Projecting Supply & Demand in the CAP Service Area

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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”
Complexities

• **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
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
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)
**Entitlements:** Rights, contracts and policies

**Supply Requests:** Generally the same as the entitlements, but Ag 1's request for CAP less than their allocation.

**Demands:** Generally developed without regard to the availability of supply. If a demand is supply defined (e.g., AWBA) the demand is unlimited (i.e., 999).

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**Available Supply:** Overall physical/legal availability. The order of preference determines the overall sequence used in the "Fulfill Requests" step.

**SUPPLIES = DEMANDS**

<table>
<thead>
<tr>
<th>Entity</th>
<th>SW</th>
<th>CAP</th>
<th>GW</th>
</tr>
</thead>
<tbody>
<tr>
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<td>200</td>
<td>999</td>
</tr>
<tr>
<td>Muni 1</td>
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<td>50</td>
<td>999</td>
</tr>
<tr>
<td>Muni 2</td>
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</tr>
<tr>
<td>AWBA</td>
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**Entitlements**

<table>
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</thead>
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<td>Muni 1</td>
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**Available Supply**

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<td>3</td>
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**SW:** The 50 AF is divided between Muni 1 & 2 on the basis of their entitlements/requests (50 & 100).

**CAP:** Muni 1 gets its full entitlement; Muni 2 only needs 67 AF to satisfy its remaining demand. Ag gets its request. AWBA gets what is left.

**GW:** All unsatisfied demand is met with GW (if requested/entitled).
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
Growth Rate

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

- Annual housing unit growth can be adjusted to account for the effects of the recession.

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

- Projected: 30,000 to 60,000 Units Annually
Water Provider Overlay
Growth Scenarios

- Based on a model developed by *Applied Economics*
- Considers: historical growth, development projects, employment centers, transportation infrastructure, and land value
Growth Scenarios

Large Urban Provider

Growing Rural Provider
Municipal Demand & Supply

• Demand
  – Housing units are multiplied by a provider-specific value of Gallons Per Housing Unit per Day (GPHUD)
  – Can adjust rate of change, and minimums and maximums
  – Separate calculations for new and existing housing units

• Supply
  – Each water provider’s unique supply portfolio is included
    • 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
Municipal Demand & Supply

- A unique projection is developed for each water provider

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

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

**A Medium-Sized Provider, with Rapid Growth, and No Renewable Supplies**
Agricultural Demand & Supply

- Data from several sources:
  - Acreage by Crop Type (NASS, 2008-2014)
  - Usage by Supply Type (ADWR, 1985-2013)
  - Crop Consumptive Use factors (ADWR)

- CAP:SAM can simulate changes in efficiency, crop mix and climate-based changes in evapotranspiration
Agricultural Urbanization

- Projected urbanization is based on the housing unit projection and growth scenario
  - The relative “preference” of development on active Ag land vs. adjacent desert land can be simulated
- Ag demand by district is recalculated based on the remaining acreage
Other CAP:SAM Features

• Dynamic allocation of water to recharge facilities (USF and GSF) based on each entity’s storage preferences and available capacity
• Calculation of recovery of water stored by the Arizona Water Banking Authority
• Calculation of CAGRD replenishment obligation
• Integration with stochastic output from CRSS
• Ability to quickly generate alternate scenarios
Current Status

• Model is constantly being improved
  – Effluent production and fate
  – Subcomponents of municipal demand
  – Refined assumptions of SRP supply

• Being used to support to two “Basin Studies”
  – West Valley Water Association (formerly WESTCAPS)
  – Lower Santa Cruz River Basin (i.e., Tucson AMA)