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Economic Analysis of the Bay Delta Conservation Plan

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Several Economic Analyses Underway

- Study of contractor willingness to pay
  - Assess whether the benefits of BDCP are sufficient to justify the costs to the agencies receiving project water supplies
  - Necessary condition for BDCP to go forward
  - Not a statewide benefit-cost analysis
  - Costs of BDCP are described in Chapter 8
- Study of public good benefits of Delta habitat restoration
  - Determine whether these benefits are sufficient to justify anticipated public expenditures on restoration
- Study of the indirect public benefits of BDCP
  - Regional output and income
  - Employment

Several Economic Analyses Underway

- Statewide benefit-cost study
  - Measure changes in the economic welfare of California residents related to
    - Water supplies
    - Delta agriculture
    - Urban water treatment costs
    - Commercial fishing
    - Recreational activity
    - Non-market environmental impacts
      - Air emissions
      - C-sequestration
      - Reduced soil erosion
      - Habitat values and biodiversity

Update on Contractor Benefits Research

- Urban Water Supplies
- Agricultural Water Supplies
- Analyzing Ranges of Delta Exports
- Water Quality Impacts
- Reduction in Seismic Risk

Urban Water Supplies

Analysis Background

BDCP benefits to urban agencies are primarily the value of avoiding future shortages

We evaluate shortage losses at the agency level for 36 urban water utilities receiving SWP supplies

- All MWD member agencies
- 10 other CA water agencies

Impact model considers a range of factors, including demand growth, water supply alternatives and operation of storage facilities

Urban Water Supply Portfolio

Local Supplies

- ♦ Groundwater
- ♦ Local surface water
- ♦ Recycled water
- ♦ Desalination

Imported Supplies

- ♦ Colorado River Aqueduct
- ♦ State Water Project
  - <u>Table A</u>: scheduled
  - <u>Article 21</u>: unscheduled water
- ♦ LA Aqueduct and Others

Forecasting Urban Water Demand (2012–2050)

Southern California

- ♦ Use MWD - MAIN model that relies on
  - Projected retail water rates
  - SCAG and SANDAG demographic projections
    - Population
    - Household size
    - Employment
    - Income
  - Conservation projections

Northern and Central California and Central Coast

- ♦ Provided by the agencies

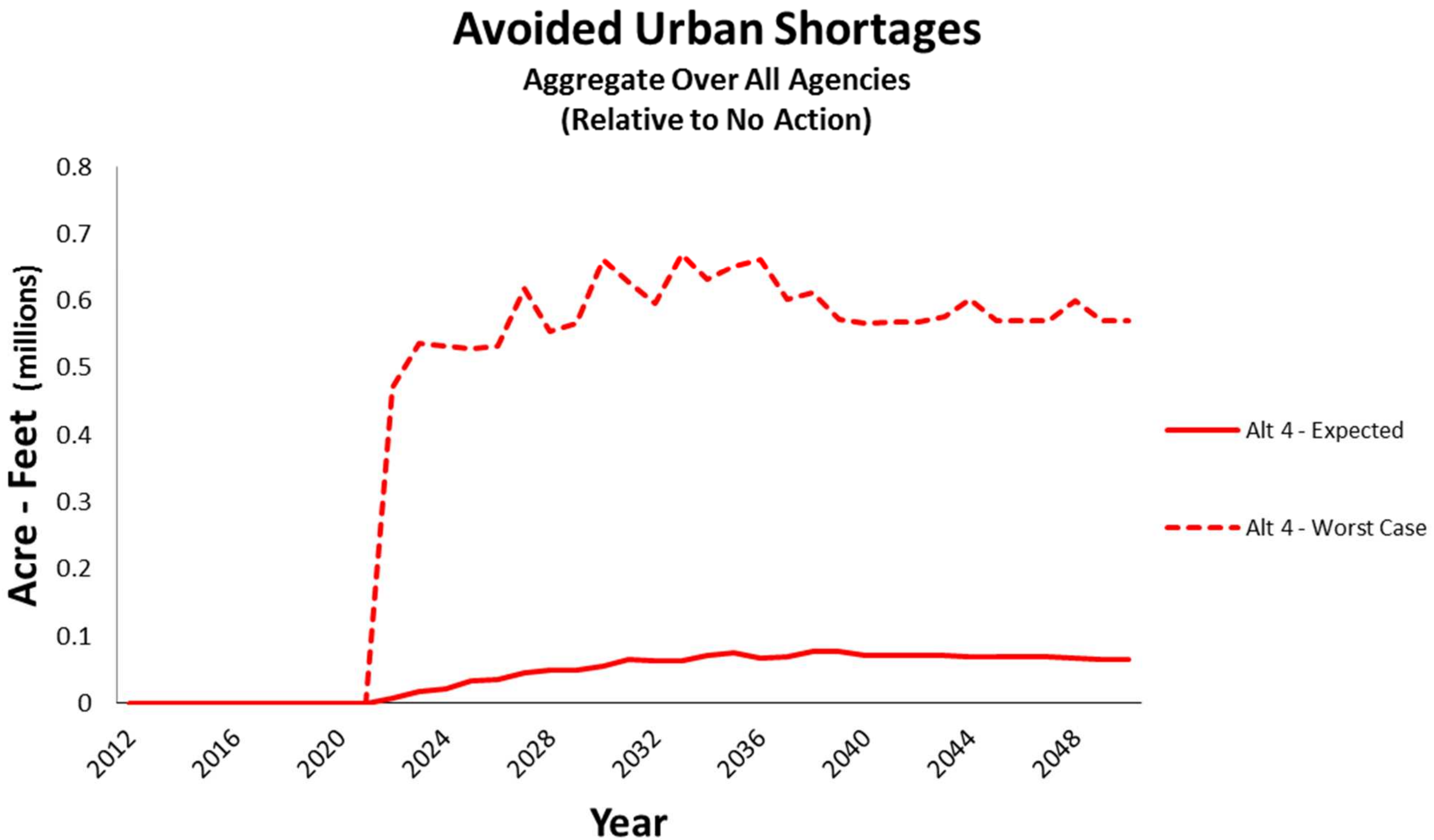
Forecasting Urban Shortages (2012–2050)

Shortage is simply a condition of excess demand

Calculate shortages using a rotating Monte Carlo simulation

- Use the whole 83-year hydrologic record (1922–2004)
- Rotate through 83 trials of the hydrologic pattern given the forecasted demand and water supplies
- Accounts for on-going storage fluctuations given previous year levels

Avoided Shortages in Average and Dry Years (Example: EIR Alt 4 Relative to NAA)



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Framework for Valuing Urban Water Shortages

Allocate shortages at the agency level using a rationing rule

- Allocate shortages across sectors
  - Ag SFR CII Other
- Allocation rule mimics typical agency policies
  - Attempt to insulate CII demands to preserve jobs, economic activity

Loss functions incorporate existing water rates and estimated demand elasticities

Estimating Price Elasticity of Demand

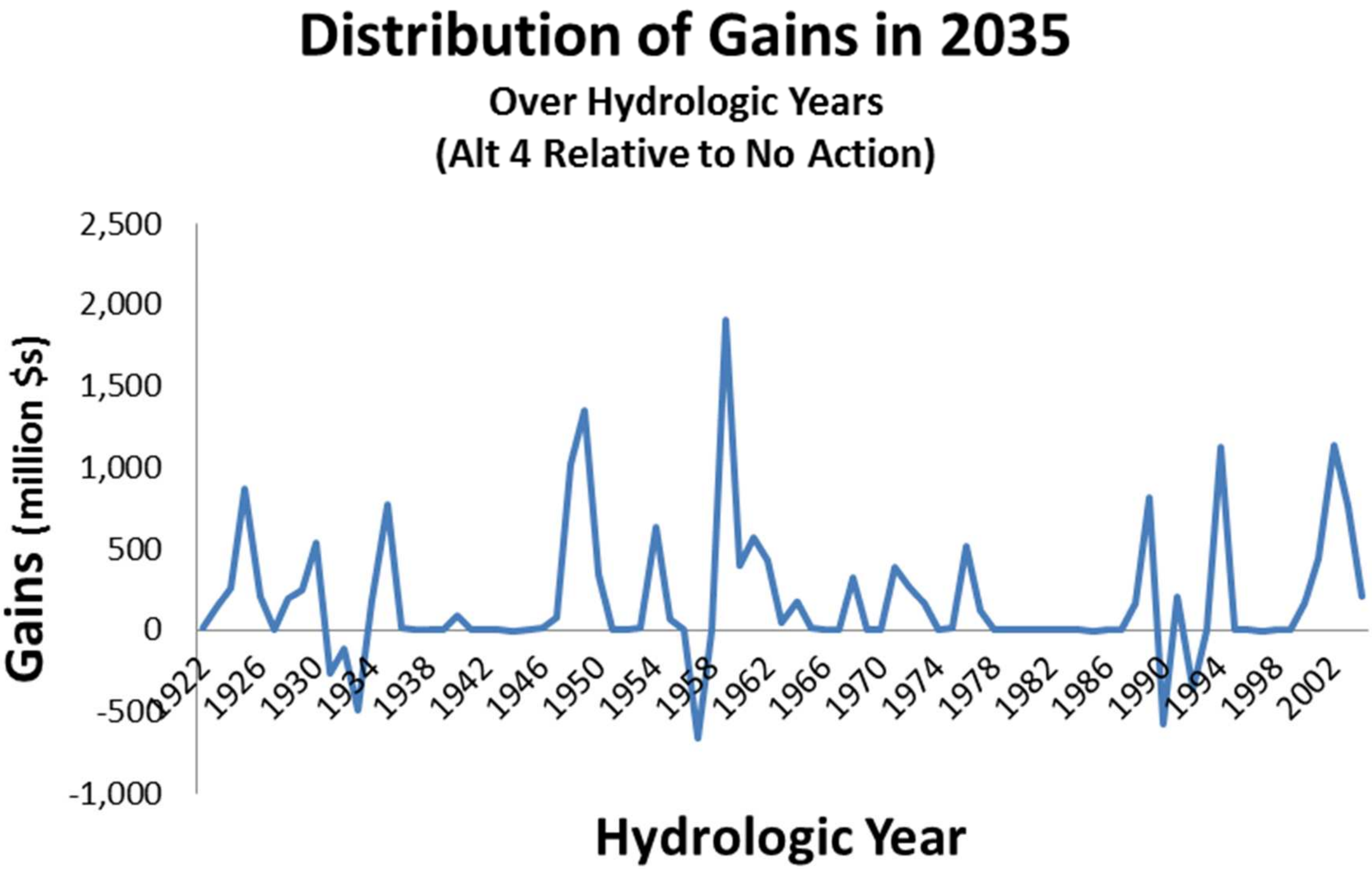
Data Collection

- Track 119 retailers in California from 1995 – 2010
- Roughly 1,200 price – consumption observation points

Variables included in econometric model

- Consumption
- Price
  - Median tier water rate
- Median household income
- Price interacted with income
- Weather
  - Average summer max daily temperature
  - annual precipitation
- Year and retailer fixed effects

Example: Value of Avoided 2035 Shortages Across the Hydrologic Record



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Agricultural Water Supplies

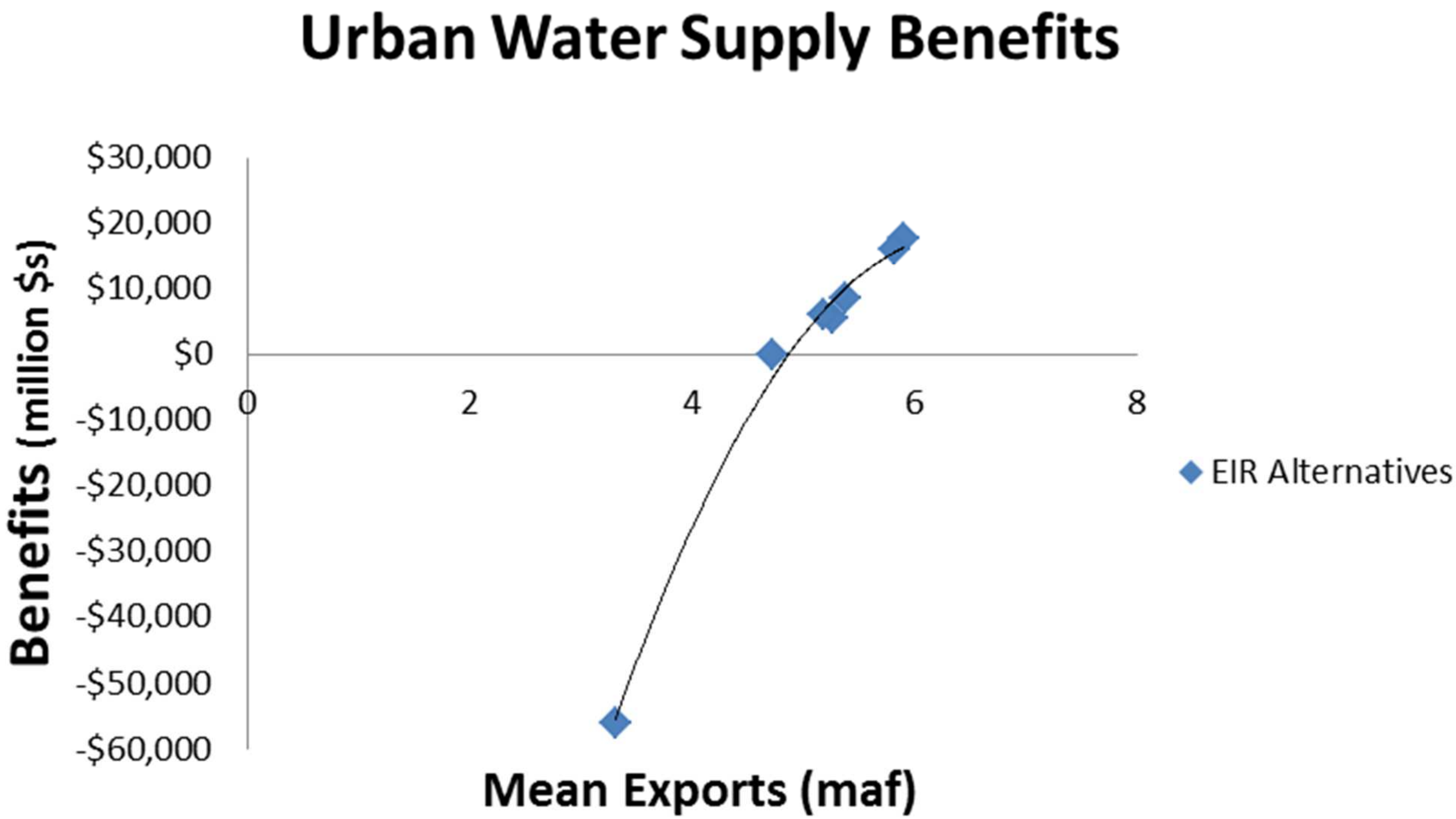
CVP and SWP Agricultural Water Supply Benefits

Benefits are estimated using the Statewide Agricultural Production (SWAP) model

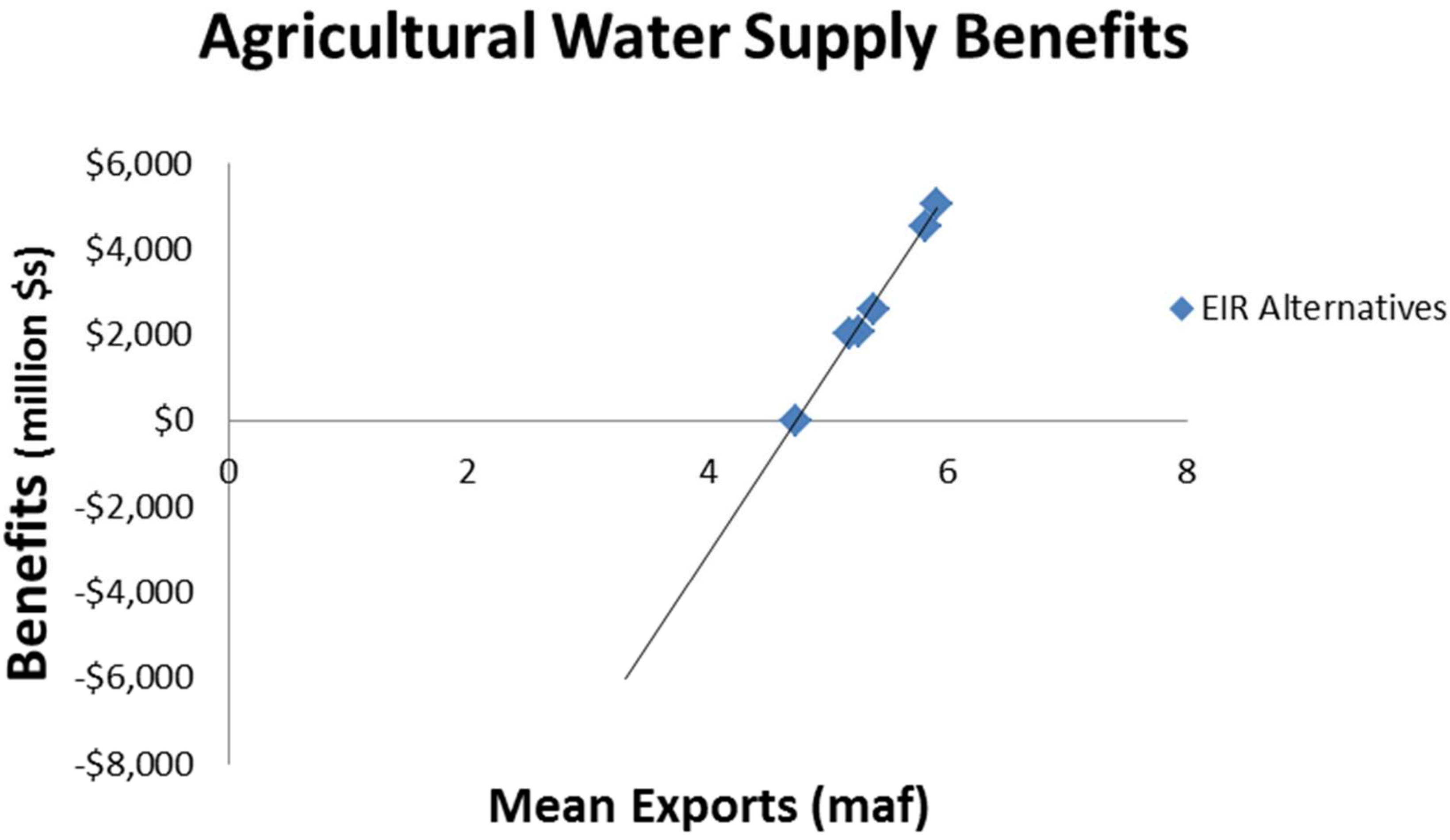
- ♦ Simulates the profit-maximizing decisions of agricultural producers given inputs:
  - Availability and cost of water
  - Land
  - Labor
  - Other
- ♦ Accounts for SWP & CVP water, other local supplies, and groundwater

Analyzing Ranges of Delta Exports

Urban Water Benefits vs. Mean Delta Exports



Agricultural Water Benefits vs. Mean Delta Exports



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Water Quality Impacts

Water Quality Impacts

Two models used to estimate salinity - related benefits

- Lower Colorado River Basin Water Quality Model
- South Bay Water Quality Model

Main variables

- Total dissolved solids (TDS) concentration
- Water deliveries
- Costs to users
- Demographic characteristics

Evaluates reduced salinity impacts on

- Useful life of appliances
- Specific crop yields
- Cost to industrial and commercial customers
- Amount of irrigation water needed

Value of Water Quality Impacts

Present Value (in millions)

	Alt 4
SWP - Urban	$3,601
SWP - Agricultural	$130
CVP - Agricultural	$153
Total	**$3,884**

Seismic Risk

Estimating Seismic Risk to Urban Agencies

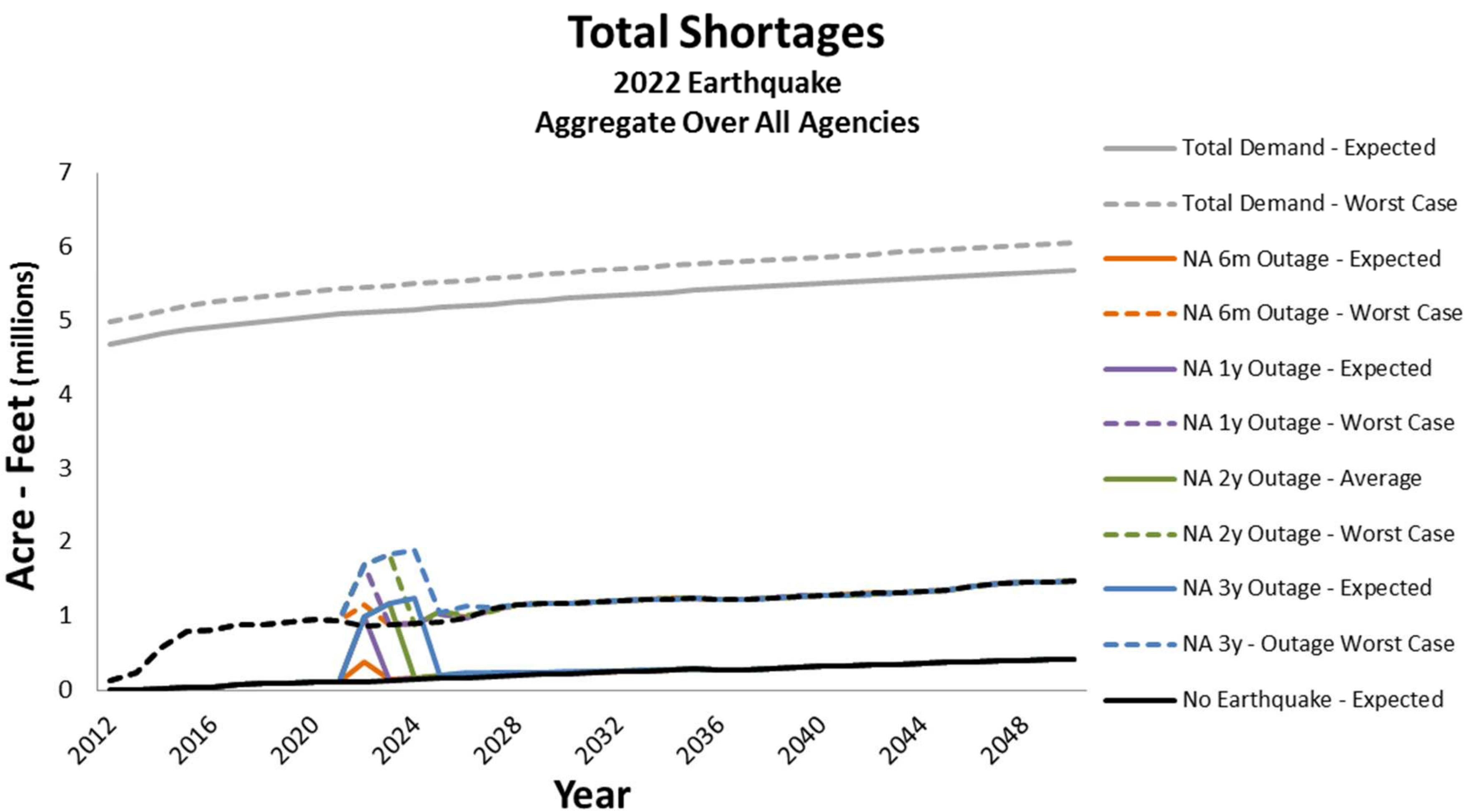
Framework

1) **Assume year of earthquake**
   - Example: Year 2022
2) **Evaluate shortages at four levels of outage**
   - 6 months, 1 year, 2 year, 3 year
3) **Calculate PV loss under 83 hydrologic trials**
   - Similar to urban supply benefit calculations

Measure range of impacts based on variation in these three factors

Companion agricultural analysis is in progress

Total Urban Shortages
Comparison Across All Outage Levels



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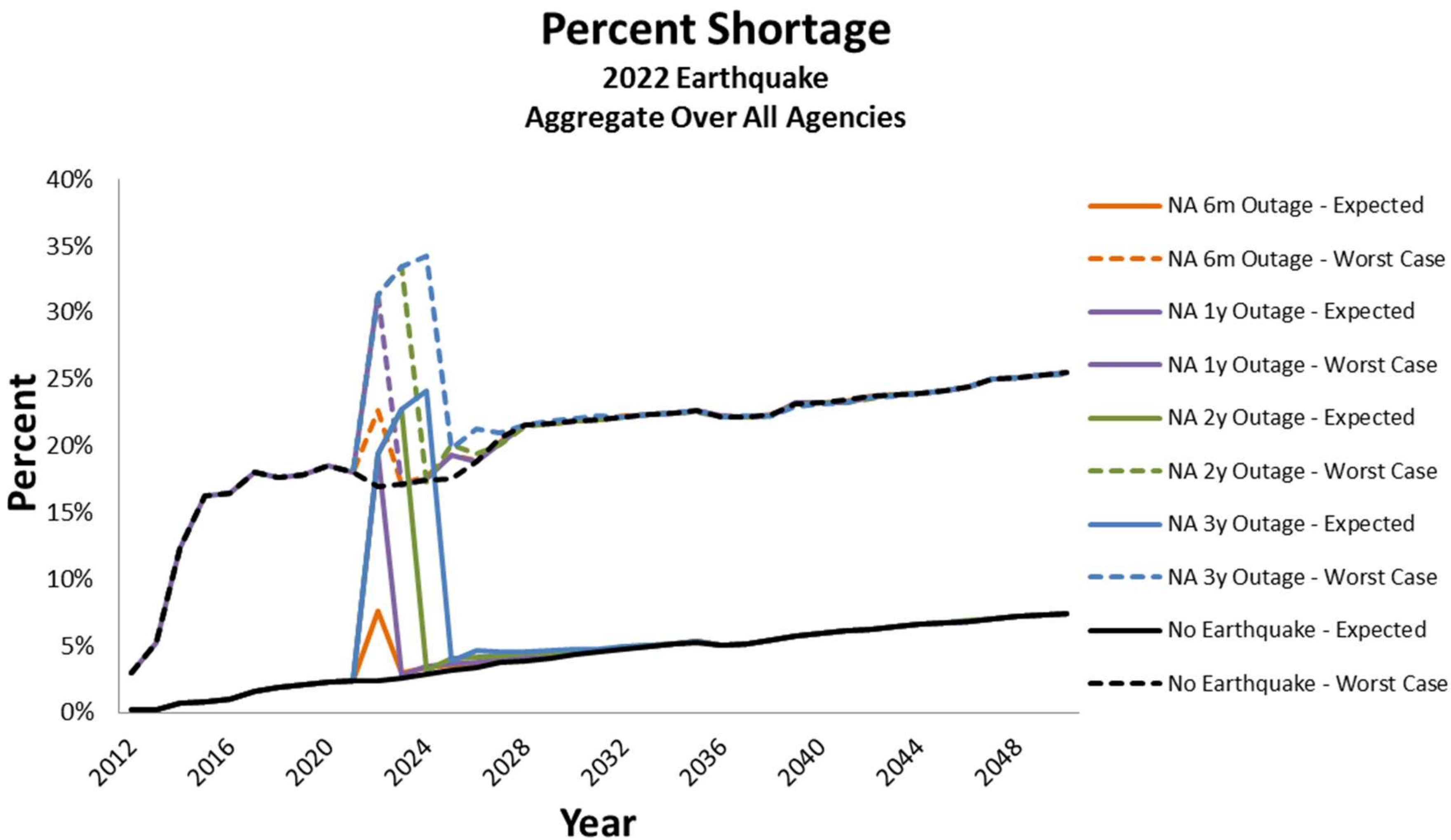
Percent Shortage
Comparison Across All Outage Levels



Value of Seismic Risk Reduction

Value of Seismic Risk Reduction to SWP Urban Agencies (in millions)

Outage	6 Month	1 Year	2 Year	3 Year
Expected	$684	$2,537	$5,686	$9,058
Worst Case	$2,147	$4,648	$8,850	$12,691

Conclusions and Further Work

Comparing Benefits to Costs

Should compare calculated benefits to the present value of BDCP costs

- Just over $11 billion for CM1
- Figure is derived in detail in the new version of Chapter 8
- Accounts for the time value of money in the same way we have done in the benefits analysis

Conclusions and Further Work

Ongoing work:

- Analyze ranges of project yields when available
- Completing analysis of seismic risk reduction for agricultural water supplies
- Change in terminal surface and groundwater storage
- Impact of sea level rise and high water events (LLT)
- Statewide benefit-cost analysis and other studies