

Download Presentation
↓

Effective Aerification of Sports Fields

Roch Gaussoin, PhD
University of Nebraska-Lincoln
rgaussoin1@unl.edu



2024 OTF Conference + Show

1


Why do we aerify?

- Compaction
- Organic matter management
- Surface quality

2

Causes and Locations of Traffic Stress

- Foot traffic
- Equipment
- Utility Vehicles



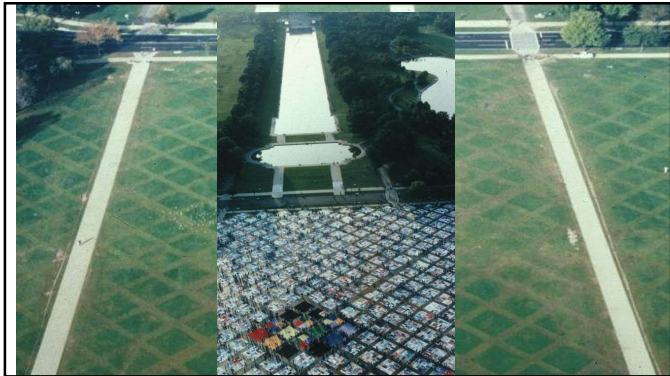
3



4



5



6



7



8



9



10

Underground: Sight Unseen

- Soil "Health"
- Plants are immobile
- Often forgotten
- Large impacts on growth and development
- Water
- Nutrients

11

Landscape

"The ~~Nation~~ that destroys its soil destroys itself"

Franklin D. Roosevelt

12

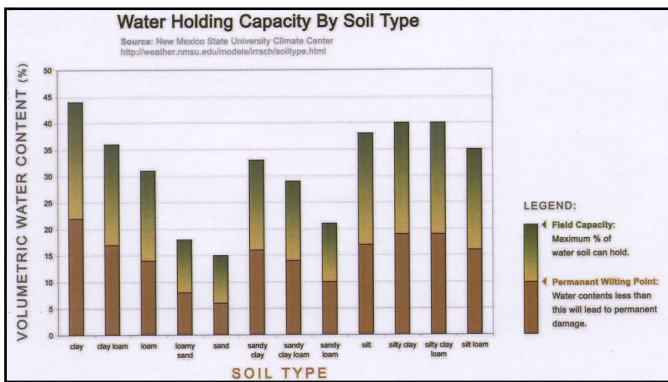


13

Soil Texture Problems

- Air/water movement
- Root development
- Water holding capacity
 - Irrigation requirements
- Nutrient holding capacity
 - Leaching potential
 - Fertilizer requirements
- Soil microbial populations

14



15

Soil Structure

- Impacts
 - Water infiltration
 - Root development
 - Microbial populations
 - Other critters
 - Overall plant health

16

Soil Bulk Density

- Density of the bulk soil in its natural state, including both particles and pore space
- Inversely related to porosity
- Organic soils have lower bulk densities
- Sands have higher BD than clays
- Impact how the soils perform

17

Where do roots grow??

Roots do not grow *in the soil*, they grow in the *air space* in the soil.

18

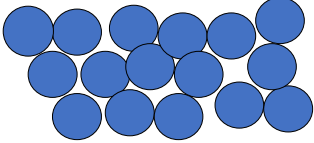
Soil Porosity

- Amount of air space (pores) in the soil normally expressed as a %
- Based on size and shape of soil particles
- Pore size
 - Macropores
 - large
 - aeration, infiltration
 - Micropores
 - small
 - water holding
 - nutrient holding


19

Soil Particle Shape

SAND



CLAY




20

Which soil has higher porosity?

a. Sandy
b. Clayey

21

What weighs more ?

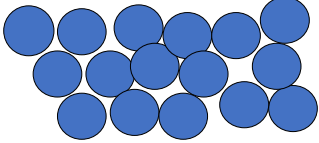


- A bucket of sand
- A bucket of clay

22


Soil Texture Effects on Porosity

SAND



**Macropores-
low porosity**

CLAY



**Micropores-
high porosity**

23

Air and water movement through soils

- Water infiltration
 - Macropores
 - Pore space continuity
- Water holding
 - Micropores
- Air movement
 - Pore space continuity
 - Micropores are barriers for movement
- Desirous to have 50% porosity
 - Half water
 - Half air filled

24

Soil Macropores

Pore space must be connected ("continuous") & open at surface

25

Idealized Proportions of Solids and Pores in Soil

Source: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052836.pdf

26

Compaction is the compression of soil particles resulting in loss of pore space in the soil profile resulting in a decrease in soil aeration and water infiltration

Clays and silts have a high capacity for compaction; sands do not

27

To maintain optimal plant growth the entire volume of air to a depth of eight inches must be renewed every hour

Why?

28

Where do roots grow??

Roots do not grow *in the soil*, they grow in the *air space* in the soil.

29

Soil Temperature

Compacted Soil = +/- 10 F

Thermal conductivity is increased by compaction because of decreased porosity.

30



31

Improvement of compacted soils?

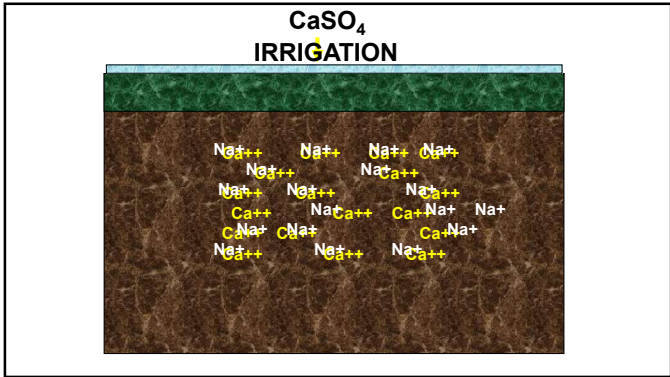
- Wetting Agents
 - Improve short term water infiltration in hydrophobic soils
- Gypsum (CaSO_4)
 - "soil buster"
 - Only effective in sodic (sodium affected soils) with good drainage
 - Ca effect on soil structure not compaction relief

32

Reality

Gypsum (calcium sulfate) is used to improve aggregation of silt-crusted puddled soil or soil damage/ dispersed by excess sodium.

33



34

Thatch

A loose, intermingled, organic, layer of dead and living shoots, stems, and roots that develops between the zone of green vegetation and the soil

35




36



37


Why does thatch occur?

- Rate of organic matter production exceeds ability of micro- and macro-organisms to decompose this material
- Management practices discourage activity of micro- and macro-organisms



38

Thatch: The Negative




- Can become hydrophobic (water repellent)
- Porous; poor water retention
- Difficult to rewet
- Poor N and K retention
- Increased weed, disease, and insect problems
- Decreased pesticide effectiveness (insecticides)

39

Layering

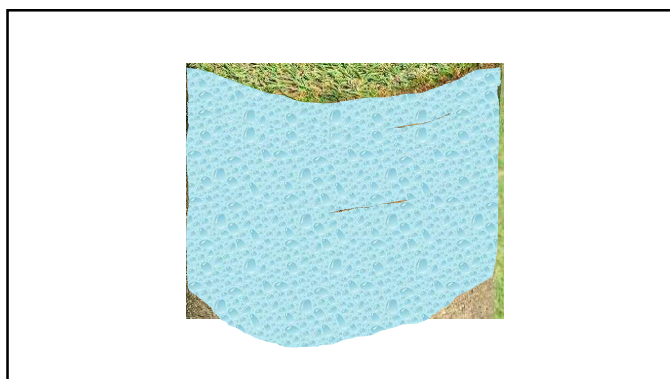
- Water retention is non-uniform
- Thatch/mat layers can store twice as much water than the root zone



NOT a function of drainage

Rather it is the difference in pore size distribution among layers


40



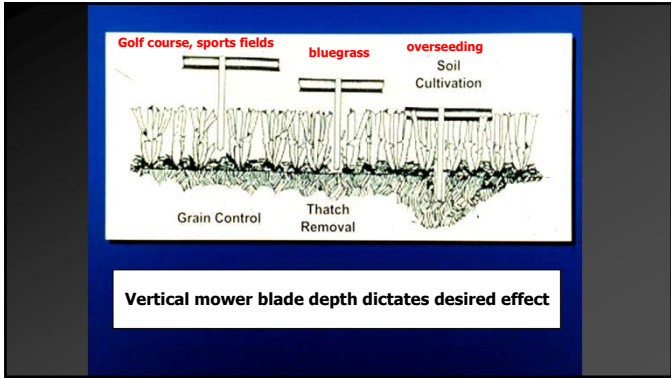
41

Turfgrass Thatch/Compaction Remedies

- Cultivation techniques
 - Core cultivation
 - Vertical mowing



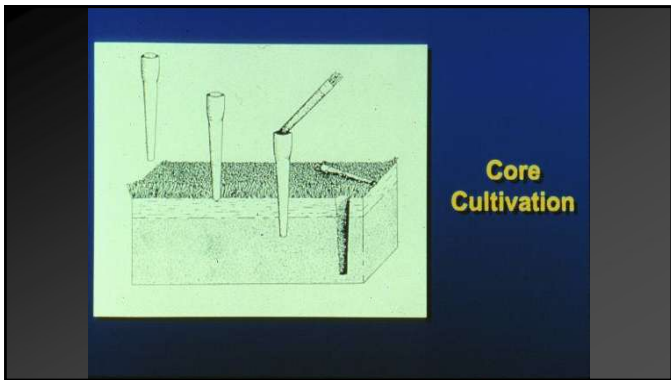
42



43



44



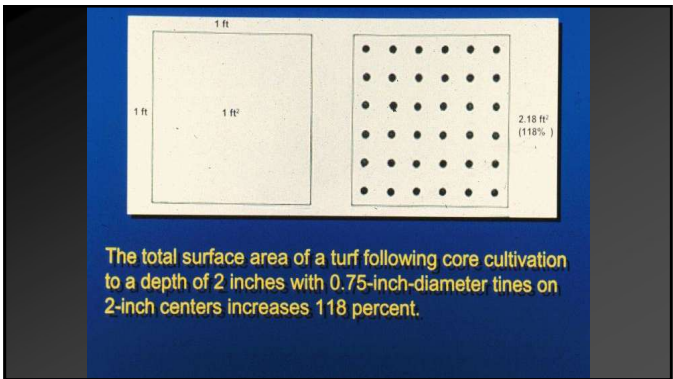
45



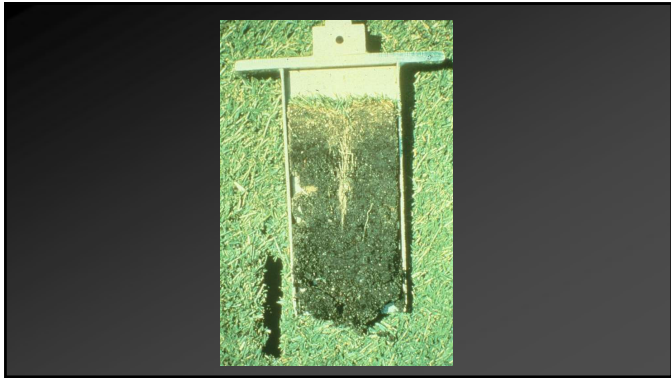
46



47



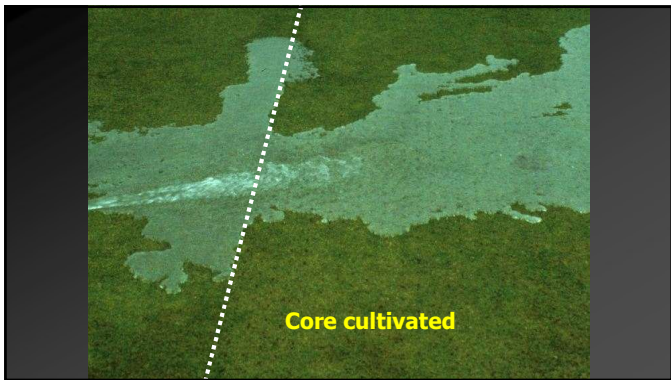
48



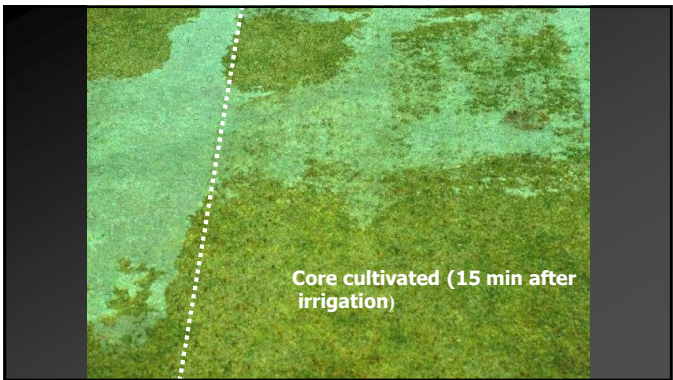
49



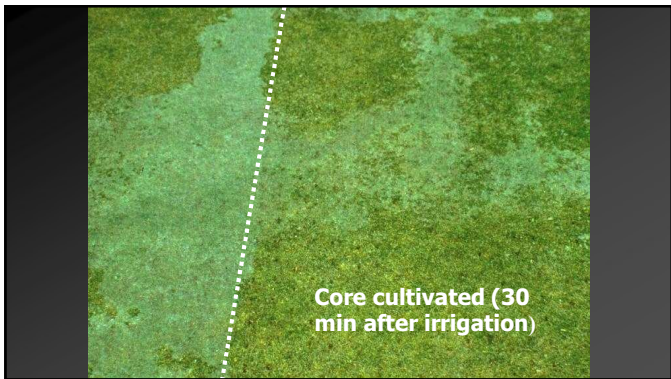
50



51



52



53

Dragging cores, post cultivation, into the turf is topdressing

Topdressing after core cultivation

Topdressing material for lawns can be compost or other amendments but not sand

54

Mat

Thatch that has been intermixed with mineral (soil) matter. Biologically Active & critical for healthy turfgrass

55



56

Frequently Asked Questions

57



58

When is the best time to core cultivate ?

- Spring
 - Active root growth is occurring
 - Just prior to irrigation season
 - Good time for overseeding
- Fall
 - Will stimulate some root growth
 - Good time for overseeding
 - Takes advantage of winter freeze/thaw cycles
- Summer
 - Less desirable due to heat, excessive drying problems

The diagram shows a cross-section of turf with a core cultivator tool removing soil cores. The soil is shown in shades of brown and tan, and the grass is green.

59

- How often can you core cultivate?**
- Depends on soil type, amount of thatch, level of compaction
 - At least yearly for the average location
 - More often for thatchy, compacted turf
 - Combine with overseeding or fertility

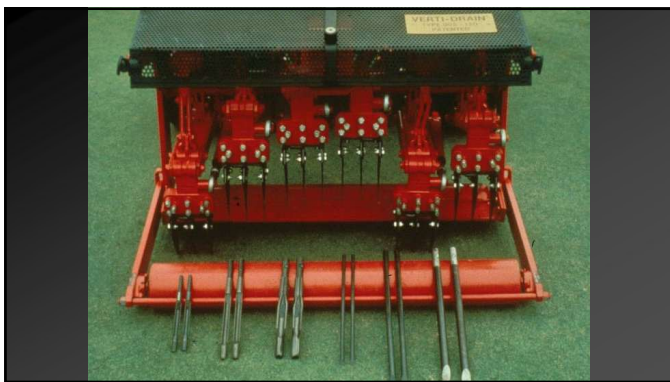
60



61



62



63

DryJect

64



65

Soil Moisture Content Prior to Aeration

moist drier

hollow tine, very compacted ↔ solid tine, slicing, spiking

use soil moisture content to optimize desired effect

66

Thanks!

Roch Gaussoin
rgaussoin1@unl.edu