Building Resilience to a Changing Climate:

A Technical Training in Water Sector
Utility Decision Support

WUCA
Water Utility Climate Alliance
10 YEARS · 2008-2018

Decision-Making in the Face of Uncertainty:

The evolution of supply planning and climate adaptation at the Portland Water Bureau

Kavita Heyn, Climate Science Program Manager
Portland Water Bureau

PORTLAND WATER BUREAU
FROM FOREST TO FAUCET

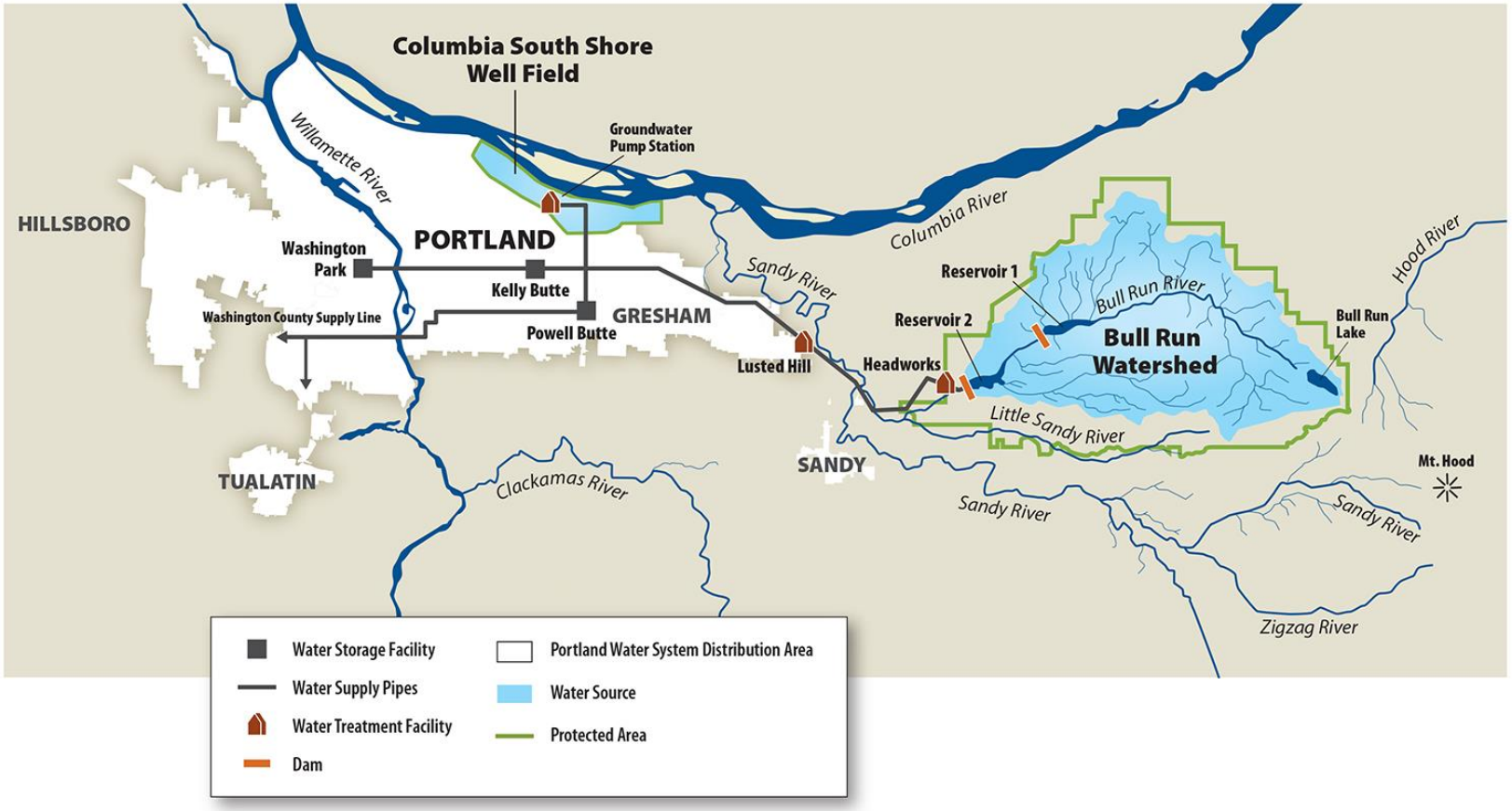
Portland's water system

- Two supply sources:

1. Bull Run Watershed primary surface supply serving water since 1895 (102 sq. miles, highly protected)

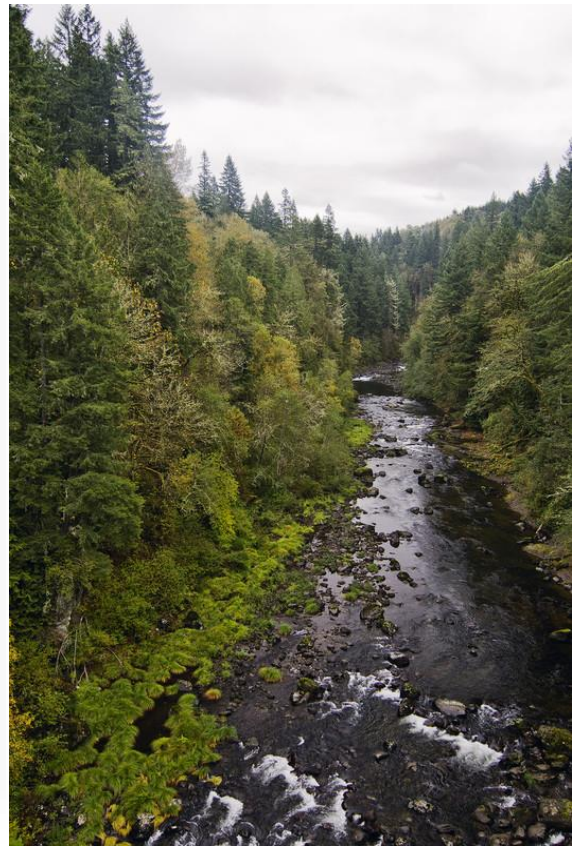
2. Columbia South Shore Well Field (Groundwater aquifers)

- Serve 952,200 retail & wholesale customers (1/4 of Oregon's population)



Portland's water system

- Bull Run Watershed mixed rain-snow, ~135 inches precipitation annually on average.
- Bull Run reservoirs refill annually (not multi-year storage) so rely on fall rains to refill.
- Management of reservoirs is sensitive to variability in spring and fall rainfall, and low spring and summer streamflows.



This story begins in 2001

Deterministic planning approach for Infrastructure Master Plan

- PWB extrapolated past trends in demand, assuming growth and higher total demand
- Climate assessment using 4 climate models (forward-thinking!)
- But averaged results across models and ascribed too much certainty by providing specific forecasts calling for more supply.

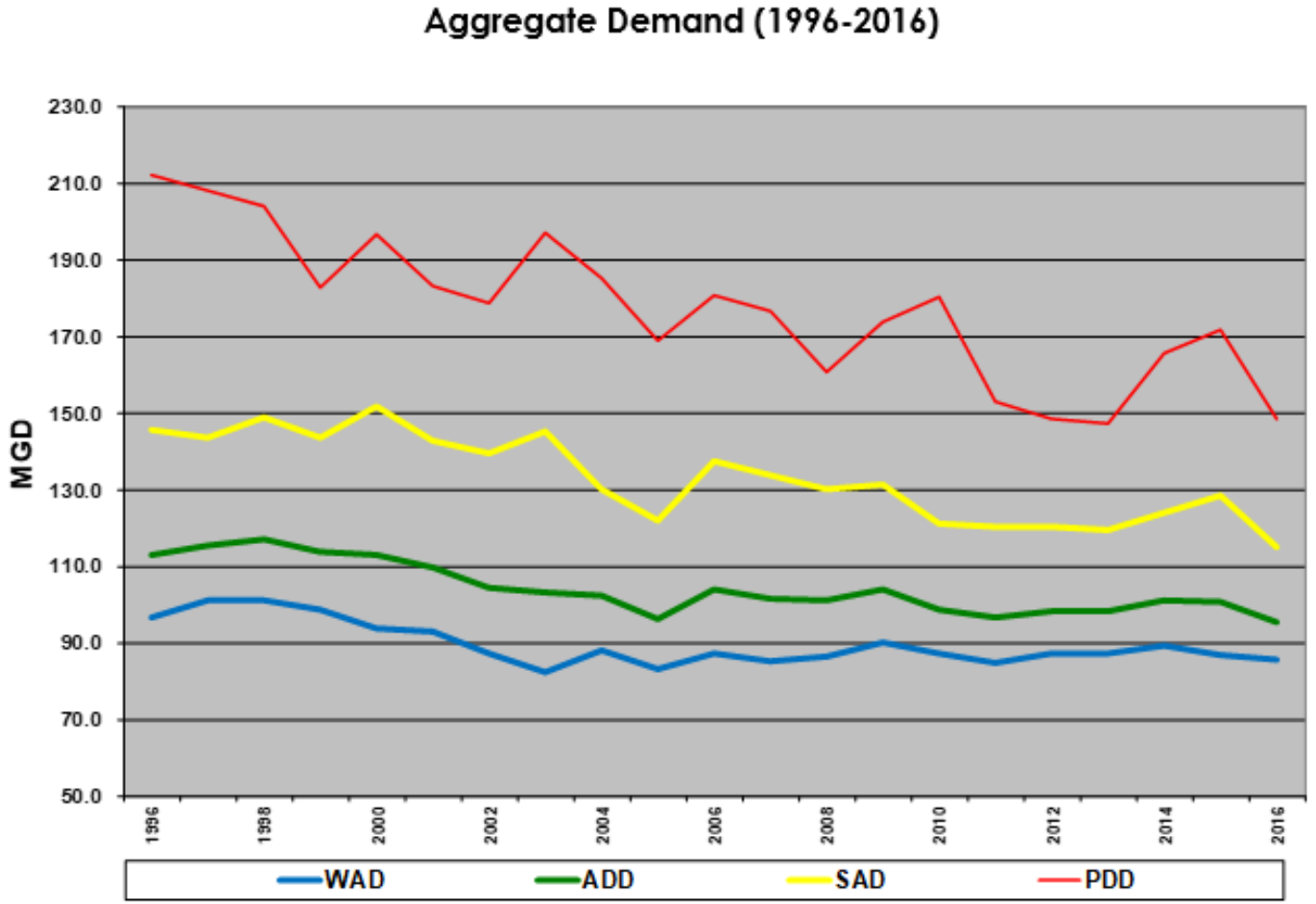
Results incorporated into 2001 IMP:

- ❑ 8 BG supply gap from climate change and increased demand by 2020
- ❑ 9.6 BG supply gap from climate change and increased demand by 2040
- ❑ Expand Dam 1 & 2, or build Dam 3 to meet supply deficit/needs

Fast forward to the future

….But, what really happened?

- Demand decreased
- No need for additional sources
- IMP became outdated very quickly

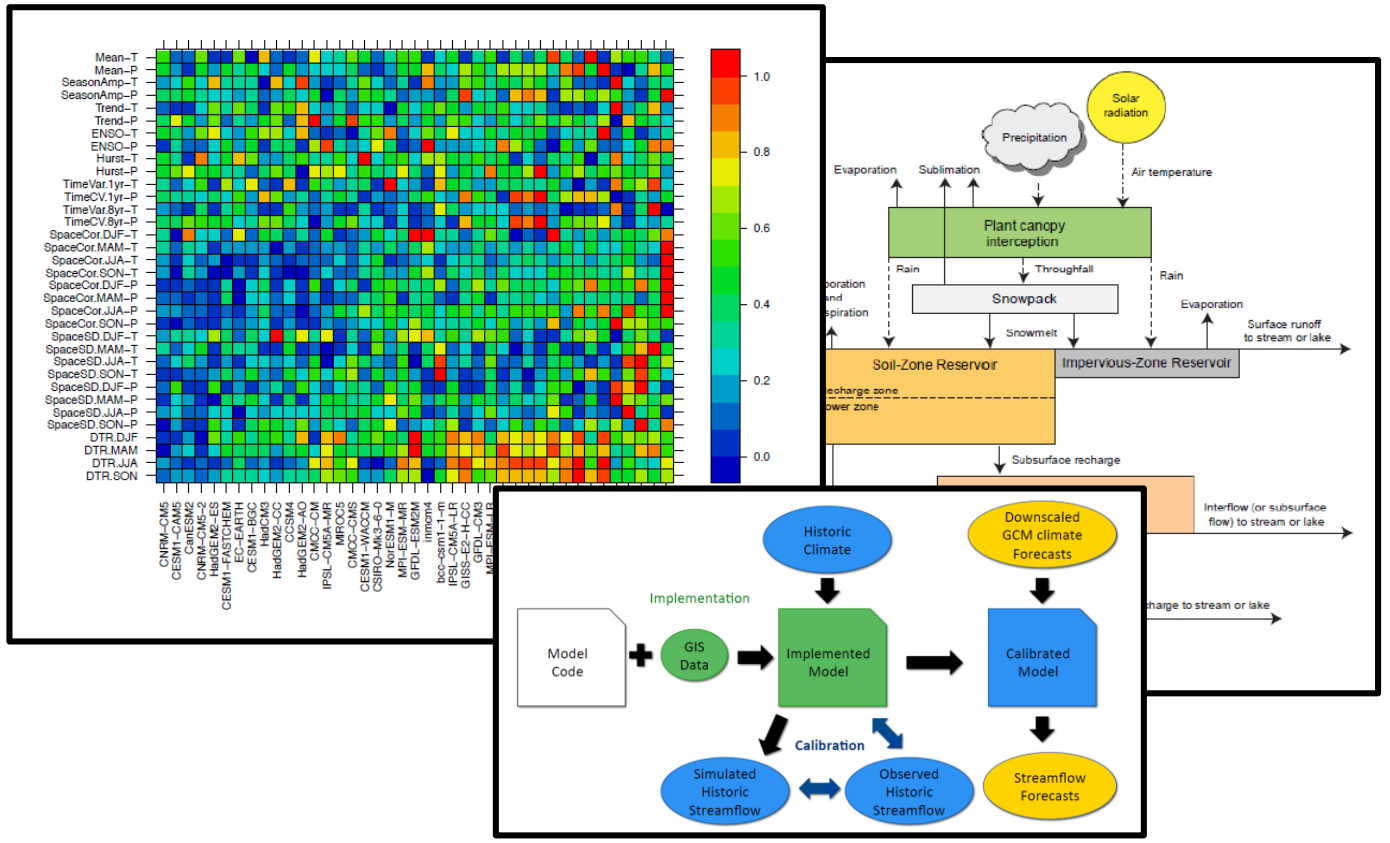


Can science solve this problem?

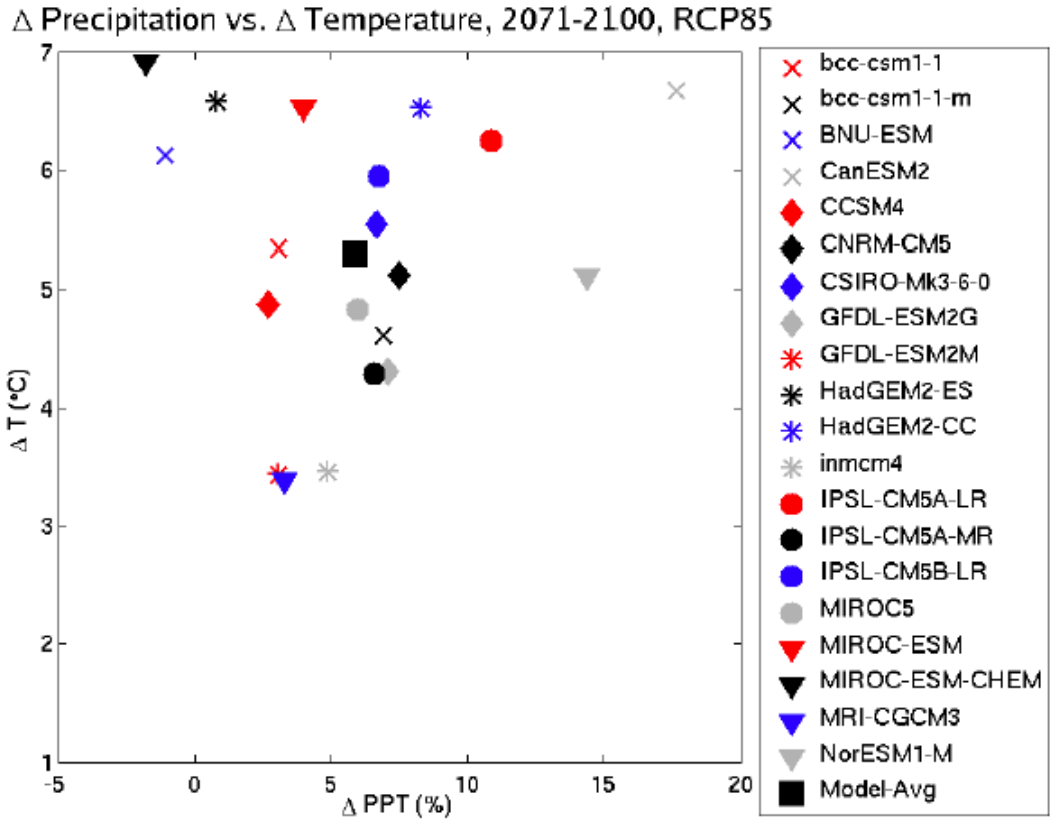
Built capacity & tools to update climate & supply modeling with newer information and data

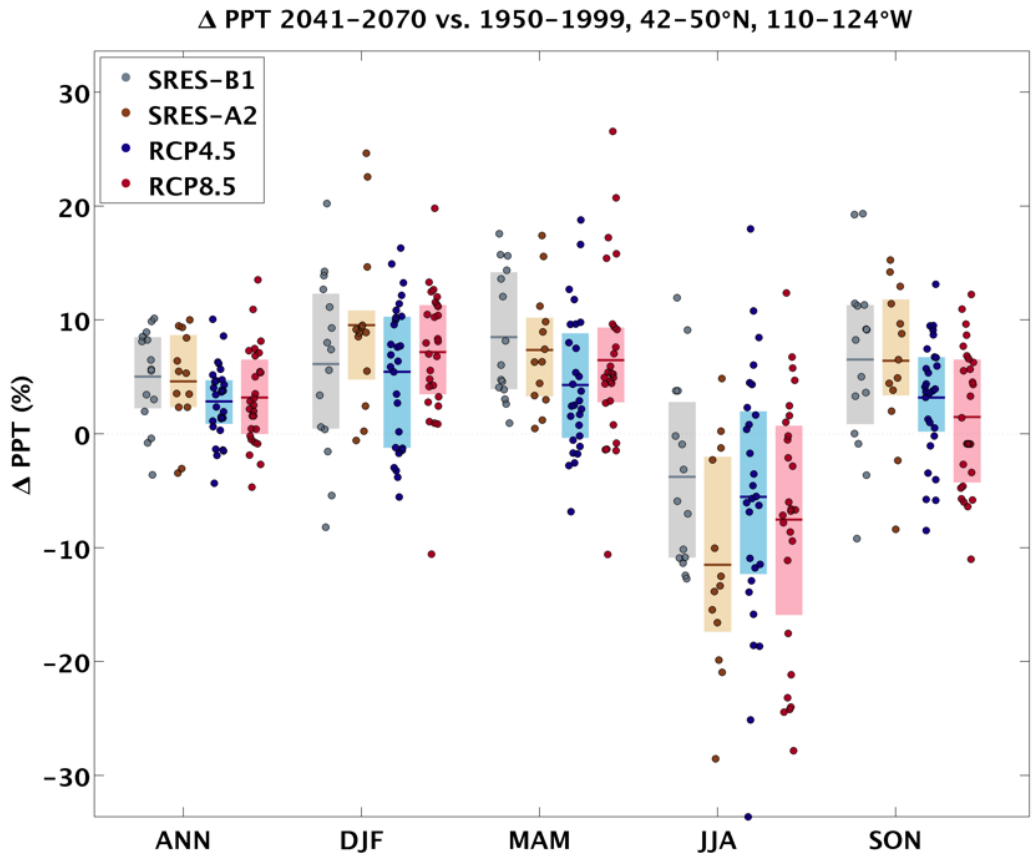
Obtained downscaled climate data for Bull Run to generate future climate-informed hydrology

Assumed more resolution and more local data would give us more clarity



Science can only take us so far…

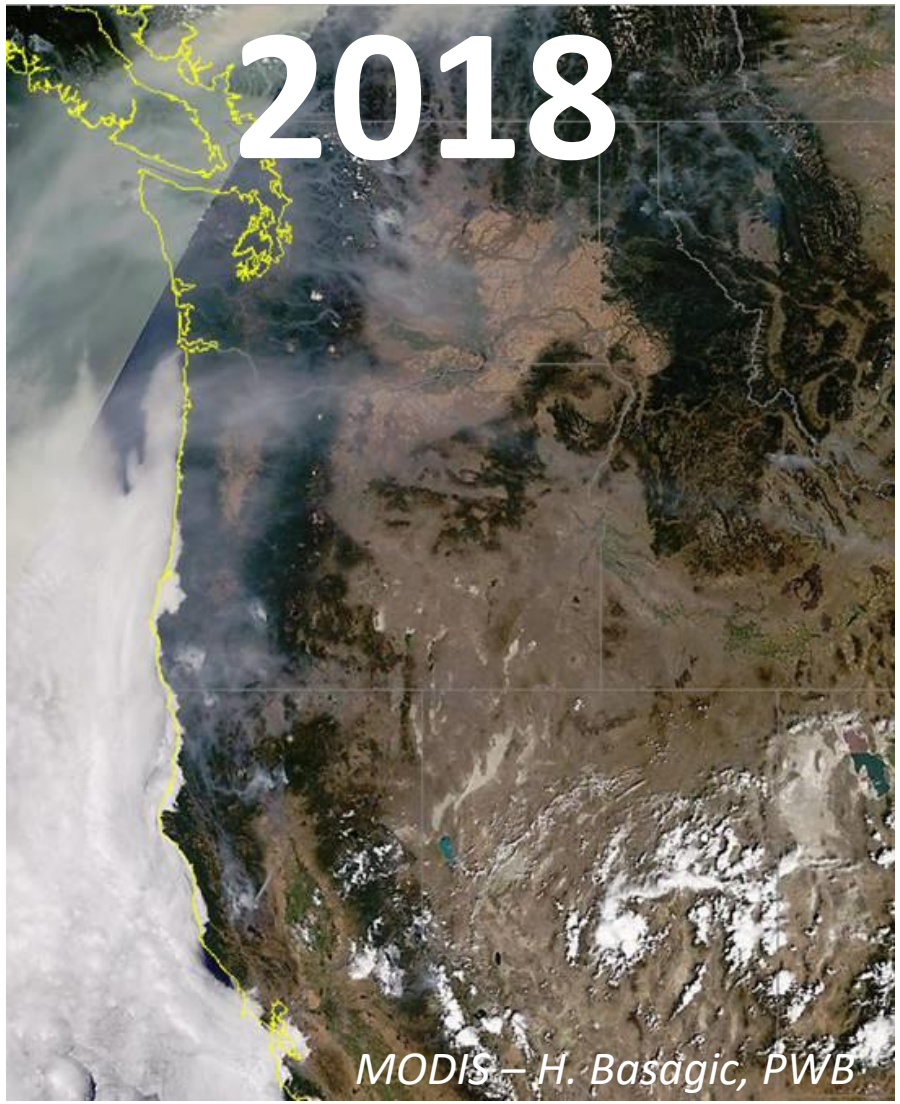




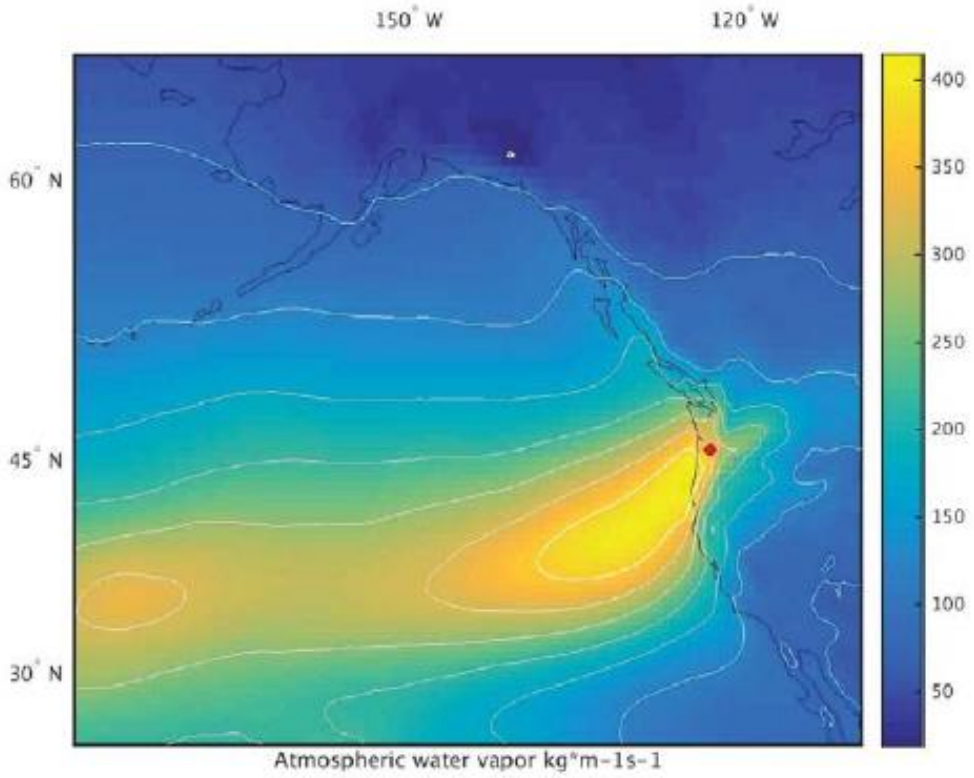
WHAT NUMBER DO I PICK??

In the meantime, a preview of a warmer future

In the meantime, a preview of a warmer future



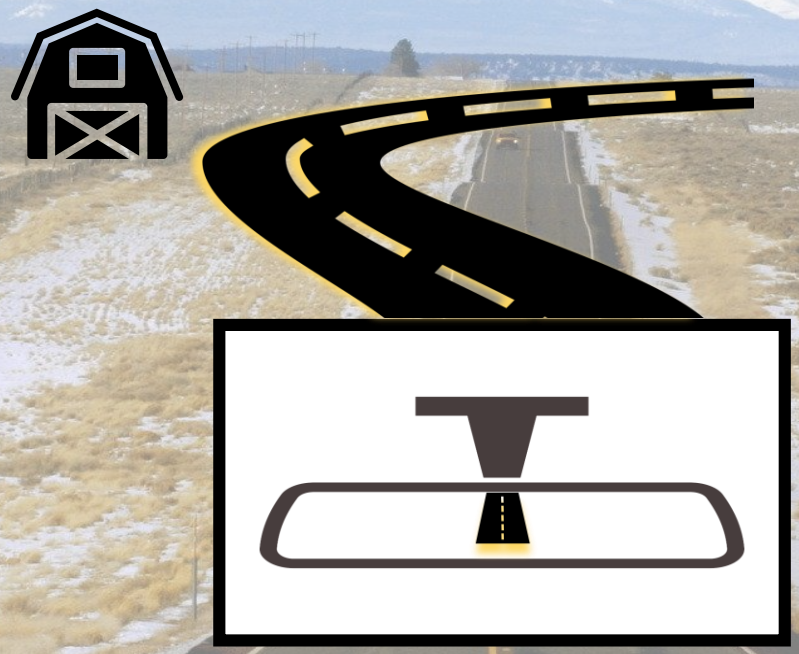
In the meantime, a preview of a warmer future



Loikith, Aragon 2017

Institute for Sustainable Solutions
PORTLAND STATE UNIVERSITY

Can’t keep planning the same way



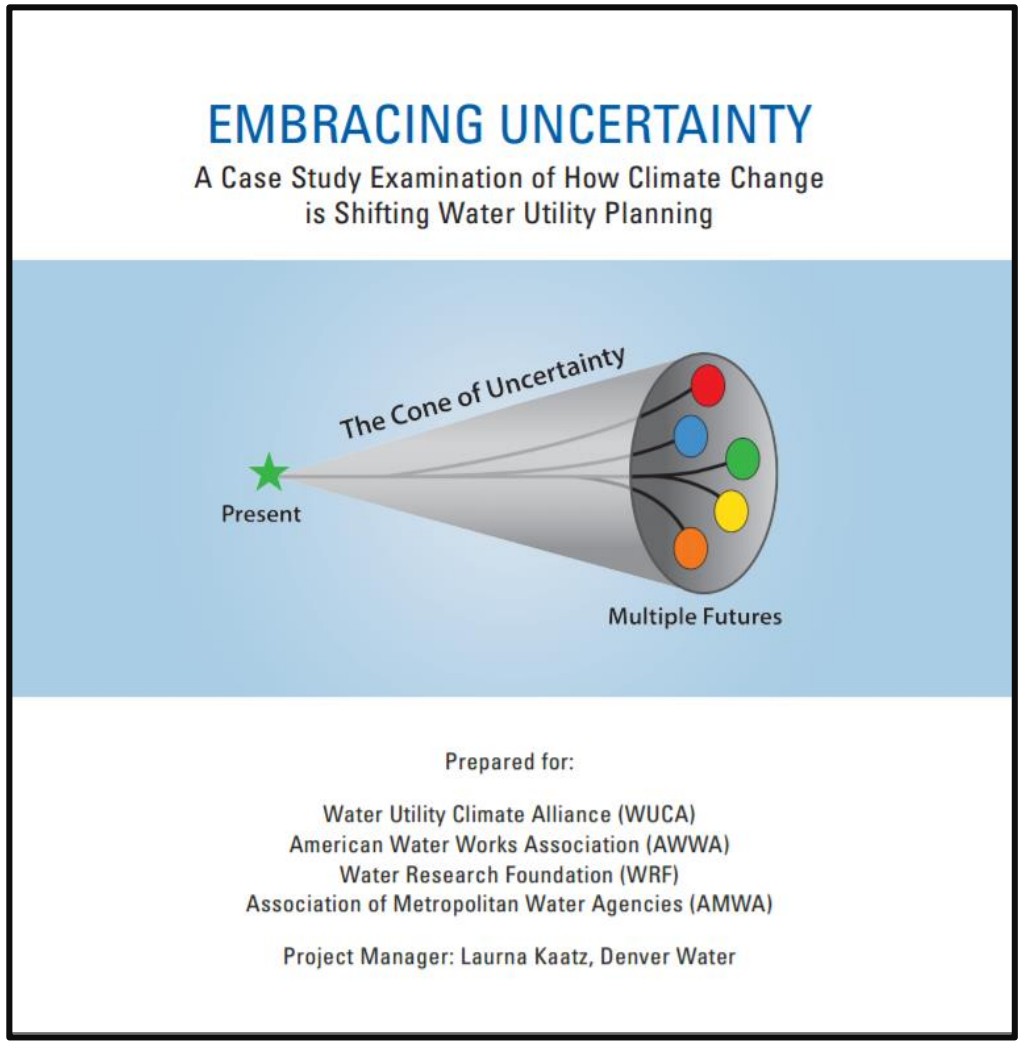
Climate change is the curve in the road ahead

Lessons learned so far

- Deterministic planning becomes irrelevant very quickly
- Historical information can still be useful (e.g. seasonal planning, understanding system vulnerability) but has limitations for long-term planning
- Science cannot “solve” this problem, but going through a process to recognize this is in itself valuable
- Recent events have shown our system is resilient, but are a wake up call to how we need to plan differently in the future to weather future extremes
- Climate change is the curve in the road ahead

HOW DO WE PLAN DIFFERENTLY?

Learning from our peers



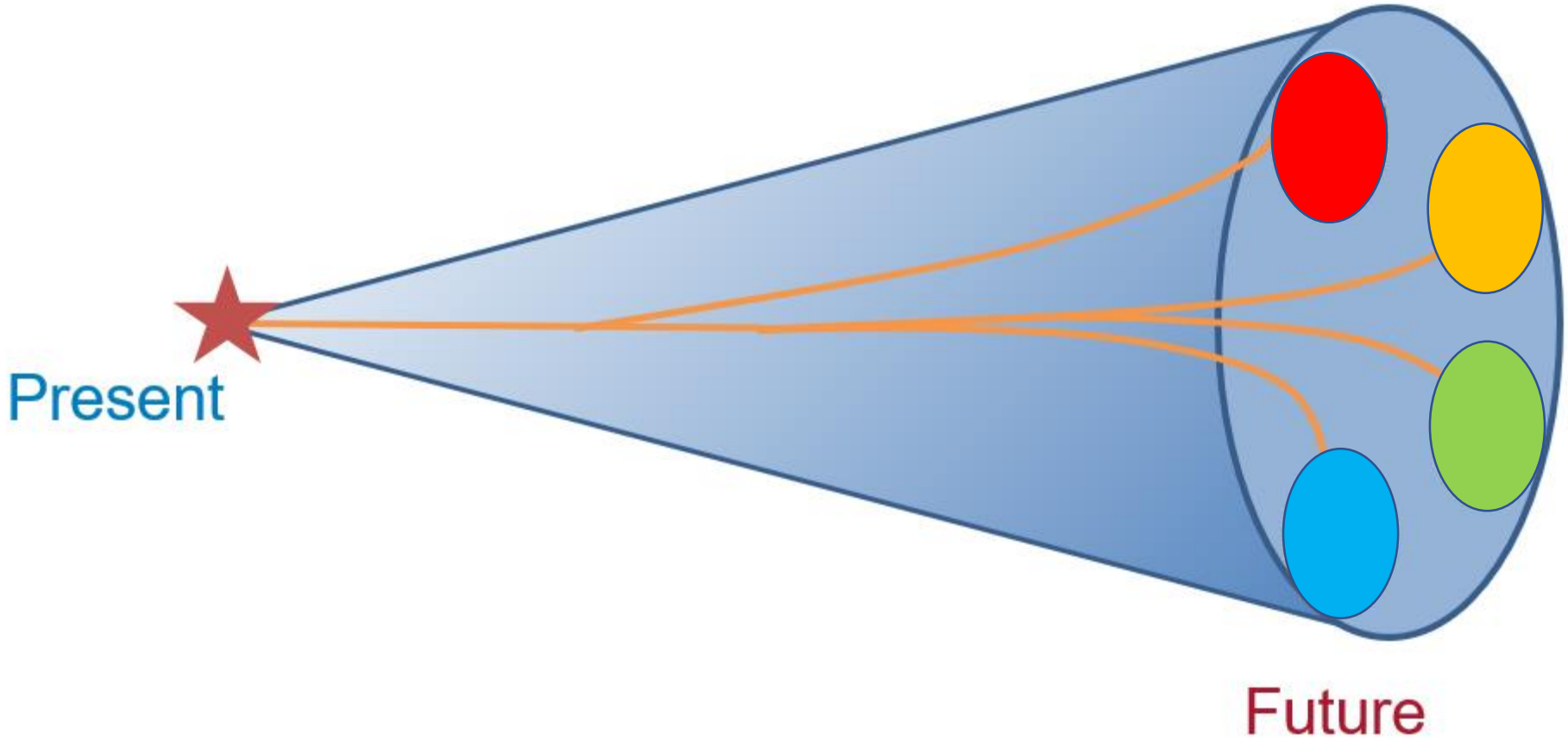
Brandon Goshi
Metropolitan Water District of Southern California

Laurna Kaatz
Denver Water

Learning from our peers

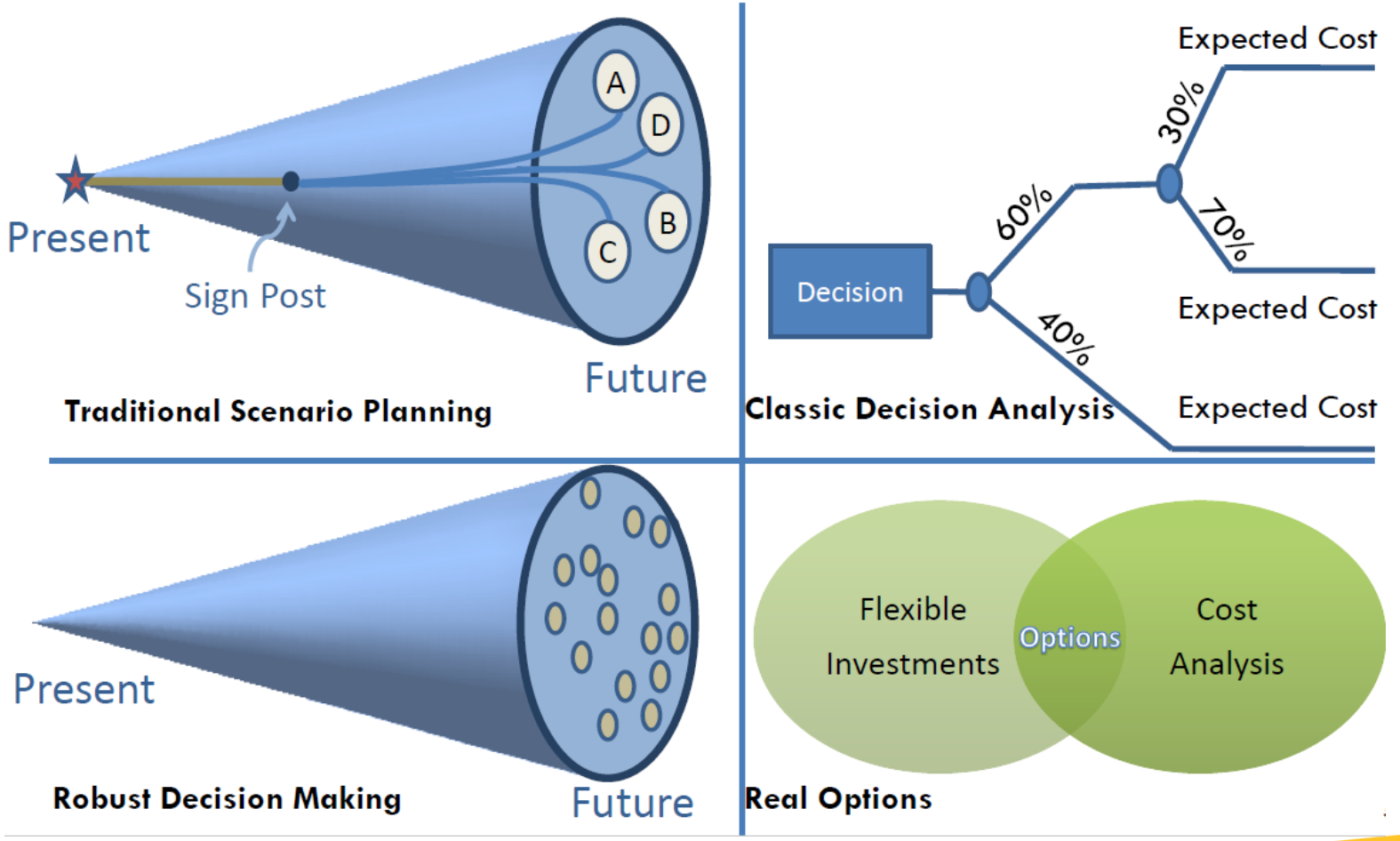
PWB climbs to the top of Mt. Hood

The cone of uncertainty



L. Kaatz, Denver Water

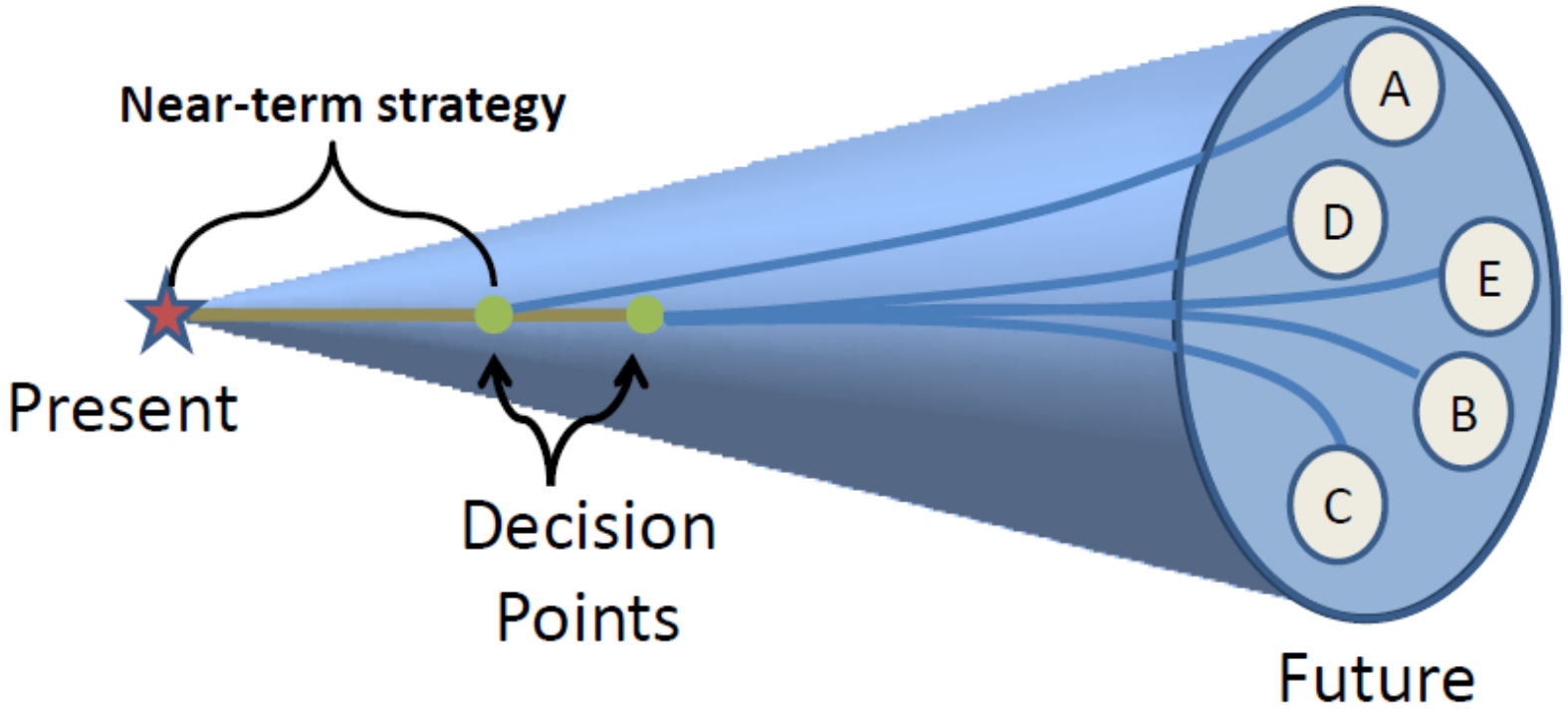
A new approach: Plan for multiple futures



L. Kaatz, Denver Water

Simple but powerful: Scenario planning

Goal is not to predict but make better decisions!

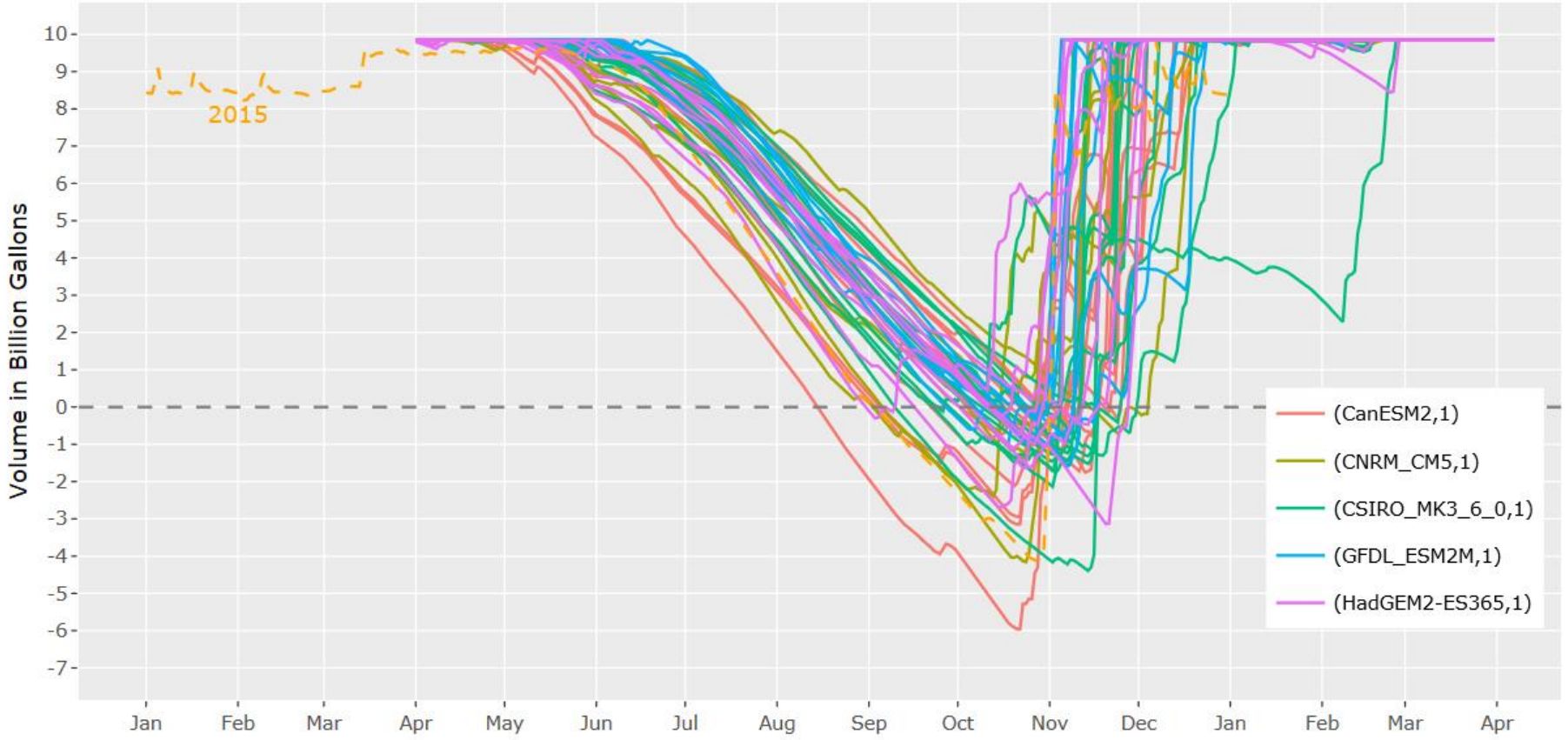


Using climate & supply modeling tools:
Simulate a range of future water supply outcomes

450 projected future reservoir drawdown curves:

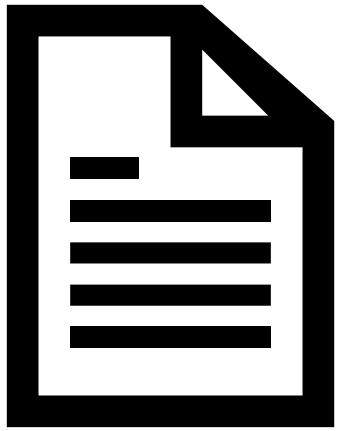
1. 3 demand year forecasts
2. 5 climate models
3. 30 “weather” years

Historic reference: 2015

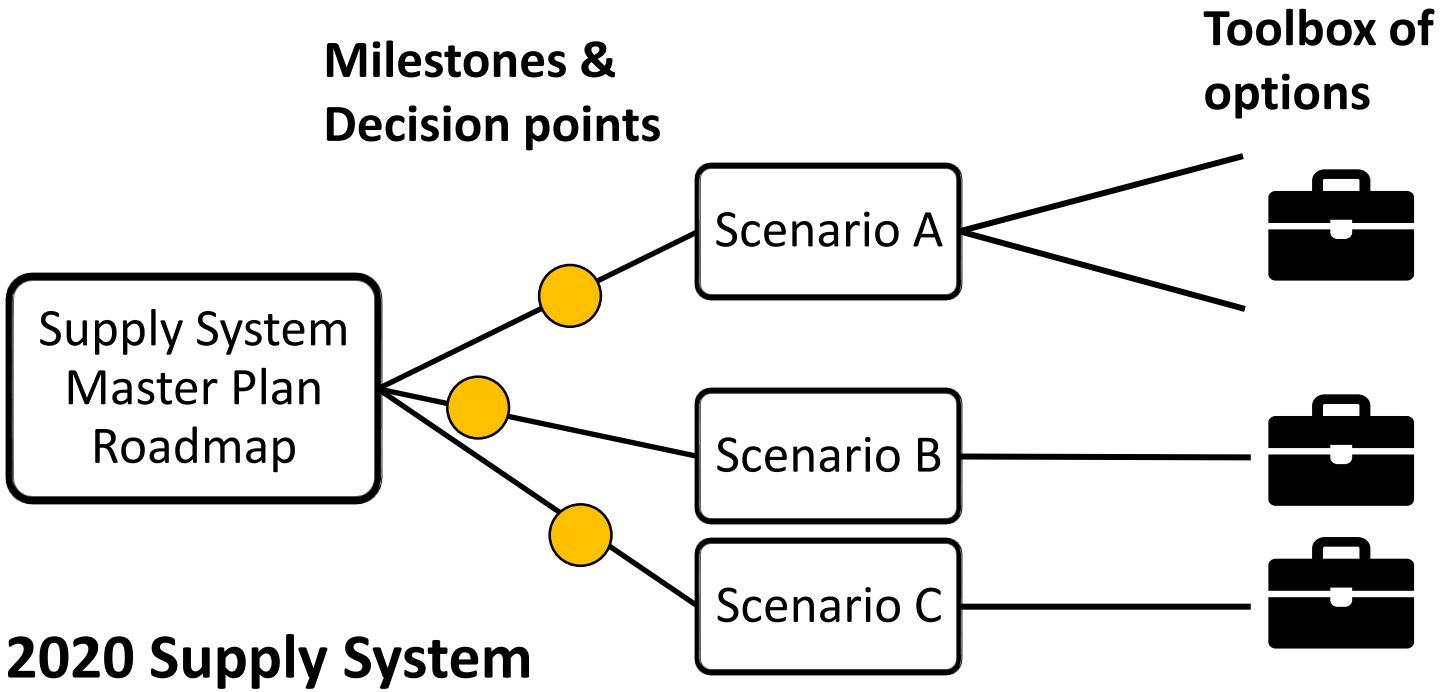


Shift to continuous, adaptive planning *process:*

First up – Supply System Master Plan

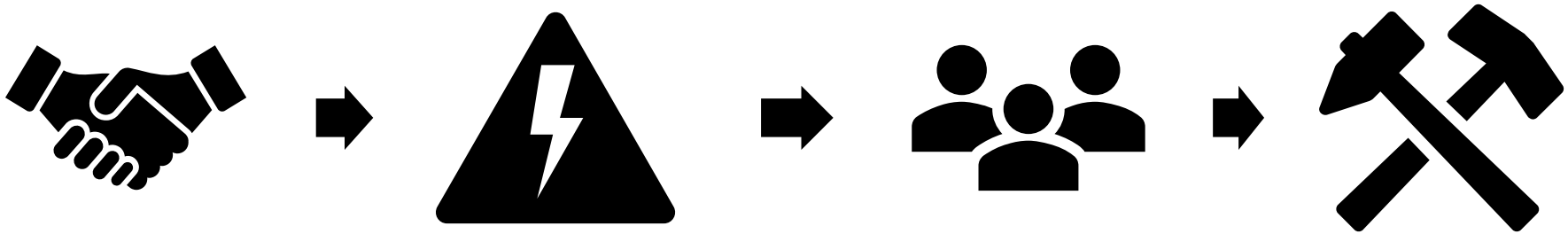


2001 Infrastructure Master Plan (to 2020)



2020 Supply System Master Plan (to 2045 & beyond)

What has enabled PWB's planning to evolve?



Learning from our peers

Anticipating uncertainty & future stressors

Internal champions

Building tools & staff capacity

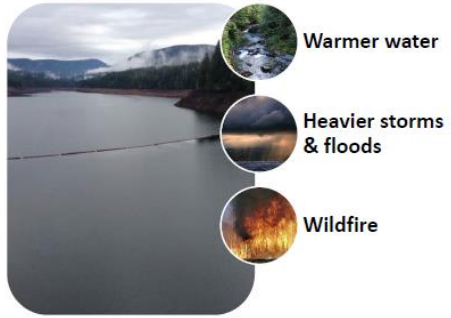
“Uncertainty is an uncomfortable position. But certainty is an absurd one.”

- Voltaire

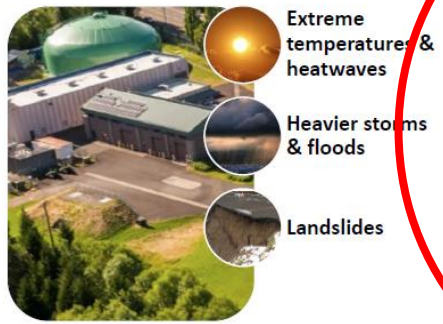
Climate adaptation at PWB:
Plan & prepare for a spectrum of climate risks

Workforce Health & Safety

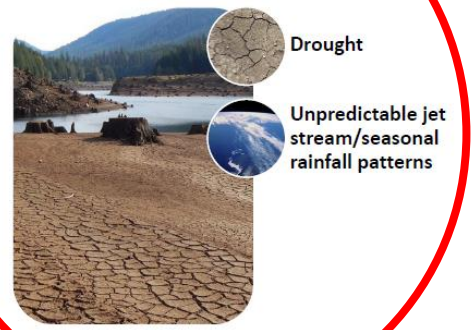
Water Quality



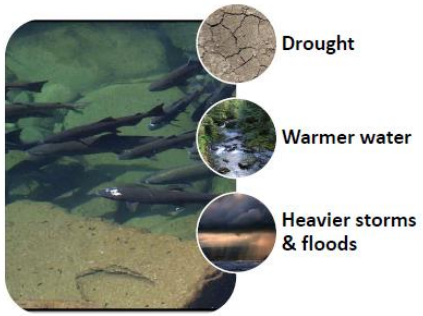
Infrastructure & Assets



Water Supply & Reservoir Storage

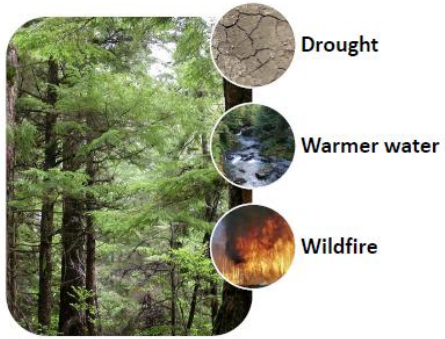


Regulatory Compliance



Financial Risk

Environmental Impacts



Carbon Emissions

Supply planning is one component

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