

WRRC
WATER RESOURCES RESEARCH CENTER



THE UNIVERSITY OF ARIZONA

College of Agriculture
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Cooperative Extension

Water security of the groundwater-dependent Santa Cruz Active Management Area Arizona, USA

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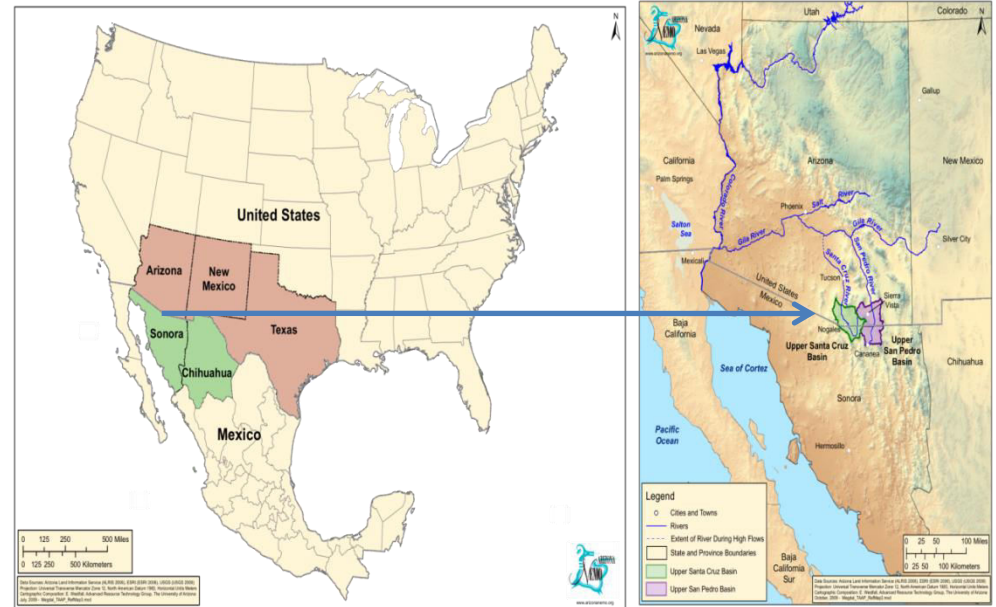
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Water management and water security

- Groundwater dependence in the border region known as Ambos Nogales
- Santa Cruz River flows depend on precipitation events and, in some portions, effluent flows
- Different water management regimes on the two sides of the border and lack of a binational water management framework, though good cooperation through the International Boundary and Water Commission.
- Within the region, there are shallow groundwater basins, where recharge and water in storage are highly dependent on changing precipitation patterns and pumping regimes
- Binational effluent collection, outflows, and recharge are of importance but beyond the scope of this presentation

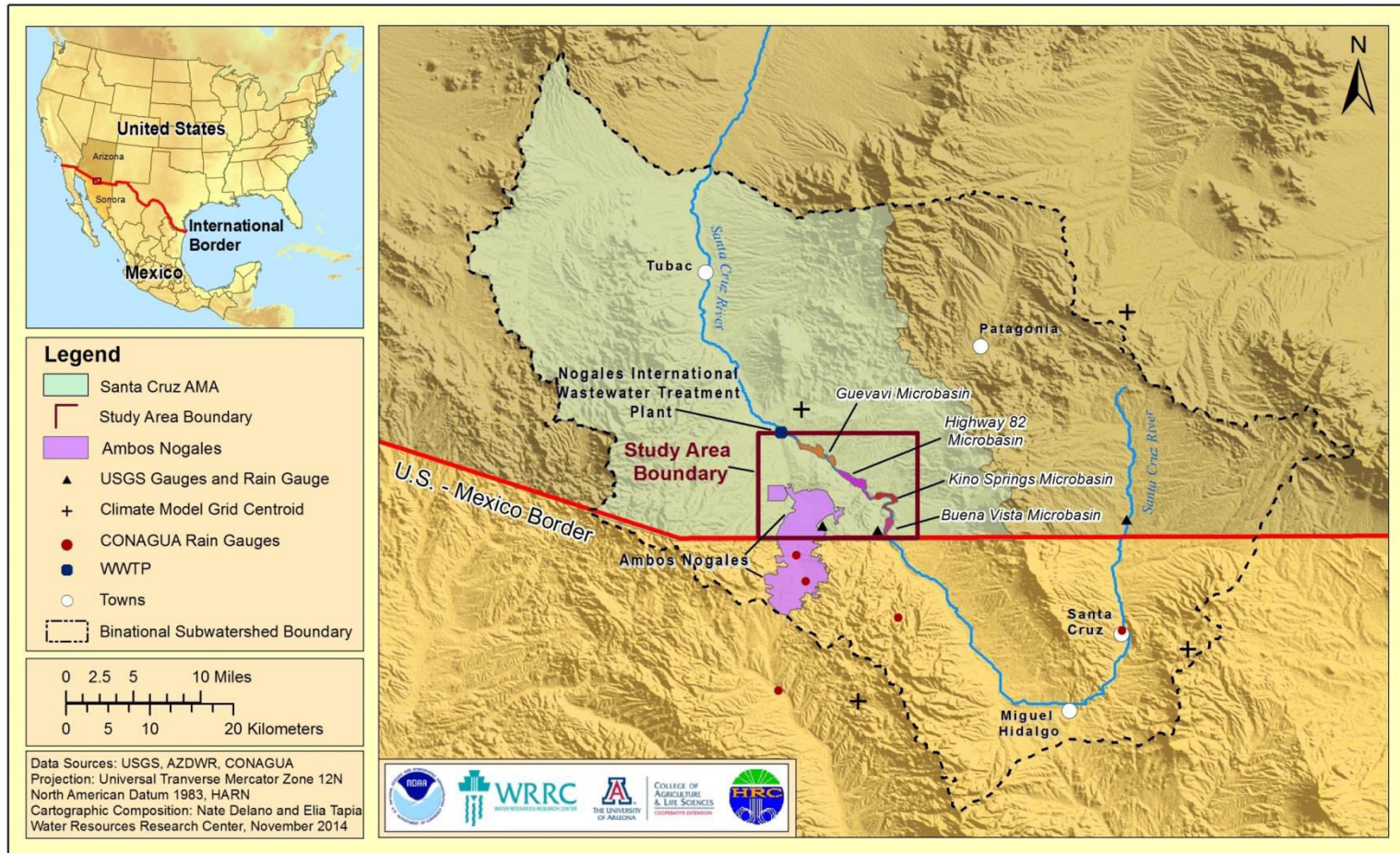
Two projects in this US-MX border region

- Transboundary aquifer assessment study (**TAAP**)
 - Federal-university partnership
 - US State of Arizona and Mexican State of Sonora
 - Santa Cruz aquifer is one of the two aquifers for which binational reports are in final stages of preparation
- Project funded by U.S. National Oceanic and Atmospheric Administration (NOAA), Groundwater, Climate and Stakeholder Engagement (**GCASE**)

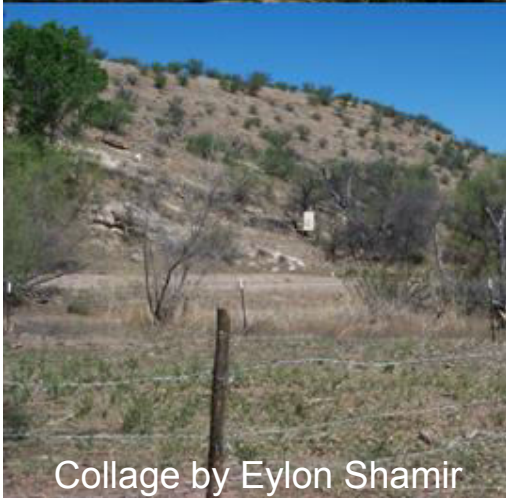


TAAP Study Area

GCASE study area within Santa Cruz Active Management Area



http://en.wikipedia.org/wiki/Nogales,_Arizona#/media/File:Mexican-American_border_at_Nogales.jpg



Collage by Eylon Shamir

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Groundwater, Climate, and Stakeholder Engagement (GCASE) Project Goals

1. Develop water resources decision support modeling framework that addresses future climate uncertainties
2. Increase stakeholders' capacity to adapt water planning and management to future climate uncertainties
 - The requirement for 100-year Assured Water Supply
3. Establish transferability of the modeling approach and stakeholder engagement

Project Team

- Partner PI: Eylon Shamir, Hydrologic Research Center
- UA Interdisciplinary Co-Pis: Dr. Susanna Eden, Dr. Karletta Chief; Dr. Chris Castro
- Small, engaged Project Advisory Committee
- Graduate students, post-doc, stakeholders

GCASE Project Approach

STAKEHOLDER
ENGAGEMENT



MODELING FRAMEWORK

Hourly Rainfall Generator



Daily Streamflow Model



Groundwater Storage Changes



Assessment of Management
Scenarios



PROJECTIONS OF
FUTURE CLIMATE

Future climate scenarios
from output of
dynamically downscaled
climate models



- Case study – Santa Cruz AMA
- Transferability Workshops
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 - Prescott AMA
 - Phoenix Region
 - Tucson Region
 - San Pedro River Basin
 - Mexico

GCASE Case Study Conclusions

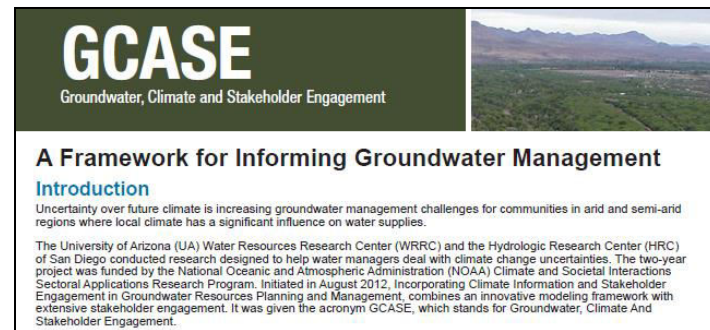
- Climate projections indicate greater uncertainty for water management
- For any given pumping rate and threshold, future water supply reliability decreases, deficits increase, and recharge decreases under projected future climate conditions.
- Some water management strategies provide better reliability, lower deficits, and greater recharge than others
- Potential for transferability of modeling approach to other areas

Concluding Remarks

- Additional work is being done on groundwater scenarios on the US side of the border in collaboration with the Arizona Department of Water Resources
- Groundwater management in the U.S. is under the jurisdiction of the U.S. states, so any approach to binational management requires federal and state cooperation
- Potential for the GCASE approach to be applied in Sonora, Mexico
- The transboundary aquifer assessment report will provide binationally-agreed upon baseline information
- In the US, there is increasing understanding of the role of groundwater in meeting water needs and that drought is a serious concern
- These concerns should be recognized for groundwater-dependent communities, both large and small

Thank you !! And some resources

- Web pages
 - GCASE <http://wrrc.arizona.edu/GCASE>
 - TAAP <http://wrrc.arizona.edu/TAAP>
- Four-page summary on the GCASE Project <https://wrrc.arizona.edu/sites/wrrc.arizona.edu/files/AWR-GCASE-Insert-Spring-2015.pdf>



- Related published articles (open access)
 - Shamir, E., Megdal, S.B., Carrillo, C., Castro, C., Chang, H., Chief, K., Corkhill, F., Eden, S., Georgakakos, K., Nelson, K., and Prietto, J. (2015, February). Climate change and water resources management in the Upper Santa Cruz River, Arizona. *Journal of Hydrology* 521, pp. 18-33. doi: 10.1016/j.jhydrol.2014.11.062.
 - Megdal, S.B., and Scott, C. (2011). The importance of institutional asymmetries to the development of binational aquifer assessment program: The Arizona-Sonora experience. In Viaggi, D. (Ed.) [Special Issue on Water Policy]. *Water* 3(3), pp. 949-963. doi: 10.3390/w3030949.