

The Advantages of Late-Season Fertilization

by Susan E. Young

Turf under high traffic stress is hungry throughout the year. It must be aggressive at all times during the season without being lush. Fertilizer timing is critical and fall applications are more critical than others.

Why is fall fertilization so important? If you think it's a way to help the turf survive the winter, you're right. Late-season fertilization not only improves turf density and color, it enhances spring green-up and makes turf maintenance more effective the following year.

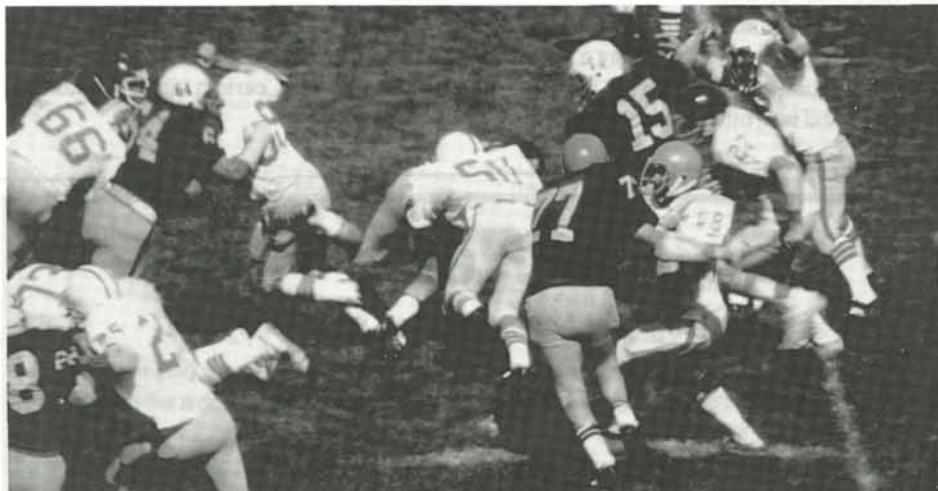
Timing – For cool-season grasses, fertilizer is best applied as late in the season as possible, anytime from late September to early November. Timing should coincide with the natural slowdown of turfgrass growth which depends upon the area of the country and the weather pattern. This is about the time of the last regular mowing.

Although it's called "late fall," the application should not be made when the ground is frozen, or too close to the time when it will freeze. Fertilizer applied to frozen ground is less likely to be available to the plant in sufficient quantities.

In the South, a late fall application should be made before the first frost. That's when bermudagrass usually stops growing and goes dormant, remaining so until soil temperature again reaches 60 degrees F. It's important to remember that bermudagrass roots remain active for roughly 30 days after topgrowth ceases. The idea is to provide enough nutrients for winter storage without encouraging the bermuda to start growing again.

Difficulties may arise when bermudagrass is overseeded with perennial ryegrass or other cool-season turf. In general, fertilizer rates of one half pound of nitrogen per 1,000 square feet and 1.5 pounds of potassium will maintain optimum turf quality and enhance winter hardiness.

In the southernmost regions of the country, Florida especially, a nitrogen rate between 0.9 and one pound of nitrogen per 1,000 square feet is desirable to maintain healthy turf. This feeding should include an equivalent amount of potassium.



Timing of fertilization is critical to turf under high traffic stress.

Understanding the Process – After vegetative growth (leaf production) has slowed down in the fall, the plant begins to increase food production (carbohydrates and proteins) for storage in the crown and root system. These carbohydrates and proteins are used as energy sources throughout the fall and winter. The buildup of nutrition in the plant's roots and rhizomes is perhaps the most significant benefit of fall fertilization and leads to improved green-up and vigor the following spring.

Major Nutrients – Research supports the use of a complete fertilizer – one containing nitrogen, phosphorus, and potassium – for fall feeding. Nitrogen encourages root growth, provides good winter/early spring color, increases turf density, protects the plant against damage from cold and drought, and helps the plant recover from stresses.

Fertilizers with a high analysis, controlled-release nitrogen source are ideal for encouraging root system development without excessive topgrowth. Be careful not to apply too much nitrogen in late fall. Excessive nitrogen can divert the energy meant to enhance root growth to the production of lush top growth. It makes plants more susceptible to turf diseases and freezing damage to the crown. Fertilizers with controlled-release nitrogen sources applied at moderate amounts (about one pound of nitrogen per 1,000 square feet) can elimi-

nate such problems. In general, the benefits of late fall fertilization far outweigh any negative effects.

Phosphorus plays an important role in the transfer of energy in the grass plant, a vital part of plant growth. Root growth in the fall and winter provides more active sites for nutrient uptake.

Phosphorus is less mobile in cooler soils (below 50 degrees F.) and tends to be fixed readily. This is particularly evident if the soil analysis of a given area shows less than 15 parts per million (ppm) of phosphorus. If routine applications during the season have supplied 0.6 to one pound per 1,000 square feet, a high analysis feeding of phosphorus is generally not needed.

A late fall feeding of phosphorus supplies small, readily available amounts to meet plant needs. By being available, it enhances shoot density, increases tillering, improves establishment of seedlings, and encourages growth of shoots, roots, and rhizomes.

Potassium aids in conditioning or hardening off the turf plant to lessen chances of winter injury. It plays an important part in plant metabolism and protein synthesis and regulates water absorption and retention in the plant. Furthermore, potassium acts as a deterrent to a number of important turf diseases and aids in the recovery of others, such as leaf spot.

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Late-Season Fertilization

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Apply potassium if analysis reveals your soil contains less than 75 ppm of exchangeable potassium, particularly on sandy soils. Nitrogen-to-potassium ratios in the 3:1 to 2:1 range are recommended under these conditions. Generally, it is best to apply potassium when the turf is actively growing for maximum uptake.

Secondary & Micro-Nutrients – Just as each of the major nutrients play a specific role in the turf growth, so do the secondary elements and micronutrients. It's important

to understand their roles in order to determine whether or not they should be applied during the fall.

* **Calcium:** A vital component of cell walls which is critical for growth and essential for good root development.

* **Magnesium:** Aids in translocation of phosphorus. As an integral part of chlorophyll, magnesium is essential for photosynthesis.

* **Sulfur:** Together with nitrogen, sulfur makes protoplasm for plant cells. It is an integral part of certain amino acids and proteins.

* **Boron:** Essential to carbohydrate metabolism and sugar movement with the plant.

* **Copper:** Contributes to plant metabolism by activating various enzyme components vital to protein synthesis and formation of chlorophyll.

* **Iron:** Directly involved with plant respiration. Improves chlorophyll synthesis and turf color.

* **Manganese:** Activates numerous enzymes involved in chlorophyll synthesis and photosynthesis.

* **Molybdenum:** Activates enzyme system that controls high concentrations of nitrates in grass plant.

* **Zinc:** Regulates sugar consumption and chlorophyll production.

Importance of pH – Nutrient availability and exchange is greatly influenced by the pH of the soil. The optimum range is between 5.6 to 6.6. Bentgrass, red fescue, centipedegrass, and carpetgrass prefer the lower, more acid part of the range. Kentucky bluegrass, perennial ryegrass, tall fescue, annual bluegrass, bermudagrass, zoysia, bahia, and St. Augustine perform best on the high end.

Utilization of nutrients can be increased by changing the soil pH. Sulfur or acid-forming fertilizers decrease the pH while lime increases it.

Fall is an excellent time to amend soils to correct pH problems. Nutrient storage is directly related to availability and uptake. Since much of this storage takes place in the fall, soil nutrient deficiencies at this time can greatly hamper the health of the turf the following season.

Fertilizing in the fall gives managers of high-traffic turf a leg up in the spring, especially if their turf will be used early in the season. With the demand for golf and sports increasing steadily, turf is put into play earlier each spring and remains in play longer each fall.

Turfgrasses have survived cold stress and other weather phenomena for eons without any help from fertilizers. However, it is very doubtful whether they could survive the demand placed on them today without a carefully planned program of fertilization. That program should clearly include nutrient applications in the fall.

Editor's Note: Susan Young is executive editor of "ProTurf Magazine" and supervisor, communications support for the Professional Business Group of The O.M. Scott & Sons Co. in Marysville, OH.

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RESEARCH CENTER FOR SPORTS TURF OPENS

The International Sports Turf Research Center, Inc. (ISTRC), an idea six years in the making, opened for business in Olathe, KS this month. ISTRC President David Doherty announced in September that the center will be ready to perform its first soil tests and make its first recommendations for construction of golf and sports field rootzones by the middle of this month.

Charles Dixon, formerly director of the Turf Services Division of K.W. Brown in College Station, TX, is ISTRC's vice president of technical operations. Dixon has broad experience in testing and selection of rootzone components for United States Golf Association green construction and sand-based technology for athletic fields. He also worked with Dr. James Beard on designing the new turf horse racing track at Santa Anita in Arcadia, CA.

"Chuck is one of the premier soil experts in the country," said Doherty, "and has worked with golf course superintendents, builders, groundskeepers, and university turf specialists across the country. There is a critical shortage of laboratories that can perform the type of soil testing necessary

during construction or renovation. Our goal is to provide test results in two days from receipt of a sample. Chuck will also offer a range of consulting services vital for golf courses and athletic fields."

ISTRC will work with a number of turfgrass consultants across the country to provide construction, renovation, and maintenance assistance when needed, adds Doherty. "Our goal is to recognize key problem areas in turf management and sponsor research at various universities to come up with answers," he states. Currently the center is helping fund research by Dr. David Minner at the University of Missouri in Columbia.

LPGA STAR PROMOTES FINE LAWN PRODUCTS

Nancy Lopez, winner of 42 LPGA tour events, has been named the official spokesperson for Fine Lawn Research, Inc., Dublin, OH. Lopez, the youngest inductee to the LPGA Hall of Fame, will represent the seed company on the tour and at various turf industry shows.



Lopez will help the company introduce the first *Poa supina* in the United States. Known as Supra, this wear tolerant turfgrass was discovered on mountain trails in Europe and has been used successfully for soccer fields in Germany. William P. Junk, Fine Lawn general manager, says the turfgrass can play an important role on golf courses and athletic fields in the northern U.S. and Canada.

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Turf Vehicles Reach A New Level Of Importance

When Ransomes purchased Cushman last year, manufacturers and distributors of utility turf vehicles and related attachments took notice. The acquisition was a signal to the industry that multi-use utility turf vehicles were reaching a new level of importance in the maintenance of golf courses, parks, schools, and other large turf areas.

In many respects, the turf equipment industry has come full circle with regard to the use of one power source to operate a number of different maintenance tools. Tractors have long been the "prime mover" for mowers, aerifiers, sprayers, spreaders, topdressers, and various other attachments. During the past 30 years, however, tractors have lost ground to equipment dedicated to one specific use. Mowers are the most obvious example of dedicated power units. The list has grown to include aerifiers, sprayers, bunker rakes, field liners, basepath groomers, and topdressers.

These dedicated units were designed to be more efficient, easier to operate, and specifically for the turf professional. Many golf course superintendents, groundskeepers, and other sports turf managers were willing to trade versatility for greater productivity. However, where productivity is not an issue or a certain type of equipment is used infrequently, dedicated units are not always economically feasible.

Productivity has become an important

factor in turf maintenance largely because of increasing labor costs. In addition to the amount of time needed to perform a maintenance task with a certain piece of equipment, getting from one place to another on a large turf facility is a big consideration.

Today's turf manager must be able to move his crew, necessary tools, and supplies around the facility quickly. This has led to the predominance of the utility vehicle. Greensmowers, irrigation parts, line markers, hole cutters, trimmers, seed, fertilizers, and sand can be carried in the bed of a vehicle by one or two workers from one worksite to others. The concept caught on and has evolved to broaden the versatility of such vehicles.

"The first utility vehicles were very work specific," explains Michael Alexander, product manager of Club Car's Carryall line of vehicles. "They were designed to accomplish a specific job. As labor costs continued to escalate, golf and sports turf managers started looking for ways to economically mobilize their work force.

"Used golf cars equipped with makeshift cargo boxes filled the basic need, but not without problems," Alexander states. Then a few golf car manufacturers started to upgrade suspensions, engines, transmissions, and chassis. They reengineered golf cars or personnel carriers to become cargo carriers.

The degree of reengineering varied con-



Low profile sprayer on Cushman Turf-Truckster.



Club Car Carryall II with hydraulic dump cargo bed.

siderably and was reflected in the price of the vehicles. Payloads ranged from 500 pounds to 1,500 pounds. Some manufacturers started to offer a dump option for their cargo boxes, ramps, and stake beds. The versatility of the utility vehicle started to grow.

With each change, utility vehicles resembled golf cars less and less. They began to take on an identity of their own. Superintendents and sports turf managers started to use the cargo area of the vehicles to carry sprayers, spreaders and topdressers. In some cases they would add a hitch to pull small trailers, aerifiers, and gang reel mowers. They were discovering that some of the features of dedicated, single-use equipment could be added to utility turf vehicles.

A few manufacturers realized that a market was developing for "multi-purpose utility vehicles (MPUV)." They put their engineers to work in an effort to improve the safety, versatility, and power of the work systems. The engineers explored some of the factors that made single-use models valuable to institutional turf managers. These included powering the work unit from the vehicle's engine and increas-

ing capacity and stability.

"We determined that when you added a sprayer to the bed of a Truckster, the center of gravity was too far back," recalls Clarke Staples, vice president of Cushman, Inc. "We began offering power take-off (PTO) to run a sprayer and spreader in the '60s. To improve the stability of the vehicle, we started to explore convenient methods of removing the cargo box so that other types of equipment could be attached lower on the chassis. In 1973, we developed the pin system, which enabled vehicle owners to convert their Truckster from a dump body to a sprayer or spreader in a matter of minutes." The system uses three pins to connect the work unit to the vehicle's chassis.

Today, Cushman, E-Z Go, Toro, John Deere and others compete for the multi-use utility vehicle market. Jacobsen has announced it will reenter the field this winter with a new line of vehicles offering a choice of work units. The concept of using one vehicle to perform a number of turf maintenance tasks is now embraced by the golf and institutional turf industries.

This has opened up the MPUV market to another level of vehicles which are less

"work specific," says Club Car's Alexander. "As sales of MPUV's increased," he comments, "manufacturers began to seriously consider developing them separate from their golf car product lines. Since the early '80s, there have been significant changes in MPUV design features and a larger selection to choose from. The most significant changes in the industry have occurred over the last five to ten years.

"Although somewhat fueled by growth, changes have been influenced more by a shifting in buyer preference from "work specific" turf trucks toward MPUVs," Alexander adds. "First, the cost of "work specific" vehicles continues to increase faster than MPUVs." Since these vehicles utilize quick change options to perform a number of different jobs, Alexander says golf courses and sports turf facilities need just a few "work specific" vehicles. This



John Deere 1500 utility vehicle with 1,500-pound payload bed.



Jacobsen's new three-wheel utility vehicle.

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Turf Vehicles

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opens up the market for vehicles which can perform day-to-day tasks.

"As the need for MPUVs continues to rise with an abundance of models to choose from, the decision on which MPUV to acquire has become more confusing," admits Alexander. "You need to consider factors such as the main function the vehicle will perform, gasoline or electric power, three- or four-wheel suspension, body and frame construction, required vehicle speed, and alternative usage possibilities. Also pay attention to local dealer support, quality and availability of service support manuals, and purchasing or leasing options."

The main function of a MPUV can range from "bare bones" models to more work specific versions. Basic transportation vehicles can be used to perform such tasks as changing pin positions and tee areas, roping off ground under repair, carrying irrigation parts, or providing a mobile office for supervisors. Manufacturers are becoming more competitive in this category by offering options such as lights, fuel gauges, hour meters, seating for two people, and canopy tops. Some have hydraulic dump-bed options for lightweight hauling.

Gasoline power is preferred over electric, says Alexander. The primary reason is the limited range of electric models between battery charging. He adds that some four-wheel vehicles today are as maneuverable as three-wheel versions and provide more stability.

Manufacturers are increasing the dura-

bility of their vehicles with materials that are rust- and corrosion-proof, especially for frames and cargo boxes. Vehicle durability, appearance, and function have been improved by utilizing injection-molded plastic components. "MPUVs constructed of corrosion-resistant or rust-proof materials command a higher trade-in price and can lower the vehicle's long-term operating expense," Alexander reveals.

Speed is one way to differentiate between vehicles designed for turf applications and those for other industries. Alexander advises against vehicles which travel more than 16 miles per hour for turf facilities. He cites terrain and operator safety as major concerns. "Faster vehicles are intended for travelling longer distances on improved surfaces," he warns.

E-Z-Go is an example of a manufacturer that offers utility vehicles ranging from basic transportation to work-specific models. Today its electric XT-500 and two-cycle gasoline-powered GXT-800 are manufactured for light-duty personnel and cargo transport, while its GXT-1500 has been constructed for attachments and heavier duties. The large unit has a 20-hp, four-cycle gas engine and five-speed synchronized transmission that allows it to carry up to 1,500 pounds in its 19-cubic-foot bed, according to Ron Skenes, marketing communications manager.

Another company straddling both areas is John Deere. Its 1500 Utility Vehicle is clearly work-specific, while the AMT 600 and 622 are both transportation oriented. "Budget largely determines the type of

vehicle turf managers want," remarks Bill Frank, manager of product information for Deere's Golf & Turf Division. "Dedicated machinery is still very popular with high-budget facilities. We know this because our 1500 is often purchased as a dedicated sprayer, even though it has other attachments. When budgets start getting tight, the demand for the other attachments goes up."

Frank is uncertain whether or not the two levels of equipment will ever meet in the middle. "Any trend depends on the useful life of the vehicles and the life and performance of the attachments," he states.

The quality and productivity of attachments receive a high priority at Cushman. The company recently introduced a line of attachments based upon "fifth-wheel" technology. A single, fifth-wheel mounting on the frame of a truckster allows larger attachments to be towed with greater maneuverability by the vehicle. Now the truckster has the ability to pull a double-wide topdresser, the company's GA-60 aerifier, a sprayer, and a dump trailer.

"Fifth wheel attachments are as strong as dedicated units," says Staples. "Turf managers don't have to compromise quality or productivity any longer to achieve versatility." Furthermore, the economy resulting from increased versatility enables superintendents of municipal and daily fee courses, park superintendents, and institutional groundskeepers to raise their turf standards. Budgets are less of an obstacle to quality.

As you can see, the utility turf vehicle is approaching the tractor in terms of versatility. It is becoming a prime mover for all types of attachments, as well as challenging dedicated equipment in terms of productivity and efficiency.

A new challenge facing the industry in this decade will be regulations for off-highway emissions, Frank alerts the industry. As these regulations begin to impact equipment on parks, campuses, and golf courses, each piece of motorized equipment will be subject to increasing scrutiny. This may have the effect of reducing the number of prime movers for turf maintenance at recreational and institutional facilities. It may also rekindle interest in electric vehicles for transportation.

All these factors make the utility turf vehicle an important piece of turf equipment to watch in the '90s. Each change is a signal that the market is changing. Like manufacturers and distributors, turf managers should take notice. ☺

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BACON BRINGS HOME FIELD OF DREAMS

When young children discover baseball, a likely parental response is a new glove and a day of Little League tryouts. However, Ed Bacon of Salem, OR, head of Salem Hospital's audiovisual department, had a different idea. He built his own field.

Unlike the central character in the popular 1989 motion picture, "Field of Dreams," his motivation was more paternal than supernatural. "My two boys were showing an interest in baseball and I had some property," he explains.

Bacon started constructing his field on a corner of his property in 1986. Located six miles from downtown Salem, it is surrounded by rural countryside and is adjacent to a seed grower with more than 300 acres of fine fescue seed. Sightings of deer, coyote, beaver, quail, bear, and even an occasional cougar are common.

"During the summer, we have played games until dark and could hear coyotes howling up on the hill above the outfield," says Bacon.

The infield was seeded in the fall of 1986. The outfield was seeded in two stages. Its construction began as an effort

to restore the infield, which had been damaged by a flash flood in June 1988. Both areas were seeded with a custom blend of three proven turf-type ryegrasses called Jock Elite. Because the field is constructed on a gentle slope, drainage is not a problem.

Bacon's maintenance team consists of his wife, Marilyn, their sons, ages ten and 12, and himself. They spend approximately 12 hours each week mowing, watering, and grooming the field. "I have a striping machine for games," Bacon adds.

Improvements to the field this year have included landscaping along left field, which is also the western border of Bacon's property. A home run fence, which will have advertising space available for local Salem businesses, a drinking fountain, and lighting are planned for the future.

UNIVERSITY RECEIVES FIRST BERMUDAGRASS ROYALTIES

New Mexico State University President James Halligan recently accepted the first royalty check for NuMex Sahara bermudagrass from Farmer's Marketing Corporation of Arizona. The improved,

seed-propagated bermudagrass was developed by NMSU's Agricultural Experiment Station turfgrass breeding program under the direction of Professor Emeritus Dr. Arden Baltensperger.

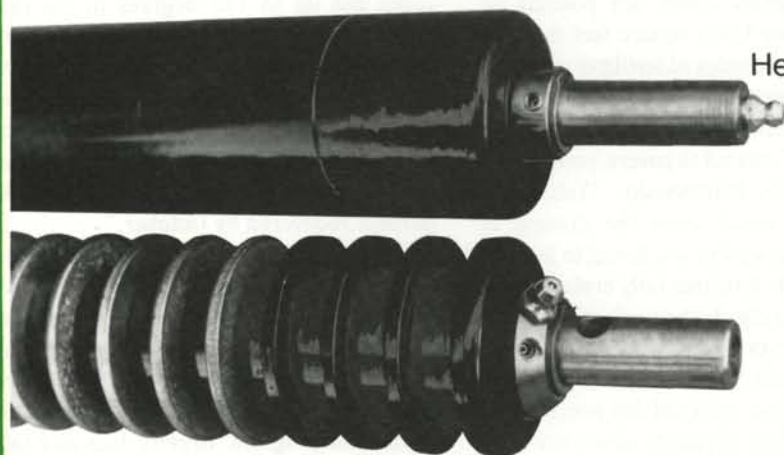
The University will share the royalties with the United States Golf Association, which supported the breeding research for five years beginning in 1984. Within four years, Baltensperger and his staff selected the new variety for its denser and lower growth habit and better drought tolerance compared to common bermudagrass.

"NuMex Sahara is the first turfgrass released by a USGA-sponsored research program intended to produce minimal maintenance turfgrasses for golf," said Michael Kenna, director of green section research for the USGA. It is also the first bermudagrass to generate royalties for the university. "Taxpayers should be pleased to see money being returned to the university so it can be channeled back into the research program," Baltensperger stated.

The seed-propagated bermudagrass has been planted on golf course fairways in the Southwest, Hawaii, and Japan. "Growing turf from seed is less expensive than sprigging or laying sod," Baltensperger pointed out.

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NORTHERN SUPERINTENDENT DEVELOPS DISEASE CONTROL STRATEGIES

Ron Wisniewski, superintendent at Flushing Valley Golf & Country Club in Flushing, MI, began formulating his own ideas about golf course management as a teenager. From the age of 15, when he mowed his first green, Wisniewski remembers that he always tried to think of ways to make the most out of every hour on the golf course.

Wisniewski's inquisitiveness motivated him to earn degrees in both turf management and nursery management at Michigan State University in East Lansing. Throughout college and following graduation, he worked on Michigan golf courses. Today, he puts his lifetime of experience to good use at Flushing Valley.

His techniques sometimes differ from those of other superintendents, however Wisniewski has maintained a healthy and popular course in an area with particularly challenging geographic characteristics. Flushing Valley was built 30 years ago in a low valley with heavy soils. High humidity and damp soil are constantly on Wisniewski's mind as he guards the health of his turf from season to season.

Like many other golf course superintendents in this region of the country, he finds that one of his most significant pest problems is pink snow mold (*Fusarium nivale*). Although the disease can infect all turf species, it is a particular threat to closely mowed turf. Conditions which bring on outbreaks of pink snow mold are cold, wet weather with temperatures ranging from 30 to 60 degrees F. Turf in poorly drained or shady areas is especially vulnerable.

To stay on top of the disease, Wisniewski adjusts management techniques according to the weather and follows a schedule of fungicide applications. "When it's 50 degrees outside and wet, the snow mold is active, so that's when you start beating it down," he says. "Once it gets a foothold, you are going to be seeing it in the spring."

"We stop mowing the greens after October 20. The weather is turning cold and damp. If snow mold is present, mowing can spread it around. The days are also shorter. The turf needs the extra leaf surface to carry out photosynthesis. Taller turf also



Pink snow mold on bentgrass.

has more 'body' going into the winter, and acts like a blanket."

However, management techniques alone can not control snow mold when conditions favor an outbreak. "I go out and spray all my greens and tees with 26019 (Chipco) at two ounces per 1,000 square feet on October 1," Wisniewski said.

Unlike many other superintendents, Wisniewski does not use covers during the winter to protect his greens. Instead, he topdresses them with sand throughout the year and applies about ten pounds of Milorganite per 1,000 square feet in January. The dark particles of fertilizer melt any ice on the greens and absorb heat from the sun during winter and spring.

"Once you commit to covers, your hands are tied," says Wisniewski. "You can't change your mind when the ground is frozen because you're not going to get the stakes out. The fertilizer only costs \$150 a year and I can check the turf without having to lift a cover."

Another area in which the superintendent differs from many of his peers is his refusal to collect clippings when mowing. "The guys who have been running into problems with patch diseases are the ones who have been catching clippings for the past six or seven years," he states. "They have taken the clippings away and never compensated for the organic matter that they've removed." He adds that disposal of clippings is increasingly complicated.

Wisniewski believes in using phosphorus and potassium nitrate relatively fre-

quently. He explains that heavy, poorly aerated soils can become a breeding ground for diseases such as pythium. The phosphorus makes the turf less vulnerable to patch diseases and potassium helps out against pythium, he finds. Wisniewski also schedules his fertilizer applications to prevent rapid top growth and to avoid thatch buildup.

"Two years ago, we were treating greens and tees for pythium, but not fairways," states Wisniewski. "That summer the heat index got up to 115 degrees in the first week of August and we lost about one-third of our fairway grass to pythium. Fortunately, we had shut the water off, because we knew it was hot and humid. So, the pythium did not hit the crown, but rather just ran across the leaf blades. We were 99 percent recovered by October."

Pythium can fool you, Wisniewski adds. First it appears like wilt. "If you think it's wilt and put water on it, you are just adding fuel to the fire," warns the superintendent.

To prevent a recurrence, he has placed the golf course on a preventative fungicide protection program. Greens, tees and fairways are treated on a regular basis by alternating between Chipco Aliette and Subdue.

"Sometimes instead of asking yourself what it will cost to do something," Wisniewski remarks, "you need to ask what the cost will be if you don't." After the pythium outbreak, he was able to convince the greens committee of the need to treat the fairways as well as greens and tees.