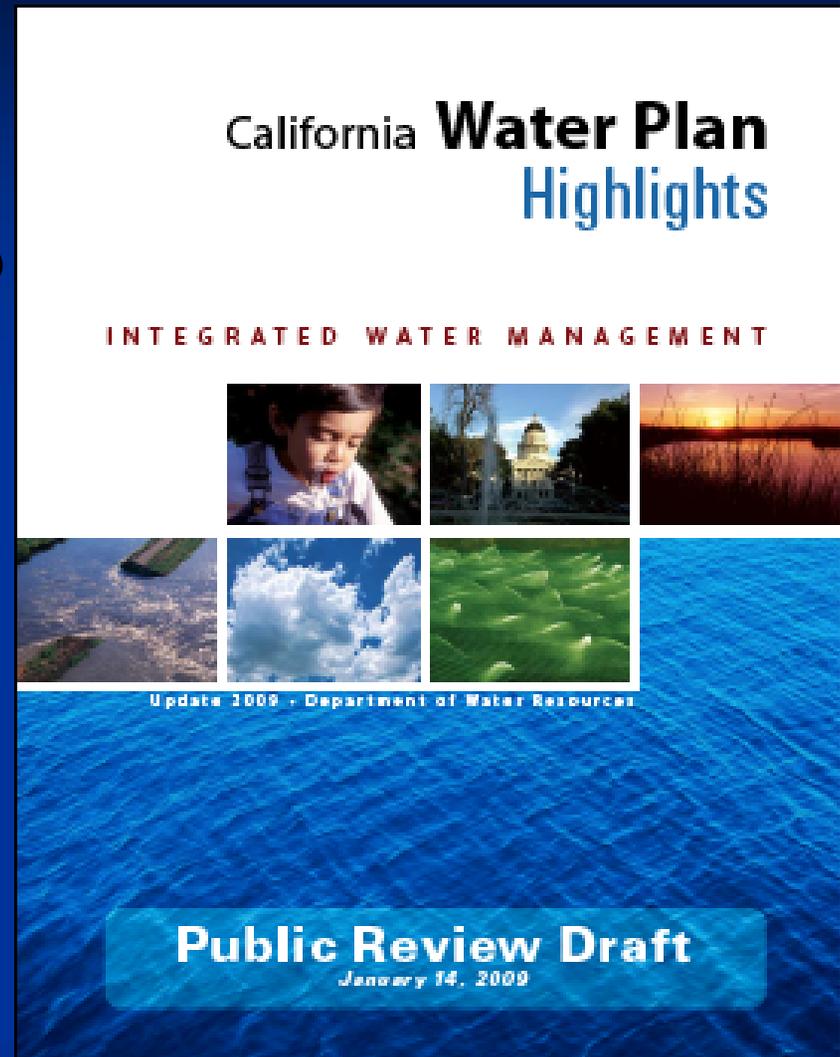


# Statewide Water Analysis Network

Technical Workshop  
February 11<sup>th</sup>, 2009



# Purpose of Today's Workshop

- Present three narrative scenarios
- Describe quantification of important scenario factors/drivers
- Review preliminary WEAP water demand results at the Hydrologic Region
- Consider presentation techniques and graphics to display WEAP results in Update 2009;
- Review status of the more detailed Planning Area scale WEAP model



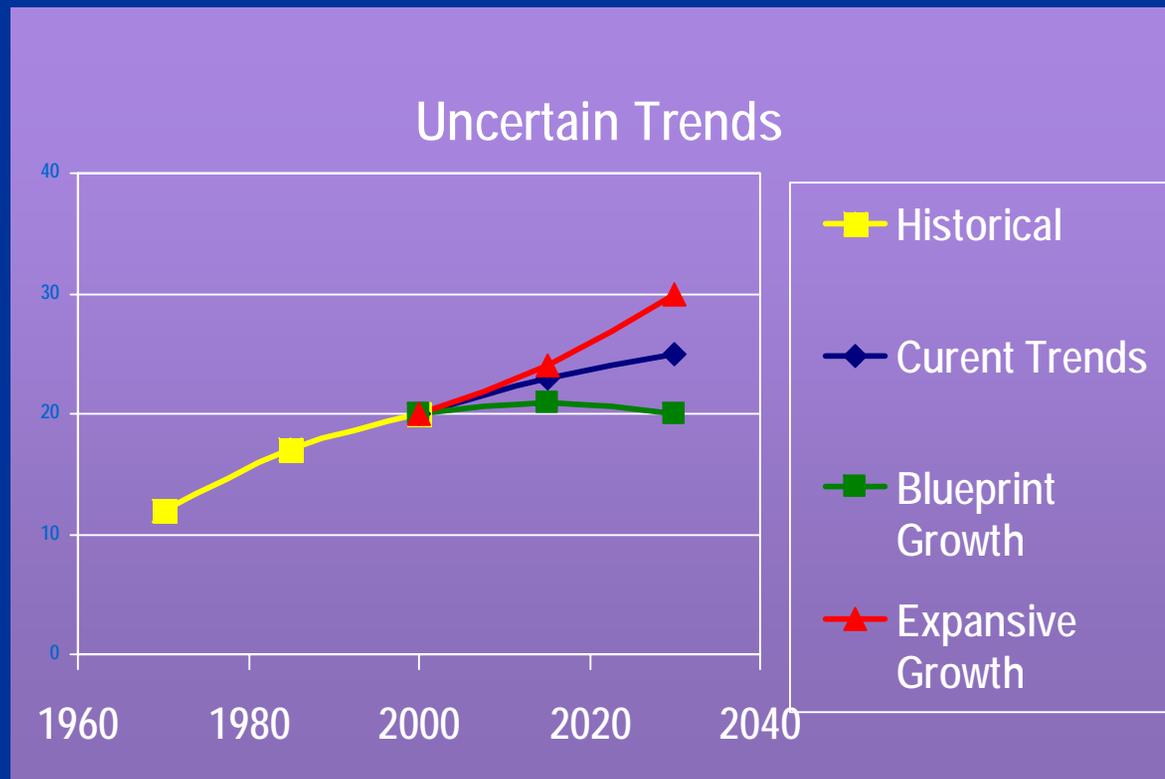
# Overview of Today

- Introductions / Agenda review
- Scenario overview
- WEAP development for Update 2009
- WEAP calibration and scenario results
- Planning area scale analysis
- Lunch
- Breakout discussion in the afternoon



# Scenario Overview

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



# 8 Key Activities of Update 2009

- Evaluate progress on Update 2005 & Revise the Strategic Plan
- Update the Future Scenarios & develop Response Packages
- Quantify Climate Change impacts & recommend Adaptation Actions
- Update & Expand 12 Regional Reports
- Update 27 Resource Management Strategies
- Add Water Portfolio data for 5 years: 1999, 2002 – 2005
- Improve Analytical Tools, Data & Data Exchange
- Incorporate Companion State Plans

# Scenario Concepts



# Water Plan Scenarios Represent Baseline Conditions

- Plausible during planning horizon under consideration
- Influence future water management decisions
- The water community has little control over
- Explore key uncertainties facing water managers



# Uncertainties Affecting California Water Management

- Future climate change
- Vulnerable flood management system
- Severity of the next drought
- Collapsing Delta ecosystem
- Growing population
- Invasive species



# Scenarios Organized Around Uncertainty

**Economic  
and Financial**

**Institutional  
and Political**

**Natural  
Systems**

**Technology**

**Social  
Practices**



# Natural Systems Uncertainty

Air Temperature variability

Air Temperature trends

Precipitation Variability

Precipitation Trends

Snowpack/melt (intermediate factor)

Sea-level Rise

River/Stream Unimpaired Flows

Species recovery

Extent of Invasive Species

Resilience of Endangered Species

Water Temperature Variability

Water Temperature Trends

Stream-Aquifer Interaction

Catastrophic Events

Saltwater Intrusion

Extreme Precipitation Events

Condition of Pelagic Fishes

Groundwater Recharge Area

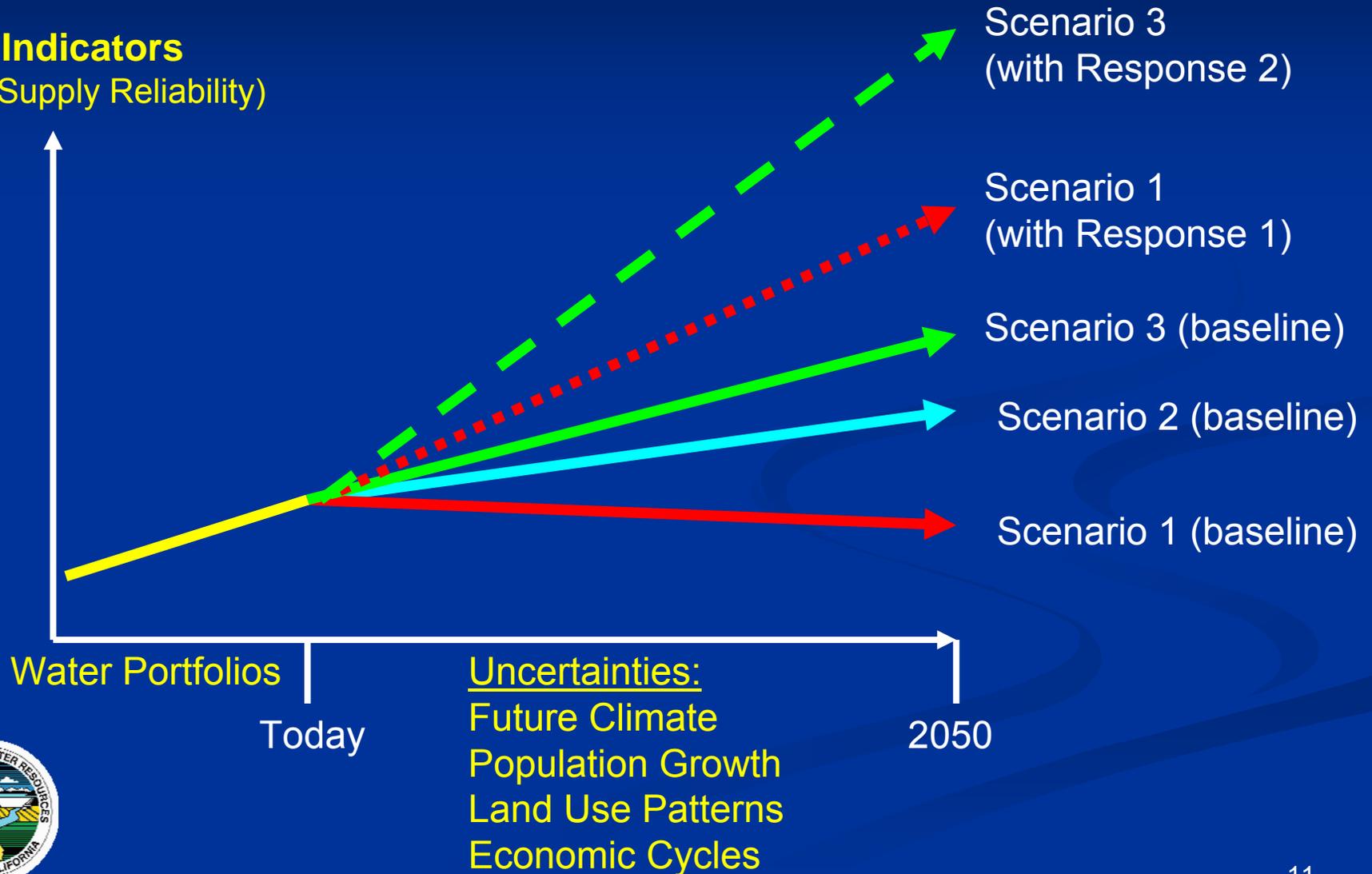
Phytoplankton Densities

Water Quality ( Surface Water / Groundwater)



# Evaluating Uncertainty Using Scenarios

**Indicators**  
(e.g. Supply Reliability)



# Scenario Narratives



# Advisory Committee Explored Scenario Themes

- *“CHALLENGING CONDITIONS” scenarios*
  - ◆ “Cascading Catastrophes”
  - ◆ “Armageddon”
  - ◆ “World Falls Apart”
  - ◆ “Gloom and Doom”
- *“OPTIMISTIC OUTLOOK” scenarios*
  - ◆ “Optimal Multiple Benefits”
  - ◆ “Eureka!”
  - ◆ “Native Control”
  - ◆ “Blue Skies”



# Scenario Storylines

- Scenario 1 – Current Trends
- Scenario 2 – Blueprint Growth
- Scenario 3 – Expansive Growth

NOTE: All scenarios evaluated against climate variation (climate change, multiple year droughts, wet years)



# Current Trends Scenario

- Recent trends continue for:
  - ◆ Population growth and development patterns
  - ◆ Agricultural and industrial production
  - ◆ Environmental water dedication and protection
- Climate Change consistent with IPCC and Climate Action Team
- Improved regional water management, but lacking statewide integration



# Blueprint Growth Scenario

- Population growth lower than current trends
- Higher housing density
- Higher agricultural and industrial production
- More water for the environment
- Climate Change consistent with IPCC and Climate Action Team
- Improved regional water management with statewide integration



# Expansive Growth Scenario

- Population growth higher than current trends
- Lower housing density
- Steeper decline in agricultural land
- Less additional water for the environment
- Climate Change consistent with IPCC and Climate Action Team
- No additional regional water management



# Summary of Key Scenario Factors

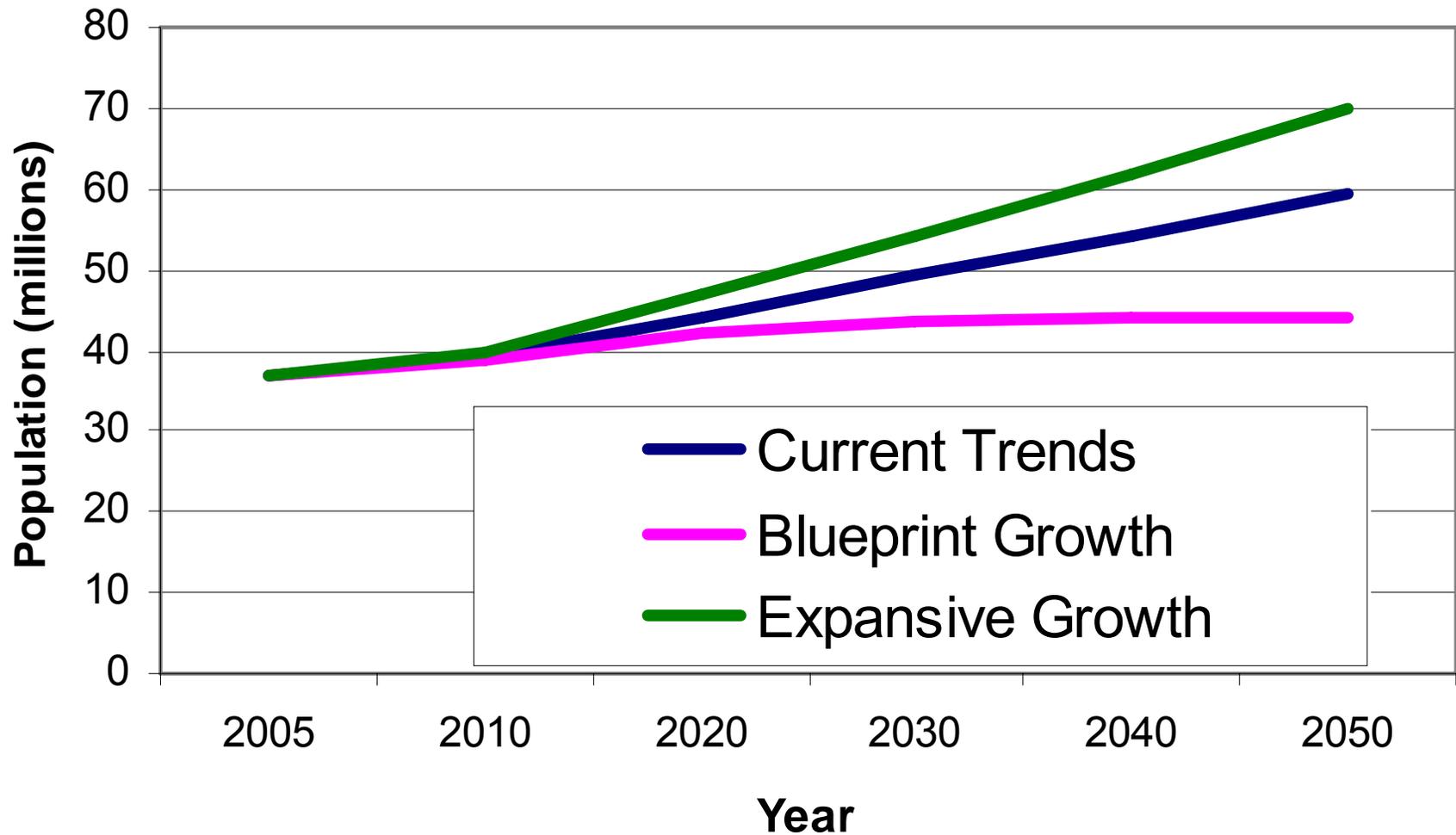


# Demographic Factors

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



# California Population by Scenario



# Irrigated Agricultural Area

Working Paper 2003-04

How We Will Grow:

Baseline Projections of the Growth of  
California's Urban Footprint through the  
Year 2100

John D. Landis and Michael Reilly  
Department of City and Regional Planning



# Irrigated Agricultural Area

Landis study:  
2020 and 2050  
urbanization

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

Alternative  
development  
densities

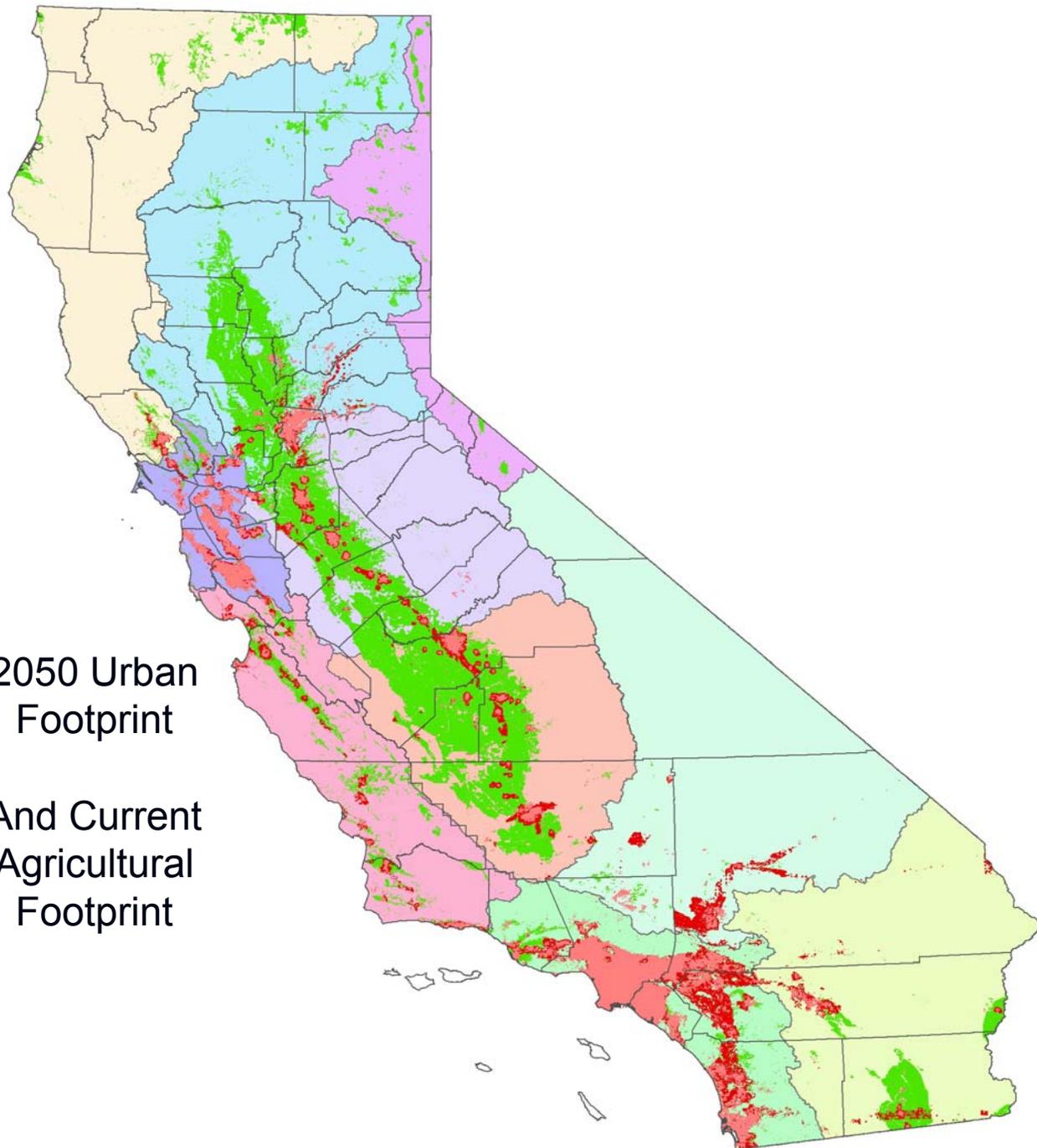
Alternative scenarios  
of future irrigated land  
area for 2050

DWR Land  
Survey  
Data

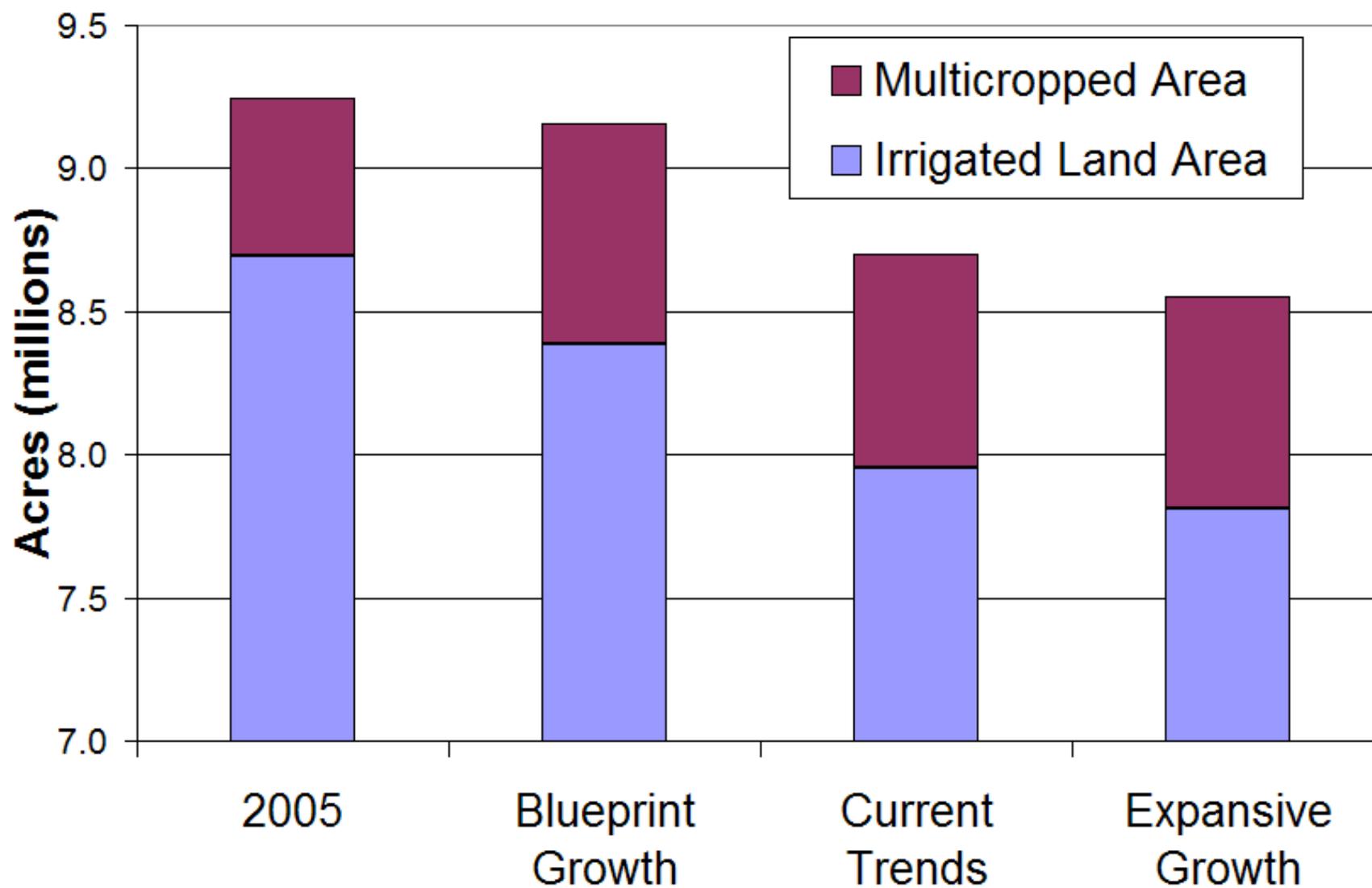
Farmland  
Mapping  
Data



2050 Urban  
Footprint  
And Current  
Agricultural  
Footprint



## 2050 California Irrigated Crop Area by Scenario

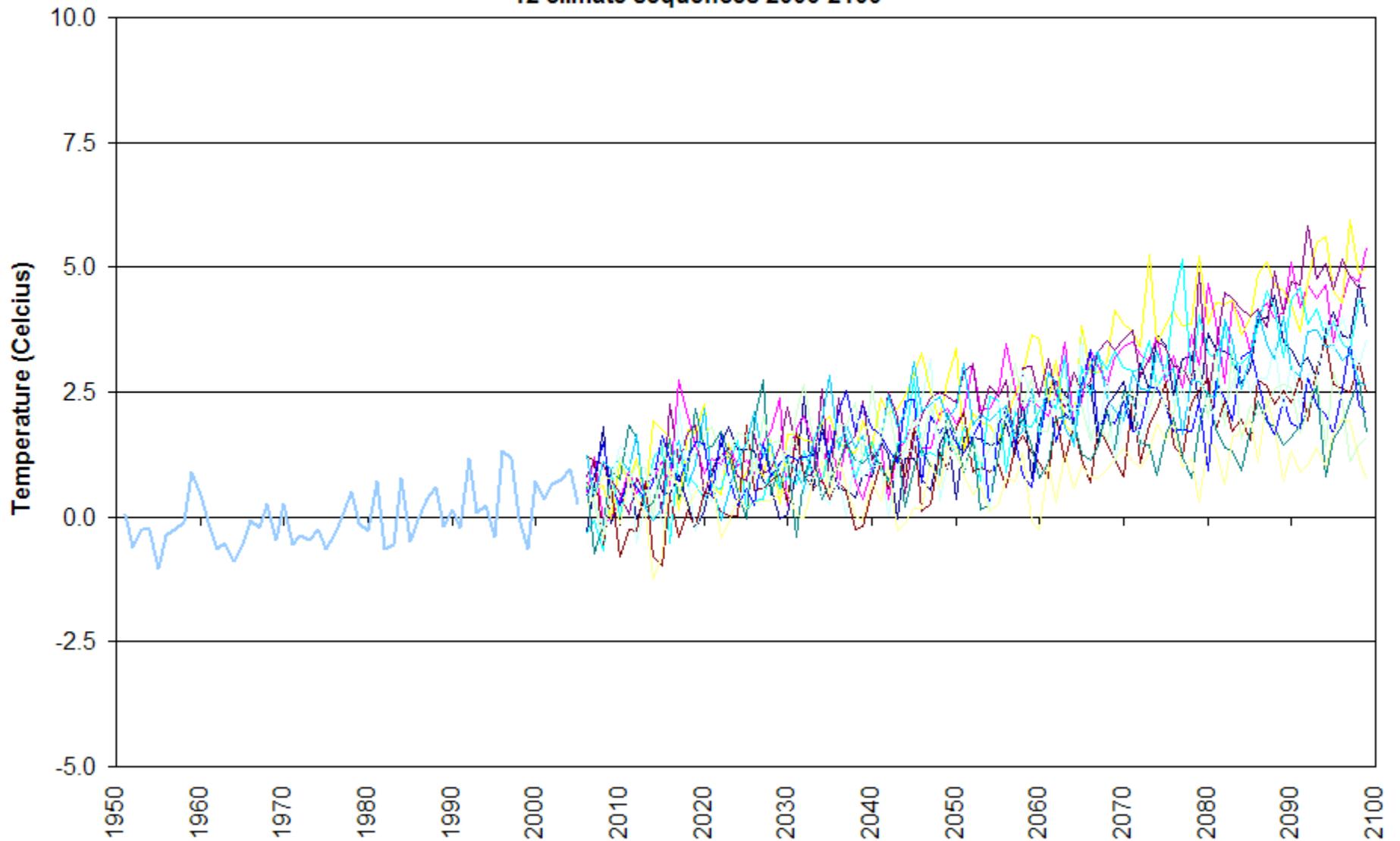


# Climate Factors

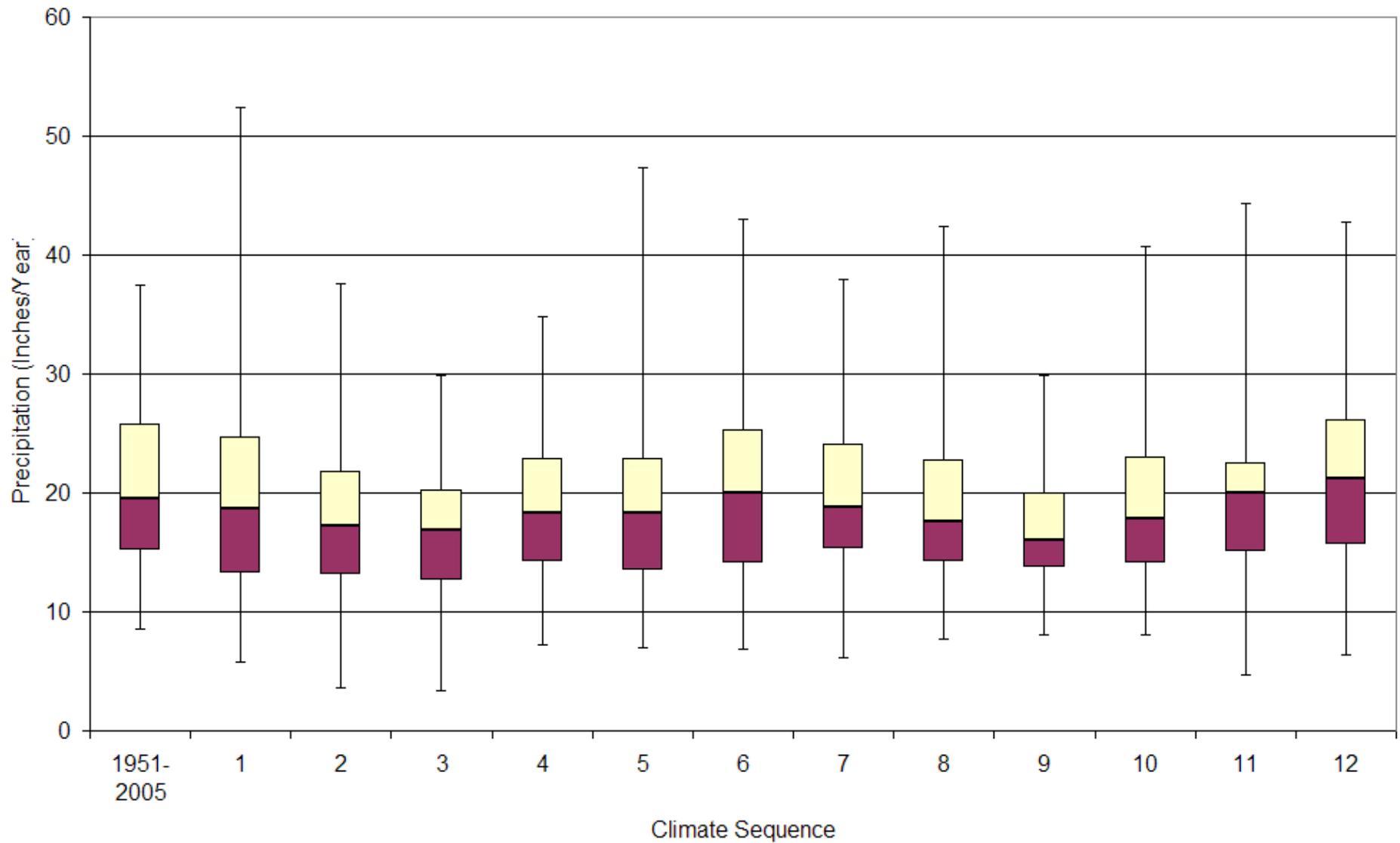
- Developed estimates of future precipitation, temperature, wind speed, and relative humidity
- Used in calculation of applied agricultural and outdoor M&I water use
- LLNL-Reclamation-SCU downscaled climate projections – CMIP3 dataset
  - [http://gdo-dcp.ucllnl.org/downscaled\\_cmip3\\_projections/](http://gdo-dcp.ucllnl.org/downscaled_cmip3_projections/)



**Change in average annual temperature for the Sacramento Valley floor  
from historical 1951-2005 average for historical period and  
12 climate sequences 2006-2100**



## Variation in Precipitation for Sacramento Valley Floor Historical 1951-2005 and by Climate Sequence



# Unmet Environment Objectives

e

ENVIRONMENTAL DEFENSE

finding the ways that work

To: Kamyar Guivetchi, DWR, Michael Perrone, DWR, Jennifer Koiford, DWR

CC: B160 Advisory Committee Members

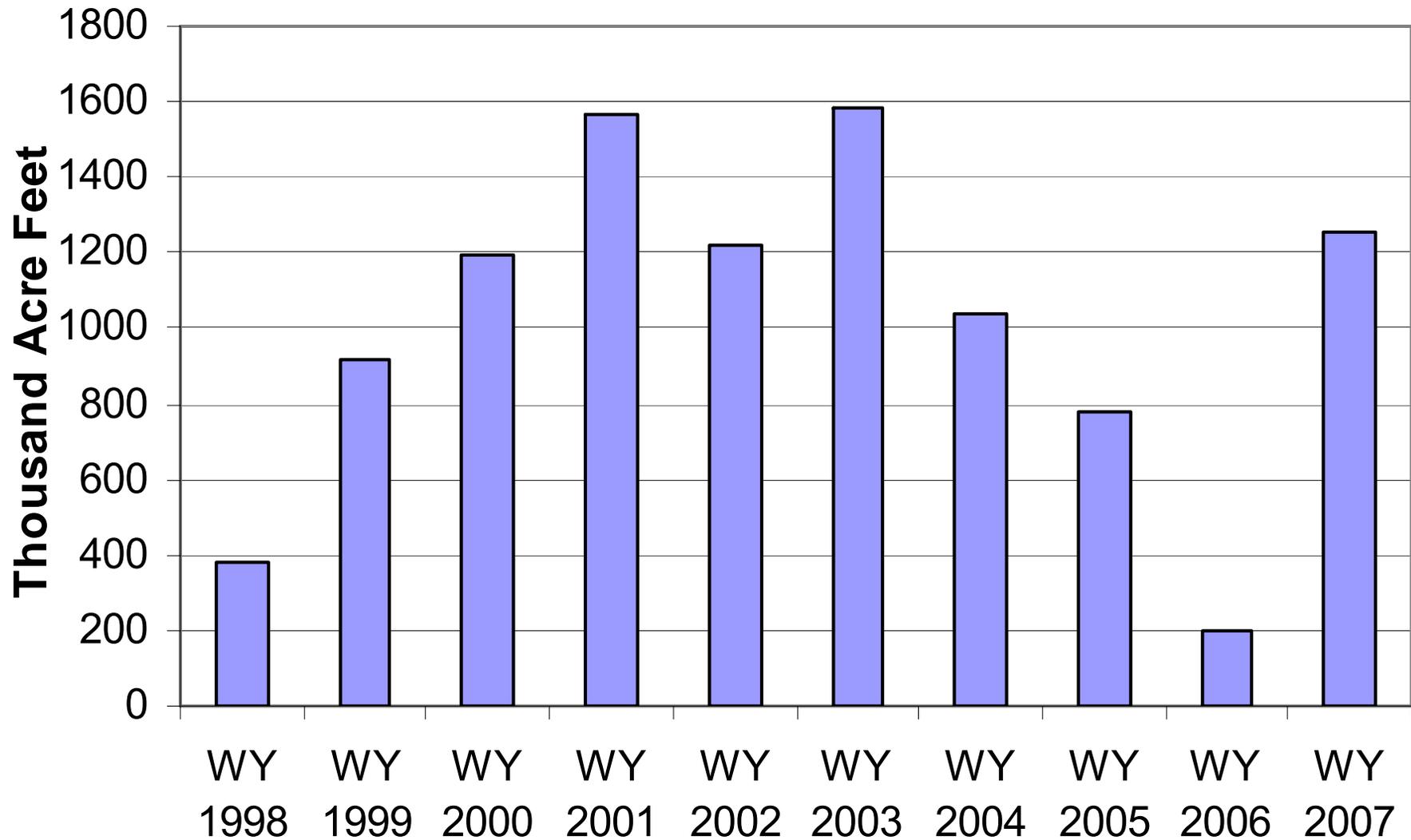
From: Ann Hayden

Date: October 29, 2004

Subject: Recommendations regarding scenarios and application of environmental water "demands" in the State Water Plan Update.



## Summary of Unmet Environmental Objectives California (not exhaustive)



# Quantifying Scenarios for Update 2009



# Deliverables for Update 2009

## Using WEAP

- DWR is using WEAP platform for Update 2009 to evaluate future scenarios and water management responses
  - Successful WEAP application for IEUA
  - Contracting mechanism and expertise in place
  - Graphical nature supports collaboration
  - Shorter learning curve than alternatives



# Technical Outreach and Refinement of Proposal

- December 2007 – WEAP proposal
- April 2008 – Shared Vision Planning
- June 2008 – WEAP proposal
  - Climate change
  - Environmental water
  - Flood management
  - Water quality



# 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, including mountain counties



# Sacramento and San Joaquin River Regions - Planning Area

- 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

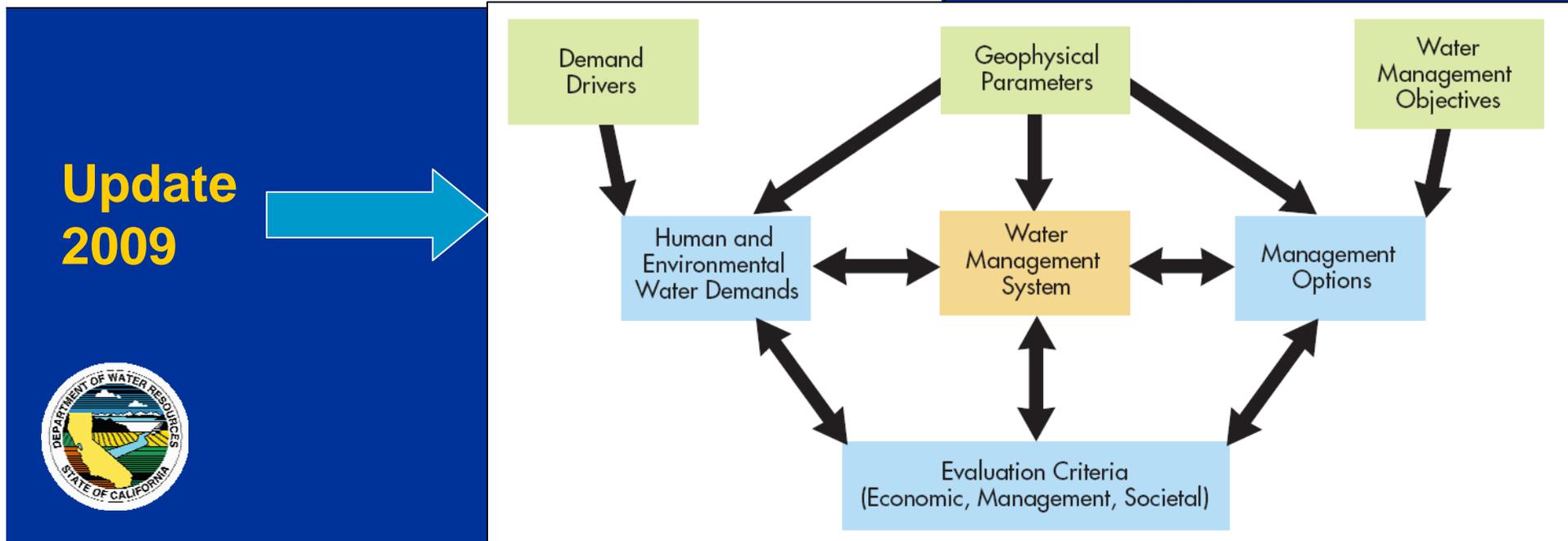
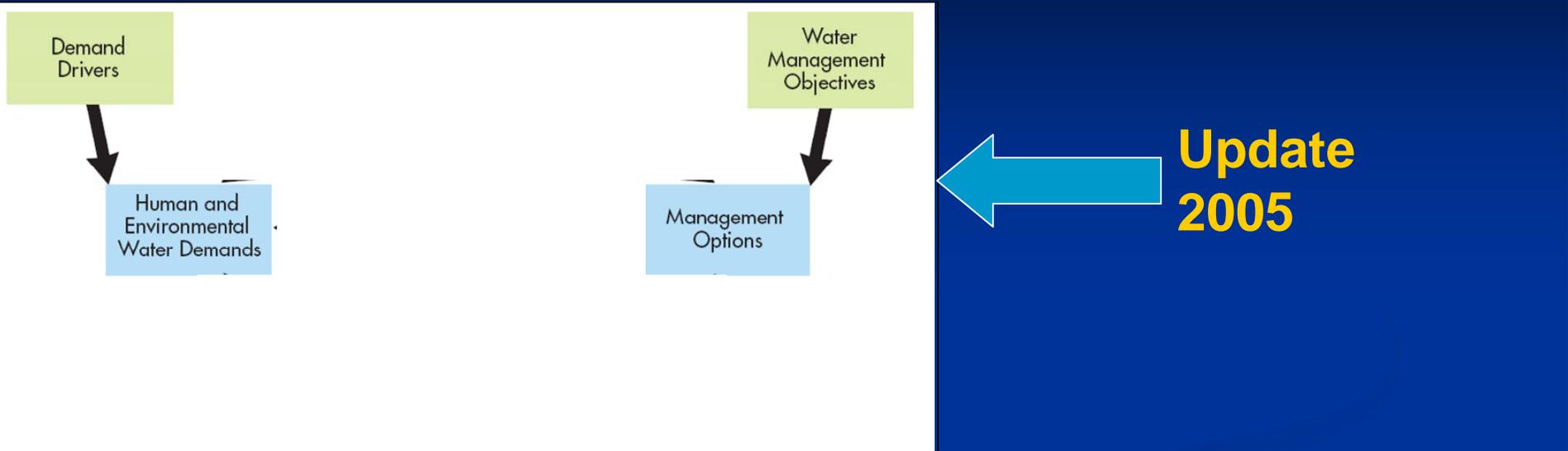
Sacramento River & San Joaquin River Hydrologic Regions



# Describing and Evaluating Resource Management Strategies



# Quantifying Management Responses



# Resource Management Strategies

- Reduce water demand
- Improve operational efficiency
- Increase water supply
- Improve water quality
- Practice resource stewardship
- Improve flood management
- Other strategies



# Summary of CWP 2009 Update Scenario Framework

Scenario Factors	Management Strategies
Economic and Financial Institutional and Political Natural System ( <b>climate factors</b> ) Technological Social Practices	Water use efficiency New surface storage Recycled wastewater use Desalination Conjunctive management Conveyance
Models	Outcomes
Water Evaluation And Planning model Planning Area for Sacramento and San Joaquin River regions (monthly time step from 2005-2050)	Demand Available supply Shortage frequency and magnitude Reliability Delta salinity Hydro power and flood performance Economic measures



# Evaluation Framework

Questions for  
the Water Plan

What do we want to know? (Objectives)

Evaluation  
Criteria

What we are measuring? (Indicators)

Metric

What is the quantity measured?

Measure

How are we measuring of progress?



# Timeline for Scenario Work at Hydrologic Regional Scale

- December 2008 – February 2009
  - Scenario based demands
- February – April, 2009
  - Develop and test scenario baseline supplies
  - Develop future water management responses
- May, 2009
  - Evaluate scenarios using evaluation framework
  - Complete scenario results for Update 2009
- June 5, 2009
  - Final date for public comments



# Future workshops

- February 23<sup>rd</sup> – CWEMF Annual Meeting in Pacific Grove
- April to May – Water Plan Regional workshops
- Spring – SWAN workshop on Planning Area WEAP application
- Late Spring – SWAN Workshop on completed scenarios



# Reference Information

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- (916) 651-9225
- SWAN
- <http://www.waterplan.water.ca.gov/swan>

