Wicked Water Problems of the Colorado River Basin

Dr. Sharon B. Megdal, Director

Porter School Webinar, Tel Aviv University

30 November 2020

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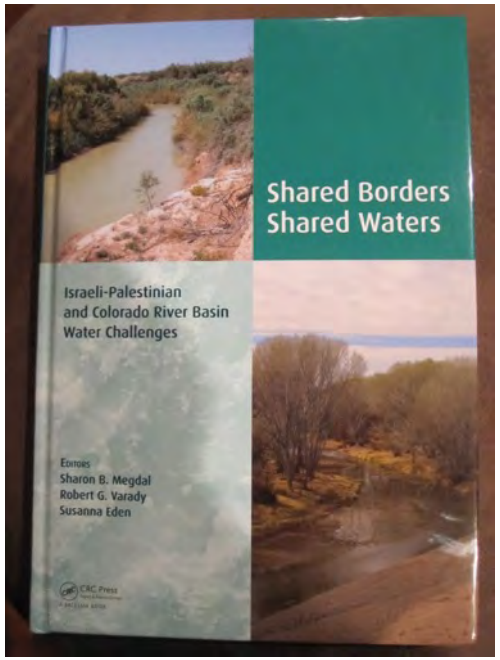
Have been a student of Israeli water management since 2006. Sixteen professional visits.



Public Policy Review

by Sharon Megdal

Visit Shows Israel Faces Similar Water Management Issues as Arizona

I traveled to Israel this summer to present a paper at a conference and to meet with researchers and other water professionals to learn about Israeli water management and policy. My perception was that, while quite a bit of Arizona-Israeli collaboration on technical water issues seemed to have occurred, less had taken place in the social science and policy arenas. I hoped to build upon recent collaboration with an Israeli resource economist. My trip was extremely productive. Fortunately my travels were unaffected by the violence in Gaza; the trouble to the North did not erupt until after I returned to the United States.

nation. I explained that desalination along coastal California has the potential to enable landlocked Arizona to gain more Colorado River water. Israel, like the United States, has long considered seawater desalination. Repeated droughts there have prompted a program to construct several plants over a five-year period to eventually deliver 315 million cubic meters of freshwater. With construction having begun in 2003, the plant in Ashkelon was built through a public-private partnership as a build-operate-transfer (BOT) facility. Fully operational in 2005, the plant produces 100 million cubic meters (approximately 81,100 af) of desalted water per year. It is a 20-minute process to produce fresh water. Also Israel shares Arizona's interest in removing salts from brackish groundwater, with projects underway in the southern part of the country.

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A tale of two rivers: Pathways for improving water management in the Jordan and Colorado River basins

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Bridging Through Water

by Sharon B. Megdal

November 20, our day in Israel, included visiting the Yad Hanna Wastewater Treatment Plant, which is located just on the Israel side of the Green Line and wall separating the West

Jerusalem, March 7, 2020

Sharon B. Megdal and David Lehrer, Executive Director, Arava Institute for Environmental Studies

Reflections: Being on Sabbatical During the COVID-19 Pandemic

by Sharon B. Megdal
03/20/2020

This is the second *Reflections* on my Spring Semester sabbatical activities. While a sabbatical is intended as a time away from some routine faculty activities, it is not meant to be time off from professional endeavors. Faculty members must receive approval of their planned sabbatical program. My approved sabbatical program was to lecture on topics relevant to my research and Extension work on our region's water issues, for which there is a lot of interest globally. After visiting Singapore in late January (see my previous ***Reflections***) and Mexico City, my schedule from early March through early July was filled with an interesting mix of presentations in Arizona, elsewhere in the United States, Mexico, Israel, Australia, and France. Obviously, the seriousness of the COVID-19 pandemic has led to the almost complete curtailment of these planned activities. However, even as recently as early March, I had no idea of how this virus would change all of our lives. I write this *Reflections* piece as a mix between a travelogue and a record of just how quickly things changed in a way none of us could have anticipated.

החוג למדיניות ציבורית, אוניברסיטת תל-טביב
The Department Public Policy, Tel Aviv University

סדרת הסמינרים: מדיניות וקיימות
Sustainability and Policy Seminar Series:

Sunday, March 15, 2020, 12:00
Naftali Building, Seminar Room 527

Hosts Special Guest:

Professor Sharon Megdal,

Director, Water Resources Research Center, University of Arizona

CANCELLED DUE TO COVID

"Managing North American Transboundary Waters: Insights for Israel and the Middle East"

Water policy and management reflect many determining factors

- Resource Availability
- Location of water demands and supplies
- Economics
- Historic and Current Legal/Institutional Framework
- The nature of involvement of multiple governmental and non-governmental entities, including the extent of centralized versus decentralized decision making
- Politics of Area
- Public values and socio-cultural factors
- Historical context
- Information
- Etc…

Importance of Context

Colorado River Basin (CRB)

W:\480790 CRBS P2\GIS\MapFiles\Chapter_Figs\March2015_edits\Figure_1-1_v3.mxd_lheverda 3/20/2015

Geographic Context

Colorado River Drainage Basin
637,000 km²
~40 million people depend on Colorado River water

Arizona land area
295,253 km²
Population = 7.4 million in 2020

Israel land area
22,140 km²

Wicked Water Problems – We've talked about them here before – September 2017

AMERICAN WATER RESOURCES ASSOCIATION
AND
WATER RESEARCH CENTER • TEL AVIV UNIVERSITY

2017 International Conference
CUTTING-EDGE SOLUTIONS TO
WICKED WATER PROBLEMS

FINAL PROGRAM

Hosted By Tel Aviv University • Tel Aviv, Israel

September 10-11, 2017

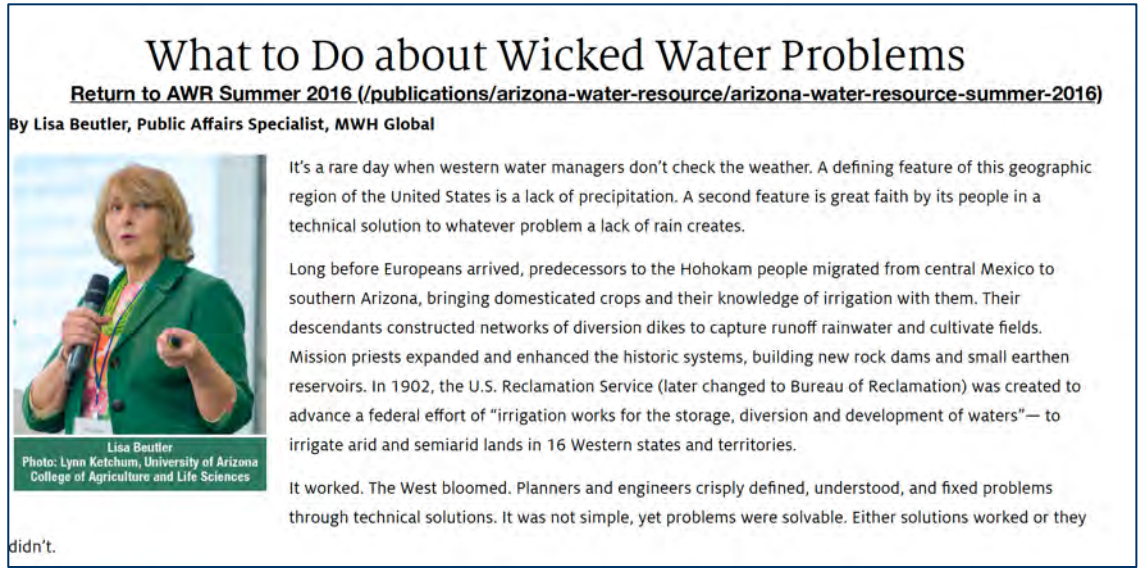
AWRA

Water Research Center
Tel Aviv University

Wicked Water Problems

Lisa Beutler (2016)

- "Lately, more and more water problems seemingly defy standard solutions."
- Four reasons
  - incomplete or contradictory knowledge
  - the number of people and opinions involved
  - the large economic burden
  - the interconnected nature of these problems with other problems [e.g., geopolitics, poverty]



What to Do about Wicked Water Problems

Return to AWR Summer 2016 (/publications/arizona-water-resource/arizona-water-resource-summer-2016)

By Lisa Beutler, Public Affairs Specialist, MWH Global

Lisa Beutler
Photo: Lynn Ketchum, University of Arizona College of Agriculture and Life Sciences

It's a rare day when western water managers don't check the weather. A defining feature of this geographic region of the United States is a lack of precipitation. A second feature is great faith by its people in a technical solution to whatever problem a lack of rain creates.

Long before Europeans arrived, predecessors to the Hohokam people migrated from central Mexico to southern Arizona, bringing domesticated crops and their knowledge of irrigation with them. Their descendants constructed networks of diversion dikes to capture runoff rainwater and cultivate fields. Mission priests expanded and enhanced the historic systems, building new rock dams and small earthen reservoirs. In 1902, the U.S. Reclamation Service (later changed to Bureau of Reclamation) was created to advance a federal effort of "irrigation works for the storage, diversion and development of waters"— to irrigate arid and semiarid lands in 16 Western states and territories.

It worked. The West bloomed. Planners and engineers crisply defined, understood, and fixed problems through technical solutions. It was not simple, yet problems were solvable. Either solutions worked or they didn't.

- Wicked problems are not solved—they can only be mitigated.
- Interdisciplinary collaboration that captures a broader knowledge of science, economics, statistics, technology, psychology, politics, and more is necessary for effective change.
- Managing wicked problems is a new kind of work. It requires changing the questions, managing uncertainty, and creating resilience.

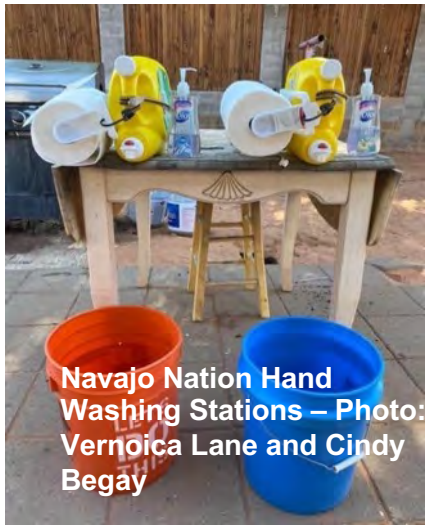
Colorado River Basin wicked water problems

- Imbalance of water demand and supply in the Colorado River Basin

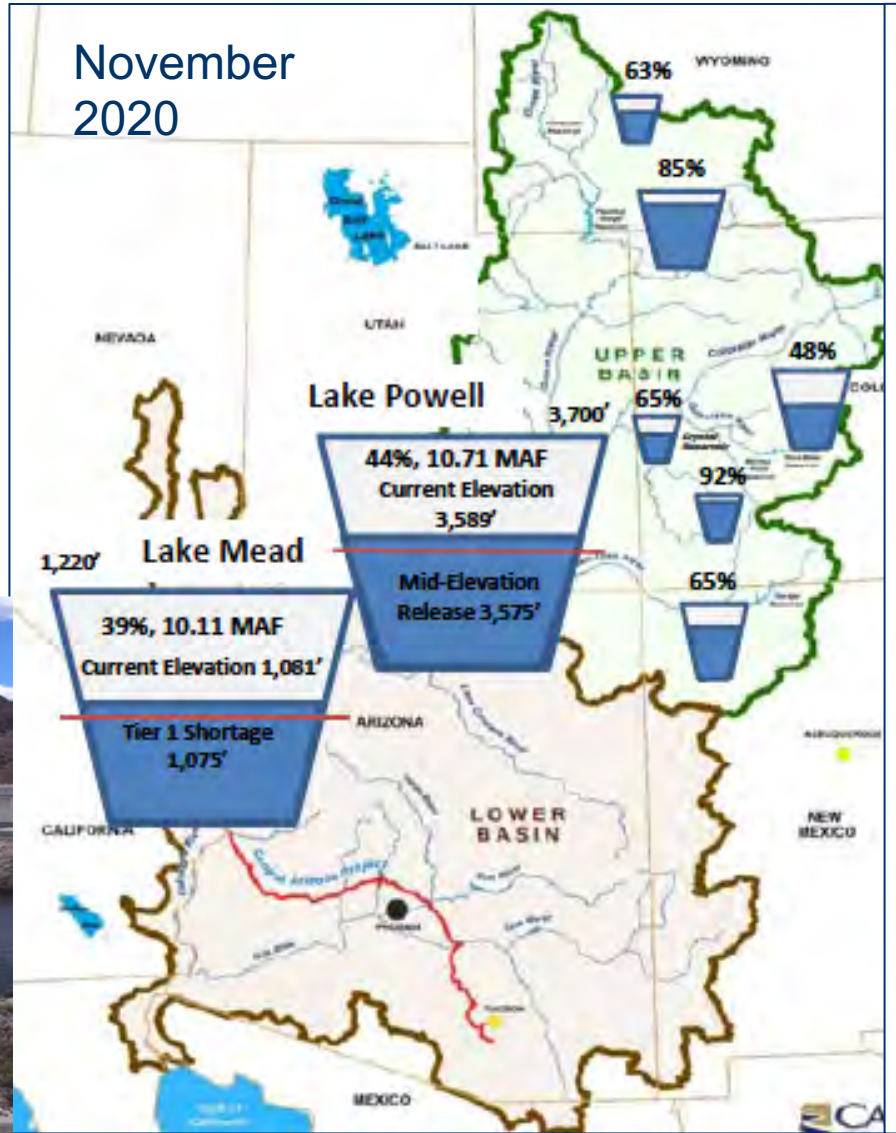
- Groundwater overdraft and invisibility

- Lack of attention to water for nature (environmental flows)

- Lack of water and water infrastructure



Imbalance of demand and supply
Regulations regarding shortage sharing



11/29/2020 Colorado River runoff plunges, raising shortage concerns | Local news | tucson.com

https://tucson.com/news/local/colorado-river-runoff-plunges-raising-shortage-concerns/article_c2458f69-0714-523d-9983-767175baf355.html

FEATURED

Colorado River runoff plunges, raising shortage concerns

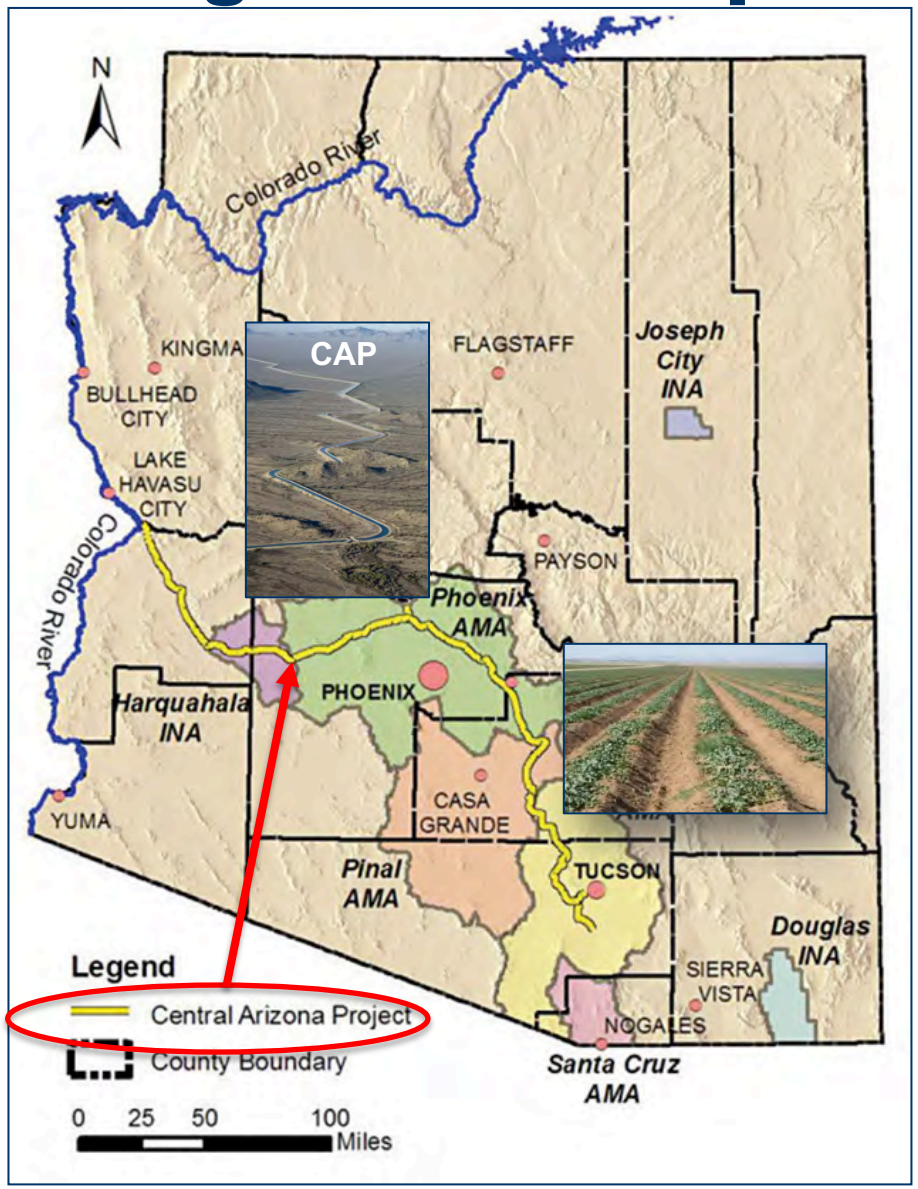
Tony Davis
Nov 29, 2020

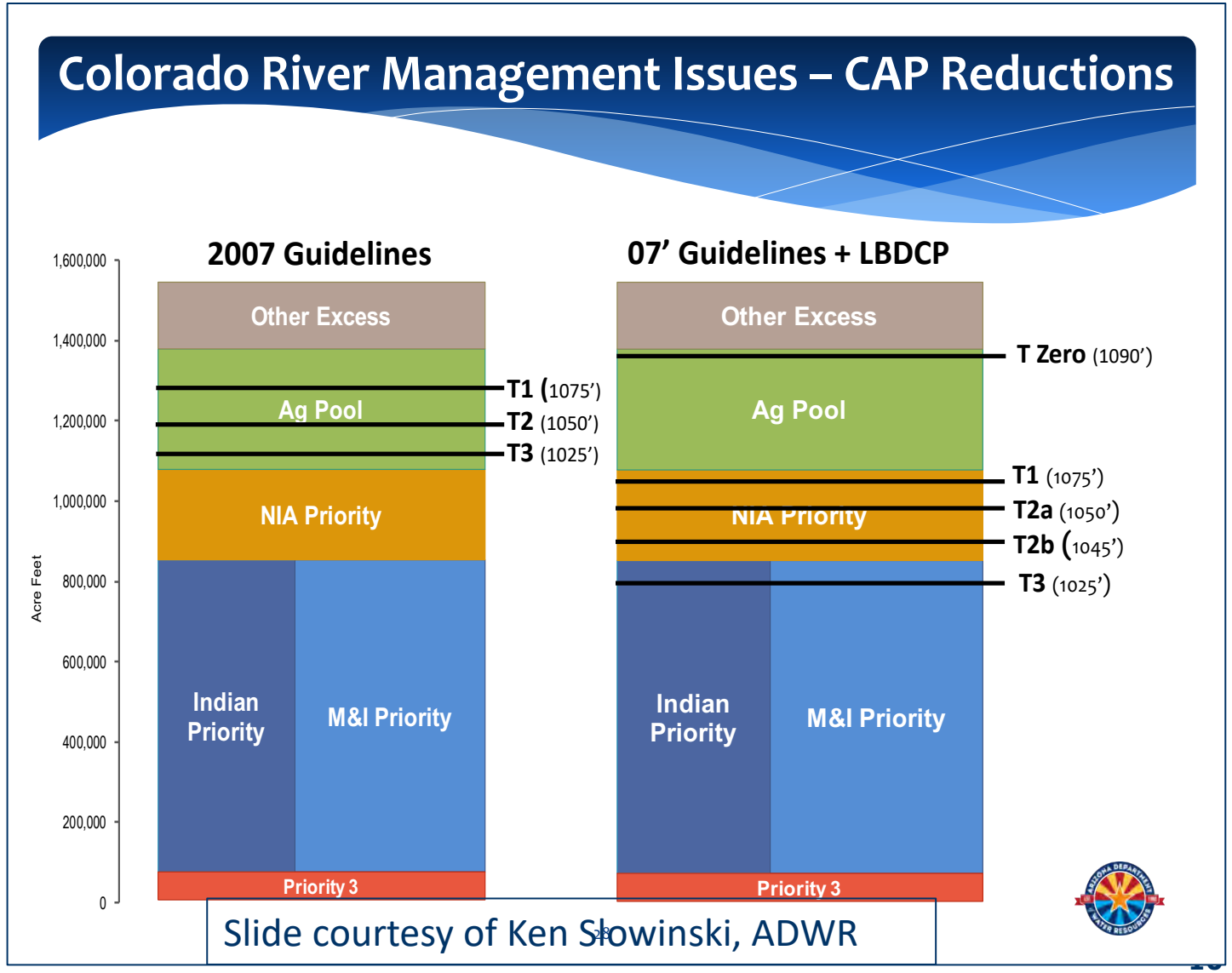
Dry soil conditions mean when snow melts much of it will soak into parched ground rather than flow to rivers such as the Crystal River in Colorado, pictured above.

Heather Sackett / Aspen Journalism

Tony Davis

Implications for Central Arizona Project (CAP)
Re: agriculture in particular





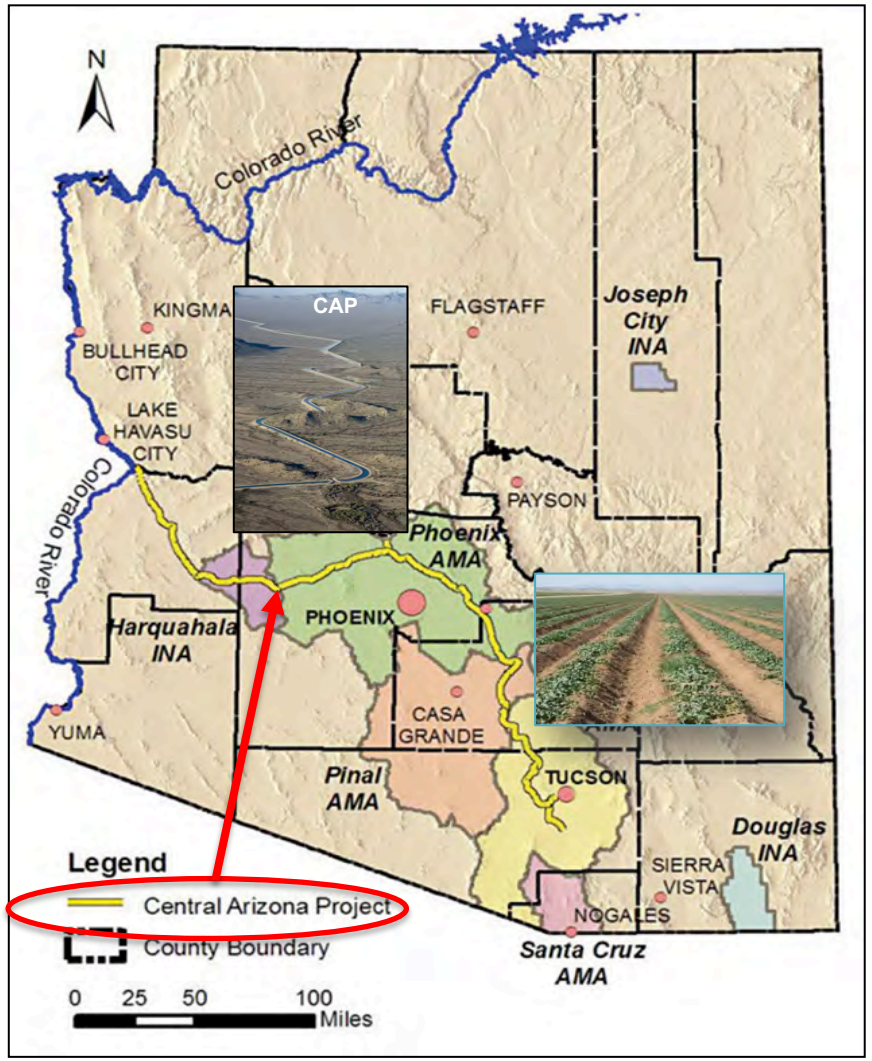
Slide courtesy of Ken Slowinski, ADWR

Drought Contingency Planning: The players

- Federal (US and Mexico) and state governments
- Colorado River water users/stakeholders
  - Municipal, Tribal, Industrial, Agricultural, NGOs, development
- Key Players in Arizona
  - Governor, Arizona Department of Water Resources (ADWR)
  - Legislature
  - Steering Committee convened by ADWR and CAP (official name is Central Arizona Water Conservation District (CAWCD))

Steering Committee

Groundwater Overdraft and Invisibility
Central Arizona groundwater



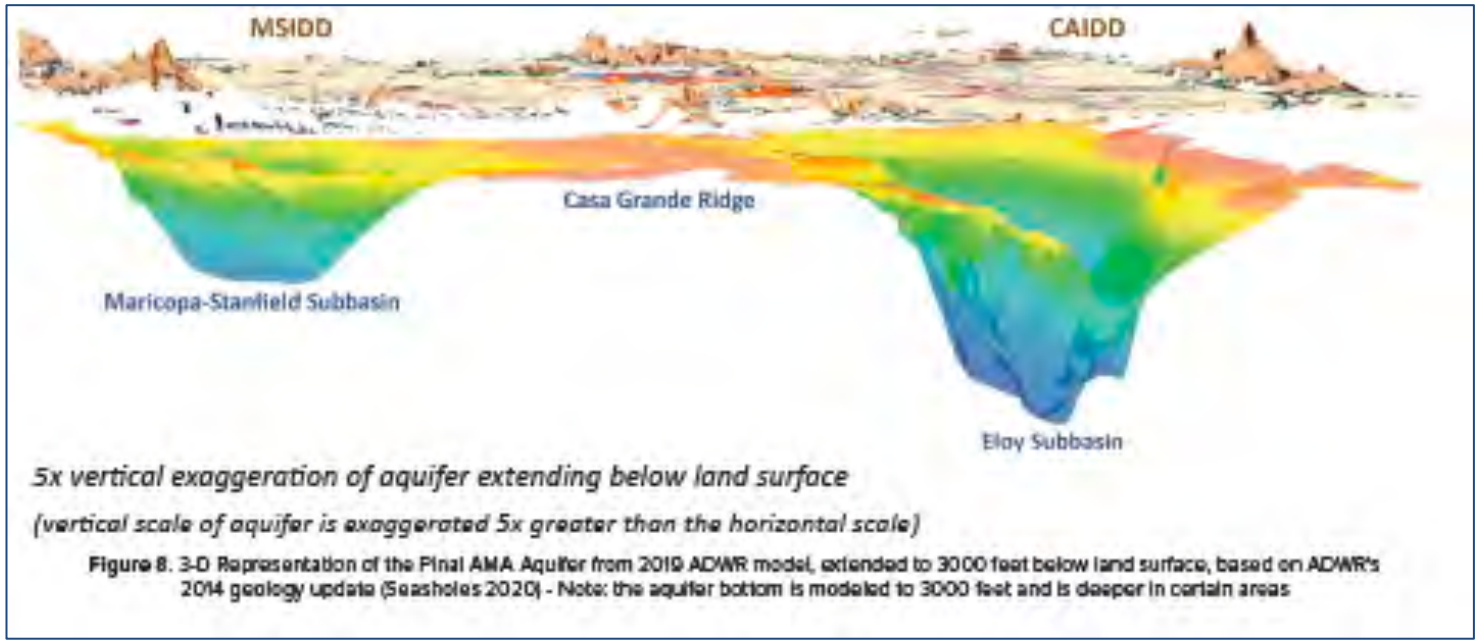
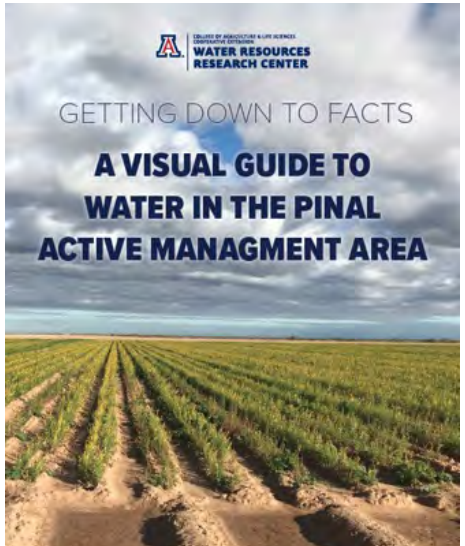
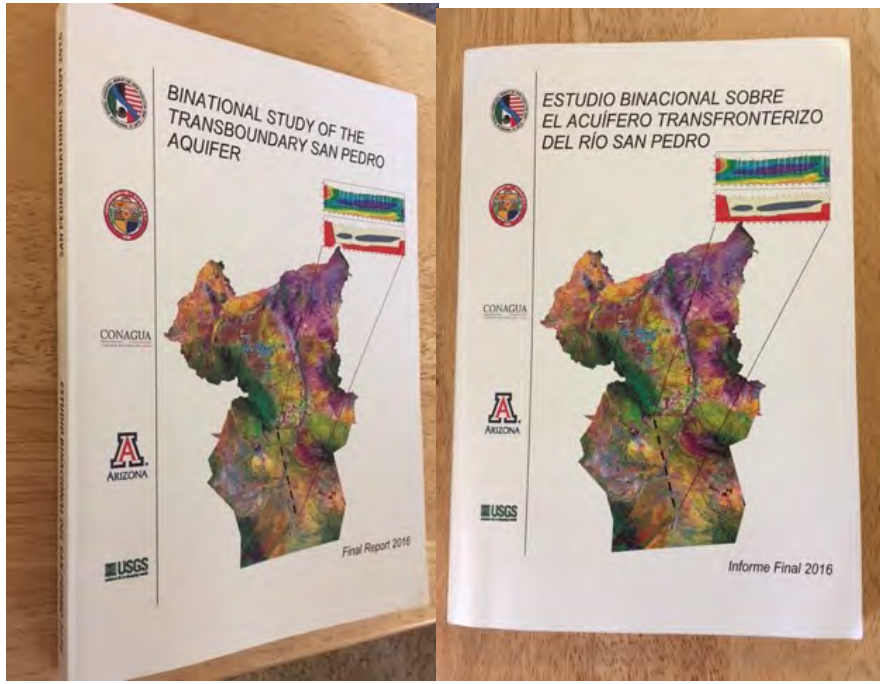


Figure 8. 3-D Representation of the Pinal AMA Aquifer from 2019 ADWR model, extended to 3000 feet below land surface, based on ADWR's 2014 geology update (Seasholes 2020) - Note: the aquifer bottom is modeled to 3000 feet and is deeper in certain areas

Stakeholder group formed in addition to Statewide Governor's Water Augmentation, Innovation and Conservation Council



Groundwater Overdraft and Invisibility Transbounday Aquifer Assessment Program, US-MX



Journal of Hydrology: Regional Studies 20 (2018) 60–73

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Journal of Hydrology: Regional Studies

journal homepage: www.elsevier.com/locate/ejrh

Findings and lessons learned from the assessment of the Mexico-United States transboundary San Pedro and Santa Cruz aquifers: The utility of social science in applied hydrologic research

J.B. Callegary[a,*], S.B. Megdal[b], E.M. Tapia Villaseñor[b], J.D. Petersen-Perlman[b], I. Minjárez Sosa[c], R. Monreal[c], F. Gray[a], F. Grijalva Noriega[c]

Federally authorized Binational Cooperative Framework
States-level working groups

Contact me if interested in contributing a paper to a special issue of *Water* on "Advances in Transboundary Aquifer Assessment"

Water for Nature

Thirsty Rivers in Water-Scarce Regions: Experiences from the Colorado River

Sharon B. Megdal, Ph.D.
smegdal@email.arizona.edu or megdal.sharon@gmail.com
Rehabilitation of the Lower Jordan River
International Conference
21 October 2014

Renewal – A Reborn Colorado River Once Again Finds Her Path to the Sea

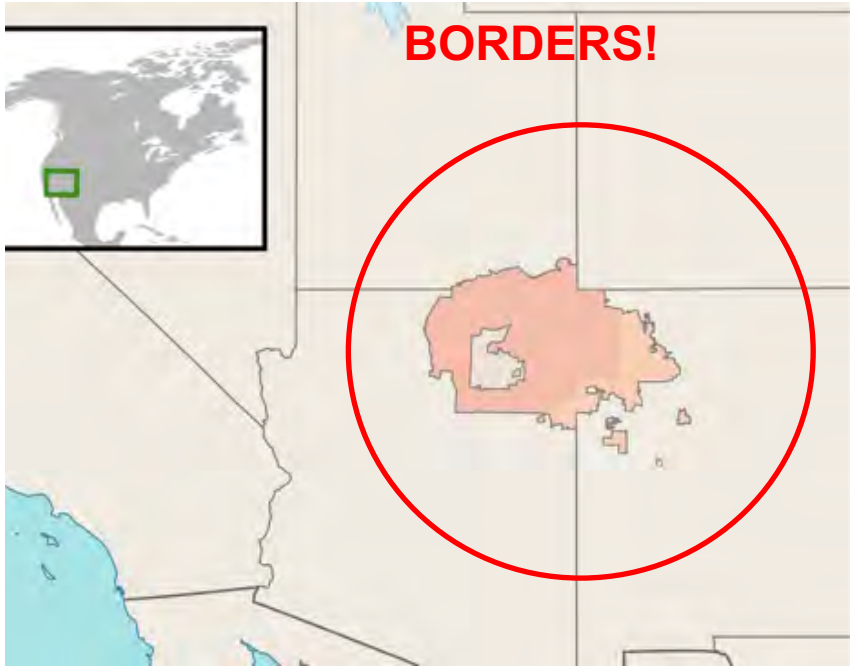
http://youtu.be/TODV7FW746s

Working groups established by the International Boundary and Water Commission; major role for environmental NGOs

2014 Pulse Flow

- Occurred March 23rd – May 18th, 2014.
- Designed to mimic, at a reduced scale, spring floods that affected the Colorado River Delta for years. Cottonwoods and willows were producing seeds during that time, and those seeds need to land on wet ground to germinate and support restoration goals of the Pulse Flow.

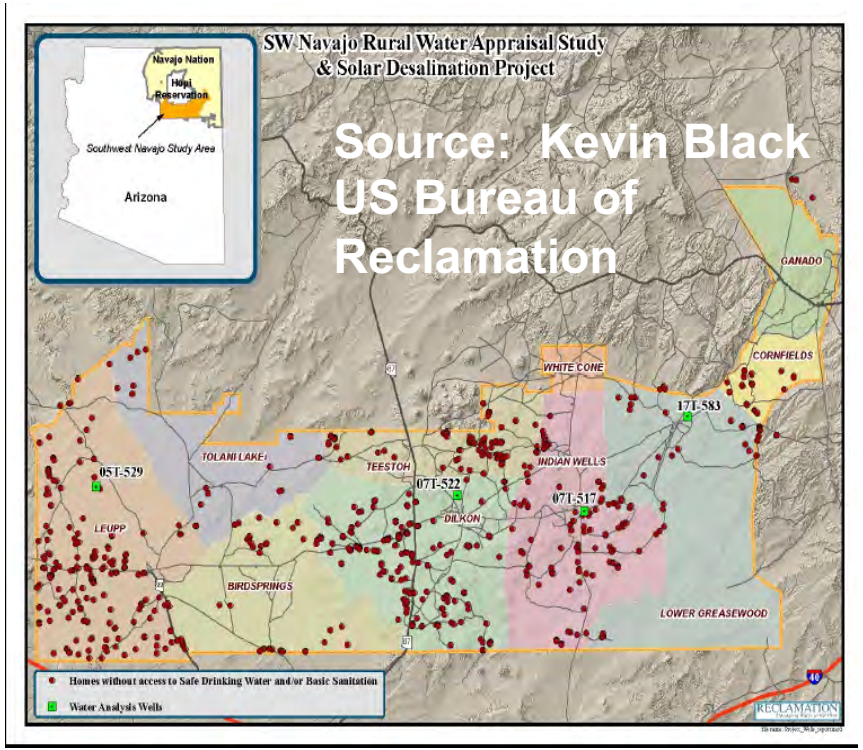
Direct Linkage Between Water and Salinity Management and Environmental Values



Navajo Nation 69,930 km2
On-reservation population = 173,000
Total pop = 350,000
~30% of homes without running water

Water Access Coordination Group plus more

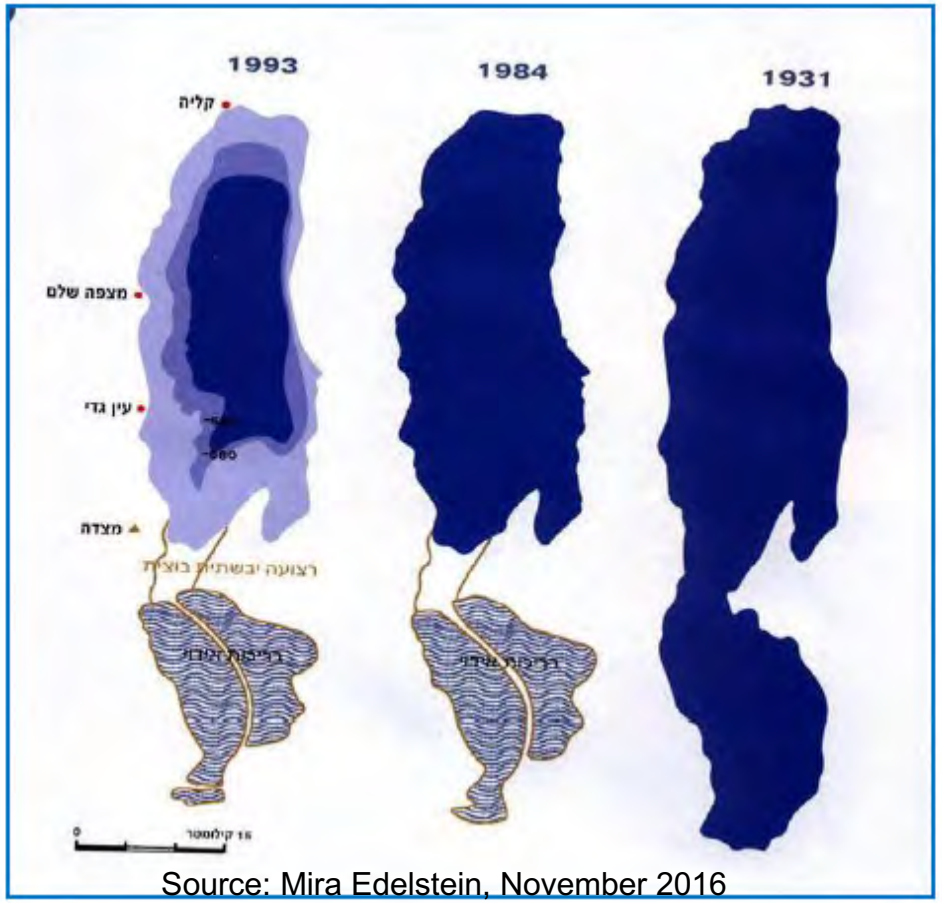
COVID-19 Incidence on Navajo Nation and water availability



https://www.youtube.com/watch?v=KAPpQA9SCwc&feature=youtu.be

Wicked water problems, Middle East

- Lower Jordan River flows
- Dead Sea condition
- Water scarcity



Source: Mira Edelstein, November 2016

West Bank Water Provision; Wastewater Treatment

Searching for Pathways to Solutions Process is important

- Developing information collaboratively
- Developing partnerships
  - Within states and regions
  - Interstate
  - International
  - Tribal Nations
- Considering and implementing options
  - Desalination
  - Reuse
  - Conservation
  - Water banking
  - Voluntary transactions, marketing
  - Rainwater harvesting; grey water systems
  - New ways of designing the built environment

"Wicked problems are not solved—they can only be mitigated."

Some Key Factors that Contribute to Mitigating Wicked Water Problems

- Functioning cooperative mechanism(s)
- Trust and mutual respect
- Involvement of key stakeholders
- Good communication
- Persistence
- Patience
- Sharing experiences and lessons learned
- Eating with your partners

Long-term efforts – The work continues.

Reflections on a Successful Israeli Conference Experience

by Sharon B. Megdal
12/06/2019

Concluding Remarks

"*Managing wicked problems is a new kind of work. It requires changing the questions, managing uncertainty, and creating resilience*."

- Technology is important, as is economics
- Process of working with and through stakeholders is key to making progress
- Continuing educational efforts at all levels, but…

When will we be able to meet and eat again with our partners?

2019 WRRC Annual Conference

2020 WRRC Annual Conference

Questions/Discussion

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My CV with links to many relevant publications at wrrc.arizona.edu/director

Special invitation
for a contribution
(short deadline, short article for professional audience)
January 2021 Issue of IMPACT, a publication of the American Water Resources Association, on Wicked Water Problems