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USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

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Figure 1

Aerial Fungicide Applications?

by **LEE RECORD,** Director, USGA Green Section, Mid-Continent Region

During the summer of 1971, Len Hazlett, Superintendent of The Country Club, Cleveland, Ohio, asked about using a helicopter for applying fungicides on fairways. "Why not?" I replied! This caught Len off guard, and then with a big grin and a sparkle in his eyes, he said, "Who told you?" No one had told me, but knowing Len Hazlett, there had to be a reason for his question. "Why did you do it?" I asked.

"We started it this spring," Len began, "because it was too wet to spray on the ground and because of the time factor in applying the fungicide. Charlie Tadge, Superintendent of the Mayfield Country Club, sprayed his fairways by helicopter. I asked him to send the pilot over so that I could discuss the possibility of spraying our fairways. I have used him twice this spring."

During May of 1972, Len again asked if I would use a helicopter to apply fungicides. "Okay," I said, "let's hear the story."

The following story Len told me while he showed movies of the helicopter spraying his fairways at The Country Club. Place yourself in front of the screen and picture a helicopter (figures 1, 2, 3 and 4) coming at you; you have a front seat!

Len: I'm using one pound of TGF and three pounds of iron sulphate per acre. We had trouble at first pumping this mixture from his 300-gallon tank into the helicopter. I suggested they take the screen out of the tank and spray, but the pilot was concerned about plugging his nozzles on the Ag Master boom he was using. We checked the size of his nozzle screens and they were a little larger than the ones still in the tank. He had a 200-mesh screen. So I said, okay, let's take them out and try it. We did, and didn't have any trouble.

The pilot this spring would only carry 25 gallons of material per application. He was up and down more times, and by doing this he lost track of his position; I was already out on the golf course trying to point out to him where he should be going. He went over one fairway three times; you know that is not right. You can't rely on someone like that.

Lee: The pilot who sprayed for you last year; how many gallons did he carry per application?

Len: Fifty gallons per application. This pilot wasn't as satisfactory as the one last year, because he would only go up and down one fairway. You know, if we are applying five gallons per acre, he should have completed one fairway and continued on to another. I haven't five acres in any one of my fairways.

Lee: Was he going up and down the side of each fairway, or just going down one side?

Len: On some fairways it looked like he would go up and back down and was empty and ready to go back to refill, because he would start down another fairway and no spray would appear.

He was getting at least five gallons of material per acre, and sometimes he might have been putting down a little more. Here he is

Figure 2

Figure 3

coming in high and is dropping down at the same time he is going down the fairway; this is hole 6. Look at the crosswind he had at this time of the morning. I took a picture of the flag, so you would have some idea of the strength of the wind. Here he is coming back again. He is now over the fourth fairway. Look when he turns the machine on; he is 30 to 40 feet in the air!

Now he is coming up the fairway and he runs out of material. He goes back down the fairway thinking he is still spraying. Here he comes back; the second time over the same fairway. He turns the helicopter around right in front of the green. Now he is going back down again and still there has been nothing put down in front of the green.

Lee: Why didn't you have him spray the fairway and around the green and back down the opposite side of the fairway?

Len: I only wanted him to spray fairways. When I caught up to him, I asked him what was the problem. One of his reasons was that his electrically operated release of the chemical was not working properly. I said, I can't depend on you; this is not good coverage.

Lee: Suppose you had this pilot come back to your course as well as the other golf courses in the area two or three times in the spring; he might get used to what you want and I think you would then have something.

Len: What we need is a radio so we could communicate with the pilot directly. I could talk to him and point out the areas he missed. You must make sure the job is done properly.

I was talking to Dr. Howard Potter at Michigan State University, and he told me that no boom on a helicopter should exceed half the width of the rotor prop. The boom on this helicopter is 35 feet and sprays a swath of 60 feet when flying 10 feet above the fairway. Each boom on the side of the helicopter shouldn't extend beyond half the length of the rotor prop. Dr. Potter said the reason for this was because that was the best spray pattern.

Lee: Doesn't the vortex force this material right into the plant?

Len: It does. It atomizes the water droplets there and forces it down in; but, as I pointed out, I was standing close enough to a fairway and the spray didn't touch me or my glasses, and I had areas where there were 30 to 40 grass blades that weren't covered. If you had disease, it could develop there as well as anywhere else. The only protection you have is where the spray actually hits. Perhaps the water was so atomized that I couldn't see it. This is a possibility.

Let's look at the film I took last year. See the spray pattern here? It is fantastic. I put more faith in the helicopter spraying last year with the former pilot than I did this spring with the new pilot.

Lee: Okay, but there was not as much wind that day.

Len: That's right, plus the fact that you can see by the amount of spray coming out of the boom that there is a considerably greater gallonage per acre here than what I had this spring.

Lee: Is last year's pilot flying slower than the pilot this spring?

Len: No, I don't believe he is. I think the ground speed is about 30 to 35 miles per hour, and he is staying about 10 feet off the ground. The pilot this spring was staying about 25 feet off the ground in some instances.

Lee: How long, Len, did it take to spray the course?

Len: It takes about 45 minutes to an hour. Closer, I would say, to an hour.

Lee: And the rest of the time is just down time for filling up his machine?

Len: That's right. But I think what we need is

Figure 4

to have closer communication with the pilot, not to confuse him with a lot of talk, but to tell him that he didn't hit the fairway, etc. Now here is an example of the spray not going on. He saw his spray pattern and there is just a little bit coming out of the machine. He didn't realize it wasn't coming out, because he is forward of the spray boom. He assumed that the fairway was sprayed. Now, had I had radio communication with him, I could have told him this.

Lee: Why don't you use a little more material at a slower rate, so he can do a more thorough job?

Len: I would buy that. In my opinion, that would be the optimum in spraying fairways with a helicopter. You get a little more gallonage applied and do not try to cover such a great area.

Lee: Len, did you have any *Helminthosporium spp.* show up within a week or so after this application?

Len: No, I had it prior to this application. You know, Lee, I can't blame the pilot for being a little leery. There are many holes surrounded by trees 60 to 80 feet in height; when you are flying five to six feet off the ground and you must come up to the approach of a green, then shut the spray off, you need a lot of lifting power to get that helicopter up out of there vertically. Otherwise, you must be able to stop the machine and swing it around and come right back out on the fairway.

Lee: If the pilot hasn't enough material in his tank to run out over a green or to start back up the fairway, he has wasted time here.

Len: That is true. That means he will have to load up and come in with a full load and hit that same area again, and his feeling is that he is not too anxious to come back with 50 gallons of material in those tight corners. The pilot told me he had to have fresh air over the rotor blades at all times. When he is dropping down, he is not drawing fresh air over the blades; he is letting the air slide past the blades. Sometimes in the operation of a helicopter I think these pilots are a little uneasy about it. I believe the more open a golf course, the better your chances of successful helicopter spraying.

I can't see that aerial spraying can be anything but great. If your ground speed is right, you don't exceed the limits of the boom; I don't think you could go wrong.

Lee: You do believe then that there is a future in helicopter spraying?

Len: Only under those circumstances.

Lee: What about the superintendents in the greater Cleveland area, will they eventually use more helicopters for fungicide applications?

Len: I don't believe there are enough superintendents at the present time ready to spend $250 per application. I don't feel there has been that much demand for spray work on fairways in the Cleveland district. Superintendents are suffering through diseased fairways, but until they are forced to really go out and cure the disease, are they going to have helicopter spraying.

Lee: You have always used the helicopter in the spring for *Helminthosporium* control, primarily when the ground has been too wet to get out on the course and use a regular spray tank.

Len: That's right. I think this would be the thing that would necessitate helicopter spraying. Other than that, I don't believe there would be a great advantage to it.

Lee: Would you use it for brown patch or dollar spot control in the summer?

Len: No, I don't think so, only because fairway conditions in the summer generally will hold a spray tank. We are going into broadcast type spraying equipment, which doesn't require large booms. I can use a single jet nozzle that will put out 10 gallons a minute and will cover

a fairway 25 to 30 feet wide. I used two trucksters with 100 gallon spray tanks last summer, and got the job done in 6 hours.

Lee: You're talking about two trucksters in six hours where many superintendents have only one truckster and one 100-gallon spray tank to use, or one spray applicator and that's it. What kind of cost are you talking about in relation to manpower versus aerial application?

Len: Take six hours per man, that's 12 hours. Take an average of $2 per hour and you are talking 12 hours. That's $24 for an application by two men. If you go into overtime, which may or may not be necessary; let's say time and a half on overtime, you are talking $36 per application, plus the $200 for chemicals. You should also consider that you are using 40 gallons of water per acre, which has been the optimum amount of water per chemical application.

Lee: What about the helicopter application and not using any of your people, only supplying the material. You would now have two men that are free to do other jobs at a period of the year when you are short of help, and although they are doing the spraying job in six hours using two trucksters, or 12 hours for one truckster, at many courses it may take a day and a half to get the job done, depending upon the terrain, breakdowns, golfers, etc. Have you compensated for this amount of time saving labor?

Len: I don't believe you can justify the $250 in time saving.

Lee: Would you use the helicopter for any other pesticide applications?

Len: I would not use a helicopter for herbicide application at any time of the year, but I would consider using it for insecticides, depending upon what the problem may be. We may have an opportunity to do a lot of gnat spraying, or perhaps spraying for black flies, mosquitoes or insects of this nature.

Lee: Would you suggest that other superintendents throughout the country give aerial fungicide applications a chance?

Len: Definitely. I think every superintendent should try it at least once to get the sensation of seeing a helicopter apply the material and to evaluate the coverage over the country; to see if everyone is getting uniform coverage, getting any degree of control, getting satisfaction, and to see how everyone basically earmarks this type of application for the future; we should pool this information.

Lee: Are you planning to use a helicopter for spraying in the future?

Len: We may, I'm not sure.

Lee: It would probably depend upon weather and if you could get your equipment out on the course to spray.

Len: If we are stymied, have a rapid disease infection come in and need fast coverage, it is possible I'll use helicopter spraying again.

* * *

After listening to Len's story, I talked with Charlie Tadge, Superintendent of the Mayfield Country Club, Cleveland, Ohio, to hear his comments; they are as follows:

"I went into the helicopter spraying program because of my labor situation in early spring. I have a small crew at this time and I couldn't have the men tied up spraying when trying to bring the course out of the winter, getting ready for spring play. It wasn't the fact that it was cheaper; as a matter of fact, it cost a little more, and I couldn't go out and hire another man at this time. Last year, I used the helicopter and was pleased with the results. This year, I have already used the helicopter twice for *Helminthosporium* control, and plan on using the service twice more in late summer when I normally have dollar spot problems.

"The pilot is new this year, as you know, but I am satisfied with his performance. I found from experience, when you tell a pilot not to spray greens, he shuts his spray off too soon when approaching the green and you have a large area that is not treated. I'd rather put the extra material on the greens instead of having everything up against the greens.

"I did use the helicopter once last year for mosquito control. The pilot covered our wooded area and the local area around the course. This was done at night.

"With all the regulations the Occupational Safety and Health Act is coming up with, I may just use the helicopter more and more. Why not place a little responsibility on the custom applicator and let him comply with the pesticide laws? This would certainly relieve some pressure from my shoulders.

"The only restrictions I could see against using the helicopter would be local ordinances against helicopters flying low or not being able to land in a city, or just having local residents excited. Last year they wouldn't allow Santa Claus to land at a local shopping center. This was out of the township where our course is located, so I'm not too concerned about restrictions at this time. I intend to continue to use aerial fungicide applications when I feel they are necessary."

Len and Charlie are very progressive superintendents. They continue to strive forward in improving their turf management programs.

Without question, we need to investigate aerial pesticide applications for golf courses in more depth, and we need to exchange more ideas on the subject.

Bonnieblue—A New Bluegrass

by C. REED FUNK, ALEXANDER M. RADKO and ROBERT J. PETERSON

The story began on the second fairway of the Bellevue Country Club near Syracuse, N.Y., back in 1958. Thomas E. Topp, Superintendent, had just pointed out a handsome patch of bluegrass to Alexander M. Radko, USGA Green Section Agronomist. Close examination showed no apparent disease, the clone displayed vigorous growth and apparently had persisted for many years under the rigorous fairway conditions of close mowing and heavy use. This patch of bluegrass had an exceptionally pleasing, bright, medium green color, good density and texture and a growth habit similar to Merion Kentucky bluegrass.

The excitement of this discovery became even more apparent during subsequent consultations. There was no diminution in the quality of this clone; it appeared to be an unusual selection, indeed. The next obvious step was to get it to one of the agricultural experiment stations, one prominent in turfgrass research.

Immediately thoughts of another Merion raced through their minds. Would this be the beginning of a new bluegrass variety, one which would prove to be of significant value to the turfgrass industry? Only time would tell! Time to research the many variables that go to make up an improved turfgrass. Both men knew that it would take years of observation and testing before this question could be answered.

Plugs of this new bluegrass were then brought to Rutgers University. Ralph E. Engel, professor of turfgrass management and Elwyn Deal, a graduate student in turfgrass research, produced a small quantity of seed and established a turf plot of the new selection to compare it with standard varieties and other experimental selections. Performance of the new Bellevue selection continued to be outstanding. It was essentially equal to Merion in density, texture and resistance to the leaf spot and crown rot disease caused by *Helminthosporium vagans.* In addition, it showed excellent resistance to leaf rust and moderate resistance to the stripe smut disease. The most outstanding attribute of the new Bellevue bluegrass was its extremely attractive color in late winter and early spring.

Tests by the Jacklin Seed Company, in Dishman, Wash., showed it to have good seed production potential. Unfortunately, the characteristic of producing a high percentage of reproductive tillers that made it look good for seed production also resulted in a rather stemmy turf during late spring and early summer. In addition, progeny tests showed the variety to reproduce only about 60 per cent of its seed by apomictic reproduction. The other 40 per cent of the seed results from sexual reproduction and produces plants quite different from the original selection.

The outstanding features of the Bellevue selection made it a prime candidate for use in the Kentucky bluegrass hybridization being developed at Rutgers University in the early 1960's. Another bluegrass from Penn State, which was subsequently released as the variety "Pennstar," had also performed well in test plots at Rutgers and at a number of other locations throughout the country. These two bluegrasses seemed to compliment each other in a number of ways. Pennstar was highly apomictic, had large seed, had excellent resistance to stripe smut and maintained a leafy turf during seed production time in late spring and early summer. These were characters needed to improve the Bellevue selection. The decision was made to hybridize these two elite bluegrasses and attempt to recombine the best characteristics of each parent into a highly apomictic, true-breeding hybrid.

During the summer of 1963, spaced plants of both Bellevue and Pennstar were established in space-planted nurseries at Rutgers. The following February the plants were brought into the greenhouse and the cross was made using the Bellevue selection as the female parent. Seed from this cross was germinated and the resulting seedlings were transplanted to a spaced-plant nursery in August of 1964. By June of 1965 each plant was examined to

determine whether it was a hybrid and of sufficient promise for additional testing. Seed was then harvested from the best hybrids and used to plant turf trials in September, 1965.

One of the hybrids, designated NJE P-106, showed consistently high performance under the stress of 3/4-inch mowing, periodic drought stress and conditions favorable to leaf spot and stripe smut. Jerry Pepin, a graduate student at Rutgers at the time, chose this hybrid as one to include in his Masters thesis study. P-106, later to be named "Bonnieblue," and the other hybrids chosen for this study were intensively evaluated for turf performance, disease reaction, apomictic reproduction, spaced-plant nursery performance, and cytological characteristics.

Chromosome studies showed that Bonnieblue had approximately 94 chromosomes. Thus, it has all 56 chromosomes of the Bellevue parent combined with about one half the chromosomes of Pennstar. An unreduced egg of Bellevue had been fertilized by a reduced sperm from the pollen of Pennstar.

The next question that needed an answer was; Could this promising new hybrid produce seed economically in the traditional seed producing area of the West? Repeated observations of Bonnieblue by George Burlingham, Robert Peterson and George Valentine of the E. F. Burlingham Seed Company of Forest Grove, Ore., convinced them that it was worth testing. In early July of 1968, a small quantity of seed was carefully harvested from ten plants of Bonnieblue and air mailed to Burlingham to establish a 1/2-acre seed evaluation block on the farm of Cliff Plagman near Albany, Ore. Mr. Plagman, one of the leading growers of quality turfgrass seeds, was very favorably impressed with the beautiful color and the excellent rhizome development of the new variety. The Oregon State certification officials agreed to carefully inspect the evaluation test so that it could be used for stock seed increase if the variety was released.

By the fall of 1970 favorable reports on the turf performance of P-106 were received from a number of turfgrass research centers throughout the country. Sufficient stock seed had been carefully harvested from the 1/2 acre increase test plot and the decision was made to seed a one hundred acre field for certified seed increase. The first seed was harvested from this field in July of 1972 and is being marketed by E. F. Burlingham and Sons.

Bonnieblue is a moderately low-growing, leafy, turf-type variety with good density and vigor and a medium texture. It has a very attractive, bright, moderately dark green color. Its pleasing, fresh green color is especially noticeable in early spring before most other bluegrasses become green and again in late fall after most other varieties begin to lose color.

Bonnieblue has demonstrated excellent resistance to the leaf spot and crown rot disease caused by *Helminthosporium vagans* and the stripe smut disease caused by *Ustilago striiformis*. It also has moderately good resistance to leaf rust incited by *Puccinia poae-nemoralis* and Typhula snow mold.

Turf performance trials at Rutgers and a number of other locations throughout the country indicate that Bonnieblue should be well suited for quality lawns, parks and sports turf in areas where Kentucky bluegrass is well adapted. It should be compatible in blends with most other bluegrass varieties and in mixtures with fine fescues and the improved, fine-textured, turf-type varieties of perennial ryegrass.

Bonnieblue recombines most of the favorable characteristics of its two elite parents. From its Bellevue parent, Bonnieblue inherited its exceptional color in early spring and late fall, its stiffer, more upright leaf and its moderately good seed production potential. From the Pennstar parent, Bonnieblue obtained its moderately dark green color, its leafiness during seed head time in late spring, its excellent resistance to stripe smut, its large seed and its high degree of apomictic reproduction. From both parents, Bonnieblue received its turf-type growth habit, its good resistance to leaf spot and rust and its moderate tolerance to drought and close mowing.

The Rutgers University turfgrass breeding program is being supported in part by the U. S. G. A. Green Section Research and Education Fund, Inc., for the specific purposes of improving bluegrasses through selection and breeding. Hundreds of outstanding bluegrasses have been selected from golf courses and hybridization progenies and are being tested specifically for fairway use. Over the next decade we look forward to the development of several promising bluegrasses that are better suited to fairway use where bluegrasses can be grown. Sincere appreciation is also extended to the many observant superintendents, such as Tom Topp, who bring these grasses to our attention.

Editor's Note

Tom Topp has been golf course superintendent at Bellevue Country Club since 1955. His observations of a standout Kentucky bluegrass patch on his No. 2 fairway during droughty summers led to the selection that became known in the Rutgers University Kentucky bluegrass breeding program as the Bellevue selection. Subsequent selections that were made, which are similar to it, became known as "the Bellevue type."

Sources and Uses of Soil Modifiers in Turf

by **HOLMAN M. GRIFFIN,** Director, USGA Green Section, Mid-Atlantic Region.

The popular term for a soil modifier is a soil amendment. I feel either term is adequately descriptive. An amendment is something which is added to anything to modify it. A soil is any substance or medium in which something can take root and grow. Since few natural soils are suitable for good turf growth when subjected to compaction, we use amendments to make them more acceptable.

The sources of soil modifiers are limited only by the imagination, and they may be either natural or manufactured. Some of the basic categories of soil modifiers are: other soils, organic materials, plastics, ion exchange resins, and rubber. The types of organic modifiers alone would fill a small book, and hydroponic farms are evidence of the fact that plants can be grown with a minimum of soil solids.

Turf managers have long sought methods of evaluating soil materials for use in growing turf under special conditions. Either a practically priced "mail order" mix, or a formula for making suitable soils from the materials available to them would be acceptable. Modern technology has offered some of both. Individuals may have their component materials analyzed by special laboratories and mix their own, or they may purchase mixed soils which have been properly analyzed from several relatively new companies.

Soils may be modified for a number of reasons with some of the most basic being to provide the right kind and amount of pore space for the retention and movement of air and water, to reduce compaction tendencies, to give resiliency and to improve the capacity for storing and exchanging nutrients. A good soil amendment may do all these things or a specific amendment may be selected for a single purpose.

A few years ago, many turf managers were concerned about the trend toward too much sand in greens. As a result of experimentation at Purdue University, pure sand of a selected particle size has been shown to be satisfactory for good turf production, and when modified in the top few inches, it will produce a satisfactory golf green, tee, football field, bowling green, or other sports turf area. Of course this isn't quite as simple as I have made it sound, and you should know all the details before you attempt to use this method.

Pure sand with a particle size range of 0.2 mm to 1.0 mm resists compaction and will

Poor soil mix to begin with (bottom) was only made worse by a thick layer of muck (top) adhering to sod.

provide adequate pore space for water and air movement. Pore size is considered to be one-third of the diameter of the solid particles in a uniform mix, therefore a uniform material with the particle size just described would have many pores ranging from .06 mm to .3 mm.

Most authorities seem to agree that a soil which contains a minimum of 12 to 18 per cent non-capillary or air-filled pore space will support good turf growth. The previously described mixture meets those requirements but needs some means of moisture retention to be managed easily. Moisture retention in the proper amount as well as nutrient storage and exchange capacity can be added with soil amendments.

A clay soil or a silty soil on the other hand will never have enough pore space of the right size to work well in a golf green, but it has a terrific capacity for moisture retention and nutrient storage. A heavy clay soil is penetrated by air and water only with great difficulty, and once admitted, these elements along with the transported nutrients may be held so tenaciously as to be unavailable to the turf.

The ideal solution to our problems would seem to be to mix the two materials just described, but clay, silt and fine sand only tend to clog up the pore space in a good mix and they are unnecessary.

In this age of modern technology we have to leave behind the old wives' tale about a black soil being the most productive. This is especially true of heavily trafficked turf areas. My thinking is that no silt, clay, or fine sand, commonly referred to as "soil" is needed in a turf bed at all. It is added simply because heretofore we have thought it necessary and because we had no other amendment as readily available, or as cheap.

The best time to incorporate soil modifiers into a soil is during construction when all materials may be mixed uniformly; however, soil modifiers may be introduced into a turf bed at any time with good results. On a golf green, these materials are placed in holes made by aeration machines or other hole-punching tools, such as a soil probe. Soil modification to the working depth of most aerifiers, which is some three or four inches, can certainly help, but the modification is more effective if it is accomplished to a depth of 12 to 16 inches, or at least deep enough to penetrate into the drainage system, if one exists.

Although some soil amendments alone may support turf growth, we should keep in mind that most amendments are just that and not complete soils in themselves. For this reason, only soils modified with amendments and not straight amendments should be incorporated into holes made in an established turf bed.

If the material introduced into holes in a green is not capable of supporting good turf growth by itself, then we are simply filling holes with a different material which may be almost as undesirable as the original. Although some immediate improvement may occur in the turf when aeration holes are filled with pure amendment, continued modification will cause a different set of problems and the immediate benefits will be short-lived.

We all know the problems associated with soil layering, and vertical layering is exactly what we are doing when we introduce pure soil amendments into aerifier holes. Layering also occurs when a modified soil is introduced, but to a lesser extent. Also, with repeated hole-punching-hole-filling operations using properly modified soils rather than pure amendments, the long range picture gives us more assurance of lasting success.

Taking into consideration the maintenance

Standing water on the green surface can cause real problems. Even in heavy rains, a well built green is free of ponded water in about 15 minutes.

level to be employed and an accurate estimate of use, a turf bed can be constructed by using modern laboratory analysis as a basis for mixing materials. This bed should never have to be rebuilt because of soil failure, and it will require a minimum of subsequent mechanical aeration. Essentially, these are stabilized soils which can only be compacted so far and no further under normal use and maintenance.

For conservative turf managers who are more interested in facts and sound investments than they are in risking their employer's money and their own reputation just so they can claim to be soil experts in their own right, the days of "by guess and by golly" are almost over. I say almost over because there is still a tremendous amount of misinformation and a gapping lack of any information at all on **what** is wanted in a soil mix as well as **where** and **how** the necessary analysis should be made.

We now have a considerable amount of information on soil physical analysis and a good technician can measure the physical properties of soil materials and positively determine the proportions needed for an acceptable putting green soil. This is a monumental achievement which was not accomplished overnight and will be of lasting value, but it is only a good point from which to start further investigations into the nature and properties of soils for turf.

Oakland Hills Prepares for a Major Championship

by **TED WOEHRLE**, Superintendent, Oakland Hills Country Club, Birmingham, Michigan

Oakland Hills Country Club, of Birmingham, Mich., was the site of the 1972 PGA Championship in August. After the membership agreed to host this major event, the services of a well-known golf course architect were sought to make suggested changes. Based on his recommendations, four new bunkers were built in the fall of 1971, and one modification to an existing bunker was made.

When the general condition of the playing turf was under control, we concentrated our efforts on installing the many utility wires required to make the Championship a success. Some of the utilities included underground telephone wires (some 30,000 feet) installed by our own crew to prevent the possibility of damage to the existing water lines, tile lines, and electrical control wires for our automatic irrigation system. Other utility installations included a multitude of electrical wires and television cables. Scoreboards, leaderboards and television towers were installed two weeks before tournament time. Additional towers for still photography, movie cameras and general radio and press coverage were also installed. Over 30 tents and trailers were placed around the course just one week before the Championship. These structures were used by the concession people and other public facilities.

As the Championship drew closer, we had to take into consideration the various heights of cut on the grass. Greens were to be 3/16-inch, fairways 5/8-inch, tees 1/2-inch, intermediate rough about 10 feet wide cut at 2½-inches, and the deep rough as tall as nature would permit. Fairways were narrowed to 30 yards in the landing areas. A collar of 30 inches was mowed around each green, followed by 5 feet of short rough. The remainder of the turf surrounding the green is considered deep rough. All of these features place a premium on accurate shot placement.

Throughout the entire tournament the gallery was of prime concern to the club, especially the safety of the spectator. The placement of gallery ropes helped to control the crowd, as well as affording them safety. The ropes are placed in such a manner as to give greatest visibility for the gallery. We also cut low-hanging branches on our trees to give an unobstructed view of play and at the same time protect the crowd from accidental eye injuries.

Traffic control on the course during the week of the Championship is perhaps the biggest headache encountered. Strict schedules for delivery trucks which service the concession tents must be enforced. An employee of the grounds crew must accompany each truck. This includes the truck servicing the comfort stations at night. The collection and removal of trash from the premises is a monumental task. The local Boy Scouts gather up loose trash and place it in receptacles. The waste is then bagged for pick-up by the grounds crew and brought to

Seeding near gallery ropes prior to tournament time.

a collection area where it is placed into rubbish trucks and compressed.

Some protection for the anticipated wear on the turf was made just prior to the Championship. We seeded over the existing turf in the obvious wear areas and let the foot traffic of the gallery trample the seed into the ground where it will begin to germinate a few days after the tournament is over.

Maintenance during the week of the Championship was broken into two distinct categories; routine and abnormal. Routine maintenance consists of mowing tees and greens every morning before play, changing cups and repairing ball bruises, raking traps and night watering if necessary. Abnormal maintenance consisted of late afternoon or evening mowing of fairways, divot repairs with seed and soil both on the tees and the fairways. Because we mowed the fairways in the evening, we had to remove the dew from them each morning. This was accomplished by dragging water hose between two vehicles the full length of the fairway with one vehicle on each side of the fairway.

Broken ropes and bent stakes must be repaired and straightened throughout the tournament. This is done during play by roving crews of grounds men and marshalls. There are 1,800 stakes and some 50,000 feet of rope needed to control the gallery, and at the end of one day much of these are in need of attention.

Parking for the tournament was on our North Course, which is adjacent to the Championship Course. Protection against traffic damage to the automatic irrigation system was of great concern to us. We placed empty 55-gallon drums over all the pop-up sprinklers. If we needed to water in the evenings, we simply knocked over the drums and watered. The next morning we placed the barrels over the sprinkler heads again. Over 100 drums were supplied by local golf course superintendents. The greens and tees on the North Course were fenced off with snow fence and roping to protect them from car traffic as well as foot traffic. Of course we had to continue mowing these areas during the tournament.

The entrances and exits to the North Course were prepared well in advance. Definite construction specifications were made by the County Road Commission, and these were followed.

The USGA Green Section Agronomist played an important role in guiding the club in its preparation. Suggestions concerning the general condition of the course and many helpful hints in conditioning for a major championship were passed on to the staff, and they were deeply appreciated. Some of the suggestions involved proper timing of top-dressing, fertilizing, watering, mowing, spiking and protection measures against the natural problems of weather. From these we were able to put together a well-

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ABOUT THE AUTHOR

Ted Woehrle became one of the first golf course superintendents in the nation to be certified in the GCSAA Certification Program initiated in 1971. He has been Superintendent at Oakland Hills Country Club since 1968 after serving nine years in a similar position at Beverly Country Club, Chicago. Son of the late Herman Woehrle, Superintendent of The Elks Country Club, Kankokee, Ill., Ted is a graduate of Purdue University and currently serves as President, Michigan and Border Cities GCSA, and Director in the Golf Course Superintendents Association of America.

planned program of preparation.

We of the grounds department were caught up in the excitement of the Championship, the preparation and execution of duties throughout the tournament and made it all seem worthwhile. The hard work and long hours are soon forgotten, along with the anxieties and frustrations. These all seemed a natural part of a major tournament.

With a little cooperation from nature, the recovery from the Championship should be complete and the scars healed over before the first welcome snow arrives this winter.

Utility wires buried for protection from the gallery. Easily removed after the tournament.

Bridges Serve the Golf Course

by **WILLIAM G. BUCHANAN,** Eastern Agronomist, USGA Green Section

Bridges are constructed to various sizes and shapes, but they all serve the same purpose, to move people and vehicles safely over obstacles that would be difficult to traverse otherwise. Bridges constructed on the golf course speed play, speed maintenance, and make it more comfortable for golfers to span hazardous terrain (water, deep valleys, ditches, swampland, etc.). Bridges, therefore, are constructed primarily for utility. However, they should not detract from the overall beauty of the golf course. Finally, and most important, they must be constructed well enough to provide safe passage for all manner of traffic.

All bridge construction must be done well, but especially important is the superstructure which is the basic span with foundation tie-ins. The superstructure can be made of either steel or timber stringers that rest on abutments and any intermediate supports. The load-carrying component of the superstructure is the stringer system, which may be rectangular timber, round timber, or steel beams. Steel stringers are either I-beams, wide-flange beams, channel beams or built-up beams. Span length depends on the size of the beam and capacity requirements of the bridge.

Abutments and intermediate supports make up the substructure; these may be timber bents, timber piers, pile bents, or a combination of these supports. Rock and concrete piers are very popular around golf courses. Soil and water conditions at the bridge site dictate what type of intermediate support can be used. Deep water, swift current or adverse footing conditions make the use of piles necessary.

Figure 1 is a very good example of creek bank work, abutment installation and using steel I-beams for intermediate supports. The I-beam piles have angle iron lateral bracing. This particular bridge is located close to a dam that stores irrigaton water. The abutments of the bridge were built into the wing walls that prevent the creek bank from eroding behind the dam.

Figure 2 shows one abutment. The sill of the abutment is concrete with steel stringers on top. All decking on this bridge is 2x6-inch

Figure 1

Figure 2

Figure 5

Figure 6

lumber.

Figure 3 is an excellent example of a steel I-beam used for intermediate support. Concrete serves as a base for the I-beam.

Figure 4 — Rock and concrete are used on this bridge for intermediate supports. Steel stringers are placed into concrete abutments. The decking on the bridge is 2 x 6 with 3 x 12 used for treadway.

Figure 5 — This bridge is all steel, with the exception of the treadway and concrete footings. The span is approximately 180 feet high; the middle intermediate support is 35 feet high. An example of a bridge that does not span water.

Figure 6 — This bridge has a solid concrete intermediate support, has wooden stringers and is strictly for golf cart and foot traffic.

Many suspension bridges are used on golf courses. On a suspension bridge the floor system is suspended from cables which are supported on towers and anchored to abutments.

Regardless of the type of bridge, preventive maintenance is necessary. Figure 7 shows a suspension bridge that had a plywood treadway. The flooring had become rotted over a period of years and resurfacing became necessary. Floor support was 6 x 6 timbers. (Figure 8) Before the flooring was replaced, treated 2 x 4s were placed on either side of each 6 x 6 and then the flooring was replaced. (Figure 9) This bridge is capable of supporting an 8,000-pound load.

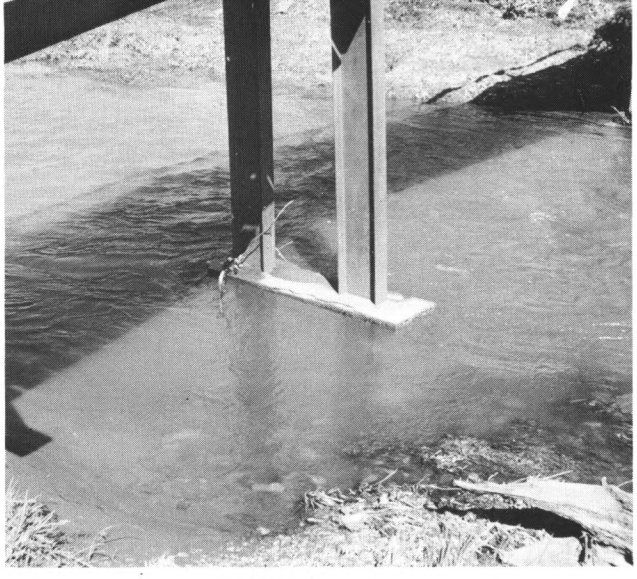

Figure 3

Figure 4

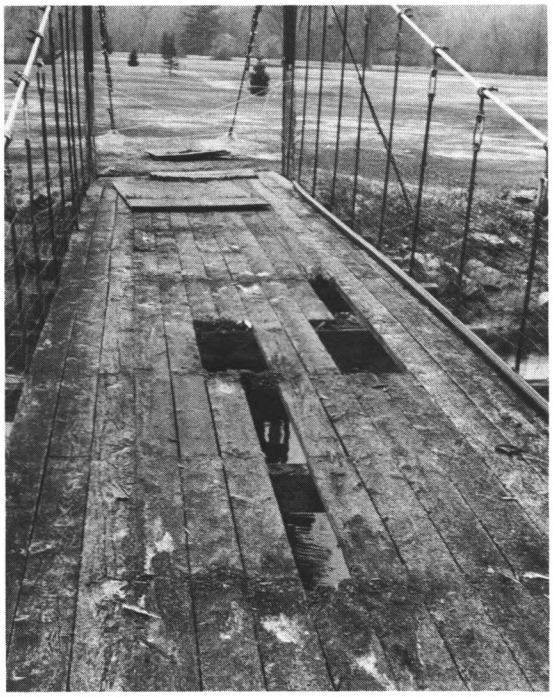

Figure 7

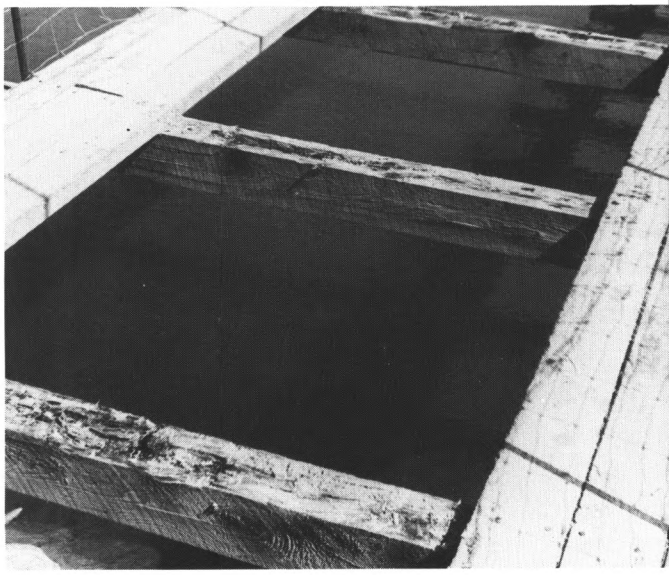

Figure 8

The expanded use of golf carts is forcing clubs to increase cart path systems and use bridges where in prior years a person could walk across an area or use a very simple bridge.

Figure 9

GREEN SECTION RECORD
SEPTEMBER 1972

TURF TWISTERS

SYSTEMICS FOR SMUT

Question: I keep hearing about Stripe Smut Disease. What is it? What do I look for and how is it controlled? (Michigan)

Answer: Stripe Smut *(Ustilago striiformis)* is most evident in late spring and early fall. When you notice the grass going off color to yellow or brown and not responding to nitrogen, look for greyish to blackish streaks between the veins on the leaf. The systemic material benomyl or benlate has been effective in controlling this turf pathogen.

COMPOSTING FOR FALL

Question: In our area, there is a ban on open burning. Do you have any ideas on how I can get rid of the leaves that drop in the fall? (Conn.)

Answer: Perhaps the best answer to this question is to go back to the old practice of composting. A mixture of shredded leaves, grass clippings, sand and soil plus any broken bags of fertilizer and lime will decompose readily. In several years, it will leave an excellent soil amendment material.

TOP-DRESSING FOR WINTER

Question: I have been told that a late fall application of top-dressing is helpful in slowing down the spread of snow mold. Is this true? (Mass.)

Answer: Yes, the application of 1 to 1½ yards of top-dressing per 5000 square feet of green late in the season, after the grass growth ceases, is helpful in reducing the spread of snow mold. The addition of a snow mold preventative fungicide to the top-dressing soil is an excellent combination to provide longer-lasting protection through the winter. It also serves the role of insulating the turf against desiccation. This is especially important on high, wind-swept greens.