



United States Department of Agriculture

# **USDA-NRCS Programs and Interpretation of Haney Soil Health Test Results**

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# Nutrient and Pest Management Standards Upcoming Changes

- New Conservation Practice Standards for both.
- Update all supplemental guidance
- New CNMP policy and template
- New Nutrient Management Software
- Updating website
- Training Field Staff and Technical Service Providers (TSP)

# Integrated Pest Management (595)

- Name changed from Pest Management to Integrated Pest Management
- Align with PAMS—Prevention, Avoidance, Monitoring, and Suppression activities
- New purposes to prevent and mitigate
- WIN-PST (Windows Pesticide Screening Tool) will need to be run to determine the producer's mitigation points.

# Nutrient Management (590)

- Definite changes but Minnesota is currently doing quite a few
  - Certified Labs for soil and manure
  - Nitrogen Loss Assessment
  - Phosphorus Loss Assessment/P-Index
  - Low, Medium, and High phosphorus risk assessment

# Nutrient Management (590)

- Emerging Strategies or Technologies
  - Adaptive Nutrient Management
  - Organic Crop Production
  - Cover Crops
  - Precision Agriculture
  - Enhanced-efficiency fertilizer products
  - Feed Management



# Nutrient Management (590)

- 4Rs concept
  - Right Amount
  - Right Source
  - Right Placement
  - Right Timing
- Frozen/Snow Covered/Saturated Soils



# Environmental Qualities Incentives Program (EQIP)

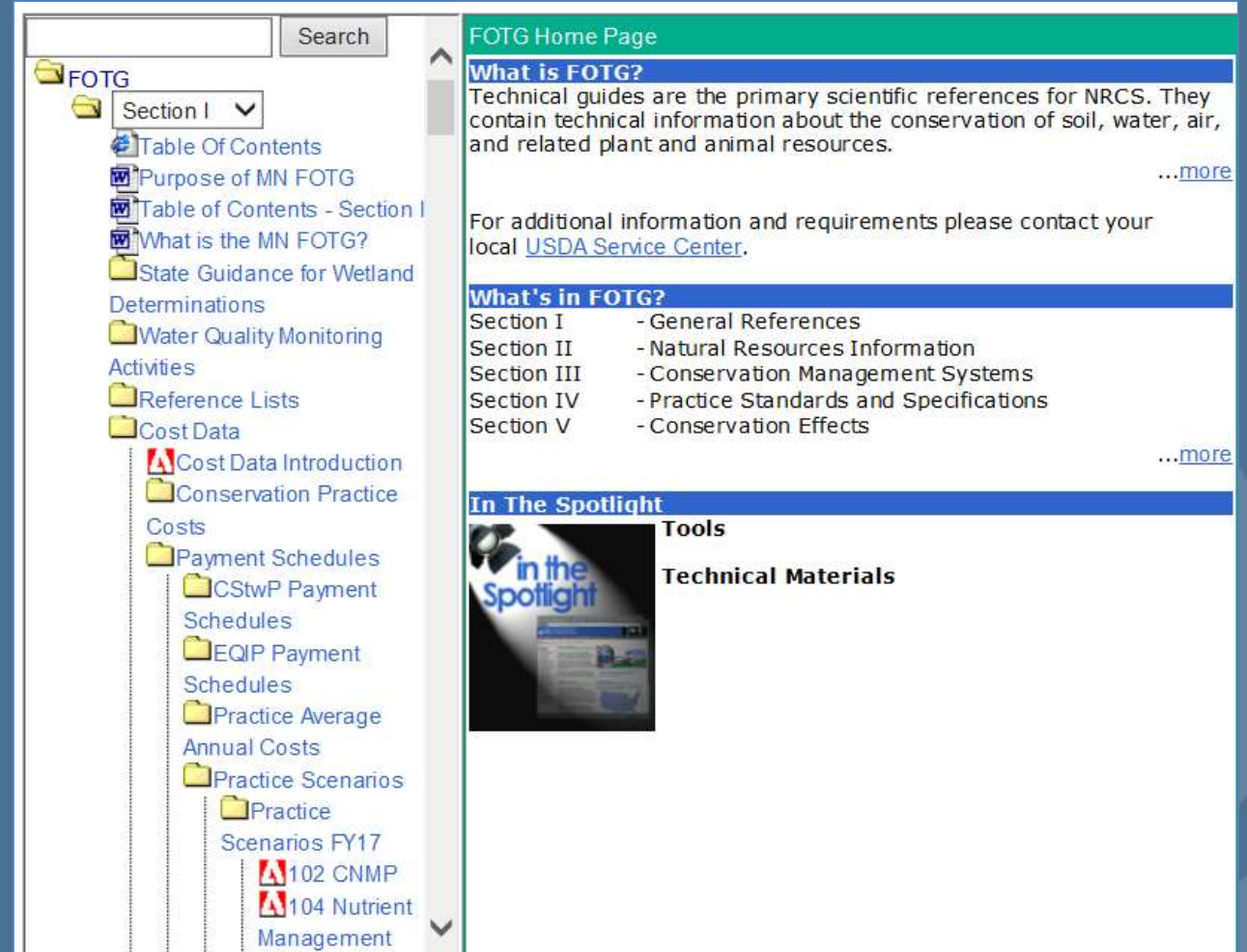
EQIP is a voluntary conservation program. It supports production agriculture and environmental quality as compatible goals. Through EQIP, farmers may receive **financial** and **technical** help to install conservation practices on agricultural land to solve a resource concern.

[https://www.nrcs.usda.gov/wps/portal/nrcs/detail/mn/programs/financial/eqip/?cid=nrcs142p2\\_023506](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/mn/programs/financial/eqip/?cid=nrcs142p2_023506)

# Payment Scenarios

## Location: FOTG Section 1

- Cost Data
  - Payment Schedules
  - Practice Scenarios
    - Practice Scenarios FY17





# Payment Scenarios

- Scenario Description
- Before Situation
- After Situation
- Scenario Unit
- Typical Size
- Typical Cost
- Components and Qty.

USDA - Natural Resources Conservation Service

Minnesota

Practice: E32713622 - Establish Monarch butterfly habitat

Scenario #1 - Establish monarch butterfly habitat

Scenario Description:

Seed or plug milkweed (*Asclepias* spp.), the Monarch butterfly larval hostplant, and high-value monarch butterfly nectar plants in non-cropped areas such as field borders, contour buffer strips, and associated grasslands.

Before Situation:

Resources are protected at the minimum level of the Conservation Practice Standard (CPS) 327 - Conservation Cover

After Situation:

The adoption of this enhancement will provide resource protection above the minimum level as described in Conservation Practice Standard (CPS) 327 - Conservation Cover

Feature Measure: Acre

Scenario Unit: Acre

Scenario Typical Size: 1.0

Scenario Total Cost: \$2,367.41

Scenario Cost/Unit: \$2,367.41

Cost Details:

Component Name	ID	Description	Unit	Cost	QTY	Total
Equipment Installation						
Mower, Bush Hog	940	Equipment and power unit costs. Labor not included.	Hour	\$51.70	1	\$51.70
Chemical, spot treatment, single stem application	964	Ground applied chemical to individual plants or group of plants, e.g., backpack sprayer treatment. Equipment and labor cost included.	Hour	\$64.64	2	\$129.28
Cultipacking	1100	Includes equipment, power unit and labor costs.	Acre	\$7.67	1	\$7.67
Labor						
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$41.90	2	\$83.80
Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$95.60	1	\$95.60
Materials						
Highly Specialized native grass and forb mix	2618	A mix of native grass and forbs to be used for restoration of Monarch butterfly foraging and larva development habitat. Includes material and shipping only.	Acre	\$1,999.36	1	\$1,999.36

# Conservation Stewardship Program (CSP)

- Encourages producers to address resource concerns in a comprehensive manner by undertaking additional conservation activities and improving, maintaining and managing existing activities.
  - [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mn/programs/financial/?cid=nrcs142p2\\_023501](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/mn/programs/financial/?cid=nrcs142p2_023501)

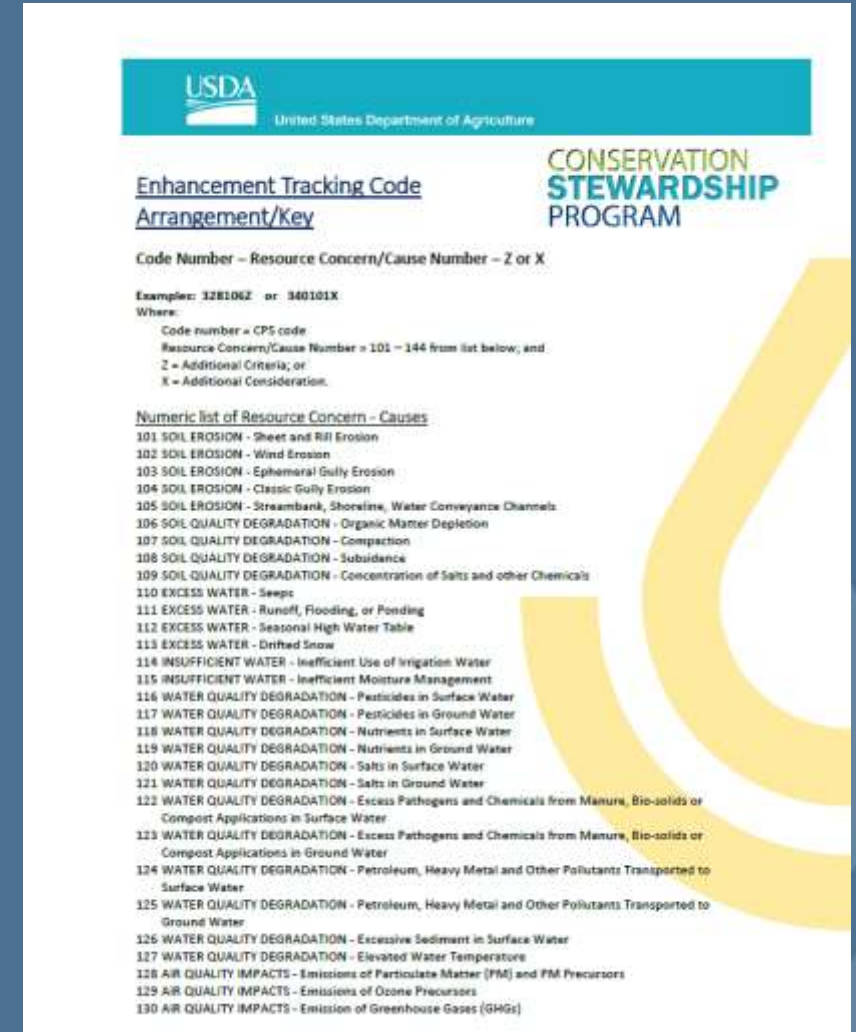
# Conservation activities available for implementation

- There are **131** enhancements available in MN to meet or exceed resource concerns.
- **22** Bundles are available for most operations.
- There are also **60** practices available to address resource concern causes.

# Enhancement code naming convention

E329101Z1

- Enhancement identifier
- CPS code
- Resource concern/cause number
- Alpha digit is one of four options
  - Z=CPS additional criteria
  - X=CPS additional consideration
  - R=Resource conserving crop rotation for a supplemental payment
  - I=Improved resource conserving crop rotation for a supplemental payment
- Sequence number is used when more than one enhancement option is present for the same CPS, resource concern/cause number, and alpha digit



# Conservation activities available for implementation

327 Conservation Cover (4)  
328 Conservation Crop Rotation (18)  
329 Residue and Tillage Management (7)  
340 Cover Crop (10)  
345 Residue and Tillage Management (7)  
374 Farmstead Energy Improvement (2)  
382 Fence (1)  
386 Field Border (7)  
390 Riparian Herbaceous Cover (3)  
391 Riparian Forest Buffer (3)  
393 Filter Strip (3)  
528 Prescribed Grazing (16)

449 Irrigation Water Management (2)  
472 Access Control (2)  
484 Mulching (1)  
511 Forage Harvest management (4)  
512 Forage and Biomass Planting (18)  
554 Drainage Water Management (1)  
578 Stream Crossing (1)  
580 Streambank and Shoreline Protection (1)  
590 Nutrient Management (4)  
595 Integrated Pest Management (3)  
612 Tree Shrub Establishment (10)  
666 Forest Stand Improvement (19)

# Integrated Pest Management (595)

- 3 different enhancements for this Practice Standard
  - E595116X Reduce risk of pesticides in surface water by utilizing precision pesticide application techniques
  - E595116Z Reduce risk of pesticides in surface water by utilizing IPM PAMS techniques
  - E595129Z Reduce ozone precursor emissions related to pesticides by utilizing IPM PAMS techniques
- No requirement for MN supplements
- Integrated Pest Management (IPM) and Prevent, Avoidance, Monitoring, and Suppression (PAMS)



# Nutrient Management (590)

- 4 different enhancements for this Practice Standard
  - E590118X Reduce risks of nutrient losses to surface water by utilizing precision agriculture technologies to plan and apply nutrients
  - E590118Z Improving nutrient uptake efficiency and reducing risk of nutrient losses to surface water
  - E590119Z Improving nutrient uptake efficiency and reducing risk of nutrient losses to groundwater
  - E590130Z Improving nutrient uptake efficiency and reducing risks to air quality-emissions of greenhouse gases (GHGs)
- All enhancements need documentation of a 590 Nutrient Management Plan

# Conservation Crop Rotation 328

- E328106Z2 Modifications to improve soil health and increase soil organic matter
  - Crop rotation shall include a minimum of 4 different crop types. A cover crop is considered a different crop.
  - Cropping system must produce a SCI of 0 or higher and result in a positive trend in the Organic Matter (OM) subfactor value over the life of the rotation.
  - Soil Health assessments taken year 1 (primary) and year 3 (follow-up)
    - No specific soil health assessment type is required or recommended by NRCS, but at a minimum the assessment must account for soil organic matter. The specific assessment selected should provide the grower information based on their soil health objectives.
  - Modifications to the crop rotation and/or crop management will be made as a result of the assessment results
    - Adding a new crop and/or cover crop to the rotation
    - Making changes to planting and/or tillage system,
    - Harvest timing of crops, or Termination of cover crops



# Cover Crop 340

- E340106Z4 Use of Soil Health Assessment to assist with development of cover crop mix to improve soil health and increase soil organic matter.
  - For a list of approved cover crop species, reference the Cover Crop Conservation Practice Standard (340).
  - Do not harvest the cover crop
  - Cover crop must provide soil coverage during ALL non-crop production periods in the annual crop rotation.
  - 2 soil health assessments will be taken. At a minimum the assessment must account for soil organic matter. The specific assessment selected should provide the grower information based on their soil health objectives. The assessments will be taken in year 1 and in year 3. If organic matter hasn't increased in year 3, then additions of a cover crop or other management activities can be completed to have an impact on soil health by the end of the contract.

# Cover Crop 340

- E340106Z4 (continued)
- Minimum of a 4 species cover crop mix that is chosen to increase biomass and maintain or increase soil organic matter. See **Table 2** in the Cover Crop Practice Standard for a list of potential cover crop species (soil builder, lasting residue, etc.).
  - Soil Conditioning Index (SCI) of zero or higher must be achieved and results in a positive trend in the Organic Matter (OM) subfactor value over the life of the rotation.
  - Cover crops may only be grazed in a manner that retains or enhances the purpose of increasing soil organic matter. See also MN Cover Crop Job Sheet Table A for fall and spring grazing recommendations.

**Table 2**  
Identification and Comparison of Performance and Goals for Each Species

SPECIES	NITROGEN- SOURCE	SOIL BUILDER	EROSION FIGHTER	WEED FIGHTER	NITROGEN SCAVENGER	BIOMASS GROWTH	LASTING RESIDUE	GRAIN/SEED O HARVEST	INTERSEED WITH CASH	GRAZING	FORAGE HARVEST
<b>NON-LEGUMES</b>											
SPRING BARLEY	0	0	0	0	0	0	0	0	0	0	0
WINTER BARLEY	0	0	0	0	0	0	0	0	0	0	0
BUCKWHEAT 1/2	0	0	0	0	0	0	0	0	0	0	0
FLAX	0	0	0	0	0	0	0	0	0	0	0
FOXTAIL MILLET	0	0	0	0	0	0	0	0	0	0	0
JAPANESE MILLET	0	0	0	0	0	0	0	0	0	0	0
PEARL MILLET	0	0	0	0	0	0	0	0	0	0	0
PROSO MILLET	0	0	0	0	0	0	0	0	0	0	0
OATS	0	0	0	0	0	0	0	0	0	0	0
WINTER CEREAL RYE	0	0	0	0	0	0	0	0	0	0	0
ANNUAL RYEGRASS	0	0	0	0	0	0	0	0	0	0	0
PERENNIAL RYEGRASS	0	0	0	0	0	0	0	0	0	0	0
CRABGRASS	0	0	0	0	0	0	0	0	0	0	0
WINTER TRITICALE	0	0	0	0	0	0	0	0	0	0	0
SPRING WHEAT	0	0	0	0	0	0	0	0	0	0	0
WINTER WHEAT	0	0	0	0	0	0	0	0	0	0	0
<b>BRASSICAS</b>											
YELLOW MUSTARD	0	0	0	0	0	0	0	0	0	0	0
ADIRAD (BRASSICA 2/2)	0	0	0	0	0	0	0	0	0	0	0
RAPESEED (BRASSICA)	0	0	0	0	0	0	0	0	0	0	0
FORAGE TYPE TURNIP	0	0	0	0	0	0	0	0	0	0	0
<b>LEGUMES</b>											
ALFALFA	4	4	4	4	4	4	4	4	4	4	4
BERSEEM CLOVER	4	4	4	4	4	4	4	4	4	4	4
CRIMSON CLOVER	4	4	4	4	4	4	4	4	4	4	4
RED CLOVER	4	4	4	4	4	4	4	4	4	4	4
WHITE CLOVER	4	4	4	4	4	4	4	4	4	4	4
SOYBEANS	4	4	4	4	4	4	4	4	4	4	4
FIELD/WHITE PEA	4	4	4	4	4	4	4	4	4	4	4
SOYBEANS	4	4	4	4	4	4	4	4	4	4	4
SWING CLOVER	4	4	4	4	4	4	4	4	4	4	4
HAIRY VETCH	4	4	4	4	4	4	4	4	4	4	4
<b>MIXES</b>											

**Table A**  
Recommended Harvest Management Strategies for Cover Crops\*

Primary Objective**	Common Cover Crop Type	Fall Grazing Recommendations	Spring Grazing Recommendations	Mechanical Harvest Recommendations
Mulch for Subsequent Crop	Small grain	2" residual	6" residual***	6" residual***
Break up Compaction Layer	Brassica	No residual	No residual	N/A
Weed Suppression	Small grain	2" residual	8" residual***	N/A
Feed Soil	Cocktail mix	2" residual	No residual	N/A
Reduce Erosion	Small grain	2" residual	2" residual	2" residual
Nitrogen Fixation	Legume	No grazing	No residual	2" residual



# Haney Soil Health Testing



United States Department of Agriculture  
Natural Resources Conservation Service

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**USDA NRCS**

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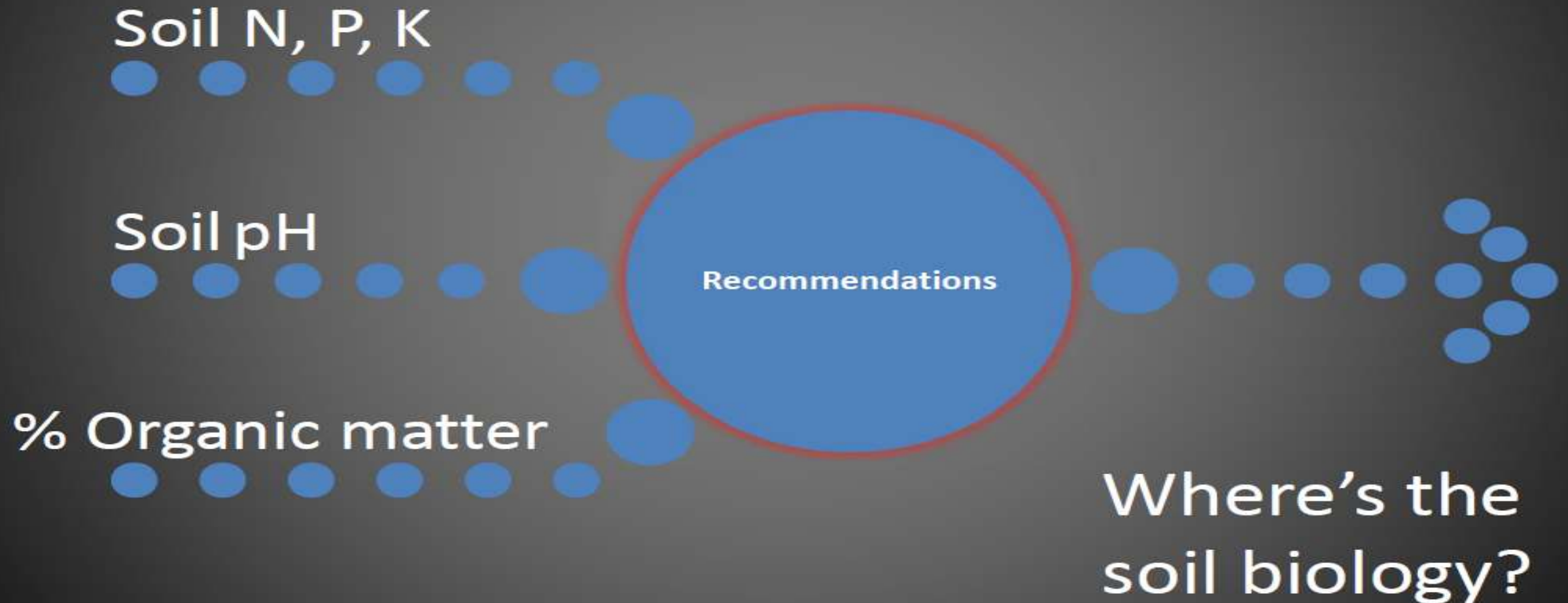


# Soil Health

The ability of the soil to function

- Filtering and buffering
- Physical stability and support
- Cycling nutrients
- Regulating water
- Sustaining plant and animal life

# Traditional Soil Testing Methods

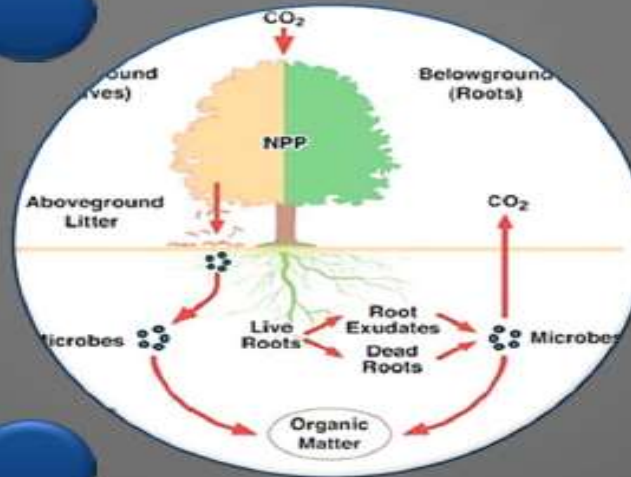




## Soil N, P, K

# Microbial Activity

## C:N balance



# Why Test for Soil Biology?

- Indicator of Soil Functions
  - Nutrient cycling
  - Water regulating
- Measure of impact of management activity
  - Soil is habitat for microbes
- Soil is a living biological ecosystem– Not just the sum of the physical and chemical components

# What the Haney Soil Test Is

An integrated approach to soil testing using chemical and biological soil test data, to mimic nature's approach to soil nutrient availability as best we can in the lab.

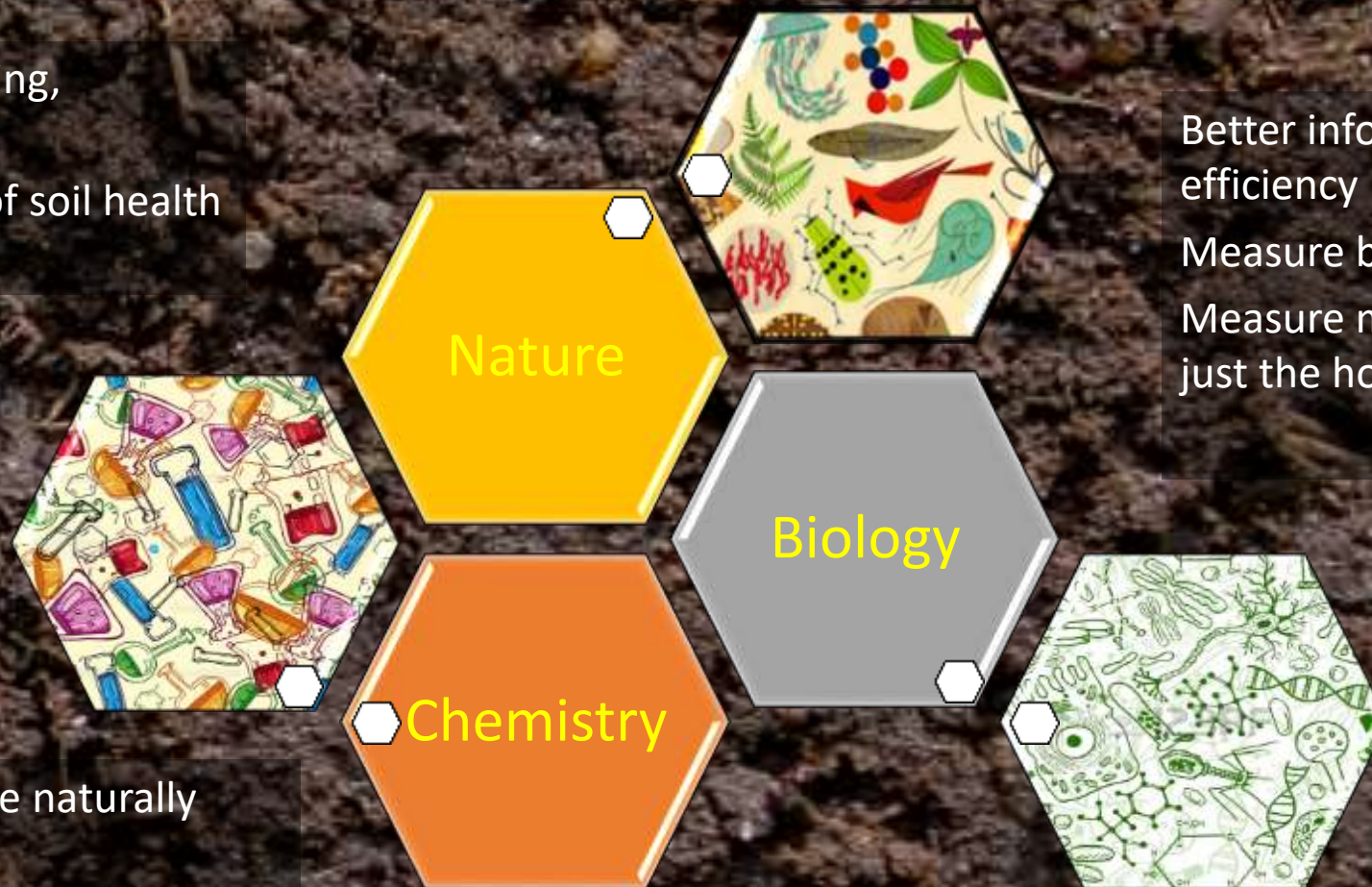
- What is your soil's condition?
- Is your soil in balance?
- What can you do to help your soil?



# What the Haney Test Does

Treat the soil as a living,  
integrated system  
Use new indicators of soil health  
and function

Better information leads to better  
efficiency  
Measure biological activity  
Measure microbial food and not  
just the house



Use soil extracts that are naturally  
occurring

Integrate the data to form a more complete picture of biology  
and chemistry



1:1 Soil pH	5.7	ICAP Aluminum, ppm Al	308
1:1 Soluble Salts, mmho/cm	0.25	ICAP Iron, ppm Fe	266
Excess Lime Rating,	1		
Organic Matter, %LOI	4.8	<b>Calculations</b>	
WDRF Buffer pH	6.3	Organic C:Organic N	11.8
		Nitrogen Mineralization, ppm N	16.3
<b>Solvita CO2 Burst</b>		Organic Nitrogen Release, ppm N	25.2
Solvita CO2-C, ppm C	108	Organic Nitrogen Reserve, ppm N	0
		Phosphorus Mineralization, ppm P	12.4
<b>Water Extract</b>		Organic Phos Reserve, ppm P	10.8
Total Nitrogen, ppm N	44.4	Phos Saturation Al/Fe, %	14.5
Organic Nitrogen, ppm N	25.2	Phosphorus Saturation Ca, %	15.9
Total Organic Carbon, ppm N	297		
		<b>Soil Health</b>	
<b>H3A Extract</b>		Soil Health Calculation	14.7
Nitrate, ppm NO3-N	14.8	Cover Crop Suggestion 40% Legume 60% Grass	
Ammonium, ppm NH4-N	1.6		
Inorganic Nitrogen, ppm N	16.5		
Inorganic (FIA) Phosphorus, ppm P	60		
Total (ICAP) Phosphorus, ppm P	83.2		
Organic Phosphorus, ppm P	23.2		
ICAP Potassium, ppm K	115		
ICAP Calcium, ppm Ca	525		
<b>Nutrient Quantity Available for Next Crop</b>		<b>Nitrogen Savings by Using the Haney Test</b>	
Nitrogen, lbs N/A	83.3	Traditional Evaluation, lbs N/A	29.7
Phosphorus, lbs P2O5/A	166	Haney Test N Evaluation, lab N/A	83.3
Potassium, lbs K2O/A	138	Nitrogen Difference, lbs N/A	53.6
Nutrient Value, \$/A	187.05	N Savings, \$/A	34.31



# pH

- Ideally 6.5 - 7.5
- P and some micronutrients can get tied up outside of the optimal range



# Organic Matter

Soil organic matter is the fraction of the soil that consists of plant or animal tissue in various stages of breakdown (decomposition).



# Organic Matter

## Physical Benefits

Enhances aggregate stability, water infiltration and soil aeration, reducing runoff  
Improves water holding capacity-1% holds 16,500 gallons of plant available water  
Reduces surface crusting

## Chemical Benefits

Increases the soil's ability to hold onto and supply essential nutrients  
Improves the ability of a soil to resist pH change  
Makes soil minerals available for plant uptake  
1% of OM releases 15lbs of N, 1.5 lbs of P, 0.6 lbs of K annually

## Biological Benefits

Provides food for the living organisms in the soil  
Enhances soil microbial biodiversity-suppression of diseases and pests  
Enhances pore space-increasing infiltration and reduce runoff

# Solvita<sup>®</sup> 1-day CO<sub>2</sub>-C:



This number in ppm is the amount of CO<sub>2</sub>-C released in 24 hours from soil microbes after your soil has been dried and rewetted.

Is a measure of the microbial activity in the soil and is highly related to soil fertility. In most cases, the higher the number, the more fertile the soil.

Soil respiration is also dependent on SOM content, temperature, moisture, salinity, pH, and porosity.

Would like to see this number >30





# Solvita<sup>®</sup> 1-day CO<sub>2</sub>-C:

This result can be highly variable depending on conditions when sampling, when and how the sample was collected, and handling prior to testing



# Calculations

Organic C : Organic N

Nitrogen Mineralization ppm

Organic Nitrogen Release ppm

Organic Nitrogen Reserve ppm

Phosphorus Mineralization ppm

Organic Phosphorus Reserve ppm



# Organic C: Organic N

- Ratio of organic C from the water extract to the amount of organic N in the water extract
- Critical component of the nutrient cycle. This number is a very sensitive indicator of soil health and has significant impact on soil microbes
- A soil organic C: N ratio above 20:1 generally indicates that no net N and P mineralization will occur, meaning the N and P are “tied up” within the microbial cell until the ratio drops below 20:1. As the ratio decreases, more N and P are released to the soil solution which can be taken up by growing plants. We like to see this number between 8:1 and 15:1
- The C: N ratio is also used in calculating the Soil Health number and the Solvita CO<sub>2</sub>-C number to estimate potential N and P release and used in the Soil Health Calculation

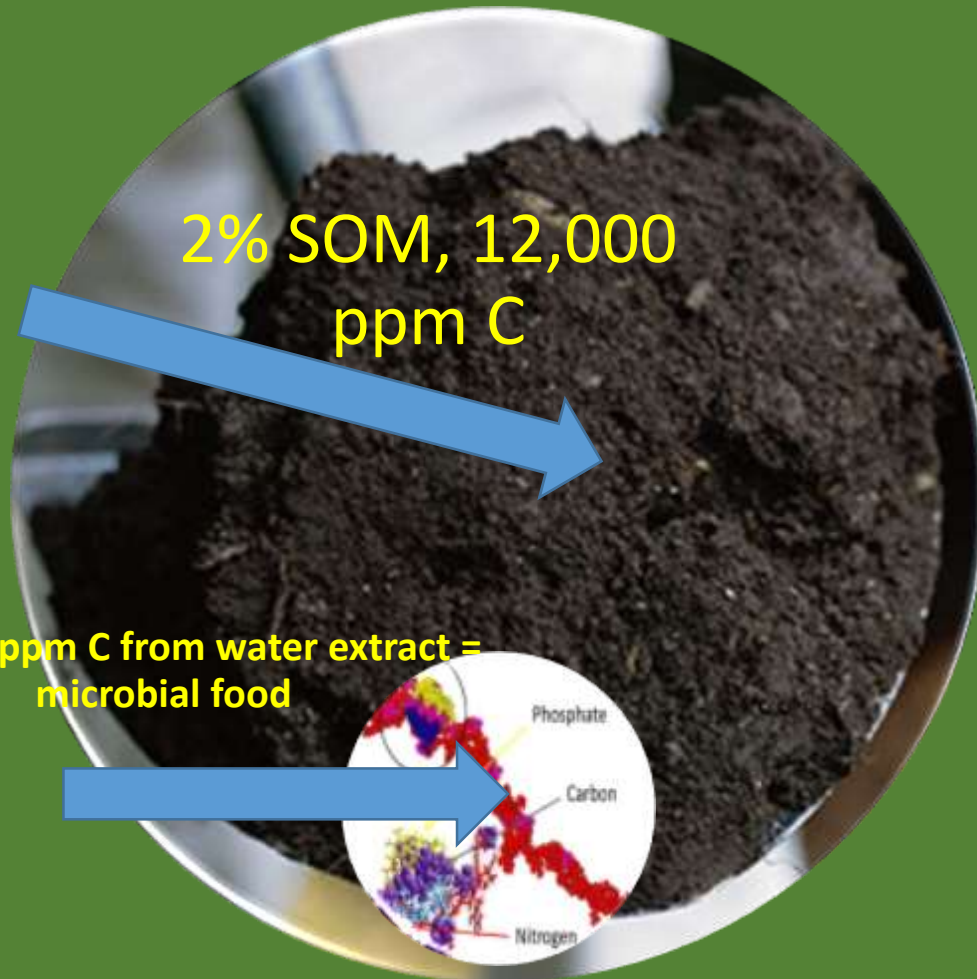
Soil Organic Matter is the “House” microbes live in, Water Extractable Organic Carbon is the “**Food**” they eat.

House

2% SOM, 12,000  
ppm C

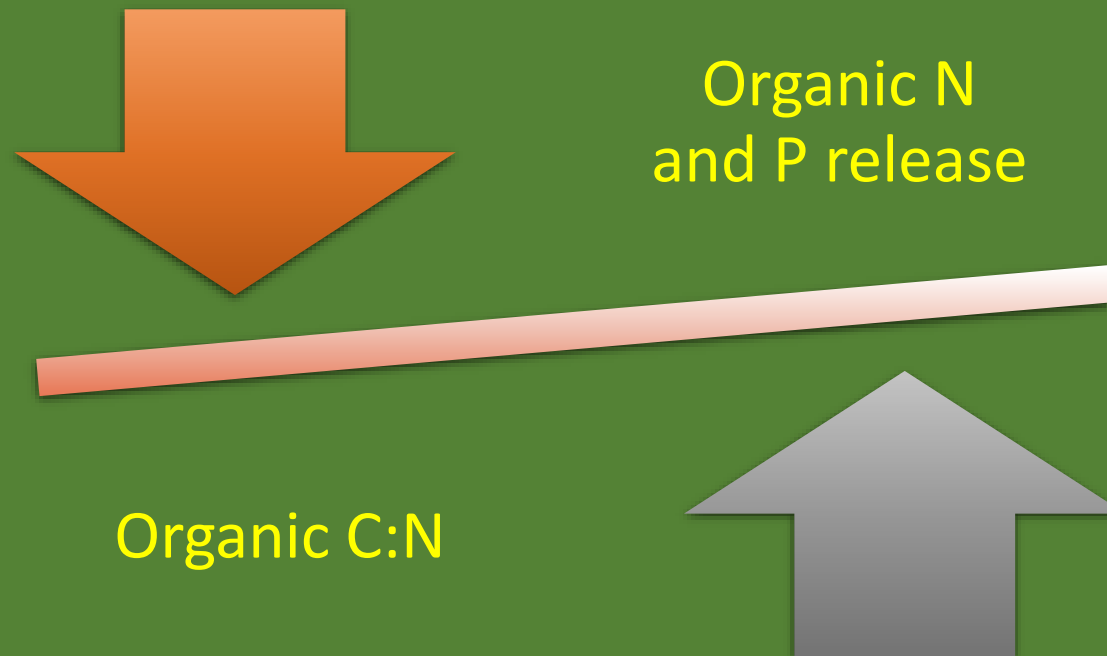
100-300 ppm C from water extract =  
microbial food

Food



# Balance in Your Soil-Water Extract

- $C:N = \text{Organic } C \div \text{Organic } N$
- High C:N >20 :1 calculates no N and P mineralization
- As C:N is lowered N and P mineralization increases but is dependent on soil microbial activity



# Nitrogen Mineralization

Ignore

# Organic Nitrogen Release ppm

This is the portion of the organic N that we credit as plant available based on the microbial activity, WEOC, WEON and the balance of the two (C: N).

$$\text{Solvita burst} / \text{Total Organic C} \times \text{Organic N} \times 4 = X.$$

If  $X \geq \text{Organic N}$ , then all of the Organic N is credited

# Organic Nitrogen Reserve

- This number would be the difference between the Total Organic N minus the Organic Nitrogen Release
- This is the amount of organic N that is not credited as plant available usually due to lower microbial activity relative to the WEOC and WEON pools. If this number is 0 then the entire WEON pool is considered plant available.

# Phosphorus Mineralization

Ignore

# Organic Phosphorus Reserve

The same as described above for nitrogen



# Soil Health

Soil Health Calculation

Cover Crop Suggestions

# Soil Health Calculation

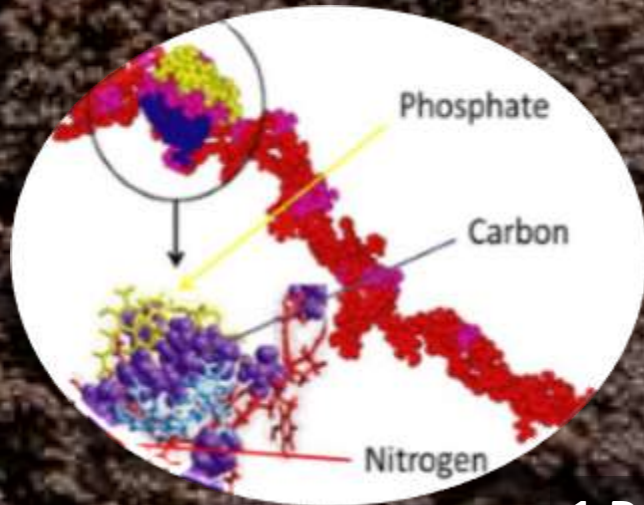
- Represents the overall health of your soil system. It combines 5 independent measurements of your soil's biological properties.
- The calculation looks at the balance of soil C and N and their relationship to microbial activity.
- This soil health calculation number can vary from 0 to more than 50. This number indicates your current soil health. Keeping track of this Soil Health number will allow you to gauge the effects of your management practices over the years to determine if your management practices are improving your soil.





**Water Extraction for C and N**

**Solvita  
1 day CO<sub>2</sub>-C**



**WEOC**

**WEN**

**WEON**

**NH<sub>4</sub>-N + NO<sub>3</sub>-N**

**Soil Health  
Calculation**

$$1\text{-Day CO}_2\text{-C}/10 + \text{WEOC}/100 + \text{WEON}/10 = \text{SHC}$$

# Cover Crop Mix

- This is a suggested cover crop planting mix based on your soil test data. This is a recommendation of what you can do to increase your Soil Health number, but it is not what you have to do.
- It is designed to provide your soil with a multi-species cover crop to help you improve soil health and thus improve the fertility of your soil (designed to improve the Soil Health calculation and the Organic C:N Ratio if necessary).
- Must take other factors into account not limited to crop rotation, herbicides, pests issues, etc.



# Nutrient Quantity Available for Next Crop

Nitrogen lbs/ac

Phosphorus lbs/ac

Potassium lbs/ac

Nutrient Value \$/ac

# Nitrogen lbs/ac

This represents the amount of N present in your soil in lb/ac including:

- Inorganic N (NH<sub>4</sub>-N & NO<sub>3</sub>-N)
- The amount of N that the soil microbes will provide based on soil microbial activity (Solvita<sup>®</sup> 1-day CO<sub>2</sub>-C),
- the organic C: organic N ratio
- N from the organic pools.

These numbers are based on the Haney results

# Phosphorus lbs/ac

These numbers represent the amount of P<sub>2</sub>O<sub>5</sub> present in your soil in lb/ac. The numbers include :

- PO<sub>4</sub>-P from the H<sub>3</sub>A extractant
- The amount of P that the soil microbes will provide based on soil microbial activity (Solvita<sup>®</sup> 1-day CO<sub>2</sub>-C) T
- he organic C: organic N ratio
- P from the organic pools

These numbers are based on the Haney results



# Potassium lbs/ac

These numbers represent the amount of  $K_2O$  present in your soil in lb/ac

These numbers are based on the Haney results





# Nutrient Value \$/ac

Current fertilizer prices are multiplied by the nutrients present in your soil. This is the value in dollars per acre of nutrients currently in your soil.

# Nitrogen Savings by Using the Haney Test

Traditional evaluation (NO<sub>3</sub>-N Only) lbs per acre

Haney Test N Evaluation lbs per acre

Nitrogen Difference lbs per acre

Nitrogen savings per acre

# Traditional evaluation (NO<sub>3</sub> Only) lbs per acre:

This value represents the amount of N in your soil when testing for only nitrate, similar to common soil tests. This number is the same as Nitrate NO<sub>3</sub>-N but converted to lbs/ac

# Haney Test N Evaluation lbs per acre

This is the amount of available nitrogen measured using the Haney Test and is the same as the available N value on the report

# Nitrogen Difference lbs per acre

This number represents the difference in the amount of nitrogen found using the Haney Test compared to the NO<sub>3</sub>-N only approach.

# Nitrogen savings per acre

This value represents the amount of nitrogen saved in dollars per acre when using the Haney Test compared to traditional testing measuring only NO<sub>3</sub>-N



# Using the Haney Test

- Soil health testing provides a snapshot in time of soil characteristics. It is recommended to continue to use standard soil testing in conjunction with soil health testing to avoid over or under fertilizing and causing negative environmental impacts or yield losses
- Most importantly, compare the annual numbers to determine if your management is improving conditions



# Using the Haney Test

There are two major ways to use the information from the Haney Test.

- First, you can use the test just a soil health indicator, meaning that you are still using more traditional tests to evaluate fertilizer needs. This means that a sample can be pulled any time of the year, but we want to be consistent from year to year for making comparisons and tracking changes in soil health.
- Preliminary research suggests that the soil health number increases during the growing season as soil temperatures warm and we have an active plant/soil microbial community. However, this doesn't necessarily mean that sampling has to be done during this time when tracking soil health.



# Using the Haney Test

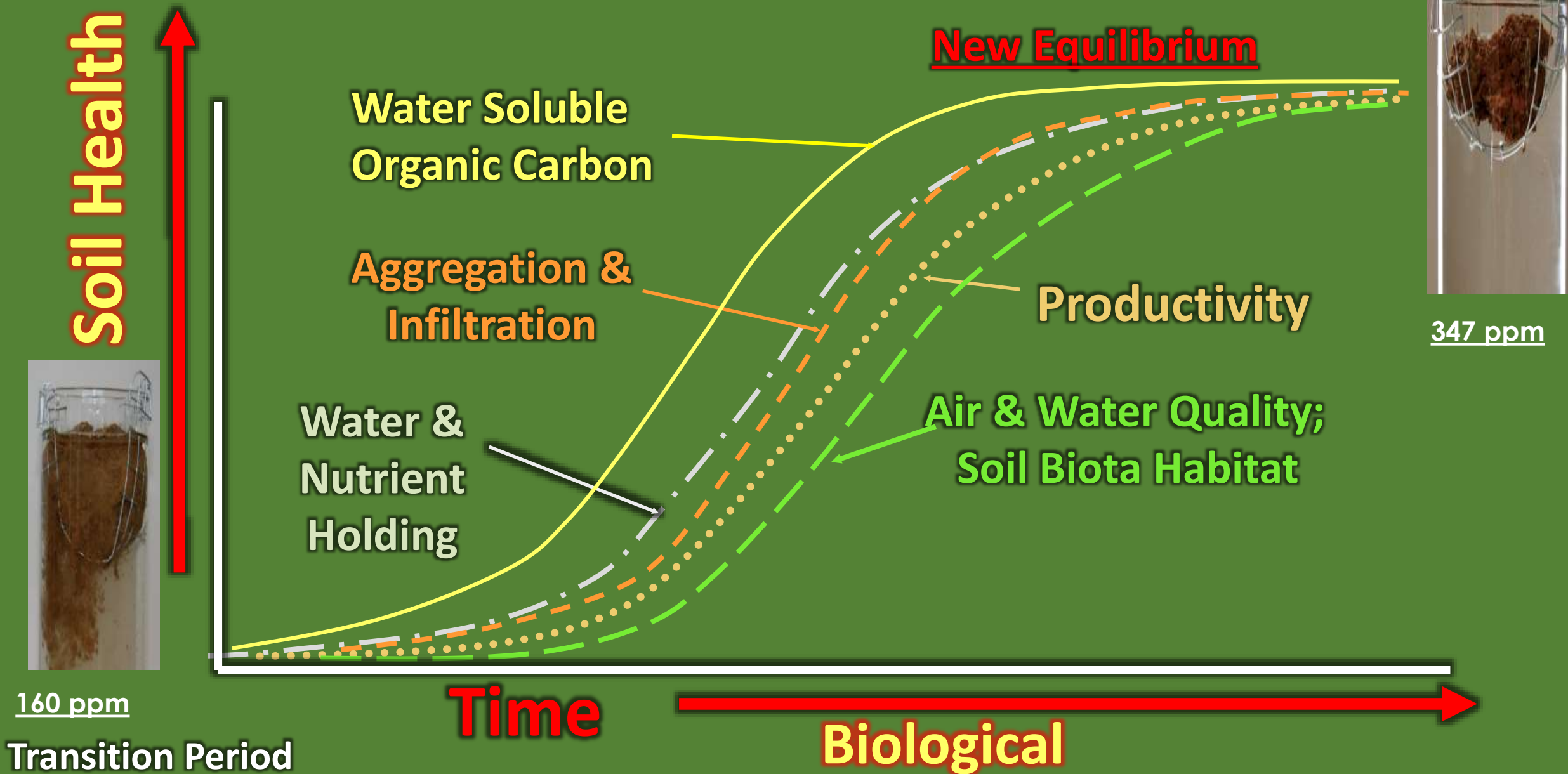
- Second, you can use the Haney test information to help guide a fertility program. If this is the goal, then sample either in the fall or spring depending on when fertilizer will be applied
- If using a fall cover crop after harvest, then wait until next spring prior to planting
- The test can also be pulled prior to side dress to determine N rates
- You can do a combination of soil health tracking and fertility planning, but this means that you would want to pull samples at a time that is going to coincide with your fertilizer program and simply watching the soil health score every year. Doing the opposite and pulling samples during the growing season works well for soil health but not for fertility recs.



# Considerations Using Haney

- Getting reproducible test results using a common set of soil samples
- Requires standardization, cross-lab validation, and lab performance testing
- Big effect of soil moisture content at time of testing
- Relatively low values were obtained with the Haney protocol
- Soil respiration measurements were not always a good predictor of measured N mineralization
- Little or no correlation or calibration research has been done with the procedures and extractants utilized by nonstandard tests in Minnesota

# Benefits of Improving Soil Health



# Other Soil Health Testing

- PLFA (Phospholipid fatty acids)
- Cornell Soil Health Assessment
- Beta-glucosidase test





# Economics

- Focusing on high yields only may cause high input costs in relation to net returns
- Focusing on economics allows balance
- Focusing on tools to use for net returns per ac can help determine what activities will provide the best bang for the buck

# Questions?

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