

Supply & Demand - Key Factors and Approaches

EMS Basin Study
Supply & Demand Team
Meeting #3
March 12, 2019

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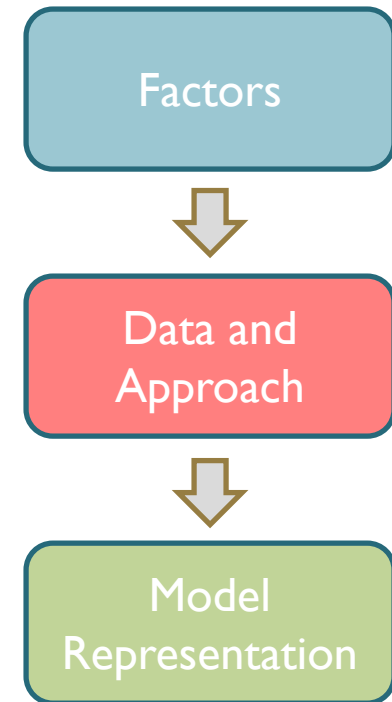
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YOUR WATER. YOUR FUTURE.

Goals of Today's Meeting

- ★ Begin to develop a comprehensive list of factors affecting:
 - Supply
 - Demand
 - Reliability
- ★ Discuss approaches for how each of these factors might be assessed and represented in the model

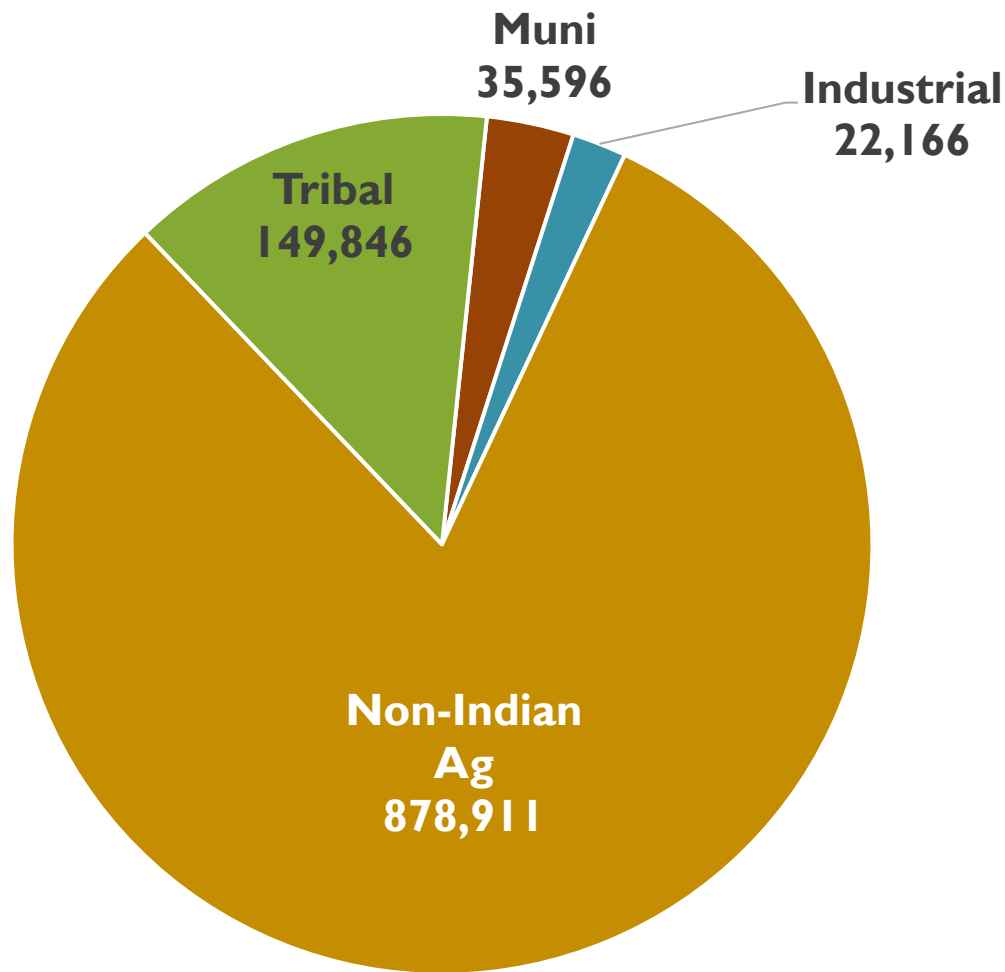


Questions to Consider

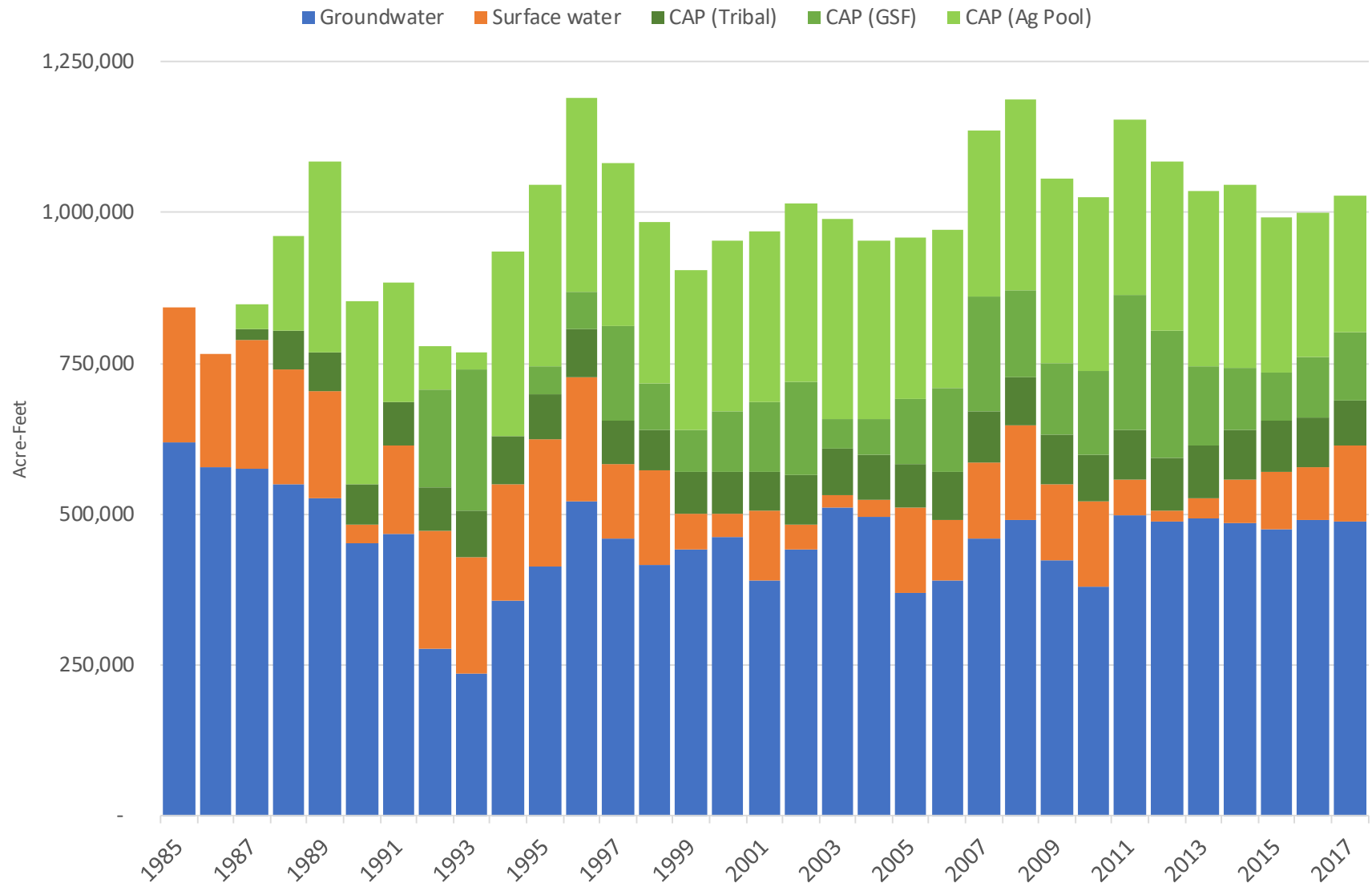
How might the EMS Basin water supply, demand and reliability be affected by:

- ? Agricultural trends
- ? Rate & location of growth
- ? Residential demand factors
- ? Commercial & industrial uses
- ? Climate Variability
- ? Shortage Impacts
- ?

Pinal AMA Water Use (2017)



Pinal AMA Crop Water Use



Source: ADWR "Pinal AMA Historic Template and Summary for web.xls"

Agricultural Demand Factors

- Development on Ag land
- Land fallowing
- Changes in crop types
- Changes in irrigation technology/efficiency
- Cropping intensity
- Pumping costs/DTW
- Water quality
- Other?

Agricultural Data

- **ADWR Annual Reports**

- Use by supply type for IGFRs & Districts
- Well pumpage by #55
- BMP practices

- **Crop Coefficients**

- ADWR & FAO

- **CAP Data**

- Ag Pool deliveries
- GSF deliveries and partnerships

- **GIS Layers**

- District & IGFR boundaries
- Canals & Laterals

- **Ag District Data**

- Irrigation techniques?

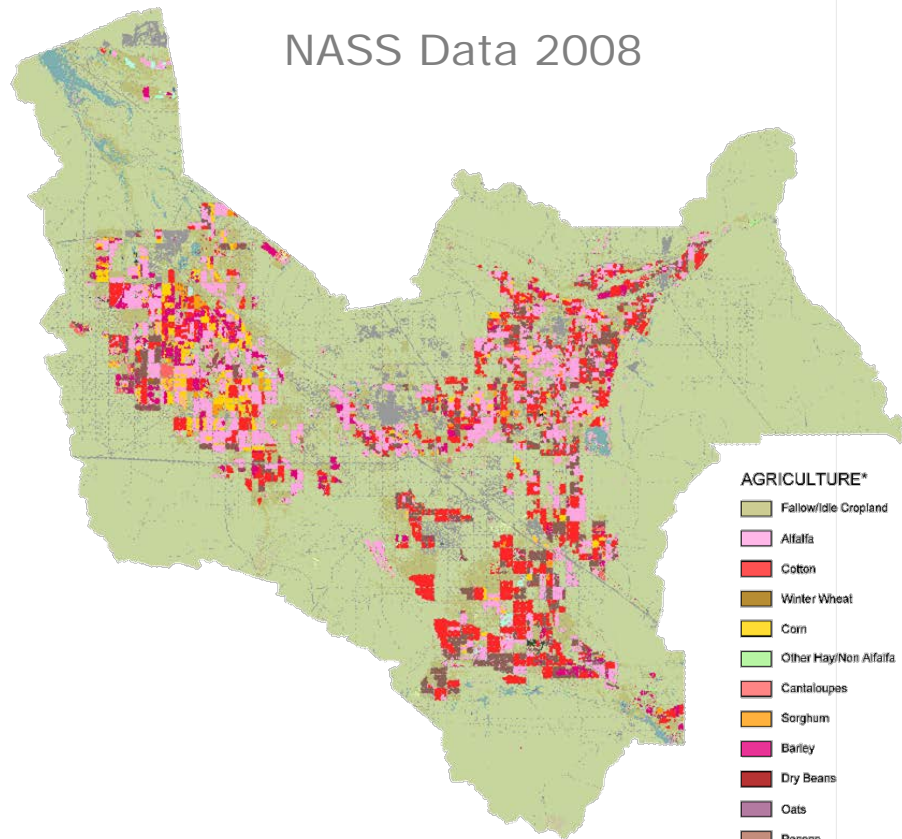
- **Satellite Data**

- NASS CropScape

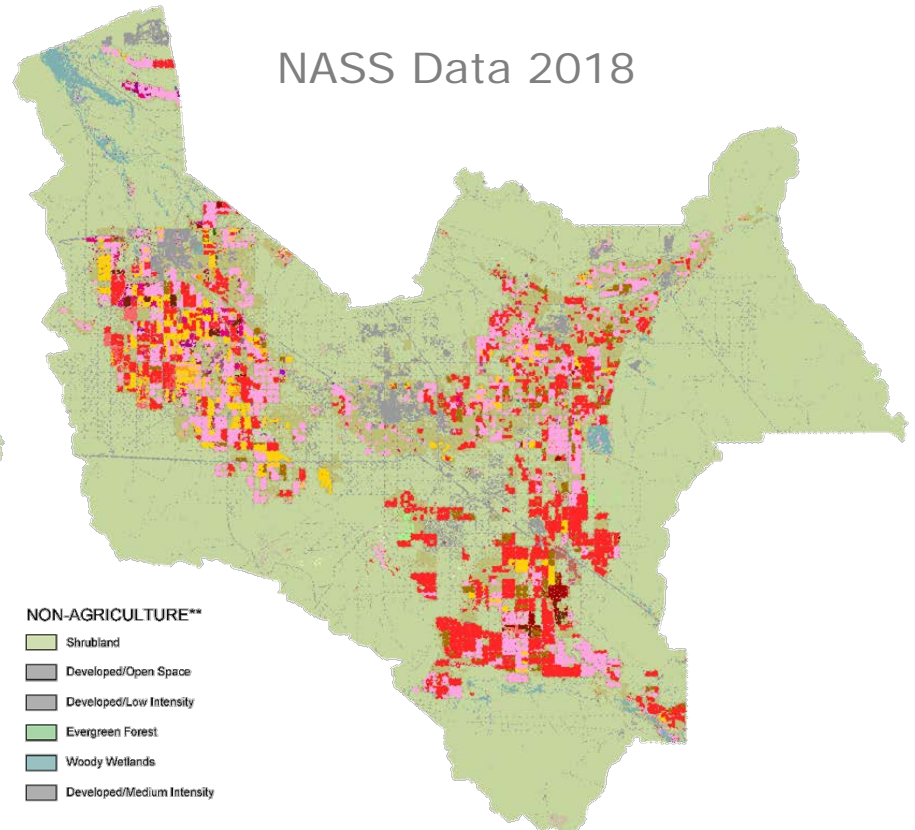
- **Other**

Crop Types

NASS Data 2008



NASS Data 2018



AGRICULTURE*

- Fallow/Idle Cropland
- Alfalfa
- Cotton
- Winter Wheat
- Corn
- Other Hay/Non Alfalfa
- Cantaloupes
- Sorghum
- Barley
- Dry Beans
- Oats
- Pecans
- Dbl Crop WinWhl/Cotton
- Dbl Crop WinWhl/Sorghum
- Potatoes
- Olives

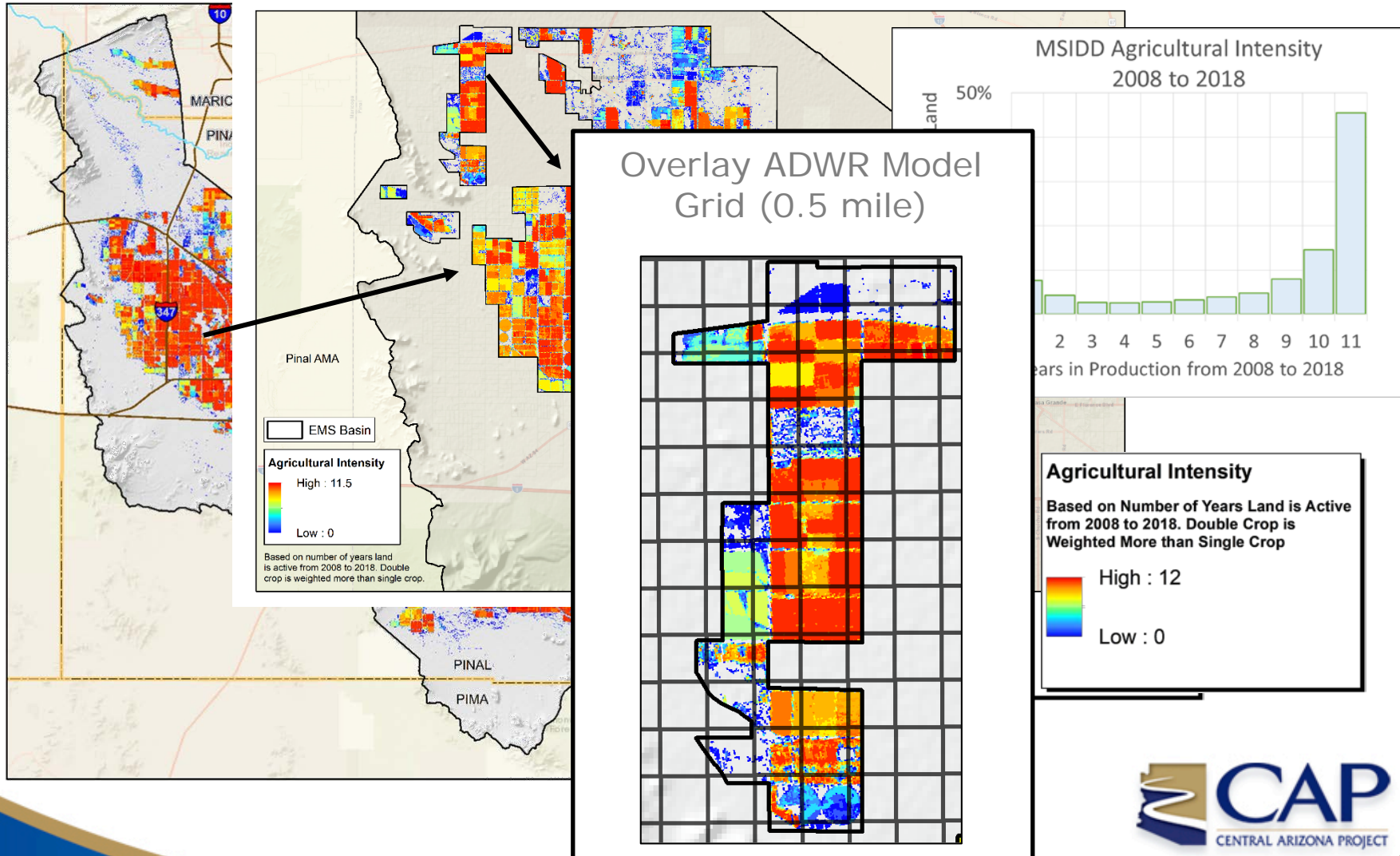
NON-AGRICULTURE**

- Shrubland
- Developed/Open Space
- Developed/Low Intensity
- Evergreen Forest
- Woody Wetlands
- Developed/Medium Intensity

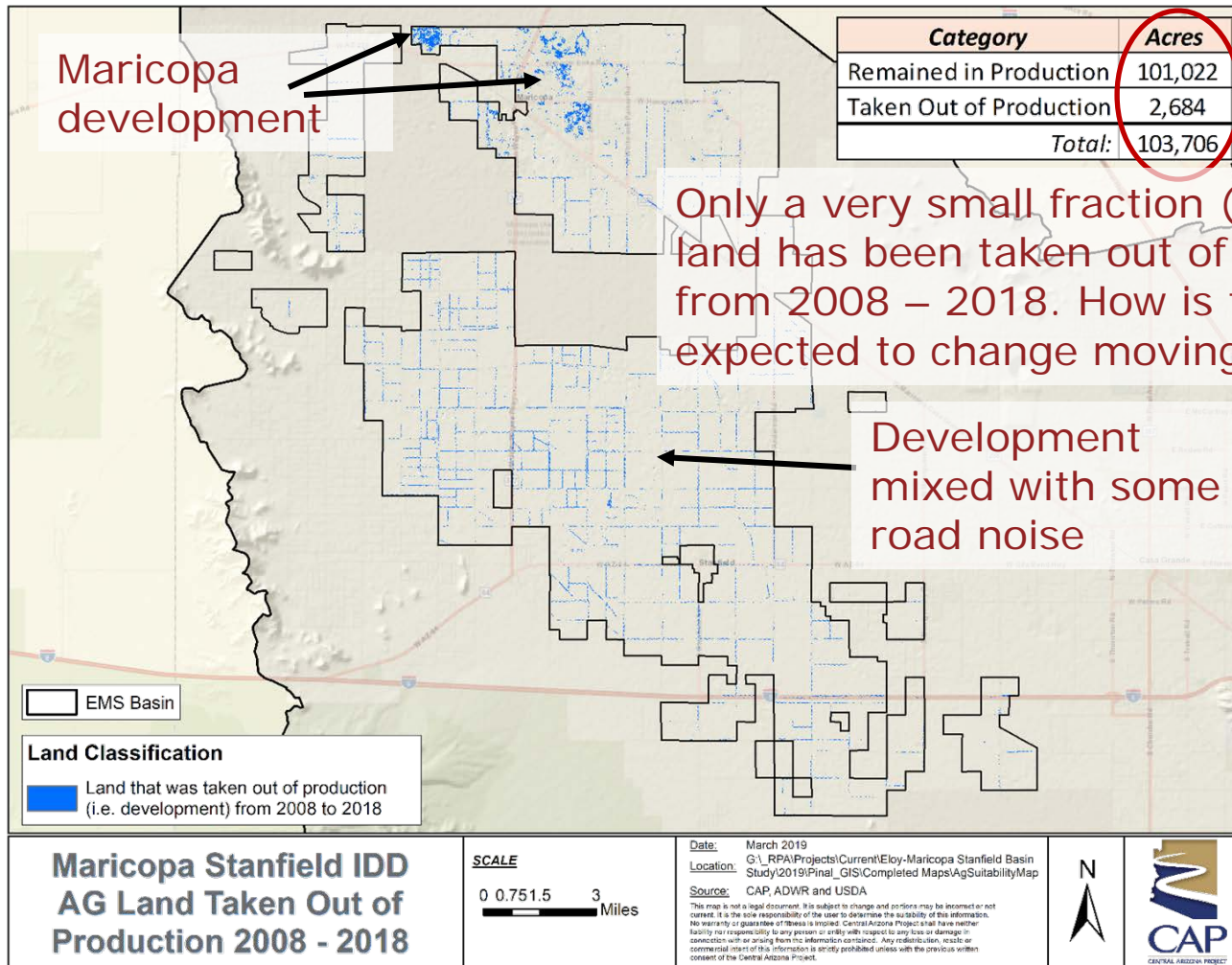
- Produced by the USDA: National Agricultural Statistics Service (NASS)
- Crop type at 30-meter resolution
 - 2008 - 2018
- Rich dataset for determining agricultural trends

Cropping Intensity

Maricopa Stanfield Irrigation District



Development on Ag Land



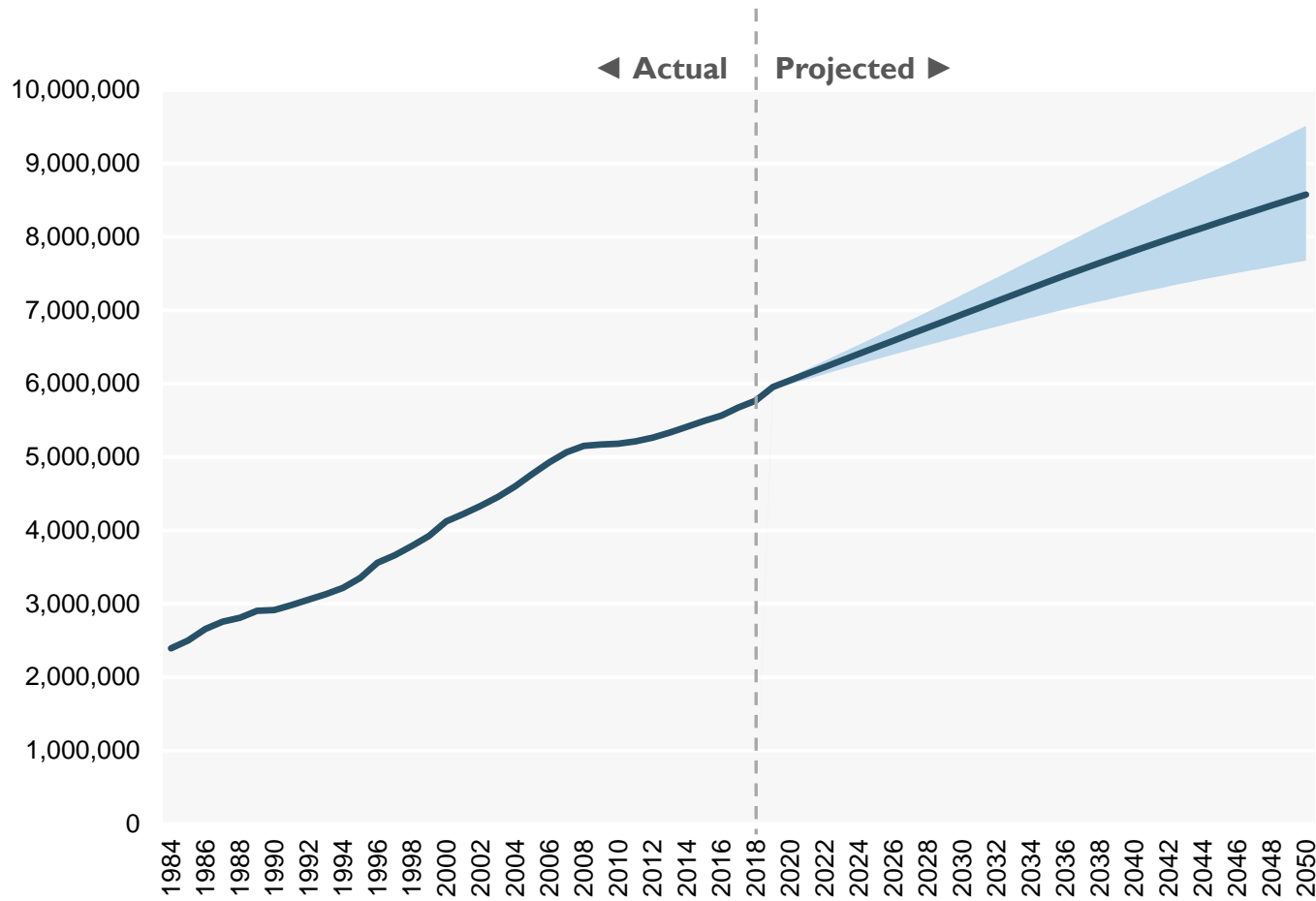
Only a very small fraction (~2.6%) of land has been taken out of production from 2008 – 2018. How is this expected to change moving forward?

Growth

- Municipal
 - Rate of growth in Central Arizona
 - Spatial distribution
 - Official growth pattern?
 - Spillover from Phoenix?
 - Growth along transportation corridor?
 - Expanded local manufacturing?
 - Constraints on growth...?
- Industrial
 - Where is industry expected?
 - What is the status of these projects?

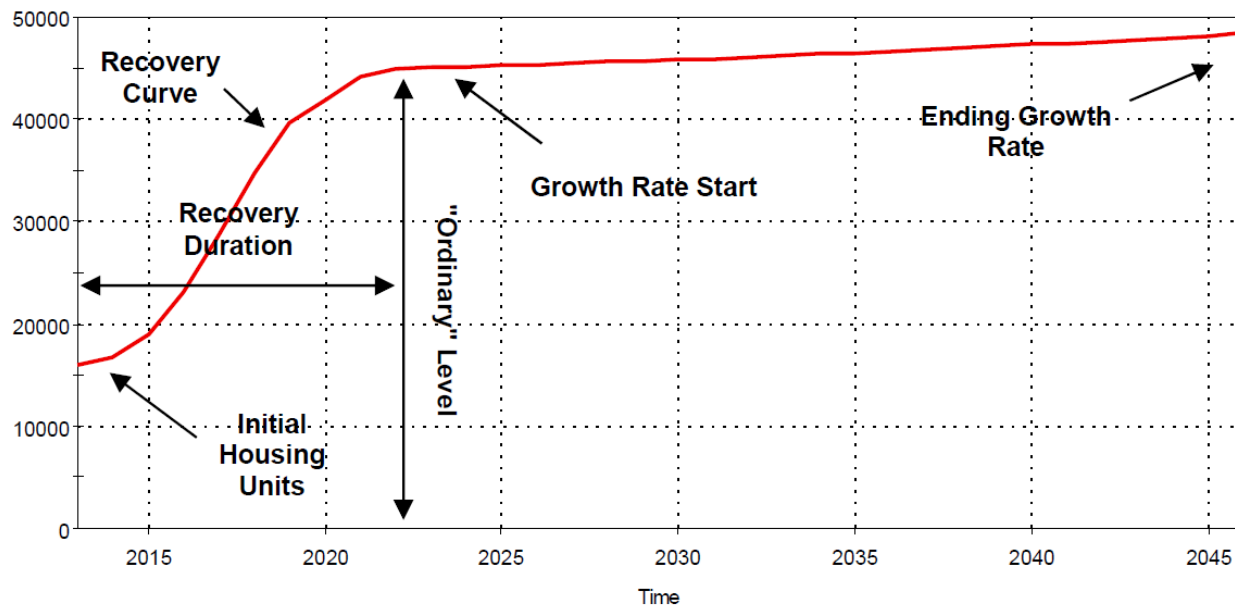
Growth Data

AZ Department of Administration (Low, Med, High Series)



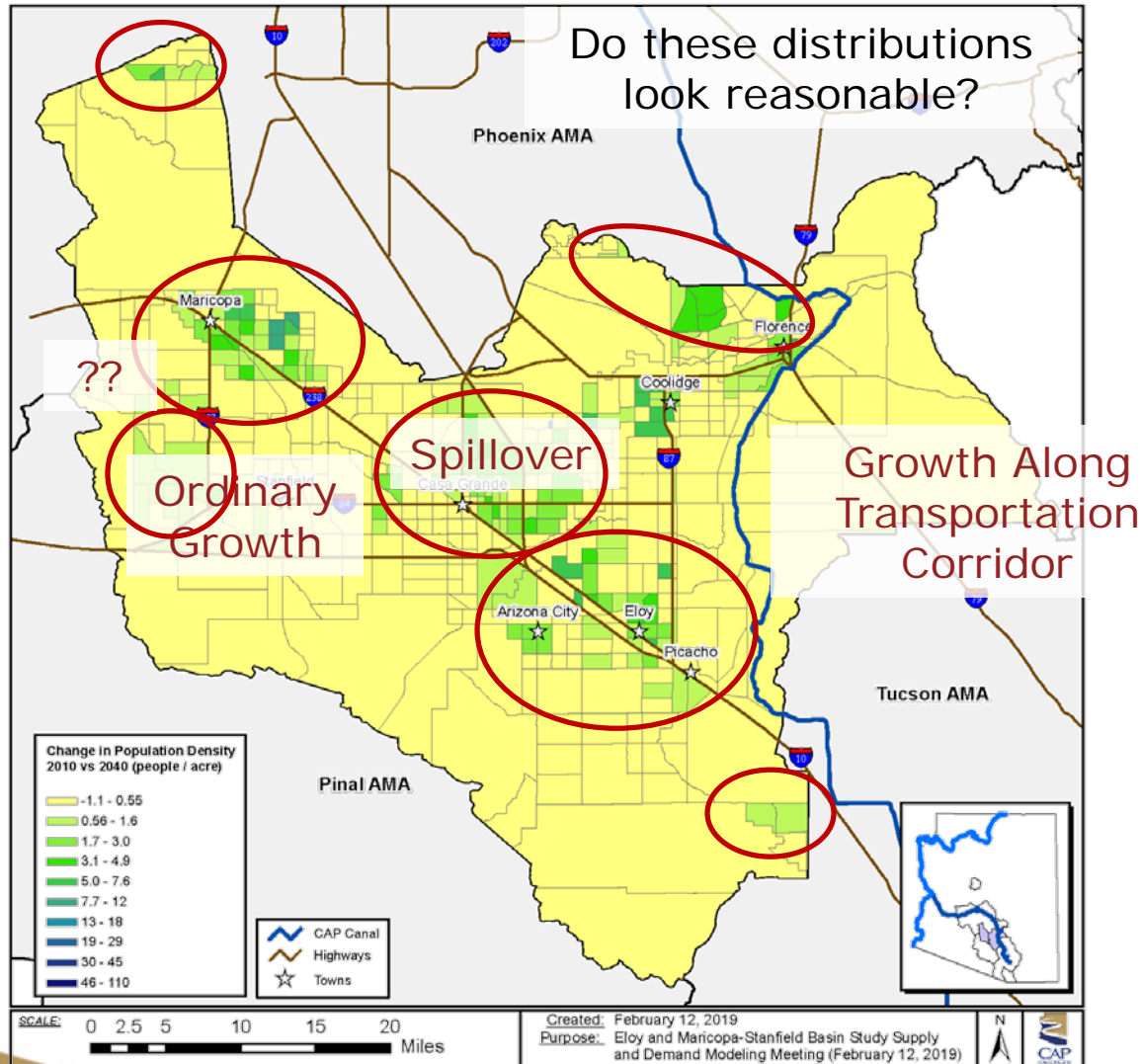
Growth Rate Adjustments

- In CAP: SAM growth is represented by housing unit projections
- Annual housing unit growth can be adjusted in a variety of ways:



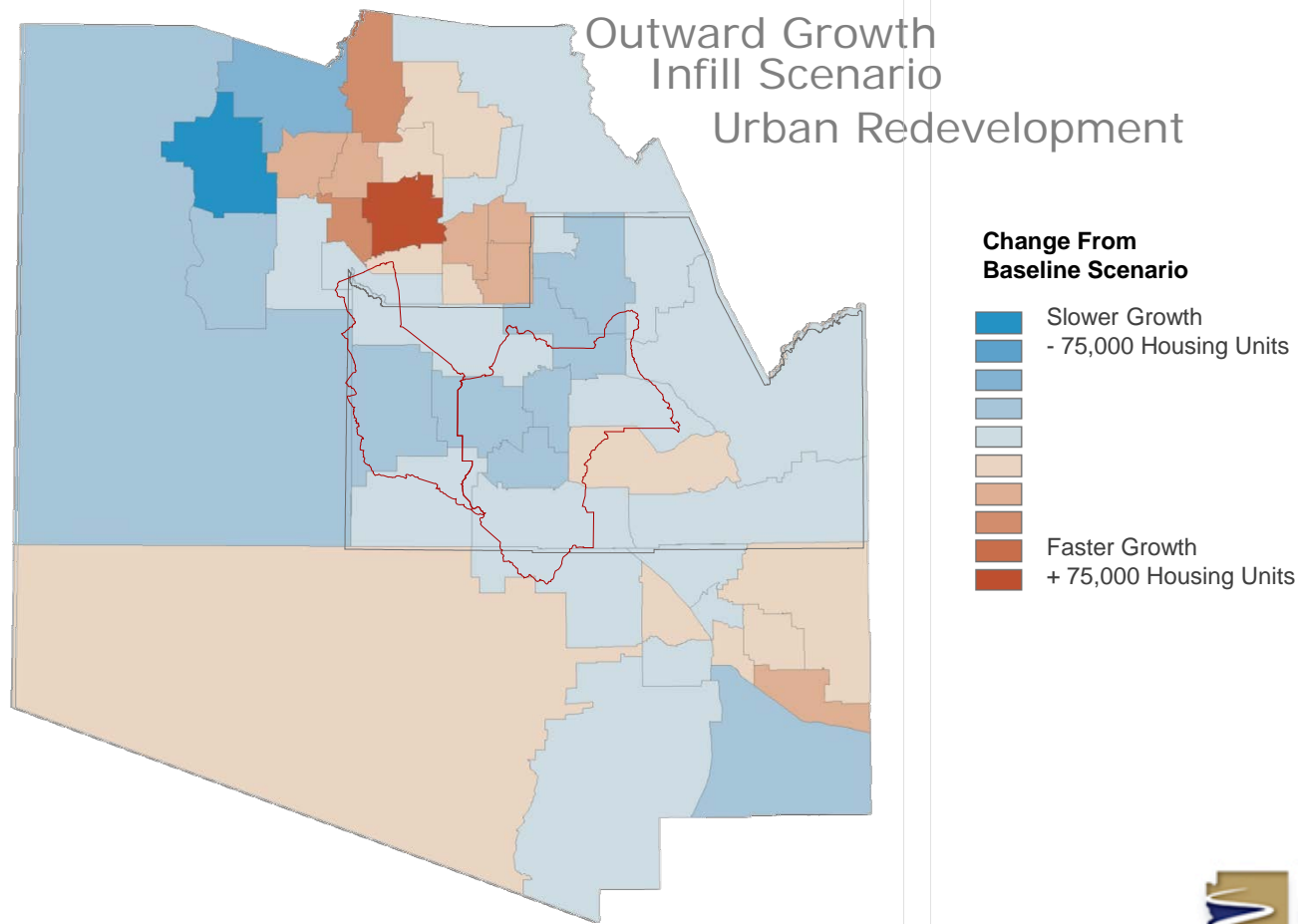
Growth Distribution

CAG TAZ Level Projections: Change in Population Density 2010 vs 2040



Alternative Growth Scenarios

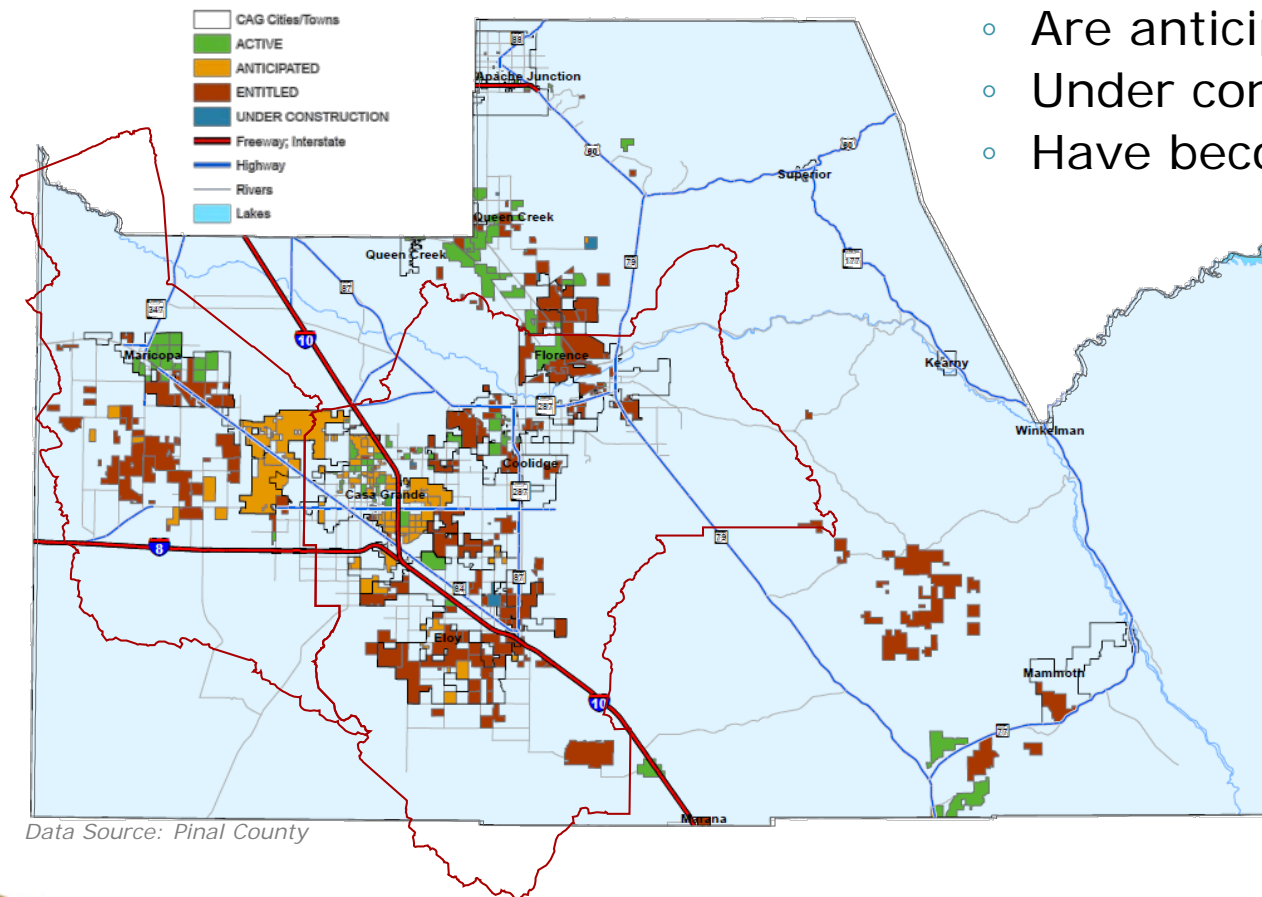
Developed by *Applied Economics*, Based on a Socioeconomic Allocation Model



Development Projects

CAG 2014 Pinal County Development Projects

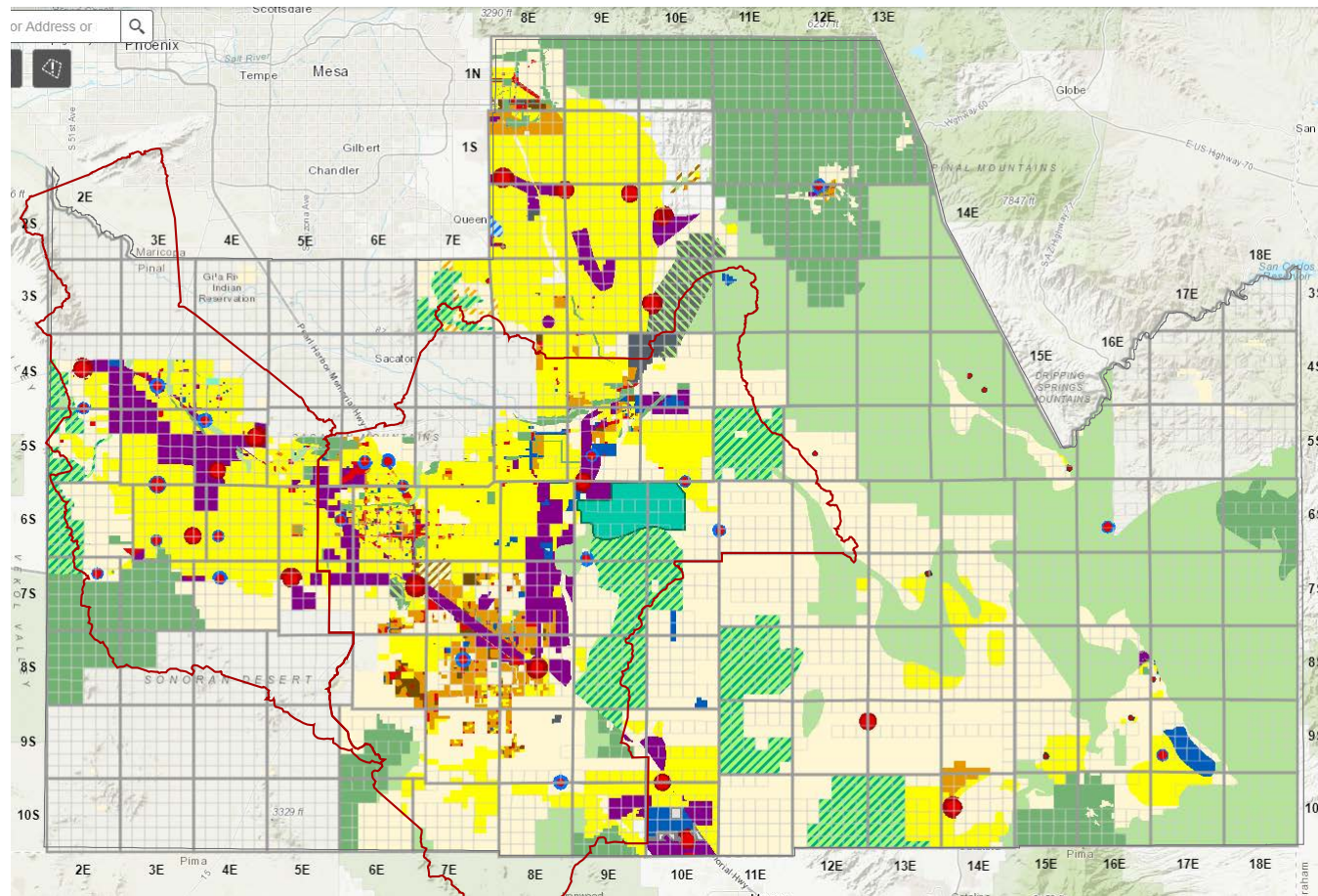
- Which projects:
 - Are anticipated?
 - Under construction?
 - Have become active?



Data Source: Pinal County

Development Projects

Comprehensive Plan: Community Development Projects



Data Source: Pinal County

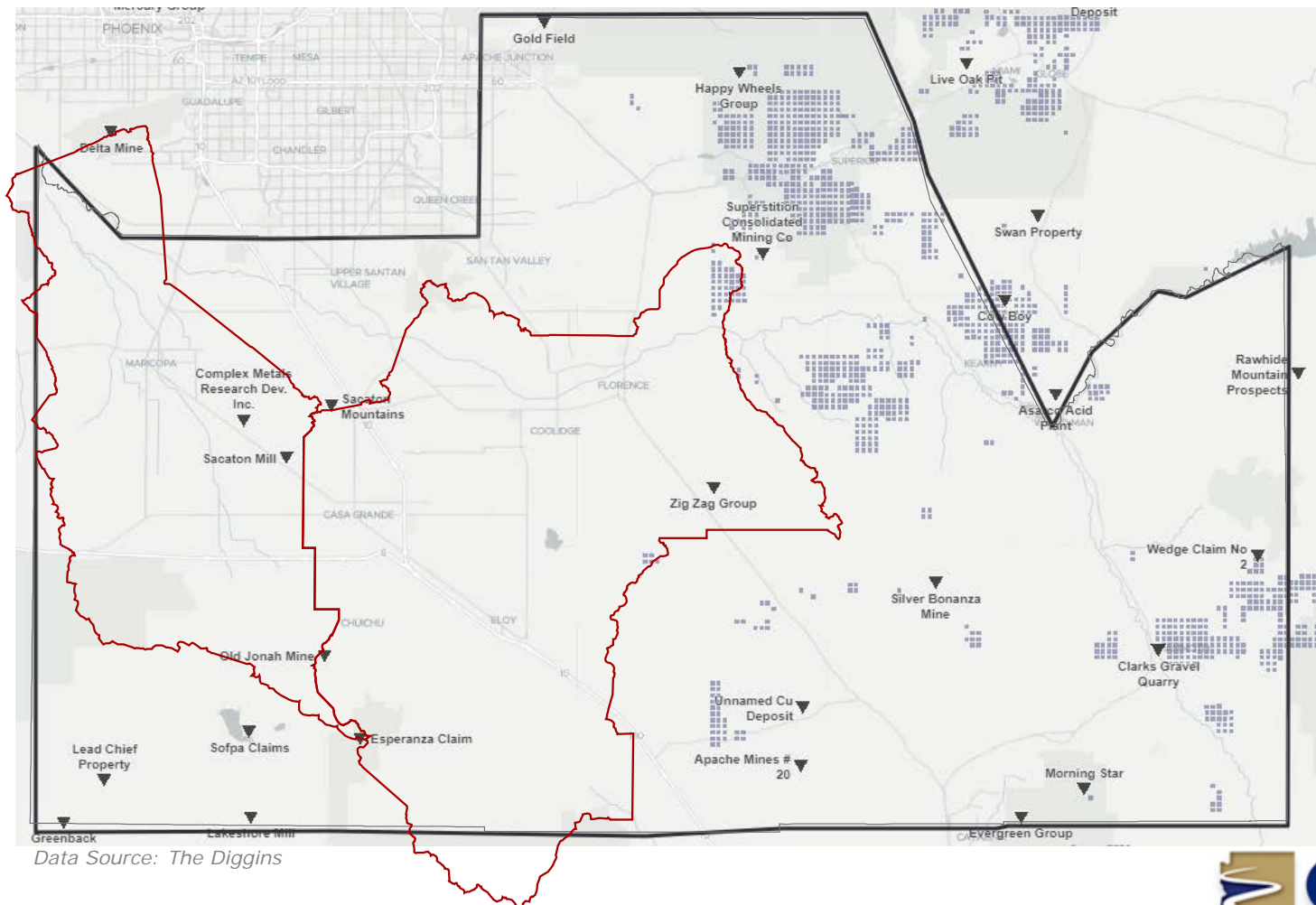
Comprehensive Plan

Land Use Elements

- Ranchette Residential (0-0.3 du/ac)
- Rural Residential (0-0.5 du/ac)
- Very Low Density Residential (0-1 du/ac)
- Low Density Residential (0-2 du/ac)
- Moderate Low Density Residential (1-3.5 du/ac)
- Medium Density Residential (3.5-8 du/ac)
- High Density Residential (8-24 du/ac)
- Mixed Use-Residential Focused
- General Commercial
- Agriculture
- Aviation Based Commerce Center
- Employment
- Airport Reserve
- Noise Sensitive Area
- Recreation/Conservation
- Major Open Space (or 1 du/ac)
- Restricted Use Open Space
- Existing/Planned or Proposed Regional Park
- Military
- General Public Facilities/Services
- Low Intensity Activity Center
- Mid Intensity Activity Center
- High Intensity Activity Center

Mining Activity?

Pinal County: Active Mining Claims



CAP: SAM Dashboard



Settings and Scenarios

Calculate Demands

Municipal Demand

Institutional Demand

Agricultural Demand

Tribal Demand

Other Demand

Available Supplies

Request Supplies

Fulfill Requests



Service Area Model

Municipal Demand > Housing Projections

Jump to Data

Jump to Model

Jump to Results

Default Values

Run Model

Activate Dashboard



GPHUD

HU Projections

Effluent

Results

Housing Scenarios

Spatial Distribution Scenario

Baseline HU Projection from CC

Baseline HU Projection from COGs

Scenario A: Applied Econ Mid

Scenario G: Suburban Growth

Scenario J: Interior Growth

Scenario L: Max Redevelopment

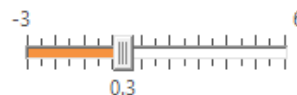
Housing Recovery

Medium

Lowest Year
Housing Units

10000

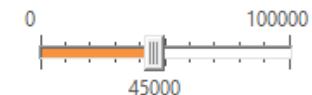
Growth Rate After Recovery



Growth Rate After 50 years

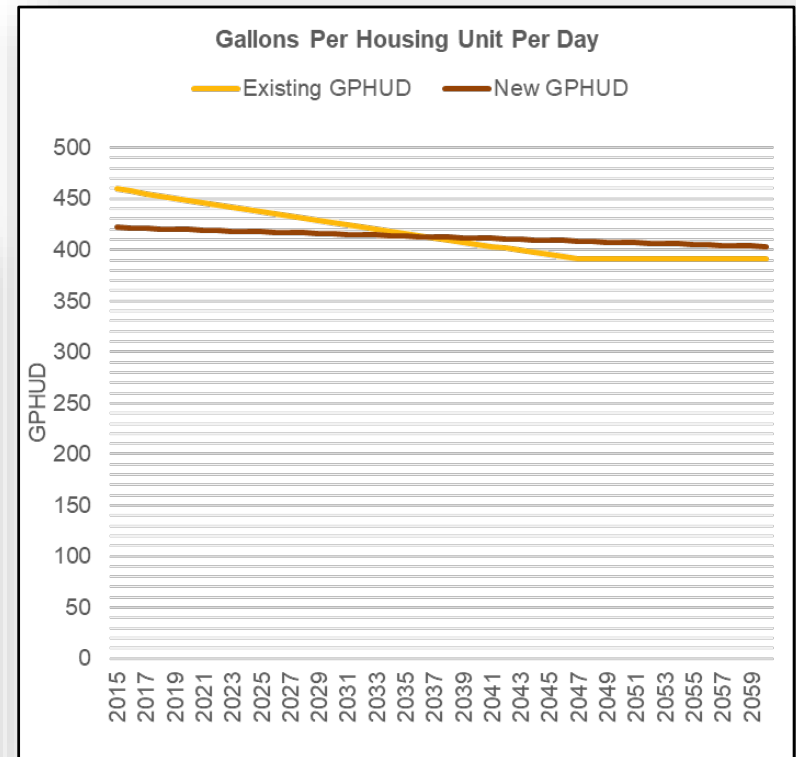
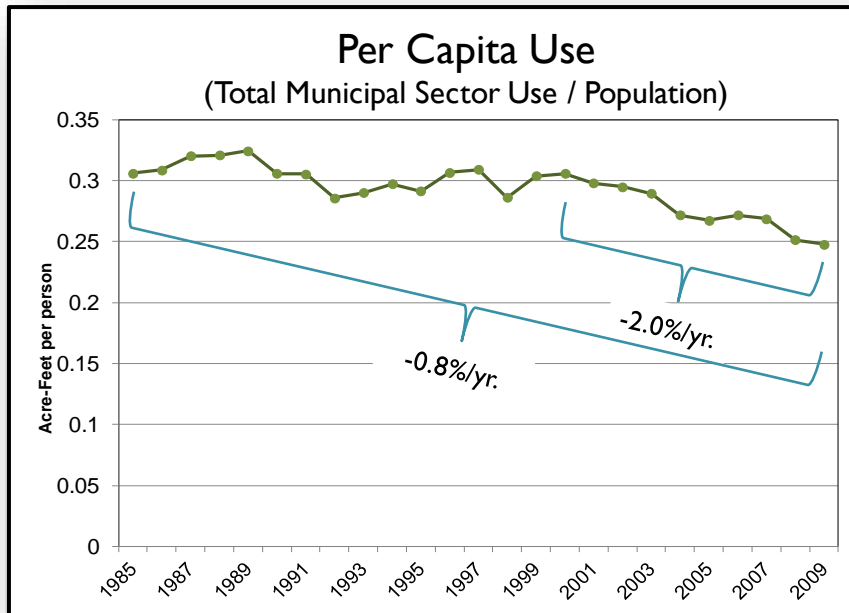


"Ordinary" Rate



Changes in Demand Factors

- How is demand expected to change?
 - Existing GPHUD
 - New GPHUD



Climate Variability

- Effect on demand:
 - Crop evapotranspiration
 - Change in per capita water use
 - Exterior demand change from higher temperatures and longer growing season
- Shortages to Water Supply
 - Frequency, duration and severity of CAP shortage
 - Availability of surface water for SCIDD

Global Circulation Models (GCMs)

Temp, Precip, etc.

Hydrologic "Traces"

Colorado River Simulation System (CRSS)

Supply to AZ

Arizona On-River Uses

Land Use, Housing & Pop (COGs, Census, Applied Economics)

Growth Projections

Water Supply Portfolios, Use, etc. (ADWR, CAP)

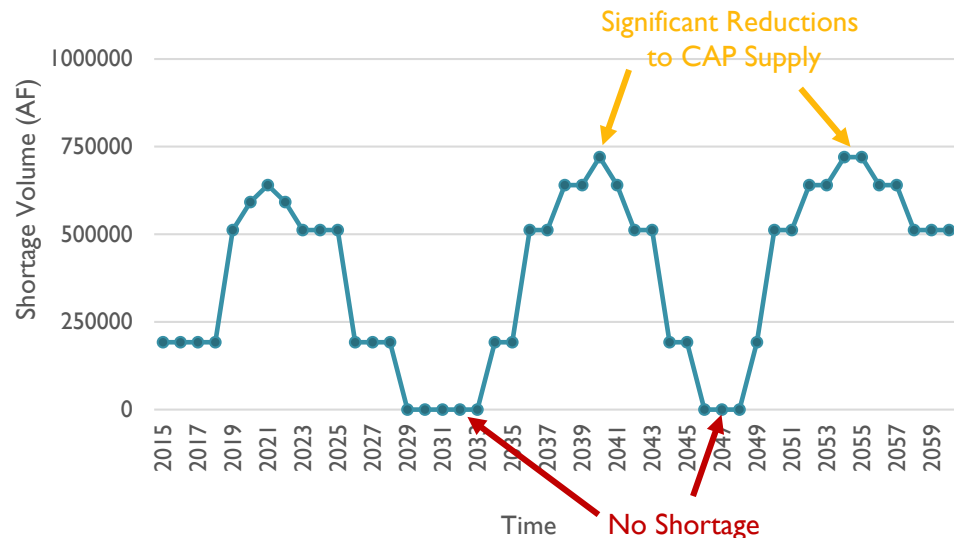
- CRSS simulates a range of hydrologic scenarios to account for future hydrologic uncertainty
 - Periodic shortages vs deep and sustained

CAP:SAM

Supply & Demand by Entity

Pumping & ...

Example Periodic CO River Shortages



Summary

Factors that can currently be adjusted in the CAP: SAM Model

Housing Unit Projection

- Start Year Housing Units by WP
- Housing Recovery Rate (Fast/Medium/Slow)
- Growth Rate After Recovery
- Growth Rate After 50 Years
- “Ordinary” Growth Rate
- UofA Housing Projections

Housing Unit Projection by TAZ

County Association of Governments

- MAG and CAG (2010-2040)
- PAG (2010-2050)

Applied Economics

Socioeconomic Allocation Model

- Outward Growth Scenario
- Infill Scenario
- Urban Redevelopment Scenario

Gallons Per Housing Unit Per Day New and Existing

- Annual % Change
- Cumulative Max Change
- Absolute Min Limit

Municipal Effluent Demand

- Non-potable demand scenarios: Flat growth versus tied to annual or cumulative growth

Supply Availability & Entitlements

- Set or calculate surface water supplies
- Effluent availability for reuse
- LTSA Balance
- Leases and exchanges (including future Reallocations)

Request for Supplies

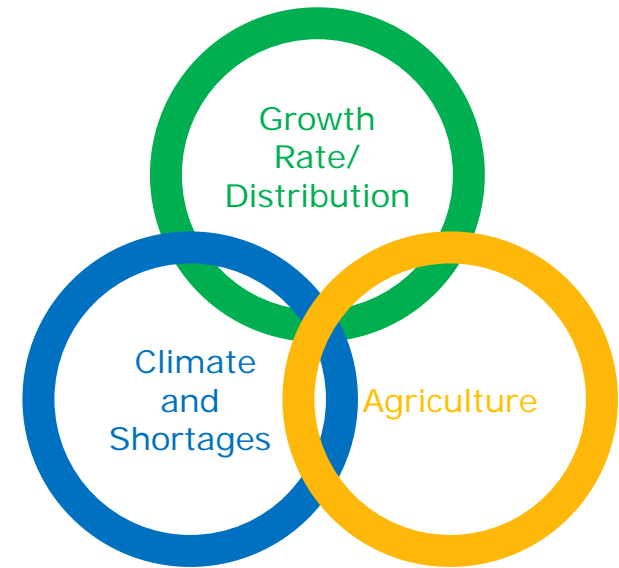
- User preferences on accumulation or use of LTSCs
- User preference for CAP utilization
- Storage facility preference

Agricultural Demand

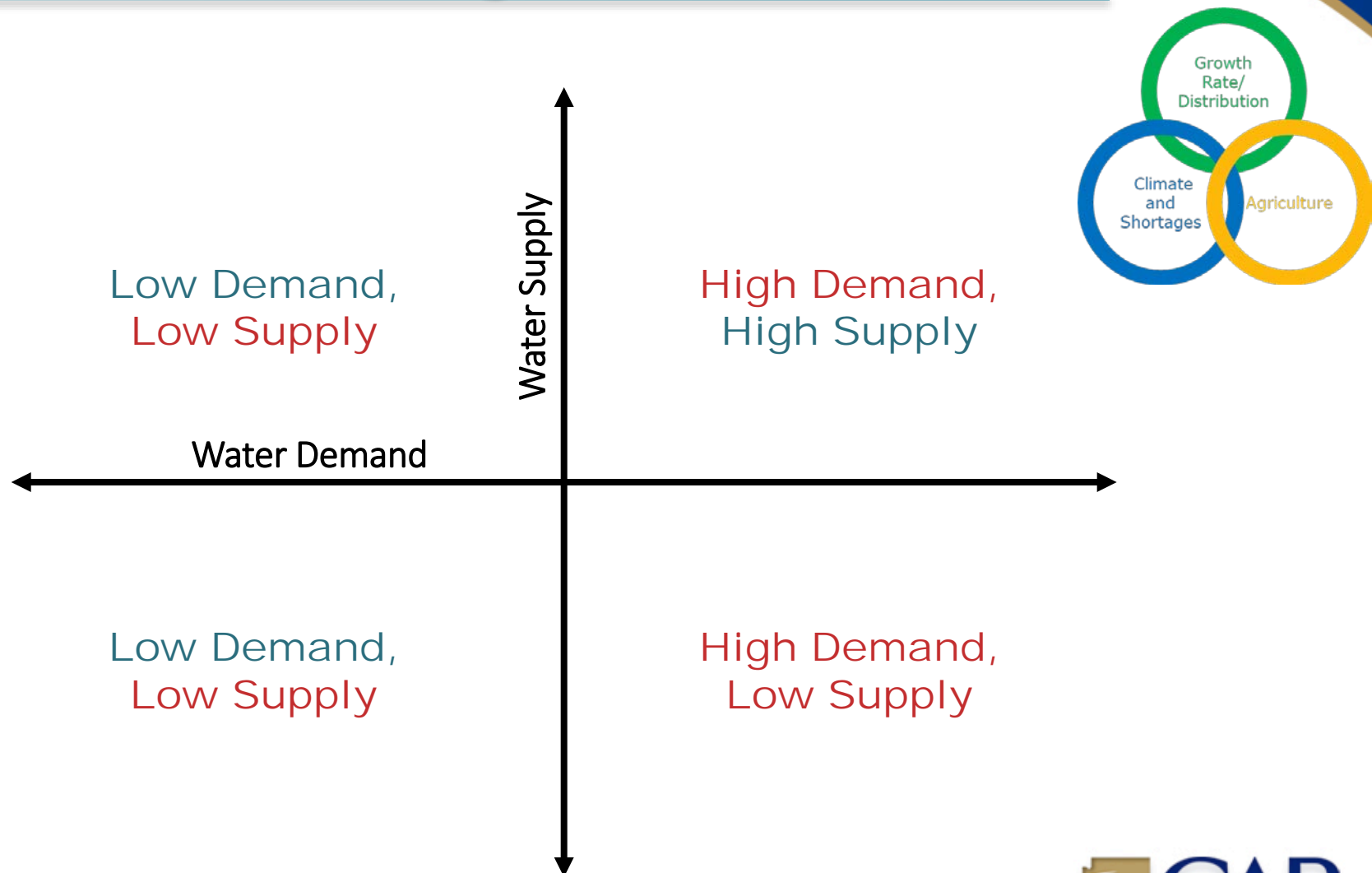
- Development on Irrigated Acres
- Intensity of use
- Replacement rate of high water use crops
- Replacement crop water use (AF/ac)
- Adjust crop efficiency

Next Step: Model Scenarios

- Incorporate the principal driving forces into a handful of model scenarios
- The goal is to evaluate and compare a range of different alternatives



Scenario Categories



Example Scenario Development

Growth

Climate Change

AG Urbanization

Scenario	Low	Med	High	None (Historic)	Hot/ Dry	Warm/ Wet	Low	Med	High
A	X				X			X	
B		X			X			X	
C			X		X				X
D		X		X				X	
E			X			X		X	
...									