Healthy Soils = Healthy Trees

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Warnell School of Forestry & Natural Resources

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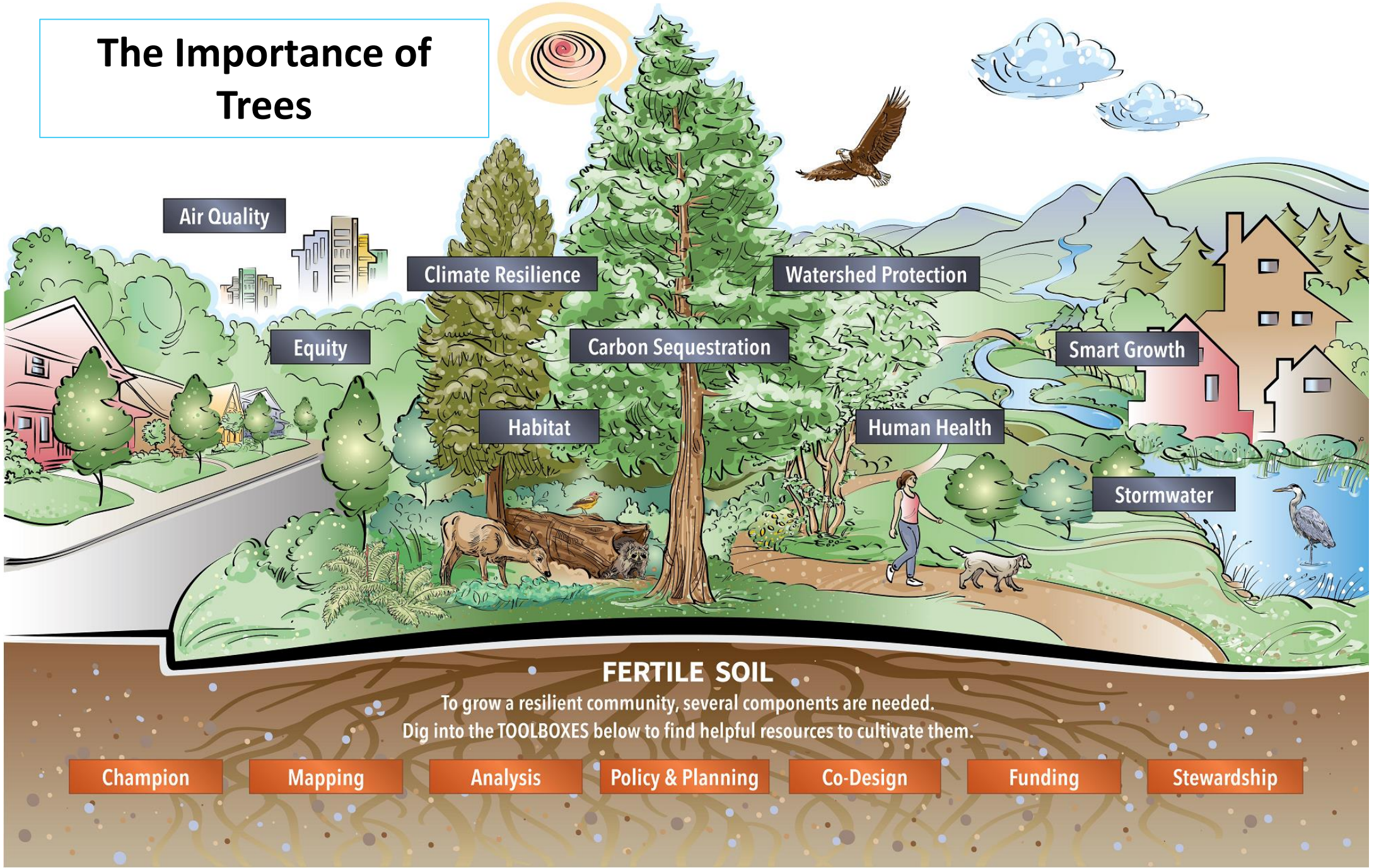
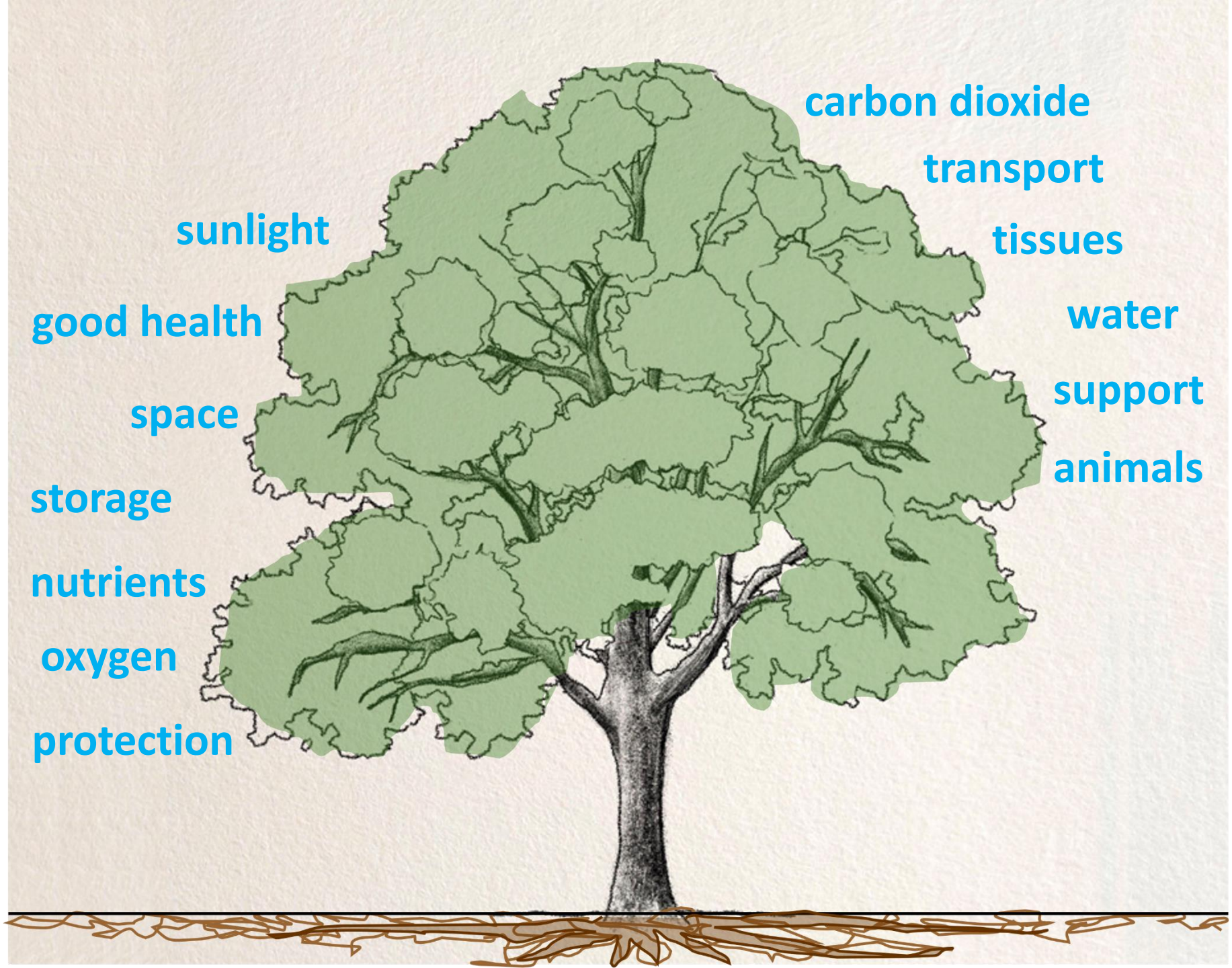
The Importance of Trees

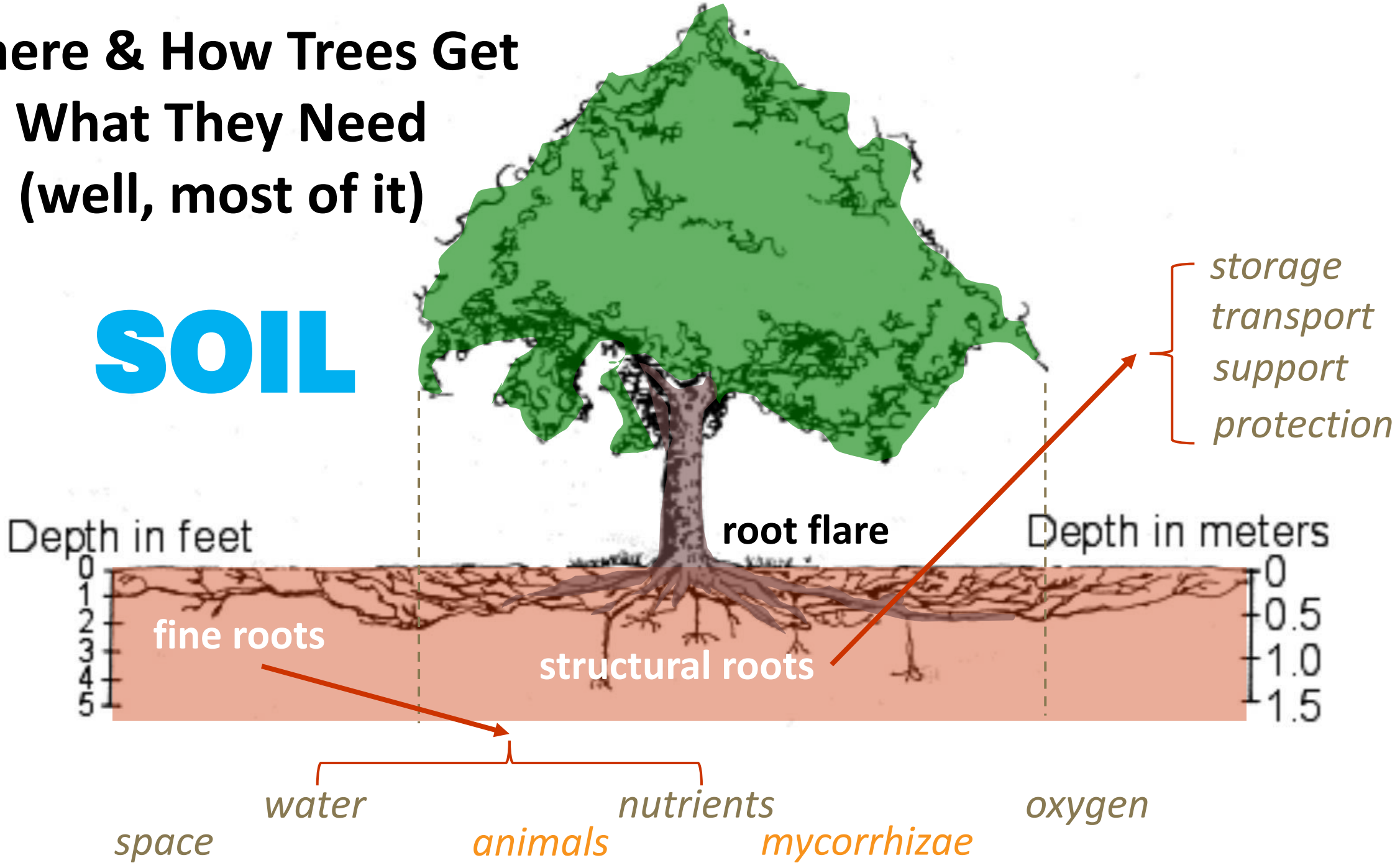


Puget Sound Conservation District

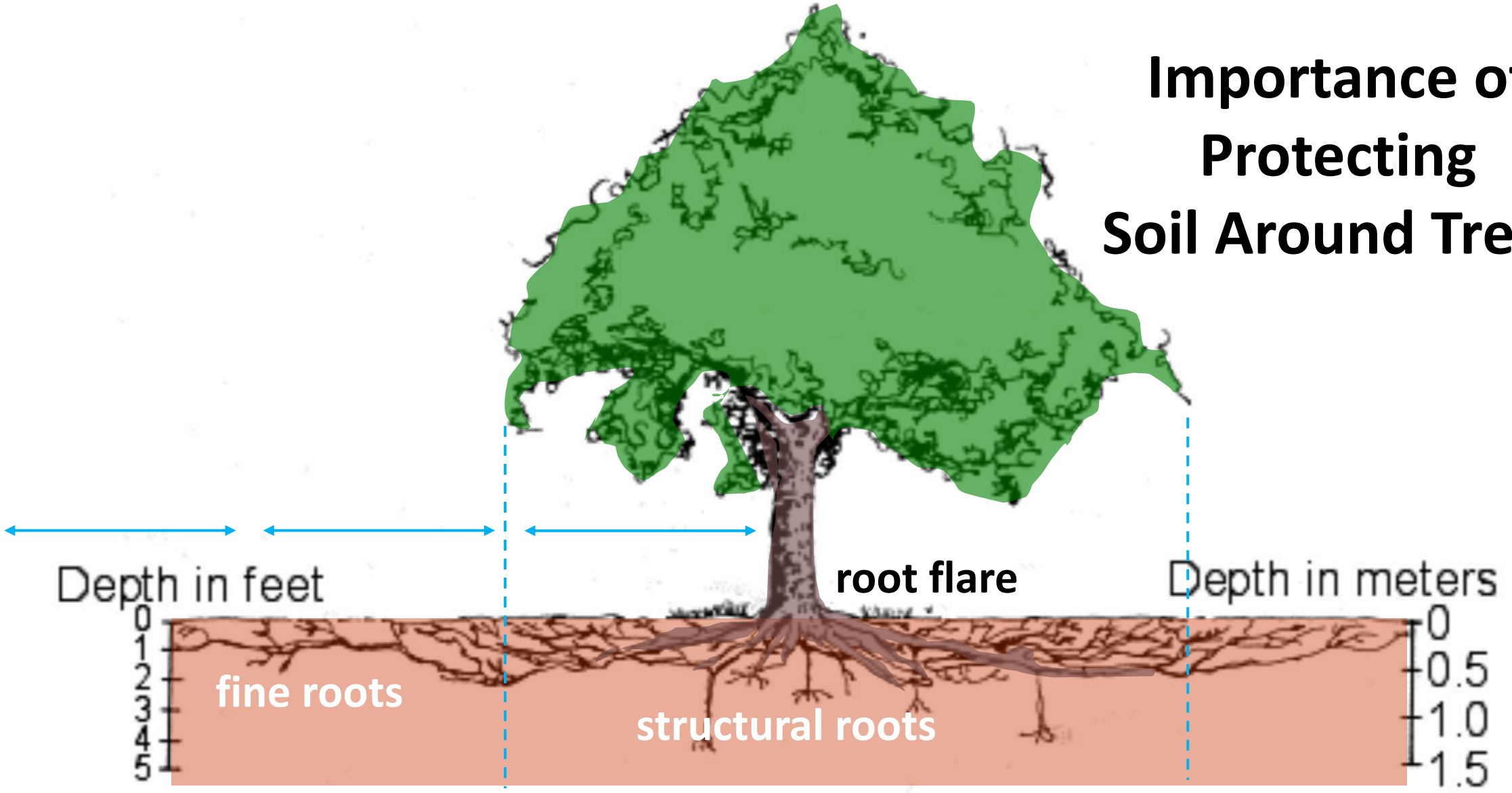
What Do Trees Need?



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



Importance of Protecting Soil Around Trees



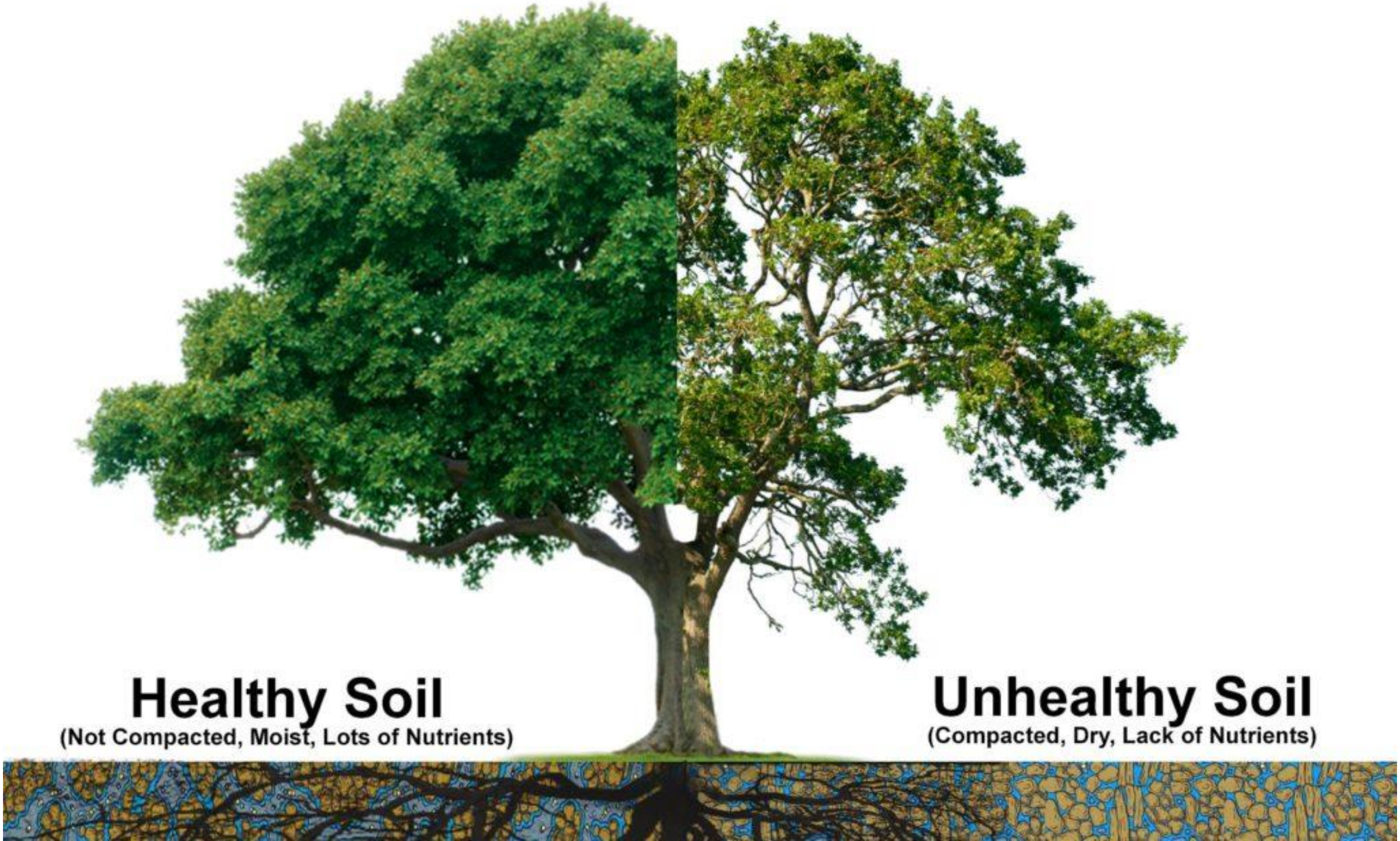
---Most roots located in top 3’ of soil (with majority <12” deep)

---Tree roots can grow laterally 2-3X canopy radius (or more)

Soil Damage is Tree Damage

Protecting soil is one of the <u>best</u> things we can do for trees!

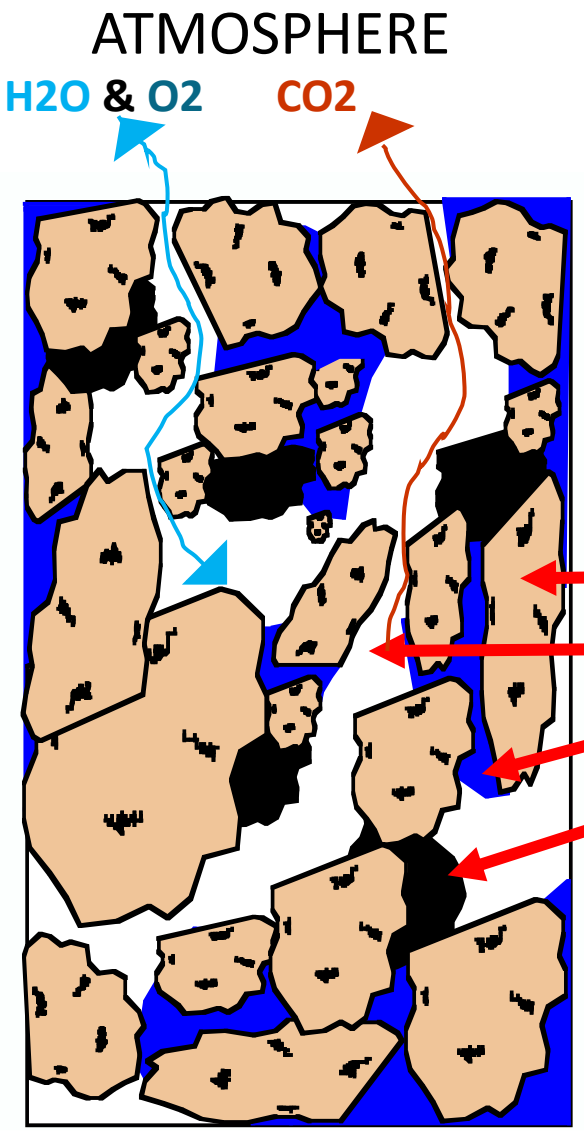
Image Credits: National Park Service


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, ...



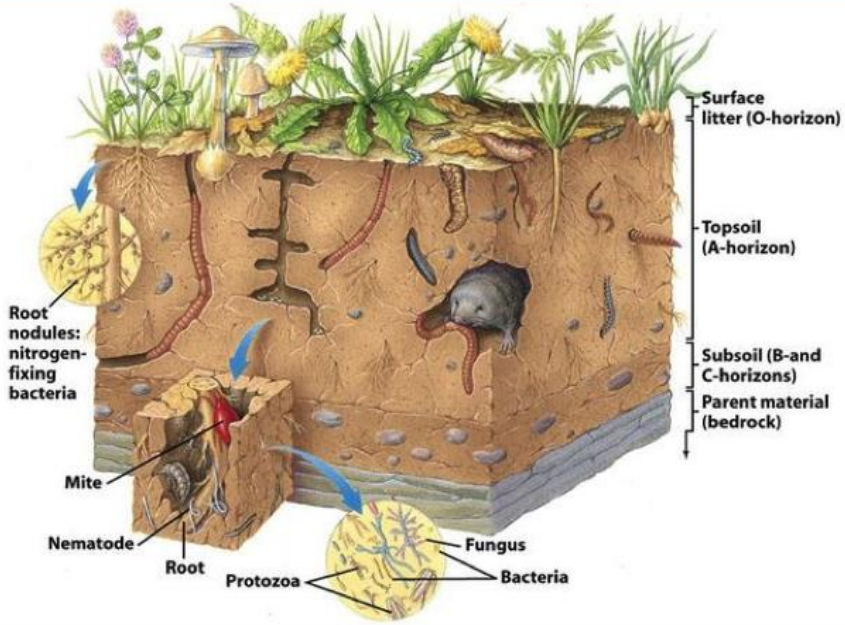
Soil looks like:

Soil Ingredients:

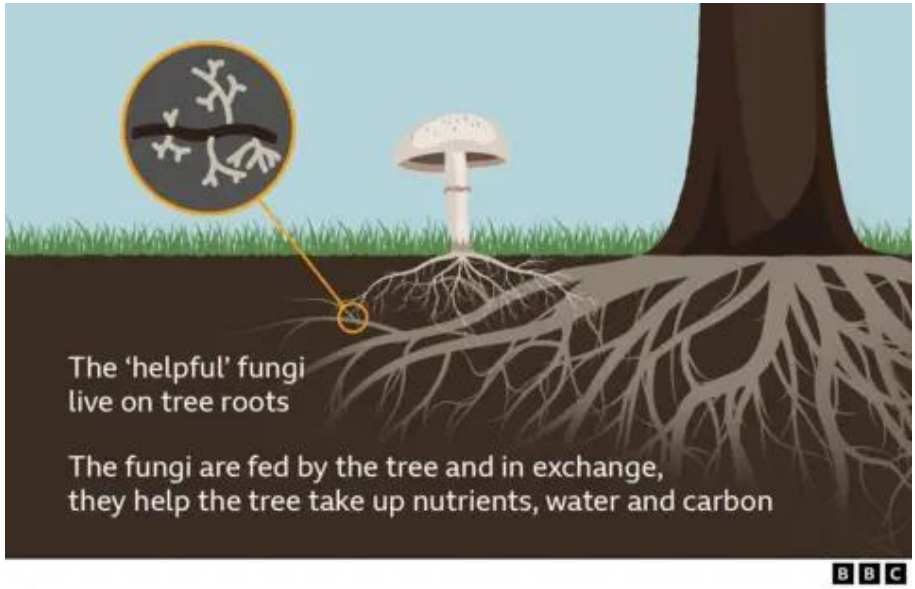
- 45% solid (mineral part)
- 25% air
- 25% water

≈ 50% pore space

- 5% organic matter (OM)



Soil organisms are abundant.

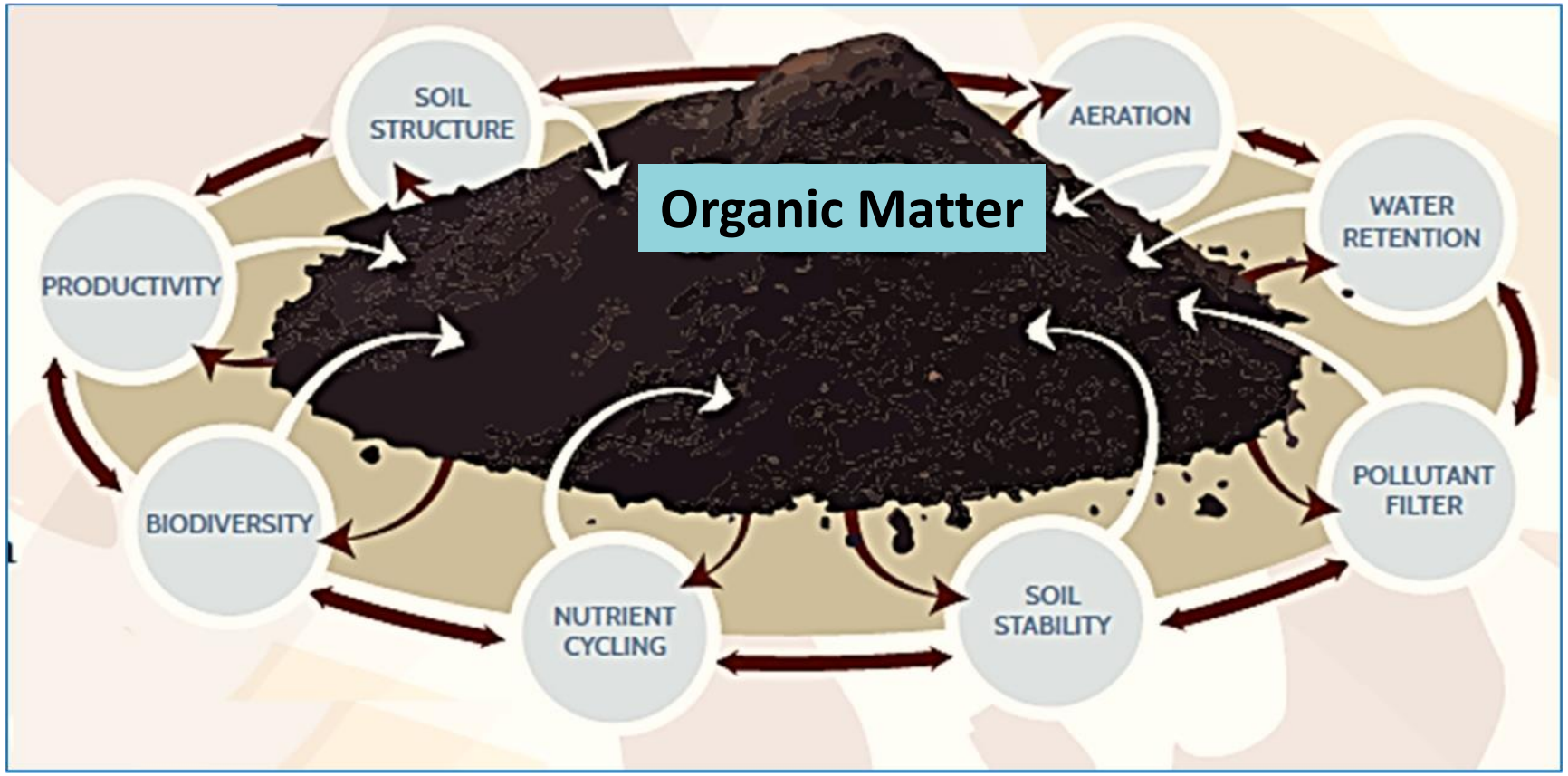


In an Ideal World, ...

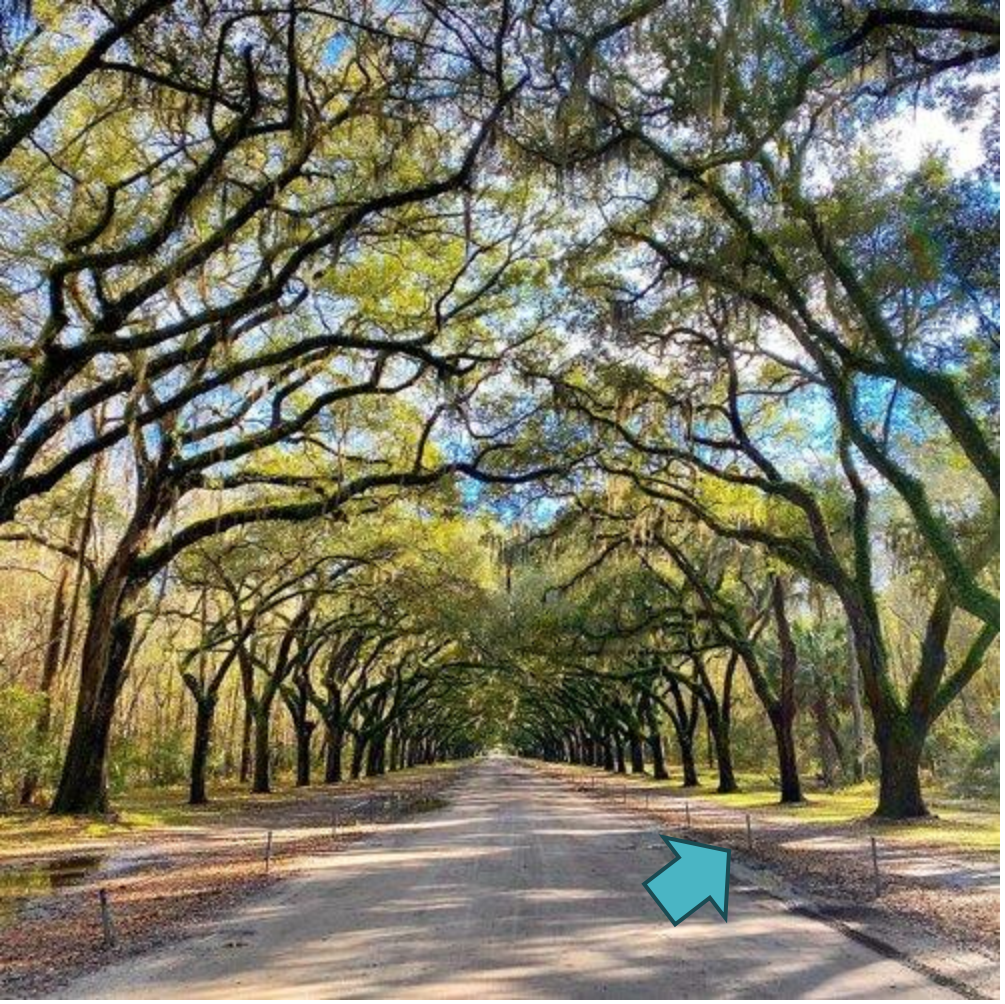
Bartlett Tree Experts

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.



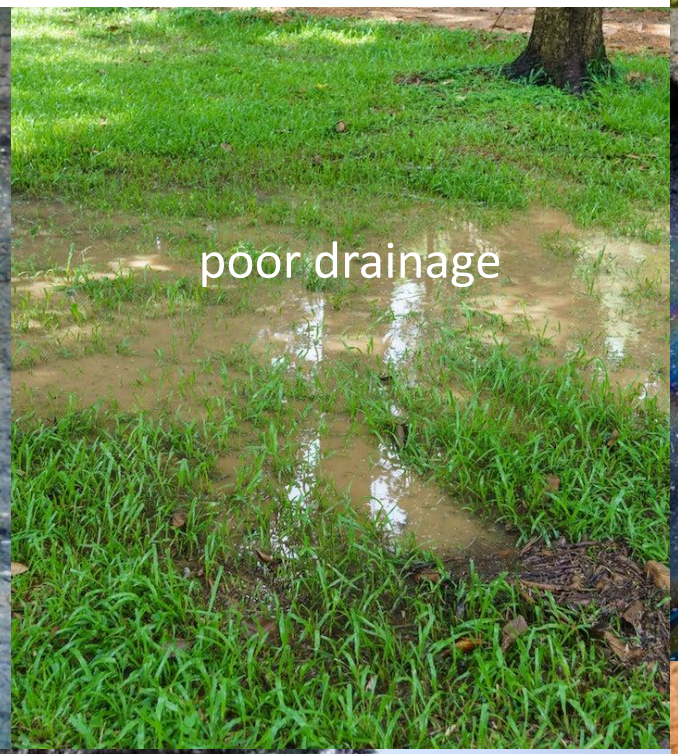
GA DNR

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

In an Ideal World, …

Reality in Developed Areas


major soil disturbance


poor drainage


soil pollution


soil crusting


soil compaction

and, much more.

Common Soil-Tree Challenge Relevant to Campuses

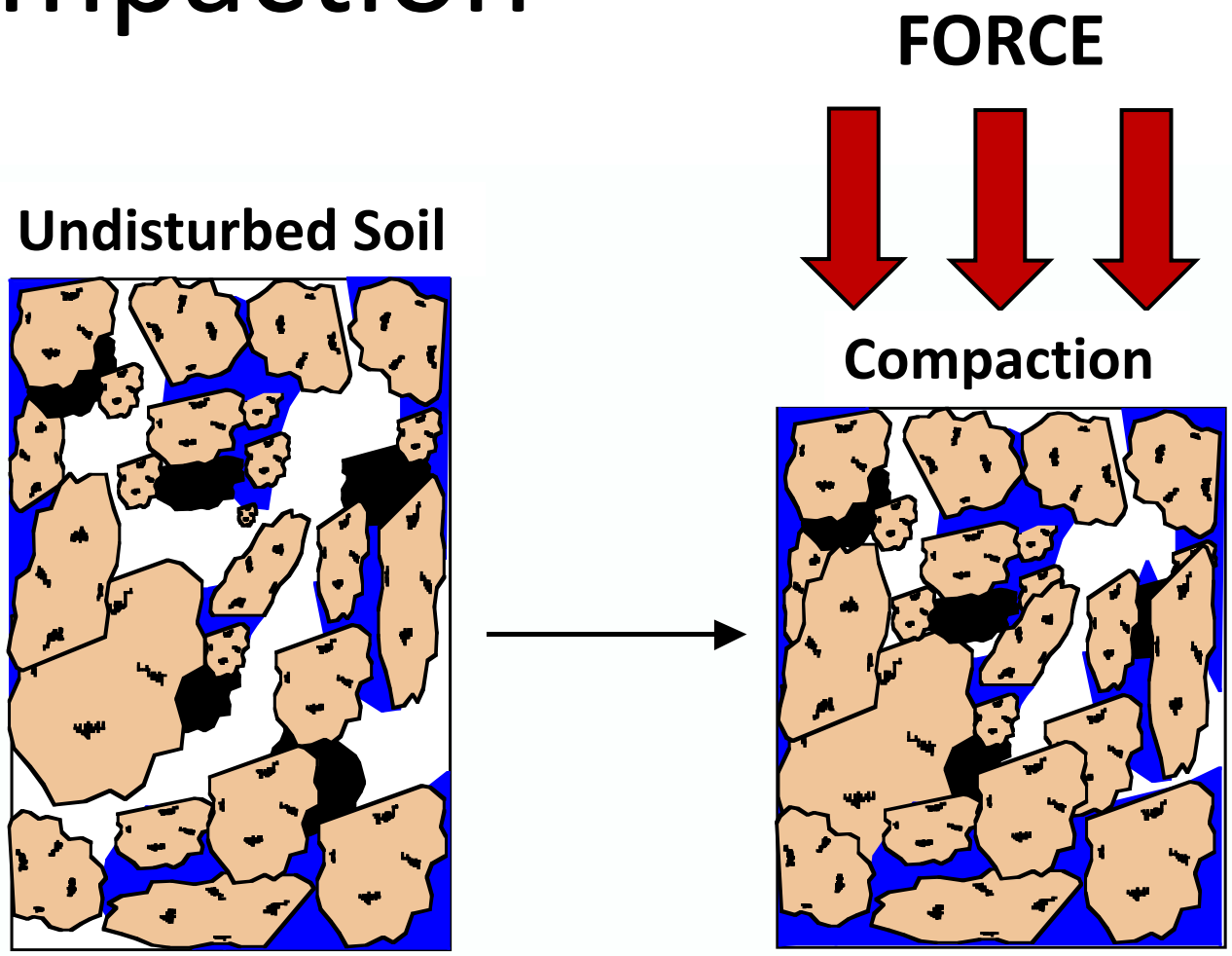
Soil Compaction

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)



Soil Compaction: Signs & Symptoms

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


Poor Drainage


Exposed Roots

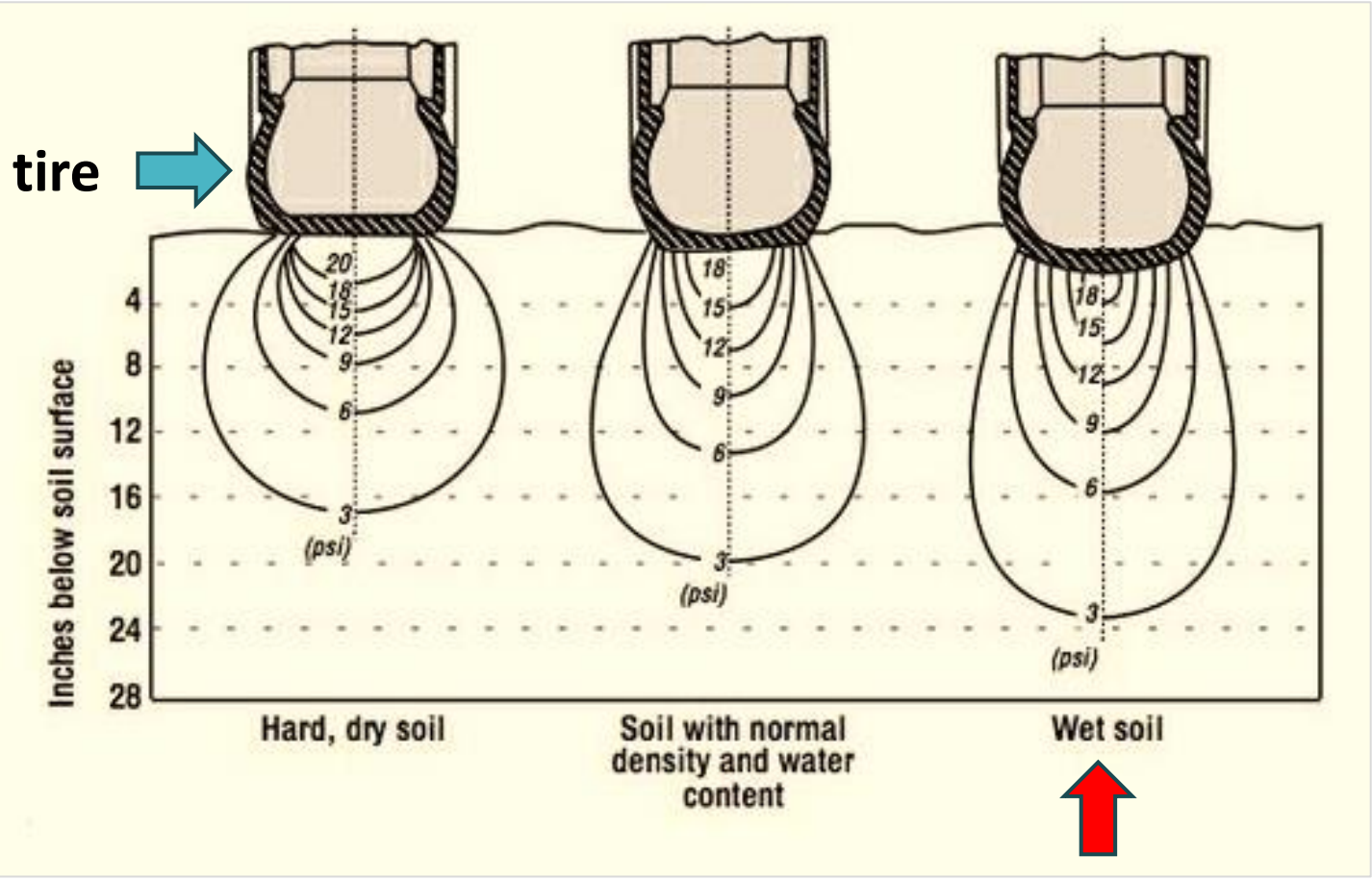

Soil Crusting

Compaction: Surface

Foot traffic and tillage hardpan. Usually about 6 inches deep

Compaction: Subsurface

Heavy equipment. Up to 2 feet deep

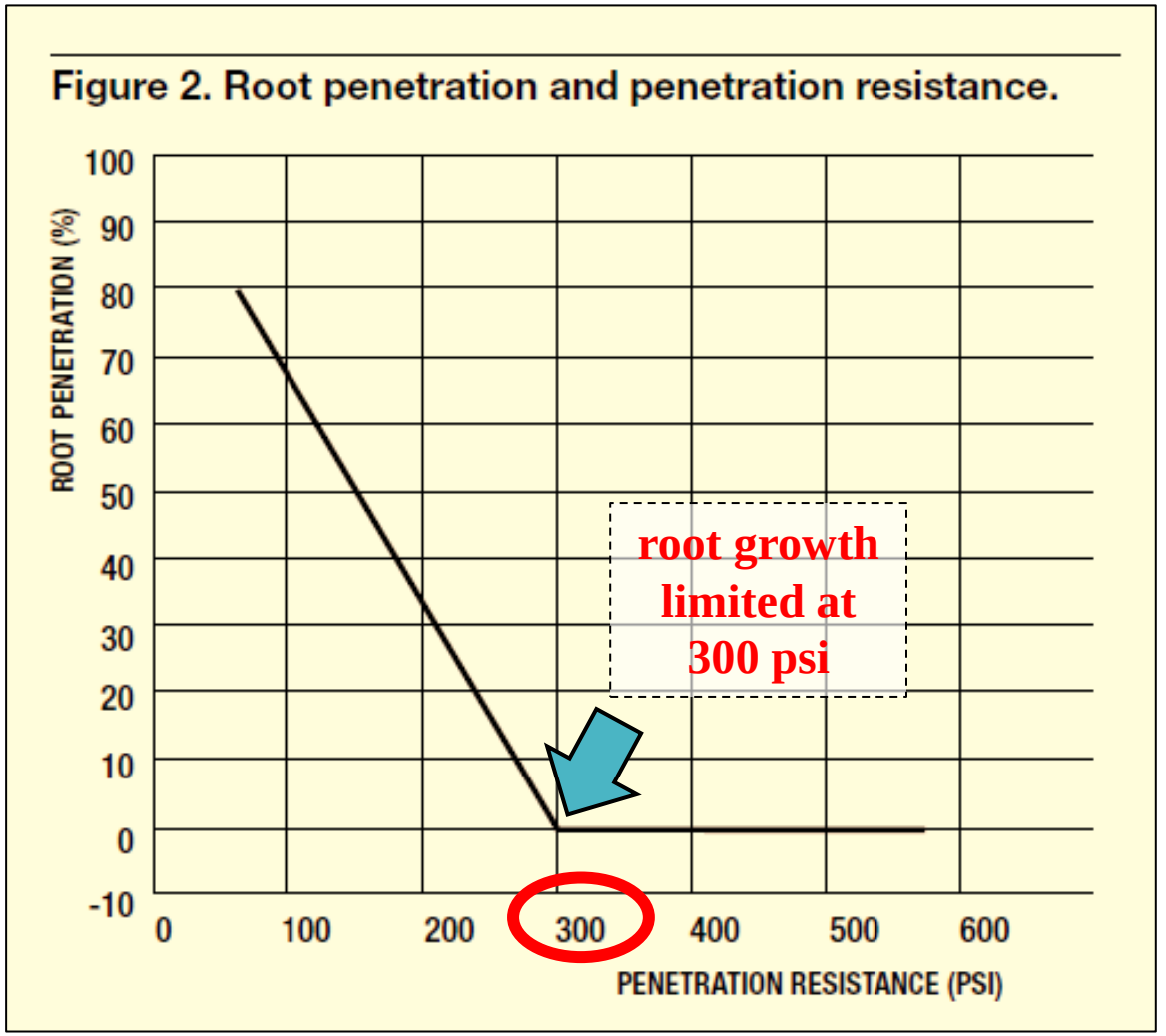


Bill Lackey

Compaction Impacts Tree Root Growth

Penetrometer

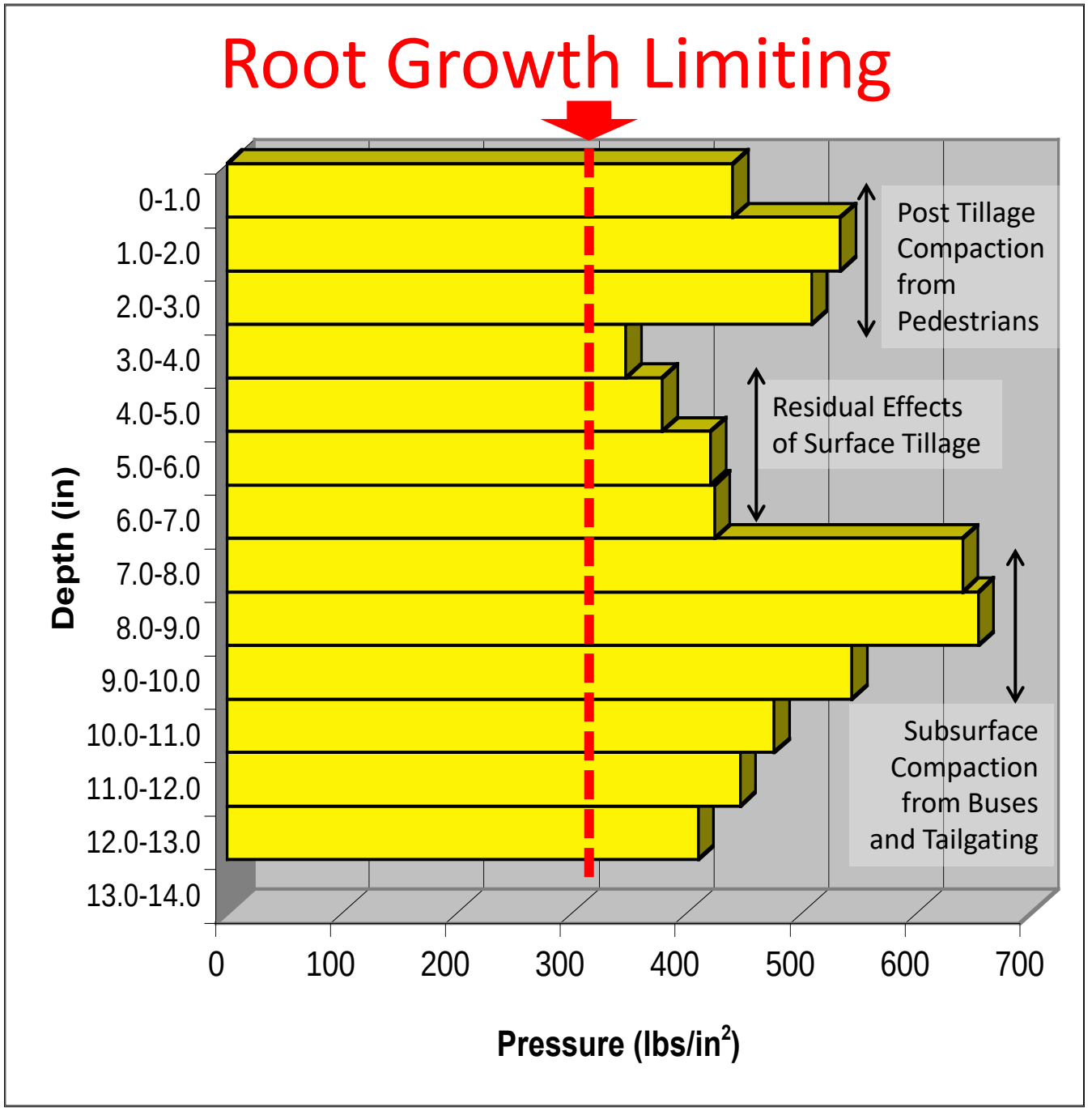
Agreto



Duiker (2002)

*Soil compaction measured at field capacity

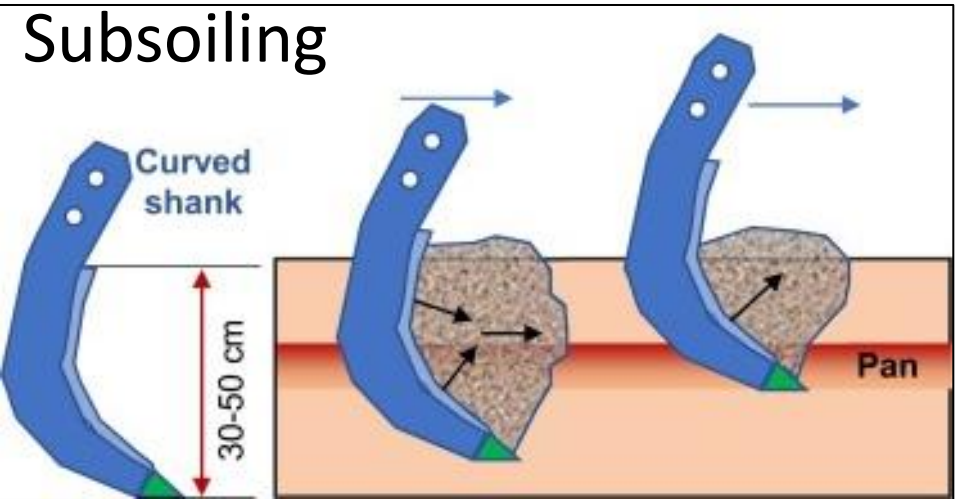
Example: UGA Bus Stop
Soil Compaction Study Examining Surface and Subsurface Compaction



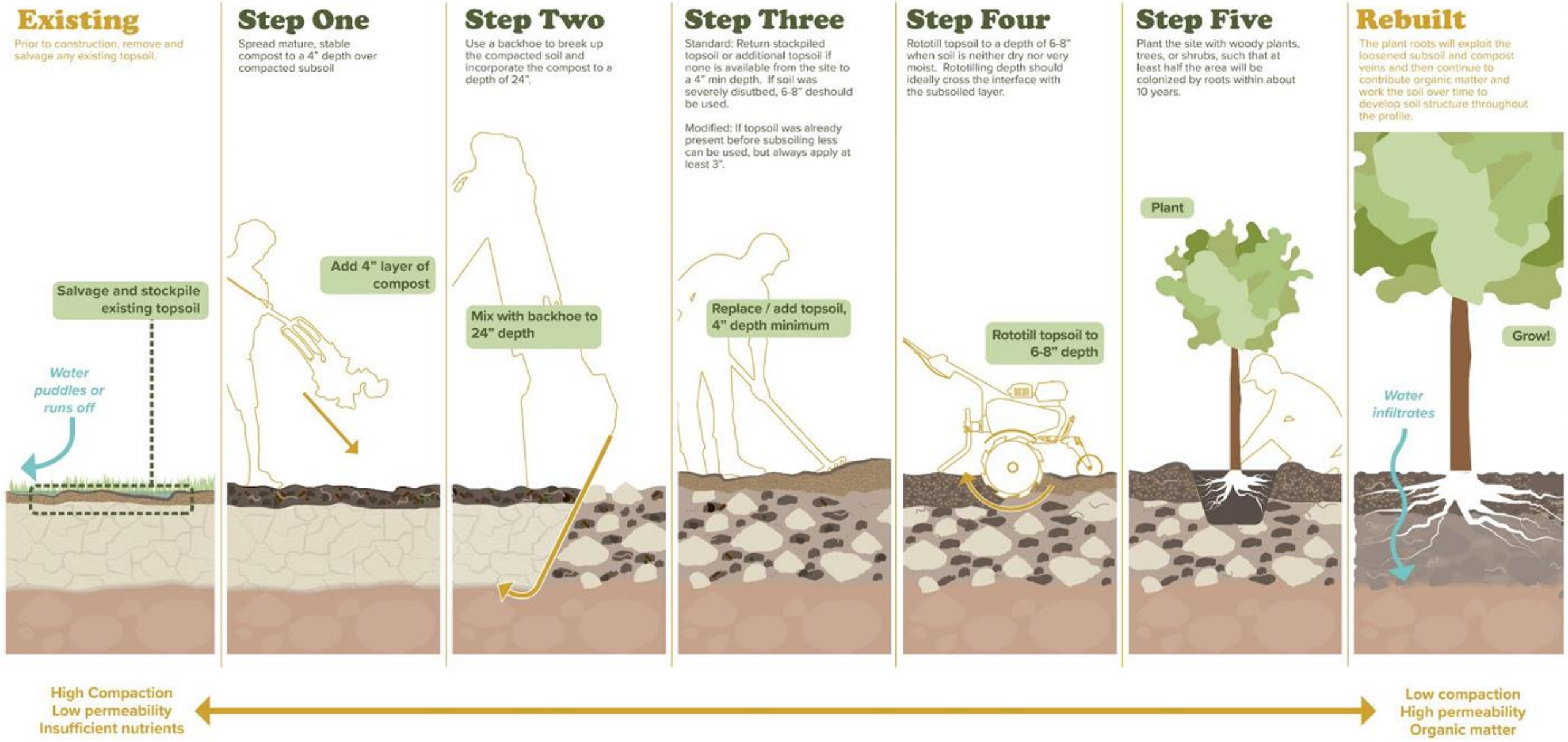
Larry Morris

Ameliorating Compaction (Pre-Planting)

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



Lockhart and Wiseman (2023)



Soil Profile Rebuilding

Diagram: Tree People Los Angelos; Data: Susan Day

Example: Soil Profile Rebuilding
Tree Planting (Post-Construction)
JJ Harris Elementary School
Athens, GA

SPR in tree planting area

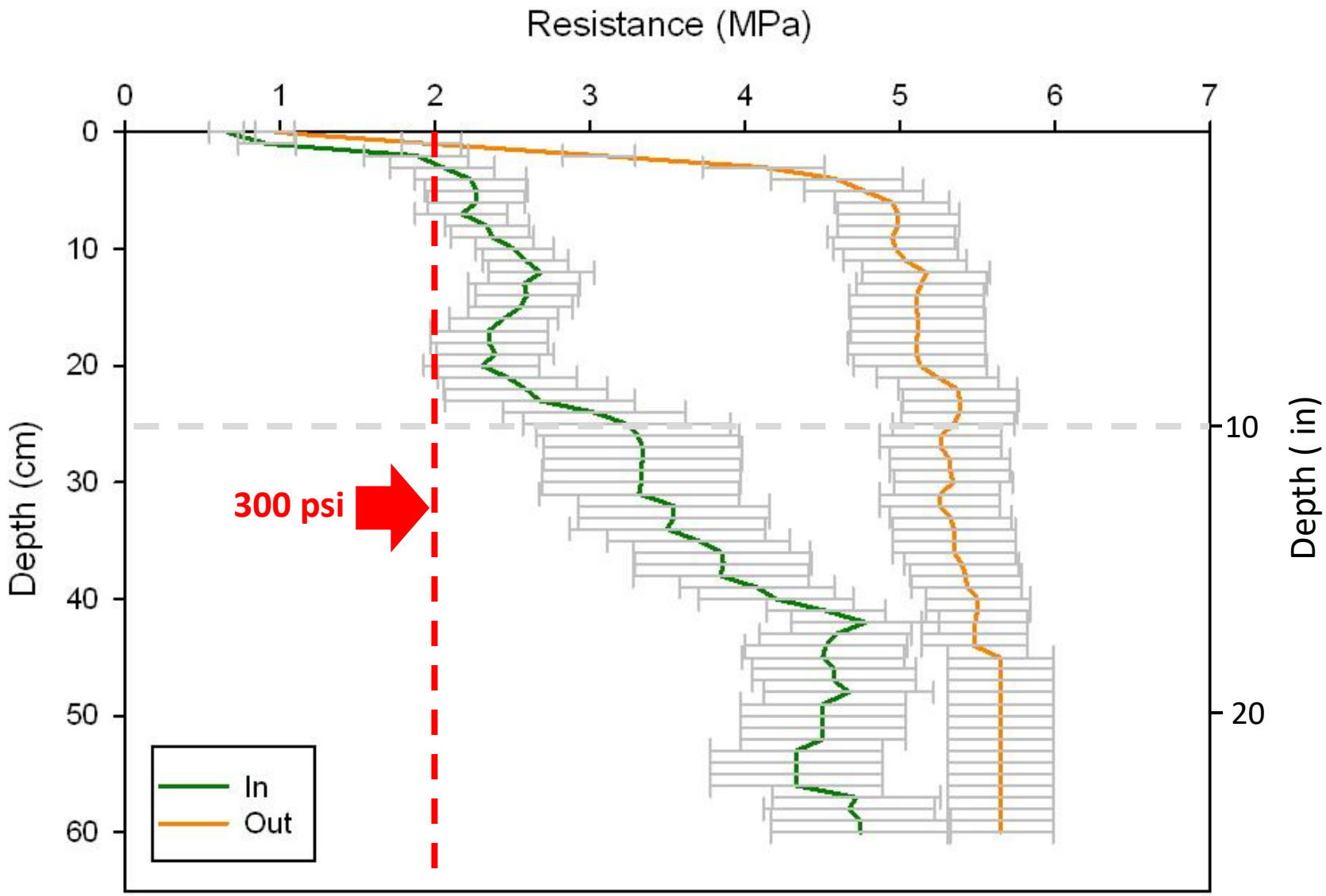

2017
Penetrometer use in SPR area


Images: Larry Morris and Holly Campbell

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!

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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