Salinity Soil Management *via* Perennial Cropping Systems

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Introduction

Salinity is caused by the translocation of water soluble salts in the soil that accumulate in a discharge area. Salts prevent crops' ability to uptake water and nutrients. These white spots are common along the landscape and reduce yields. The only way to manage salinity is through water management. Water management strategies can be drainage (subsurface and surface) or through cropping systems. Cropping system strategies include, high water use crops, cover cropping after harvest, and perennial cropping. A study at the North Central research Extension Center in Minot and near Bowbells was initiated in 2013 and 2014 respectively to look at perennial cropping effects on reducing soil salinity. Regardless of the management strategy, soil salinity will take three or more years to observe a significant improvement.

Electrical conductivity (E.C.) is the measurement of salinity. The E.C. units are mmhos/cm. Most crops will grow well when E.C. is 2 mmhos/cm or less. When salinity is greater, yield reduction is observed on salt sensitive crops like soybean, corn, and alfalfa. Salt tolerant alfalfa appears to grow well up to an E.C. of 3 mmhos/cm. Salt tolerant crops (barley, sunflower, canola, and sugar beet) may see a yield reduction, but can still fair well when the E.C. is 4 mmhos/cm. However, salt levels greater than this can greatly reduce yield and quality. When E.C. is greater than 5 mmhos/cm, salt tolerant perennial grasses like tall wheat grass, NewHy hybrid wheatgrass (AC Saltlander), western wheatgrass, and beardless wildrye have the best chance of establishing and using soil moisture.

Materials and Methods

Contour maps of the soil salinity were created by grid sampling (approximately every 50 feet) and measuring the E.C. (0-6 in depth) of the grid point. Latitude and longitude were recorded by G.P.S. at each soil sample location. This was done to see if E.C. changed from the perennial cropping management. The maps were created by QGIS (QGIS Development Team, 2002).

Results

When this study was initiated, a majority of both sites were too saline to support cash crop growth (Figure 1). Since the initiation of this project, the prevalence and severity of saline soils has greatly decreased at Minot (NCREC) and Bowbells (Figure 1). The average electrical conductivity at Bowbells decreased from 2.8 in 2015 to 1.8 mmhos/cm in 2019. The Minot mean E.C. decreased from 3.2 in 2013 to 1.0 mmhos/cm. The decrease in E.C. at all sites was significant at the 0.001 level (Table 1). This project will evaluate the salinity one more year and may convert the area back to a cash crop and continue to monitor soil salinity changes.

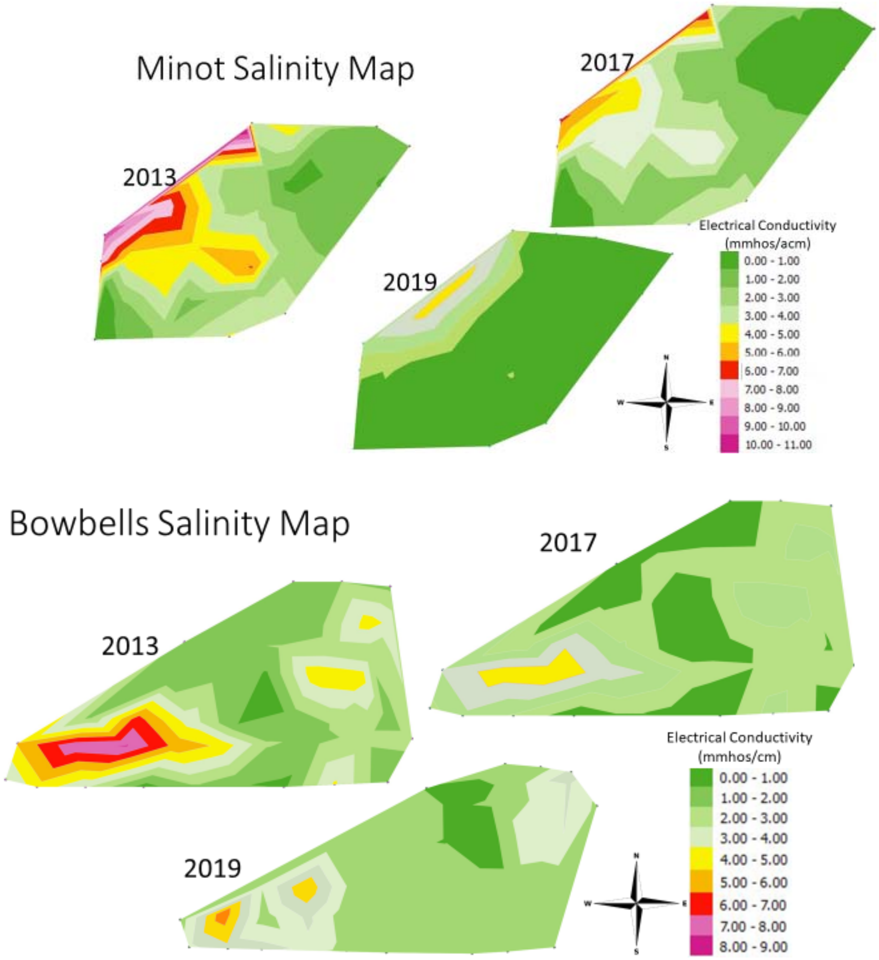

Figure 1. Salinity map of different years at Minot (NCREC) and Bowbells.

Table 1. Mean electrical conductivity, range, and P-value of the sites.

Site	Year	Mean	Minimum	Maximum	Median	P-value
		-Electrical Conductivity (mmhos/cm)-				
Bowbells	2015	2.8	0.5	8.1	2.1	<0.001
	2019	1.8	0.3	5.7	1.3	
Minot	2013	3.2	0.4	11.0	2.7	
	2019	1.0	0.2	4.5	0.6	