can hold only half its weight of water. In contrast, 100 pounds of decaying organic matter may hold as much as 190 pounds, or nearly twice its weight of water. Most soils are mixtures in varying proportions of sand, clay, silt, and organic material. As a rule the greater the proportion of organic matter contained in the soil the greater its water-absorptive capacity, and the greater reserves of moisture it will retain for resistance to drought and hot weather.

Photograph by Albert A. Hansen, Purdue University, La Fayette, Ind.

A demonstration of the value of rolling following seeding

The entire area shown in the illustration had been newly sown with grass seed, but a good catch was secured only where the soil had been compacted by footprints, and particularly by the wagon tracks which appear in the picture.

Rolling following seeding compacts the soil around the grass seeds, resulting in better germination and minimum mortality in the seedlings. Rolling may be a deciding factor in the success of newly seeded grass areas. The saving of expensive seed, to say nothing of the time involved, is a good argument for rolling all new seedings.

Lime in Some Typical Sands and Its Effect on Soil Acidity

By O. J. Noer, Madison, Wis.

In some districts clover is prevalent and does not seem to diminish as a result of consistent use of sulphate of ammonia. Large quantities of lime carbonate in the sand used in top-dressing mixtures is responsible in many instances.

While clover prefers and grows best in non-acid soils, soil reaction is probably only one factor in its control. Casual inspection also seems to indicate that white clover is somewhat more tolerant of acidity in the soil than some of the other legumes. Nevertheless it can be eradicated. Judicious feeding to encourage the grasses and thus maintain a dense turf makes it difficult for clover to establish itself. In this connection only enough phosphoric acid and potash should be applied to satisfy the demands of the grasses, because in larger

amounts both tend to encourage clover, particularly if the soil is non-acid or only slightly acid. Close inspection of turf on greens frequently discloses the presence of minute clover plants, ready to spring forth and encroach upon areas of thin turf. Bare areas resulting from improper feeding, winterkill, or the ravages of fungus or insect pests, often become infested with clover and serve as centers from which it rapidly spreads.

Glacial sands in limestone sections frequently contain appreciable amounts of lime carbonate. It is sometimes present in beach and lake sands in the form of shell fragments. Wherever these are present the sand should be looked upon with suspicion. Last year the possibility of sand contaminated with lime carbonate counteracting the acid-producing power of sulphate of ammonia was pointed out. Since that time a number of sand samples have been examined and the lime carbonate content determined. The results are summarized in the accompanying table.

LIME CARBONATE CONTENT OF SOME SANDS USED IN TOP-DRESSING MIXTURES

Source of Sand	Lime Carbonate Content	
	Per cent	*Pounds per ton*
Wisconsin:		
Michiwaukee Golf Club, Milwaukee	37	740
Lake Lawn Golf Club, Delavan	20	400
Illinois:		
Beverly Country Club, Chicago	15	300
Edgewood Valley Country Club, La Grange	23	460
Ridgemoor Country Club, Norwood Park	16	320
Westward Ho Country Club, Chicago	21	420
Indiana:		
Indianapolis Country Club, Indianapolis	31	620
Meridian Hills Country Club, Indianapolis	31	620
Highland Golf Club, Indianapolis	31	620
Broadmoor Country Club, Indianapolis	32	640
Ohio:		
Canterbury Golf Club, Warrensville, No. 1	22	440
Canterbury Golf Club, Warrensville, No. 2	16	320
Pennsylvania:		
Philmont Country Club, Philadelphia (Scholey)		None
Philmont Country Club, Philadelphia (Drinker)		None
Springhaven Country Club, Philadelphia (Blaisdell)		None
Crystal Sand Co., Bridgeton, N. J.		None
Pittsburgh Field Club, Pittsburgh		Trace
New York:		
Hempstead County Club, Hempstead, L. I.		None
New Jersey:		
Newark County Club, West Orange		None
Virginia:		
Virginia Hot Springs Co., Hot Springs		None
District of Columbia:		
Potomac River sand		None

Some of the sand contains as much as 400 to 700 pounds of lime carbonate per ton. Evidently sands in the midwestern states must be looked upon with grave suspicion. Several samples of sand from Minneapolis, tested with muriatic acid, showed the presence of considerable lime carbonate; but exact determinations of the amounts were not made. Apparently eastern districts are obtaining satis-

factory sand as far as lime carbonate content is concerned. This difference in lime carbonate content may partially explain why clover is more prevalent and harder to control in Milwaukee, Chicago, Indianapolis, Cleveland, and Minneapolis than in Pittsburgh, Philadelphia, and New York.

Several clubs in Milwaukee desired to secure lime-free sand. Samples of sand were requested from companies whose pits were located in a non-limestone section of the state. Two were found to be lime-free, one from Portage and the other from Amherst Junction. The Portage sand was too fine-grained, but the sand from Amherst Junction was satisfactory in all respects. It costs about $2 per ton f. o. b. Milwaukee, and $2.25 at Chicago. In Cleveland a silica sand free from lime carbonate was also found.

While 10 per cent of lime carbonate may not seem unreasonable, yet the amount of lime carbonate applied to the green may be large. A thousand pounds of sand at each top-dressing would contain 100 pounds of lime carbonate, and at least 65 pounds of sulphate of ammonia would be required simply to neutralize the lime. This does not leave any excess to create soil acidity. It is doubtful if greens ever receive this quantity of sulphate between successive top-dressings; and where sand of higher lime content is used, greens are becoming more alkaline in spite of the repeated use of sulphate of ammonia.

There is no practical and economical method of removing lime carbonate from sand. It is necessary to search for suitable material in non-limestone sections.

The surface soil in limestone regions is often acid. The original lime carbonate has been leached out. Yet limestone soils are rarely as acid as those in non-limestone regions, and consequently it usually takes longer to obtain sufficient acidity to eradicate clover completely. In these regions it is important to eliminate lime from top-dressing mixtures and thus secure maximum benefit from the sulphate. Where clover is absent from greens regularly receiving lime-contaminated sand, the turf is usually so dense that clover is unable to gain a foothold; but infestation will begin once the turf becomes thin.

The soil used in top-dressing mixtures sometimes contains up to several per cent of lime carbonate, particularly in limestone regions. In such regions lime-free soil is more frequently found at higher elevations on knolls than in the valleys and draws, due to the more thorough leaching.

Another source of lime is the well water of limestone regions used for sprinkling greens. While the amount is exceedingly small per gallon of water, in the aggregate it may be considerable, due to the large quantities of water used. Here again removal is impractical.

The presence of lime carbonate in suspected sand can be determined by pouring muriatic acid upon it. Effervescence occurs if lime carbonate is present. A more exact determination can be quickly made by a chemist.

Why the white tee box?—Most tee boxes are painted white. There seems to be no necessity for this, and it has the disadvantage of making ugly things more obvious. White shows up more plainly the scratches, pencil writings, and carvings of caddies. Why not paint tee boxes a color in harmony with their surroundings? Olive green would be admirable for the purpose. It looks well even when faded.