Western Water Assessment 2013 Stakeholder Meeting

WORKSHOP REPORT

November 13, 2013
Boulder, Colorado
Cooperative Institute for Research in Environmental Sciences

Edited by Elizabeth C. McNie, PhD
Contributing authors: Elizabeth McNie, Eric Gordon, Jeff Lukas

CIRES
Western Water Assessment
University of Colorado Boulder

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Word cloud of most common words used in WWA Stakeholder Meeting. Produced through www.tagxedo.com.

I. Purpose of Workshop

Western Water Assessment (WWA) is in the process of preparing a proposal for its next round of funding from the National Oceanic and Atmospheric Administration (NOAA), a process WWA undergoes every five years. This workshop was intended to serve two purposes. First, WWA wanted to share its successes in research, outreach and education over the past year, and highlight some of its more recent work, including responses to the epic rainfall and associated flooding in Colorado in September 2013. Second, WWA wanted to listen and engage with stakeholders in order to understand their climate, natural resource, and water-related challenges. By understanding these challenges, in addition to related goals and outcomes stakeholders seek to achieve, WWA will be able to shape its research agendas and priorities in ways that will result in better decisions in stakeholders' communities and organizations. Ultimately, development of these research agendas will inform the development of its rebid proposal to NOAA in 2014.

The main objectives of this workshop was to:

- Shape Western Water Assessment's future in collaboration with its stakeholders
- Demonstrate the scope and depth of WWA's activities and accomplishments during the previous year
- Identify major challenges and opportunities driving climate, natural resource and water-related challenges in the Intermountain West, in various sectors, and in stakeholders' organizations

- Clarify and describe stakeholders' desired outcomes and goals that they would like to pursue – in association with Western Water Assessment – in the next three to ten years
- Identify specific outputs that are needed to support achieving the outcomes described
- Identify possible collaborators and other actors who need to be engaged in producing the outputs and achieving the outcomes

This workshop was not intended to:

- Scope out specific research projects in detail
- Select winning or losing ideas or projects
- Eliminate ideas or opportunities
- Complete WWA's rebid proposal for NOAA

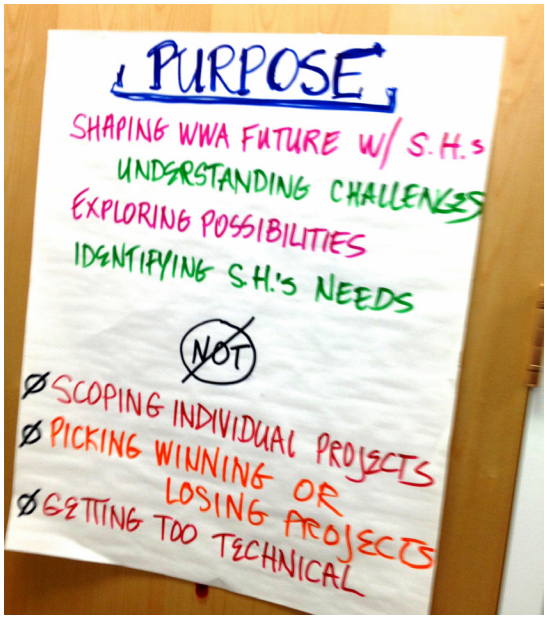


Photo credit: Elizabeth McNie

Breakout session discussion. Photo credit: Elizabeth McNie.

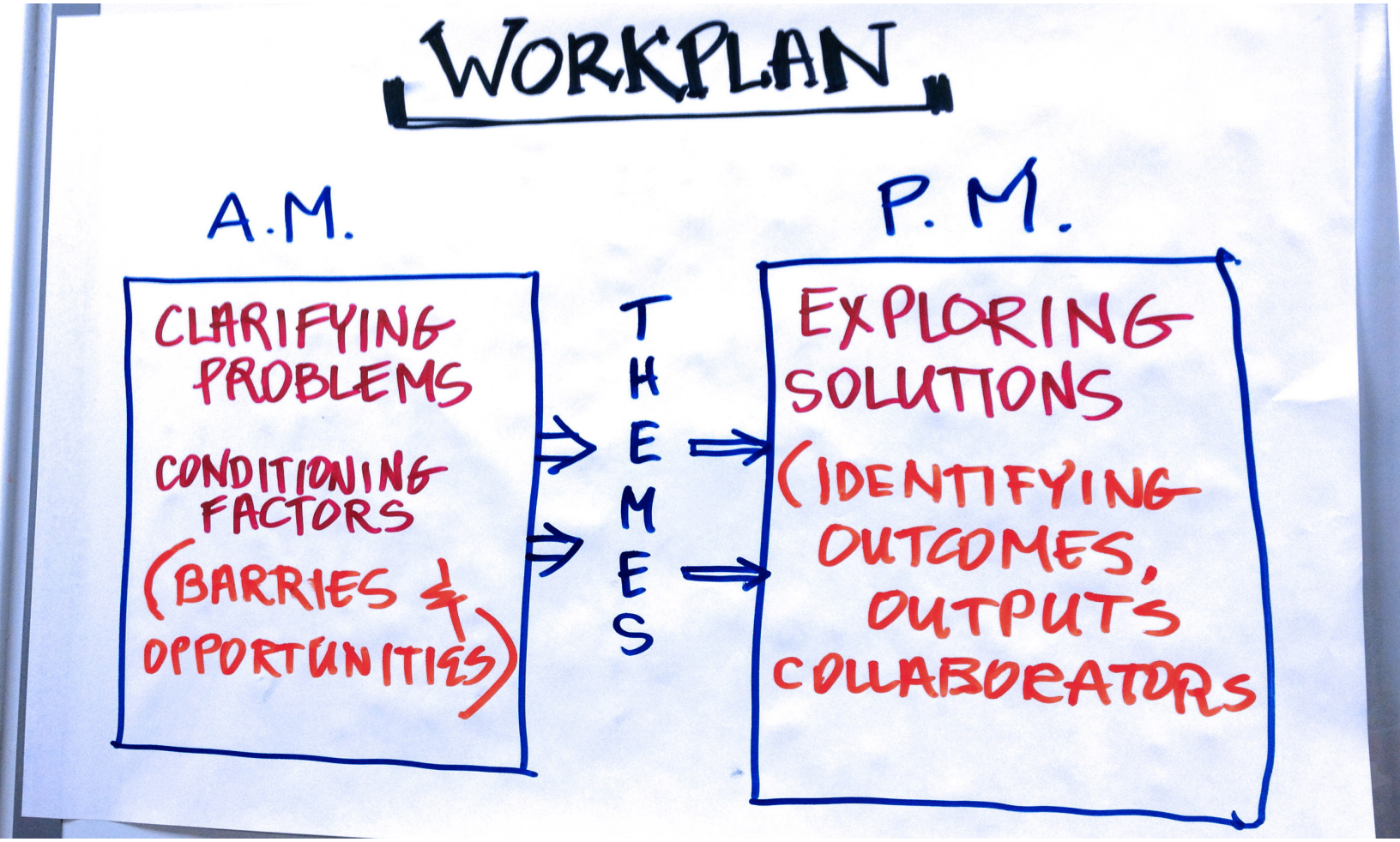
II. Western Water Assessment Accomplishments

The workshop began with an hour-long presentation by Eric Gordon and Jeff Lukas on WWA accomplishments since the previous stakeholder meeting, held in October 2012. This presentation was intended to provide meeting attendees with an overview of WWA's most recent work in order to set an appropriate context for the discussion that would take place later in the day about future research themes for WWA.

The accomplishments presentation included:

- Internal organizational structure of WWA staff and team
    - Includes new faculty associate directors Lisa Dilling and Noah Molotch
    - Includes new team members Elizabeth "Bets" McNie and Imtiaz Rangwala
- Awards and recognitions for WWA
    - CIRES Outstanding Performance Award (Lukas, Bardsley, Gordon)

    - Department of Interior Partners in Conservation Award (Barsugli)
    - Colorado Governor's Award for High-Impact Research (Wolter)
- Research publications (15 peer-reviewed papers and 14 book chapters)
- Rapid response to Front Range flooding of September 2013
- Specific Projects
    - Snow, Dust, Beetles, and Climate
    - Extreme Dust and Climate Change
    - Energy-Water Nexus
    - Guidance on Downscaled Climate Projections for Decision Making
    - Understanding Local Climate Knowledge
    - Decision Making Under Climate Uncertainty
    - Drivers of Adaptation in the West
    - Wasatch Front Paleohydrology
    - Adaptation Guidance for Salt Lake City
    - Media Coverage of Colorado River Discussions
    - Evaluation of Climate Services
    - Intermountain West Climate Dashboard



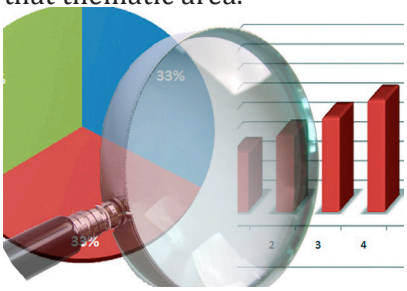
Abridged Agenda . Photo credit: Elizabeth McNie.

III. Identifying and Describing Challenges and Opportunities

- *Climate Change in Colorado* Update
- Colorado Climate Change Vulnerability Study
- Climate Literacy Outreach

Stakeholders were asked to identify the major challenges that shape climate, natural resource and water-related problems and opportunities in the Intermountain West, in their respective sectors, and in their organizations. Conditioning factors could be driven by economic, political, demographic, financial, environmental, technical, social, and demographic factors, etc. These factors can manifest themselves both as challenges to be overcome and opportunities to be pursued. Understanding the various conditioning factors informs our understanding and development of desired goals and outcomes, as well as the kinds of outputs needed to achieve the outcomes. Eleven major themes were identified, and then stakeholders were asked to 'vote' for two themes they believed were most relevant to their own work. Stakeholders expressed some frustration at not being able to vote for more than just two themes, and so the low

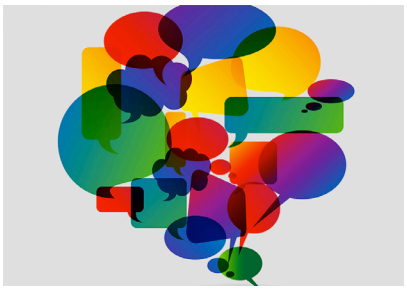
number of votes for some themes does not adequately reflect the overall interest of the stakeholders in that thematic area.



The following list includes a description of each of the themes and, in parentheses, the number of votes each of the themes received.

1. Data gathering and monitoring (2)

Financial and technical constraints continue to limit researchers' abilities to gather critical data and conduct monitoring of key environmental and hydrological conditions. These challenges affect the ability of resource managers and utility operators from improving skill and near-term forecast abilities. Other challenges concern the fact that access to data is difficult, not necessarily because it doesn't exist but because data are scattered across multiple agencies and departments.

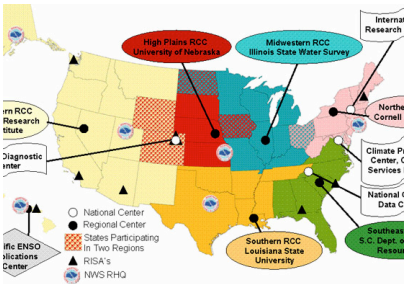


2. Messaging and communication (2)

Communicating climate science information, and particularly topics such as uncertainty, risk, and impacts, continues to be difficult. Not only are stakeholders and the public bombarded by multiple and at times contradictory messages (and inaccurate information propagated by some special interests), but the nature and complexity of climate science adds to the inherent difficulty of improving public understanding of climate change. Lack of public understanding of climate creates challenges for some stakeholders as the public continues to expect the same performance levels and operational features despite climate variability and change. Alternatively, extreme events, in the form of fires, floods, heavy rainfall, drought, etc., can lead to a more receptive public, creating opportunities to communicate climate science to a broader audience—though in nearly all cases these extreme events cannot be conclusively linked to anthropogenic climate change, and the messaging needs to reflect that.

3. Institutions, policies, water rights, markets (2)

Water policies, water rights, and related institutions continue to pose major challenges to implementing and managing water resources more efficiently and equitably in the Intermountain West. Emerging issues related to the linkages between water and energy production create additional challenges for water managers. Improving understanding of water markets and development of more robust institutions could create new opportunities for stakeholders to improve access to water and improve efficiencies.



4. Coordination of regional climate service entities (7)

In the absence of a coordinated National Climate Service, US federal agencies, states, and intergovernmental organizations have created new networks of entities to assess climate variability and change, and provide climate information to a wide variety of stakeholders. The proliferation of such entities leads to both barriers and opportunities for stakeholders. One the one hand, more climate-science information (content, scale, format, etc.) is available for stakeholders and the general public than ever before. On the other hand, stakeholders find it difficult to navigate an increasingly complex environment, leading to challenges in finding relevant information and understanding more broadly the relative strengths and weaknesses of information sourced from different entities. This crowded landscape of climate service entities leads to questions about their value, effectiveness, and

redundancy.

5. Ecosystem services (1)

Healthy ecosystems provide numerous quantifiable and non-quantifiable values to the public through services such as clean water, biodiversity, timber, aesthetic value, tourism, etc. Current understanding of linkages between the various components of ecosystem services remains weak. Improving our understanding of ecosystem services, developing better accounting mechanisms, and forging stronger institutional capacity could lead to opportunities for stakeholders to improve management and efficient use of natural resources while maintaining other ecosystem values.

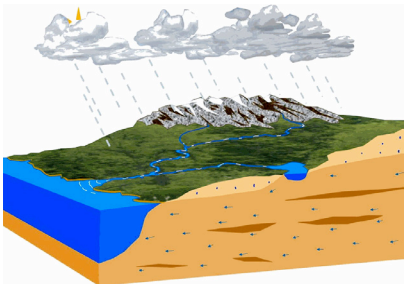
6. Linking science to decision making (13)

Linking climate-science information to decision making remains a challenge. Some of the barriers involve aversion to using new information to inform decisions by some decision makers in organizations, sectors, or departments. Improved skill in forecasts has not necessarily led to their use in decision-making, suggesting that organizational and behavioral factors inform these challenges more than the quality of the information alone. Other challenges center on the limited relevance of information; information may reflect conditions at the wrong scale, arrive in a less timely manner than decision makers need, or be too complex to be adequately integrated into existing decision making models and operational frameworks. Stakeholders also noted that the proliferation of climate-service related entities (see challenge #3) could create new opportunities for improving the production of more relevant site- and sector-specific information.

7. Water demand and use including competition (1)

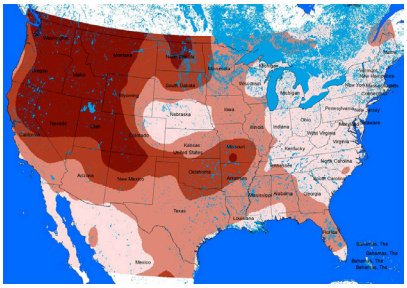
Quantifying water demand, and more importantly, water supply remain significant challenges to better management and more efficient use of water resources. A National Water Census is underway, but stakeholders see potential problems with the census, believing that the project lacks resources and technological capacity to adequately gauge water supply, demand and use. Stakeholders also note that even within the heavily-studied Colorado River system, we still have numerous unanswered questions that limit efficient use of water resources.

8. Forecasting water supplies and hydrological models (10)



Stakeholders, particularly water utility managers and US Bureau of Reclamation operations managers, identified the lack of shorter-term river forecasts and poor skill of some forecasts as challenges that limit their effectiveness of efficient management and allocation of water and hydropower resources. Specifically, stakeholders identified the limited availability of five to seven-day forecasts, monthly forecasts, and forecasts extending from six months to a year with sufficient skill as challenges.

9. Climate model projections (2)



In principle, models can aid in decision-making that leads to better outcomes. But stakeholders noted that with the proliferation of increasingly complex climate models comes increased ambiguity about their construction, value, purpose, skill and utility. A lack of a framework in which to compare and evaluate different models also limits stakeholders' abilities to identify and leverage the best models for their needed applications.

10. Extreme events: flood, drought, fire (1)

Extreme events pose significant challenges for efficient management, conservation and use of natural resources. Our scientific understanding of the complex feedback mechanisms between these events and their impact on ecosystems and ecosystem services remains poor. Such events disrupt regular management and operations, thus creating challenges for stakeholders to balance their customers' expectations regarding service delivery with adjustments that have to be made as a result of extreme events.

11. Dust, beetles and other drivers of landscape changes (1)

Black carbon, dust-on-snow, and the extensive die-off of pine and spruce forests drive changes in landscapes in many ways. These factors cause changes to the rate and timing of snowmelt, to hydrological conditions, ecosystem health, biodiversity, and to ecosystem services. These challenges then affect hydropower production, water availability and quality, tourism, timber production and many other sectors. We still have only limited understanding of how these drivers affect landscape processes, and more importantly, how to translate research findings into usable information for decision makers.

Breakout session discussion. Photo credit: Elizabeth McNie.

IV. Developing Outcomes and Identifying Outputs and Actors

After identifying the eleven challenges listed above, the workshop facilitators aggregated some themes into single 'breakout tables', while other themes were assigned more than one 'breakout table'. Two 45-minute breakout sessions were held with the goal of populating each breakout table with approximately 3 to 8 stakeholders during each session. Stakeholders self-selected breakout tables to join. Every stakeholder was able to participate in a breakout table that represented their first choice of themes. The following breakout groups were created based on the themes identified above:

- Data Gathering and Monitoring & Water Demand, Use and Competition
- Linking Science to Decision Making & Messaging and Communication (2 groups)
- Institutions, Policies, Water Rights and Markets
- Coordination of Regional Climate Service Entities (2 groups)
- Forecasting Water Supplies and Hydrological Models & Climate Model Projections (2 groups)
- Ecosystem Services and Extreme Events: Flood, Drought, Fire & Dust, Beetles and Other Drivers of Landscape Changes

Definition of terms (See Appendix III for definitions of outcomes and examples of outputs):

- Outcomes were defined as some expression of a value and desired future state or condition, such as improved understanding of climate science, resources conserved or saved, losses avoided, political influence exercised, etc.
- Outputs were defined as objects, actions or events that are necessary to aid in achieving identified outcomes.
- Actors were defined as those people or organizations that need to be engaged in the process of achieving the outcomes.

Stakeholders were asked the question:

"Given these challenges, what are your organization's desired outcomes and goals that you would like to pursue – in association with Western Water Assessment – in the next three to ten years?"

They were tasked with brainstorming solutions, and to not edit nor eliminate possibilities based on the capability of Western Water Assessment to contribute to such outcomes. The idea behind this request was to ensure WWA identified the most accurate and complete set of desired outcomes, but also identify new, and as yet, untapped opportunities for WWA, as well as opportunities for new collaborations. After developing a list of outcomes, stakeholders were asked to identify outputs necessary to achieve the outcomes, as well as those actors and entities that would need to be engaged in achieving the outcomes. What follows is a complete and unabridged list of the desired outcomes, outputs, and actors that were captured in each breakout group.

A. Data Gathering and Monitoring & Water Demand, Use and Competition (themes 1 and 7)

Outcomes:

- Improve understanding of water systems including surface water – groundwater interactions. Improve extent and quality of data gathering and monitoring.
- Improve stakeholders' understanding (both today and in the future) of water supply, demand, and use; surface and groundwater interactions; concepts of sustainability; limitations and opportunities of various models.
- Quantification of future groundwater use in terms of future demand.
- Better understanding of what sustainability means, what tradeoffs are required.
- Identification of decisions that can no longer be made if monitoring sites are removed.

Outputs:

- Educational material that describes how to manage 'big data'.
- Downscaled Water Census for the Colorado River. Use multiple credible sources (state, federal, WWA, etc.) to ensure quality of data and make census publicly available in usable formats. Include quantification of future groundwater use in terms of future demand.
- Reconcile existing multiple definitions of water use, and standardize reporting so anyone can use it for their own purpose. Existing definitions result from historical and legal differences. Ensure

information is presented in a usable format for stakeholders.

- Evaluate relevance, validity and reliability of key metrics and indicators currently used.
- Communicate need for funding data gathering and monitoring efforts and how these efforts can inform improved management of water resources. Identify how removal of specific monitoring sites will adversely impact decisions and management practices. Possible activities include lobbying Congress, public outreach and educational material produced by WWA).

Actors to Engage:

- Consumers of data (NGOs, state and federal agencies, utilities and their customers)
- Entities that collect data (municipalities, etc.)
- Consortium of Universities for the Advancement of Hydrological Science
- Biological, recreation, energy and other communities

B. Linking Science and Decision Making & Communication (themes 2 and 6)

Outcomes:

- Decision frameworks are flexible and can incorporate new climate-related information.
- Uncertainties of the science are represented in planning processes and documents (e.g., forthcoming State Water Plan).
- Improve management of public expectations concerning natural resources management in the face of climate variability and change and related risk and uncertainty.
- Develop political leverage for water managers to improve support for the implementation of management and operational schemes.
- Enhance resource managers' understanding of and engagement with climate information in planning processes and improve their awareness of how climate information is already embedded in their operations and decisions.
- Create are more flexible linkages, in both directions, between the scientific information used as inputs to decisions and the decision processes (i.e., the latter are less deterministic).
- Improve and depoliticize communication of climate science and projections in straightforward, less technical messaging and storylines.
- Identify 'no regrets' actions for responding to climate variability and change in the future.
- Ensure technical capacity, including measuring and monitoring 'the right things', is deployed to best meet decision-support needs.
- Research and synthesize where climate information is going, to whom, where, and how it is being used, e.g. using network analysis.
- Research questions and agendas are informed by decision needs.

- Science is effectively translated to multiple, different levels of understanding.

Outputs:

- Climate Variability and Change 'Presentation Packet'. This packet is designed to help stakeholders communicate concepts of climate science, risk, uncertainty and the use of projections in the management of natural resources to their customers. It will communicate concepts such as "past performance is not necessarily indicative of future returns", identify and clarify what we know and don't know about climate science. It will include a section of 'FAQs'. It will include a list of uncertainties.
- presented in a hierarchical format. Tailor the packet for two audiences including the public at large and savvy intermediate users.
- Deconstruct complexity and scenarios and data. Tailor this message for respective audiences ("What is important for 'me'?").
- Presentation and discussion on "least changed" cases. It can be useful to talk about the best-case scenario with respect to climate change (least changes), stakeholders aren't turned away by talking about worst-case and potential dramatic changes.
- Localized products. Will include fact sheets, briefs, tools, and action items targeted to specific local issues and audiences.
- Produce information focusing on preparedness and actions for climate change, not just impacts of climate change.
- Outreach to audiences beyond the 'water wonks' at water conferences; e.g., elected officials and others.
- Engage with stakeholder communities to help frame research in a language that they understand.
- Targeted engagements with decision-makers, e.g., State House committee meetings, vs. maybe reaching a few state legislators at a water conference.
- Create climate 'storylines' that are constructed specifically to support planning processes.
- Workshop hosted by WWA on how to Communicate Climate Variability and Change. Aimed at savvy decision makers such as federal, state and municipal entities who want to improve their public outreach and education efforts to their customers.
- Outputs with multiple levels of outreach based on the same information, e.g., (a) CO Climate Report, distilled into (b) Executive Summary and (c) 1-page handout, and released via (d) workshop.
- Workshop on "best practices" in the use of climate science in planning.
- Use mass media strategically to increase coverage of local and regional climate-change issues.
- Outreach on the Snowmelt Perturbations project.
- Briefing co-convened with NC CSC on the National Climate Assessment release in spring 2014.
- Workshop on how and why CMIP5 differs from CMIP3 and implications for hydrologic and ecologic modeling.
- Section in Colorado State Water Plan on implications of climate change projections.
- New planning frameworks that facilitate the outcomes described above.

Actors to Engage:

- Federal, state and municipal utilities and water managers
- Irrigation districts
- NCAR (climate change translation, e.g., G. Meehl)
- River Forecast Centers
- UT/WY EPSCOR Hydrological Modeling effort
- University of Wyoming
- NCPP project
- RAND for scenario planning
- Smaller entities with less technical and adaptive capacity
- NGOs
- The public living in the watersheds
- Colorado Municipal League (CML), Colorado Counties, Inc. (CCI), councils of governments (COGs)
- In forums and processes that connect and coordinate multiple levels of stakeholders (local, state, Fed) – the Fed, especially, is often not well connected to the other levels
- Non-traditional sources of social capital such as the LDS in Utah
- USGS Policy Analysis and Science Assistance (PASA) program
- Key science journalists in the region
- Colorado Foundation for Water Education (CFWE)
- Trusted local spokespeople on science issues, e.g., weathercasters
- University water centers, e.g., Colorado Mesa Water Center

C. Water Law, Rights, Institutions and Markets (theme 3)

Outcomes:

- Increase efficiency in how water is allocated, including to agriculture and in-stream uses. Current water law results in inefficient water allocation (see for example Weld County shutdown of wells).
- Get the broadest social payoff of water, not just monetary use but other value demands such as ecosystem services.
- Improve flexibility of water operations (e.g., let ditch companies shift water more easily to where it is most needed).
- Reduce costs of water transactions. Having to go through water court and related review by division

engineer is time consuming and costly.

- Improve understanding of surface and ground water interactions.
- Improve linkages between climate projections and long-term planning of water resources management and operations.
- Increase the quantity and effectiveness of water markets.

Outputs:

- Create public and transparent framework to share price of water and participants in water transactions.
- Research how possible climate-change scenarios will alter the value of water and incorporate into models to improve estimation of future water prices.
- Workshop and/or report for water-rights holders that communicates key climate science issues in 'non-jargony' terms and other information about forecasts that clarifies the value of water rights.
- Research to identify how water is used, and what the benefit would be if more climate information were available, and how to make that information more available if it is useful.
- Clarify to agricultural users what information is available and then put the information into a usable format.

Actors to Engage:

- People who can translate technical climate information
- The agricultural community to ascertain their needs
- Water law experts
- Managers of agricultural- municipal water transactions
- M&I providers with less reliable supplies
- Agricultural extension agents
- Farmers
- Large companies involved in water

D. Coordination of Regional Climate Service Entities (theme 4)

Outcomes:

- It is clear where to go and who to talk with to get data.
- Stakeholders' needs are efficiently shared among all climate-service providers.
- Stakeholder fatigue caused by serving on committees, attending meetings and performing service with climate-service entities is kept to a minimum.
- Stakeholders are well informed about the activities of climate-service providers.

- Efficient coordination between climate-service providers enables stakeholders to receive the best sound science available for more robust results.
- Science and research agendas are coordinated across organizations.
- WWA plays a leadership role in coordinating resources.

Outputs:

- "Dummies Guide to Federal Services". A comprehensive explanation to users of what various entities (LCCs, CSCs, RISAs, etc.) actually do.
- Matrix of activities and roles.
- Outreach through newsletters,, not from single organizations but perhaps combined efforts.
- WWA-facilitated meetings, disseminating and sharing lessons learned and leading by example.
- White papers that summarize roles on a regional scale (for those not yet connected). Knowledge of who does what and who is the output geared towards.
- Layered approach needed.
- Social Networking events to get the right people together.
- Engage.

Actors to Engage:

- Representatives from each group (WWA, CSC, LCC, etc.)
- University-based groups
- Socioeconomic survey people, Colorado College for example
- Weather and climate focused research groups
- Engage the regional climate service providers first and then use their networks to engage others, including university research groups

E. Extremes, Disturbances & Ecosystem Services (themes 5, 10 and 11)

Outcomes:

- Improve management of taxpayer-financed resources.
- Improve resilience in managed resources and complex and coupled social-ecological systems.
- Non-market and environmental values are identified and quantified.
- Ecosystem considerations are broadly incorporated into decision-making.
- Reduce vulnerabilities to inevitable disturbances and extremes.
- Improve efficient use of long-term resource investments, land use (e.g., permit holders on USFS lands)

and maintaining flexible terms and conditions.

- Improve understanding of extreme events and disturbances.
- Improve planning to include both short and long-term priorities.
- Improve understanding of larger-scale systems and connections (e.g., forest and water).

Outputs:

- Synthesis & Assessment Report at Regional and Landscape Levels.
- Include human managed systems and societies.
- Translate relevant climate information to the scale of human operations and actions for application in county and local government land-use planning.
- Communicate concept that ecosystems are non-stationary.
- Educate public about concepts of disturbances and that they are part of our natural and socio-ecological systems.

Actors:

- NGOs (e.g., TNC)
- County and local governments
- National Interagency Fire Center (NIFC)

F. Forecasting Water Supplies and Hydrological Models & Climate Model Projections (themes 8 and 9)

Outcomes:

- Better understanding of what water-forecasting information is currently available: what's currently used; 'knowns' and 'unknowns'; what's being developed.
- Understand what we can get out of what we have right now, and what a better forecast would get us.
- Understand what and why some information is 'decent' enough to use in making decisions, and what and why other information is not.
- Understand how climate change influences reservoir operations, how decisions affect climate change resilience.
- Shift in response and influence public behavior and use of water during drought.
- Identify unacceptable outcomes and risks (different definitions of risk, probability-based). Can this information be pulled out of climate information?
- How systems perform in future: Will they be good enough? Or should they be altered? More reliability allows more flexibility for in-stream uses; avoids flooding; and improves environmental flows.
- Show the uncertainties and be transparent about ranges [in forecasts and projections]: what we

know and what we don't), this can inform action. Uncertain projections can be actionable. Use of scenarios can help.

- Identify and be transparent about what is known and what is not known scientifically.

Outputs:

- Improve forecast skill (optimize).
- Improve decision skill (mid-term).
- Improve communication of skill [in forecasting].
- Develop reliable climate and water models of 1 week and 1 to 2 years.
- Improve short and long term (20-30 year) water supply forecasts.
- Improved 3-5 day skill (Quantitative Precipitation Forecasts), and real time decision making between Bureau of Reclamation and River Forecast Center.
- SWSI (State Water Supply Initiative) opportunity (tie to all of the above).
- Communicate what is understood and what is not about decadal variability and its role in extremes, e.g. 2000s dry period.
- Information is 'decent' enough to use in making decisions.
- Improve ensemble representation of possible futures and range of uncertainty, compare against 'competing models'.
- Streamflow and snowmelt projections to aid in planning for fire in short and long term; understand how to adjust decision; translate to management variables.
- Testbed watershed that could be used for science and decision-scale analysis.
- Aid in navigating the utility of research outputs, e.g., JPL snow data, remote sensed products, vs. SNOTEL for water management.
- Reconciling flows on shorter timescales.
- Have a Colorado River Basin and Missouri Basin "Bake-off" to share lessons learned.
- Identify what we know about decadal variability, causes of the dry period of the 2000s.
- Identify limits on skill improvement and potential--how far can we take it?
- Mechanism (adaptive) to change with new information for infrastructure and operations.
- Develop scenarios that would apply to a range of folks.
- Map out what we do and do not know along a continuum.
- Translational services regarding uncertainties.
- Quantitative vulnerability assessment for the water sector.
- Opportunity for Colorado Statewide Water Supply Initiative (tie to all of the above).

- Acronym guide for users.
- "Dummies" guide to federal climate entities.
- Composite index of evapotranspiration and drought projections at appropriate scales from 1895 to 2100.

Actors:

- Bureau of Reclamation
- "Landscape folks": federal land managers, US Forest Service, etc.
- NOAA Climate Prediction Center
- North Central Climate Science Center
- NOAA River Forecast Centers
- US Forest Service
- Natural Resources Conservation Service/Agricultural Research Service
- State Climate Offices
- Offices of Emergency Management
- National Interagency Fire Center
- NCAR climate modelers
- Snowpack researchers
- USGS group working on Precipitation-Runoff Modeling System
- NASA Jet Propulsion Lab

Breakout session discussion. Photo credit: Elizabeth McNie.

V. Next Steps

As part of the rebid, WWA is also taking a closer look at our own strengths, mission and vision for the future. Once again WWA turned to its stakeholders for input to answer the question: *Western Water Success - What Does It Mean To You?* Stakeholders were invited to write responses and generated the following list:

- Recognized and acknowledged as authoritative source of information on climate-relevant 'water' information.
- WWA's work helps inform real decisions.
- Development of 'actionable science' makes Colorado a better place.
- Helping stakeholder-implemented climate-change adaptation programs.
- Inter-regional collaboration, collecting, and dissemination of climate information.
- Bridging the gap between the research community and practitioners such as water managers.
- Sending relevant research findings, papers and reports directly to water managers.
- WWA's outstanding leadership.

WWA cannot pursue all of the ideas generated from this workshop, but will attempt to develop a research portfolio that advances everyone's understanding of climate science, aids in the collective ability to tackle major climate-related challenges, and supports better planning, resilience and adaptation to climate variability and change. WWA will take the findings from this workshop and integrate them with findings from other 'listening sessions'. Next, it will identify potential lines of research and activities that may be possible during the next 3 to 10 years. WWA will reach out to many of its stakeholders in the coming months to help refine and improve its research and project proposals to ensure that such efforts will best serve its stakeholders' needs. WWA looks forward to working with its stakeholders today, and in the months to come, to develop and submit a winning proposal.

Thank you all very much for participating!

Appendix

Appendix I: Agenda

Wednesday, November 13, 2013
University of Colorado Boulder
Institute for Behavioral Sciences

8:15–8:45am
Breakfast and Registration

8:45–8:50am
Welcome
Kristen Averyt,WWA Director

8:50–9:50am
2013 Highlights from WWA's Work
Eric Gordon and Jeff Lukas, WWA

9:50–10:05am
Overview of WWA's Rebid and Planning Processes: What We Have Done & Where We are Going
Kristen Averyt, WWA Director

10:05–10:30am
Introductions

10:30–11:00am
Coffee and Networking Break

11:00am
Moving Forward: Identifying Key Climate Related Challenges in the Intermountain West
Bets McNie, WWA and Lisa Dilling, Associate WWA Director

12:00pm Lunch

1:00pm
Brainstorming Outcomes and Outputs: Breakout #1
Leaders & Rapporteurs: Noah, Joe, Carol, Bobbie, Eric G, Jeff L, Katie, Mary, Imtiaz, John, Ben, Tim

2:00pm
Brainstorming Outcomes and Outputs: Breakout #2
Leaders & Rapporteurs: Noah, Joe, Carol, Bobbie, Eric G, Jeff L, Katie, Mary, Imtiaz, John, Ben, Tim

3:00pm
Coffee and Networking Break

3:30pm
Breakout Session Report Backs

4:00pm
Wrap Up and Next Steps
Kristen Averyt, WWA Director

4:30pm
ADJOURN

Appendix II: Participant List

Kristen Averyt
WWA Team Member

Barry Baker
The Nature Conservancy

Tim Bardsley
WWA Team Member

Leon Basdekas
Colorado Springs Utilities

John Berggren
WWA Team Member

Bret Bruce
USGS Rocky Mountain Regional Executive's Office

Katie Clifford
WWA Team Member

Michael Cohen
Pacific Institute

Jeffrey Deems
WWA Team Member

Lisa Dilling
WWA Team Member

Taryn Finnessey
Colorado Water Conservation Board

Eric Gordon
WWA Team Member

John Gross
US National Park Service

Polly Hays
US Forest Service

Mike Hobbins
NOAA Earth System Research Laboratory

Hannah Holm
Water Center at Colorado Mesa University

Charles Howe
University of Colorado Boulder

Mary Huisenga
WWA Team Member

Kevin Johnson
US Fish and Wildlife Service

Dave Kanzer
Colorado River Water Conservation District

Joseph Kasprzyk
University of Colorado Boulder

Melinda Kassen
Independent Consultant

Bobbie Klein
WWA Team Member

Eric Kuhn
Colorado River Water Conservation District

Jeff Lukas
WWA Team Member

Bets McNie
WWA Team Member

Erin Messner
City of Aurora, Colorado

Noah Molotch
WWA Team Member

Jeff Morisette
North Central Climate Science Center

Ken Nowak
US Bureau of Reclamation

Jim Prairie
US Bureau of Reclamation

Imtiaz Rangwala
WWA Team Member

Ursula Rick
Western Energy Alliance

Dominik Schneider
WWA Team Member

Bob Steger
Denver Water

William Travis
WWA Team Member

Seshu Vaddey
US Bureau of Reclamation

Carol Wessman
WWA Team Member

Meg White
The Nature Conservancy

Steve Wolff
Wyoming State Engineer's Office

Klaus Wolter
WWA Team Member

Appendix III: Outputs and Outcomes Defined

Sample Outputs:

- Workshops
- Peer-reviewed publications
- New collaborations
- White papers
- Research findings
- Web pages
- Models
- Projections
- Conference proceedings
- Proposals
- Management plans
- Meetings
- Webinars
- Synthesis reports
- Forecasts
- Testimony
- Adaptation plans
- Identification of triggers
- Expanded networks
- New customers

Sample Outcomes and Value Demands
(Adapted from Lasswell & McDougall, 1972)

VALUE	DESCRIPTION	CLIMATE-RELATED EXAMPLES
Power	Making decisions that can be enforced, alignment, politics	Developing policies, justifying adoption of specific policy alternatives, justifying previous policy decisions, application of policy
Enlightenment	Informativeness, gathering and spreading information, learning	Fundamental understanding of climate systems, knowledge of future likely impacts, clarification of vulnerabilities, understanding of how climate change information matters in a particular knowledge system
Wealth	Production and distribution of goods and services	Money saved by adopting and implementing emergency preparedness plans, reduced cost of operating hydropower facilities, education and training activities
Well-being	Salubrity, safety, health and comfort	Lives, property or environment conserved by, reducing risks, improving resiliency to climate variability, long-range policy development
Skill	Craftsmanship, ability to gain and exercise excellence in a specialized operation	Development of decision tools, regional climate models, paleo-climate stream-flow reconstructions, etc.
Affection	Friendliness, giving and receiving friendship, loyalty	Development of relationships between researchers and users, development of social capital
Respect	Distinction, recognition and mutual honoring of freedom of choice	Attention to contextual needs of decision makers, perception of RISAs as legitimate actors, development of social capital
Rectitude	Morality, responsibility, conduct	Production of credible scientific information, meeting ethical standards, providing moral justification

Western Water Assessment

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