COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Colorado Water Conservation Board

Water Plan

Water Project Summary

Name of Applicant	Onward! A Legacy Foundation DBA Dolores Watersheds Collaborative
Name of Water Project	Developing and Implementing Hydrologically-Informed Forest Treatments in Semi-Arid Southwestern Colorado
Grant Request Amount	**$879,470.00**
Primary Category	$879,470.00
Watershed Health & Recreation	
Total Applicant Match	**$13,453.00**
Applicant Cash Match	$0.00
Applicant In-Kind Match	$13,453.00
Total Other Sources of Funding	**$581,762.00**
Dolores Water Conservancy District	$49,086.00
CO DNR COSWAP	$317,558.00
USDA-ARS SW Watershed Research Center	$147,668.00
San Juan National Forest	$28,650.00
The Nature Conservancy	$20,000.00
Mountain Studies Institute	$13,800.00
University of Arizona	$5,000.00
Total Project Cost	**$1,474,685.00**

Applicant & Grantee Information

Name of Grantee: Onward! A Legacy Foundation DBA Dolores Watersheds Collaborative
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Description of Grantee/Applicant

Not for profit forest and watershed collaborative working in the upper Dolores and Mancos watersheds in Montezuma and La Plata counties. We operate under the fiscal sponsor of Onward! A Legacy Foundation

Type of Eligible Entity

- ☐ Public (Government)
- ☐ Public (District)
- ☐ Public (Municipality)
- ☐ Ditch Company
- ☐ Private Incorporated
- ☐ Private Individual, Partnership, or Sole Proprietor
- ■ Non-governmental Organization
- ☐ Covered Entity
- ☐ Other

Category of Water Project

- ☐ Agricultural Projects
  Developing communications materials that specifically work with and educate the agricultural community on headwater restoration, identifying the state of the science of this type of work to assist agricultural users among others.
- ☐ Conservation & Land Use Planning
  Activities and projects that implement long-term strategies for conservation, land use, and drought planning.
- ☐ Engagement & Innovation Activities
  Activities and projects that support water education, outreach, and innovation efforts. Please fill out the Supplemental Application on the website.
- ■ Watershed Restoration & Recreation
  Projects that promote watershed health, environmental health, and recreation.
- ☐ Water Storage & Supply
  Projects that facilitate the development of additional storage, artificial aquifer recharge, and dredging existing reservoirs to restore the reservoirs' full decreed capacity and Multi-beneficial projects and those projects identified in basin implementation plans to address the water supply and demand gap.

Location of Water Project

Latitude	37.582778
Longitude	108.438611
Lat Long Flag	Precise coordinates: Project coordinates are readily definable and precisely define the location of the project
Water Source	House Creek sub basin of the upper Dolores River Watershed
Basins	Southwest
Counties	Montezuma
Districts	71-West Dolores Creek/Tribs.

Water Project Overview

Major Water Use Type	Environmental
Type of Water Project	Study
Scheduled Start Date - Design	2/1/2025

Scheduled Start Date - Construction

Description

Southwestern Colorado is experiencing decreased snowpack and increased wildfire, leading the Colorado Water Plan to identify wildfire mitigation as a key action to support thriving watersheds. Likewise the Southwest Basin Implementation Plan recognizes that forest health projects are needed to increase source water protection. As over 70% of our water originates as snow in forested mountains, there is an urgent need to adjust forest management strategies to incorporate interdisciplinary knowledge including hydrology, forestry, and ecology. To address these community needs, we propose generating hydrologically-informed forest treatments in the Dolores watershed, leveraging three years of existing local data to generate high resolution, localized ecohydrologic models of the upper and lower Dolores watershed above McPhee Reservoir. The models will be applied to collaboratively develop and implement hydrologically-informed treatments via funding from COSWAP, install infrastructure necessary to assess the ecohydrologic impacts of these treatments, complete the first year of monitoring, develop protocols for future monitoring and conduct outreach. We will also use existing local datasets to develop a higher elevation forest hydrologic model, which can help improve predictions of snowmelt amount and timing and runoff forecasting. This proposal represents one of the first efforts to apply locally-informed modeling to design and implement forest treatments that delay snowmelt to enhance soil moisture, fuels moisture, and summer low flows.

Measurable Results

	New Storage Created (acre-feet)
	New Annual Water Supplies Developed or Conserved (acre-feet), Consumptive or Nonconsumptive
381,000	Existing Storage Preserved or Enhanced (acre-feet)
	New Storage Created (acre-feet)
	Length of Stream Restored or Protected (linear feet)
	Length of Pipe, Canal Built or Improved (linear feet)
	Efficiency Savings (dollars/year)
	Efficiency Savings (acre-feet/year)
380	Area of Restored or Preserved Habitat (acres)
	Quantity of Water Shared through Alternative Transfer Mechanisms or water sharing agreement (acre-feet)
	Number of Coloradans Impacted by Incorporating Water-Saving Actions into Land Use Planning
28,903	Number of Coloradans Impacted by Engagement Activity

Other

This project designs and implements 30 acres of hydrologically-informed forest treatments in the SW Colorado ponderosa pine forests. Pending results, this project has the potential to inform water-saving forest treatments on approximately 150,000 acres of ponderosa pine forest in the San Juan National Forest.

The acres treated above refers to the total acres of forest treatments in the House Ck watershed associated with the CO DNR COSWAP award that is part of this project. The storage preserved refers to McPhee Reservoir. An intended outcome of this effort is to increase the length of time water is stored in the soil through delayed snowmelt through hydrologically-informed forest treatments. At this time we are unable to predict this in acre-feet.

Water Project Justification

Decreased snowpack, earlier snowmelt, and increased wildfire in the Southwest have led land managers and collaboratives to prioritize forest health, source water protection, and water availability. This concept is evidenced by both the Southwest Basin Implementation Plan and the Colorado Water Plan identifying the importance of balancing water availability needs amongst all water use sectors while promoting healthy forests and watersheds. The Colorado Water Plan also identifies thriving watersheds that prioritize watershed health, forest health, wildfire mitigation, and river health as one of four key action areas.

As forested, snow-dominated, mountain watersheds are responsible for generating the majority of surface water available to all sectors in southwestern Colorado, interdisciplinary approaches to watershed management are imperative to ensure source water protection. Our local stakeholders include the Dolores Water Conservancy District (DWCD), who manages the McPhee reservoir (381,000 acre feet of capacity) serving multiple municipalities, one tribe, farmers and ranchers (63,000 irrigated acres) and downstream fisheries. Like many water users and managers across Colorado and the Intermountain West, DWCD is concerned about the future of the watershed and its ability to supply water and forecast quantity and timing. Reduced snowpack and snowmelt runoff together with earlier snowmelt contributes to decreased water supply and increased risk of severe wildfire and the attendant impacts on watershed health, soil erosion, water quality, and future snowmelt runoff. Efforts to proactively reduce severe fire risk include millions of acres of mechanical thinning to reduce fuel loads and connectivity through efforts such as the Collaborative Forest Landscape Restoration Program.

With these recent changes in the hydrology of forested watersheds, Dolores Watersheds Collaborative (DWC) and its partners have invested heavily into understanding where and how forest management can improve source water protection and hydrologic function. In partnership with DWCD, Mountain Studies Institute (MSI), the United States Department of Agriculture (USDA) and The Nature Conservancy (TNC), we have been building and studying a network of forest-snow monitoring stations, called Snowtography sites. These sites span gradients of elevation, forest type, canopy amount, and spatial arrangement of post-treatment canopy in the San Juan Mountains. Snowtography fills critical gaps in existing snow measurements in that SNOTEL stations capture unforested clearings and remote sensing maps for the Airborne Snow Observatory (ASO) or satellite imagery can be infrequent and expensive. Through merging remotely sensed snow maps with daily Snowtography measurements, we are now able to train a hyper-resolution forest-snow model called SnowPALM, at mid and high-elevation sites in the Dolores Watershed to accomplish two major objectives: 1) In the high elevation site, this model will provide daily snowmelt maps across spruce-fir forests which are critical sources of runoff and streamflow prediction for water managers such as DWCD and forecasters including Colorado Airborne Snow Monitoring Team (CASM) and the Colorado River Basin Forecast Center (CRBC). 2) Meanwhile, the mid-elevation site will be utilized to develop hydrologically-informed forest treatments to conserve snowpack and soil moisture, which are key for fire-resistant watersheds. These treatment units will be developed alongside our partners in the Dolores District of the San Juan National Forest, implemented, and then monitored for comparisons with no treatment and “treatment as usual” control units. The SnowPALM models resulting from this project can provide inputs to watershed-scale hydrologic models and inform future water resources assessments and forest treatment planning across the region’s many watersheds with similar elevations, forest types, and management considerations. All Snowtography stations have soil moisture monitoring sensors. This data will be made available to the Colorado State University In-RICHES Colorado Soil Moisture Monitoring Network.

In addition to meeting the needs of our stakeholders, this project addresses challenges and advances goals and objectives of the Southwest Basin Implementation Plan including but not limited to 1) projects that build resilient watersheds and healthy forests impacted by drought, fire, and climate change; 2) efforts to enhance and maintain watershed health by protecting and/or restoring watersheds to ensure sustainable water supply, water quality, critical infrastructure, and/or environmental and recreational areas; and 3) supporting dialogue and fostering cooperation, collaboration and conflict resolution among diverse water users.

Related Studies

NOTE: See Scope of Work for complete list of references and studies.

E. Batllori, F. Lloret, T. Aakala, W.R.L. Anderegg, E. Aynekulu, D.P. Bendixsen, A. Bentouati, C. Bigler, C.J. Burk, J.J. Camarero, M. Colangelo, J.D. Coop, R. Fensham, M.L. Floyd, L. Galiano, J.L. Ganey, P. Gonzalez,

A.L. Jacobsen, J.M. Kane, T. Kitzberger, J.C. Linares, S.B. Marchetti, G. Matusick, M. Michaelian, R.M. Navarro-Cerrillo, R.B. Pratt, M.D. Redmond, A. Rigling, F. Ripullone, G. Sangüesa-Barreda, Y. Sasal, S. Saura-Mas, M.L. Suarez, T.T. Veblen, A. Vilà-Cabrera, C. Vincke, & B. Zeeman (2020) Forest and woodland replacement patterns following drought-related mortality, Proc. Natl. Acad. Sci. U.S.A. 117 (47) 29720-29729, https://doi.org/10.1073/pnas.2002314117.

Belmonte, A., Ts. Sankey, T., Biederman, J., Bradford, J. B., & Kolb, T. (2022). Soil moisture response to seasonal drought conditions and postthinning forest structure. Ecohydrology, 15(5), e2406.

Biederman, J. A., Brooks, P. D., Harpold, A. A., Gochis, D. J., Gutmann, E., Reed, D. E., ... & Ewers, B. E. (2014)a. Multiscale observations of snow accumulation and peak snowpack following widespread, insectinduced lodgepole pine mortality. Ecohydrology, 7(1), 150-162.

Biederman, J. A., Harpold, A. A., Gochis, D. J., Ewers, B. E., Reed, D. E., Papuga, S. A., & Brooks, P. D. (2014)b. Increased evaporation following widespread tree mortality limits streamflow response. Water Resources Research, 50(7), 5395-5409.

Broxton, P. D., Harpold, A. A., Biederman, J. A., Troch, P. A., Molotch, N. P., & Brooks, P. D. (2015). Quantifying the effects of vegetation structure on snow accumulation and ablation in mixedconifer forests. Ecohydrology, 8(6), 1073-1094.

Chase, C. W., Kimsey, M. J., Shaw, T. M., & Coleman, M. D. (2016). The response of light, water, and nutrient availability to pre-commercial thinning in dry inland Douglas-fir forests. Forest Ecology and Management, 363, 98-109.

Dwivedi, R., Biederman, J. A., Broxton, P. D., Lee, K., & van Leeuwen, W. J. (2023)a. Snowtography quantifies effects of forest cover on net water input to soil at sites with ephemeral or stable seasonal snowpack in Arizona, USA. Ecohydrology, 16(2), e2494.

Dwivedi, R., Biederman, J. A., Broxton, P. D., Lee, K., van Leeuwen, W. J., & Pearl, J. K. (2023)b. Forest density and snowpack stability regulate root zone water stress and percolation differently at two sites with contrasting ephemeral vs. stable seasonal snowpacks. Journal of Hydrology, 624, 129915.

Dwivedi, R., Biederman, J. A., Broxton, P. D., Pearl, J. K., Lee, K., Svoma, B. M., ... & Robles, M. D. (2024). How three-dimensional forest structure regulates the amount and timing of snowmelt across a climatic gradient of snow persistence. Frontiers in Water, 6, 1374961.

Taxpayer Bill of Rights

N/A