



Soils Basics for Trees

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We find trees in many environments in nature

DIFFERENT TREE SPECIES ARE ADAPTED TO GROW IN DIFFERENT CONDITIONS



<http://i.dailymotion.com/types-of-landscapes/>

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Towns and cities are different growing environments



<http://i.dailymotion.com/types-of-landscapes/>

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Some conditions in towns and cities make it difficult to grow trees

In this lesson, we're going to learn

- Soil basics
- Why some trees have trouble growing in the built environment



How do I know the tree in this photo is dead?

Soil is the foundation of a forest

PROBLEMS WITH SOIL CAN BE ONE OF THE BIGGEST ISSUES FOR URBAN TREES



http://www.forestsoil.com/soil/Forest_Soil.jpg

There are many different types of soil across the world

Soils are affected by:

- The type of rocks in a place
- Seasonal temperature and rainfall
- The shape of the landscape
- The type of plants and animals
- The amount of time it has developed
- The impact of humans



Soil is a mixture of...

Very small rock fragments (minerals)



Parts of once living things (organic matter)



Living things (roots, insects, fungi, microbes)



Water 

Air 

Soils have many features we can use to describe them

TODAY WE WILL FOCUS ON A FEW BASICS THAT ARE VERY IMPORTANT TO TREES

Texture describes that amounts of sand, silt, and clay pieces in a soil

MINERAL COMPONENT - VERY TINY ROCK FRAGMENTS

Sand = Largest Particle



0.05 mm to 2 mm wide (thickness of paper to thickness of a nickel)

Silt = Medium Size



0.002 mm to 0.05 mm (thickness of human hair to paper)

Clay = Very Small



Less than 0.002 mm (thinner than human hair)

Soil texture in perspective

Sand = Largest Particle



Silt = Medium Size



Clay = Very Small

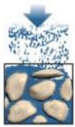


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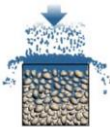
Soil contains different amounts of each particle size

Soil with a lot of sand
feels gritty



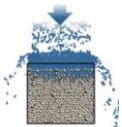
Water moves through easily, good drainage

Soils with a lot of silt
feel like flour



Moderate drainage

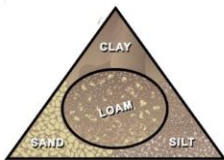
Soils with a lot of clay
feel sticky



Can hold water for a very long time, poor drainage

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Soils with a mix of sand, silt, and some clay is called a loam



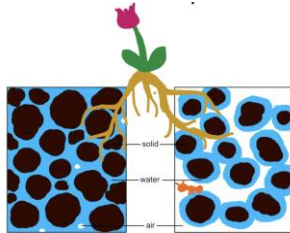
Loam is a combination of all these

We'll practice estimating soil texture later

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Pores are spaces between solid soil pieces

- Pores help soil act like a sponge
- Water and air move in and out of soil
- Critical for living things in the soil



Organic matter comes from the breakdown of things that used to be alive

DECOMPOSITION



At first, it looks like the original living thing



Over time, it changes into generic dark brown material

Soil organic matter is very important

- Adds nutrients to the soil (sort of like vitamins)
- Acts like a sponge to keep soil moist
- Is food for the microbes and insects that live in the soil



Very little organic matter, lighter color

More organic matter, darker colors

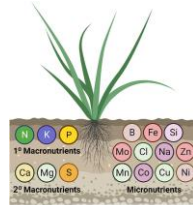
Mineral particles and organic matter can stick together to form aggregates

- Aggregates = clumps of soil
- Aggregates make bigger pores that connect together
- Water and air move more easily through the soil
- Easier for roots to grow



Nutrients are chemical elements that plants need to survive and grow

- Nitrogen, phosphorus, and potassium are nutrients that plants need from soil in pretty large quantities
- There are 14 other elements plants need from soil as well
- Plants get nutrients from both the mineral and organic parts of soil
- Fertilizers are also a source of nutrients



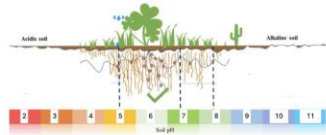
Soil pH affects how easy it is for plants to get nutrients out of soil

pH measures how acidic or how basic the soil is



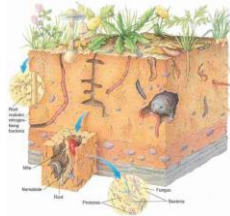
Most garden plants prefer a pH to be between 5 and 6.5

- If pH is too low or too high, some plants can be stressed
- Though other plants are adapted to lower or higher pH



Living things in the soil create a good growing environment for plants

- Living things can:
 - Make nutrients more available for plants
 - Eat harmful pests and diseases
 - Create more pore spaces for air and water



Imagine you're digging a hole to plant a tree in. The soil seems to have high clay content, is light in color, and lacks aggregates.

Why might this be a challenging environment for a new tree?

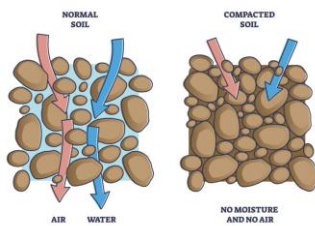
Now that we know a bit about what makes good soil for trees...

WHAT CAN GO WRONG?

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Soil Compaction

- Soil mineral pieces are compressed together
- Decreases pore space and aggregates
- Harder for air and water to flow through



<http://www.geogistuff.com/what-is-soil-compaction-and-how-can-it-be-prevented/>

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Soil Compaction

- The soil feels tough and resists digging
- Can be caused by
 - Heavy foot traffic from humans in the environment
 - Heavy machinery and vehicles
 - Pavement and construction

Why would this be bad for trees?



<http://www.advancedurbanfarming.com/resources/soil-compaction-problems-and-best-practices/>

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Low Soil Volume

What do roots need to get out of soil?

- Less soil = less water, air, and nutrients
- Compaction can decrease available soil volume under pavement

Less compacted soil
Easier growing volume



Where are most of the roots going to be in this photo?

More compacted soil
Less growing volume

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Too little water

- When it rains, where is most of the water going to go in this photo?
- Pavement and compacted soil make it difficult for water to be absorbed into the soil



Where are most of the roots going to be in this photo?

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Road Salt

- Adds sodium chloride (NaCl) into the environment
- Too much NaCl can be toxic to plants, hurting roots and leaves
- NaCl can make it difficult for roots to absorb water out of the soil
- NaCl can break apart aggregates and contribute to compaction



Image of how salt that goes on roads can affect the soil

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What are some things we can do to ensure good soil for trees?

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Tap or hover over that icon or ground hit a blue screen close the note



Let's practice testing some soil

Tap or hover over that icon or ground hit a blue screen close the note