



KNOW YOUR SOILS: Foundation for Sustainable Management

Jackie Lyn “Jack” A. Guevara, Ph.D.
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My Turfgrass Story



My Turfgrass Story

Study Abroad

Michigan State University – Fall 2016



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Michigan State University – Fall 2016

Internship

The Country Club – Summer 2017

Internship at The Country Club





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B.S. Agriculture (Soil Science)

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HANCOCK TURFGRASS RESEARCH CENTER

- **23 hectares** dedicated for turfgrass research



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- 90% of the turfgrass has **computerized irrigation**



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Facilities

On-site laboratory

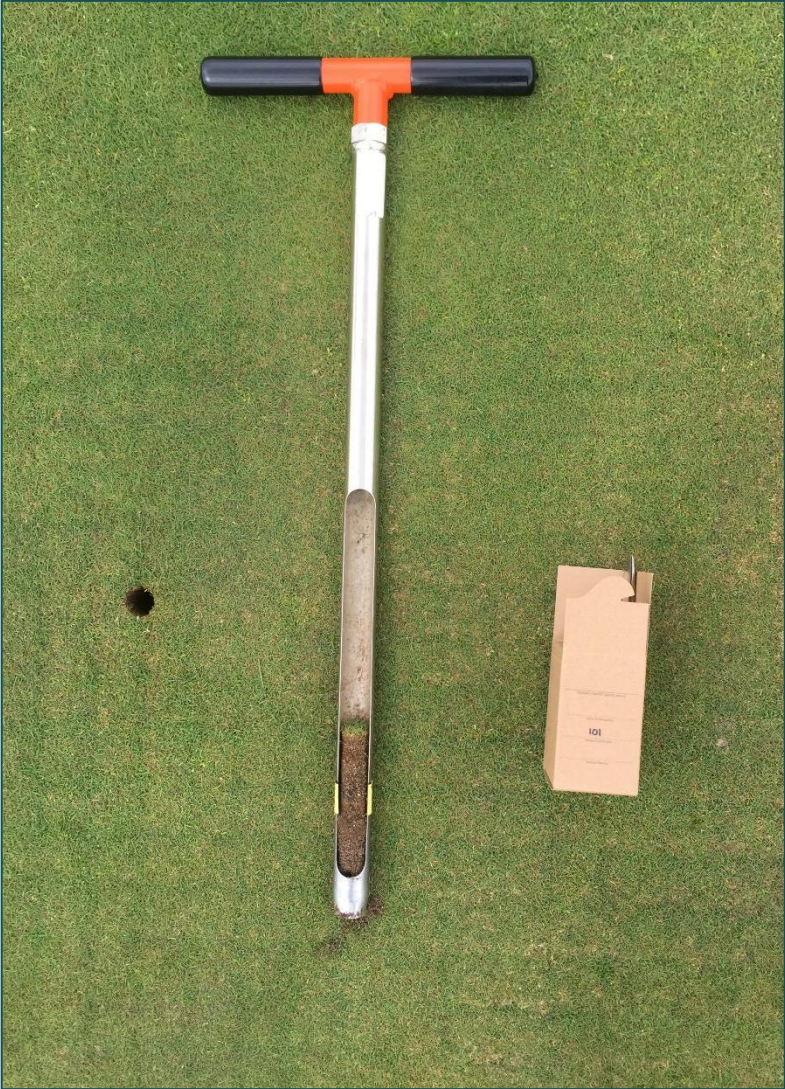
Maintenance shop

Equipment storage facility





Photo by: T. Nikolai



PHILIPPINE GOLF COURSE MANAGEMENT CONFERENCE



THE SUSTAINABLE EDGE:
Elevating Operations to
World-Class Playing Standards

May 14-15, 2026



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Michigan State University – Class of 2025



**Jackie Lyn “Jack” A. Guevara, Ph.D.
Assistant Professor, Michigan State University
Research Associate, FIFA World Cup 2026 Field Research**



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The Perfect Putting Green

The Country Club (2016)

PHILIPPINE GOLF COURSE
MANAGEMENT CONFERENCE



THE SUSTAINABLE EDGE:
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World-Class Playing Standards

May 14-15, 2026

The Perfect Putting Green

- **Healthy plant growth**
- **Smooth and firm**
- **Tolerates traffic**

The Country Club (2016)



It all starts in the *SOIL*

Healthy greens start with a properly built and managed soil profile



I hope by the end of this presentation, you will be able to:

- Understand the **different soil particle sizes** and their influence on **turfgrass growth, drainage** and **surface playability**.
- Recognize the issues caused by soil layering and **avoid common practices that lead to layering** in turf systems.



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United States Golf Association (USGA) Specifications (2018 version)

TABLE 3. Recommended Particle Size Distribution for a Putting Green Rootzone Mixture			
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Very coarse sand
(1 – 2 mm)

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(1 – 2 mm)

Coarse sand
(0.5 – 1 mm)

Very coarse sand
(1 – 2 mm)

Coarse sand
(0.5 – 1 mm)


Medium sand
(0.25 – 0.50 mm)

Very coarse sand
(1 – 2 mm)

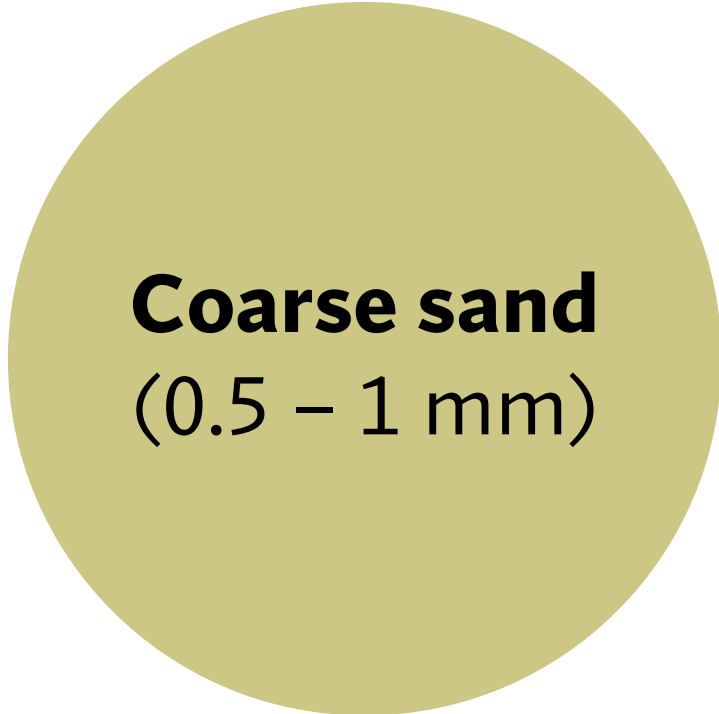
Coarse sand
(0.5 – 1 mm)

Medium sand
(0.25 – 0.50 mm)

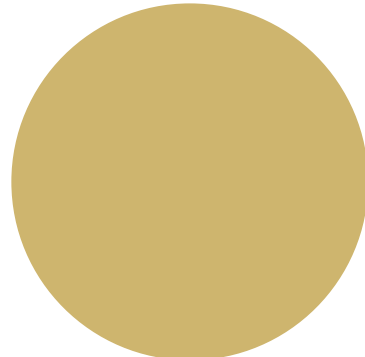
Fine sand
(0.15 – 0.25 mm)



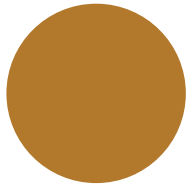
Very coarse sand
(1 – 2 mm)




Coarse sand
(0.5 – 1 mm)



Medium sand
(0.25 – 0.50 mm)



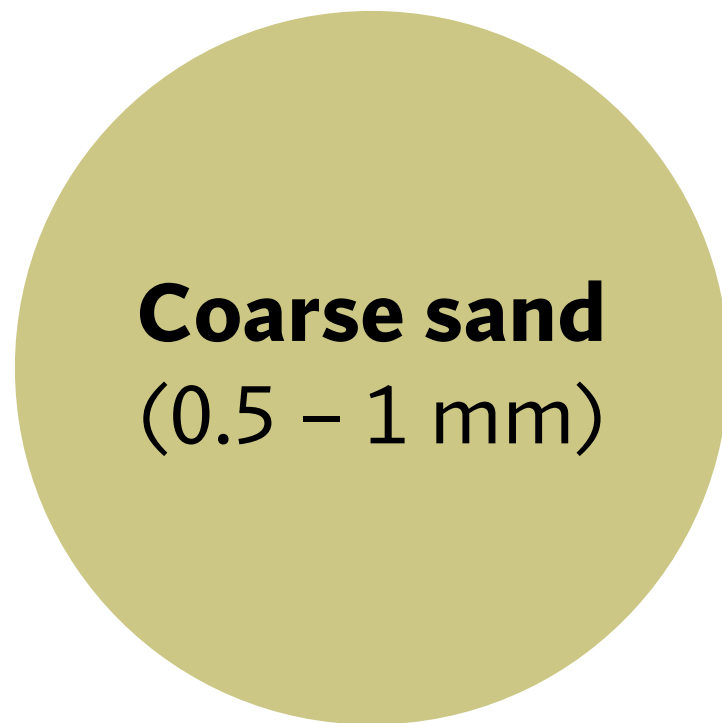
Fine sand
(0.15 – 0.25 mm)



Very fine sand
(0.05 – 0.15 mm)

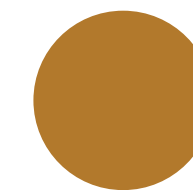
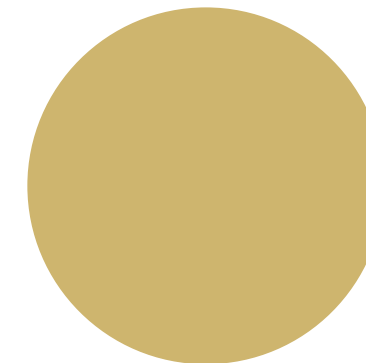


Very coarse sand
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Coarse sand
(0.5 – 1 mm)

Medium sand
(0.25 – 0.50 mm)



Fine sand
(0.15 – 0.25 mm)



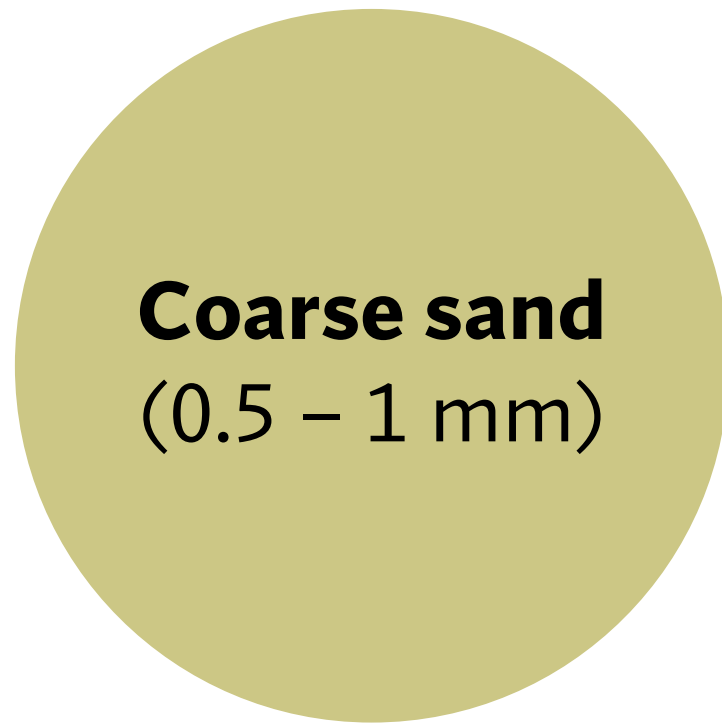
Very fine sand
(0.05 – 0.15 mm)



Silt
(0.002 – 0.05 mm)

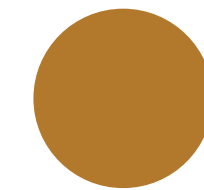
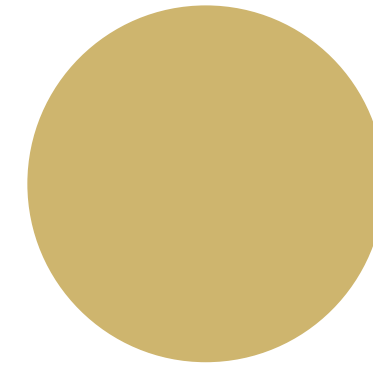


Very coarse sand
(1 – 2 mm)



Coarse sand
(0.5 – 1 mm)

Medium sand
(0.25 – 0.50 mm)



Fine sand
(0.15 – 0.25 mm)



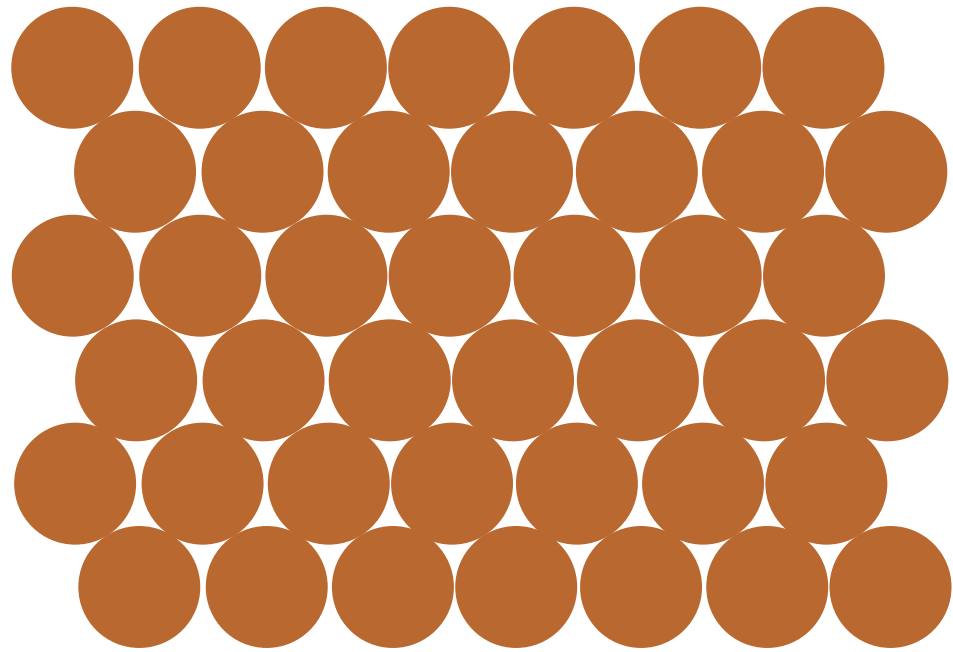
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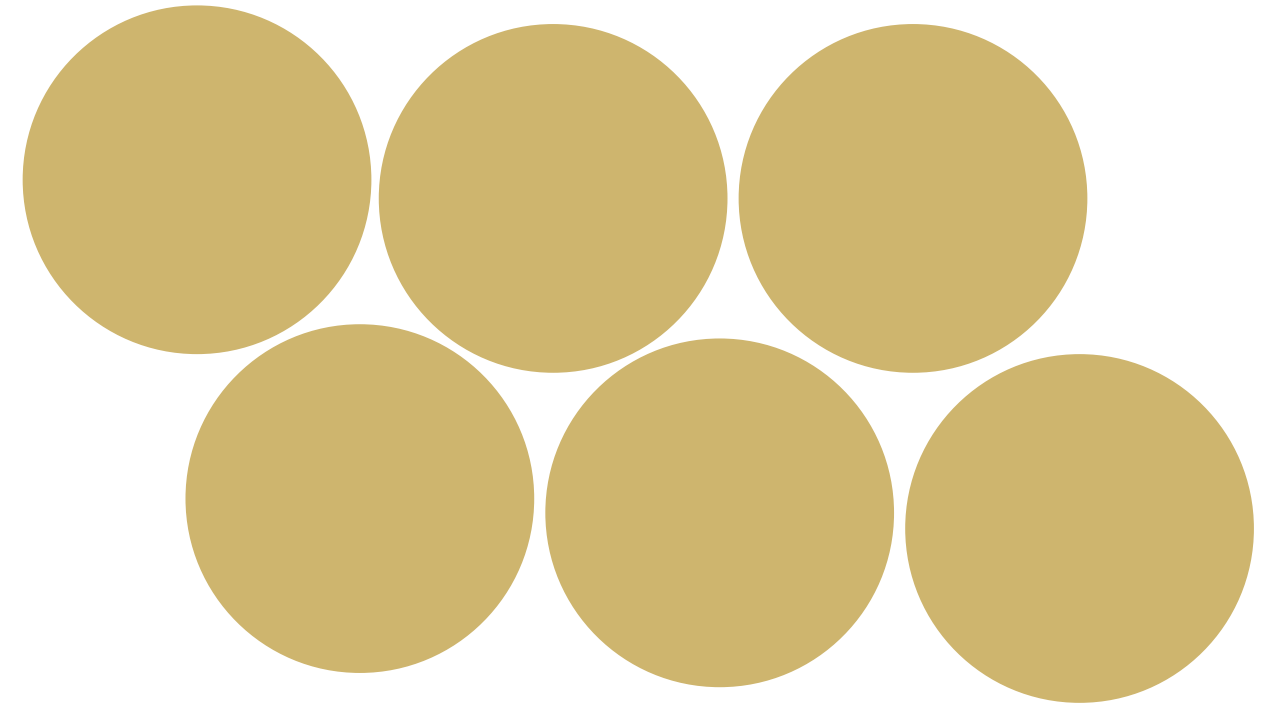
Clay
(<0.002 mm)

Smaller (finer) particles

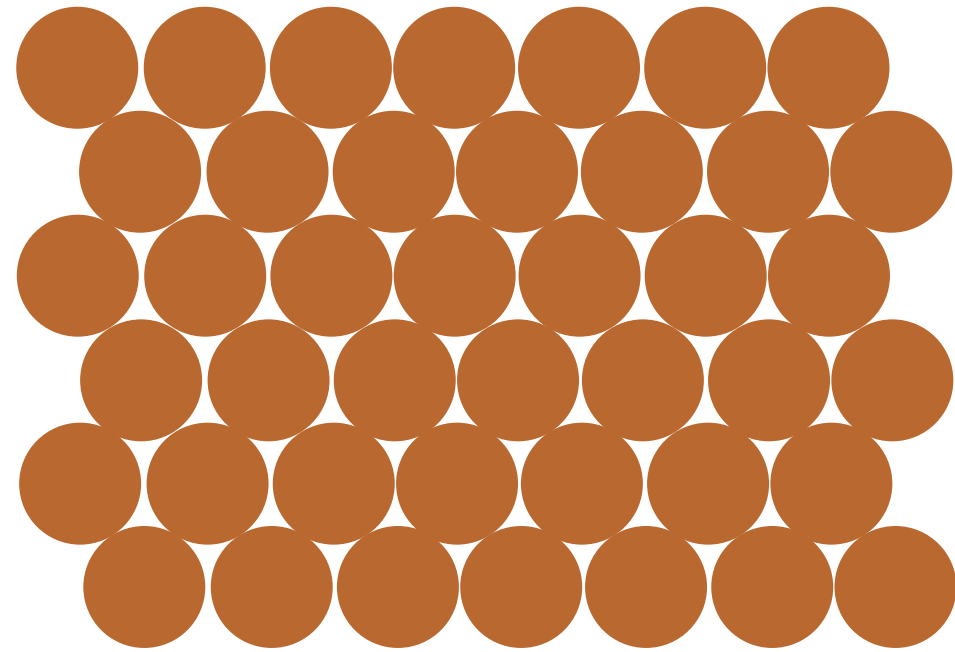


vs.

Bigger (coarser) particles

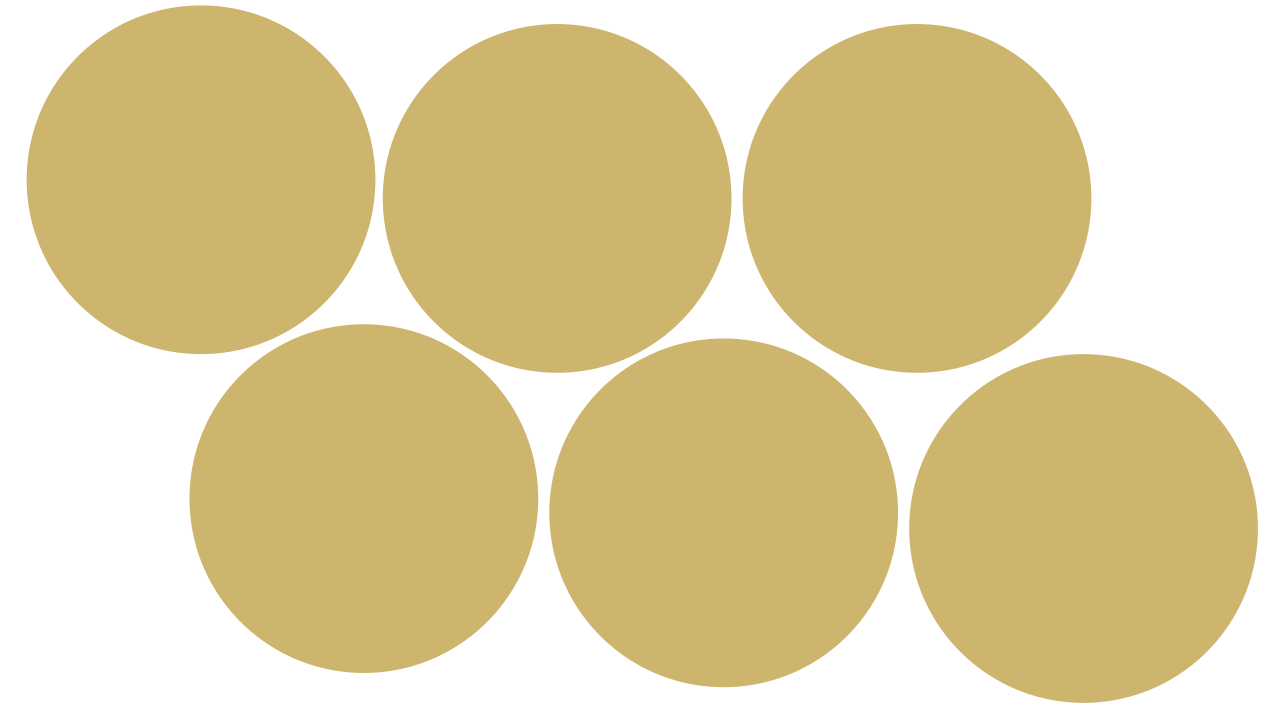


Smaller (finer) particles



vs.

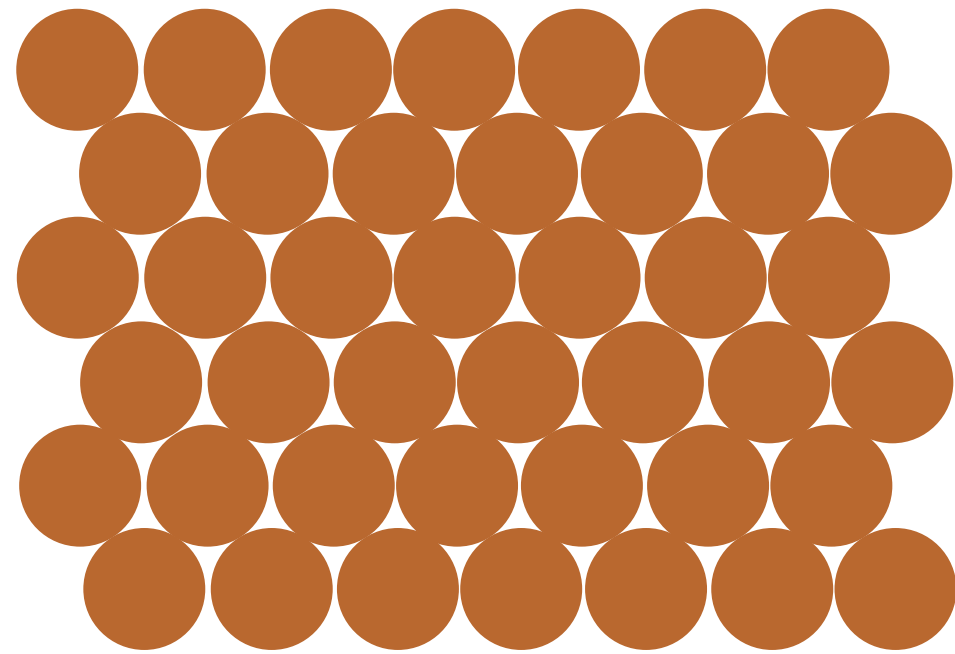
Bigger (coarser) particles



**Higher number of particles per gram
= holds more water & nutrients**

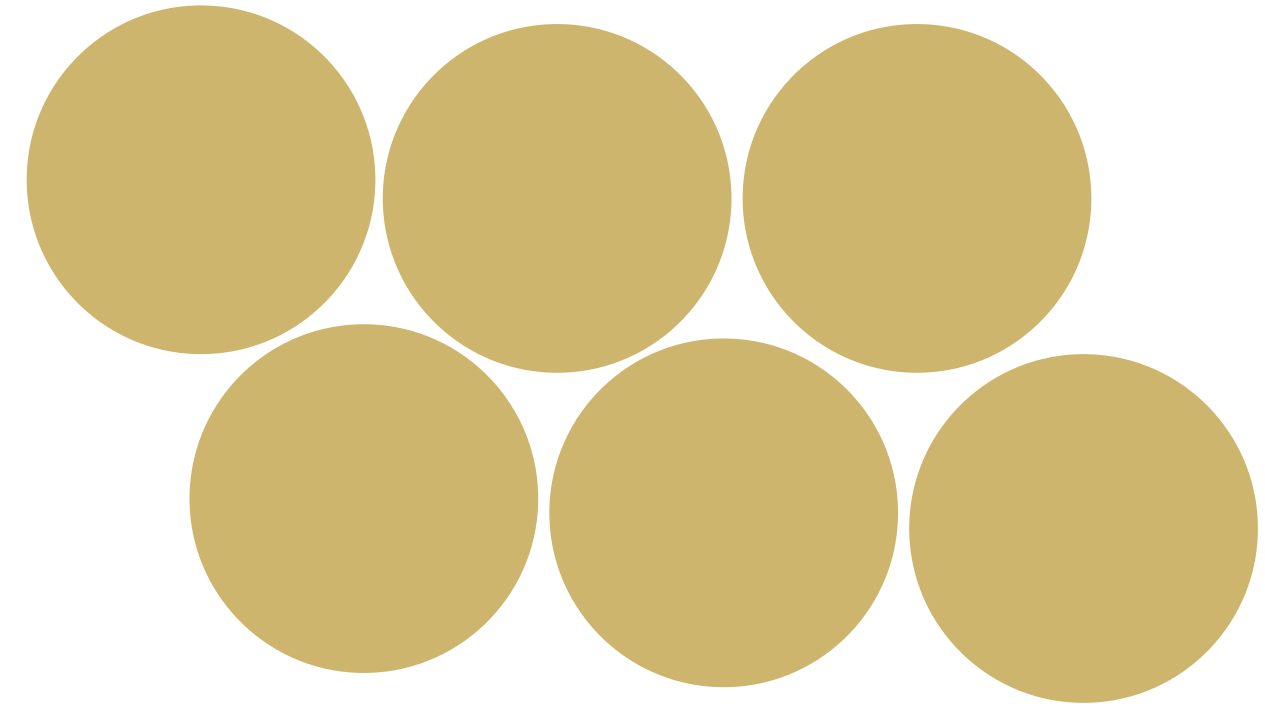
**Lesser number of particles per gram
= holds less water & nutrients**

Smaller (finer) particles



vs.

Bigger (coarser) particles



**Higher number of particles per gram
= holds more water & nutrients**

Smaller pores = low drainage

**Lesser number of particles per gram
= holds less water & nutrients**

Bigger pores = higher drainage

United State Golf Association (USGA) Specifications (2018 version)

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Higher percentage of coarser particles = high drainage

Because when the soil is poorly drained, it leads to...

- Increased disease = more pesticide application
- Poor rooting = more fertilizer application
- Soft putting surface = less playability



© United States Golf Association

<https://www.usga.org/content/usga/home-page/course-care/forethegolfer/2018/weather-ready.html>

When the soil is well drained, it leads to...

The Perfect Putting Green

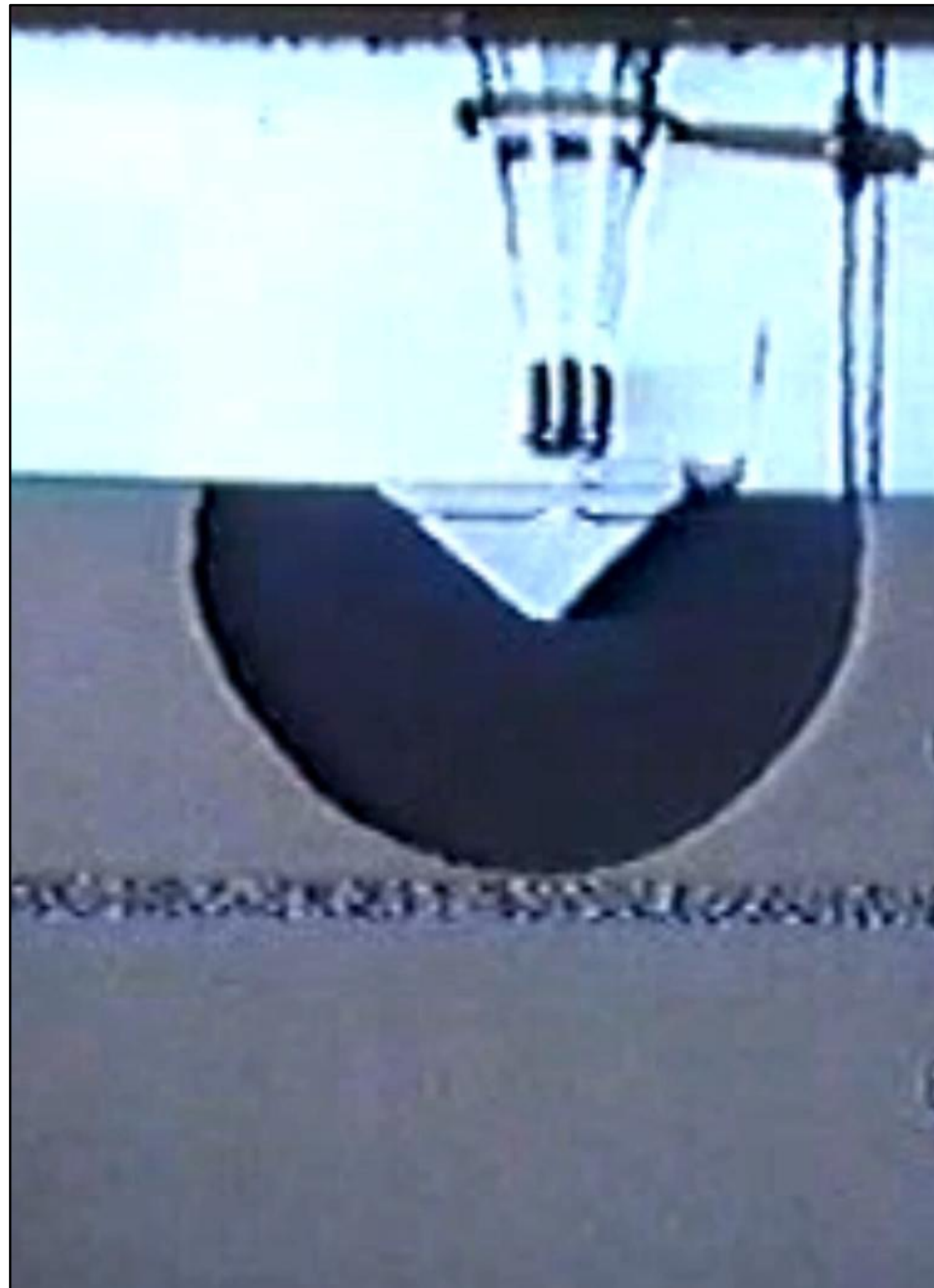
- **Healthy plant growth**
- **Smooth and firm**
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The Country Club (2016)



Poor drainage in greens after construction or renovation is often caused by *soil layering* – when incompatible soil materials create distinct layers that restrict water movement.

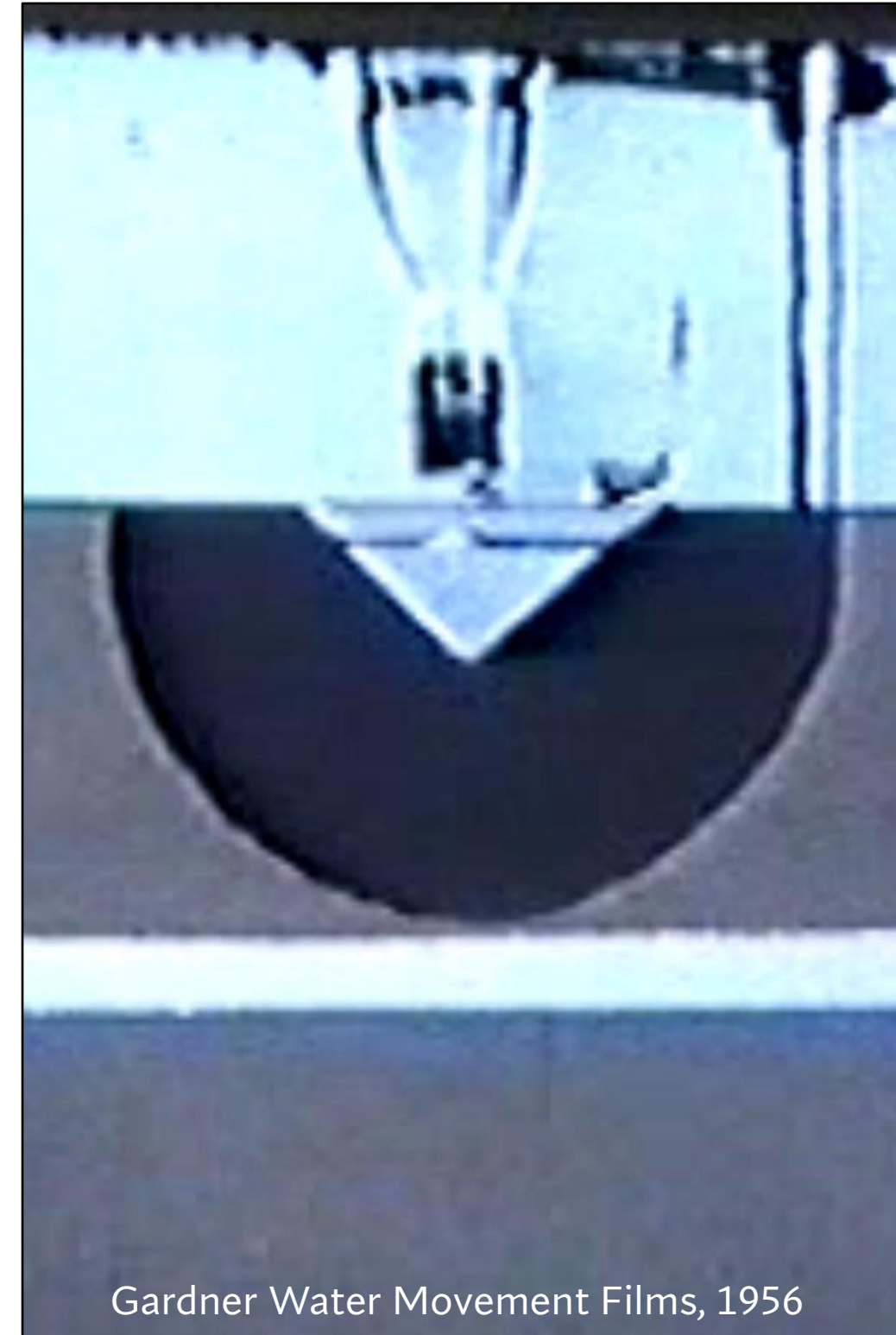
Fine over Coarse



Fine particles

Coarse

Coarse over Fine



Coarse particles

Fine

Gardner Water Movement Films, 1956

Common causes of soil layering

(1) Incompatible sod or topdressing



Common causes of soil layering

(1) Incompatible sod or topdressing

Sample	Fine gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt + Clay
Sod	0.3	1.1	18.2	41.3	20.2	8.5	10.4
Rootzone	1.3	7.8	24.9	39.0	16.0	4.9	6.1

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(1) Incompatible sod or topdressing

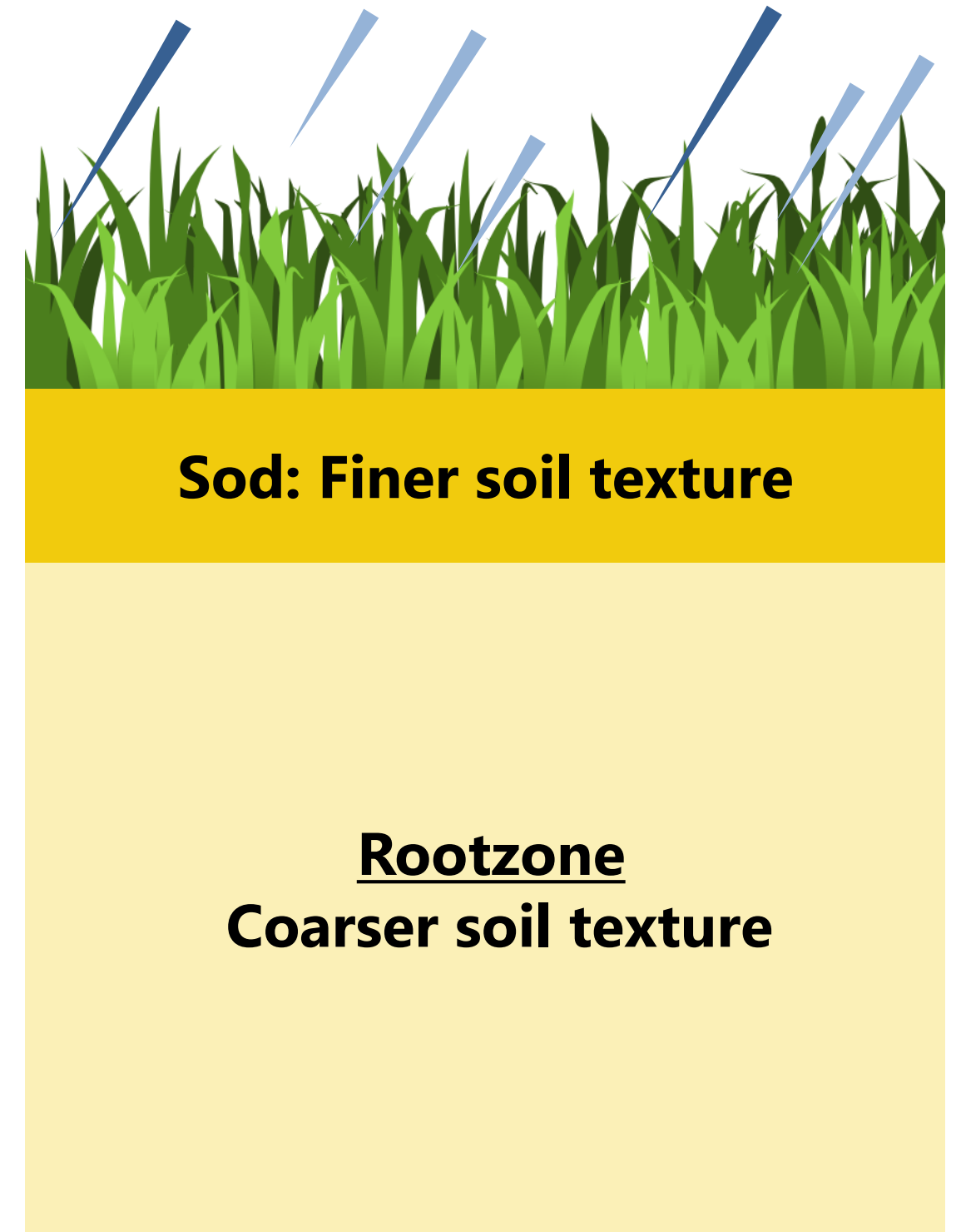


Sod: Finer soil texture

**Rootzone
Coarser soil texture**

Common causes of soil layering

(1) Incompatible sod or topdressing



Common causes of soil layering

(2) Excessive accumulation of thatch

dead plant materials (stolons and rhizomes)



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<https://www.usga.org/content/usga/home-page/course-care/green-section-record/61/issue-14/what-is-thatch-and-why-should-i-care-.html>

Common causes of soil layering

(2) Excessive accumulation of thatch

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Thatch

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Soil organic matter

similar to clay particles



<https://www.asianturfgrass.com/post/soil-organic-matter-should-be-invigilated/>

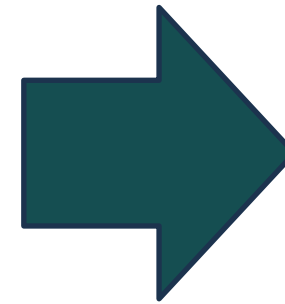
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<https://www.usga.org/content/usga/home-page/course-care/green-section-record/58/9/dont-layer-it-on.html>

Common causes of soil layering

(3) Infrequent, heavy topdressing applications

Burying instead of diluting soil organic matter



Soil organic matter (fine)

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Sand (coarse)

Soil organic matter (fine)

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Soil organic matter (fine)

Sand (coarse)

Soil organic matter (fine)

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Common causes of soil layering	How to avoid it
Incompatible sod or topdressing	Have sod rootzone and topdressing materials analyzed for compatibility before use.
Excessive accumulation of thatch	Regular verticutting and proper fertilization to avoid excessive turfgrass growth.
Infrequent, heavy topdressing	Schedule light, frequent topdressing applications to dilute organic matter.

Thank you for your attention!

Acknowledgements



**President
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**PGCMC
Committee
Ma'am Olyn &
Ma'am Anna**

Bruce Williams of Executive Golf Search



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