COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Colorado Water Conservation Board

Water Plan

Water Project Summary

Name of Applicant	Drylands Agroecology Research
Name of Water Project	Agroecology Incubator Program
Grant Request Amount	**$70,000.00**
Primary Category	$70,000.00
Engagement & Innovation Activities	
Total Applicant Match	**$216,000.00**
Applicant Cash Match	$216,000.00
Applicant In-Kind Match	$0.00
Total Other Sources of Funding	**$10,000.00**
Wright-Ingraham Institute	$10,000.00
Total Project Cost	**$296,000.00**

Applicant & Grantee Information

Name of Grantee: Drylands Agroecology Research
Mailing Address: 12191 North Foothills Highway Longmont CO 80503
FEIN: 822,651,409

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Description of Grantee/Applicant

Drylands Agroecology Research is a non-profit organization dedicated to restoring the earth and our communities through regenerative agricultural design. Using keyline design, agroforestry, drought resilient seed and stock breeding programs, and careful livestock integrations, DAR designs farm systems that reverse desertification, sequester carbon, enhance biodiversity, support marginalized communities, and produce an agricultural yield. These implementations are embedded within a research and educational program to document and scale successes. DAR has completed its pilot project and is in the process of scaling its implementations and research.

Type of Eligible Entity

☐

- [ ] Public (Government)
- [ ] Public (District)
- [ ] Public (Municipality)
- [ ] Ditch Company
- [ ] Private Incorporated
- [ ] Private Individual, Partnership, or Sole Proprietor
- [x] 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.
- [x] 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	40.200000
Longitude	105.250000
Lat Long Flag	
Water Source	South Platte Basin
Basins	South Platte
Counties	Boulder
Districts	4-Big Thompson River; 6-Boulder Creek; 5-St. Vrain Creek

Water Project Overview

Major Water Use Type	
Type of Water Project	Education
Scheduled Start Date - Design	4/1/2024
Scheduled Start Date - Construction	

Description

Our Agroecology Incubator Program is designed to facilitate the widespread adoption of passive water-harvesting earthworks, agroforestry, and holistic grazing to restore degraded drylands. We are creating perennial food systems that regenerate without maintenance, reduce reliance on scarce water resources, and are resilient to fire/flood cycles. We intend to develop these systems across 1000 acres in Boulder County by 2023 and use every project to provide valuable training through two pathways: 1) Hosting an immersive apprenticeship program

to train five aspiring land stewards in ecological design, regenerative farming, project implementation, and research. 2) Creating a 112-hour Foundations of Agroecology Course to train land owners, and aspiring land stewards in how to design, create, and manage these systems. The cornerstone of all learning and implementation is water management, which we understand to be the limiting factor for food production, carbon sequestration, and biodiversity in semi-arid climates. Funding from this grant support the pilot year of this program, including curriculum development and refinement, compensation for lead facilitators, and a portion of the apprenticeship stipend. After completing a pilot year, our intention is to expand our reach to greater numbers of land stewards in the South Platte River Basin and beyond.

Measurable Results

	New Storage Created (acre-feet)
	New Annual Water Supplies Developed or Conserved (acre-feet), Consumptive or Nonconsumptive
	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)
125	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
2,000	Number of Coloradans Impacted by Engagement Activity
Other	

Numbers of trees/linear feet intended to be planted next year in context of apprentice projects:
Approximately 15,000 linear feet of swales dug (enabling the planting of about 10,000 trees and shrubs in 2025)
Across 100-150 acres
3000 trees planted in 2024 (in existing 5000’ of linear swales at Metacarbon/Yellow Barn Farm)

Water Project Justification

Our methodology is grounded in the understanding that in arid and semi-arid climates, water is the limiting factor for ecosystem health and agricultural productivity, so the management of water underlies everything we do and teach. Using passive water-harvesting earthworks to catch and distribute rainfall in arid climates makes it possible to establish trees and shrubs without irrigation. The growth of these trees and shrubs further rehydrates the landscape while sequestering carbon, supporting biodiversity, building fertility, and producing abundant yields of fruit and forage for human and livestock consumption.

In the Colorado Water Plan 2023:
In Section 1, page 9, our project supports the example action areas of thoughtful storage, meeting future water needs, wise water use, healthy lands, and engaged partners. Our regenerative agriculture methodologies and Agroecology Incubator Program center on:
1) Keyline design as a framework for managing water through passive water harvesting earthworks to make it possible to establish vegetation
2) The intentional use of integrated forest-grassland management so that vegetation can further rehydrate landscapes
3) The development of soil as a living sponge capable of storing rainfall and making it available for future use

In Section 1, page 10, we align with the plan’s listed tools for action such as: public outreach and education,

collaboration groups, climate adaptation, innovation, equity, land use and water planning integration, data collection and sharing, water efficiency, and water reuse. Our project collaborates with producers to implement these dryland agroforestry climate adaptation practices alongside intensive rotational grazing and bioregional crop production, resulting in the creation of highly diverse, productive, and resilient farm ecosystems and land use. Our water project is directed towards education, innovation, and public outreach as we will provide in-depth education to five apprentices and 15-20 diverse individuals engaged with land management, as well as 2000+people annually who attend our events and other programs.

In Section 6, page 176, Vision and Actions for Addressing Colorado's Risks: Robust Agriculture indicates the need for innovation to “sustain irrigated agriculture, including strategies to stretch available water supplies, increase resiliency, enhance food production, and maintain profitability. Water supplies for Colorado’s urban growth should not come at the expense of our rural communities through indiscriminate buy and dry methods.” Cultivating farm systems that reduce reliance on progressively diminishing irrigation resources is crucial in regions facing growing water scarcity. Our approach moves beyond traditional water conservation, focusing on developing systems that retain more water rather than just systems that use less.

In Section 6, page 195, Partner Actions Rely on Effective Engagement and Education at Different Levels: “Providing pathways for success to the next generation of farmers will help sustain the agricultural workforce and may attract new people to the industry.” Our program provides apprentices with deep, diverse experiential training in agriculture, project implementation, and research, so they develop skills to enable the furthering of these types of water management systems in our rural communities. This is specifically designed to propel people into livelihoods, the knowledge will go to the next generation of farmers and projects in the future!

In Section 6, page 196, Agency Actions:
2.1 is to expand agricultural water conservation, education, and peer-to-peer programs that enhance motivation with Resilient Planning. Our course is available to 10-12 additional large-scale landowners in or near Boulder County who intend to directly implement it, expanding the acreage by an additional 100+ acres.
2.2 Integrate capacity building efforts to support agriculture. Our curriculum is piloted and formalized so that by 2025 we can expand programming to train and educate more people in water management and build capacity. One of our project goals is to create a network for ongoing knowledge sharing, mentorship, and access to funding
2.5 Support the integration of robust agriculture into local government planning - Resilient Planning, Vibrant Communities. Our projects are featured to over 2000 people, including resident voters, annually through tours, workshops, and other events, helping disseminate our deepening findings about this type of water efficiency and landscape regeneration.
2.10 Integrate soil health, water conservation, and adaptive practices that increase economic outputs with less water use. Our research reports aim to demonstrate positive changes in biodiversity, soil health, water retention, and crop yields over time.

In the 2015 Colorado Water Plan:
Chapter 3, page 13 suggests that agriculture is the dominant water user and accounts for 85 percent of total water diversions. As more water is diverted to M&I uses, the expectation is that this will have a negative effect on rural communities, open spaces, wetlands, and recreation areas, as well as the local economy and food security. Our water project supports the Colorado Water Plan because we are pioneering agricultural systems that thrive with little or no irrigation and therefore free up water for M&I and environmental uses while the agricultural economy continues to thrive. It also allows non-irrigated lands to be revitalized and productive agricultural acres to grow.

In Chapter 6.2, the Colorado Water Plan Explicitly lists these goals related to shortages and declining irrigated

acres:
“Ensure that agriculture remains a viable economic driver in Colorado by supporting food security, jobs, and rural communities while protecting private property rights.”
“Meet Colorado’s agricultural needs.”
“Implement efficiency and conservation measures to maximize beneficial use and production.”
“Protect and enhance Colorado’s natural resources, and provide ecosystem services”

Chapter 5 Pg 40 also advocates the development of multi-purpose projects that simultaneously support agriculture, community water needs, environmental needs, and recreation. DAR’s work designs systems that support both agriculture and ecological health, while providing agrotourism benefits as well. DAR already embraces the water conservation techniques you suggest and goes further to innovate additional solutions for water conservation.

Chapter 6, Page 96 expands on soil health improvement methods to specifically cite mulching, drip irrigation, and “soil health” practices as cultivation techniques for reducing evaporative losses. DAR embraces these by:
1) Exploring new, drought-resilient crop types including small grains and high-value perennial fruit and nut crops, all of which also support livestock and require very little water
2)Designing systems that are never or very rarely irrigated
3) Improving soil health by increasing the ability of the systems to store water and support soil life, revegetating denuded areas and rarely leaving soil bare, and building fertility and microbiological health with careful livestock management

DAR is taking these conservation methods one step further by using less adopted methods like contour swales, agroforestry, and intensive livestock management to further lower agricultural water needs. This falls under the water conservation and reuse goal in Chapter 6 p. 59: “Seek creative options for improving agricultural irrigation conservation and efficiency.”

DAR promotes low tech, low cost water storage in the most accessible container around, the soil, which will also rehydrates underground aquifers and supports environmental health.

Chapter 3, Page 14 discusses how use of alluvial groundwater and aquifers offer opportunities to expand sustainable water use. By recharging groundwater, DAR’s systems support this goal. Chapter 3 also expands upon opportunities for water storage infrastructure to enhance water use efficiencies and supply reliability. DAR’s methodologies provide a very low-infrastructure alternative (storage in soil) that supports the same aims. DAR’s implementations will give working lands the ability to buffer the effects of drought, flooding, and climate change.

Chapter 4 pages 4-6 outline how variability of falling water creates problematic flood and drought conditions. Chapter 7 also speaks to the importance of drought and flood resilience. The South Platte basin goals & measurable outcomes (Chapter 6 pg 25) include meeting community water needs throughout Colorado by “assuring strong drought protection programs through broad development of protection plans and dedicated reserves potentially including storage, interruptible service agreements (ISAs), water banks, water use restrictions and nontributary groundwater, among others.”

DAR develops farming systems that are inherently drought and flood resistant, as there is infrastructure to slow, spread, and sink water in both events. Moreover, the ability of these landscapes to retain water would, over a large acreage, help prevent flooding.

In the analysis and technical update, on page 14, there was a discussion that, with climate change, snowmelt is likely to happen as much as one month sooner, followed by hotter and drier summers. This creates a very

problematic situation for farmers relying on late season irrigation from mountain snowmelt. It becomes increasingly important to design systems that do not rely on late-season irrigation. DAR's implementations are capable of soaking up significant moisture from spring precipitation events and holding it well into summer.

Related Studies

DAR's work is research focused, which will maximize the usefulness of its findings to other landowners and water conservationists and is also a stated goal of the CWCBP on pg 101: "The CWCB will continue to work with research institutions in Colorado to advance agricultural conservation and efficiency." DAR 2022 Research Report for an overview of the data we collect and research methodologies: https://www.dar.eco/research

Soil water holding capacity buffers crop yields:
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0160974

Agroforestry as a tool for rehydrating rocky, desertifying landscapes:
https://www.cabdirect.org/cabdirect/abstract/20203126592

Documented ecosystem services of agroforestry in Southern Africa:
https://www.ajol.info/index.php/ajest/article/view/135037

Essence of keyline design for rehydrating landscapes: https://www.cabdirect.org/cabdirect/abstract/19540603672

Case study of keyline design with bean crop: https://www.mdpi.com/2071-1050/13/17/9982

Considerations for using animals to enhance grassland water retention and productivity:
https://academic.oup.com/jas/article-abstract/93/6/2626/4703397

Using animal integration to help crop residues enhance soil health & productivity:
https://www.sciencedirect.com/science/article/abs/pii/S0308521X14000651

Taxpayer Bill of Rights

N/A