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Revegetation of Salt-Impacted Soils in South Dakota

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The intent of this publication is to provide suggested native species suitable for the revegetation of salt-impacted soils. The suggested species are listed as native to South Dakota according to the USDA NRCS Plants Database.

Introduction

An estimated 3.4 million hectares of land in South Dakota have salt-impacted soil (Seelig 2000; Millar 2003; Hopkins et al. 2012; Carlson et al. 2013; Soil Survey Staff). Commonly recommended practices of remediating salt-impacted (tile drainage, gypsum application, and salt leaching using irrigation water) were developed in more arid areas with much more irrigation (such as the Southwestern U.S.). Studies have shown that these practices can be ineffective at remediating salt-impacted soil in South Dakota and may even worsen the problem (Northcote & Skene 1972; McIntyre 1979). Because common practices of remediating salt-impacted soil in South Dakota are ineffective, new practices, including revegetation using native plants, are being researched. The hope is that growing native plants in salt-impacted areas will provide cover, decrease erosion, and start to reestablish soil health.

Methods

To investigate revegetating salt-impacted soils using native plants, we examined the survival of eight native species transplanted in salt-impacted soil. Our field site was on private cropland previously managed in a conventional corn/soybean rotation in Clark County, South Dakota. Four grass species (alkali sacaton, Canada wildrye, slender wheatgrass, and western wheatgrass) and four forb (wildflower) species (blanketflower, Maximilian sunflower, showy milkweed, and showy ticktrefoil) were grown in the greenhouse (March 2019; see Figure 1) and planted at the field site (June 2019, see Figure 2). Species were chosen based on their germination ability in saline conditions. We planted 2,016 transplants (252 per species) into soil with high, medium, and low/no salt concentrations. Before planting, existing vegetation was mowed (where there was any vegetation) and Dewitt woven ground cover was used. Woven ground cover was used to keep any other vegetation from growing, specifically invasive species kochia and foxtail barley.

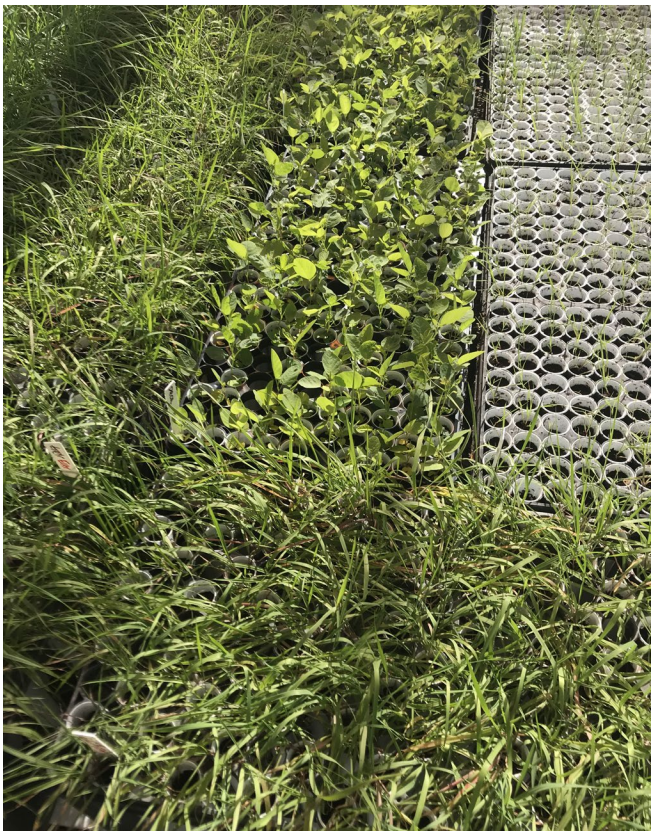

Figure 1. Native plants were grown in individual containers before being transplanted at the field site.

Figure 2. Native species (clockwise: showy ticktrefoil, alkali sacaton, and slender wheatgrass) planted in low/no salt at the field site.

Results

End-of-season sampling (October 2019) revealed that native grasses had greater survival than forbs in all salt concentrations (Figure 3). Overall, grasses had significantly higher survival in low and medium salt concentrations compared to the high salt concentration, except alkali sacaton. Interestingly, alkali sacaton survival increased as the salt concentration increased (Figure 4), from 53% in low salt to 90% in high salt. None of the forbs survived the high salt concentration. However, blanketflower, Maximilian sunflower, and showy milkweed had surviving transplants in the low and medium salt concentrations. The highest survival in the low salt concentration was 33% for blanketflower, while the highest survival in the medium salt concentration was 24% for showy milkweed. Showy ticktrefoil only survived in the low salt concentration, with 9% survival.

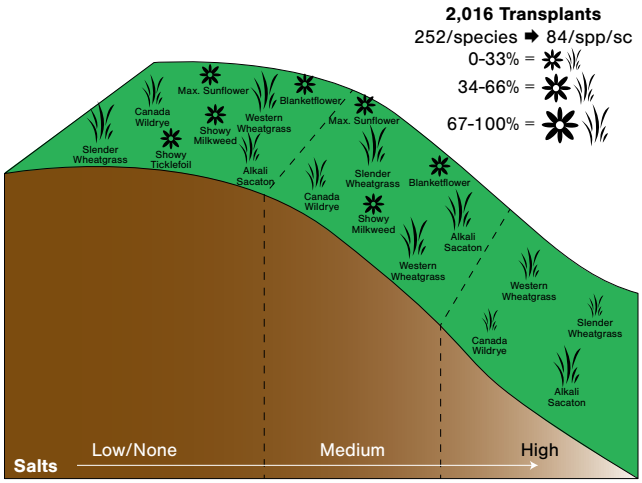

Figure 3. Survival for South Dakota native grasses and forbs (wildflowers) across a salt concentration gradient. The larger the icon, the higher the survival.

Figure 4. Alkali sacaton growing in high salt. Notice the saline/sodic soil (white crust) on top of the woven ground cover.

Implications

This study identified salt-tolerant native species suitable for the revegetation of salt-impacted soil in South Dakota. Overall, the four native grasses had a higher salt tolerance than the four native forbs. Alkali sacaton exhibited high survival in salt-impacted soil especially as the salt concentration increased, making it a promising species for revegetation even in soils with the highest salt concentrations. Blanketflower, Maximilian sunflower, and showy milkweed showed promise as forbs that may be suitable for revegetation in low to medium salt concentrations. With these results, South Dakota landowners can make more informed decisions on how to revegetate their salt-impacted soils.

Acknowledgements

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