

## Rethinking fall fertilization September 2, 2014

Fall is arguably the most important season for turfgrass managers. While we're busy preparing for a new growing season in spring and trying to survive stressful conditions in the summer, fall is the time to recover from summer, renovate, and prepare for winter. It's a season of seeding, cultivation, weed control, and fertilization. While fall fertilization is still widely considered the most important time to fertilize turfgrass, our recommendations have changed over the years. During my graduate studies, I had the opportunity to work with two research groups that were looking into fall fertilization. At UW-Madison, Dr. Soldat's group was studying late fall nitrogen applications, and at Cornell Dr. Rossi's group was finishing up work with late season potassium fertilization. These experiences influenced my opinion of late fall fertilization.

Fall nitrogen applications are essential to promote plant regrowth, summer stress recovery, and maximize carbohydrate storage prior to winter. Previous recommendations were to apply nitrogen during early to mid-September and then make a heavy application of nitrogen fertilization at the end of the growing season (early to mid-November). The rationale was the cool weather stunted shoot growth while the nitrogen fertilizer was still taken into the plant because the soils are still relatively warm. Dr. Soldat's group actually found that nitrogen uptake was lower during the end of fall compared to earlier in the season (Figure 1). Nitrogen in the soil solution is transported to the roots via plant transpiration through a process called mass flow. The higher the transpiration rate, the more nitrogen gets to the roots. Low evapotranspiration during late fall limits mass flow and reduces access to nitrogen. As a result, nitrogen from late fall fertilization either sits in the soil until the grass resumes growth in the spring or it is lost through processes such as leaching (especially in sand-based soils during high precipitation winters). This work has since been replicated and confirmed by researchers at the University of Minnesota and Penn State University.

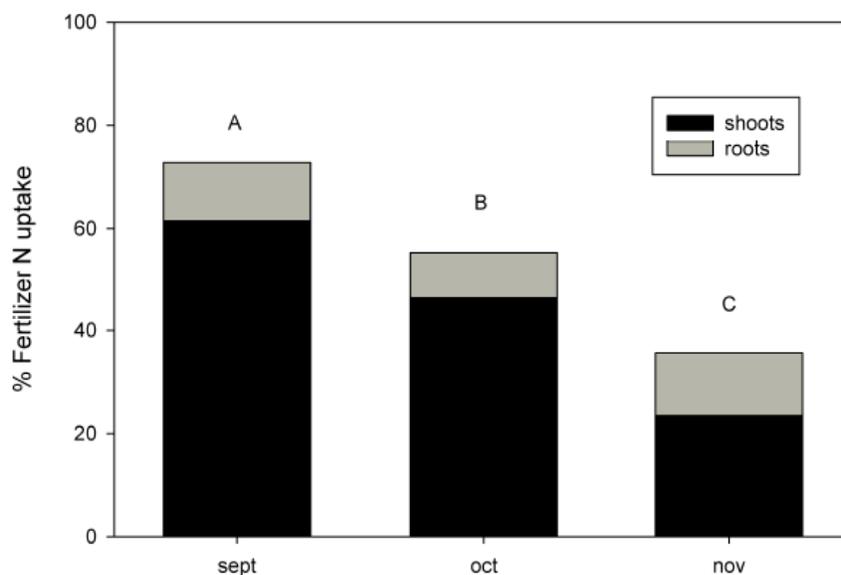


Figure 1. Nitrogen fertilizer uptake efficiency declines later into the fall. Fertilizer that isn't taken up by the plant sits in the soil until the following spring or is leached out during winter. Avoid late season apps that are inefficient. September fertilization is best to maximize recovery and prepare for winter. Courtesy of Doug Soldat

At Cornell, I met then Ph.D. student Dave Moody who was also studying with Dr. Rossi. Moody's Ph.D. work focused on fall potassium fertilization and turf winter survival. This idea has been around the industry for years. It's known that fall potassium fertilization is important for cold tolerance in warm-season turf, but research on cool-season turf shows little or no improvement in cold tolerance. Interestingly, Dave Moody's Ph.D. work found that fall potassium fertilization increased annual bluegrass susceptibility to gray and pink snow mold. The more potassium applied, the more snow mold occurred. Moody concluded that the excessive amounts of potassium changed the concentration of other nutrients (i.e. calcium and magnesium) and altered how sugars (carbohydrates) were distributed within the plant. These changes in plant growth and physiology that resulted from excessive levels of potassium, and not the potassium direct, increased the susceptibility to snow mold.

Our current recommendations for fall fertilization are as follows:

Sand-based systems (golf greens, tee, athletic fields):

Continue to spoon-field soluble nitrogen sources into the fall. Gradually reduce nitrogen rate as evapotranspiration rate declines. Final application should be made from early to late October depending on your location within Nebraska. Otherwise, apply 0.5 to 1.0 lbs of nitrogen from a slow release fertilizer in mid-September while uptake efficiency is still high. Aim for a product with at most 50% slow release nitrogen and use a product with a low SGN to reduce the potential of mower pick-up. This strategy supplies the plant with the nitrogen it needs to recover from summer stress and produce storage carbohydrates from winter (Figure 2). Apply potassium if it's required by soil test or if annual nitrogen is much greater than annual potassium rate. The most efficient time to apply potassium is actually in the spring because it minimizes the risk of leaching during winter when uptake is minimal.

Soil-based turf systems (lawns, athletic fields, golf fairways):

Apply slow release granular products in mid-September at 1.0 lbs/1000 ft<sup>2</sup>. Aim for a product with 50% slow release nitrogen or less. If additional nitrogen fertilization is required later in the fall, use products with more quick release nitrogen and don't apply nitrogen after mid to late-October depending on your location within Nebraska. Later applications will linger in the soil and promote excessive spring growth. This increases mowing requirements in spring and depletes carbohydrates prior to summer. It's essential the same as applying nitrogen fertilizer in early spring. Apply potassium based on soil test recommendations.

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Figure 2. Nitrogen fertilizer response on a creeping bentgrass putting green in Madison, WI on November 7, 2008. 100% quick release nitrogen was applied at 1.0 lbs/1000ft<sup>2</sup> on September, October, or November 15<sup>th</sup>. October application provided the best fall color but the September application had the best nitrogen uptake. The best way to fertilizer sand based turf is to continue spoon feeding until turfgrass slows in the end of October. Courtesy of Doug Soldat