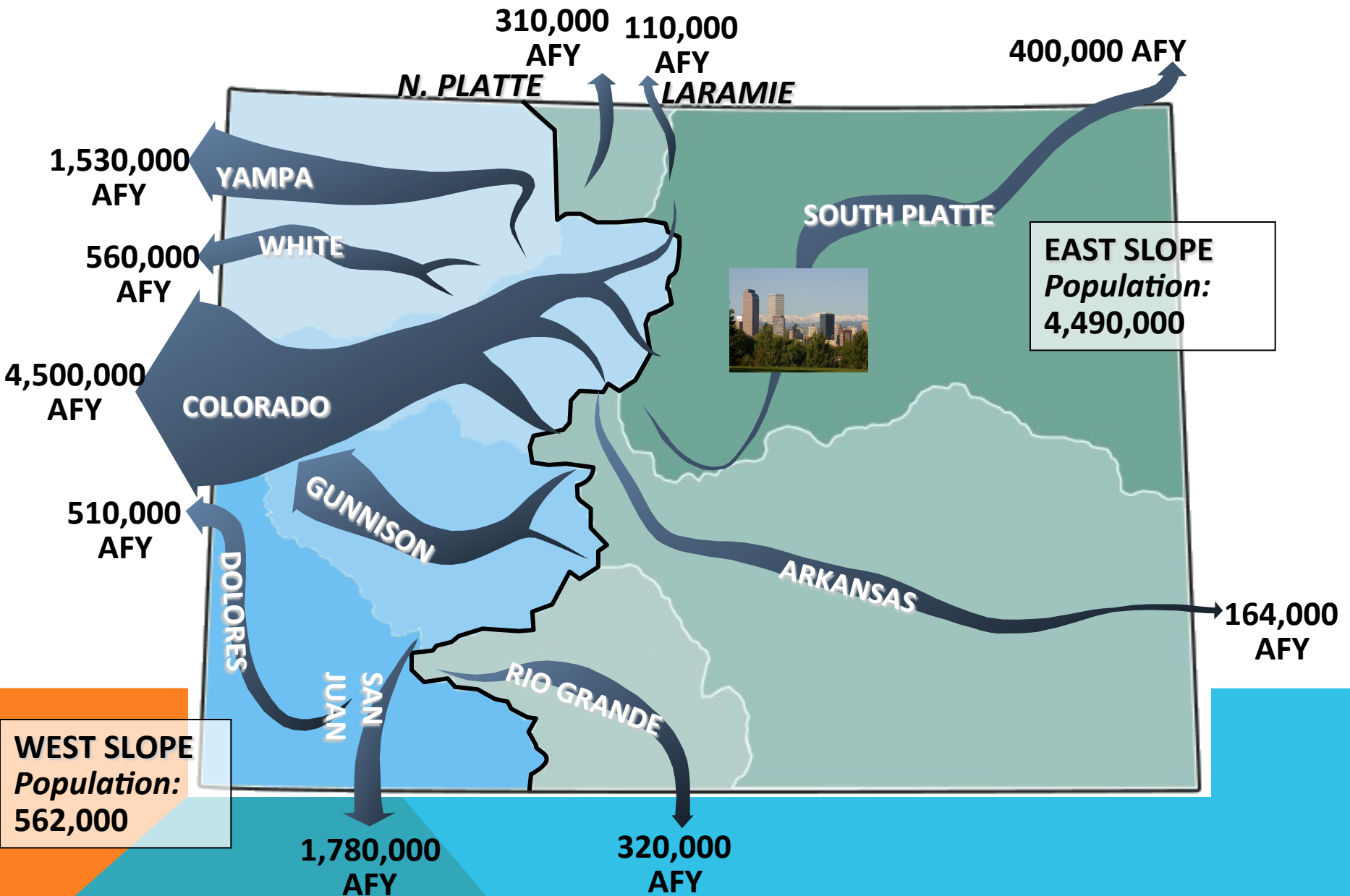




LAURNA KAATZ ~ CLIMATE POLICY ANALYST
AUGUST 15, 2013 ~ WALTER ORR ROBERTS LECTURE

THE TIME FOR CLIMATE ADAPTATION IS **NOW**

COLORADO WATER





ISSUES FACING WATER SUPPLY



Climate change

Drought

Wildfires

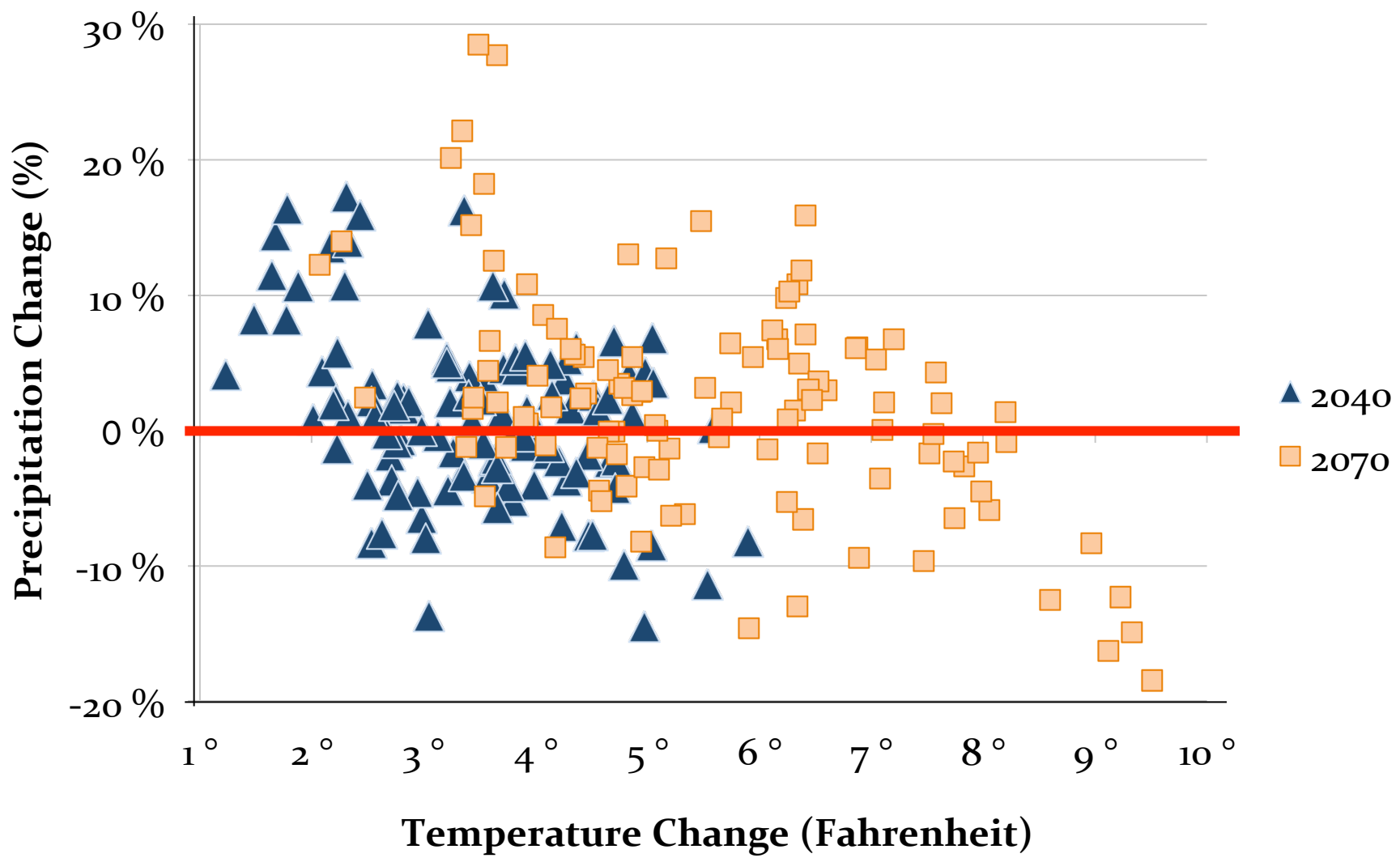
Consumer risk tolerance

Economic uncertainties

Growth

Colorado River Compact call

Projected Changes for North Central Colorado



POTENTIAL IMPACTS TO WATER RESOURCES IN COLORADO

Temperature increases alone will have implications to the hydrologic system:

- Changes in snowpack
- Earlier run-off
- Frequent, extended and intense drought and flood conditions
- Changes in evaporation, soil moisture, sublimation, dust
- Watershed impacts ~ wildfires and vegetation changes
- Water quality degradation
- Changes in water use



OBSERVATIONS: THEY'RE ADDING UP!

Across western North America:

- Warmer temperatures
- Declining late season snowpack
- Northward shifting winter storms
- Increased precipitation intensity
- Worst drought since observations began
- Declines in Colorado river storage
- Vegetation mortality
- Increases in large wildfire frequencies

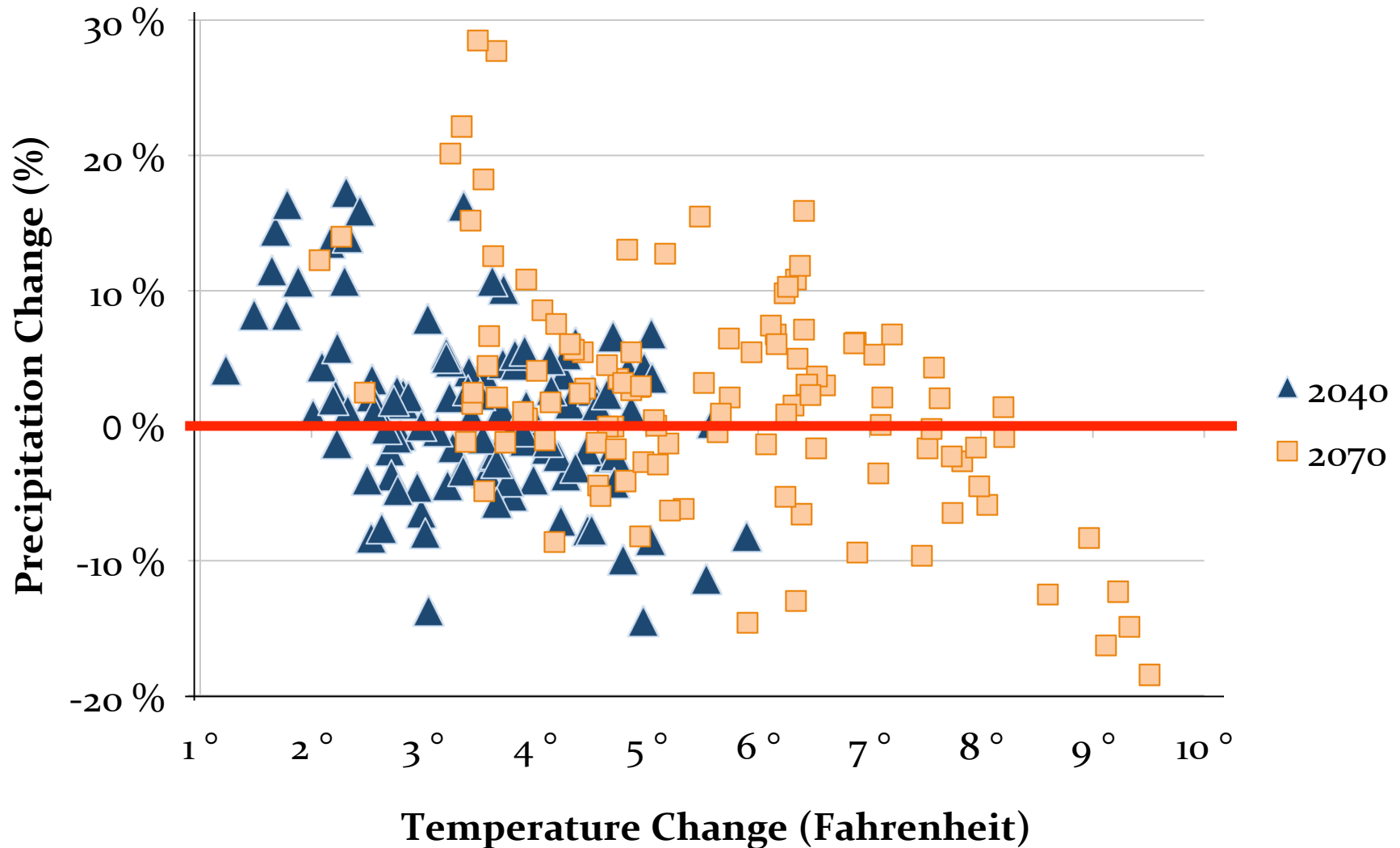
SWCA, 2013;
Overpeck and Udall,
Science 2010

DENVER WATER'S SIMPLE ASSESSMENTS

2009	2° F		5° F	
	Colorado	South Platte	Colorado	South Platte
Precipitation increase to offset warming	4.75%	4.75%	8.25%	11.50%

2010	5° F
	% Change
Yield	-22%
Demand	20%

Projected Changes for Denver's Watersheds



DILEMMAS

What information should be used?

Available data differs from our needs.

Data is not user friendly.

How do we use the data?

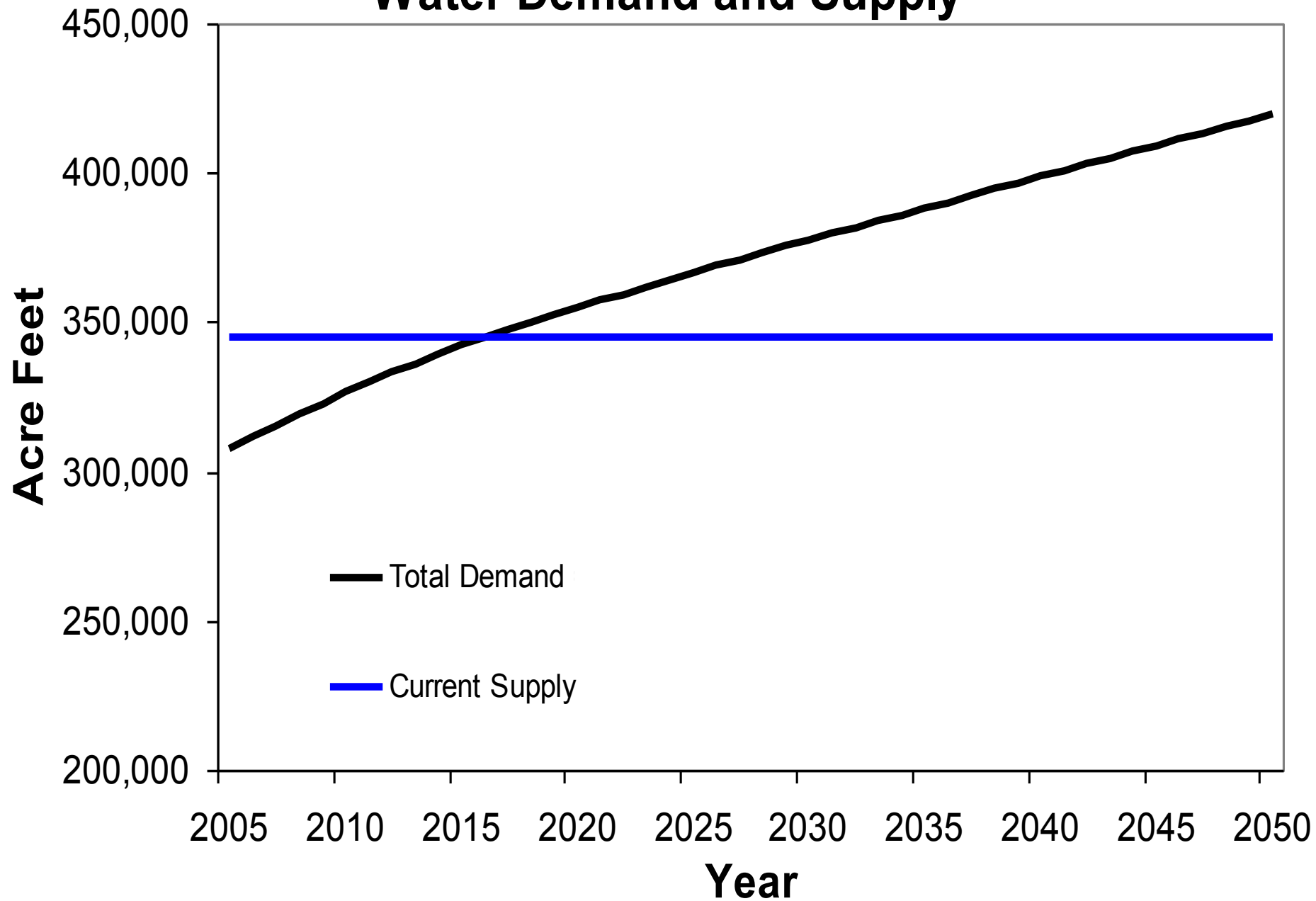
How do you incorporate
uncertainties?

How do you make a long
range plan that will work
for a variety of futures?





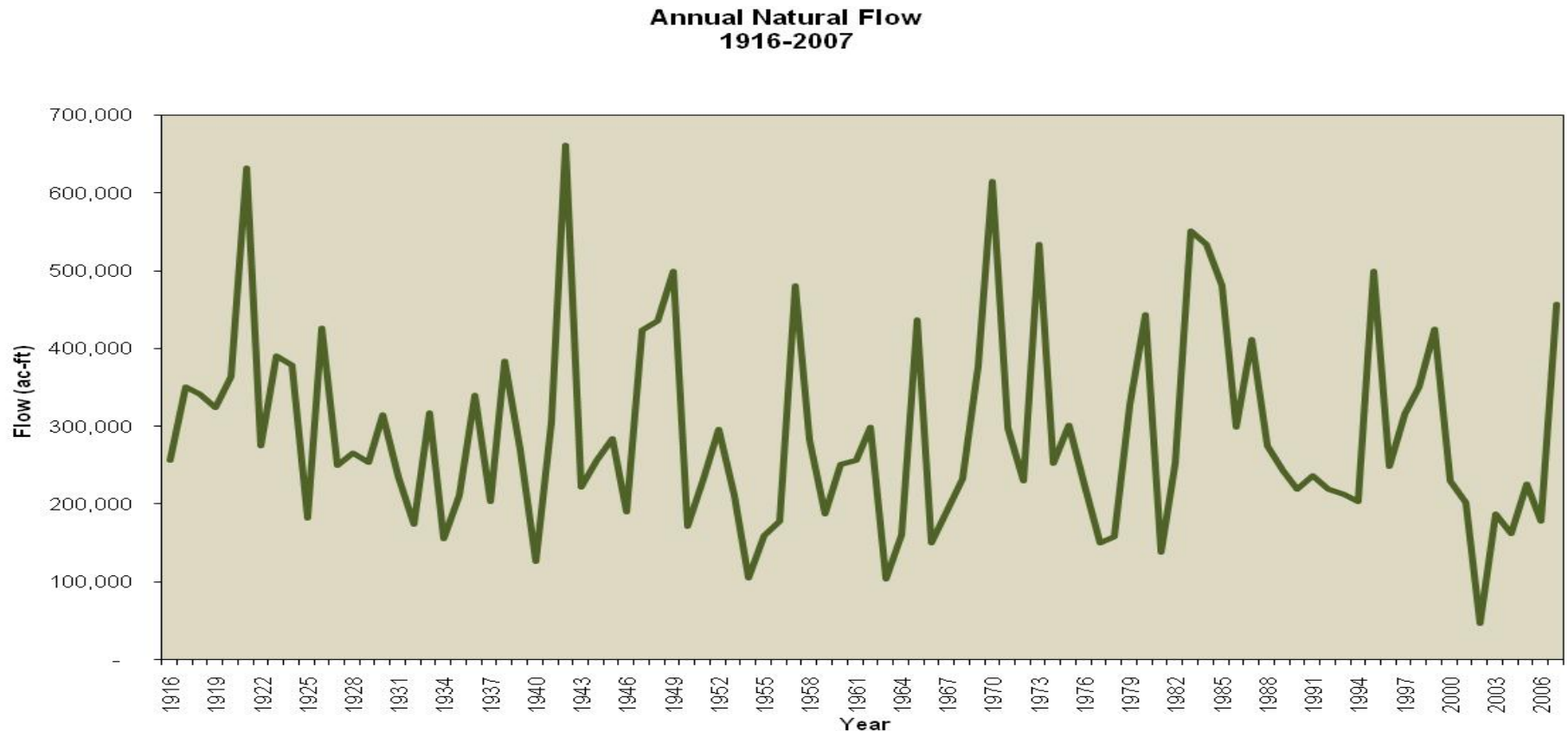
Water Demand and Supply



TRADITIONAL WATER SUPPLY PLANNING

Based on observed weather and hydrology

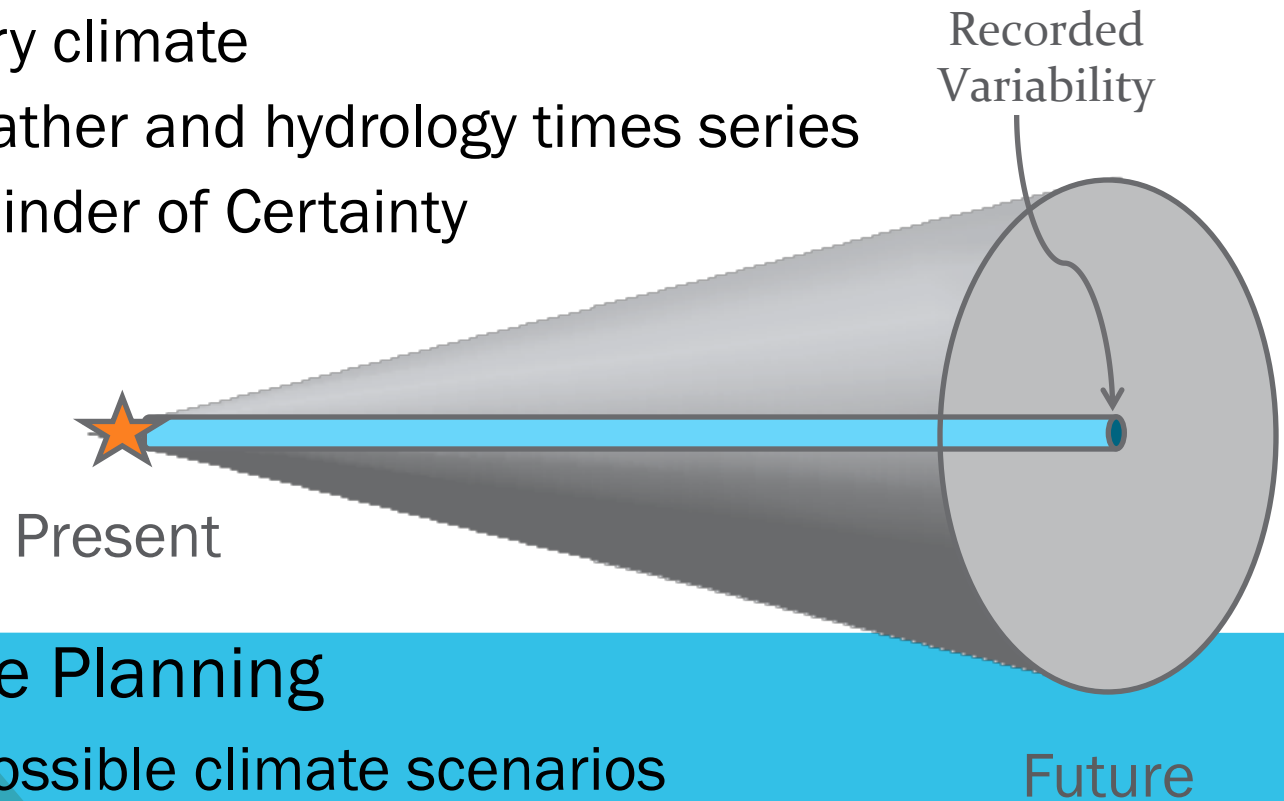
Assumes historic variability, history repeats, stationary climate



CONE OF UNCERTAINTY

○ Conventional Planning

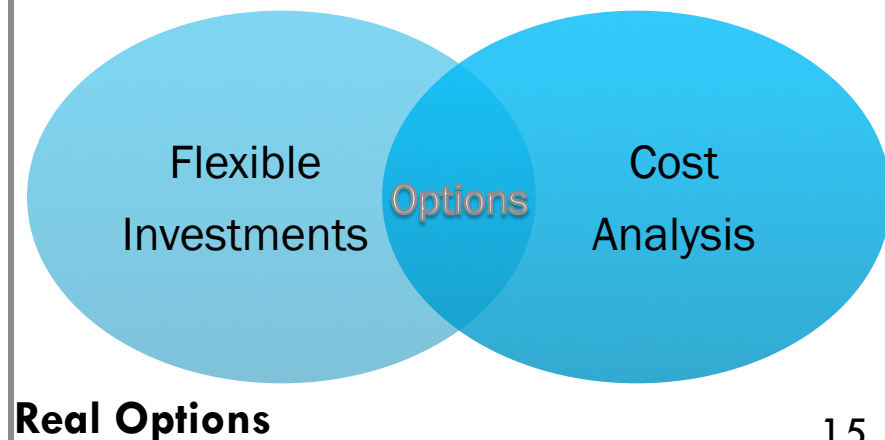
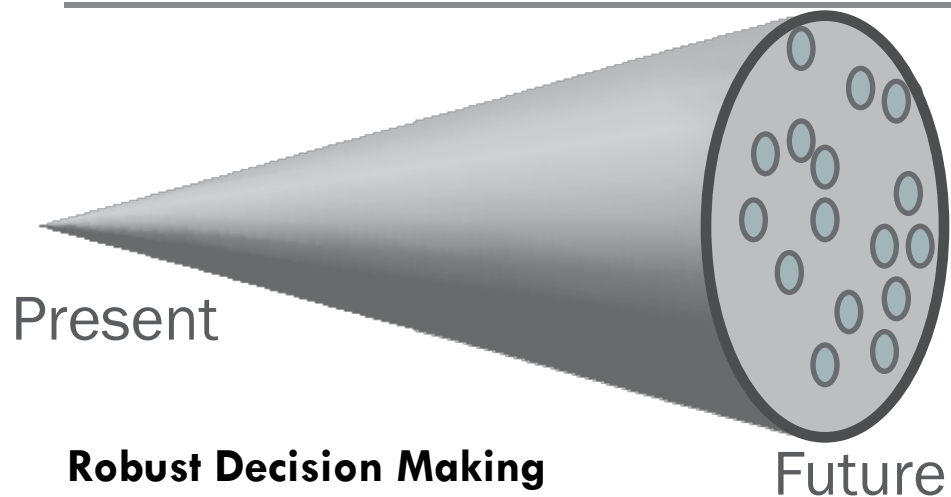
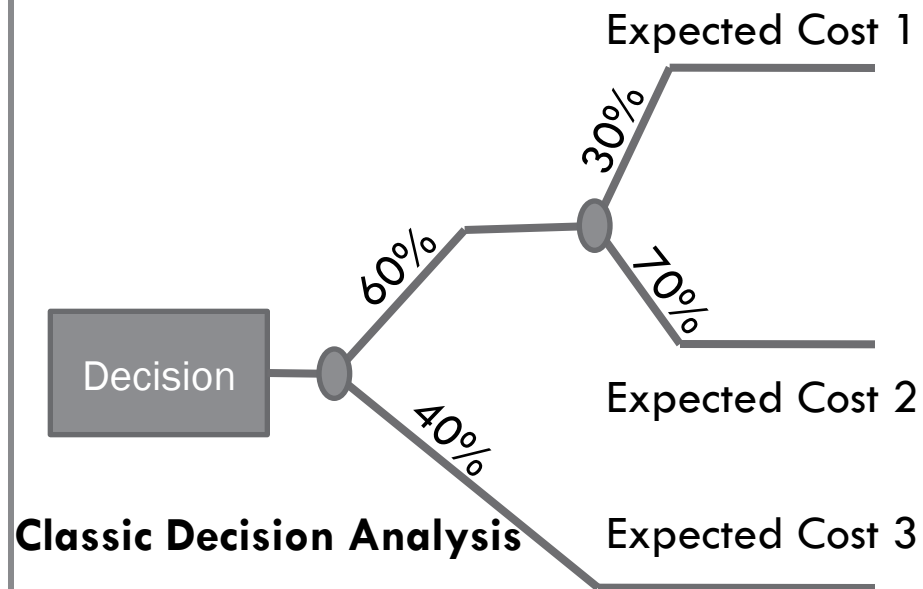
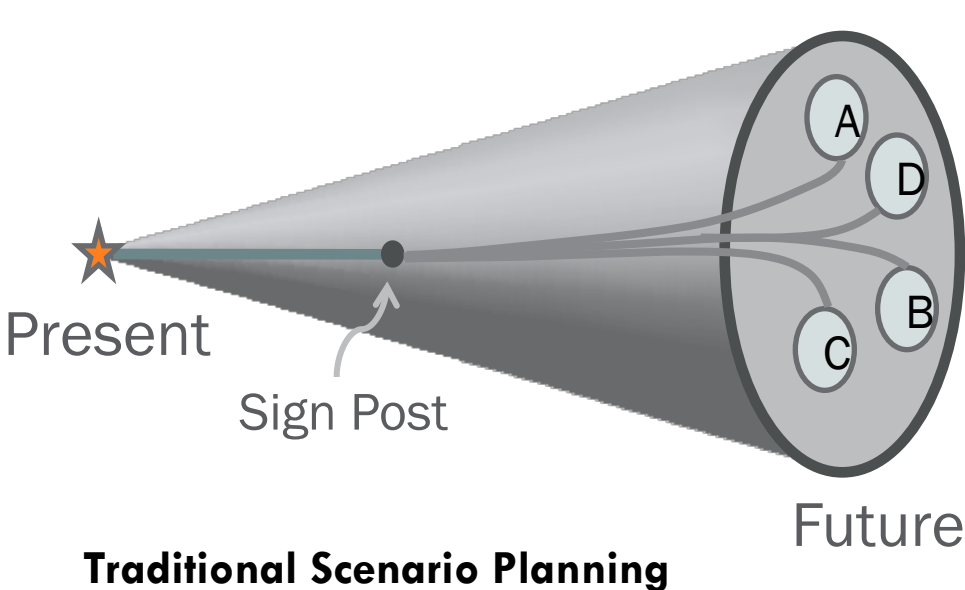
- Assumes stationary climate
- Uses recorded weather and hydrology times series
- Plan inside the Cylinder of Certainty



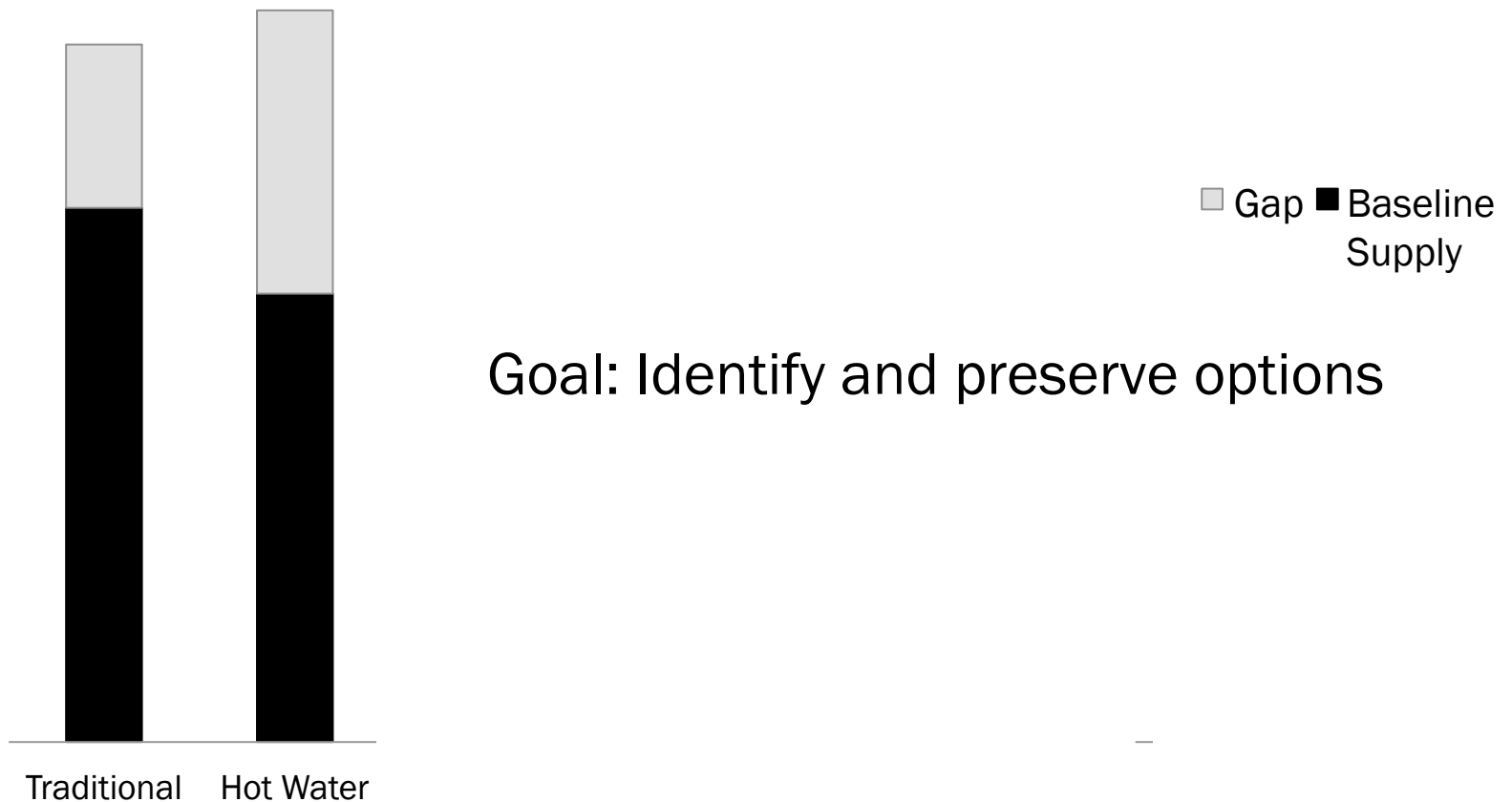
○ Climate Change Planning

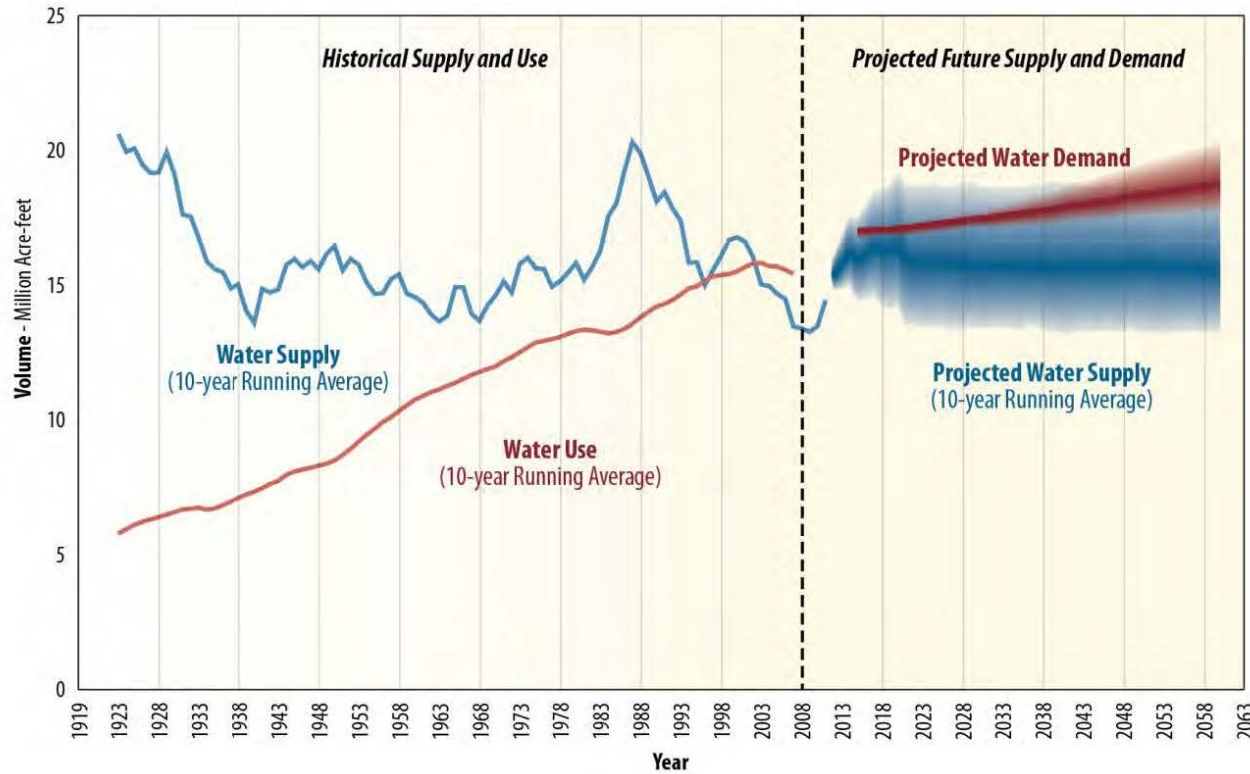
- Hundreds of possible climate scenarios
- Multi-outcome planning
- Robust over optimal

FOUR PROMISING PLANNING METHODS

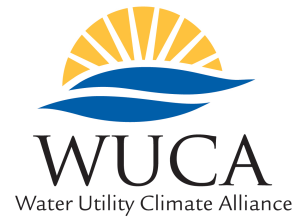


Supply Gaps in 2050



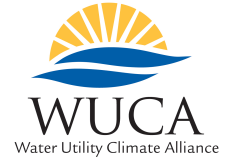


WATER UTILITY CLIMATE ALLIANCE



The Water Utility Climate Alliances provides leadership in assessing and adapting to the potential effects of climate change through collaborative action. We seek to enhance the usefulness of climate science for the adaptation community and improve water management decision-making in the face of climate uncertainty.

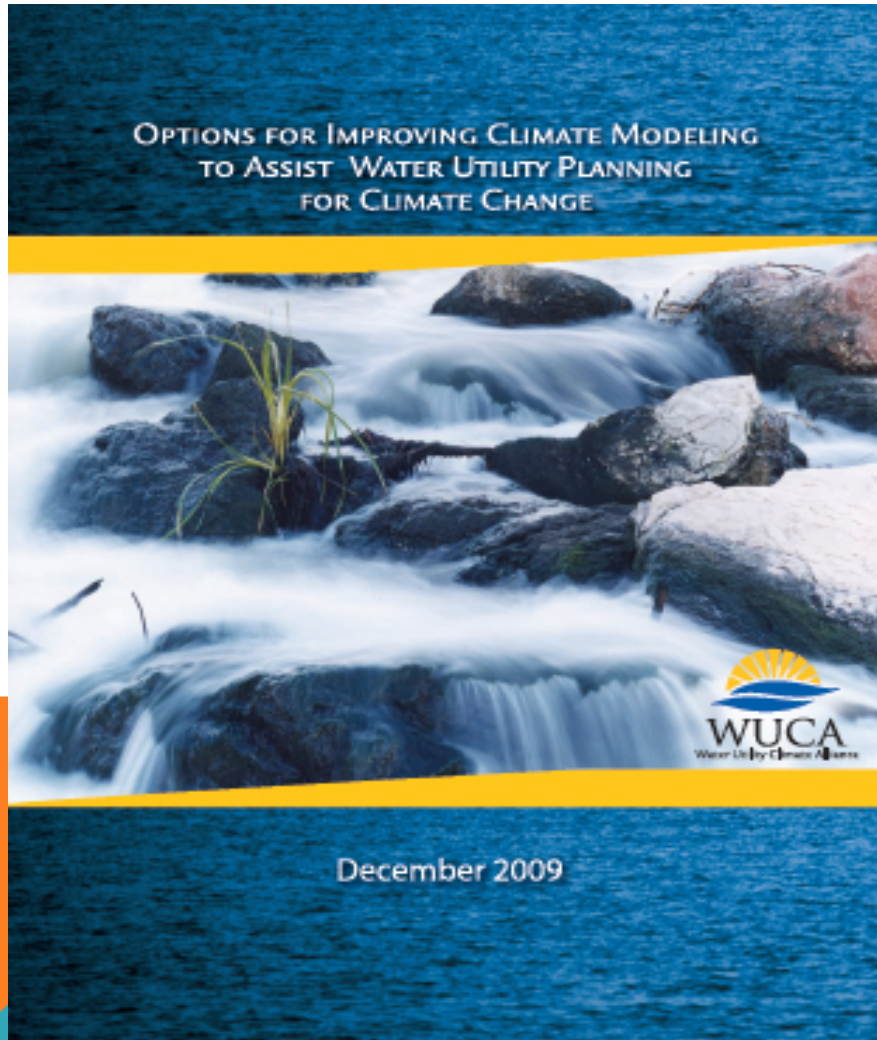
FOUR ADAPTATION STEPS



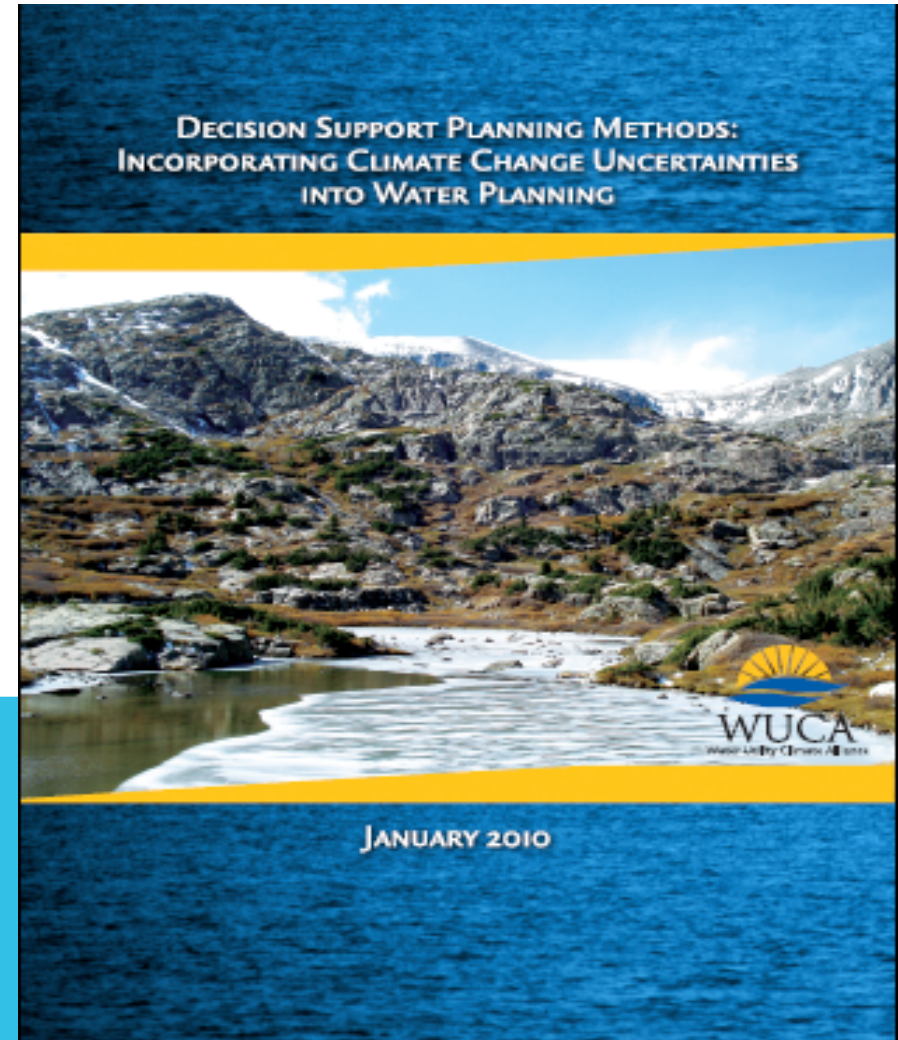
- 1. Understand**
climate science and model projections – capabilities and limitations
- 2. Assess**
water system vulnerabilities to potential change
- 3. Plan**
incorporate climate change uncertainty into water utility planning
- 4. Implement**
adaptation strategies in the face of climate uncertainties

RESOURCES AT WUCAONLINE.ORG

Understanding



Planning



CASE STUDY WHITE PAPER

- What prompted the need to change your planning method?
- What approach was chosen and why?
- What barriers were encountered?
- What level of support did you need and how much engagement was there from boards or city councils?
- Have you made decisions based on climate change information?
- How has this changed the way you view long-term planning?
- Did you discover any surprise findings or new ways of thinking about your system?
- Have you been able to change your organizations thinking from static to dynamic in terms of decisions made outside of the planning group or department?

CONCLUSIONS

Get on with it.

Plan for multiple futures.

Focus on the process not the result.

Look towards low regrets planning - increase system reliability, diversity, and flexibility.



“All I’m saying is now is the time to develop a plan to deflect an asteroid.”



THANK YOU

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