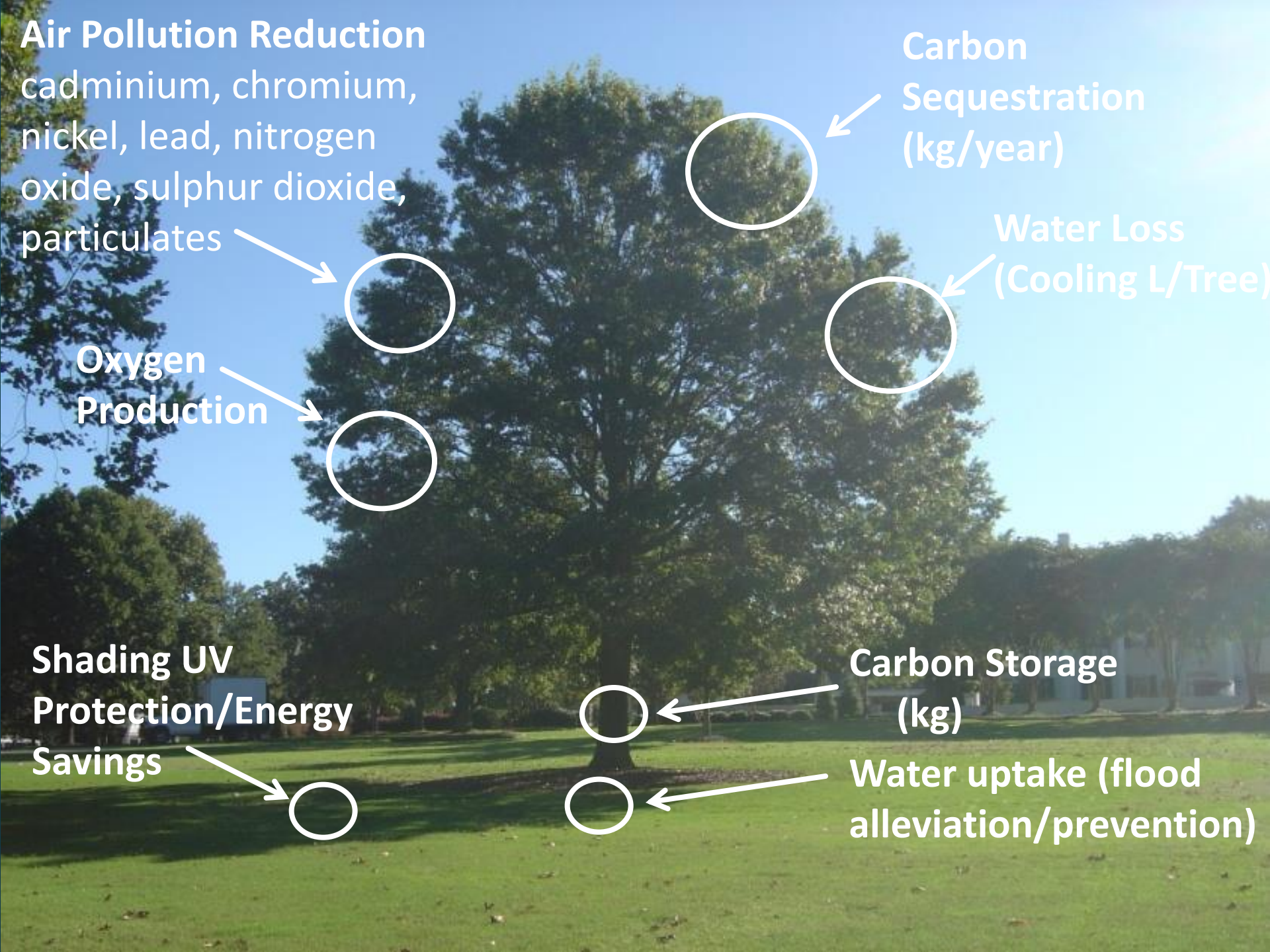
Soil Management

- Dr G. Percival
- Bartlett Tree Research Laboratory
- Charlotte, NC

Established Trees Provide Many Benefits

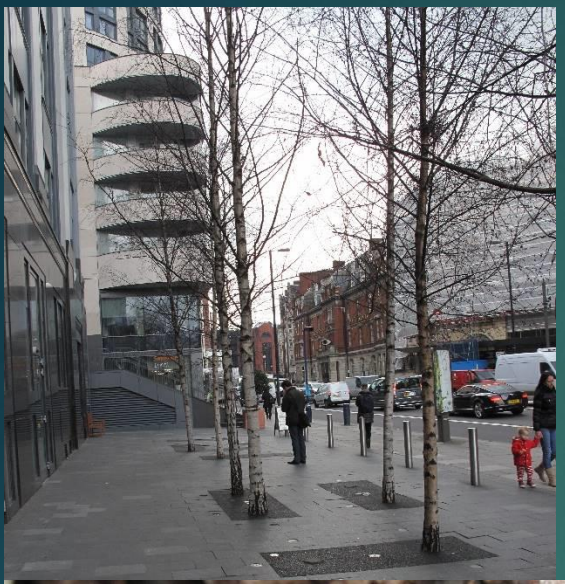

Air Pollution Reduction
cadminium, chromium, nickel, lead, nitrogen oxide, sulphur dioxide, particulates
Carbon Sequestration (kg/year)
Water Loss (Cooling L/Tree)
Oxygen Production
Shading UV Protection/Energy Savings
Carbon Storage (kg)
Water uptake (flood alleviation/prevention)

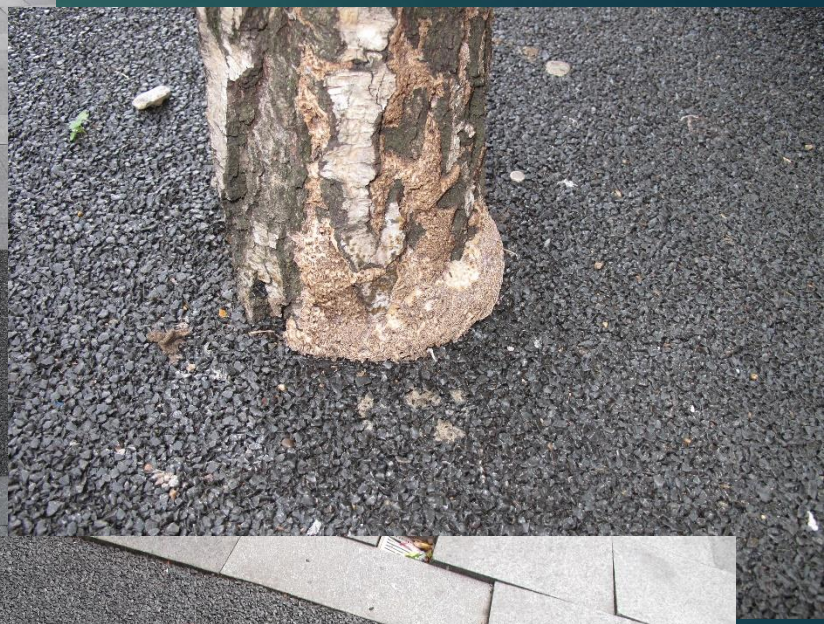
Soil

90% of all above ground problems are caused by below ground issues

SOIL QUALITY IS THE KEY TO TREE SURVIVAL AND LONGEVITY

The Extent of the Problem





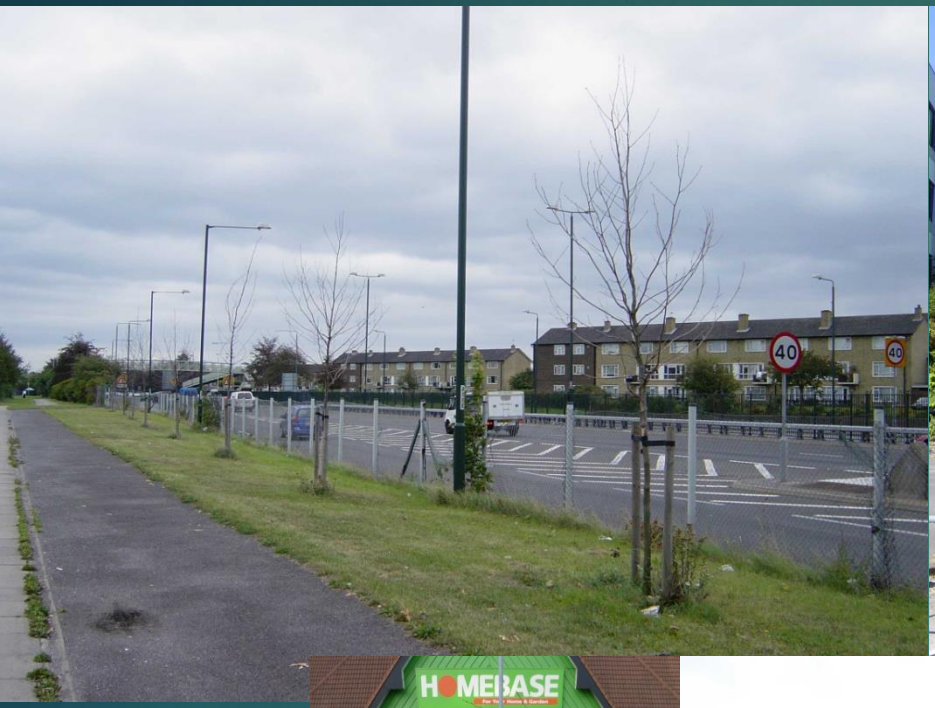
Planted Jan 2019: Assessed July 2019 (87% Death Rate)

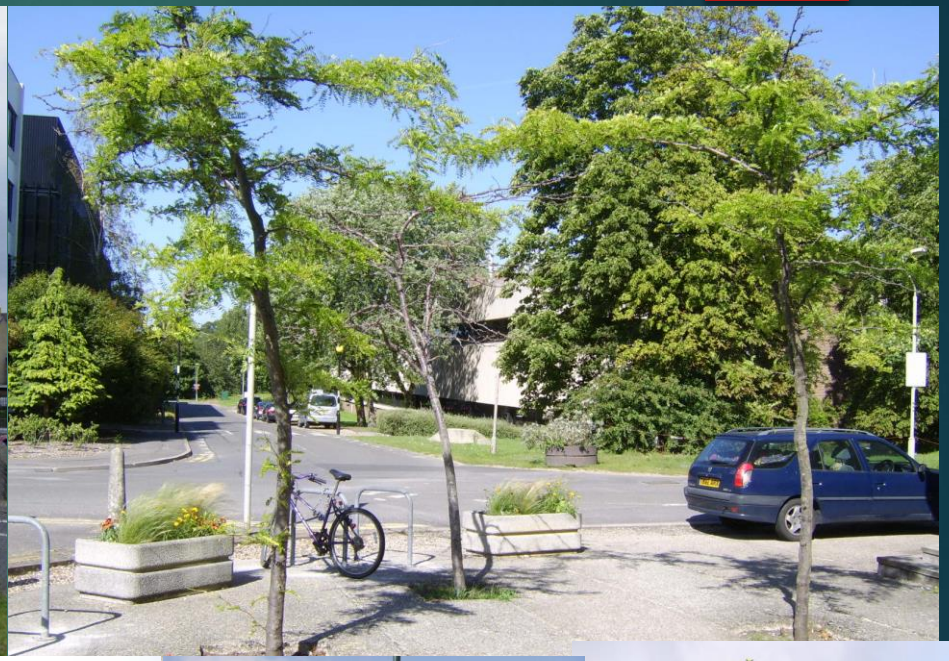
Is this soil?

Construction Damage

- Construction causes root damage which reduces the tree's ability to uptake water and nutrients for survival leading to water stress characterized by reduced shoot growth, branch dieback and tree death.

The Result of Poor Soil





Two Quick Tests for Soil Quality

1. If you don't like digging it, then roots don't like growing in it.

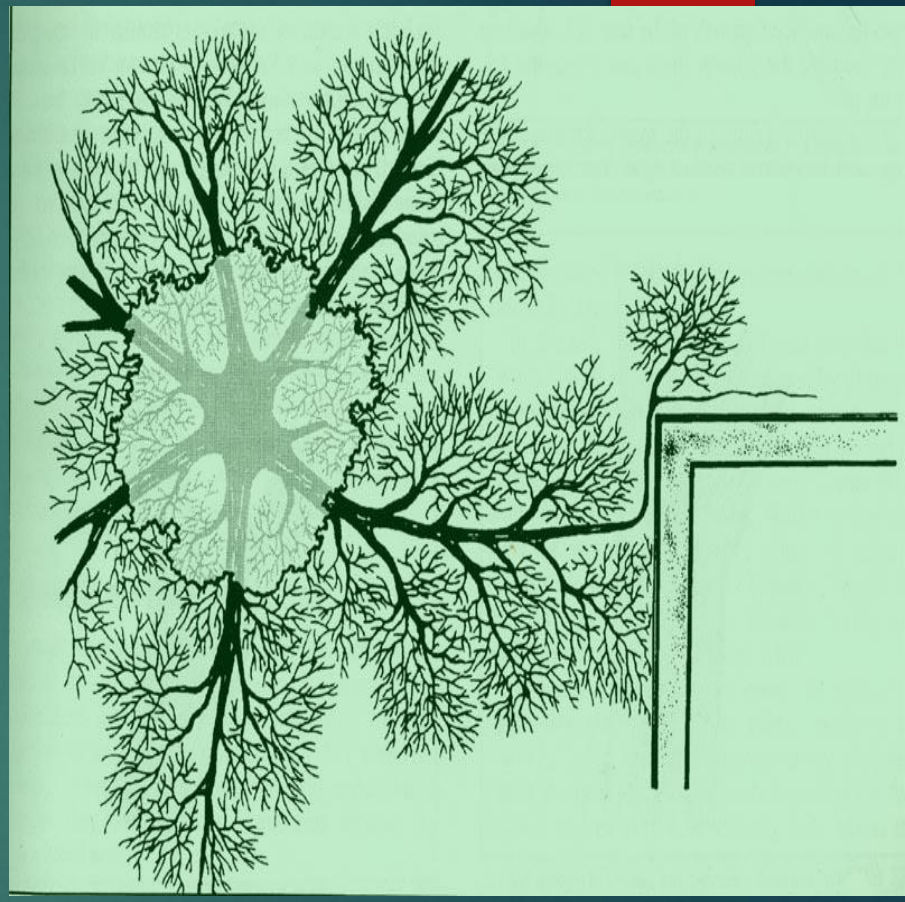
Count The Number of Worms Per Spade of Soil

Worms are an excellent indicator of soil fertility

Number of worms	Soil health
0-1	Poor
2-3	Could be improved
4-5	Good
6 or more	Excellent

Roots – Where do they grow?

- Anywhere that conditions allow:
  - Space
  - Moisture
  - Oxygen
  - Temperature
  - Nutrients
  - Pores (adequate density)
- All with as little energy input as possible



Drainage Analysis

If water level in hole drops….	Site is
Less than 1.25 cm per hour	Poorly drained and suited to *Phytophthora*
1.25-2.50 cm per hour	Moderately well drained. Still suitable for *Phytophthora*
More than 2.5 cm per hour	Well drained. less chance of *Phytophthora* spread

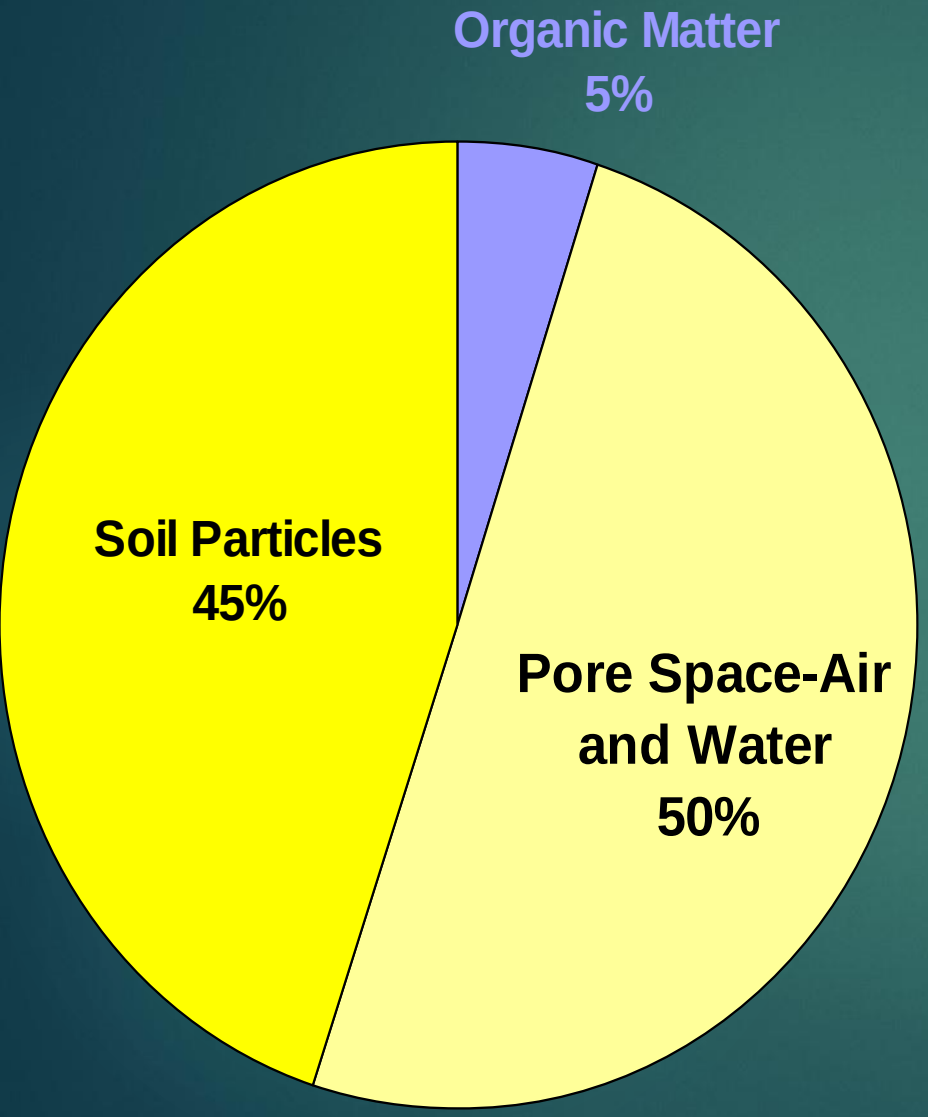
Soil structure

Soil profile

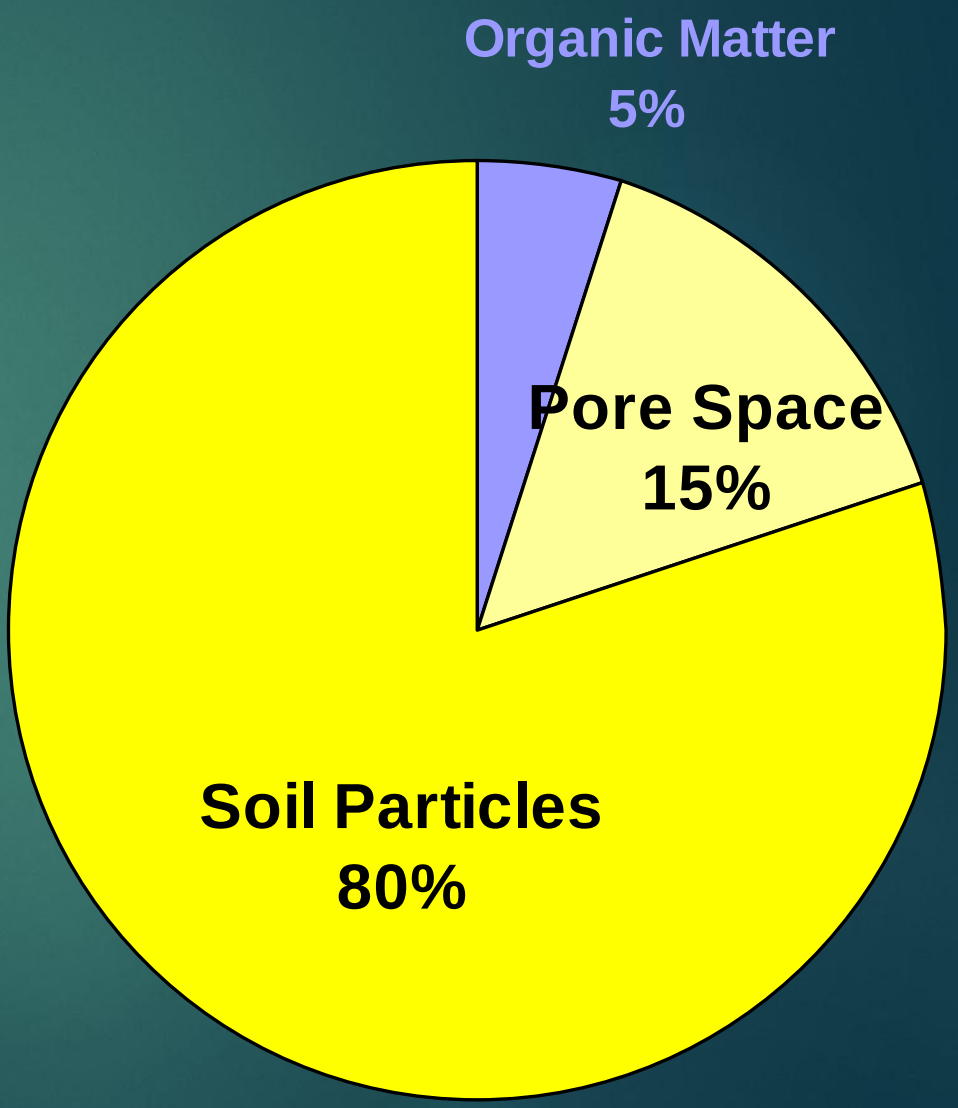
Soil Decompaction

- Caused by road surfacing and machinery, trampling by humans, traffic etc and is a serious problem in urban soils.
- Physical impedance to root growth and reduced levels of aeration.
- Increased thermal conductivity
- A tendency to winter waterlogging due to slowed water infiltration, and summer drought due to low moisture holding capacity
- Reduced nutrient availability, e.g. impaired uptake by roots and slower nitrogen mineralisation
- Detrimental effects to soil flora and fauna, such as a reduction in mycorrhiza formation; and increased disposition to disease (*Phytophthora* spp).

Ideal Soil

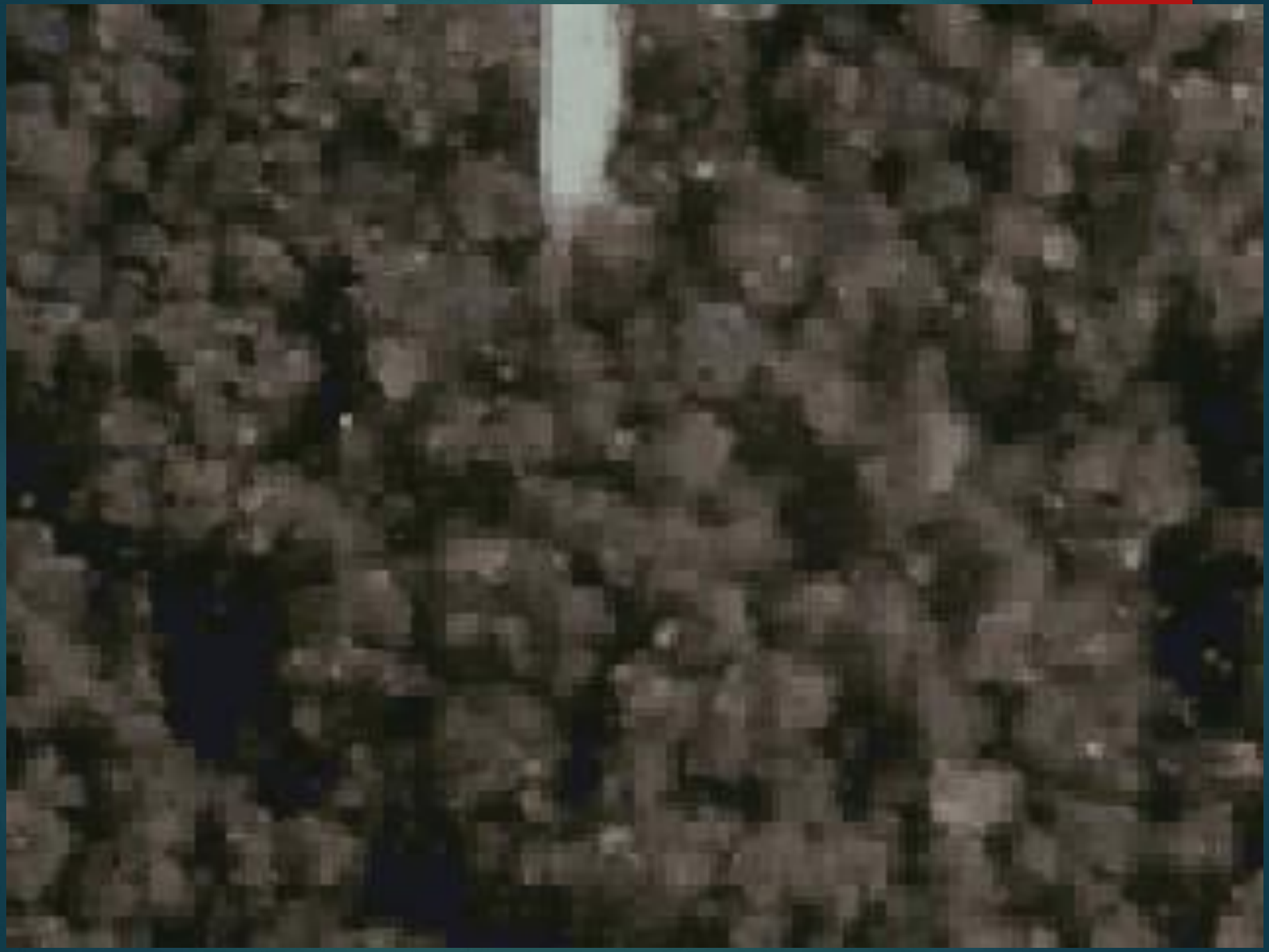


Compacted Soil



Relationship Between Bulk Density and Planting Failure

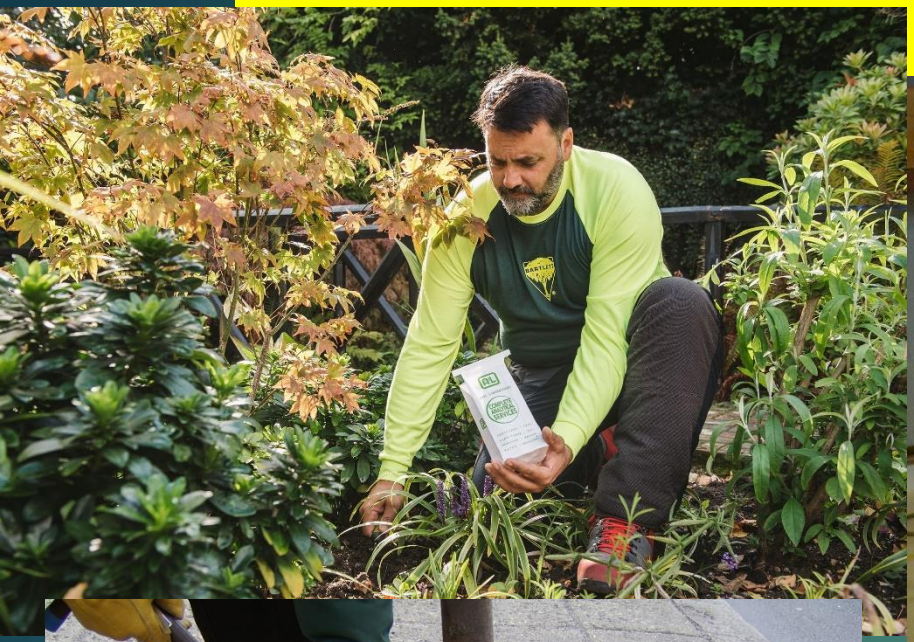
Bulk Density	Planting Success
1.25 – 1.34	Successful: 100%
1.34 – 1.44	Mostly Success: 60%
1.45 – 1.54	Partial Failure: 33%
1.55 – 1.64	Mostly Failure: 10%
>1.65	Total Failure: 0%



SOIL COMPACTION EVALUATION


Break up Compaction

Soil Analysis



BARTLETT TREE EXPERTS

SCIENTIFIC TREE CARE SINCE 1907

Soil Nutrient Analysis Report

July 7, 2018

Friends of Holland Park

W8 6LU

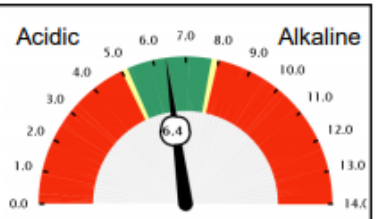
[redacted]

Adam Steggles
Arborist Representative
asteggles@bartlettuk.com

Plant Species: Ironwood, Catalinia
Objective: Promote Growth
Location:

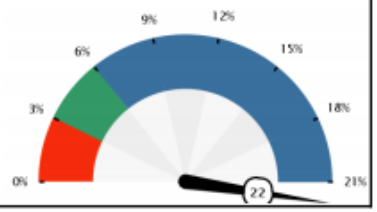
Soil pH:
6.4 Acceptable

Ideal pH range for this species:
5.0 to 8.0

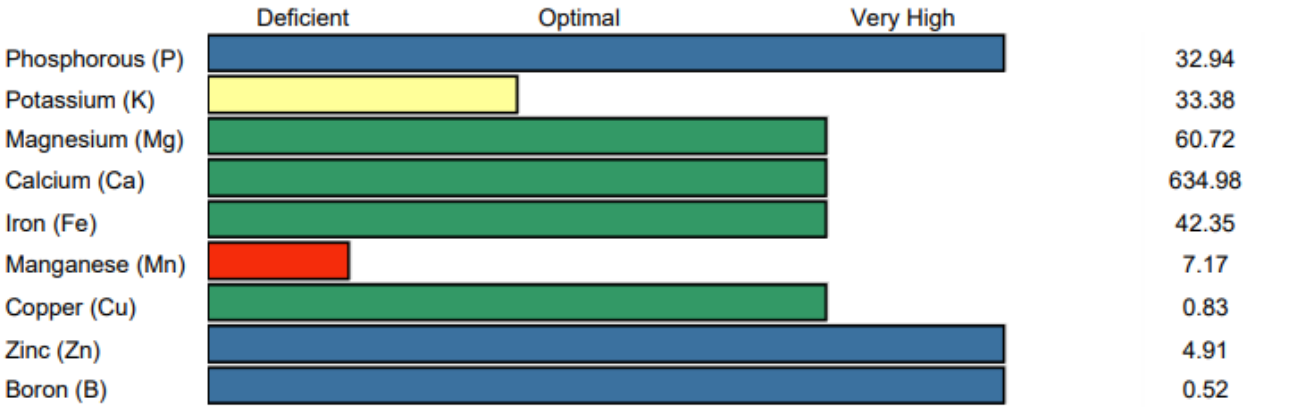


Soil Organic Matter:
22.0% High

Ideal range 3-5%



Soil Nutrient Levels | Nitrogen ENR 50.9 g/m² | Nutrient Retention: 19.1 Very High

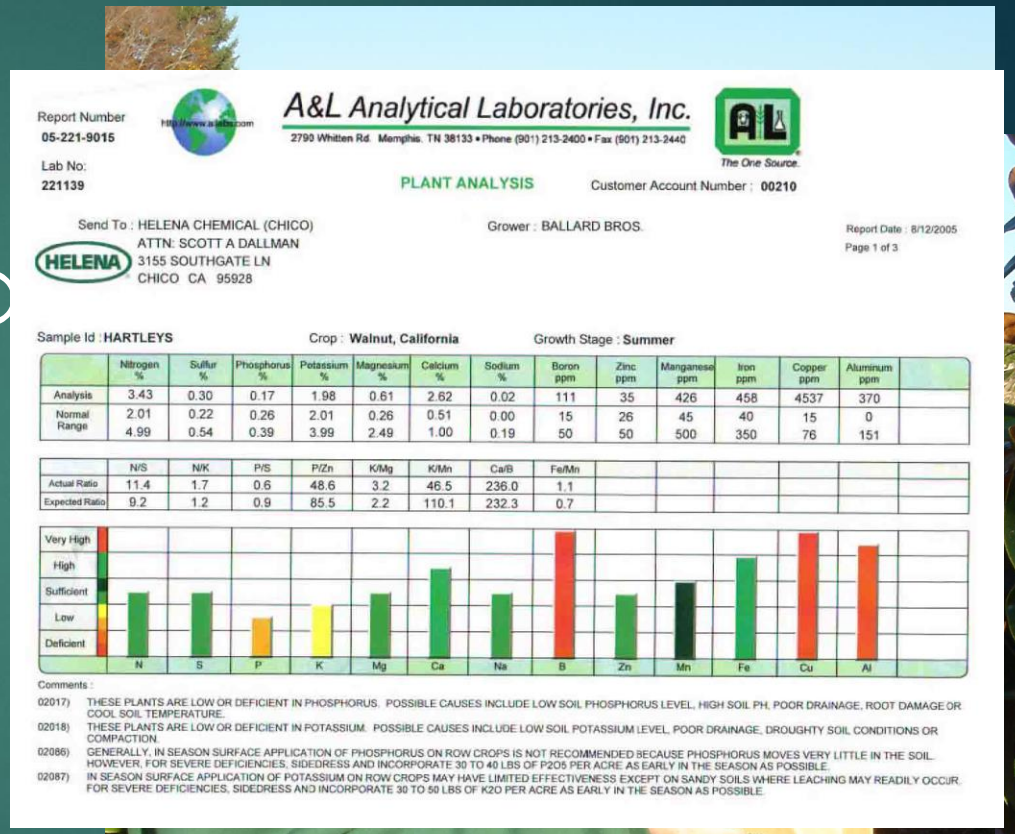


Current Levels g/m²
32.94
33.38
60.72
634.98
42.35
7.17
0.83
4.91
0.52

Deficient Needs treatment | Moderate Could be treated | Optimal Within ideal range | Very High Above optimal

Foliar Nutrient Samples

- 20 leaves minimum
- Fully hardened no colour change
- Paper bag w/holes
- Send to a reputable lab



Report Number
05-221-9015

Lab No:
221139

A&L Analytical Laboratories, Inc.
2790 Whitten Rd. Memphis, TN 38133 • Phone (901) 213-2400 • Fax (901) 213-2440
The One Source.

PLANT ANALYSIS

Customer Account Number : 00210

Send To : HELENA CHEMICAL (CHICO)
ATTN: SCOTT A DALLMAN
3155 SOUTHGATE LN
CHICO CA 95928

Grower : BALLARD BROS.

Report Date : 8/12/2005
Page 1 of 3

Sample Id : **HARTLEYS** Crop : **Walnut, California** Growth Stage : **Summer**

	Nitrogen %	Sulfur %	Phosphorus %	Potassium %	Magnesium %	Calcium %	Sodium %	Boron ppm	Zinc ppm	Manganese ppm	Iron ppm	Copper ppm	Aluminum ppm
Analysis	3.43	0.30	0.17	1.98	0.61	2.62	0.02	111	35	426	458	4537	370
Normal Range	2.01 4.99	0.22 0.54	0.26 0.39	2.01 3.99	0.26 2.49	0.51 1.00	0.00 0.19	15 50	26 50	45 500	40 350	15 76	0 151

	N/S	N/K	P/S	P/Zn	K/Mg	K/Mn	Ca/B	Fe/Mn
Actual Ratio	11.4	1.7	0.6	48.6	3.2	46.5	236.0	1.1
Expected Ratio	9.2	1.2	0.9	85.5	2.2	110.1	232.3	0.7

Comments :

02017) THESE PLANTS ARE LOW OR DEFICIENT IN PHOSPHORUS. POSSIBLE CAUSES INCLUDE LOW SOIL PHOSPHORUS LEVEL, HIGH SOIL PH, POOR DRAINAGE, ROOT DAMAGE OR COOL SOIL TEMPERATURE.

02018) THESE PLANTS ARE LOW OR DEFICIENT IN POTASSIUM. POSSIBLE CAUSES INCLUDE LOW SOIL POTASSIUM LEVEL, POOR DRAINAGE, DROUGHTY SOIL CONDITIONS OR COMPACTION.

02086) GENERALLY, IN SEASON SURFACE APPLICATION OF PHOSPHORUS ON ROW CROPS IS NOT RECOMMENDED BECAUSE PHOSPHORUS MOVES VERY LITTLE IN THE SOIL. HOWEVER, FOR SEVERE DEFICIENCIES, SIDEDRESS AND INCORPORATE 30 TO 40 LBS OF P2O5 PER ACRE AS EARLY IN THE SEASON AS POSSIBLE.

02087) IN SEASON SURFACE APPLICATION OF POTASSIUM ON ROW CROPS MAY HAVE LIMITED EFFECTIVENESS EXCEPT ON SANDY SOILS WHERE LEACHING MAY READILY OCCUR. FOR SEVERE DEFICIENCIES, SIDEDRESS AND INCORPORATE 30 TO 50 LBS OF K2O PER ACRE AS EARLY IN THE SEASON AS POSSIBLE.

Fertilisation Goals

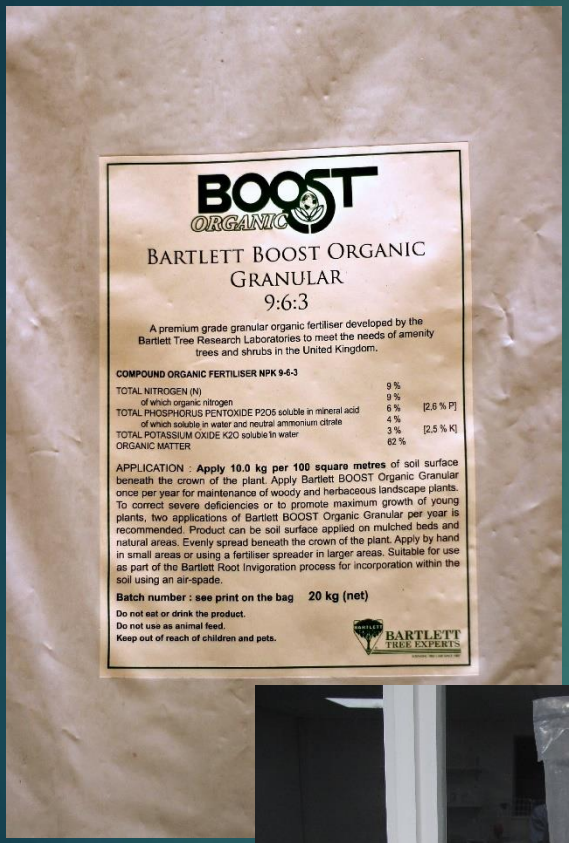
- Young Tree  Growth

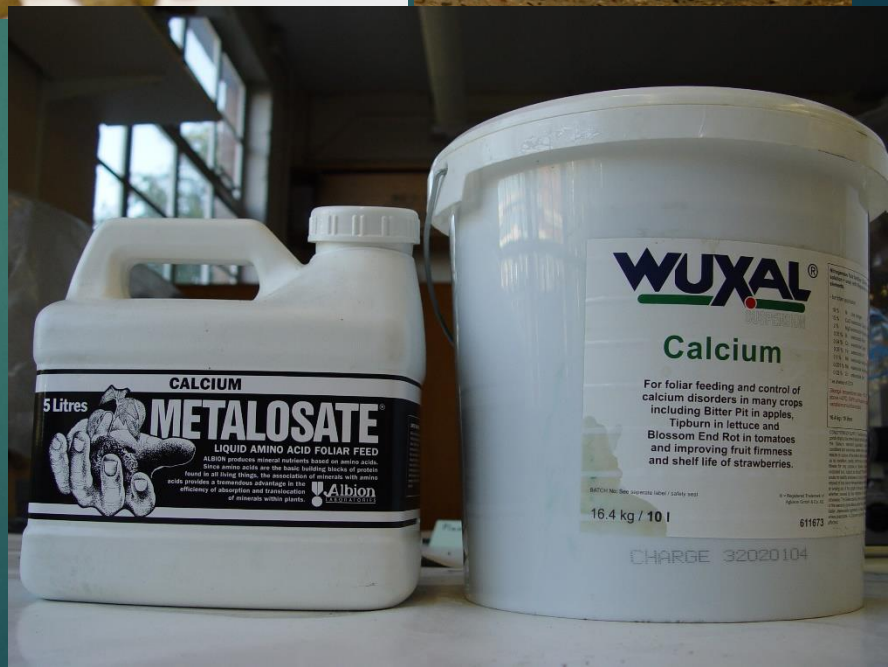
- Mature Tree  Maintenance/ Stable Growing Environment

- Deficient Plant  Correcting Deficiency

- Damaged Plant (Pest or Construction)  Overcoming the Problem

FERTILISERS





Fertilisation

End result

Before

After


Primary fertilization area

Aftercare: Mulching

One of the most simplest systems of promoting tree vitality and managing soil borne diseases.

Plant resource competition

Soil Nutrition

Soil temperature fluctuations

Soil Moisture Retention

Plant Disease

Soil Biota

Soil Compaction

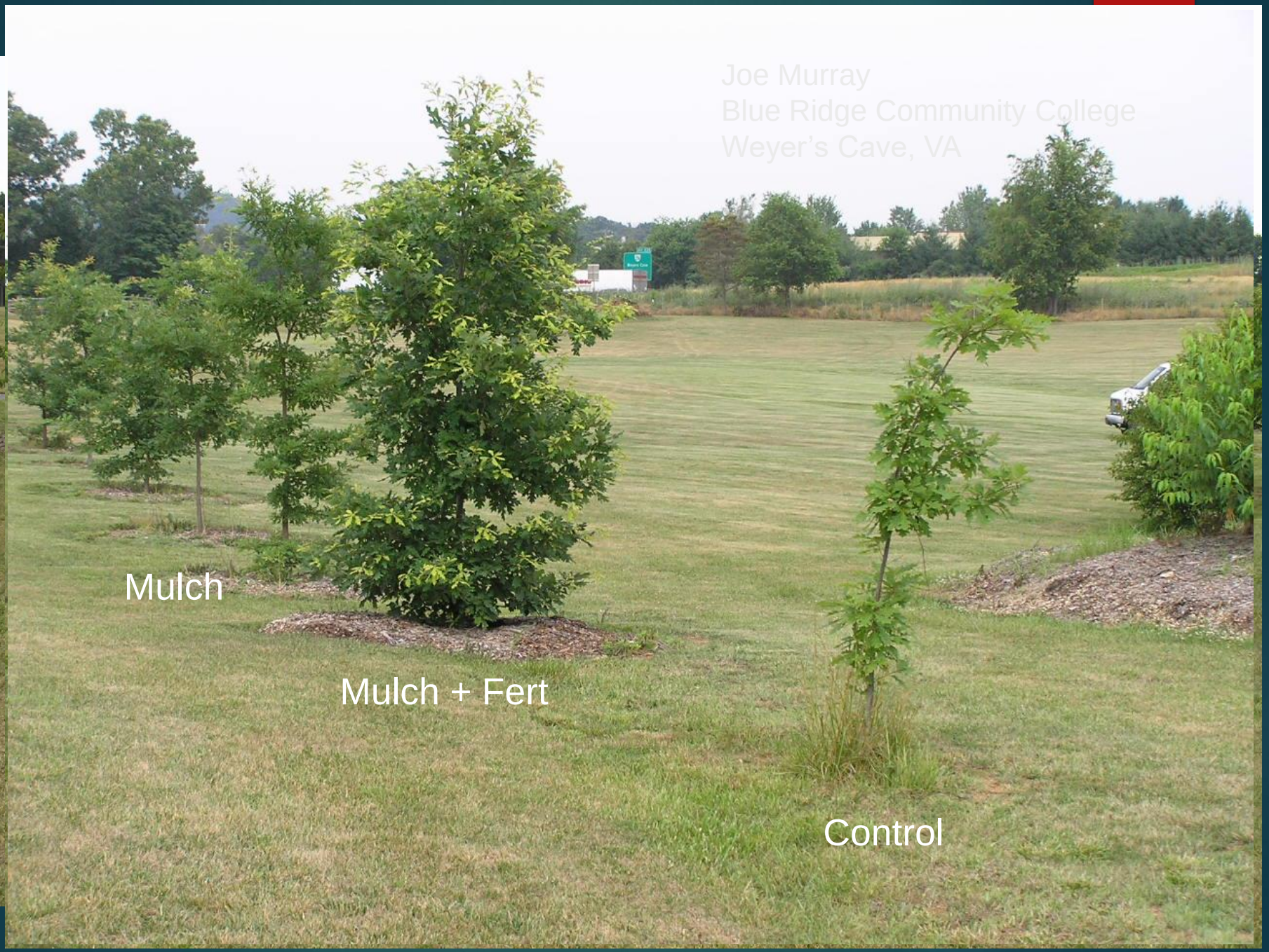
Root Establishment

Impact of Soil Contaminants

Plant Performance

− ORGANIC MULCH +

(5-10 cm DEPTH)


Joe Murray
Blue Ridge Community College
Weyer's Cave, VA
Mulch
Mulch + Fert
Control

Trees (Ash) in with shared mulched areas grew more than twice as fast as trees with mulched rings

Mulch rings

Shared mulch areas

Two years after planting

Only in America?

Decling tree

Soil Conditioning – air spading of the soil

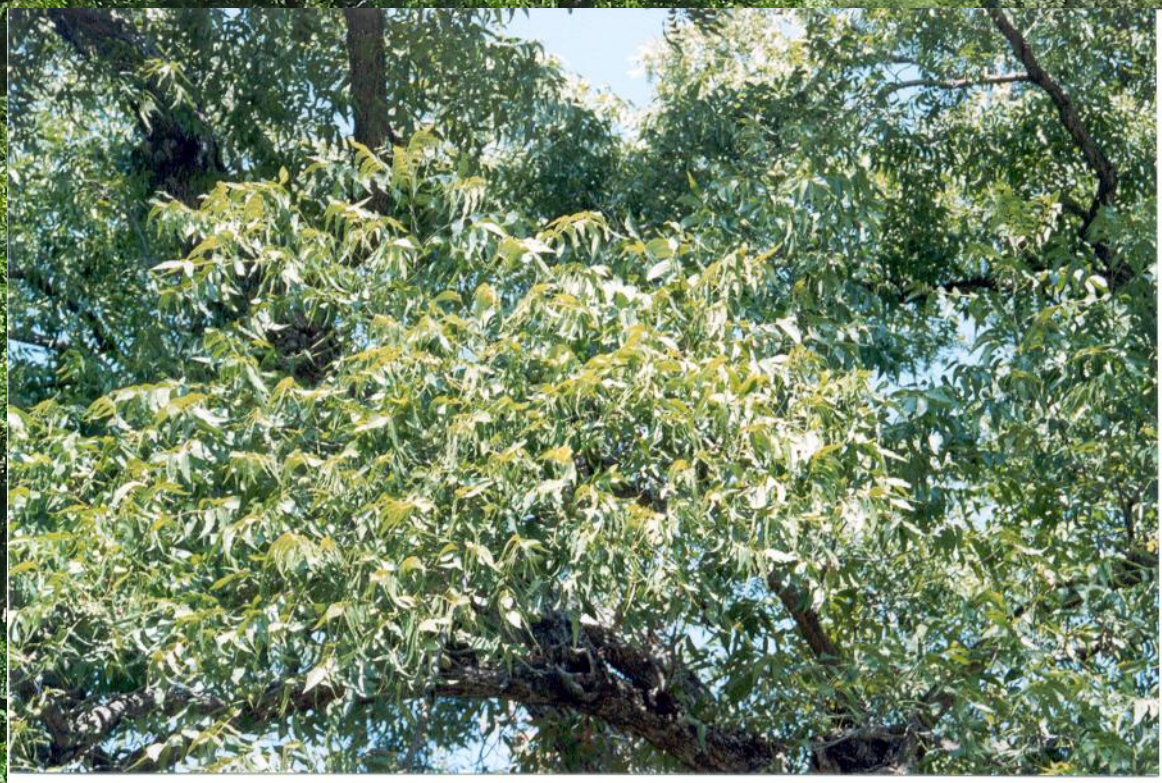
Working in organic matter,

Fertiliser and Native Soil

One Year into Recovery

Two years after treatment

3 years after treatment

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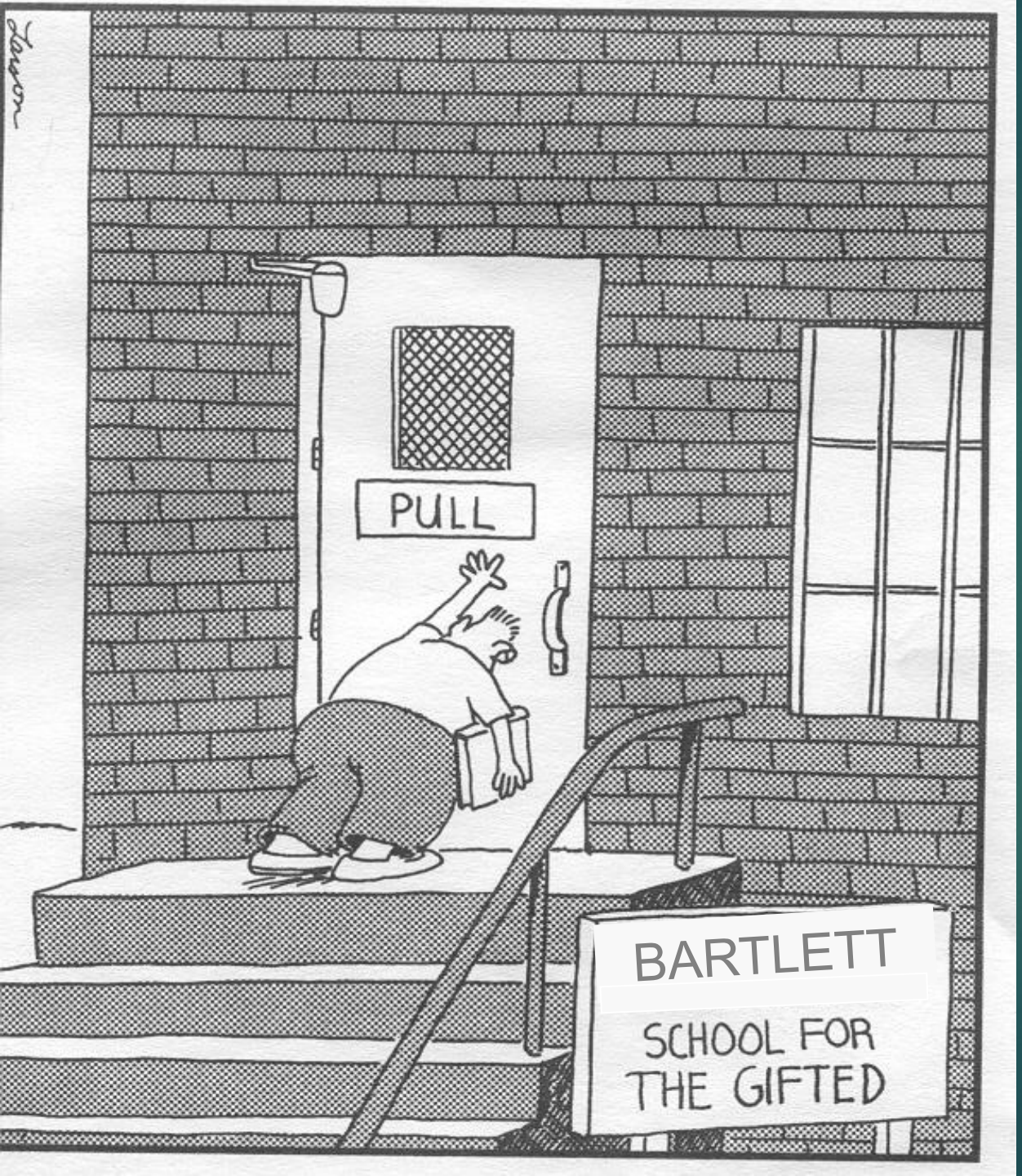

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