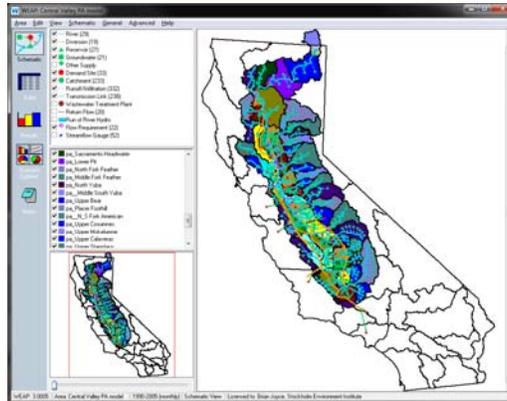


Introduction to the Central Valley WEAP Model



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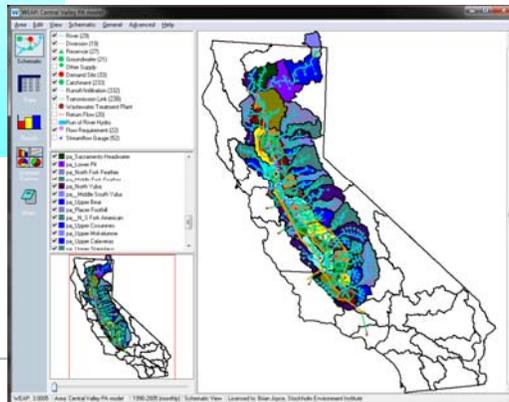
Water Evaluation and Planning (WEAP) System



Water Evaluation And Planning System

Generic, object-oriented, programmable, integrated water resources management modeling platform

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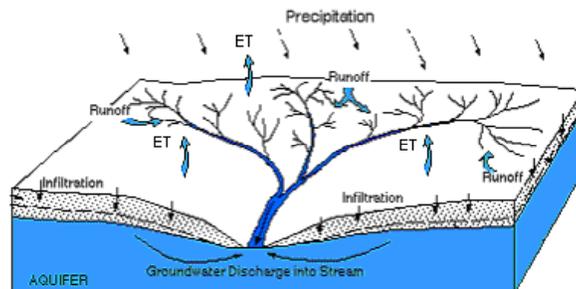


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WEAP as an Integrated Water Basin Analysis Tool

Full accounting of water flows throughout watershed:

- **Rainfall-runoff modeling**
- **Snow accumulation/melt**
- **Groundwater-surface water interaction**

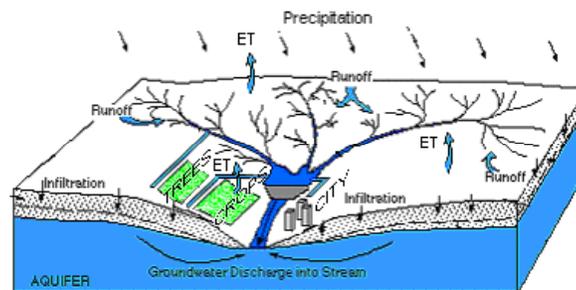


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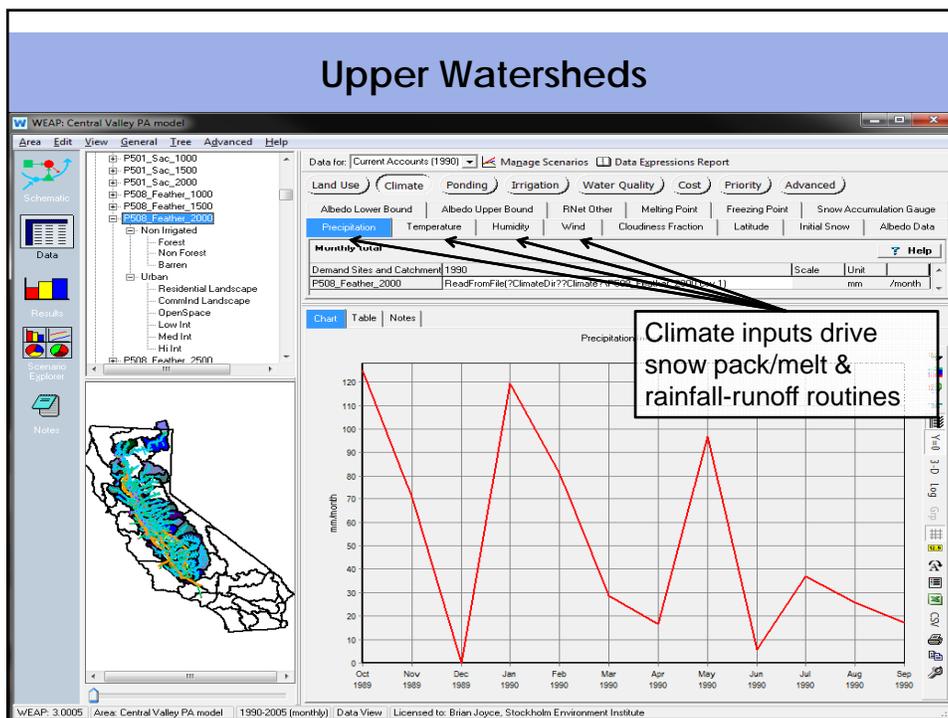
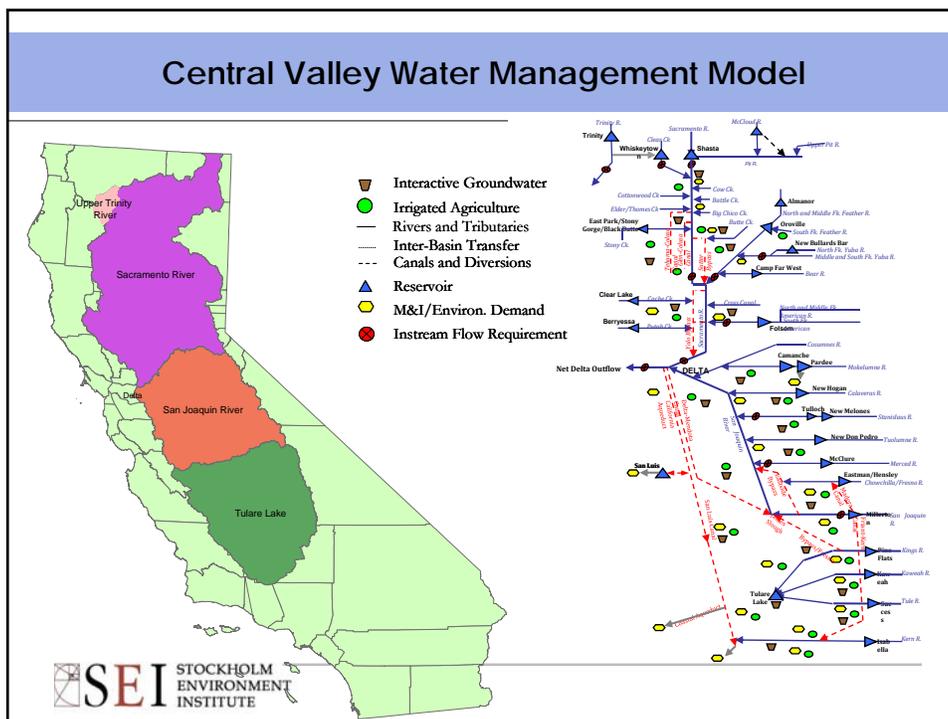
WEAP as an Integrated Water Basin Analysis Tool

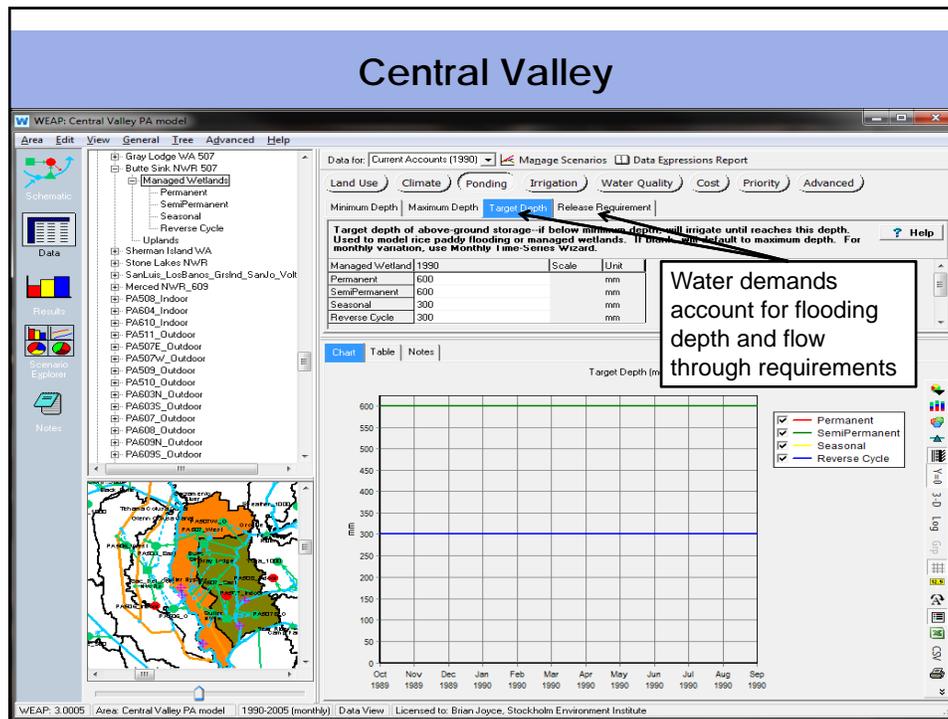
Water infrastructure and demands are nested within the underlying hydrological processes

- **Programmable operating rules for infrastructure**
- **Represents water demands from all sectors**



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Model Considerations

What's included:

- Climate-driven hydrology: supply and demand
- Water supply operations
- Ecosystems: in-stream flow, managed wetlands
- Groundwater
- Water quality: Delta Salinity
- Flood conveyance

What's NOT included:

- Economics
- Hydropower
- Water quality: Temperature, BOD

Considering Uncertainty

- **Use WEAP to evaluate:**
 - 12 future climate scenarios;
 - Based on outputs from six general circulation models (GCMs) were used to estimate future climate conditions under two IPCC emission scenarios: A2 and B1
 - 3 future demographic and land use scenarios:
 - Current Trends, Strategic Growth, Expansive Growth



Demographic and Land Use Scenarios

We use a narrative approach to develop scenarios for future changes in:

- Population
- Land use
- Irrigated area
- Environmental water
- Water conservation

	Current Trends	Slow & Strategic Growth	Expansive Growth
Factors of Uncertainty	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.	Private, public, and governmental institutions form alliances to provide for efficient planning and development that is less resource 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.	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.
Population	59.5 million* (22.8 million increase)	44.2 million (7.5 million increase)	69.8 million (33.1 million increase)
Land Use	Continued development	Compact development	Sprawling development
Irrigated Crop Area	8.6 million acres (0.7 mil. acre decrease)	9.0 million acres (0.2 mil. acre increase)	8.2 million acres (1.0 mil. acre decrease)
Environmental Water	1.0 additional MAF	1.5 additional MAF	0.6 additional MAF
Background Water Conservation	10% more efficient	15% more efficient	25% more efficient

LEGEND

Water demand change:

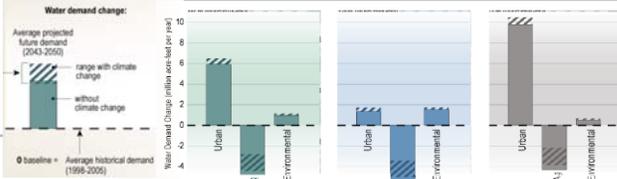
Average projected future demand (2043-2055)

range with climate change

without climate change

0 baseline = Average historical demand (1998-2005)

2050 Water Demand Changes by Scenario





Response Packages

Water management strategies range from specific structural modifications to general approaches aimed at changing water use patterns through adoption of new policies

Response Packages are comprised of different groupings of individual resources management strategies

Some Proposed Resources Management Strategies

Reduce Water Demand

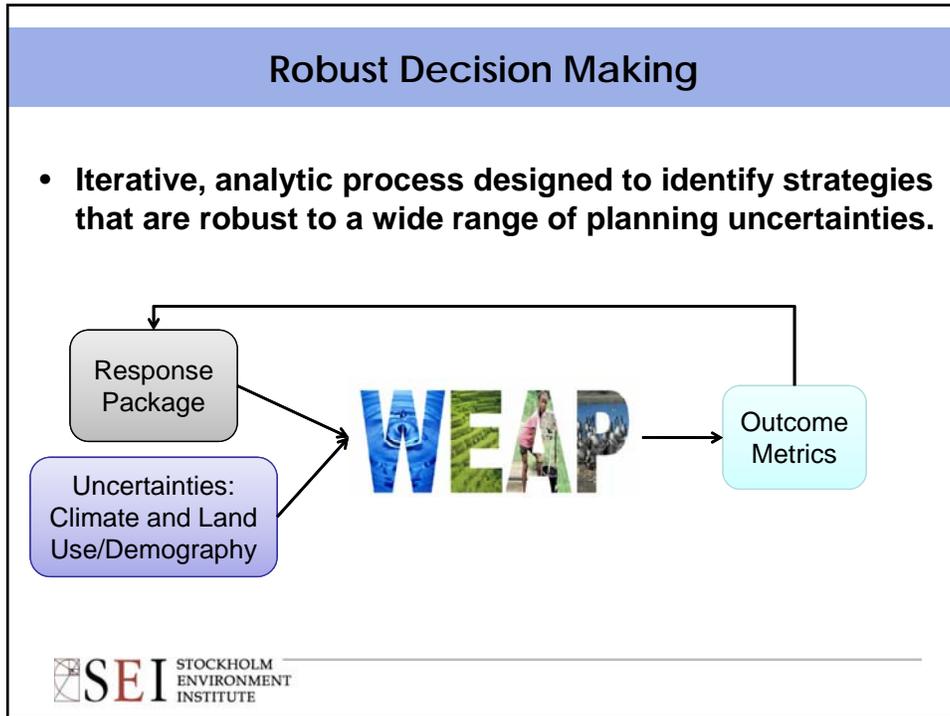
- Agricultural Water Use Efficiency
- Urban Water Use Efficiency

Increase Water Supply

- Conjunctive Management and Groundwater Storage
- Recycled Municipal Water
- Surface Storage – Federal/State
- Surface Storage – Regional/Local
- Desalination
- Precipitation Enhancement

Improve Operational Efficiency

- System Reoperation
- Water Transfers
- Enhanced Conveyance – Delta
- Enhanced Conveyance – Regional/Local



Evaluation Criteria

The WEAP model can report on the projected state of the modeled water management system using a wide variety of metrics

Performance Metric Category	Performance Metric
Demand	- Monthly and annual demand by node (irrigated agriculture, indoor urban, outdoor urban)
Supply	- Surface supply delivered - Groundwater supply delivered
Reliability	- Unmet demand by node - % of years with unmet demands
Environmental Objectives	- Anadromous Fish Restoration Programs flows - Delta inflow - Delta outflow - X2 position - Water quality (temperature)
System Operations	- Flows into major reservoirs - Storage volume for major dams - Delta exports (Cal Aqueduct and Delta Mendota Aqueduct) - Groundwater levels
Financial	- Capital costs - Fixed costs - Variable costs
Hydropower	- Annual hydropower generation
Economic impacts	- Economic impacts of shortages

Contact Information



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