

Putting Green Management Systems

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INTRODUCTION

The sites for this long-term study are push-up and sand putting greens constructed in 1993 and seeded to 'Pennncross', 'Providence', and 'Crenshaw' creeping bentgrass in 1994. The primary objective of this project is to determine how putting green type, bentgrass cultivar, and mowing height alter putting green quality. This information is then applied in the selection of appropriate management systems and in assigning dollar costs to management systems.

The original intent was to gather information on pure stands of creeping bentgrass and then transition into mixed stands of Poa annua and bentgrass. Actions taken in 1998 and 1999 to bring about this transition were not successful. A new approach taken in 2000 is showing signs of having succeeded in the introduction of Poa into the greens.

METHODS

The treatments in this study are putting green (push-up vs. sand) and three bentgrass cultivars, each mowed at heights that maintain putting green speeds consistently greater than 10 feet, around 9 feet, and around 8 feet. The bentgrass cultivar-mowing height combinations are replicated three times in randomized complete blocks on each type of putting green.

In 1996, a group of golf course superintendents assisted in selection of the cultural practices listed below that have been employed at each mowing height.

Management System I — Green speed > 10 feet:

Mowing:	6 to 7 times/week at 0.105 to 0.125 inch.
Fertilization:	Granular fertilizers spring and fall, light and frequent liquid applications During the growing season.
Disease control:	Preventative, in actuality, most disease control was curative in order to observe treatment effects on disease severity.
Grooming:	Every 3 weeks.
Topdressing:	Bi-monthly with 1 ft ³ sand/M, one application being made at the time of grooming.
Growth regulator:	Primo monthly at 0.24 oz/M, starting in mid-May.
Core aeration:	Early September, cores removed and holes backfilled with topdressing sand.
Traffic:	Simulated traffic (rollers with golf shoe spikes at frequencies up to the equivalent of 35,000 founds of golf per season).

Management System II — Green speed around 9 feet:

Mowing: 6 times/week at 0.156 inch.
Fertilization: Combination of granular and liquid.
Disease control: Same as Management System I.
Grooming: Once per month.
Topdressing: 1 qt³/M of topdressing sand at time of grooming.
Growth regulator: Same as Management System I.
Core aeration: Same as Management System I.
Traffic: Same as Management System I.

Management System III — Green speed around 8 feet:

Mowing: 5 times/week at 0.208 to 0.230 inch.
Fertilization: All granular.
Disease control: Curative only.
Grooming: 2 to 3 times per season.
Topdressing: Only in conjunction with core aeration.
Growth regulator: None in 1986 to 1989; Primo in 2000.
Core aeration: Same as Management Systems I and II.
Traffic: Same as Management Systems I and II.

The greens were irrigated daily at 100% of estimated plant ET except when rainfall was 0.25 inch or more. Fertilization frequency was according to bentgrass color. Rates ranged from 0.25 to 1.0 lb N/M, depending on management system and time of year. Phosphate and potash rates were those required to achieve a season total N:P₂O₅:K₂O ratio of 4:1:3. Annual N rates were 2.24 lb for Management System I, 2.54 lb for System II, and 2.0 lb for System III.

OBSERVATIONS

The information gathered since 1996 is summarized in Table 1. This information supports the discussion that follows.

RESULTS

Sand vs. Push-up Putting Greens:

The push-up green exhibited several advantages over the sand green and a few disadvantages. The push-up greens, having better moisture and nutrient retention, maintained bentgrass stands that were 28% more dense, provided significantly better conditions for root growth, were less prone to invasion by algae and had a 69% reduction in the severity of infection by dollar spot. The only disadvantages observed were a 10% increase in clipping production and somewhat greater susceptibility to traffic damage.

Table 1. Relative effects of putting green type, bentgrass cultivar, and mowing height on factors that contribute to putting quality and management.

Factor	Relative influence		Mowing height †	
	Type of green	Bentgrass cultivar	0.156 inch	0.225 inch
Clipping weight	Soil + 10%	Crenshaw – 4%	+ 17%	+ 46%
Stand density	Soil + 28%	Crenshaw + 6%	+ 11%	+ 11%
Rooting depth	Soil + 91%	None	+ 6%	+ 8%
Root mass	Soil + 5%	None	+ 25%	+ 52%
Algae invasion	Sand + 7%	Pennncross +143%	– 92%	– 97%
Dollar spot	Sand + 69%	Crenshaw + 1070%	+500%	+890%
Traffic damage	Soil + 9%	Crenshaw + 4%	– 10%	– 4%
Speed	None	Pennncross + 3%	– 9%	– 23%

† Compared to mowing at 0.125 inch.

Pennncross vs. Providence vs. Crenshaw:

Among these three creeping bentgrass cultivars, Crenshaw exhibited slight advantages with respect to clipping production, stand density, and traffic tolerance. As is well known, Crenshaw's major disadvantage is its high susceptibility to infection by dollar spot. Severity of dollar spot in the Crenshaw plots exceeded that for Pennncross and Providence by 1070%. Pennncross provided slightly higher speeds than Providence or Crenshaw, but was much more prone to algae invasion at low heights of cut. There were no differences among the three cultivars as far as root growth was concerned. In every regard, Providence gave results intermediate between Pennncross and Crenshaw.

Mowing at 0.125 vs. 0.156 vs. 0.225 Inch:

Mowing height had a much greater impact on the putting greens than did type of green or bentgrass cultivar. In all instances the effects of mowing at 0.156 inch rather than 0.125 inch were intermediate to what occurred when the height of cut changed from 0.125 to 0.225 inch. Thus, this discussion is being simplified by confining it to the contrasting effects of mowing at 0.125 and 0.225 inch. In other words, the contrast is between putting greens maintained at speeds >10 feet and those maintained at around 8 feet.

Mowing to maintain a putting green speed >10 feet rather than around 8 feet has many notable consequences, some positive and some negative from a management perspective. The positive aspects are a 46% reduction in clipping production, an 890% reduction in the incidence and severity of dollar spot, and 4 to 10% less damage from traffic. Offsetting negative effects include an 11% reduction in bentgrass stand density, an 8% reduction in

rooting depth, a 52% reduction in root mass and a 97% increase in the area of the greens invaded by algae.

CONCLUSIONS

Data gathered over the 5-year lifetime of this project support the following conclusions:

Push-up greens have several advantages over sand greens. They maintain higher bentgrass stand densities, better root growth, are less prone to invasion by algae, and are less susceptible to attack by dollar spot. Disadvantages are greater clipping production and lower traffic tolerance. All factors considered, push-up greens are easier to manage at lower cost and can be maintained at the same speeds as sand greens.

The most important consideration in selection of a bentgrass cultivar is disease tolerance/resistance. A second but considerably less important factor is stand density. Cultivars that maintain higher stand densities are less likely to be invaded by algae and provide somewhat better traffic tolerance.

The effects of mowing height on putting green quality overshadow any positive influences that are associated with type of putting green or the bentgrass cultivar grown. Mowing at 0.125 inch or less to achieve speeds consistently greater than 10 feet is highly detrimental to the quality of putting greens and creates much greater demands in terms of cultural practices and elevates management costs. If one were to select out of this study an “ideal” mowing height, it would be something close to 0.156 inch. This height of cut consistently provides green speeds around 9 feet, maintains stand densities that minimize invasion by algae, and sustains better bentgrass root growth. The negatives identified in going from a mowing height of 0.125 to 0.156 inch are greater susceptibility to attack by dollar spot and a slight reduction in traffic tolerance. Increasing the mowing height from 0.156 to 0.225 inch slows putting greens down to 8 feet or less, significantly increases clipping production, increases dollar spot severity, and has relatively small effects on turfgrass root growth and stand density.