

Reclamation of Saline-Sodic Fairway Soils

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The objective of this study is to develop remediation strategies for saline-sodic fairway soils. The study is being conducted on 24, 12'x12' plots of established bermudagrass located at the University of Arizona's Karsten Turf Research Facility in Tucson, Arizona. Sodium chloride was applied to study plots during the summer of 2014 to develop saline-sodic soil conditions ($EC_e > 4$; $ESP > 15$). Plans to initiate treatments during the late summer of 2014 were postponed when heavy rains and flooding compromised the salinity and sodium levels of plot soils. Plot soils were resampled during the spring of 2015 and additional amounts of sodium chloride were applied to increase sodium and salinity to targeted levels.

Study treatments were initiated in July of 2015 and were designed to assess the effectiveness of soil chemical amendments (gypsum, sulfur), irrigation rate (deficit and leaching) and soil tillage (hollow tine vs. no tillage) on soil salinity (EC_e) and sodium levels (ESP). Tillage treatments were applied to a depth of 3" using a walk-behind aerator outfitted with 0.5" hollow tines (Fig. 1). Gypsum and sulfur treatments were applied using a hand spreader (Fig. 2) at rates of 5.8 and 1.2 tons/acre, respectively. Irrigation treatments were initiated after application of soil amendments and consisted of daily irrigations at rates equal to 70% (slight deficit) and 100% (leaching) of standardized reference evapotranspiration (ET_o) as estimated from a weather station located within 100' of the study site. Irrigation events were reduced or eliminated during periods of rainfall to maintain water applications near targeted levels. All plots and subplots were subjected to a series of bi-weekly measurements to assess visual turf quality, turf growth rate (from clippings), soil moisture and soil compaction. Data from biweekly measurements obtained this past summer are being analyzed at present.

The study was overseeded with perennial ryegrass in October of 2015. Irrigation treatments were suspended for the two-week establishment period, but care was taken to minimize overwatering in an effort to maintain the non-leaching (deficit) irrigation treatment. The bi-weekly measurements of visual quality, turf growth rate, soil moisture and soil compaction were reinstated in November and will continue until next spring when a second aerification operation will be imposed on subplots supporting the tillage treatment.

Soils will be resampled in mid-December and analyzed for EC_e and ESP to provide an initial assessment of the effectiveness of the various treatment combinations. This initial post-treatment assessment may provide the lone chance to effectively assess study irrigation treatments. Current forecasts for the coming winter call for above normal precipitation due to the presence of a strong El Niño event in the tropical Pacific Ocean. Abundant winter precipitation could lead to high levels of leaching in both irrigation treatments and minimize or eliminate the impact of the irrigation treatments going forward in time.

Project Bullets

1. The study was initiated in July 2015 after a delay of nearly one year caused by heavy rains and flooding during the summer of 2014. Sodium chloride was applied to soils supporting established bermudagrass turf to create saline-sodic soil conditions ($EC_e > 4.0$ and $ESP > 15\%$).
2. Treatments were implemented to evaluate the effectiveness of recommended remediation procedures for saline-sodic soils and included applications of soil chemical amendments (gypsum, sulfur and control), two levels of irrigation (deficit and leaching) and soil tillage (hollow time and control).
3. Measurements of turf quality, turf growth rate, soil moisture and soil compaction are obtained every two weeks on all plots and subplots.
4. Soils will be sampled in December of 2015 to provide a preliminary assessment of the effectiveness of the remediation treatments.



Figure 1. Student worker, Adam Killebrew, applies NaCl to the plots



Figure 2. Tillage treatments consisted of one pass with walk-behind aerator outfitted with hollow tines. Soil cores were raked off and removed from the plots.



Figure 3. Applications of gypsum and sulfur were made using a hand spreader.



Figure 4. Irrigation treatments consist of a deficit and surplus (leaching) regime. Catch cans are used to monitor the precipitation rates of the plot irrigation systems.