



# Water Sustainability for the California Water Plan

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California Department of Water Resources

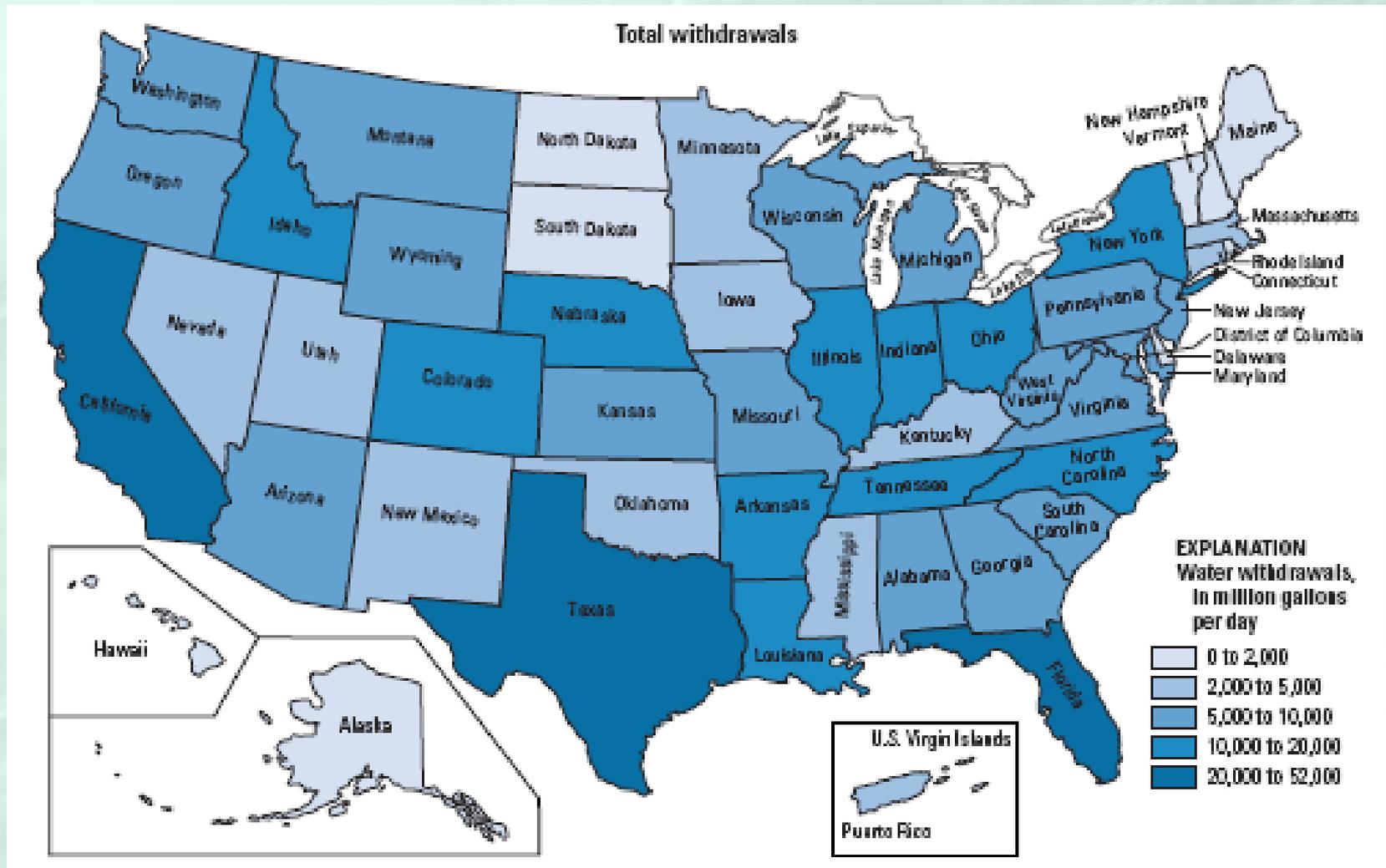


# Overview

- 💧 A California perspective in water resources management
- 💧 Water sustainability concepts
- 💧 Measuring water sustainability
- 💧 Summary points

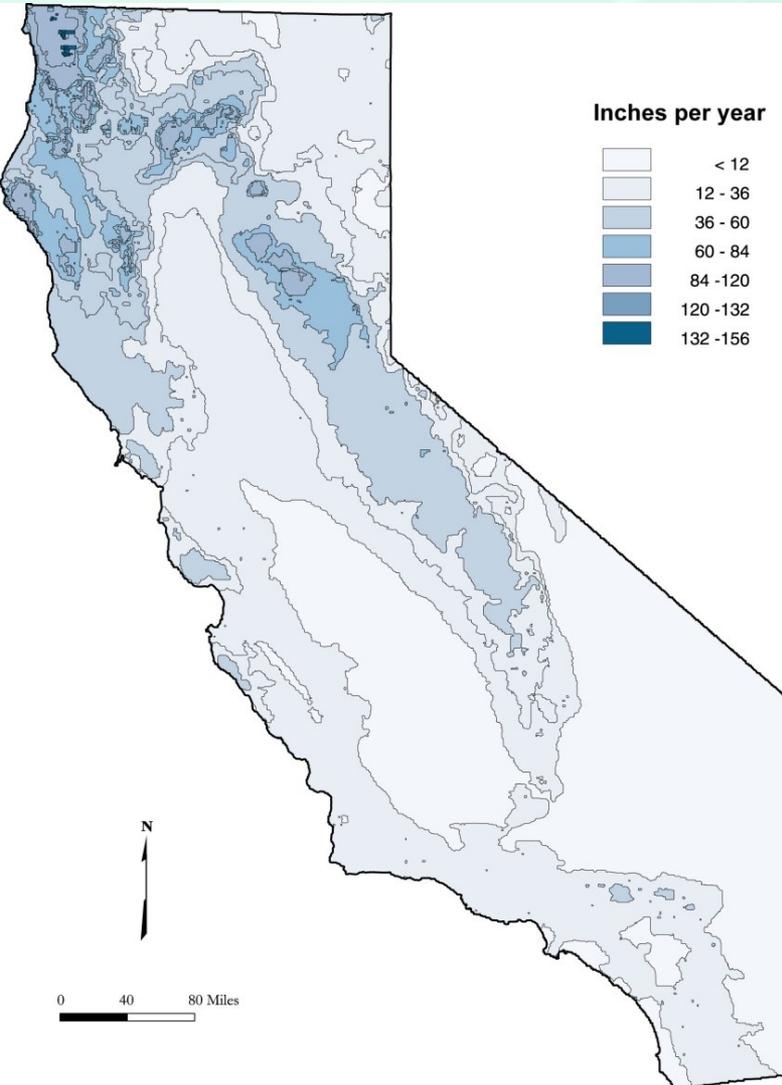


# Water Withdrawals



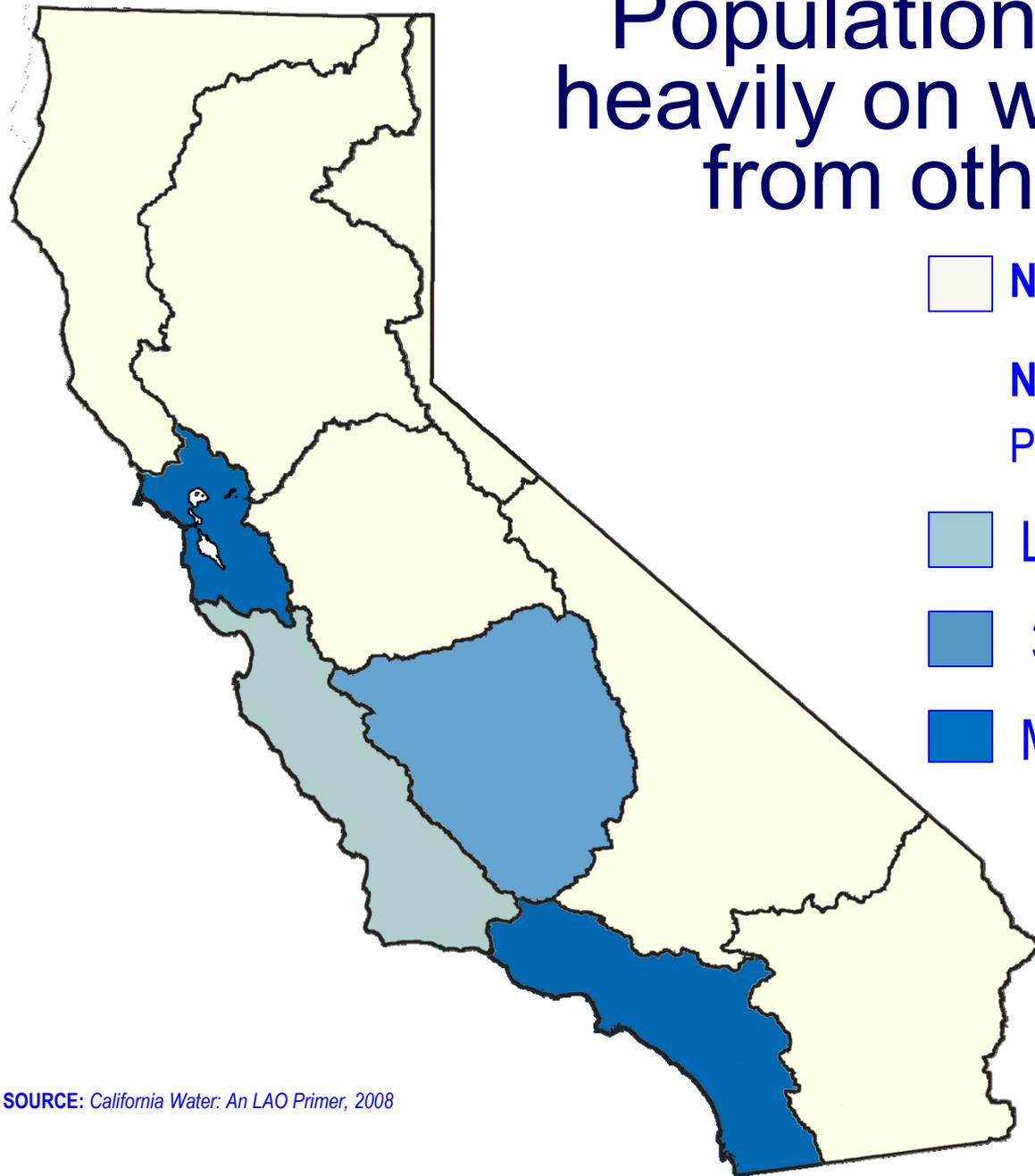
From USGS 2000

# California Water



Mean annual precipitation in California, 1951 to 1990

# Population centers rely heavily on water imported from other regions



 Net Exporters\*

**Net Importers**

Percent urban & agricultural water use from Imports

 Less than 30%

 30 to 60%

 More than 60%

\* While the Colorado River is a net exporter of water within California, its main source of water is imported from the Upper Colorado Basin

SOURCE: *California Water: An LAO Primer, 2008*

# Imperative to Act

**The *Entire System* –  
water & flood facilities,  
watersheds & ecosystems**

**– has lost resilience and is  
changing in undesirable  
ways.**



# Imperative to Act to Keep Pace w/ Changes



- Population growth & movement
- Shift to permanent crops
- Increasing flood risk
- Declining Delta & watersheds
- Impaired water bodies
- Climate Change profoundly impacting water systems
- Aging water & flood systems challenged by legal remedies & regulatory protections
- Growing economic & societal consequences of declining water reliability and degraded quality of surface & groundwater supplies

# California Water Plan

## *State's Blueprint for Integrated Water Management & Sustainability*



# Why Are We Doing This?

## A Recurring Question:

“How can we ascertain that resource management strategies and objectives are providing sustainable water uses and reliable supplies for the State and its regions?”

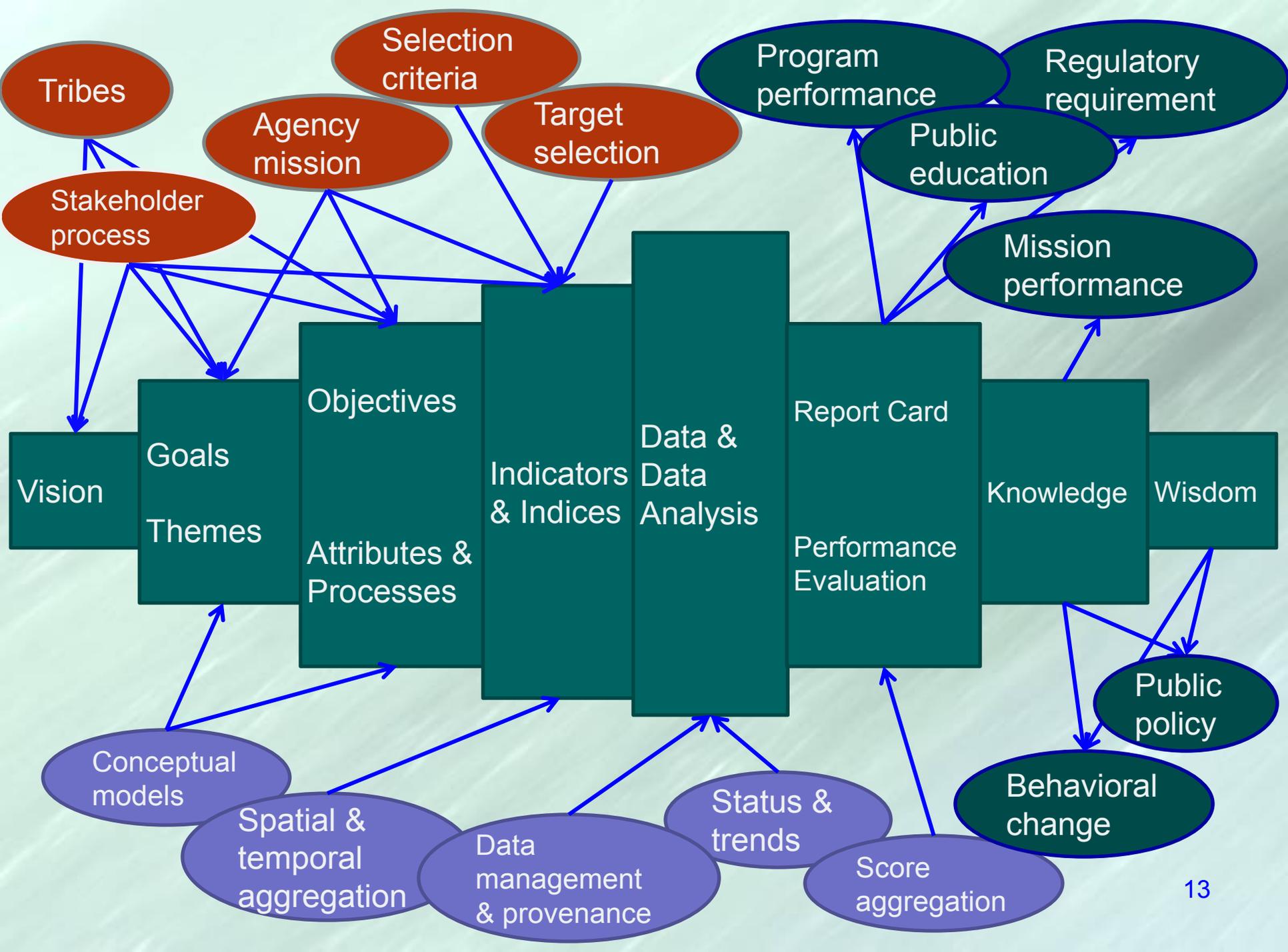
# Defining Water Sustainability

- 💧 *A system that is sustainable, should meet today's needs without compromising the ability of future generations to meet their own needs” (Brundtland Commission, 1983)*
- 💧 *Water sustainability is the dynamic state of water use and supply that meets today's needs without compromising the long-term capacity of the natural and human aspects of the water system to meet the needs of future generations.*

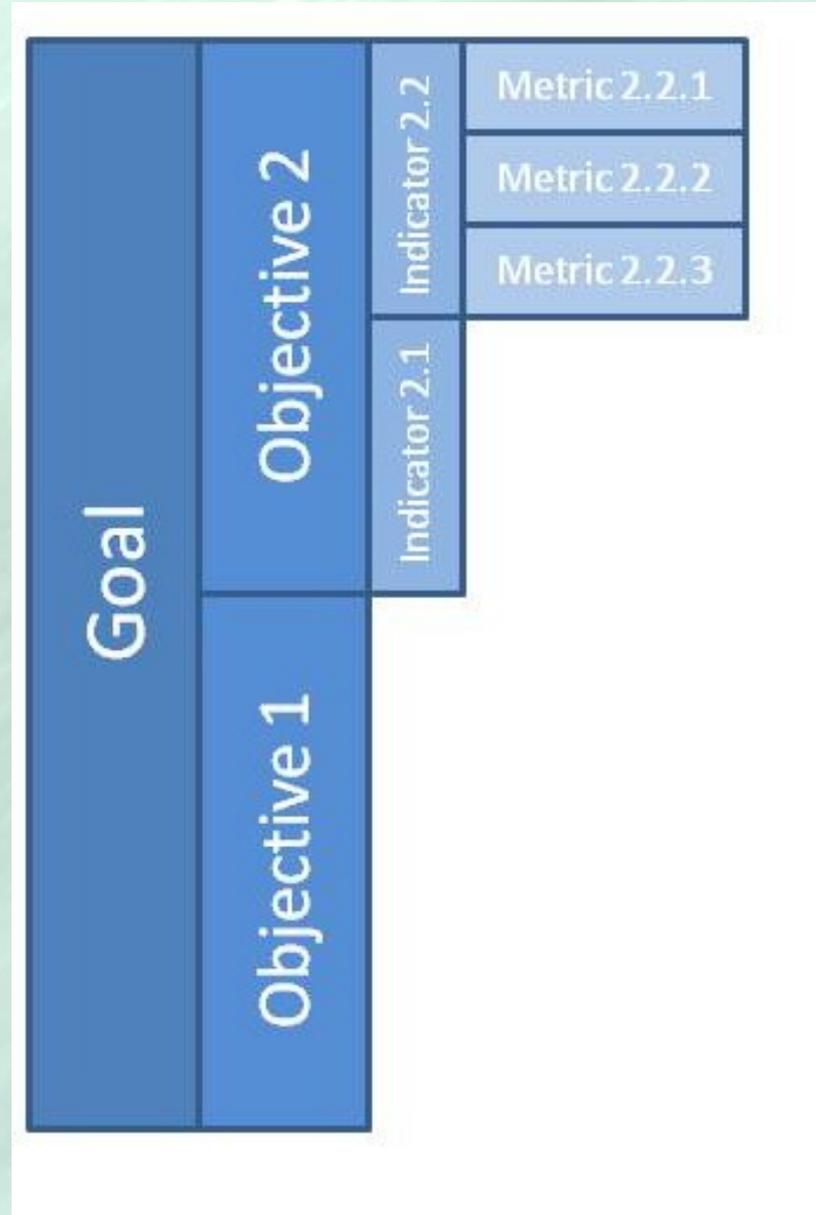
# Water Plan Update 2013

## CA Water Sustainability Indicators Objective

Help monitor progress to meeting water sustainability objectives through the development and application of an analysis framework.



# Organizing indicators



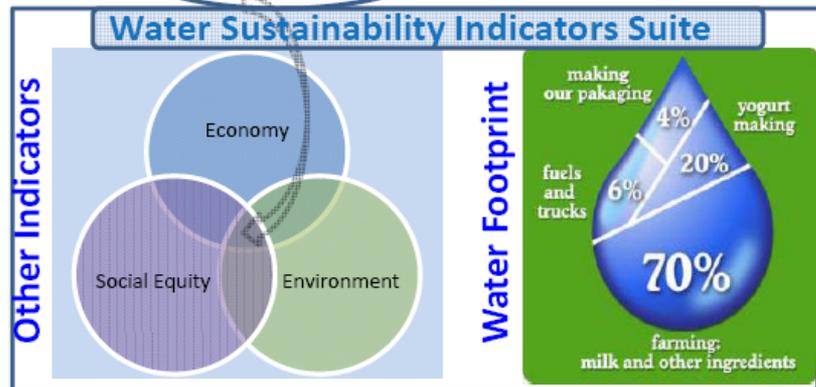
# Example Report Card from the Sacramento River Watershed Project; Shilling et al., 2010

Goals	Measurable Objective	Condition	Trend	Confidence
Water quality and supply for natural and human communities	Water quality for aquatic health	50	↔	Medium-high
	Maintain natural stream flows	55	n/a	Medium
Protect and restore native animals and plants	Native birds	100	↔	Medium
	Native invertebrates	46	↔	High
	Native fish	49	↔	High
	Agricultural/urban development	90	n/a	Medium
Protect and enhance habitats, ecosystems, and watersheds	Protect aquatic connections	77	n/a	Medium-high
	Protect landscape connections	33	n/a	High
	Maintain natural production and nutrient cycles	82	↓	Medium
Maintain and restore natural disturbance	Restore natural fire regimes	9	↔	Medium
	Encourage natural flooding, while protecting people	50	n/a	Low
Improve social and economic conditions & benefits from healthy watersheds	Enhance wildlife-friendly agriculture	83	↑	Medium-high
	Improve community economic status	51	↓	High

Proposed Sustainability Objectives	Relationship to Water Plan 2009
Goal 1: Manage and make decisions about water in a way that integrates water availability, environmental conditions, and community well-being for future generations.	Reflects overall goal of sustainability
Goal 2. Improve water supply reliability to meet human needs, reduce energy demand, and restore and maintain aquatic ecosystems and processes. <u>Objectives</u> : Increase water recycling; Increase water use efficiency; Reduce water demand; Increase water supply.	CWP Objective 2, 9; RMS Reduce demand
Goal 3. Contribute to social and ecological beneficial uses and reduce impacts associated with inter-basin water transfers and to the Delta. <u>Objectives</u> : Improve regional water movement operations and efficiency; Investigate new water technologies.	CWP Objective 1, 2, 7, 11, RMS Operational efficiency
Goal 4. Increase quantity, quality, and reliability of drinking water, irrigation water, and in-stream flows <u>Objectives</u> : Increase conjunctive management of new and recycled water from multiple sources.	CWP Objective 3, 12, 13; RMS Increase water supply
Goal 5. Safeguard human and environmental health and secure California water supplies. <u>Objectives</u> : Protect and restore surface water and groundwater quality; Protect the natural systems that maintain these services.	CWP Objective 4; RMS on water quality; chapter 4 discussion of water quality sustainability indicators
Goal 6. Protect and enhance environmental conditions by improving watershed, floodplain, and aquatic condition and processes <u>Objectives</u> : Practice, promote, improve, and expand environmental stewardship.	CWP Objective 5, 12, 13; RMS Natural Resources
Goal 7. Integrate flood risk management with other water and land management and restoration activities.	CWP Objective 1, 6, 12, 13; RMS Improve flood
Goal 8. Support decision-making, especially in light of uncertainties, that support integrated regional water management and flood and water resources management systems. <u>Objectives</u> : Improve and expand monitoring, data management, and analysis.	CWP Objective 10; various RMSs; CWP Vol. 1 Chapter 6 Integrated Data and Analysis

# CA DWR – USEPA – UC Davis Collaboration

## Water Sustainability Indicators Framework



Identify areas where GRACE informs Water Planning

	Trend (mm/yr)	Volume lost (km <sup>3</sup> )
GRACE Total Water Storage	-37	31.3
Snow	2	1.7
Surface Water	-9	7.6
Soil Moisture	-2	1.7
Groundwater	-24	20.3

*Table 1. Trends in the major water storage components in the combined Sacramento-San Joaquin river basins (left column). Volume lost for the study period (right column).*

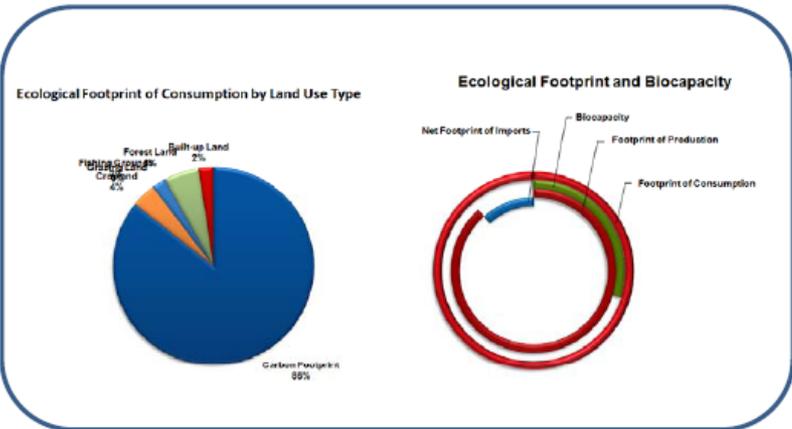
GRACE

Scenarios of relationships on water indicators including water footprint and water resource management will be presented

Identify connections between eco & water footprints that informs water planning

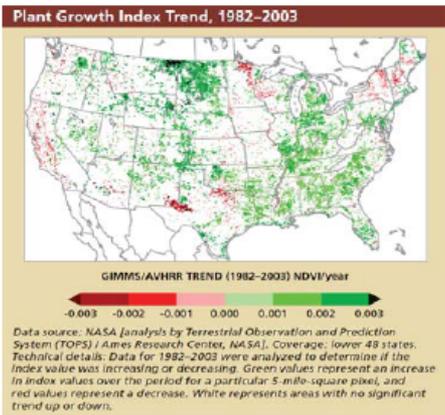
Summary screen will be presented with sub-pages containing graphics

Ecological Footprint



Identify areas where PGI confirms Eco footprinting

Summary screen of footprints and biocapacity will be presented with drilldowns to underlying data and calculations



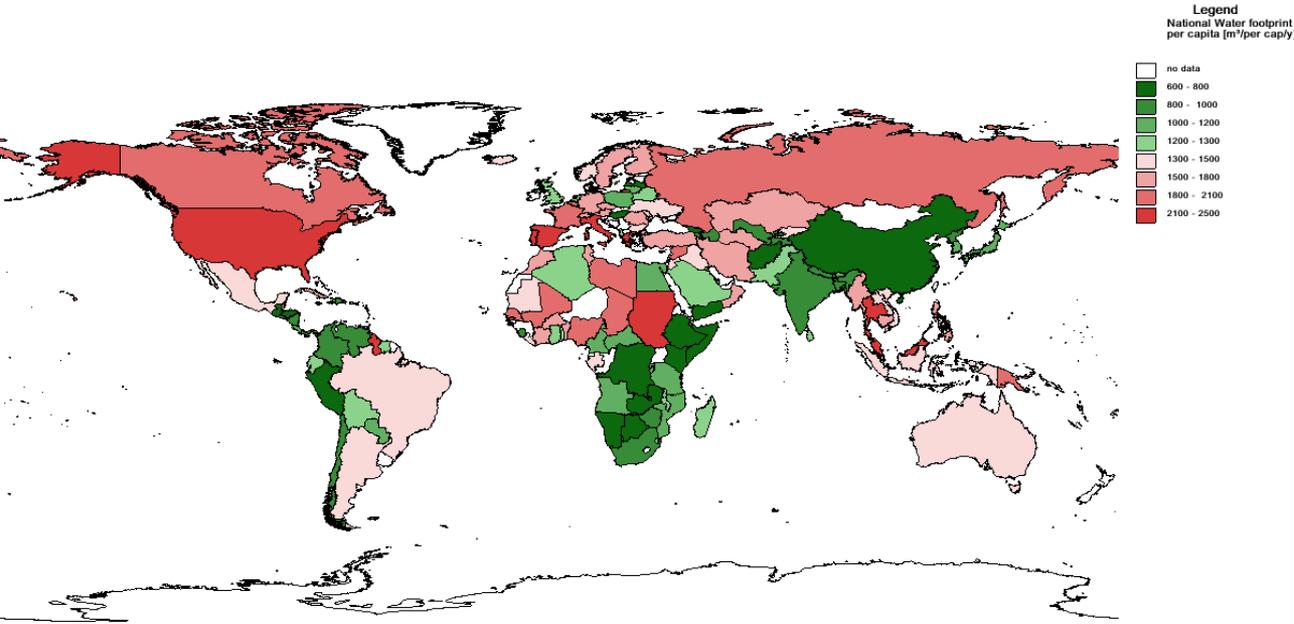
Plant Growth Index

Show similar chart for CA with sub-pages contain examples & discussion

# CA DWR – USEPA – UC Davis Collaboration

- 💧 Project is funded by the USEPA Advance Monitoring Initiative (AMI) and CA DWR
- 💧 Includes a water footprint at a regional and state scale
- 💧 Includes a decision support tool as a Global Earth Observation System of Systems (GEOSS) project

# Global Water System Project



People Powered Machines.com

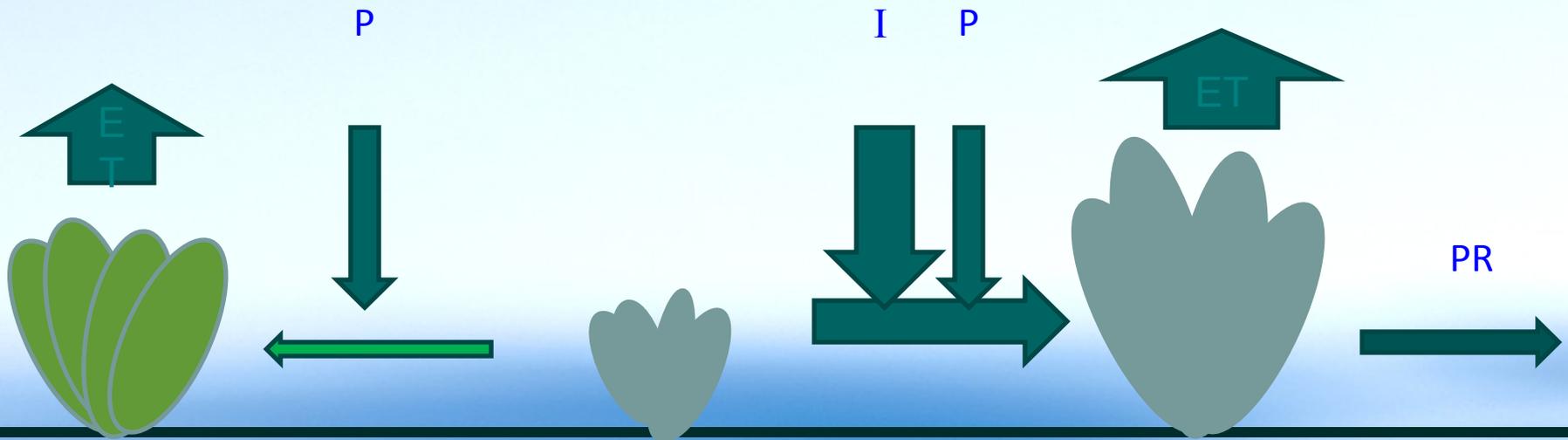
## It takes...



Include Water Footprint Calculation as Index of Water Use and Impacts



World Wildlife Fund



Green water is the precipitation-derived moisture in soil (= P) that provides the minimal ET needs of plants

Blue water is the applied water (irrigation = I) that provides additional ET needs of plants, to a maximum possible ET

Gray water is the polluted runoff (= PR) to other waters and describes the assimilative capacity needed to bring the pollutants levels down to an ecologically-tolerable level.

Agriculture example

# Water Footprint in Santa Ana Watershed

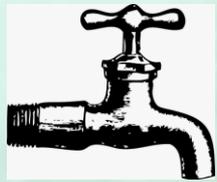
WF is made up of many parts, including consumed goods, food production and consumption, commercial and industrial activity, energy production, etc.



# Partnership with Santa Ana Watershed Project Authority

Local water

Import water



Blue water  
Green  
water

Gray  
water

Water Footprint

Industrial use

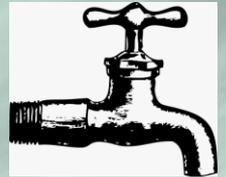
Agricultural  
use

Residential  
use

Sectoral,  
regional, per  
capita footprint

Blue water  
Green  
water

Gray  
water



# Closing Thoughts

- ◆ Sustainability's Answers Require:
  - Systems' Thinking
  - Holistic Approach
  - Awareness of Time Horizons, Scales, Trajectories
  - Managing Risk & Uncertainty
  - Improved Data and Tools
  - Discovering Common Ground for Solutions
  - Continuous Education

# Contact Information

- 💧 Project Lead (CA DWR): Abdul Khan (akhan@water.ca.gov) and Rich Juricich, (juricich@water.ca.gov)
- 💧 Project Lead (Region 9): Vance Fong (Fong.Vance@epa.gov) and Don Hodge, Hodge.Don@epa.gov)
- 💧 Technical Lead (UC Davis): Fraser Shilling (fmshilling@ucdavis.edu)
- 💧 California Water Plan

<http://www.waterplan.water.ca.gov>

# Linking Sustainability to the Water Plan

Sustainability Objective	Related CWP Objective and RMS	Example Indicators	Relevance to Sustainability Objective
<p>Goal 2. Improve water supply reliability to meet human needs, reduce energy demand, and restore and maintain aquatic ecosystems and processes.</p> <p>Objectives: Increase water recycling; Increase water use efficiency; Reduce water demand; Increase water supply.</p>	<p>CWP Objective 2, 9; RMS Reduce demand</p>	Energy required per unit of clean drinking water	Reduce energy demand for providing water
		Average water use per household,/capita, 20% reduction by 2020	Increase water conservation
		Sufficient flows and timing of flows for maintaining historically-present native aquatic fauna	Restore and maintain native ecosystems

# Linking Sustainability to the Water Plan

Sustainability Objective	Related CWP Objective and RMS	Example Indicators	Relevance to Sustainability Objective
<p>Goal 5. Safeguard human and environmental health and secure California water supplies.</p> <p>Objectives: Protect and restore surface water and groundwater quality; Protect the natural systems that maintain these services.</p>	<p>CWP Objective 4; RMS on water quality; chapter 4 discussion of water quality sustainability indicators</p>	Ratio of observed to expected native aquatic species	Protect and restore water quality for environmental health
		Surface-water Water Quality Index	Surface water quality to safeguard human and environmental health
		Groundwater Water Quality Index	Ground water quality to safeguard human health