Topdressing and Cultivation for Your Athletic Fields Part - 2

NICK CHRISTIANS AND ADAM THOMS
IOWA STATE UNIVERSITY

1

Background

B.S. Iowa State (2006)

Research Leader for Center for Athletic Field Safety

M.S. and Ph.D. from University of Tennessee (2008 and 2015)

Extension Specialist – Assistant Professor – Iowa State (2016)

2

DEEP LAYERS AND COMPACTION

3

4

Aerification Encourages Rooting

5

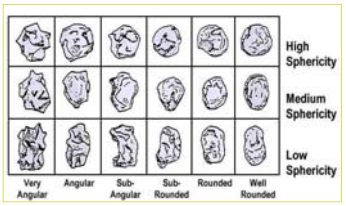
30 Years of Topdressing

6

Sand Topdressing Program
Material Selection

Sand source

- Match rootzone
  - Layering
  - Perched water
- Soil rootzone
  - Well-graded sand
  - Sub-angular sand
  - Calcareous?



7

Sand Topdressing Program
Rate and Frequency

Topdressing rate and frequency

- Codependent
- Light rate, high frequency best for turf
- Depends on rate of thatch accumulation
  - monitor growth rate of turf
  - seasonal, warm-season vs. cool-season
- USGA recommends 40-50 ft^3/M annually to maintain OM < 4%

8

Hollow Tine Cultivation
How many passes?

% turf affected = hole area / spacing
- hole area = πr^2 (π =3.14, r = tine radius)
- hole spacing = tine spacing x machine spacing

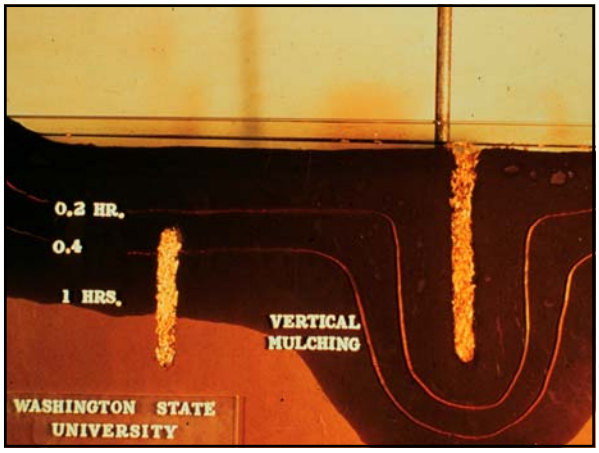
Example: turf cultivated with ½" diameter tine at a 2" by 2" spacing
- hole area = $(3.14)x(0.25)^2 = 0.20$
- hole spacing = 2 x 2 = 4
- % affected = 0.20 / 4 = 0.05 = 5%

9

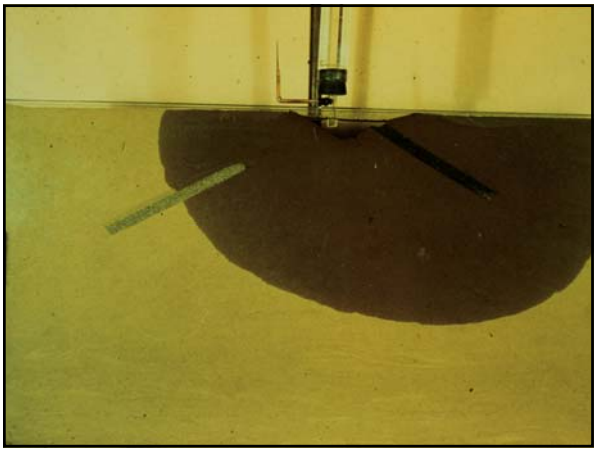
Turf Area (%) Affected By Core Cultivation

Tine Diameter (in)	Tine Spacing (in^2)										
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0
1/4	4.9	3.3	2.5	2.0	1.6	1.4	1.2	1.1	1.0	0.9	0.8
3/8	11.0	7.4	5.5	4.4	3.7	3.2	2.8	2.5	2.2	2.0	1.8
1/2	19.6	13.1	9.8	7.9	6.5	5.6	4.9	4.4	3.9	3.6	3.3
5/8	30.7	20.5	15.3	12.3	10.2	8.8	7.7	6.8	6.1	5.6	5.1
3/4	44.2	29.5	22.1	17.7	14.7	12.6	11.0	9.8	8.8	8.0	7.4
7/8	60.1	40.1	30.1	24.1	20.0	17.2	15.0	13.4	12.0	10.9	10.0
1	78.5	52.4	39.3	31.4	26.2	22.4	19.6	17.5	15.7	14.3	13.1
1 1/8	99.4	66.3	49.7	39.8	33.1	28.4	24.9	22.1	19.9	18.1	16.6
1 1/4	---	81.8	61.4	49.1	40.9	35.1	30.7	27.3	24.5	22.3	20.5
1 3/8	---	99.0	74.2	59.4	49.5	42.4	37.1	33.0	29.7	27.0	24.7
1 1/2	---	---	88.4	70.7	58.9	50.5	44.2	39.3	35.3	32.1	29.5

10



11



12

Current Research

Size of Topdressing Sand (Murphy, 2012)

- Avoiding bridging of sand and plant material
- Use dry sand
- Dry playing surface before topdressing
- Apply topdressing more frequently at lower rates

13

Current Research

Size of Topdressing Sand (Murphy, 2012)

Topdressing at 0, 50 lbs. or 100 lbs. per 1,000 ft^2

- Topdressing improved quality (Greater rate best quality)
- Medium sized sand was better than coarse sand (Less on surface)
- Sand size has yet to consistently change surface firmness and soil water content
- Some disease has been less on bentgrass when topdressed

14

Hollow Tine Recycling Study

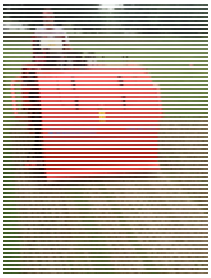
15

Sand is expensive so how can I save?

16

Core Recycling

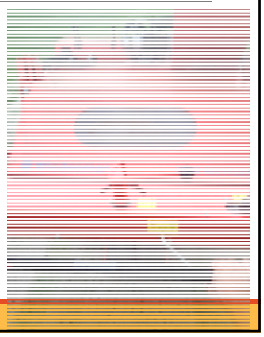
- Hollow Tine Core Recycling
- Can returning cores help?
- Will water infiltration slow?



17

Core Recycling

3.7 MPH max working speed
106 gallon or 400 lbs. payload
Dump bed into utility vehicles
47" working width
1800 lbs. max weight
40% less sand used



18

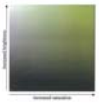
Testing Devices

- Water Infiltration
- Surface firmness
- VWC- water content
- Water Infiltration
- Organic Matter Samples

19

Digital Image Analysis to Determine Percent Green Cover

Light Box & Digital Camera



SimgaScan Pro 5 Software

20

Treatments

Topdressing
- Topdressed 1st then aerified
- Aerified then topdressed

Hollow Tine Cores were pulled
- ½" tines on 2 by 2 inch spacing

Core Treatments
- Recycled
- Cores were removed

21

Aerification & Core Removal

22

Post Treatment Comparison

23

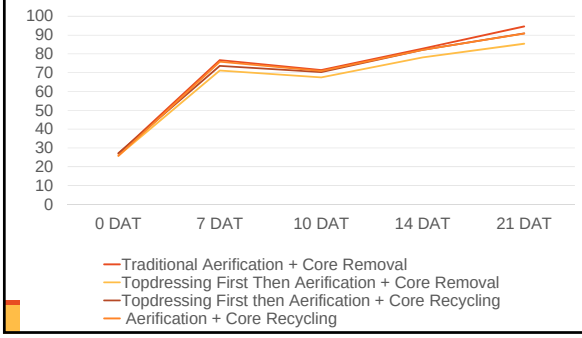
First Year Results

Significant Date-by-Treatment Interactions:

- Organic matter
- Amount of sand in the clippings
- Recovery
  - As expected with time % Cover Increased

24

Percent Green Cover by Date



25

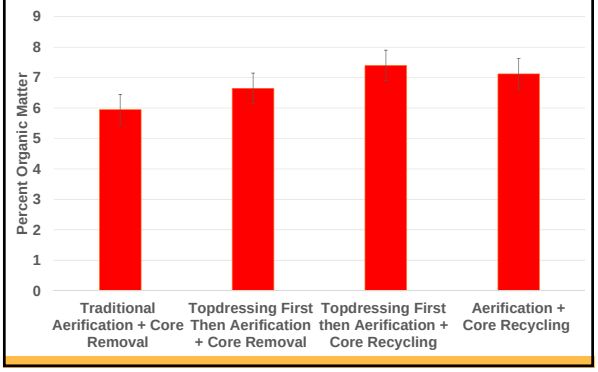
Treatment Comparison for Percent Green Cover

Treatment Comparisons
- Traditional vs. Recycled
- Topdresssed before Aerification vs. Topdressed after Aerification

No differences were determined between treatments for percent green cover on any rating date (0, 7, 14, 21 DAT)

26

Percent Organic Matter (21 DAT)



27

Percent Organic Matter

- Higher amounts of organic matter were present in the soil after the treatments were healed in the Recycled plots vs. Traditional plots (<0.0001)
- No differences in topdressing timing treatments

28

Other Data Results

Volumetric Water Content (%VWC)
- TDR results- 14 DAT Recycled plots had higher %VWC than Traditional Core removal plots (26.5% vs. 24%)
- No differences at 21 DAT

Water infiltration
- No differences between treatments (6 in./hr.)

Surface hardness remained similar

29

Keys to Success

- Lower soil moisture will work best
- Lower core removal success on higher cut turf
- Separation of organic matter did occur on native soil
- Brush height should be just off surface

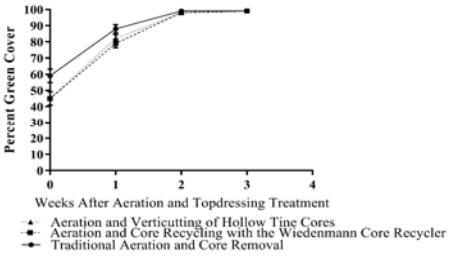
30

Conclusions

- No negative results in year one
- Core recycler does remove organic matter and return sand
- Topdressing prior to aerification resulted in more sand on the surface
- Sand savings around 60%

31

Turfgrass Recovery



32

Recycling Study

- All plots experienced a reduction of soil organic matter from the aeration regardless of core or topdressing treatment
- No differences were present between treatments for soil organic matter
- Few differences were found between treatments for the variables measured
- This indicates that in year one the Wiedenmann Core Recycler or verticutting hollow tine cores can provide a way to return sand into the rootzone without negative effects of recycling on the rootzone characteristics and performance

33

Future work

- Repeated recycling & water infiltration?
- What happens with if pigments build up in profile and recycling?
- Does weed pressure build by recycling?
- How much sand was saved?

34

Paint and Rootzone

35

Topdressing & Athletic Field Paint

- What is the problem?
- What is it doing to the plant?
- **What is happening to the rootzone?**
- How do we limit negative effects?

36

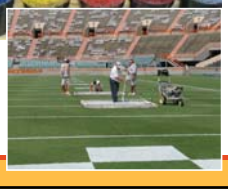
What's in Athletic Paint?

Paint
- Pigment
  - Titanium dioxide
  - Clay
  - Calcium carbonate
- Glue (latex)
- Water
- Additives

37

Previous work

- Athletic field paint color impacts on transpiration and canopy temperature in bermudagrass
- Athletic field paint impacts light spectral quality and turfgrass photosynthesis
- More focus on paint color to above ground tissue



38

Previous work

- Extending the life of a painted line
  - Additions of plant growth regulators
  - Ratios of paint to water
- Improving the removability of synthetic turf paint
- Removable natural turf paints (Chalks)

39

Rootzone Research

- Greenhouse flats – trying to mimic USGA sand-based athletic field rootzones
- Perennial ryegrass and Kentucky bluegrass turfgrass at 100% cover to start
- 3 pant rates (1x, 2x, and O times per week)
- 6 months

40

Project Details

Data Collections:
- Digital Image Analysis (Percent Paint Coverage and Percent Green Cover)- weekly
- Soil physical analysis- Macro- and micro-porosity, water infiltration, soil organic matter changes- after 6 months
- Changes in Sand, Silt, and Clay- after 6 months

41

Paint and Rootzone

42

Compost Topdressing on Athletic Fields?

43

OUR RECOMMENDATION

- IF EXISTING PROGRAM WORKS, DON'T CHANGE
- IF YOU NEED TO CHANGE, REBUILD IF POSSIBLE
- ONCE YOU START, DON'T QUIT
- TIMING IS CRITICAL
  - TOO SLOW, THATCH
  - TOO FAST, LAYERS

44

Questions?

ATHOMS@IASTATE.EDU
515-294-1957 OFFICE
@THOMSTURF

45