Physical Soil Factors Cause Big Turf Loss in 1949

By O. J. NOER

The cooler weather in September came as a welcome relief to greenkeepers and club officials throughout the bent grass area. Recovery of afflicted turf was more rapid than seemed possible during the bad weather. Excepting Texas and Oklahoma, where weather was more favorable, the season of 1949 will go down as one of the worst for grass since 1920, second only to 1928. That year the acid theory died along with the grass and ended the so-called "acid era" in turf maintenance.

This season may mark another era. It is bound to emphasize the physical soil factors, particularly air and water and their relationship to the amount and depth of roots.

The spring was early and dry in most places. Hot humid weather started in mid-June and lasted through August. The above-normal temperature exceeded 1,000 degrees in the Mid West, and was as bad or worse elsewhere. Based on temperature only, the weather throughout the North was better for Bermuda grass than for indigenous kinds. The summer was too dry in some places and too wet in others. With an adequate amount of water available at all times, the maintenance of bent grass greens is easier without rain than when drenching showers make surfaces sopping wet during hot humid weather.

The layman thinks drought the biggest enemy of grass. He confuses fairways and greens. Those with drought experience know how to use water under those conditions and recognize the symptoms of dry spots.

N.E. Drought Serious

New England experienced its worst drought in 109 years. Nobody now living will be here for the next really bad one. Local authorities in some places prevented clubs from using water at all, others were restricted to two or three hours per day, usually at specified times between midnight and dawn. Restrictions were not necessarily because of water shortage, but more frequently because the capacity of the water mains was inadequate to provide for the heavy demand from expanded industries and homes. One greenkeeper, when ordered to stop watering threatened to bring suit for the loss of greens unless the same restrictions were applied to every other business in the community. The logic of the contention that golf is a business and be treated as such changed the attitude of city officials. A compromise was reached and the club got enough water to keep the grass alive.

The experience of clubs in New England with respect to water supply in critical periods presents a problem for the future. Those dependent upon the uncertainties of an inadequate municipal system, with its inevitable restrictions on everybody during drought periods, should search for a dependable supply of their own. Likewise, one must consider fairway watering systems in association with an assured supply of water.

Disease Control Problems

Brownpatch was exceedingly bad from June on, and was even worse in August than at any time earlier in the season. One Sunday morning a single spot on a seaside bent green in New York was six feet across. Tersan and corrosive sublimate were the best fungicides. They stopped the disease, provided the grass was not soft and tender from too much water or too much nitrogen. Many prefer Tersan because of the safety factor, but increased dosage was needed to give control in many instances. Some greenkeepers added a small amount of corrosive sublimate, usually from one-half to one ounce to a green of 5,000 square feet, and felt it worthwhile. The cadmium complexes and the phenyl mercury fungicides did not stop brownpatch.

Pythium was rampant in many districts and took a heavy toll because no fungicide has an appreciable effect upon it. Light dusting with hydrated lime did as much good as anything.

Lime had a marked effect upon copperspot at the turf plots in Kingston, R.I. The effect was startling and may explain why this disease in less common in midwestern courses than in the East. The limed plots were singularly free of copperspot, as compared with the unlimed ones. Even an annual application of 25 pounds per thousand square feet was enough.

The sand used in topdressing mixtures in Chicago and vicinity contains up to 30 per cent lime carbonate. The greens there get a generous application of lime every time they are topdressed.

Iron chlorosis was bad on some greens. This was discussed in August GOLFDOM and need not be repeated here. Excessive soil moisture and high content of readily decomposable organic matter accentuate the condition. It occurs most commonly after heavy downpouring rains, or where overwatering is common practice. Overliming and the excessive use of soluble phosphate fertilizers are other likely contributing factors. Iron chlorosis is most common on the velvet bents. The topdressing used on it should be rather sandy with little or no organic matter, and excessive amounts of water should be avoided.

Scald Blamed for Damage

Scald was blamed for the loss of much turf. This loosely applied term is used to describe collapse of grass in large irregular sized areas where any one of the commonly known diseases was not to blame. Excessive soil moisture is the basic cause, and is the reason why algae (green scum) accompanies scald. After the grass disappears, or becomes thin enough to expose the soil surface, algae multiply rapidly. Water from stagnant ponds is usually blamed as the source of algae, but these minute plants are present in all soils. They are held in check so long as turf density is sufficient to exclude light from the soil surface. Algae must have sunlight, like every other green plant to make vigorous growth.

The characteristic foul odor of soil in scalded areas is further evidence of a temporary waterlogged soil condition. Excessive wetness may be due to any one or more of several causes. Poor surface drainage, principally low lying pockets which hold water, ineffectual subsoil drainage, due to an impervious clay subsoil, bad air drainage, excessive soil acidity, soil compaction, imbedded layers of sand or clay near the surface, excessive amounts of peat, matted turf, and a network of tree roots near the surface may be responsible for scald in midsummer. Now is the time to correct any one or all of the causes, especially on greens which were bad in 1949.

Three gang spike discer on green. This tool helps prevent dry spots. Makes greens take water better but is ineffectual after dry spots develop.

Aerifier on green, showing raised turf around each hole. Rolling lightly in opposite direction following removal of plugs puts green in shape for immediate play.

Lime was used quite generally on ailing greens. It produced startling results on those which were strongly acid, and on excessively wet ones, irrespective of soil reaction. The ailing grass invariably started to recover. The immediate and startling effect at times obtained from a little lime on diseased and scalded turf is hard to explain, but may be due in part to hydrate's marked effect as a drying agent. It seizes and holds part of the free soil water. On wet greens lime may help in that respect and chemically by precipitating soluble organic decomposition products, some of which might be toxic in the soluble state.

The repeated use of lime hydrate in light doses is not apt to cause bad secondary effects so long as soil reaction is in the range of pH 7 or below. But on alkaline soils, particularly when reaction is pH 7.5 or above, the repeated use of lime may induce deficiencies of iron, manganese, copper, or other so-called basic elements. The only time lime hydrate should be used on these soils is when algae puts in an appearance after a period of heavy downpouring rains which saturate the soil and make the turf thin.

One of the $64 questions which has been asked many times and never satis-

factorily answered is—"How can we be rid of poa annua?" When poa annua is the only kind of grass on all or on any part of the green, the places become bare ground when it is lost during hot weather, or during bad winters. Its loss is not serious when there is plenty of bent grass left to provide coverage.

Some contend that spring applications of nitrogen should not start until after the poa annua produces seeds and commences to weaken. This seems logical where the proportion of poa annua is large. Others believe that greens should get plenty of nitrogen right from the start in the spring. This contention seems like sense when the proportion of bent grass is high. The nitrogen gets it off to a good start so it can resist infestation. The correct answer will be forthcoming one day, because there are examples of greens which were mostly poa annua, but are now pure bent for all practical purposes. The change occurred without major rebuilding.

Attention was called to the prevalence of cut worms and sod web worms, etc. in August GOLFDOM. Worms and even grubs were more troublesome than usual. Quicker and better control was obtained with Chlordane than with lead arsenate. However, this does not necessarily mean that there is no place for lead arsenate on greens. Many greenkeepers still use it in late spring to check earthworms and grubs, and also to curb crabgrass. High cost will stop extensive use on fairways, but should not necessarily be the reason on greens. The area involved is not extensive so the cost is not prohibitive.

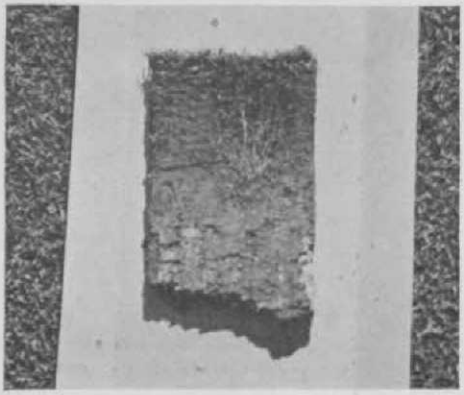
Watering Practice Appraised

Excessive wetness from overwatering or from too much rain was bad. Early morning watering appeared to be best. Heavy night time watering seemed to make brownpatch worse. That would seem only reasonable because the grass stays wet from the time watering stops until several hours after sun-up.

There are several other good reasons for the early morning choice. Workmen see what they are doing during daylight hours. It is easier to obtain better coverage and avoid overlaps. When sprinklers overlap in the center everytime the green is watered the turf in that part of the green is bound to weaken and become bad. Dew is absent or disappears in areas where the soil underneath is dry. The absence of dew is one way to spot the drier parts of the green. When root systems are shallow, early morning watering carries the grass farther into the day before the turf starts to footprint and turn the characteristic grayish-blue color.

Tests by Dr. Hoffer show the presence of nitrates in guttated water on the grass leaves. Guttation occurs during the night. The plant physiologist uses the term to describe exudation of water from an uncut plant surface. According to Dr. Hoffer, the nitrates are reduced to highly toxic nitrites. Light watering in early morning to wash the nitrates off the leaf and into the soil is most essential, in his opinion.

Mid-day wilting of grass on greens has been an increasing problem for some time. It was worse this year than ever before.



New white roots in aerified green. The cultivating effect of spoons produces roots over an area of more than an inch in width. Picture taken less than month after aerifying.

Wilting is inevitable on windy days in hot weather, when grass roots are shallow. There will be quick and bad loss of grass unless a little water is applied promptly when the grass turns blue and foot prints badly.

It was necessary to watch greens for wilt on Saturdays and Sundays, as well as the other five days in the week. Grass does not observe the 40 hour week. Greens maintenance is a seven-day job during bad weather. On two bad weekends in August the man in charge at one club with 36 holes found it necessary to keep 12 men on the job all day Saturday and Sunday. Although there were bad greens on nearby courses, the turf on his greens came through without any serious blemishes.

Wilting occurred this summer on greens where root system seemed to be within reach of water. It happened after drenching, downpouring rains. The grass turned a reddish color, then it withered and died. Those who applied a little water promptly, before the reddish color developed, saved the grass—even though there was

water in the cups. A delay of half an hour was too long and too late. It would seem that badly needed water was absorbed directly by the grass leaves.

After witnessing this puzzling type of wilt, a statement made by one of the speakers at the Mineral Plant Nutrition Symposium at the University of Wisconsin in early September seemed significant. He discussed the relation of physical soil factors upon the growth and behavior of plants. According to him, oxygen must be present in the soil before plants can assimilate water, or absorb and utilize soil nutrients. Marvin Ferguson of the Green Section, USGA, called my attention to a similar statement made by Dr. D. R. Hoagland in one of his published lectures. Tomato plants grown in unaerated water cultures wilted while similar ones grown under exactly the same conditions except that a minute amount of water was bubbled through the culture solution showed no signs of wilt.

Work for Deeper Roots

The search for the answer to deeper root formation has emphasized the nutritional side. That grass must have all the chemical elements required for growth is obvious. Fertilizer programs have not been universally bad, although the tendency by some has been to stint on potash. The need for free oxygen in the soil has been stated time and again, but seems to be overlooked and lacks popular appeal. The problem of providing roots with oxygen is being further complicated each year by soil compaction as a result of increased traffic and the use of power equipment. Matted turf is another reason for shallow roots.

The layman looks upon soil as so much dirt. Actually it is more than that. A highly productive soil is a mixture of a solid, a gas, and a liquid. The mixture is about one-half solids, one-fourth air, and one-fourth water, so the voids are about equal to the solids on a volume basis.

The framework of the soil is most important. There are the capillary and the non-capillary pores. The smaller capillary ones provide the plant with moisture. The larger non-capillary pores contain the air in a well-drained soil, and are the channels for the rapid movement of water. In the distant past the lowly earthworm helped provide these passageways. They are no longer tolerated because of the objectionable casts they throw; and rightfully so from the players' point of view. These channels are being destroyed by overwatering, by the traffic of increased play, and by power mowers and other types of machinery. Cultivation of a sort to improve the structural soil framework is badly needed on many greens and is sure to prove beneficial on others. The various spikers, the hollow-tine fork, the drilling machine called the "Turferator" and the spoon of the F. G. Aerifier represent attempts to improve soil physically and increase the amount of air in the soil.

The spikers have their place, but the holes are too shallow and too small to make profound changes. The hand forks are good, but too slow. The Turferator does a fine job. The deep white roots found in the holes during all of the next season are evidence of that fact. Surfaces are reasonably good for play right after drilling, but it takes two men half a day or more to do an average size green.

The F. G. Aerifier is fast and does a good cultivating job. The objection raised by some is the condition of the playing surface after the job is finished. Art Twombly at Pelham demonstrated that it need not be that way. He used the half-inch spoon and operated the small tractor at a snail's pace. Then he used a light greens roller in the opposite direction to press the raised turf back into place. A leaf sweeper was used to remove the plugs, then the green was rolled lightly and cut. Players thought the operation had no bad effect on the putting quality of the greens. This fall and next spring are good times to drill or aerify the greens. The operation may seem costly, but those who have had experience say the benefits justify the expense.

ANNUAL TURF CONFERENCES

Oct. 24-28—American Society of Agronomy Annual Meeting, Milwaukee, Wisconsin.

Nov. 28-30—Oklahoma-Texas Turf Conference, Tulsa, Oklahoma.

Jan. 30 - Feb. 3—19th Annual One Week Turf Short Course, Rutgers University, New Brunswick, New Jersey. (Tentative)

Feb. 27 - Mar. 2—19th Annual Turf Conference, Pennsylvania State College, State College, Pa.

Mar. 6-8—Midwest Regional Turf Conference, Purdue Univ., Lafayette, Ind.

Mar. 10-11—Annual Turf Conference (Concluding 10 Weeks Winter School), Univ. of Massachusetts, Amherst, Mass.

Mar. 13-15—16th Annual Greenkeepers Short Course, Iowa State College, Ames, Iowa.

Mar. 14-16 — Third Annual Turf Conference, Cornell University, Ithaca, N.Y.