Conservation Evaluation & Monitoring Activity 216 Update

Soil Health Division

Nathan Lowder,
National Soil
Health Specialist
(acting)

Why now???

Revision to CEMA 216 was needed to provide a product that

- Allows for increased availability of commercial labs to be able to offer the services to producers
- Is simpler and easier to understand methods for producers, technical service providers (TSPs), Qualified Individuals (QIs), and field office staff
- Streamlines the payment scenarios

Announcement of Regenerative Pilot Program (RPP)

- Requires CEMA 216 – year 1 & 5
- The streamlined CEMA 216 will improve the RPP experience for producers, QIs, and field staff

What is being updated???

- **CEMA 216 guidance - **published 1/28/26****
- **Payment schedules -**
- **Tech notes**
  - TN 470-SH-01
  - TN 470-SH-07
  - TN 470-SH-16
  - TN 470-SH-10
- **Fact sheets**
- **Job aids**
- **Training materials**

Objectives

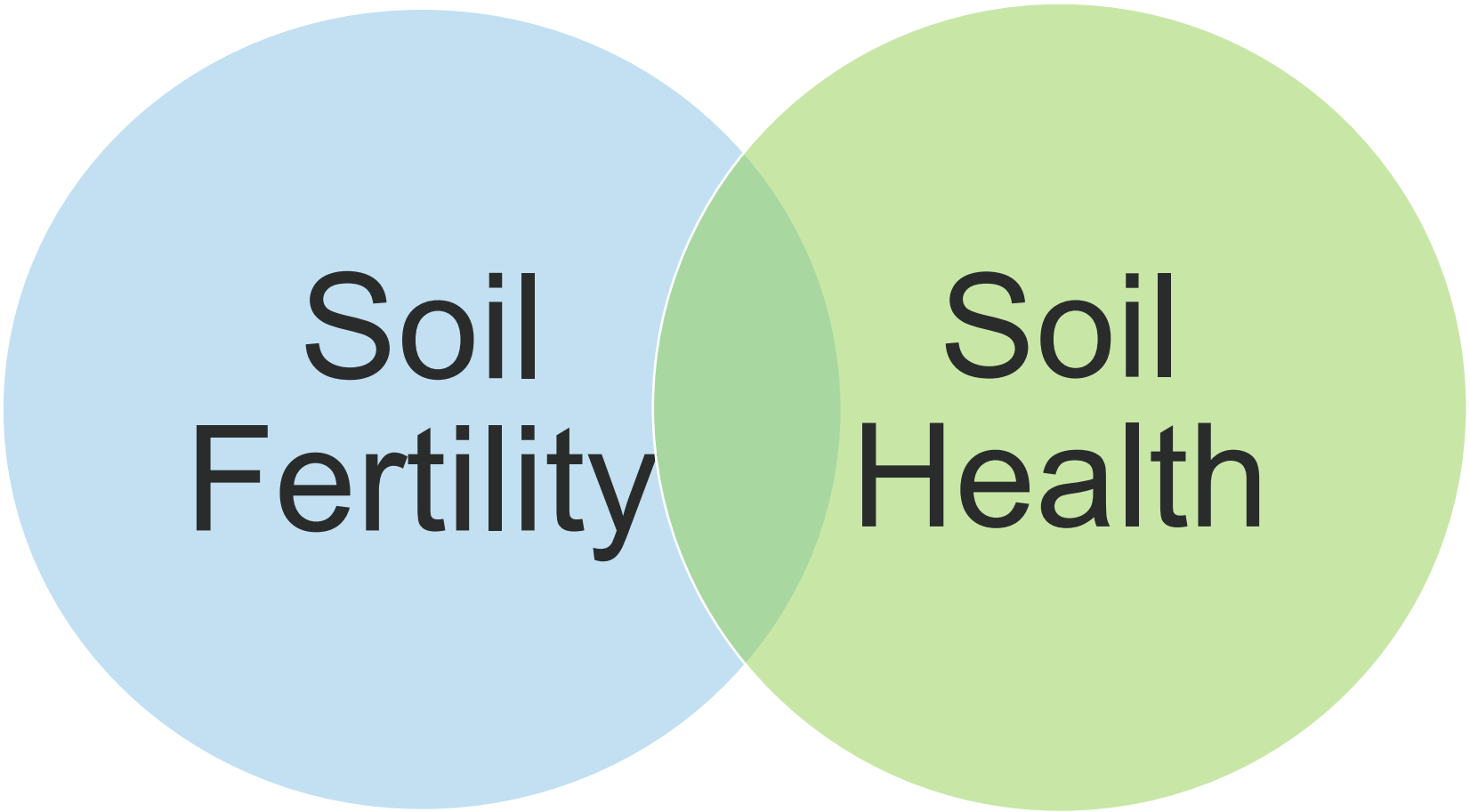
1. What is Soil Health?
2. What is Soil Health Testing?
3. Soil Health Indicators (New Changes)
4. Identify definitions of CEMA 216
5. What is a QI?
6. Discuss step by step implementation

What is Health?

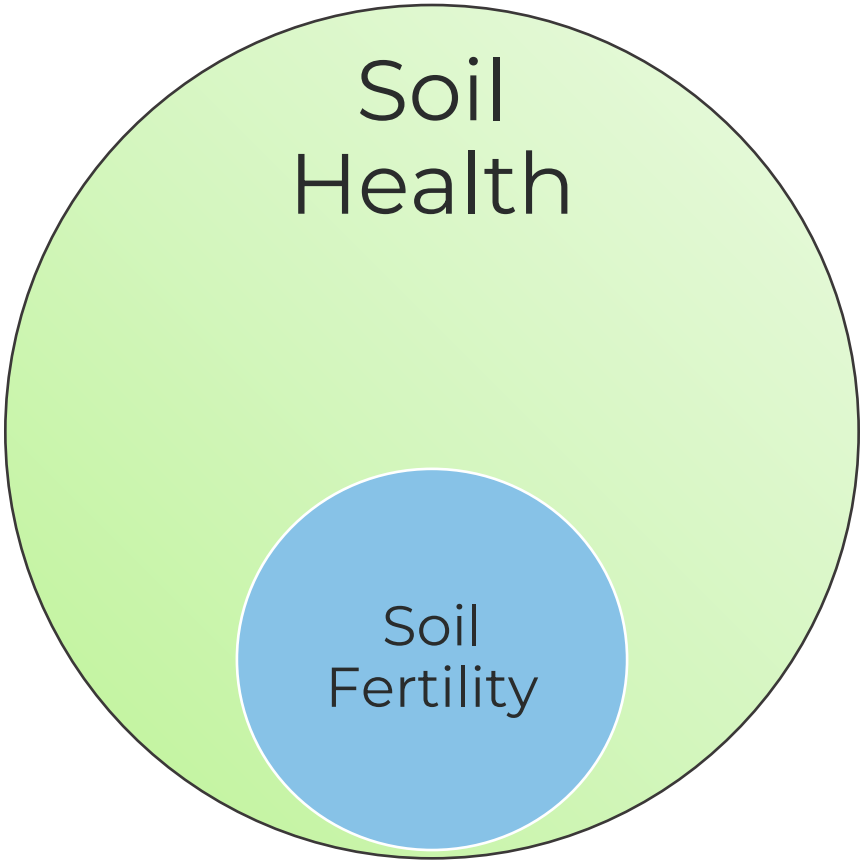
- Is this person healthy?
- What would we measure to see if they are healthy?
- How would we track changes to their health?

What is Soil Health?

If we apply what we discussed about human health, what would we want to know about soil to determine the health?



How does soil fertility fit into soil health?



Soil fertility is a critical component of soil health. Like the status of your blood in relation to your overall health.

Human Health		Soil Health
Given Physical Attributes	→	Inherent Soil Properties
Weight, Blood Pressure	→	Soil Health Indicators
Blood Test	→	Soil Fertility Test

Monitoring Soil Health

Soil Health Indicators and Beyond!

Differences Between Soil Fertility and Soil Health Tests

CEMA 217

Soil Fertility

- Used to make nutrient recommendations
- Lab tests that use regionally appropriate methods
- Many methods correlated to yield trials at LGU's

CEMA 216

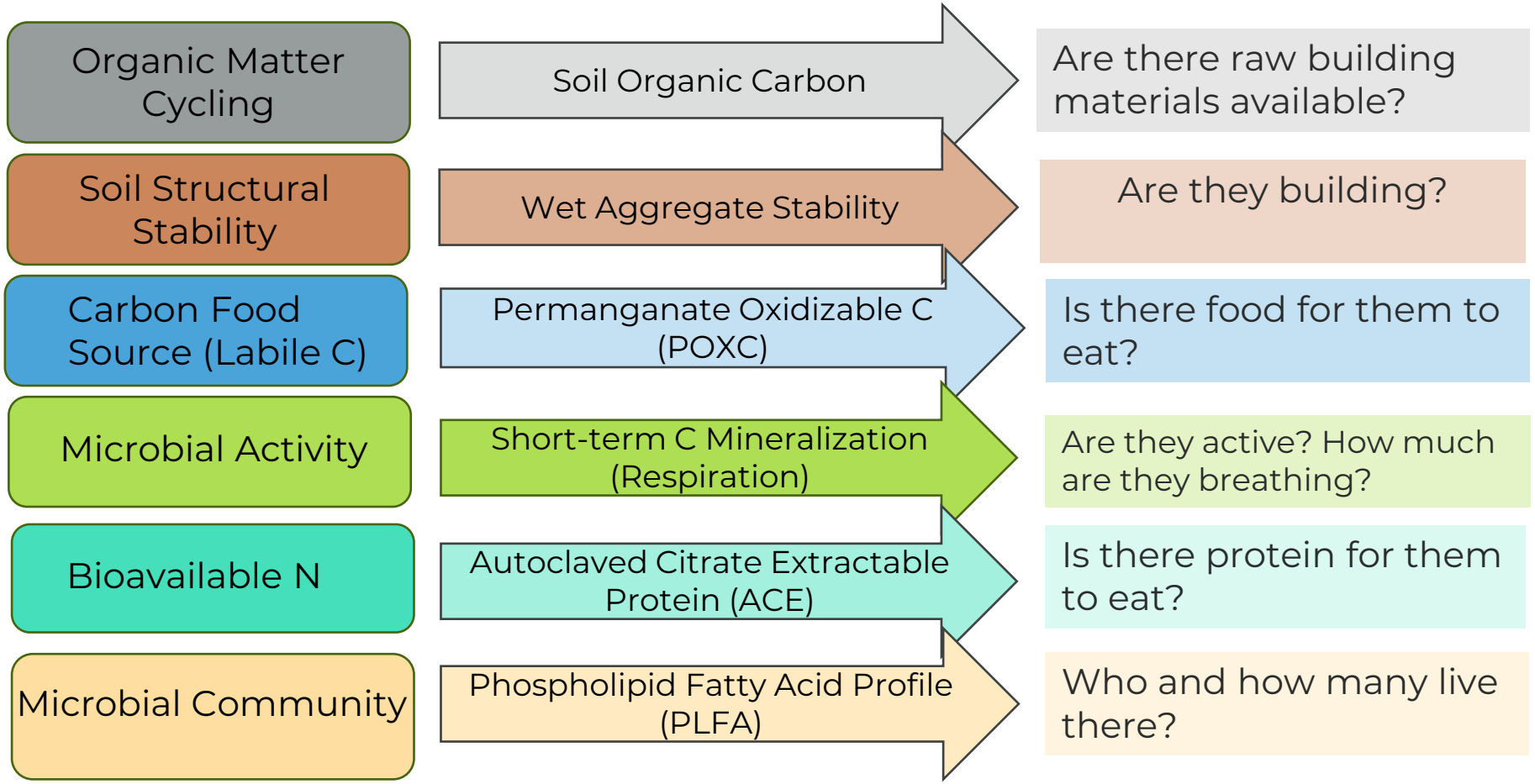
Soil Health

- Used to monitor trends
- Can include qualitative and quantitative measures
- Soil fertility, pH, and soil texture are important part of soil heath monitoring
- Ongoing research and data collection to improve regional interpretive value

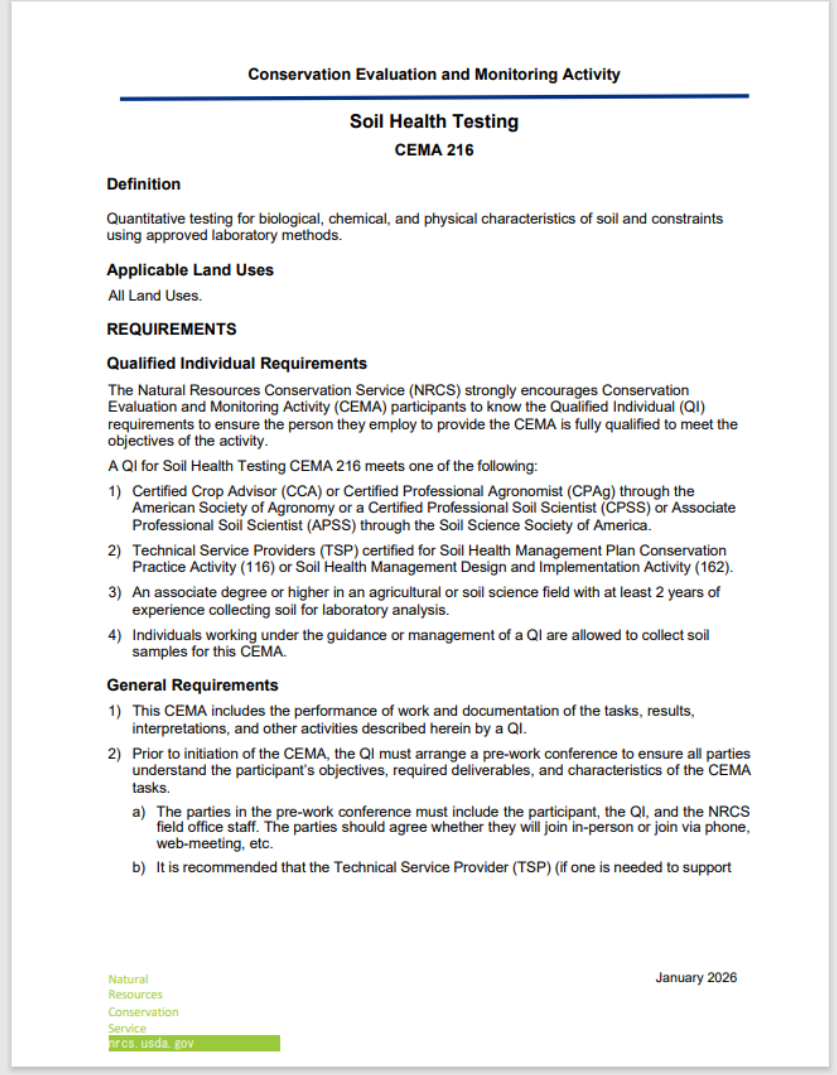
Common Components of Soil Fertility and Soil Health Lab Tests

Soil Fertility	May be found in both	Soil Health
Nitrogen	pH	Soil Respiration
Phosphorus	Texture	Labile Carbon (POX-C/ Active C)
Sulfur	Organic Matter	Organic N
Ca/Mg	Electrical Conductivity	Wet Aggregate Stability
Cation Exchange Capacity		Microbial biomass/community structure
Micronutrients		Soil Organic Carbon

Measuring Soil Functions



Conservation Evaluation and Monitoring Activity 216 - Soil Health Testing



Conservation Evaluation and Monitoring Activity

Soil Health Testing

CEMA 216

Definition

Quantitative testing for biological, chemical, and physical characteristics of soil and constraints using approved laboratory methods.

Applicable Land Uses

All Land Uses.

REQUIREMENTS

Qualified Individual Requirements

The Natural Resources Conservation Service (NRCS) strongly encourages Conservation Evaluation and Monitoring Activity (CEMA) participants to know the Qualified Individual (QI) requirements to ensure the person they employ to provide the CEMA is fully qualified to meet the objectives of the activity.

A QI for Soil Health Testing CEMA 216 meets one of the following:

1) Certified Crop Advisor (CCA) or Certified Professional Agronomist (CPAg) through the American Society of Agronomy or a Certified Professional Soil Scientist (CPSS) or Associate Professional Soil Scientist (APSS) through the Soil Science Society of America.
2) Technical Service Providers (TSP) certified for Soil Health Management Plan Conservation Practice Activity (116) or Soil Health Management Design and Implementation Activity (162).
3) An associate degree or higher in an agricultural or soil science field with at least 2 years of experience collecting soil for laboratory analysis.
4) Individuals working under the guidance or management of a QI are allowed to collect soil samples for this CEMA.

General Requirements

1) This CEMA includes the performance of work and documentation of the tasks, results, interpretations, and other activities described herein by a QI.
2) Prior to initiation of the CEMA, the QI must arrange a pre-work conference to ensure all parties understand the participant's objectives, required deliverables, and characteristics of the CEMA tasks.
   a) The parties in the pre-work conference must include the participant, the QI, and the NRCS field office staff. The parties should agree whether they will join in-person or join via phone, web-meeting, etc.
   b) It is recommended that the Technical Service Provider (TSP) (if one is needed to support

Natural Resources Conservation Service
nrcs.usda.gov

January 2026

- Definition: Quantitative testing for biological, chemical, and physical characteristics of soil and constraints using approved laboratory methods.
- CEMA 216 can be implemented on all land uses.

Why Use CEMA 216?

To monitor changes to soil health after a change in management

To investigate problem areas

To determine soil health regenerative potential – achieve producer goals

- Requirements: CEMA 216 must be completed by a QI.

- QI must meet one of the following:
  - Be a CCA, CPAg, CPSS or APSS
  - Be a TSP who is certified in CPA 116 or DIA 162
  - Have an associate degree in ag or soil science field and have at least 2 years of experience of collecting soil for analysis
  - Be an individual who operates under supervision of QI that meets at least one of the bullet points above

General Requirements

All parts of this CEMA are to be completed by a QI. Example

- Performance of work
- Documentation of task
- Results and interpretations
- Additional activities to support the CEMA

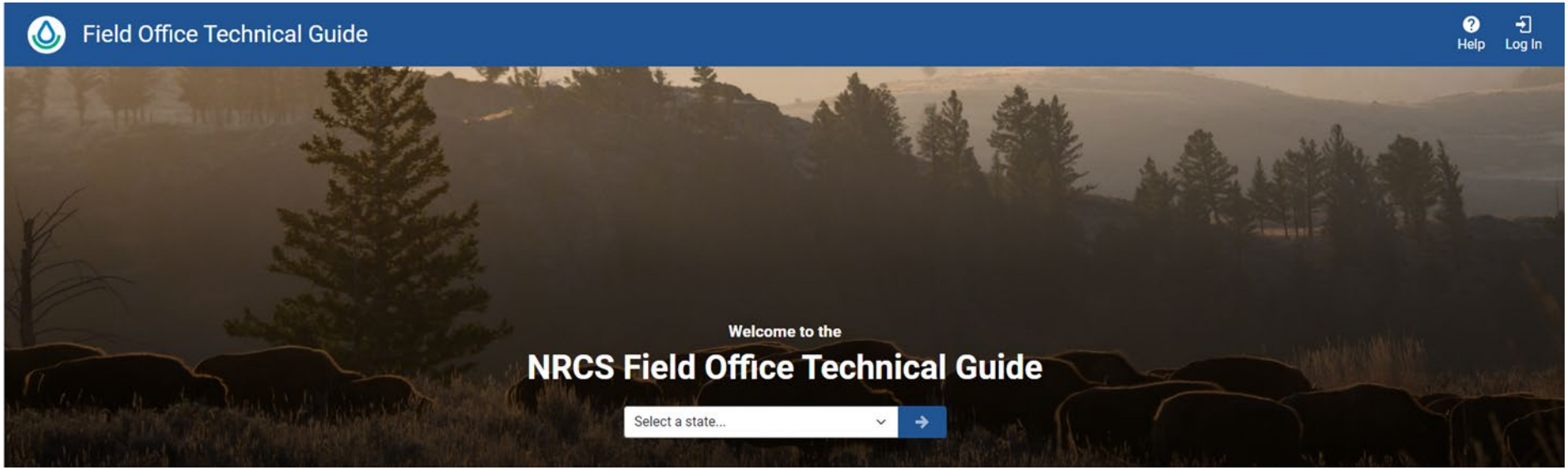
General Requirements Cont.

Prior to CEMA implementation

- QI must arrange prework conference
  - To ensure all parties understand the participants objectives
  - Cover the required deliverables
  - Identify tasks while implementing the CEMA
  - Must include the participant, QI, and NRCS FO staff
  - If additional parties will be a part of separate activities within the CEMA they should be in attendance as well

Reference Information

- Must be state specific



- Details to collect and analyze soil based on soil health resource concerns and planning objective(s)
- Soil samples are collected from the planning area (PLU) and sent to commercial labs for analysis using standardized methods.

Requirements for all soil testing

Record purpose and strategy used

- Design sampling strategy considering the following:
  - Producer goals
  - Available tools
  - Other applicable guidance
- Analyze:
  - Soil type
  - Topography
  - Producer management
  - SSPOT – Soil Sample Planning Optimizer Tool or other tool https://sspot.scinet.usda.gov/

216 Participants select desired indicator analysis:

- Basic Soil Health Testing
- Basic Soil Health Testing, plus one or more Single Indicator Testing
- Minimal Suite of Soil Health Indicators
- Minimal Suite of Soil Health Indicators, plus one or more Single Indicator Testing
- Single Indicator Testing

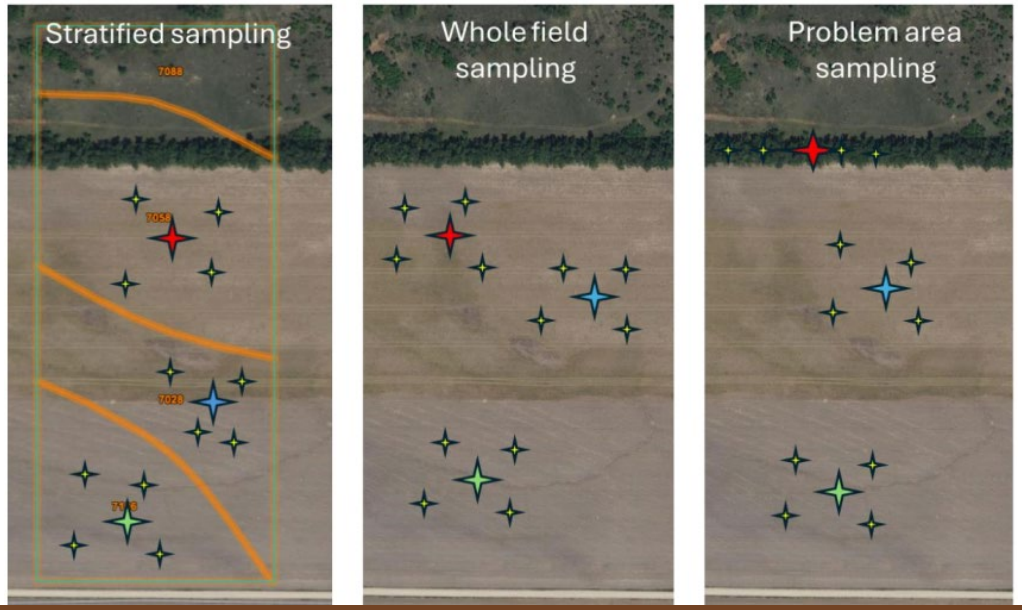
- **216 participants select the desired testing package:**
  - **Soil Health Testing**
  - **Advanced Soil Health Testing**

Sampling Strategies

- Use one or combination of the following
  - Stratified
  - Whole Field
  - Problem

Equipment

- Maintain equipment keeping it clean and free of residue.
- Remove vegetation or debris from the soil surface sampling area



Sample Collection

- During current crop year or,
- Same timeframe from subsequent sampling procedure
- Avoid temperature and moisture extremes
- Avoid sampling when there have been recent:
  - Physical disturbances
  - Soil amendments
  - Chemical inputs

Sampling Conditions

- Avoid collecting or combining samples from:
  - Wheel tracks, drive lanes, field borders, depressions, odd areas
  - Areas with historically lower or higher productivity
  - Different landscape positions
  - Fields with different crops and management
  - Row vs. inter-row
  - Eroded vs. non-eroded
  - Saturated soil

Monitoring Practice Effects

- When sampling multiple years, remain consistent with the following:
  - Georeferenced locations
  - Same sampling strategy
  - Sampling collection under similar conditions
  - Sampling collection at same time of year
  - Utilize same lab, lab test and methods

Follow all regulations proposed by USDA-APHIS covering soils that maybe:

- Prohibited
- Regulated
- Quarantined

Requirements for all soil health testing

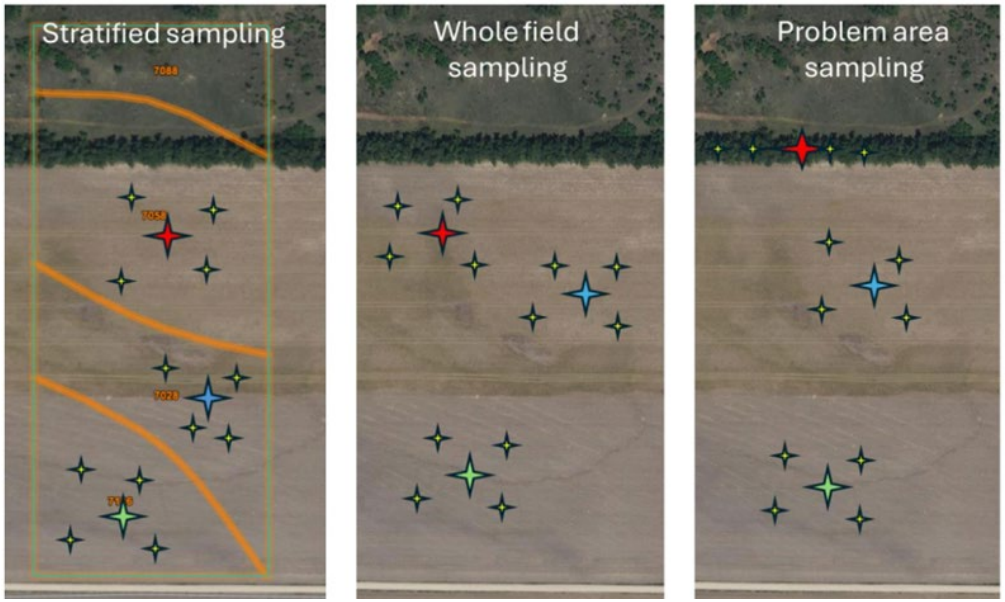
Laboratory certifications must remain current with one of the following:

- The Performance Assessment Program (PAP) from The North American Proficiency Testing Program (NAPT) under the auspices of the Soil Science Society of America,
- The American National Standards Institute (ANSI) National Accreditation Board (ANAB),
- The International Organization for Standardization (ISO/IEC 17043:2010) for ISO 10694:1995,
- State-approved certification program that considers laboratory performance and proficiency to assure accuracy of soil test results.

Now we will look specifically at CEMA 216 implementation:

Complete where resource concerns have been identified through appropriate assessments for the specific landuse

- Within the PLU, identify **3** main locations
  - Keep samples from each of the **3** locations separate to allow for comparisons in each management area



Sampling tools and collection

- Utilize a tile spade, sharp-shooter or straight shovel
- Dig 8-inch hole and remove 2-inch vertical slice from one side
- Vertical slice preserves soil structure and aggregates
- Note: If probe is used, probe should be 1-inch or larger inside diameter – What are the negative impacts?

At each main location collect one sample and **4** additional from locations 20-50 feet from main location (**5** subsamples per main location

- Create a composite sample from all **5** subsamples by:
  - Gently breaking large clods
  - Remove stones, roots and debris
  - Mix soil thoroughly

Soil Health Sample Collection

Steps to take before going to field

- Contact soil testing lab to confirm:
  - Necessary indicators and methods are available
  - Soil temp and moisture
  - Storage
  - Shipping times for specific indicators
- Prior to shipping, store samples in cooler or refrigerator if not sent directly after sampling. Note: special care for biological indicators.

** Call the lab, websites are frequently not updated

CEMA 216 Practice Scenarios-Updated

1. Soil Health Testing.
2. Advanced Soil Health Testing

Scenario 1

- Soil Health Testing
  - The soil health test includes 7 of the following indicators:

1) Soil Texture
2) Soil pH
3) Soil Aggregation – Wet macro-aggregated stability
4) Carbon Cycling – Soil Organic C (SOC)
5) Microbial Activity – Soil Respiration
6) Carbon Food Source for Microorganisms – Labile Carbon
7) Food Source for Organisms – Bioavailable Nitrogen

Scenario 2

- Advanced Soil Health Testing
  - The advanced soil health test includes 8 of the following indicators:
    1) Soil Texture
    2) Soil pH
    3) Soil Aggregation – Wet macro-aggregated stability
    4) Carbon Cycling – Soil Organic C (SOC)
    5) Microbial Activity – Soil Respiration
    6) Carbon Food Source for Microorganisms – Labile Carbon
    7) Food Source for Organisms – Bioavailable Nitrogen
    8) **Microbial & Functional Diversity**

Table 1. Each soil process should be measured to evaluate overall soil health. Choose a method to measure the soil indicator from each column to complete a Soil Health Test.

Soil Process and Indicator	Soil Aggregation – Wet Aggregate Stability	Carbon Cycling – Soil Organic C (SOC)	Microbial Activity – Soil Respiration	Carbon Food Source for Microorganisms – Labile Carbon	Food Source for Organisms – Bioavailable Nitrogen
Reason for Measurement	Measure of the physical soil environment. Related to water infiltration, carbon and nutrient storage, biological activity, and reduced erosion	Related to soil structure, fertility, and provides microbes with food	Measure of how active the microbes are in the soil	Carbon food that is easily taken up by microbes	Related to protein that is readily available to microbes
Preferred Method	Wet sieving (NRCS Soil Survey Staff, 2022)	Dry combustion (NRCS Soil Survey Staff, 2022)	24-hour incubation/burst (Zibilske, 1994)	Permanganate Oxidizable Carbon (POXC) (NRCS Soil Survey Staff, 2022)	Autoclaved citrate extractable (ACE) protein content (Hurriso et al., 2018)
Alternate Method	Cornell Sprinkle infiltrometer (Ogden et al., 1997)	SOC calculated from Soil Organic Matter measured by Loss on Ignition (NRCS Soil Survey Staff, 2022)	96-hour incubation (Zibilske, 1994)	Water extractable organic carbon (WEOC) (Haney et al., 2018)	Water extractable organic nitrogen (WEON) (Haney et al., 2018)

Table 2. Soil characteristics are used to interpret soil health indicators. Choose a method to measure the soil characteristic from each column.

Soil Characteristic	Soil Texture	Soil pH
Preferred Method	KSSL Particle Size Distribution Analysis by pipette (NRCS Soil Survey Staff, 2022)	1:1 water (NRCS Soil Survey Staff, 2022)
Alternate Method	Hydrometer Method (Gee and Bauder, 1986)	0.01M $CaCl_2$ (NRCS Soil Survey Staff, 2022)

Table 3. If additional soil biological information is desired, choose a method to measure microbial/functional diversity.

Soil Indicator	Microbial Diversity/Functional Diversity
Preferred Method	Phospholipid Fatty Acid (PLFA) (Buyer and Sasser, 2012)
Alternative Method	Choice of three of the following enzymes: β-Glucosidase (Carbon Cycling) N-acetyl-β-D-glucosaminidase (Carbon and Nitrogen Cycling) Protease (Nitrogen Cycling) Acid and/or Alkaline Phosphatase (Phosphorus Cycling) Arylsulfatase (Sulfur Cycling)

Deliverables

- The QI must provide documentation showing that all tasks indicated in the following sections have been completed:
  - General Requirements
  - Technical Requirements

Product Report

- This report should be given to the participant and contain the following sections:
  - Cover page
  - Notes and correspondence
  - Maps
  - Testing results

Cover Page – must include the following

1) CEMA name and number
2) Participant info
3) Qualified Individual (QI) info
4) QI statement – QI explaining how they meet QI requirements
5) QI statement – QI documents that product meets NRCS standards and specification
6) Participants signature of acceptance
7) NRCS reviewer signature

Notes and Correspondence

1) Documentation of site visits, people in attendance, activities and results from site visit
2) Copies of QI and participant decision making conversations
3) Copies of observations, data, or test results prepared during completion of the CEMA

Maps

1) Maps should be provided to include the following:

- General location to indicate sampling area
- Include geographic coordinates or land survey coordinates
- Road names to access site
- Soil sampling map should include polygon data and GPS (WGS84 Lat and Long)
- Other maps as needed

2) All maps developed for the CEMA will include:

- Map title
- Clients name
- QI name
- Date prepared
- Map scale
- North arrow
- Appropriate symbols and legend

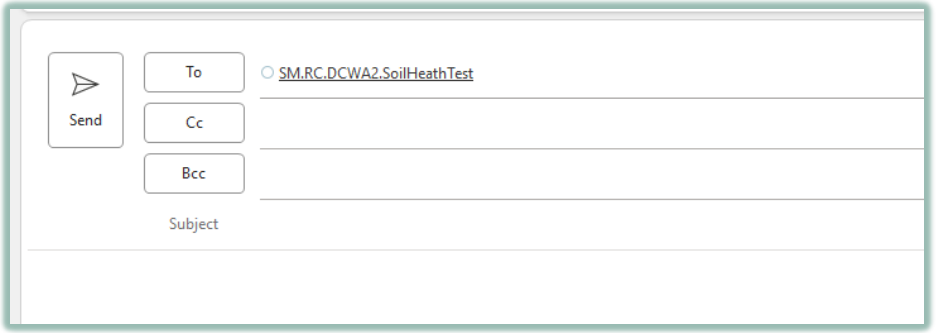
Testing Results

- At a minimum, QI should prepare a report with the following information:
  - Described sampling strategy
  - Soil sample identification codes
  - Laboratory test results
  - Schedule for additional testing or monitoring

Deliver Completed Work

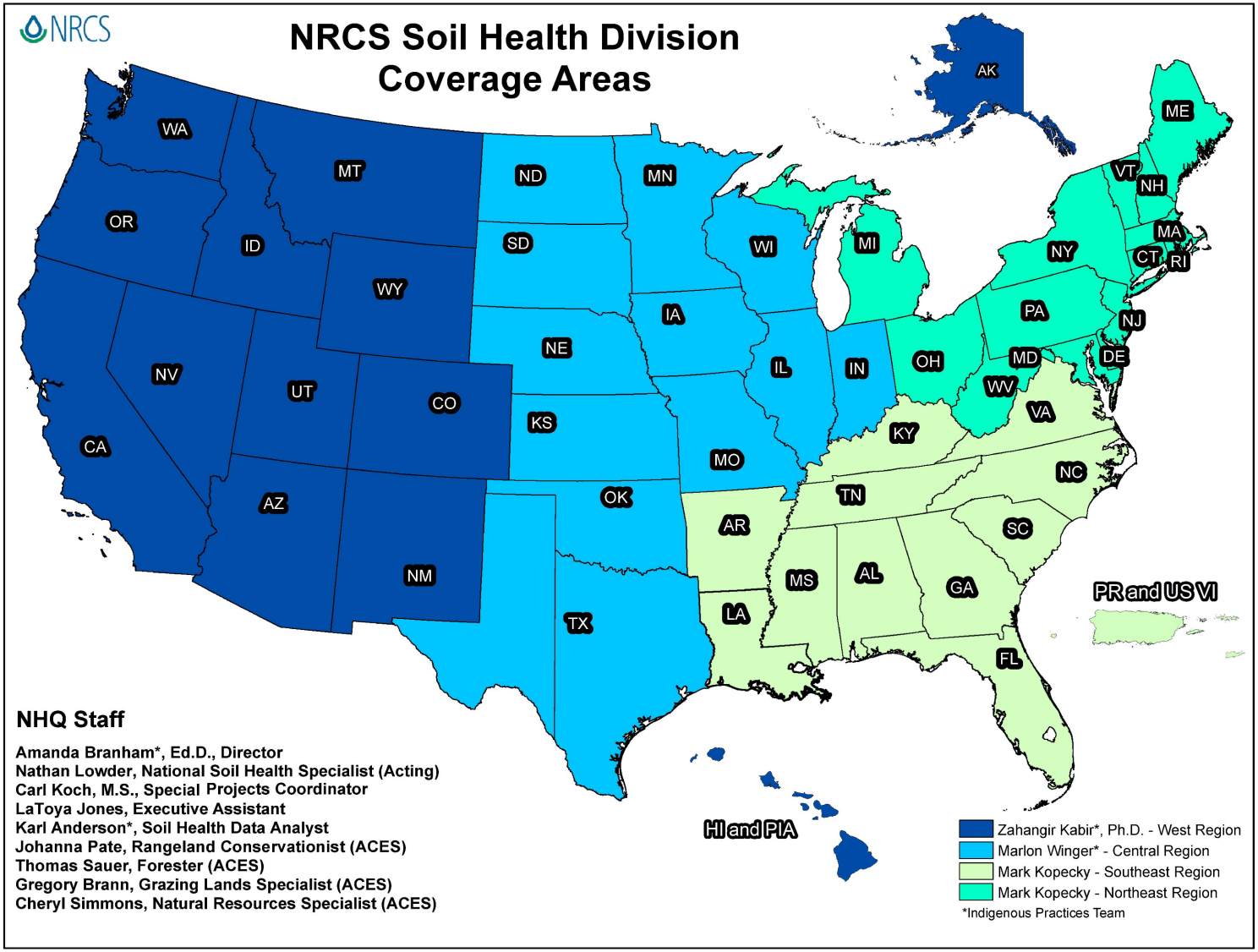
- The QI must prepare two sets of completed report
- One set is for the CEMA participant
- One set is for NRCS
- The QI may transmit directly to NRCS if CEMA participant has authorized it

- After lab results are supplied, participants may submit raw data and sampling location(s) coordinates to SoilHealthTest@usda.gov
- Raw data will be used to improve and strengthen the Soil Health Assessment Protocol and Evaluation (SHAPE) process, procedures, and results to help producers interpret results of tests for their operations
- Appropriate waivers to release participant information may be used to grant permission for the QI or NRCS field office to submit the test results



For more information

- Nathan Lowder, National Soil Health Specialist (Acting)
  - Nathan.Lowder@usda.gov
  - (202) 480-4895
- Amanda Branham, Director, Soil Health Division
  - Amanda.Branham@usda.gov
  - (202) 821-5823


NRCS
NRCS Soil Health Division
Coverage Areas
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
LA
WI
IL
MS
MI
IN
AL
OH
KY
TN
GA
WV
VA
NC
SC
FL
PA
NY
MD
DE
NJ
CT
RI
MA
VT
NH
ME
AK
HI and PIA
PR and US VI
NHQ Staff
Amanda Branham*, Ed.D., Director
Nathan Lowder, National Soil Health Specialist (Acting)
Carl Koch, M.S., Special Projects Coordinator
LaToya Jones, Executive Assistant
Karl Anderson*, Soil Health Data Analyst
Johanna Pate, Rangeland Conservationist (ACES)
Thomas Sauer, Forester (ACES)
Gregory Brann, Grazing Lands Specialist (ACES)
Cheryl Simmons, Natural Resources Specialist (ACES)
Zahangir Kabir*, Ph.D. - West Region
Marlon Winger* - Central Region
Mark Kopecky - Southeast Region
Mark Kopecky - Northeast Region
*Indigenous Practices Team

Thank you!

For more information on Managing Soil Health, visit us here:

https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health