MARCH 1969

USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

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VOL. 7, NO. 2 MARCH 1969

Dr. Fred V. Grau (left) receives the USGA Green Section Award from Alexander M. Radko, Eastern Director of the Green Section.

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USGA Green Section Conference Issue

Subject: Economy in Golf Course Maintenance

The material presented on the following pages has been condensed from papers delivered at the Green Section's Annual Conference on Golf Course Management in New York City. The meeting was held on January 24, 1969, with over 200 in attendance. It is reproduced here as a permanent record of the Conference.

The USGA Green Section Award

Dr. Fred V. Grau, of College Park, Md., was named recipient of the Green Section Award of the United States Golf Association. The award is presented annually in recognition of distinguished service to golf through work with turfgrass.

Dr. Grau is a consulting agronomist and was in Vietnam on a mission for the Air Force at the time of the presentation. The award was accepted in his behalf by Alexander M. Radko, Eastern Director of the Green Section and a former Associate of Dr. Grau.

The award was presented by Hord W. Hardin, of St. Louis, President of the USGA, and Henry H. Russell, of Miami, Chairman of the Green Section Committee, during the Association's annual Conference on Golf Course Management at the Biltmore Hotel in New York City.

Dr. Grau was born on a farm in Nebraska and became a golf superintendent while attending the University of Nebraska. He was graduated in 1931, and then studied for his masters degree at the University of Maryland, where he became a research assistant for the Green Section. He earned his Ph.D. at Maryland in 1935, the same year in which he discovered Penngift crown vetch, a strain of grass used as ground cover alongside highways.

Dr. Grau and C. N. Keyser developed a hydraulic method of seeding slopes that was used on the Pennsylvania Turnpike in 1940.

Dr. Grau served with the War Department during World War II, and in 1945 he was named director of the USGA Green Section, then located at United States Department of Agriculture's Plant Industry Station in Beltsville, Md. During this period he became associated with the development and release of improved turfgrasses, such as Merion bluegrass, Meyer Zoysia, U-3 bermudagrass, and ugandagrass.

Dr. Grau resigned from the Green Section in February, 1953, and entered a national research project of somewhat broader scope than turf for golf alone.

Dr. Grau has inspired a number of students to pursue turfgrass work as their profession, among them Radko; James B. Moncrief, Southern Director of the Green Section; Dr. Marvin H. Ferguson, former Mid-Continent Director and National Research Coordinator of the Green Section; and Charles G. Wilson, former Western Director.

He is a member of the American Society of Agronomy, the American Association for the Advancement of Science, and the Golf Course Superintendents Association of America.

Dr. Grau is the ninth recipient of the Green Section Award. Previous winners were Dr. John Monteith, Jr., of Colorado Springs, Colo.; Professor Lawrence S. Dickinson, of Amherst, Mass.; O. J. Noer, Milwaukee Wis.; Joseph Valentine, Ardmore, Pa.; Dr. Glenn W. Burton, Tifton, Ga.; Professor H. Burton Musser, State College, Pa.; Elmer J. Michael, Rochester, N. Y.; and James L. Haines, of Denver.

A one-year-old green needing tile lines (and probably much more).

Building Golf Holes for Good Turf Management

by WILLIAM H. BENGEYFIELD, Western Director, USGA Green Section

Since World War II, we have all witnessed the phenomenal growth of new golf courses. They have arrived in all sizes, shapes, and descriptions. Unfortunately many of them (including those with good design) also arrived by way of poor construction methods.

It may take only a year to build a new golf course, but if the work is not properly done, it may take the next eight to ten years to untangle the mistakes and put the course in manageable order. Often, initial errors can never be corrected.

Why is it that the "here and now" of construction invariably captures the attention of golf course developers, while the most important economic consideration of all — the untold years of maintenance that lie ahead — is hardly given a thought?

The problem of poorly-built golf courses probably stems from one of these three sources:

1) A number of golf course architects, knowledgeable in the field of design, have generally failed to show a real understanding of fundamental turfgrass requirements.

2) Some totally unqualified individuals have entered the field of golf course architecture. They are superb in salesmanship, but basically lacking in an appreciation of design, golfing values, course construction and maintenance.

3) Key men behind the development of golf courses, those with an investment to protect, frequently believe wrongly

that to do anything well exorbitant costs are necessary and can never be recovered. In effect, they choose to compromise with the future.

Sources of the Problem

Let's take a closer look at these problem sources.

Golf course design and construction is not easy work, especially if it is to be done correctly. However, a close look at golf courses built during the past 20 years only strengthens the contention that experienced architects have been more concerned with layout and design than with the basic and essential agronomic requirements of their work. The point is easily illustrated.

Not many years ago two rather renowned golf course architects in the United States collaborated on a published article discussing the relationship between golf course design and turfgrass management. They wrote in part:

"High quality turf is essential for good play, but it receives only casual player recognition if design is faulty and uninteresting."

Good turf, they are telling us, will not compensate for poor design. Of course, the exact opposite is also true!

The architects' statement may have some validity if applied strictly to championship courses throughout the country. But the architect authors have overlooked the fact that the majority of golf courses in the United States today are not championship courses. Not every club member or every golfer would want them that way. On the non-championship-type courses, of which there are so many, good turf has, and will continue to compensate for questionabe design.

For proof, look only at the renovation and rebuilding work now going on. In nearly every case it is being done to correct agronomic deficiencies of early architecture, not design deficiencies. The man paying most of the golf bill, the average golfer, has constantly demonstrated his interest in a green, well-groomed and well-turfed golf course. It is totqlly unfair to contend that he only "casually recognizes" golfing turf.

The Case of Merion

This should not be construed to mean that design is unimportant or architects unnecessary. Beyond question they are essential in the development of any golf course. Furthermore, we believe they should be given complete freedom in design. But the architect is not omnipotent; he is not all-knowing, and particularly not in agronomic matters. For the good of golf he must devote greater attention and more effort to the construction phase of his work.

The professions of golf course architecture and construction have had an additional problem in recent years. At a time when golf courses are being built so rapidly it is inevitable that incompetent and basically unqualified individuals will become active in the field. After all, one is not necessarily a "golf architect" just because he is a scratch golfer, a retired professional, a superintendent or a landscape designer.

There are untold examples of so-called "architects" through haste, lack of knowledge, lack of supervision, indifference, and in some cases through greed, leaving a new club with problems that must be solved another day. Anyone involved in developing a new golf course should be alert and aware of this dangerous situation. Two examples will amplify the point.

A feature article appeared in a major newspaper in the Southwest recently devoted to a "young and promising golf course architect." During the interview the young man was asked how much formal education was required to become a golf course architect?

"None, if you know enough bulldozer operators," he replied. "It just takes practical knowledge."

Merion Golf Club, one of the great courses in America, was built in 1910 by "amateur architects." They were a group of businessmen and golfers interested in developing a new golf course, and they spent two energetic years in planning and construction. One of their members spent over two months in England and Scotland studying and sketching renowned golf courses there. This group may have started out as "amateurs," but they spent over two years putting together the elements of strategy, construction and design in building this outstanding course. And then, they were fortunate enough to have the assistance of Joe Valentine, one of the earliest and finest golf course superintendents in the country.

Merion proves that amateurs can do the job. But it takes certain qualities not in the possession of everyone. Qualities such as inherent talent for design adequate time and financing, an understanding of golf, dedication and self-sacrifice. It takes much more than merely knowing several bulldozer operators!

Question of Costs

Finally, there is the question of costs. Every experienced architect has had a client with 130 acres who wants a championship 18-hole course measuring 7,000 yards. The client also wants 100 homesites developed on the property, a clubhouse with adequate parking, a driving range, roads, a 10-acre lake and some service buildings as well. And he wants the course built for $200,000, including an automatic irrigation system!

Of course, it can't be done. It's unreasonable of any client to expect an architect to build a cheap palace. Similarly, it's unreasonable of any architect to overdesign and overcharge for good construction. In any undertaking, certain basic costs must prevail, and compromising these costs for expediency or profit is not the answer; it is the crime.

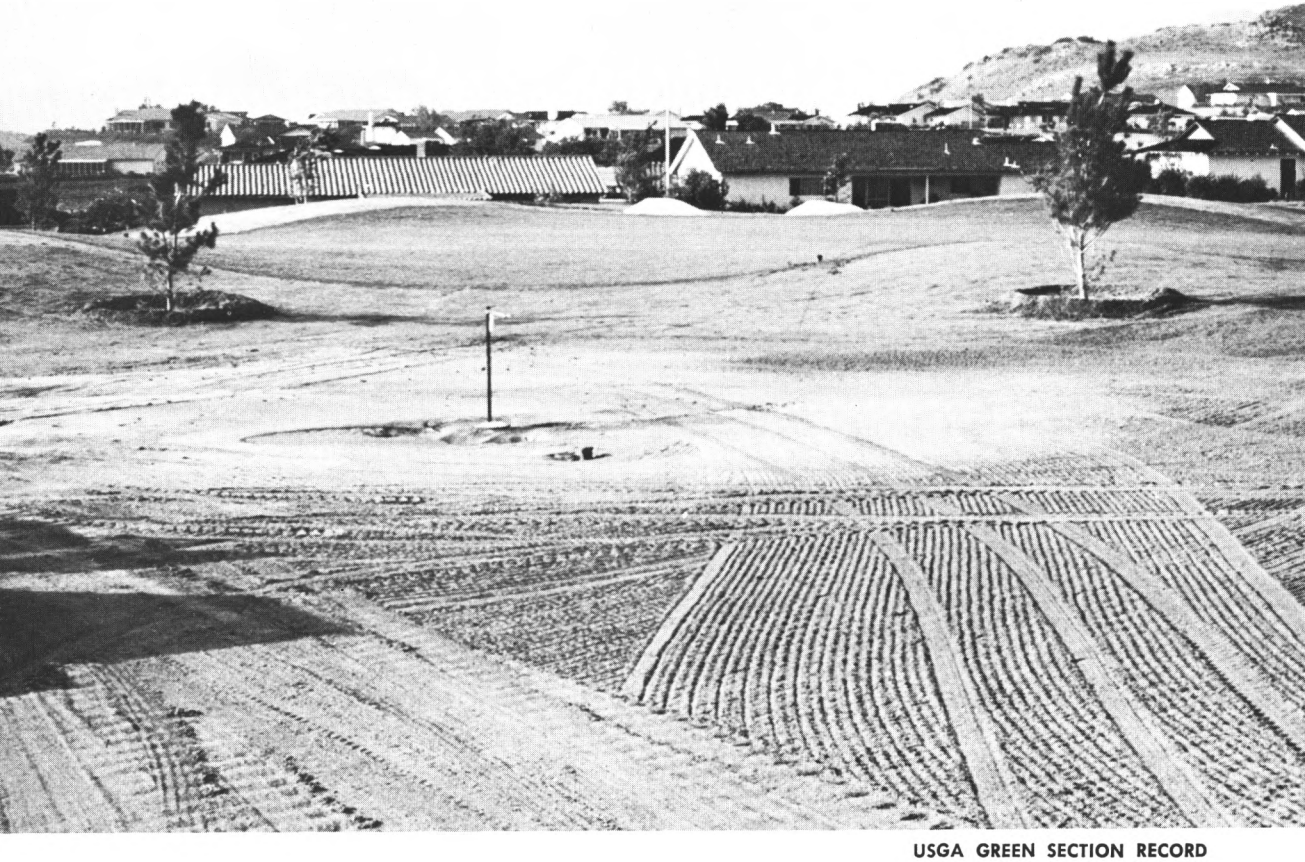
If it is too costly to build a green correctly, it will be far more costly to build it incorrectly. In the long run, the cheapest way of doing any job is to do it right the first time. If nothing else, I hope that one point will stick in your mind:

Economy in golf course maintenance can best be achieved by doing a job right the first time.

Progressive golf course architects recognize that sciences and arts other than pure design are involved in planning golf courses today. When good design principles are blended with golf strategy and accepted agronomic techniques a proud product is produced.

Golf is played on grass. Grass responds to good management. Good management begins with good construction. It is in this context that we say, "Economy in Golf Course Maintenance means doing the job right the first time."

The most economical way to do any job is to do it right the first time.



Committees: Their Role in Course Economy

by DR. FRED M. ADAMS

In the past 12 years as Chairman of the Green Committee at Orchard Lake Country Club, a family club of 600 members in Michigan, and for the past six years having served in a similar capacity with the Golf Association of Michigan, I feel that I have made enough mistakes to qualify as an expert. I would like to share with you some of my observations regarding this Committee's functions, malfunctions, pitfalls, trials and tribulations both from the Committee's and the green superintendent's point of view.

Committee responsibilities in a country club have always been an enigma to me. We have, in general, a real paradox; the Boards of Governors hire competent and generally well-trained club managers, golf professionals, and green superintendents and then appoint committees composed of poorly-trained, thoroughly inexperienced club members who are eager to run the operation. This obvious paradox in many instances leads to undermining the trained personnel with resultant confusion, inefficiencies and utter chaos.

This reminds me of a parallel situation involving parents and their children's education. All parents, and more recently the students, believe they are born educators, and they don't mind letting the teachers know it.

Similarly, all golfers seem to be born agronomists and have no reluctance to let the superintendents and the Green Committee in on all their knowledge.

Human nature being what it is, most individuals when appointed to the Green Committee wish to make a contribution. Unfortunately for most of us, this contribution must represent change. After all, the new committee member has played golf for many years, and, therefore, he's had an opportunity to play most of the different courses in his area, as well as many of the fine courses throughout the country. With these experiences he has drawn conclusions of what he personally thinks makes a great golf course, both from the architectural point of view and from the maintenance procedures he has seen. Now, with appointment to the Green Committee he finally has an opportunity to implement all these long sought after changes, and he can hardly wait for the first Committee meeting to express all his ideas for improvements.

The Green Chairman's Lawn

Now let's stop a minute and objectively analyze our committee's preparedness for this job. While many of us have lawns at home we fertilize regularly, water irregularly, occasionally spray for weeds, and mow about once a week with surprisingly good results, we still can't consider ourselves agronomists. The chances are we have no concept of plant morphology in relationship to what the fertilizer requirements might be; we have never heard of the types of subsoils or their makeup in relationship to maintenance procedures; we probably think *Poa annua* is a rare exotic potted plant and dollarspot must have something to do with the Internal Revenue Service.

Let's face it, we are ill prepared to offer much in the way of constructive criticism to a superintendent's maintenance procedures.

What then, we may ask, should the Green Committee's functions be? How can these truly interested individuals make a significant contribution without jeopardizing the beauty and playability of the course, the maintenance practices of a superintendent or the superintendent himself?

First of all, it becomes necessary for the Board of Directors to choose a Chairman who has enough maturity and self-discipline to recognize that he really doesn't know much about agronomy. He will therefore be happy to leave the enormously complex problems related to growing grass up to the man who has been trained for this job — the superintendent.

It's surprising how much more cooperative the superintendent will be if this philosophy

is understood and conveyed to him from the start.

A Green Chairman's Tenure

Of equal importance is the projected tenure of this Chairman. Nothing is more devastating to the efficient operation of the Green Committee than the common practice of changing the Chairman every year or two. The confusion that arises from this frequent changing of the guard can't help but disturb a smooth running operation. It takes at least two years for the Chairman to begin understanding the complexities and uncertainties of managing turf. Therefore, just as our man has his and the committee's responsibilities in proper perspective he retires — a sad state of affairs.

In my opinion, no one should be offered this job unless he is willing to serve at least five years and possibly longer. He also should have an indoctrination period of two to three years as a committee member before being offered the Chairmanship. In this way the superintendent will have had an opportunity to make his own observations of the possibility of a potential personality clash. The club President would do well to consult and heed the superintendent's feelings concerning the appointment of a prospective new Chairman.

The superintendent should take it upon himself to introduce his entire crew to the Green Committee, and the committee members should familiarize themselves with the crew's names and their jobs. Nothing motivates a man to do a good job more than recognition. If he has previously been complimented on his work, he is much more likely to tolerate criticism for a subsequent mistake.

Advisory or Supervisory Role?

This committee should act primarily in an advisory rather than in a supervisory capacity.

Even the best trained superintendent needs help with many problems related to turf management.

Communication is one area that should be the prime responsibility of the Green Committee. It should act as a buffer between the membership and the superintendent, thus saving him valuable time and thereby increasing the economy of the operation. In addition to

DR. FRED M. ADAMS

planned construction projects, many unforeseen problems arise that inhibit the playability of the course. Unless the membership is appraised of these contingencies as they arise, they will be all over the superintendent, making his life miserable.

If, however, information is given to the membership, it will soften the blow. Most people when presented with the facts will accept the inconveniences, recognizing that the end results could further their enjoyment of the game.

The superintendent must initiate this flow of information to the Committee so that the word can be properly disseminated. Nothing is more embarrassing or frustrating to a Committee member than being asked why certain procedures are being carried out when

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ABOUT THE AUTHOR

As past President of Orchard Lake Country Club, Orchard Lake, Michigan (1962) and Green Committee Chairman for 12 years, Dr. Fred M. Adams is well versed in country club administration. A pediatrician by vocation, golf has become his avocation. He has been a member of the USGA Green Section Committee for the past eight years and Green Committee Chairman of the Golf Association of Michigan for the past six years.

he himself doesn't realize what they are or why they are being done.

He should also be reminded to advise the club manager and golf professional staff of his plans. It is very important that these three departments coordinate all their activities, preferably in writing. How ridiculous it looks to have the greens aerified the day before a special tournament is being held, simply because the superintendent wasn't notified of the event.

It is becoming increasingly more important to have a Committee member who has had experience in personnel management and labor negotiations. While all costs are constantly rising, the biggest increase in green budgets have to do with the labor force. In order to forestall union activity, country clubs had better be aware of competitive wage scales and be prepared to include fringe benefits of health and life insurance, plus pension plans for the green crew. Most superintendents are generally unfamiliar with the complications and ramifications of these plans and they welcome help from the appropriate member of the committee.

Similarly, it is logical to have an individual very familiar with machinery to aid the superintendent in making an inventory of all his mechanical equipment and prepare a long range plan for an orderly and sensible replacement of these items. Such planning obviates having to go before the Board of Directors with the ridiculous request for four new green mowers, two new tractors, and one seven-gang fairway unit, all in one year. Silly as this statement may seem, it is all too common a practice.

Elevate the Superintendent

Continuing with the philosophy of elevating the status of the superintendent in the membership's eyes, it is a good policy to have him periodically appear before the Board of Directors at their regular meetings. Doesn't it make good sense when attempting to obtain Board approval for a major capital expenditure either for equipment or renovation procedures to have the man most familiar with the ramifications of the proposals make the presentation? Valuable time too frequently is lost by the inability of the Green Committee Chairman or his appointed representative to answer pertinent questions relating to this expenditure. However, if the green superintendent makes the presentation to the Board, all questions can be promptly and correctly answered. Further, by appearing before the Board his status will be enhanced. He will then be, in fact, the boss of the operation.

Built into the framework of the organization and primarily to protect the entire club membership from either an overzealous Green Committee or an equally ambitious superintendent, I would like to recommend that every club take advantage of some of the other services that are available.

The USGA Green Section

First is the USGA's Green Section Visiting Service — a truly great contribution toward improving golf courses. To be able to take advantage of on-the-spot evaluation of problems by the real experts in the field is rather obvious.

Complementing the Green Section activity and equally as important is the turf research done at many universities. Attendance at turf conferences sponsored by these institutions should be mandatory for all superintendents, and Green Committees. Through these educational opportunities the Green Committee members soon learn what a complex, but fascinating problem growing grass is. It is interesting to watch them become more humble and less dogmatic in their attitudes toward the well-trained superintendent.

Of equal importance when considering built-in protections for the membership is for each club to consider seriously having a registered golf course architect on a retainer basis. More money is wasted and more golf holes are ruined by amateurish attempts at renovation by Green Committees than I care to think about. One of the greatest insurance policies a membership can have is the services of a good architect.

In summary, it has become rather obvious that in the years that I have served as a Green Committee Chairman my basic ideas have changed as to the true role of the Green Committee. In any efficiently-run, successful business, appropriateiy trained individuals are given the responsibilities of the many facets of the operation. Why can't our golf courses be managed with a similar philosophy?

The green superintendent should be given the responsibilities that are obviously in his domain, without constant unwarranted criti-

cism. The committee's chief functions necessarily should be in the areas in which they individually or collectively have expertise, such as communications, equipment, and labor relations.

By coordinating and supplementing the talents of the Green Superintendent and his Committee with the consultant and educational services made available through agronomy centers, along with the USGA Green Section Visiting Service and retaining a golf course architect can't help but lead to a much better, economically sound golf course operation.

Labor on the Golf Course

by JAMES L. HOLMES

Keeping labor expenditures in line, increasing labor productivity, and still maintaining playing conditions without player inconvenience is to be expected of the modern golf course superintendent. Today's maintenance programs have to be precise. Firm decisions must be made and expedited. Final results must be constructive and any errors corrected immediately.

Demands made by the golfing membership often either hamper, prevent, or delay necessary programs. Therefore, continuing long range programs are necessary to cope with existing problems before new ventures are attempted. Thorough knowledge of budgets, personnel, equipment, and communications are key factors in understanding expenditures. The responsibility, organization and facilitation of these programs is the business of the golf course superintendent.

Labor is the greatest expense in each golf course operation; polls report that labor accounts for between 60 and 75 per cent of the cost. In order to keep this large expenditure within reasonable limits, the golf course superintendent has to think as an owner and perform as the chief administrator, regardless of the size of his operation. Productivity through manpower then is the most important facet of any golf course operation.

To receive the most productivity from an employee, the workman must be aware of what is expected of him. He must know how to do the job in question. He must know the standards that are set for each particular job. It is important that he carry out his duties because he wants to, and can take pride in accomplishment.

Train the Employee

When an employee starts work it is important that he complete the job the way it should be done. Perhaps this is the first time the man has worked on a golf course. Work patterns, as they are first developed, are relatively easy to alter. If bad or wasteful habits are developed over a period of time, they are harder to break. Considerable effort is necessary to train competent employees.

The employee's job is "production oriented," while the superintendent's job is "people oriented." The superintendent must create an environment in which his men can reach maximum production. The superintendent must provide all the equipment and facilities that are required to complete a job, and he must pay a reasonable wage.

In that labor management and communication are the greatest challenges to a successful superintendent, these challenges must be conquered before other phases of turf maintenance and management programs fall into line. The superintendent must continue to educate himself, his employees and his membership.

Other pertinent phases of "labor on the golf course" must also be considered. How many men are required to maintain a normal 18-hole golf course in the "cool-grass" region of the United States and Canada? Obviously, this will vary from course to course, depending upon many factors, such as size of the layout, demands of the membership, and demands of the superintendent himself. However, regardless of the number of employees, if they do not have the desire to work be-

cause of inadequate wages, lack of proper supervision or for some other reason, there is no possible way effectively to reduce labor expenditures.

Size of the Crew

Ten to 12, and occasionally 16 to 20 men are employed on most 18-hole golf courses during the season. A consideration by each superintendent must be, "can six or seven (or less) year-round, well-trained and competent employees accomplish as much?" This approach has been tried at a number of golf courses. This is difficult to accomplish because it is almost impossible to keep six or seven men productively employed during the winter. Furthermore, there is always a need on a well-maintained 18-hole golf course, for a number greater than six to seven sometime during the active golf-playing season. As a result, practically all golf course superintendents depend upon a nucleus of from two to four well-trained competent men, and employ seasonal or part-time help during the season. Obviously these permanent employees are the highest paid with one or two being retained on a salary basis. Golf course superintendents expect at least a 15-20 per cent salary increase demand this coming year from their employees. Not only is a significant increase in the hourly wage rate a consideration, but permanent club employees are becoming more interested in such things as retirement benefits, hospitalization, insurance and other side issues which fulfill the basic human desire for security.

Permanent employees are usually selected either from new men who have had previous experience in golf course work, or by retaining a part-time employee who shows an interest in turf work and has proved to be a competent man during his seasonal labor.

Sources of Seasonal Help

Seasonal help is obtained as follows:

1. "Walk-ins" off the street.
2. Through advertising in local newspapers and advertising by word-of-mouth. Word-of-mouth advertising includes the word being spread by former employees, currently employed men and club members or other persons familiar with the superintendent and know of some particular individual looking for a job.
3. Contacts at colleges and high schools.
4. Through the caddie master by simply requesting that he direct two or three of his better caddies to the superintendent.
5. Itinerant labor. These men have proved to be competent, trustworthy, and excellent adjuncts to the labor force for a number of years. At the present time it can be estimated that 30 per cent of the entire golf course labor force in the greater Chicago area is composed of itinerant laborers.

In addition to the nucleus of permanent employees, seasonal help can be divided into two catagories. Those who are employed for eight or nine months and those who are employed for three months.

The eight- or nine-month group are primarily itinerant workers; the three-month group are high school and college students. Many high school and college students can and are employed yearly, for from four to eight years. Some of these men become well-trained, dependable, and valuable employees.

At least once during every year an emergency arises and extra workmen are needed. Superintendents normally obtain such workers through temporary employment agencies or by hiring a number of caddies temporarily. Further, if the emergency situation should exist at one club only, perhaps previous to or during a large tournament, workers can be "borrowed" from other golf courses.

Labor expense for a typical work week can be quite easily determined. Most normal golf course operations require that all employees work 48 hours during the golf season. The work week load reduces to 40 hours during the off season. Therefore, if the size of the crew and the wage rate for each individual employee is known, the amount of money required during any given week or period of time for operation of the golf course can be determined.

A Look at the Future

What can be expected in the future regarding "labor on the golf course," or what is the overall outlook? This has been discussed with many golf course superintendents, Chairmen of Green Committees and other involved persons. There is general agreement

that if cost of labor can be held in line or held at the current total expenditure rather than constantly increasing, the situation is livable. But if the wage rate continues to escalate or the total number of employees increase, it seems that the only logical way to maintain golf courses as we now know them is through mechanization. This mechanization is machine, chemical, biological and architectural.

MACHINE

A significant increase in mechanization has already taken place. Such things as automatic irrigation systems, multiple mowing machines and the use of helicopters for applying such things as fertilizers and pesticides are a few. Obviously, considerably more innovations are forthcoming. Such things as air flotation equipment for transportation and mowing grass with a sound wave principle are being currently considered.

CHEMICAL

Even though tremendous strides have been made in this area through rapid and inexpensive weed control, disease control and other pest regulation, greater advancements are on the drawing board. In the future, it may be possible to control one specific type of plant or weed in a given population; limit growth, including height of a specific plant or increase growth as desired; or apply a chemical to a given soil which will encourage desirable physical reactions. These are only a few items under consideration. We can expect tremendous strides in the chemical mechanization field in the future.

BIOLOGICAL

There is a rapid increase in the availability of more desirable-type plants at the present time. Improved *Poa Annua's* are currently available, a number of research agencies are investigating improved bentgrasses, and biological control of various pests is being studied. Perhaps the most overall advancement in the golf-turf labor field can be gained through biological advancement.

ARCHITECTURAL

If other turf management operations are effectively mechanized in order to hold "labor on the golf course" in line, design must be such that all facets of mechanization can be applied to a "designed" piece of property. Obviously a course can be built or rebuilt which requires considerable hand labor to maintain properly. Such courses can be and usually are a pleasure to play and an interesting challenge. But they are expensive to keep. In areas where labor costs are becoming prohibitive, care must be exercised so that mechanization of operation is possible through correlated design.

The time has arrived when soaring labor costs on golf courses simply must be stopped if we expect to play golf as we know it. If we properly use technology available today and keep abreast of new developments, it is possible that increases in labor expenditures for golf course maintenance have reached their zenith, or actually may begin to decrease.

James L. Holmes

JAMES L. HOLMES RESIGNS

James L. Holmes, Mid-Continent Director of the USGA Green Section, recently announced his resignation. He has been with the Green Section since 1957 and pioneered the Visiting Service Program in the Mid-Western states. He intends to enter private business.

Another Look at Labor

by HOLMAN M. GRIFFIN, Southern Agronomist, USGA Green Section

It is difficult to understand why there is a problem of unemployment when so many golf courses need employees.

Some clubs have acute labor problems, while others never seem to have any. Though the wage scale at most clubs is still shrouded in secrecy and comparison is difficult, it is doubtful that wages are the only differences between the clubs that have problems and those that do not. Investigation may reveal basic differences in morale, pride, and interest. If a club seeks to hire and hold capable employees, it must be interested in the people it is hiring and interest them in the job to be done. The result of interest is pride, which creates high morale. These attitudes encourage an effective and efficient working force.

Interest must be in force at all levels to make the plan work. To start with, the club must be interested in its key man — the golf course superintendent. Clubs must look on the superintendent as a capable administrator who knows what it takes to get a job done. He is a supervisor, and his attitude is usually reflected in many ways by the men he supervises. Interest in the key man usually shows all the way down to the newest man on the force. Just like money in the bank, the interest is compounded.

Motivation Is the Key

It is one thing to hire a man for his abilities, but quite another to be able to recognize potential. Motivation holds the key to successful labor management, and a manager must create the proper attitude in his men or be content with just so many warm bodies to be put through the routine motions. We have all heard the story of the three brick masons. The first, when asked what he was doing, replied "I am laying brick." The second said he was building a wall. The third said he was helping to build a great cathedral.

The third man obviously had pride in his job, and he was happy to be a part of the overall project. He acknowledged that he was part of a team working toward a very meaningful end.

Part-Time Labor

On the subject of part-time labor, with the exception of students and retired people who fill a special need in a special way, probably there is no such thing as a good temporary employee. The main incentive for the temporary employee is a pay check, and he will tend to leave when he can make more money elsewhere. When there is a quick dollar to be made on a local landscaping job or some other similar project, the temporary help often calls in sick, or just fails to show up.

When they do return, their stories of quick money and their "couldn't care less" attitude demoralizes the permanent crew.

If further proof of the inadequacy of part-time help is required, you have but to ask yourself how much incentive a man can have when he knows his ultimate reward will be to be laid off at the end of the season.

Last, but not of least importance, we come to the pay check. For the marginal worker there is little incentive to work on a golf course when he can make almost as much tax-free money from unemployment as he can for working eight hours a day.

Adequate Wages

Unemployment compensation is a fine thing if used honestly by those who need it. However, many clubs presently abuse the system by actually planning unemployment as a part of an employee's total salary. Under this system, a laborer works a few months each summer then draws unemployment during the winter. By allowing this, a club simply perpetuates one of the deep-seated roots of their own labor problem — the ability of potential laborers to get something for nothing.

Many clubs now pride themselves on getting by with paying a legal minimum wage. In effect, they are waiting until someone tells them how much they have to pay rather than setting their own wage scale according to what the job is really worth.

Someday soon these clubs will learn that too high, rather than too low a price will be dictated and that it is too late to do anything about it.

We must realize now that if clubs are to have a good labor force, they must hire competent, full-time employees and pay them a wage comparable to the industries in the area. This makes the difference here and now between the clubs that have labor problems and those that do not.

Equipment That Saves on Labor

Superintendent Tom Sams urges you to "Put your men on wheels."

by TOM SAMS

High among the requisites of today's modern golf course complexes is an up-to-date maintenance equipment inventory. Competing in the labor market against private enterprise has become one of the most critical problems for most turf managers. One way to alleviate this condition is by "putting your men on wheels."

The transition to mobility at Audubon Country Club, where I have been superintendent for the past 13 years, started in 1961. It was due to a labor problem and the realization that most men could perform their duties more efficiently by riding rather than walking.

My biggest problem was the selling job I had to do on my Green Committee. Thanks to a very open-minded and progressive group of men, I was able to get my ideas across. In every request made for labor saving equipment I explained what the primary function was and how we could benefit from the purchase of each item. This helped me a great deal because, in looking back, I can't recall one request that I made that was refused.

In July, 1965, when I had a fairly large inventory of modern machinery, our maintenance building burned to the ground with a complete loss of equipment. After the first shock wore off, I realized that the fire could be a blessing in disguise. Here was a chance to hand-pick all of my equipment needs and erect a maintenance building that was more functional than we had in the past. The building came first. Thanks to Dave Dillon, a very generous member who is in the construction business, we built a concrete block, 8,000 square foot, two-story structure for $25,000.

I exercised great care in purchasing my equipment, selecting what I thought would serve me best. These purchases included trucksters, small seven- and 10-H.P. tractors and trailers, triplex mowing units, power drag mat, power roller with sulky, electric carts, oversized spray rigs with booms, riding tee mowers with catchers and sulkies for anything we

could attach them to. About the only thing that stayed the same were the putting green mowers. Now, thanks to a progressive turf equipment manufacturer, riding triplex greens mowers are available, and my order for one has been in for over three months.

All of my efforts to make the complete transition to mobility became more satisfying to me about two years ago. At that time our Board of Directors received a letter from one of our members who plays golf every day. His letter carried the complaint that he didn't see the workers out on the golf course very often. It just so happened that in that particular year, conditions were second to none at Audubon.

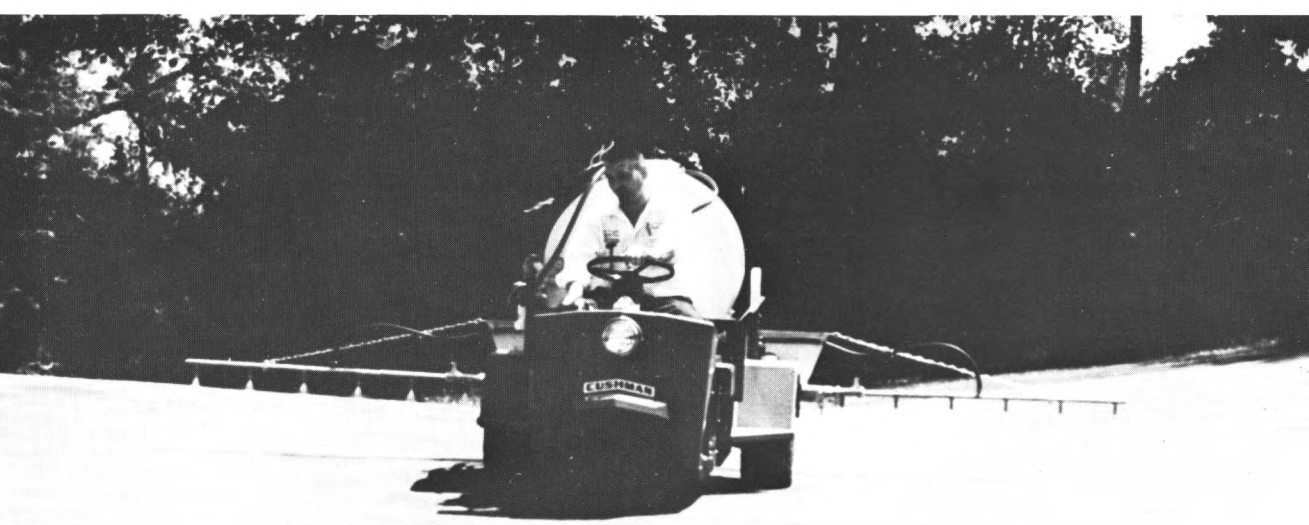
A triplex putting green mower — forerunner of a new era.

When confronted by my chairman with this complaint, I could have been sarcastic and answered that I was a magician; when I want fairways cut, I wave my arms and when I need rainfall I do a rain dance. Instead, I asked my chairman if he was satisfied with playing conditions as he found them. He answered, "They couldn't be better." Then I said, "Mr. Adams, this complaint is a tribute to me and my crew. You see, we are getting the job done and getting it done as inconspicuously as possible. Isn't that what it's all about; getting the job done but not letting them know how we do it?"

ABOUT THE AUTHOR

Tom Sams has been the golf course superintendent at the Audubon Country Club, Louisville, Ky., for the past 13 years. He is currently President of the Midwest Turf Foundation, Purdue University, and editor of Kentuckiana Klippings, a publication of the Kentucky Golf Course Superintendents Association. He has also served as President and a Director of the KGCSA.

An efficient and effective way to spray greens (and the wide tires do not harm the putting surface).



Automatic Irrigation and Conversion

by GEORGE RUDGE and RAY HANSEN

Water has become a critical and valuable resource in the United States. For the first time in our history many areas of the country which previously had ample water resources are experiencing water shortages with the accompanying regulations and restrictions imposed by federal and state agencies. New controls are being developed and implemented which will have far-reaching consequences for all of us.

During the drought period of the mid 1960's in the eastern part of the United States, it became painfully apparent that we must not take this valuable resource for granted. During this period golf courses were among the first to be affected by the stopgap efforts to conserve water supplies. Some golf courses were restricted to minimal amounts of water for irrigation; others were entirely cut off from traditional sources of supply. There were cases of wells and pumping stations being seized under the right of eminent domain, with financial compensation paid to the courses.

The actions of many agencies during this period were harsh, unduly harsh in many cases. If we are to profit from past experiences we must study the lessons of this period and give full consideration to these lessons in planning and developing irrigation programs.

Many of the conditions which precipitated the water crisis still exist. Subsurface water tables have stabilized, but have shown no significant improvement. Additional reservoir capacity has been offset to a certain extent by increased consumption. The contribution of stream and river purification facilities is still to be realized. It is entirely possible that a crisis of the proportion of the mid 1960's can reoccur.

Practice Conservation

If our golf courses are to have access to the water they need for their survival, they must recognize their responsibilities and obligations to practice the conservation of water resources. In many areas of the country today it is necessary to secure the approval of a state water control agency before sufficient quantities of well water may be used by a golf course. Many of our states that face critical water problems recognize the conservation aspects of automation and are much more sympathetic to the requirements of golf courses and other recreational-type developments which use automatically controlled irrigation systems.

In addition to the problem of water supply, golf courses share a problem which plagues all of us — rising costs and labor availability. The cost of labor, equipment and materials will continue to increase. The availability of adequate, dependable labor is a continuing problem in golf course management. It will become more severe in the future.

Today we have an opportunity to exercise control of our spiraling irrigation costs and to fulfill our responsibilities for water conservation.

Automation of manual irrigation systems, or "conversion" as it is popularly known, offers many immediate and long-term benefits for the golf course. Unlike the system, the benefits are not automatic. Careful planning and proper execution of the plans are a prerequisite to these benefits.

Conversion of a manual irrigation system to fully automatic operation is not a step; it is a program. It is a program of many phases, and the immediate economies are but a portion of the ultimate benefit to be achieved.

Automation is not a panacea. It will not make an inadequate system adequate. It will not compensate for inherent faults or defects of the present system. The system must be capable of performing all the desired functions before automation, or the cost of automation must include the cost of correcting the deficiencies.

No longer do we look to the irrigation system solely for the distribution of supplemental water. Droughts, negligible amounts

of beneficial rainfall, high humidity-high temperature conditions, have all played a part in placing more demands upon our irrigation facilities.

Uses of Irrigation

The irrigation system has been called upon to perform a wide range of functions in the past few years. Micro-climate control, that is using water to cool the atmosphere to decrease the transpiration rate of turfgrasses, and fertilizer injection are two of the more recent applications of properly engineered irrigation systems.

We are finding ourselves entering a period where greater demands will be placed upon the capabilities of the irrigation system. For these reasons, conversion to fully automatic operation must assume added significance in our overall turf program!

Arriving at a plan of conversion is a team function. The superintendent, the engineer, and the committee should develop a close working relationship so that maximum utility might be realized from the final system. Together, the superintendent and the engineer can begin developing and analyzing the data which is the basis for any good design.

The first phase of the conversion program should be a detailed analysis of water resources; terrain, soil, and topographical features of the course; pumping equipment and facilities; and piping, valves, and other appurtenances which form the system network. Always bear in mind that the assumptions which were the basis for the original system design may no longer be valid.

Phase one is the time for analysis and examination. Cost information involving labor, equipment, and operation should be developed. This will be the principal basis for judging the economic benefits of conversion and the type of automatic system to be designed.

It is important when considering the desirability of wells as a primary source of water, whether any restrictions have been imposed by state and/or federal agencies.

Use of Wells

Wells have long been used as the primary source of water in turf irrigation. In most areas of the United States, adequate volumes can be received, and the water available has not been contaminated by industrial and sewage effluents. Wells age and deteriorate just like the rest of us. The recovery rate should be tested biannually to determine that productive capacity and the recovery rate of the strata has not declined. This is a relatively simple test and can save a great deal of worry during peak use periods. It is also important to determine that the well, when drilled, was developed for maximum productive capacity.

In completing the evaluation of a well as our primary source of water, it is advisable to conduct a cost study of the entire source complex. This includes not only the cost of depreciation and maintenance of the well, but also pumping maintenance and depreciation cost for the equipment necessary to deliver the water to the irrigation system. These figures should be analyzed and evaluated to determine that maximum efficiency is being achieved in the pumping phase of the system.

Phase one of the conversion program developed the data concerning the course and the condition and cost of operation of the existing facilities. Phase two is the determination of the type of automatic system which best meets the requirements of the course, is compatible to the greatest possible extent with the existing facilities, and complements the overall turf program to the maximum degree.

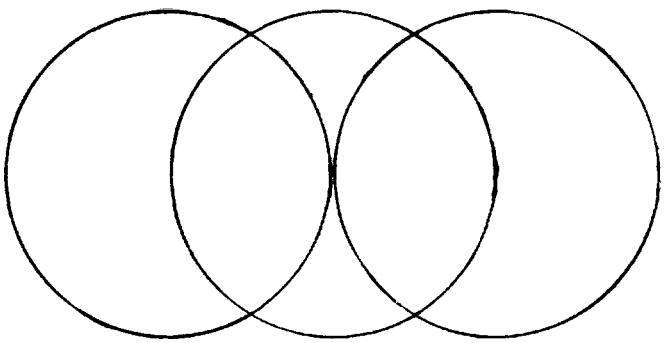
Presently, there are two options for consideration. The first is the single row automatic system. This system offers the same coverage pattern, precipitation rate, and overall water consumption rates as the existing manual system. Its principal benefits are a control of labor expense and a control of the operational time of the sprinklers. The cost of this conversion is relatively low, and disruption to playing facilities can be minimized through proper planning and coordination of construction activities. In most systems of this type the sprinkler head and automatic valve are located in the center of the fairway on the same riser. Electric wires or control tubing are run from the sprinkler-valve location down the center of the fairway to the controller to an electrical source such as the pumphouse, maintenance shop or clubhouse. The controller can be equipped to operate the pumps on a start-stop basis according to the pre-set irrigation schedule.

The Multi-Row System

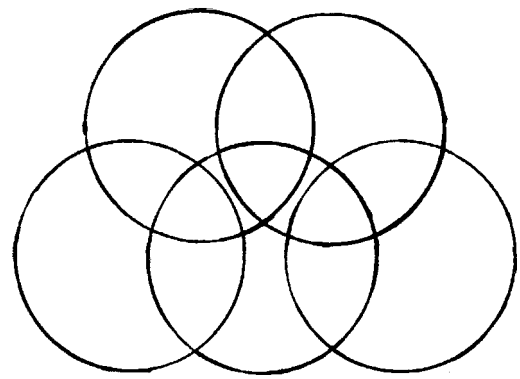
Usually several heads in different locations on the course are operated simultaneously from a single station on the controller. When this type operation is programmed extreme care should be taken to assure that the sprinklers are located in compatible areas. For instance, a sprinkler in a valley should not be combined with a sprinkler irrigating a hillside area. When combining sprinklers for a single station, slope areas should be combined with slope areas, valleys with valleys, etc., assuming that the soil, drainage and prevailing winds are similar.

The multi-row system is a much more definitive method for applying irrigation water. This system utilizes smaller sprinklers with a more efficient spacing and overlapping coverage to achieve greater uniformity in the distribution of the water. Two, and sometimes, three rows of smaller sprinklers are commonly used in this type system.

Exhibit I illustrates the general difference in coverage of a multi-row system and a single row system for the same area.



SINGLE ROW SYSTEM



MULTI-ROW SYSTEM

EXHIBIT I

The principal advantage of the multi-row system is a higher efficiency of distribution and consumption of water.

To illustrate, Exhibit II is a typical water distribution curve of sprinkler head performance.

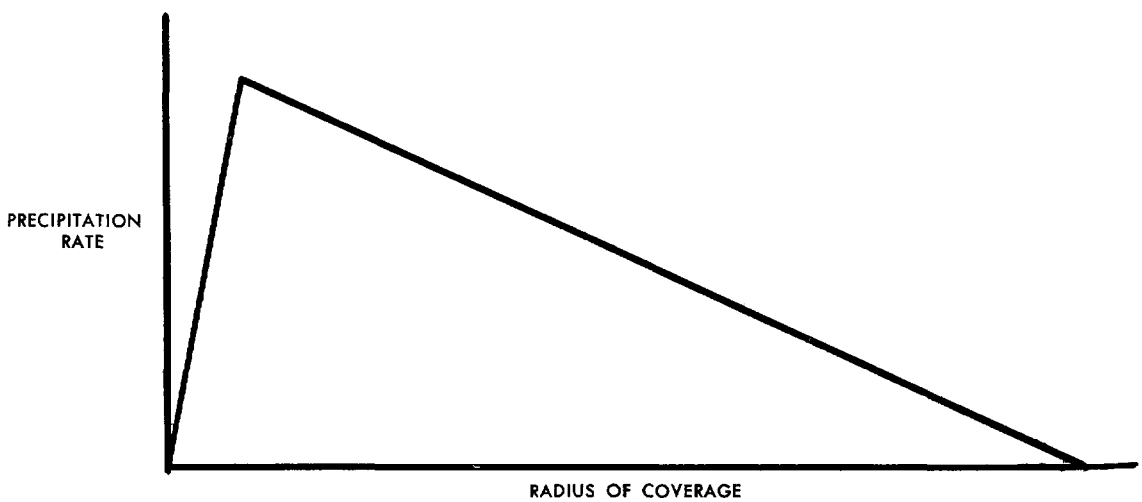
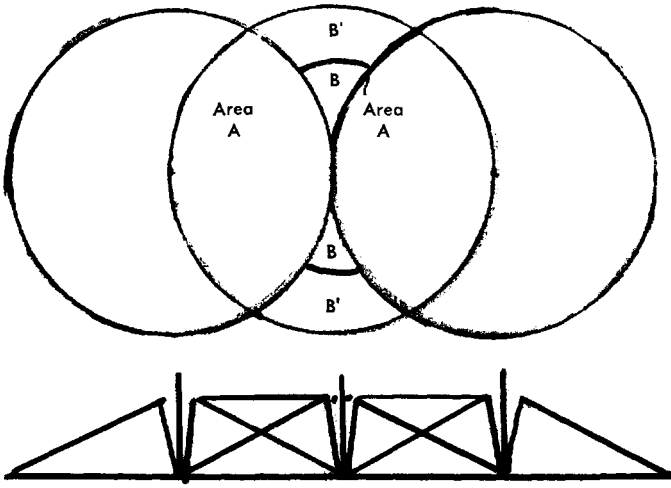


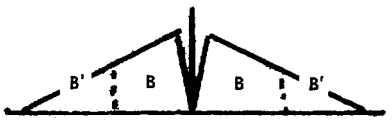
EXHIBIT II

As you will note, the sprinkler distributes more water in the first half of the radius than in the second half of the radius. Because of this characteristic, it is necessary to overlap the sprinkler coverage to achieve an effective distribution of the water.

In a single row system, the water distribution pattern will correspond to Exhibit III.



TYPICAL OVERLAP WATER DISTRIBUTION. PATTERN = AREA A



TYPICAL WATER DISTRIBUTION. AREA B = B'

_____ SPRINKLER DISTRIBUTION

_ _ _ _ _ VOLUME OF WATER DISTRIBUTED

EXHIBIT III

Using a full radius overlap, which is common in single row design, it is apparent that Area A, (Exhibit III), in the system will receive twice as much water as Area B, (Exhibit III). When we consider this factor in conjunction with the distribution curve in Exhibit II, the following becomes apparent:

1) Area B comprises approximately 50 per cent of the course area, and receives only half as much water in a given time as Area A.
2) To provide sufficient water to Area B, Area A must be substantially overwatered.
3) The distribution curve in Exhibit II indicates that twice as much water is distributed in the first half of the radius as is distributed to the second half of the radius. In a single row system, the second half of the radius of coverage comprises approximately 25 per cent of the course area. Thus, if we consider these areas as A, B, and B', we find that in delivering sufficient water to Area A, Area B will receive only half the sufficient water and Area B' only a quarter of the water necessary. Should Area B determine the amount of water to be applied, Area A would receive twice the desired amount, and Area B' only half the desired amount. Most watering programs, consciously or unconsciously, gear their operation schedules to provide adequate water to maintain the fringe areas (Area B'), and as a result apply substantial quantities of excessive and unnecessary water to the center of fairway areas.

Thus, the inherent overwatering characteristics of the single row system result in excessive water consumption, inefficient water distribution, and higher costs in pumping and system capacity investment.

The distribution curve in Exhibit II is also typical of the sprinklers used in multi-row systems. The multi-row system, however, recognizes the characteristics of the sprinkler and compensates for its limitations by triangular spacing which offers a higher degree of uniformity and reduces the fringe areas from 25 per cent of the course area to 8 to 10 per cent of the course area.

The uniform distribution of water which can be achieved with a multi-row system will eliminate the necessity of overwatering 75 per cent of the course to provide sufficient

George Rudge, President of the Irrigation Associates, Inc., and Ray Hansen, superintendent at the Essex County Country Club in West Orange, N. J.

water for fringe areas. Water consumption can thus be reduced by 40 per cent or more. The resultant savings in water and pumping costs are a continuous savings to the course year after year.

The determination of the type of system should entail careful consideration of water requirements for tree areas. (A mature tree 22 feet high with a 12-inch trunk will require approximately 250 gallons of water per day.) In order to maintain healthy turf in tree areas, provisions must be made to supply ample amounts of water to meet the tree's daily requirements.

Construction Phase

Phase III of our program is the construction phase, and the success of this phase of the project depends greatly upon the selection of the contractor.

A basic understanding must be reached between the engineer, superintendent and the contractor. Changes and improvements are invariably necessary once construction begins. Therefore, it is most important that the three principals involved have a complete understanding of their respective obligations, not only to each other, but primarily to the club and it's membership. Many of these elements will be covered in the contract, but it should be remembered that NO contract can cover ALL contingencies.

The membership should be made completely aware of what the conversion of the irrigation system will entail. They must be aware of the slight inconveniences they will be subjected to, and how they can cooperate so that the *entire* operation proceeds smoothly.

The location of the sprinkler heads and controllers is the initial step in the conversion program. The staking operation should be done by the contractor in complete coordination with the engineer and superintendent. This approach will insure a totally complete and workable system.

Controllers must be located so that the areas they operate can be visually observed from their vantage point. This is vital for such activities as syringing, watering in and application of chemicals, and the elimination of dew and frost.

Confining the installation to one, or a maximum of two holes at a time is mandatory. Adhering to this basic policy will provide efficiency as well as a minimum of inconvenience to the membership.

Modern Techniques Essential

The use of modern techniques and equipment is essential in the conversion of an irrigation system. Existing risers are tapped, the automatic valves are installed, and the pipe and wire are moled. The sprinkler heads are set and the wire splices are made. This is accomplished with very little disturbance to existing turf.

Daily records must be maintained. Any changes or modifications must be carefully noted so that a complete and accurate "as built" drawing can be compiled upon completion.

If the investment in automation is to bear fruit, each phase of the conversion program must be pursued with diligence. Analyze the existing facilities and conditions, plan the alterations with due consideration to the future, and execute your plans with qualified, knowledgeable engineers and competent contractors, and you will reap the full benefit of conversion.

Figure I, a multi-row automatic irrigation system.

Automatic Irrigation— Experiences in Conversion

by RAY HANSEN

In considering some of the practical aspects of conversion, we would like to tell you what we already have done at Essex County Country Club, and what we intend to do during the spring of 1969.

Essex County Country Club consists of two golf courses, an 18-hole private course and an 18-hole public course. In 1959 a single row manual system was installed on our private course. At this time most courses in the Northeast were installing this type system. It was designed to supplement natural rainfall during an average year. However, in most cases the weather during these years has been far from average.

During this same period the trend has been to maintain fairways more like greens. This presents problems because in almost every case fairways are not constructed in the same manner as greens. We find undulations where stumps have decayed, ledge rock sometimes within an inch of the surface, and poorly drained areas. A mistake in the application of water on these fairways can be more critical than on greens because of these built-in hazards.

With this in mind, plus the lack of water available in the New Jersey area in 1967, we installed a multi-row automatic irrigation system on our public course.

Main Line in Rough

We placed the main lines down the rough, branching off to a battery of sprinkler heads. Terrain was kept in mind so as to group heads having similar elevations and conditions. In the multi-row automatic system, we used two to three 15 gallon-a-minute heads to cover the same area formerly covered by one 60 to 70 gallon-a-minute head on a single row system (Figure 1).

We are using more equipment, but with the capability of a lighter precipitation rate. This achieves greater uniformity. With the added advantage of automatic valves and control-

Figure II, run-off left high areas dry.

lers, we are able to operate the sprinkler heads at short intervals several times in one night. This reduces run-off, yet allows us to water to field capacity.

The year 1968 brought us a variety of conditions, especially in rainfall and humidity. At times we received as much as one inch of water in 30 minutes; much too fast for our soils to absorb. This caused run-off into low areas, leaving high areas dry (Figure 2). Differences were often found within the range of the same sprinkler head. To save the grass in these areas it was necessary to water the best way possible with the men and equipment available.

In keeping records of the total amount of water used on each course, we found that we were watering the course with the multi-row automatic system much more uniformly than we were the course with the single-row manual system. Our total consumption of water used was approximately one-third less where the multi-row system was in operation. Also, with the single row system, we could see where the fairways were creeping in from the edges.

We placed rain gauges (Figure 3) on similar fairways on each course; one gauge in the center and one ten yards out on each side. Both systems were put into operation for 40 minutes. In checking the gauges on the single-row system we found 3/10 of an inch in the outside gauge, 6/10 of an inch in the center and 2/10 in the one on the other side.

When we checked the gauges on the multi-row system, we found 5/10 of an inch in the outside gauge, 5/10 in the center gauge and 4/10 on the other side.

This proved to us that in order to place enough water on the outside edges of our fairways with the single row system, we were putting much more than we needed in the center. Or, in reverse, if only enough water

Figure III, rain gauges measuring amount of water applied.

were placed in the center, the outside portions would suffer.

Multi-Row System Needed

These facts made it apparent that for efficiency and sound economics, the single-row system had to be converted to an automatic, multi-row system. The consulting engineer prepared a basic design, and the required gallonage for the system was determined. The techniques and methods to be used in the conversion program were then chosen.

In placing the pipe in the ground, two methods were considered: trenching and mole installation. Figure 4 shows the trenching method. The sod was cut and placed to the side of the trenching area. Trenching operations were completed, pipe put in place, soil compacted, and the sod replaced.

We also tried the mole method (Figure 5) for pipe installation. Two cubic-foot holes were dug at each sprinkler and valve location and the pipe was "moled" in as shown. This method proved to be far more satisfactory than trenching. It was more efficient, more economical and caused little disruption to play.

Control wire can also be installed in this manner on short runs. On longer runs a modified subsoil attachment affixed to a tractor will do the job better. As you can see, a very small mound is raised by mole installation, but is easily returned to its original condition. This method is also good in the rough areas where more stone is likely to be encountered.

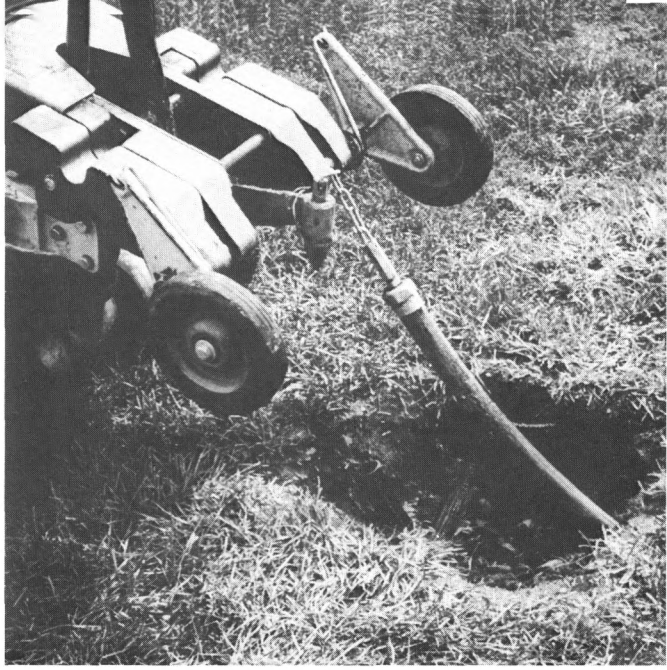


Figure V, mole method of laying pipe.

In conclusion, may I point out why we chose the multi-row automatic system and the moling technique of conversion;

1) The multi-row system provides even and effective water distribution.
2) The moling method leaves little damage to turf areas.
3) A minimum of inconvenience to the golfer during the installation period.
4) And finally, a capital improvement that will be totally enjoyed by the most important people — the golfers.

Figure IV, trenching method of laying pipe.

Needed: Adequate Maintenance Equipment

A mist blower used for spraying greens at DuPont Country Club, Delaware.

by LEE RECORD, Mid-Continent Agronomist USGA Green Section

One must remember that equipment alone will not save on labor costs unless sound management programs are being initiated. With a sound program and modern equipment supervised by a competent golf course superintendent, labor expenditures can be substantially reduced.

Scientific discoveries and achievements during the past few decades have contributed much to the reduction of labor expenditures on the golf course. The necessity for endless hours of hand labor has been circumvented. Our scientific age continues to revolutionize this great and challenging profession. Consider what has been gained through years of mechanical and chemical advancement:

> The day of hand putting green mowing is past history. The 20th century has brought tri-plex green mowers; once they were walked behind, now they are ridden upon. The time required to mow greens has been cut by a factor of three.
>
> Application of chemicals, such as fungicides, insecticides, nematocides, etc. is no longer guess work. The obsolete wooden barrel and faulty pump is no longer relied upon. New pumps, new engines, new ways of applying chemicals have reduced the original two- or three-man task to a one-man operation.

Mobile equipment such as trucksters used on greens to deliver fertilizer and pesticides is common practice. Many superintendents have "put every employee on wheels." Certainly, this reduces the total number of employees necessary to effectively operate a course, and it increases their productivity.

"Drop fertilizer spreaders" are becoming history, and with them goes a three man operation. Perhaps the cyclone fertilizer spreader has saved more man hours than any other innovation. Fertilizer misses, burns and uneven distribution need no longer be an occupational hazard.

Top-dressing greens has also been revolutionized by mechanization. Hand shoveling and push type top-dressing machines are outdated and grossly un-

economical. The new improved method is all power, with even distribution of material assured. Weeds that once ruled the domain are no longer a problem. But let us not forget the countless hours of hand labor spent in weeding greens and bunkers. Today, pre- and post-emergent materials are used without hesitation and with little injury to desirable growth. Hand labor for weeding has all but been eliminated.

Finally, let us not forget the hours that are being saved with automatic irrigation. The night waterman for the automatically irrigated golf course is no longer so important. Wilt, which could not be thoroughly controlled on hot days, can now be checked within minutes.

Automatic irrigation is only one example of mechanical labor saving. The use of two-way radios and television is just coming into its own. Labor may be reduced here through greatly improved communication.

TODAY'S EQUIPMENT

There is no substitute for having adequate equipment in good repair. The November, 1966 issue of the **USGA Green Section Record** suggested a list of "Golf Course Maintenance Equipment." This list is suggested for the majority of 18-hole courses in the United States and should be consulted.

In conjunction with the maintenance building, an additional building is needed for the storing and mixing of top-dressing material. Top-dressing should be kept in a dry area so that it will be available at any time of the season. Space for a two-year supply should be provided.

MANPOWER

If we have the necessary equipment and an adequate maintenance building, how many men will be required to keep the equipment rolling for the turf maintenance program? We suggest that the following personnel be considered for the average 18-hole golf course in the Northeast.

1 superintendent (year round employment).
1 assistant superintendent or foreman (year round employment).
1 mechanic (year round employment).
2 laborers (year round employment).
3 laborers to be hired at the beginning of the outside maintenance season and continued until fall maintenance is completed.
3 laborers to be hired as summer help.
11 men total.

Regardless of the maintenance building and modern equipment, the work load cannot be carried out unless an adequate work force is available; a work force that can be depended on, day in and day out; men with responsibility to themselves, to the golf course they are working for and to the equipment they are handling. Any appreciable construction work should be supplemented with additional labor.

IRRIGATION EQUIPMENT

Pumping station and number of heads will be determined by the superintendent at each individual course.

This suggested list has only touched a few of the many odds and ends and pieces of equipment needed. If we have omitted the one piece of equipment you feel is necessary, by all means add it to the list.

A maintenance building should meet the following requirements:

(1) Superintendent's office (desk, file cabinets, adding machine, phone, etc.).
(2) Toilet facilities (shower, lockers, etc.).
(3) Adequate heating and ventilation.
(4) Paint spraying room.
(5) Herbicide-fungicide, etc. storage room.
(6) Fertilizer storage area.
(7) Adequate storage area for all equipment.
(8) Adequate maintenance area.

THE FUTURE

What can we look forward to in the future as a contribution toward reduced labor costs? As we gaze into the crystal ball, countless dreams are before us. Selective chemicals which biologically control growth as desired or systemic pesticides which need be applied only once or twice a year may be just around the corner.

We are already working with grasses which grow to a limited height. But, can't you see new improved bluegrasses, bents, bermudas and zoysias that resist disease, traffic and insects! How about the new plastic turf

currently being tried that needs only vacuuming.

Perhaps the crystal ball will show that wheel marks will no longer be seen after the turf has been cut with sonar principle equipment.

There is no need to worry about clipping accumulation or dew as air cushion machines take care of these problems as well as offering swift and "rutless" transportation. Helicopters are made practical for fungicide, insecticide, herbicide and fertilizer applications if indeed our new improved plants require them.

These are only a few of the dream mechanisms being visualized. Are they unreal? I don't think so. Today's technology won't let them be unreal. The Saturn rocket and Apollo capsule were in the crystal ball only a few years ago. Today, man has almost reached the moon.

Pesticides for Warm Season Grasses

by JAMES B. MONCRIEF, Southern Director, USGA Green Section

FUNGICIDES

In the South, fine leaf bermudagrasses are used mainly for greens and very little fungicide is used in a preventive disease control program. A preventive program is used when greens are overseeded, but it is not as efficient as it should be. A curative program on overseeded greens is followed in most cases, but not always with satisfactory results.

A fungicidal program has a wide range of cost per square foot. The lower cost of fungicide per 1,000 square feet is usually between 48¢ to 55¢ whereas the upper range of cost will run between 95¢ to $1 per 1,000 square feet per treatment. A preventive program will cost more than a curative one; the final figure depending on the choice of fungicide. However, the resulting better turf will offset the cost increase.

One disease complex causing concern with bermudagrass is spring dead spot. When a green is lost, it may cost as much as 20¢ per square foot for resodding. This is about $200 per 1,000 square feet, or $2,000 for 10,000 square feet of green. Leaf spot is probably found more often than any other fungi on bermudagrass. In most cases, this foliage disease is easy to control.

HERBICIDES

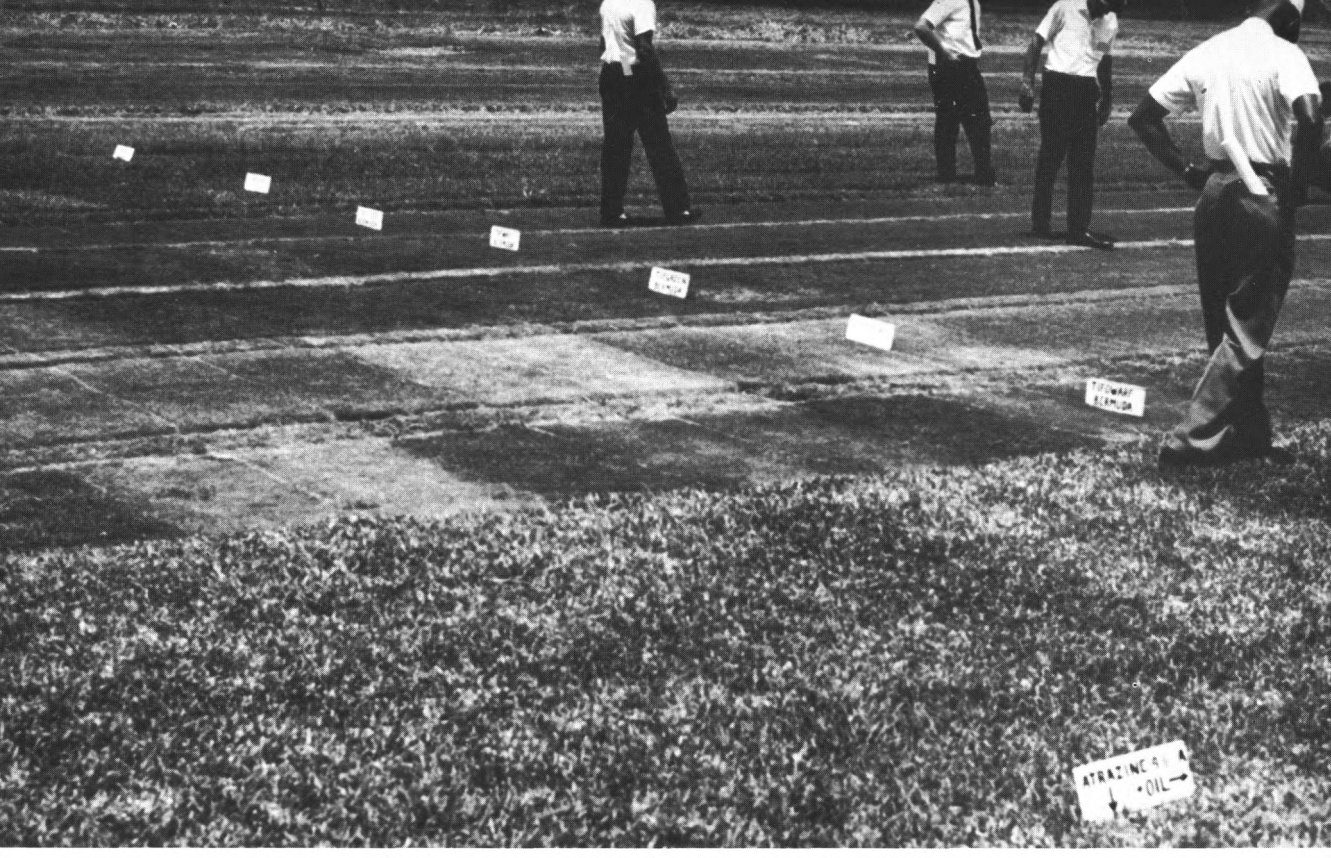
Herbicides may generally be divided into pre-emergence and post-emergence categories and also as selective or non-selective types. Selectivity is based on physiological, morphological, translocation, and absorption differences between plants.

The physiological plant differences are probably least understood, and it involves the internal chemistry of the plant. Some compare it to the resistance or susceptibility of humans to certain diseases.

Translocation can occur through the xylem, phloem, or between cells. The xylem tissues move plant nutrients from the roots to other plant parts, and the phloem tissues move manufactured food from the leaves to other parts of the plants, mainly roots, fruit, and storage areas.

Morphological plant differences refer to size, shape, leaves, and stages of growth. Weeds are the result of poor turf quality, not the cause. A healthy turf offers the best control. Herbicides will do an excellent job for you where they are needed and if they are properly used. Unfortunately, mis-use during the past several years in the form of poor distribution has been most noticeable.

There is a wide range in "cost per acre" between pre-emergence and post-emergence materials. Good results have been realized with either type when properly handled. The bermudagrasses are especially tolerant of the arsenate products, such as disodium methyl arsenate and monosodium methyl arsenate.



Application rates are established by extended research.

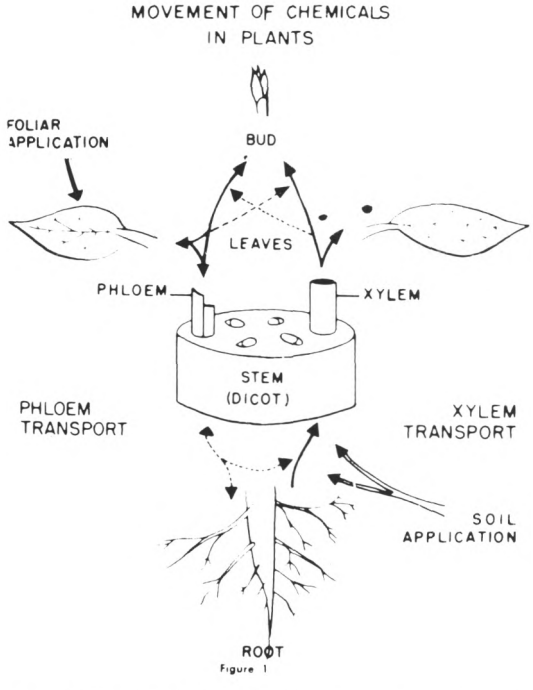
At the 1968 Southeast Weed Conference, the following estimated economic losses due to weeds in turf were presented. The figures do not include golf course turf. If they did, the figures would be much higher.

Be sure you know your weed problem and the chemicals that will eliminate them without harming your turf. This is the first step in effective and economical weed control.

INSECTICIDES

Warm season grasses are constantly being attacked by insects. The farther south one goes, the larger the insect population, the more insecticides required and the greater the problems.

Most insect problems are controlled by the curative method. When insects are observed, grass is immediately sprayed. Various symptoms are associated with each insect, but some are so similar to other problems caused by disease, drought and nutrient deficiency that one must beware of a snap judgment. This is why experience and knowledge of the problem at hand is so important before control is satisfactory.



Translocation of herbicides can occur through the xylem, phloem, or between cells.

The one insect that seems to be a constant problem is the sod webworm. Fortunately, there are numerous insecticides that do a marvelous job in controlling them. One of the most used procedures and probably the best method of control is to spray the foliage in the afternoon, leaving it on overnight, and syringing it off the next day.

Insects, especially sod webworms, first seem to become a problem on the best turf in the neighborhood. No doubt this is due to the better turf color. Moths lay eggs where the life cycle will have the best chance for completion, and this, of course, is in better turf.

Bermudamite damage is now being observed more frequently in Florida. There is usually a disease complex associated with it. A fungicide can be used in conjunction with an insecticide to control both problems. Of course, the fungicide, insecticide, and the water used for the solution have to be checked to see if they are compatible. In some cases, a synergistic effect occurs when two chemicals are used and better control is achieved.

CATEGORY I – ECONOMIC LOSSES DUE TO WEEDS

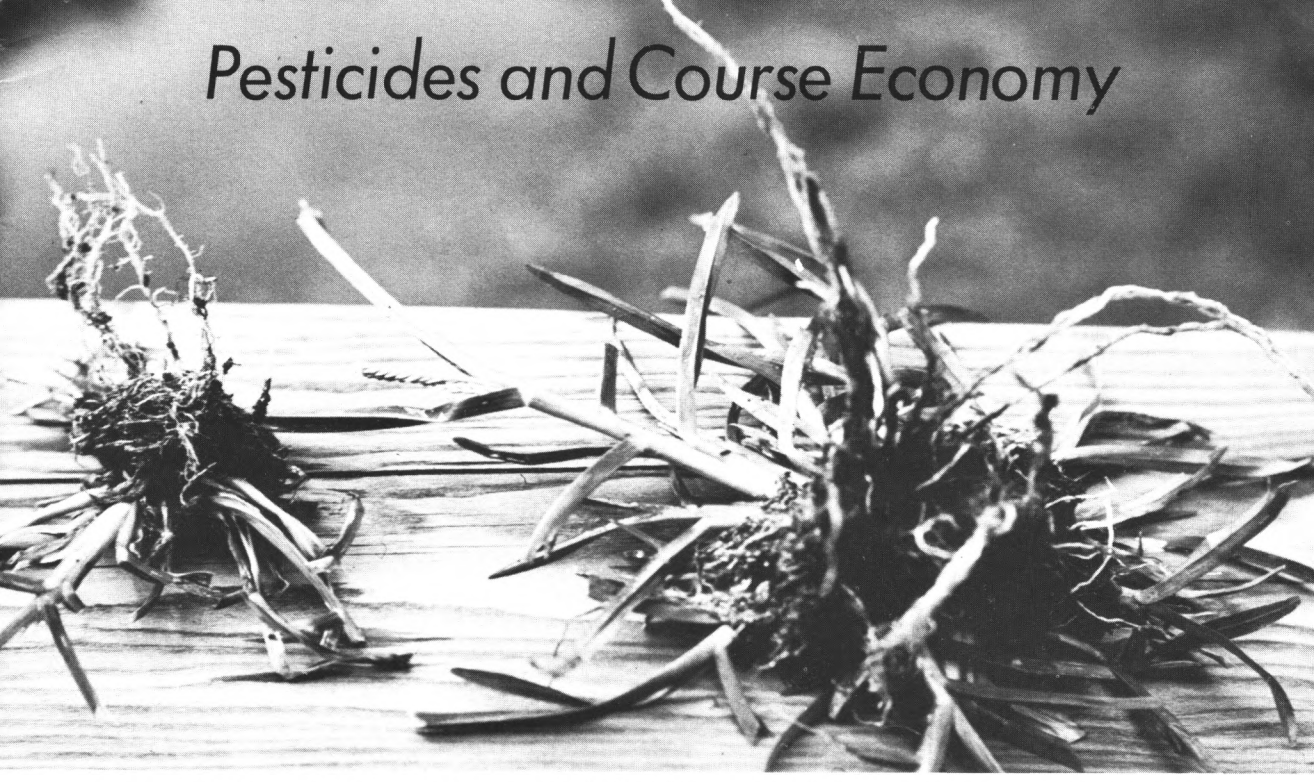
TABLE 15. ESTIMATED LOSSES DUE TO WEEDS IN TURF

(Total Values Expressed in Thousands of Dollars, Acres in Thousands of Acres)

		ARKANSAS	*GEORGIA*	*KENTUCKY*	*LOUISIANA*	*OKLAHOMA*	*TEXAS*	*VIRGINIA*
Cost of Herbicides	a. Acres	20	160	200	30	100	110	125
	b. Cost/A	$ 7.00	8.00	10.00	20.00	20.00	25.00	20.00
	c. Total Value	$ 140	1,280	2,000	600	2,000	2,750	2,500
Loss in Quality	a. Acres	15	500	NA[1]	NA	100	250	300
	b. Cost/A	$ 10.00	4.00	"	"	50.00	50.00	5.00
	c. Total Value	$ 150	2,000	"	"	5,000	12,500	1,500
Loss in Land Value	a. Acres	15	NA	NA	70	NA	Questionable	NA
	b. Cost/A	$ 10.00	"	"	50.00	"		"
	c. Total Value	$ 150	"	"	5,000	"		"
Cost of Mechanical Control	a. Acres	NA	NA	NA	NA	60	20	335
	b. Cost/A	"	"	"	"	10.00	20.00	10.00
	c. Total Value	"	"	"	"	600	400	3,350
TOTAL VALUE		$ 440	3,280	2,000	5,600	7,600	15,650	7,350

[1] Not available or not applicable

Pesticides and Course Economy



Root restriction action of pre-emergence herbicides —note differences between treated plant on left and untreated on right.

by ALEXANDER M. RADKO, Eastern Director, USGA Green Section

Pesticides are now playing a larger role in the healthful management of cool-season grasses. Reasons are many fold: better pesticides are available, budgets are larger and members are not opposed to spending, better equipment is available for application of improved materials, and members are demanding a perfectly conditioned course from tee to green during the entire playing season!

Pests may be defined as plants and animals in existence where they are not wanted. Golf course maintenance has had its share of problems due to turf pests and though it has been an uphill battle, the number of serious problems is narrowing.

This does not mean that the use of pesticides will be reduced in the years ahead. There is no program that will erase all pests for all time. Rather, today's chemicals are used to hold pests in check and minimize competition with the desirable grasses and damage to playing areas. Certain years will require greater use of one pesticide over another; much depends upon weather conditions. Weather in certain years will bring on problems with diseases, while in other years weather may cause more weed, insect, or wilt damage. However, it all evens out over the years because the war against pests is never ending and control programs must constantly be kept in force.

GREENS AND APRONS

Weeds, diseases and insects are mostly controlled on a preventive basis. Greens average between two and three acres on most 18-hole golf courses. Since the total area is relatively small and so critical to the game, pesticides found early use here. Their cost was justified because of the results they produced.

TEES

As the desire for better tees arose, the pesticide program used on greens became commonplace on tees as well. Members began to take special pride in healthy, well-maintained tees. This increased the pesticide budget, adding another one to two acres to the costs of pesticide materials, plus the man hours required to apply the materials.

Hand weeding crabgrass from greens. Remember when this was commonplace? Today it is a rarity!

FAIRWAYS

Members today demand perfection in fairway turf, too! Since fairways comprise anywhere between 30 to 50 acres on a regulation 18-hole course, the use of all chemicals is increasing on most well-managed golf courses. These include fungicides, herbicides, insecticides, and wilt-proofing materials. With this much ground to cover, the amount of pesticide required is a very significant item in today's golf course management budget. Its use must be carefully planned.

ROUGHS

Weed and insect control in the roughs are the two programs most regularly followed by the better maintained courses. There are a few courses where the roughs are treated in the same manner as fairways. In any event, as pesticide use is increased, all other factors relating to good turf management also increase. Factors such as aeration, thatching, more fertilizer, more lime, more irrigation—all of these practices, too, must be employed in a rounded program of management. Once a move towards perfection is made, it is necessary to work at it relentlessly to retain that improvement. Practices that improve are not onetime practices!

TREES

Trees are important to any golf course, and they come into strong perspective in the need for pesticides to keep them healthy and to preserve course beauty. In the East, the tragic loss of thousands of American elms, one of the best suited trees for golf strategy and course beauty, brings the importance of healthy trees into sharp focus. Tragically few elms have been saved, but many were sprayed with costly pesticides in a frantic last-ditch attempt at preservation. The labor costs in removal and replacement of diseased elms, or any tree, while not directly related to pesticide use, certainly must be classified as an unwanted budget item.

Developing a Program

In developing a pesticide program for your golf course, consider the following questions of economic and practical importance:

What is the life cycle, life history of the pest in question?

Is it an annual or perennial pest?

In what stage is it most susceptible to chemical control?

Can it be subdued more easily in one stage than another?

Is more than one annual pesticide application required?

What pesticides are available? In what formulation—pre- or post-emergence, wet or dry, powder or granular, wettable powder or emulsion? Cost comparisons of each?

What are the safe minimum and maximum use rates?

Have they been tested by turf researchers at the universities and/or experiment stations?

What has been the experience of golf course superintendents with each one?

Which formulation is right for you. Which can you apply the easiest and most uniformly with your caliber of labor and equipment?

Is there a residual effect on desirable vegetation? on soils?

Does it effect overseeding with desirable grasses?

How long a waiting period is required before new seed will germinate?

How do treatments affect desirable grasses?

Is there any diminishing effect on turf quality? What interferences to play and what effect on playing quality are members to expect?

Have you observed all the requirements for most effective, safe use?

Have you considered the effects on neighboring properties?

Did you read and understand the label?

Should an emergency arise, do you know the antidote?

Do you know who to call for medical assistance?

Do you know the telephone number of your pesticide control center?

When you consider that these questions need to be studied and answered for each pesticide used, some idea of the magnitude of the task behind a pesticide program comes into sharper focus. The larger the pesticide program, the more time required to bring it to effective staging. The larger the pesticide program, the more time required to study and plan all facets of a safe, efficient and effective project.

(courtesy Dr. Herb Streu, Rutgers University)

The hyperodes weevil from larva at left through pupa stages to adult at right.

TURF TWISTERS

BERMUDAGRASS OR BENTGRASS

QUESTION: We have Tifgreen bermuda greens and have been losing bermuda each spring. Can we convert to bent without rebuilding? We are about 700 feet altitude in the Piedmont area. (North Carolina)

ANSWER: Yes, if your greens were constructed properly originally. If not, changing grass alone may create a problem worse than your present one. If you have lost bermuda each spring, it would not be advisable to convert to bent without having a competent person familiar with bent growth habits check your greens.

BUMPY POA ANNUA

QUESTION: Our greens are solid *Poa annua* and every spring they are very bumpy. Why? (New York)

ANSWER: *Poa annua* is not a single pure strain. For example, there are a number of Kentucky bluegrass varieties such as Merion, Delta, Park, Windsor, Newport, etc. Each has a different growth habit, and so it is with *Poa annua*. Any one green may have thousands of separate types — some that will seed profusely, some that will not; some that are wide-bladed, some that are very narrow-bladed; some that are tall growing, some that resemble the short blade of Velvet bentgrass. With this hodgepodge of varieties, is there any wonder that growth is uneven — especially in spring when all *Poa annua* plants make their strongest growth?

TESTING: ONE; TWO; THREE

QUESTION: How often should soil tests be taken and what part of the course should they cover? Also, is there any certain time of year to take the tests? (Colorado)

ANSWER: Unless you have a specific problem or reason to test soil at a given time, soil tests every 3 or 4 years should be sufficient to keep tabs on nutritional and pH levels. Generally, the sampling of 4 or 5 representative greens and a similar number of fairways and tees will be sufficient to establish a "pattern" for you. The late fall, winter or spring months are the most popular for sampling. Once you establish a time, future samples should be taken during the same general period.