NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

SALINITY AND SODIC SOIL MANAGEMENT

(ACRE)

CODE 610

DEFINITION

Management of land, water, and plants to control harmful accumulations of salts on the soil surface or in the root zone.

PURPOSES

- To reduce and control harmful salt concentrations in the root zone
- To reduce problems of crusting, permeability, or soil structure on sodium affected soils
- To promote desired plant growth and to utilize excess water in the root zone in non-irrigated saline seep areas and their recharge areas.

CONDITIONS WHERE PRACTICE APPLIES

The practice applies to all land uses where the concentration or toxicity of salt limits the growth of desirable plants or where excess sodium causes crusting and permeability problems. The practice also applies to non-irrigated land where a combination of factors such as topography, soils, geology, precipitation, vegetation, land use and cultural/structural practices can increase the extent and concentration of salts in saline seep areas.

CRITERIA

Compliance with federal, state, and local regulations is the responsibility of the landowner and operator. All required permits shall be obtained prior to reclamation activities.

Grading and shaping operations shall be planned to permit the use of conventional tillage equipment and to provide positive drainage where needed.

Other Field Office Technical Guide practices shall be used where necessary to prevent erosion and prevent off-site damage.

Grading and shaping techniques shall leave the soil in suitable enough condition to allow for seedbed preparation operations.

Topsoil treatments will provide a minimum of 6 inches of cover.

Permanent vegetative cover will be used on all sites where at least 75 % of the horizontal electromagnetic induction meter (EM) readings are less than 425 mS/m (millisiemens/meter).

Sites where 50%-75% of the horizontal EM readings are greater than 425 mS/m will likely require a combination of treatments.

Sites with only 50% or less of the horizontal EM readings are less than 425 mS/m are difficult to vegetate and may be treated with either of the following options:

Organic matter will be applied at a 6 inch thickness or, permanent water cover by diking around the affected site. See Standards and Specifications for Diking (Practice Code 356). Any discharge will be outletted to a grassed waterway or filter strip.

Salt affected areas to be grazed with an adjoining pasture shall be vegetated with

grasses that have approximately the same palatability, maturity, and growth period.

Naturally occurring saline or sodic seeps may not benefit long term from soil remediation practices (e.g. gypsum application) unless the groundwater charging the seep is intercepted.

Additional Criteria to Reduce and Control Harmful Salt Concentrations in the Root Zone

On irrigated lands, leaching requirements shall be determined as presented in National Engineering Handbook Part 623, Chapter 2.

On non-irrigated land, reclamation shall utilize vegetative methods, soil amendments, and/or enhanced drainage to effect a reduction in soil salinity.

Additional Criteria to Reduce Problems of Crusting, Permeability or Soil Structure on Sodium-affected Soils.

Apply soil amendments containing soluble calcium, or that cause calcium in the soil to become available.

Additional Criteria Specific to Saline Seeps and Their Recharge Areas

Plant and/or maintain adapted high water use vegetation in recharge areas to utilize soil water.

CONSIDERATIONS

Soil salinity levels can be monitored to minimize the effects of salinity on crops and to evaluate management practices.

Tools such as electromagnetic induction (EMI) and salinity probes are appropriate for evaluating and for monitoring soil salinity levels.

The drainage water from Salinity and Sodic Soil Management may have high levels of salts. Select an outlet or disposal area that will minimize the effects of the saline or sodic water.

Removal of salts from the root zone by leaching operations may increase contamination of water tables. Avoid excessive leaching and schedule leaching operations during seasons when potential contaminants in the soil profile, such as nitrogen, are low.

For irrigated conditions, an irrigation water management plan should minimize non-point pollution of surface and groundwater resources.

Chiseling and subsoiling can improve permeability, root penetration and aeration where water movement is restricted by layered soils. Avoid inversion tillage that can bring salinity to the surface and interrupt the leaching process.

Green manure crops or applications of organic matter can improve soil structure and permeability.

Polyacrylamides may improve effectiveness of leaching and reclamation of some soils.

Applications of gypsum, sulfur or calcium will help in displacing sodium from the root zone.

Water of slight to moderate salinity not dominated by sodium can enhance leaching of salts.

Residue management can improve the organic matter content of the soil, improve infiltration and minimize surface evaporation and capillary rise of salts to the soil surface.

Consider selecting crops with tolerance to salinity/ sodium levels in the soil.

Consider bedding and planting methods designed to reduce salinity near plant root zone, especially for germinating seeds.

PLANS AND SPECIFICATIONS

Site specifications for establishing and maintaining the practice will be prepared for each conservation treatment unit. Specifications can be recorded in narrative format, on job sheets, or forms designed to

provide specific requirements for the practice. Items to be documented include:

- Map or diagram documenting location of site to be treated.
- Required grading and shaping
- Quantities and quality of soil amendments
- Seed mixtures
- Seeding dates
- Operation and maintenance

EM readings will be taken in the horizontal orientation. Maximum distance between EM readings will be based on the size of the area to be remediated. The maximum distances are found in the following table.

<0.1 acre	0.1-0.5 acre	>0.5 acre
5 meters	10 meters	20 meters

Soil Amendments

Prior to seeding apply 4-tons/acre gypsum along with sufficient quantities of organic matter to cover the treated area to a depth of 3 inches. Incorporate to a depth of 3 inches. Apply nitrogen at 120 lbs./acre. Apply phosphorus only if soil tests fall below 15 lbs. P/acre. Potassium fertilizers are not recommended for saline soils. Soil tests and the following formula will be used to determine supplemental gypsum applications:

Tons pure gypsum required

(ESP-5) x CEC x .017 where,

ESP = Percent exchangeable Sodium

CEC = Cation Exchange Capacity

Do not apply more that 5-tons/acre gypsum at one time.

Example: Soil test data for a site requiring additional gypsum. CEC=15, ESP=25

(25-5) x (15) x .017 = 5 tons

Seedbed Preparation and Seeding

Incorporate amendments with a disc or chisel plow. The seedbed shall be firmed by rolling or harrowing prior to seeding. Seed may be applied using drill or broadcast methods. Select species from Table 1. A barley companion crop will be seeded at 20 lbs./acre.

Table 1.

Species	Maximum EM mS/m	Minimum Plant Density (plants/ft^2)	Seed Rate PLS lbs./acre
'Jose'Tall Wheatgrass	425	8	20
Switchgrass	275	3	8-10
Tall Fescue	250	8	15

OPERATION AND MAINTENANCE

Frequent inspections should be made to evaluate stand development during establishment and at least annually thereafter.

Mow only if weeds compete with establishing vegetation. Allow established species to form and mature seeds.

Top dress with appropriate amendments where vigor of established species decline.

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