

Amador County Rangeland Soil Health Project

2020 Project Update

A project by the Amador County Resource Conservation District and the University of California Cooperative Extension

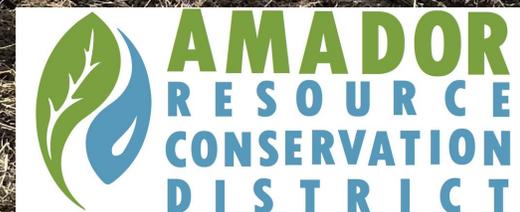
Compost on Rangelands

Studying the effects of a one-time application of compost to annual rangelands

Rangeland covers more than half of California's land mass. These rangelands provide a multitude of beneficial uses, including open space, livestock grazing and wildlife habitat.

The goal of this project is to increase the implementation of best management practices that will improve soil health, and address a number of key issues facing livestock producers. Livestock producers in the area are challenged with multiple landscape scale issues. Rangelands are typically on shallow soils that are nutrient poor and low in organic matter. Climate variabilities including winter drought and infrequent precipitation decrease winter forage availability and the length of the growing season. As a result, invasive weeds thrive and outcompete desirable vegetation. These compounding issues result in less forage for livestock and make it economically difficult for producers.

Studies have shown a direct benefit from the one-time application of compost to rangelands, including increases in water holding capacity, forage productivity, and carbon sequestration (Silver et al 2010, Ryals and Silver 2013). Based on these preliminary studies, this project is testing the one-time addition of compost to annual rangelands in an area that currently lacks localized data. By adding compost to the soil, we hope to see an increase in both soil fertility and water holding capacity which will ultimately increase the ability of desirable vegetation to be more resilient to climate variability and better able to compete against noxious weeds. In addition, the added fertility will make desirable forage more nutritious and more abundant for livestock, ultimately resulting in a financial benefit to the producer.



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Meet the Ranchers...

There are five producers participating in the compost project. They manage over 10,000 acres of rangeland in Amador and neighboring counties.

- Molly Taylor of PT Ranch, 525 acres of rangeland and irrigated pastureland. They raise pastured poultry, pork and grass-finished lamb.
- J.W. Dell'Orto operates a commercial cow-calf operation on approximately 3,000 acres of annual rangeland and over 50,000 acres of mountain grazing allotments.
- Stan Dell'Orto of Dell'Orto Livestock operates a commercial cow-calf operation on approximately 4,000 acres of annual rangelands and over 40,000 acres of mountain grazing allotments.
- John Brownlie of J.B. Cows, operates a cow-calf operation on approximately 8,000 acres and in the summer months leases two U.S. Forest Service allotments.
- Tim Curran of Circle Ranch raises registered Sim-Angus bulls on approximately 800 acres of lower elevation foothill pasture of which about 200 acres are irrigated.



Molly Taylor



J.W. Dell'Orto



Stan Dell'Orto



John Brownlie



Tim Curran

Setting up the Trial - Spring 2019

In spring we set up the trial at each ranch. Each ranch has four treatments with each treatment replicated 3 times. Each treatment measures 0.5 acre with a block of all four treatments taking up 2 acres.



The four treatments are:

- 1. Compost applied*
- 2. Seeded with clover mix*
- 3. Compost applied & Seeded with clover mix*
- 4. No treatment*

Initial Sampling - Spring 2019

Extensive soil sampling was conducted in spring 2019 to get a baseline of soil conditions - special thanks to USDA Soil Scientists Andrew Paolucci, Luis Alvarez, Theresa Kunch, Jon Gustafson, USDA District Conservationist Bobette Parsons, and Resource Conservation District Resource Specialist, Gordon Long.



Compost Applications and Seeding - Fall 2019

200 yards of compost was delivered to each ranch in fall of 2019.



Compost was applied using a spreader at a rate of 1/2 inch per acre (roughly 67 cubic yards/acre). Special thanks to Mid Valley Ag in Linden, CA for use of the spreader.

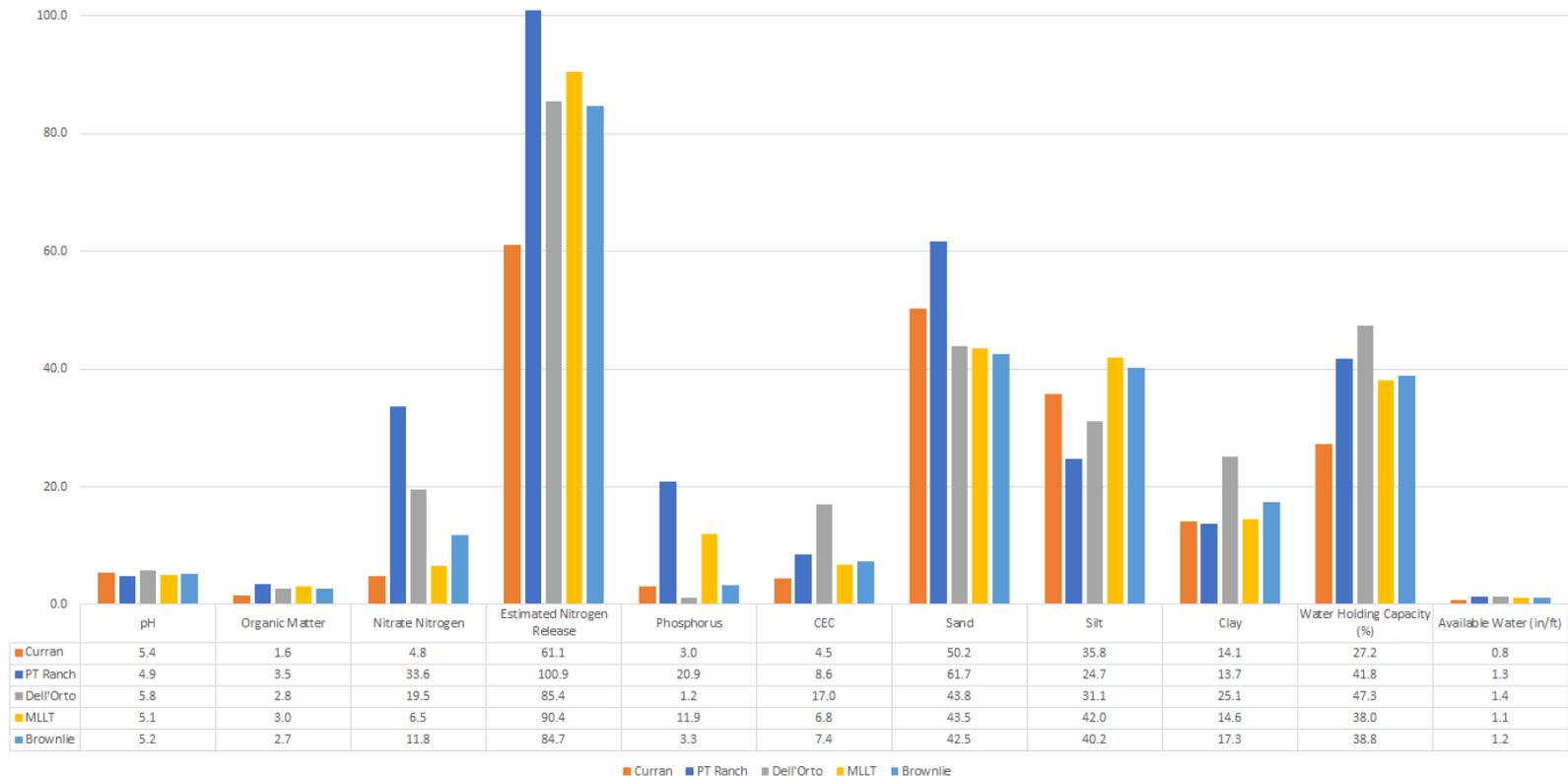


First year of data is in...

Soil Conditions Prior to Treatments

The soils across all five locations are very consistent. These foothill soils are slightly acidic with low organic matter and are often low in the macro nutrients nitrogen and phosphorus.

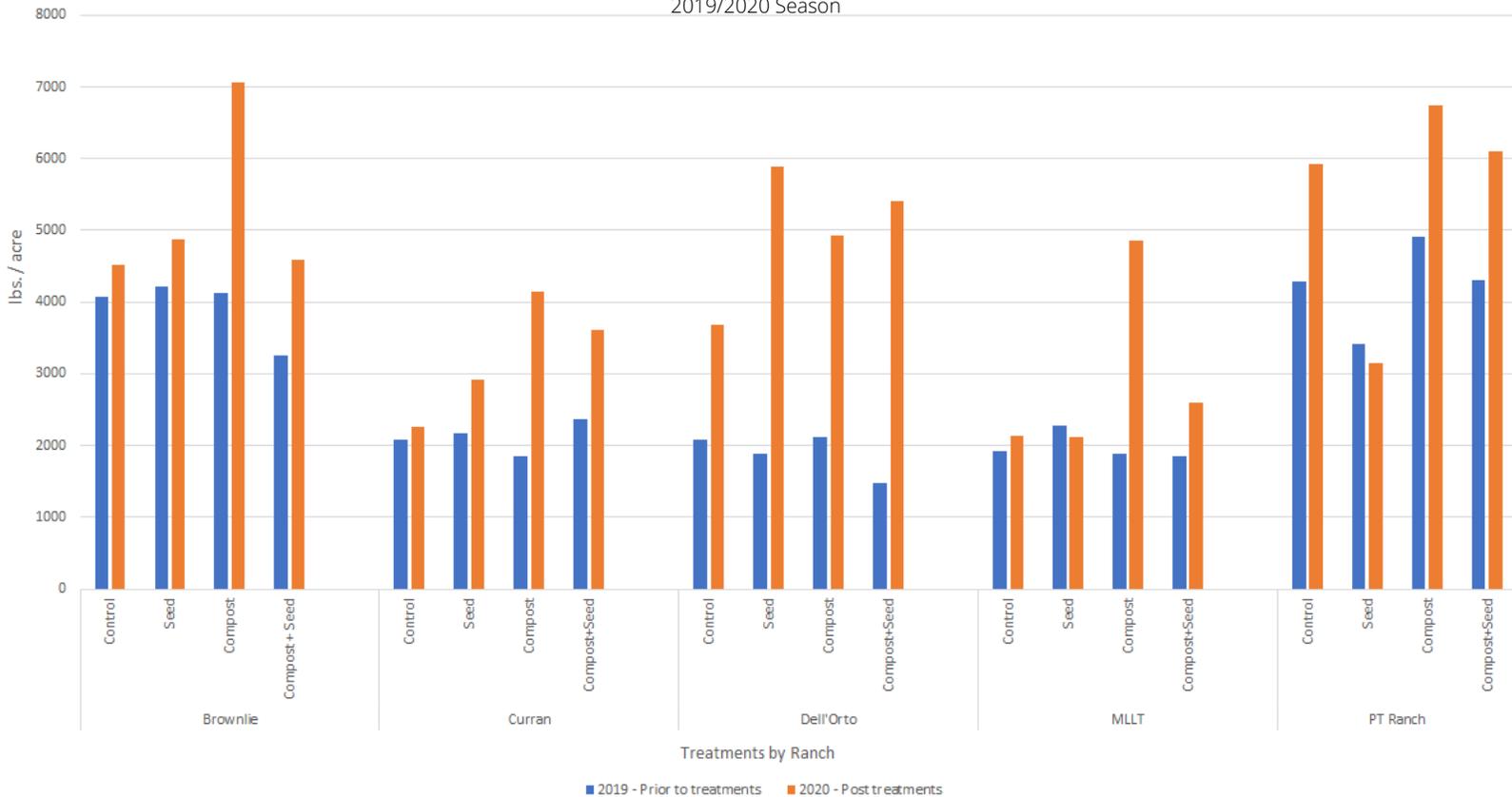
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Soil Analysis Prior to Treatments
2018



Forage Productivity

Total forage production is measured at peak standing crop, when the plants have reached their maximum total biomass.

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The Effects of Compost and Seed on Annual Forage Production
2019/2020 Season

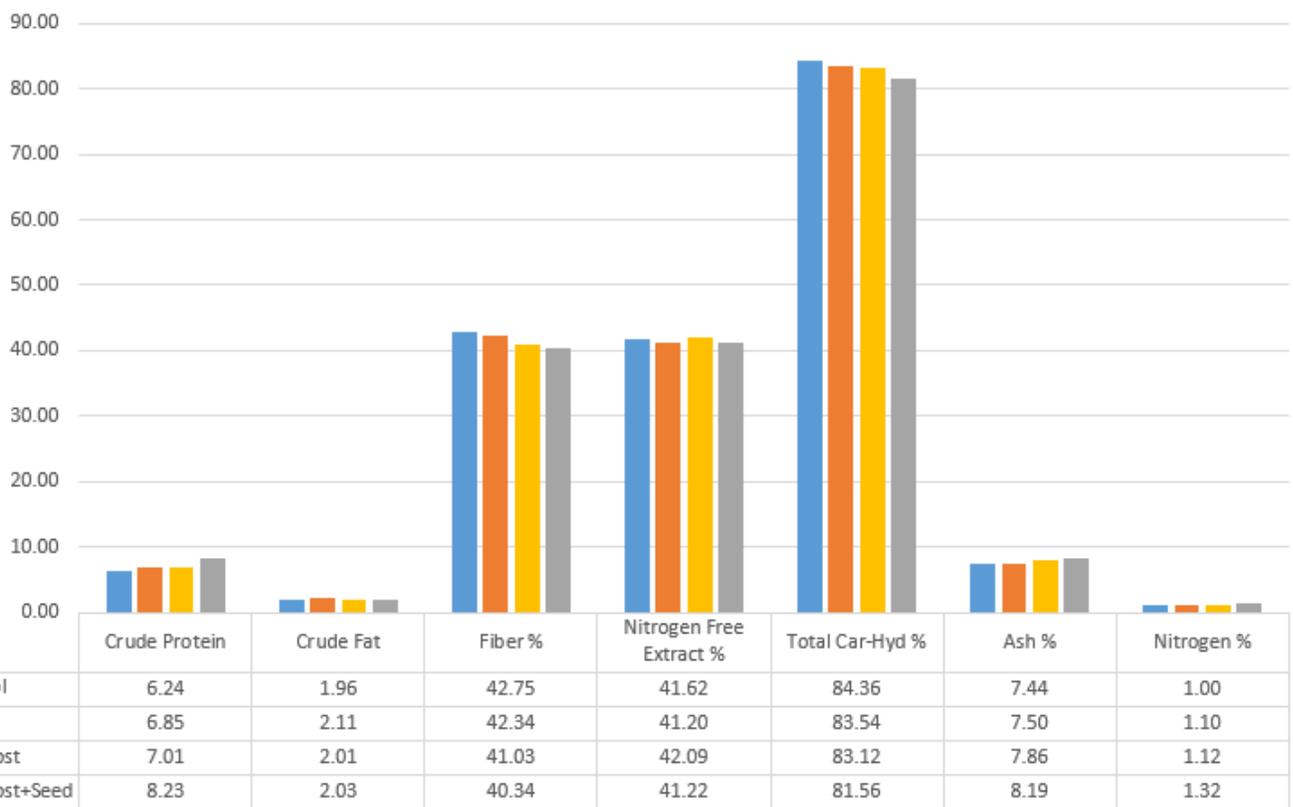


Was there a difference in forage production between treatments? Well..... it turns out we did see a difference. Of course we are only looking at one years worth of data but across all treatments at all sites, we did see some similarities. The blue bar represents forage production taken at peak standing, May 2019 prior to doing any of the treatments. The orange bar which represents this year's forage production. When compared to the control or the untreated plots, we saw an increase in forage this year in the plots that received compost. We also saw an increase in forage on the plots that received both compost and seed when compared to the control.

Forage Quality

Forage quality is a measurement of the nutrient value of forage and varies with plant species, season, location and range practices. Indicators of high forage quality such as protein, energy, vitamins and minerals decline as the growing season progresses. Conversely, indicators of low quality such as fiber and lignin increase as forage plants mature. The below samples were taken at peak standing when plants were at maturity.

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Forage Quality 2019/2020 Season



Control Seed Compost Compost+Seed

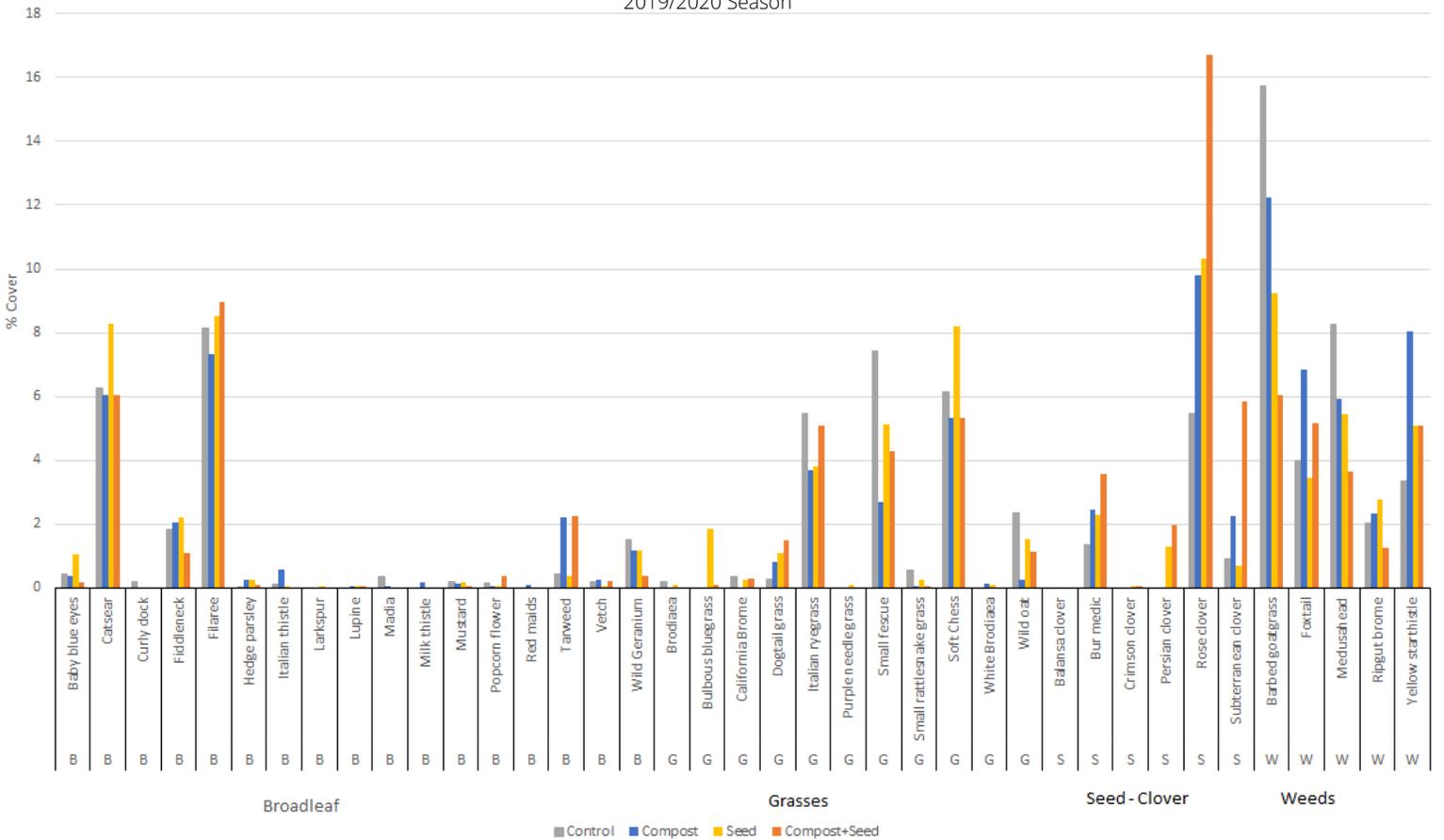
One of the best indicators of forage quality is crude protein. Data shows that across all sites, areas treated with compost and seed had 31% more crude protein than the untreated plots. Also, fiber which is an indicator of low quality was higher in the untreated plots.

Plant Diversity

One of the main goals in this project is to examine the effects compost and/or seeding with a clover mix may have on desirable vegetation and invasive weeds. All five ranchers have increasing weed populations including yellow starthistle, medusahead, barbed goatgrass and ripgut brome.

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% Plant Cover by Treatment
2019/2020 Season

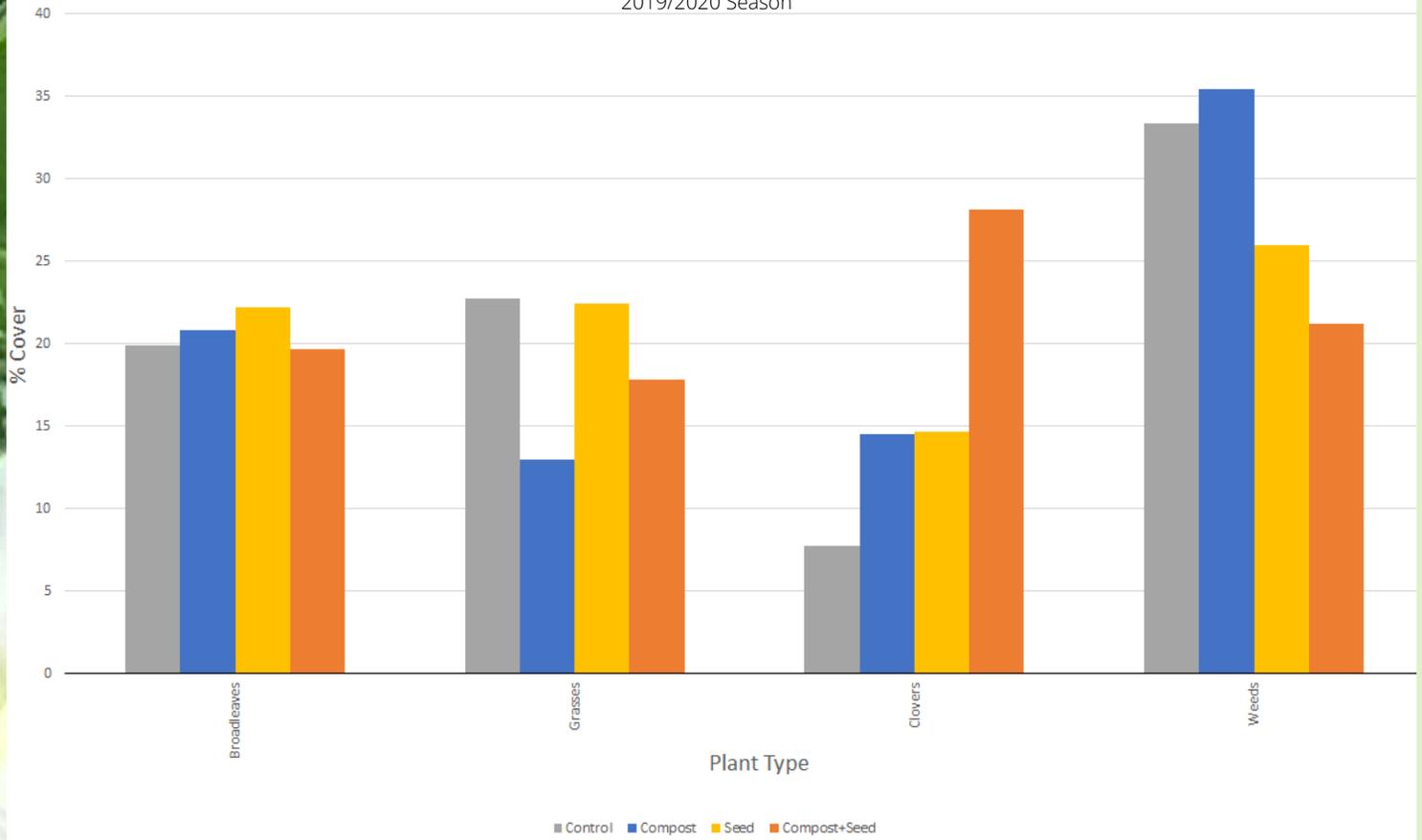


The above graph shows the percent cover of every species found across all sites. The plants are categorized based on type: broadleaf plants, desirable grasses, clover, and weeds. In the seed-clover category, clover cover was highest for nearly all species where seed was combined with compost. Does the compost give a competitive advantage to the clover, or is their nutrients in the compost that help the clover? All things we will continue to explore.

For weeds, we saw a decrease in barb goatgrass in all treatments when compared to the control and it was again the compost+seed treatment that gave the greatest reduction. We saw a similar decline in medusahead. Again with only one year of data we will continue to collect data and examine these trends.

Plant Diversity

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% Cover of Plant Types by Treatment
2019/2020 Season



By combining all plant species into major groups (broadleaf, desirable grasses, seed/clover, and weeds), we can get a sense of what effects any of the treatments might have on each of these groups. In looking at broadleaf plants, there were no significant differences between treatments. For the desirable grasses, we saw a decrease in the compost treatments as compared to the other treatments. This may indicate that the addition of compost may give a competitive advantage to broadleaf plants. In the clover section we saw a slight increase in clover in the seed treatment, however it was no different than the compost only treatment. However, we had a significant increase in the amount of clover in the compost plus seed treatment. When we look at the weed group, we saw the greatest decrease in weed cover in the compost plus seed treatment.

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