WRRC Water Webinar

Empowering Arizona's Water Resource Management: Navigating Equity, Economic, and Ecological Challenges with Cutting-Edge Decision-Support Tools

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Presentation Outline

My story

1. About me
2. Examples of our work
3. Contribution to AZ water management frontiers
My childhood

My daily routine was centered around water.
I went to school and got degrees

Why do I get sick from drinking water?

Where can we find water?

How much and how safe is the water?

Where does the rain go? Why is its pattern changing?

How can we model all of these?
And so, percentages like….

Colorado River - 36%
Groundwater - 41%
In-state rivers - 18%
Reclaimed water - 5%,

Reminds me of my days as a “child water manager”
Seen it, studied it, done it!

Source: https://news.asu.edu/
ABC news: Arizona commits $1 billion to boost water supply with alternative water projects

**2023 WATER PROJECTS**

- $27.8 MILLION – GILBERT WELLS PROJECT
- $25 MILLION - SANTA ROSA CANAL ALTERNATIVE
- $20 MILLION – LITTLE COLORADO RIVER LEVEE
- $16.2 MILLION - ON-FARM IRRIGATION EFFICIENCY GRANTS
- $11 MILLION - BRACKISH GROUNDWATER PILOT
- $10 MILLION – PEORIA WELLS PROJECT
- $9.5 MILLION - WATER QUALITY FEE FUND DEPOSIT
I became a water professional

Diversity of sources (Supply mgt.)

Conveyance: (Supply mgt.)

Non-consumptive: (Demand mgt.)

Consumptive: Food, Ag., etc. (Demand mgt.)

Water Quality: (supply mgt.)
ABC news: Arizona commits $1 billion to boost water supply with alternative water projects

- $7 MILLION - WATER INFRASTRUCTURE GRANT FUNDING
- $5 MILLION - STATEWIDE WATER RESOURCES PLANNING PROGRAM
- $5 MILLION - PFAS MITIGATION
- $3.4 MILLION – MOHAVE WASH RECHARGE BASIN
- $3 MILLION - RURAL WATER LEGAL ASSISTANCE
- $810K – GLENDALE IRRIGATION SYSTEM AND XERISCAPING
- $100K - BRACKISH WATER STUDY
- $10 MILLION – PEORIA WELLS PROJECT
- $9.5 MILLION - WATER QUALITY FEE FUND DEPOSIT

Source: https://news.asu.edu/
I became a water professional

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Water Quality:
(supply mgt.)

Consumptive: Food, Ag., etc.
(Demand mgt.)
Arizona Governor Katie Hobbs' administration announced on Monday two steps to stop a controversal Saudi Arabian company from using groundwater beneath state land in western Arizona to grow and export alfalfa.

Hobbs said in a statement the Arizona State Land Department had canceled one of its leases to Fondomente Arizona, and would not renew three others that are set to expire in February.
I became a water professional

Diversity of sources (Supply mgt)

Conveyance (Supply mgt.)

Non-consumptive: (Demand mgt.)

Consumptive: Food, Ag., etc. (Demand mgt.)

Water Quality: (supply mgt.)
I became a water professional

Diversity of sources (Supply mgt.)

Conveyance: (Supply mgt.)

Non-consumptive: (Demand mgt.)

Consumptive: Food, Ag., etc. (Demand mgt.)

Water Quality: (Supply mgt.)
Examples of our work: Remote Sensing of Water

• Integrating data from a suite of satellites into frameworks that support preparedness and response to water challenges.

• Example:

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Landsat 8/9</td>
<td>30 m</td>
<td>8 days</td>
<td>11 bands ✓</td>
<td>Free ✓</td>
<td>Large ✓</td>
</tr>
<tr>
<td>Sentinel 2</td>
<td>10 m</td>
<td>5 days</td>
<td>13 bands ✓</td>
<td>Free ✓</td>
<td>Medium ✓</td>
</tr>
<tr>
<td>PlanetScope</td>
<td>3 m ✓</td>
<td>Daily ✓</td>
<td>8 bands</td>
<td>Commercial</td>
<td>Small</td>
</tr>
</tbody>
</table>
Comparing PlanetScope to Landsat-8 and Sentinel-2 for Sensing Water Quality in Reservoirs in Agricultural Watersheds

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Examples of our work: GIS based modeling of groundwater vulnerability

- Vulnerability to groundwater depletion
- Vulnerability to anthropogenic groundwater contamination
- Overlayed in a GIS environment
- Analysis of vulnerability in that study area.
Vulnerability of a Tunisian Coastal Aquifer to Seawater Intrusion: Insights from the GALDIT Model

Adel Zghibi 1,*; Amira Merzougui 2; Abubakarr S. Mansaray 3; Ali Mirchi 4; Lahcen Zouhri 5; Anis Chekirbane 2; Mohamed Haythem Msaddek 1; Dhekra Souissi 1; Amina Mabrouk-El-Asmi 6; and Abdelmadjid Boufekane 7
Examples of our work: Climate impacts

- We use climate projections to build scenarios of dry spells, precipitation frequency and intensity, and temperature trends.
- We use the SC-CASC’s Climate Projections Evaluation Project (C-PrEP)
  - Contains 27 projections per variable and emissions scenario
  - Uses three different global climate models (GCMs): Community Climate System Model (CCSM4), Model for Interdisciplinary Research on Climate (MIROC5), and Max Planck Institute Earth System Model (MPI-ESM-LR)
  - Created with three different statistical downscaling techniques: Delta method (DeltaSD), Equidistant Quantile Mapping Method (EDQM), and a Piecewise Asynchronous Regression Method (PARM).
  - Uses three observational datasets to provide training data for statistical downscaling: Daymet, Livneh, and Parameter-elevation Relationships on Independent Slopes Model (PRISM).
  - Utilizes historical and three futuristic representative concentration pathways (RCPs): rcp26, rcp45, and rcp85
Analysis of climatic trends in climate divisions of Oklahoma, USA

Aseem Singh¹ · Ali Mirchi¹ · Saleh Taghvaeian² · Abubakarr Mansaray³ · Phillip D. Alderman⁴ · Daniel Moriasi⁵

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Abstract
We used monthly climatological datasets from the NOAA US Climate Divisional Database to detect long-term trends (1951–2021) in the nine climate divisions of Oklahoma, USA. We applied Hargreaves-Samani method to calculate reference evapotranspiration (ET₀) and used 12-month standardized precipitation index to characterize meteorological droughts.
Honorable mentions:

- Using downscaled GRACE data to delineate changes in groundwater storage.
- International transboundary water management - a good fit for the AZ-Mexico border (both surface and groundwater).
- Hydrologic and Water Quality System for Oklahoma (OK-HAWQS):
  - Support BMP selection, design, and evaluation
  - Support tracking of TMDL plans
  - Support preparedness and response to extreme water quality problems
- Oklahoma Well Owner Network
  - Free well water quality screening and education for private well owners across the state
- Virtual Fencing in grazing lands
  - Promote conservation practices (rotational grazing)
  - Protect stream ecosystems (quarterly stream health assessment)
  - Maximize food production
- My job: Lead grant writing efforts, help recruit students, coordinate implementation, manuscript preparation (reports, journal articles, newsletters, extension factsheets, etc.), provide training, attending meetings, building relationships
Contribution to the ongoing efforts of the Arizona Water Resources Research Center
Channeled into the University’s Land Grant mission: Teaching, Research & Extension

Secure extramural funding to:

a) Train the next generation of water professionals
b) Conduct research to find answers to critical questions about water sustainability
c) Utilize WRRC’s extension and outreach system to work with AZ communities of practice in coproduction of knowledge, tools, and advancement of sustainable water solutions.

University experts (within UA and from other universities in the state), water related agencies, policy makers, tribal nations, local communities, and regional, federal, and international partners
Env. Pillar

Climate variability
Biodiversity
Vegetation cover
Soil health
Soil properties
Pollutant load, etc.

All affect water availability and water quality
Economic pillar

Water Demand vs. Water Supply
Expanding Infrastructure
Food Security (Grazing, farming, poultry, etc.)
Technology
Public Health
Equity

Rural vs. urban water supply
Interested parties (Ag., cities, manufacturing, mining, etc.)
Private vs. public
Affluent vs. marginalized communities
Water urbanization: expansion of cities transforming rural waters to urban waters

Allocation - Environmental flows, common interest, economic growth = sustainable water resource management
Conclusions

• When it comes to water, the centrality of the Water Center both within the university, across the state and beyond requires someone with the requisite breadth and depth of transdisciplinary water/environmental background that allows actionable engagement and leadership.

• What am I bringing?
Thank you!