NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

TOXIC SALT REDUCTION

(acre)
CODE 610

DEFINITION

Reducing or redistributing the harmful concentrations of salt and/or sodium in a soil (sometimes referred to as leaching).

PURPOSES

To permit desirable plants to grow.

CONDITIONS WHERE PRACTICE APPLIES

On land where the accumulation of salt at or near the surface limits the growth of desirable plants.

CRITERIA

Identify the most sensitive crop to be grown in each field and list the target soil salinity/sodicity level for each field.

Show the quantity of water needed for initial leaching and for subsequent maintenance leaching.

Identify the time of year to do the leaching and where it fits in the conservation cropping sequence.

List soil and water irrigation tests needed and the amount and timing of any soil amendments to be used.

For fields with perched water tables affecting the root zone, identify the subsurface drain system and its outlet. List any monitoring work to be done.

For sodic soils, add such soil amendments as gypsum, sulfur, lime-sulfur solution, sulfuric acid, iron sulfate, aluminum sulfate, or limestone at a rate based on laboratory analysis. See Table 6, page 49, USDA Agriculture Handbook 60, for amounts of gypsum and sulfur required to replace indicated amounts of exchangeable sodium.

High sodium soils may require 4 or 5 tons/acre of gypsum or 4 tons/acre of lime if the soil pH is low. Incorporate low soluble amendments into the topsoil before leaching is started. Some amendments can be dissolved and applied in irrigation water during the leaching period.

If necessary, provide subsurface drainage so that water will move downward and out of the soil profile.

Take periodic tests to determine the level of salinity. The required level is reached when the electrical conductivity of a saturation extract or soil paste is at the level required for satisfactory plant growth of the desired crop. Consult references for salt tolerances of specific crops.

Ponding Method of Reclamation

Level land as needed for uniform ponding and surface control of water.

Construct dikes or borders on a contour to obtain uniform ponding. Dikes may be constructed by any convenient method.

Temporary water control structures are generally required to control depth of water in ponds. These structures may be wooden, metal, or concrete. Plastic lined spillways may be used in lieu of the above structures.

Alternative wetting and drying usually is more efficient than continuous wetting on most soils.

Sprinkler Method of Reclamation

Sprinkling may provide better water control than ponding, gives adequate salt reduction with less water and allows for more uniform leaching.

Design sprinkler systems in the same manner as sprinkler systems for irrigation.

The coefficient of uniformity (UC) should be 80 or greater. The more uniform the water is applied the better the leaching will be.

Water application rate should be less than field intake rate in order to avoid ponding. Where intake rate is a

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problem, intermittent sprinkling may be desirable, especially on finer textured soils.

More water must be applied than evaporates. Evaporation rates are greater in the daytime. Therefore, it may be advantageous to use sprinklers at night, especially on fine textured soils where the application rate may be almost the same as evaporation rates.

CONSIDERATIONS

Base the desirable soil salinity/sodicity level on the most sensitive crop to be grown and the level of yield reduction acceptable to the grower.

Estimate the quantity of water required for the initial leaching job, and assure sufficient supply of this needed quantity. As a "general rule" for each foot of soil to be leached:

-- 6 inches of irrigation water is required to leach out 50% of the salt.

-- 12 inches of irrigation water is required to leach out 80% of the salt, and

-- 24 inches of irrigation water is required to leach out 90% of the salt.

The time needed for leaching varies greatly and may take from 10 to more than 120 days.

Prior to leaching, it is desirable to use a deep tillage practice so that greater water penetration can be achieved. Do this when the soil is at its driest stage.

In conjunction with this practice, a good irrigation water management program is needed to maintain a favorable salt and sodium balance. Sufficient water must be infiltrated during irrigation to avoid new concentration of salts and sodium in the root zone.

Avoid tillage when soil is wet and any other tillage operation that compacts the soil. Chiseling, subsoiling and plowing when dry and leaving the field rough will be helpful in getting water into the soil, but should not be used as a substitute for proper leveling and other practices needed for irrigation water management.

Maintain soil tilth and productivity by using a good conservation cropping sequence, drainage improvement, irrigation water management, subsoiling, crop residue use, cover and green manure crops. These are important practices that will help keep a soil free from salt and sodium.

Subsequent to the leaching operation, the soil may be quite sterile and devoid of organic matter and needed nutrients. A good practice is to plant a green manure crop as the first or even second crop and plow this in to build up organic content and improve the tilth of the soil. Animal manure and/or commercial fertilizer are usually needed to replace nitrogen that is usually lost with the leachate.

In the event the leaching process was not complete, or for some reason stopped short of completeness, consideration should be given to planting a salt tolerant crop as a cash crop for the first season following leaching. This will provide for further natural leaching, during the growing of the cash crop and will provide the operator with some income during this period.

Endangered Species Considerations

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Some species are year-round residents in some streams, such as, freshwater shrimp. Other species, such as steelhead and salmon, utilize streams during various seasons. Be aware that during critical periods, such as spawning, eggs in gravels and rearing of young may preclude activities in the stream that may directly affect the stream habitat during those periods. For example,

there should be no disturbance of stream gravel beds that may have eggs in them. That could include any equipment in the stream or even walking in the stream or work upstream that may result in sediment depositing in the gravel beds. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Water Quantity

The practice requires the application of irrigation water at a rate that exceeds filling the plant rootzone and moves the toxic salts below the rootzone to percolating waters. Toxic salt reduction may have minimal impacts on surface water quantity, with the exception where additional irrigation supplies may be required as a part of the leaching process.

The increase in water available for ground water recharge may equal the "leaching fraction", less any drainage outflow, which is computed as a percentage of the water required to fill the rootzone.

1. Effects on the water budget, especially on infiltration, deep percolation, and ground water recharge. Consider the variability (volume and timing) of the leaching fraction, the need for additional irrigation water, and the impact of drainage if installed as an associated practice.

Water Quality

Changes in surface water quality may be minor, unless drainage is installed as an associated practice. Increasing irrigation supply may increase sediment, and absorbed chemicals. The increase may be minimal, because erosion is mainly associated with the first water applied.

Where drainage is used to remove excess water from the rootzone, the increase in toxic salts, soluble nutrients and pesticides in the receiving surface waters will be essentially equal to the amounts removed from the rootzone by the leaching fraction, less the amount that bypasses the drainage system.

The opportunity for ground water pollution from toxic salts is equal to the volume of salts removed from the rootzone by leaching. The salts removed reside in an intermediate zone, or in the case of high water tables, are moved directly into the saturated zone. Other soluble chemicals such as nutrients and pesticides are leached below the rootzone.

Effects on irrigation induced erosion, sedimentation, and soluble and sediment-attached substances in irrigation tailwater.

Effects of leaching on the volume of toxic salts and soluble nutrients and pesticides removed from the root zone. Identify the ultimate residence of the chemicals and the surface and ground water impact of drainage if installed as an associated practice.

PLANS AND SPECIFICATIONS

Plans and specifications shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

The owner or operator will be responsible for operating and maintaining this practice. Periodic soil and irrigation water sampling will be performed and another leaching operation performed or additional irrigation water applied at selected intervals to control soil salinity.