

Improving Rootzone Quality in Lawn & Landscape Turf

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**NEW ENGLAND
REGIONAL
TURFGRASS
FOUNDATION**
ESTABLISHED 1998
2023 Conference March 7th - 9th
Providence, RI

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What are we talking about?

- Urban soil (NRCS def.) refers to soils in areas of high (**or not**) population density in the built environment. These soils can be significantly changed by human-transported materials, human-altered materials, or minimally altered or intact "native" soils (**suburban, peri-urban, rural**).
- Soils in urban areas exhibit a wide variety of conditions and properties and **may will** have impervious surfaces, such as buildings and pavement

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Improving Lawn Soils

Lots of issues; limited resources

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Underground: Sight Unseen

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

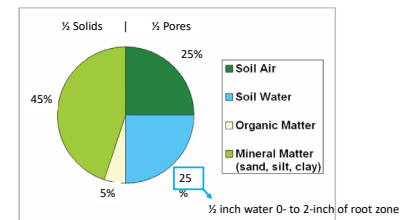
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Landscape
~~The Nation~~ that destroys
 its soil destroys itself"

Franklin D. Roosevelt

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Idealized Proportions of Solids and Pores in Soil



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

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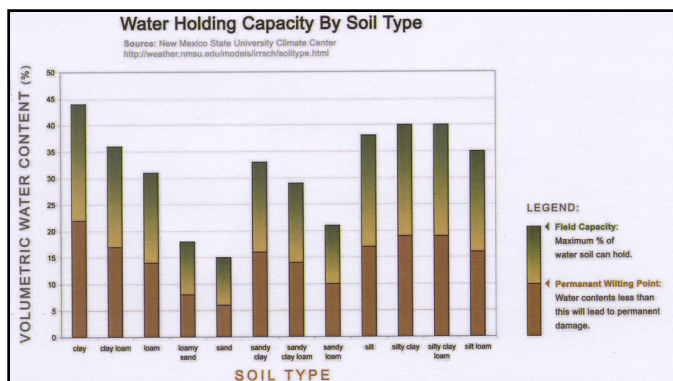


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Soil Texture Problems

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

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Soil Structure

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

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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

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Where do roots grow??

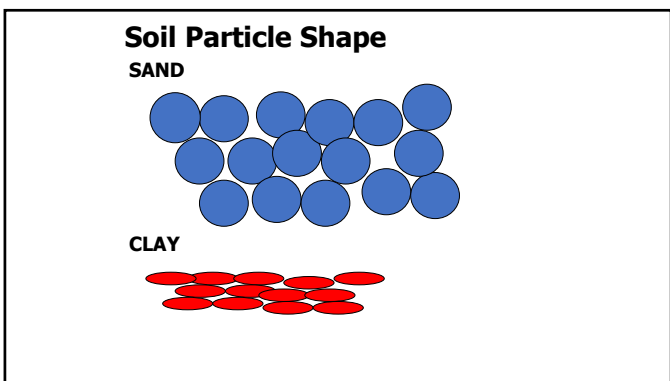
Roots do not grow *in the soil*, they grow in the *air space* in the soil.

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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

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Which soil has higher porosity?

- a. Sandy
- b. Clayey

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What weighs more ?

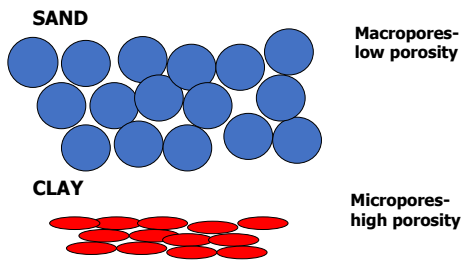


- A bucket of sand

- A bucket of clay

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Soil Texture Effects on Porosity



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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

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Soil Macropores



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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

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

Why?

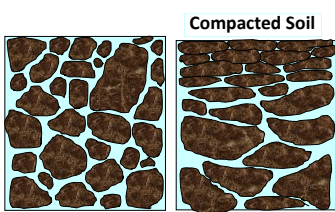
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Where do roots grow??

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

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Soil Temperature



Thermal conductivity is increased by compaction because of decreased porosity.

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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

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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

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Mat

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

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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



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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)



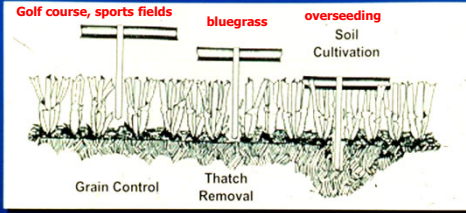
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Turfgrass Thatch/Compaction Remedies

- Cultivation techniques
 - Core cultivation
 - Vertical mowing



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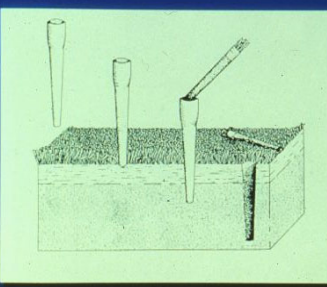


Vertical mower blade depth dictates desired effect

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Core Cultivation

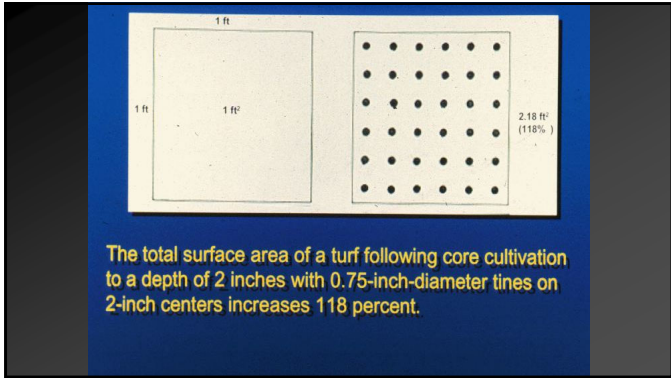
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The total surface area of a turf following core cultivation to a depth of 2 inches with 0.75-inch-diameter tines on 2-inch centers increases 118 percent.

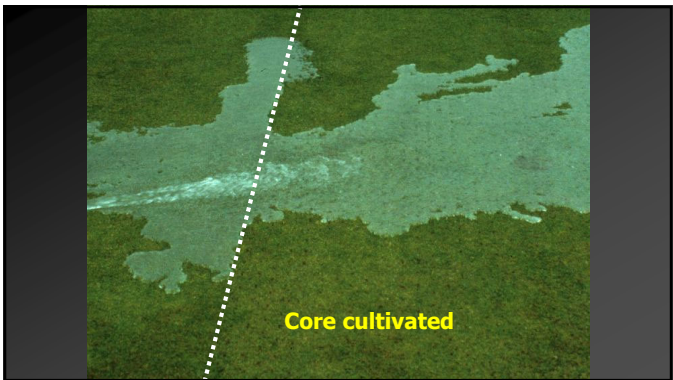
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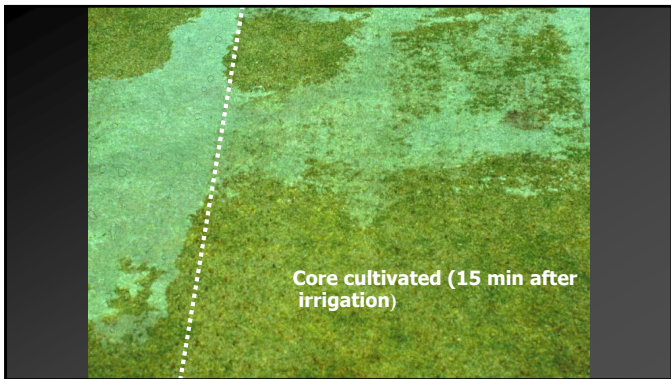
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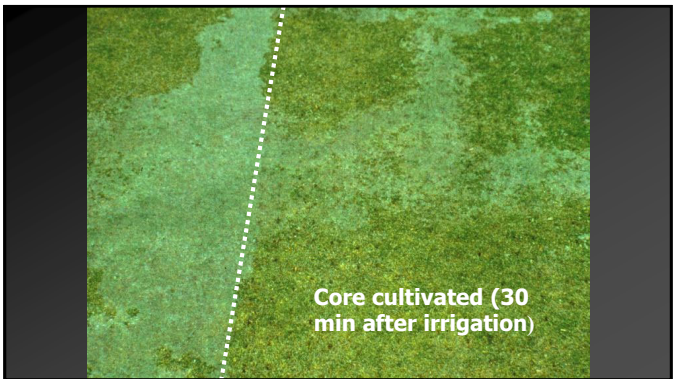
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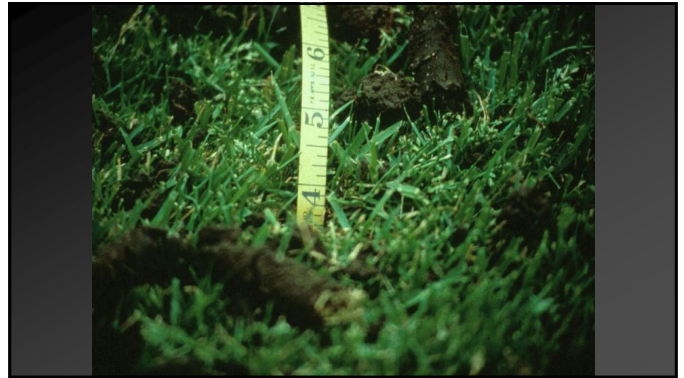
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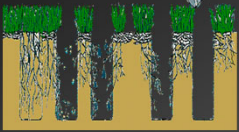
Frequently Asked Questions

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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

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Improvement of compacted soils?

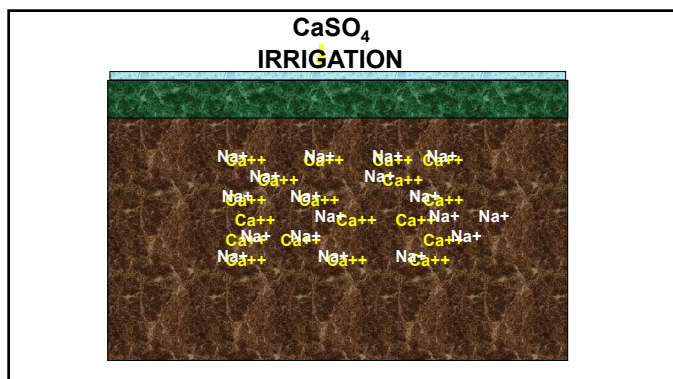
- Wetting Agents
 - Improve short term water infiltration in hydrophobic soils
- Gypsum (CaSO_4)
 - "soil buster"
 - Only effective in sodic (sodium affected soils) with good drainage
 - Ca effect on soil structure not compaction relief

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Reality

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

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Amend clay soil with sand to improve water drainage.

Belief

- Water moves easily through sand, so adding sand to clay soil is a great way to improve water movement in heavy clay soil.

Reality

- Soil must contain at least 50% sand before it takes on the characteristics of sandy soil.

Comparative size of sand, silt and clay.
Image from Colorado State University Extension.

The Myth of Soil Amendments Part II, Linda Chalker-Scott, Washington State University. <https://go.unl.edu/sandy>

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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

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Compost & “other amendments”

- If chosen correctly, will improve soil and plant health
- Depending on source, compost may be high in salts and or fine soil particles

- Inorganic amendments may improve soil physical properties but may be cost prohibitive

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Compost & “other amendments”

- Biochar** - is black carbon produced from biomass sources [i.e., wood chips, plant residues, manure or other agricultural waste products] for the purpose of transforming the biomass carbon into a more stable form (carbon sequestration).
 - Historical soil amendments from the Amazon rain forest
 - Can be purchased from suppliers, like compost source (where it came from) has an impact, albeit limited data.

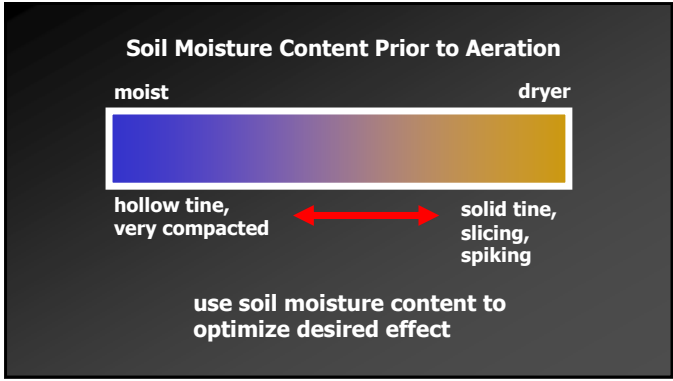
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How often can you core cultivate?

- 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, fertility or amendment

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Thanks!

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