Temiskaming Crops Coalition/Cochrane District Soil & Crop Improvement Association

Rapid Development of Farmland from Boreal Forest and an Evaluation Relative to Traditional Clearing Methods 2016 Interim Report





Funding for this project was provided through a Tier Two grant supported by the Ontario Ministry of Agriculture, Food and Rural Affairs and the Ontario Soil and Crop Improvement Association.







This project would not have been possible without the support and commitment from project partners:



GB Equipment, located in Sainte-Brigitte-des-Saults, Quebec, provided both rounds of land preparation (surface mulching & subsoiling) as an in-kind contribution. Further information on GB Equipment and their services can be found at <u>www.gbequipment.ca</u>

Carl Dodds & Will Runnalls: the producer cooperators have donated acres for the duration of the project and have donated their time and equipment for various activities, including timbering, planting, harvesting, etc.

OMAFRA: Dan Tassé, Tom Hamilton, Barry Potter

Project Steering Committee

Introduction

This three year project has two main objectives: (1) to assess and mitigate the soil impacts and crop growth potential resulting from a mulching/subsoiling process and (2) develop a business case that will evaluate mulching and other methods of traditional land clearing. Based on outcomes from this project, mulching and its role in agriculture will be better understood and producers will have sound information necessary to make informed decisions regarding their land management practices.

Project Background

Northern Ontario contains a vast amount of Class 2, 3 and 4 land which is not currently in production (4+ million acres). Some of this land was farmed in the past, but has lain idle for a number of years and has grown in up in scrub bush. Other blocks have had mature trees harvested and are now covered in successional scrub and trees, while other areas contain mature tree stands.

In order to convert these areas into productive farmland, the tree stems and large branches have to be physically removed, burned or mechanically processed in place. Stumps and roots may be excavated or raked out and removed from the site, piled and burned, left in the ground to rot or mechanically processed on site.

The use of large industrial shredder/grinders to process standing stems, slash, and root beds is increasing in the North. Information on the long term effectiveness, cost efficiency, and suitability for agricultural purposes of these machines is lacking. Some of this cleared land has seen successful crop growth afterwards and some has not – this could be attributed to a number of factors including method of mulching, tree composition, volume of woody material incorporated, etc. It is anticipated that this study will provide initial information related to these variables and how they could potentially impact future crop growth.

Project Progress

In 2015, the project sites were selected, baseline soil sampling and a forest inventory was completed and all land preparation, including mulching, subsoiling and installing tile drainage, was completed.

In 2016, both sites were planted with a combination of clover, oats and buckwheat, underwent spring and fall soil sampling, plant tissue analysis and a plant count.

In 2017, both sites are expected to be planted with a cash crop to further asses yield potential. It is anticipated that a section of each site will be left with 2015's crop to assess the implications of incorporating additional crop residue into the soil.

Project Sites

Cochrane

The Cochrane site was planted on June 18, 2016 with a combination of oats & red clover (see Figure 1). Oats were seeded at 80 pounds/acre, red clover was seeded at 10 pounds/acre and 150 pounds of 8-32-16 was broadcast and lightly disked and 150 pounds of 11-52-0 were added to the site with a drill.

Approximately 5 mulched acres were seeded into red clover, 5.5 mulched acres were seeded into oats and red clover and 2 conventional acres were seeded into oats and clover. The oats were cut on October 10, 2016 and baled on October 11, 2016 with approximately 1,100 pounds/bale.



Figure 1: Aerial photos of the Cochrane site, picture on left taken on July 20, 2016 (approximately one month after planting) and picture on right taken August 17, 2016

Temiskaming

The Temiskaming site was planted on June 16, 2016 with a combination of oats, buckwheat and red clover (see Figure 2). Oats/buckwheat were seeded at 90 pounds/acre, red clover was seeded at 10 pounds/acre and 100 pounds of 0-0-60 and 180 pounds of 11-52-0 were broadcast and lightly disked into the soil. Growing conditions after seeding were quite dry.

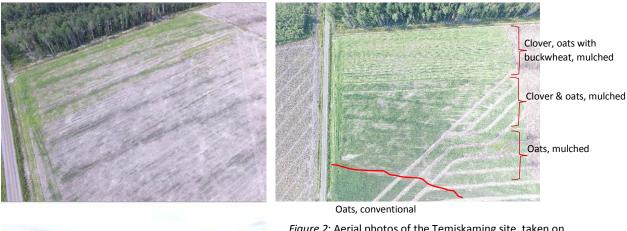




Figure 2: Aerial photos of the Temiskaming site, taken on (from clockwise) July 19, 2016, August 19, 2016 and October 27, 2016

Results

Based upon the 2016 soil sampling, tissue analysis and plant count, the soil impacts and crop potential of mulched land and traditionally cleared land was assessed. The preliminary results indicate that within the first year of the land being cleared, mulching has little impact on soil fertility within the parameters that were assessed (see Figure 5 & 6, Appendix 1). However, there was an impact on yield potential as the conventionally cleared land had higher plant counts and higher average and maximum plant heights, as seen in Figure 3 & Figure 4. Aerial photos in Figure 1 & Figure 2 also indicate a difference in crop growth between the conventional and mulched areas. Field data was subjected to a one-way ANOVA test, which found that there is a statistically significant relationship between plant growth and land preparation such that plant maximum height and plant average height are higher for conventionally cleared land.



Figure 3: Plant count & plant height in Cochrane, conventional compared to mulched

Oat yield in Cochrane - 3,520 pounds/acre on conventionally cleared land vs. 2,750 pounds/acre on mulched land

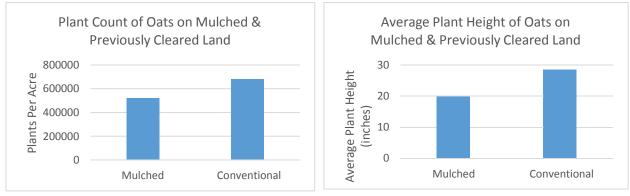


Figure 4: Plant count & plant height in Temiskaming, conventional compared to mulched

A secondary objective of the project was to assess the impacts of an oat cover crop and an oat/buckwheat cover crop. The Cochrane site had less bare ground with a cover crop (48%) than with no cover crop (52%) with 42% less weeds with a cover crop compared to no cover crop. The Temiskaming site had progressively less bare ground with the inclusion of additional crops – 61% bare ground with oats, 53% bare ground with oats/clover and 38% bare ground with oats, clover and buckwheat. The one-way ANOVA test found this relationship was statistically significant.

Figure 5 Temiskaming Soil Sampling: June 26, 2015 (in brackets); May 20, 2016 (composite), October 28, 2016

	$\boldsymbol{\mathcal{C}}$	T4S-16		T3S-16		T2S-16		T1S-16			
		OM: 8.4%		OM: 6.6%		OM: 6.5%		OM: 6.9%			
2016 Spring Sampling	J	Phos: 5 ppm		Phos: 5 ppm		Phos: 5 ppm		Phos: 5 ppm			
Event		K: 63 ppm	K: 60 ppm			K: 64 ppm		K: 65 ppm			
		pH:7.5		pH:7.5		pH:7.8		pH:7.7			
		C:N Ratio—11.2		C:N Ratio—10.2		C:N Ratio—10.9	C:N Ratio—9.8				
†	T10	OM: 10.7 %(8.9)	т9	OM: 8.8% (8.4)	Т4	OM: 7.2% (8.6)	Т3	OM: 6.8% (7.4)			
l		Phos: 7 ppm (??)		Phos: 8 ppm (5)		Phos: 5 ppm (5)		Phos: 5 ppm (5)			
N		K: 56 ppm (49)		K: 57 ppm (38)		K: 52 ppm (44)		K: 60 ppm (44)			
Spring sampling was based		pH: 7.7 (7.1)		pH: 7.5 (7.0)		pH: 7.8 (7.2)		pH: 7.6 (7.7)			
on composite grid sampling (ie. Grids outlined		C:N Ratio-11.0		C:N Ratio– 8.3		C:N Ratio—8.4		C:R Ratio—9.4			
in orange correspond to	T11	OM: 7.9 %(6.6)	т8	OM: 8.0% (5.0)	T5	OM: 6.7%(5.8)	T2	OM: 7.9% (7.1)			
the sample information in orange)		Phos: 7 ppm (6)		Phos: 5 ppm (4)		Phos: 5 ppm (5)	Í	Phos: 5 ppm (4)			
Fall sampling will be		K: 43 ppm (43)		K: 56 ppm (29)		K: 49 ppm (28)		K: 43 ppm (42)			
completed using the one		pH: 75 (7.2)		pH: 7.5 (7.0)		рН: 7.5 (7.4)		рН: 7.5 (7.6)			
acre grid pattern established in 2015		C:N Ratio—8.9		C:N Ratio—7.3		C:N Ratio—10.1		C:N Ratio—11.3			
	Ť12	OM: 6.8% (8.1)	т7	OM: 4.9% (6.1)	Т6	OM: 5.8 % (6.8)	T1	OM: 6.8% (6.2)			
		Phos: 7 ppm (6)		Phos: 5 ppm (4)		Phos: 4 ppm (4)		Phos: 5 ppm (5)			
		K: 60 ppm (49)		K: 55 ppm (38)		K: 51 ppm (31)		K: 58 ppm (54)			
		pH: 7.8 (7.4)		pH: 7.5 (7.2)		рН: 7.9 (7.6)		pH: 7.8 (7.8)			
		C:N Ratio- 7.6		C:N Ratio- 8.3		C:N Ratio—8.6		C:N Ratio—9.7			

Highway 69 Tile drainage runs

C6	OM: 7.6% (7.1)	C5 OM: 6.2% (5.9)	C4 OM: 6.0% (5.9)	↑	
	Phos 13 ppm (5)	Phos 21 ppm (3)	Phos 6 ppm (5		Traditionally cleared section
	K: 125 ppm (83)	K: 120 ppm (96)	K: 104 ppm (85) N	CC (Fall 2016)
	pH: 6.6 (6.5)	pH: 6.7 (6.8)	pH: 6.8 (7.0		OM: 7.6%
	C:N Ratio—9.0	C:N Ratio-8.2	C:N Ratio– 9.9	C3S-16	Phos: 9 ppm K: 69 ppm
C7	OM:8.0%(5.8)	C8 OM:4.6% (5.8)	C9 OM:6.1% (5.5)	OM: 6.8%	pH:7.2
	Phos 10 ppm (3)	Phos 19 ppm (2)	Phos 10 ppm (2)	Phos: 4 ppm K: 121 ppm	C:N Ratio—9.9
	K: 113 ppm (90)	K: 102 ppm (97)	K: 107 ppm (90)		C4S-16 (Spring 2016)
	pH: 6.7 (6.7)	pH: 7.5 (6.7)	pH: 7.1 (6.4)	C:N Ratio—10.3	OM: 10.0%
	C:N Ratio—11.4	C:N Ratio-7.5	C:N Ratio– 9.0)	Phos: 5 ppm
C12	OM:7.1%(6.1)	C11 OM:5.9% (5.7)		-	K: 106 ppm pH:7.2
	Phos 8 ppm (4)	Phos 6 ppm (2)		014 6 494	C:N Ratio—9.9
	K: 87 ppm (86)	K: 109 ppm (87)		Phos: 4 ppm	C16 (2015)
	pH: 7.2 (6.8)	pH: 7.0 (7.0)	pH: 7.2 (6.9		OM: 8.5%
	C:N Ratio-8.0	C:N Ratio-9.9	C:N Ratio-9.3	C:N Ratio—8.9	Phos: 6 ppm
C13	OM:5.9% (6.8)	C14 OM:10.4% (9.9)		C1S-16	K: 82 ppm pH:7.0
	Phos 5 ppm (4)	Phos 8 ppm (4)	Phos 15 ppm (5)		μπ.7.0
	K: 100 ppm (79)	K: 73 ppm (55)	K: 90 ppm (89	Phos: 7 ppm	C17 (2015)
	pH: 7.1 (6.6)	pH: 6.8 (7.0)		K: 120 ppm	OM: 8.0%
	C:N Ratio-9.0			pH:7.3	Phos: 4 ppm K: 77 ppm
	C.N Natio-9.0	Floods Landing Rd		C:N Ratio—10.1	pH:6.9
		noous canung Nu			

C4-C6 higher density with larger trees (partially logged end of June/start of July); C7 & C14 quite swampy in sections; C13-C15 higher coniferous population; C15, C8 & C5 more

open space

*C1-C3 plus section of C4-C6 (- - -) included in initial project layout but not mulched

Trees per hectare—853 Stand Volume—3.94 m³/ha

Discussion

During the project planning stage, two factors were identified that might impact future crop potential on mulched sites: (1) the importance of seed bed preparation to ensure that woody residue did not impact seed placement (2) the potential for incorporated woody residue to impact the carbon-nitrogen ratio and cause potentially harmful impacts to soil fertility.

Seed bed preparation likely impacted the plant counts on both sites – the mulched project area had lower plant counts than the conventionally cleared project area, which might be due to larger chunks of wood residue displacing the seed drill. Approximately one month after planting, a site inspection at both project sites found uneven crop distribution and evidence that larger wood chunks negatively impacted the presence of seed in the immediate area.

The soil fertility, based upon the parameters assessed, remain relatively similar pre mulch and post mulch and between the mulched project area and the traditionally cleared project area. However, plant vigour and growth was higher in the conventionally cleared area than the mulched area – given that this difference in yield cannot be statistically attributed to a higher plant count and the impact of seedbed preparation, other variables could be impacting the yield potential of the mulched land.

Based on the second year activities, tentative recommendations for producers who are considering mulching include:

- Complete mulching in the fall, let the residue winter on the ground and subsoil in the spring
- Plant a high biomass crop for the first year or two to give wood residue time to break down and further incorporate within soil
- ☐ Consider broadcast or aerial seeding to reduce seed displacement caused by mulched seedbed.

Future Steps

The field work in Year 3 will build upon the findings from Year 2 and further assess the impacts on soil health and yield potential of mulching compared to traditional clearing. It may be determined that further study needs to be undertaken outside the scope of this project in a controlled environment to assess how mulch vs. conventional impacts other variables such as water retention, nutrient availability, etc. Further interpretation of the soil results will continue throughout early 2017 to assess what changes (if any) in the soil could be responsible for the difference in growth between the project areas.

Work is currently underway on developing a reference document for land clearing that will provide producers with the information required to make proper land management choices with respect to clearing land. This document is expected to be completed and released by July 2017.

2016 Cochrane Project Summary

	Description Average pre-conventional Average post-conventional Average pre-mulch Average post-mulch	Soil Soil Soil Soil		bhorus P- Bicarb Potas 5.00 7.00 3.50 10.07	87.50 3 86.08 3	ppm 107.50 261 185.00 258	ppm 5.00 15. 5.00 13. 1.67 14.	pH 50 6.95 50 7.20 92 6.76	5.18		%Mg 1.10 18.3 1.30 18.7 1.53 19.8 1.74 17.6	0 75.15 3 68.91	4.50 0 9.29 0	Sulphur S 2 ppm p 35 8.00 35 7.50 44 8.08 35 6.86	inc Zn Mana pm Mn pp 2.20 2.95 1.66 2.41	14.50 10 15.00 10 13.92	Fe Copy ppm 02.00 01.00 98.17 99.79	0.90 0.78	n B Satura % P 0.25 0.30 0.19 0.23	ppm 1.00 10 1.50 9 0.42 10	num Al Saturati %Al 025.50 964.50 056.83 052.36	Ratio 0.10 0.10 0.20	C:N Ratio 0.06 0.07 9.85 0.08 0.10 9.44
											Percer	t Base Saturation (%)										
Sample Number C16 C17 C4S-16 CC	Description Conventional 2015 pre-clear Conventional 2015 pre-clear Conventional Spring 2016 Conventional Fall 2016	Type Soil Soil Soil Soil		ohorus P- Bicarb Potas 6 4 5 9	Magnes sium K ppm Mg ppm 82 77 106 69	395 420 405	ppm 2530 2700 2790	la pH 14 7 17 6.9 13 7.2 14 7.2			%Mg 1.1 17 1.1 1 1.5 18 1.1 19	9 73.3 3 75.4	6.3 4.5	Sulphur S 2 ppm p 0.3 8 0.4 8 0.3 8 0.3 8 0.4 7	tinc Zn Mana pm Mn pp 2.2 2.2 3 2.9	gnese Iron I om ppm 15 14 15 15	Fe Cop ppm 100 104 99 103	per Cu Boro ppm 0.7 0.8 0.9 0.9	n B Satura % P 0.2 0.3 0.4 0.2	ppm 1 1 2	num Al Saturati %Al 1038 1013 869 1060	Ratio 0.1 0.1 0.1	C:N Ratio 0.06 0.06 0.08 9.9 0.06 9.8
								6 . r.	Boron	Manga		eeppe	ninum										
CCO16	Conventional Oats 2016	Tissue	Nitrogen Sulfu 1.68	0.1	phorous Potassiu 0.47			Sodium 0.9 0.04		13 nc ppm	Iron ppn 79 3-		n Chloride 59										
CCC16	Conventional Clover 2016	Tissue	3.05	0.23	0.17			.54 0.08		66	63 1	9 6	42										
			Organic Phos	ohorus P-	Magnes	ium Calcium Ca	Sodium N	la	CE	c				Sulphur S	inc Zn Mana	gnese Iron	Fe Cop	per Cu Boro	n B Satura	ation Alumin	num Al Saturati	ion K/Mg	
Sample Number	Description				sium K ppm Mg ppm		ppm	рН	pH Buffer me		%Mg	%ca %H	%Na		pm Mn pp		ppm	n ppm	% P	ppm	%AI	Ratio	C:N Ratio
C4 2015	Pre-mulch 2015	soil	5.9	5	85			11 7	7	13.1	1.7 19			0.4 7	1.8	28	114	0.6	0.1		1093		0.09
C4	Post Mulch Fall 2016	soil	6	6	104 96			13 6.8 13 6.8		13	2 19 1.9 20		5	0.4 7 0.4 8	2.4	22	96	0.9	0.3		1123		0.1 9.9
C5 2015 C5	Pre-mulch 2015 Post mulch Fall 2016	soil soil	5.9 6.2	21	120			13 6.7		12.8 15.5	1.9 20 2 16			0.4 8 0.3 7	1.8 3.6	16 19	107 102	0.7	0.2		1118 1161		0.09 0.12 8.2
C6 2015	Pre-mulch 2015	soil	7.1	5	83			11 6.5		14.5	1.5 20).3 9	1.6	11	91	0.9	0.2		1186		0.07
C6	Post Mulch Fall 2016	soil	7.6	13	125	335		12 6.6		16.7	1.9 16	7 59.7	21.4	0.3 7	3.1	23	113	1	0.2	3	1141	0.2	0.11 9
C7 2015	Pre-mulch 2015	soil	5.8	3	90			11 6.5		13.2	1.8 21			0.4 7	1.6	11	93	0.7	0.2		1101		0.08
C7	Post Mulch Fall 2016	soil	8	10	113			11 6.7		15.3	1.9 16			0.3 6	2.6	21	112	1.1	0.3		1020		0.11 11.4
C8 2015 C8	Pre-mulch 2015 Post mulch fall 2016	soil	5.8 4.6	2 19	97 102			11 6.7 13 7.5		14.4 18.4	1.7 21 1.4 15			0.3 8 0.3 6	1.7	12 23	89 93	0.8 0.9	0.2	2	1057 990		0.08 0.09 7.5
C8 C9 2015	Post mulch fall 2016 Pre-mulch 2015	soil soil	4.6 5.5	19	102			13 7.5 12 6.4		18.4 12.9	1.4 15 1.8 20).3 6).4 8	2	23	93 87	0.9	0.2	-	990 1086		0.09 7.5
C9 2015	Post mulch fall 2016	soil	6.1	10	107			12 0.4		14.5		9 69.9).4 8).4 7	2.1	21	104	0.9	0.2		1110		0.1 9
	Post mulch Spring 2016	3011	0.1	10	107	550	2020			14.5	1.5		0.0				104	0.5	0.1	-	1110	0.1	0.1 5
C3S 2016	composite sample (C4-C9)	soil	6.8	4	121	320	2070	13 7.1		14.7	2.1 18	2 70.5	8.9	0.4 6	2.3	18	88	0.7	0.3	1	961	0.1	0.12 10.3
									Boron	Manga			ninum										
	a		Nitrogen Sulfu	Phos	phorous Potassiu	um Magnesium	n Calcium	Sodium	ppm Zin	nc ppm ppm	Iron ppn	ppm ppn	h Chlorid										
CC3S16	Composite clover sample (C4- C9)																						
						27		79 0.03	13	27	74	4 7											
003516	(9)	Tissue	2.41	0.19	0.15	2.7	0.48 2.	.79 0.03	3 13	27	74	4 7	37										
CO3516	Composite oat sample (C4-C9)		2.41	0.19	0.15			.79 0.03		27 12		4 7 15 5	37 44										
			1.62	0.17	0.21	3.41	0.24 0.	.98 0.05	5 3	12				Culabur C	i 7- M		F		- D - Cabura		un Al Caburati		
	Composite oat sample (C4-C9)		1.62 Organic Phos	0.17 phorus P-	0.21 Magnes	3.41 ium Calcium Ca	0.24 0.	.98 0.05	5 3 CE	12 C				Sulphur S	inc Zn Mana om Mn oc	gnese Iron I	Fe Cop	per Cu Boro	n B Satura % P	ation Alumini	num Al Saturati %Al		
CO3516	Composite oat sample (C4-C9)		1.62 Organic Phos	0.17 phorus P-	0.21	3.41 ium Calcium Ca ppm	0.24 0. Sodium N ppm	.98 0.05 Ia	5 3 CE pH Buffer me	12 C	44	5 5 %ca %H	44 %Na			0			n B Satura % P 0.3			Ratio	
CO3S16 Sample Number	Composite oat sample (C4-C9 Description) Tissue	1.62 Organic Phos Matter ppm 6.8 6.7	0.17 phorus P-	0.21 Magnes sium K ppm Mg ppm	3.41 ium Calcium Ca ppm 395 370	0.24 0. Sodium N ppm 2390 2370	.98 0.05 la pH 13 6.5 12 7.2	5 3 CE pH Buffer me 9 6.9	12 C 2g/100g %K	44 9 %Mg	5 5 %ca %H 7 71.6	44 %Na 6.9 4.5	ppm p	pm Mn pp	om ppm 11 18	95 103	0.9 1.1	% P		%AI	Ratio 0.1	C:N Ratio
CO3516 Sample Number C10 2015 C10 C11 2015	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015) Tissue soil soil soil	1.62 Organic Phos Matter ppm 6.8 6.7 5.7	0.17 ohorus P- Bicarb Potas 3 9 2	0.21 Magnes ssium K ppm Mg ppm 96 127 87	3.41 ium Calcium Ca ppm 395 370 385	0.24 0. Sodium N ppm 2390 2370 2040	.98 0.05 la pH 13 6.5 12 7.2 11 7	5 3 CE pH Buffer me 0 6.9 2	12 CC 2g/100g %K 16.7 16 15.5	44 9 %Mg 1.5 19 2 19 1.4 19	5 5 %ca %H 7 71.6 2 73.9 6 65.8	44 %Na 6.9 4.5 12.8	ppm p 0.3 9 0.3 7 0.3 7	pm Mn pp 1.9 2.5 1.4	om ppm 11 18 14	95 103 102	0.9 1.1 0.8	% P 0.3 0.3 0.2	ppm 2	%AI 1034 1123 1026	Ratio 0.1 0.1 0.1	C:N Ratio 0.08 0.1 9.3 0.07
CO3S16 Sample Number C10 2015 C10 C11 2015 C11	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016) Tissue soil soil soil soil soil	1.62 Organic Phos Matter ppm 6.8 6.7 5.7 5.9	0.17 bhorus P- Bicarb Potas 3 9 2 6	0.21 Magnes ssium K ppm Mg ppm 96 127 87 109	3.41 calcium Ca ppm 395 370 385 325	0.24 0. Sodium N ppm 2390 2370 2040 1820	.98 0.05 la pH 13 6.5 12 7.2 11 1 12 1	5 3 CE pH Buffer me 9 6.9 2 7	12 22 25 26 29 27 100g %K 16.7 16 15.5 13.9	44 9 1.5 19 1.4 19 2 19 1.4 19 2 19	%ca %H 7 71.6 2 73.9 6 65.8 5 65.4	44 %Na 6.9 4.5 12.8 12.8	ppm p 0.3 9 0.3 7 0.3 7 0.3 7 0.4 5	pm Mn pp 1.9 2.5 1.4 1.8	om ppm 11 18 14 18	95 103 102 101	0.9 1.1 0.8 0.9	% P 0.3 0.3 0.2 0.2	ppm 2 2	%AI 1034 1123 1026 1100	Ratio 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9
CO3S16 Sample Number C10 2015 C10 C11 2015 C11 C12 2015	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post Mulch fail 2016 Pre-mulch 2015	soil soil soil soil soil soil soil	1.62 Organic Phos Matter ppm 6.8 6.7 5.7 5.9 6.1	0.17 bhorus P- Bicarb Potas 3 9 2 6 4	0.21 Magness ssium K ppm Mg ppm 96 127 87 109 86	3.41 calcium Ca ppm 395 370 385 325 360	0.24 0. Sodium N ppm 2390 2370 2040 1820 1960	.98 0.09 la pH 13 6.9 12 7.2 11 1 12 1 13 6.8	5 3 pH Buffer me 9 6.9 7 7 7 8 6.9	12 52 16.7 16.7 15.5 13.9 14.2	44 9 1.5 19 2 19 1.4 19 2 19 1.5 21	%ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8	44 %Na 6.9 4.5 12.8 12.8 8.2	ppm p 0.3 9 0.3 7 0.3 7 0.4 5 0.4 8	pm Mn pp 1.9 2.5 1.4 1.8 1.5	om ppm 11 18 14 18 12	95 103 102 101 93	0.9 1.1 0.8 0.9 0.8	% P 0.3 0.2 0.2 0.2 0.2	ppm 2 2	%AI 1034 1123 1026 1100 1042	Ratio 0.1 0.1 0.1 0.1 0.2	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9 0.07
CO3S16 Sample Number C10 2015 C10 C11 2015 C11	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016	soil soil soil soil soil soil soil soil	1.62 Organic Phos Matter ppm 6.8 6.7 5.7 5.9	0.17 bhorus P- Bicarb Potas 3 9 2 6	0.21 Magnes ssium K ppm Mg ppm 96 127 87 109	3.41 calcium Ca ppm 395 370 385 325 360	0.24 0. Sodium N ppm 2390 2370 2040 1820 1960	.98 0.05 la pH 13 6.5 12 7.2 11 1 12 1	5 3 pH Buffer me 9 6.9 7 7 7 8 6.9	12 22 25 26 29 27 100g %K 16.7 16 15.5 13.9	44 9 1.5 19 1.4 19 2 19 1.4 19 2 19	%ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8	44 %Na 6.9 4.5 12.8 12.8 8.2	ppm p 0.3 9 0.3 7 0.3 7 0.3 7 0.4 5	pm Mn pp 1.9 2.5 1.4 1.8	om ppm 11 18 14 18	95 103 102 101	0.9 1.1 0.8 0.9	% P 0.3 0.3 0.2 0.2	ppm 2 2	%AI 1034 1123 1026 1100	Ratio 0.1 0.1 0.1 0.1 0.2	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9
CO3S16 Sample Number C10 2015 C10 C11 2015 C11 C12 2015	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Post Mulch Fall 2016	soil soil soil soil soil soil soil soil	1.62 Organic Phos Matter ppm 6.8 6.7 5.7 5.9 6.1	0.17 bhorus P- Bicarb Potas 3 9 2 6 4	0.21 Magness ssium K ppm Mg ppm 96 127 87 109 86	3.41 ium Calcium Ca ppm 395 370 385 325 360 325	0.24 0. Sodium N ppm 2390 2370 2040 1820 1960 2180	.98 0.09 la pH 13 6.9 12 7.2 11 1 12 1 13 6.8	5 3 CE pH Buffer me 9 6.9 7 7 8 6.9 2 3	12 CC Eg/100g %K 16.7 16 15.5 13.9 14.2 14.6 13.6	44 9 1.5 19 2 19 1.4 19 1.5 21 1.5 21 1.5 18 2 19	5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5	44 %Na 6.9 4.5 12.8 12.8 8.2 4.5	ppm p 0.3 9 0.3 7 0.3 7 0.4 5 0.4 8	pm Mn pp 1.9 2.5 1.4 1.8 1.5	om ppm 11 18 14 18 12	95 103 102 101 93	0.9 1.1 0.8 0.9 0.8	% P 0.3 0.2 0.2 0.2 0.2	ppm 2 2	%AI 1034 1123 1026 1100 1042	Ratio 0.1 0.1 0.1 0.1 0.2 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9 0.07
CO3S16 Sample Number C10 2015 C10 C11 2015 C11 C12 2015 C12	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post Mulch Fail 2016 Pre-mulch 2015 Post Mulch Fail 2016 Spring 2016 composite sample	soil soil soil soil soil soil soil soil	1.62 Organic Phos Matter ppm 6.8 6.7 5.7 5.9 6.1 7.1 6.1	0.17 bhorus P- Bicarb Potas 3 9 2 6 4 8 4 8	0.21 Magnes ssium K ppm Mg ppm 96 127 127 87 109 86 87 106	3.41 ppm 395 370 385 325 360 325 315	0.24 0. Sodium N ppm 2390 2370 2040 1820 1960 2180 2140	98 0.09 a pH 13 6.9 12 7.2 11 5 13 6.8 15 7.2 14 7.3	5 3 PH Buffer me 9 6.9 2 7 7 8 6.9 2 8 8 8 8 8 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9	12 сс сур/100g %к 16.7 16 15.5 13.9 14.2 14.6 13.6 Малда	44 % %Mg 1.5 19 1.4 19 2 19 1.5 2 1.5 18 2 19 nese	5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alu	44 %Na 6.9 4.5 12.8 12.8 8.2 4.5	ppm p 0.3 9 0.3 7 0.3 7 0.4 5 0.4 8 0.4 6 0.4 6	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2	ppm ppm 11 18 14 18 12 14	95 103 102 101 93 103	0.9 1.1 0.8 0.9 0.8 1	% P 0.3 0.2 0.2 0.2 0.2 0.2	ppm 2 2	%AI 1034 1123 1026 1100 1042 1049	Ratio 0.1 0.1 0.1 0.1 0.2 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9 0.07 0.08 8
CO3S16 Sample Number C10 2015 C10 C11 2015 C11 C12 2015 C12	Composite oat sample (C4-C9) Description Pre-muich 2015 Post muich fail 2016 Pre-muich 2015 Post Muich Fail 2016 Pre-muich 2015 Post Muich Fail 2016 Spring 2016 composite sample (C10-C12)	soil soil soil soil soil soil soil soil	1.62 Organic Phos Matter ppm 6.8 6.7 5.7 5.9 6.1 7.1	0.17 bhorus P- Bicarb Potas 3 9 2 6 4 8 4 8	0.21 Magnes isium K ppm Mg ppm 96 127 87 109 86 87 87	3.41 ppm 395 370 385 325 360 325 315	0.24 0. Sodium N ppm 2390 2370 2040 1820 1960 2180 2140	.98 0.09 a pH 13 6.9 12 7.2 11 5 13 6.8 15 7.2	5 3 PH Buffer me 9 6.9 2 7 7 8 6.9 2 8 8 8 8 8 8 8 8 9 9 9 9 9 9 9 9 9 9 9 9 9	12 CC Eg/100g %K 16.7 16 15.5 13.9 14.2 14.6 13.6	44 9 1.5 19 2 19 1.4 19 1.5 21 1.5 21 1.5 18 2 19	5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alu	44 %Na 6.9 4.5 12.8 12.8 8.2 4.5	ppm p 0.3 9 0.3 7 0.3 7 0.4 5 0.4 8 0.4 6 0.4 6	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2	ppm ppm 11 18 14 18 12 14	95 103 102 101 93 103	0.9 1.1 0.8 0.9 0.8 1	% P 0.3 0.2 0.2 0.2 0.2 0.2	ppm 2 2	%AI 1034 1123 1026 1100 1042 1049	Ratio 0.1 0.1 0.1 0.1 0.2 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9 0.07 0.08 8
CO3S16 Sample Number C10 2015 C10 C11 2015 C11 C12 2015 C12	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post Mulch Fail 2016 Pre-mulch 2015 Post Mulch Fail 2016 Spring 2016 composite sample	soil soil soil soil soil soil soil soil	1.62 Organic Phos Matter ppm 6.8 6.7 5.7 5.9 6.1 7.1 6.1	0.17 bhorus P- Bicarb Potas 3 9 2 6 4 8 4 8	0.21 Magnes ssium K ppm Mg ppm 96 127 127 87 109 86 87 106	3.41 ium Calcium Ca ppm 305 370 385 325 360 325 315 im Magnesium	0.24 0. Sodium N ppm 2390 2370 2040 1820 1960 2180 2140 2140	98 0.09 a pH 13 6.9 12 7.2 11 5 13 6.8 15 7.2 14 7.3	5 3 CE pH Buffer me 6.9 7 7 8 6.9 8 8 8 0 9 8 8 0 7 7 7 7 7 8 8 9 7 7 7 8 9 8 9 9 9 9 8 9 9 9 9	12 сс сур/100g %к 16.7 16 15.5 13.9 14.2 14.6 13.6 Малда	44 % %Mg 1.5 19 1.4 19 2 19 1.5 2 1.5 18 2 19 nese	5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alui ppm ppn	44 %Na 6.9 4.5 12.8 12.8 8.2 4.5	ppm p 0.3 9 0.3 7 0.3 7 0.4 5 0.4 8 0.4 6 0.4 6	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2	ppm ppm 11 18 14 18 12 14	95 103 102 101 93 103	0.9 1.1 0.8 0.9 0.8 1	% P 0.3 0.2 0.2 0.2 0.2 0.2	ppm 2 2	%AI 1034 1123 1026 1100 1042 1049	Ratio 0.1 0.1 0.1 0.1 0.2 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9 0.07 0.08 8
C03516 Sample Number C10 2015 C10 C11 2015 C11 C12 2015 C12 C25 2016	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9-) Tissue soil soil soil soil soil e soil	1.62 Organic Phose 6.8 6.7 5.7 5.9 6.1 7.1 Nitrogen Sulfur 2.62	0.17 bhorus P- Bicarb Potas 3 9 2 6 4 8 4 7 Phosy 0.21	0.21 Magness sium K ppm Mg ppm 96 127 87 109 86 87 109 86 87 209 86 87 209 86 87 209 80 87 209 80 80 80 87 209 80 80 80 80 80 80 80 80 80 80 80 80 80	3.41 Calcium Ca ppm 395 370 385 325 360 325 315 m Magnesium 2.46	0.24 0. Sodium N ppm 2390 2370	98 0.05 13 6.4 11 7.7 11 7.7 12 7.7 13 6.8 13 6.8 14 7.3 Sodium 24 0.06	5 3 PH Buffer me 9 6.9 7 7 8 6.9 8 8 8 8 9 9 7 7 7 8 14	12 сс sg/100g %к 16.7 16 15.5 13.9 14.2 14.6 13.6 13.6 13.6 13.6 23	44 % 1.5 19 2 19 1.4 19 2.5 21 1.5 21 1.5 18 2 19 rese Iron ppn	5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alui ppm ppn	44 %Na 6.9 4.5 12.8 12.8 8.2 4.5 ninum n Chlorid	ppm p).3 9).3 7).3 7).4 5).4 8).4 6).4 6).4 6	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2 2.2	ppm ppm 11 18 14 14 12 14 14 15	95 103 102 101 93 103 88	0.9 1.1 0.8 0.9 0.8 1 0.7	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2	%Al 1034 1123 1026 1100 1042 1049 828	Ratio 0.1 0.1 0.1 0.1 0.2 0.1 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9 0.07 0.08 8
C03516 Sample Number C10 2015 C10 C11 2015 C11 C12 2015 C12 C25 2016 CC2516	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post Mulch Fail 2016 Pre-mulch 2015 Post Mulch Fail 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9- C12)) Tissue soil soil soil soil soil e soil	1.62 Organic Phos, Matter 6.8 6.7 5.7 5.9 6.1 7.1 Nitrogen Suffu 2.62 Organic Phos,	0.17 ohorus P- Bicarb Potas 9 2 6 4 8 4 7 Phosy 0.21 ohorus P-	0.21 Magnes sium K ppm Mg ppm 96 127 87 109 86 87 106 horous Potassiu 0.17 Magnes	3.41 ium Calcium Ca ppm 395 370 385 325 325 315 um Magnesium 2.46 ium Calcium Ca	0.24 0. Sodium N ppm 2390 2370 2370 2370 2370 2370 2370 2370 237	In 12 12 12 12 12 12 12 12 12 12 12 12 12	5 3 pH Buffer me 9 6.9 7 7 8 6.9 2 8 Boron ppm Zin 5 14 CE	12 cc 2g/100g %K 16.7 16 15.5 13.9 14.2 14.6 13.6 13.6 13.6 23 23	44 9 %Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 2 1 5 19 2 19 2 19 85 11	5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alu ppm ppm 9 7	44 %Na 6.9 4.5 12.8 8.2 4.5 minum chloride 60	ppm p 3.3 9 3.3 7 3.3 7 3.4 5 3.4 8 3.4 6 3.4 6 3.4 6 5 5 5 5 5 5 5 5 5 5 5 5 5	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2.2 2.2 inc Zn Mana	m ppm 11 18 14 18 12 14 15 gnese Iron	95 103 102 101 93 103 88 Fe Cop	0.9 ppm 0.9 1.1 0.8 0.9 0.8 1 0.7 0.7	% P 0.3 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2	%Al 1034 1123 1026 1100 1042 1049 828	Ratio 0.1 0.1 0.1 0.1 0.2 0.1 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.1 9.9 0.07 0.08 8 0.1 8.9
C03516 Sample Number C10 2015 C10 C11 2015 C12 C22 2016 C252016 CC2516 Sample Number	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9- C12) Description) Tissue soil soil soil soil soil soil e soil tissue	1.62 Matter Phose 6.8 6.7 5.7 5.9 6.1 7.1 0.1 Nitrogen Suffu 2.62 Organic Phose ppm	0.17 ohorus P- Potas 3 9 2 6 4 8 4 8 7 Potas 9 2 6 4 9 2 6 4 8 0.21	0.21 Magness 96 127 87 109 86 87 106 0.17 Magnes 0.17 Magnes 90 80 80 80 80 80 80 80 80 80 80 80 80 80	3.41 Calcium Ca ppm 305 370 385 325 315 315 am Magnesium 2.46 ppm	0.24 0. Sodium N ppm 2390 2390 2390 2390 2390 2390 2300 2180 2180 2180 2180 2180 2180 2180 21	II 0.05 II PH 13 6.5 12 7.3 11 7.3 11 7.3 13 6.8 17 7.3 14 7.3 Sodium 24 0.06 Ia PH	5 3 pH Buffer me) 6.9 7 8 8 8 8 8 8 9 14 CEE pH Buffer me	23 C 55 C 55 C 76 15.7 15.5 13.9 14.2 14.6 13.6 Manga Manga C 75 C 55 C 55 C 55 C 55 C 55 C 55 C 55	44 ***********************************	5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 5 65.4 1 68.8 6 74.9 3 78.5 Copper Aluu ppm ppm 9 7 %ca %H	44 %Na 6.9 4.5 12.8 8.2 4.5 ninum 60 %Na	ppm p 0.3 9 0.3 7 0.3 7 0.4 5 0.4 8 0.4 6 0.4 6 0.4 6 0.4 6	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2 2.2 inc Zn Mana pm Mn pp	m ppm 11 18 14 12 14 15 15	95 103 102 101 93 103 88 Fe Copp	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 per Cu Boron n ppm	% P 0.3 0.3 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 2	%Al 1034 1123 1026 1100 1042 1049 828 828	Ratio 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.08 8 0.1 8.9 0.1 8.9 C:N Ratio
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 CC2516 Sample Number C13 2015	Composite oat sample (C4-C9 Description Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post Mulch Fail 2016 Pre-mulch 2015 Post Mulch Fail 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9- C12) Description Pre-mulch 2015	soil soil soil soil soil soil soil soil	1.62 Organic Phos 6.8 6.7 5.7 5.9 6.1 7.1 0.1 Nitrogen Sulfu 2.62 Organic Phos Matter Phos 6.8	0.17 ohorus P- Bicarb Potas 9 2 6 4 8 4 7 Phosy 0.21 ohorus P-	0.21 Magnes ssium K ppm Mg ppm 96 127 87 109 86 87 109 86 87 109 0.17 0.17 0.17 Magnes 79	3.41 calcium Ca ppm 395 370 385 325 315 	0.24 0. Sodium N ppm 22390 22390 22370 22370 22370 22370 22400 1 Calcium 0.51 3. Sodium N Sodium N 2210		5 3 pH Buffer me 6.9 7 8 8 8 6.9 2 7 8 8 8 8 9 14 CE pH Buffer me 5 14 CE pH Buffer me 5 14	23 C rgg/100g %K 16.7 16.5 13.9 14.2 14.6 13.6 13.6 23 C rgg/100g %K 15.3	44 ***********************************	5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Coper Alut ppm ppn 9 7 %ca %H 5 72.2	44 5.9 4.5 12.8 12.8 8.2 4.5 minum h Chloridi 60 %Na 7.6	ppm p 0.3 9 0.3 7 0.4 5 0.4 6 0.4 6 Sulphur S 2 ppm p 0.4 9	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2 2.2 inc Zn Mana pm Mn pp 1.7	gnese Iron i 10 11 18 14 14 15 15 10 m ppm 10	95 103 102 101 93 103 88 Fe Copp 92	0.9 1.1 0.9 1.1 0.9 0.9 0.8 1 0.7 0.7 0.7	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 2 ation Alumini ppm 1	%Al 1034 1123 1026 1100 1042 1049 828 828 828 828 828 828	Ratio 0.1 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.08 8 0.1 8.9 0.1 8.9 C:N Ratio 0.07
C03516 Sample Number C10 2015 C10 C11 2015 C12 C22 2016 C252016 CC2516 Sample Number	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9- C12) Description) Tissue soil soil soil soil soil soil e soil tissue	1.62 Matter Phose 6.8 6.7 5.7 5.9 6.1 7.1 0.1 Nitrogen Suffu 2.62 Organic Phose ppm	0.17 ohorus P- Potas 3 9 2 6 4 8 4 8 7 Potas 9 2 6 4 9 2 6 4 8 0.21	0.21 Magness 96 127 87 109 86 87 106 0.17 Magnes 0.17 Magnes 90 80 80 80 80 80 80 80 80 80 80 80 80 80	3.41 ium Calcium Ca ppm 395 370 325 325 325 335 345 pm Magnesium 2.46 pm 340 320	0.24 0. Sodium N 2390 2390 2390 2370 2370 2370 2370 2370 2380 2180 2180 2180 0.51 3. Sodium N ppm 900	II 0.05 II PH 13 6.5 12 7.3 11 7.3 11 7.3 13 6.8 17 7.3 14 7.3 Sodium 24 0.06 Ia PH	5 3 pH Buffer me 6.9 7 8 8 8 6.9 2 7 8 8 8 8 9 14 CE pH Buffer me 5 14 CE pH Buffer me 5 14	23 C 55 C 55 C 76 15.7 15.5 13.9 14.2 14.6 13.6 Manga Manga C 75 C 55 C 55 C 55 C 55 C 55 C 55 C 55	44 ***********************************	5 5 5 %ca %H 7 71.6 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alu 78.5 Copper Alu 9 7 9 7 %ca %H 5 72.2	44 %Na 6.9 4.5 12.8 4.5 %No 60 %Na 7.6 8.8	ppm p 0.3 9 0.3 7 0.3 7 0.4 5 0.4 8 0.4 6 0.4 6 0.4 6 0.4 6	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2 2.2 inc Zn Mana pm Mn pp	m ppm 11 18 14 12 14 15 15	95 103 102 101 93 103 88 Fe Copp	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 per Cu Boron n ppm	% P 0.3 0.3 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 2	%Al 1034 1123 1026 1100 1042 1049 828 828	Ratio 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 k/Mg Ratio 0.2 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.08 8 0.1 8.9 0.1 8.9 C:N Ratio
C03516 Sample Number C10 2015 C10 C11 2015 C12 C25 2016 C25516 Sample Number C13 2015 C13	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9-C12) Description Pre-mulch 2015 Post Mulch Fall 2016	soil soil soil soil soil soil e soil tissue soil soil	1.62 Natter 6.8 6.8 5.7 5.9 6.1 7.1 6.1 Nitrogen Suffu 2.62 Organic Phosy 6.8 5.9	0.17 ohorus P- Potas 3 9 2 6 4 8 4 8 7 Potas 9 2 6 4 9 2 6 4 8 0.21	0.21 Magness 96 127 109 86 87 109 86 87 106 0.17 Magnes 0.17 Magnes 90 80 90 90 90 90 90 90 90 90 90 90 90 90 90	3.41 ium Calcium Ca ppm 395 370 385 325 360 360 370 375 360 375 360 375 360 375 360 375 360 375 360 375 375 375 375 375 375 375 375	0.24 0. Sodium N ppm 2390 2040 1820 1960 2140 1 Calcium 0.51 3. Sodium N ppm 2210 1970 1970 1210	In 198 0.05 In pH 13 6.5 12 7.2 11 7.2 12 7.2 13 6.4 13 7.3 14 7.3 Sodium pH 13 6.4 14 7.3 14 7.3 14 7.3 14 7.3 14 7.3 14 7.3 14 7.3 13 1.4 13 6.4 13 7.2 13 7.2 13 7.2 14 7.3 14 7.3 14 7.3 14 7.3 14 7.3 15 7.2 16 7.3 17 7.3 17 7.3 18 7.3 19 7.3 10 7.5 10 7.5	5 3 CE pH Buffer me 9 6.9 7 3 6.9 2 3 Baron Zin 5 14 CE pH Buffer me 5 6.9 7 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 3 6,9 2 5 6 7 5 6 9 7 7 8 6 9 7 7 8 6 9 7 7 8 6 9 7 7 8 8 6 9 7 7 8 8 8 7 7 8 8 8 7 7 8 8 8 8 7 7 8 8 8 8 7 8 8 8 7 8 8 8 8 8 7 8 8 8 8 8 8 8 8 8 8 8 8 8	12 C gg/100g %к 16.7 15.5 13.9 14.2 14.6 13.6 малда с с с с с уg/100g %к 15.3 14.1 15.7 17.4	44 * %Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 21 1.5 21 1.5 8 2 19 ************************************	% % % % % % 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alun ppm ppn 9 7 % 5 7 % 5 72.2 7 69.2 3 62	44 %Na 6.9 4.5 12.8 2.2 4.5 minum 60 %Na 7.6 8.8 12.8	ppm p ,3 9 ,3 7 ,3 7 ,4 5 ,4 8 ,4 8 ,4 8 ,4 6 ,4 7 ,4 7	pm Mn pp 1.9 2.5 1.4 1.8 1.5 2 2.2 2.2 inc Zn Mana pm Mn pp 1.7 2	gnese Iron i 10 18 14 18 12 14 15 10 10 14 10	95 103 102 101 93 103 88 Fe Copj 92 99 115 109	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 pper Cu Boroo ppm 0.9 1.5	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 2 2 3 3 3 3 1 1 1	%Al 1034 1123 1026 1100 1042 1049 828 828 828 828	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.2 0.1 0.2 0.1 0.2 0.1	C:N Ratio 0.08 0.1 9.3 0.07 9.9 0.07 8 0.08 8 0.1 8.9 C:N Ratio 0.07 9
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25216 C25216 Sample Number C13 2015 C13 C14 2015 C14 C15 2015	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post Mulch fail 2016 Pre-mulch 2015 Spring 2016 composite sample (C10-C12) Composite clover sample (C9-C12) Description Pre-mulch 2015 Post Mulch fail 2016 Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015	soil soil soil soil soil soil soil soil	1.62 Organic Phos 6.8 6.7 5.7 5.9 6.1 7.1 Nitrogen Sulfur 2.62 Organic Sulfur 6.8 5.9 6.8 5.9 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	0.17 ohorus P- 3 9 2 6 4 8 4 7 Phosy 0.21 ohorus P- Bicarb Potas 5 4 5 4 5	0.21 Magness sium K ppm Mg ppm 96 127 87 109 86 87 109 0.17 0.17 Mg ppm 79 0.5 5 73 89	3.41 ium Calcium Ca ppm 395 370 385 325 360 325 335 315 315 40 2.46 ppm 340 2.40 320 315 315 315 315 315 315 325 335 345 345 345 345 345 345 34	0.24 0. Sodium N ppm 2390 2390 2200 2180 2190 210 21	A Constant of the second secon	5 3 CEE pH Buffer me 6.9 7 7 8 6.9 8 8 8 6.9 2 8 8 6.9 2 14 CEE pH Buffer me 5 14 CEE 6.9 8 6.9 8 8 6.9 8 8 6.9 8 8 6.9 8 8 8 8 9 8 14 14 14 14 14 14 14 14 14 14	c cyg/100g %K 16.7 16.7 13.9 14.2 14.6 13.6 Mangan cyg/100g %K 15.3 14.1 15.7 15.7	44 * %Mg 1.5 19 2 19 1.4 19 2 19 1.5 22 1.5 18 2 19 1.5 22 1.5 18 %Mg 1.3 18 1.8 18 0.9 16 1.1 16 1.4 19	% % %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 77.9 3 78.5 copper Alu ppm ppm 9 7 %ca %H 5 72.2 9 70 7 69.2 3 62 1 70.8	44 %Na 6.9 4.5 12.8 12.8 12.8 4.5 minum 60 60 %Na 7.6 8.8 20.4 7.4	ppm ;).3 9).3 7).3 7).3 7).4 5).4 6 .4 6 .5 .5 .4 6 .5 .5 .4 9).4 9).4 9).4 9).4 9 .1 4 .5 .5 .4 8 .5 .5 .4 8 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	pm Mn pp 1.9 2.5 1.4 1.8 2.2 2.2 2.2 2.2 3.2 4.7 7 2 1.4 2.5 1.4 1.5 2 1.4 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	gnese Iron i om ppm 11 18 14 12 12 14 15 15 10 14 16 10 16	Ppm 95 103 102 101 93 103 88 Fe Copp 92 99 99 115 109 100	0.9 ppm 0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 1.5 0.8 1 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 2 2 3 3 3 3 1 1 1	%AI 1034 1123 1126 1100 1042 1049 828 828 828 \$28 \$28 \$28 \$28 \$28 \$28 \$28	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.2 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.0 9.9 0.08 8 0.1 8.9 C:N Ratio 0.07 9.0 0.05 0.07
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25516 Sample Number C13 2015 C13 C14 2015 C14	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Composite clover sample (C1C-C12) Description Pre-mulch 2015 Post Mulch Fall 2016	soil soil soil soil soil soil soil e soil soil soil soil soil soil soil soil	1.62 Natter Porm 6.8 5.7 5.9 6.1 7.1 6.1 Nitrogen Suffu 2.62 Organic Pons Matter Pons 6.8 9.9 9.9 10.4	0.17 ohrrus P- Bicarb Potas 3 9 2 6 4 8 4 9 2 6 4 4 8 7 Phosp 0.21 0.21 Potas 6 4 5 4 8 8	o.21 Magness 96 127 109 26 87 109 26 87 100 20 86 87 100 20 87 90 90 90 90 90 90 90 90 90 90 90 90 90	3.41 ium Calcium Ca ppm 395 370 385 325 360 325 335 315 315 40 2.46 ppm 340 2.40 320 315 315 315 315 315 315 325 335 345 345 345 345 345 345 34	0.24 0. Sodium N ppm 2390 2390 2200 2180 2190 210 21	In 198 0.05 In pH 13 6.5 12 7.2 11 7.2 12 7.2 13 6.4 13 7.3 14 7.3 Sodium pH 13 6.4 14 7.3 14 7.3 14 7.3 14 7.3 14 7.3 14 7.3 14 7.3 13 1.4 13 6.4 13 7.2 13 7.2 13 7.2 14 7.3 14 7.3 14 7.3 14 7.3 14 7.3 15 7.2 16 7.3 17 7.3 17 7.3 18 7.3 19 7.3 10 7.5 10 7.5	5 3 CEE pH Buffer me 6.9 7 7 8 6.9 8 8 8 6.9 2 8 8 6.9 2 14 CEE pH Buffer me 5 14 CEE 6.9 8 6.9 8 8 6.9 8 8 6.9 8 8 6.9 8 8 8 8 9 8 14 14 14 14 14 14 14 14 14 14	12 C gg/100g %к 16.7 15.5 13.9 14.2 14.6 13.6 малда с с с с с уg/100g %к 15.3 14.1 15.7 17.4	44 * %Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 21 1.5 21 1.5 8 2 19 ************************************	% % %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 77.9 3 78.5 copper Alu ppm ppm 9 7 %ca %H 5 72.2 9 70 7 69.2 3 62 1 70.8	44 %Na 6.9 4.5 12.8 12.8 12.8 4.5 minum 60 60 %Na 7.6 8.8 20.4 7.4	ppm p 1.3 9 3.3 7 3.3 7 3.4 5 5 4.4 6 0.4 6 0.4 6 0.4 6 0.4 6 0.4 7 0.4 7 0.4 7 0.4 7 0.4 8 0.4 8 0.4 6 0.4 7 0.4 8 0.4 6 0.4 7 0.4 8 0.4 8	pm Mn pp 1.9 2.5 1.4 1.5 2 2.2 2.2 2.2 1.4 1.5 2 2.2 1.4 1.5 2 1.5 2 1.5 2 1.5 2 1.5 2 1.5 2 1.5 1.5 2 1.5 1.5 2 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	gnese Iron i 10 18 14 18 12 14 15 10 10 14 10	95 103 102 101 93 103 88 Fe Copj 92 99 115 109	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.7 0.9 1.5 0.8 1	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 2 ation Aluminu ppm 1 1 2	%AI 1034 1123 1026 1100 1042 1049 &228 %AI 1022 1079 918 1040	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.2 0.1	C:N Ratio 0.08 0.1 9.3 0.07 9.9 0.07 0.1 9.9 0.08 8 0.1 8.9 C:N Ratio 0.1 9 0.05 0.1 9 0.05 11.9
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25216 C25216 Sample Number C13 2015 C13 C14 2015 C14 C15 2015	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9-C12) Description Pre-mulch 2015 Post Mulch Fall 2016	soil soil soil soil soil soil soil e soil soil soil soil soil soil soil soil	1.62 Organic Phos 6.8 6.7 5.7 5.9 6.1 7.1 Nitrogen Sulfur 2.62 Organic Sulfur 6.8 5.9 6.8 5.9 0.4 0.4 0.4 0.4 0.4 0.4 0.4 0.4	0.17 ohorus P- 3 9 2 6 4 8 4 7 Phosy 0.21 ohorus P- Bicarb Potas 5 4 5 4 5	0.21 Magness sium K ppm Mg ppm 96 127 87 109 86 87 109 0.17 0.17 Mg ppm 79 0.5 5 73 89	3.4.1 m Calcium Ca ppm 395 370 385 325 360 325 360 325 360 325 360 325 360 325 360 345	2390 2390 2390 2390 2180 2180 2180 2180 2180 2180 2180 218	A Constant of the second secon	5 3 CE pH Buffer me 6.9 7 7 8 6.9 8 Boron Zin 5 14 CE pH Buffer me 5 6.9 7 6 .9 8 6.9 14 CE 6.9 8 6.9 14 CE 14	23 C c g/100g %K 16.7 16.1 13.9 14.2 14.6 13.6 Mangan 23 C c g/100g %K 15.3 14.1 15.7 15.7 15.7 21.5	44 * %Mg 15 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 18 2 19 nese Iron ppn 85 1: %Mg 1.3 18 1.8 18 0.9 16 1.1 16 1.4 19 1.1 3	%Ca %H %Ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alu ppm ppm 9 7 %Ca %H 5 72.2 7 60.2 3 62 1 70.8 4 85.4	44 %Na 6.9 45 12.8 8.2 4.5 7.6 60 %Na 7.6 8.8 12.8 20.4 7.4	ppm ;).3 9).3 7).3 7).3 7).4 5).4 6 .4 6 .5 .5 .4 6 .5 .5 .4 9).4 9).4 9).4 9).4 9 .1 4 .5 .5 .4 8 .5 .5 .4 8 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2	gnese Iron I m ppm 11 18 14 15 15 10 10 10 16 14	95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Aluminn ppm 1 1 1 1 2 1	%AI 1034 1123 1126 1100 1042 1049 828 828 828 \$28 \$28 \$28 \$28 \$28 \$28 \$28	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25516 C25516 Sample Number C13 2015 C13 C14 2015 C14 2015 C15	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Composite clover sample (C1C-C12) Description Pre-mulch 2015 Post Mulch Fall 2016	soil soil soil soil soil soil e soil tissue tissue soil soil soil soil soil e soil e soil e soil soil soil soil soil soil soil soil	1.62 Organic Phose 6.8 6.7 5.7 5.9 6.1 7.1 Nitrogen Sulfur 2.62 Organic Phose 5.9 6.8 5.9 6.1 7.1 Nitrogen Sulfur 6.8 5.9 6.1 7.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0	0.17 ohorus P- Bicarb Potas 3 9 2 6 4 4 8 7 Phosp 0.21 ohorus P- Potas 4 5 4 8 5 15 7	0.21 Magnes sium K ppm Mg ppm 96 127 87 109 86 87 109 86 87 109 86 87 0.17 Mg pm Mg ppm Mg ppm 55 55 73 89 90	3.4.1 m Calcium Ca ppm 395 370 325 325 325 325 335 345 m Magnesium 2.46 ppm 340 343 343 343 344 340 345 345 345 345 345 345 345 345	0.24 0. Sodium N ppm 2390 2390 2390 2210 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 0.51 3. 3. Sodium N ppm 2210 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.	A Constant of the second secon	5 3 CE pH Buffer me 6.9 7 8 6.9 8 Boron Zin 5 14 CE pH Buffer me 5 6.9 8 6.9 14 CE 6.9 14 CE 6.9 14 CE 6.9 14 CE 8 6.9 14 CE 14 CE 14 CE 14 CE 14 CE 14 CE 14 CE 14 CE 15 14 CE 15 14 CE 15 14 CE 15 14 CE 15 16 16 16 16 16 16 16 16 16 16	23 C c g/100g %K 16.7 16 15.5 13.9 14.2 13.6 13.6 13.6 13.6 13.6 13.6 13.6 13.7 23 23 23 23 23 23 23 23 23 23 23 23 23	44 * %Mg 15 19 2 19 14 19 2 19 15 28 15 18 2 15 15 18 2 15 15 18 15 18 2 15 15 18 15 18 15 18 15 18 15 18 15 18 15 19 15 21 15 19 15 21 15 19 15 21 15 19 15 21 15 19 15 21 15 21 15 19 15 21 15 19 15 21 15 19 15 21 15 21 15 19 15 21 15 21 15 19 15 21 15 21 15 19 15 21 15 19 15 21 15 18 15 19 15 21 15 18 16 19 15 21 15 18 18 19 15 18 18 19 18 18 18	%Ca %H %Ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alu ppm ppm 9 7 %Ca %H 5 72.2 7 %Ca 5 72.2 7 %Ca 6 80.2 6 70.8 6 85.4 6 60.7 Copper Copper	44 %Na 6.9 4.5 12.8 12.8 2.2 4.5 60 60 %Na 7.6 8.8 12.8 20.4 7.4 7.4	ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	pm Mn pp 1.9 2.5 1.4 1.8 2.2 2.2 2.2 2.2 3.2 4.7 7 2 1.4 2.5 1.4 1.5 2 1.4 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	gnese Iron i om ppm 11 18 14 12 12 14 15 15 10 14 16 10 16	Ppm 95 103 102 101 93 103 88 Fe Copp 92 99 99 115 109 100	0.9 ppm 0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 1.5 0.8 1 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1	%AI 1034 1123 1126 1100 1042 1049 &228 %AI 1022 1079 918 1040 999 970	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 9.3 0.07 0.0 9.9 0.08 8 0.1 8.9 C:N Ratio 0.07 9.0 0.05 0.07
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25516 C25516 Sample Number C13 2015 C13 C14 2015 C14 2015 C15	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9- C12) Description Pre-mulch 2015 Post mulch Fall 2016 Pre-mulch 2015 Post mulch Fall 2016 Prest mulch Fall 2016 Spring 2016 composite sample (C14-C15)	soil soil soil soil soil soil soil soil	1.62 Organic Phose 6.8 6.7 5.7 5.9 6.1 7.1 Nitrogen Suffur 2.62 Organic Phose 0.8 9.9 10.4 0.4 9.9 10.4	0.17 ohorus P- Bicarb Potas 3 9 2 6 4 4 8 7 Phosp 0.21 ohorus P- Potas 4 5 4 8 5 15 7	0.21 Magnes sium K ppm Mg ppm 96 127 87 109 86 87 106 Potassiu 6,17 Mg pm Mg pm 55 57 73 89 90	3.4.1 m Calcium Ca ppm 395 370 325 325 325 325 335 345 m Magnesium 2.46 ppm 340 343 343 343 344 340 345 345 345 345 345 345 345 345	0.24 0. Sodium N ppm 2390 2390 2390 2210 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 0.51 3. 3. Sodium N ppm 2210 3. 3. 3. 3. 3. 3. 3. 3. 3. 3.	A Constant of the second secon	5 3 CE pH Buffer me 6.9 7 8 6.9 8 Boron Zin 5 14 CE pH Buffer me 5 6.9 8 6.9 14 CE 6.9 14 CE 6.9 14 CE 6.9 14 CE 8 6.9 14 CE 14 CE 14 CE 14 CE 14 CE 14 CE 14 CE 14 CE 15 14 CE 15 14 CE 15 14 CE 15 14 CE 15 14 CE 15 16 16 16 16 16 16 16 16 16 16	12 C 13/100g %K 16.7 15.5 13.9 14.2 14.6 13.6 Mangan c cp pm pm 23 23 C c;g/100g %K 15.3 14.1 15.7 15.7 15.7 17.4 15.7 15.7 19.4	44 * * %Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 18 1.8 18 1.8 18 1.8 18 1.8 18 1.8 18 1.8 18 1.4 19 1.4 19 1.5 21 1.5 31 1.5 21 1.5 11 1.8 18 1.8 18 1.1 1.6 17 1.1 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	%Ca %H %Ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 3 78.5 Copper Alu ppm ppm 9 7 %Ca %H 5 72.2 7 %Ca 5 72.2 7 %Ca 6 80.2 6 70.8 6 85.4 6 60.7 Copper Copper	44 %Na 6.9 4.5 12.8 8.2 4.5 Chlorid 60 %Na 7.6 8.8 12.8 20.4 7.4	ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2	gnese Iron I m ppm 11 18 14 15 15 10 10 10 16 14	95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1	%AI 1034 1123 1126 1100 1042 1049 &228 %AI 1022 1079 918 1040 999 970	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25516 Sample Number C13 2015 C13 C14 C15 2015 C15 C15 2016	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch fall 2016 Pre-mulch 2015 Post Mulch fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9-C12) Description Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Pre-	soil soil soil soil soil soil soil e soil soil soil soil soil soil soil soil	1.62 Organic 6.8 6.8 5.7 5.7 5.9 6.1 7.1 Nitrogen Sulfur 6.8 0.7 0.7 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.17 ohorus P- Bicarb Potas 9 2 6 4 4 8 7 0.21 0.21 ohorus P- ohorus P- ohorus P- otas 5 4 5 5 7 7 7	0.21 Magnes 96 127 87 109 86 87 109 86 87 0 109 0 86 87 0 0 0 127 89 90 120 120 120 120	3.41 Calcium Ca pm 395 370 385 325 325 325 325 325 325 325 32	0.24 0. Sodium N ppm 2390 2390 2290 22140 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 2170	A Constant of the second secon	5 3 CE pH Buffer me 6.9 7 7 8 6.9 8 Boron Zin 5 14 CE pH Buffer me 6.9 8 8 8 6.9 14 CE 6.9 14 CE 9 8 8 6.9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 14 CE 9 14 14 14 14 14 14 14 14 14 14	C (y) 100g %K 16.7 15.5 13.9 14.2 14.6 13.6 13.6 13.6 13.6 13.7 13.9 14.2 13.6 13.9 14.2 13.6 13.9 13.6 13.7 14.2 13.7 14.1 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 19.4 Mangan 15.7	44 * %Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 18 2 19 1.5 38 1.8 18 0.9 16 1.8 18 0.9 16 1.4 19 1.1 13 1.4 19 1.1 13 1.6 17 mese Iron ppn	% 5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 ppm ppm 9 7 %ca %H 5 72.2 7 %ca 5 72.2 7 69.2 3 62 1 70.8 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7	44 %Na 6.9 4.5 12.8 8.2 4.5 Chlorid 60 %Na 7.6 8.8 12.8 20.4 7.4 %Na 7.6 8.8 12.8 20.4 7.4 %Na 60 %Na 60 %Na 60 %Na 7.6 5 7.6 %Na 7.6 %Na 7.6 %Na 7.5 %Na ***********************************	ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2	gnese Iron I m ppm 11 18 14 15 15 10 10 10 16 14	95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1	%AI 1034 1123 1126 1100 1042 1049 &228 %AI 1022 1079 918 1040 999 970	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25516 C25516 Sample Number C13 2015 C13 C14 2015 C14 2015 C15	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9- C12) Description Pre-mulch 2015 Post mulch Fall 2016 Pre-mulch 2015 Post mulch Fall 2016 Prest mulch Fall 2016 Spring 2016 composite sample (C14-C15)	soil soil soil soil soil soil soil soil	1.62 Organic Phose 6.8 6.7 5.7 5.9 6.1 7.1 Nitrogen Sulfur 2.62 Organic Phose 5.9 6.8 5.9 6.1 7.1 Nitrogen Sulfur 6.8 5.9 6.1 7.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0	0.17 ohorus P- Bicarb Potas 3 9 2 6 4 4 8 7 Phosp 0.21 ohorus P- Potas 4 5 4 8 5 15 7	0.21 Magnes sium K ppm Mg ppm 96 127 87 109 86 87 109 86 87 109 86 87 0.17 Mg pm Mg ppm Mg ppm 55 55 73 89 90	3.41 Calcium Ca pm 395 370 385 325 325 325 325 325 325 325 32	0.24 0. Sodium N ppm 2390 2390 2290 22140 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 2170	Ja pH 13 6.5 14 7.3 15 7.3 15 7.3 14 7.3 Sodium	5 3 CE pH Buffer me 6.9 7 7 8 6.9 8 Boron Zin 5 14 CE pH Buffer me 6.9 8 8 8 6.9 14 CE 6.9 14 CE 9 8 8 6.9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 14 CE 9 14 14 14 14 14 14 14 14 14 14	23 C c g/100g %K 16.7 16 15.5 13.9 14.2 13.6 13.6 13.6 13.6 13.6 13.6 13.6 13.7 23 23 23 23 23 23 23 23 23 23 23 23 23	44 * %Mg 15 19 2 19 14 19 2 19 15 28 15 18 2 15 15 18 2 15 15 18 15 18 2 15 15 18 15 18 15 18 15 18 15 18 15 18 15 19 15 21 15 19 15 21 15 19 15 21 15 19 15 21 15 19 15 21 15 21 15 19 15 21 15 19 15 21 15 19 15 21 15 21 15 19 15 21 15 21 15 19 15 21 15 21 15 19 15 21 15 19 15 21 15 18 15 19 15 21 15 18 16 19 15 21 15 18 18 19 15 18 18 19 18 18 18	% 5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 ppm ppm 9 7 %ca %H 5 72.2 7 %ca 5 72.2 7 69.2 3 62 1 70.8 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7	44 %Na 6.9 4.5 12.8 12.8 2.2 4.5 60 60 %Na 7.6 8.8 12.8 20.4 7.4 7.4	ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2	gnese Iron I m ppm 11 18 14 15 15 10 10 10 16 14	95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1	%AI 1034 1123 1126 1100 1042 1049 &228 %AI 1022 1079 918 1040 999 970	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25516 Sample Number C13 2015 C13 C14 C15 2015 C15 C15 2016	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch fall 2016 Pre-mulch 2015 Post Mulch fall 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9-C12) Description Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Pre-	soil soil soil soil soil soil soil e soil tissue soil soil soil soil soil soil soil soil	1.62 Organic 6.8 6.8 5.7 5.7 5.9 6.1 7.1 Nitrogen Sulfur 6.8 0.7 0.7 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.17 ohorus P- Bicarb Potas 9 2 6 4 4 8 7 0.21 0.21 ohorus P- ohorus P- ohorus P- otas 5 4 5 5 7 7 7	0.21 Magnes 96 127 87 109 86 87 109 86 87 0 109 0 86 87 0 0 0 127 89 90 120 120 120 120	3.41 Calcium Ca pm 395 370 385 325 325 325 325 325 325 325 32	0.24 0. Sodium N ppm 2390 2390 2290 22140 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 0.51 3. Sodium N ppm 2210 2170	A Constant of the second secon	5 3 CE pH Buffer me 6.9 7 8 8 Boron ppm Zin 5 14 CE pH Buffer me 6.9 8 8 Boron 5 14 CE 9 8 6.9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 15 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 15 14 CE 9 14 CE 9 14 CE 9 15 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 14 CE 9 15 14 CE 9 14 CE 9 15 15 16 7 16 7 16 7 16 7 16 7 16 7 7 7 7 7 7 7 7 7 7 7 7 7	C (y) 100g %K 16.7 15.5 13.9 14.2 14.6 13.6 13.6 13.6 13.6 13.7 13.9 14.2 13.6 13.9 14.2 13.6 13.9 13.6 13.7 14.2 13.7 14.1 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 19.4 Mangan 15.7	44 * %Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 18 2 19 1.5 38 1.8 18 0.9 16 1.8 18 0.9 16 1.4 19 1.1 13 1.4 19 1.1 13 1.6 17 mese Iron ppn	% 5 5 %ca %H 7 71.6 2 73.9 6 65.8 5 65.4 1 68.8 6 74.9 ppm ppm 9 7 %ca %H 5 72.2 7 %ca 5 72.2 7 69.2 3 62 1 70.8 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7 6 80.7	44 %Na 6.9 4.5 12.8 8.2 4.5 Chlorid 60 %Na 7.6 8.8 12.8 20.4 7.4 %Na 7.6 8.8 12.8 20.4 7.4 %Na 60 %Na 60 %Na 60 %Na 7.6 5 7.6 %Na 7.6 %Na 7.6 %Na 7.5 %Na ***********************************	ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2	gnese Iron I m ppm 11 18 14 15 15 10 10 10 16 14	95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1	%AI 1034 1123 1126 1100 1042 1049 828 %AI 1022 1079 918 1040 999 970	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6
C03516 Sample Number C10 2015 C10 C12 2015 C12 C25 2016 C25516 Sample Number C13 2015 C13 C14 C15 2015 C15 C15 2016	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fall 2016 Pre-mulch 2015 Post Mulch fall 2016 Pre-mulch 2015 Post Mulch Fall 2016 Composite clover sample (C9-C12) Composite clover sample (C9-C12) Description Pre-mulch 2015 Post Mulch Fall 2016 Pre-mulch 2015 Composite clover sample (C14-C15) Composite clover sample (C14-C14)	soil soil soil soil soil soil soil e soil tissue soil soil soil soil soil soil soil soil	1.62 Organic 6.8 6.8 5.7 5.7 5.9 6.1 7.1 Nitrogen Sulfur 6.8 0.7 0.7 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	0.17 ohorus P- Bicarb Potas 9 2 6 4 4 8 7 0.21 0.21 ohorus P- ohorus P- ohorus P- otas 5 4 5 5 7 7 7	0.21 Magnes 96 127 87 109 86 87 109 86 87 0 109 0 86 87 0 0 0 127 89 90 120 120 120 120	3.41 ium Calcium Ca ppm 335 345 345 345 345 345 345 2.46 ium Calcium Ca 345 345 345 345 345 345 345 345	0.24 0. Sodium N ppm 2330 2330 2330 2330 2330 2330 2330 2330 2330 2330 2330 2340 2340 2140	A Constant of the second secon	5 3 pH Buffer m 6 9 7 7 8 8 8 8 9 9 9 14 15 15 15 15 15 15 15 15 15 15	C (y) 100g %K 16.7 15.5 13.9 14.2 14.6 13.6 13.6 13.6 13.6 13.7 13.9 14.2 13.6 13.9 14.2 13.6 13.9 13.6 13.7 14.2 13.7 14.1 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 17.4 15.7 19.4 Mangan 15.7	44 * %Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 18 2 19 1.5 38 1.8 18 0.9 16 1.8 18 0.9 16 1.4 19 1.1 13 1.4 19 1.1 13 1.6 17 mese Iron ppn	%ca %fa 7 71.6 7 73.9 6 65.8 5 55.4 6 74.9 3 78.5 Copper Aluin 9 7 9 7 7 56.2 9 7 7 62 1 70.8 6 80.7 Copper Aluin 7 68.2 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 6 </td <td>44 %Na 6.9 4.5 12.8 8.2 4.5 Chlorid 60 %Na 7.6 8.8 12.8 20.4 7.4 %Na 7.6 8.8 12.8 20.4 7.4 %Na 60 %Na 60 %Na 60 %Na 7.6 5 7.6 %Na 7.6 %Na 7.6 %Na 7.5 %Na ***********************************</td> <td>ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5</td> <td>рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2</td> <td>gnese Iron I m ppm 11 18 14 15 15 10 10 10 16 14</td> <td>95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81</td> <td>0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9</td> <td>% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2</td> <td>ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1</td> <td>%AI 1034 1123 1126 1100 1042 1049 828 %AI 1022 1079 918 1040 999 970</td> <td>Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1</td> <td>C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6</td>	44 %Na 6.9 4.5 12.8 8.2 4.5 Chlorid 60 %Na 7.6 8.8 12.8 20.4 7.4 %Na 7.6 8.8 12.8 20.4 7.4 %Na 60 %Na 60 %Na 60 %Na 7.6 5 7.6 %Na 7.6 %Na 7.6 %Na 7.5 %Na ***********************************	ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2	gnese Iron I m ppm 11 18 14 15 15 10 10 10 16 14	95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1	%AI 1034 1123 1126 1100 1042 1049 828 %AI 1022 1079 918 1040 999 970	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6
CO3S16 Sample Number C10 2015 C10 C11 2015 C11 C12 2015 C25 2016 CC2S16 Sample Number C13 2015 C14 2015 C15 2016 C15 2016 CC1S16	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post Mulch fail 2016 Pre-mulch 2015 Post Mulch fail 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9-C12) Description Pre-mulch 2015 Post Mulch fail 2016 Pre-mulch 2015 Post mulch fail 2016 Spring 2016 composite sample (C14-C15) Composite clover sample (C14 C15) Overall site composite sample (C14) C15	soil soil soil soil soil soil soil soil	1.62 Matter 6.8 5.7 5.7 5.9 6.1 0.1 0.1 Nitrogen Suffur 2.62 Organic Phose 5.9 0.4 7.4 4.9 7.7 Nitrogen Suffur 7.7 Nitrogen Suffur 7.7 7.7 Nitrogen Suffur 7.7 Nitrogen Suffur	0.17 shorus P- Bicarb 9 2 6 4 8 4 7 Phose 4 5 4 8 5 4 5 4 5 4 5 4 7 7 Phose 7 0.23	0.21 Magnes sium K ppm Mg ppm 96 127 87 109 86 87 109 0 0 0 0 100 53 38 90 100 53 73 89 90 100 53 73 89 90 0 120 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.41 ium Calcium Ca ppm 335 345 345 345 345 345 345 2.46 ium Calcium Ca 345 345 345 345 345 345 345 345	0.24 0. Sodium N ppm 2330 2330 2330 2330 2330 2330 2330 2330 2330 2330 2330 2340 2340 2140	A Construction of the second s	5 3 pH Buffer m 6 9 7 7 8 8 8 8 9 9 9 14 15 15 15 15 15 15 15 15 15 15	23 24 27 26 27 27 28 29 20 20 20 50 50 50 50 50 50 50 50 50 50 50 50 50	44 : 5 Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 22 1.5 22 1.5 22 1.5 23 1.5 23 1.3 18 18 1.3 18 18 1.3 18 18 1.4 19 1.1 15 18 1.5 19 1.1 15 1.5 19 1.3 18 18 1.1 15 1.1 15 1.5 19 1.1 15 1.5 19 1.1 15 1.5 19 1.5 19 1.3 18 18 1.1 15 1.6 17 1.1 15 1.6 17 1.6	%ca %fa 7 71.6 7 73.9 6 65.8 5 55.4 6 74.9 3 78.5 Copper Aluin 9 7 9 7 7 56.2 9 7 7 62 1 70.8 6 80.7 Copper Aluin 7 68.2 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 6 </td <td>44 5.9 4.5 12.8 8.2 4.5 12.8 8.2 4.5 60 60 7.6 8.8 12.8 20.4 7.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 5 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8</td> <td>ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5</td> <td>рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2</td> <td>gnese Iron 1 m ppm 11 18 14 15 15 10 10 16 14</td> <td>95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81</td> <td>0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9</td> <td>% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2</td> <td>ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1</td> <td>%AI 1034 1123 1126 1100 1042 1049 828 %AI 1022 1079 918 1040 999 970</td> <td>Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1</td> <td>C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6</td>	44 5.9 4.5 12.8 8.2 4.5 12.8 8.2 4.5 60 60 7.6 8.8 12.8 20.4 7.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 5 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8	ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2	gnese Iron 1 m ppm 11 18 14 15 15 10 10 16 14	95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1	%AI 1034 1123 1126 1100 1042 1049 828 %AI 1022 1079 918 1040 999 970	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6
CO3S16 Sample Number C10 2015 C10 C11 2015 C11 C12 2015 C25 2016 CC2S16 Sample Number C13 2015 C14 2015 C15 2016 C15 2016 CC1S16	Composite oat sample (C4-C9) Description Pre-mulch 2015 Post mulch fail 2016 Pre-mulch 2015 Post Mulch fail 2016 Pre-mulch 2015 Post Mulch fail 2016 Spring 2016 composite sample (C10-C12) Composite clover sample (C9-C12) Description Pre-mulch 2015 Post Mulch fail 2016 Pre-mulch 2015 Post mulch fail 2016 Spring 2016 composite sample (C14-C15) Composite clover sample (C14-C15) C000000000000000000000000000000000000	soil soil soil soil soil soil soil soil	1.62 Matter 6.8 5.7 5.7 5.9 6.1 0.1 0.1 Nitrogen Suffur 2.62 Organic Phose 5.9 0.4 7.4 4.9 7.7 Nitrogen Suffur 7.7 Nitrogen Suffur 7.7 7.7 Nitrogen Suffur 7.7 Nitrogen Suffur	0.17 shorus P- Bicarb 9 2 6 4 8 4 7 Phose 4 5 4 8 5 4 5 4 5 4 5 4 7 7 Phose 7 0.23	0.21 Magnes sium K ppm Mg ppm 127 87 109 86 87 106 0.17 0.17 0.17 0.17 0.17 100 55 73 89 90 100 53 73 89 90 0.18	3.41 Calcium Ca pm 395 370 385 325 325 331 325 331 325 335 335 340 340 340 340 340 340 340 340	Sodium N ppm 2390 2330 2340 2040 2240 22140 22140 22140 3 Calcium N ppm 2210 22140 3 Calcium N 2210 2140 3 Calcium N 2210 2140 2140 2150 2140 2150 2140 2150 2140 2150 2150 2150 2150 2150 2150 2150 215	A Construction of the second s	5 3 CE pH Buffer me 6.9 8 Boron Zin 5 14 CE pH Buffer me 6.9 8 Boron Zin 6.7 6.7 6.7 6.7 6.7 6.7 6.7 6.7	23 24 27 26 27 27 28 29 20 20 20 50 50 50 50 50 50 50 50 50 50 50 50 50	44 * %Mg 1.5 19 2 19 1.4 19 2 19 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 21 1.5 32 1.5 18 2 19 1.5 32 1.5 18 2 19 1.5 32 1.5 18 1.5 32 1.5 32 1.5 18 1.5 32 1.5 32 1.5 32 1.5 19 1.5 21 1.5 21 1.6 1.1 15 1.1 15	%ca %fa 7 71.6 7 73.9 6 65.8 5 55.4 6 74.9 3 78.5 Copper Aluin 9 7 9 7 7 56.2 9 7 7 62 1 70.8 6 80.7 Copper Aluin 7 68.2 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 7 9 6 </td <td>44 5.9 4.5 12.8 8.2 4.5 12.8 8.2 4.5 60 60 7.6 8.8 12.8 20.4 7.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 5 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8</td> <td>ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5</td> <td>рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2 2 1.4 2.5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2</td> <td>gnese Iron 1 m ppm 11 18 14 15 15 10 10 16 14</td> <td>95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81</td> <td>0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9</td> <td>% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2</td> <td>ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1</td> <td>%AI 1034 1123 1126 1100 1042 1049 828 %AI 1022 1079 918 1040 999 970</td> <td>Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1</td> <td>C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6</td>	44 5.9 4.5 12.8 8.2 4.5 12.8 8.2 4.5 60 60 7.6 8.8 12.8 20.4 7.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 12.8 20.4 7.4 5 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8	ppm ;).3 7).3 7).3 7).4 5).4 8 0.4 6 .4 6 .5 .5 .5 .5 .5 .5 .5 .5 .5 .5	рт Мпрр 1.9 2.5 1.4 1.5 2 2 2.2 2.2 2.2 1.4 4.5 5.7 2 1.4 2.5 1.8 2 2 1.4 2.5 1.8 2 2 2 1.4 2.5 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	gnese Iron 1 m ppm 11 18 14 15 15 10 10 16 14	95 103 102 101 93 103 103 88 88 99 99 99 115 109 100 81	0.9 1.1 0.8 0.9 0.8 1 0.7 0.7 0.9 1.5 0.8 1 0.9 0.9 0.9 0.9	% P 0.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	ppm 2 2 2 ation Alumint ppm 1 1 1 1 1 1 1 1 1 1	%AI 1034 1123 1126 1100 1042 1049 828 %AI 1022 1079 918 1040 999 970	Ratio 0.1 0.1 0.1 0.2 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1	C:N Ratio 0.08 0.1 0.3 0.07 0.08 8 0.1 8.9 0.08 0.07 0.1 9 0.5 0.07 0.07 0.07 0.07 0.08 8.6

2016 Temiskaming Project Summary

Percentage Base Saturation

Percentage Base Saturation

 Organic
 Phosphorus P Potassium K
 Magnesium
 Calcium Ca
 Sodium
 CEC
 Sulphur S
 Zinc Zn
 Managnese
 Iron Fe
 Copper
 Boron B
 Saturation
 Aluminum
 Saturation
 K/Mg

 Description
 Matter
 ppm Bicarb
 ppm
 Mg ppm
 ppm
 Na ppm
 pH
 PH Buffer
 meg/100g
 %K
 %Mg
 %Ca
 %H
 %Na
 ppm
 Mn ppm
 ppm
 %P
 Al ppm
 %Al
 Ratio
 C/N Ratio

 Average pre-mulch
 Soil
 7.035
 35.5
 2371.666667
 12.75
 7.35
 0
 15.55
 0.666666666667
 19.09167
 76
 4
 0.366667
 25.583333
 92.41667
 10.33333
 0.191667
 8.8
 8.8
 0.066667
 0.303833
 0.0666667
 0.035833
 0.0666667
 0.035833
 0.0666667
 0.035833
 0.0666667
 0.037833
 0.051667
 0.038126
 0.03785
 9.4375
 0.0425
 6.5625
 2.01875
 22.375
 86.3125
 0.05125
 0.05187

Sample			Organic	Phosphorus	P- Potassium K	Magnesiur	n Calcium Ca	Sodiu	m		CEC					Su	Iphur S Zind	Zn	Managnese	Iron Fe	Coppe	er Boron	B Saturation	Aluminur	n Saturation	л K/N	Mg	
Number	Description	Type	Matter	ppm Bicarb	ppm	Mg ppm	ppm	Na pp	m pH	pH But	fer meg/100g %K	%	Me %	ca %H	%N				-	ppm	Cu pp		% P	Al ppm	%AI	Rat		:N Ratio
T1	Pre mulch 2015	soil	6.2		5			930	12	7.8	17.5	0.8	15.3	83.8		0.3	9	1.8	26	7			0.1	1 7	19	0	0.05	
T1	Post mulch fall 2016	soil	6.8		5	58 3	70 2	660	19	7.8	16.6	0.9	18.6	80.2		0.5	7	2.2	21	8	9	1.1	0.2	8	36	0	0.05	9.7
T2	Pre mulch 2015	soil	7.1		4			010	13	7.6	18.3	0.6	17.1	82.2		0.3	8	1.7	26	9	0		0.2		18	0	0.04	
T2	Post mulch fall 2016	soil	7.9	•	5	43 3	10 1	940	12	7.5	12.4	0.9	20.8	78.2		0.4	6	2	14	8			0.2	1 7	56	0.1	0.04	11.3
T3	Pre mulch 2015	soil	7.4		5			490	14	7.7	15.7	0.7	19.9	79.3		0.4	11	1.8	15	8			0.3		57	0	0.04	
Т3	Post mulch fall 2016 Post mulch spring 2016	soil	6.8	5	5	60 3	80 2	750	16	7.6	17.1	0.9	18.5	80.4		0.4	7	2.1	22	9	0	1.1	0.2	7	66	0	0.05	9.4
T1S16	composite (T1-T3)	soil	6.9)	5	65	355 2	330	14	7.7	14.8	1.1	20	78.7		0.4	6	2.1	21	8	3	0.9	0.3	7	56	0	0.06	9.8
T4	Pre mulch 2015	soil	8.6	;	5	44 3	75 2	640	13	7.2	17.3	0.7	18.1	76.4	4.5	0.3	10	1.6	28	10	2	1.3	0.2	1 8	32	0.1	0.04	
T4	Post mulch fall 2016	soil	7.2	1	5	52 3	40 2	530	13	7.8	15.6	0.9	18.1	80.9		0.4	7	1.7	25	8	2	1.1	0.2	8	02	0	0.05	8.4
T5	Pre mulch 2015	soil	5.8	1	4	28 3	35 2	090	14	7.4	13.3	0.5	20.9	78.3		0.5	6	1.3	30	8	8	0.9	0.1	7	93	0.1	0.02	
T5	Post mulch fall 2016	soil	6.7	,	5	49 3	60 2	290	13	7.5	14.6	0.9	20.6	78.5		0.4	6	1.9	23	9	0	1	0.1	1 8	56	0.1	0.04	10.1
T6	Pre mulch 2015	soil	6.8	1	4	31 3	35 2	380	11	7.6	14.8	0.5	18.9	80.5		0.3	7	1.4	24	8	7	0.9	0.2	7	38	0	0.03	
T6	Post mulch fall 2016	soil	5.8	1	4	51 2	95 2	880	15	7.9	17	0.8	14.4	84.6		0.4	6	2	25	8	2	0.9	0.2	e	51	0	0.06	8.6
	Post mulch spring 2016																											
T2S16	composite (T4-T6)	soil	6.5		5	64 3	50 2	680	14	7.8	16.5	1	17.7	81.2		0.4	6	2	27	8	6	1	0.4	6	62	0	0.06	10.9
T7	Pre mulch 2015	soil	6.1	L	4	38 3	75 2	390	13	7.2	15.9	0.6	19.6	74.9	4.5	0.4	7	1.6	32	9	0	1	0.2	1 7	88	0.1	0.03	
T7	Post mulch fall 2016	soil	4.9	•	5	55 3	30 1	960	13	7.5	12.7	1.1	21.6	77.1		0.4	7	1.7	22	9	3	1	0.2	1 9	73	0.1	0.05	8.3
Т8	Pre mulch 2015	soil	5		4	29 2	90 1	560	14	7	11.9	0.6	20.4	65.7	12.8	0.5	8	1.7	23	10	0	0.8	0.1	1 8	98	0.1	0.03	
Т8	Post mulch fall 2016	soil	8	:	5	56 3	65 2	350	14	7.5	15	1	20.3	78.6		0.4	7	2.2	24	8	8	1.1	0.2	1 8	03	0	0.05	7.3
Т9	Pre mulch 2015	soil	8.4	L .	5	38 3	55 2	220	11	7	16.3	0.6	18.2	68.1	12.8	0.3	9	1.6	24	9	8	1	0.2	1 7	61	0.1	0.03	
Т9	Post mulch fall 2016	soil	8.8		8	57 3	60 2	640	14	7.5	16.4	0.9	18.3	80.6		0.4	7	1.8	25	8	5	1.2	0.3	1 8	91	0	0.05	8.3
	Post mulch spring 2016																											
T3S16	composite (T7-T9)	soil	6.6	5	5	60 3	15 2	020	13	7.5	12.9	1.2	20.3	78.3		0.4	6	2.1	23	8	9	0.9	0.3	1 7	94 .	0.1	0.06	10.2
T10	Pre mulch 2015	soil	8.9	•	14	49 3	85 2	590	12	7.1	17.9	0.7	17.9	72.3	8.9	0.3	10	2.1	25	10	0	1.1	0.3	3 9	15	0.1	0.04	
T10	Post mulch fall 2016	soil	10.7	,	7	56 3	75 2	660	16	7.7	16.6	0.9	18.8	80.1		0.4	8	2.3	21	8	2	1.2	0.2	1 8	22	0	0.05	11
T11	Pre mulch 2015	soil	6.6	5	6	43 3	35 1	960	13	7.2	13.4	0.8	20.9	73.4	4.5	0.4	9	1.8	30	9	6	1	0.2	1 8	83	0.1	0.04	
T11	Post mulch fall 2016	soil	7.9	•	7	43 2	90 1	950	13	7.5	12.3	0.9	19.6	79.3		0.5	6	2.1	21	8	4	0.9	0.2	1 7	91	0.1	0.05	8.9
T12	Pre mulch 2015	soil	8.1	L	6	49 3	75 2	200	13	7.4	14.3	0.9	21.9	77.1		0.4	8	1.6	24	9	3	1.1	0.2	1 9	04	0.1	0.04	
T12	Post mulch fall 2016	soil	6.8		7	60 3	75 2	300	16	7.8	14.8	1	21.1	77.7		0.5	7	1.9	23	8	5	1.1	0.2	1 8	81	0	0.05	7.6
	Post mulch spring 2016																											
T4S16	composite (T10-T12)	soil	8.4	L .	5	63 3	50 2	430	16	7.5	15.3	1.1	19.1	79.6		0.5	6	2.2	21	8	5	0.9	0.3	1 7	38	0	0.06	11.2
										Boron					ninum													
					Phosphorou						Zinc ppm ppm		on ppm pp	om ppm		loride												
TOS16	composite oat sample		2.08	0	21 0	0.17 2	.95	0.3	1.01	0.1	7 19	41	126	7	83													
TBS16	composite buckwheat sample		2.04		18 0	0.26 1	.69 (0.57	2.08	0.04	11 22	195	187		547													
TCS16			2.04						3.26	0.04	11 22 12 25	195 68	187	8	27													
10210	composite clover sample		3.66	, 0	10	0.2 2	./1 (101	5.20	0.02	12 25	00	102	ō	27													