Evaluation of Perennial Grasses and Legumes Yield Across Salinity Gradients

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The Carrington Research Extension Center, USDA – Natural Resource Conservation Service Plant Materials Center – Bismarck, Foster and Stutsman County Soil Conservation Districts, and the North Dakota Natural Resource Conservation Service are conducting a demonstration in two locations near Carrington and one near Buchanan evaluating selected perennial grass and legume species establishment and yield over time across a salinity gradient.

Species List:

Smooth Bromegrass - Rebound
Meadow Bromegrass - Fleet
Canada Wild rye - Mandan
Beardless Wild rye – Shoshone
Tall Wheatgrass – Alkar
Slender Wheatgrass – Revenue
Western Wheatgrass – Rodan
Hybrid Wheatgrass - NewHy
Creeping Foxtail – Garrison
Switchgrass – Forestburg
Green Wheatgrass - AC Saltlander
AC Saltlander Commercial Mix
Prairie Cordgrass - Red River
Prairie Cordgrass - CREC Germplasm
Alfalfa – 12 varieties/lines
Strawberry Clover - O'Conners

Methods:

Salinity is a soil property referring to the amount of soluble salt in the soil. It is generally a problem of arid and semiarid regions. Electrical conductivity (EC) is the most common measure of soil salinity and is indicative of the ability of an aqueous solution to carry an electric current.

By agricultural standards, soils with an EC greater than 4 dS/m are considered saline. In actuality, salt-sensitive plants may be affected by conductivities less than 4 dS/m and salt tolerant species may not be impacted by concentrations of up to twice this maximum agricultural tolerance limit.

Sites were mapped for EC with a Veris machine and ground truthed with laboratory testing to determine the field gradient. This information was used to determine the proper placement and orientation of demonstration across the salinity gradient prior to seeding. Plots were seeded May 21, May 22, and June 10, 2010. Plots are 10 feet wide by 200 feet long.

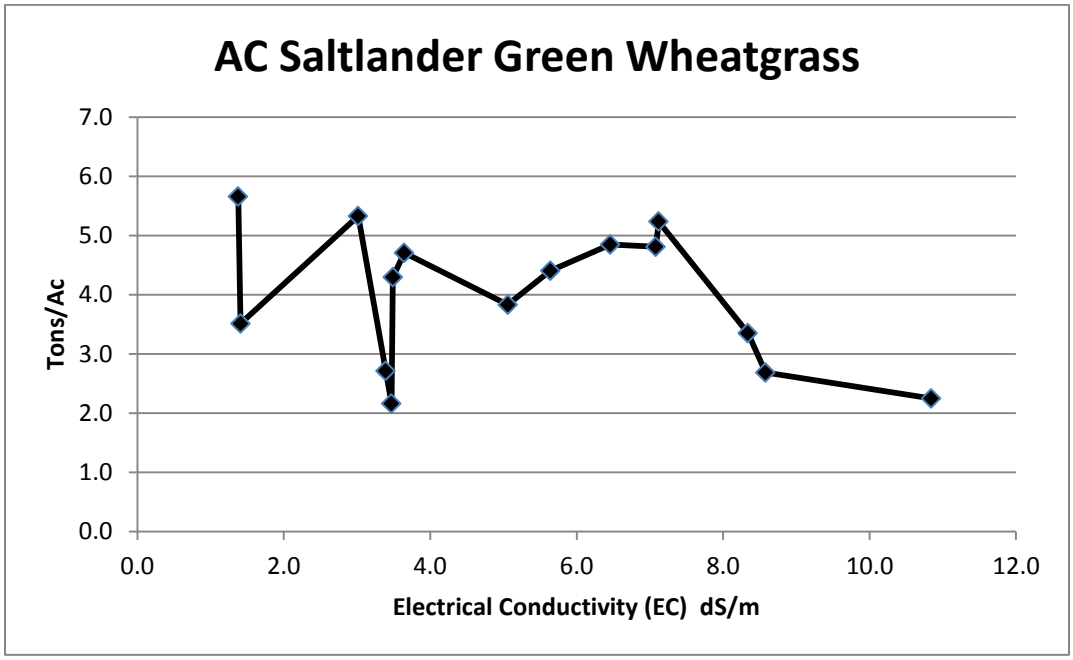
This demonstration will track salinity, stand, and forage production over several seasons to help determine the most appropriate species for various salinity levels and targeted end uses by personnel, landowners, and/or renters.

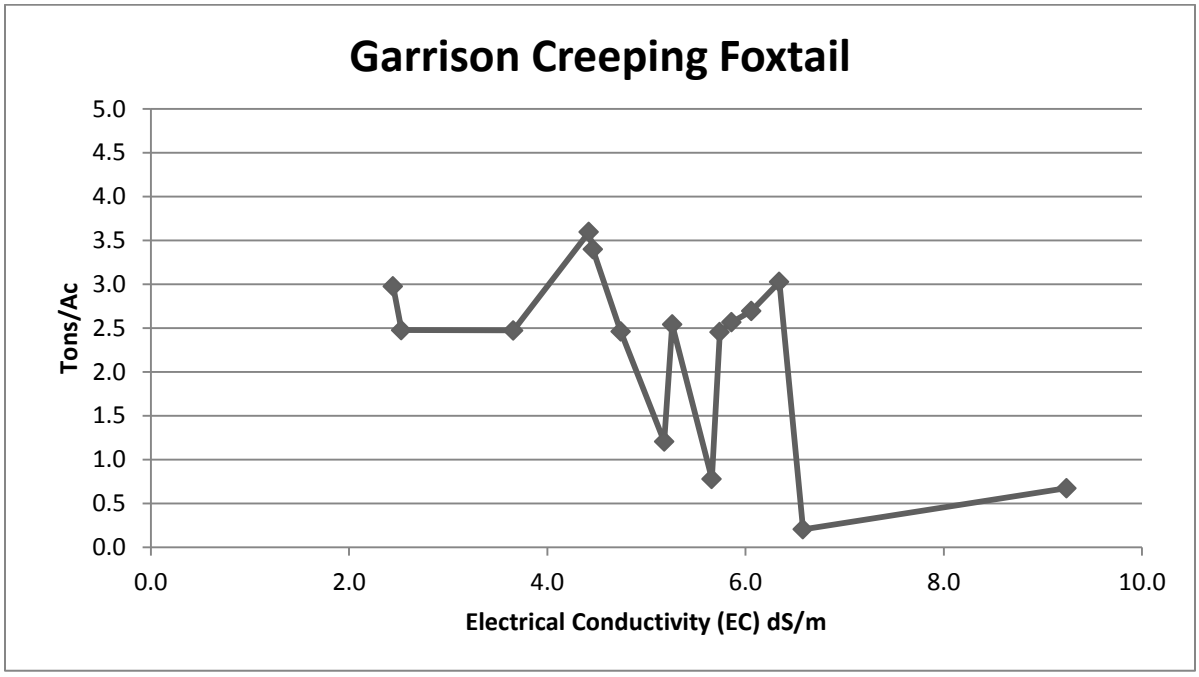
Results:

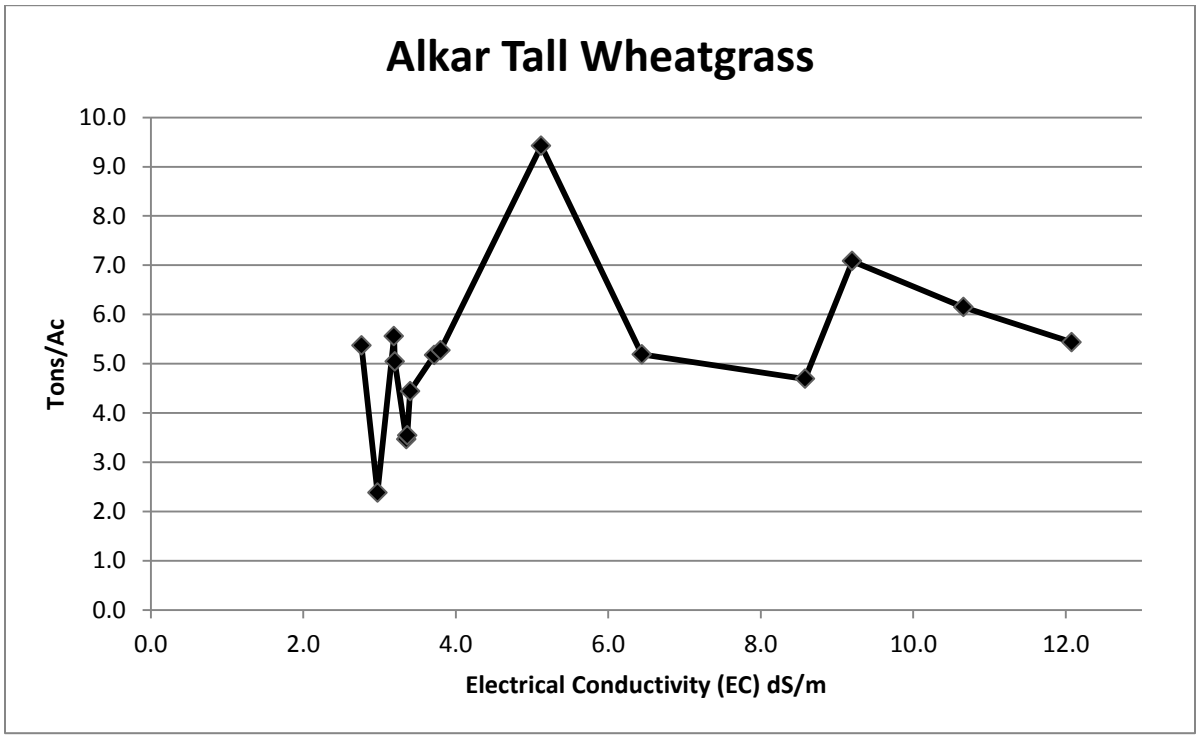
- Plots with adequate stands were harvested at the approximate stage for hay production for each species.
- Prairie Cordgrass plots were not harvested due to minimal, inconsistent stands throughout the gradients. However, they may be harvested in the future if they fill in dramatically.
- EC readings were taken in plots the same day they were harvested for yield.

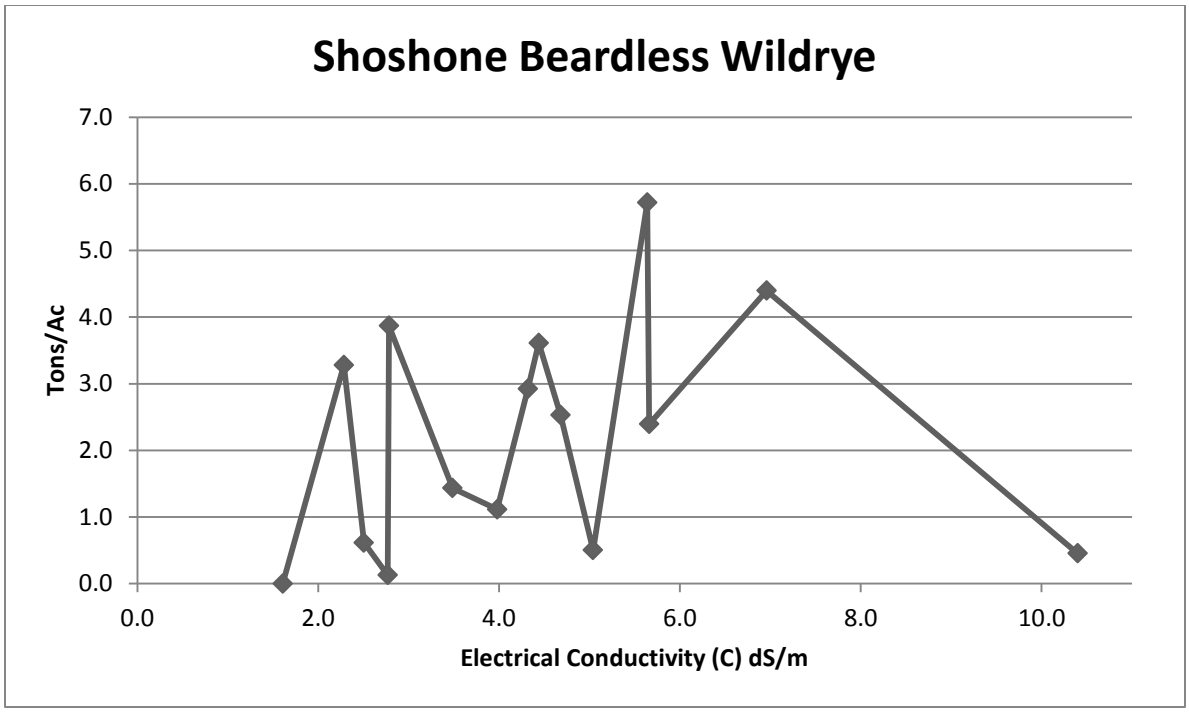
Following are graphs of selected species showing biomass yield across a range of soil salinity. The forage yield is on the vertical axis reported as dry tons/acre and the salinity rating (1:1 EC) is on the horizontal axis. This should give us an inclination of their potential productivity and with more data from future research we will be able to refine our recommendations based on the end user's needs.

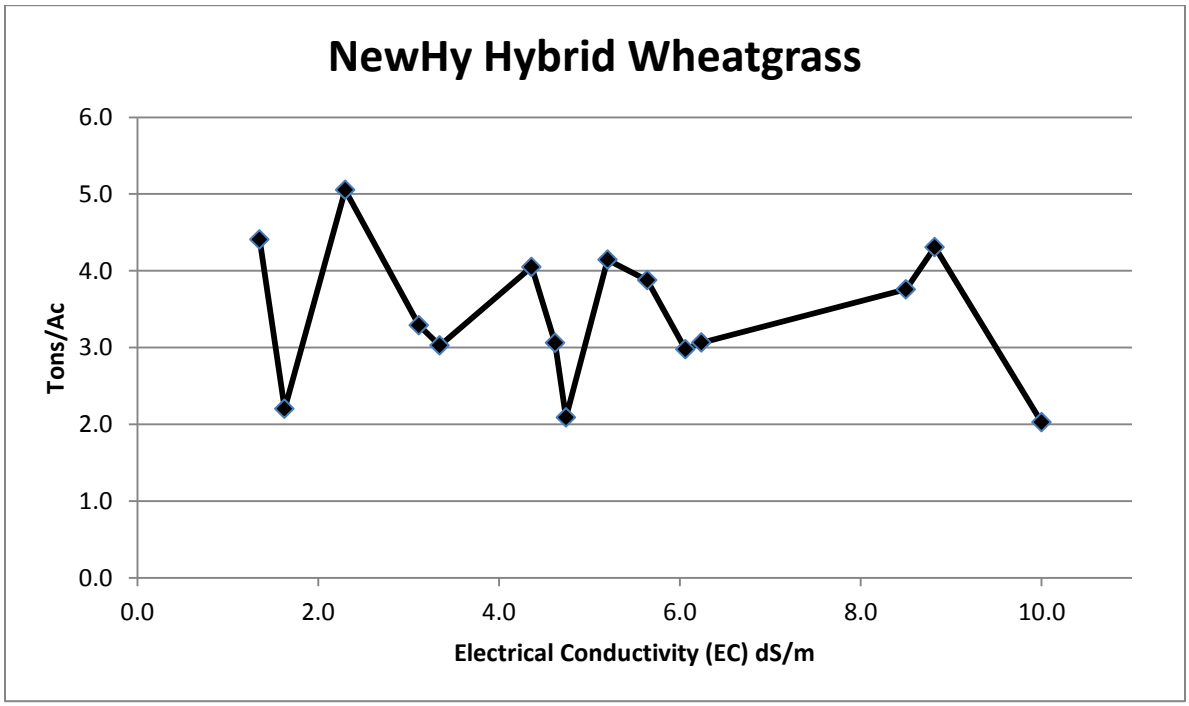
Perennial grass plots (left to right): NewHy green wheatgrass; Rodan western wheatgrass, Revenue slender wheatgrass, and Alkar tall wheatgrass.




Garrison Creeping Foxtail
Tons/Ac
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.0
2.0
4.0
6.0
8.0
10.0
Electrical Conductivity (EC) dS/m


Alkar Tall Wheatgrass
Tons/Ac
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
0.0
2.0
4.0
6.0
8.0
10.0
12.0
Electrical Conductivity (EC) dS/m


Shoshone Beardless Wildrye
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Tons/Ac
0.0
2.0
4.0
6.0
8.0
10.0
Electrical Conductivity (C) dS/m


NewHy Hybrid Wheatgrass
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Tons/Ac
0.0
2.0
4.0
6.0
8.0
10.0
Electrical Conductivity (EC) dS/m