



Sports Turf and Technology

J.N. Rogers, III
Plant, Soil and Microbial Sciences
Michigan State University

High School Athletic Field

- Sports and community events

- Football
- Lacrosse
- Soccer
- Cheerleading
- Marching band
- Rugby
- Track and field



High School Athletic Field



- Sports and community events

- Football
- Lacrosse
- Soccer
- Cheerleading
- Marching band
- Rugby
- Track and field





High School Athletic Field

- Sports and community events

- Football
- Lacrosse
- Soccer
- Cheerleading
- Marching band
- Rugby
- Track and field



Native Soil Athletic Fields

- High in silt and clay
 - Advantage
 - Stable when dry
 - Das, 2006
 - Disadvantage
 - Low infiltration rates
 - Hillel, 2004



During Heavy Rainfall

- Saturated field conditions
 - Decrease soil stability
 - Das, 2006



Haslett, Mich., Oct. 28, 2006



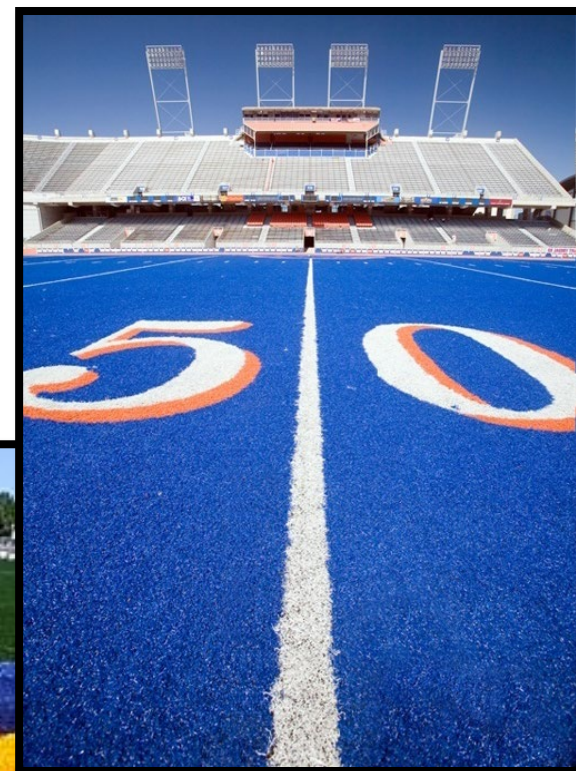
Haslett, Mich., Nov. 2006





Solutions

- Complete field renovation
 - Synthetic athletic field
 - \$600,000 - 1,000,000
 - Adamson, 2006





Complete Field Renovation

■ Sand-based systems

- Natural playing surface

- Rapid infiltration rates

 - Henderson et al., 2005

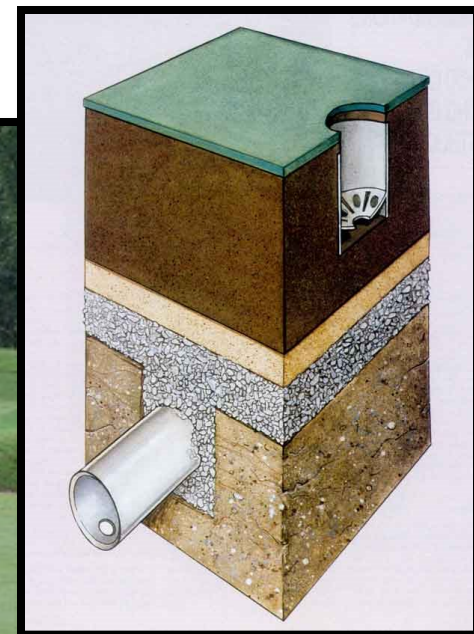


- Maintain stability during periods of heavy use

 - Bingaman and Kohnke, 1970

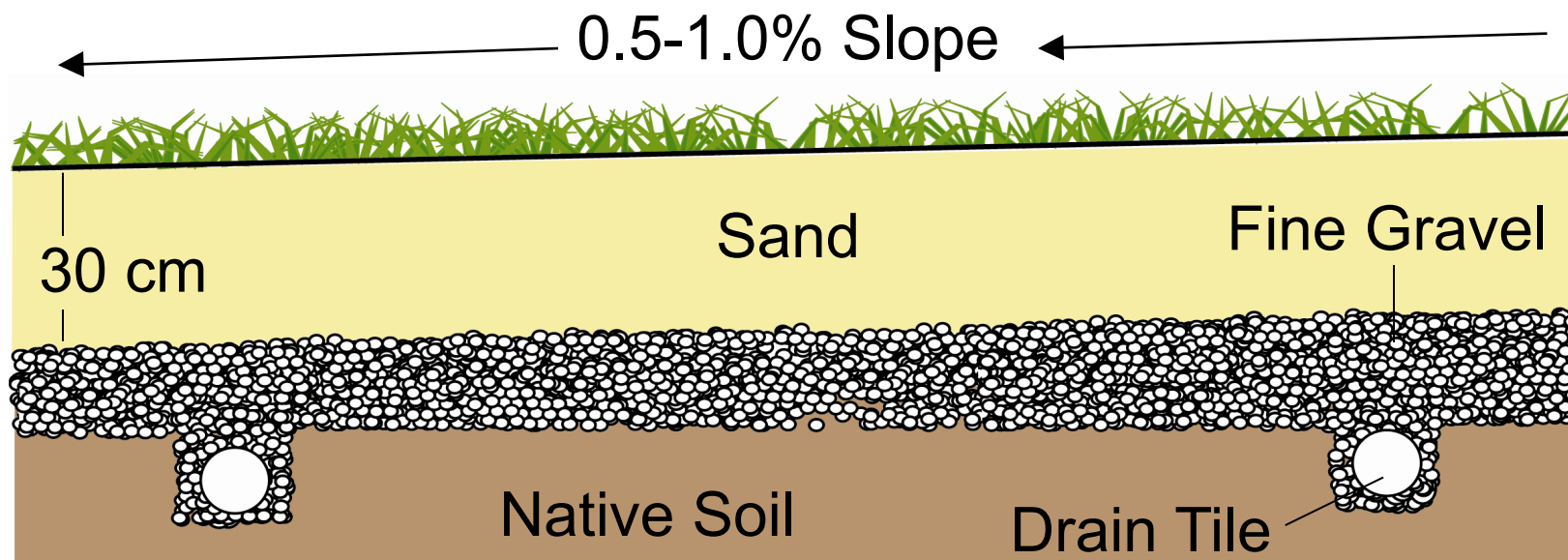
Sand-based Systems

- United States Golf Association (USGA)
 - USGA Green Section Staff, 1960



Sand-based Systems

- Conventional sand-based field
 - Jakobsen and McIntyre, 1999
 - \$400,000 - 600,000

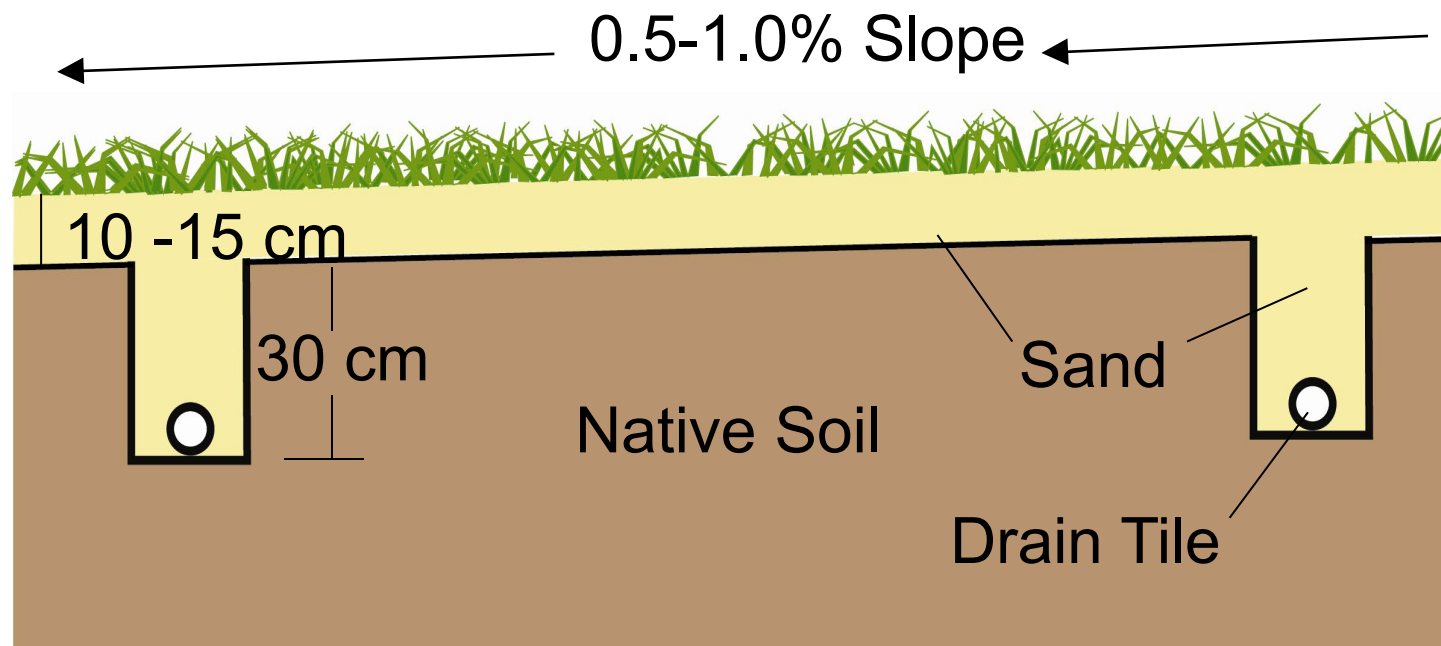


Sand-based Systems

■ Sand-capped system

□ Daniel and Freeborg, 1983

■ \$200,000 - 300,000



Complete Field Renovations



- Expensive
- Field temporarily useless



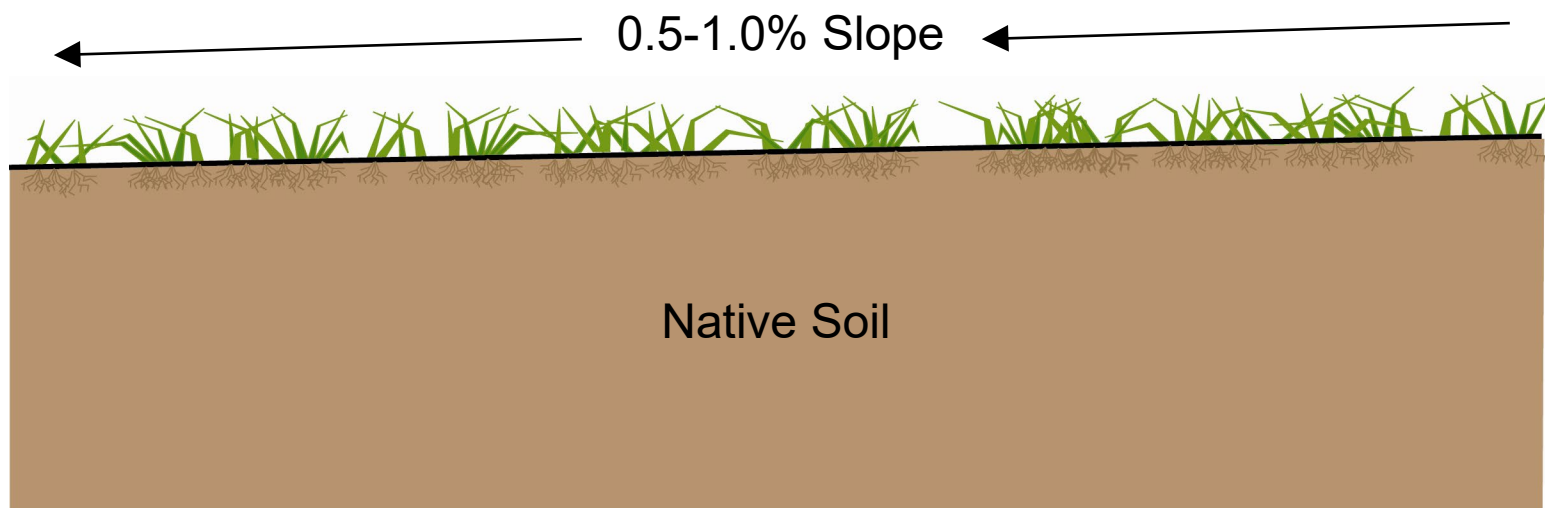
Alternative Renovation Process

- Intercept drain tile installation
- Cumulative topdressing
 - Built-up sand-capped system

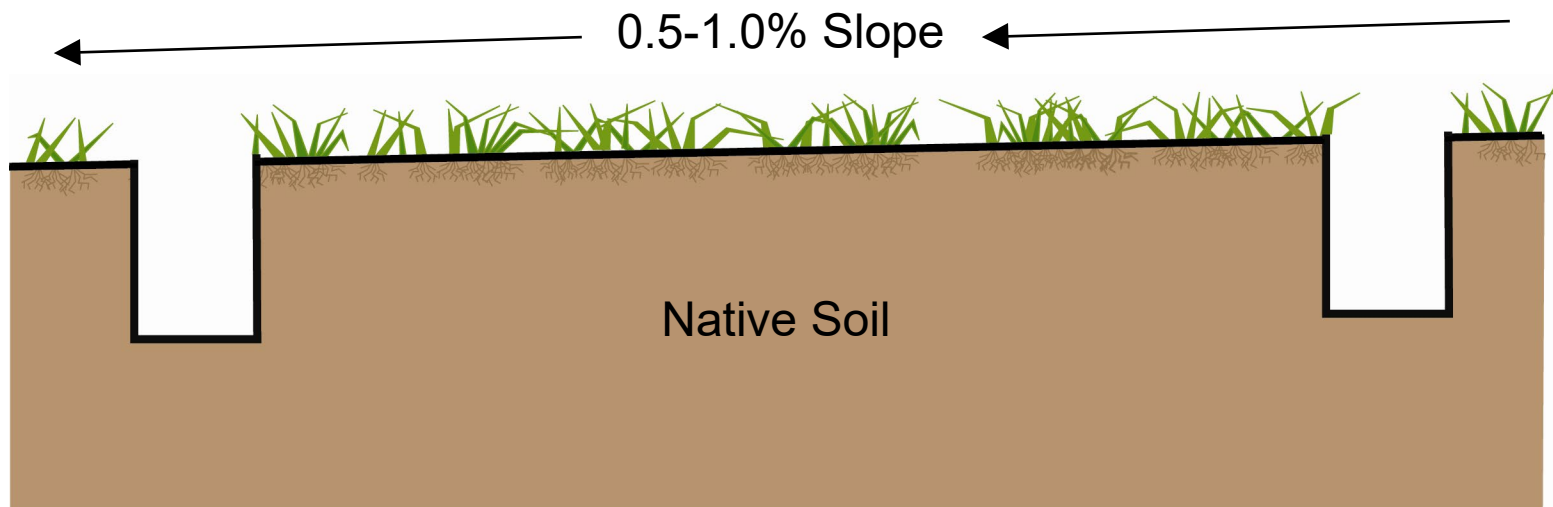




Native Soil Athletic Fields

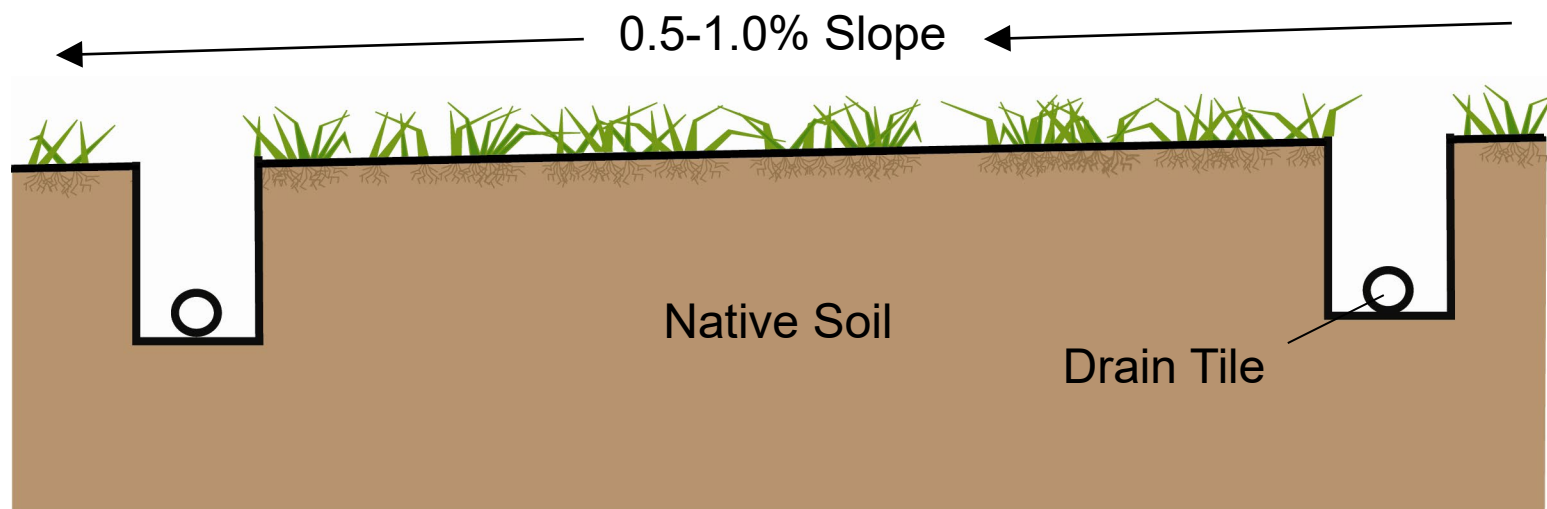


Cut Drain Lines



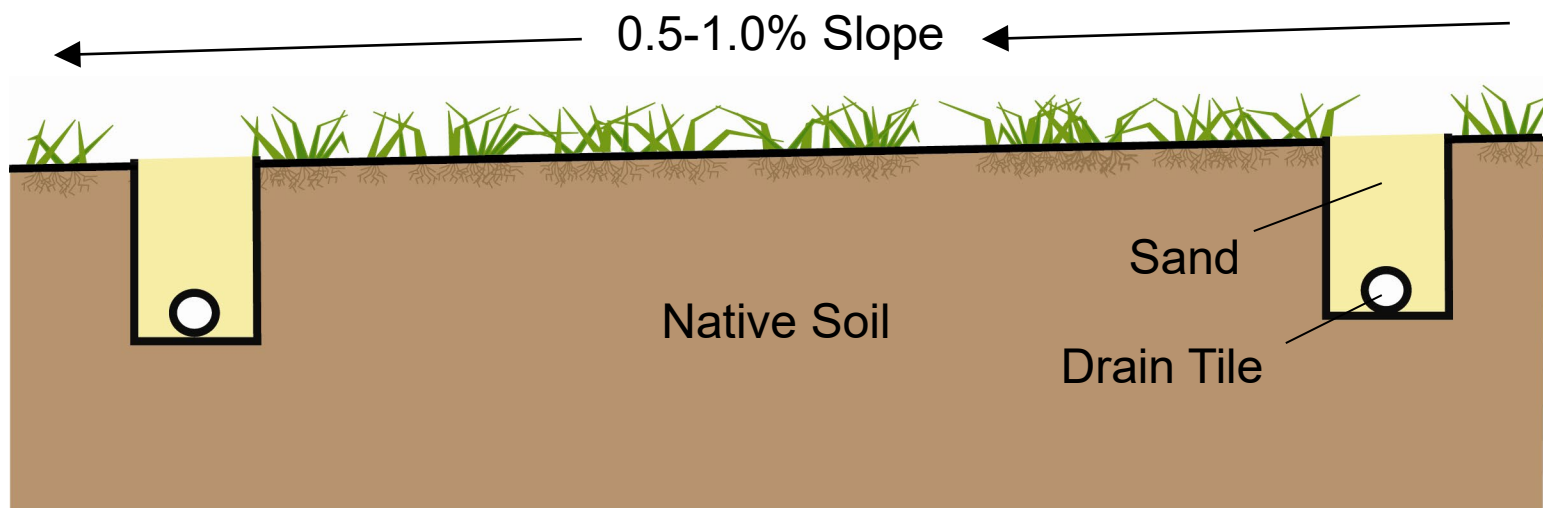


Install Drain Tiles

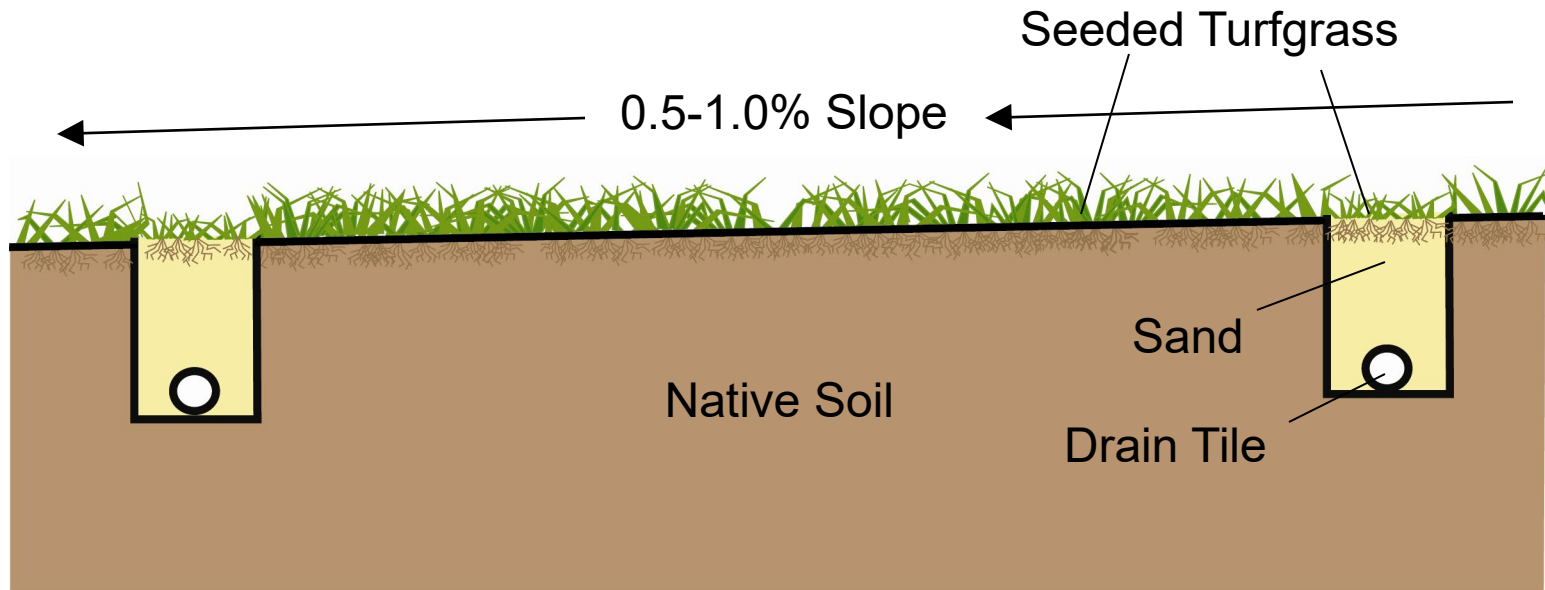




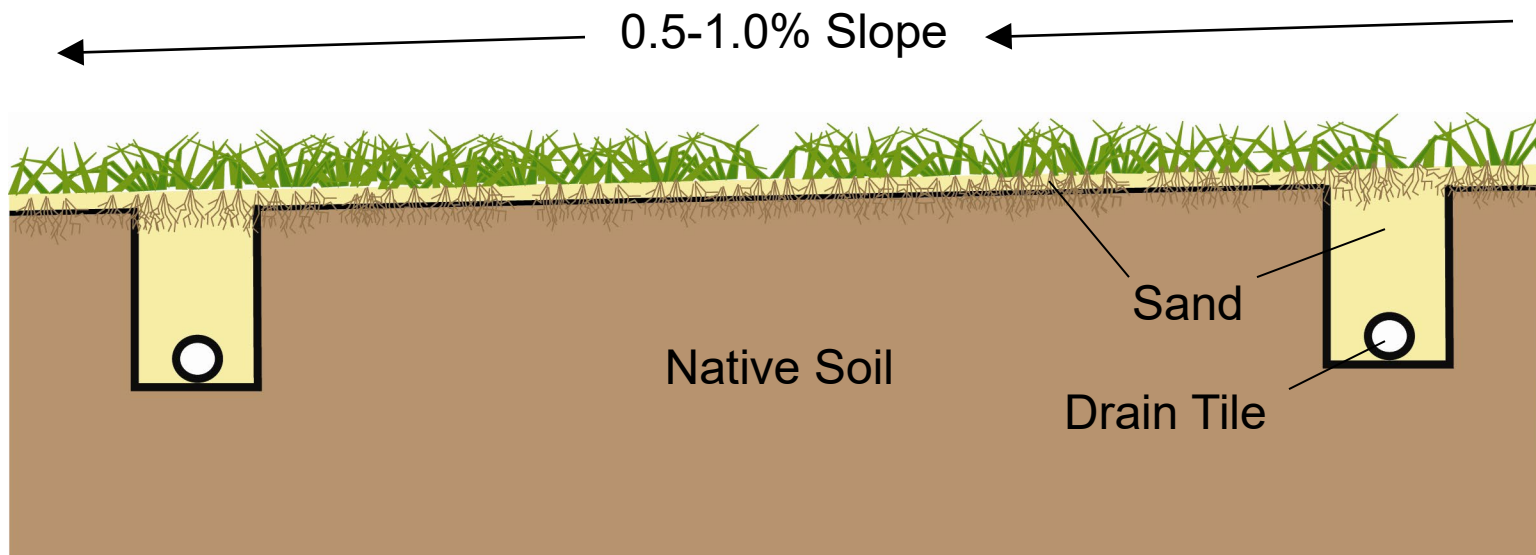
Fill Drain Lines with Sand



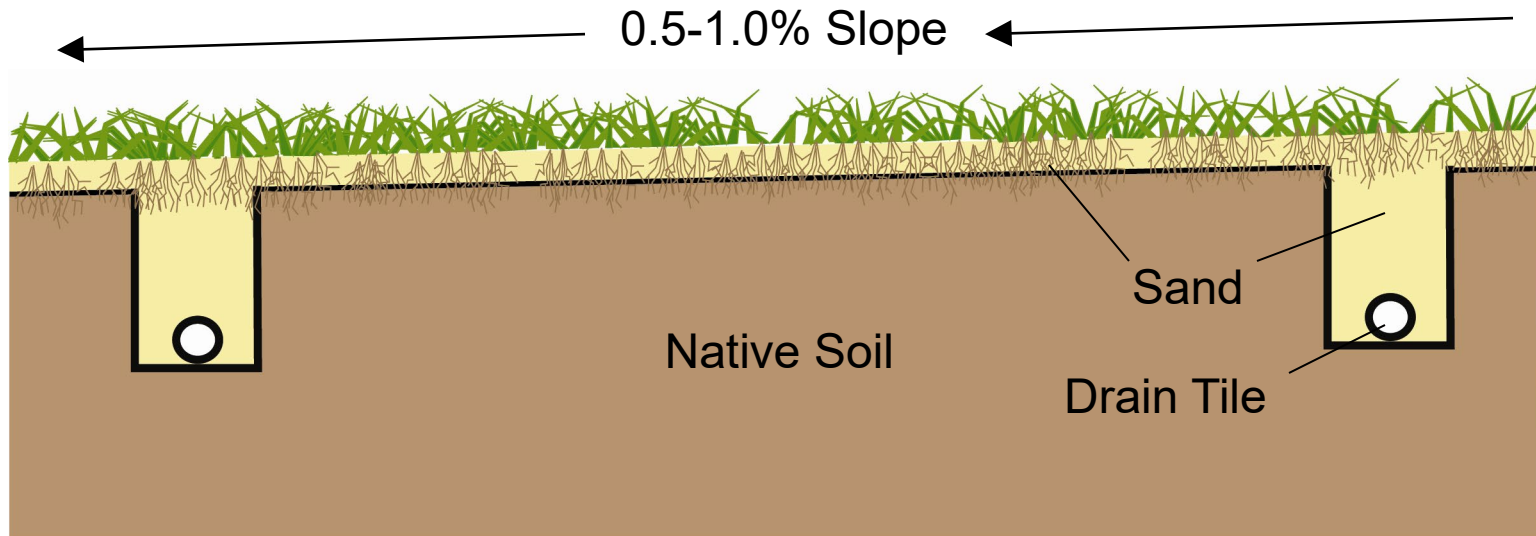
Inter-seed



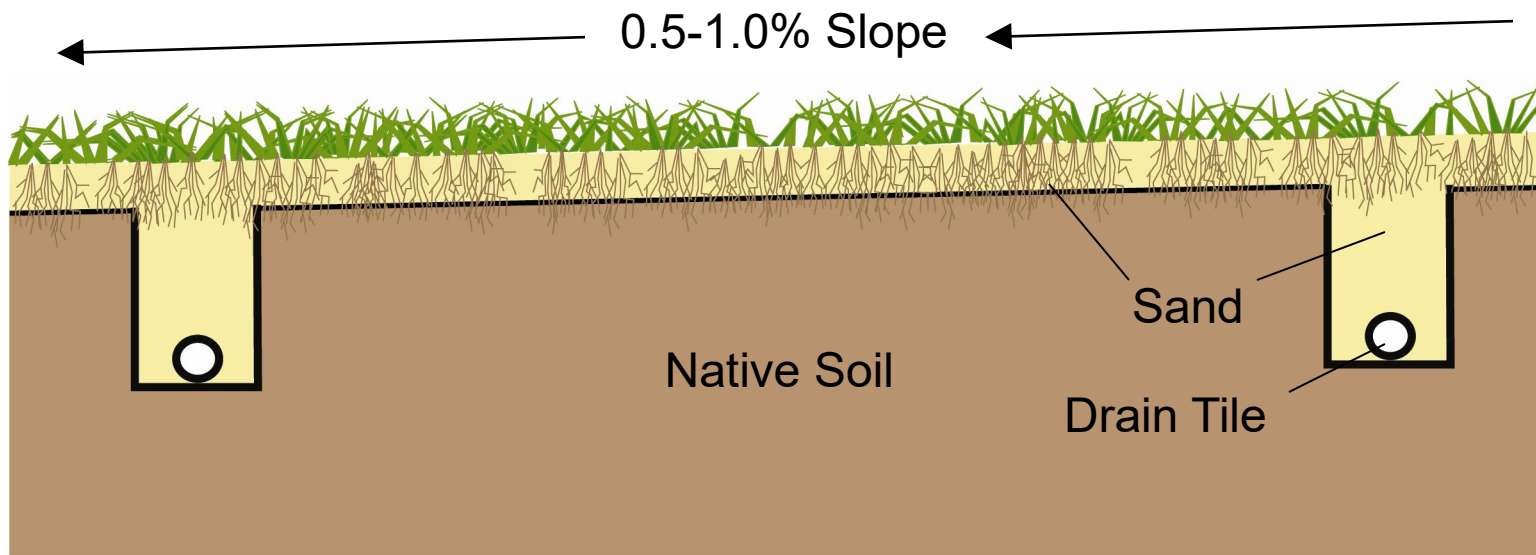
Sand Topdressing #1



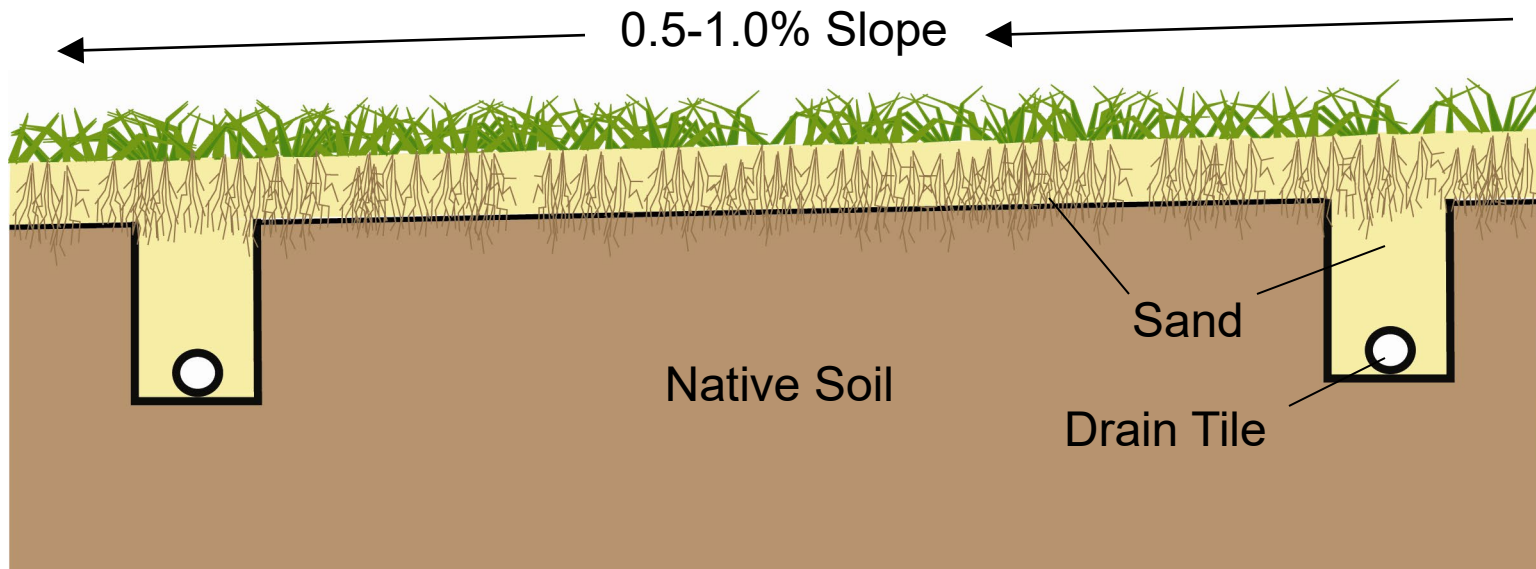
Sand Topdressing #2



Sand Topdressing #3



Sand Topdressing #4



Sand Topdressing



- “In fact, Old Tom Morris began to apply sand to his greens in 1875 to make them firm and smooth.”
 - Golf Course Superintendents Association of America, 2003.





There are relatively few new ideas, only technology to carry the original ones forward.

- 
- 
- Sand Topdressing
 - Drainage





Built-up Sand-capped System

■ Benefits

- Field is never totally out of play
- Reduced installation cost



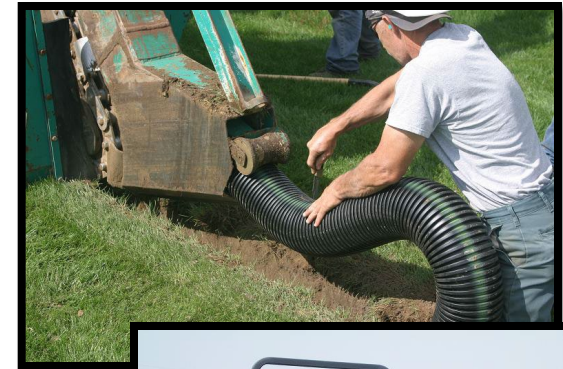
Built-up Sand-capped System

- Synthetic field
 - \$800,000 - 1,200,000
- Conventional sand-based system
 - \$600,000 - 800,000
- Sand-capped system
 - \$400,000 - 500,000
- Built-up sand-capped system
 - **\$250,000**



Built-up Sand-capped System

- Irrigation system
 - \$30,000
- 6.0 ft. drain tile spacing
 - \$70,000
- 6 in. sand topdressing
 - \$144,000
- Local professionals





The Built-Up Sand-Capped Athletic Field System

A. R. Kowalewski, J.N. Rogers, III, and J. R. Crum
Crop and Soil Sciences Department
Michigan State University

Questions



Questions



- How much sand can be applied in a single topdressing application?



Questions



- How much sand can be applied in a single topdressing application?
- How many annual topdressing applications can be made?



Walnut Hills Country Club
Private



7.5 cm in 30 yrs



7.5 cm in 3 yrs

Questions



- How much sand can be applied in a single topdressing application?
- How many annual topdressing applications can be made?
- Can field use continue throughout the topdressing process?



**PLEASE!
KEEP OFF
PLAYING SURFACE**

**Thank you for helping to ensure the
well-being of our student athletes**

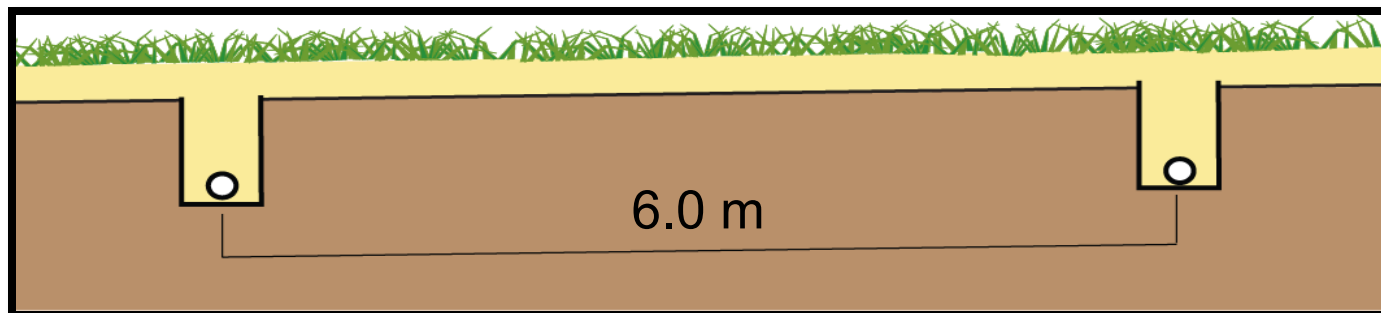
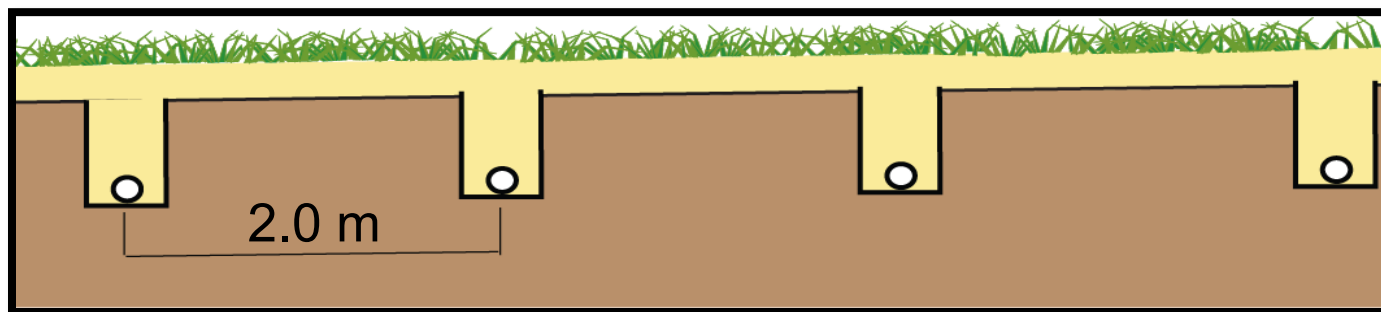
Questions



- How much sand can be applied in a single topdressing application?
- How many annual topdressing applications can be made?
- Can field use continue throughout the topdressing process?
- When sand topdressing is included, what drain tile spacing is necessary to provide a dry and stable playing surface?

Current Recommendations

- Increase drain tile spacing
- Reduced sand topdressing depth
 - Further reduction in renovation cost



Questions



- How much sand can be applied in a single topdressing application?
- How many annual topdressing applications can be made?
- Can field use continue throughout the topdressing process?
- When sand topdressing is included, what drain tile spacing is necessary to provide a dry and stable playing surface?



Questions

- Experiment 1
 - How much sand can be applied in a single topdressing application?
- Experiment 2
 - How many annual topdressing applications can be made?
 - Can field use continue throughout the topdressing process?
- Experiment 3
 - When sand topdressing is included, what drain tile spacing is necessary to provide a dry and stable playing surface?



Overall Conclusions

- As much as 0.33 in. of topdressing can be applied in a single application.
- 0.5 inch of topdressing accumulated over a 5 week period, in the summer, will provide the optimum fall turfgrass wear tolerance and surface stability.
- Summer traffic applied to a newly established turfgrass stand, while being topdressed, will decrease fall surface shear strength.
- A drain tile spacing of 13.0 ft. apart will provide a dry and stable playing surface when 1.0 in. of topdressing has been accumulated.
- When 2.0 in. of sand topdressing has been accumulated, and a adequate surface slope is available ($\geq 1\%$), drain tile spacing can be increased to distances greater than 20 ft.

Overall Conclusions

- New recommendations

- Irrigation system

- \$30,000

- 13 ft drain tile spacing

- \$35,000

- 2.0 in. sand topdressing

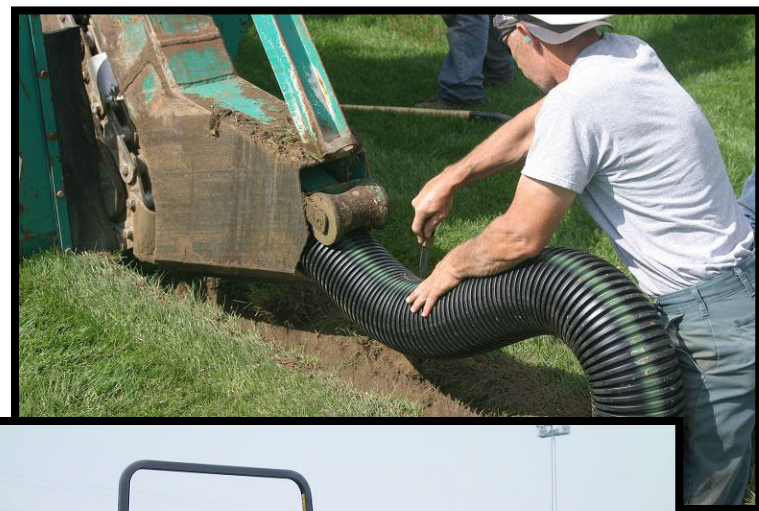
- \$48,000

- Total

- \$118,000

- Old recommendations

- \$250,000



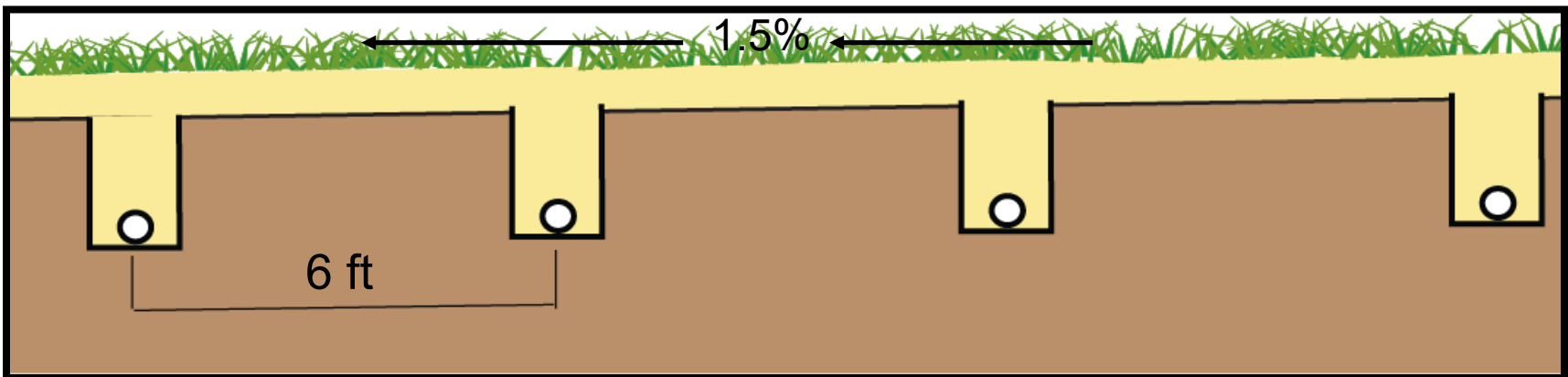
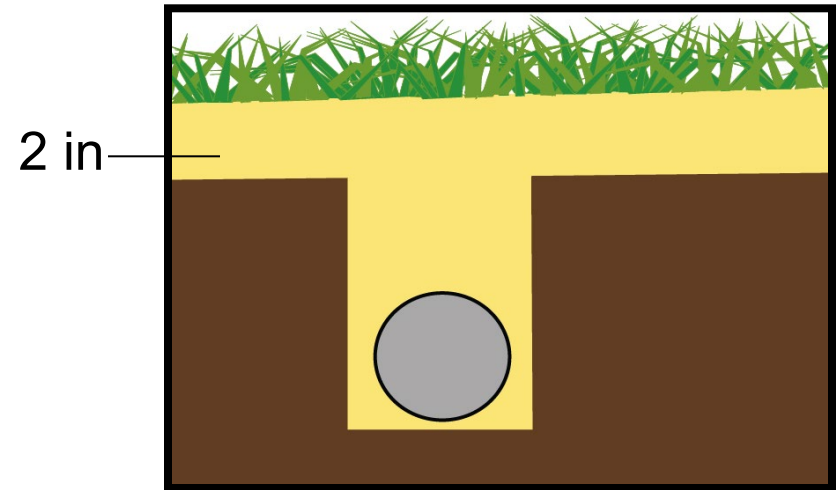
Case Studies



Grand Blanc High School



■ May 2007



Grand Blanc HS – Dec. 2007



Grand Blanc HS – May 2009

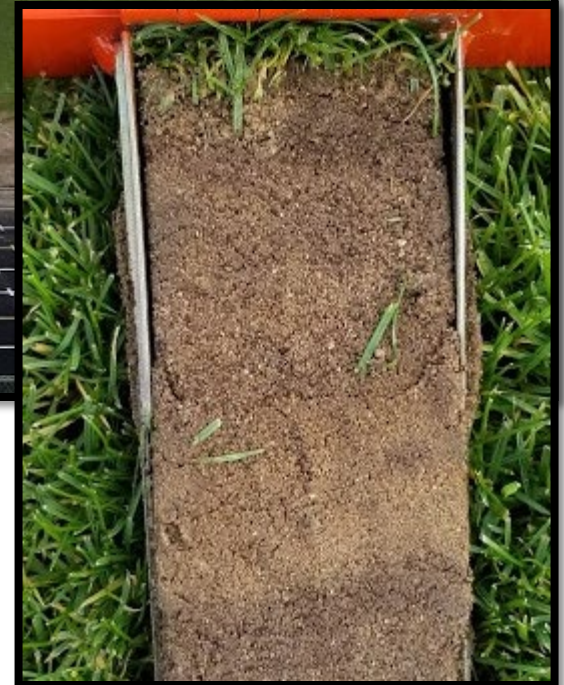


Grand Blanc HS – Nov 2017



Field Usage

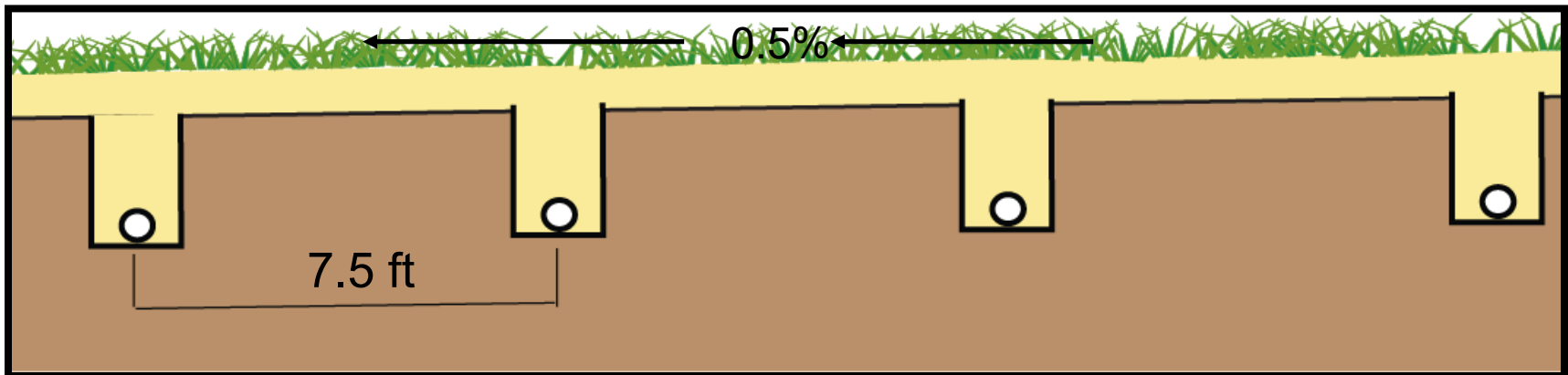
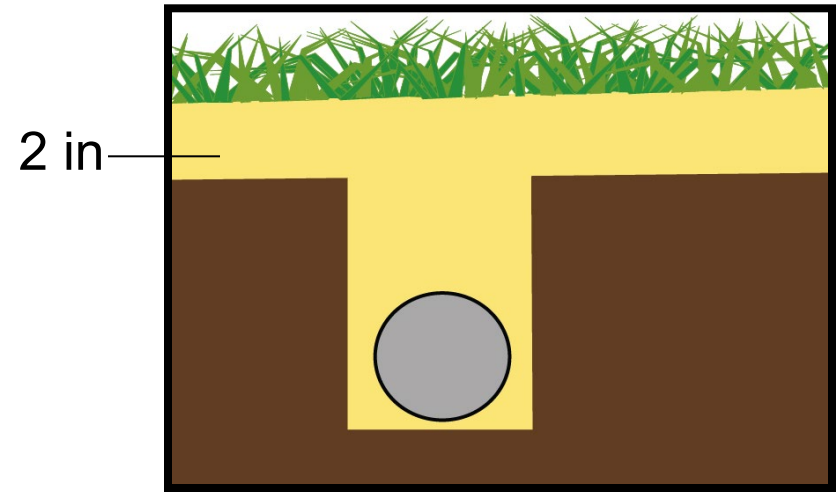
- 18 HS Football games
- 16 Youth Football games
- 30 Football practices
- 36 Band practices
- 30 Lacrosse games (SP)



Okemos High School



■ Aug. 2007



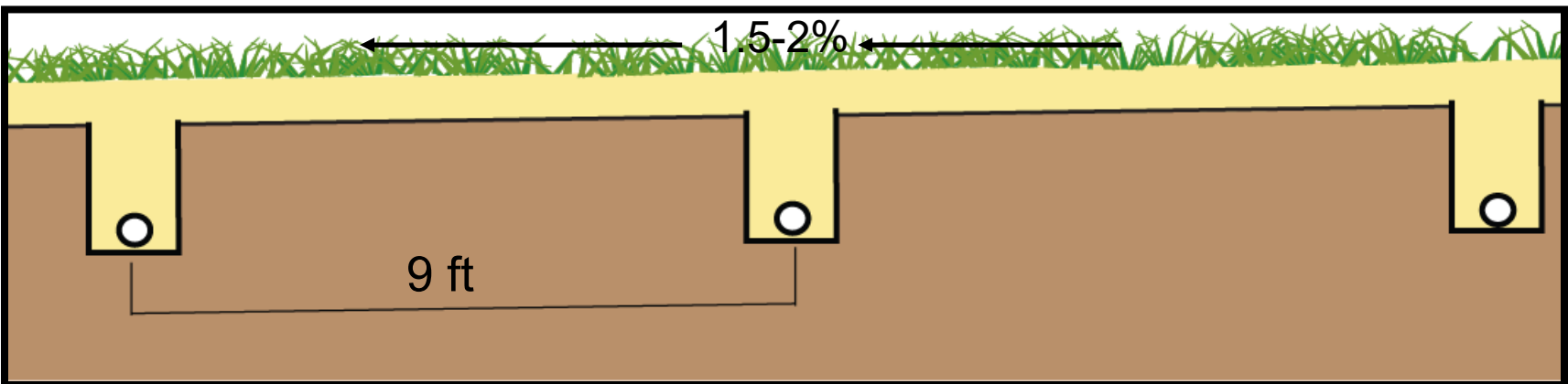
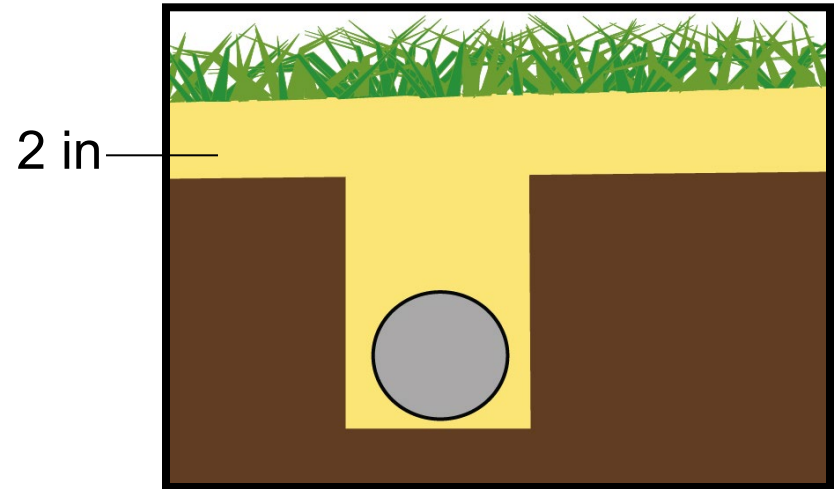
Okemos Practice Field - Nov. 3, 2008



Okemos High School



■ May 2008



Okemos Football Field – Oct. 27, 2009



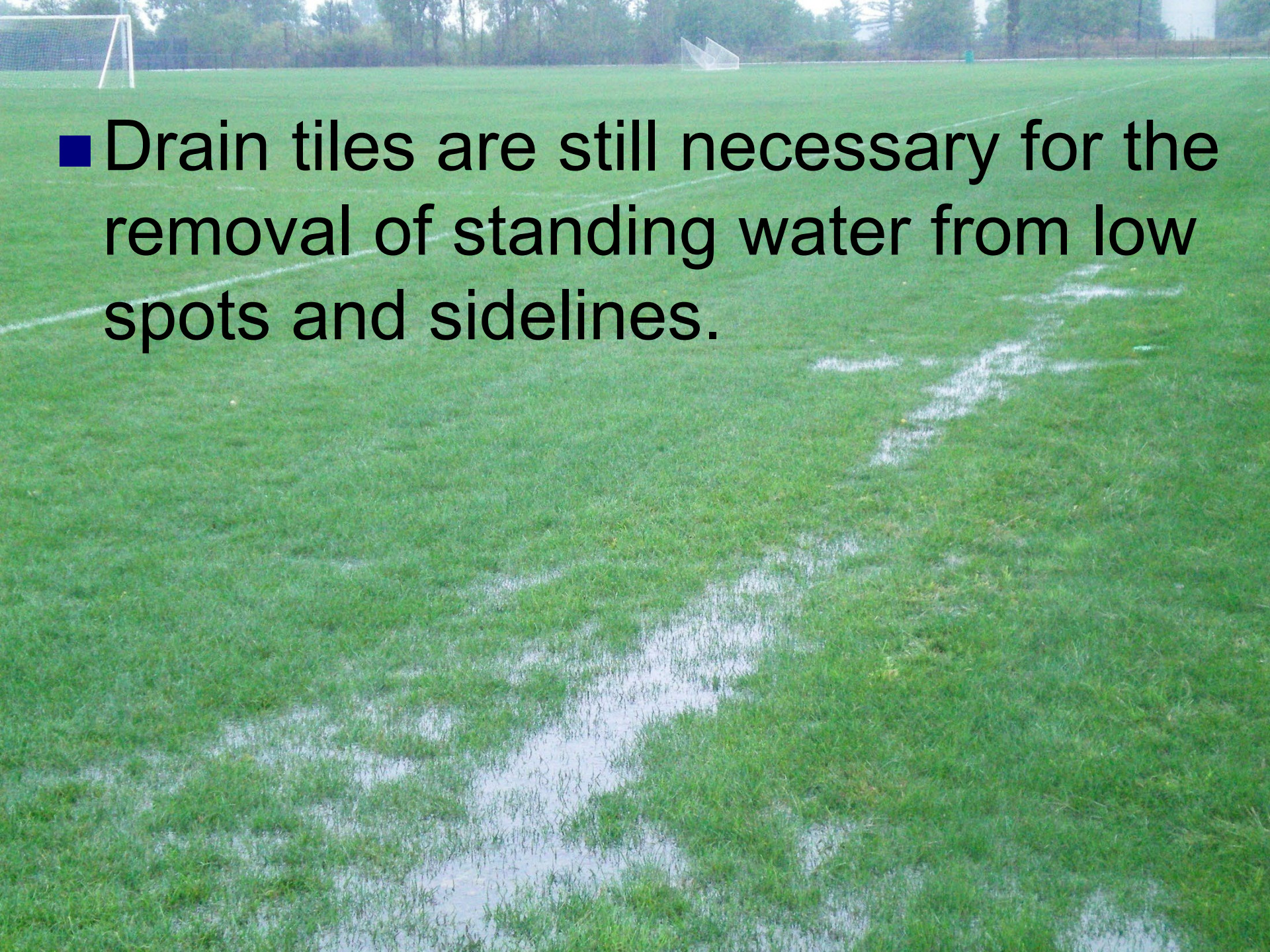
2008 Results



- Can topdressing alone provide an adequate playing surface without drain tile installation?



- Drain tiles are still necessary for the removal of standing water from low spots and sidelines.



Quantification of the Effect of Cultural Practices on Wear Tolerance of an Athletic Field



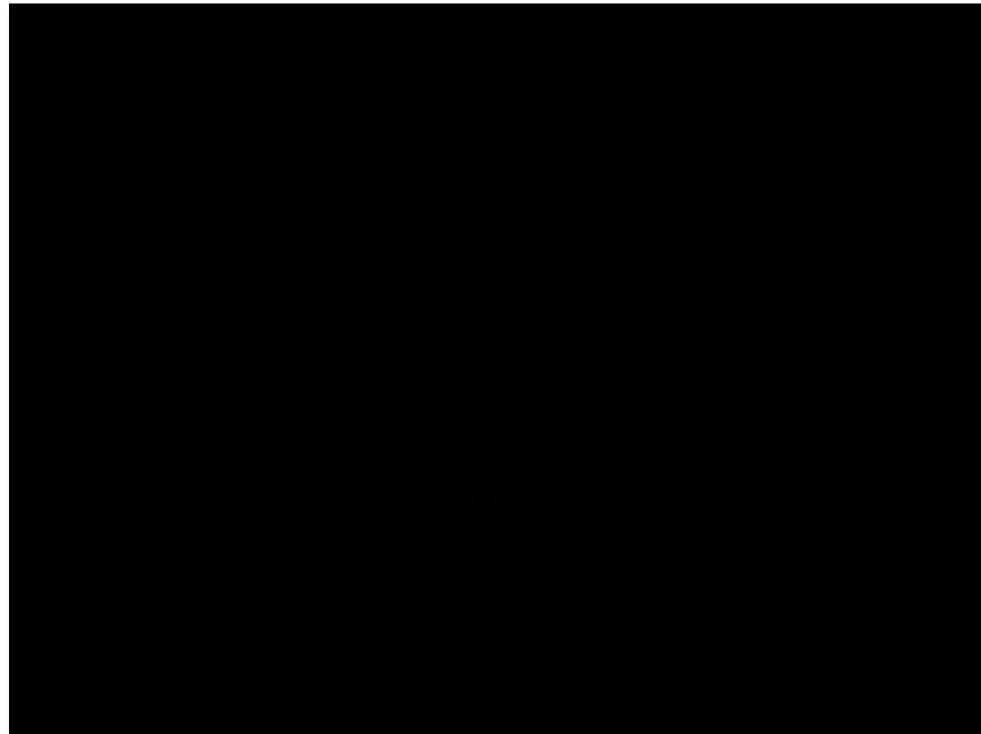
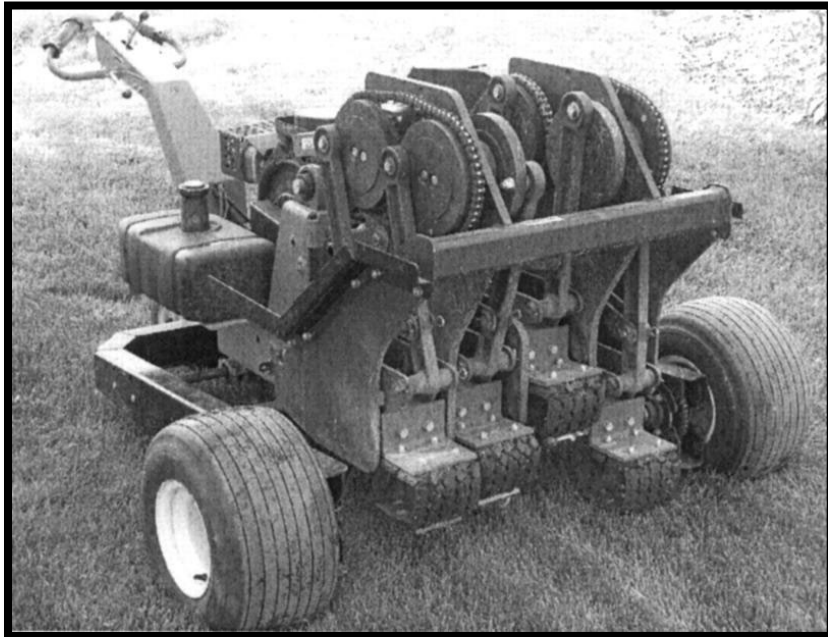
Lisa M. Lundberg, Graduate Assistant
Department of Crop and Soil Sciences
Michigan State University



An aerial photograph of a large green sports field, likely a soccer or football field, with white yard lines. In the background, there is a red brick building with several windows. The field is surrounded by a white fence, and there are trees and a parking lot visible in the distance. The text "How many games can I expect out of my field?" is overlaid in yellow on the field.

How many games
can I expect out of
my field?

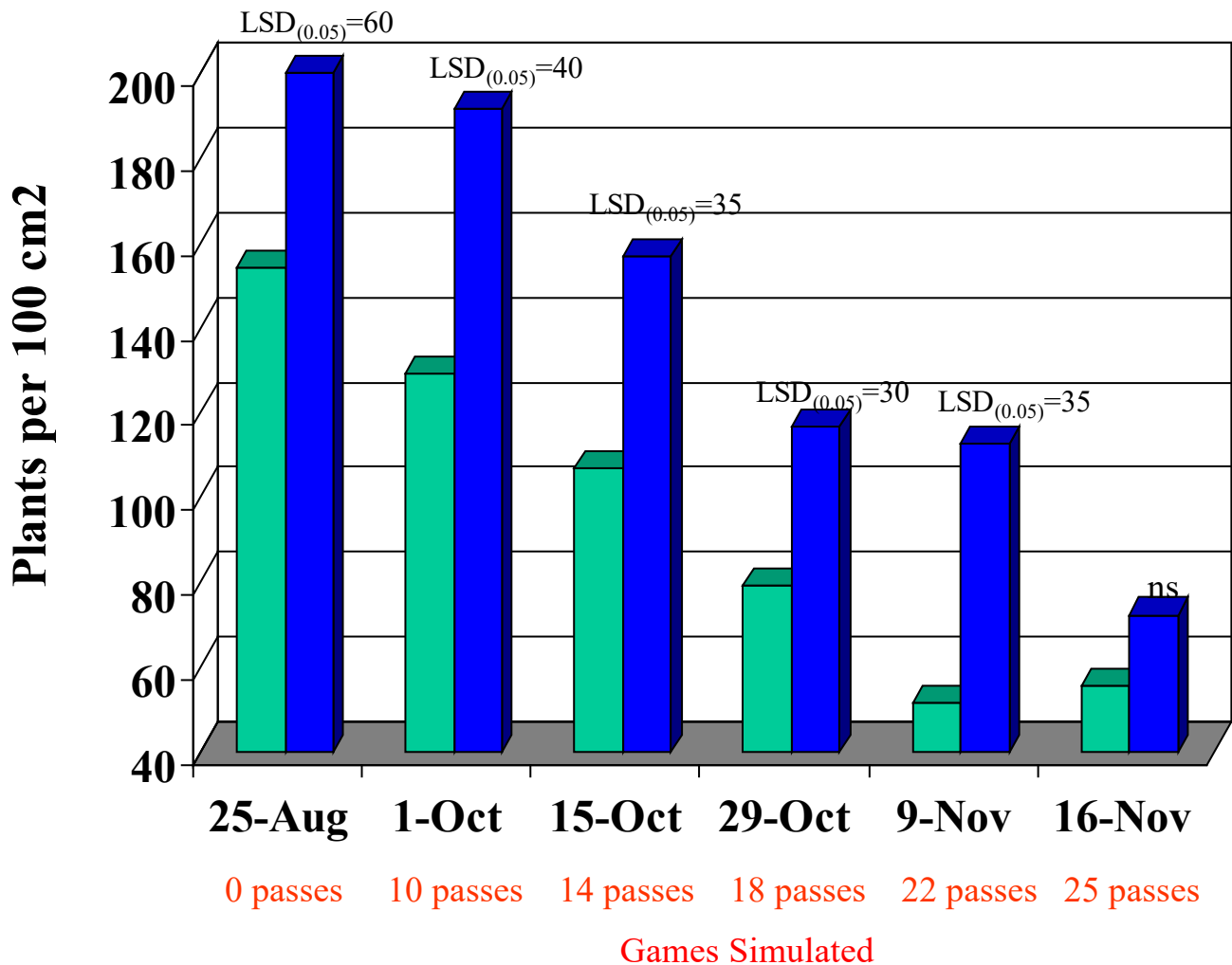
Cady Traffic Simulator



Effect of Cultural Practices and wear on Plant Counts



Cady traffic simulator




- Low mow, Low infrequent fert., Low cult.
- High mow, High fert., High cult.

Effect of Fertilization, Mowing Frequency and Cultivation on Number of Simulated Football Games with Acceptable Turf Cover


**Medium Fert.
Infrequent
Mow 1x/week
5# N/M/YR
\$2,686**

	1	1			1	1	1
April	May	June	July	Aug	Sept	Oct	Nov




**High Fertility
Mow 2x/week
Cultivation 2x
5# N/M/YR
\$5,377**

1	1	1	1	1	1	1	1
April	May	June	July	Aug	Sept	Oct	Nov




**Medium Fert.
Infrequent
Mow 1x/week
5# N/M/YR
\$2,686**

	1	1			1	1	1
April	May	June	July	Aug	Sept	Oct	Nov



**High Fertility
Mow 2x/week
Cultivation 2x
5# N/M/YR
\$5,377**

1	1	1	1	1	1	1	1
April	May	June	July	Aug	Sept	Oct	Nov



Simulated Football Games



MOWING

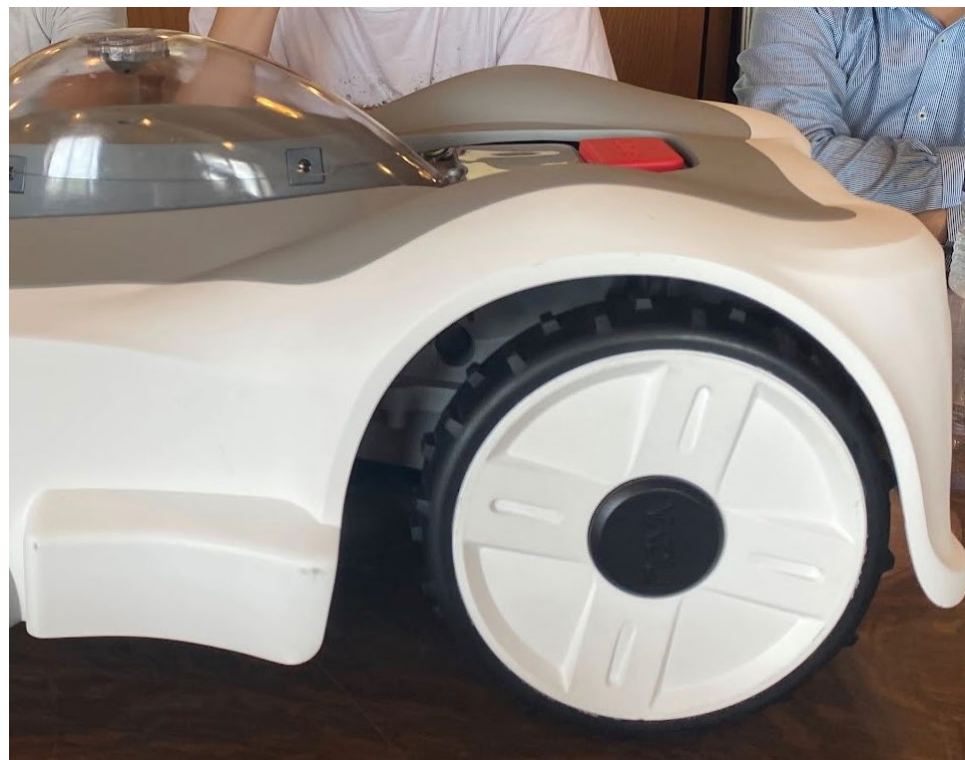
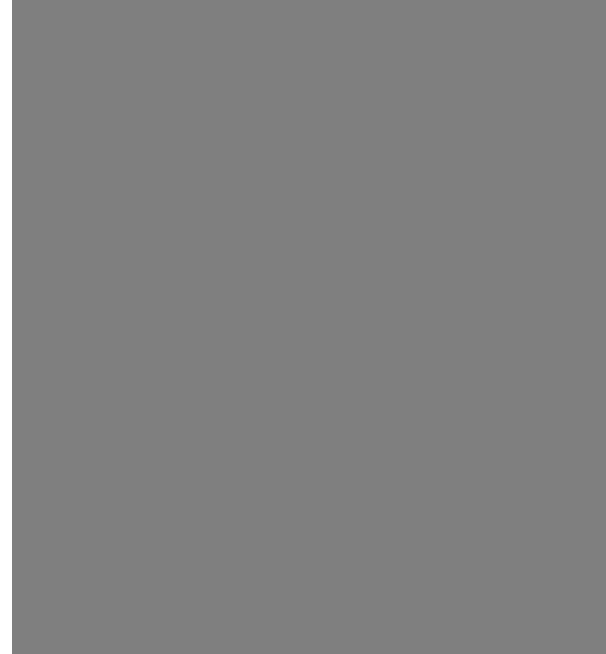


Robotic Mowing



www.selfguidedsystems.com









HUSQVARNA
AUTOMATIC

300 YEARS
INNOVATION
HUSQVARNA

Wasserman
3/2/14



Barton Hills CC – April 2024





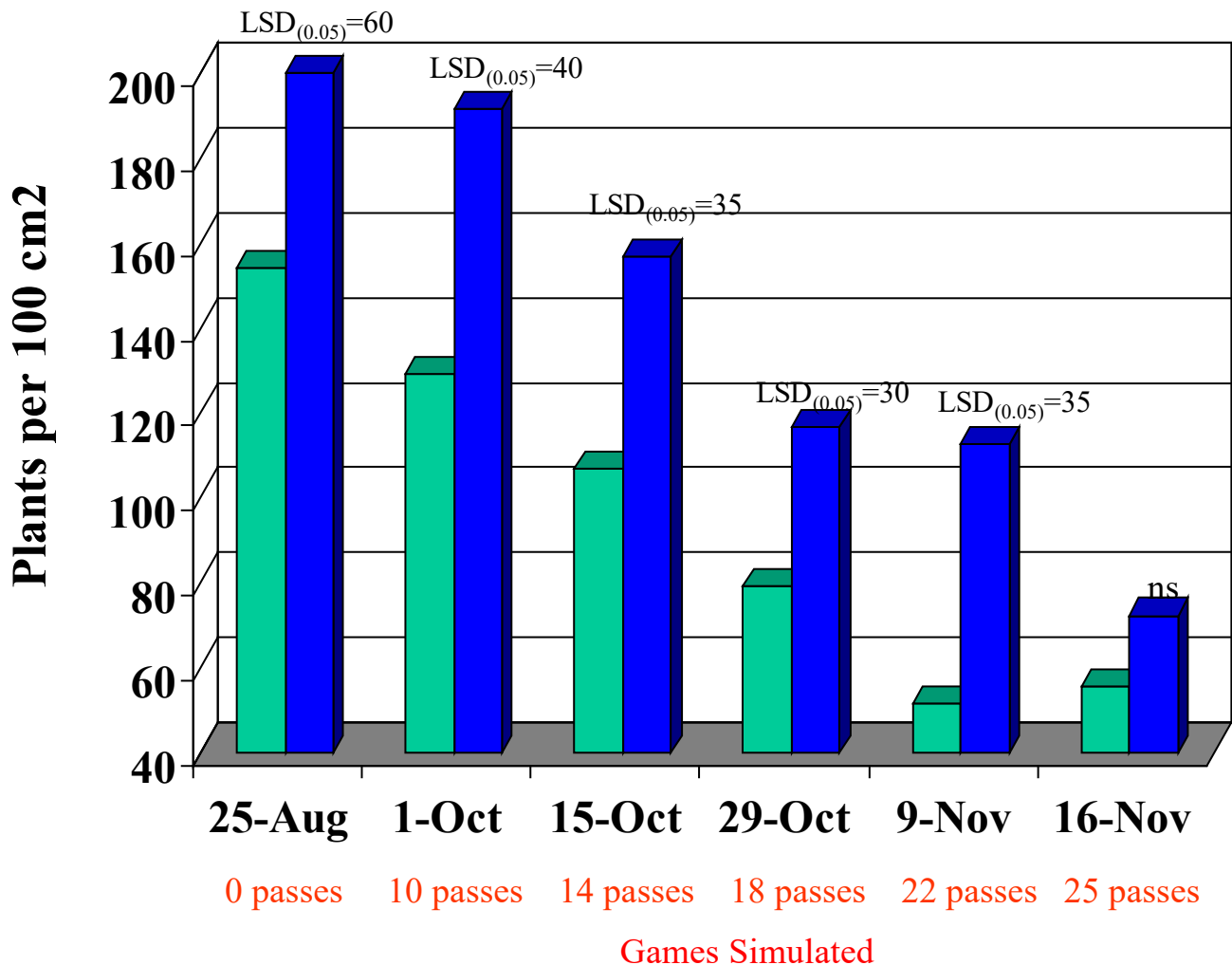


Autonomous Mowing

Effect of Cultural Practices and wear on Plant Counts



Cady traffic simulator



- Low mow, Low infrequent fert., Low cult.
- High mow, High fert., High cult.



Thank you.



The Built-Up Sand-Capped Athletic Field System

J.N. Rogers, III
Plant, Soil and Microbial Sciences
Michigan State University