**This conservation message is brought to you by the West Greeley Conservation District (WGCD). WGCD is located in Weld County and covers more than 1.6 million acres.**

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The Natural Resources Conservation Service (NRCS) and other agencies have teamed up to declare 2015 the International Year of Soils. Healthy soils are the foundation of agriculture and NRCS will be showcasing the importance of soil with monthly themes. I have selected a few themes that are especially important to Weld County and asked Clark Harshbarger, Resource Soil Scientist, to write on those topics throughout the year. Below is the second installment in support of the International Year of Soils.

## April Conservation Message: What is a Soil Health Test and Why Should I Get One?

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A Soil Health test uses an integrated approach to soil testing by accounting for biological, physical and chemical soil properties to evaluate how well a soil is functioning. Historically, soil tests have tested for chemical properties, such as the available inorganic nutrients, like nitrate, and soil pH. The only physical property that has traditionally been tested for is soil texture. Having an understanding of soil texture, available nitrate and the soil pH are all important to help producers with management decisions. But by quantifying biological activity in soil too, one can gain a better understanding of the total Nitrogen and Phosphorous pools that are available to plants. Managing for total N and P (inorganic and organic) could potentially provide savings to producers, by allowing them to reduce fertilizer application rates without yield loss. By observing additional physical properties, such as soil structure, compaction, available water holding capacity and infiltration, one can see how management decisions affect the amount of water that enters into the soil (Cornell Soil Health Test Assessment).

Laboratories testing for soil health are using a combination of tests such as the Haney Test and Solvita test, to provide producers an estimated amount of the total available N and P (organic + inorganic) that soil microbes will release into the soil. The science is based on measuring the microbial activity in the form of $CO^2$ respiration (Haney, 2008). Soil health tests also measure water extractable organic carbon (microbe food), water extractable organic N (which is plant available N), and an organic C to organic N ratio. Ward Labs in Kearney, NE, is measuring ratio of fungus to bacteria, phosopolipid fatty acids (PLFA), and other biological indicators to give producers an estimate of microbial biomass, which can be compared and contrasted across different management systems (Ward Labs, 2015). The Cornell Soil Health Assessment, takes into account the physical, chemical, and biological properties and provides an overall soil health score.

The Haney test, is one of the most widely used tests to measure soil microbial activity. The Haney test attempts to mimic the conditions a plant would see in the soil. By wetting and drying the sample, the test simulates a rain event, which in turn, stimulates microbial activity. The water used contains an extract called H3A, which was developed by Dr. Rick Haney with the USDA-ARS in Temple, TX. H3A is composed of chemicals that mimic root exudates released by plants in the forms of organic acids (Haney, 2010). Soil microbes digest the compounds and release back soil

nutrients in plant available forms. Organic acids, sugars and amino acids (proteins) provide a carbon source for the soil microbes, which they need to survive. This phenomenon can best be summed up by simply stating that plants exchange sugar for food with the microbes. This symbiotic relationship is how plants have been surviving in the prairies and forests for millennia.

When sampling for soil health, soils can be sampled similar to traditional soil testing by taking a gridded sample with a one inch soil core to a depth of 6 inches. Testing fields with similar management and soil types together is highly encouraged. Also, taking the samples at the same time each year is important, because soil biology is highly dynamic and constantly evolving based on soil temperature, moisture, amount of oxygen and plant species diversity in the system. One word of caution when sampling for soil life, is protecting the samples from high temperatures. High temperatures sterilize soils. Temperatures in excess of 140º F, will kill most microbial populations. Laboratories may require some precautions in order to insure the samples are received intact for analysis. Please inquire with the lab to insure proper technique is followed in order to get the most accurate information for your money when testing for soil health.

One of the most important reasons a farmer should consider having a soil health test completed is to determine that all of the plant available forms of nitrogen in the soil are accounted for. Recently in Burlington, CO, producers who have had soils analyzed with soil health test, are finding that there is more available N in the soil profile then they once had thought. Excess N in soil will either be lost to volatilization, denitrification or nitrification (A&M Extension, 2009). Excess mineralized nitrogen will limit microbial bacteria from naturally fixing nitrogen (Jones, 2012). It will also provide fuel for weed growth. This is especially true in a fallow system. Following fertilizer recommendations provided by a soil health lab agronomists could provide savings in fertilizer cost, in addition to reducing the potential for the leaching of nitrogen into groundwater, by nitrification (mobile form of N03-N). Groundwater supplies in the parts of the Great Plains Region have tested high in nitrates in recent years and a soil health test is one way producers can be pro-active to determine the amount of fertilizer they are using meets their fertility needs but does not exceed them. Using diverse rotations, keeping a living root in the soil by continuous cropping with cover crops, and no-till management can help insure the nitrogen is used by desired plant species throughout the year.

USDA NRCS is currently conducting a nationwide study called the Soil Health Nutrient Tool (SHNT) project to test the Haney Test results in different regions of the country and under different cropping systems. The objective of the SHNT project is to:

1. Learn how management can lead to improved soil health.
2. Identify the impact of using multi species cover crops.
3. Evaluate different soil health management system methods.
4. Develop a national database of information.

Over 1200 soil samples have been submitted from 37 different states, approximately 75% on cropland and 25% on grassland. The Haney test is available from several regional commercial labs that conduct traditional soil testing as well. For more information on soil health testing please visit the following websites: http://soilhealth.cals.cornell.edu/; https://producers.wardlab.com/default.aspx; http://solvita.com/; http://earthfort.com/.

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