ANNUAL REPORT

Grant Code: AP7218

Title: Precipitated Calcium Carbonate to Remediate Acidic Eastern Idaho Soils

Personnel: Jared Spackman, Assistant Professor, UI Aberdeen; Kurt Schroeder, Associate Professor, UI Moscow; Tom Jacobsen, UI Fremont Cty; Justin Hatch, UI Caribou Cty; Joseph Sagers- UI Jefferson and Clark Cty; Jared Gibbons- UI Madison Cty

Address: Jared Spackman 1693 S. 2700 W. Aberdeen, ID 83210; (208) 312-2454; jspackman@uidaho.edu

Accomplishments: Describe accomplishments relative to the proposed objectives.

Objectives:

1) Conduct on-farm field trials to identify the PCC application rate required to raise soil pH to 6, determine the time required for PCC to fully react, and the duration of soil pH modification.

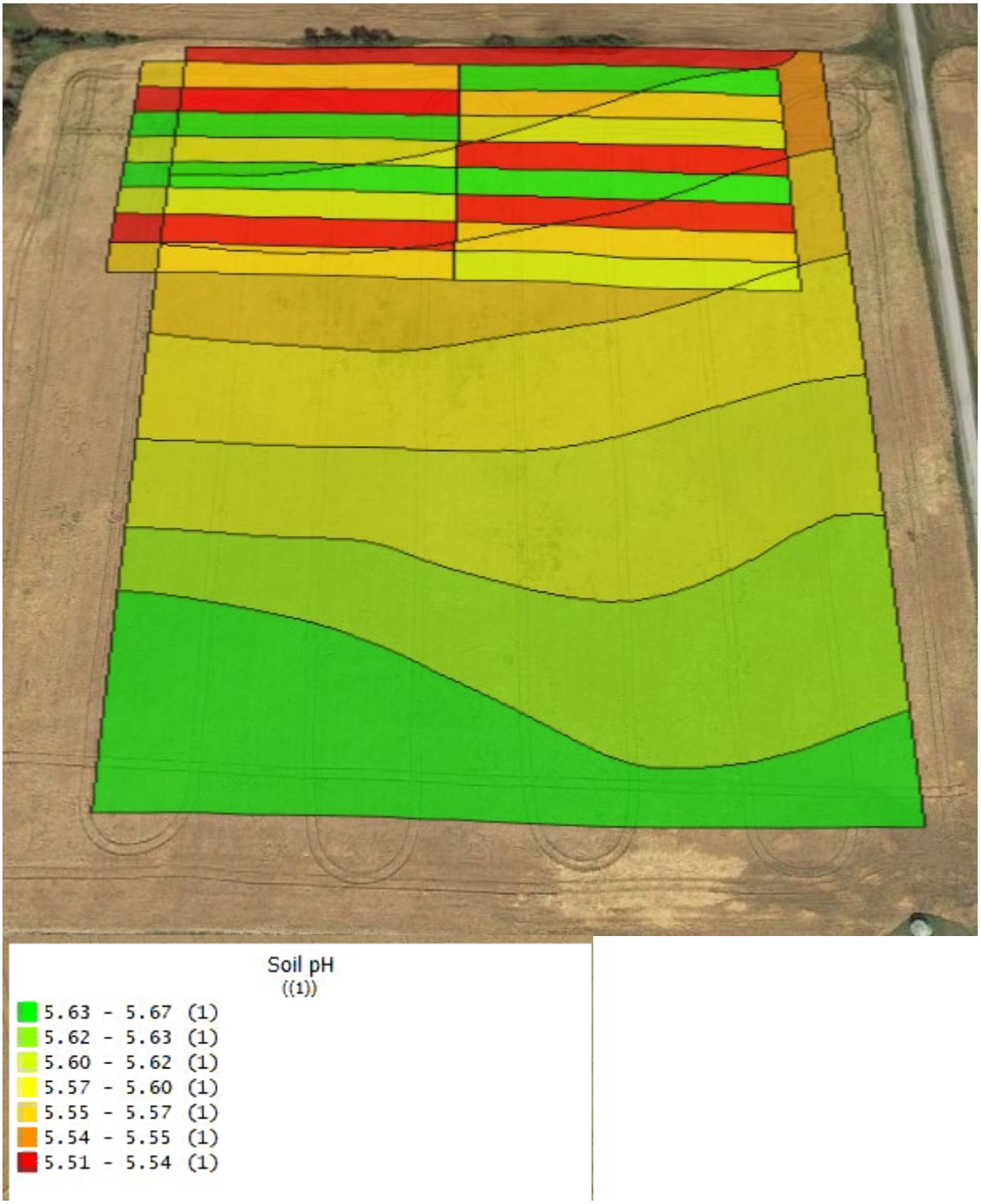
We successfully established 2 field sites utilizing funds from this grant and 3 field sites utilizing funds from a WSARE grant. 4 field sites were established at acidic fields north of Soda Springs and 1 field site was established in Lamont, halfway between Ashton and Driggs. We worked with Crapo Trucking to ship precipitated calcium carbonate from Amalgamated Sugar in Paul to each of the field sites. We worked with Valley Wide to use their equipment to spread the lime at 0, 2, 4, and 6 tons per acre with four replications in October 2023. To verify the lime application rate, we measured the applied lime every 100' along the center of each strip with disposable 9x13" paper plates. The mass of each plate plus lime was measured and used to verify the expected lime rate was correctly applied. Unfortunately, none of the Lamont plates successfully measured the lime application rate because the applicator had three large wheels that effectively ran over each plate with every pass.

Each plot is 450' long by 50' wide. Before applying lime, we collected soil samples from 3 georeferenced locations within each plot approximately 100' from each other (except at one site described below). Soil samples were collected at 0-2, 2-4, 4-6, 6-12" depths, dried, and are in the process of being ground by a BYU-Idaho intern. These soils will be analyzed for soil pH1:1 (soil: water), electrical conductivity, and free lime if the soil pH>7. Additional soil samples were collected at 0-6" depths and analyzed for extractable aluminum (a source of soil acidity and root toxicity).

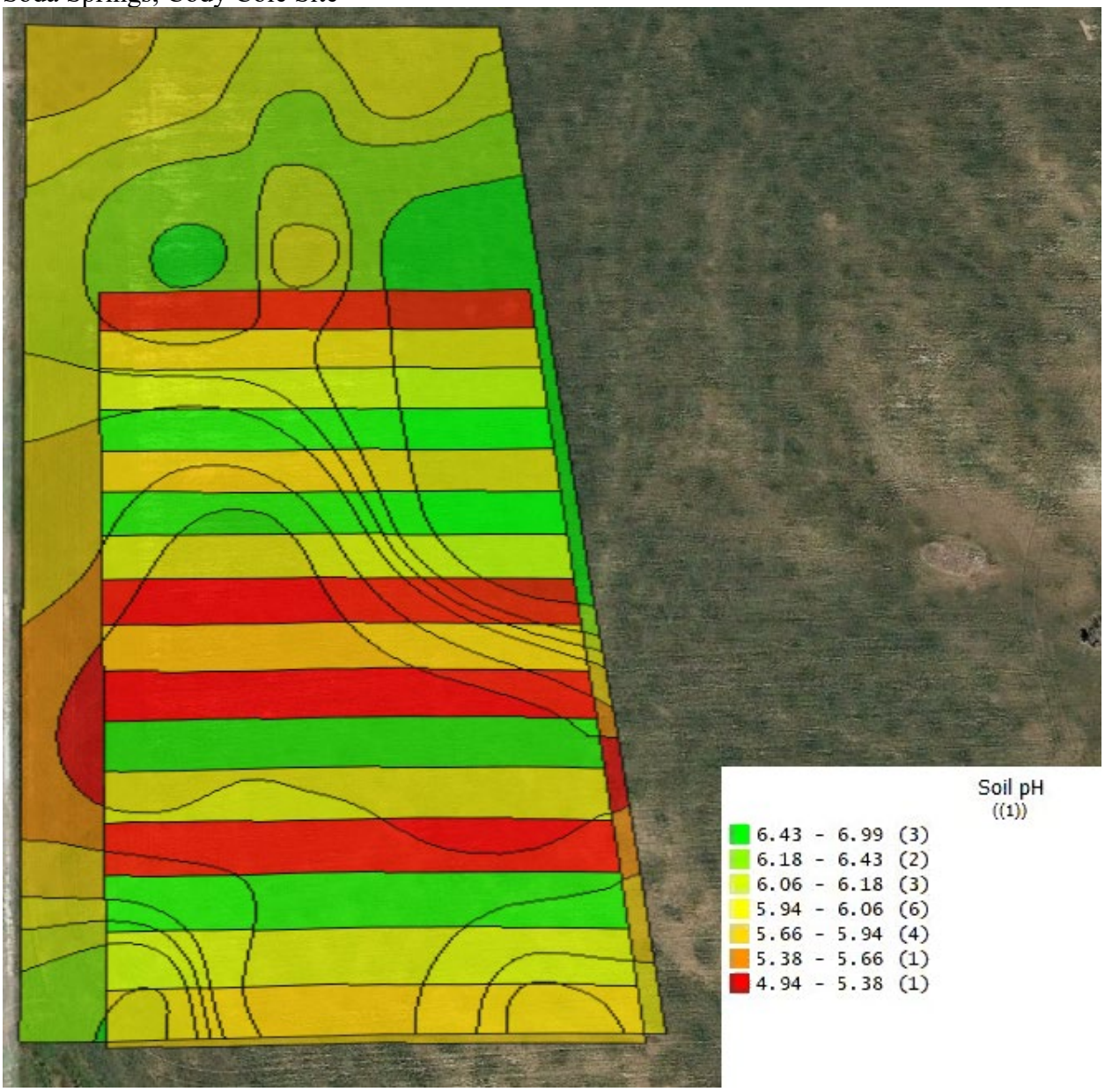
As previously mentioned, soil samples were collected from 3 georeferenced points per plot at all sites, except one site north of Soda Springs. At this site, we only selected 2 georeferenced points per plot because the cooperating grower was interested in testing out another lime source- crushed limestone dust- derived from a concrete production facility in Preston. This additional source would be applied at the same lime rates as the precipitated calcium carbonate. We set up the field study to accommodate these additional plots and intended to follow the same sampling structure as the other studies. Unfortunately, the producer was not able to acquire and transport the limestone material to the field site before the spreader arrived to apply this projects' treatments. We may still apply the limestone material next year and have an interesting secondary study.

Other than liming, the strip trials will be managed according to the producer's practices including method and depth of lime incorporation, crop rotation, and harvest timing. One field has already been planted to winter wheat while the remainder are expected to be planted to either spring barley or spring wheat.

Lamont, Idaho Harshbarger Farms Site. Plots overlain in red received no lime. Plots overlain in orange, yellow, or green received 2, 4, or 6 ton/ac respectively.

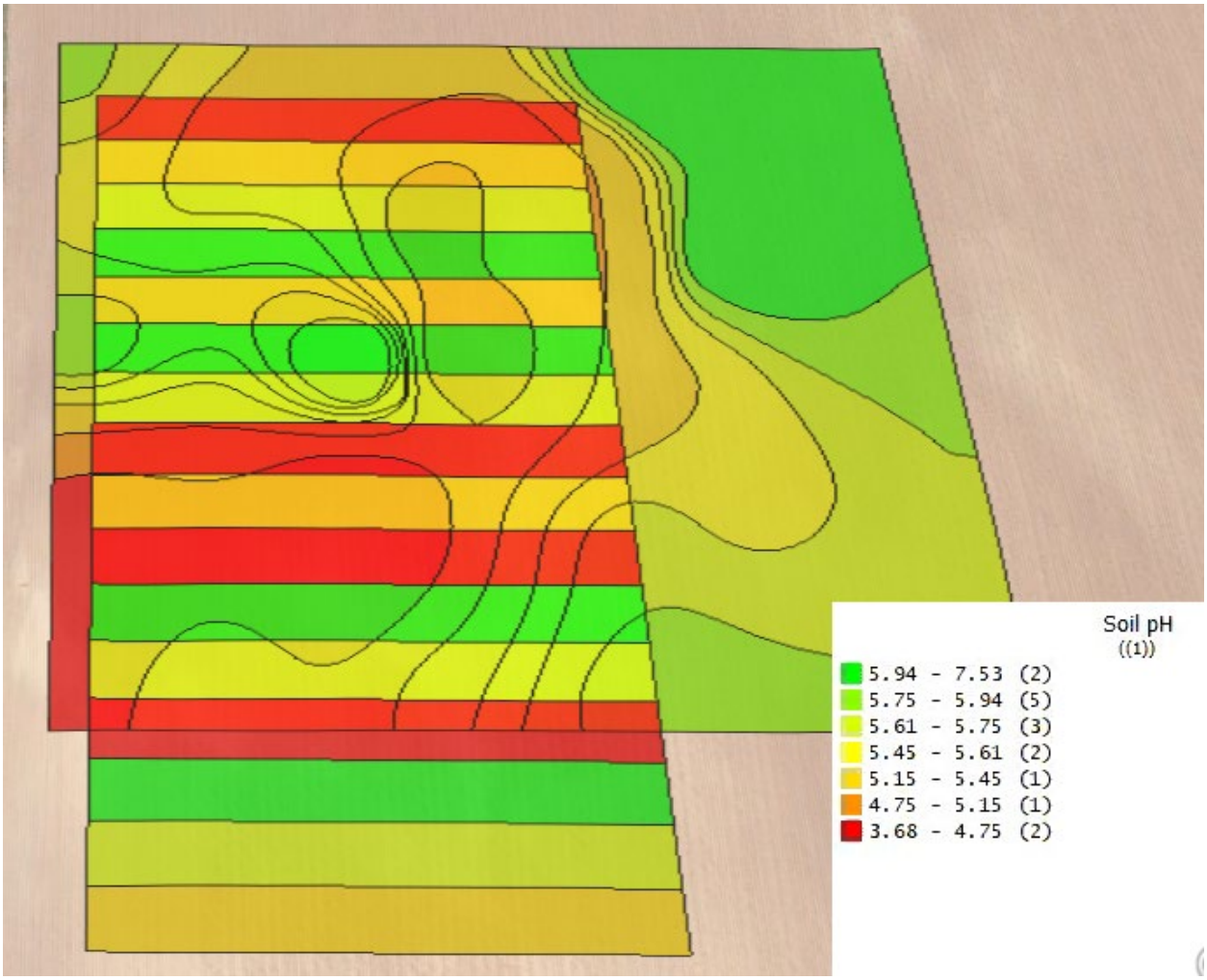


Soda Springs, Cody Cole Site



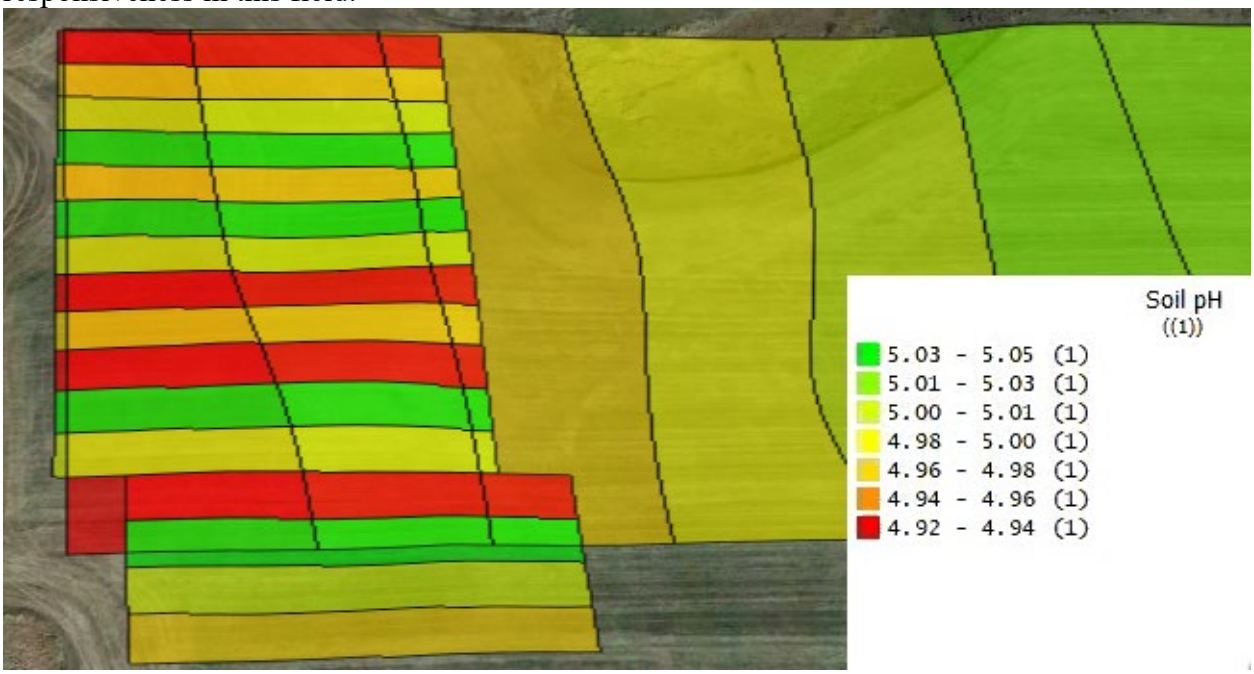
Soda Springs, Jake Ozburn

This site is particularly exciting as the soil pH is so low that there were visible areas where the 2023 barley crop would not/could not grow. This field is a prime example of one of the negative consequences of using acidifying nitrogen fertilizers (especially anhydrous ammonia) for 100 years. We anticipate seeing drastic differences in crop performance between treatments in the coming years.



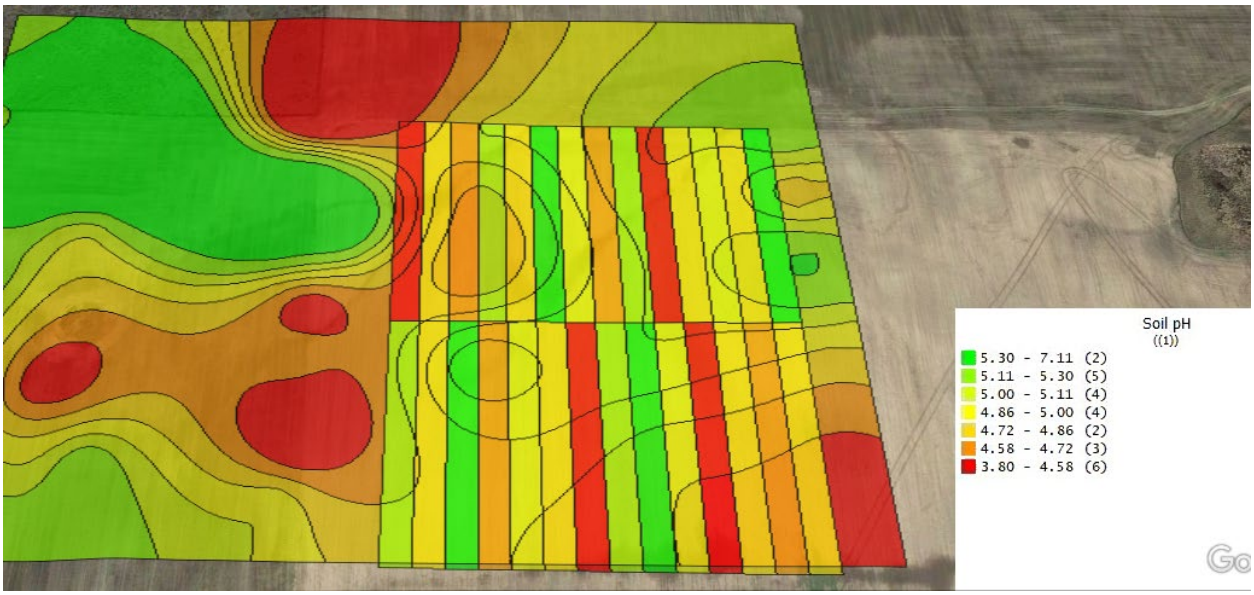
Soda Springs, Kyle Wangeman Site

This site will be interesting due to the plots running up from a potentially excessively wet lowland up and over the top of a hill. Topography could have some major impacts on lime responsiveness in this field.



Soda Springs, Jeff Godfrey Site

This is the site that we might eventually apply crushed limestone to other plots.



2) Evaluate tools like the DualEM electrical conductivity sensor to map changes in soil texture across a field and to develop variable-rate lime prescriptions across the field.

We worked with Valley Wide Ag to attempt to map out the fields for electrical conductivity. However, their equipment malfunctioned several times. So, we will attempt to collect this data utilizing equipment from the College of Southern Idaho, Amalgamated Sugar, or the Soil and Water Systems department in Moscow, Idaho this spring. I am currently negotiating equipment rental/usage and data processing with each of the organizations to find the best deal.

Projections:

I will be discussing this research project and additional results from a liming study done on irrigated acres funded by the IWC at the February 2024 cereal school meetings in Ashton and Soda Springs. The results from these studies will be shared with the Fertilizer Research Support Tool- Liming team to build a national database of lime research.

Publications: Cite all publications (or abstracts) that have resulted from the project.

There have been no publications from this specific IBC-funded project yet. However, below are the citations from the IWC-funded project. I have also attached posters describing our results given at the ASA-SSSA-CSSA and Western Nutrient Management Conferences.

1) Mookodi, K.L. 2023. Liming for Improved Nutrient Utilization and Weed Management. Aug 2023. https://www.lib.uidaho.edu/digital/etd/items/mookodi_idaho_0089n_12704.html.
2) Mookodi, K., J.A. Spackman, A. Adjesiwor. First-year evaluation of precipitated calcium carbonate as a lime amendment in Eastern Idaho. Plant Sciences Departmental Seminar. Kimberly, ID. 24 Feb. 2023. (Zoom 17 attendees; 35 minutes)
3) Spackman, J.A., A. Adjesiwor, J. Bevan, J. Sagers, and T. Jacobsen. 2023. Precipitated Calcium Carbonate as a Lime Amendment in Southern Idaho Soils. ASA-CSSA-SSSA Annual Meetings. St. Louis, MO. 29 Oct. – 1 Nov. 2023.
4) Spackman, J.A., A. Adjesiwor, T. Jacobsen, and J. Sagers. 2023. Precipitated Calcium Carbonate as a Lime Amendment. 2023 Western Alfalfa and Forage Symposium: Soil Fertility and Health Workshop. Reno, NV. 12 Dec. 2023.

5) T. Jacobsen, J.A. Spackman, A. Adjesiwor, Mookodi, K., J. Sagers, K. Schroeder, and J. Bevan. 2023. First-Year Evaluation of Precipitated Calcium Carbonate as a Lime Amendment in Eastern Idaho. University of Idaho Annual Extension Conference. Sun Valley, ID. 11 – 12 Apr. 2023.
6) Mookodi, K., J.A. Spackman, A. Adjesiwor, J. Sagers, T. Jacobsen, K. Schroeder, and J. Bevan. 2023. First-Year Evaluation of Precipitated Calcium Carbonate as a Lime Amendment in Eastern Idaho. Western Nutrient Management Conference. Reno, NV. 8 – 10 Mar., 2023.