Soil Health Benchmark Study Update
Dr. Yamily Zavala and Dianne Westerlund, CARA   February 2024

The final report for the Soil Health Benchmark Study was submitted in 2023 to Alberta Agriculture and Irrigation's Natural Resource Management Branch. The project was designed to promote a better understanding of soil health and to develop a provincial database of physical, biological and chemical soil indicators, all of which contribute to an overall measure of soil health. A biological and physical baseline for provincial soils will provide a framework which can help define strategies for managing and improving the productive capacity, and sustainability, of our soils. Understanding and managing for a diverse micro-biological functional group underground may contribute to an overall healthier soil by improving soil aggregation, soil water infiltration and storage, as well as improved carbon sequestration. The improved aggregation stability will also contribute to enhanced carbon sequestration levels in the soil. Healthy soils produce healthy plants resulting in a higher quality food product. Knowing their soil health constraints will give Alberta producers a valuable tool for use in making strategic management decisions, and monitoring those practices, on their farms and ranches.

The database will also be used to develop regional scoring functions for assessing, interpreting and understanding soil health status and management responses. The overall soil health benchmark will contribute to target, monitor and adjust soil health constraints not only at the provincial level but also in each region represented by the 11 Alberta Applied Research and Forage Associations involved in this project.

During the course of the project, soil samples were collected from over 1800 sites across Alberta by partnering organizations. Soil health indicators for physical (soil compaction, water infiltration, texture and wet aggregate stability), biological (active carbon, soil microbial respiration, total fungal and bacteria biomass were done under the guidance of Dr. Yamily Zavala at the CARASHLab using protocols adapted from Cornell University as well as the Canadian Soil Food Web Protocols. Total carbon, organic and nitrogen levels were analyzed in partnership with the University of Alberta and chemical characteristics (soil minerals and fertility) were evaluated at a commercial laboratory. The database and regional scoring curves are continually evolving as information from benchmark analysis from samples outside the project are added. Soil health reports were initially generated using the Cornell Comprehensive Assessment of Soil Health (CASH) framework.

Dr. Zavala has observed a few trends from samples. Compaction, Soil wet aggregate stability and poor water infiltration are common concerns at many sites and are often associated with lower biological components. She has found a great diversity of beneficial soil creatures and predatory species.

Some of the sites sampled in 2019 were re-visited in 2022 for collection of on-site compaction and infiltration measurements as well as a full analysis. Any changes observed in soil parameters will be correlated to management practices at these sites during the past three years. Evaluation of the data from site re-visits will be a highlight of the project. The information is intended to be a working tool that helps managers better understand soil health, how various management practices impact it and those which might contribute to improving land resilience.

Funding for further monitoring was received from RDAR for a verification of management on soil health at specific sites during 2022 through 2024. The verification project is a collaboration of all groups who have been working with producers across Alberta. Most of the soil health reports have been shared with regional associations and their producers. Additional meetings are planned for discussion of individual site information.

Participating groups included soil health information in many events and activities during the year. Several methods of sharing information were utilized, including one-on-one consultations, seminars, workshops, field tours, webinars and more. Dr. Yamily Zavala has met with several producers to discuss their benchmark reports as well as strategies for remediation of identified constraints. An update on the Soil Health Benchmark project was made by project lead Dr. Zavala at the Western Canada Conference on Soil Health and Grazing held in December 2022 in Edmonton to over 500 conference attendees. The project received attention as the first submission for the Cattlemen magazine's new research update column early in 2023.

Dr. Yamily Zavala participated in RDAR's January 2023 Research Review with a poster presentation of the project.

Figure 1 shows an example of one of the soil health indicators' scoring functions for the 3 depths of soil samplings. The scoring functions were initially developed using the Cornell Comprehensive Assessment of Soil Health (CASH) framework because there was not adequate information from Alberta soils. The scoring functions are now based on the data collected during the Alberta Benchmark Study and will replace those generated earlier.
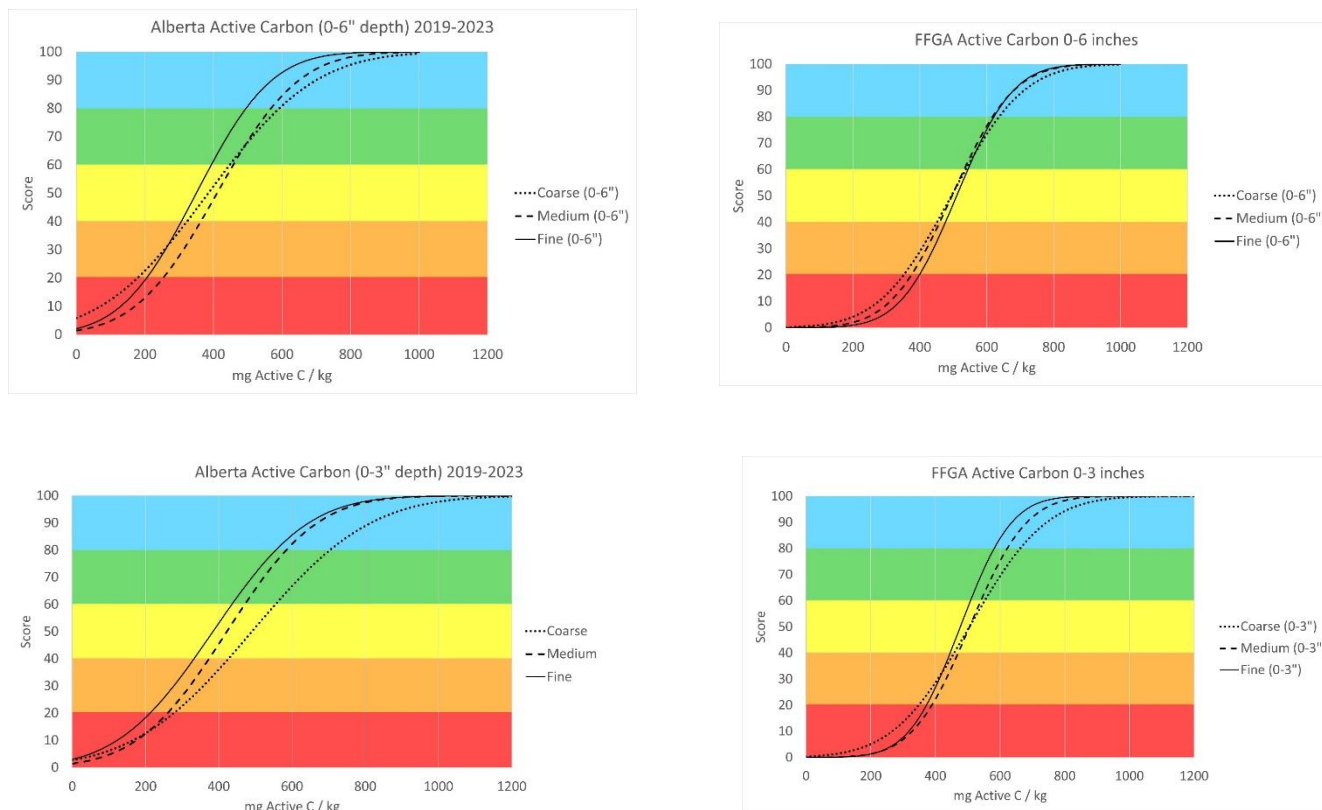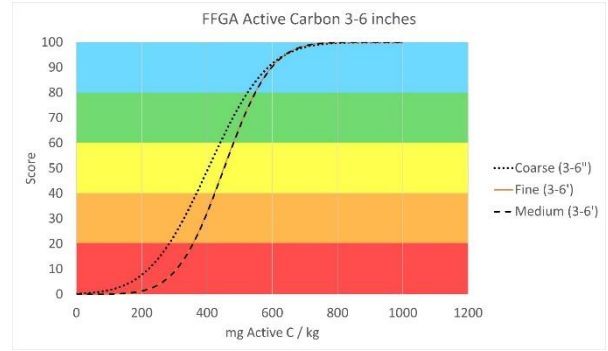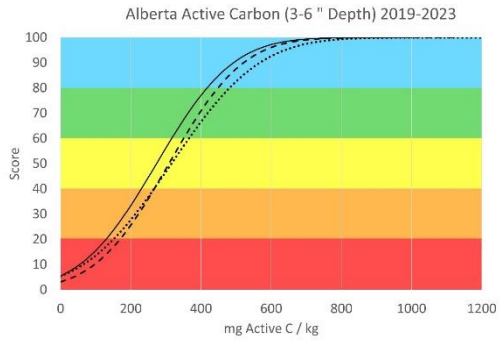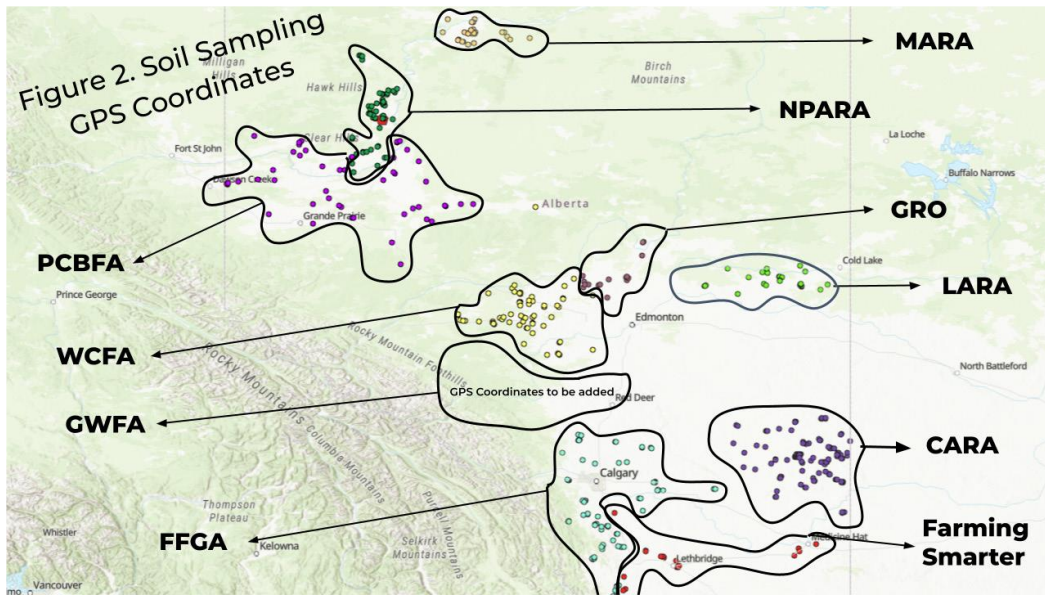
Figure 2 shows few of the GPS sampling areas for 10 of the association.

Figure 2. Soil Sampling GPS Coordinates

For more information on the Soil health benchmark Scan the Barcode: