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Demonstration Turf Garden Reports

Summary of Reports from Twelve Gardens for 1929 Season

By John Monteith, Jr.

During 1928, in cooperation with local golf organizations, the Green Section established a number of demonstration turf gardens in different sections of the country. These demonstration gardens were to provide local stations at which the Green Section might test a number of different grasses, fertilizers, and cultural methods under a variety of soil and climatic conditions to serve as checks on some of the results obtained in the experimental turf gardens at Arlington and elsewhere. They were also to serve as outposts for the Green Section work to present to greenkeepers and green-committee members the elemental principles of scientific turf culture in a manner that could be readily understood and at locations where they would be more readily available than is the case with the larger experimental turf gardens. The purposes and locations of these several demonstration gardens were set forth in the December, 1928, number of the Bulletin.

These gardens are divided into series of plots 10 feet square, each series receiving some treatment different from its adjoining series. The seed and stolons for planting the gardens were furnished by the Green Section. Part of each garden was devoted to tests on putting green turf, and this part was cut, watered, and top-dressed like putting greens on a new course. The top-dressing material was the regular compost used on the course where each planting was made. Except for the fertilizer series no standardized treatment was prescribed. Therefore in addition to differences due to soil and climate there were differences in the care of the several gardens, including differences in watering, mowing, top-dressing, fertilizers used, and other maintenance procedures. Consequently the grasses which received the highest ratings in the accompanying tables demonstrated their ability to produce good turf under a great variety of soil, climatic, and cultural conditions. The fact that the care of these gardens has been left entirely in the hands of some of the country's best greenkeepers who employ somewhat different methods on their courses, speaks well for the practicability of the results obtained. The accompanying chart shows the plan of these demonstration gardens. In two cases, where soil conditions seemed to justify it, the arrangement of the plan was somewhat altered. The garden at the Interlachen Country Club is an instance of such an alteration; its plan is shown in the illustration on page 223 of this number of the Bulletin.

In order to avoid danger of interference with different fertilizers used in the compost on the several courses, the top-dressing used on the fertilizer series was merely the natural soil of the garden that was planted. This top-dressing was used to fill in the low spots so as to give a true surface. The fertilizers were sent out from the Washington office of the Green Section in order that these materials would be the same on all plantings and also to relieve those who cared for the gardens from the tedious task of carefully weighing the small quantities involved.

The gardens in many sections proved of much interest and were carefully watched by greenkeepers and green-committee members in their neighborhoods. Meetings of greenkeepers and green-committee

PLAN OF DEMONSTRATION TURF GARDENS

	A	B	C	D	E	
1						Optional.
2	Red fescue. Chewings' fescue	Wash- ington Metro- politan.	Colonial, western. Colonial, N. Zealand	Colonial bent, R. I.	Velvet bent seed.	Trial plots of putting green grasses.
3	Annual bluegrass.	Virginia. Columbia.	Seaside bent.	German mixed bent.	Highland velvet. No. 14276 velvet.	
4	Sewage sludge.	Poultry manure tankage.	Check.	Sulphate of ammonia.	Compost and sulphate of ammonia.	Fertilizer experiments on putting green grass (seeded German mixed bent).
5	Check.	Nitrate of soda.	Urea.	Phosphate of ammonia.	Check.	
6	Complete fertilizer 6-12-4	Complete fertilizer 12-6-4	Check.	Lime and sulphate of ammonia.	Bone meal.	
7	* German mixed bent.	German mixed bent.	German mixed bent.	Metro. bent stolons.	Chewings' fescue.	Putting green length.
8	* Ky. blue and redtop.	Ky. blue and redtop.	Ky. blue, redtop and Ger. mixed bent.	Ky. blue and redtop	Chewings' fescue and Ger. mixed bent.	Fairway length.
9	Ky. blue, redtop and Chewings' fescue	Ky. blue and redtop.	Ky. blue, redtop and Ger. mixed bent.	R. I. bent.	Chewings' fescue and Ger. mixed bent.	Trial plots of fairway grasses.
10	Bone meal.	Lime.	Check.	Sulphate of ammonia.	Sewage sludge.	Fertilizer experiments on fairway grasses (Kentucky blue grass and redtop mixture).
11	Check.	Manure.	Complete fertilizer 6-12-4	Complete fertilizer 12-6-4	Check.	

* Soil in plots 7A and 8A poisoned with arsenate of lead before seeding.

members were held during the summer on many of the gardens. Some of these meetings were attended by visitors from courses over 100 miles away. In this number of the Bulletin, Frank H. Wilson, Jr., who has charge of the garden in the Boston district, and Erich W. Pahl, who has charge of the garden in Minneapolis, give their impressions of the value of their gardens not only to themselves but to their fellow greenkeepers. These two articles require no comment, for they well illustrate how these demonstration gardens are serving their purpose of aiding those who choose to use them to their full advantage. Many of the other gardens have been likewise used during the year and enthusiastic reports have been received from them. These two reports are published because they represent opinions from two districts far apart but where the fine attitude of helpful cooperation is quite evidently the same.



At the Green Section's demonstration turf gardens, greenkeepers have opportunity to gather from time to time to inspect experimental results and discuss the various features of the work

The plans for these turf gardens call for periodic reports on the condition of the plots. These reports are prepared in duplicate, one copy being sent to the Green Section office in Washington, the other being retained for home use and reference. In most cases the reports were submitted monthly from May to October; and it was indeed encouraging to find that with very few exceptions the notes showed evidences of conscientious endeavor to register observations in a fair-minded and accurate manner. Taking notes is at best a tedious task; but since no individual's mind is reliable enough to remember the changes that come about in the various plots of such a series throughout the year, much less over a number of years, it is essential that some record be made if the work is to mean anything as time goes on. Most of those who undertook to care for these turf gardens gladly complied with the request for notes throughout the season of 1929, and we are therefore able to present to our readers a summary of the results obtained on 12 of these turf gardens. In a few cases, for one reason or another, the periodic reports were not made out. Where records were made for only part of the season or where there was evidence of carelessness or indifference in their preparation, the reports have not been used in this summary. The turf gardens from

which this review is compiled and the names of those who prepared the notes in each case are shown in the accompanying list.

DEMONSTRATION TURF GARDENS COOPERATING WITH THE GREEN SECTION

ALLEGHENY COUNTRY CLUB.....	PITTSBURGH
John Pressler and Lois Miller	
CENTURY COUNTRY CLUB.....	METROPOLITAN DISTRICT
Henry Shakeshaft and G. W. Milnes	
CHARLES RIVER COUNTRY CLUB.....	BOSTON
F. H. Wilson, Jr.	
DETROIT GOLF CLUB.....	DETROIT
Alex McPherson	
INDIAN TRAIL GOLF COURSE.....	GRAND RAPIDS
Floyd Metcalf and H. Pas	
INTERLACHEN COUNTRY CLUB.....	MINNEAPOLIS
E. W. Pahl	
MASSACHUSETTS AGRICULTURAL COLLEGE.....	AMHERST
Wm. E. Robison, Jr., and L. S. Dickinson	
MEADOWBROOK COUNTRY CLUB.....	DETROIT
Wm. Slack and T. Slessor	
MORRIS COUNTY GOLF CLUB.....	METROPOLITAN DISTRICT
G. Donofio and G. W. Milnes	
OAKMONT COUNTRY CLUB.....	PITTSBURGH
Emil Loeffler and Lois Miller	
UPPER MONTCLAIR COUNTRY CLUB.....	METROPOLITAN DISTRICT
George Robertson and G. W. Milnes	
WHEATLEY HILLS GOLF CLUB.....	METROPOLITAN DISTRICT
Frank Krause and G. W. Milnes	

In order to simplify as much as possible the taking of notes and to avoid the danger of hair-splitting details which would make the notes difficult to interpret it was decided to standardize the details as much as was practical. Accordingly blank forms were provided to be filled in with a few simple markings. The turf on each plot was rated as excellent, good, fair, or poor. In determining this rating of the turf it was specified that consideration be given its density, vigor, color, fineness, freedom from nap, and any other factor that would affect its quality for golf turf purposes.

No effort was made to establish any one standard of excellence by devising a score card. The ratings are therefore to be regarded as merely relative. In the series of plots of different grasses for putting greens, for instance, a report from one club might indicate that a certain grass was good whereas the report from another club might rate the same grass as fair. As an actual fact the turf in the latter case might be fully the equal of the former, but the person or persons making the report were probably more critical and exacting in the latter case than those making the report from the club where the grass was given a rating of good. However, the individual who was more exacting and held higher standards would naturally scale down all the ratings in the same degree. Since the purpose of the reports

was to compare the grasses side by side rather than to compare the ratings of different sections, all reports that were made with care and fairness were equally valuable. It will be noted in the foregoing list that in the majority of cases the notes were made by two individuals, which of course helped to avoid oversights.

Many who are interested in these gardens have wondered just how these records could be of value without a definite standard to guide in making the ratings. To make this clear we use a single example. Reports were received from three gardens which for convenience will be referred to as reports No. 1, No. 2, and No. 3. In report No. 1, Metropolitan bent is rated as excellent and Virginia bent as good; in report No. 2, Metropolitan is rated good and Virginia fair; in report No. 3, Metropolitan is given a rating of fair and Virginia is poor. This might be interpreted as meaning that in garden No. 1 the Metropolitan was much superior to the Metropolitan in either of the other two gardens, and that the Virginia in garden No. 1 was superior to the Metropolitan in garden No. 3. Such a conclusion is unwarranted for these differences may merely mean that those who made out report No. 3 held a much higher standard of excellence than those who made out No. 1. Such comparisons between different course reports may or may not have some significance other than the personal factor. The important point in the three reports is that the Metropolitan proved superior to the Virginia in each instance regardless of differences in soil and climate.

PUTTING GREEN FERTILIZER RATINGS, ON GERMAN MIXED BENT TURF, FROM 12 DEMONSTRATION GARDENS DURING 1929

(The order given is from highest to lowest rating for the year)

	May and June		July and August		September and October		Entire season (totals)	
	Excel- lent Good	Fair Poor	Excel- lent Good	Fair Poor	Excel- lent Good	Fair Poor	Excel- lent Good	Fair Poor
Complete fertilizer (12-6-4) .	11	1	12	0	12	0	35	1
Complete fertilizer (6-12-4) .	12	0	10	2	11	1	33	3
Sulphate of ammonia	11	1	9	3	12	0	32	4
Phosphate of ammonia	8	4	10	2	11	1	29	7
Poultry manure tankage	10	2	9	3	10	2	29	7
Urea	9	3	9	3	11	1	29	7
Activated sludge	8	4	8	4	10	2	26	10
Sulphate of ammonia and compost	10	2	6	6	8	4	24	12
Sulphate of ammonia and lime	5	7	6	6	11	1	22	14
Nitrate of soda	8	4	5	7	9	3	22	14
Bone meal	5	7	6	6	8	4	19	17
Checks (no fertilizer)	1	11	1	11	2	10	4	32

From some of the gardens the reports for the entire year did not include a single rating of excellent even though the turf was well cared for and many of the plots in these particular gardens had turf which would have been a credit to most courses of that neighborhood.

This merely indicates that those who prepared the notes in many instances were extremely critical and were inclined to underrate the turf rather than to assign any flattering ratings. This tendency of course makes the accompanying tables more interesting than would have been the case had the tendency been the other way, with ratings universally higher. No attempt is made in this summary, nor will any such attempt be made in the future, to publish comparative ratings of the different gardens, for such a comparison would serve no useful purpose and might tend to encourage less critical rating if the individual or individuals making the notes felt that low ratings would bring discredit to those caring for the garden being rated. The Green Section wishes to encourage a critical attitude toward these gardens, and it is hoped that the standards of excellence will be raised even higher as the turf becomes older.

Wherever possible the reports have been condensed to tables. An attempt will be made in the text to call attention to the chief points of interest in each; but it is recognized that any set of tables contains almost unlimited possibilities for analyses. The reports cover a period of six months; but to simplify the tables they are arranged in three periods of two months each, representing early summer, mid-summer, and late summer or early fall. In the tables the two columns at the right give the totals of these three bimonthly summaries. The ratings excellent and good, as well as fair and poor, have been combined to further simplify the tables. A few deviations were made from the standard plan of the gardens, which resulted in omitting certain grasses from some gardens. Where any grass or combination of grasses was not planted in all of the 12 demonstration gardens attention is called in the tables to this omission.

PUTTING GREEN FERTILIZER RATINGS

The putting green fertilizer tests were made on German mixed bent turf. There are 15 plots in this series, 11 receiving different fertilizers and 4 being check plots which received no fertilizer. The check plots are so arranged that every fertilizer plot is beside one which is not fertilized. The fertilizers were applied each month from May to October. The rates of application were figured on a nitrogen basis. The quantities used for a full-strength application contained 1/10 pound of nitrogen to a plot. This is at the rate of 1 pound of nitrogen to 1,000 square feet, which is the amount carried in 5 pounds of sulphate of ammonia, in 16 2/3 pounds of the complete fertilizer with an analysis of 6-12-4, or in 33 1/3 pounds of bone meal analyzing 3 per cent nitrogen. During July and August the rates of applications were cut in half to reduce the danger from burning. Therefore in the six applications during the year each fertilized plot received 1/2 pound of nitrogen. The nitrogen basis for comparing the fertilizers was chosen instead of the cost basis, which has been suggested several times, because it is more definite and usable. Costs vary according to many local conditions as well as the seasonal changes. Knowledge of the relative effects of different fertilizers when compared on the nitrogen basis enables anyone to determine by simple arithmetic the values of fertilizers according to his local quotations.

In the accompanying table the fertilizers which received the largest number of ratings of excellent or good during the season have been placed at the head of the list while the check plots, receiv-

ing no fertilizers, which were given the fewest excellent or good ratings, are at the bottom. It is interesting to note that the two complete fertilizers head the list, which indicates that some readily available phosphorus and potash are desirable for grass in its first season. These complete fertilizers were prepared by mixing sulphate of ammonia, phosphate of ammonia (Ammono-phos), superphosphate, muriate of potash, and sand. No organic material was used in their preparation. The sand was used as an inert filler to add weight to make up the desired proportions. If the strength of a 12-6-4 fertilizer is reduced by the addition of an equal amount of inert material, such as sand, it gives double its weight of a 6-3-2 fertilizer. Since all the fertilizers were applied on a nitrogen basis only half the quantity was used of the 12-6-4 as of the 6-12-4 fertilizer. Therefore this quantity would carry as much fertilizer as would have been carried in a 6-3-2 applied at the same rate as the 6-12-4. The difference in the fertilizers applied to these two plots is therefore merely a difference in proportions of phosphorus and potash. The 12-6-4 formula was used on the plots in preference to the diluted 6-3-2 formula merely because the modern trend of fertilizer formulas is in favor of the more concentrated mixtures to save freight charges on inert materials.

In the plot receiving sulphate of ammonia and compost, only half the quantity of sulphate of ammonia was used as in the plot receiving the sulphate alone; the other half of the required amount of nitrogen was furnished by the compost. The results indicate that the nitrogen in the compost was not as readily available as in the inorganic fertilizers. Lime was applied on one plot in the spring. A small amount of injury resulted from this application on some of the gardens and the rating was therefore lowered early in the season.

It is interesting to note that the check plots, which were given no fertilizers, received only 4 high ratings out of the 36, indicating that the soil where these plots were planted was of low fertility.

In examining the table it must be remembered that it is a record of one season only. The really important test of a fertilizer is its ability to produce results over a period of years. It is well known that a fertilizer which may give excellent results at the start may be far outclassed in a period of years by some other fertilizer which at first was none too promising. It is to be hoped that these gardens will be continued in order that the accumulative value of these fertilizer tests will be available to golf clubs year after year. Even at this early date they are certainly of value to those who are interested in getting the most rapid turf development in the first season. The results are also significant in showing that the tests on a great variety of soils substantiate the more intensive tests at the Arlington turf garden and other experimental turf gardens in showing the prompt response of grass to fertilizers containing ammonia in its cheapest form, such as sulphate or phosphate of ammonia.

FAIRWAY FERTILIZER RATINGS

The fairway fertilizer series consisted of 10 plots planted with a mixture of 80 per cent Kentucky bluegrass and 20 per cent redbud. Three of the plots were not fertilized, to serve as checks against the seven fertilized plots. As in the putting green series, the nitrogen fertilizers were applied to give the same quantity of nitrogen for each plot and at the same rates as those used in the putting green ferti-

lizer series. These rates are regarded as excessive for annual applications to fairway turf and will be reduced next season. Early development of a fairway turf is, however, desirable, and it was therefore decided to make heavy applications of fertilizers the first season to attain this end.

FAIRWAY FERTILIZER RATINGS ON MIXED TURF OF KENTUCKY BLUEGRASS AND REDTOP FROM 12 DEMONSTRATION GARDENS DURING 1929
(The order given is from highest to lowest rating for the year)

	May and June		July and August		September and October		Entire season (totals)	
	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>
Complete fertilizer (6-12-4) .	10	2	9	3	9	3	28	8
Complete fertilizer (12-6-4) .	9	3	7	5	10	2	26	10
Sulphate of ammonia.....	7	5	5	7	8	4	20	16
Activated sludge.....	4	8	5	7	8	4	17	19
Bone meal.....	4	8	5	7	7	5	16	20
Manure	4	8	3	9	4	8	11	25
Lime	2	10	4	8	3	9	9	27
Checks (no fertilizer).....	2	10	2	10	2	10	6	30

The results on the fairway grass mixture show an interesting correlation with the fertilizer tests on the mixed bent in the putting green series. Here again the list is headed by the two complete fertilizers made by mixing in different proportions sulphate of ammonia, phosphate of ammonia, superphosphate, muriate of potash, and sand. It will be noted that the order of these two is reversed, but the differences are too slight to justify general conclusions. The significant point brought out by these results, especially on the unwatered fairway plots, is that the addition of some readily available phosphorus and potash is desirable on some soils to encourage seedling growth. The results indicate that although a certain proportion of each of these elements is important, an excessively large proportion of either does not add to the vigor of the turf.

Manure, which was applied in the spring, gave the poorest results of any of the fertilizers.

The plots which received lime alone were little better than the check plots. It is recognized that lime is not ordinarily classed as a fertilizer and for turf work should be used in conjunction with some fertilizer containing nitrogen. It was used in these plots, however, because many clubs in this country still use lime on fairways without any fertilizers. The results on these plots further demonstrate the futility of using lime in this manner.

The low ratings given the check plots again indicate the poor character of the natural soil on most of these gardens.

PUTTING GREEN GRASS RATINGS

The grasses tested at the turf gardens are grouped, in the accompanying table of ratings, according to botanical relationship, and within the groups are listed in order of favorable ratings.

In the group of creeping bents are four strains planted with stolons and one planted with seed. It is interesting to note that the seaside bent received a rank midway among the five. The ratings of the Metropolitan and Virginia strains of creeping bent will doubtless be of interest to those who make sweeping criticisms of creeping bent. An interesting detail not shown in the table is that out of the 36 ratings in the year's summary, Metropolitan received 12 ratings of excellent and Virginia only 2 (the figures in the table showing merely a combination of the ratings excellent and good).

PUTTING GREEN GRASS RATINGS FROM 12 DEMONSTRATION TURF GARDENS
DURING 1929

	May and June		July and August		September and October		Entire season (totals)	
	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>
Colonial bent:								
Rhode Island grown.....	9	3	9	3	8	4	26	10
Western grown.....	8	4	7	5	7	5	22	14
New Zealand grown*.....	7	4	7	4	6	5	20	13
Creeping bent:								
Metropolitan (stolons)....	11	1	11	1	11	1	33	3
Washington (stolons)....	10	2	11	1	10	2	31	5
Seaside (seed).....	9	3	11	1	9	3	29	7
Columbia (stolons).....	5	7	7	5	7	5	19	17
Virginia (stolons).....	6	6	5	7	5	7	16	20
Velvet bent:								
No. 14276* (stolons)....	1	10	8	3	8	3	17	16
Highland (stolons).....	2	10	4	8	8	4	14	22
Canadian (seed)*.....	..	..	5	5	5	5	10	10
Mixed bent (German).....	9	3	9	3	9	3	27	9
Fescue:								
Chewings'	9	3	6	6	6	6	21	15
Red	3	9	0	12	1	11	4	32
Annual bluegrass.....	7	5	4	8	3	9	14	22

The mixed bent seed used in this series was the same as that used in the putting green fertilizer series. It was purchased in open market as a representative of the German mixed bent of the trade. Seed sold under this name is chiefly Colonial bent but with a varying percentage of velvet bent and creeping bent as well as different amounts of redtop. The results on the gardens indicate that this mixture produced a turf with a rating very close to Colonial bent.

The Colonial bent (commonly known as Rhode Island bent or brown top bent) was grown from seed which came from three different sources. The reports indicate that there is little difference in the turf produced by this species of grass regardless of the origin of the seed.

The velvet bents made a poor showing early in the season but improved as they grew older. The stock available for these plantings

* Not reported from all 12 gardens.

in 1928 was limited and the plantings were accordingly far too sparse. This shortage of planting material largely accounted for the thin stand and low ratings early in 1929. The Canadian velvet bent, as will be noted, was produced from seed, but the seed was not planted until the spring of 1929; in considering its rating, therefore, allowance must be made for this delayed planting.

Both of the fescues showed a decline from spring to fall. The two plots showed a striking difference between the genuine red fescue of the trade and the Chewings' fescue, especially at the end of the season.

The plot of annual bluegrass (*Poa annua*) was planted with seed of mixed bluegrasses of which a little over 50 per cent was the annual bluegrass. This was the best seed of this grass available on the market, and although the turf produced was by no means truly representative of the annual bluegrass turf on many putting greens in the United States it is likely that the proportion of annual bluegrass will increase in the plots if the grass reseeds and crowds out the other bluegrasses.

FAIRWAY GRASS RATINGS

FAIRWAY GRASS RATINGS FROM 12 DEMONSTRATION GARDENS DURING 1929

	May and June		July and August		September* and October*		Entire season (totals)	
	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>	<i>Excel- lent Good</i>	<i>Fair Poor</i>
Colonial bent*.....	4	3	2	5	4	2	10	10
Kentucky bluegrass, redtop, and mixed bent.....	6	6	6	6	6	5	18	17
Chewings' fescue and mixed bent	7	5	5	7	6	5	18	17
Kentucky bluegrass, redtop, and Chewings' fescue.....	6	6	4	8	5	6	15	20
Kentucky bluegrass and red- top	4	8	4	8	4	7	12	23

Of the four mixed grasses in the fairway plots the Kentucky bluegrass and redtop mixture was given the lowest rating. The addition of either mixed bent or fescue seemed to improve the bluegrass-redtop combination. The mixture of bent and fescue made a creditable showing, as did the Colonial bent when planted alone. It is well known that Kentucky bluegrass is not aggressive during the first season; it is therefore too early as yet to pass judgment on these fairway grasses.

OTHER TESTS ON THE DEMONSTRATION GARDENS

In each of the demonstration gardens one putting green plot and one fairway plot were treated with arsenate of lead before sowing the

* Not reported from all 12 gardens.

seed. This poison was used at the rate of 5 pounds to 1,000 square feet. Beside each of the poisoned plots was one of the same grass on which arsenate of lead had not been used. In the first reports received from some of the gardens it was noted that some retardation of seedling development occurred in the plots treated with arsenate of lead. Later reports indicated that this was merely a temporary checking of growth, for by midsummer no difference was apparent in quality of turf on the poisoned plots and those not poisoned. The primary purpose of this test was to demonstrate the effect of this chemical on grubs, but none of the gardens were bothered with these pests last season.

Some interesting observations were made on the effect of arsenate of lead on earthworms. The poison used on all the gardens came from the same package and was applied at the same rates and in the same manner just before sowing the seed. In spite of this standard application of chemical there was apparently a difference in control of earthworms. On several gardens the number of earthworms in the poisoned plots was much smaller than in the check plots, but on other gardens the worms were equally numerous in both. This difference is probably due to a difference in soil, as has been indicated in previous tests. However, observations must be continued several more years before the full value of arsenate of lead as a control for earthworms is determined.

The reports on arsenate of lead as a control for weeds also failed to give conclusive evidence for or against this treatment. Five of the gardens were reported as showing some indication of a slight reduction in weed growth where arsenate of lead was used, but in the other gardens there was no apparent difference. As in the control of earthworms, soil conditions may have some influence on the effectiveness of this chemical when used for checking weeds.

In spite of the fact that during 1929 brown-patch was in general much less prevalent than usual, many interesting observations were made on the demonstration gardens. The reports however did not bring out anything new. It was noted on several gardens that there was a decided difference in susceptibility shown by the several putting green grasses, and it was also observed that the fertilized plots were more subject to attacks of diseases than were the check plots. Brown-patch is commonly more severe on older turf, and it is probable that many interesting observations will be recorded as these gardens grow older. Later observations when used with those made during the past season should be of much value in understanding and controlling turf diseases in the regions where these gardens are located.

The tests on cutting at different heights did not show anything of interest. Most of the gardens did not start these particular tests until late in the season. This delay was in order to allow the turf to become well established before changing the mowers. This type of test of course is not expected to show any striking differences for at least two years.

The lower rainfall of the past season in many sections where the demonstration gardens are located presented an opportunity to note the value of artificial watering of fairway turf in the plots where this test was made.

The demonstration turf gardens have proved of great interest during the year, and from every indication at present it is safe to predict

that they will prove more interesting and instructive as they develop farther and accumulative effects of fertilizers and treatments become a factor. Most of the gardens were used by individuals in their neighborhood to an extent far greater than those who planned the gardens had expected for the first year. The gardens have not solved all of the problems of turf culture nor have they solved any single problem. Such solutions were not expected by anyone who has any reasonable appreciation of such work. It is quite apparent however that they have encouraged an open-minded attitude among many who have visited them, and the results already obtained lead one to question many of the hard-and-fast rules by which some individuals feel turf culture can be governed. Such an accomplishment, independent of all the other features of value, has fully repaid the money and energy so far expended on these gardens.

Sorrel and Its Control

One of the more persistent weeds in fairways and putting greens, when once it has a foothold, is sheep sorrel. This is a low-growing, creeping perennial belonging to the buckwheat family and closely related to the docks. The weed is variously known also as horse sorrel, field sorrel, red sorrel, sour weed, or simply as sorrel, the name sorrel being derived from a German word meaning sour, and having reference to the sour taste of the leaves. Other plants with sour-tasting leaves are also called sorrel, but none of them are as troublesome as the sheep sorrel.

Sheep sorrel forms dense clusters of small arrow-shaped leaves, which lie close to the ground in poor soils and form thick mats of foliage on more fertile ground. The plant spreads by means of creeping underground stems or runners, somewhat after the fashion of the strawberry plant, and in addition produces an abundance of small, triangular seeds. The seeds are borne in loose clusters on slender stalks and are of a peculiar reddish brown color. In late May or early June a patch of sorrel is conspicuous for miles around, owing to the red mass of ripening seed heads.

This plant is a common weed in old pastures, meadows, stubble fields, and lawns throughout the United States. It is particularly abundant on dry, sandy, or gravelly soils that are in a run-down condition, although it sometimes becomes troublesome in more fertile soils following seasons of unusual drought. Its presence is often, though not necessarily, an indication of an acid condition of the soil, as the weed will thrive on acid soils more vigorously than will most other plants. Like any other plant, sheep sorrel prefers a rich, well drained soil well supplied with lime; but it usually can not compete with other plants under such conditions.

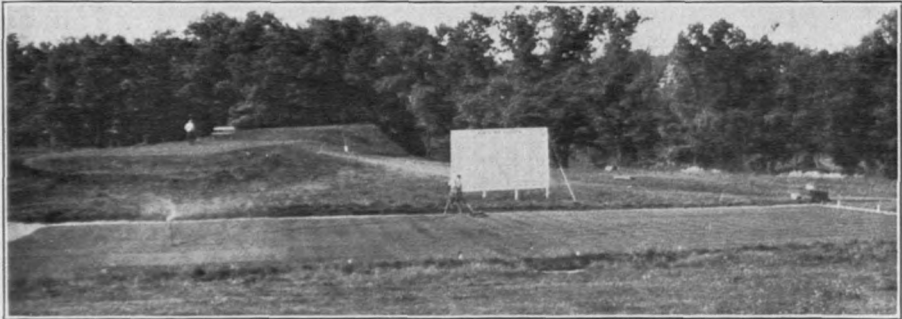
Sorrel can be destroyed by spraying with a solution of sulphate of iron (copperas) made at the rate of $1\frac{1}{2}$ pounds to a gallon of water. The treatment will not permanently injure grass, and will destroy the weed if repeated as often as the sorrel tries to send out new leaves. Sulphate of iron is deadly to clovers as well as to many broad-leaved weeds, but is not injurious to animals or to the soil. The spraying method is useful where the sorrel occurs as patches in a good stand of grass, or for working around rocks or fences. Where it is not abundant it may be weeded out by hand.

Demonstration Turf Garden at Interlachen Country Club

By Erich W. Pahl

Secretary, Greenkeepers' Association of Minnesota

The selection of the Interlachen Country Club, Hopkins, Minn., as the site for the demonstration turf garden for the Minnesota district, was made by the United States Golf Association Green Section on account of its accessibility and the fact that its soil appeared to approach nearest to the average for the district. The garden was laid out and planted during the first week of September, 1928. The sod that was removed from the location selected was used in reconstruction work on the Interlachen course. The planting was done by the greenkeepers of the Minneapolis-St. Paul district, under the supervision of a Green Section representative who had come to Minneapolis especially for the purpose. The seed was furnished by the Green Section. After planting, the turf developed rapidly, requiring two cuttings the ensuing fall. On the suggestion of Charles E. Van Nest, chairman of the green committee of the Interlachen Country Club, the clubs of the district gladly consented to contribute toward the upkeep of the plots for a period of five years.



The demonstration turf garden at the Interlachen Country Club

Fertilizer applications were begun in the spring of 1929 and have proved to be of great interest not only to the local greenkeepers but to many nurserymen and others who have visited the plots. A representative of the Minneapolis Park Board has visited the plots several times during the summer and was much impressed with the value of the work to the community. A rather interesting thing developed during the fall of 1929, when it was found that the plots which were fertilized with a mixture containing phosphate of ammonia had the least number of earthworms and that the plot receiving phosphate of ammonia alone had no worms at all. Of especial interest also was the comparison of the merits of different grasses on the plots in respect to the creeping habits of the various bent grasses, the texture of the turf produced, the local suitability of various grass mixtures, the ability of the grasses to withstand our severe winter conditions and hot, humid weather of summer, and their resistance to the brown-patch and snow-mold diseases.

The Greenkeepers' Association of Minnesota met at the plots several times during the summer, and many of the greenkeepers visited the plots also on Sundays, when they had leisure to examine them carefully and compare the results of different fertilizers during the

successive periods of the summer. The plots have been a great help to many in deciding on the kind or mixtures of fertilizers best suited to their needs and to the various grasses represented in the plots. The garden has taught us much during the past season, and I have no doubt that during the next four years it will teach us more than we now realize.

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Two views of the sign board erected alongside the demonstration turf garden at the Interlachen Country Club.

DEMONSTRATION PLOTS
SUPERVISION OF U. S. G. A. GREEN SECTION
SUSTAINING ORGANIZATIONS
MINNESOTA GOLF ASSOCIATION
MINIKANDA CLUB
MINNEAPOLIS GOLF CLUB
TOWN AND COUNTRY CLUB
MIDLAND HILLS COUNTRY CLUB
SOMERSET COUNTRY CLUB
WOODHILL COUNTRY CLUB
GOLDEN VALLEY GOLF CLUB
INTERLACHEN COUNTRY CLUB

To assist in explaining the demonstrational work under progress at the garden a large sign board was erected at the side of the plots. On the side of the board facing the plots is painted a sketch of the plan of the garden and details showing for the respective plots the kind and quantity of seed or stolons used in

planting the plots, the fertilizers being applied, and other pertinent facts. On the side of the board facing a path from the 13th green to the 14th tee is given a list of the organizations contributing to the upkeep of the garden.

The work of the Green Section of the United States Golf Association has been a great help to the greenkeepers of the country, and it is up to the greenkeepers to give it all the assistance possible at any and all times.

Systematic and intelligent buying is as important on a golf course as in a business run for profit. What is wisely saved is available for wise investment.

Demonstration Turf Garden at Charles River Country Club

By Frank H. Wilson, Jr.

President, Greenkeepers' Club of New England

When we were asked to start a demonstration turf garden at Charles River Country Club, Newton Centre, Mass., little did I realize the great value such a project could be to the golf clubs of this section of the country. The interest in the garden was continuous from early spring until the ground became covered with snow. Hardly a day went by without some greenkeeper or green-committee chairman making us a visit. Two meetings were held at the garden during the season, one in May by the Greenkeepers' Club of New England and one in September by the New England Service Bureau in conjunction with the Greenkeepers' Club. At the May meeting the greenkeepers showed much enthusiasm over the work, and monthly thereafter reports of results and observations have been printed in their *Newsletter*. At the September meeting 26 clubs were represented. In one instance the garden was used by a green-committee chairman and his greenkeeper to determine what kind of grass should be selected to plant greens on their course, and in another instance to determine what kind of bent stolons should be planted on a certain course. The garden has been generally educational. I have spent many hours explaining the work on the garden, and have received a great deal of pleasure and profit from it. Our optional plots have been occupied by four clubs that had strains of bent grasses which they thought possessed special merit; these strains are being compared with the grasses in rows 2 and 3.

The thing that strikes me most forcibly at the end of this first season's work at the garden is the everlasting change in appearance, showing that one can not pass final judgment on any single grass or fertilizer without careful observation over a long period. Weather conditions, disease, and other factors change the appearance of a grass from one week to another. One plot in particular which was extremely fine throughout the spring was completely wiped out by leaf-spot in July.

We have achieved some outstanding results. On the fairway plots the watered section was much better than the unwatered section, due to an extremely dry summer, except that the unwatered plot of Chewings' fescue and German mixed bent did well and stands out as the leading fairway mixture. Arsenate of lead injured the seedling turf, did not control earthworms, but did eradicate chickweed. Plots treated with organic fertilizers seemed to stand up under the summer heat better than those treated with inorganic fertilizers. In the selection of grasses for putting greens by those who visited the plots, color and texture seemed to be the deciding factors. Few seemed to take into consideration susceptibility to disease and other factors.

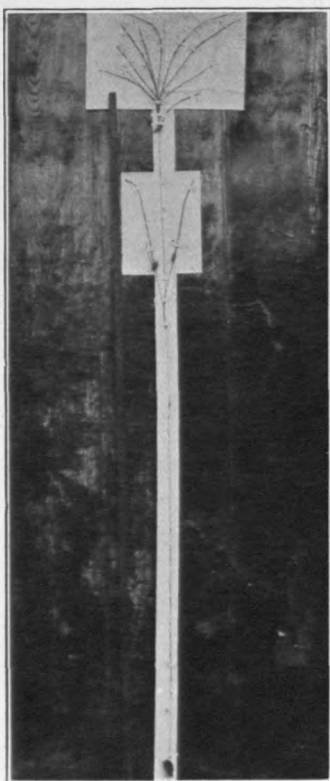
The work has been of great value to me in the operation of my own course and should be increasingly so as time goes on. The old adage "seeing is believing" holds good here. I have changed my fertilizer program to some extent because of results brought out on the plots. The results on the fairway plots will save time and money in the renovation and building up of fairways. The fertilizer plots of German mixed bent cut to putting green height certainly keep one thinking. I feel that other clubs also have benefited by using the

garden. The growing of the various leading putting green grasses in close proximity to each other is very helpful. The most important thing of all is the fact that the garden has become a meeting place for those who have the care of golf courses. We have also had a few gardeners visit the plots. Such an undertaking is useful in direct proportion to the interest shown in it, and I feel that our garden has been well worth while.

Control of Coco or Nut Grass on Southern Golf Courses

By Roy Kuykendall

Delta Branch, Mississippi Agricultural Experiment Station



A single plant of nut grass which developed from a tuber buried 6 feet in the soil. The original tuber from which the plant developed is seen at the base of the stem. About three-fourths up the stem a pair of underground rootstocks have developed, each bearing a tuber. It required 18 months for the upward growing stem to reach the surface of the soil.

In the South, coco or nut grass is one of the worst weeds in golf course turf. It is found in all the States bordering the coast line from New York to Texas, also in southern California. It does not seriously infest any of the inland States except Arkansas. It is objectionable in turf because of its characteristic growth, which interferes with the true rolling of the ball on a putting green. It is also objectionable in sand traps.

The character which makes nut grass so very pernicious is its habit of tuber production. Each of its tubers is capable of producing from 1 to 50 plants. The tuber normally sends up a slender thread, at the top of which a new plant is formed. As the plant matures, it usually enlarges at the base, forming a basal tuber, which in turn sends out lateral threads or rhizomes. Each of these rhizomes may form a new plant directly, or it may grow deeper into the soil, swelling at intervals, thus forming the chain of nuts so characteristic of the grass. Each of these new nuts may germinate and form new plants the same season, or it may remain dormant until the following season and then germinate. At the Delta branch experiment station, Stoneville, Miss., one nut planted in a 2-foot tile produced more than 1,100 nuts in a single growing season. The tip of the burrowing thread or rhizome is very sharp and is capable of piercing potatoes, dahlia bulbs, and similar growths. Nuts

have been known to germinate and force their way through ordinary tar roofing paper, form a new plant, and continue to grow. At this station one nut buried 6 feet deep in the soil germinated, sent a long slender thread upward, reached the surface after 18 months, and produced a strong, vigorous plant.

On account of the persistence of the plant, it seems impractical to eradicate it from putting green turf. While trying to get rid of nut grass the desirable turf grasses would also be destroyed. It has been said that the only way to get rid of nut grass is to die and leave it. The Delta station has been experimenting on its eradication since 1926. Every weed poison known has been tried, with but few favorable results. There are many sprays, gases, and salts which will kill the tops of the plants, but the reserve strength in the nuts is sufficient to produce new growth in a very short time. As much as an inch of growth may be formed over night. Of the many chemicals tried, common table salt, calcium chloride, and sodium chlorate have given best results. Any of these three chemicals should give favorable results in sand traps. The table salt or the calcium chloride should be applied at the rate of $1\frac{1}{2}$ to 2 pounds to the square foot. Sodium chlorate should be applied in a solution of 2 pounds to 1 gallon of water, with a pressure sprayer, both the plants and the ground being completely saturated with the solution. About three applications at intervals of two to three weeks should be sufficient to eliminate most of the nut grass in the sand traps or other places where all vegetation may be destroyed. Care should be exercised in handling sodium chlorate, because organic matter or dust mixed with the chemical makes it highly inflammable. Clothing, wood, or other organic matter when soaked in a solution of sodium chlorate may be easily set on fire by friction.

In view of the grave condition presented when nut grass has gained a foothold in a putting green a word of caution must be sounded to greenkeepers in the nut grass regions to be on guard at all times to prevent the introduction of the weed. It is especially liable to be introduced in soil used for top-dressing purposes. A green free from nut grass may be quickly ruined if top-dressing is used which contains viable tubers of the grass.

QUESTIONS AND ANSWERS

All questions sent to the Green Section will be answered in a letter to the writer as promptly as possible. The more interesting of these questions, with concise answers, will appear in this column. If your experience leads you to disagree with any answer given in this column, it is your privilege and duty to write to the Green Section.

While most of the answers are of general application, please bear in mind that each recommendation is intended specifically for the locality designated at the end of the question.

Organic fertilizers for fairways.—I have been a reader of the Bulletin for several years, but do not recall that you have urged strongly the fertilizing of fairways each winter with manure, a practice which has been observed consistently on many courses. Do you recommend a liberal top-dressing of fairways with manure each winter or spring? (Illinois.)

ANSWER.—There are several reasons why we have not strongly urged the top-dressing of fairways with manure, while at the same time we have not condemned the practice. Manure is yearly becom-

ing more difficult to procure in many golf centers. Due to its scarcity we think clubs may be well advised to use to the best advantage such manure as they may procure; and it may be used to the best advantage in the making of compost. There are other organic fertilizers, possessing higher fertilizer content, which may be used more economically for top-dressing purposes, such as pulverized poultry manure, activated sludge (Milorganite), and cottonseed meal. The nitrogen content of manure is about 1 per cent, so that 1 ton of manure would contain only 20 pounds of this most important fertilizing element; while 20 pounds of nitrogen may be obtained in about 300 pounds of any of these other three organic fertilizers, which also contain phosphorus and potash, as does manure. It is the greater bulk of organic material contained in manure which makes it especially useful for mixing with soil in that it improves the mechanical texture of the soil. If manure is spread directly on established turf, much of its organic content is lost, since it can not be expected that such light, strawy material will work its way into a heavy, dense soil in this manner. Another objection to the use of manure for top-dressing purposes is that it frequently contains considerable weed and clover seed which, upon germinating, may be detrimental to fairways, whereas the other organic fertilizers to which we have referred do not contain weed seeds. Fertilizers for top-dressing turf should be purchased largely on their nitrogen content, since this is the most valuable element for turf fertilization. In this connection attention is invited to the Bulletin for June, 1928, which contains a list of plant food material contained in the various fertilizers.

It is preferable to fertilize fairways in late summer or early fall, since the summer weeds are then beginning to disappear and turf grasses are recovering from the heat of summer and are in excellent condition to make good use of fertilizers. It is sometimes objectionable to apply manure to fairways at that time of the year, and therefore when manure is applied to fairways it is usually applied in the winter just previous to the spring thaws. The manure lying on frozen fairways over winter, however, does no good, and it may be that a great deal of fertilizing material is lost by being washed from the frozen ground.

Compost and commercial fertilizers.—My attention has been called to a product called * * * which is advertised to take the place of the compost we have been using for top-dressing purposes. What advice can you give me on this point? (Michigan.)

ANSWER.—The product you mention is a good fertilizer. However, there are many other good complete fertilizers on the market. For golf turf maintenance it is especially necessary to provide a relatively large amount of nitrogen in fertilizing material. We therefore advise purchasing fertilizers primarily on a nitrogenous basis. If a complete fertilizer is required there should be some phosphoric acid and potash added. As far as this product's taking the place of compost is concerned, that would be possible if the compost were used only for the purpose of providing plant food for the turf, but when compost is employed for adding organic material to the top soil to keep the soil texture in good mechanical condition and to assist in maintaining a true putting surface, like results could not be obtained by any such commercial fertilizer.



**Nothing will ever be attempted if all possible objections
must be first overcome.**

Samuel Johnson

