



International Boundary and Water Commission United States Section

For immediate release
March 19, 2025

USIBWC Southeast Arizona Citizens Forum Public Meeting in Tucson on April 15

The U.S. Section of the International Boundary and Water Commission (USIBWC) Southeast Arizona Citizens Forum board will host an in-person and virtual public meeting on:
Tuesday, April 15, 2025, from 4-6 p.m. MST

- **John Light, USIBWC Nogales Field Office Area Operations Manager**, will provide field office updates and the status of the Nogales International Wastewater Treatment Plant rehabilitation project.
- **Dr. Sharon B. Megdal, Director, Water Resources Research Center, & Dr. Elia Tapia Professor, Universidad de Sonora** will provide a joint presentation on the Transboundary Aquifer Assessment Program, discuss broader groundwater management efforts in Arizona, and will hold a brief discussion on prioritizing Transboundary Aquifers in the Arizona–Sonora Region.

The public meeting will be held in person at:
Water Resources Research Center, University of Arizona
350 N. Campbell Ave.
Tucson, AZ 85719

The public meeting will also be held virtually. [Click here to join the meeting](#). If possible, it may be helpful for you to test connectivity on your own prior to the meeting by clicking on the “Join” link and ensuring your camera and microphone are functioning. Or join by phone: +1 915-320-4718,,805438016# Phone conference ID: 805 438 016#

For those connecting via phone, the presentations will be available before the start of the meeting. Go to the USIBWC Citizens Forum page at <https://www.ibwc.gov/citizens-forums-past-meetings/> and look for the Southeast Arizona Citizen Forum meeting.

If you would like to speak during the public comment period, please sign up by contacting Frankie Pinon at frankie.pinon@ibwc.gov or 915-832-4716 by noon on April 14, 2025.

Media Contact :

Frankie Pinon
frankie.pinon@ibwc.gov
915-832-4716

SOUTHEAST ARIZONA CITIZENS FORUM

Tuesday, April 15, 2025, from 4-6 p.m. MST

Water Resources Research Center, University of Arizona

350 N. Campbell Ave.

Tucson, AZ 85719

And Via Teams

Agenda

- **Welcome and Introductions** – USIBWC Citizen Forum Board
- **John Light, USIBWC Nogales Field Office Area Operations Manager**, will provide field office updates and the status of the Nogales International Wastewater Treatment Plant rehabilitation project.
- **Dr. Sharon B. Megdal, Director, Water Resources Research Center, & Dr. Elia Tapia Professor, Universidad de Sonora** will provide a joint presentation on the Transboundary Aquifer Assessment Program, discuss broader groundwater management efforts in Arizona, and will hold a brief discussion on prioritizing Transboundary Aquifers in the Arizona–Sonora Region.
- **Public Comment**
- **Board Discussion**
- **Suggested Future Agenda Items**

If you have a disability that you wish to self-identify confidentially that requires accommodation, please advise us ahead of time. For more information call 915-832-4716 or email frankie.pinon@ibwc.gov

Microsoft Teams meeting

Join on your computer, mobile app or room device: [Click here to join the meeting.](#)

Meeting ID: 284 437 094 981

Passcode: 3xh6Na9p

[Download Teams](#) | [Join on the web](#)

Or call in (audio only)

+1 915-320-4718,,805438016#

Phone conference ID: 805 438 016#

USIBWC



OUR INFRASTRUCTURE

The International Boundary and Water Commission is responsible for **applying the boundary and water treaties** between the United States and Mexico. The USIBWC has a broad range of responsibilities, including:

- **Flood Control:** More than 500 miles of levees and 20,000 acres of flood plain
- **Water Delivery:** Ensure compliance with the 1906 Convention and 1944 Water Treaty for the Rio Grande and Colorado River
- **Dams and Hydroelectric Power Plants:** Manage two international dams with hydroelectric plants and four diversion dams
- **Sanitation:** Border sanitation with two international wastewater treatment plants in San Diego, CA and Nogales, AZ
- **Boundary Demarcation:** Maintain two international bridges and almost 800 monuments, markers and buoys that demarcate the U.S.-MX border



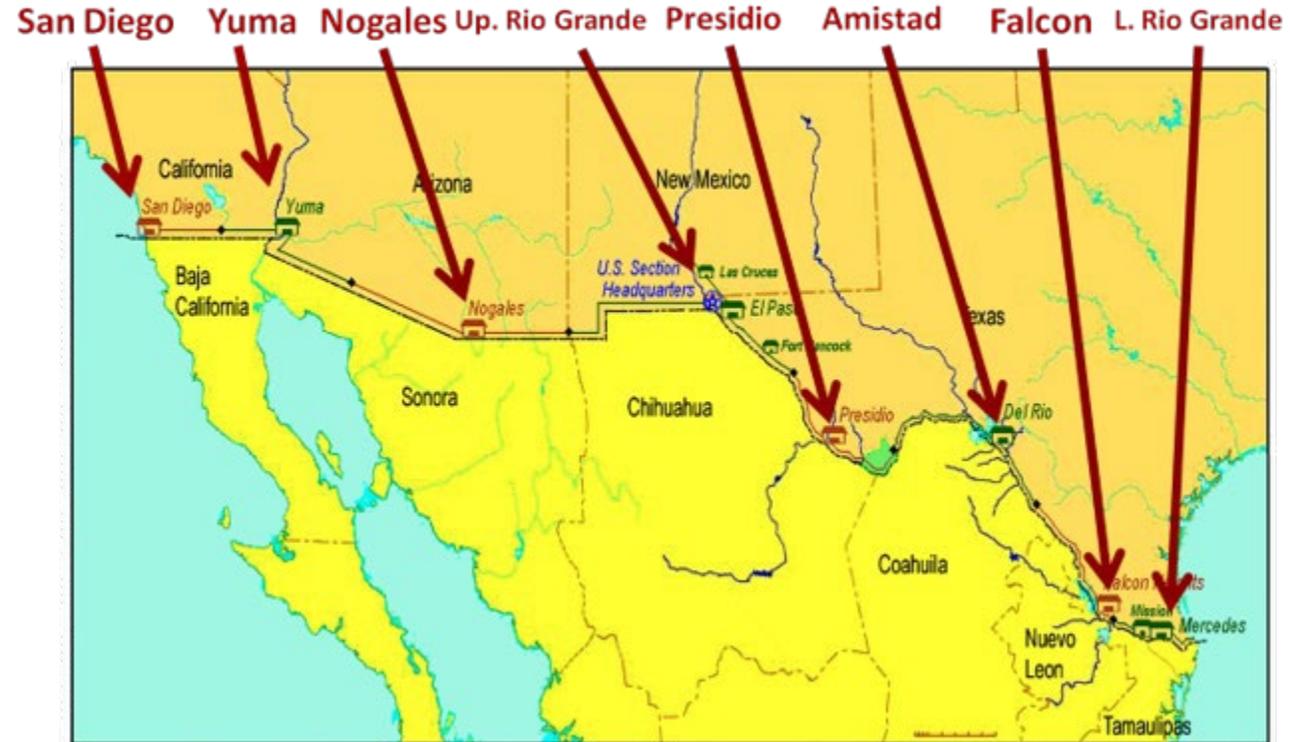
UNITED STATES POWER PLANT at Falcon Dam.





MAJOR ONGOING PROJECTS

- South Bay International Wastewater Treatment Plant (SBIWTP)
- Colorado River Conservation Projects (Minute 323)
- Nogales International Outfall Interceptor (IOI)
- Nogales International Wastewater Treatment Plant (NIWTP)
- Upper Rio Grande: Sunland Park Levee Construction
- Lower Rio Grande: Edinburg Levee Construction and Arroyo Colorado Sediment Removal
- Amistad Dam Seepage Correction
- Heavy Equipment Replacement
- Mercedes, TX Field Office Administrative Building



USIBWC staffing at 12 offices in the border region and Washington D.C.:

- 300 authorized positions
- 1/3 of employees at or near retirement age



NIWTP



Nogales International Wastewater Treatment Plan (NIWTP) of the U.S. Section of the International Boundary and Water Commission



GIS Section
Master Planning Office
International Boundary and Water Commission
GIS Section
Date Revised: 6/2024 9:21 PM



NIWTP PURPOSE

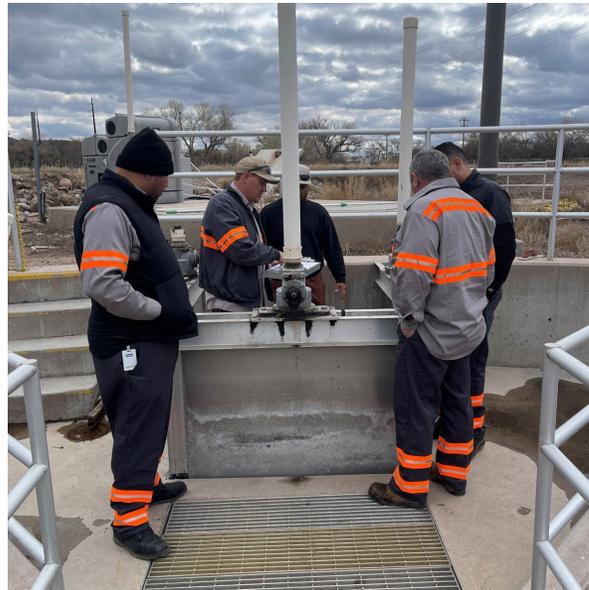
- Apply provisions of 1944 Water Treaty between U.S. and Mexico
- Apply Minutes 206,227, 261, 276 and 294
- Protect the Health & Safety of Ambos Nogales residents through safe and effective international wastewater treatment





NIWTP PARAMETERS

- ~80% of Influent flow originates in Nogales, Sonora Mexico, remainder is United States contribution
- Water is treated to United States Clean Water Act standards and to Federal and State discharge requirements
- Influent from Mexico is conveyed to NIWTP through 9 mile International Outfall Interceptor (IOI)
- Treatment capacity is 14.74 Million Gallons Per Day (MGD)
- NIWTP is routinely well above capacity ranging from 100% to 120% resulting in no system redundancy ability
- NIWTP was upgraded in 2009 and is 75% of way through life cycle





CIP EVALUATION SCOPE

- USIBWC Contracted for a WWTP Capital Improvement Plan (CIP)
- The Contractor will be performing a Wastewater Treatment Asset Management Plan (AMP), including the NIWTP and SBIWTP starting in August 2024. The AMP included an updated 5-year capital improvement plan (CIP) and a projection of long-term renewal and replacement (R&R) funding needs.
- In advance of this future work, IBWC authorized the contractor to conduct a high-level review of both facilities to identify critical needs to include in the current 5-year CIP projections for 2024-2028



NIWTP CIP EVALUATION OVERVIEW

The NIWTP is an advanced wastewater treatment facility with the following design capacities:

- Treatment capacity: 14.7 million gallons per day (mgd)
- Hydraulic capacity: 34 mgd

Originally constructed in 1970 with upgrades in 1990 and 2009. Major processes and facilities include:

- Headworks with settling basins, screening, grit removal and odor control
- Biological Treatment with three bioreactors, aeration blowers, and glycerin feed system
- Final Clarifiers with three tanks and return sludge pumping
- Final Effluent with five traveling bridge filters and ultraviolet (UV) disinfection
- Biosolids with rotary drum thickeners, aerobic digester lagoon, belt presses, and polymer feed
- Support facilities include electrical distribution, back-up generators SCADA, buildings, roads, and levees



NIWTP CIP CONTRACTOR KEY FINDINGS

- The NIWTP consistently operates at 16 -18 mgd (up to 20% above the design treatment capacity)
 - The treatment processes lack redundancy making the plant vulnerable to critical equipment failures and process upsets
 - Tanks and equipment cannot be taken out of service for proper maintenance
- Wet weather flows routinely exceed the 34 mgd hydraulic capacity
 - The headworks is overwhelmed resulting in debris accumulating in downstream processes which impacts performance and damages equipment
- The solids handling processes are inadequate for the new requirement to haul dewatered solids to a remote landfill in Tucson
 - Currently high transport and disposal costs up to \$3MM annually



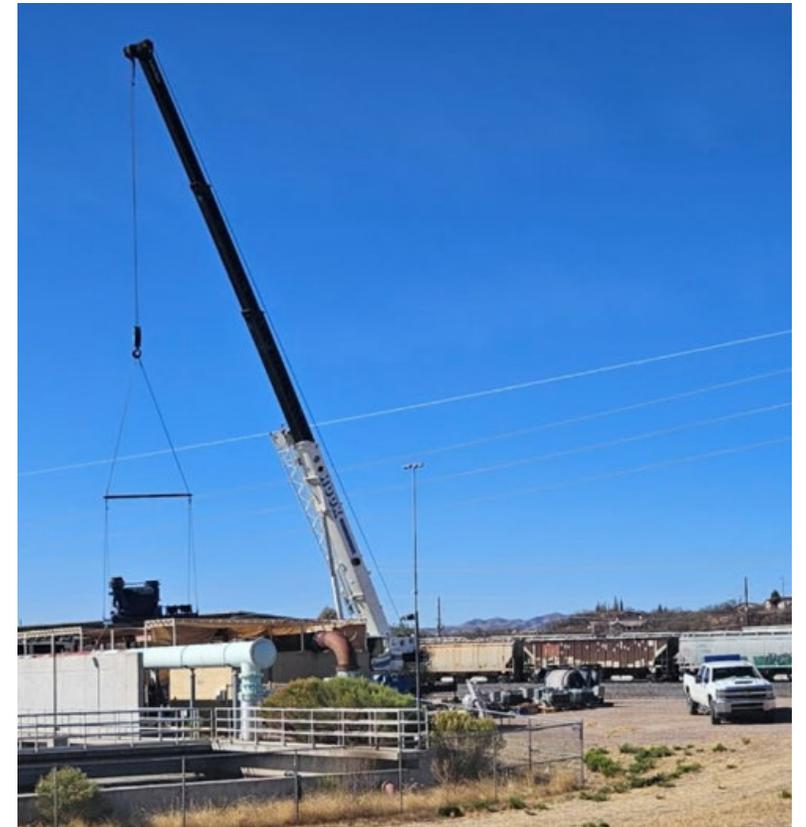
NIWTP CURRENT PROJECTS

Bioreactor #1 Diffuser Replacement Project- to include the following:

- Replacement of 3500 fine air diffuser membranes,
- 2 new blowers,
- 4 RAS pumps, Clarifier gearbox-
- Awarded, 35% complete
- Fiscal magnitude ~1.3 Million Dollars

Influent Magnetic Flow Meter-

- Replace current 35-year-old inoperable unit
- Awarded- Fiscal Magnitude ~122 Thousand Dollars





NIWTP PLANNED PROJECTS

- Biosolids handling improvements- Reduction of biosolids moisture content to >80% dried solids. Solicitation currently being advertised- Fiscal Magnitude ~10-25 Million Dollars
- Add 4th Bioreactor, 5th RAS pump and Final Clarifier for redundancy- In planning phase for design- Fiscal magnitude ~20-30 Million Dollars.
- Headworks- Additional coarse screen for redundancy, replace fine screens, add screenings compactor washer, extend conveyor – In planning phase- Fiscal Magnitude ~1-2 Million Dollars
- Clarifier 2&3 Rehabilitation- Planning phase- Fiscal Magnitude ~1-2 Million Dollars



NIWTP PLANNED PROJECTS

- Tertiary Filters Rehabilitation- Planning phase- Fiscal Magnitude ~1.5-2.5 Million Dollars
- Ultraviolet Disinfection Rehabilitation- Planning phase- Fiscal Magnitude ~.5-1 Million Dollars
- Process Instrumentation Modernization- Add instrumentation to improve efficiency- In process ~200-600 Thousand Dollars
- SCADA Rehabilitation/Modernization- Planning- Fiscal Magnitude ~300-700 Thousand Dollars
- Other Misc. Upgrades/improvements- Levees, roads, ingress/egress, polymer- In process- Fiscal Magnitude ~1.5-2.5 Million Dollars

Water Research Resources Center



About the Water Resources Research Center and Update on the Transboundary Aquifer Assessment Program

Sharon B. Megdal, Ph.D.
US IBWC Southeast Arizona Citizens Forum
April 15, 2025



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COOPERATIVE EXTENSION

**WATER RESOURCES
RESEARCH CENTER**

smegdal@arizona.edu



wrrc.arizona.edu

About the WRRC

Bridging academic and non-academic communities

- Applied research
 - Groundwater governance and management
 - Transboundary Aquifer Assessment Program
 - USDA-funded work on irrigated agriculture in the Southwestern US
 - Groundwater, including governance and managed aquifer recharge
 - Colorado River Basin water issues
- Extension and Engagement
 - Water RAPIDS
- Work across different water-using sectors
- Partnerships are foundational to our work
- Applied research, engagement, and education efforts are interwoven



Update on the Transboundary Aquifer Assessment Program, with a focus on the Arizona-Sonora Components

Sharon B. Megdal, Ph.D.
US IBWC Southeast Arizona Citizens Forum
March 19, 2024

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WATER RESOURCES RESEARCH CENTER

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 WATER RESOURCES RESEARCH CENTER

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Home

Greater depth, broader perspective for a clear water future

We tackle key water policy and management issues, empower informed decision-making, and enrich understanding through engagement, education, and applied research.

[ABOUT US](#)

Photo: 2023 WRRC Photo Contest: "Water Scarcity & Extreme Weather" - Jim Muntz - After the Storm, Marana, AZ, 2023

Much useful information and many resources

WRRC celebrated 60 years in 2024 as a federally authorized center

- WRRC is the designated Water Resources Research Institute (WRRI) for Arizona pursuant to the Water Resources Research Act (WRRRA) of 1964, as amended
- Funds from the WRRRA Section 104(b) program help support:
 - Research on water-related issues involving students at Arizona's 3 state universities
 - 2024 project: Indian Water Rights Settlements in AZ: An Analysis of their History and Potential Future (Aminta Menjivar, PhD candidate)
 - WRRC's robust Information Transfer Program
 - **Weekly Wave e-News Digest:** 3,853 subscribers as of 9/2024
 - **Water Webinars:** average 148 attendees/webinar in 2023
 - **2024 Annual Conference:** 900 registrants (in-person & virtual)
 - **Arroyo:** sent to 10,628 recipients in 2023
 - **County Water Factsheets:** 14 of 15 counties complete
 - **WRRC Website:** 196,323 page views in 2023
- This status connects us to the Transboundary Aquifer Assessment Program



WRRC Annual Conference

Last year: Implementing Water Solutions Through Partnerships

Dialogue, collaboration matter most to Arizona's water future

An annual conference, presented by the university's Water Resources Research Center, brought together a wide-ranging constituency to discuss solutions to the state's water-related problems.

By Brad Poole, University of Arizona Cooperative Extension
March 13, 2024

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Session recordings available!

<https://wrrc.arizona.edu/news-events/2024-conference/wrrc-2024-conference-agenda>



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MAY 20–21
Student Union Memorial Center
The University of Arizona

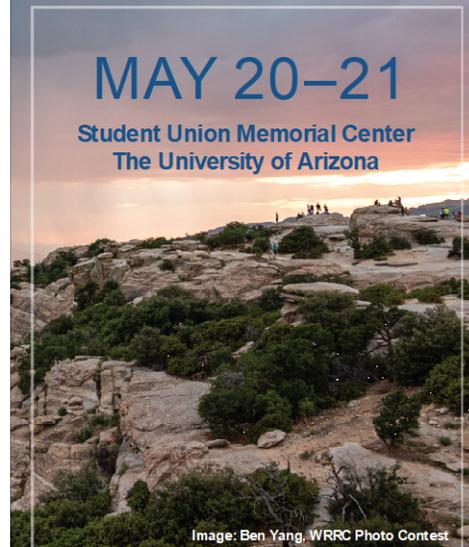


Image: Ben Yang, WRRC Photo Contest

The WRRC 2025 Annual Conference, *Shared Borders, Shared Waters: Working Together in Times of Scarcity*, will be held May 20–21 at the University of Arizona Student Union in Tucson, Arizona. The program will focus on the challenges and successes of collaborations across borders, including waters shared by the United States and Mexico, as well as borders shared with sovereign Tribal Nations, interstate borders, and borders within Arizona. The QR code below will take you to our [conference page](#), where you can access the [agenda](#), registration information, list of 2025 sponsors, and more!

REGISTER TODAY!



wrrc.arizona.edu/conference

Publications and other products

ARROYO

2024



To read the 2024 Arroyo use the QR code or link below: wrrc.arizona.edu/arroyo-2024



SOLUTIONS TO ARIZONA'S WATER CHALLENGES: WHAT CAN WE DO?

Authors: Courtney Lee, Austin Bauer, and Susanna Eden
 Layout: John Polle
 Executive Publisher: Sharon B. Megdal
 Cover Photo: Stephen Cumberworth – Rainfall; Tucson, AZ. WRRCC Photo Contest

INTRODUCTION

Water resources in Arizona are under stress from climate change, a two-decade megadrought, and chronic overuse. These combined influences have led to surface water losses, drying streams and wetlands, and groundwater depletion as pumping exceeds replenishment. Communities are facing the possibility that the water sources they rely on now may shrink in the future, or even vanish. Uncertainty regarding Colorado River water – a large component of Arizona's water portfolio and one that is shared with six other US basin states – also raises questions about Arizona's water future. The quality of available water is a concern as well.

Where supply is limited, lower quality water and wastewater can be valuable resources, but only if they can be treated to suitable standards. **These concerns beg the question: What can be done?**

That very question was the focus of the Water Resources Research Center's 2023 annual conference, "What Can We Do? Solutions to Arizona's Water Challenges." Panelists and presenters highlighted ongoing efforts to address the state's water challenges, as well as new and innovative solutions currently under development. During the conference, several additional themes emerged, such as the need for better, more accessible data, improved technology, and collaboration.



ARIZONA WATER FACTSHEET Cochise County

Get to know water in your county
February 2023

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wrrc.arizona.edu/arizona-water-factsheets

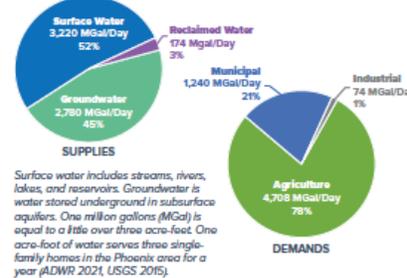
Water in Arizona

Arizona's future depends on sustainable water supplies, which in turn depend on vigilant and innovative management of those supplies. In our varied landscapes, from low deserts to high mountains, counties and communities face different water challenges and take different approaches to addressing those challenges, while conforming with regional, state, and federal requirements. The Arizona Department of Environmental Quality (ADEQ) is responsible for water quality and tasked with enforcing federal environmental standards. The Arizona Department of Water Resources (ADWR) oversees the use of surface water and groundwater, which are legally distinct though physically interconnected. ADWR regulates groundwater more strictly in Active Management Areas (AMAs) than in the rest of the state.

Statewide Context

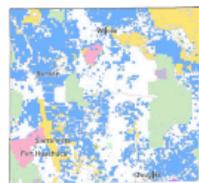


Arizona Water Supply and Demand



Water in Cochise County

From mountain woodlands to desert scrub, Cochise County is home to diverse life zones and biomes. Precipitation varies widely from 11 to 41 inches annually in the county, which supports large areas of farming as well as riparian habitat located near naturally flowing streams and springs. Some perennial streams such as the San Pedro River, which runs north from Mexico, provide refuge for hundreds of species of birds, plants, and animals. Approximately 40% of the county is privately owned, more than twice the average for Arizona of just 18%. State and federal ownership account for most of the remaining land.



Land ownership in Cochise County (Arizona State Land Department 2020).



Agriculture, recharge, and subsidence in Cochise County (ADWR, USDA 2022).

Reflections: Testifying on Reauthorization of the Transboundary Aquifer Assessment Program

Images: Subcommittee on Water, Wildlife and Fisheries legislative hearing, Oct. 25, 2023



by Sharon B. Megdal
10/27/2023

On October 25, 2023, I had the honor of presenting testimony on H.R. 5874 at the U.S. House of Representatives Committee on Natural Resources, Subcommittee on Water, Wildlife and Fisheries. H.R. 5874, introduced by Arizona District 6 Representative Juan Ciscomani, amends the United States-Mexico Transboundary Aquifer Assessment Act by reauthorizing the United States-Mexico transboundary aquifer assessment program. In addition, the bill, co-sponsored by New Mexico District 1 Representative Melanie Stansbury, modifies a restriction on designation of additional transboundary aquifers along the border shared by Arizona and the state of Sonora, Mexico.

The subcommittee heard several bills. First, House subcommittee members, along with the bills' sponsors, had the opportunity to offer remarks. Then each of the invited witnesses had five minutes to comment on one or more of the bills, after which the witnesses were available to answer questions. Prior to the hearing, I submitted written testimony, from which I drew my five minutes of strictly timed oral testimony.

In his remarks at the [subcommittee legislative hearing](#), Representative Ciscomani noted that water security is on the top of Arizonans' minds and underscored the importance of groundwater to communities along the border, many of which are rural and underserved. He highlighted the transboundary aquifer assessment program's role in assisting communities shape their water futures.

Representative Jim Kolbe (1942–2022), who represented Southern Arizona in Congress from 1985 to 2007, was the House sponsor of the bill to establish a transboundary aquifer assessment program. Representative Kolbe invited me to testify in May 2006 on H.R. 469, which was identical to the Senate bill introduced by Senators Jeff Bingaman of New Mexico and Jon Kyl of Arizona. Representative Raúl Grijalva (District 7), who has represented Arizona's border communities since 2003 and serves as House Natural Resources Committee Ranking Member, has likewise advanced the program.

I reflected on my first experience delivering oral testimony to a congressional subcommittee in my early 2007 essay, [Front-Row View of Federal Water Lawmaking Shows Process Works](#). This latest opportunity to offer testimony on the program prompted me to reflect on the value of the program. What follows is the essence of my submitted written H.R. 5874 testimony. I omit the opening and closing remarks of thanks and the screenshot of the bulletin on the Binational Study of the Transboundary San Pedro Aquifer that was appended to my written testimony. It contains a summary of what this program has accomplished and where it is heading. I am proud to have worked on this cooperative binational program since its inception. I hope you'll read on to become familiar with the Transboundary Aquifer Assessment Program and how the partners are working strategically to foster understanding of the characteristics of shared aquifers. I invite you to email me comments and/or questions at smegdal@arizona.edu.



TRANSBOUNDARY AQUIFER ASSESSMENT PROGRAM (TAAP)

Collaboration in Binational Research and
Engagement on Shared Aquifers

Photo: Santa Cruz River

Background

Para la versión en español, [HAZ CLICK AQUI](#)



TRANSBOUNDARY AQUIFER ASSESSMENT PROGRAM (TAAP)

(TAAP-A/S) (Programa de Evaluación de Acuíferos Transfronterizos)

Article

Prioritizing Transboundary Aquifers in the Arizona–Sonora Region: A Multicriteria Approach for Groundwater Assessment

Elia M. Tapia-Villaseñor ^{1,*}, Sharon B. Megdal ^{2,*}  and Eylon Shamir ³ ¹ Departamento de Geología, Universidad de Sonora, Hermosillo 83000, Mexico² Water Resources Research Center, The University of Arizona, Tucson, AZ 85719, USA³ Hydrologic Research Center, San Diego, CA 92127, USA; eshamir@hrcwater.org

* Correspondence: elia.tapia@unison.mx (E.M.T.-V.); smegdal@arizona.edu (S.B.M.)

Abstract: Groundwater is vital to the well-being of over 20 million people in the nearly 2000-mile-long, arid U.S.–Mexico border region, supporting agricultural, industrial, domestic, and environmental needs. However, persistent droughts over the past two decades, coupled with increasing water demand and population growth, have significantly strained water resources, threatening the region’s water security. These challenges highlight the importance of comprehensive transboundary aquifer assessments, such as those conducted through the Transboundary Aquifer Assessment Program (TAAP), a collaborative effort between the U.S. and Mexico to evaluate shared aquifers. The TAAP focuses on four aquifers: the Santa Cruz and the San Pedro in Arizona and Sonora and the Mesilla and the Hueco Bolson in Texas, New Mexico, and Chihuahua. With the need for additional aquifer studies in this arid region, it is important to determine and prioritize which aquifers would benefit most from transboundary assessment. This study aims to prioritize aquifers in the Arizona–Sonora region based on multiple criteria. The results from this study reveal regional disparities in the need for transboundary aquifer studies, with some aquifers highlighted due to their groundwater use for economic activities, while others stand out for their population density and the transboundary nature of the hydrogeologic units. By leveraging publicly available data, this research established a priority ranking for these aquifers to support decision-making processes in identifying and addressing the most critical aquifers for binational assessment, while providing a framework that can be replicated across other shared aquifers between the U.S. and Mexico and elsewhere.

Keywords: transboundary aquifers; assessment; prioritization; United States; Mexico



Academic Editor: Dimitrios E. Alexakis

Received: 31 December 2024

Revised: 25 January 2025

Accepted: 28 January 2025

Published: 5 February 2025

WRRC Water Webinar: Prioritizing Transboundary Aquifers in the Arizona-Sonora Region



When

12:00 to 1:15 pm MST, March 28, 2025

Speaker(s)

Elia Tapia

Professor, Universidad de Sonora

<https://wrrc.arizona.edu/events/wrrc-water-webinar-prioritizing-transboundary-aquifers-arizona-sonora-region>

 [Prioritizing Transboundary Aquifers \(pdf\)](#)

WRRC Water Webinar: Prioritizing Transboundary Aquifers in the Arizona-Sonora Region

Date: Friday, March 28, 2025

Time: 12:00 pm – 1:15 pm Arizona Time

Speaker: Elia Tapia, *Professor, Universidad de Sonora*

Groundwater is essential for millions living along the arid US-Mexico border, yet persistent droughts, increasing demand, and population growth continue to strain these critical resources. This WRRC Water Webinar will explore a multicriteria approach to prioritize transboundary aquifers in the Arizona–Sonora border region, leveraging publicly available data to assess which shared aquifers would benefit most from binational studies. The findings highlight key regional disparities in groundwater needs and provide a replicable framework for improving cross-border aquifer assessments.



Elia M. Tapia (Mexico) is a faculty professor at Universidad de Sonora in Hermosillo, Mexico. She holds a PhD in Arid Lands Resource Sciences and a Minor in Hydrology from the University of Arizona. Her expertise includes applied hydrology, hydrogeology, climate change, and disaster risk assessment. She has contributed to the US-Mexico Transboundary Aquifer Assessment Program (TAAP) and projects for private and public institutions across the US, Latin America, and the Caribbean. Tapia has also worked with the Inter-American Development Bank (IDB) on transboundary water initiatives, focusing on governance, stakeholder engagement, and climate resilience in water resources.

The WRRC uses Zoom to host its webinars and attendees can ask questions via the Zoom chat function. To request an alternate format of this webinar for disability-related access, please contact us at wrrc@arizona.edu.

Thank you!

smegdal@arizona.edu

University of Sonora MX

USIBWC Southeast Arizona Citizens Forum Public Meeting

Prioritizing Transboundary Aquifers in the Arizona-Sonora Region

Elia M. Tapia-Villaseñor, Sharon B. Megdal, and Eylon Shamir

April 15, 2025

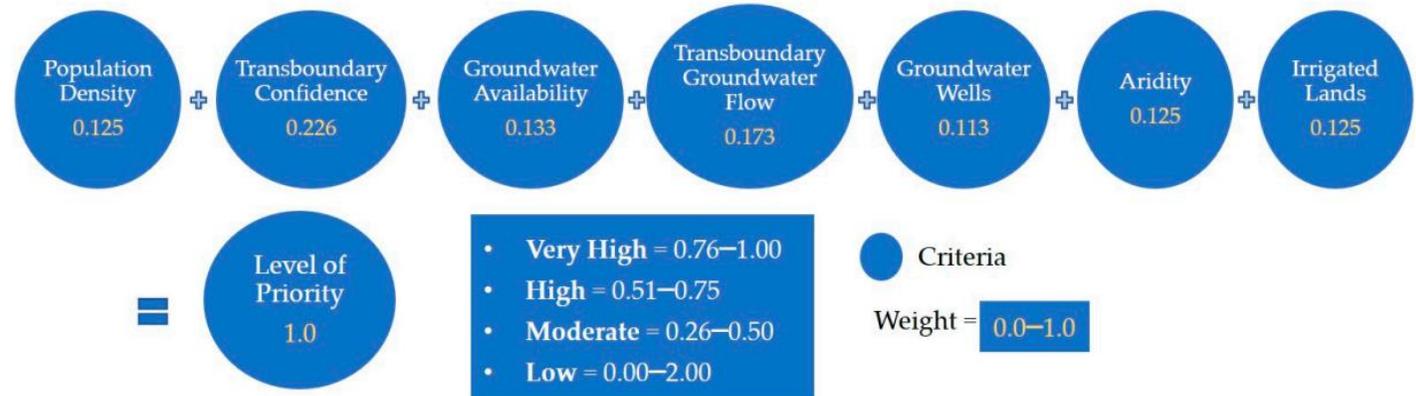
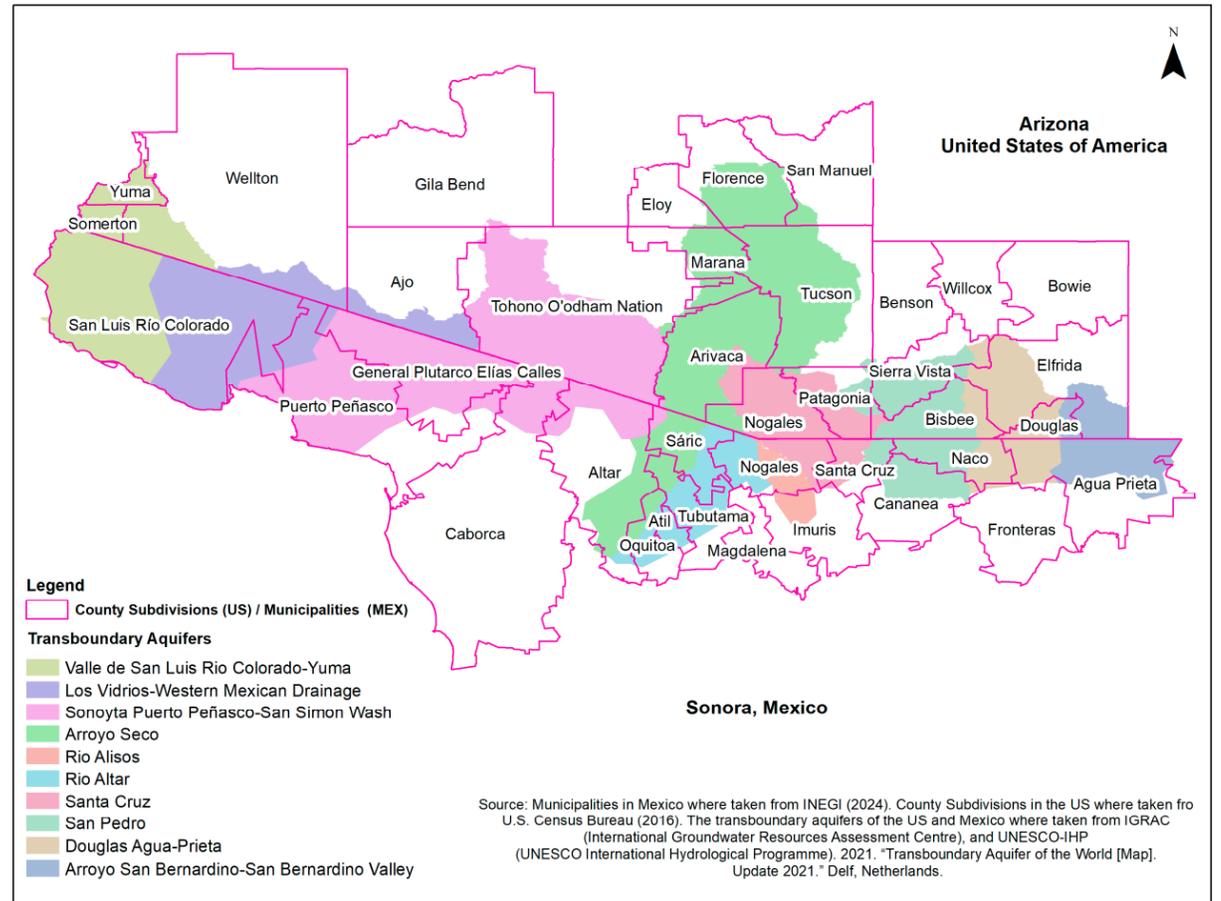


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RESEARCH CENTER**



Introduction

- This study uses a multicriteria analysis (MCA) approach for transboundary aquifer prioritization.
- MCA techniques are widely recognized for their effectiveness in supporting water-related decision-making processes.
- Help decision-makers assign relative importance (weights) to multiple criteria and are particularly suitable for integrating diverse factors.
- Offers an advantage over single-criterion methods, hydrological models, or cost-benefit analysis by accounting for multiple interacting dimensions.



Data Sources and Criterion Selection

Criteria were chosen based on data availability, reliability, and applicability to other aquifers.

Population Density

- Indicates water demand and potential pressure on aquifer resources.
- Data sources: U.S. Census Bureau (2020), INEGI (2020); analyzed using GIS.

Transboundary Groundwater Flow

- Estimates horizontal groundwater flow across the international boundary, highlighting shared dependency.
- Based on CONAGUA's water availability reports (NOM-011-CONAGUA-2015); results expressed in MCM per year.

Irrigated lands

- Measures areas irrigated by groundwater, directly reflecting water demand.
- Data sourced from FAO and World Bank global maps of irrigated areas; expressed in hectares.

Transboundary Confidence

- Categorizes aquifers based on the certainty of cross-border connectivity: reasonable, some, or limited.
- Framework established by Sanchez et al. (2016); higher confidence indicates higher priority.

Number of Wells

- Counts registered wells as a proxy for extraction pressure.
- Data sources: Arizona Department of Water Resources GIS Portal (U.S.) and Public Registry of Water Rights (CONAGUA, Mexico).
- A higher number of wells suggests greater extraction and higher aquifer priority.

Groundwater Availability

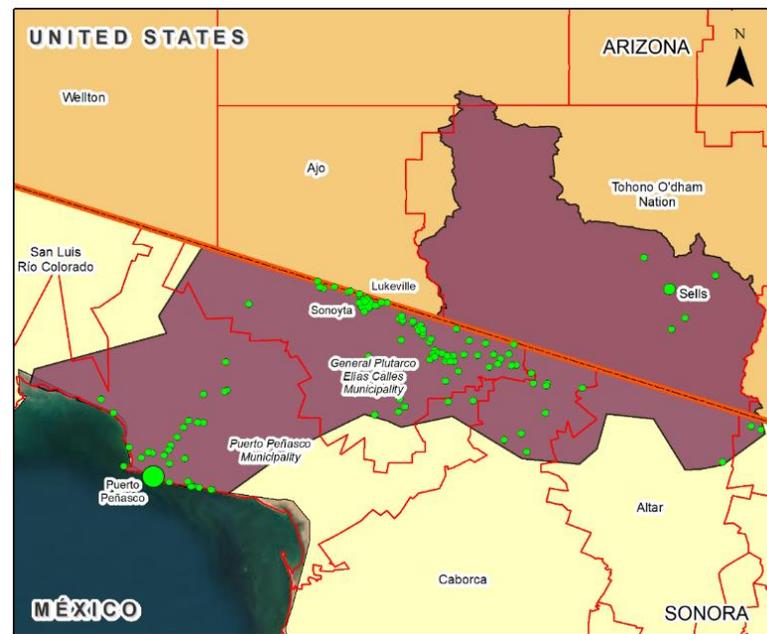
- Measures balance between recharge and groundwater extraction.
- Calculated using CONAGUA methodology (NOM-011-CONAGUA-2015); results in Million Cubic Meters (MCM) per year.
- Positive availability suggests sustainability; negative indicates stress or overexploitation.

Aridity

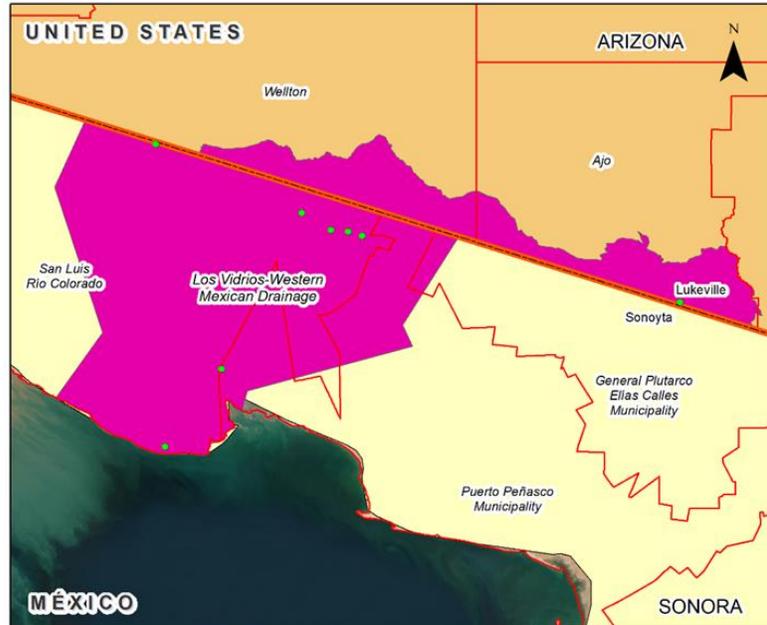
- Developed an Aridity Index (AI) indicating climatic stress, using the ratio of precipitation to potential evapotranspiration and barren land cover changes.
- Lower AI indicates higher aridity; calculated from TerraClimate dataset.



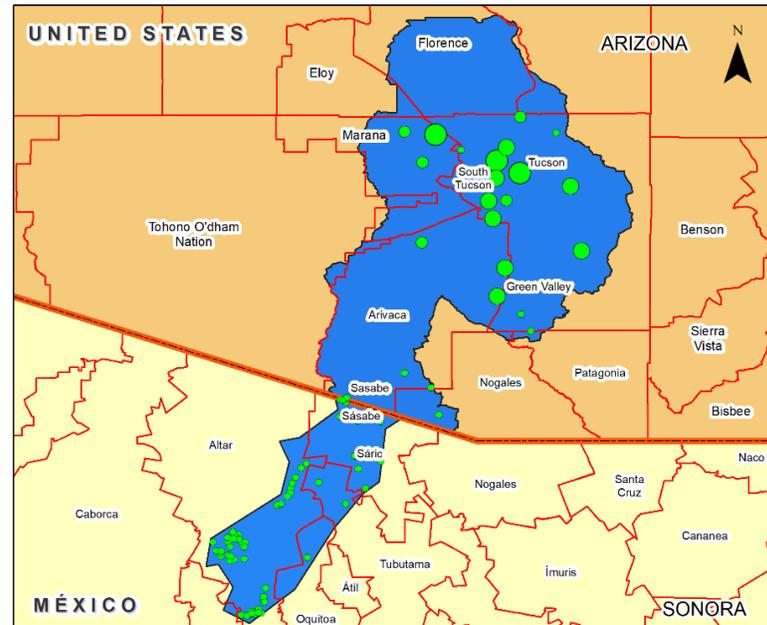
Valle de San Luis Río Colorado – Yuma Aquifer.



Sonoyta Puerto Peñasco-San Simon Wash Aquifer.

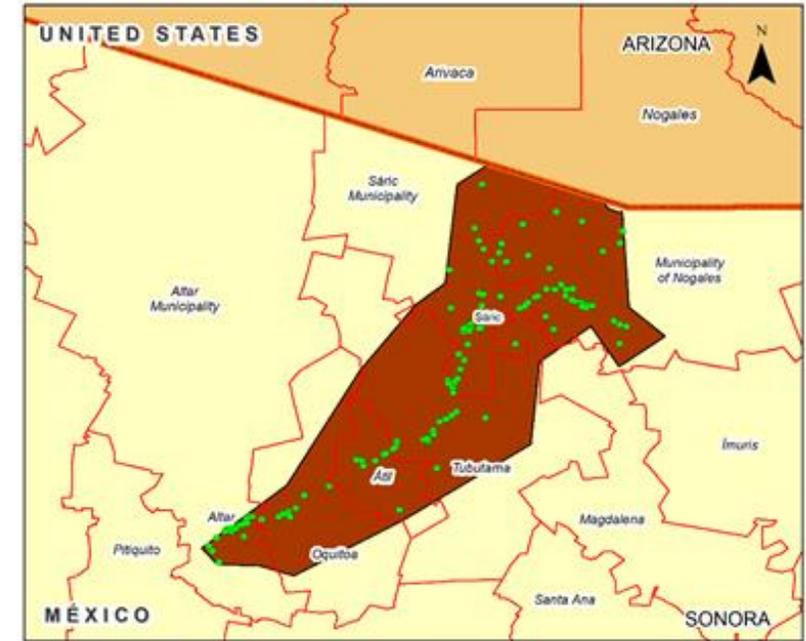


Los Vidrios-Western Mexican Drainage Aquifer

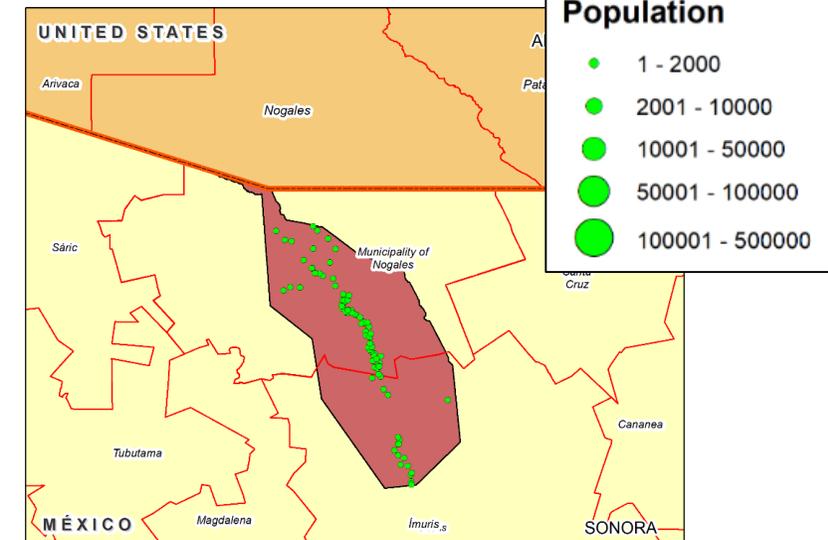


Arroyo Seco Aquifer

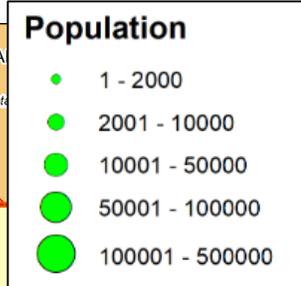
Population Density



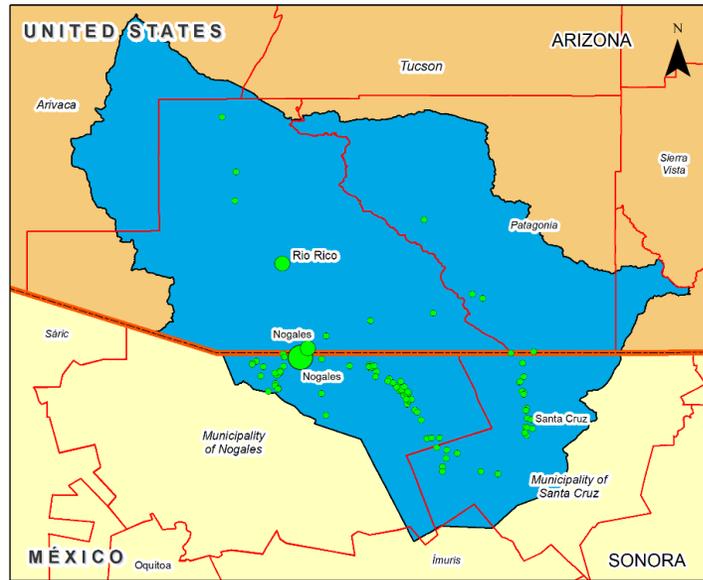
Río Altar Aquifer



Río Alisos Aquifer



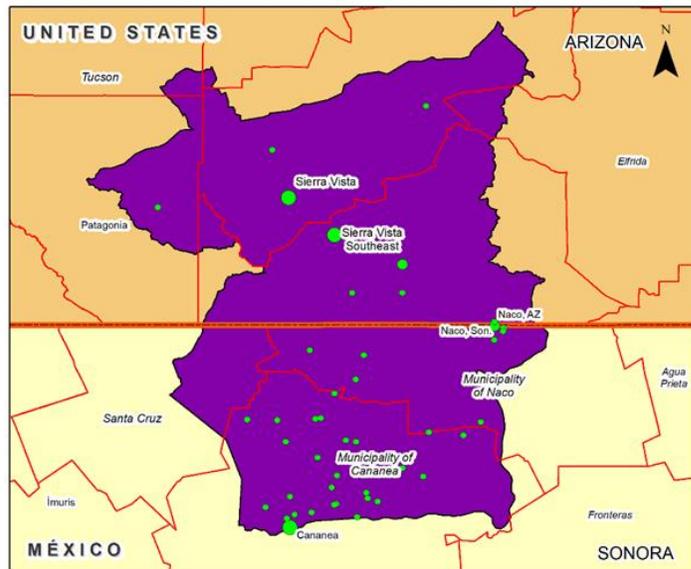
Population Density



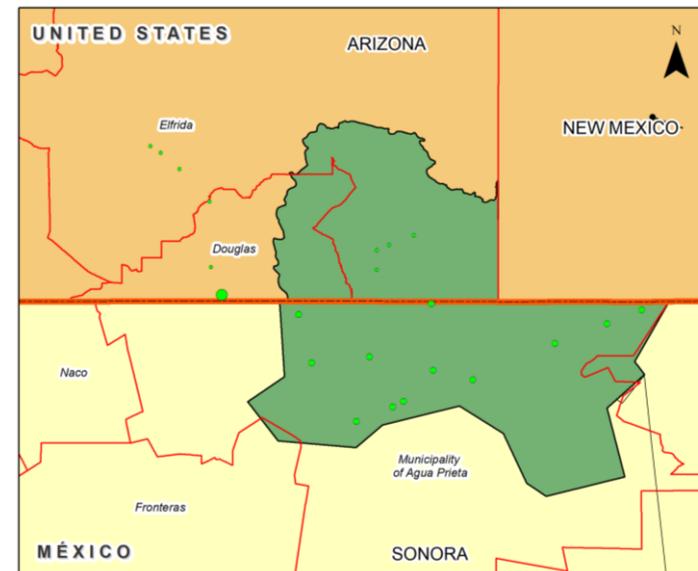
Santa Cruz Aquifer



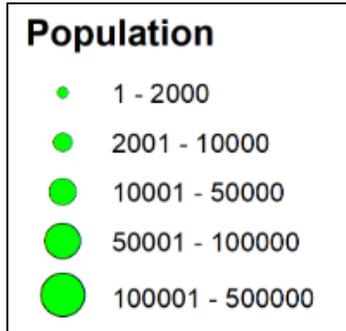
Douglas-Agua Prieta Aquifer.



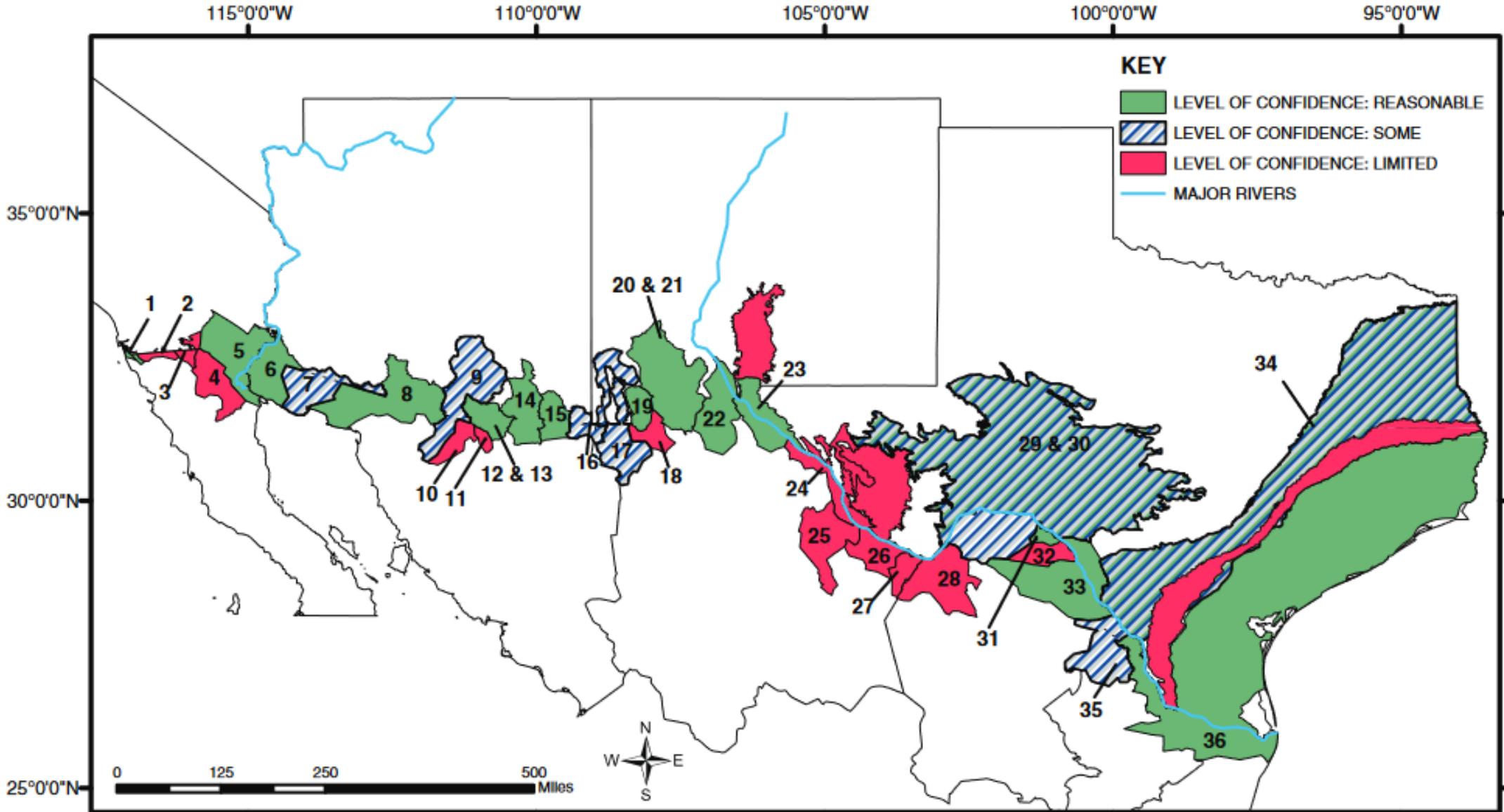
San Pedro Aquifer



Arroyo San Bernardino-San Bernardino Valley Aquifer.



Transboundary Confidence



Transboundary Groundwater Flow



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA ANUAL DE
AGUA EN EL ACUÍFERO NOGALES (2650), ESTADO DE SONORA

CIUDAD DE MÉXICO, 2024



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA ANUAL DE
AGUA EN EL ACUÍFERO RÍO SANTA CRUZ (2615), ESTADO DE
SONORA

CIUDAD DE MÉXICO, 2024



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA ANUAL DE
AGUA EN EL ACUÍFERO VALLE DE SAN LUIS RÍO COLORADO
(2601), ESTADO DE SONORA

CIUDAD DE MÉXICO, 2024



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA ANUAL DE
AGUA EN EL ACUÍFERO LOS VIDRIOS (2602), ESTADO DE
SONORA

CIUDAD DE MÉXICO, 2024



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA
ANUAL DE AGUA EN EL ACUÍFERO RÍO ALTAR (2608),
ESTADO DE SONORA

CIUDAD DE MÉXICO, 2024



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA ANUAL DE
AGUA EN EL ACUÍFERO RÍO SAN PEDRO (2616), ESTADO DE
SONORA

CIUDAD DE MÉXICO, 2024



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA ANUAL DE
AGUA EN EL ACUÍFERO SONOYTA-PUERTO PEÑASCO (2603),
ESTADO DE SONORA

CIUDAD DE MÉXICO, 2024



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA ANUAL DE
AGUA EN EL ACUÍFERO RÍO AGUA PRIETA (2629), ESTADO DE
SONORA

CIUDAD DE MÉXICO, 2024



SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA
ANUAL DE AGUA EN EL ACUÍFERO ARROYO SECO
(2607), ESTADO DE SONORA

CIUDAD DE MÉXICO, 2024

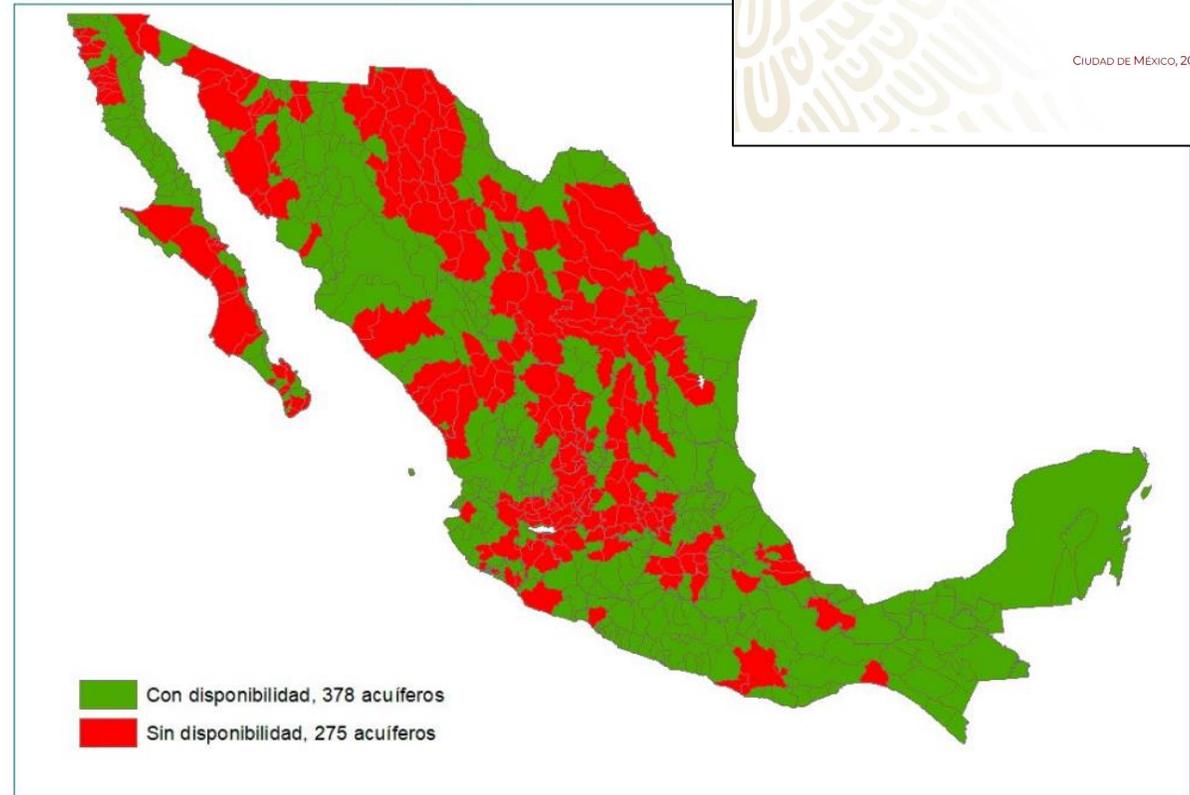
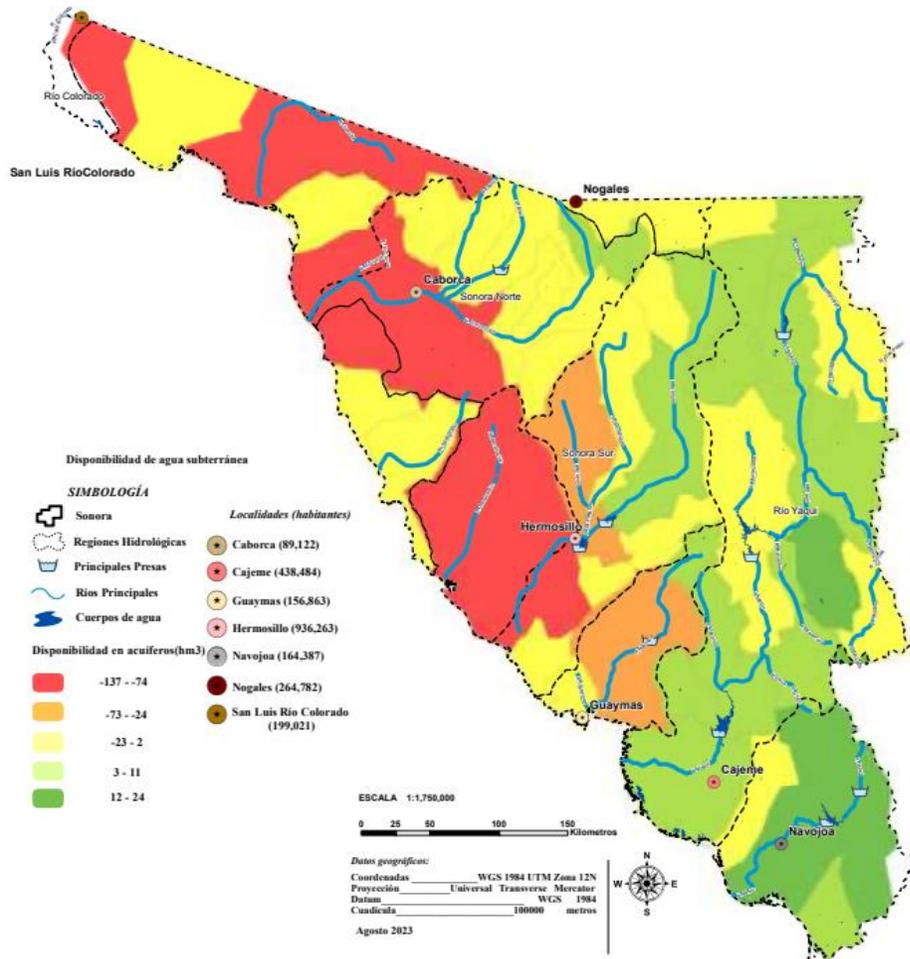


SUBDIRECCIÓN GENERAL TÉCNICA
GERENCIA DE AGUAS SUBTERRÁNEAS

ACTUALIZACIÓN DE LA DISPONIBILIDAD MEDIA ANUAL DE
AGUA EN EL ACUÍFERO ARROYO SAN BERNARDINO (2630),
ESTADO DE SONORA

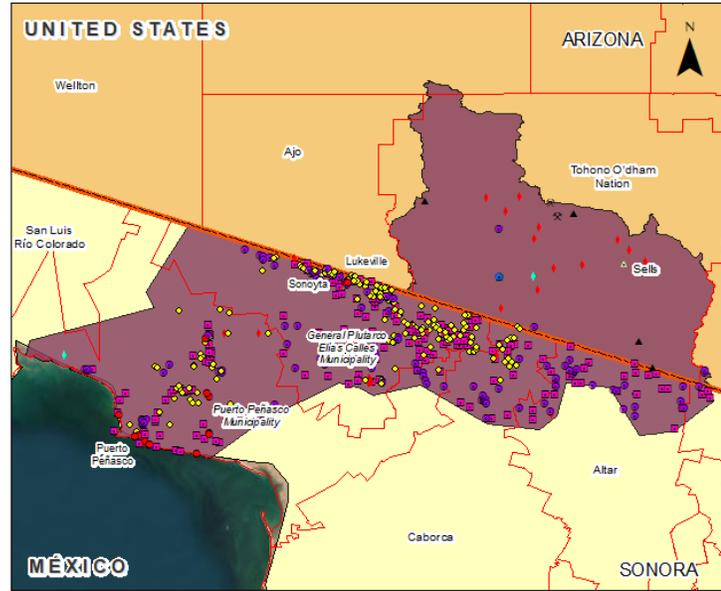
CIUDAD DE MÉXICO, 2024

Groundwater Availability

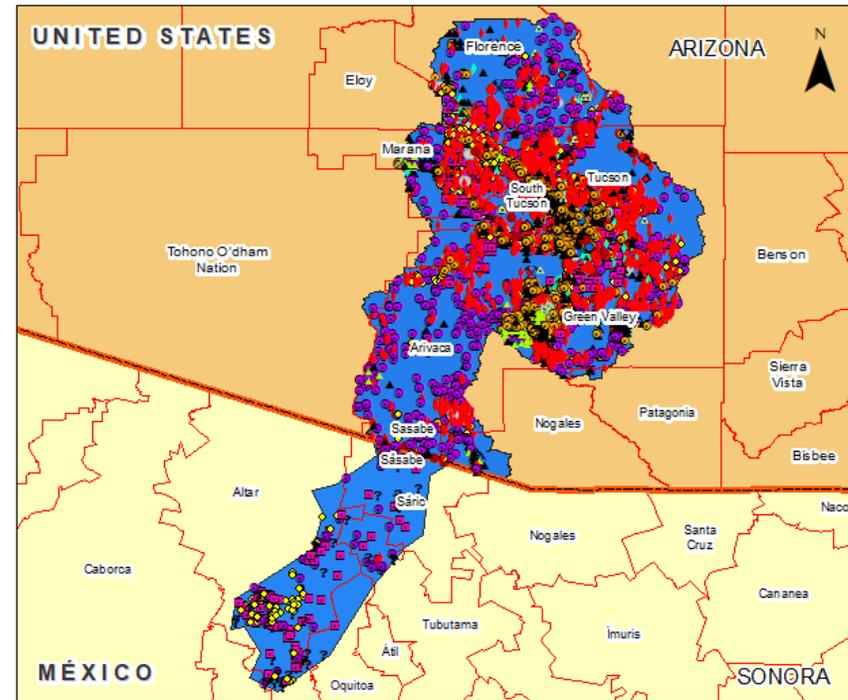


Fuente: CONAGUA (2023c).

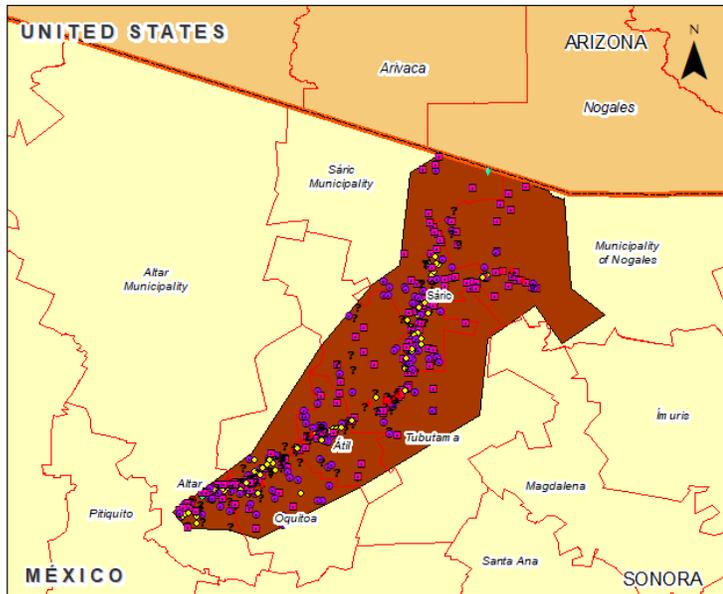
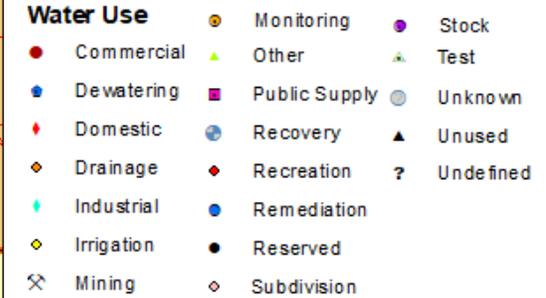
Groundwater wells



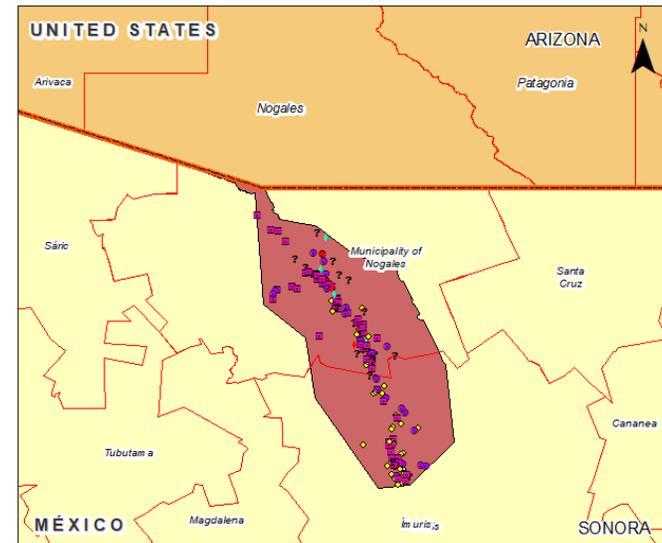
Sonoyta Puerto Peñasco-San Simon Wash Aquifer



Arroyo Seco Aquifer



Río Altar Aquifer



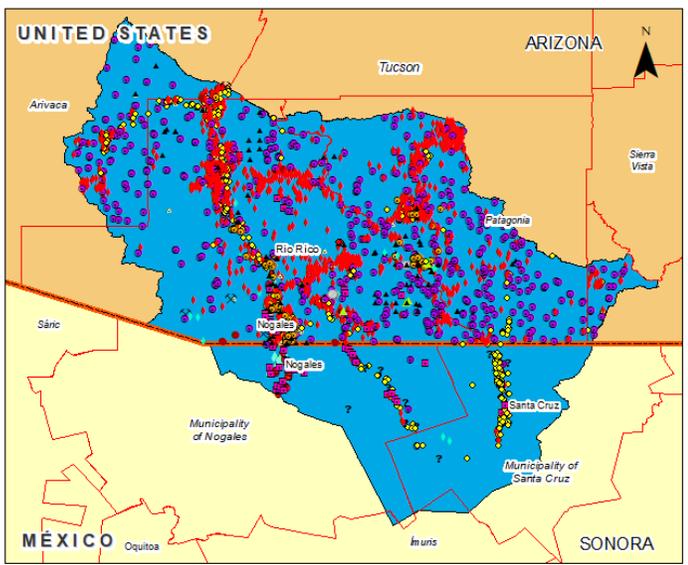
Río Alisos Aquifer



Groundwater wells

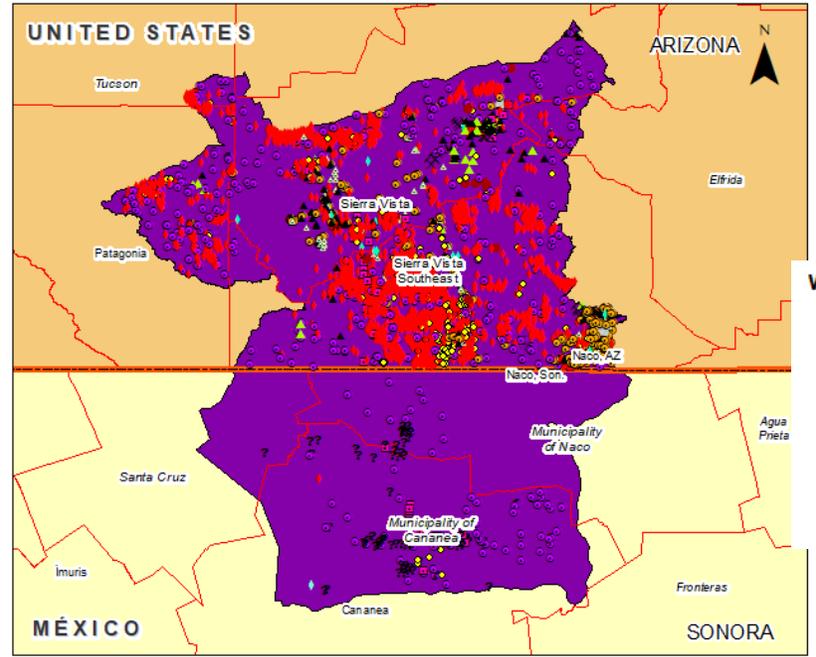
Santa Cruz Aquifer.

- Water Use**
- Commercial
 - Dewatering
 - Domestic
 - ◆ Drainage
 - ◆ Industrial
 - ◆ Irrigation
 - ⊗ Mining
 - Monitoring
 - ▲ Other
 - Public Supply
 - ◆ Recreation
 - Remediation
 - Services
 - Stock
 - ▲ Test
 - Unknown
 - ? Undetermined
 - ▲ Unused



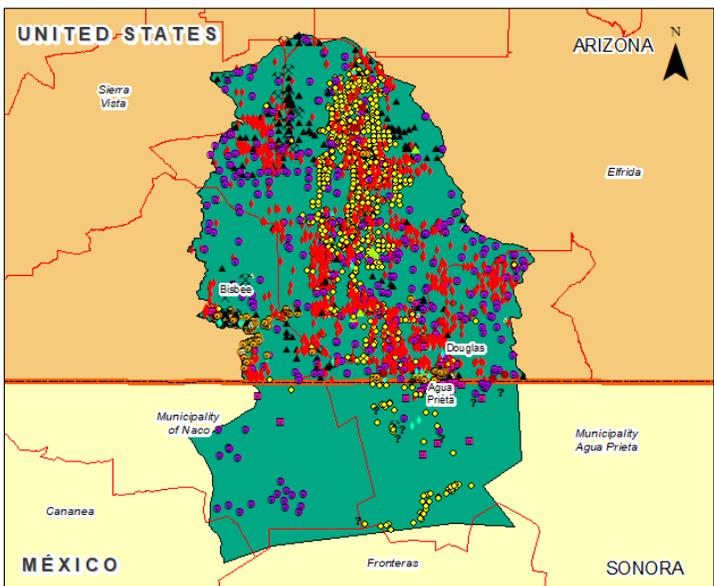
San Pedro Aquifer

- Water Use**
- Commercial
 - ◆ Domestic
 - ◆ Industrial
 - ◆ Irrigation
 - ⊗ Mining
 - Monitoring
 - ▲ Other
 - Public Supply
 - ◆ Recreation
 - Stock
 - ◇ Subdivision
 - ▲ Test
 - Unknown
 - ▲ Unused
 - ? Undetermined



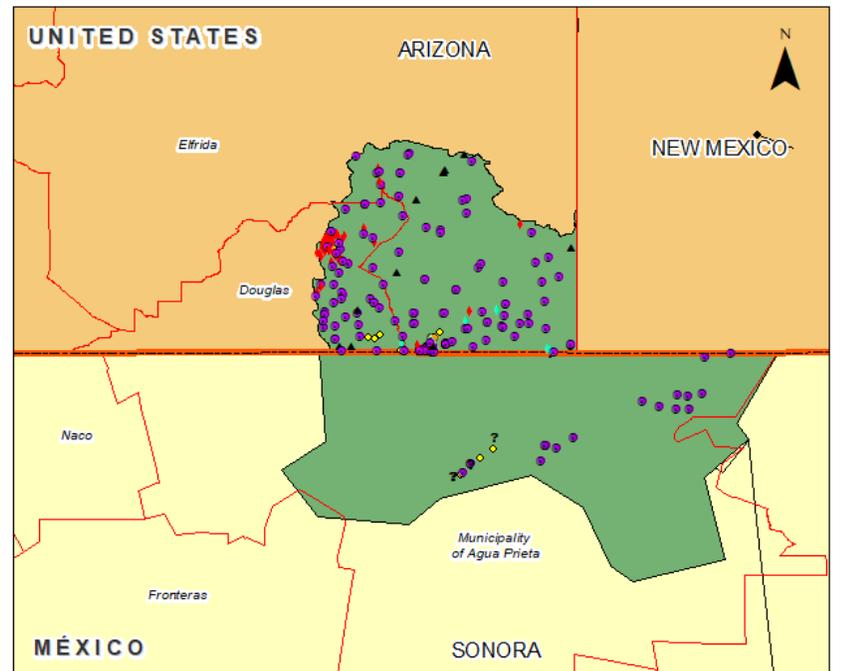
Douglas-Agua Prieta

- Water Use**
- Commercial
 - Dewatering
 - ◆ Domestic
 - ◆ Industrial
 - ◆ Irrigation
 - ⊗ Mining
 - Monitoring
 - ▲ Other
 - Public Supply
 - Remediation
 - Stock
 - ▲ Test
 - ▲ Unused



Arroyo San Bernardino-San Bernardino Valley Aquifer

- Water Use**
- ◆ Domestic
 - ◆ Industrial
 - ◆ Irrigation
 - Monitoring
 - Stock
 - ▲ Test
 - ▲ Unused
 - ? Undetermined



Aridity

Basin area average aridity index and the relative change

| | | 1978-2000 | 2001-2023 | Change | Rank |
|----|---|-----------|-----------|--------|------|
| 1 | Valle de San Luis Rio Colorado-Yuma | 0.042 | 0.031 | -26.6% | 1 |
| 2 | Los Vidrios-Western Mexican Drainage | 0.062 | 0.046 | -24.9% | 2 |
| 3 | Sonoyta Puerto Penasco-San Simon Wash | 0.14 | 0.11 | -19.2% | 3 |
| 4 | Arroyo Seco | 0.23 | 0.19 | -17% | 4 |
| 5 | Rio Altar | 0.24 | 0.21 | -12.5% | 8 |
| 6 | Rio Alisos | 0.33 | 0.29 | -12.7% | 7 |
| 7 | Santa Cruz | 0.31 | 0.27 | -14.3% | 5 |
| 8 | San Pedro | 0.28 | 0.24 | -13.6% | 6 |
| 9 | Douglas Aqua-Prieta | 0.23 | 0.2 | -12.5% | 9 |
| 10 | Arroyo San Bernardino-San Bernardino Valley | 0.23 | 0.2 | -12.1% | 10 |

Irrigated Lands



Figure 4: Loss or gain of shrubland by comparing 2015 and 2010 NAEA 30m land cover maps for the SCR-BMX. The analysis is available from:

<https://storymaps.arcgis.com/collections/c6ec1f9a8199450283557e21eef481b1?item=1>

Table 1: Irrigation demand for the various estimated cultivated areas

| Source | Ag Area (km ²) | Irrigation demand ¹ (MCM/Yr) | Corrected Irrigation Demand ² (MCM/Yr) |
|-----------------|----------------------------|---|---|
| CONAGUA (2020) | 8.3 | 4.9 | 11.5 |
| INEGI | 15.7 | 9.3 | 21.8 |
| LANDSAT 8 | 17 | 10.0 | 23.6 |
| GoogleEarth | 14.4 | 8.5 | 20.0 |
| NAEA 30m (2010) | 21.43 | 12.6 | 29.8 |
| NAEA 30m (2015) | 21.77 | 12.8 | 30.3 |
| ADWR (1997) | 13.3 | - | - |
| Corallo (1964) | 9.3 | - | - |
| Anderson (1955) | 9.9 | - | - |

¹Calculated as the difference between the estimated consumptive use and the average annual

²Calculated as #1 but considering effective rainfall is 37% of annual rainfall and irrigation efficiency of 60%.

Analyzed Criteria

| Aquifer Name | Aquifer Area (km ²) | Population | Population Density (Person/km ²) | Transboundary Confidence | Groundwater Availability (MCM */Year) | Transboundary Groundwater Flow (MCM/year) | No. of Groundwater Wells | Aridity Index (% Change) | Irrigated Lands (Hectares) |
|---------------------------------------|---------------------------------|------------|--|--------------------------|---------------------------------------|---|--------------------------------------|--------------------------|----------------------------|
| Los Vidrios–Western Mexican Drainage | 7189.21 | 53 | 0.01 | Some | 0.00 | 4 | MX: 1 U.S.: 33 Total: 34 | –24.9 | 374 |
| Sonoyta–Puerto Peñasco–San Simon Wash | 14,731 | 79,339 | 5.4 | Reasonable | –83.72 | 9 | MX: 525 U.S.: 27 Total: 552 | –19.2 | 5495 |
| Río Altar | 2794 | 11,188 | 4.0 | Limited | 0.00 | 7.3 | MX: 558 U.S.: 0 Total: 558 | –12.5 | 9146 |
| Río Alisos | 890 | 3264 | 3.7 | Limited | 0.00 | 0 | MX:173 U.S.: 0 Total: 173 | –12.7 | 2196 |
| Santa Cruz | 3891 | 306,989 | 78.9 | Reasonable | 0.00 | 2 | MX: 297 U.S.: 3855 Total: 4152 | –14.3 | 2965 |
| San Pedro | 4469 | 115,749 | 25.9 | Reasonable | –6.71 | 10.8 | MX: 177 U.S.: 5883 Total: 6060 | –13.6 | 1054 |
| Douglas–Agua Prieta | 3780 | 116,019 | 30.7 | Reasonable | –0.05 | 2.6 | MX: 127 U.S.: 4009 Total: 4136 | –12.5 | 5035 |
| Arroyo San Bernardino | 2658.08 | 108 | 0.04 | Some | 0.00 | 8.4 | MX: 25 U.S.: 249 Total: 274 | –12.1 | 364 |

Note: * MCM: Millions of cubic meters.

Table 2. Weight of each criterion for transboundary aquifer prioritization.

| Criteria | Weight of Criteria | Alternative | Weight of Alternative | Unit of Alternative |
|--------------------------------|--------------------|-----------------|-----------------------|--------------------------------------|
| Population density | 0.125 | ■ 0–20 | ■ 0.096 | Persons per square kilometer |
| | | ■ 20–40 | ■ 0.161 | |
| | | ■ 40–60 | ■ 0.277 | |
| | | ■ 60–80 | ■ 0.466 | |
| Transboundary confidence | 0.226 | ■ Limited | ■ 0.164 | NA |
| | | ■ Some | ■ 0.297 | |
| | | ■ Reasonable | ■ 0.539 | |
| Groundwater availability | 0.113 | ■ –25–0 | ■ 0.096 | Millions of cubic meters (MCM/year) |
| | | ■ –50––25 | ■ 0.161 | |
| | | ■ –75––50 | ■ 0.277 | |
| | | ■ –100––75 | ■ 0.466 | |
| Transboundary groundwater flow | 0.173 | ■ 0–40 | ■ 0.096 | Millions of cubic meters (MCM/year) |
| | | ■ 40–80 | ■ 0.161 | |
| | | ■ 80–120 | ■ 0.277 | |
| | | ■ 120–160 | ■ 0.466 | |
| Groundwater wells | 0.113 | ■ 0–100 | ■ 0.096 | Number of wells |
| | | ■ 100–1000 | ■ 0.161 | |
| | | ■ 1000–10,000 | ■ 0.277 | |
| | | ■ 10,000–22,000 | ■ 0.466 | |
| Aridity | 0.125 | ■ –12––16 | ■ 0.096 | Relative change in aridity index (%) |
| | | ■ –16––20 | ■ 0.161 | |
| | | ■ –20––24 | ■ 0.277 | |
| | | ■ –24––26 | ■ 0.466 | |
| Irrigated lands | 0.125 | ■ 0–3000 | ■ 0.096 | Hectares |
| | | ■ 3000–6000 | ■ 0.161 | |
| | | ■ 6000–9000 | ■ 0.277 | |
| | | ■ 9000–13,000 | ■ 0.466 | |

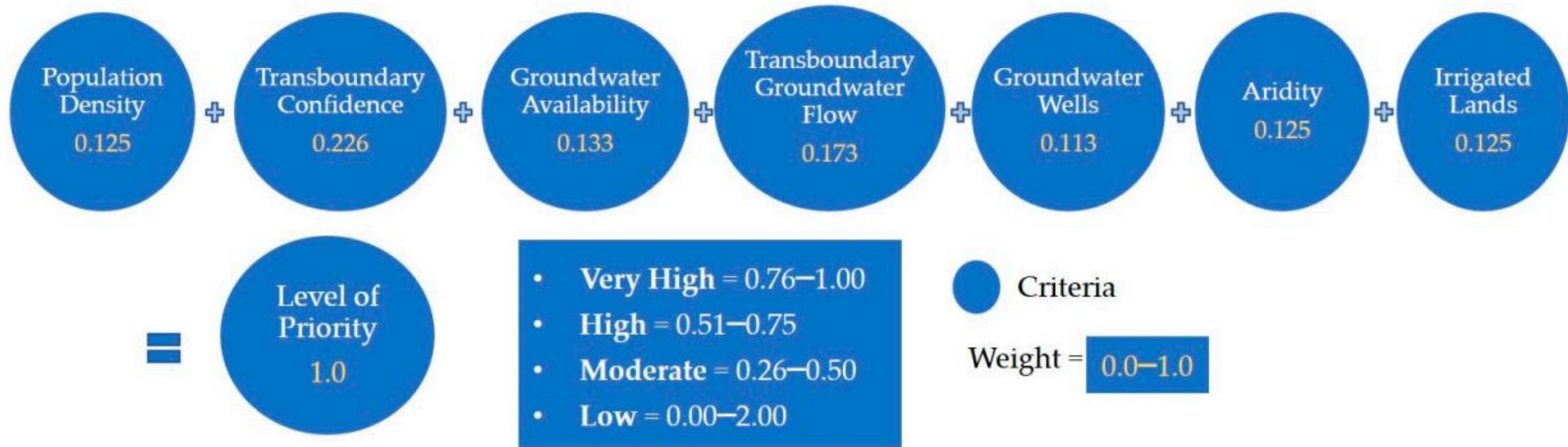


Figure 2. Transboundary aquifer prioritization process.

Table 3. AHP scores and level of priority.

| Aquifer Name | Population Density | Transboundary Confidence | Groundwater Availability | Transboundary Groundwater Flow | No. of Ground-water Wells | Aridity Index | Irrigated Lands | AHP Score | Level of Priority |
|---|--------------------|--------------------------|--------------------------|--------------------------------|---------------------------|---------------|-----------------|-----------|-------------------|
| Sonoyta–Puerto Peñasco–San Simon Wash System | 0.096 | 0.539 | 0.466 | 0.161 | 0.161 | 0.161 | 0.161 | 0.564 | 1 |
| Santa Cruz Aquifer | 0.477 | 0.539 | 0.096 | 0.096 | 0.277 | 0.096 | 0.096 | 0.546 | 2 |
| San Pedro Aquifer | 0.161 | 0.539 | 0.096 | 0.277 | 0.277 | 0.096 | 0.096 | 0.529 | 3 |
| Douglas–Agua Prieta Aquifer | 0.161 | 0.539 | 0.096 | 0.096 | 0.277 | 0.096 | 0.161 | 0.481 | 4 |
| Los Vidrios–Western Mexican Drainage | 0.096 | 0.297 | 0.096 | 0.096 | 0.096 | 0.466 | 0.096 | 0.388 | 5 |
| Río Altar | 0.096 | 0.164 | 0.096 | 0.161 | 0.161 | 0.096 | 0.466 | 0.364 | 6 |
| Arroyo San Bernardino–San Bernardino Valley Aquifer | 0.096 | 0.297 | 0.096 | 0.161 | 0.161 | 0.096 | 0.096 | 0.331 | 7 |
| Río Alisos Aquifer | 0.096 | 0.164 | 0.096 | 0.096 | 0.161 | 0.096 | 0.096 | 0.245 | 8 |

Aquifer Prioritization Results

Highest Priority: Sonoyta–Puerto Peñasco–San Simon Wash System

- Reasonable transboundary confidence
- Groundwater deficit: -83.72 MCM/year
- Wells: 525,
- Irrigated land: 5495 hectares
- Aridity index: -19.2%

Current TAAP Aquifers: Santa Cruz & San Pedro

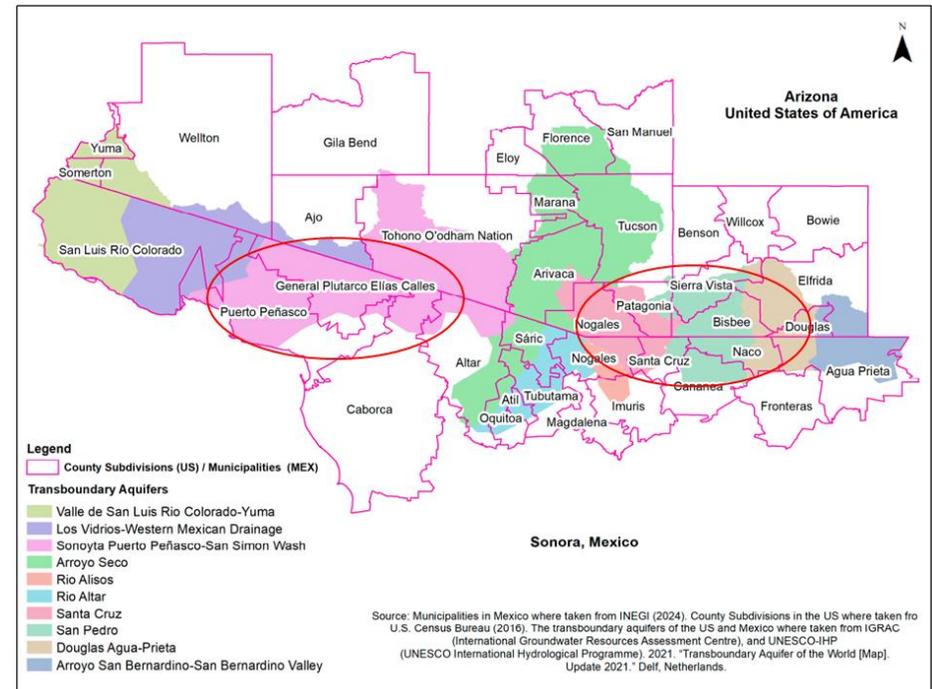
- Groundwater availability: 0.0 & -6.17 MCM/year
- Moderate deficits, slightly lower priority

Next Priority: Douglas–Agua Prieta Aquifer

- Groundwater deficit: -0.05 MCM/year
- Wells: 4136, Irrigated land: 5035 hectares
- Aridity index: -12.5%

Lower Priority Aquifers: Los Vidrios–Western Mexican Drainage, Río Altar, Arroyo San Bernardino–San Bernardino Valley, Río Alisos

- Moderate-to-low priority, lower immediate need



Discussion

- **Multicriteria Analysis (MCA) Application:**

- Can be used in water-resource decision-making.
- Criteria tailored to specific regional objectives (Illinois: water quality; California: integrated criteria).

- **Criteria Selection & Limitations:**

- Water quality excluded due to inconsistent binational data.
- Governance and hydro-political factors excluded due to quantification challenges.
- Lack of consistent groundwater-level data limited assessment accuracy.
- Highlights need for binational standardized monitoring.

- **Future Recommendations:**

- Stakeholder engagement for complementary insights.
- Methodology replicable, adaptable, robust for future assessments.
- Data sets support informed management and responsible aquifer use.

- **Data Gaps**

- Data gaps and inconsistent monitoring across the border limited some criteria.
- Despite limitations, binationally available data revealed key stressors on groundwater availability.



Thank you!

Aquifer Prioritization Paper:

<https://wrrc.arizona.edu/news/transboundary-assessment-framework-published-mdpi-water-journal>

TAAP Webpage:

<https://wrrc.arizona.edu/programs/taap-transboundary-aquifer-assessment-program>

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