Lots of good reading about putting greens in this issue. Read what Cookson, Dushane, Erdahl and Otto have to say!

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PUTTING GREEN MANAGEMENT

The Wisconsin Survey

By Robert J. Erdahl

Part Two

As you may recall, the wealth of information generated by the putting green management surveys that I sent out to twenty-five Wisconsin golf course superintendents dictated a two-part article. The first part of the article appeared in the May/June 1989 edition of *THE GRASS ROOTS* and detailed the background information and the putting green fertilization programs for the twenty-five surveyed golf courses. The second half of the article will deal with the so-called "cultural practices" employed by the twenty-five golf course superintendents responding to this survey. The topics of discussion will include:

Aerification	Irrigation
Spiking	Pesticide Applications
Verticutting	*Poa annua* Control
Turf Groomers	Snow Mold Control
Top Dressing	Winter Protection
Overseeding	Wetting Agents
Mowing	Changing pH's
Rolling	Special Topics

What better way to begin than with aerification. The very mention of this dreaded word causes the hair to stand up on the back of most golfers' necks. Even my own father is constantly complaining about how he played John Doe Country Club last week and they had the nerve to be aerifying the putting greens!

We all know that golfers dislike aerification, but that attitude can be changed through proper public relations on our part. Now what about us? Do we as golf course superintendents still feel that putting greens must be aerified every year? The results listed in Table 1 indicate a resounding yes answer to that question. In fact, only two golf courses have no scheduled putting green aerification for this year. It appears that modern soil mixes and sand top dressing programs are no substitute for regularly scheduled aerification.

Table 1 shows that the choice of equipment for putting green aerification is relatively balanced between Ryan (17) and Toro (12) with Core Master (2) just gaining a foothold in the marketplace. The overwhelming choice for tine size is 0.50″ and the depth of penetration is 2.5″-3.0″ for all survey respondents except one. This one superintendent is planning to use a Core Master seven times over the course of the season with 0.25″ tines at 1.0″ depth of penetration.

The timing of putting green aerification was the most interesting comparison for me. Table 1 shows a balance between Spring and Fall aerification. I could find no correlation between the timing of aerification and the age of the putting greens, the soil mix, the bentgrass/*Poa annua* populations or the fertility programs. I am left to conclude that timing of putting green aerification is scheduled to disrupt the golfers as little as possible. Here are two examples: 1) All the daily fee golf courses aerify in late September or early October to coincide with their slowest time of year; and 2) Many private country clubs aerify just after the Memorial Day weekend to take advantage of a brief drop off of play after the holiday weekend.

It should be noted that six superintendents aerify many putting greens on an as-needed basis and three superintendents aerify all of their putting greens every other year. In addition, several superintendents indicate that if they would desire to overseed in conjunction with aerification they would schedule the combined operation for late August or early September.

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While putting green aerification is as popular as ever, spiking putting greens appears to be a lost art since only five of the twenty-five golf courses in this survey employ this procedure. Of these five, three spike every three to four weeks, one spikes once a year in conjunction with overseeding and one spikes along with sand top dressing applications.

Table 1.
Aerification Summary for Putting Greens in the 1989 Wisconsin Survey.

Machine		Season		Tine Size	
Coremaster	2	Spring	12	1/4″	1
Ryan	17	Fall	14	3/8″	3
Toro	12			1/2″	18
				5/8″	3

Values indicate number of golf courses in each category. Golf courses can be listed more than once in each column.

All five superintendents that spike putting greens use Toro triplex greensmowers equipped with spiking units set at a depth of 1.0″. Because this equipment makes the spiking operation efficient and clean, the lack of popularity for spiking putting greens must be due to the absence of beneficial results observed by the majority of superintendents in this survey.

In contrast to spiking, verticutting of putting greens is employed on a regular basis by twenty out of the twenty-five surveyed golf courses. Of the twenty superintendents verticutting, the choice of equipment was an even split between Jacobsen and Toro triplex greensmowers equipped with verticutting units. The average frequency of verticutting was every three weeks from May-September. Light (1/16″ to 1/8″ penetration) verticutting dominated the survey with several superintendents occasionally using verticutting in conjunction with their top dressing programs.

The recent introduction of turf groomers for putting green maintenance has not generated a lot of interest among the surveyed golf courses. Only five superintendents report using turf groomers; two use Jacobsen walking units, two use Jacobsen triplex units and one uses a Toro triplex unit. The average frequency of use was two to three times per week. Of those superintendents who have tried turf groomers but did not purchase a unit, several state that they are impractical at their golf courses because the slightest penetration by the turf groomer kicked up enough soil mix to ruin a mower after just one green. Still other superintendents see no need to change their current management programs. Time will tell whether turf groomers are a fad or a wave of the future that has yet to crest.

Top dressing of putting greens is a cultural practice that all the surveyed superintendents employ on a regularly scheduled basis. Table 2 lists the machines and materials used for top dressing. The choice of top dressing machines is a fairly even match among the four units. It should be noted, however, that the majority of superintendents only indicated the machine they use for light top dressing applications and did not include information on how they fill their aerifier holes.

The choice of top dressing material yields two favorites; 80/20 — sand/peat mixtures and Lakeshore TDS 2150. The 80/20 sand/peat mixture is a generic label given to many different sands and peats that are blended at approximately an 80/20 ratio. The actual percentages and the quality of the mixture depends on the adherence to USGA guidelines and testing procedures. The quality of the pure sand used for top dressing must also follow USGA guidelines and testing procedures. In this survey, twelve out of sixteen superintendents that top dress with pure sand think that Lakeshore TDS 2150 is the best choice.

The comments I received regarding overseeding of putting greens serve to reinforce my belief that it is usually not a success when attempted in an established green during verticutting, top dressing or aerification. In fact, six superintendents went out of their way to emphasize that it seemed like a complete waste of time and money.

When a putting green has been damaged by disease or winterkill, however, the situation changes. Under these conditions, overseeding at the time of verticutting, top dressing or aerifying yielded positive results for many superintendents.

The overwhelming choice for overseeding was Penncross bentgrass. Other bentgrasses, such as Penneagle and Pennlinks, appear to be used on an experimental basis.

Table 2.
Top Dressing Summary for Putting Greens in the 1989 Wisconsin Survey.

Machine		Material	
Cushman	6	80/20 — Sand/Peat Mix	9
Lely	7	Lakeshore TDS 2150	12
Turfco	5	Portage Silica	1
Vicon	7	Waupaca #4070	3

Values indicate number of golf courses in each category.

The choice of putting green mowers is obviously one of the most important decisions a superintendent has to make. That choice has both subjective and objective components that are based on a superintendent's experience and personal preferences. Table 3 lists the choices made in this survey. The most popular putting green mower is the Toro triplex with eleven bladed reels. In fact, eleven bladed reels were the choice on two-thirds of the mowers, regardless of make and model.

Table 3.
Greensmower Summary for the 1989 Wisconsin Survey.

Machine	No. of Golf Courses
Jacobsen Triplex 9 Bladed Reels	7
Jacobsen Triplex 11 Bladed Reels	2
Jacobsen Walker 9 Bladed Reels	3
Jacobsen Walker 11 Bladed Reels	3
John Deere Walker 9 Bladed Reels	1
Toro Series 4 Walker	1
Toro Triplex 8 Bladed Reels	3
Toro Triplex 11 Bladed Reels	11

Note: Several golf courses use more than one type of greensmower.

It is most interesting to note the number of golf courses mowing putting greens with walkers; it appears they are making a comeback. In addition, many superintendents who generally mow their putting greens with a triplex mower indicated that they usually mow one or more prob-

lem putting greens with walkers for most of the summer.

When it comes to rollers on the cutting units, three superintendents use solid front rollers while the remainder use grooved front rollers.

Mowing heights on putting greens varies from 0.10″ to 0.18″ with an average mid-season value of 0.140″. This average is up from the 0.125″ height of cut that many superintendents were at a few years ago. Perhaps we have turned the corner on the quest for speed and can now concentrate more on maintaining healthier putting greens.

Speaking of speed, let's talk about the stimpmeter. In this survey nineteen out of twenty-five superintendents regularly use a stimpmeter. The range for mid-season readings on these nineteen golf courses was 7′6″ to 10′6″. The average mid-season reading was 8′10″, plenty fast for 99% of Wisconsin golfers.

The recently revived practice of rolling putting greens generated some of the strongest comments from survey respondents. Only two of the twenty-five superintendents have plans to roll their putting greens in 1989. Many of those who have no plans for rolling expressed strong reservations about a maintenance procedure they view as unwise and unwarranted.

When discussing irrigation practices, the most interesting statistic is the comparison of light and frequent irrigation with heavy and infrequent irrigation. In this survey, nineteen superintendents practice light and frequent irrigation and supplement this with syringing and hand watering when necessary. Only six superintendents practice the heavy and infrequent irrigation strategy that used to be the technique of choice. It seems that modern, automatic irrigation systems that can operate on short cycles have changed the way we water not only our putting greens, but our entire golf course as well.

The subject of pesticide applications on putting greens to control disease, insects and weeds is basically a hohum discussion because all of the surveyed golf courses are on a regularly scheduled, preventative program that limits the chances for the occurrence of problems. The average disease control program is based on the rotation of the three basic fungicide types; sterol inhibitors, systemics and contacts. Only pythium and yellow tuft were singled out as problems that might take an extra application. Insect control also seems to be quite successful using the available insecticides with only cutworms giving any real cause for concern. And when it comes to weed control, most superintendents answered with one word — none.

Table 4.
Fungicides Used for Snow Mold Control in the 1989 Wisconsin Survey.

Fungicide	No. of Golf Courses
CaloClor, CaloGran or PMAS	23
Chloroneb	14
Thiram	13
PCNB	7
Benomyl	2
Dyrene	1
Iprodiore	1

A look at the snowmold control programs on the twenty-five surveyed golf courses points out how heavily we rely on the mercury compounds to control this winter nemesis. It turns out that twenty-three out of twenty-five superintendents base their snowmold control strategy around mercury compounds. Table 4 lists the fungicides and the number of golf courses that use them for snowmold control.

Split applications for snow mold control fungicides were employed by eighteen of the twenty-five superintendents while ten superintendents take the advice of Dr. Worf at the University of Wisconsin and apply their snowmold control treatments three to four weeks earlier than is traditional.

The use of covers for winter protection of putting greens is starting to catch on in Wisconsin. Nine superintendents report good results in covering from just one or two problem greens to all eighteen greens on their respective golf courses.

An even dozen superintendents end the year with a heavy application of top dressing in late November. They like the extra protection it affords the crowns of plants and report earlier recovery in the spring.

A discussion of attempts to chemically control *Poa annua* could fill an entire issue of *THE GRASS ROOTS* and still only scratch the surface. In this survey, the results show that eight superintendents are attempting to control *Poa annua* on their putting greens with chemicals. The chemicals and number of superintendents using them are as follows: Betesan — one, Cutless — one, Prograss — one, Rubigan — five. Of these four chemicals, only Rubigan has been used regularly for more than one year. None of the eight superintendents gave any indication as to the success of their chemical applications in decreasing the amount of *Poa annua* in their putting greens.

The remaining seventeen superintendents are employing fertilization, irrigation and other cultural practices to encourage bentgrass over *Poa annua*. Eight of these seventeen took the time to detail their various attempts over the years to chemically control the growth of *Poa annua*. They reached the conclusion that in the long run *Poa annua* always persists despite attempts to chemically control its growth.

Table 5.
Wetting Agents Used on Putting Greens in the 1989 Wisconsin Survey.

Wetting Agent	No. of Golf Courses	
	Under 20 oz./M/season	Over 20 oz./M/season
Aqua Gro	8	5
Clearys Super Wet		1
Hydro Wet	3	5

Wetting agent use on putting greens is quite popular with only three out of the twenty-five surveyed superintendents not using these treatments. For discussion purposes, it is convenient to divide wetting agent use into two categories: less than twenty ounces/M/season and more than twenty ounces/M/season. Table 5 lists the wetting agents and number of golf courses using them.

Those superintendents using less than twenty ounces/M/season generally apply small amounts (1.0-2.0 ounces/M/treatment) of wetting agent with several of their regularly scheduled pesticide applications.

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consin was maintaining good paced greens (9.5 stimpmeter) for regular play while mowing greens at 1/8". When preparing for an event or tournament and he wanted to quicken the pace he would roll them 2-3 days before and during the event using a set of triplex rollers he copied from an old set of cast iron rollers. He used plastic water pipe sections filled with concrete and tennis balls to get the desired weight he wanted. Total time to roll all of the greens with one set of rollers was 2½ hours. The results were immediate as he gained an additional 10" on the stimpmeter. Because he has been sand topdressing for 16 years he did not have a compaction problem. Under conditions of heavy rains, high dew points or stress he would not roll the greens to prevent damage to the turf. His rolling program was done on an as needed basis and he was able to achieve faster greens when needed without lowering the height of cut or cutting back on fertilization.

Rolling greens, providing the greens are constructed with the proper soil mix, is an alternative to be considered rather than obtaining ultra fast greens through low fertility and close mowing. Most modern putting greens are constructed with a sand root zone that meet USGA Green Section guidelines. These type of greens are not prone to compaction therefore rolling could be beneficial in obtaining faster green speeds. Many courses that do not have high sand content greens but have been sand topdressing for a number of years could roll greens and not be concerned with compaction. I will try rolling next year on a limited basis to see if I can maintain fast greens while managing the turf under less extreme agronomic practices.

Putting green speed was a controversial topic 10 years ago, it still is today and it will be 20 years from now. From my viewpoint I see the trend for moderately fast greens continuing but avoiding the ultra fast greens that were commonplace just a few years ago. We, as superintendents, cannot get caught in the same situation and try to compete against one another for the fastest greens. Technology in the future may allow us to achieve faster putting surfaces without sacrificing the turf. Let's wait for that day to arrive.

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Superintendents who apply more than 20 ounces/M/season usually make one or two heavy applications (6.0-8.0 ounces/M/treatment) in the Spring, Summer and Fall. In addition, they sometimes add small amounts (1.0-2.0 ounces/M/treatment) to their regularly scheduled pesticide applications.

Altering the pH of putting green soil mixes is only being attempted by three superintendents in this survey. Two are attempting to lower their pH with elemental sulfur and one is using lime to raise the pH. The remaining twenty-two superintendents are content to manage pH values that range from 6.2 to 7.6.

Special topics included in this survey were questions about problems with algae, black layer and C-15 bacterial wilt. Only the C-15 bacterial wilt has proven to be a serious problem with six superintendents indicating damage that ranged from general thinning of turf to the complete loss of three putting greens.

In wrapping up this two-part article, I would like to express my appreciation to those superintendents who took the time to fill out the survey and provide me with the raw material for this article. Being able to evaluate twenty-five different putting green management programs has given me new insight and even greater respect for those select few who claim the title of golf course superintendent.

In writing this article, my goal has been to define the state of putting green management in Wisconsin for 1989. It is my hope that this article will serve as a benchmark against which past and future putting green management techniques can be compared.

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MEMO TO: *GRASS ROOTS* file
FROM: Editor
RE: Distinguished Service Award

Do not forget to collect your thoughts and emotions from receiving the WGCSA Distinguished Service Award and share them with your friends in the WGCSA.

Tell them how many times you have tried to put on paper the high honor you feel and how grateful you are. As you have said a hundred times, you are not really a success in your chosen field if you do not have the respect of your colleagues. It doesn't matter how great your golf course is, how well you manage it or how much your golf players like you if you don't have that peer respect. There's just no fooling those guys.

Money doesn't substitute. New shops and irrigation systems and new features don't matter much if the people you call "colleagues" don't extend their respect. That is why the DSA means so much.

Mention how glad you are to be a golf course superintendent in Wisconsin — a great career choice in a great state. Tell how you feel your essential worth is tallied in a sort of "spiritual" return you received from this commendation of your fellow golf course managers. No form of compensation comes close to the esteem of the Distinguished Service Award.

And be sure to say how you think about it nearly every day while working on the golf course. Then there's the great company you probably don't deserve — Belfield, Worf, Love, Welch, Sell and Verhaalen. What a great group to be a part of.

Try to keep it short, yet include the enormous pride you feel. Write a line or two about your heightened devotion and dedication to this profession and the people in it. It is, after all, a labor of love.

You might even admit you know full well who wrote the flattering story in the last *GRASS ROOTS*, the one you refused to proofread. I love that kid, Mike Lee.

Then thank everybody again.