MEETING REPORT

The 2023 Western Water Congress: A Conference for Building Capacity for a Climate-Smart West

Fort Collins, CO
June15-16, 2023

August 17, 2023

Compiled by the Conference Organizers
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WAAESD
Western Association of Agricultural Experiment Station Directors
Western Water Network

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The 2023 Western Water Congress
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Western Water Network

WWN Congress Purpose: To chart a vision for land-grant-focused research and engagement to address Western U.S. water challenges for the next ten years.

INTRODUCTION

This report catalogs the results of the 2023 Western Water Congress. The Congress is a milestone in the ongoing efforts to address the mounting challenges posed by climate change and water scarcity in the western United States. With average temperatures rising, the water supply becoming increasingly variable, and long-term droughts becoming more frequent, the need for proactive action and collaboration is now being widely recognized (Aliyari et al., 2021; Heidari et al., 2021; Zhang et al., 2021).

This Congress is a product of two events that paved the way for the meaningful dialogue that occurred in this meeting. In August 2020, the Western Association of Agricultural Experiment Station Directors (WAAESD) convened an online Water Security Summit. At the Summit water scientists and extension specialists explored innovative approaches to climate adaptation, water conflict resolution, and resilience in the face of water scarcity and variability. Following this, in March 2022, the Western Water Network (WWN) gathered in Reno, NV, to deliberate on its role in enhancing water security across the region and establishing effective collaboration on water management, policy, and sustainability.

Building on the insights and groundwork laid during these meetings, the 2023 Western Water Congress emerged as a logical next step in this progression. The Congress was hosted in conjunction with the Universities Council on Water Resources (UCOWR) and National Institutes of Water Resources Annual Water Resources Conference in Ft. Collins, CO. With a focus on facilitating un-siloed discussions, the WWN Congress aimed to connect a diverse community of stakeholders, researchers, extension specialists, and educators, to discuss the most pressing water challenges in the West.

The purpose of this report is to document the conversations, insights, and wall notes that emerged from various breakout and plenary sessions at the meeting, not to develop recommendations or collective conclusions. As such, this report serves to document the rich and dynamic exchanges that occurred between Congress participants.

The Western Water Congress was guided by three objectives:

- Identifying pain points in the adoption of water management technologies or approaches and proposing audacious solutions to overcome them.
- Advancing the understanding of integrated water resources decisions, encompassing agricultural sustainability, thriving communities, and vibrant economies at scale.
- Fostering outcomes that intertwine economic viability, environmental protection, and social equity, recognizing the multi-dimensional nature of water management.

Through this Congress, we sought to foster open dialogue between researchers, extension specialists, and stakeholders with authors who are working on synthesis white papers and a common vision paper to consider how to create climate-smart water management in the West. It is important to note that while the Congress brought together a diverse and inclusive group of participants, the intention was not to arrive at definitive conclusions or recommendations at this meeting. The intent was to inform the authors of these papers on the diverse thinking among meeting participants about strengthening western water security and about how the Western Water Network (WWN) can be a facilitator of collaboration and information exchange.

This report documents the insights, ideas, and potential pathways that emerged during the Congress. As we navigate the uncertain waters of water management in the West, these notes serve as a collective memory of the discussions at the Congress.

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Aliyari, F., R.T. Bailey, and M. Arabi. 2021. Appraising climate change impacts on future water resources and agricultural productivity in agro-urban river basins. Sci Total Environ 788. doi: 10.1016/J.SCITOTENV.2021.147717.

Heidari, H., M. Arabi, and T. Warziniack. 2021. Vulnerability to Water Shortage Under Current and Future Water Supply-Demand Conditions Across U.S. River Basins. Earths Future 9(10): e2021EF002278. doi: 10.1029/2021EF002278.

Zhang, F., J.A. Biederman, M.P. Dannenberg, D. Yan, S.C. Reed, et al. 2021. Five Decades of Observed Daily Precipitation Reveal Longer and More Variable Drought Events Across Much of the Western United States. Geophys Res Lett 48(7): e2020GL092293. doi: 10.1029/2020GL092293.

ORGANIZATION COMMITTEE

The organizing committee for this conference consisted of a subset of the Western Water Network leadership members (underlined) and contributors who volunteered at the Reno WWN assembly.

Kristiana Hansen (chair), Associate Professor of Agricultural Economics and Extension Water Resource Economics Specialist, University of Wyoming, Laramie, WY

Travis Warziniack, Research Economist, USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO

Qin Zhang, Professor of Agricultural Automation Engineering, Washington State University, Prosser, WA

Ginger Paige, Professor and Water Resource Extension Specialist, University of Wyoming, Laramie, WY

Robert Heinse, Associate Professor of Soil and Environmental Physics, University of Idaho, Moscow, ID

Hope Braithwaite, Extension Assistant Professor of Watershed Quality, Utah State University, Logan, UT

Guojie Wang, Assistant Professor of Soil and Water Conservation, Eastern Oregon University, La Grande, OR

Brad Gaolach, Extension Assistant Professor and Center Director for WSU's Metropolitan Center for Applied Research & Extension and the Western Center for Metropolitan Research and Extension, Washington State University, Everett, WA

Derek Godwin, Extension Watershed Management Faculty, Oregon State University, Corvallis, OR

Facilitator: Michael Fraidenburg, The CooperationCompany.com, Olympia, WA

Agenda and Process

The WWN Congress's purpose was to, “To chart a vision for land-grant focused research and engagement to address Western U.S. water challenges for the next ten years.”

The Congress was scheduled immediately following the Universities Council on Water Resources (UCOWR) annual meeting. To support the Congress UCOWR assisted by scheduling special sessions in their meeting to share information, spur discussion, and promote thinking on the topics to be discussed at the Congress.

The meeting management process for this two-day workshop involved a combination of brainstorming, discussion, and analysis sessions. The Congress aimed to introduce the goals and objectives of the WWN to the participants and intersect these discussions with reflection on the water security challenges and opportunities where the WWN could contribute.

The first day kicked off with an opening reception to set the stage for the workshop. The second day was packed with working activities that included an opening session and three work sessions each with breakout sessions.

During the breakout sessions, participants engaged in brainstorming and discussion activities related to these water management topics,

- Hydrologic Processes and Human Water Systems,
- Planning for a Future with Uncertain Climate,
- Valuing Environmental and Human Health Benefits in Water Management,
- Addressing Educational Gaps,
- Diversity, Equity, And Inclusion in Water Management (not held as a separate breakout session but included in each of the other breakout sessions), and
- Interstate Collaboration and Barriers to Transboundary Water Management.

The objectives for the breakout sessions were to identify gaps, challenges, and potential solutions to consider for inclusion in a comprehensive vision paper for water security in the West to be written by the Western Water Network.

The meeting culminated in a closing plenary session where the results and conclusions from the breakout sessions were presented and discussed for the authors to use in authoring their white papers and the WWN’s vision paper.

The agenda for the meeting was,

WAAESD
Western Association of Agricultural Experiment Station Directors
Western Water Network

WWN Workshop Agenda
Fort Collins Colorado
June 15-16, 2023

Thursday, June 15

5:00-7:00 pm **Opening Reception:** WWN is hosting an opening reception for workshop participants to introduce goals and objectives of the Network.
Location: Lory Student Center Ballroom C/D

Friday, June 16 *All Sessions on Friday will be in the Nutrien Agricultural Science Building*

7:30- 8:00 am **Breakfast** *Location: Nutrien Agricultural Science – Commons Area*

8:00-9:00 am **Opening Session** *Location: Room 135*

9:00-10:00 am **Work Session 1** – Situation Assessment and Gap Analysis (Six Breakout Sessions)

1. **Hydrologic Processes and Human Water Systems** *Location: Room 135*
2. **Planning for a Future with Uncertain Climate** *Location: Room 163*
3. **Valuing Environmental and Human Health Benefits in Water Management** *Location: Room 166*
4. **Addressing the educational gaps:** Are water education programs in the western states creating a sufficient workforce for a climate-challenged agriculture *Location: Room 211*
5. ~~**Increasing DEI in western water management** *Location: Room 163*~~
6. **Interstate Collaboration and Barriers to Transboundary Water Management** *Location: Room 102*

10:00-10:15 am **Break** *Location: Hallway of room 135*

10:15-11:30 am **Work Session 2** –Solutions *Location: return to work session 1* room

11:30 am- 12:15 pm **Lunch** *Location: Room 135*

12:15-1:15 pm **Six Topic Report Out** *Location: Room 135*

1:15-3:30 pm **Work Session 3** – Pulling it All Together & Closing Session *Location: Room 135*
What Does It Take to Build a Next Steps Vision Paper
Building out Western Water Network?

3:30 pm **Meeting Adjourned**

RESULTS

This report provides documentation of the results from the Congress. It does not present conclusions and recommendations.

The primary purpose of the Congress was to sponsor rich and dynamic conversations between people who are working on western water issues. This report captures the thoughts, ideas, and potential pathways explored by the diverse community of stakeholders, researchers, extension specialists, and educators who participated in the event.

As a facilitator of collaboration and information exchange, the Western Water Network hosted the Congress to support authors working on topical white papers from the breakout sessions and crafting a synthesis vision paper for addressing Western water security issues. By documenting the insights and ideas shared during the Congress, this report serves as a collective memory of the discussions for that use.

WORK SESSIONS 1 and 2 – SITUATION ASSESSMENT, GAP ANALYSIS, and SOLUTIONS (morning sessions)

Breakout Session on Hydrological Processes and Human Water Systems

Facilitators: Ginger Paige, Sam Fernald

Participants: Thushara Gunda, Jamie McEvoy, Bret Hess, Jim Dobrowolski, Alan Cai, Fabian Nippgen, Emile Elias

Situation Assessment and Gap Analysis

- Capacity to understand watershed hydrology but not understand the impacts of climate change.
- We are missing atmospheric scientists – climatologists.
- Need to collaborate with organizations such as DOE (Water for Ag) and NOAA – national water model.
- Where do the National Labs fit in? PARTNERSHIPS?
- What are others (partners) doing in the "water space."
- Gap in understanding water scarcity issues solutions e.g., heritage crops.
- How much will they really work? Will AGAVE save Arizona?
- Cloud seeding - $$$ but does it work?
- What are the barriers to understanding the full impacts of "adaptation solutions." 140!!
- National Academies – MAR on Aquifer recharge.
- Human side – states are trying to change "water law" – beef brief!! Emile.
- Implications – regarding conserved water – sustainable water,
    - Access disparity,
    - Water access & water.
- Front line or underserved communities (justice impacts front).
- (Need shared definitions of terms).
- CRB -delay in recognizing the problem – with sudden emergency response.
- Information stream to reduce conflicts.
- How to reduce the conflict… Or is this a human issue? Psycho-social power….
- (How to reduce large-scale conflict?).
- How visible is water in day-to-day decision making?
- Peace Engineering (conflict resolution).
- (Solutions Journalism – new version of "positive" storytelling).
- How does the WWN reach stakeholders?
    - Where the data are and where they go.
    - Communities – State - Policy Jurisdictions- Federal/State/ local management.
    - CAN WWN facilitation work across stakeholder groups or the West?
    - Take the stakeholder projects.
- Funding question… how does the funding work….

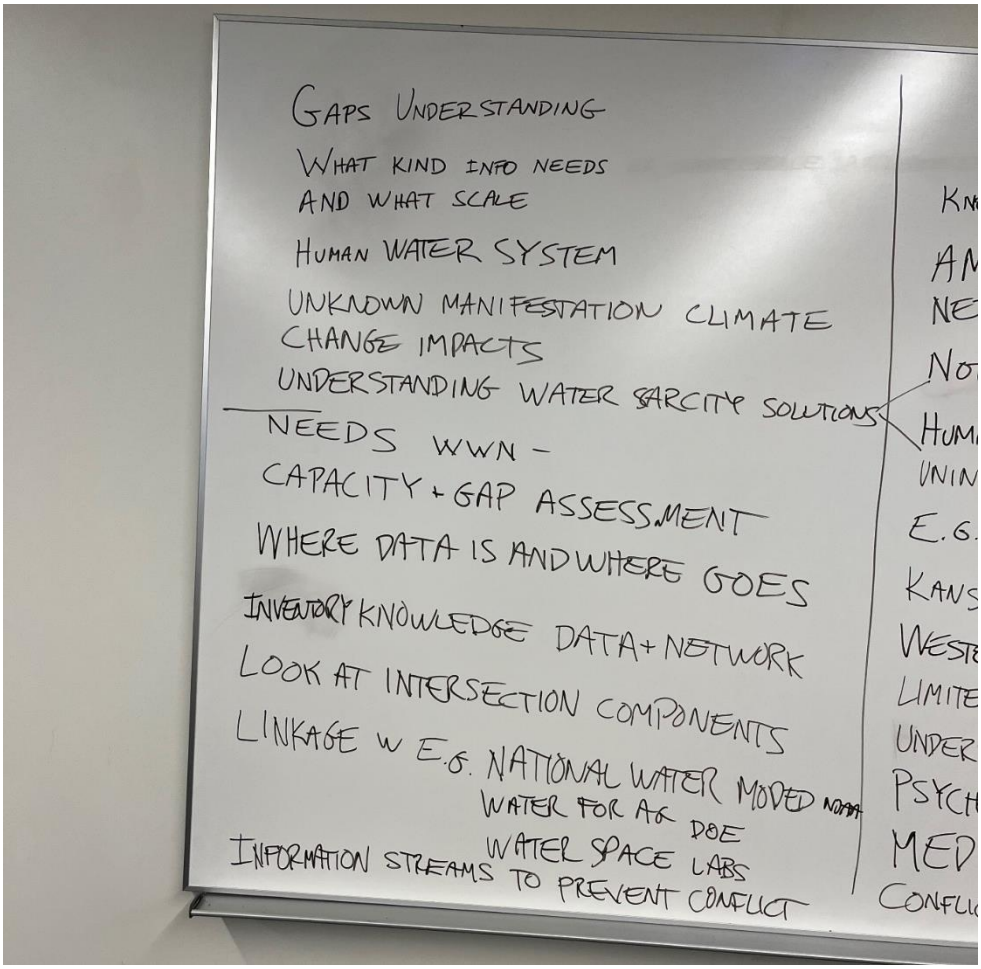
Solutions

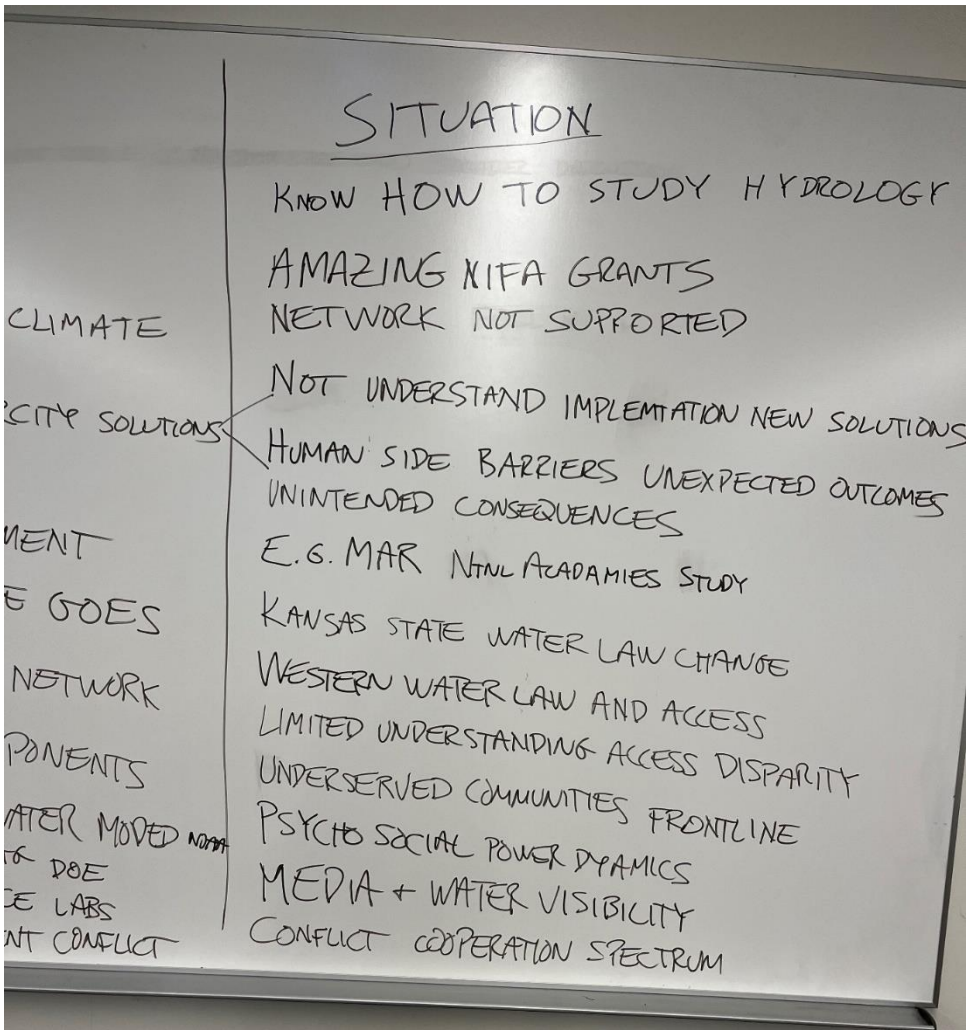
- WWN can serve as a Facilitated Support Network.
- Need to reach out to Congress as well – need to be their go-to source for western water!!
    - Need to have the WWN include all of the entities in the western water space. Not compete but collaborate.
    - Question: Is the WWN limited in numbers?? How to grow the Network and make certain that people and organizations feel invited and included….
- What WWN does: We can come together with different disciplines and expertise to address complex issues.
    - Evaluation of trade-offs and intersections.
    - Members Identify scales at which they work.
- Question: How do we manage the membership – who is in (how much do they need to participate? Tiers- etc. for membership. The sociology and business world has lots of information on how to start up organizations.
- The WWN needs to have LIAISONS (paid positions) to manage incoming parties and communications.
    - Have a defined DEI space –
- How to partner with communities.
- Determine "dimensions" and metrics for DEI (SPAN – Southwest Practitioners Action Network).
- "In-reach" --- how to work with underserved communities.
- Training within the Network?? ….Use extension network – but expand its capacity!!
    - Could be by geography and/or discipline.
- Need to develop tactics to get there.
    - Outward facing component – e.g. WEBSITE.
    - Ask an expert - Interactive - Online community interface – tech exchange.
    - Old Extension model (e.g. E-extension).
- ***How to start developing the Knowledge BASE? Clearing HOUSE.
- Start with the SAS – CAP NIFA grants? Harvest the information from the grants!!
- Publications and information need to get OUT to the public- stakeholders- researchers etc…. e.g., CORN CAP – Ogallala.
- ***Evaluation of what people are doing on the landscape - what works and why and at what scale? and through Water Adaption Techniques Atlas (WATA)!!
- Use funding to support stakeholders and reach policymakers.
- Obtain funding to support the network.
- More strategic engagement with existing organizations such as AGU. How to tap into these groups better.
- Need to understand the limitations of human capacity and how to make it easy to engage at different levels.
    - Tier support to facilitate the development of the Knowledge Base (data and knowledge).
    - Catalog of information.
    - Look to Congress and the Western Governors Association.

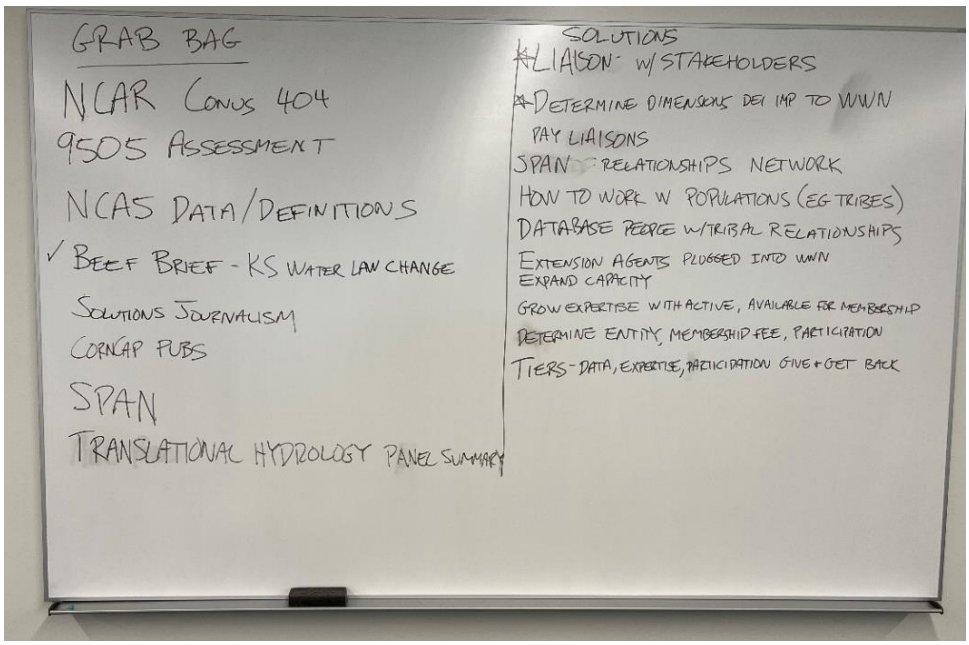
Gab Bag

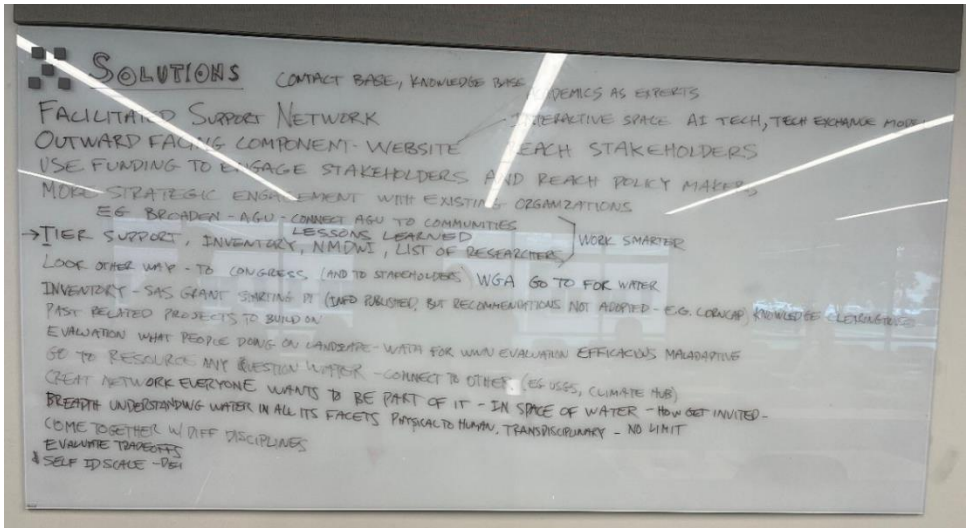
- NCAR CONUS 404- Data set.
- 9505 Assessment 1 by 4 KM grid cell assessment for hydropower – temperature/precipitation.
- National Climate Assessment – NCA5.
- There is still a lot of information on human systems that we don't know – time consuming and time (left blank).
- We have grants and results - need to integrate and access data.
- Store/inventory data and knowledge.
- What kind of information exists and at what scale? How to learn from others about what works and successes that couple stakeholders' identified needs and successful research.
- Western water is very broad – need to develop a capacity and gap assessment across the west.

Whiteboard Notes from the sessions:




SITUATION
KNOW HOW TO STUDY HYDROLOGY
AMAZING NIFA GRANTS
NETWORK NOT SUPPORTED
NOT UNDERSTAND IMPLEMTATION NEW SOLUTIONS
HUMAN SIDE BARRIERS UNEXPECTED OUTCOMES
UNINTENDED CONSEQUENCES
E.G. MAR NTNL ACADAMIES STUDY
KANSAS STATE WATER LAW CHANGE
WESTERN WATER LAW AND ACCESS
LIMITED UNDERSTANDING ACCESS DISPARITY
UNDERSERVED COMMUNITIES FRONTLINE
PSYCHO SOCIAL POWER DYAMICS
MEDIA + WATER VISIBILITY
CONFLICT COOPERATION SPECTRUM
CLIMATE
CITY SOLUTIONS
MENT
E GOES
NETWORK
PONENTS
ATER MODEL
DOE
E LABS
NT CONFLICT


GRAB BAG
NCAR CONUS 404
9505 ASSESSMENT
NCAS DATA/DEFINITIONS
✓ BEEF BRIEF - KS WATER LAW CHANGE
SOLUTIONS JOURNALISM
CORNAP PUBS
SPAN
TRANSLATIONAL HYDROLOGY PANEL SUMMARY
SOLUTIONS
LIAISON W/STAKEHOLDERS
DETERMINE DIMENSIONS DEI IMP TO WWN
PAY LIAISONS
SPAN RELATIONSHIPS NETWORK
HOW TO WORK W POPULATIONS (EG TRIBES)
DATABASE PEERGE W/TRIBAL RELATIONSHIPS
EXTENSION AGENTS PLUGGED INTO WWN
EXPAND CAPACITY
GROW EXPERTISE WITH ACTIVE, AVAILABLE FOR MEMBERSHIP
DETERMINE ENTITY, MEMBERSHIP FEE, PARTICIPATION
TIERS - DATA, EXPERTISE, PARTICIPATION GIVE + GET BACK


SOLUTIONS
CONTACT BASE, KNOWLEDGE BASE
FACILITATED SUPPORT NETWORK
OUTWARD FACING COMPONENT - WEBSITE
USE FUNDING TO ENGAGE STAKEHOLDERS
MORE STRATEGIC ENGAGEMENT WITH EXISTING ORGANIZATIONS
EG BROADEN - AGU - CONNECT AGU TO COMMUNITIES
→TIER SUPPORT, INVENTORY, NMDWI, LIST OF RESEARCHER
LESSONS LEARNED
WORK SMARTER
LOOK OTHER WAY - TO CONGRESS, AND TO STAKEHOLDERS
WGA GO TO FOR WATER
INVENTORY - SAS GRANT SORTING BY
PAST RELATED PROJECTS TO BUILD ON
EVALUATION WHAT PEOPLE DOING ON LANDSCAPE - WATCH FOR WWW
EVALUATION EFFICACIOUS MALADAPTIVE
GO TO RESOURCE ANY QUESTION WATCH - CONNECT TO OTHERS (EG USGS, CLIMATE HUB)
CREAT NETWORK EVERYONE WANTS TO BE PART OF IT - IN SPACE OF WATER - How GET INVITED -
BREADTH UNDERSTANDING WATER IN ALL ITS FACETS PHYSICAL TO HUMAN, TRANSDISCIPLINARY - NO LIMIT
COME TOGETHER W/ DIFF DISCIPLINES
EVALUATE TRADEOFFS
& SELF IDSCAPE - DEI

Breakout Session on Planning for a Future with Uncertain Climate

Facilitator: Steve Buck

Attendees: Sri Pinnamaneni, Munib Inam, Nico Quintana, Nick Pates, Chris Ortiz, Mani Rouhi Rad, Dilek Uz, Daniel Mooney, Alex Maas, Medhi Nemati

Situation Assessment and Gap Analysis

Institutions involved:

- Bureau of Reclamation
- Universities
- ICWPR
- Army Corps of Engineers
- Water institutes in each state (Universities Council on Water Resources, National Institutes for Water Resources)
- Water centers
- W4190*** and other multi-state hatches
- State-level water regulators (water resource departments and other state agencies)
- Irrigation districts
- Ducks Unlimited
- National Wildlife Foundation
- US Geological Service
- National Institutes for Water Resources *** made up of administrators researchers people with funding for researchers
- Industry**
- Non-Profits**

Other Organizations: Do we need to invite representatives from these institutions to future conferences and give them a chance to sponsor, etc.?

- Army Core of Engineers: Need big projects and need to have research partners on these projects.
- Water institutes: Have access to all the faculty and can help recruit new members.
- Irrigation districts: Create their own tax and regulation.
- Tier institutions: Industry (stakeholders, corporate responsibility, vendor r&d), non-profit/foundations, crop consultants, research, non-profits for policy and advocacy research, state governments, federal, industry financial partners (Patagonia, Bechtel, Walton Family Foundation, Microsoft, Johnson and Johnson)

- Side question: Is it a Western Water Network's role to seek financial assistance from these entities?
- Industry R&D: This might be a quick win, financial investment to expedite their research and buy-in.

Institutional Issues/Policies:

- Bureau of Reclamation: Deep uncertainty, too many assumptions about what will happen; which sources of uncertainty, if we add constraints, will reduce the level of uncertainty.
- Existing Funding: Historically not a lot of water funding; can this group help with that?
- Data sharing: Economic value of new information.

Research:

- Conceptions of uncertainty: risk, ambiguity (unknown distribution).
- Beliefs about weather and climate: different stakeholders' beliefs, producer beliefs.
- Producer response functions: land-use decisions.
- Water management response functions: varying levels of sophistication.
- Interstate response functions: thinking about response functions at different decision making points.
- **Measuring sensitivity.
- **What data should we collect?
- Managing heat and water.
- ***Open hub to market and advertise data sharing (WWN data dump), the value of new information (data sharing), methods, and data management.
- Infrastructure needs in response to climate change/adaptation.
- **Speed of research to market.
- Interdisciplinary research for land use.

Teaching:

- How does extension faculty get their information out?
- How to design curricula for workforce development and research practitioners?
- Interstate collaboration among students.
- IGERT in USDA-funded space.

Extension:

- Cover crops, irrigation and tile draining, subsidies, and climate science communication.
- **Communication, what information are producers getting, and from whom ? An interesting area of research focuses on crop consultants.
- Groundwater and surface water management.
- Monitoring and reporting.
- Kent Messer CBEAR.
- Conference for some type of research presentation, drive recruitment.
- How can W-4190 and WWN complement each other?

Solutions

More partnerships: What larger entities can we attract to work with? What other funding is out there? Maybe from industry partners and do some of these people need to be invited to this conference to see the work and encourage investment? Do we offer sponsorship opportunities for them? How does collaboration look with their involvement?

Data sharing: All data is useful; we can determine the value and could help the speed of research. Data sharing hub with research partners, vendors, etc. needs to drive through marketing.

Research: How is this research quickly applied? How is it used to develop a curriculum that helps create a workforce? How is extension most effective?

Teaching: Interstate collaboration between students? More environmental issues addressed in undergraduate instruction (work with extension, specificity with WWN issues, etc.)? IGERT Model for Ag and Environmental Sciences.

Extension: One of the biggest issues is crop consultants and their communication with producers. What information are they giving and where do they get this information? How can we improve monitoring and reporting?

WWN Evolution: How can we drive recruitment of members and partners? How does it differentiate from W-4190?

Quick Wins to give WWN form:

1. Two-page briefs for each topic area + Vision paper.
2. Disseminate the briefs and vision paper along with personal invitations and conversations to join WWN. These conversations with invitees should include an "ask of" and a "benefit for" the invitee. For example,
    a. NIFA grant support for invitee & WWN,
        i. Training related to NIFA goals,
        ii. WWN graduate student exchange,
        iii. WWN data sharing repository, and

iv. WWN is a vehicle to market your research and results.

3. WWN subcommittee formation to research and design PPIC or JPAL-like research/policy institutes.
4. Designate universities as locations for a mobile WWN institute--CSU for a year or two, and then elsewhere.

Breakout Session on Valuing Environmental and Human Health Benefits in Water Management

Facilitators: Hope Braithwaite, Travis Warziniack

Situation Assessment and Gap Analysis

Policies:

- There were a number of policies mentioned (Endangered Species Act, Clean Water Act) that are used to protect nature and water systems. Much of the conversation seemed to talk about policies as a constraint to conservation and action, which is interesting given their original intent (protect the environment). Perhaps the issue is that the policies are outdated and inflexible.
- Some of these issues get at infrastructure needs and the disparity of infrastructure between communities, including tribal communities.
- Water quality:
- Municipal drinking water (and others) have to be treated to standards, but the ability to do that varies by the community (rich, poor, rural, urban).
- Some people are not on drinking water systems (wells) and don't monitor frequently. There is a disparity there. Also, drinking wells are tightly linked to septic systems.
- Septic systems are connected to other water systems (rivers, groundwater).
- Migratory communities.
- When water quality in canals and waterways ways is not up to par, often it is the poor communities that are swimming and fishing in them. This is in part a communication issue – reaching the most vulnerable.
- Health departments are important partners that might not already be at the table.
- Public trust, both in the quality of local water and also in the messaging and messengers, is important. When public trust is eroded, it takes years to get back.
- Non-ag benefits of water, but also a recognition that "ag" is very diverse:
- How much water is "enough" – for households, for various crops?
- This is partly related to block pricing of water and water as a human right. Sometimes talks of efficient water pricing might conflict with the ability to provide water for themselves and their livelihoods. One can imagine something like a backyard garden that allows a family to feed themselves or provide fresh veggies. What does more expensive household water mean for such families?
- Ag is painted with a broad brush, but there are nuances.

- Urban areas in a city – what are cities willing to give up (lawns?) but also do they understand their connection with rural farms and food production?
- Tradeoffs and values – water touches all parts of life. One can make a 'water-only' conservation decision, but that comes at the cost of many very important human benefits.
- Individual choices aggregate up to large impacts. The impacts of ag and "big business" are the product of individuals.
- Ecosystem services, e.g., cooling (shade), flood mitigation, instream flows, mental and physical health.

Education gap – where it [water] goes, how it is consumed, and how it is returned to the environment:

- There is a general lack of what water means and how much is used. The environment uses a lot of water to provide grasslands, for example. Ag uses a lot of water withdrawn, but maintaining the ecosystem is also a large use.
- The above goes to a general issue of lack of knowledge about things like the water cycle.
- The potential for change is quite small. Households might already be at the limits of conservation. This might also be true of ag, despite the large volume that it uses.

Solutions

Crop insurance

- Ag is about risk, and the traditional system does not allow for flexibility of innovation or conservation.
- It is hard to commit to new high-value or novel crops because crop insurance is based on proven yield. If you lose a crop and there is no historically proven yield, you cannot claim damages.
- More flexibility in insurance programs might encourage conservation and reduce externalities.
- Policy briefing, training, and community communication/outreach: Residential groundwater quality and quantity:
- This is often an equity issue because poor communities have older or less monitored systems. But… development in WUI is also often on wells and septic systems. These are generally wealthier communities.
- Address knowledge/policy gaps:
- Resources and training around what policies are and what their implications are. Maybe get research involved in the early stages of policy development
- There might be interest in regular white papers, policy briefs, and communication tools (infographics):
    - For example, groundwater
    - Human health

Breakout Session on Addressing the Educational Gaps

Facilitators: Robert Heinse, Derek Godwin

Participants: Jim Elkins, Val (Navajo), Climate Hub, Kendall (USDA), Jay Ham

Situation Assessment, Gap Analysis, and Solutions Combined

Jim Ekins:

- A lot of us are doing things; how to better network and share programs and materials. Realtor professional development is one example. IdahH2O and Project Web are the core of his work engaging K-12. Materials as a hub with spokes that allows flexibility in addressing all kinds of issues including introducing jobs in water. Professional development K-12 teachers. Publications and movies (educational videos). Moog for citizen scientists.
- Ideas for dissemination: podcasts, YouTube, Instagram.
- Time and funding are needed. (Podcasts and dissemination need support!!!)
- The gap in water education narrowed for the UCOWR meeting to limit the discussion to workforce development in the context of irrigation.
- Derek gave an overview:
- What scale are we talking about? All water employed people, watershed scale who all is involved.
- Disconnect between recruitment and future workforce needs. Agriculture is perhaps seen as too narrow, which leads to people not pursuing careers in agriculture.

Kendall USDA Ft. Collins:

- He used to hire farm kids in college for his workforce needs. They don't exist anymore. He trains them now. Most don't have any experience, but learn quickly. Students are on TikTok, we are not. Need to target them on whatever platform they are on (and that platform will change all the time).
- Some universities have abandoned traditional agriculture students by focusing more on environmental issues. Plus there all fewer farm kids to go around.
- History of discouraging ag careers (also in tribal context). Also in Latino communities. Ag is stigmatized as hard manual labor.
- Helping people understand the diversity of careers in agriculture. Make a map of the diverse water jobs within a watershed as a possible product. Watershed concept to talk about water jobs. Video tour that introduces people and jobs.
- Divergence in what is relevant to the new generation vs. the existing generation. Bridge gap between generational knowledge.

- Idea: Have young people produce content connecting the OLD knowledge and producing content relevant to their generation (service learning project).
    1. Connecting to youth
    2. Bridging the gap between operation knowledge and skills; upskilling

Jay Ham gave a presentation on upskilling. The module leads to certification (badge). Instead of a degree program, people get badges. Original focus on teaching the teachers.

- Digestible components. We need to educate people who are not in school…including the underrepresented (that is the only way they access education).
- How to standardize and accredit badges. Associations can do that. Make it free?
- Free access to the training, but you need to pay for the certificate. Employer works for the certificate.
- Tribes? No private companies come into tribes. DEI efforts attempt to connect to tribes (but maybe not particularly well-intentioned or sensitive). Lots of one-off interactions. No continuity.
- Navajo…mostly women farm (matrilineal). Training is internal. Women train women. The woman is the center; and head of household. Balanced life. Things in fours.
- Producers are busy. The universal design of learning… takes the essence and makes it transferable.
- Pair up faculty for six months with a producer (for example Australia; Ph.D. students do it for food safety). As faculty members, we wish that we had this kind of exposure and learning ability.
- Researchers need better connections to producers.
- Tools needed for producers; make it simple; combine apps. Help with decision making…soft skills program management, stress, and conflicting tasks that are not teachable in a science curriculum.
- How to train the workforce. Go talk to producers…what do they need? Talk to the industry and learn how they talk to growers. The synergy between producers and industry.
- It has to be adopted and used on the farm. Why is there no feedback from the industry communicating back to training programs? Why does training have to be ad-hoc rather than intentional? Which colleges have the best connections to certification agencies, industries, and programs?
- Advisory boards may be ineffective because board members are no longer at the forefront of development. So how can they help direct us toward the upcoming needs?

- Tribes have workforce issues just the same. At the end of the day, farms have to make money. There is a need, but there are barriers to trying something new. Why invest in employees if they are temporary?
- Is it our role to reach migrant workers; including training workers AND provide services to the families so that they can participate in the training?
- 2018 Yuma lettuce outbreak example. Farmers that got grants instead of looking at product, something that went against food safety regulations and practices was reported quickly and they were rewarded for reporting (worker was rewarded).

Equity: Who will have access to robotics? Future workforce needs. What will the workers do in the future and what do we need to train them for?

Information security: Data sharing is okay for farmers as long as they can see their neighbors ' data.

Anticipate future workforce needs: At the university level we need to integrate engineers, agronomy,… in short, unsilo. Ag engineering went away in a lot of institutions. ASABE and some universities that still have strong Ag Eng. Not many irrigation programs in the nation (Nebraska, USU, Davis). Death spiral; professors are missing, next generation of educators and researcher is not being trained.

Successful programs have strong industry partners: Broader impacts in grants make it difficult to compete for grants compared to environmental issues.

Programs that pair colleges with industry: Different paths for students to go towards RD, farm management. Cooperative work experiences. Should we re-develop cooperative education; or internship? Give credit for experiences rather than taking knowledge.

Water education programs: TAPS program: variable rate center pivot. Bring in, producers. Have a competition on several plots with variable rates. Awards for the highest yield, most waterwise, and most profitable. Everyone learns from other teams. Nebraska, replicated in Oklahoma and Colorado.

Breakout Session on Interstate Collaboration and Barriers to Transboundary Water Management

Facilitator: Kristi Hansen

Presentation by the Facilitator

Entities already working in this space

- Interstate Council On Water Policy
- Western States Water Council, Western Governors Board
- Council of State Governments West
- Army Corps of Engineers
- Bureau of Reclamation
- Colorado River Forum
- Great Salt Lake Commission
- Western Governors Association
- NRCS networks
- Internet of Water Coalition

Research Extension and teaching

- AFRI
- SARE
- State Extension and National Extension

Teaching Resources and making water-competent, civic citizens

- National Institute Of Water Resources (WIRRI)
- Tribes and Tribal Colleges (ten tribes partnership)
- Inter Columbia Tribal

Political Realm

- State Agricultural R. Leaders (SARL)
- PENWAR

Research Question and GAPS

- How to identify which compacts are “outdated” or “unsustainable” and which ones are “tweakable” for future success. Thinking about political and socio-economic feasibility. Flexibility, adaptation, blow it all up.
- Database of river and water compacts. What exists, and what is similar or different? (National Center for Interstate Compacts; CWP inventory of interstate compacts).
- Transfer Lessons from other basins and what networks should be responsible for it. International and domestic.

- How to change behavior incentives, and interplay between policy regulation and enforcement?
- How to move by norms versus regulation—is there a better option?
- Most problems are actually about water use: understanding spatial and temporal interactions.
- USGS is trying to address this via estimates on water diverted vs. use.
- Water used and "value," how do we recognize ecosystem services more holistically and push that out?
- Water need and when disutility of conservation becomes substantial.
- Transboundary water data (meters, groundwater, etc.). Think also about conjunctive use.
- OPEN-ET or Metric type remote systems for consumptive use of agriculture – consumptive use measures.
- How to make information public (water banks, transfers, etc.)?
- Understanding how drought affects water quality.
- Groundwater regulations and how they work.
- Do principles of physics/chemistry/etc. help us understand the world? (e.g. Mass balance). The core course is part of a liberal arts education (something akin to the core Economy).
- Understanding agency and sociopolitical power at each level of water use/policy decisions (farm->water district->state->federal->international al). "Principal Agent" problems at each level.
- Create a forum for "learning" space and knowledge sharing (maybe ICWP).

Take away points and what the WWN should do.

- Data Visualization that is digestible and useful.
- Sharing information (compacts, issues, lessons learned) via forums, reports, etc.
- Identify metrics by which we can evaluate current policies into 3 categories (working, not working-but fixable, blow it up, and try again).
- Create an open-access educational resources forum for the classroom, extension, and the community.
- Identify specific products and communication strategies (consistent messaging) for western water issues.
- Working with Jackie (CSG) to develop a water curriculum for policymakers.
- How we create community and empathy across user groups, and try to expand the community. (Can we even do this?)
- How do we disseminate through newer channels (beyond websites, which are necessary)? Active engagement vs. passive engagement
- Create an avenue for outreach, and define products.
- Can we create an incentive-based "ticket system" connecting experts to policy questions? Imagine $200 to an F&A account for each response, or some other incentive (media outlet).

Questions for …Bret maybe?

- What should WWN be? Housed at a university? Funding sources? National Extension on Climate Initiative as a model. A concerted effort from USGS 104b or 104g carve-outs.
- HOW CAN WE ASSIST?

Transboundary Breakout Session #1, Post-It Notes

What is missing or what changes do you recommend in the slide summary of situation/gaps?

- The possibility that compacts, etc., are NOT sustainable. (Consider political feasibility when evaluating incremental vs. transformative change.)
- Bringing in lessons from other basins is important, but not done often enough. Examples:
    - Tahoe water quality improvements (people there know how monumental the change was; others do not)
    - East Snake River Aquifer Basin
    - International examples are also important to bring in
- A mismatch between incentives and agency/aligning incentives with social objectives
- Governance, policy, and enforcement: interplay across scales; incentives in water management/policy/use.
- A better understanding of water USE (across sectors, time, geography)
- A better understanding of the value received from water use: WHY do we use water?
- How much water do we NEED, both for human and natural uses?
    - Consider ecosystem services and infrastructure here
    - Education on this point is important and needed
- Better DATA collection is needed: transboundary water data, collaborating across state boundaries, and existing entities; Examples of innovative ways to do this:
    - OpenET approach
    - Internet of Water Coalition
- More public information available on water markets and banks is needed (price is what's not readily available)
- EDU needed. Examples:
    - GW is part of the hydrologic cycle

    - Foundational grounding in water; core course for ALL first-year students in the water cycle, as part of a liberal arts education
- Research into the connectivity of water in different uses
- Policy research needed on transboundary water use:
    - Political will is often a bottleneck to needed policy change
    - Consider constraints: federal policy/obligations (e.g., ESA)
    - GW; differential effects of state policies on water use, aquifer withdrawal

Transboundary Breakout Session #2, Post-It Notes

Initial prompt: Of the transboundary gaps raised in Session #1, which ones could/should WWN take on? Which gaps could WE [in this room] take on?

Prompt developed organically by the group: What should be done to address the issues raised in Session #1? How can WWN assist?

- WWN is a Forum for sharing information/stories/experiences across basins. ICWP and CSGW as partners in this task because they endeavor to do the same thing for their members.
- Research: Evaluation of outdated vs. tweakable Compacts.
- In addition to Forum, something more tangible: WWN could provide a resource on Compacts (again with ICWP and CSWG because they endeavor to do the same thing for their members).
- WWN as convener between entities.
- Data visualization.
- Forum/data visualization/sharing case studies/stores as a source for education/extension modules; “open access education resource” as a potential repository for these materials.

Participant suggestion to re-center on HOW WWN can assist:

- Extension Climate Initiative as model/collaborator.
- Funding resources: 104bs, 104gs.
- Products/forum to inform public policy.
- WWN needs a well-thought-out communication strategy.
- WWN could provide consistent messaging on transboundary water issues/water management challenges (i.e., key talking points) for its members/states who do not have time/bandwidth to focus.
- EDU: general education courses on water, developed and shared. U. of AZ has funds for this type of module.

- CSG West does continuing education courses for its newly elected officials. WWN is a resource for these courses, towards the goal of building knowledge; tribal perspective is hugely important for these continuing education courses.
- Incorporate tribal perspective (ideally tribes would provide this perspective).
- Who does WWN want to engage/communicate with?

[Back to HOW….]

- Educate/create empathy among/across user groups.
- Website is the end product? No! Discussion of passive vs. active engagement approach.
- What is the envisioned WWN organizational structure? WWN needs to consider whether it is pushing products, events, research products, reports, or what. WWN needs to decide HOW it will engage.
- Return to the role of WWN: Match experts with those in need of information/knowledge/resources. Water center ticket system as a model. Maybe have a $500 reward for answering a question, or maybe media exposure is reward enough.

WORK SESSION 3 – PULLING IT ALL TOGETHER
(afternoon plenary session)

Kristi Hansen's Notes

Observations from the floor on the five breakout groups.

- Across the sessions, the research is there, the research has been done. The challenge is to disseminate, in extension and education realms. That connection seems to be missing, or somewhat missing.
- We discussed this in our group, too. We discussed how to integrate and disseminate research.
- Kristi was pushing for an early win. From our group, we discussed a comparative analysis of compacts—what works, what doesn't; which compacts are resilient, and which ones are not?

What other early wins from the other groups, would launch the network?

- Sharing information.
- A lot of research is going on. How do we use it? There's not as much reward for sharing in academics as there could be. I am looking for connections from this group to be more powerful. We need to do things differently; sharing and working together, in our teaching and with our on-the-ground applications.
- Our group talked about having an open-access education tool.
- The dairy CEO complained about changing crop patterns. I provided an answer. Idea of a ticket system, to facilitate information transfer from experts to people in need of information/ resources.
- Facilitator's Question: If you go home and report to somebody on what happened today, what would be the one report-out that you would most want them to understand?
- A ticket center is a great idea.
- I learned the value of a regional network, in providing value to other regional entities who focus on policymakers and/or state agencies (rather than the researchers/extension professionals that represent the core membership of WWN).
- This network is important because we don't know a lot about what other people are doing in the water. I think this network can be project driven. Takes critical investments in infrastructure and human resources. SNOWTEL data, e.g., but not compatible across types/systems.

How to Build out the WWN

1. **How to succeed in the recruitment of participants in the WWN?**
    - WERA. The funding for WERAs is from AESs, but you don't have to have an AES appointment to participate.
    - Seeking people who bring value to our organization, especially at this early stage of growth.

- Use UCOWR/NIWR meetings as a recruitment technique.
- Participation is free and by personal invitation, snowball strategy.
- Drought Learning Network. The people we kept and were working actively, are things that were already in their work plan, that the network will help them do. So, identifying what the WWN is going to do. We used a constellation model to build our teams.
- Identifying groups that represent stakeholders. Lean in on those names that you are already compiling. So, rather than recruiting stakeholders at an individual level, recruit>>>[text is missing].
- Work toward the next WWN meeting at the UCOWR/NIWR 60th anniversary meeting in St. Louis.
- Is St. Louis a good location for a meeting? Ginger's response: I've been wondering about that too. The only way it works is if WWN sponsors lots of sessions at St. Louis.

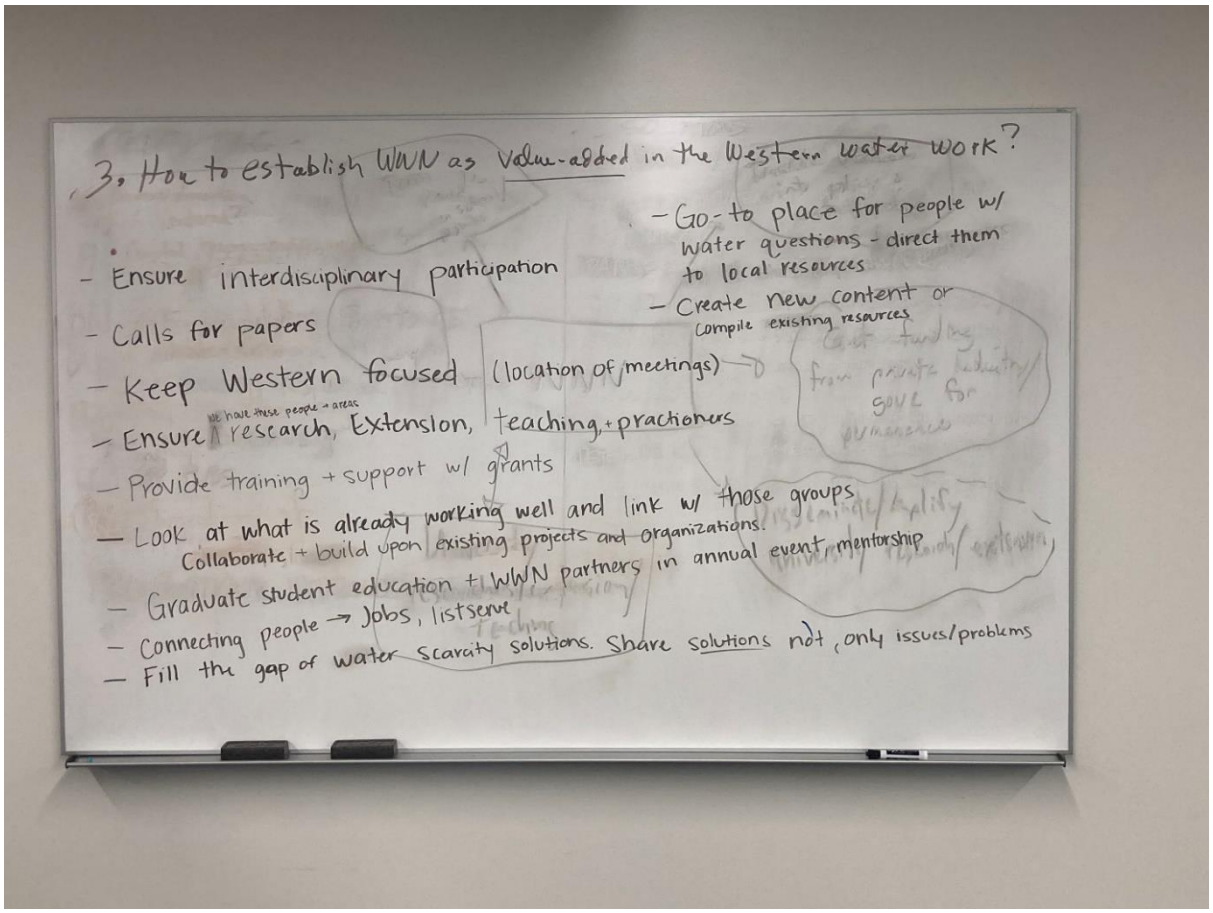
2. **How to secure funding for setting up and long-term operation?**
    - Seek private-sector financial support.
    - Charge people to attend meetings.
    - Charge institutions for membership? Brad: This is how our center operates. $5k per institution, and we have 14 institutions.
    - Secure funding ASAP.
    - Five FTEs, for WWN development and grant writing.
    - Water Re-use Assn, lots of funding from ag-tech firms, industry, etc. We can't tap into them because they have shifted over to indirect potable water. Tech firms supporting precision ag looking for ways to support it.
3. **How to establish WWN as value-added in the West?**
    - The value that Dannele sees in this group: ensure interdisciplinary participation.
    - Foster Extension participation.
    - Ensure balance between research, extension, teaching, and practitioners.
    - WWN could sponsor training for NIFA grants, especially interdisciplinary teams. And maybe charge for them.
    - The idea is to focus on solutions. (We have lots of discussion of challenges/problems.) Working to fill in the gap in the solution space. This could be a place for the network to go in the future.
    - Early success: success stories. WSARE
    - WWN as a one-stop shop for…everything water-related? Or as a stop for connecting people to resources/other people? The latter.
    - Create content that lends credibility. Creating original content rather than rehash would be useful.
    - Would university accrediting bodies accredit something like a water certification program? What are the standards? We need to explore

options. That could be a value-add, having WWN be the certifying agent for what that might be.

- This [point directly above] was the model of the 406 programs. It was branded as a regional output.
- WAAESD office provides support to the [western region academic programs]. They are interested in some sort of badge in water. Beyond continuing education, some sort of coursework. If WWN moves forward with this, I would connect WWN with that academic programs office.
- Early wins are what WWN needs. Who is going to do this work?
- Another challenge is to develop products with WWN attribution.
- We talked about a whole lot of stuff today. What are the things we need to move forward? (How a bill becomes a law.) What can we deliver, conditional on getting resources moving forward?

Hope Braithwaite's Notes

- Ensure interdisciplinary participation.
- Calls for papers.
- Keep Western focused (location of meetings included).
- Ensure we have the people and areas of Research, Extension, Teaching, and practitioners.
- Provide training and support with grants.
- Look at what is already working well and link with those groups,
- Collaborate and build upon existing projects and organizations.
- Graduate student education and WWN partners in annual event mentorship.
- Connecting people with jobs, listservs.
- Fill the gap of water scarcity solutions. Share solutions, not only issues/problems.
- The go-to place for people with water questions – direct them to local resources.
- Create new content or compile existing resources?



Steve Buck's Notes

Here is a list of questions generated by the audience in the bigger session in the afternoon:

- Areas of water focus? Should/will WWN start with a narrow focus? For example, ag water?
- Should WWN identify a bigger concept? e.g., mass water balance?
- What is WWN's audience? Water-users? Policymakers? Academics?
- How will directors use WWN? Method to support funding allocation as it becomes available?
- Will WWN be human-dimension-centered? Coupled human-environmental systems?
- Statement from ICWP: Academic institutions are a driver of the network.
- What is the big "Why?" for WWN?
- Can WWN leadership identify a timeline of milestones?

Travis Warziniack's Notes

On the Visioning Paper

The big "Why?" of the WWN:

- To aggregate scientific information and provide a tool for experiment stations and decision-makers (and funders like NIFA looking for direction) tied to water security in the West.
- For science members: To amplify the impact of their research and to build networks for co-produced science and solutions-driven science.
- Networks [like WWN] combine actions and outcomes across scales. Local decisions move through the network and the network sometimes defines the scope of local decisions.

Framework: Water in = Water Out

- Within this framework, we see obvious questions and hurdles:
    - Paper vs. wet water
    - How do we define consumptive use?
    - What are the institutional constraints?

A multitude of beneficial uses defines western water. Are we moving out of a world of "types" of water? Is there a difference in water for ag vs. water for cities?

Communications (maybe this is what we are about, rather than doing). Communication outward, but also some understanding of how human behavior and institutions might link to hydrology (and food provision).

Conclusions of vision paper:

- Timescale and next steps: This will be in the vision paper.
- Coordinating framework.
- Is WWN a network of academic institutions with the intent to reach out to managers (I think not – I think we want managers in the network)?
- Members: Who are they and how can we get them together?

Acknowledgments

We extend our gratitude to all the participants of the 2023 Western Water Congress who generously shared their expertise and allocated time from their busy schedules to participate in this meeting. Your active involvement and thoughtful contributions were instrumental in making the Congress a success.

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Furthermore, we want to extend our thanks to the funders of the Congress whose willingness to invest in improved collaboration 'at scale' made this gathering possible. Your support enabled us to bring together a community of stakeholders, researchers, extension specialists, and educators to collaboratively work toward enhancing water security in the West.

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As we reflect on the remarkable journey of collaborative efforts already underway, we are inspired by the value of coming together to address western water security challenges. Through continued partnerships and shared vision, we believe the challenges can be met to create a resilient and sustainable future for the region.

Thank you all for being a part of this important work.