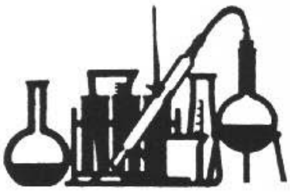

Poa annua in Creeping Bentgrass

By Dr. Wayne R. Kussow
Department of Soil Science
University of Wisconsin-Madison

A popular topic among golf course superintendents is *Poa annua*—creeping bentgrass conversion programs. The intent here is not to evaluate these programs, but to provide the background needed to make an informed decision regarding the design and implementation of a conversion program. The best way to approach this subject is to recognize that we're really dealing with four different aspects of the *Poa annua* (PA) problem. These are: (1) the preconditions for PA invasion of creeping bluegrass; (2) factors affecting PA seedling survival; (3) factors affecting spread of PA; and (4) the means for controlling PA once established in creeping bentgrass.

The Preconditions

The preconditions for PA invasion of any turf are very simple but too often overlooked. They are the presence of viable seed and an environment that favors germination. Because PA is so prolific, even when mown at putting green height, seed abounds on golf courses. A single PA seedhead typically contains about 80 seeds (9) and a single PA plant will produce about 320 to 360 seeds per season in Wisconsin (2).

Even if one were to suddenly halt all new PA seed production, there would still remain tremendous reserves of older seed in soil on the golf course. Soil seed banks have been reported for bentgrass (6) and perennial ryegrass (11) turfs. The numbers are remarkably similar—somewhere in the range of 600 to 4,200 PA seeds per square foot of soil surface. To put these numbers in perspective, a recommended creeping bentgrass seedling rate of 1.4 pounds seed per 1,000 square feet (1) translates into about 8,000 seeds per square foot.

Simply because there is an abundance of PA seed elsewhere on the golf course does not automatically signify that there will be rapid invasion into new creeping bentgrass turf. First there is the matter of seed viability. Research has shown that when PA seed heads are mown off on a regular basis, many of the seeds are immature and the initial germination rate is only about 50 percent. Unfortunately, this percentage typically rises to as much as 95 percent in a few months time. There is some evidence that PA seed germination percentages vary substantially with the source of the seed. A study conducted in Australia (9) revealed that as long as four months after production, PA seeds from fairways and roughs had no viability while the germination of seed from putting greens was nearly 100 percent. This suggests that roughs and fairways do not represent major seed sources for PA invasion of putting greens. However, the same study (9) also showed that chilling increased the viability of fairway and rough PA seeds to approximately 95 percent within six months after seed production. The implications here are that PA seeds from fairways and roughs may not be a threat to creeping bentgrass putting greens the season of production but certainly will be after a single Wisconsin winter.

> ***"For those of you contemplating a PA to bentgrass conversion program, be mentally prepared for a long-term and, quite likely, a never-ending process."***

What about the viability of PA seed in soil? Concise information is lacking but the general picture is one of germination percentages of about 90 percent one year after seed production, a rapid decline in year two to about 50 percent germination and smaller declines in viability in each successive year to a germination percentage of about 25 percent in year six (11). This is a very disconcerting observation because it suggests that if we were to suddenly halt all PA seed production in a PA-infested turf, six years later the soil might still contain 150 to 1,000 viable seeds per square foot of that turf.

Professional turf managers have long noted that field germination of spring-produced PA seed often peaks about three months after production (2). This is the result of two things—increases in PA seed viability over time, and the on-set of edaphic conditions favorable for germination.

Included among the edaphic factors favoring PA seed germination are contact with a continuously moist soil surface, soil temperatures in the range of 55 to 60°F, a soil pH above 5.0 and light (1,2,3,11). Thus, low turf density, thatch removal, turf injury, earthworm activity and cultivation, including topdressing, are factors that favor PA seed germination. Our research has shown that in creeping bentgrass grown on a silt loam soil that is a good earthworm habitat, earthworm casts are prime sites for invasion by PA.

Germination of PA declines rapidly as soil temperatures drop below 40 or exceed 85°F (2,11). This is one reason why PA populations peak in spring and fall (8). Another reason is improved moisture supply. Light, frequent rainfall or irrigation that keeps soil surfaces moist favors PA germination (10,11).

Lowering of soil pH through application of elemental sulfur has been proposed as a method for controlling PA (7,13). Significant reductions in PA germination have been observed at soil pH values of 5.0 or less (7). Since this pH is outside the range recommended for bentgrass (1), concern has to be shown for the long-term impact of deliberately reducing soil pH to 5.0 for the purpose of controlling PA.

Early indications that high light intensity is essential PA germination have proved erroneous (11). It is true, however, that burying PA seed and thereby excluding light reduces germination by approximately one-half (2).

Seedling Survival

Ecological studies have repeatedly shown that PA seed germination is just the starting point. Successful invasion of creeping bentgrass is also strongly dependent on seedling survival rates. These rates are determined by the relative competitiveness of the two grasses. In the absence of adverse environmental conditions, the competitiveness of PA is directly related to the numbers and sizes of invasion gaps in the creeping bentgrass turf (12).

Invasion gaps arise in many different ways. The more common ones are declining bentgrass stand density, mechanical or pest injury, core aeration,

(Continued on page 33)

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(Continued from page 31)
chemical burn, winter injury and earthworm activity. We have observed that at creeping bentgrass verdure levels above 1.1g per/ft^2, PA populations are suppressed. Such verdures are possible in bentgrass fairways receiving 4 to 5 pounds N/1000ft^2/season. They are not attainable at the cutting heights of putting greens.

Once PA seed germinates in an invasion gap, seedling survival is influenced by several edaphic factors. Recent research suggests that root competition for nitrogen is a prime factor (12). In contrast, supplies of phosphorus and potassium have no influences on PA seedling survival and growth rates (5,12). Soil acidity reduces seedling survival only if soil pH is below 5.5 (13).

Professional turf managers are well aware that PA is less heat tolerant than is creeping bentgrass. Signs of heat stress begin to appear in PA shoots as air temperatures exceed 80°F (2). Roots of PA begin to discolor and decline when soil temperatures climb about 70°F (2), but only if the root surfaces are colonized by fungi responsible for PA summer patch diseases (pers. comm. D. H. Wilkinson, Univ. Ill). Regardless, heat stress is likely the major reason why PA seedlings have very low summertime survival rates.

Poa annua seedling survival has often been associated with moisture supply (1,2,14) and has led to the idea that PA has a higher moisture requirement than does bentgrass. This is a questionable assumption. The association between moisture and PA survival is strongest where soil is compacted. Bentgrass thins out in these compacted areas and PA invasion gaps develop. Because of the compaction, rooting of the PA is very shallow and ample moisture becomes a necessary condition for seedling survival. In the absence of soil compaction, PA roots just as deeply and vigorously as does creeping bentgrass (1,10).

Spread

Once PA has invaded creeping bentgrass, spread is largely governed by seed supply and the presence of invasion gaps at key times during the season. The key times are those when PA seed viability is high and edaphic conditions favor germination and seedling survival. In the upper Midwest these key times occur from about late April to mid-June and from late August through the month of September.

Evidence for the existence of key times for PA spread lie in the observations of Dr. D.B. White and his co-workers at the University of Minnesota (8). They have carefully documented natural shifts in PA populations at multiple sites on golf courses. One example of what they have observed on a putting green is shown in the chart below.

TIME OF YEAR	PERCENT PA IN BENTGRASS TURF
Early May	90
Mid-summer	24
Late fall	81

Recognition of these dynamics of PA populations during the season is extremely important, especially when it comes to evaluating the effectiveness of PA control measures. Large reductions in PA populations between spring and summer are natural occurrences and cannot be taken as evidence for the effectiveness of a PA control program. Permanent shifts in PA populations can only be verified over several growing seasons.

Control

Clues as to how one might assemble a PA control program lie in the foregoing discussion of the preconditions for PA invasion, factors involved in seedling survival, and subsequent spread in pre-existing bentgrass turf. Some readily identifiable possibilities are reduction of seed supply, creation of less favorable conditions for germination and enhancement of the relative competitiveness of the bentgrass.

Researchers at Michigan State University (6) are using this knowledge in a comprehensive investigation of ways to reduce PA populations in bentgrass turf. Their observations are very illuminating and illustrative of what regulation of PA seed supply, modification of certain cultural practices, and introduction of new practices can do to PA populations in creeping bentgrass.

Reduction of seed supply: Two possibilities exist for reduction of the PA seed supply; removal of clipped seedheads and chemical suppression of seedhead formation. The Michigan State studies have quantified the effects of clipping removal on PA populations in bentgrass and the PA seed bank. Over a three year period clipping removal reduced PA populations an average of 12 percent and the PA seed bank declined 31 percent.

The effects of plant growth regulators (PGR's) on PA seedhead formation and growth have proved erratic. In one study conducted by Michigan State researchers, application of a PGR at six different locations reduced PA populations an average of 28 percent in two year's time (3). A second study failed to show any significant influence of two PGR's applied for three successive years on PA populations in bentgrass (6). Two PGR's failed to reduce PA populations during the summer of 1990 (4). These observations collectively convey the message that the role of PGR's in PA control programs is unclear at this time.

Germination and seedling survival: The fact that a continuously moist soil surface favors PA germination (2) suggests that frequency of irrigation has an effect on PA populations. Michigan State researchers have examined this possibility by observing PA populations under three different irrigation regimes. In comparison to daily irrigation of a bentgrass fairway, tri-weekly irrigation reduced PA populations 6.5 percent over a three-year period. Irrigating only when the bentgrass showed signs of wilt led to an additional 3.1 percent reduction in the PA population. Statistically, only the 9.6 percent PA difference between daily irrigation and irrigation at wilt was significant (6). Thus, a change in irrigation scheduling alone does not appear to be an effective means for reducing PA populations in bentgrass turf.

High rates of N application have often been cited as a factor that favors PA. Recent evidence that competition between PA seedlings and the grass being invaded arises from rootzone competition for N (12) lends support to this idea. However, when Michigan State University researchers observed changes in the PA populations in bentgrass turf supplied with either 2 or 6 lb. N/1000ft^2/season for three years, a significant difference occurred in only one of the three years and PA populations were identical at the two N rates when averaged over the three year period (6). This does not disprove rootzone competition for N, but suggests that even 2 lb N/season are sufficient to overcome whatever competition exists.

Another possible means for controlling PA invasion of bentgrass turf is to reduce the number or size of invasion gaps. Researchers at Michigan State sought to minimize invasion gaps by annually overseeding the turf with bentgrass (6). The practice led to only a 2.8 percent reduction in PA populations over three years. While this does not encourage overseeding as a PA control practice, it needs to be pointed out that the research site was not subjected to the normal wear and tear of golf course fairways.

Turfgrass agronomists have long recognized that there is no single cultural practice that can control PA in bentgrass turf. Rather, successful control requires implementation of a combination of cultural practices. This was taken into account in the design of the Michigan State University study (6). The effectiveness of various combinations of clipping removal, irrigation frequency, fertilizer N rate, overseeding, and TGR use in reducing PA populations in bentgrass turf was examined. Among all the combinations studied, the most effective was that of clipping removal and broadcast overseeding with bentgrass in August of each year. The combined effect of these two cultural practices was a 28 percent reduction in the PA populations after three years.

Clearly, there are some cultural practices that aid in the control of PA in bentgrass turf and have potential for reducing PA populations. We do need to recognize, however, that other cultural practices deemed essential on today's golf courses probably favor PA. Included among these PA-favoring cultural practices are daily irrigation, low cutting heights, aeration, and topdressing. Add to these practices the normal abuse that golfers impose on turf and you have a situation in which PA quickly becomes a permanent resident.

For those of you contemplating a PA to bentgrass conversion program, be mentally prepared for a long-term and, quite likely, a never-ending process. Some of the cultural practices discussed here are the heart of any conversion program. To what extent PGR's can aid in this effort is not clear at this time.

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Probabilities in Turf Diseases: *How Do We Deal With It?*

By Dr. Gayle L. Worf
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I've been convinced for a long time that we would have much better and more dependable control methods available today if we could count on all of our severely damaging diseases to occur every year!

This thought returned to me recently while I was reviewing the results of our field research efforts of the past season. We had conducted extensive trials on Poa summer patch at Pine Hills and Nakoma again this year—and again—no disease. We tried to assess what impact that early season (April and May) summer patch control treatments might have upon subsequent anthracnose and mid-summer Poa decline problems at Blackhawk. We also looked at red thread control options on red fescue, still trying to determine what we might suggest now that Actidione is no longer available. We tried to determine whether we might make certain treatments of Aliette useful against yellow tuft disease to supplement the effective but "resistance-vulnerable" Subdue treatments, and to assess the role that ProStar can play in controlling fairy ring disease.

To be sure, with some of these trials we obtained some useful information about residual effects on other diseases, and may have picked up some ideas about how these long lasting products might influence development of other disease problems, favorably or unfavorably. But we didn't learn *anything* about how to control the problems we earmarked. So we go yet *another* year without more important answers.

It's frustrating. But it's the real world. That's because disease development is linked up with the most whimsical characteristics of mother nature, e.g. humidity, rainfall, nighttime temperature, daytime temperature, spring weather conditions, summer weather events, genetic makeup of the pathogens and hosts, etc., etc. It's an absolute kaleidoscope of events.

We can expect disease problems every year, but we can't be sure which ones they are going to be. From the standpoint of a superintendent trying to figure out what to do, it's got to be especially annoying, since most control measures require preventive, rather than corrective treatments! And increasingly, treatments are more expensive, and much more subject to environmental impact and scrutiny.

So what's a person to do? We can roll the dice. Or we can work on ways to work with the two important "P's"—probability and predictability. The ideas below come to my mind as I reflect upon this very important question for every superintendent who is responsible for the health of his or her golf course.

1. What are the problems I have encountered on my course over the last five years? Never mind what other courses have experienced. Each one is different. I do want to know what is occurring elsewhere, so that I can keep an eye out for it on my course. But their grasses, soil type, specific environmental conditions, cultural and fertilizing practices, maybe their fungicide treatments, etc., are different, so I have a different disease probability situation.

2. How much *damage* did the diseases I encountered cause when they occurred? Were they annoying only to me, or did players sense something going on? And was it threatening my greens and tees?

3. Is the threat more to *me* than to my course? Will I get in trouble with my greens committee if I don't take some kind of action, even if it's only to let them know that I'm doing my job? Or can I take them into my confidence, and discuss what's going on—the expected effects, the treatment alternatives that are available, etc., sometimes coming to the conclusion that doing nothing is the best alternative available.

4. Can I "read the weather" and predict with reasonable certainty what's likely to occur? And if there are good corrective treatments available, can I keep an eagle eye out during critical periods for very early stages of problems, and start remedial treatments at the right time? Maybe I can use the new diagnostic kits to help me in certain situations.

Effort has been made in a number of situations to try to develop predictive models for such diseases as Pythium, Rhizoctonia and Anthracnose. My perception is that they have been good starts, but they were rushed into release before they were perfected. Conditions from one region or state to another are simply too variable for them to apply effectively or dependably.

For example, we reported to you last issue about the considerable differences we are encountering as we look at temperature thresholds on various isolates of Rhizoctonia. I really believe considerable progress can be made with disease prediction, but the amount of work done to date on individual turf diseases and their patterns just scratches the surface. Two crops I'm familiar with where disease predictability patterns are being used with good success in directing fungicide application patterns are potatoes and apples. For potatoes it is for two diseases, late blight and early blight; with apples it is for only *one* disease, apple scab. And the background research that led to the information spanned a fifty year period of time! And we have more than one or two diseases to contend with. Obviously, it doesn't require that much research time, but neither can the research be done in a limited area, with only two or three years of invested time, to come up with dependable data and models.

But two important discoveries make disease prediction models and their application likely tools for future superintendents, in my opinion. The first is the computer, which can measure the critical environmental events and simultaneously make the necessary mathematical computations that say "go" or "no go". The second is the advent of fungicides that have sufficient "kick back", or therapeutic capability that can do some good once an infection period has been detected.

5. How effective are my treatment options? How about summer patch treatments, for instance? Much has been made over the past couple of years about treating before the soil temperatures reach 60°F in order to give the fungicides a chance to work

on the fungus before it causes serious root and crown damage. And some of the sterol inhibitors appear to be effective when applied this way. The same is probably true with take-all patch, which has increased in appearance in recent years in Wisconsin. (However, it is still affecting only a relatively few courses. So it's probably someone else's problem, not mine!) And fortunately, take-all patch, where it has occurred, has not been nearly as damaging to Wisconsin turf as it has been in the cooler coastal states.

These are root-attacking fungi. Unfortunately, we still have quite a ways to go in developing useful control measures for pathogens that attack underground, or those that become systemic within the plant. The products we might use for them are also expensive, have a long residue, and have sometimes shown a tendency towards increasing other diseases. So unless I'm having such problems on my greens or tees, I'm probably going to shy away from treating them. They don't occur predictably, and on the basis of experience, their probability is not high enough to justify the preventive treatments that are required.

I *can* treat effectively for dollar spot, Pythium, Rhizoctonia, Helminthosporium. These I can handle preventively on greens and tees where I must keep disease out of the picture, and I can treat therapeutically at first symptoms on fairways. I can significantly reduce Poa anthracnose problems with preventive applications on fairways where the probabilities are pretty high that I'll encounter the problem. The same is true for snow mold disease in the fall of the year.

These are my reflections on dealing with disease probability. What are yours?

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NOER CENTER NEWS: *An Update*

By Monroe S. Miller

Two things bring home just how close the reality of the NOER CENTER is these days.

The first is the job opening notice of the manager's position for the NOER CENTER. It's found on page 15 of this issue of *THE GRASS ROOTS*. This new position, which is being funded by the Wisconsin Turfgrass Association from April of this year until June of 1992, starts just about the same time the facility will be completed.

The second is the actual construction of the building itself. Among Bob Newman, Tom Harrison and myself, one of us visits the NOER CENTER each day. As this is written (2/27/91) the building is almost entirely closed in.

The next step will be to use temporary heat to take the frost out of the ground. The sand base will then be regraded, the plumbing finished and the slab poured.

Once that concrete work has been completed, the finish work on the building interior can be started—rooms, labs, hallways and all the other features you have seen on the plans so often.

The utilities—natural gas and electrical— are close at hand. The well for our irrigation and building water is set.

When spring comes and soil conditions are dry, the Bruce Company will finish spreading topsoil on the research area and grade to the building, parking lot and entrance. The seeding will then be accomplished.

That will leave irrigation work. Tom Emmerich has dedicated himself to design and coordination of the irrigation system. Only when the final details are public will you be able to appreciate what a tremendous effort this man has put forth.

Sometime in the summer, when turf is well established, Midwest Irrigation will supervise installation of the irrigation system. Peter Beaves and Gordon Cunningham will provide the equipment and skilled people to make the installation. Our job will be to plan and organize work days to handle backfilling and cleanup. Don't be surprised if someone asks you to lend a helping hand for a day this summer.

Finally, Jerry Draeger is developing a master landscaping plan for the entire facility. The most important areas will be completed first and lesser important venues will be planted down the road a bit.

The following highlights recent events, people and immediate plans for the CENTER.

Construction Starting Date: The topsoil stripping, grading and top soil replacement was started on October 8, 1990. The bulk of the topsoil will be hauled back into place when conditions permit this spring.

Concrete work for the foundation of the building started on November 8, 1990. Heavy snow on December 3 prevented the pouring of the slab itself.

Steel and other building components arrived on January 25, 1991 and the building started going up on January 28, 1991.

Engineering: Grading plan and site development were done by the engineering firm of D'Onofrio, Kottle and Associates in cooperation with the University of Wisconsin-Madison Department of Campus Planning and Construction (Ed Hopkins), UW-Madison faculty (Kussow, Koval, Newman and Worf) and the Wisconsin Turfgrass Association (Harrison, Huggett and Miller).

Site Contractor: The Bruce Company, Middleton (Lee Bruce).

Building Designer and Builder: American Structures General Inc., Madison (Bill Rigalli).

Seeding: Seed for the initial seeding was donated by Kellogg Seed, Olds Seed, Northrup King and O.M. Scott & Sons. Don Stein coordinated the varieties and the donations.

Location: On Dane County Highway M, Town of Verona, between Midtown Road and County Highway PD.

Land Donor: The University of Wisconsin Foundation. The NOER CENTER is situated on ground owned by the UWF that also includes the new University of Wisconsin golf course.

Final Owner: The University of Wisconsin-Madison. The NOER CENTER will become a part of the UW-Madison College of Agricultural and Life Sciences Experiment Station system. In fact, the new West Madison experiment station is about 3 miles away, on Mineral Point Road. Talk about convenience!

Operations: A job description for a NOER CENTER manager is written and found on page 15 of this issue of *THE GRASS ROOTS*. As you can see, the position is going to be a demanding one. The governor's hiring freeze necessitated a commitment on the part of the Wisconsin Turfgrass Association to fund the manager's position from this April until June of next year. Then the CALS will assume the position in its budget.

Construction Decisions: The dean's office in the CALS has given Dr. Wayne R. Kussow the authority and responsibility to make decisions on behalf of the administration. This speeded up that process by light years!

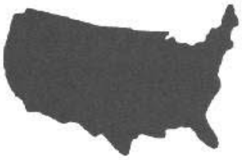
This arrangement also satisfies requirements of the UWF. The NOER CENTER committee has also asked Wayne to handle decisions on interior matters—things like paint colors, window treatments, electrical and plumbing details. He accepted.

Irrigation: As noted, NOER CENTER water requirements will be met with a well. Tom Emmerich has done the irrigation design and specification work, with input from the UW faculty. The control will be done, at this point, with TORO Network 8000 satellites. There will be four part circle sprinkler heads on each 50'x50' plot. Much of the material and supplies needed have been or will be donated. Once that giving has been detailed, you will read about it here.

Completion: We are anticipating that the bulk of the work will be completed sometime in the month of April. The exception will be the irrigation system; that will be dependent on availability of Midwest Irrigation and on the development of the grass stand. The landscaping will be completed as funds permit. Finally, when we are convinced that heavy equipment is done moving in and out of the NOER CENTER, the paving of the roadways and parking lot will be accomplished. That could possibly change if it appears we could get an extremely favorable paving bid from the same company doing the paving at the UW golf course facilities.

Details aside, the reality of the O.J. NOER CENTER for TURFGRASS RESEARCH is assured. If you doubt it, stop out and see for yourself if you are ever in the Madison area.

You'll be impressed. Guaranteed.



Putting on the Edge of Disaster

By Jerry Tarde

EDITOR'S NOTE: *Once again, I've been reminded of what fine people work in the game of golf. In my task of seeking permission to reprint the following article (you'll love it!), I had the chance to visit with a very nice person. Delores Siletto is the licensing manager for GOLF DIGEST magazine.*

I called her at the magazine's Trumbull, Connecticut office. She told me that they rarely allow reprint of their articles; on those rare occasions when they do grant that permission, they also charge a significant fee. As you can imagine, the number of such requests they get is nearly enormous.

However, she suggested I put my request in writing and send it to her, along with a couple of back issues of THE GRASS ROOTS. She assured me she would carefully consider the request.

What a treat it was to come home from the GCSAA conference to a letter from Delores. She gave us permission to reproduce Mr. Tarde's article in this issue of THE GRASS ROOTS.

So sit back, read one golfer's opinion of fast greens and remember that thanks are due to Delores Siletto.

When old Bill Fownes wanted to check the green speed at Oakmont, he would walk out to the second hole and carefully drop a ball on the back of the putting surface. If it didn't roll down the slope, off the front of the green and into the fairway, he would tell the grounds crew to cut and roll the green again.

At least that is according to Oakmont lore. For most of this century, Oakmont has set the standard against which all other top clubs measure their green speeds. Now comes new evidence from architect Pete Dye that green speed in the old days may be wildly exaggerated.

Dye has had motion pictures of the 1962 U.S. Open at Oakmont studied by mathematical experts. Analyzing the time lapse of putts rolling across the greens, they have concluded that Oakmont's speeds back then were "about 8 on the Stimpmeter," what today is considered relatively slow.

If true, Dye's discovery is important because it might curb the chase for faster greens, golf's costly equivalent of the arms race. "The USGA is trying to raise $10 million to find hardier turf," says Dye. "All they've got to raise is the mowers, 1/16th of an inch."

But golfers persist in the mistaken belief that faster is better. And just as mistakenly, club members argue that their greens were faster back in the '50s and '60s. Most agronomists agree that this is not possible, and USGA Green Section National Director Jim Snow cites four innovations that have greatly added speed in recent times:

- It's only been in the last 15 years that clubs cut greens seven days a week; they used to be cut every other day, a big change.
- Cutting greens at 3/16ths was considered very close and 1/4th of an inch was common until the 1970s; the introduction of thinner bedknives (against which the rotary blades of mowers cut) allowed greens to be scalped below 1/8th of an inch.
- Clubs used to top-dress greens once or twice a year; now they do it lightly every three weeks.
- And until the 1970s, we didn't have verticutters and groomers, new machinery that takes the excess top growth off the leaves of grass.

But the real culprit is a yard-long metal rod known as the Stimpmeter, which was developed to quantify green speed. When it was introduced in the mid-'70s, the USGA surveyed more than 1,500 greens in 36 states and found that the average roll was 6 feet 6 inches on the Stimpmeter. "It's crept up over the years until the average is closer to 8 today, and 9 feels slow to some people," says Snow.

The result has been higher expenses for maintenance of weaker turf that's more susceptible to disease. Several years ago in the Midwest, dozens of country clubs noticed that their bentgrass greens were dying of bacteria known as C15 Decline, while the greens at neighboring daily-fee and municipal courses were unaffected. Turf-types began calling it "Rich Man's Disease," because it only hit the wealthy courses like Muirfield Village and Butler National, where the greens were cut too low.

"Trying to maintain consistently fast greens means always living on the edge of disaster," says Snow.

Some classic, old courses have now increased their speeds to the point that severely undulating greens are unputtable. Then members argue the greens have "settled" over time and now need to be rebuilt. Of course, all they need to do is play the greens at the speed they were designed for.

Now some courses are starting to post their green speeds on lockerroom bulletin boards. This only encourages idiotic competition among clubs for the fastest greens in town and leads macho golfers to demand higher numbers or the super's job.

Longtime turf authority Al Radko says good putting begins at 7 feet 6 inches. And for everyday play, it should not get above 9.

The PGA Tour aims to have its greens at around 10 feet, and the U.S. Open shoots for 10 to 11½ feet. But those are once-a-year occasions, with the host club's maintenance program targeted for tournament week.

Speed Kills, we've learned. If not your superintendent, your greens.

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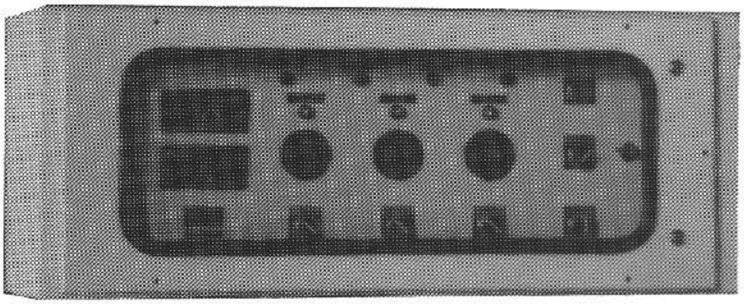

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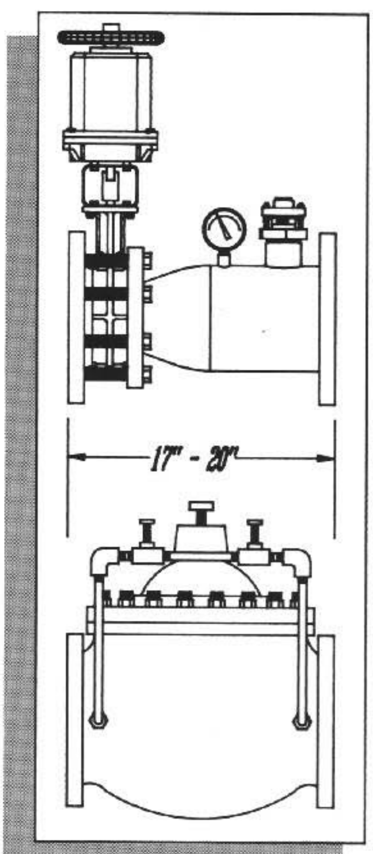

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