Langdon Research Extension Center – Getting our worst areas analyzed

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Most producers have areas of fields which lack profitable production. A soil can be fertile, however, it may not be productive due to soil health related problems. In fact often times soils which don't support healthy plant growth are adequate for most of the essential plant nutrients. This results in not having enough plants to uptake nutrients and yearly fertilization at the time of seeding.

The ongoing wet weather cycle since the mid-1990s has led to high water-table issues which then result in the accumulation of excessive soluble salts (soil salinity) and/or excessive sodium (soil sodicity) within the plant root zone. A high water-table itself creates a very unhealthy growth environment for plants and microorganisms as it depletes oxygen from the soils. Knowing the nature and extent of the problems is very crucial as leaving these spots unplanted will only make the problem worse.

What to Test for?

Soil properties like texture don't really change with time. Properties like soil salt and sodium levels, however, can fluctuate much due to management practices and changes in weather. Salts and sodium levels also vary for different soil depths. Considering that, it is not only essential to sample our worst areas, but to also analyze different soil depths separately. Unlike our productive areas, we don't have to get the samples analyzed for plant nutrients as we would first want to know whether there is salinity and sodicity problems along with soil pH results. That will require EC (electrical conductivity), SAR (Sodium Adsorption Ratio) and pH analysis. It is also important to get the samples analyzed through the saturated paste extract method versus the less precise method of 1:1 by weight soil-to-water slurry. We may also want to know about the soil organic matter content, especially for the 1st foot. If we would like to know the type of salts our soils have, we can also get the samples analyzed for sulfates, chloride and alkalinity (includes carbonates and bicarbonates). If soil results are high for excessive sodium, then in order to calculate the rate of a soil amendment we will also need soil cation exchange capacity (CEC) results.

Zoning the Sampling Areas

Before sampling, it is important to separate our problematic spots into different zones. There may be areas that produce nothing. They should be sampled separately. In addition sample areas separately that result in some germination, however, still yield poorly. Mixing the samples from severe and moderate problematic areas will only give us an average and not the true extent of the problems in each area. Once we zone our problematic areas based on visual symptoms we should sample each area separately.

Sampling and Analysis

Each sample should be comprised of at least 2-3 soil cores. That means taking 3 cores of equal depths from each zone. When sampling for soil salinity and sodicity, sampling depth should be at least 3 feet. Each sample should be broken into 3 depths: 0-12", 12-24" and 24-36". If we are taking 3 cores, then 0-12" depths from all 3 cores should be mixed together. Repeat for 12-24" and 24-36". This will end up with 1 sample from 3 depths. When we send this sample to the lab, we should request separate analysis of all 3 depths for the same parameters. This is done because soil properties including salt and sodium levels vary with depths. In order to keep it simple and cost-effective in the beginning, we can request EC, SAR and pH analysis through saturated paste extract method. It would be helpful if we hold on to some soil from each sample incase labs need more soil for analysis. Also, if some samples are high for sodium, then we may need to get those samples analyzed for CEC in order to calculate the rate of soil amendment.

Producers can get their samples analyzed either through a commercial lab by requesting specifically for EC, SAR and pH through saturated paste extract or through NDSU Soil Lab by requesting saturated paste package (includes EC, SAR, pH and saturation %). For more information please follow: http://www.ndsu.edu/soils/services/soil_testing_lab/.

Common characteristics of saline, sodic and saline-sodic soils are given below.

Management of Saline and Sodic Soils, Kansas State University, May 1992.

To discuss your soil analysis results in detail, either contact the author at the Langdon Research Extension Center or by contacting other NDSU Soil Health Team Members.

Classification	Electrical Conductivity (mmohs/cm)	Soil pH	Exchangeable Sodium Percentage	Sodium Adsorption Ratio	Soil Physical Condition
Saline	4.0 or more	< 8.5	< 15	< 13	Normal
Sodic	< 4.0	8.5	15 or more	13 or more	Poor
Saline-Sodic	4.0 or more	< 8.5	15 or more	13 or more	Normal
> = greater than, < = less than					