How bale grazing effects soil nutrients

DRAFT


Photo 1

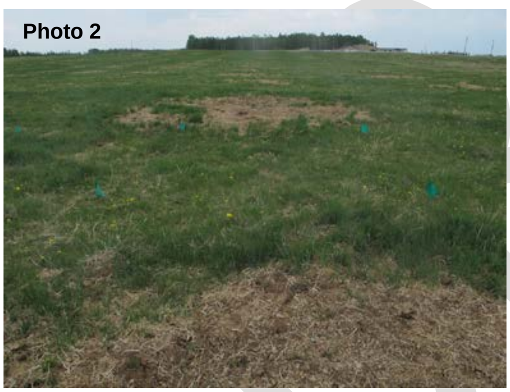
Photo 2


Photo 3

With support from the Alberta Crop Industry Development Fund (ACIDF), Agriculture and Agri-Food Canada (AAFC) initiated a study to determine if bale grazing twice in a three year period had any positive or negative effects on soil nutrient levels.

Two old perennial pasture sites in Central Alberta were selected for study. Site one is located north of Caroline in the Dry Mixedwood Subregion of the Boreal Forest Natural Region on an Orthic Gray Luvisol while site two is located south of Vermilion in the Central Parkland Subregion of the Parkland Natural Region on a thin Black Chernozem.

Each site was bale grazed twice in three years (winter 2012/13 and winter 2014/15). Bale spacing for both treatments was 12.5 m (40 feet) with the second treatment offset from the first for better nutrient distribution. Following the 2014/2015 bale grazing, we tracked various soil nutrient parameters including nitrogen, phosphorus and potassium at the two 2014/15 bale locations at each location (one grazed early season and one late season 2014/2015).

Photo 1 shows the residue distribution immediately following the 2014/15 bale grazing (January 2015). By May, 2015 (Photo 2), forage had begun growing through the residue and by August 2015 (Photo 3), forage production on the areas dominated by residue early in the year were out-producing the 2012/2013 bale locations.

ACIDF

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Key Findings

Soil tests in 2016/17 revealed that soils under the 2014/15 bale locations were 78% more fertile than the 2012/13 bale locations (**bolded** numbers in Table below).

Soil Nutrients by Bale Grazing Year ***Does not Include Bale 1 or Bale 2 data**		Average Nutrient Values for Bales 1 - 10					
		Caroline			Vermilion		
		baseline	2016	2017	baseline	2016	2017
N Topsoil 2012/13	(ppm)	0.6	0.6	0.6	0.5	0.8	**4.5**
N Topsoil 2014/15	(ppm)	0.6	**2.9**	**1.1**	0.5	**1.0**	2.4
N Subsoil 2012/13	(ppm)	0.5	0.6	0.5	0.5	0.7	1.6
N Subsoil 2014/15	(ppm)	0.5	**5.7**	**1.8**	0.5	**5.6**	**2.6**
P Topsoil 2012/13	(ppm)	13.8	**16.5**	**17.5**	2.8	5.1	7.2
P Topsoil 2014/15	(ppm)	13.8	14.7	16.1	2.8	**7.0**	**9.4**
*P Subsoil 2012/13	(ppm)	-	9.9	**12.5**	-	2.4	3.6
*P Subsoil 2014/15	(ppm)	-	**10.8**	12.1	-	**3.4**	**4.0**
K Topsoil 2012/13	(ppm)	135	181	206	191	496	402
K Topsoil 2014/15	(ppm)	135	**566**	**294**	191	**576**	**463**
*K Subsoil 2012/13	(ppm)	-	124	**166**	-	246	200
*K Subsoil 2014/15	(ppm)	-	**193**	159	-	**248**	**268**
*TC Topsoil 2012/13	(%)	-	**2.16**	2.28	-	2.50	**2.76**
*TC Topsoil 2014/15	(%)	-	1.98	**2.44**	-	**2.68**	2.75
*TC Subsoil 2012/13	(%)	-	**0.58**	0.71	-	1.15	1.43
*TC Subsoil 2014/15	(%)	-	0.55	**0.91**	-	**1.45**	**1.48**

The soils at both locations were of low fertility. While improved by bale grazing, nitrogen and phosphorus levels remained low at both locations, regardless of when they were bale grazed. Baseline potassium levels were already high with bale grazing increasing them further. By 2017, Vermilion topsoil potassium values started to decline while Caroline levels continued to increase. By year three, nitrogen, phosphorus and potassium remained higher than baseline values thus proving that bale grazing can be used to improve soil fertility.

Bale grazing increased average Total Carbon (TC) from 2016 to 2017 at both locations. The reaction of soil carbon to winter bale grazing still requires further research to determine if there are significant and long lasting effects.

Title of the document

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