JULY 1963

USGA GREEN SECTION RECORD

A Publication on Turf Management
by the United States Golf Association

A PARKING PROBLEM

A cart has been driven between a green and a bunker at the Riverdale Country Club, Little Rock, Ark. This is an unhappy moment for Harry Bryant, the Golf Course Superintendent.

USGA GREEN SECTION RECORD

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Traffic on the Golf Course - Part 2

A continuation of reports from the 1963 Educational Program of the United States Golf Association Green Section. Other reports appeared in the May issue.

Minimizing Effects of Traffic

A PANEL DISCUSSION

By **A. M. Radko,** Eastern Director, Green Section of the United States Golf Association,
And GROVER C. KEETON, Dallas, Texas, Member USGA Green Section Committee

A. M. RADKO:

Growing quality turf for golf is an exacting science. "Tough" turf is the order of the day because weak turf cannot long exist in this period of accelerated play and golf turf interest. Golfers today are as keenly interested in better playing conditions as they are in the game. They play at many different courses, remember the best from each course, and hope to introduce these "bests" into their home courses. These may include improvements in strains of grasses, management practices, machinery and products for use in maintenance. These all are aimed at the pursuit of the "tough" turf goal.

Turfgrasses become weak or injured because of a number of factors. Traffic is a major cause - traffic of golfers, utilty equipment, maintenance equipment, and golf cars and carts. Heavy use of the course makes it difficult to manage for the best interest of the grass. The timing of management practices often is thrown off because it is necessary to get work done "in between foursomes", so to speak. Play, and not the best interests of the grass, dictates many management practices.

Increased foot traffic means more turf wear, scuffing, spike and spike shoulder marks. More play means more bruised turf due to ball marks and divots.

Use of the course when it should be closed leads to compacted soils and bruised turf. Play after heavy rains, or while soil is in process of thawing in spring, or when grasses are frozen in winter, or when grasses are wilting . . . all lead to trouble.

Traffic injury is frequently caused by features of terrain or design which funnel players or equipment into a definite pattern around greens, aprons, tees, bunkers, or approach areas. The use of equipment or golf cars during unfavorable conditions of soil, turf, or climate greatly increases the injury pattern.

The human element - whether it be vandalism, an error in judgement or calculation, or the misuse of equipment - also may weaken or injure the grasses.

GROVER C. KEETON:

In recent years practices in golf course maintenance have changed considerably. Sometimes we wonder if the initiative for these changes hasn't come about through the player rather than through the golf superintendent and the management controlling course maintenance. We, as superintendents and managers, are confronted with the challenge of staying ahead of the players with research work, planning, and adapting research results to our local course operations. Educational meetings result in the supervisory personnel gaining advance knowledge and taking stronger lead.

Maintenance practices may be con-

sidered in the categories outlined in the following paragraphs.

I strongly believe that one good practice which will minimize or overcome harmful effects of traffic is maintenance of a proper attitude on the part of maintenance personnel toward traffic on a golf course. Traffic, on country club courses and even more so on public courses, is what we want. Golf courses are closed due to **lack** of traffic, not due **to** traffic.

Soils

What are the harmful effects of traffic on turf? What are we actually treating? Traffic is imposed at the surface; the turf shows the first effects but the soil sustains the greatest damage. The result is compaction, which simply means the reduction of pore spaces within a soil mass.

Irrigation, aeration and fertilization require one to work with soils. Soil has four functions. It provides support, nutrients, water, and air. In order to perform these functions properly, it must resist compaction under daily traffic even under adverse weather conditions.

We rely to a great extent on visual symptoms of poor soils. These include: 1. Shallow root system; 2. Hard soil; 3. Algae; 4. Dry spots; 5. Layers; 6. Variation in texture.

Fertilization

Fertilization is one of the equalizers to traffic damage on turfgrass. In planning a fertilization program, I like to apply what Dr. William O. Trogdon of Texas A & M College has said: "Use the **right amount** at the **right time.**" Used under this guide, fertilizer will speed the growth of turf to recover from traffic damage.

Aeration

In the case of cultivation, the right time and right kind are applicable, and sometimes the right amount may be a factor to consider. Applying fertilizers after aerification or spiking is one way of getting fertilizer down to the root zone. Spiking is also used to overcome crusting and to provide oxygen during a period of warm weather when we have heaviest play. Aerification, by itself, is helpful; but generally it should be part of an overall program.

Irrigation

Irrigation is part of the daily operation during the warm season, but experience has indicated the wisdom of heeding the admonition to"water sensibly." Not enough water results in wilted grass and eventually loss of grass during the warm season. On the other hand, too much water aggravates compaction and creates difficulties.

Since the object of irrigation is to get the desired amount of moisture to the roots, an effective procedure is to check this by use of the soil probe. The Department of Irrigation, University of California, made a study of watering various soils which included sands, loams and clays. Results were presented in chart form by Dr. Robert Hagan. His chart has proven very helpful. For example, if we want to wet a 12-inch depth of loam soil, 1 1/2 inches of water is required. If grass has effective roots to a 24-inch depth and soil is wet to this depth, in the case of loam, we can go approximately 21 days between irrigations.

In general, the experienced irrigator is trying to "connect the moistures." Too many times, watering is done by guessing. Careful observation and use of available information make this practice unnecessary.

Conclusion

Golf has become tremendously pop-

ular, and our job is not to fight traffic-foot or equipment. As representatives of golf course management, we want to think in terms of inviting more players to play. We must study the over-all picture with a broader perspective. There are enough tools available to enable us, through sufficient knowledge and imaginative management, to maintain good golf courses.

We should consider traffic on the golf course as a challenge rather than a problem.

Care and Handling of Golf Carts

A PANEL DISCUSSION AMONG:

JAMES L. HOLMES, Moderator; Midwestern Agronomist, Green Section of the United States Golf Association

CHARLES STEWART, Mississippi City, Miss.; Member USGA Green Section Committee

ROBERT W. WILLITS, Kansas City, Mo.; Member USGA Sectional Affairs Committee

JAMES L. HOLMES:

What are the financial aspects of handling and care of golf carts? The following data are derived from: (1) "Golf Cart Usage and Control in the Metropolitan New York Area" — a survey among Member Clubs of the Metropolitan Golf Association, March, 1960; (2) Minutes of a meeting on "Golf Carts" held by the Chicago District Golf Association at Riverside Golf Club, January 21, 1961; (3) Personal correspondence with Oliver F. Burnett, Paradise Valley Country Club, Scottsdale, Arizona; (4) Personal experience.

Installation Costs

A. CLUB OWNERSHIP:

1. Four electrically equipped garages, built to house a total of 110 cars, cost $41,000; thus, approximate cost to house one car is $375. This is for completely enclosed building including electrical installation costs.

2. Two clubs installed electrical equipment but left cars in open. Cost $3,600 and $3,000. Unless adequate power is available to club grounds, electrical installation will probably exceed $3,000 for 25 car outlets.

3. Initial investment for electric carts and garage: If cars are purchased in numbers, costs is around $1-000 per unit. Therefore, initial investment for 20 cars is: $1,000 x 20 plus $375 x 20 equals $27,500.

4. Cart owners pay from $1.25 to $25 per month to store carts in club-owned property. The average of 15 clubs in New York and Chicago is about $15 per month during the season and $3 a month for winter storage.

5. An initial garage charge of $300 to $400 is assessed when a member first installs his cart at one club. This is in line with the original $375 cost to garage one electric cart.

B. RENTAL:

1. Every conceivable arrangement has been made with rental agencies. Some clubs merely agree to use the agency's carts, and it is the agency's sole responsibility to deliver them to the first tee. Some clubs supply electricity, others housing and electricity, still others housing, electricity, and maintenance. Consequently, the installation cost to the club varies to such an extent among clubs that it is not practical to suggest any general estimates.

Profit (and Loss)

A. CLUB (OR MEMBER) OWNERSHIP:

This does not include club ownership whereby the club plans to make a

profit through cart rentals.

1. Of 9 clubs in the New York area, 7 reported a profit; 2 a loss. Apparently with a reasonably sensible operation, it is not difficult to break even or show a profit. Two clubs in Chicago reported that any profits were turned over to the grounds department to improve cart traffic facilities and to repair any damage to the course as a result of cart usage. One Chicago club maintains a sinking fund, and any profits are used to repair carts, garages, etc.

B. Club Ownership For Profit:

1. One Chicago club reported 15,311 cart rounds in 1960 with a gross income of $137,790, and expected to gross $175,000 in 1961; I understand it did. Net income was not available. At this club everyone who plays must rent and use a cart. If the player desires a caddie, it is his responsibility to obtain one. Thus, carts can be operated at a profit at a private club if so desired.

2. My experience indicates that other private clubs are beginning to seriously consider the operation of carts for a profit.

C. Rental Ownership:

The profit division between the rental agency and the club depends upon the cost to the agency and is usually in proportion to the extent of the club's assistance in maintaining carts. Normal splits are 70-30, 60-40, and 50-50. In all cases I have observed where it is not 50-50, the rental agency receives the larger share. Last fall I ran across a new plan: for the first 50 rounds a car operates, the rental agency receives 70% of rental income; after 50 rounds, the club receives 90% of the rental income on a seasonal basis.

1. In no instance, to my knowledge, has there been a net loss to a club as a result of using rental golf carts.

2. Three Chicago clubs reported net profits of $3,774; $5,283; $6,508.

3. Four New York clubs reported gross revenues of $8,000, $5,000, $3,100 and $1,900. Costs vary from club to club but are considerably less when rentals are used. In any event, these clubs grossed an average of $4,500 from rental carts. Net profits could not be ascertained from available data.

4. Cart rounds in the northern part of the country at private clubs figure to be around 80 per cart. One club in Arizona reported that 300 rounds per cart netted $160 per cart in 1961. One public course reported an income of $760 per cart, but this figure did not include amortization of the carts which the club owner purchased. It can be derived from this that a private club in the northern part of the country can expect to net a profit of at least $150 per cart rented if an intelligent operation is initiated and followed. A public club may expect to net a greater profit, all factors considered.

General Data

1. The 1963 Annual Issue of "Golf", Vol. 5, No. 2, reports that in 1953 there were 1,000 carts in use; now there are 70,000. Manufacturers estimate 100,000 will be in use by 1965. It is a $100,000,000 gross business at present.

2. Depreciation of both gas and electric carts is between $250 and $300 per year.

3. Electric motors on carts run 27 to 30 minutes on an 18-hole round. Batteries usually last 3 years in the north and 14 months in the South with about the same amount of use. Cost per round is 12c to 18c for electricity. Maintaining exact tire pressure is vitally important.

4. Approximately ½ gallon of gasoline is used per round in gasoline carts. Installation price is cheaper than for electric carts. Low pressure, 12-inch

tires can be used more effectively on gasoline carts. Maintenance costs are somewhat higher.

5. There is a noticeable percentage increase in the use of gasoline carts.

Conclusion

Obviously, mechanized golf is here to stay. Clubs have learned that handsome profits can be obtained from cart operation. If the operation is maintained in a business-like fashion, each mechanical unit should net at least $150 per season in the northern part of the country for a private club operation and more for a public type of operation; farther south, net profit will be correspondingly greater.

Rounds per car vary from an average of 80 in the north to 300 in the "year 'round" southern area. There is a greater emphasis on use of carts in the south and southwest.

There is violent disagreement as to which is better—rental carts or club-owned carts. The rental cart school seems to be gradually gaining pupils.

CHARLES STEWART:

The following recommendations are offered to clubs which anticipate the acquisition of golf carts:

1. Have club appoint an efficient Golf Cart Committee that will work conscientiously with maintenance men as well as the course superintendent.

2. Have committee, after careful study, decide on make of cart.

3. Purchase number that club can afford, or assist in financing the professional so that he may purchase the required number.

4. Hire a good maintenance man. Arrange with cart factory for maintenance man to visit plant to see how cart is made from start to finish and get a general schooling. Then send him to the battery distributor for like schooling. This education, which will take all of about a week, should be done before carts arrive.

5. Purchase no carts with tires smaller than 8.00 x 6.

6. All carts should have six heavy duty batteries, and definitely not the regular automobile battery.

7. No carts should be allowed to be rented that have a hydrometer reading of under 1200 (at sea level).

8. After each rental, maintenance man should be required to:

(a) Hose off batteries with pressure water.

(b) Hose over-all cart and wipe dry.

(c) Check tires for required pressure.

(d) Check batteries and charge not to exceed 1260 (sea level).

(e) Check water in batteries.

9. Have spare parts such as batteries, switches, tires, spindle, motor belts, and the like.

10. If course is wet enough to damage any areas, have steadfast rule of "NO CARTS ALLOWED TODAY."

11. Give maintenance man salary plus commission.

ROBERT W. WILLITS:

We have been told about the damage that normal golf cart traffic does to turfgrasses. Think, then, for a moment of what the misuse of golf carts can do to a golf course — to greens, traps, teeing areas, and particularly to those areas likely to hold moisture. The misuse of carts increases the golf course superintendent's maintenance problems beyond all reason.

As a direct result of misuse, we have "misetiquette" to fellow-golfers. There is the speed driver who thinks that there is only one speed—that is, with his foot through the floor. A gentleman anticipates an afternoon of golf, relaxing in the fresh air; and by the

time he gets through trying to run up and down the hills with wide-open speed, he cannot get hold of the golf club because of the death grip he has had to maintain to keep himself in the golf cart.

Here are a few examples of accidents:

We had the Women's District golf tournament at the club. The distance from the 14th green to the 15th tee is approximately 50 yards, with a gradual slope in which a golf cart would maintain a normal speed of travel without acceleration. Upon approaching the teeing area, the driver of a cart applied the throttle instead of the brake. Ten feet in front of the tee was a creek with a 6-foot drop. Off they went! Fortunately there was a 3-foot pool of water there to absorb the shock, and there were no injuries to the passengers; but there was need for one new cart.

A gentleman out in our country had been in a very serious automobile accident; he was restrained from playing golf for a period of seven years. His first outing was in a golf cart. (The golf cart had come into being during his lay-off.) The driver saw a white line protecting a loosely sodded area and he made a quick turn to the right. Out went the fellow. Result, one broken ankle. Needless to say, he is not a cart enthusiast.

We had another example of a fellow playing in the semi-finals of the club championship, and this might have some further ramifications. At the end of the 13th hole, the victim was 3 up. His opponent was driving him or was the operator of the vehicle, and he thought he was in reverse when he was in forward speed; he ran over the gentleman and broke his leg in two places. What do you do? The victim was 3 up with 5 holes to play. Perhaps the Rules Committee of the USGA will be asked to pass a rule, thereby putting the responsibility of safe transport of one's opponent on the driver. Failure to transport an opponent safely might mean forfeiture of the match.

The things that happen in the misuse and mishandling of golf carts are unbelievable. There is only one answer —a vigorous and constant program of indoctrination in the proper operation of these potentially lethal weapons.

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	Woodland Hills Country Club, Woodland Hills
Wash.	Fort Lewis Golf Club, Fort Lewis
Wyo.	Old Baldy Club, Saratoga

Winter-Spring Injury in the East

By Members of the Staff of the USGA Green Section:
ALEXANDER M. RADKO, Eastern Director
HOLMAN M. GRIFFIN, Northeastern Agronomist
LEE RECORD, Northeastern Agronomist
RAYMOND E. HARMAN, Northeastern Agronomist

To everyone but those on the Eastern Coast, July may seem an inappropriate time to discuss winter-spring injury. Never has weather in the East wrought so much damage to the fine turfgrasses as was done this year. Golf courses were especially hard hit. The effects will certainly be felt through the 1963 season, and this summer may prove to be one of our most trying seasons in golf course management. Again, much will depend on weather.

What caused this severity of damage? To explain it fully, it is necessary to describe the weather we have had. Veteran superintendents, to a man, agree that the '62-'63 winter season for turf was the most severe ever.

Cold was accompanied by freezing rains which seemed to fall every few days. One freeze compounded the next, and so a total of 9 to 12 inches of solid ice accumulated on **closely** mowed turf. In rough areas, where turf was higher, there seemed to be enough air cushion to keep the ice from adhering strongly to the turf and so it never seemed to bother these areas.

On greens and tees, however, ice was so thick, and remained so long, that superintendents and their crews could do little to encourage quick removal. (See Photos 1 and 2) They could only attempt to break through the ice in several places to allow air to get through to the base so that it would be easier to remove the ice at a later date. Picks, axes, crow-bars, 'dozers, and shovels were used to little avail. The ice would not be forced until it was ready to come off. It adhered to the turf so strongly that large pieces of grass were torn up when attempts were made to force the ice off the green.

Where did the ice form thickest and remain longest? Successive rains froze immediately upon reaching the ground, and the **normal surface drainage channels and swales** became most heavily covered with ice. It remained longest on these low areas, actually until the spring thaw. The high

Photo 1. The No. 5 green at Kernwood Country Club, Salem, Mass., under solid ice. Note thickness to right of shovel and pick. Les Allen photo

Photo 2. The same green at Kernwood after the ice melted. Note injury pattern in foreground — the area of natural surface drainage.

mounded and contoured areas on greens thawed more quickly, but it was not until the second and third weeks of March that most superintendents were able to remove the ice from the low drainage paths.

Finally, during the last week of March, we experienced two days of 80-degree weather and the ice disappeared entirely. It appeared at the time that all was well. The turf under the more heavily iced areas was a vivid green, while the high areas were not of as good color. The high areas were exposed to the elements earlier and so were hardened-off to take that "off-green" color which most cool-season grasses have as they emerge from the winter.

Weather Change is Deadly

Then the roof fell in! After two days of summer-like temperatures, weather once more turned very cold, the winds blew incessantly, and extreme drought set in. The grasses that were under ice longest and were a vivid green-soft and succulent—collapsed.

The effect was deadly. It was just like taking a plant out of a hot-house and placing it in freezing temperatures. Toxic gases such as methane and carbon dioxide may have been a contributing factor. In the pattern on surface drainage, entire areas of turf turned brown or black, took on a slimy appearance, and horrendous odors were reported. The hardened-off high areas were not affected.

Men who attempted to turn on irrigation systems found that numerous breaks occurred due to the deep freeze, far more than in even the most severe prior year. One club reported in excess of 60 breaks in its system. (See Photo 3). Others reported fewer, but enough to keep them from using the water system when it was critically needed, especially in the renovation attempts that followed.

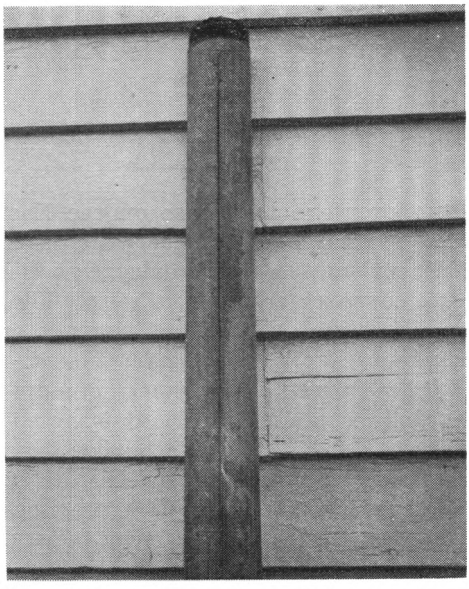


Photo 3. Water line break — split in center. Many such breaks were reported — split at the bottom —due to deep freeze.

Injury was so widespread that the USGA Green Section's Eastern Office issued the following statement in early April to USGA Member Clubs in the area affected:

MEMORANDUM TO: Chairmen, Green Committees and Superintendents of USGA Member Clubs:

A large amount of winter injury is prevalent on golf courses throughout the Northeastern Region. This has been due to several factors but mostly due to ice accumulation on greens, frozen soil especially in low portions of greens, also some desiccation. The lateness of the spring growing season, the high winds, the lack of warmth and rainfall have further hampered recovery of injured turf. We are at least two weeks behind in growing weather, and unfortunately so, because the turf is extremely weak and play on weak turf will retard recovery.

We have inspected numerous courses throughout the region and the pattern is the same . . . the turf is brown or hay colored . . . and looks absolutely dead . . . yet close inspection of injured areas shows that root systems are alive and growing points of the grasses are green. It will

take time, patience, some better weather, and programming but we feel that chances for recovery will be good.

Steps that should prove helpful in the recovery program:

(1) Apply any organic nitrogen or topdressing to attract the heat of the sun's rays . . . one to one and one-half pounds of nitrogen equivalent per 1000 sq. ft. depending on products you choose, or one cubic yard of topdressing, or both for an average green.

(2) Aerate the greens when roots are strong enough to keep the sod from lifting.

(3) Spike the greens several times over and overseed the browned-off areas.

(4) Syringe the greens lightly if high winds and/or low humidity should be a factor. In any case, attempt to keep adequate moisture on the turf and in the soil without overdoing it. Remember that the surface temperature of injured turf will be higher than that of healthy growing turf and it will dry faster; therefore, several syringings may be required daily.

(5) Keep play on injured greens to a minimum, and provide temporary greens for those severely injured. This may be necessary for two to three weeks.

We trust that this will be helpful . . . if we can be of further help, please write.

Sodding, of course, is a method of reestablishing greens quickly. However, in many cases there was not enough nursery sod available. Moreover, it is quite difficult to do a patching job on a putting green in spring and have it turn out well. While this note pointed primarily to greens, tees and fairways also suffered greatly. Many tees were lost completely, and large patches of fairway turf also died in low areas and depressions where ice layers formed strongest.

The effect on hillsides and slopes was very similar to that damage which occurs where youngsters coast and sleigh ride over turf where the snow packs to form ice sheets. The turf beneath turns brown, and normally is the last area to green up in the spring. This year the ice on all these areas packed similarly and the "hot-house" effect mentioned earlier was disastrous. (See Photos 4 and 5). High areas, where ice melted earlier and the grasses had a chance to acclimate themselves to the cold, came through without any trouble.

New turf was not injured. New courses and newly sodded areas on old courses where soil was prepared or

Photo 4. No. 17 hole at Wellesley Country Club, Wellesley, Mass. — note severe injury on sloped fairway where ice remained longest. This was typical of injury pattern.

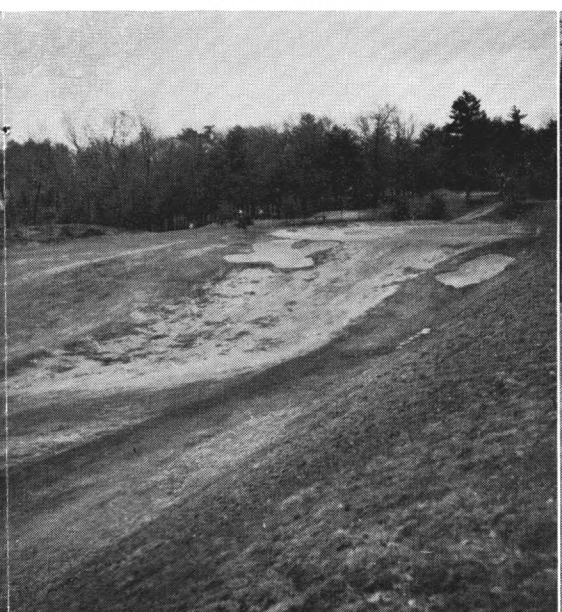
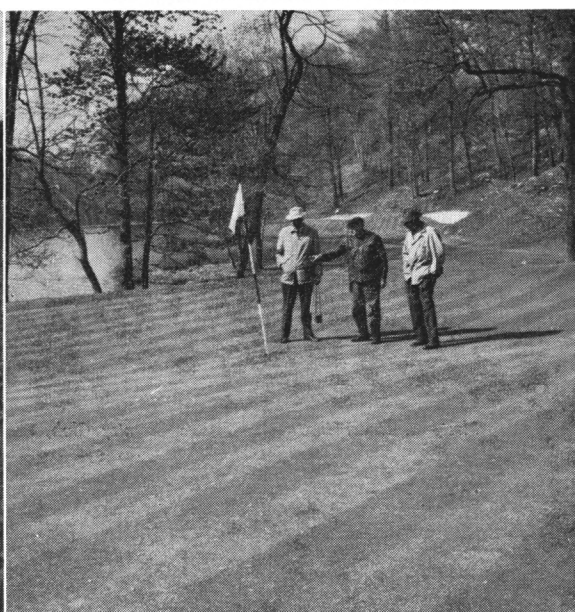


Photo 5. Not all greens were injured in areas of drainage. Supt. Nick Florio, center, makes point at Somerset Hills Country Club, Bernardsville, N. J., with Holman Griffin, USGA Green Section Agronomist, left, and Chairman of Green Committee John Winston on No. 11 green.



altered prior to grass establishment came through with flying colors. It certainly appears that well aerated soils were a prime factor in survival.

Of those inspected, courses 6 years old or younger didn't show any ill effects. (See Photo 6). Some chairmen and superintendents on older courses attributed their lack of trouble to timely ice removal in the spring and/or timely aeration or cultivation in the fall.

In the low areas all turf was injured badly. Bentgrass was hurt in varying degrees, but *Poa annua* was killed out completely. (See Photo 7). Attempts to renovate were seriously hampered by high winds, lack of rainfall and lack of warm weather. Those who were most drastic in aeration, thatching, spiking, and in using vertical mowers prior to seeding were more sucessful than those who tried to coax and baby the turf along. The weather was so dry, cold, and windy that even *Poa annua* didn't volunteer as it normally does in spring. Recovery was so slow that many clubs, for the first time in their history, closed regular greens.

Officials at The Country Club, Brookline, Mass., site of the 1963 Open Championship, chose to close their course until the first week of June because of the severe setback. They could have opened earlier but they elected to remain closed in order to provide the very best possible playing conditions for the Open Championship.

The pattern of injury also can be associated with heavy play. Heavily played municipal courses and private courses that have many guests were more seriously injured than others. Courses that do not allow winter play on regular greens fared better than those that do. It appeared to be the cumulative effects of traffic subtly taking its toll over the years on courses most seriously affected. Walk-off areas, where traffic is funnelled from green to tee, were seriously injured.

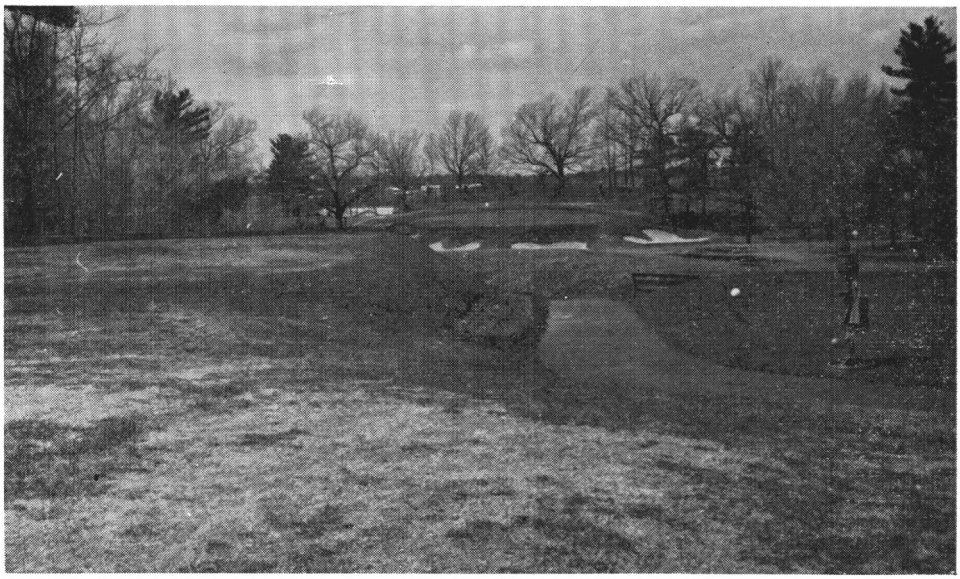


Photo 6. The 11th hole at Salem Country Club, Peabody, Mass. Note new tee to right came through unblemished . . old tee to left injured by winter.

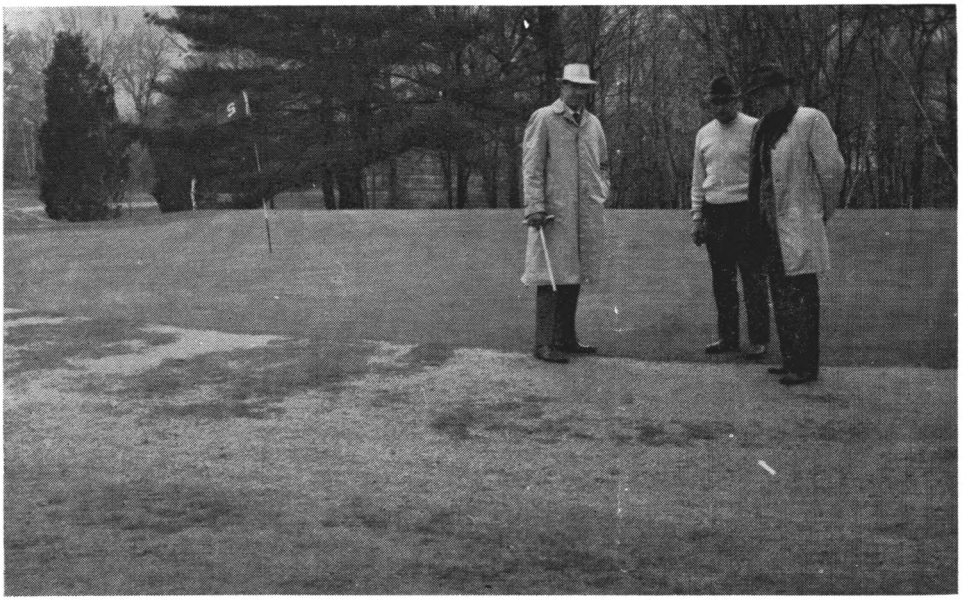


Photo 7. Holman Griffin, USGA Green Section Agromist; Charles J. Wenzel and John O'Connor, Golf Course Superintendent of the Salem Country Club, Peabody, Mass., examine Poa annua apron that went out . . while bentgrass green came through without a blemish.

How much traffic does it take to kill turf in winter? Supt. Jack Ormond of Canoe Brook Country Club, Summit N.J., can tell you. Photo 8 shows the effects of one routine treatment to one of his greens. Though other greens had thawed, this tree-protected green was still frozen at the time. A small spreader was used to apply limestone in December 1962. The picture was taken May 1, 1963. Note the footprints and wheel marks five full months after the spreader was used! The turf was severely injured, and did not recover until some time in June. Other greens that were limed the same day came through unscathed.

The question is often asked, "How much harm can we do by playing greens in Winter?" This is very difficult to answer, but a year like this gives far more graphic answer than words. As shown in Photo 8 injury occurs when grass is frozen.

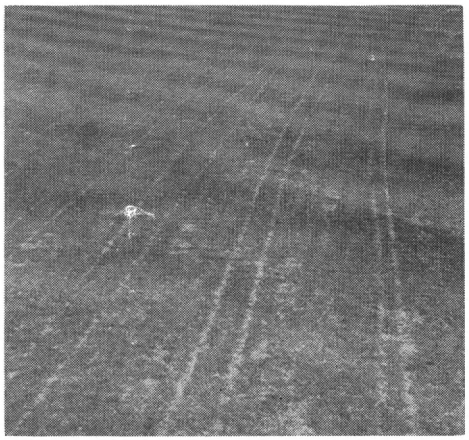


Photo 8. Spreader tracks and footprints show up on greens five months after being made on frozen grass.

A more subtle type of injury occurs when the ground is thawed to a depth of one inch or less and the pressure of foot traffic squeezes the soil and destroys its structure. The lubricating action of the moisture makes "mud pies" beneath the turf and the soil becomes severely compacted at the

surface. February and March are the months to watch most carefully for this injury. When the ground is frozen solidly or thawed beyond one inch, there seems to be no cause for alarm regarding severe soil compaction. However, one cannot be sure that conditions will not change during the course of one round - from frozen to thawed soil in the time it takes a four-ball to play 18 holes.

From safe to hazardous conditions in a few hours . . . so how is it possible to answer firmly and definitely the question, "Is it safe to play regular greens today?" The decision to close the course must be flexible, and it must rest with the superintendent, the Green Chairman and his Committee; but their decision should be final.

There are several kinds of winter problems; injury usually is due to one or more of the following:

(1) Snow mold - a fungus disease. Not much snow mold was apparent this year. One can protect against this by treatment with fungicides. It normally is not a severe problem.

(2) Desiccation - a dehydration of the grasses caused by high, dry winds that remove water from the plant when ground is frozen and roots can't pick up enough water from the soil to replace the water lost through the leaves.

(3) Ice damage - a smothering or suffocation of the turf due to ice remaining on it too long.

(4) Excess water in upper soil fraction during thaw.

(5) The "hot-house" effect we seemed to experience this year.

(6) Toxic gases - methane and/or carbon dioxide.

(7) Over-succulence going into the winter months.

(8) Traffic when grasses are frozen - when soils are thawed in upper inch.

Frequently the question is asked, "Should I remove the ice from greens?" The answer is "Yes" if you are sure that subsequent weather is going to turn and stay warmer, and "No" if the weather is going to be cold, dry, and windy. If warm weather had continued as it started in late March this year, we would have had far fewer problems. Just a simple turn of the weather caused extreme problems of almost unbelievable proportions. The general geographic pattern for injury to cool-season grasses was from the northern Massachusetts border to central New York State to Wilmington, Del. Injury to warm-season grasses was reported as far south as Atlanta.

Bermudagrass injury during the winter and early spring was rather severe throughout the East this year. The cause often defies explanation. In Philadelphia much of the loss can be attributed to an unusually cool spring. Superintendents reported that bermuda came through the winter

COMING EVENTS

August 6 — U. S. Department of Agriculture, Field Day, Beltsville, Md.

August 7-8 — Rutgers Turfgrass Field Day, Rutgers University, New Brunswick, N. J.

August 27-29 — Turfgrass Management Conference, University of Florida, Gainesville, Fla.

September 4 — Annual Turf Field Day, Virginia Polytechnic Institute, Blacksburg, Va.

September 5-6 — Auburn Turfgrass Conference, Auburn University, Auburn, Ala.

September 11-12 — Penn State Field Day, University Park, Pa.

September 18-19 — Fourth Annual Lawn & Turf Conference, University of Missouri, Columbia, Mo.

alive, but because of the cool weather in March, April and May it was unable to produce any top growth.

The spring weather was warm enough on several occasions to break the root dormancy but there was no top growth to manufacture new food, and roots began to rot. By late May, much bermudagrass appeared to be injured beyond recall even in areas which had survived the past 12 to 14 winters. Similar injury was observed as far south as Atlanta.

Although much of the answer lay in the poor growing weather during the spring, this did not seem to be the sole cause of injury. Desiccation from high winds along with compaction from traffic and damage from ice and water are all sources of possible injury.

At least two things were evident. Where the bermudagrass was clipped higher, as in the rough, it was not as severely affected. Areas sheltered by trees or steep banks seemed to be healthier.

A third factor was noted—bermudagrass nurseries seemed to have less damage than the course. In speculating, one might assume that lack of traffic and extra care brought nursery areas through the winter better than other sections. Many nursery areas were burned off in late fall and it is possible the dark color of the charred remains absorbed additional heat from the sun.

In contrast to bermudagrass, zoysia, which has a higher minimal growing temperature and is more winter hardy, came through the winter in good condition.

There was much concern for all grasses during this particularly adverse year, and re-seeding or, in the case of bermudagrass, re-sprigging or sodding was in order for many clubs.

In past years we have learned a great deal about the management of turfgrass, but we must still have help from the natural climatic factors which ultimately control the growth of grasses.

Because of the extremely cold, dry spring season, knotweed, dandelion, and plantain grew uninhibited with no competition from *Poa annua* or permanent grasses. Knotweed is especially abundant again on most courses, and because of the extreme drought few superintendents hazarded the chance to apply chemical controls. Courses will be plagued with this weed in '63, and it certainly will be a problem for the next few years. If we have unfavorable climate this summer, many courses will be weak. If high temperatures and high humidity persist, we could lose a large percentage of the newly seeded greens because they were borderline going into June.

Summary

In summary, winter-spring injury was more severe -

On heavily played courses.

On walk-off paths from greens, tees, and in confined approach areas where traffic was funnelled.

On poorly drained areas where ice remained longest - in depressions especially.

On **good** natural surface drainage areas, too . . . where ice accumulated.

On close clipped turf more so than high cut turf.

On *Poa annua* more than on bentgrass.

Where water could not escape when soil and ice first thawed.

Where toxic gases were formed under ice and water.

USGA GREEN SECTION RECORD
40 East 38th Street, New York 16, N. Y

TURF TWISTERS

Question: Recently I read something about "powdered water." I wonder whether you have information regarding its use on a golf course. . . . P. W., CALIFORNIA

Answer: It seems that the National Cash Register Company has been successful in producing powdered water for industrial use. The powder is manufactured by coating tiny particles of water with gelatin. Although dry to the touch, the powder can easily be crushed or dissolved to a liquid state. The producer is adapting the technique to coat bank deposit slips and other forms — so that carbon copies can be made without the use of carbon paper.

Science has indeed made some unusual advances in recent years. However, the practical use of "powdered water" on the golf course seems to be many years away if it is in the future at all.

Question: We have heard favorable comments of oiled sand scrapes on country courses in California, and we would be interested to learn of the method of preparation and composition of the material used.

Our course is situated 45 miles north of Adelaide in the Barossa Valley, a district famous for its many wineries and vineyards. We have a temperate climate, which we imagine is very similar to yours—rainfall is 22 inches, spread mainly over the five winter months, viz. May—September. Our soil is sandy loam topsoil over a clay base, varying in depth from twelve feet to a few inches in parts. The course is on an area of 160 acres, and we have no suitable water to water grass greens, and we feel that good sand scrapes are our best plan. . . . J. M. L., SOUTH AUSTRALIA

Answer: There are few golf courses in the United States using oiled sand scrapes as "greens." To our knowledge, all golf courses in California now have grass greens.

In the United States, grass greens are preferred by the golfer because of superior putting qualities and beauty. Bentgrass greens are found from the deserts to the mountains and from Texas to the Canadian border.

If your area has a climate similar to California, we feel reasonably confident that bentgrass could be developed on your course. A reservoir or well that could furnish 1¼ inches of water per week for putting green areas is necessary. This is the maximum irrigation requirement during the summertime in coastal areas of California. If at all possible, grass greens at your course should be attempted.