Effects of Traffic on Turf

By MARVIN H. FERGUSON
Mid-Continent Director and National Research Coordinator, USGA Green Section

The effects of traffic are apparent to the casual observer as worn spots in turf, as discolored turf, and as bare soil showing through sparse, trampled-down vegetation.

The most common damage is simple bruising. Traffic from street shoes may not produce injury immediately visible. However, bruising does damage structural elements of the plant. It ruptures some cells. It disrupts the plant's rather elaborate "plumbing system". Frequently the leaf blade dies after such injury.

Turf under moisture stress is more likely to be severely injured than turf well supplied with water. Turgid cells are not as susceptible to rupture of cell walls as are cells which are flaccid and limp. Compare a tire filled with air with one flat. The tire with adequate air pressure supports the weight of a vehicle with no harm to the tire. But when the tire goes flat, it is soon ruined. Similarly, the turgid cell supports weight without injury and the flaccid cell does not.

In such superficial damage as bruising of leaves, grass recovers quite quickly because leaves are regenerated easily.

But if injury goes deeper and you begin to damage the crown or the roots of the plant, you inflict a much greater injury and one from which the grass plant recovers more slowly. This is an important point, because later we want to emphasize distribution of traffic insofar as possible. The reason for that is that you can inflict superficial damage to leaves and turf will recover quickly; but when you damage the plant more severely by prolonging traffic, you slow down its ability to recover.

A divot represents a type of damage that takes a long time to recover, because you removed not only the leaves but the crown of the plant and a part of the roots. New plants have to be developed to fill in this area. If the torn area is topdressed immediately and filled with soil before all the underground growing parts dry out, it will recover from the damage much more quickly than if the area is allowed to dry out before it is topdressed.

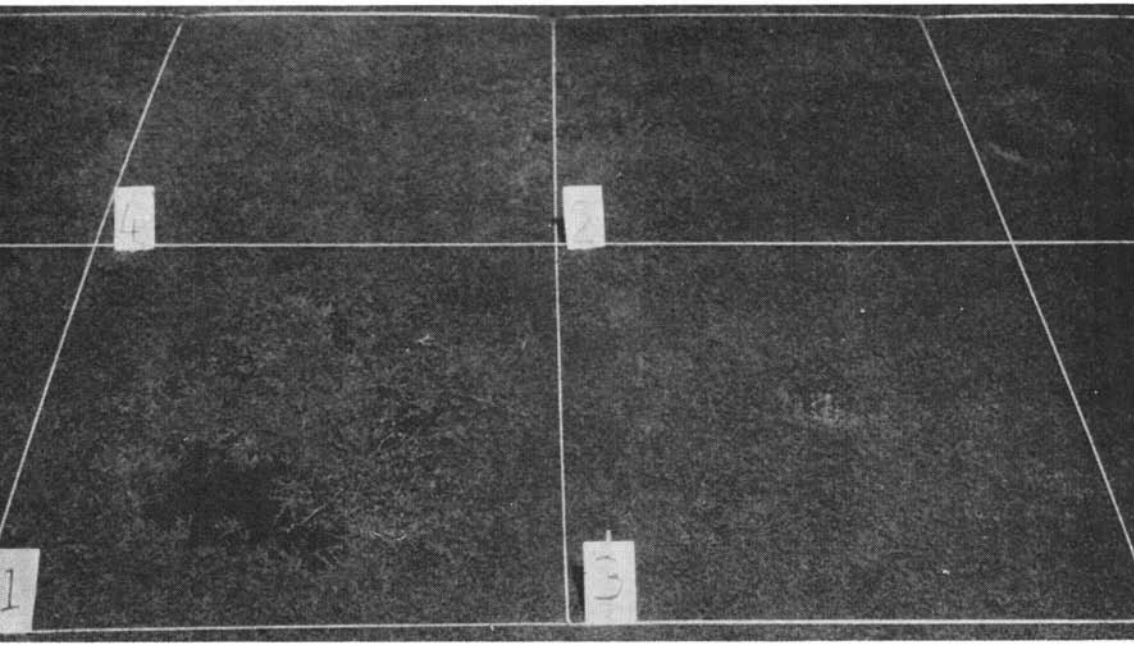
Another type of damage is indirect. Traffic bruises the plant at a critical time and predisposes it to disease injury. It is common that the most seriously damaged part of a putting green suffering from disease activity coincides with the area where the flagstick was last placed. Sometimes even single footprints are apparent.

You may wonder why traffic would have anything to do with disease. It bruises the leaves and makes a ready entry point for fungus growth. It further presses the healthy leaves into the turf and down into the mat. If the green is wet and the healthy leaves are pressed down into the mat where the disease organisms may be living or simply biding their time for a chance to attack, you have the combination of bruising the leaf and pushing the grass into contact with the inoculum.

Speed of recovery of turf from injury depends upon a number of things —the strain of grass, management practices, the severity of injury.

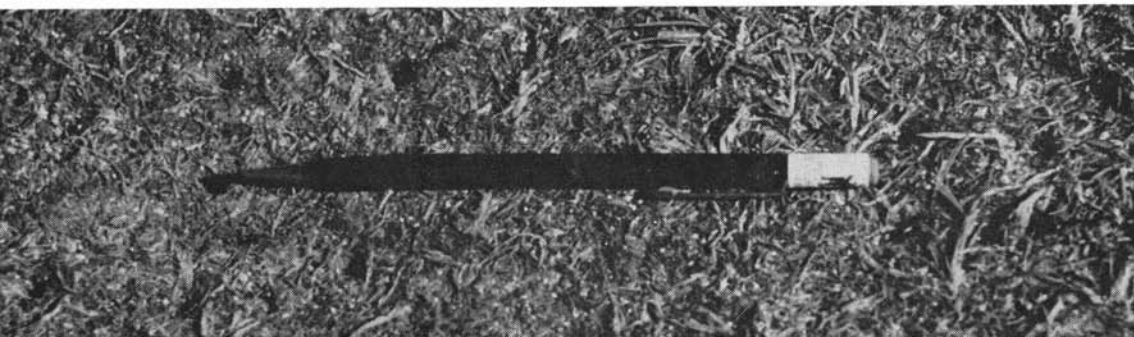
Therefore, the most important thing to remedy damage to turf is to distribute traffic. We can move tee mark-

Damage to Seaside bentgrass after 630 traverses during 6 weeks in 1958 by: left—ripple sole shoes; center—rubber lug sole shoes; right—conventional spiked shoes. Ripple sole shoes produced least damage, conventional spiked shoes greatest damage.



Above, Seaside bentgrass 6 weeks after traffic experiment 1959. 1—conventional spiked shoes; 2—modified spiked shoes; 3—ripple sole shoes; 4—check, no traffic. Note weeds and algae in 1.

Below, close-up of Seaside bentgrass after 5 weeks traffic (10 minutes daily) with conventional spiked shoes. Soil appears extremely compact; grass stems and leaves are pressed into soil. Spikes penetrate soil, leaving all of the golfer's weight resting on metal shoulders surrounding spike.



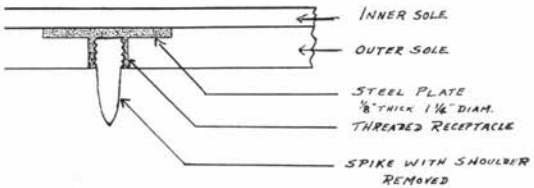
ers quite frequently so we don't inflict serious damage on turf before it gets a chance to recover. We can move flagsticks quite frequently. We must do everything possible to allow recovery time after grass has been injured so we don't get down to tearing the very heart out of the plant.

Work was done at Texas A & M in 1958 and 1959 on types of soles and spikes on golf shoes (reported in the USGA JOURNAL AND TURF MANAGEMENT for November, 1958 and September, 1959). Essentially, the experiment consisted of comparing wear resulting from shoes of different kinds.

An early test consisted of walking in a straight line across putting green turf and noting the damage resulting from the use of conventional golf spikes, lug soles, and ripple soles (Figure 1). Conventional spikes were most damaging and ripple soles least damaging.

Because the elements of turning, changing direction, and "body English" were missing from this type of exposure to wear, a second test was devised in which the experimental plots were 3-foot squares. The squares were marked off, a cup placed in the center of each square, and a man spent ten minutes each day for five weeks putting a ball into the cup, retrieving it, taking his stance, and putting again. In this study, the shoes were the conventional golf spike, the ripple sole shoe, and a modified spike (see front cover). In the modified spike, the shoulder was removed from the spike, and a circular disk which would support the receptacle containing the female threads was welded to the receptacle and placed between the inner sole and the outer sole of the shoe. Thus, only the spike itself protruded (Figure 2, and above).

After five weeks the experiment



Position of a steel disk welded to the base of threaded receptacle. Only spike protrudes beneath shoe sole.

was abandoned. At that time, plots on which both the conventional and the modified spike had been used were badly worn (Figure 3). Ripple sole plots sustained moderate damage. Plots were allowed to recover, and six weeks after the removal of traffic they were again evaluated. The plots where the modified spikes and the ripple sole were used had made complete recovery. The plot on which the conventional spikes were worn had a partial turf cover infested with weeds and a growth of algae (Figure 4). Thus, it appeared that the compacting effect of the shoulder around the conventional spike produced more lasting injury than any other factor involved.

In summary, any kind of traffic is damaging to grass, but grass has a remarkable ability to recover from light injury. It is damaged permanently when the wear is prolonged to the point where the regenerative tissue of the plant is destroyed.

Thus, it would appear that the most effective single device the superintendent may use is frequent rotation of movable features such as flagsticks, tee markers, ball washers, and benches.

There is no way to *make* grass grow, but you can *allow* it to grow. The statement has been attributed to Professor Lawrence Dickinson that one should "let the little grass plant grow—you can't make it grow—but it wants to grow—you help it."