Improving Analytical Capabilities of the California Water Plan

Rich Juricich, California Dept. of Water Resources
Overview

- Describe Statewide Water Analysis Network (SWAN) and its roles in Update 2009
- New planning approach for the Water Plan
- Scenario analysis from Update 2005
- Developing a proposal for Update 2009
What is SWAN
Purpose

- Primary technical advisory group for the California Water Plan
  - Provide recommendations on improvements to analytical tools and data
  - Through Water Plan, recommendations will guide other statewide and regional planning efforts
  - Provide feedback on proposals by Water Plan team
Why a Network?

- Problems identified for Water Plan are not unique
- Solution requires better integration and consistency at federal, state, regional, and local scales
- We have had difficulty reaching consensus on quantitative deliverables
- Expertise and funding are diffuse
How SWAN Can Help

- Build common conceptual understanding of water management system
- Identify appropriate scales for Water Plan analysis
- Develop strategy for making water planning information transparent
- Develop guidelines for integrating information
Needed SWAN Expertise

- Estimating future agricultural, urban, and environmental water demand
- Estimating future management responses
- Considering uncertainty about future climate conditions
- Identifying relationships between management of water, water quality, flood management, and energy
- Data management, visualization, and exchange
SWAN Pilot Studies

- Integrating UWMP’s with Water Plan
  - SWAN Workshop (January 2007)
- Common Schematic – TBD
- Common Conceptual Model using Object Oriented Modeling
  - SWAN Workshop (December 2006)
Related Activities

● Southern California Water Demand Study
  - RAND/UCSB (Completed June 2006)

● WEAP Climate Change and Decision Making under Uncertainty
  - IEUA / RAND (Completed June 2007)

● WEAP Climate Change Sac Valley
  - DWR / SEI / NCAR / USEPA (Completed June 2007)

● MOA with Army Corps, IWR
  - (Completed April 2007)
SWAN Activities During Update 2009

- Present results of completed pilot projects
- Implement other pilot studies
- Develop and implement comprehensive strategy Water Plan Update 2009
- Scope out longer term improvements
Outcomes of California Water Plan Update 2005
“DWR and other state agencies must improve data, analytical tools, and information management and exchange needed to prepare, evaluate, and implement regional integrated resource plans and programs in cooperation with other federal, tribal, local, and research entities”
Objectives for Water Plan Analysis

- How does water scarcity affect the economy and all beneficial uses?
- How does water quality affect water management and vice versa?
- How does land use affect water management?
Objectives Continued

- How should local, regional, and state agencies manage water during multiple year droughts?
- How will climate change affect water management?
- What are some of the costs, benefits, and tradeoffs between different water management strategies?
Multiple Quantitative Views

- **Water Portfolios**
  - Describe where water originates, where it flows, and what it is used for based on recent data

- **Future Baseline Scenarios**
  - Describe expected changes by 2030 if water managers do not take additional action

- **Alternative Response Packages**
  - Describe packages of promising actions, predict expected outcomes, and compare performance under each scenario
Using Scenarios in the California Water Plan

Uncertain Trends

Historical
Current Trends
Less Resource Intensive
More Resource Intensive

1960 1980 2000 2020 2040
In a scenario process, managers invent and then consider, in depth, several varied stories of equally plausible futures. The stories are carefully researched, full of relevant detail, oriented towards real-life decisions, and designed (one hopes) to bring forward surprises and unexpected leaps of understanding.

- Peter Schwartz, “The Art of the Long View, Planning for the Future in an Uncertain World”
Schwartz’ View of Scenarios

- Serve as a tool for ordering one’s perceptions
- Evaluate different actions or responses based on different plausible futures
- Do not want to pick one preferred future or the most likely future
- Make strategic decisions that will be sound for all plausible futures
Water Plan Scenarios Represent Baseline Conditions

- Water Plan Scenarios only consider conditions that:
  - are plausible during planning horizon under consideration
  - affect future water demands or supplies
  - the water community has little control over
Scenario Narratives
Used in Update 2005

- Scenario 1 – Current Trends
- Scenario 2 – Less Resources Intensive
- Scenario 3 – More Resources Intensive
## Update 2005

### Table of Scenario Factors

<table>
<thead>
<tr>
<th>FACTOR 1</th>
<th>SCENARIO 1</th>
<th>SCENARIO 2</th>
<th>SCENARIO 3</th>
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<tr>
<td>Total Population</td>
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<td>Population Density</td>
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<td>Population Distribution</td>
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<td>Higher Inland &amp; Southern</td>
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<td>Total Commercial Activity</td>
<td>Current Trend</td>
<td>Decrease in High Water Using Activities</td>
<td>Lower Coastal &amp; Northern</td>
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<td>Commercial Activity Mix</td>
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<td>Increase in Trend</td>
<td>Increase in Trend (Same as Scenario 2)</td>
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<td>Total Industrial Activity</td>
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<td>Irrigated Crop Area (includes Irrigated Land Area and Multi-cropped area)</td>
<td>Current Trend</td>
<td>Level Out at Current Crop Area</td>
<td>Increase in High Water Using Activities</td>
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<td>Crop Unit Water Use</td>
<td>Current Trend</td>
<td>Decrease in Crop Unit Water Use</td>
<td>Level Out at Current Crop Area</td>
</tr>
<tr>
<td>Environmental Water-Flow Based</td>
<td>Current Trend</td>
<td>High Environmental Protection</td>
<td>Year 2000 Level of Use</td>
</tr>
<tr>
<td>Environmental Water-Land Based</td>
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<td>High Environmental Protection</td>
<td>Year 2000 Level of Use</td>
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<td>Higher than NOC Trend in MOUs</td>
<td>Lower Than NOC Trend in MOUs</td>
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<td>Urban Water Use Efficiency</td>
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<td>Ag Water Use Efficiency</td>
<td>Currently Planned</td>
<td>Currently a Repeat of History</td>
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<td>Per Capita Income</td>
<td>Equal to 4.4 Plan</td>
<td>Current Conditions</td>
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<td>Ratio of Seasonal to Permanent Crop Mix</td>
<td>Current capacities, management practices and operations</td>
<td>As Projected From Current Trends</td>
<td>Current Conditions</td>
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<td>Hydrology</td>
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<td>Current Level of Use</td>
<td>Present Demand Trends Continued</td>
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<td>Climate Change</td>
<td>Current Level + Permitted/Financed</td>
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<td>Colorado River Supply</td>
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<td>Currently Approved Transfers</td>
<td>Currently Approved Transfers</td>
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<td>Existing Inter-Regional Import Projects</td>
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<td>Current Practices - pricing constrained to cost recovery</td>
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<td>Ambient Water Quality</td>
<td>Current Level + Permitted/Financed</td>
<td>Currently Approved Transfers</td>
<td>Current Practices - pricing constrained to cost recovery</td>
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<td>Ag Discharge Requirements</td>
<td>Current Level + Permitted/Financed</td>
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</tr>
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<td>Urban Runoff Mgmt.</td>
<td>Current Level + Permitted/Financed</td>
<td>Currently Approved Transfers</td>
<td>Current Practices - pricing constrained to cost recovery</td>
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<td>Recreation</td>
<td>Current Level + Permitted/Financed</td>
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<td>Current Practices - pricing constrained to cost recovery</td>
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<td>Currently Approved Transfers</td>
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<td>Current Practices - pricing constrained to cost recovery</td>
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<tr>
<td>Water Transfers Within Regions</td>
<td>Current Level + Permitted/Financed</td>
<td>Currently Approved Transfers</td>
<td>Current Practices - pricing constrained to cost recovery</td>
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<td>Water Transfers Between Regions</td>
<td>Current Level + Permitted/Financed</td>
<td>Currently Approved Transfers</td>
<td>Current Practices - pricing constrained to cost recovery</td>
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<td>Conjunctive Use and Groundwater Management</td>
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<td>Currently Approved Transfers</td>
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<td>Surface Water Storage</td>
<td>Current Level + Permitted/Financed</td>
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<td>Conveyance Facilities</td>
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<td>Rate Structure</td>
<td>Current Level + Permitted/Financed</td>
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</table>

All Cost Effective BMP’s in Existing MOU’s Implemented by Current Signatories (present commitments)

All Cost Effective EWMP’s in Existing MOU’s Implemented by Current Signatories (present commitments)
Quantified Scenarios of 2030
California Water Demand
By David Groves, Pardee RAND Graduate School and Scott Matyac and Tom Hawkins, DWR
<table>
<thead>
<tr>
<th>Population Growth</th>
<th>Number of single and multiple family housing units</th>
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<td>Number of commercial and industrial employees</td>
<td>Changes in water conservation</td>
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<td>Household income</td>
<td>Household size</td>
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<td>Water price</td>
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Update 2005 Scenarios Population

<table>
<thead>
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<th>Year</th>
<th>Current Trends</th>
<th>Less Resource Intensive</th>
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<td>2000</td>
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Population (Millions)
## Update 2005 Scenarios
### Agricultural Water Demand Factors

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<td>Irrigated land area</td>
<td>Crop yield</td>
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<tr>
<td>Multiple crop area</td>
<td>Irrigation practices</td>
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<td>Changes in water conservation</td>
<td>Water price</td>
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<tr>
<td>Agricultural economic markets</td>
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Update 2005 Scenarios
Crop Area

Area (Million Acres)

<table>
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<tr>
<th></th>
<th>Year 2000</th>
<th>Current Trends</th>
<th>Less Resource Intensive</th>
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<tr>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Multiple</td>
<td></td>
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Area: Crop Area

Irrigated Land Area

Multiple Crop Area
## Update 2005 Scenarios

### Information Sources for Environmental Objectives

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
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<tbody>
<tr>
<td>Trinity River Main stem Restoration Plan ROD</td>
<td>Final Restoration Plan for the Anadromous Fish Restoration Program</td>
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<tr>
<td>Central Valley Project Improvement Act “B2” fishery goals</td>
<td>San Joaquin River restoration goals</td>
</tr>
<tr>
<td>Central Valley Project Improvement Act “Level 4” Refuge requirements</td>
<td>CALFED Bay-Delta Program Ecosystem Restoration Program goals</td>
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<td>San Joaquin River Vernalis flow goals</td>
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### Year 2000 unmet environmental water objectives

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<tr>
<th>Location</th>
<th>Unmet Objective (TAF)</th>
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<tr>
<td>Trinity River (Lewiston)</td>
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<td>American River (Nimbus)</td>
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<td>San Joaquin River (Vernalis)</td>
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<tr>
<td>San Joaquin River (Below Friant)</td>
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<td>Stanislaus River (Goodwin)</td>
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<tr>
<td>ERP Flow Objective</td>
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<tr>
<td>Level 4 Wildlife Refuge Supply</td>
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<td><strong>Total</strong></td>
<td><strong>987</strong></td>
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Scenario Demand Changes Statewide

Changes by Sector

- **Urban**
- **Agricultural**
- **Environmental**

<table>
<thead>
<tr>
<th></th>
<th>Million Acre-Feet Per Year</th>
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<td><strong>Less Resource Intensive</strong></td>
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<td><strong>More Resource Intensive</strong></td>
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29
Scenario Demand Changes by Region
Update 2009 Scenarios
Some Considerations

- Scenario themes and factors
- Planning horizon / Time step
- Climate change
- Drought conditions
- Flood management
- Others?
Next Steps on Scenarios

- Develop narrative scenarios
  - Advisory Committee, Regional Forums, and Plenary
- Identify options for quantifying scenarios
  - Statewide Water Analysis Network
- Include scenario narratives and factors in Assumptions and Estimates Report
Implementation

Goals

Promote Collaboration
Facilitate Information Exchange
Improve Numbers
Applying Shared Vision Planning to Develop a Proposal for Update 2009
What is Shared Vision Planning

Shared Vision Planning incorporates tried and true planning principles and technical analysis and collaboration into a practical forum for making resource management decisions.

Goal - get agreement on the facts so that the discussion can focus on the value conflicts.
How Shared Vision Planning Can Help

- Can be applied to any water resource problem where stakeholders are willing to come to the table
- Allows stakeholders to identify what can be done and what ought to be done
- Focuses on facts and data relationships first, then values and tradeoffs
- Provides a method to structure and facilitate the debate
- Integrates policy, collaboration, and technical analysis
SVP foundations: Technical Analysis Models

- Models are visual, processes transparent
- Public and experts work together
- Process and model help find win-win solutions

Remember to ask: “Who will use the model?” and “How it will be used?”
Schedule for Developing Proposal

- December 2007 - Draft proposal
  - Integrate water portfolios, scenarios, and responses
  - Apply shared vision planning approach through SWAN
- March 2008 - Final proposal
Reference Information

- [http://www.waterplan.water.ca.gov](http://www.waterplan.water.ca.gov)
  - Volume 1, CH 4, Update 2005 – Scenarios
  - Volume 3, Update 2005 – Water Portfolios
  - SWAN

- Rich Juricich
  - (916) 651-9225
  - juricich@water.ca.gov
Questions?

- SWAN
- Quantitative deliverables
- Developing proposal
Scenario 1
Current Trends

- Recent trends continue for the following:
  - Population growth and development patterns
  - Agricultural and industrial production
  - Environmental water dedication
  - Naturally occurring conservation (like plumbing code changes, natural replacement, actions water users implement on their own)
Scenario 2
Less Resource Intensive

- Includes the following:
  - Recent trends for population growth
  - Higher agricultural and industrial production
  - More environmental water dedication
  - Higher naturally occurring conservation than Current Trends (but less than full implementation of all cost-effective conservation measures available)
Scenario 3

More Resource Intensive

● Includes the following:
  ✦ Higher population growth rate
  ✦ Higher agricultural and industrial production
  ✦ No additional environmental water dedication (year 2000 level)
  ✦ Lower naturally occurring conservation than Current Trends
Update 2005 Scenarios Employees

Year 2000

Current Trends

Less Resource Intensive

More Resource Intensive

Employees (Millions)

- Commercial Employees
- Industrial Employees
Update 2005 Scenarios
Housing Units

Housing Units (Millions)

Year 2000
Current Trends
Less Resource Intensive
More Resource Intensive

Single Family Houses
Multiple Family Houses