

Optimizing Rootzone Conditions:

Warmed Air, Air Consistency, & Pipe Technology

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Agenda/Learning Objectives

- Discuss Forced Air Systems Evolution
- Convey Key Benefits of Vacuum/Ventilation and Soil Warming Technology
- Explain How Vacuum/Ventilation and Soil Warming Systems Benefit the Natural Grass Playing Surface

What Impacts Air & Water Movement Through the Soil Naturally?



Soil profile picture 2018 - Amy Fouty

Air Movement

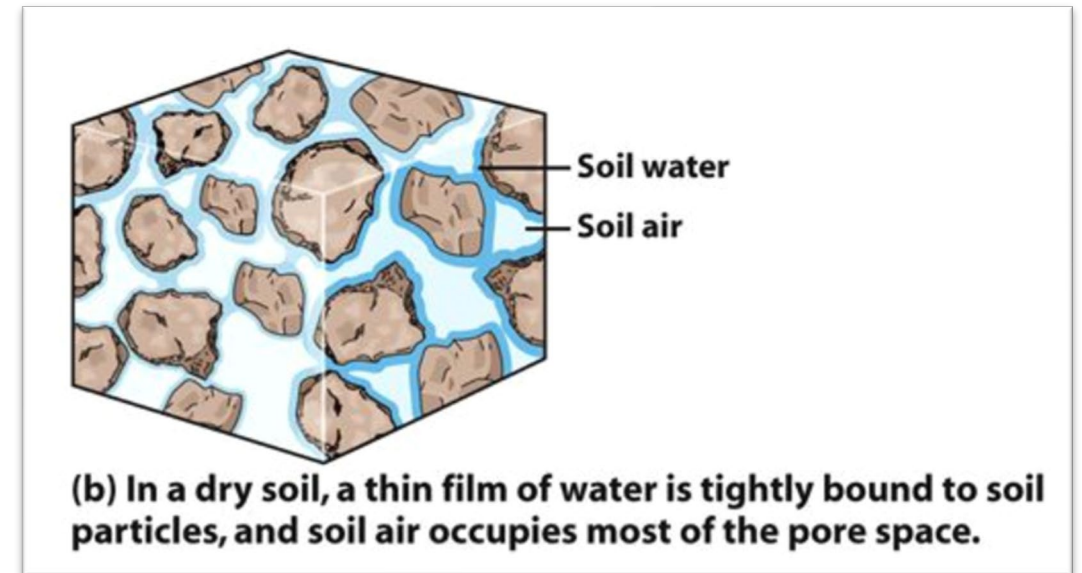
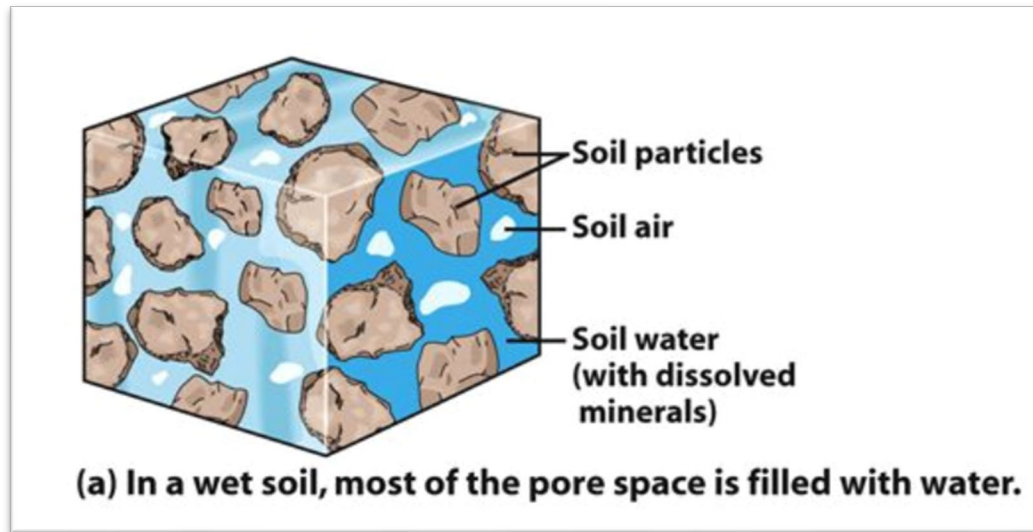
Water Movement



Soil profile picture 2019 - Amy Fouty

How Does Air Move Through the Soil Naturally?

Diffusion- dynamic processes within the soil



Why is Soil Aeration Important ?

- Exchange of gases in the soil
 - Example: O₂, CO₂
- Grass and Microbes need O₂

Typical Mechanical solution:

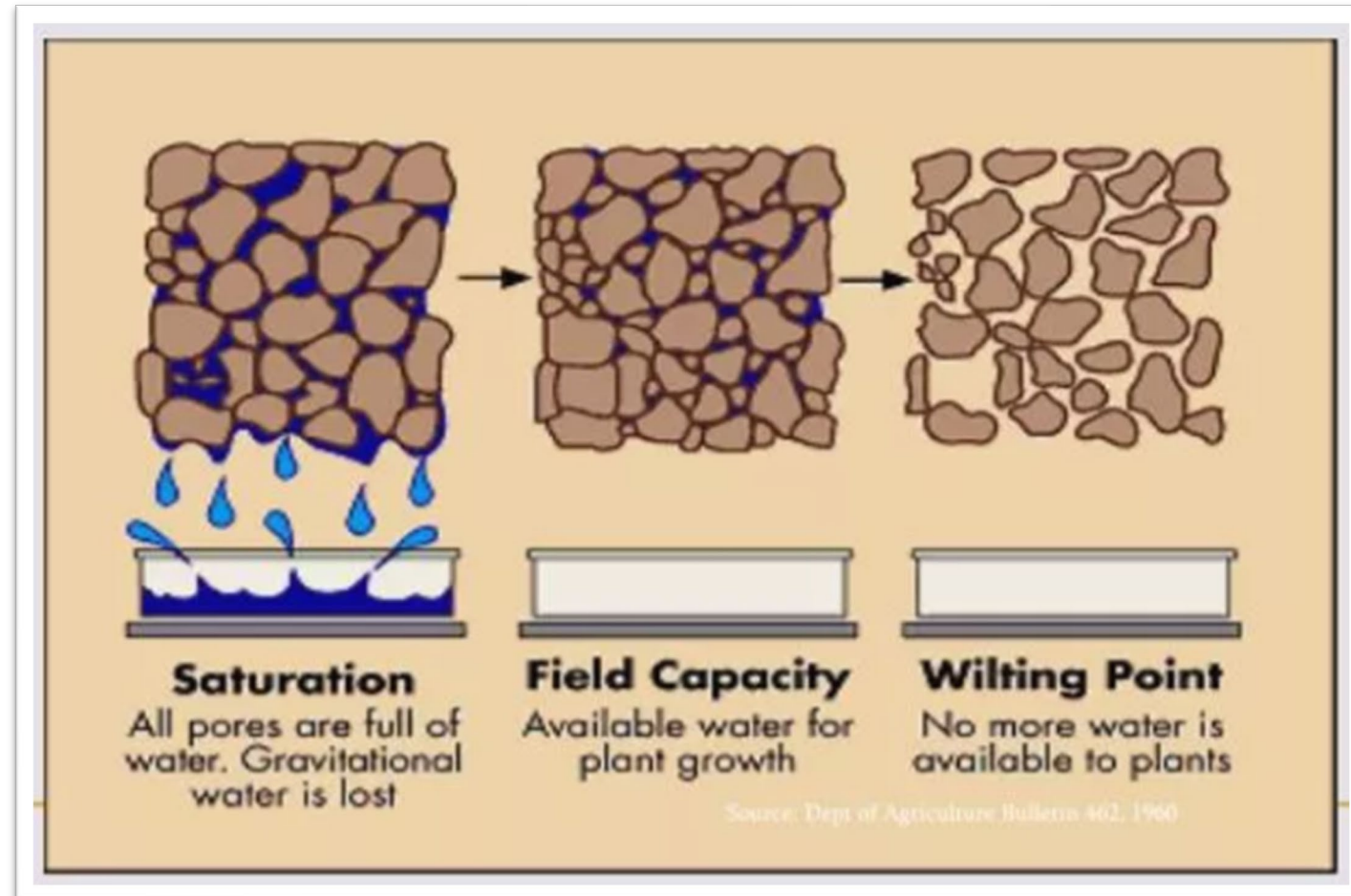
- Aeration methods



Field aerations pic 2009, Amy Fouty

How Does Water Move Through the Soil Naturally?

- Water percolates through the soil
- Pore space
 - Gravity - macro
 - Adhesion – micro



Why is Proper Moisture Management Important?

- Maintain proper soil and plant health

Solutions

- Proper Irrigation
- Cultivation
 - Create channels
 - Relieves compaction



Soil profile pictures 2016- Amy Fouty

Why Vacuum/Ventilation Systems

Facility Event Load

- Naturally does not occur fast enough for the facility usage
 - Playability
 - Safety
 - Agronomic



Evolution of Rootzone Management Systems



Courtesy Purdue University Libraries, Archives and Special Collections

Evolution and Innovation

1970'S

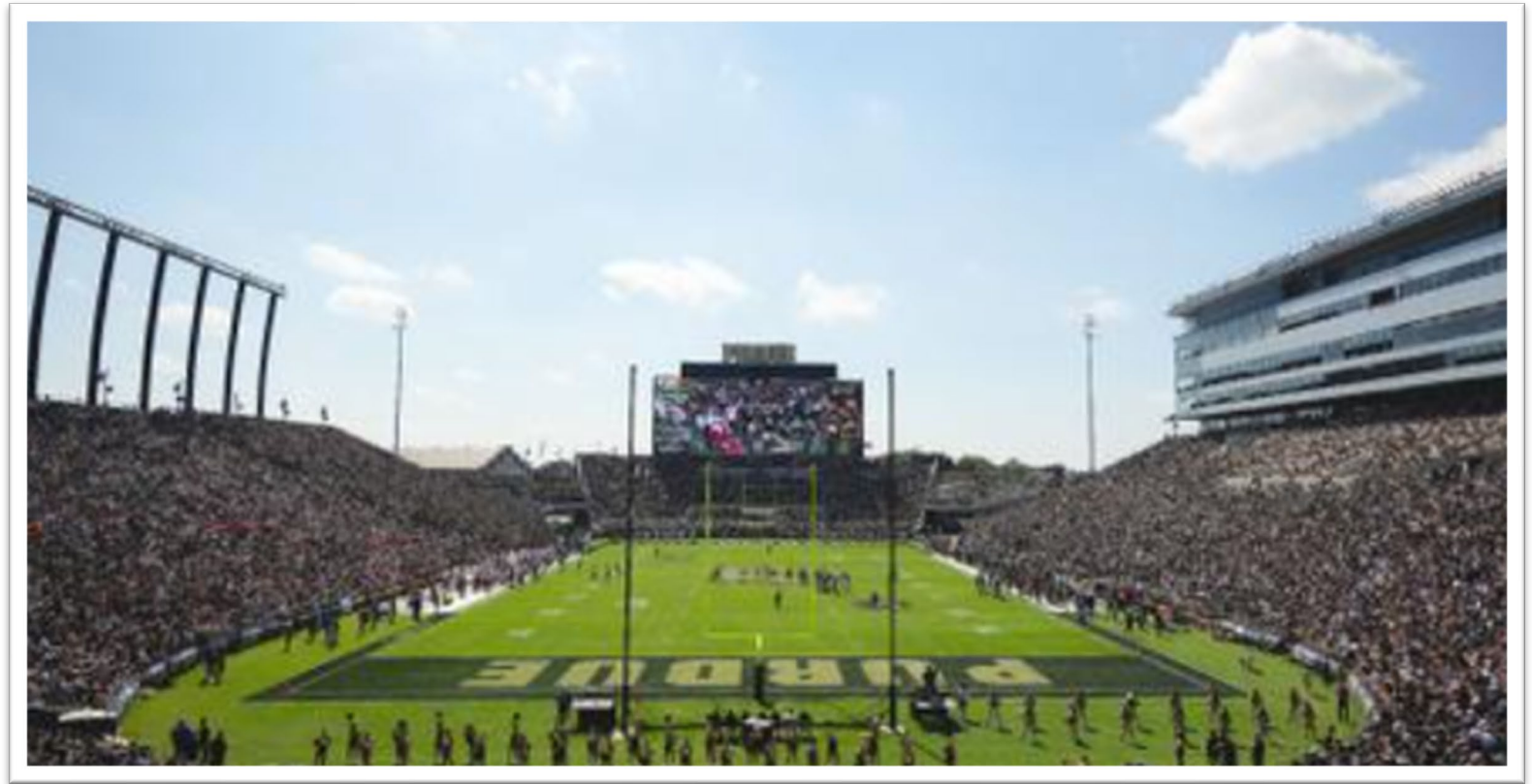
- Dr. Bill Daniel
 - Sports turf researcher and SFMA founder
- Enhanced drainage
- Extended playability
- Safety
- Information



Evolution and Innovation

1970'S

- Vacuum drainage
- Water conservation
- Subirrigation
- Moisture sensors
- Automation



Ross-Ade Stadium

Evolution and Innovation

Mid 1970s - Early 1990s

Purdue University '74

RFK Stadium '75

Cincinnati Bengals '83

Soldier Field '88

Michigan Stadium '91

Camden Yard '92

Mile High Stadium '75

Orange Bowl '76

Fulton County Stadium '87

Ohio Stadium '90

Bryant Denny Stadium '91

Klockner Stadium '92

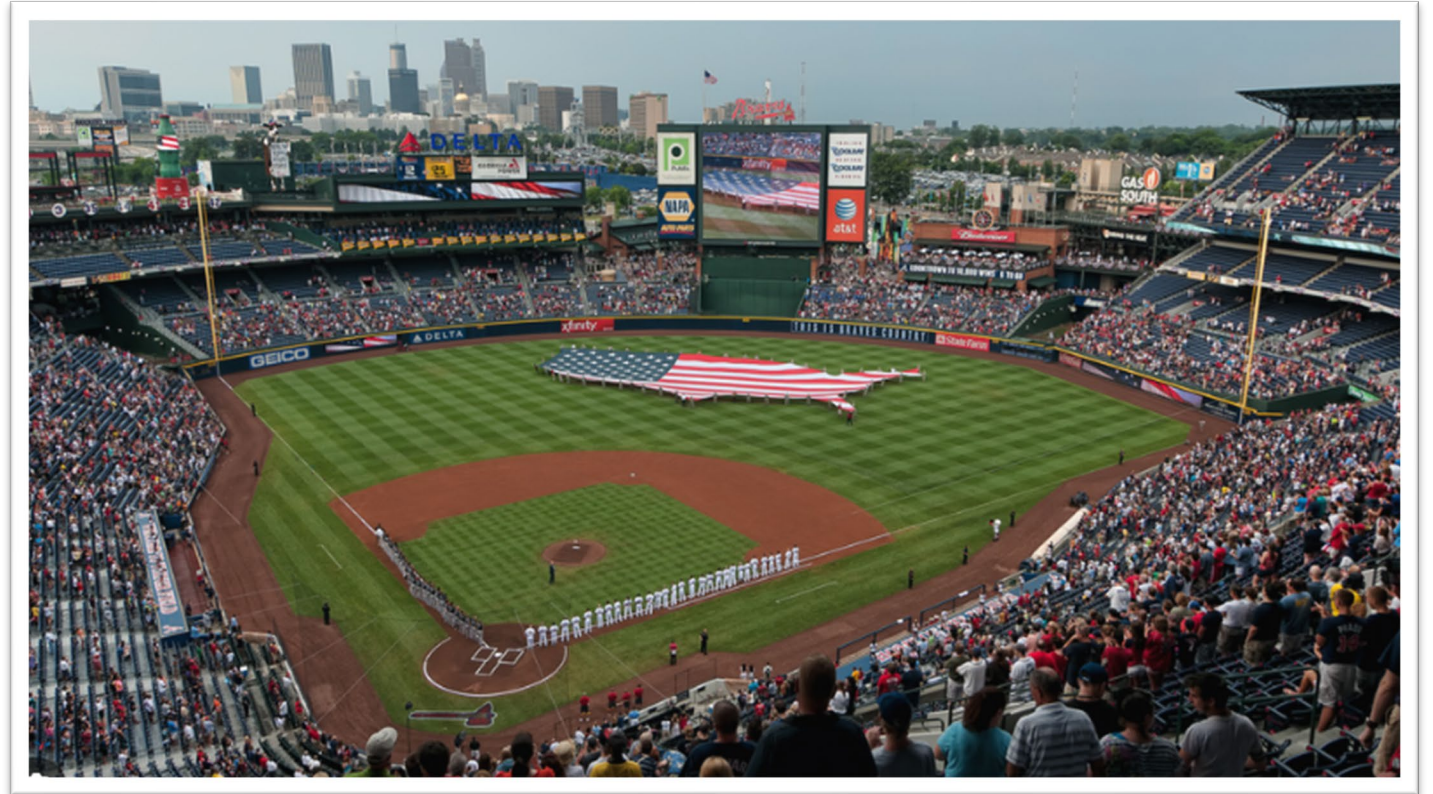


RFK Stadium

Evolution and Innovation

Mid '90s

- ADS N12, AdvanEdge
- Vacuum
- Soil sensors
- Control software
- User interface



Turner Field, 2010 Mark Whitt Photography

Evolution and Innovation

1990s

- Vacuum/ventilation introduced at Augusta National Golf Course



Augusta National Golf Course

Evolution and Innovation

2000s

- Vacuum/ventilation introduced into sports fields
- Direct fired furnace for rootzone warming

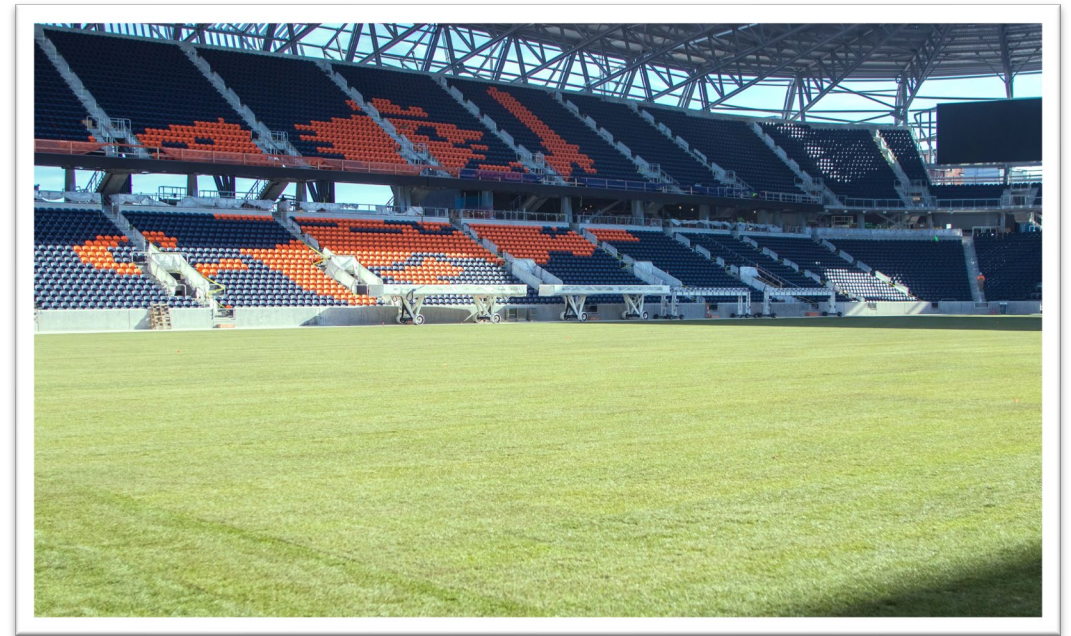


Haymarket Stadium, Nebraska

Evolution and Innovation

2010's

- Thermodynamic-generated heat for rootzone warming
- Advances in wireless soil sensing
- Control software upgrades, graphic interfaces



TQL Stadium, John Thorne

Evolution and Innovation

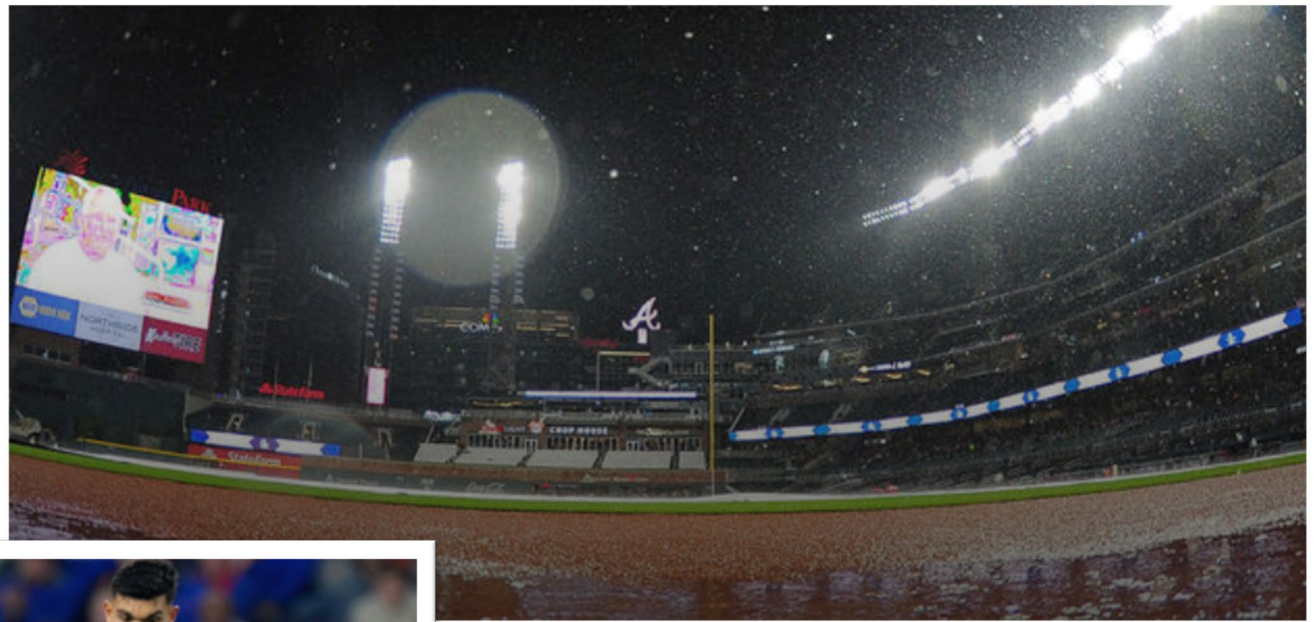
2020's

- Remote access, user platforms
- Further integration with ancillary systems
 - Hydronic, electric soil heating
 - Building Management Systems (BMS)
- Regarded as a must-have



Columbus Crew Stadium, Ryan Margraf

Benefits & Considerations



Why is Vacuum/Ventilation Important?

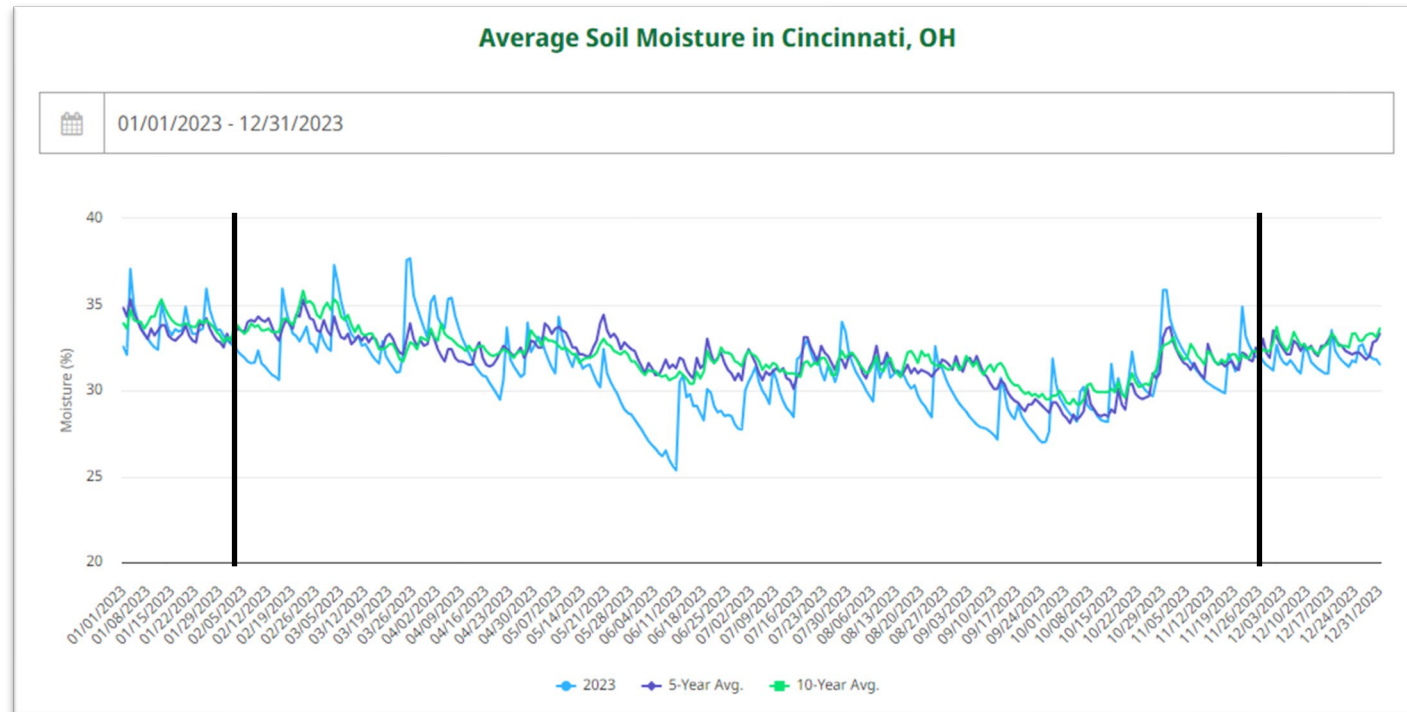
More tools in the Toolbox

- Process of gravity drainage to game ready field can take x amount of days
- Weather pattern changes
- Multi use stadiums less time to prepare
- Playing field expectations



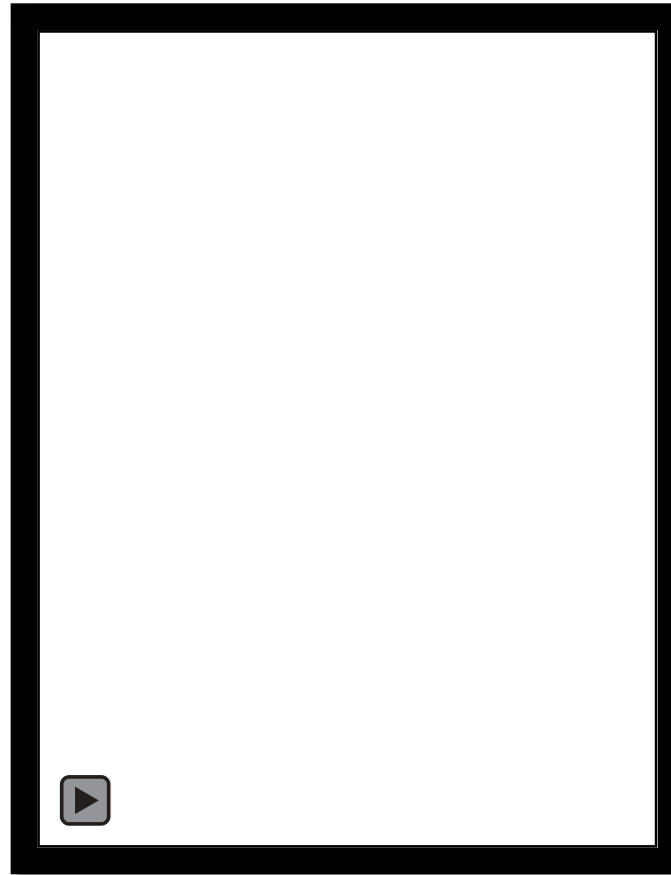
Benefits of Vacuum

Playability & Consistency



Vacuum

Typical Sports
Field Construction



Sand

Gravel

Sub soil

Gardner Water Movement Films, 1956

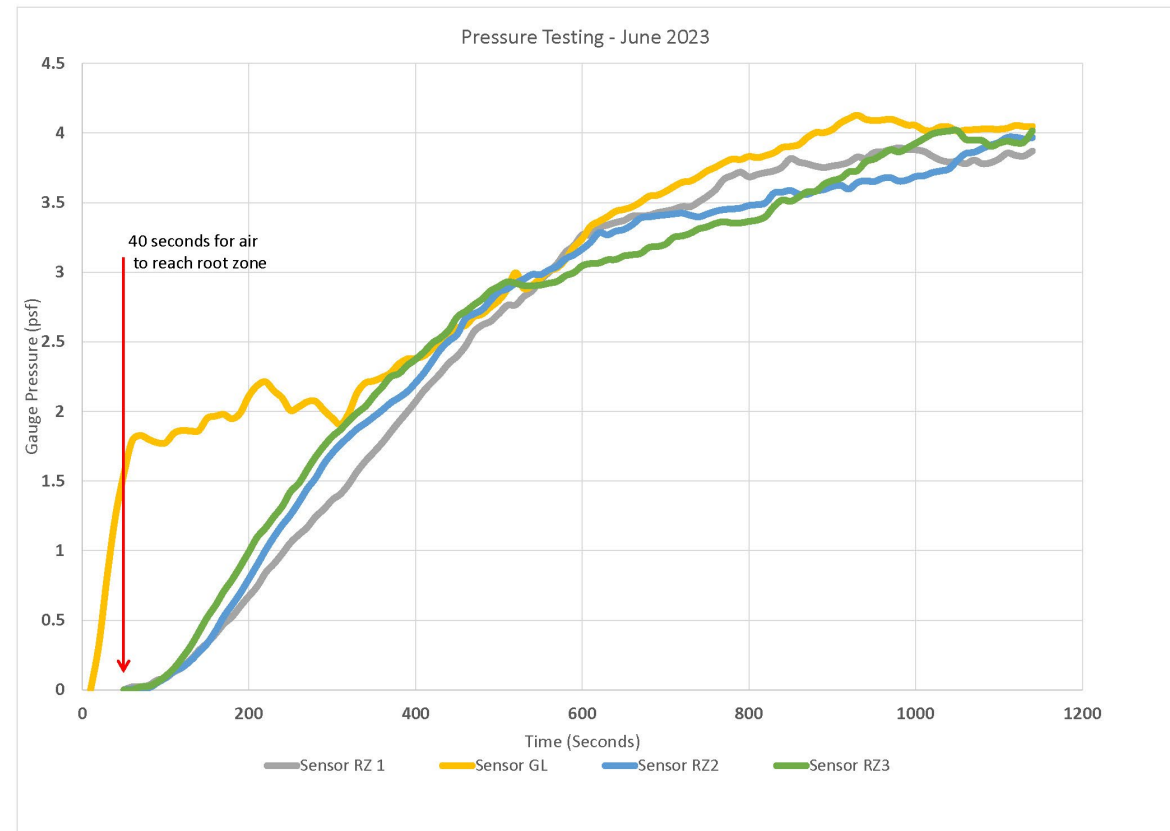
Benefits of Ventilation

- Increased and supports gas exchange for healthy soils
- Optimize
- Eliminate condition that lead to black layer
- Rootzone health
- Microorganism health



Ventilation

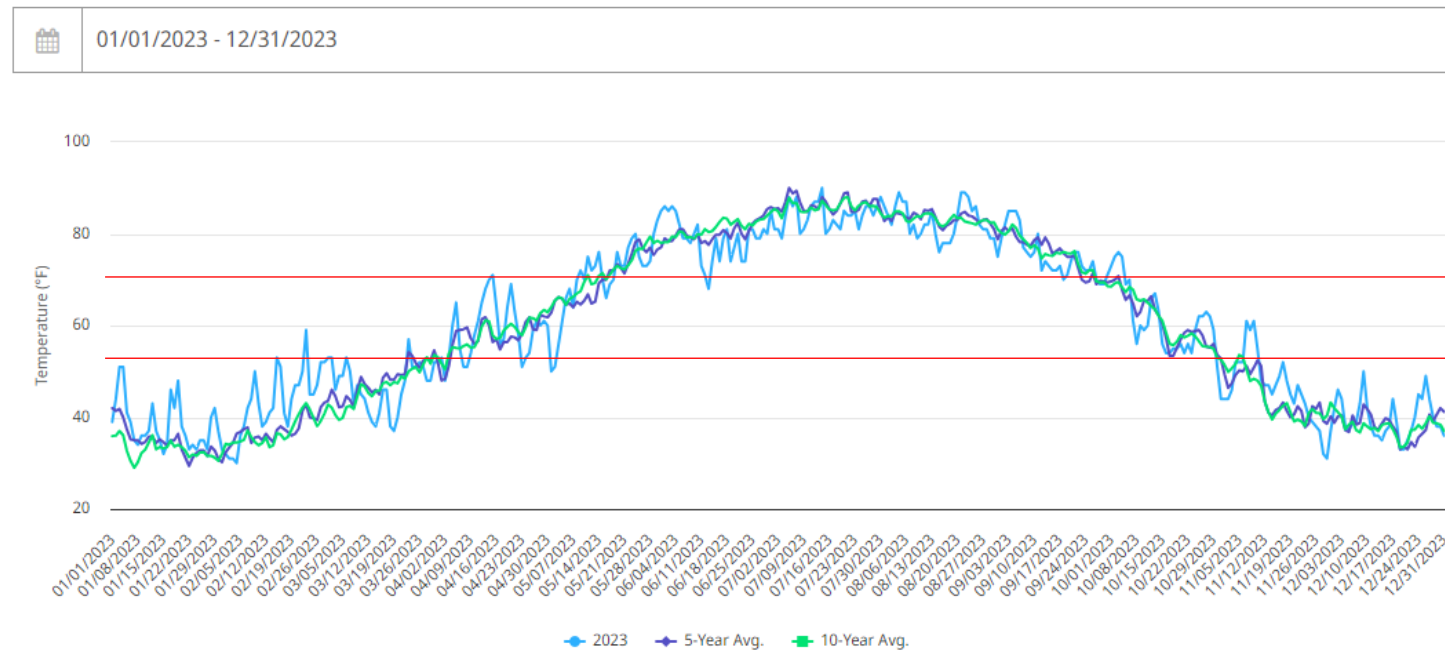
- R & D aims to optimizing distribution of Air
- Key
- Consistency
- Uniformity



Benefits of Soil Warming

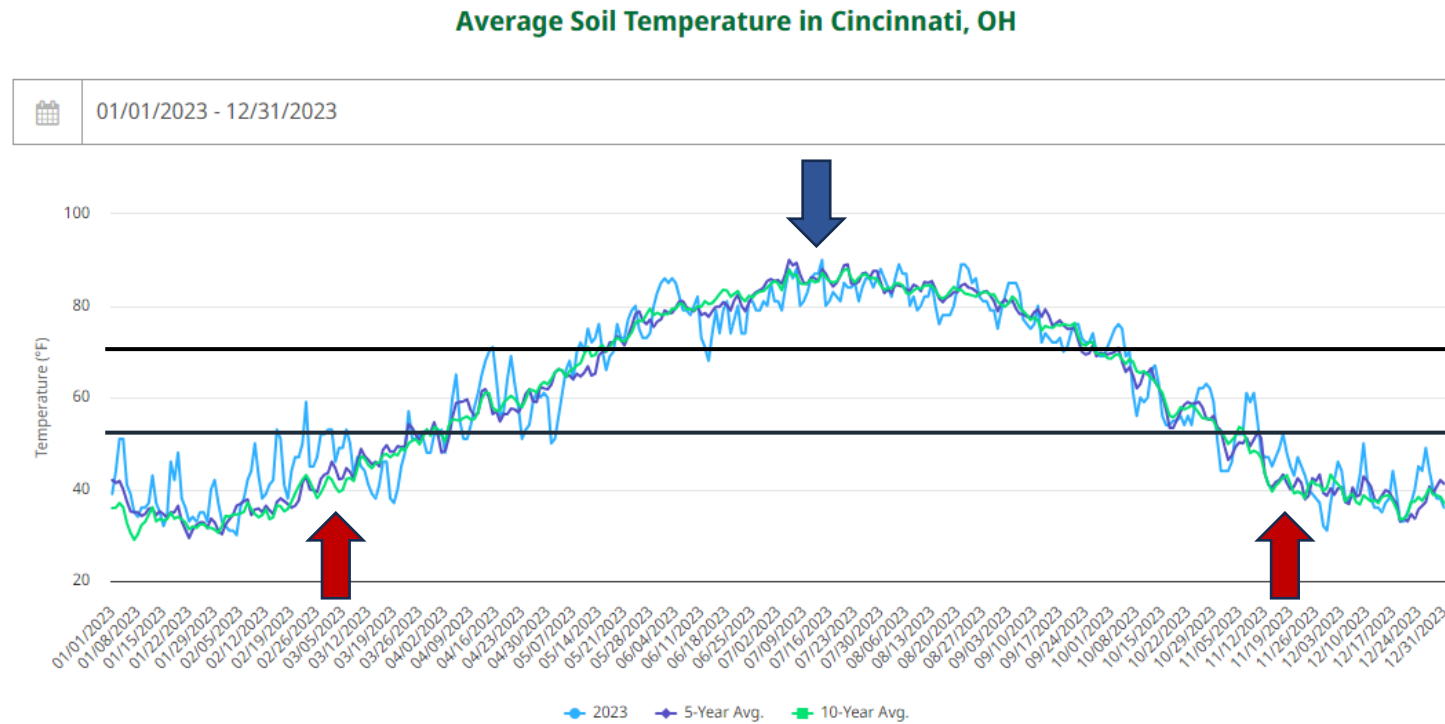
Annual Fluctuation of Soil Temperature

Average Soil Temperature in Cincinnati, OH

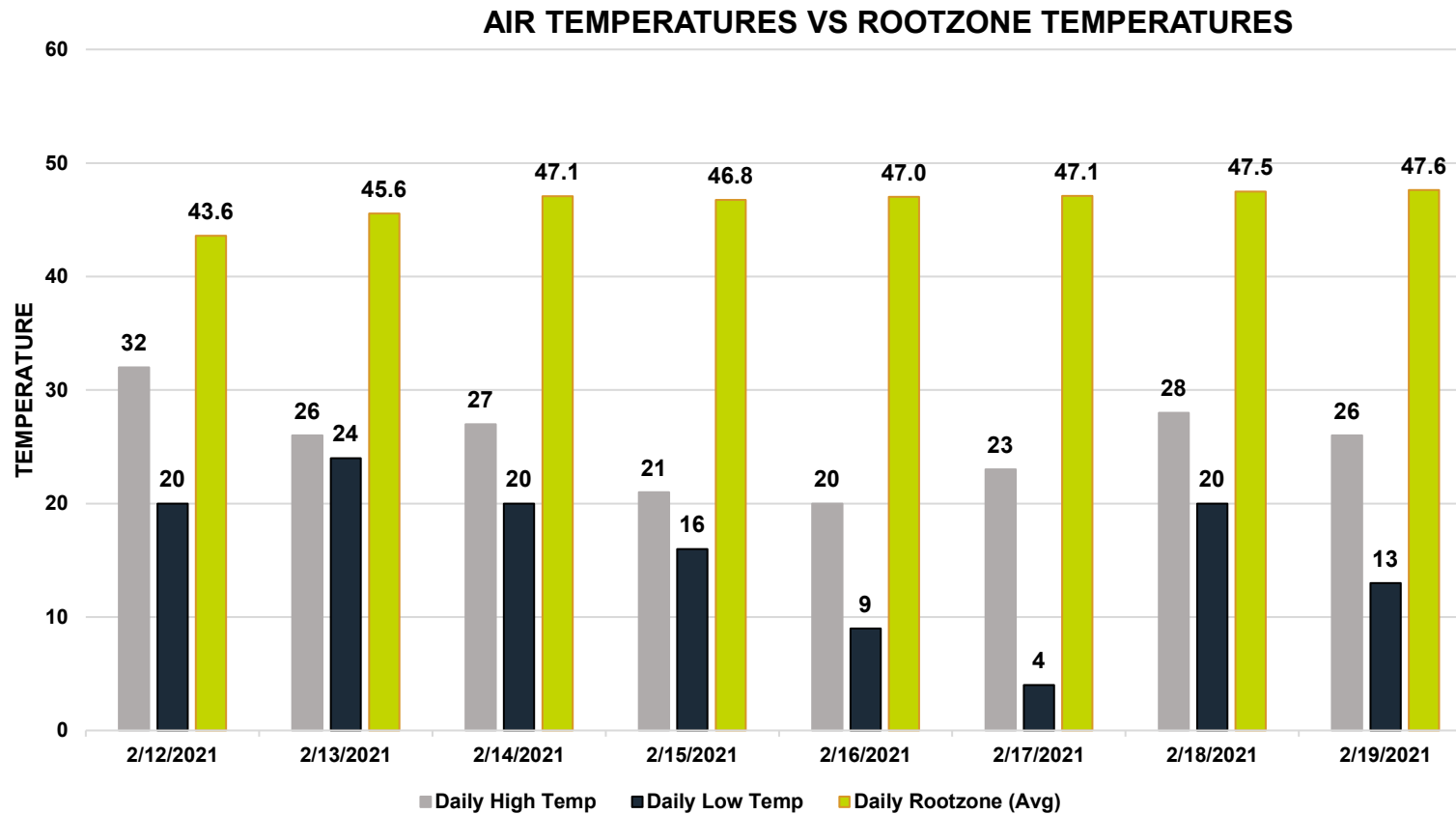


Benefits of Soil Warming

Annual Fluctuation of Soil Temperature

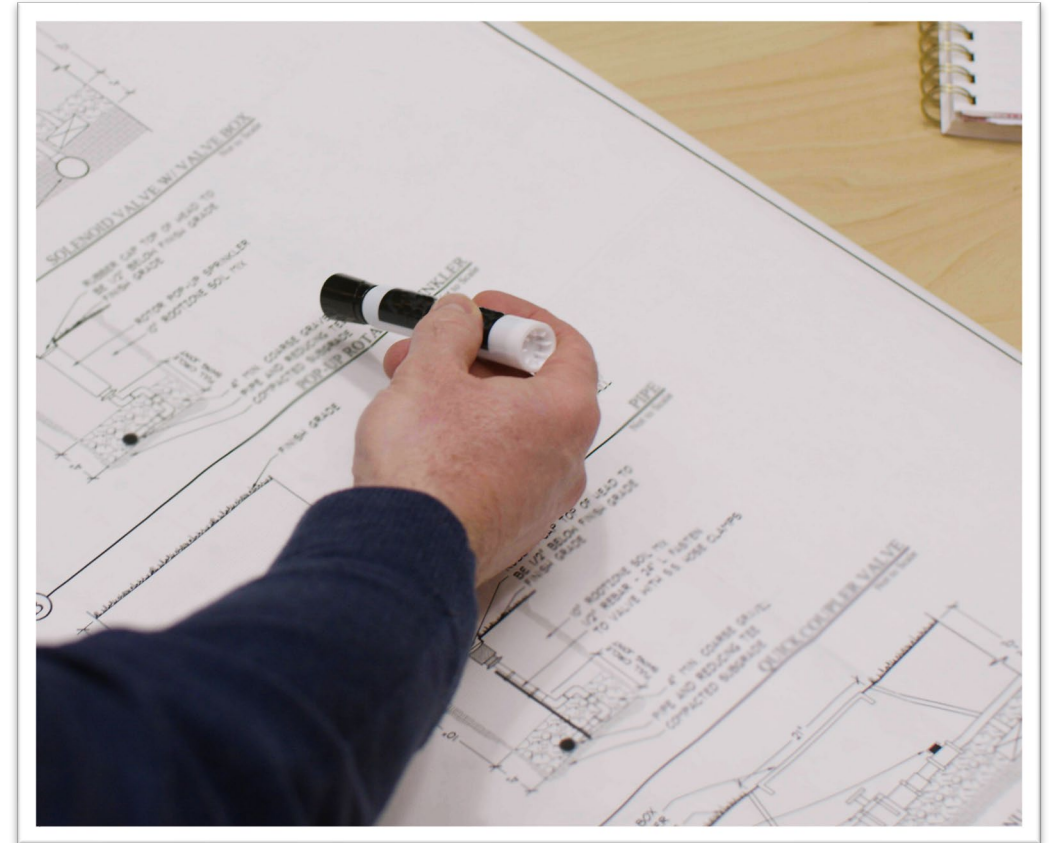


Soil Warming



Consideration with These Tools Address

- Cost
- Highly unlikely that these systems can be coupled on to an existing drainage system
- Planning and Integration with facility infrastructure
 - Structural
 - MEP



We Appreciate Your Interest in This Topic

Q & A



**AMY
FOUTY**

Field Consultant



**MARK
HEINLEIN**

Director of Technical
Projects & Research

Video

