

Introduction: Framing the Report

Making Voluntary Irrigation Withdrawals on Grass Pasture Work for Livestock Production and Water Conservation in the Upper Basin

Daniel Mooney¹, Dana Hoag², Seth Mason², Perry Cabot³

Purpose of the Report

This report explores what it will take to make voluntary, temporary, and compensated irrigation withdrawals on grass pastures feasible for livestock producers, with a focus on western Colorado. Our aim is to provide insights that support the development of workable programs and policies that contribute to meaningful regional water conservation, without undermining the long-term viability of irrigated agriculture or livestock operations.

A Realistic and Constructive Perspective

We focus on the field-level perspective—examining technical, operational, economic, and behavioral factors around producer implementation of irrigation withdrawal practices on working pastures. The report does not address broader elements of water conservation planning, such as water shepherding, water rights, or regional and multistate coordination. Nor does it offer normative judgements about whether, or how much water should be conserved through agricultural withdrawals versus alternatives like urban conservation, efficiency improvements, or supply enhancement efforts.

Importantly, this report is also not a prescription for curtailment. Rather, it is an effort to clarify the conditions under which voluntary irrigation withdrawals could work—for producers, for programs, the public, and for the region. Our goal is to inform water conservation strategies that are feasible, effective, and adapted to the realities of pasture-based livestock production in the Upper Colorado River Basin.

By sharing field-based insights and practical considerations with an eye towards implementation, we aim to support more informed decision-making around irrigation withdrawal practices by producers, water managers, conservation organizations, and policymakers—helping each weigh tradeoffs, anticipate challenges, and identify opportunities suited to their own contexts.

Context and Significance

Water scarcity in the Colorado River Basin is intensifying. Persistent drought, a declining snowpack, and growing demand among river water users have pushed water managers, policymakers, and agricultural producers to explore new ways to conserve water while sustaining livelihoods (Udall and Overpeck, 2017). The region contributes nearly \$20 billion annually to the national economy (Crespo et al. 2025), underscoring its importance. These stresses pose significant risks across sectors, especially to agriculture in the Upper Basin, where water rights are closely tied to irrigated crop and livestock production (Mooney and Hansen, 2024). With agriculture accounting for over 70% of water use, it is central to conservation efforts.



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Author affiliations: ¹Agricultural and Resource Economics, Colorado State University (CSU); ²Systems Engineering, CSU, ³Western Colorado Research Center, CSU

The seven basin states are working toward a shared water management vision, but as one observer noted, if they “cannot come to consensus, they will forfeit a chance to have a strong, united voice in their own water future. Without a basinwide proposal, the federal government will move forward with its own management options based on a variety of proposals, letters, climate models and more” (Mullane, 2025).

In response, Upper Basin states have begun investigating voluntary, compensated water-sharing arrangements, and policy makers have pledged millions of dollars in funding to support them (Booth, 2023). Within agriculture, these strategies often focus on temporary practices—such as seasonal fallowing (i.e., full-season irrigation withdrawal), split season irrigation (i.e., standard irrigation early in the growing season followed by irrigation shutoff later in the season), or crop switching—that aim to reduce consumptive water use. These actions can, in turn, support other downstream water uses (hydroelectric power production, urban demand, ecological flows, recreation, etc.) and help meet compact obligations (Upper Colorado River Commission, 2024).

The Challenge

Irrigated grass pastures—grazed by livestock and occasionally cut for hay—make up a significant share of irrigated acreage in western Colorado. As a result, they offer potential opportunities for voluntary, temporary, and compensated irrigation reductions as a strategy to reduce consumptive water use (Cabot et al., 2023). However, managing such reductions poses unique challenges related to livestock operations, pasture recovery, and economic viability.

Livestock-based operations are often overlooked in water conservation planning, yet they are a key component of the Upper Basin’s economy, where grass, pasture, and alfalfa dominate land use. Unlike specialized crop or hay producers, livestock producers face higher risks: herds can be quickly downsized in response to forage scarcity, but require years to rebuild, making operations less adaptable to sudden or irregular irrigation cuts. Water programs must therefore go beyond acreage- or yield-based financial breakeven incentives and consider the distinct needs of livestock enterprises.

While implementing voluntary irrigation withdrawal practices on grass pastures may be technically possible, it is also operationally complex and economically uncertain. Producers must weigh how short-term changes in water use affect forage availability, animal performance, and long-term land productivity. At the same time, designing programs that support these efforts requires attention to behavioral factors such as demographic factors associated with producers’ willingness to participate, their preferences over program or policy attributes, or attitudes towards water conservation in general. Put simply: water conservation on grass pastures could play a meaningful role in helping the region meet its water goals—but only if solutions are practically feasible, locally grounded, and compatible with producers.

Given this context there is a pressing need for field-scale evaluations of full- versus partial-season irrigation practices tailored to mid-elevation pasture (5,000-7,000 feet)—which account for more than half of consumptive use (CU) in the UCRB. These land areas are central to sustaining cow-calf and hay operations across the region. In response, this project aimed to generate new insight into the feasibility and scalability of voluntary irrigation withdrawal strategies that can support both water conservation and livestock operation viability.

Approach and Structure

The report is the result of a collaborative, multi-stakeholder research partnership between Colorado State University, Western States Ranches, and Conscience Bay Research. The goal was to evaluate the water conservation potential of eight irrigation withdrawal practices designed to maintain hay and livestock production on irrigated pastures—offering alternatives to widespread fallowing in the Upper Colorado River Basin. The project aimed to assess whether these practices could provide a more

producer-compatible approach to water conservation, balancing systemwide goals with on-the-ground realities of livestock production.

Our analysis is grounded in field-scale demonstration trials conducted on two Upper Basin states owned by Western States Ranches, supplemented by interviews, field data, producer input, and expert perspectives. We combine a range of sources, including simulation models, climate and evapotranspiration data, market prices, and a survey of over 400 water experts and users---to build an improved understanding of feasibility, outcomes, and barriers. This report summarizes Phase I of the project, presenting preliminary insights. Additional results will follow in forthcoming Phase II.

The report is presented as a series of concise briefs, each examining a key dimension of this issue:

- Technical and agronomic factors, including the water conservation potential and yield effects of split-season and other partial irrigation strategies relative to no- and full-withdrawal alternatives.
- Operational and livestock management challenges, focusing on the complexities producers face when implementing reduced irrigation practices.
- Economic tradeoffs and producer decision-making, with attention to compensation levels necessary to incentivize participation.
- Behavioral and policy design considerations, including which types of producers and operations are most likely to adopt these strategies and what program features support their involvement.

By testing these strategies in real-world conditions, this project reflects the value of on-the-ground demonstration and acknowledges the risks innovative operations like Western States Ranches and project sponsors like Conscience Bay Research take when piloting new water management approaches.

Demonstration scale projects help bridge the gap between theory and practice. They allow stakeholders to observe outcomes, adapt methods, and gain trust through direct experience or learning from others (Mooney et al., 2023)—especially important in sectors like ranching, where variability in terrain, climate, and herd management can affect feasibility. Without field-based trials, it can be difficult to assess how conservation practices perform under real operational constraints or to develop policies that are both effective and translatable. Overall, by generating local evidence, this project helps inform more practical, scalable, and producer-compatible approaches to conservation in the Upper Basin.

In this Issue

The findings and perspectives reported here represent an initial summary of findings, with further research related to the study objectives ongoing.

- The first brief, “***Estimating the Water Conservation Potential of Voluntary Irrigation Withdrawals on Working Livestock Pastures***,” prepared by CSU agricultural engineer Perry Cabot and CSU civil and environmental engineers Jose Chavez and Adwoa Serwaa Amankaa, lay the foundation by assessing the technical potential of voluntary withdrawal scenarios to conserve water at the field level. It reports the results from demonstration-scale field trials conducted at two locations in western Colorado in collaboration with Western States Ranches.
- Serving as a companion to the first, the second brief, “***Evaluating Yield Performance across a Spectrum of Irrigation Withdrawal Scenarios in Pasture-Livestock Systems***,” prepared by Perry Cabot, presents forage production data from the same demonstration trials. This analysis summarizes data to better understand the agronomic trade-offs associated with the timing of voluntary irrigation withdrawal.
- Expanding the focus to operational considerations, the third brief, “***Recommendng Practical Strategies to Make Limited Irrigation Practices Work on Pasture-Based Livestock***

Operations,” prepared by CSU agricultural economist Daniel Mooney and Perry Cabot, incorporates producer input from Dan Waldvogle and Mike Higuera. It examines how voluntary irrigation withdrawal practices can align with grazing schedules and day-to-day management needs.

- Building on these insights, the fourth brief, “**Determining the Impact of Limited Irrigation Practices and Water Conservation Payments on Livestock Producers’ Bottom Line**,” prepared by Daniel Mooney, fellow CSU agricultural economists Dana Hoag and Bhishma Dahal, and Perry Cabot, offers an economic perspective. It analyzes breakeven values for water conservation payments at the field level, based on the foregone revenues from hay production and reduced grazing days across different withdrawal scenarios.
- Finally, the fifth brief, “**Identifying Factors Associated with Farmer Willingness to Participate in Regional Water Conservation Programs**,” prepared by CSU systems engineer Seth Mason with Dana Hoag and Daniel Mooney, examines the behavioral factors influencing producer participation decisions. It sheds light on the variability in producers’ willingness to engage in water conservation efforts across program and policy design attributes as well as producer demographics and attitudes.

The remainder of the report provides an in-depth look at each brief, providing more information on our findings and practical insights to support decision making around voluntary withdrawal practices and to guide the development of feasible and effective regional conservation programs.

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