

Chapter: 32

The Management and Identification of Saline and Sodic Soils in the Northern Great Plains



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Salt-affected soil is a serious problem in the northern Great Plains. If high salt concentrations exist, then the problem's type and magnitude must be accurately diagnosed. The objective of this chapter is to discuss diagnosis and remediation of South Dakota's saline and saline/sodic soils. Key terms used in this chapter are provided at the end of the chapter. Clay dispersion can occur when the soil electrical conductivity (EC) is less than 2 dS/m and % sodium on the exchange sites is greater than 4%.

Basic Information

Due to increased rainfall, changing land uses, and that many of South Dakota's soils were developed over marine sediments, the amount of land impacted by high salt concentrations has been increasing. High salt concentrations have a staggering impact on crop yields. For example, the NRCS reported that in Beadle, Brown, and Spink counties, high soil salt concentrations have resulted in an annual economic loss of over \$26 million.

South Dakota soils affected by saline and sodium (Na^+) are separated into three groups: saline (high total salts), saline/sodic (high total salts and Na^+), and sodic (high Na^+). The classification of a salt-affected soil into one of these groups is based on the soil electrical conductivity (EC, reported as dS/m) and the amount of Na^+ on the cation exchange sites. The soil cation exchange capacity (CEC) is the capacity of the soil to retain positively charged cations. Common cations include Ca^{2+} , Mg^{2+} , NH_4^{1+} , K^{1+} , Fe^{3+} , and Na^{1+} . The CEC helps the soil retain these nutrients from one year to the next. Because anions (negatively charged ions), such as nitrate (NO_3^{1-}), chloride (Cl^{1-}) or sulfate (SO_4^{2-}) are repelled by the soil's negative charges, anions are more rapidly lost with water percolating through the soil than cations.



Figure 32.1 A northern Great Plains dispersed soil. (Courtesy Cheryl Reese, SDSU)

Sodic soils have high Na^+ concentrations, which can result in soil dispersion, decreased water infiltration, and increased erosion. Saline/sodic soils have high EC and high Na^+ concentrations. Yields in these soils are reduced by the combined impact of high salt and Na^+ concentrations. In South Dakota, soil clay dispersion (Fig. 32.1) can occur when drainage is placed under soils with an EC value < 2 dS/m and when the percentage of Na on the cation exchange sites is greater than 4.

