

Organic Matter Dilution Programs for Sand-based Putting Greens

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Objectives:

To compare various cultivation approaches that remove from 10 to 27% surface area and determine treatment effects on agronomic performance of a mature putting green in east-central Virginia. The ultimate goal is to determine which organic matter dilution program maintains mat layer organic matter at less than 4% while providing the fewest days of putting quality disruption each year.

Start Date: 2008

Project Duration: three years

Total Funding: \$9,000

Aggressive organic matter dilution programs are intended to slow loss of aeration porosity and subsequent infiltration rates thereby allowing superintendents to more easily manage their putting greens and lessen the effects of summer bentgrass decline. Our research compared various cultivation approaches that removed from 10 to 27% surface area to determine the effects on agronomic performance of a mature putting green in east-central Virginia.

We used a mix of tine sizes and verticutting to achieve a range of surface removal. Our research was done on mature (8-yr-old) 'Penn A4' greens that are in play. Our treatments were imposed on two practice putting greens at the Independence Golf Club, the home course of the Virginia State Golf Association near Richmond.

Prior to initiation of the study, analysis of 4 randomly-selected cup cutter cores revealed a mat layer with 5.8% organic matter and an infiltration rate of 11 inches/hr. Various combinations of small tines (0.25"), big tines (0.50"), and verticutting (3-mm blade) were imposed in late March and early September to provide a

range of seasonal surface removal from 0% to 26.6% (Table 1). Verticut blade spacing and depth was 1 inch, while tine spacing was 1.33" X 1.5", with a coring depth of 2".

Heavy sand topdressing of approximately 12 ft³ (1,200 lbs/1000 sq. ft.) was applied on both days of cultivation, supplemented by six light topdressings of 2 ft³ (200 lbs/1000 sq. ft) every 3 weeks between cultivations for a seasonal total of about 36 ft³. Cultural management of these greens were identical to all others on the golf course, receiving preventive pesticide applications, daily mowing at 0.115", and April through September fertilization of 1.6 lbs N/1000 sq. ft.

Cultivation treatment had no effect on soil temperature, soil moisture, or ball roll distance throughout the summer season. Close-up pictures were taken for digital image analysis of recovery rate, but analysis is still in process. Visual quality observations indicated almost complete recovery of cover at 2 weeks after coring in the spring for treatment 2, where 0.25" tines were used in 2 passes to remove 5% surface area. All other spring treatments were more aggressive, removing 10 to 14%; these treatments required 8 to 10 weeks for recovery.

Fastest fall recovery was again seen with the small tines (0.25"). Interestingly, fill-in was just as fast when 2 passes were made with the ¼-inch tines as when only 1 pass was made. This observation agrees with others who observed that recovery was only affected by tine diameter and not by tine spacing. Cup-cutter plugs for quantification of mat layer percent organic matter were taken in late October and have yet to be processed.



Cultivation treatments being applied on Sept 4. Left lane shows a 0.25" tine treatment; middle lane shows a 0.5" treatment; right lane shows a 0.25" coring + verticutting treatment.

Summary Points

- Previous transition zone research at the University of Arkansas on a relatively young (2-yr-old) 'Penn G2' sand-based green indicated that aggressive annual removal of 15-23% surface area via verticutting was required to keep mat layer organic matter below 4%. However, recovery of putting green uniformity took at least twice as long as coring.
- Our transition zone study in Richmond, Virginia is being conducted on 8-yr-old 'Penn A4' sand-based putting greens that are in-play, and began the trial at 5.8% organic matter (above the USGA recommended mat layer limit of 4%).
- Closely spaced core aeration, with or without verticutting treatments, were imposed spring and fall so that annual surface area removal of plots ranged from 10% to 27%.
- No overall bentgrass decline was noted during the 2008 growing season and none of the treatments affected soil temperature, soil moisture, or ball roll distance.
- Faster recovery was seen on those plots where surface area removal was the least. That is, where ¼-inch tines were used at close spacing (1.33" x 1.5"), and the green was either cored once or twice.

Treatment	Surface Area Removed (%)		
	March 28	Sept 4	Total
1. Untreated check	0	0	0
2. 0.25" tine core aerations X2	5	5	10
3. 3-mm blade verticutting	11.8	11.8	23.6
4. 0.25" tine core aeration + 3-mm blade verticutting	2.5	2.5	16.8
5. 0.5" tine core aeration + 0.25" tine core aeration X2	9.8	5	14.8
6. 0.5" tine core aeration	9.8	9.8	19.6
7. 0.5" tine core aeration + 3-mm blade verticutting + 0.25" tine core aerations X2	9.8	11.8	26.6

Table 1. Cultivation treatments and percent surface area removed.