



(Left to right) Shoe No. 1, Shoe No. 2, Shoe No. 3, Shoe No. 4.

Golf Shoe Study II

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THE SWILCAN Bridge, at the 18th hole of the Old Course, at St. Andrews, Scotland, is over 800 years old. For centuries it has withstood the trodding of townspeople and traders alike, from harbor to town, and it has endured the crossings of St. Andrews golfers since well before Columbus sailed for America. If your mind follows a logical bent, the bridge must be one of golf's greatest contradictions, mysteries and miracles! How has this graceful granite arch held its ground against the onslaught of man, shoe, and club all these years?

One of the reasons for its endurance, at least for the first 750 years, may be that the bridge never had to contend with the conventional spiked golf shoe! Allan Robertson, the world's first golf professional (1815 - 1859), or even Old Tom Morris did not tread Swilcan in them. In fact, the earliest evidence so far of golf shoes with protrusions from the sole comes from an 1893 photograph of players in New Zealand's First Interprovincial Contest between Otago

Golf Club, Dunedin, and a Christchurch team. Two of the golfers are shown wearing shoes with hobnails — short nails with large, rounded heads.

In this country, at the turn of the century, red rubber sole shoes were in vogue. In his book, *The Walter Hagen Story*, Hagen describes how he dressed for the 1913 U.S. Open, including his wearing "red rubber-sole shoes" at The Country Club, in Brookline, Mass. The following year he wore the same general getup except for the shoes. "I slid all over the course at Brookline in wet weather (in 1913)," he said, and so he bought a pair of hobnail shoes for the 1914 Open. He won!

We know the Englishman Harold H. Hilton won the U.S. Amateur Championship, in 1911, in sneakers, and that Jerome D. Travers also appears to have worn sneakers in his 1907 victory. But there is no doubt the hobnail shoe was coming into its own. Bob Jones wore them at Merion in the 1916 Amateur, and Jess W. Sweetser (1922 Amateur Champion) remembers "golf shoes with

spikes" as standard foot gear by 1919. The trend was established and the boding not good for the growers of grass.

In the modern era, the spiked golf shoe has long been of interest to the USGA Green Section. The first scientific studies were undertaken in 1958-59 by Dr. M. H. Ferguson to determine the effect on wear and putting qualities of putting green turf by different shoes. The conventional metal spike shoe, the "ripple sole" shoe, and a modified golf shoe spike (with recessed or flattened spike shoulder), were tested.*

The conventional golf shoe spike not only caused severe damage to the grass plant, but the rounded shoulder of the spike also caused significant soil compaction and delayed grass recovery for weeks beyond that of other shoes. The ripple sole shoe soon dropped from the golfers' favor (and was banned by some clubs) because of the distortion it caused

*See USGA GREEN SECTION RECORD: November, 1958 & September, 1959 issues.



O'Sullivan's Golf Knobs.

Any shoe will make a Golf Shoe by attaching O'SULLIVAN'S GOLF KNOBS of New Rubber.

Practical, durable, satisfactory, economical—just what golf players have been looking for.

They are easily and quickly attached by any one.

A sample set sent (enough for one pair of shoes, soles and heels) post-paid to any address for 75 cents.

O'Sullivan Rubber Co.

LOWELL, MASS.

Makers of O'Sullivan Rubber Heels.

A 1901 advertisement for "Golf Knobs" to be attached to any shoe for turn-of-the-century golfers.

to the putting surface. The modified golf shoe spike, with the shoulder either flat with the sole or else recessed within the sole, proved to be less damaging to soils and turf, and it is still manufactured today for golfers who prefer spiked shoes but who are concerned with preserving putting green quality.

Course superintendents and green committee chairmen were also concerned. Charles Cogan, Green Committee Chairman at Irvine Coast Country Club, California, undertook his own study of spiked shoe damage to greens in 1960:

"The average golf shoe has 12 spikes; i.e., 24 spikes per golfer. I have found golfers take an average of 26 full steps (52 paces) per green. Therefore, each golfer leaves (26 x 24) 624 spike marks on each green. On 18 greens, he leaves 11,232 spike marks. If there are 200 rounds of golf played a day, there are 2,246,400 spike marks left behind. If this goes on for 30 days, you have 67,392,000 spike marks per month. And now, you wonder why you can't sink a putt?"

Both the player and the grass grower have a right to be concerned over golf shoes and what they are doing to the playing quality of our turf. But there is another, less visible factor that also deserves attention. There is increasing concern over the added costs in labor, aerifying, topdressing, mowing, weed control, cup changes, etc., brought about by spiked shoes. William H. Bengeyfield, one of the authors of this article, believes that \$10 million is a conservative estimate, and he attributes that to course conditioning alone. What of the additional costs in replacing pro shop and locker room carpeting, asphalt and concrete paths, door sills, wooden steps, benches, electric cart flooring, dashboards, tee markers, etc.? Does the spiked shoe cost golf \$15 million or \$20 million a year? Whatever it is, there is no doubt of its destructiveness.

But who among us is crusader enough, with courage to ask and optimism enough to expect today's golfer to readily give up wearing shoes with spikes?

The golfer has been conditioned. He believes that he needs the spiked shoe and, no doubt, some golfers probably do. The power behind the big drive in golf (250 or more yards), it is said, comes from the legs. Powerful legs need a secure grip. But not everyone who plays this game for the fun of it drives 250 or more yards! Not every golfer has that kind of leg power.

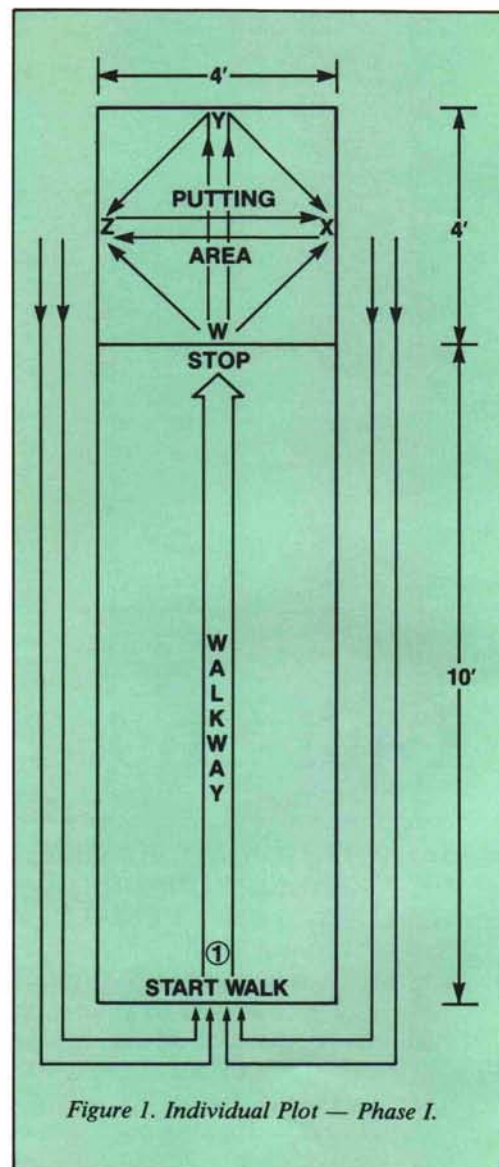


Figure 1. Individual Plot — Phase I.

Furthermore, not every round of golf is played under wet, slippery conditions. Fortunately, there are increasing numbers of golfers today, including many club professionals, who enjoy the game and play it very well in shoes without spike or stud. Indeed, most golfers could easily play and enjoy the game, especially on dry days, in



Photograph by MAX CLOVER, U.C. EXTENSION SERVICE

The Green Section Golf Shoe Study II participants (left to right) W. Bengeyfield, R. Loyland, Dr. V. Younger, M. Huck, R. O'Tee, Kevin O'Keefe, Dr. V. Gibeault at Industry Hills, California.

spikeless shoes. Hooray for them, for they shall lead the way to better putting turf at a lower cost.

The New Shoes

In 1982, a dramatic change in the design of golf shoes took place. New, multi-stud sole shoes were introduced into the United States. The studs are

made of either rubber or a composition material. Advertising claims of "better traction" and "no damage to greens" were widely circulated. In one case, it was proclaimed that the new shoes were "USGA approved," a statement with no basis in fact.

As more and more of the new shoes were produced, reports from golf course superintendents indicated that, contrary to the advertising claims, they were significantly damaging greens and adversely affecting putting surfaces, especially wet ones! Claims and counter-claims multiplied. The time was right for Green Section Golf Shoe Study II.

Early in 1983, an experimental plan was developed at the University of California, Riverside, to evaluate the effect of four different types of golf shoes on turfgrass quality and injury to putting green turf. The experiment and lessons from earlier shoe studies were incorporated in this plan. The new study began in May, 1983.

At Industry Hills, Calif., General Manager Bill Bryant offered the use of one of the Penncross bentgrass nursery greens for the experiment. The turf was nearly a year old and had developed approximately a 1/2-inch depth of thatch.

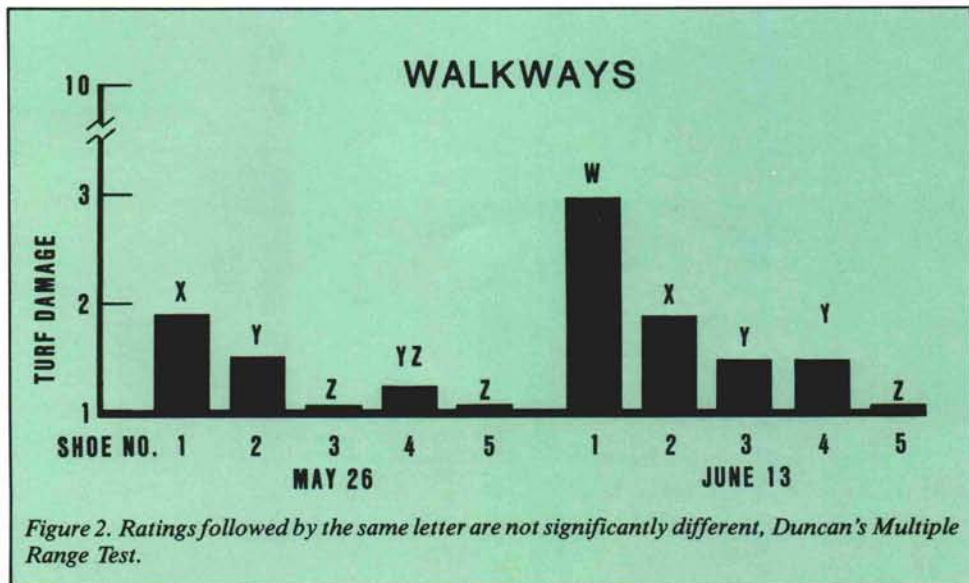


Figure 2. Ratings followed by the same letter are not significantly different, Duncan's Multiple Range Test.

It was mowed daily at 3/16 of an inch. The nursery green itself was built three years earlier to USGA Green Section Specifications. It received no other traffic than that imposed by the experiment, plus normal maintenance procedures. Four types of shoes were used in the study:

- Shoe No. 1) The conventional metal spike golf shoe.
- Shoe No. 2) One of the popular, new multi-stud sole golf shoes.
- Shoe No. 3) A new "spikeless" golf shoe with very small suction-type cleats.
- Shoe No. 4) Another one of the new multi-stud sole shoes but with a different sole design from No. 2.

The overall experiment was designed for Three Phases:

Phase I was to evaluate the shoes under normal weather conditions. This phase would require six weeks of testing.

Phase II would immediately follow Phase I and be a subjective test of the putting qualities of each plot. Two golf professionals and one amateur golfer would, in a prescribed manner, individually putt and rate the plots.

Phase III was to evaluate, under extremely wet conditions, the four shoes, as to wear injury effect over a period of three weeks.

PHASE I

After a brief preliminary investigation, the study commenced on May 2 and continued through June 13, 1983. Each plot measured 4 feet by 14 feet and was separated from adjacent plots by a 2-foot path. There were five randomized plots (one for each shoe type plus one check plot) in each replication, and four replications used in this experiment.

Four men, wearing a different type of golf shoe each day (in a predetermined order), walked and putted the plots designated for that particular shoe. They followed a prescribed walking and putting traffic pattern as shown in Figure 1. Each completed pattern was considered to be one treatment and each plot received four treatments daily. The men, wearing a different shoe type each day (in the predetermined order), carried out the treatments for four days, took the fifth day off, and so continued throughout the six-week span. Ratings were taken every two weeks using a scale of 1, equaling no visible damage, to 10, equaling bare ground.

TABLE 1.
Putting Surface Quality
as Affected by Shoe Type
(Normal Weather Conditions)

SHOE	AVERAGE PUTTING RATING
1	6.8 a*
2	3.9 b
3	3.6 b
4	4.4 b
CHECK PLOT	3.9 b

*Rating of 1 being excellent and 10 being extremely poor. Ratings followed by the same letter are not significantly different, Duncan's Multiple Range Test.

The Walkway Ratings

Turf damage to the walkway areas was rated on May 26 and June 13 and is shown in Figure 2. Since there was no visible damage to the walkways on May 10, no ratings were made.

On May 26, 24 days after beginning the experiment, Shoe No. 1 (spiked) showed the most damage to the walkway area. Shoes No. 2 and 4 (studded) showed slight damage. Shoe No. 3 (suction cleats) and the check plot had no visible damage.

On June 13, the turf damage on walkways was more severe. Again, damage from Shoe No. 1 was clearly more severe than the other shoes, followed by No. 2. No. 3 and No. 4 shoes were about alike in damage. All shoes showed statistically greater damage than the untreated check plot.

The Putting Area Ratings

Turf damage ratings to the putting areas on May 10, 26, and June 13 are shown in Figure 3.

Apparent damage to the putting plots increased throughout the duration of the study. Shoes No. 1, No. 2, and No. 4, in that order, caused the most damage. Shoe No. 3 caused some wear, but considerably less than the other shoes. On the final day of these ratings, all shoe plots showed significantly more damage than the check plot.

An example of damage caused by Shoe No. 1 on June 13, is shown in Figure 4. The Penncross creeping bentgrass had poorer color, decreased density, and a scruffy, ragged appearance, showing mechanical damage. These plots also had a noticeable surface depression and overall unevenness.

PHASE II

Immediately at the conclusion of Phase I, the subjective determination of the putting qualities of each plot was made. Paul McGuire (PGA), Julie Lynd

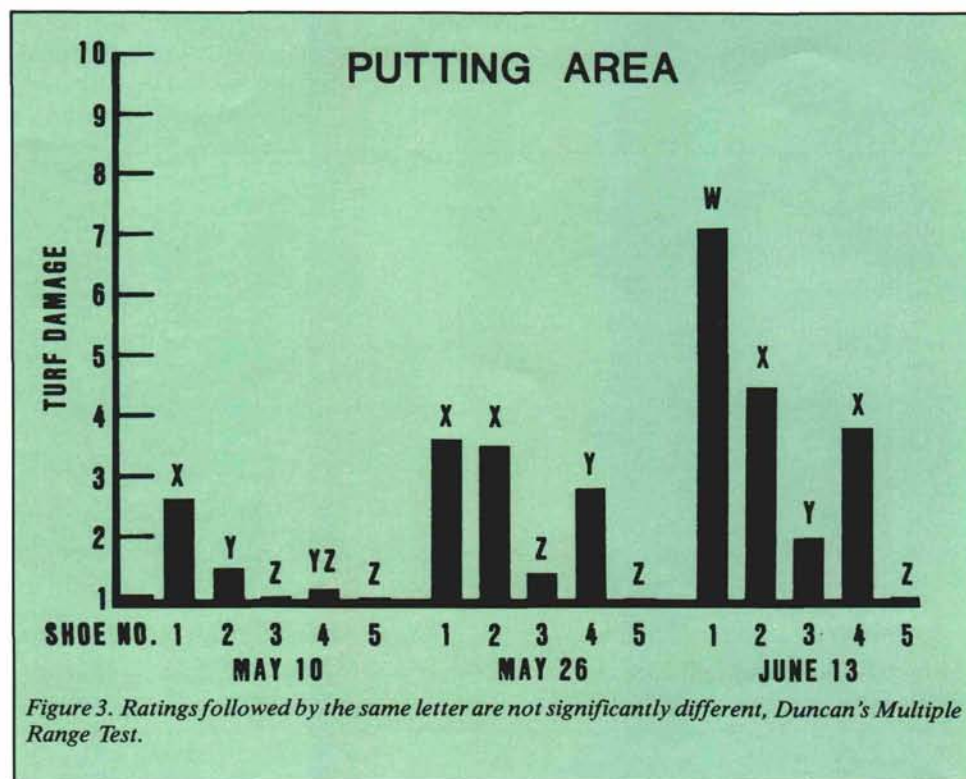


Figure 3. Ratings followed by the same letter are not significantly different, Duncan's Multiple Range Test.



Photograph by MAX CLOVER, U.C. EXTENSION SERVICE

Figure 4. Conventional spike shoe wear to putting area.

(LPGA), and Ross O'Fee (amateur golfer) cooperated in this experiment. They followed the putting pattern shown in Figure 5. Ratings were made from 1 (excellent putting qualities) to 10 (totally unsatisfactory putting qualities).

Putting ratings were made on the walkways as well as the putting areas of each plot. The only noticeable shoe influence, however, was observed on the concentrated putting areas, and these results are presented in Table 1.

These results show that, when putting across plots where Shoe No. 1 was worn, a decidedly poorer quality putting rating was given by the golfer. On the plots of the other shoes, there was no noted statistical difference between them under the conditions of this experiment, i.e., normal weather.

PHASE III

This study was to evaluate the effects of the four shoes on putting green turf under very wet conditions. Earlier reports indicated that the multi-stud shoes caused considerable damage to wet putting surfaces. In some cases they have actually been banned from golf courses in this country.

In Phase III, the individual plots measured 2 feet by 10 feet, and consisted of straight walkways over which 25 round trips were completed each day for three weeks. There were no putting areas in this test. All plots were replicated four times, and, again, the four men changed to a different type of shoe (in a predetermined order) each day and walked only those plots designated for that particular shoe.

Every day, just before walking began, the test area was heavily and thoroughly hand watered. The surface area was saturated until water was standing on it. It was allowed to drain, and the plot was again irrigated to saturation and standing water. Immediately following the second drainage, walking began. At the end of three weeks, the plots were rated on the same scale as before, 1 equaling no damage and 10 equaling bare ground.

The results are shown in Figure 6. They are similar to those in Phase I except the damage is greatly accentuated. The ratings show that damage from Shoe No. 1 is greater than the damage from Shoe No. 2, and Shoe No. 2 caused

more damage than Shoe No. 4, and Shoe No. 4 caused more damage than Shoe No. 3.

Discussion and Conclusion

From an overall view, the results obtained on turf damage and putting quality confirmed those of the Golf Shoe Study 25 years ago!

SHOE No. 1 (spiked shoe)

Under all conditions, this was the most damaging shoe tested. It also caused the longest lasting damage. In fact, four weeks after concluding the Phase I experiment, turfgrass damage was still apparent on all Shoe No. 1 plots (Figure 7). The length, shape and metallic nature of the spike, as well as the limited number of metal spikes on each shoe, are factors that account for most of the observation of this study. The effect of compaction, caused in large part by the weight-bearing shoulder of the metal spike, as well as the limited number of bearing surfaces (i.e., 11 or 12 spikes per shoe) was pointed out in the 1958-59 studies. The contention that the metal spike helps aerate the upper soil surface is without factual basis.

SHOES No. 2 and No. 4 (studded shoes)

Shoes No. 2 and No. 4 were the second and third most damaging shoes in this study. The slightly less grass damage caused by these shoes seems attributable to their greater total surface contact area (i.e., more, wider studs or nubbins) on the shoe soles. The studs are shorter than metal spikes, more blunt and tend not to pierce the plant tissue.

Conversely, however, these shoes, under wet and certain other conditions, have a marked tendency to ruffle or disrupt otherwise smooth putting surfaces and cause a waffle-like imprint. Because the studs are blunt, with approximately 108 of them per shoe, they each cause a larger area of depression than the metal spike (with 11 or 12 per shoe), which slices through the surface and into the ground. How long the multi-stud imprint remains on the grass depends on many factors, including the type of grass, how wet the surface, general drainage characteristics of the green, thatch density and depth, height of cut, rooting depth, and soil types heavier than those encountered in this experiment.

SHOE No. 3 (suction cleats)

Shoe No. 3 was the least damaging of all to the turf and putting surface. Again,

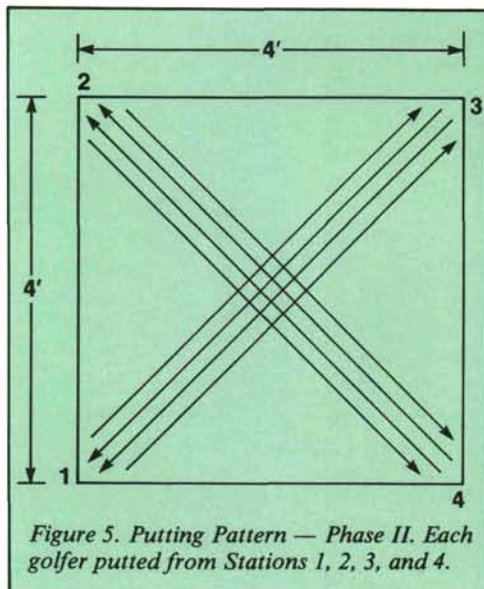


Figure 5. Putting Pattern — Phase II. Each golfer putted from Stations 1, 2, 3, and 4.



Hand watering the "wet plots" before walking.

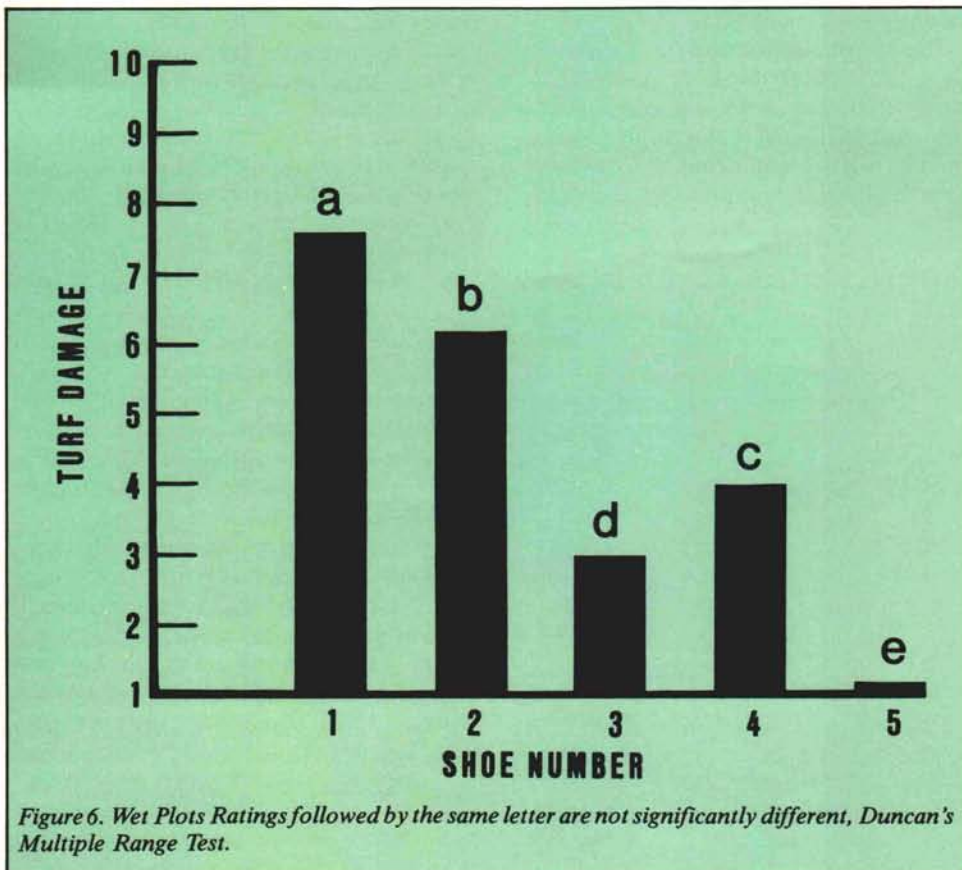


Figure 6. Wet Plots Ratings followed by the same letter are not significantly different, Duncan's Multiple Range Test.

this seems attributable to the very high surface contact area, no great protruding spikes or studs and a non-metallic sole composition. The sole is comprised of approximately 750 small rubber cleats.

Some Concluding Thoughts

The standard golf shoe spike, or any shoe with nobs, studs or protrusions of any kind, unquestionably causes greater damage to the grass and adversely affects putting qualities more than flat type shoes. Golf is one of the few games, perhaps the only one, where the player's own equipment — spiked shoes — directly, undeniably, and significantly affects the most critical playing surface of the game — the putting green. Even baseball and hockey smooth over their playing surfaces halfway through the contest! Golfers can't do that, and day after day, step after step, the spiked golf shoe takes its toll.

Is there a compromise? Is there some way out of this dilemma? In this technical age, a new idea for golf shoes may be lurking somewhere. Surely it is



(Left) Figure 7. Damage from metal spikes was still evident four weeks after discontinuing the experiment.

(Below) General view of experimental shoe trial area.



Photograph by MAX CLOVER, U.C. EXTENSION SERVICE

possible to develop a sole that will grip the ground without tearing the grass plant asunder.

Perhaps instead of one pair of shoes for all seasons, golfers should have two pairs of shoes for two seasons; a spikeless shoe for normal weather conditions and a spiked shoe, if necessary at all for the golfer, for wet days. Oh! What a relief THAT would be! It would save our putting greens, our clubhouses and our maintenance budgets millions of dollars a year. And, yes, it could mean at least another 800 years for the Swilcan Bridge. That along would make it worthwhile!

IN SUMMARY

SHOE No. 1

Metal spikes
 Long, pointed spikes
 Mechanical tearing, piercing
 Low surface contact area
 11 or 12 spikes per shoe
 Spikes with shoulders

HIGH TURF DAMAGE

SHOE No. 2 & No. 4

Composition sole
 Shorter, blunt studs
 Medium surface contact area
 Approximately 108 studs per shoe

MEDIUM TURF DAMAGE

SHOE No. 3

Composition sole
 No spikes
 High surface contact area
 750 small rubber cleats

LOW TURF DAMAGE