Water Forward 2024: Scenario Planning Approach

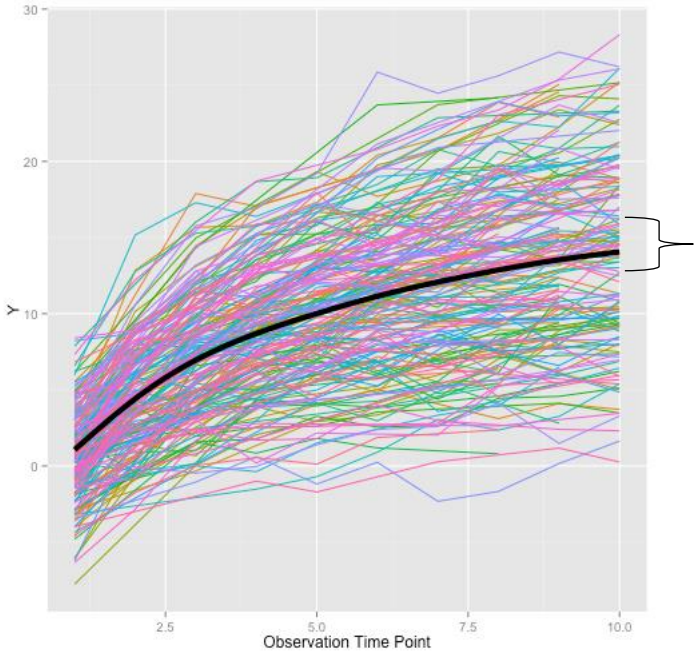
Drivers from Water Forward 18

- Clearer approach to water needs identification
- More robust approach to addressing risk and uncertainty
- Development of a more comprehensive adaptive management plan

Planning for plausibility vs. probability

- Uncertain parameters cannot be predicted or well understood using standard statistical methods

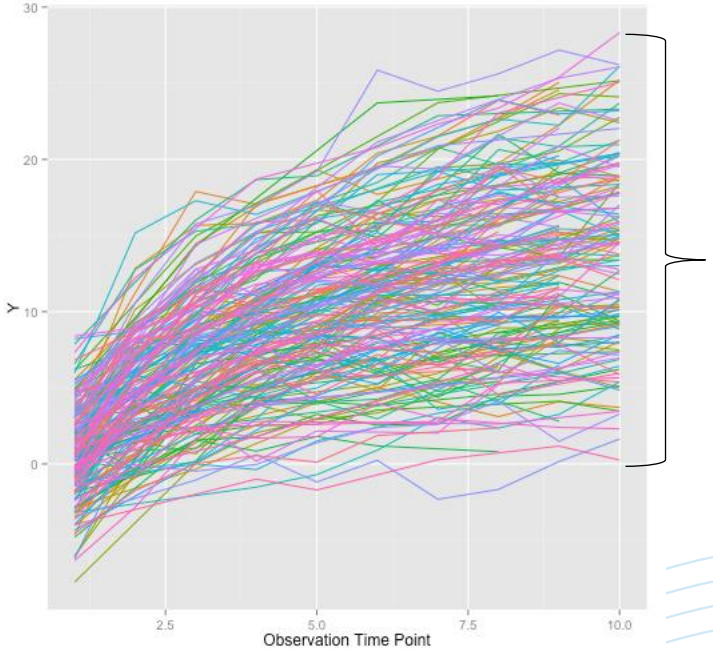
Predicting the most likely future or creating a plan that performs best on average



Strategies perform well against “most likely” future conditions

vs.

Finding robust strategies that perform well across a wide range of plausible futures, or scenarios

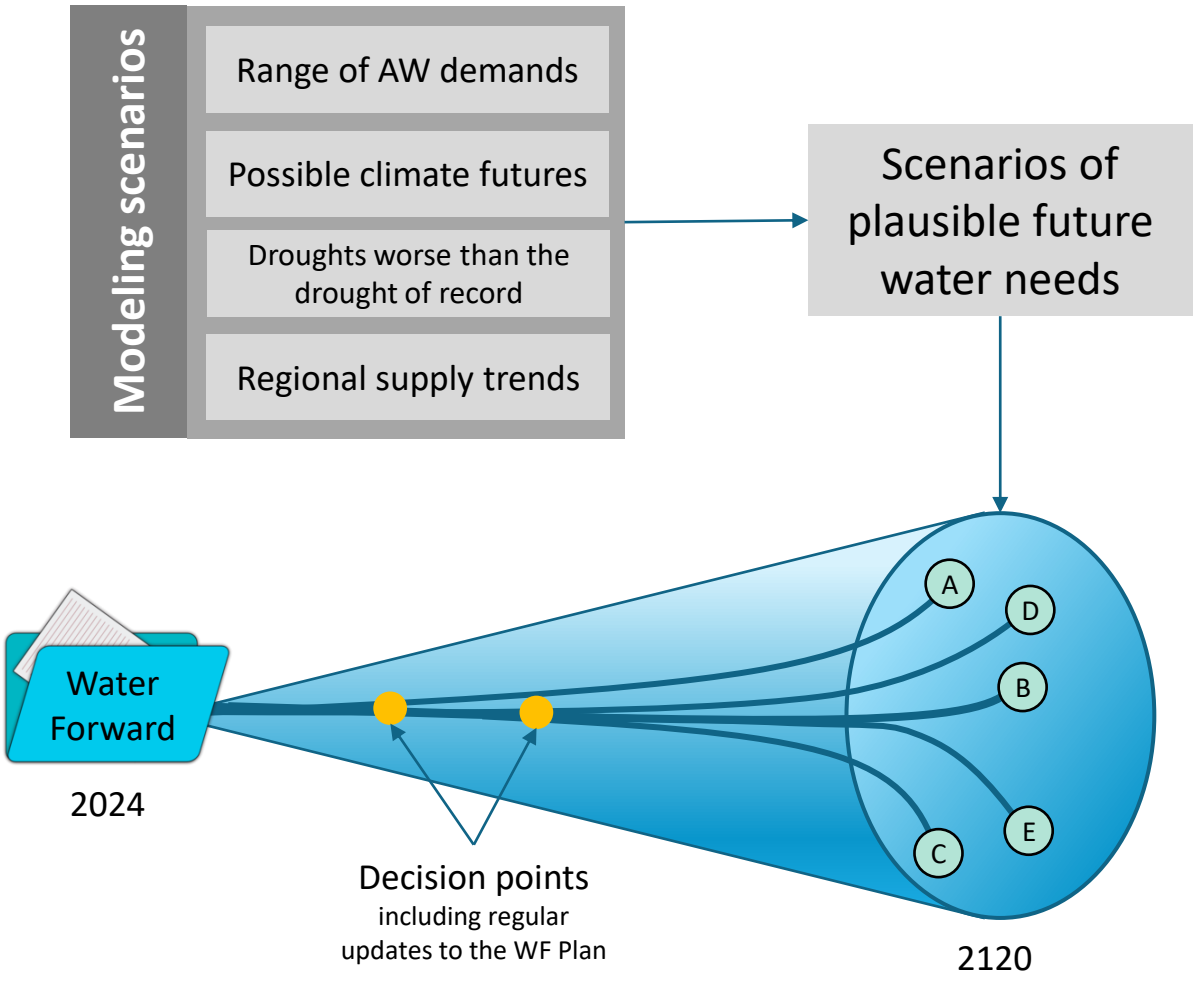


Strategies perform well across range of possible scenarios

https://www.r-bloggers.com/2014/10/my-commonly-done-ggplot2-graphs/

Planning for Uncertainty in WF24

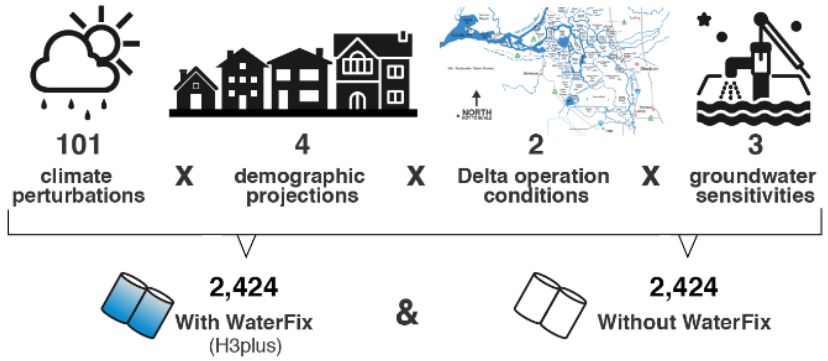
- Develop a range of plausible future scenarios
- Find common near-term water management strategies (WMSs) that perform well over many scenarios
- For long-term (WMSs), develop an adaptive management plan with key decision points
- Continue to update the plan, re-evaluate, and adapt

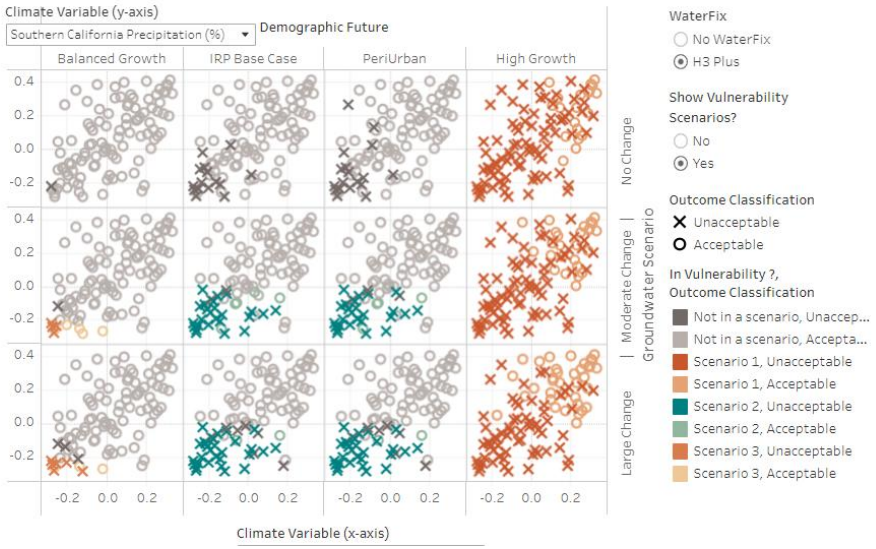


Scenario planning examples

- Metropolitan Water District of Southern California

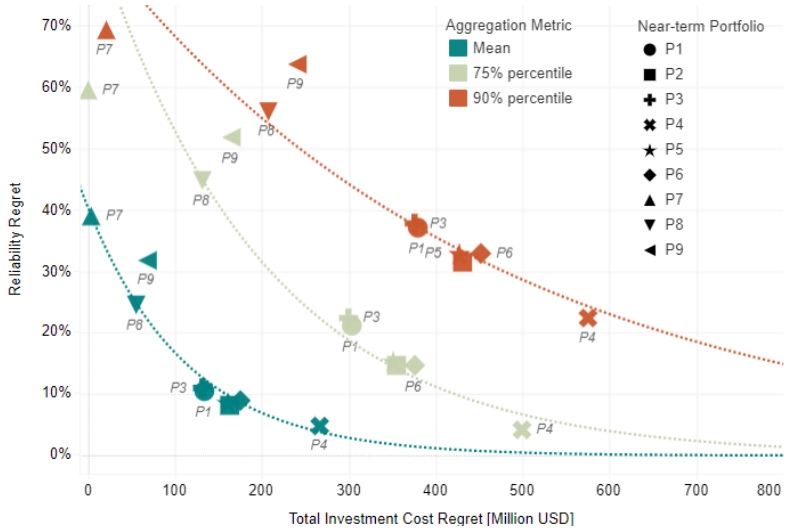
Figure 3. Experimental Design and Number of Futures





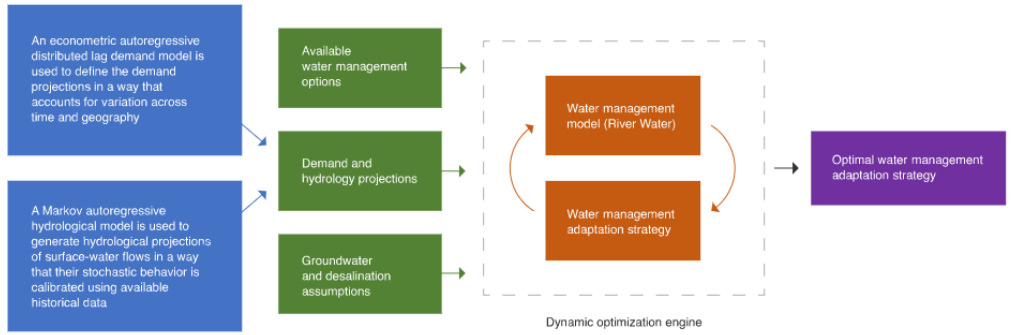
https://www.rand.org/pubs/tools/TL320/tool/case-studies/southern-california.html

- Monterrey, Mexico



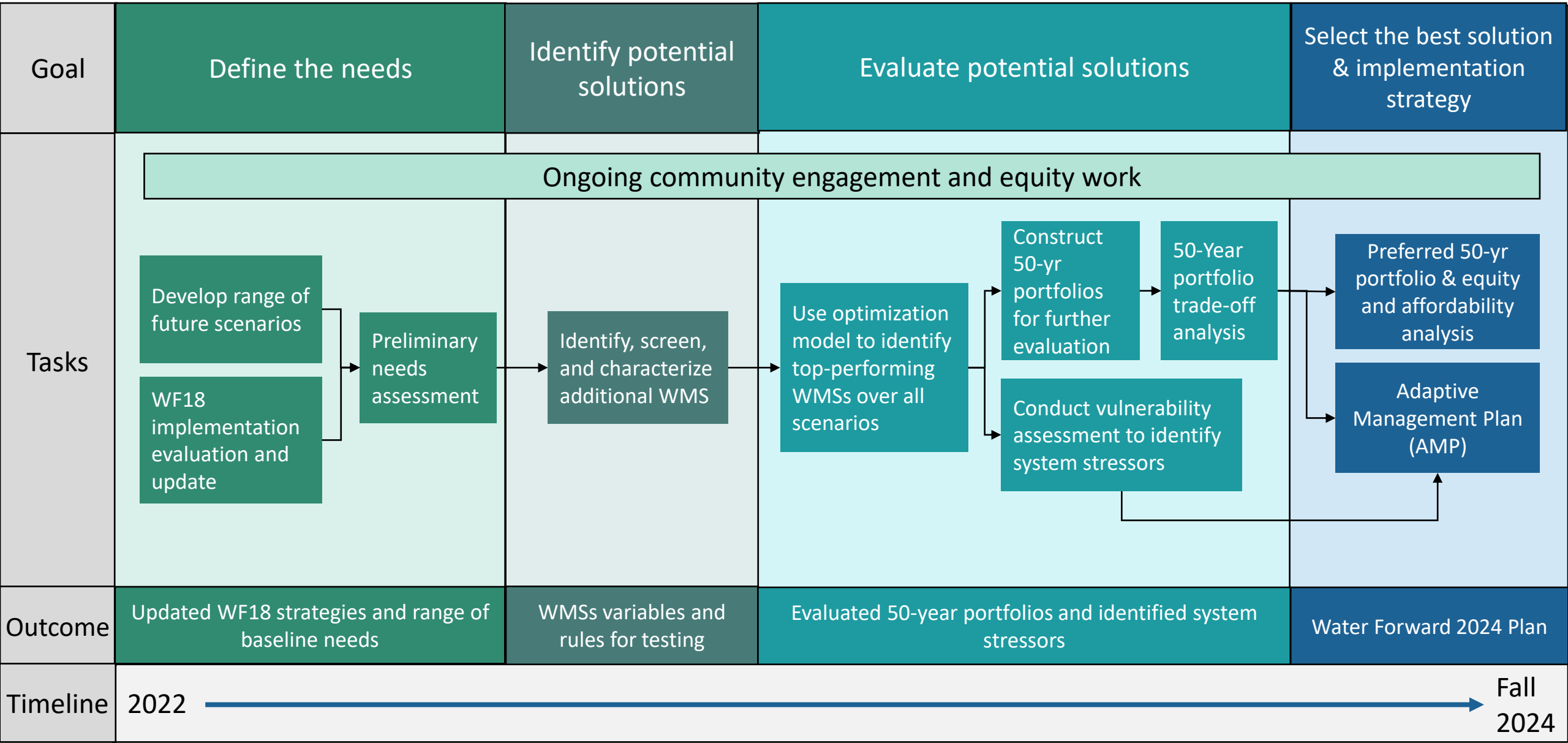
https://www.rand.org/pubs/tools/TL320/tool/case-studies/monterrey.html

Figure 4. Integrated Assessment Model



SOURCE: Adapted from Molia-Perez et al., 2019, p. 26.

WF24 scenario planning methodology overview



Overview of planning scenarios

Total water availability planning scenarios: **639**

Range of future water availability sequences to test water management strategies (WMSs)

71
Hydrologic Scenarios

1 Period of Record (POR) sequence	**15** Global climate model (GCM) flow output sequences
10 Droughts worse than the drought of record (DWDRs) stochastically sampled from POR hydrology	**15** POR sequences adjusted for climate effects
	30 DWDRs stochastically sampled from climate-adjusted POR

3
AW Demand Scenarios

- Higher AW demand
- Baseline AW demand
- Lower AW demand

3
Regional Supply Scenarios

- Repeat of baseline regional supplies in second half of century
- Baseline Region K regional supplies
- Slower implementation of baseline Region K regional supplies

Water availability planning scenarios represent possible future conditions against which we can test strategies. They do not represent the probability of any particular outcome, and are geared towards testing drought outcomes for this process.

Using Scenarios in WF24

- Scenarios describe a range of plausible future water availability conditions we may face
- **Use #1**: Water Management Strategy optimization
  - Identify WMSs combinations that perform the best in terms of reliability and cost across all scenarios
  - All WMS combinations must meet minimum reliability standards
  - 50-year portfolios for full trade-off evaluation will be developed based on results
- **Use #2**: Vulnerability assessment
  - Use scenarios to identify stressors for adaptive management plan

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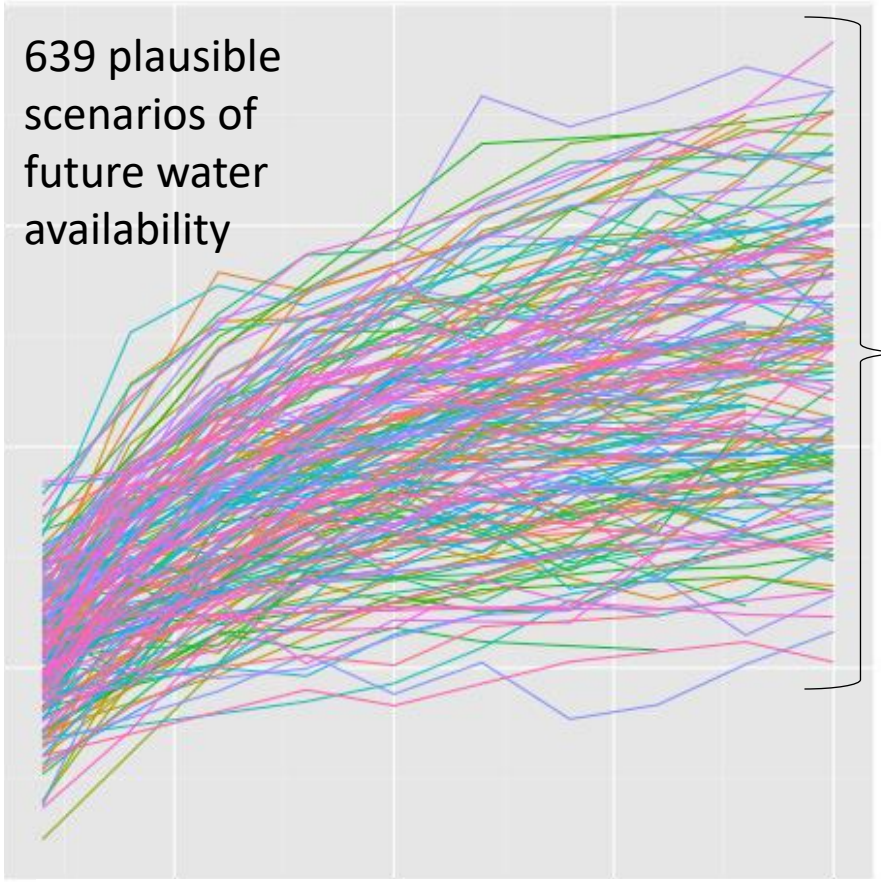


Use #1: WMS Optimization

- Hydrologic outputs from preliminary needs analysis WAM runs
- Mini-WAM WMS mass balance model
- Borg optimization algorithm
- WMS information
- Reliability, resiliency, and vulnerability (RRV) metrics→ identifying which combinations meet goals

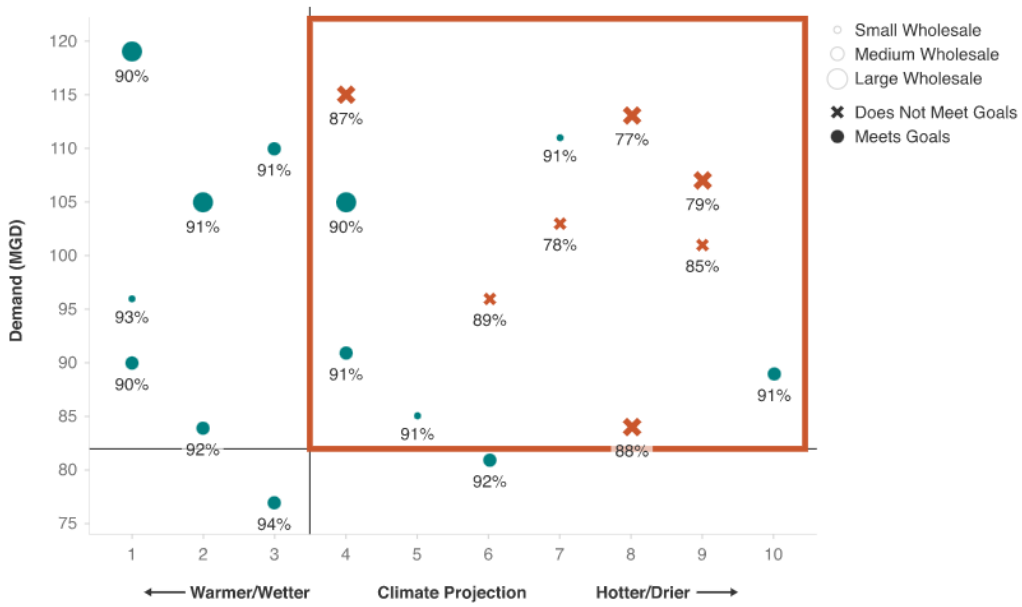
WMS optimization vs. 50-year portfolio evaluation

Optimization allows us to identify combinations of WMSs that meet or exceed minimum RRV goals at the lowest cost. Portfolio evaluation will determine which of the optimum solution set is preferred based on our Water Forward criteria, which include criteria such as environmental impacts and equity in addition to reliability and cost.

Use #2: Vulnerability Analysis

- Look at full range of plausible future conditions
- Identify future conditions that frequently cause failure, for example:
  - Low rainfall
  - High demand
- These stressor conditions feed into adaptive management plan
  - What are the supply-related signposts?
  - What are the demand-related signposts?
  - How much lead time do projects need?

Figure 6. Example Outcomes for Baseline Strategy and Alternative Vulnerability for RDM



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Questions?