

# 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 was done on 9-yr-old 'Penn A4' practice putting greens at the Independence Golf Club near Richmond. Prior to initiation of the study, analysis of four randomly-selected cup cutter cores revealed a thatch/mat layer (~0-2" deep) with 5.8% organic matter and an infiltration rate of 11 inches per hour.

Various combinations of small tines (0.25" inside diameter, id), big tines (0.50" id), 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). Verticutter blade spacing was 1", while depth was 0.75"; tine spacing was 1.33" X 1.5", with a coring depth of 2". Heavy sand topdressing of approximately 12 ft<sup>3</sup> (1,200 lbs/1000 ft<sup>2</sup>) was applied on both days of cultivation, supplemented by four light topdressings of 0.15 ft<sup>3</sup> every 4-6 weeks between cultivations, for a seasonal total of about 24.6 ft<sup>3</sup>.

Cultivation treatment had no

effect on soil temperature, soil moisture, or ball roll distance throughout the 2008 season and were not measured in 2009. At the end of 2008, only those coring treatments that removed 14.8 to 19.6% significantly reduced % OM relative to the untreated control (Table 1). Use of smaller tines-alone, verticutting-alone, or combinations of the two, failed to reduce % OM in 2008.

At the end of 2009, all treatments, except verticutting alone, significantly decreased % OM in the thatch/mat layer relative to the control. Coring spring and fall with 0.5" ID tines on a tight spacing (1.33" x 1.5") to remove approximately 9.8% surface area to a depth of 2" resulted in the least OM (3%) over the two years. These data imply that verticutting to a depth of 0.75" does not remove enough depth of material for adequate organic matter dilution, even though this procedure removes a large amount of surface area (11.8%) with each pass.

To track percent cover or recovery rate following cultivation treatments in 2009, digital images were taken every 7 to 14 days with a light box and analyzed with SigmaScan software. Linear regression was then used to predict the number of days required for each treated plot to return to 99% cover or a non-disrupted putting surface. Fastest spring recovery of 24 days was measured for treatments including small tine coring and verticutting. Large diameter coring or small diameter coring + verticutting on the same day required 31 to 36 days for spring recovery.

Late summer/early fall recovery data were very similar for cultivation treatments that remained the same as their spring counterpart. Verticutting treatments recovered in only 21 days, while large diame-

ter coring-alone required only two extra days of recovery (38 versus 36 days), relative to the spring. Fastest early September recovery of 7 days was with 0.25" tine core aeration + 3-mm blade verticutting where only 2.5% surface removal occurred.

Data indicate that as little as 10% surface area removal via spring and fall coring may be sufficient for Virginia conditions, while 15 to 20% annual removal should almost always keep you on the safe side. While verticutting alone provides fast healing, our data indicate that it needs to be combined with at least one annual coring for adequate results.

## Summary Points

- The least disruptive treatment in terms of percent removal (Trt 2, 10%) healed quickly (24 to 34 days) and reduced thatch/mat OM to an acceptable level of 3.4% after two years.
- Verticutting alone each spring and fall (Trt 3) resulted in the second fastest recovery of any treatment (21 to 24 days), but failed to significantly reduce OM to a level below the untreated.
- Treatment 4 resulted in the least amount of days of disruption over the season (38), while also reducing OM to an acceptable 3.7%. Total recovery time was 7 days less than verticutting-alone, with a slightly faster rate of OM reduction.
- Using large tines (0.5" ID) at a close spacing both spring and fall each year (19.6% surface removal, Trt 6) worked best in terms of final OM at 3.0%, but required approximately two extra weeks each season for recovery relative to two passes with small tines or verticutting alone.
- Being ultra-aggressive by removing 26.6% surface area (Trt 7) per year did not work in this trial. Recovery time was significantly delayed without achieving greater OM dilution relative to treatments that removed 10 to 20% surface area.

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.