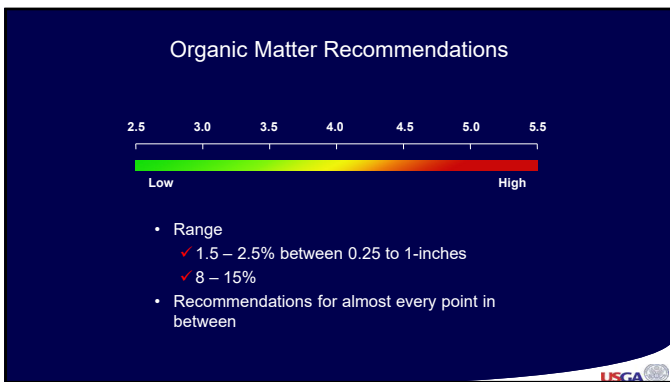




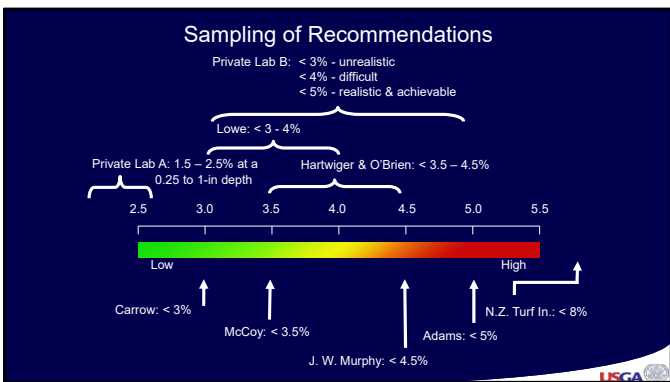
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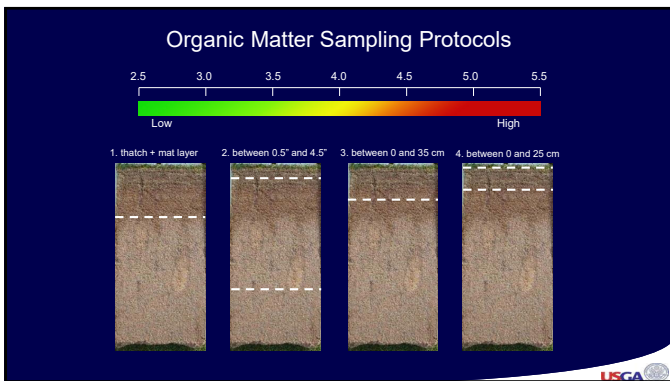
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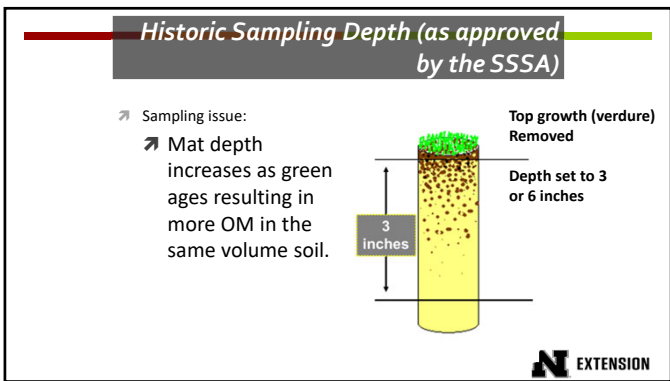
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Accuracy and Precision

Need to have a root zone specific *sampling* and analysis protocol for OM in sand based rootzones

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Developing a Standard for Measuring Organic Matter in Putting Green Soils

▪ Collaborators:

- Roch Gaussoin / Professor / Agronomy & Horticulture/University of Nebraska-Lincoln
- Doug Linde / Professor / Plant Science / Delaware Valley University
- James Murphy / Professor / Plant Biology / Rutgers University
- Doug Soldat / Professor / Soil Science / University of Wisconsin-Madison
- Travis J. Miller / Graduate Student / University of Wisconsin-Madison

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What is the most common analytic test?

Loss on Ignition (LOI)

- 100-1200°C (370-420 °C norm)
- Sample is weighed, placed in oven, then weighed again
- OM% determined % by weight (or mg/g)
- Ovens are \$1200-\$2500

N EXTENSION

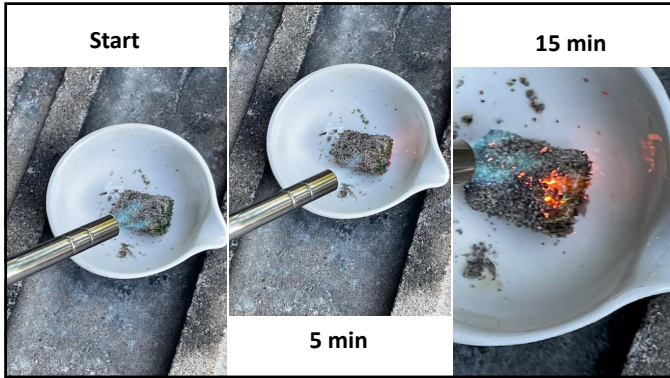
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Can the superintendent do this?

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Developing a simple, practical method for organic matter content determination by superintendents

Leifeld and Kogel-Knabner (2001)

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Don't try this at home.....

- Methods using hydrogen peroxide adapted from Leifeld and Kogel-Knabner (2001) were time-consuming and step intensive for practical use.
- Attempts to find a correction factor were also not discovered.
- Regression models based on data of the best attempt showed a high level of variation measuring OM percentages of pre-determined lab mixed samples.
- A rapid, practical, inexpensive, and reliable method to test OM content on golf using equipment available on a typical golf course is not feasible.
- Like the torch fiasco, you still need an analytic balance and other lab equipment

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Taking a representative sample

- Sample depth(s)
- Number of samples
- Sample location
- Sample size
- Time of year
- Verdure on or off?

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Develop an accurate and efficient method for characterizing OM in sand root zones


Questions that need to be answered:

1. How does sample preparation affect mean SOM?
2. How does core diameter affect mean SOM?
3. How many samples are required to adequately characterize the mean SOM on a single putting green?
4. How far apart should samples be taken?

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How does sample preparation affect mean SOM?

- Some researchers leave verdure on, some remove, how does this impact mean SOM?
- Most labs grind and sieve samples, how does this impact the mean SOM when verdure is left on?
- Does increased core diameter size affect the mean SOM?



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Site Characteristics

Samples were taken at the OJ Noer Turf Research Facility and University Ridge Golf Course in Verona, WI


50 samples were taken from five different root zones on a 10'X10' grid
 3 from research plots
 2 from putting greens

	Mean OM %
Putting Green 1	5.82
Putting Green 2	5.39
Research Green 2	5.23
Research Green 3	5.07
Research Green 1	4.74

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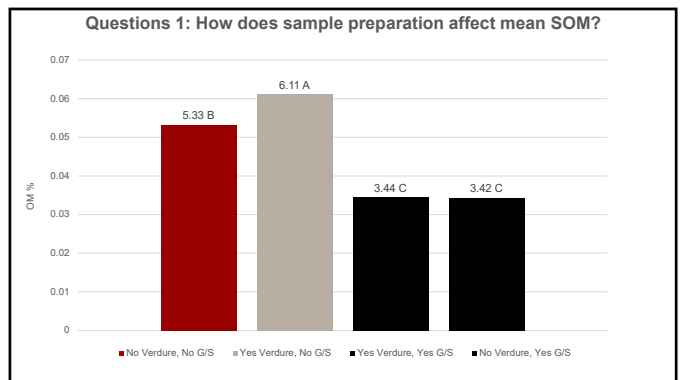
Sample Preparation

- Core diameter evaluation
 - 0.75 inch or 1.5 inch
- Verdure evaluation
 - removed above the thatch layer to remove all green material left on
- Grinding/sieving evaluation
 - analyzed intact
 - ground with mortar and pestle and sieved with no. 10 sieve
- All samples were dried for 24 hr. at 105 C before weighing and burned and 360 C for 2 hours



Diameter (cm)	Verdure	Sieve
3.8	Yes	No
1.9	Yes	No
1.9	Yes	Yes
1.9	No	Yes
1.9	No	No

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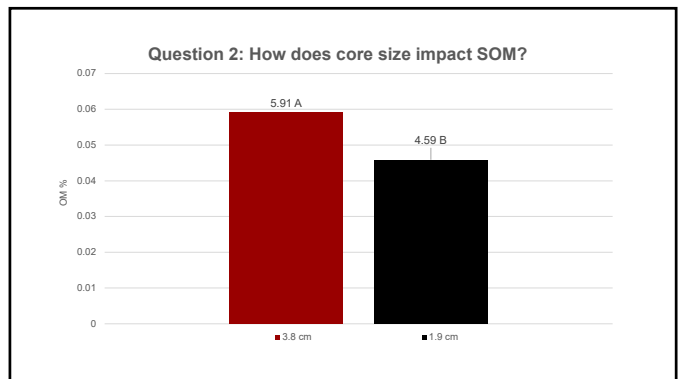


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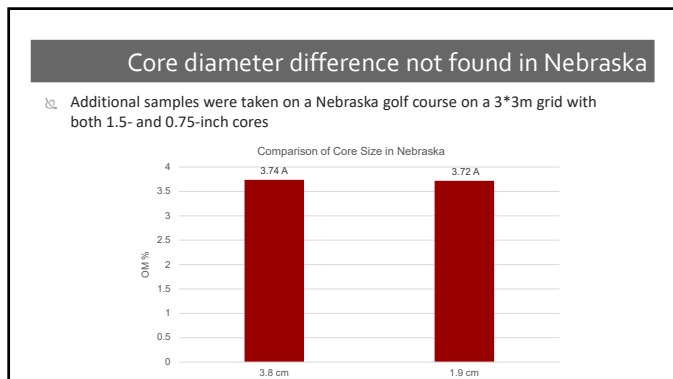
Sample size



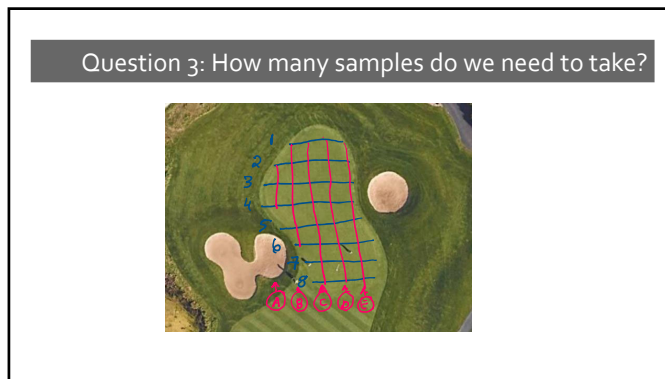
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of samples and location

- 3 golf courses at different geographic locations
- 5 holes at each course
- Samples from N to and E to W on 10 ft centers

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Loc	N	E
1	1	B
2	1	C
3	1	D
4	1	E
5	2	A
6	2	B
7	2	C

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With standard 0.75 inch probes most greens need only 5 samples to characterize the mean OM

Wisconsin			Pennsylvania			Nebraska		
Green	# Samples	Average OM	Green	# Samples	Average OM	Green	# Samples	Average OM
Chip	5	4.59	6	7	17.14	9	5	4.01
12	5	7.21	2	5	10.83	8	5	4.09
8	5	7.23	3	8	15.66	7	5	3.95
4	5	7.06	4	5	11.72	6	5	3.60
1	5	6.69	7	5	13.2	5	5	3.09

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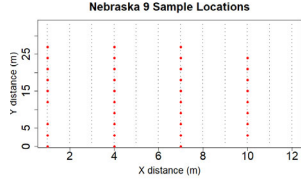
With the 1.5 inch probe need between 4-5 samples to achieve the same precision

Nebraska Standard			Nebraska Large		
Green	# Samples	Average OM	Green	# Samples	Average OM
9	5	4.01	9	4	3.96
8	5	4.09	8	5	4.09
7	5	3.95	7	5	3.90
6	5	3.60	6	4	3.62
5	5	3.09	5	4	3.20

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Question 4: How far apart should samples be taken?


- 🔗 What we did
 - ⌘ Same sampling technique, 3*3m grids, 0.75 inch probe on 5 greens at 3 courses
 - ⌘ Analyzed the data using spatial variograms to determine sampling distance



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Initial findings for how to take samples


- 🔗 Choose 5-10 random locations 25 -30 ft apart
- 🔗 Use 0.75-inch diameter probe to a depth of 1 inch (larger cores acceptable but not necessary)
- 🔗 Leave verdure on without grinding and sieving




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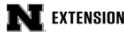
What are you most interested in?



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OM Testing


- Take annual tests to determine long-term trend
 - Same time of year
 - Same location and green
- Correlate your test results with turf quality and performance during stressful environmental conditions to determine need for changes in management program
- Threshold/critical levels likely vary across the globe and from course to course



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Chapter 12 ASA Monograph (3RD Edition)
Characterization, Development, and Management of Organic Matter in Turfgrass Systems

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