

Presentation Abstracts

November 6

8:40 The Colorado River: What's so special about our little river?

Dr. Gigi Richard, Associate Professor of Geology, Director of the Water Center, Colorado Mesa University

While not considered one of the world's large rivers, the Colorado River is remarkable for the magnitude of beneficial uses it supports. Draining a mostly arid and semi-arid watershed, the highest elevation regions in the watershed comprise only 15% of the drainage area, yet produce nearly 85% of the streamflow. For the last 100 years, humans have managed the Colorado River to control the hydrologic variability and to meet human need for water in an arid environment. The resulting system of reservoirs and diversions stores more than six times the annual flow of the river and diverts water to supply municipal, industrial and agricultural needs outside of the drainage basin. Human use and management of the Colorado River are not without impact. As human population continues to grow and the climate warms, understanding the interconnections between the natural and human components of the river system is critical to continued sustainable use and management of the Colorado River

9:00 Understanding and using Water Supply and Streamflow Forecasts

CMIP5 vs. CMIP3 - Do the new Global Climate Model results give a different picture of future Colorado River streamflows? *Imtiaz Rangwala, Western Water Assessment, University of Colorado*

This presentation will attempt to draw a selective comparison of climate projections for the Upper Colorado River Basin from the CMIP3 and CMIP5 generation of climate modeling efforts. Specifically, it will show an evaluation of changes in temperature and precipitation for the region for different periods in the 21st century on both annual and seasonal bases, under different emission scenarios. A brief discussion will be made on the potential significance and management implications of the differences found between CMIP3 and CMIP5. Finally, selective climate model uncertainties relevant to the western US will be presented.

Colorado Dust-on-Snow Program, *Chris Landry, Center for Snow and Avalanche Studies*

A directly funded applied science partnership is providing the Colorado and greater Colorado River Basin water management community with unique dust-on-snow monitoring and analysis services in the face of a rapidly emerging challenge to 'business as usual'. Desert dust storms originating in the Colorado Plateau are depositing vast and increasing quantities of dark mineral material onto the Colorado mountain snowpack each spring. Recent research has shown that dust deposition in Colorado has increased by more than 200% in the recent past, a trend that western Colorado residents have palpably experienced as more frequent and more intense events. For the Colorado water community, dust-on-snow, and the dramatic reductions in snow albedo that dust produces, results in increased uncertainty in snowmelt runoff behavior and management. Snowmelt runoff timing, rates, duration, and yields are all being influenced by dust-on-snow, in interaction with spring weather. In the face of an early and intense dust-enhanced runoff in spring 2006, several water agencies pooled resources to underwrite a Colorado Dust-on-Snow monitoring program at the Center for Snow and Avalanche Studies, based in Silverton. That CODOS program has expanded to include many more water districts, the cities of Denver and Grand Junction, the State, and the Bureau of Reclamation. CODOS performs continuous field-based monitoring of dust-on-snow at its Senator Beck Basin Study Area at Red Mountain Pass. CODOS also travels to and performs fieldwork several times each spring at ten additional sites located in major headwaters in the Colorado Mountains. An iterative series of CODOS products describe dust-on-snow and snowpack conditions as they develop at all eleven monitoring sites, estimating or explaining how dust contained in the snowpack may influence, given weather forecasts, or actually is affecting spring snowmelt and runoff. Spring 2013 produced two particularly significant and alarming dust-on-snow events.

River Forecast Application for Water Management: Oil and Water? *Kevin V. Werner, NOAA*

Managing water resources generally and managing reservoir operations specifically have been touted as opportunities for applying forecasts to improve decision making. Previous studies have shown that the application of forecasts into water management is not pervasive. This study uses a scenario-based approach to explore whether and how people implement forecast information into reservoir operations decisions in a workshop setting. Although it was found that participants do utilize both forecast and observed information,

they generally do not utilize probabilistic forecast information in a manner to appropriately minimize risks associated with the tail end of the forecast distribution. This study found strong tendencies for participants to wait for observed information, as opposed to forecast information, before making decisions. In addition, study participants tended to make decisions based on median forecast values instead of considering forecast probability. These findings support the development of quantitative decision support systems to optimally utilize probabilistic forecasts as well as for forecast agencies such as NOAA/NWS to continue investments in work to better understand contexts and environments where forecasts are used or have the potential for use in supporting water management decisions.

10:20 Water Quality and Habitat Initiatives

Measures Taken at the Moab UMTRA Project Site to Address Suitable Habitat Migration in the Colorado River, *Elizabeth Moran, S & K Moab TAC Team, Contractor for the US Department of Energy*

The Moab Uranium Mill Tailings Remedial Action (UMTRA) Project site is located on the Colorado River, northwest of Moab, Utah. The site boundary includes about 3,500 feet of riverbank. The former uranium mill operated from 1956 to 1984 and resulted in a tailings pile 90 feet thick and having a volume of approximately 12 million cubic yards. Excess water in the tailings that contained dissolved ammonia leached into the ground water, creating a plume that discharges to the side channels of the river at the site. Extraction of ground water as part of site remedial actions reduces the discharge of contaminants to the river. Sedimentation and erosion along the channels influence where the ground water discharges.

After the peak spring runoff, these channels may serve as suitable habitat for young-of-year Colorado pikeminnow and other endangered fish species native to the area. Favorable aquatic habitats form when the channels become blocked off from the main channel on the upriver end, but remain open downriver. The morphology of the side channels varies from year to year due to high and low river flow and from storm events that cause flow in the nearby Moab Wash. Over the past 10 years, river flow and storm events have resulted in the migration of the location of the suitable habitats 1,000 ft downriver.

The project uses two methods to reduce the ammonia concentrations in the suitable habitats. Freshwater injection occurs on the riverbank to form a hydraulic barrier and to dilute ammonia concentrations in the ground water prior to discharging to the river, and surface water diversion is utilized directly in the suitable habitats to protect the aquatic life from elevated ammonia. Annually, the project monitors the snowpack in the Upper Colorado River Basin and the river flow forecast. Once the peak runoff has occurred, the configuration of the side channels is evaluated for the likely formation of a suitable habitat to determine the best implementation of these two methods if needed.

Capturing Water in Ephemeral Streams within the Gunnison Basin Sage-brush Scrublands – A Visual Snapshot of One-Rock Dams, *Claudia Strijek, Strijek Design*

Riparian areas within the dry sage-brush scrublands of Gunnison Basin provide critical habitat and forage for many species, including the Gunnison sage-grouse. These valuable ecosystems are at risk due to a variety of factors. The Nature Conservancy and the Gunnison Climate Working Group have come together with ecological consultant specialist Bill Zeedyk to install small rock dams in several ephemeral streams near Gunnison, Colorado, in order to build resiliency into these ecosystems.

This video documentary gives an overview of the project partners and goals of the project. The video is 6 minutes long. A short power point describing how the rock dams are constructed and how they work will follow the video after which questions about the project will be fielded.

Pitkin County's Healthy Rivers and Streams Fund, *Lisa MacDonald, Pitkin County*

By approving Referendum IA on November 4, 2008, Pitkin County voters authorized a sales tax of 0.1% to be dedicated to establishing a Healthy Rivers and Streams Fund in order to provide the County with possibilities for protecting our rivers and streams.

Referendum IA provided for the administration of a Healthy Rivers and Streams Fund by the Board of County Commissioners of Pitkin County with the advice of a volunteer Citizens Advisory Board. Such Board was established in 2009 and meets monthly. Bylaws for the Citizens Advisory Board were also drafted and adopted in 2009.

Goals and Objectives of the fund include:

- (1) Maintaining and improving water quality and quantity within the Roaring Fork watershed;
- (2) Purchasing, adjudicating changes of, leasing, using, banking, selling, and protecting water rights for the benefit of the Roaring Fork watershed;
- (3) Working to secure, create and augment minimum stream flows in conjunction with non-profits, grant agencies, and appropriate State and Federal agencies to ensure ecological health, recreational opportunities, and wildlife and riparian habitat; promoting water conservation; and
- (4) Improving and constructing capital facilities that contribute to the objectives listed above.

Funds to date have been used for defense of county water rights, prosecution of change cases, and protection of instream flows along with grants to various entities for work including but not limited to restoration, river assessment studies, stormwater improvements and gaging assessments.

11:20 Permitting Canal Hydropower Projects: Effects of Recent Legislation

Legislative and regulatory changes affecting canal hydropower permitting, Ted Dunn, US Bureau of Reclamation

This presentation will give a brief overview of the Bureau of Reclamation's Lease of Power Privilege Process and the Bureau of Reclamation Small Conduit Hydropower Development and Rural Jobs Act.

Project Permitting experiences in the Uncompahgre Valley, Steve Fletcher, Uncompahgre Valley Water Users Association

This presentation will relate the experiences the Uncompahgre Valley Water Users Association has had with permitting canal hydropower projects both before and after the regulatory changes. The Association has completed one power plant on the South Canal, which carries water from the Gunnison River that has been brought through the Gunnison Tunnel to the Uncompahgre Valley, and is in the process of developing two more.

1:30 Historical and Literary Perspectives on Western Water Challenges

History for the Future: Using History to Shape Resilience in Colorado's Headwaters Communities, Danielle Ryan Ph.D.

Candidate, McMaster University, Adjunct Professor, Western State Colorado University

The American West is a place of contentious meanings and contrasting views where unintended consequences have had profound impacts on the land and its people. This meeting ground has created a confluence of conflicting attitudes, ideas, perceptions, and actions across the western landscape. And yet, this complex milieu has resulted in more than just conflict as communities in Colorado's Headwaters (and elsewhere) have adapted to changing social, political and environmental conditions. Seemingly contradictory characteristics in western American identities like "rugged individualism" are reconciled with social and ecological resilience—those institutional rules and diverse ecosystems that create resilient communities. How have Colorado's Headwaters communities historically struggled to be resilient? What can we learn by looking at the history of Colorado's Headwaters communities about staying in this beautiful, if sometimes hostile, environment? In exploring these questions this paper addresses issues of resilience and sustainability, western identity, uniqueness of place, and how a historical framework might be used along with interdisciplinary studies about building resilience into Colorado's Headwaters communities' futures.

Review of books that define the role of water in the arid West, Greg Trainor, City of Grand Junction

Water is a defining essential in the struggle for settlement and on-going habitation of the arid Colorado River basin. A foundation for informed dialogue is necessary in the coming debates and negotiations over the Basin's dwindling water supply. Plans are being devised. Minutes are being taken. Defenses are being constructed. Data is being collected, charted and explained. How much, where, and for what purposes will the Basin's water be put to use. The stakes are high in a land where paleo-dendrochronology indicates that droughts of 50 years or more were common in the 1100-1300's

The writings of dozens of individuals have produced a trove of insight from their story telling of the water riddle. This fifteen minute presentation will be a review of several books that define the role of water in the arid West. It will whet the appetite of listeners to read the books that convey the central necessity of water to the survival of human life and will in the Colorado River basin.

2:10 Water education: Reaching the General Public

On Air with Connecting the Drops: Engaging all of Colorado in Water Education through Mass Media *Nicole Seltzer, Colorado Foundation for Water Education*

Public education and understanding is always a challenge in water management, and reaching new audiences is a constant struggle for water educators. In July, 2013, Rocky Mountain Community Radio Stations began airing more water coverage. Stories on cooperative water management to meet the state's many water demands have played over the past few months, reaching thousands of listeners statewide. This, as a result of the Connecting the Drops Radio Program—the Colorado Foundation for Water Education's new collaborative project with Colorado Community Radio stations in which a new story is produced and played each month for the next year. Join us to hear how stimulated radio coverage is generating dialogue around water management, enhancing the information available through and directing listeners to print publications and reaching new wide audiences with water education.

Gunnison Basin "Handbook for Inhabitants" *George Sibley, Gunnison Basin Roundtable*

This presentation will discuss the purpose and methods behind the distribution of a Gunnison Basin "Handbook for Inhabitants" in newspaper inserts throughout the Gunnison Basin.

3:10 What Pressures are Agricultural Producers in the Colorado River Basin Experiencing in Regard to Environmental Issues and How Are They Dealing with Them?

Moderator: Dr. Pete Taylor, Colorado State University; Panelists: John Ott, Animas Consolidated Ditch, CO; Larry Hicks, Little Snake River Water Conservation District, WY; Bill Brandau, Farmer on the Gila River, AZ

Colorado Water Institute at Colorado State University, in conjunction with water institutes in the other six Colorado River Basin states, have undertaken an initiative to find out what ag producers and ag water managers in the Colorado River Basin are thinking about pressures on ag water.

They have recently completed a report of their findings from 60 interviews and an online survey. This presentation will take the form of a dialogue among three of those interviewed, in regards to one of the pressures that came up in the interviews and the survey—that of environmental issues.

Specifically, they will discuss:

- What are the pressures on agriculture from environmentalist concerns you have experienced?
- How are you and others in your area responding to that pressure?
- What are your ideas for how agricultural and environmental stakeholders might work together in the future to mutual benefit?

4:10 – 5:00 Finding Common Ground between Agricultural and Conservation Stakeholders: Participant report from a 6-month dialogue sponsored by the Walton Family Foundation and the Colorado Cattlemen's Association

Moderator: Hannah Holm, Water Center at Colorado Mesa University; panelists: Cary Denison, Trout Unlimited and Randy Carver, Montezuma Valley Irrigation Company

This panel will describe the stakeholder dialogue process between agricultural and conservations stakeholders, discuss areas of common ground, and will show a short animated video that provides an example of how irrigation infrastructure improvements can benefit multiple interests.

5:00 Short films from the Colorado College State of the Rockies Project "Powell to Powell: Portraits of the Upper Colorado." These can be viewed at <http://downthecolorado.org/>.

November 7

8:40 After the Colorado River Basin Water Supply and Demand Study: What's next?

Moderator: Ted Kowalski, Colorado Water Conservation Board; Panelists Eric Kuhn, Colorado River District, Marc Waage, Denver Water, John Sanderson, The Nature Conservancy, Dave Kanzer, Colorado River District

Following a brief review of the US Bureau of Reclamation's Colorado River Basin Water Supply and Demand Study, representatives from each of the work groups set up to follow up on the study will report on their progress. There are work groups in each of the following areas: Municipal and Industrial Conservation and Water Reuse; Environmental and Recreational Flows; and Agricultural Conservation, Productivity and Water Transfers.

10:20 Urban Conservation Tools

Working Together to Conserve, Kate Gardner, Center for ReSource Conservation

For over 15 years, the Center for ReSource Conservation (CRC) has been working with water utilities to implement water conservation programs. These programs began as a collaboration between the CRC and the City of Boulder, and have grown to encompass a unique partnership with over 30 water utilities. Through this innovative model, the CRC works closely with municipal governments, utilities and water districts to implement and measure water conservation programs on their behalf. By taking advantage of economies of scale, all sizes of water providers can offer a range of high quality programs to their customers at a much lower price, and with much less work, than by each provider implementing their own programs. The number of water providers that participate in CRC's programs has grown organically every year, and currently includes communities from Gillette, Wyoming to Colorado Springs. This model provides a great example of how nonprofit organizations and water providers can team up to offer programs that lead to direct conservation benefits and to measure the results of those programs. The partnership is truly synergistic, with both the water providers and CRC being able to offer services that neither could individually.

In 2013, constantly changing weather conditions made it very difficult for most utilities to plan and implement conservation programs. The high likelihood of drought conditions at the beginning of the summer had the potential to cause many water service providers to scale back their "standard" conservation programs in favor of short-term, acute drought response. On the opposite end of the spectrum, the record setting Front Range floods of September 2013 overwhelmed many utilities and could have resulted in the cancellation of important conservation programs. By and large, the water providers that partner with CRC were able to avoid these problems, and offer appropriate, high-quality programs to customers throughout the season. In particular, the extreme conditions of 2013 demonstrated the importance of regional scale partnerships in addressing water conservation.

This talk will discuss the history of CRC's programs, the growth of the partnership and present results from partner and customer surveys. The talk will also include analysis of both the pros and cons of a partnership model. In addition, the talk will particularly focus on the challenging conditions encountered in 2013, and explain how a regional partnership was able to provide services in a way that individual providers could not have.

Where's the water going? An analysis of factors contributing to outdoor residential water use, *Dan Stellar, Center for ReSource Conservation*

In Colorado along the Front Range, over 50%¹ of residential water use is put on the landscape. An estimated 5-40%² of this water is wasted due to problems such as inefficient watering practices and broken or improperly operating sprinkler systems. Irrigation inspections programs are used to enhance the efficiency of an irrigation system by educating the owner on their landscape water needs and irrigation system operation as well as identifying any major leaks or system repair requirements. Since 2004, the Center for ReSource Conservation (CRC) has conducted approximately 15,000 irrigation inspections across the Front Range, educating homeowners on how they can water more effectively and efficiently and gathering data on landscape and irrigation systems. The CRC has also collected water record data from participating households to assess and

¹ Mayer et al. 1999. REUW; Aquacraft, 2007. Colorado Drought and Water Supply Update 2007.

² Colorado WaterWise and Aquacraft. 2010. Guidebook of Best Practices for Municipal Water Conservation in Colorado.

measure the effectiveness of the program into the future. Previous work by the CRC has shown that for at least two years following the inspection, the average homeowner sees water savings of 5,000 gal per year, with taking weather variation into account. Now, the CRC is using the data set to better understand what factors control outdoor water use in general. Understanding these factors would help both the CRC to better design the program and the partner utilities to better target customer groups so that the most water can be saved from the inspections.

The analysis included a sample of approximately 2,200 participants and incorporated descriptive, parametric and non-parametric statistical tests for significant differences in water use based on a variety of landscape and irrigation system factors. Factors included in the analysis included, but were not limited to, sprinkler system age, presence of drip systems, amount of xeriscape landscape, severity of irrigation system problems (e.g. broken/tilted heads/overspray/poor spacing), distribution uniformity, precipitation rate, and other factors that may contribute to inefficient water use. Surveys of the number of residents and indoor water efficient appliances were also included. The results at this point are preliminary, but seem to indicate that very few of the included factors are determinant of outdoor watering levels. These findings along with our previous work that showed that the inspections do in fact save the average participant a significant amount of water could combine to suggest that the educational gain by the homeowner may be the most important part of the audit, rather than the manipulation of physical aspects of the sprinkler system.

11:00 – 12:00 Planning for and adapting to water shortages

Arizona prepares for reduced Powell releases, Tom Buschatzke, AZ Department of Water Resources

This presentation will give some background about the water budget in Arizona, our water management programs and especially those that have better prepared us to deal with shortages, our underground storage and water banking efforts and then some details about how a shortage declaration by the Secretary for the lower basin would directly impact water users in Arizona based upon the near term probabilities in the 2015 and 2016 time frame as outlined by BORs 24 month study and the 07 Guidelines.

Colorado Drought Plan, Taryn Finnessey, Colorado Water Conservation Board

The State of Colorado has recently revised the existing State Drought Mitigation and Response Plan This effort builds on previous efforts on improved drought preparedness statewide. The revision process has resulted in a State Drought Plan that uses state of the art planning techniques to prepare Colorado for drought and integrates lessons learned from the last three years of drought. The plan further streamlined the state's response to drought and enhanced tools for local water providers to prepare for drought. The revised plan also updates mitigation efforts that will help the state and local communities reduce impacts from drought; and includes a revised vulnerability assessment of sectors affected by drought statewide. The role of climate change in future variability is also examined. Taken as a whole the document helps Colorado to be better prepared for possible shortages across all sectors statewide.

12:00 Keynote Speaker James Eklund, Director, Colorado Water Conservation Board

Mr. Eklund will discuss the water challenges facing the state and the approach of the Colorado Water Conservation Board in addressing them.

1:30 Panel Discussion: Are changes in inter-state water administration needed to allow cross-state water marketing, banking or other allocation tools? Moderator: Mark Hermundstad, Panelists: Dan McCool, University of Utah, Eric Kuhn, Colorado River District, Tom Buschatzke, AZ Department of Water Resources, John McClow, CO Representative to the Upper Colorado River Basin Commission

Each panelist will open with a brief statement giving their perspective on the discussion question and then respond to questions from each other and the audience.

3:00 September's Extreme Weather: How the weather system that flooded Colorado's Front Range affected the Upper Colorado River Basin

Dr. Jeff Lukas, Western Water Assessment, University of Colorado

From September 9-17, 2013, a near-stationary weather system led to extraordinary rainfall totals on Colorado's Front Range, causing severe to extreme flooding in many drainages and enormous damage to homes and infrastructure. The same system also had a significant impact—though largely beneficial—west of the Continental Divide. Widespread rainfall of 2"-6+" occurred during the event, and September ended up as one of

the wettest months on record for western Colorado. I'll describe the atmospheric setup for this event, how it played out, and the short- and long-term effects for the Upper Colorado River Basin. I'll also place this event in the context of both the historic climate record and projected future climate.