Golf Greens: Core Vs. No Core

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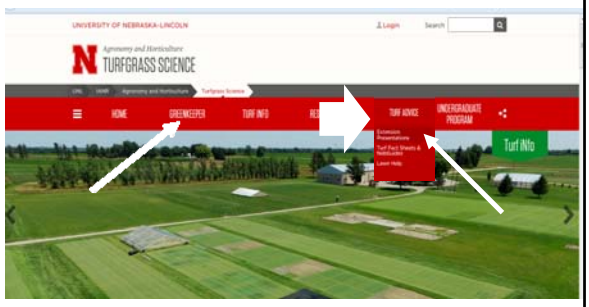
Alberta Golf Course Superintendents Association
2016 Property Manager's Conference
Canmore, Alberta



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ASA Monograph (3RD Edition)

Chapter 12
Characterization, Development, and Management of Organic Matter in Turfgrass Systems

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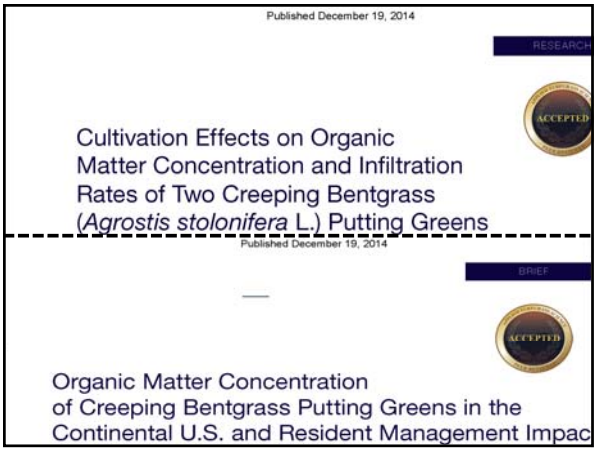


Physical And Chemical Characteristics Of Aging Golf Greens

Roch Gaussoin, PhD
Jason Lewis
Ty McClellan
Chas Schmid
Bob Shearman, PhD

Treatments

- rootzone Mix
  - 80:20 (sand/peat)
  - 80:15:5 (sand/peat/soil)
- Grow-In Procedure
  - Accelerated
  - Controlled

Project Schedule (Phase I)

1996 | 1997 | 1998 | 1999 | 2000

Greens construction (one set per year)

Seeding

Data collection on soil physical, chemical, and microbial characteristics influenced by rootzone materials and grow-in procedures.

Project Schedule (Phase II)

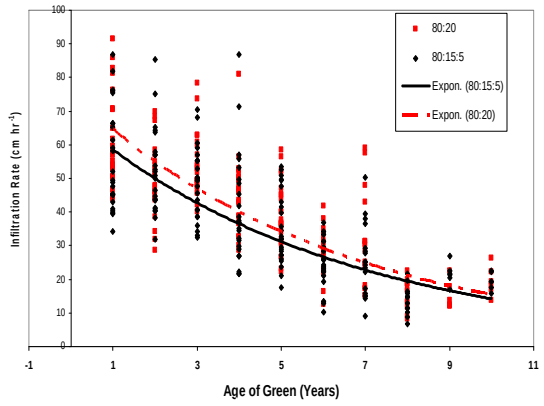
2002 | 2003 | 2004 | 2005

Data collection on soil physical and chemical characteristics as influenced by age, rootzone materials and grow-in procedures.

Materials and Methods

9 yr old green	10 yr old green	12 yr old green	13 yr old green

As of 2009



OM accumulates as sand greens age

Source: Gaussoin and Shearman, 2003; Gaussoin et al., 2006

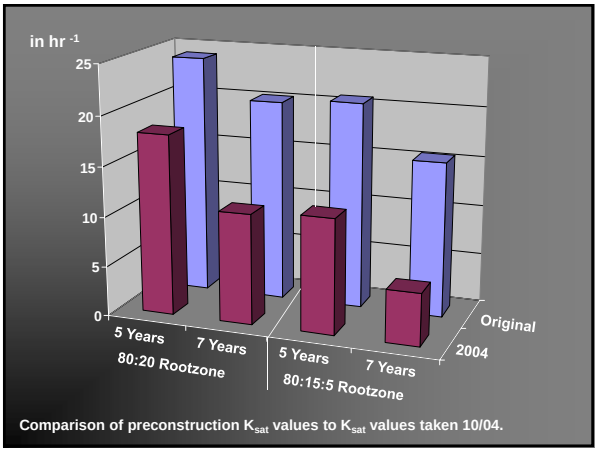
Formation of Mat

- Formation of mat layer currently increasing approximately 0.65 cm annually (following establishment year).
- No visible layering, only a transition is evident between mat and original rootzone.
- Topdressing program
  - Light, Frequent
    - every 10-14 days (depending on growth) and combined with verticutting
  - Heavy, Infrequent
    - 2x annually (spring/fall) and combined with aerification

- 2004 USGA research committee site visit
- original rootzone
- mat development

Materials and Methods

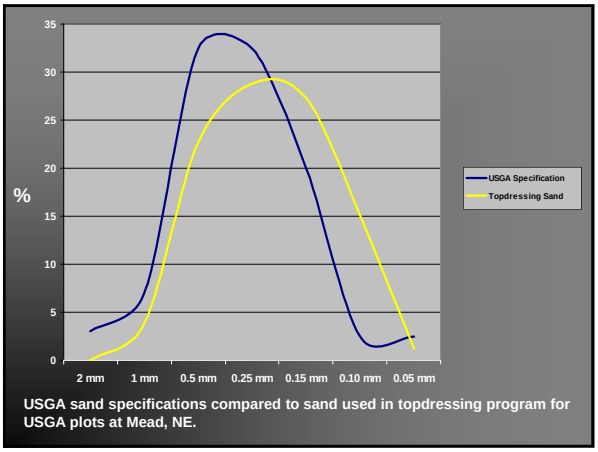
- 2004 rootzone samples taken below mat layer from each soil treatment and sent to Hummel labs for Quality Control Test (24 total samples) & tested against original quality control test (z-score).
- Other analysis also completed



Comparison of preconstruction K_{sat} values to K_{sat} values taken 10/04.

Change in Rootzone Particle Size Distribution

- All rootzones tested in 2004 showed increased proportion of fine sand (0.15 – 0.25 mm) with decreased proportion of gravel (> 2.0 mm) and very coarse sand (2.0 – 1.0 mm).
- 5 of 8 rootzones were significant (z-score) for increased fine sand content.



USGA sand specifications compared to sand used in topdressing program for USGA plots at Mead, NE.

Conclusions

- The K_{SAT} decrease over time ***may*** be due to organic matter accumulation above and in the original rootzone and/or the increased fine sand content originating from topdressing sand

Organic Matter Management Study

Objectives

1. Determine if conventional hollow tine is more effective than solid tine aerification at managing organic matter accumulation

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2. Determine if venting methods are effective at managing OM accumulation

Treatments

Tine Treatment	Venting Treatment
None	None
2X Hollow tine	PlanetAir
2x Solid tine	Hydroject
	Bayonet tine
	Needle tine

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None	None
2X Hollow tine	PlanetAir
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	Bayonet tine
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15 Trts per Rep

6 Reps per year

2 different years

= A whole lot of fun for one graduate student or 180 trts

Materials and Methods

- Green Age:
  - 12 years
  - 9 years
- Data collected:
  - OM% (pre-cultivation/monthly)
  - Single wall infiltration (monthly)

OM Data Analysis Year 1

- No differences between green age except for higher % in older green

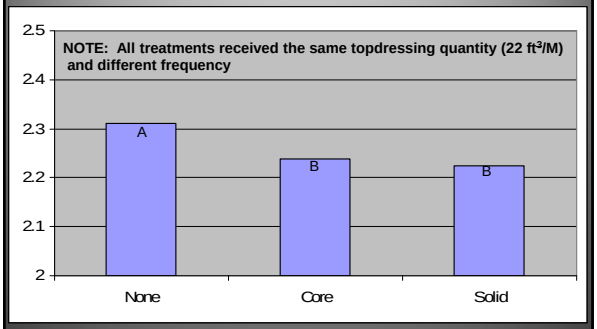
OM Data Analysis Year 1

- No differences between green age except for higher % in older green
- No differences among venting methods

OM Data Analysis Year 1

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

Effect of Tines on OM after 1 yr



OM Data Analysis Year 2

- No differences between green age except for higher % in older green

OM Data Analysis Year 2

- No differences between green age except for higher % in older green
- No differences among venting methods

OM Data Analysis Year 2

- No differences between green age except for higher % in older green
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OM Data Analysis Year 2

- No differences between green age except for higher % in older green
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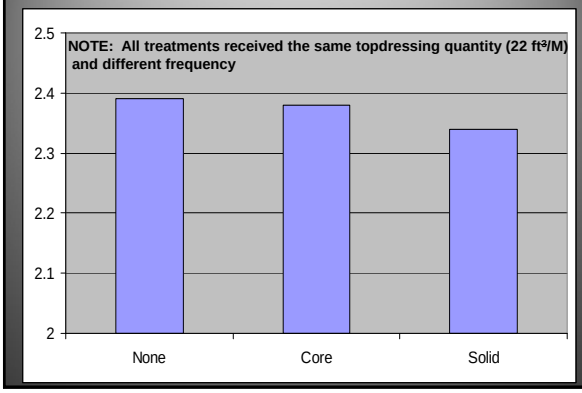
Effect of Tines on OM after 2 yrs



What these data do/don't suggest

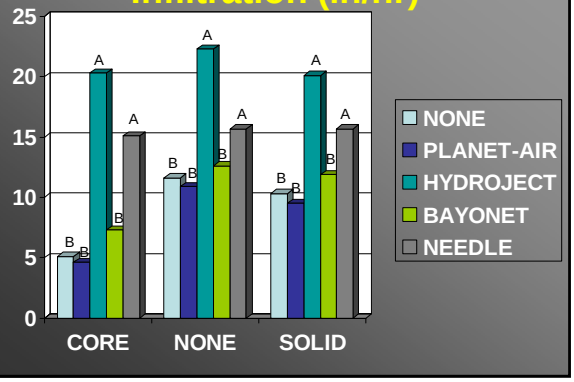
- Topdressing is the most consistent and repeatable factor in OM management
- Cultivation, when topdressing quantity was equal, was insignificant as a means to control OM
- However, a superintendent must use whatever tools they have at their disposal to insure sand is making it into the profile and not the mower buckets

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

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

*Observed and calculated based on displacement and surface area opened

Infiltration (in/hr)



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RESEARCH

ACCEPTED

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

Abstract

"the solution to pollution is dilution"

Topdressing

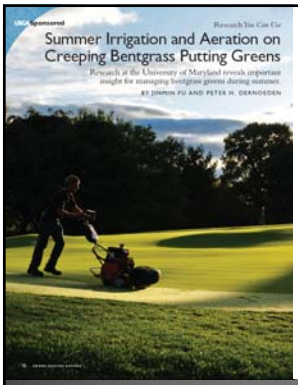
Old Tom Morris (1821–1908) is thought to have discovered the benefits of topdressing accidentally when he spilled a wheelbarrow of sand on a putting green and noted how the turf thrived shortly afterward (Hurdzan, 2004).

J.B. Beard is his classic textbook "Turfgrass Science & Culture, 1973 writes:

"The most important management practice for OM management is topdressing"

Best Management Practices for the Control of Anthracnose on Annual Bluegrass Putting Greens – Rutgers University

but later reduces disease severity. Light, frequent applications (topdressing every seven or 14 days at 1 or 2 cubic feet/1,000 square feet [304.8 or 609.6 cubic centimeters/square meter]) provided the most rapid and substantial reduction of anthracnose. Sand topdressing every 21 or 42 days at a higher rate (4 cubic feet/1,000 square feet [1,219.2 cubic centimeters/square meter]) also reduced disease by August in 2006 and 2007.



Summer Irrigation and Aeration on Creeping Bentgrass Putting Greens

Research at the University of Maryland reveals important insight for managing bentgrass greens during summer.

BY JINMIN FU AND PETER H. DERNOEDEN

OBJECTIVES

- Evaluate physiological processes and rooting of putting-green-height creeping bentgrass in response to two irrigation management and three core aeration regimes.
- Determine the effects of core aeration and irrigation frequency on creeping bentgrass summer performance and root longevity during periods of high temperature stress.
- Provide information on the effects of soil temperature and soil water content on carbohydrate metabolism and its relationship to summer bentgrass decline.

Green Section Record: July-August 2009

An interview with Dr. Pete Dernoeden *regarding research on the effects of irrigation and coring strategies for maintaining creeping bentgrass putting greens.*

Q: *Do your results suggest that superintendents who use a light, frequent irrigation strategy produce greater organic matter in their greens (i.e., thicker thatch layer)?*

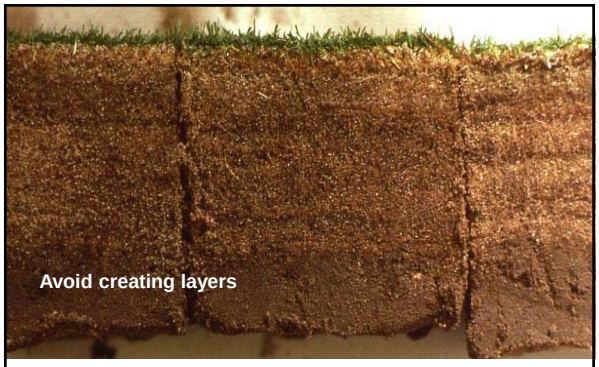
A: The study clearly showed that light, frequent irrigation enhanced organic matter production in the thatch-mat layer. This was attributed to the ability of plants to produce more tissue in the presence of plentiful soil moisture versus less growth that occurred in drier soils of deeply/infrequently irrigated plots in summer.

Q: *Your studies indicate that spring and spring plus summer cored plots develop a thicker thatch layer than non-cored plots. Isn't this contrary to popular belief that coring speeds up thatch breakdown?*

A: Coring is performed for several reasons, including improving air and water infiltration, promoting rooting and root longevity, and presumably to reduce thatch. In fact, most studies show that coring alone has little or no impact on reducing thatch. The current study evaluated spring and summer coring without routine topdressing (although spring cored holes were filled and sand was reincorporated following summer coring). Data clearly showed that coring alone had no impact on organic matter formation. These findings were similar to coring studies conducted by Dr. Murphy and Dr. McCarty and co-workers in Michigan and South Carolina, respectively. Research conducted by Dr. McCarty and co-workers also demonstrated that an aggressive program of coring combined with verticutting and frequent topdressing is required to stay ahead of thatch production.

How much sand to use for topdressing?

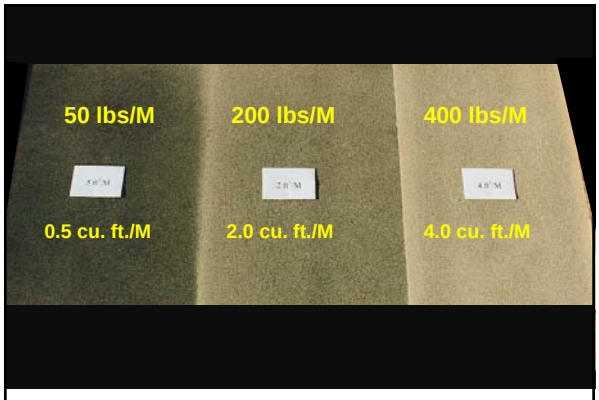
- Generic recommendation is 20-40 ft^3 per 1000 sq. feet/yr (about 0.5 inch/M/yr)
  - ***UNL worked showed 20-24 ft^3 for OM management***
- Varies by amount of:
  - Traffic
  - Grass species or cultivar
  - Nitrogen Applied
  - Water Applied
  - Microclimate/Location



Light, Frequent Topdressing

Rate of sand application on greens

- **use 0.5-4.0 cu.ft./1000 sq.ft. during normal growth periods. Every 2-3 weeks. Note: 100 lbs sand = 1.0 cu.ft. sand; 1 cu. Yd. = 2700 lbs.**
- **use 0.5-2.0 cu.ft./1000 sq.ft. during slow growth periods. Every 2-3 weeks.**
- **Hollow tine core aerations operations usually allow 8-12 cu. ft. sand per 1000 sq. ft. per application.**



Topdressing volumes can be tricky to visualize

Rate of Topdressing[a]

Quantity (ft^3 per 1000 ft^2)		Depth of Application: inches	mm
0.50	Light, frequent topdressing rates	.006 (1/168)	.15
0.75		.009 (1/111)	.23
1.0		.012 (1/84)	.31
2.0		.024 (1/42)	.61
4.0		.048 (1/21)	1.22
8.0		.100 (1/10)	2.55
12.0		.144 (1/7)	3.67
16.0		.200 (1/5)	5.10
20.0		.240 (¼)	6.12

[a] 1 yd^3 = 27 ft^3; 1 inch = 25.4 mm; 1 m^2 = 10.76 ft^2; 1 ft^3 = 0.0283 m^3; 1 m^3 = 35.3 ft^3

- Depth of application cannot be readily measured.
- Calibrate spreader over known area where sand can be picked up and weighed.
- Dry sand flows better than wet sand.

Topdressing and the new bents

Easy or hard???

It has been said that mowing heights <0.09" are not receptive to topdressing sand

0.09" X 25 mm/" = 2.25 mm

Sands range from 0.02-2 mm Topdressing sand specifications indicate that >60 of the sand should be between 0.25 - 1 mm so it is conceivable that a portion of the sand is "thicker" than the bench set mowing height…….but is it a realistic assumption??

How do you get rid of OM?

- Decomposition (microbial)
  - Increase surface area and aeration
  - Inoculation (???)
- Removal
  - Power raking, dethatching, core aerification
- Dilution
  - Topdressing

Clarification/over-simplification *regarding OM Management* on sand based rootzones

- One size does not fit all
- The optimal %OM has not been scientifically/universally determined and may be mythical
- Cultivation is critical to increase efficiency in sand incorporation
- Solid are not different than coring tines
- The benefits of topdressing continue to be identified.

Soldat's Hierarchy of Golf Course Soil Problems

- Compaction
- Excessive organic matter and thatch accumulation
- Layering

Layering

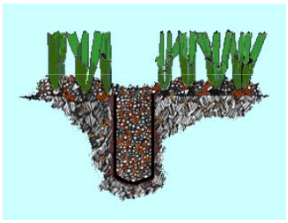
- Water retention is non-uniform
- Thatch/mat layers can store twice as much water than the root zone

NOT a function of drainage

Rather it is the difference in pore size distribution among layers

Layering

- Aeration alone not that effective
- Must topdress to dilute OM (change its pore size distribution) and use deficit irrigation



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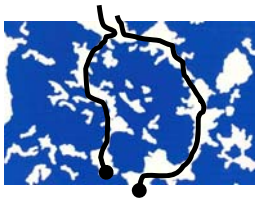
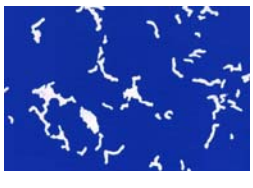
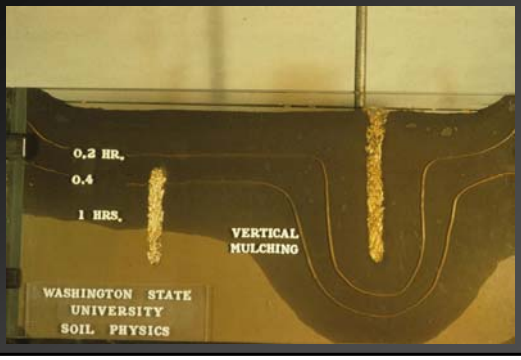




Pores must be continuous (connected)!

Continuity of Soil Pores



Acknowledgements

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- Jacobsen, Toro, JRM & PlanetAir
- Nebraska Turfgrass Association