

RECLAMATION

Managing Water in the West

Colorado River Basin Water Supply and Demand Study

Climate Change and America's Infrastructure
National Academy of Engineering Workshop
Tempe, AZ
January 29, 2013



U.S. Department of the Interior
Bureau of Reclamation

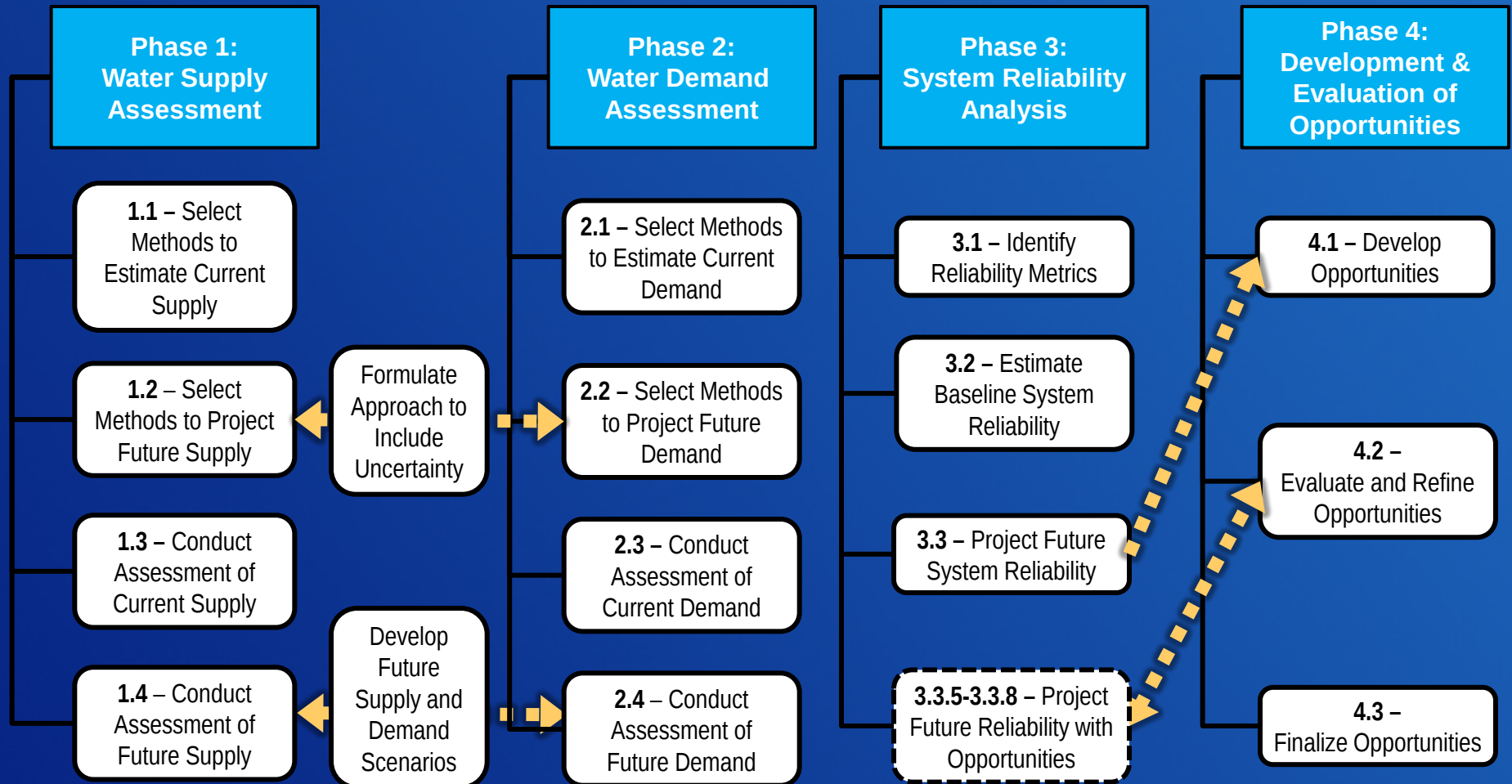
Colorado River Basin Water Supply and Demand Study

- Study Objective
 - Assess future water supply and demand imbalances over the next 50 years
 - Develop and evaluate opportunities for resolving imbalances
- Study conducted by Reclamation and the Basin States, in collaboration with stakeholders throughout the Basin
- Began in January 2010 and completed in December 2012
- A planning study – does *not* result in any decisions, but will provide the technical foundation for future activities



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Study Phases and Tasks



Final Study Reports

- The final Study is a collection of reports available at:
<http://www.usbr.gov/lc/region/programs/crbstudy/report1.html>

Executive Summary

Study Report

Technical Report A – Scenario Development

Technical Report B – Water Supply Assessment

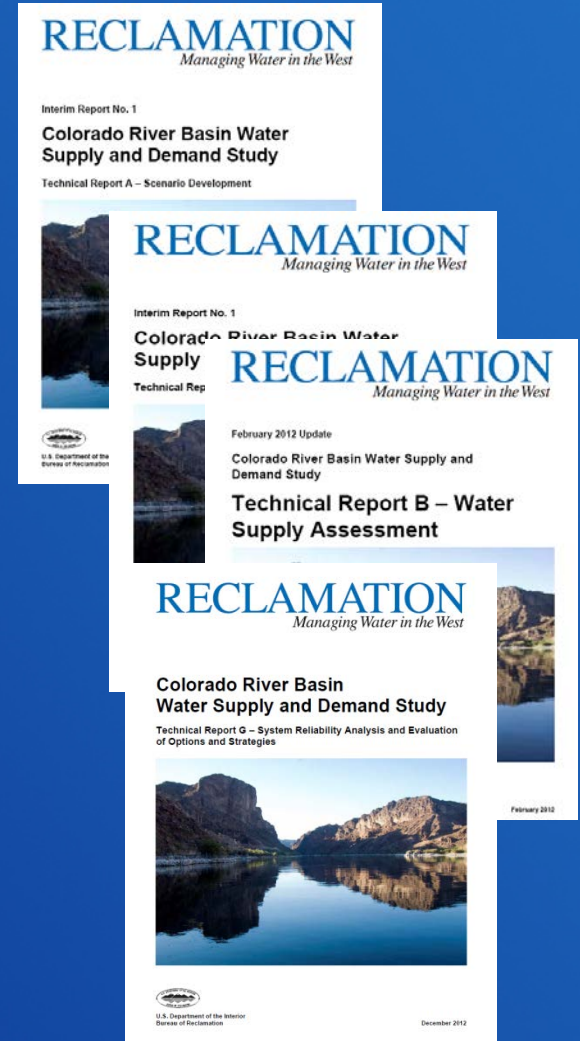
Technical Report C – Water Demand Assessment

Technical Report D – System Reliability Metrics

Technical Report E – Approach to Develop and Evaluate Opportunities to Balance Supply

Technical Report F – Development of Options and Strategies

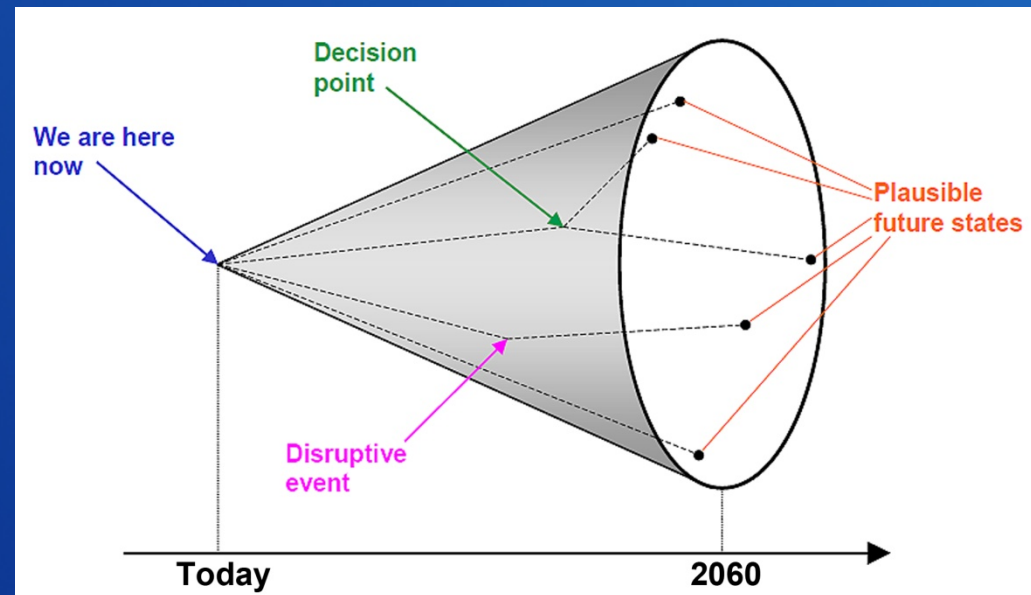
Technical Report G – System Reliability Analysis and Evaluation of Options and Strategies



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Scenario Planning: Addressing an Uncertain Future

- The path of major influences on the Colorado River system is uncertain and can not be represented by a single view
- An infinite number of plausible futures exist
- A manageable and informative number of scenarios are being developed to explore the broad range of futures



(adapted from Timpe and Scheepers, 2003)

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Water Supply Scenarios

Observed Resampled:

- future hydrologic trends and variability will be similar to the past 100 years

Paleo Resampled:

- future hydrologic trends and variability are represented by the distant past (approximately 1250 years)

Paleo Conditioned:

- future hydrologic trends and variability are represented by a blend of the wet dry states of the paleo-climate record but magnitudes are more similar to the observed period

Downscaled GCM Projected:

- future climate will continue to warm with regional precipitation trends represented through an ensemble of future GCM projections

Water Demand Scenarios

Current Projected (A):

- growth, development patterns, and institutions continue along recent trends

Slow Growth (B):

- low growth with emphasis on economic efficiency

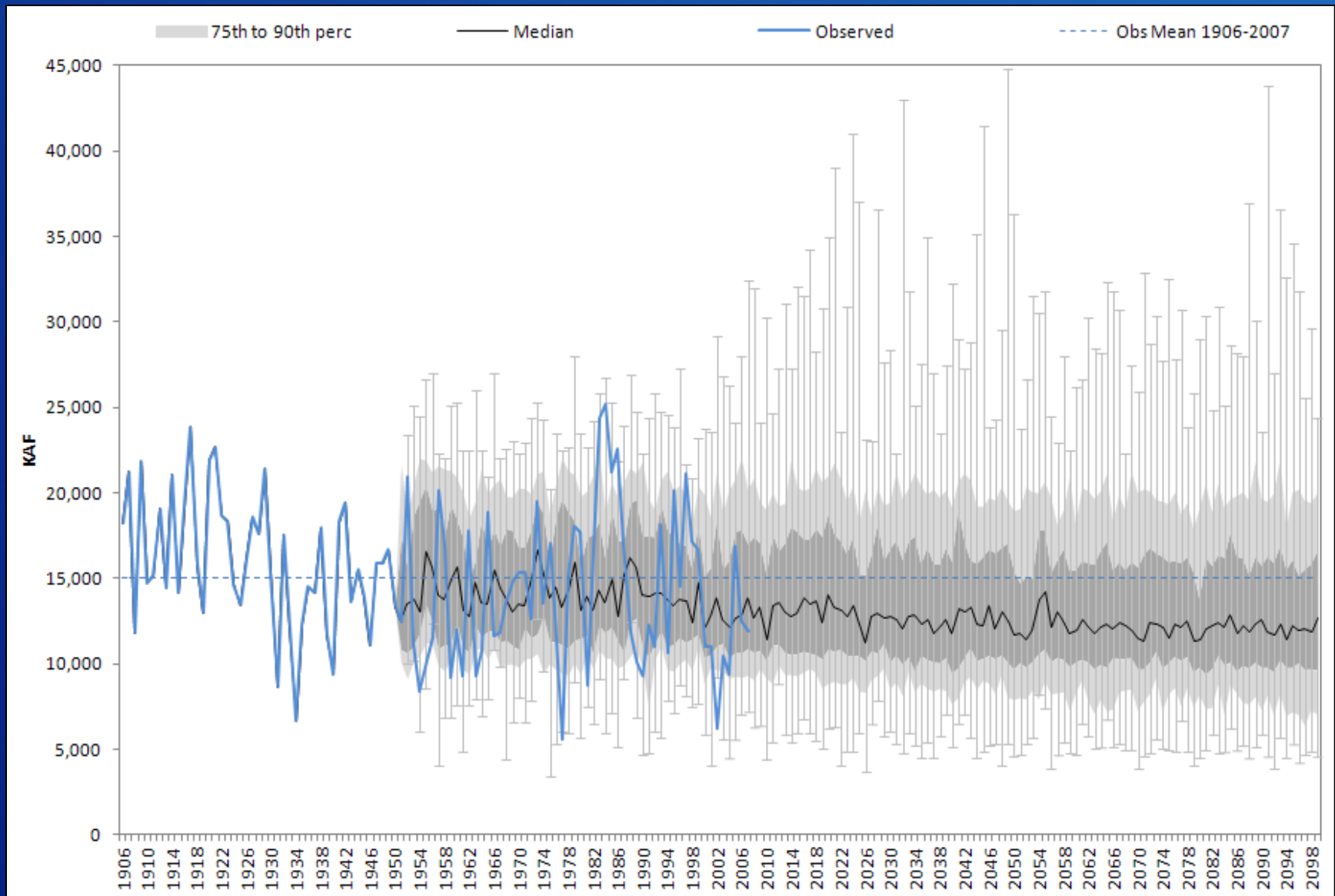
Rapid Growth (C1 and C2):

- economic resurgence (population and energy) and current preferences toward human and environmental values
 - C1 – slower technology adoption
 - C2 – rapid technology adoption

Enhanced Environment (D1 and D2):

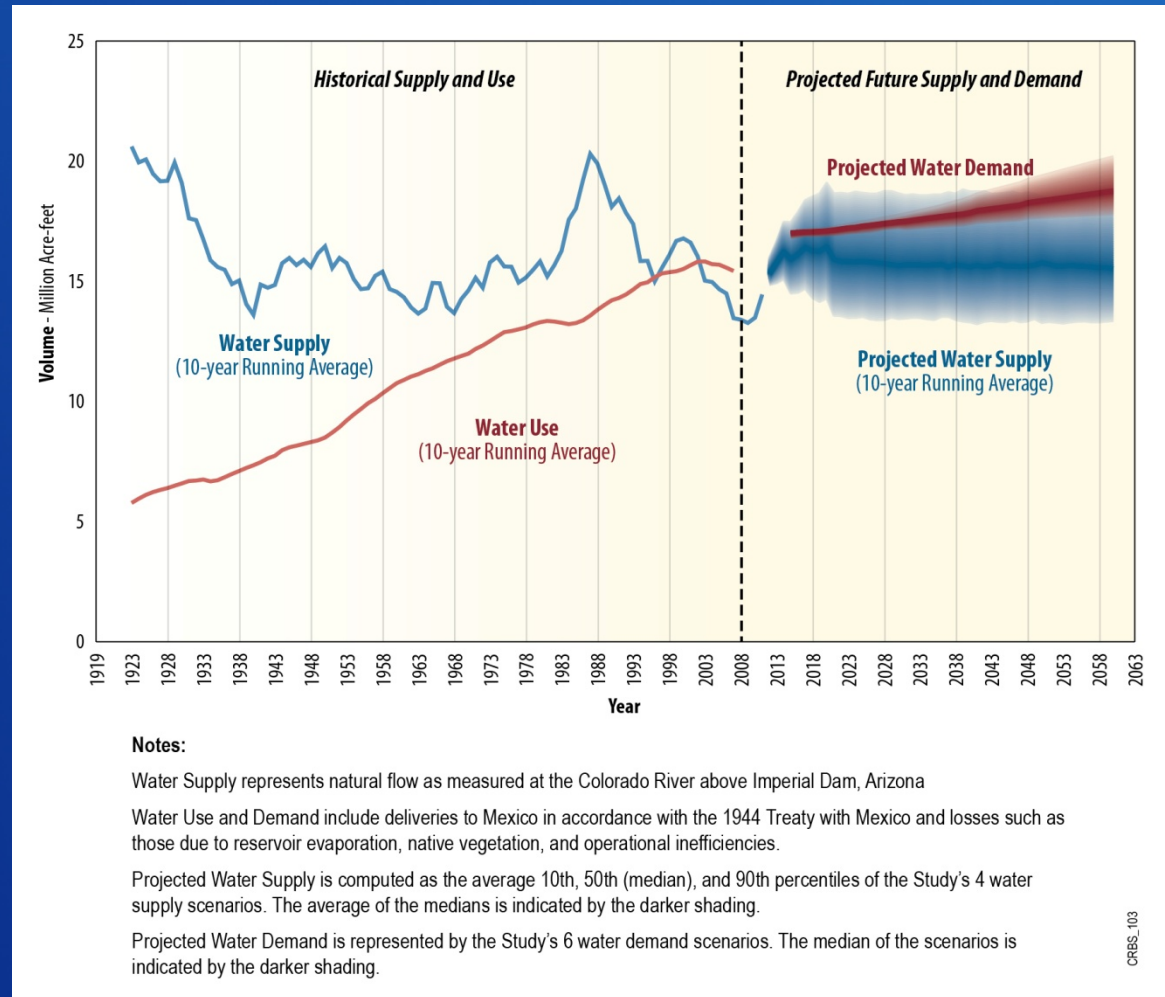
- expanded environmental awareness and stewardship with growing economy
 - D1 – with moderate population growth
 - D2 – with rapid population growth

Climate Projections and Observations



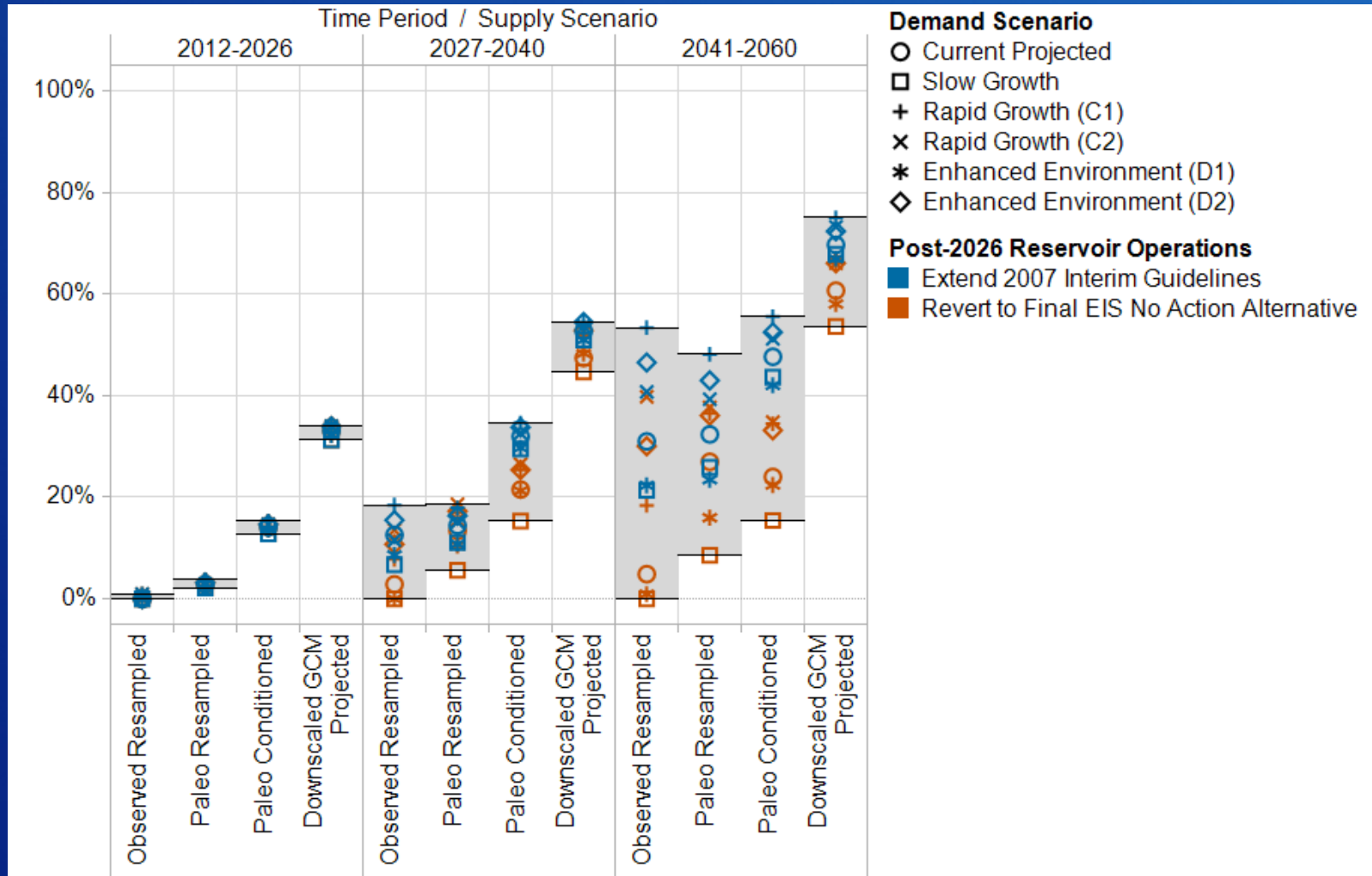
Projected Future Colorado River Basin Water Supply and Demand

- Average supply-demand imbalances by 2060 are approximately 3.2 million acre-feet
- This imbalance may be more or less depending on the nature of the particular supply and demand scenario
- Imbalances have occurred in the past and deliveries have been met due to reservoir storage



Lake Mead Pool Elevation < 1,000 feet

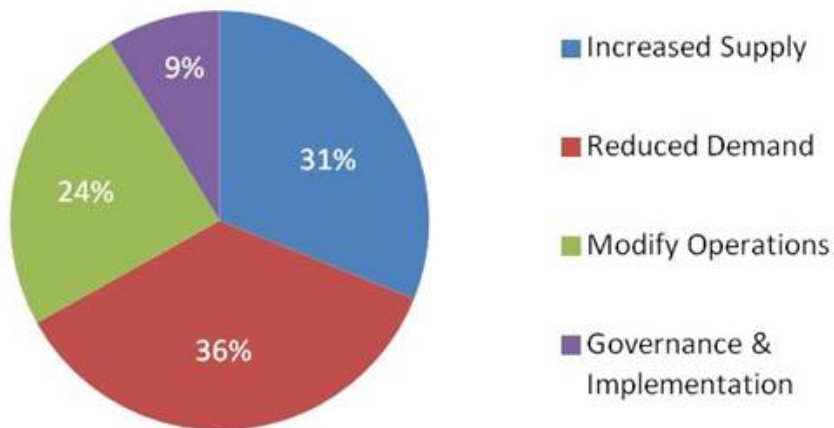
Percent of Traces Vulnerable



Summary of Options Submitted

- Over 150 options were submitted to the Study from Nov 2011 - Feb 2012
- All options received were included and are reflected in the Study

Distribution of Options Received



Increased Supply – reuse, importation, desalination, etc.

Reduced Demand – M&I and agricultural conservation, etc.

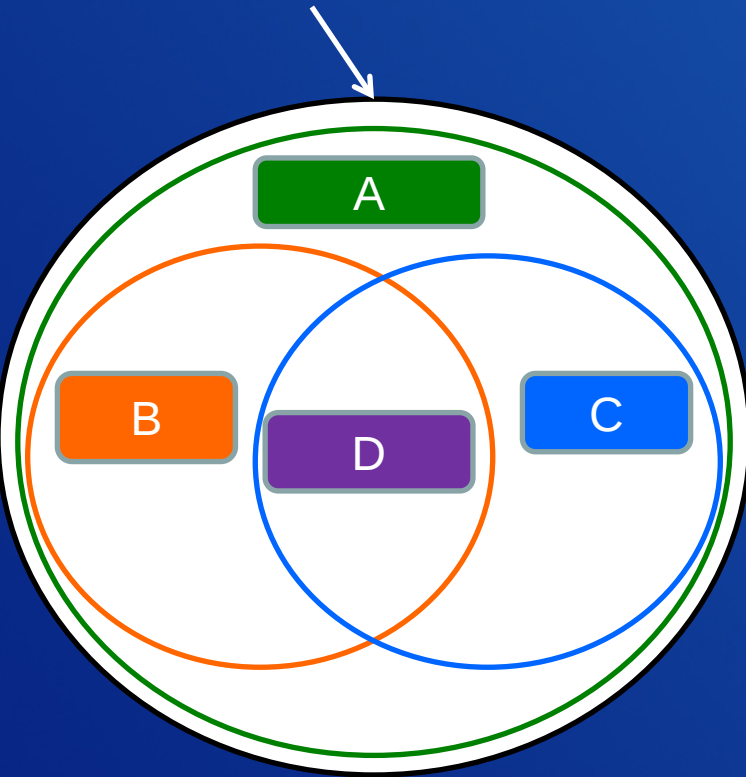
Modify Operations – transfers & exchanges, water banking, etc.

Governance & Implementation – stakeholder committees, population control, re-allocation, etc.

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Portfolios Explored in the Study

Universe of options
considered

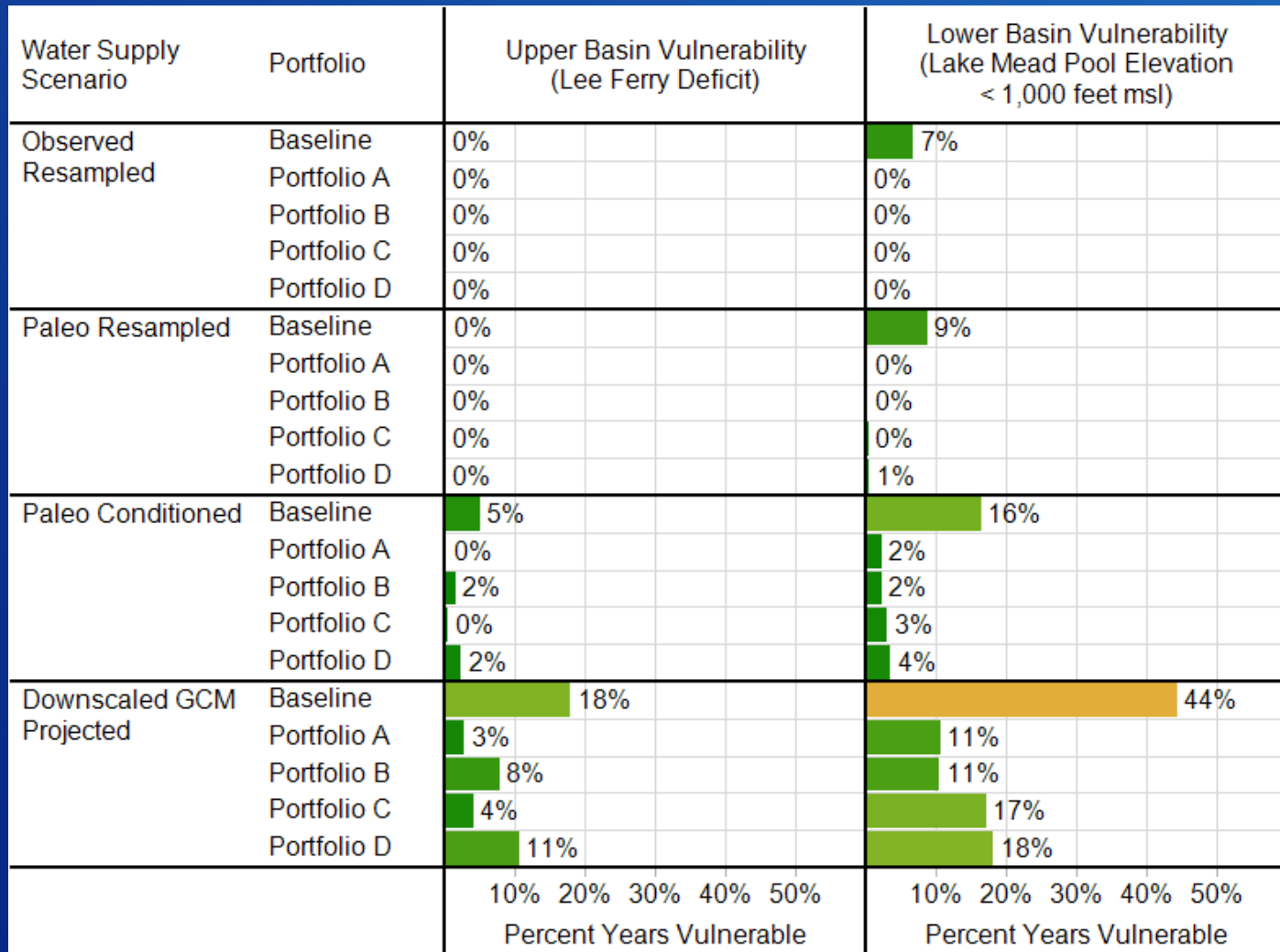


Option Selection

- Least restrictive, highly inclusive
- Considers the largest set of options
- Seeks a low-risk strategy in the long-term with high reliability
- Excludes options with high permitting, legal and policy risks
- Prioritizes options that have low environmental impacts and long-term flexibility
- Excludes options with high permitting risk
- Most restrictive, highly selective
- Considers smallest set of options

Portfolios Effectiveness at Reducing Vulnerability

Percent of Years Vulnerable from 2041 - 2060



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Summary

- The system is vulnerable if we do nothing
- Doing something greatly reduces that vulnerability and makes us more resilient to adverse conditions but does not eliminate vulnerability
- In the near term, all portfolios show that conservation, transfers, and reuse are cost-effective ways to reduce vulnerability
- In the longer term, more tradeoffs emerge to achieve an acceptable level of risk in terms of options, cost, resources, and other implications.

Next Steps

- Reduce uncertainties related to water conservation, reuse, water banking, augmentation, and weather modification concepts
- Further study of tribal water issues
- Advance science and modeling tools used in the Study
- Consider strategies that provide a wide-range of benefits to all water users
- In early 2013, convened by Reclamation, a workshop will be held to initiate actions to implement next steps

Colorado River Basin Water Supply and Demand Study

Study Contact Information

- Website: <http://www.usbr.gov/lc/region/programs/crbstudy.html>
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