VEGETATIVE MANAGEMENT IN RESPONSE TO SOIL SALINIZATION
<table>
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<th>CLASS</th>
<th>*Saturated Paste E.C. (dS m)</th>
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<tr>
<td>Very Slightly</td>
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<tr>
<td>Slightly Saline</td>
<td>4-8</td>
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<tr>
<td>Moderately Saline</td>
<td>8-16</td>
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<tr>
<td>Strongly Saline</td>
<td>&gt;16</td>
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*Sat. Paste E.C.’s are about 2 times 1:1 E.C.’s.
DEVELOPMENT OF SALINITY

FROM SALTY WATER DRYING IN SOIL

SALT SURFACE SALT

CAPILLARY FRINGE IN LOAMS

WATER TABLE
Figure 1. Capillary rise from a 9 foot water table depends on soil texture. Capillary rise will extend higher in a clay soil than in a sand.

SF-1087-Franzen, 2007
Relative Agronomic Yields at 8 dS m
Holm, 1979

- Barley 76%
- Durum Wheat 72%
- Sunflowers 71%
- Spring Wheat 45%
- Corn 23%
- Soybeans 7%

Shift in crops has exacerbated and emphasized the problem
Salinity Cover Crop Demo

Performance of selected warm season grass species

- Siberian millet
- Sorghum-sudangrass
- Grain Sorghum
- Sweet Sorghum

Growing our food, feed, fiber, fuel
Salinity Cover Crop Demo

• Sesbania is the most tolerant legume tested however seed cost prohibits extensive use. Chickling Vetch looks promising.

• Most of the brassicas and types of beets performed similarly

• The cool season grasses of barley and rye performed well

• The warm season grass Siberian millet performed fairly well

• With these areas we need to think about production vs. cost. With that in mind bin run barley, rape, and the finger millets will provide some cover at a reasonable cost
The Carrington Research Extension Center, Foster and Stutsman County SCDs, North Dakota NRCS, and the USDA- NRCS - Plant Materials Center - Bismarck are conducting a demonstration at locations near Carrington and one near Buchanan evaluating selected perennial grass and legume species across a salinity gradient.

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

Growing our food, feed, fiber, fuel
Perennial Salinity Demo

Growing our food, feed, fiber, fuel

Yield Dry T/acre vs. EC 1:1

- Revenue Slender Wheatgrass
- Alkar Tall Wheatgrass
- Rodan Western Wheatgrass
Perennial Salinity Demo

Growing our food, feed, fiber, fuel

Yield Dry T/acre vs. EC 1:1

- AC Saltlander Forage Mix
- NewHy Hybrid Wheatgrass
- AC Saltlander Green Wheatgrass
Most of the wheatgrasses established similarly however yields differ in both quantity and quality

The wildryes also performed well but are more difficult to establish

The warm season grass switchgrass did not perform well

With these areas we need to think about production and cost. Determining the best fit for the producers needs based on EC’s and what their intended use is.
FIELD ASSESSMENT

- VISIBLE SOIL SALTS/TYPME
- VEGETATION RESPONSE
- CALCULATE WATER USE/BUDGET
- PRECIPITATION HISTORY
- SOIL TYPE - SOIL SURVEY/ONSITE
- GEOLOGIC STRATIFICATION
- TOPOGRAPHY
- EM38 METER/1:1 SOIL WATER EC
- HISTORIC NATIVE VEGETATION
Put T back into ET and Reduce E

Will result in intercepting water, reducing soil surface evaporation, and lowering of water table necessary to restore or maintain natural water cycle.
SOIL/VEGETATIVE MANAGEMENT

Resource and Economic Goal: Reduce management-induced soil salinity resulting in improved soil health for a better rooting environment for plant growth and return to agronomic productivity.

Reverse the process by:

1) transpiring water
2) lowering water table
3) encouraging salt leaching with rainfall

*Treat the cause not the symptom*
SOIL/VEGETATIVE MANAGEMENT

How to Achieve:

REduce compaction - improve aeration
- Reduce traffic - especially when wet
- Reduce tire pressure
- Increase organic matter
- Grow aggressive taprooted plants
- Reduce bare soil surface
- No-till improves soil aggregation

Manage landscape water
- Grow high water-use crops
- Grow full season perennials
- Grow cover crops
Kathryn Site – Barnes County SCD
Bare Ground- Herbicide and Tillage Results - High Evaporation & Salt Concentration
Low Soil Biological Activity - Poor Soil Aggregation & Water Infiltration
New System – No-till, Cover Crops, Perennials
Establishment of Cover Crops Difficult South End
Mulching Improved Establishment
Plot #1

Alfalfa planted in 2008

Slides-Maria Breker, Valley City
Plot #2

- Native grass planted in 2008
  - Canada wildrye
  - Prairie cord grass
  - Switch grass
  - Big bluestem

**Sample 15**

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Plot #3

Tame grass planted in 2008
- Western wheatgrass
- Slender wheatgrass
- Alfalfa
- Sweet clover

Sample 12

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Established Stand of Salt-Tolerant Perennials
Mod. To Strongly Saline Soils (1:1 EC’s 6-16)
Plot #4

Various Cover Crop mixes

Sample 9

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Plot #5

- 2008-09: Cover crop mix
- 2010: Sunflowers
- 2011: Corn
- 2012: Cover crop
- 2013: Soybeans

### Sample 6

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Plot #6

Sample 3

- 2008: Cover crop
- 2009: Corn
- 2010: Soybeans
- 2011: Wheat & Cover crop mix
- 2012: Soybeans
- 2013: Corn
Managing Saline Soils in North Dakota
SF1087 – NDSU Extension Service

Cover Crops for Wet Soils and Prevented Plant Ground - Agronomy Technical Note No. 1 - ND NRCS