Perennial Grasses for Saline Soils

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Soil salinity has been an escalating problem in agricultural fields since the early 1990s when the most recent wet cycle settled into the region. Excess rainfall elevated water tables near the soil surface, often containing saline groundwater. When saline groundwater is drawn toward the soil surface through capillary rise, the water evaporates, but the dissolved salts remain behind; this causes salts to accumulate at the soil surface. Over time, the accumulation of salts can become so severe that crop productivity is reduced, salt-tolerant weeds such as kochia and foxtail barley begin to dominate, and eventually barren areas devoid of vegetation remain. These stages of soil salinization are not uncommon, and their extent often continues to expand if not addressed deliberately.

Managing soil salinity is about managing soil water. Water is how the salts moved to there; water is how the salts will be moved away from there. The solutions are not quick either. The salinity problem developed over many years, and it will require many years to correct. The most straightforward solutions are (1) salt-tolerant crops and (2) tile drainage; however, these options are not always applicable or available in certain areas or landscapes. The next option requires a long-term cropping system change: perennial forages that use more water to prevent additional salt accumulation and spread. Perennial grasses are usually the best option. There are no commercially available legumes suited for very saline soils. Strawberry clover, the most salt-tolerant legume, is only suited to wet and saturated soils (USDA-NRCS, 2010).

Well-established perennial grasses are resilient and tolerant to high salinity. Full-season perennial grasses with deep root systems are able to use soil water at a greater depth and for a longer period than annual crops. As a result, perennial grasses can intercept groundwater rising to the soil surface to inhibit salt accumulation at the soil surface. Their full-season water use also creates opportunity for rainfall to leach salts from the soil surface to a location deeper in the soil profile. Perennial grasses promote improved soil structure that increases infiltration and downward water movement to leach salts deeper. With time, perennial grasses can become a valuable forage source while reducing soil salinity and preventing its spread across a field.

When evaluating grass species for salinity tolerance (Table 1), please confirm if reported salinity tolerance is rated for electrical conductivity (EC) determined by the 1:1 soil:water method or saturated paste method. The salinity ranges in Table 1 are converted to the 1:1 routine method, so growers can use the EC (soluble salt) results from their routine soil test reports.

Table 1. Perennial grass species for saline soils. †

Relative salinity tolerance ‡	MS	MT	T	Wet
Electrical conductivity (dS/m) §	2.5-4.5	4.5-7.0	7.0-11.5	sites
Species				
Brome, smooth	X			
Brome, meadow	X			
Cordgrass, prairie		X		*
Fescue, tall		X		*
Foxtail, creeping	X			*
Grama, blue	X			
Ryegrass, perennial		X		
Timothy	X			
Wheatgrass, fairway crested		X		
Wheatgrass, intermediate		X		
Wheatgrass, 'AC Saltlander' hybrid			X	*
Wheatgrass, 'NewHy' hybrid			X	*
Wheatgrass, slender			X	*
Wheatgrass, tall			X	*
Wheatgrass, western			X	
Wildrye, Altai			X	
Wildrye, beardless			X	*
Wildrye, Canadian		X		
Wildrye, Russian			X	

† List compiled and adapted from Franzen (2013), USDA-NRCS (2007), and USDA-NRCS (2010).

‡ MS, moderately sensitive; MT, moderately tolerant; T, tolerant.

§ Electrical conductivity ranges (saturated paste) converted to 1:1 routine method used in commercial laboratories.

A common grass seed mixture for salt-affected soils sold by commercial grass seed dealers in the region contains: 20% AC Saltlander green (hybrid) wheatgrass, 20% intermediate wheatgrass, 20% slender wheatgrass, 20% western wheatgrass, and 20% smooth brome. Consult your grass seed provider for details on species availability and seeding techniques.

The additional resources listed provide valuable information and specific details on grass species, their suitability to saline soils and production systems, and seeding techniques. Please consult these resources as you plan to address saline soils with perennial grasses; these resources address important aspects of specific grasses species and their uses. Our team of soil scientists is also available to provide assistance in management of saline soils.

Additional resources:

Plants for Saline to Sodic Soil Conditions

USDA-NRCS. 2010. Plants for saline to sodic soil conditions. Technical Note Plant Materials No. 9A (revised). Boise, ID. 10p.

- Seedbed preparation and seeding for salt-affected soils.
- Species and variety selection for salt-affected soils.
- Seeding rates for selected grasses, forbs, legumes, and rangeland shrubs.

Plant Materials for Salt-Affected Sites in the Northern Great Plains

USDA-NRCS. 2007. Plant materials for salt-affected sites in the Northern Great Plains. Bismarck, ND. 4p.

- Seedbed preparation and seeding for salt-affected soils.
- Species selection for salt-affected soils.

Grass Varieties for North Dakota

Sedivec, K., D.A. Tober, W.L. Duckwitz, and J.R. Hendrickson. 2011. Grass varieties for North Dakota. NDSU Ext. Circ. R-794 (revised). North Dakota State Univ., Fargo, ND. 20p.

- Comprehensive guide on grass species and varieties.
- Guidelines on grass species uses and compatibility.

Managing Saline Soils in North Dakota

Franzen, D. 2013. Managing saline soils in North Dakota. NDSU Ext. Circ. SF-1087 (revised). North Dakota State Univ., Fargo, ND. 12p.

- Comprehensive guide on saline soil development and management.
- Species selection for salt-affected soils.