Watershed Friendly Design:

Planning for the Future of California as if Water Mattered

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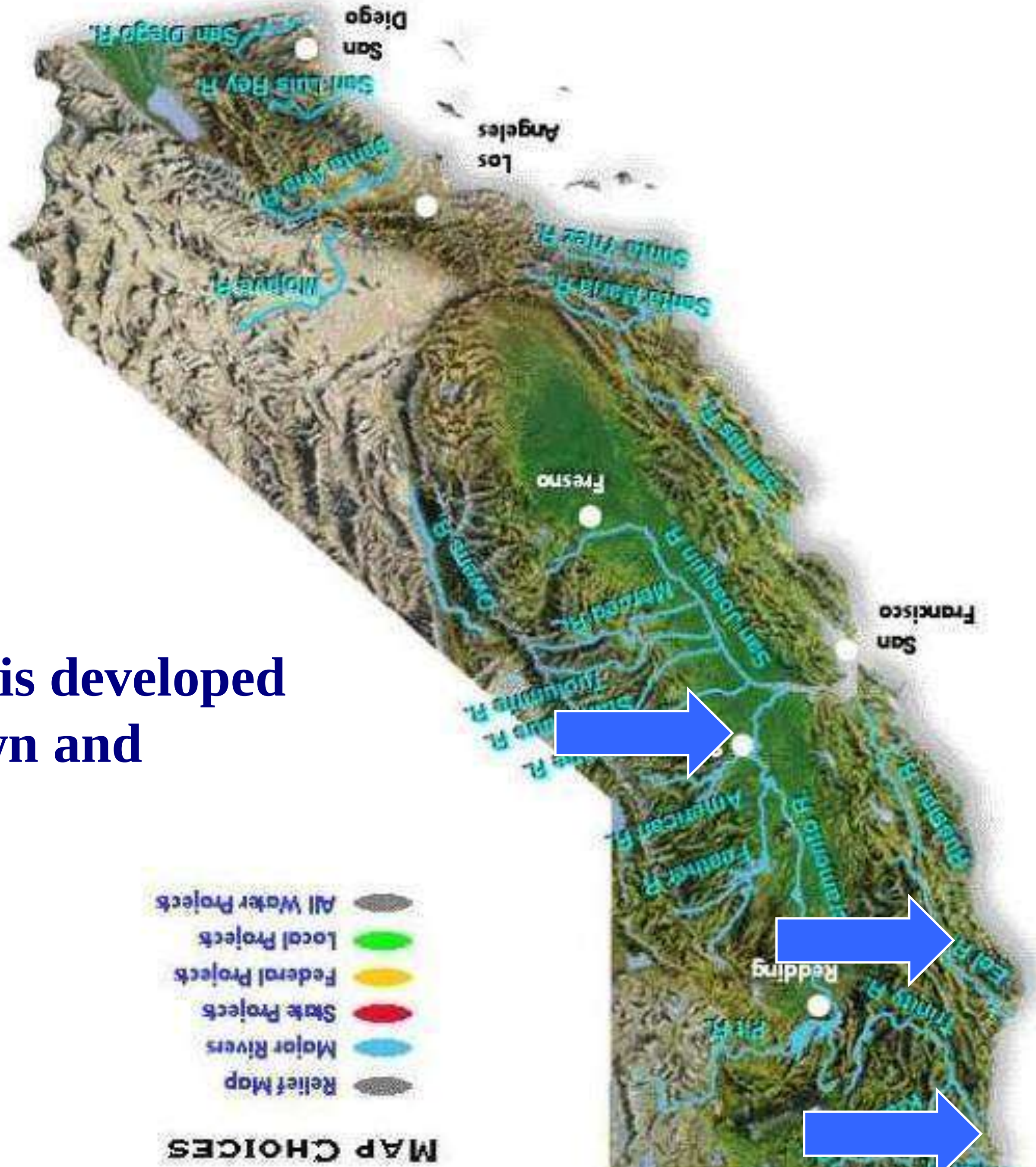
Adam Smith
The Wealth of Nations

"How is it that water, which is so very useful that life is impossible without it, has such a low price- while diamonds, which are quite unnecessary, have such a high price?"

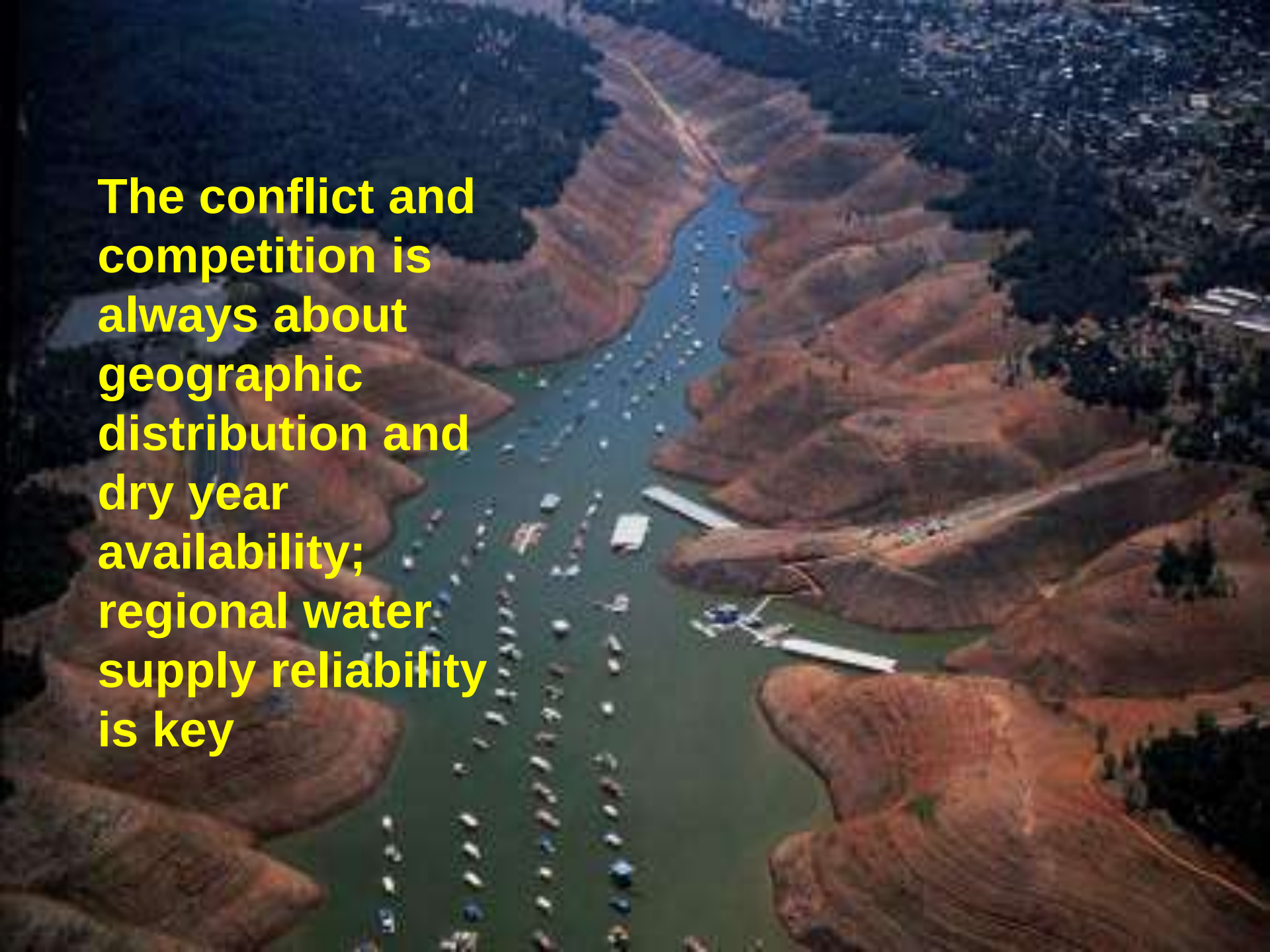
Key Topics

- Why do we care?
- What are we trying to achieve?
- How do we get there?

Why do we care?
Not enough water in the "right" places at the "right" times

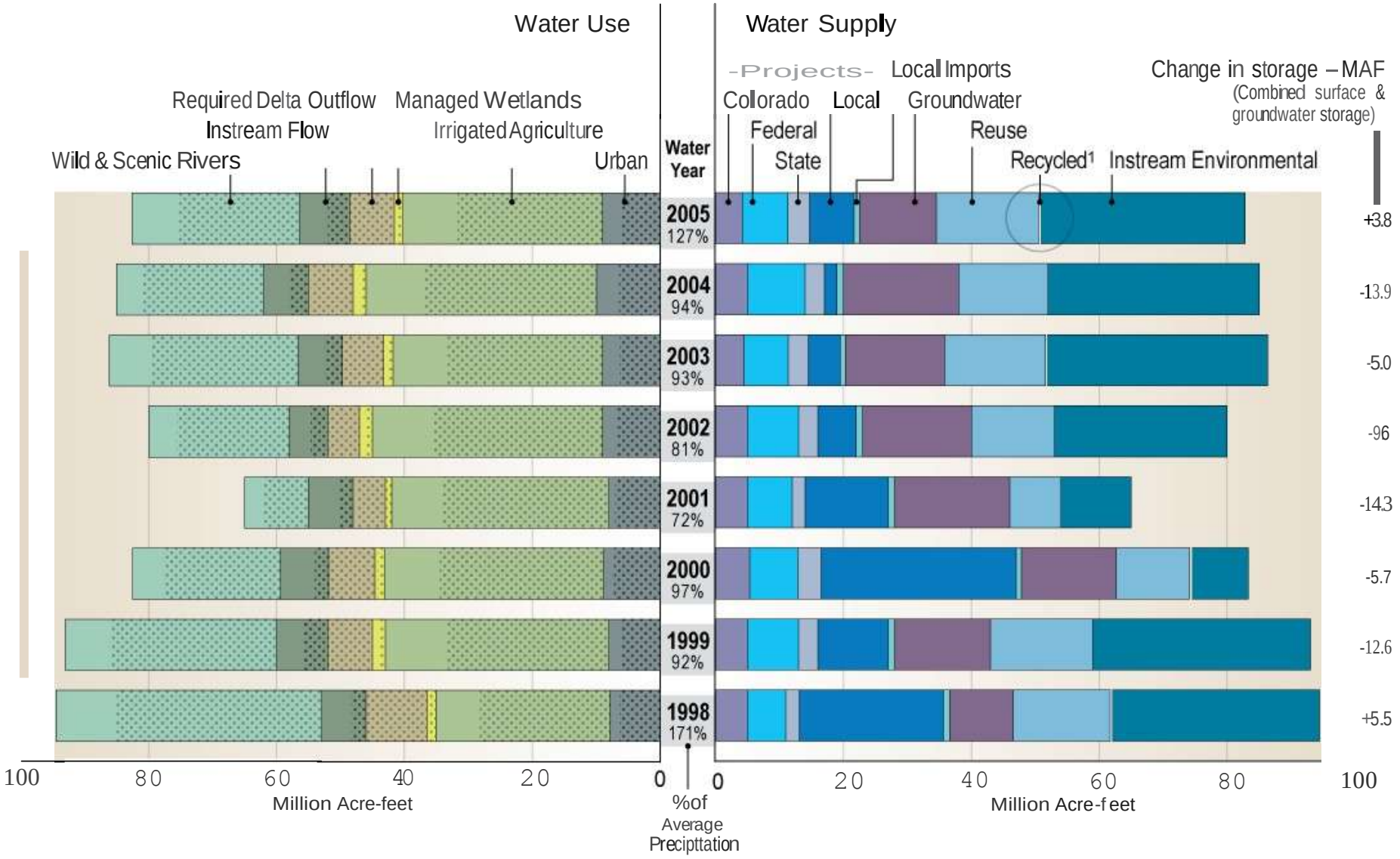


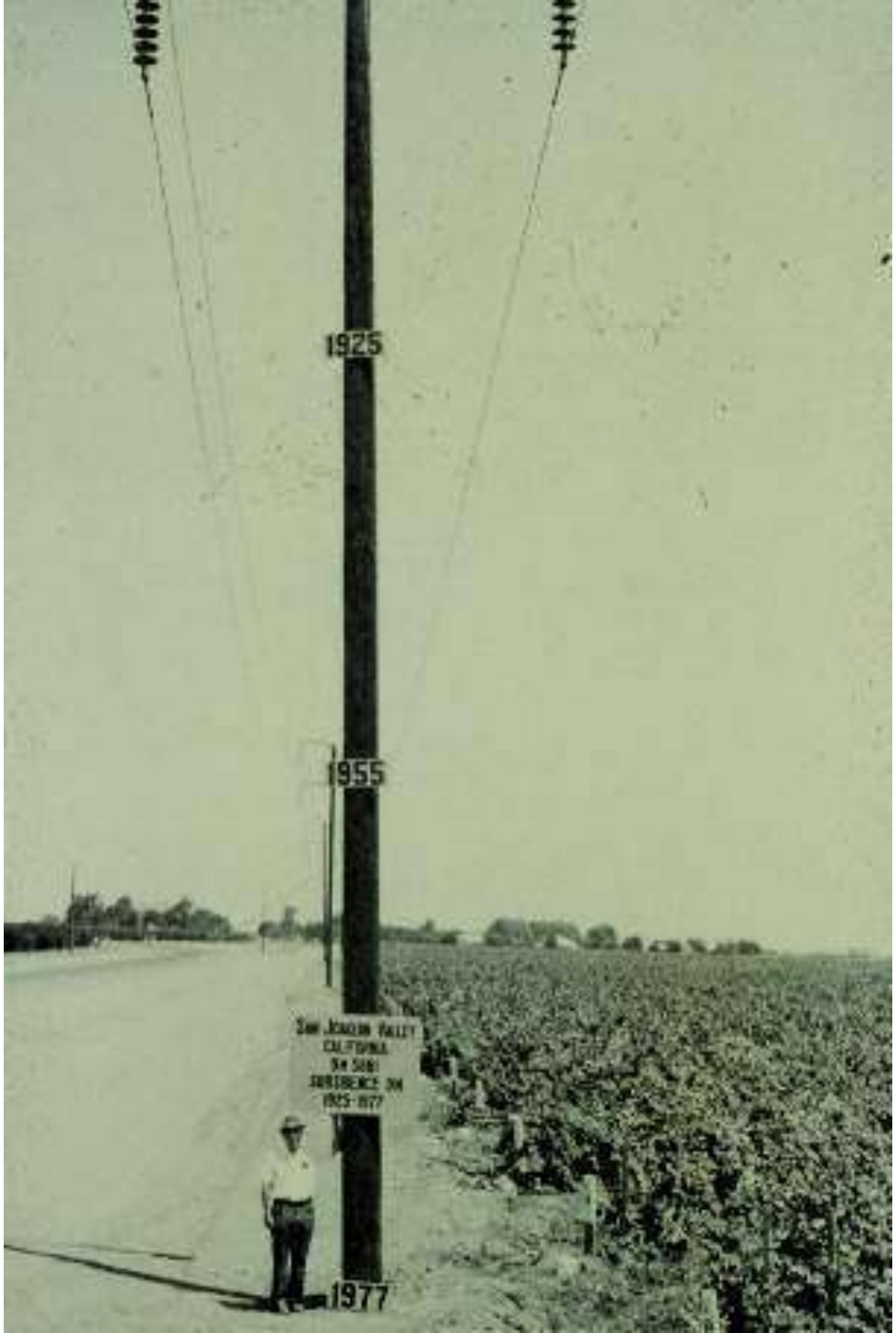
California is developed upside down and backwards


The conflict and competition is always about geographic distribution and dry year availability; regional water supply reliability is key

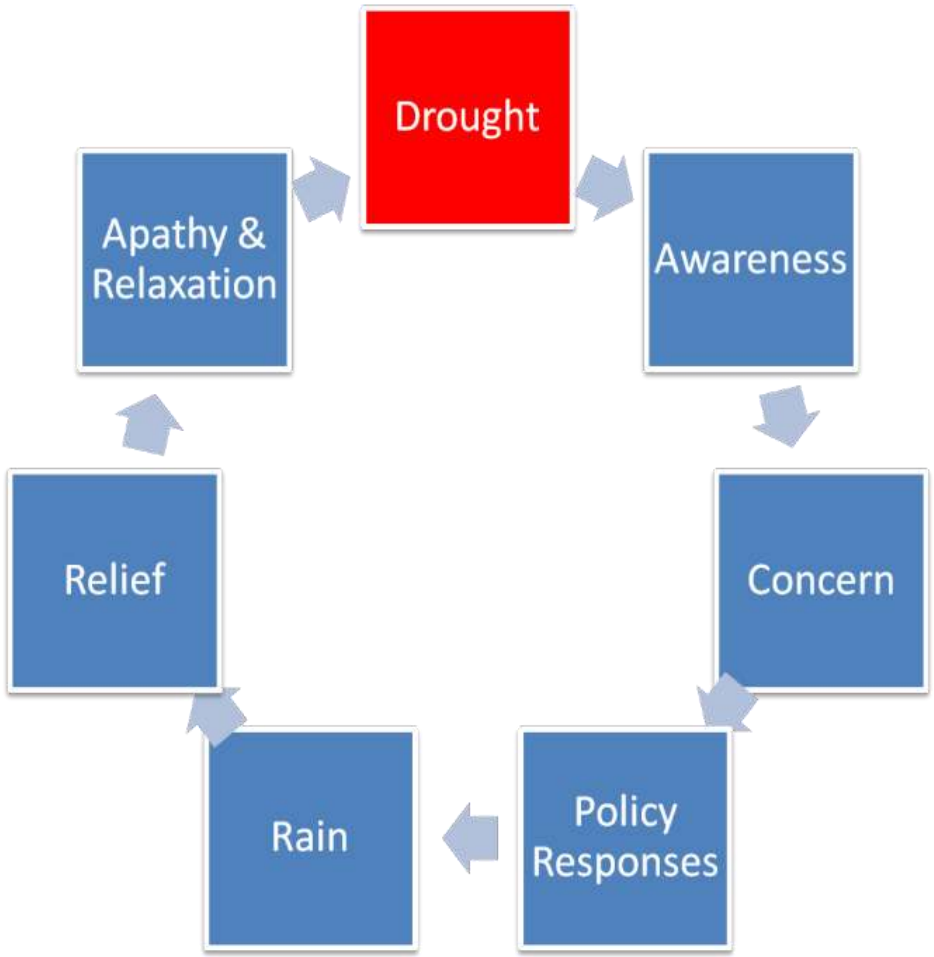
California Water Balance by Year

A lot of information is presented in this figure including statewide water use, source of supply, annual change in storage, and percentage of average precipitation

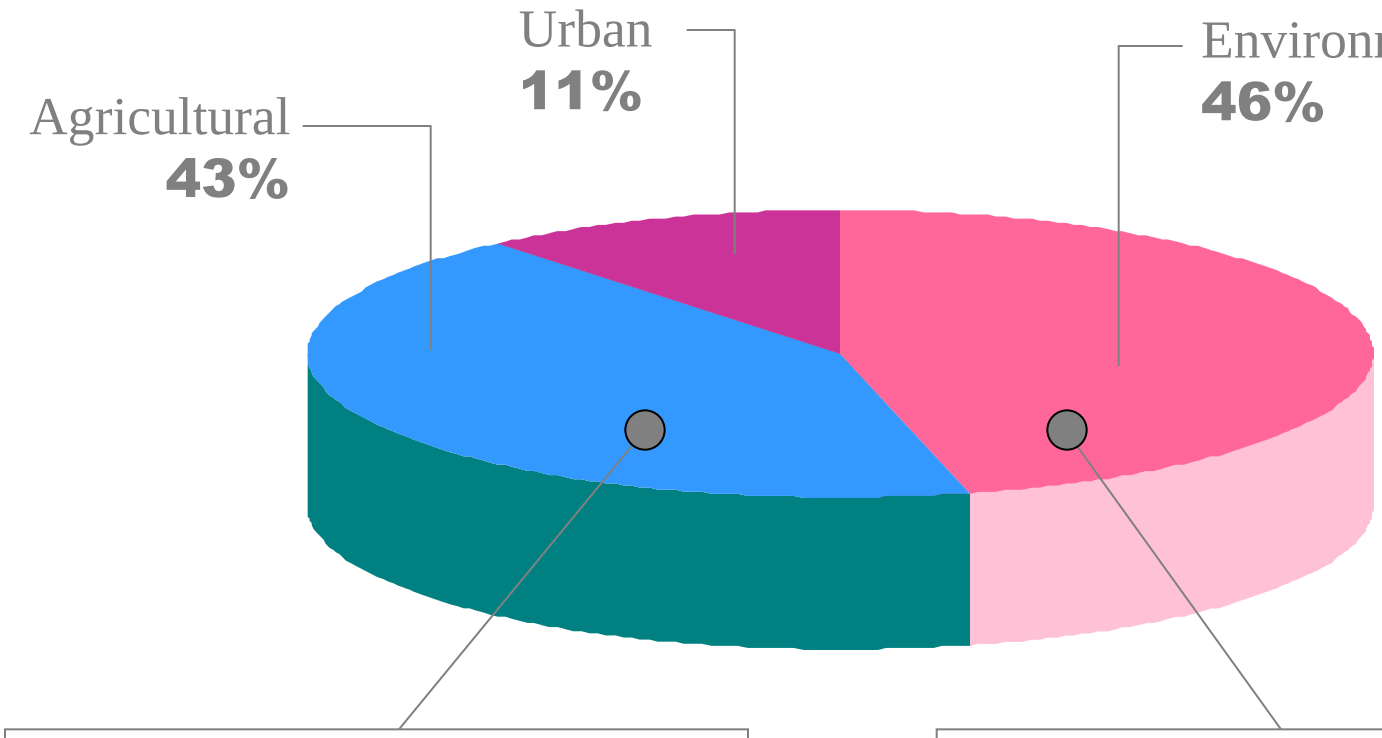



1925
1955
1977

Hydro – Illogic Cycle



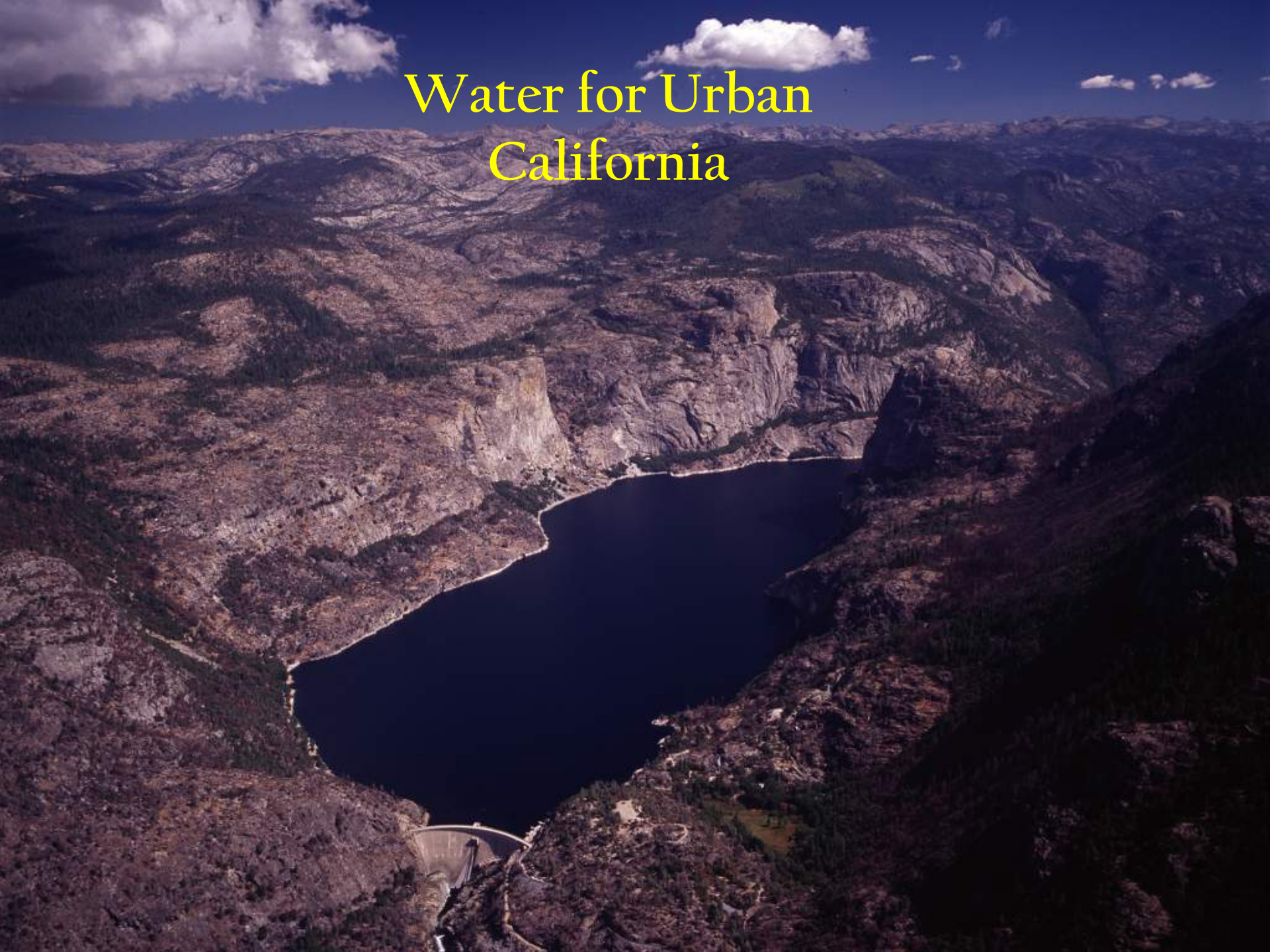
Statewide Water Usage



Agricultural demands = 80% of total agricultural/urban water usage

Environmental Water Usage
- Bay/Delta Estuary
- Instream Flows
- Wetlands

Water for the Environment


Water for Urban
California

EAST COAST SPRAWL

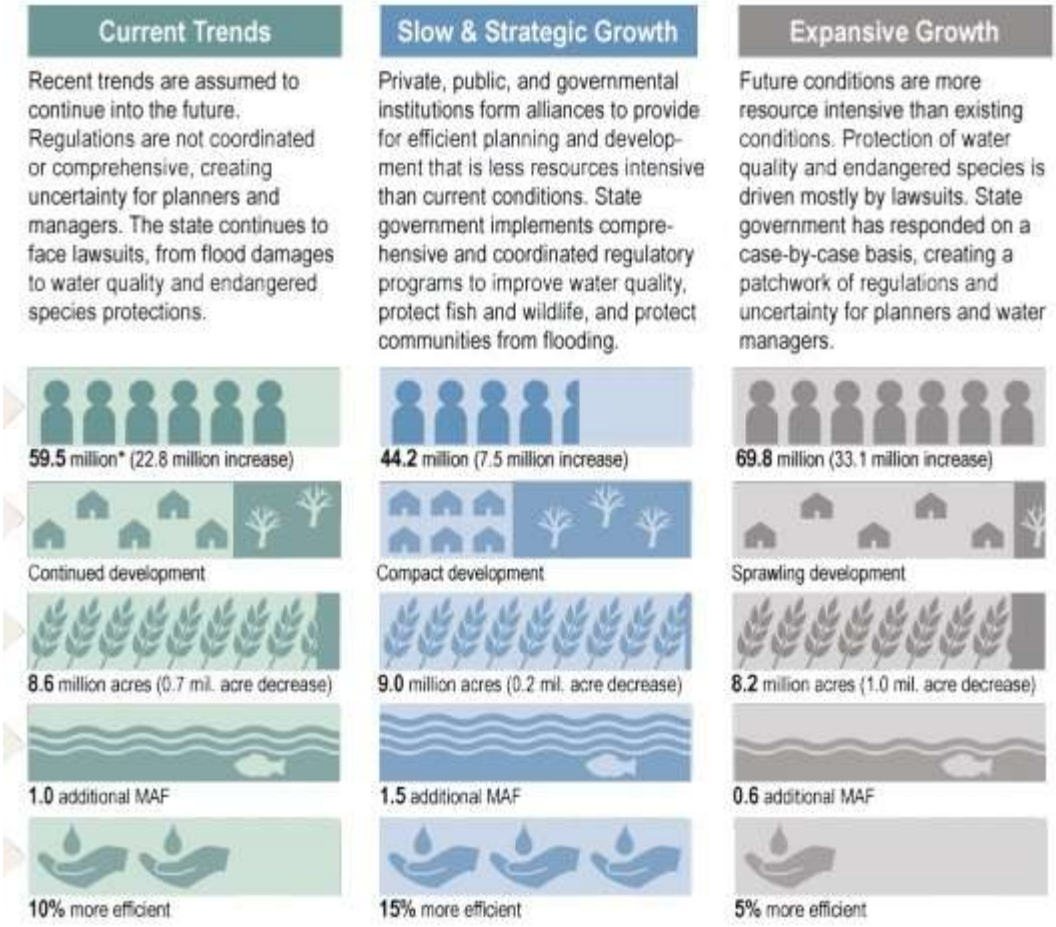
CALIFORNIA SPRAWL

EAST COAST DENSITY

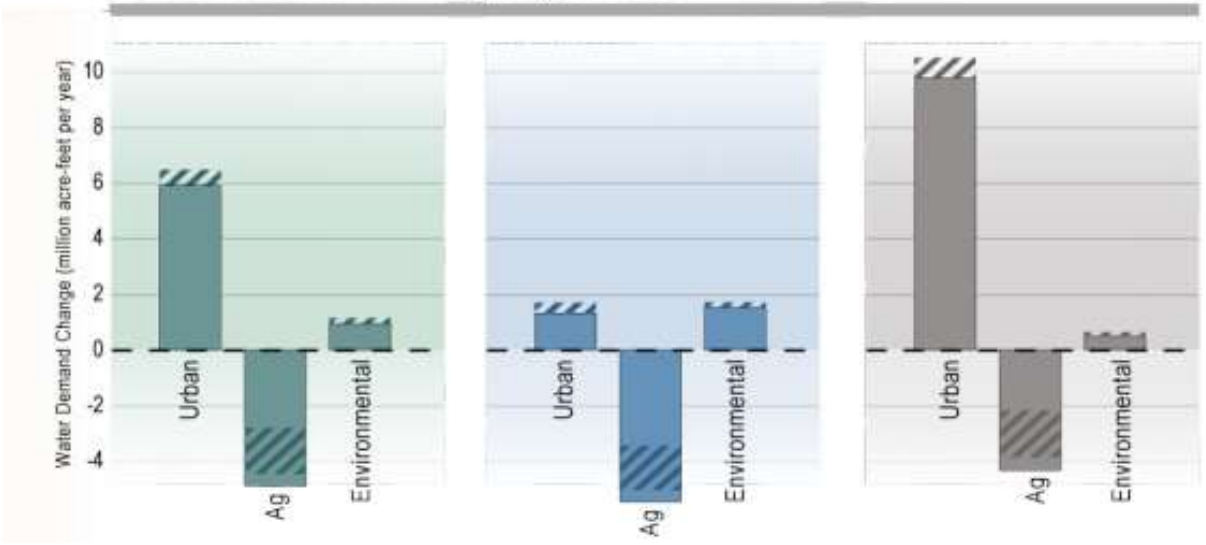
CALIFORNIA DENSITY

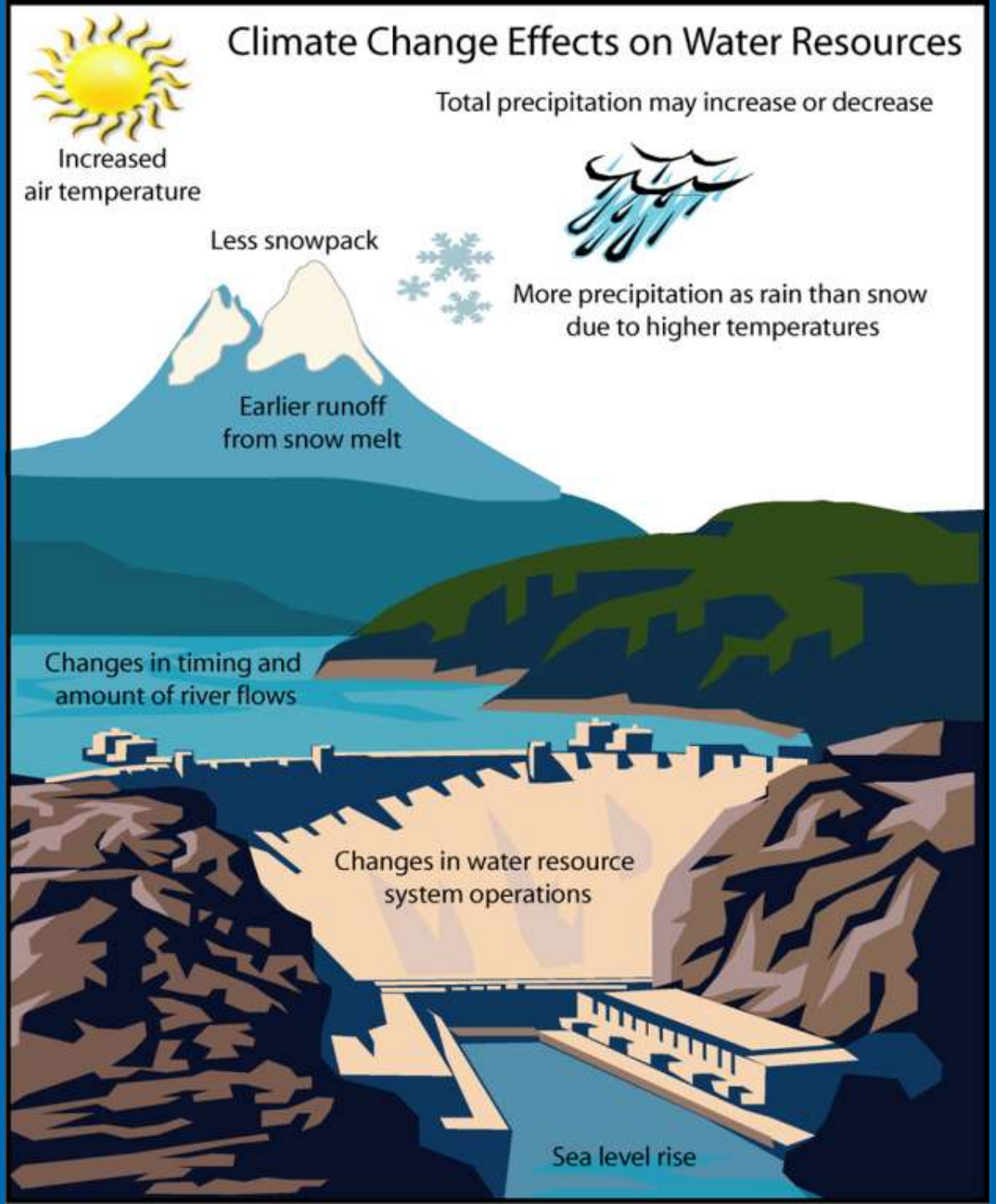
Future Water Supplies and Demands

- 37 million to 50 million Californian's by 2030
- 2-6 million acre feet annual increase in urban demand (assuming conservation)
- Where: Inland Empire, San Joaquin Valley, Sacramento – hotter, drier
- Groundwater contamination and overdraft impacts
- Increased regulation, environmental water use and drinking H2O standards
- "Hardening" of supplies because of laudable conservation efforts; there is no fudge factor in the next drought
- Loss of 800,000 AFY from Colorado River
- Climate Change and water supply


Current Trends
Recent trends are assumed to continue into the future. Regulations are not coordinated or comprehensive, creating uncertainty for planners and managers. The state continues to face lawsuits, from flood damages to water quality and endangered species protections.
59.5 million* (22.8 million increase)
Continued development
8.6 million acres (0.7 mil. acre decrease)
1.0 additional MAF
10% more efficient
Slow & Strategic Growth
Private, public, and governmental institutions form alliances to provide for efficient planning and development that is less resources intensive than current conditions. State government implements comprehensive and coordinated regulatory programs to improve water quality, protect fish and wildlife, and protect communities from flooding.
44.2 million (7.5 million increase)
Compact development
9.0 million acres (0.2 mil. acre decrease)
1.5 additional MAF
15% more efficient
Expansive Growth
Future conditions are more resource intensive than existing conditions. Protection of water quality and endangered species is driven mostly by lawsuits. State government has responded on a case-by-case basis, creating a patchwork of regulations and uncertainty for planners and water managers.
69.8 million (33.1 million increase)
Sprawling development
8.2 million acres (1.0 mil. acre decrease)
0.6 additional MAF
5% more efficient

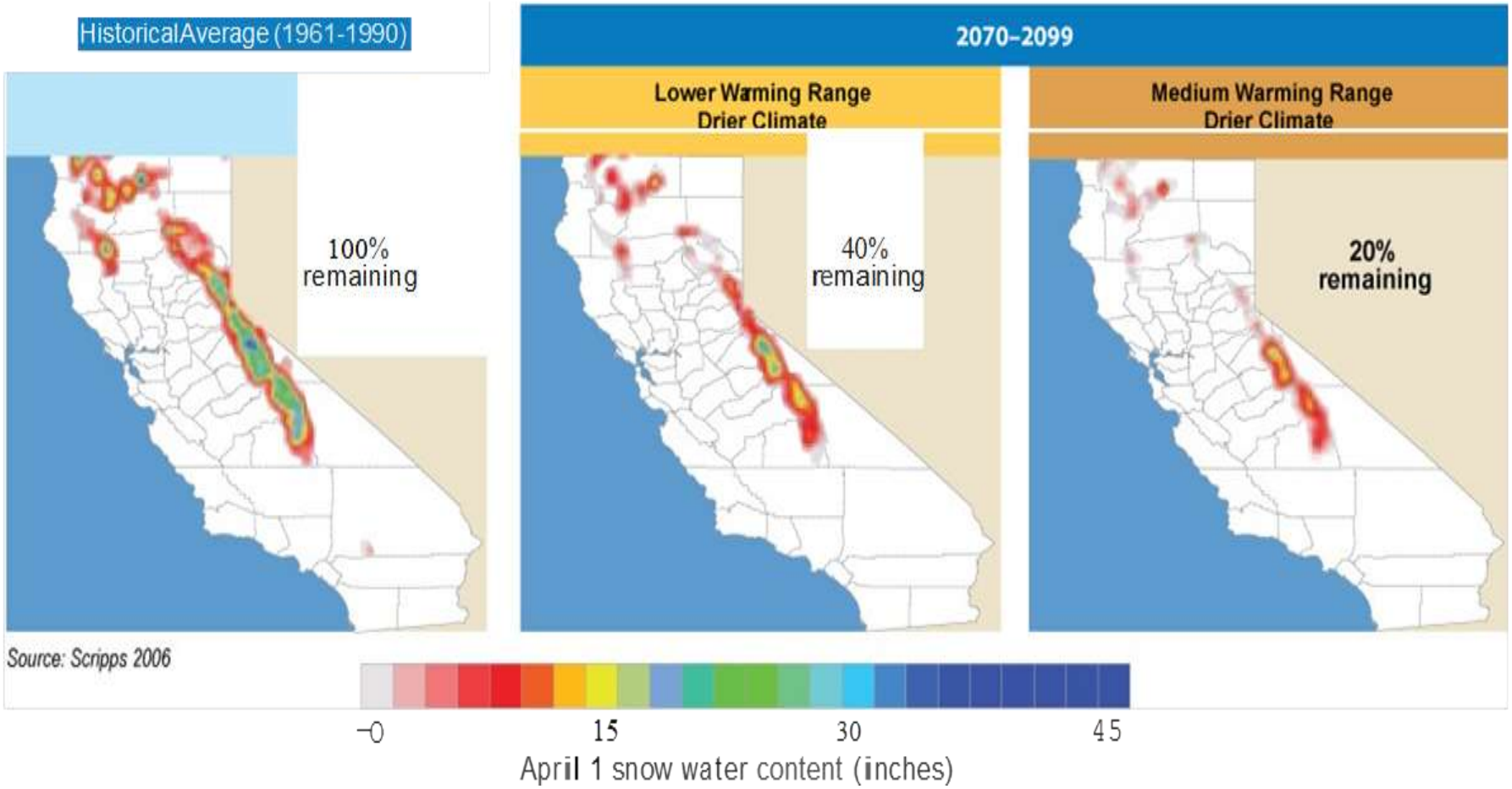
2050 Water Demand Changes by Scenario

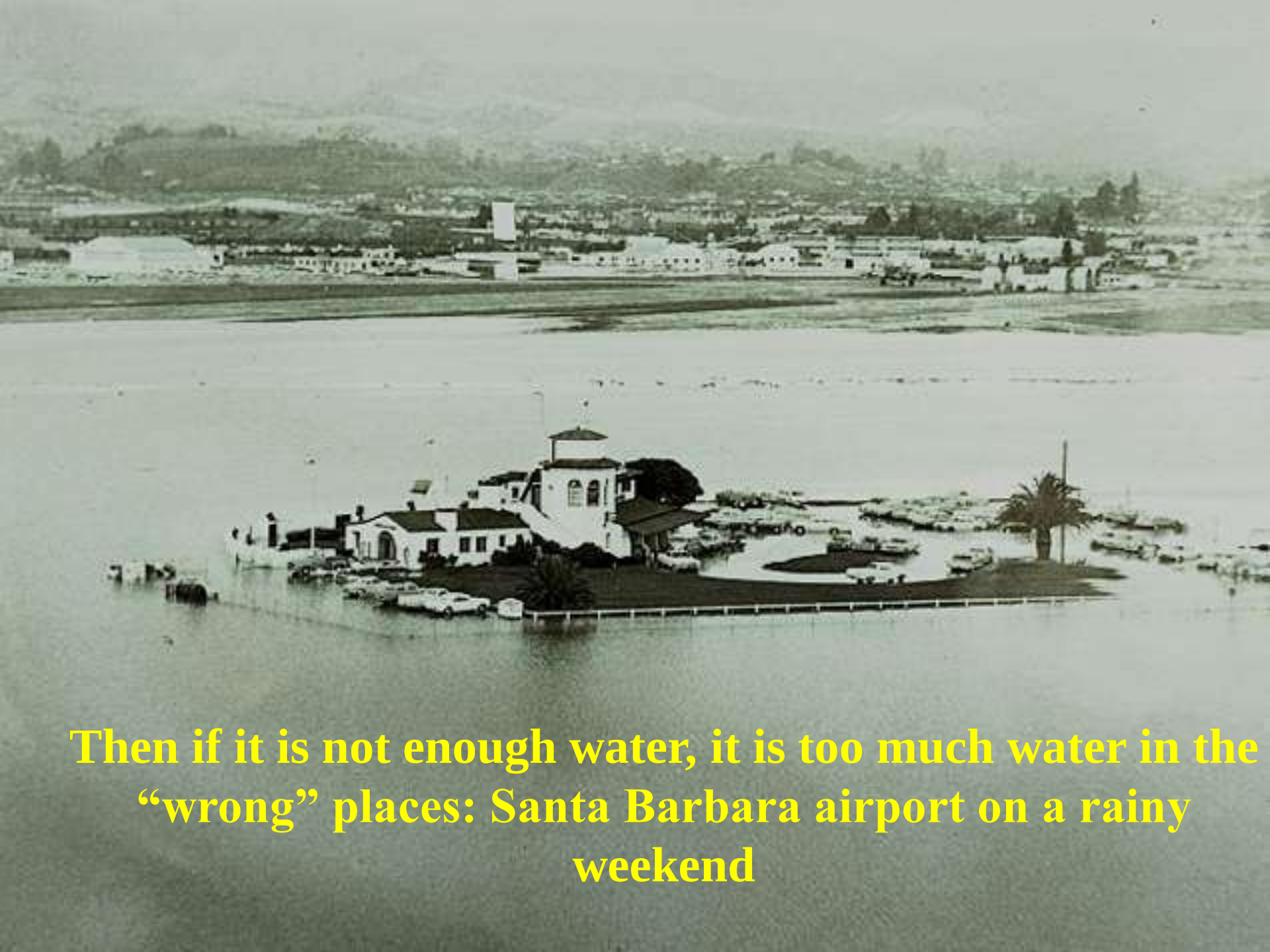



Climate Change Effects on Water Resources
Total precipitation may increase or decrease
Increased air temperature
Less snowpack
More precipitation as rain than snow due to higher temperatures
Earlier runoff from snow melt
Changes in timing and amount of river flows
Changes in water resource system operations
Sea level rise

Decreasing California Snowpack

These figures show projections of how two climate scenarios may reduce Sierra snowpacks to 40% and 20% of recent historical averages

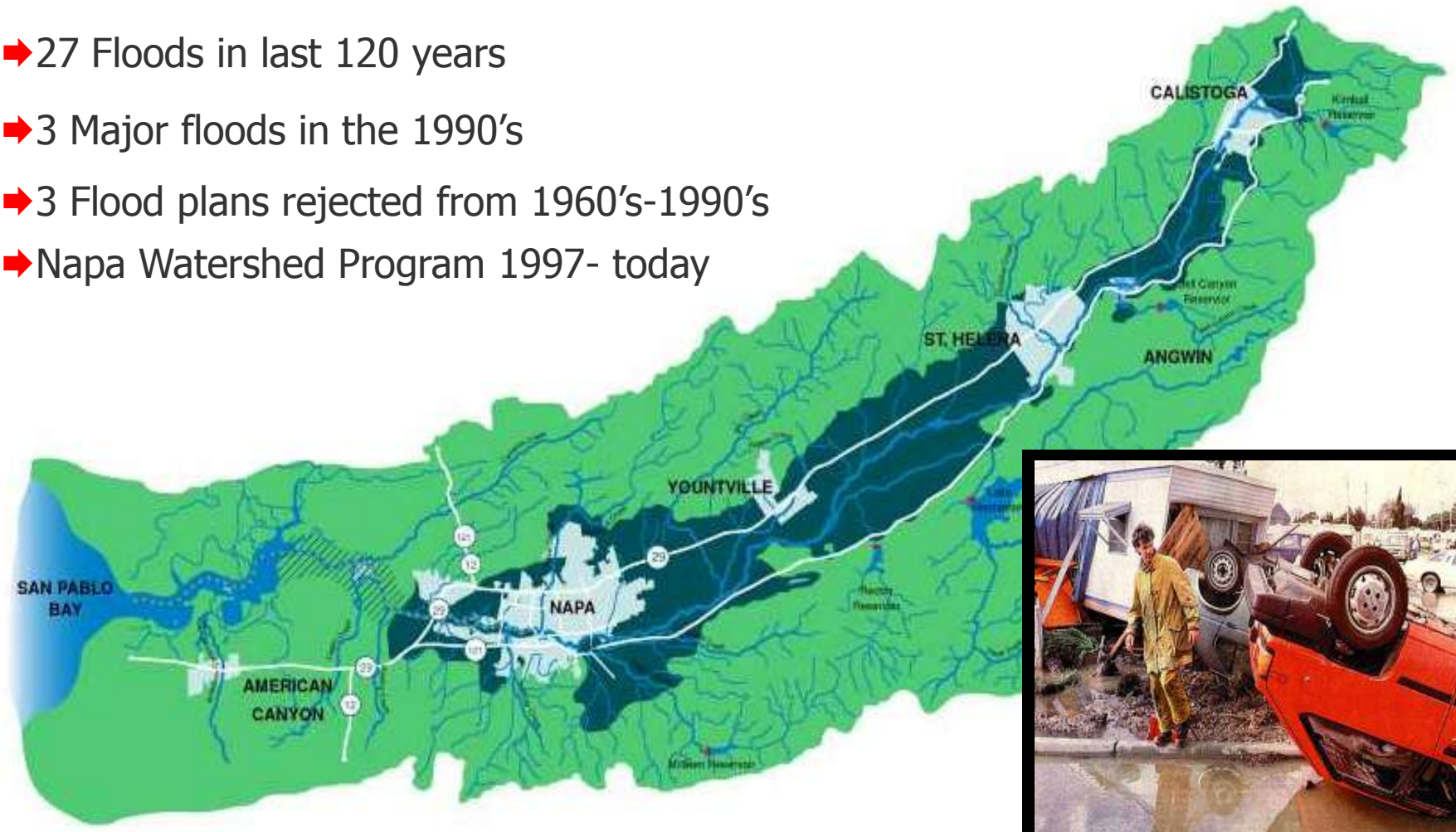




Then if it is not enough water, it is too much water in the "wrong" places: Santa Barbara airport on a rainy weekend

Napa River Watershed

- 27 Floods in last 120 years
- 3 Major floods in the 1990's
- 3 Flood plans rejected from 1960's-1990's
- Napa Watershed Program 1997- today



ORGANIZING FOR ACTION:

Coalition Structure

Joint Flood District/Community Executive Committee

Countywide Local Elected Officials, Army Corps Rep, Key Napa City/County Staff & Two Community Reps

Community Coalition

Friends of the Napa River	**Napa Valley Economic Development Corp**	**Napa Chamber**
Flood Plain Business Coalition	Napa Valley Grape Growers Association	Sierra Club
State Fish and Game	Napa County Resource Conservation District	Napa County Land Trust
United Napa Valley Associates	Napa Valley Fisherman's Association	Building Trades Council
Agricultural Commission	American Center for Wine, Food and Arts	Suscol Council
Homeowner Organizations	Upvalley Chambers of Commerce	Napa Valley Expo
Napa County Landmarks	Napa County Conference & Visitors Bureau	Napa Downtown Merchants
Napa County Farm Bureau	Natural Resources Conservation Service	Napa Valley Vintners Assoc

Design Review Committee

Community Panel, **Resource Agencies**, City/County & Army Corp Staff, River Experts & Consultants

Financial/Regulatory Committee

Community Panel, City/County Staff and Consultants

Workgroups

Upvalley Retention | Oxbow/Downtown | South of 3rd St. | Water Quality/Fish Habitat

Crisis, Coalition Building & Consensus

ORGANIZING FOR ACTION:

Getting 23 Government Agencies to Play Ball as a Team

FEDERAL	STATE	REGIONAL	COUNTY	CITY
Army Corps of Engineers	State Dept. of Water Resources	Bay Area Water Quality	County of Napa	City of American Canyon
Environmental Protection Agency	California Dept. of Fish & Game	California Coastal Conservancy	Napa County Flood Control and Water Conservation District	City of Napa
US Fish & Wildlife Service	State Lands Commission		Napa County Resource Conservation District	Town of Yountville
National Marine Fisheries Service	The Governors Office of Emergency Services		Napa County Agriculture Commission	City of St. Helena
Federal Emergency Management Agency	California Dept of Commerce			City of Calistoga
USDA Natural Resources Conservation District	CALTRANS			

Wetlands Restoration

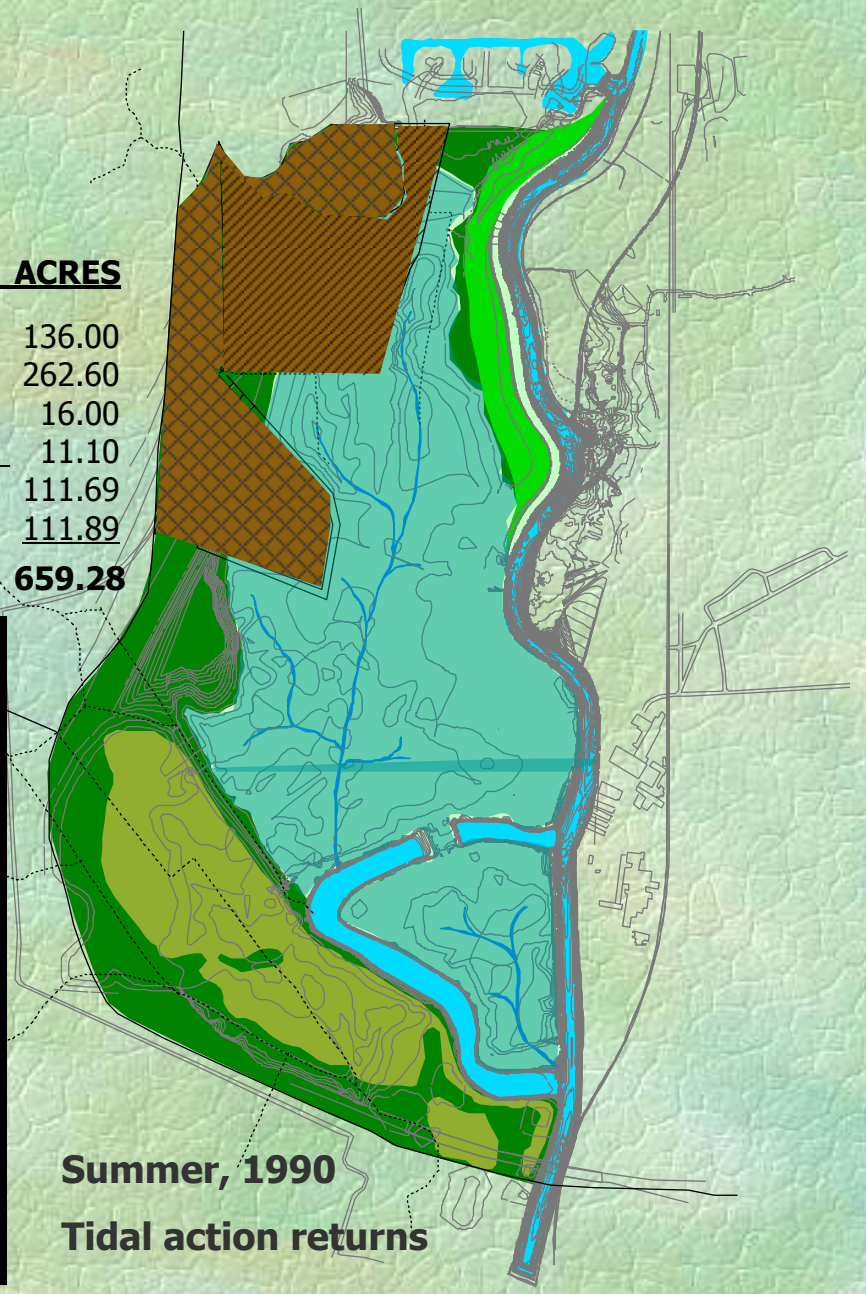
Pre-project Condition-diked grazing land

Technical Analysis

Wetlands Restoration

After

CONVERTED FROM	CONVERTED TO	ACRES
Farmed seasonal wetland	non-farmed seasonal wetland	136.00
	emergent marsh	262.60
	open water/tidal mudflat	16.00
	high-value woodland	11.10
Farmed uplands	emergent marsh	111.69
	high value woodlands	111.89
TOTAL		**659.28**

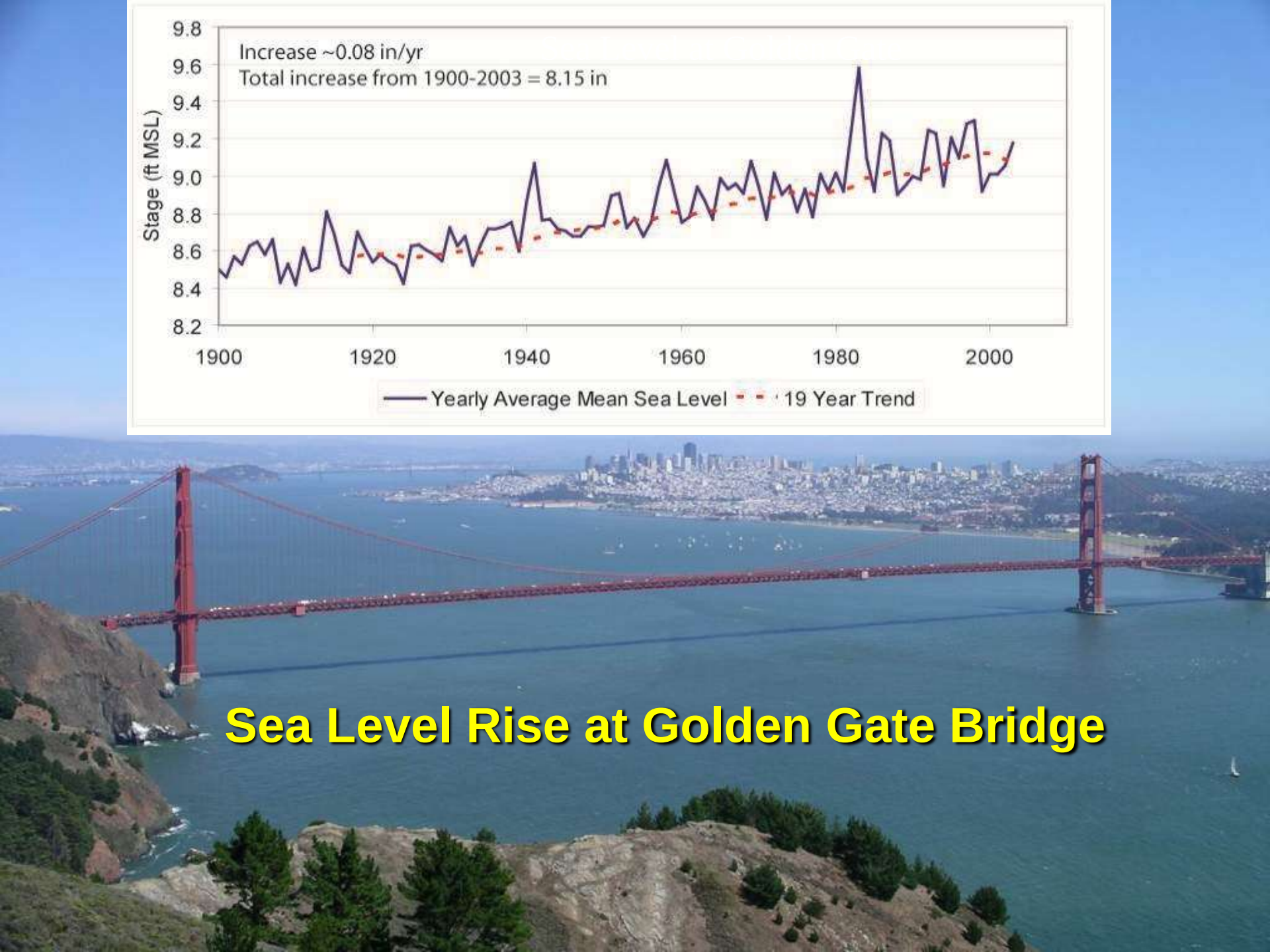


Summer, 1990

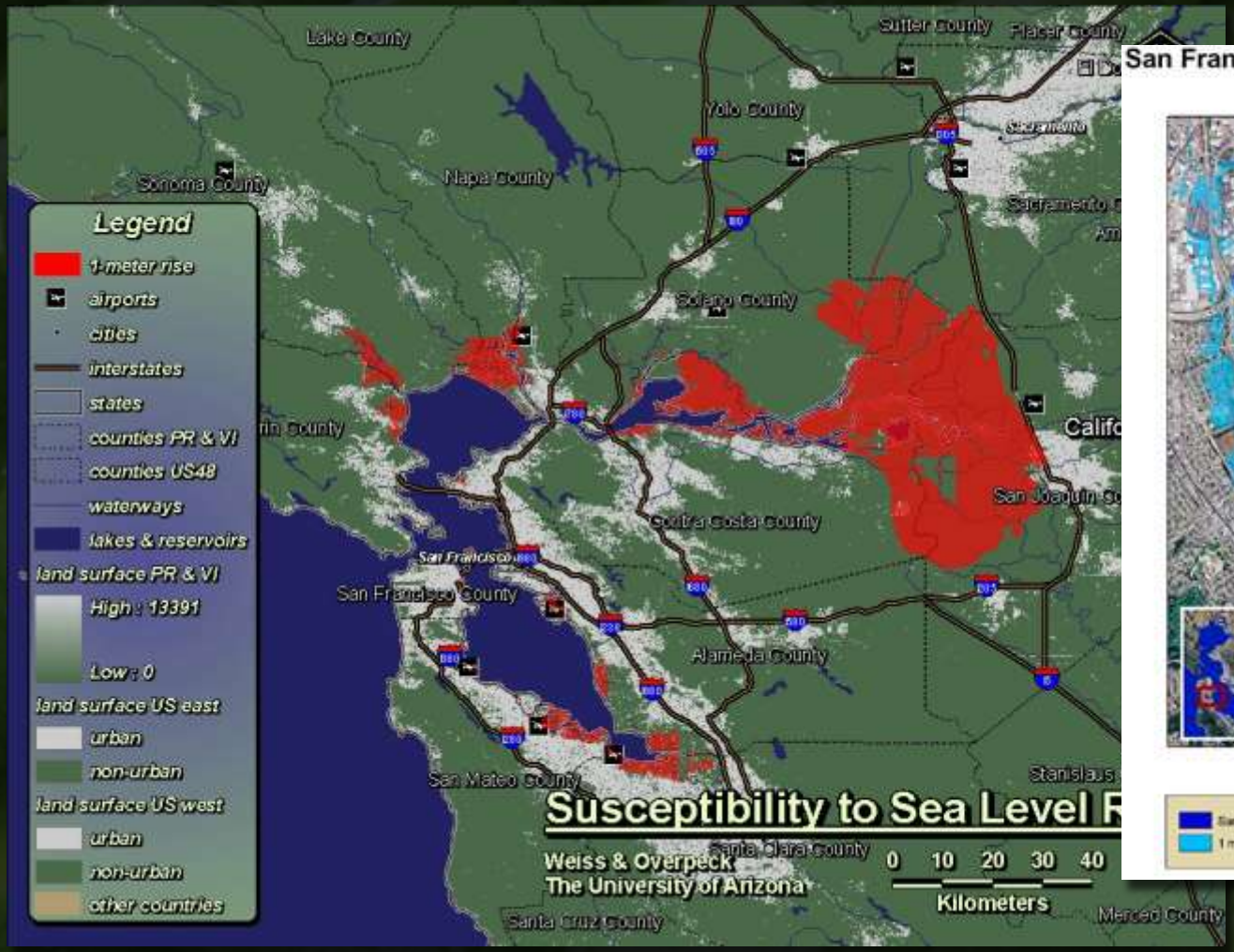
Tidal action returns

Napa River-Downtown Reach:


Climate change mitigation may be about energy, but climate change adaptation is about WATER!
January 1, 2006, Twitchell Island


Increase ~0.08 in/yr
Total increase from 1900-2003 = 8.15 in
Stage (ft MSL)
9.8
9.6
9.4
9.2
9.0
8.8
8.6
8.4
8.2
1900
1920
1940
1960
1980
2000
Yearly Average Mean Sea Level
19 Year Trend
Sea Level Rise at Golden Gate Bridge

Sea-Level Rise Vulnerability – 1 Meter



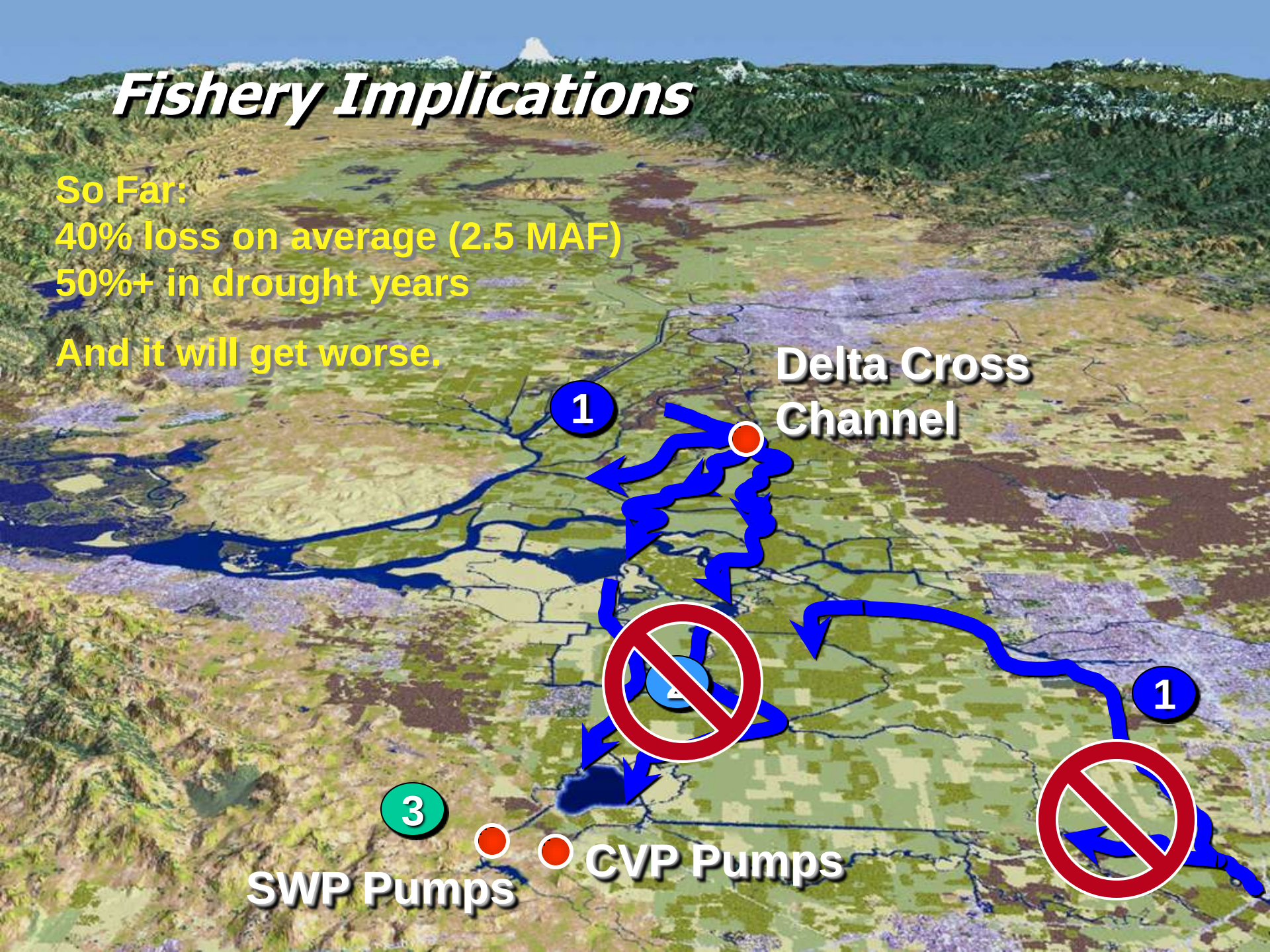
Wildfire Risks: Property and Loss of Life, Water Quality, Carbon Released

Ecosystem Damage

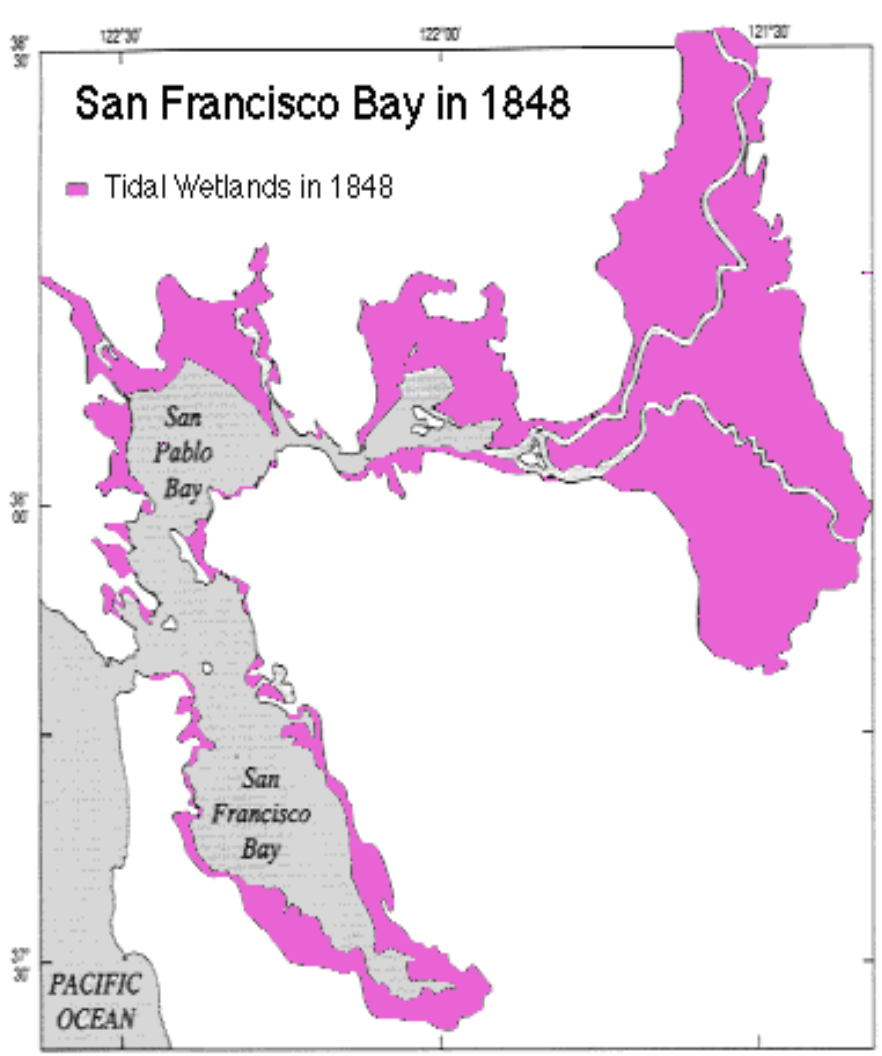
Fishery Implications

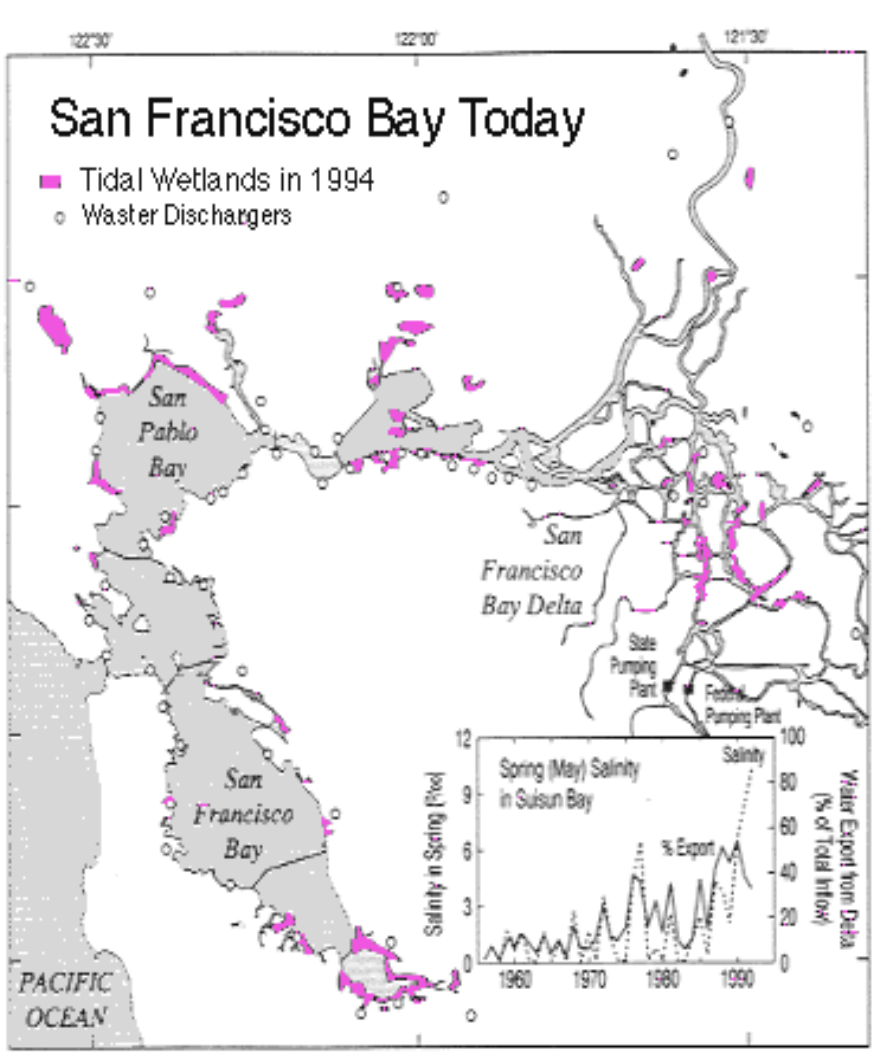
So Far:
40% loss on average (2.5 MAF)
50%+ in drought years

And it will get worse.



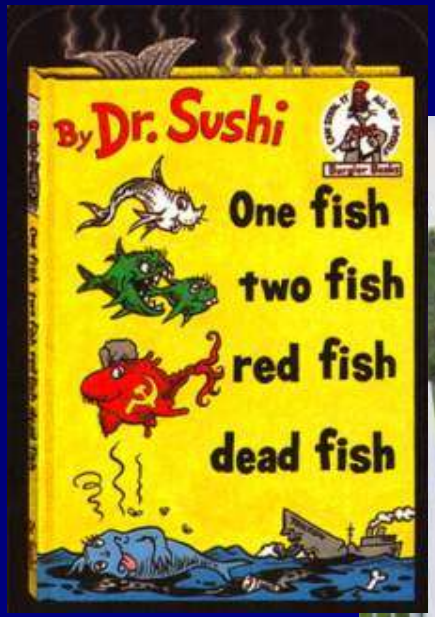
San Francisco Bay and Delta Tidal Marshes – Historical and Current Conditions





Delta Ecosystems: The Imperfect Storm of Multiple Stressors

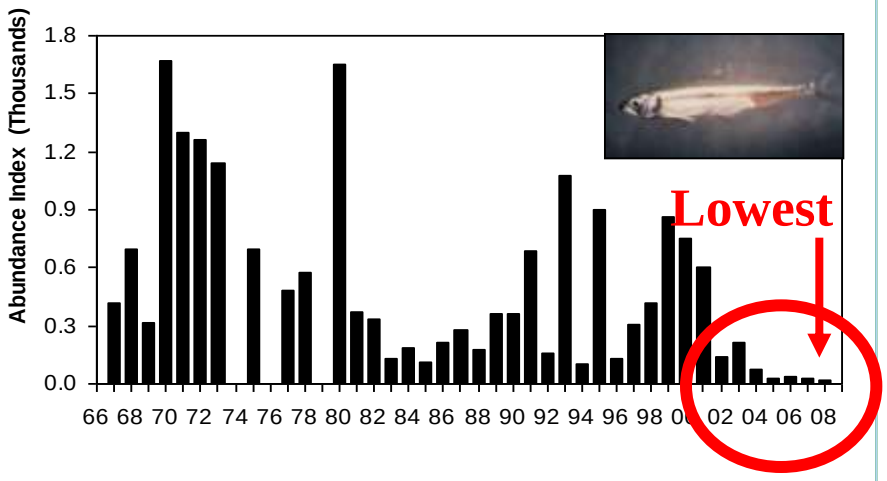
- Loss of fresh water flows, reverse flows in the south Delta, lack of flooding regime
- Pelagic fish collapse, listed species and fish entrainment
- Loss of all types of aquatic and related habitats (especially river and floodplain connections), invasive species
- Salinity problems, numerous water quality issues



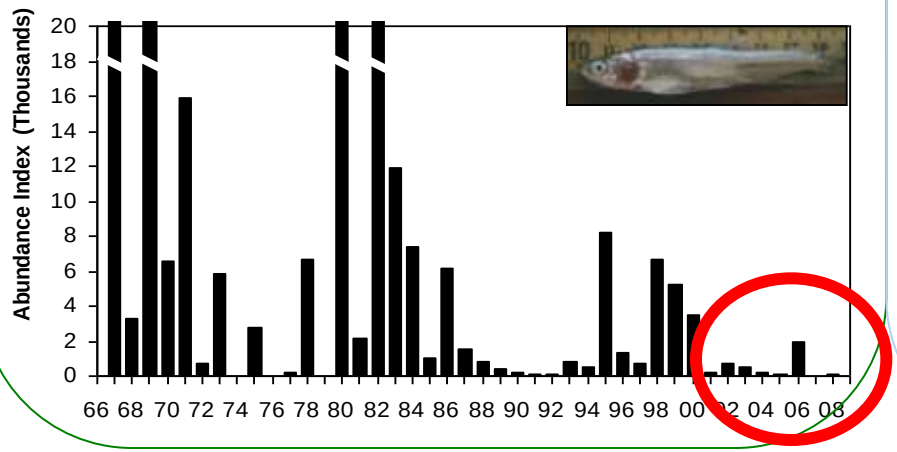
An Ecosystem in Crisis

Native

Delta Smelt

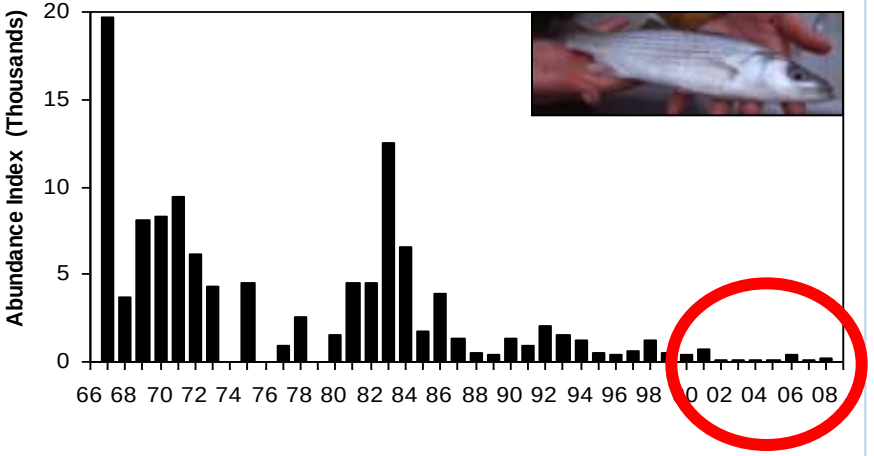


Longfin Smelt

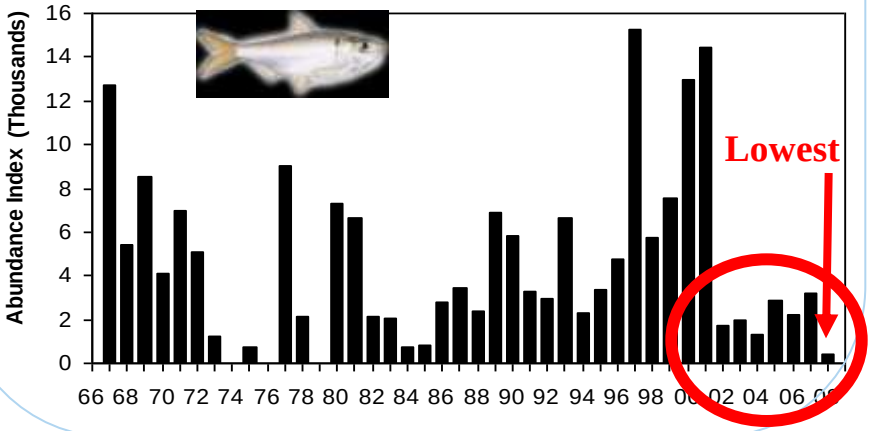


Non-Native

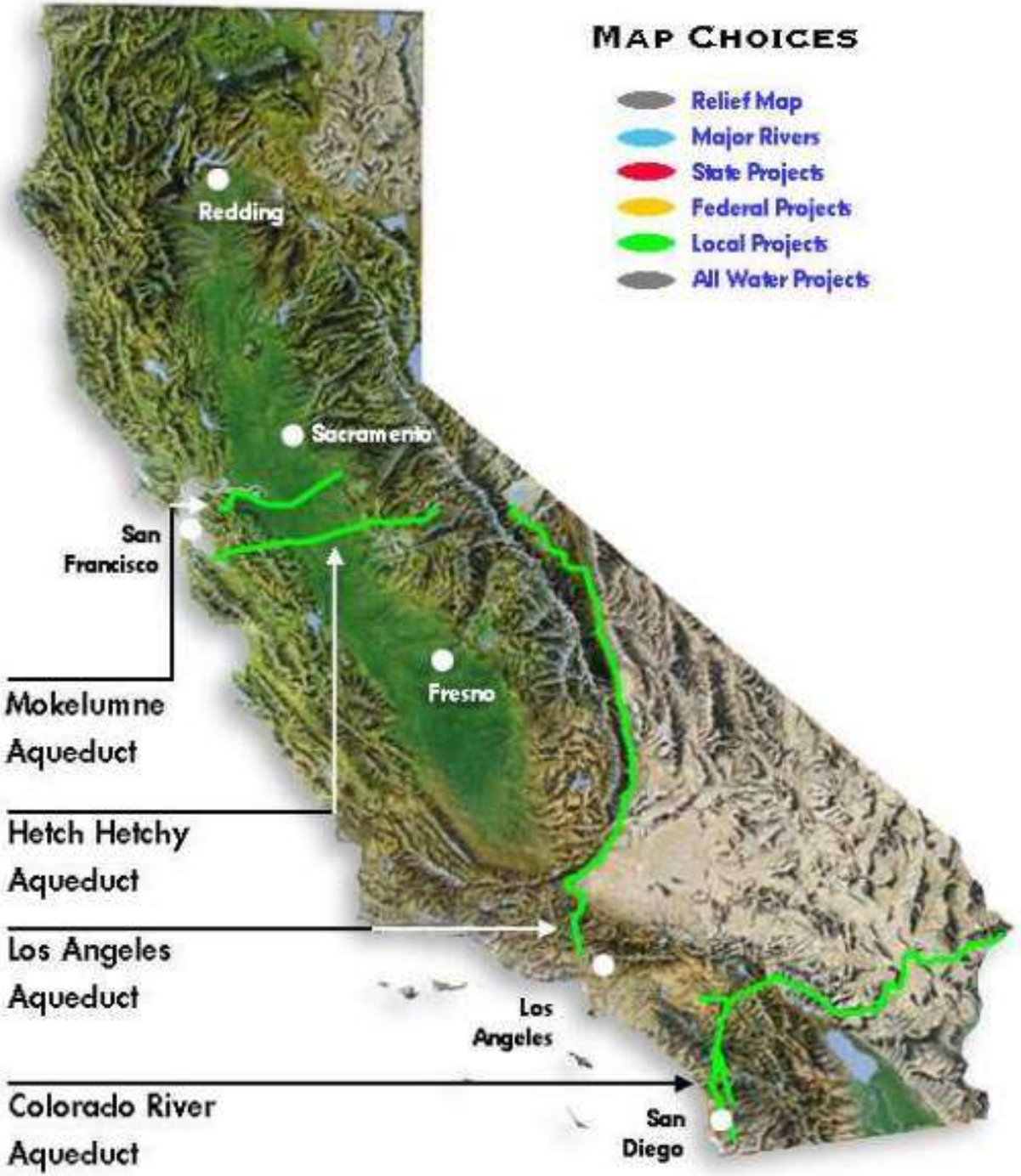
Striped Bass

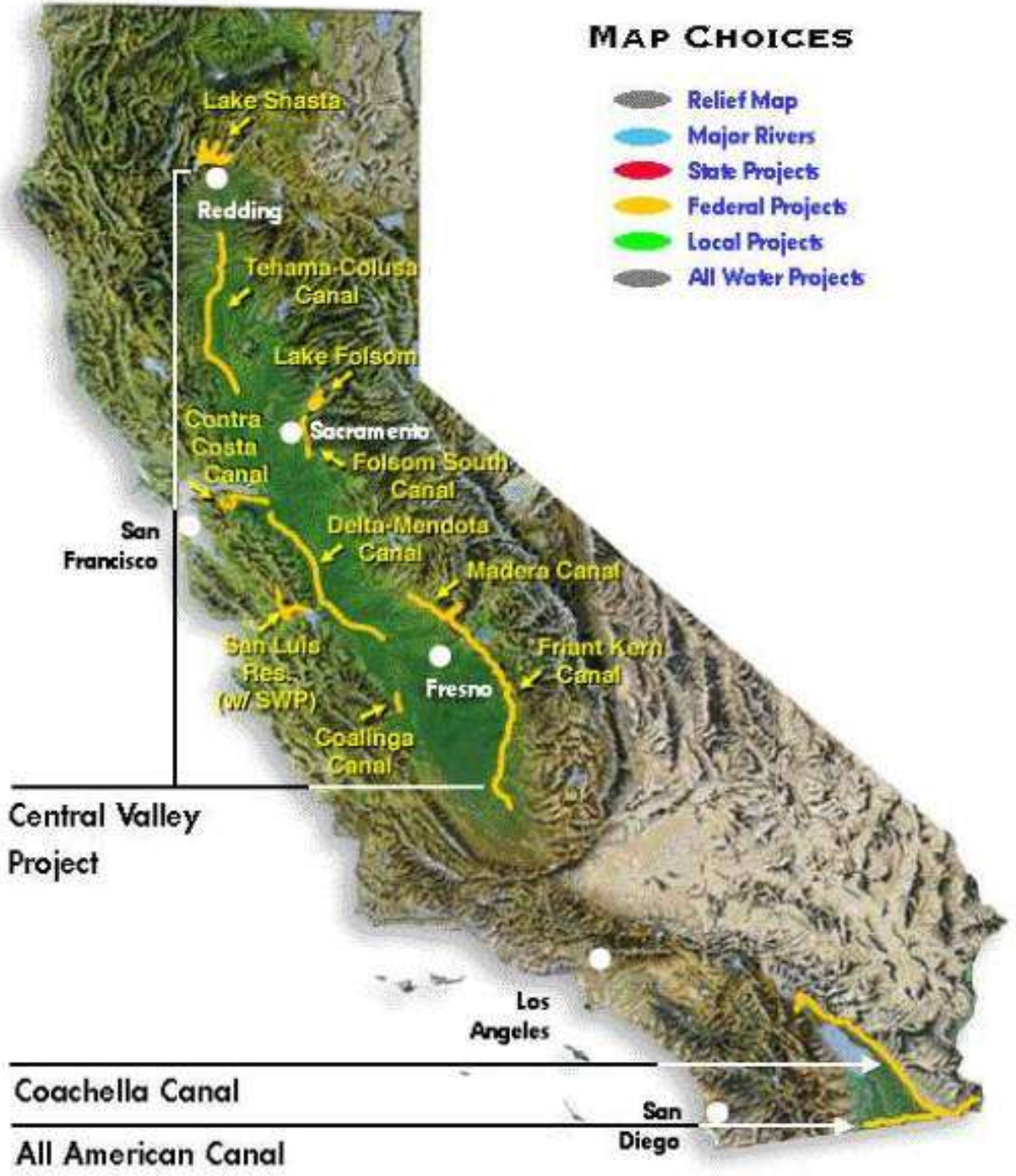


Threadfin Shad



Source DFG 2008 Fall MW Trawl; No sampling 1974 and 1979


MAP CHOICES
Relief Map
Major Rivers
State Projects
Federal Projects
Local Projects
All Water Projects
Redding
Sacramento
San Francisco
Fresno
Los Angeles
San Diego
Mokelumne Aqueduct
Hetch Hetchy Aqueduct
Los Angeles Aqueduct
Colorado River Aqueduct


MAP CHOICES
Relief Map
Major Rivers
State Projects
Federal Projects
Local Projects
All Water Projects
Lake Shasta
Redding
Tehama-Colusa Canal
Lake Folsom
Contra Costa Canal
Sacramento
Folsom South Canal
San Francisco
Delta-Mendota Canal
Madera Canal
San Luis Res. (w/ SWP)
Friant Kern Canal
Fresno
Coalinga Canal
Central Valley Project
Los Angeles
Coachella Canal
San Diego
All American Canal


Click on label or area to see facilities in that area.
REDDING
Upper Feather
Oroville-Thermalito
SACRAMENTO
North Bay
SAN FRANCISCO
South Bay
San Luis
FRESNO
Coastal Branch
South San Joaquin
West Branch
LOS ANGELES
East Branch
SAN DIEGO


MAP CHOICES
Relief Map
Major Rivers
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Federal Projects
Local Projects
All Water Projects
Redding
Sacramento
San Francisco
Fresno
Los Angeles
San Diego

A River Southern California Style

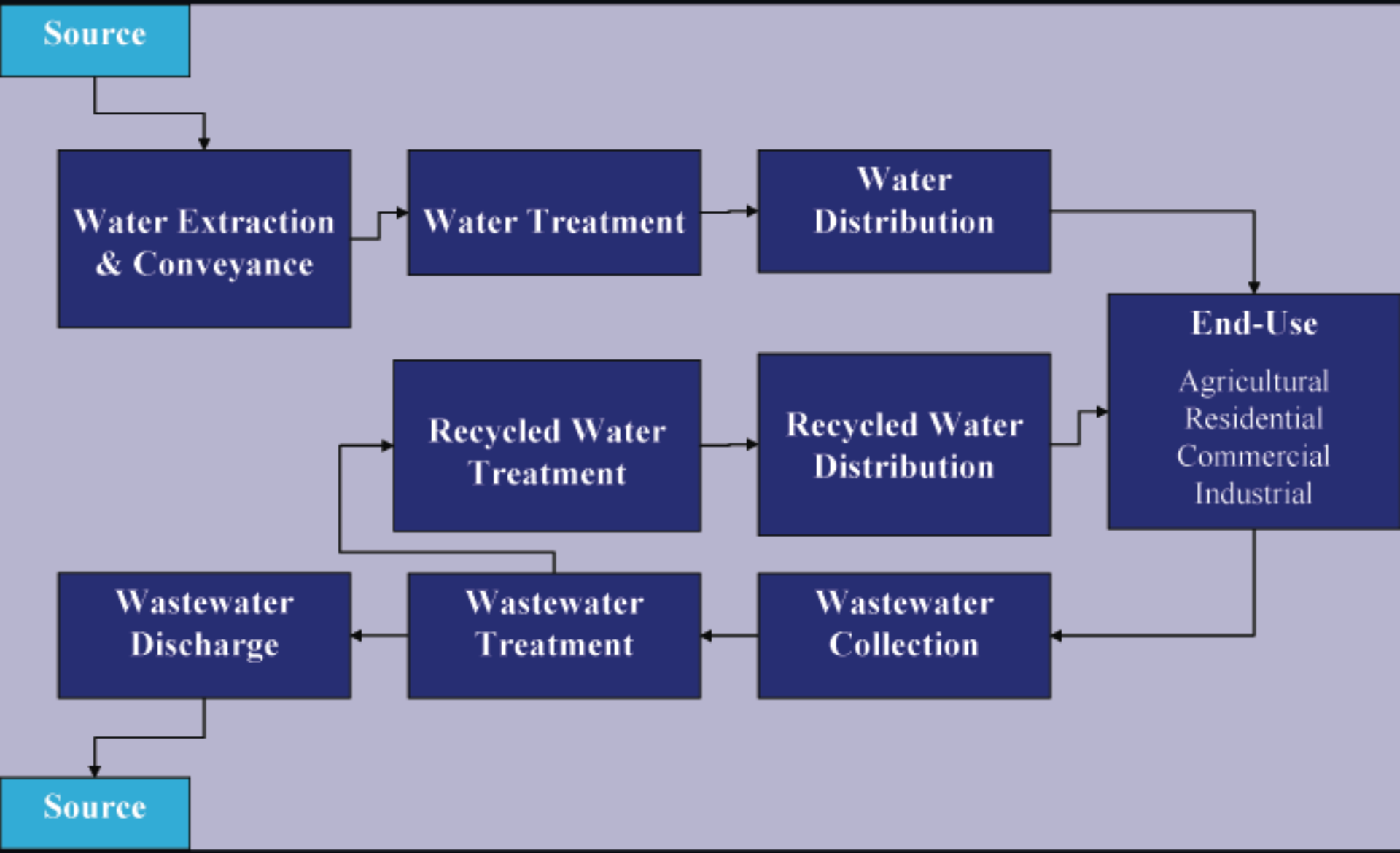
Loss of local habitats and ecosystems; loss of bio-diversity; loss of millions of $ of “free” ecosystem services

The Connection Between Water and Energy

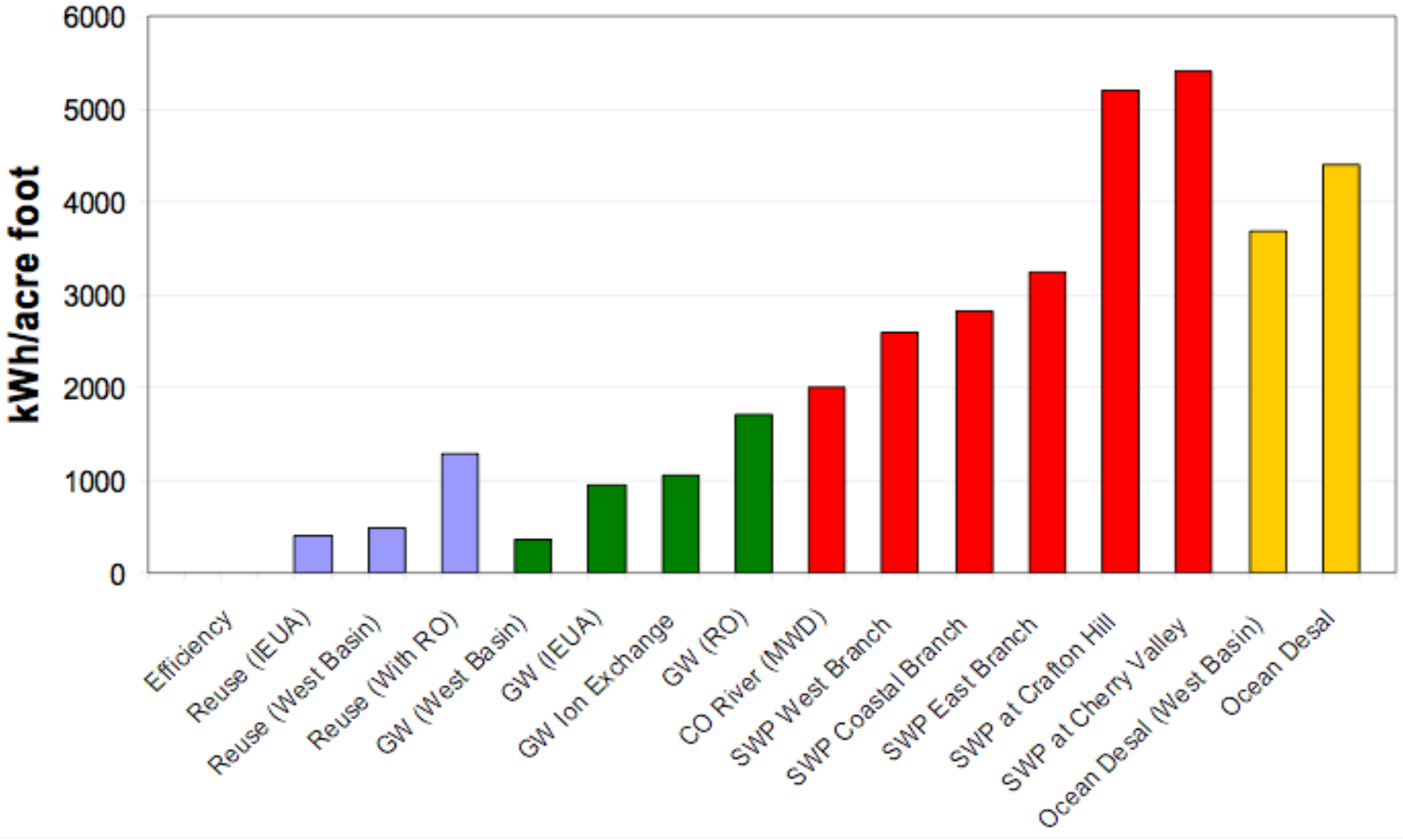
- 20% of all energy used by California is used to move and treat water
- This equates to 250,000 GWh of energy annually
- Water conservation is energy conservation


Edward Hyatt Powerplant
Thermalito Diversion Dam Powerplant
Thermalito Pumping-Generating Plant
Thermalito Afterbay
Lake Oroville
Antelope Lake
Lake Davis
Frenchman Lake
Barker Slough Pumping Plant
Cordelia Pumping Plant
Delta
Clifton Court Forebay
H. O. Banks Delta Pumping Plant
South Bay Pumping Plant
Bethany Reservoir
Del Valle Pumping Plant
North Bay Aqueduct
South Bay Aqueduct
Lake Del Valle
W. R. Gianelli Pumping-Generating Plant
O'Neill Forebay
San Luis Reservoir
Dos Amigos Pumping Plant
Governor Edmund G. Brown California Aqueduct
Las Perillas Pumping Plant
Badger Hill Pumping Plant
Devil's Den Pumping Plant (under construction)
Bluestone Pumping Plant (under construction)
Polonio Pass Pumping Plant (under construction)
Coastal Branch
Buena Vista Pumping Plant
J.R. Teerink Wheeler Ridge Pumping Plant
A. D. Edmonston Pumping Plant
Alamo Powerplant
Pearblossom Pumping Plant (three units under construction)
Mojave Siphon Powerplant (under construction)
Silverwood Lake
Devil Canyon Powerplant
Lake Perris
East Branch
Castaic Lake
West Branch
I. J. Chrisman Wind Gap Pumping Plant
Oso Pumping Plant
W. E. Warne Powerplant
Pyramid Lake

Energy Inputs to Water Systems



Energy Intensity of Selected Water Supply Sources in Southern California



Synergistic effects of solutions: Water conservation means energy conservation, especially south of the Tehachapi's

Water quality degradation: over 300 impaired water bodies in California alone
Point Source and Non-Point Source

New River Improvement Project
Strategic Plan

Vision

The New River is a healthy river corridor that serves as an asset to the people, communities, ecosystems and agricultural industry of the Imperial Valley.

Goals

Public Health:
A restored and transformed New River corridor provides a safe, healthy and accessible recreational resource for local communities.

Ecology:
Improved water quality, habitat and river corridor conditions in the New River support a healthy aquatic and riparian ecosystem and supplies water that contributes to the restoration of the Salton Sea and its delta.

Economy:
The New River is an aesthetic and environmental amenity that enhances community development opportunities and benefits agricultural activities throughout the Imperial Valley.

New River Water Pollution Issues are Severe:
12 Pollutants Impairing the River and entering the Salton Sea

Foam at the Border

Slaughterhouse discharge in Mexicali

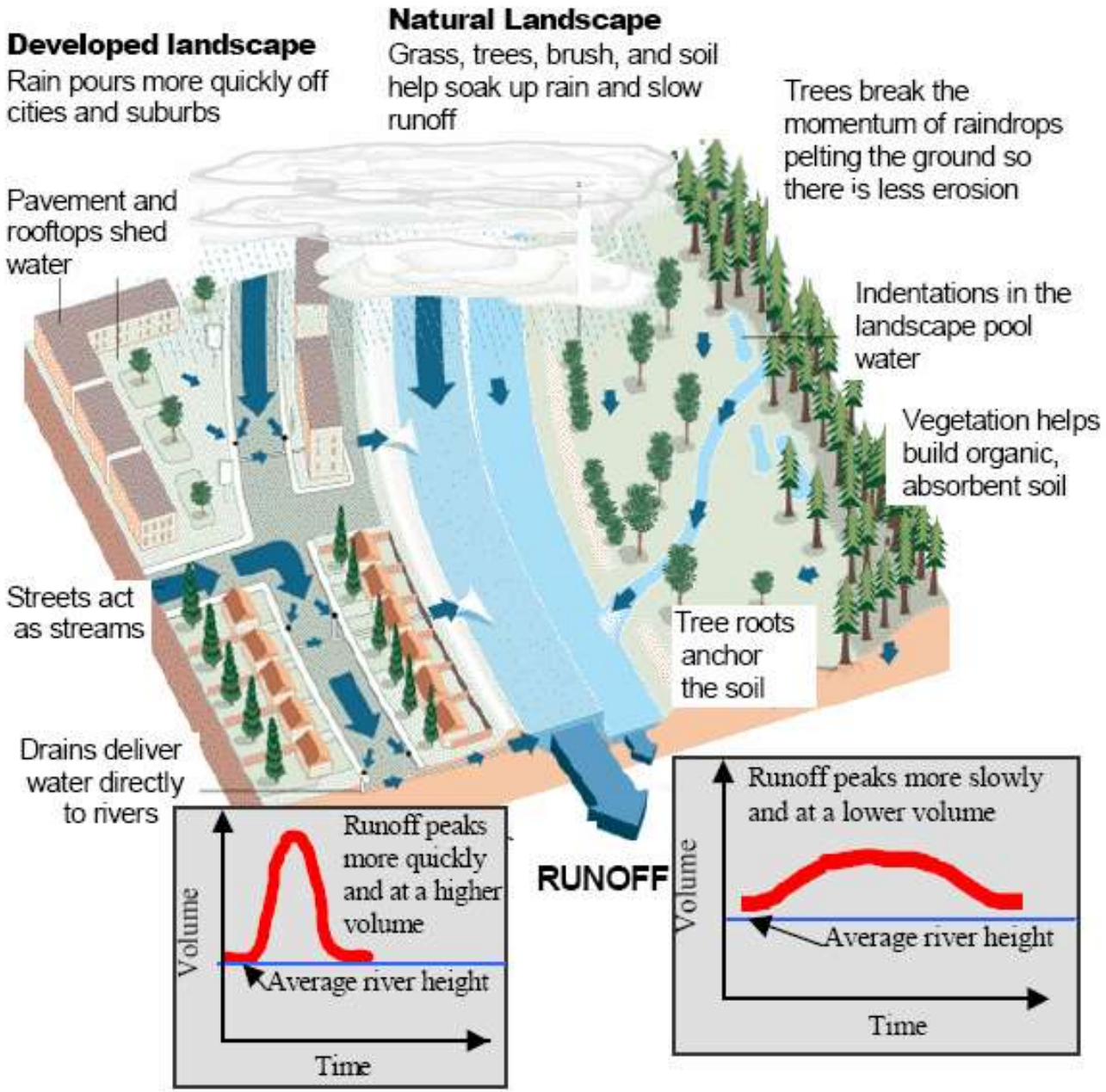

WARNING
CONTAMINATED SOIL AND
NEW RIVER WATER
KEEP OUT!!
¡PELIGRO!
TIERRA Y AGUA DEL RIO
NUEVO CONTAMINADA
¡PROHIBIDO ENTRAR!
PAID FOR BY CALEXICO NEW RIVER COMMITTEE
CITY OF CALEXICO
NEW RIVER
COMMITTEE


CITY OF CALEXICO
NEW RIVER
COMMITTEE


CITY OF CALEXICO
NEW RIVER
COMMITTEE

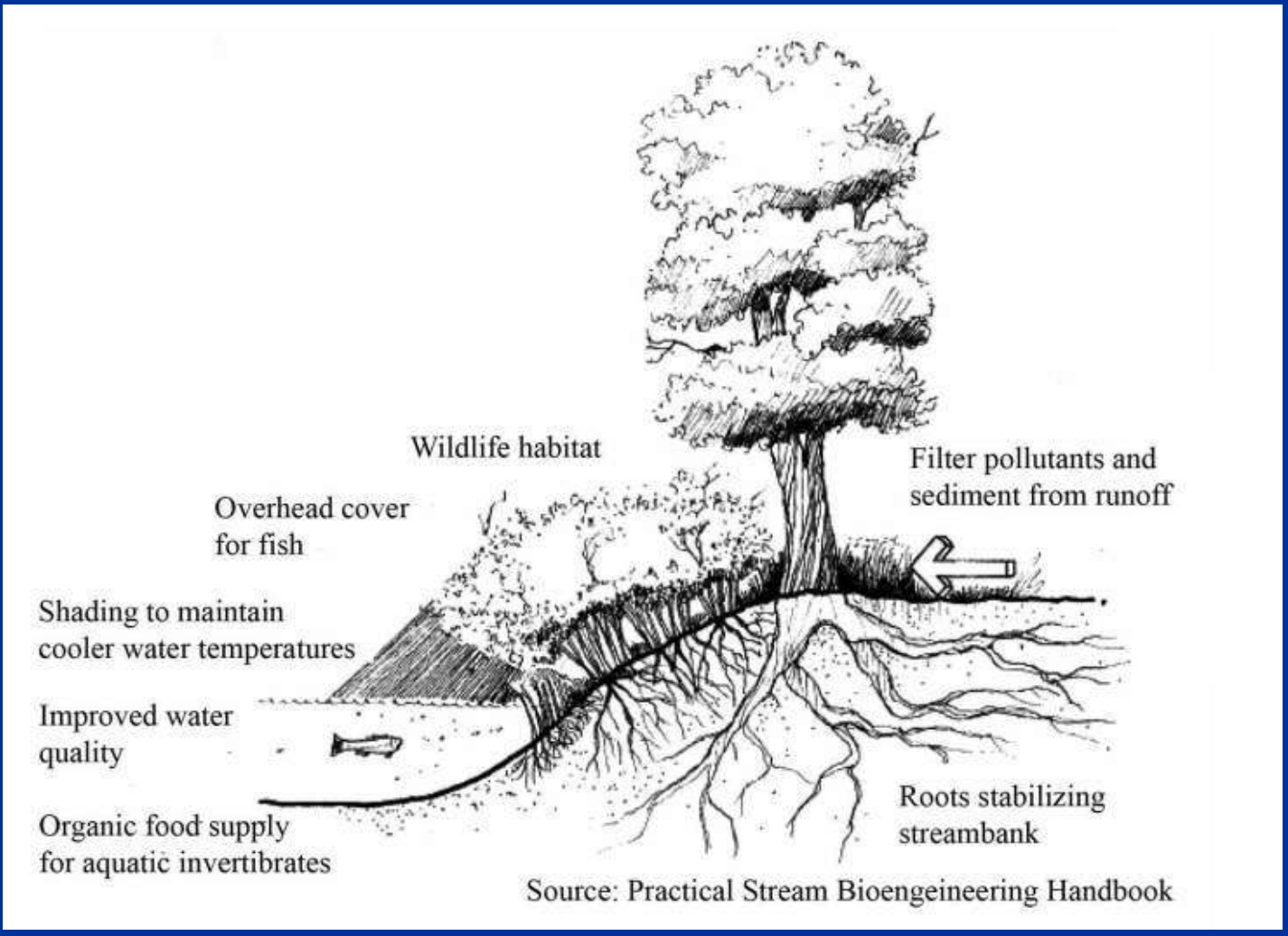
MORE WATER FASTER

Urban growth changes the way rain runs to rivers and streams



Effects of hydro-modification due to urbanization: down-cutting of streams, in-sized channels, no floodplains, high levels of erosion and sedimentation, loss of aquatic habitat

Healthy Urban Riparian Corridors and Creeks

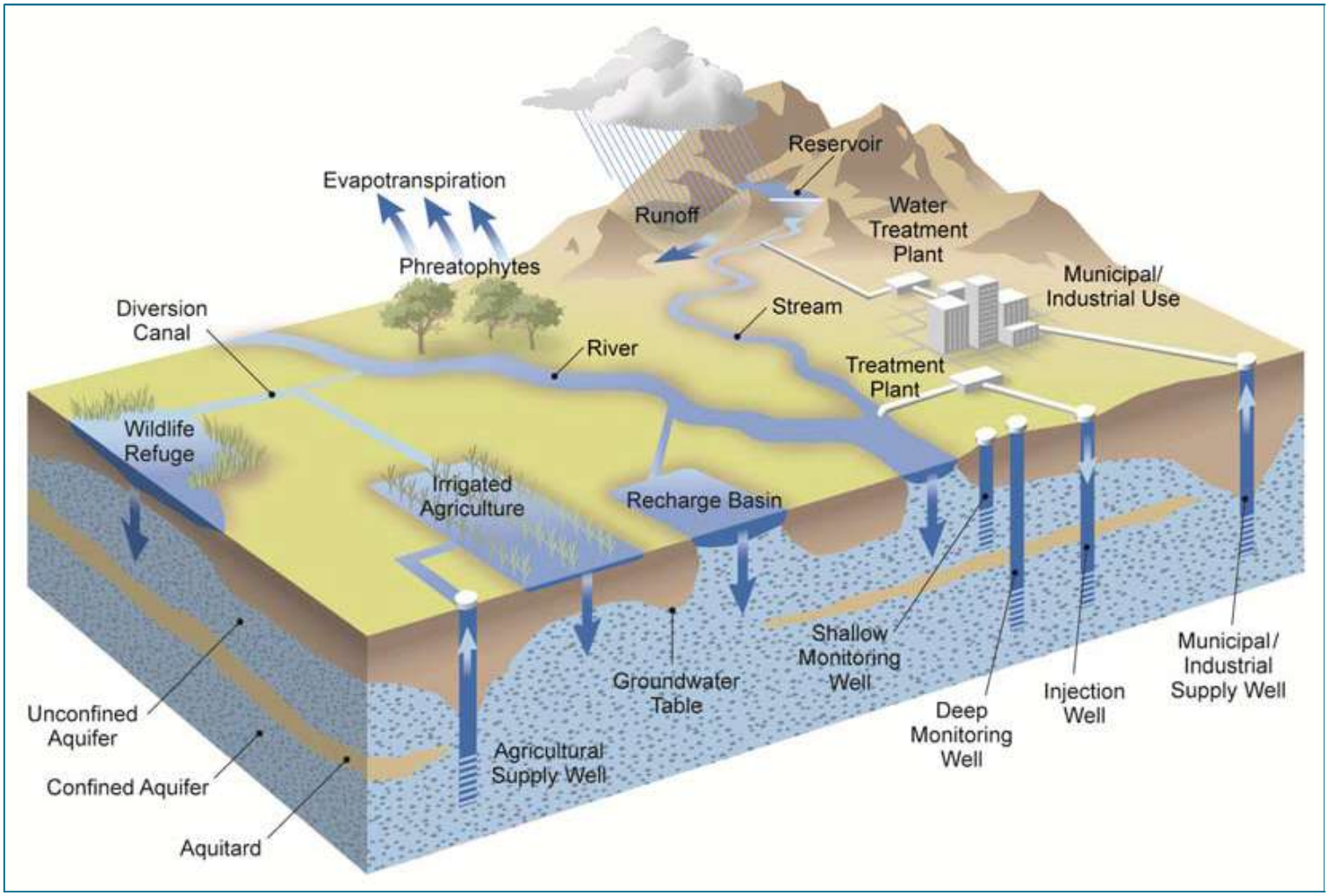


Key Issues facing California Water Policy

- Water supply reliability and future demands and sources
- Confluence of Bay Delta issues including ecosystem degradation, levee failure, water reliability and quality
- Groundwater pollution and overdraft affecting aquifers
- Impaired water bodies – NPS water pollution, enforcement of point source standards
- Urban storm water pollution – beach closures, hydro-modification, watershed effects, etc.
- Providing more water for fish and wildlife - e.g. Klamath Basin, Yuba River, American River, etc.
- Linking urban growth and water supplies
- Agricultural drainage in the San Joaquin Valley in particular; urban drainage also
- Flood risks especially in the Central Valley and coast
- Dealing with prolonged drought
- Regional issues: Salton Sea and New River, etc. etc.

What are we trying to achieve?

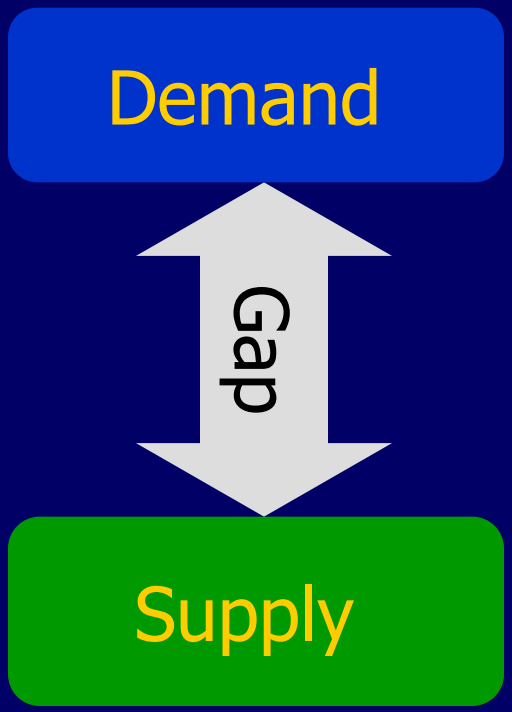
Figure 1 Conceptual Model of Water Management System



DWR's "Pyramid of a Successful Water Future

Water Supply Reliability

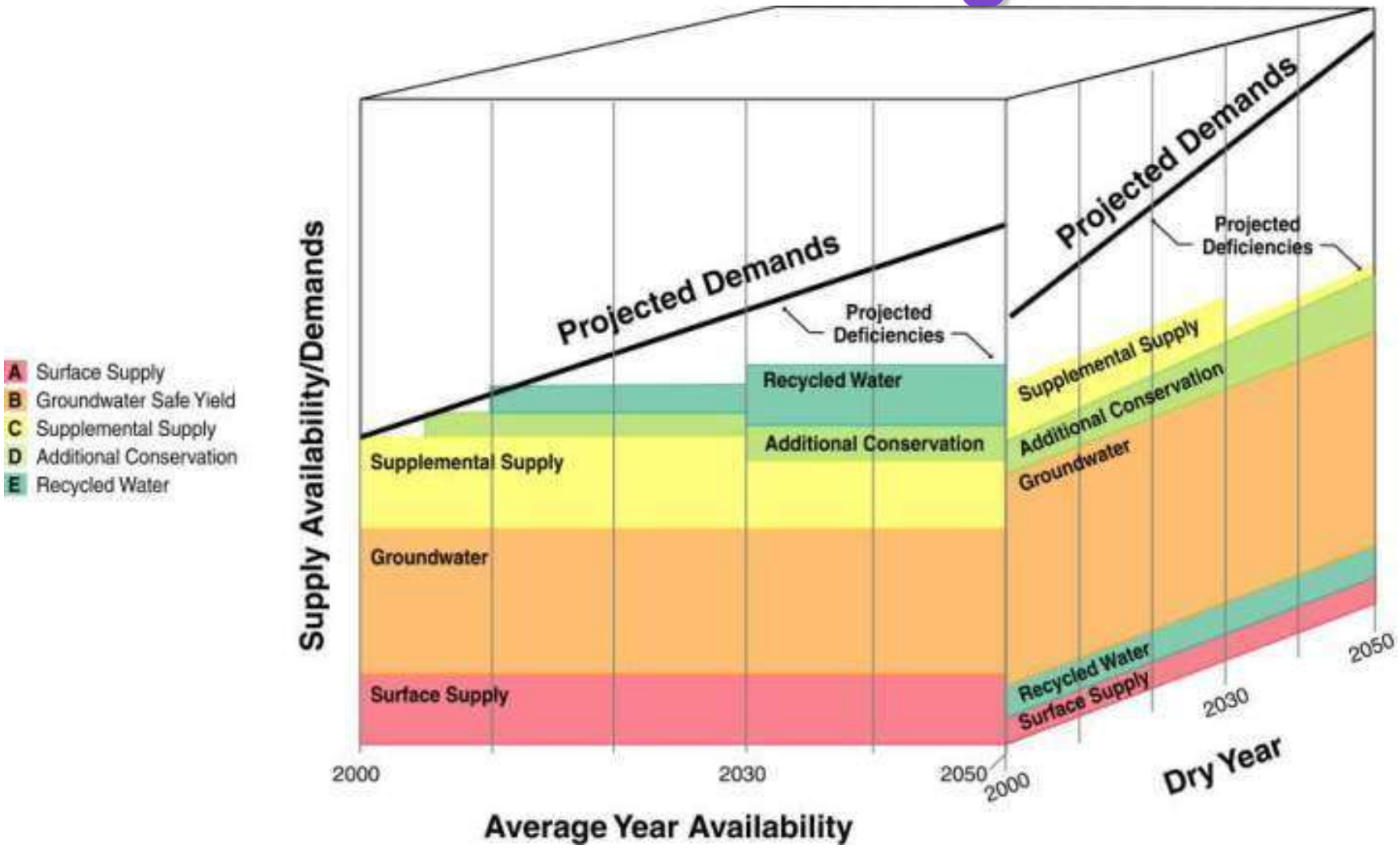
Minimize gap between supply & demand



- Conservation
- Recycling
- Surface Storage
- Groundwater Storage
- Conveyance
- Desalination
- Transfers

Diversified portfolio: optimize public investment & reduce risk

Complex and Integrated Portfolio Water Management



Integrated Land and Water Principles

Efficient Land Use and Community Design

Natural Infrastructure

Efficient Water Use

Sustainable Site Design

Implementation

Integrated Water Management

Desired future for California water

California has healthy watersheds and integrated, reliable and secure water resources and management systems that

- Enhance public health, safety, and quality of life in all its communities;
- Sustain economic growth, business vitality, and agricultural productivity; and
- Protect and restore California's unique biological diversity, ecological values, and cultural heritage.

Statements of intent / What and when

1. **Expand Integrated Regional Water Management**
   Promote, improve, and expand Integrated Regional Water Management to create and build on partnerships that are essential for California water resources planning, sustainable watershed and floodplain management, and increasing regional self-sufficiency.

2. **Use and Reuse Water More Efficiently**
   Use water more efficiently with significantly greater water conservation, recycling, and reuse to help meet future water demands and adapt to climate change.

3. **Expand Conjunctive Management of Multiple Supplies**
   Advance and expand conjunctive management of multiple water supply sources with existing and new surface water and groundwater storage to prepare for future droughts, floods, and climate change.

4. **Protect Surface Water and Groundwater Quality**
   Protect and restore surface water and groundwater quality to safeguard public and environmental health and secure California's water supplies for their beneficial uses.

5. **Expand Environmental Stewardship**
   Practice, promote, improve, and expand environmental stewardship to protect and enhance the environment by improving watershed, floodplain, and instream functions and to sustain water and flood management systems.

6. **Practice Integrated Flood Management**
   Promote and practice integrated flood management to provide multiple benefits including better emergency preparedness and response, higher flood protection, more sustainable flood and water management systems, and enhanced floodplain ecosystems.

7. **Manage a Sustainable California Delta**
   Set as co-equal goals a healthy Delta ecosystem and a reliable water supply for California and recognize the Delta as a unique and valued community and ecosystem to promote and practice management for a sustainable California Delta.

8. **Prepare Prevention, Response, and Recovery Plans**
   Prepare prevention, response, and recovery plans for floods, droughts, and catastrophic events to help residents and communities, particularly disadvantaged communities, make decisions that reduce the consequences and recovery time of these events when they occur.

9. **Reduce Energy Consumption of Water Systems and Uses**
   Reduce the energy consumption of water and wastewater management systems by implementing the water-related strategies in AB 32 Scoping Plan to mitigate greenhouse gas emissions.

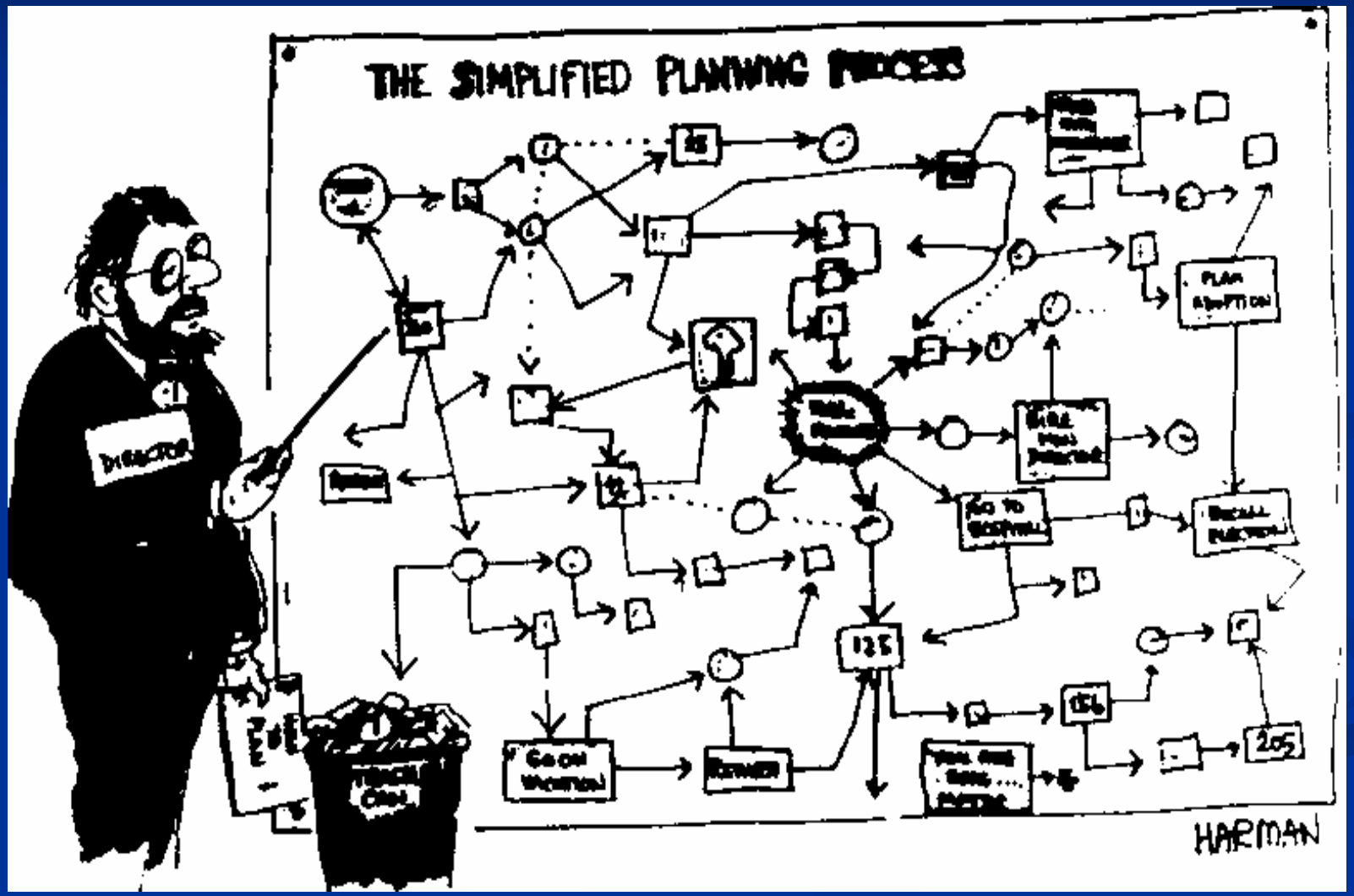
10. **Improve Data and Analysis for Decision-making**
    Improve and expand monitoring, data management, and analysis to support decision-making, especially in light of uncertainties, that support integrated regional water management and flood and water resources management systems.

11. **Invest in New Water Technology**
    Identify and fund applied research on emerging water technology to make them attainable and more cost effective.

12. **Improve Tribal Water and Natural Resources**
    Develop Tribal consultation, collaboration, and access to funding for water programs and projects to better sustain Tribal water and natural resources.

13. **Ensure Equitable Distribution of Benefits**
    Increase the participation of small and disadvantaged communities in state processes and programs to achieve fair and equitable distribution of benefits. Consider mitigation of impacts from the implementation of state government programs and policies to provide safe drinking water and wastewater treatment to all California communities and ensure that these programs and policies address the most critical public health threats in disadvantaged communities.

How do we get there?

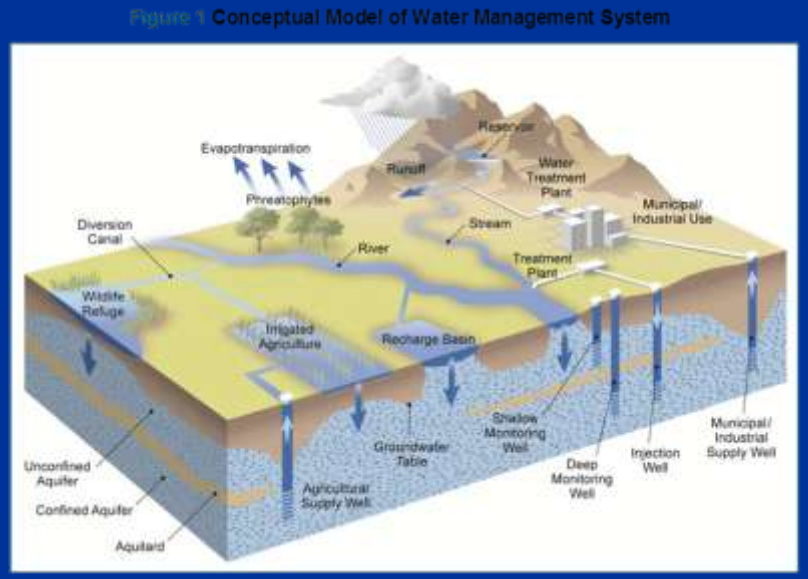


Moving from Conflict and Competition to Collaboration

Water wars

Integrated Regional Water Management Plans

- IRWMP's consider all parts of the water cycle, include all regional partners and look for ways to save money, use water wisely and link ecosystem protection, water quality, quantity and flood/drainage management
- Most regions in California are developing one (linked to billions of dollars of Proposition funding)
- Are they "integrated" and "regional" or are they: "I Really Want My Project"
- Will they engage all the stakeholders and issues?

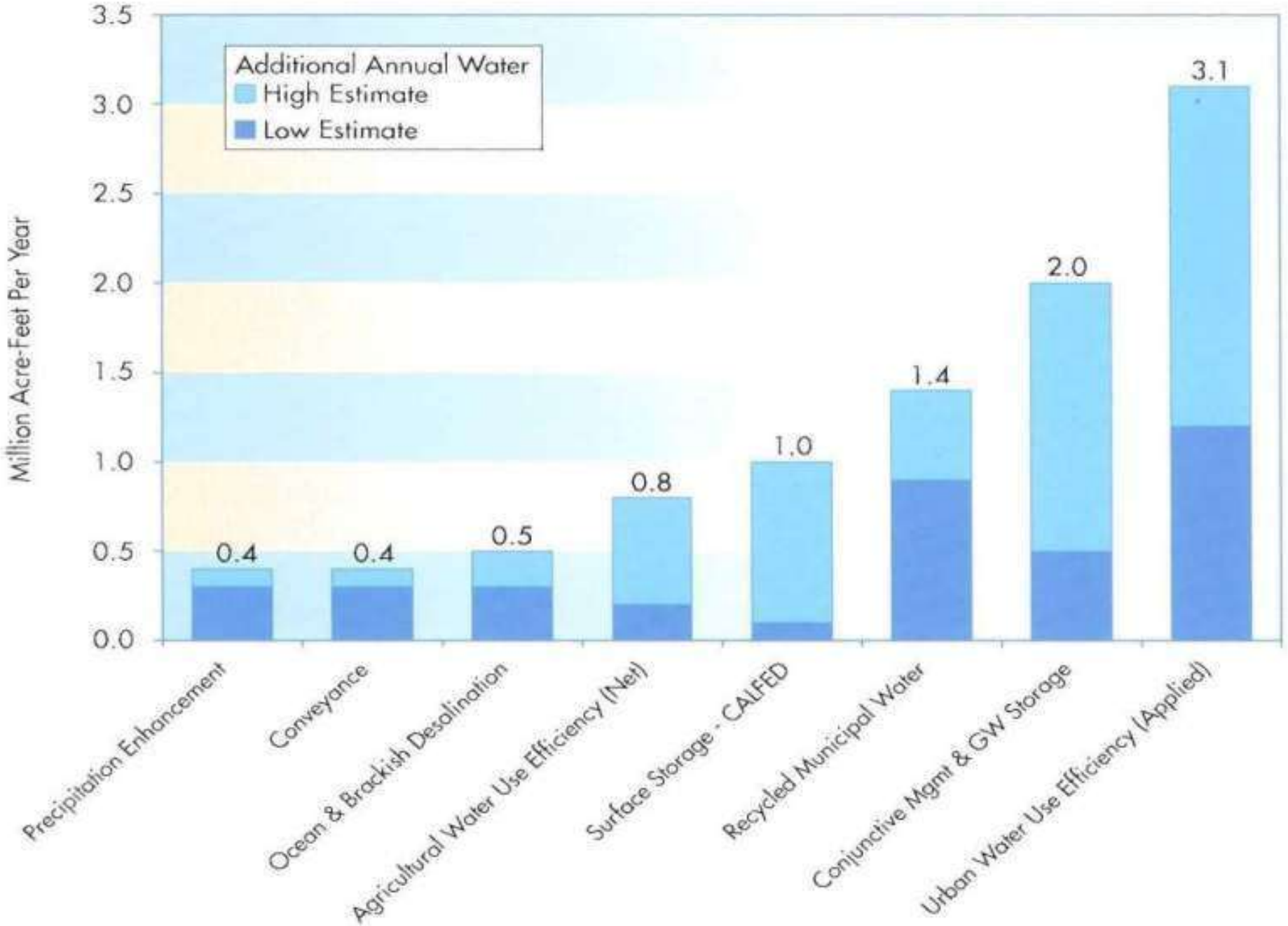


Sacramento Water Forum: Watershed scale focused on water supply & ecological restoration

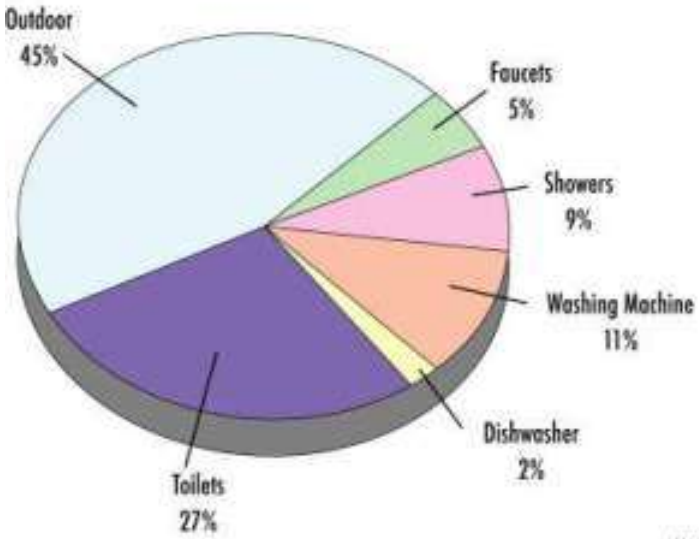
40 stakeholder organizations; 7 years to agree on the plan, 30 years of implementation

Where will we get our water: are we likely to become more sustainable?

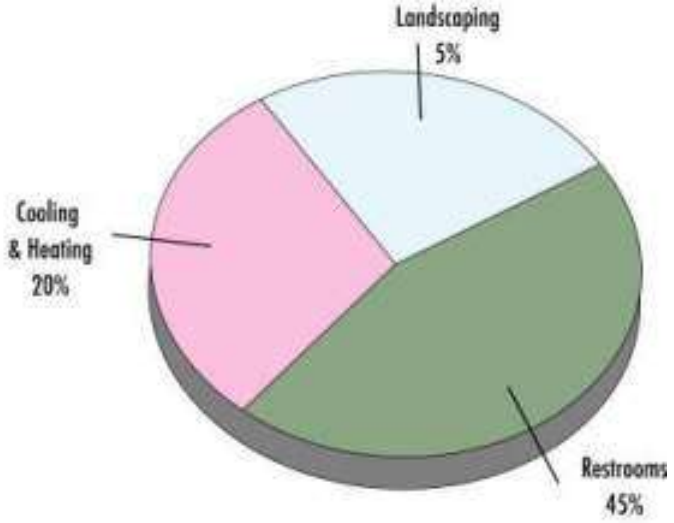
Figure 1-1 Range of additional annual water for eight resource management choices



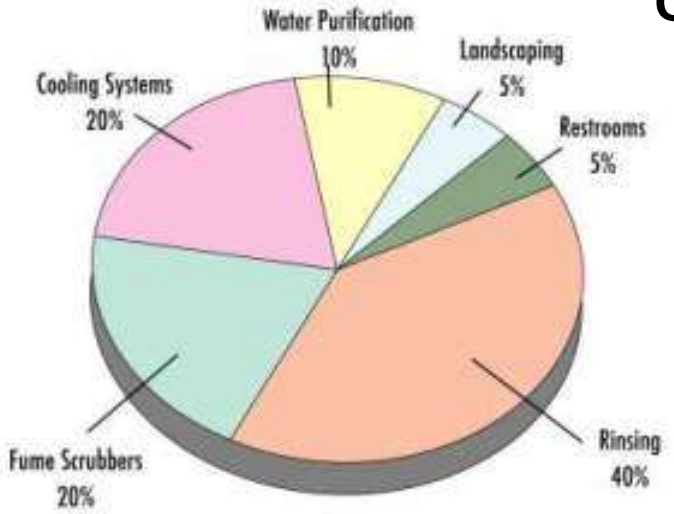
Water Conservation



Single-Family Residential



Commercial



Industrial

Urban Water Conservation

- Three recent California studies
- 10-33% conservation over current water use levels
- Costs range from $220-600/acre foot; less than most alternate new supplies
- Total amount conserved annually: 1.2-2.3 million acre feet
- Projected shortfalls of 2-6 maf/year by 2030
- Governor's "policy" 20X2020
- None of the studies considered climate change effects
- **California Urban Water Conservation Council continues to leas the way**

H2OUSE
WATER SAVER HOME

- Garden Tours
- Garden Gallery
- Common Names
- Botanical Names
- Characteristics
- My Plant List
- Plant Search

Search All Plant Name Search

HOME CHARACTERISTICS COMMON NAMES

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Click on a photo for a detailed description. O Pages: 1 2 3 4

Ocahui Agave

Ocotillo

October Daphne

Octopus Agave

Old Gold Pfitzer

Old La Rochette Alum Root Hybrid

O Pages: 1 2 3 4

Best Management Practices

- Water Audits Program for single-family and multi-family residential customers
- Residential plumbing retrofit
- Distribution system water audits, leak detection, repair
- Metering with commodity rates
- Large landscape conservation programs/incentives
- High-efficiency washing machine rebate programs
- Public information

Best Management Practices

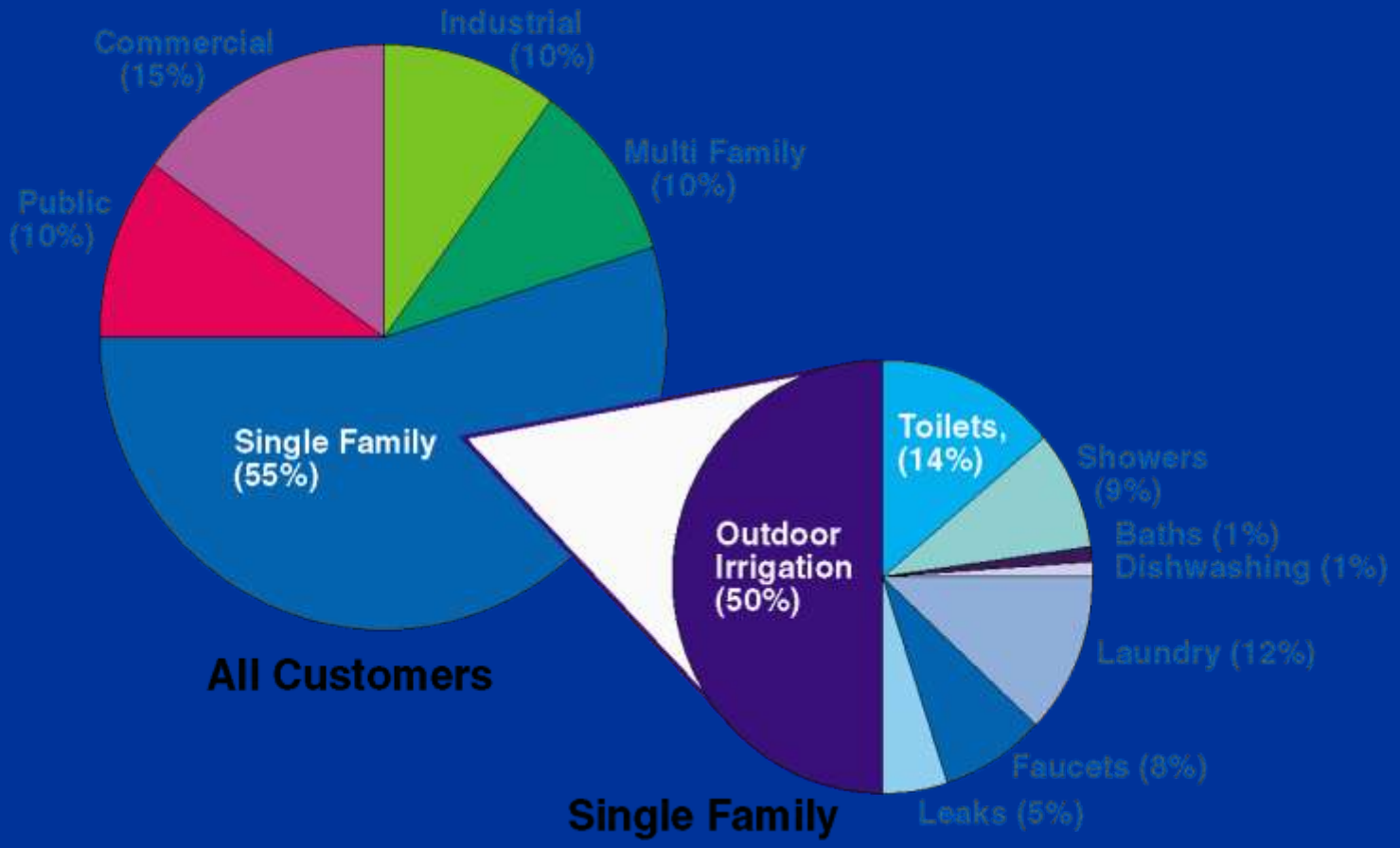
- School education programs
- Commercial/industrial/institutional conservation programs
- Wholesale agency assistance programs
- Conservation pricing
- Conservation coordinator
- Water waste prohibition
- Residential ULFT replacement programs

New Conservation Measures Must Go Above & Beyond

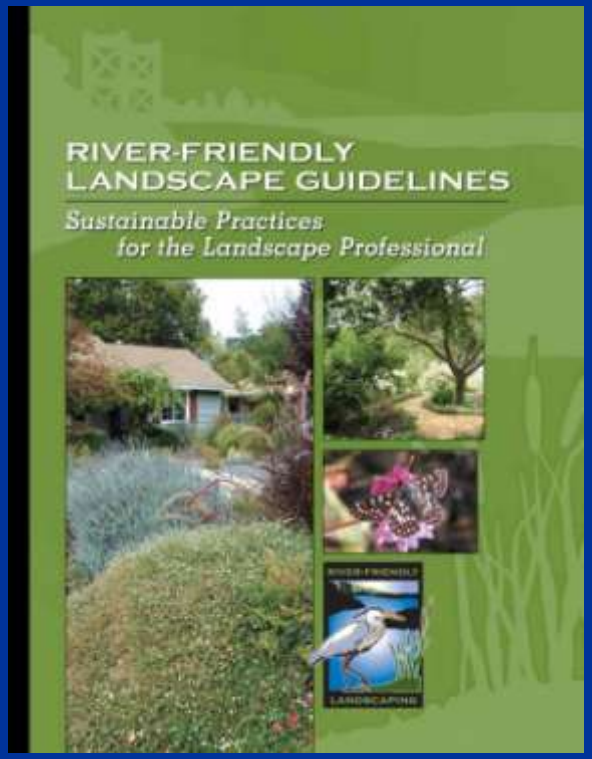
- Artificial turf
- Moisture sensitive irrigation sensors
- Use of CIMIS for urban parks and landscapes
- Water-less urinals and ultra-low flow toilets
- Rain water and gray water capture and use
- Recycled water for private as well as public spaces and indoor uses
- Aggressive conservation pricing; retro-fit on resale; conservation off-set programs
- Aggressive landscape conservation

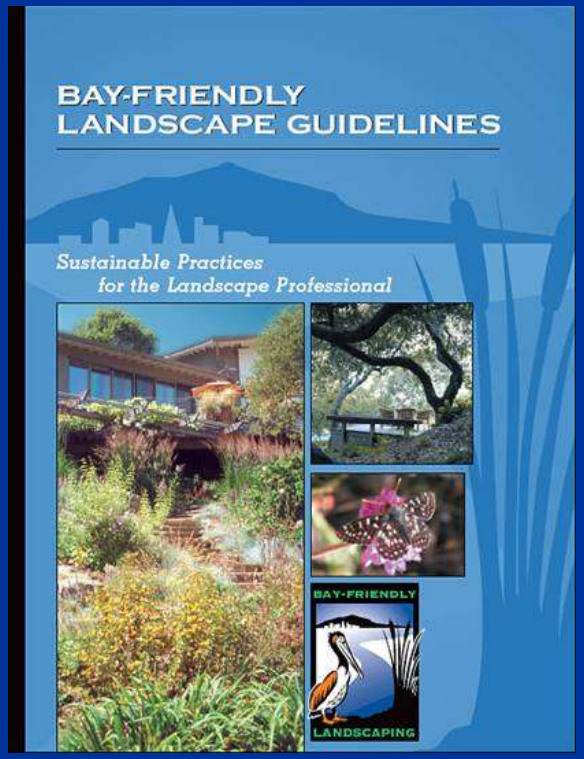

(1) Weather data (collected by weather stations) are automatically transmitted to a central computer located in Sacramento.
(2) The weather data is analyzed and stored in a database server.
(3) Weather data is made available over the Internet.

Landscape Water Conservation:
A Very Large Untapped Resource
1.4 million acres of urban irrigated landscape in California



Getting Consistent Adoption of Appropriate Policies and Design Standards





retired lawn


Zero-scape or xeriscape?

No Panacea (Maybe Panic, See ya!)

- How well we will implement measures, especially in the face of economic challenges?
- Will energy savings get factored in?
- What happens in a prolonged drought; do we have any more to “squeeze out of the sponge”?
- Will they last over time (e.g. trading out landscaping, poor maintenance, declining budgets)?
- Who monitors and enforces?
- How (and when) we will push agricultural conservation?

Water Storage and Harvesting

CBF Merrill Environmental Center, Annapolis, MD

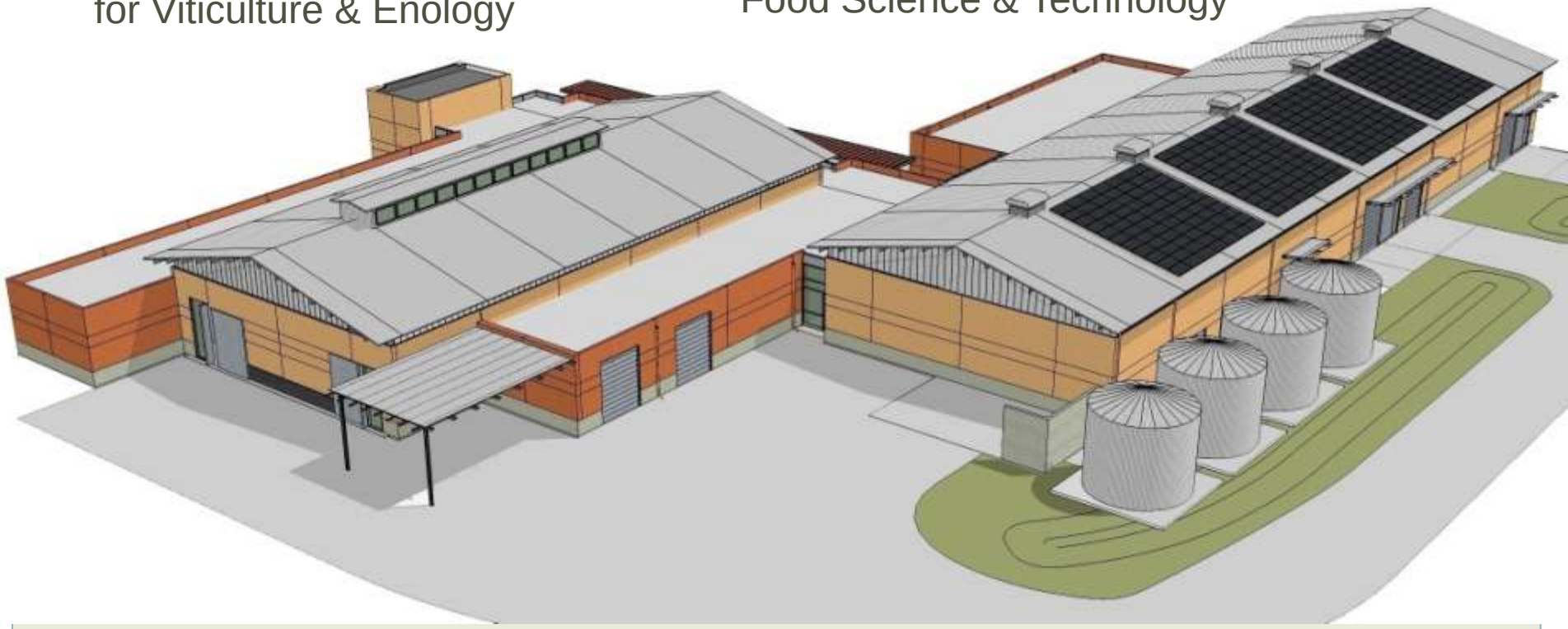
- **Cisterns**
  - Collect rainwater from roof and store it for irrigation and other non-potable uses
  - Attenuate peak runoff flows
  - Conserve potable water resources


Fireman Hose
Hookup

UC Davis Mondavi Center Winery and Brewery

Research & teaching winery for Viticulture & Enology

Research & teaching brewery, food processing and milk processing lab for Food Science & Technology



LEED Platinum Certification

Rainwater Harvest System Overview

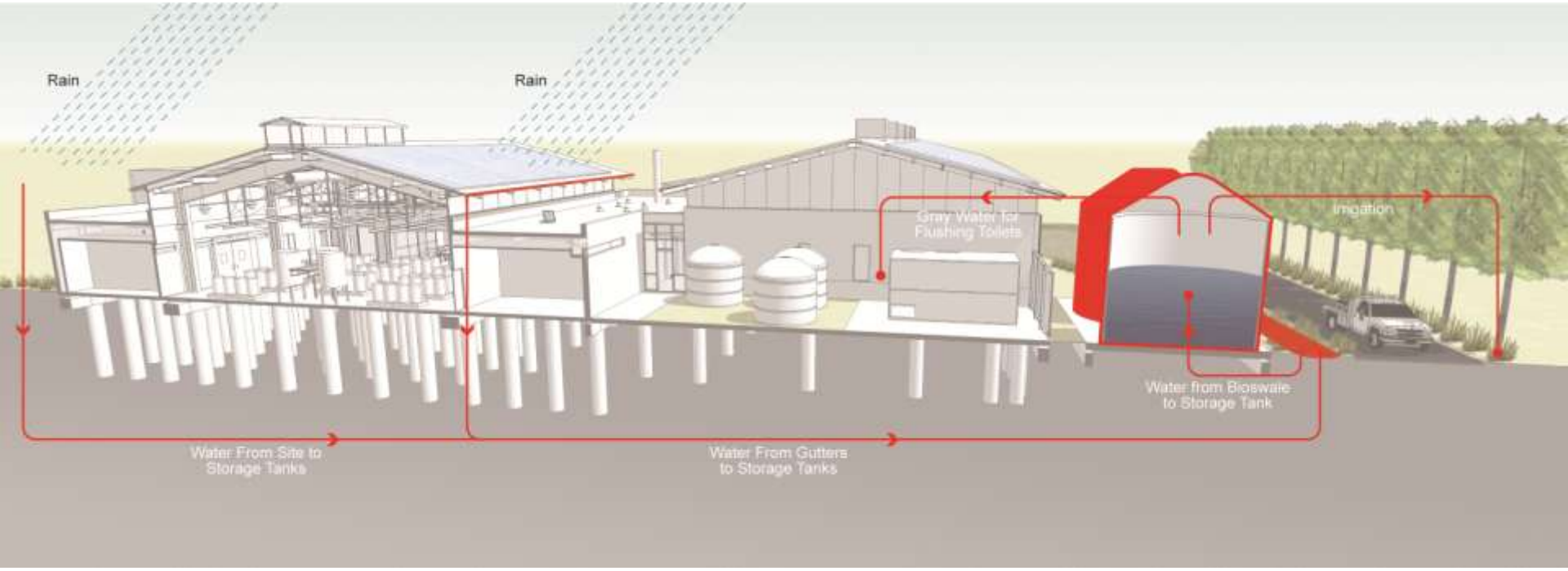
Rainwater is directed from roofs and surface areas into bioswale

1

2 Bioswale filters and pipes the water to the lift station

3 Lift station pumps water into first water storage tank

Sustainable Solutions: LID with Rain Water Harvest

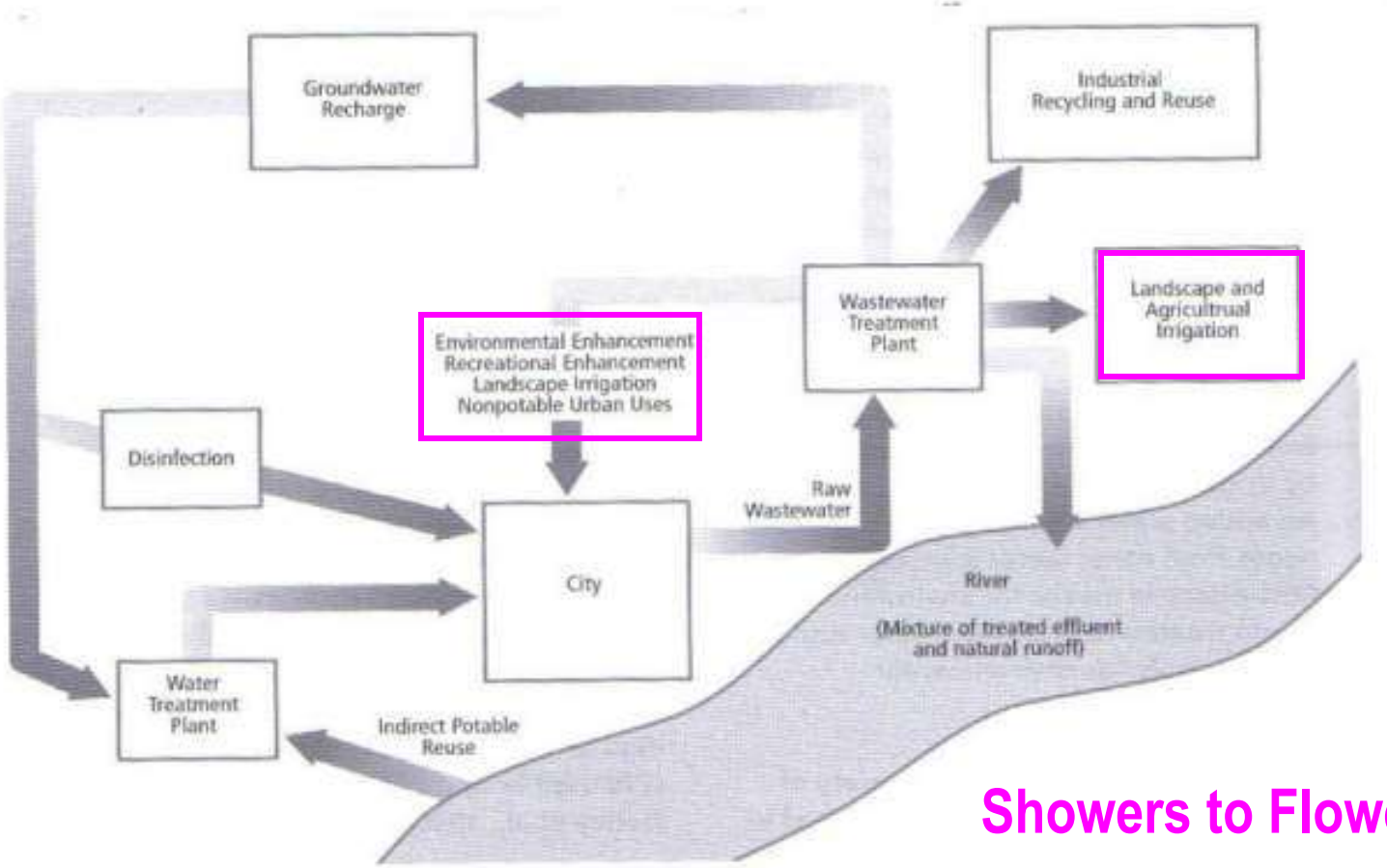


UC Davis Brewery, Winery & Food Pilot Facilities

Rainwater Harvesting

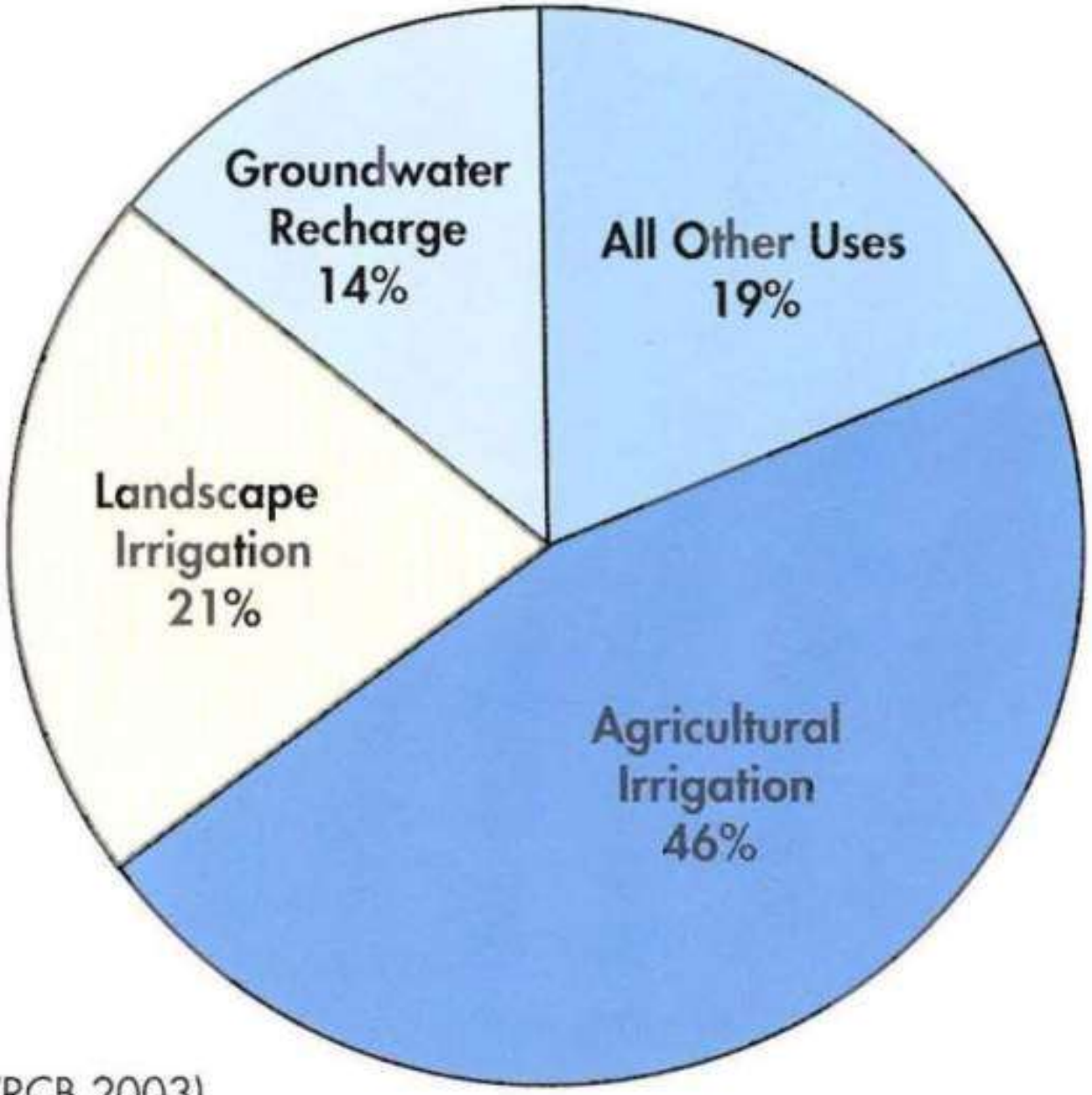
Rain water harvest, bio-swale treatment, storage and treatment system at UC Davis

Direct and Indirect Recycled Water Uses (toilets to tap or showers to flowers?)



Source: HDR, 2005

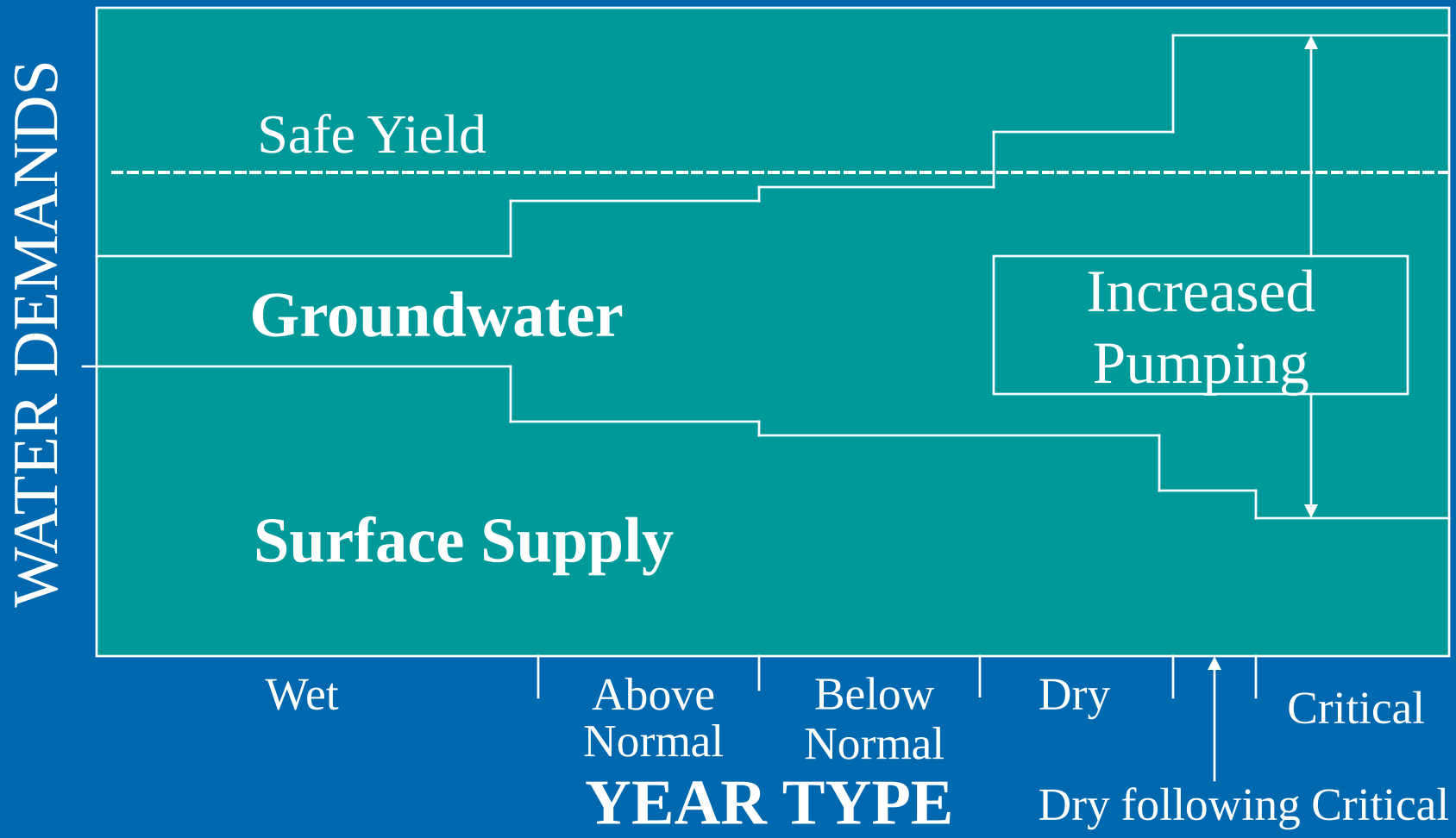
Figure 6-1 Where recycled water is used in California



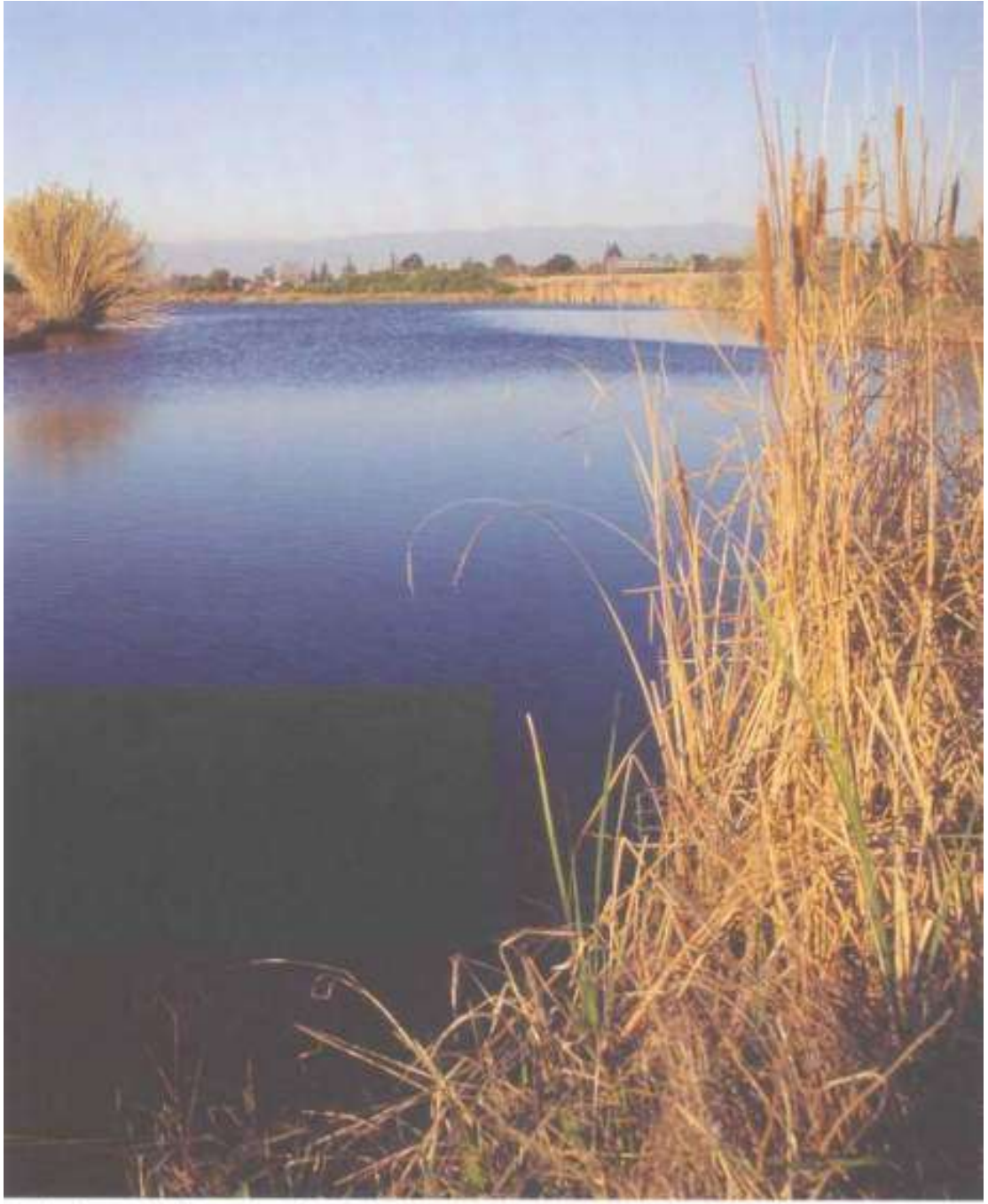
(SWRCB, 2003)

Serrano Housing Development in California's Foothills

Conjunctive Use of Surface and Groundwater



Ground water Recharge & Conjunctive Use



Natural and constructed recharge areas must be protected to maintain groundwater quantity and quality. (DWR photo)

Table 6-1 Desalting in California for new water supply

	Plants in Operation		Plants in Design & Construction		Plants Planned or Projected	
Feedwater Source	No. of Plants	Annual Capacity	No. of Plants	Annual Capacity	No. of Plants	Annual Capacity
Groundwater	16	79,100	6	29,500	6	61,700
Seawater	7	1,500	1	300	13	415,100
Total	23	80,600	7	29,800	19	476,800
Cumulative			30	110,400	49	587,200

Desalination Plant in Santa Barbara

Sweetwater Authority customers benefit from this desalination facility that treats brackish or saline groundwater. About 24 groundwater desalting plants operat in California and provide water for municipal purposes. The total capacity of these plants is approximately 79,000 acre-feet per year. (DWR photo)

Agriculture to Urban Water Transfers

How should we assess so-called third party impacts? Do we have adequate tools to do this? What are the long term land use implications of these transfers? What about "conservation" transfers like ImpreialValley?

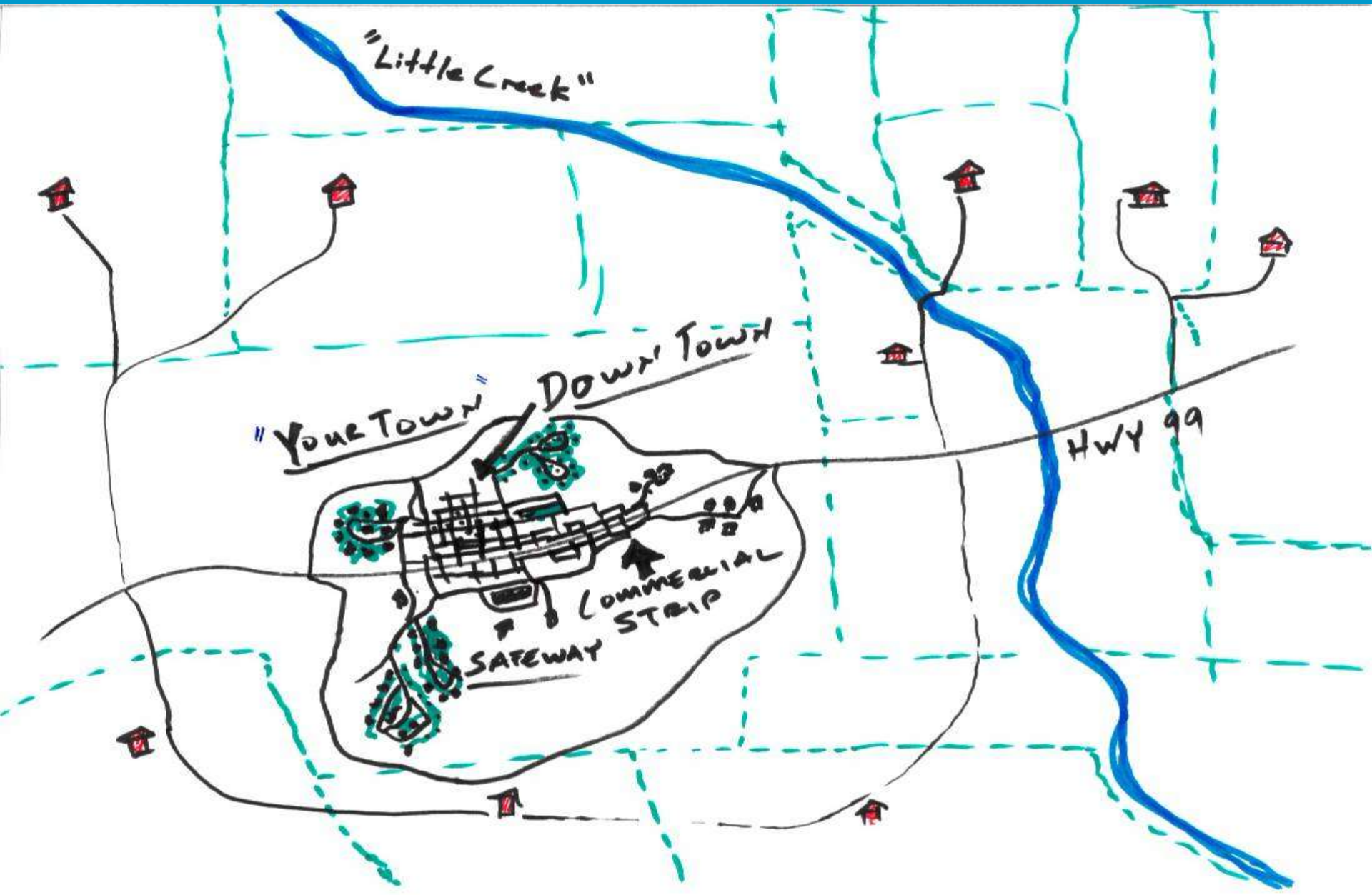
Table 23-1 Pending or approved long-term water transfers[1,2]

Seller	Buyer	Maximum Annual (Acre-feet)	Duration (years) (from/to)	Purpose
Imperial ID	San Diego County WA	200,000	35-75	Agriculture to Agriculture and Urban (QSA)
Imperial ID	Coachella Valley WD	103,000	35-45	Agriculture to Agriculture (QSA)
Imperial ID	Coachella Valley WD	50,000	46-75	Agriculture to Agriculture (QSA)
Imperial ID	Metropolitan WDSC	110,000	54 years or 60 years + 210 days or 90 years + 210 days	Agriculture to Urban (QSA)
Imperial ID	QSA Joint Powers Authority (through San Diego County WA) for Salton Sea Mitigation Program	150,000	maximum of 15	Agriculture to Environment (QSA)
Butte WD	Madera ID and Root Creek WD	15,000	25	Agriculture to Urban
Merced ID	U.S. Fish and Wildlife	47,000	10	Agriculture to Environment
Palo Verde ID	Metropolitan WDSC	111,000	35	Agriculture to Urban
South San Joaquin ID	Cities of Tracy, Escalon, Manteca, and Lathrop	75,000	25	Agriculture to Urban

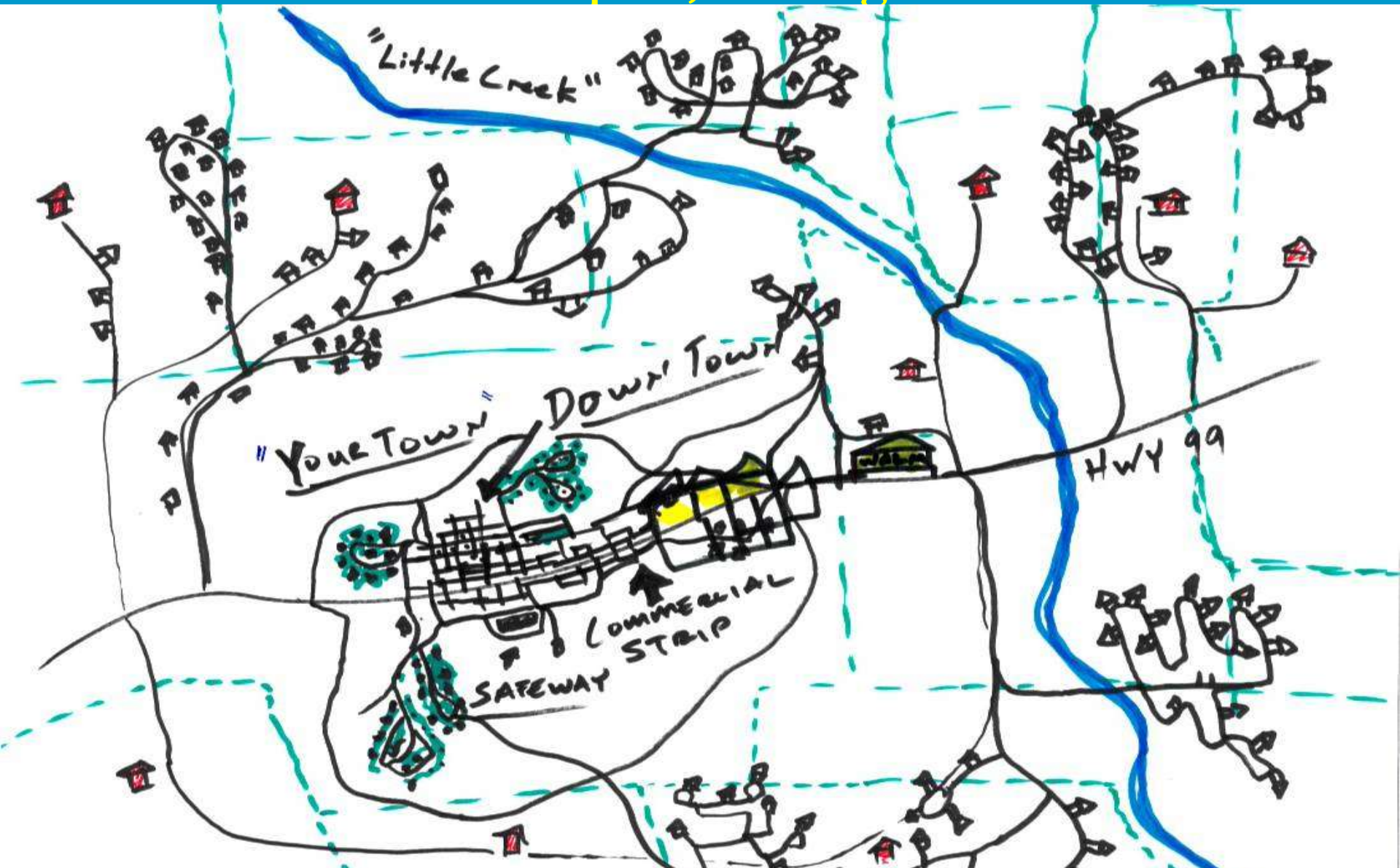
Non-traditional off stream, off peak surface water reservoirs

Surface storage plays an important role in California where the pattern and timing of water use does not always match the natural runoff pattern. Contra Costa Water District pumps high quality water into its Los Vaqueros Reservoir and uses it to lower salt content of water it pumps from the Delta. (DWR photo)

Where we Build and How we Build has a lot to do with Water Quantity and Quality



Water demand, cost of infrastructure and service, water quality, economies of scale for wastewater and water, creek and wetland impact, drainage and runoff



Compact Development Patterns are more water efficient

SACOG region

Its members include the counties of El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba as well as their constituent municipal governments.

How to Best Manage Growth?

Seven principles of smart growth

Stakeholder Based Planning Process

- 5,000 citizens' input in over 50 workshops
- Regional committee of city and county planners
- Analyzed multiple scenarios

Water Demand Analysis: SACOG Blueprint

Region		Base Case (acre-feet/year)	Preferred Scenario (acre-feet/year)	% Difference
Residential	Incremental Demand	661,125	408,362	-38%
	Demand Per Unit	0.86	0.50	-42%
Employment	Incremental Demand	199,817	181,611	-9%
	Demand Per Employee	0.22	0.18	-20%
Total	Total Incremental Demand	860,942	589,973	-31%

Water Quality Solutions

New River Improvement Project
Strategic Plan

Vision

The New River is a healthy river corridor that serves as an asset to the people, communities, ecosystems and agricultural industry of the Imperial Valley.

Goals

Public Health:
A restored and transformed New River corridor provides a safe, healthy and accessible recreational resource for local communities.

Ecology:
Improved water quality, habitat and river corridor conditions in the New River support a healthy aquatic and riparian ecosystem and supplies water that contributes to the restoration of the Salton Sea and its delta.

Economy:
The New River is an aesthetic and environmental amenity that enhances community development opportunities and benefits agricultural activities throughout the Imperial Valley.

Examples of Remediation

Imperial Pilot Wetlands

TMDL Voluntary Compliance Program - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://www.ivtmdl.com/

Customize Links Free Hotmail Windows Marketplace Windows Media Mozilla Firefox Start P... Windows

About | Forms | Calendar | BMP's | News & Reports | Grower Resources | Contact Us | Links

Imperial County Farm Bureau

TMDL

Total Maximum Daily Load

Voluntary Compliance Program

NOTICE

Farm Water Quality Management

Plan Update Deadline:

September 1, 2007

1000 Broadway - El Centro , CA 92243 - 760.352.3831 - Fax 760.352.0232 - info@ivtmdl.com

"To inform, educate and demonstrate how to reduce impairments in drainwater"

another quality conveyorgroup production

Done

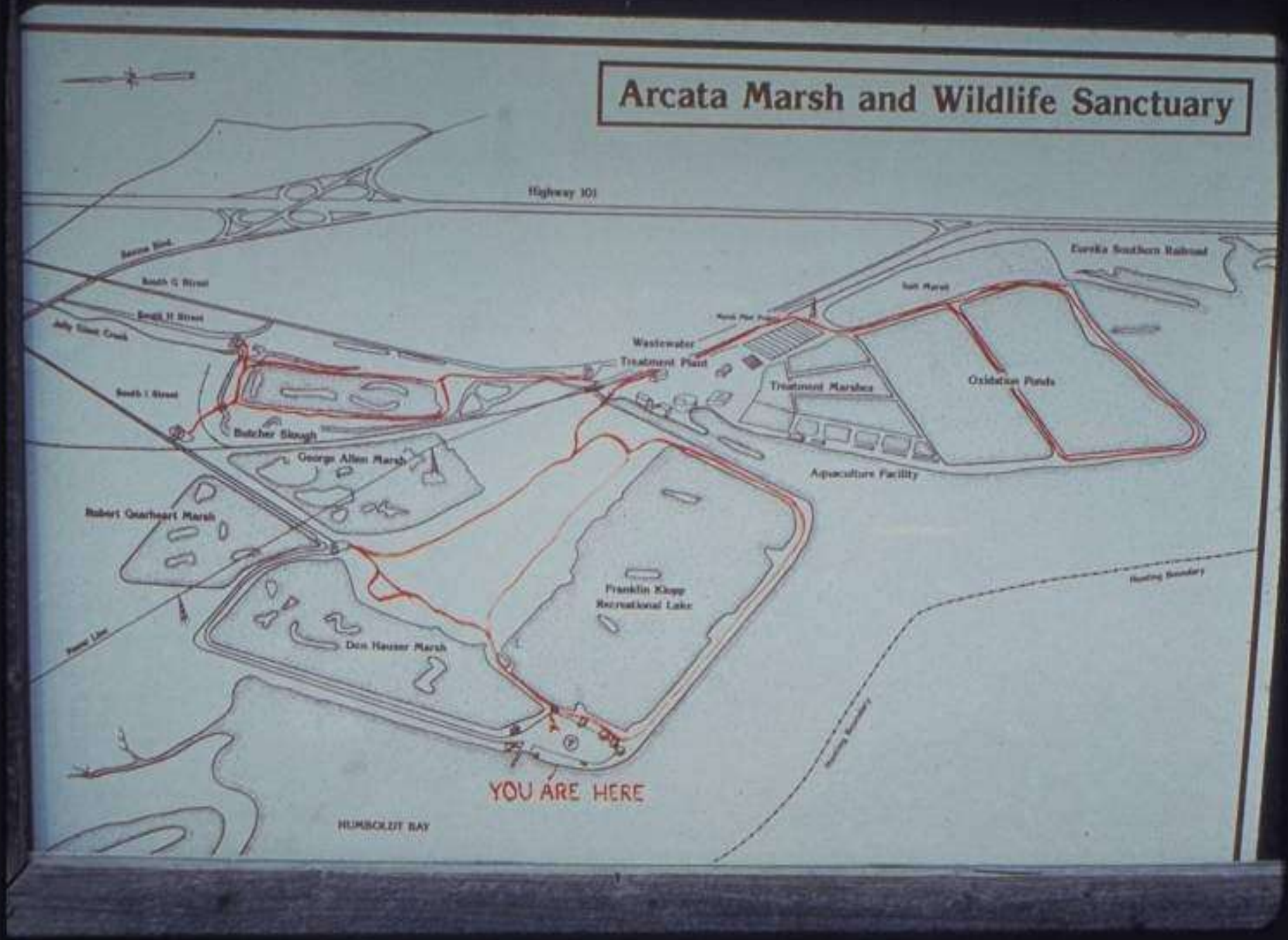
McAfee SiteAdvisor

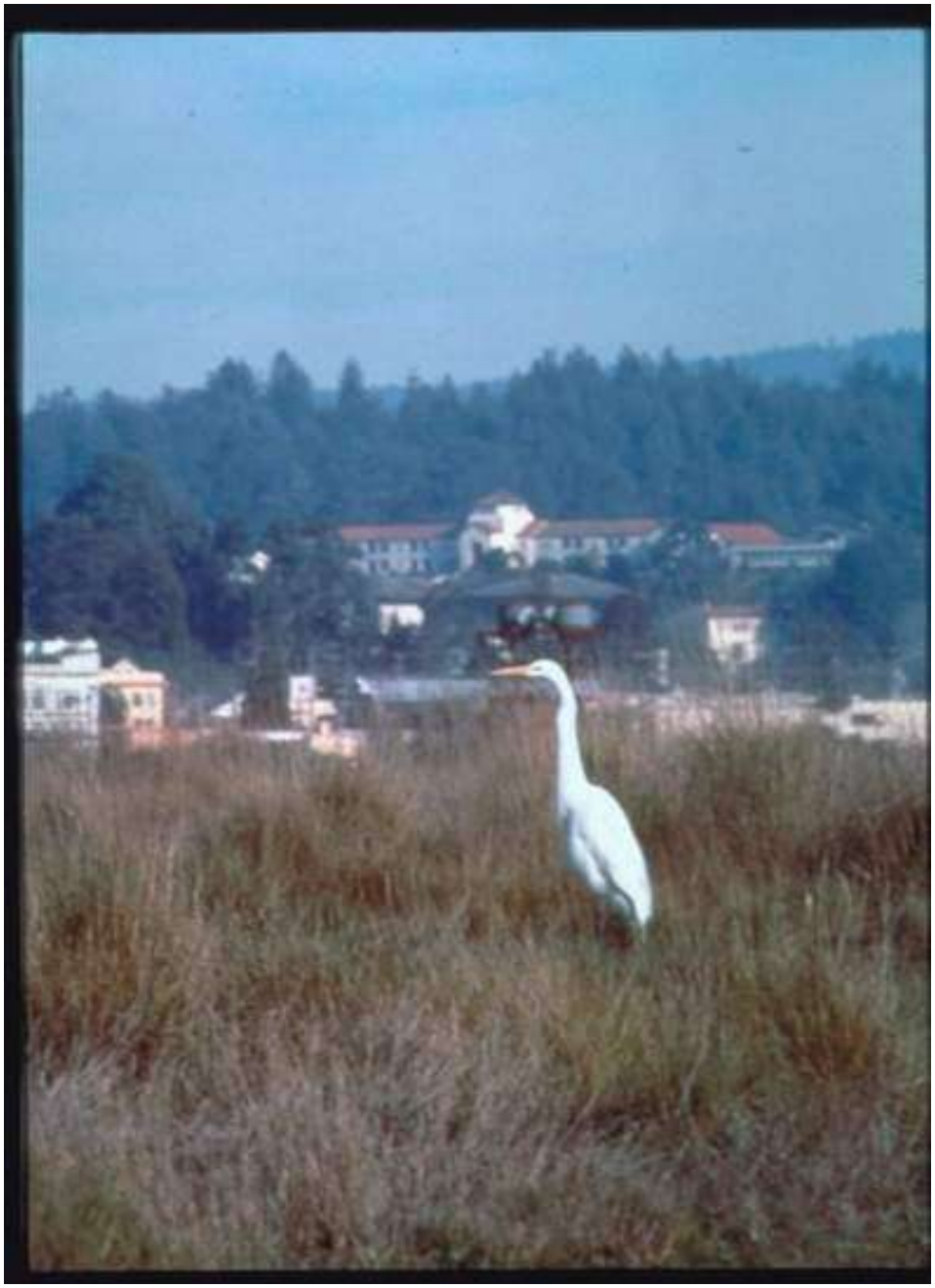
DEVELOPED A USER FRIENDLY WEBSITE (www.ivtmdl.com)

Best Management Practices BMP

Existing	Planned (within a year)	N/A	
◉	○	○	IID regulation 39 adherance-Tail water drain box with working raised, adjustable grade board (in working, measurable condition)
○	○	◉	Erosion wings on drain box
○	○	◉	Cascade Irrigation-drainwater used to irrigate adjacent field
○	○	◉	Wider drain box (42 inches)
○	○	◉	Multiple Drainboxes
◉	○	○	Land leveling including field at proper grade near the drain box
◉	○	○	Pan ditch (wide, flat tailditch) with or without grass growing in the bottom
○	○	◉	No drain ditch
○	○	◉	Settling Basin
◉	○	○	Gopher Control and/or Gopher Ditch
○	○	◉	Tailwater ditch checks or check dams
○	○	◉	Lined spillways or drop boxes to drain water into drain ditch
○	○	◉	Plastic sheeting used to control erosion
○	○	◉	Fiber mat used to control erosion
○	○	◉	Filter Strips
○	○	◉	Grass Strips in tailditch
◉	○	○	Irrigation Water Management
○	○	◉	Sprinkler irrigation including sprinkler germination
○	○	◉	Drip irrigation
○	○	◉	Level basin irrigation
○	○	◉	Pump-back System
○	○	◉	Use of Polyacrylamides (PAMs)
○	○	◉	Reduced Tillage (including minimum till planting)

Innovative and effective BMP's were developed by the farmers

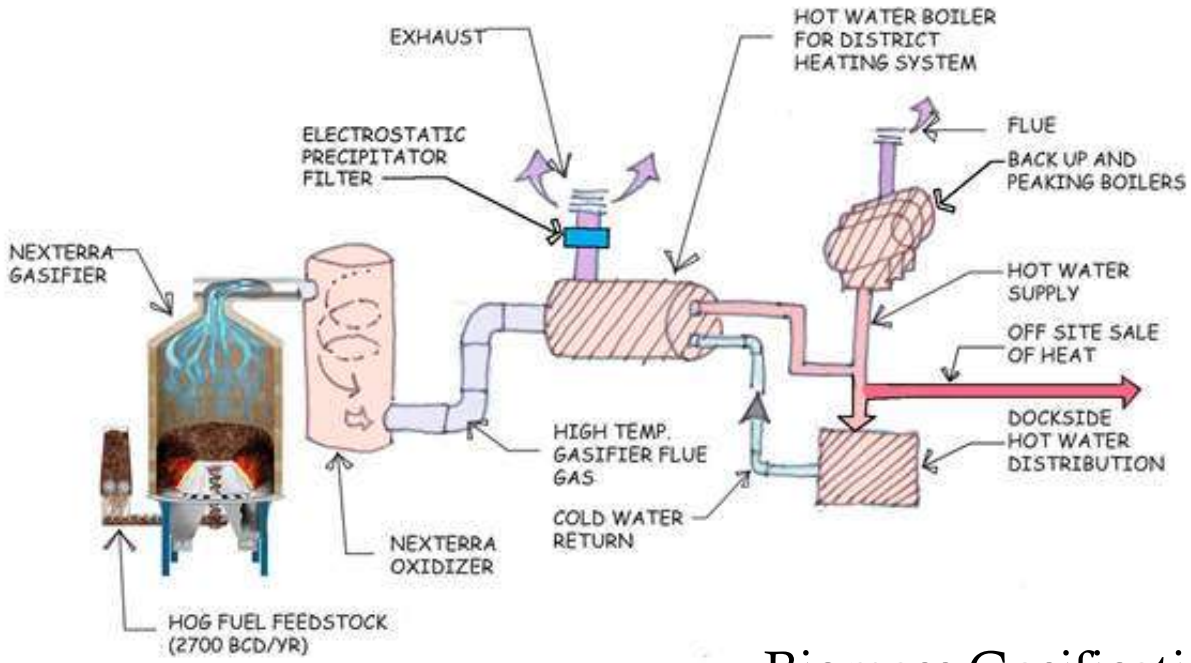

Arcata Marsh and Wildlife Sanctuary
Highway 101
Eureka Southern Railroad
South G Street
South H Street
South I Street
Jolly Giant Creek
Wastewater
Treatment Plant
Treatment Marshes
Oxidation Ponds
Aquaculture Facility
Butcher Slough
George Allen Marsh
Robert Gearheart Marsh
Franklin Klopp
Recreational Lake
Don Hauser Marsh
Hunting Boundary
YOU ARE HERE
HUMBOLDT BAY



Dockside Green

The 1st Carbon Neutral Community in North America

Biomass Heat and Energy



- Biomass Gasification System to produce heat and energy.
- No smoke is produced in the process – just green energy and clean, odorless flue gases.
- Provides heat and energy for 26 buildings and 2,500 people.
- Excess biomass heat will be sold to off-site customers.

Sewage Treatment Facility

100% Sewage Treated On-site

7 Treated water can be reused for landscape irrigation, constructed waterways, toilet flush water and for laundry facilities.

Collection Tank

Anoxic Chamber

Aerobic Chamber

Membrane Filtration

UV or Ozone

Storage Tank

Conventional Storm Drainage

- Collect storm water in curbs, gutters, and drainage pipes, channels and conduits as fast as possible
- Transport storm water through smooth conduits as fast as possible to streams, rivers, lakes or other receiving discharge points

Low Impact Development

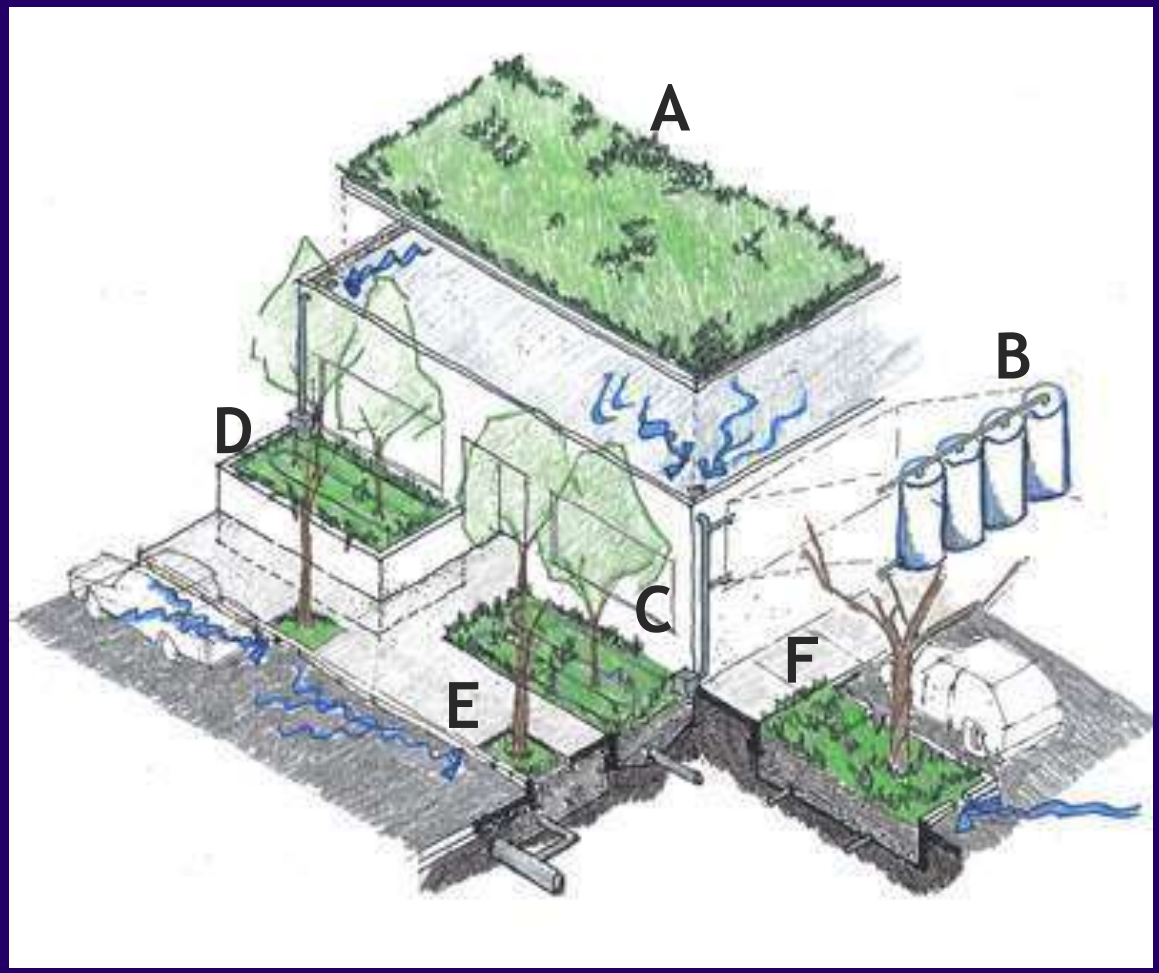
Tries to make this…

…function like this.

Low Impact Development Using a Tool Box Approach

Combined Solutions:

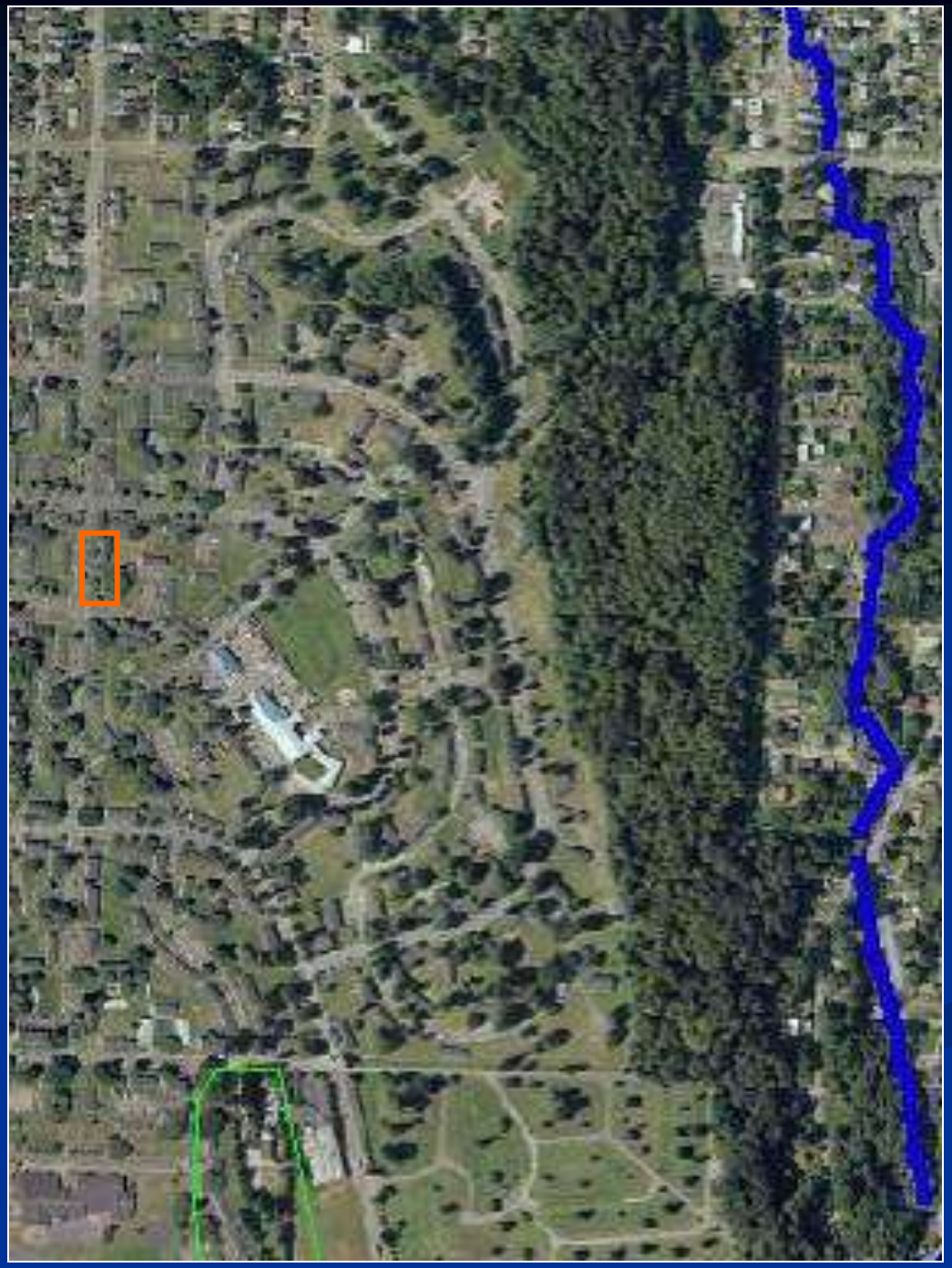
- **Protected stream segment +**
- **Green Roof +**
- **Rainwater garden +**
- **Bio-retention tree well +**
- **Infiltration basin…**

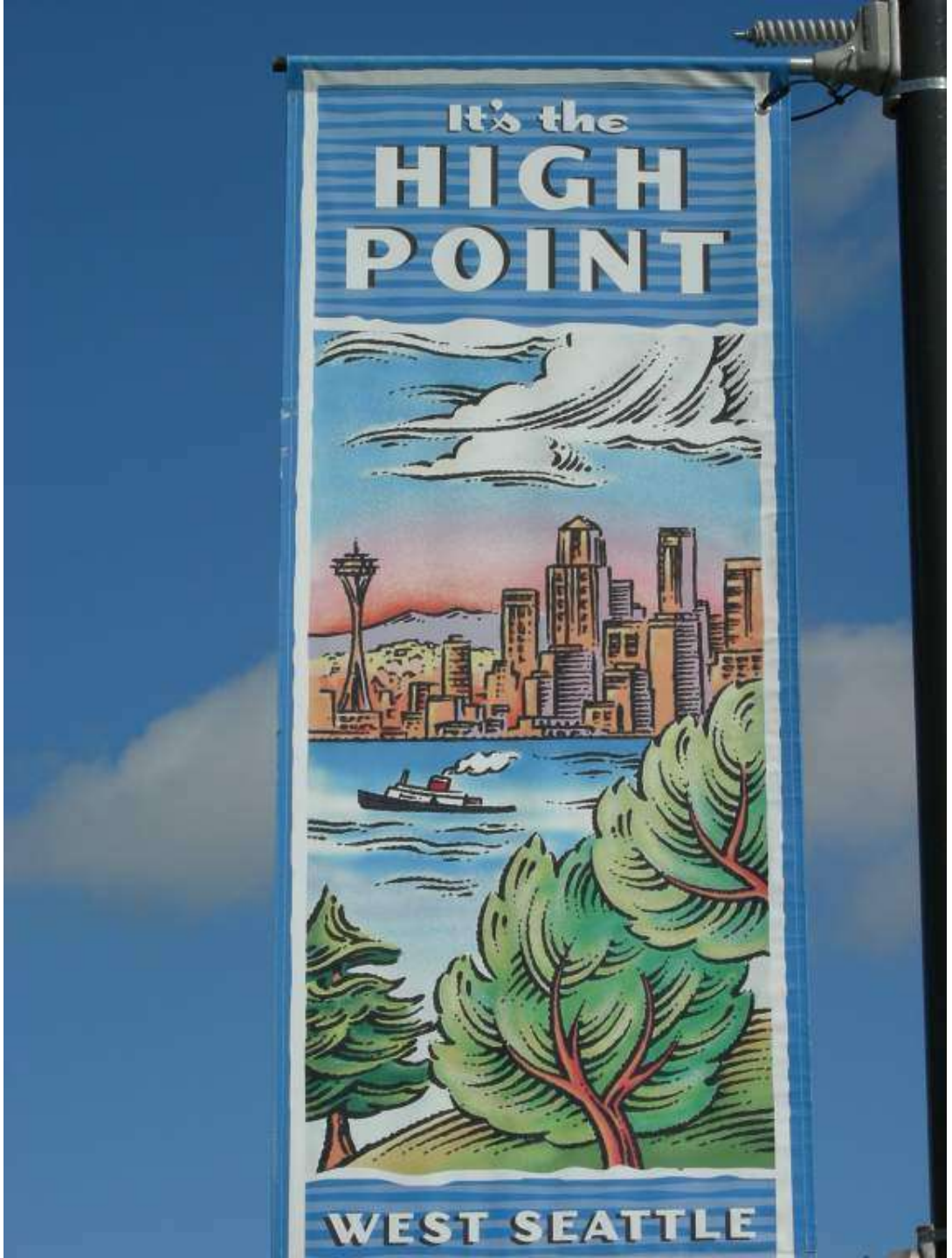


Longfellow Creek Watershed

High Point Redevelopment

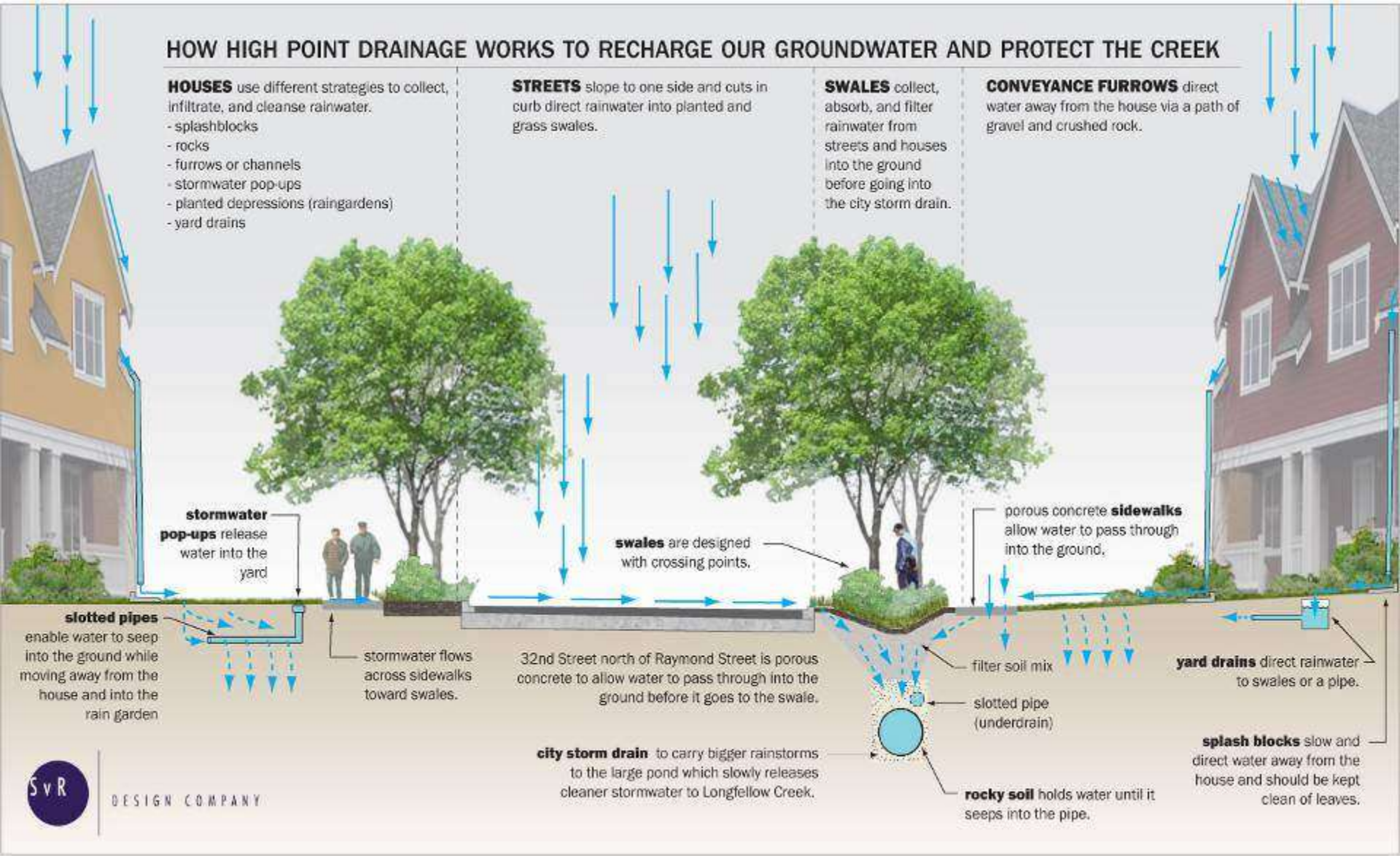
- **130-acre site**
- **new right-of-way**
- **1,600 units**
- **65% impervious area**
- **9% of watershed**




It's the
HIGH
POINT
WEST SEATTLE

High Point Neighborhood

HOW HIGH POINT DRAINAGE WORKS TO RECHARGE OUR GROUNDWATER AND PROTECT THE CREEK

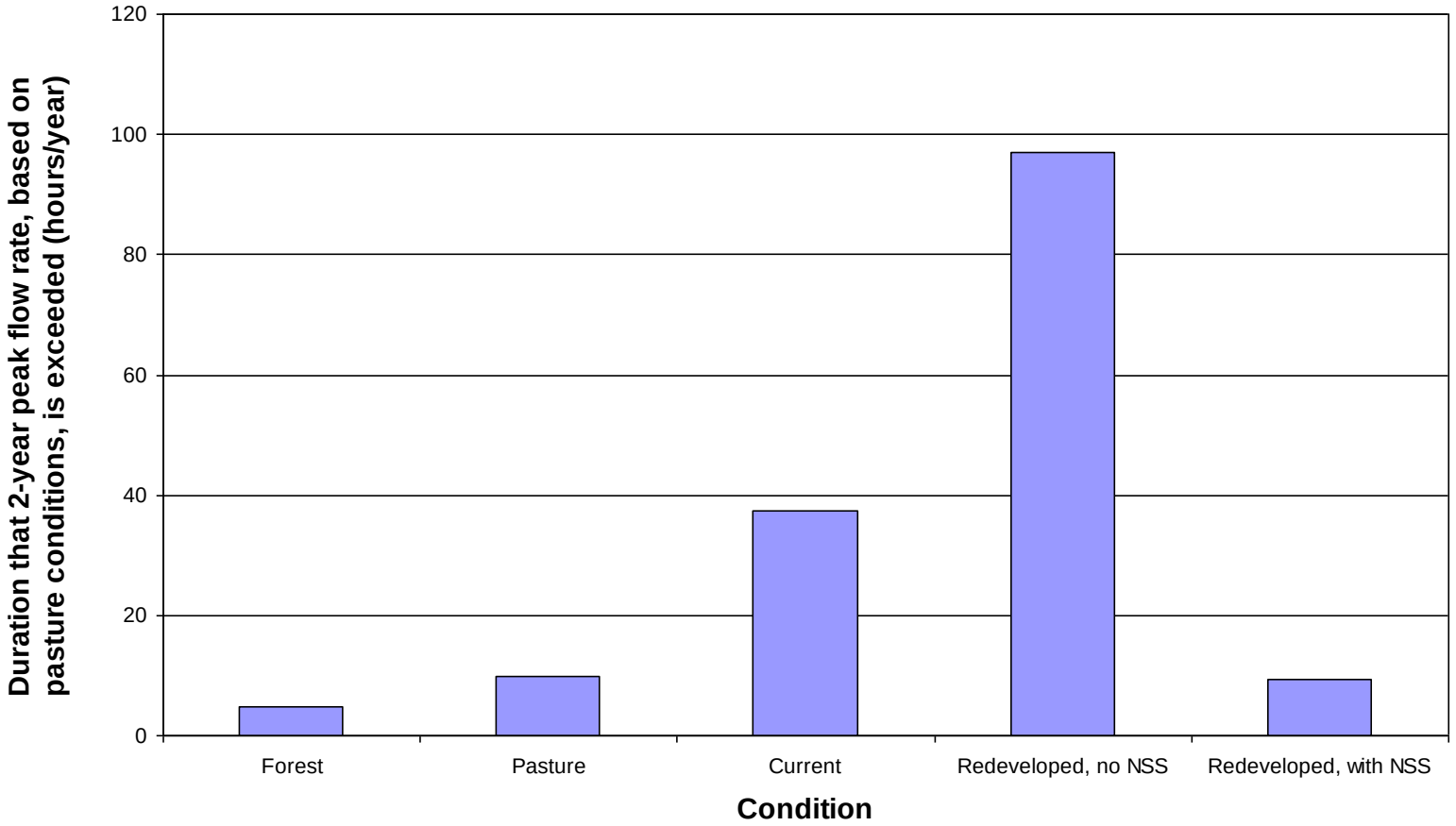


SvR DESIGN COMPANY

POROUS STREET & SIDEWALKS

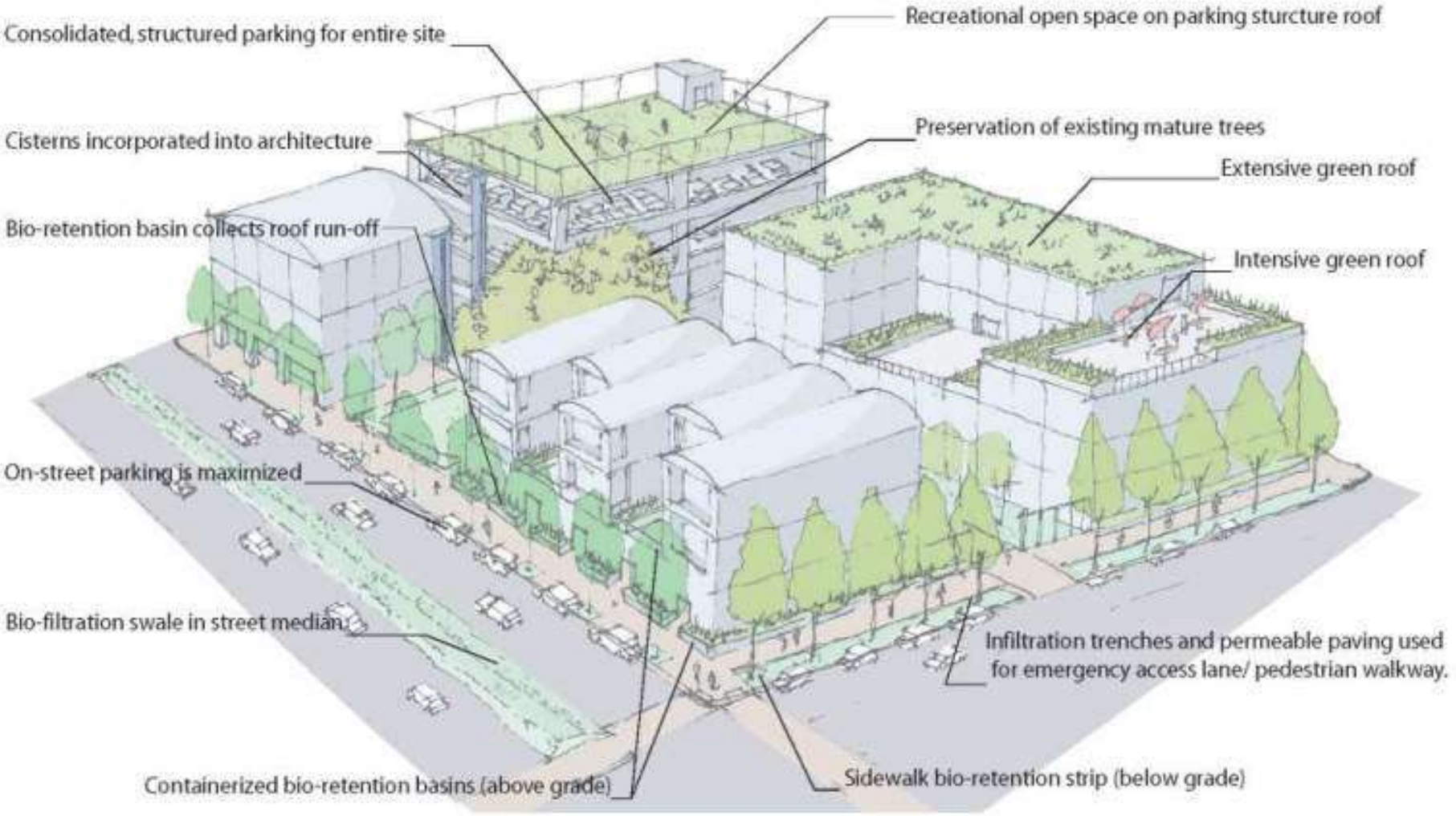
Water seeps through and goes into the adjacent ground and drainage swale.

Case Study: High Point Redevelopment, Seattle, WA



Stormwater Quality Solutions for the City of Emeryville

December 2005



Portland's Green Street Demonstration Projects:

NE Siskiyou Green Street

SW 12th Avenue Green Street

Glencoe Elementary Raingarden

Others…

Drawn by: Kevin Perry


LANE TRANSIT DISTRICT
Springfield Station

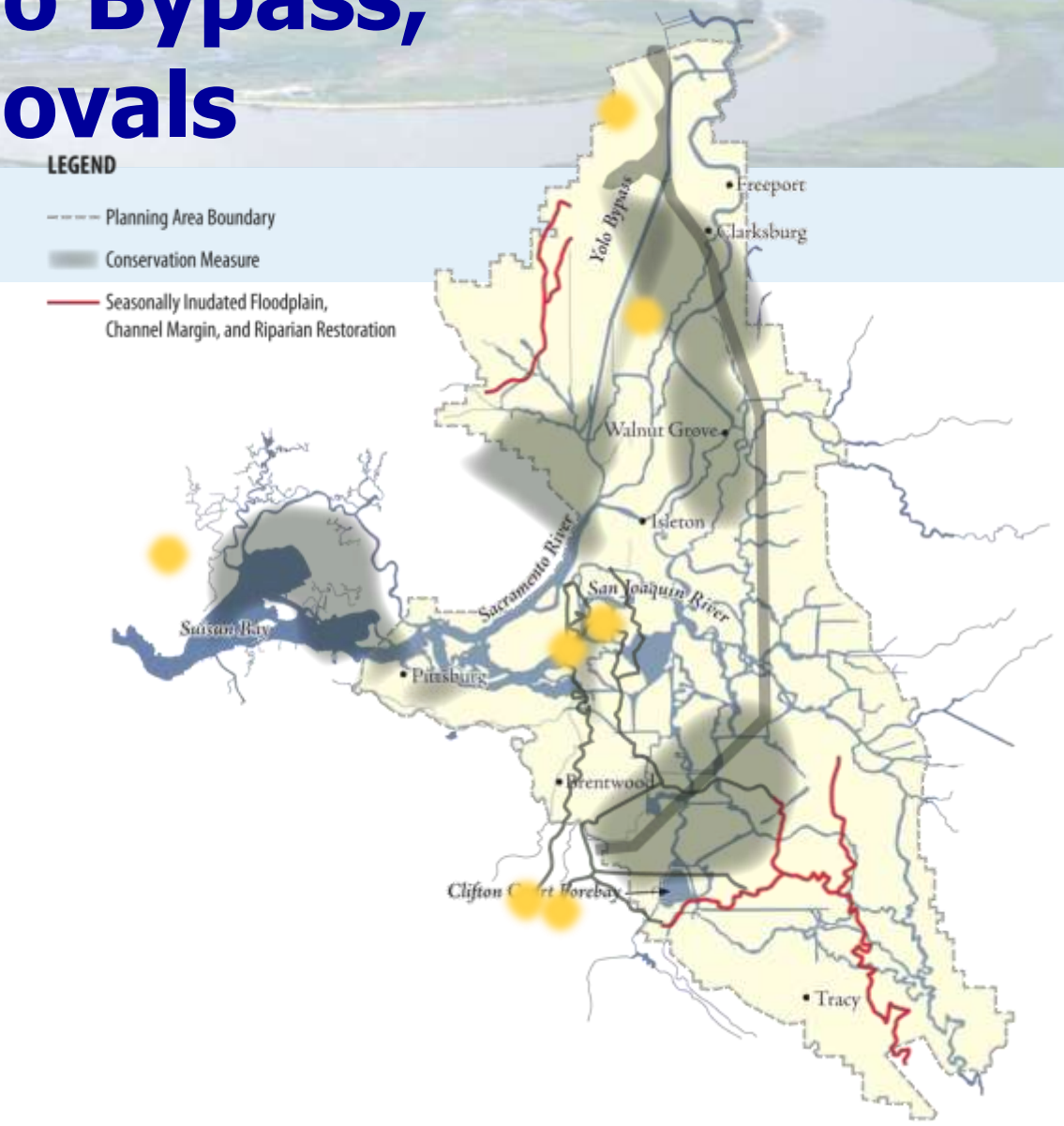
Water Quality Results:
estimates of percent reduction in mass loading

Pollutant	Removal
TSS	84 (72-92)
TN	63 (53-74)
TP	63 (49-74)
Copper	83 (77-88)
Zinc	76 (46-85)
Lead	90 (84-94)
Motor oil	92 (86-97)

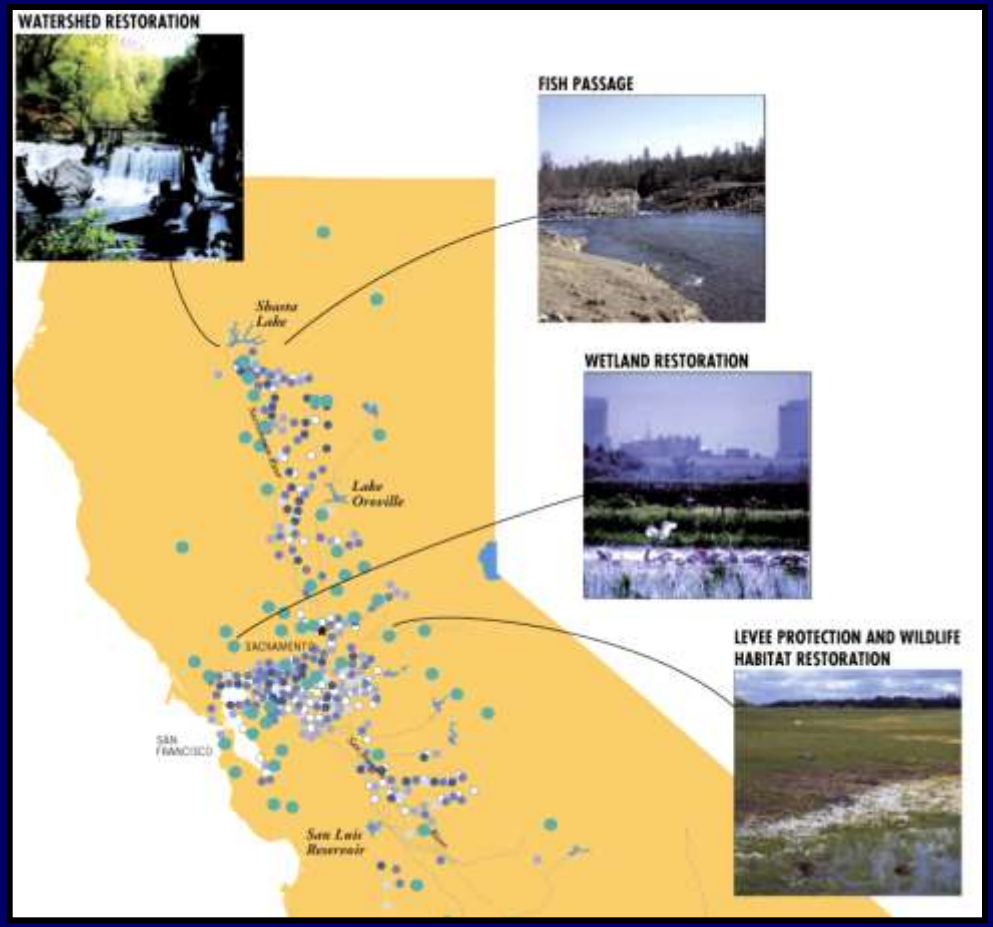
Large Scale Restoration: Bay Delta, Yolo Bypass, Dam Removals

- Conveyance and Flow
  - Amount of diversions
  - Cross channel operations
  - Old & Middle River flows
  - Pump operations
  - Delta outflows

- Habitat restoration
  - Yolo Bypass operations
  - South Delta floodplain
  - Suisun Marsh



Ecosystem Restoration Accomplishments



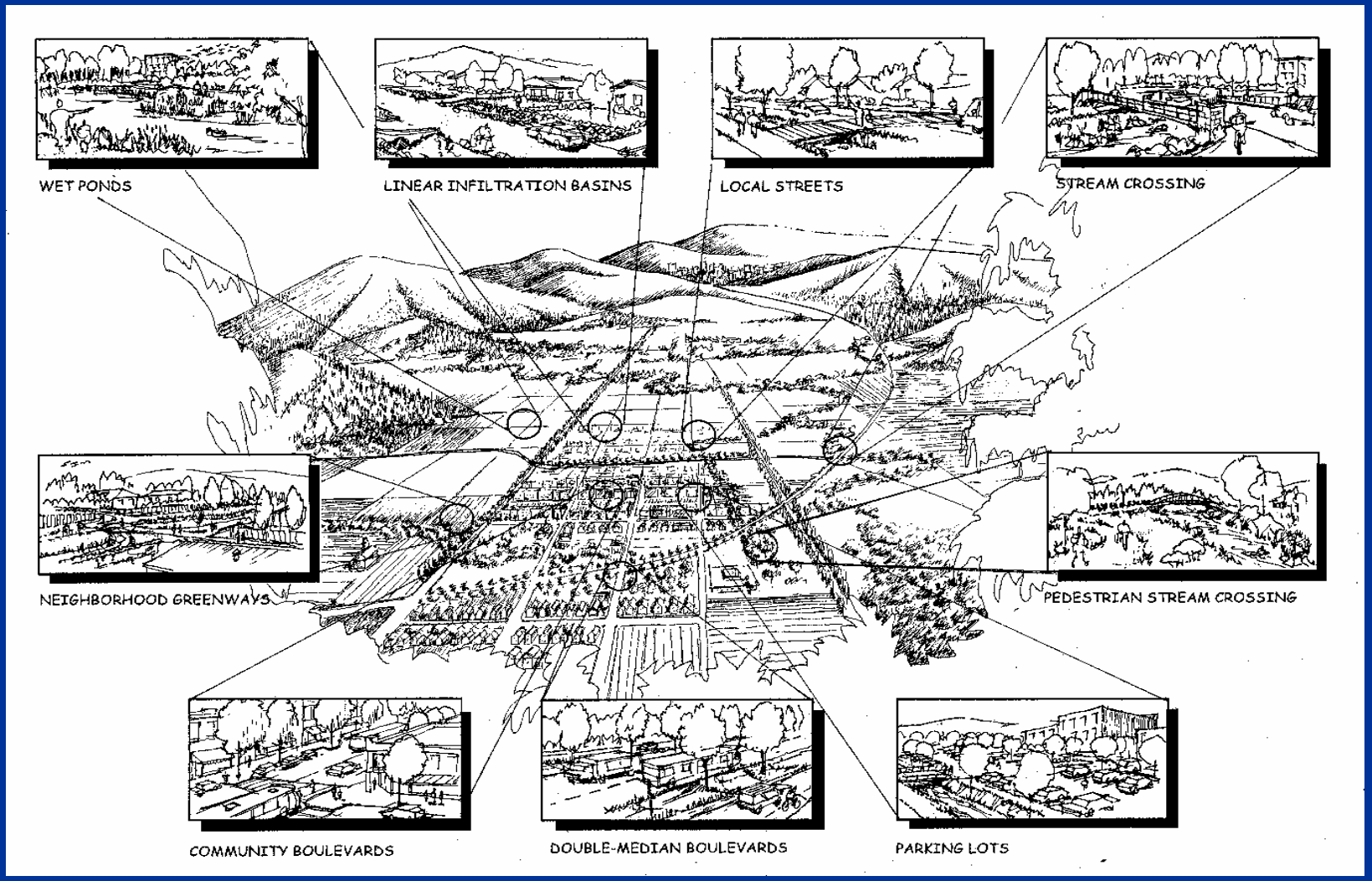
- Over 400 ecosystem projects funded for over $500 million
- 39,000 ha (97,000 acres) of habitat protected or restored
- 75 new or improved fish screens
- 23 comprehensive scientific studies


Enhancing stream flows: Tuolumne
River water purchases

Restoring ecological processes: channel restoration on the Merced River

Recovering at-risk species through fish screens and flow enhancement: Spring-run Chinook salmon in Butte Creek

Community-scale and site-scale-wide projects and programs that work together



STRAWBERRY CREEK PARK

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STRAWBERRY CREEK PARK


Freiburg, Germany


GOLDENER


Bitte nicht be-
rühren und
nicht mitn
men!

Chinese ideogram
for “crisis,” which
is comprised of the
characters for “danger”
and “opportunity.”