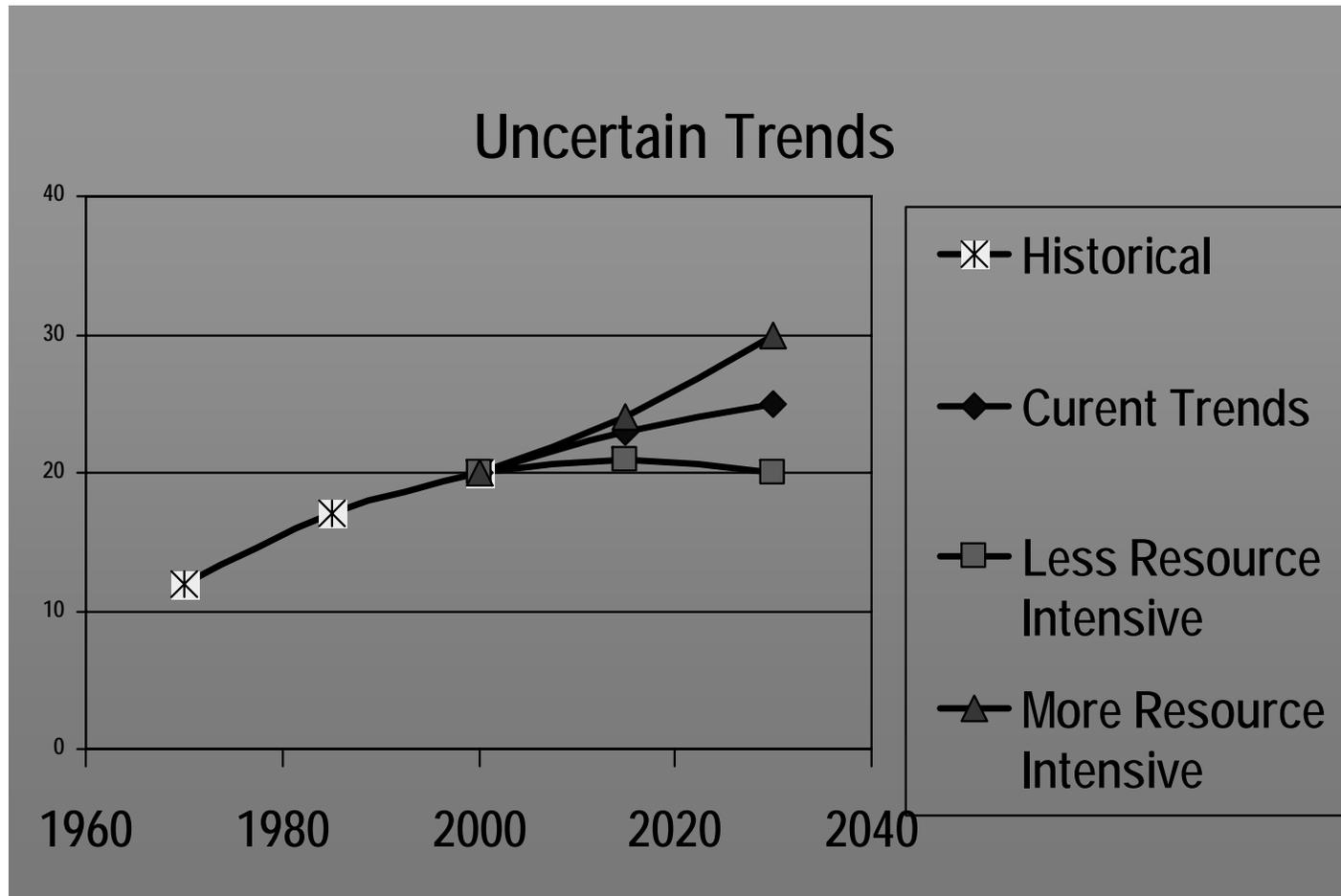


# Using Scenarios in the California Water Plan



# Scenario Overview

- Where do scenarios fit into Water Plan analysis
- Background on Scenarios
- Update 2005 narratives
- Suggestions for Update 2009



# Where Do Scenarios Fit Into Water Plan Analysis

- ***Water Portfolios***

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

- ***Future Baseline Scenarios***

- Describe expected future changes 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



# Objectives for Water Plan Analysis From Update 2005

- 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 From Update 2005

- 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?



# Key Uncertainties Affecting California Water Management

- Adapting to future climate change
- Improving the state's flood management system
- Preparing for the next drought
- Restoring the Delta



# Background on Scenarios

“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

- Plausible during planning horizon under consideration
- Influence future water management decisions
- 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



# 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 housing density
  - ◆ 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
  - ◆ Lower housing density
  - ◆ Higher agricultural and industrial production
  - ◆ No additional environmental water dedication (year 2000 level)
  - ◆ Lower naturally occurring conservation than Current Trends



# Update 2005

# Table of Scenario Factors



FACTOR <sup>1</sup>	SCENARIO 1 CURRENT TRENDS	SCENARIO 2 LESS RESOURCE INTENSIVE	SCENARIO 3 MORE RESOURCE INTENSIVE
Total Population	DOF	DOF	Higher than DOF
Population Density	DOF	Higher than DOF	Lower than DOF
Population Distribution	DOF	DOF	Higher Inland & Southern; Lower Coastal & Northern
Total Commercial Activity	Current Trend	Increase in Trend	Increase in Trend (Same as Scenario 2)
Commercial Activity Mix	Current Trend	Decrease in High Water Using Activities	Increase in High Water Using Activities
Total Industrial Activity	Current Trend	Increase in Trend	(Same as Scenario 2) Increase in Trend
Industrial Activity Mix	Current Trend	Decrease in High Water Using Activities	Increase in High Water Using Activities
Irrigated Crop Area (Includes Irrigated Land Area and Multi-cropped area)	Current Trend	Level Out at Current Crop Area	Level Out at Current Crop Area
Crop Unit Water Use	Current Trend	Decrease in Crop Unit Water Use	Increase in Crop Unit Water Use
Environmental Water-Flow Based	Current Trend	High Environmental Protection	Year 2000 Level of Use
Environmental Water-Land Based	Current Trend	High Environmental Protection	Year 2000 Level of Use
Naturally Occurring Conservation <sup>2</sup>	NOC Trend in MOUs	Higher than NOC Trend in MOUs	Lower Than NOC Trend in MOUs
Urban Water Use Efficiency	All Cost Effective BMP's in Existing MOU's Implemented by Current Signatories (present commitments)		
Ag Water Use Efficiency	All Cost Effective EWMP's in Existing MOU's Implemented by Current Signatories (present commitments)		
Per Capita Income	Current Trends		
Ratio of Seasonal to Permanent Crop Mix	Current Trends		
Irrigated Land Retirement	Currently Planned		
Hydrology	Essentially a Repeat of History		
Climate Change	Essentially a Repeat of History		
Colorado River Supply	Equal to 4.4 Plan		
Existing Inter-Regional Import Projects	Current Conditions		
Flood Management	Current capacities, management practices and operations		
Energy Costs	As Projected From Current Trends		
Ambient Water Quality	Current Conditions		
Drinking Water Standards	Current and Planned		
Ag Discharge Requirements	Current and Planned		
Urban Runoff Mgmt.	Current Level of Use		
Recreation	Present Demand Trends Continued		
Desalting	Current Level + Permitted/Financed		
Recycled Water	Current Level + Permitted/Financed		
Water Transfers Within Regions	Currently Approved Transfers		
Water Transfers Between Regions	Currently Approved Transfers		
Conjunctive Use and Groundwater Management	Current Level + Permitted/Financed		
Surface Water Storage	Current Level + Permitted/Financed		
Conveyance Facilities	Current Level + Permitted/Financed		
Rate Structure	Current Practices - pricing constrained to cost recovery		

# Suggestions for Update 2009



# Suggestions for Update 2009

- Planning horizon / Time step
- Geographic scale
- Climate change
- Drought conditions
- Flood management
- Catastrophic events
- Other considerations?



# Temporal Scale

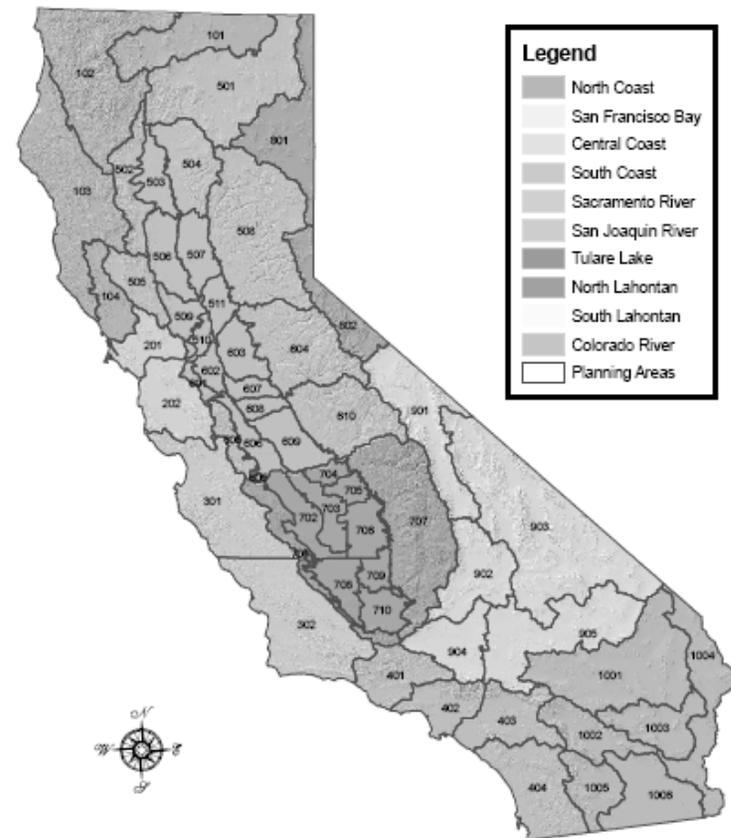
## Planning Horizon / Time Step

- Include 2010 to 2050 for planning horizon
  - Shorter horizon to be consistent with city / county general plans
  - Longer horizon to evaluate climate change (up to 2100)
- Report at 5 or 10 year intervals
- Show trends over time



# Geographic Scale

- Ability to look at smaller than Hydrologic Region scale
  - Watersheds
  - IRWMP regions
  - Planning Areas



Prepared by: Scott Hayes  
31-Oct-2005  
<http://www.landwateruse.water.ca.gov>



# Climate Change

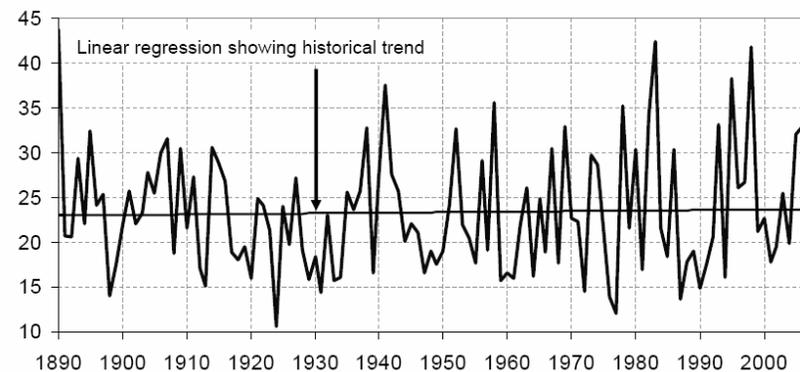
- Key factors

- Temperature
- Precipitation
- Snowpack
- Land use patterns / vegetation
- Sea level rise

- Key responses

- Facility reoperation
- Other

Ca Precipitation Trend



# Drought

- Key factors
  - Multi year and multi decade droughts
  - Different areas of occurrence
  - Land use changes / demand hardening
- Key responses
  - Water conservation efforts / new technologies
  - Other



# Flood Management

- Key factors
  - ◆ Land use planning / future growth
- Key responses
  - ◆ Facility reoperation and regulatory controls
  - ◆ Additional bypasses / conveyance capacity
  - ◆ Local, on-property water storage (for example stock ponds)
  - ◆ Other



# Other Considerations

- Land use changes
- Water use changes
- Economic changes
- Facility & system operation
- Catastrophic events



# Land Use Changes

- Housing densities
- Population growth
- Trends in agriculture
- Rural growth
- Environmental protection



# Water Use Changes

- Conservation efforts
- Population growth
- Environmental protection
- Water quality regulations



# Economic changes

- Military base closures
- New regulations (for example to limit green house gases)
- Energy costs
- Economic recession / depression



# Facility & System Operation

- Delta “Fix”
- Flood management alternatives
- Adapting to climate change
- Response to catastrophic events



# Catastrophic Events

- Earthquakes
- Wildfire
- Levee failures
- Intentional disruption
- Chemical spills
- Facility malfunction



# Next Steps on Scenarios

- Refine scenario framework
- Update list of scenario factors and establish ranges
- Develop narrative scenarios
- Identify options for quantifying scenarios and performance of response packages
- Include scenario narratives and factors in Assumptions and Estimates Report



# Reference Information

- <http://www.waterplan.water.ca.gov>
  - ◆ Chapter 4, Volume 1, Update 2005
  - ◆ Volume 4 Article, “Quantified Scenarios of 2030 Water Demand”
  - ◆ Volume 4 Article, “Future Scenarios Presented in Water Plan Update 2005”

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**Questions?**