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RUTH POWELL HUTCHINS  
WATER CENTER

Twelfth Annual

UPPER COLORADO  
RIVER BASIN  
WATER FORUM:

# RESHAPING THE RIVER

Reimagining Water Use  
and Management in the  
Upper Colorado River Basin

October 30–31, 2023  
Grand Junction, Colorado



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[watercenter@coloradomesa.edu](mailto:watercenter@coloradomesa.edu)

Twelfth Annual  
**UPPER COLORADO RIVER BASIN WATER FORUM:**  
**RESHAPING THE RIVER**

Reimagining Water Use and Management in the Upper Colorado River Basin  
**October 30–31, 2023**

**MONDAY, OCTOBER 30 – DAY 1**

7:30–8am

**Breakfast**

8am

**Welcome and Preview of the Day**

*Joel Sholtes, Interim Director,  
Ruth Powell Hutchins Water Center, CMU*

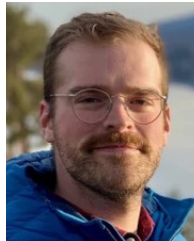
8:10am

**Keynote Speaker:**  
**Luke Runyon**

*Co-Director of The Water Desk,  
University of Colorado Boulder*

Luke Runyon is a journalist covering water and climate change in the Western U.S. He serves as the co-director of The Water Desk at the University of Colorado's Center for Environmental Journalism. In a previous role, Luke built a collaborative network of public media stations throughout the Colorado River watershed as a managing editor at KUNC, the NPR station for northern Colorado. He has also reported for Harvest Public Media, Aspen Public Radio and Illinois Public Radio. He currently serves as the board president of the Society of Environmental Journalists, and he's a former University of Colorado Ted Scripps environmental journalism fellow.

Luke is a contributor to NPR's Morning Edition, All Things Considered, Weekend Edition and APM's Marketplace. He has a master's degree in Public Affairs Reporting and a bachelor's degree in Communication from the University of Illinois Springfield. His work has been recognized by the Society of Environmental Journalists, the Society of Professional Journalists, the Radio Television Digital News Association, the Colorado Broadcasters Association and the Public Media Journalists Association.



**Session 1: Impacts and Innovations to  
Agricultural Water Management**

9am

**Drought Impacts to Western Slope Rangelands  
and Resources**

*Retta Bruegger with Colorado State University Extension*

Abstract: Rangeland are estimated to cover 75% of the land area in Colorado and play an important role in agricultural production and conservation in the state. Prolonged drought has impacted western Colorado rangeland productivity, and future projections suggest this trend will continue. Rangeland users will need to adapt to current and future conditions, where reduced productivity overall and high variability between years are expected. This presentation will cover some of the challenges facing rangelands in western Colorado, as well as resources available from CSU Extension and Drought Advisors for mitigating the impacts of drought through drought planning.

9:20am

**Artificial Intelligence for Sustainable Water,  
Nutrient, and Salinity Management in the  
Upper Colorado River Basin**

*Dr. Perry Cabot with Colorado State University Extension*

Abstract: The "Fourth Industrial Revolution" described by Klaus Schwab in his 2017 book involves the ongoing automation of manufacturing and industrial practices, with modern "smart technology" as an organizing concept. Agriculture has trended similarly using precision agriculture (PA), digital agriculture (DA), artificial intelligence (AI), and big geodata analytics. Aridification in the Colorado River basing necessitates irrigation as a critical practice that will benefit from using these tools to increase sustainable water use, along with better nutrient, pest, and salinity management. Foundational knowledge of remote sensing data to model and monitor agricultural processes is at the stage where local to regional scale applied research is needed to translate

basic science into actionable strategies and tools. Previous research has often emphasized single or a few agricultural system components: water management, soil mapping, crop phenotyping, crop water requirement estimation, nutrient management, pest detection, and monitoring. Despite significant advances, previous projects often: i) have narrow scope (e.g., estimate idealized crop water requirements for non-stressed crops), ii) do not integrate stress indicators, iii) fail to take full advantage of integrated big geodata, AI, and data assimilation, iv) do not connect with industry partners to ensure full translation of academic research into actionable tools for growers. The project's rationale derives from an interdisciplinary integration of available knowledge and tools under a single AI framework for system-wide sustainable agricultural and natural resource management. The project will translate knowledge on farm-scale interactions between crops, soils, and environmental conditions into more resource-conscious irrigation using advanced infrastructure.

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9:40am

### **Unpacking the Social and Environmental Controls on the Scalability of Water Conservation Programs**

*Seth Mason with Lotic Hydrological*

Abstract: Implementation of consumptive water use reduction (i.e., water conservation) programs across the state is one important strategy proposed for reducing risks that persistent drought, growing populations, and climate change place on a finite water supply. Voluntary, temporary, and compensated water conservation programs and policies are gaining traction as the most acceptable and viable means for achieving consumptive use reduction goals. A limited number of pilot studies, to date, have endeavored to implement and test outcomes of water conservation efforts among agricultural producers. No reliable data is available to characterize water conservation program participation rates among diverse groups of water users at scale. Additionally, information characterizing the consumptive water use saving achieved under different water conservation practices and across diverse geographies is exceedingly sparse. This presentation outlines a CSU research project that aims to fill both information gaps by conducting quantitative social surveys and mapping and classifying consumptive use patterns for agricultural parcels on the West Slope over recent years.

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10am

**Break**

## **Session 2: Restoring and Repairing the River**

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10:30am

### **Resilient Riverscapes: The Role of Integrated Riverscape Management**

*Brian Murphy with River Network*

Abstract: Streams and riverine landscapes, or "riverscapes," are composed of the river channel, connected floodplain, and biotic communities that make up the valley bottom and maintain the physical and biological processes vital to riverscapes and the associated ecosystem services. Rapid development within those riverscapes and a changing climate influence water and land use, degrade river health, and reduce the benefits of ecosystem services to communities. Across the West, communities are struggling with responding to those adverse conditions and evolutionary changes. An emerging tool in the resiliency toolbox is integrated riverscape management, or IRM, which aligns the management of water resources, land use changes, and hazards to improve benefits for communities equitably. IRM emphasizes three core objectives: (1) preserve and restore the capacities of rivers to withstand floods safely; (2) maintain and restore floodplains and wetlands to absorb high river levels; and (3) protect and regenerate the vegetation along the river corridor to slow water flow, filter pollutants, recharge the aquifer, and provide habitat. This presentation will describe a new IRM program in Colorado and summarize the tools that shift best practices away from top-down, reach-scale engineering towards catchment-scale planning, nature-based solutions, and adaptive management. The program will accelerate the adoption of IRM across Colorado, focusing on opportunities for strengthening implementation within the four interdependent sectors of emergency management and hazard mitigation planning, community and land use planning, land management, and water resources management.

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10:50am

### **The Slow Water Movement in Rio Blanco County: Dryland Riparian Restoration Using Nature Based Solutions**

*Deirdre Macnab with White River Alliance*

Abstract: Drought, overgrazing, loss of beavers, highly erosive soil: These elements have come together to create a dry landscape where healthy riparian with forage, water and cover for wildlife and birdlife is a distant memory. Like many remote high desert areas in the West, Rio Blanco County in rural and remote NW Colorado, has miles of highly eroded dry creeks and part time water ways both in BLM and private land. Springs and riparian areas are drying up every day

on an increasing scale with the growing heat and drought. The White River Alliance is a small stakeholders' group that teamed up with The Nature Conservancy to get a grant to teach our community about Nature Based Solutions for Riparian Restoration. These include Beaver Dam Analogs and One Rock Dams. We'd like to present what we learn and some of the pilot projects that ranchers and landowners are using to help renew riparian areas, along with managed grazing of livestock.

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11:10am

### **Environmental Water in Colorado: Instream Flow Rights and Streamflow Restoration Tools**

*Tony LaGreca with Colorado Water Trust*

Abstract: Successful water management in Colorado increasingly requires cooperation between multiple user groups and utilization of a vast array of tools. While the primary focus is on municipal and agricultural water, environmental water use is an important factor when looking towards the future of water management in Colorado. Incorporating environmental flows into management goals greatly expands the toolbox available to water managers to meet the needs of the future. The Colorado Water Trust will outline Colorado's instream flow program and the various tools we utilize to partner with water users to create win-win projects.

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11:30am

**Lunch**

### **Session 3: Unpacking Diminishing Water Supplies**

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12:55pm

#### **Water Conservation and Contaminant Removal from Greywater Using Colorado Native Plants in a Hydroponic Green Wall**

*Holly Stanley and Ashley Emery of Colorado Mesa University*

Abstract: The Upper Colorado River Basin has experienced drought conditions for the last 20 years as climate change creates an increasingly warm, dry semi-arid west (Outcalt, 2022). As populations continue to increase and water supplies dwindle, water conservation is of paramount concern. Greywater reuse is a logical way to reduce overall household water demands (Estrada et al. 2020). Our study examined

the effectiveness of a green wall to remove commonly found contaminants in laundry greywater. We hypothesize that a treatment green wall occupied by Colorado native plants, edible leafy greens, and perlite will be more successful than a control green wall containing only perlite and no plants in removing the contaminants. In our study, we constructed both the treatment and control walls, used a lab made synthetic greywater, conducted three experimental runs, and examined nine chemical parameters including COD, TP, TN, DO, and COD in both the influent and effluent greywater. Our results showed that both walls were successful in removing TP (76% removal by control, 89% removal by treatment), TN (68% removal by control, 30% removal by treatment), TSS (89.2% removal by control, 99.5% removal by treatment), and COD (51% removal by control, 66% removal by treatment), and that the Colorado native plants and edible leafy greens increased the removal efficiency for most of these contaminants. This study also highlighted the need to improve future green wall designs by implementing screens between trays to reduce perlite movement from one tray to another, an earlier and more thorough plant establishment with consistent watering schedule to decrease plant mortality and increase the establishment of root systems and using soil as the main growing substrate for the Colorado native plants to help reduce plant mortality.

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1:15pm

#### **Groundwater Resources in Grand Valley**

*Matt Seitz with HRS Water Consultants*

Abstract: Groundwater resources and aquifer storage have huge potential to offer solutions in the Grand Valley. We will discuss the aquifers under our feet, their interactions with surface water, aquifer recharge, groundwater conjunctive use, and possible future groundwater usage trends.

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1:35pm

#### **Grand Junction's Gunnison River Reservoirs Project**

*Matt Bliss with DiNatale Water Consultants and Randi Kim with City of Grand Junction*

Abstract: The City of Grand Junction obtained a grant from the Colorado Water Plan to begin the design of its Gunnison River Reservoirs Project. The Project will provide approximately 1,700 acre-feet of water storage by converting two gravel pits along the Gunnison River into water storage reservoirs. The reservoirs will have a variety of uses, including direct municipal use, protection from downstream senior calls, irrigation use, and environmental benefits. This multiple-benefit project can bolster Grand Junction's existing partnership with another local municipal water provider to meet future demands and improve redundancy and resiliency

in both municipal systems. Notably, the Project will allow Grand Junction to continue using its high-elevation reservoirs to deliver high-quality water into its system – even when those reservoirs’ junior water rights are out of priority – by delivering water from the Gunnison River Reservoirs to the downstream calling water right. The Project will also provide irrigation deliveries to a local irrigation district near the end of the canal system, which can increase efficiency in the diversion and delivery of water within the upper parts of the irrigation system, including an option to generate additional hydropower and increase flows through an environmentally sensitive reach of the Colorado River.

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1:55pm

### **UCRC’s System Conservation Pilot Program: “Lessons Learned” in 2023 and Outlook for 2024**

*Chuck Cullom and Sara Larsen with  
Upper Colorado River Commission*

Abstract: With support and coordination with the Upper Division States (CO, NM, UT, and WY) and the Bureau of Reclamation, the Upper Colorado River Commission (UCRC) administered the System Conservation Pilot Program (SCPP) in 2023. The SCPP is a temporary, voluntary, and compensated water conservation pilot initiated to mitigate drought conditions and to address declining water levels in Lake Mead and Lake Powell. Over the course of the program, UCRC staff visited and collected feedback from program participants and many other stakeholders around the Upper Basin to compile “lessons learned” for the UCRC Commissioners’ consideration. This presentation provides an overview of the 2023 experience, critical updates to the program in 2024, and “next steps” for interested water users in the Upper Basin.

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2:15pm

### **Session 4: State of the River Address**

*Moderator: Luke Runyon the Co-Director of The Water Desk,  
University of Colorado Boulder*

Panel Discussion with Amy Ostdiek (Interstate, Federal, and Water Information Section Chief Colorado Water Conservation Board), Andy Mueller (General Manager Colorado River District), Lily Bosworth (Staff Engineer, Colorado River Authority Utah), Ali Effati (Colorado River Basin Bureau Chief, New Mexico Interstate Stream Commission), Jeff Cowley (Administrator Interstate Streams, Wyoming State Engineer’s Office)

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3:15pm

**Break**

### **Session 5: Balancing Development and Water Resources**

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3:45pm

#### **Water Yield Change with Urban Development in the Denver Metropolitan Area**

*Aditi Bhaskar with University of Colorado Boulder*

Abstract: This research presents an analysis of the changes to streamflow in the semi-arid area of Denver, Colorado, USA with a focus on (1) contributors to stream baseflow, and in particular water supply pipe leakage and lawn irrigation return flow and (2) an analysis of changes in streamflow response to rainfall events with urbanization. To estimate contributions to stream baseflow, we used water-stable isotope analysis of surface water, tap water, and precipitation. Thirteen urban streams and two grassland streams were selected for sampling. An isotope mixing analysis using tap and precipitation end-members estimated that tap water contributed a mean of 80% of urban baseflow on specific days in late summer. After taking contributions from infrastructure leakage into account, we estimated that lawn irrigation return flows made up 32% to 82% of the analyzed baseflow. For changes to streamflow response to rainfall events, we used eight years of instantaneous streamflow data in 21 watersheds ranging in size from 1 to 90 km<sup>2</sup> with impervious areas ranging from 1% to 47%. Using a semi-automated method we identified 2,877 streamflow events. We found that more impervious watersheds had perennial or nearly perennial flow, unlike the least impervious watersheds which usually were dry. Streamflow events were shorter in duration and had higher peak flow in watersheds with more impervious surface cover. This work points to the need for local adaptation of stormwater management that seeks to mitigate the effects of streamflow changes with urbanization.

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4:05pm

#### **Examining Urban Outdoor Water Usage within the Colorado River Basin**

*Nicholas Guthro with University of Colorado Boulder*

Abstract: The Colorado River Basin services the residential water use needs of nearly 40 million people. Residential use is the largest component of water use in urban areas, with outdoor water use representing a significant portion of a household’s water use. The outdoor portion of residential use is often not disaggregated from the residential water use total. This lack of data can be challenging when tracking the effectiveness of efforts to reduce outdoor usage. In this study, the water use of urban areas in the Colorado River Basin Service area was compiled. An estimate of outdoor

water usage in winter months is being provided by Flume Data labs. This estimate is then being used to determine an indoor usage baseline that will be subtracted from total usage to determine each month's outdoor usage. Results show a large variability in outdoor water usage per capita between different population sizes and city locations. Cities that started implementing watering restrictions before 2017, such as Las Vegas, saw a steady decrease in water usage per capita over the study period. Our future work will include examining a longer time period of data from more cities in the river basin and seeing how various explanatory variables (population, region, climate, and policy) can help predict outdoor water use in a city. This work can help quantify the amount of outdoor water usage for municipalities within the Colorado River Basin usage area and allow for urban areas to see the effects of water use reduction efforts.

4:25pm

### **Uncertain Future: How Conditional Rights can Impact the Prior Appropriation System**

*Andrew Teegarden with University of Colorado Boulder*

Abstract: Conditional water rights are a unique aspect of water regulation within the state of Colorado. In fact, Colorado is one of the only states using the prior appropriation system where there is no hard and fast time limit to either apply the water to a beneficial use or begin construction. Other states not only put limits on when water must be perfected but also limit when conditional uses can be changed. For example, in Wyoming and Nebraska, the right to appropriate is a usufructuary right and not considered a property right which means that users cannot change their granted use. These conditional rights also create uncertainty within water administration because the priority system could allow senior conditional rights to come online and remove water from users who have been receiving water for decades. One industry in particular, oil shale, has taken advantage of this unbalanced system to preserve their unused water rights for decades. While the system of conditional rights does allow for long-term municipal water supply planning, it allows speculation to play a much larger role in the creation and obtainment of water rights. Speculation drives up the operational costs for other users within the system and in theory is against the laws of the state. Despite strong anti-speculation language, the legislature has failed to rein in the oil shale industry by allowing their rights to continuity in perpetuity.

4:45pm

### **Session 6: Creating Generational Connections**

*Moderator: Stacy Beaugh with Strategic By Nature, Inc.*

Abstract: Panel Discussion with KennaLee Worster and Samantha Hamilton from Colorado Mesa University and Kaitly Bishay and Santiago Ramírez-Núñez from University of Colorado Boulder.

5:30pm

### **Reception and Networking Event**

A reception will be held immediately after the forum at 5:30pm. Join us to continue networking while enjoying some light appetizers and refreshments.

## **TUESDAY, OCTOBER 31 – DAY 2**

7:30–8am

### **Breakfast**

8am

### **Welcome and Preview of the Day**

*Joel Sholtes, Interim Director,  
Ruth Powell Hutchins Water Center, CMU*

8:10am

### **Keynote Speaker, Lorelei Cloud**

*Vice Chair, Southern Ute Indian  
Tribal Council*

Vice Chairman Lorelei Cloud is a member of the Southern Ute Indian Tribe and proudly serves the Tribal Membership on the Southern Ute Indian Tribal Council. Born and raised on the Southern Ute Reservation, Cloud was first elected to Tribal Council in December 2015. During her first term on Tribal Council, she welcomed the opportunity to serve as Vice-Chairman and Treasurer. After being re-elected in December 2018, Cloud continued her service to the Tribal Membership as a member of Council and Treasurer. In 2021, Ms. Cloud was once again sworn into office, serving her third term on Tribal Council.



Prior to joining tribal leadership, Cloud worked for Red Willow Production Company and Sky Ute Sand and Gravel. While employed with the Growth Fund, she served on the Southern Ute Growth Fund Art Committee, Traveling Team, Tribal Member Employment Advisory Committee. She has also worked with the Southern Ute Housing Authority, and at the Bank of Colorado.

She also serves on the Water and Tribes Initiative, Tribes and States Dialogue, and The Nature Conservancy Board. Cloud is Co-Chairman of the Indigenous Women's Leadership Network. In 2023, Governor Polis appointed Cloud to the Colorado Water Conservation Board. She is a true advocate for the Ute language, traditions, and culture; actively participating in cultural events and traditional gatherings. She is very passionate about helping the Southern Ute youth, women, and elders. She has four children (three daughters and one son) and three grandchildren.

## Session 7: Improvements to Monitoring Water Supplies

9am

### Soil Moisture Observations to Support Water Management in the Upper Yampa: Accomplishments and Next Steps

*Anna Wilson from Center for Western Weather and Water Extremes, Scripps Institution of Oceanography, University of California San Diego*

Abstract: The dynamics of snowmelt driven runoff in the Yampa basin are changing. Water managers in the Yampa Basin have observed a greater variability in the dynamics of runoff in the Yampa basin across a wide spectrum of total snowpack magnitudes. Changes in the timing, magnitude and duration of snowmelt may substantially alter downstream water availability. The details of the snowpack composition, both spatial and elevation distribution, are certainly important to understanding the changing dynamics of what drives the Yampa system. Equally important to a better understanding of basin runoff dynamics is soil moisture data at the onset of snowmelt and how soil moisture levels may affect infiltration and runoff for the next snow and melt season. The Center for Western Weather and Water Extremes, the Colorado Mountain College, and the Yampa Valley Sustainability Council, developed a partnership with the Upper Yampa Water Conservancy District to add observations of streamflow predictors such as precipitation, snow depth, soil moisture, and other hydrometeorological data. A pilot station was installed in Fall of 2022 and the data is publicly available in near-real time. The existing partnership grew to include the

Colorado River District and the Colorado Water Conservation Board, and eight new hydrometeorological stations will be installed over the coming years. This presentation will include an initial interpretation of the network's long-term utility in supporting robust and reliable predictions of water availability and developing strategies for water resiliency in the Upper Yampa River Basin and beyond.

9:20am

### Harnessing the ongoing revolution in real-time stream monitoring to support operational decision-making and improve aquatic health: a case-study in the Yampa Basin

*Alex Brooks with Lotic Hydrological*

Abstract: The ever-increasing availability of real-time stream monitoring data has ushered in a new era of possibilities for aquatic resource management, offering unprecedented access to datasets, forecasts, and advanced modeling techniques. These advances present new opportunities for building real-time decision-making tools that can improve aquatic health outcomes. Despite these opportunities, developing tools that are effective and useful in practice can remain challenging. Successful tool development requires careful consideration of scientific principles, technical design, management constraints, stakeholder needs, and user design. The presentation will discuss the recently developed Yampa River Water Temperature Forecast Tool as a case-study in decision-making tool development. This machine learning-based tool provides 5-day forecasts of daily water temperature for the Yampa River at Steamboat Springs. Leveraging a diverse set of real-time inputs, the model generates a probabilistic representation of water temperatures, and predicts impacts to water temperatures based on a set of alternate flow release scenarios from the upstream Stagecoach Reservoir. The model structure and predictions leverage learning both from historical observations and from a mechanistic model that simulates water temperatures under ranges of conditions not found in the historical record. The presentation will focus on how the tool was co-developed with Yampa Basin stakeholders, highlighting how stakeholder input was critical to informing both technical and user design considerations. We will further discuss more broadly the technical opportunities and the challenges associated with the development of decision-making tools. Finally, we will reflect on some best practices for designing monitoring programs that can maximize opportunities to develop similar tools elsewhere.

9:40am

**Water Security Index in the Colorado River Basin Cases from the Upper Basin: Grand Junction, Colorado**

*Dr. Paul Hernández-Romero and Ryan Lima with Babbitt Center for Land and Water Policy*

Abstract: Since 2012, the World Economic Forum has considered the Water crisis as one of the most prominent global risks that humanity is facing in short and medium-term impact. Various reports from different agencies around the world establish that all sectors involved in the management and sustainable use of water resources must reach a shared vision to achieve an integrated management approach that ensures and preserves water security. Building upon the concept of water security - whose main objective is to meet equitable demands for water in terms of quantity and quality at affordable prices while considering environmental sustainability and promoting economic growth for the benefit of society - a Water Security Index for the Colorado River Basin (WSICRB) is being proposed. This index contemplates the implementation in the Grand Junction region, considering the components of quantity, quality, accessibility, and potential water-related risks. The WSICRB is integrated into a Geographic Information System (GIS) for spatial analysis with a local and regional focus. This initial proposal to establish a quantitative measure of Water Security at the watershed level is the first approach to determine the current state of the Water Resources in the region. Partial preliminary results show that in the Grand Junction region, there is Low Water Security with a WSICRB value of 0.565, indicating very low water availability, moderate water quality, high accessibility to the resource, and relatively low potential risks of natural disasters according to the classification established in this research.

10am

**Break**

**Session 8: Upper Colorado River Recovery Programs and Partnerships**

10:30am

**Overview of Recovery Programs**

*Julie Stahli Program Director for the Upper Colorado River Endangered Fish Recovery Program at U.S. Fish and Wildlife Service*

Abstract: The Upper Colorado River Basin is home to four rare native fishes that are either threatened or endangered. All four of these fishes, bonytail, Colorado pikeminnow, humpback chub and razorback sucker, call the Upper Colorado River their home while Colorado pikeminnow and razorback sucker are also found in the San Juan River. These Recovery Programs are public and private partnerships of water users, conservation groups, and state and federal agencies. These partnerships work towards the recovery of these endangered and threatened species while still allowing water delivery and development to occur.

11am

**Collaborative Partnerships Working Towards Recovery**

*Moderator: : David Graf, Instream Flow Coordinator at U.S. Fish and Wildlife Service*

Panel Discussion with Aaron Chavez (Executive Director, San Juan Water Commission), Lee Traynham (Deputy Area Manager of Western Colorado Area Office, Bureau of Reclamation), Leslie James (Executive Director, Colorado River Energy Distributors Association), Joe Trungale (Fresh Water Scientist, The Nature Conservancy), Melissa Trammell (National Park Service).

Noon

**Closing remarks and lunch to go**



## POSTERS

Posters will be displayed in the lounge adjacent to the lunch area throughout the Forum.

### Analyzing the Rainwater Harvesting Potential to Supply Residential Irrigation Demand in Colorado's Main Urban Areas under Future Climate Scenarios

Santiago Ramírez-Núñez with University of Colorado Boulder

### Application of RGB and Multispectral Drone (sUAS) Photogrammetry of Alluvial Fans in the Grand Valley of Colorado, USA for Detecting Shallowly-Buried Channel Features that May Act as Groundwater Conduits: Geological Society of America Abstracts with Programs

KennaLee Worster and Greg Baker with Colorado Mesa University

### Image Analysis for Flow and Water Quality Monitoring

Junwon Lee with University of Colorado Boulder

### Novel Biochar Injection Concept — Field Trial

Michael Lobato with Lobato Farms, LLC

### Scaling Up Local Capacity for Multi-Benefit Projects Throughout Colorado

Chelsea Silva with River Network and Stacy Beough with Strategic by Nature, Inc.

### Utilizing Dendrochronology of Ponderosa Pine Trees to Determine Potential Climate Change Refugia in Bangs Canyon Recreation Area

Lauren Brandt with the Physical and Environmental Sciences Department of Colorado Mesa University

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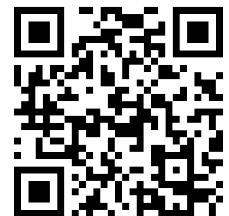
## Mobile App, Web Portal:

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[https://whova.com/portalannua13\\_202305/](https://whova.com/portalannua13_202305/)



Mobile app



Web portal

## Biographies and Abstracts:

Speaker biographies and presentation abstracts are available on the Whova app or on the Forum website at [coloradomesa.edu/water-center/forum](https://coloradomesa.edu/water-center/forum).



## Forum Evaluation

Thank you for taking the time to provide your feedback on the 2023 Upper Colorado River Basin Water Forum.

<https://forms.gle/FFunT2dC1e6TdVf48>





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Registration scholarships for the water user community and CMU faculty along with travel support for CU students and faculty are supported by a grant from the University of Colorado, Boulder Community Outreach and Engagement Program.

 University of Colorado **Boulder**

An aerial photograph of a winding river in a canyon. The river is a muddy brown color and flows through a deep, rocky gorge. The canyon walls are composed of layered, reddish-brown rock. Sparse green vegetation is visible on the slopes. The text is overlaid in the center of the image.

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