MANAGEMENT

Reducing Seepage From Stock Tanks no. 4.905

by R.J. Reginato, F.S. Nakayama, J.B. Miller and R.M. Hyde [1]

Quick Facts...

Seepage from many stock tanks in calcium-aggregated soils can be greatly reduced with sodium carbonate treatments.

Broadcast salt on the surface, then work it into the soil by disking or harrowing to the predetermined treatment depth.

Two or three years after treatment, the seepage rate may start to increase as sodium is lost.

Seepage from many stock tanks in calcium-aggregated soils can be greatly reduced by treatment with sodium carbonate without soil compaction. The proper amount of sodium carbonate, determined by soil analysis, is broadcast on the soil and mixed into the top 3 to 5 inches. Seepage losses were reduced from 5 inches a day to 0.15 inch a day in field tests.

Pretreatment Survey

Make the following measurements and analyses before treatment:

1. Measure the rate of water loss to make sure there is a seepage problem. Drive a marked stick into the pond bottom and measure the drop in the water surface over a period of several days free of rainfall and runoff. Part of the water loss is due to evaporation, which can be estimated from local National Weather Service records.
2. Measure the soil depth in the pond bottom (minimum acceptable depth is one foot).
3. Take at least three separate random soil samples from the bottom and three from the side of the pond at the 0- to 6-inch depth. Mix the three bottom samples together and the three side samples together. Have these two composited samples analyzed for the following:
   a. clay content — percent by weight of material less than 2 microns in diameter,
   b. cation exchange capacity (CEC) in milliequivalents per 100 grams of soil, and
   c. exchangeable sodium (ES) in milliequivalents per 100 grams of soil.
4. Measure the area and depth of the pond. Don’t guess! Calculate the amount of water the pond holds at different water depths.

Treatment Criteria

Experience indicates that treatment with sodium carbonate is successful if the following criteria are met:

1. The depth of the soil overlying sand, gravel or porous rock is at least 12 inches.
2. Clay content is 15 percent or greater.
3. Cation exchange capacity (CEC) exceeds 15 milliequivalents per 100 grams of soil.

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Calculating Sodium Carbonate[2]

In the following calculations, use the information from the soil sample with the highest CEC. The amount of sodium carbonate required for treatment can be estimated with the following equation:

$$Na_2CO_3 = 0.004\ DA\ (0.15\ CEC - ES)$$

where:

Na_2CO_3 is pounds of sodium carbonate,
D is depth of soil to be treated (in inches),
A is area to be treated (in square feet),
CEC is cation exchange capacity (meq/100g), and
ES is exchangeable sodium (meq/100g).

Treatment Procedure

Clear the sides and bottom of the pond of grass, shrubs, trash and rocks prior to treatment. To ensure uniform distribution of the salt, stake out a grid system on the treatment area, using string or twine stretched between stakes. Each grid section should cover an area that can be treated conveniently with 20-, 50 or 100-pound quantities of salt, assuming the salt is obtained in 100-pound bags.

If this method is not feasible, mark the pond roughly into quarters and broadcast one-fourth of the salt uniformly into each section. If the salt is obtained in bulk, weigh the amount applied to each grid or quarter section. Broadcast the salt on the surface, then work into the soil by disking or harrowing to the predetermined treatment depth.

Face masks are recommended during salt broadcasting. Soil compaction is not necessary. The pond is ready to receive water immediately after treatment.

Maintenance

Two or three years after treatment, the seepage rate may start to increase as sodium is lost. The initial treatment should reduce seepage drastically, but does not completely stop it. Calcium and magnesium in the pond water eventually replace the sodium applied in the treatment.

This problem is solved by adding sodium carbonate and sodium chloride to the water in the pond. The amount of sodium carbonate added should not exceed 6.5 pounds per 1,000 cubic feet of water. More than this may increase pH above 9.5. Add additional sodium in the form of sodium chloride. A suggested guide follows:

1. Na_2CO_3 - 6.5 V where Na_2CO_3 is pounds of sodium carbonate and V is volume of pond in 1,000-cubic-foot units.
2. NaCl = 0.25 Na_2CO_3 used in original treatment minus the Na_2CO_3 added to water, where NaCl is pounds of sodium chloride.
3. Total salt = steps 1 + 2. Mix the sodium chloride and sodium carbonate together and broadcast evenly over the water surface. Broadcasting from a small boat usually is desirable.

To convert to metrics, use the following equivalents: 1 inch = 2.5 centimeters; 1 square foot = .09 square meter; 1 pound = .45 kilogram; 1 cubic foot = .03 cubic meter.

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[2]Granular soda ash, technical grade, 99 to 100 percent sodium carbonate (Na_2CO_3).

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