Overview of CAP:SAM

Lower Santa Cruz River Basin Study Meeting
April 27, 2016

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YOUR WATER. YOUR FUTURE.

CAP Service Area Model (CAP:SAM)

- Tool for projecting supply and demand in CAP's three county service area
- Accounts for complex legal and physical characteristics of users and supplies
- Can simulate a wide range variations of "driving forces"
- Designed to generate "what if" scenarios

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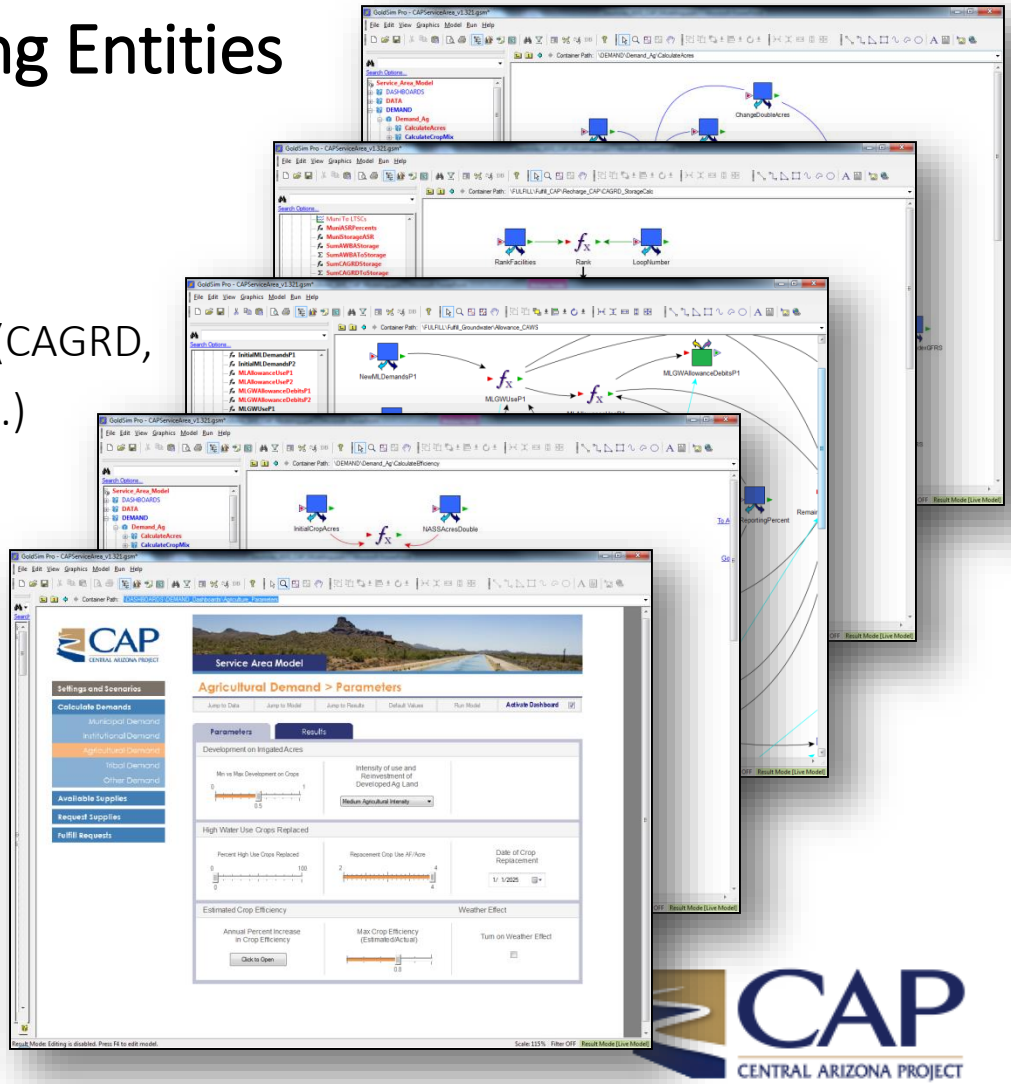
CAP Service Area Model (CAP:SAM)

- All Major Water Using Entities
  - 80 Municipal Providers
  - 23 Irrigation Districts
  - 12 Tribes and Districts
  - 20+ other user categories (CAGRD, AWBA, Industrial users, etc.)
- 16 Water Supply Types
  - Includes Surface Water, Effluent, CAP, LTSC, Groundwater, Recovered Water, etc.
  - Incorporates shortage scenarios from Colorado River Simulation model (CRSS)



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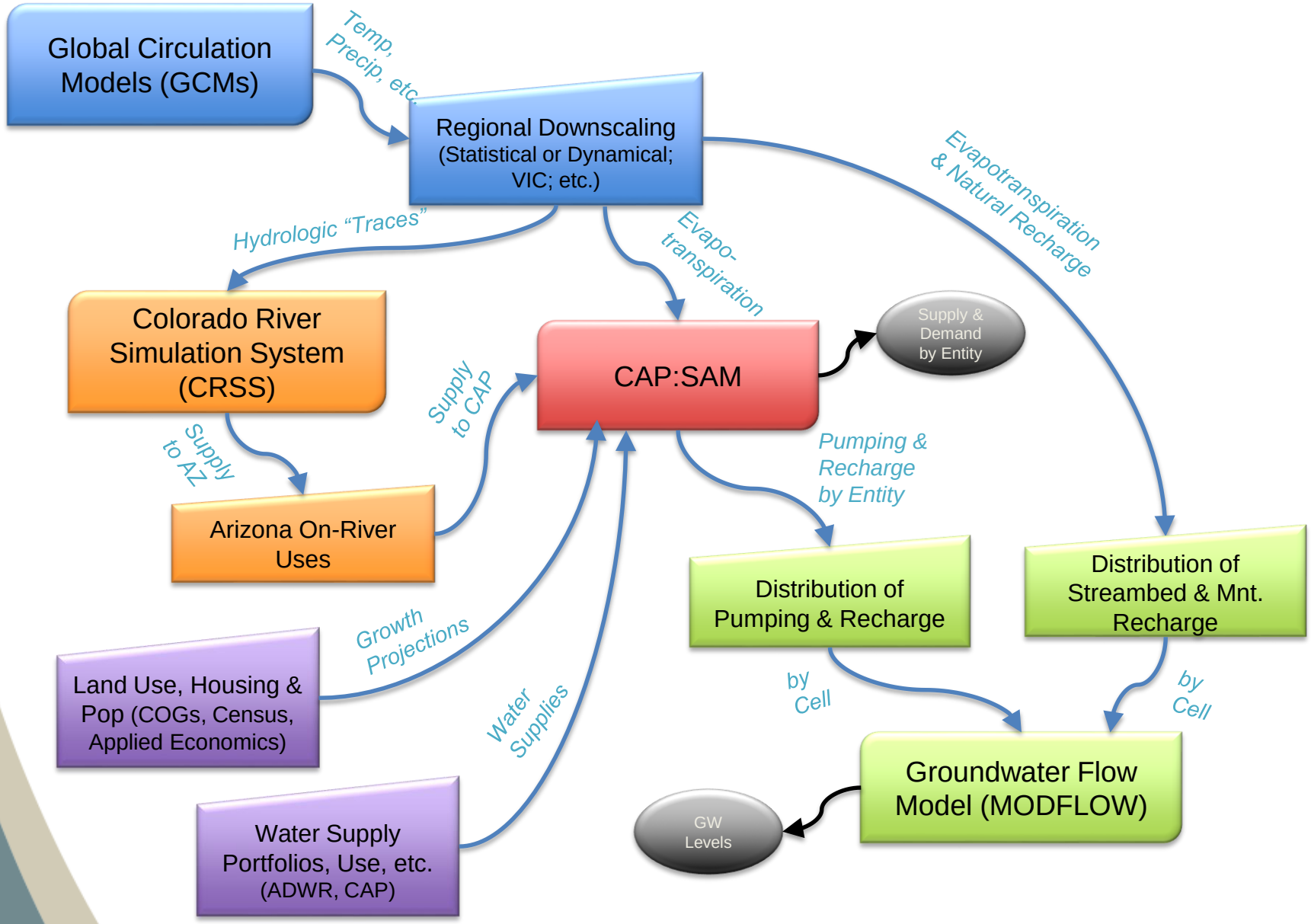
Model Integration



Supply, Demand & Uncertainty

Some of the major factors that affect water supply, demand and reliability:

- Growth
- Shortage
- Climate
- Socioeconomics
- Sector Trends
- Policy Changes
- Behavioral Shifts
- ….

"Driving Forces"

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Challenges

- Complex relationships among supply & demand factors
  - Within demand (e.g., housing development on Ag land)
  - Within supply (e.g., use of long-term CAP contracts affects Excess CAP)
  - Between supply & demand (e.g., reductions in interior use affect effluent supplies)
- Significant uncertainties across multiple dimensions
  - The rate of growth
  - The location of growth
  - Changes in current and future demand factors
  - The use of different supply types
  - The reliability of those supplies

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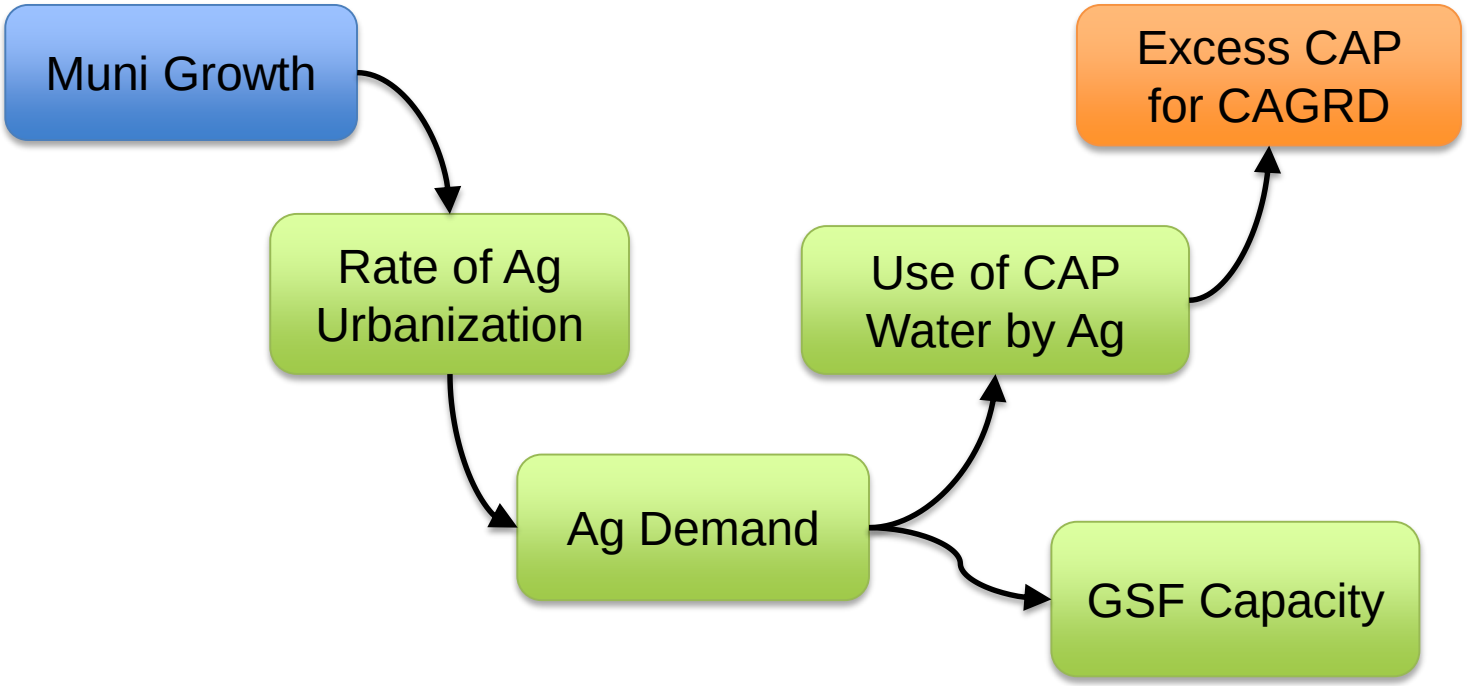
Interdependencies

Sector Example



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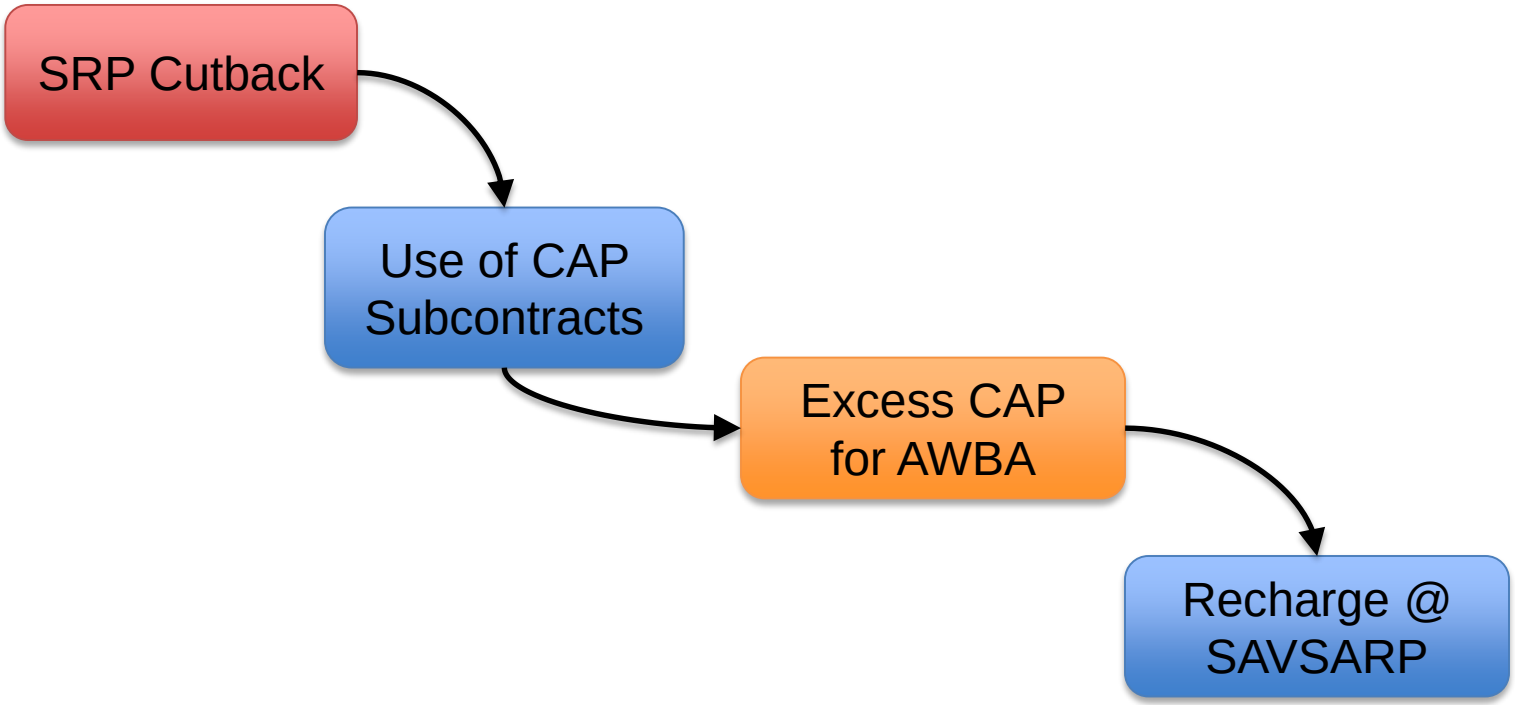
Interdependencies

Geographic Example



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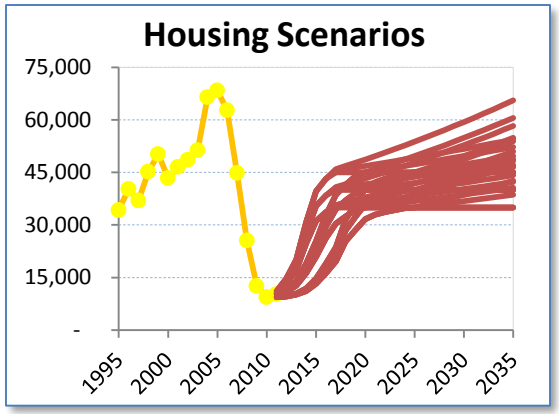
Growth

Both the rate of growth and the location of growth are critical



- Rate
  - Affects total use of supplies
- Location
  - Different water use characteristics for each utility
  - Different water supply portfolios
  - Different regulatory and institutional requirements

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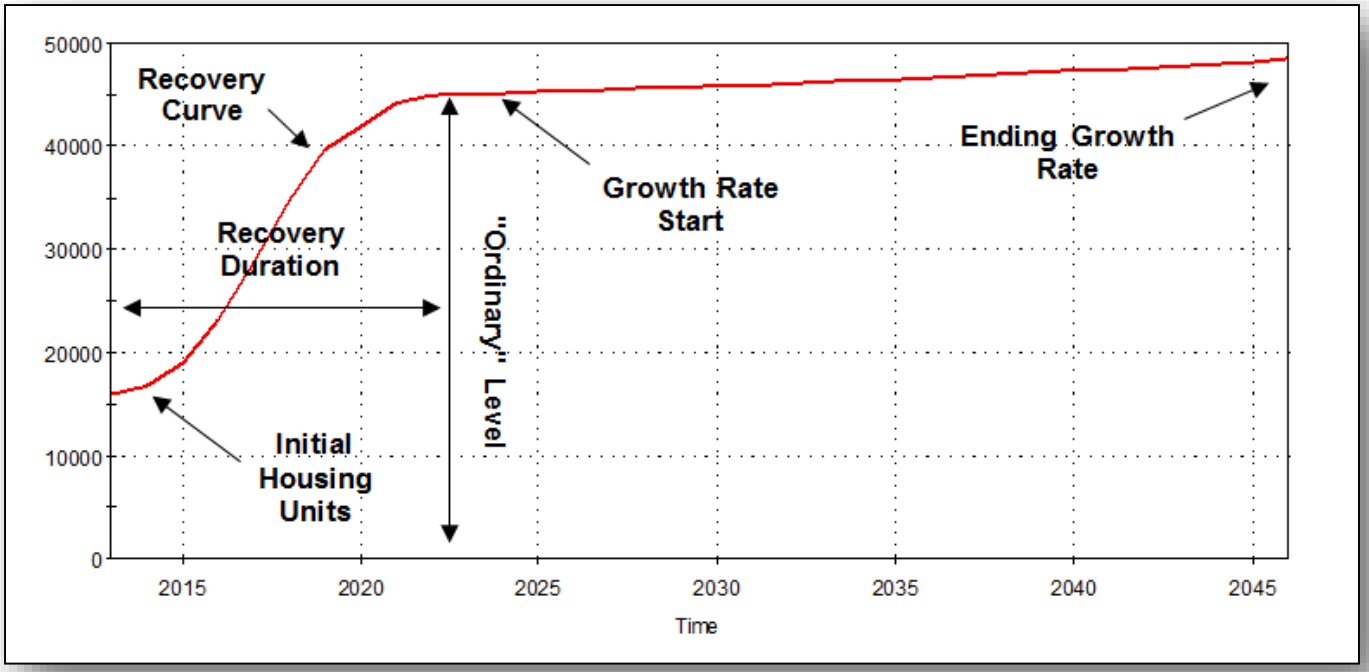
Growth Rate

- Annual housing unit growth can be adjusted to account for the effects of the recession, and longer-term trends



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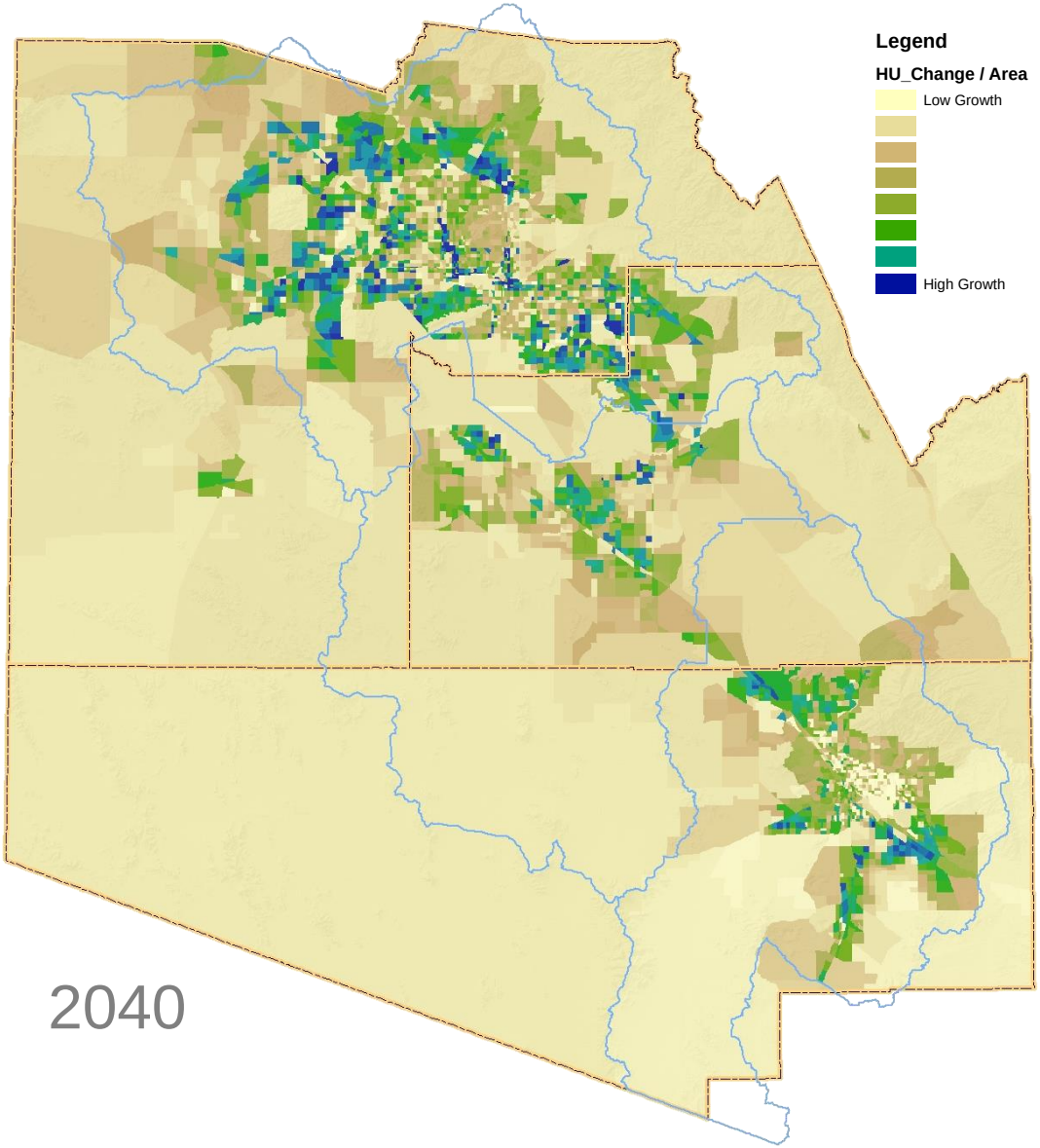
Growth Location: Baseline



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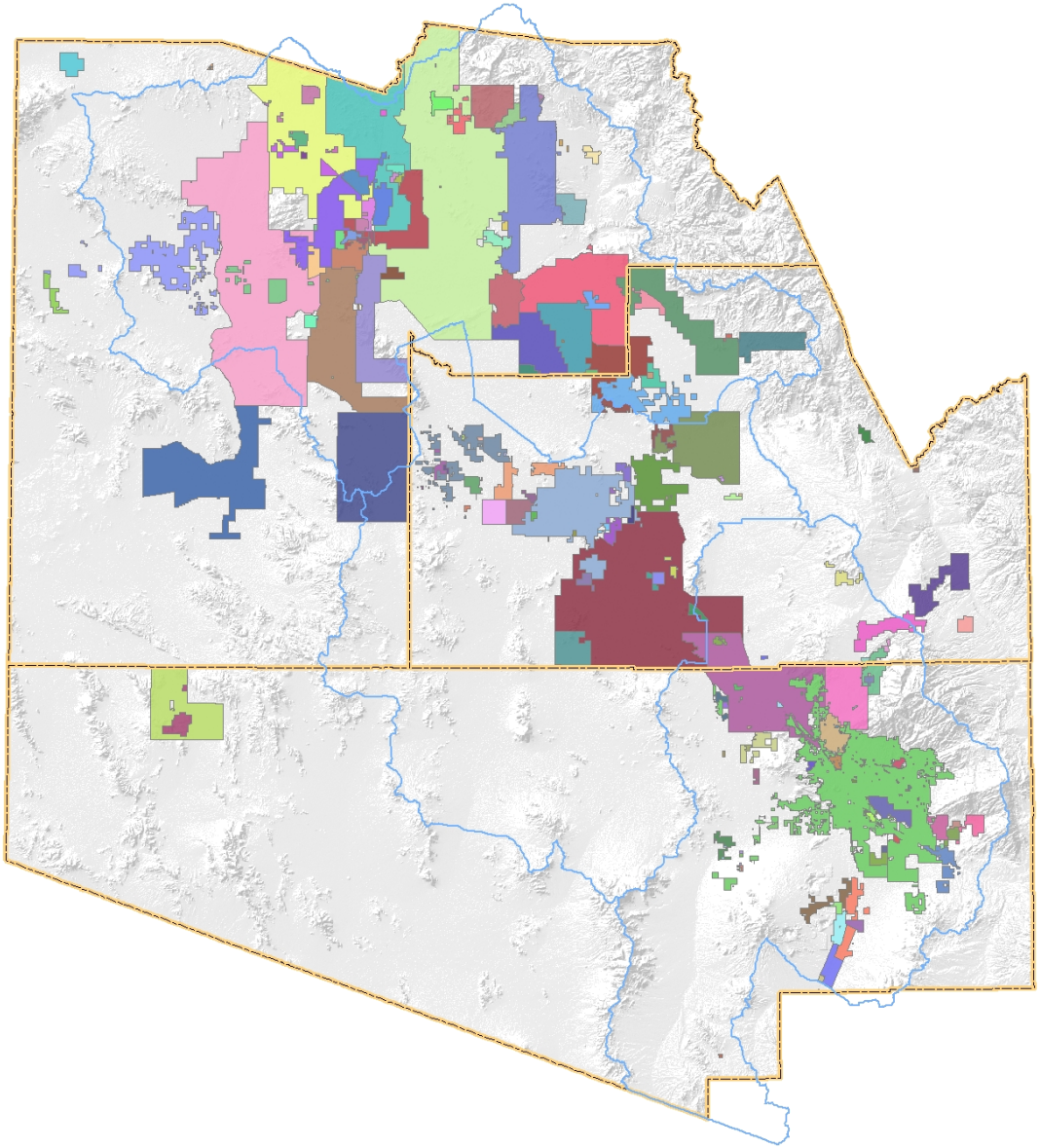
Water Provider Overlay



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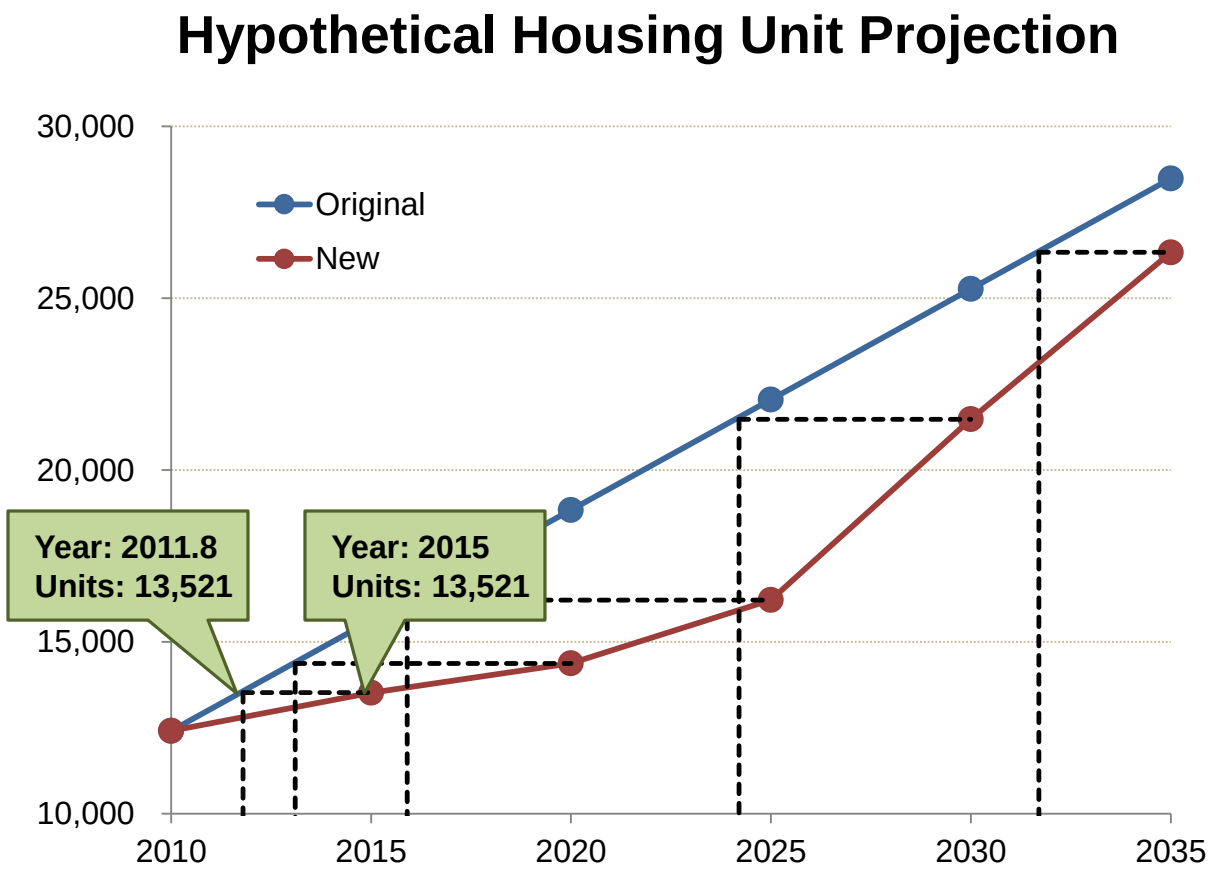
Reconcile Growth Rate & Location



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Alternate Growth Scenarios

- Socioeconomic Allocation Model
  - Developed by *Applied Economics*
    - Land use analysis with linear regression techniques
    - 46 study areas in CAP Service Area
    - Reallocated to neighborhood level, then to water provider
  - Allocation Factors
    - Historical growth patterns
    - Major residential development projects
    - Employment centers
    - Transportation infrastructure
    - Land value

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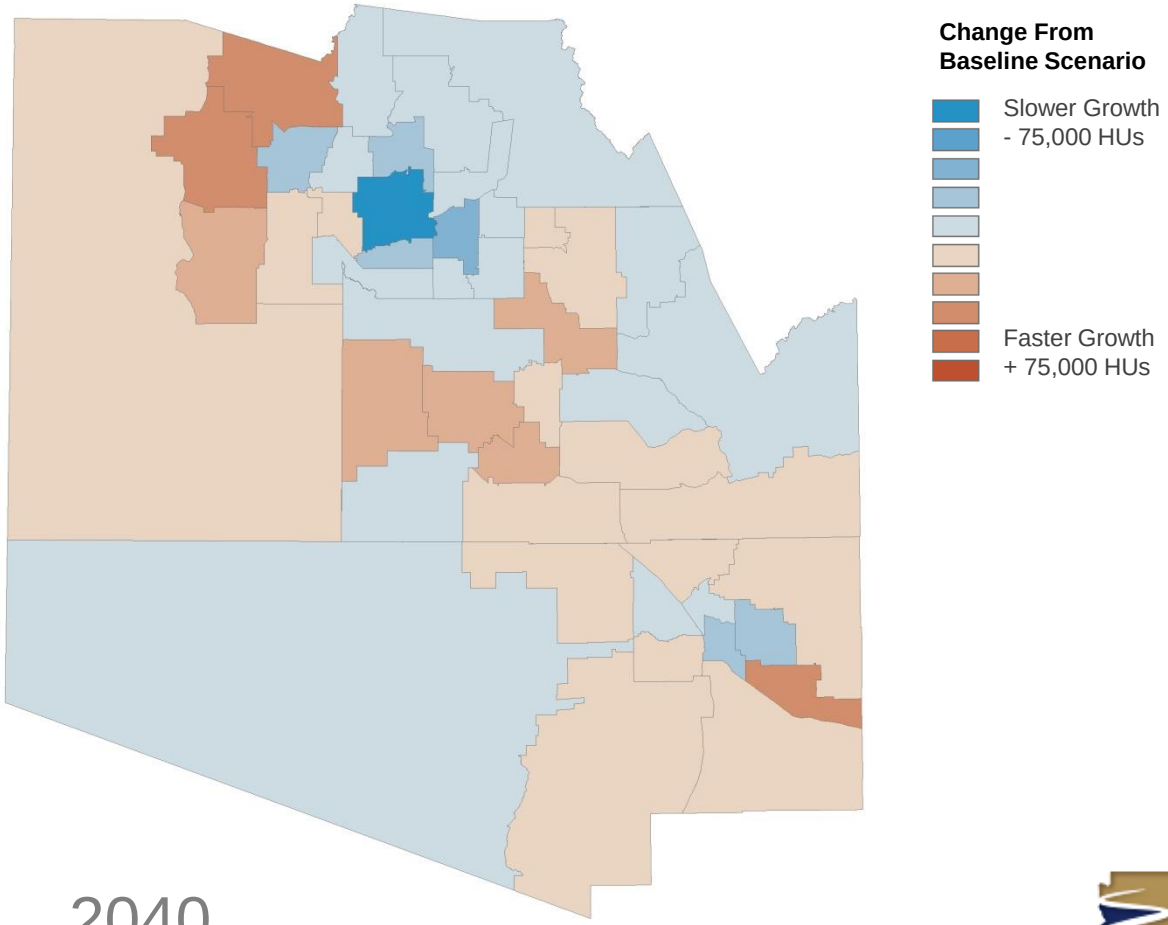
Outward Growth

- Commute time less important



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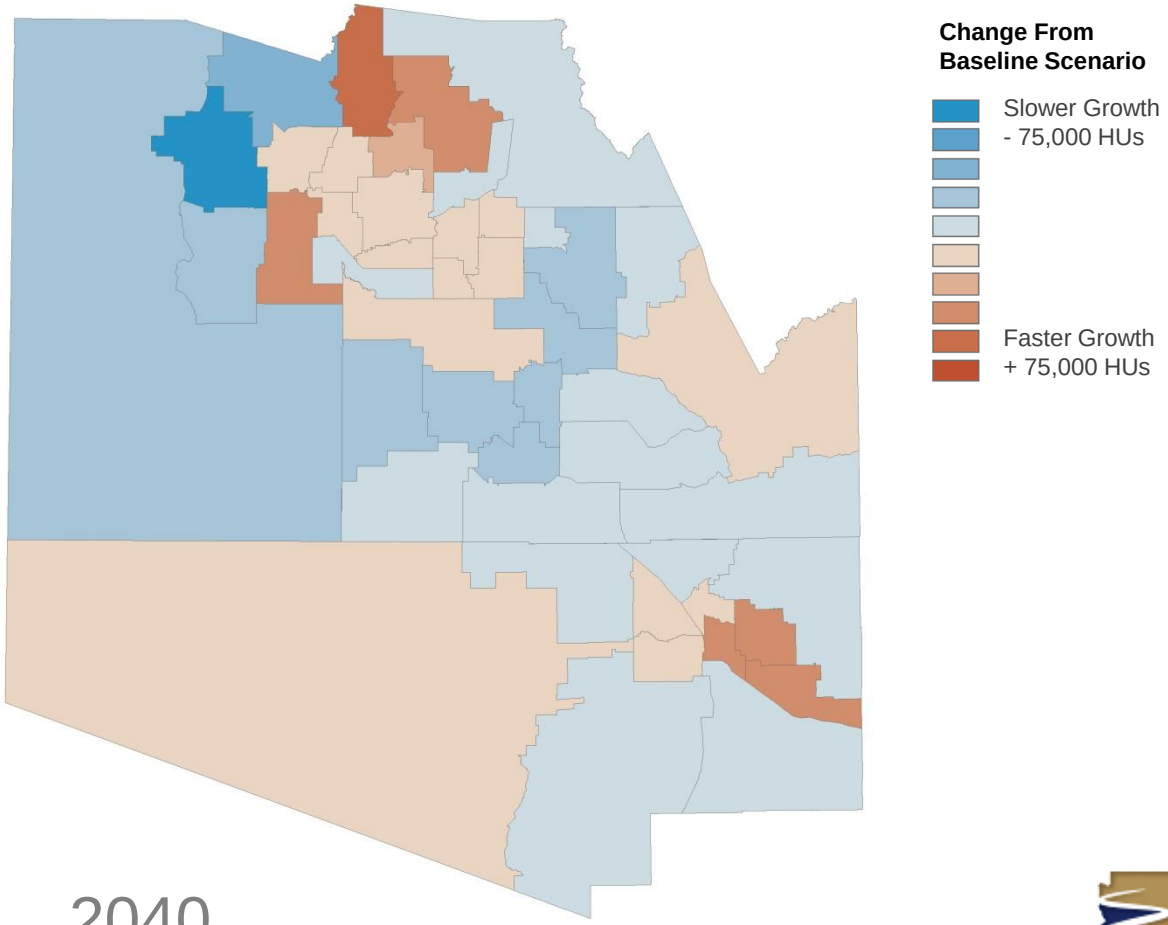
Infill

- Planned residential development projects less important
- Commute time more important



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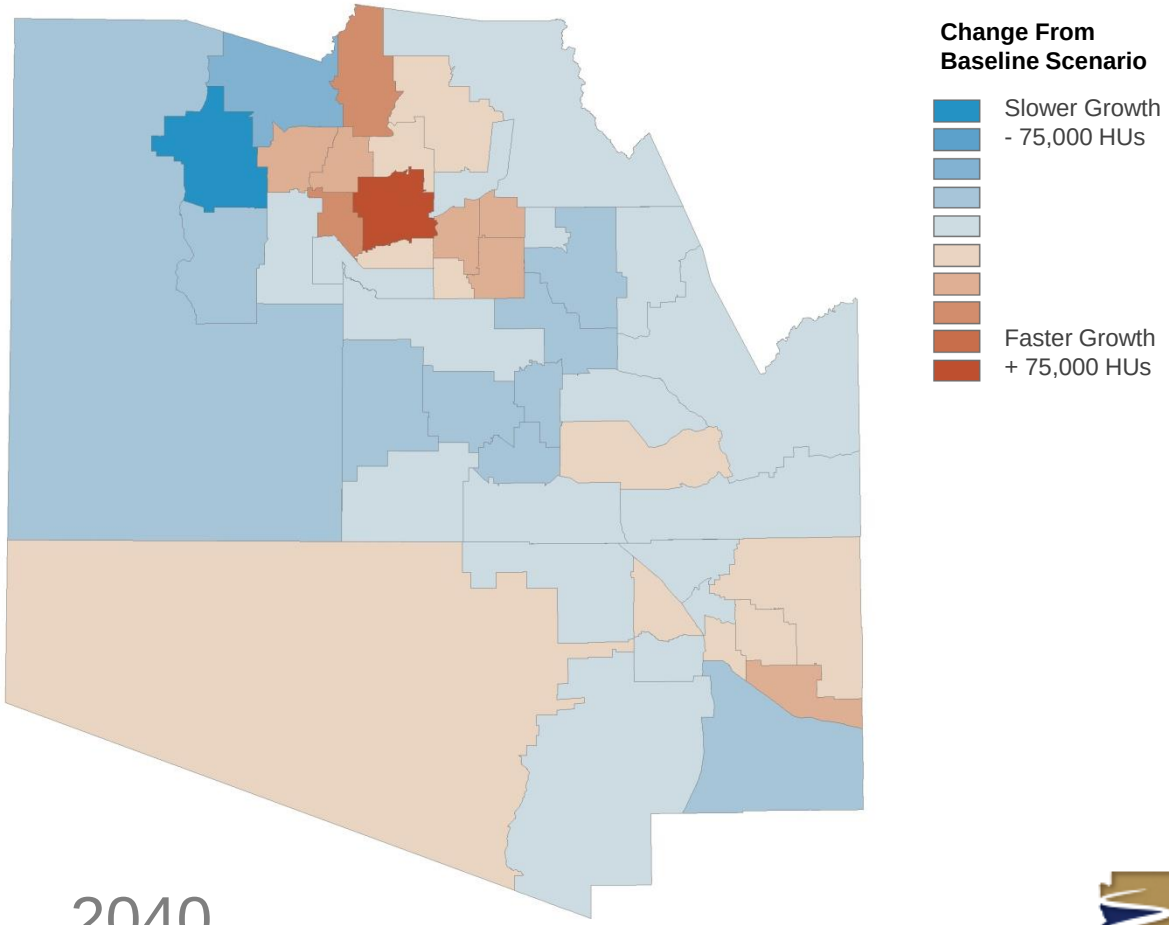
Urban Redevelopment

- Planned residential development projects less important
- Additional capacity for redevelopment



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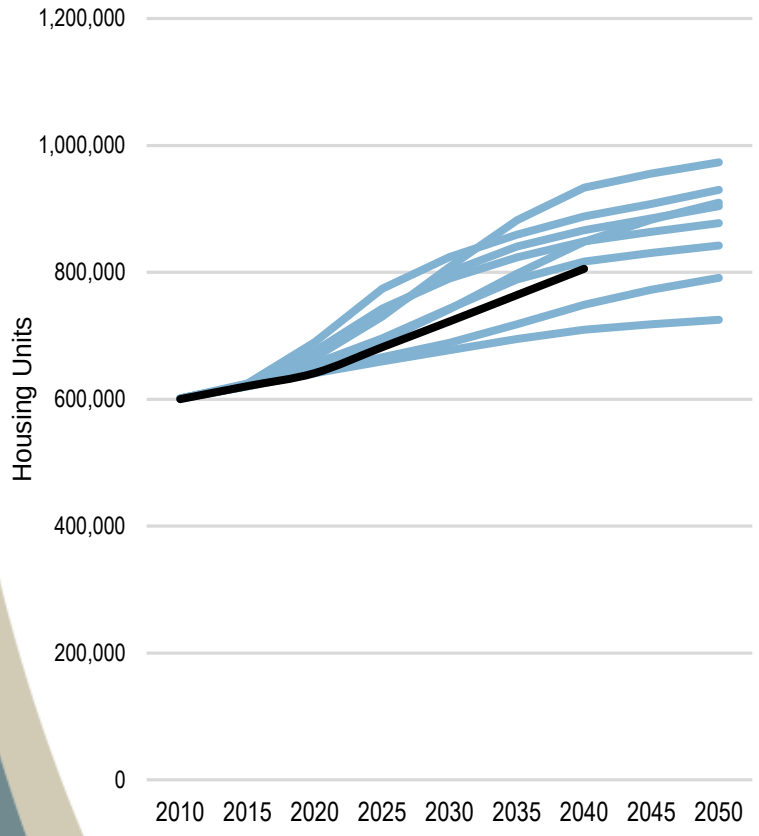
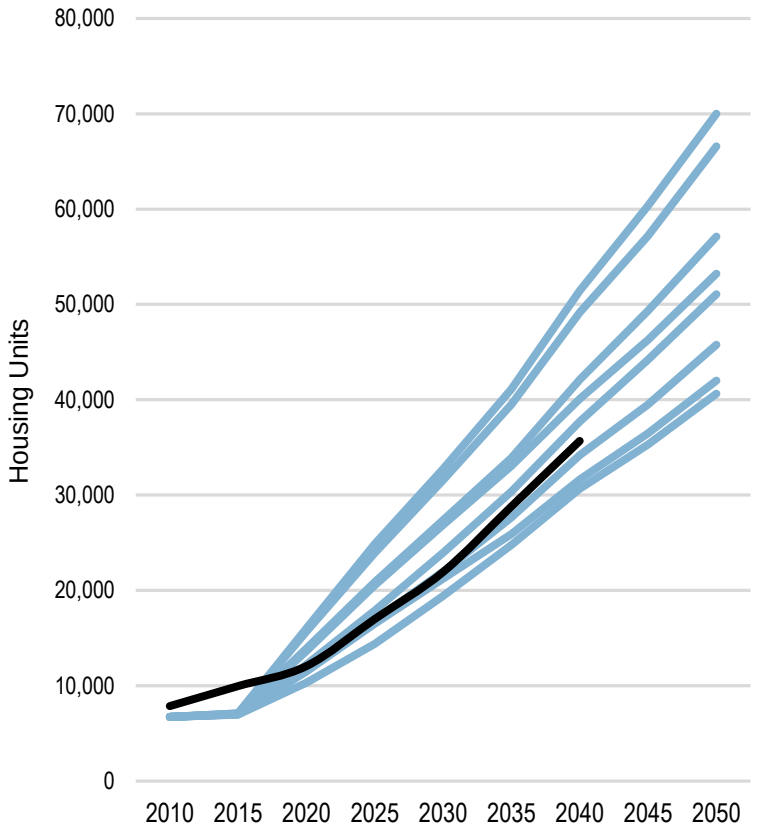
Growth Scenarios

Large Urban Provider



Growing Rural Provider



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Conversion to Water Demand

- Existing Approach
  - Housing units are multiplied by a provider-specific value of Gallons Per Housing Unit per Day (GPHUD)
  - Can adjust rate of change, maximum change and minimum floor
  - Separate calculations for new and existing housing units
- Enhancements
  - Interior versus exterior demand
  - Commercial, industrial, and irrigation
  - Socioeconomic & housing characteristics
  - Changes in demographics
  - Heat Island effects

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Supply Utilization

- The model contains each water provider's unique portfolio of supplies (i.e., entitlements)
  - Annual supplies (e.g., CAP, surface water, effluent)
  - Volumetric supplies (e.g., LTSCs, GW allowances)
  - Accrual (and debiting) of long-term storage credits is modeled, as is incidental recharge and Pinal renewable GW allowances
  - Leases, exchanges, transfers and reallocations through time can also be modeled

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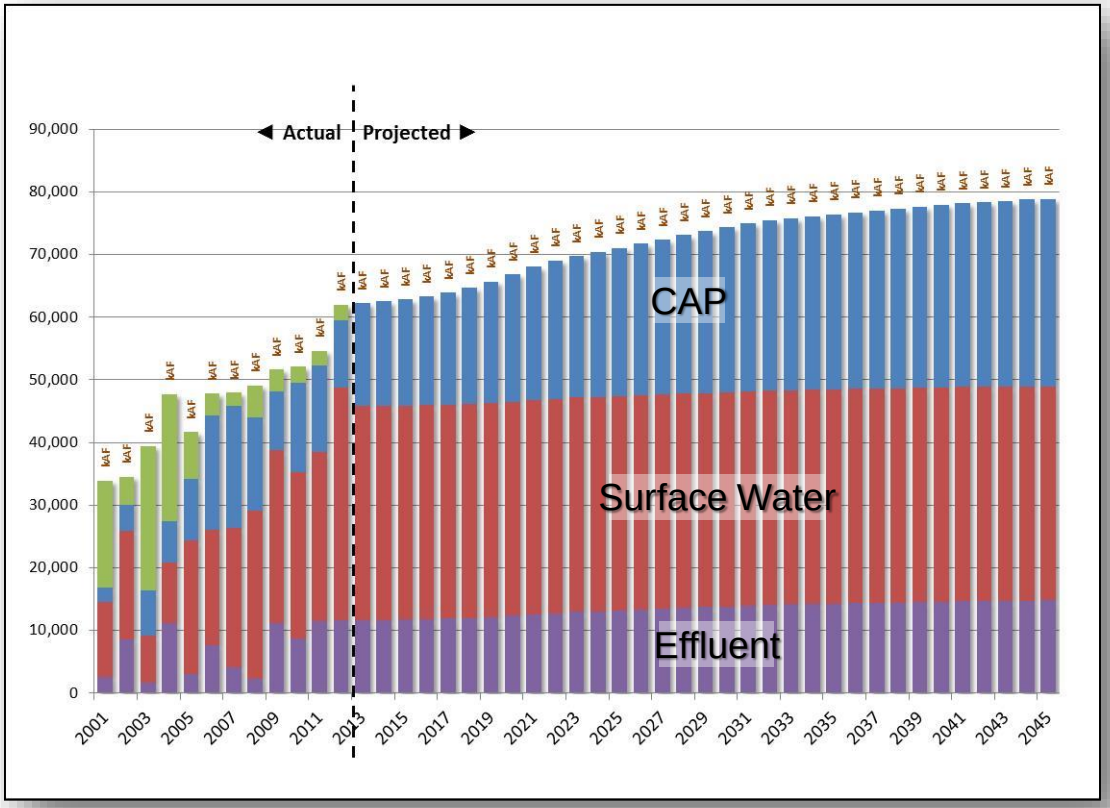
Supply Utilization

An Established City, with Moderate Growth, and a Diverse Renewable Supply Portfolio



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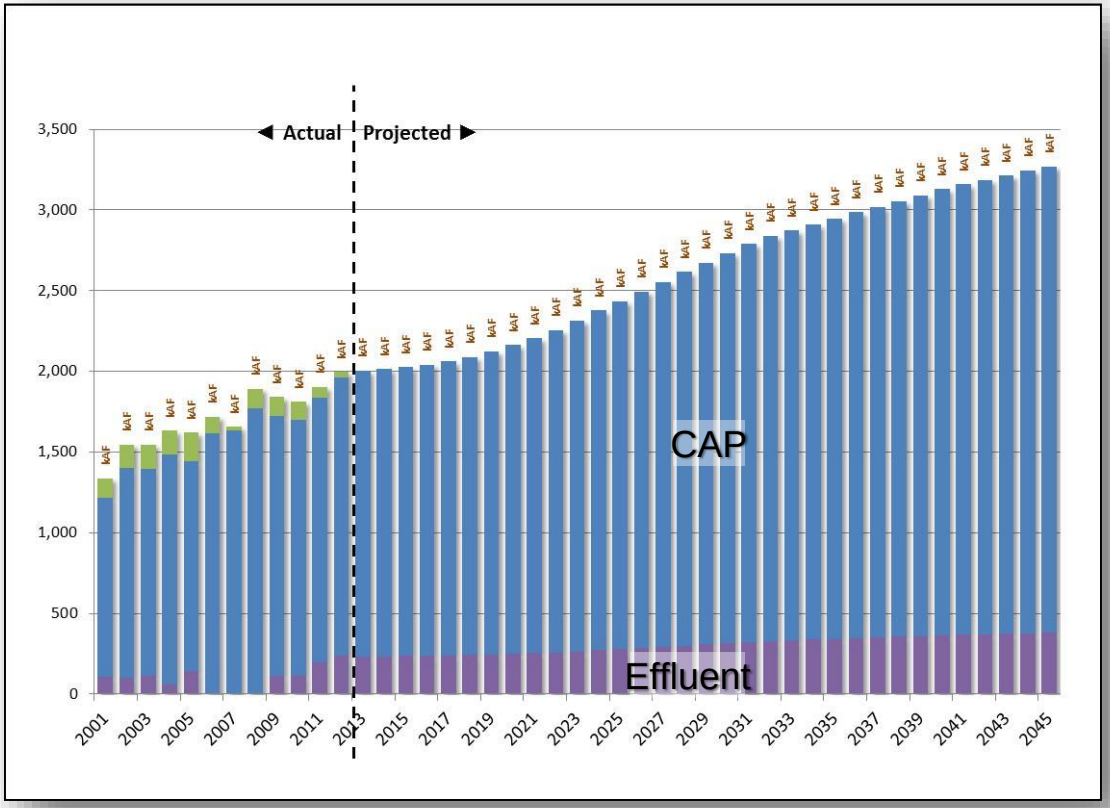
Supply Utilization

A Medium-Sized Provider, with Moderate Growth, and a Large Renewable Supply Portfolio



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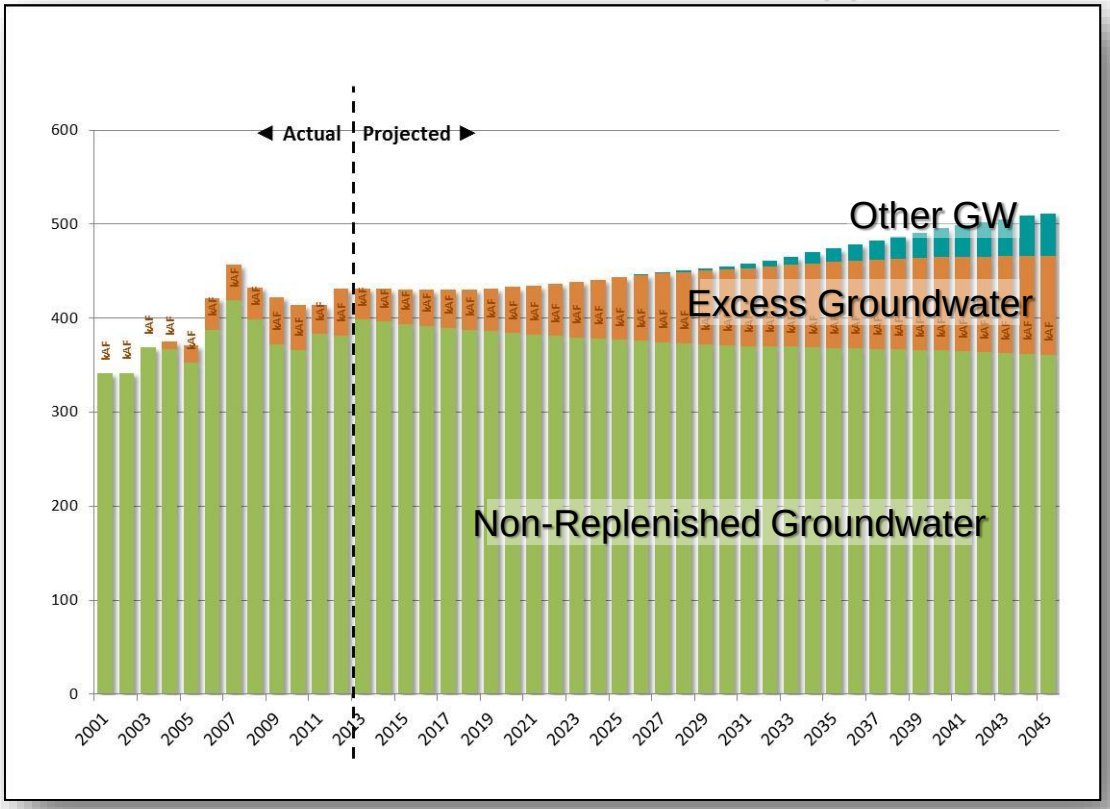
Supply Utilization

A Small Member Land Provider, With Low Growth, and No Renewable Supplies



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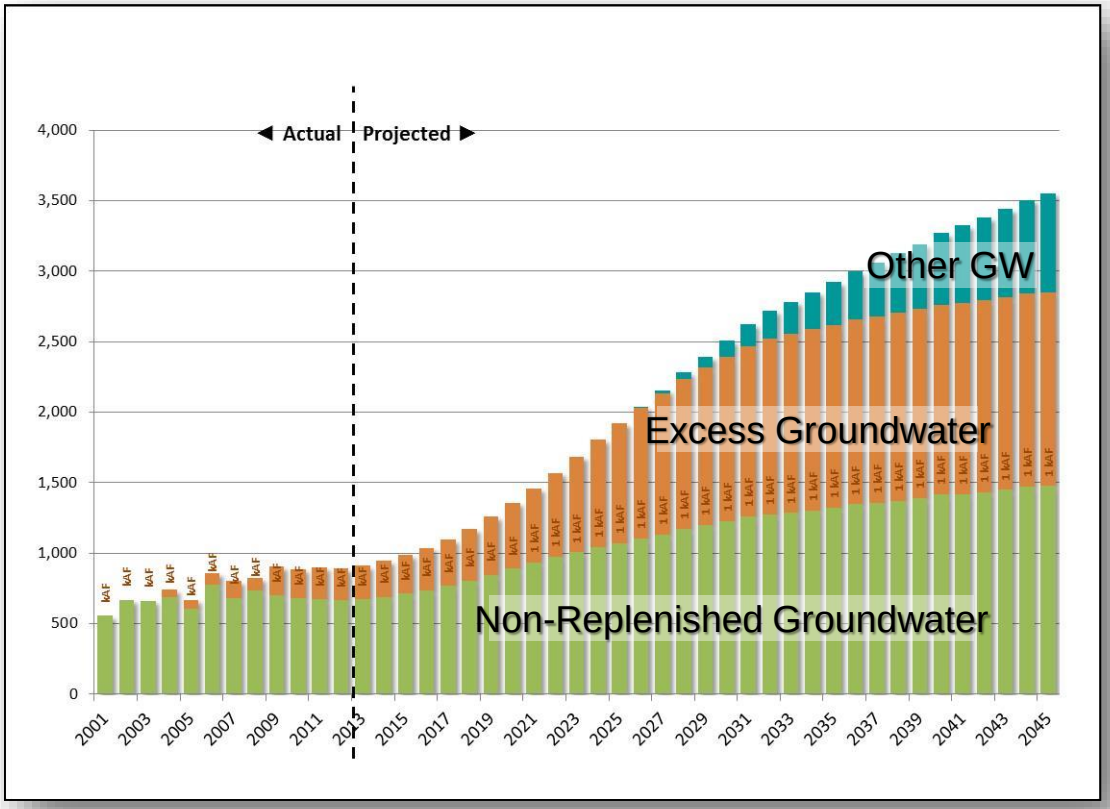
Supply Utilization

A Medium-Sized Provider, with Rapid Growth, and No Renewable Supplies



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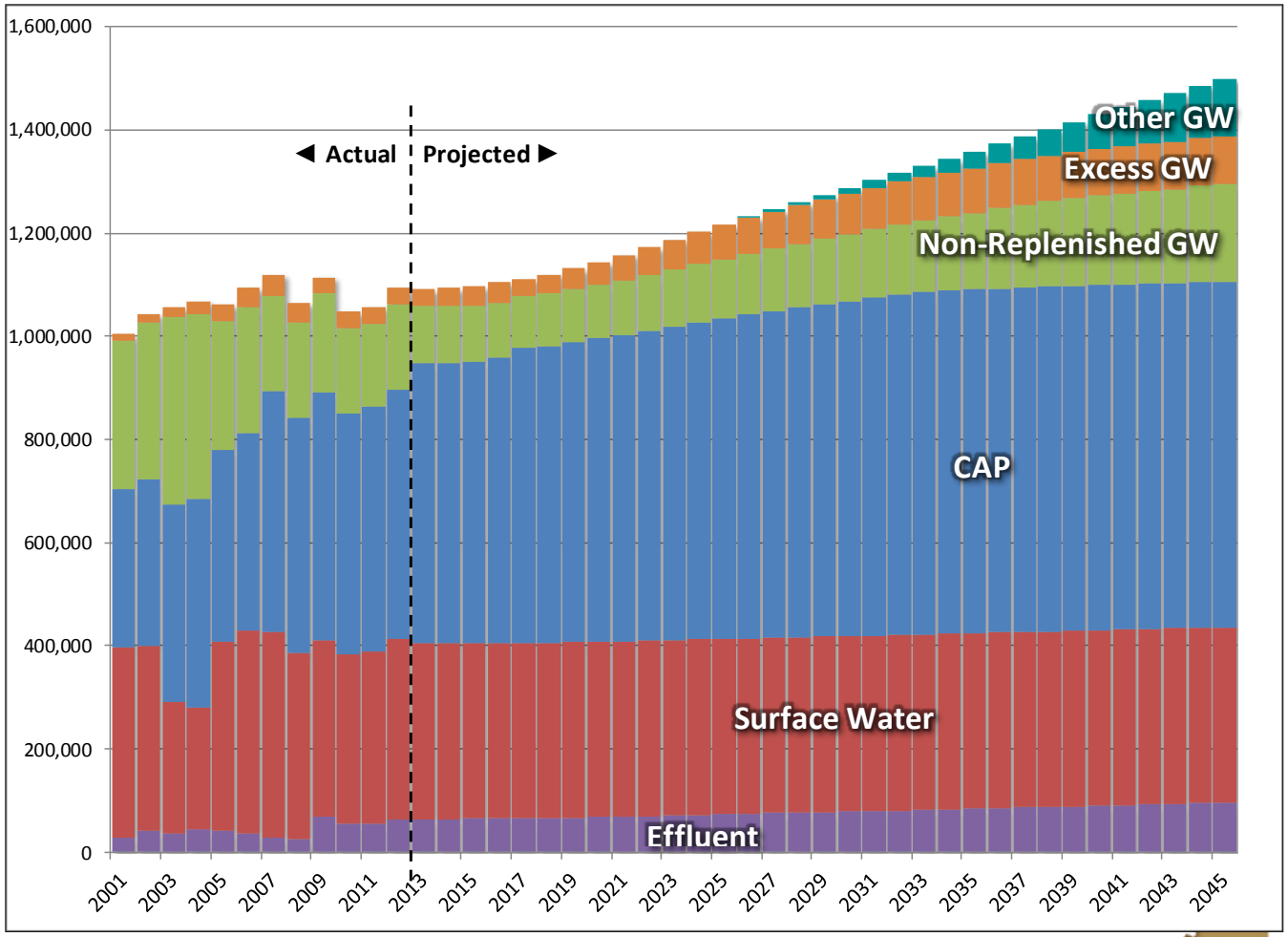
Supply Utilization: Total



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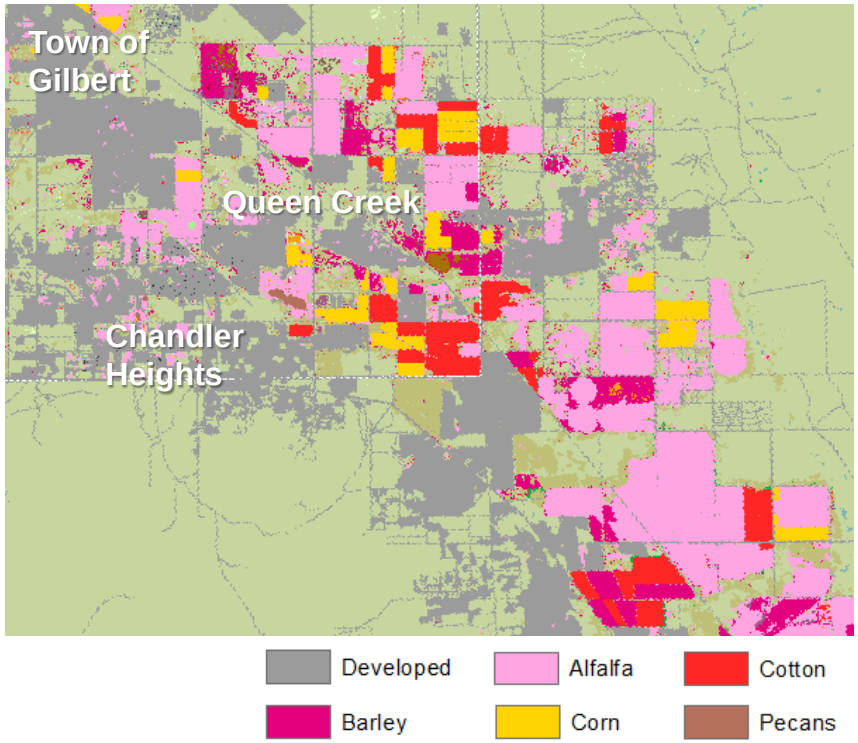
Urbanization of Agricultural Land

- The spatial housing unit scenarios can be used to project urbanization of agricultural land
- Agricultural Data:
  - Acreage by Crop Type (NASS, 2008-2014)
  - Usage by Supply Type (ADWR, 1985-2013)
  - Crop Consumptive Use (ADWR)

National Agricultural Statistics Service CropScape Data Layer, 2013



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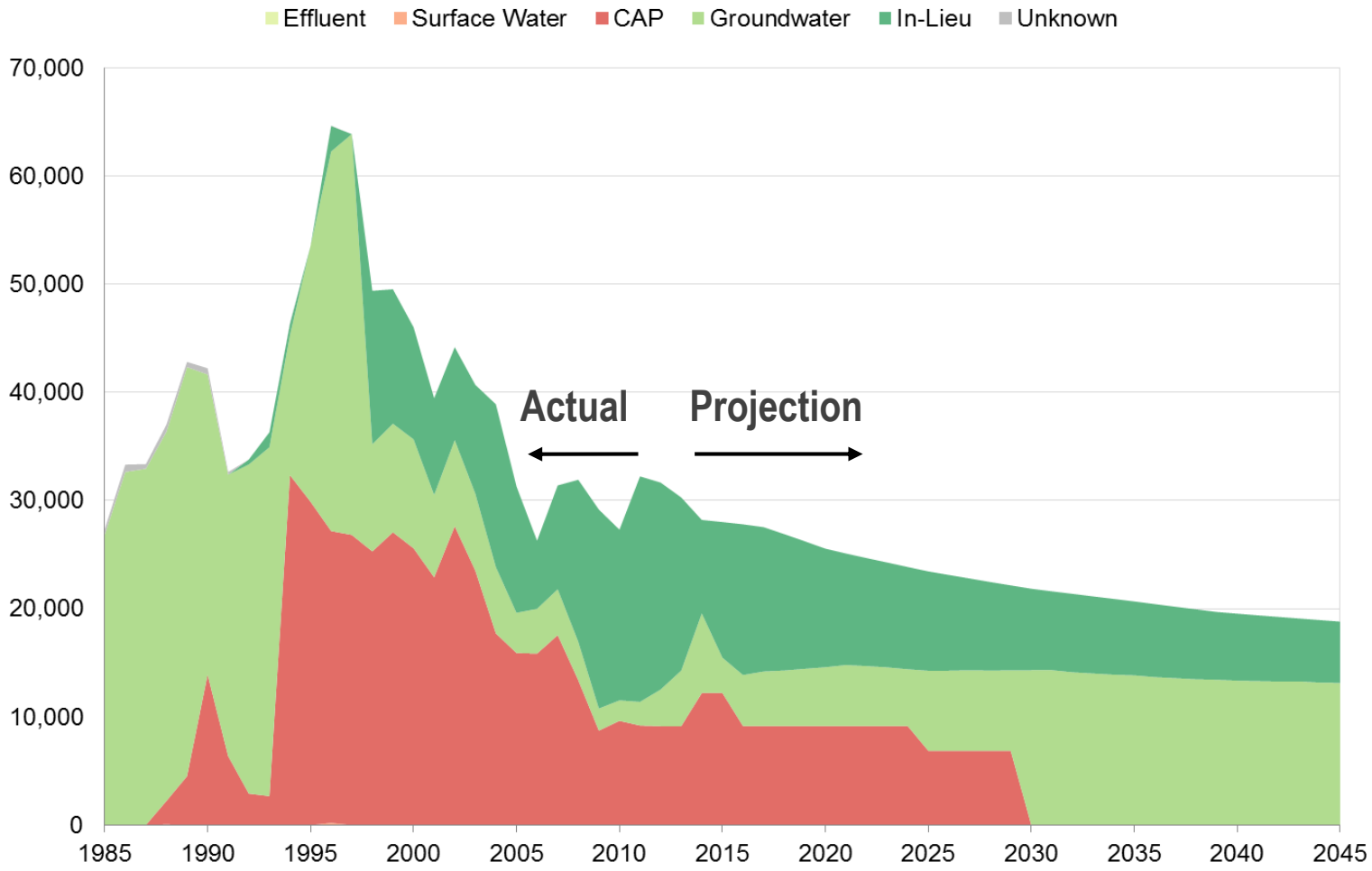
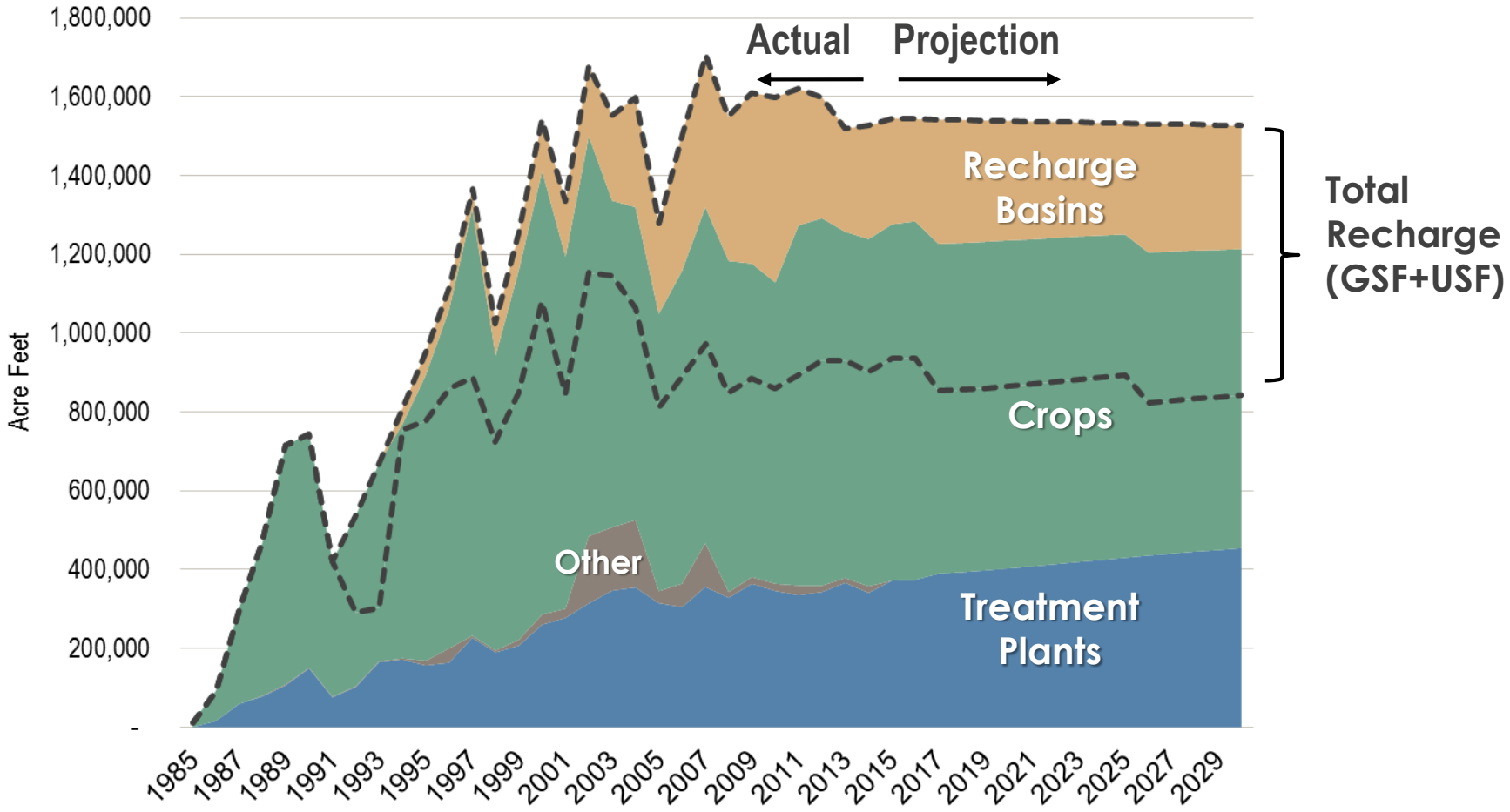
Example Projection of Irrigation District Supply Utilization



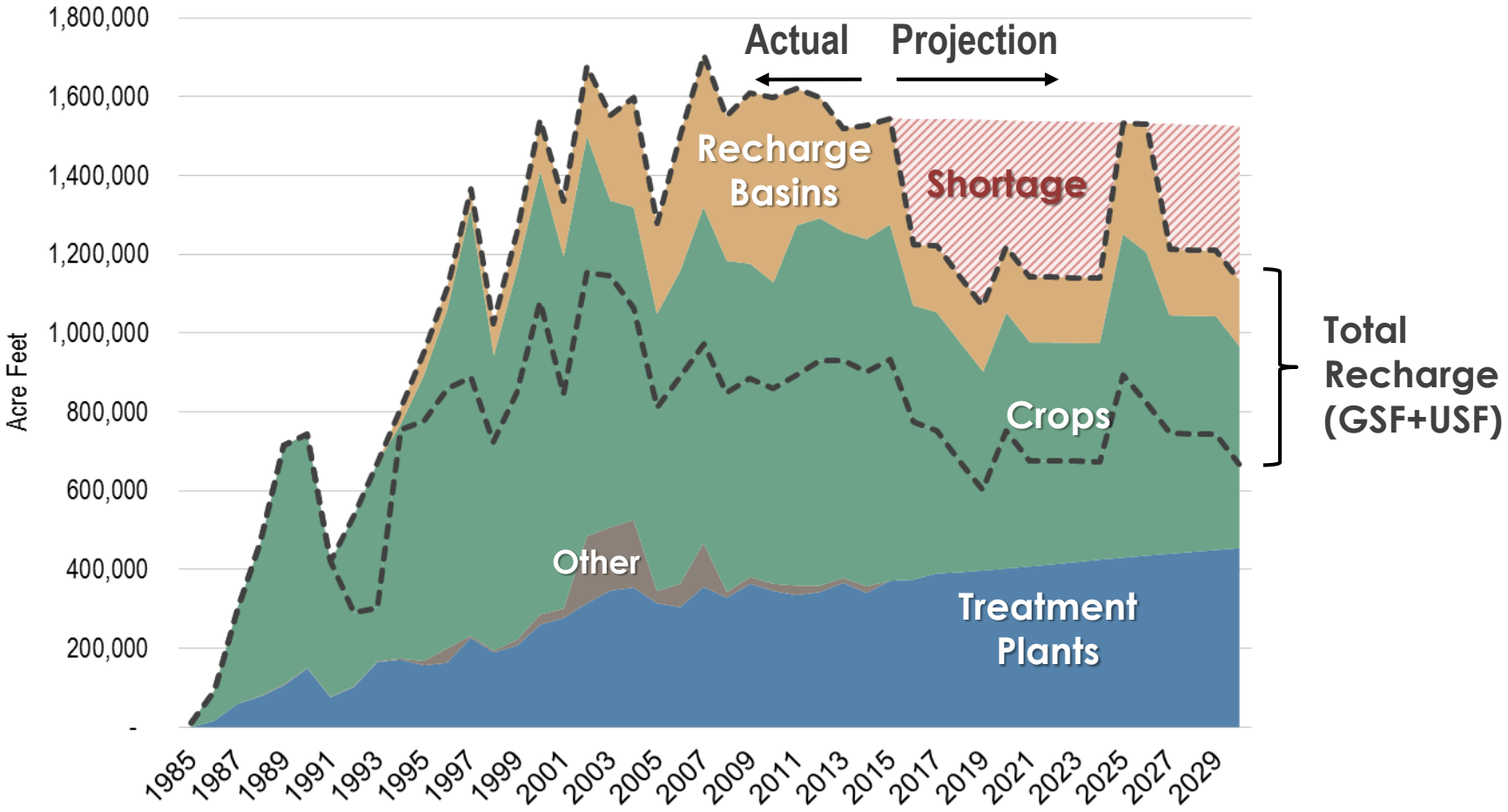
Service Area Analysis Example

CAP Water Use by Destination



Service Area Analysis Example

CAP Water Use by Destination with Shortage



Validation Steps

- Base data validation
  - Maps of projected service areas
  - Review of supply portfolios
  - Base case model run validation
    - Anticipated supply utilization
    - Incorporation of known events

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Scenario Generation

- Review and confirmation of driving forces (including climate)
  - Sensitivity analysis can be used to help identify
- Selection of internally consistent ensembles of factors
  - e.g. in a “Hot & Dry” scenario, crop E_t and residential exterior demand adjusted upwards
- Review of results

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Options & Strategies Runs

- Selection of “control case”
- Selection of potential adaptation/ mitigation strategies
  - e.g., new regional infrastructure, increased supply leasing, policy changes, etc.
- Comparison of Strategy versus Control Case
  - Effect on GW levels, etc.

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