

Can You Identify Brown-Patch?

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IN any group of greenkeepers there is usually a great divergence of opinion as to the cause of brown-patch. There are many who have by repeated observation learned to attribute it to the mold or fungus which they have seen growing over the grass in the early morning. There are others who maintain that insects are entirely responsible for brown-patch. Basing their argument on the observation that it is most frequent in the lower greens or in "pockets," others insist that the injury is simply due to defective drainage. Still others maintain that it is due to poisons generated in the soil or to gases given off in certain low sections of the green. There are a few who prefer to play safe and attribute it to the practically meaningless designation "natural killing out." From time to time one hears a variety of such theories advanced to explain brown-patch. In many cases the deductions are the results of keen observations and careful thought on the part of the individual offering the explanation, but unfortunately, in too many instances, it is merely the result of an over emphasis of "theorizing."

Be Sure it is Brown-Patch Before Treatment

Perhaps the most important reason for the conflicting ideas as to the cause of brown-patch is the rather general confusion among greenkeepers in certain localities as to just what brown-patch is. In any discussion of this turf injury it is well to start out with a warning remark that not every patch of browned turf is brown-patch. This is perfectly obvious to most greenkeepers but for the benefit of those who still fail to draw these distinctions it is well to point out that there are many other types of injury which are frequently lumped together under the heading "brown-patch." Among these may be mentioned: injuries produced by grubs or insects feeding on the roots or blades of grass; drying out, especially on knolls; poor drainage and too much water, especially where it settles in pockets and "drowns out" the grass; poor soil conditions; chemicals applied in excess; snow mold or other winter injury.

Naturally unless one distinguishes between these various types of browning he is unable to give a single explanation which will apply to all and is likewise prac-



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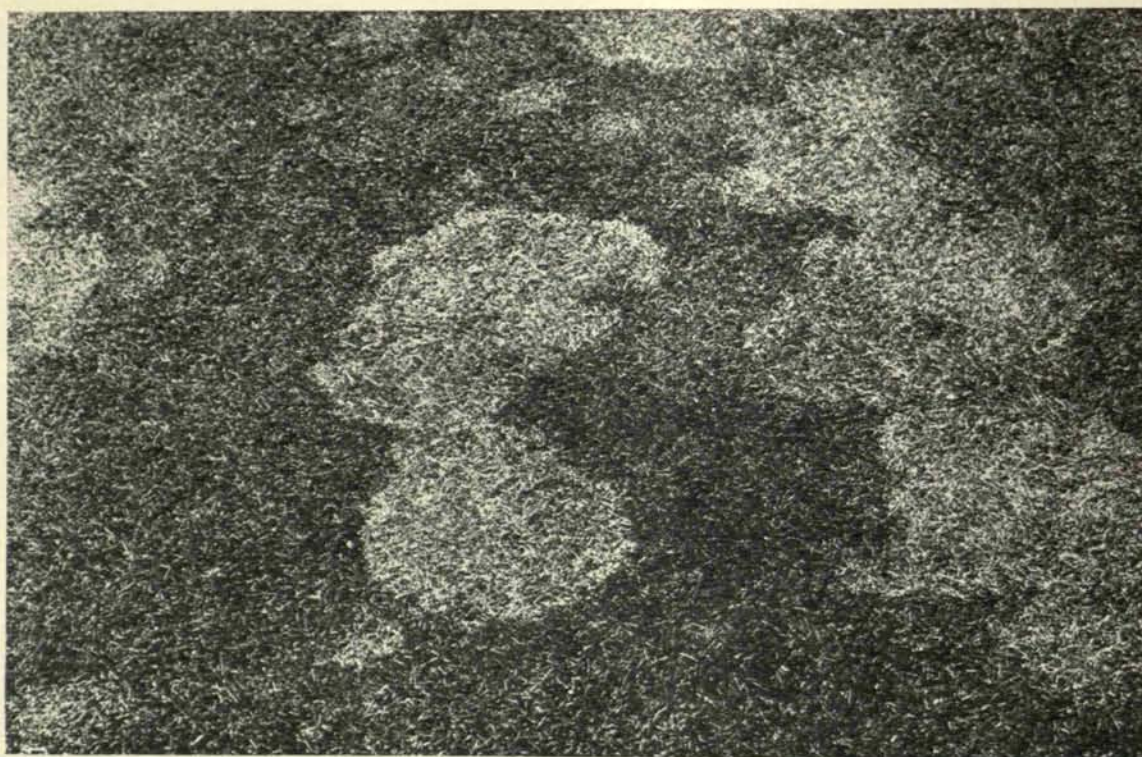
Mr. Monteith's field in his connection with the U. S. Department of Agriculture is the investigation of forage crop diseases, and for several years he has been conducting experimental work on the identification, cause and cure of the diseases of golf turf on plots furnished by the United States Green Section for this purpose. In a later article Mr. Monteith will describe the methods he has used in controlling Brown-patch and the results of his careful experiments. Prior to the scientific investigation for which Mr. Monteith is responsible, many putting greens were completely destroyed by this turf disease.

tically helpless in fighting it for it is apparent that the control for any of these turf injuries depends wholly on their separate causes. The general designation of "brown-patch" to cover all browning of turf may in a general way be likened to our term "sick" as applied to human ailments. Years ago, before the advent of medicine, a man who was not healthy was simply "sick" or "possessed with an evil spirit." He was submitted to the ceremony of driving off the evil spirit, or was later treated with the more advanced practice of "bleeding." Today we smile at those methods of cure in spite of the fact that their advocates no doubt were able to point to innumerable cases which were "completely cured" by those means. Nowadays a man may be "sick" but even in the popular mind that is not sufficient diagnosis; he is suffering from tuberculosis, diphtheria, pneumonia or some of the various other human ills and the treatment is administered according to the disease. It is true that most of us can not recognize the fine distinctions between many of these human ailments but we have con-

fidence in the scientific methods at present available to distinguish between them. In greenkeeping there are many who still consider that any brown or "sick" grass is "brown-patch" and as a result the methods sometimes used to control the injury are in some respects about on a par with the ancient practice of "driving off the evil spirit."

Two Distinct Types, Large and Small

To the large majority of observant greenkeepers, in sections of the country where it is common, brown-patch means a definite kind of injury. There are two well recognized types which to most greenkeepers need no introduction; the large spreading one known as "large brown-patch" and the smaller one known as "dollar spot" or "small brown-patch." At times it is difficult to distinguish between them but as a rule the symptoms are entirely different and they offer little chance for confusion. Large brown-patch appears suddenly as circular or irregular areas which at times may be several feet across. Ordinarily they measure from two or three inches to two feet in diameter. In the early stages there



Large brown-patch showing the light, browned areas as contrasted with the dark healthy grass

is usually a blackened or scalded appearance and one can see fine cob-web-like threads spread over the grass. On close examination it is found that the majority of the grass leaves in this affected area have lost their normal green color, appear blackened or scalded and are no longer turgid. When exposed to the sun or wind the affected leaves turn brown and dry out, giving the area of dead leaves a brown color which has resulted in the name descriptive of the injury, "large brown-patch."

This browned area frequently continues to enlarge, in which case there is a dark border where the grass has just become affected. This dark border is frequently referred to by greenkeepers as the "smoke screen" due to its dark or smoky appearance as contrasted with the green of the healthy turf beside it. In mild cases the percentage of leaves involved may be so small that little injury is done and the normal color returns in a few days, as soon as new blades develop to replace those that have been killed. In severe cases most of the leaves are destroyed and recovery is necessarily much slower. If the turf is in a weakened or starved condition the recovery from an attack of brown-patch is slow, whereas if it is growing rapidly the scars are soon hidden by the new growth. In any but the most severe cases the stolens or buds of grass are not killed, which means that they are able to grow again and replace the injured turf as soon as brown-patch is no longer spreading.

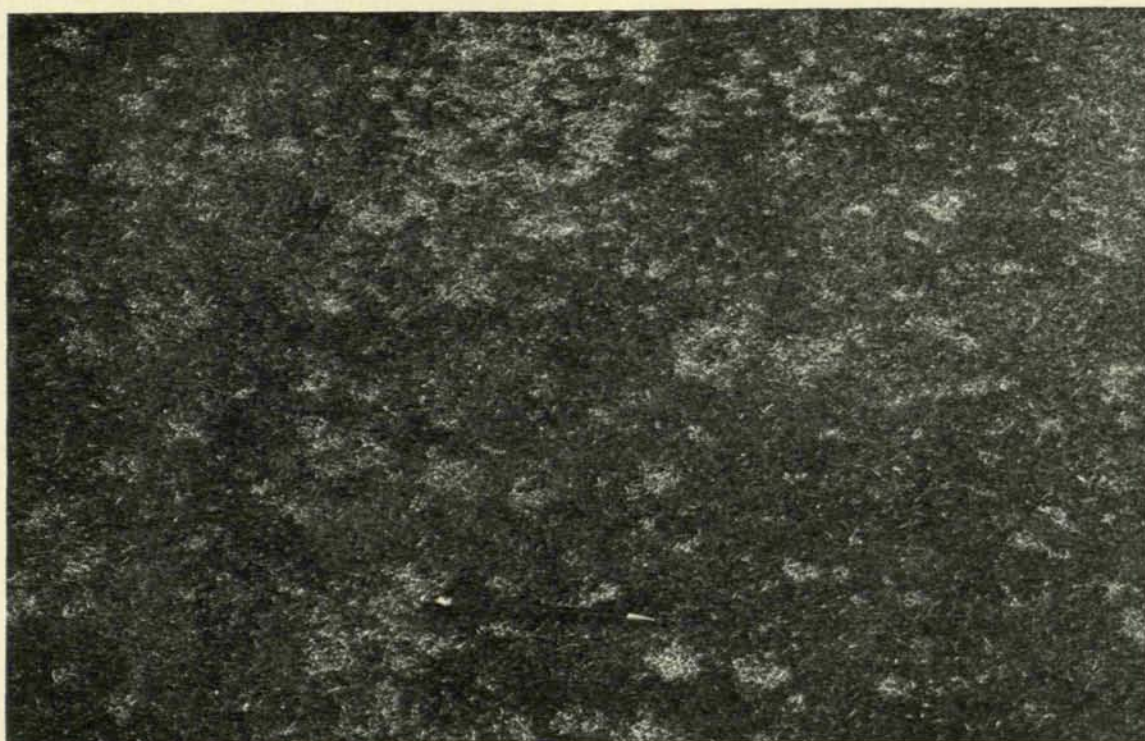
Dollar Type Most Injurious

"Small brown-patch" or "dollar-spot," as the name implies, is much smaller, occurring as bleached or light

straw-colored spots which usually do not become larger than a silver dollar. Frequently these spots are so numerous that they join and affect practically all the grass over a large area. The turf in these spots is as a rule more seriously damaged than in the case of large brown-patch, but in this type also the buds and roots may escape uninjured. Like large brown-patch, this injury appears suddenly and overnight the green may develop the "moth-eaten" appearance so well known to greenkeepers where dollar-spot is common.

Not All Fungus Denotes Brown-Patch

Before we can efficiently and intelligently prevent or control any injury it is essential that we know something about its origin. The causes of many turf injuries are perfectly obvious but others can be definitely traced only by means of modern scientific methods. Brown-patch belongs to this latter group. All the theories and observations of greenkeepers could not be expected to definitely determine the cause of brown-patch, since the actual proof involves the use of a microscope or other equipment not available on golf courses. For instance, the finding of a fungus constantly associated with the dead grass does not necessarily prove that the fungus killed the grass for everyone knows that if grass clippings are thrown in a moist place they will soon be covered with a mold, or fungus. The fungus in the latter case does not affect the grass until after it is killed by cutting and furthermore this fungus when placed on healthy plants even under the most favorable conditions does not in-



Dollar-spot or small brown-patch; showing the typical speckled appearance of turf affected with this disease. The pencil will serve to indicate the relative size of spots

jure growing grass. In the case of brown-patch, we are able, by means of a microscope, to see the fungus penetrating into the growing grass blade. By various methods used in the study of both animal and plant diseases it is possible to grow the fungus free from any other organism and to produce the disease by placing this fungus on healthy grass. In this way we can check up on theories by scientific methods and readily prove the cause of brown-patch.

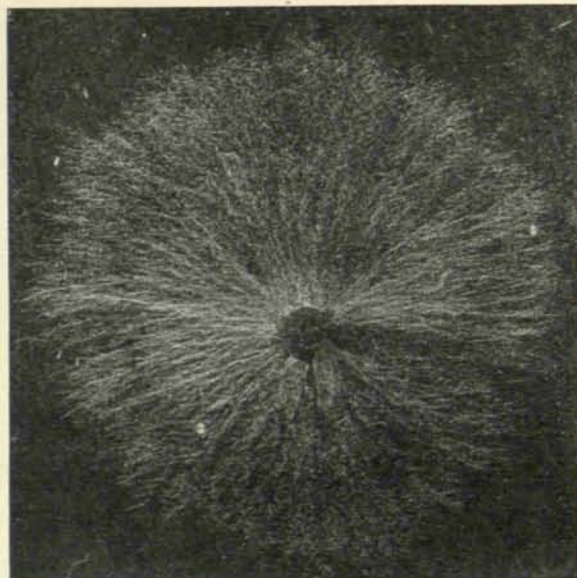
Diseases of plants caused by fungi are by no means new. Every farmer is familiar with the rusts of grain, mildews of various crops and the numerous other injuries to plants caused by fungi. It has been shown by scientific methods that both types of brown-patch are also plant diseases caused by fungi, readily distinguishable when grown in the laboratory. Many greenkeepers have for a long time been aware that brown-patch is due to the cob-web-like growth of fungus which they see growing over the patches early in the morning although some have confused it with the harmless spider webs which are conspicuous on greens covered with dew. This article is written for the benefit of those who are not familiar with brown-patch or who have not observed the fungus on the grass where brown-patch is developing. If those who doubt this relationship will make a point of carefully examining turf early in the morning when the disease first appears, they will no doubt soon be able to distinguish the threads of the fungus and will observe the wilted leaves hours before they dry and turn brown.

A fungus is a form of plant life; the most familiar are mushrooms, toadstools and molds. As in the case of our green plants, there are thousands of different fungi. One need only be reminded of the numerous cases of poisoning due to eating poisonous mushrooms to realize that there is a distinct difference between fungi.

Brown Patch Fungi Live in Soil

Greenkeepers frequently notice a mold growing over their compost piles and become somewhat concerned as to whether this fungus is the same as that causing brown-patch. There is always a possibility that the brown-patch fungus may be present but the common forms growing over manure or compost piles are entirely different from those causing the two types of turf diseases. The brown-patch fungi live in the soil and under certain conditions may be entirely harmless. When conditions are right the fungus grows up over the grass and penetrates into the leaf. When once it has gained entrance into the blade it feeds on the grass sap and finally destroys all the portion that has been penetrated, therefore, the recovery of the browned turf must depend on the production of new leaves to replace those that have been injured. This has a direct bearing on the use of ammonium sulphate or other fertilizers to stimulate grass after an attack of brown-patch.

When it is stated that brown-patch is caused by a fungus which has been in the soil for some time the question is usually raised as to how it happens that the disease appears so suddenly and at other times there



The large brown-patch fungus grown by laboratory methods. (Magnified 5 times)

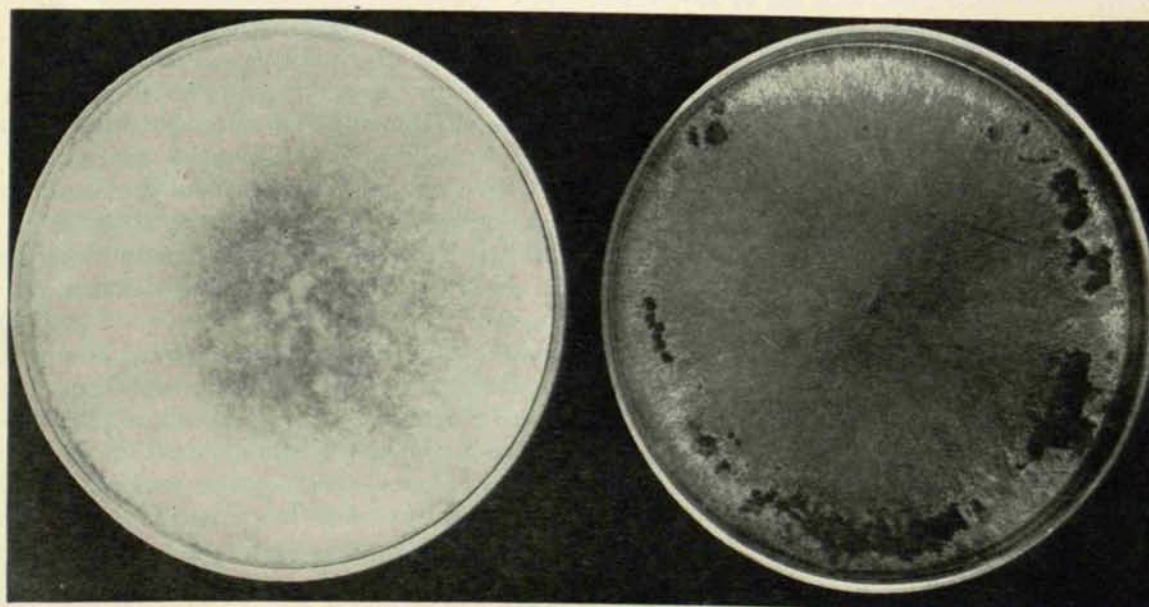
is no trace of any injury whatsoever. Also why does it affect one green and leave another on the same course untouched? Numerous similar questions are asked by greenkeepers who are interested in determining the "why and wherefore" of brown-patch.

In considering a disease of this type it must be remembered that we are dealing with two separate plants; grass and the disease-producing fungus. Each of these living things is influenced by its surroundings. Every greenkeeper knows that grass grows best at a fairly low or medium temperature. Although it needs plenty of water, too much is as detrimental as not enough. It thrives in a certain type of rich soil. The common

putting green grasses usually grow best when they have plenty of sunlight; provided they are not allowed to dry out too much in sunny weather. A great many other factors might be cited which affect the growth of grass. The fungi causing brown-patch are likewise stimulated or retarded by moisture, sunlight, temperature, soil and many other factors. These conditions may affect both grass and fungus in the same way or they may have directly opposite influences.

Conditions Influence Growth of Fungus

As an example of the latter we may take sunlight. Every greenkeeper knows that if he covers grass with anything which keeps off the sunlight for a few days, the grass will become yellow and generally unhealthy in appearance. Furthermore, if the cover is left on long enough there will be a moldy growth (fungus) over the soil and dead turf. In other words, sunlight is a direct help to grass and darkness is helpful to growth of fungi. In prolonged periods of cloudy weather the absence of bright sunlight may have a direct bearing on brown-patch, for the grass is less vigorous and the fungus causing the disease has a chance to develop unchecked. Cloudy weather alone will not induce brown-patch, however, for there must be plenty of moisture for the fungus to grow. A cloudy day, with a good breeze which keeps the grass perfectly dry, does not provide conditions favorable for the fungus. If one takes two pieces of dry bread and puts one in a perfectly dry place and the other in a moist place he will soon see a difference. Even though both are in the dark and at about the same temperature, the one where there is plenty of moisture soon becomes covered with a mold whereas the dry piece is not affected. The same influence of moisture



Brown-patch fungi grown on a gelatin-like material in glass dishes. The fungus at the left causing small brown-patch is readily distinguished from the large brown-patch fungus on the right



These two pots of grass were grown side by side in a moist greenhouse. One was "inoculated" by placing a piece of the fungus in the center but the other had nothing added. As is shown in the pot at the left, the fungus had overgrown and killed all the grass in a short time, while the other remained healthy

on the bread fungus applies to the one causing brown-patch.

The Effect of Temperature

Temperature also has a direct bearing on the growth of fungi. Those causing brown-patch grow best at relatively high temperatures. This is particularly the case with large brown-patch. We know that some of our best turf grasses grow best in the comparatively cooler periods of spring and fall and that the extremely high temperatures of mid-summer tend to decrease the vigor of the grass plants. Therefore a high temperature which checks the grass and stimulates the fungus feeding on the grass makes conditions ideal for the development of brown-patch.

The acidity of the soil, amount and kind of plant food available, and a great many other factors may have direct or indirect effects on the growth of the grass and the fungi; thereby influencing the occurrence of the disease.

This means that one night the dew, soil moisture and other conditions may be favorable for the development of the fungus, except that the temperature is too low; therefore brown-patch will not appear.

Circulation of Air Important Factor

At another time the temperature, soil moisture and other factors are favorable but throughout the night

there is sufficient breeze to keep the surface of the grass dry so that the fungus is unable to grow. It may be that the breeze keeps all the greens dry except those that are situated in low protected areas or where a bank of trees or heavy shrubbery prevents the proper air circulation. Frequently these low areas occur only in certain parts of a single green. Under such conditions the disease may appear only on these greens, or portions of a green, where there are these so-called "dead air pockets."

Likewise there may be any number of possible combinations of conditions which will determine whether or not brown-patch will develop and whether it will appear in scattered areas or over the entire course.

This explanation no doubt will sound complicated to many greenkeepers. However, anyone who has watched the periodic appearance of these injuries on turf will realize that brown-patch certainly is a puzzle. We frequently find a man who is sure that he knows the last word in brown-patch and can tell the whole story in a few words. Needless to say that man soon displays his ignorance. When one is working with a living thing such as grass he has plenty of complicated problems—otherwise there would be no need for a greenkeeper. Add to

(Continued on page 31)

Can You Identify Brown-Patch?

(Continued from page 11)

that another living thing, the fungus, constantly in competition with the grass and naturally the problems become more complicated.

Brown Patch Can Be Completely Controlled

We do know what many of the conditions are that make the fungus harmful at one time and perfectly harmless at others. There are many other conditions that are at present not thoroughly understood but in spite of this enough has been learned to enable greenkeepers to fight it in an effective way. Furthermore enough is known about it so that, for the intelligent greenkeeper, it has been removed from the realms of speculation and superstition.

In a later article it will be pointed out how, by understanding the cause and development of the disease, one is able to modify certain golf course conditions in such a way that the injury can be greatly lessened and that by using certain chemicals it is possible to completely control brown-patch.

The New Oak Knoll Country Club Alameda, California

PLEASE send me all back numbers of the magazine. I am enclosing my 1927 dues. I have often wondered why there was no greenkeepers' magazine published before this, as there are plenty on every profession known, except that of greenkeeping. I am proud indeed that I am a member of the association, and a Charter member at that," writes A. B. Schoenbeck, greenkeeper at the new Oak Knoll Club at Alameda, California.

Mr. Schoenbeck continues, "As soon as I have a little more time, I shall be very glad to write something on greenkeeping for the magazine, but our club is new and not yet open for play. We have only ten greens and fairways done yet, and the others will be started in the fall.

"I took charge here on March 15, and have since top dressed and seeded most of the greens. The soil is for the most part sandy and very stony, while another part of the course is adobe, and cracks badly under the hot sun. Our water supply is not what it should be, but plans are laid and we will soon have plenty of water.

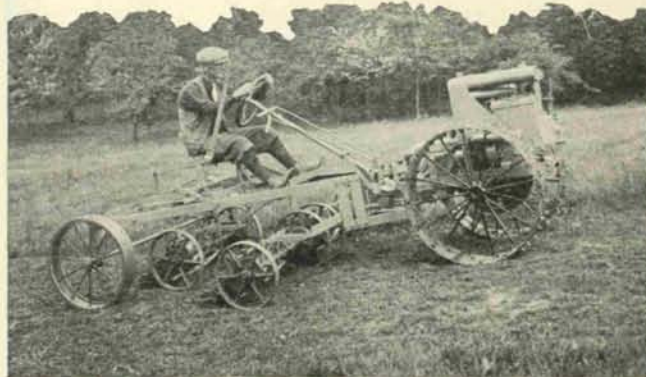
"Morning glories on the greens, traps, mounds, fairways, in fact everywhere I look I see them. Please tell me how to destroy them without hurting the grass. Every kind of weed that will grow in America grows on this land. It is almost impossible to keep ahead of the weeds at this time, and I have a gang of ten men working at them.

"There are some beautiful views here, and as soon as I have a little time, I will be glad to send some pictures. Oak Knoll Country Club will soon be heard from."

So Oak Knoll Country Club will soon be heard from, and we can well believe it. In the midst of new construction work, hot weather, 'dobe land and flourishing weeds, the greenkeeper must have plenty of courage, and Mr. Schoenbeck has his share. The readers of this magazine should look forward with a great deal of interest to the story of how Oak Knoll is being built and started on its way. Best o' luck, Mr. Schoenbeck, to you and to your club.

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At Left:
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Below:
At work on
the fairway.

