Timing nitrogen fertilizer applications
December 30, 2019

We've received several questions about timing nitrogen fertilizer applications following the recent Turf iNfo articles warning against late fall fertilization. A well-timed fertilizer application supplies the turf with nutrients when they are needed by the plant and when the soil isn't already supplying the nutrient. It's a two-part problem, and factors like weather conditions and soil health further complicate the story. Therefore, it's difficult to provide a generic turfgrass fertilization program for all situations.

Part 1: Plant Nitrogen Demand

Actively growing turfgrass is chronically hungry for nitrogen fertilizer. Even small additions of nitrogen fertilizer can increase clipping yield during the growing season – if there is water for the turf and the soil is not compacted. Nitrogen demand does diminish when temperatures fall below or above the ideal air temperature for each grass species. This is why turfgrass researchers warn against fertilizing in late-fall and early-spring.

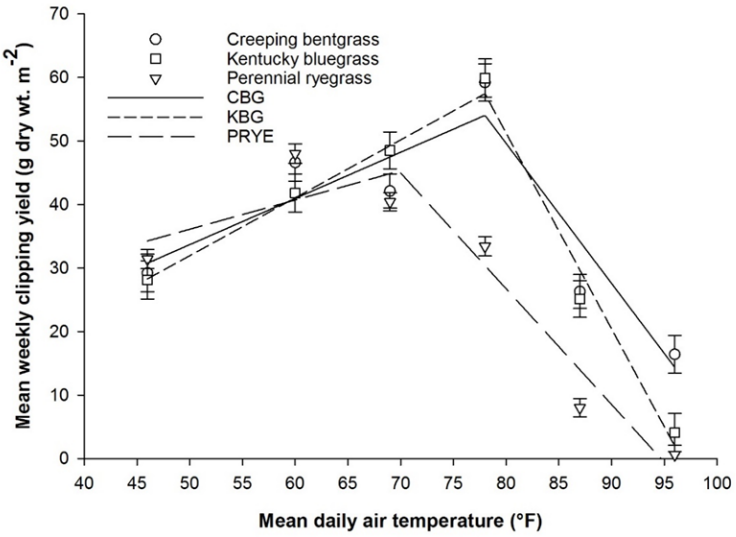

Figure 1. Clipping yield response to nitrogen fertilizer at different air temperatures in three cool-season grass species. These grasses have high demand for nitrogen when the average air temperature is between 60 and 75F.

A recent growth chamber study at the University of Nebraska (Fig. 1) found that growth rate or clipping yield response to nitrogen fertilizer varies with air temperature. Species like Kentucky bluegrass (KBG) and creeping bentgrass (CBG) preferred warmer temperatures than species like perennial ryegrass (PRYE). Peak fertilizer responsiveness for Kentucky bluegrass and bentgrass occurred when the daily *average* air temperature – not high temperature – was 78F. The perennial ryegrass growth/clipping yield response peaked at 69F and then rapidly declined.

The majority of turfgrass fertilizer should be applied when the grass is actively growing, which is between 60 and 75F for these three coo-season turfgrass species. Application of nitrogen when the average air temperature is above 85F or below 45F is less efficient and should be avoided.

Part 2: Soil Nitrogen Availability

Understanding plant demand for nitrogen is only half the story. We fertilize turfgrass to supply nutrients that aren't being supplied by the soil. The presence of plant available nitrogen in the soil is constantly changing during the year. This is why it is impractical to soil test for nitrogen. The release of plant available nitrogen – called nitrogen mineralization – occurs when soils are warm,

wet and aerated. These soils also need to have enough organic matter to degrade into plant available forms. As a result, old turf stands (with more soil organic matter) may not require nitrogen fertilizer in the middle of summer, but newer turf stands (lower soil organic matter) generally benefit from mid-summer fertilization.

There is also a significant amount of plant available nitrogen in the soil after winter. Freeze and thaw cycles during winter release a significant amount of mineral nitrogen, but the soils are too cold for significant turf (or microbe) uptake of this nitrogen. Once temperatures become conducive for turfgrass growth in mid-spring, it can be hard to keep up with mowing. This is most common on fine-textured soils with mature turfgrass stands. It is less common on soils with low organic matter content (new stands) or on sandy or sand-based soils. Some nitrogen fertilizer in spring can benefit these turf stands, especially if spring traffic is a concern (i.e. spring baseball).

The ideal time to apply nitrogen fertilizer is when soil mineralization turf growth rate is lowest. Traditionally these slow growth periods are from late-May through mid-June and again after Mid-August in Nebraska (Fig 2). Most cool-season turfgrass stands benefit greatly from nitrogen fertilizer applications in late May and mid- to late-August. Warm-season grasses like buffalograss benefit from fertilizer applications in early-August.

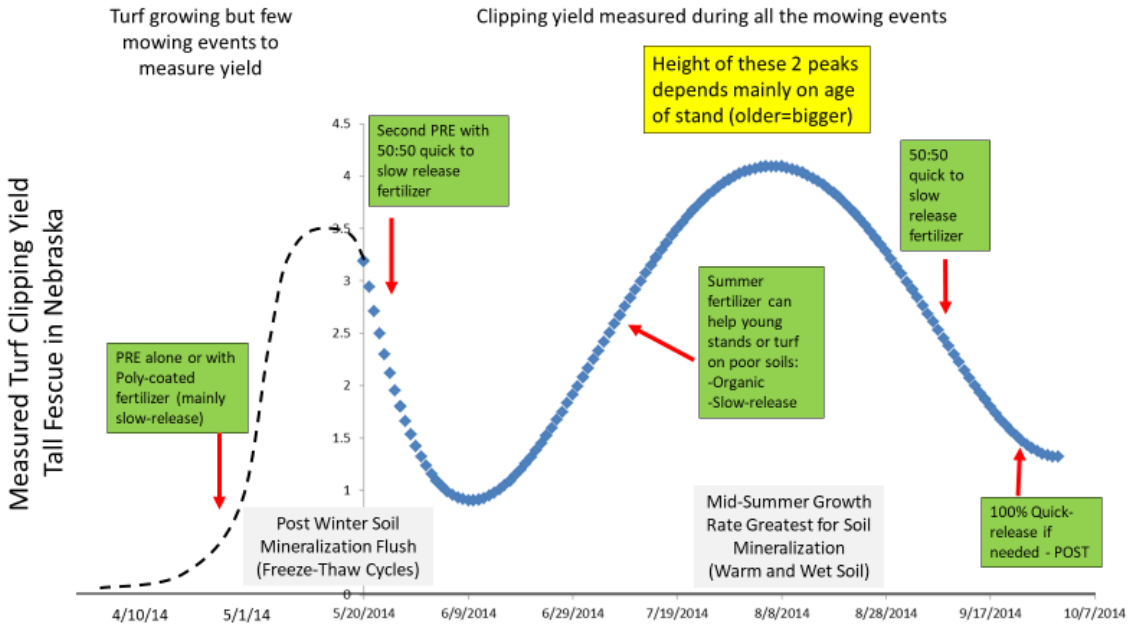

Figure 2. Commonly observed growth rate/clipping yield of tall fescue lawns in Lincoln, NE when fertilizer is withheld. The height of the growth peaks is affected by the age of the stand (amount of soil organic matter). As the turf stand ages, fertilizer application during these growth peaks can be eliminated because the soil is providing the fertilizer via nitrogen mineralization.

Nitrogen Fertilization Considerations

- Don't fertilize turf that isn't actively growing. An exception would be low rates of nitrate-based fertilizers in spring to promote green up (i.e. sports turf). The nitrate in the fertilizer helps stimulate the turf to resume normal growth following winter.

- When the turf is actively growing, fertilize with nitrogen to sustain uniform growth rates. For lawns, we recommend 1.5 inches of new growth a week. This equates to weekly mowing when the mower is set to three inches. For putting greens, a good goal is roughly 1.0 to 1.5 quarts of clippings per 1000 sqft during each mowing. If clipping production falls below these levels, then an application of nitrogen fertilizer is recommended. If clipping yields are well-above these levels, then skip the fertilizer application. It really can be that easy if managing one property.

- Older lawns need less fertilizer and fewer applications annually than newer stands. Eliminate applications during high mineralization periods such as mid-summer or spring. Continuing to over-fertilize turf can lead to issues of excessive thatch accumulation, diseases like brown patch, nitrate leaching to groundwater and it wastes money.

- Different fertilizer sources have different release characteristics. Inorganics (i.e. ammonium sulfate) and urea are immediately available and provide short lived response – roughly three to four weeks. Sulfur coated products slow nitrogen release, especially if soil moisture is low. The release of natural organics, synthetic organics (i.e. methylene urea), and polymer coated nitrogen is highly affected by soil temperature and moisture. Release will be faster if soils are warm and slow when soils are cool and dry. Mixing quick-release sources with slower release sources at a 50:50 ratio can provide eight or more weeks of fertilizer response during Nebraska summers.

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