Turf Damage From Foot Traffic

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Traffic effects on turf become increasingly troublesome. The numbers of golfers are increasing, the amount of cart traffic is increasing, and maintenance is becoming more intensive. These facts provide a good reason for trying to evaluate the damage caused by traffic on turf.

Damage from traffic is manifested in at least three ways. First, there is attrition to the grass plant itself, the bruising and tearing of the plant structures. Second, the soil is compacted and it loses desirable structural qualities. Third, there are the resulting effects of encroachment of weeds, infection by diseases, and infestation by algae. These troubles come about partly because of thin, worn turf and because of soil compaction.

During the last two years, some rather simple experiments involving the effects of different types of shoe soles have been conducted by students in agronomy at Texas A. & M. College, These tests have provided some interesting information with regard to the degree of damage caused by various types of shoe soles but they have provided also some insight into the relative importance of the various manifestations of damage.

1958 Studies

The results of the first series of tests, which were conducted in the early summer of 1958, were published in the USGA Journal of November, 1958. The traffic described in these tests consisted of paths which were traversed 630 times during a period of six weeks. Of the shoes employed in the test, it was found that the ripple-soled shoes were least damaging and that conventional spikes were most damaging. Figure 1 illustrates this fact.

Several methods were used in attempts to measure and report the degree of damage. Visual observations and the DQ (double quadrat) technique were used in recording the amount of wear on the

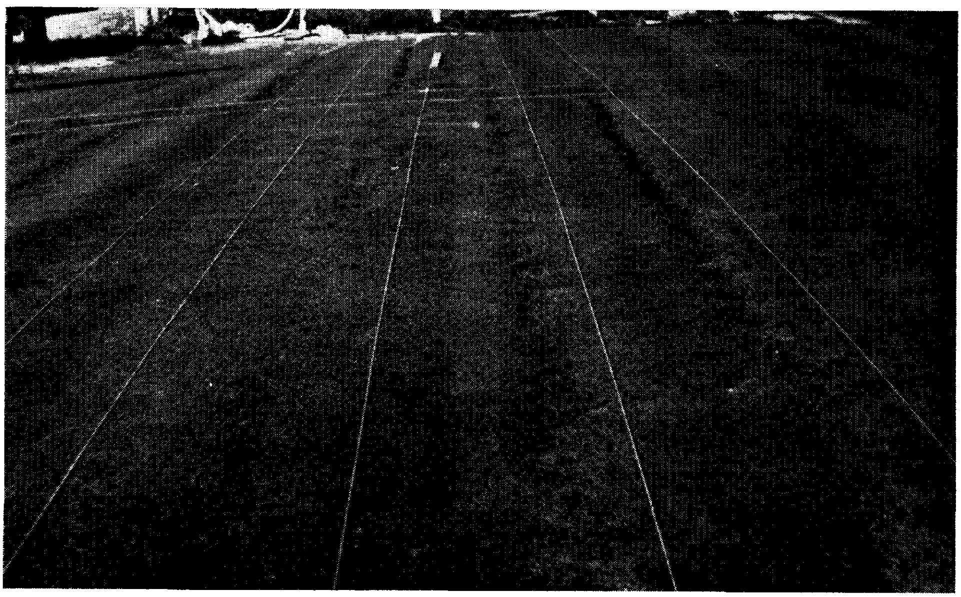

Figure 1. Damage to Seaside bentgrass turf after 630 traverses during a 6 weeks period in 1958. Left, ripple sole shoes; Center, rubber lug sole shoes; Right, conventional spiked shoes. Ripple sole shoes produced least damage; conventional spiked shoes produced greatest damage.

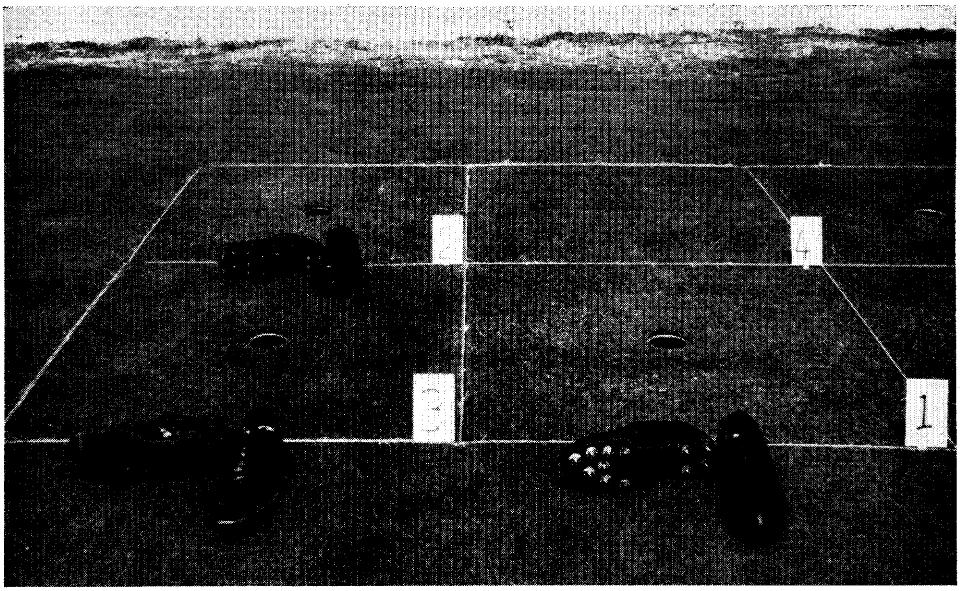

Figure 2. Seaside bent grass plots after 3 weeks traffic (10 minutes daily), 1959. Plot 1—conventional spiked shoes; Plot 2—modified spiked shoes; Plot 3— ripple sole shoes; Plot 4—check, no traffic.

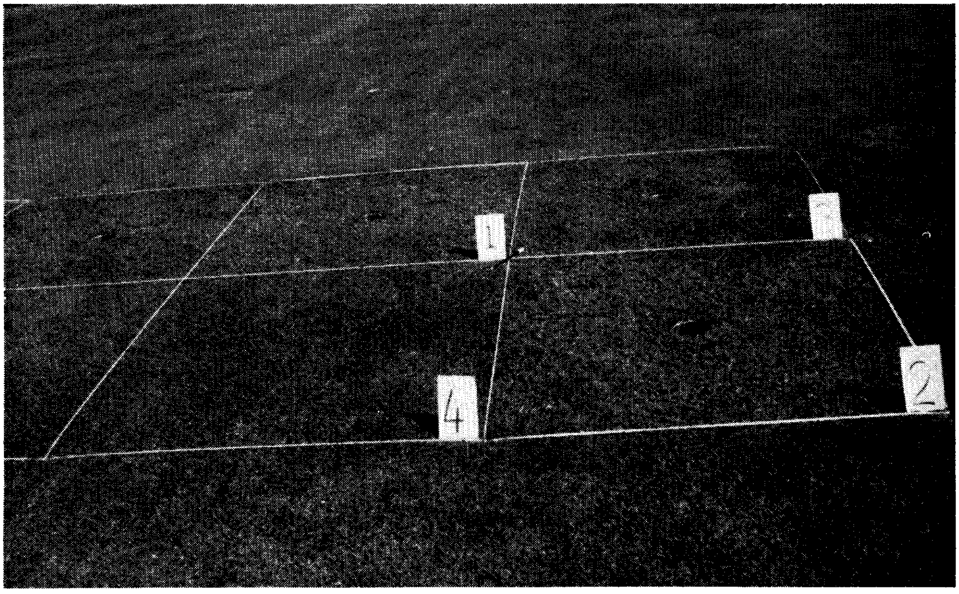

Figure 3. Seaside bent grass plots after 5 weeks traffic (10 minutes daily), 1959. Plot 1—conventional spiked shoes; Plot 2—modified spiked shoes; Plot 3— ripple sole shoes; Plot 4—check, no traffic.

plants making up the turf. An indication of the degree of soil compaction was obtained by measuring the amount of deformation which occurred across the paths.

1959 Studies

A second series of studies was conducted in the spring of 1959. Mr. Dale Darling, a senior student in agronomy at Texas A. & M., and a recipient of the Trans-Mississippi Golf Association scholarship, did this research as a special problem.

There were numerous criticisms of the techniques employed and the conclusions drawn from the first series of tests. The following complaints were typical.

1. Golfers do not make paths in putting greens. The tests measured only the effects of walking in a straight line.
2. There was no effect of turning such as the golfer does when he applies "body English" and when he retrieves his ball from the cup.

The 1959 tests were set up in such a way that these faults of technique would be corrected. Squares of turf (2½' x 2½') were marked off and a cup was set in the middle of each square. The tests were replicated three times. Each replication consisted of four plots. Of these, three were subjected to traffic from different shoe sole types and one plot received no traffic. This plot served as the check.

The traffic was applied in the following manner. A man took a putter and one golf ball and spent ten minutes each day putting the ball into the hole. He dropped the ball, putted it into the hole, retrieved it, dropped it on another part of the plot, moved around the cup, assumed his stance, putted the ball again, etc. Thus, with each type of shoe, ten minutes traffic each day was applied to the appropriate plot. The tests were continued for a period of five weeks.

In the 1958 tests, there was some indication that the shoulder surrounding the spike used on conventional golf shoes was contributing to the compaction of the soil. Therefore, in these tests, the three shoe types employed were the conventional spiked shoes, the ripple soled shoe, and one with modified spikes. The modification consists of removing the shoulder from around the spike. The threaded receptacle which fits between the layers of the shoe sole is enlarged by the addition of a metal disk. Thus the only protrusion from the shoe sole is the spike itself.

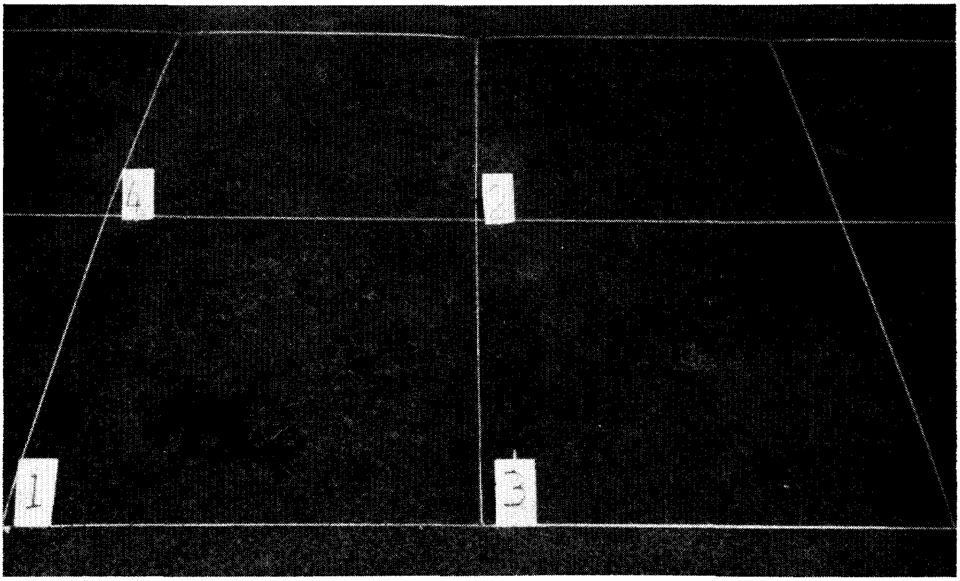

Figure 4. Seaside bent grass plots 6 weeks after termination of traffic experiment—1959. Plot 1—conventional spiked shoes; Plot 2—modified spiked shoes; Plot 3—ripple sole shoes; Plot 4—check, no traffic. Note weeds and algae growing in Plot 1.

Figures 2 and 3 illustrate the amount of damage to the turf appearing at different stages of the experiment. The damage to the grass plants appeared to be about the same in the case of both conventional and modified spikes. Damage was considerably less severe on plots on which the ripple sole shoe was used.

The degree of damage to the soil did not become fully apparent until several weeks after the termination of the experiment when the plots began to recover. In Figure 4, the plots are shown 6 weeks after the termination of the experiment. All plots had recovered with the exception of the ones on which conventional spikes were used. These plots still showed some bare areas and an infestation of algae and weeds.

Conclusions

These tests, while not extensive, point up clearly several facts about traffic damage on turf. They indicate a need for much more attention to this matter of wear.

The first visible effects of traffic are the footprints which may be only temporary in nature. Then comes the bruising of stems and leaf structures which becomes noticeable when the damaged tissue dies and begins to dry out. As bruising continues, the crown of the plant, the stolons, and the upper part of the root system begin to be damaged.

Concurrent with injury to the structure of the plant, the soil is compacted. Air is excluded from the root zone and infiltration of water is retarded. A weakened turf, and the encroachment of weeds and algae, are almost certain results.

Grass plants which are injured may recover and heal any bare areas that may exist, but the correction of soil structural deterioration is a very slow and difficult matter. Thus some of the most serious traffic damage is not visible on the surface.

In the light of observations reported here, it would appear that frequent changes of cup locations and tee markers is extremely important. If one waits until the turf area begins to show visible damage before changing the cup location, he has allowed far more serious invisible damage which may not show up until some later period when conditions are unfavorable to turf growth.

COMING EVENTS

September 14-15
Midwest Regional Turf Foundation Field Day
Purdue University
Lafayette, Indiana
Dr. William H. Daniel

September 15
Cornell Field Day
Cornell University
Ithaca, N. Y.
Dr. John Cornman

September 15-16-17
University of Florida Turfgrass Management Conference
Dan McCarty Hall, University of Florida
Gainesville, Florida

September 17 and 18
28th Annual Golf Course Superintendents' and Turfgrass F'eld Day
University of Rhode Island
Kingston,, R. I.

September 23-24-25
Northwest Turf Asociation Conference
Washington State College
Pullman, Washington
Dr. J. K. Patterson

September 28-29
Utah-Idaho Turf Conference
Twin Falls, Idaho
Mr. Jay Richardson

September 29
St. Louis District Field Day
Sponsored by St. Louis District Golf Association and Mississippi Valley Golf Course Superintendents Association

October 1-2
Arizona Turfgrass Conference
University of Arizona
Tucson, Arizona
Mr. Joseph S. Folkner

October 5-6
New Mexico Turfgrass Conference
New Mexico A. & M. College
State College, N. M.
Prof. C. E. Watson

October 8-9
Rocky Mountain Turf Conference
Colorado State University
Fort Collins, Colorado
Prof. George A. Beach

October 21-22-23
10th Central Plains Turfgrass Conference
Kansas State College
Manhattan, Kansas
Dr. Ray A. Keen

November 16-20
Fifty-Second Annual Meeting of American Society of Agronomy
Netherlands-Hilton Hotel
Cincinnati, Ohio

December 2-3-4
14th Annual Oklahoma Turfgrass Conference
Oklahoma State University
Stillwater, Oklahoma
Dr. Wayne W. Huffine

December 7-8-9
14th Annual Texas Turfgrass Conference
Texas A. & M. College
College Station, Texas
Dr. Ethan C. Holt