

COLDHARBOUR INSTITUTE

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# RANGELAND RESILIENCE RESEARCH

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EXPLORING THE CONNECTIONS  
SOIL - PLANTS - PEOPLE - CLIMATE

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AN INVALUABLE LOCAL RESOURCE:  
DIVERSE GRASSLANDS

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# RANCHING

GUNNISON HAS A RICH HISTORY AND CULTURE SURROUNDING RANCHING

**The sustainability of this livelihood depends upon the conservation and regeneration of perennial grasslands for cattle grazing.**

# RANCHERS HAVE EXPERIENCED THE EFFECTS OF CLIMATE CHANGE:

## Extreme Drought



In 2018, the Gunnison Valley experienced an extreme **drought** period causing ranchers to **shut off** their **irrigation waters** two weeks **early**. This **decreased yields** and caused **economic losses** for ranchers. After, ranchers were apt to **find a way** to **improve** their lands **soil health** to **increase** their **resilience** to future **drought** events.

# LAND MANAGEMENT APPROACH

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To improve the soil's **water holding capacity** ranchers can **increase** the amount of **organic matter** in the soil. One approach is to **amend the soil** with **compost**. The addition of compost adds organic matter to soil, along with nutrients that **increase plant productivity** with the **co-benefit** of **climate mitigation** through **carbon sequestration**.

## SOIL HEALTH



**Soil Health:** the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.

## SOIL ECOSYSTEM SERVICES



water  
filtration



nutrient  
cycling



temperature  
regulation



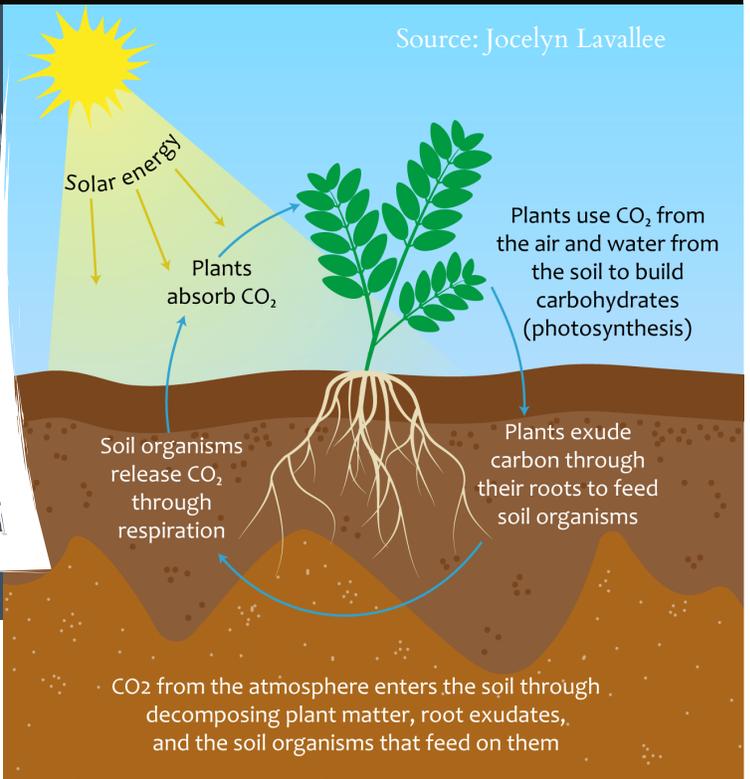
carbon  
storage



# CLIMATE MITIGATION

SOILS HAVE THE POTENTIAL TO STORE TONS OF CARBON DIOXIDE (CO<sub>2</sub>) FROM THE ATMOSPHERE

**Soil carbon sequestration** is a process in which **CO<sub>2</sub>** is **removed** from the atmosphere and **stored** in the **soil carbon pool**. This **process** is primarily mediated by **plants** through **photosynthesis**, with carbon stored in the form of **soil organic carbon**.



For more information about compost and carbon sequestration research, kindly visit [WWW.MARINCARBONPROJECT.ORG/](http://WWW.MARINCARBONPROJECT.ORG/)

# CO-PRODUCTION OF KNOWLEDGE

This project utilized a co-production in knowledge process to understand what the ranching community needed.

We worked collaboratively with ranchers to address their expressed need of improved soil health while researching the potentials of our rangelands to store carbon.

RESEARCH THAT IS SITE SPECIFIC AND CATERED TO ADDRESS COMMUNITY NEEDS IS MORE LIKELY TO BE ADOPTED

# RANGELAND RESEARCH

## Soil Health as Climate Mitigation: *Community Needs Directing Research*



### COMMUNITY & RESEARCH

This project was adapted to address the specified needs of ranchers in Gunnison, CO to improve their resiliency to drought. This project also hopes to understand how high elevation cold & arid climates respond to land management approaches to improve carbon sequestration.

### PROJECT DESCRIPTION

We designed a long-term ecological study, to monitor the effects of a compost application on irrigated rangelands. In June of 2019, 2 inches of a biosolid compost was applied at four ranches, one of those being Coldharbour Institute.

### VARIABLES MEASURED

With the addition of compost we were curious how it would effect:

- **Plant biomass e.g. grass yields**
- **Species diversity**
- **Soil organic matter (SOM)**
- **Soil moisture**
- **Soil organic carbon (SOC)**

### RESEARCH GOALS

Our project aims to understand the **complex interrelations** between **soil health, drought resiliency** and **climate mitigation**.

### COMPOST

This project used a local resource "GunnyGold", a Class A biosolid compost from the City of Gunnison's Wastewater Treatment. Biosolid compost has been proven to be safe for agricultural and was used to close the loop of nutrients in our community.

For more information



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### FUNDING



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# RESEARCH SITES

## BEAUTIFUL PERENNIAL RANGELANDS



The four sites varied in their grazing management, initial soil health and plant species diversity



**Does land management change the effectiveness of compost amendments?**

The **answer** to this question will **determine** the **appropriateness** of adding **compost** on **rangelands** as a **climate mitigation** and **adaptation tool**.

ALL RESEARCH SITES WERE PLACED ON WORKING RANCHES IN THE GUNNISON VALLEY

COLDHARBOUR RANCH - CRANOR RANCH - PARKER PASTURES - WILEY LANE RANCH



Alexia Cooper



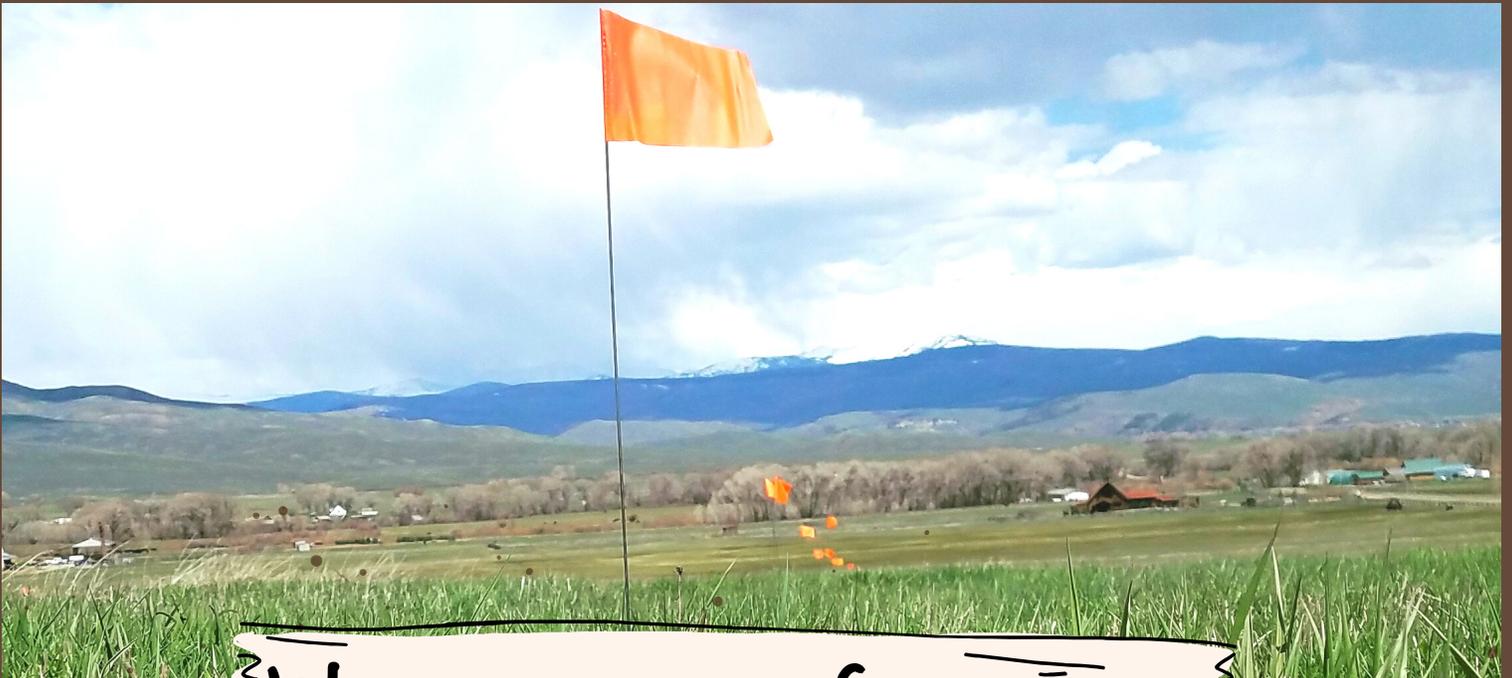
Shaun McGrath



Alex VanTill



Dr. Jennie DeMarco



# WOMEN IN SCIENCE

This has been a women-led research project started by Master in Environmental Management (MEM) student Alexia Cooper and her advisor Dr. Jennie DeMarco.

The **Compost Amendments on Rangelands Experiment (CARE)** is continued by graduate students, Shaun McGrath (MEM) and Alex VanTill. (MS Ecology).



YEAR

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RESULTS



Plant biomass **increased** across all sites by an average of **86%**, with an average increase of production by **4,145 lbs/ha**

Across all sites treatment plots maintained a **higher soil moisture** throughout the **growing season**



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There was a general trend of **increased soil organic carbon**, but it was not a significant change

*FUTURE RESEARCH WILL INVESTIGATE THE LONG-TERM CHANGES IN SOIL HEALTH, MICROBBIAL COMMUNITIES, AND CARBON STORAGE*