

# Healthy Soils = Healthy Trees



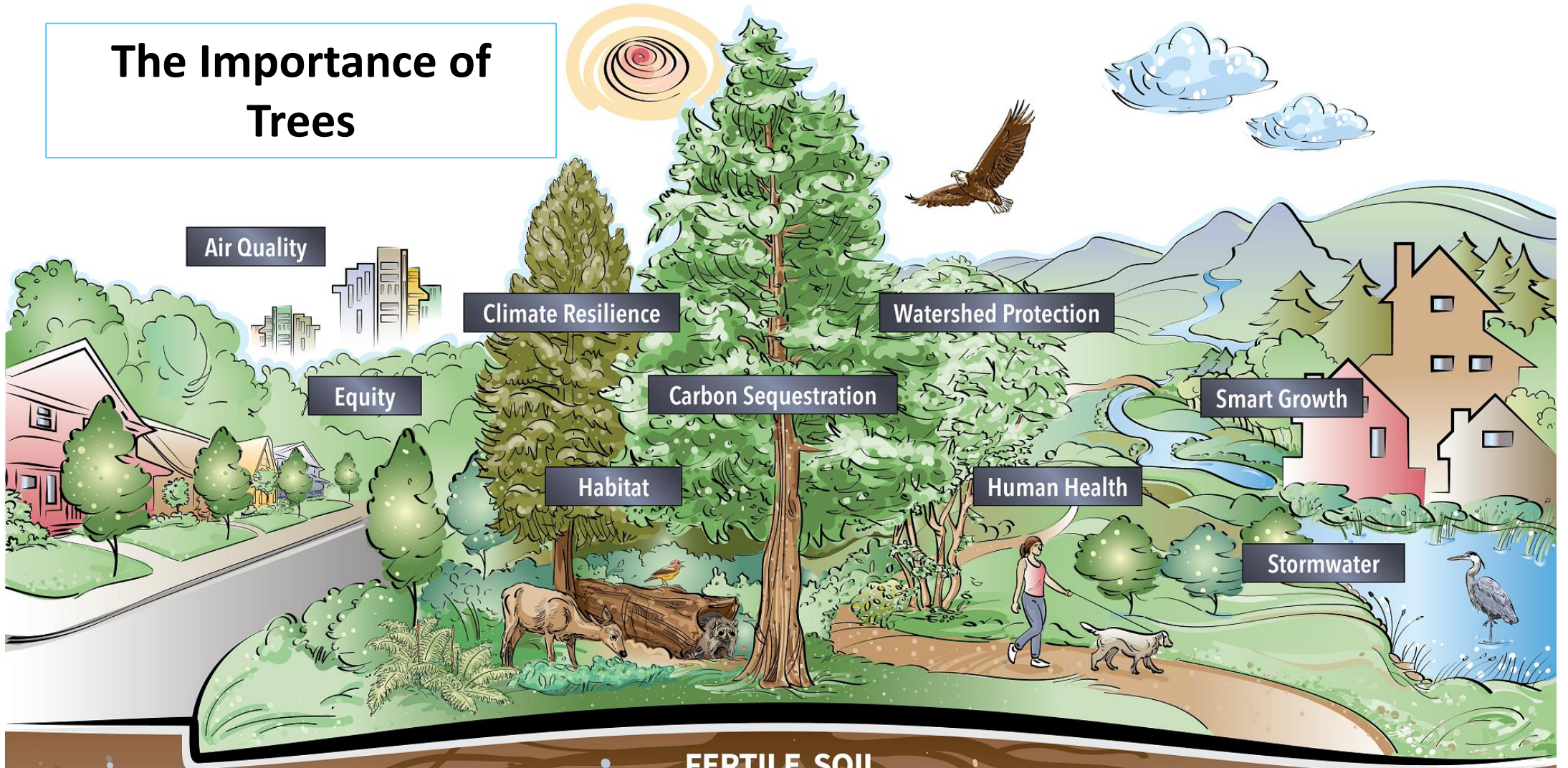
Georgia Southern University

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ISA Certified Arborist: GO-0139A



GTC Campus Tree Conference, Statesboro, GA, September 18, 2024

# The Importance of Trees



## FERTILE SOIL

To grow a resilient community, several components are needed.  
Dig into the TOOLBOXES below to find helpful resources to cultivate them.

Champion

Mapping

Analysis

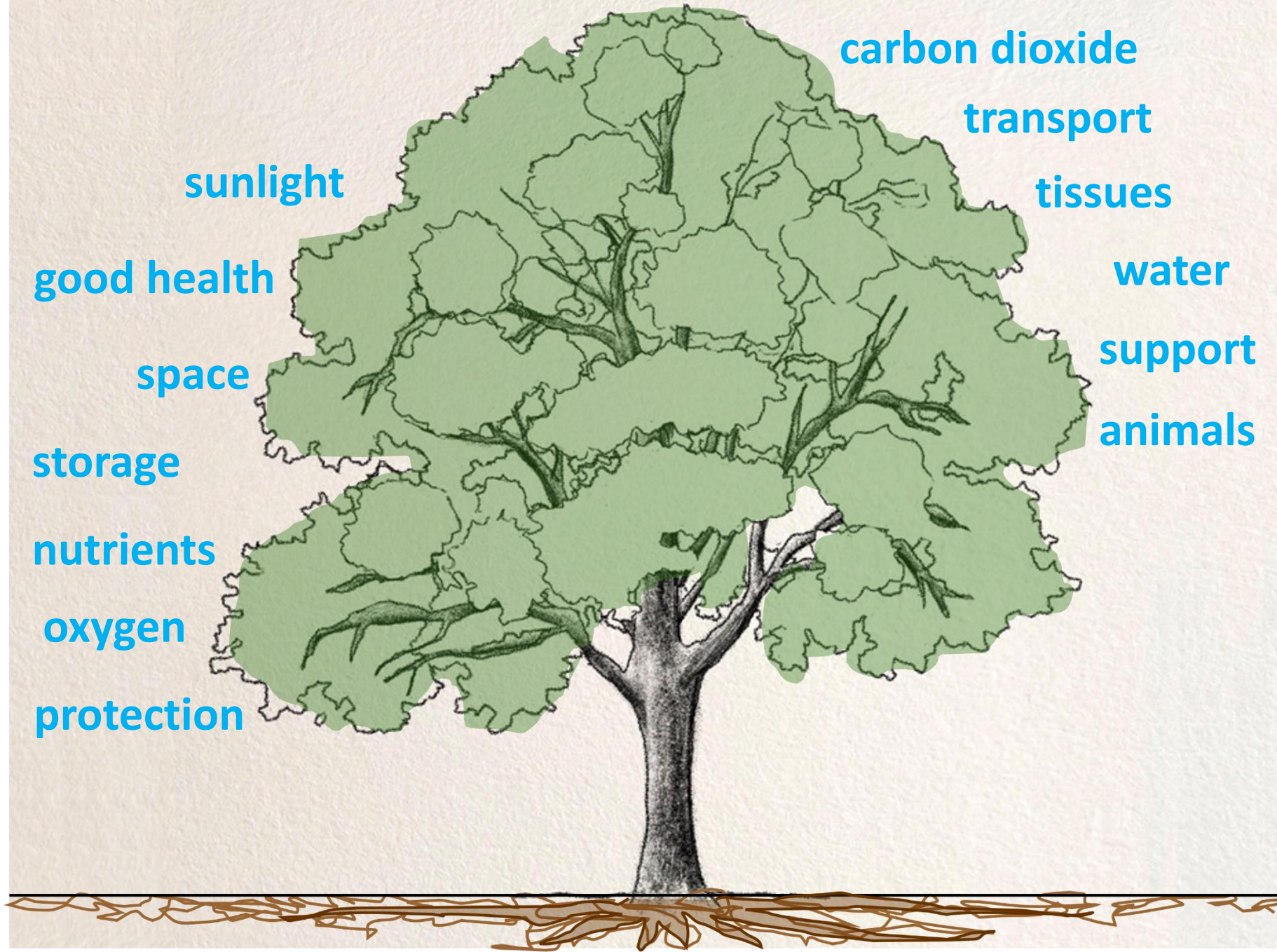
Policy & Planning

Co-Design

Funding

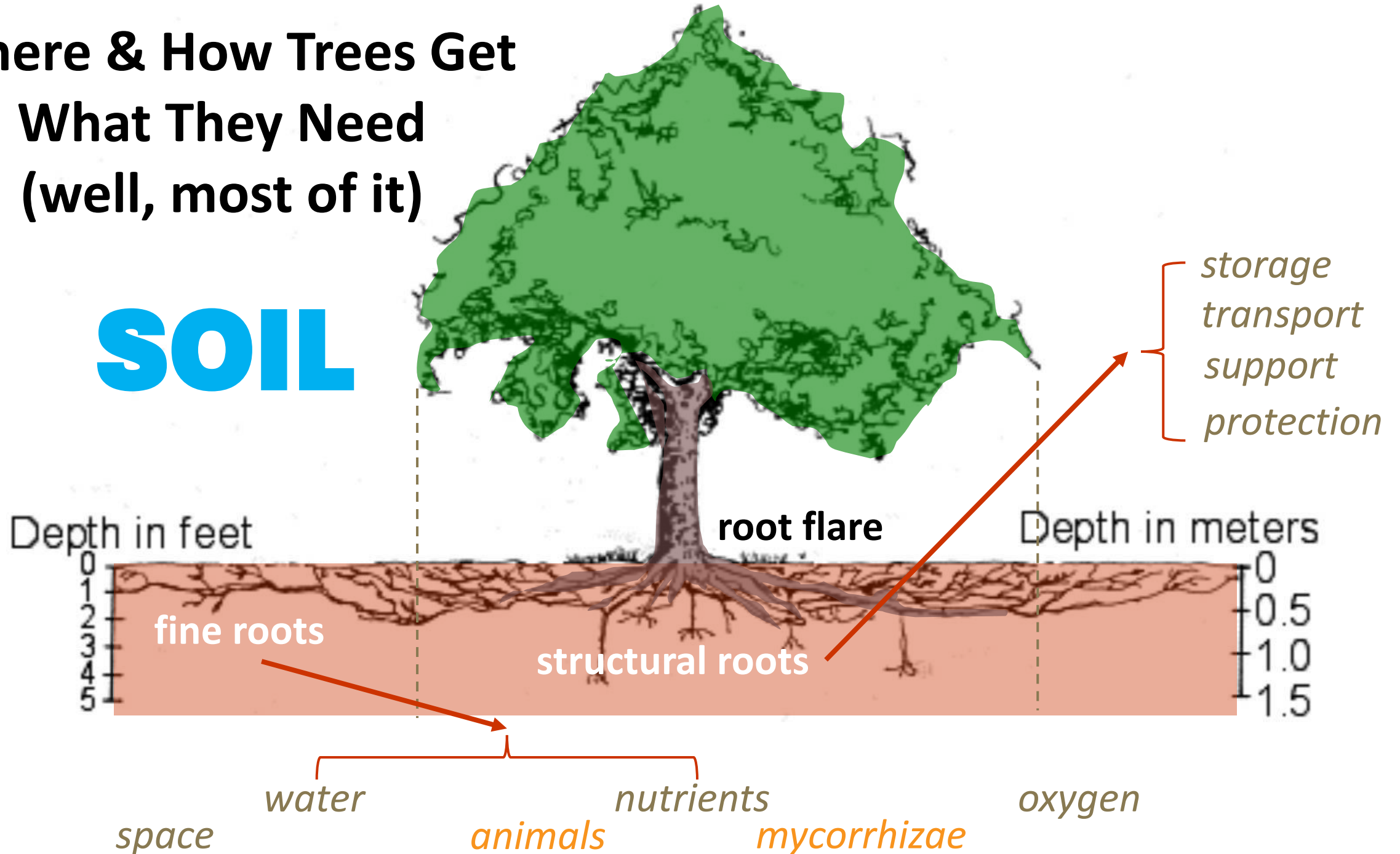
Stewardship

# What Do Trees Need?

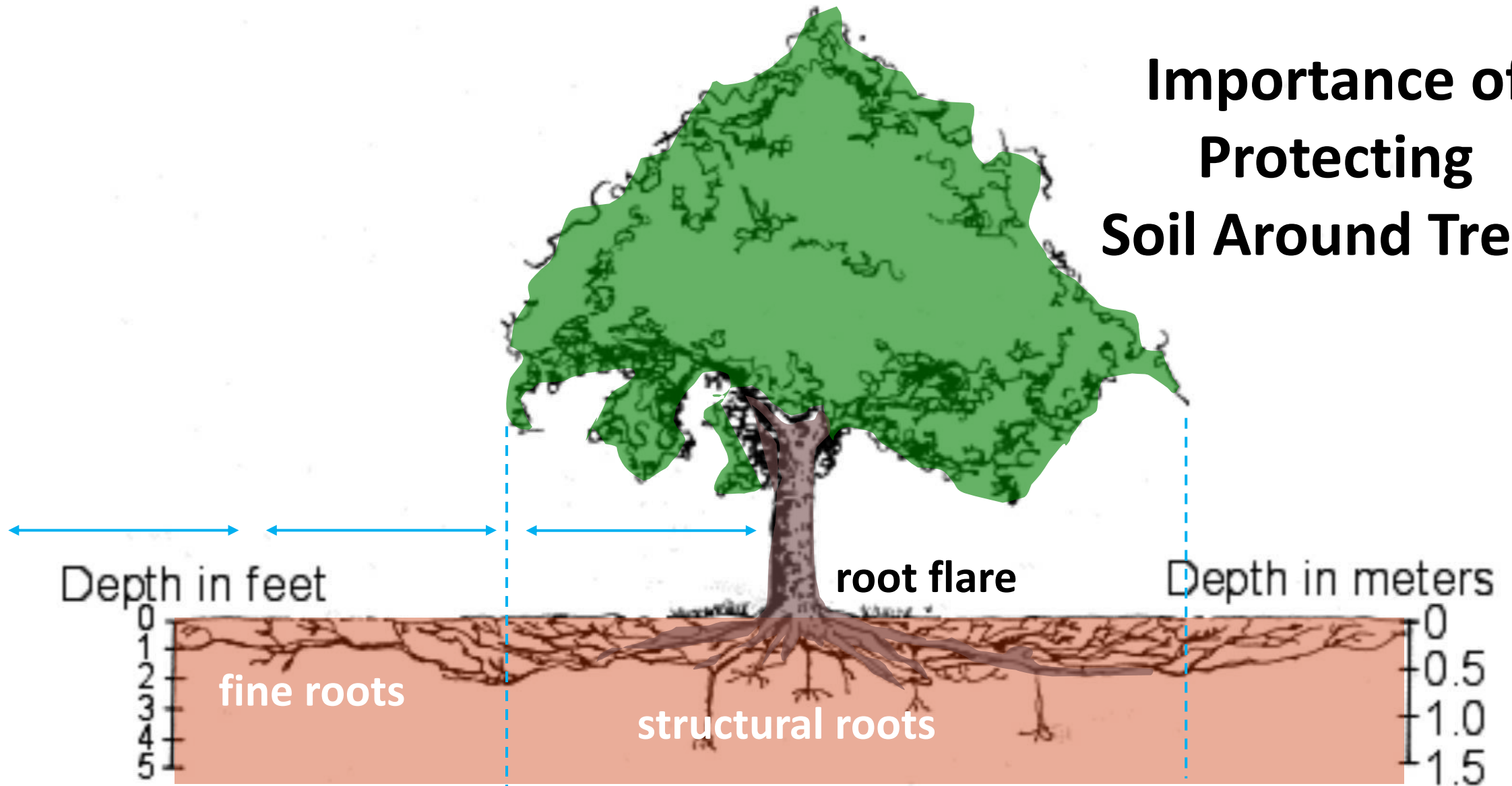


# Where & How Trees Get What They Need (well, most of it)

# SOIL



# Importance of Protecting Soil Around Trees

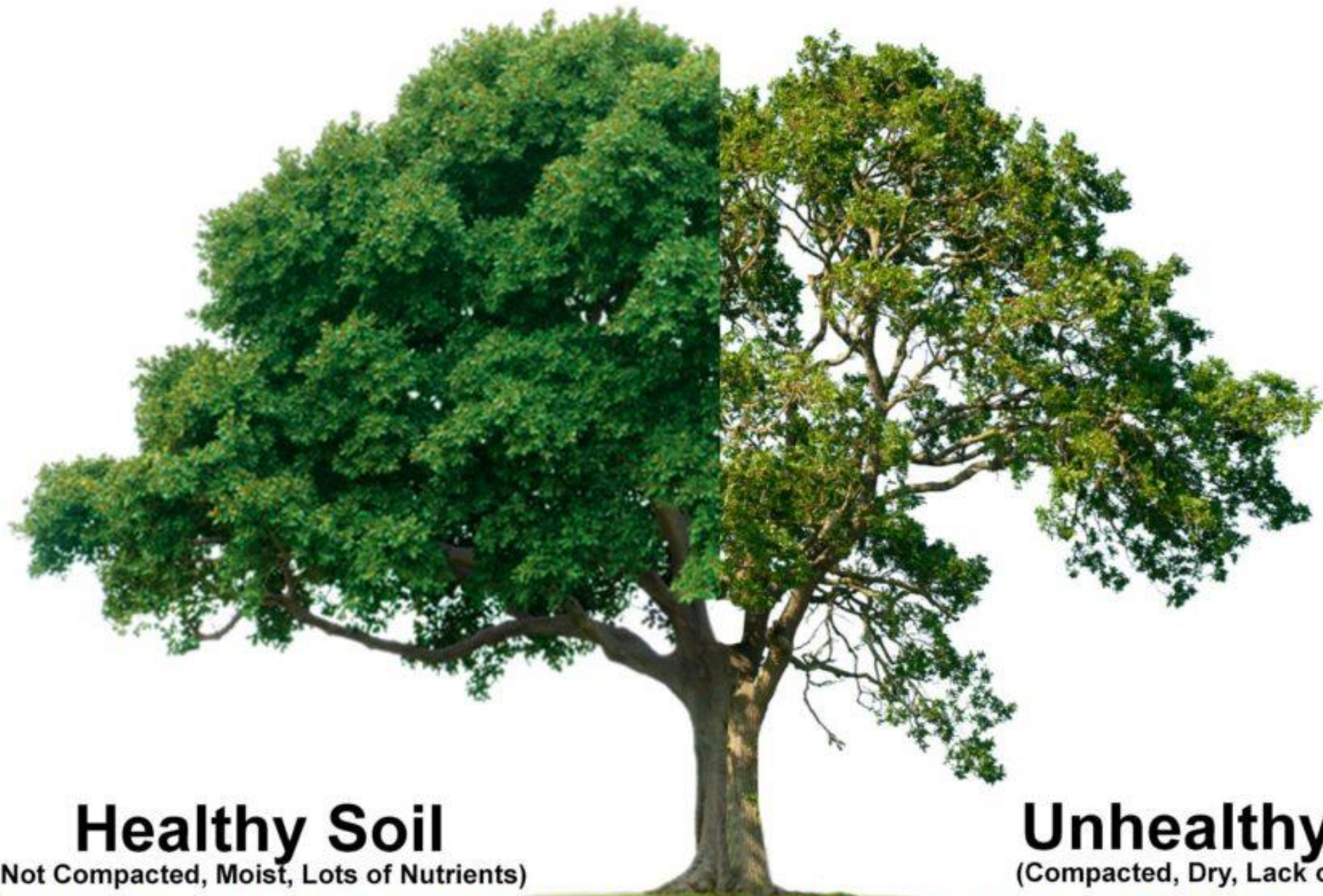


- Most roots located in top 3' of soil (with majority <12" deep)
- Tree roots can grow laterally 2-3X canopy radius (or more)

# Soil Damage is Tree Damage



Protecting soil is one of the best things we can do for trees!



## Healthy Soil

(Not Compacted, Moist, Lots of Nutrients)

## Unhealthy Soil

(Compacted, Dry, Lack of Nutrients)

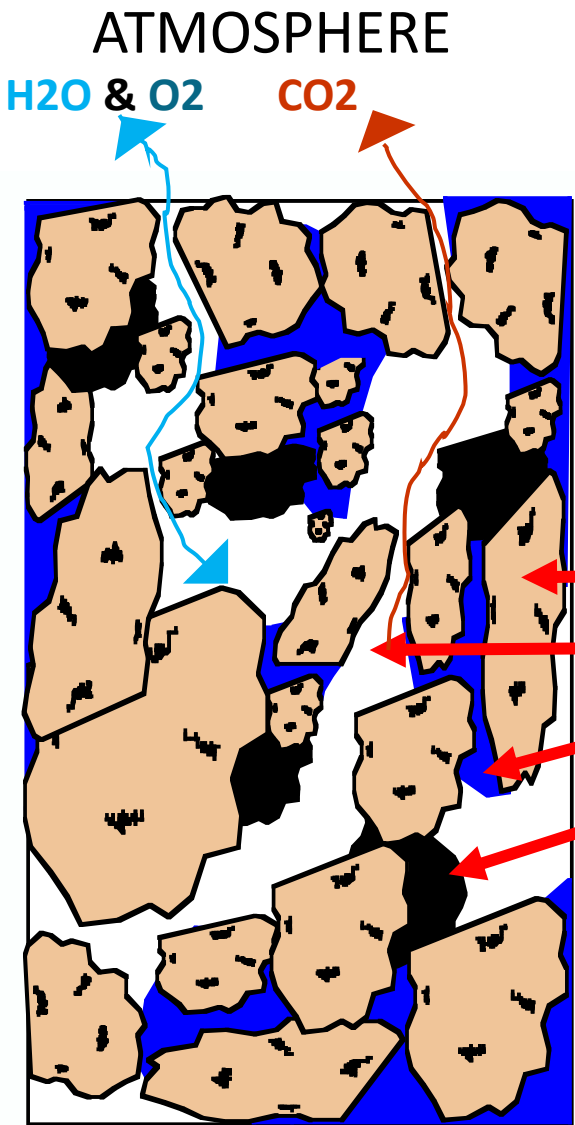


# Soil Basics

*The more you know, the better caretaker  
you can be*



# In an Ideal World, ...

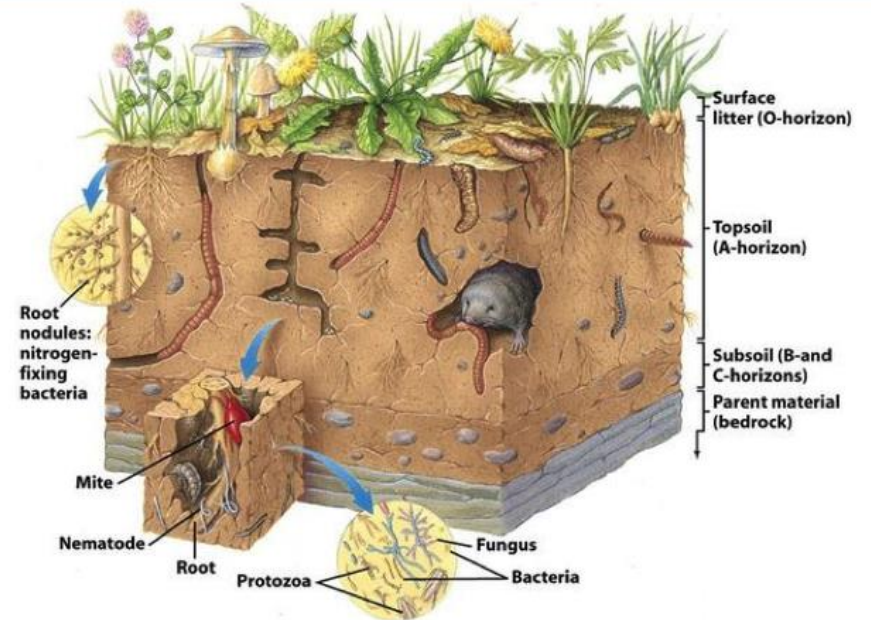


Soil looks like:

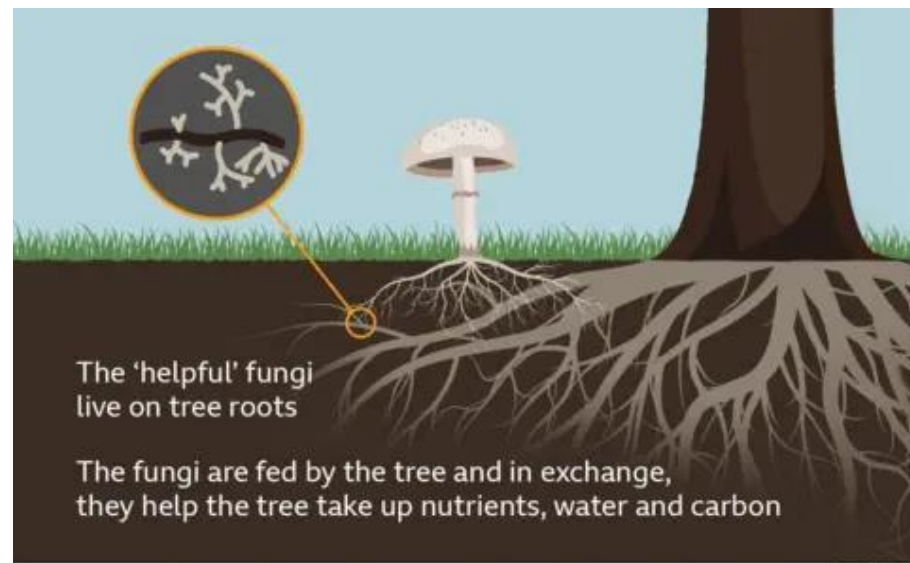
**Soil Ingredients:**

- 45% solid (mineral part)
- 25% air
- 25% water
- 5% organic matter (OM)

} ≈ 50% pore space



Soil organisms are abundant.





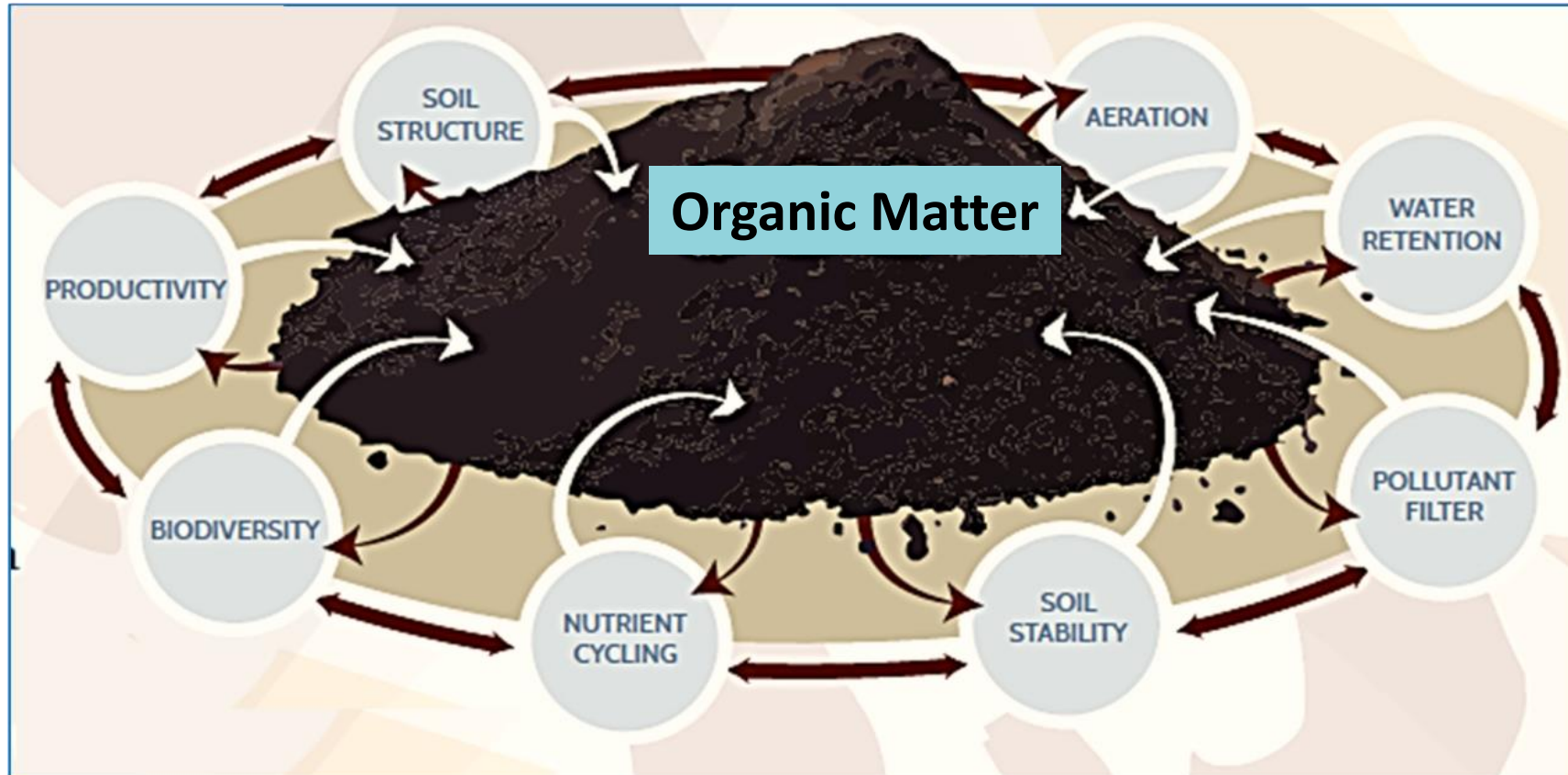
In an Ideal World, ...



Bartlett Tree Experts

Soil is covered with organic matter to prevent erosion and provide numerous benefits, like...

# Organic Matter Benefits to Soil (& Plants)



Organic matter examples: compost, leaves, mulch, decaying organisms, old roots, etc.

# In an Ideal World, ...



GA DNR

Soil has low compaction, can easily infiltrate water, and pollution is minimal or absent



Adobe Stock | #120764014

# Reality in Developed Areas



and, much more.



# Common Soil-Tree Challenge Relevant to Campuses

Soil Compaction



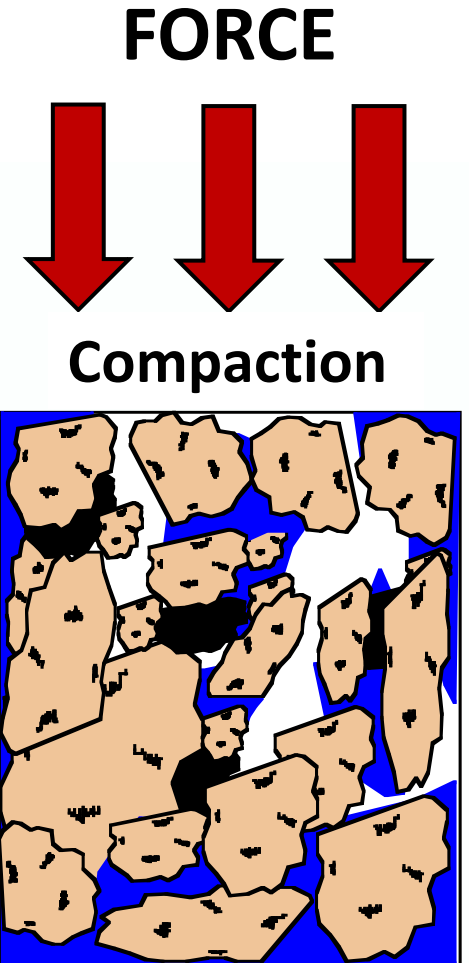
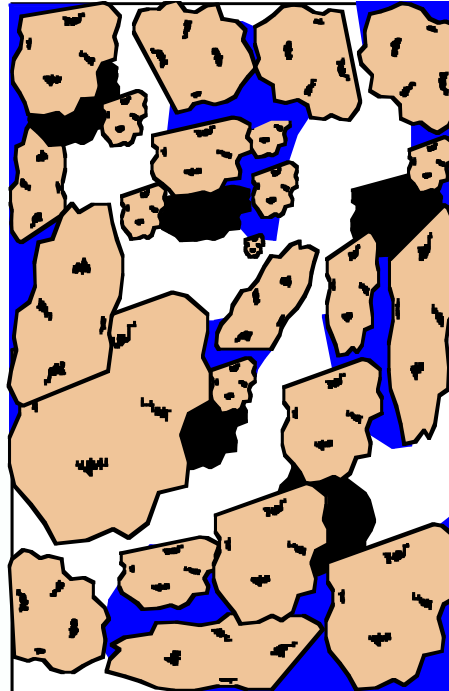
# Soil Compaction

Compaction: exerting force on a volume of soil, pressing it into a smaller space. The wetter the soil, the more easily it compacts.

Results in:

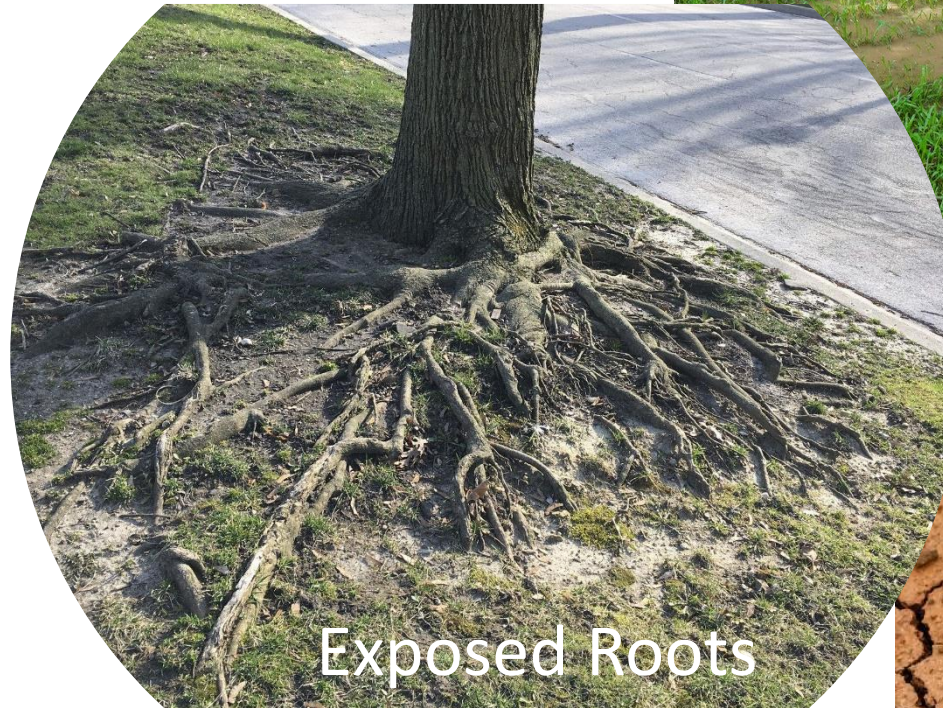
- Fewer soil pores
- Poor water and air infiltration (and drainage)
- Tree roots have a very difficult time growing (limiting water and nutrient uptake)

Undisturbed Soil



# Soil Compaction: Signs & Symptoms

- Hard soil (even when moist)
- Soil crusting
- Pooling of water
- Increased surface runoff
- Surface root exposure
- Reduced plant growth





# Compaction: Surface

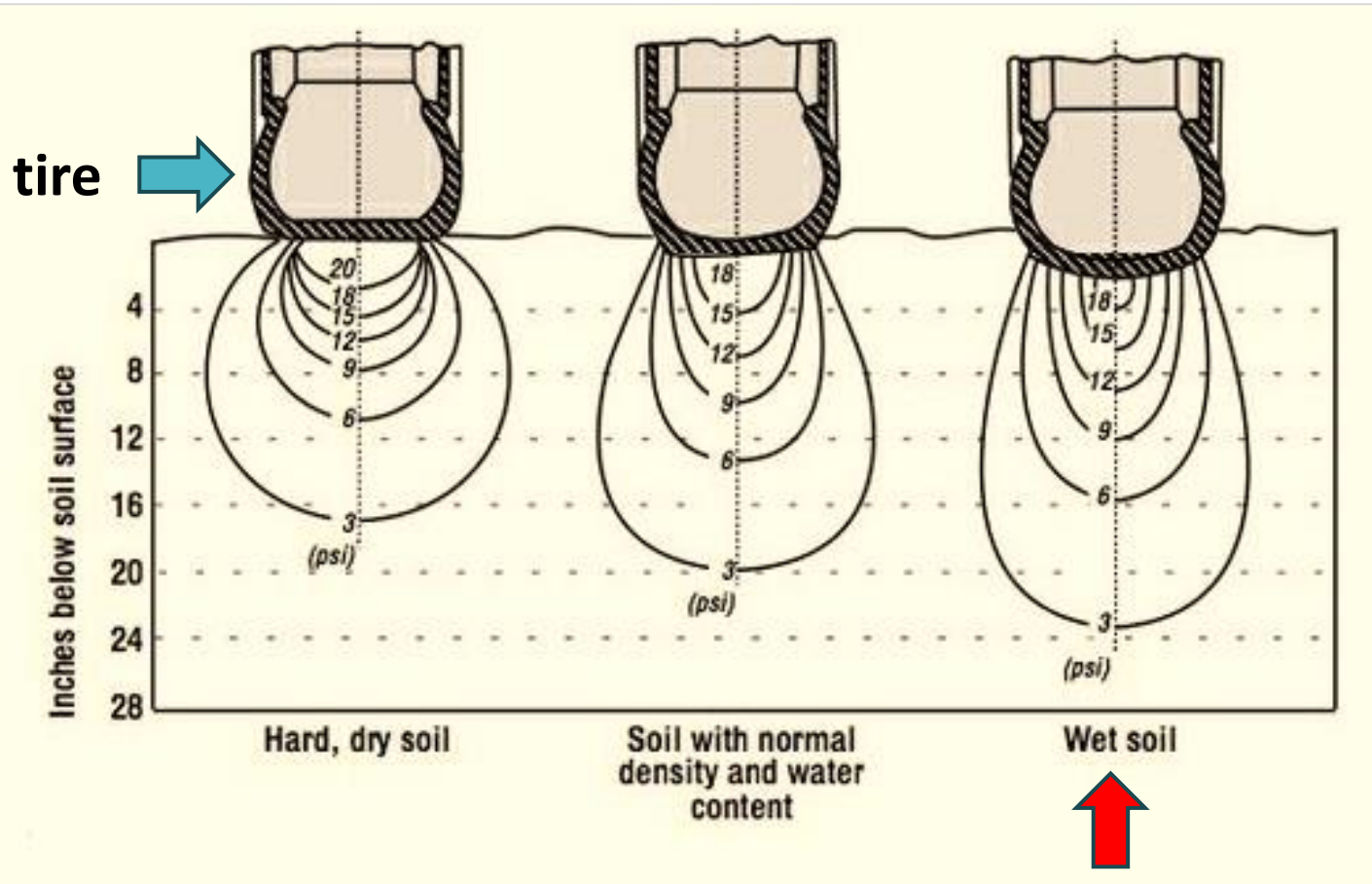
Foot traffic and tillage hardpan. Usually about 6 inches deep



surface compaction

# Compaction: Subsurface

Heavy equipment. Up to 2 feet deep



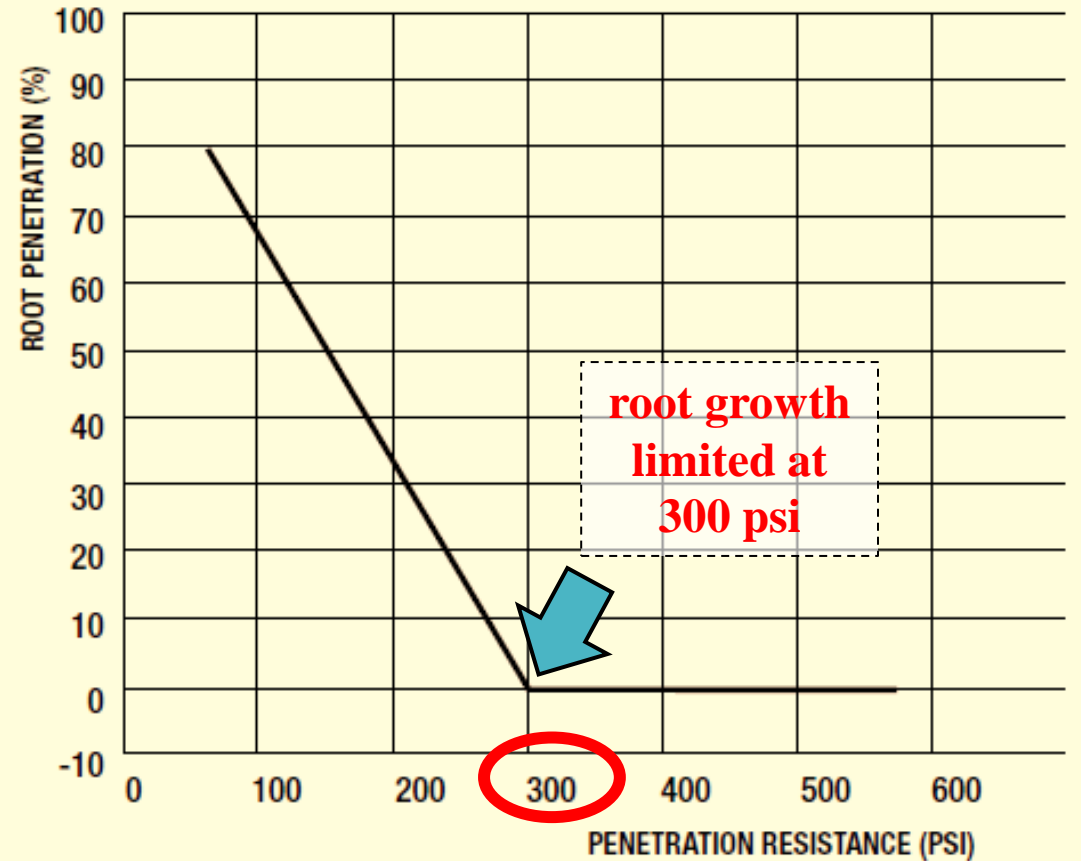
# Compaction Impacts Tree Root Growth

## Penetrometer



Agreto

Figure 2. Root penetration and penetration resistance.

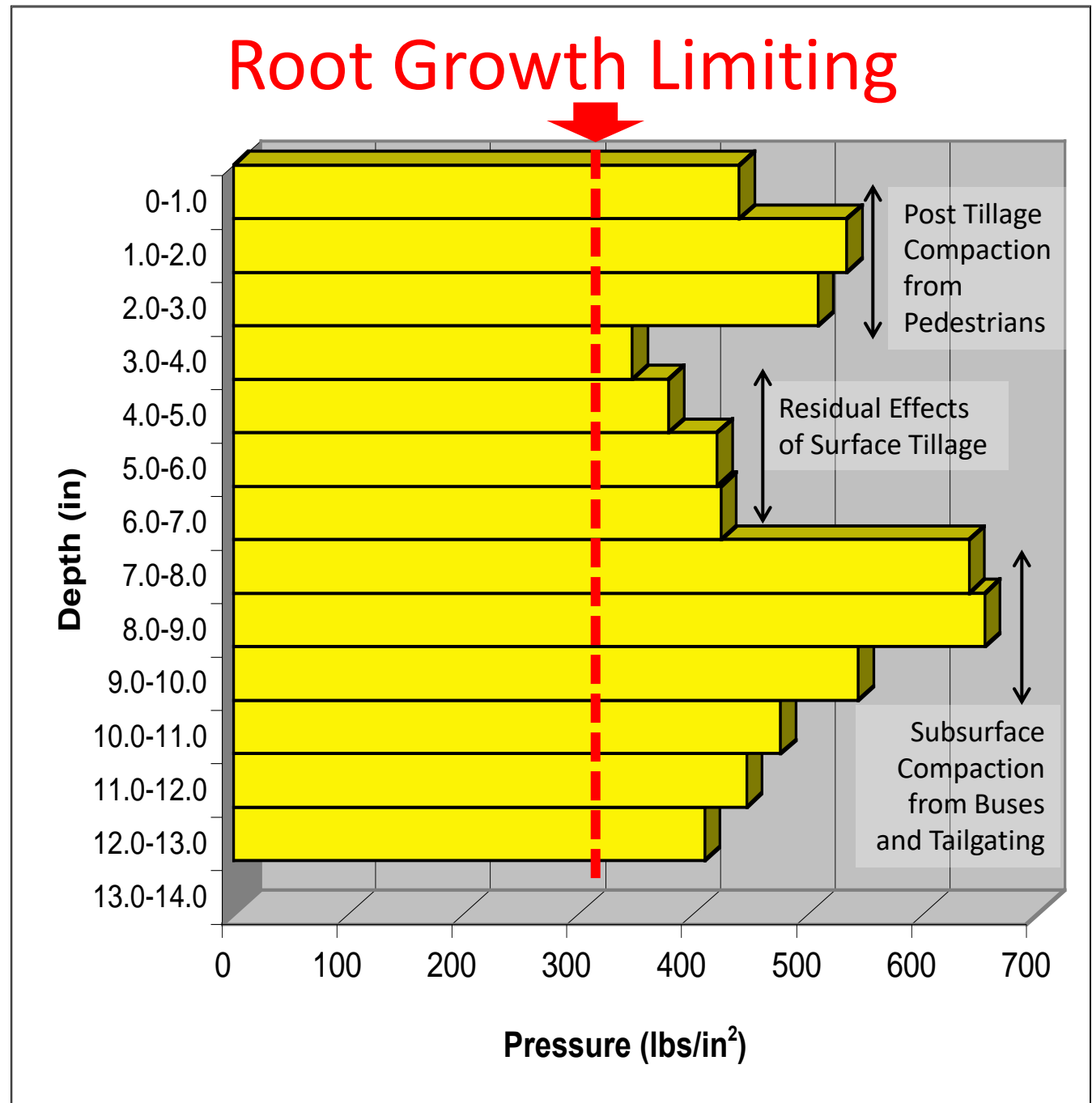


Duiker (2002)

\*Soil compaction measured at field capacity

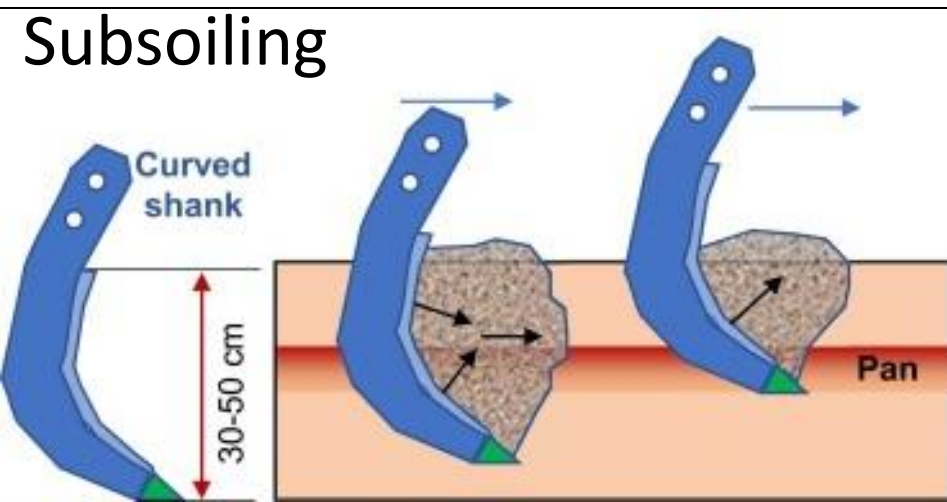
# Example: UGA Bus Stop

## Soil Compaction Study Examining Surface and Subsurface Compaction



# Ameliorating Compaction (Pre-Planting)

- Mulch/compost
- Surface tillage
- Subsoiling
- Soil Profile Rebuilding

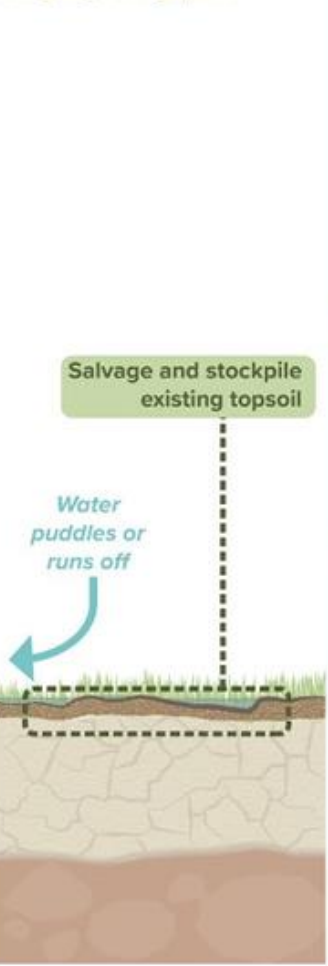


Lockhart and Wiseman (2023)

Soil Profile Rebuilding

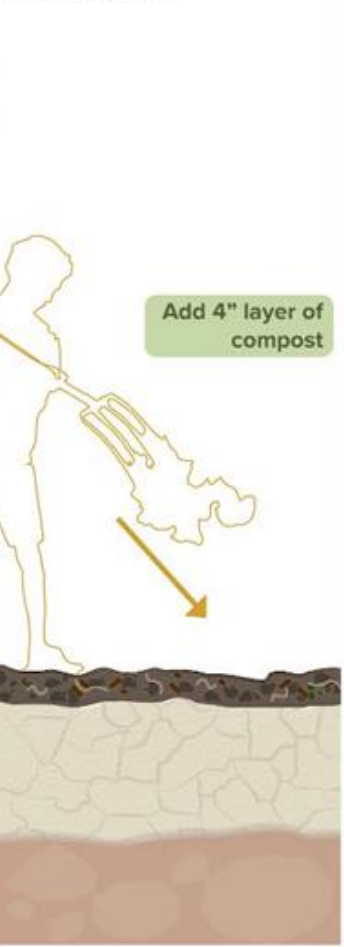
# Existing

Prior to construction, remove and salvage any existing topsoil.



# Step One

Spread mature, stable compost to a 4" depth over compacted subsoil



# Step Two

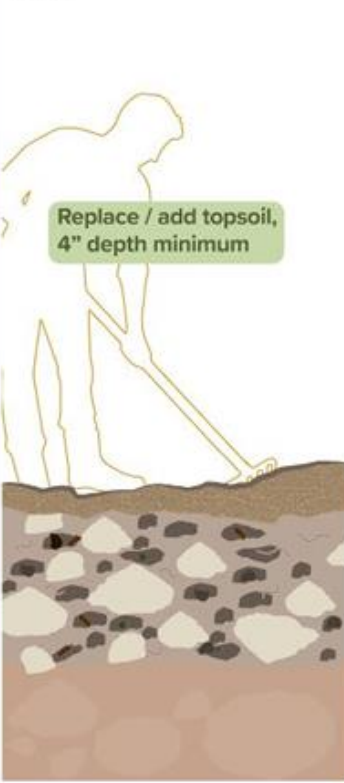
Use a backhoe to break up the compacted soil and incorporate the compost to a depth of 24".



# Step Three

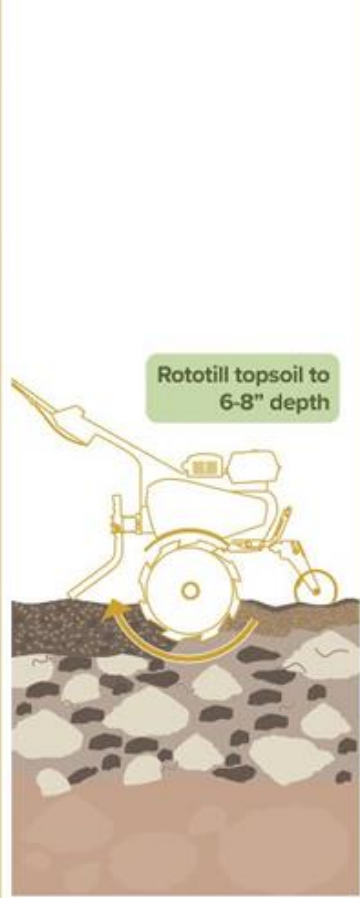
Standard: Return stockpiled topsoil or additional topsoil if none is available from the site to a 4" min depth. If soil was severely disturbed, 6-8" should be used.

Modified: If topsoil was already present before subsoiling less can be used, but always apply at least 3".



# Step Four

Rototill topsoil to a depth of 6-8" when soil is neither dry nor very moist. Rototilling depth should ideally cross the interface with the subsoiled layer.



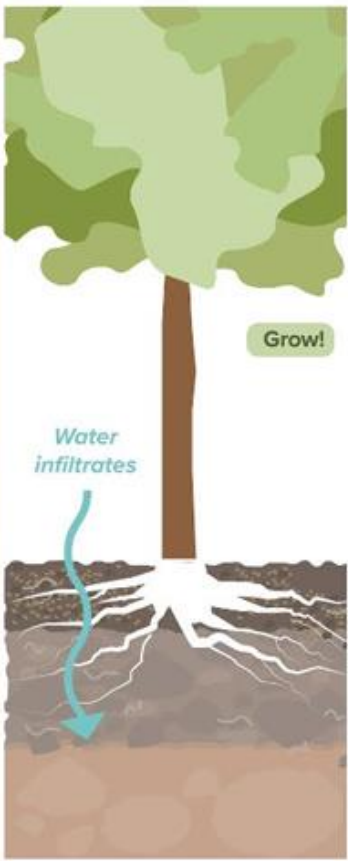
# Step Five

Plant the site with woody plants, trees, or shrubs, such that at least half the area will be colonized by roots within about 10 years.



# Rebuilt

The plant roots will exploit the loosened subsoil and compost veins and then continue to contribute organic matter and work the soil over time to develop soil structure throughout the profile.



High Compaction  
Low permeability  
Insufficient nutrients



Low compaction  
High permeability  
Organic matter

# Soil Profile Rebuilding

Example: Soil Profile

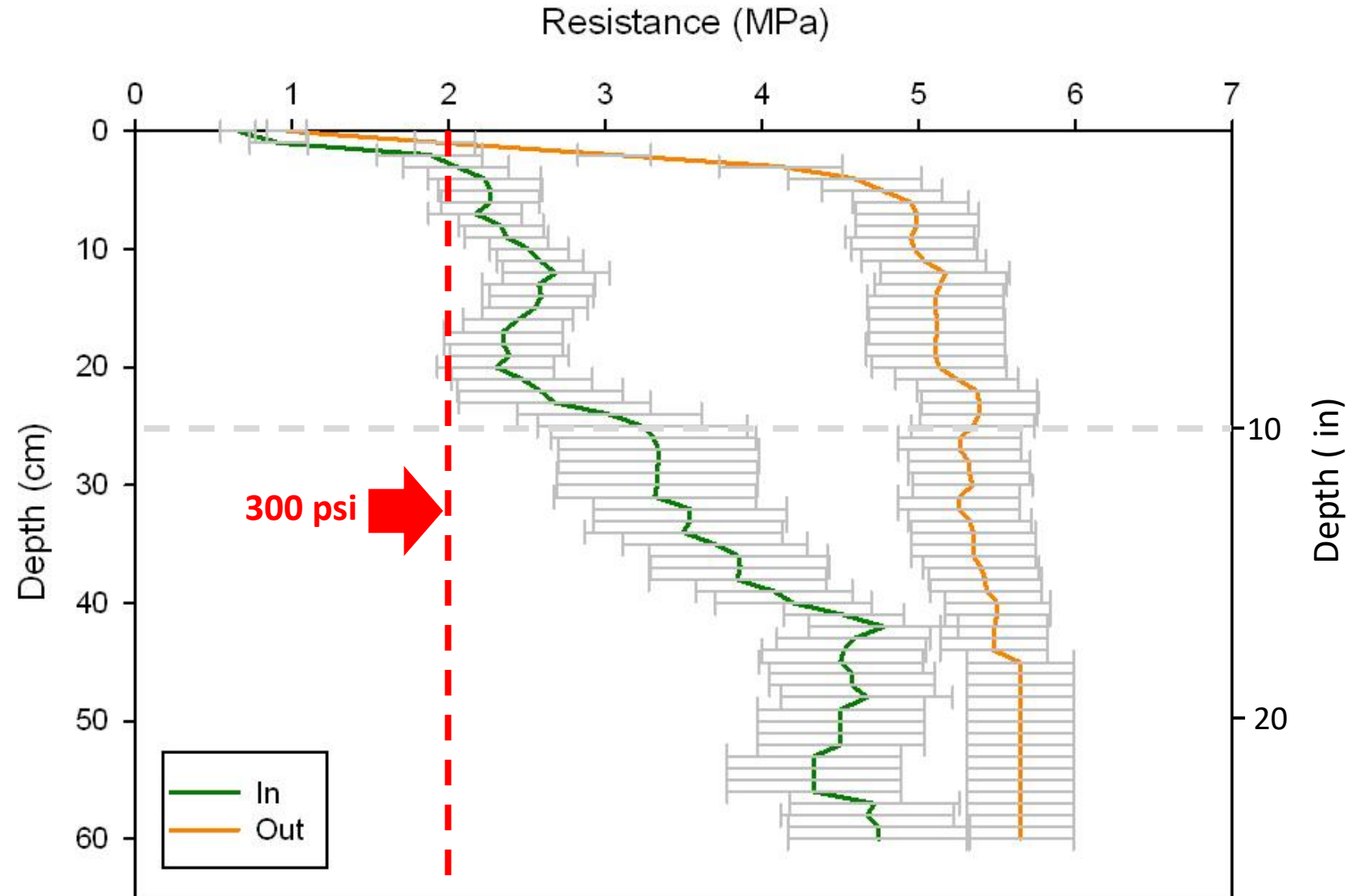
Rebuilding

Tree Planting (Post-Construction)

JJ Harris Elementary School  
Athens, GA



# Soil Profile Rebuilding in Compacted Schoolyard



Trees planted with  
SPR  
(improved soil):



Trees planted  
without SPR  
(unimproved soil):





# Ameliorating Compaction (Post-Planting)

- mulch/compost (slow)
- vertical mulching (through hardpan)
- air tillage (impacts large soil volume, but can be \$\$)



# Preventing Compaction

- Barriers
- Protection during construction
- Vegetation design
- Directing traffic
- Education





Ask not,  
what  
trees can  
do for  
you, but  
what can  
you do  
for trees?

GIVE  
THEM  
GOOD  
SOIL!



# Thank You!

Ms. Holly Campbell

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Soil Profile Rebuilding: <https://sres.frec.vt.edu>

Trees & Soil Compaction Stress (Coder, 2024):  
<https://resources.ipmcenters.org/resource.cfm?rid=17129>



green ash tree, Mt Vernon, Virginia