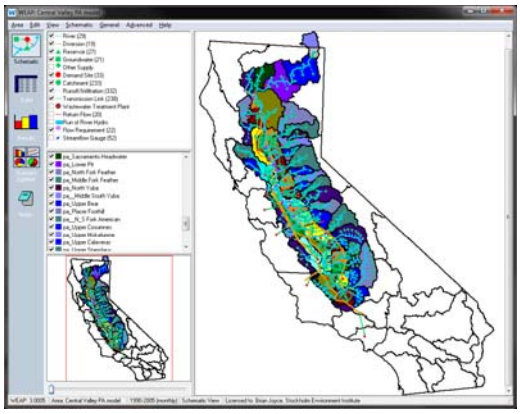
Introduction to the Central Valley WEAP Model



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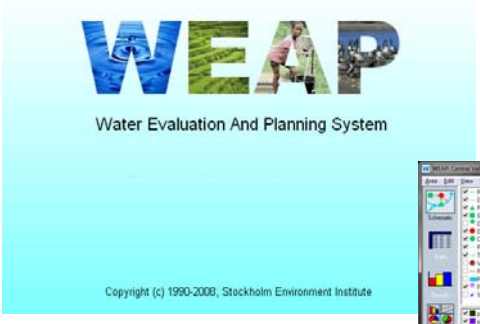
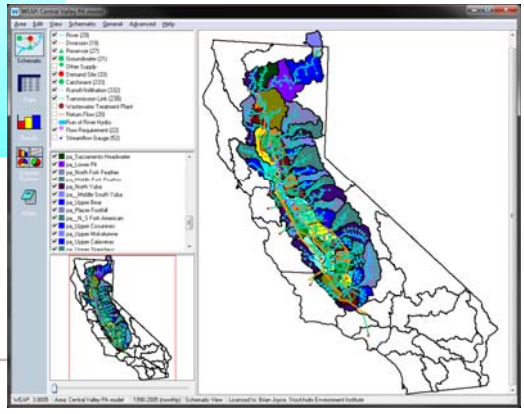
Water Evaluation and Planning (WEAP) System



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



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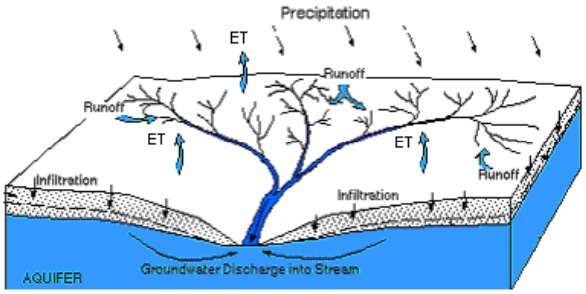
WEAP as an Integrated Water Basin Analysis Tool

Full accounting of water flows throughout watershed:

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



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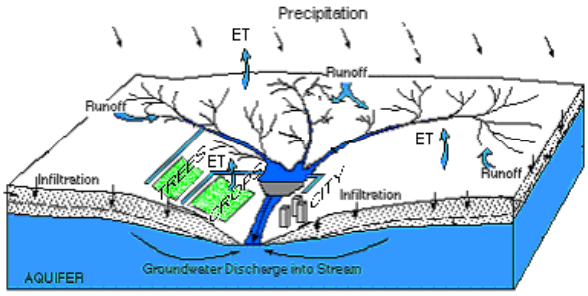
WEAP as an Integrated Water Basin Analysis Tool

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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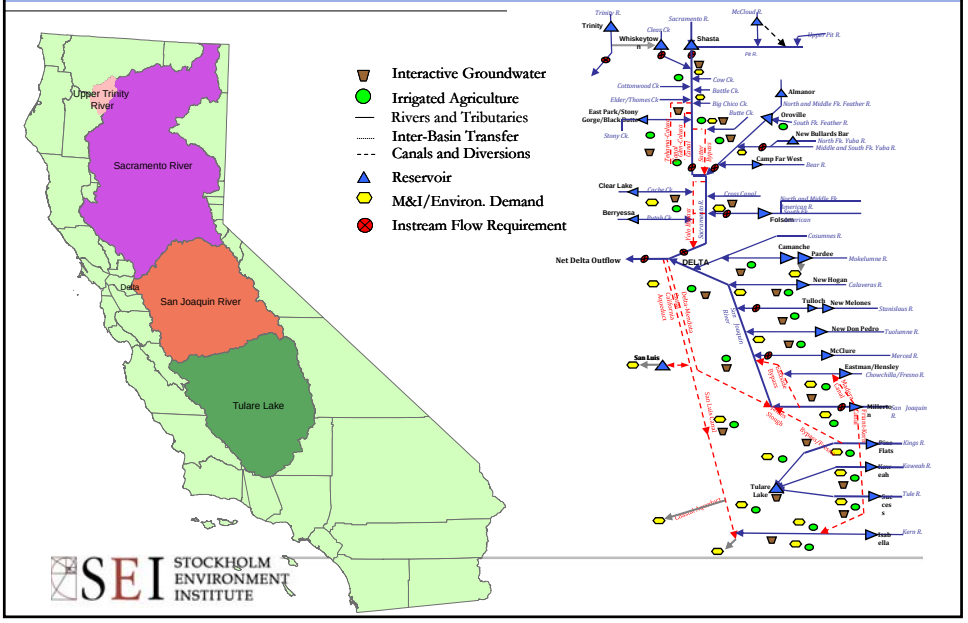
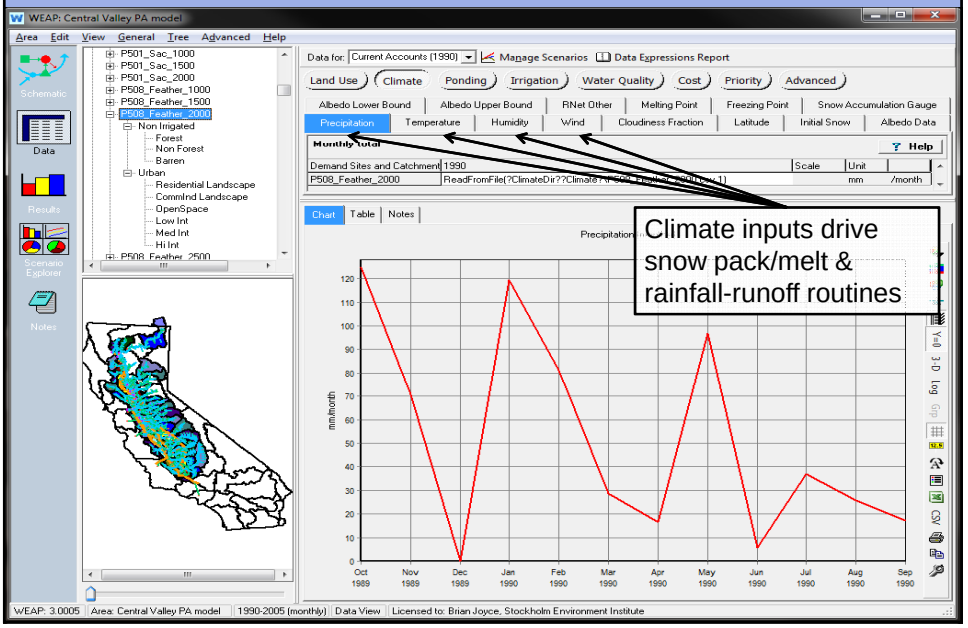
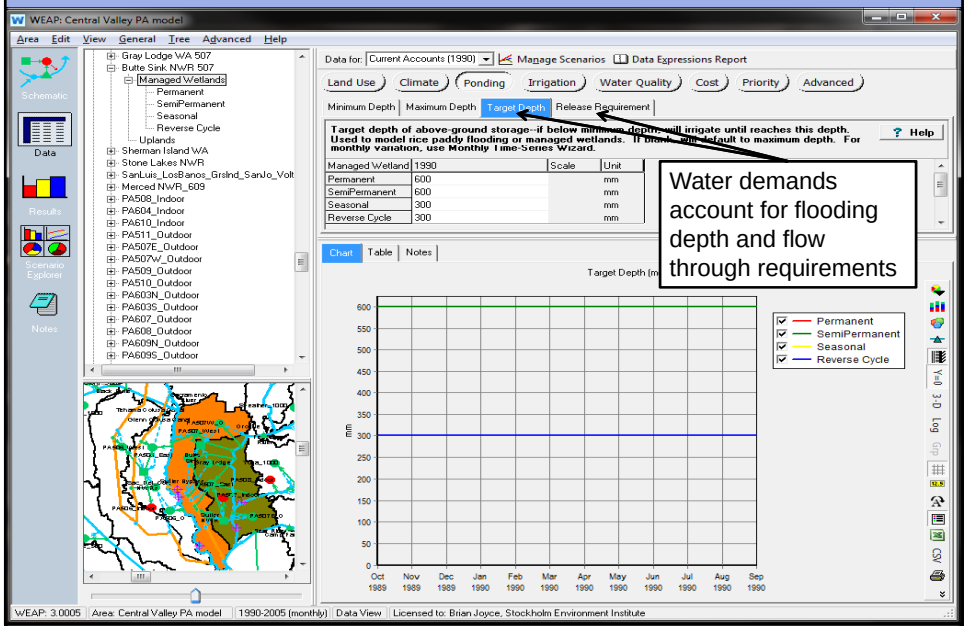
Central Valley Water Management Model



Upper Watersheds



Central Valley



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

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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

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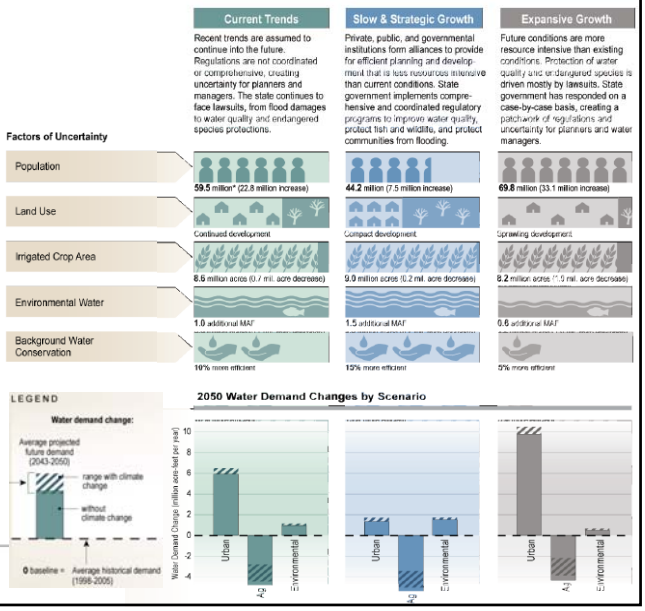
Demographic and Land Use Scenarios

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

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



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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

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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

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Robust Decision Making

- **Iterative, analytic process designed to identify strategies that are robust to a wide range of planning uncertainties.**

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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

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