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Contents

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Experimental Results at Miami Beach, Florida

By John Monteith, Jr.

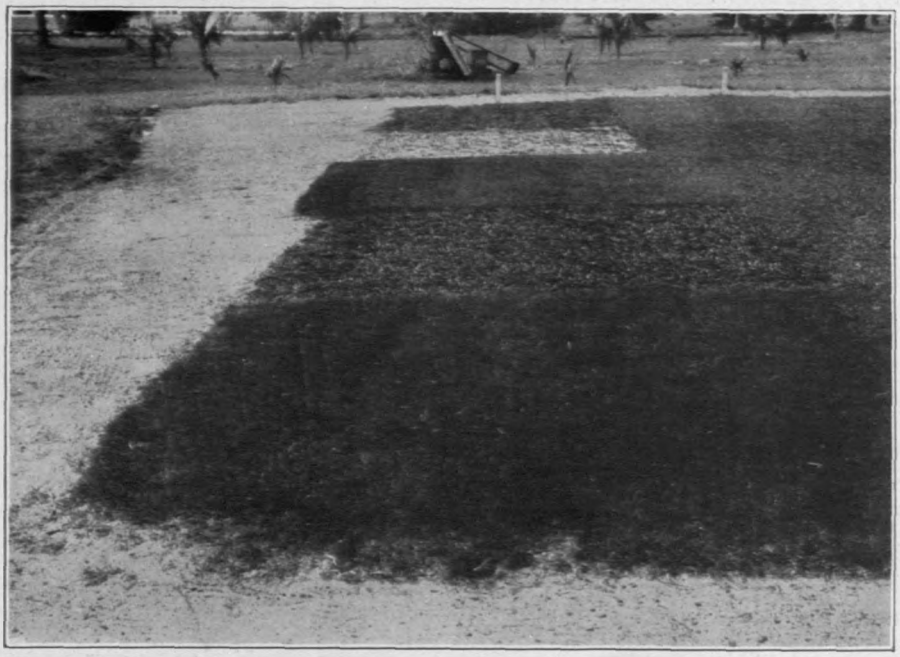
The series of demonstration gardens which have been established by the Green Section was extended into Florida in October, 1930, when a garden of this nature was planted on the Bay Shore Golf Course at Miami Beach. The character of the work being undertaken at the Green Section's demonstration gardens has been described in numbers of the Bulletin for December, 1928; December, 1929; and June, 1931. While the garden at Miami Beach conforms to the general plan of the Green Section's demonstration gardens in the North, it has been sufficiently changed in detail to meet the requirements of southern problems. As in the northern demonstration gardens, notes are made each month on the condition of the turf in the various plots in the garden and a copy of these notes is forwarded to the Green Section's office in Washington. The garden at Miami Beach is in charge of Fred Hoerger. The fertilizer and grass ratings herewith presented have been taken from Mr. Hoerger's notes.

General view of the Green Section's demonstration turf garden at Bay Shore Golf Course, Miami Beach, Florida

The garden at Miami Beach is planted on natural sandy soil without the addition of marl or organic material, except the series of five plots where mixtures of clay and organic materials are being compared. As in the northern gardens, there are two main sections, one for putting green tests and the other for fairway tests. Different grasses and fertilizers are being compared in adjoining plots for their values for putting green and fairway turf. Some of the tests are designed to apply merely to winter use, whereas others are intended for all-year-turf purposes. The tests of fertilizers for both putting greens and fairways are made on Bermuda grass turf.

Each 100-square-foot plot in the putting green fertilizer series has received 1.6 ounces of nitrogen a month except that in July, August, and September only one-third of that rate was used. At this rate each plot in 12 months receives 1 pound of nitrogen, which is the

equivalent of 50 pounds of sulphate of ammonia to 1,000 square feet. During the course of the year each fairway plot of 100 square feet receives 7 ounces of nitrogen. It takes ½ ton of sulphate of ammonia to the acre to supply the proportionate amount. The nitrogen content was used as the basis for rates of application on the different plots—that is, all of the plots in the fertilizer series which received any nitrogen received it in equal amounts. The differences in the applications to the various plots therefore represent differences in the form of nitrogen or in its combination with other fertilizer elements.



Row of fairway grass plots at Bay Shore Golf Course, Miami Beach, Florida. Foreground, Bermuda grass; second plot, carpet grass; third plot, St. Lucie Bermuda grass; fourth plot (practically bare), Manila grass; fifth plot (in background), centipede grass

The following tables give some of the results for the first year at the demonstration garden. In going over these tables it should be borne in mind that the results are for one season only and that the winter season represented here was an unusual one in many respects in the section where this garden is located; therefore the summaries here given should not be read too critically. The tables do, however, include some interesting indications as to what may be expected from this type of work if properly conducted over a period of years on different types of soil. The favorable results obtained by using fertilizers containing potash offer one of the most interesting suggestions in the fertilizer tests. The fertilizers used on golf courses in the section of the country where this garden is located are generally deficient or entirely lacking in potash. It is indeed probable that, as a result of this type of work, fertilizing programs of golf courses in the South may be notably changed in the future.

PUTTING GREEN FERTILIZER RATINGS AT MIAMI BEACH NOVEMBER, 1930, TO OCTOBER, 1931, INCLUSIVE

	Good	*Fair*	*Poor*
Complete fertilizer 12-6-4	10	2	—
Complete fertilizer 6-12-4	8	4	—
Castor bean pomace	8	4	—
Cottonseed meal	7	5	—
Activated sludge	7	5	—
Sulphate of ammonia	1	10	1
Urea	—	8	4
Bone meal	—	5	7
Nitrate of soda	—	3	9
Ammonium phosphate	—	3	9
Check (5-E) (not fertilized)	—	1	11
Sulphate of ammonia and lime	—	—	12
Check (4-C) (not fertilized)	—	—	12
Check (5-A) (not fertilized)	—	—	12
Check (6-E) (not fertilized)	—	—	12

FAIRWAY FERTILIZER RATINGS AT MIAMI BEACH NOVEMBER, 1930, TO OCTOBER, 1931, INCLUSIVE

	Good	*Fair*	*Poor*
Complete fertilizer 12-6-4	10	2	—
Complete fertilizer 6-12-4	10	2	—
Sulphate of ammonia and muriate of potash	10	2	—
Cottonseed meal	9	3	—
Sulphate of ammonia	5	6	1
Castor bean pomace	4	7	1
Activated sludge	3	8	1
Nitrate of soda	1	7	4
Bone meal	—	7	5
Manure	—	6	6
Tobacco	—	4	8
Sulphate of ammonia and lime	—	4	8
Ammonium phosphate	—	1	11
Lime	—	—	12
Check (11-C) (not fertilized)	—	—	12
Check (12-A) (not fertilized)	—	—	12
Check (12-E) (not fertilized)	—	—	12
Check (13-C) (not fertilized)	—	—	12
Check (14-A) (not fertilized)	—	—	12
Check (14-E) (not fertilized)	—	—	12

In the fertilizer tests the plots were rated as good, fair, or poor, according to the density and general vigor of the turf. The complete mixed fertilizer 12-6-4 had the highest rating in both the putting green and the fairway series. The other complete mixed fertilizer (6-12-4) was tied for first place in the fairway series and for second place in the putting green series. These two complete fertilizers were prepared by mixing sulphate of ammonia, commercial ammonium phosphate, superphosphate, muriate of potash, and sand. These are the same mixtures which have given such good results in the demonstration gardens on northern golf courses. The combination of sulphate of ammonia and muriate of potash in the fairway fertilizer series, as well as the two complete mixed fertilizers containing muriate of potash, indicate that potash is a valuable ingredient of fertilizers on the particular soil where this garden is located. The poor showing of ammonium phosphate, as compared with the two complete mixed fertilizers, further emphasizes the need of this soil for potash. It is interesting to compare these tables of results with the fertilizer

rating tables obtained by consolidating reports from several of the demonstration gardens on northern golf courses as presented in the Bulletin for December, 1929, and June, 1931. The low rating of the check plots emphasizes the poor condition of the sandy soil on which the garden is located and shows the need for fertilizer to produce satisfactory turf on such soil.

RATINGS OF PUTTING GREEN GRASSES AT MIAMI BEACH

Northern Grasses Without Bermuda Base

	*Oct., 1930	Nov., 1930	Dec., 1930	Jan., 1931	Feb., 1931	Mar., 1931	Apr., 1931	May, 1931
Annual bluegrass (*Poa annua*)	good	good	good	good	good	good	good	poor
German mixed bent	good	fair	good	good	good	good	good	poor
Metropolitan creeping bent	good	fair	good	fair	fair	good	good	good
Seaside creeping bent	good	fair	good	fair	good	good	good	fair
Bulbous bluegrass (*Poa bulbosa*)	poor	poor	poor	fair	fair	poor	poor	poor

Winter Grasses on Bermuda Base

	*Oct., 1930	Nov., 1930	Dec., 1930	Jan., 1931	Feb., 1931	Mar., 1931	Apr., 1931	May, 1931
Annual bluegrass (*Poa annua*)	good	good	good	good	good	good	good	poor
Redtop	good	good	good	good	good	good	good	poor
Colonial bent	good	fair	good	fair	good	good	good	fair
Italian rye grass (American)	good	fair	good	fair	good	good	good	fair
Italian rye grass (European)	good	fair	good	fair	good	good	good	fair
Kentucky bluegrass	good	fair	good	fair	good	good	good	fair
Perennial rye grass	good	fair	good	fair	good	good	good	fair
Seaside creeping bent	good	fair	good	fair	good	good	good	fair
40% rye grass, 20% redtop, 40% Kentucky bluegrass	good	fair	good	poor	good	good	good	poor
Bulbous bluegrass (*Poa bulbosa*)	poor	poor	good	poor	fair	fair	fair	poor

RATINGS OF FAIRWAY GRASSES AT MIAMI BEACH

	Good	*Fair*	*Poor*
St. Lucie Bermuda grass	10	1	1
Bermuda grass	9	3	—
Carpet grass	8	4	—
Centipede grass	—	2	10
Manila grass	—	—	12

The tests with different northern grasses for winter putting greens included one set of five plots planted on freshly prepared natural soil without a Bermuda grass base. In another set of 10 plots comparison was made of different grasses on a Bermuda grass base. The results of this comparison are given in the accompanying table. The season was a generally unfavorable one for turf and Mr. Hoerger did not rate any of the plots excellent throughout the year. The initial ratings, which were taken in October and appear in the table in the column at the extreme left, were concerned only with the germination of the newly seeded grasses, and, as will be noted, were uniformly good except for bulbous bluegrass. All of the grasses listed were planted entirely for winter use and they were all rated as poor in June. The ten grasses on a Bermuda base fall into four ratings in the table. Annual bluegrass and redtop are tied for first place with a good rating throughout the season until May, when they both disappeared rapidly from the turf. Six plots were tied for second place in this series; these six have been listed

* Report on germination.

alphabetically in the table. It is noted that all of these six plots continued in fair condition longer than the other plots of this series.

The garden included other tests of interest, but a full report of these results will be withheld until further data are available. Like all the other demonstration gardens, the one at Miami Beach has been made accessible to anyone sufficiently interested in grass culture to visit the garden. Many visitors interested in southern turf problems have gone over the garden from time to time during the year and made first-hand observations of the results obtained in the various series of plots. A Green Section meeting was held at the garden April 3, which was well attended by men in charge of golf courses in various parts of Florida.

All-Year Turf at Tampa, Florida

By Ray Tower

Forest Hills Country Club

Our golf course is situated on high, rolling ground six miles north of Tampa. It was built in 1925 and 1926 and opened in November, 1926. The soil is a light, deep sand. The 18 greens average in area 6,800 square feet, in addition to which we have 13,500 square feet of club house lawn maintained as a practice putting green. The average area of the tees is 1,500 square feet. The fairways occupy 55 acres; upon three holes the fairway turf is displaced by water hazards. These water hazards call for no special maintenance other than the keeping down of excessive growth of grass and sedge about the borders. The rough occupies approximately 35 acres, and the traps and bunkers 60,000 square feet. Our water supply, which is the same as that of residences in the locality, comes from deep wells and is medium-hard with lime. The course is in use 365 days in the year.

Our fairway construction presented no particular problems. The cleared ground was plowed about 4 inches deep, disced, harrowed, and leveled. Low places were filled and tile overflow lines laid in two places. Other fairway drainage was provided by deepening existing water holes, using the excavated dirt as fill, the open catch basins thus formed being so located as to form part of the course hazards. Nearly all of the fairways were dressed with 2 or 3 inches of black soil obtained from nearby dredging operations. These areas were limed and later fertilized with commercial organic fertilizers, chiefly blood and bone tankage.

The roughs received no special treatment; they were simply cleared of brush and stumps and mowed down to playable length.

The tees were brought to the desired grade and top-dressed with about 4 inches of the same black soil that was used on the fairways. This was limed and fertilized before being planted.

The greens were brought to contour and covered with a full 12 inches of the black soil from the dredging operations, limed and fertilized with organic fertilizers.

Originally the fairways were planted with stolons of Bermuda grass and were seeded at the same time with Bermuda grass and carpet grass. The carpet grass now predominates in all the fairways except one and in all the tees except one. All the greens were planted

with Bermuda grass stolons and at the same time seeded with Bermuda grass. The method of planting the stolons in trenches was used on all but three of the greens but it proved to be a very unsatisfactory method for producing turf quickly. On the last three greens to be planted, the stolons were cut to 2-inch lengths, broadcast over the surface, and covered with ½ inch of prepared soil, on the top of which Bermuda seed was sown at the rate of 3 pounds to 1,000 square feet, covered lightly with soil, and kept moist until growth was well established. This latter method produced a solid turf in less than one-half the time required by the trench-planting method.

Bermuda grass putting green in the background, carpet grass fairway in the foreground. Eighteenth green, Forest Hills Country Club

For two years after the course was opened our fairways received no fertilizer. The result was logical—poor fairways. In 1928 we did some seeding with carpet grass and made one application of fertilizer at the rate of about 500 pounds to the acre. In 1929 some further seeding with carpet grass was done and one application of bone meal was made. A top-dressing of local topsoil at the rate of about 25 yards to the acre was also made. Some of the fairways were disced and rolled after the top-dressing was applied; others were dragged with a plank float and rolled. The results were very gratifying. In 1930 all the fairways received two applications of a 6-3-0 inorganic fertilizer at the rate of 500 pounds to the acre, one application in June and another in September. This season a new program for fertilizing the fairways has been adopted, as follows: for May, a 10-9-0 inorganic fertilizer at the rate of 400 pounds to the acre; for July, a mixture containing 80 per cent of castor bean pomace and 10 per cent of sulphate of ammonia at the same rate; for September, castor bean pomace alone at the same rate.

All watering of the putting greens is done at night. Owing to lack of volume we can operate only 9 rotary type of sprinklers on ¾-inch hose at one time. Ordinarily each green is watered thoroughly twice a week, but in protracted spells of hot, dry weather, three

times a week. One man on a 10-hour schedule does the watering, and usually has the sprinklers moved over to the tees early enough to permit of watering the tees by the time the day crew arrives.

Our putting greens are swept every morning with cane poles. This is for the purposes of giving each green an early morning inspection, aiding in the control of fungi, leveling worm casts, conserving the dew moisture, and hastening the drying of the putting greens ahead of the mower. Ordinarily the putting greens are mowed every other day. A power mower does 90 per cent of the mowing, cutting 9 putting greens each day. The mowers are set at 3/8 inch, or as high as the players will stand for. Both power mowers and hand mowers are of the roller type; and the greens receive no other rolling, except that applications of top-dressing are finished off with a light roller.

Narrow strip of Bermuda grass which has crowded out the carpet grass on the fairway. This strip of Bermuda grass is over a tile line carrying overflow from a septic tank. Forest Hills Country Club

With our local soil and climatic conditions it is our experience that light applications of fertilizer at frequent intervals give better returns for the money and labor invested than an equal amount of the same fertilizers put on in one heavy application. We are convinced also that in this locality organic fertilizers are preferable to inorganic fertilizers. Inorganic fertilizers give quick but not lasting results, and may do more harm than good where courses are dependent on rainfall for water, as are most of the courses in this section.

Our fairways are not watered. They are mowed as necessary, at infrequent intervals during dry weather, and once—rarely twice—a week during the growing season. The only rolling they receive is that of the wide tractor wheels when they are mowed. They are not seeded with winter grasses, nor do the roughs receive any treatment in the way of seeding.

Our program for fertilizing the putting greens is flexible, being governed by conditions of the turf, weather, and finances. Ordinarily we use 10 to 12 pounds of a good commercial fertilizer carrying a fair percentage of organic matter, to 1,000 square feet. This is applied with compost soil and top-dressing. On account of its manner of growing, Bermuda grass must be top-dressed frequently to maintain a good putting surface, at least every 6 weeks during the growing season. The top-dressing is applied by hand, using square-toed No. 2 shovels. The prepared soil is hauled to the putting greens on a platform truck, transferred to wheelbarrows, and moved over the putting greens on board tracks. We use about 1 yard of soil to 5,000 square feet of surface. The soil is then worked in with a steel mat drag, rolled lightly, and watered by hand. Since opening our course the compost which we have regularly used on our greens is a well-rotted mixture of sand, black soil, dairy manure, grass clippings, leaves, and other such materials, piled in successive thin layers with a little lime added.

Our winter putting greens and tees are seeded in November. Many of the local courses seed earlier. In this matter, temperature is our guide. As long as the weather is warm enough to keep the Bermuda growing there seems to be no necessity for planting rye grass. We use domestic Italian rye grass, seeding it at the rate of approximately 100 pounds to 5,000 square feet. The seed is broadcast over the closely-mowed Bermuda turf, covered with our regular top-dressing material, rolled down, and the soil kept moist until the seedlings are well established. We do not take our putting greens out of play at this time. As a matter of fact, we have never used temporary greens since the first spring after the course was opened.

As the weather warms up in the spring, the rye grass gradually disappears and is all gone by June. We try to make the disappearance of the rye grass a gradual process, finding it can be regulated by using good judgment in watering and general care of the greens. Only abnormally hot weather will burn the rye grass out faster than the Bermuda can replace it. To anticipate such a condition and avoid thin or spotted turf, we try to give our putting greens an application of fertilizer and a top-dressing of soil as soon as the weather begins to get too warm for the rye grass. Rye grass and redtop in combination make a finer winter turf than rye grass alone; but the redtop is much more apt to cause trouble in converting the putting greens from winter to summer play. Redtop, when sowed in sufficient amounts to produce a good putting turf, crowds the Bermuda grass and retards the slight but desirable growth which the Bermuda makes during our normal winters. A ragged putting surface results in the spring due to the inability of the Bermuda grass to replace the redtop as fast as it is burned out. On a year-round course it is important that there shall not be an interval of 6 or 8 weeks of poor playing conditions at any season of the year.

We find that all of the fungous diseases to which both our summer and winter turf are subject are controlled by mercury compounds. To 1,000 square feet of surface we apply 1 ounce of corrosive sublimate and 2 ounces of calomel mixed with a convenient volume of slightly moist sand and broadcast over the affected areas when the grass is dry. The application is then swept with a cane to afford a bet-

ter distribution and water is withheld for at least 24 hours. This is followed by a light application of fertilizer to stimulate a quick recovery of the injured turf. We treat the greens and tees only. Any chemical treatment of the fairways is entirely out of the question, except in the immediate vicinity of the putting greens. We have not had any severe attacks of large brown-patch since 1929, and then on one putting green only. Small brown-patch is with us persistently, but so far has not been severe. In this locality fungous diseases of turf are troublesome only during the cooler months, from October to May.

Our most troublesome weed is sand spur (*Cenchrus tribuloides*), also known as sand bur. It makes very little trouble in heavy turf, but is very serious and almost uncontrollable at times in our fairways and roughs. The only way to control this weed seems to be to keep the roughs mowed so that seed stalks do not develop, dig the plants out of the thin places on the fairways where they become established, and prevent seed development in every way possible.

We are also troubled with crab grass (*Syntherisma sanguinalis*), yard grass (*Eleusine indica*) also known as goose grass, and blanket grass (*Syntherisma serotina*). These we dig out of the putting greens with sharp knives, taking pains to cut below the crown of the plant. Clean culture about the putting greens will do much to prevent weed seeds from being blown or carried to them. We are now trying to control carpet weed (*Euphorbia maculata*), also known as ground spurge or milk purslane, with a spray of iron sulphate. Water pennywort (*Hydrocotyle umbellata*) is a wet-ground plant growing from small tubers and spreading by long, slender runners that root at every joint. We have found that for this the best control is to treat with lead arsenate and keep the infested areas well on the dry side.

We have found that putting greens on which corrosive sublimate has been used for the purpose of controlling brown-patch are usually fairly free from grubs and earthworms. When, however, corrosive sublimate is not wholly effective we make applications of lead arsenate for controlling these pests. Only one or two of the many species of ants are troublesome in heavy turf with us, but we have found that a poison prepared by a local chemical house is very effective in controlling the ants. This poison is simply sprinkled on the ant hills, and as it is carried by the ants into their nests whole colonies disappear in a very short time.

We have very few animal pests on our course. The only one of any consequence is the pocket gopher, known here as the salamander. This is a small fur-bearing mammal with cheek pouches, apparently closely related to the western pocket gopher. It lives in tunnels from 4 to 12 inches below the surface of the soil, throwing out mounds of dirt at frequent intervals. It can be controlled by opening up the tunnel, putting in a liberal dose of Cyanogas, and closing the opening. The most effective control, however, is the use of a No. 2 steel trap. We open the tunnel and insert the trap, leaving the hole open; the gopher springs the trap in pushing up dirt to close the tunnel. Skunks sometimes do damage to our fairways in digging for grubs and worms, but on the whole they do more good than harm. Land turtles dig burrows in our loose soil, but work mostly in the rough. They may be killed by inserting about 2 tablespoonfuls of Cyanogas well down into the hole and plugging the opening to confine the gas.

Bermuda Turf on Beach Sand

By Fred Hoerger

Bay Shore Golf Course, Miami Beach, Fla.

The site of the Bay Shore Golf Course was an expanse of white beach sand at the time of its construction in 1921. The areas for the fairways were surfaced with a layer of black sandy soil several inches thick, and the grass was planted on this surface. In building the greens a mixture of this black sandy soil and marl topsoil, in equal proportions, was laid over the sand, and the grass then seeded. The tees were built up in about the same manner as the greens, about 6 inches of the same soil mixture being used. No soil was added to the rough, the grass being planted directly in the sand. The course has been in play since January 1, 1923, but is not open throughout the entire summer. We have had no trouble with sour soil, but have had trouble with salt. This was very difficult to overcome, success being attained only after proper drainage had been installed.

Bermuda grass responds well to fertilizer. The grass throughout this picture is Bermuda grass. On the left is the starved semi-dormant grass of the rough and on the right is the fertilized fairway turf which grows vigorously even in winter. Bay Shore Golf Course

Since their construction the fairways have been top-dressed several times with a marl topsoil and have been regularly fertilized. The fertilizer we use on the fairways is a 3-to-1 mixture of castor bean pomace and sulphate of ammonia. This is applied at the rate of 1,200 to 1,500 pounds to the acre. About four applications are made each year at intervals of 5 or 6 weeks, beginning about the middle of October. It is warm enough here during the winter so that, with plenty of fertilizer and water, the Bermuda grass will maintain a beautiful dark green color throughout the winter. Only the past three years have we been watering the fairways. We mow the fairways whenever needed, which is usually about twice a week.

On our Bermuda grass greens a northern grass is sown for winter play. About the first of October the Bermuda grass is cut very short, raked, brushed, and top-dressed sufficiently so that, after dragging the green with a mat, simply the very top of the grass will show through the dressing. The top-dressing consists of 4 parts of black

sandy soil and 1 part of marl topsoil. This black sandy soil consists of sand and well-decayed muck in about equal proportions. We do not keep a compost pile or soil bed. Usually no fertilizer is used when the top-dressing is applied, since it would produce too much growth of the Bermuda grass. About a week or two after the Bermuda has had time to come through this top-dressing, and while still thin, we usually seed the greens with Kentucky bluegrass. We have tried different grasses, but get the best results from Kentucky bluegrass alone. This is seeded at the rate of 6 or 7 pounds to 1,000 square feet and covered with sufficient of the same top-dressing material to cover most of the seed. We have found that at this time it is best not to use any nitrogen fertilizer, in order to prevent setting back the development of the winter grass by inducing a vigorous growth of the Bermuda, but at the same time a small amount of a phosphatic fertilizer will greatly help the young seedlings. About every two weeks after the young grass is strong enough we apply a good, balanced fertilizer analyzing 5-8-2 or 6-8-2 at the rate of 10 to 15 pounds to 1,000 square feet. When the winter grass has become well established, we top-dress the putting greens every three or four weeks, and fertilize at the time of top-dressing, using mostly organic fertilizers such as activated sludge applied at a rate as high as 20 to 25 pounds to 1,000 square feet. The fertilizer is applied with a spreader, not mixed with the top-dressing but on top of it and before it has been dragged with the mat. The dragging mixes the fertilizer with the top-dressing and also greatly reduces the danger of burning. The greens are mowed by hand early each morning, and rolled with a light roller two or three times a week.

We have not found it necessary to have separate greens for summer and winter play, since the winter grass disappears gradually in the spring and the Bermuda returns to form a vigorous turf with surprising rapidity.

Our water is supplied from the City of Miami Beach and is purified. The fairways are watered twice a week when needed. Two men, starting early each morning, water from 4 to 5 fairways, depending on the size. We have a 1-inch hose system and, with a 3/8-inch nozzle, pressure at the sprinkler is 125 pounds. The valves are at the edge of the fairways, about 150 feet apart. Three to six sprinklers are used on each fairway, according to size. One man changes the sprinklers on two or three small fairways. The sprinkling is completed by 8 or 8.30 o'clock, when the hose and the sprinkler are removed, and the hose coiled at the side of the fairway. On three or four short holes, only the approaches to the green are watered and the green sprinkler is used for this purpose. In the late afternoon the hose and sprinkler are moved to the fairways that are to be watered the next morning. Starting about 6 o'clock in the morning, one man waters the greens, using the same type of sprinkler as used on the fairways but with a smaller nozzle. The whole area of the putting green is covered without moving this type of sprinkler. The sprinklers are set and allowed to run for about one hour. The tees are watered in the early mornings about twice a week. The tees have underground pop-up type sprinklers controlled by a valve at the side of the tee, and the entire tee can be watered in 10 or 15 minutes.

About the only turf disease with which we are troubled at Miami

Beach is a fungous disease resembling brown-patch. It can be controlled by applications of corrosive sublimate and calomel or any of the remedies on the market for brown-patch. We are rarely bothered by this disease except in the young winter grass.

The mole cricket attacks our greens and tees, but does not bother the fairways. To control this insect on the putting greens, we apply from 5 to 7 pounds of arsenate of lead to each 1,000 square feet early in the fall with the first few top-dressings. This is either mixed with the top-dressing or applied on top of the dressing before it is dragged. During the winter the arsenate of lead is also applied each time we top-dress the greens, but in much smaller quantities. The tees are treated in the same manner as the greens whenever they appear to be in the need of treatment.

A Winter Course on a Limited Budget

By Terry Dolson
Punta Gorda Country Club, Punta Gorda, Fla.

The Punta Gorda Country Club occupies 105 acres of uniform sandy loam on flat, slightly sloping ground 1½ miles from Charlotte Bay. The highest elevation is but 13½ feet above sea level with a tide-water creek entering the property for a short distance. The present course was built in 1928, utilizing such improvements as have been made since I came to Punta Gorda in 1922, and was opened for play in January, 1929. It is essentially a winter-resort course which must be maintained on a basis of strict economy working on a limited monthly budget. From April to September a mechanic and one laborer are employed to keep the fairways mowed and to haul in at least 350 cubic yards of top-dressing. From October to March four additional laborers are employed. A daily record kept on a form sheet helps me to plan the work economically.

Proper drainage was the main consideration in the construction of the course because the carpet grass, which thrives in this section, requires sufficient drainage to remove standing water without lowering the water table. Marl pockets are occasionally encountered several feet below the surface but I have never noticed a trace of marl in the top-soil. Playable ditches 10 yards wide were dug 1 foot deep on the high back part of the property, gradually increasing to a depth of nearly 3 feet on the lower, front part. This drainage system intercepts water from the back country and discharges into a pond developed from the slough and into two artificial ponds. The water level holds up well in these ponds during the dry winter months. The excavated dirt was used for building putting greens and tees, and the muck from the slough was used for the top 5 inches of the putting greens and tees. All ditches are water hazards, turfed, and playable except during the rainy period. The ponds have a depth of from 2 to 4 feet during the dry months. Their banks are turfed and kept mowed to the water's edge. We have not tried to keep the ponds cleared. Rushes grow along the banks of the ponds and water lilies have been introduced. There is good bass fishing in the big pond, and one or two alligators sunning themselves on the banks prove a source of interest to the winter golfers.

We have an adequate water supply from two 6-inch wells sunk 400 feet in sand. The water is pumped directly to the putting greens,

tees, and club house by two 6-horsepower gas engines. The water is exceptionally pure for this part of the country, being relatively free from iron and sulphur. Grass near the pump house receiving excessive amounts of this water is not harmed.

In building the fairways the ground was thoroughly plowed and disc-harrowed. Most of the pulverizing and smoothing was done with an Acme harrow. Cow manure at the rate of 4 cubic yards to the acre was worked in at a cost of about $7.50 a cubic yard. The results were good, but I would not recommend cow manure for this section because of its cost. We have never observed any infestation of grubs from its use, however, and in fact have never had any trouble from grubs, although June beetles are occasionally in evidence. Carpet grass seed at the rate of 120 pounds to the acre was sown on the fairways in 3 seedings; each seeding was followed by a light harrowing, and the last one finished with a plank float. A very uniform stand of grass was obtained.

The putting greens were built with the sand and soil from the drainage system. On this was spread 5 inches of muck from the slough and mixed with the top 2 or 3 inches of sand. After the final smoothing, wood ashes and tankage were carefully raked in. They were planted with stolons of giant Bermuda grass spaced about 10 inches apart; this was done during the two weeks before June 15, when the rainy season definitely set in. There was some damage from washing, but the grass knit quickly and upon my return the following October it had become thoroughly matted. No seed was used on the putting greens. The stolons were all obtained from the first putting green which I had planted on the course several years previous. They had originally been obtained from the golf course at Useppa Island, 25 miles to the south, where I had found this giant Bermuda grass producing a turf of superior quality on very sandy soil and presenting a fair putting surface. It is true that the giant variety of Bermuda grass can not be recommended for its putting surface; yet with top-dressing, as is necessary with all varieties of Bermuda grass, and with the use of a power putting green mower with a high-speed reel, it makes a putting surface that is surprisingly little inferior to that of the finer varieties. I prefer the giant variety for this particular course for two reasons: in putting greens that are not cut during the 6 summer months, or are scantily maintained during that time, the giant variety holds its own better; further, it stands up better under the quick succession of heavy top-dressings and accompanying rakings and brushings that are necessary in October and November, when we apply about 3 cubic yards of top-dressing to 1,000 square feet of surface.

Our top-dressing material is obtained from the cultivated edge of a muck pond about 3 miles from the course. It is not muck, but a soil with a varying degree of muck containing some marl. When the tomato season is over and before the rain sets in, the men shovel off the tops of the cultivated rows. This is easy to shovel and is practically weed-free. The material is hauled to the course and dumped in piles closely together so that, when leveled, the top of the material is only about 18 inches high. It is then plowed and disced twice a month during the rainy season, which ends about October 1. As most of it is put on the putting greens with shovels, it is applied either wet or dry. Some of it is hauled under shelter so that it can be screened

and used in the light top-dressing of the winter grass seed. After it is shoveled on the putting greens it is raked, dragged with a large cocoa mat, and then washed down well into the grass with an open hose. After the next to the last top-dressing the putting greens receive an application of 40 pounds of hardwood ashes to 1,000 square feet. After the last top-dressing they receive an application of 40 pounds of castor bean pomace and 5 pounds of a commercial grade of ammonium phosphate to 1,000 square feet (hardwood ashes and organic fertilizer are applied separately to prevent quick release of nitrogen from the organic fertilizer). A week later Italian rye grass is sown with a mechanical seeder, in two sowings, at the rate of 25 pounds to 1,000 square feet. Each seeding is lightly top-dressed with a mechanical top-dresser. Arsenate of lead and a commercial organic mercury compound, the former at the rate of 12 pounds and the latter at the rate of 7 ounces to 1,000 square feet, are mixed with the last of these top-dressings. December 1 is the earliest time advisable to sow winter grass of any kind in this section.

We start cutting the putting greens in about a week or 10 days, depending on the growing conditions. For about two weeks, hand mowers are used to prevent damage on the turns; after that power mowers are used. We have 3 power mowers, which have been highly satisfactory in results obtained and money saved. On putting greens that are gently contoured they have no drawbacks, but on sharply contoured putting greens, especially those of a sandy nature, they may be troublesome because of slipping and scalping. An adjustable brush attachment for the mowers is useful for light brushings of the Bermuda grass, to prevent graining, or for heavy brushings to loosen the soil and tear up the old roots. The brush is never used on the winter greens. During the winter only two of these mowers are ordinarily in daily use, one being kept for emergencies.

From the time of seeding to the end of the winter season the putting greens are never top-dressed. Light applications of commercial ammonium phosphate are made on an average of once every two weeks, with a barrel sprinkler. A concentrated commercial fertilizer containing potash, in addition to ammonia and phosphoric acid, was used for a time, but was abandoned because it resulted in so great a stimulation of the Bermuda grass that the latter started to crowd out the rye grass.

All of our putting greens except one are rather uniform in their water requirements. This one has an impervious marl base and requires only about one-third of the amount of water needed on the other putting greens. On an average each of the 17 putting greens gets 3 hours of watering every other night from one sprinkler. The pressure at the sprinkler is from 25 to 30 pounds. Regular watering of the putting greens is practiced only from the time the winter grass is sown until the close of the winter season.

From April to September inclusive, 9 holes are closed to play and the putting greens watered until the grass has become tall and gone to seed and the hot weather has killed out the winter grass. Neither these greens nor the tees are cut until fall. On the other 9 holes there is a little local play. They are watered a bit during drought and top-dressed once or twice. No fertilizer is applied during the summer and little weeding can be done.

The rough is cut twice a year. After the November cutting, the clippings are raked away from the trees, plantings, and clumps of palmetto that have been allowed to grow, and the rough, except that containing any Australian pine trees, is then burned over. This burning, which has been done for three years, is not intense enough to burn out the soil or destroy the grass roots, as each year the grass in the rough becomes denser with the invasion of carpet grass. Although the rough grows but little during the playing season, it is given a cutting toward the latter part of February to improve the unkempt appearance. During the playing season the rough can not be burned; so the near-rough is raked about 10 yards in from the fairway, and the rakings piled out of the way of play and burned at the end of the playing season. From June until the cutting and burning in November a golf ball driven into the rough is as good as lost. Regular cutting would tend to change the rough from field grasses to carpet grass.

Bermuda grass at Punta Gorda attacked by disease

Carpet grass seems to have a limited range for fairway use. It seems to thrive best on low land which has a high water table, but standing water will cause it to thin out or die. It has a very extensive root system and, under suitable conditions, it makes an ideal turf. It mats well, and a golf ball sits up nicely on the stiff blades, but heavy top-dressing will smother it.

Here at Punta Gorda there is a 3-acre spot on the course that is a bit more sandy and higher than the rest of the course, and rendered dome-shaped by grading. Carpet grass would not grow on the high part. I plowed up this entire area, turning the furrows over onto bunches of cuttings of a common variety of Bermuda grass. I used 20 wagon loads of cuttings on the 3 acres. I then top-dressed with 75 cubic yards of muck. For a year I had a fine mat of Bermuda, but now, after 3 years, the carpet grass has completely taken over the

ground up to its former limit, and the higher part of the ground has a fairly good turf of blanket grass (*Syntherisma serotina*), which probably came in with the muck. Hardly a blade of Bermuda grass is left, yet during all this time the turf has been consistently good. A mat of Bermuda grass, in putting greens or fairways, will give way to other grasses on sandy soil unless top-dressed regularly.

Our tees during the entire year are covered with Bermuda grass and some carpet grass. During the winter, before receiving the frequent, light top-dressings, worn parts and divot holes are lightly sown with Italian rye grass. They are mowed with lawn mowers set as low as possible.

Brown-patch is our worst trouble. Copper-lime dust was first used as a control measure, but had to be discontinued on account of its toxic effect on the grass. Since then, mercury preparations have been used. I was able to get 150 pounds of a commercial organic mercury preparation last winter and with it was able to protect our greens from the time of seeding. As we did not have enough to treat the tees also, they suffered, and one was entirely killed. It was resodded but became badly damaged again before the end of the season. The disease appears in two forms—one the typical, large, circular brown patch with the weblike appearance in the early morning, the other the occasional irregularly-shaped patch. It appears first in early fall, is worst during the early winter, and seems to lessen somewhat in March. It can be controlled with mercury, and will not kill the turf if treatment is promptly applied. We seem to get about 2 weeks' protection by applying 7 ounces of the organic mercury preparation to 1,000 square feet. The ammonium phosphate fertilizer is applied about every two weeks with the mercury preparation. Ten days after the mercury has been applied we watch sharply for any sign of the disease. If the greens do not need fertilizing, a few spots of brown-patch can be checked with a light dusting with the mercury. Sometimes it is necessary to give the entire green a separate treatment. Every green is watered rapidly and lightly before 9 in the morning, to wash off the dew, which is ordinarily heavy and hinders the putting of early golfers. On nearby wind-swept island or beach courses the disease does not seem to appear, and it is possible that the removal of the dew by early-morning watering may aid in the control of the disease on our course.

The extensive drainage system, including three ponds and playable water hazards, and encountered to a greater or less degree on every hole, makes the 6,365-yard course sufficiently testing. There are but one extensive fairway trap and no sand traps adjacent to the putting greens. I believe that the winter tourist, whom I had in mind when I built the course, would rather play from a grassy depression or from the hard sand of a water bed, than from the soft sand and sand traps, and it results in a saving in maintenance costs.

Trees need enormous quantities of water to keep them in a healthy condition. An apple tree 30 years old gives off approximately a barrel of water a day in summer, and a good-sized birch tree gives off nearly 2 barrels of water on a hot day. A single oak tree is known to have given off into the air in the form of vapor approximately 800 barrels of water in a growing season.

QUESTIONS AND ANSWERS

How can we control Bermuda grass in putting greens of bent grass? (Tennessee)

ANSWER.—It is probable that if the Bermuda grass is weeded out of the putting greens by hand as soon as it begins to appear in the spring, and a careful watch is maintained through the spring and summer to keep the greens clean, they may be effectively rid of the Bermuda grass. You will probably find that much of the Bermuda grass has winterkilled and that comparatively little will be left in the putting greens to weed out in the spring. Your conditions in Tennessee are doubtless similar to those in Oklahoma, where there are many beautiful putting greens of seaside creeping bent grass. In those putting greens the Bermuda grass starts out with only a few scattered patches in the spring, but by fall it has sometimes taken over large areas on the putting greens. The putting greens, however, are played on over winter and a great deal of the Bermuda grass winterkills so that by the following spring there are only a few scattered patches left. These patches again increase in the summer until gradually the Bermuda grass takes over more and more of the bent putting greens. The plants should therefore be removed before they have a chance to spread.

Should manure be used very often during the summer as a fertilizer on putting greens? (Texas)

ANSWER.—We advise against the use of manure on putting greens, since it usually contains a large quantity of weed seeds. For fertilizing putting greens we recommend other nitrogen carriers, such as cottonseed meal, bone meal, pulverized poultry manure, and activated sludge. Organic fertilizers must be used with care during the late spring and summer as they are apt to break down rapidly during the hot weather and may stimulate more growth than is desirable. The growth of the grass can be controlled better during the summer by making lighter and more frequent applications of soluble nitrogen carriers, such as sulphate of ammonia, ammonium phosphate, and urea.

What should be used as a dressing to create the best cushion under grass? (Texas)

ANSWER.—Sandy loams containing much organic matter are best for improving the cushion on putting greens.

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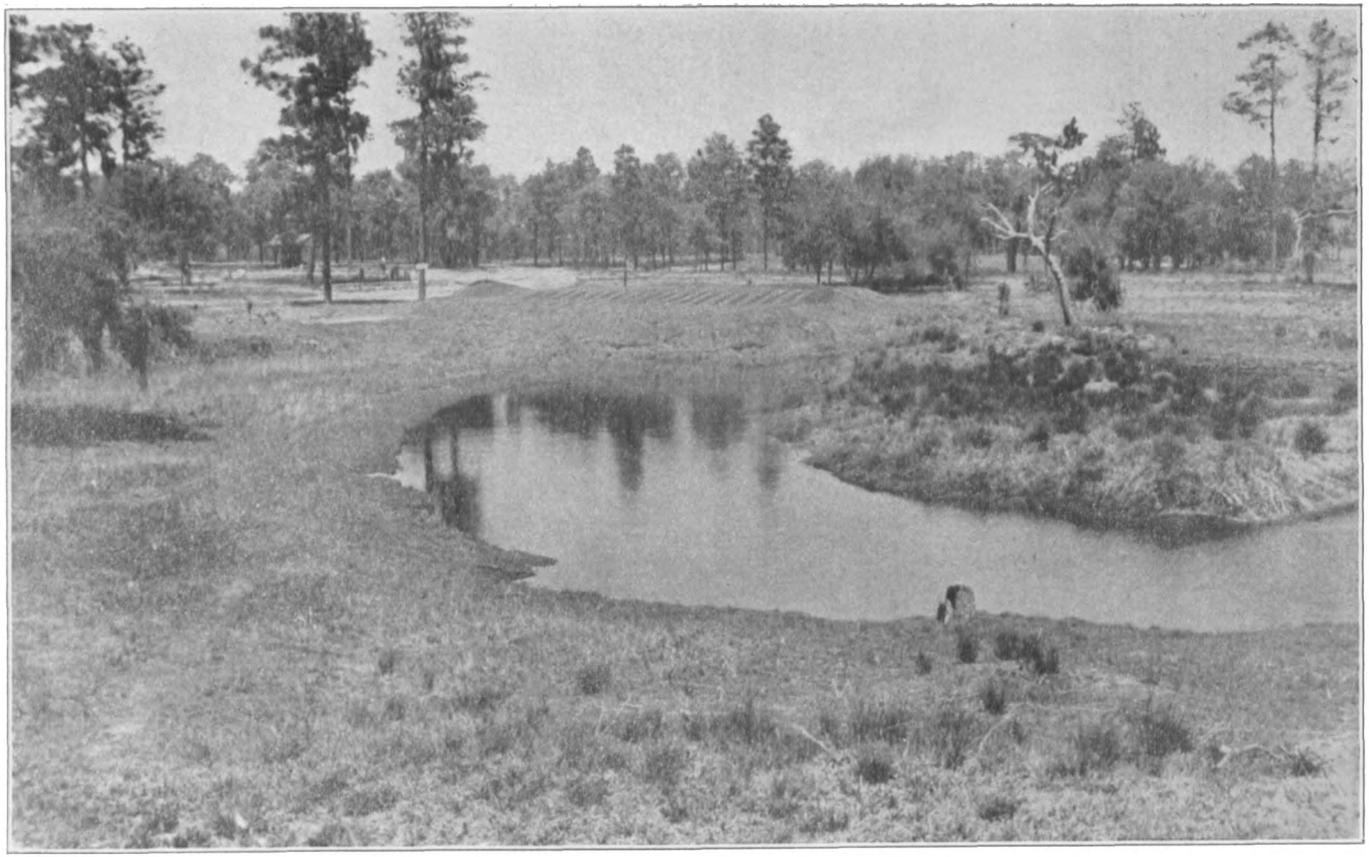

Thirteenth hole (130 yards), Forest Hills Country Club, Tampa, Fla.

The foolish and the dead alone never change their opinion.

James Russell Lowell