
Preparing for Climate Change in the Santa Ana Watershed: Linking Water and Land Use

Martha Davis, Executive Manager for Policy Development
Inland Empire Utilities Agency
For the Ahwahnee Water Principles Workshop
October 18, 2007

Climate Change Is Expected to Make Existing Water Challenges Even More Difficult

The Santa Ana River Watershed currently faces:

- Continued, rapid growth
- Increasingly unreliable imported water supplies
- Increased development which reduces natural infiltration of water into groundwater basins
- Increased water quality concerns
- Increased cost of water supplies

How may changes in climate impact the Santa Ana Watershed?

- Increase temperature?
 - Increase outdoor irrigation and environmental demands?
 - Change precipitation patterns?
 - Diminish snow pack and reduce imported supplies?
 - Increased intensity of storms when they do occur, with increased potential for flooding and decrease groundwater recharge?
-

How Should Water Agencies Plan for Water Reliability Under Conditions of Uncertainty??

RAND Project – 5 Year National Science Foundation Study

- ⊖ State-of-the-art modeling tools to evaluate implications of potential climate change on regional areas
 - ⊖ Use of 17 GCM Projections – thousands of model runs – each forecast is weighted by ability to reproduce past climate and level of agreement with other forecasts
 - ⊖ *IEUA case study – Extrapolate information to SAR Watershed*
 - √ Evaluated performance of IEUA water management strategies (2005 Urban Water Management Plan) against integrated climate/supply/demand scenarios
-

Temperature is Expected to Increase

- Historic record and modeling suggests increases in higher daily temperatures will continue to occur in SAR Watershed

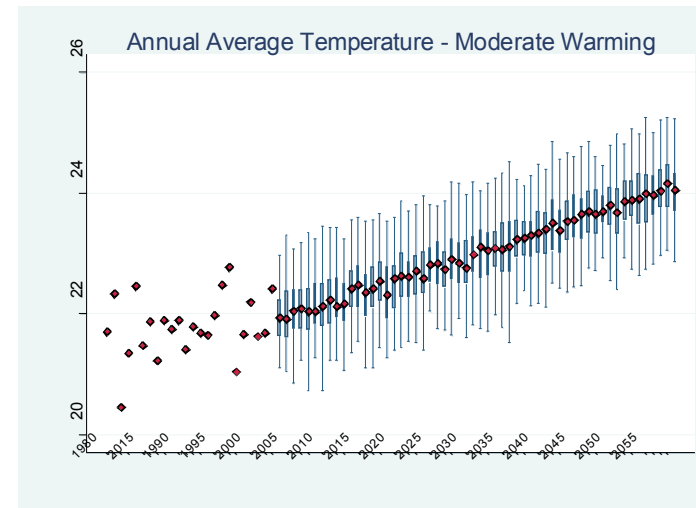
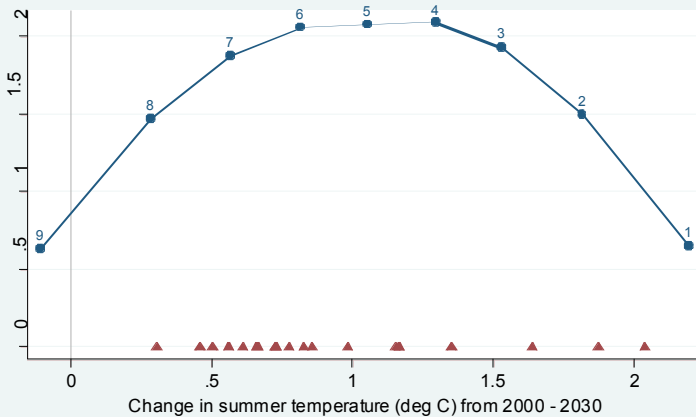


Figure 2: Historical annual average temperature (1980 – 2003) and ranges of projected annual temperature (2005 – 2059) corresponding to the average expected warming of 29 GCM over the IEUA service area.

Modeling suggests that summer temperatures could increase by 1-2 degrees by 2030

Figure 1: Probability distribution function of projected change in summer time temperature from 2000 to 2030 due to climate change derived from 17 GCM models, weighted according to Tebaldi et al.

Precipitation is Expected to be Variable, but Probably Drier

Precipitation
in SAR
Watershed
may
decrease by
10-15%

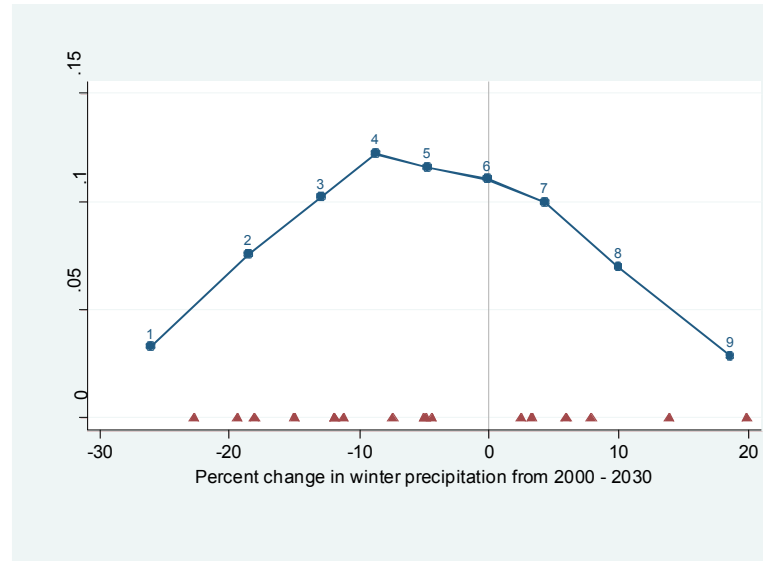
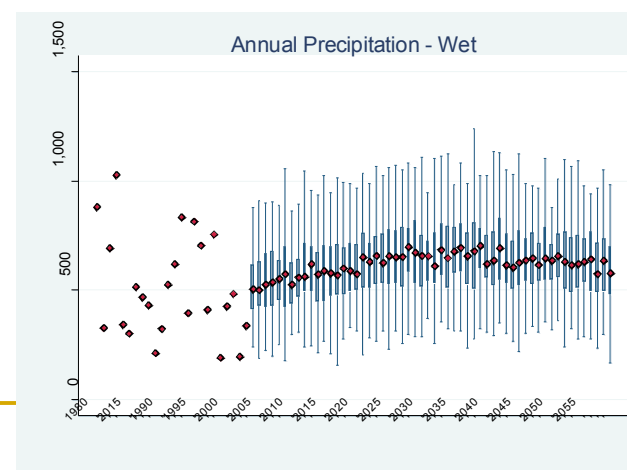
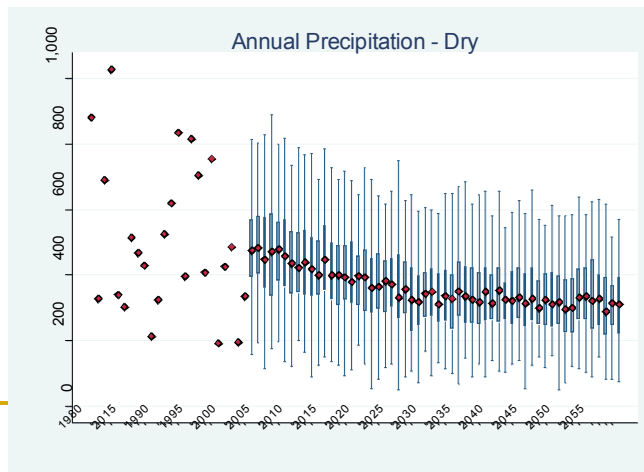
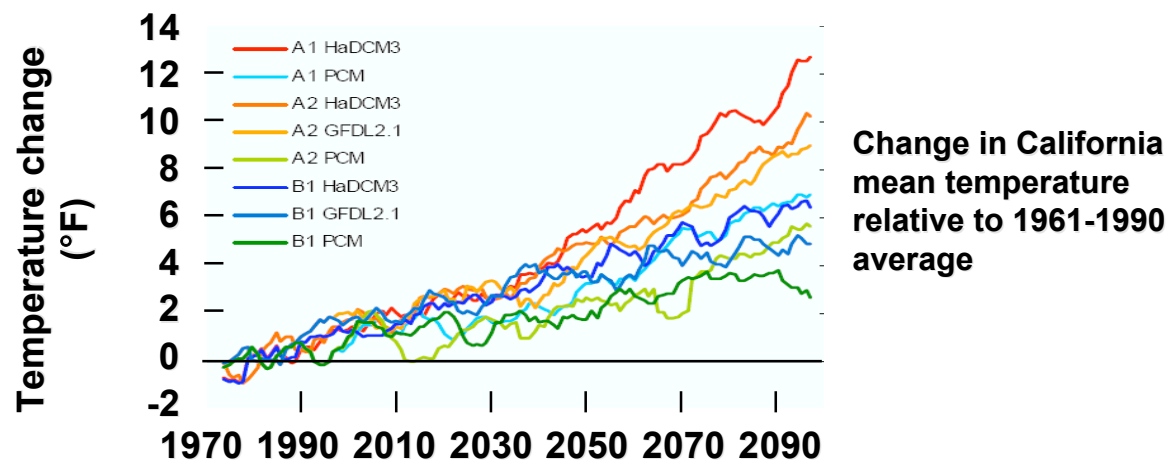


Figure 3: Probability distribution function of projected percent change in precipitation from 2000 to 2030 due to climate change derived from 17 GCM models, weighted according to Tebaldi et al.

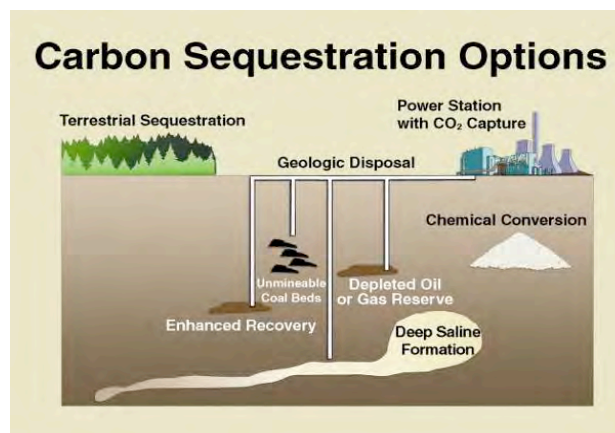


But These Estimates Remain Deeply Uncertain

- Climate models disagree



- √ Potential for abrupt changes



- √ Net emissions reductions will depend on use of still unproven technologies

v Thank you...

For more information, contact:
Martha Davis
Inland Empire Utilities Agency
909-993-1742
mdavis@ieua.org

Climate Change Impacts: What Does this Mean for the Santa Ana Watershed?

- ⊖ Temperature Increase:
 - √ Increased water demand (increased evapo-transpiration) for urban and environment
 - √ Intensified heat island effect, further increasing summer temperatures
 - √ Impact wildlife habitat (shift habitat, increased conflicts)
 - √ air quality (increased smog)

 - ⊖ Precipitation Variability:
 - √ Reduced flows in local streams and rivers, impact local sources of water supply
 - √ Reduced natural groundwater replenishment and reduce ability to capture water for infiltration
 - √ Increased storm intensity and the potential for flooding
 - √ Increased erosion and related water quality problems
 - √ Impact wildlife habitat by increased water temperature and changes in amount and pattern of flows

 - ⊖ Statewide temperature and precipitation trends
 - √ Reduced available water for imports by:
 - ⊖ Reduced snowpack
 - ⊖ Earlier runoff in Sierra
 - ⊖ Increased environmental impacts in Delta
 - √ Decreased energy production through hydro (potential increase in fossil fuel)

 - ⊖ Global Sea Level Rise:
 - √ Impact coastal communities, essential infrastructure
 - √ Increased sea water intrusion into groundwater supplies
-

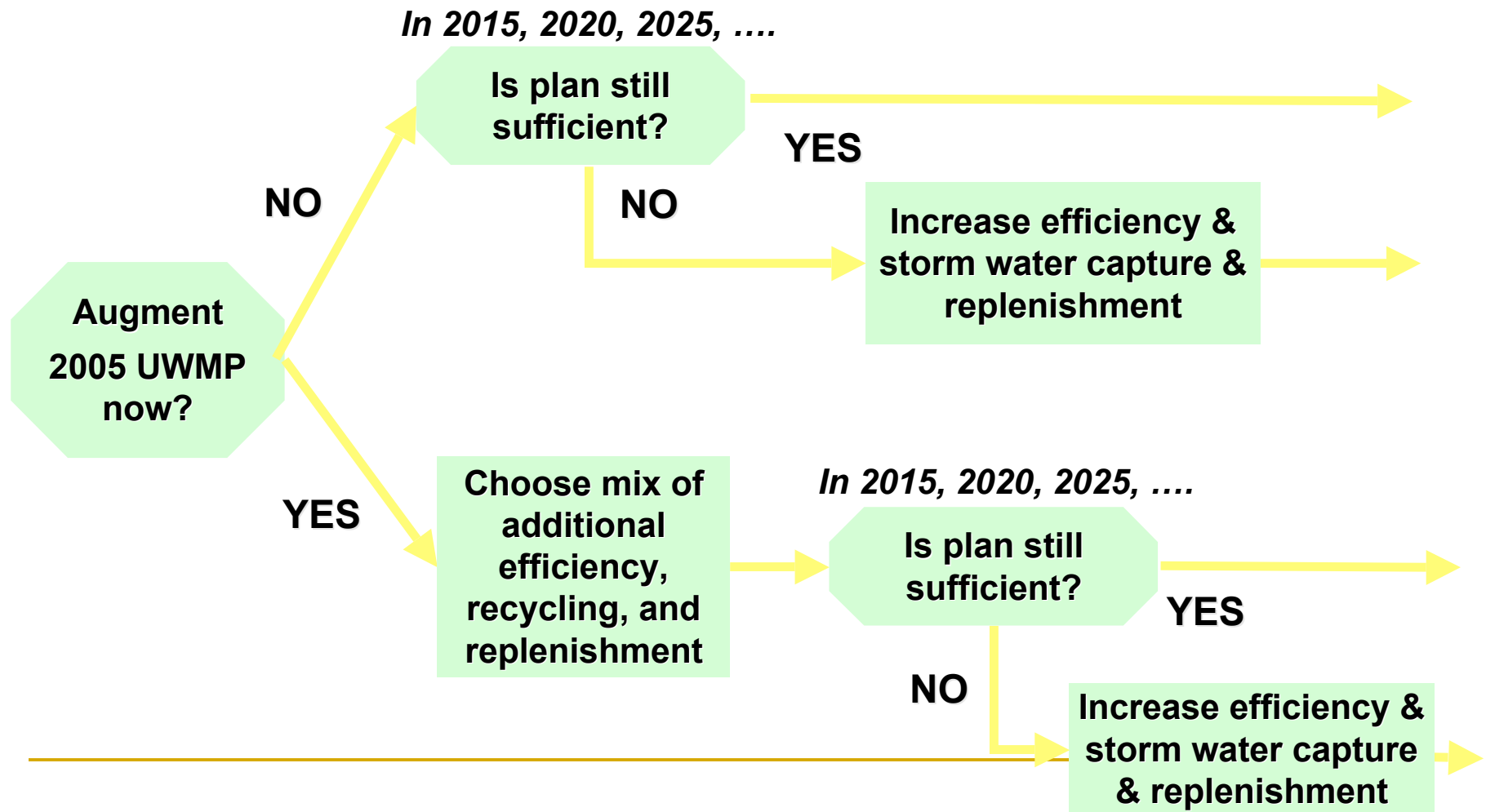
Probable Climate Change Consequences for Water Supplies in Santa Ana River Watershed

- v Reduced water supply reliability
 - v Higher future costs for meeting water needs
 - v Lower environmental quality
-

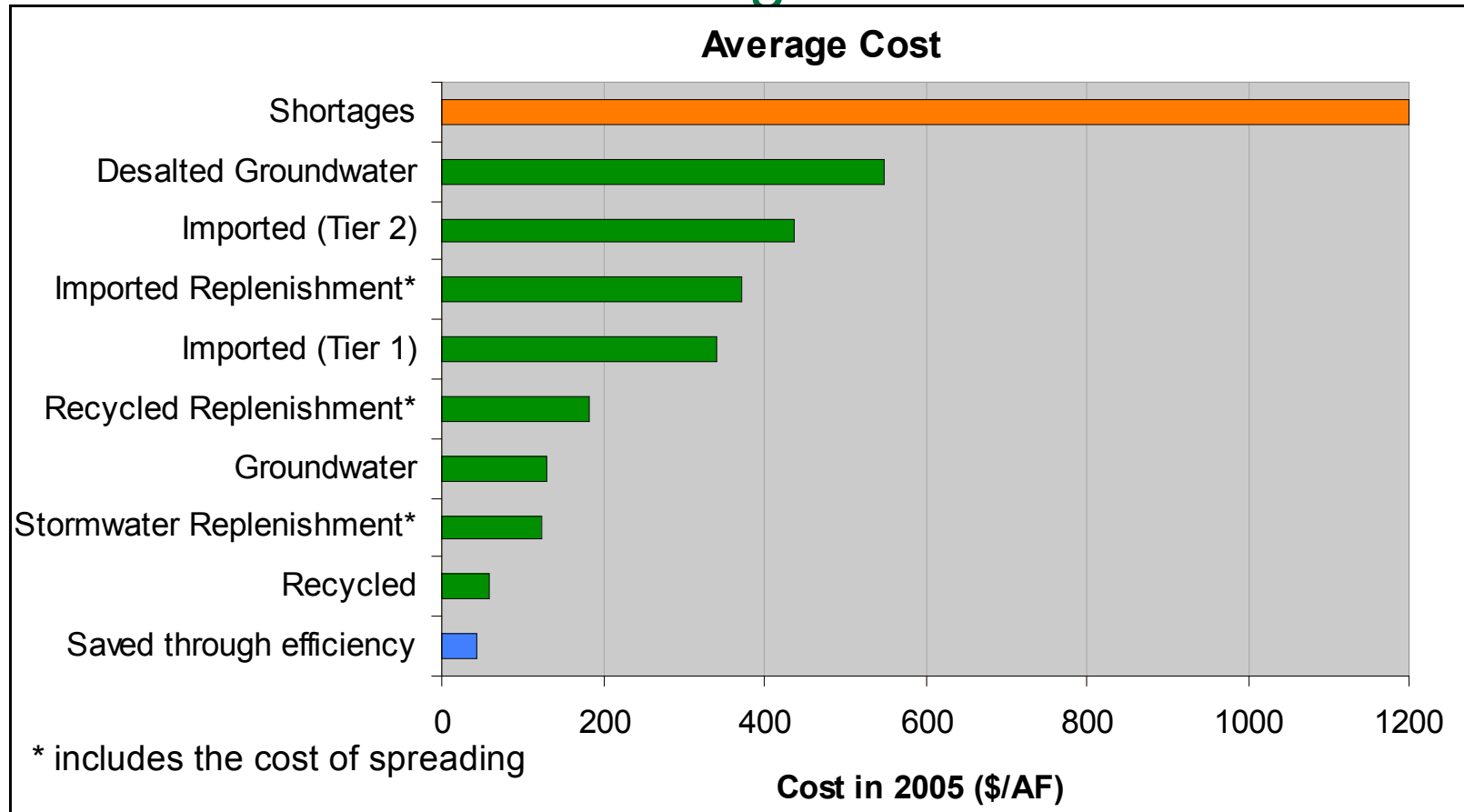
RAND's IEUA Case Study: Water Supply Planning - Performance Evaluation

- ✓ IEUA UWMP 2005: Develop Local Supplies and Reduce Dependence on Imported water
 - ⊖ By 2025, IEUA expects that its service area will be able to meet nearly 80% of water needs through local sources
 - ⊖ Full service imported water supplies are expected to remain roughly at the same level as 2005 or to decline slightly
 - ✓ Conservation – 33,000 acre-feet (10% of demand)
 - ✓ Recycled water – 100,000 acre-feet
 - ✓ Groundwater production – 200,000 acre-feet
 - ✓ Desalted groundwater – 40,000 acre-feet
 - ✓ RAND Evaluation
 - ⊖ IEUA UWMP performs well under many potential changes in climate
 - ⊖ *Risks remain* with UWMP if nothing more is done now or in the future
-

Water Supply Planning Under Conditions of Uncertainty: *Adaptive* Strategies



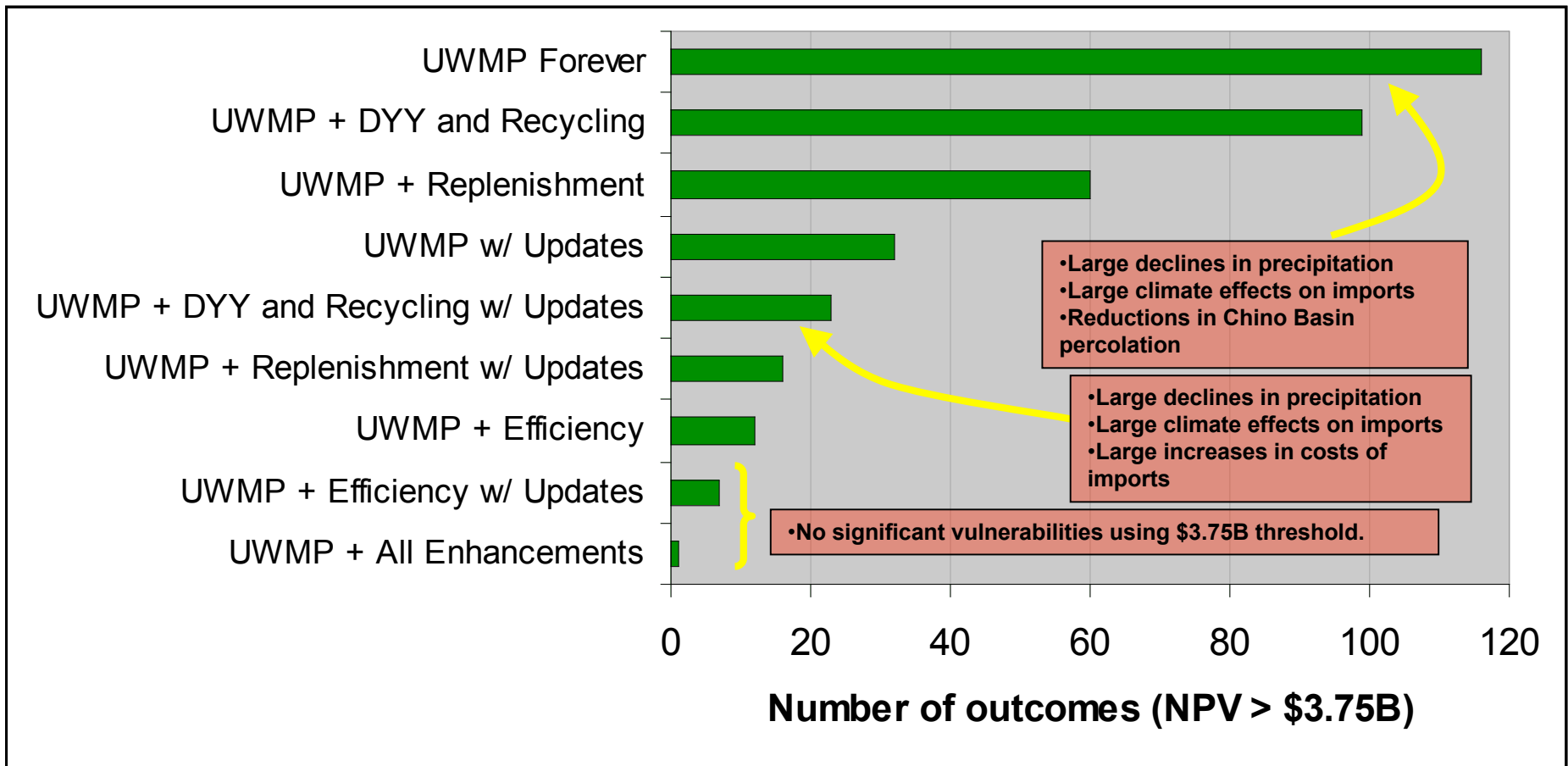
Estimates of Water Supply and Water Shortage Costs Based On the Perspective of the Region's Water Agencies



**Costs increase over
time**

Data provided by IEUA

Key Point: Investment in Local Resources Now Buys Down Risk to Future Key Water Vulnerabilities

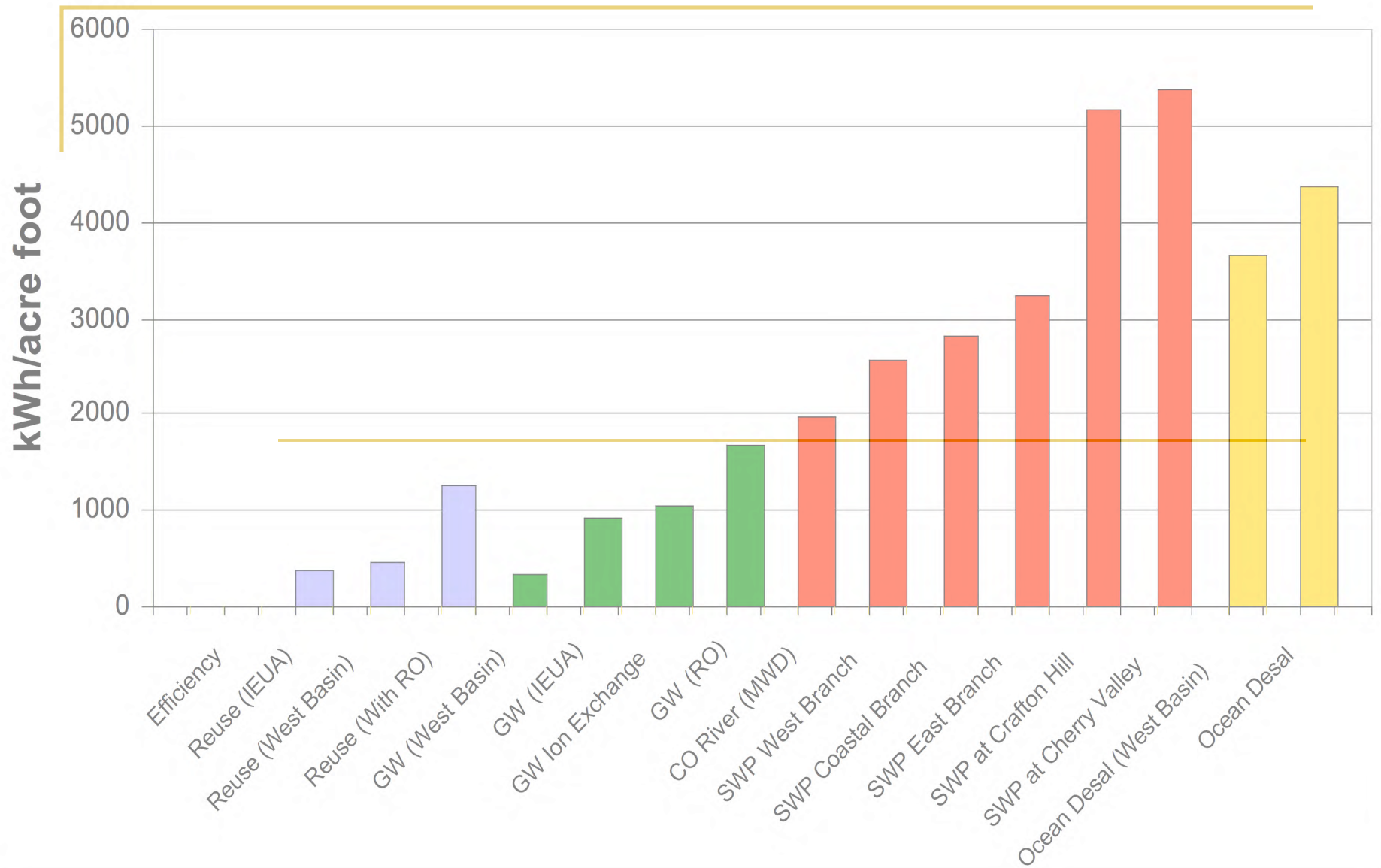


PRELIMINARY RESULTS – HAVE NOT UNDERGONE FORMAL REVIEW

Key Water/Energy/Climate Strategies

- ✓ Maximize local supply development to increase locally controlled “drought proof” supplies and balance less reliable, more costly imported supplies
 - ⊖ *Early, aggressive conservation significantly reduces need for additional future water*
 - ⊖ *Recycled water most resilient water supply under conditions of climate change*
 - ⊖ *Dry year groundwater supplies significantly improve resiliency under climate change*
- ✓ Implement “green” development standards for new and existing housing (Awhwanee Water Principles) *including implementation of water conserving landscaping*
- ✓ Develop Santa Ana River Watershed “comprehensive” water quality/supply management strategies
- ~~✓ Maximize integration of water supply investments to reduce CO2 “Footprint” under AB 32~~

Energy Intensity of Selected Water Supply Sources in Southern California



IEUA Innovations to Address Energy Needs

- Constructed the nation's first platinum LEED-rated headquarters by a public agency (2003). With installation of cogeneration in 2007, it will become a Zero Energy facility.



- Constructed the nation's first and largest centralized anaerobic digester to convert dairy manure, biosolids and food waste to methane gas (2003). With planned expansions, it will generate 3 MW.