



Turning a New Leaf Conference
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Track D: Soil Science Simplified

Session D.3 Urban Soil Husbandry and Sustainable Hydrologic Landscapes. Stuart Schwartz, PhD, Senior Research Scientist, Center for Urban Environmental Research and Education, University of Maryland, Baltimore, Maryland.

- Characteristics of an Urban Environment:
 - Compacted, disturbed soil!—how do we deal with it?
 - Decompact soils and amend with organic compost
 - Sub-soiling: normal agricultural tilling process creates a compaction pan under soil that can't be penetrated by root. Sub-soiling breaks it up with blades .
- Post-construction hydrology would mimic healthy forest hydrology regardless of previous hydrology: MD Environmental Site Design (ESD)
- In forested landscapes-
 - half of rainfall is returned to atmosphere- most remaining rainfall is absorbed by duff --15-20% total becomes runoff with <10% making it to streams
 - complex soil ecosystem
- Characteristics of Suburban landscape:
 - topsoil loss
 - disturbed soil profile is the standard landscape today—reduced infiltration, lots of runoff, impoverished soil ecosystem—LOST FUNCTION
 - Water budget depends on style of development—is it limited to footprint of house?—could get SSI points if so
 - Compaction with low organic content is good for construction. There is no settling, it is cost effective to compact the entire site, but maybe we should limit it to just footprint of construction.
 - Pervious concrete doesn't do that much if the soil underneath is compacted.
 - Sod has really small water capacity/ nutrient retention. It saturates quickly causing overland sheet flow. The form and function is decoupled.
 - Leaking landscapes up to 3 days after a storm
 - Effective impervious area rapidly expands
- How do we measure infiltration?
 - Double ring infiltrometer—if soil is not saturated- water may just be filling pores instead of infiltrating—double-ring helps with this by limiting radial flow of inner ring
 - Must have infiltration and drainage if you don't want a puddle
 - For SSI credit there must be a Curve Number (CN) of at most 70—woods in good condition have a CN of 55 (lower is better)
 - Curve numbers cannot be used accurately for disturbed soils

- On disturbed soils it's anybody's guess what the hydrologic soil type is—an onsite investigation must be made
- Cone penetrometer- sharp stick you poke into the ground (@ field capacity a cone index of 200psi or lower is usually penetrable by roots)
- An athletic field produces runoff like an urban area -- WHAT CAN WE DO ABOUT IT?
 - Decompaction 24" and amendment of 6" is a heavy duty solution (goes from a CN 95 to 72)
 - This requires substantial equipment: 30-70 horsepower/blade—could be done easily on a current construction site—could be very economical
- When using subsoiling vs topsoiling there is more infiltration, turf grows better and outgrows clover
- How long does compost amendment last?
 - High levels last a while- renewal of organic matter from decaying and new roots
 - Doesn't last long when left bare
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- Depth of incorporation of nutrients is 32cm!—from a spader instead of tiller
- “natural” recovery may not be an option—the more compacted the soil, the less likelihood of return (on human timescales)
- On a homeowner lot one could try core aeration and top dressing. Target a specific area and figure out how many passes you need to make to pull out 20% of that area. Machinery can be rented at a good rental store.
- Wrap-up:
 - Use urban soil husbandry to get the crops you want to grow- and encourage high infiltration rates
 - Works technically
 - Trying to get it to work economically
 - Working to get credits from regulatory bodies
 - Be wary of the APPEAL OF SIMPLE SOLUTIONS
 - Compaction is ubiquitous by design
 - We can restore Environmental Services
 - Can be cost effective for stormwater credits
 - Builds sustainable landscapes

References:

- SCS Curve Number
- NEH
- MD Environmental Site Design
- Sustainable Sites Initiative

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- Q & A
 - Rental core aerator goes 6 inches deep—can get different depths—make sure to vary lengths
 - 100% vegetative compost—Leafgro—all nutrients must be in organic form—low C to N ratios
 - Does this work in dense clay soils?
 - doesn't work for drainage problems—important to diagnose problem
 - You want to have a plan for your soil—what is realistic?
 - get a soil test
 - can take a couple years
 - timing can be important