Risks to Water Municipal Water Deliveries

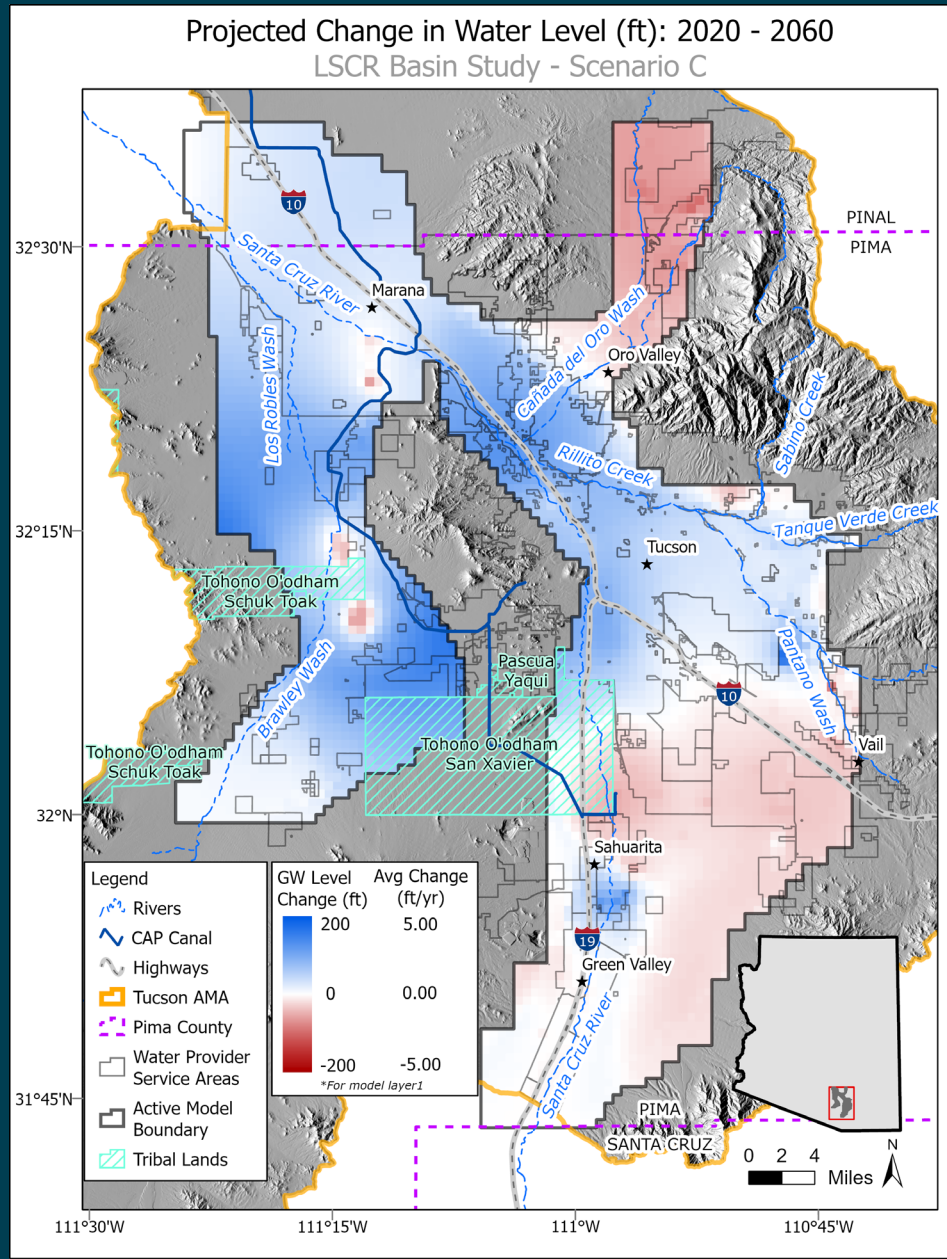
- Designated providers with CAP allocations have been importing more water into the AMA than is pumped from wells.
- Imbalances in groundwater storage/use indicate growing demand without recharge/replenishment in the area of pumping.
- Providers with Assured Water Supply (AWS) Designations have planned to serve a population within the means of their designations.
- These providers will be reluctant to absorb areas of growth that impact the sustainable water use assigned by their AWS designations.

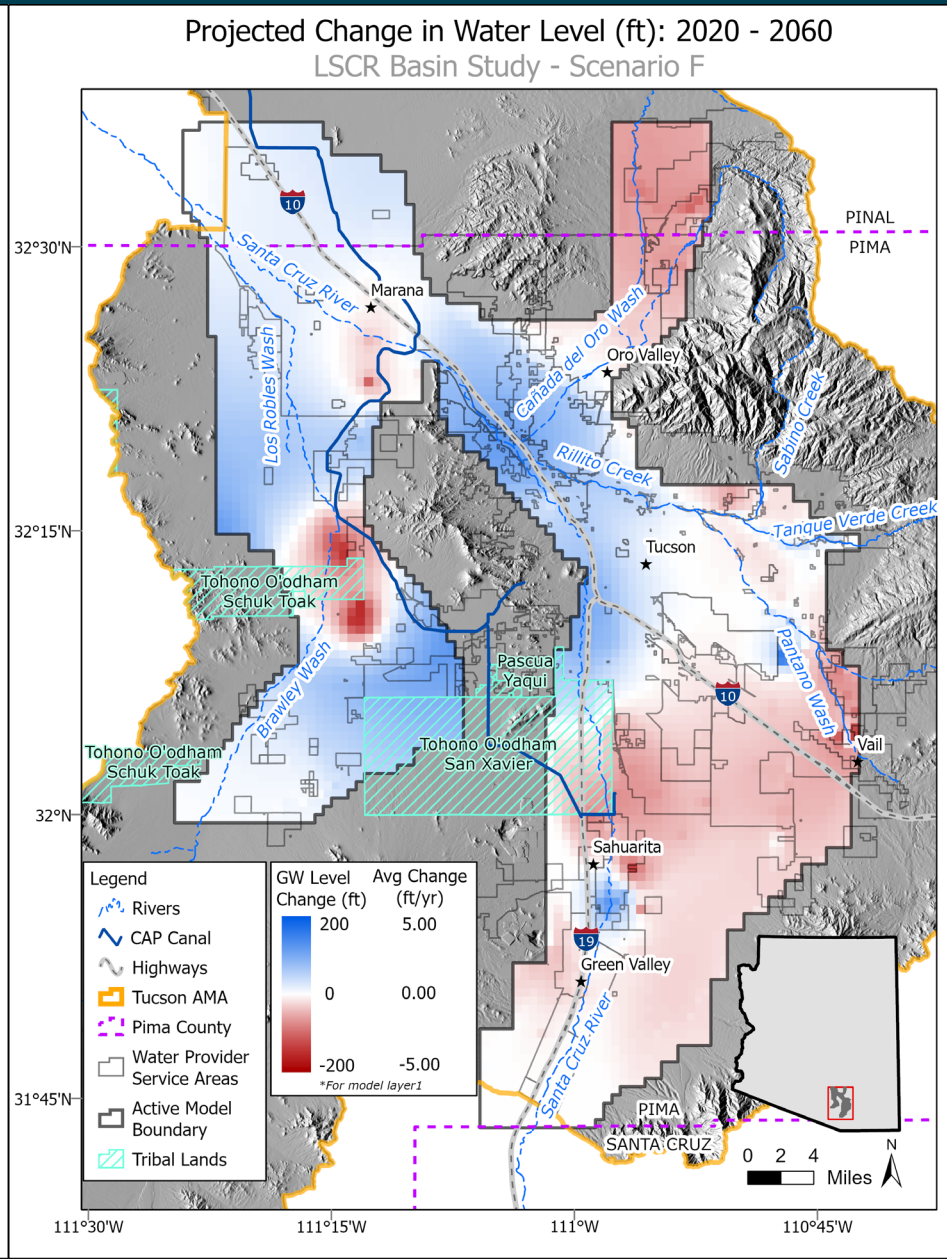
Risks to Water Municipal Water Deliveries, continued

- Areas anticipated to support large populations without direct aquifer replenishment should expect to bear the full cost of obtaining renewable supplies, including pipeline construction and maintenance.
- Wheeling partnerships have been a highly successful way for providers with CAP allocations to move renewable water to meet demands without pumping localized wells.
- Exempt wells at the boundaries of the Basin are typically deeper and rely on mountain front recharge which can be reduced by climate change.
- Continued expansion of exempt wells at the Basin boundaries will only exacerbate water level declines causing some older wells to go dry.

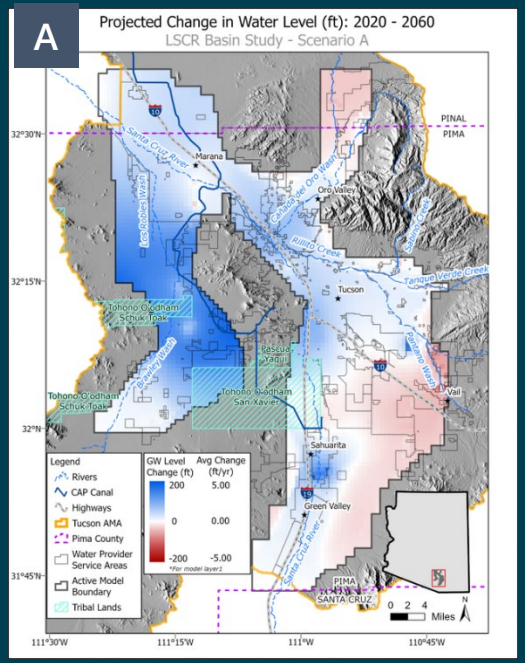
Demand Growth Impact - Change in Head

Climate	Demand Growth: Slow, Compact	Demand Growth: Medium, Official	Demand Growth: Rapid, Outward
Worse Case	D	E	F
Best Case	B		C
Current Climate		A	

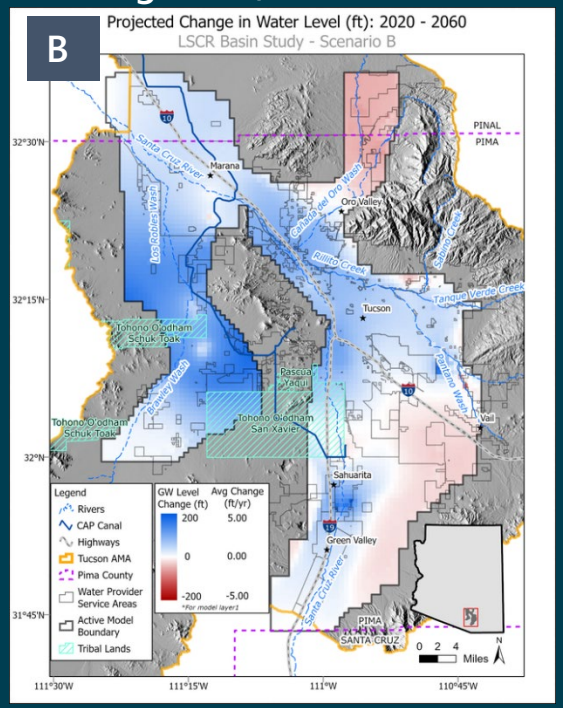




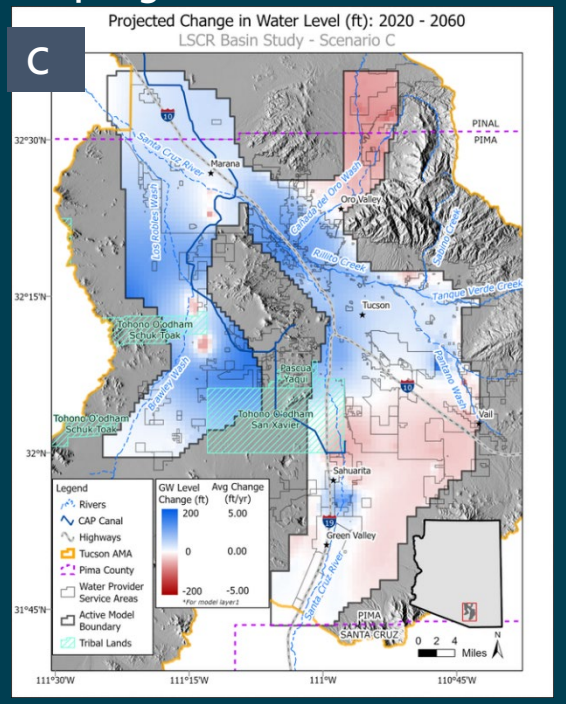
Official growth, current climate



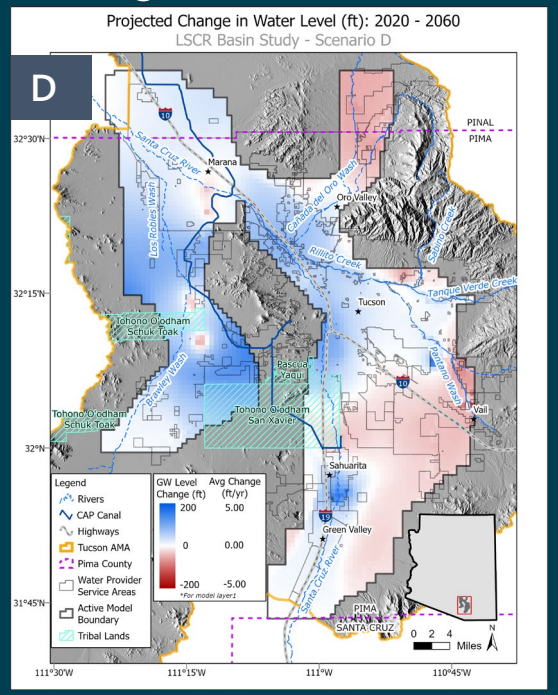
Slow growth, Best climate



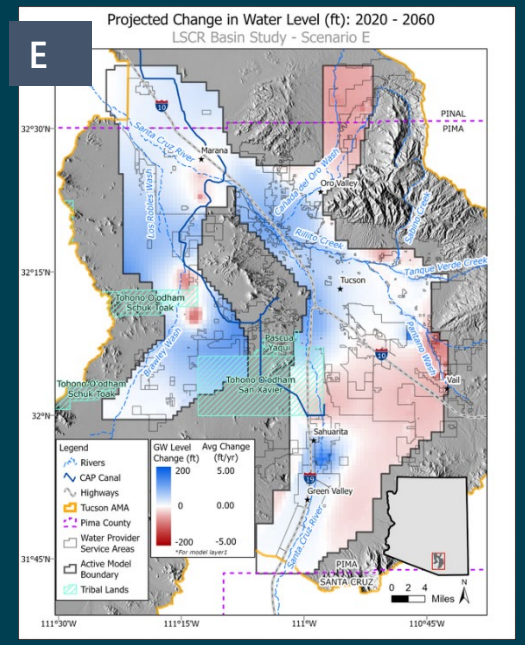
Rapid growth, Best climate



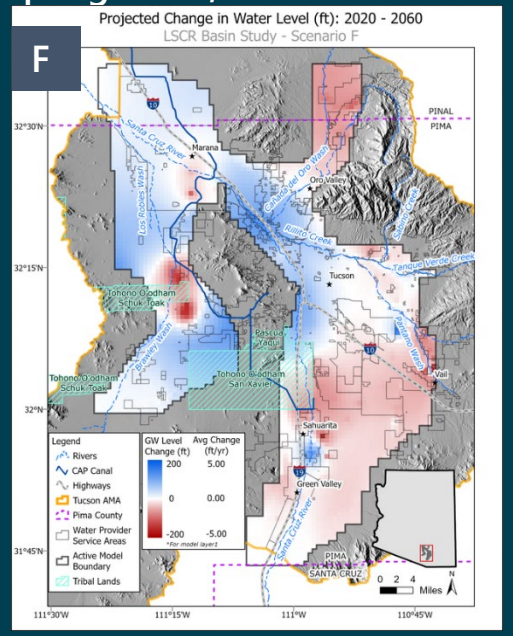
Slow growth, Worse climate



Official growth, current climate



Rapid growth, Worse climate



Risks to Environment

<u>Environmental effects</u>

Plume mgt- all scenarios have potential

Gravel pits: LSCR, all scenarios have potential

Stream flow-LSCR, Santa Cruz River @ San Xavier Distrit: all scenarios?

Rillito/Tanque Verde: scenarios B, C

Desiccation-Rillito/Tanque Verde/ Sabino: scenario E, F

Desiccation-Rincon/Cienega: All scenarios

Desiccation-Sutherland/Canada Del Oro: All scenarios

Desiccation- Ventana: All scenarios

Subsidence- Pima Mine Road: C, E, F; Avra: E, F

LSCR Basin Study: Evaluation Criteria

LSCR Adaptation Workshop 2

2/22/21

Introduction

- Purpose: Systematically review the merit or significance of proposed adaptation strategies
- Multiple Perspectives:
  - Water for Society
  - Environmental Considerations
  - Broad Considerations

Water for Society:
Consistent with the need to comply with Arizona's Assured Water Supply Rules

1. Minimizes impacts of pumping to parts of the aquifer vulnerable to storage depletion
2. Minimizes impacts of over-pumping in aquifer regions connected to riparian areas
3. Minimizes costs of new infrastructure
4. Minimizes costs of operations and maintenance
5. Promotes water supply reliability
6. Has a significant impact on the projected supply/demand imbalance

Environmental Concerns:

Protect and enhance environmental resources, and maintain environmental quality of life.

1. Enhances or protects high value habitat
2. Promotes landscape connectivity
3. Protects water quality
4. Promotes accessible recreational opportunities
5. Enhances or protects Cultural /Heritage values
6. Reduces flood risk

Broad Considerations:

Big-picture reflection and considerations in evaluating adaptation strategies.

1. Provides benefits to a large population
2. Addresses multiple adaptation objectives/sectors (multiple co-benefits)
3. Addresses a priority risk
4. Builds on existing resources and projects/leverages existing investments
5. Low cost relative to benefits
6. Low opportunity cost

Questions?

Synthesis of Adaptation Options

Lower Santa Cruz River Basin Study
Adaptation Workshop One

November 21, 2019 | Pima Association of Governments, Tucson AZ

Workshop Summary

Table of Contents

Summary of Issues/Risks

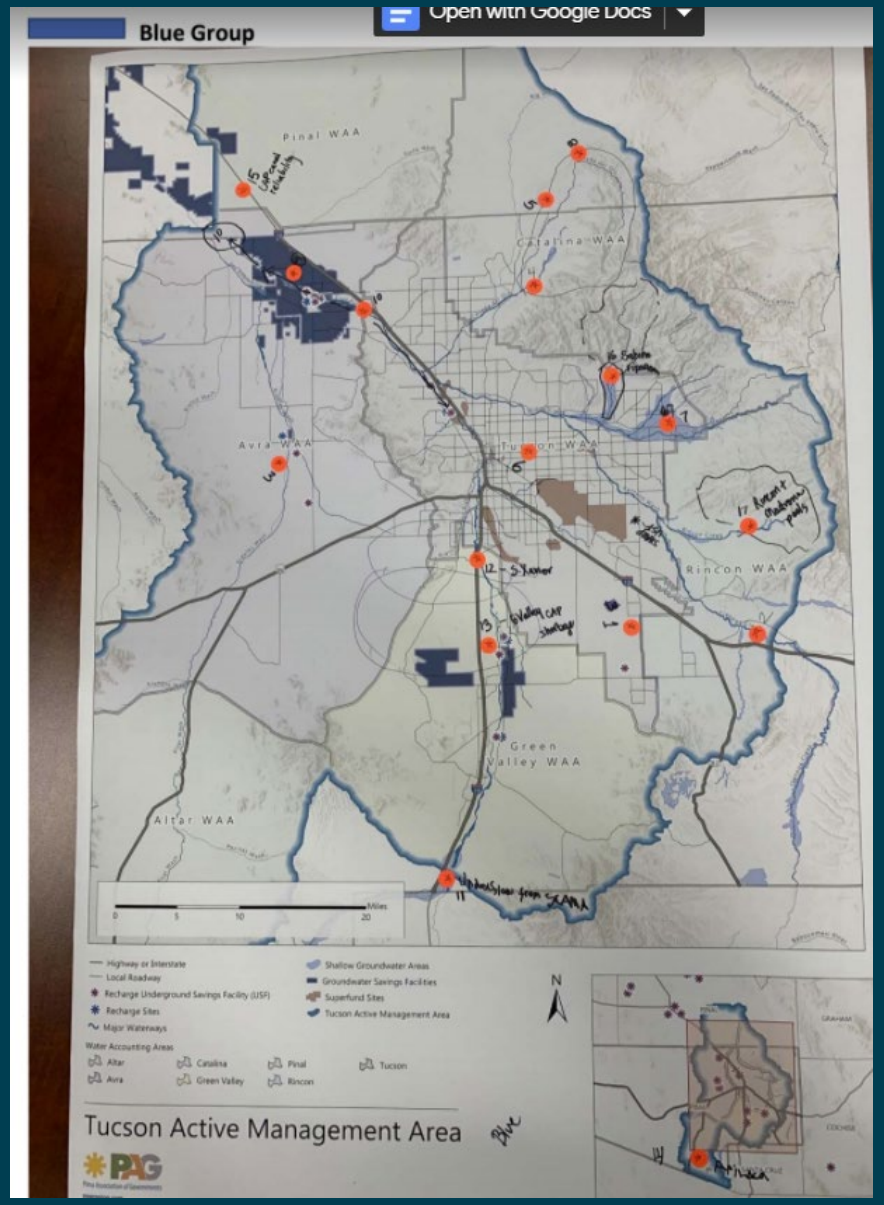
Blue Group – Facilitated by Tahnee Robertson

Numbers correspond to Blue group map (orange dots) which can be found in Appendix B.

1. South Houghton corridor
2. Cienega Creek and Davidson Canyon – desiccation of a riparian area. Exempt wells, Vail wells, Rosemont Mine surface water diversions and groundwater draw toward open pit.
3. Avra Valley – eventual recovery of restored water, potential contamination of supply with proposed Interstate 11
4. Canada Del Oro/Sutherland Wash – potential effects of natural recharge by changing conditions and forest fires, expanded groundwater pumping, aquifer stress
5. Saddlebrooke Ranch – residential demand. Concern that much of the area to the south contributes to Pima County Regional Wastewater Reclamation Department-not locally recharged.
6. Tucson center – potential future reduction of Colorado River could result in additional groundwater pumping
7. Tanque Verde/Agua Caliente – riparian areas
8. Town of Oracle – physically outside of the AMA, but pumping from inside the AMA in an area with little recharge

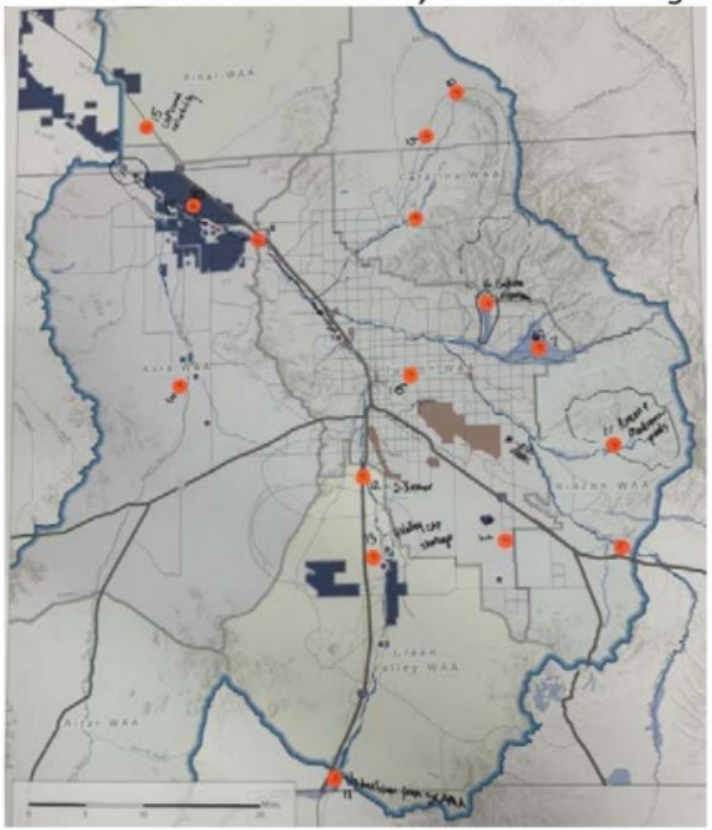
Summary of Issues/Risks (continued)

9. Marana area – future reduction of CAP deliveries could cause problems with supply - demand balance
10. Lower Santa Cruz River (from Roger Road past Trico Road) – effluent dependent riparian/wetland area would lose water if effluent used elsewhere.
11. Green Valley – dependent on underflow, possible impacts from Santa Cruz County effluent flows
12. I-19 Bridge at Santa Cruz River – groundwater levels support surface flow
13. Green Valley/Pima Mine Road – potential future CAP shortages. Cone of depression.
14. Arivaca Valley – riparian issues
15. CAP Canal – limits to canal capacity; potential future reliability issues due to single siphons
16. Sabino Canyon - desiccation of a riparian area. No nearby recharge.
17. Rincon Creek/Madrona pools – risks to natural riparian area. Is SHARP (South Houghton Area Recharge Project) recharge close enough or large enough?



Synthesized list (combined from all groups)

*Those with * were mentioned by more than one group*



Geographic areas of concern for all groups
(Maps for individual groups are in Appendix B.)

LSCR Basin Study – Workshop 1 - November 21, 2019 - Proposed Adaptation Strategies

#	Strategy	Location	Issue	Comments	Demand Objective	Environmental Objective	R	B	G	Y
				CAP Water Strategies						
A	Maximize [efficient] use of CAP water allocation in TAMA at existing facilities and consider new ones 1) Directly use CAP water in areas of GW decline. 2) Recharge in stream channels 3) Recharge in new basins 4) Wheel water (e.g. OV to Saddlebrooke) using a shared infrastructure	1) OV area 2) Saddlebrooke and Eagle Crest area 3) Subsidence areas 4) Overdraft areas 5) Stream channels 6) San Xavier District, Tohono O'odham Nation 7) Northern Avra Valley and Altar Valley aquifers	Future water supply reliability, Local GW declines	**Why:** GW level declines. Build storage capacity for future. **What:** up to 50K AF/Y, including AWSA water(30KAFY stored outside TAMA), partners: SXD, BoR, CAWCD, CoT, ADWR. **Who:** municipalities, farmers, TO (w/ AWSA water to TO Districts to restore aquifer), state and federal agencies. **Benefits:** Provide reliable supplies, encourage flowing water in streams in AV, Green Valley, SXD; reduce subsidence, improve riparian habitat, maximize CAP use **Chlng**: Lack of funds, need to establish trust/collaboration, potential to introduce invasive species in streams if CAP is recharged directly (but not through rising groundwater). **Chlng:** Water needs to be pumped to point of use (capital expenses for pipeline, annual power costs)	✓ Satisfies 100yr assured water supply criteria ✓ Minimizes impacts of pumping in sensitive aquifer of over-pumping in aquifer regions connected to riparian areas	✓May preserve high value habitat ✓May protect cultural value/ heritage	✓	✓		✓
B	Modify Central AZ Groundwater Replenishment District (CAGRD): 1) Limit use of GW outside recharge area of impact 2) Require direct delivery infrastructure (paid by developer) 3) Restrict rate of depletion in outside the recharge impact area 4) Incentivize or encourage wheeling	Regional, especially where there is groundwater use near phreatic ecosystems: • Sabino Creek • Tanque Verde • Cienega Creek	Local GW declines	**Why:** Policies are currently unsustainable, GW levels are decreasing, need reliability **Where:** existing/future CAGRD subdivisions (only 8-10 providers do not have this issue) **When:** Now, solutions can be phased, consider legislative timing **Who pays**: Shift from homeowner to developer **Details:** Kyl Center at ASU (Kathy Ferris, Sarah Porter); UofA (Robert Glennon, Rep. Kristen Engel); ADWR; CAWCD **Chlng**: politics, requires infrastructure funding, state statute **Benefit:** incentivizes wheeling of renewable supplies	✓ Satisfies 100yr assured water supply criteria ✓ Minimizes new development in areas without assured water supply ✓ Minimizes impacts of over-pumping in aquifer regions connected to riparian areas ✓ Minimize subsidence	✓ Preserves high value habitat ✓ Preserve areas with high vulnerability	✓			

ADWR	Arizona Department of Water Resources
AF/Y	Acre-feet per year
ASU	Arizona State University
AV	Avra Valley
AWSA	Arizona Water Settlements Act
BLS	Below land surface
BoR	Bureau of Reclamation
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CAGRD	Central Arizona Groundwater Replenishment District
Chlng	Challenge
CoT	City of Tucson
DEQ	Pima County Department of Environmental Quality
EPA	Environmental Protection Agency
ESA	Endangered Species Act
GI	Green Infrastructure
GW	Groundwater
GSF	Groundwater Savings Facility
LTSC	Long Term Storage Credits
OSC	Pima County Office of Sustainability and Conservation
O&M	Operation and maintenance
OV	Oro Valley
RFCD	Pima County Regional Flood Control District
RW	Reclaimed Water
RWRD	Pima County Regional Wastewater Reclamation District
SCR	Santa Cruz River
SW	Stormwater, surface water
SXD	San Xavier District
TAMA	Tucson Active Management Area
TO	Tohono O'odham Nation
UofA	University of Arizona
WMG	Watershed Management Group
WW	Wastewater

Area 4: Green Valley and Sahuarita			
Option	Adaptation Strategy	Description	Specifics for consideration/analysis in this location
A	Natural channel design	Modify stream channels (for example, check dams, soil bank stabilization, side spreading) to increase flood storage, infiltration/recharge, enhance habitat and limit flood erosion	
B	Watershed & Riparian Protection	Some options include: Restore or enhance riparian tree health, tree canopy, seasonal surface flows, and/or groundwater levels. Minimize wildfire loses through prescribed burns and removal of fuel load. Monitor habitat, aquatic and riparian species and groundwater levels for baseline conditions and changes.	
C	Maximize Use of Wastewater	Some options include: Install wastewater reuse infrastructures (home/business graywater systems, secondary treatment and/or tertiary/advanced treatment, local package plants) customized to the water source supply and reuse demand (landscape irrigation, recharge, riparian habitat sustainability) to meet multiple objectives (reduce groundwater withdrawals, restore groundwater levels, and benefit the environment).	
D	Maximize Use of Stormwater	Some options include: Install Low Impact Development features (berms or collector pipes downstream of impervious surfaces; check dams, basins or cisterns; porous surfaces; native vegetation to collect rainfall or stormwater runoff, store temporarily (if needed) and then use to recharge aquifers, irrigate plants or supply potable water. Retrofit neighborhoods and design new residential areas with (passive and/or active use of runoff or large-scale projects like Kino Environmental Restoration Project).	
E	Improve Water Delivery Infrastructure	Install infrastructure (i.e., pipelines, reservoirs, pumps) supporting use of renewable supplies (CAP water, reclaimed water, stormwater) in lieu of groundwater pumping.	
F	Reduce Local GW pumping	Some options include: Install meters on exempt wells; limit new wells; and/or use monitoring devices to evaluate household or commercial/industrial water use. Conserve indoor and outdoor water use in residential, commercial, turf sectors. Establish conservation surcharges for summer water use.	
G	Recover stored water in area of hydrologic impact and/or change recovery criteria	Modify AMA management plan and/or CAGRD operations to limit groundwater declines in area of concern. This could require recovery of stored water in the area of hydrologic impact or changes to the allowable decline rates in recovery wells.	
H	Agricultural & Mining	Reduce agricultural water using technology (Options include: enhanced laser leveling, soil and leaf temperature sensing) and plant management (tree pruning, understory). Reduce mining water use (Options include: maximize use of reclaimed water for air quality control; use of surfactants and stabilizers to prevent dust events; revegetation of tailings; enhanced mineral processing techniques)	


BUREAU OF
RECLAMATION