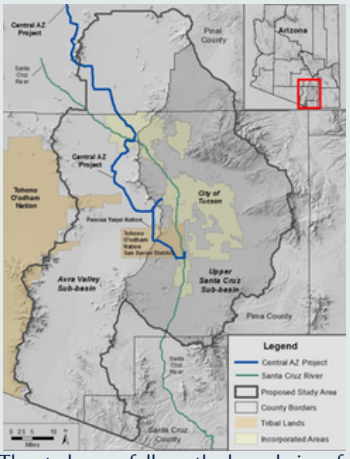
Lower Santa Cruz River Basin Study

Introduction



The study area follows the boundaries of the Tucson Active Management Area.

The study is the first direct assessment of the impacts of climate change and growth on the Lower Santa Cruz River Basin water supplies and demands. It is also the first effort to comprehensively identify areas of future groundwater level change and associated impacts. The LSCRBS focuses on identifying potential supply and demand imbalances within the study area, as well as adaptation strategies to address them. It incorporates both historical observations and model-based projections. The LSCRBS is a collaboration between the US Bureau of Reclamation and six non-Federal cost-share partners under the authority of the 2009 Secure Water Act. It includes:

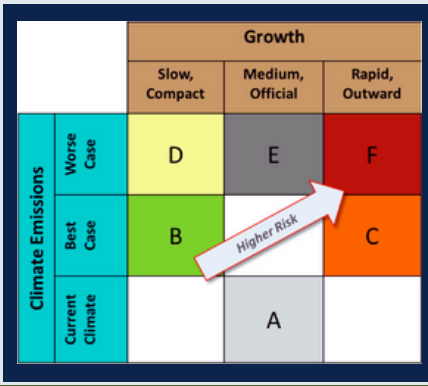
- State-of-the-art projections of future supply and demand by river basin.
- An analysis of how the basin's existing water operations and infrastructure will perform in the face of changing water realities.
- Development of strategies to meet current and future water demands.
- A trade-off analysis of strategies identified.

The cost-share partners include the Southern Arizona Water Users Association (SAWUA), the Arizona Department of Water Resources (ADWR), the Central Arizona Water Conservation District (CAWCD), the Cortaro-Marana Irrigation District (CMID), the Pima Association of Governments (PAG), and the University of Arizona.

Goals

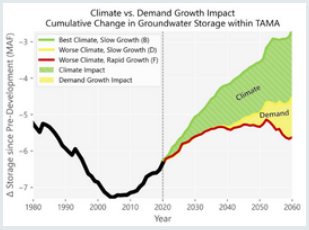
Overall goals were to identify where physical water resources are needed to mitigate supply-demand imbalances, and to develop strategies to improve water reliability for municipal, industrial, agricultural and environmental sectors. The specific goals of the study included understanding:

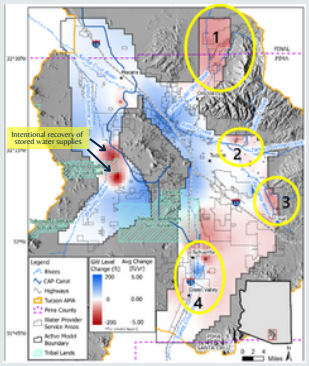
- How climate changes could alter seasonal and annual surface runoff, stream infiltration and recharge, thereby impacting the distribution of groundwater supplies basin-wide
- The impacts of changing climate, surface and groundwater hydrology on local environmental resources, particularly riparian areas
- The volume and location of new water demand, as well as the impact of cutbacks to municipal providers' CAP supplies
- The impacts of climate changes vs. alternative socio-economic growth patterns through comparison of scenarios.



The study partners agreed to evaluate a high-risk 'worse case' scenario as the basis for adaptation planning. This scenario included a high global greenhouse gas emissions trajectory as well as rapid growth in local municipal demand with a spread-out land use pattern.

Findings





- All models and climate scenarios consistently identify increases in average annual temperature through time,
- Projected precipitation change ranges from minimal (best-case) to basin-wide reductions of approximately four inches per year (worse-case).
- There is a high probability of increased variability for precipitation – longer droughts, more intense rainstorms, and higher flood peaks.
- Under the worse-case scenario, hotter and drier weather will lead to a reduction in the amount of streamflow available to replenish the Tucson area's aquifers.
- Under the worse-case climate scenario, seasonal streamflow discharge and soil moisture will decrease, and the number of dry stream days will increase.
- Water management interests have stored large quantities of renewable supplies underground. However, reductions in CAP supplies may eventually lead to more groundwater pumping.
- Specific areas of concern include: the Canada del Oro / Saddlebrooke area; Sabino Canyon/Tanque Verde; Southeast Tucson; and Green Valley.
- Increasing demand is the major driver of localized projected drawdowns in areas of concern.

Innovations

Scientific

- Incorporation of a dynamically downscaled (high resolution, regional) climate projection for the basin, created specifically for this project by experts at the University of Arizona.
- Dynamical downscaling explicitly simulates medium-scale atmospheric processes, allowing results to vary outside the range of historic values. This method does not rely on statistics from the historic climate, since historic conditions may not be representative of future conditions.
- Simulation of variability in seasonal streamflow based on a weather generator that mimics historic patterns.
- Consideration of the impacts of climate change on both imported (through the Central Arizona Project) and local water supplies (groundwater, surface water, effluent).

Process

- Highly inclusive processes for identifying study objectives and criteria, projections of demand for each sector, etc.
- Collaborative identification of areas of concern based on the integration of data from multiple models
- Workshops to develop adaptation strategies that included traditional and green infrastructure
- A tradeoff analysis for the adaptation strategies that included community-driven evaluation criteria and remote polling of participants through Zoom.

Lessons Learned

- Climate change will impact most water-related resources and processes, most likely negatively.
- Early adaptation can reduce the impacts of climate change
- While there is no "silver bullet" solution, viable adaptation strategies exist to address challenges.
- Wet water management (including new infrastructure) could help to offset the impacts of climate change and demand growth on areas of concern.

This project summary was prepared by the University of Arizona.

Arizona Institute for Resilient Environments & Societies