Reclamation of Saline-Sodic Fairway Soils

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Objectives:

The objective of this study is to evaluate the effectiveness of two soil chemical amendments (gypsum and sulfur), two irrigation rates (deficit and leaching) and soil tillage (hollow tine and no tillage) on soil sodium and salt levels, related soil physical properties and turfgrass performance.

The first four months of the study were spent preparing the twenty-four, 12'x12' bemudagrass plots that are being used for the study. The soils in each plot were sampled to a depth of 3' in April to determine the resident salinity and sodium levels (Figures 1 & 2). Samples were separated into 1' depth increments with each depth increment analyzed for soil salinity (ECe), cation exchange capacity (CEC) and exchangeable sodium percentage (ESP).

The resulting soil tests were used to compute the amount of sodium chloride (NaCl) required increase the ESP to ~30% and ECe to ~4 dS/m. The individual irrigation systems (24) used to irrigate the study plots were then subjected to an extensive evaluation that included system rehabilitation, if required, followed by an extensive evaluation of system precipitation rate using catch cans (Figure 3).

Efforts to increase the ECe and ESP of plot soils to target levels (ESP = 30% and ECe = 4.0 dS/m) were initiated in August when the growth rate of bermudagrass had reached its annual peak. The initial application of NaCl consisted of applying 50 lbs of fine, livestock-grade sodium chloride (Figures 4 & 5). Irrigation was applied following NaCl application to wash the salt into the soil.

As all plots required in excess of 50 lbs of NaCl, the experimental plan was to apply the remaining NaCl about one week after the initial application. The initial NaCl application damaged the bermudagrass, causing it to turn brown and the decision was made to delay the

Figure 1. Soils were sampled to a depth of 3' in April using a Giddings Probe.

Figure 2. Soil samples being removed from sample tube. Samples were divided into 1' increments then analyzed for cation exchange capacity, exchangeable sodium percentage and soil salinity.

Figure 4. Student worker, Adam Killebrew, applies NaCl to the plots in August, 2014.

Figure 3. Precipitation tests were run a minimum of five times per plot to accurately determine the precipitation rate of each plot irrigation system.

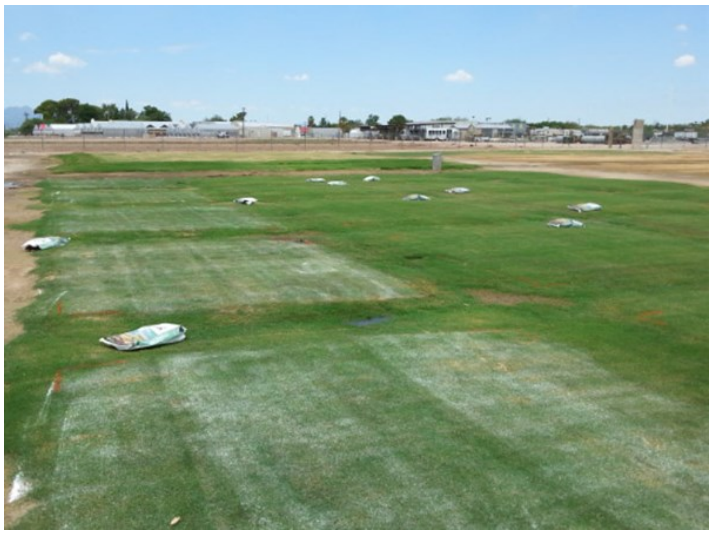

Figure 5. Photo showing four plots following application of 50 lbs of NaCl.

next NaCl application a second week to provide additional time for the grass to recover.

Shortly before the planned next NaCl application a flash flood in the wash that borders the Karsten Turf Facility sent flood waters over the plots, subjecting the study area to a very substantial leaching event (Figure 6). This flooding event has since been followed additional very heavy rainfall events associated with Tropical Storms Norbert and Simon (Figures 7). These untimely weather related events have forced a change in project protocol and the associated project timeline. We feel it is likely that much of the initial NaCl application was lost to leaching in the recent heavy rain events.

We have decided to resample the soils for ESP and ECe and reapply NaCl based on the results of the new samples. With winter dormancy less than a month away, we have decided let the grass go dormant, then make the required NaCl application in late winter. Study treatments will then be initiated next spring once the bermudagrass emerges from dormancy.

Figure 6. A view of the plot area as water from August flash flood slowly recedes.

Figure 7. Plot area following the passage of Tropical Storm Simon. A similar flooding/leaching event occurred two weeks earlier with Tropical Storm Norbert.

Summary Points

- Plot preparation work was completed in early July on the twenty-four, 12'x12' plots of bermudagrass used for the study. Preparation work included: 1) sampling the soils in 1' increments to a depth of 3', 2) analyzing soil samples for cation exchange capacity, salinity and exchangeable sodium percentage and 3) determining the precipitation rate and uniformity of the individual irrigation systems that service each plot.
- Efforts to increase the sodium and salinity levels of plot soils were initiated in August. Sodium chloride was applied to each plot in an effort to increase salinity levels to 4.0 dS/m and exchangeable sodium to 30%, then washed in with irrigation.
- A flash flood during the third week of August, followed by additional heavy rains from Tropical Storms Norbert and Simon produced a series of uncontrolled, heavy leaching events. These extraordinary precipitation events left in question the salinity and sodium status of plot soils.
- Plots soils are being resampled to assess current sodium and salinity status. Sodium chloride will be applied again in late winter based on the updated soil analyses, and study treatments will be initiated next spring once the bermudagrass emerges from dormancy.