TOPDRESSING

NICK CHRISTIANS
ADAM THOMS
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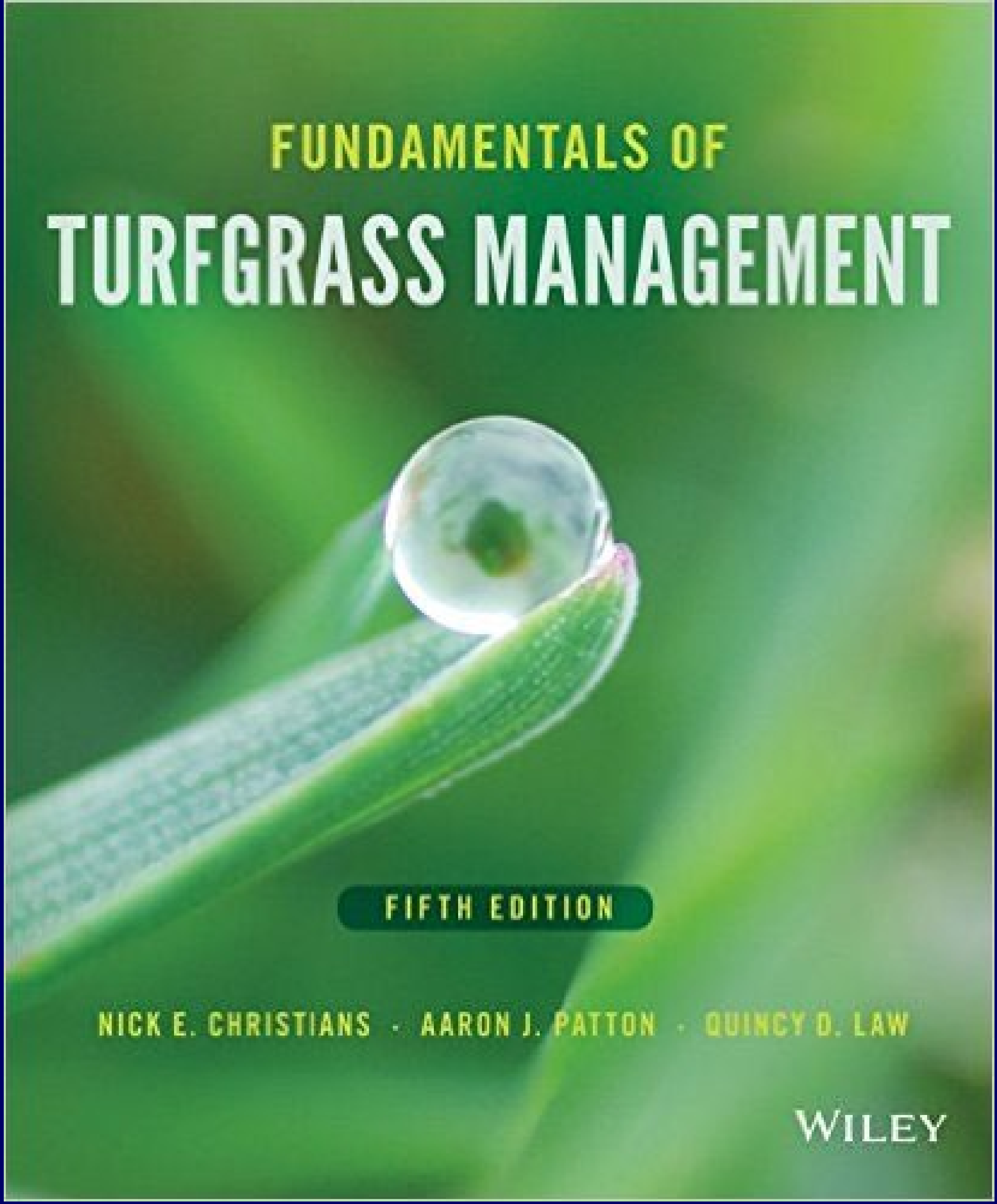

FUNDAMENTALS OF
TURFGRASS MANAGEMENT
FIFTH EDITION
NICK E. CHRISTIANS · AARON J. PATTON · QUINCY D. LAW
WILEY

TOPDRESSING

FOR QUALITY TURF

MOST CRITICAL

MOST DIFFICULT

MOST MISUNDERSTOOD

MOST ABUSED

TWO APPROACHES

- WITH AERIFICATION
- FREQUENT LIGHT

WHY TOPDRESS?

- THATCH CONTROL
- SMOOTHING
- FILL AERIFICATION HOLES
- SOIL MODIFICATION
- COVER SEED OR STOLONS
- WINTER PROTECTION

BASIC RULES

- COMPARABLE TO UNDERLYING SOIL
- PREPARE AS CAREFULLY AS ORIGINAL MIX
- IF EXISTING WORKS, DON'T CHANGE IT
- IF YOU CHANGE, DON'T QUIT

PURE SAND TOPDRESSING

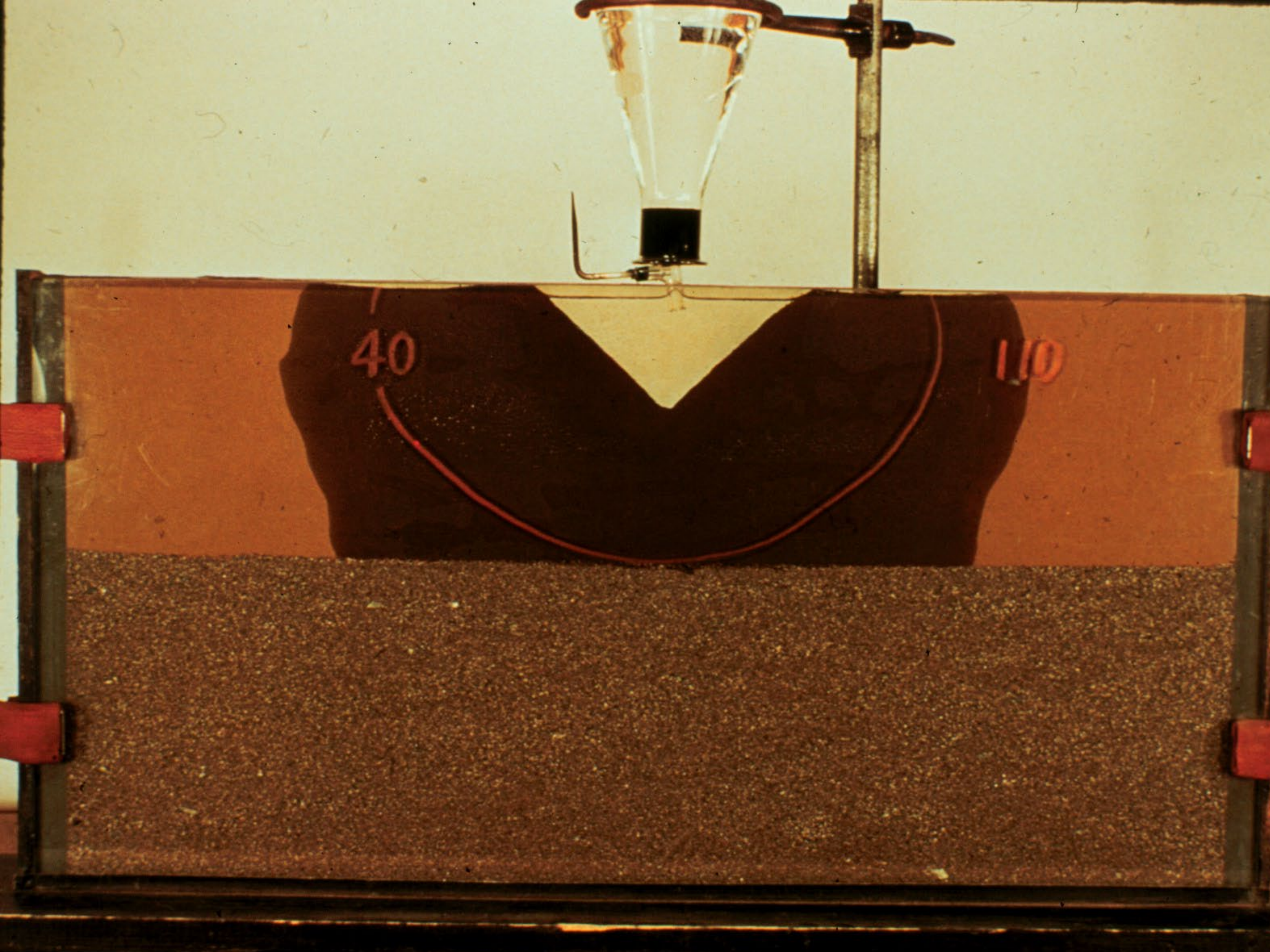
- JOHN MADISON - 1974
  - UNIFORM SAND 0.05-1.0 mm
  - 3 ft^3 / 1000 ft^2
  - USE N, K, MICRONUTRIENTS AND SEED
- JOHN MADISON - 1981
  - 0.1-1.00 mm SAND
  - BE SURE OF AVAILIABILITY

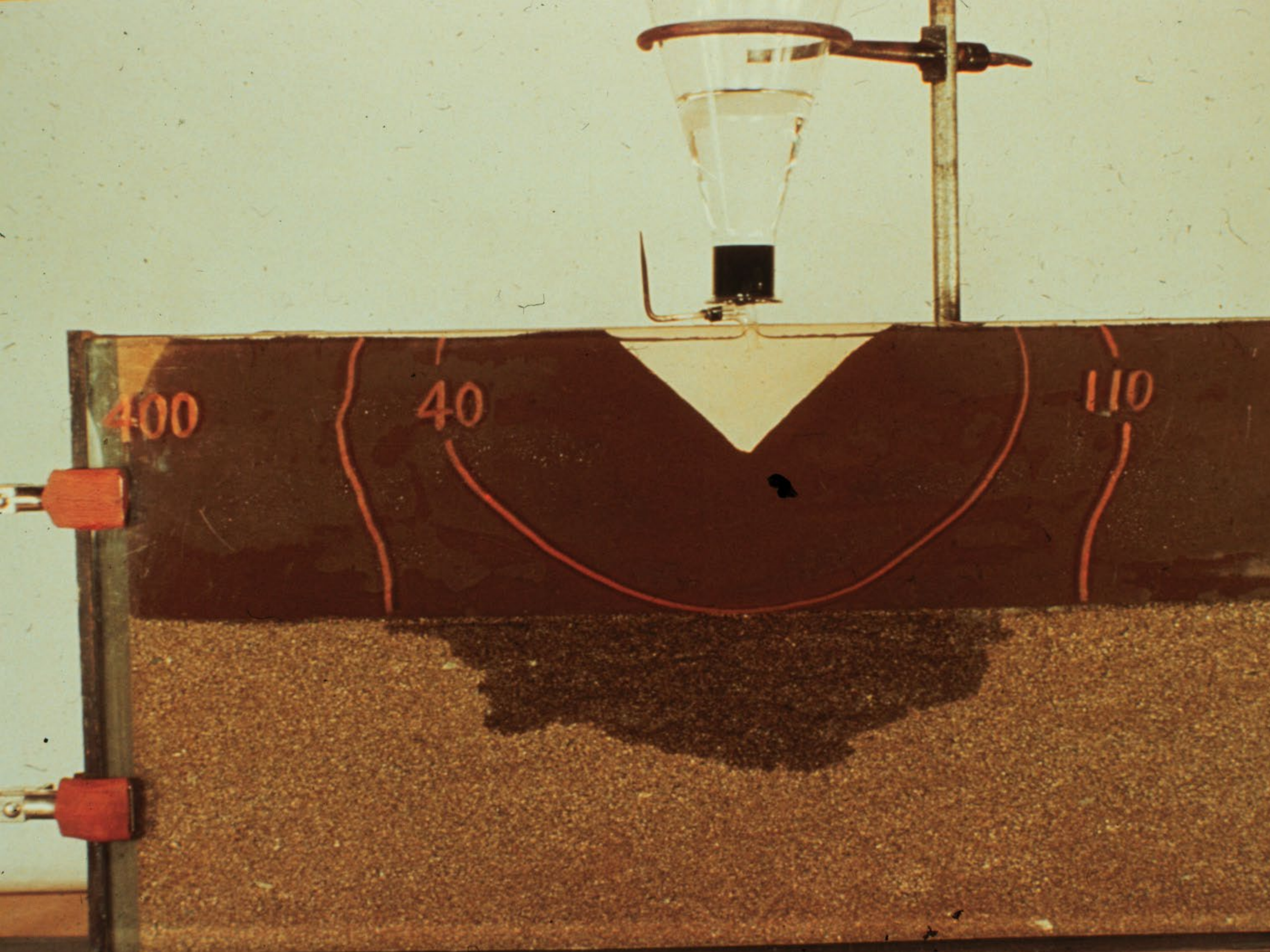
PROBLEMS WITH PURE SAND

- LAYERING
- NUTRIENT LEACHING
- HIGH WATER INFILTRATION
- LOW MOISTURE HOLDING CAPACITY
- MICROBIAL DISRUPTION


For Good
inches
cm

COARSE OVER FINE WORKS, FINE OVER COURSE DOES NOT


40
110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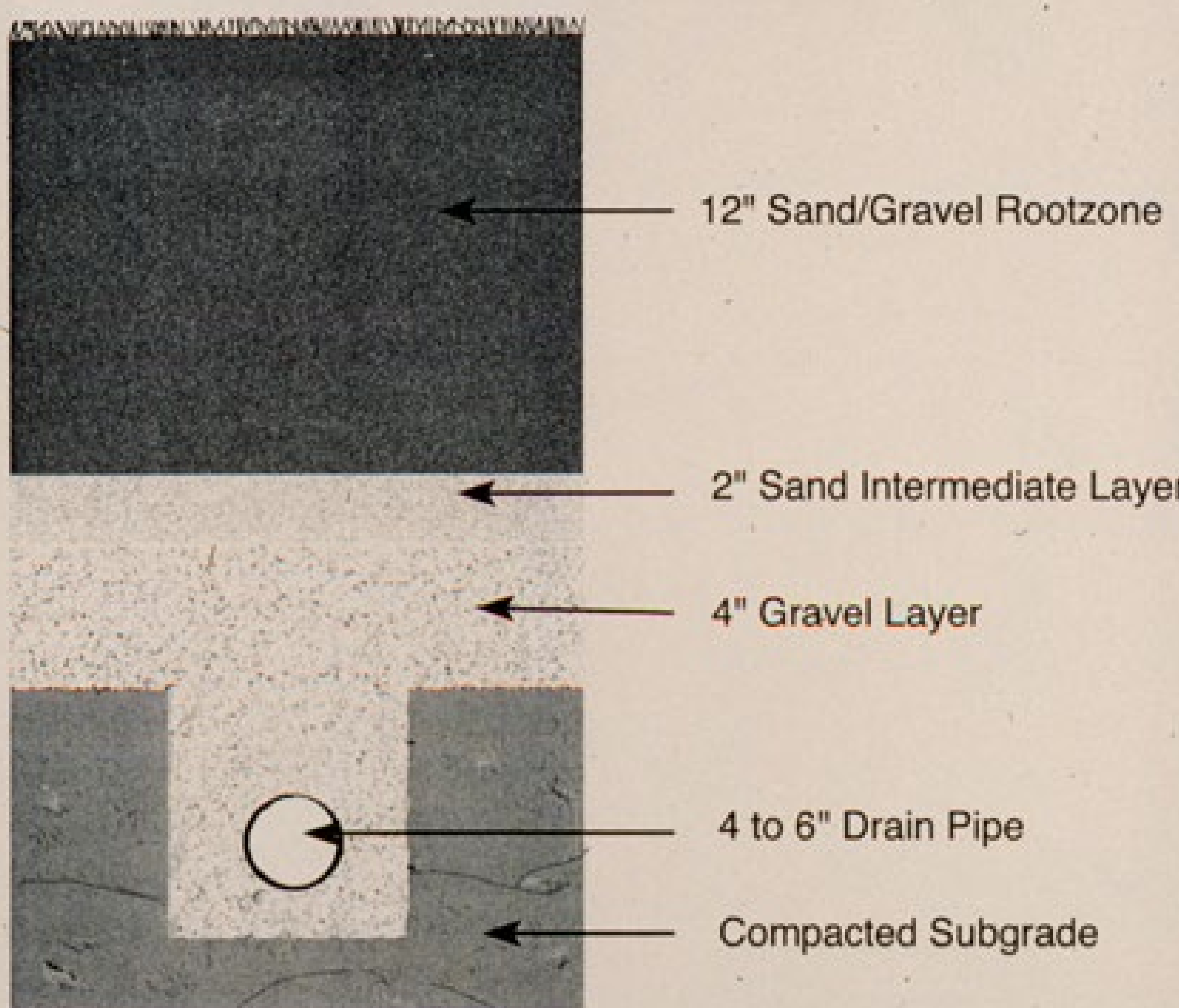
USGA GREEN
'WITH INTERMEDIATE LAYER'

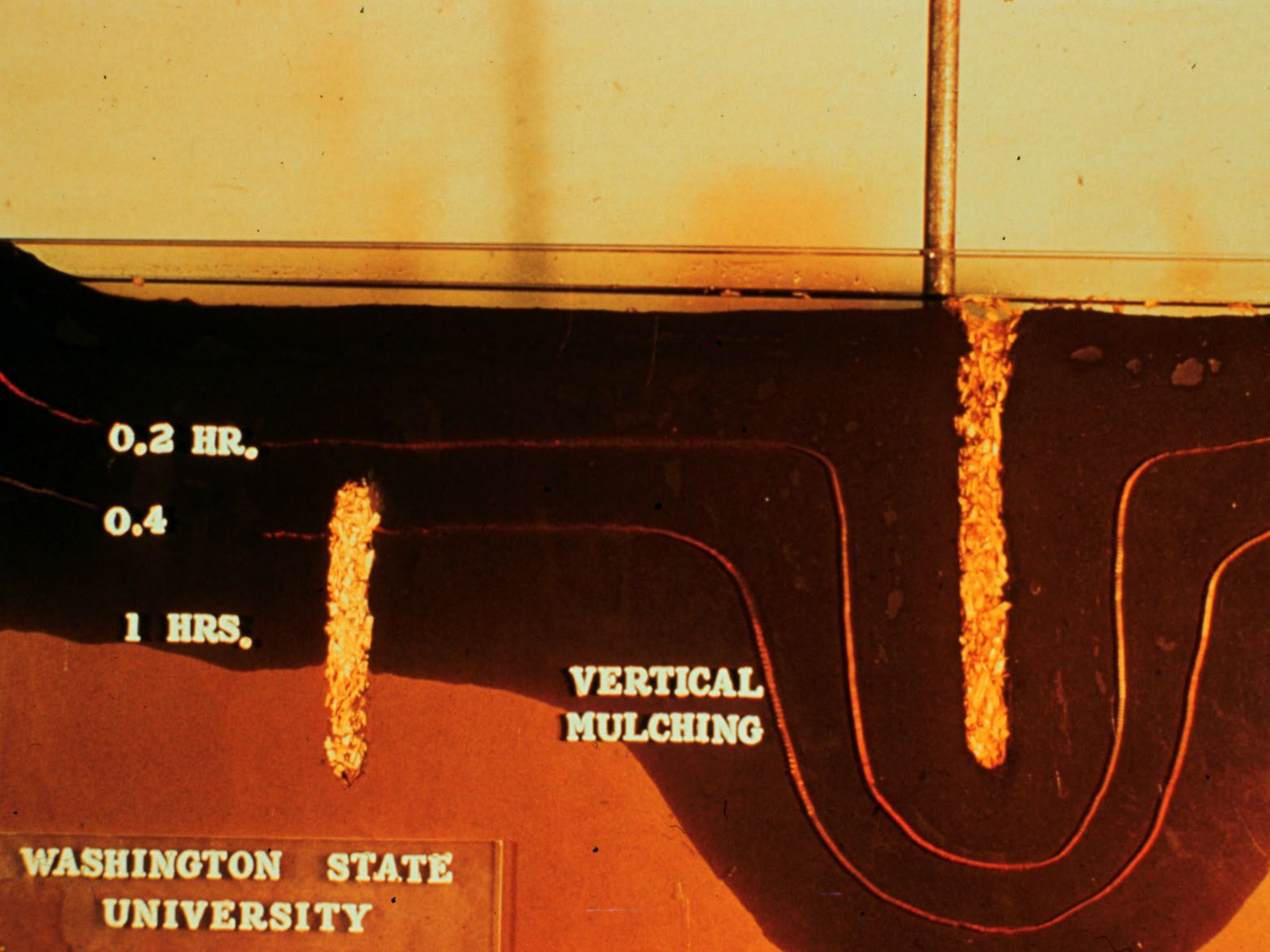


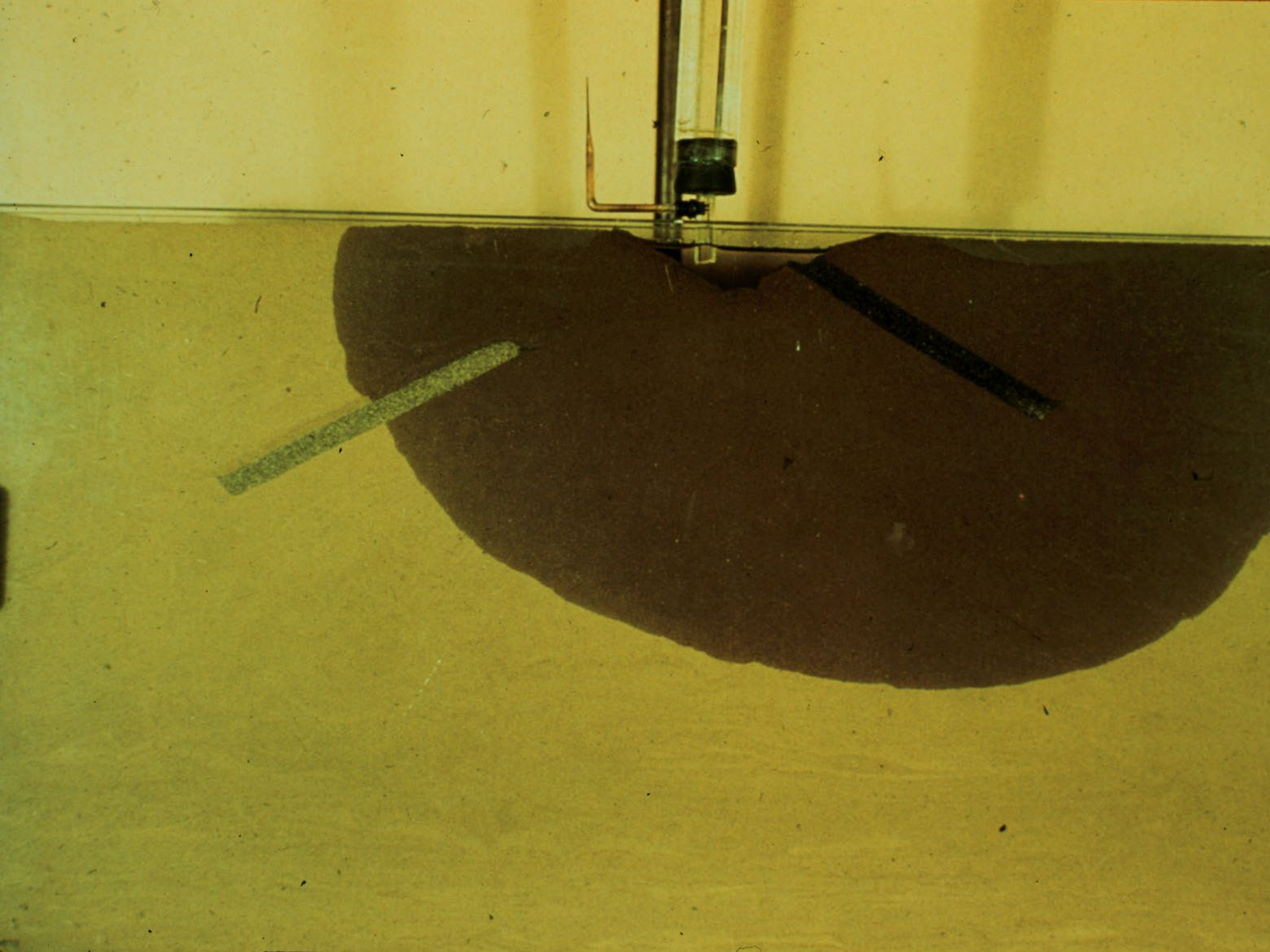
LAYERS ARE A BIG PROBLEM

MULTIPLE LAYERS ARE A BIGGER PROBLEM

HOW DO I FIX A LAYERING PROBLEM?

REBUILD


0.2 HR.
0.4
1 HRS.
VERTICAL
MULCHING
WASHINGTON STATE
UNIVERSITY



OUR RECOMMENDATION

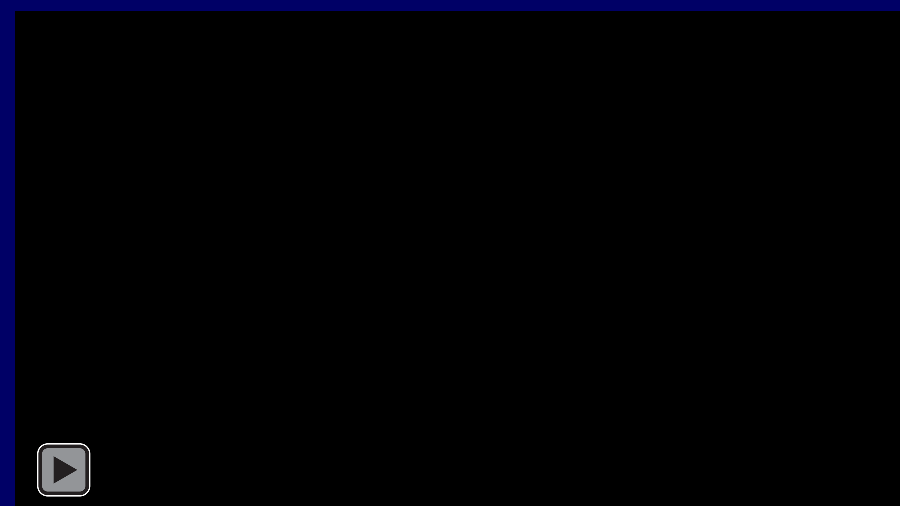
- IF EXISTING PROGRAM WORKS, DON'T CHANGE
- IF YOU NEED TO CHANGE, REBUILD IF POSSIBLE
- ONCE YOU START, DON'T QUIT
- TIMING IS CRITICAL
  - TOO SLOW, THATCH
  - TOO FAST, LAYERS

DEEP LAYERS AND COMPACTION

Aerification Encourages Rooting

Shockwave Aerification

- Uses offset blades to fracture soil
- Slices soil leaving minimum surface disruption
- Deep aerification effects (25.4 cm depth)



Control vs Shockwave 1x

1 game | 22 games | 1 game | 22 games

30 Years of Topdressing

Sand Topdressing Program
Material Selection

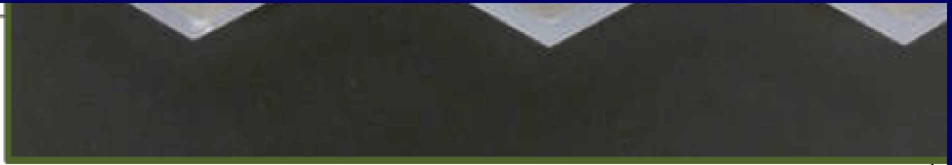
- Sand source
  - Match rootzone
    - Layering
    - Perched water
  - Soil rootzone
    - Well-graded sand
    - Sub-angular sand
    - Calcareous?

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

Inorganic Amendments



Inorganic Amendments

- 3 Major Classes
  - Diatomaceous Earth (DE); eg. Axis Fine
  - Zeolites; eg. Ecolite
  - Calcined Clay; eg. Profile

- Contain Internal Porosity (Bigelow et al., 2004)
  - Amendment Alone: 34 to 47% of Total Porosity with Diameters < 0.006 mm
  - 20% vol. Mixes with Sand: 12 to 16% of Total Porosity with Diam. < 0.006 mm

- Contain Cation Exchange Capacity (CEC) in the Order (Bigelow et al., 2003)
  - DE < Calcined Clay < Zeolite

LOCALIZED DRY SPOT

University of Florida
Profile® Porous Ceramic
1995-present

Dr. Grady Miller reports, "The statistical trend indicates Profile-amended plots to be the highest in quality and with the least L.D.S. symptoms."

Tifton Physical Soil Labs
Profile Porous Ceramic
1992-present

Powell Gaines reports, "In every sand tested, Profile always increases water retention without sacrificing percolation rates."

University of Missouri
Profile Porous Ceramic
1992-1995

Dr. Dave Minner concludes, "After three years of research, plots topdressed with Profile significantly improved turf quality and reduced localized dry spot injury."

Penn State University
Profile Porous Ceramic
1995-present

Dr. Charles Mancino says, "Plots topdressed with Profile had higher overall quality than plots topdressed with sand during drought stress. The 100% Profile topdressed plots exhibited higher quality and lower drought stress than wetting agent-treated plots."

HIGH-TRAFFIC AREAS

Iowa State University
Profile® Field & Fairway™
Three-Year Study

1- and 2-ton rates per 1,000 square feet of Profile Field & Fairway were tilled into intense traffic sports fields with native soil. Results of the study showed that the plots revealed significant reductions in bulk density with the 1- and 2-ton rates, indicating more favorable bulk density and less compaction.

POOR DRAINAGE AND OXYGEN IN THE ROOT ZONE

University of Missouri
Profile Porous Ceramic

It was found that all the greens constructed with Profile (as compared to peat root zone) had significantly higher water infiltration. After four years of topdressing with Profile, it was found that Profile doesn't produce the negative effects of layering.

University of Florida
Profile Porous Ceramic

It was reported that hydraulic conductivity increased with an addition of Profile.

Pennsylvania State University
Profile Porous Ceramic

A field study conducted showed that no physical obstruction (such as layering) occurred using Profile.

CONSTRUCTION AND REBUILDS

University of Missouri
Profile Porous Ceramic

Greens constructed with sand and Profile versus sand and peat ALWAYS had higher infiltration and perc rates. Also, when Profile was used in a 15% to 30% construction mix, root branching and root volume increased as the amount of Profile in the mix increased.

TOPDRESSING NUTRIENT RETENTION

North Carolina State University
Profile Porous Ceramic

Profile blended into organic potting mixes, reduced leaching of potassium and made more potassium available to the plant.

University of Missouri
Profile Porous Ceramic

The top three inches of soil topdressed with Profile had more potassium than the plots topdressed with sand.

Ohio State University
Profile Porous Ceramic

Increased Profile percentages resulted in a uniform increase in CEC for all sand and sand/peat blends. Profile has the ability to reduce potassium leaching and make potassium available to the plant.

University of Florida
Profile Porous Ceramic

Adding 10% Profile to the sand increased potassium concentration 256% in tifdwarf bermuda tissues. Diatomaceous earth and peat are not adequate in retaining potassium compared to Profile.

REDUCED DROUGHT STRESS

The Ohio State University
2010 - Present

Computer modeling studies, completed by Dr. Ed McCoy confirmed that a root zone amended with 15% Profile can delay the onset of visual drought stress by up to 3 days relative to un-amended sand and by about 2 days compared to a sphagnum peat amended root zone.

DISSOLVED SALTS

The Ohio State University
2011 - Present

A non-equilibrium sorption experiment, completed by Dr. Ed McCoy and Dr. Keith Diedrick, cited that no salinity hazard exists using Profile inorganic amendments.

Current Research

Proctor et al., 2014

Sand color makes a difference in recovery

Table 3. Total days disrupted (TDD) per rating season by year for cultivation and sand topdressing treatments on a T-1 creeping bentgrass golf green at the Palouse Ridge Golf Club, Pullman, WA in 2008, 2009, and 2010.

Cultivation method[v]	2008	2009	2010
	d[w]		
Sand color			
Tan	55	55	75
Black	49	55	72
LSD	5	ns	ns

Make sure sand size works with existing root zone

Table 4. Mean days disrupted (MDD) following cultivation and sand topdressing treatments on a T-1 creeping bentgrass golf green at the Palouse Ridge Golf Club, Pullman, WA in 2008, 2009, and 2010.

	2008		2009		2010	
Cultivation method[u]	TS[v]	BS[w]	TS	BS	TS	BS
	days					
CRL	9	7	18	11	21	18
CRS	3	3	6	5	6	5
VT	4	4	4	4	8	7
VM	–[x]	–	4	4	4	4
LSD[y]	1.25		1.75		1.05	
ANOVA						
	F-value[z]					
Cultivation method (C)	79.83***		306.02***		487.06***	
Sand color (S)	10.02ns		17.77*		31.41**	
C x S	5.86*		10.24**		5.41*	

[u] CRL, core removal large tine; VT, venting; CRS, core removal small tine; VM, vertical mowing.

[v] TS, tan sand topdressing.

[w] BS, black sand topdressing.

[x] Disruption from vertical mowing did not fully recover between applications in 2008, thus was not included in analysis.

[y] LSD, Least significant difference. Mean separation by Fisher's LSD $P \leq 0.05$.

Current Research

Proctor et al., 2014

Sand color makes a difference in recovery

Table 5. Days to recover (DTR) following aeration and topdressing with tan or black sand for six early-season cultivation dates at the Turfgrass and Agronomy Research Facility, Pullman, WA, in 2008 and 2009.

	2008			2009		
Cultivation date	TS[w]	BS[x]	Date mean	TS	BS	Date mean
	days					
15 Apr.	30	32	31	28	24	26
1 May	34	30	32	27	26	26
15 May	19	18	19	16	16	16
1 June	22	18	20	25	16	21
15 June	12	15	13	22	16	19
1 July	11	13	12	17	15	16
LSD[y]	6.0		5.5	4.7		4.6
Sand color mean	21	21		22	19	
LSD	NS			1.2		

Table 6. Days to recover (DTR) following aeration and topdressing with tan or black sand for six late-season cultivation dates at the Turfgrass and Agronomy Research Facility, Pullman, WA, in 2008 and 2009.

	2008			2009		
Cultivation date[u]	TS[v]	BS[w]	Date mean	TS	BS	Date mean
	days					
15 Aug.	10	10	10	24	24	24
1 Sept.	17	12	15	16	15	15
15 Sept.	20	16	18	13	16	15
1 Oct.	42	44	43	DNR[x]	DNR	–
15 Oct.	DNR	DNR	–	DNR	DNR	–
1 Nov.	DNR	DNR	–	DNR	DNR	–
LSD[y]	2.6		5.5	ns		3.1
Sand color mean	22	20		17	18	
LSD	1.4			ns		

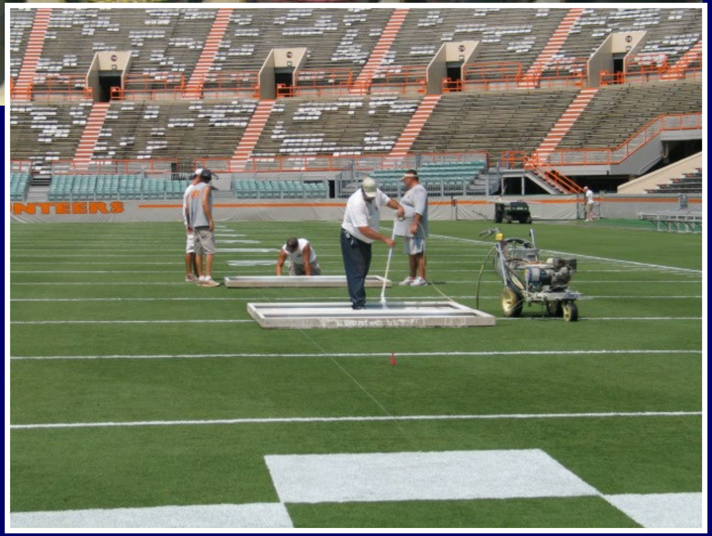
Paint and Rootzone

Topdressing & Athletic Field Paint

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

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



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)

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

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

Compost Topdressing on Athletic Fields?

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Questions?

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