California Water Plan Update 2009

Future Scenarios
North Lahontan HR

2009 Regional Workshops

Integrated Water Management

Bulletin 160-09 - Department of Water Resources

Volume 3
Regional Reports

Public Review Draft
January 2009
Water Plan Scenarios Used To Consider Future Uncertainty

- Three plausible yet very different conditions during 2050 planning horizon
- Explore key uncertainties facing water community
- Factors water community has little control over
- Not predictions ---- used to evaluate water management responses
Quantifying Future Scenarios for Update 2009

- Using WEAP analytical tool to quantify water demand and supplies for future scenarios and water management responses.

- WEAP Hydrologic Region analysis being done for all regions --- high level, coarse representation.

- WEAP Planning Area analysis for Sacramento and San Joaquin regions --- more physically based.

- Each scenario evaluated with 12 climate sequences (climate change, multiple year droughts, wet years).
WEAP Model

- Water Evaluation And Planning Model
- High level screening tool with graphical interface
- Demand & Supply in a single tool
- Demand driven water supply allocation model
- Steps through time to simulate future conditions
- Very suitable to build and study future water scenarios as affected by population, socio-economic factors and climate change
- Explore management strategies (demand reduction, supply augmentation)
- Recent successful WEAP application for Inland Empire Utilities Agency
Hydrologic Region Analysis

- Monthly, climate-driven demands to 2050
  - reflect global climate change projections
- Inventory current supplies by source
- Coarse representation of response packages

All 10 Hydrologic Regions
Planning Area Analysis
Sacramento and San Joaquin River Regions

- Hydrologically-based water system simulation by month to 2050
  - Reflect global climate change projections
- Estimate environmental flows, system operations, deliveries, and reliability
- More direct representation of response packages

Sacramento River & San Joaquin River Hydrologic Regions
Scenario Overview

- Scenario concepts
- 3 scenario narratives
- Quantifying important factors
- Evaluation framework

Uncertain Trends

- Historical
- Current Trends
- Blueprint Growth
- Expansive Growth
Demographic Factors

- Population, Employment, Housing, Income
- Used to determine indoor urban demands
- Population used to estimate outdoor urban landscape area, future urbanization of agricultural lands
Irrigated Agricultural Area

Future Growth studies: 2020 and 2050 urbanization

Alternative population from DOF and PPIC for 2005, 2020 & 2050

Alternative development densities

Alternative scenarios of future irrigated land area for 2050

DWR Land Survey Data

Farmland Mapping Data
Environmental Demand Estimates

- Based on recent years current environmental water requirements.
- Using future hydrologic sequences with climate change to generate environmental needs for three scenarios.
Climate Factors

- Model estimates of future precipitation, temperature, wind speed, and relative humidity
- Used in calculation of applied agricultural and outdoor M&I water uses
- Developed using World Climate Research Programs downscaled climate projections – CMIP3 dataset
  - [http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/)
3 Baseline Scenarios for 2050
Plausible Yet Different Futures

- **Current Trends**
  - Recent trends continue into the future for population, agricultural production, environmental water, and background water conservation

- **Blueprint Growth**
  - More coordinated planning & infill
  - Lower population growth
  - More agricultural prod. -- 2000 level
  - New environment water -- High
  - More background water conservation

- **Expansive Growth**
  - Less coordinated planning & sprawl
  - Higher population growth
  - More agricultural prod. -- 2000 level
  - New environment water -- Low
  - Less background water conservation
## Scenario Assumptions for Key Factors

### North Lahontan Hydrologic Region

<table>
<thead>
<tr>
<th>Scenario Factors Affecting Water Demand</th>
<th>Year 2005 Observed</th>
<th>2050 Current Trends</th>
<th>2050 Blueprint Growth</th>
<th>2050 Expansive Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (thousands)</td>
<td>104</td>
<td>147</td>
<td>126</td>
<td>165</td>
</tr>
<tr>
<td>Irrigated Crop Area (thousands of acres)</td>
<td>128</td>
<td>125</td>
<td>127</td>
<td>123</td>
</tr>
<tr>
<td>Background Water Conservation (% Incr.)</td>
<td>----</td>
<td>10%</td>
<td>15%</td>
<td>5%</td>
</tr>
</tbody>
</table>
Scenario Water Demand Changes
HR Results for 1 Climate Sequence

- Change in urban water demand
- Change in irrigated agriculture water demand
- Change in environmental water
- Net Change in regional water demand
Urban Water Demand Changes – 2005 to 2050
North Lahontan HR

Change in 2041-2050 Average Applied Urban Water Demand from 1998-2002 Historical Average by Scenario
North Lahontan Region, Climate Sequence 1

- **Current Trends**
  - 2005 Population = 104,000
  - 2050 Population = 147,000

- **Blueprint Growth**
  - 2050 Population = 126,000

- **Expansive Growth**
  - 2050 Population = 165,000
Farm Water Demand Changes – 2005 to 2050
North Lahontan HR

Change in 2041-2050 Average on-Farm Applied Water Demand from 1998-2002 Historical Average by Scenario
North Lahontan Region, Climate Sequence 1

- Current Trends
  - 2005 Irrigated Crop Area = 128,000
  - 2050 Irrigated Crop Area = 125,000

- Blueprint Growth
  - 2050 Irrigated Crop Area = 127,000

- Expansive Growth
  - 2050 Irrigated Crop Area = 123,000
Net Water Demand Changes – 2005 to 2050
North Lahontan HR

Change in 2041-2050 Average Applied Water Demand from 1998-2002
Historical Average by Scenario
North Lahontan Region, Climated Sequence 1

Current Trends
- 2050 Irrigated Crop Area = 125,000
- 2050 Population = 147,000

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- 2050 Irrigated Crop Area = 127,000
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Expansive Growth
- 2050 Irrigated Crop Area = 123,000
- 2050 Population = 165,000
Technical Outreach for Scenario Work

- December 2007 – Scenario proposal
- April 2008 – Shared Vision Planning
- June 2008 – Refinement of scenario proposal
  - Climate change
  - Environmental water
  - Flood management
  - Water quality
- February 2009 – Review of preliminary demands
Steps for Scenario Work

- **December 2008 – February 2009**
  - Develop scenario water demands

- **February – May 2009**
  - Develop scenario water supplies
  - Test future water management responses

- **June 16, 2009**
  - Workshop on Regional and Planning Area results in Sacramento
Reference Information

- DWR Scenario Team Lead – Rich Juricich
  email: juricich@water.ca.gov

- Statewide Water Analysis Network (SWAN)
  website: http://www.waterplan.water.ca.gov/swan