Seven Colorado River Basin States Joint Efforts

CWCB DROUGHT CONFERENCE
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Colorado River Basin

- The Colorado River Basin includes 7 States and Mexico
- The Colorado River Compact divided the basin into the Upper Basin and Lower Basin
- The Colorado River Compact defined Colorado, New Mexico, Wyoming and Utah as the "Upper Division States," and
- Arizona, Nevada and California as the "Lower Division States"

“Law of the River”

- All 7 Basin States have a right to use Colorado River water under the “Law of the River,” which is a body of laws that include the Colorado River Compact, the Upper Colorado River Basin Compact, the Colorado River Basin Project Act, the Supreme Court decree in Arizona v. California, and other sources of law.
- Mexico has a right to delivery of Colorado River water under the Mexican Water Treaty of 1944.

Obstacles to Cooperation

- Colorado River is a limited resource
- History of conflict in the Basin
- Long term drought over most of the past 12 years

Increase in 7 States Collaboration

- Cooperative efforts among the Basin States and the U.S. Bureau of Reclamation have increased since the successful agreement among the States and U.S. Dept of Interior that led to the 2007 Interim Shortage Guidelines
- The 2007 Interim Guidelines provide for coordinated operations of Lake Powell and Lake Mead.

7 Basin States Collaboration

The 7 Basin States Collaboration includes:

- River Operations
  - The Long Term Environmental Management Plan (LTEMP), which is the Dept of Interior's development of new environmental compliance documents for operation of Glen Canyon Dam
- Treaty Interpretation
  - Treaty Minutes 316, 317 and 318

7 Basin States Collaboration, cont'd

- Augmentation and Water Quality
  - Weather Modification (cloud-seeding)
  - Vegetative management (tamarisk removal)
  - Salinity Control Forum uses irrigation improvements, vegetation management, and point source control to reduce salinity
- Studies
  - The Basin Study
  - Augmentation Study (desalinization, importation, other options)

Basin Study Purposes

- The Bureau of Reclamation is developing the Basin Study with the cooperation of the 7 Basin States, which are funding partners.
- **Define** current and future **imbalances** in the water supply and demand in the Colorado River over the next 50 years
- **Develop and analyze strategies** to resolve possible supply and demand imbalances

Basin Study Purposes, cont'd

- The Basin Study is scheduled to be released November, 2012
- The Basin Study is intended to be an informational study only, and is **not decisional document**

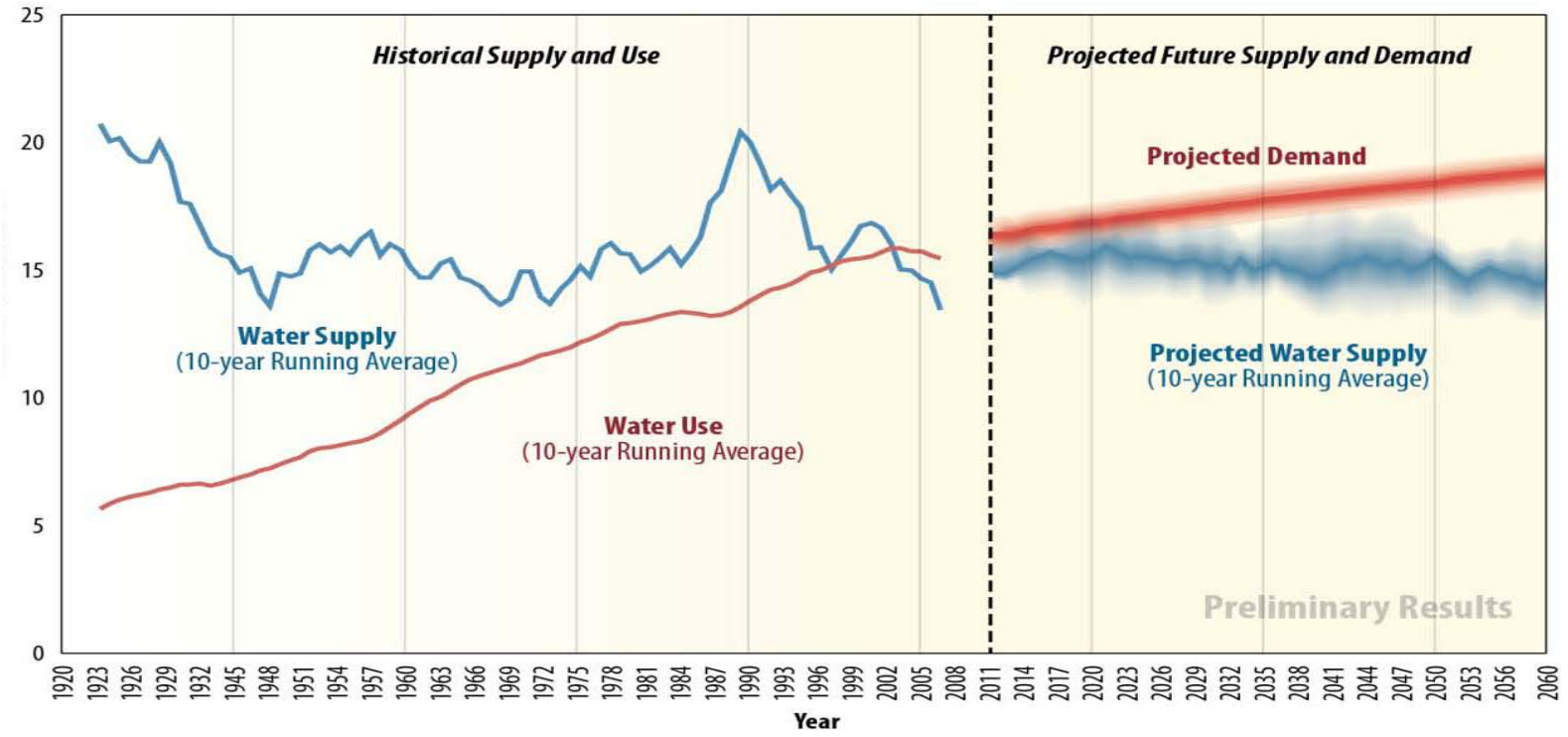
Basin Study Water Supplies

- The Basin Study used four supply scenarios to project a range of potential future Colorado River supplies until 2060:
  - Historical (observed);
  - Paleo Resampled;
  - Paleo Conditioned;
  - Global Climate Models (GCMs)

Basin Study Demands

- The 7 Basin States provided range of projected future demands in the Colorado River Basin until 2060 based on six different demand scenarios:
  - Current Trends
  - Economic Slowdown
  - Enhanced Environment (D1)
  - Enhanced Environment (D2)
  - Rapid Growth (C1)
  - Rapid Growth (C2)

Colorado River Basinwide Supply and Demand



State of Colorado's Demands

18% range in 2060 Colorado River demands

2060 demand s may be between 7 - 26% higher than 2015 demands

Do not meet full Compact apportionment by 2060

Basin Study Vulnerabilities and Options

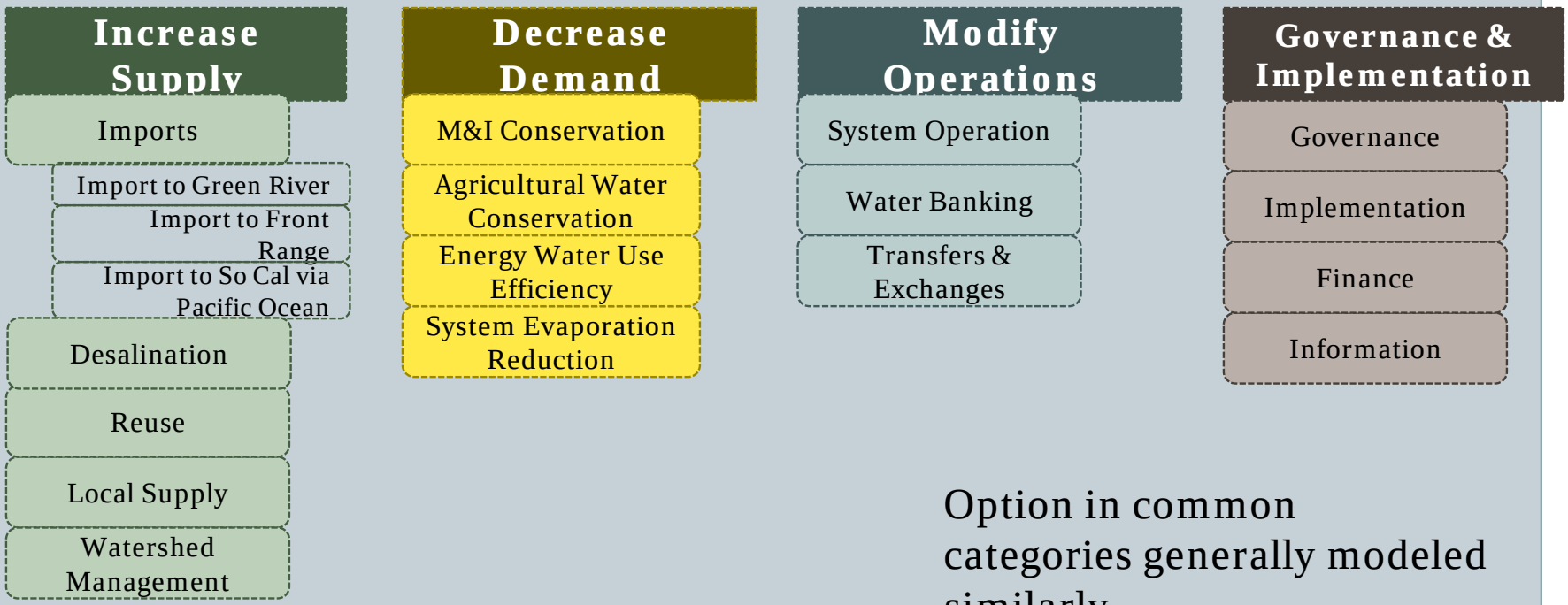
- The Basin Study used the projected demand and supply scenarios to identify potential supply and demand imbalances (vulnerabilities).
- The Study then developed and analyzed potential options to address vulnerabilities.
- Options were sorted into four categories:
  - Increase Supplies
  - Decrease Demands
  - Modify River Operations
  - Governance and Implementation

Metrics

- System reliability metrics measure the ability of the Colorado River system to meet the needs of Basin resources under multiple future conditions.
- Metrics will be used to measure (quantitatively or qualitatively) the potential impacts to Basin resources from potential supply and demand imbalances and to measure the effectiveness of options and strategies to remedy imbalances
- Metrics include:
  - Water Delivery
  - Hydropower generation
  - Water Quality
  - Flood Control
  - Recreation
  - Ecological

Options to Address Vulnerabilities

Over 150 Public-Submitted Options



Option in common categories generally modeled similarly

Basin Study Option Scoring

- The Basin Study then scored or ranked the options based on a wide range of metrics, including:
  - Yield (how much water the option would generate)
  - Cost
  - Technical Feasibility
  - Reliability
  - Hydropower
  - Environmental
  - Legal, Permitting and Policy Considerations
  - Implementation Risks

Basin Study Signposts

- The Upper Division States have an obligation under the Colorado River Compact "not [to] cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of 10 consecutive years." Art. III Colorado River Compact
- The "Signposts" are observable conditions that anticipate vulnerabilities, such as deficits at Lee Ferry.
- Signposts have the potential to anticipate deficits at Lee Ferry up to 5 years before the deficit occurs.

Basin Study Signposts

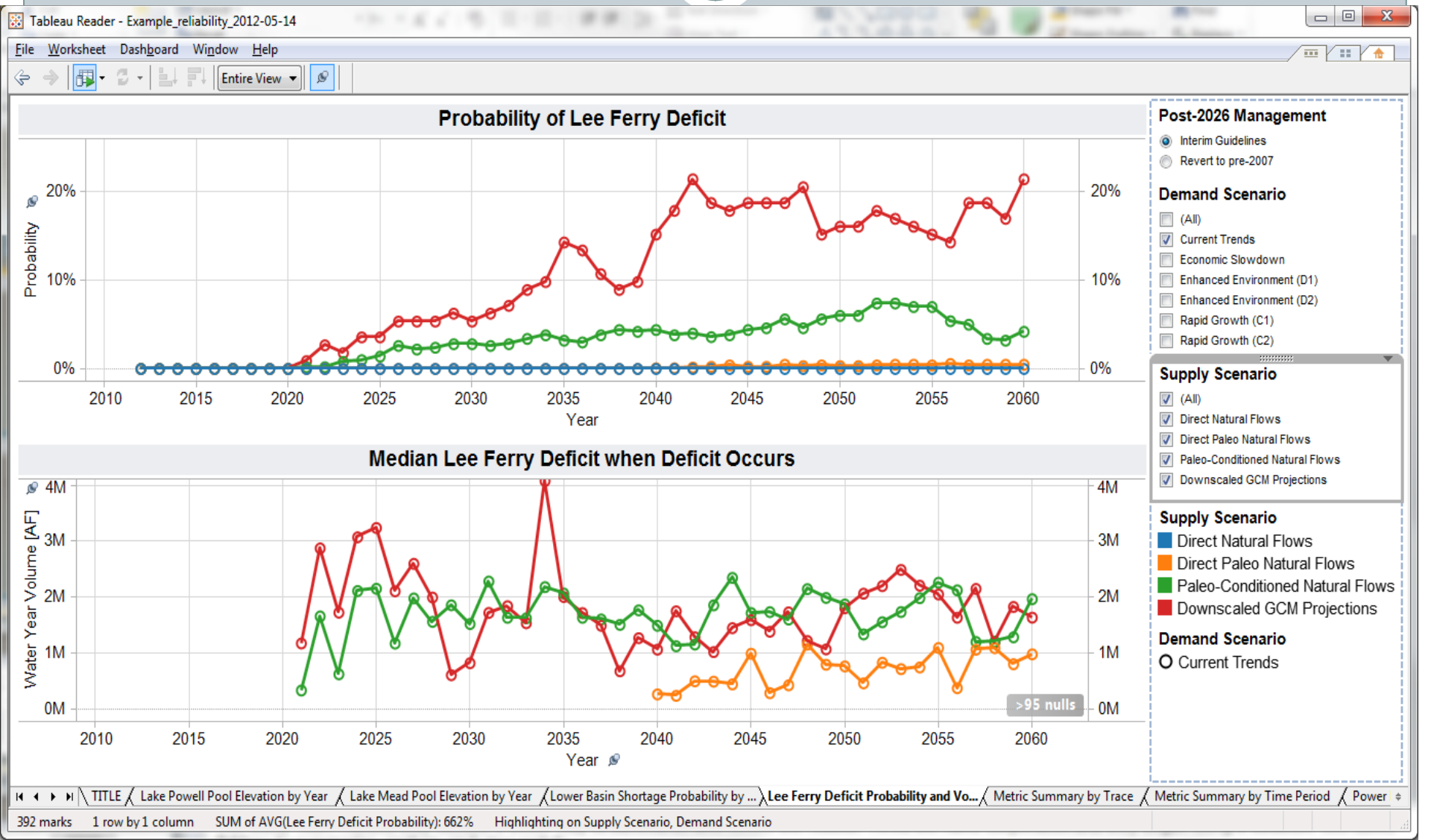
Signposts

Indicator Metric/ Vulnerability	Lead Time	Conditions			
		Lake Powell	Lake Mead	LF 5yr mean flow*	UB Shortage
Lee Ferry Deficit	5 Years	3490'	NA	12.39 MaF	NA
Lower Basin Shortage (>1 MaF over 2 yrs)	3 Years	NA	1060'	13.51 MaF	NA
Lower Basin Shortage (>1.5 MaF over 5 yrs)	3 Years	NA	1075'	13.51 MaF	NA
Mead Pool Elevation (< 1000')	3 years	NA	1040'	13.35 MaF	NA
Upper Basin Shortage (>25%)	0 Years	NA	NA	NA	25%

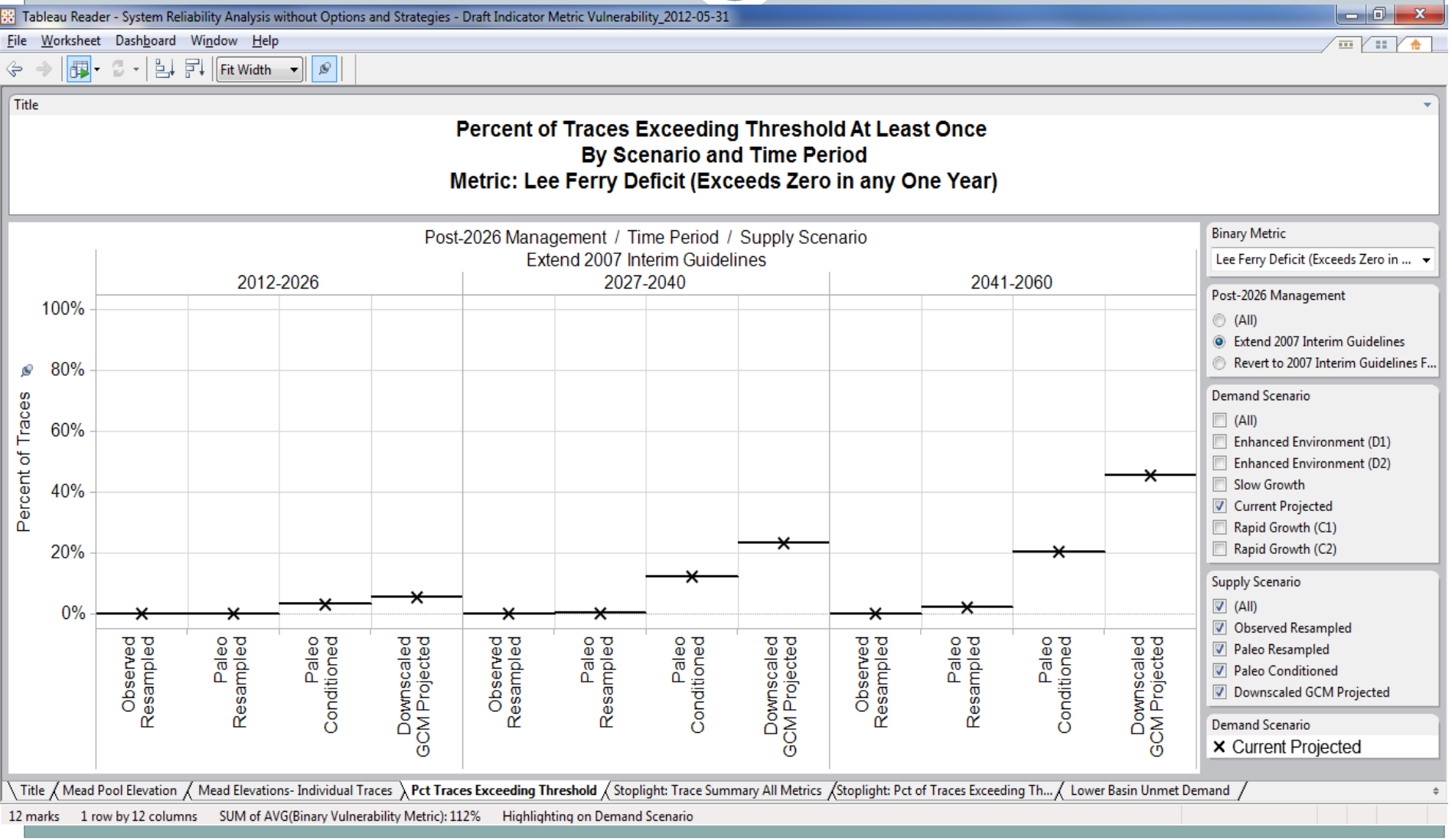
Basin Study Scenario Planning Tool

- After the Basin Study team:
  - Gathered all of the supply and demand data
  - Identified system vulnerabilities and ‘signposts’
  - Developed options
- Developed a Scenario Planning Tool which simulates the effectiveness of any of the options by applying any of the four supply scenarios or any of the six demand scenarios

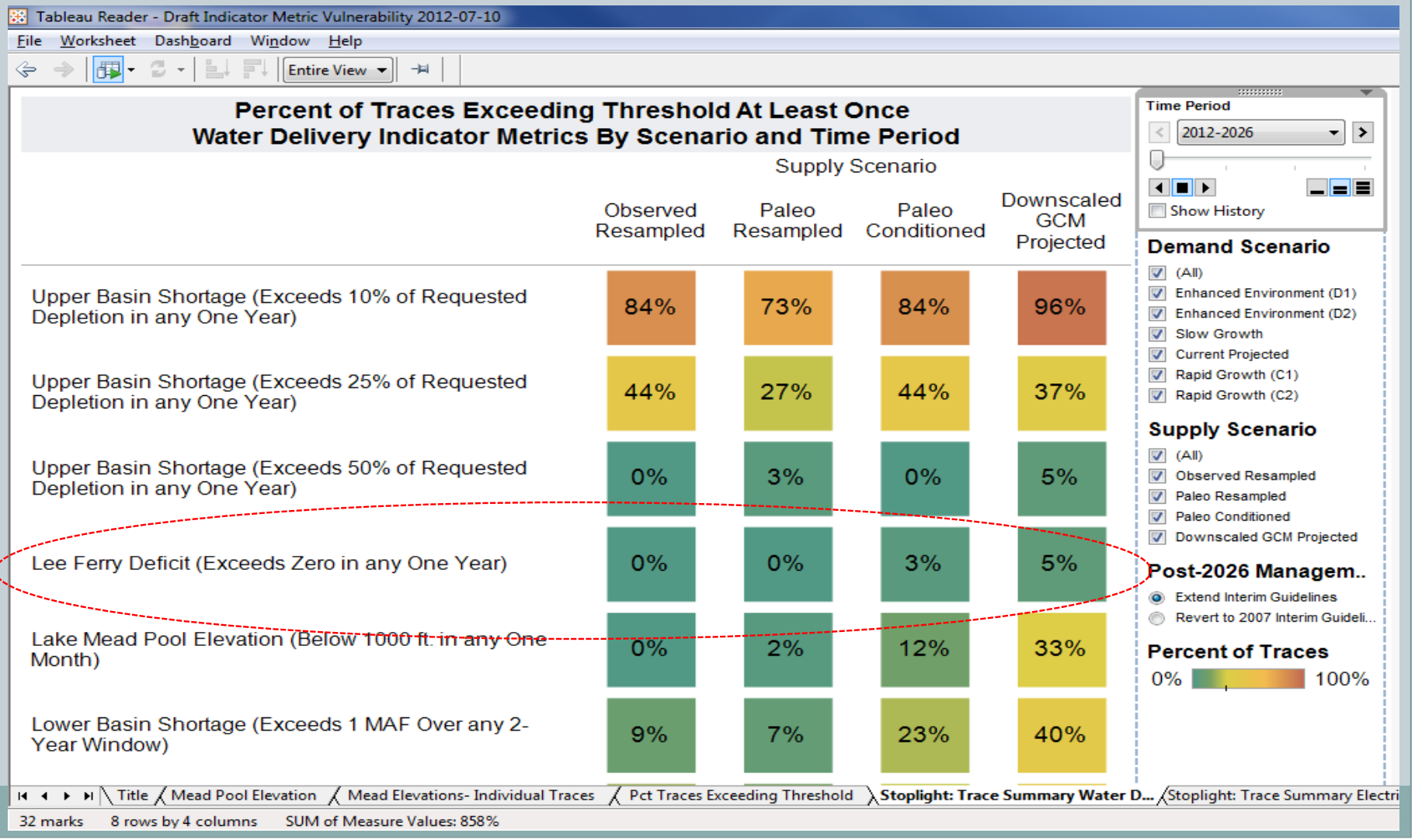
Simulate System Reliability



Simulate System Reliability



Indicator Metrics Define Vulnerabilities



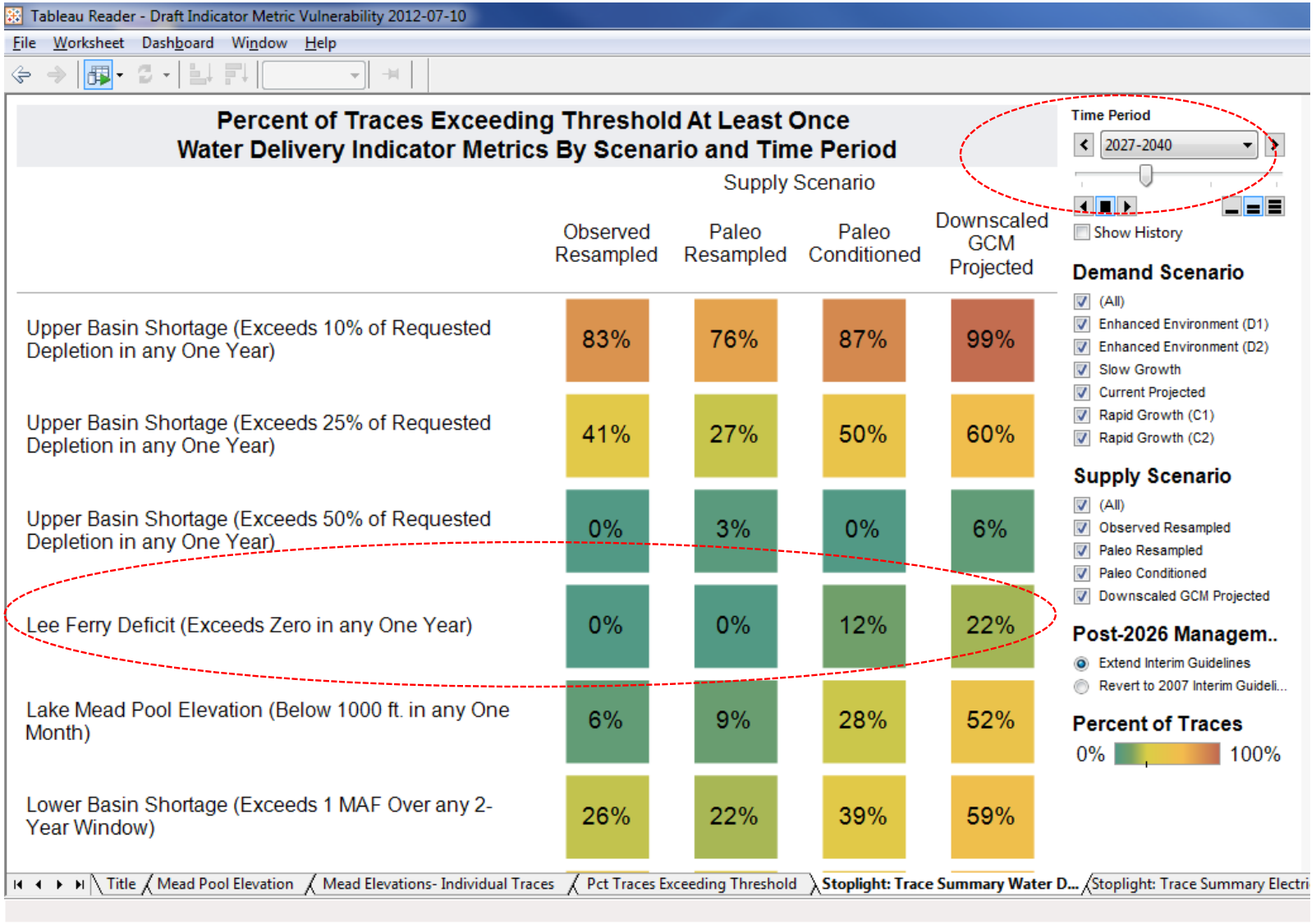


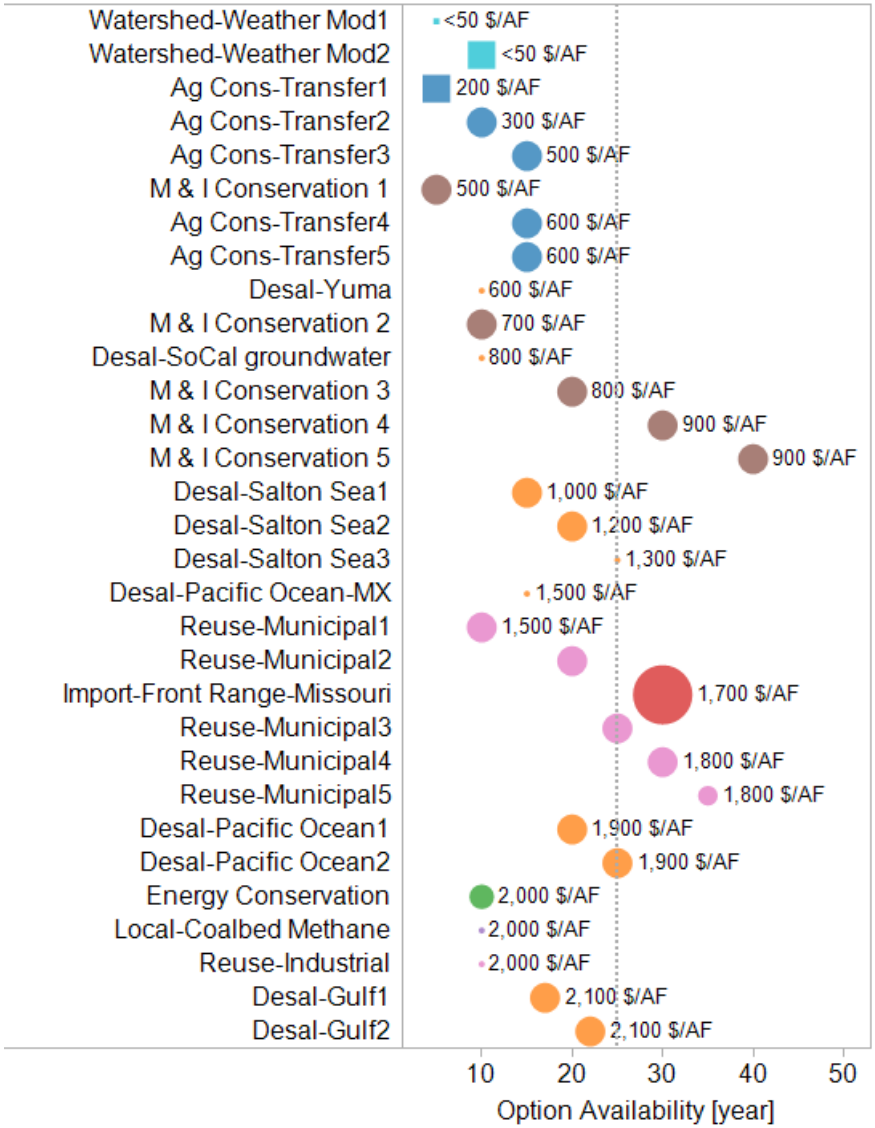
Tableau Reader - Draft Indicator Metric Vulnerability 2012-07-10
File Worksheet Dashboard Window Help
Percent of Traces Exceeding Threshold At Least Once
Water Delivery Indicator Metrics By Scenario and Time Period
Supply Scenario
Observed Resampled
Paleo Resampled
Paleo Conditioned
Downscaled GCM Projected
Upper Basin Shortage (Exceeds 10% of Requested Depletion in any One Year)
83% 76% 87% 99%
Upper Basin Shortage (Exceeds 25% of Requested Depletion in any One Year)
41% 27% 50% 60%
Upper Basin Shortage (Exceeds 50% of Requested Depletion in any One Year)
0% 3% 0% 6%
Lee Ferry Deficit (Exceeds Zero in any One Year)
0% 0% 12% 22%
Lake Mead Pool Elevation (Below 1000 ft. in any One Month)
6% 9% 28% 52%
Lower Basin Shortage (Exceeds 1 MAF Over any 2-Year Window)
26% 22% 39% 59%
Time Period
2027-2040
Show History
Demand Scenario
(All)
Enhanced Environment (D1)
Enhanced Environment (D2)
Slow Growth
Current Projected
Rapid Growth (C1)
Rapid Growth (C2)
Supply Scenario
(All)
Observed Resampled
Paleo Resampled
Paleo Conditioned
Downscaled GCM Projected
Post-2026 Managem..
Extend Interim Guidelines
Revert to 2007 Interim Guideli...
Percent of Traces
0% 100%
Title
Mead Pool Elevation
Mead Elevations- Individual Traces
Pct Traces Exceeding Threshold
Stoplight: Trace Summary Water D...
Stoplight: Trace Summary Electri

Portfolio Development

- Portfolios are developed by:
  - Identifying system vulnerabilities
  - Selecting options to address the vulnerabilities
- Results of implementing a Portfolio can be simulated with the Scenario Planning Tool.

Draft Portfolio #1 – "Long-Term" Reliability

Portfolio Options Ranking: Portfolio 1



		Long-term		Near-term		Grand Total	
		Number of Options	Sum of Yield (AF/yr)	Number of Options	Sum of Yield (AF/yr)	Number of Options	Sum of Yield (AF/yr)
Augment Supply	Desalination	2	300K	8	1,176K	10	1,476K
	Import	1	600K			1	600K
	Local Supply			1	100K	1	100K
	Reuse	3	532K	3	440K	6	972K
	Watershed Management			2	300K	2	300K
	Total	6	1,432K	14	2,016K	20	3,448K
Reduce Demand	Agricultural Conservation			5	1,000K	5	1,000K
	Energy Water Use Efficiency			1	160K	1	160K
	M & I Conservation	2	400K	3	600K	5	1,000K
	Total	2	400K	9	1,760K	11	2,160K
Grand Total		8	1,832K	23	3,776K	31	5,608K

Summary When All Options Online

Average Cost Per Acrefoot	$1,191
Total Annual Cost	$6,679M

Portfolio
Portfolio 1

Timing Bin (user)
- ☑ 1-5 years
- ☑ 6-10 years
- ☑ 11-15 years
- ☑ 16-30 years
- ☑ 31-40 years
- ☑ 41-50 years

Coloring
- Agricultural Conservati..
- Desalination
- Energy Water Use Effi..
- Import
- Local Supply
- M & I Conservation

Always On
- ● Responds to Signposts
- ■ Always On

Yield (AF/yr)
- ≤ 100K
- 200K
- 400K
- 600K
- 800K

Long-term Year Threshold
25

Aggregate Score Year
60

Sort
Custom Sort

Basin Study Findings on Demands

- Upper Basin projected demands do not reach full Compact apportionment by 2060
- Lower Basin demands exceed Compact apportionment by 2015

Basin Study Findings on Shortages

- Shortages in the Lower Basin are primarily due to high demands in the Lower Basin
- Shortages in the Upper Basin are primarily due to limited supply

Basin Study Findings

- Better future supply/demand modeling
- ‘Signposts’ or warnings of shortages
- Scenario Planning Tool

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