# UPDATES ON UNIVERSITY RESEARCH OF INTEREST TO TURF MANAGERS

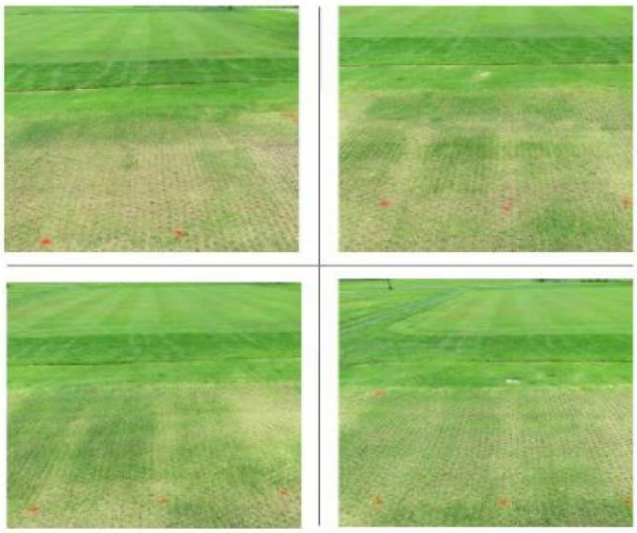
*Editor's note:*
*Once again we have asked some of the nation's leading turfgrass research programs to share some details on what they are currently working. Look for more updates in coming issues.*

## University of Kentucky

**Zoysiagrass for sports turf.** Zoysiagrass has long been considered unacceptable for athletic fields because its rate of recovery is quite poor compared to other grasses. There are, however, many beneficial reasons to consider zoysiagrass, including excellent wear tolerance, shade tolerance, tolerance to high and low air temperatures, C4 photosynthetic pathway (reduced water usage compared to C3), and stolons and rhizomes for footing and recovery. Although the above are all great reasons for using zoysiagrass, the few athletic facilities that have tried it over the years have quickly moved to a different species because of the recovery concern.

However, because there are several new cultivars available, a study was designed to test recovery of zoysia cultivars following traffic. Zoysias used in the study included the *Zoysia japonica cultivars* 'Meyer' and 'Compadre'(seeded), and the *Zoysia matrella* cultivars 'Diamond' and 'Zeon'. Cultivars were planted by sprigs or seed during the summer of 2014 and traffic was initiated beginning July 2015 and repeated in July 2016. Traffic was applied 17 times over a 6-week period with a Brinkman traffic simulator in two directions on each event. Nitrogen (urea) was applied every 2 weeks beginning early June at rates of 0, 1/4, 1/2, and 1 lb. N/1000 ft2 until September. Following the traffic period, digital images were taken for recovery analysis each week until recovered. Initial data taken immediately following the traffic period showed that Compadre (35%) and Meyer (36%) had significantly less cover than Diamond (44%), which was less than Zeon (56%). By 4 weeks after traffic, turf cover had improved to 84% for Meyer, 89% for Diamond, 91% for Compadre, and 95% for Zeon. Nitrogen rates were also important in that no nitrogen caused more plot disruption during traffic and less recovery following traffic. Excessive nitrogen (1 lb. N/1000 ft2 every 2 weeks) was also not beneficial as there were no differences between the ½ lb. and 1 lb. rates at any observation date.

**Fraze mowing.** Fraze mowing research being conducted at UK includes fraze mowing bermudagrass as a pre-plant treatment to improve perennial ryegrass overseed and fraze mowing to convert old bermudagrass cultivars to new and improved cultivars. The overseeding study is being conducted with the University of Tennessee and we've found that removing the bermudagrass canopy with a fraze mower is a



Effect of traffic on zoysia cultivars and N rates following 17 traffic events. Nitrogen treatments are from low to high (right to left) in each image. L to R: Meyer; Diamond; Zeon; and Compadre.

Bluegrass and bermudagrass cohabitating the same space. Notice the difference in color on the plot compared to the bermudagrass only area to the left.

very effective method of establishing perennial ryegrass. The one large concern with this method is that it takes a full week for the perennial ryegrass to germinate and begin to fill in so the only situation where fraze mowing would work as a pre-plant method is when there is an off week between games.

The bermudagrass conversion work is being conducted with Mississippi State University and looks promising when glyphosate is applied prior to fraze mowing. 'Riviera' bermudagrass was seeded into each plot and the least amount of common bermudagrass regrowth occurred on plots where deeper cuts were made that were preceded by an herbicide application.

**Joint study on establishing Latitude 36**. We have also completed a joint study with Louisiana State, Oklahoma State, and Mississippi State, looking at sprigging and nitrogen rates for optimum establishment of Latitude 36 bermudagrass. Higher sprig rates with judicious or even no nitrogen during the establishment period resulted in the quickest time to 100% cover.

I frequently get the question from sports turf managers managing bermudagrass, "How do I seed bermudagrass in the spring without annual grassy weeds taking over the stand?" We are working with a chemical company on this problem and are seeing very promising results using a pre-emergent herbicide at seeding that is selective towards the grassy weeds, but not bermudagrass. This study will continue next year as well but currently we are seeing about a 60-80% reduction in crabgrass and goosegrass in treated versus untreated plots.

**Maximizing turf cover in all seasons**. Lastly, we are working with Brian Winka, CSFM, Chesterfield, MO Parks and Rec, on mixing bermudagrass and Kentucky bluegrass to maximize turf cover during all seasons. Early results show excellent color and cover. This is exciting work that could change the face of sports turf management in the transition zone.

Pre-planting techniques for establishing perennial ryegrass overseeding. Image on the left is day of planting and image on the right is 3 weeks after planting. Treatments on both images from right to left are: 1" deep fraze mow, ½" deep fraze mow, ¼" deep fraze mow, vertical mow, no pre-plant treatment.

*Compiled by Dr. Gregg Munshaw, Turf Extension Specialist, University of Kentucky Sports Turf Research.*

## University of Georgia, Athens

**Several research trials** that may be of interest to sports turf managers are currently being conducted at the University of Georgia. The following projects are at various stages of completion:

**Comparison of Handheld vs. Mobile Devices to Assess Athletic Fields**. Performance testing of natural turfgrass sports fields requires sampling to obtain information on surface properties (e.g. soil moisture, soil compaction, surface hardness, and turfgrass vigor). Researchers and field managers may conduct performance testing in order to evaluate or develop standards for these properties to improve player safety and field playability. Although handheld devices are more abundant, mobile devices are available for field assessment. Results from this research will be appearing in an upcoming issue of the academic journal *HortScience*.

**Creating Site Specific Management Units for Athletic Fields**. Sports turf managers often apply cultural practices to entire fields or complexes without taking into consideration the variability that may exist with respect to soil moisture, soil compaction, etc. Performance testing provides the end user with maps that depict the variability of a given attribute within and across fields. These maps can be used to break areas up into smaller site specific management units, allowing the manager to better focus input application and foster uniform turfgrass growth/health. Results from this research are currently being evaluated and written for publication.

**Spatial Interaction between Field Surface Properties and Rooting Dynamics**. Field surface properties such as soil moisture, soil compaction, surface hardness, etc. can influence one another; therefore, having a profound impact on the rooting dynamics of sports fields. Mapping the agronomic conditions of athletic fields while simultaneously taking soil samples at various depths may further the understanding of these interactions. Results from this research are currently being evaluated and written for publication.

**Correlation between Athletic Field Surface Properties and Player Injuries**. Sports fields play a greater role in athlete performance than most people believe. Performance testing on a regular basis along with techniques to simultaneously track player injuries and severity may provide insight into the specific field conditions or field locations that may increase potential for athlete injuries. Our group, in conjunction with several kinesiologists, is in the second year of evaluating such research across men and women's rugby and ultimate Frisbee.

**Athlete Perception of Field Quality and Injury Risk.** Qualitative research (i.e. interviews) is a way to understand social phenomena in a natural setting by focusing on the experiences and views of the participants, which cannot be explained with quantitative research (e.g. anything measurable). Recognizing athletes' experiences, views, and opinions on field properties may be fundamental in the development of natural turfgrass sports field research and management. This study involves conducting "walking interviews" (with men and women rugby and ultimate Frisbee athletes) to obtain site-specific opinions of surface properties (e.g. ground cover, surface hardness, traction, etc.) and how changes within the field influence playability and safety. All interviews take place on the actual fields and locations of participant responses are geo-referenced and compared to maps of field properties. This research is currently ongoing and will be completed in the fall of 2016.

**Effect of Irrigation Timing and Dry down on Surface Hardness and Soil Compaction.** Athletic turf managers often debate whether to reduce or even avoid irrigation practices prior to sporting events. The length of dry down following irrigation may have a significant impact on surface hardness and soil compaction, which can affect field performance and player safety. Results from this research are currently being evaluated and submitted for publication.

**Effect of Site Specific Cultivation on Soil Compaction and Rooting Characteristics.** Cultural practices are often conducted over entire sports fields without taking into consideration the spatial variability of soil characteristics. Site-specific cultivation focuses on heavily compacted regions of athletic fields in an attempt to increase turfgrass rooting and create more uniform soil structure. This research is currently being conducted over multiple years.

**Long-term Effects of Open Spoon Aerification on Soil Compaction of Athletic Fields.** Although deemed less effective than vertically operated hollow tine aerifiers, 47% of sports turf managers surveyed in 2013 (total of 218) in the United States indicated using open spoon aerification as a form of cultivation used on their fields. ***In situ*** evaluation of aerification regimes may provide the most applicable results; therefore, our research evaluated the 2-year effect of open spoon aerification timing and frequency on soil compaction, surface hardness, turfgrass vigor, and root mass of community level sports fields. Results from this research have been submitted for publication in an academic journal.

**Advances in Thick-cut Sod Production.** Sports fields are often resurfaced with thick-cut sod in order to reduce establishment time before play can be resumed. Currently only a few hybrid bermudagrass cultivars are being grown for thick-cut sod production. Upcoming research in our group will investigate sod production of additional bermudagrass cultivars/turfgrass species, alternative establishment methods, and enhanced installation techniques.

*Compiled by Gerald Henry, PhD, Associate Professor - Environmental Turfgrass Science*

*Athletic Association Endowed Professor. Other members of the environmental turfgrass science team include: Graduate Research Assistant Chase Straw; Graduate Research Assistant Rebecca Grubbs; and Research Associate Kevin Tucker.*

## Rutgers University

**These sports field and grounds research projects** are based at Rutgers University's horticultural farm No. 2, North Brunswick, NJ.

**2011 National Turfgrass Evaluation Program (NTEP) Kentucky bluegrass Test.** The 2011 NTEP Kentucky bluegrass Test was seeded in October 2011 to assess the tolerance of entries to wear applied with the Rutgers Wear Simulator (RWS) and trampling caused by the Cady Traffic Simulator (CTS). Machine passes were applied in separate RWS and CTS strips to all entries during three seasons (spring, summer, and autumn) during 2012-16. Plots were visually evaluated at the conclusion of each season and images of each plot were captured and subjected to digital image analysis of green cover.

Analysis of digital images and visual ratings indicated that the RWS caused more damage to Kentucky bluegrass compared to the CTS in each season during 2015. Digital image analysis was unable to differentiate between CTS-treated and non-trafficked Kentucky bluegrass at the conclusion of spring, summer, and autumn 2015

This research quantifies the strengths and weaknesses of machines used to apply traffic to turfgrass so that varieties can be better evaluated for use on highly trafficked turfs such as sports fields. For complete study results, see www.ntep.org

**2012 NTEP Tall Fescue Test.** The 2012 NTEP Tall Fescue Test was established to assess entry response to the combined stresses applied by the RWS and CTS. Previous research at Rutgers determined that combining the RWS and CTS was an effective strategy to apply to traffic stress to turfgrass. Machine passes were applied to entries during spring, summer, and autumn. Plots were evaluated similar to the 2011 NTEP Kentucky bluegrass Test.

Analysis of digital images (green cover) provided confounding results compared to visual assessments generated by experienced human evaluators during 2015. Visual ratings tended to provide more differences among entries compared to digital image analysis. Subtle differences in turf density, undetectable by digital image analysis, were the source of discrepancies between visual and digital analysis. Tall fescue entry responses to traffic can be found at www.ntep.org and in the Rutgers Turfgrass Proceedings (http://turf.rutgers.edu/research/reports/).

**Performance of cool-season seed blends and mixtures under low maintenance.** There is an increasing demand for

turfgrasses that are well adapted to fewer irrigation, fertilization and pesticide inputs, particularly for general grounds and sports fields where few resources are allocated, both turfs that sports turf managers are frequently required to maintain. A research trial was established at in autumn 2011 with the objective of evaluating the performance of cool-season turfgrass blends and mixtures under moderate fertilization and limited irrigation and pesticide inputs.

During 2013-15, the test was mowed approximately once per week with a rotary mower at 2.5 inches; mowing was withheld from the test whenever the trial exhibited drought stress. Irrigation was applied once to the trial during 2013, withheld completely from the trial in 2014, and during 2015 was withheld until September. The trial was thoroughly irrigated in September 2015 to encourage recovery from severe drought stress. Annual nitrogen quantities were 1.7, 2.1, and 1.8 lbs. N per 1000 ft2 during 2013, 2014, and 2015, respectively.

Entries containing perennial ryegrass exhibited better than expected turf quality during 2014; however, many of these entries exhibited a dramatic decline in turf quality during above average air temperatures and below average rainfall in July and August 2015.

Better turf quality was exhibited by entries containing tall fescue during this stress period in 2015. In large part, this was due to the ability of these plots to maintain greater and more uniform turf cover compared to other plots. Tall fescue has long been recognized for its very good high-temperature and drought tolerance, better insect tolerance, and ability to persist under low fertility. Full research results can be found in the Rutgers Turfgrass Proceedings (http://turf.rutgers.edu/research/reports/).

**Fine Fescue Research**. Fine fescues (hard fescue, strong creeping red fescue, slender creeping red fescue, Chewings fescue, sheep fescue, and blue x hard fescue) can provide quality surfaces for general grounds where limited water, fertilizer, and mowing inputs are provided. Traditionally, fine fescues are considered to have minimal traffic tolerance. Research at Rutgers University is assessing the wear and traffic tolerance of these fine fescue species. The goal is to improve the ability of fine fescues to tolerate and recover from traffic.

Ten fine fescue entries were seeded in September 2012 for the purpose of comparing the effects of RWS and CTS operation on fine fescues during spring, summer, and autumn beginning in autumn 2013 and concluding in summer 2016. Year 1 and 2 results indicated that fine fescue were more tolerant the trampling traffic imparted by the CTS compared to abrasive traffic caused by the RWS. The abrasive traffic caused more severe leaf bruising during autumn and summer compared to traffic during spring.

The same ten fine fescue entries were established in September 2012 to assess the effects of the RWS in spring, summer, and autumn. The RWS was applied in separate seasonal strips during spring (April to June), summer (July to August) and autumn (September to November) during autumn 2013 through spring 2016. Results indicate that wear was more damaging to 1-yr-old (autumn 2013) fine fescues compared to more mature plots.

### 2014 NTEP FINE FESCUE TEST

Seeded in 2014, the 2014 NTEP Fine Fescue Test was established to assess the tolerance of sixteen strong creeping red fescue entries, twelve hard fescues, ten Chewings fescue entries, three slender creeping red fescues, and one sheep fescue entry. Wear will be applied using the RWS and commencing in autumn 2016 (September to November) with a seasonal wear schedule to follow: spring (April to June) and summer (July to August). Plots will be evaluated similar to other NTEP wear/traffic tests at Rutgers University Hort. Farm No. 2.

**Using herbicides and perennial ryegrass to renovate turf dominated by annual bluegrass**. Annual bluegrass is a highly opportunistic weed that frequently invades sports turfs. Among cool-season turfgrasses, perennial ryegrass is effective when overseeded into existing turfs given its rapid germination and aggressive establishment. A research study was initiated on a mature stand of annual bluegrass in September 2015 to assess the effectiveness of herbicide programs designed to suppress annual bluegrass in turf overseeded with perennial ryegrass.

Programs involved applications of glyphosate (Roundup PRO), amicarbazone (Xonerate), mesotrione (Tenacity), and ethofumesate (Prograss) applied during September through December 2015. 'Manhattan 5 GLR' perennial ryegrass was slit-seeded on September 14, 2015.

All herbicide programs increased the establishment of perennial ryegrass. Glyphosate (applied September 4, 2015) followed by application of ethofumesate on October 3, November 3, and December 4, 2015 resulted in the greatest perennial ryegrass population (91.3%) when evaluated on December 22, 2015. Plot evaluation continued during spring and summer 2016. The trial will be repeated during autumn 2016 and will be evaluated though autumn 2017.

Compiled by Bradley S. Park, Sports Turf Research & Education Coordinator; personnel responsible for conducting sports field and grounds research at Rutgers Hort. Farm #2 include: Eric Chen, Graduate Student; Joe Clark, Research Farm Supervisor; Dr. James Murphy, Extension Specialist in Turfgrass Management; Dr. William A. Meyer, Associate Director, Center for Turfgrass Science; and Dr. Bruce Clarke, Director, Center for Turfgrass Science.

Research is sponsored by: Rutgers Center for Turfgrass Science; New Jersey Agricultural Experiment Station; National Turfgrass Evaluation Program; United States Department of Agriculture Specialty Crops Research Initiative; and the Sports Field Managers Association of New Jersey.

*For additional information, please contact Brad Park at park@aesop.rutgers.edu or Dr. James Murphy at murphy@aesop.rutgers.edu.* ST