Drylands Agroecology Research
DAR Executive Research Report 2025

Executive Summary

2025 was a year defined by continuity and presence. At Drylands Agroecology Research (DAR), the work centered on returning to the same landscapes, asking the same questions, and continuing to listen. Across four long-term research sites in Longmont, Colorado, DAR maintained a commitment to place-based research that observes how dryland ecosystems respond to care, disturbance, and time under active agroecological management.

The strength of this work lies in its duration. Long-term ecological datasets remain rare in agroecological research, often constrained by short funding cycles and shifting conditions. DAR's ability to continue collecting data through uncertainty provides a critical advantage, allowing patterns to emerge beyond the typical three to five year research window. This temporal depth strengthens our understanding of how management decisions influence soil, water, plants, insects, and microbial communities over time.

We extend sincere gratitude to the landowners, collaborators, volunteers, and supporters who made this work possible. Showing up consistently is not easy, yet it is essential. Presence itself becomes an act of stewardship, enabling research that would otherwise be impossible.

As Joanna Macy reminds us, *"The heart that breaks open can contain the whole universe."* In honoring her legacy, this research acknowledges that staying present to ecological change, including stress, decline, and uncertainty, is part of building the resilience required for regeneration.

This report organizes DAR's research through a simple and repeatable framework that emphasizes clarity, accountability, and learning over time.

Action
Actions are the intentional land management practices implemented to support ecological regeneration. At DAR, these include agroforestry establishment and maintenance, soil organic matter development, and adaptive grazing management. Actions represent what is done on the land to initiate and sustain long-term ecological processes.

Indication
Indications are the measurable signals used to evaluate how ecosystems respond to management actions. DAR uses indicators such as soil water holding capacity and predator insect diversity to assess ecosystem function, resilience, and balance. Indications help translate complex ecological dynamics into observable trends over time.

Outcome
Outcomes are the cumulative ecological responses that emerge from sustained management and monitoring. These include changes in insect richness, grassland conditions, and overall ecosystem stability. Outcomes reflect longer-term shifts in soil, plant, and biological systems and guide future adaptive management decisions.

Together, this framework supports DAR's commitment to long-term learning, adaptive management, and the development of resilient, climate adaptive dryland agroecosystems.

Agroforestry Survival in Dryland Conditions

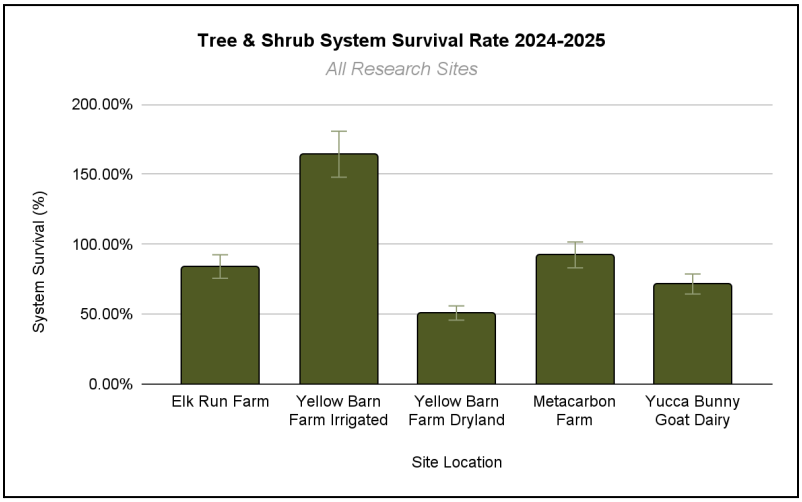
Tree and Shrub Census

Drylands Agroecology Research (DAR) continues to track tree and shrub establishment across its long-term research sites, with the most recent census showing a cumulative average survivability of **74.7%** when excluding the newly planted Yellow Barn irrigated system. This average reflects outcomes across established sites, including strong performance at Elk Run Farm and Metacarbon Farm, moderate survivability at Yucca Bunny Goat Dairy, and the most challenging conditions at Yellow Barn's dryland site, where rocky soils and extreme exposure continue to test perennial establishment. The Yellow Barn irrigated system, planted in the previous year, recorded unusually high survivability due to a 2025 planting and was intentionally excluded from this average..

Action

DAR actively establishes trees and shrubs within dryland terrace systems as a deliberate management action to catalyze agroecosystem regeneration. This intervention introduces long-term perennial structure into the landscape, setting the conditions for trophic development, increased biodiversity, and ecological complexity over time. As these systems persist, they drive functional outcomes including canopy formation, improved soil health, greater water retention, and expanded habitat for wildlife, demonstrating how targeted management actions translate into durable ecological gains.

Location	Percent Survival 2024/2025
Elk Run Farm	84.09 %
Yellow Barn Farm Irrigated	164.42 %
Yellow Barn Farm Dryland	50.84 %
Metacarbon Farm	92.40 %
Yucca Bunny Goat Dairy	71.58 %



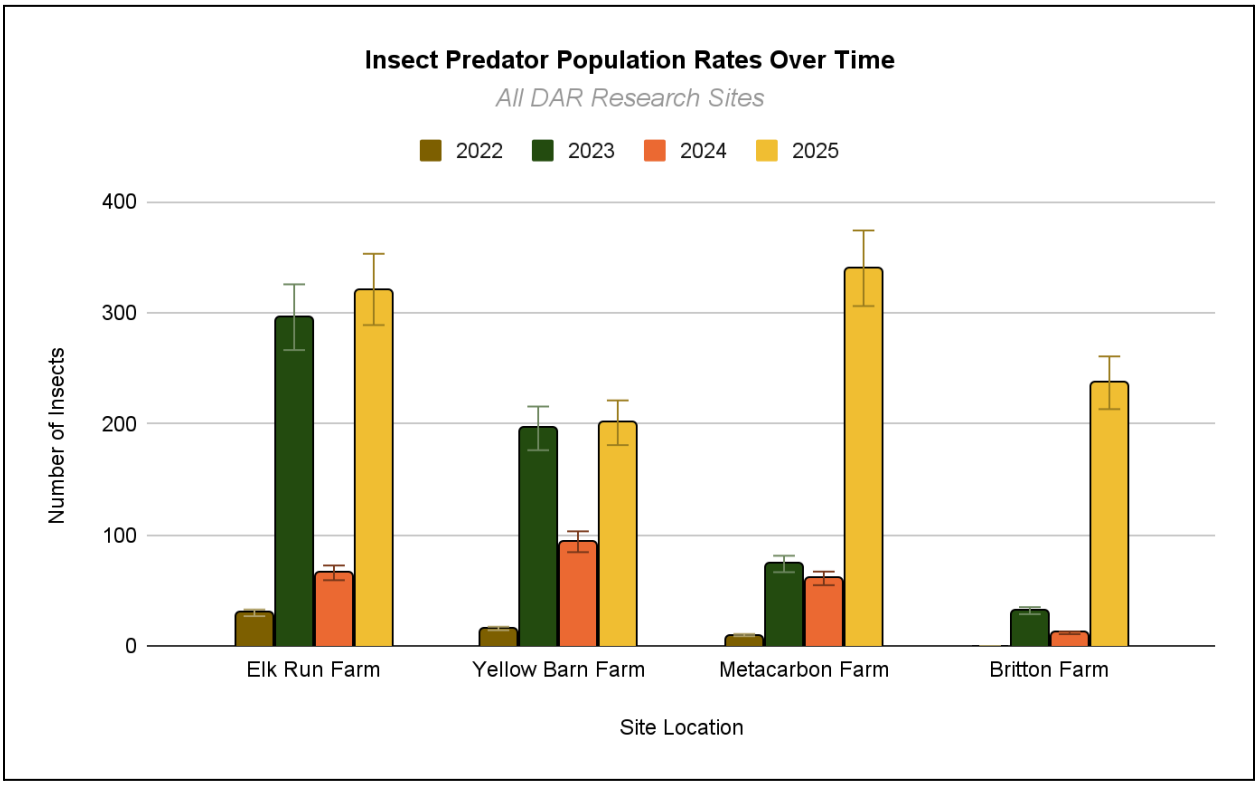
Bioindicators of Change

Predator Insect Diversity Survey

DAR uses predator insect diversity as a biological indicator of ecosystem function and recovery across research sites. Survey data from 2022 through 2025 show strong year to year variability, reflecting both disturbance impacts and ecological rebound. Following significant declines associated with the Stone Canyon Fires and related environmental stressors, predator counts increased markedly in 2025 across all monitored sites, with substantial rebounds at Elk Run, Yellow Barn, Metacarbon, and Britton Farms. These increases suggest recolonization and improving habitat conditions as vegetation structure and prey availability recover and ecosystems continue to build around terraced agroforestry management systems.

Indication

Predatory insects, including wasps and other beneficial taxa, respond quickly to changes in habitat complexity and food web stability. Rising predator diversity indicates sufficient lower trophic support and improving ecosystem balance, signaling that current land management practices are contributing to functional recovery and increasing ecological resilience over time.



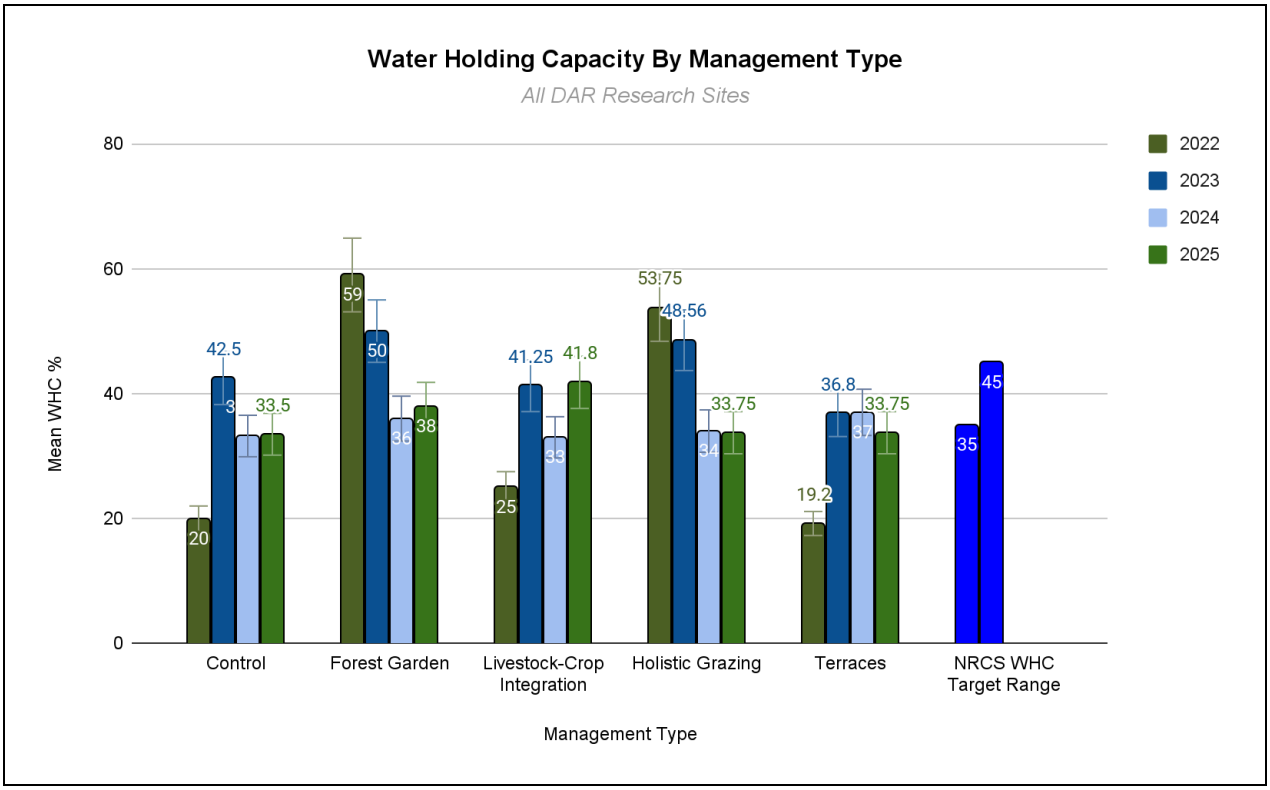
Water In Movement

Soil Water Holding Capacity

Soil water holding capacity measurements in 2025 reflect ongoing recovery and adjustment following recent climatic extremes. Results show continued variability across management types, with livestock crop integration and forest garden systems performing closest to the NRCS target range of 35 to 45. Terrace systems remain below target, indicating gradual improvement but persistent limitations in moisture storage. This is likely due to cuts in the ground changing the soil horizon profile and how water penetrates larger parent material more readily. Holistic planned grazing showed a slight decline compared to previous years, highlighting sensitivity to both management intensity and environmental conditions.

Outcome

Soil water holding capacity remains one of the most critical outcomes of effective land management, particularly within dryland agroecosystems. The capacity of soils to store and retain moisture directly supports plant productivity, microbial activity, and ecosystem resilience under increasingly variable climate conditions. These outcomes underscore the role of regenerative management in strengthening soil function and long term ecological stability.

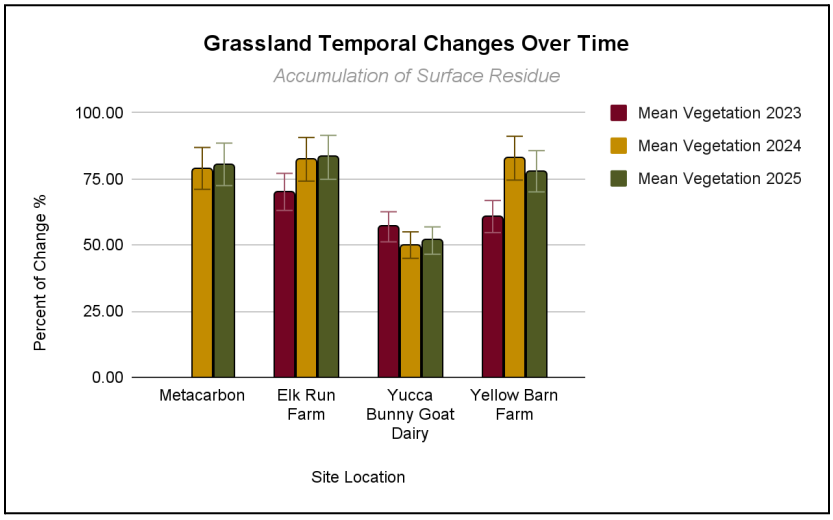


Grassland Agroecology

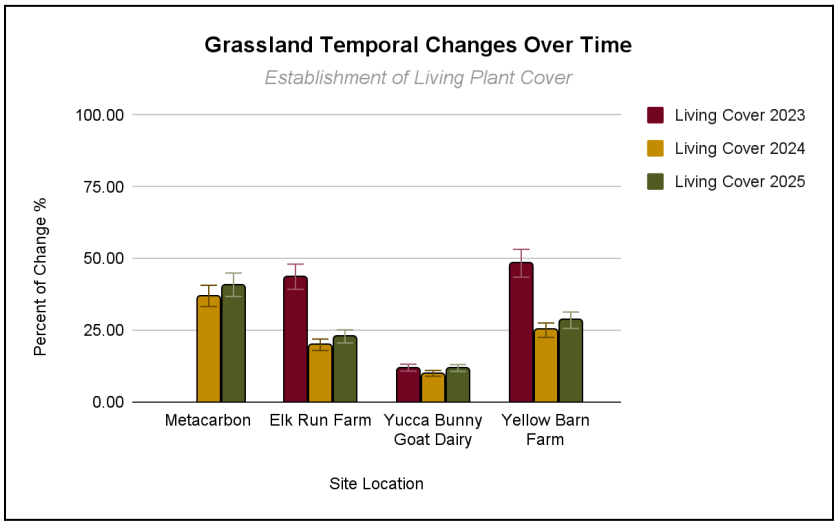
Grassland Health

Grassland health monitoring in 2025 indicates overall stabilization and modest gains in living plant cover across DAR research sites following prior climate stress. Mean vegetation cover remained high at Elk Run Farm and Yellow Barn Farm, while Metacarbon and Yucca Bunny Goat Dairy exhibited incremental increases relative to 2024. Living cover increased across all monitored sites, reflecting improving plant establishment and persistence despite continued dry conditions. These trends suggest that managed grazing systems are supporting the maintenance and recovery of living vegetation under variable environmental pressure.

Outcome



Grassland health outcomes reflect the cumulative effects of regenerative grazing and adaptive land management practices implemented across DAR sites. Increasing amounts of dead plant material retained on the soil surface provide consistent ground cover that protects soils from erosion, moderates temperature, and supports moisture retention. At the same time, the expansion and persistence of living plant cover indicate active vegetation recovery, contributing to root growth, soil structure, and ongoing biological function. Together, the buildup of surface residue and the establishment of living vegetation demonstrate the capacity of well managed grasslands to recover from disturbance, sustain biodiversity, and maintain ecological function under drought conditions. These complementary processes reinforce grassland management as a key driver of resilient dryland ecosystems under variable environmental pressure.



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