If Organic is So Good, Then Why am I Tearing up my Greens to Get Rid of it?

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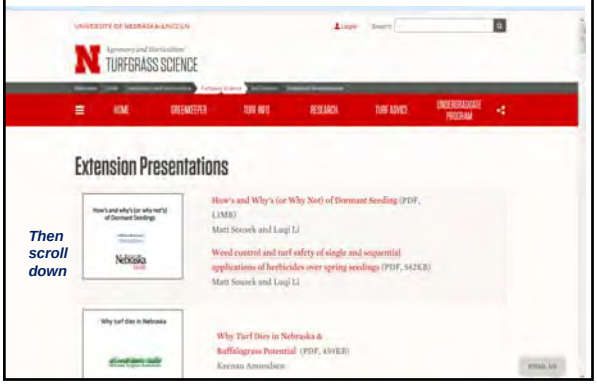

ASA Monograph (3RD Edition)

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

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The organic matter journey……

- USGA/EIFG Greens Study (9 years).
- People a lot brighter than me
  - "Talking Turf" GCSAA conversation.
  - Paul Rieke, USGA visit
  - Conversation with Paul Vermeulen. Director, Competitions Agronomy at PGA TOUR, former USGA Agronomist.
- Great funding support from USGA (initially), NE-GCSA, GCSA of SD, Peaks and Prairies GCSA, industry and a slew of GC supers (3 years).
- Road Show.

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)

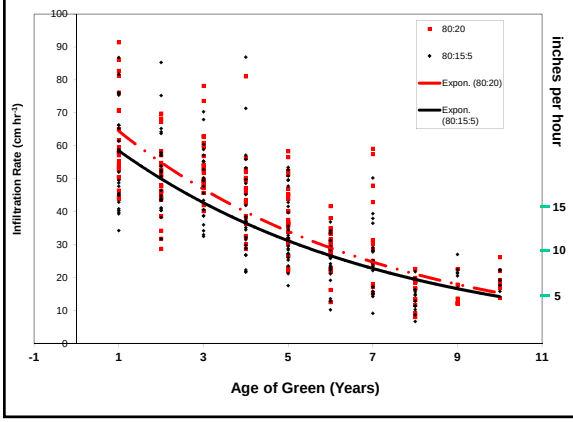
2002 | 2003 | 2004 | 2005

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

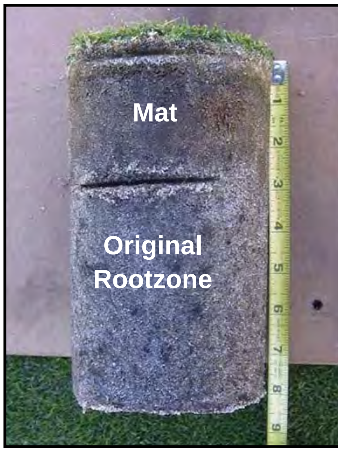
As of 2009



OM accumulates as sand greens age

Formation of Mat

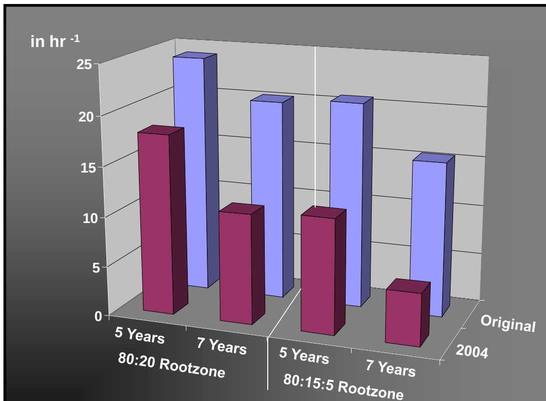
- Formation of mat layer currently increasing approximately 0.65 cm annually (following establishment year).
- No visible layering, only a transition is evident between mat and original rootzone.
- Topdressing program
  - Light, Frequent
    - every 10-14 days (depending on growth) and combined with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



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

Materials and Methods

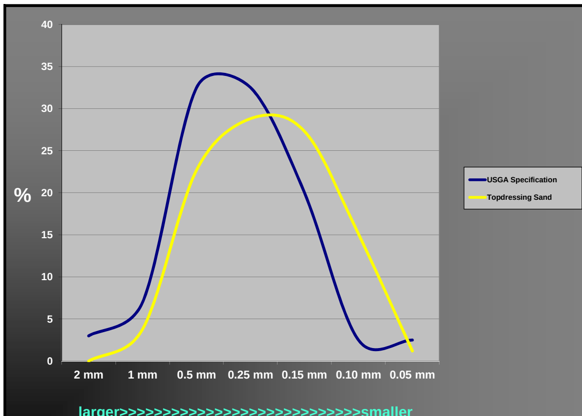
- **2004 rootzone samples taken below mat layer from each soil treatment and sent to Hummel labs for Quality Control Test (24 total samples) & tested against original quality control test (z-score).**
- **Other analysis also completed**



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.**



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

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

Treatments

Tine Treatment
None
2X Hollow tine
2x Solid tine

Venting Treatment
None
PlanetAir
Hydroject
Bayonet tine
Needle tine

2 different years

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

NOTE: All treatments received the same topdressing quantity (22 ft³/M/yr)

Materials and Methods

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

NOTE: All treatments received the same topdressing quantity (22 ft³/M) and different frequency

OM Data Analysis Year 1

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

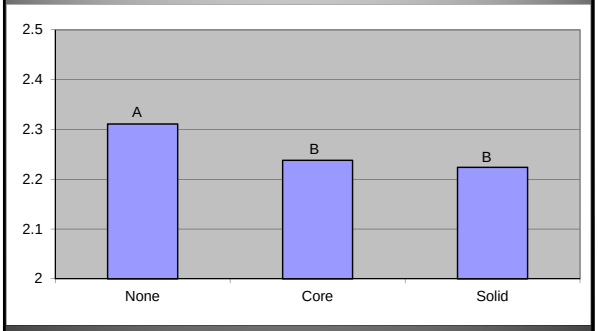
OM Data Analysis Year 1

- 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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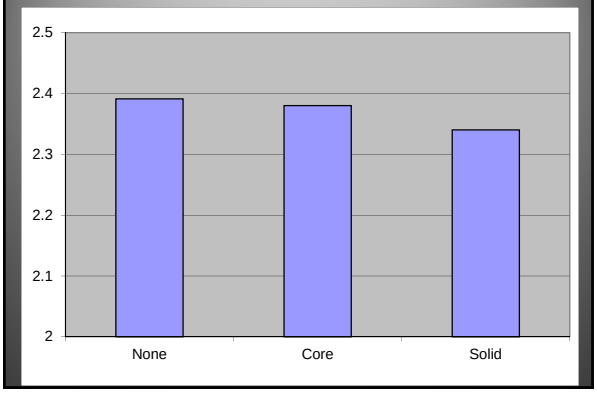
- No interactions with solid/hollow/none

OM Data Analysis Year 2

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

Effect of Tines on OM after 2 yrs



What these data do/don't suggest

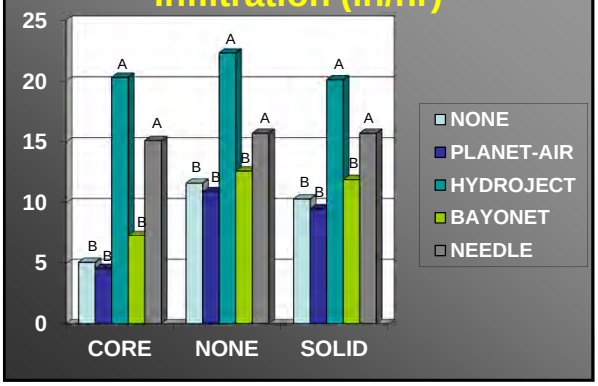
- Topdressing is the most consistent and repeatable factor in OM management
- Cultivation, when topdressing quantity was equal, was insignificant as a means to control OM
- However, a superintendent must use whatever tools they have at their disposal to insure sand is making it into the profile and not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

Available on UNL Turf website

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

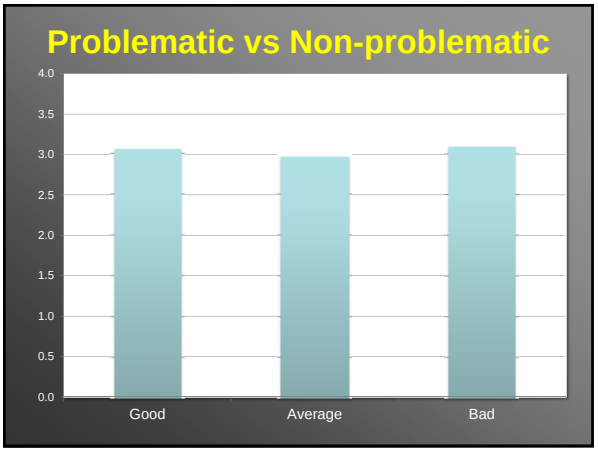
Abstract

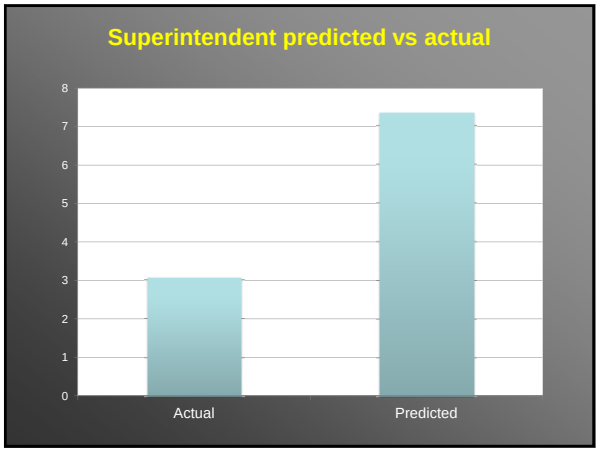
Project Objective

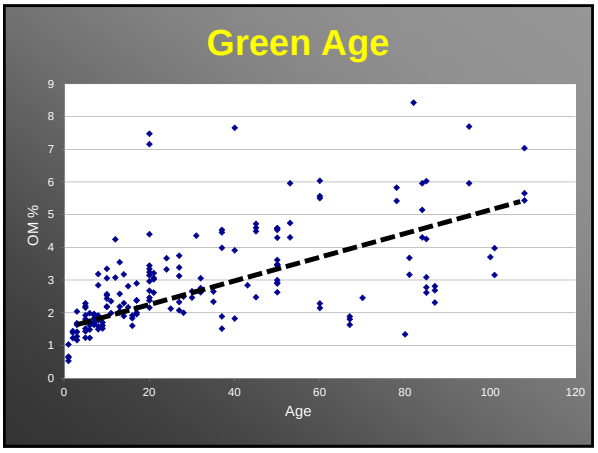
- National Survey
  - Determine cause and effect relationship among maintenance practices and their interactions relative to surface OM accumulation

2006/07/08 Samples

- Sixteen states
  - Nebraska, South Dakota, Iowa, Wyoming, Colorado, Washington, Wisconsin, Illinois, New Jersey, Minnesota, New Mexico, Montana, Hawaii, California, Connecticut, Arkansas.
- 117 golf courses sampled
  - More than 1600 samples



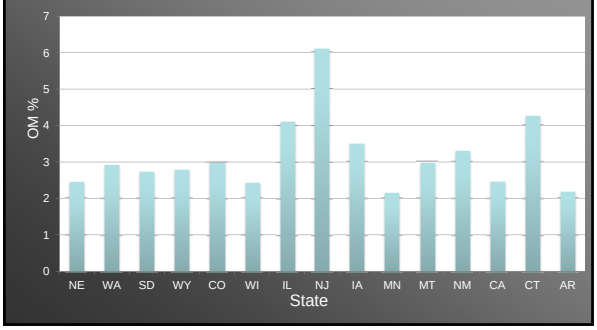




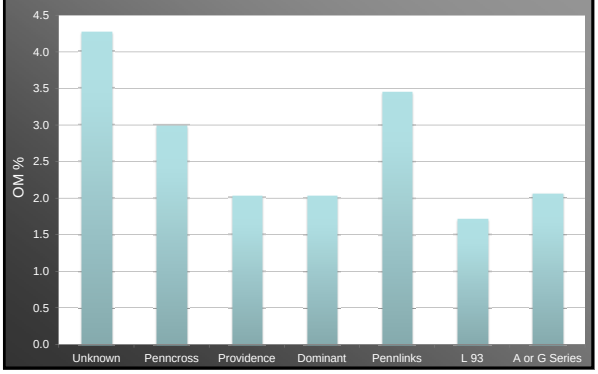
Is the age effect misleading?

- **Sampling issues:**
  - **Mat depth increases as green ages resulting in more OM in the same volume soil.**
  - **Because deposition is relatively uniform, % per unit depth within the true mat layer is relatively uniform**

State Differences (highly correlated with age)



Cultivar



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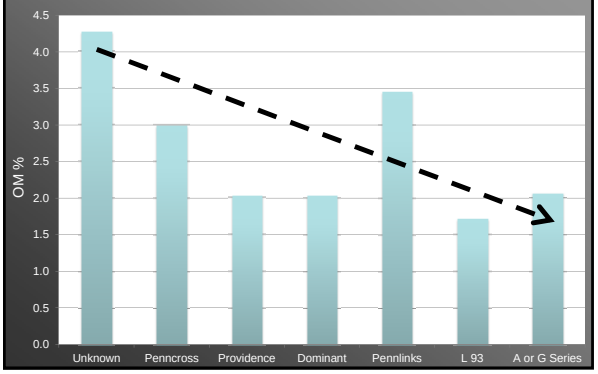
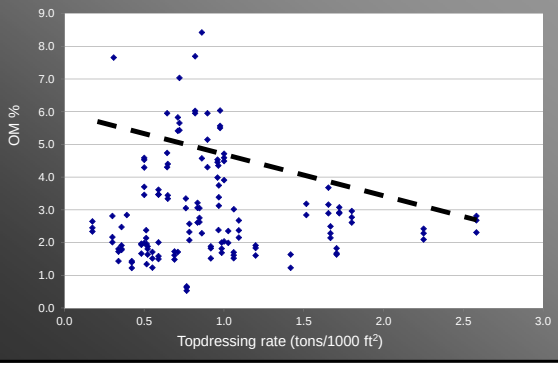


Topdressing



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" *consistently* 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 Impac

"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"

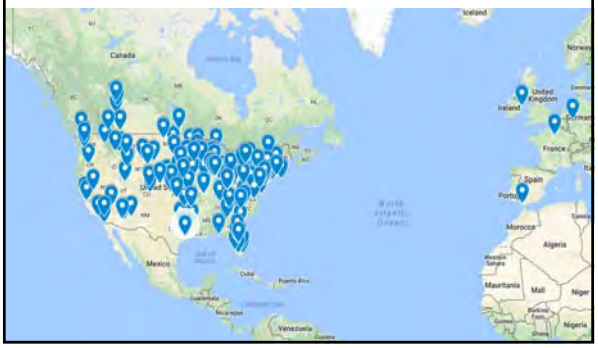
GreenKeeper Survey

cool season only, mark all that apply

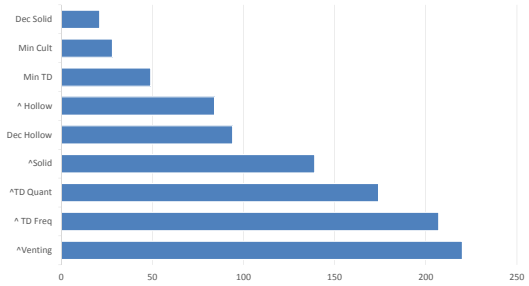
In the last 5-10 years, on our greens, our facility has:

- ❑ Increased topdressing quantity.
- ❑ Increased topdressing frequency.
- ❑ Increased hollow (equal or greater than 0.5") tine aeration.
- ❑ Increased solid tine (equal or greater than 0.5") aeration.
- ❑ Decreased hollow (equal or greater than 0.5") tine aeration.
- ❑ Decreased solid tine (equal or greater than 0.5") aeration.
- ❑ Made minimal changes in topdressing application quantity/frequency.
- ❑ Made minimal changes in cultivation practices.
- ❑ Increased "venting" practices.

Survey Respondents via Greenkeeper

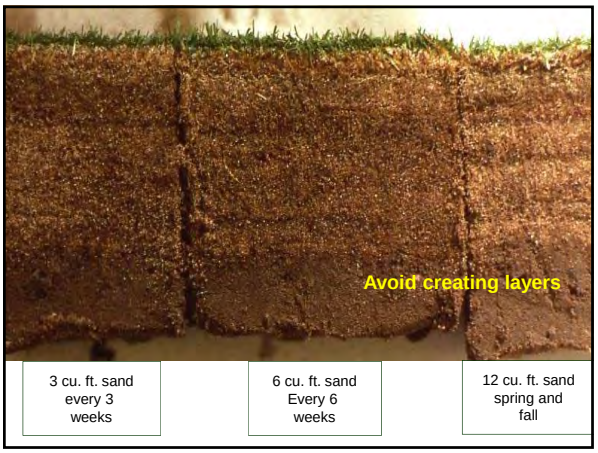


303 Responses



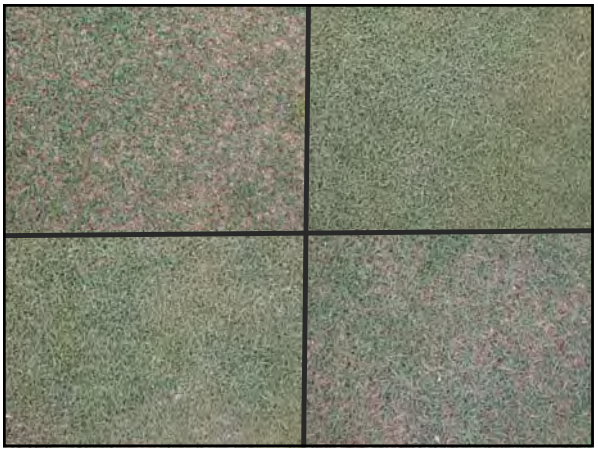
How much sand to use for topdressing?

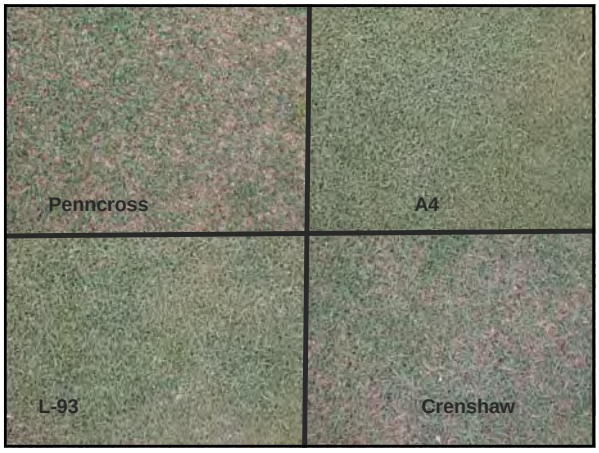
- Generic recommendation is 20-40 ft^3 per 1000 sq. feet/yr (about 0.5 inch/M/yr)
  - ***UNL worked showed 20-24 ft^3 for OM management***
- Varies by amount of:
  - Traffic
  - Grass species or cultivar
  - Nitrogen Applied
  - Water Applied
  - Microclimate/Location



Topdressing and the new bents

Easy or hard???





New bents = denser and more upright

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

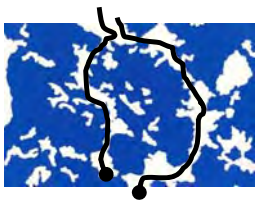
NOT a function of drainage

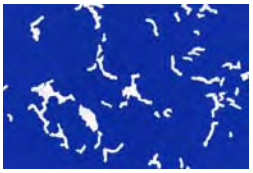
Rather it is the difference in pore size distribution among layers

Layering

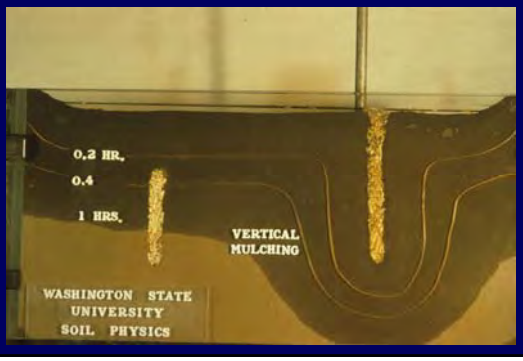
- Aeration alone not that effective
- Must topdress to dilute OM (change its pore size distribution) and use deficit irrigation

Pores must be continuous (connected)!





Continuity of Soil Pores



Acknowledgements

- USGA
- Environmental Institute for Golf
- Nebraska GCSA
- GCSA of South Dakota
- Peaks & Prairies GCSA
- Jacobsen, Toro, JRM & PlanetAir
- Nebraska Turfgrass Association