

## NATURAL RESOURCES CONSERVATION SERVICE

### CONSERVATION PRACTICE STANDARD

#### Salinity and Sodic Soil Management

(Ac.)

Code 610

#### DEFINITION

Management of land, water and plants to control and minimize accumulations of salts, and/or sodium on the soil surface and in the crop rooting zone.

#### PURPOSES

- To reduce and control harmful salt concentrations in the root zone

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where the concentration or toxicity of salt limits the growth of desirable plants.

#### CRITERIA

##### General Criteria Applicable to All Purposes

Plans and application of this standard will comply with all applicable federal, state, and local laws and regulations.

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.

**Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service or download it from the Filed Office Technical Guide for your state.**



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

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

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

Sites with 50% or less of the horizontal EM readings less than 425 mS/m are difficult to vegetate and shall be treated by adding organic matter as indicated in Table 3.

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.

Native plant species will be used whenever possible. Known invasive species will not be used.

All manufacturers' label requirements will be followed when applying herbicides.

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 Table 1.

**Table 1 – maximum distance for EM readings**

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

### Soil Amendments

Prior to seeding, apply gypsum along with organic matter as indicated in Table 2. Incorporate to a depth of 3 inches.

Apply nitrogen at 50 lbs per 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 table will be used to determine supplemental gypsum applications:

**Table 2 - Tons pure gypsum and organic material required**

mS/m	Gypsum (tons)	Organic Material (tons)
0-99	0	0
100-150	2	0
151-250	3	0
251-350	4	2-3
351-450	5	4-5
451+	5	5 + soil *

\* 4 to 6 inches of soil, suitable to grow vegetation, shall be mixed in with the gypsum and organic material to augment a suitable medium.

### Organic Material

Organic Material can include strawy manure, leaves, old hay, woodchips, and sawdust or like material approved by NRCS. Runoff and leaching potential shall be evaluated when amendments include manure.

### 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 3. If needed, a barley companion crop will be seeded at 20 lbs per acre.

**Table 3 – suitable species for Saline/Sodic sites**

Species	Maximum EM (mS/m)	Minimum Plant Density (plants/ft <sup>2</sup> )	Seed Rate (PLS Lb/acre)
Tall Wheatgrass*	425	8	20
Switchgrass	275	3	8-10
Tall Fescue	250	8	15
Winter Barley**	N/A	N/A	20

\* 'Jose' Tall wheatgrass has been found to be a good selection for Indiana.

\*\* Winter Barley is utilized for a companion crop with the other species, not as a permanent seeding and utilized with all fall seedlings'.

### Seeding Date Criteria

Species/Mix	IN Seeding Dates*	Dormant Seeding Dates**
Switchgrass	4/1-6/15	12/1-4/1
Tall Fescue & Tall Wheatgrass	3/1-5/15 or 8/1-9/15	12/1-3/1
Winter Barley	8/15 – 10/31	N/A

\* Seeding which includes Tall Fescue and a mulch cover may extend to 9/30 for fall seeding due to the reduced time for germination and range of cold tolerance.

\*\*Increase seeding rates by 25% when dormant seeding. Broadcasting of warm season grasses should only be done into a prepared seedbed with protection from erosion as a consideration. Seed the area immediately after the earthwork is completed.

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

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

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

### 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.

To benefit ground nesting wildlife, management practices and activities do not disturb cover during the primary nesting period for grassland birds of April 1 through August 1.

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

## PLANS AND SPECIFICATIONS

Specifications for this practice will be prepared for each site. Specifications will be recorded using approved specification sheets, job sheets, and narrative statements in the conservation plan or other acceptable documentation including:

- 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

## OPERATION AND MAINTENANCE

An operation and maintenance plan will be provided to and reviewed with the landowner. The plan shall include the following items and others as appropriate.

- 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.
- Any species, whose presence or overpopulation may jeopardize this practice, will be controlled. Spraying or other control methods will be done on a "spot" basis to protect forbs/legumes that benefit native pollinators and other wildlife.
- Top dress site with appropriate amendments when the vigor of the established species declines.

## REFERENCES

ASCE, 1990. Agricultural Salinity Assessment and Management, ASCE Manuals and Reports on Engineering Practice No. 71, New York, NY.

California Fertilizer Association. 1998. Water and plant growth. p. 21-66. *In* Western Fertilizer Handbook. Interstate Publishers, Inc., Danville, Illinois.

USDA. 1954. Diagnosis and Improvement of Saline and Alkali Soils. Agriculture Handbook No. 60. Washington, DC.

Southern Indiana Brine Coalition. 2003. Remediation of Oil Brine Damaged Soil, Revision 1. Winslow, Indiana

National Engineering Handbook Part 623, Chapter 2.