Up By Roots
Healthy Soils and Trees in the Built Environment

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Practical Applications
Preserving, repairing, and replacing soil and improving drainage
Soil Compaction Modification

Over compaction in soil is one of the greatest causes of plant decline!

1. Mechanical modification

2. Subsoil modification

3. Compaction reduction within the root zone of mature trees
1. MECHANICAL COMPACTION REDUCTION METHODS

Step 3
Respread topsoil

Remove topsoil

Step one

Machine “double spading”

Topsoil from first row

Turn Subsoil

Add compost

Soil moisture is critical
Not to wet or dry

Step two

1. MECHANICAL COMPACTION REDUCTION METHODS

English “double spading”
Compost!!!!
Get it into the soil, not just on top!

But there are issues with tillers
Spade tillers do less damage.

COMPOST TILLING AND SURFACE COMPACTION REDUCTION
Subsoiling large site

Subsoiling small site

Trenches filled with compost

SUBSOILING
Dealing with compaction: Cultivation (break it up!)

- Backhoe
- Auger
- Chisels and rippers
3. Compaction reduction in the root zone of mature trees

- Vertical mulching
- Radial trenching
- Air Spade / compost soil mixing
Hydro excavation
Drainage Modification

1. Drain lines
2. Topography modification
3. Soil bulk density modification
4. Soil texture modification
Drain lines

Forget the sock!

Coarse sand
Solid lines under walks

Design layout and pipe slopes.

Provide for plenty of clean outs and inspection risers

Pipe spacing closer and set deeper than agricultural field recommendations
1. PVC pipe
2. Double walled pipe
3. Corrugated pipe

Cleanouts and inspection risers

Back flow preventer
Topography modifications

Raised beds and planting sites
Subsoiling improves drainage

Subsoiling large site

Subsoiling small site

Trenches filled with compost
Soil texture modification

In heavy clay soils:

Adding sand unless in very large amounts (over 50% by volume) does not significantly improve drainage.

Gypsum can improve structure which improves drainage 250ml/1M2

Adding expanded shale (lava rock) at about 25-30% by volume may increase soil drainage.
Adding sand to improve drainage

Sand does not mix into surface soil well and is not advised unless the soil is a soil mix component and large equipment is used.

Use coarse sand (concrete sand) not masonry sand and at quantities where the medium to coarse sand in the mix will exceed 55%.
Compost may improve drainage in the Soil layer in which it is placed,

But....

If the soil below does not drain,
the added compost can make an anaerobic stew!
Increasing soil water holding capacity

1. Soil texture modification
2. Topography modification
3. Soil amendments
1. Soil texture modification

It is very difficult to add clay soil to a sandy soil to increase water holding capacity.
Don’t add too much compost to soils below the top 6 inches.

Greater than 10-15% by volume will result in soil shrinkage.
Topography modification

Plant in low areas

Flatten slopes
Soil removal / replacement

Soil removal and ped retention

Use big loaders and excavators

Remove soil in big scoops to preserve clumps. Do not screen. Preserve peds!
What are natural soils?

Collected soils for resale

Undisturbed field soil

Construction on disturbed soils

Previous development sites

While these soils may look terrible they may be just fine with the addition of compost.
Redefining usable soil

Field mixing several soil layers with compost (4:1) to make good quality planting soil
Soil Installation

1. Install in layers 12-18” thick.
2. Scarify or till bottom of excavation.
3. Supporting side slope beside walk of undisturbed subgrade.

Till 4” compost into top 6” of installed soil.
Soil Installation

Traditional soil delivery

Requires more mounding to accommodate settlement

Alternative soil delivery

Lift 1 becomes overly compacted

Delivery stockpile

Lift 1

Lift 2

Delivery stockpile

Lift 1b Lift 2b Lift 3b

Lift 2a Lift 2a Lift 3a
Soil Installation

A/O horizon with added compost tilled into upper soil layer

Added soil to accommodate settlement

Specified soil depth

Surface preparation prior to planting

Anticipated settlement

- Sand Lawn soils: 5% of soil depth
- Soil/sand/compost soil mix: 10% of soil depth
- Loam soil w/ peds and small amounts of compost: 10-15% of soil depth
Constantly loosen soil while installing to avoid buildup of deep compaction.

Require all equipment to have teeth on bucket to scarify soil
Re-Thinking Soil and Soil Mixes
Too much Sand?  Too little Sand?  No sand?