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Turf & Soil Specialist

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The responses from my cultural practice presentations starting in 2014 have been encouraging to say the least. The continued comments from turf managers indicating their willingness to evaluate new practices/ technologies at their site is exactly the reason I started organizing the data and sharing. My intent is not to say that every facility has to utilize solid tine aeration and abandon core aeration, but to give confidence that alternative methods can be successful. Five years later superintendents across the country continue to share their experiences with me about how they have improved their operation by implementing different cultural practices. The following article is an attempt to share updated information regarding these **cool season** turf management strategies.

The goal of any subsurface cultural program is to maintain or reduce soil organic matter (OM), silt/clay content and compaction to improve turf health and playability. There are many tools that help to accomplish this, but it is up to the turf manager to determine what practices are best suited for their site based on many factors (budget, labor, existing physical conditions, weather, turf varieties, demands on playability, etc.). Superintendents should utilize representative samples and data to evaluate current practices and better determine future needs.

First and foremost, solid tine aeration only on putting greens has not worked everywhere to prevent organic matter (OM) accumulation. The main reason for this seems to be limited annual surface area disruption that allows for sand incorporation (<15% per year). Another reason for increased OM levels has been due to higher annual Nitrogen applications (>4 lbs./ 1000 sq.ft.). The final reason for increased OM appears to be due to insufficient sand application prior to solid tine aeration. If there is not enough sand applied prior to punching, then the traffic from additional sand application can result in holes being partially closed before completely filled as pictured on the right.

One of the most interesting things to me is the ingenuity of superintendents to incorporate sand into greens. Applying sand prior to solid tine has proven to be extremely effective, and the next step is to brush or blow the rest of the sand into the holes. Anything that can be done to minimize traffic on open holes is a step in the right direction. The use of brushes or a drag directly behind the aerator is another piece of this puzzle.

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The averages for the upper root-zone in some of the highest maintained greens remain at approximately <1% Clay, 2-3% Silt, and 2.15% OM (360 LOI) utilizing USGA/A2LA accredited testing at Brookside Labs. These are results for samples with the turf removed (top 1/8"), and they are not the same as samples tested that include the turf like the newer 360/440 testing. The 360/440 method is being conducted to help determine what portion of the organic matter is humus.

The data listed for greens 2 and 18 is from the original course I worked with that implemented solid tine aeration only fifteen years ago. Unfortunately, the physical testing was not conducted from year one, but the data from this year continues to rank among the lowest in silt/clay and organic matter content and among the highest in playability. These are sand based greens seeded to L-93, which has shown to be a very aggressive organic matter producer. A combination of conventional and deep-tine solid tine aeration disrupting >20% of the surface annually has worked to achieve these results. Three inches of sand has accumulated in the past 15 years on these green which equates 0.2" per year on average. Thank you to Matt Cielen for allowing me to share his data.

Date	Sample ID	Clay (%)	Silt (%)	Sand (%)	Organic Matter (%)	Fine Gravel - 2 mm (%)	Very Coarse Sand - 1 mm (%)	Coarse Sand - 0.5 mm (%)	Medium Sand - 0.25 mm (%)	Fine Sand - 0.15 mm (%)	Very Fine Sand - 0.106 mm (%)	Very Fine Sand - 0.0
	USGA Guide	*<=3*	*<=5*			*<=3*	*<=10*	*>=60*		*<=20*	*<=5*	
11/5/19	2G (0-2")	0.4	2.1	97	2.2	0.2	7.4	28.9	45.3	12.2	2.7	0.8
11/5/19	18G (0-2")	0.2	2.6	97	1.7	0.3	7.9	31.5	43.2	10.9	2.5	0.9
9/14/16	2-G (0-2")	0.8	2.3	96	2.4	0.7	6.4	30.1	41.5	12.9	3.9	1.4
9/14/16	18-G (0-2")	0.8	2.5	96	2	0.5	5.6	30.9	42.2	13.1	3.2	1.2
5/15/12	2-G (0-2")	0.4	2.8	97	2.5	0.3	4.2	33.1	44.3	11.5	2.4	1
5/15/12	18-G (0-2")	0.2	3.2	97	2.1	0.1	3.7	35.5	43.8	10.6	2.1	0.8

The cultural practices that seem to be most successful are those that disrupt 15-25% of the surface area each year that allow for sand incorporation. This can be a combination of solid tine, coring tines, vertical tillage (Graden, Sisis, VC-40, etc.), Dry-Ject to name a few. The availability of dry sand allows the vertical tillage to be effective as well as smaller coring or slid tines (0.3"). The smallest holes I have seen filled with wet sand were .375", but the ability to fill even smaller holes may allow for monthly aeration that has minimal effect on playability. If using 0.3" tines on 1.5" x 1.5" spacings, that would disrupt 3% of the surface area. Most that have been utilizing solid tines are using .625-.75" tines on 2" x 1.5-2" spacings to disrupt 7.6-11% of the surface each time.

Desired depth to aerate needs to be determined based on existing conditions (layers, compactions, etc.). Some situations need sand incorporated as deep as possible while others may only need sand concentrated in the upper inch. There appears to be two new options for incorporating wet sand into the root-zone as well with a modification to Dry-Ject and now S-Tec Top Changer. The amount of surface area disrupted seems to be 5% or less for each machine which suggests a need for additional aeration unless using these machines 3-5 times per year.

Whatever practices you are utilizing, I recommend monitoring the physical conditions with representative samples. Do not be the blind man heading towards the edge of the "Cliff". Utilize the data to get out of your comfort zone and evaluate new practices for your site. Maybe you will stumble on the next practice or combination that helps improve turf management for everyone.

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