



United States Department of Agriculture

March 4, 2021

 **Nebraska NRCS  
State Technical  
Committee  
Meeting**



Natural  
Resources  
Conservation  
Service

[nrcs.usda.gov/](https://nrcs.usda.gov/)

# FY 2021 Soil Health Update

Aaron Hird

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- Nebraska's Healthy Soil Task Force – LB 243
  - Final Report Submitted and LR-5 forwarded to the Legislature.
  - Next Steps: Finding support of the various aspects of the strategic plan and advancing those forward.
  - Key NRCS Deliverables:
    - Nebraska Resource Assessment Maps
    - Work to Establish a “Measurement of Success” in Nebraska via Cooperative Partnerships with UNL.

# FY 2021 Program Opportunities

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- 2019 RCPP with TNC, Central Platte and Upper Big Blue NRD's and associated partners.
  - Ecosystem Services Market Consortium
    - Led by former Chief Bruce Knight
    - Originally conceived by the NOBLE Research Foundation in partnership with TNC and NRCS.
  - Major Businesses and NFP's, and Ag Industry contributed matching funds
  - Hiring full time employees to be hosted at NRD offices and NRCS/FSA Office.
  - Soil Health Management System Planning and Contracting
  - 100,000 acres of cover crops in 3 years
  - Voluntary participation in multiple incentive programs and investment markets.
- 2020 Game and Parks Commission RCPP – Partnership with Pheasants Forever in Hitchcock, Red Willow and Furnace Counties. Cover Crops for Wildlife Habitat – Season Long Cover or After Wheat.
  - Interest has grown over the past 3 years and Quinn Barnas has completed Soil Health Inventories on many fields.
- 2020 Precision Ag Coordinator – Nathan Pflueger – York F.O. – PF and QF – Cover Crop Initiative

# Northeast Community College (NECC)

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Community College Alliance for Agricultural Advancement (C2A3) Project with NECC at Norfolk, NE.

NRCS National and Regional Office level cooperative agreement

Facilitate the engagement with Community Colleges and opportunities to establish Conservation Plans on College Farms, provide outreach and educational opportunities for the community and students and advise projects investigating the benefits of soil health management.

Community College Level internship opportunity for a student to conduct a field trial and facilitate the ongoing treatment of the college field already in a comparison study hosted by Soil Health Partnership.

The synergy in this project is amazing.

# UNL – NRCS Partnership

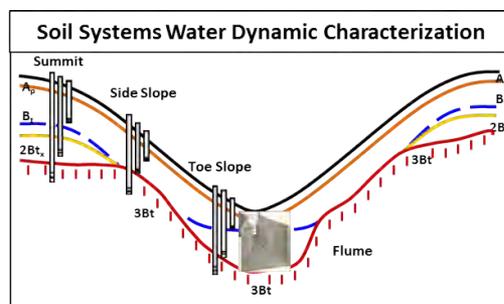
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The UNL – NRCS Partnership continues to expand and improve.

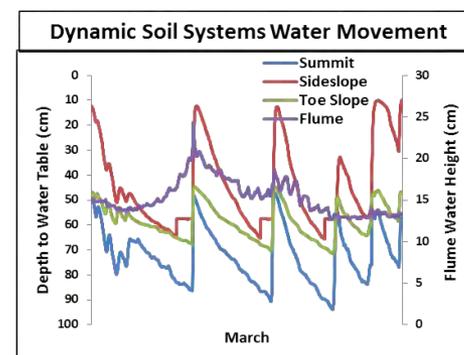
- 2010 – Present – **UNL’s Soil Health Clinic** – Biological, Chemical and Physical Soil Properties – by Dr. Keith Glewen.
- 2014- Present – **Eastern Nebraska’s Soil Health Conference** – UNL - ENREC - Meade, NE
- 2016 - Present – Nebraska’s On Farm Research Network – **Soil Health Demo Farms Cooperation**
- 2018-2022 – UNL’s IANR – Dept. of Agri/Hort – Assistant Professor, Dr. Andrea Basche - **Soil Health Demonstration Farm Cooperative Agreement for Analysis and Case Studies**
- 2018-Present – **Nebraska’s On Farm Research Network Soil Health Study Results Update Meeting** – York, NE
- 2019 CIG – Nebraska’s On Farm Research Network CIG – **Precision Ag and Nitrogen Management**
- 2019 CIG – Nebraska’s TAPS program CIG – **Developing the Best of the Best Good Farming Practices**
- 2019 CIG – SWCS and Land O’Lakes – **Facilitating Farmer Cooperatives in their network to test and promote soil health Mngt.**
- 2020-2023 – UNL’s School of Natural Resources – Conservation and Survey Division – Assistant Professor Dr. Judy Turk - **The relationship between soil color and soil organic carbon in Nebraska soils**
- 2020-2023 – UNL’s IANR – Department of Agronomy and Horticulture – Assistant Professor Dr. Michael Kaiser - **Impact of land use on deep soil organic carbon dynamics in Nebraska**
- 2020-2023 – UNL’s IANR – Department of Agronomy and Horticulture – Assistant Professor/Extension Specialist, Dr. Bijesh Maharjan - **Developing An Interactive Soil Health Reference Site Map for Nebraska to Understand the Soil Health Gap.**

# NRCS - National Soil Science Center (NSSC) Research in Nebraska

Soil Water Movement Study – Research Project in Nemaha County studying the relationship between soil, management and the landscape on the movement of water in a watershed.



Static SSURGO Water Movement		
SMU Characteristics	GID3	WeC2
Depth to Water Table	>200	>200
Ponding Frequency Class	None	None
Flooding Frequency Class	None	None
Septic Tank Absorption	Very limited	Somewhat limited



# DSP Repeated Measures

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- 2013-15 DSP Inventories were a new idea promoted and adopted for use in Nebraska.
- 2015-2019 DSP Inventories were piloted in two comparison studies in Nebraska.
- 2020 - DSP Inventories will be utilized during the development of Soil Health Reference Sites:
  - 20 Paired locations (Un-Plowed Range & Cropland) will include “Deep Carbon Sampling”
  - 10 Sites will be selected in Dominant/Critical Soils in Production Landscapes across Nebraska
  - These soil samples will be utilized as a pilot for the Soil Color : Soil Organic Matter Correlation
- 2019 – Lincoln MLRA office completed 10 DSP & kSAT inventories on the Uly Soil.
- 2021 – Lincoln MLRA Office proposed to complete 10 DSP/kSAT inventories on the Holdrege Soil.
- 2020 – 41 DSP Inventories were completed at the Soil Water Movement Study Land Scape Positions.
- 2021 – 30 DSP Inventories are planned in collaboration with UNL partnership opportunities.

# 2021 Soil Health Workload Update

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- 2016-17 Soil Health Demonstration Farms
  - Drawing toward the end – Progress and Current Crops
  - 2020 Fall Field Work – What, When and Where? – Area Team Meetings
  - Field Days Coming up – Howard & Greeley Counties
- Updated Soil Health Worksheet and App
- UNL Demo Farm Cooperative Agreement
  - Management System Intensity Assessment
  - TerrAvion Imagery Analysis – in field validation of remote sensing
  - Final Case Study Development – OFR Agronomic Info for 2021
  - SHA on the 2017 contracts each year, now at randomized locations.



# NRCS Nebraska Soil Health Strategic Plan

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STRATEGICALLY THINKING FOR THE  
FUTURE

# NRCS Nebraska's Soil Health Initiative and Support

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2014 – Nebraska's Soil Health Assessment Worksheet and Area SH Committees Developed

2015 – Nebraska's Soil Health CIG to review Haney Test Results across a spectrum of soils.

2016-2017 Concept for the Nebraska Soil Health Initiative

2017-2020 The Nebraska NRCS Soil Health Strategic Plan

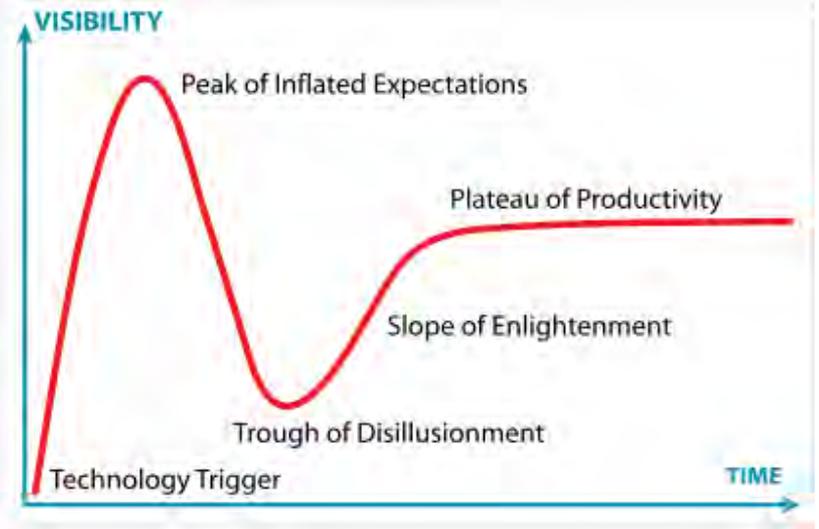
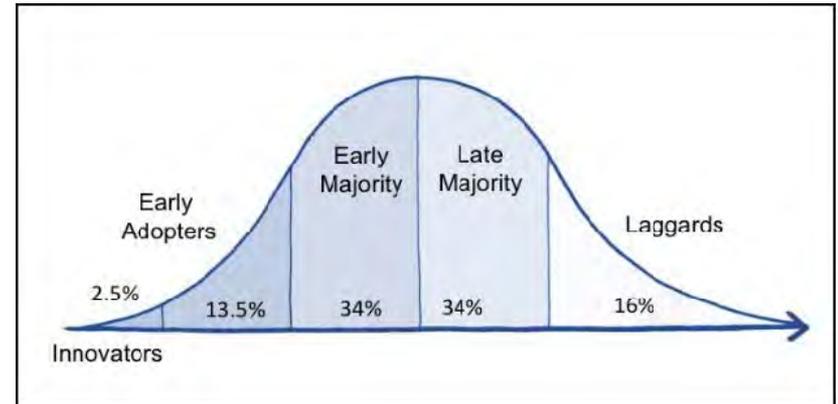
2018-19 – Nebraska Soil Health Round Table Discussion

2019 – Support of Nebraska Legislative Task Force resulting from LB-243

2021 – Moving forward...

# Nebraska NRCS Soil Health Initiative Strategic Foundation

- ▶ Communication, Coordination and Collaboration
- ▶ Partnerships Remain a Central Focus
- ▶ The Innovation Adoption Curve – The Early Majority Audience
- ▶ Facilitating Geographically Distributed, Locally Important, Statistically Valid, On Farm Research
- ▶ Developing and Utilizing Measurements of Success
- ▶ Working to Advance the Science of Soil Health



# Online or In-Person, February 25<sup>th</sup> or 26<sup>th</sup> at multiple locations!

## ON-FARM RESEARCH NETWORK

WORKING WITH PRODUCERS TO ADDRESS CRITICAL PRODUCTION, PROFITABILITY, AND NATURAL RESOURCES QUESTIONS.

### NEBRASKA ON-FARM RESEARCH NETWORK

## 2021 Annual Results Update

### LOOKING FOR LOCAL & RELIABLE AGRONOMIC INFORMATION?

Nebraska farmers are conducting research across the state in cooperation with Nebraska Extension. There are 100+ projects this year! Come hear what we are learning, meet other innovative farmers, and consider conducting research on your own farm.

#### REGISTRATION

Pre-registration is required!

- Seating is limited to provide a low density environment - register early! **Events are subject to change.** In-person meetings may be cancelled based on local health measures. If a location is canceled, we will contact you and provide an online option.
- Get latest information & register at [go.unl.edu/2021onfarmresearch](http://go.unl.edu/2021onfarmresearch).
- Questions: [onfarm@unl.edu](mailto:onfarm@unl.edu) or 402-624-8030

#### February 25

- **AUBURN** - 4-H Building Nemaha County Fairgrounds, 816 I St., Auburn, NE
- **BEATRICE** - Gage County Extension Office, 1115 West Scott, Beatrice, NE
- **CLAY CENTER** - Clay County Fairgrounds, 701 N. Martin Ave., Clay Center, NE
- **DAVID CITY** - David City Library, 399 N 5th St., David City, NE
- **WAHDO** - Lake Wahahoo Education Building, 655 County Road 28, East side of Lake Wahahoo, Wahos, NE
- **YORK** - Cornerstone Event Center, Fairgrounds York, 2400 N. Nebraska Ave., York, NE
- **ONLINE ONLY OPTION AVAILABLE**

#### February 26

- **ALLIANCE** - Knight Museum, 908 Yellowstone, Alliance, NE
- **CLAY CENTER** - Clay County Fairgrounds, 701 N. Martin Ave., Clay Center, NE
- **KEARNEY** - Buffalo County Extension Office, 1400 E. 34th (Fairgrounds), Kearney, NE
- **NEBRASKA CITY** - Kimball Orchard Education Building, 5995 S Rd., Nebraska
- **NORFOLK** - Madison County Extension, 1305 S. 13th Street, Norfolk, NE
- **NORTH PLATTE** - West Central Research, Extension, and Education Center (WCREEC), 402 W. State Farm Road, North Platte, NE
- **OSCEOLA** - Polk County Fairgrounds, Ag Hall, 12931 N Blvd, Osceola, NE
- **SEWARD** - Harvest Hall, Fairgrounds Seward, 1625 Fairgrounds Circle, Seward, NE
- **WEST POINT** - Nelson Center - West Point, 200 Anna Stalo Ave, West Point, NE
- **WILBER** - Saline County Extension Office, 306 W 3rd Street, Wilber, NE
- **ONLINE ONLY OPTION AVAILABLE**

Sponsored by:

In partnership with:



### ON-FARM RESEARCH UPDATE SCHEDULE

Times are Central Standard Time, 8:30 a.m. Central / 7:30 a.m. Mountain: Check-in

- 8:30-9:00 Attendee check-in at local facilities
- 9:00-9:10 Welcome!
- 9:10-9:30 Leveraging Precision Ag Technologies to Conduct Reliable On-Farm Research Studies - *Dr. Joe Luck, Precision Ag Specialist*
- 9:30-9:40 Introduction to the Nebraska On-Farm Research Results Update Book - *Nothan Mueller & Laura Thompson, Extension Educators*
- 9:40-10:45 Local on-farm research results discussions
- 10:45-10:55 Break
- 10:55-11:10 Presentation 1: Option A: Update of NRCS Soil Health Demo Farm Projects - *Fernanda Kinpek OR Option B: Manure and Mulch applications for Crop Production and Soil Properties - *Carla Melgar Vets**
- 11:10-11:25 Presentation 2: Option A: Sensor Based Nitrogen Management for Dryland Corn - *Samantha Tezen OR Option B: Sensor Based Fertiligation - *Jackson Stansell**
- 11:25-11:35 Presentation 3: Precision Nitrogen Management Project - Crop Model Based Nitrogen Management - *Laura Thompson and Lallo Pustel*
- 11:35-11:45 Upcoming research opportunities
- 11:45-12:15 Group discussion of research topics for their area
- 12:15-12:25 New On-Farm Research Products
- 12:25-12:30 Thank you to participating farmers and recognition
- 12:30 Evaluation and dismissal



Nebraska University of Nebraska-Lincoln Institute of Agriculture and Natural Resources

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# SOIL HEALTH INITIATIVE

DEMONSTRATING SOIL HEALTH MANAGEMENT ACROSS NEBRASKA

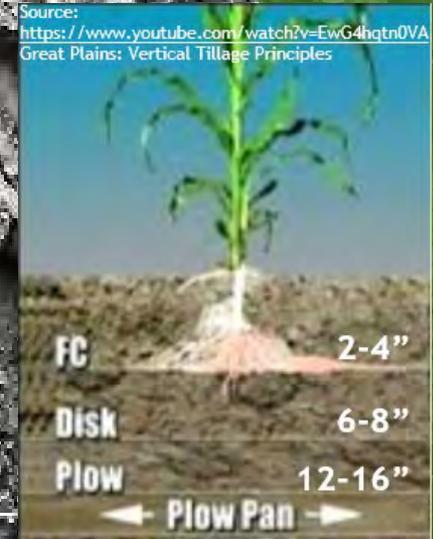


The University of Nebraska, the Natural Resources Conservation Service, and Nebraska farmers and ranchers are participating in a state-wide effort to enhance the adoption of soil health and rangeland health management systems through the Soil Health Demonstration Farms and Ranch Initiatives. These initiatives will establish in-field management comparisons across the state to showcase grazing management and cropping system comparisons.

**SOIL HEALTH INITIATIVE**

[About the Soil Health Initiative](#)

# A Common problem in Nebraska: Tillage Induced, Root Restrictive, Compaction Layers



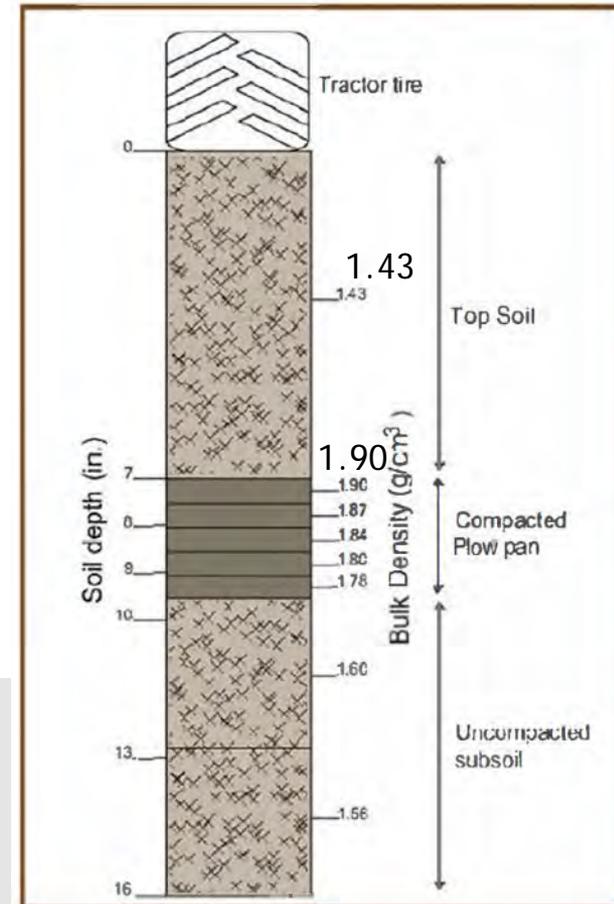
Cover Crops can have a High Rooting Pressure Tolerance and Can Push through High Bulk Density Layers!

# Root Restrictive Bulk Density

Soil Texture	Ideal Density (g/cm <sup>3</sup> )	Density Affects Roots	Density Restricts Roots
Sands, loamy sands	< 1.60	1.69	>1.80
Sands, loamy sands	< 1.60	1.69	>1.80
Sandy loams, loams	< 1.40	1.63	>1.80
Sandy clay loams, clay loams	< 1.40	1.6	>1.75
Silts, silt loams	< 1.40	1.6	>1.75
Silt loams, silty clay loams	<1.40	1.55	>1.65
Sandy clays, silty clays, clay loams	< 1.10	1.49	>1.58
Clays (>45% clay)	< 1.10	1.39	>1.47

Note: The engineering standard soil bulk density is 1.33

- Top Soil = 1.43, Plow Pan starts at 1.90
- No Tillage systems Retain or Sustain soil structure.
- Biological Activity Regenerates soil structure.



# The Compounding Effects of Applying the Principles

<b>Bulk Density Change with Soil Health Management</b>	<b>0-5 cm depth</b>					
<b>Demonstration Farm</b>	<b>Years of Cover Crops Use</b>	<b>Soil Survey Determined Ideal Density (g/cm<sup>3</sup>)</b>	<b>Average 2016 or 2017 Benchmark Bulk Density</b>	<b>Average 2018 Bulk Density</b>	<b>Average 2019 Bulk Density</b>	<b>Average 2020 Bulk Density</b>
Nemaha County - Obermeyer - WH	5	Silty clay loam < 1.40	1.25	1.17	1.26	1.26
Nemaha County - Obermeyer - WK	5	Silty clay loam < 1.40	1.25	1.30	1.27	1.27
Otoe County - McDonald	9	Silty clay loam < 1.40	1.15	1.07	1.12	1.18
Seward County - Ficke	5	Silty clay loam < 1.40	1.23	1.19	1.31	-----
Stanton County - Pestel	8	Silty clay loam < 1.40	1.09	1.09	1.11	1.14
Knox County - Steffen	7	Silt loam < 1.40	1.22	1.32	1.13	1.27
Franklin County - Bauer	5	Silt loam < 1.40	1.37	1.31	-----	1.30
Merrick County – Seim – Striptill	4	Loamy sands < 1.60	1.35	1.41	1.25	1.36
Howard County – Sack – Convert to Notill	4	Silty Clay Loam < 1.40	1.08	1.23	1.15	1.07

# 2020 Cover Crop Research – Dodge Co

## Incorporation of Small Grains and Cover Crop in a Corn-Soybean Rotation, NRCS Demo

**Table 1.** Soil physical, chemical, and biological properties for check and intensive system treatments.

Treatment	Infiltration (in/hr)	Soil moisture (%)	Bulk density (g/cm <sup>3</sup> )	Soil temp. (F)	Soil respiration <sup>1</sup>	Total soil health score <sup>2</sup>
<b>2017</b> (1 sample per treatment replication, n=4 per treatment; samples collected on Nov. 14, 2020)						
Check	0.015 A*	24.5 A	1.21 A	41.9 A	3.67 A	12.6 A
Intensive System	0.480 A	23.5 A	1.06 A	42.5 A	3.92 A	15.2 A
P-Value	0.551	0.3471	0.315	0.500	0.678	0.272
<b>2019</b> (1 sample per treatment replication, n=4 per treatment; samples collected on Nov. 6, 2019)						
Check	1.84 A	26.8 A	1.06 A	39.92 A	3.12 A	14.9 B
Intensive System	3.20 A	25.8 A	1.06 A	39.95 A	3.00 A	18.5 A
P-Value	0.2692	0.591	0.869	0.718	0.638	0.0721
<b>2020</b> (2 samples per treatment replication, n=8 per treatment; samples collected on Nov. 3, 2020)						
Check	1.36 A	28.7 A	1.14 A	44.1 A	2.94 A	17.8 B
Intensive System	3.46 A	28.7 A	1.14 A	44.0 A	2.94 A	18.6 A
P-Value	0.117	0.969	0.992	0.781	1.00	0.055

<sup>1</sup>Soil respiration (Modified Solvita burst).

<sup>2</sup>Score based on field assessment. The overall indicator score is based on the sum of 8 indicators (1=degraded, 2=in transition, 3=healthy): soil structure, structure type, surface condition, soil management, soil pores, earthworms, biological activity, and smell.

Soil assessment was not completed in 2018 as it was originally planned for every other year interval.

\*Values with the same letter are not significantly different at a 90% confidence level.

**Table 3:** 2020 corn moisture, yield, and net return for check and intensive system treatments.

	Moisture (%)	Corn Yield (bu/ac)†
Check	14.7 A	183 B
Intensive System	14.3 A	202 A
P-Value	0.168	0.00413

†Values with the same letter are not significantly different at a 90% confidence level.



# New Soil Health Resource Concerns and Payments

Slides Credit to:  
Brandon R. Smith, Ph.D.  
USDA-NRCS Soil Health Division  
Carlos Villarreal, State Soil Scientist, NE

# New NRCS Soil Health Resource Concerns

- Compaction
- Organic matter depletion
- Concentration of salts or other chemicals
- Soil organism habitat loss or degradation
- Aggregate instability



# Cropland In-Field Soil Health Assessment Worksheet

## Soil Health Resource Concerns

CPT: Compaction

SOM = Soil organic matter  
depletion

AGG = Aggregate instability

HAB = Soil organism habitat  
degradation

Location
Field/CMU
Tract#
Client/Customer
Planner

### Indicator

Timing: Anytime , After rain or irrigation , With adequate moisture , Primarily for  
Before a tillage event , Interview , Before growing season , During growing season

### Soil cover

Meets: Surface cover from plants, residue or mulch; cover greater than 75%.

### Residue breakdown

Meets: Natural decomposition of crop residues is as expected with crop and conditions.

### Surface crusts

Meets: Crusting on no more than 5% of the field.

### Ponding

Meets: No ponding within 24h following typical rainfall or surface irrigation event.

### Penetration resistance

Meets:

- Penetrometer rating less than 150 psi within top 6" depth and < 300 in 6-18" depth;
- OR Slight or no resistance with wire flag inserted to 12".

### Water stable aggregates

Meets:

- Cylinder: At least 80% remains intact after 5 minutes with little cloudy water
- OR Strainer: soil remains intact with aggregates apparent
- OR Soil Quality Test Kit (SQTK): meets stability class 6

### Soil structure

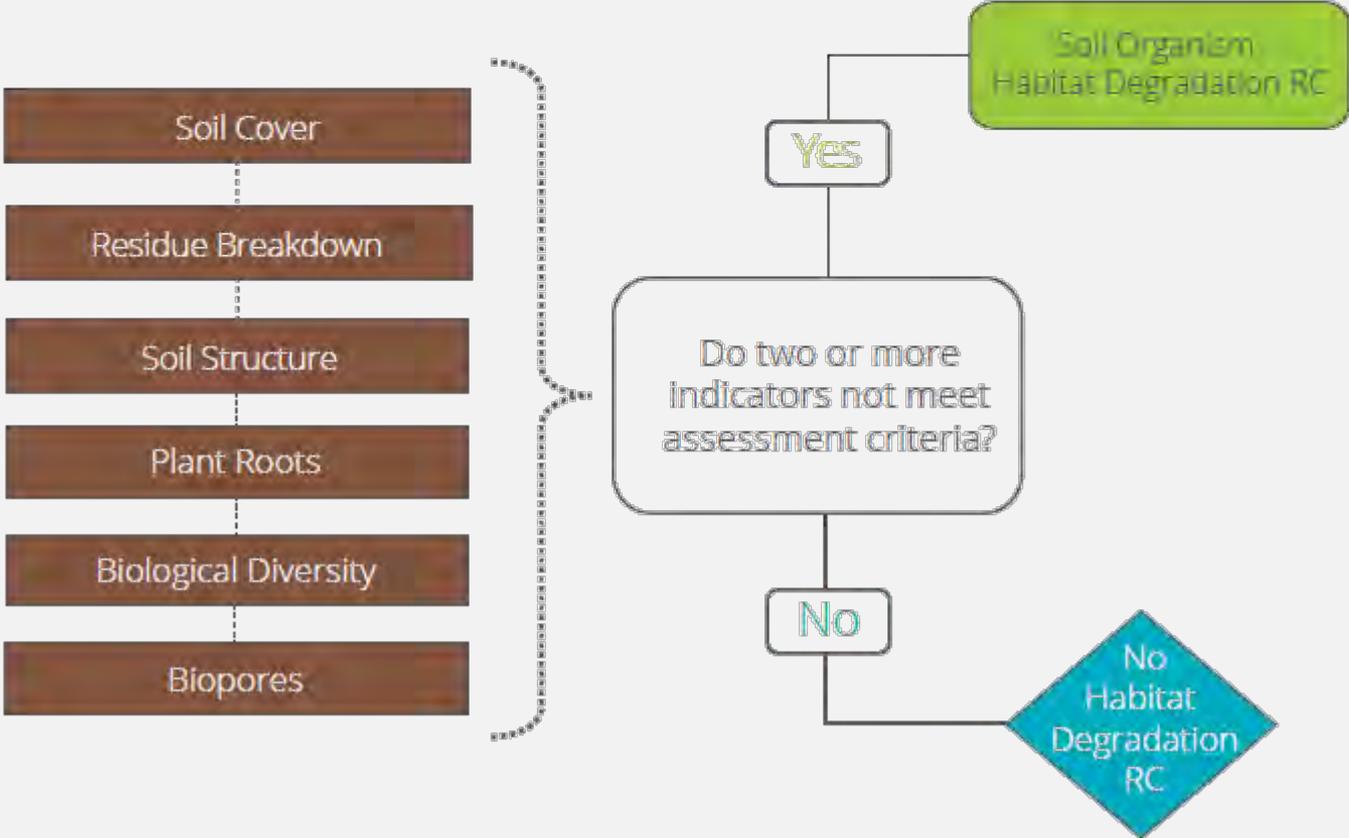


Legend (for all RCs)

-  = Field indicator
-  = RC present
-  = RC not present

# Soil Organism Habitat Degradation Resource Indicator Decision Tree

Circle the indicators that do not meet assessment criteria during the evaluation and follow decision tree below to determine if the given resource concern (RC) is present. Document on worksheet.



# New Conservation Practices

- Soil Testing Activity (216)
  - Soil Health Assessments
  - Heavy Metal Testing
- Soil Carbon Amendment (808)



# CP 216 - Soil Sampling Practice

- **Facilitating Cons. Practice**
- **Quantitative analysis of soil physical, chemical, and biological properties**
- **Assist in designing Soil Health Management System (implementation requirements) based on results of the soil test**
- **5-yr recommendation; 3-yr preference**
- **Cons. Practice made available for FY2021**



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Using same methods & validated

Soil Structural Stability & Water Partitioning

- **Aggregate stability**

May 2019

Soil Organic Matter Cycling

- **Soil organic C**

Carbon Food Source

- **Permanganate oxidizable C (Active C)**

Microbial Activity

- **Short-term C mineralization (respiration)**

Bioavailable N

- **Acid Citrate Extractable protein**



United States Department of Agriculture

Natural Resources Conservation Service



## Soil Health Technical Note No. 450-03

### Recommended Soil Health Indicators and Associated Laboratory Procedures



Natural Resources Conservation Service

# CP 216 - Soil Sampling Practice

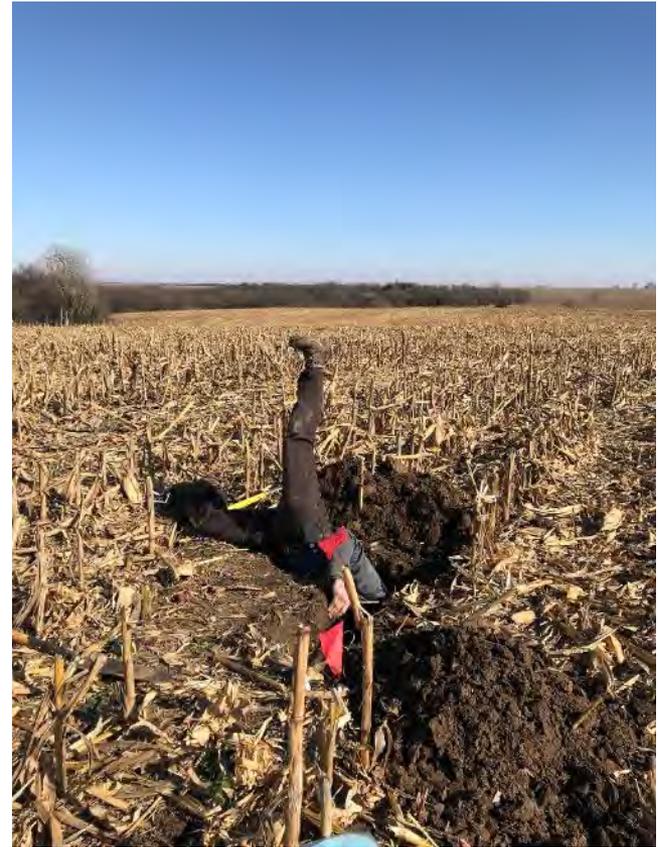
## Typical scenario:

**Conservation Planner and Producer identify *Compaction and Sheet and Rill Erosion* as potential resource concerns.**

**Participant chooses to adopt *cover cropping and No-Till residue management* conservation practices.**

**There are still decision to be made!**

- **Cover crop mix/seeding rate**
- **Residue type/amount**
- **Crop Rotation**
- **Soil Carbon Amendments**



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# Planning and Monitoring

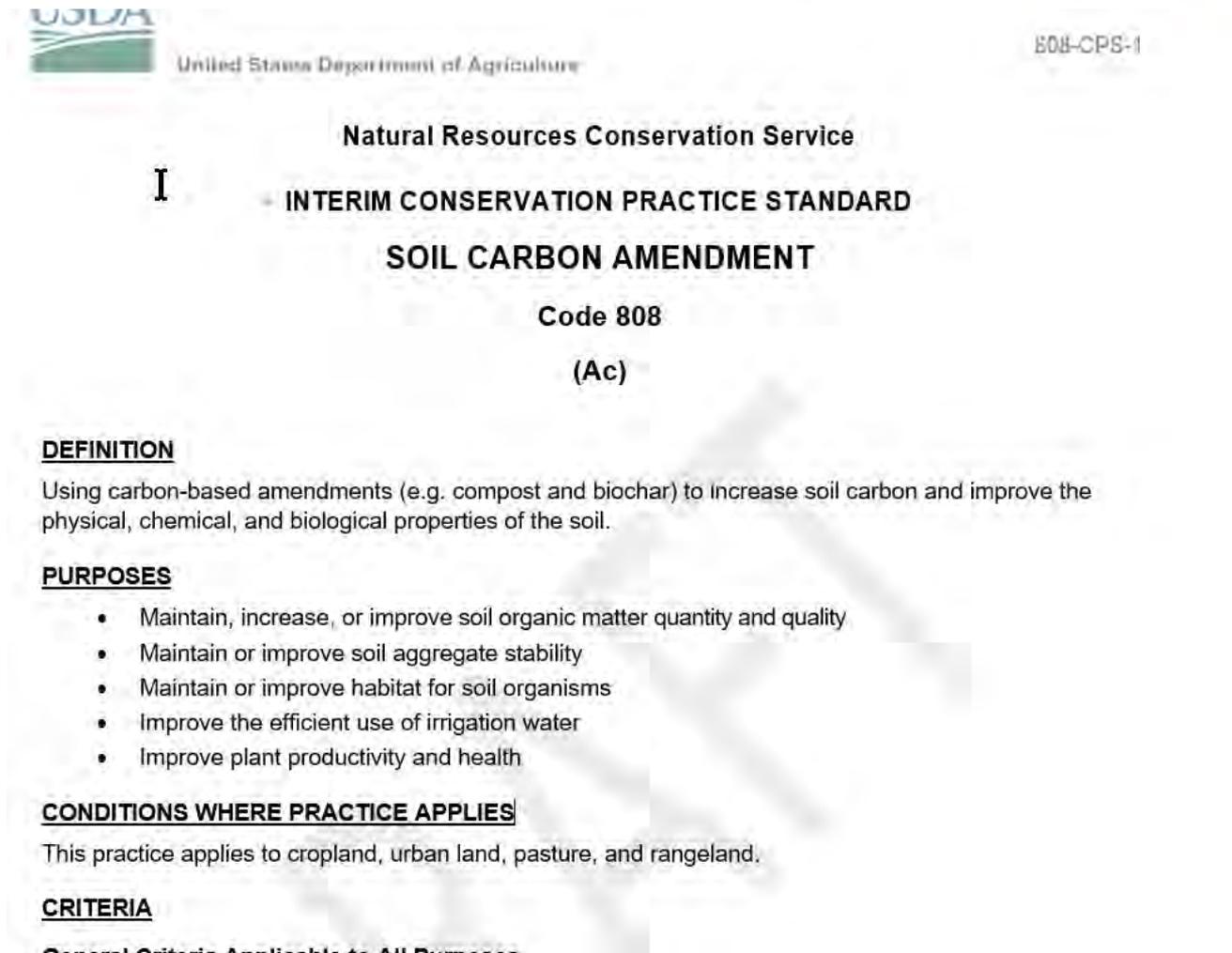


## Tech note for understanding soil health assessment results to plan and monitor practices

Indicator	Suggested Management Practices		NRCS Practice (code)
	Short Term	Long Term	
<b>Low Aggregate stability</b>	<ul style="list-style-type: none"> <li>• Incorporate fresh organic materials</li> <li>• Use shallow-rooted cover/rotation crops</li> <li>• Add manure, green manure, mulch</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce tillage</li> <li>• Use a surface mulch</li> <li>• Rotate with sod crops</li> </ul>	<b>(328)</b> Conservation Crop Rotation; <b>(329)</b> Residue Mgmt No-Till/Strip-Till; <b>(340)</b> Cover Crop; <b>(484)</b> Mulching; <b>(512)</b> Forage & Biomass Planting; <b>(528)</b> Prescribed Grazing
<b>Low Active Carbon</b>	<ul style="list-style-type: none"> <li>• Add fresh organic materials</li> <li>• Use shallow-rooted cover/rotation crops</li> <li>• Add manure, green manure, mulch</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce tillage/mechanical cultivation</li> <li>• Rotate with sod crop</li> <li>• Cover crop whenever possible</li> </ul>	<b>(328)</b> Conservation Crop Rotation; <b>(329)</b> Residue Mgmt, No-Till; <b>(340)</b> Cover Crop; <b>(484)</b> Mulching; <b>(345)</b> Residue Mgmt, Mulch Till; <b>(528)</b> Presc. Grazing; <b>(511)</b> Forage Harvest Management; <b>(512)</b> Forage & Biomass Planting



# Soil Carbon Amendment (808)



**DEFINITION**

Using carbon-based amendments (e.g. compost and biochar) to increase soil carbon and improve the physical, chemical, and biological properties of the soil.

**PURPOSES**

- Maintain, increase, or improve soil organic matter quantity and quality
- Maintain or improve soil aggregate stability
- Maintain or improve habitat for soil organisms
- Improve the efficient use of irrigation water
- Improve plant productivity and health

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to cropland, urban land, pasture, and rangeland.

**CRITERIA**

**General Criteria Applicable to All Purposes**

This practice includes the application of carbon-based amendments to improve the condition of the soil.

**Amendment Analysis:** It is the responsibility of the amendment provider to provide analysis of material. In cases where the amendment is produced on-farm or on-site, the producer must have the material tested.



# Soil Carbon Amendment (808)

**Compost:** Use compost that is either analyzed for the following parameters according to the Test Methods for the Examination of Composting and Compost (TMECC) or other Land Grant University (LGU) recognized methods:

- Maturity index rating of “mature” or “very mature”
- Carbon to nitrogen (C:N) ratio between 15:1 and 30:1 at maturity
- 40-60% moisture (60-40% solids) at maturity

Measure and document the amount of phosphorus, potassium, pH, soluble salts (electroconductivity), organic matter, and bulk density.

**Other Carbon Amendments:** Use regionally appropriate carbon-based materials, such as wood chips, pulverized paper, bagasse, coal ash, wood ash, or distillation residue to meet the conservation objective. Consult appropriate land-use specialists for assistance to plan for a specific conservation objective using alternative carbon amendments.

**Biochar:** Use biochar that is produced by heating biomass to a temperature in excess of 350°C under conditions of controlled and limited oxidant concentrations to prevent combustion (pyrolysis or gasification).

Measure and document the amount carbon, nitrogen, phosphorus, potassium, and pH.

**Woody Materials:** Use regionally appropriate woody materials, such as wood chips, sawdust, pulverized paper, bagasse, distillation residue to meet the conservation objective.



# Biochar

## Stable form of carbon



in organic-mineral complexes that are very slowly decomposed and thus can be retained in the soil for decades to centuries or more. Following fires, small amounts of so-called ‘black carbon’ are produced, which constitute a **nearly inert carbon fraction with turnover times that may span millennia.** Biochar C<sup>4</sup> may be produced through pyrolysis and amended to soils with a long turnover time.

Lehmann et al.

**Good for soil organism habitat, other important things**

**Good companion with Woody Residue Trt. (e.g. Kansas), Brush Management, TSI**

**ROI**  
Recycle Original Innovation

CARBONIZERS ▾ BIOCHAR PRODUCTION MARKETS ▾ USED EQUIPMENT 🔍

**The Future of Wood and Vegetative Debris Recycling**

The mobile CARBONATOR is the most advanced, cost-effective and environment-friendly wood debris recycling systems ever built. The CARBONATOR 500 converts wood and other suitable biomass in to a high quality biochar at high throughput rates. Designed to accept trees, brush, stumps and other wood debris, as well as C&D, without grinding or chipping.

Not an endorsement  
only an example

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# 3 to 5 years down the road...

**Repeat Soil Sampling with  
216 Soil Testing**

**Evaluate Environmental  
Benefits and Outcomes**

**Make Plan Adjustments**

**Share Information**

**Support Education**



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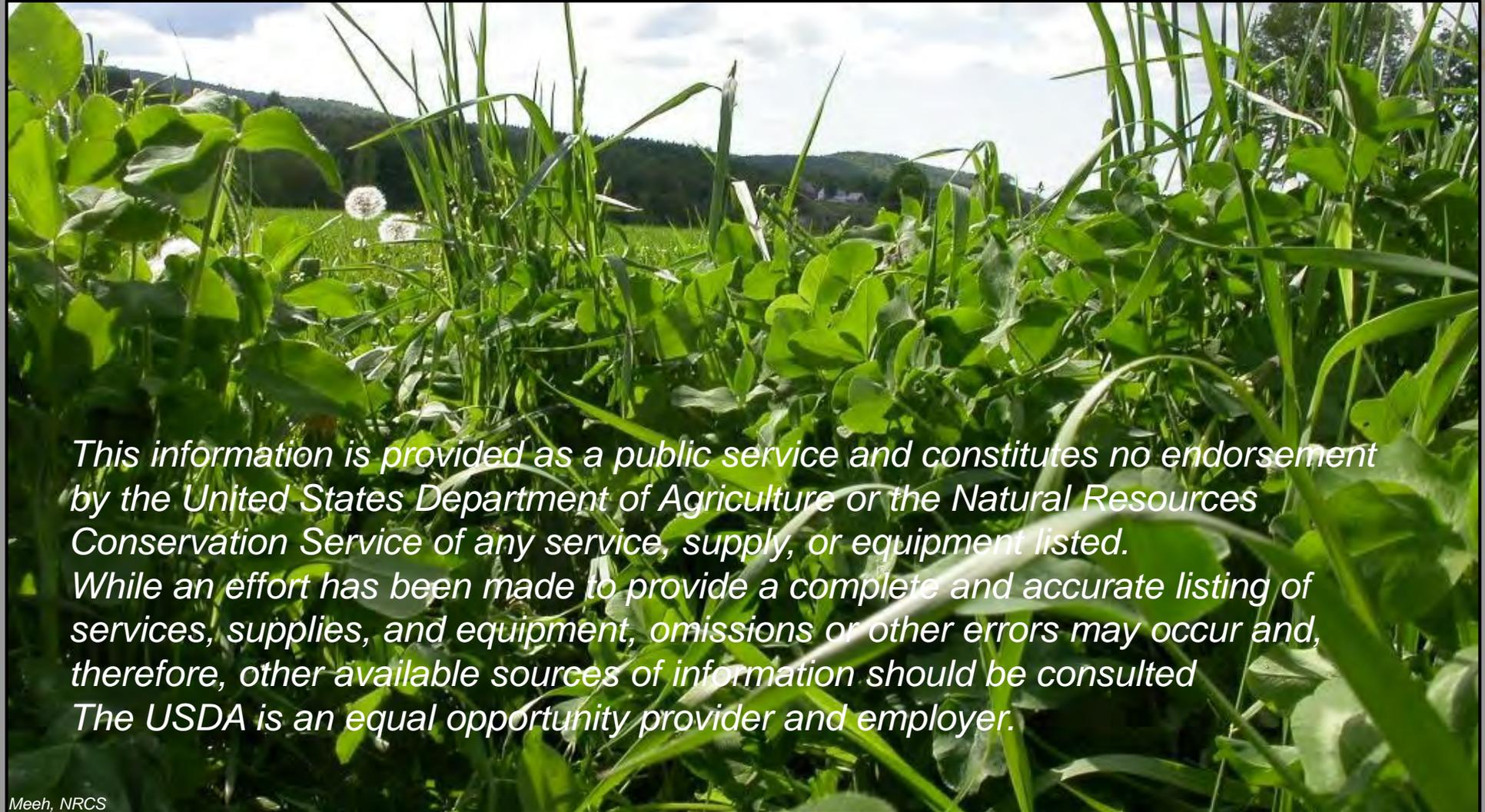
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# For more information

- **Contact your local USDA-NRCS Service Center to discuss these new opportunities.**
- **Field Office Technical Guide (eFOTG) - to learn about expected physical effects of conservation management systems**
- **Web Soil Survey - for general land use planning and decision making**





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**How soon do we need to improve Soil Health and what would that change?**





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