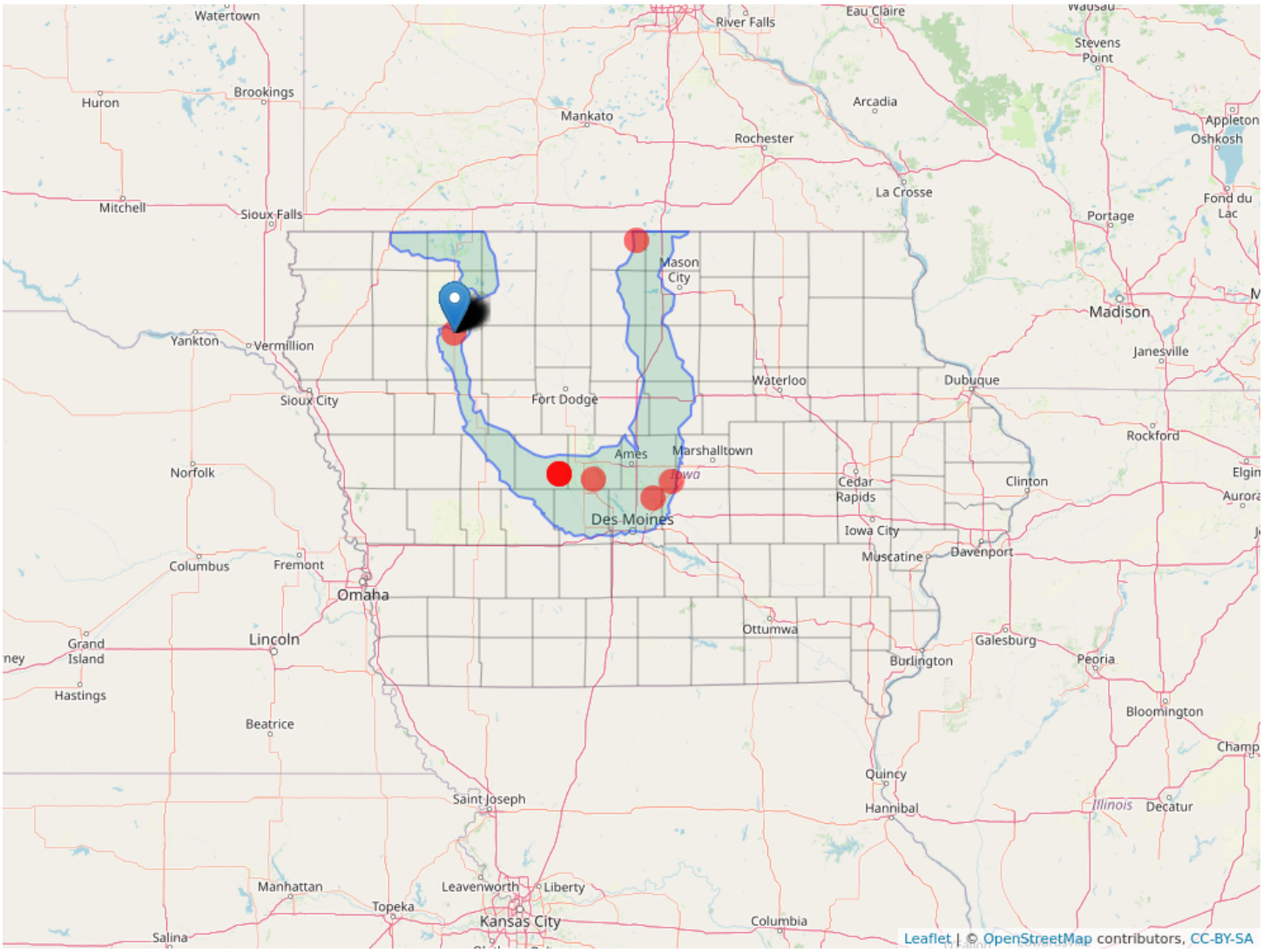
Health Test Data: Haney Report

2023-01-26

Contents

1 Introduction

This report has been generated for your field ST2021IASE007. The map below displays your field (as a Blue Marker) in the context of the other fields comprising the Soil Health Background Database containing fields from your field's Geographic Subregion.



2 Subregion

Based on the geographic information contained within the data, we've identified your Geographic Subregion as Bemis Till Plain. Below is a description of this subregion:

Bemis Till Plain – This is the oldest part of the Des Moines Lobe with the most irregular topography. It surrounds the Algona and Altamont till plains and extends further to the south. It is partially crossed by streams and rivers and has variable texture soils often chalky with calcium carbonate and layered with loam to silt loam or sandy loam, a heterogenous mixture of clay, sand, gravel, and boulders. The ground is predominantly moraine which is material left behind by a moving glacier. Upland hilltops are usually loam, while the upland depressions or channels are typically clay loam in soil texture.

Although poorly drained soils and potholes also dot the landscape in this subregion of the Des Moines Lobe, the concentration of poorly drained soils in this region is the lowest of the Des Moines lobe subregions. This region has slightly higher slopes and less extensive flat areas than the northern Algona and Altamont till plains subregions, but good organic matter and complimentary topography make this region good for growing crops.

Although not quite as flat as other areas of the Des Moines Lobe, with a 2% median slope gradient, there are relatively few significantly convex, concave or straight downhill areas as illustrated by the distribution of hillslope positions in the subregion: Summit (typically flat): (18%) Shoulder (typically convex): (13%) Backslope (Backslopes have the greatest potential for erosion with water speed able to increase on any straight part of the down slope): (20%) Footslope (typically concave): (16%)

Toeslope (typically flat): (33%)

Dominant Soil Series: Clarion (29%), Nicollet (13%), Webster (13%), Canisteo (11%)

The Clarion soil series consists of very deep, moderately well drained soils on uplands. These soils formed in glacial till and are on higher landscape positions on convex slopes and have a frequently saturated zone between depths of 4 to 6 feet during March to June in normal years during the wettest periods of years when precipitation is within one standard deviation of 30 year mean annual precipitation. Slopes range from 1 to 9 percent. Mean air annual temperature is about 48 degrees F.

The Nicollet soil series consists of very deep, somewhat poorly drained soils that formed in calcium carbonate rich (more than 15%) chalky/limestone, loamy glacial till on till plains and moraines that crumble easily. They are in higher landscape positions on flat and rises. Nicollet soils are on till plains, ground and terminal moraines left by the retreating glacier. In an undrained condition, a frequently saturated zone occurs at the surface to a depth of a foot during the wettest periods of years when precipitation is within one standard deviation of 30 year mean annual precipitation. Slopes range from 0 to 5 percent.

The Webster soil series consists of very deep, poorly drained, moderately permeable chalky soils formed in glacial till or local alluvium derived from till on uplands. A saturated zone occurs within depths of 0 to 6 inches during the wettest period in normal years in natural conditions. Slopes range from 0 to 3 percent.

The Canisteo soil series consists of very deep, poorly and very poorly drained soils that formed in calcium carbonate rich, loamy till or in a thin mantle of loamy or silty sediments and the underlying chalky, loamy till. a frequently saturated zone occurs at the surface to a depth of 1 foot during the wettest periods of years when precipitation is within one standard deviation of 30 year mean annual precipitation. These soils are on rims of depressions, depressions and flats on material left behind by a moving glacier or till plains. Slopes range from 0 to 2 percent.

Dominant Land Uses: Row Crop (75%), Urban (10%), Grassland/Pasture (9%) Vegetation: Most areas are artificially drained and cultivated. The principal crops are corn, soybeans, small grains, and legume hay. Reed canarygrass commonly dominates partially drained pasture. Native Vegetation is predominantly wet-site tall prairie species such as prairie cordgrass, switchgrass, big bluestem, little bluestem wooly sedge, giant goldenrod and Canada goldenrod. The native Vegetation on very poorly drained ponded phases is herbaceous marsh species tolerant of excessive wetness such as, cattails, bulrushes, giant burreed, giant reed grass and hydrophytic sedges.

3 SHAPE Test

The Soil Health Assessment Protocol and Evaluation (SHAPE) tool finds soil organic carbon (SOC) to be a key proxy measurement of soil health because it can detect changes in soil biological and chemical functions related to agricultural productivity and ecosystem health. Understanding soil health from this perspective can help to ensure sustainable land management. Fortunately, SOC can be extrapolated from soil organic matter, which is a common measurement in standard soil testing, and is able to be analyzed for this SHAPE metric through the portal.

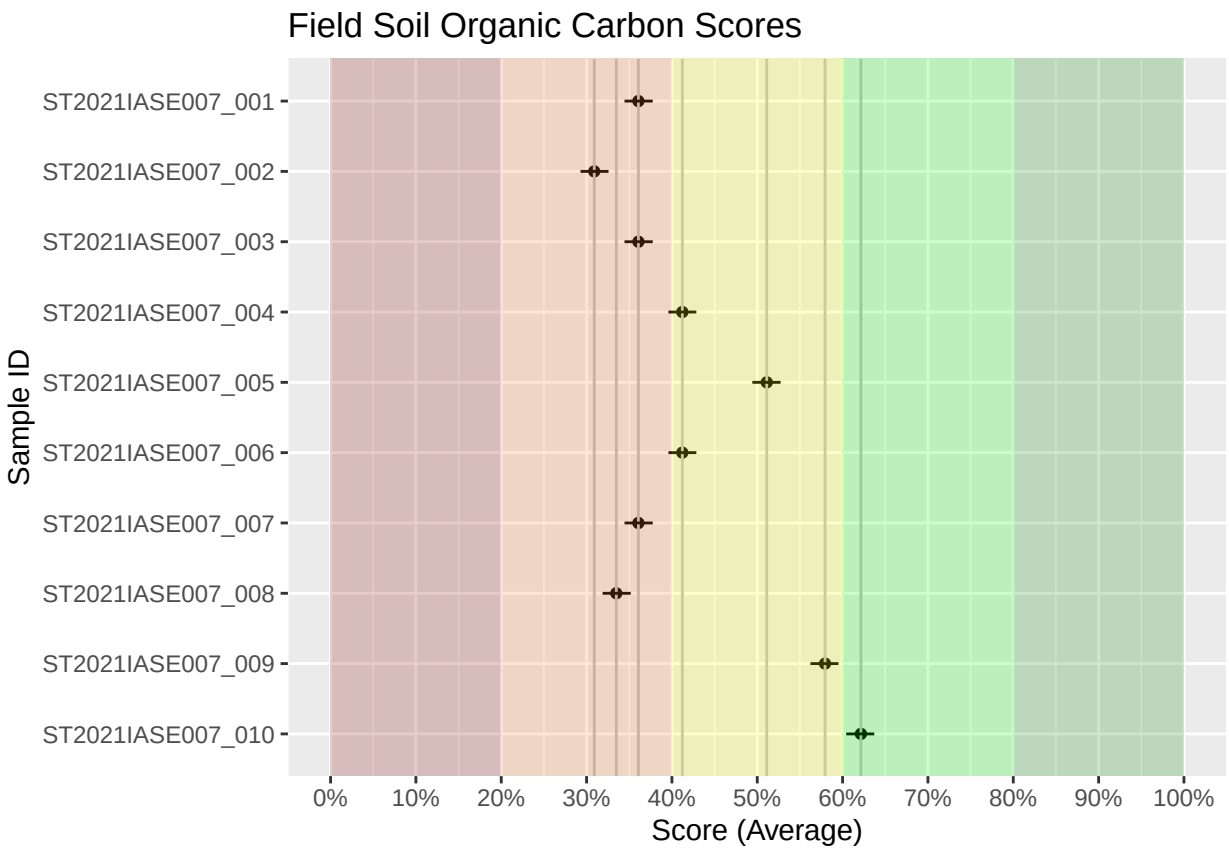
Scored values represent the percent of this soil's capacity to produce organic carbon that is being achieved based on this location and 30-year weather history, rather than compared to soils in any other location.

For more information about the SHAPE Test, please click here.

3.1 Your Results

Table 1: Full SHAPE SOC Results for your field.

Point	Field_ID	MATC	MAPmm	SOC	Score_2.5%	Score_Mean	Score_97.5%
1	ST2021IASE007_001	8.146882	814.6871	2.093023	0.3444307	0.3607151	0.3775338
2	ST2021IASE007_002	8.146882	814.6871	1.976744	0.2928999	0.3089808	0.3256985
3	ST2021IASE007_003	8.146882	814.6871	2.093023	0.3444307	0.3607151	0.3775338
4	ST2021IASE007_004	8.146882	814.6871	2.209302	0.3959236	0.4122055	0.4286580
5	ST2021IASE007_005	8.146882	814.6871	2.441861	0.4942360	0.5111173	0.5273647
6	ST2021IASE007_006	8.146882	814.6871	2.209302	0.3959236	0.4122055	0.4286580
7	ST2021IASE007_007	8.146882	814.6871	2.093023	0.3444307	0.3607151	0.3775338
8	ST2021IASE007_008	8.146882	814.6871	2.034884	0.3187289	0.3348166	0.3517393
9	ST2021IASE007_009	8.146882	814.6871	2.616279	0.5622344	0.5794144	0.5951918
10	ST2021IASE007_010	8.146882	814.6871	2.732558	0.6042355	0.6214515	0.6371050



4 Health Test Results

Your processed soil health test results are shown below.

Table 2: Full Health Test Data Results for your field.

ID	CO2C_Burst	MAC%	Organic C	Organic CN	Organic N	SH_Calc	SoilOM	SOC
1	83.69	117.12	71.46	8.90	8.03	10.60	3.6	2.093023
2	99.24	122.87	80.77	8.87	9.11	12.45	3.4	1.976744
3	45.31	33.79	134.08	10.67	12.56	8.47	3.6	2.093023
4	93.07	92.69	100.40	9.56	10.50	12.36	3.8	2.209302
5	81.01	55.22	146.71	10.75	13.65	12.40	4.2	2.441861
6	101.42	126.17	80.39	9.02	8.91	10.95	3.8	2.209302
7	50.04	39.73	125.96	11.30	11.15	8.64	3.6	2.093023
8	105.51	103.30	102.15	10.07	10.14	11.85	3.5	2.034884
9	71.03	28.72	247.37	13.87	17.83	13.83	4.5	2.616279
10	211.14	230.78	91.49	9.86	9.28	17.84	4.7	2.732558

5 Sample Point Analysis

The results below are given for each sample point in your field, across a number of metrics.

5.1 Soil Respiration

Soil Respiration: This test measures the amount of Co2-C a soil can produce over a 24-hour incubation period following drying and rewetting. The more CO2, the more microbial biomass. Above 70 has good potential for microbial activity and some N credit. Above 100 means reduced N fertilizer is possible, but carbon inputs may be required to sustain this level. Above 200 has high potential for N mineralization, and N fertilizer reductions can be substantial.

Table 3: Soil Respiration results for your field

Point ID	Score	Rank	Implications	Management Needs
ST2021IASE007_1	83.69	Above Average	Good potential for microbial activity; moderate N credit may be given depending on size of organic N pool; can typically reduce N application rates	High biological activity breaks down organic residue and cycles nutrients making them available for crop growth. Moderate use of N fertilizer; continue best practices.
ST2021IASE007_2	99.24	Above Average	Good potential for microbial activity; moderate N credit may be given depending on size of organic N pool; can typically reduce N application rates	High biological activity breaks down organic residue and cycles nutrients making them available for crop growth. Moderate use of N fertilizer; continue best practices.
ST2021IASE007_3	45.31	Slightly Below Average	Low to moderate potential for microbial activity; some N credit may be given	Reduce tillage to minimize compaction, grow cover crops, leave residue
ST2021IASE007_4	93.07	Above Average	Good potential for microbial activity; moderate N credit may be given depending on size of organic N pool; can typically reduce N application rates	High biological activity breaks down organic residue and cycles nutrients making them available for crop growth. Moderate use of N fertilizer; continue best practices.
ST2021IASE007_5	81.01	Above Average	Good potential for microbial activity; moderate N credit may be given depending on size of organic N pool; can typically reduce N application rates	High biological activity breaks down organic residue and cycles nutrients making them available for crop growth. Moderate use of N fertilizer; continue best practices.
ST2021IASE007_6	101.42	High	High potential for microbial activity; more carbon inputs may be needed to sustain microbial biomass; moderate to high N credit from available organic N pools may be given; N fertilizer reduction can be substantial	High biological activity breaks down organic residue and cycles nutrients making them available for crop growth. Moderate use of N fertilizer; continue best practices.
ST2021IASE007_7	50.04	Slightly Below Average	Low to moderate potential for microbial activity; some N credit may be given	Reduce tillage to minimize compaction, grow cover crops, leave residue
ST2021IASE007_8	105.51	High	High potential for microbial activity; more carbon inputs may be needed to sustain microbial biomass; moderate to high N credit from available organic N pools may be given; N fertilizer reduction can be substantial	High biological activity breaks down organic residue and cycles nutrients making them available for crop growth. Moderate use of N fertilizer; continue best practices.
ST2021IASE007_9	71.03	Above Average	Good potential for microbial activity; moderate N credit may be given depending on size of organic N pool; can typically reduce N application rates	High biological activity breaks down organic residue and cycles nutrients making them available for crop growth. Moderate use of N fertilizer; continue best practices.
ST2021IASE007_10	211.14	Very High	High to very high potential for microbial activity; residue decomposition may be <1 year; keeping the soil covered could be a problem in some systems; high potential for N mineralization and N credits from available organic N pools may be given; N fertilizer reduction can be substantial.	High biological activity breaks down organic residue and cycles nutrients, however, too high could indicate an unstable system and loss of soil organic matter due to excessive tillage or other factors degrading soil health. Reduce N fertilizer.

5.2 C to N Ratio

Organic C to Organic N Ratio. High WEOC but low WEON means lots of energy but low nutrition for microbes. Low WEOC and High WEON has lots of N available but little energy to help microbes carry out important soil functions. A good balance is required. Ideal is a ratio between 10:1 to 12:1.

Table 4: C to N Ratio results for your field

Point ID	Score	Rank	Implications	Management Needs
ST2021IASE007_1	15	Marginal	Some N tie up means slower mineralization and lower N credit from WEON	Increase legumes in rotation or cover crops and reduce high carbon inputs. Grazing can also help reduce carbon
ST2021IASE007_2	15	Marginal	Some N tie up means slower mineralization and lower N credit from WEON	Increase legumes in rotation or cover crops and reduce high carbon inputs. Grazing can also help reduce carbon
ST2021IASE007_3	13	Good	Less N tied up means greater potential for N mineralization and higher credit from WEON	Make slight adjustments if near the ratio limits to close in on ideal ratio.
ST2021IASE007_3	13	Good	Less N tied up means greater potential for N mineralization and higher credit from WEON	Make slight adjustments if near the ratio limits to close in on ideal ratio.
ST2021IASE007_4	15	Marginal	Some N tie up means slower mineralization and lower N credit from WEON	Increase legumes in rotation or cover crops and reduce high carbon inputs. Grazing can also help reduce carbon
ST2021IASE007_5	13	Good	Less N tied up means greater potential for N mineralization and higher credit from WEON	Make slight adjustments if near the ratio limits to close in on ideal ratio.
ST2021IASE007_5	13	Good	Less N tied up means greater potential for N mineralization and higher credit from WEON	Make slight adjustments if near the ratio limits to close in on ideal ratio.
ST2021IASE007_6	15	Marginal	Some N tie up means slower mineralization and lower N credit from WEON	Increase legumes in rotation or cover crops and reduce high carbon inputs. Grazing can also help reduce carbon
ST2021IASE007_7	13	Good	Less N tied up means greater potential for N mineralization and higher credit from WEON	Make slight adjustments if near the ratio limits to close in on ideal ratio.
ST2021IASE007_7	13	Good	Less N tied up means greater potential for N mineralization and higher credit from WEON	Make slight adjustments if near the ratio limits to close in on ideal ratio.
ST2021IASE007_8	13	Good	Less N tied up means greater potential for N mineralization and higher credit from WEON	Make slight adjustments if near the ratio limits to close in on ideal ratio.
ST2021IASE007_8	13	Good	Less N tied up means greater potential for N mineralization and higher credit from WEON	Make slight adjustments if near the ratio limits to close in on ideal ratio.
ST2021IASE007_9	10	Ideal	Greatest potential for N mineralization from WEON pool with a good balance of available energy and N for microbes	Increase intensity to drive both WEOC and EWON up together to help increase biological processes
ST2021IASE007_10	15	Marginal	Some N tie up means slower mineralization and lower N credit from WEON	Increase legumes in rotation or cover crops and reduce high carbon inputs. Grazing can also help reduce carbon

5.3 Microbially Active Carbon

Microbially Active Carbon (%MAC). A value below 25% means WEOC is not too low and therefore poor fertility, cold soils or drought could be inhibiting soil respiration. Above 80% indicates that WEOC could be too low and thus limiting microbial respiration. %MAC between 50-75% is optimal for most systems, meaning the soil has balanced fertility and WEOC for microbial biomass support.

Table 5: Microbially Active Carbon results for your field

Point ID	Score	Rank	Management Needs
ST2021IASE007_1	0.51	**Optimal**	Soil has balanced fertility and energy for microbial biomass support.
ST2021IASE007_2	0.53	**Optimal**	Soil has balanced fertility and energy for microbial biomass support.
ST2021IASE007_3	0.15	**Respiration Limiting**	Water Extractable Organic Carbon is probably not the factor limiting microbial respiration. Drought, prolonged cold temperatures or overall poor soil fertility may be tbe cause.
ST2021IASE007_3	0.15	**Respiration Limiting**	Water Extractable Organic Carbon is probably not the factor limiting microbial respiration. Drought, prolonged cold temperatures or overall poor soil fertility may be tbe cause.
ST2021IASE007_4	0.40	**Marginal**	Other factors could contribute to less than optimal microbial respiration, such as soil fertility, drought or cold temperatures.
ST2021IASE007_5	0.24	**Respiration Limiting**	Water Extractable Organic Carbon is probably not the factor limiting microbial respiration. Drought, prolonged cold temperatures or overall poor soil fertility may be tbe cause.
ST2021IASE007_5	0.24	**Respiration Limiting**	Water Extractable Organic Carbon is probably not the factor limiting microbial respiration. Drought, prolonged cold temperatures or overall poor soil fertility may be tbe cause.
ST2021IASE007_6	0.55	**Optimal**	Soil has balanced fertility and energy for microbial biomass support.
ST2021IASE007_7	0.17	**Respiration Limiting**	Water Extractable Organic Carbon is probably not the factor limiting microbial respiration. Drought, prolonged cold temperatures or overall poor soil fertility may be tbe cause.
ST2021IASE007_7	0.17	**Respiration Limiting**	Water Extractable Organic Carbon is probably not the factor limiting microbial respiration. Drought, prolonged cold temperatures or overall poor soil fertility may be tbe cause.
ST2021IASE007_8	0.45	**Marginal**	Other factors could contribute to less than optimal microbial respiration, such as soil fertility, drought or cold temperatures.
ST2021IASE007_9	0.12	**Respiration Limiting**	Water Extractable Organic Carbon is probably not the factor limiting microbial respiration. Drought, prolonged cold temperatures or overall poor soil fertility may be tbe cause.
ST2021IASE007_9	0.12	**Respiration Limiting**	Water Extractable Organic Carbon is probably not the factor limiting microbial respiration. Drought, prolonged cold temperatures or overall poor soil fertility may be tbe cause.
ST2021IASE007_10	1.00	**Respiration Limiting**	Water Extractable Organic Carbon could be too low and thus limiting microbial respiration.
ST2021IASE007_10	1.00	**Respiration Limiting**	Water Extractable Organic Carbon could be too low and thus limiting microbial respiration.

5.4 Water Extractable Organic Carbon

Water Extractable Organic Carbon (WEOC). The range is generally 50-800 ppm, generally 100-300 ppm average. Manure and Compost can raise levels. Also, levels fluctuate throughout the year, higher in late winter, early spring, dipping as microbial activity picks up. In the growing season, plant roots leak more carbon into the system until it reaches equilibrium. At crop maturity in late summer and early fall there is a carbon influx as root systems breakdown, so sample date is important here.

Table 6: Water Extractable Organic Carbon results for your field

Point ID	Score	Rank	Management Needs
ST2021IASE007_1	71.46	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_2	80.77	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_3	134.08	**Below Average**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_4	100.40	**Below Average**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_5	146.71	**Below Average**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_6	80.39	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_7	125.96	**Below Average**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_8	102.15	**Below Average**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_9	247.37	**Below Average**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_10	91.49	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.

5.5 Water Extractable Organic Nitrogen

Water Extractable Organic Carbon (WEOC). The range is generally 50-800 ppm, generally 100-300 ppm average. Manure and Compost can raise levels. Also, levels fluctuate throughout the year, higher in late winter, early spring, dipping as microbial activity picks up. In the growing season, plant roots leak more carbon into the system until it reaches equilibrium. At crop maturity in late summer and early fall there is a carbon influx as root systems breakdown, so sample date is important here.

Table 7: Water Extractable Organic Nitrogen results.

Point ID	Score	Rank	Management Needs
ST2021IASE007_1	8.03	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_2	9.11	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_3	12.56	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_4	10.50	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_5	13.65	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_6	8.91	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_7	11.15	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_8	10.14	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_9	17.83	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.
ST2021IASE007_10	9.28	**Low**	Add manure or compost, leave crop residue, reduce legumes in cover crop mix.