BUREAU OF RECLAMATION

Reclamation Basin Studies: Overview and Examples

Upper San Pedro Partnership
Policy Advisory Commission Meeting,
February 9, 2022

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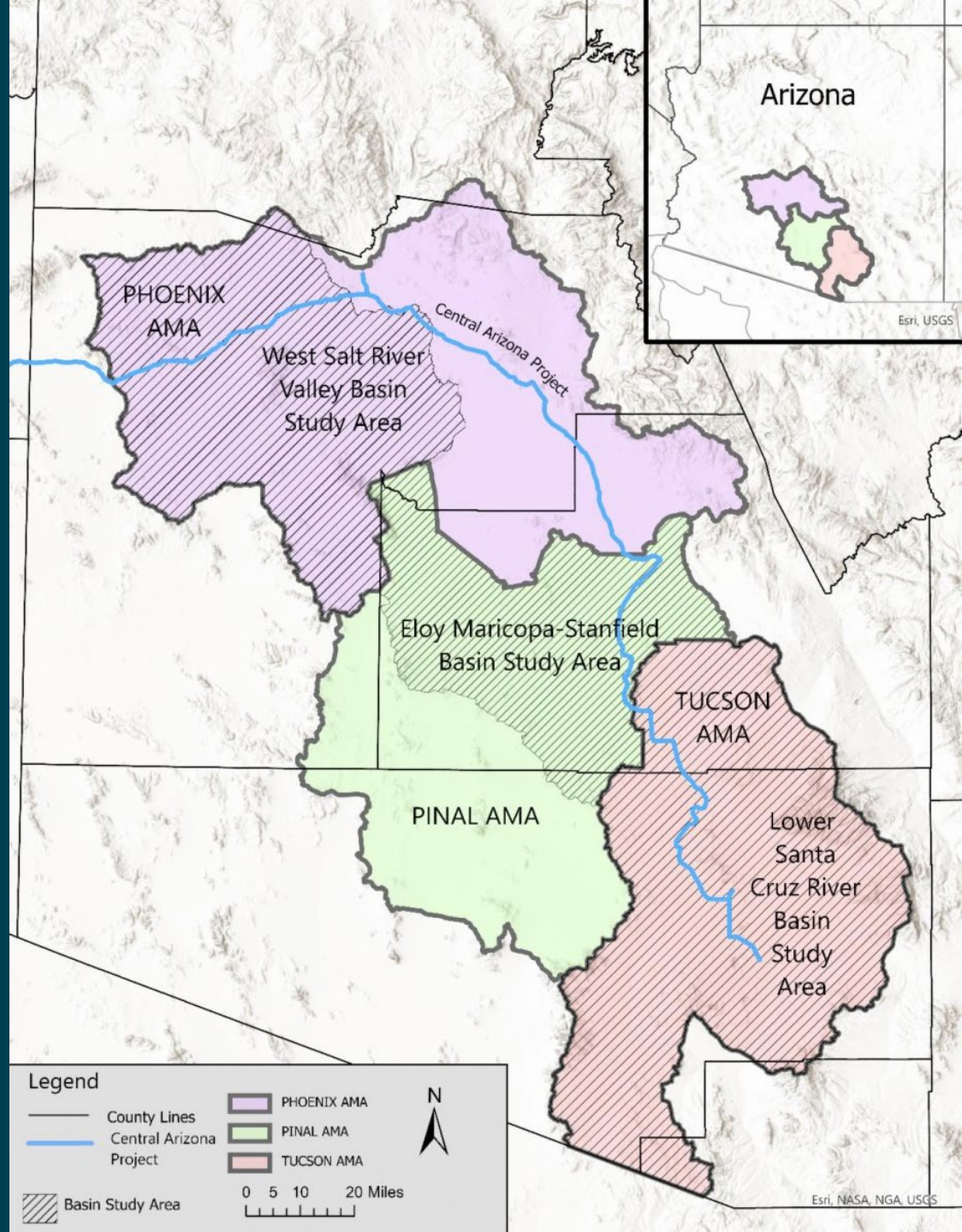
Phoenix Area Office



Presentation Outline

- Motivation
- What is a Reclamation Basin Study?

5 min.

- Reclamation Basin Studies in Arizona
  - West Salt River Valley
  - Lower Santa Cruz
  - Eloy-Maricopa Stanfield
- What could an Upper San Pedro Basin Study look like?

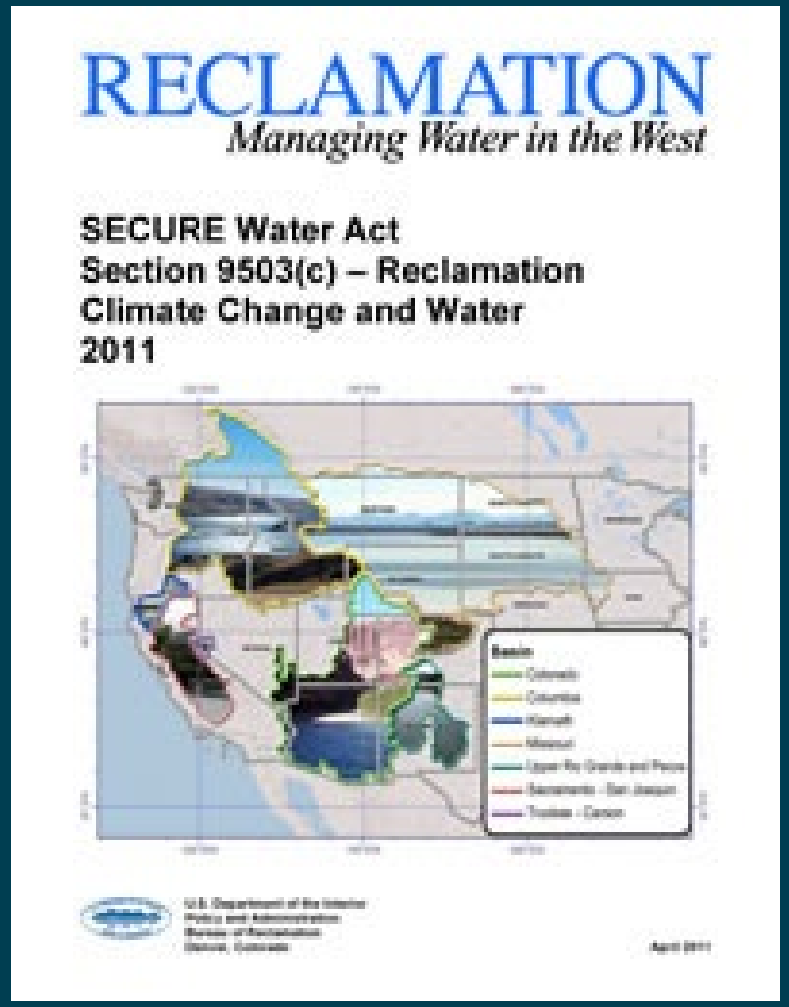
15 min.

- Questions and Discussion

10 min.

SECURE Water Act of 2009

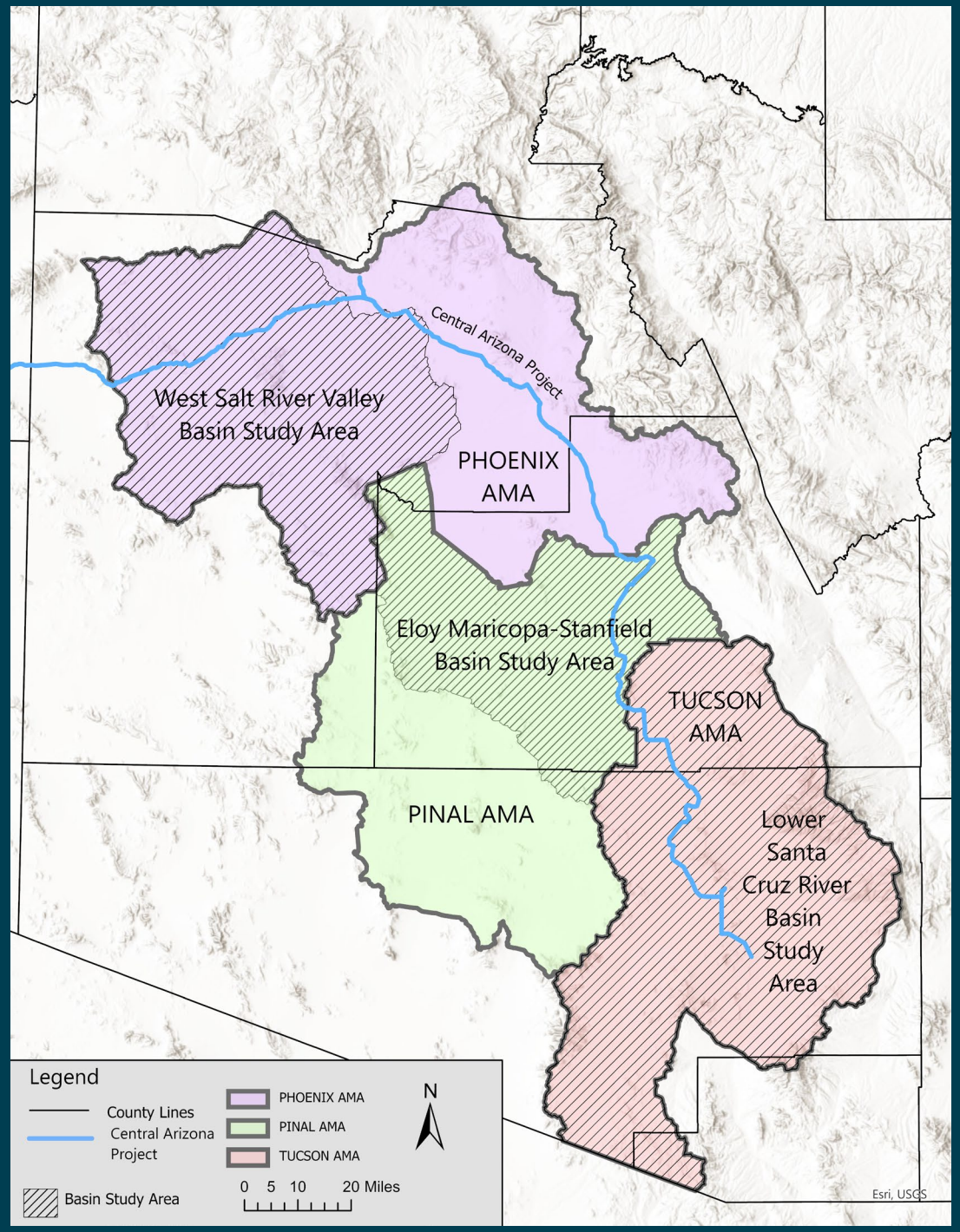
- Directs the Secretary of the Interior to establish a climate change adaptation program to:
  - Assess risks to water supply
  - Analyze the impacts of changes in water supply on a variety of demands
  - Develop adaptation strategies in consultation with non-Federal participants


RECLAMATION
Managing Water in the West

SECURE Water Act
Section 9503(c) – Reclamation
Climate Change and Water
2011

Reclamation Basin Studies in Arizona

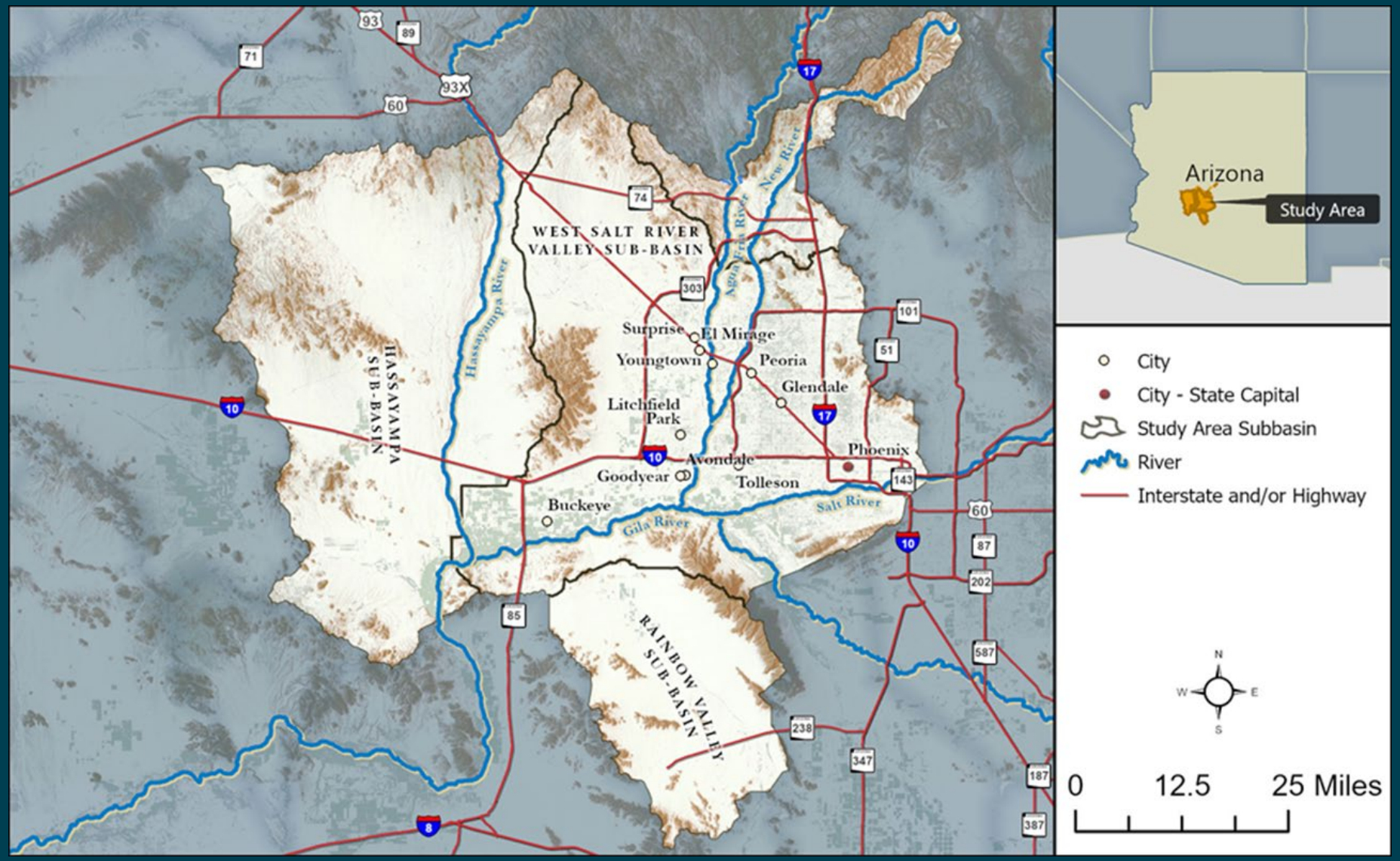
- West Salt River Basin Study
- Lower Santa Cruz River Basin Study
- Eloy Maricopa-Stanfield Basin Study



Four elements of a Reclamation Basin Study

Element 1	Element 2	Element 3	Element 4
Project future supply & demand imbalances, including effects of climate change	Evaluate risks to infrastructure & other systems	Develop & investigate adaptation strategies (structural and non-structural)	Perform trade-off analysis of strategies

West Salt River Valley Study Area



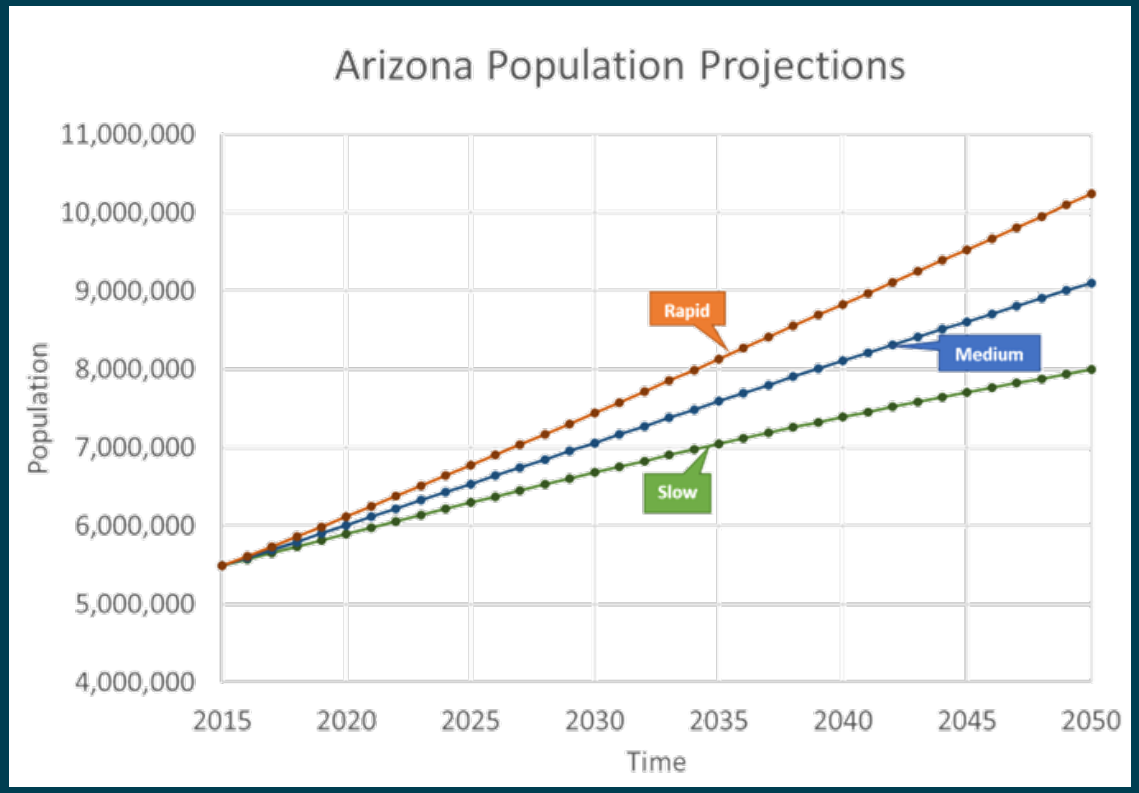
Climate Change Analysis

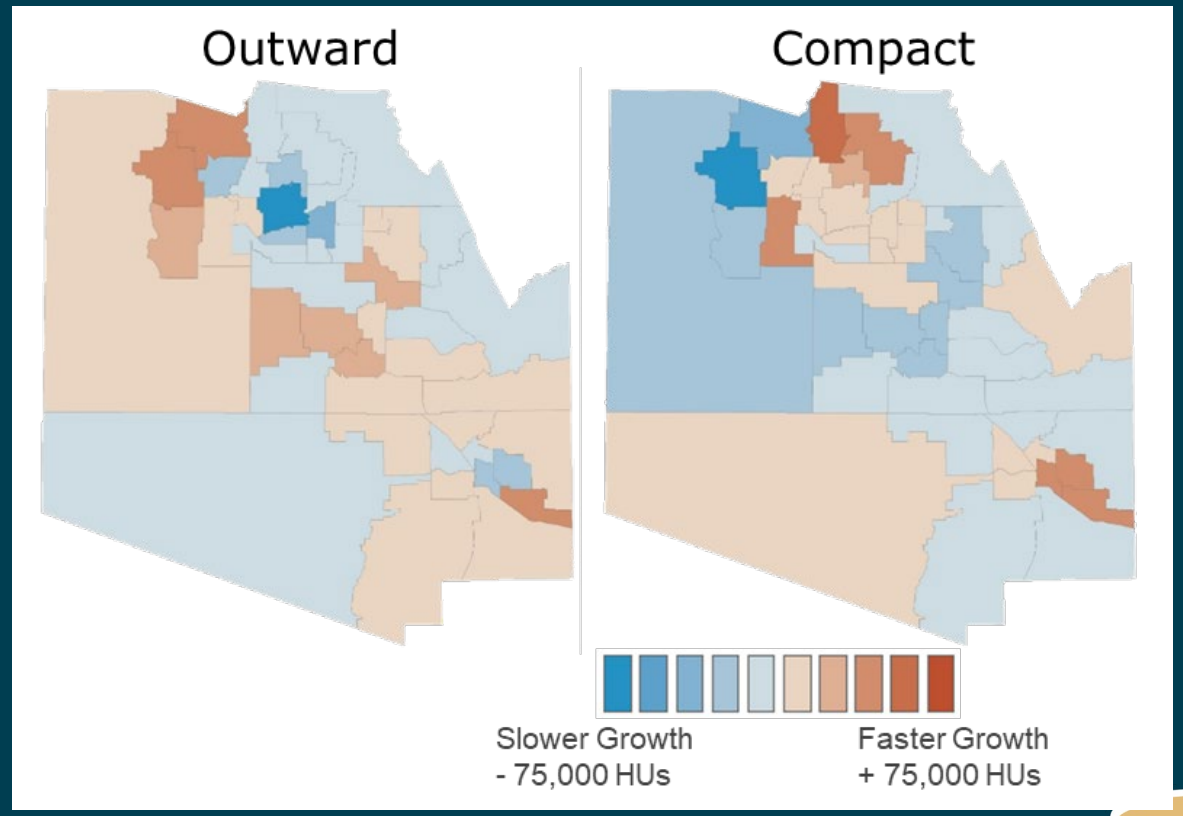
Climate Change analysis performed by Reclamation TSC.
Change factors were provided for key locations and ET for groundwater modeling

Historical, 1950-1999	Basin Mean	
	Temperature (°F)	Precipitation (in)
Baseline	59.3	15.9
Climate Change Scenarios, 2060s (2045-2074)	**Projected Change in Basin Mean**	
	Temperature (°F)	**Precipitation (%)**
Hot Dry (HD)	+ 6.9	- 12.9
Hot Wet (HW)	+ 6.6	+ 10.0
Central Tendency (CT)	+ 4.6	- 0.6
Warm Dry (WD)	+ 3.6	- 10.2
Warm Wet (WW)	+ 2.8	+ 8.8

Projected Change in Mean Annual Basin-wide Temperature and Precipitation for the Climate Change Scenarios Based on CMIP5 BCSD Projections; Historical Period, 1950- 1999; Future Period, 2060s (30-year range, 2045-2074).

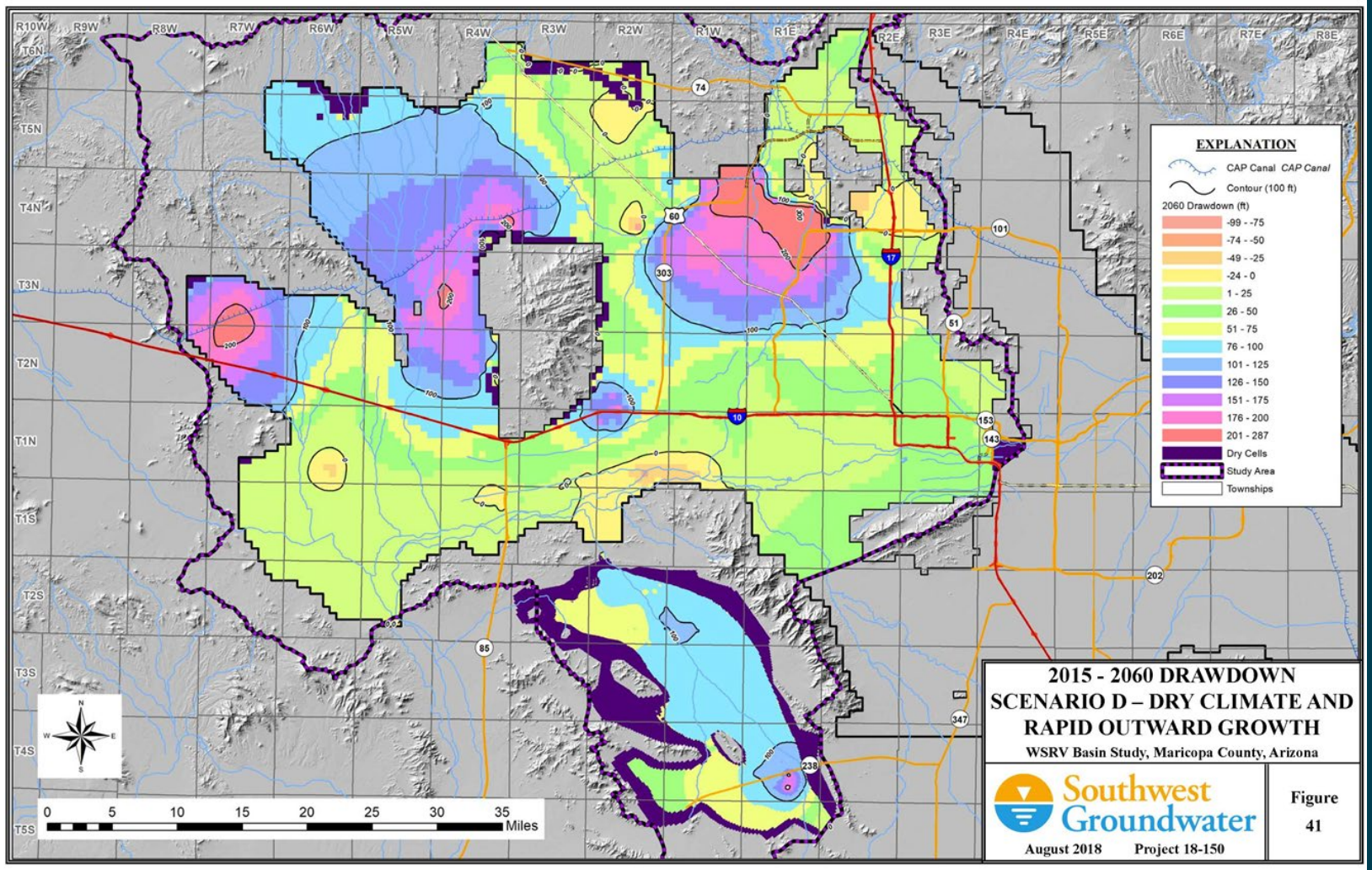
Population growth projections varied based on location and rate





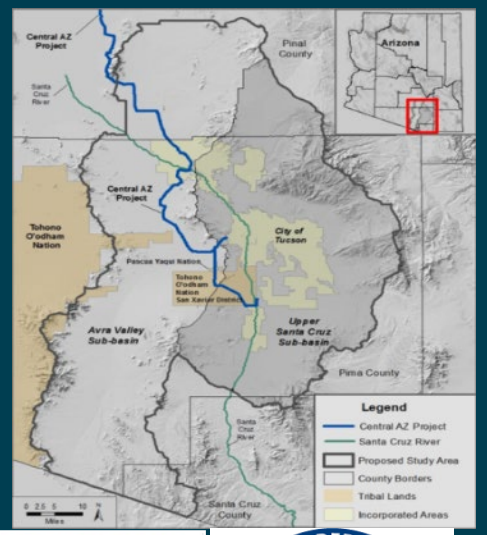
Summary of findings (groundwater model)

- Groundwater model results show <u>increased groundwater pumping to meet the 2060 demand will lead to water level declines.</u> Those declines vary by location and the amount of pumping associated with each scenario.



Strategy	All Criteria	Economic & Financial	Environment & Sustainability	Social & Administrative	Team Survey	Overall
(1) Demand Management	100%	100%	92%	94%	100%	**100%**
(2) Regional Effluent – Direct Potable Reuse	61%	45%	82%	51%	61%	**62%**
(3) Regional Effluent – Direct Non-Potable Reuse	81%	61%	79%	99%	79%	**81%**
(4) Local Effluent Reuse/Recharge – Potable or Non-Potable	88%	63%	100%	96%	86%	**88%**
(5) Regional Effluent Recharge	89%	64%	97%	100%	86%	**89%**
(6) Poor Quality Groundwater Treatment	62%	60%	51%	70%	59%	**61%**
(7) Ocean Desalination	67%	70%	72%	50%	71%	**68%**
(8) Inland Desalination/Brackish Water Treatment	41%	34%	43%	46%	41%	**41%**
(9) Groundwater Transactions/ Exchanges	54%	58%	41%	57%	51%	**53%**
(10) Surface Water Transactions/ Leases/Exchanges	79%	79%	79%	70%	78%	**79%**

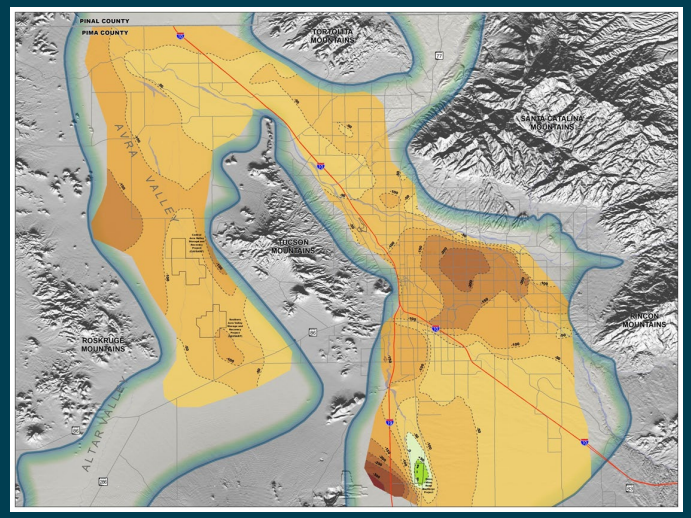
Lower Santa Cruz River Basin Study



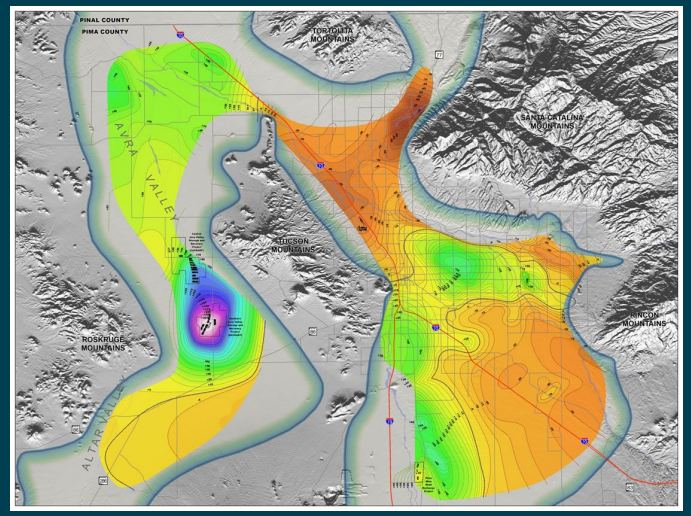
Important contributions:

- Risk-based strategy
- Includes seasonality, variability and extremes analysis using advanced methods
- Developed surface and groundwater modeling results
- Considers effects to streams and riparian areas

Tucson Basin Water Level Changes



1950 - 2000

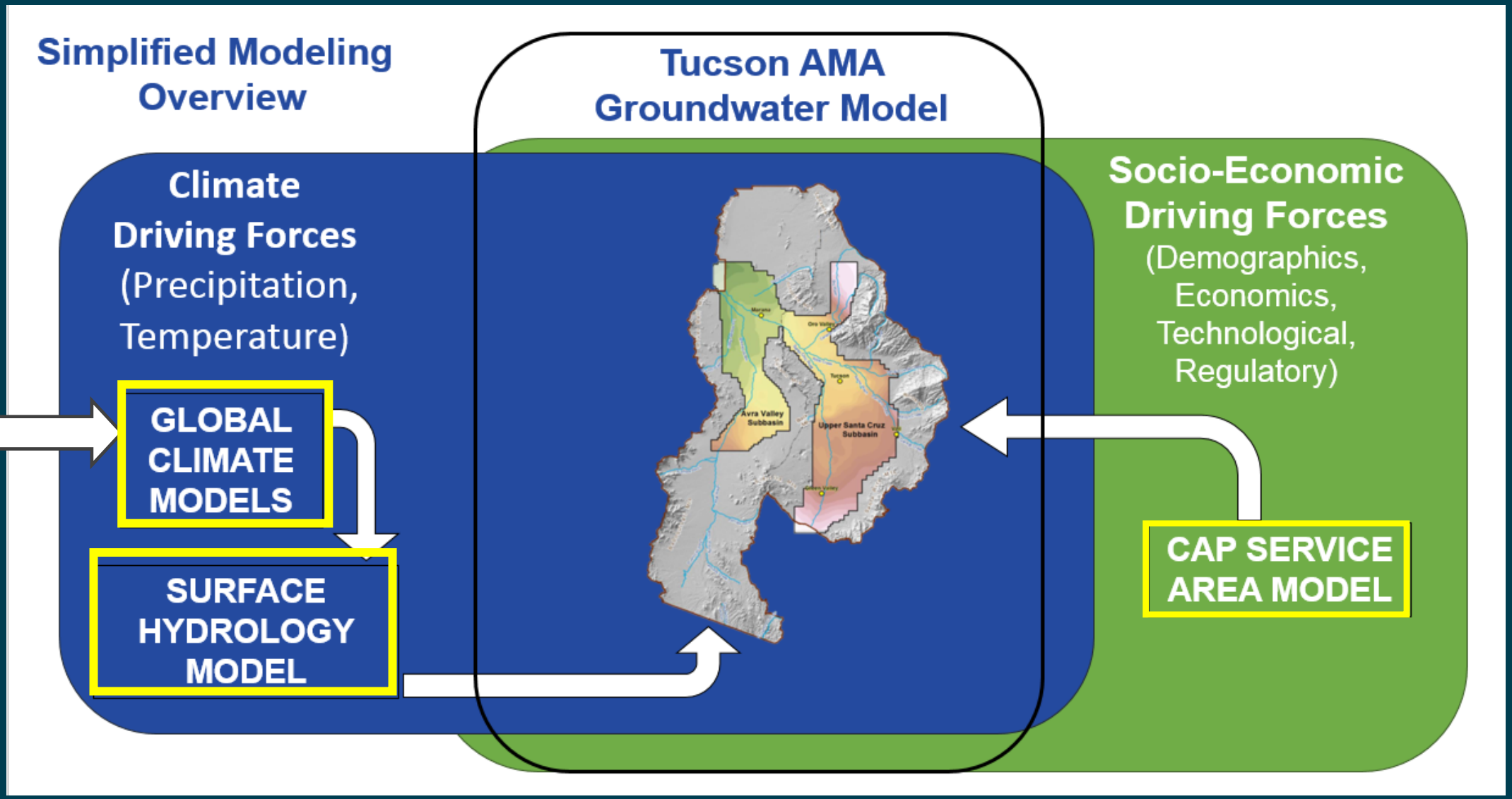


2000 - 2014

LSCR Basin Study Objectives

1) Identify Where Physical Water Resources are Needed to Mitigate Supply-Demand Imbalances

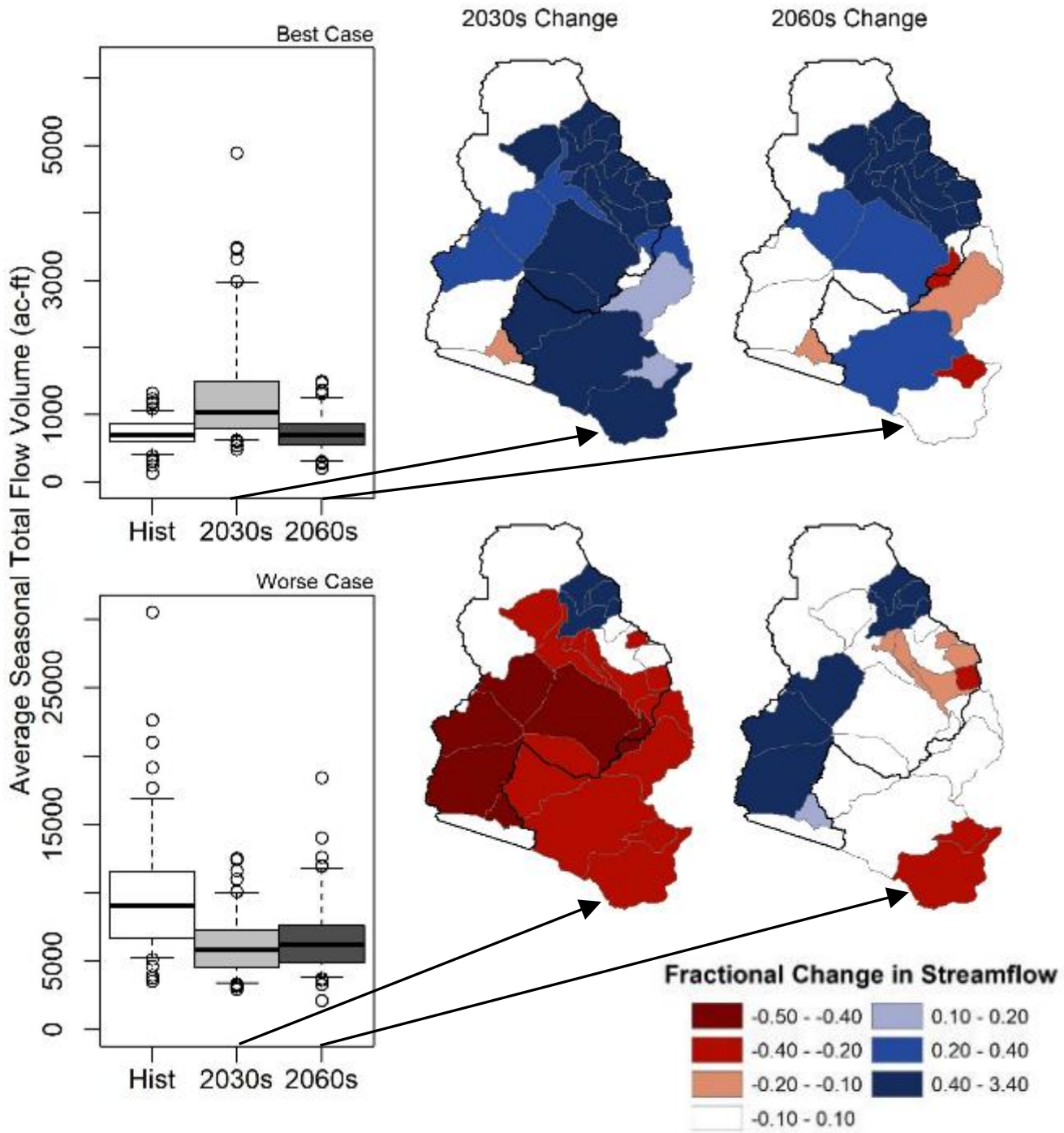
2) Develop Strategies to Improve Water Reliability for Municipal, Industrial, Agricultural and Environmental Sectors


Simplified Modeling Overview
Tucson AMA Groundwater Model
Climate Driving Forces (Precipitation, Temperature)
Socio-Economic Driving Forces (Demographics, Economics, Technological, Regulatory)
EMISSIONS SCENARIOS (RCPs)
GLOBAL CLIMATE MODELS
SURFACE HYDROLOGY MODEL
CAP SERVICE AREA MODEL
Avra Valley Subbasin
Upper Santa Cruz Subbasin

Surface Water Basin Configuration

Monsoon Season: Probability Distribution of Streamflow Change

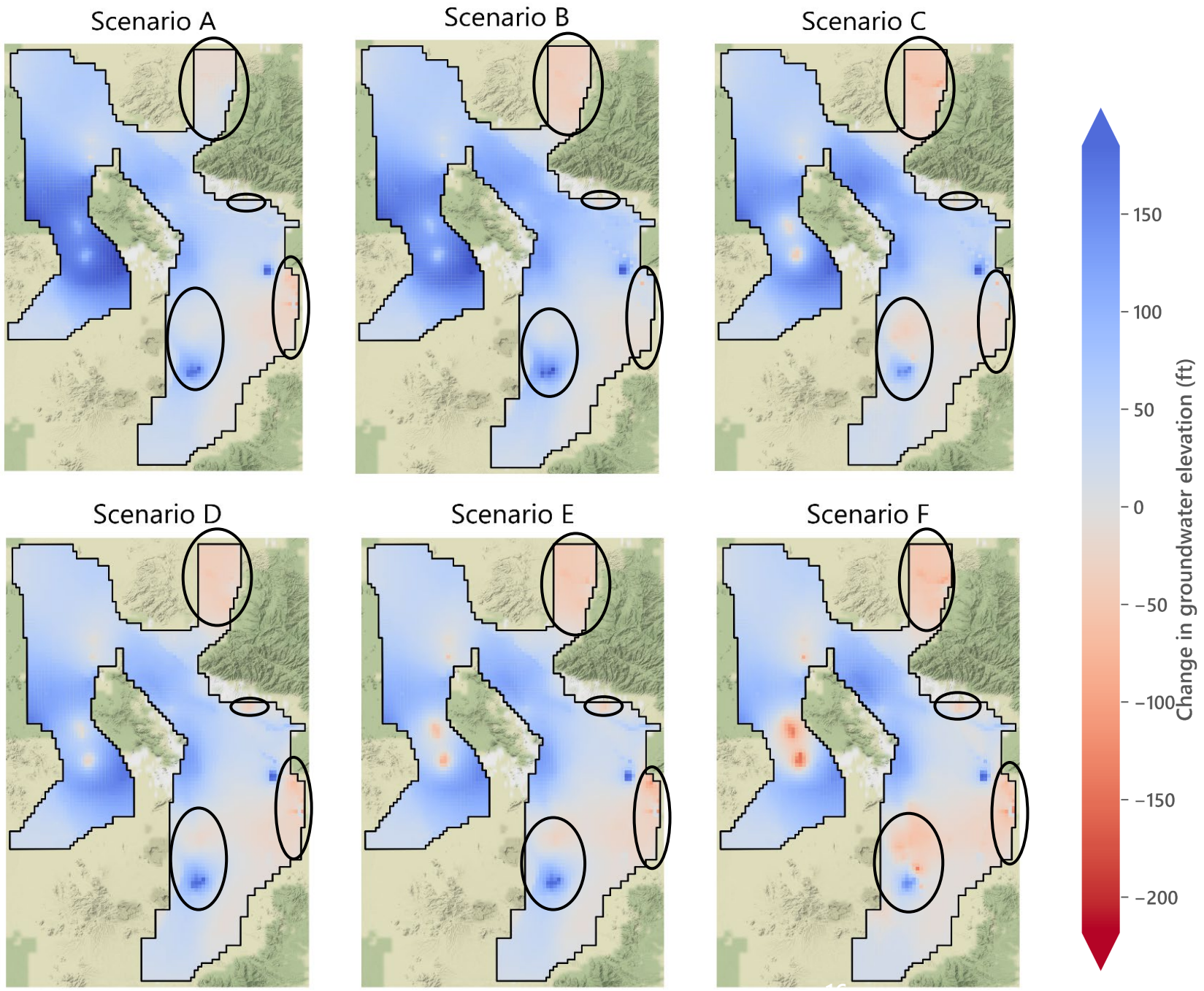
But this map is just a change in the median of a range of possible futures!



RECLAMATION

Projected Change in Groundwater Elevation, 2020 to 2060

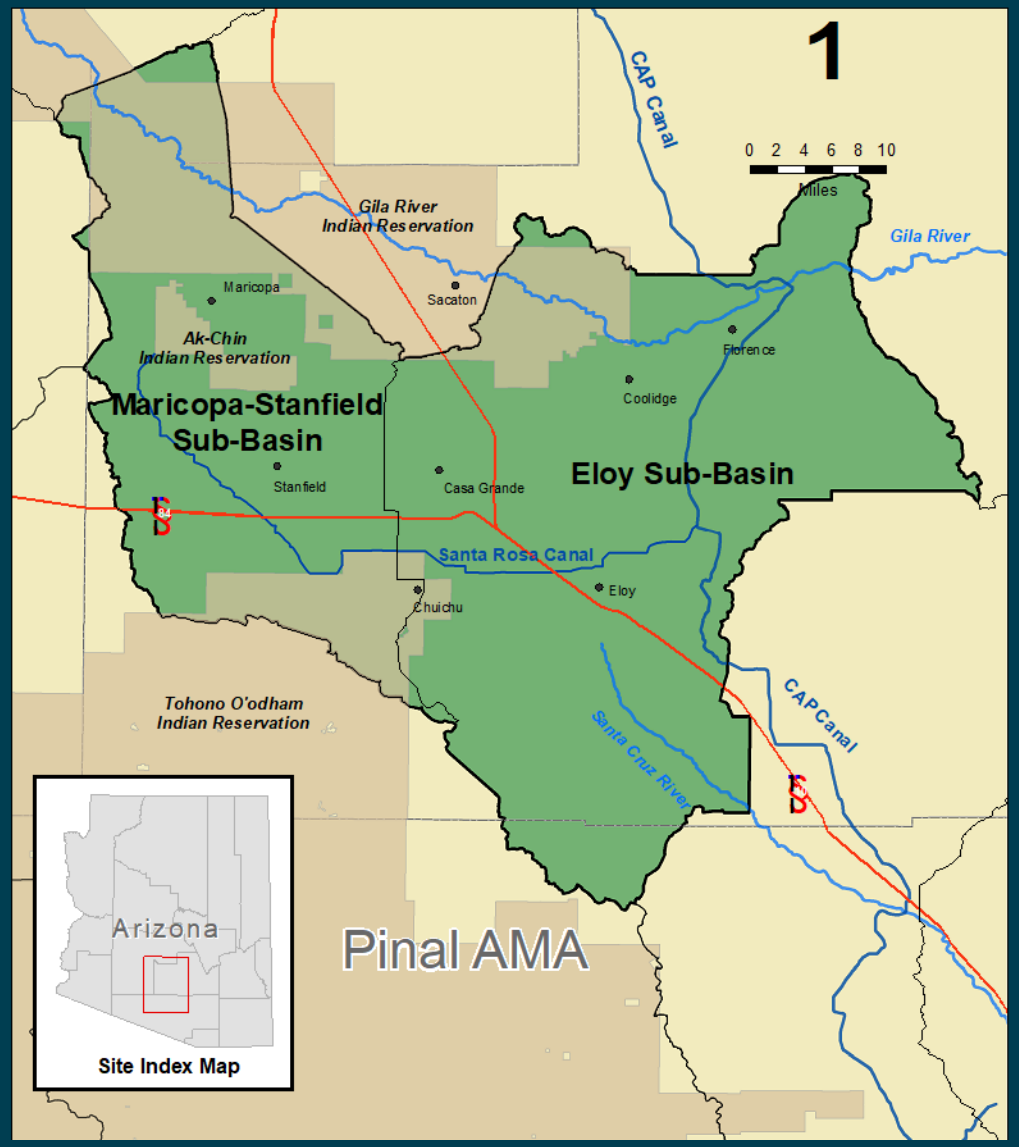
		Demand Growth		
		Slow, Compact	Medium, Official	Rapid, Outward
Climate	Worse Case	D	E	F
	Best Case	B		C
	Current Climate		A	



Evaluation Criteria

Criterion	Description	Measurement	Directionality
(1) Water Supply Reliability Benefit	Benefit from reducing future shortages anticipated for the study area.	Monetized	Benefit
(2) Capital Cost	Cost of construction or implementation (upfront cost).	Monetized	Cost
(3) O&M Cost	Cost of operation and maintenance (ongoing cost).	Monetized	Cost
(4) Aquifer Benefit	Improvements in groundwater levels to reduce pumping costs, prevent subsidence, or improve general aquifer condition.	0 to 3	Benefit
(5) Quality of Life Benefit	Improvements in recreation, aesthetics, health, safety, heat island effect, or cultural resources.	0 to 3	Benefit
(6) Leverage Existing Resources	Utilizes or enhances existing investments or infrastructure.	0 to 3	Benefit
(7) Barriers to Implementation	Obstacles from public perception, regulations, administrative complexity, or physical limitations.	-3 to 0	Cost
(8) Riparian Impact	Changes to riparian habitat and conditions.	-3 to 3	Cost/Benefit
(9) Water Quality Impact	Changes in the chemical, physical, or biological characteristic of water resources.	-3 to 3	Cost/Benefit
(10) Flood Risk Impact	Changes in flood risk (probability or consequences).	-3 to 3	Cost/Benefit

Eloy-Maricopa Stanfield Basin Study Area



- Located south of Phoenix metropolitan area in Pinal County
- Study area: 1575 sq. mi.
- Pinal Active Management Area (AMA) as defined by Arizona Department of Water Resources (ADWR)
- Water demand has historically been dominated by agriculture sector
- Agriculture and agribusiness contributes $1.1 billion to local economy

Pinal County Major Water Uses

- Agriculture sector
- Rapid municipal growth

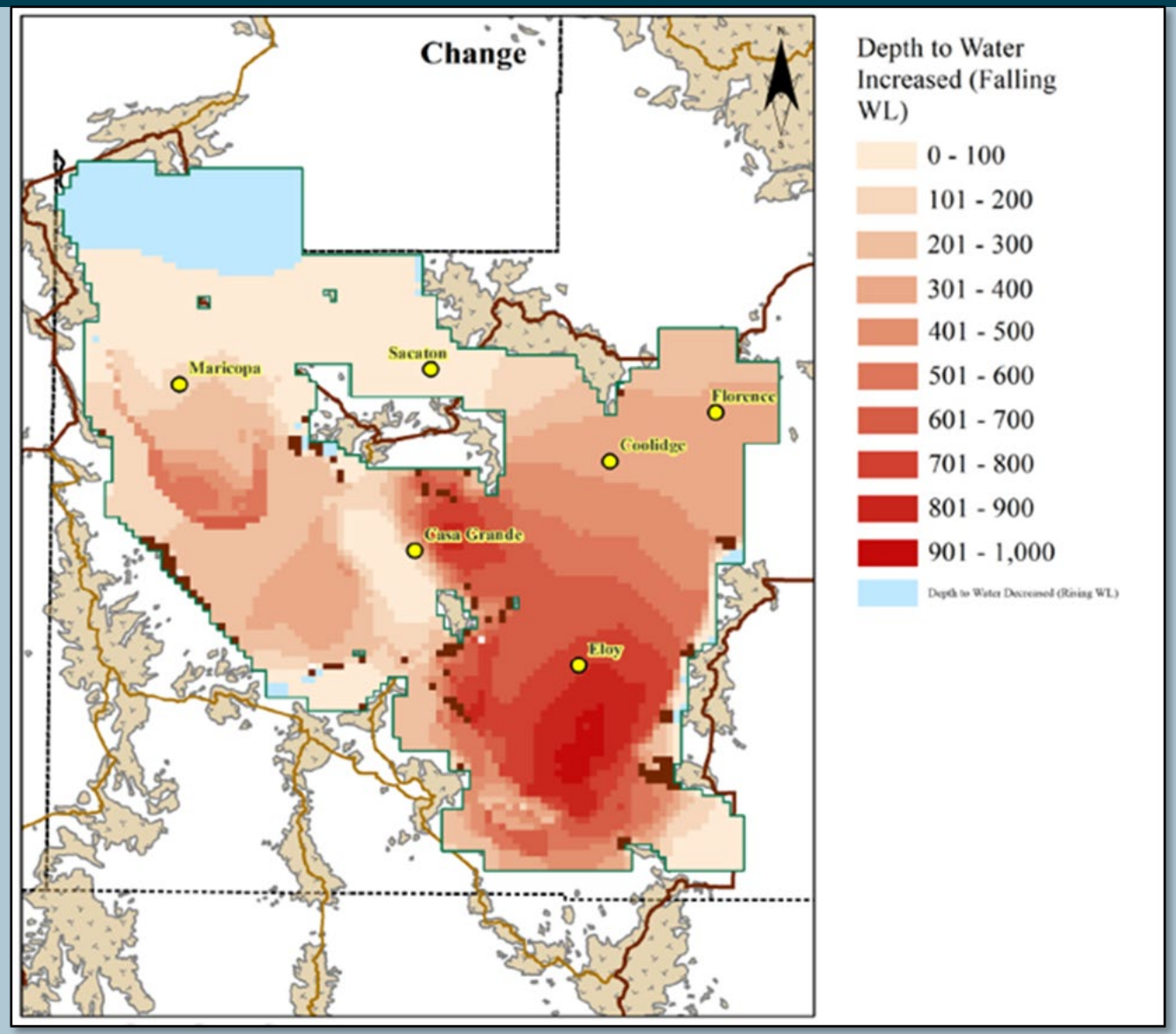
Projected Long-Term Problem

Projected Deficit:

8.1 million acre feet

"Looking out 100 years, there is insufficient groundwater in the Pinal Active Management Area to support all existing uses and issued assured water supply determinations."

ADWR Presentation to the House Ad Hoc Committee on Groundwater Supply in Pinal County, October 11, 2019



Projected aquifer change over 100-years adapted from ADWR

What would a San Pedro Basin Study look like?

- Would incorporate completed and on-going analyses to the greatest extent possible
- Could include an analysis of climate variability, seasonality and extremes
- Could include an analysis of environmental impacts
- Would set the stage for future Reclamation or other grant opportunities

Questions are welcome

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