1969

Spring 1969

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More detailed information on the subjects discussed here can be found in bulletins and circulars or may be had through correspondence with the editor.

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Table of Contents

Design Features the Golfer Wants
by Geoffrey S. Cornish & William G. Robinson
Page 3

How Water Moves in the soil
by Walter H. Gardner
Page 6

Course Care in Winter
Page 8

Spray-on Protein Boosters
by S. K. Ries
Page 9

1969 Turf Conference Program
Page 12

How To Get More Benefits From Our Next Conference
Page 13

Budget Control
by Ken Voorhies
Page 15

Turf Analysis Test
by Dale Kern
Page 18

Tolerance of Various Turfgrasses to Foliar Applications of Road Salt
by W. E. Cordukes
Page 22

"He 'Fitz' The Bill"
by Gerry Flinn
Page 24
FIGURE 1: Hole No. 15 under construction at the Halifax (Nova Scotia) Golf and Country Club. The two ponds are strategically placed to provide a short route to the green for the long accurate player with a longer route around the ponds for the less experienced.

While National Golf Foundation figures show new course construction to be off in the nation in 1968 we do not find this trend to be pronounced in the Northeast and Eastern Canada. In fact planning and construction of municipal courses is booming. And in rural areas of northern New England, upstate New York and Pennsylvania any number of private clubs are being built with Farmers Home Administration financing. Long established clubs throughout the region are adding second and third nines. Other established clubs, notably in Canadian cities, are selling existing facilities for industrial and residential development and are moving into the country.

With funds from sale of their old courses amounting to millions of dollars, it is possible for these clubs to install 36 holes at the new site, larger clubhouses and many other facilities including swimming, indoor tennis and curling. Then there may be a million or more dollars left over to be invested with the interest helping to maintain these elaborate new facilities.

Committees at these clubs never leave a stone unturned to make sure the new course is what their members want. Indeed they travel far and wide in the U.S. and Canada and to Great Britain to find out what other clubs have received for their money. It is not surprising these committees become most sophisticated in their demands. It is therefore useful to outline several design features they expect in their new layouts. It should be added that more often than not the committee's insistence on these features is profoundly influenced by the fact that these features were absent on the obsolete layouts.

ADEQUATE LENGTH:

Most committees require 6600 yards or more from championship tees with shorter length from regular and ladies' tees. But it is variety and balance in length of individual holes that really counts. A balanced golf course calls for the use of every club in the bag by the average golfer. This provides a more testing and enjoyable round than does a short regulation course which can be
mastered with fewer clubs — although it is true that scores may not be lower on the shorter layout. It is also noteworthy that many a well designed par 3 or executive type course actually requires use of more clubs than do some regulation courses.

FREEDOM FROM VERY SHORT PAR 4’S AND PAR 3’S

Until recently architects stated that short par 4’s from 250 to around 300 yards comprised the no man’s land of golf design. With players getting more distance off tees we now find that par 4’s under 330 yards unless uphill, into a strong prevailing wind or to a severely contoured or very small green, are not really golf holes. On a 300-yard hole, for example, a golfer may muff his tee shot and still get home without difficulty on his second. Or he can play both his tee and approach shots with his 5 iron. The bold golfer using a wood or a long iron off the tee is therefore not rewarded in accordance with the contemporary philosophy of strategic design.

Until the introduction of the wedge, golf architects planned for a very short one-shooter 140 yards or less in length. Today, however, many a low handicapper can be so deadly with his wedge that invariably he puts for a two on these very short holes.

EACH NINE RETURNS TO THE CLUBHOUSE:

According to golf lore, Donald Ross felt the cardinal sin to be the playing of only 9 holes. At any rate the 9th on many of his older layouts was about as far as it was possible to be from the clubhouse. For decades this did not appear to be too objectionable. Provision was always made for an inside nine to return to the clubhouse. But once the tidal wave of newcomers to the game arrived on the nation’s courses after the Korean War it was found there were all sorts of objections to this arrangement — not the least of which is that the inside nine may receive double the play.

ABSOLUTE VISIBILITY:

Except on doglegs the ideal is to have every hazard, the landing area and the putting surface clearly visible from the tee. This adds to the thrills of golf. It is particularly thrilling for the player to see his ball roll on landing areas and on greens.

VARIETY IN TEE SHAPE AND LOCATION:

To obtain flexibility in yardage for championship play at one extreme and ladies’ play at the other, very long or multiple tees are needed.

FIGURE 2: York Downs Golf and Country Club under construction in Toronto, Ontario. Diagram shows grouping around clubhouse of starting tees and finishing holes of all four nine together with practice areas. Committees expect every nine to return to the clubhouse.
FIGURE 3: Compartment Green. The putting surface is divided into six to eight compartments with each compartment allowing for two to four cupping areas. The complete rotation takes around four weeks when the cup is changed six times weekly.

Some clubs prefer multiple tees although they create maintenance problems. Others prefer long tees. Again variety is the best solution. But with long tees it is important not to end up with many monotonous rectangles. Variation in shapes adds to eye appeal. In achieving these variations it is necessary to make sure that the larger part of the teeing surface is planned for regular play.

FREEDOM FROM TIE-UPS:
Until two years ago the achievement of this important point was one of the most difficult problems golf architects faced. Despite the utmost common sense in planning, serious tie-ups occurred on the new layout. Today computers help to prevent these bottlenecks by providing average waiting time at tees. From this architects can adjust plans accordingly.

FREEDOM FROM STEEP CLIMBS, BUILT IN MAINTENANCE PROBLEMS AND SHARP DROP-OFFS:
These problems have been discussed so often it is almost redundant to repeat them. Certainly the contemporary golfer abhors cardiac slopes, although some medical men have stated that moderate slopes are possibly better for the heart than continued walking on flat land.

New courses must be planned with machine maintenance in mind. The labor problem is now acute. It will probably be even more critical within the near future. Obviously a solution lies in the wonderful maintenance equipment now being developed or already on the market. However, many sharp drop-offs, steep rises and abrupt mounds will seriously limit machine maintenance on any course characterized by their presence.

PONDS IN MODERATION:
Water hazards add immeasurably to golfing interest. Nevertheless ponds can be overdone. Golfers are strange creatures. They travel South to play and enjoy courses with water on every hole. Yet if we work more than a few water holes into their courses up North we compromise the layouts in their eyes and thus reduce the pleasures of a round. Therefore the watchword on courses in the North in regard to ponds is moderation. Strategic placement is also a must.

COMPARTMENT GREENS
Committees often request compartment type greens (see Figure 3). Again, however, variety is of paramount importance. While we recommend several compartment greens on each nine, we do not feel 18 such putting surfaces are warranted on a course.

UNLIMITED EYE APPEAL:
Immaculate turf, stately trees, white sand and tranquil ponds automatically afford eye appeal. This beauty is further enhanced through arrangement of all features in accordance with the principles of art. Contemporary golf architects are intensely aware of these principles as in fact were many of their famous predecessors.

Contemporary man yearns for beauty more than ever before. It is small wonder that committees insist on unlimited eye appeal on every hole.

In summary, committees expect their new courses to be exciting and pleasurable for all types of golfers, maintainable without exorbitant outlays and with maximum eye appeal on every hole.
How water moves in the soil

by Walter H. Gardner

Walter H. Gardner is a soil scientist at Washington State University. This article is adapted from a two-part series that appeared in the October and November 1962 issues. Because of a steady demand from teachers and others, the issues have become virtual collectors’ items.

Water — as a liquid or vapor — is nearly always moving in the soil. It moves downward following rain or irrigation. It moves upward to evaporate from the soil surface, or into plant roots and eventually into the atmosphere through transpiration. Horizontal movement also is important as for example when water moves out from an irrigation furrow. Water movement can be in any direction depending on conditions.

Water flows through the open pores between soil particles. In an ordinary silt loam, for example, half the soil volume is pore space. Water and air share this pore space. For most plants it must be possible for air from the root zone to exchange with air from the surface. Air from the root zone is laden with carbon dioxide as a result of metabolism in the roots.

Pores in different soils vary in size and number. Silty and clayey soils generally have smaller pores but many more pores than sandy soils. Because of the number of pores, when silty and clayey soils are filled with water these soils contain more total water than sandy soil with all its pores filled.

Some of the water in soils with fine pores is held so tightly that it is unavailable. Even so, the amount that is available in these soils is greater than the amount available to plants in soils with large pores.

Two major forces move liquid water through the soil pores: gravity and adhesion. Gravity is most important in saturated soils. It causes a downward force on water. When a soil is near saturation, the large pores are filled and water moves rapidly through them.

When a soil is not saturated, the larger pores are empty and contribute little to flow. In the unsaturated soils in which most crops grow, the major force moving water is adhesion. Adhesion — together with cohesion, which causes water molecules to hang together — makes water move on particle surfaces and through the finer pores. These are the same forces that make water rise in capillary tubes and that account for the absorptive properties of blotting paper.
Water moves until the forces balance, at which point water films on soil particles are uniform in thickness throughout any homogeneous soil except for some vertical differences that exist because of gravity. If the soil is not uniform or homogeneous, the portions of the soil that have the smallest pores retain water most strongly.

In stratified soil — soil with various “layers” — the size of the pores in the strata affect water flow. If an advancing wetting front encounters fine materials, the resistance in the extremely fine pores may slow the movement. But the water nevertheless, continues to move. If the wetting front encounters coarse materials, water movement stops until the soil becomes nearly saturated.

Stratified soils also tend to hold more water for plant use than uniform soils. Since the different layers slow the movement of water, more remains in the root zone.

Uniform or homogeneous soils

Water was added to the center of this dry homogeneous soil. Under this unsaturated condition the water moves out almost equally in all directions. Gravity has only a small effect as indicated by the slightly greater downward wetting. Under saturated conditions, or as saturation is approached, gravity begins to play a much greater role in water movement.

Clay layer

When water reaches the clay, the very fine pores of this layer resist water flow. Although water does pass through the clay, its penetration is so slow that water tables often build up above the clay. Some plow pans act similarly.

Sand layer

When water passes through fine soil and reaches a layer of coarse sand it stops until enough water accumulates to nearly saturate the fine soil. When the fine soil is almost saturated the water readily moves from it into the large pores of the sand. This is much the same as adding water to blotting paper. Only when the blotting paper is near saturation does it begin to drip.

Coarse sand or gravel subsoil

Fine soil overlying a coarse sand or gravel subsoil must become very wet before water will move down through the large pores of the subsoil. Under these conditions the overlying soil holds up to two or three times as much as it would if the coarse subsoil were not present.

Layer of coarse aggregates in fine soil

Any change in soil porosity encountered by a wetting front affects water movement. A layer of coarse soil aggregates acts much like a layer of sand, with one important difference: water can move through the interior of the aggregates themselves. But the relatively small number of contacts between the aggregates limits the amount of water that actually moves through this layer. Only when the soil is nearly saturated does the water move rapidly through the soil aggregate layer. Saturation was not reached in this test.

Vertical mulching

Here, deep vertical channels are cut in the soil and filled with chopped organic matter. If the channels remain open to the surface, the large pores in the organic matter take free water from rain or irrigation and transmit it deep into the soil. Then it is absorbed by the soil. If the channels are not open to the soil surface, vertical mulching does little good.

Holes left in the soil by angleworms, rodents, or decaying crop residue act like vertical mulch channels. If they remain open to the surface and exposed to free water, they carry water readily. These open channels or holes also help soils with poor aeration by permitting the exchange of gases between the soil atmosphere and the air above.

Straw or organic matter layer

Straw plowed under and left in a layer forms a barrier to the downward movement of water much like a layer of sand or coarse soil aggregates. If the straw is mixed with the soil, its decomposition releases substances which help to maintain the open porous structure created by plowing. Where the porous structure extends to the soil surface the large pores speed downward movement of the water.

Soil texture and infiltration

Water was applied to three soils at the same time and rate. Infiltration and the advance of wetting front is more rapid in sandy soil than in either loam or a clay soil.

Soil texture and water-holding capacity

The same amount of water was applied to each of three soils. The clayey soil holds the water in a smaller proportion of its volume than either the loam or the sandy soil. This indicates that clay soils can hold more total water than either loams or sands. Because they hold more water, fine silt loams and clay loams are likely to be better soils for dryland farming than coarse sandy soils. But under irrigation the poor water-transmitting properties of such soils make them less desirable than sandy soils.
Uneven surface
If water is applied to rolling or hilly terrain more rapidly than it can infiltrate, it runs off the high spots and accumulates in the low spots where it penetrates to greater depths. If the water application rate equals the infiltration rate, the soil wets uniformly. Surface conditions favorable to high infiltration rates permit higher application rates with uniform wetting.

Soluble fertilizers move with water
Dye tracers indicate the direction of water movement in irrigation furrows. Water and soluble fertilizers move almost radially away from the point where water was applied in the furrows. After the wetting fronts join, the direction of flow changes slightly. Above the water level of the furrows, the movement is upward toward drier soil. Below the free water level, soluble materials move downward. In addition, evaporation from the soil surface causes an upward movement of soluble materials in the soil solution.

Reprints of this article are available at 25 cents each (prepaid) or $20.00 for 100 copies from CROPS & SOILS MAGAZINE 677 South Segoe Road, Madison, Wis. 53711. Write for prices on larger quantities.
A 27 minute, 16 millimeter color, time-lapse motion picture film with sound and 35 millimeter color slides illustrating the principles shown are available from the Agronomy Club, Department of Agronomy, Washington State University, Pullman, Wash. 99163.

Course Care in Winter
Here are some basic recommendations to follow when playing in cold weather:
(1) Call to see if course is open for play before you go. Expect that it will be closed on days when weather so dictates. February 1 through March 15 is the most critical time for turfgrasses—try to arrange matches before and after these dates.
(2) Begin play after the grasses have thawed. Frozen grasses are brittle. They bruise and break easily when trampled. This may permanently weaken them.
(3) Avoid all puddles. Traffic through puddled turf breaks down soil structure, adds to compaction woes.
(4) Do not walk across a green or tee when you can avoid it. Keep steps to a minimum on each. Move on and off tees and greens by the most direct route.
(5) Step lightly around cups. Don’t try putts a second time. Play one ball, don’t re-play shots to greens.
(6) Repair ball marks carefully. If the turf is soft, divots will fly as the ball “bites.” Stretch these pieces of sod and carefully replace them in repairing each ball mark.
(7) Wear shoes with recessed spikes, or spikeless shoes for winter play.
(8) If conditions become too soft any time, pick up and try again tomorrow.

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Spraying small quantities of a herbicide on plants that ordinarily would be vulnerable to the chemical seems to raise their protein levels. The diagram shows where the simazine may act to increase protein content.

Chemicals are used worldwide as plant nutrients and to control plant pests. Now it may also be practical to utilize chemicals to increase desirable nutritive constituents such as protein.

A common weed killer applied at rates too low to control weeds may lead to improved diets in developing countries. The chemical is simazine. When it is sprayed at low rates on susceptible crops such as beans, rice, and forages, it dramatically boosts the protein levels of the crops.

Intolerance a virtue

We first thought that simazine might raise nitrogen content (and, hence, protein) when we saw in 1961 that the leaves of apple trees sprayed with simazine were a darker green than unsprayed leaves.

For several years, we worked with plants that are tolerant to simazine — apple seedlings and corn. It was not until we tried this chemical at extremely low concentrations on susceptible crops that we obtained a substantial response.

In laboratory tests in 1966, we found that extremely low levels (40 parts per billion) of simazine increased the total water extractable protein of young rye plants from 20 to 79 percent. We also grew a crop of peas to maturity in growth chambers with an increase of more than 40 percent more protein per plant in the seed.

These increases were consistently obtained under widely varying temperatures, levels of nitrogen, and amounts of light. However, the maximum increases were obtained when the temperature and nitrogen level were too low for the best growth of the control plants.

In the spring of 1967, we started field experiments at East Lansing and Fremont, Mich., and at two locations with different tropical
environments near San Jose, Costa Rica. In most of these tests the crops were fertilized, planted, and handled as growers customarily do. The herbicides were sprayed pre-emergence in most cases, but the spraying rates were one-sixteenth to one pound per acre. Such low rates usually won’t kill weeds.

The results from the field tests were encouraging. All the forage and seed crops harvested, except corn, which is resistant to simazine, increased in protein content or yield or both. Under the vastly different environmental conditions of Michigan and Costa Rica, simazine sprayed at one-half pound per acre or less increased the total crude protein per acre as follows: Rye grass forage, 52 percent; canning peas, 41 percent; alfalfa forage, 10 percent; edible beans, 45 percent; oat groats, 12 percent; rice foliage, 33 percent. The water extractable protein was also analysed to further substantiate the protein increases.

Other chemicals, too

To us it is remarkable that such large responses could be obtained considering how little information we have about the best rate, method, or time of simazine applications. And simazine isn’t the only chemical that could be used. Atrazine, diuron, and terbacil cause similar effects, but we do not know which chemical is best for individual crops.

How does simazine increase a plant’s protein content? It’s not clear, but we do know that some changes take place in the metabolism of the plant when very low concentrations of simazine are applied to rye or oat plants in the laboratory.

Enzyme changes

Within a few hours after application of low concentrations of simazine to rye or oat plants in the laboratory, the nitrate level and the amount of nitrate reductase enzyme increase. The plants respire more rapidly and take a higher percentage of nitrate out of the nutrient solution. The increased levels of nitrate are reduced to ammonia which is incorporated into amino acids and ultimately into more protein. Thus it is logical that the response will be greater where either nitrate or temperature are below the optimum level for plant growth.

Nitrogen insurance

Usually during the growth of a crop, nitrate availability and temperature are limiting, therefore this type of chemical may eventually be used as insurance against nitrogen deficiency in areas where nutrients are not usually deficient.

In developing countries, where nitrogen is the most limiting plant nutrient, we might expect to get rather dramatic results from the application of one-eighth to one-quarter pound an acre on almost all grain and forage crops that are susceptible to the chemical at normal rates used to kill plants (2 to 4 pounds an acre).

Resistant plants apparently do not respond because they change the chemical very rapidly to a non-toxic compound, that does not affect protein synthesis.

Although the simazine increases total protein while the amino acid composition and protein composition stay the same, it is still necessary to prove the increased protein is truly useful to animals.

Regardless of the problems, we believe that our laboratory and field research have proved that plants will accumulate more total protein in response to simazine. We also believe that this research suggests a new approach for increasing total protein and food productivity, particularly in developing countries. The obvious advantages are that the treatment is inexpensive (less than $1.00 per acre), easily applied, and should not conflict with cultural patterns and traditions.

More efficient N use

Besides increasing protein content, U.S. growers may also benefit from these findings by using small quantities of chemicals such as simazine to increase the efficiency of their nitrogen applications particularly under sub-optimal growing conditions.

Laboratory results and field studies with fruit trees indicate that simazine doubles the plant’s efficiency in taking up nitrate, thus cutting the necessary nitrogen rate applied in half.
How Agway helps bring golf to you in living color

Agway serves golf course superintendents everywhere in the Northeast from the ground down.

Lynn Kellogg (right), superintendent, Oak Hill C. C., Rochester, N.Y., and Agway's Bob Carson discuss condition of the greens in preparation for the 1968 U.S. Open. Carson is an Agway specialist in professional turf maintenance.
1969 TURF CONFERENCE

"Better Turf through Research and Education"

On March 5, 6, and 7, 1969, The Massachusetts Cooperative Extension Service, The Massachusetts Turf and Lawn Grass Council, and the Golf Course Superintendents Association of New England will sponsor their annual Turf Conference at the Highpoint Motor Inn, Chicopee Falls, Mass. (Exit 5, Mass. Turnpike). The three-day event will feature lectures by some of the foremost turf authorities in the country and is headed by Mr. John K. Campbell, links supervisor of St. Andrews in Scotland. For information regarding registration, room reservations and meals write to:

Dr. Joseph Troll
RFD No. 2
Hadley, Massachusetts

Conference Program

WEDNESDAY, MARCH 5

- Morning -
11:00-1:00 Registration - Lobby
- Afternoon -
GENERAL SESSION
Hall of Fame
Chairman: Mr. Anthony Caranci, President
Golf Course Superintendents Association of New England
1:00 Welcome
Dr. Frank W. Southwick, Head
Department of Plant and Soil Sciences
University of Massachusetts
1:15 The Reluctant Human
Professor John Denison
University of Massachusetts
2:00 Communicating
Mr. Frank Gallagher
Hercules Incorporated
2:45 Break
3:00 Vandalism on the Golf Course
Mr. E. B. Patroski
Pinkerton's Incorporated
3:45 GCSAA Organization - and What It means to You
Mr. John Spodnik, President
GCSAA
4:45 Lunch
4:45 Massachusetts Turf and Lawn Grass Council Membership Meeting
- Evening -
8:30 Films
Room ABC

THURSDAY, MARCH 6

GOLF COURSE SESSION
Hall of Fame
Chairman: Mr. Anthony Caranci
- Morning -
9:30 The Role of Potash in Turf Production
Dr. Lindsay D. Brown
Southwest Potash Corporation
10:15 Dew Is Not Dew
Mr. Tom Mascaro
West Point Products Corporation
11:00 Review of Turf Diseases
Dr. Joseph Troll
University of Massachusetts
11:45 Lunch
- Evening -
1:30 Insects in Turf and Their Control
Dr. John C. Schread
Connecticut Agricultural Experiment Station
2:15 Turf Treatment and the Balance of Nature
Dr. Haim B. Gunner
University of Massachusetts
3:00 Break
3:15 The After-Effects of Irrigation
Dr. John C. Harper, II
Pennsylvania State University
7:00 Banquet
Room ABC
Chairman: Dr. Joseph Troll
University of Massachusetts
Speaker: Bob Ronson
"Trust Everyone but Cut the Cards"

ALTERNATE SESSION
Room ABC
Chairman: Mr. George Moore, President
Massachusetts Turf and Lawn Grass Council
- Morning -
9:30 Athletic Field Specifications and Maintenance
Dr. John C. Harper, II
Pennsylvania State University
10:15 Seeding vs. Sodding
Mr. Norman A. Gray
Transit Seeding, Incorporated
11:00 Synthetic Turf
Mr. R. Spencer Thompson
Monsanto Company
11:45 Lunch
How To Get More Benefits From Our Next Conference

The key to bigger returns from conference attendance is planned participation. Now that the event is just around the corner, it will pay you to heed these reminders, which are based on member experience.

1. Evaluate the program. Study every session, speaker, social function, etc., well in advance, to get them fixed in your mind. Underscore the ones that interest you most. Then some last-minute distraction is less likely to divert you.

2. Summarize your needs. One of the main reasons for holding the conference is to bring members together, so they can swap ideas and solve each others’ problems. Jot down your own concerns and dilemmas and bring your notes to the meeting, so you can get first-hand advice and suggestions. Use it as your “shopping list” for ideas and solutions.

3. Command attention. Once at the conference, be sure to speak up. Don’t wait to be called upon; if you don’t inject your interests and problems, who will? Take advantage of discussion periods, and reciprocate by answering as many questions as you can. There’s a way to do this without appearing to dominate. First, hold back to see if others have an answer; second, accumulate three or four unanswered points and tie them together when you take the floor.

4. Keep on the go. Circulate — don’t hide away. The convention is a banner opportunity to contact others and learn what you want to know. Breaks, luncheons and impromptu “bull sessions” sometimes yield better returns than the formal sessions. You can absorb a lot, just lounging around with people and talking shop. That’s no reflection on the program, which is the catalyst that brings the group together.

5. Don’t hide away. Eat with someone different every meal. “Float” at parties and receptions. The member you haven’t spoken to yet may help you most.

6. Get directions. If you don’t know which members can aid you with a given problem, consult an officer or someone on the staff. They usually know who is most qualified or experienced in particular areas, and can steer you to the experts.

7. Introduce yourself. Your badge gives you the right to accost new people, most of whom will be pleased to get this attention. Years later, some will say, “You were the first person to speak to me at my first convention.”

8. Make notes. In the rush of activity, it’s easy to forget specific tips, names and sources. Keep a special notebook and write them down while they are fresh in your mind. After adjournment, if you need more information, you can follow up by telephone or letter.

Your fellow members will be glad to hear from you.

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Budget Control

Budgets may make or break a golf course superintendent. Few professionals are subject to more pressure for more favors from clientele than are superintendents. Seldom does a day of the season pass that some good, solid club member does not offer a suggestion for betterment of the course.

A firm budget and the information at hand to put a dollar cost on any maintenance item or course change can solve a lot of problems which involve improvements. Ideas or notions, as the case may be, can be placed in perspective. Solid suggestions, with the proper dollar cost, can be submitted to the greens committee or directors for consideration. Committing these to action then becomes a matter of extra funds, or limiting of some current item to fit them into the existing budget.

For Ken Voorhies, 10-year veteran superintendent at Columbine Country Club, Denver, Colorado, a routine record system has been the answer. His budget for the coming year can be firmed up within hours, using the past season’s records as a base. Most important, Columbine directors appreciate an accurate accounting of funds, broken down by the job. Further, they know that estimates of improvement costs or changes in maintenance will prove reliable.

Records Are Routine

Of particular interest is the fact that Columbine’s superintendent has been able to develop such a system without becoming a slave to records, a timekeeper or an accountant. He uses a time clock system and some simple forms on which he records daily work. These daily work records are totaled by pay periods monthly and then by season. The end result is a dollar cost and an hour figure for each job and for each type of maintenance or course change.

Columbine is one of the top 20 courses which is still operated under a budget of less than $100,000 annually. This includes no tournaments, no capital improvements, no new construction. When these are planned as is the case practically every year, past time records show what cost these will entail, almost to the dollar. For example, the recent PGA tournament held at Columbine required 8744 extra hours of labor for grounds and maintenance crews. This was in addition to the regular 24,000-hour yearly workload for the course. Normal labor rates for the area are now about $2 per hour.
Simple multiplication pinpoints costs, for extras or regular work.

The time card is used in conjunction with a time clock. Men punch in and out. However, the time card contains a chart for date, job code, and total hours spent during the day for each type of job.

**Jobs Are Numbered**

Job codes are simply numbers which are used to speed up the record system. Codes begin with watering which is No. 11, mowing fairways, No. 13, etc. These records are utilized in making final monthly and yearly totals, allowing easy comparisons of variations by year and season. The Columbine Club's fiscal year is Nov. 1 through Oct. 31. Once October hours are posted, a detailed report is prepared and this is used to set up a budget for the new year. This is practically automatic since detailed work and cost records are easily available.

Records also work to facilitate changes or operational improvements. Voorhies, who checks his course by golf cart four times daily during the playing season, says maintenance can be studied with records in hand. This permits charting moves for new efficiencies. Noting that trap maintenance was running more than 2000 hours every season, the operation was checked closely for a time and 300 hours per season were cut off this type maintenance.

Besides hourly work records, monthly statements are furnished to Club officers on maintenance costs, golf shop profit, golf cart income, and green fees.

Currently, records on watering costs are helping to show the validity of a new automatic watering system. The proposed system, which is estimated to cost almost one-quarter million dollars.
dollars will cut 30 percent off water use. It can be shown that the system will amortize itself over a long period. The plan includes radio receivers or channels for each station, with a probability of several hundred channels. Columbine is fortunate in having telephone and electricity available on each hole, which makes such a plan feasible without being unduly high in cost.

Interesting on the Columbine Course are hard-surfaced (some gravel and some asphalt) cart paths. No one is allowed to stray off these trails. The 70 carts thus do not damage turf. These carts are washed and waxed twice weekly with a jet spray. One man can service 20 carts per day.

The current system of record keeping was started in 1959. It was felt that it would be valuable as a public relations tool with the Board of Directors and would facilitate the mammoth rebuilding and improvement job believed to be necessary on Columbine’s 18-hole course. Pinpointing costs and spreading improvements over a period of years have developed what is now a well planned and challenging course. It was selected for the ’67 PGA tournament, which incidentally had been planned for the previous year but was stymied by the mammoth Denver flood of 1965.

Turf quality is important in the thinking of Columbine’s Golf Course superintendent and he has become a specialist in turf care. A regular program, with heavy outlays for fertilizer and chemicals, is carefully followed. This is one reason for seeking a watering system which will help put the right amount of water on with more efficient timing.

Records, Voorhies believes, are the basis for developing an overall management system. Being able to predict unusual expenditures gives the superintendent a status with club officials which aids in developing programs which are mandatory if a course is to show progress in terms of improvement and satisfaction to those who use it.

---Reprinted from WEEDS TREES and TURF Vol. 8, No. 1

---Master sheets, such as this specimen, are used by Voorhies for keeping records by jobs performed during each pay period. Employees are paid twice monthly. Note that job code numbers pinpoint the type of work done and the date and time spent for each employee.

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Turf Analysis Test

By DALE KERN

Today there is good news for you who are professional turf men. No longer are you forced to live with the law of averages when you plant seeds! This law of averages indicates that 20 percent of the professional turf men who seed grass on golf courses will be sowing *Poa annua* up and down fairways next spring. That's one of every five.

Again, the law of averages says 8 percent will be dropping timothy seed from tee to green on No. 7 or maybe the other seventeen. Four percent will be planting sorrel — and 5 percent will infest fairways with chickweed, come planting in May.

These percentages are dictated by the law of averages. But, this law, like every law, has a loophole.

"Beating the law of averages" wasn't conceived by my profession. The United States Department of Agriculture thought of the idea many years ago. In fact, this department established the standards that the seed industry must meet in order to sell seed.

Standards established by the USDA were designed to protect the farmer from unscrupulous seed merchants. As you know, every lot of seed offered for sale must carry a tag or label. The seed grower and seed merchant must be sure his seeds are properly labeled before they are offered for sale. So, the grower or merchant submits samples of seeds to laboratories for testing. These laboratories meet the specifications established by law, and provide the seed merchant with a certificate of analysis. Now the merchant can legally label and sell his seed.

This is a good arrangement; except — government regulations and standard laboratory tests DO NOT GIVE YOU, THE PROFESSIONAL TURFMEN, WHAT YOU NEED.

Why?

Standard laboratory tests that meet government specifications fail to tell the full story. A standard analysis tag means different things to different people. To the merchant, it means he can legally sell his wares. To the lab technician, it means all his procedures have complied with Federal Seed Act Regulations. To the buyer who will plant the seed, this tag could mean almost everything . . . or practically nothing.

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need the sustained feeding of NITROFORM® nitrogen — a ureaform turf food that is long-lasting, nonburning, odorless, resists leaching, and builds a residual. Available as granular free-flowing BLUE-CHIP® for mechanical spreaders and as sprayable POWDER BLUE+ for liquid application.

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buyer? Simply this: 97.85 pounds in every 100 pound bag is pure Merion bluegrass. The other 2.15 pounds are made up of inert, crop and weeds.

If you know the percentage of pure seed, and the total number of pounds in the lot, it's a matter of multiplying the percentage by the total weight to know the pounds of pure Merion bluegrass you are getting for your dollars. There isn't much to guess about in the "Pure Seed" category.

Back to the tag — this time look at Crop percentage. Here we find the percentage figure .10%.

Now, what do you know?

Well, you know that by weight there is about one-tenth of one percent Crop Seed in the lot. You also know Crop is any seed grown for economic purpose.

Anything left to guess about? You better believe there is! First of all, what kind of crop makes up this one-tenth of one percent by weight?

If you guess Delta, Park, Newport bluegrass, or seeds of Red, Chewing or Illahee fescue, no problem. The plants produced by these seeds will probably never be noticed by the average golfer.

But, if you guess wrong — if the crop seeds are timothy, redtop, tall fescue, ryegrass, Orchard grass or bentgrass — you're in trouble. Most of these are pasture grasses. Their plants are broad-leaved, off-color, fast growing clump or bunch grasses, and appear unsightly to everyone.

**How Many Seeds**

Here is something else in the Crop category you can guess — HOW MANY SEEDS are represented in this .10%.

As you know, all crop seeds are not the same size. Some are large, some are quite small. They come in assorted sizes. The .10% represents only about 1½ ounces in a hundred pound bag.

Suppose you are going to seed a new fairway that is about 400 yards long and 50 yards wide.

If .10% by weight of tall fescue (the seeds being quite large and heavy) this would be equivalent to 54,400 plants of this type up and down your fairway.

If this were .10% Orchard grass, it would give you 364 seeds per pound, or 72,000 pounds in your fairway of this type of plant.

Another old pasture grass often found in Merion is timothy. That .10% would produce 254,000 plants of this nature up and down your fairway.

The smallest crop seed we see is bentgrass. Seed is so small that .10% by weight equals 948,000 seeds in the 200 lbs. of Merion bluegrass required.

(Continued on Page 20)
(Continued from Page 19)

to seed that 400 x 50 yard fairway. Yes, that is right, 948,000 seeds providing bent patches all up and down your fairway.

In each case, the .10 percent of the crop seeds just mentioned would be a serious problem.

**Inert Materials**

Now we come to inert — the percentage by weight of anything that is not classified as seed. This could be corn cob, ground up hay, sand, or chaff — we’ve seen them all.

Here we see the figure 2.00%. The only type of inert likely to be present in the seed you are buying is chaff, which are empty hulls.

Now, let’s consider the last item on our now familiar tag. Here we see weeds, .05%.

Simple arithmetic — and you will know the number of ounces or pounds of weeds in a lot of seed.

From this point on the prognosticator can really have a field day. And, I know of no place where guessing wrong carries greater penalty.

You can guess:

1. What kind of weeds are in the lot?
2. Are the weed seeds large or small?
3. How many seeds does this .05% represent in a 100-pound bag?
4. Are they problem weeds?
5. Will the weeds survive low, frequent mowing and a freezing winter?
6. Will the weeds spread out in all directions by underground stems called rhizomes?
7. Will the texture and color stand out and be unsightly?

If we take that .05% weeds and start seeding our 400 x 50-yard fairway, here’s what could happen.

This .05% by weight of knotweed, when expanded to the fairway, would give you 75,000 of these plants to distract from the uniformity of your bluegrass. Suppose it’s only .05% of chickweed. These seeds are extremely small and you could place 4 to 5 of them on the head of a pin. Their smallness would account for 560,000 of these plants up and down your fairway. Let’s take a look at an old familiar one to all. If the .05% weed happened to be all Poa annua seeds that would calculate out to 151,200 annual bluegrass plants to combat. We regularly see these weeds present in that amount. It is obvious that out in the fairway not every one of these problem seeds survive. Many do not germinate, others start to grow and are not strong enough to survive. Still others will lay in the soil for some years before they come forth to plague you. However in these great numbers, enough of them will make it to create real problems.

**One Gram Tests**

Now, let’s consider one gram of seed. It fills a teaspoon about 2/3 full! This is the amount of seed the U.S. Department of Agriculture recommends to be used in making a purity analysis. Every laboratory in the country uses 1 gram of seed (Merion bluegrass included) to determine the percentage of pure seed, crop, inert and weeds.

This one gram is sub-divided from a large amount of seed, and could represent 5 pounds or 5,000 pounds. In spite of the very small amount of seed used, the test is fairly accurate.

When I say this one gram test is fairly accurate, I do not wish to infer that it is always adequate. This is pretty much the crux of our discussion — what is adequate for the farmer, the home gardener, or the housewife is by no stretch of imagination adequate for you as a professional turfman.

Let me explain!

Suppose we take the two items you are most interested in when you buy a lot of seed; namely, weed and crop. As I said before, every laboratory in the country uses 1 gram (or about 2/3 teaspoon of seed) in making the test. Now, if no weeds or no crop are found in this very small amount, naturally the tag would read "NONE" under the weed column, and .00% under the crop column. You, as the buyer, would assume when you read the tag that the entire crop was free of weeds and crop.

Unfortunately, in most instances this JUST ISN'T TRUE!

If the seed laboratory were to take 10 or 25 times the original one gram and examine this amount of seed, the analyst would come up with quite a different story.

State and Federal agencies recognize the inadequacy of the one gram test. To protect the buyer, these agencies specify that 25 grams be examined for certain weed seeds.

**Which Weed Seeds**

The Certification agencies say the seed laboratory must look for certain weeds and list them as they examine the 25 grams. There are two that might be a problem to you; quackgrass and wild garlic. You can forget about the rest; you’ll never have a serious problem with them. Keep in mind that this list was designed to cover all kinds of certified seed, not just Merion bluegrass.

What happens when the seed analyst detects other weed seeds that you and he know could be very bad in your fairway? Now remember, the government and certification instructions say to list ONLY THE WEED SEEDS SPECIFIED. Well, the analyst ignores the other weeds — that’s what he is instructed to do.

How many crop seeds will the analyst list as he examines this 25 grams? The answer is NONE.
The 25 gram examination is for certain weeds only, and that is precisely how the test is conducted. Weed seeds not on the list, and all crop seeds are ignored in the 25-gram test.

We at Seed Technology, Inc., have recognized for a long time that standard tests and simple compliance with government and certification regulations is inadequate. Professional turfmen need more information than this from a Seed Laboratory.

**Turf Analysis Test**

From this philosophy and to give precise information, we developed the TURF ANALYSIS TEST. This Turf Analysis test is designed especially for the professional turfman in the golf and sod areas. It is not structured to meet government (either state or federal) specifications, neither is it designed for the farmer or any certification group.

The upper one-third of the Turf Analysis test report sheet is the standard purity test, meeting government requirements. The information given in this section is no better (or no worse) than the information you get on every tag. The BOTTOM TWO THIRDS lists 49 of the most troublesome crop and weed seeds to the professional turfman, for whom the analysis test was designed.

But even more significant than the crop and weed seeds listed, is the fact that we examine 25 grams of seed when making this analysis, in order to improve the chances of finding crop and weed seeds.

For a comparison of a standard test and a Turf Analysis test, made of the same lot of seed, see Example I and Example II.

The standard report shows a purity of 98.43; Crop .16; Inert 1.41 and .00 weeds, based on 1 gram sample. True, we did not find any weeds in the 1 gram purity test, so none is listed. On the standard test we then examined the large 25 grams of seed for the noxious or prohibitive weeds on the Certification list and again we did not find any so “none found” is typed on the report. The standard test requires the examination of 1 gram for “other weeds and crop.” This we did and reported “none found” under other weeds and .16% Kentucky bluegrass under crop. This from the surface looks like very acceptable lot of seed. Certainly no one would hesitate to seed it.

Now let’s take a look at the same seed when subjected to the Turf Analysis test. The 1 gram purity remains the same. The percentage of pure seed, crop and weeds does not change. However, when we examine the large amount for everything present, the true picture comes to light. When we examined the 25 gram for crop we found 91 bentgrass, 72 ryegrass, 18 timothy for a total of 181 per pound of obnoxious crop seed. When we examine the 25 grams for all weeds and not just the few in the states or certification list, note what happened. Instead of reporting “none found,” we list 7 different kinds of weeds for a total of 797 weed seeds per pound. Included in the 797 weeds per pound are such things as 109 seeds of chickweed, and the presence of Poa annua at the rate of 91 per pound.

**Poa Seldom Wanted**

Poa annua is not considered prohibitive for certification and is considered noxious in only a few state seed laws. But we know what a bug-a-boo it is to most turf professionals.

(Continued on Page22)
TURF BULLETIN

(Continued from Page 21)

*Poa annua* is a member of the bluegrass genera, and to the naked eye or under low magnification, it is literally impossible to distinguish it from other bluegrass. Put this same seed under a microscope and the difference is easy to spot.

Here's the problem: The total viewing area under the microscope is about the size of the head of a thumb tack. Now, how do you glue 48,000 seeds to the head of tacks, and then place all of these tacks, one by one, under the scope?

Obviously, this is impossible. At Seed Tech, we search for *Poa annua* under a microscope. We have combined special vibrators with a microscope, and march the seeds in a single layer under the scope. This enables our analyst to look at more seeds under higher magnification in much, much less time.

A special microscope check is made on approximately 40,000 seeds to tell you how much *Poa annua* is present in every pound of seed. And, we know we're right!

Another interesting operation made in every Turf Analysis test at our lab is the bentgrass check. Bentgrass is an extremely small seed, and has the tendency to lodge or stick to larger seeds and ride over the screens during the cleaning operation.

The bentgrass seed is still riding "piggyback" on the larger seed when it comes into the laboratory. This means the larger seed could, and in many instances does, hide the bentgrass from the analyst's view. You just can't turn over 120,000 seeds to see what's hiding underneath.

We solved this problem at Seed Tech by developing a special piece of equipment that literally shakes the bentgrass seed out of the larger seed. Since the bentgrass seed is smaller, it passes through special screens and is easily collected, and examined under a microscope. We are the only laboratory in the country making this kind of a check.

In the Turf Analysis test, you get the name (and number per pound) of every weed seed and every crop seed found in a 25 gram sample! This includes a special 10 gram *Poa annua* and bentgrass check.

**New for the Industry**

If you went to your family doctor for an examination along about the time the government set up the first standards for the seed industry, here is about what the good ol' doc would have done: Looked down your throat, checked your pulse and listened to your heartbeat through his stethoscope. And, that's about it.

Since that time the medical profession has developed techniques, instruments and equipment that stagger the imagination. But, the seed industry has not made similar strides which are necessary.

What will tomorrow bring? What are we experimenting with today that will make your profession more efficient and more useful tomorrow? We can list three projects. One is available now. The other two could make exciting news — maybe next year, maybe five years from today.

In the future we see first the use of chemicals to learn if a seed is dead or alive, weak or strong. Second, the use of electronic eyes to count the seeds that germinate and measure the rate of growth. Third, micro photography will enable us to make a fingerprint of a plant or single leaf and identify its variety or trueness to type.

The chemical triphenyl tetrazolium chloride is now being used by Seed Tech to quickly determine the germination potential of a lot of seed. At Seed Tech in 24 hours and for the cost of a carton of cigarettes you can get the known germination. This is our Tetrazolium test. The live embryo shows red, the dead seed remains white. At the present time about all we can give you in germination is the total percentage that will grow. Two lots of seed each germinating 90% can be quite different. One could be a vigorous fast growing lot and at 10 days 80 plants out of a 100 would have grown to an inch height with an inch long root. In the same 10 days, the other lot might have only 30 plants of equal height and root length. With the use of electric eyes and counters we will soon be giving a germination percentage plus an A, B, or C rating depending on how many and how fast the seeds grow. This could mean cutting the critical time required to establish turf by days through choosing a fast growing lot.

The trend is for more and new varieties of grasses to become available to you. As this continues it will become increasingly important to make certain that the variety is not some old one with a new name and secondly that when you pay a premium price that you get what you're paying for. There is good promise that by making a fingerprint of the leaf surface and then photographing it through a microscope, it will some day be possible to identify a single plant or possibly a single leaf, making certain that you are getting that highly desirable grass that you want. This service will no doubt be forthcoming in the future.

The Turf Analysis test is a break-through in giving information, and more insight into what to expect when you buy a lot of seed. But, no one recognizes more than we at Seed Tech that we must offer more comprehensive tests and analysis in the months and the years to come.

—Reprinted from WEEDS TREES and TURF Vol. 8, No. 1
TOLERANCE OF VARIOUS TURFGRASSES TO FOLIAR APPLICATIONS OF ROAD SALT

by W. E. Cordukes

Plant Research Institute, Ottawa, Ontario

Road salt is commonly used in most areas of Canada in winter as an aid to snow removal and to enhance vehicular and pedestrian traffic. Thus turf areas located along household paths and lanes, sidewalks and roadsides are subject to the frequent splashing action of road salt solutions. Various turf species may be used on different sites and are thus subjected to such action. The extent of damage to the turf is dependent on the frequency and concentration of the salt solutions, depth of snow cover and the degree of leaching from melted snow and rain in spring. Little information is available on the tolerance of turf grasses to road salt spray treatments applied. The bentgrasses, Poa annua L. and creeping red fescues were more sensitive to the salt treatments than Kentucky Bluegrass. Tall Fescue (cv. Kentucky 31) and Norlea Perennial Ryegrass were the most tolerant species in this test. Of the various Kentucky Bluegrass cultivars, Fylking a Danish strain newly licensed for sale in Canada, was slightly more tolerant than common. A comparison of data obtained from pots of mature Merion Kentucky Bluegrass and that obtained from newly established Merion, suggest that old or mature turf might be less tolerant of such salt sprays. There was also a difference in the salt tolerance of three common lawn weeds. Mouse-eared Chickweed was particularly sensitive to foliar salt applications. However, despite marked visible damage from the treatment, this weed continued to produce new vegetative growth. Common Plantain, however showed little visible effects due to salt spray. Following an immersion and leaching with water and a 35-day recovery period, all turf species produced fresh foliar tissue. Dry matter yields taken at this time indicated that all species had fully recovered from the salt foliar treatments.

This experiment indicates that most turf species can withstand considerable amounts of foliar road salt sprays and that certain species are more tolerant than others. Tall Fescue was particularly tolerant and thus would be a useful component of turf mixtures subjected to frequent splashing from road salt. Norlea Perennial Ryegrass, frequently used as a nurse grass during establishment of the more permanent species would also be useful for such locations. The results of this test would also suggest that leaching or hosing with water of salt-damaged turf in spring would tend to reduce turf injury and enhance recovery.

In November, 4 cultivars of Kentucky Bluegrass (Poa pratensis L.), 2 cultivars of Creeping Red Fescue (Festuca rubra L.), 2 bentgrasses (Colonial Bentgrass, Highland type (Agrostis tenuis Sibth.) and Creeping Bentgrass, cv. Penncross (Agrostis palustris Huds.), Tall Fescue (Festuca arundinacea Schreb.) Perennial Ryegrass cv. Norlea (Lolium perenne L.) and Annual Bluegrass (Poa annua L.) were each seeded separately in solid stands in 6 inch diameter fibre pots. Replicated pots of Common Dandelion (Taraxacum officinale Weber), Common Plantain (Plantago major L.) and Mouse-eared Chickweed (Cerastium vulgatum L.), common lawn weeds in the Ottawa area, were also included in the test. A 3:1:1 mixture of soil, sand and peat was used as the growing medium. The turf pots were clipped to height of 1 1/2 inches and fed with a 20-20-20 liquid fertilizer weekly. Foliar spray treatments of filtered road salt solutions (Windsor Safe-T-Salt from the Canadian Salt Co., Ltd.) were begun on January 9. The salt solutions were applied as a foliar spray using an atomizer spray gun at the rate of 10 ml. per pot. The schedule of spray treatments applied was as follows: January 9 — March 11, 2% Sol. twice weekly; March 12 — April 21, 4% Sol. twice weekly; April 21 to May 13, 4% Sol. three applications per week. On May 13, the foliar spray treatments were discontinued and the leaf tissue harvested for yield and percentage dry matter. Visual ratings and photographs of foliar damage were taken during the course of the experiment. Following cessation of the salt treatments, the pots were immersed in cold water, allowed to drain and then leached twice. The pots were then given a 35-day recovery period which included regular clipping and nutrient feeding. Following the recovery period all pots were visually rated for recovery and the foliage clipped for yield and dry matter determinations.

In general, turfgrasses will withstand and survive considerable salt spray. While 2% salt solutions applied 2 or 3 times weekly did produce slight visible damage to most species, it was necessary to increase the concentration and frequency of application of the salt solutions to produce serious visual effects to the species under test. Different species varied in their tolerance to the foliar treatments applied. The bentgrasses, Poa annua L. and creeping red fescues were more sensitive to the salt treatments than Kentucky Bluegrass. Tall Fescue (cv. Kentucky 31) and Norlea Perennial Ryegrass were the most tolerant species in this test. Of the various Kentucky Bluegrass cultivars, Fylking a Danish strain newly licensed for sale in Canada, was slightly more tolerant than common. A comparison of data obtained from pots of mature Merion Kentucky Bluegrass and that obtained from newly established Merion, suggest that old or mature turf might be less tolerant of such salt sprays. There was also a difference in the salt tolerance of three common lawn weeds. Mouse-eared Chickweed was particularly sensitive to foliar salt applications. However, despite marked visible damage from the treatment, this weed continued to produce new vegetative growth. Common Plantain, however showed little visible effects due to salt spray. Following an immersion and leaching with water and a 35-day recovery period, all turf species produced fresh foliar tissue. Dry matter yields taken at this time indicated that all species had fully recovered from the salt foliar treatments.

This experiment indicates that most turf species can withstand considerable amounts of foliar road salt sprays and that certain species are more tolerant than others. Tall Fescue was particularly tolerant and thus would be a useful component of turf mixtures subjected to frequent splashing from road salt. Norlea Perennial Ryegrass, frequently used as a nurse grass during establishment of the more permanent species would also be useful for such locations. The results of this test would also suggest that leaching or hosing with water of salt-damaged turf in spring would tend to reduce turf injury and enhance recovery.

—Reprinted from GREENHOUSE-GARDEN-GRASS Vol. 7, No. 3
Jim Fitzroy is one of those young lions of the modern age who is a refreshing departure from the snarling rebels apparently bent on hogging the spotlight from the majority of their otherwise enterprising generation.

"Fitz" is this year's winner of the Lawrence S. Dickinson Memorial Scholarship, a sterling project of the New England Association which heaps financial reward on a deserving student in turf grass management.

There is no doubt about the qualifications of Fitzroy, a 21-year-old native of Hinsdale, Massachusetts who is undertaking the four-year program at the University of Massachusetts.

Fitzroy made it to the December meeting for the presentation ceremonies, conducted by scholarship program chairman Phil Cassidy. He impressed all with a matured approach to his future and a solid hold of himself in expressing his appreciation for the honor.

There is every reason to believe that Fitzroy will be joining the ranks of professionals in the turf management field. Jim started to show interest during his vacation stints from Wahconah High School. He spent those working at the Wahconah Country Club in Dalton and even found time to steal away long enough to establish a 12-handicap as a golfer.

Athletics walk hand in hand with Fitzroy's assured outlook. He was a rugged linebacker on Wahconah football teams, played on the school basketball squad and made it to the starting line on the golf team.

Professor Joe Troll was highly pleased with Fitzroy's selection. "He is one of our top boys at UMass," Joe revealed. "Right now, he seems definitely interested in becoming a golf course superintendent. What I like about him is that he has his two feet on the ground and has the self-assurance to go along with lofty ambitions. We're all sure he'll be top-grade when he graduates and moves into the challenge of a superintendent's position."

Fitzroy, then, would appear to be a solid choice. He "Fitz" the bill as scholarship material. The selection committee should be commended.


Join Your Massachusetts Turf and Lawn Grass Council

For more information write:
Mass. Turf and Lawn Grass Council
 attn.: Dr. Joseph Troll
RFD #2, Hadley, Mass., 01035
or
George Moore, President MTLGC
1295 State St., Springfield, Mass.

The Massachusetts Turf and Lawn Grass Council is a non-profit corporation. Its officers derive no benefits except the satisfaction of keeping Massachusetts and its neighbors first in turf. It was founded on the principle of "Better Turf Through Research and Education." We must support our University to accomplish this, and we can with a large and strong Turf Council.

Membership is not restricted to Massachusetts residents or turf professionals alone, all are welcome to take part. Write today.