SEPTEMBER 1976

USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

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VOL. 14, No. 5 **SEPTEMBER 1976**

COVER PHOTO—Collars are a source of trouble because they are cut higher and become thatched more quickly than close-cut bentgrass.

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Pitfalls of renovation

by ALEXANDER M. RADKO,
National Director USGA Green Section

Somehow the golf course superintendent always faces a backlog of problems. The problems may have been built into original design in the form of poor drainage, small tees or imperfect greens. Additional problems may have developed as the course matured, including such things as soil settling, decay of buried trees and other debris or poor air drainage that developed as a result of excessive underbrush and tree growth around tees and greens. Whatever the cause, the remedy is to renovate—to renew the troubled area and to eradicate the problem.

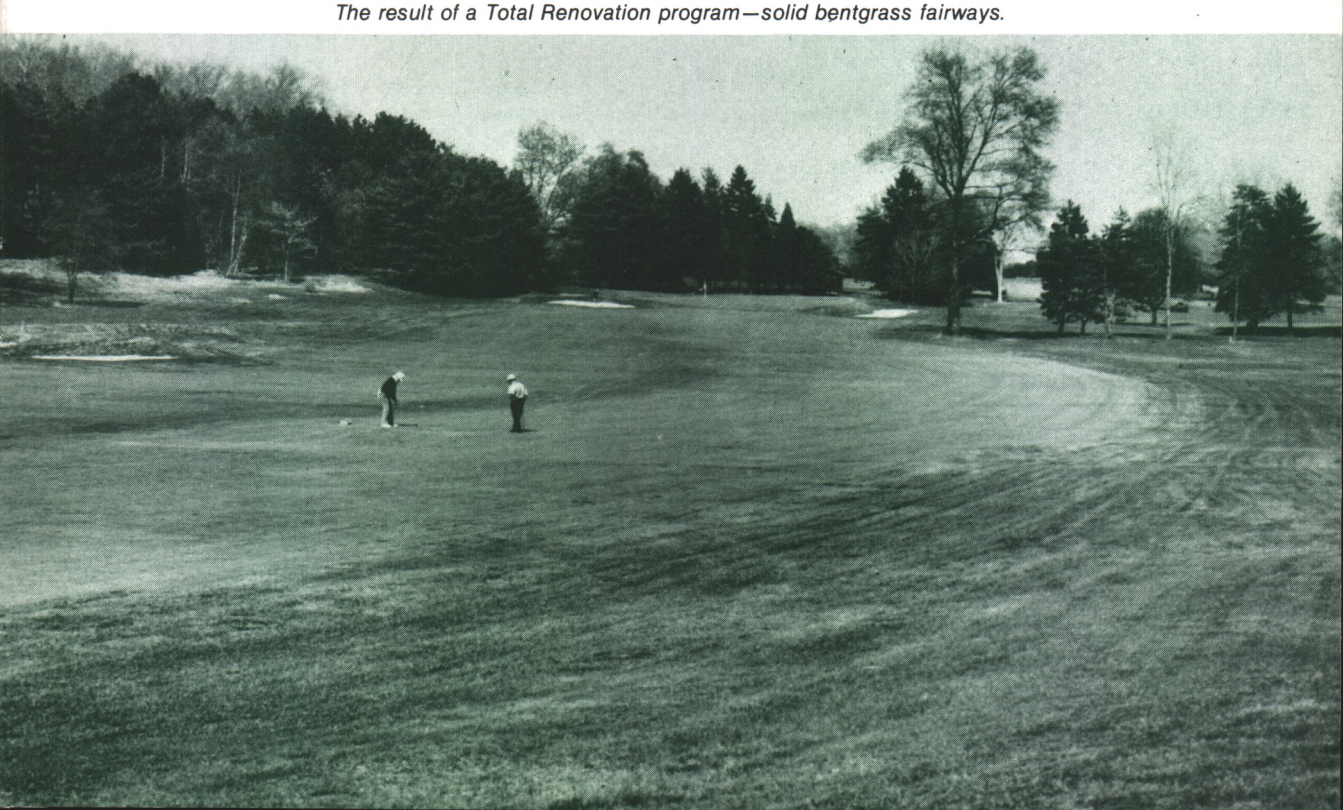
This is not always easy because golf course maintenance crews are limited in numbers and routine maintenance still must be done while the improvement is undertaken. The urge to skimp rather than go all out with renovation work is strong because of membership pressures. Members want improvements, but they get terribly annoyed when the work force is in the way of their golf or if a dues increase becomes necessary. Renovation involves much more than simply doing the work. It involves personalities and complaints and keeping the course playable while improvements are being made. Bear in mind also that often the problem may be one that the superintendent has never tackled before, so he must spend time to study all the ramifications involved. Each renovation problem involves "new wrinkles" and these must be studied carefully before work begins.

The first step in renovation is to diagnose the problem. For example: the problem may be one of all greens draining in one direction—to the front—making the approach excessively wet. Good shots to the green fail because they fall short and the approach is so wet that the ball just "dies" as it lands. The diagnosis; a poor drainage pattern; the solution: to improve the drainage run-off, to run it from the wet areas into rough areas, away from play. This must be done by collecting all the water that seeps to this area, and moving it away from this prime target by means of tile drains.

Almost any operation performed on the golf course might be classified as renovation. However, for purposes of this article, the term "renovation" refers to large-scale operations such as fall overseeding, major drainage improvements, rebuilding or enlarging tees or greens and any other project of major proportion.

Of course the first move in renovation is to diagnose the problem. Once determined, the problem is then written up covering all aspects of remedying the cause, a listing of materials required, cost estimates and each step in logical succession is outlined. The plan or program of renovation is prepared for the Green Committee Chairman

The result of a Total Renovation program—solid bentgrass fairways.



Fundamental problems must be corrected before renovation is undertaken.

and other club officials to inspect and relate to interested parties what will be done, at what costs, when and at what inconvenience to the golfer. Nobody likes unpleasant surprises, least of all golfers. A well-communicated plan goes a long way in smoothing over the "hurt of renovation." Having no plan or just "flying by the seat of your pants" can only mean trouble; something is always left out and something always goes wrong. Do not enter the renovation processes loosely. Have a complete outline of your plan.

Considerations in Fairway Renovation

The task might be overseeding the course to introduce permanent grasses into predominately *Poa annua* turf. The first step here is to check the pH and nutrient levels of the soils to see if they are suitable for growing the grasses you are going to plant. Next you must check drainage problems. If not corrected, no amount of renovation will cure a soggy low area from dying out annually after heavy summer rains. Next, you must use some sort of *Poa annua* suppressant. If not, the new seed will be taken over by the existing or new *Poa annua* that evolves after the aeration and thatching process. Very little new seed will germinate; it will be crowded out by *Poa.* There is no better way to perpetuate *Poa annua* than by annual aeration in early spring and late fall. If no *Poa annua* suppressant is used, you might best save your money, time and energy. *Poa annua* is going to win.

Choosing the right seed or stolons is important. Choices for the northern climate for fairways include the bentgrasses, bluegrasses, fescues and ryegrasses. Simply sowing the seed doesn't assure success because there are pitfalls in using some of these grasses on established turf. For example, any attempt to introduce a Kentucky bluegrass seed into a predominately *Poa annua* turf is virtually impossible. The bluegrasses take up to 21 days to germinate and this gives *Poa annua* too much of a head start in establishment. On the other hand, seeding Kentucky bluegrasses, the new perennial ryegrasses and fescues into predominately Kentucky bluegrass fairways is a good practice. This can be successfully accomplished! Seeding bentgrasses into an existing Kentucky bluegrass stand will provide results, since bentgrass germinates much quicker—usually within 7 days. Ryegrasses and fescues also are quick germinators; hence they do well in any established turf when they are overseeded.

Choosing the right seed mixtures and the correct seeding rates are also most important to successful overseeding. Normally lighter rates are recommended because of the limited space allowed by the thatch for new seed. If a thoroughly new seedbed is prepared (fallow ground), then full seeding rates are essential. In some cases, seed treatment is required so that the new grasses will not be affected by diseases after germination.

In the South, the choice of grasses is much

easier. The great Tifton varieties prevail. They have revolutionized golfing turf in the southern states. The Green Section has supported the research of Dr. Glenn Burton since 1946 and his work has made these developments possible.

The correct timing of each renovation process is extremely important. For example, there are several materials available for the control of *Poa annua*. What you use dictates subsequent steps to follow since the toxicity residual lingers and will affect what you seed as well as the *Poa annua* seed which is already present. Bensulide (Betasan or Presan), benefin (Balan), or DCPA (Dacthal) require a 3-month waiting period before new seed can be successfully established because of soil toxicity residuals. On the other hand, the use of growth retardants or non-selective contact herbicides such as Paraquat or Round-Up allow you to introduce new seed within days of application. The non-selective herbicides produce a scorched earth result; all vegetation is killed. With growth retardants correctly applied, only the *Poa annua* and the new perennial ryegrasses are killed off; other permanent grasses survive.

A good seedbed is essential to a good seed catch. The more open soil, the better the chances the newly planted seed will become established. Thatch and heavy turf growth are the primary reasons for overseeding failure because the newly planted seed never makes contact with the soil, except in aeration holes and grooves made by the thatching operation. Without question, the best preparation is to remove all the turf cover before overseeding. Overseeding fallow ground insures the best catch possible. Other techniques of seedbed preparation include the aeration of an area eight to 12 times prior to overseeding or the use of a thatcher-type seeder in two directions preferably.

Overseeding must often be performed when the turf is in its best condition of the year. *Poa annua* is a strong spring and fall grower but is pitiful in summer! It is the main reason why courses are experiencing so much difficulty yearly. *Poa annua* culture requires you to irrigate more often than you like; to mow more in spring and fall; to apply more insecticides and more disease control applications in the attempt to keep it healthy during the entire season. The extra watering makes the course soggy, causing flyers and softness in greens. Playing to soft greens requires far less skill than playing to firm greens. Soft greens take a lot of the finesse and pleasure out of seeing well-struck shots dance and hold as they should.

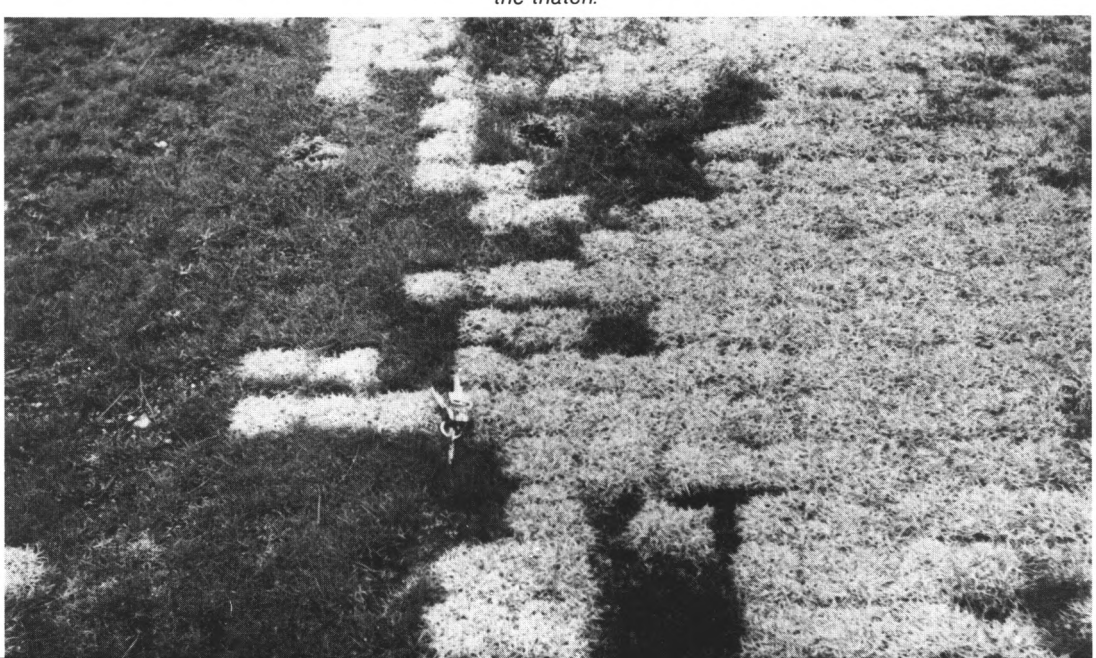
Suppressing Poa annua

The use of growth retardants (MH-30 maleic hydrazide or Maintain CF-125) will eradicate *Poa annua* if correctly used. One of the problems with the use of growth retardants is the fact that you must wait until early October in most northern regions for it to be superlatively effective in *Poa annua* eradication. This prompts a question as to whether to overseed then or to await the following spring to do so, or to attempt overseeding well in advance of October so that new seedling growth can withstand the chemical action of growth retardants. The latter most certainly places the newly overseeded grasses in jeopardy—the same as overseeding into thickly established turf; chances are slim for a good seed catch.

In most cases it would be best to seed late and take your chances that the permanent grasses that remain after herbicide application will make adequate growth before the cold weather sets in. In most cases it is surprising how much permanent grass is present under a thickly grown stand of *Poa annua* after it is suppressed. In some cases just the mere fact that you allow the permanent grasses some growing room will result in a good stand of desirable grasses. Therefore, if too late for seeding in October, take your chances and simply overseed weak areas in the following spring.

Bringing seedlings through to successful turf

New seed will germinate in fallow ground, not in thatch. Note that absolutely no seed has germinated in the thatch.



establishment requires skill in watering and some help from well-timed fertilizer application. One pitfall is to apply too much fertilizer and therefore resurrect a *Poa annua* stand from the seed that is everpresent in the thatch and soil. Within two weeks of seeding time, one-half pound of nitrogen provided by a chemical fertilizer (because of the fall application) should encourage seedling growth. This should be followed by another application approximately two weeks later. If growth retardants are used, it would seem logical to follow with a program of dormant feeding because the nutrients applied would be going entirely to the permanent grasses. Here a chemical or organic fertilizer could be used at rates of one to two pounds of nitrogen preferably applied in November and again in January at the same rate.

Prior to any major seeding operation, it is advisable to check out pH levels in the soil and to apply pulverized limestone at rates up to 1,000 pounds to the acre well prior to overseeding. Normally it is best not to exceed 1,000 pounds per acre on established turf because heavier rates will layer the soil, and soil layering is detrimental to good turfgrass management practices. If the soil is turned over and pulverized, then larger amounts of limestone may be added and worked into the soil.

Tee Renovation

Another area frequently requiring improvement and renovation is that of teeing grounds. Tees originally were built on private courses for possibly 300 to 400 rounds of golf per week. Golf in those days (1930s through the mid 1940s) at private clubs was a Saturday afternoon and Sunday morning event. Very little golf was played on weekdays. Occasionally a women's fourball would appear, but rarely did men come out during the week. After World War II, golf became everybody's game, and now play of 300 rounds per day is not unusual.

In an effort to modernize tees, adequate size is of prime concern. The minimum usable space has been defined by Green Section Agronomists as 100 square feet (on par-4 and par-5 holes) for every 1,000 rounds of golf played annually. Double this for par-3 holes where iron play predominates. Thus, if there are 40,000 rounds of golf a year on the course, the par-4 and par-5 tees should average about 4,000 square feet in size.

The soil materials found on tees often require correction. Modern tees are generally built of soils equivalent to those used in greens. Sandy soils that drain well and with subtle surface drainage are preferred. A depth of soil six inches minimum generally is required to improve tees. Furthermore, it is essential to thoroughly settle any new soil brought into place. Too often new soil is placed on the site and overseeded the same day with no thought given to proper settling. The settling of soil between terraces is also important because water funnels into any depression and not only causes a wet area, but also weak turf.

Normally a slight front-to-rear slope is desired on tees to insure good surface drainage. If terraces are present, provision for surface runoff of some type must be made.

Green Renovation

Greens, too, may call for renovation of one sort or another. Unfortunately, many greens should be rebuilt to correct the fundamental fault of poor topsoils and poor drainage. In the early days of construction, putting green soils were rarely modified to provide a medium for good growth. It wasn't until recent years, and as a result of Green Section supported research, that the need for greater amounts of sand and the need for using the right kind of sand were emphasized in putting green construction.

It is most difficult to introduce new ideas in any profession, but it has been my experience that the field of golf course management is one of the fields where new ideas are not quickly accepted, no matter how thoroughly documented. One of these concepts is the physical soil analysis that the Green Section Soils Laboratory at Texas A & M University provides for anyone interested in new construction. The Green Section Soils Laboratory is now located at Texas A & M University, College Station, Texas, and under the direction of two scientists who were prominent in effecting changes that are now defined in the "Refined Green Section Specifications for Putting Green Construction": Dr. Richard L. Duble and Dr. Kirk W. Brown.

A physical analysis determines the correct ratios for mixing the sand, soil and organic matter available at any particular club. The laboratory is also concerned with providing a good growing medium for deep roots, good internal drainage, adequate nutrient and water retention to sustain growth, resistance to compaction and a bulk density reading to determine surface resiliency. If too much clay and silt is mixed into the topsoil, greens will be compact and bulk density readings will be high. If too much organic matter is included in the topsoil mixture, greens will be soft and soggy. Soil tests which provide the physical analysis of soils also give the necessary information on bulk density of your mixture. It is important that your soils meet these requirements before construction is undertaken.

In Conclusion

Renovating and improvement projects are never ending on American golf courses. Perhaps this is part of the heritage we all share—wanting to make things better and never being satisfied with mediocrity! It's a noble goal. And avoiding the pitfalls of renovation will help us move ahead that much faster. No one has yet found a way better than, "Doing it right—the first time!"

The Team (left to right, R. Harrison, D. Plato, G. Acia and G. Mainland) and the pipe puller at Alameda.

How We Cut Irrigation and Electrical Pipe Costs

by D. GRANT MAINLAND, Director of Recreation & Parks
and
DENNIS PLATO, Golf Course Maintenance Superintendent

Alameda, Calif., (Population 75,000) has two 18-hole Municipal Golf Courses. The North Course (remodelled in 1967) had all electrical wiring for automatic irrigation controllers laid directly in the ground and after seven years it was causing many problems. The South Course, build in 1956 primarily over a garbage dump and in heavily-alkali-marsh-type soil, had an irrigation system of galvanized pipe and fittings.

The maintenance on the South Course pipe became greater each year until necessary repairs were taking the equivalent of one full time staff person, costly materials, extra care of equipment, and very importantly, great inconvenience to the golfers. In addition, the system did not extend to the degree that it was capable of keeping turf and trees in rough areas alive.

Repairs to the electrical system on the North Course were also becoming a costly operation. There was no real way to determine accurately the location of a break in the wire due to the great distances between the electrical panels.

During the summer of 1975, in anticipation of the coming rainy season and because of the electrical problems, Dennis Plato, the golf course maintenance superintendent, determined that an inexpensive method of pulling pipe was an absolute necessity. Budget considerations eliminated the possibility of purchase of a pipe-pulling piece of equipment. Plato and members of the golf course maintenance crew decided it had to be done with present equipment and as inexpensively as possible.

To hear Plato tell the story, the labor costs amounted to 11 hours, "One hour of welding and ten hours of planning, thinking, and trying various pieces of equipment."

It was finally decided that the basic piece of equipment was to be the D-4 caterpillar tractor. A blade to be used for pulling the pipe and cutting

The business end of the puller.

through the sod and earth was purchased for $135. A hole was drilled in it for $16 and a basket assembly (electrical pull basket) for plastic pipe 1¼" x 2" was obtained from the City's Bureau of Electricity. With this, the pulling of pipe was ready to start. One bolt connects the whole assembly.

As noted above, both irrigation pipe (PVC) and electrical conduit can be pulled with this equipment. The ground must be fairly solid so that the tractor treads don't sink in too deeply. Eliminated is the need for cutting and removing sod and the use of a trencher, which means backfilling, replacement of sod and the possibility of uneven ground around the cut after the completion of the project.

The crews found that it is well to glue the pipe the day before the operation. Basically, only two men are needed to pull the pipe once the holes for the inspection box every 200-250 feet are dug. With the aid of an auger (which was not available at the Alameda Course), it is estimated that ten hours labor on each fairway could be saved! One man runs the tractor while the other connects and disconnects the plastic pipe.

Following the pipe placement, the tractor operator backs up over the small cut in the sod and pushes it back down with the tracks of the tractor. Within a very short time the marks are nearly invisible and the sod is back to normal. With a trencher operation this is impossible.

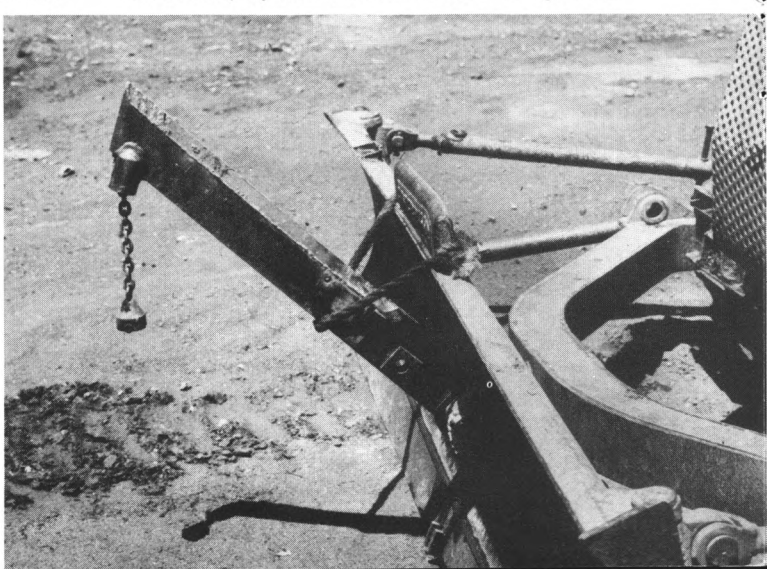
We have determined that this pipe puller can pull as much as 8,000 feet per day under ideal conditions. Under normal conditions, 4,000 feet can be replaced in a working day. When working around tees and greens and making 90 degree turns, the process slows somewhat primarily due to the need to be centered over the main line.

With this equipment, old pipe and other obstructions are cut through readily and do not slow the operation.

As of now the total electrical system for the North Course irrigation system has been placed in plastic pipe (4,000 feet) and 6,000 feet of pipe has been pulled for irrigation on the South Course. This has completed three fairways, and a new gate valve system with controlled heads has been placed around five greens.

As time and weather permits, it is planned to complete this process on the remaining nine fairways where replacement is a necessity and on all greens on the South Course. This will be the first step in the eventual automation of the South Course irrigation system. In addition, the Driving Range is planned for remodelling and a completely new irrigation system will be installed by the city golf crew.

Alameda is convinced that the time and money saved, the simplicity of the operation and the ingenuity of the golf workmen has been instrumental in making Alameda's Courses two of the best in the area; something that is borne out by the increase in play and the comments of the golfers.



For less than $200, ingenuity fashioned the pipe puller.

SUMMER 1975
VOL. 1 NO. 1

TURFGRASS RESEARCH REVIEW

A PUBLICATION OF THE COOPERATIVE EXTENSION SERVICE OF THE UNIVERSITY OF RHODE ISLAND

by C.R. SKOGLEY*

Turfgrass research is expensive. Consider the labor, equipment and facilities required to perform legitimate and meaningful field research with turfgrasses. Maintaining and evaluating turfgrass research plots is a continuous process, usually requiring several years to obtain useful results with any single project. Because of the expense the number of turfgrass research locations has been very limited. Even today with major public interest in turf there are a limited number of sizable turfgrass research programs nationally. Despite this fact there are probably no regions within the country without access to research findings applicable to the climate, soils and use needs of the region.

Unfortunately, much of the research information derived at any given location may not be well disseminated to the potential interested audience. Using the research program at the University of Rhode Island as an example, I will try to explain this last statement.

Turfgrass research was initiated at the Rhode Island Agricultural Experiment Station in 1890. It has been continuous since that time. The program has grown from the part-time effort of one researcher to involve full or part-time efforts of almost a dozen researchers, teachers and extension specialists.

Throughout the years many research and extension publications have been released from our Station to report research results or to provide recommendations for turfgrass management. It has been unfortunate, however, that much accomplished research has never been published and much of that which has been released is in the form of papers published only in science journals. These papers are read primarily by other researchers and are usually in a form not terribly useful to the professional turfgrass manager.

This situation is not unique to the Rhode Island Station. The situation occurs for a number of reasons. First, a university researcher must publish if he is to be retained and promoted. However, it is primarily the papers published in the professional science journals that are judged "proper" publications for university researchers. Trade journal articles, those that in fact reach the real user, get little weight in annual evaluation. It is very easy to see why a researcher spends what time he has available on scientific papers rather than on other forms of more useful writing.

Secondly, many university turfgrass researchers are also involved in teaching and Cooperative

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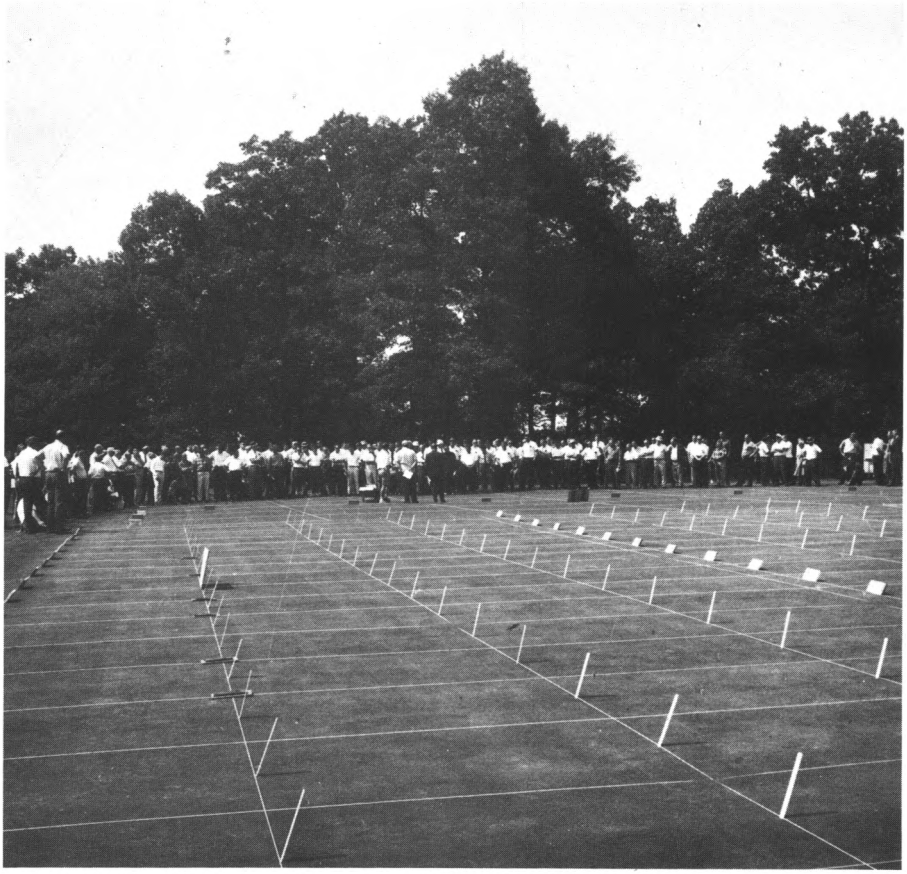


The subject of turfgrass management is invariably of interest to a large segment of the population at any location.

Extension activities. The subject of turfgrass management is invariably of interest to a large segment of the population at any location. This holds for the amateur as well as the professional. The number of letters, office visits and phone calls requesting advice may be considerable during many months of the year. Time spent in this manner cannot be spent writing.

A third reason for unpublished data relates to the manner in which much research is accomplished. At most major university turfgrass research locations, graduate assistants are retained to assist in the program. These graduate students greatly extend the amount of work that can be accomplished. Too often, however, these researchers complete a project, obtain their advanced degree and depart to make a living without personally publishing their work. In the meantime, new assistants are started and may require considerable attention from the research professor, thus again limiting writing time.

To turfgrass researchers, and perhaps to most Agricultural Experiment Station workers, publishing research results is often one of the most difficult things to accomplish. Research is of little value unless the information attained is presented to those who might benefit from the results. For this reason the turf group at the University of Rhode Island have initiated a publication entitled "U.R.I. Turfgrass Research Review." It will be a quarterly publication sponsored by Cooperative Extension and intended primarily for professional turfgrass managers throughout the New England region.

The publication will contain reviews of Station research performed through the years that still have practical value. Much can often be gained from history. The publication will also contain findings from current research projects. Hopefully, the information will be presented in language that the reader can readily understand. We hope that we can make our research efforts of much greater value to the turfgrass industry thorugh the publication of, "U.R.I. Turfgrass Research Review."

THE STRIKE *at the San Francisco Municipal Golf Courses*

by WM. H. BENGEYFIELD
Western Director & Green Section Publications Editor

"This is the 34th day that the San Francisco Municipal Golf Courses have been without water, mowing or maintenance of any kind. While there are probably more hurtful effects of the City worker's strike which began March 31, 1976—for a turfgrass manager, the effect on the golf courses has been like being at the bedside of a dying friend."

So wrote John Grant, the extraordinary Director of Golf Courses for the City of San Francisco. The question of man's cruelty toward man has never been in doubt. This tragic event seems only to emphasize how closely it may come to self-destruction. Certainly man's world of recreation is no longer apart.

The strike began when city plumbers, electricians, machinists, carpenters, and laborers (including the gardeners who maintain the golf courses) and the negotiator for the Board of Supervisors could not agree on a new pay formula. The old formula, which set wages in accordance with whatever the same crafts were paid by private industry, was repudiated by the voters in November, 1975.

Two facts magnified the damage and shortened the life of the golf courses: the strike committee refused to allow emergency watering; the city, trying to show a minimal effect of the strike, insisted on keeping the courses open. Sensing free lunch, the less-knowing golfers continued to use the courses in spite of golf management's requests that they stay off. The predictable results of no water, no maintenance and continued play are pictured in this article.

The more responsible golfers, fearing long term damage, not only stayed off the courses and encouraged others to do the same, but formed volunteer bucket brigades to attempt to at least save the greens. It will be months before the full damage of the strike will be known but substantial repair and rebuilding needs are obvious.

One lesson learned is the advantage of an on-site-controlled automatic irrigation system. Two of the 9-hole courses have automatic systems. At one of these, multiple line breaks mysteriously occurred during the strike and, in the end, it went 45 days without water. On the other automatic irrigation course, minimal damage from a lack of water occurred.

The three remaining 18-hole courses plus another 9-hole course were dependent on irrigation pumps controlled by stationary engineers observing picket lines and on antiquated hose and quick-coupler systems controlled by strikers. An obvious conclusion here is that, in the future, authority be given to those responsible for turfgrass management to develop an irrigation system which can be professionally or administratively controlled. Golf course irrigation systems must be designed and the installation supervised by a professional in the field with follow-up responsibility. It seems a mistake to have this essential turf management tool in the hands of engineers in a Public Parks Department.

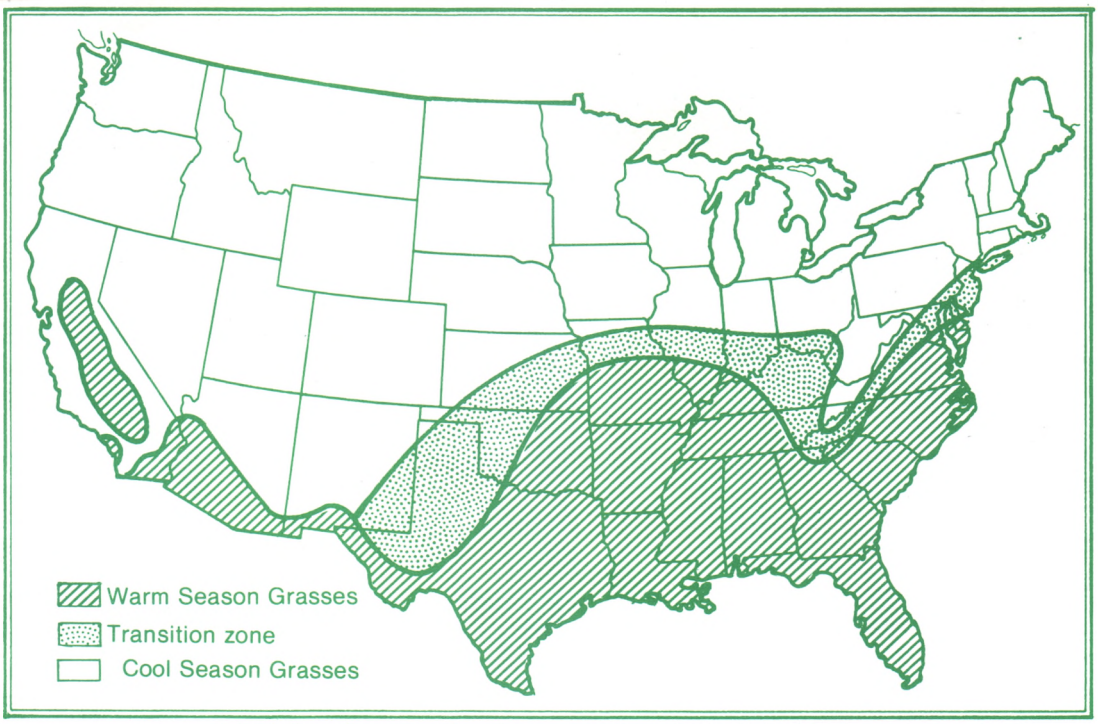
An even more obvious lesson came out of the San Francisco Municipal Works strike: When city services to citizens and golf courses get caught in a power struggle, citizens and turfgrass lose.

The strikers agreed to return to work pending the results of a fact finding committee on Monday, May 10, 1976. After 40 days without watering or mowing or maintenance or fertilization or anything—the care of the golf courses began again. It was at this point they were finally and officially closed for repair. Harding Park, one of the most beautiful municipal golf courses in the country, suffered most from use, vandalism and neglect. Nevertheless, because of its most favorable soils and climate, it was the first to return to color and playable condition. On Monday, May 24, 1976, two weeks after maintenance was resumed, five of the six city courses opened for play.

It is difficult to comprehend the senseless, wasteful and willful loss of a public recreational facility. To those who love the beauty of outdoors and the enjoyment of golf in a crowded metropolitan area, it will always be a hard memory. John Grant says it best:

> "Golf courses are living things—don't strike them. If a strike becomes inevitable and maintenance unavailable, lengthen the remaining course life by closing it. But perhaps most important of all, don't allow golf turf to become a pawn in a political power struggle."

There are really no winners; we are all losers.



Adaptation of warm and cool season grasses in the United States.

Zoysiagrass in the Transition Zone

by RICHARD HURLEY, Agronomist, Tavistock Country Club, Haddonfield, N.J.

For the superintendent who maintains a golf course located in the transition zone, summer can be a frustrating experience.

The transition zone encompasses an area roughly from Philadelphia, south to Richmond, Va. and west to St. Louis, excluding areas of high elevation. It is a region where the weather is extremely hot and humid in the summer, making it difficult to maintain consistently a quality turf which makes use of the cool season grasses (bentgrass or Kentucky bluegrass). Yet, it is too cold in the winter for the warm season grasses, such as bermudagrass, to escape possible low temperature injury.

For many years superintendents maintaining turf in the transition zone have turned away from recommended varieties of bluegrass and bentgrass because of continual failure of localized or large areas of fairways, tees and approaches. The observation made by many superintendents was that no matter what management procedures were followed, these areas would result in weeds, thin turf and failure. Even with the tremendously improved Kentucky bluegrass varieties available today, none can thrive in the heat and humidity which is present during July and August in the transition zone.

Because manicured and closely clipped fairways and tees are most desirable in the golf game, the superintendent attempts to keep turf actively growing throughout the season with the aid of his irrigation system, fertilization program and various other techniques. Due to the severe weather conditions, turf managers may run into overpowering turf problems in trying to attain this goal.

When bentgrasses are used in a fairway one must contend with their inherent weakness against summer diseases, namely dollar spot, brown patch and pythium. There are available a limited number of improved varieties which perform better than common types for fairway turf. However, a costly disease control program must be followed with no guarantee against deterioration of fairway turf.

The use of ryegrasses on fairways and tees has increased now that a group of greatly improved varieties has become available. These varieties have been developed over the last ten years through a number of vigorous university and commercial breeding programs. These ryegrasses

Superintendent Hurley (center) supervising plugging operation in the first fairway, Tavistock C.C., New Jersey.

have found a place in many overseeding programs and will continue to perform well in certain locations and for specific purposes. However, as a group, the ryegrasses still have weaknesses. They are susceptible to brown patch, pythium, dollar spot, red thread and snow mold, and have displayed some winter desiccation. These weaknesses limit the use of ryegrasses on fairways and tees in the transition zone.

For many years bermudagrass has been selected for its cold hardiness and there is a limited group that are recommended for use in the transition zone (Midiron and Tufcote). Even with these relatively winter-hardy varieties, one still runs a risk of turf loss from winter kill and spring dead spot. In the early 1960s the transition zone experienced a particularly severe winter. At the time, golf courses were incorporating U-3 bermudagrass in problem areas or whole fairways and were relying on its summer performance for improved turf quality. Through the severe winter most of the bermudagrass was lost through winter kill. Continued breeding of bermudagrass for cold hardiness may provide us with a group of varieties hardy enough to survive the coldest of winters as far north as New York City. At the present, however, bermudagrasses cannot give us the dependability of winter survival in the northern portion of the transition zone.

Do the warm season grasses have a place on golf courses in the transition zone? Most definitely yes! Many of the golf courses in this zone have from small to extremely large areas that have microclimates which are extremely favorable for the growth of warm season grasses. Turf growing on a south or southwest slope may cause a microclimate or "hot spot" which is unfavorable for the growth of Kentucky bluegrass, bentgrass or ryegrass. One must survey his golf course and pinpoint the microclimates and use warm season grasses accordingly.

What warm season grass should you select? Bermudagrasses have a great appeal in the southern portions of the transition zone and would have more widespread adaptability if new winter hardy strains were developed. To-date, zoysiagrass should be given serious consideration over bermudagrass especially in the northern half of the transition zone. Zoysiagrass, like bermuda, goes into dormancy with the first hard fall frost and resumes growth in the spring when average temperatures rise above 55-60 degrees. Zoysia will thrive at temperatures in excess of 85 degrees. It provides a turf with pleasing light green color and medium texture. The stiffness of the blade provides excellent lies when used as fairway grass if clipped to ½ and a maximum of ¾ of an inch. Like bermuda, zoysia will produce a tight knit summer turf which gives maximum competition against summer weed invasion. Zoysia and bermuda grasses also have excellent wear tolerance during the growing season but can be damaged with excessive winter traffic.

Meyer Z-52 zoysia has definite advantages over bermudagrass for use in the transition zone. Some of these are:

1—It has shown winter hardiness north to the Boston area. When used in the transition

zone there should be no threat of winter kill.

2—It will not display a spring dead spot as commonly found in bermudagrass.

3—Relative to bermudagrass, zoysia greens up earlier in the spring and retains its color later into the fall.

4—Kentucky bluegrass and the improved varieties of perennial ryegrass can be overseeded into the zoysiagrass which adds color to the turf during the early spring and late fall. A relatively stable population of Kentucky bluegrass and zoysia can be maintained whereas bermudagrass may provide too much summer competition for a cool season companion grass.

5—It is somewhat more shade tolerant than bermudagrass.

In my opinion these advantages far outweigh the disadvantages of slow rate of establishment and recovery from scarring, proneness to thatch buildup and puffiness, and a susceptibility to insect damage (billbug, chinch bug, sod webworm and cutworm).

Once a decision has been made to experiment with zoysiagrass, it should be restricted to fairways, green approaches and possibly par-3 tees. It is not recommended for use on tees where a wood is used for driving; one would have difficulty in properly teeing up the ball because of the characteristic puffiness found in established zoysiagrass. For use on fairways it should be maintained at ½ to ¾ inch which will provide an excellent playing surface which will hold the ball up giving a clean lie. As for the straw color of zoysiagrass during winter dormancy, I feel all that is sacrificed is color. Even in dormancy zoysia provides an excellent, if not green, playing surface. As previously mentioned, Kentucky bluegrass and perennial ryegrass can be overseeded into zoysiagrass providing a stable population that will add fall color to the zoysia stand.

Because there is little zoysiagrass seed available, plugs or stolens of selected varieties are used for establishment. If seed were to be used it would provide variable plants with traits probably unlike the desired turf characteristics of the parental lines. The selections of zoysia which have shown excellent and good winter hardiness are Meyer Z-52 and emerald, respectively. *Zoysia matertla* has a somewhat finer texture when compared to Z-52 and emerald but is slower growing and less winter-hardy. For detailed information on the best adapted variety for your area, fertility requirements, weed and thatch control, watering and soil requirements, consult your local USGA Green Section agronomist or university turf specialist.

In summary, I feel we must look at all alternatives to provide our membership with the best adaptible and least expensive to maintain golf courses. At Tavistock we have started a nursery of Meyer Z-52 zoysiagrass and have purchased additional plugs to fill approximately 15,000 square feet of zoysia into two sections of two fairways.

I am looking to zoysia not as the salvation of my summer turf problems but as a useful alternative to add to my total maintenance program.

Starting a nursery of Zoysia with plugs.

TURF TWISTERS

WINTER

Question: Can I safely, and effectively, use powdered charcoal to melt snow and ice on our clubhouse sidewalks? (Maine)

Answer: Yes, any dark-colored material should work well.

WATER

Question: What are the major mistakes made in automatic irrigation installations today? (Texas)

Answer: 1) Spacing sprinkler heads too far apart.
2) Main lines not "looped" to insure uniform pressure.
3) Too many heads under the control of one control station.
4) Sprinkler heads under the control of one station not placed at or about the same elevation.

WONDERING

Question: How long have the hormone-type weed killers been around, which one was it, and where was it first used? (New Jersey)

Answer: The first practical usage of a hormone weed killer was about 1943 and the chemical was 2,4-D. Its first usage on golfing turf was at the Chevy Chase Club in Maryland, the **day after** its selective weed control possibilities were recognized by the Green Section botanist, Dr. Fanny Fern Davis. Interestingly, since there was no commercially available formulations of 2,4-D (and 2,4-D is insoluble in water), it had to be mixed with heated 500 pound drums of Carbowax (a material that both dissolves 2,4-D and is itself dissolved by water and has a low melting point), and then carefully applied to the turf to avoid potentially disastrous drift with the crude sprayers of that day. We've come a long way since then.

The Michigan State University Press reports that printing has been delayed on the publication of *Turfgrass Bibliography* and the *Poa Annue Bulletin* because of a strike. It is expected they will be available sometime in September.