

# A Study of Putting Green Variability

by A. M. RADKO, R. E. ENGEL, and J. RICHARD TROUT\*

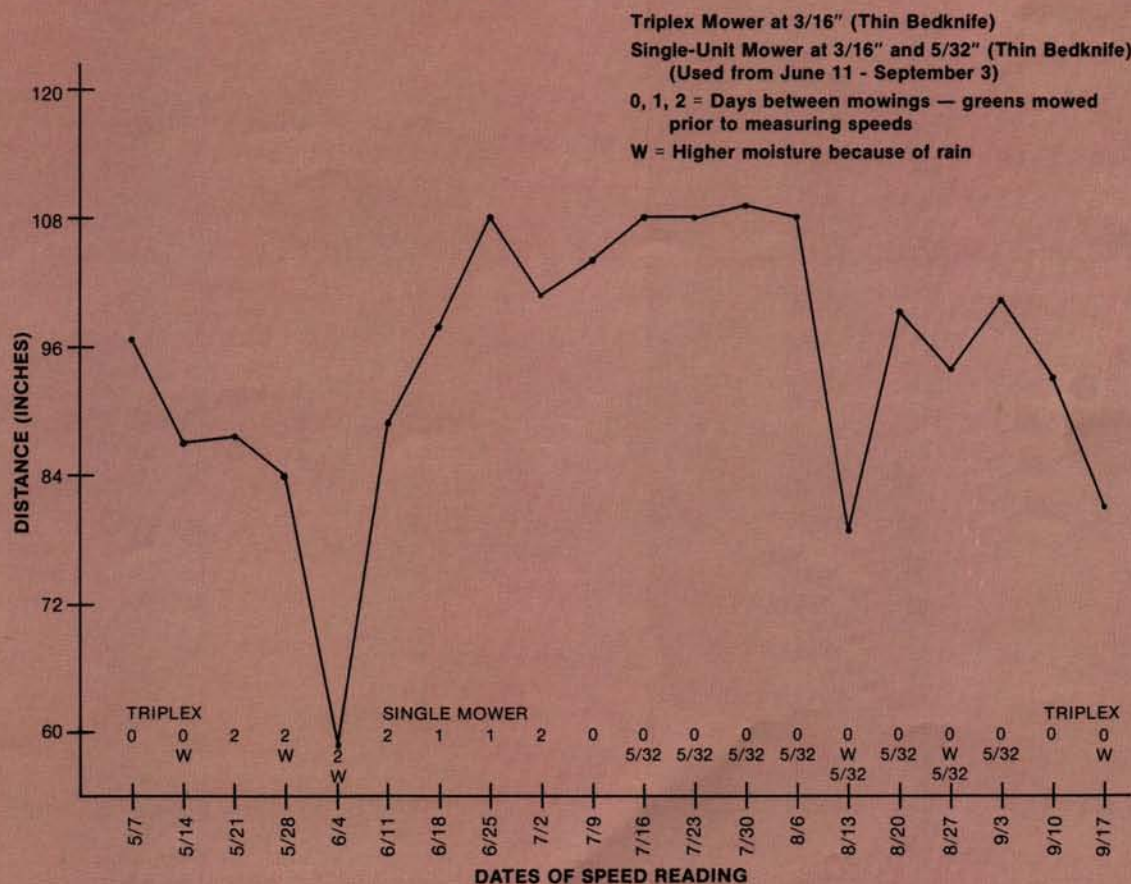
**T**HE STIMPMETER, a device for measuring the speed of greens, has been available for almost three years. It is a management tool the golf course superintendent can use in consultation with his green committee chairman. Together they can promote uniform greens after deciding upon the speed of greens that is comfortable for the membership. Charts were devised after USGA Green Section agronomists tested the speed of more than 1,500 putting greens throughout the country. Speeds designated for tournament and regular membership play have been defined as follows:

**TABLE 1**  
**USGA Green Speed Test Comparison**

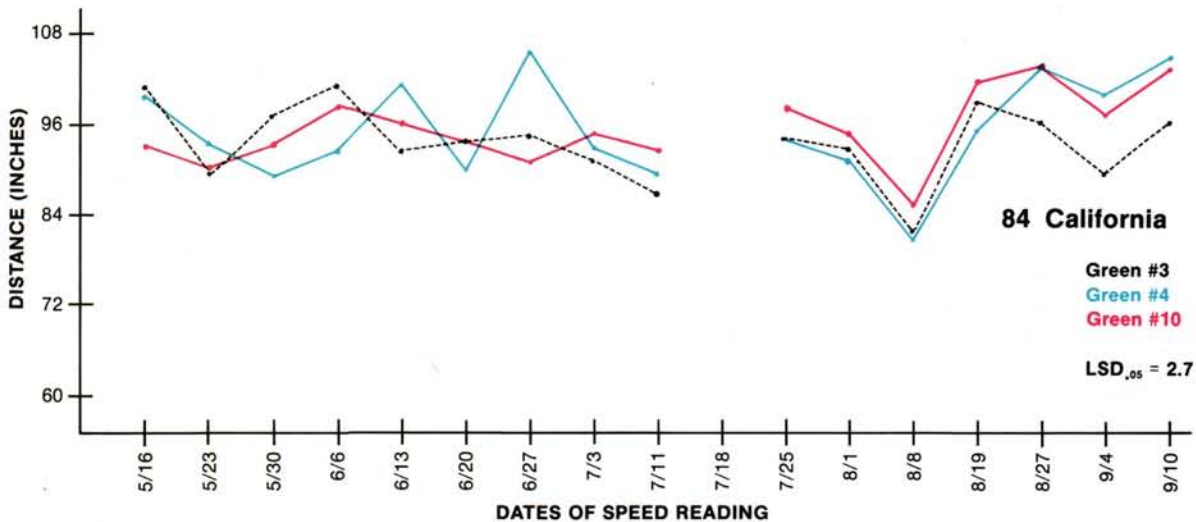
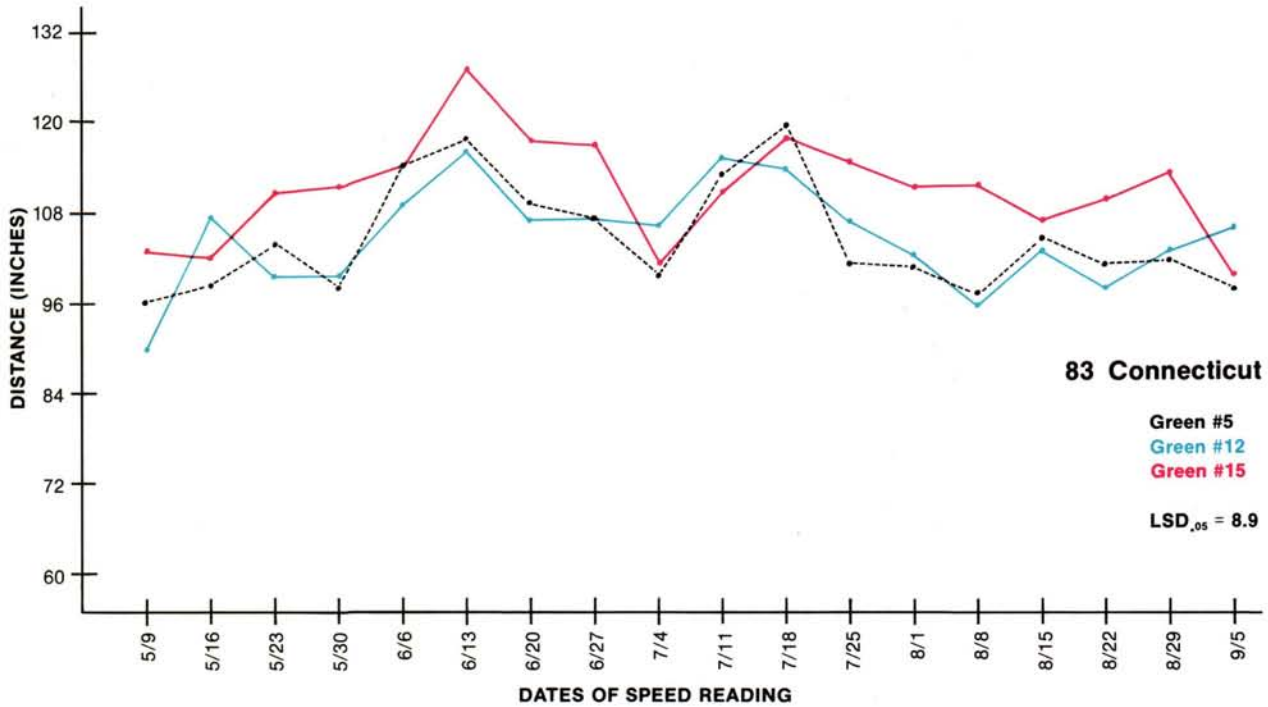
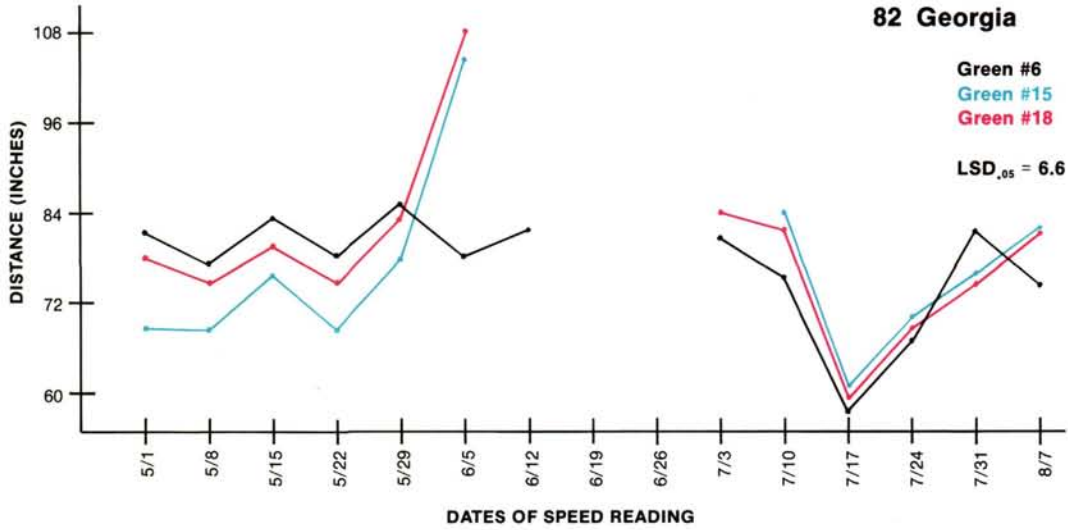
	<u>Regular Membership Play</u>	<u>Tournament Conditions</u>
Fast	102"	126"
Medium Fast	90"	114"
Medium	78"	102"
Medium Slow	66"	90"
Slow	54"	78"

\*National Director, USGA Green Section, Far Hills, N.J.; Res. Prof. of Turfgrass Management, and Associate Prof. of Statistics, Cook College, Rutgers University, New Brunswick, New Jersey, respectively.

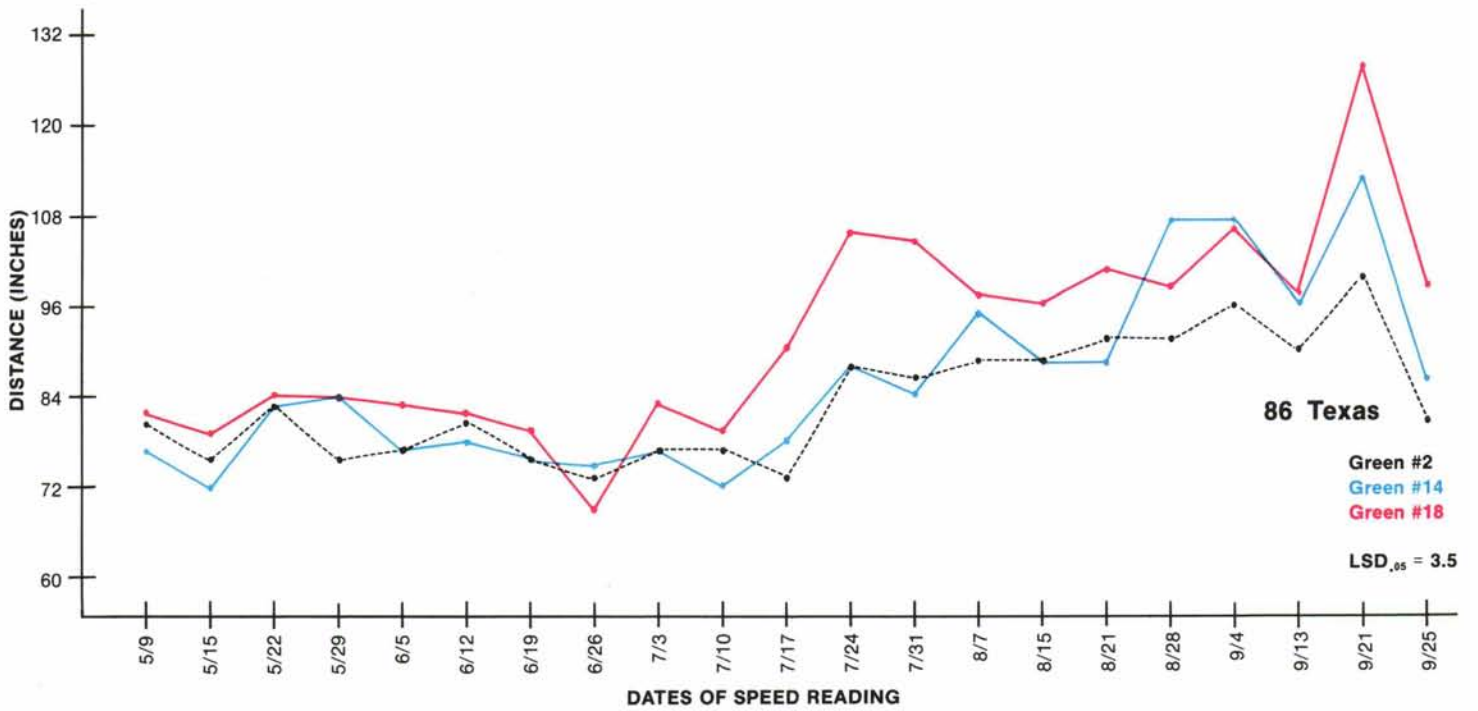
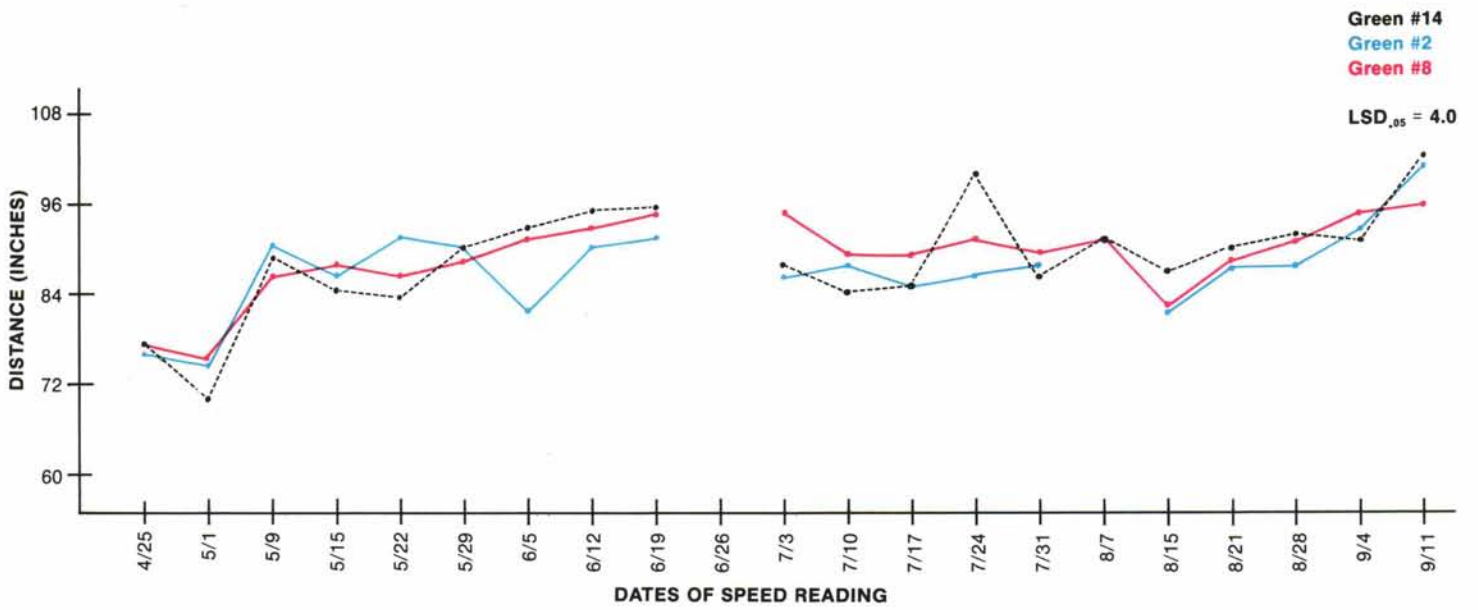
**Figure 1.**  
**1979 Weekly Readings on a Golf Course in Connecticut — Average of Three Greens**



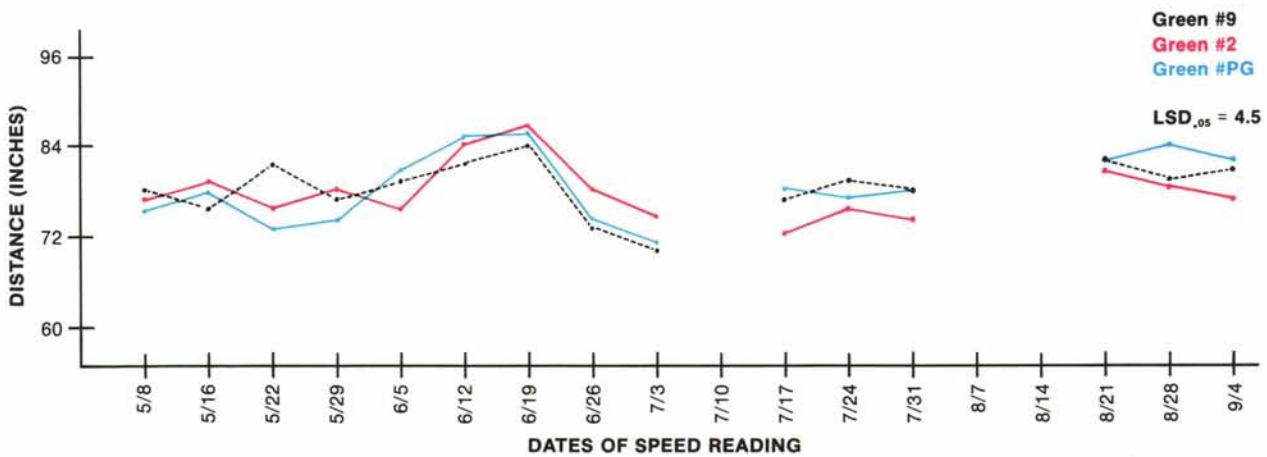
**Figure 2.**  
**1980 Green Speed Readings for Eight Golf Courses**  
**During The Period of May-September —**  
**Average of Three Greens**

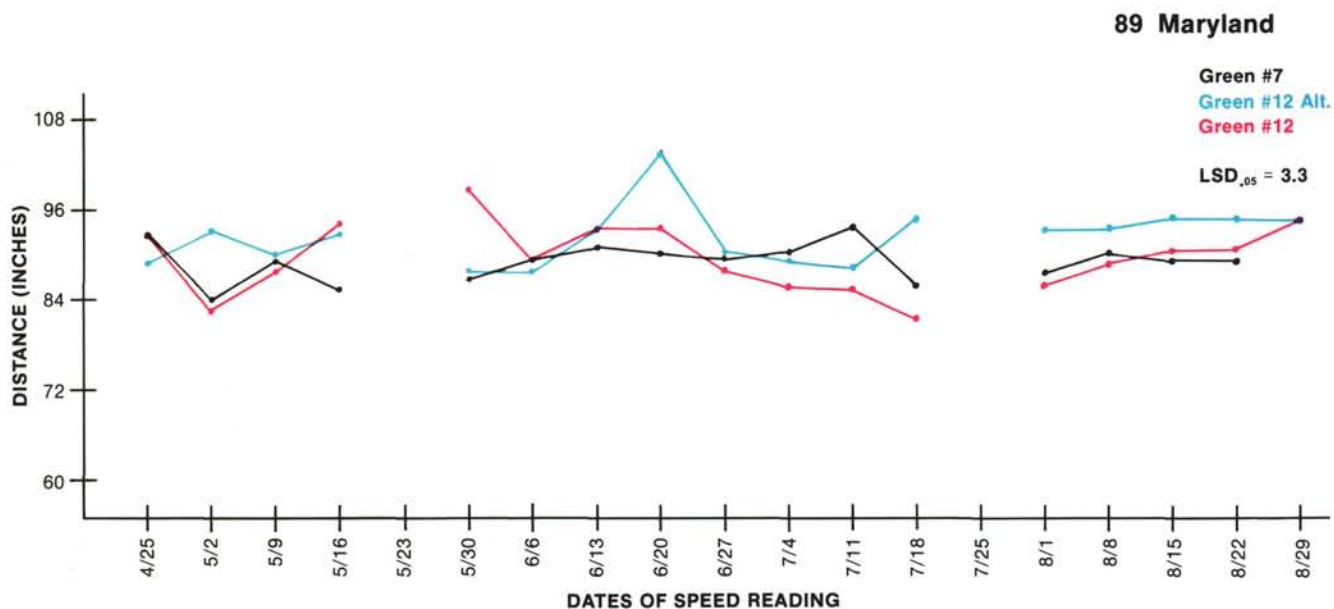
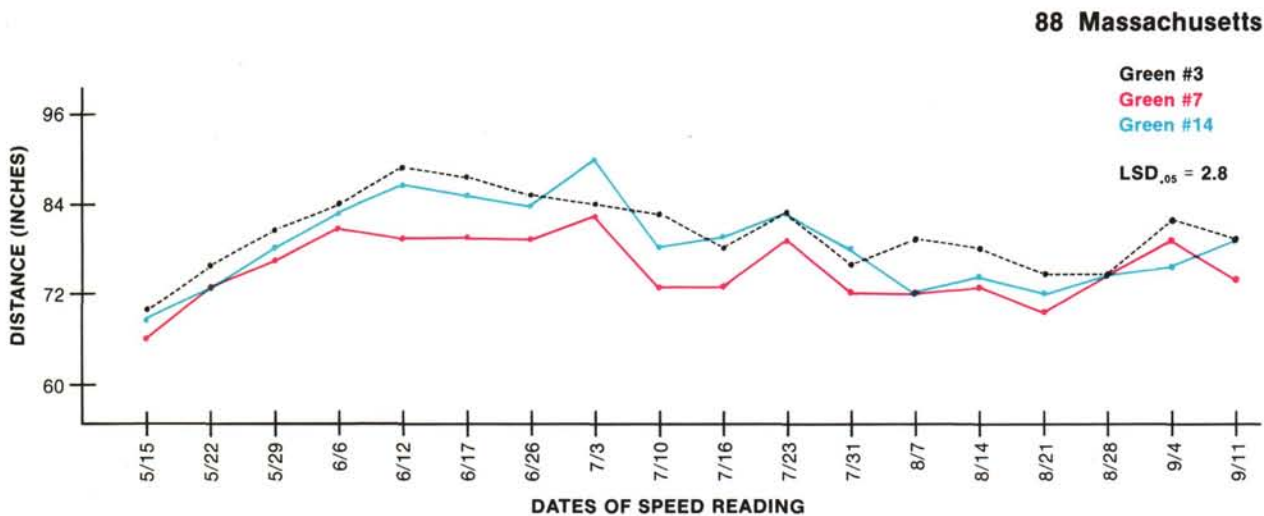


### 85 New York



### 87 Vermont





It was developed and named the Stimpmeter by Edward S. Stimpson, of Massachusetts.<sup>1</sup> Preliminary use gave indication that this device, which rolls a ball down the same angle of slope, could be an important management tool. Subsequent experience with the Stimpmeter combined with discussions with golf course superintendents proved this theory to be correct. As a result, research tests were devised to help determine what effect management had on speed and uniformity of greens. The first research report appeared in the January/February, 1980, USGA GREEN SECTION RECORD.<sup>2</sup>

This is the second of a series of articles planned to show the seasonal speed of putting surfaces. Superintendents from eight states cooperated in this study. The states represented are California, Connecticut, Georgia, Maryland, Massachusetts, New York, Texas, and Vermont. Routine management practices were used during the test period and were documented during the course of this study. Three greens were selected for testing at the golf course superintendent's discretion. A flatter portion of the green was used for measuring green speed, and the starting points and direction were the same each

week during the test period. Distance of the Stimpmeter roll away from each of the four marked starting positions and the return roll were measured and averaged to give four speed readings per green per week. Readings were taken weekly, within hours of the day's mowing, from early May until mid-September, except as weather or other conditions dictated.

#### GREEN SPEED RESULTS

The average weekly speed of the three greens measured in 1979 is given in Figure 1. While these readings were commonly in the range of from eight to

nine feet, they showed abrupt drops in speed on two occasions when excessive wetness developed. In the first, daily mowing was interrupted in the wet period of late May and early June. Greens were mowed then readings were taken, after a two-day interval between mowings, on May 21, 28, June 4 and 11. The speed had dropped to 7 feet on May 28, 4.9 feet on June 4 and back to 7.5 feet on June 11. A total of seven inches of rain occurred in the five-day period that ended June 4. Excessive wetness and lack of regular mowing appeared to give a brief but severe breakdown of the putting surface. On August 13, with daily mowing, a second and similar break in the normal putting speed occurred with three inches of rain. Fortunately, neither breakdown in normal putting lasted more than a week. The 1979 observations showed the need for more long-term speed readings which were taken in 1980.

Seasonal putting speed performances of 1980 are given for eight courses in Figure 2. The average green speed for the group ranged from approximately five to nine feet for the season. This translates into a range of slow to fast according to the USGA scale. While these clubs were essentially a random selection, as an aggregate, they represent better than average golf courses nationally.

When comparing the graphs for the different courses, note the LSD values which range from 2.7 to 8.9 inches for the LSD<sub>.05</sub> (least significant difference) with a probability of .05. This not only aids in evaluating differences on a given graph, but these values show the

measuring procedures contributed a surprisingly small amount of error in the differences recorded. Results support the USGA contention that greens are considered uniform if all are within  $\pm 6$  for Championship play, which requires speed readings of over 102 inches.

The summary of variances in Table 2 shows that several courses had surprisingly uniform speed for the three greens sampled. Note the low variance figures for *Among Greens* of courses 82, 84, 85, 87, 88 and 89. Similarly, courses 84, 87 and 89 showed very consistent speed through the season *Date*. The courses with the greatest change of green speed occurred on those having transition from cool-season to warm-season turf. Two of the courses with the most consistent green speed occurred in regions where the growing season has less variable weather. A lack of consistency between greens need not be a reflection on the course. Choice of the three greens tested was left to the golf course superintendent who, purposely, may have chosen greens that were different. Note that *Date* of reading was the largest source of variance in Table 2. This indicates that season was producing change which was due most likely to weather or changes in maturity of the turf. Considerable variance was associated with *Among Greens* from *Date to Date* for two of the courses with the highest total variance. This suggests relative speed was shifting among greens for the dates of test reading.

Two of the courses with the highest variance among the four rolls, taken

per green on a given day, were among the three that had the highest total variances for the season. This variation could arise from a number of factors that range from variation in grass type, foot traffic indentations, fine gravel exploded from bunkers, cleat marks, inconsistency in operating the Stimp-meter or other causes. Most of these possibilities confront the golfer.

## SUMMARY AND CONCLUSIONS

The Stimp-meter was used to evaluate the greens speed of nine different courses in 1979-80. Weekly measurements were made on the same three greens at the same locations.

Green speed averaged from less than five to nearly nine feet. This wide range was scarcely expected.

Excess of water may have an uncontrollable effect on green speeds. For example, the breakdown in green speed in the wet periods of 1979 shows the body of the putting surface can be lost. In this case it was short-lived.

While some courses showed significant variability between greens and some speed change through the season, a majority of the courses in this study showed remarkable uniformity.

## REFERENCES:

1. Stimpson, Edward S. "Putting Greens — How Fast." GOLF JOURNAL, April 1974, pgs. 28-29.
2. Engel, R. E.; Radko, A. M.; and Trout, J. R. "Influence of Mowing Procedure on Roll Speed of Putting Greens." USGA GREEN SECTION RECORD, Jan./Feb. 1980, pgs. 7-9.

**TABLE 2**  
**Individual Components of Variance and Total Variance of Putting Green Speed at Several Golf Courses, 1980**

Course No.	State	Mean Roll Distance (inches)	Variance Due To:				Total Variance
			Among Greens	Date	Inconsistency Among Greens From Date to Date	Among Rolls per Green	
82	Ga.	78	0	76.27	37.32	22.16	135.64
83	Conn.	107	11.04	29.11	4.98	40.34	85.47
84	Calif.	95	0.08	16.82	12.79	3.68	33.37
85	N.Y.	88	0.09	34.57	6.69	7.71	49.06
86	Texas	87	19.87	94.39	21.29	6.12	141.67
87	Vt.	78	0	9.17	4.67	10.11	23.72
88	Mass.	78	5.24	21.96	3.03	4.06	34.28
89	Md.	90	4.48	2.14	8.52	5.64	20.78