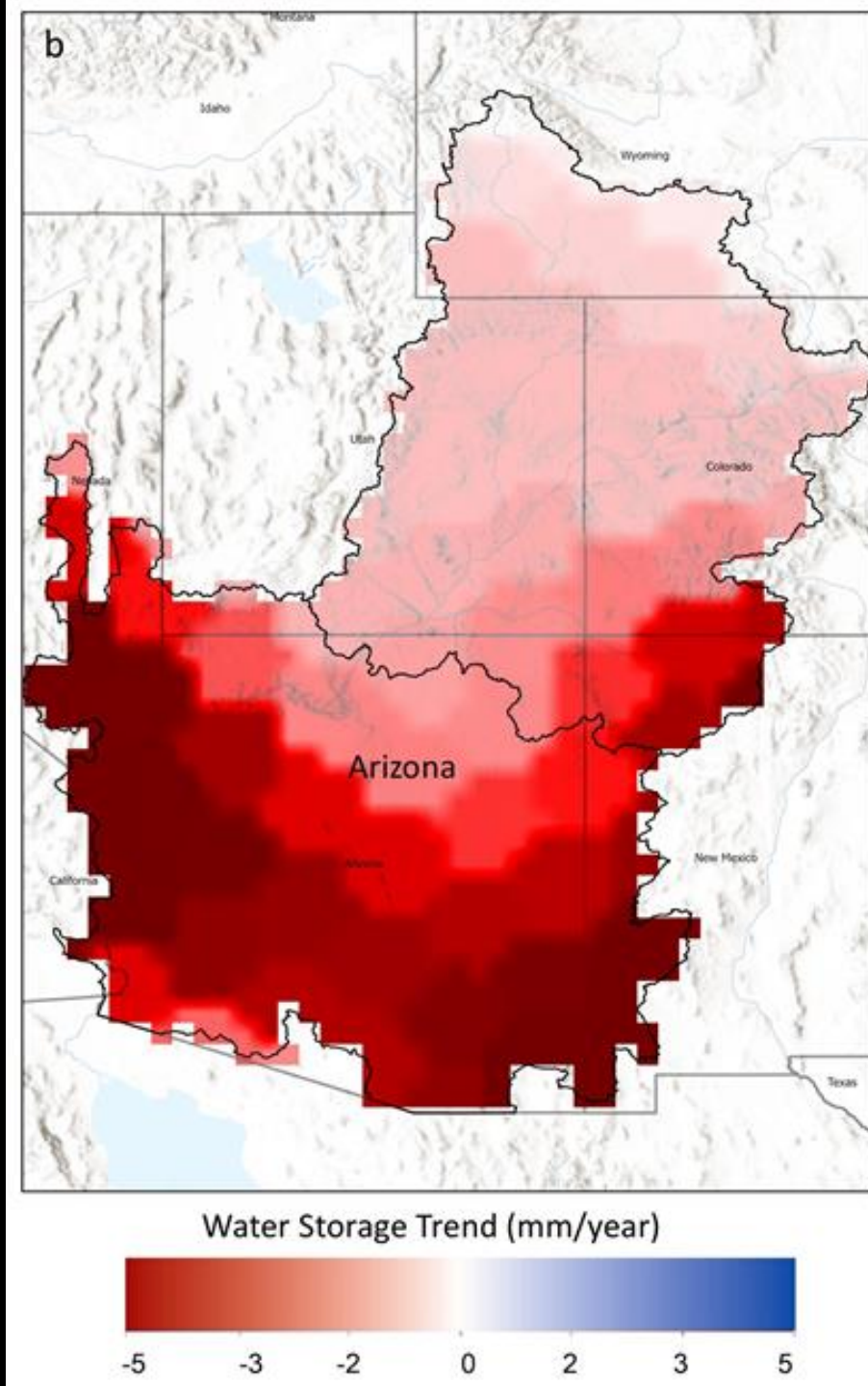


Groundwater in Arizona

Sarah Porter
September 17, 2025



Mission: promote informed public dialogue on critical **water issues in Arizona and the West**

- **neutral & non-partisan**
- **research & analysis**
- **historical understanding**



Arizona **Water Blueprint**

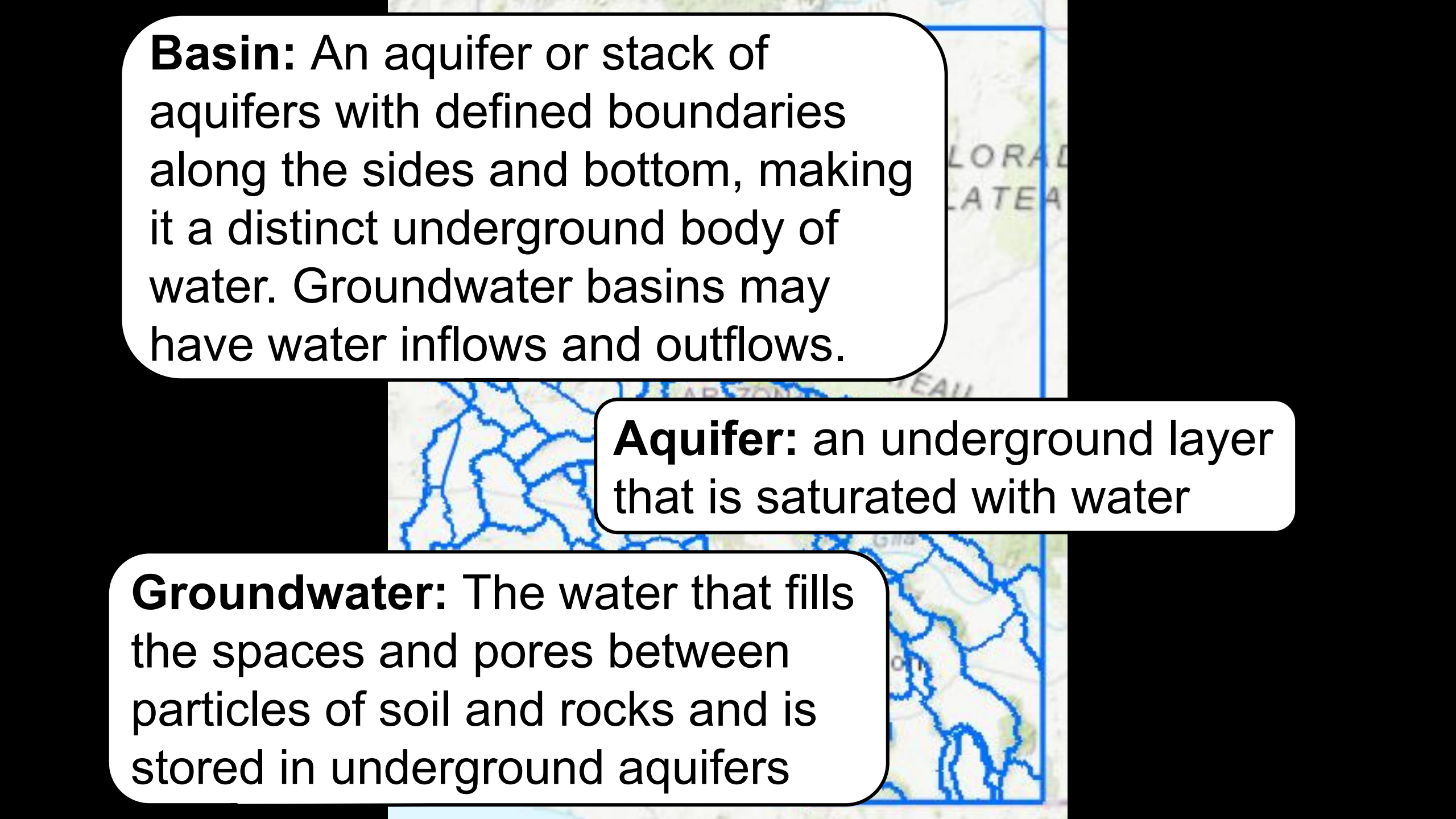


azwaterblueprint.asu.edu

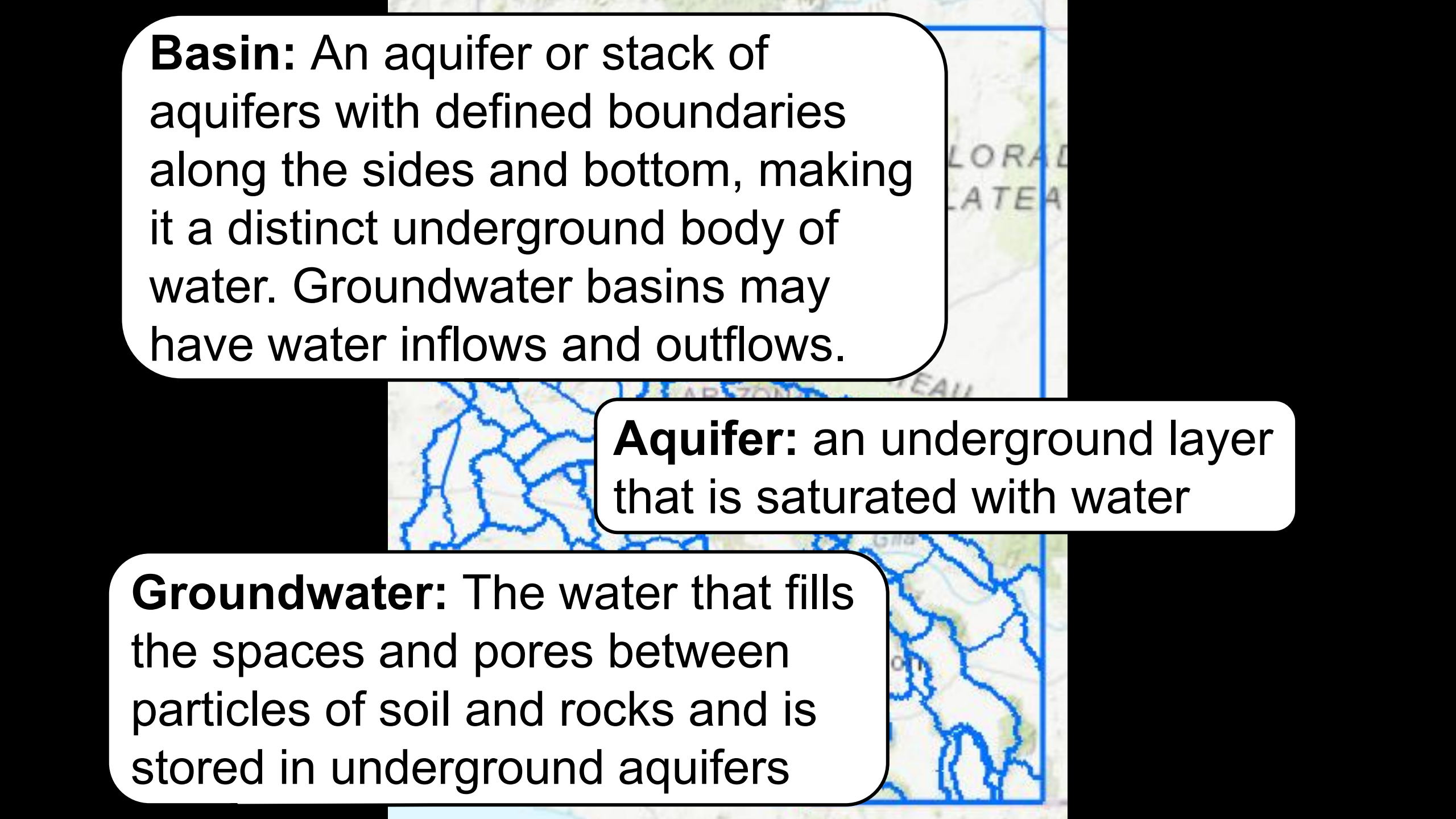
{ Basin basics
The data
Tools you can use

Basins

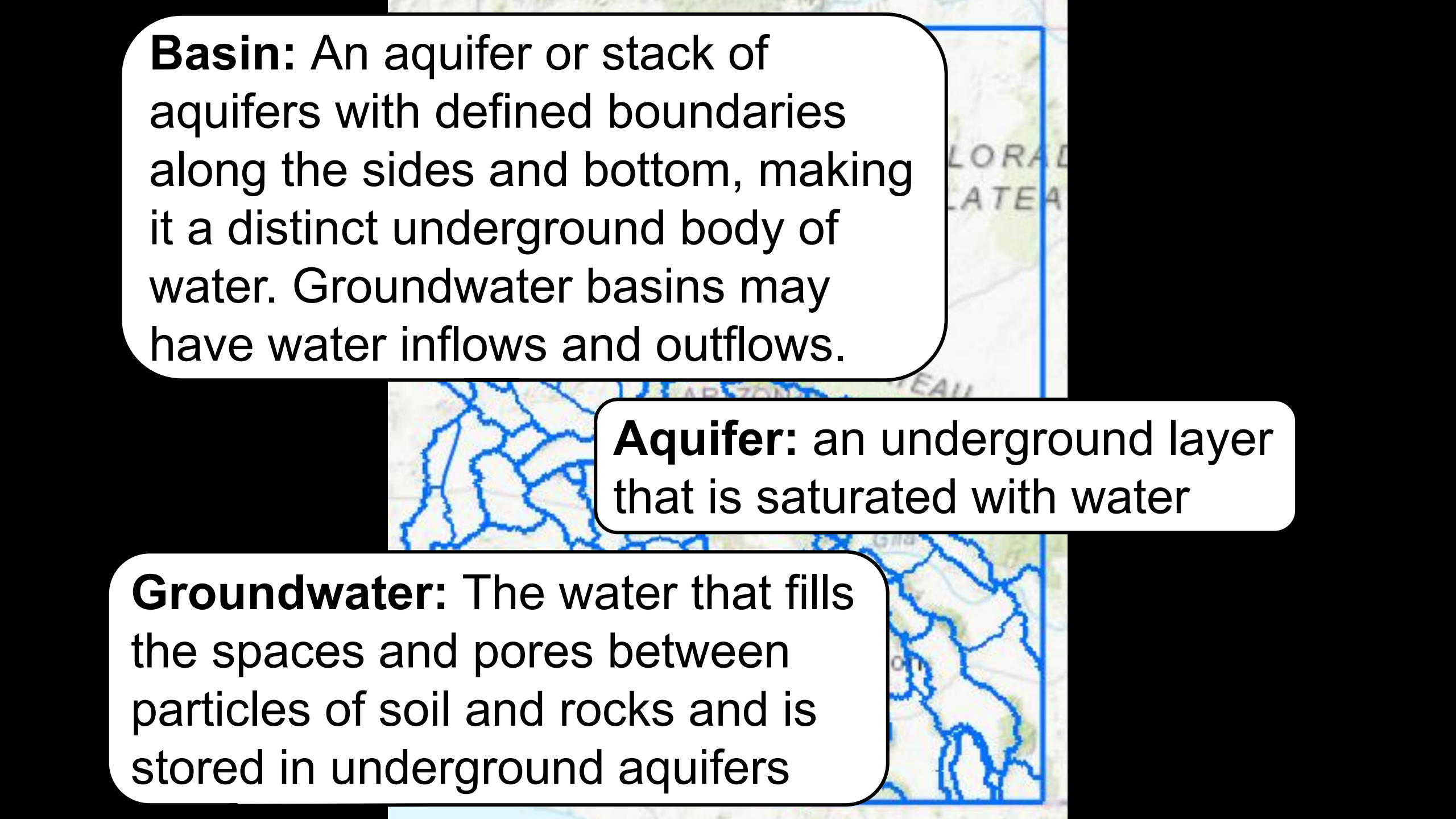




Basin: An aquifer or stack of aquifers with defined boundaries along the sides and bottom, making it a distinct underground body of water. Groundwater basins may have water inflows and outflows.



Aquifer: an underground layer that is saturated with water



Groundwater: The water that fills the spaces and pores between particles of soil and rocks and is stored in underground aquifers



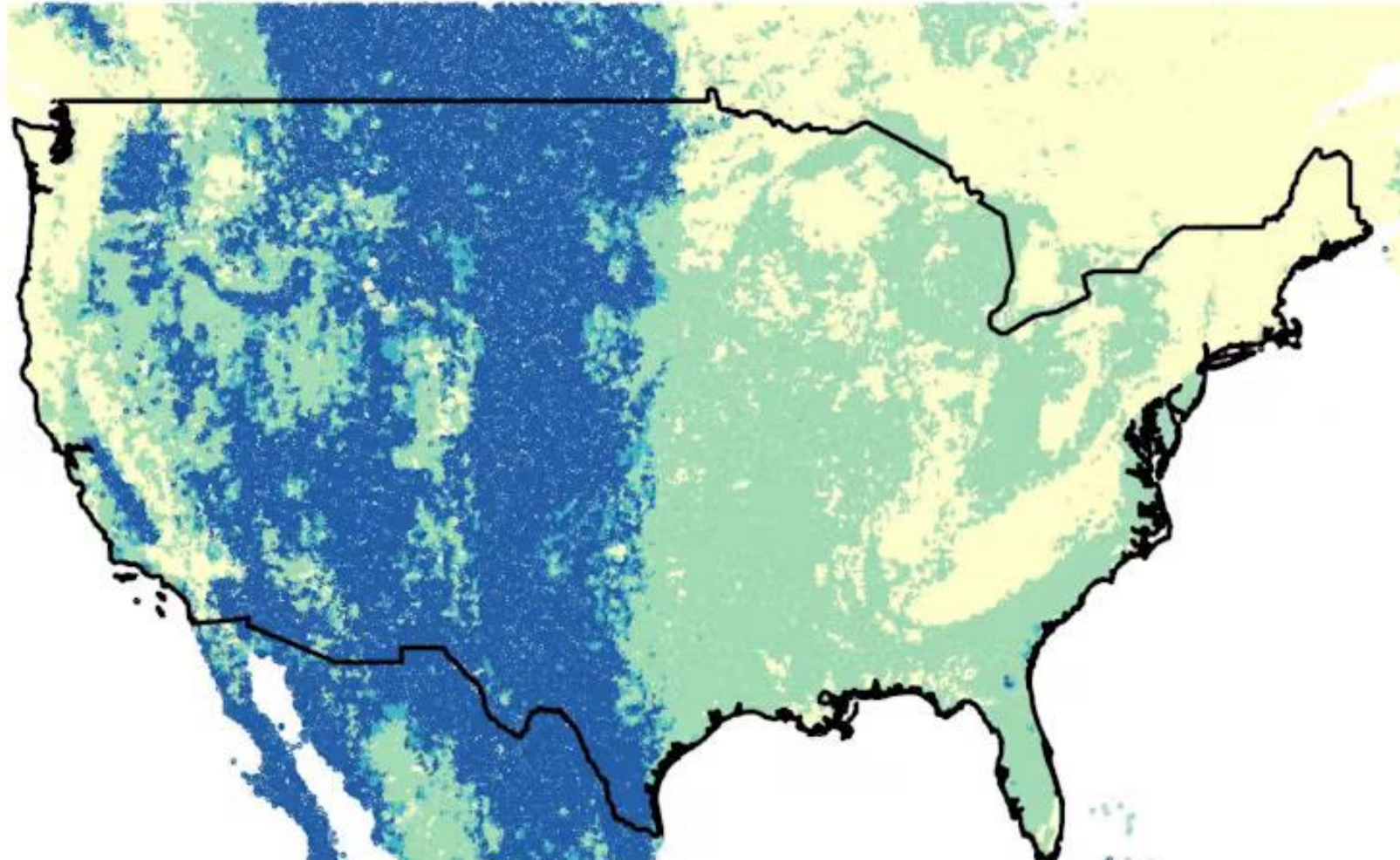
“Over drylands like Arizona, most precipitation is partitioned into ET, and only a small fraction (**2.54% for Arizona . . .**) of precipitation is converted to groundwater.

Qui et al (2025)



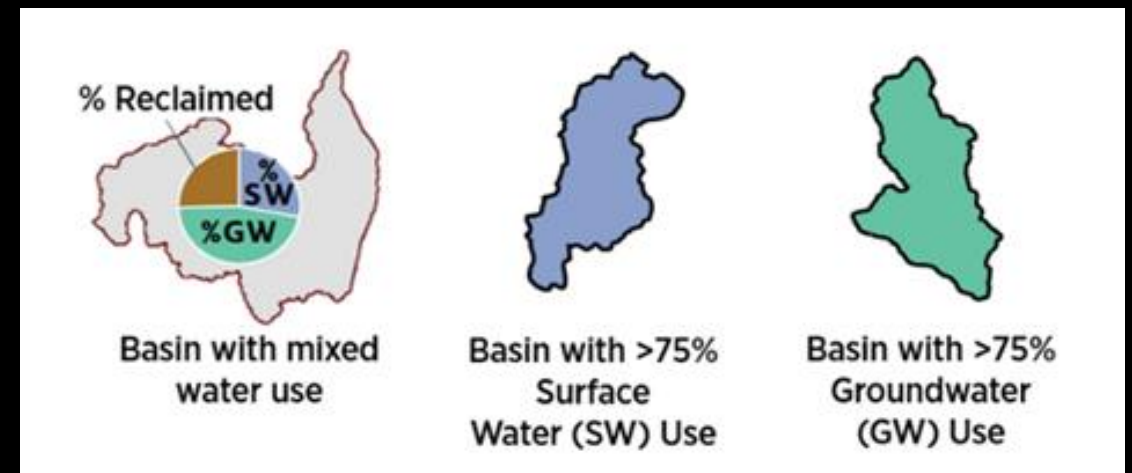
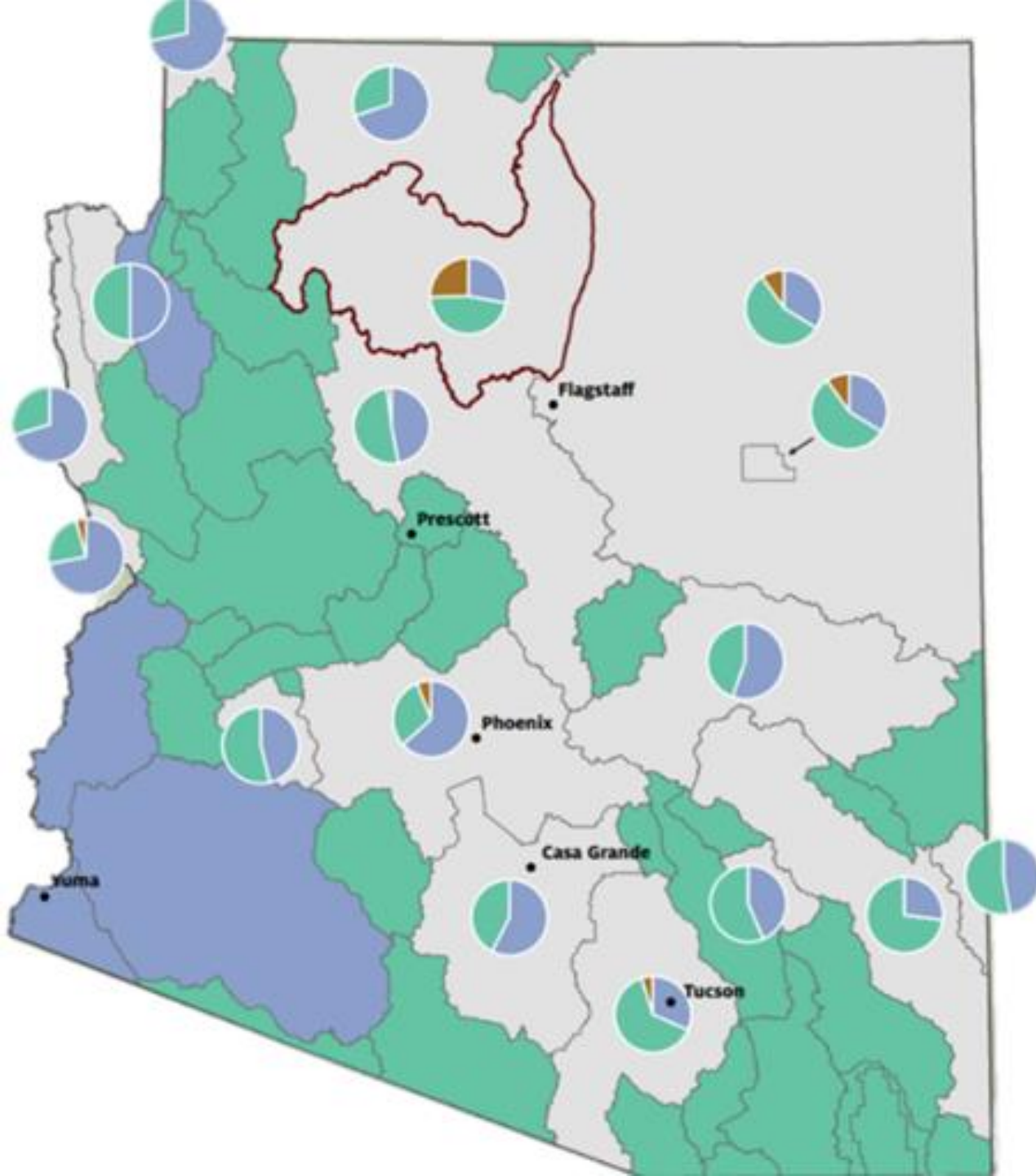
The oldest water in the U.S.

The West's aquifers have some of the longest turnover times in the country. Turnover time is the amount of time required for groundwater to be replenished naturally.



Average turnover time for groundwater

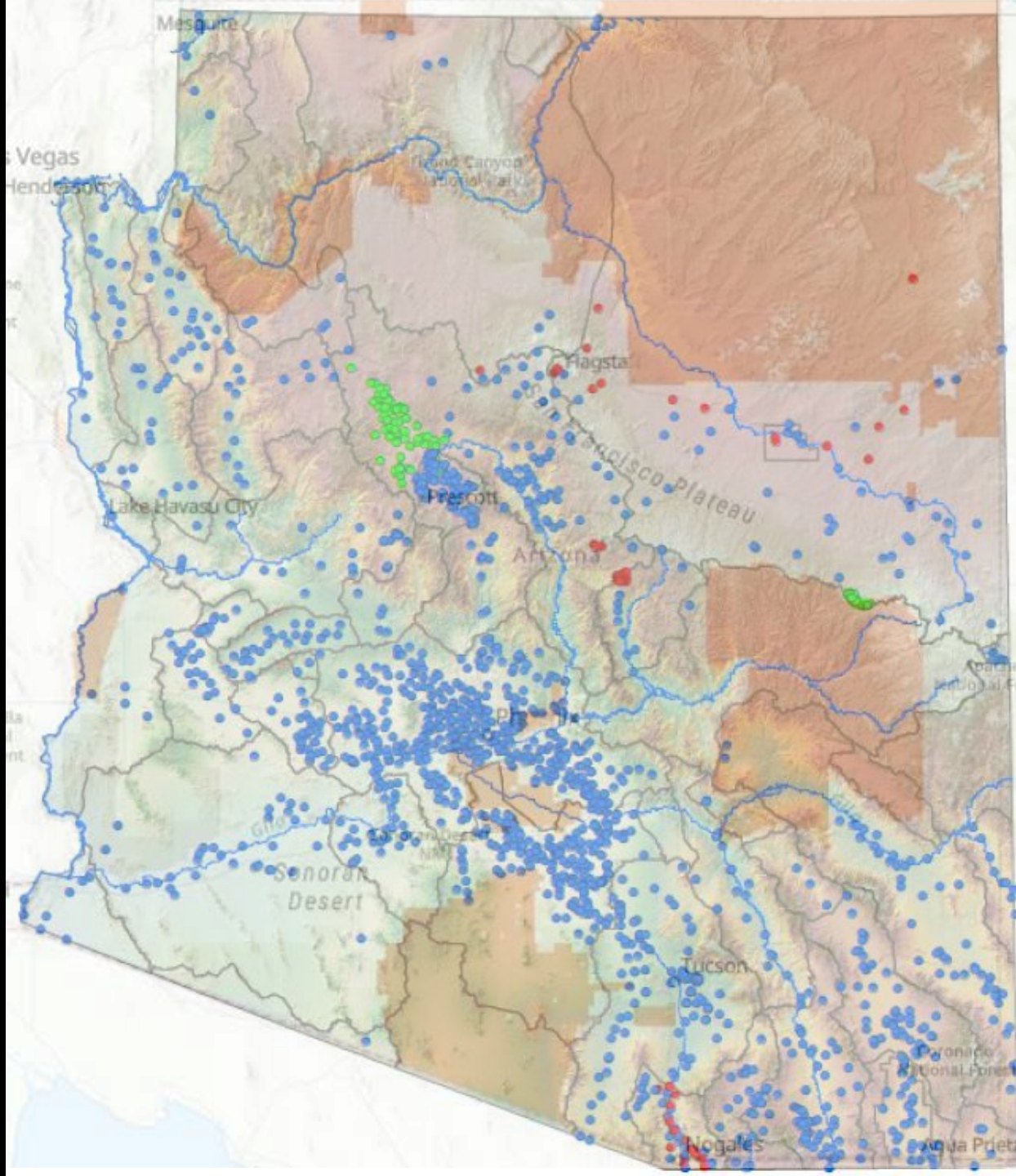
Source: Seltzer (2021)





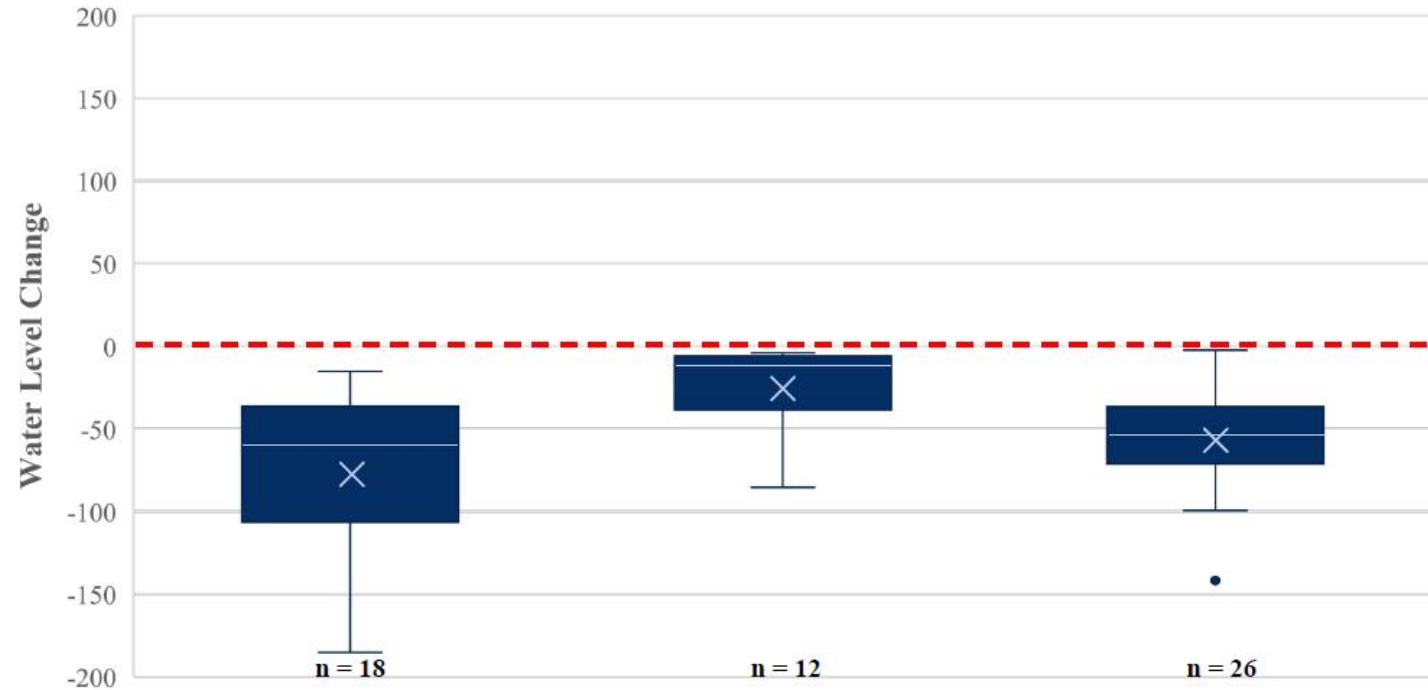
Data

{ Index Wells
Satellites
Supply & Demand



Priority (Severe Decline) Basins

Priority (Severe Decline) Basins

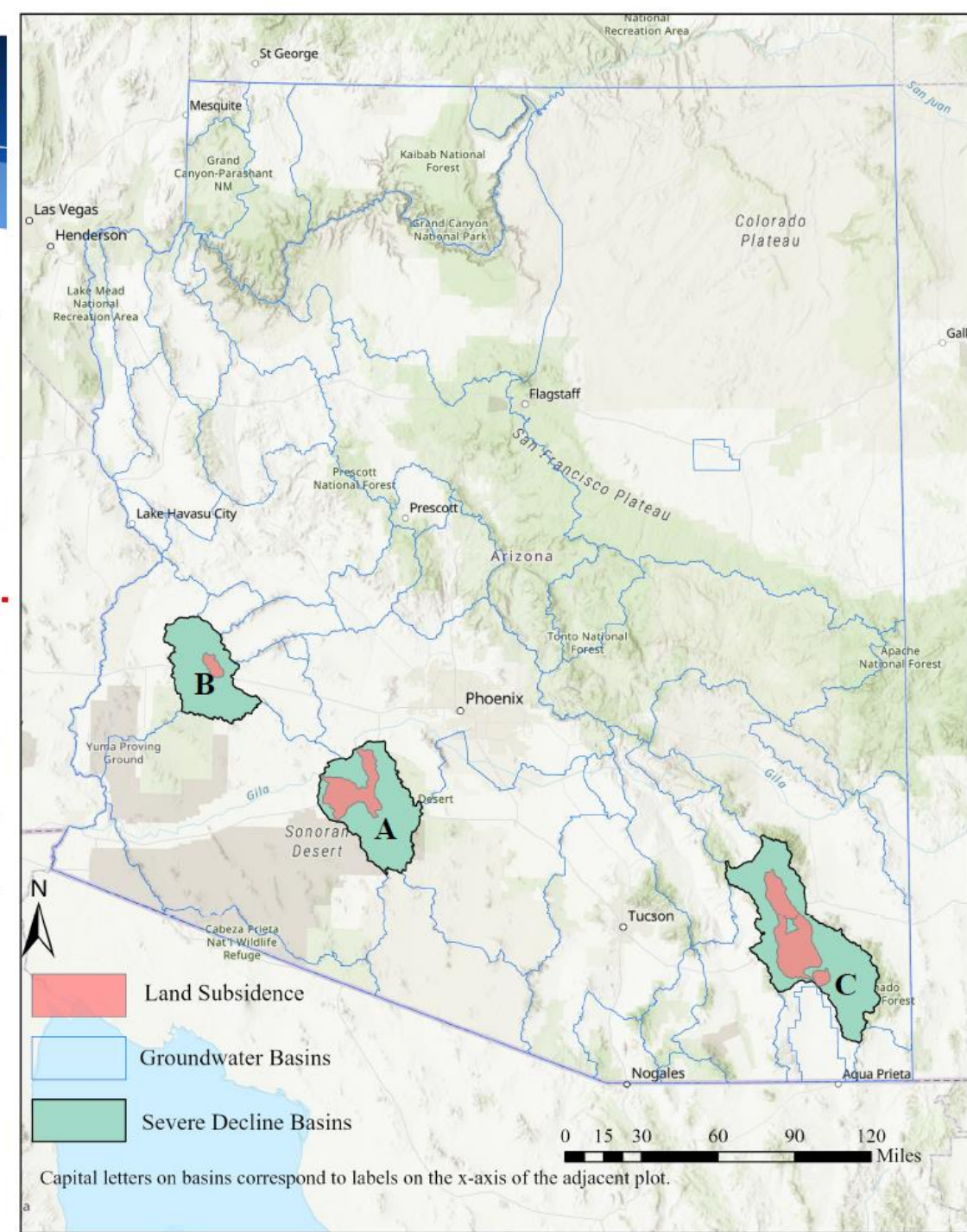


(A) Gila Bend Basin †

(B) Ranegras Plain Basin †

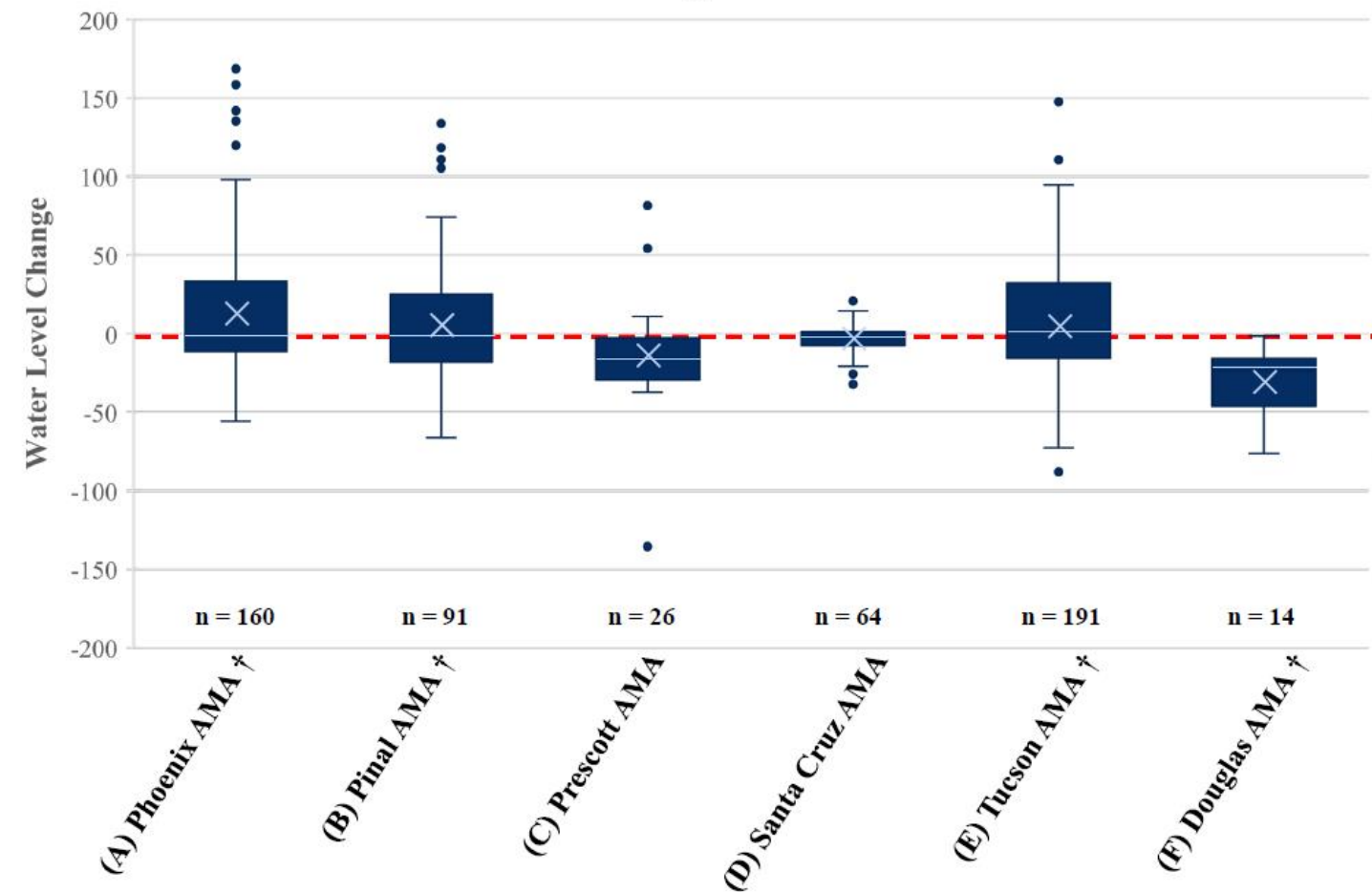
(C) Willcox Basin †

† Basin with subsidence

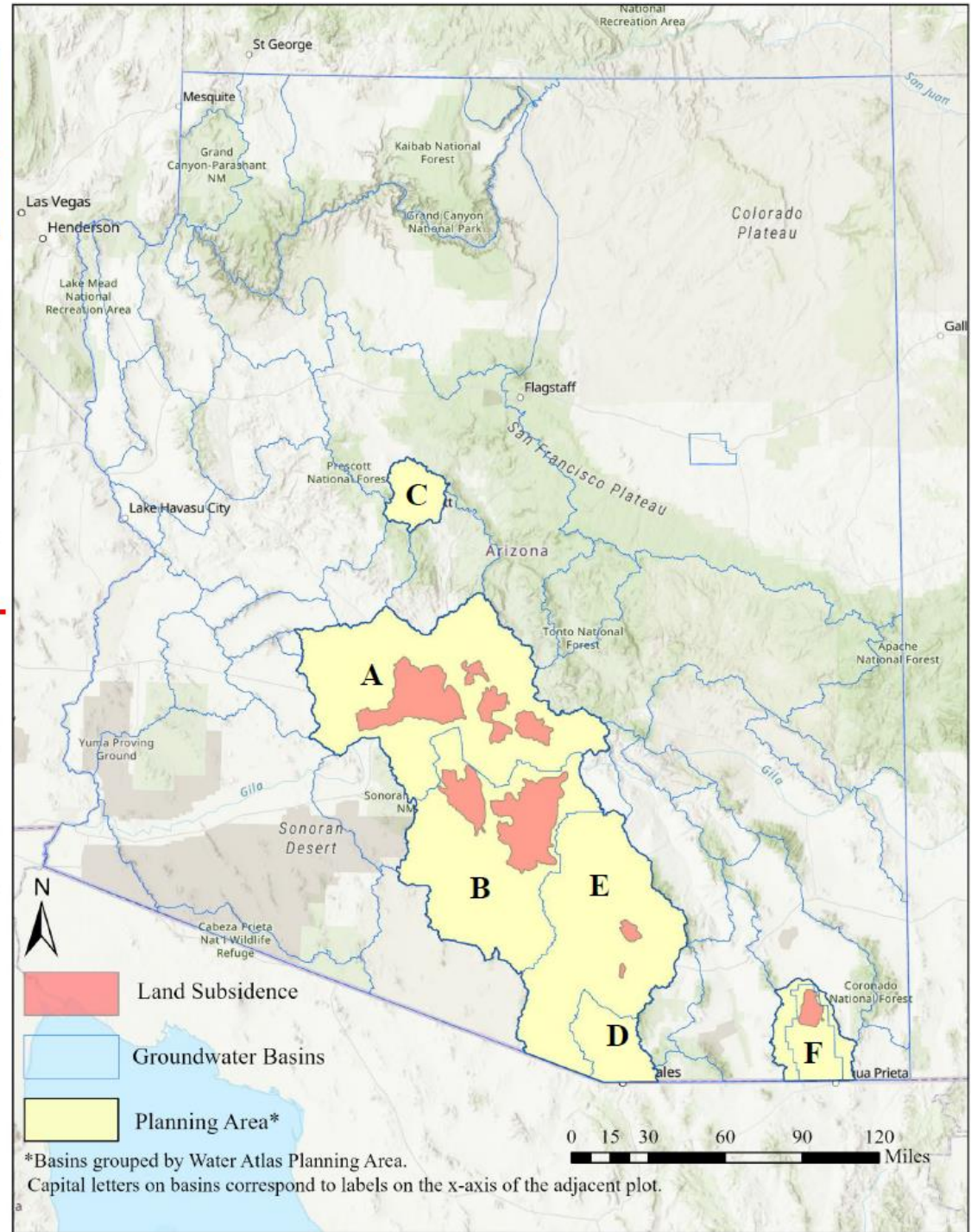


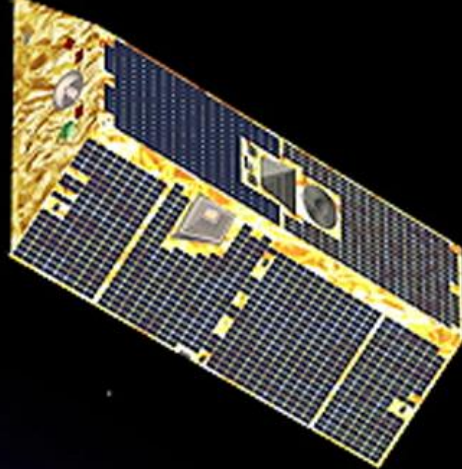
Active Management Areas

Active Management Areas



† Basin with subsidence





GRACE (2002-2017)

GRACE-FO (2018-)

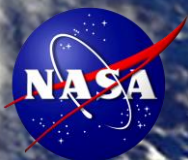
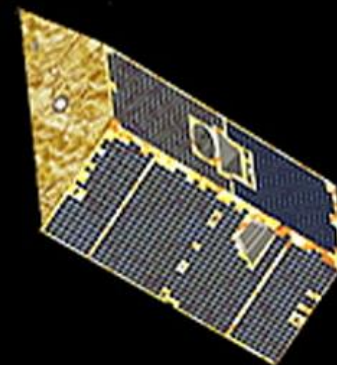
Functions like a 'scale in the sky'

Measures *changes in total water storage*

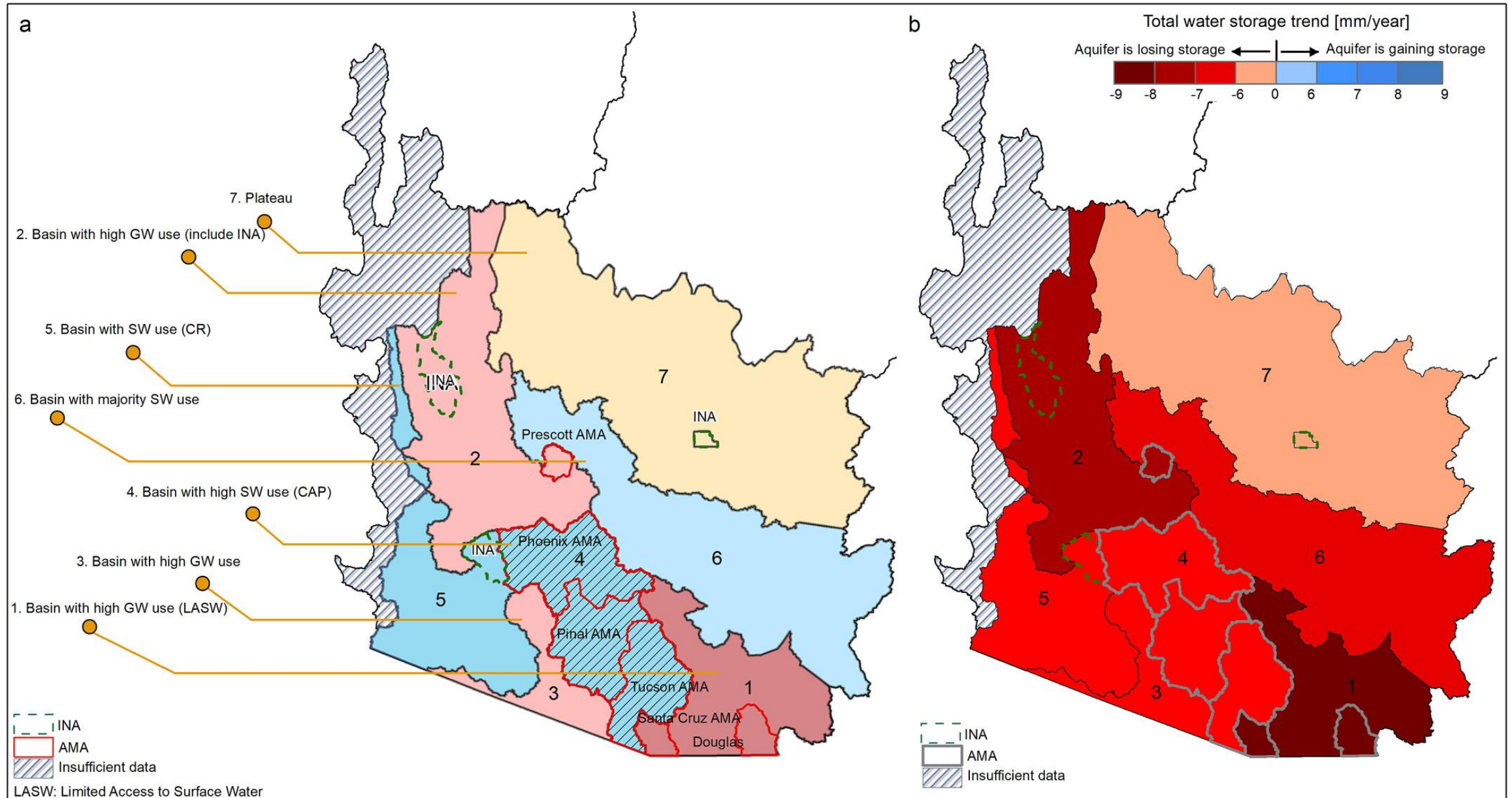
Timescales > monthly

Regions > 625 km² (after model-based downscaling)

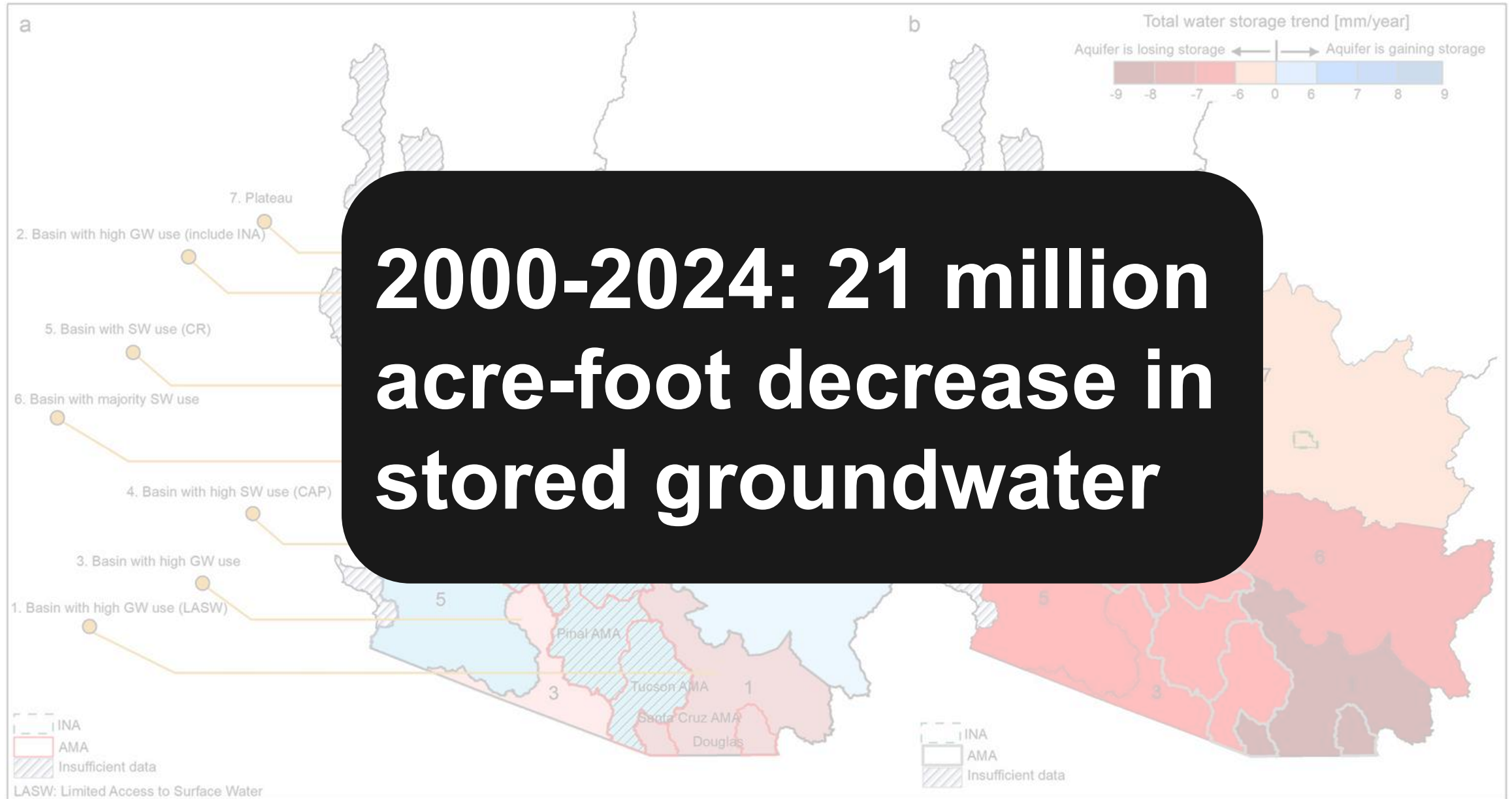
Accuracy 1.5 cm equivalent water height



Estimating groundwater storage changes with GRACE/FO



Estimating groundwater storage changes with GRACE/FO



ADWR Supply and Demand Studies

ARS § 45-105(B)(14): supply and demand assessment of each groundwater basin at least once every five years; at least six assessments per year

Dashboard

Completed

Agua Fria
Big Sandy
Butler Valley
Cienega Creek
Donnelly Wash
Gila Bend
Harquahala INA
Lower San Pedro
McMullen Valley
Ranegras Plain
San Bernardino

San Rafael
Tiger Wash
Tonto Creek
Upper Hassayampa
Upper San Pedro
Verde River
Willcox
Douglas AMA
Prescott AMA
Santa Cruz AMA

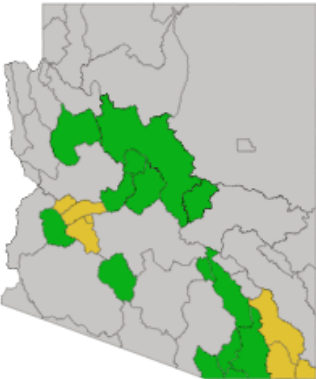
All changes have been saved

Supply & Demand Report Basin Schedule

As of January 2025

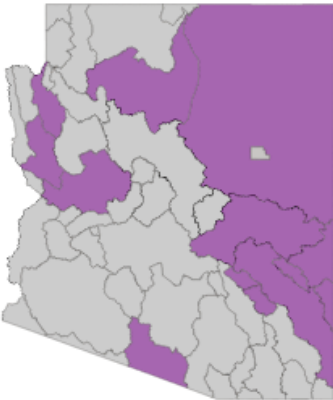


Basins Assessed 2023/2024
2023



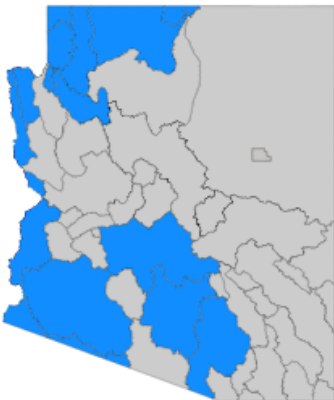
Agua Fria
Big Sandy
Butler Valley
Cienega Creek
Donnelly Wash
Douglas
Gila Bend
Harquahala INA
Lower San Pedro
McMullen Valley
Prescott AMA
Ranegras Plain
San Bernardino Valley
Santa Cruz AMA
San Rafael
Tiger Wash
Tonto Creek
Upper Hassayampa
Upper San Pedro
Verde River
Willcox

Upcoming 2025 Basins



Aravaipa Canyon
Bill Williams
Bonita Creek
Coconino Plateau
Dripping Springs Wash
Duncan Valley
Hualapai Valley
Little Colorado Plateau
Morenci
Sacramento Valley
Safford
Salt River
San Simon Wash

Remaining Post 2025



Detrital Valley
Grand Wash
Kanab Plateau
Lower Gila
Lake Havasu
Lake Mohave
Meadview
Paria
Parker
Peach Springs
Pinal AMA
Phoenix AMA
Shivwits Plateau
Tucson AMA
Virgin River
Western Mexican Drainage
Yuma

ADWR Supply and Demand Studies

ARS § 45-105(B)(14): supply and demand assessment of each groundwater basin at least once every five years; at least six assessments per year

Completed

- Agua Fria

Big Sandy

Butler Valley

Cienega Creek

Donnelly Wash

Gila Bend

Harquahala INA

Lower San Pedro

McMullen Valley

Ranegras Plain

San Bernardino
- San Rafael

Tiger Wash

Tonto Creek

Upper Hassayampa

Upper San Pedro

Verde River

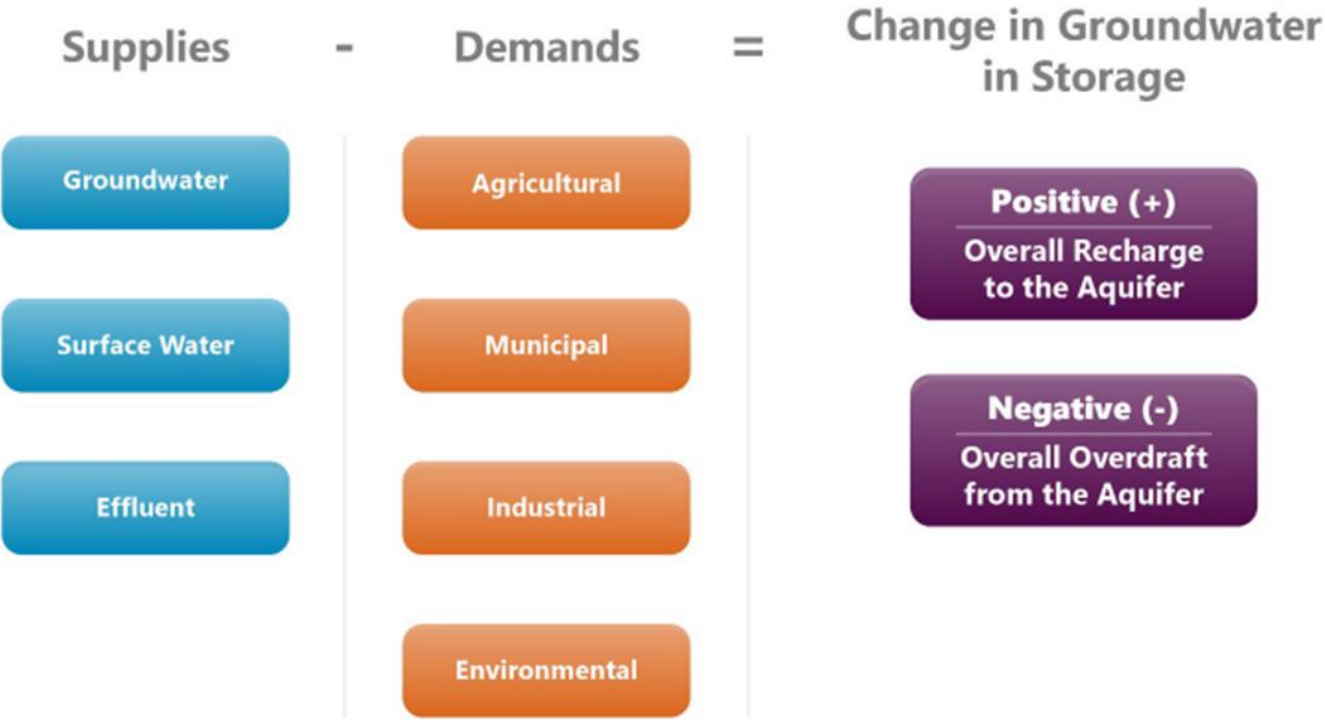
Willcox

Douglas AMA

Prescott AMA

Santa Cruz AMA

Water Budget



ADWR Supply and Demand Studies

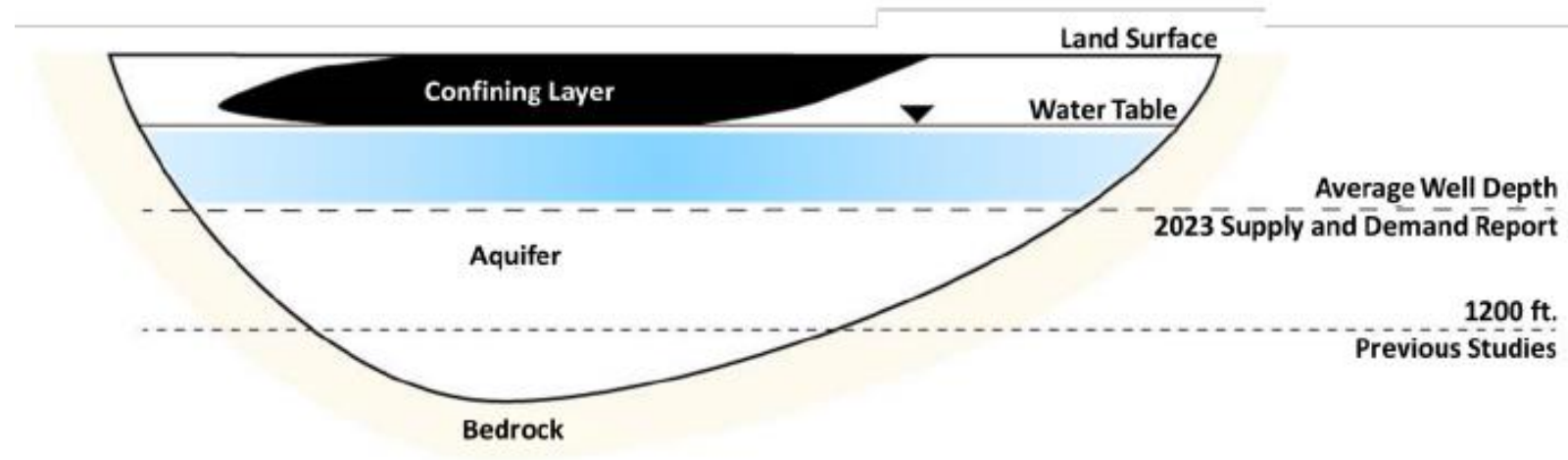
ARS § 45-105(B)(14): supply and demand assessment of each groundwater basin at least once every five years; at least six assessments per year

Completed

Agua Fria
Big Sandy
Butler Valley
Cienega Creek
Donnelly Wash
Gila Bend
Harquahala INA
Lower San Pedro
McMullen Valley
Ranegras Plain
San Bernardino

San Rafael
Tiger Wash
Tonto Creek
Upper Hassayampa
Upper San Pedro
Verde River
Willcox
Douglas AMA
Prescott AMA
Santa Cruz AMA

Water Budget



TL;DR

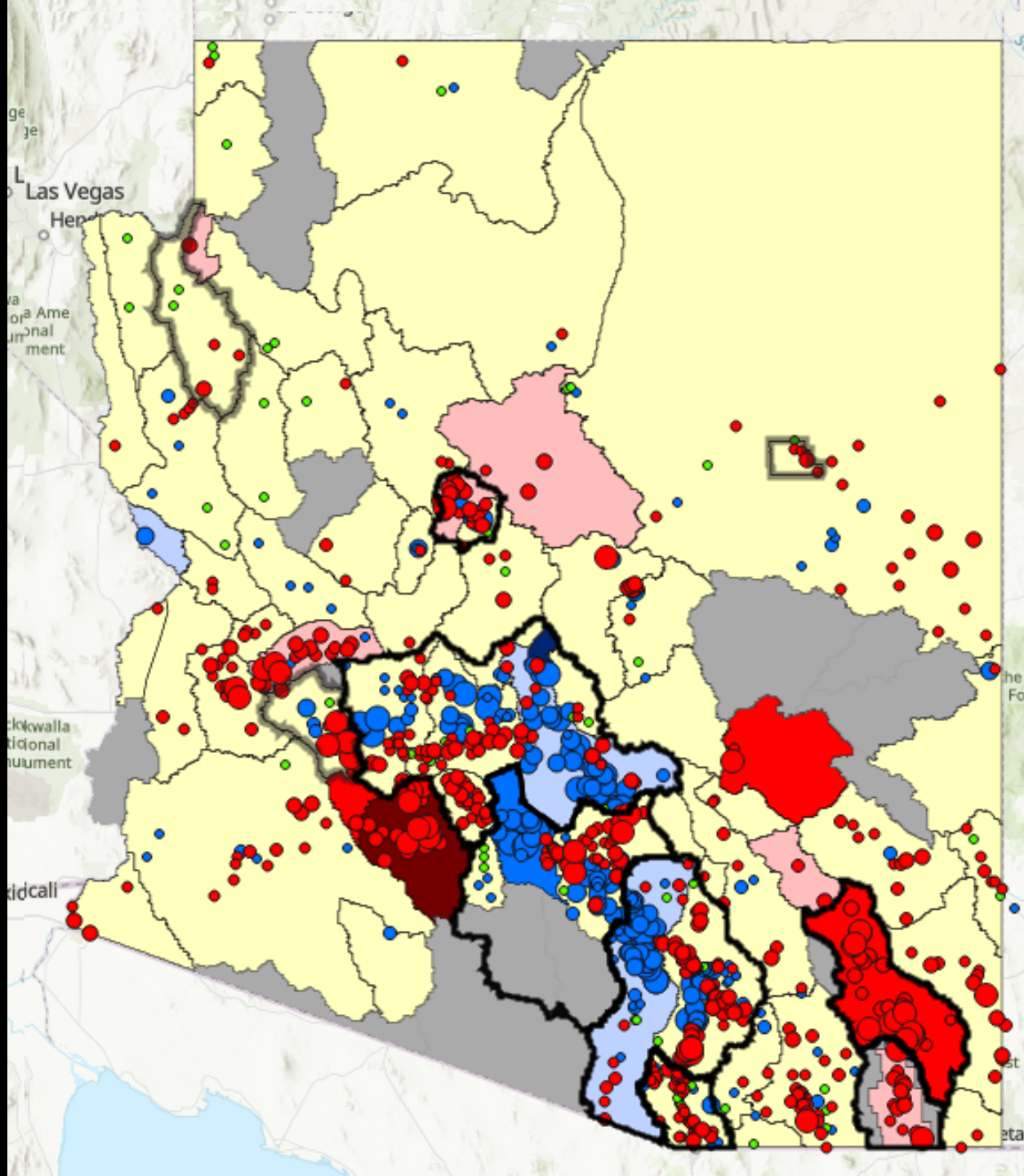
Basin	Ag Acres	Ag demand	Total Annual Demand	% from Ag Demand	Average Well Depth	% dry by 2075	Total Storage*	Annual Balance (AF/Y)	Supply	Demand / Supply
Agua Fria	428	-921	-6,029	15.3%	unknown	unknown	unknown	-	-	-
Donnelly Wash	0	0	-6,789	0.0%	476	unknown	unknown	-	-	-
Tiger Wash	0	0	-87	0.0%	400	50%	214,000	-434	-347	1.58/1
Big Sandy	0	0	823	0.0%	410	unknown	2,685,933	12,063	11,240	0.04/1
Verde River	1,000	-2,412	-6,076	39.7%	unknown	unknown	3,300,000	244,941	251,017	0.02/1
Tonto Crk	200	-896	-5,652	15.9%	161	60%	3,117,611	175,876	181,528	.03/1
San Bernadino	0	0	-376	0.0%	unknown	unknown	unknown	5,061	5,437	0.07/1
Up Hassayampa	0	0	-7,714	0.0%	360	60%	763,512	27,654	35,368	0.2/1
Prescott AMA	500	-1,647	-25,060	6.6%	364	54%	11,280,000	11,311	36,371	0.7/1
San Rafael	0	0	-1,278	0.0%	310	61%	511,788	365	1,643	.08/1
Cienega Creek	185	-331	-7,057	4.7%	357	53%	2,569,295	42	7,099	1/1
Lr San Pedro	1,327	-3,937	-40,137	9.8%	290	60%	3,427,460	-17,813	22,324	1.8/1
Up San Pedro	2,286	-5,777	-40,253	14.4%	332	63%	4,180,000	-20,051	20,202	2/1
Willcox AMA	64,000	-155,805	-206,323	75.5%	409	**	-624,300	-108,429	97,894	2.1/1
Gila Bend	47,128	-311,786	-328,788	94.8%	648	57%	8,800,000	-173,493	155,295	2/1
Douglas	18,000	-61,469	-67,494	91.1%	356	59%	7,754,700	-45,324	22,170	3/1
Harquahala INA	31,880	131,778	-136,872	98.0%	666	46%	4,798,300	-93,654	43,218	3/1
Santa Cruz	2,000	-7,899	-19,693	40.1%	281	61%	257,622	-14,336	5,357	3.7/1
Butler Valley	3,100	-17,368	-17,376	100.0%	718	61%	1,712,500	-14,463	2,913	6/1
McMullen Valley	17,000	-52,093	-52,596	99.0%	573	46%	1,318,500	-44,377	8,219	6.3/1
Ranegras Plain	7,917	-40,083	-41,417	96.8%	35	61%	2,520,808	-40,398	1,019	41/1

***Storage to average well depth**

****Storage volume is below average well depth**

Tools





Most Recent Water Year (2020)  

Layers



☐ Wells: 1-YR Water Level Change (2019-2020) ...

☐ Sub-basins: 1-YR Rate of Change (2019-2020) ...

☐ Wells: 10-YR Water Level Change (2010-2020) ...

☐ Sub-basins: 10-YR Rate of Change (2010-2020) ...

☒ Wells: 20-YR Water Level Change (2000-2020) ...

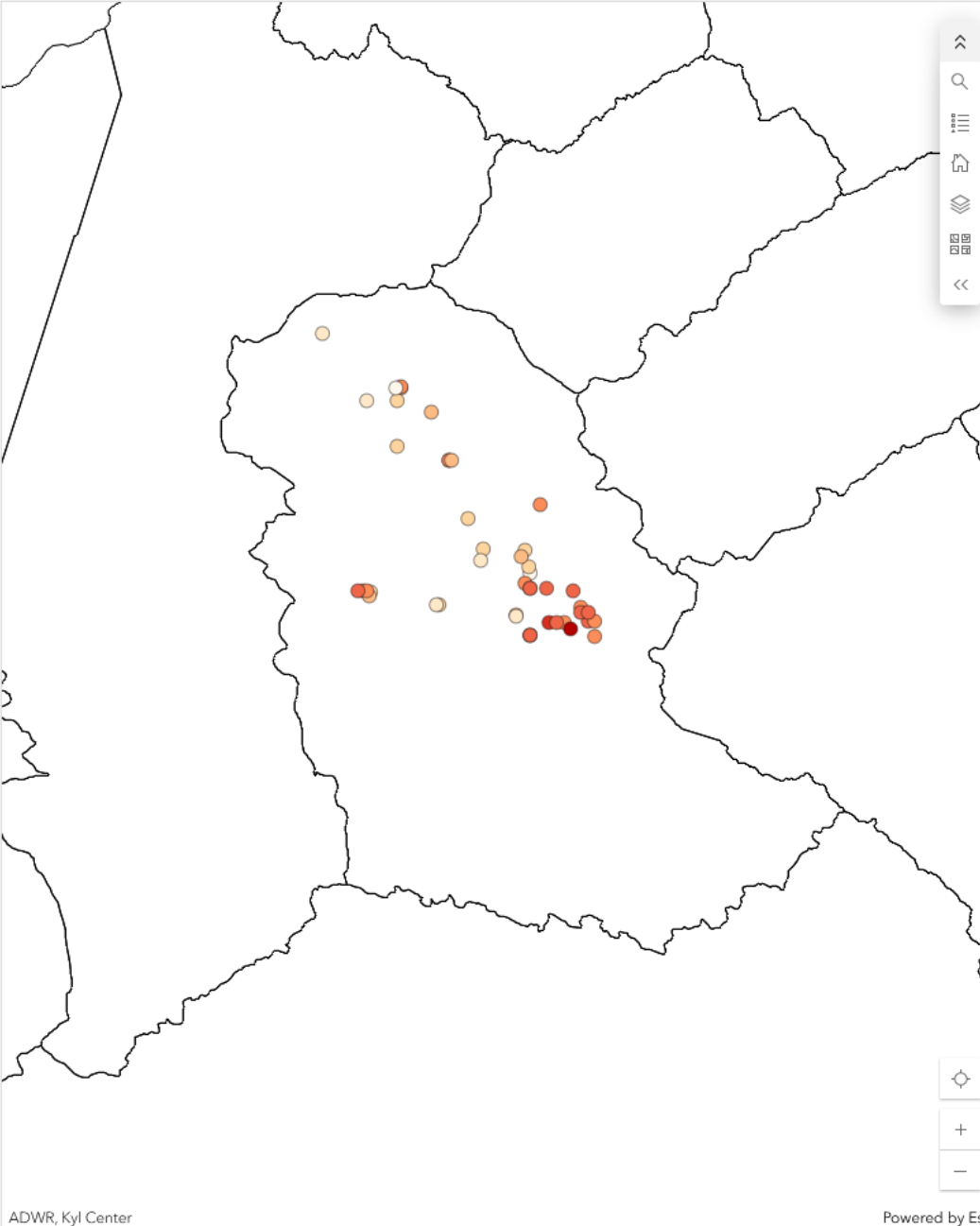
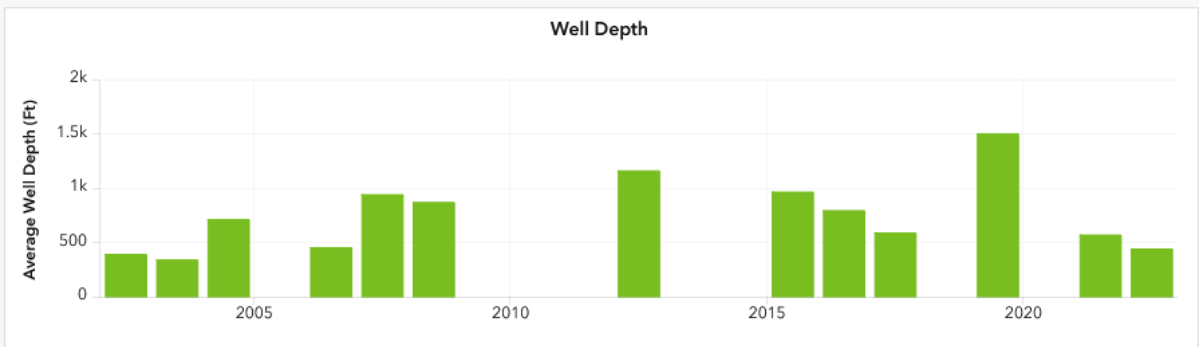
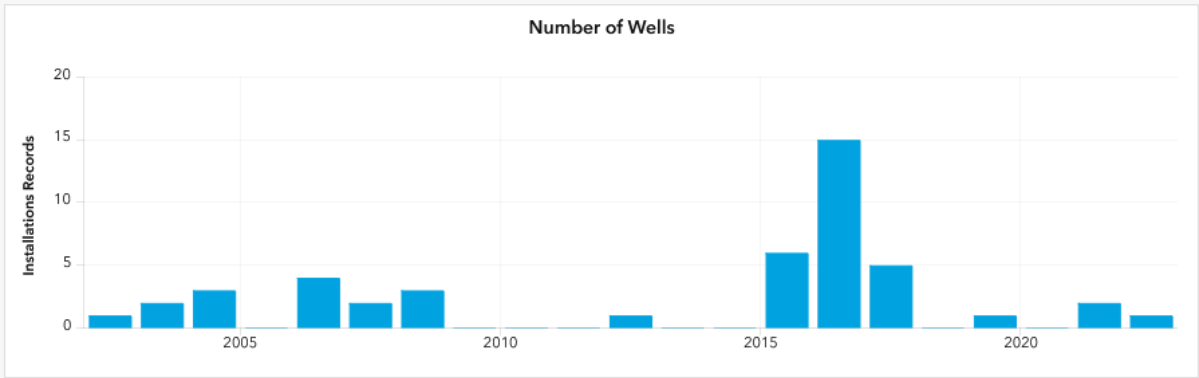
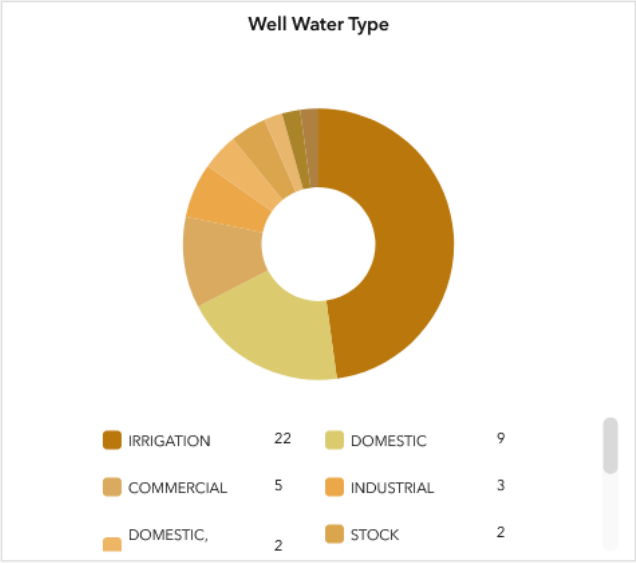
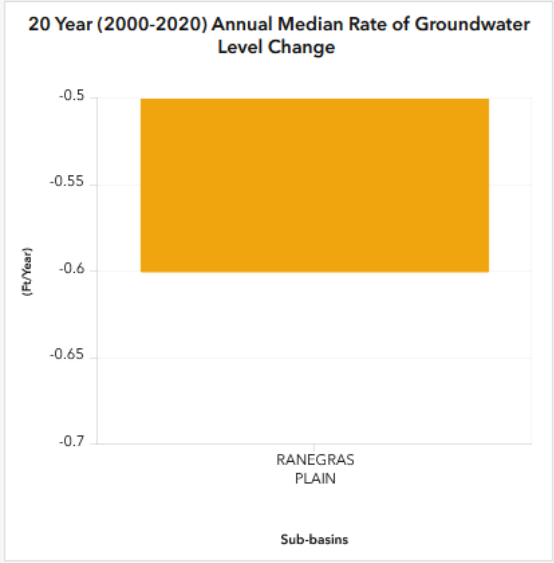
20-YR Water Level Change (ft)

-  > 60
-  40 to 60
-  20 to 40
-  10 to 20
-  > 1 - 10
-  < 1 foot change
-  -1 to -10
-  -10 to -20
-  -20 to -60
-  < -60

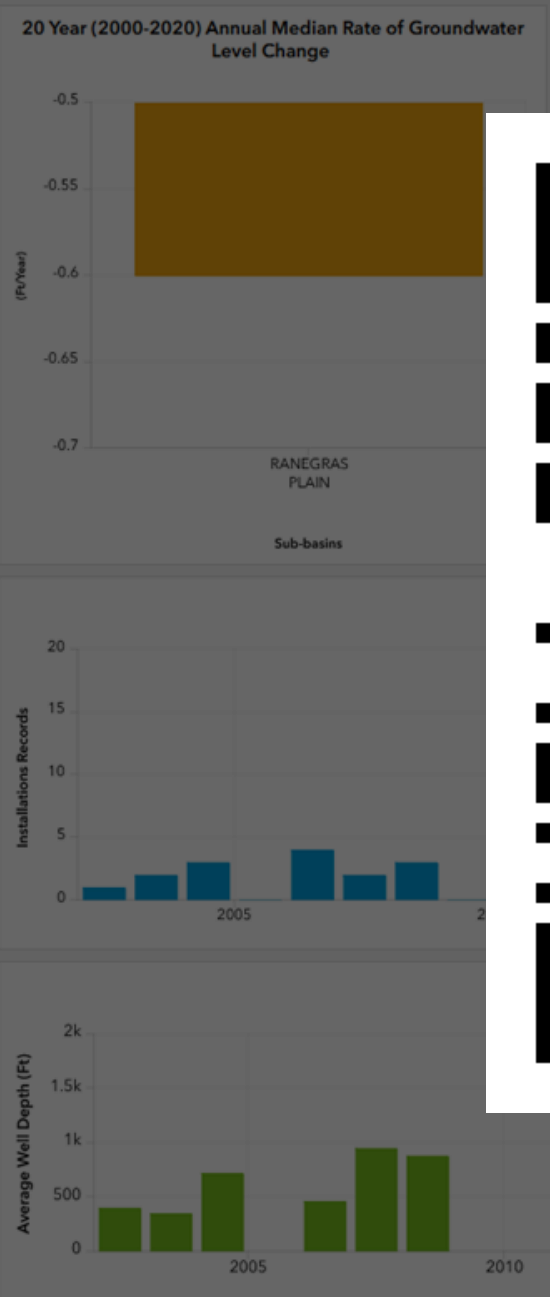
☒ Sub-basins: 20-YR Rate of Change (2000-2020) ...



- Groundwater Sub-basins
- LA POSA PLAINS
 - LAKE HAVASU
 - LAKE MOHAVE
 - LAKE PLEASANT
 - LITTLE CHINO
 - LITTLE COLORADO RIV...
 - MAMMOTH
 - MARICOPA-STANFIELD
 - MCMULLEN VALLEY
 - MEADVIEW
 - MORENCI
 - PARIA
 - PEACH SPRINGS
 - RAINBOW VALLEY
 - RANEGRAS PLAIN**
 - SACRAMENTO VALLEY
 - SALT RIVER CANYON
 - SALT RIVER LAKES
 - SAN BERNARDINO VAL...
 - SAN CARLOS VALLEY
 - SAN RAFAEL
 - SAN SIMON VALLEY
 - SAN SIMON WASH
 - SANTA CRUZ AMA
 - SANTA MARIA



- Groundwater Sub-basins
- LA POSA PLAINS
 - LAKE HAVASU
 - LAKE MOHAVE
 - LAKE PLEASANT
 - LITTLE CHINO
 - LITTLE COLORADO RIV...
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 - SANTA CRUZ AMA
 - SANTA MARIA



Rural Groundwater Resilience Workshops

Supporting rural communities to protect groundwater



ASU Julie Ann Wrigley
Global Futures Laboratory™
Arizona State University

Arizona Water Innovation Initiative



BABBITT CENTER
FOR LAND AND WATER POLICY

A Center of the Lincoln Institute of Land Policy



Locally-driven Co-Developed Workshops

Convene local steering committee & work with Resource Strategy Group

- **Workshop Objectives**
- **Workshop Structure**
- **Workshop Content**
- **Workshop Participants**

2025 Workshops

Call for Interest & Resource Strategy Group



La Paz County

Champion: Holly Irwin

- Targeting **February 2025**
- Participants from: La Paz County, La Paz Economic Development, McMullen Valley Chamber of Commerce, Wenden Water Domestic Improvement District, Town of Parker



Patagonia

Champion: Bob Proctor

- Targeting **Spring 2025**
- Participants from: Town of Patagonia, Friends of Sonoita Creek, Cienega Watershed Partnership, Sonoita/Elgin Planning & Preservation Committee, The Nature Conservancy, Tucson Audubon



Little Colorado River Plateau

Champions: Ron Doba & Patrice Horstman

- Targeting **June 2025**
- Participants from: Coconino Plateau Watershed Partnership, Coconino County, NAMWUA, City of Flagstaff, City of Sedona, USGS, AZ Water Company, Grand Canyon Trust

Sulphur Springs Valley Exploratory Scenario Planning workshop



1 Sulphur Springs Water Alliance
new watershed collaborative with consensus
commitment for common actions

40
workshop participants with varying
viewpoints

100
adaptive strategies to increase
water resiliency

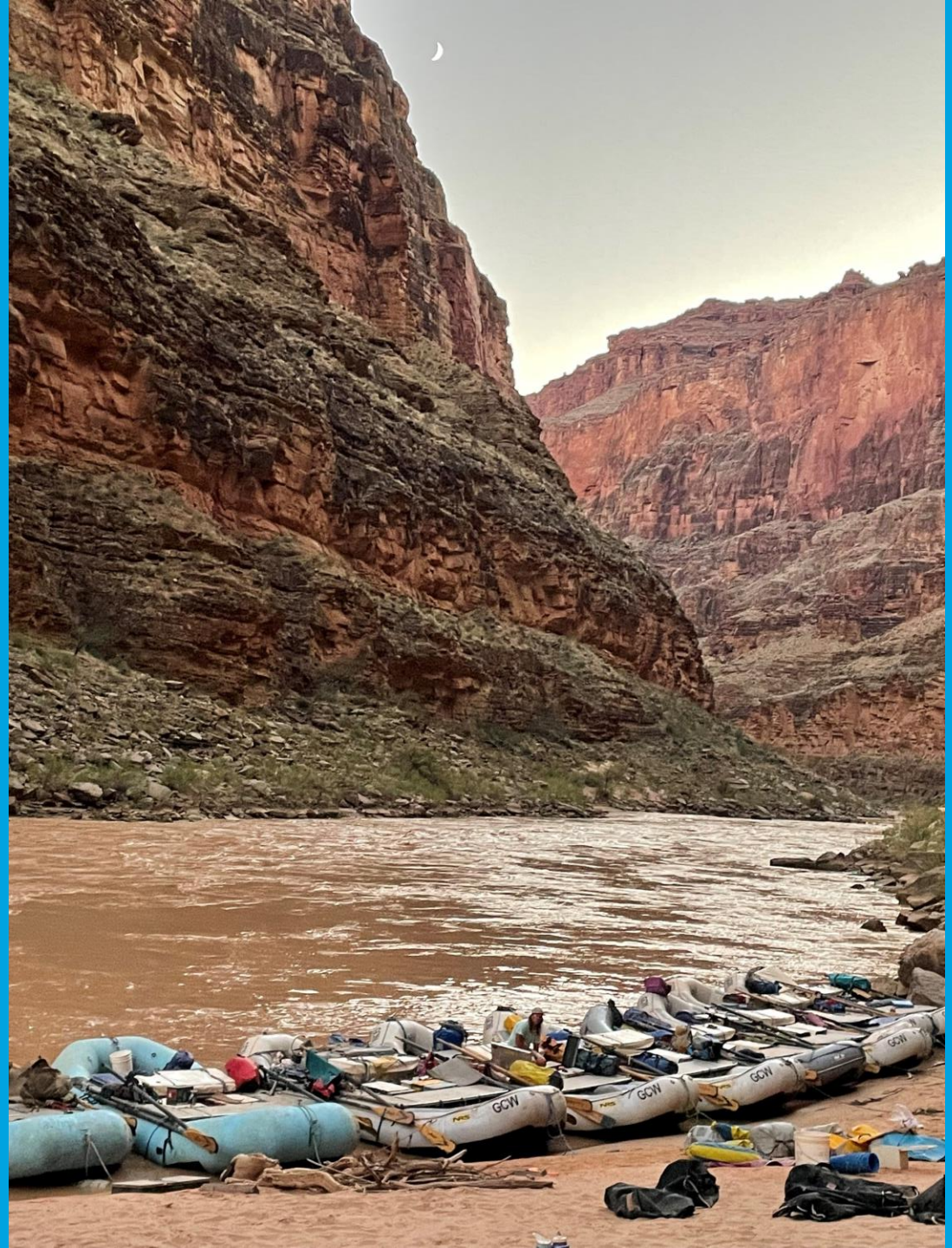


Sarah Porter
s.porter@asu.edu



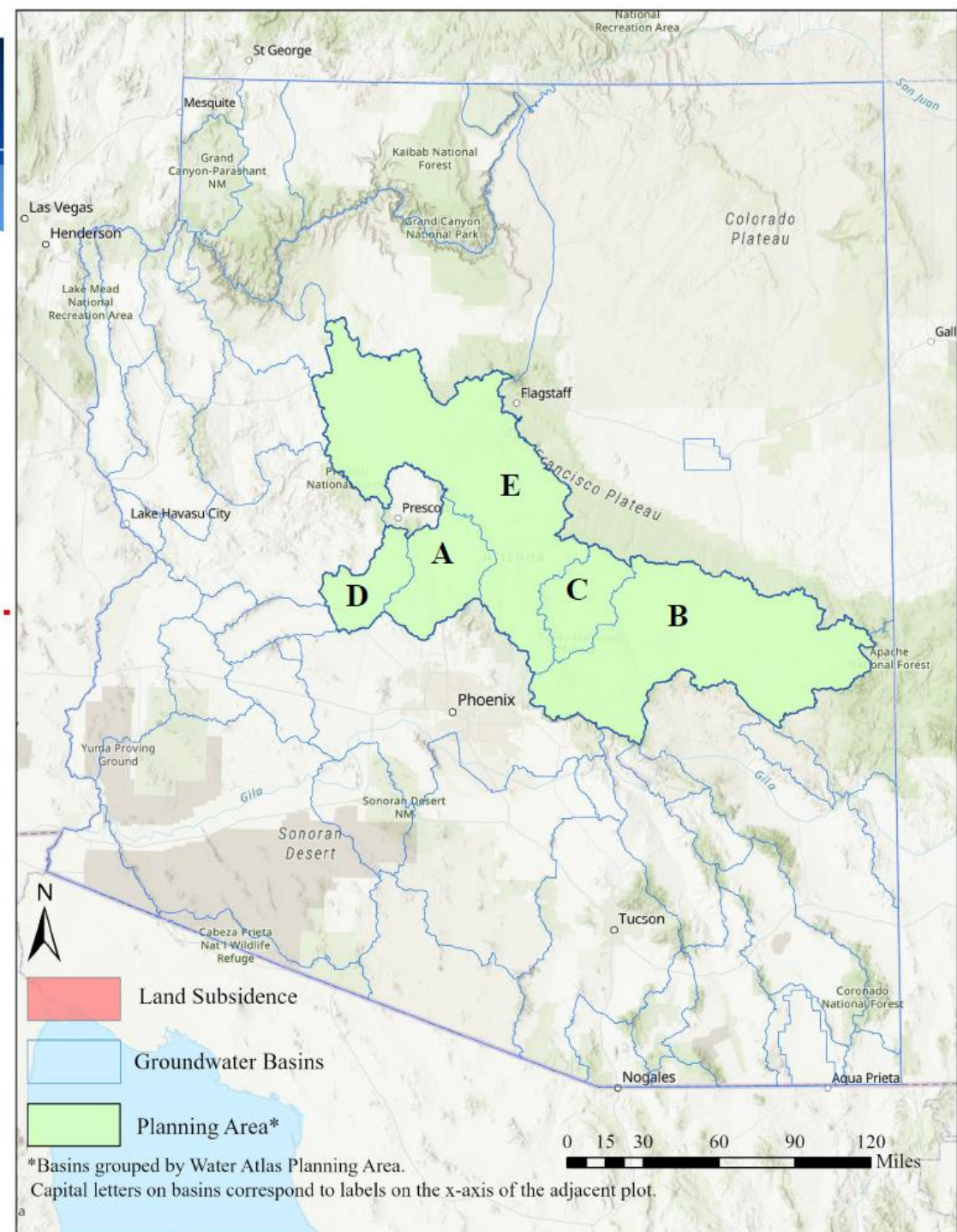
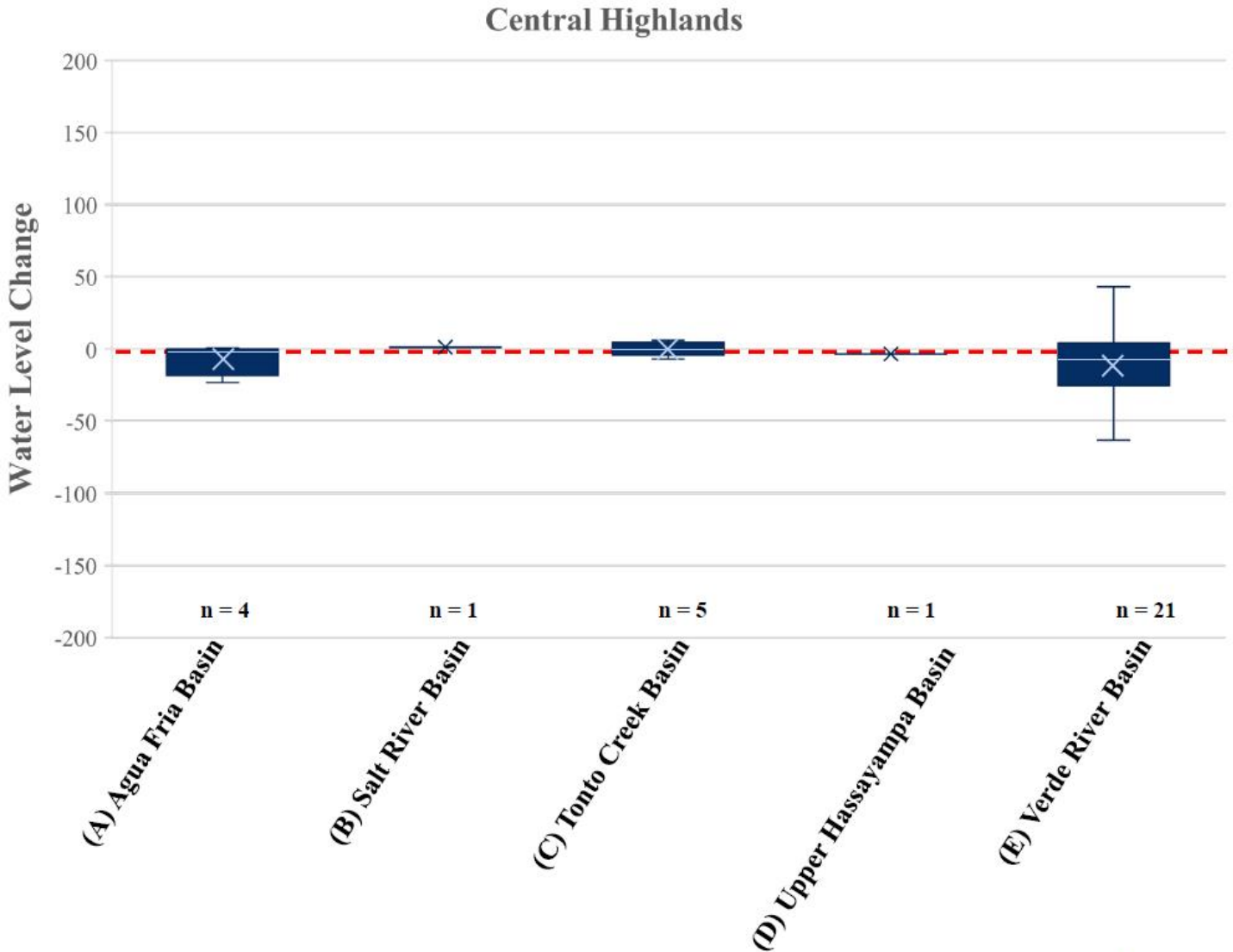
**Arizona
Water
Blueprint**

[**azwaterblueprint.asu.edu**](http://azwaterblueprint.asu.edu)



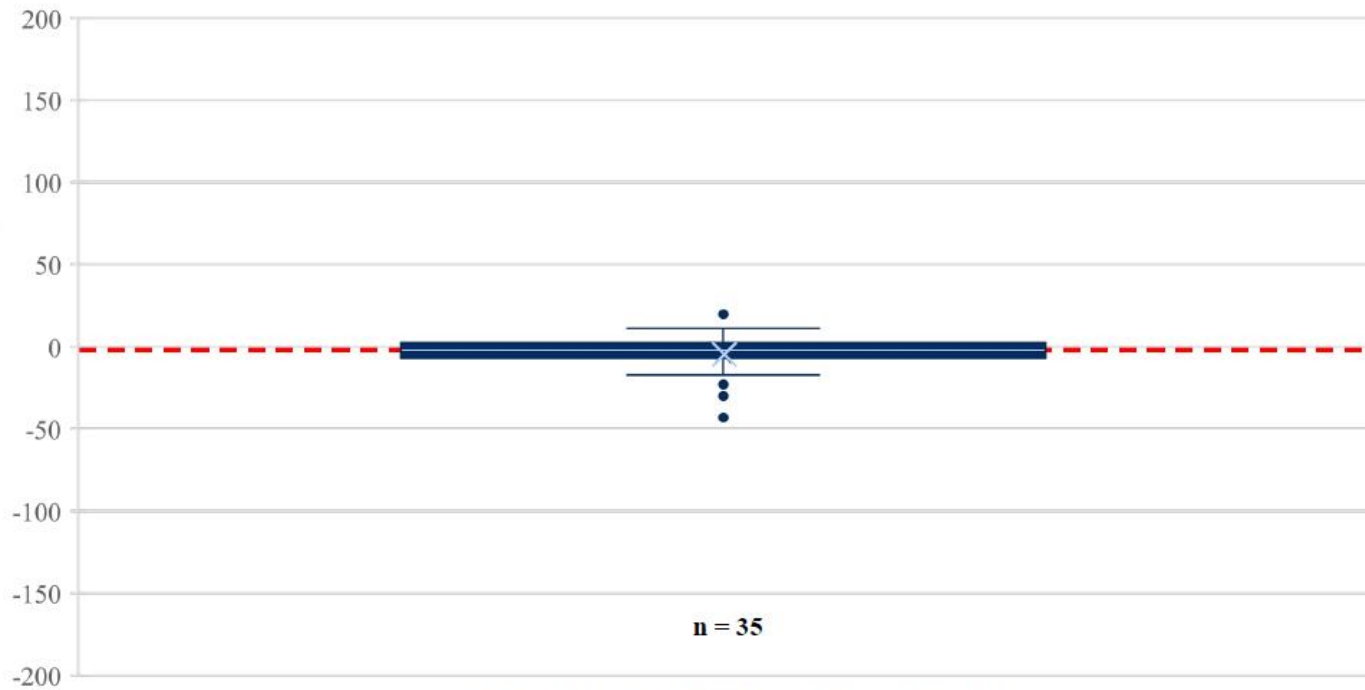
EXTRA SLIDES

Central Highlands



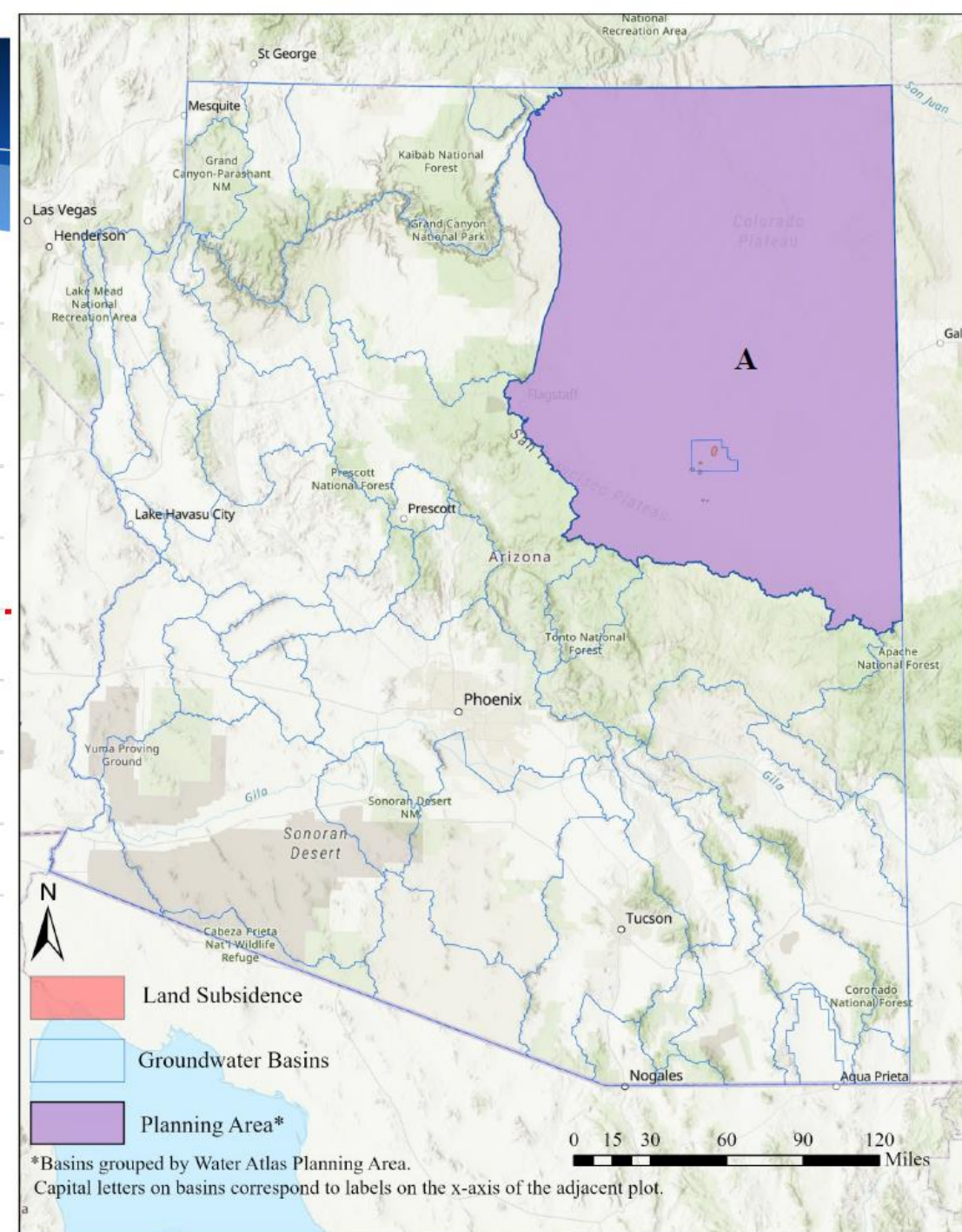
Eastern Plateau

Eastern Plateau



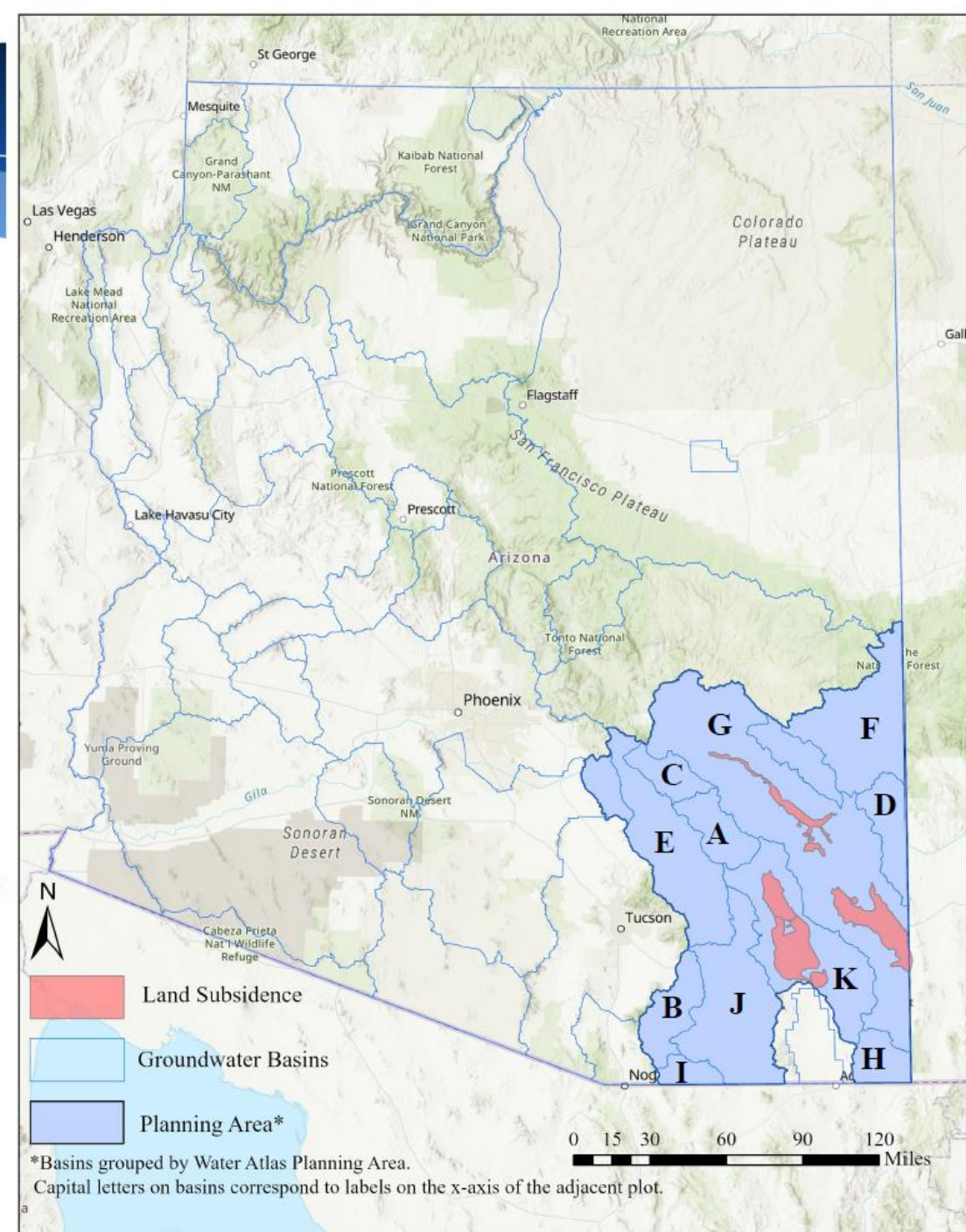
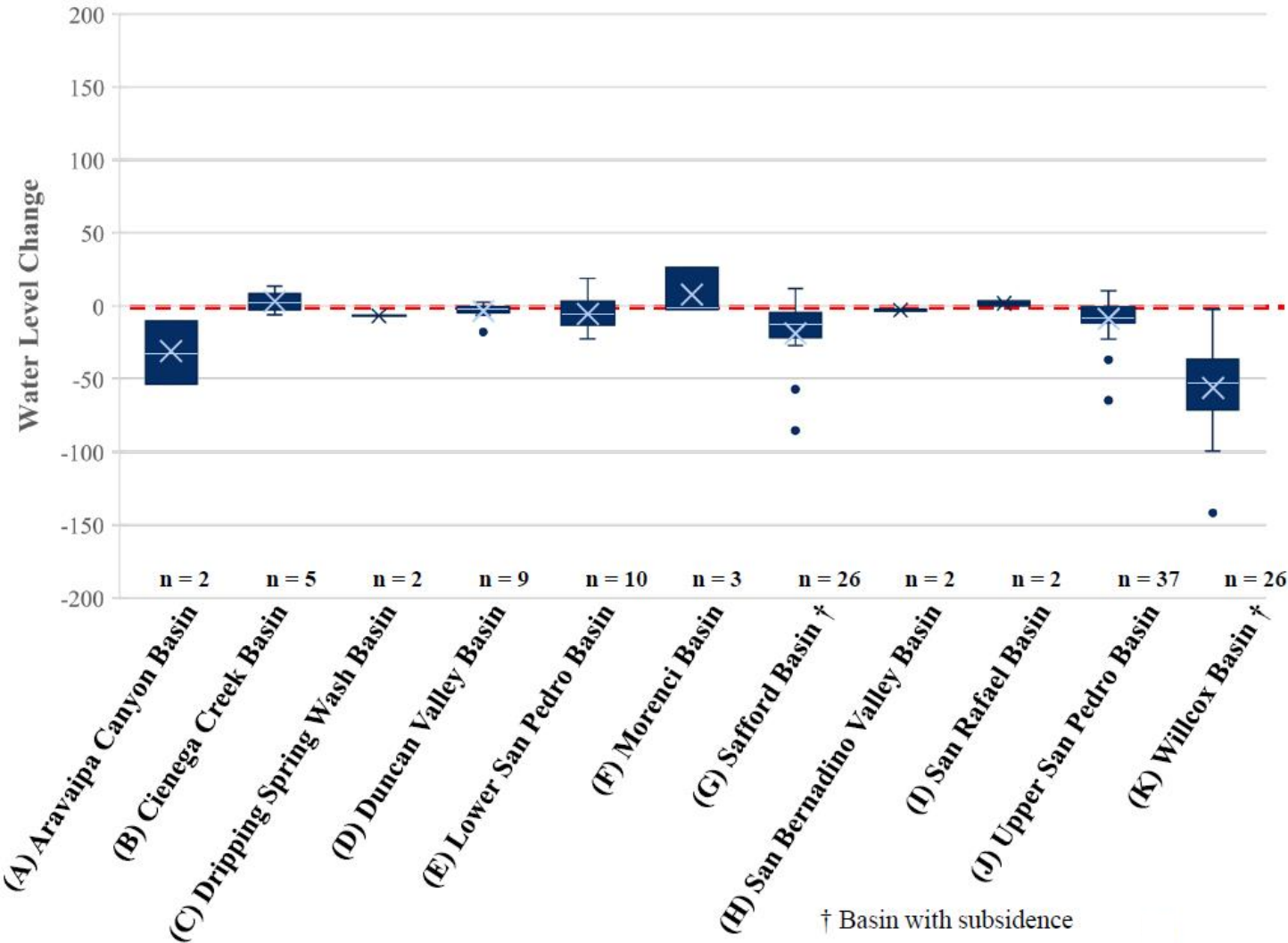
(A) Little Colorado River Plateau Basin †

† Basin with subsidence



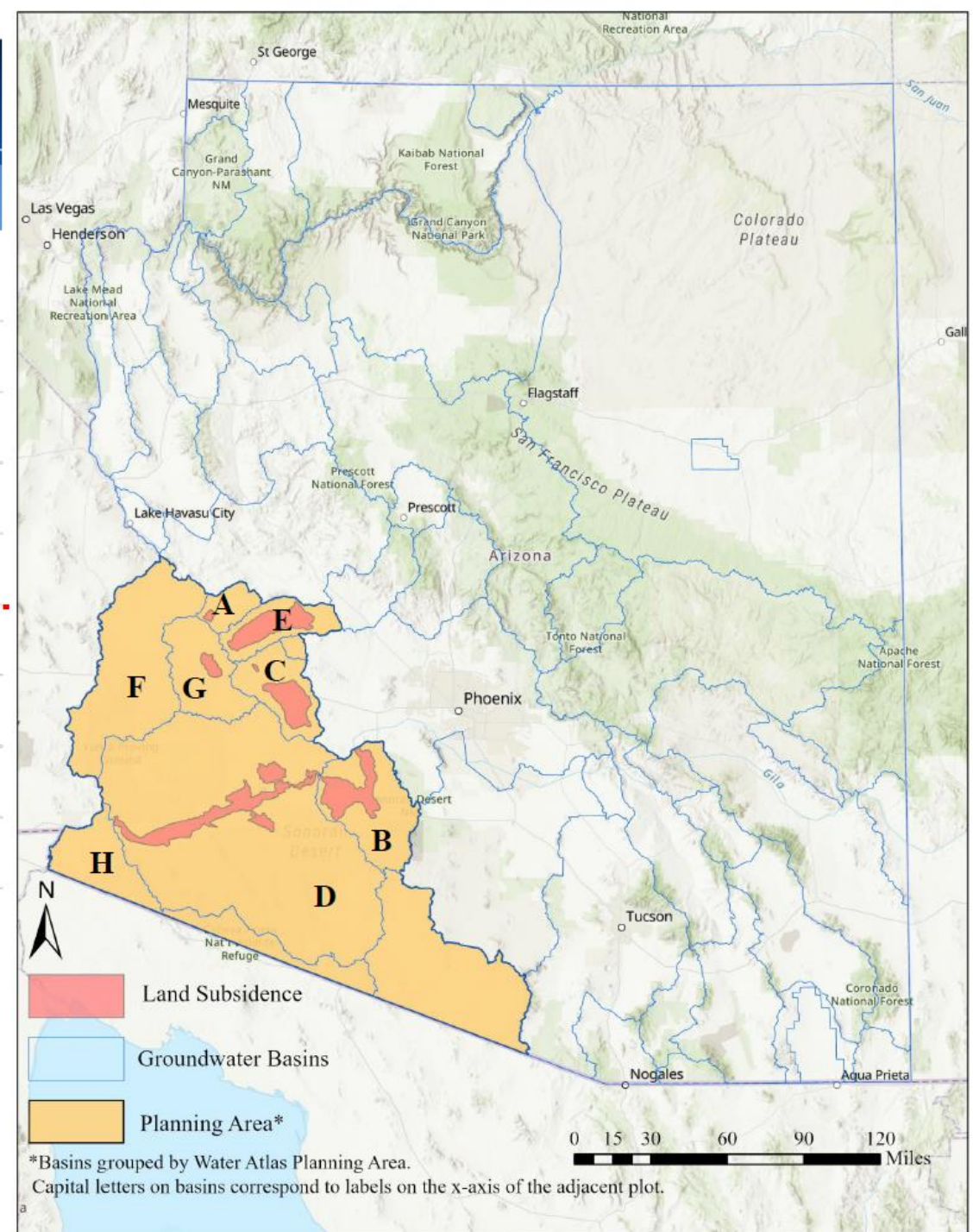
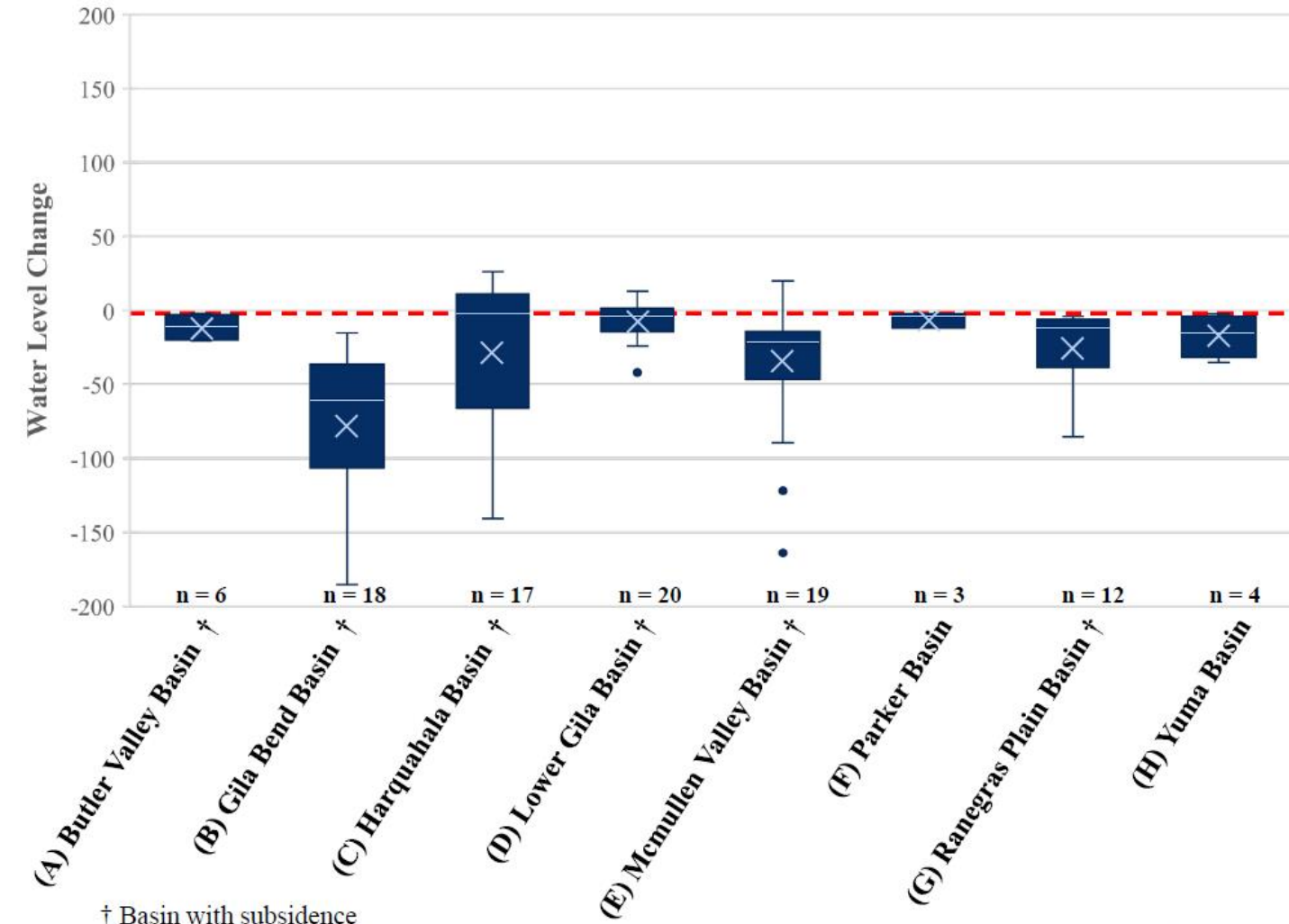
Southeastern Arizona

Southeastern Arizona



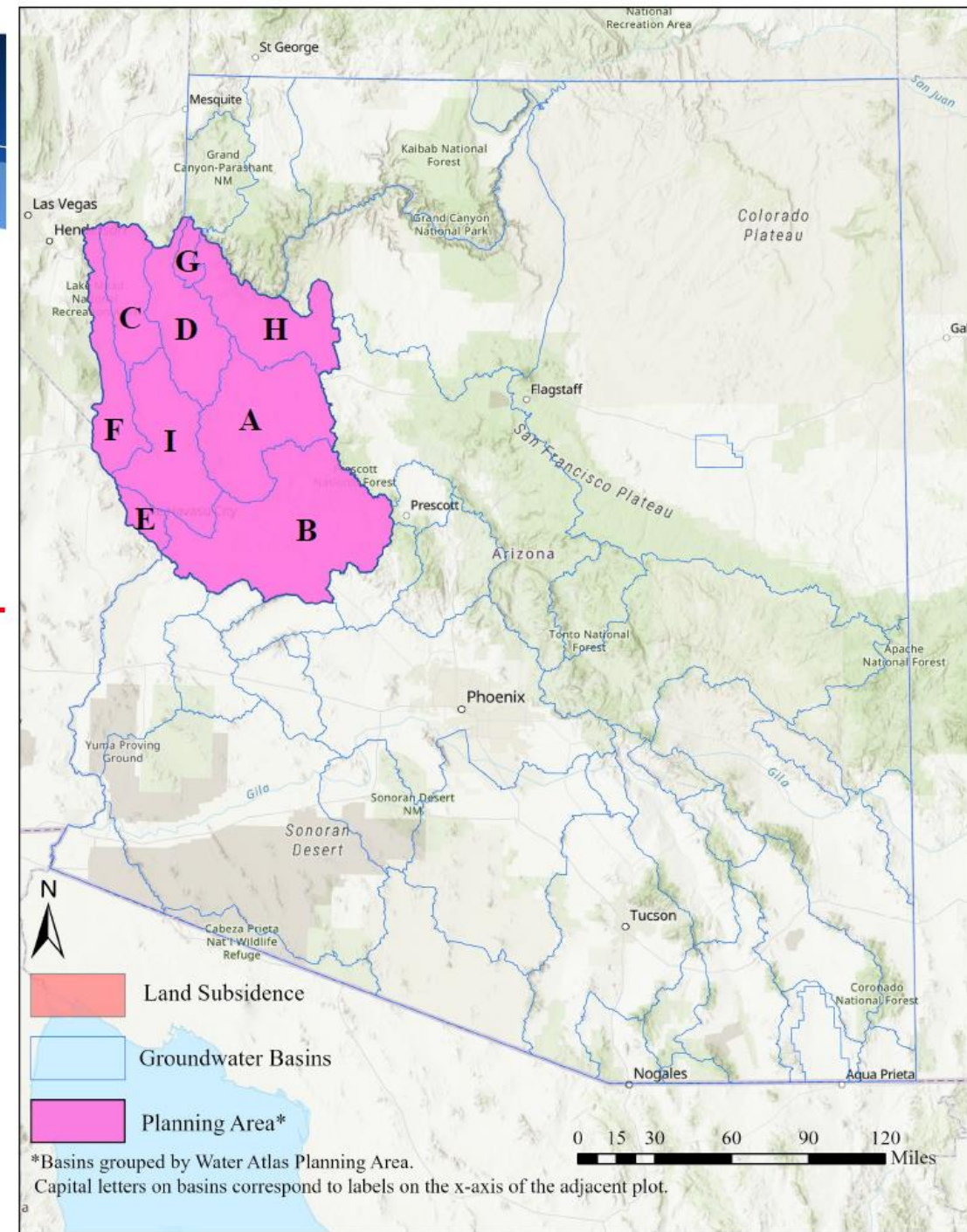
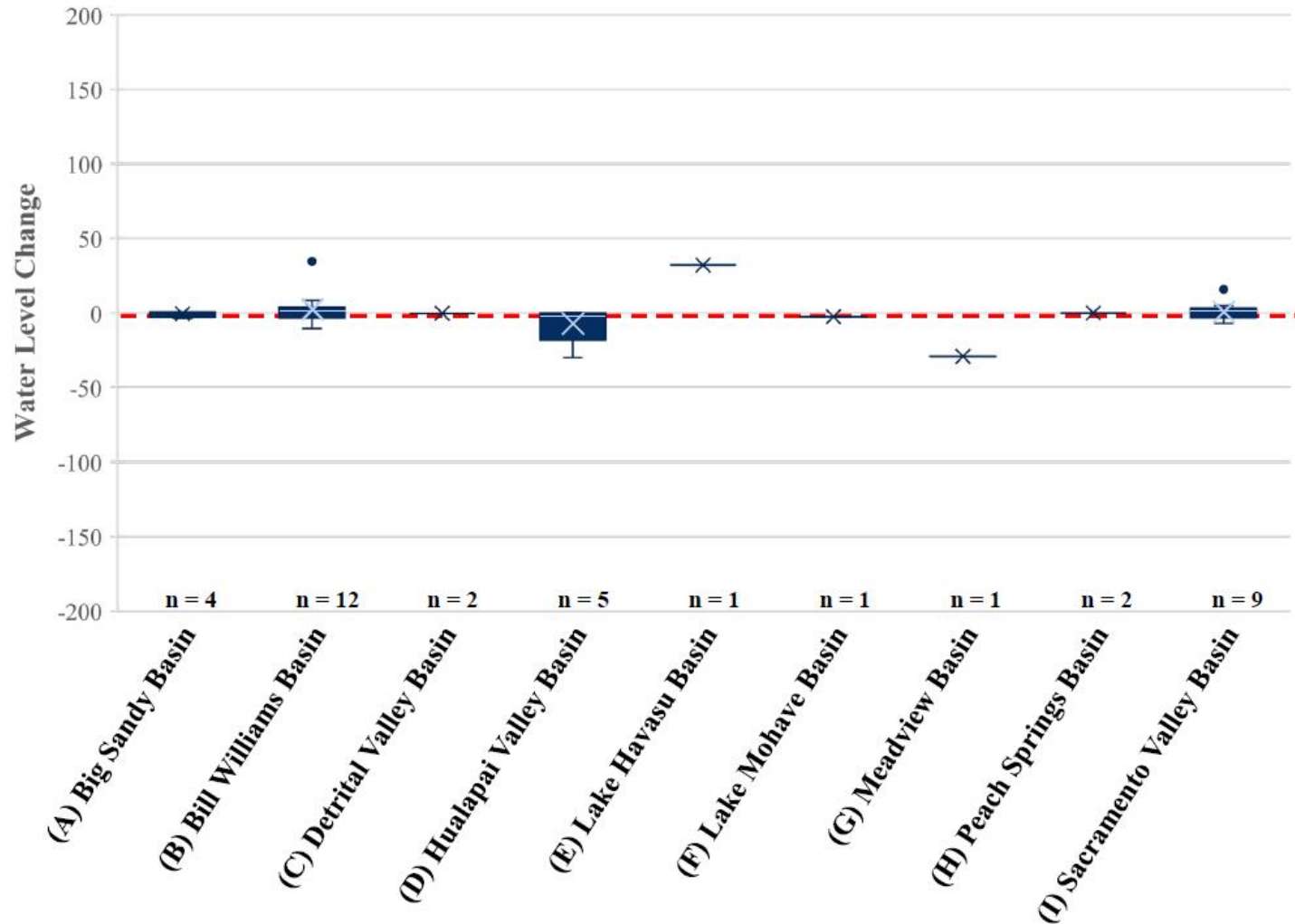
Lower Colorado River

Lower Colorado River



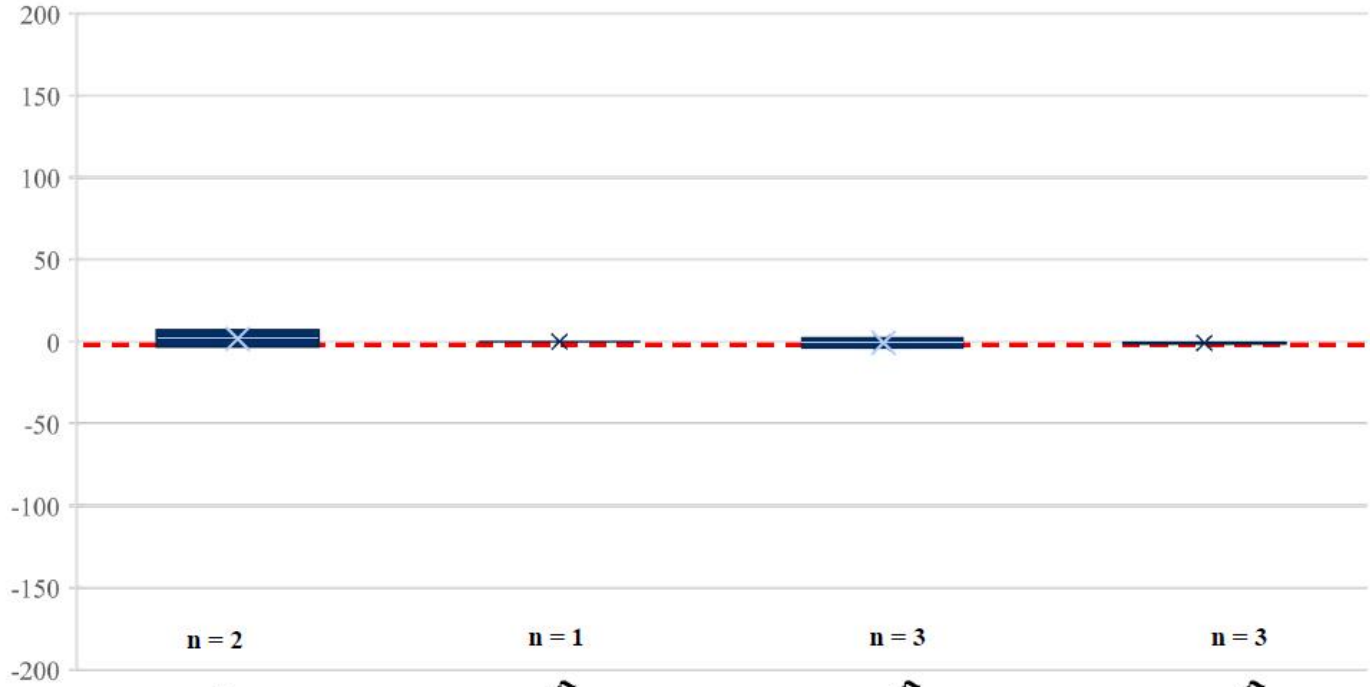
Upper Colorado River

Upper Colorado River



Western Plateau

Western Plateau



(A) Coconino Plateau Basin

(B) Grand Wash Basin

(C) Kanab Plateau Basin

(D) Virgin River Basin

