Is He Really Going to Talk About Organic Matter…..Again?

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Heads up!

- Abbreviated format modification:
  - Supplemental reading
  - Access by QR code
  - Use your phone to access and download or save the image.

https://turf.unl.edu/

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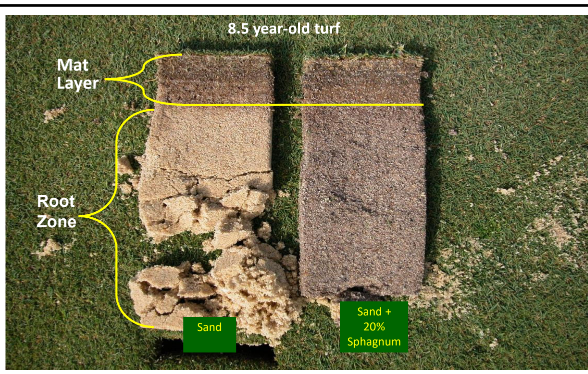

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Practices to change thatch into mat include topdressing and …

4

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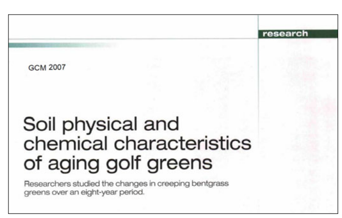
Where it all started

- Gaussoin, R., R. Shearman, L. Wit, T. McClellan, and J. Lewis. 2007. Soil physical and chemical characteristics of aging golf greens. *GCM* 75(1):p. 161-165.


research

GCM 2007

Soil physical and chemical characteristics of aging golf greens

Researchers studied the changes in creeping bentgrass greens over an eight-year period.

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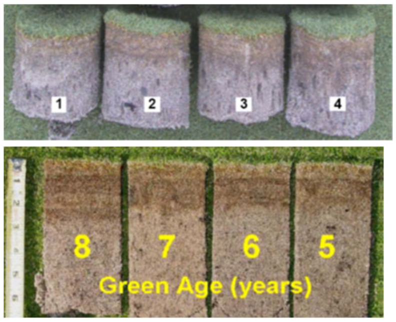
OM accumulates as sand greens age



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➢National Survey

➢Determine cause and effect relationship among management practices and their interactions relative to surface OM accumulation

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117 courses,
> 1600 samples

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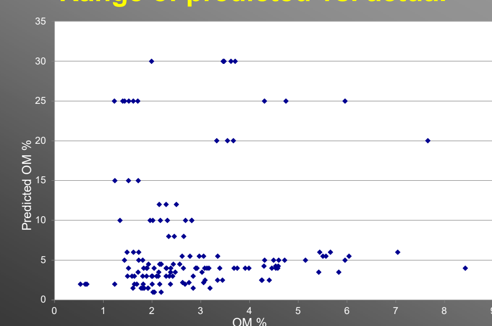
Range of predicted vs. actual



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Why the disconnect?

- Construction values are based on volume ratios
  - *80/20 = 8 buckets of sand: 2 buckets of organic material*
- Organic Matter is reported as a % from a lab analysis measured by weight
  - *3.5% OM X 10 = 35 grams OM/kg soil*

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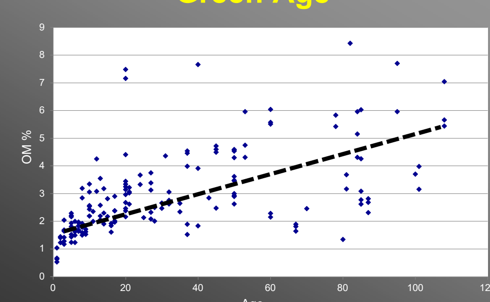
Green Age



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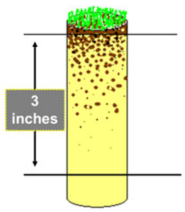
Is the age effect misleading?

- Sampling issue:
  - Mat depth increases as green ages resulting in more OM in the same volume soil.



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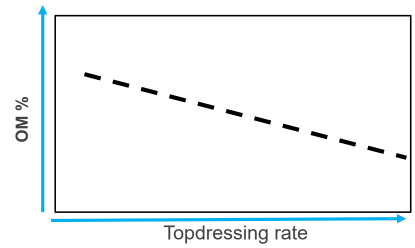
Topdressing



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Survey Summary

- None of the variables collected, by themselves, or in combination with others, *predicted* OM
- Courses using >18 cubic ft*/M of topdressing with or without "venting" had lower OM
- Of the *known* cultivars, no differences in OM were evident

**1 ft³ = 100 lbs of dry sand; yd³ = 2700 lbs*

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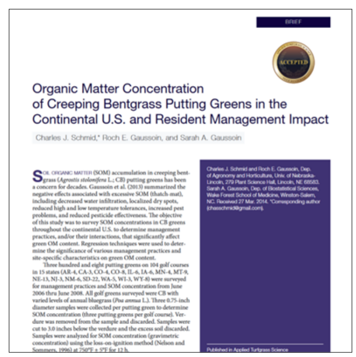
Organic Matter Concentration of Creeping Bentgrass Putting Greens in the Continental U.S. and Resident Management Impact

Charles J. Schmid,* Roch E. Gaussoin, and Sarah A. Gaussoin

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Organic Matter Management Study

Objectives

1. Determine if conventional hollow tine is more effective than solid tine aerification at managing organic matter accumulation
2. Determine if venting methods are effective at managing OM accumulation

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Treatments

Tine Treatment
None
2X Hollow tine
2x Solid tine

Venting Treatment
None
PlanetAir
Hydroject
Bayonet tine
Needle tine

All possible combinations = 180 treatments, applied for 2 consecutive years

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All treatments received the same topdressing quantity (22 ft^3/M*) but different frequency

Equilibrated to identify differences of the practices in question

***1 ft^3 = 100 lbs of dry sand; yd^3 = 2700 lbs**

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OM Data Analysis Year 2

- **No differences between green age except for higher % in older green**
- **No differences among venting methods**
- **No differences among solid/hollow/none**

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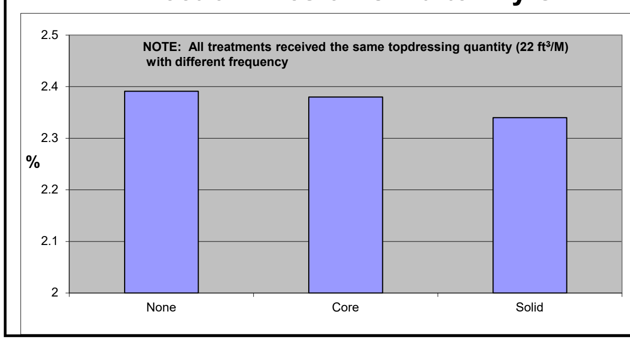
Effect of Tines on OM after 2 yrs



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Let's take a quick look at that…

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What these data do/don't suggest

- Cultivation, when topdressing quantity was equal, was insignificant in affecting OM
- Superintendents, however, must use whatever tools they have at their disposal to ensure sand is making it into the profile and not the mower buckets

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*Topdressing interval relative to Tine/Venting combinations (22 cu ft/M)**

- **NONE/NONE**
  - **5-10 days**
- **Solid & Hollow/NONE**
  - **7-14 days**
- **Solid & Hollow/Venting**
  - **14-18 days**

Observed and calculated based on displacement and surface area opened

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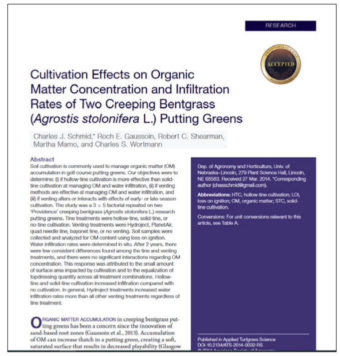

RESEARCH

Cultivation Effects on Organic Matter Concentration and Infiltration Rates of Two Creeping Bentgrass (*Agrostis stolonifera* L.) Putting Greens

Charles J. Schmid,* Roch E. Gaussoin, Robert C. Shearman, Martha Mamo, and Charles S. Wortmann

https://turf.unl.edu/

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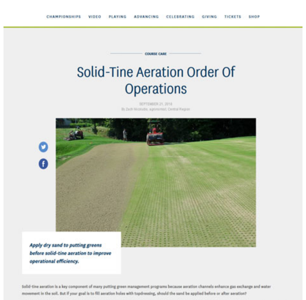
https://www.usga.org/content/usga/home-page/course-care/regional-updates/central-region/2018/solid-tine-aeration-order-of-operations.html



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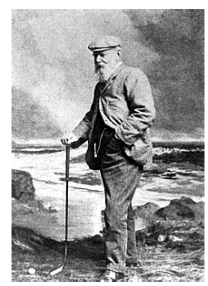
Topdressing

Old Tom Morris (1821–1908) is thought to have discovered the benefits of topdressing accidentally when he spilled a wheelbarrow of sand on a putting green and noted how the turf thrived shortly afterward (Hurdzan, 2004).



J.B. Beard is his classic textbook "Turfgrass Science & Culture, 1973 writes:
"The most important management practice for OM management is topdressing"

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How do you get rid of OM?

- Decomposition (microbial)
  - Increase surface area and aeration
  - Inoculation (inconsistent, not reliable)
  - Removal
  - Power raking, dethatching, core aerification
- Dilution
  - Topdressing

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"the solution to pollution is dilution"

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https://www.usga.org/content/usga/home-page/course-care/green-section-record/57/9/light-and-frequent-topdressing-programs.html

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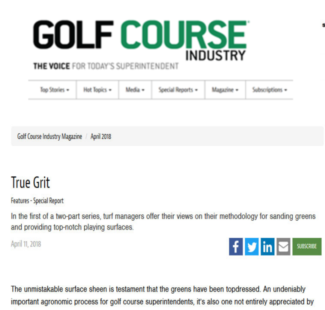

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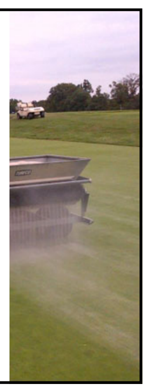
"the solution to pollution is dilution"



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What these data do/don't suggest

- Cultivation, when topdressing quantity was equal, was insignificant in affecting OM
- Superintendents, however, must use ***whatever tools*** they have at their disposal to ensure sand is making it into the profile and not the mower buckets

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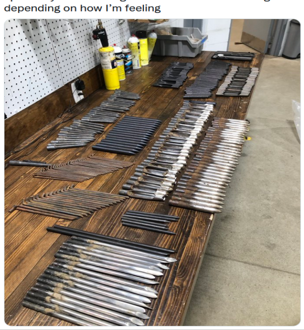

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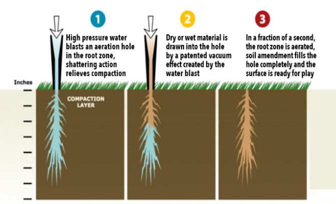
DryJect



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Dryject Trial Fall 2021

- Check
- Hollow ½" ID
- Solid ½"OD
- DryJect 1 (3x3)
- Needle
- DryJect 2 (3x2)
- Needle + Solid
- Needle + Hollow

Procore - 3" target depth on all tines except Dryject = 5"

Sampled day after treatment in 1' depth increments to 4 "

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Treatment	% OM	
Check	4.5	a
Hollow	3.7	b
Needle	3.1	c
DryJect (3x3)	2.7	d
Needle + Hollow	2.3	d
DryJect (3x2)	2.3	d
Needle + Solid	2.3	d
Solid	2.2	d

- No differences among depths
- Dilution only
- Dryject and needle tine were least surface disruptive
- Hollow tine response was unexpected
- ***<u>Data is preliminary</u>***

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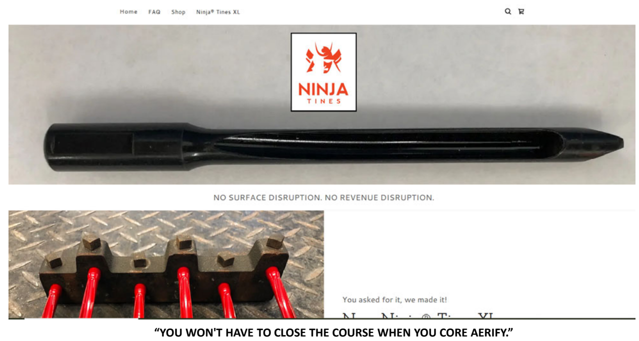

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Spring 2023 Tine Trial

- 9 tine types
- 2 devices (ProCore and DryJect)
- Multiple dual treatments

Equipment and Tine Support Provided by TORO DryJect WET

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Dilution vs decomposition

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Organic constituent composition changes with decomposition "OM quality"

lignin content ↑ with depth
(Couillard and Turgeon, 1997)

…also likely to be finer particulates, less soluble, semi-stable, and others that affect quality

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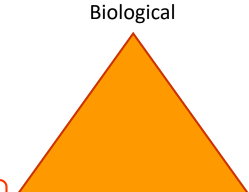
What makes up quality?



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Water Retention vs. Drainage

Photos: USGA Green Section

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RUTGERS
New Jersey Agricultural Experiment Station

J.A. Murphy
Research Objectives:

1. Effects of topdressing with sand lacking coarse particles
2. Does core cultivation and backfilling holes with medium-coarse sand offset any negative effects of topdressing with sands lacking coarse particles?

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Acknowledgements

USGA Davis

Golf Course Superintendents Association New Jersey 1926

New Jersey Turfgrass Association

RUTGERS
New Jersey Agricultural Experiment Station
Center for Turfgrass Science

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Sieve	No. 10	No. 18	No. 35	No. 60	No. 100	No. 270
	2-1 mm	1-0.5 mm	0.5-0.25 mm	0.25-0.15 mm	0.15-0.05 mm	
Sand Size	V. Coarse	Coarse	Medium	Fine	V. Fine	
	% (by weight) retained					
Medium-coarse**	0	30	60	10	< 1	
Medium-fine	0	0	74	24	2	
Fine-medium	0	4	27	48	21	
USGA (construction)	≤ 10	≥60		≤ 20	≤ 5	

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Treatment No.	Sand Size	Topdressing Rate during Growing Season	Cultivation (twice/year; May & Oct): Hollow Tine	Cultivation (twice/year; May & Oct): Backfill / Topdress	Annual Quantity of Sand Applied
		lbs. / 1,000-sq.-ft.		lbs. / 1,000-sq.-ft.	lbs. / 1,000-sq.-ft.
1	Medium-coarse	50	None	400	1,300
2	Medium-coarse	50	Core + Backfill	600	1,700
3	Medium-coarse	100	None	400	1,800
4	Medium-coarse	100	Core + Backfill	600	2,200
5	Medium-fine	50	None	400	1,300
6	Medium-fine	50	Core + Backfill	600	1,700
7	Medium-fine	100	None	400	1,800
8	Medium-fine	100	Core + Backfill	600	2,200
9	Fine-medium	50	None	400	1,300
10	Fine-medium	50	Core + Backfill	600	1,700
11	Fine-medium	100	None	400	1,800
12	Fine-medium	100	Core + Backfill	600	2,200
13	None	0	None	0	0
14	None	0	Core + Backfill	600	1,200

Factors in the Experiment

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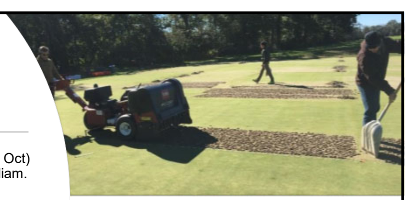
Cultivation Factor

- Plots cored twice per year (May and Oct) 10% of surface disturbed (0.5-inch diam. tines)
- Holes back-filled at 600 lb/1,000 sq ft with medium-coarse sand
- Non-cored plots topdressed with respective sand size at 400 lb/1,000 sq ft when (May and Oct) cored plots treated



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Findings

- Topdressing reduced surface water retention compared to the controls
- Topdressing with finer sand increased surface water retention
- Plots topdressed with finer sized sand often had better quality than plots topdressed with medium-coarse sand

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Findings

- Differences in surface water retention across the three sands were often negated on plots that were core cultivated

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Mat Layer

- Air-filled & capillary porosity

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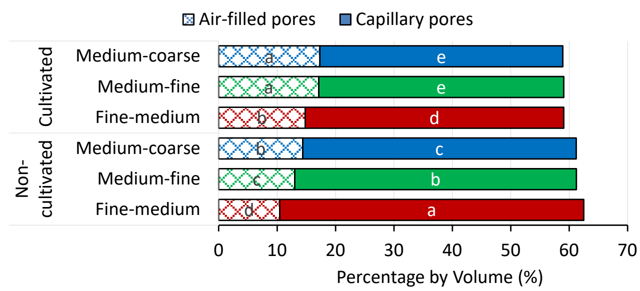
Pore Size Distribution
Sand Size × Core Cultivation Interaction



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Managing for Drier Mat

- Topdress as much and as often as feasible
- Especially important if cultivation is minimal
- Select as coarse a sand as feasible
  - 1.0-mm (coarse) difficult to incorporate
  - 0.5-mm sand okay if dominated by medium, not fine and very fine
- Cost and interference are limiting factors

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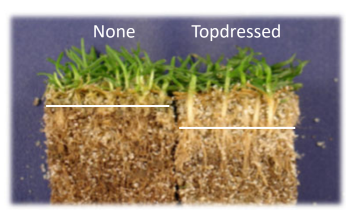
Topdressing – Major Benefits

Modify/change thatch into mat
- Retain less water
- Firm surface
- Less mower scalp
- Protect crown

Smooth the surface

Winter protection



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Topdressing Drawbacks

Disruptions due to poor incorporation
- Play
- Reel & bedknife damage

How can you offset?
- Dry sand
- Lower rates – "dusting"
- Finer sand

Photo: USGA Green Section

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Sand Particle Size (1- and 0.5-mm sands)

Particle Name	Diameter (mm)
Fine Gravel	2 – 3.4
Very Coarse Sand	1 – 2
Coarse Sand	0.5 – 1
Medium Sand	0.25 – 0.5
Fine Sand	0.15 – 0.25
Very Fine Sand	0.05 – 0.15
Silt	0.002 – 0.05
Clay	< 0.002

Photo: TJ Lawson

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<u>Chapter 12</u> ASA Monograph (3RD Edition)

Characterization, Development, and Management of Organic Matter in Turfgrass Systems

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Acknowledgements

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- Environmental Institute for Golf
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