



Water Census Ad Hoc Committee Discussion
June 9, 2010

Groundwater Resources Program: Regional Groundwater Availability Studies



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

What do we know about the Nation's groundwater availability?

The Occurrence of Ground Water
in the United States
With a Discussion of Principles

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 489

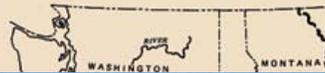
The Role of Ground Water
in the National Water Situation

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1800



Summary Appraisals of the
Nation's Ground-Water Resources—
Pacific Northwest Region

GEOLOGICAL SURVEY PROFESSIONAL PAPER 813-S



U.S. GEOLOGICAL SURVEY CIRCULAR 1099



Regional Aquifer-System Analysis Program
of the U.S. Geological Survey, 1978–1992

National
Water Summary 1984

Hydrologic Events
Selected Water-Quality Trends
and Ground-Water Resources

USGS
United States Geological Survey

GROUND WATER ATLAS
OF THE
UNITED STATES

Build on Previous Work

USGS

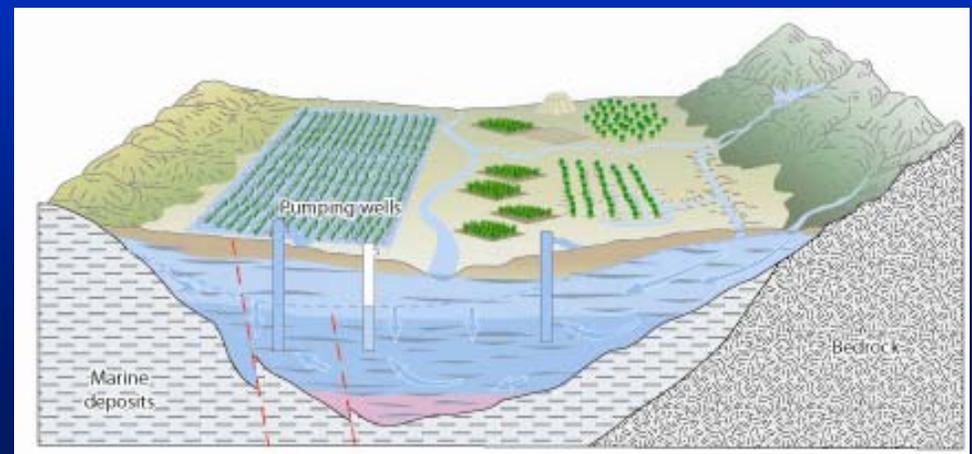
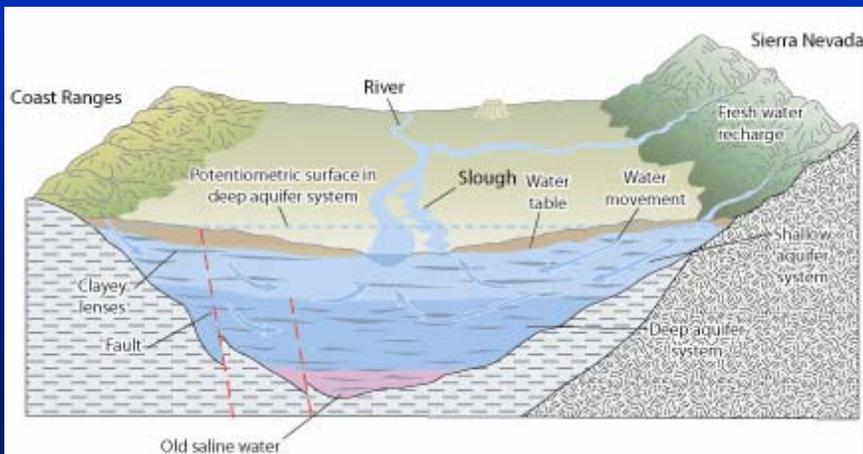
United States Geological Survey
Water-Supply Paper 2275

Context for USGS Regional Studies

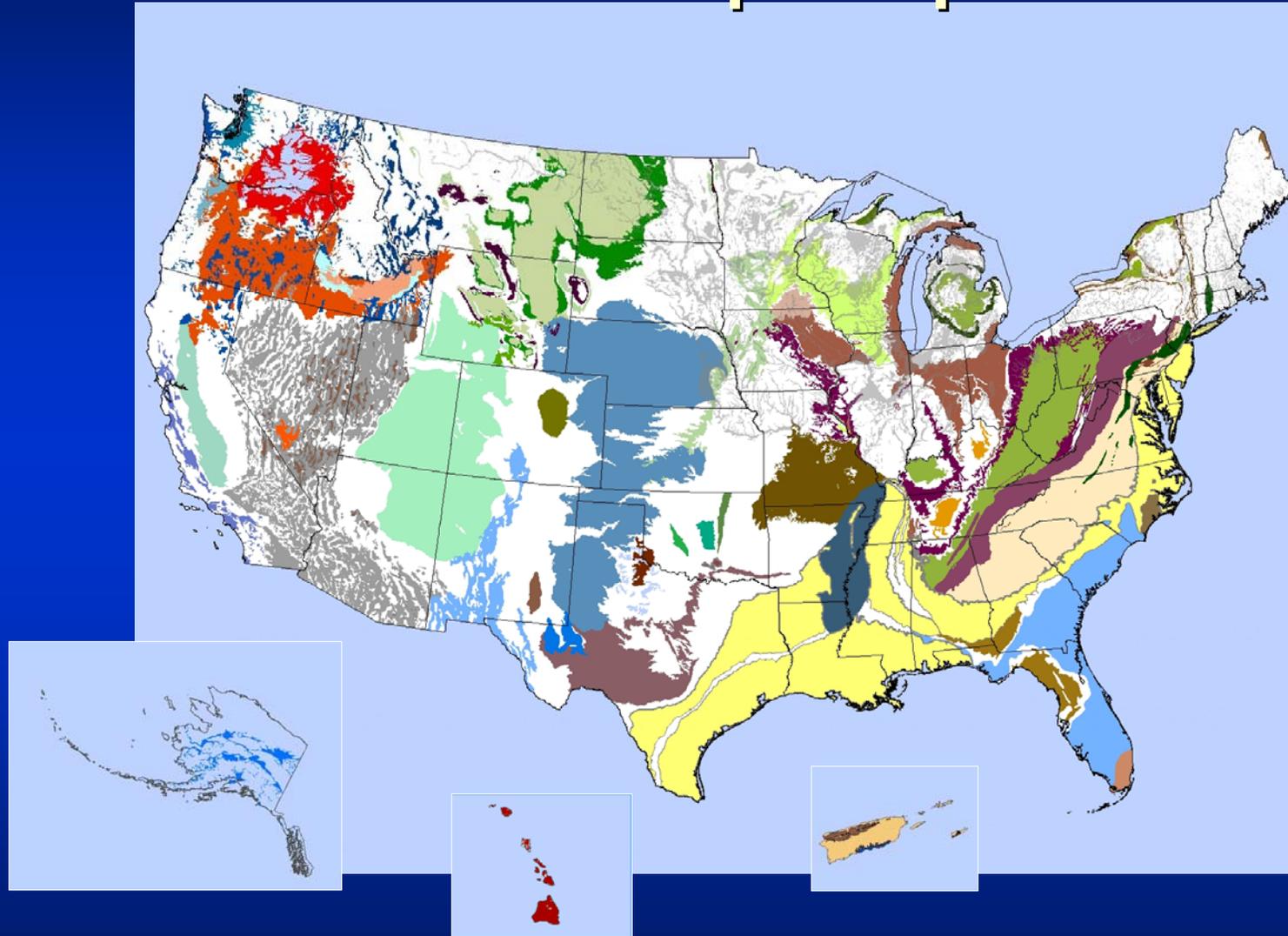
- Groundwater management decisions in the United States are made at a local level, such as the State, municipality, or a special district formed for water-resources management.
- Many aquifer systems cross these political boundaries.
- A key role of national and regional assessments is to provide consistent and integrated information across political boundaries that is useful to those who use and manage the resource.

What basic information is needed to assess groundwater availability?

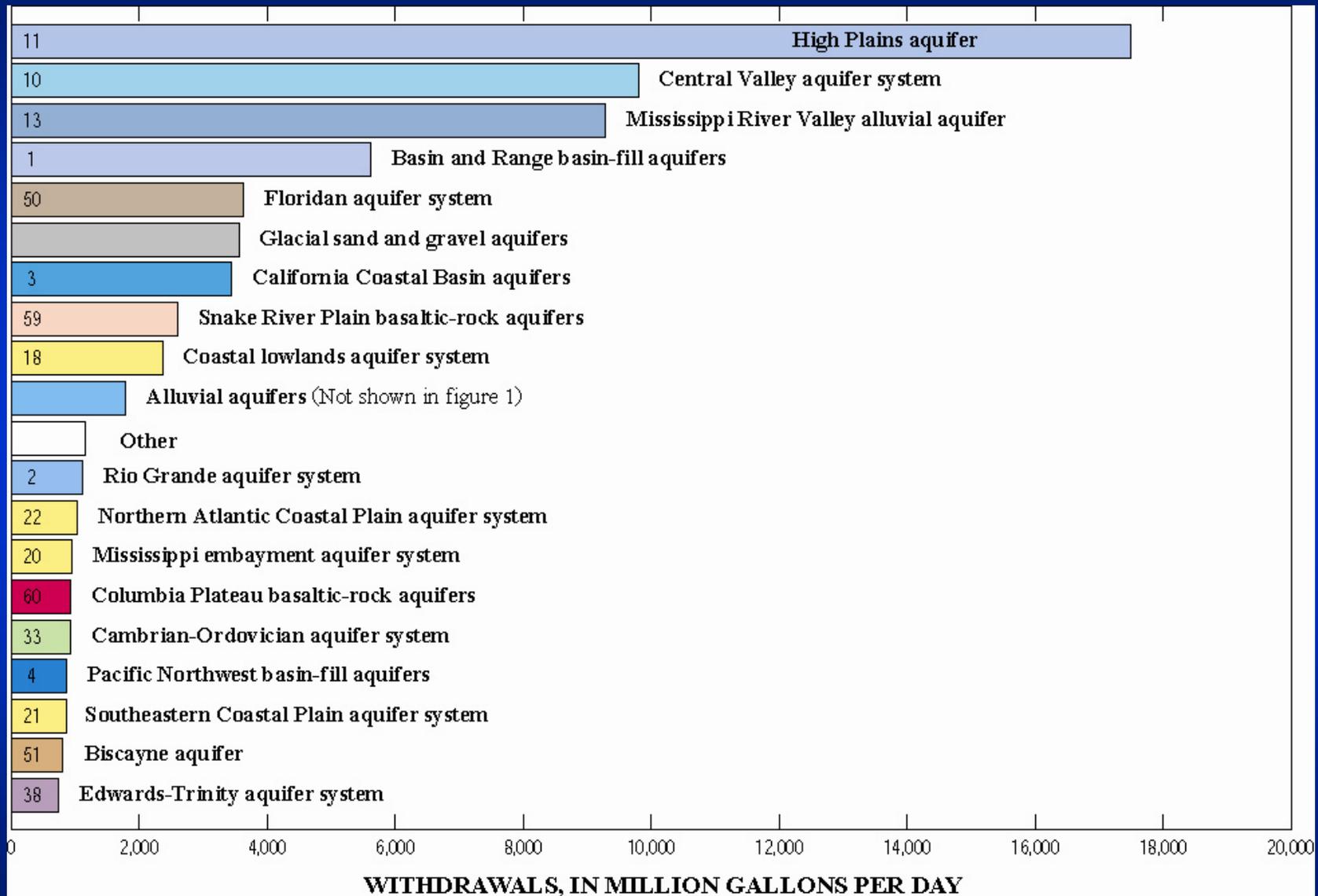
- Quantify resource (supply)
and
- Information about its use (demand).



Framework for GW Availability at a Regional Scale--Principal Aquifers



Total Withdrawals by Aquifer in US--2000



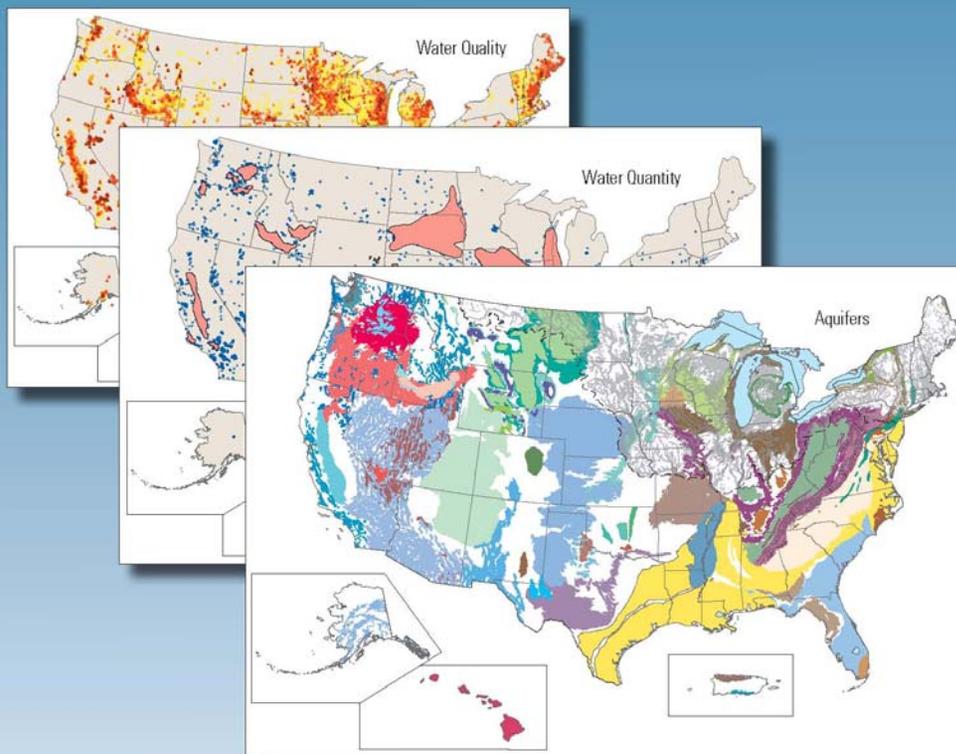
Strategy to Assess the Nation's Groundwater Availability

Reilly, T.E., Dennehy, K.F., Alley, W.M., and
Cunningham, W.L., 2008, Ground-Water Availability in the
United States: U.S. Geological Survey Circular 1323, 70
p., also available online at <http://pubs.usgs.gov/circ/1323/>



Ground-Water Resources Program

Ground-Water Availability in the United States



Circular 1323

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

Regional GW Availability Studies

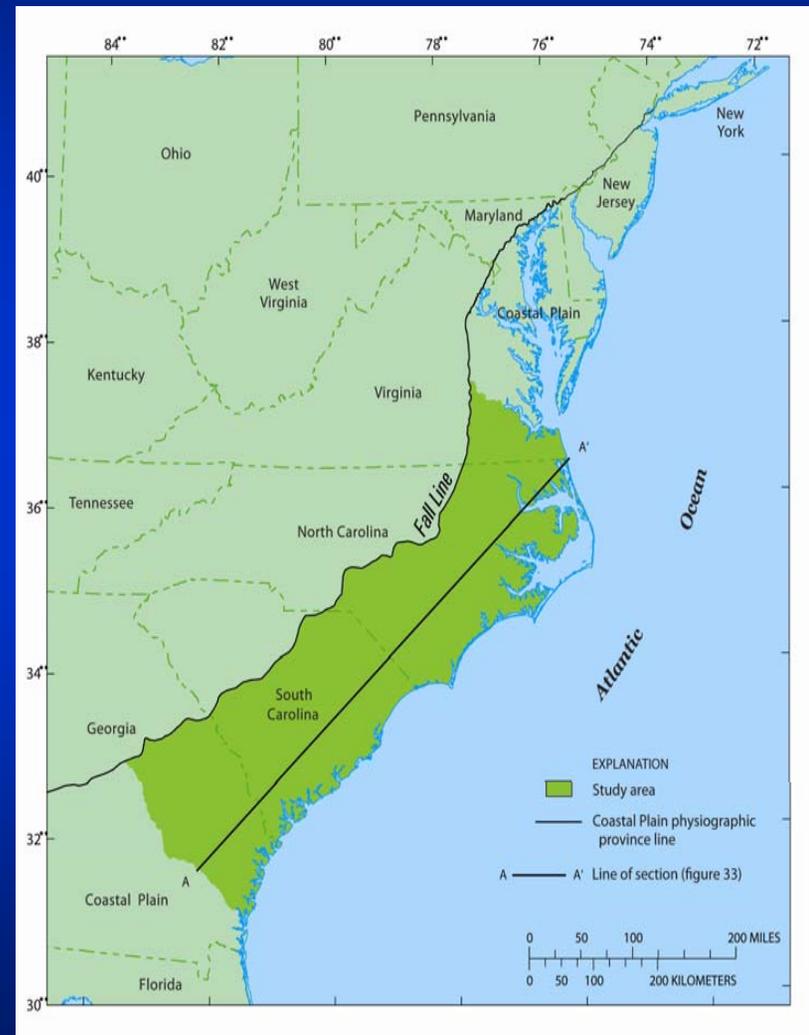
Objectives

- Quantify current ground-water resources
- Evaluate how these resources have changed over time
- Provide tools to forecast system responses to stresses from future human and environmental uses.



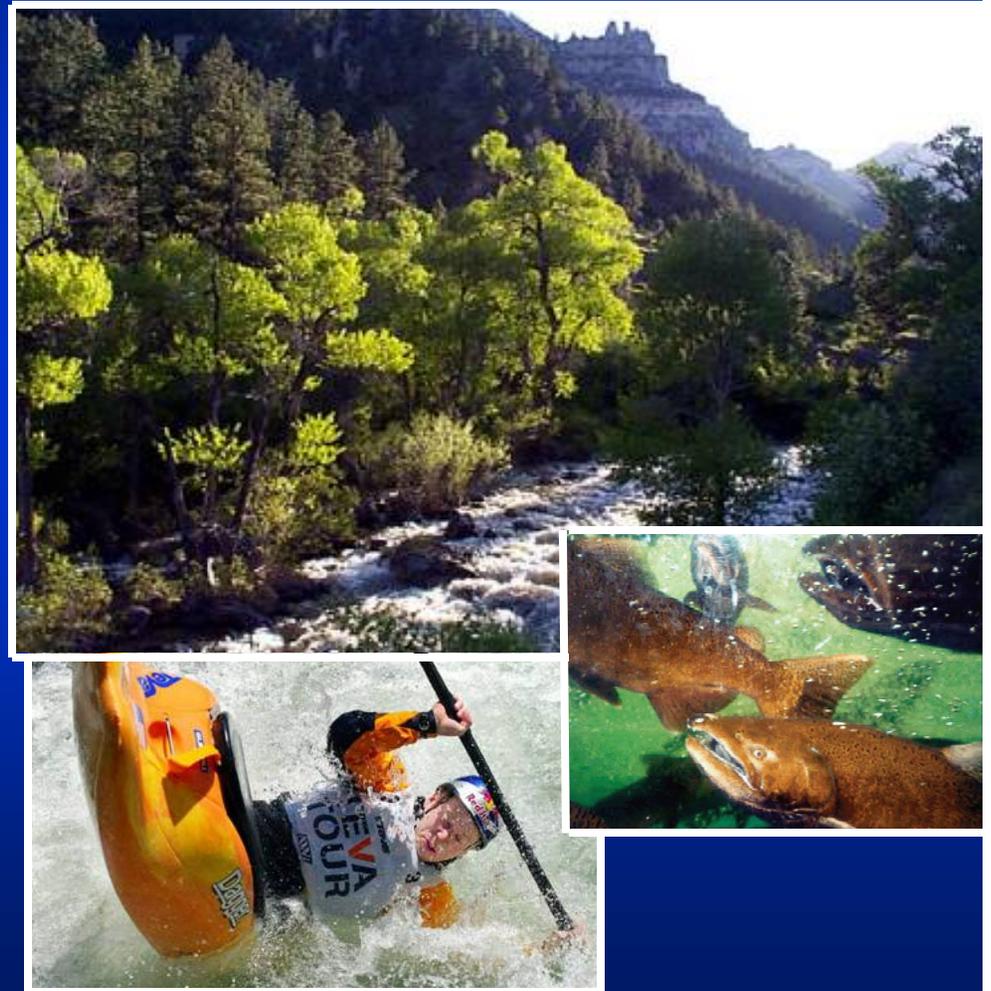
Study Design

- Build on foundation of previous studies
- Large in scope— multidisciplinary regional scale studies
- Share common national objectives
- Studies are **NATIONALLY** directed but need to be **REGIONALLY** executed.

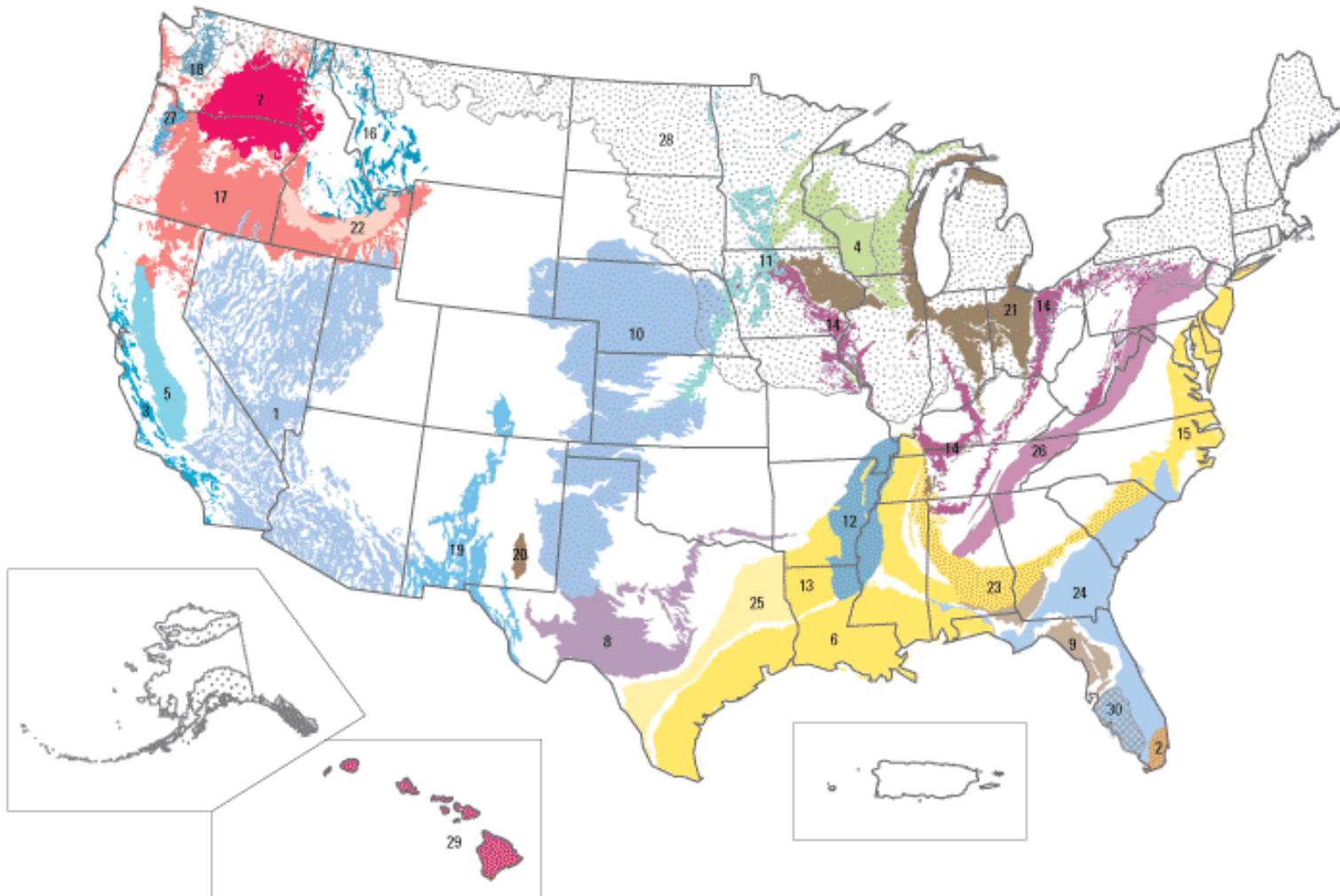


Study Design-Regional/Local Flexibility

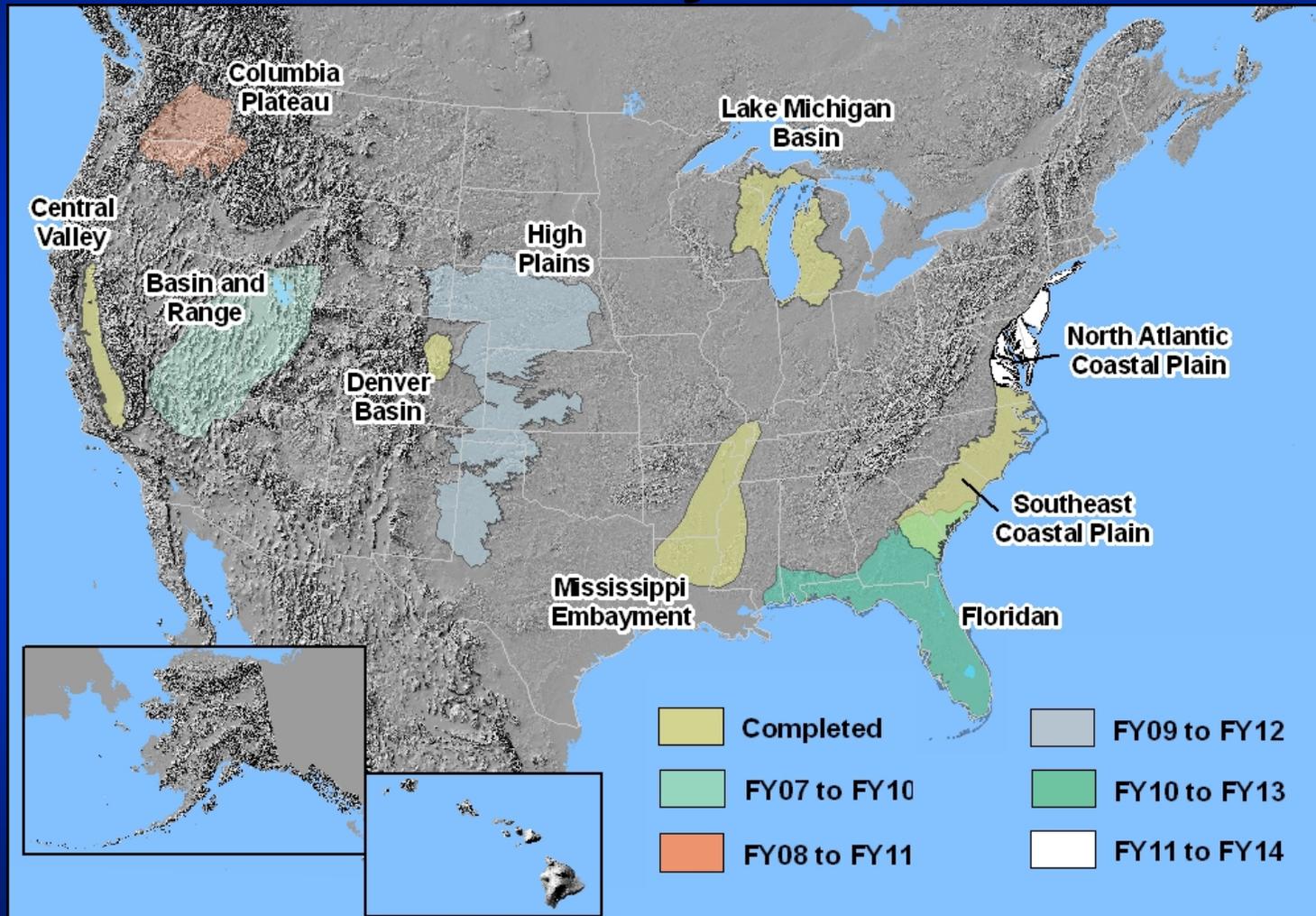
- GW/SW interactions
- Salt-water intrusion
- Impacts of GW depletion
- Subsidence
- Ecological flows
- Geologic consistency
- Water legislation
- Conjunctive use



Priority Aquifers for a National Assessment of Groundwater Availability



Regional Groundwater Availability Studies

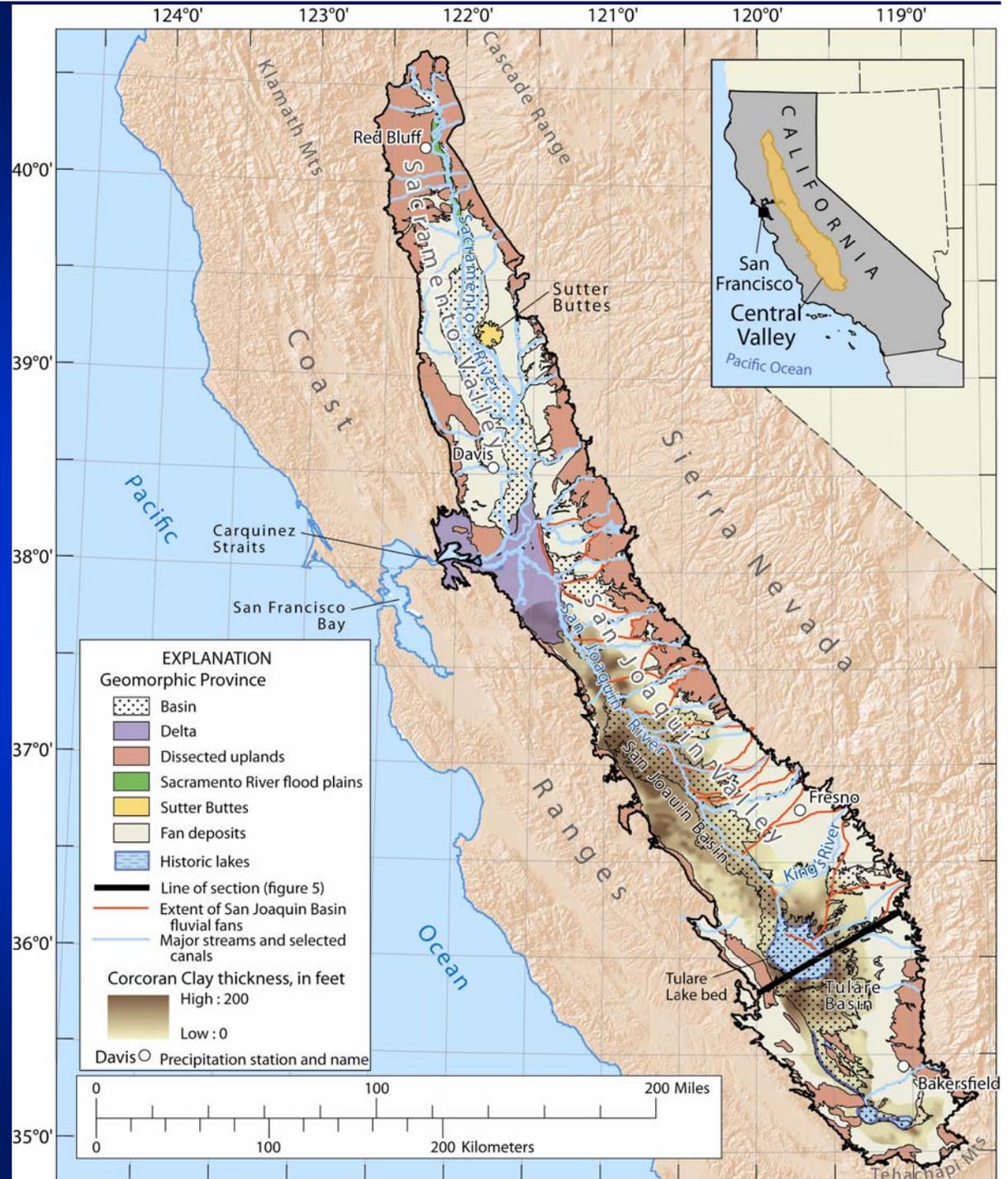


Outcomes

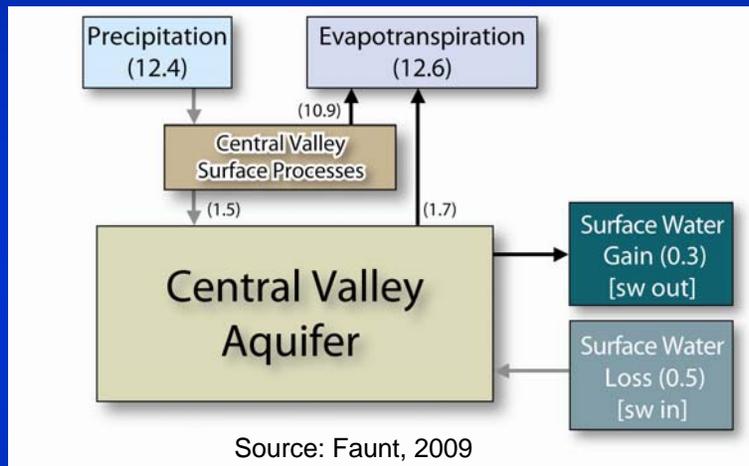
- Water budgets of major aquifers systems
- Trends in groundwater use, storage, recharge, and discharge
- Groundwater models that provide
 - Regional context for more local studies
 - Tools to make future projections of groundwater availability
- Region-wide estimates of key hydrologic variables
- Assess climate variability effects on future groundwater availability
- Evaluation of existing networks for monitoring groundwater availability

California's Central Valley

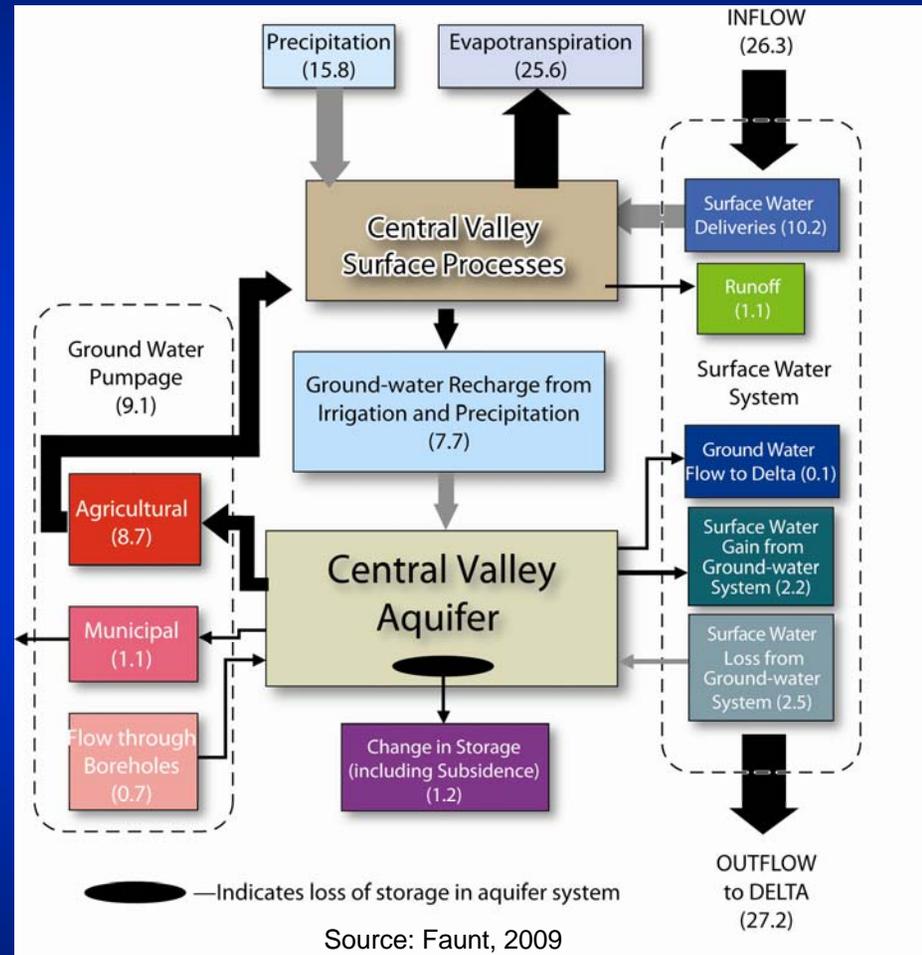
Source: Faunt, C.C., ed., 2009, Groundwater Availability of the Central Valley Aquifer, California: U.S. Geological Survey Professional Paper 1766, 225 p.



Central Valley Groundwater Budget



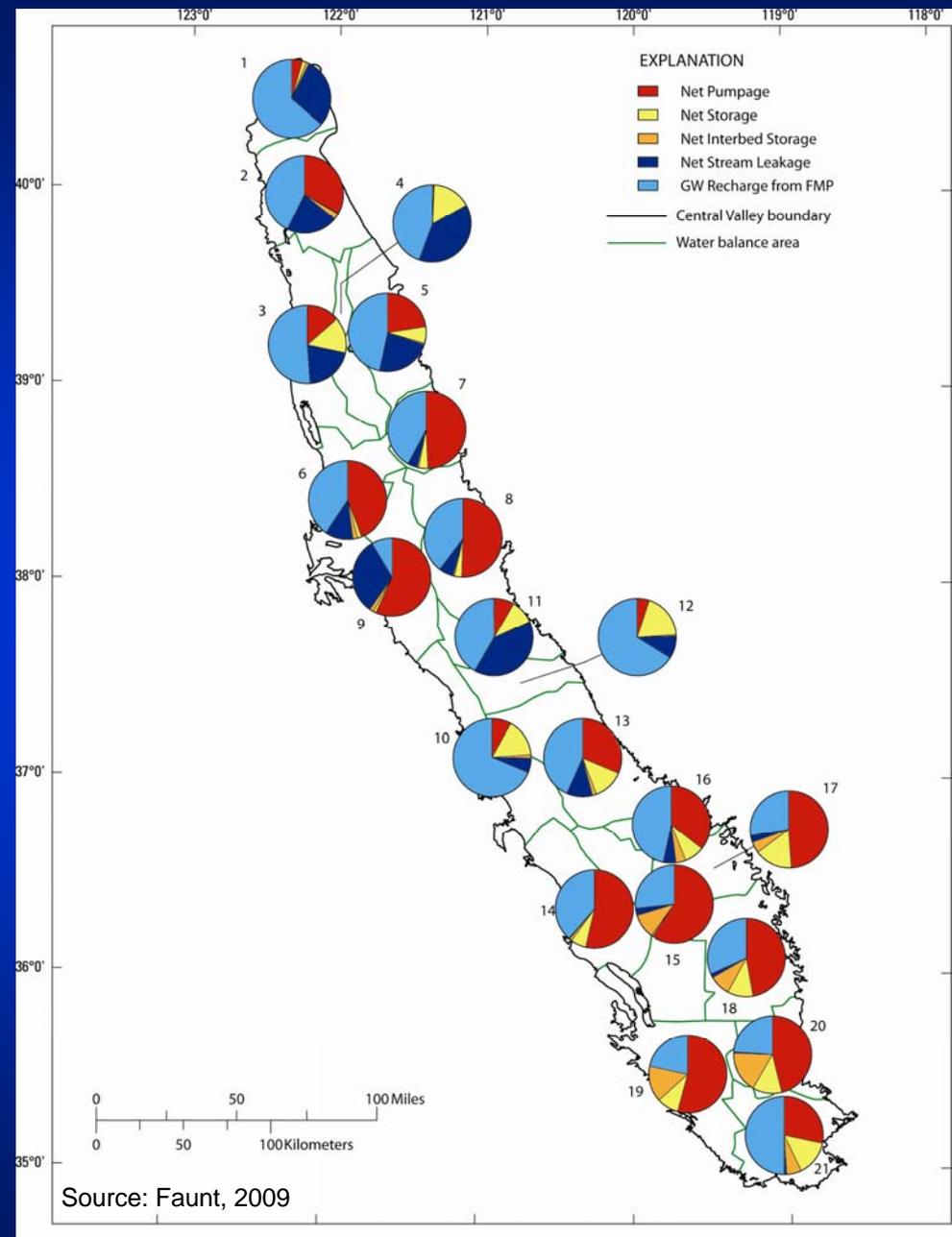
Pre-development



Post-development

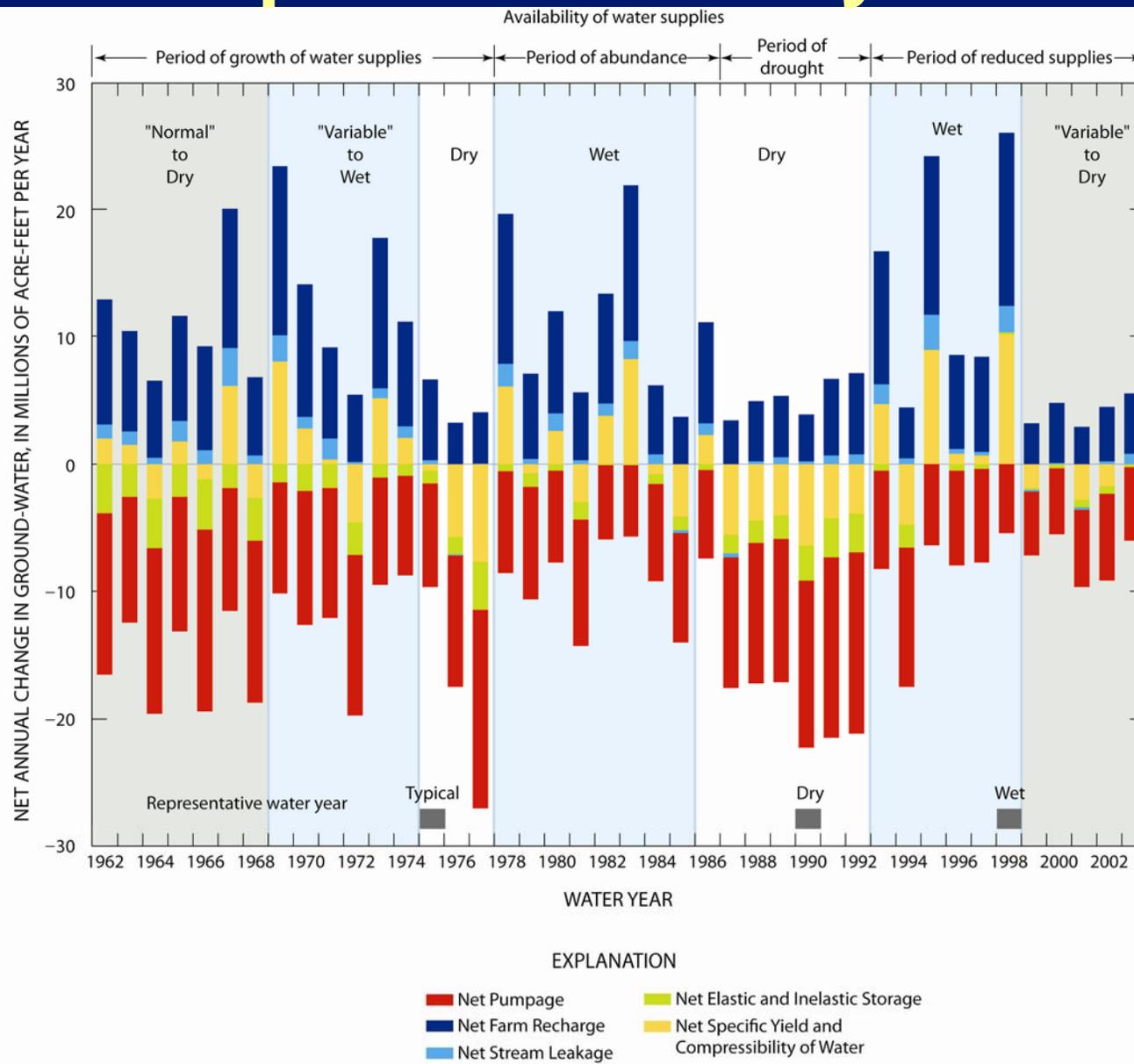
Spatial Variability

Average annual groundwater budget for 21 water balance areas



Temporal Variability

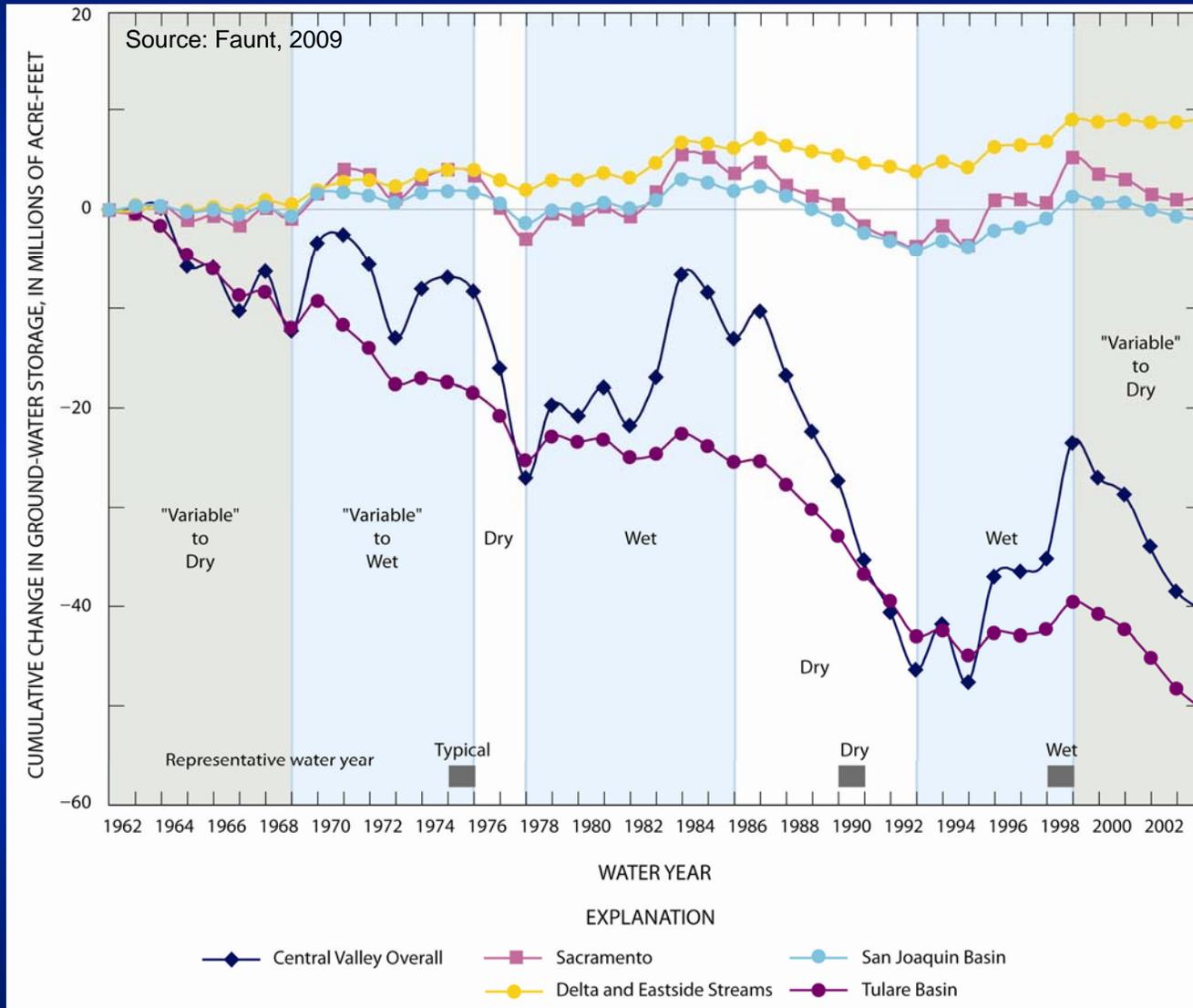
Groundwater budget changes through time



Source: Faunt, 2009



Cumulative Change in Storage



http://water.usgs.gov/ogw/gwrp/

For More Information

Kevin Dennehy
Program Coordinator
703-648-5018
kdennehy@usgs.gov



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USGS Groundwater Information

Groundwater Resources Program

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USGS Groundwater Resources Program

The Groundwater Resources Program provides the objective scientific information and develops the interdisciplinary understanding necessary to assess and quantify the availability of the Nation's groundwater resources.

Regional Groundwater Studies

- ♦ [Overview of USGS Regional Groundwater Studies](#)
- ♦ [Groundwater Availability](#)
- ♦ [Water Availability & Use](#)



Groundwater & the Environment

- ♦ [Recharge](#)
 - ♦ [Climate Variability Effects](#)
 - ♦ [Groundwater Age Dating & Recharge](#)
 - ♦ [Chloride Mass Balance in Streams to Estimate Recharge](#)
- ♦ [Karst & Fractured Rock](#)



Methods and Modeling

- ♦ [Geophysical Methods](#)
 - ♦ [Fiber-Optic Distributed Temperature Sensing](#)
- ♦ [Estimating Groundwater Recharge in Humid Areas](#)
- ♦ [Groundwater Model Development](#)

Data & Information

- ♦ [Principal Aquifers in U.S.](#)
- ♦ [High Plains Water-Level Monitoring Project](#)
- ♦ [Groundwater Level Data](#)
 - ♦ [Active Groundwater Level Network](#)
 - ♦ [Climate Response Network](#)
 - ♦ [Real-Time Groundwater Level Network](#)

About the Groundwater Resources Program

- ♦ [About GWRP](#)
- ♦ [Fact Sheet about GWRP](#)
- ♦ [GWRP photo gallery](#)
- ♦ [GWRP Intranet](#)
- ♦ [Contact the USGS Groundwater Resources Program online](#)
- ♦ Call the USGS Groundwater Resources Program at 703-648-5001.
- ♦ For general USGS questions, contact [Ask USGS online](#) or call 1-888-ASK-USGS (1-888-275-8747)

Other Water Topics

- ♦ [Water Resources](#)
- ♦ [Groundwater](#)
- ♦ [Surface Water](#)
- ♦ [Water Quality](#)
- ♦ [Water Use](#)

USGS in Your State

USGS Water Science Centers are located in each state.



Newsroom

- ♦ [Groundwater Availability Detailed in California's Central Valley](#)

USGS Groundwater Watch

USGS maintains a network of active wells to provide basic statistics about groundwater levels.



Wednesday, June 08, 2010

Publication

- ♦ [GWRP Bibliography](#)
- ♦ [Selected USGS Groundwater Publications](#)
- ♦ [USGS Publications Warehouse](#)
- ♦ [USGS Library](#)

Highlighted Information of Interest

- ♦ [The Mississippi Embayment Regional Aquifer Study \(MERAS\): Documentation of a Groundwater-Flow Model Constructed to Assess Water Availability in the Mississippi Embayment](#)
USGS Scientific Investigations Report 2009-5172
- ♦ [Groundwater availability of the Central Valley Aquifer, California](#)
USGS Professional Paper 1766
- ♦ [California's Central Valley groundwater study](#)
USGS Fact Sheet 2009-3057
- ♦ [Ground-water availability in the United States](#)
USGS Circular 1323
- ♦ [Consumptive water use coefficients for Great Lakes Basin](#)
USGS Scientific Investigations Report 2007-5197
- ♦ [Ground-water recharge in southwestern US](#)
USGS Professional Paper 1703
- ♦ [SEAWAT v4 - Simulation of 3D variable-density ground-water flow and transport](#)
USGS Techniques and Methods Book 6, Chapter A22

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