WATER DOGS Training 101 – *a myth busters review of lawn irrigation management*

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Types of Soil Amendments

- Organic
  - Compost
  - Manure
  - Fertilizer (prior to seeding/planting)
- Inorganic
  - Lime
  - Gypsum
  - Vermiculite/Perlite
  - Soil
  - Fertilizer (prior to seeding/planting)
  - Crumb Rubber
  - Fired clay (Turface. Kitty Litter)
  - Water-holding synthetics
  - Inoculums

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Why Use an Amendment?

- Improves soil physical properties
- Need for improvement
  - Soil tests
  - Construction (disturbed) soils
  - Poor performance in previous years
  - Change in water infiltration

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What Does an Amendment Do (*product claims*)?

- Soil texture modifier
- pH – modifier
- Improves drainage or water holding capacity
- Increases porosity
- Change CEC
- Change microbial environment
- Soil buffer
- Increase organic matter
- Alleviate (buffer) soil compaction

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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-crusted puddled soil or soil damage/ dispersed by excess sodium.

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Gypsum ($CaSO_4$)

- does NOT 'break up the soil'
- only good for sodic soils, which are rare in most of Nebraska
- Ca "replaces" sodium then must be leached out

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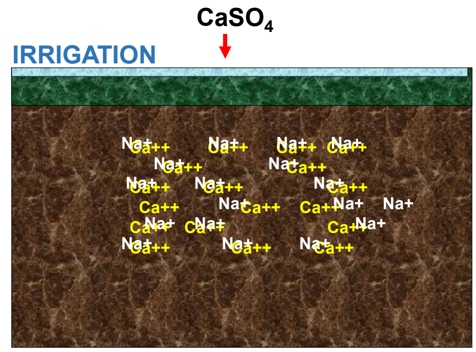

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Water-holding synthetics (hydro-gels)

- Absorb 100X their weight in water!!
  - With pure water
  - May not be available to plant
- Except for container gardening, have little utility

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Soil Inoculants

- Beneficial organisms frequently packaged with other ingredients (biostimulants) advertised to increase "soil health"
- Sensitive to UV light
- Heat instable
- Sometimes packaged as spores
- Do they work?

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Theoretical Example

- Products may contain up to 10^9 organisms per ml
- Applied at 1-6 oz/M
- Soil contains 10^8 bacteria/gm of soil
  - 100X less actinomycetes; 100X less fungi

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Assuming:

All applied microorganisms survive and maximum use rates the ratio of applied vs. native bacteria is approximately:

6000 native : 1 applied

or the applied represent *0.02 %* of the total population

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Further:

Boehm's work at OSU showed that at approximately 2 years post construction in a soil/sand/compost vs sand/peat green microbial diversity was relatively the same even though the former green was significantly higher at establishment

UNL work shows that soil addition had minimal effects

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Crumb Rubber

- *"Alleviates"* compaction
- Sports fields
- High trafficked areas

- Warmer temperatures
- Permanent

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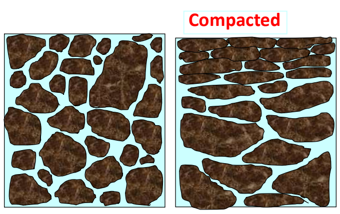
Soil Compaction and Temperature



+/- 10F

Thermal conductivity is increased by compaction because of decreased porosity.

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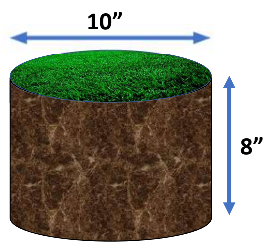
"To maintain optimal plant growth the entire volume of air to a depth of eight inches must be renewed every hour"



Volume = 126 cubic inches, assuming soil is in "good" condition with a 50% porosity, with 50% = water, 30+ cubic inches of air need to move out and return in 1 hour.

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Types of Aerators

- Spoon
- Slicer
- Spiker
- Tine
  - Solid or hollow
- VOHT (Tine)
  - Solid or Hollow
- Deep-Tine
  - Solid or Hollow

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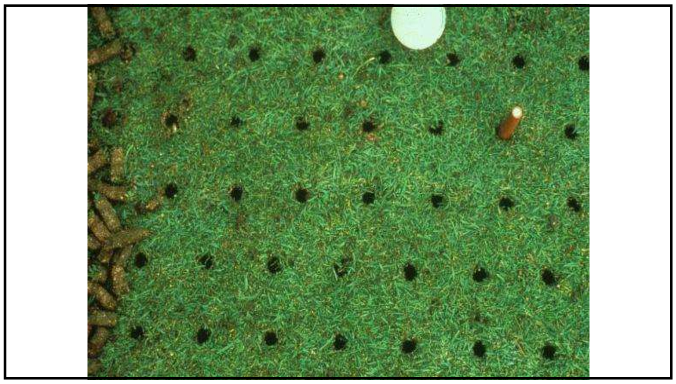

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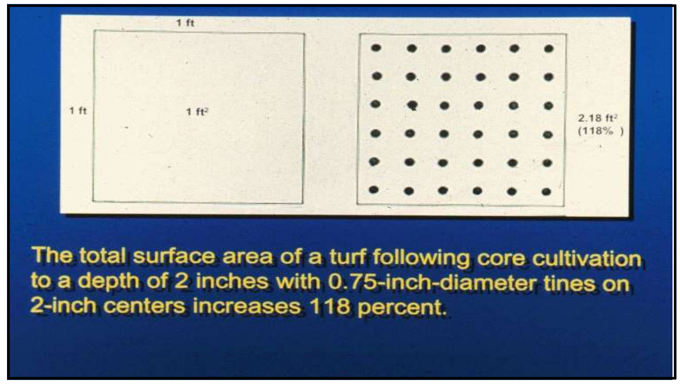

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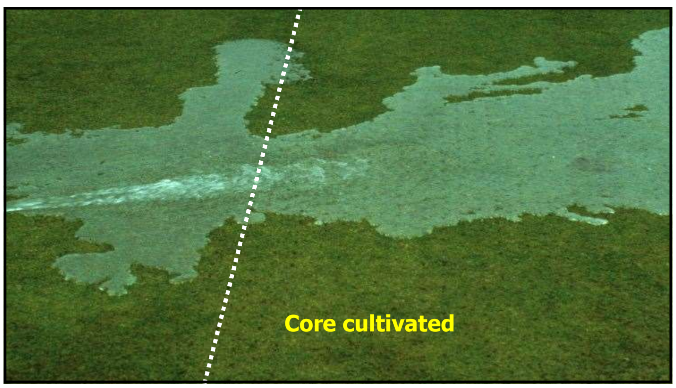

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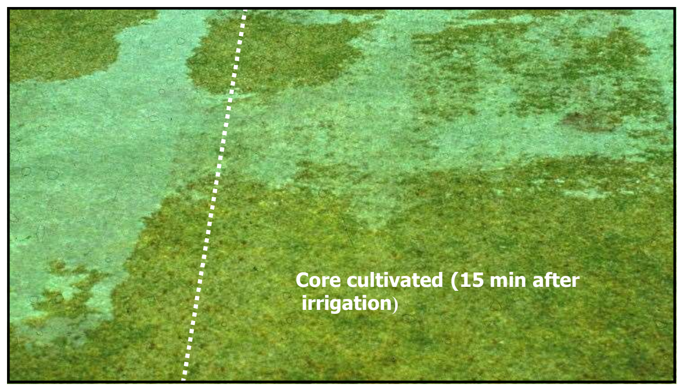

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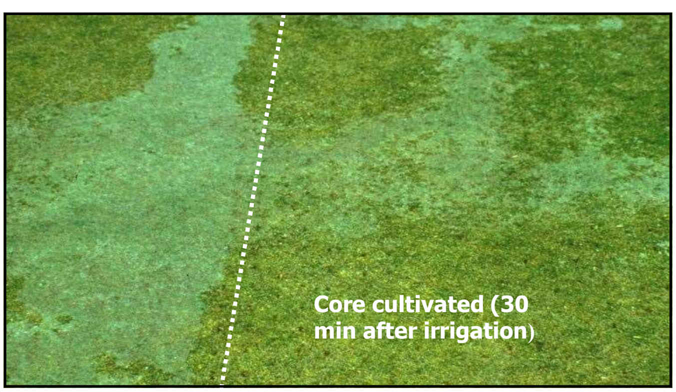

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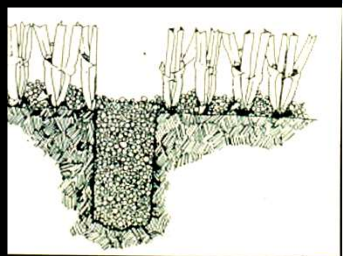
Top-dressing after core cultivation

Sand + Clay = concrete



Top-dressing material for lawns can be compost or other amendments, but not sand

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FAQ's

- When should I aerate?
  - *At least once a year*
- Is Fall better than Spring?
  - *No difference*

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Species Selection:

Kentucky Bluegrass

Turf Type Tall Fescue

~~*True Fine Fescue*~~

~~*Perennial Ryegrass*~~

Buffalograss

~~*Zoysiagrass*~~

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Kentucky Bluegrass

Poa pratensis L.

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Kentucky Bluegrass

- Rhizomes
- Fine Leafed
- Dormancy
- Fair Shade Tolerance, Good Recuperative Potential
- Many Cultivars
- Shallow Rooted
- Thatchy
- Drought Resistant

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Tall Fescue

Festuca arundinacea Shreb.

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Tall Fescue

- Bunchgrass (?)
- Good Wear & Shade Tolerance
- Coarse Texture??
- Many New Cultivars
- Deep Rooted
- Low Compaction Tolerance
- Drought Resistant

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Buffalograss

Buchloe dactyloides (Nutt.) Engelm

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Buffalograss

- Stolons
- Lower Wear & Shade Tolerance
- Blue-green color
- Improved Cultivars
- Deep Rooted
- Drought & Heat Tolerant

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Drought Response (not tolerance)

- Buffalograss
- Zoysiagrass
- Fine Fescue(s)
- Tall Fescue
- Ky. Bluegrass

Best → Least

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Drought Resistance

- Tolerance
- Avoidance
- Escape

J. Levitt, 1980

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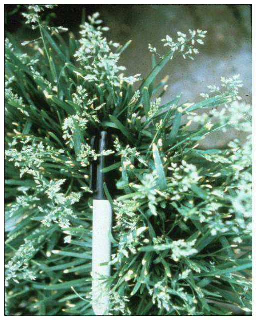
Drought Escape

- Plant completes its life cycle prior to the onset of drought

Example: any winter annual



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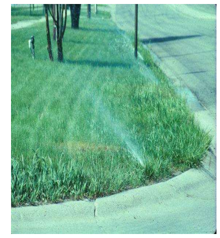
Drought Tolerance



- Increased tolerance of dehydration via dormancy
- Osmotic adjustment
  - Na^+, K^+, Cl^-
- Recycling of CO_2
- Ability to recover

Example: Kentucky bluegrass

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Drought Avoidance Mechanisms

- Deep, Extensive Root System
- Root Plasticity
- High Root:Shoot

Example: Tall Fescue

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Turfgrass water use

Total amount of water used for growth plus that lost by transpiration and evaporation from plant and soil surfaces.

J. B. Beard, 1973

May or may not be related to drought resistance

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Turfgrass ET Classification

Relative Ranking	ET mm day^{-1}
Very low	< 4.0
Low	4.0-4.9
Medium-low	5.0-5.9
Medium	6.0-6.9
Medium-high	7.0-7.9
High	8.0-8.9
Very high	>9.0

Tall fescue

Kentucky bluegrass, buffalograss

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Reported range of turfgrass ET by species:

Common Name	Scientific Name	ET+ (mm day^{-1})	Inch/wk
Tall Fescue	*Festuca arundinacea*	7-13	2.0-3.8
Perennial Ryegrass	*Lolium perenne*	7-11	1.8-3.1
St. Augustinegrass	*Stenotaphrum secundatum*	6-11	
Seashore Paspalum	*Paspalum vaginatum*	6-8	
Bahiagrass	*Paspalum notatum*	6-8	
Kikuyugrass	*Pennisetum clandestinum*	6-9	
Creeping Bentgrass	*Agrostis Palustris*	6-10	
Centipedegrass	*Eremochloa ophiuroides*	5-9	
Bermudagrass	*Cynodon spp.*	4-9	
Zoysiagrass	*Zoysia spp.*	5-8	
Kentucky Bluegrass	*Poa pratensis*	4-7	1.1-1.8
Buffalograss	*Buchloe dactyloides*	3-6	1.5-2.0

+Field grown under high evaporative demand conditions

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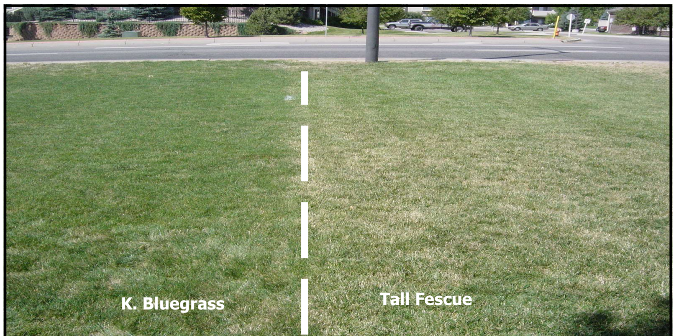

Drought Stress-Species Difference

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Lawn Irrigation

- Species Dependent
- Expectation Dependent – Form or Function
- Soil Type Dependent – infiltration vs runoff
- Seasonal Amounts – Fall/Spring vs Summer
- Seasonal Frequency – set it and forget it is unacceptable

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Most underused button on an irrigation controller

Rain (and freeze) sensor

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Irrigation: When and How Much?

- Pre-dawn
  - Winds are lower, lower evaporation loss
- Never late evening
  - Leaf wetness drives disease
- How much?
  - Systems deliver based on time, how long? is not valid without an irrigation audit
  - Regardless of species, plant and soil health and desired outcome determine how much

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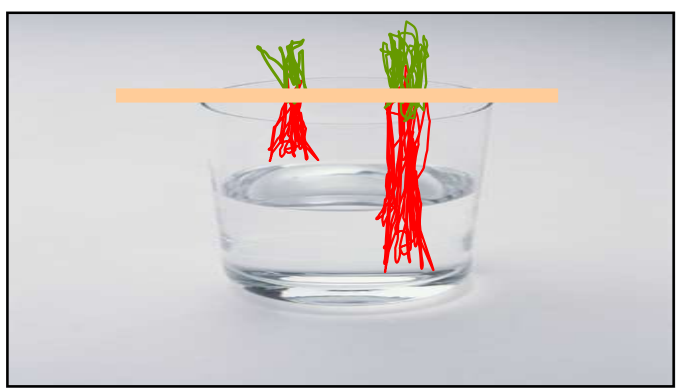

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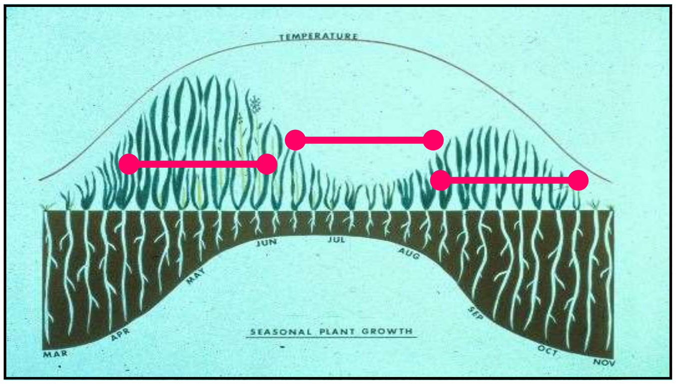
TEMPERATURE
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
SEASONAL PLANT GROWTH

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Ross Braun
@Ross_Braun
These two lawns were established with the same sod at the same time (2017). Both lawns have never received a pesticide application. However, one is fertilized twice a year (mainly fall) and mowed higher all year. #Lowinputturf pic.twitter.com/2l4Hy0nEYp
7/31/20, 7:24 AM
Note: both receive similar amounts of water (rain only with no in-ground irrigation) with the one on the right receiving hose sprinkler watering when minimal rain has occurred for 3+ weeks.
Management matters (KB in Indiana)

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