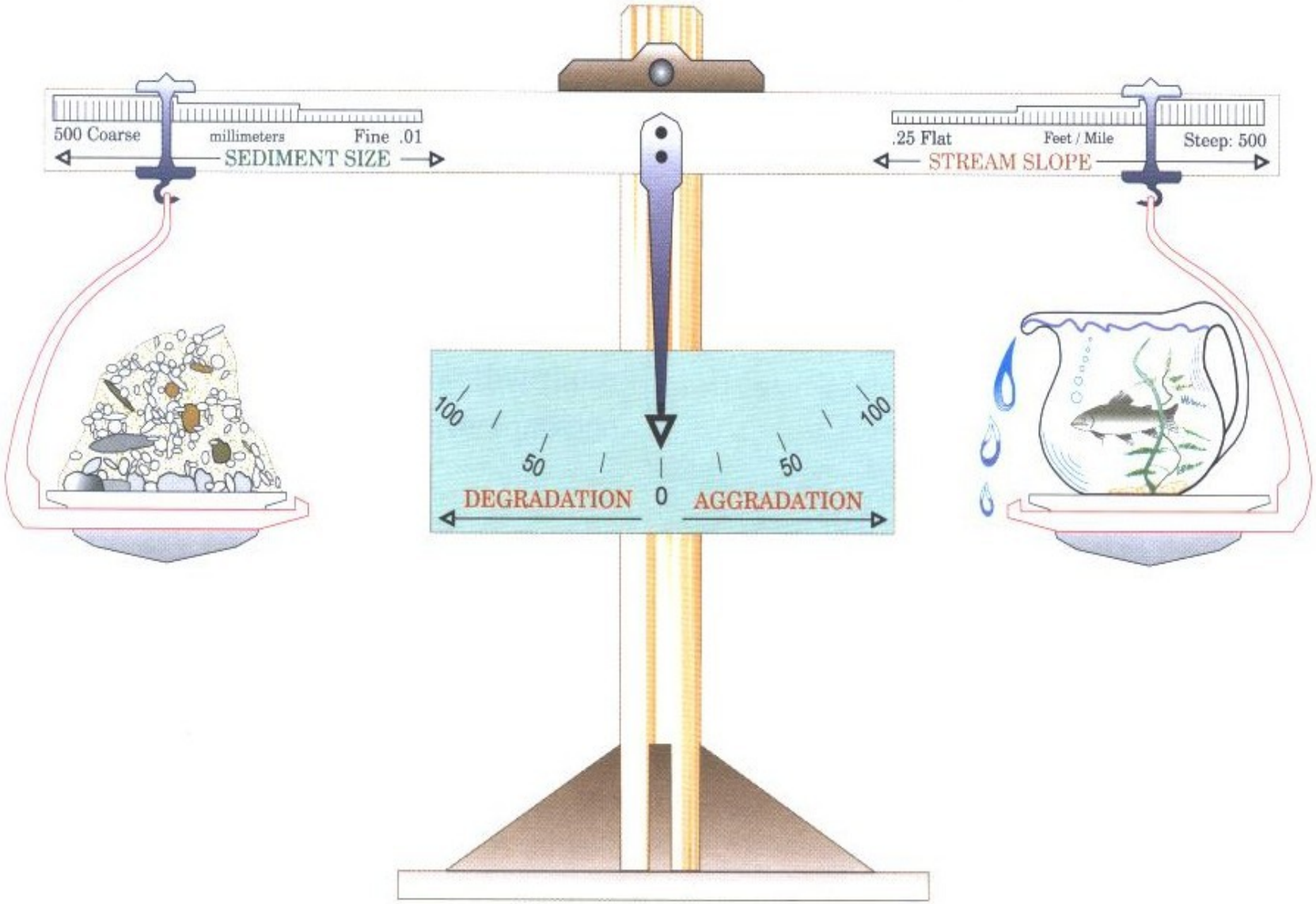
Hydrologic Changes

Urbanization tends to increase storm water runoff:

- peak flows
- volume
- frequency

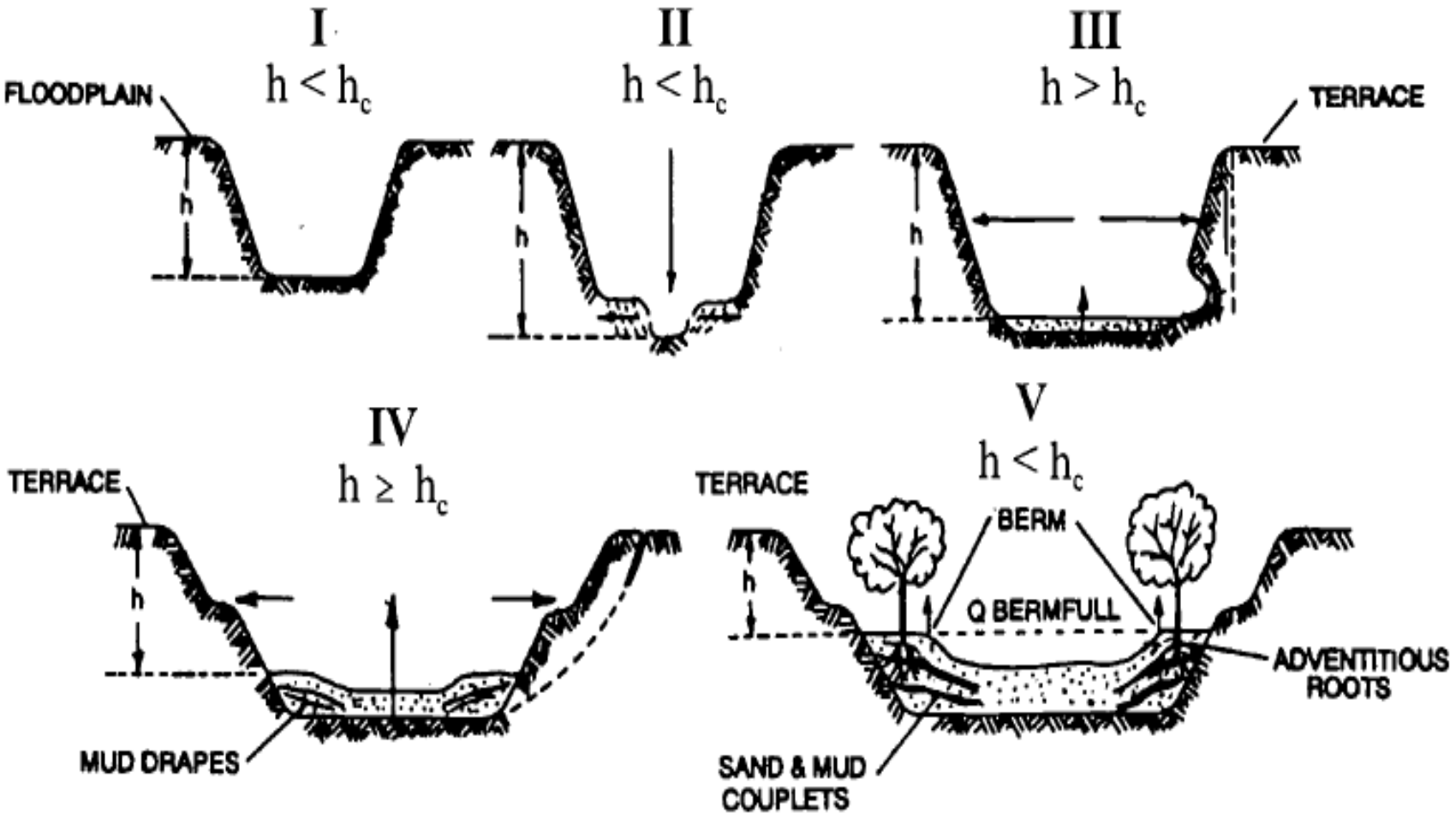


From Haltiner (2006)



After Lane (1955) as cited in Rosgen (1996)

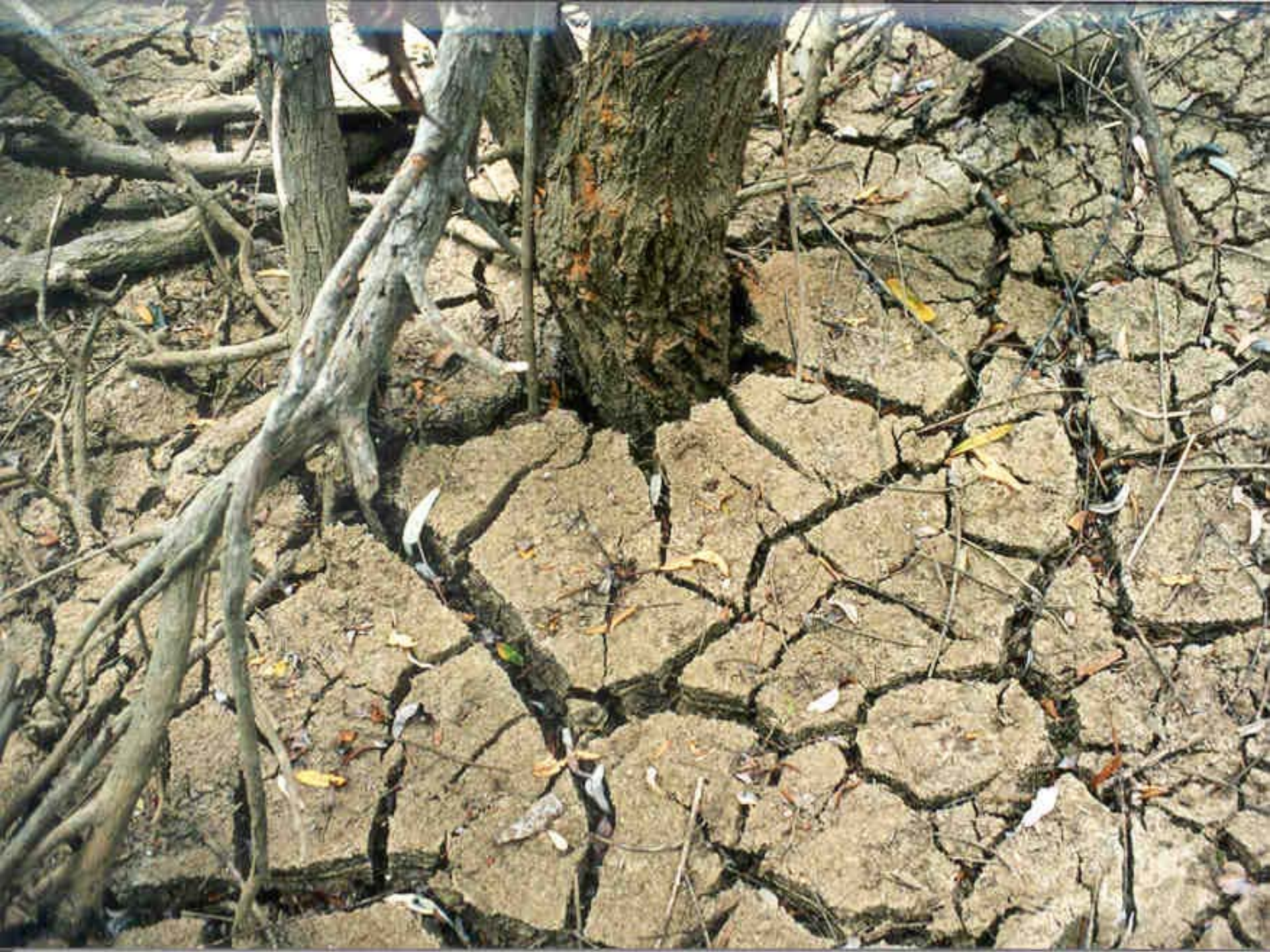
Channel Changes Associated with Urbanization



Post-Construction Impacts

Sources of Impairment (USEPA 2006)

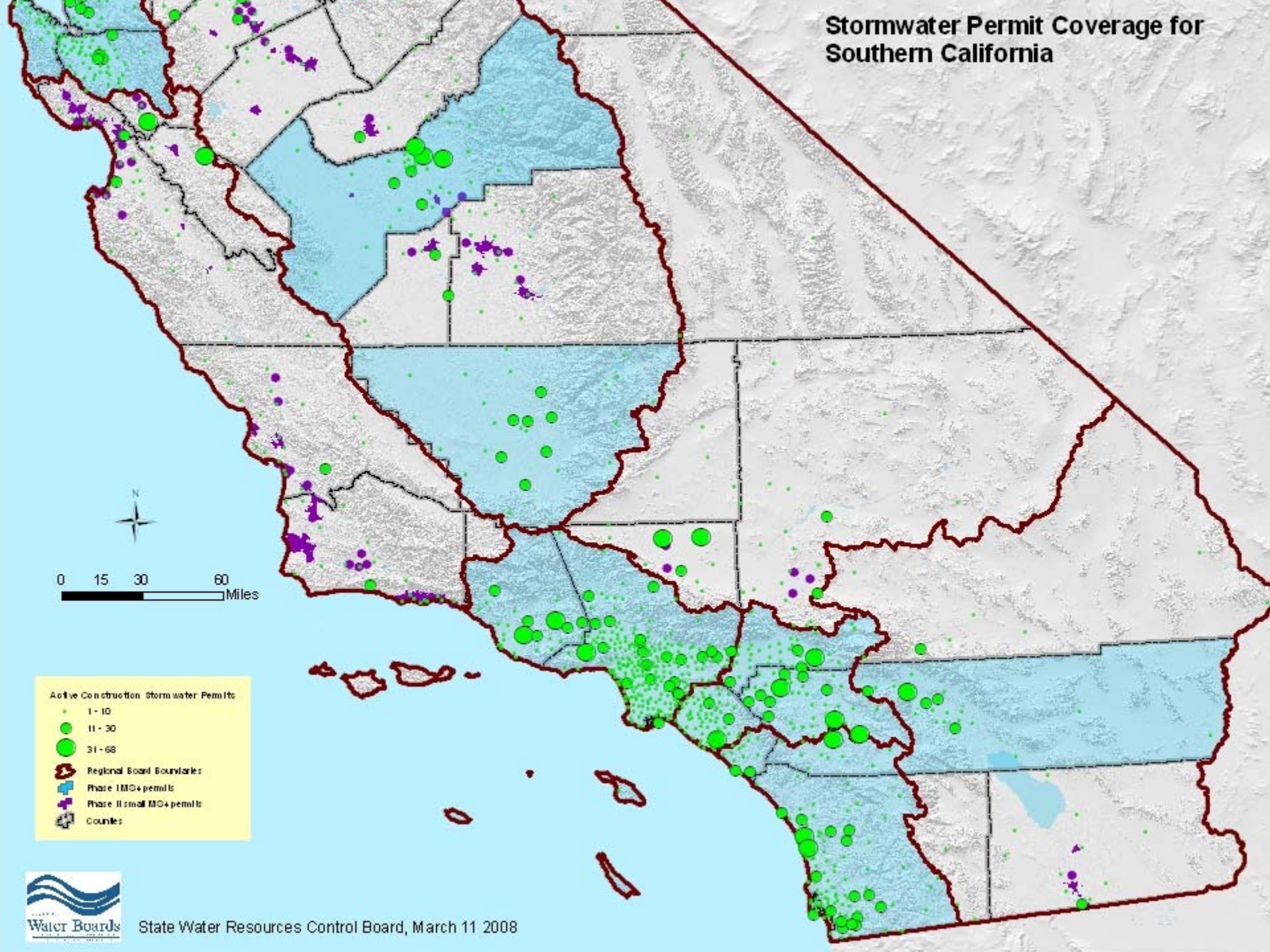
	Rivers and Streams	Lakes, Ponds, and Reservoirs	Estuaries
Sources[b]	Agriculture (48%)[a]	Agriculture (41%)	Municipal Point Sources (37%)
	Hydrologic Modification (20%)[c]	**Hydrologic Modification (18%)**	Urban Runoff/Storm Sewers (32%)
	Habitat Modification (14%)[d]	Urban Runoff/Storm Sewers (18%)	Industrial Discharges (26%)
	Urban Runoff /Storm Sewers (13%)	Nonpoint Sources (14%)	Atmospheric Deposition (23%)
	Forestry (10%)	Atmospheric Deposition (13%)	Agriculture (18%)
	Municipal Point Sources (10%)	Municipal Point Sources (12%)	**Hydrologic Modification (14%)**
	Resource Extraction (10%)	Land Disposal (10%)	Resource Extraction (12%)

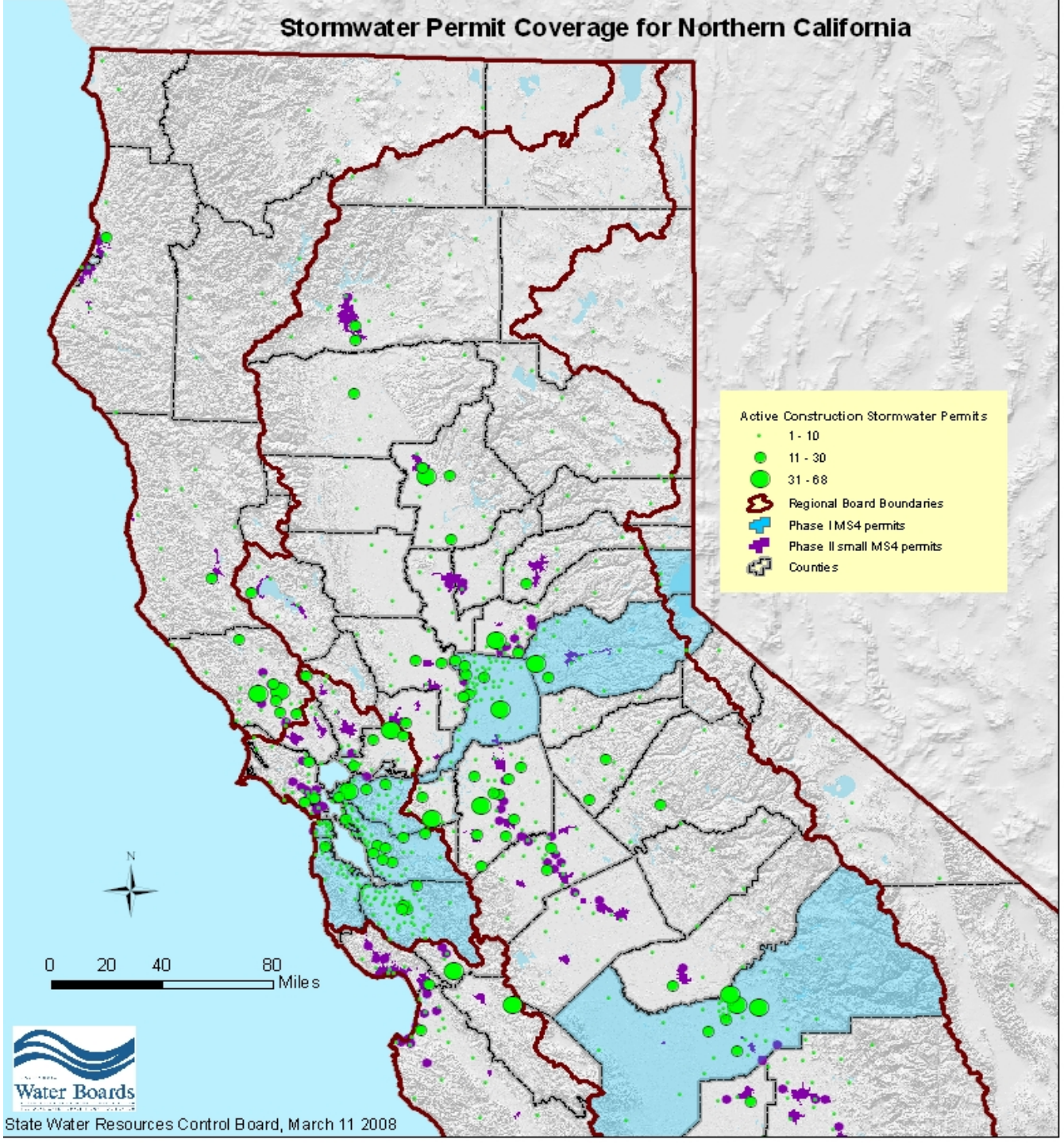



1950's – Sacramento Area


2000's – Sacramento Area

MS4 Coverage


Stormwater Permit Coverage for Southern California
N
0 15 30 60
Miles
Active Construction Stormwater Permits
1 - 10
11 - 30
31 - 68
Regional Board Boundaries
Phase I MS4 permits
Phase II small MS4 permits
Counties
Water Boards
State Water Resources Control Board, March 11 2008


Stormwater Permit Coverage for Northern California
Active Construction Stormwater Permits
1 - 10
11 - 30
31 - 68
Regional Board Boundaries
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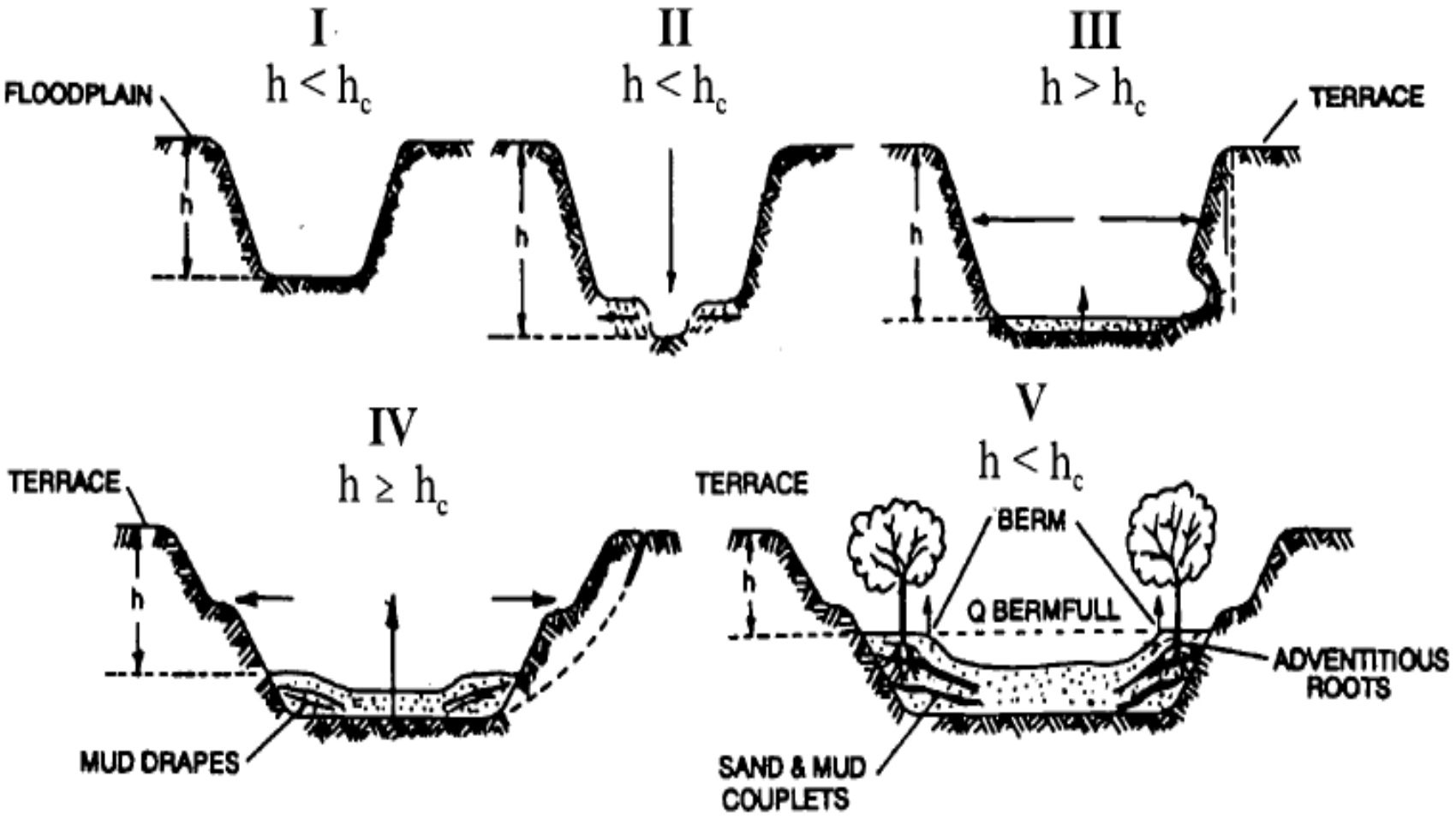
Phase II small MS4 permits
Counties
N
0 20 40 80
Miles
Water Boards
State Water Resources Control Board, March 11 2008

Channel Changes Associated with Urbanization



Post-Construction Standards

- Design to mimic pre-development water balance
- Preserve existing time of concentration
- Protect channels

Post Construction Standards

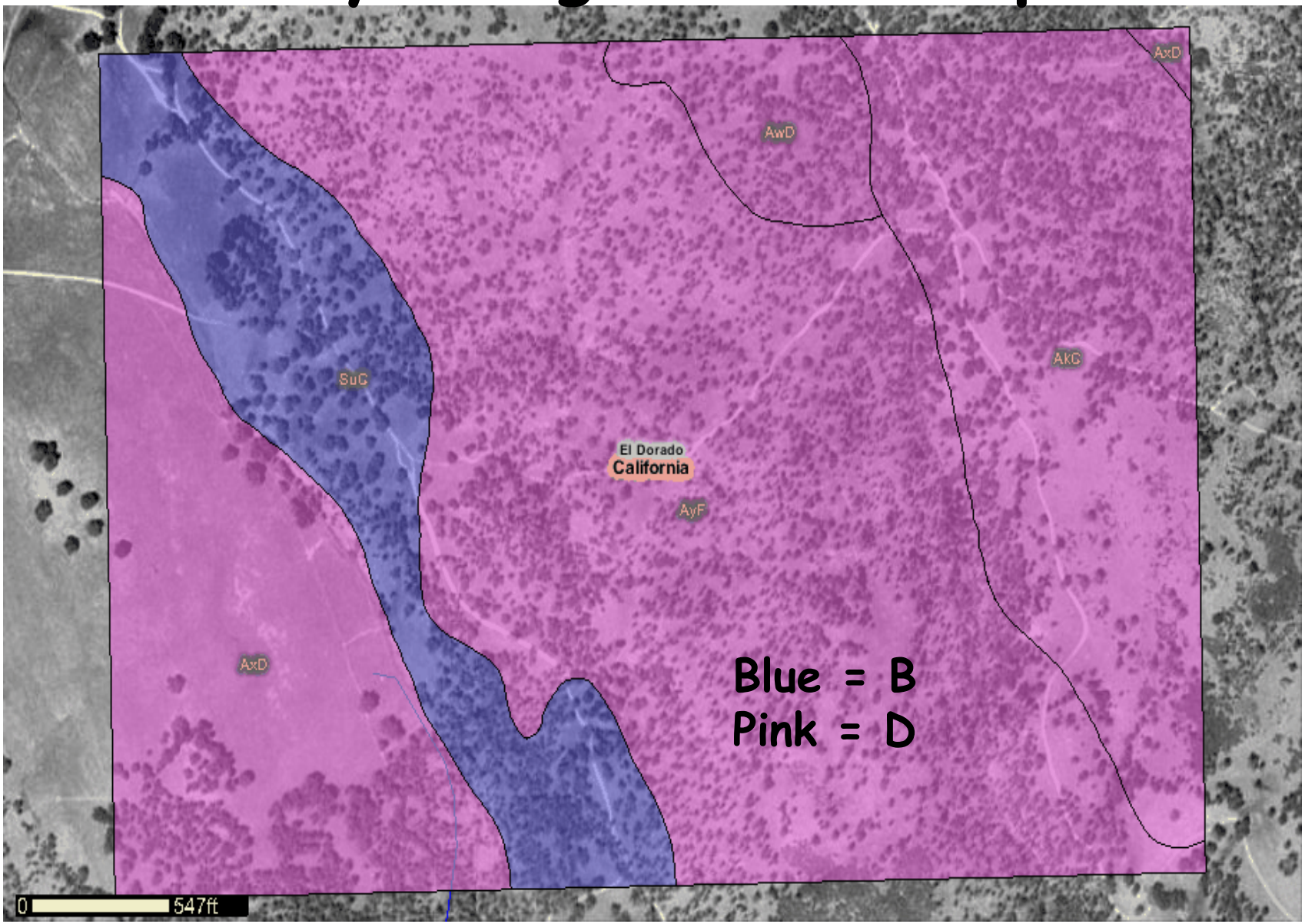
Pre = Post Development Water Balance

- Based on NRCS Hydrologic Soil Groups
- Hydrologic Soil Groups based on soil texture, runoff potential, and water transmission rate

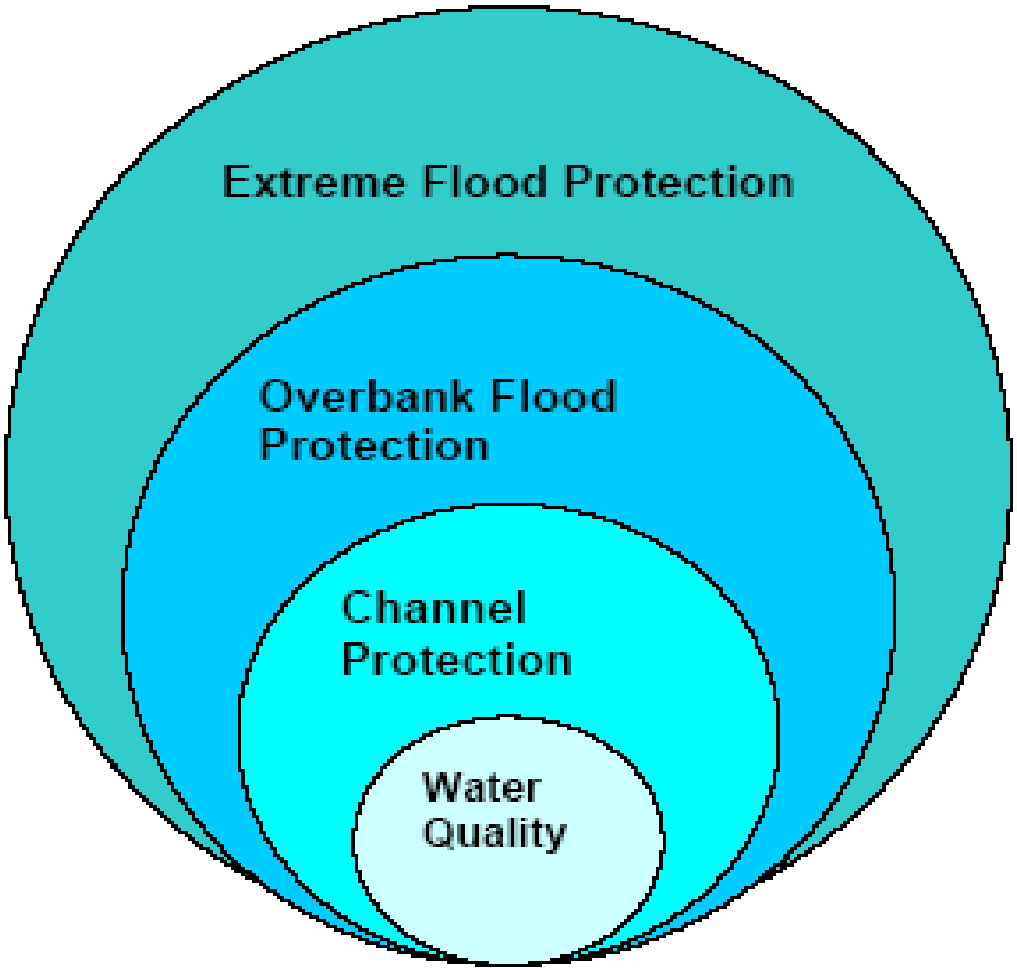
NRCS Hydrologic Soil Groups

HSG	Example Soil Texture	Runoff Potential	Water Transmission Rate
A	Sand	Low	High
B	Sandy loam	Moderately Low	Moderate
C	Clay loam	Moderately High	Low
D	Clay	High	Very Low

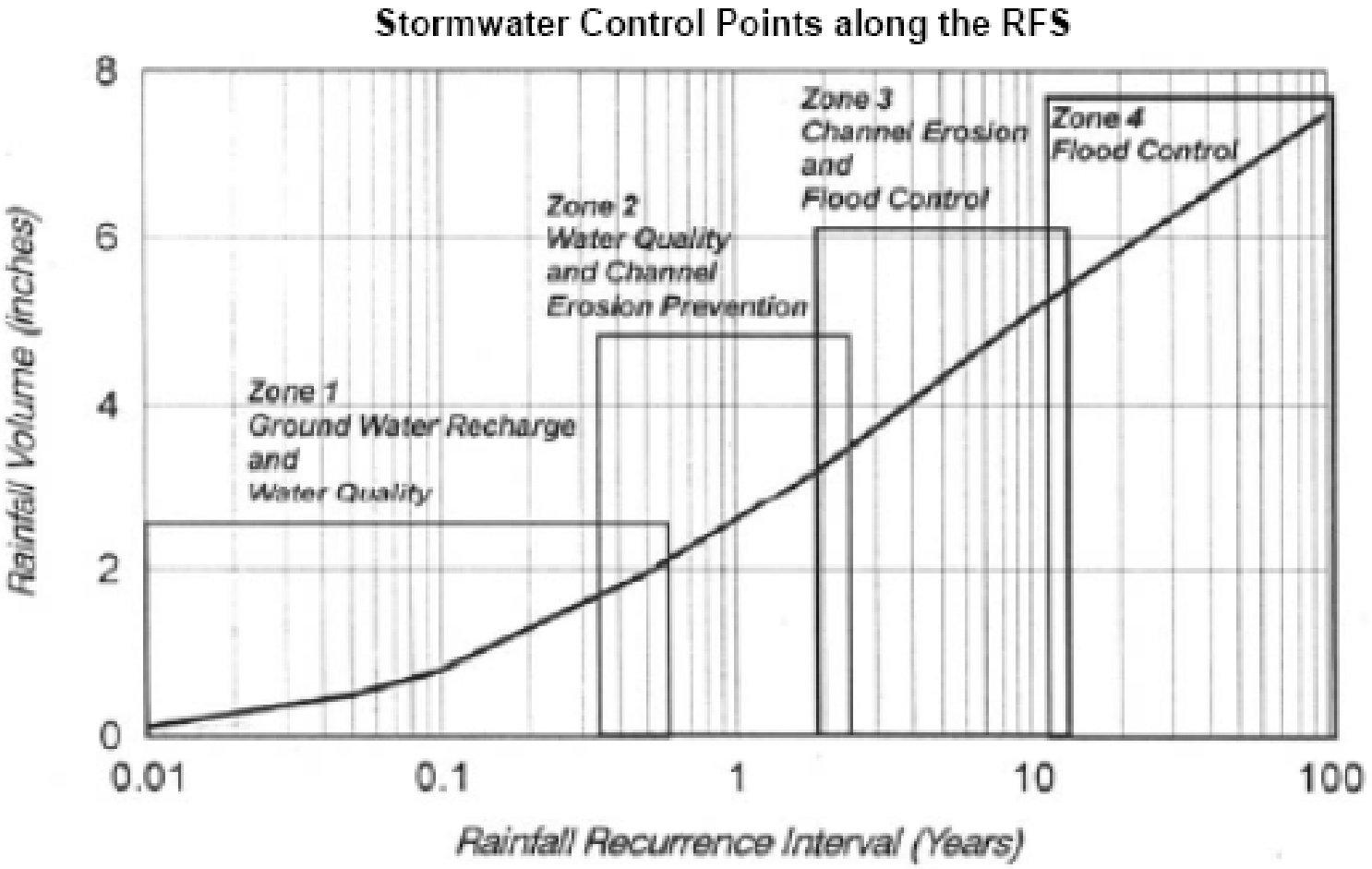
Hydrologic Soil Groups



Source: http://websoilsurvey.nrcs.usda.gov/app/



From Georgia Stormwater Manual



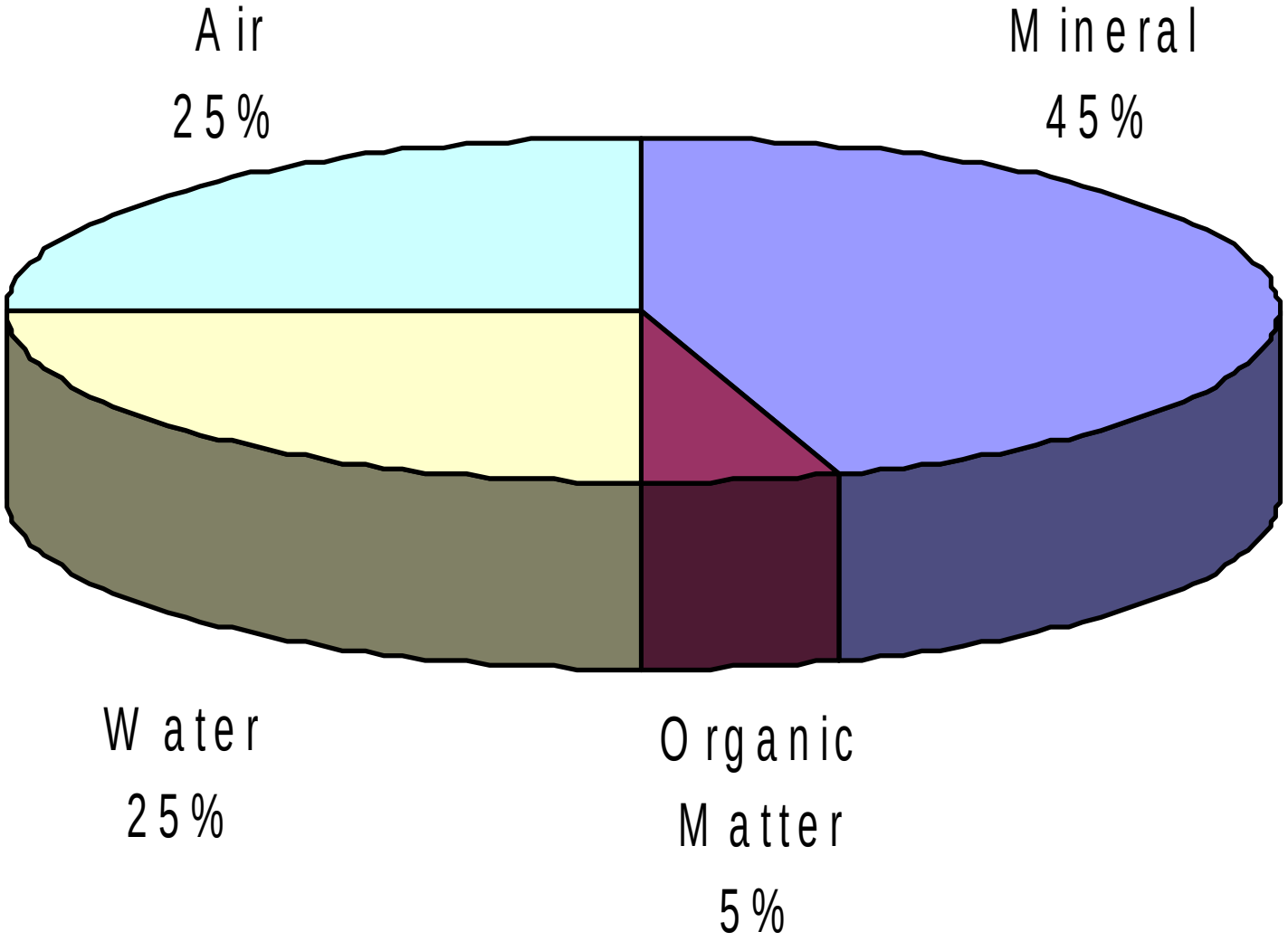
From Georgia Stormwater Manual

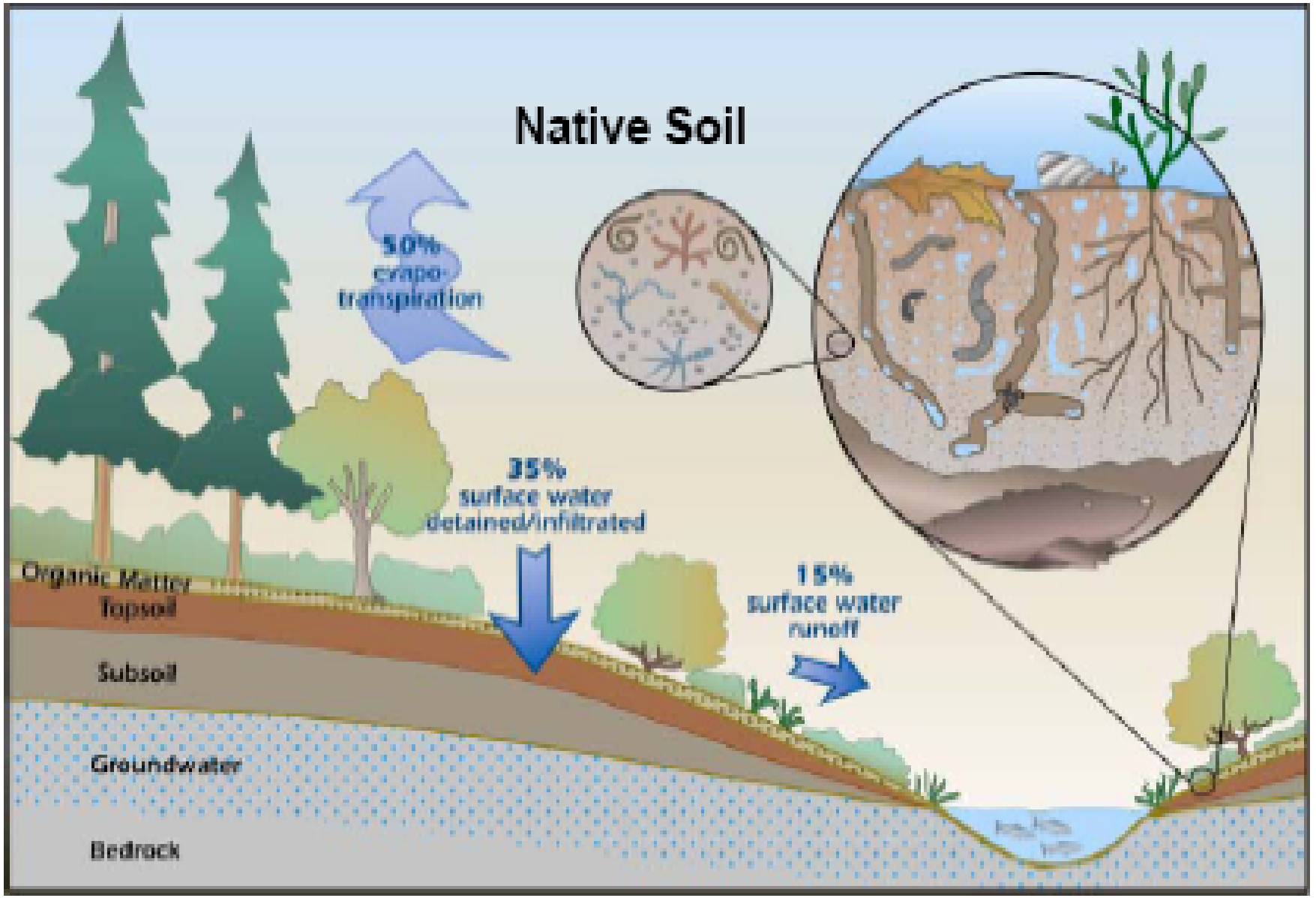
Post-Construction Solutions

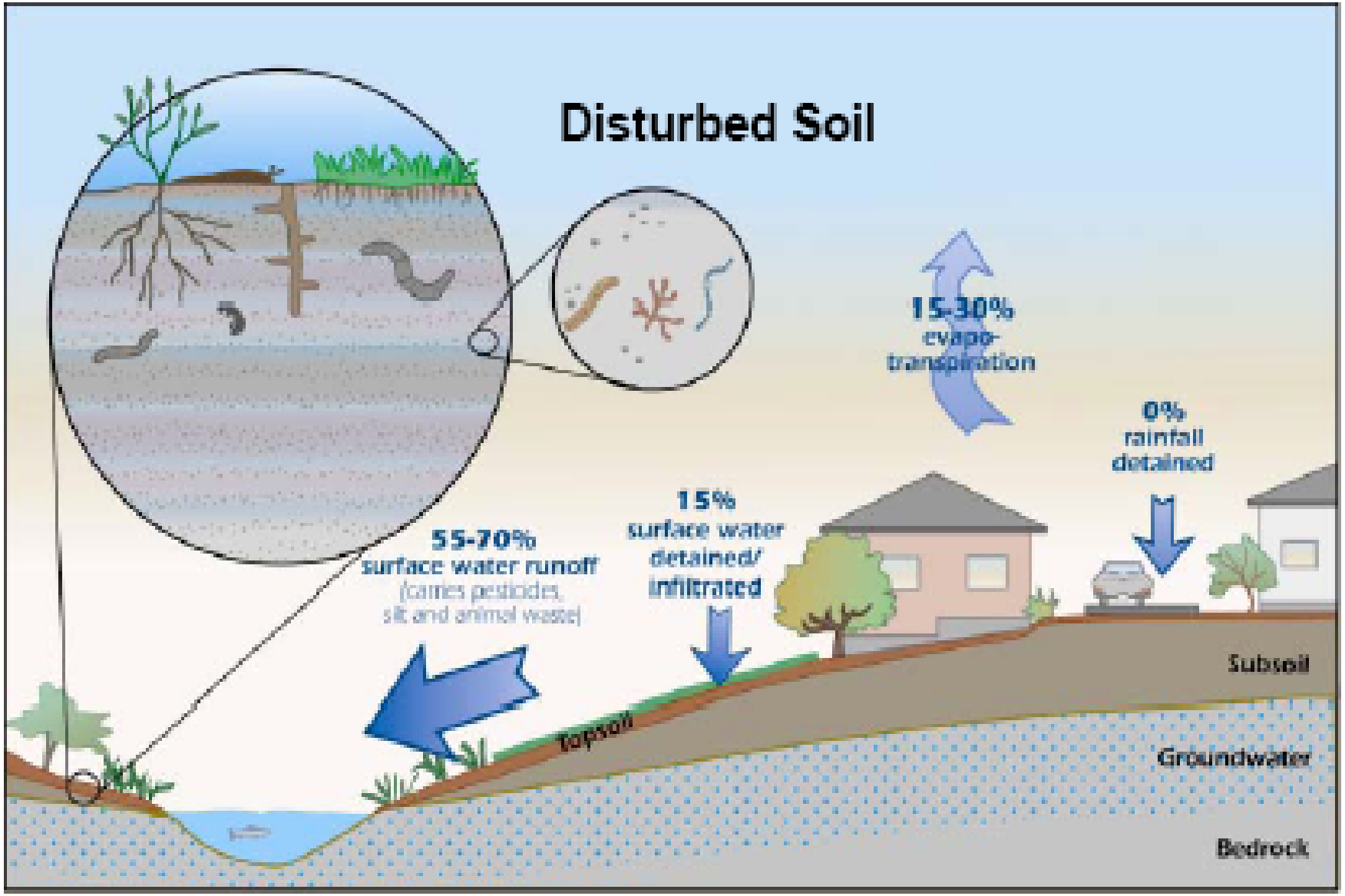
Ways to mimic pre-development water balance and T_c

- Soil quality improvement (porosity)
- Native and drought tolerant vegetation
- Trees
- Permeable pavement
- Riparian buffers
- A general reduction of connected, impervious surfaces in runoff pathways
- Bioretention
- Disconnected downspouts/rain chains/rain barrels

Ideal Soil Structure for Plant Growth




Native Soil
50% evapo-transpiration
35% surface water detained/infiltrated
15% surface water runoff
Organic Matter
Topsoil
Subsoil
Groundwater
Bedrock


Disturbed Soil
15-30%
evapo-
transpiration
0%
rainfall
detained
15%
surface water
detained/
infiltrated
55-70%
surface water runoff
(carries pesticides,
silt and animal waste)
Subsoil
Topsoil
Groundwater
Bedrock

Rain chains and mulch combo

Sacramento

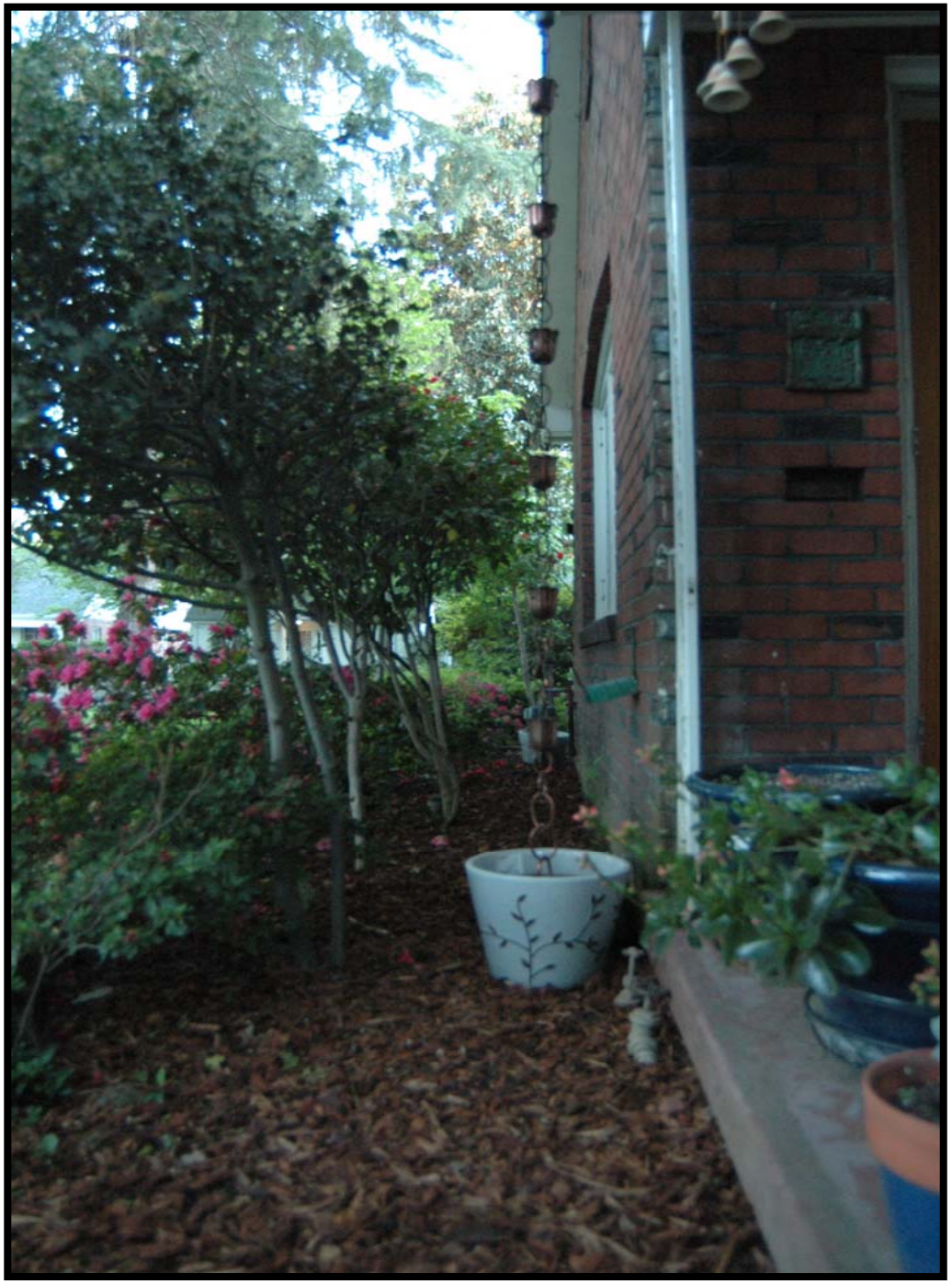


PHOTO: RIVERSIDES STEWARDSHIP ALLIANCE

Manzanita Village

University of California Santa Barbara

Questions?

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