Future Work

- Improve water supply and demand data and allowable groundwater withdrawals
- Develop ARVIN for AZ agriculture system
- Calibration

Water Sources (Surface Water, Groundwater, and Effluent)

Demand Projections (Agricultural, Industrial, Municipal, and Environmental)

Existing Infrastructure & Capacities

Energy Demand

Crop Pattern & Demand

ARVIN-FEW SD

Normal

Threats

Water Allocation

System Security Measures

Energy Production

Food Production

Water/Energy/Agriculture Management and Infrastructure Alternatives
Modeling Technique

ARVIN-FEW

Hydrology

Energy

Water Quality

Water Demand

Food

Operational Research

Social Science

Water Market

Climate Change

Envr. Water Demand
Model Calibration and Representation

- Initial GW Conditions
- Hydrology
  - Inflows – natural recharge/CR flows
  - Outflow – Distribution
- Water quality ➔ SALT
  - Accumulation over time
  - Impact of water softeners
Modeling Representation

- Source and demand representation
- Spatial detail in building water and power demands
- Cropping patterns
- Environmental demands

http://www.goldsim.com/Web/Solutions/Showcase/EnvironmentalExamples/CAPSAM/
Alternatives/Scenarios

- Determine vulnerability to acute events
  - Infrastructure failures
  - Shock to economy
  - Climatic event

- Identify chronic events for adaptive planning
  - Population growth (distribution and water/energy efficiencies)
  - Climate change
  - Conservation and development practice adoption
  - Fuel cost
  - Water & energy policies
Technological and Policy Solutions

- Reduced cost solar conversion
- Agricultural conservation practices/adaptations
- Controlled environmental agriculture
- Conservation and building/land development practices
- Energy/water pricing structures
- Gulf water desalination
Water Market/Trading Benefits

- Model estimates net benefits from innovative trading structures
- Trading increases economic value from limited water and energy resources
- Trading delays infrastructure expenditures
- Trading transmits incentives to promote conservation
- Trading reduces impact of cascading effects in food-water-energy systems
Water/Energy Market Next Steps

- Trading models nested spatially to consider exchanges of water and energy across sub-areas and states, between coastal areas (desal) and inland
- Trading models address multiple temporal scales
  - long term infrastructure investment decisions
  - short-term response to infrastructure disruption during extreme events
- Economic severity indicators for energy-water system disruptions, to prioritize investments in system robustness and resilience
Model Extensions

- Employ ARVIN within scenario planning and other planning processes
- ARVIN-OPT
  - Advanced optimization techniques
- Lower Colorado Basin (ARVIN/CALVIN)
- Other infrastructures
  - Transportation systems
  - Air quality
  - Land development