



# United States Department of Agriculture Agricultural Research Service Southern Plains Climate Hub

## How Does Agricultural Management for Soil Health in the Southern Plains Impact a Suite of Soil Health Indicators?

Grazinglands Research Laboratory, El Reno, Oklahoma

May 2017

**Background:** Producers across the Southern Plains are expected to experience a number of impacts on their operations as a result of climate change, including more variable and extreme precipitation events, higher seasonal and annual temperatures, and more prolonged and intense droughts. One possible way of buffering systems against these expected changes is to promote soil health, as healthy soils are less likely to erode, have a higher water-holding capacity, and dry more slowly than unhealthy soils. A number of producers across the Southern Plains employ practices with a specific emphasis on soil health. Many of these are designed to reduce the amount of soil disturbance and promote the return of organic matter to the soil.

There is some evidence that these soil health management practices (SHMPs) do have a positive effect on soil health, but these effects have not been quantified using a standard method across the Southern Plains, and they have not been compared extensively to sustainably managed conventional systems. Wide variation in soil types along with pronounced temperature and precipitation gradients across the region further complicate and limit the realm of inference of results from any one producer or location. A better understanding of the effects of SHMPs at the region-wide scale is important to both scientists and producers working within the context of climate change and adaptation of regional agricultural production in order to improve resilience.

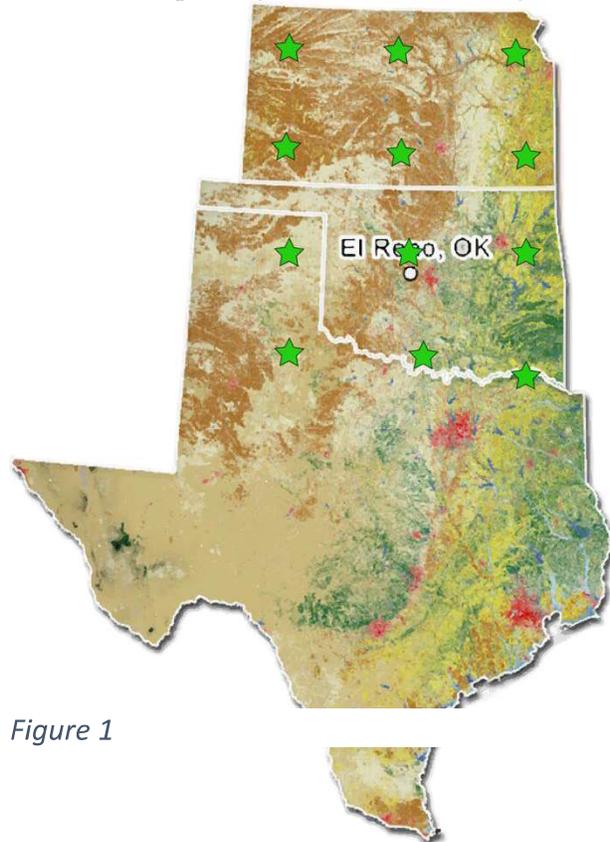


Figure 1

**Objective:** The objective of this study is to determine how soil health management practices such as no-till and the use of diverse cover crops affect a suite of soil health practices across the southern plains region of the United States.

## Research Questions:

I. How do soils associated with SHMPs and Conventional Management (CM) differ with regards to physical, chemical, and biological soil health indicators?

- a.) How does soil structure associated with SHMPs compare to that associated with CM?
- b.) How do soil microbial communities associated with SHMPs and CM differ?
- c.) How do chemical properties of soil associated SHMPs and CM differ?

II. To what extent do SHMPs accomplish their goal of improving or conserving soil health across the Southern Plains when compared to sustainable traditional management?

**What we're doing:** We have identified twelve sites (Figure 1) from northern Kansas to northern Texas. At each site, we are coordinating with local producers to collect soil samples (Figure 2) from pairs of fields consisting of one SHMP field and one CM field, which we will then analyze for a suite of characteristics that are commonly used to indicate soil health. These include texture and bulk density (physical); percent organic matter and microbial community characteristics



Figure 2

(biological); and percent carbon, percent nitrogen, pH, and electrical conductivity (chemical).

This study's paired design allows us to compare soils that have experienced very similar environmental conditions, reducing the likelihood that these same factors will have a disproportionately large impact on our results. We use paired statistical tests to identify where differences between management practices

exist, and additional analyses to show the primary drivers of these differences and spatially relevant trends.

This work is being sponsored by USDA's Southern Plains Climate Hub, which is based at the Grazinglands Research Laboratory. The Hub's mission includes developing and delivering science-based, region-specific information and technologies to agricultural and natural resource managers that enable climate-informed decision-making, and the results of this project will be made available to producers throughout the region as part of Hub outreach and stakeholder engagement activities.

---

### Project Contact Persons:

Dr. Caitlin Rottler - Hub Fellow

[Caitlin.Rottler@ars.usda.gov](mailto:Caitlin.Rottler@ars.usda.gov)

Dr. David Brown - Hub Director

[David.Brown@ars.usda.gov](mailto:David.Brown@ars.usda.gov)

Dr. Jean L. Steiner - Lab Director

[jean.steiner@ars.usda.gov](mailto:jean.steiner@ars.usda.gov)

Clay & Sarah Pope: CSP, LLC - Hub Coordinators

7207 West Cheyenne Street

Grazinglands Research Laboratory

El Reno, OK 73036

Telephone: (405) 262-5291

FAX: (405) 262-0133

<https://www.climatehubs.ocs.usda.gov/southernplains>