



Making Sense of the Primo Maxx Research at UW

By **Bill Kreuser**, Graduate Student, Department of Soil Science, University of Wisconsin - Madison

Over the past few years I have conducted several Primo Maxx research studies at the OJ Noer Turfgrass Research Facility with Drs. Wayne Kussow and Doug Soldat. Every study has helped answer questions about the effect Primo Maxx has on turfgrass growth, color, and quality. There is a fair amount of information that can be a quite overwhelming and at times hard to comprehend. During the past summer several golf course superintendents have asked questions about our research so I decided to address some of the most common questions here.

How Long Does Primo Maxx Reduce Putting Green Clipping Production?

The label states that re-applying Primo Maxx every four weeks will maintain a 50% clipping reduction. However many turfgrass managers have seen a dramatic increase in putting green clipping production sooner than four weeks after the last application. This is especially true during midsummer. The truth of the matter is that Primo's longevity is controlled by plant metabolism and not by a calendar. The rate of plant metabolism is related to temperature. Increasing temperature by only 18°F doubles the rate of plant metabolism which includes the rate of Primo degradation. The daily average air temperature for Madison, WI during the month of May is 57°F or 14°C while in July the average temperature is 71°F or 22°C. According to our data, this means that Primo will effectively reduce clipping production on bentgrass putting greens for 18 days in May and only 11 days during an average July. After the reduction phase the bentgrass putting greens experience a rebound phase of increased clipping production compared to untreated grass. Typically this rebound phase lasts as long as the reduction phase did. For example during a hot stretch of weather (think: Pythium), Primo will cause growth suppression for a week followed by one week of increased putting green growth. The result being no net reduction in growth, and possibly a net increase.

It is also important to consider grass species when thinking about the Primo longevity. Branham and Beasley (2007) found that creeping bentgrass and Kentucky bluegrass metabolize Primo at different rates. [DSS1]We are finding this to be true regarding annual bluegrass and creeping bentgrass. *Poa annua* is metabolizing Primo quicker than the creeping bentgrass. The

net effect is *Poa* enters the rebound phase while the bentgrass is still in the suppression phase of growth. This may give the *Poa* a competitive advantage over the desirable creeping bentgrass. To minimize this advantage Primo needs to be re-applied sooner before the *Poa* enters the rebound phase. This was easier said than done because it is difficult to predict the metabolism of Primo by the turfgrass until now.

How can a growing degree day system help with my Primo Maxx applications?

A growing degree day (GDD) system is helpful when using Primo because it predicts Primo's effect on turf growth. The system is very simple to use. After Primo is applied the daily average air temperatures are added together until Primo is re-applied. At that point the model is reset to 0 and the process is repeated. The temperatures are recorded in degrees Celsius with a base temperature of 0°C. The model has been calibrated and validated over the past few summer on several creeping bentgrass putting greens.

Initially after Primo application to creeping bentgrass putting greens, 0-50 GDD units, the turfgrass enters the growth suppression phase. This suppression phase will remain until approximately 200 GDD units after Primo application. Between 200 and 300 GDD units the turfgrass will transition into the rebound phase. This rebound phase will continue until 500 GDD units after treatment. Past 500 GDD units the turfgrass grows similarly to the untreated control. *Poa annua* putting greens exhibit the same cycle but on a shorter timeframe.

Keeping track of the daily air temperatures can provide a very simple and effective way to monitoring the influence Primo is having on your bentgrass putting greens. This can be useful for several situations. For example, to maintain consistent growth regulation during a growing season Primo should be re-applied every 200 GDD units. If the greens are *Poa annua* Primo should be re-applied every 150 GDD because the *Poa* metabolizes Primo quicker. Knowledge of when the rebound phase will occur can also be useful in aiding in recovery from cultural practices such as top-dressing or aerification. Withholding a practice like aerification or vertical mowing until the rebound phase (300 GDD) can aid in turfgrass recovery in similarly to application of a nitrogen fertilizer.

Does application rate affect growth rate or the growing degree day model?

No, at least when talking about grass maintained at putting green height. We have applied Primo at the labeled rate of 0.125 fl oz of product per 1000 ft² (5.4 fl oz/M) for two years now and have measured a 20% reduction in clipping production on bentgrass putting greens. Typically the maximum amount of growth suppression occurs about 125-150 GDD units after application. This year we have applied Primo at double the labeled rate, 0.25 fl oz/M, and four times the labeled rate, 0.50 fl oz/M. We expected that the increased rate would lead to an increased level of growth suppression. This didn't occur. All three application rates provided a 20% reduction in clipping production. Additionally, increased application rate hasn't affected the duration of the suppression phase. The bottom line is that applying Primo to closely mown putting greens at a rate above 0.125 fl oz/M is not effective. Next season, we will evaluate the effectiveness of reduced rates.

Is mowing height important?

Yes. Primo only enters the plant through the foliage. We hypothesized that the small amount of leaf area on a putting green may limit the amount of Primo the

plant can absorb. This isn't a new phenomenon to the turf industry. For example the herbicide Velocity isn't very effective at putting green height because of the limited leaf area to absorb the product (Branham and Calhoun, 2005). To test this we created a study that had three different application rates and two mowing height. The grass mowed to 0.125" experiences the expected 20% reduction in growth across all application rates. However the plots mowed to 0.250" about double the reduction (40%) in clipping production. The high Primo rate (0.500 fl oz/M) at the 0.250 inch mowing height has experienced up to a 65% reduction in growth. Another interesting phenomenon we've seen is that the grass at the higher mowing height is growing about half as fast as the grass at green height.

Does Primo Maxx affect putting green nitrogen and phosphorus fertility requirements?

Yes and No. Much like nitrogen, Primo enhances putting green color and visual quality. When re-applied every 200 GDD those enhancements remain constant throughout the growing season. However it takes at least four weeks of constant suppression for the increased color and quality to become apparent. If Primo isn't applied every 200 GDD these enhanced

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qualities are not apparent because the grass is constantly transitioning between the suppression and rebound phases.

We have found that Primo, when applied every 200 GDD, enhances color and quality to a level similar to doubling the nitrogen fertilizer rate. Additionally the clipping production is similar to cutting the nitrogen rate in half. For example there are plots at Noer that receive 0.2 pounds of nitrogen (N) per 1000 ft² every two weeks and have 0.25 fl oz of Primo applied per 1000 ft² every 200 GDD. These plots have similar color and quality to the plots that receive 0.4 pounds N 1000 ft² every two weeks but receive no Primo. At the same time those plots produce similar clipping masses as plots that receive 0.1 pounds N 1000 ft² every two weeks but receive no Primo. Using the GDD model is important to experience these results. We conducted this research for two years prior except Primo was re-applied every three weeks and didn't see these results. Using Primo and a GDD system can be a useful way to reduce putting green nitrogen requirements.

Although Primo can reduce putting green nitrogen requirements it hasn't had an effect on the critical soil test phosphorus requirements. It was hypothesized that the Primo induced reduced growth rate would allow the plant to better acquire and cycle phosphorus. However this hasn't been the case over the past year and a half. Phosphorus deficiency symptoms appear much like the flipping of a light switch. On our particular green, once soil test levels drop below 10 ppm Mehlich-3 P the tell-tale blue color of phosphorus deficiency becomes obvious regardless of Primo application. To date Primo hasn't affected critical soil test phosphorus requirements

In Summary

- Primo Maxx influences growth in two phases; a suppression phase followed by a rebound phase of increased turfgrass growth compared to an untreated control.
- The length of the growth suppression phase in influenced by air temperature not a calendar.
- Using a simple growing degree day model can be a useful tool to predict the level of growth regulation on a golf putting green. Before 250 GDD units the grass growth is suppress and after 250 GDD units growth is enhanced on a creeping bentgrass putting green.
- Re-applying Primo every 200 GDD units will provide consistent growth suppression on a creeping bentgrass putting green during a growing season. It is impractical to re-apply Primo on exactly 200 GDD in a golf course setting. However the GDD model can be like a fuel gauge. When the Primo fuel gauge is getting near empty it is time add Primo to the next spray tank.

- Mowing higher will lead to slower growth in general, and increased growth suppression when Primo is applied. Applying Primo at rates greater than 0.125 fl oz/M will not result in increased growth suppression on golf course putting greens.
- Re-applying Primo every 200 GDD provides a constant boost in turfgrass color and quality in a similar as increased nitrogen fertilization. Re-applying Primo properly can reduce nitrogen fertilization requirements substantially.

If you have any further questions about our Primo research please feel free to contact me at wkreuser@wisc.edu.

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Grams Takes the Helm of WGCSA

By **David Brandenburg**, Golf Course Manager, Rolling Meadows Golf Course

Brett Grams found his way to the position of Chapter Manager for the Wisconsin Golf Course Superintendents Association (WGCSA) through an unplanned route. But when you think about it, how many of us are doing exactly what we thought we would when we entered college. In reality the position of WGCSA Chapter Manager did not exist 6 months ago so it is unlikely it was anyone's childhood dream job. What is important to Brett; and of benefit to the WGCSA is the fact Brett is working in the industry he loves with people he appreciates.

Brett grew up in Waupun, WI and learned to appreciate the game of golf at Rock River Country Club in Waupun as a junior member living a 1/4 mile from the course. Brett's mom would drop him off in the morning to get in a round before swimming lessons or baseball practice. Although an active sports schedule kept him busy Gram's found time to make some money at a variety of student jobs. He worked at R-Line Foods in Ripon with Ripon Good Cookies and Smuckers Jelly, a cleaning job, and some clubhouse work at the County Club.

His mom encouraged him to find a job with more hours for the summer so Brett applied to work for Kris Pinkerton Superintendent at Rock River in 1989. When Pinkerton moved to Waupaca Country Club, Brett worked for Al Fude for a time until he left to join Pinkerton in Waupaca. Brett worked for Pinkerton in the summer and Jeff Bottensek at Stevens Point Country Club during the spring and fall while at school in Stevens Point. After taking a variety of classes in Natural Science, Business and Natural Resources, Brett settled on Psychology and received his degree while moving up to assistant superintendent at Waupaca.

Brett decided that he needed more turf knowledge if he was going to stay in the golf industry and enrolled at the 2-year program at The Pennsylvania State University, while continuing to work at Waupaca CC. During his second year at Penn State, Pinkerton moved on to Oshkosh Country Club and Brett was given the opportunity to take over at Waupaca. It was not an easy decision, when as a graduate of Penn State he had many internship and assistant positions around the county available to him. Brett decided to stay on at Waupaca and enjoyed the challenges and rewards of being a Golf Course Superintendent.

In talking to Brett it is clear he has great respect for his mentors Jeff Bottensek and Kris Pinkerton for the experiences and guidance they provided as he



Spencer, Nickolas, Nancy and Brett Grams

matured personally and professionally. Grams does joke with Bottensek that he only worked for him because he knew Jeff could help him get in the Penn State Program.

In February of 1998 Faulks Brothers in Waupaca was looking for a person with agronomic knowledge to supplement their sales team. Faulks was growing in a couple directions at the time with a bag line of consumer products and the Greensmix Blending operation that were both going nationwide. Brett along with Jim Trizinski and Christine Faulks concentrated on the Greensmix Maintenance section of Waupaca Sand, selling to golf courses. Faulks had sold products to golf facilities previously but Brett brought a new level of customer service and expanding product line to specifically help golf course superintendents. Brett hit the road to make relationships and the business soon had 15 products exclusively for golf courses through Waupaca Sand and Solutions.


I asked Brett if he missed the day to day golf course activity and although he did, having a growing family he appreciated having weekends off and normal working hours. As a benefit Gram's still worked in the industry and now he could help many golf courses and the superintendents.

Brett's family entered the apartment business and he started to feel the time constraints that come with owning your own business. As luck would have it he took an opportunity to reduce his hours at Waupaca

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Sand from 50 to 60 a week to 4-10 hour days. As the apartment business grew into more apartments Brett reduced his hours to around 20 hours per week.

This relationship worked well until with the economic challenges facing all companies Bob Faulks approached Brett and suggested he should go back to full time to grow new business or should consider moving on to allow a new salesperson the opportunity. This happened to be the same time the WGCSA Board of Directors was beginning the process of creating the position of Chapter Manger. Brett who had been the vendor liaison to the board gave up that position when he left Waupaca Sand and soon was considering being an applicant for the Chapter Manager himself.

WGCSA Chapter Manager is a natural fit for Brett given his varied experience in the industry. Golf Course Superintendent at Waupaca Country Club, sales with Waupaca Sand & Solutions, WGCSA Board Vendor Liaison, Northern Great Lakes Golf Course Superintendents Association committee service, and Past President of the Wisconsin Sports Turf Managers Association all provided Brett the experiences he will need to lead our chapter.

With a couple months under his belt, one of Brett's concerns is the membership has not been able to see the fruits of his labor. So far much of Brett's work has been behind the scenes laying the foundation for the future. Brett has updated our antiquated and duplicated member database, is re-creating WGCSA.org and creating the Industry Partner Program to give recognition and sponsorship opportunities to our vendor members in an organized fashion.

Brett realizes he will have some continuing challenges guiding our association and providing service to our members. He pointed out although agronomic systems are not changing that much, communication is changing rapidly as e-mail and websites are the norm, and some members are using facebook, twitter and other online sites to communicate while others don't even have a computer.

Product re-registration and regulation are important member concerns and Brett will be able to organize and lead the members into action when needed to head off unfair and unwise restrictions.

Gram's main goal is to ensure the members feel they are part of the association which is a challenge given the scope of location and differing roles members play. It is important to get information out to all the members. Although Brett sees the national association (GCSAA) taking a greater role in chapter administration and communication, he points out what is good for other states may not be what the Wisconsin members want so it is important to keep our chapter individuality.



Even when coaching the team Brett's golf allegiance comes out with the Titleist Hat.

Brett looks forward to working with leaders of related golf and turf organizations including Monroe Miller and the Wisconsin Turfgrass Association Board to the betterment of both organizations. Brett is proud of the funds the WTA has raised for Turf Fellowships and their endowment fund.

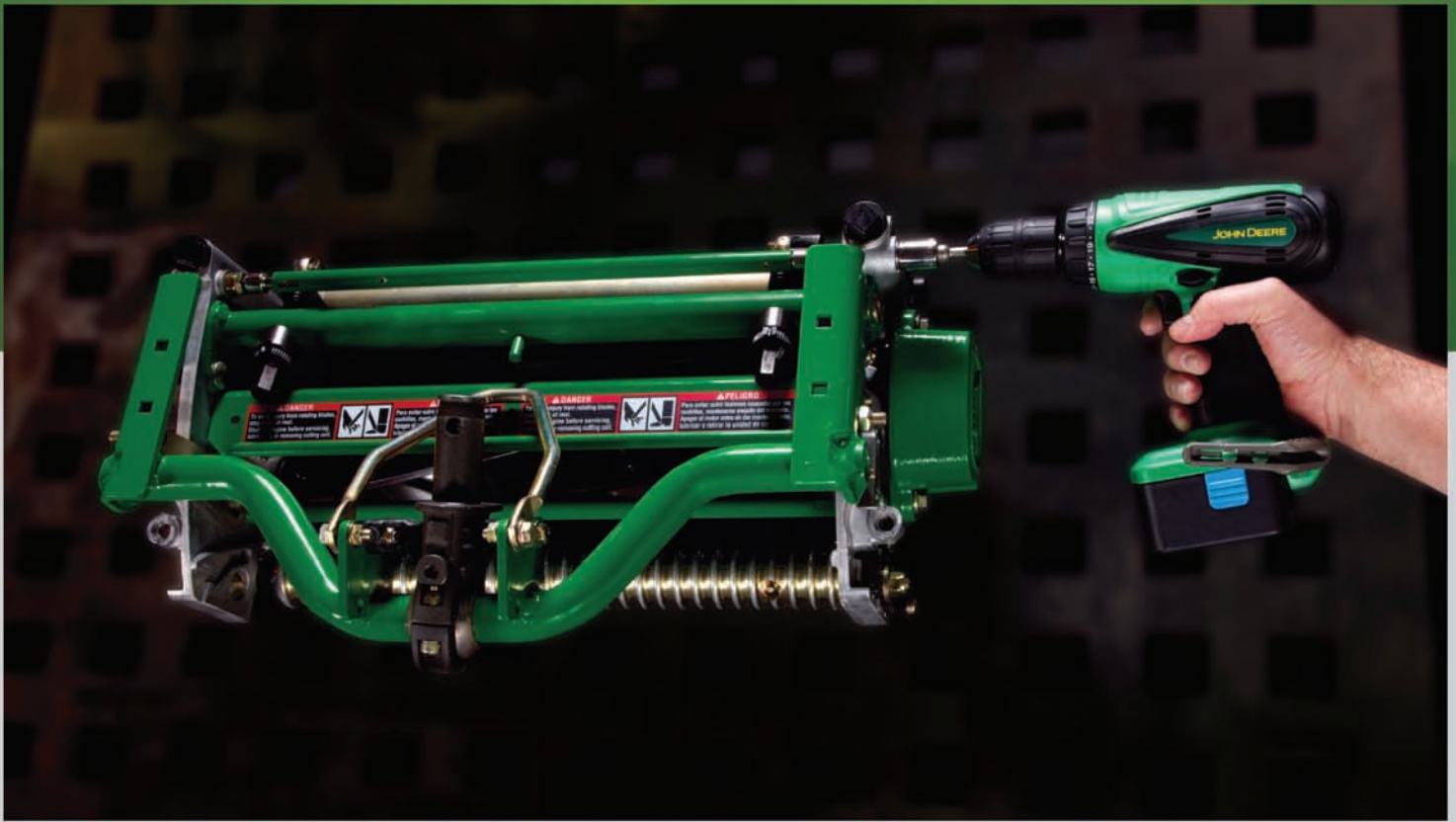
With today's economic challenges Brett feels we need to expand member educational opportunities to help quality managers adapt and survive into the future. He also feels we need to increase our educational opportunities for assistants and staff members to allow them to increase their ability and receive value for their WGCSA memberships. Gram's also sees the opportunity to expand the membership roles by reaching out to non-members to see what we can offer them that they may be missing.

Golf is not just Brett's career choice but it brought him and his wife Nancy together when she was a waitress at Waupaca Country Club. Brett joked that Nancy got him lunch when he was working. Nancy is now an elementary music teacher and although Brett shares an appreciation for music, he does not share Nancy's musical talent.

The Gram's live in Waupaca with their children Spencer 9 and Nickolas 10. The Waupaca area offers plenty to do and the family enjoys fishing on the Waupaca area lakes with their fishing boat. The kids are active in youth baseball, golf and hockey and Brett coaches hockey and golf.

Being the first at anything brings challenges but also the opportunity to set the achievement bar high. As the chapters main man, Brett will increase WGCSA's visibility and importance in the overall golf industry. 🌱

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“Greener” Mowers?

By David Brandenburg, Golf Course Manager, Rolling Meadows Golf Course

“Going green” is one of the many buzzwords associated with environmentalism. In the golf industry it relates to doing our jobs with less input of water, chemicals and fuel. For us as managers of golf’s playing surfaces less input fits right in with the current economic challenges. The less inputs we use the less financial cost to our facilities. However we need to ensure the reduced inputs do not cause a loss of income from poor conditions or increased man-hours to do the same with less.

Aron Hogden, Golf Course Superintendent, University Ridge Golf Course in Madison, WI had an opportunity to try the latest technology in propane fueled mowers with a Ferris Industries, 61” zero-turn Belly Deck Mower. Ferris is a subsidiary of Briggs and Stratton and the mower is powered by an 895cc Briggs Vanguard Engine. I attended a media presentation on the unit August 26th.

Propane mowers have improved from early generation units that suffered from fuel line freezing problems during use in hot weather. New models use the heat from hydraulic fluid flowing through the hydraulic system to keep the vaporized propane technology from freezing up even on the hottest of days. Propane is in wide use with more than 600,000 forklifts and over 200,000 buses, taxis and other fleet vehicles across the United States using the clean burning fuel.

The benefits of propane use in turf are many starting with propane powered mowers producing 77 percent less smog producing emissions than gasoline engines making it the most widely used alternative to gasoline and diesel. In addition, over 90% of the propane used in the United States is produced from North America reducing our dependence on overseas oil supplies.

Mike Sheridan, Speaker of the Wisconsin Assembly was on hand to speak and test drive the mower. Speaker Sheridan who previously saw the benefits of propane powered forklifts during his time at General Motors Manufacturing expressed that cleaner fuels are better for the environment and the direction to go for the future. He was impressed with the benefit of reduced fuel spills especially in the turf industry where small tanks are constantly being filled or overfilled causing spills. The propane technology virtually eliminates spills with its closed loop system and stops contamination of fuel sources by dirt and grass clippings.

Most propane units carry two tanks so one is in use and the other is extra allowing for more hours per trip




Wisconsin Assembly Speaker Mike Sheridan gives propane power a try with guidance from Ferris Industries Jim Lawton.

onto the golf course without having to refuel. At the same time less gasoline means less gas theft or waste.

Steve Strombus with Madison Golf and current Vice President of the Golf Course Owners Association of Wisconsin stated, golf as an industry is not driven by regulation but by our own desire to help the environment and become more efficient.

The event was hosted by the Propane Education and Research Council (PERC) and Vice President Brian Feehan presented the benefits of reduced emissions, operating costs and dependence on foreign oil as the biggest benefits to using propane powered equipment. While the units themselves may cost 30% more upfront, many states do or will offer rebates for buyers and the propane mowers will offer a 30% savings in fuel as well as extended engine life due to the clean burning fuel. Over 2500 propane fueling stations exist so far in the US and with just in time delivery on tanks inventory costs are kept low also reducing theft possibilities.

If your golf course is in the market for a new rotary mower propane power is another option for you to consider helping your bottom line and effort to “go green”. For more information you can visit www.propanecouncil.org/mowers .



Late-fall Nitrogen Applications: Not as Important as You Think!

By Dan Lloyd and Doug Soldat, Department of Soil Science, University of Wisconsin-Madison

Many superintendents place a large emphasis on fall N fertility often citing benefits such as increased root development, faster recovery from aeration, preservation of fall color, increased reserve carbohydrate storage, and hastened spring green up and recovery from winter damage. The basis of these proclaimed benefits is based on the observation that shoot growth tapers off in mid to late-October in Wisconsin while soil temperatures remain warm enough to sustain root activity. Conventional wisdom is that N uptake and photosynthesis continue and the byproducts (assimilated N, photosynthates) will be partitioned into root and rhizome development instead of being used for shoot growth as it would during the spring and summer. While this investment in infrastructure would be a very logical response for the plant, there is surprisingly little research that actually supports this notion. In fact, research generally links N uptake to growth and for many plants, a sharp decrease in N uptake has been observed when temperatures inhibit shoot growth. Limited research available on turfgrass has shown a few extra weeks of color response suggesting some amount of N taken up, although root growth, carbohydrate storage, and year round benefits have not been shown. Research is lacking directly measuring plant uptake and utilization, as well as evaluating environmental differences including soil type, plant species, and application timings. For a comprehensive scientific review of the work that has been done (or to cure your chronic insomnia), you can check the literature review section of my Master's thesis.

Because of the lack of good supporting data for one of the most important fertilizer timings, our research objectives were to evaluate beneficial claims associated with fall N fertilization. We hope that our findings will spark renewed interest in the conventional wisdom of fall fertilization and eventually lead to improved N fertilizer recommendations. This research was conducted between 2007 and 2009 and involved a greenhouse experiment and an ongoing a field study conducted in Madison, WI and St. Paul, MN.

In the greenhouse experiment, plant species (Kentucky bluegrass, creeping bentgrass, and annual bluegrass) were grown to maturity and transferred to a growth chamber set to the temperatures and day

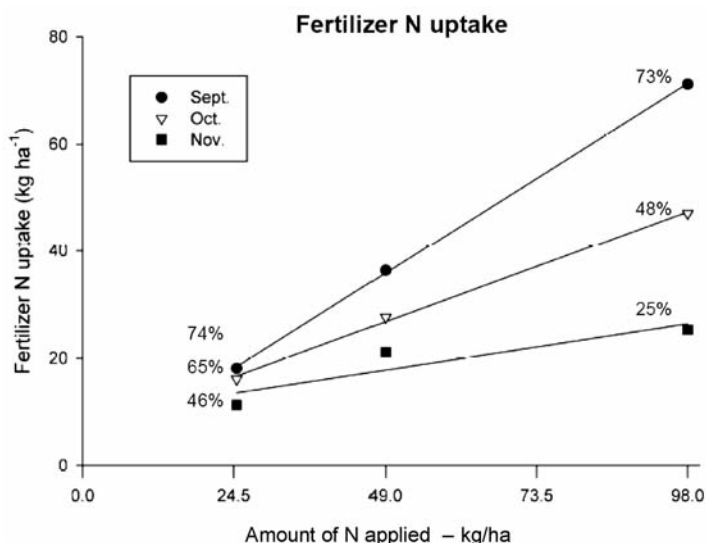


Figure 1. The amount of N taken up by the grass as a function of application rate and temperature. An application of 1 lb N/M is equivalent to 49 kg/ha. Note the inefficiency of high application rates in cool temperatures. The percent of N taken up is shown on the figure next to the data points. In summary, the best fall fertilizer plan is to continue your spoon feeding program into late fall, or apply a predominately slow-release fertilizer at a high rate in September. This research study found few, if any benefits to heavy applications of N in the late season in Wisconsin and Minnesota.

lengths characteristic of September 15th, October 15th, or November 15th for Madison, WI. Nitrogen was applied to these grasses at 0, 0.5, 1, or 2 lbs N/M. We found that the N uptake responses were fairly similar¹ among species, but very different among temperatures (Figure 1). Ten days after N was applied, uptake averaged 64, 47, and 26% of fertilizer applied in September, October, and November treatments across species. In field conditions, these numbers were even lower probably due to rainfall and other environmental factors. Root growth was not stimulated and was actually inhibited by the high application rates in September. Spring green up was greatest for October applications and

¹Interestingly, the annual bluegrass had a greater nitrogen uptake potential than Kentucky bluegrass or creeping bentgrass in cool temperatures. That means fertilizing heavier in cooler temperatures may favor annual bluegrass, or it may lead to more succulent growth of that species and therefore increased winter damage.