Organic Matter Management for Cool Season Golf Greens and Sports Turf

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Heads up!

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

https://turf.unl.edu/

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Outline

- Where does OM come from?
- Random Data
- Boon or Bane?
- When should it be "managed"?
- Where is it most problematic?

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How does organic matter accumulate?

- Organic matter; defined
  - dead or near dead plant residue which accumulates in the grass ecosystem

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How does organic matter accumulate?

- As grasses mature there is a continual senescence of non or limited function parts (roots, shoots and leaves)
- Senescence also happens when damage or injury occurs

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How much OM is produced annually?

1 inch HOC bluegrass/ryegrass approx. estimate of annual production

- Roots = 3500 lbs/acre
- Leaves = 2000 lbs/acre
- Other = 2500 lbs/acre

- TOTAL = ***8000 lbs/acre****

**Potato tuber yield is approx. 22,000 lbs and corn grain yield is approx. 11,000 lbs*

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Where does organic matter accumulate?

- Above ground
  - Thatch/Mat
  - clipping residue
    - relatively short term
    - "pseudo" thatch
- Below ground
  - rootzone
  - rhizosphere

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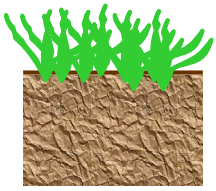
Importance of (P)OM in the rhizosphere

- deposition of particulate OM
- microbial niches
- nutrient uptake
- pathogen competition



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Rootzone accumulation yearly in sand green

Year 1	2	3
0.65%	6.0%	3.0%

USGA spec. green constructed with 20% (by volume) organic matter

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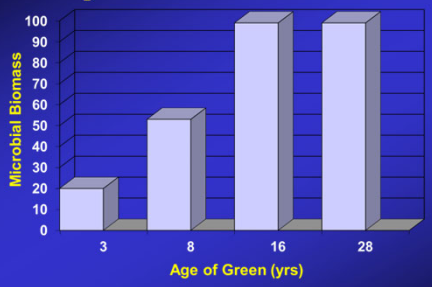
Green Age Effects on Microbial Biomass



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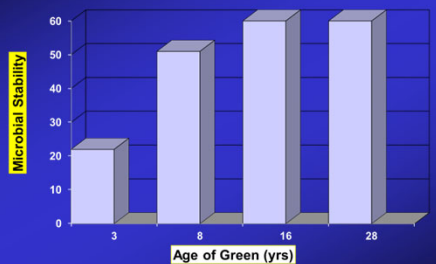
Green Age Effects on Microbial Stability



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Thatch

A loose, intermingled, organic, layer of dead and living shoots, stems, and roots that develops between the zone of green vegetation and the soil

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Mat

Thatch that has been intermixed with mineral (soil) matter

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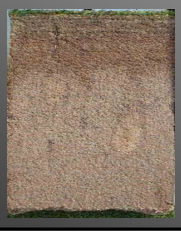
Because of inherent ambiguity in terminology and sampling techniques, the term "thatch-mat" has appeared frequently since the late 2000's (McCarty et al., 2007; Barton et al., 2009; Fu et al., 2009).



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Benefits of "Moderate" Thatch/Mat

- Improved resilience and cushion
- Improved Wear Tolerance
- Insulate Soil/Crown to Temperature Extremes

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Problems With "Excessive" Thatch/Mat

- Reduced Firmness
- Impaired Water Movement
- Increased Surface Moisture
- Reduced Stress Tolerance
- Reduced Product Efficacy
- Footprinting
- Scalping
- LDS
- …….

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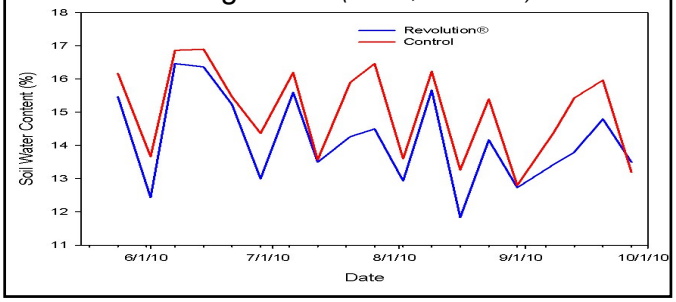
2010 – Wet Year – Low Organic Matter Putting Green *(Soldat; Wisconsin)*



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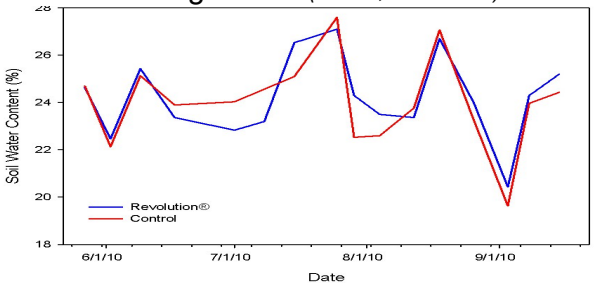
2010 – Wet Year – High Organic Matter Putting Green *(Soldat; Wisconsin)*



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and yet one more definition……..

SOM- Soil Organic Matter

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Soil Cultivation

- Program based on objectives
  - manage compaction
  - manage organic matter
    - remove and/or modify
  - Soil replacement
  - Manage compaction and organic matter

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Compaction:

- ✓ Decreased root production and shoot growth
- ✓ Poor water infiltration and percolation; inefficient water use
- ✓ Inefficient fertilizer use
- ✓ Reduced aeration
- ✓ Organic matter decomposition slowed
- ✓ Microbe populations disrupted and shifted; disease occurrence favored
- ✓ Increased potential for player injury
- ✓ Decreased traffic tolerance

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Types of aerators

- Spoon
- Slicer
- Tine
  - hollow
  - solid
- Deep-tine
  - hollow
  - solid
- Drill & Fill
- Others

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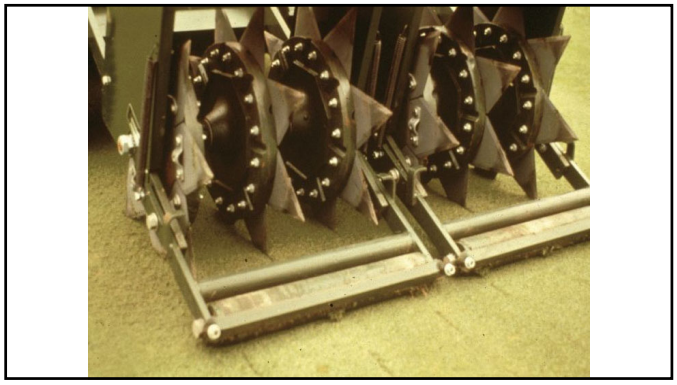

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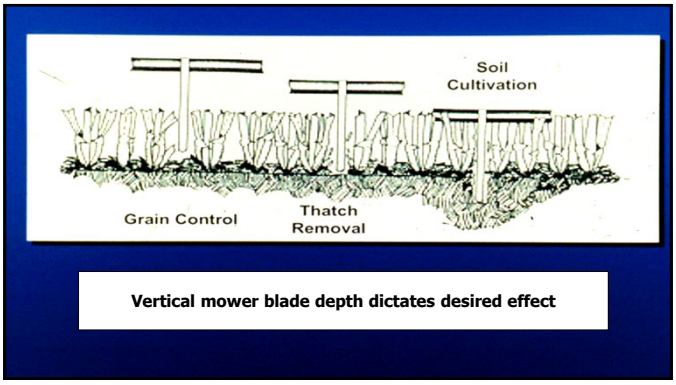

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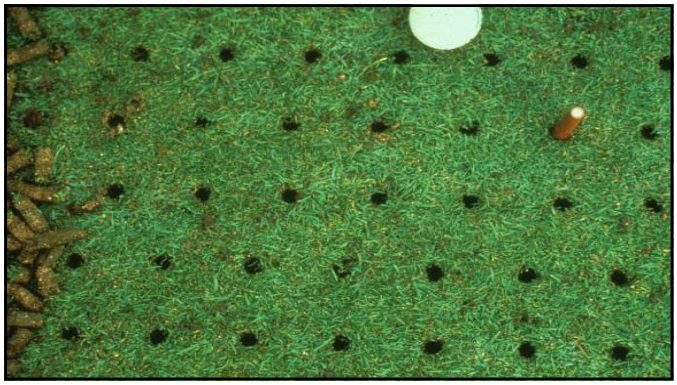

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Tine Size and Surface Area Chart

Tine Size (in.)	Spacing (in.)	Holes/ft²	Surface Area of One Tine	Percent Surface Area Affected
1/4	1.25²	100	0.049	3.4%
1/4	2.5²	25	0.049	0.9%
1/2	1.25²	100	0.196	13.6%
1/2	2.5²	25	0.196	3.4%
5/8	2.5²	25	3.07	5.3%

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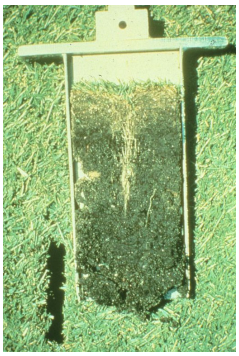

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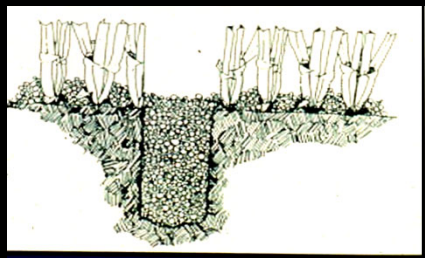
Topdressing with cultivation



Top-dressing material can be sand , compost or other amendments

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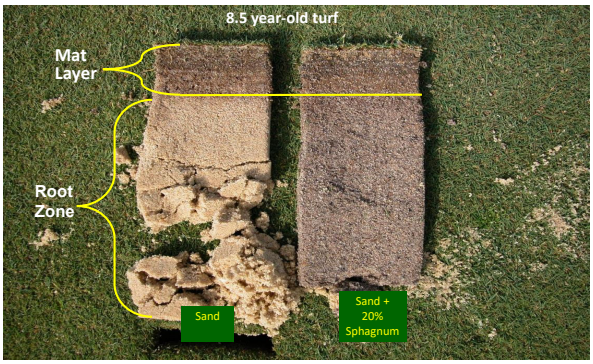

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Where is OM most problematic?

- Sandbased Rootzones
  - Reduced Firmness
  - Impaired Water Movement
  - Increased Surface Moisture

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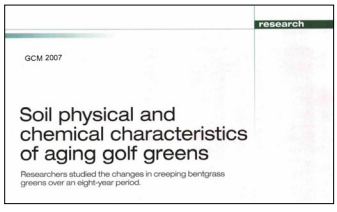
Where it all started

- **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.**



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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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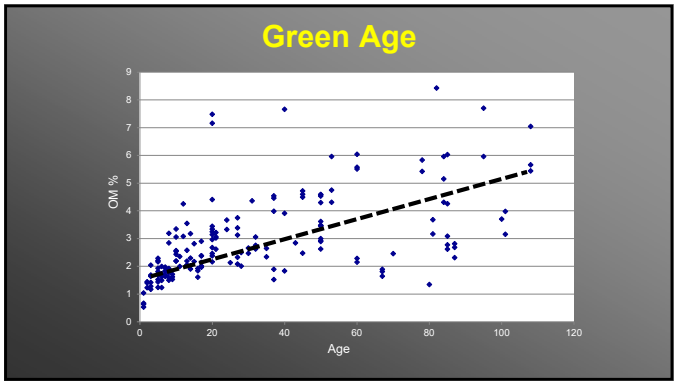

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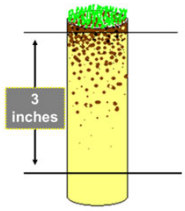
Is the age effect misleading?

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



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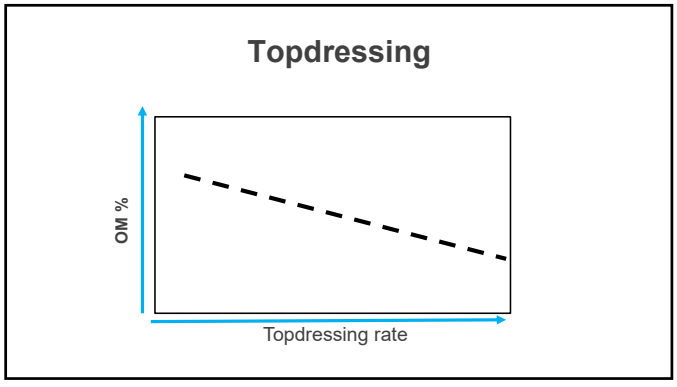

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Survey Summary

- 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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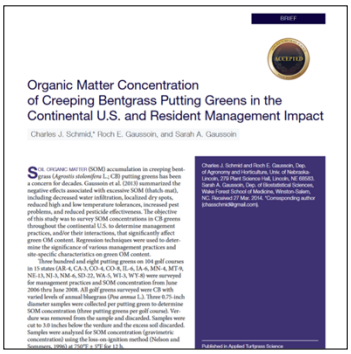
BRIEF

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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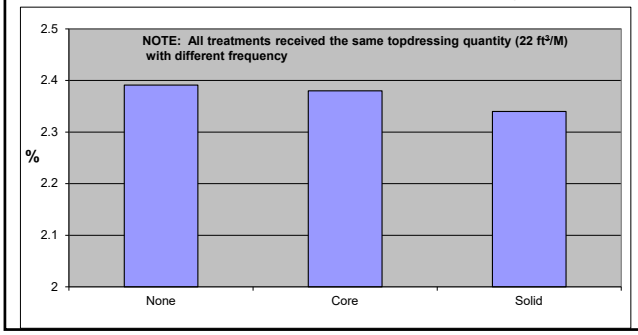
Effect of Tines on OM after 2 yrs



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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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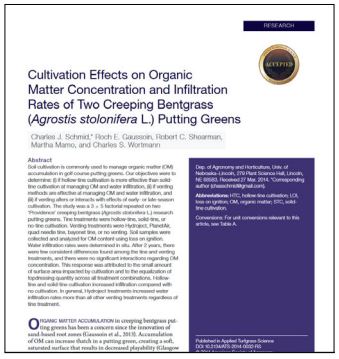
RESEARCH

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

Abstract

https://turf.unl.edu/

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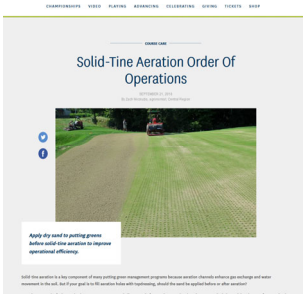
https://www.usga.org/content/usga/home-page/course-care/regional-updates/central-region/2018/solid-tine-aeration-order-of-operations.html



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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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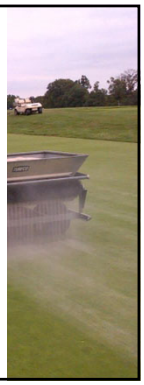
"the solution to pollution is dilution"



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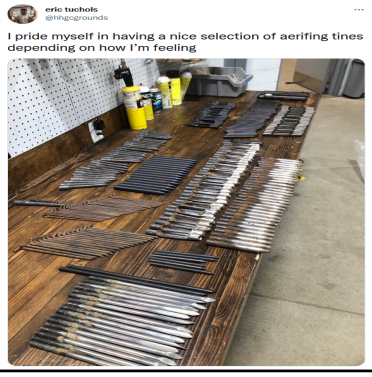

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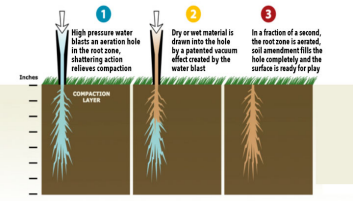
DryJect



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Tine 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
- ***Data is preliminary***

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Spring 2023 Tine Trial

- 9 tine types
- 2 devices (ProCore and DryJect)
- Multiple dual treatments
- Total of 18 treatments

Equipment and Tine Support Provided by TORO DryJect WET

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Chapter 12 ASA Monograph (3RD Edition)

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

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C.A. Dockrell, Teagasc College of Amenity Horticulture Dublin, Ireland
R.A. Drijber, Dep. of Agronomy and Horticulture, Univ. of Nebraska

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Acknowledgements

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- Nebraska Turfgrass Association

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