

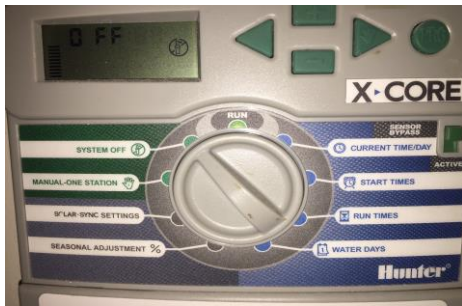
Efficient Irrigation Practices

John C. Fech
University of Nebraska-Lincoln

Considerations

- Turn it off; use it as a tool, not a thermostat
- When? Symptoms/signs of need; time of day
- How Much? Depth of roots; infiltration rate:
 - Compaction and aeration
 - Texture
 - Slope and thatch and runoff potential
- Soil texture and compaction influences on:
 - Irrigation practices
 - Root system health
- Watch it run...frequently...look for flaws

Turn it Off



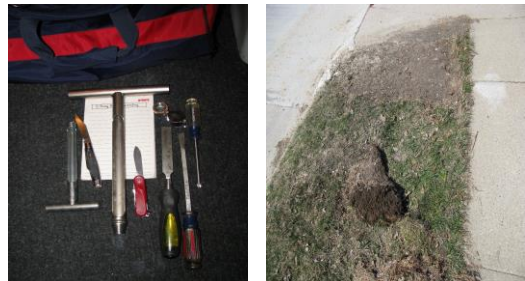
When? Symptoms/Signs of Need



Signs of Need - Like the 3 Bears....



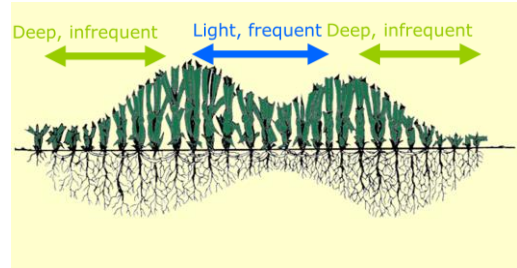
When You Dig...



When? Timing – 5-10 am



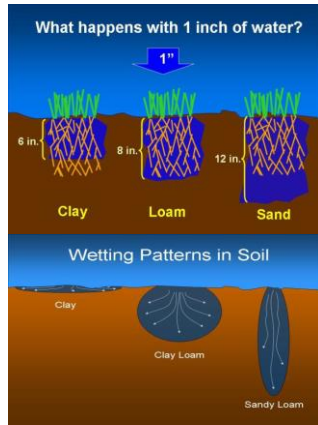
How Much? How Long? It Depends...



Two Bottom Lines: Water to the bottom of the roots and keep it moist, not soggy or dry

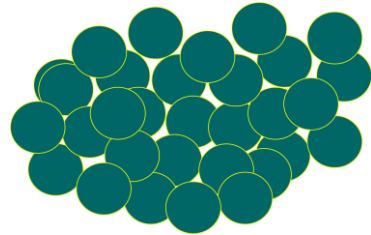
How Much, How Long?

Soils have different capacity to absorb irrigation water



Images courtesy Brad Jakubowski

Soil Compaction



Junk, Compaction Affect All LS Soils



Leads to Soil Drainage Problems



Fixing Problematic Soils

Concept: Physical disruption/loosening, then addition of organic matter

Techniques:

- “Scoop and Dump” Nina Bassuk,
- Raised Beds, Small Areas
- “The Recipe” Alan Siewart



Good candidate for fixing problematic soils

Methods

Renovating soils in existing landscapes

- S&D not done under existing trees/PRZ
- Radial Trenching as per Nina Bassuk, John Ball
- Don't add soil over top of existing roots/Planter Boxes
- Air Spading/Air Knife

Renovating landscape beds and turf areas entirely

- Don't pulverize by discing/roto-tilling
- Instead, rip out plants,
- Add lots of compost
- Recreate soil aggregates
- Small areas can be loosened with a pitchfork and pickaxe

Scoop & Dump

Soil quality after construction

Poor soil structure

Low oxygen, air penetration & organic matter content



Images by Nina Bassuk

- Apply \cong 6-8" compost on top of compacted soil
- Use backhoe bucket to dig down \cong 18"

Scoop & Dump



Yellow flags mark the root zone of an existing tree to be protected.

- Protect root zone of existing trees as previously described
- Apply \cong 6-8" compost on top of compacted soil
- Use backhoe bucket to dig down \cong 18"
- Lift and drop soil/compost combination
- Breaks up compacted soil and creates veins of compost running through it

The Recipe

- For new, non-vegetated areas:
- 1. Rip the soil to a depth of 24 inches; reintroduces air into the soil
- 2. Incorporate 1-2 inches of finished compost into the upper 10 inches of subsoil to recreate the A layer
- 3. Topdress the soil with 1 inch of compost
- 4. Wood chips over top, let sit for 6 months
- Use a rip and a rake
- New roots develop in year one in modified area and horizontally outside the modified area over time

Ripped Site



Photo: Graham Herbst, Nebraska Forest Service

Fixing Soils – OM, Compaction



Techniques for Small Areas



Techniques for Small Areas



Technique for Small Areas

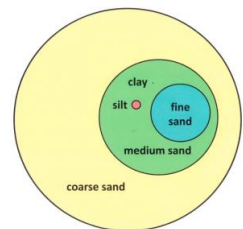


Slow, Steady Approach



- **Sand**
 - Very large particles which resist compaction.
 - Large pore spaces don't hold water or nutrients easily.
 - Facilitates drainage when it's the dominant component (more than 75%).
- **Silt**
 - Rock and mineral particles, too small to see with naked eye.
 - Slippery when wet, not rocky or grainy.
 - Medium pore spaces.
- **Clay**
 - Very small size and negative ion charge makes them good holders of some soil nutrients.
 - Small pore spaces retain water well.
 - Slower water percolation and drainage capacity.
 - Easily compacted.

Sand, Silt, Clay



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

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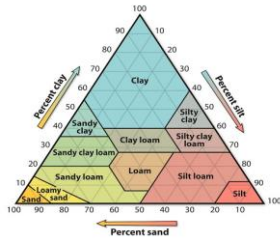
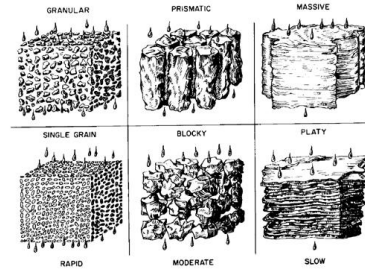


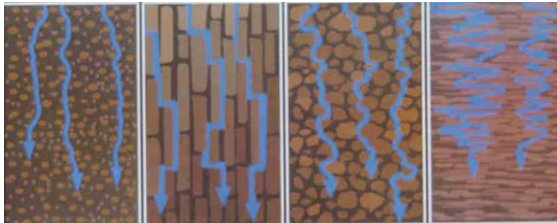
Image from Soil Science Society of America.

Soil Particles & Particle Arrangement



Soil Structure

- Impact on water infiltration
- Impact on root development and plant health
- Impact on macro and microbial populations

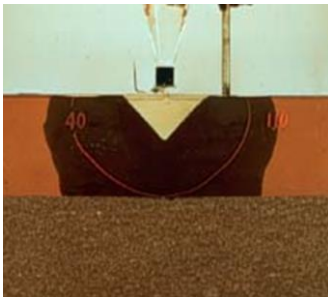


Soil Layers – C Remains



Image by John Fecht

Compaction Effects on Soil Water Movement



- "Crushed" pore spaces
- Reduced water percolation
- Water runoff
- Soil erosion
- Perched water table

Thatch Impedes Irrigation Infiltration



Increased run off potential

Slope impedes irrigation infiltration



Increased run off potential

Soil Texture and Compaction Influences on Infiltration and Root Health



Photo courtesy R. Smiley, OSU

Watch It Run...Frequently...Look For Flaws



Watch It Run...Frequently...Look For Flaws



Photo courtesy Roch Gaussoin, UNL

Ever See This?



What's Going On Here?



Audits

- 1. Turn it on and watch it run
- 2. Fix obvious flaws; fix the biggest flaw first
- 3. Measure output with cans/ruler
- 4. Replace parts/make adjustments
- 5. Re-measure output with cans/ruler
- 6. Trim – reduce runtime a little
- 7. Review an expanded version on water.unl.edu



Trim 10%

- Scale back the runtime
- i.e. from 30 minutes per zone to 27 minutes
- Not likely to notice the difference in turf quality, but it's an easy 10% savings

