



THE GRASS ROOTS



an official publication of the Wisconsin Golf Course Superintendents Association

Volume XVII, No. 2

March/April 1990

FAIRWAY MANAGEMENT

The Wisconsin Survey

By Robert J. Erdahl

If I asked you to make a list that ranked the aspects of golf course management that have changed the most in recent years, what would be at the top of your list?

Chances are pretty good that fairway management would be at the top of your list and the lists of your fellow Wisconsin golf course superintendents. That should not surprise any of us given the ongoing evolution of fairway management techniques that are now approaching those of putting green management. I'm sure you know what I mean; mowing with lightweight triplex and fiveplex units, harvesting clippings, aerifying with machines designed for putting greens, applying pesticides on preventative, bi-weekly schedules, irrigating with computer controlled, double row irrigation systems and so on.

Given this state of flux in fairway management and the heavy price tag today's technologies carry, it is crucial for golf course superintendents to make prudent choices when planning their fairway management programs. When making any tough decision, it is always best to have as much information about the problem as possible. In the case of fairway management decisions, it would be very beneficial to find out what equipment and techniques have worked for other superintendents before we finalize our own decisions. From my experience with the putting green management articles I wrote for *The Grass Roots* in the summer of 1989, I knew that if given the opportunity, golf course superintendents in Wisconsin would be more than willing to share their successes and failures in fairway management with their peers.

I decided to provide that opportunity by writing this article which is based on the results of fairway management surveys I sent to a wide cross-section of WGCSA members. I received 25 survey responses from superintendents who manage golf courses that range from a private country club in Milwaukee to a daily fee resort in northern Wisconsin. It is my hope that this diversity among the survey respondents will yield an article that is helpful to all superinten-

dents, no matter what level of fairway management they currently employ.

Topics covered in the survey include:

Background Information	Wetting Agents
Fertilization Programs	Spraying Equipment
Mowing Equipment	<i>Poa annua</i> Control
Irrigation Systems	Aerification
Pesticide Applications	Overseeding
Snowmold Control	Additional Topics

My first casual glance through the surveys revealed the expected differences between the management of bentgrass/*Poa annua* fairways and bluegrass fairways. Of the 25 survey respondents, 20 manage the former and 5 manage the latter. The dominance of bentgrass/*Poa annua* fairway management is a function of who I chose to receive the survey. I intentionally sent out the surveys in a 4 to 1 ratio of bentgrass/*Poa annua* to bluegrass. This is not intended to diminish the task of those superintendents who manage bluegrass fairways. Rather, it is a simple affirmation that management of bentgrass/*Poa annua* fairways is more technical, the margin for error is smaller and changes occur more rapidly than in bluegrass fairway management. Thus my discussion will focus on the management of bentgrass/*Poa annua* fairways, but will include information about bluegrass fairway management when warranted.

Before beginning a comparison of fairway management programs, it is necessary to first identify the background conditions under which those programs are administered. In this survey, the background conditions polled include: turfgrass population, soil type, soil pH, age of the fairways and fairway acreage.

Not surprisingly, the most dominant background condition is turfgrass population; or the ratio of bentgrass/*Poa annua*/bluegrass. Analysis of the surveys reveals differences in many management programs based on the four turfgrass population categories that are listed in Table 1.

(Continued on page 22)

(Continued from page 1)

Table 1.
Turfgrass Populations for Fairways in the 1990 Wisconsin Survey.

Group Name	Population Ratio	No. of Golf Courses
Bentgrass/<i>Poa annua</i>		
Bent	75/25	6
Bent/ <i>Poa</i>	50/50	9 (4)
<i>Poa</i>	25/75	5
Bluegrass/<i>Poa annua</i>		
Blue	75/25	5 (3)

¹ Number in parenthesis indicates golf courses that have overseeded with perennial ryegrasses.

The first group is composed of golf courses whose fairway population is over 75% bentgrass. All of those superintendents indicate that their management programs strongly favor bentgrass over *Poa annua*. They can afford to lose some *Poa annua* because there is plenty of bentgrass to fill in the bare spots. This will be called the Bent Group.

The largest group contains nine golf courses that have fairways made up of around 50% bentgrass and 50% *Poa annua*. (Please note that in this group and in the fourth group, the figure for *Poa annua* percentage may be much less where perennial ryegrasses have been overseeded. This overseeding will be discussed later in the article.) As a general rule, these are risk takers; the superintendents trying all the ways to increase bentgrass populations at the expense of *Poa annua*. This will be called the Bent/*Poa* Group.

The third group of golf courses has fairway populations of over 75% *Poa annua*. These five superintendents rely on modern irrigation systems, fungicides and aerification programs to maintain their *Poa annua* through the summer stress. They are proud of their *Poa annua* fairways and will not be interested in changing until someone comes up with "turn key" bentgrass fairways. This will be called the *Poa* Group.

The fourth group consists of the five golf courses that have predominantly bluegrass fairways. At the present time, none of these superintendents is thinking about joining the bentgrass/*Poa annua* debate. Instead they plan on upgrading their management programs with lightweight mowers and overseeding with bluegrasses and perennial ryegrasses. This will be called the Blue Group.

Soil types on the surveyed golf courses include sands, silt loams, clays and organic soils. The majority of the golf courses contained two or more soil types. It is interesting to note, therefore, that only one of the 25 superintendents indicated a need to use a specific fairway management program for each soil type on the golf course. In fact, the conclusion I draw from the surveys is that superintendents are now able to diminish the influence of soil type on fairway turfgrass quality through the proper use of fertilization, irrigation, aerification, pesticides, mowing techniques and other modern management tools.

Please understand, I am not saying that a sandy fairway can be managed the same as a clay fairway. What I am saying is that with today's technologies, we can manage both sandy and clay soils so that the turfgrass plant is less aware of the difference in soil type. Therefore, if we can negate the difference in soil type, the decision on how to manage fairways is not driven by the soil type; rather, it is driven by

the management requirements of the turfgrass species we wish to optimize.

The pH of the fairways fell in a range from 4.8-7.5 with an average of 6.8. While this range is quite large, I find only minor adjustments in management due to pH alone. One golf course with a fairway pH of 7.2-7.5 applies Agrisul at 80 pounds/Acre after aerification to lower the pH. No indication was given whether this practice was successful. The two golf courses with the lowest pHs apply iron at slightly higher rates than normal due to the reduced availability of iron below pH 5.5. Iron fertilization will be covered in more detail later in the article.

Both the age of the fairways and the total fairway acreage had no correlation to any of the management programs. It is interesting to note, however, that total fairway acreage for an 18 hole golf course fell in a range from 20-36 acres with an average of 27 acres. Contour mowing of fairways will be covered later in this article.

Now let's get on with the discussion of the fairway management techniques contained in the surveys. Remember, that for comparison purposes, the four groups listed in Table 1 and previously described will often form the basis for my discussion and conclusions. Survey results on fairway fertilization generated the most results, so let's begin there.

Table 2.

Sources of Nitrogen, Phosphorus, Potassium and Iron Fertilizer Use on Fairways in the 1990 Wisconsin Survey.

Source of Fertilizer	No. of Users
Andersons 10-15-30	1
Lebanon 18-4-10	1 ³
Lebanon 18-5-9	2 ²
Lebanon 18-0-18	1 ^{1 3}
Lebanon 29-3-5	1 ³
Lesco 20-0-15	1
Milorganite 6-2-0	13 ^{2 3}
N-Sure 28-0-0	2
Nutriculture 28-8-18	1 ³
Par Ex 21-2-6 + Team	1
Par Ex 21-3-12	1
Par Ex 24-4-12	4 ^{1 2 3}
Potassium Nitrate 13-0-44	1
Potassium Sulfate 0-0-50	15
Scotts 15-0-30	6 ¹
Scotts 20-3-8	1 ³
Scotts 22-0-22	2 ³
Scotts 31-3-10	4 ¹
Scotts 34-3-7	2
Spring Valley 5-1-10	2 ^{2 3}
Spring Valley 6-1-2	1 ^{2 3}
Spring Valley 10-5-15	3 ^{2 3}
Spring Valley 20-3-6	2 ^{2 3}
Urea 46-0-0	4 ¹

¹ Nitrogen Source for Late Fall Fertilization.

² Nitrogen Source for Dormant Fertilization.

³ Source of Iron Fertilizer.

Starting with nitrogen fertilization, we can see from Table 2 that a wide variety of nitrogen sources are used by Wisconsin superintendents. The most popular nitrogen source is Milorganite; either as the 6-2-0 or in the four Spring Valley blends. Many other nitrogen sources are listed along with the number of users. I am not surprised by the diversity of nitrogen sources. I am surprised by the absence of a nitrogen source pattern based on the four management groups.

If we look at the total yearly nitrogen applied in Table 3, we find that the four fairway management groups break out quite nicely.

The Bent Group uses an average of 1.6 pounds of N/M. The common theme in this group is to use as little nitrogen as possible in order to discourage *Poa annua* and avoid the buildup of thatch.

A 50% increase, up to 2.4 pounds of N/M, brings us to the average yearly nitrogen application of the Bent/*Poa* Group. The wide range for this group shows there is no strong consensus about how much the nitrogen rate has to be reduced in order to favor bentgrass over *Poa annua*.

The *Poa* Group uses an average of twice as much nitrogen (3.25 pounds of N/M) as the Bent Group. No surprise here since *Poa annua* is a heavier feeder than bentgrass where nitrogen is concerned.

The Blue Group appears to be quite traditional with an average yearly nitrogen rate of 2.8 pounds of N/M. Note that this group has the narrowest range which indicates strong agreement among its members.

Now that we know the yearly nitrogen requirement for the four management groups, let's look at Table 4 for the seasonal use of that nitrogen.

The Bent Group has both strong agreement and disagreement. They agree that nitrogen should be used sparingly in the summer, but they can't agree on when to apply the majority of their nitrogen. Half of them apply it in the spring and the other half apply it in the fall. When averaged, these two conflicting views give a distorted view of what is actually occurring.

Table 3.

Total Nitrogen Used on Fairways in the 1990 Wisconsin Survey.

Group Name	Total Nitrogen Used in 1990 Pounds of N/M	
	Range	Average
Bent	1.0-2.0	1.6
Bent/ <i>Poa</i>	1.75-4.0	2.4
<i>Poa</i>	2.75-4.0	3.25
Blue	2.5-3.25	2.8

Consistency is the word to describe the Bent/*Poa* Group. Their seasonal use of nitrogen is almost level. Note that the June-August use of nitrogen is halfway between that of the Bent Group and the *Poa* Group.

Speaking of summer nitrogen levels, the *Poa* Group tops the list with almost half of the total yearly nitrogen being applied in June-August. The scheduling of the summer applications is very consistent; with 0.25-0.33 pounds of N/M being applied every 3-4 weeks.

The Blue Group practices modest nitrogen applications in the spring followed by equal summer and fall applications. The nitrogen used in the summer, however, could almost be called an early fall application since it usually occurs in mid-to-late August.

From one professional to another...

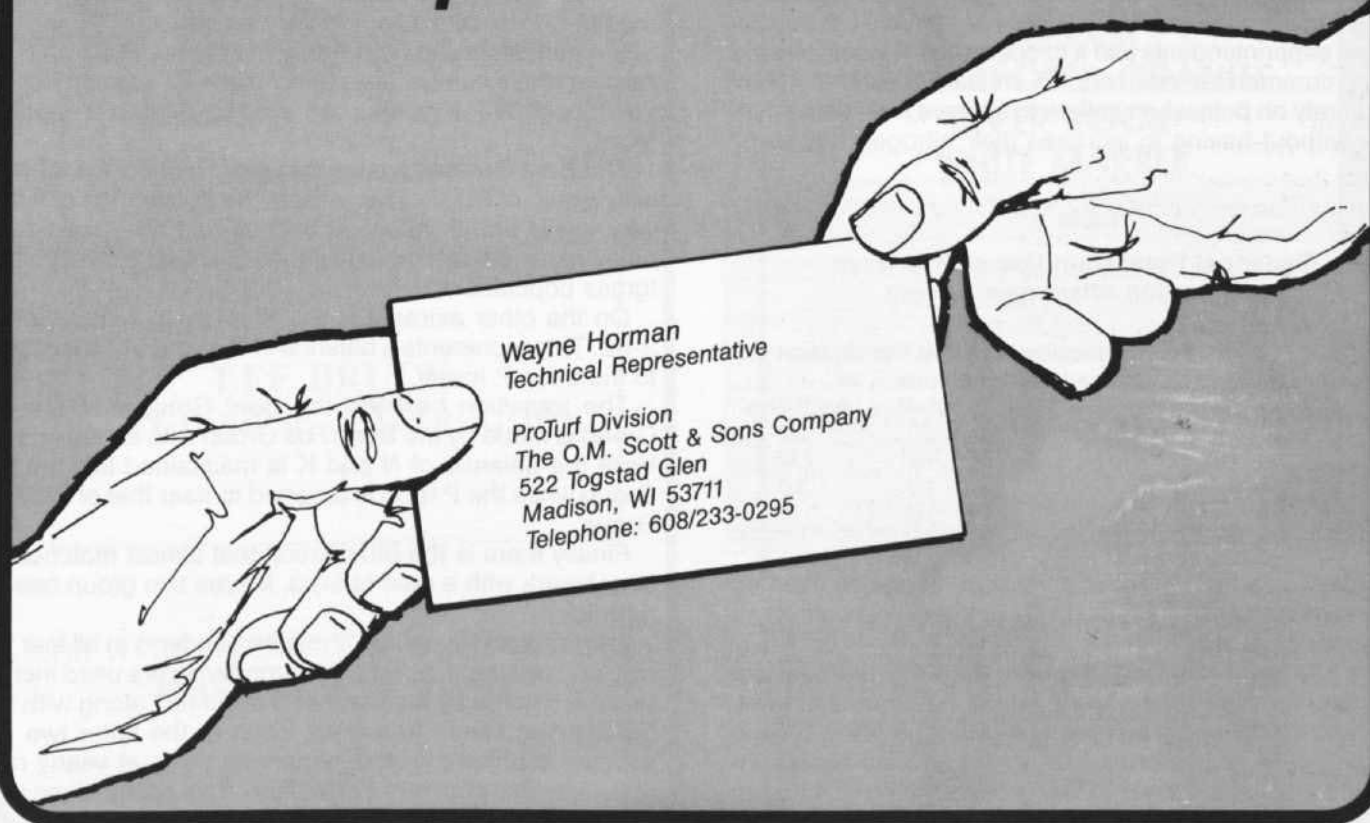


Table 4.
Seasonal Nitrogen Use on Fairways in the 1990 Wisconsin Survey.

Group Name	Percent of Nitrogen Applied per Season		
	April-May	June-Aug.	Sept.-Nov.
Bent	40	10	50
Bent/ <i>Poa</i>	30	30	40
<i>Poa</i>	25	45	30
Blue	20	40	40

Fertilizer sources used for late fall nitrogen application are indicated in Table 1 by the number 1 footnote. For the purpose of this article, late fall nitrogen fertilization is defined as applying at least 0.25 pound of N/M between October 1 and November 1.

The five products footnoted in Table 1 are used by nine superintendents. Four of them apply a heavy, late fall, nitrogen application (1.0-1.25 pounds of N/M) and then skip a dormant nitrogen application. The other five apply a modest amount of late fall nitrogen (0.33-0.75 pounds of N/M) and then apply a dormant nitrogen treatment. These nine superintendents represent all four of the fairway management groups.

Fertilizer sources used for dormant nitrogen applications are indicated in Table 2 by the number 2 footnote. For the purpose of this article, dormant nitrogen fertilization is defined as applying at least 0.25 pound of N/M after November 1.

The use of dormant nitrogen fertilizer spanned all four fairway management groups. Seventeen superintendents used seven footnoted products in Table 1. Milorganite and the four Spring Valley blends account for 65% of the dormant nitrogen fertilizer.

The sources of potassium fertilizer used by the surveyed golf courses are listed in Table 1. Many products contain potassium, but I would like to single out potassium sulfate. Fifteen superintendents use it to boost their K levels beyond that of commercial fertilizers. All six members of the Bent Group rely on potassium sulfate to achieve high potassium rates without having to increase their nitrogen rate also.

Table 5.
Seasonal Potassium Use on Fairways in the 1990 Wisconsin Survey.

Group Name	Avg. Potassium Applied Per Season Pounds of Elemental K/M			
	April-May	June-Aug.	Sept.-Nov.	April-Nov.
Bent	1.0	0.5	2.0	3.5
Bent/ <i>Poa</i>	0.6	0.95	1.1	2.65
<i>Poa</i>	1.0	1.0	1.0	3.0
Blue	0.25	0.50	1.0	1.75

Table 5 lists the seasonal potassium usage by the four fairway management groups. Note: In this article potassium is elemental K, not K₂O.

As I already mentioned, the Bent Group is the heaviest user of potassium with a yearly rate of 3.5 pounds of K/M. The application of 2.0 pounds of K/M in the fall is unique to this group. The emphasis on spring and fall potassium applications corresponds to this group's timing of nitrogen applications.

The Bent/*Poa* Group and the *Poa* Group are very similar in potassium rates. Their seasonal applications are uniform, and parallel the uniformity of seasonal nitrogen applications for both these groups.

The Blue Group requires the least amount of potassium with the majority being applied in the fall.

Phosphorus fertilizers are listed in Table 2. The point of interest here is that Milorganite and Milorganite in the four Spring Valley blends account for approximately 60% of the phosphorus applied by survey respondents.

Yearly rates of applied phosphorus are given in Table 6. Note: In this article, phosphorus is elemental P, not P₂O₅.

Table 6.
N-P-K Fertilization Ratios on Fairways in the 1990 Wisconsin Survey

Group Name	Avg. Yearly Rate in Pounds/M ¹			N-P-K Ratio	Modified N-P-K Ratio
	N	P	K		
Bent	1.6	0.27	3.5	1.6-0.27-3.5	6-1-13
Bent/ <i>Poa</i>	2.4	0.45	2.65	2.4-0.45-2.65	5-1-6
<i>Poa</i>	3.25	1.5	3.0	3.25-1.5-3.0	2-1-2
Blue	2.8	0.6	1.75	2.8-0.6-1.75	5-1-3

¹ N-P-K are expressed in Elemental, not Oxide values.

² Derivation of Modified N-P-K ratio is explained in the text.

The *Poa* Group leads the way with a yearly rate of 1.5 pounds of P/M. This is five times the rate of the Bent Group and three times the rate of the Bent/*Poa* Group. It seems we are all convinced that phosphorus can be a factor in the management of *Poa annua*.

To conclude the discussion of N, P and K fertilization, I'd like to take a look at the N-P-K ratios found in Table 6. To simplify matters, I have converted the true elemental N-P-K ratios to modified ratios. To do this, I multiply the elemental N-P-K values by a factor that changes the P value to the number 1 and then round the N and K values to the nearest whole number. As a benchmark, let's remember that "textbook" N-P-K values are around 7-1-4 in a modified form.

The Bent Group deviates the most from our benchmark with a ratio of 6-1-13. This reflects the dominance of K over very low N and P values. It tells us that this group relies on extreme fertilization techniques to maintain its high bentgrass populations.

On the other extreme is the *Poa* Group with a ratio of 2-1-2. This represents a balance of N and K but a real push to increase P levels.

The transition between the Bent Group and the *Poa* Group is made by the Bent/*Poa* Group with a ratio of 5-1-6. Here the balance of N and K is maintained like the *Poa* Group while the P level is dropped to near that of the Bent Group.

Finally there is the Blue Group that almost matches the benchmark with a ratio of 5-1-3. Maybe this group has the right idea.

Iron fertilizer is used by 21 superintendents in all four fairway management groups. The iron fertilizers used include those footnoted by the number 3 in Table 2 along with Iron Sulfate and Lesco Iron Plus. Each of the latter two iron sources is utilized by four superintendents at yearly rates of 0.25 to 0.50 pound of Fe/M. Individual applications were made at the rate of 0.25 to 0.75 ounce of Fe/M.

Milorganite and Milorganite in the four Spring Valley blends are the largest sources of iron, accounting for approximately 80% of the total iron applied by all 25 golf courses. Yearly rates for Milorganite-based iron are 0.25 to 1.5 pounds of Fe/M. Ten superintendents report that this is their only source of iron.

The survey results prove that fairway mowing is truly one of the hottest topics in golf course management. Taking a

look at Table 7, we see that three machines are the most popular: Jacobsen LF-100, Lesco 500 and Toro GM 3000. But just look at all the types of mowers listed. With this kind of diversity, can superintendents ever agree on what the best machine is for mowing fairways? Well, one of my survey questions was how you would mow fairways if money was no object. The response was split; half would mow with triplex greensmowers and the other half with fiveplex units. And of course, everyone wanted to harvest clippings!

The three management groups with bentgrass and/or *Poa annua* share the same mowing techniques. A typical fairway would be cut four to five times per week in four different directions at a height of 1/2. Twelve of the 20 superintendents in these three groups harvest clippings. Harvested clippings are disposed of using three equal methods; 1) dispersal in the roughs by hand, 2) dispersal in the roughs using manure spreaders or 3) composting. The most frequently mentioned benefits of clipping harvesting were the ability to mow early in the morning (no mess — no players — grass not under stress), less disease, reduced "silage effect", reduced seedhead problem, increase in bentgrass and improved appearance from mowing in four directions.

The machine used the most in the Blue Group was a seven gang with ground driven reels. The fairways are cut three times per week at a height of 13/16 using a stripe pattern up and down the fairway.

Contour fairway mowing is done by 18 of the 25 superintendents in all four management groups. The average reduction in fairway acreage was four acres. The decision on how to contour mow is split equally among the superintendent, the green committee or the golf course architect. The

Table 7.

Fairway Mower Summary for the 1990 Wisconsin Survey.

Machine	No. in Use
Howard Price 5 Gang	2
Jacobsen 7 Gang Pull Frame	3
Jacobsen F-10	2
Jacobsen HF-15	1
Jacobsen HF-5	2
Jacobsen LF-100	18
Jacobsen 1471	2
Jacobsen TF60	7
Jacobsen GKIV	14
Lesco 500	11
Ransomes 180	18
Ransomes 213	2
Ransomes 5000	1
Toro 7 Gang Pull Frame	2
Toro 84	2
Toro 216	3
Toro 223	3
Toro GM3000	18



**the
bruce
company** OF WISCONSIN, INC.

(608) 836-7041

LEE BRUCE
GOLF COURSE CONSTRUCTION

2830 W. BELTLINE HWY. • P.O. BOX 330
MIDDLETON, WI 53562

WAUPACA MATERIALS / GREENSMIX

can provide...

**DECOMPOSED GRANITE
RIVER ROCK
WHITE MARBLE**

...for your Golf Cart Path needs.

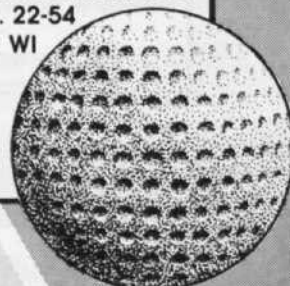
These materials are natural and more aesthetically pleasing than asphalt. Their easy installation and maintenance make them cost effective and versatile to the changing needs of your course.

**READY FOR IMMEDIATE SHIPMENT
FROM OUR QUARRIES**



WAUPACA MATERIALS, INC.
E3481 Hwy. 22-54
Waupaca, WI
54981

Call 1-800-537-1796
In Wis.: 715-258-8566
Fax: 715-258-8750



old fairway area that becomes rough when contour fairway mowing takes place can be a real problem. Some solutions and the number of superintendents using them are as follows: strip and resod — four; roundup and reseed — two; slit seed — two; aerify and seed — two; mow an intermediate rough — two.

Are fairway irrigation systems in Wisconsin keeping up with the fast-paced changes that are occurring nationwide? A quick look at Table 8 tells us that a few high-tech systems are beginning to appear, but for the most part, our irrigation systems are very outdated. With water becoming such a valuable and controversial resource, computer controlled irrigation systems that can conserve water are going to become an absolute necessity.

Table 8.
Fairway Irrigation Control Systems
in the 1990 Wisconsin Survey.

Control System	No. of Golf Courses
Toro Network 8000 with Weather Station	1
Toro Network 8000	2
Toro VT IV	1
Toro VT III	4
Toro VT II	6
Toro Varitime 4000	1
Royal Coach/Buckner	2
Weathermatic	1
Manual	7 ¹

¹ All five courses in the Blue Group have manual systems.

Here are some highlights from Table 8 and the irrigation portion of the survey:

- 1) Seven of the systems are double row.
- 2) Fifteen of the 19 automatic systems have Toro sprinklers.
- 3) Five systems are scheduled to be updated to double row computer controlled systems in the next two to three years.
- 4) Only two superintendents water heavy and infrequently; all the rest water lightly and frequently.
- 5) All the golf courses in the Blue Group have manual systems.
- 6) A computer controlled system with double row fairways and individual head control was the unanimous choice for the ideal system.

Table 9 begins our look at pesticide use on fairways. There are some very interesting trends in the top portion that deal with fungicides.

- 1) Banner is the second most popular fungicide. It is reported to give excellent control of dollar spot, *Poa annua* decline, summer patch and anthracnose. It must be applied early in the season for maximum protection.
- 2) Banol and Subdue were usually rotated to control Pythium.
- 3) Bayleton has lost its popularity and is not even used in the *Poa* Group. Reports of its inability to control summerpatch and general overuse are probably the cause.
- 4) Daconil 2787 is the most popular fungicide. It received high marks for its ability to control dollar spot and brown patch.
- 5) Dyrene is popular only in the Bent Group. I have no explanation for this.

- 6) Rubigan is very popular in the Bent Group and the *Poa* Group. The Bent Group is using it to control dollar spot. The *Poa* Group is using it to control anthracnose and summer patch.
- 7) 1991/3336 — Used to combat the summer disease complex of *Poa annua*.
- 8) The Blue Group did not use fungicides or insecticides.

Table 9.
Fungicide and Insecticide Use on Fairways
in the 1990 Wisconsin Survey.

Fungicide	No. of Golf Courses Using the Product			
	Bent Group 6 Total	Bent/ <i>Poa</i> Gr. 9 Total	<i>Poa</i> Group 5 Total	Summary 20 Total
Banner	3	5	4	12
Banol	1	2	2	5
Bayleton	3	2	0	5
Daconil	5	7	3	15
Dyrene	4	2	0	6
Rubigan	4	1	4	9
Subdue	2	2	2	6
1991/3336	2	2	1	5
Insecticide				
Dursban	1	0	0	1
Dylox	0	1	1	2
Oftanol	0	2	3	5
Proxol	1	1	0	2
Sevin	1	1	0	2
Turcam	1	0	0	1

NOTE: The Blue Group did not use any fungicides or insecticides.

The bottom portion of Table 9 lists the insecticides used in fairways. Dursban, Dylox, Proxol and Sevin are used for cutworm control. Oftanol is used for control of the *Atenius* grub. Turcam will be tried on a severe ant problem.

The use of herbicides on fairways appears to be limited to spot treatment of clover, except for the Blue Group in which some large applications of three-way herbicides are made. A second exception is one golf course that must treat with Team to control crabgrass.

In the survey, I made a separate category for snowmold control treatments because it happens to be of particular interest to me and I wanted to be sure no one skipped it. The results shown in Table 10 can be summarized as follows:

- 1) Terraclor was the most popular snowmold control. It was used alone by seven superintendents and in combination with SP by nine superintendents.
- 2) One superintendent used SP alone; the other nine used it in combination with Terraclor.
- 3) The three superintendents using Caloclor and PMAS should switch to a product that is labelled for fairway use.
- 4) Eleven superintendents made a single treatment.
- 5) Eight superintendents made two or three treatments at two week intervals.
- 6) The Blue Group did not make snowmold control applications.
- 7) Bentgrass-*Poa annua* ratio did not influence snowmold control treatments.

The use of wetting agents on fairways can be summarized as follows:

- 1) Nine superintendents do not use any.
- 2) Four superintendents use it only as a spot treatment where needed.
- 3) Eight superintendents use it in pesticide sprays at the rate of 1.0 ounces/M.
- 4) Four superintendents use it at 8 ounces/M rates in spring and/or fall.
- 5) Not enough superintendents specified a particular wetting agent, so it is not possible to make any valid conclusions.

When you add together the government regulations surrounding our pesticide applications and the cost of the products, it makes sense to apply them as efficiently and safely as possible. That's where our sprayers come in; and that's where many of us could use some improvement. Here is a breakdown of the 33 fairway sprayers included in this survey:

- 1) Eighteen have booms with flat fan nozzles.
- 2) Two have booms with porcelain tip nozzles.
- 3) Three have booms with small flood jet nozzles.
- 4) Ten have large fieldjet nozzles.
- 5) Eight have solid state control modules.

The improvements I mentioned involve eliminating the large field jets and increasing the use of solid state pressure and boom control systems.

Chemical control of *Poa annua* is one of our most elusive management goals. Many in our profession would argue that it is a false goal and its pursuit is a waste of time and money. There remain the hard core among us, however, who refuse to give in to a mere plant. These are the superintendents in the Bent/*Poa* Group who are on the frontline in the battle with *Poa annua*. Let's see how the war is progressing:

- 1) Four golf courses have used Scotts TGR. Two will continue with large scale projects. The other two are still deciding the cost/benefit/risk factors.
- 2) Two golf courses have used Cutless with success. One will apply 1/2- pound/acre/month from May-September.
- 3) One golf course has seen excellent results with Prograss and will continue to apply it, but at half the recommended rates to minimize the discoloration of the *Poa annua*.
- 4) One golf course will continue to apply Embark in mid-May at the rate of 6.0 ounces/Acre. The result has been excellent suppression of *Poa annua* seedhead formation.

Table 10.

Snowmold Control Fungicides Used on Fairways in the 1990 Wisconsin Survey.

Fungicide	No. of Golf Courses	Range oz./M	Avg. oz./M
CaloClor	2	2.0-3.0	2.5
Daconil	1	2.0	2.0
Terraclor	17	1.5-7.0	4.1
PMAS	1	2.0	2.0
SP	10	2.0-7.0	4.2
Thiram	2	1.0-2.0	1.5

In the Bent Group, three of the six superintendents have experimented with *Poa annua* control chemicals, but only one will be pursuing it on a large scale. That program will

be based on Prograss applied spring and fall at 2 qts./acre.

The *Poa* Group and the Blue Group are doing nothing to chemically control *Poa annua*. The Blue Group contains small amounts and the *Poa* Group does everything it can to encourage it.

Fairway aerification is no longer a job left for late fall when the workload has eased up a bit. On the contrary, aerification has become one of the key management tools for improving the quality of our fairways. With the help of Table 11 let's review our fairway aerification programs.

Table 11.

Aerification Summary for Fairways in the 1990 Wisconsin Survey.

Machine	No. in Use	Timing of Aerification	No. of Golf Courses
Coremaster	2	Spring	4
Hahn	2	Fall	13
Ryan Greensaire	10	Spring and Fall	4
Ryan Rennovaire	4	1/2 Spring — 1/2 Fall	4
Terra 200	2		
Terra 320	11		
Toro Greens Aerator	14		
West Point	2		

- 1) Tow behind and putting green aerifiers were equal in popularity. These numbers do not include putting green aerifiers used on approach areas; 14 superintendents utilize this technique.
- 2) There are no differences between the aerification programs used by the Bent, Bent/*Poa* and *Poa* Groups.
- 3) The Blue Group uses tow behind units.
- 4) Six superintendents use only putting green aerifiers.
- 5) Seven superintendents use a combination of tow behind and putting green aerifiers.
- 6) All machines are equipped with the largest possible tines and set for maximum soil penetration.
- 7) The four superintendents in the half-spring and half-fall group use putting green aerifiers and do nine holes in the spring and nine holes in the fall.
- 8) The average fall aerification date was October 1.
- 9) Thirteen superintendents process cores by chopping. Twelve superintendents process cores by dragging.
- 10) Three superintendents apply potassium sulfate during aerification. One superintendent applies sulfur during aerification.
- 11) Seeding at aerification will be covered in the next section.
- 12) Future plans include:
 Ten superintendents will continue their current program.
 Five superintendents will increase the frequency of their current program.
 Ten superintendents will purchase high-tech fairway aerifiers.

Overseeding fairways would seem to be one of the easiest ways to convert from *Poa annua* to bentgrass. It may look good on paper, but out in the field it's a whole different ballgame!

Members of both the *Poa* Group and the Bent/*Poa* Group complain about the difficulty of overseeding into healthy *Poa annua* fairways. Their greatest success comes when seeding into winterkill or summer stressed areas that provide less competition from *Poa annua* and greater seed-soil con-

tact. In these two groups, there are only three superintendents on a full scale overseeding program. Two are using bentgrass and one is on a perennial ryegrass program. All three drop seed following aerification.

With only one out of the 14 superintendents in the Bent/*Poa* and *Poa* Groups overseeding with perennial ryegrass, it appears this practice has lost the luster it once had five to ten years ago. Two factors account for this:

- 1) Perennial ryegrass can behave like an annual in Wisconsin.
- 2) Management of *Poa annua* has improved dramatically in the last five years with the advent of lightweight mowing with clipping harvesting, intensive aerification, and modern fungicides.

In the Bent Group, three superintendents drop seed in the aerifier holes of their *Poa annua* areas.

The Blue Group has two members overseeding a blend of bluegrasses and perennial ryegrasses following aerification.

Turf groomers have recently been introduced by Jacobsen for their LF-100 fairway mower. Three superintendents already have them and six others are considering them. All nine are members of the Bent or Bent/*Poa* Groups.

Verticutting of fairways is confined to four members of the Bent Group and four members of the Bent/*Poa* Group. Most of these superintendents are verticutting on a regular basis; seven with greensmower mounted units and one with a Roseman gang unit. All report the need to control the thatch and grain in bentgrass.

Spiking of fairways is only practiced regularly by one or two members of each management group. However, many superintendents expressed an interest in spiking in the future.

Just how sophisticated has fairway management become? By my analysis of the surveys, there are six superintendents who manage their fairways just like the finest putting greens were managed only five years ago — discounting the use of walking putting green mowers. Another ten superintendents only miss the mark by one or two pieces of equipment, which they will probably acquire in the next two to three years. Yes, we certainly have come a long way.

Before closing, I would like to thank the 25 superintendents who contributed to this article. Starting with all those surveys and condensing them down into this article has taught me a great deal about fairway management. It is my sincere hope that I have been able to pass some of that knowledge along to you.

THE GENTLE GIANTS

Here are E-Z-GO's hard workers in three- or four-wheel, gas or electric models. With durable, diamond-plated steel Polane-coated panels and load beds, including options such as sprayers, aerators, spreaders, top dressers, and more. Each one tough but easy on turf.



The GXT-1500

Here's the heavy-duty workhorse in the line. Powered by an 18 H.P. engine for payloads of up to 1500 pounds. For golf course or public grounds, its large load bed has sides and tailgate. Options include a hydraulic dump, PTO, and range changer. The GXT-1500 adapts to many accessories: sprayers, spreaders, top dressers, and aerators to handle any job.

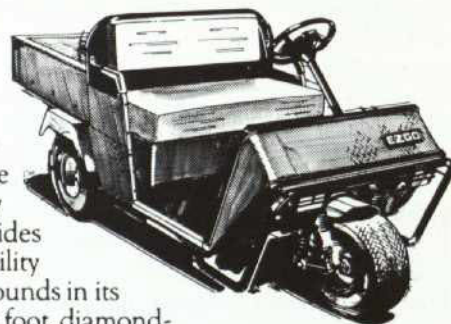
The GXT-800

Reliable, economical, this mid-size hauler more than pulls its own weight. It has a two-cycle, 244cc engine with rack and pinion steering, heavy-duty springs, and hydraulic shocks, plus a whopping 1000-pound load capacity. Options and accessories such as cabs, bed covers and loading ramps make it an ideal all-around utility vehicle.



The XT-300

This is a reliable three-wheel electric answer for a wide variety of jobs where maneuverability is critical. It provides a payload capability of up to 1000 pounds in its roomy 5.7-cubic foot, diamond-plated load bed.



For more information
please contact:

John Jorgensen
Wisconsin Sales Representative
1-800-654-3794