Lower Santa Cruz River Basin Study

Recap of Key Decisions, Progress Review and Next Steps

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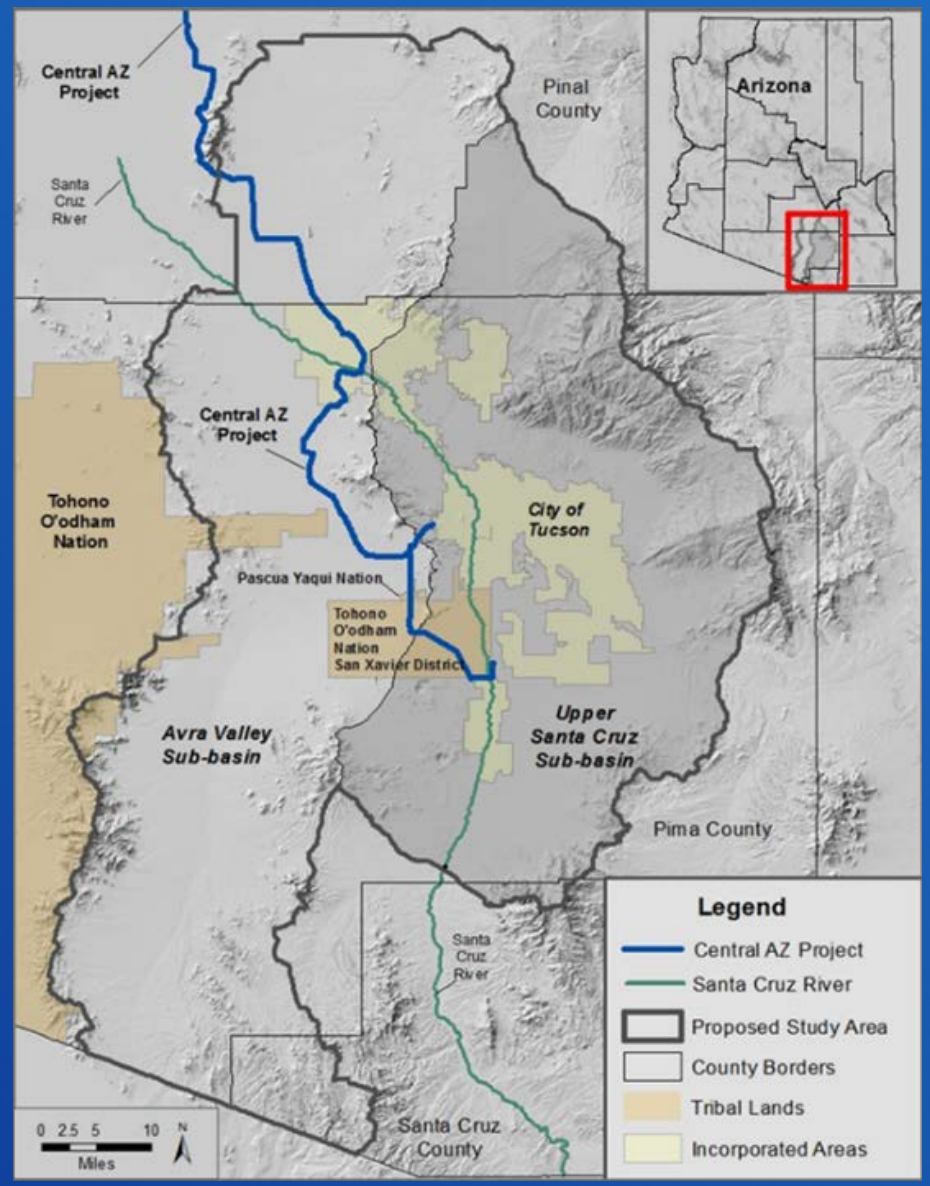
Reclamation Phoenix Area Office
Project Team and Sub –Teams Meeting
May 23, 2019



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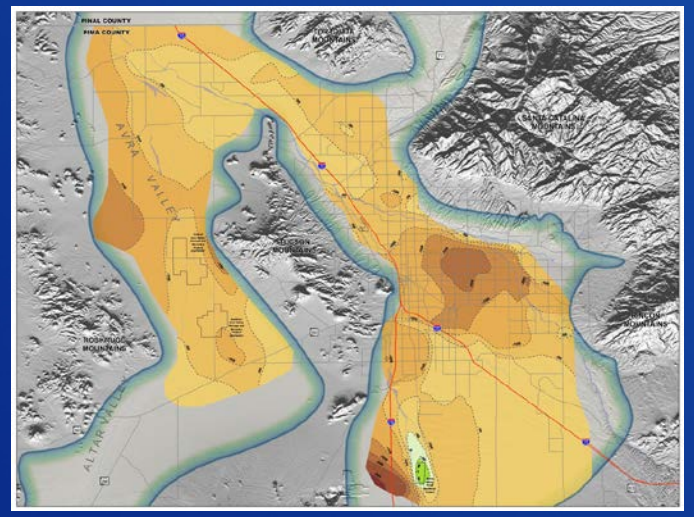
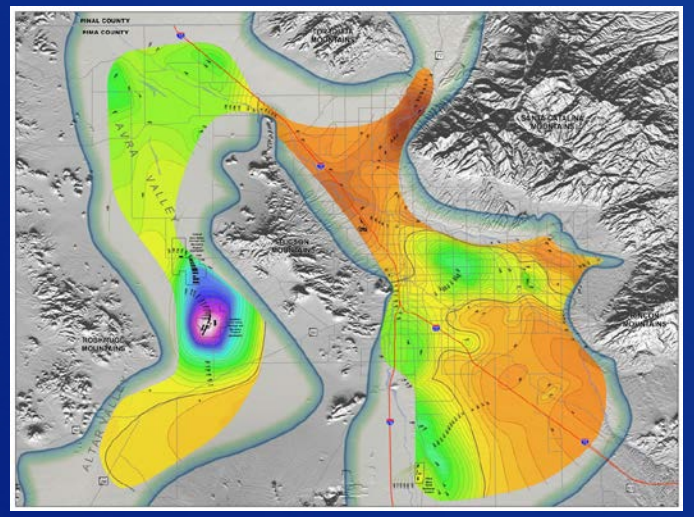
LSCR Basin Study Objectives

Tucson Basin Water Level Changes



1950 - 2000



2000 - 2014

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

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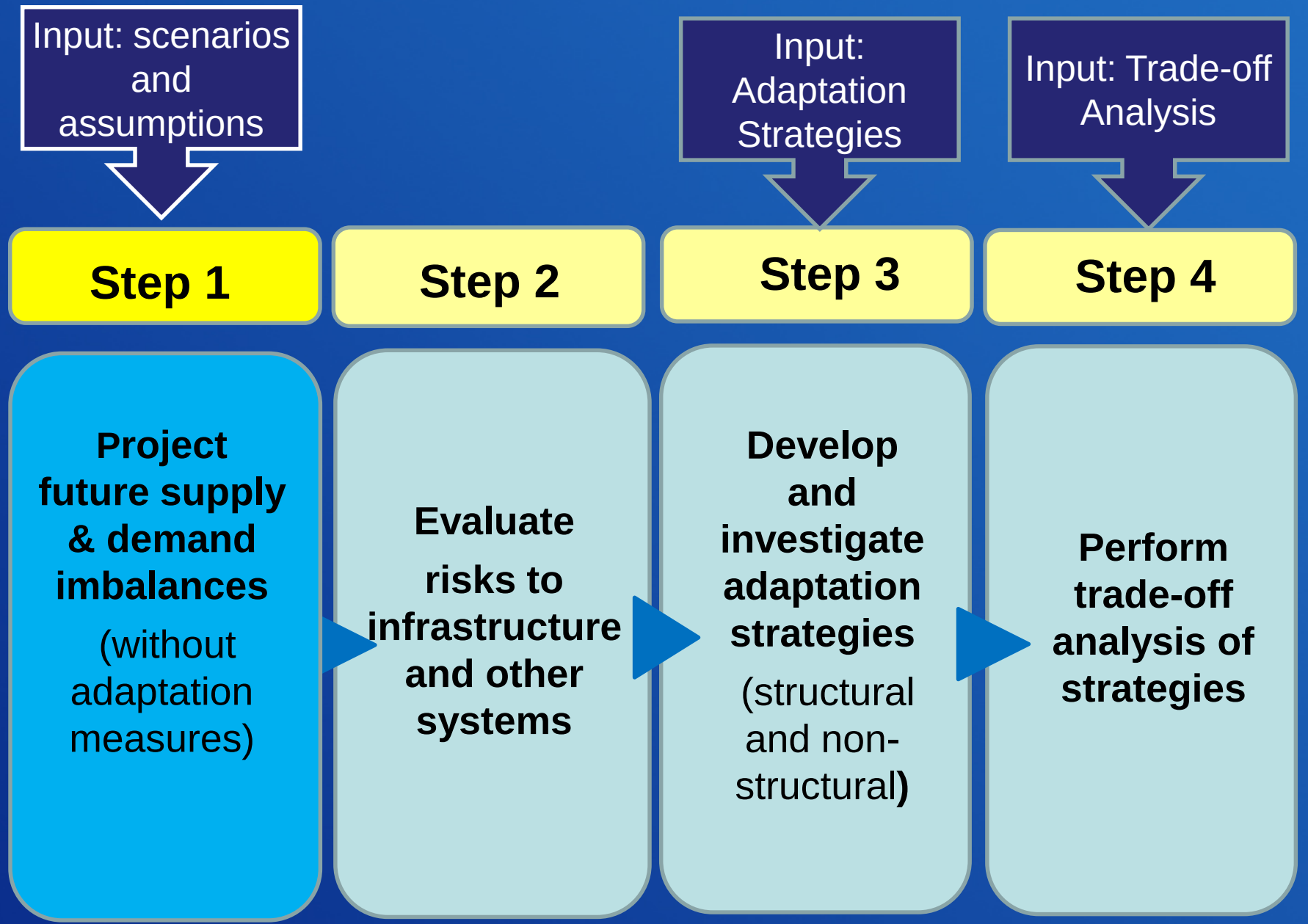
LSCR Basin Study Overview

Four Required Elements



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Simplified Modeling Overview

Tucson AMA Groundwater Model

Climate Driving Forces (Precipitation, Temperature)

GLOBAL CLIMATE MODELS

SURFACE HYDROLOGY MODEL

WE ARE HERE

Socio-Economic Driving Forces (Demographics, Economics, Technological, Regulatory)

CAP SERVICE AREA MODEL

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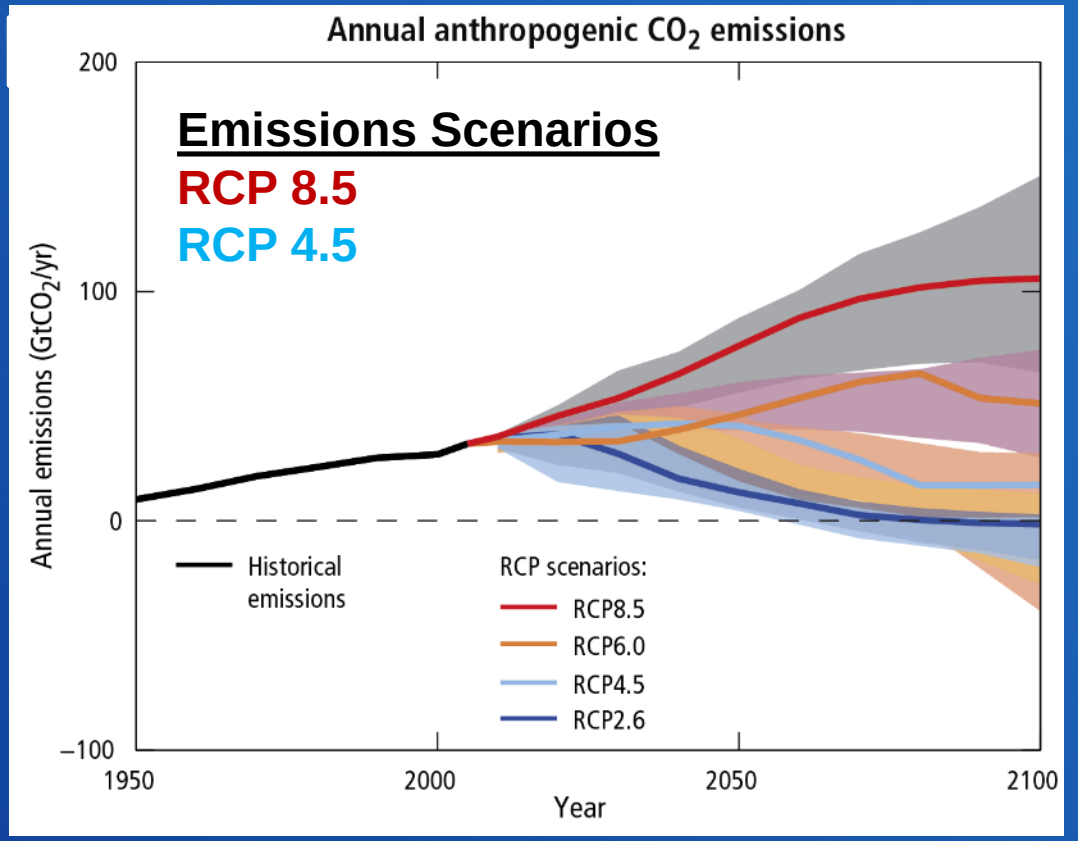
Recap of Key Climate Decisions - 1

- ***Include Dynamically Downscaled (DD) Climate Projections in Analysis***
  - Physics based model of medium-scale atmospheric processes, especially monsoon
  - Not constrained by historical data
  - Limited in spatial resolution
  - High emissions scenario (RCP 8.5) only ("Worse Case")

- ***Contrast with Lower Emission (RCP 4.5) "Best Case" Scenario***
  - Only Statistically Downscaled projections available
  - Constrained by historical data
  - Higher spatial resolution available



RCP = Representative Concentration Pathways

From CMIP5 climate model intercomparison

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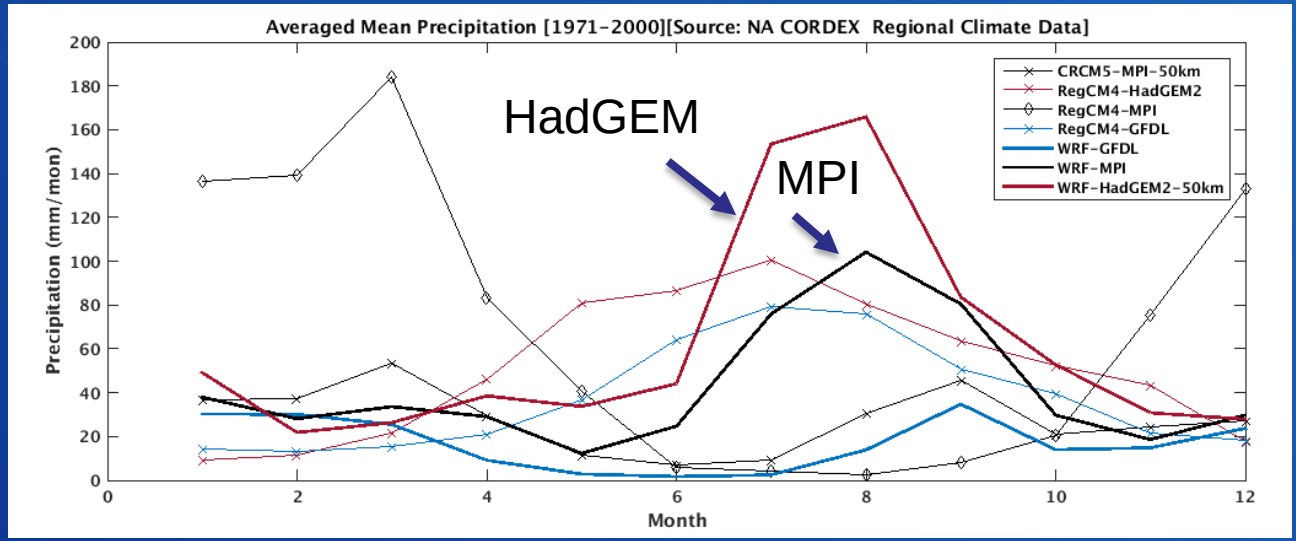
Recap of Key Climate Decisions - 2

- Develop Climate Metrics to Evaluate Appropriate DD Climate Model
- Model(s) should simulate seasonal precipitation patterns, esp. monsoon
- Project Team and other sub-teams identified key metrics:
  - Change in intensity of extreme events (precipitation and temperature)
  - Change in monsoon timing
  - Change in dry period timing
- MPI and HadGEM models selected
- Hadley model eliminated due to inconsistency in seasonal changes
- MPI climate model selected



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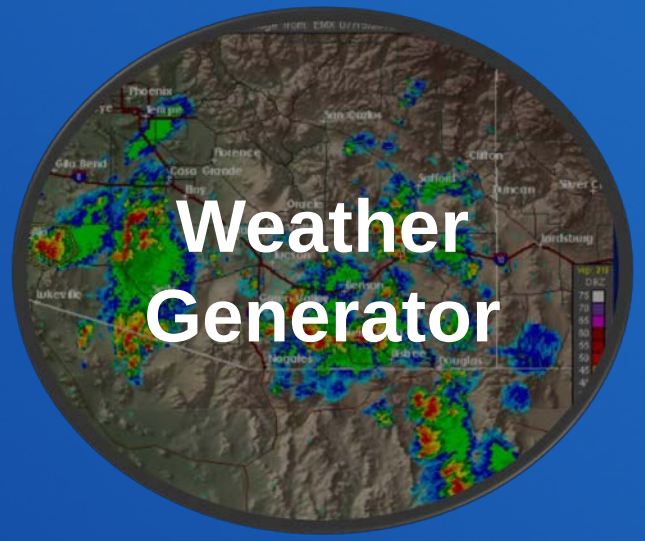
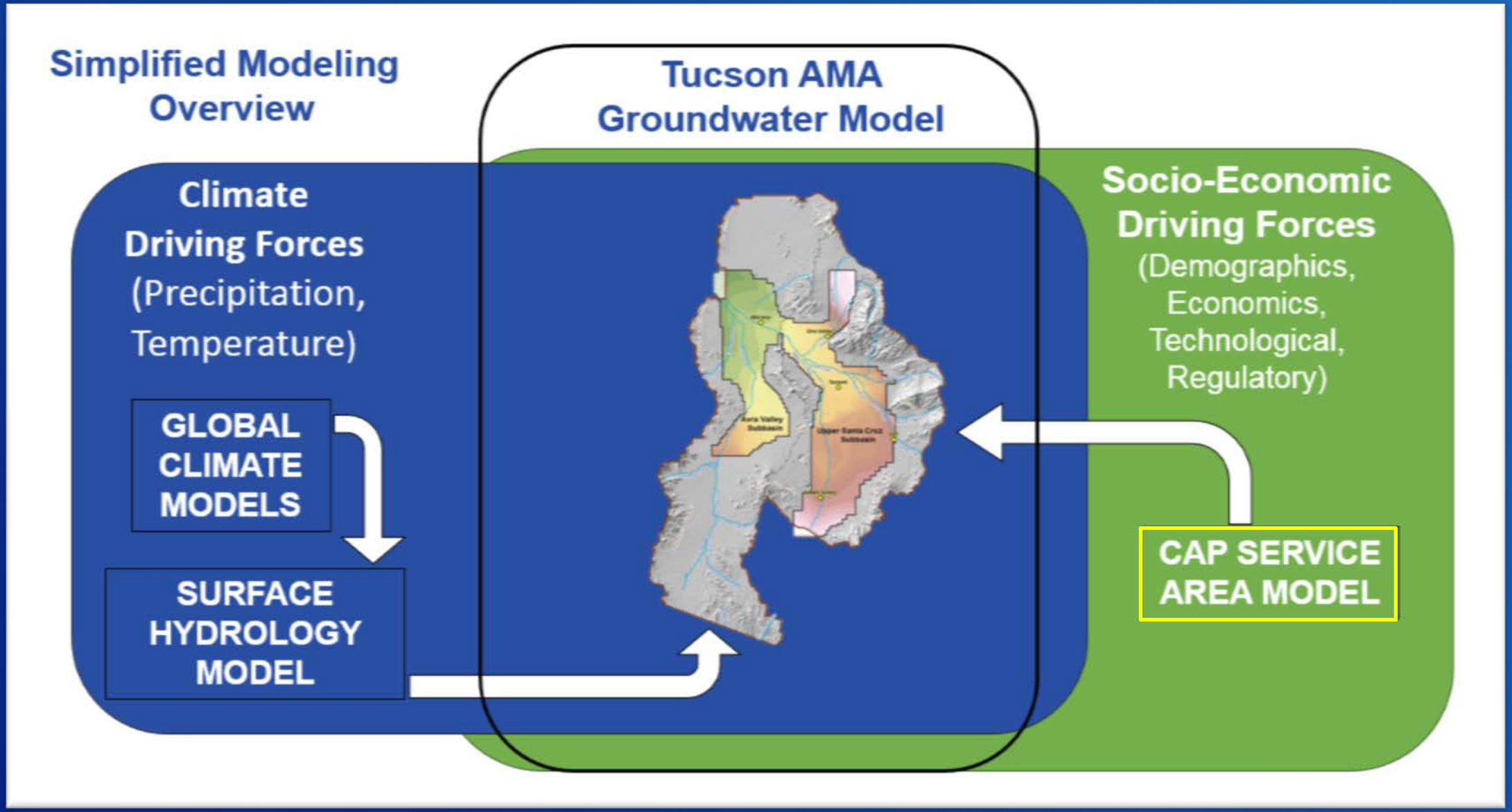
Recap of Key Climate Decisions - 3

- Variability is a defining characteristic of area precipitation patterns
- Climate model projections do not reproduce this variability
- “Weather Generator” - a technique to generate large numbers of plausible time series while preserving statistical properties of a distribution
- Use of Weather Generator recommended to produce probability distribution of future streamflow discharges



Other Progress – Modeling Future Demands



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CAP Service Area Model Demand Scenarios

Scenario Description	Official/Baseline Values	Slow Compact Growth	Slow Outward Growth	Rapid Outward Growth	Rapid Outward Growth Plus Mining without Replenishment
Demand Scenarios Summary	Growth rate: Medium series from ADOA Growth pattern: PAG CAP-SAM: standard assumptions	Growth rate: Low series from ADOA CAP-SAM: Condensed growth pattern No additional mines Green Valley area eliminates overdraft	Growth rate: Medium series from ADOA CAP:SAM Outward growth pattern Expected mine development with replenishment in Green Valley	Growth rate: High series from ADOA CAP:SAM Outward growth pattern Expected mine development with replenishment in Green Valley	Growth rate: High series from DOA CAP:SAM Outward growth pattern Mining growth w/o replenishment in Green Valley
Population Growth Rate	Medium	Low Series	Medium Series	High Series	High Series
Growth Pattern - Infill vs. Outward Growth	Baseline	In-Fill/Redevelopment	Slow Outward	Rapid Outward	Rapid Outward

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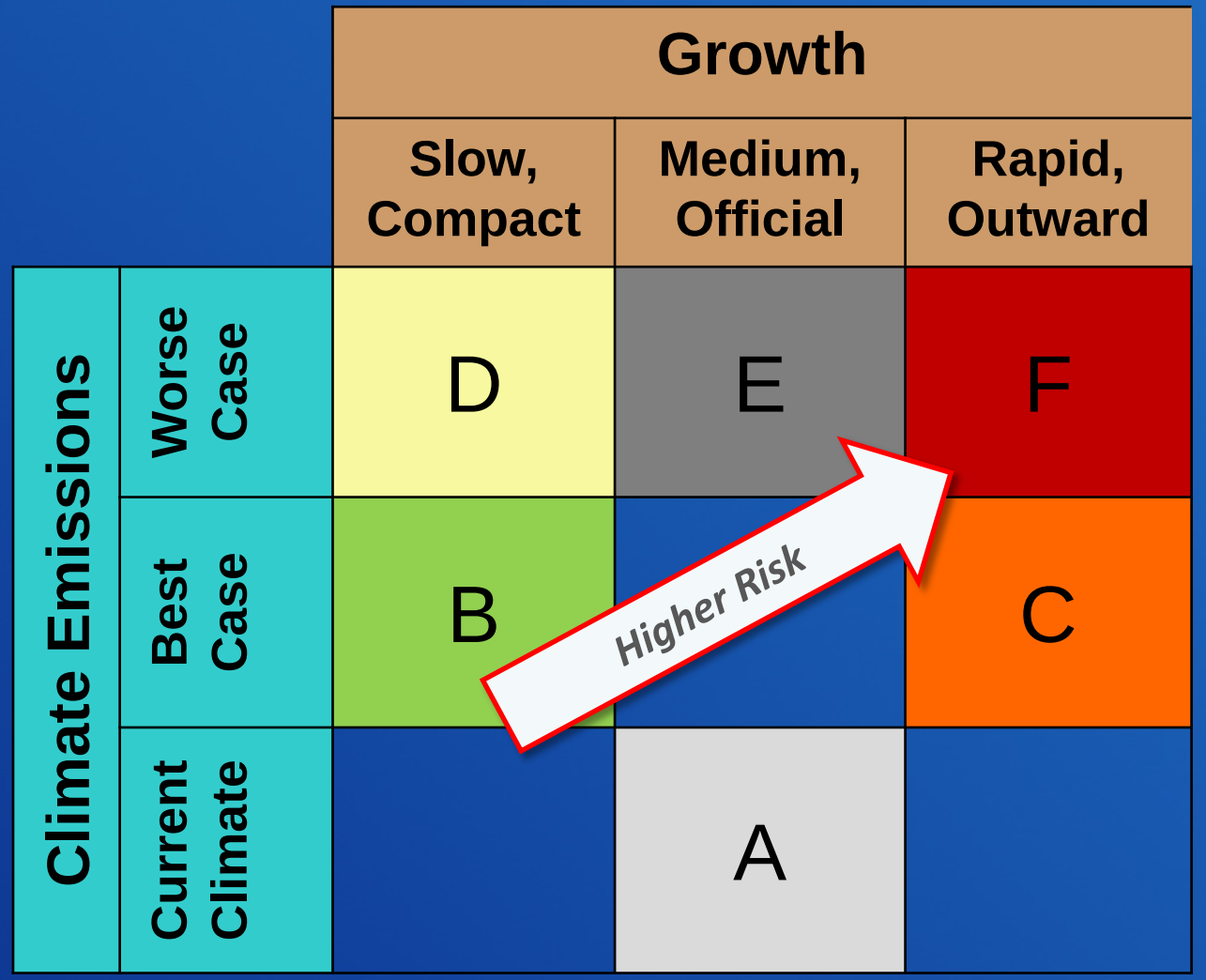
Supply-Demand Scenarios

A. *Official Projections*: Medium, mixed-density growth and Current climate
B. Slow, compact growth and *Best Case* climate
C. Rapid, outward growth and *Best Case* climate
D. Slow, compact growth and *Worse Case* climate
E. Official Projections and *Worse Case* climate
F. Rapid, outward growth and *Worse Case* climate



2018-05-08

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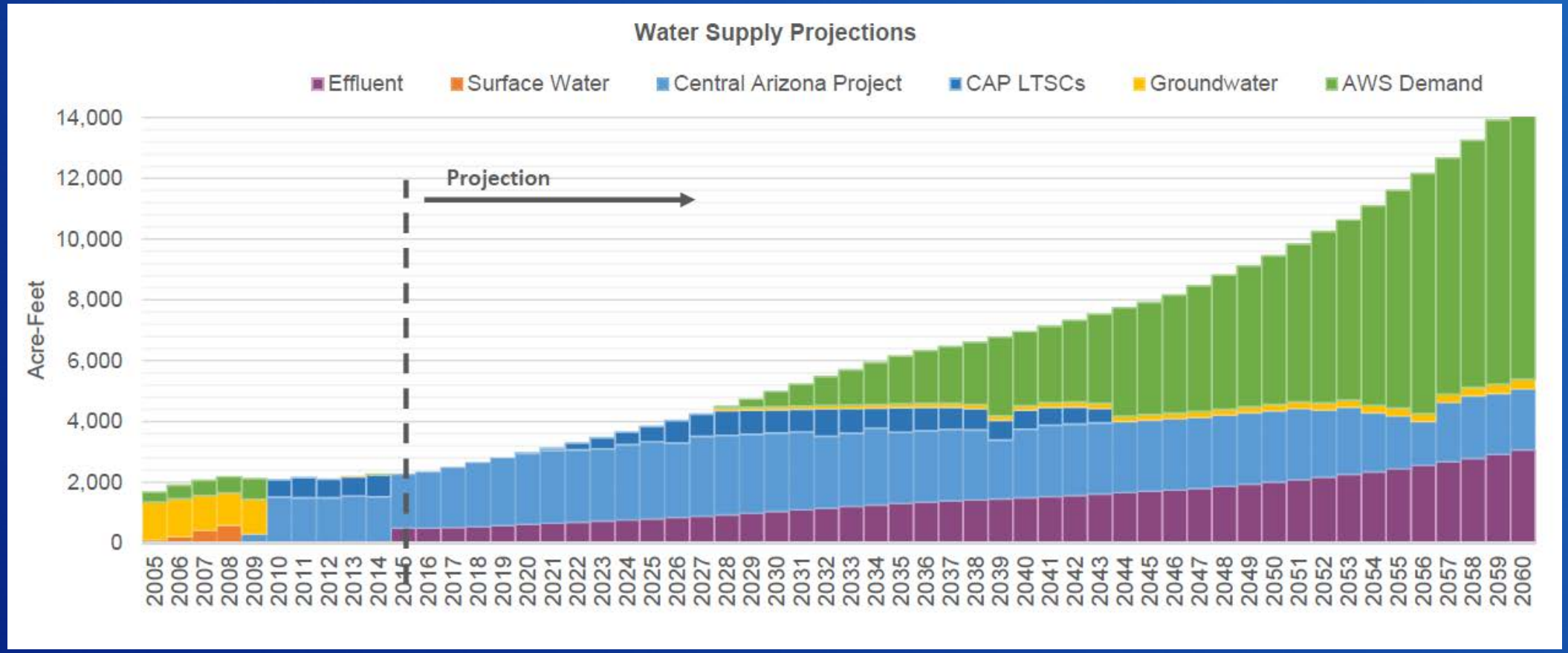
CAP-SAM Status

- **Model Runs Complete for six Climate-Growth scenarios**



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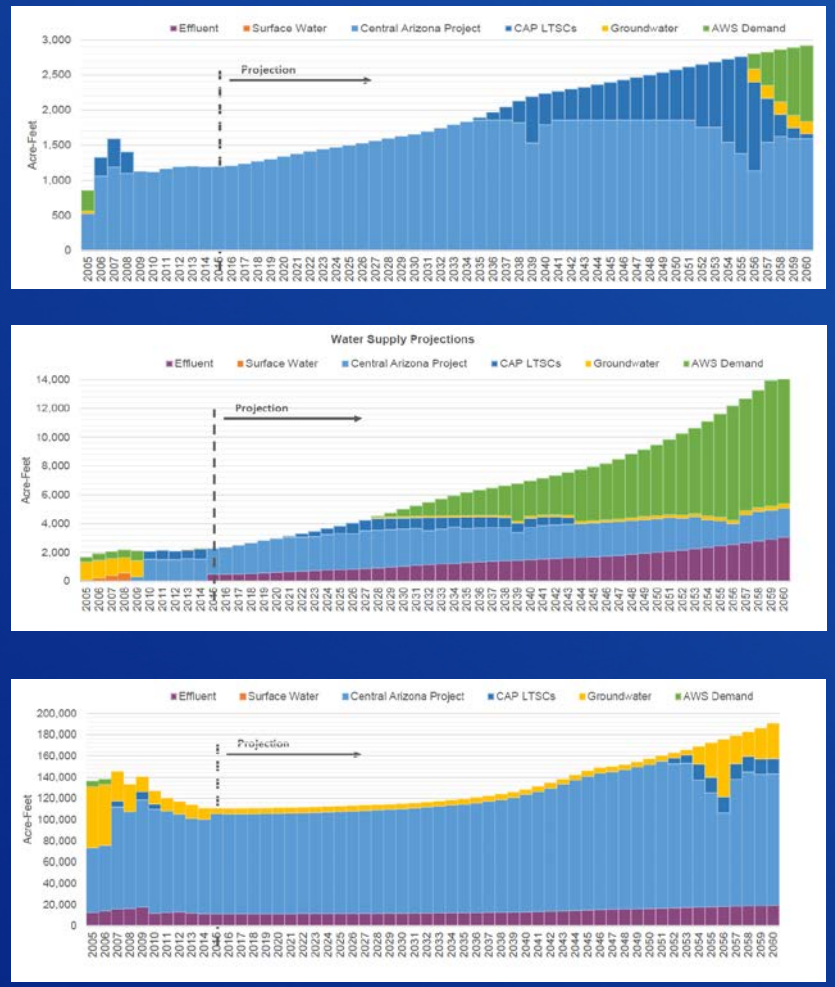
Translating Provider Demands to Modflow Input



Individual Provider Demand by Water Type

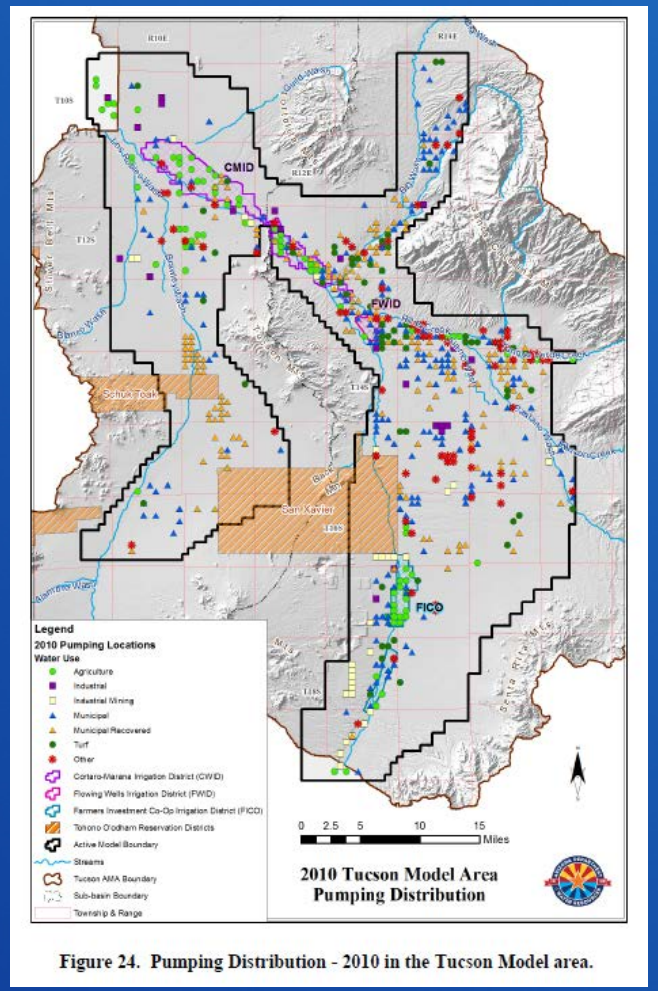


Figure 24. Pumping Distribution - 2010 in the Tucson Model area.

Individual Provider Pumping by Well

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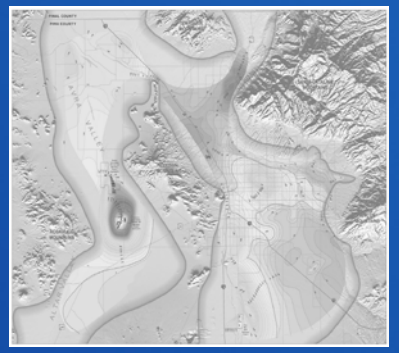
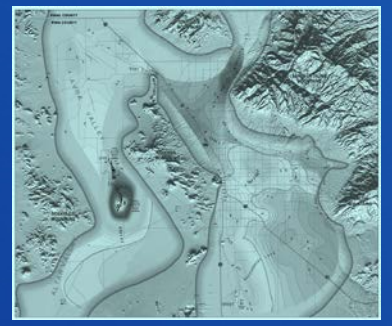
What's Next?

- **Project Supply/Demand Imbalances**
- **Run Groundwater Model under Six Scenarios**
- **Identify Where Imbalances Occur**

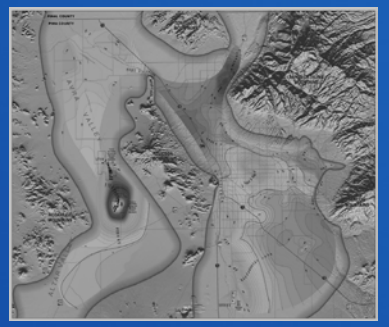


Scenario A

Scenario D

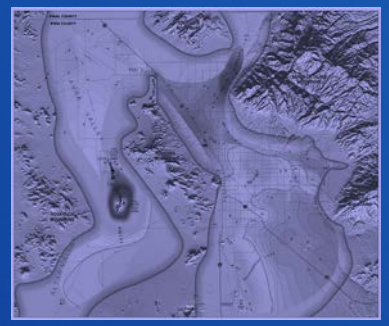


Scenario B



Scenario E

Scenario C



Scenario F

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Changes in timing and funding

- Budget increase ($325,000) and due date extension (February 2019 to September 2020) requested in March 2018
- Reclamation Policy Office granted request in June 2018
- Amendment to Memorandum of Agreement and Revised Plan of Study
- All required partner signatures have been collected
- Documents being prepared for Regional Director signature