

Compost Tea and Air Spading

Complementary Practices for Your Organic Management Plan



Introduction & Outline



Today's Topics

- Almstead's Evolution into Organics and Compost Tea
- Setting Up a Tea Business
- The Chemical, Physical, and Biological Properties of Soil
- Reading and Utilizing Soil Food Web Test Results
- Price Estimating that Anticipates Hidden Costs
- Our Brewing Process
- Air Spade Demonstration
- Tea Brewing and Application Demonstration

Keep in Touch



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Why Almstead Transitioned

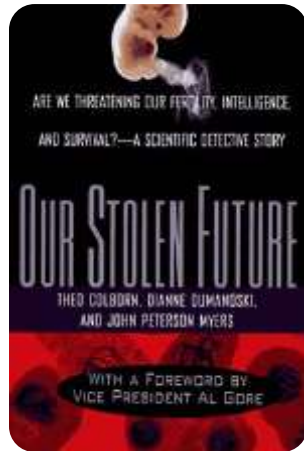
Issues with traditional cover spray treatments

- High nitrogen fertilizers spreading Phytophthora and scale insects
- Mite outbreaks after treating for adelgids on Hemlocks



Why Almstead Transitioned

Client Demand and Perception of Chemicals



Why Almstead Transitioned



Changes in the Law: Neighbor Notification

- **Mandatory in certain counties of NY including Westchester, NYC, Albany, Nassau, Rockland, Suffolk and more**
- **Opt out available to individual residents**
- **Must give 48 hours advanced notice of applications via mail**
- **Send to all abutting properties**
- **List pesticides to be used and emergency contact information**



Why Almstead Transitioned



Changes in the Law: Neighbor Notification Exemptions

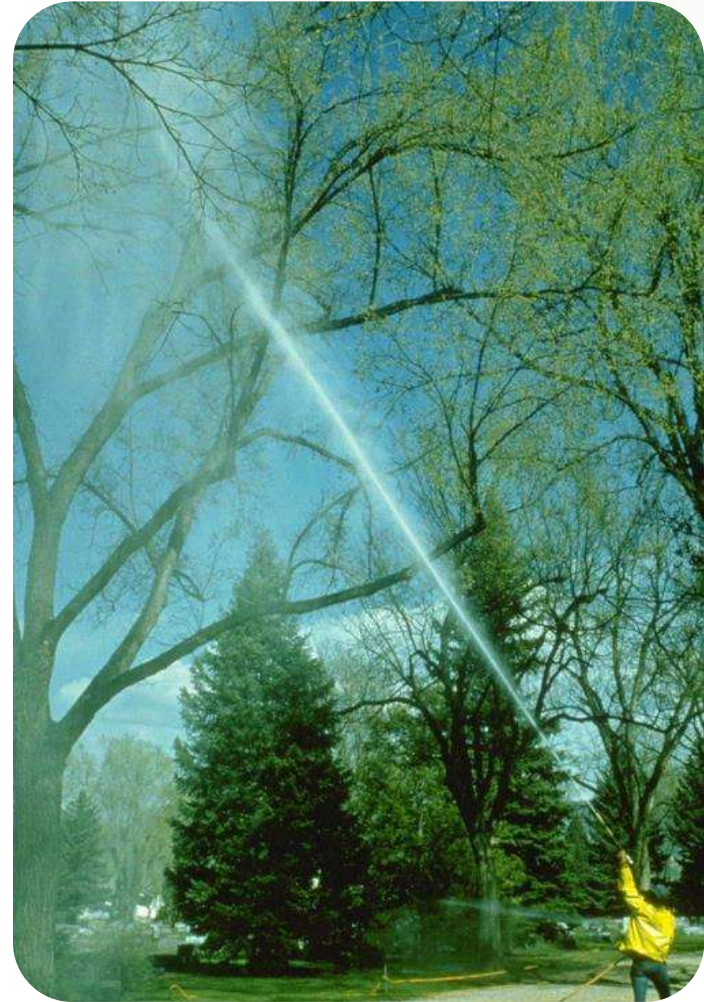
- Reduced risk pesticides and biopesticides, as determined by the EPA, are exempt from the Neighbor notification law in NY
- Exempt products include:
 - Conserve (spinosad)
 - Subdue (mefenoxam)
 - Compass (trifloxystrobin)
 - Floramite (bifenazate)
 - Heritage (azoxystrobin)
 - Hot Sauce Animal Repellent
 - Milky Spore Powder
- For a full list of exempt products:
www.dec.ny.gov/chemical/8862.html



Evolution to Organics

Traditional Cover Sprays

- “If it’s green, spray it...”
- Tank mix of single or combo chemical spray
- Long residual (45-60 days)
 - 4 or 5 visits per year





- **Saying goodbye to Malathion**
- **Introducing the scouting process**
 - Acceptable thresholds
 - Beneficial predator populations
- **Targeted controls in smaller quantities**



Scouting Report

80 Lincoln Avenue, Stamford, CT 06903
P: (203) 346-4111 F: (203) 319-0371 www.almostead.com

Prepared for _____

Address _____

City/State/Zip _____

Scouting Visit No. _____

Date _____

(The Science of Growing Systems Since 1980)

While performing a thorough inspection of the plant material on your landscape, we observed the following conditions. These conditions may mean garden maintenance will continue to be required through out the growing season in accordance with year specific Plant Health Care program.

Trees and Shrubs Treated on Property (Number condition in condition level below)

Absconded	Damaged	Lateral	Rhododendron
Apple	Elm	Live	Rose
Arbutus	Kawakawa	Linden	Spruce
Ash	Pine	Locust	Star Gum
Acacia	Fruit Trees	Magnolia	Sumac
Bachman	Ginkgo	Holly	Taxus
Beech	Hickory	Oak	Viburnum
Birch	Horsechestnut	Palm	Willow
Bur Oak	Holly	Pine	Other
Cornus	Honeylocust	Privet	
Forsteria Bush	Holly	Pyracantha	
Fraxinus	Hollyhock	Quince	
Garden	Ivy	Red Bud	
Cherry	Japanese Maple		
Chimney	Juniper		
Cornus	Laurel		
Cypripedium	Leuco		

Conditions Found and Treated For this "Plant to Live" (no conditions requiring additional work)

Insect Related

1. Aphid	7. Caterpillar	13. Leafminer	19. Thrip
2. Aged	8. Grape Mite	14. Midge	20. Twig Pruner
3. Bark Beetle	9. Sawfly	15. Nematode	21. Wasp
4. Borer	10. Japanese Beetle	16. Spider Mite	22. Weevil
5. Carabid	11. Leaf Bug	17. Scale	23. Whitefly
6. Carpenter Ant	12. Leaf Hopper	18. Spring Gall	24. _____

Disease Related

25. Anthracnose	31. Cedar-Apple Rust	37. Fusarium Wil	43. Rust
26. Apple Scab	32. Crown Gall	38. Leaf Spot	44. Tip Blight
27. Bad Blue	33. Cytospora Canker	39. Lesser Branch Dieback	45. Vascular Wil
28. Black Knot	34. Diplodia Tip Blight	40. Phomopsis	46. _____
29. Botrytis Blight	35. Fire Blight	41. Phytophthora	47. _____
30. Botrytis/Cankers	36. Pungent	42. Root Rot	48. _____

Biological Problems Identified

49. Chrysomelids	54. Crabapple Bark Scale/Worm	59. Over Mulching	64. Soil Compaction
50. Root Damage	55. Emerald Tree	60. Planted Too Deep	65. Storm Damage
51. Thistle	56. Monthly Stems	61. Rat/Tail	66. Trunk Damage
52. Excess Shade	57. Lightning Damage	62. Salt Damage	67. Weak Growth
53. Ferns Water	58. Shrubbery Deficiency	63. Stem Crack	68. _____

Control used on your property (use signature of Almond Agent Firm or initials)
Name to Client _____

Technician's Name/Number _____

*Technician take notes also indicate estimated conditions on Almond Agent Firm or initials
on plant's address

Incorporating Biorational Controls into IPM

- Highly targeted, preserve beneficial organisms, and safer to handle than most chemical pesticides
- Types of biorational controls:
 - Insect growth regulators
 - *Bacillus thuringiensis*
 - Horticultural oils
 - Insecticidal Soap
 - Entomopathogenic Nematodes
 - Neem oil
 - Sonata (*Bacillus pumilis*, insecticide)
 - Heritage (azoxystrobin, fungicide)
 - Agrifos (Phosphorus acid salts, fungicide)



Neem tree *Azadirachta indica*

2nd Evolution to Organics

Traditional NPK Fertilizer

- Disease and insect problems as a result of high nitrogen
- Nitrogen for leaves
- Phosphorus for roots and shoots
- Potassium for flowers and fruiting
- 24-10-8 in Spring
- 10-10-10 in Summer
- 6-12-12 in Fall



2nd Evolution to Organics

Moving from NPK to Biostimulants

- **Biostimulant:** a substance that is neither a plant nutrient nor a pesticide, but has a positive impact on plant health
- Mycorrhizal fungi
- Beneficial bacteria
- Humates
- Yucca
- Seaweed extract
- Fish hydrolysate
- Amino acids
- Natural sugars



2nd Evolution to Organics

Biostimulants to Compost Tea

- Biostimulants had us thinking more about roots and soil
- Saw the benefits of compost through other services
- Heard about tea through industry peers
- Tea was easier to transport and apply than traditional compost



2nd Evolution to Organics

Incorporating Air Spading into Soil and Root Care Program

- **Soil compaction was a known problem**
 - Performed vertical mulching with a drill & auger bit
 - Backfilled with compost and sand



2nd Evolution to Organics

Adding Compost Tea to the Soil and Root Care Program

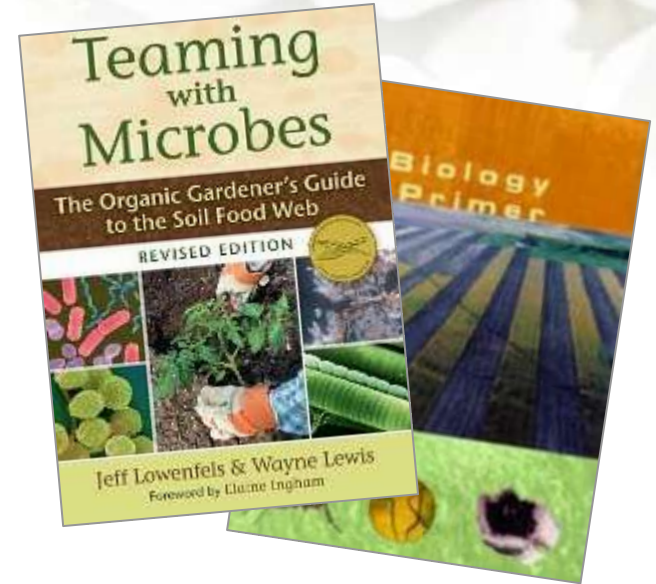
- Saw trees with decompacted soil and compost doing well
- Works best on well aerated soil
- Has become a staple of our mature tree preservation plans



Setting Up a Business

Our First Steps

- CEO took Soil Foodweb training course
 - New understanding of soil biology and plant care
 - Learned brewing and application skills
- Hiring new staff and training everyone



Resources for Getting Started

- Rodale Institute Courses with Dr. Elaine Ingham, see rodaleinstitute.org
- Teaming with Microbes Book by Jeff Lowenfels & Wayne Lewis
- Compost Tea Yahoo Group www.groups.yahoo.com/group/compost_tea
- Soil Biology Primer Book by Dr. Ingham
- Microbe Organics Website by Tim Wilson at microbeorganics.com
- Earth Fort Seminars and webinars at earthfort.com

Setting Up a Large Operation



Container: \$2,000

Setting Up a Large Operation



Brewer: \$3,850



Setting Up a Large Operation



Compost: \$300/yd



Setting Up a Large Operation



Setting Up a Large Operation



Microscope: \$600

Setting Up a Large Operation



Setting Up a Large Operation



Truck: \$85,000

Setting Up a Small Operation



Shed: \$800

Setting Up a Small Operation



Cone brewer: \$2,700

Setting Up a Small Operation



Setting Up a Small Operation



Setting Up a Small Operation



Setting Up a Small Operation



Truck: \$75,000



Setting Up a Small Operation



50 Gal. Sprayer: \$2,700

Setting Up an Air Spading Business



Setting Up an Air Spading Business



Compressor: \$150/day

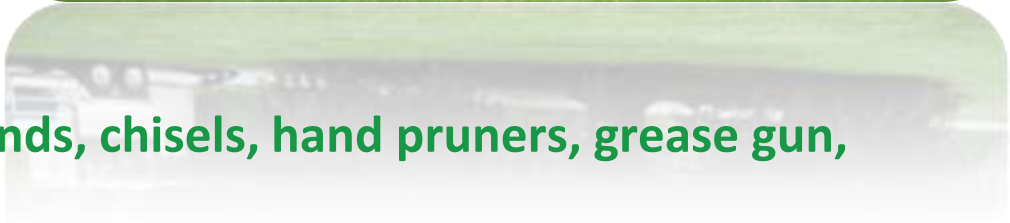


Air Spade: \$1,800

Setting Up an Air Spading Business



- Flat head shovel
- Round head shovel
- Grain scoop
- Edging spade
- Hard rake
- Soft rake
- Push broom
- Blower
- Wheel barrow
- Loppers
- 12 safety cones
- Small chainsaw
- Tool kit: bander, spare bands, chisels, hand pruners, grease gun, wire cutters, hammer



Setting Up a Business

Where to Purchase Equipment and Materials

- Compostwerks compostwerks.com
- Sherrill Tree sherrilltree.com
- Green Pro Solutions greenprosolutions.com
- Organic Approach organicapproach.com
- North Country Organics www.norganics.com
- Sustainable Turf Management nplusrob@gmail.com
- Earth Fort www.eathfort.com



Properties of Soil



**“To forget how to tend the
soil is to forget ourselves.”**

Mahatma Gandhi

Why Evaluate Soil?

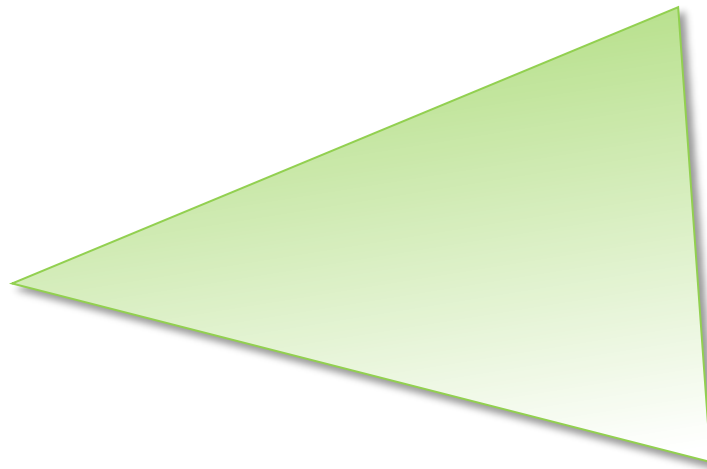
- To determine the suitability of plants prior to planting
- To determine the need for remedial work prior to planting
- To evaluate the influence on landscape management practices
- To diagnose plant problems that are soil related



Components of Soil

Physical

Chemical

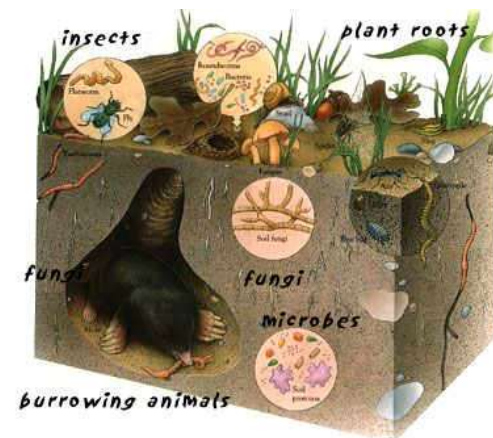
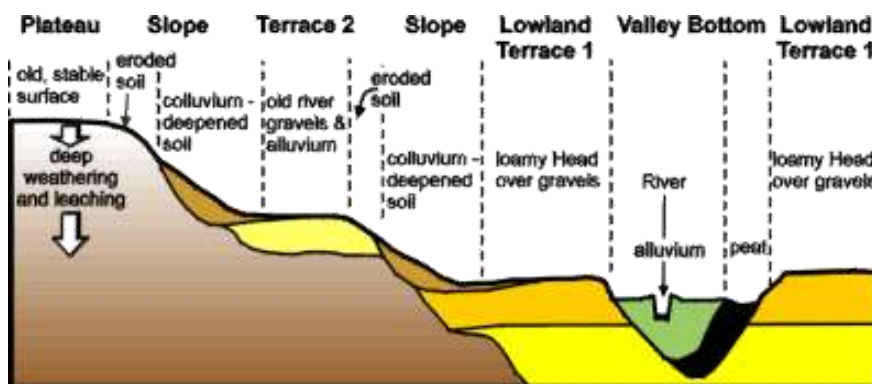
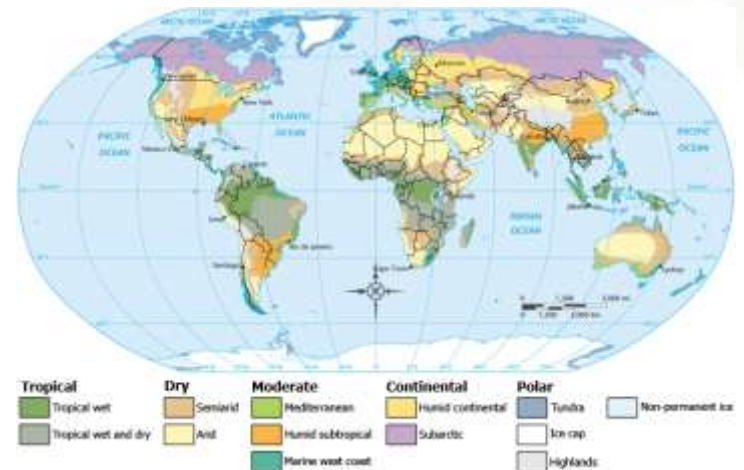


Biological

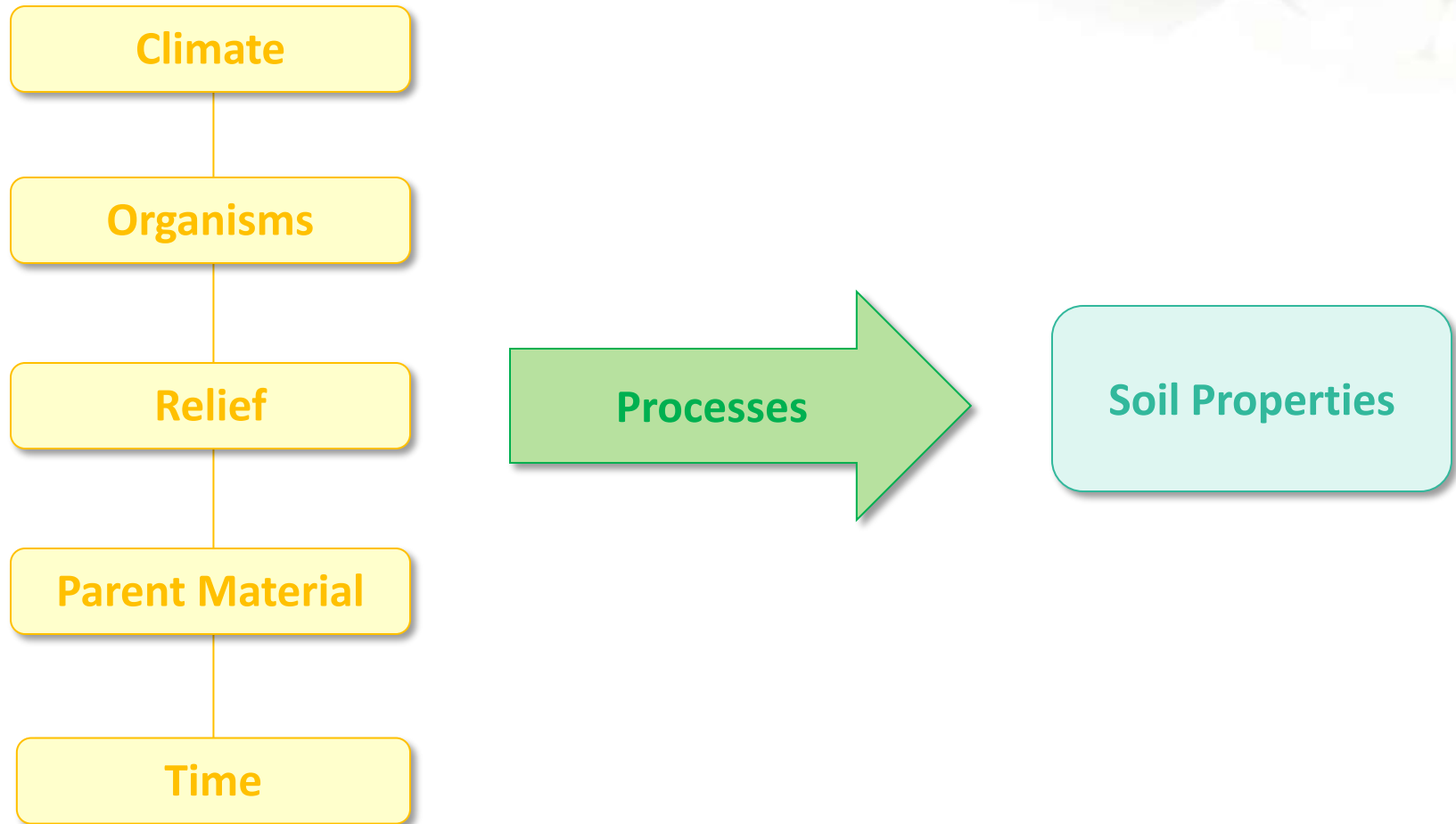
Soil Properties

Factors That Determine Soil Properties

- Climate
- Biotic activity
- Topography
- Parent material (rock)
- Time



Soil Formation



Soil Formation

Residual Soils

Depositional (transported) soils

- Deeper
- More level
- More permeable to water

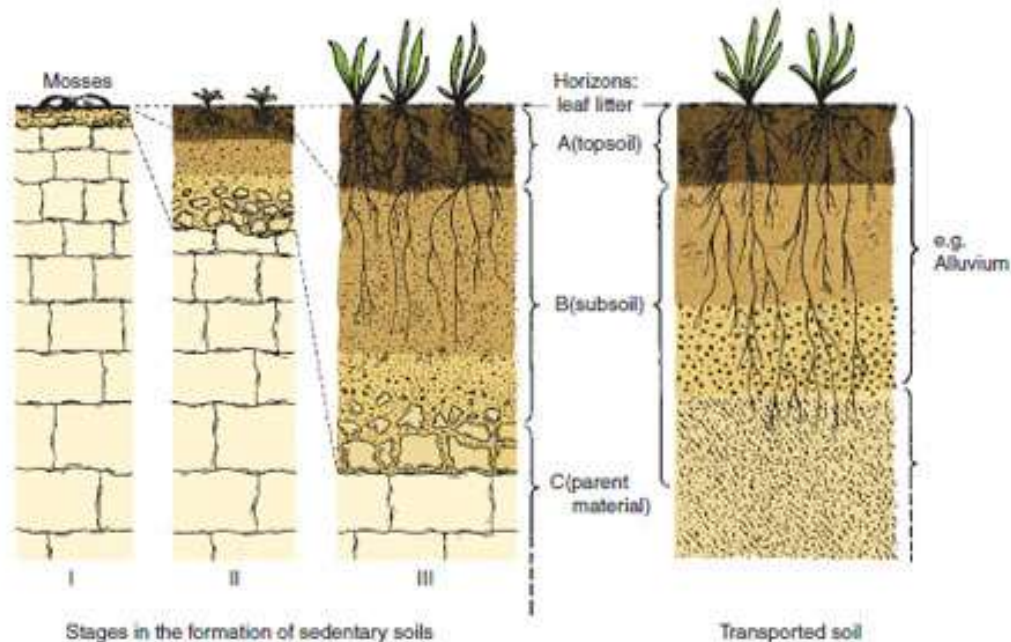


Image credit: eplantscience.com

Residual Soils



Depositional Soils



Soil Quality: Physical, Chemical, Biological

Accepting, Holding, and Supplying

- Water
- Mineral Nutrients
- Carbon

Promoting

- Root growth
- Optimum gas exchange
- Biological activity

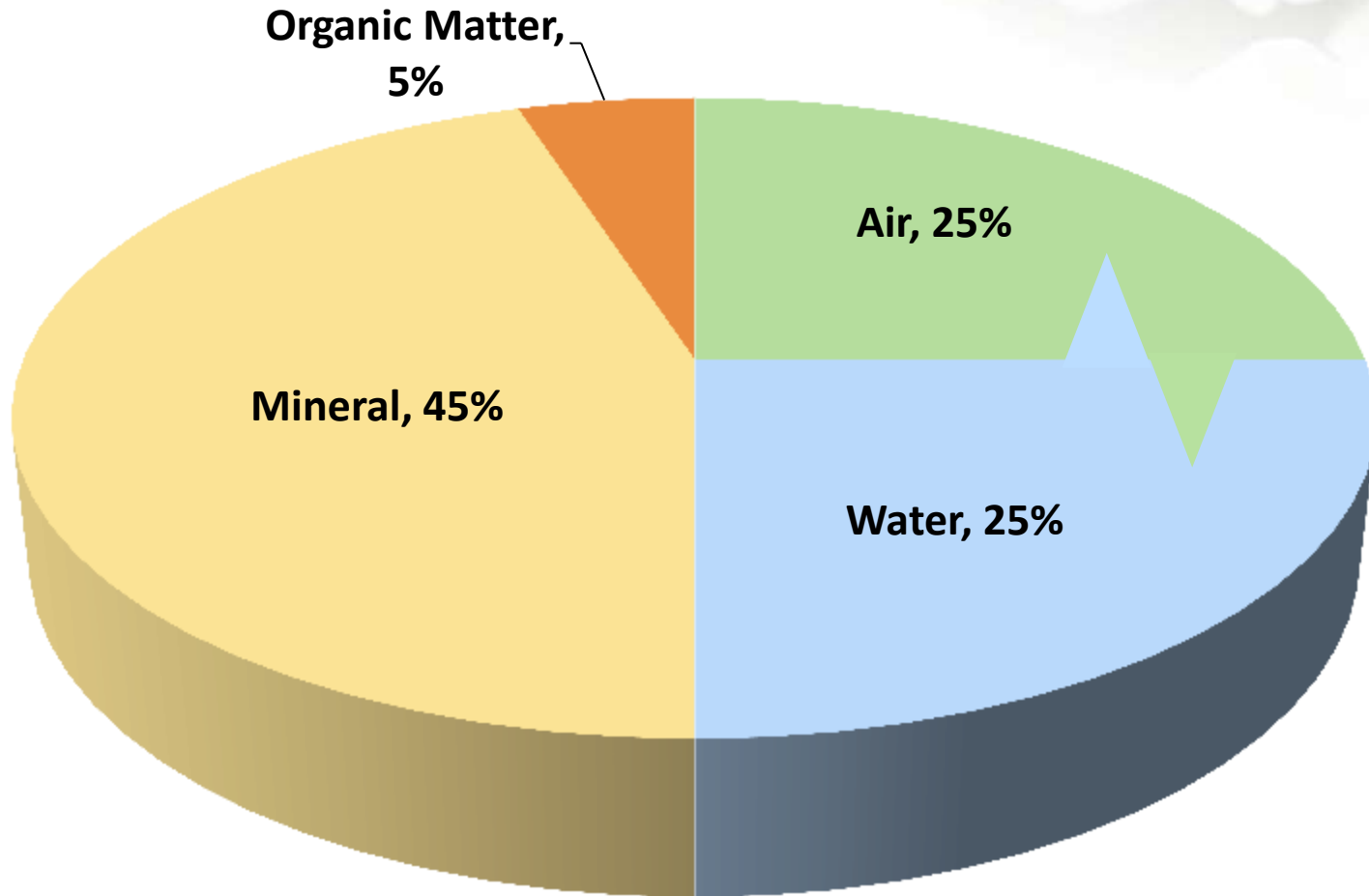


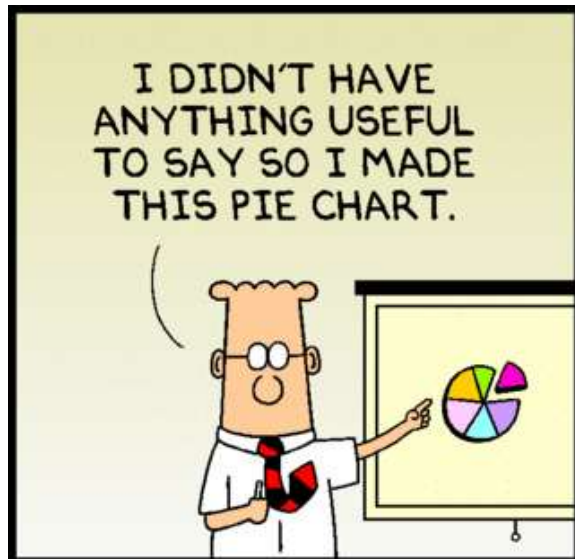
Physical Soil Properties

- Texture
- Structure
- Depth and Layering
- Topography

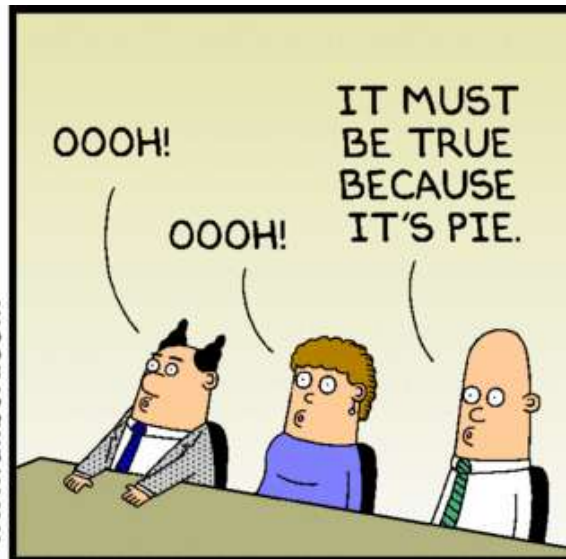


What Makes Up a Good Soil?





www.dilbert.com
scottadams@aol.com



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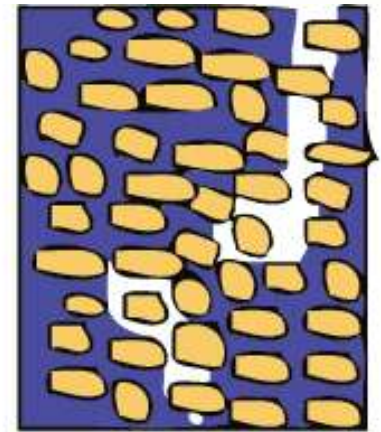
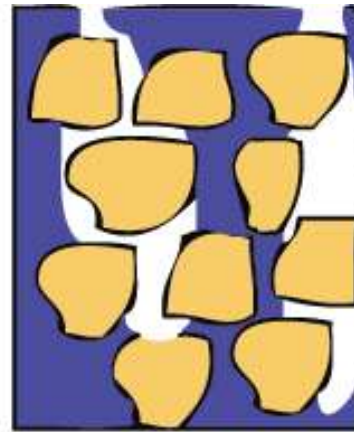
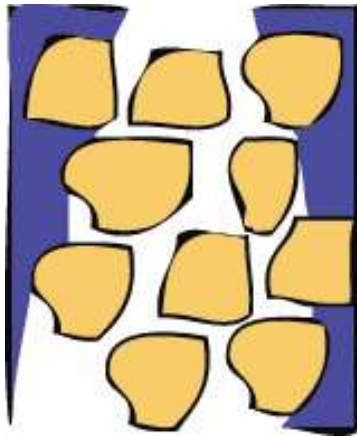
Soil Texture

Soil Texture:
Size (mm):

Sand
.05 - 2

Silt
.002 - .05

Clay
< .002



Macropores:

+++

++

(+)

Med. pores:

++

++

++

Micropores:

(+)

++

+++

Percolation:



Leaching:

Thought Experiment

**Imagine this room
completely empty.**



Thought Experiment

Is it full?



Thought Experiment

Now is it full?



Thought Experiment

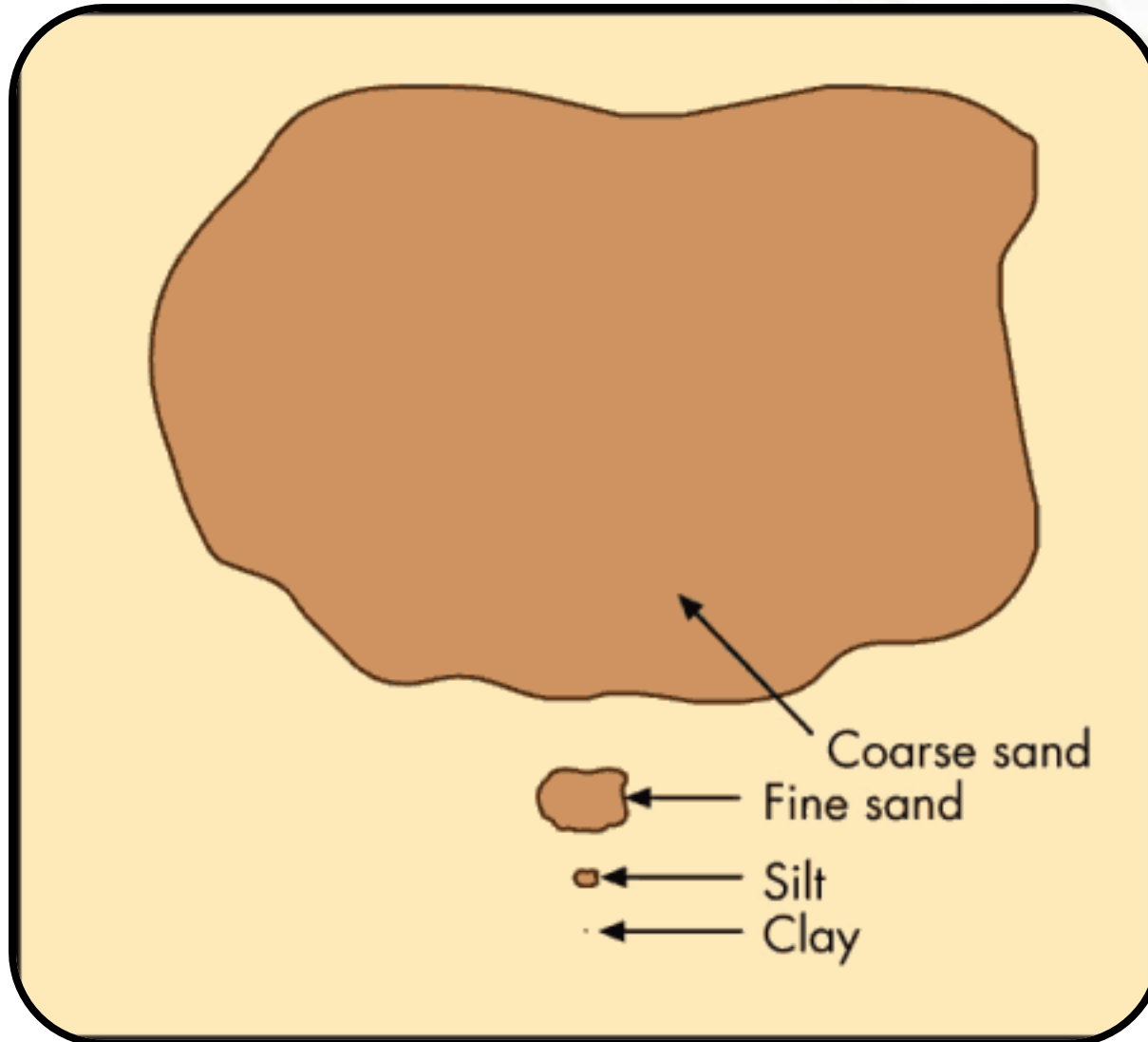
Now is it full?



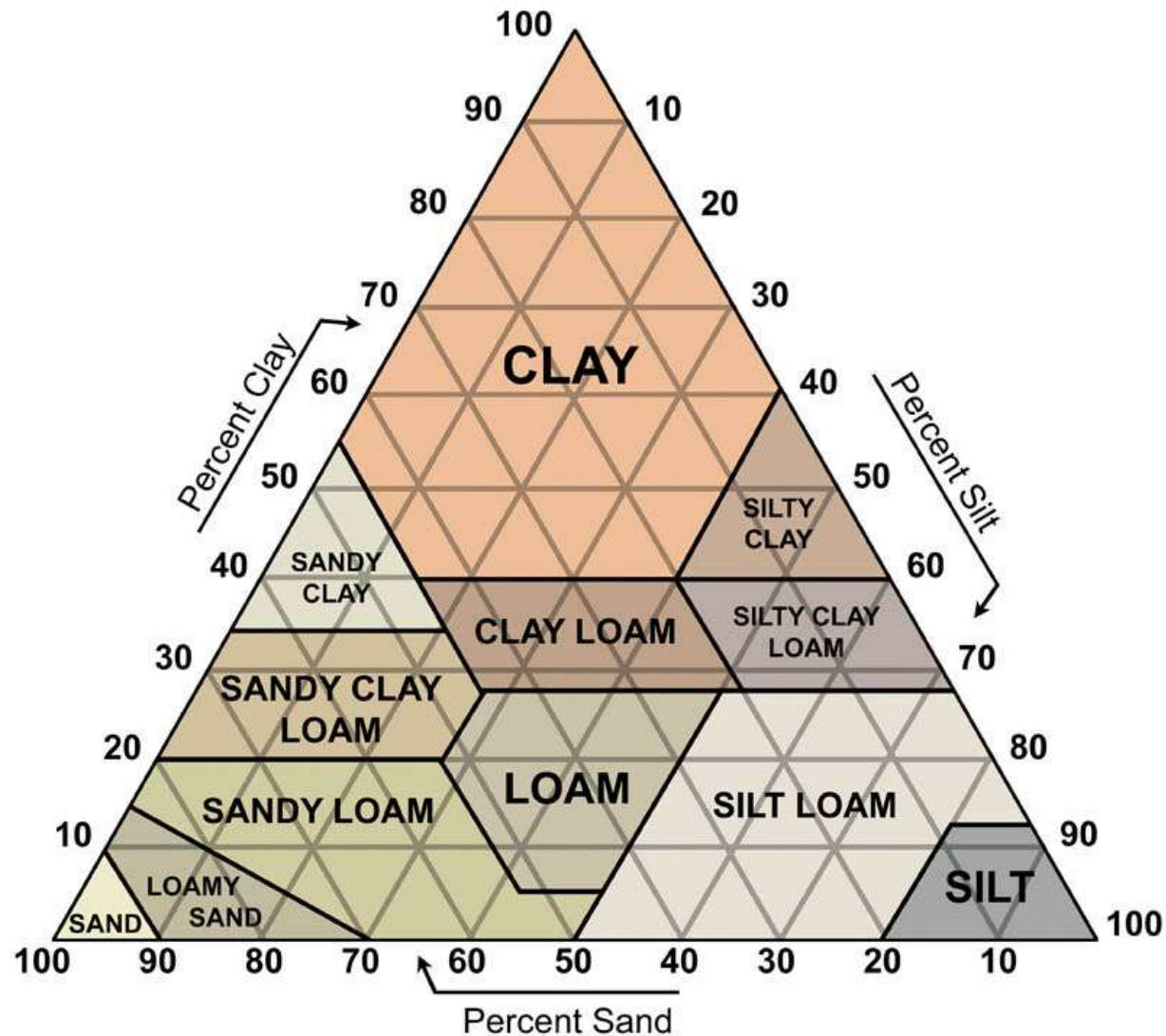
Macropores and Micropores



Soil Particle Sizes



Soil Texture Triangle



Uh Oh...

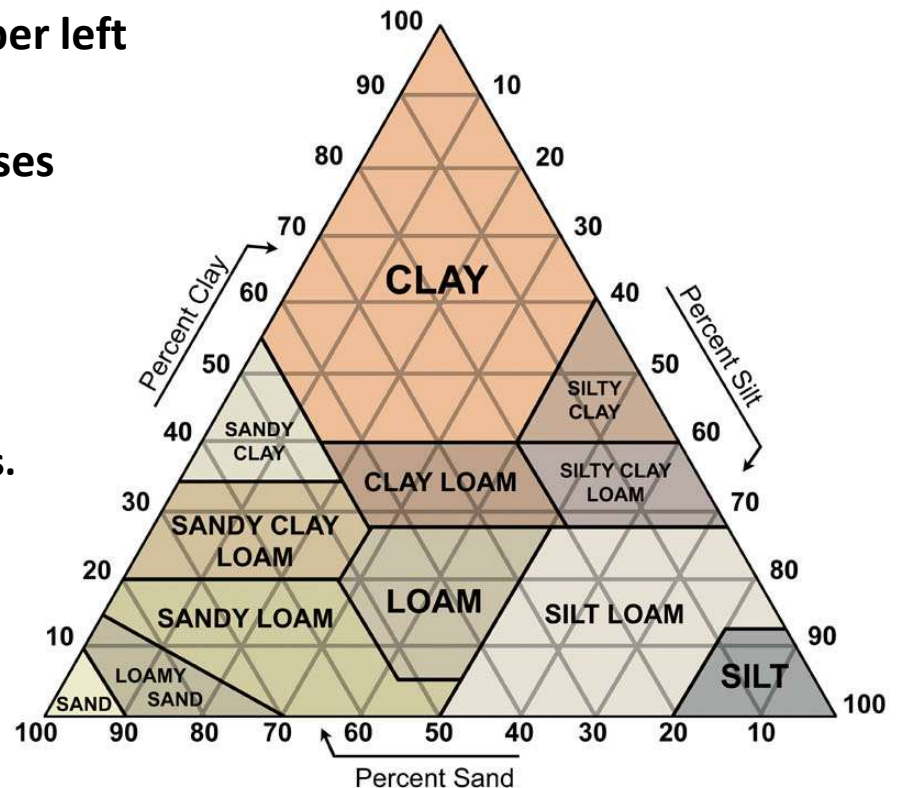
WORDY
SLIDE
ALERT!!!



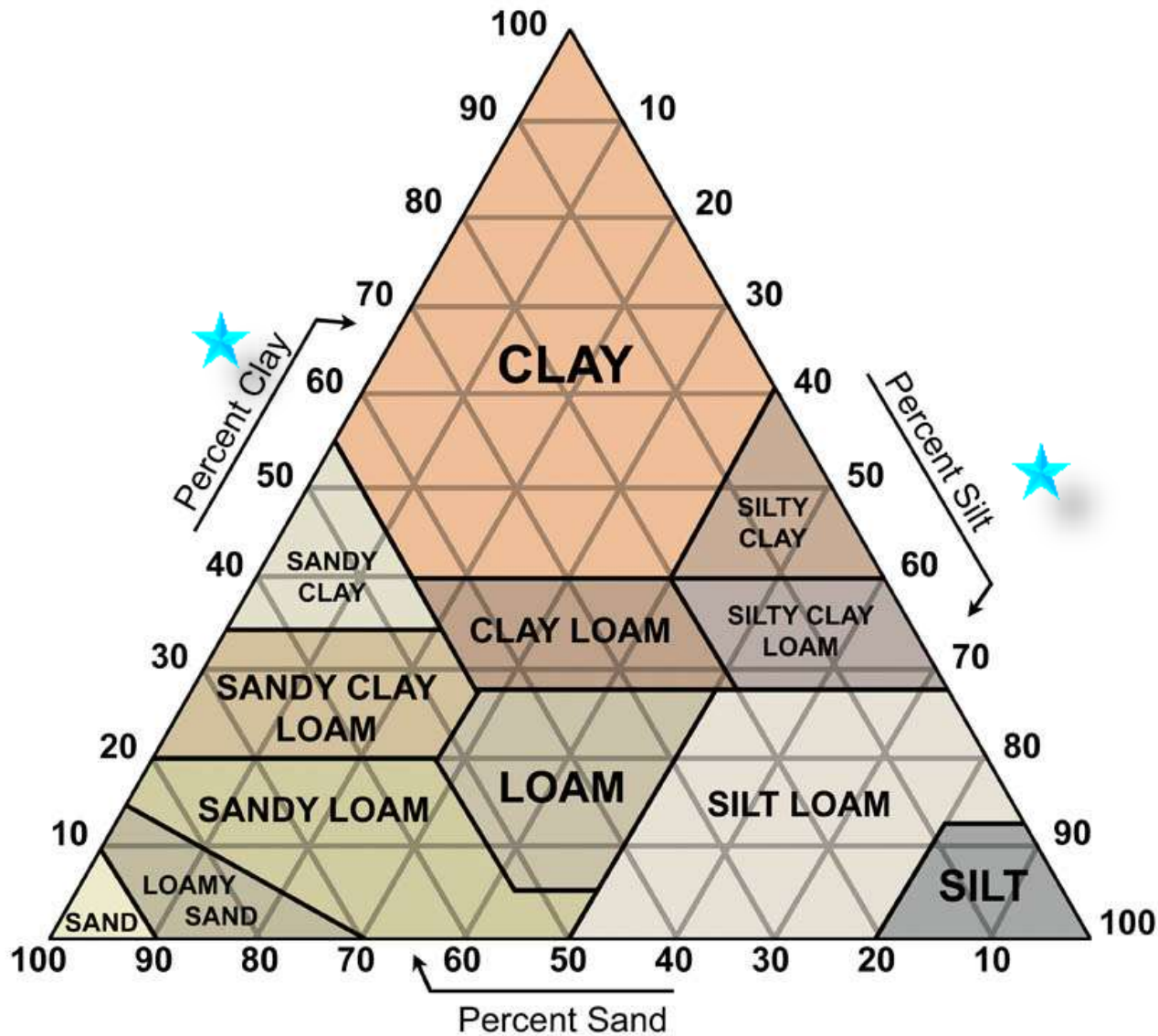
Soil Texture Triangle

This triangle is used to classify the texture class of a soil.

- The sides of the soil texture triangle are scaled for the percentages of sand, silt, and clay.
- Clay percentages are read from left to right across the triangle.
- Silt is read from the upper right to lower left.
- Sand from lower right towards the upper left portion of the triangle.
- The boundaries of the soil texture classes are highlighted in black.
- The intersection of the three sizes on the triangle give the texture class.
 - Ex. A soil with 20% clay, 60% silt, and 20% sand it falls in the "silt loam" class.



Soil Texture Triangle



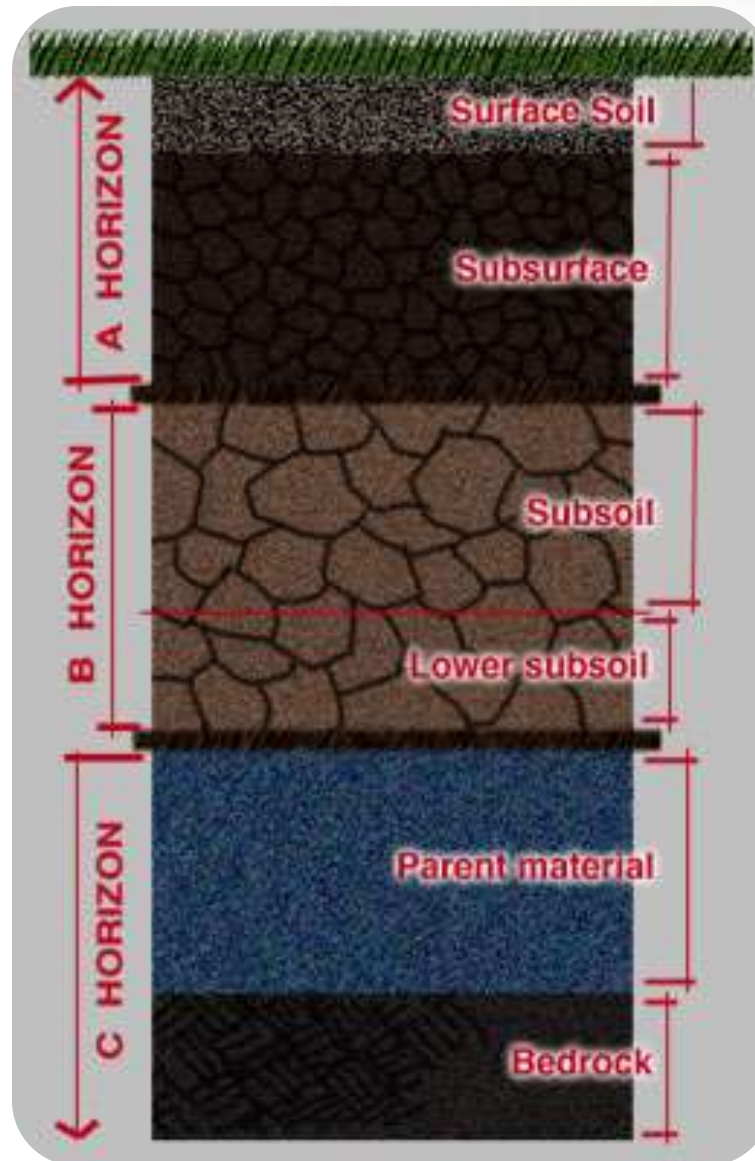
Soil Horizons

A horizon

B horizon

C horizon

R horizon



A Horizon

- “Topsoil”
- Dark color
- Decomposing organic material
- Well aerated
- Most biodiversity
- Conducive to plant growth

B Horizon

- “Subsoil”
- Forms in stable soils
- OM and clays leached from A horizon
- Lower O₂

C Horizon

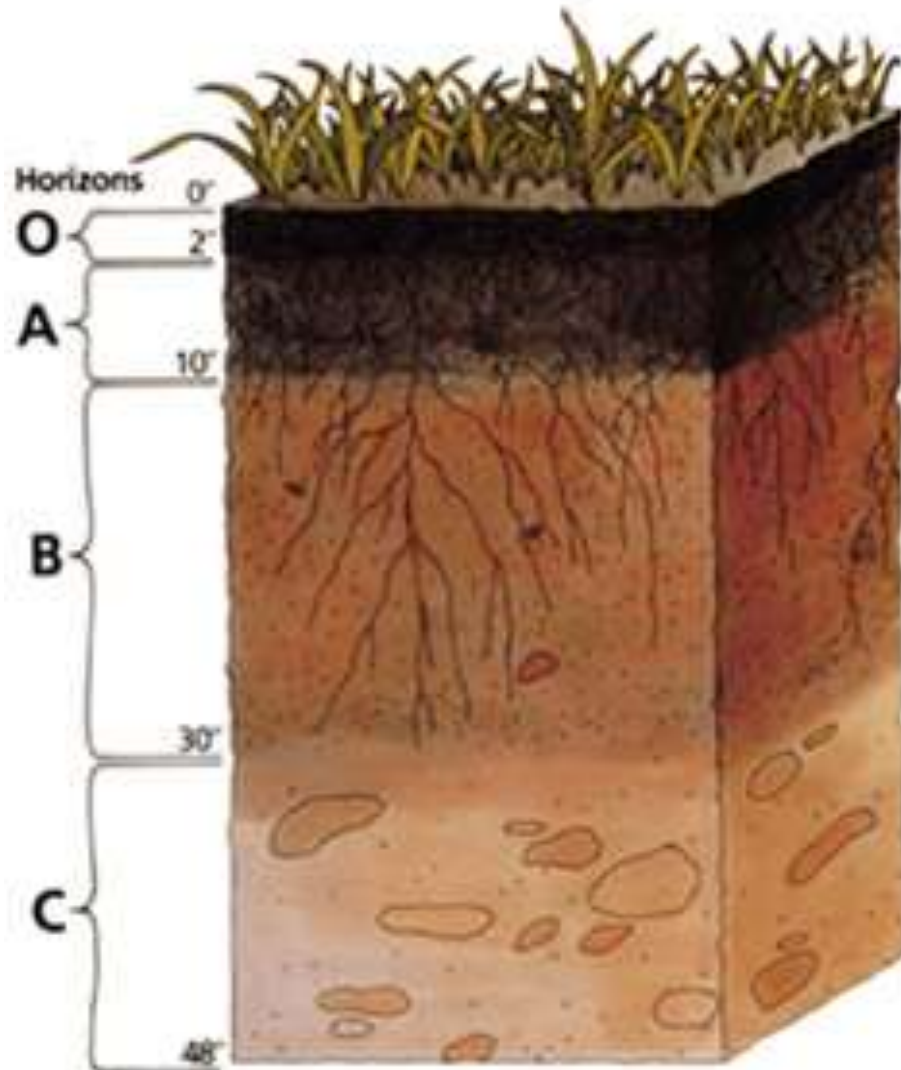
- Loose and weathered rock material

R Horizon



- R is for rock

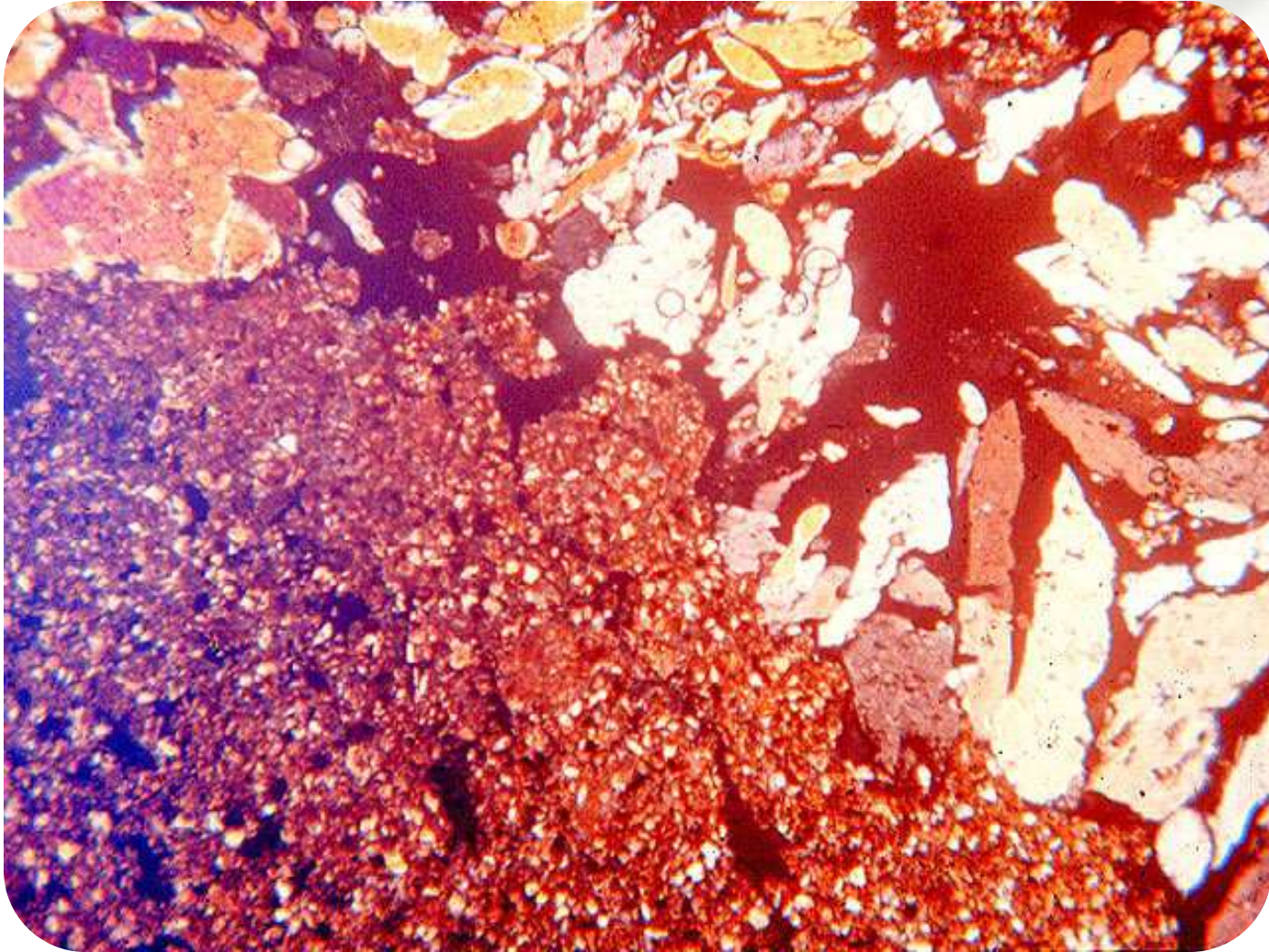
Soil Profile



Soil Profile



Chemical Properties



Chemical Properties

- Fertility
- Soil Reaction (pH)
- Salinity
- Cation Exchange Capacity (CEC)
- Anions

Nutrients and Sources

Air

- Carbon
- Oxygen

Water

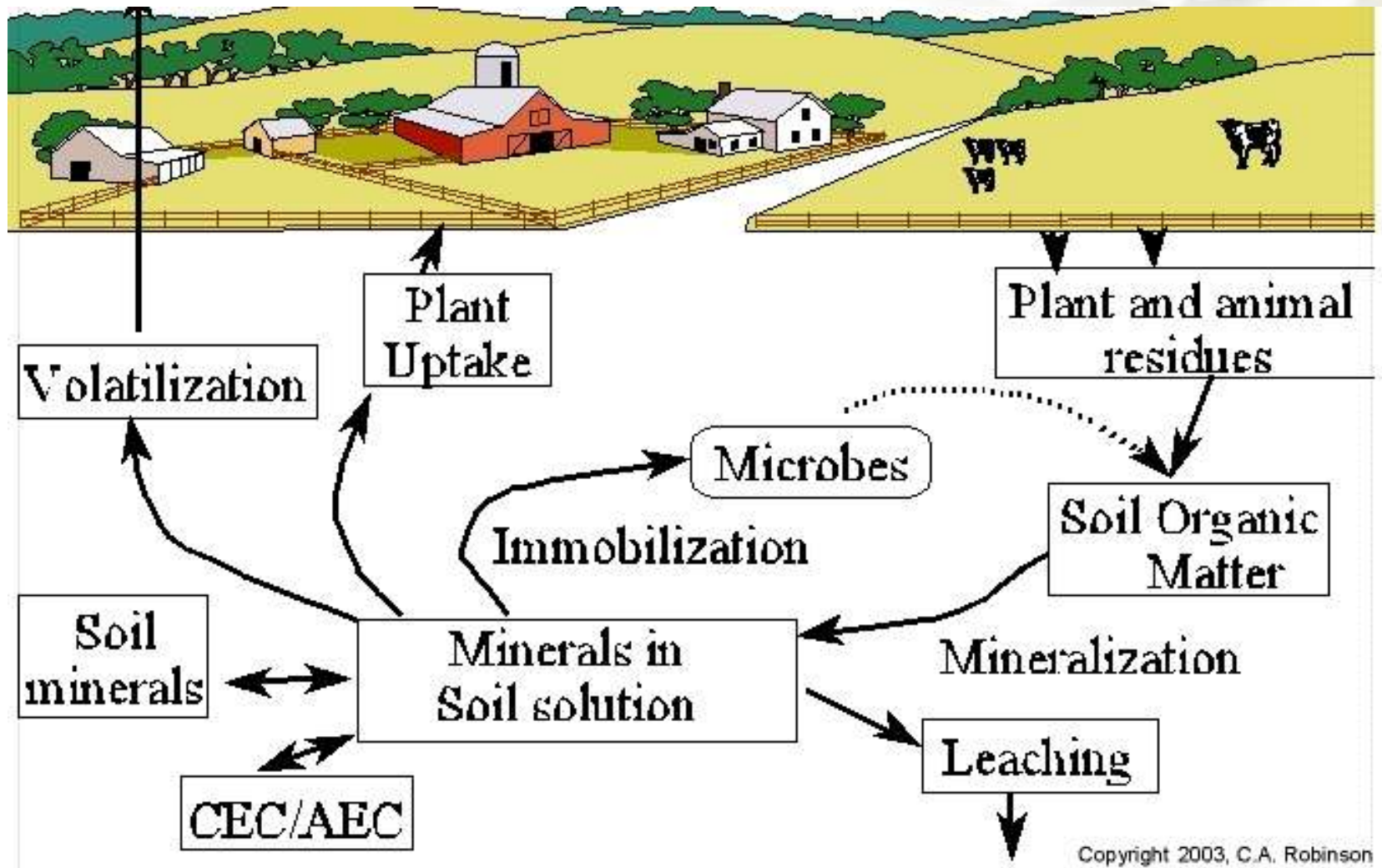
- Hydrogen

Soil

- **Macronutrients**
 - Nitrogen
 - Phosphorus
 - Potassium
 - Sulfur
 - Calcium
 - Magnesium
- **Micronutrients**
 - Iron
 - Boron
 - Manganese
 - Copper
 - Zinc
 - Molybdenum
 - Chlorine



Nutrient Cycle



A Poem

For coffee it's 5, for tomatoes it's 4;
While household ammonia's 11 or more.
It's 7 for water, if in a pure state,
But rainwater's 6, and seawater's 8.
It's basic at 10, quite acidic at 2
And well above 7 when litmus turns blue.
Some find it a puzzlement. Doubtless their fog
Has something to do with that negative log.

Soil pH or Soil Reaction

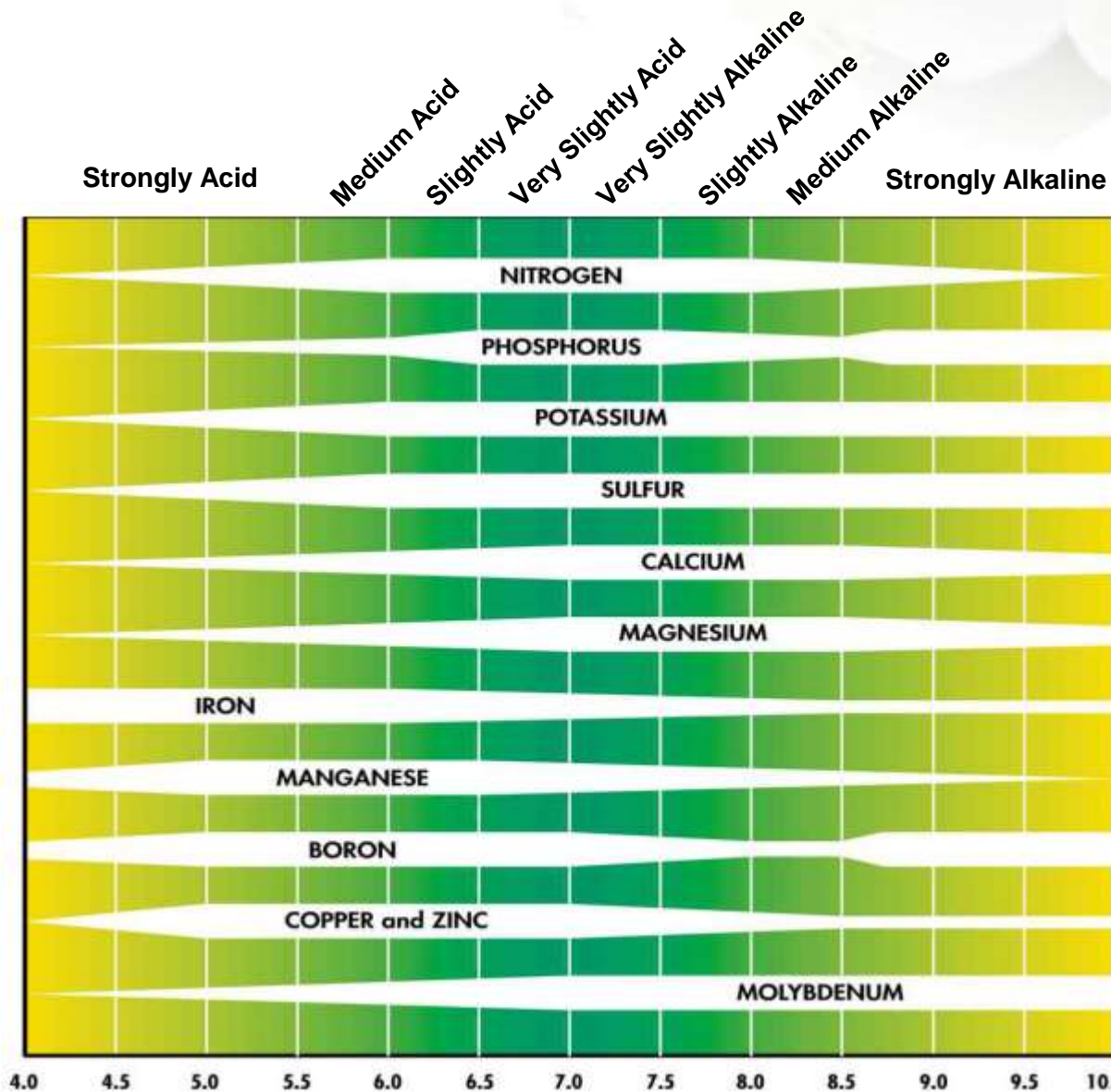
- An indication of the acidity or alkalinity of soil
- Measured in pH units
- The negative logarithm of the hydrogen ion concentration
- The pH scale goes from 0 to 14 with pH 7 as the neutral point
- As the amount of hydrogen ions in the soil increases the soil pH decreases thus becoming more acidic. From pH 7 to 0 the soil is increasingly more acidic and from pH 7 to 14 the soil is increasingly more alkaline or basic.

Soil pH or Soil Reaction



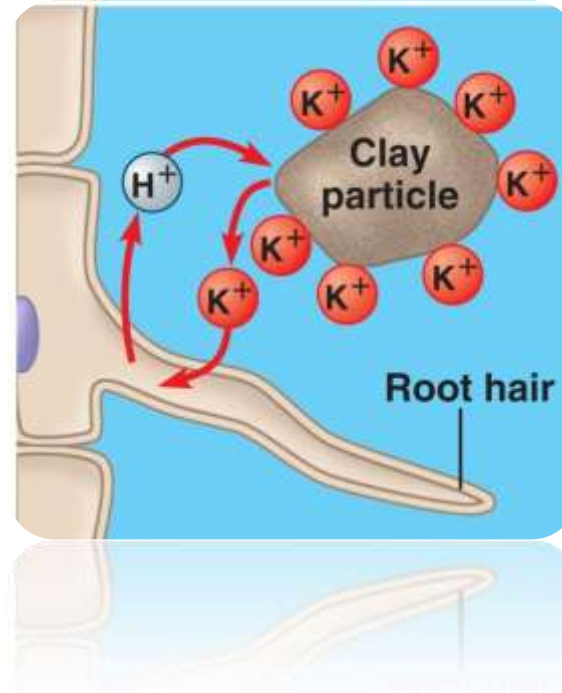
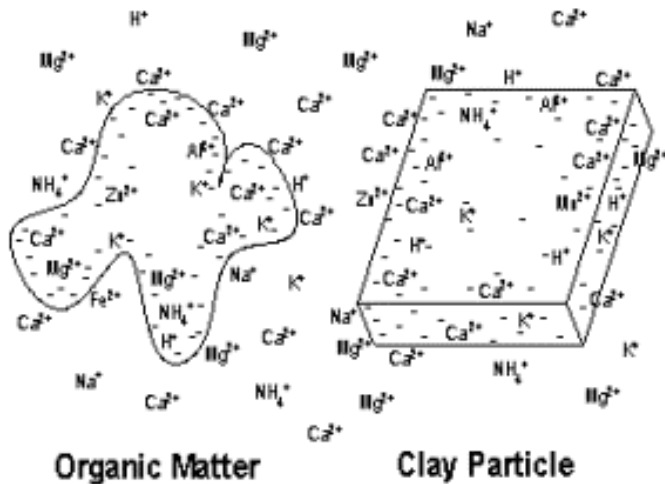
- The effect of soil pH is great on the solubility of minerals or nutrients.
- Fourteen of the seventeen essential plant nutrients are obtained from the soil.
- Before a nutrient can be used by plants it must be dissolved in the soil solution.
- Most minerals and nutrients are more soluble or available in acid soils than in neutral or slightly alkaline soils.

Soil pH or Soil Reaction



Cation Exchange Capacity

Cation exchange capacity (CEC) is the amount of positively charged ions a soil can hold.



Cation Exchange Capacity



When dissolved in water, the nutrients are either positively charged or negatively charged.

Cation Exchange Capacity

Examples of positively charged ions (cations) include:

- Calcium (Ca^{++})
- Magnesium (Mg^{++})
- Potassium (K^{+})
- Sodium (Na^{+})
- Ammonium (NH_4^{+})

Cation Exchange Capacity

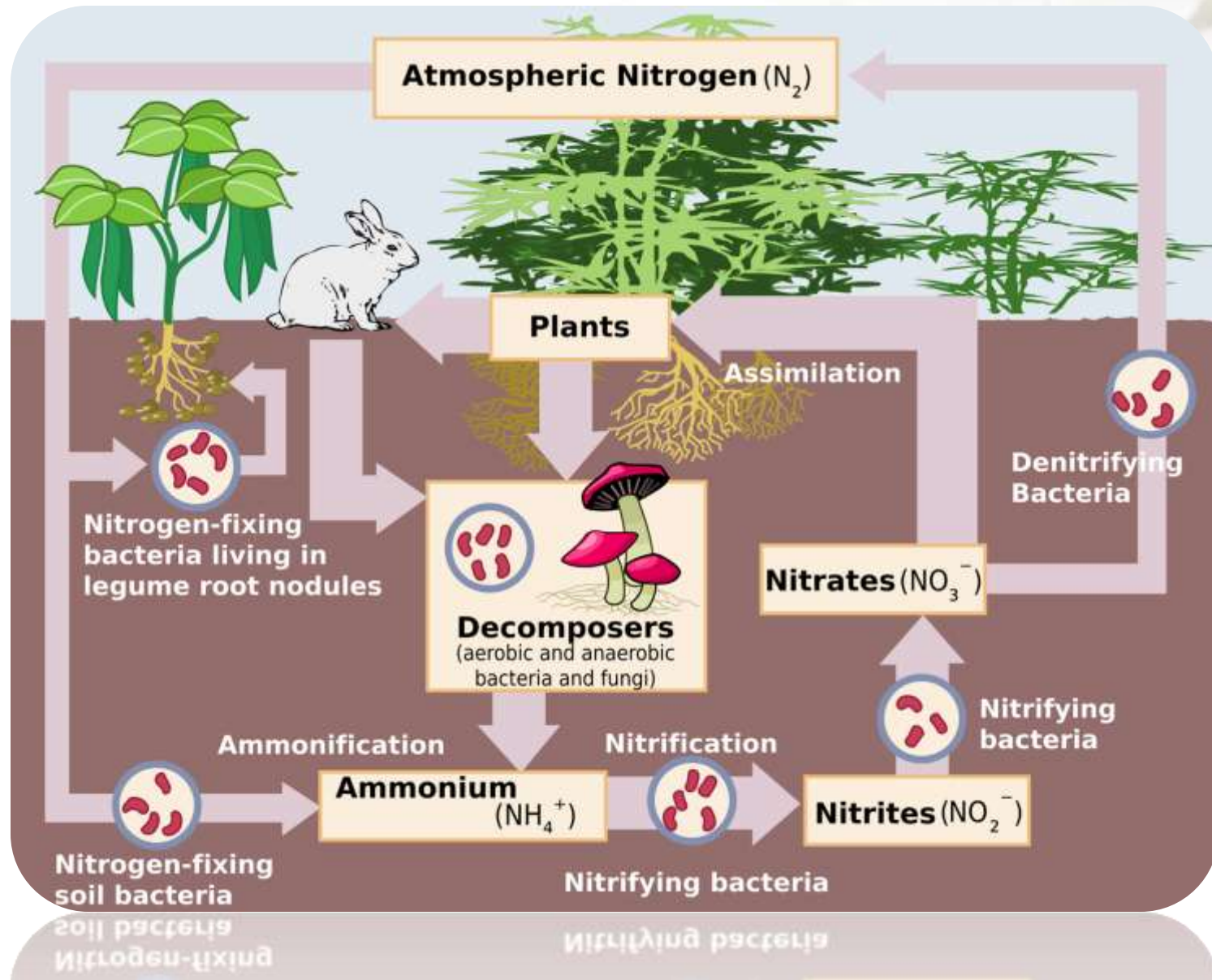


- Soils have a slight of negative charge due to the presence of clay particles and organic matter.
- Thus the higher the clay content and organic matter content, the higher the CEC of the soil.
- Soils with a high CEC will tend to hold on to nutrients better than soils with a low CEC.
- The CEC of a soil can be increased somewhat by increasing the soil's organic matter content.

Cation Exchange Capacity

- Organic matter contributes to cation exchange capacity (CEC) the retention of exchangeable cations.
- Humification produces organic colloids of high specific surface area.
- CEC of soil organic matter is completely pH-dependent and buffered over a wide range of H^+ ion concentrations.

Nitrogen Cycle



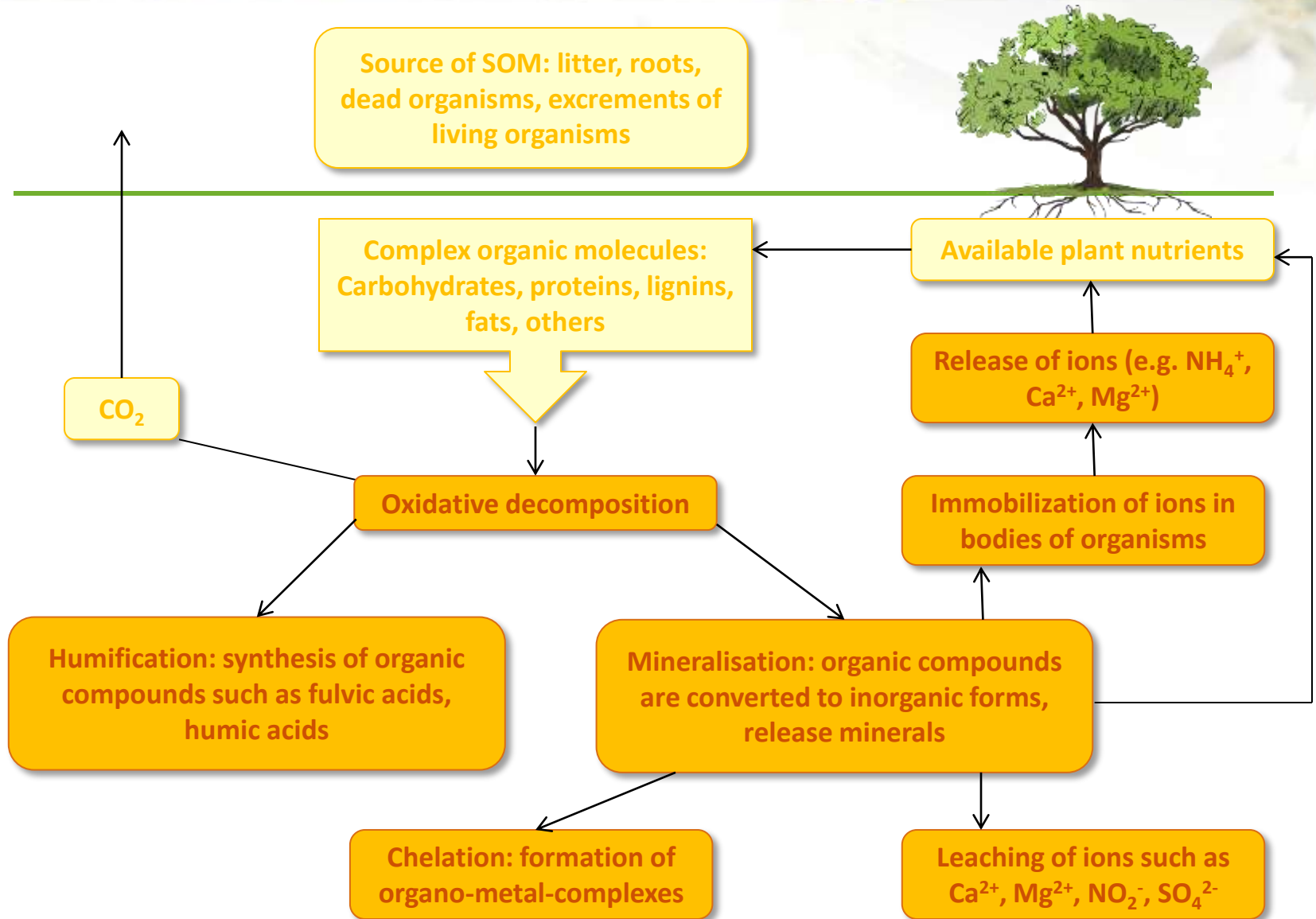
Biological Properties

“Soil health” is the biological component of soil quality

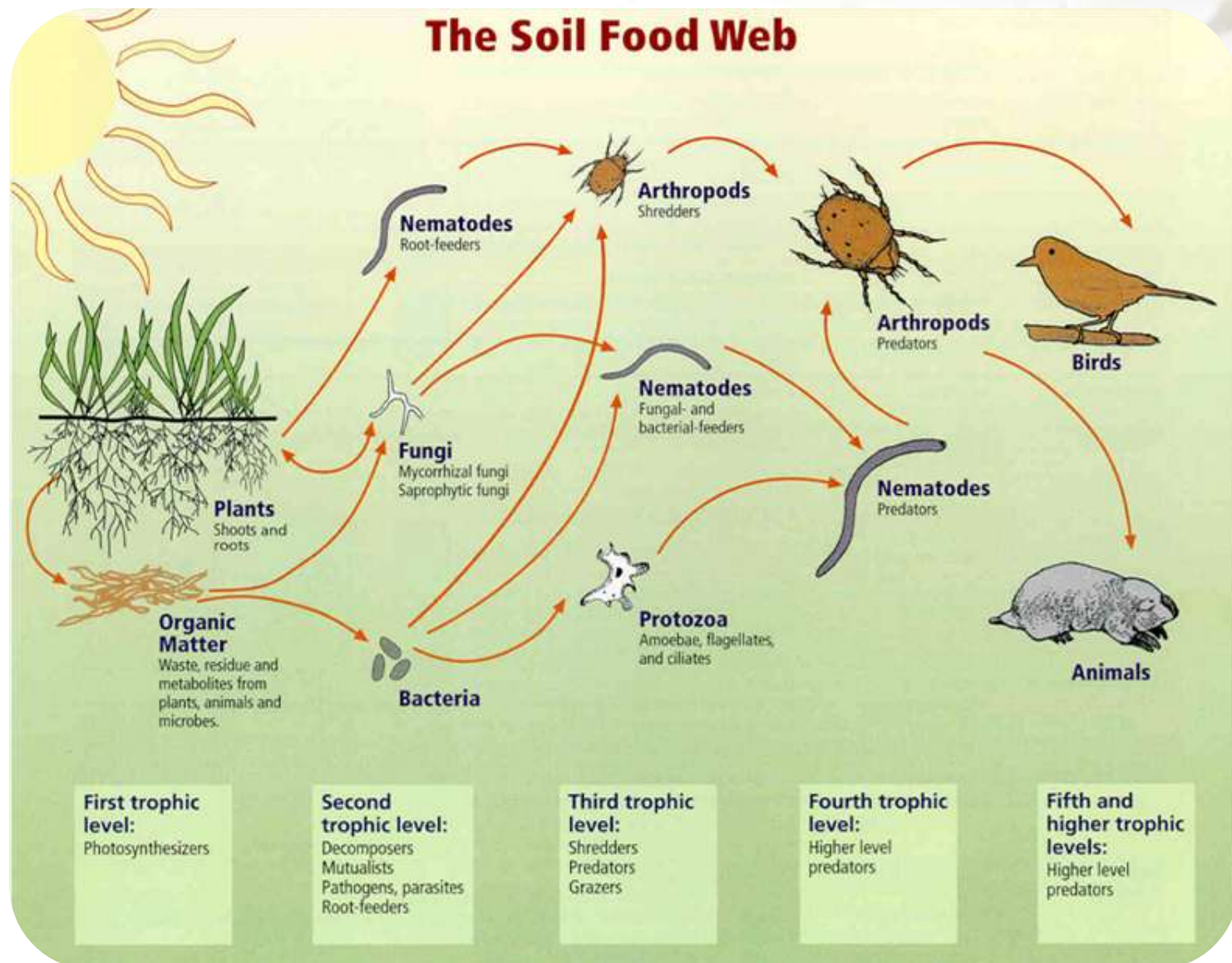
- Soil fauna
- Soil micro-flora
- Organic material (OM)
- Nitrification



Biological Properties



Biological Properties



Benefits of a Healthy Soil Food Web



- Suppresses disease
- Retains nutrients
- Nutrient cycling
- Decomposes toxins
- Builds (re-builds) soil structure
- Reduces water use, increases water holding capacity and rooting depth

Root Exudates Feed Soil Microbes

Exudates - 50% of energy to roots

- Simple sugars
- Proteins
- Carbohydrates

1 gram of typical grassland soil

- Outside roots:
 - 600 million bacteria
 - 150 μg fungi
- In root zone (rhizosphere)
 - 10,000 million bacteria
 - 300 μg fungi



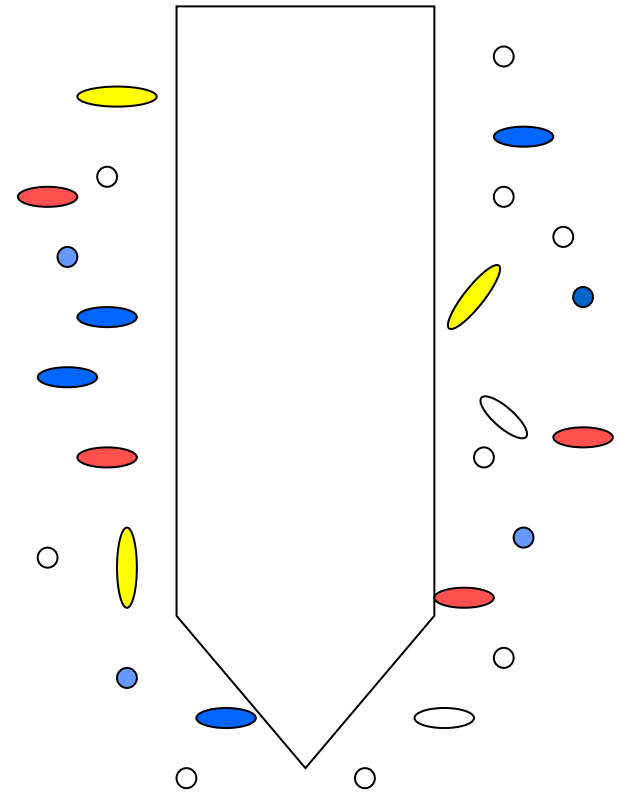
Pathogen Suppression

- Use up foods
- Inhibitory compounds, antibiotics present
- Consume pathogens
- Occupy infection sites

Verticillium



Root



Sampling Soils



Soil Sampling

Rooting depth

Physical characteristics

Chemical properties

- CEC
- P,K levels
- OM
- pH



Soil Sampling





- **Primary Focus**
 - Nutrient levels
- **Secondary Focus**
 - pH, Cation exchange capacity, Organic matter %
- **Little concern about texture, structure, compaction, biological qualities**

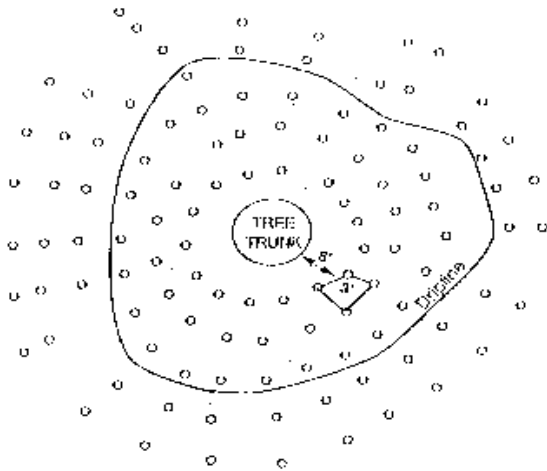
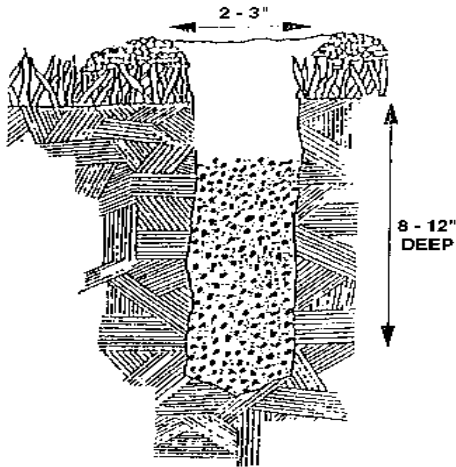
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Air Spading



Air Spade Protocols

Vertical Mulching



Air Spade Protocols

Root Collar Excavation



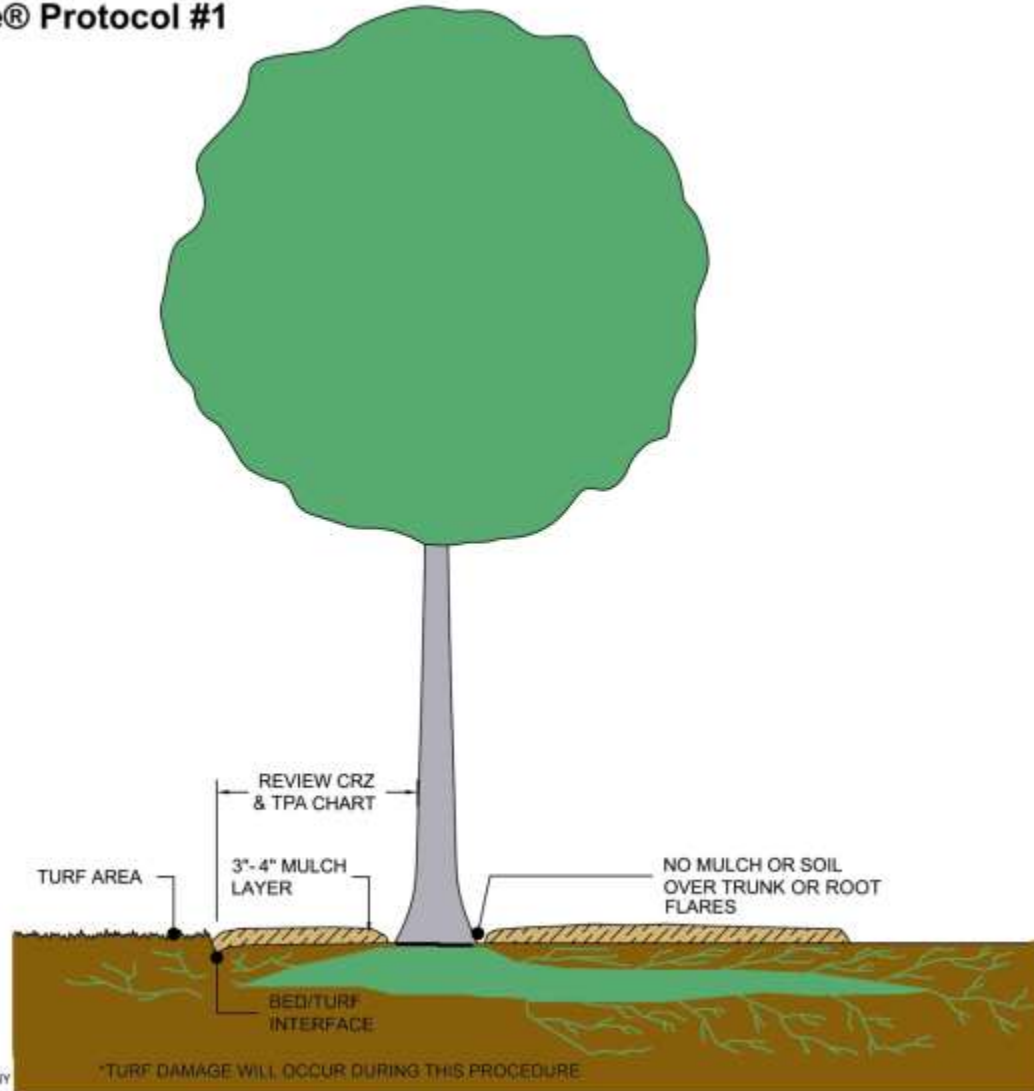
Air Spade Protocols



Air-Spade® Protocol #1

**TYPICAL TREE
PRESERVATION DURING
LANDSCAPE RENOVATION**

**REGULAR LANDSCAPE
MAINTENANCE**



NOT TO SCALE - NOT TO BE REPRODUCED IN ANY MANNER
GUIDELINES ONLY. PROPERTY OF ALMSTEAD TREE COMPANY

*TURF DAMAGE WILL OCCUR DURING THIS PROCEDURE

Air Spade Protocols

Radial Trenching

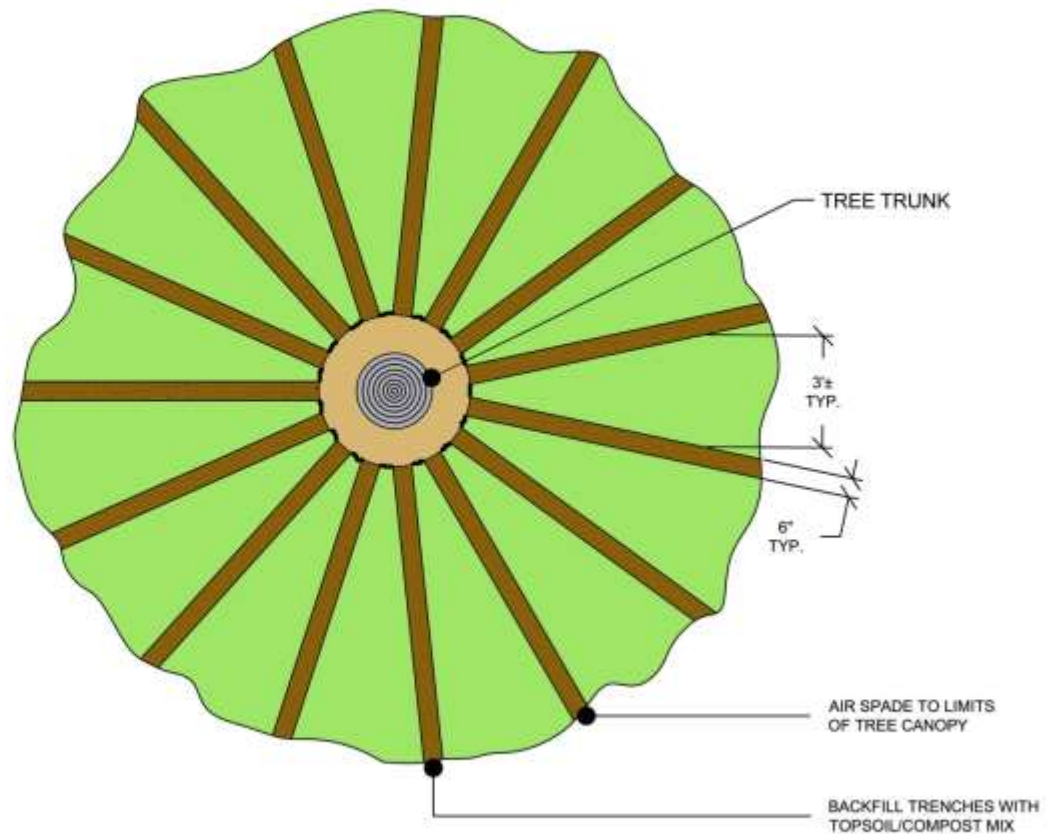


Air Spade Protocols



Air-Spade® Protocol #5

**RADIAL TRENCHING
FOR COMPACTED SOILS
WITHIN TREE CANOPY
EMPLOYING AIR-SPADE®**



NOT TO SCALE - NOT TO BE REPRODUCED IN ANY MANNER
GUIDELINES ONLY. PROPERTY OF ALMSTEAD TREE COMPANY

*TURF DAMAGE WILL OCCUR DURING THIS PROCEDURE

Air Spade Protocols



Air-Spade® Protocol #9

AIR-SPADE® TRENCHING WITHIN THE CRITICAL ROOT ZONE (CRZ) OF TREES

Protected Root Zone: by calculating the critical root radius (crr).
First, measure the tree diameter in inches at @ 55" above grade.
Then multiply that number by 1.5 or 1.0. Express the result in feet.

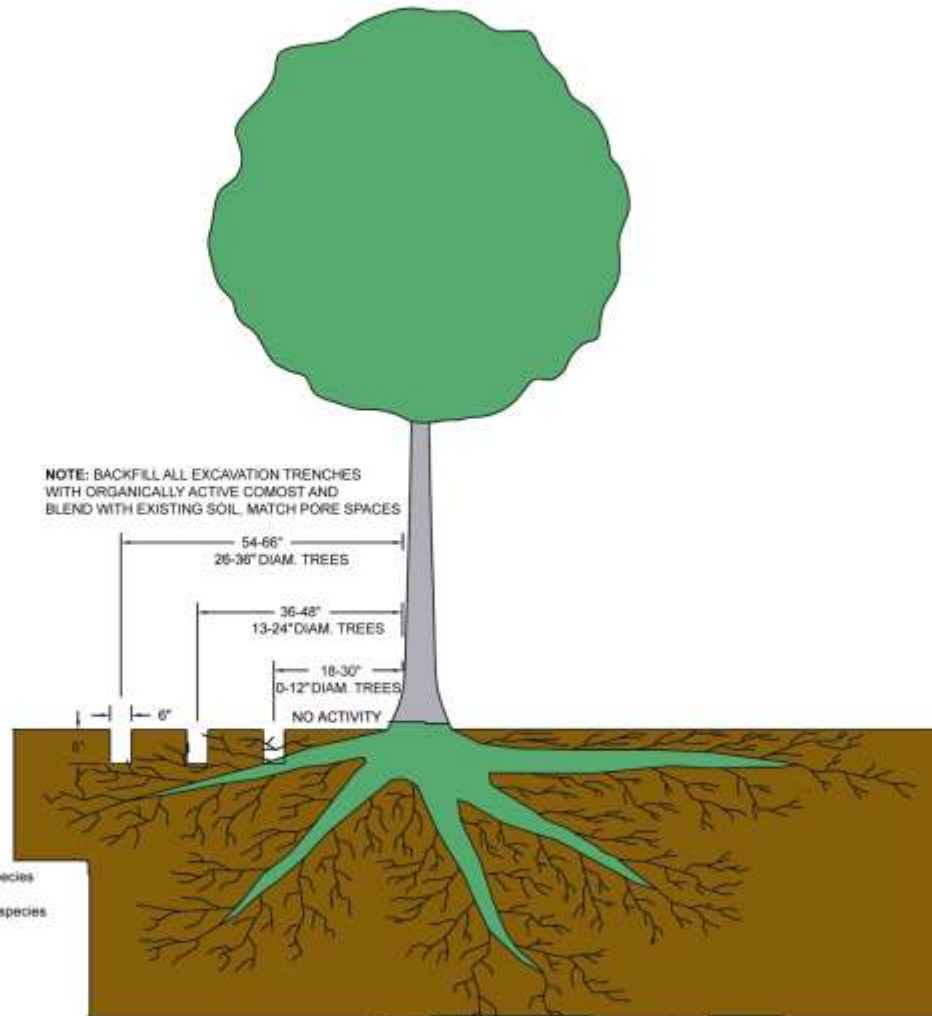
Example:

@ 55" above grade = 8 inches
 $8 \times 1.5 = 12$
crr = 12 feet

Measure diameter (width) @ 55" above grade

ht tree @ 55" X 1.5 = critical root radius for older, unhealthy, or sensitive species

or ht tree @ 55" X 1.0 = critical root radius for younger, healthy, or tolerant species



NOT TO SCALE - NOT TO BE REPRODUCED IN ANY MANNER
GUIDELINES ONLY. PROPERTY OF ALMSTEAD TREE COMPANY

*TURF DAMAGE WILL OCCUR DURING THIS PROCEDURE

Air Spade Protocols

Full Sheet Excavation



Air Spade Protocols

Soil Amendments we use to backfill

- Compost
- Zeolite
- Rhizoscience



Rye Country Day School



- 2lbs 9-0-4 organic fertilizer per year
- 2 Compost tea extract visits
- Core aeration with seeding



Soil Food Web Tests



Foodweb Analysis Soil

Report prepared for:

Almstead Tree and Shrub Care
Michael Almstead
58 Beechwood Ave
New Rochelle, NY 10801 USA
(914) 576-5448
malmstead@almstead.com

Report Sent: 7/24/2012

Sample# 01-111093 | Submission 01-021105

Unique ID: Upper Field

Plant: Ryegrass

Invoice Number: 6651

Sample Received: 3/10/2011

For interpretation of this report please contact:

Soil Foodweb Oregon

info@oregonfoodweb.com

(541) 752-5066

Consulting fees may apply

Organism Biomass Data	Dry Weight	Active Bacteria (µg/g)	Total Bacteria (µg/g)	Active Fungi (µg/g)	Total Fungi (µg/g)	Hyphal Diameter (µm)	Nematode detail (# per gram or # per mL) Classified by type and identified to genus. (If section is blank, no nematodes identified.)		
Results	0.790	55.3	616	25.4	554	2.9	Bacterial Feeders	1.53	
Comments	In Good Range	Below range	In range	Below range	In range		Achromadora		0.04
Expected Range	Low	150	600	75	300		Cephalobus		0.38
	High	0.85	570	1200	285	600	Geomonhystera		0.15
							Heterocephalobus		0.04
							Monhystrella		0.27
							Plectus		0.04
							Prismatolaimus		0.15
							Rhabditidae		0.34
							Tripyla		0.12
							Fungal Feeders	0.15	
							Discolaimus		0.04
							Eudorylaimus		0.08
							Thorus		0.04
							Fungal/Root Feeders	0.88	
							Aphelenchoides	Foliar nematode	0.27
							Aphelenchus		0.57
							Ditylenchus	Stem & Bulb nematode	0.04
							Root Feeders	0.19	
							Helicotylenchus	Spiral nematode	0.04
							Heterodora	Cyst nematode	0.12
							Pratylenchus	Lesion nematode	0.04

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DryWeight: Check plant requirements, but moisture appears to be fine

Active Bacteria: Bacterial activity above expected levels; Bacterial biomass will increase as long as nutrients are available

Total Bacteria: Higher than normal bacterial biomass suggests high bacterial species diversity

Active Fungi: Fungal activity above expected levels; fungal biomass will increase as long as nutrients are available

Total Fungi: Fungal biomass and diversity above typical range

Hyphal Diameter: Good balance of disease suppressive and normal soil fungi

Protozoa: Low flagellate numbers suggest lack of species diversity; Nutrient cycling will be limited. Need inoculum of protozoa to build populations, restore missing species.

Total Nematodes: Low numbers, OK diversity; root feeders present. Need to add both beneficial nematodes and improve growth conditions.

Mycorrhizal Col.:

TF/TB: Lacking adequate bacteria for best growth and health of ryegrass

AF/TF: Low activity relative to total biomass

AB/TB: Low activity relative to total biomass

AF/AB: Soil is fungal dominated, but becoming more bacterial, which is desirable

Interpretation Comments:

Actinobacteria Biomass = 5.8 ug/g
Good fungal diversity, hyphal diameter: 1.5 to 5um

Soil Food Web Tests



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Report Sent: 6/14/2012
Sample# 01-114102 | Submission: 01-022293
Unique ID: Upper Area
Plant: Not Indicated
Invoice Number: 8674
Sample Received: 6/5/2012

For interpretation of this report please contact:
Soil Foodweb Oregon
info@oregonfoodweb.com
(541) 752-5066

Consulting fees may apply

Organism Biomass Data	Dry Weight	Active Bacteria (µg/g)	Total Bacteria (µg/g)	Active Fungi (µg/g)	Total Fungi (µg/g)	Hyphal Diameter (µm)	Nematode detail (# per gram or # per mL) Classified by type and identified to genus. (If section is blank, no nematodes identified.)		
Results	0.810	73.3	562	44.3	721	2.85	Bacterial Feeders	7.38	
Comments	In Good Range	Below range	In range	Below range	Above range		Cephalobus		1.80
Expected Range	Low	100	400	75	300		Diploscapter		0.66
	High	0.85	380	800	285	600	Eucephalobus		0.33
							Panagrolaimus		0.33
							Rhabditidae		4.26
							Fungal Feeders	0.16	
							Mesodorylaimus		0.16
							Fungal/Root Feeders	1.31	
							Aphelenchoides	Foliar nematode	0.66
							Aphelenchus		0.49
							Filenchus		0.16
							Root Feeders	0.33	
							Heterodora	Cyst nematode	0.16
							Tylenchorhynchus	Stunt nematode	0.16
Organism Biomass Ratios	Total Fungi to Tot. Bacteria	Active to Total Fungi	Active to Total Bacteria	Active Fungi to Act. Bacteria	Plant Available N Supply (lbs/ac)	Actino Bacteria (µg/g)			
Results	1.28	0.06	0.13	0.60	200+	2.12			
Comments	Good	Low	Low	Low					
Expected Range	Low	0.75	0.25	0.25	0.75				
	High	1.5	0.95	0.95	1.5				

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Soil Food Web Tests



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DryWeight: Check plant requirements, but moisture appears to be fine

Active Bacteria: Aerobic bacteria not in growth mode; need to improve activity by adding simple, high energy sugar or amino-sugar source

Total Bacteria: Aerobic bacterial biomass in normal range

Active Fungi: Need to improve active biomass; Add 2 to 4 gal/ ac of liquid humic acids, or 5 to 10 tons/ ac fungal compost or woody mulch, or 20 gal/ ac fungal compost tea

Total Fungi: Fungal biomass and diversity above typical range for this plant group, in this soil

Hyphal Diameter: Good balance of disease suppressive and normal soil fungi

Protozoa: Low flagellate numbers suggest lack of species diversity; Nutrient cycling will be limited. Need inoculum of protozoa to build populations, restore missing species.

Total Nematodes: Low numbers, OK diversity; root feeders present. Need to add both beneficial nematodes and improve growth conditions.

Mycorrhizal Col.:

TF/TB: Good ratio for a wide variety of plants

AF/TF: Low activity; need to add fungal foods to encourage fungi

AB/TB: Low activity; add bacterial foods.

AF/AB: Soil is fungal dominated, but becoming more bacterial; addition of fungal foods might re-align balance.

Interpretation Comments:

Actinobacteria Biomass = 2.12 ug/g
Good fungal diversity

Soil Food Web Tests



- Increase of 35% active bacteria
- Total bacteria went down slightly – 9%
- Active fungi went up 80%
- Total fungi went up 30%
- Flagellates went up 103%
- Amoebae went up over 900%
- Ciliates up, however in good range already
- Total nematodes 2 ½ times the initial amount
- Removed and reduced bad root feeding nematodes
- Biomass ratio has to do with succession. We have gone from our total fungi to total bacteria from “low to “good”. This is what I tend to pay more attention to.

Soil Food Web Tests

Rye Country Day School Action Steps

- Adding nematodes
 - Arrive packed in a sponge
 - Apply 24 million per acre



Image Credit: Dr. Elaine Ingham



Soil Food Web Tests

Rye Country Day School Action Steps

- Adding hay extract for protozoa
 - Aerated hay brew

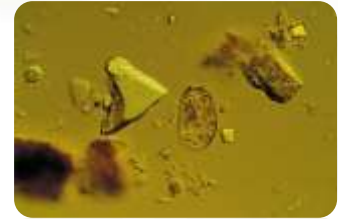
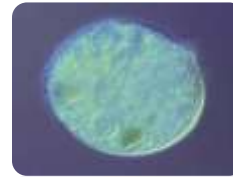


Image s: Dr. Elaine Ingham



Soil Food Web Tests



Tea Ingredients for Rye Country Day School

- **Nematodes**
- **Protozoa extract**
- **Compost**
- **Humic acid increase**
- **Soy**
- **Molasses**
- **Grobiotics**

1 Hour Lunch Break



Estimating



Marketing Costs

- **Upsell service**
 - Announcement to clients
 - Advertise on invoices and contracts
 - Highlight in newsletter
- **Create content**
 - Pages on website
 - Brochures & leave-behind material
- **Advertise**
 - Google Adwords
 - NOFA Online Profiles
- **Public relations**
 - Press releases
 - Bring tea to events
- **Posting signs and lettering trucks**



Estimating

Man Power and Overtime

- 2 hours overtime per brew
- Training
- Management time



Estimating

Materials

- 3-5 gallons per diameter inch for a tree
 - mixed with water @ 3:1 ratio
- 25 gallons per acre for lawn
 - mixed with water @ 5:1 ratio
- 3:1 is a curative ratio
- 5:1 is a maintenance ratio
- Charge \$3-6 per gallon of tea



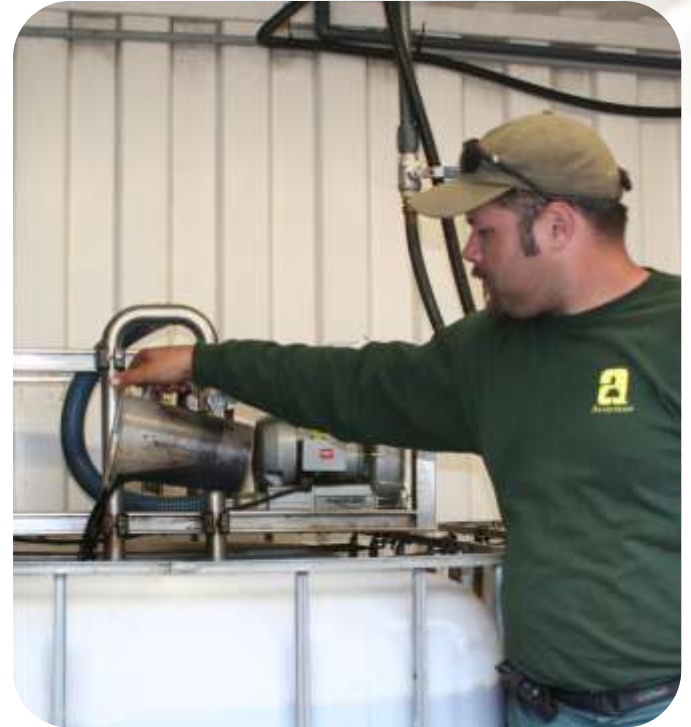
Compost Tea Recipes

Equal Fungi to Bacteria (200 Gals)

- 20 lbs Compost
- 2,400 mls Humic Acid
- 1,200 mls Seaweed Extract
- 210 mls Fish Hydrolysate

Bacterial Tea (200 Gals)

- 20 lbs Compost
- 2,400 mls Black Strap Molasses
- 1,200 mls Seaweed Extract
- 450 mls Fish Hydrolysate
- Gro-Biotix



Compost Tea Recipes



ALMSTEAD
TREE & SHRUB CARE CO.

Compost Tea Brewing Check List

General Information

Date	4/18/12
Time	7:45
Ambient Temperature	67°F
Weather Conditions	SUN

Recipe Code	Hour	H ₂ O Dissolved O ₂ (PPM)	H ₂ O Temp °C
New 1	0	9.75 ppm	19°C
	12	9.98 ppm	15.2°C
	24	9.65 ppm	15.4°C
	36		
	48		

Ingredients

Hour	OALC (lb)	LC-12 Humic Acid (ml)	Sea Kelp (ml)	Fish Hydrolysate (ml)	Molasses (ml)	Additives Code Amount
0	204lb	500 ml	750 ml	300 ml		
12						
24						
36						
48						

Additives

Code	Name
GB	Gro Biotic
T22	Trichoderma
BT	Bacillus thuringiensis (Javelin)
BP	Bacillus subtilis (Rhapody)
BPa	Bacillus pumilus (Sonara)
B	Beauveria
RD	Rock Dust
F	Flour
Other	

Microscope Rating

1=Poor 3=Good 5=Excellent

1	
2	
3	
4	
5	

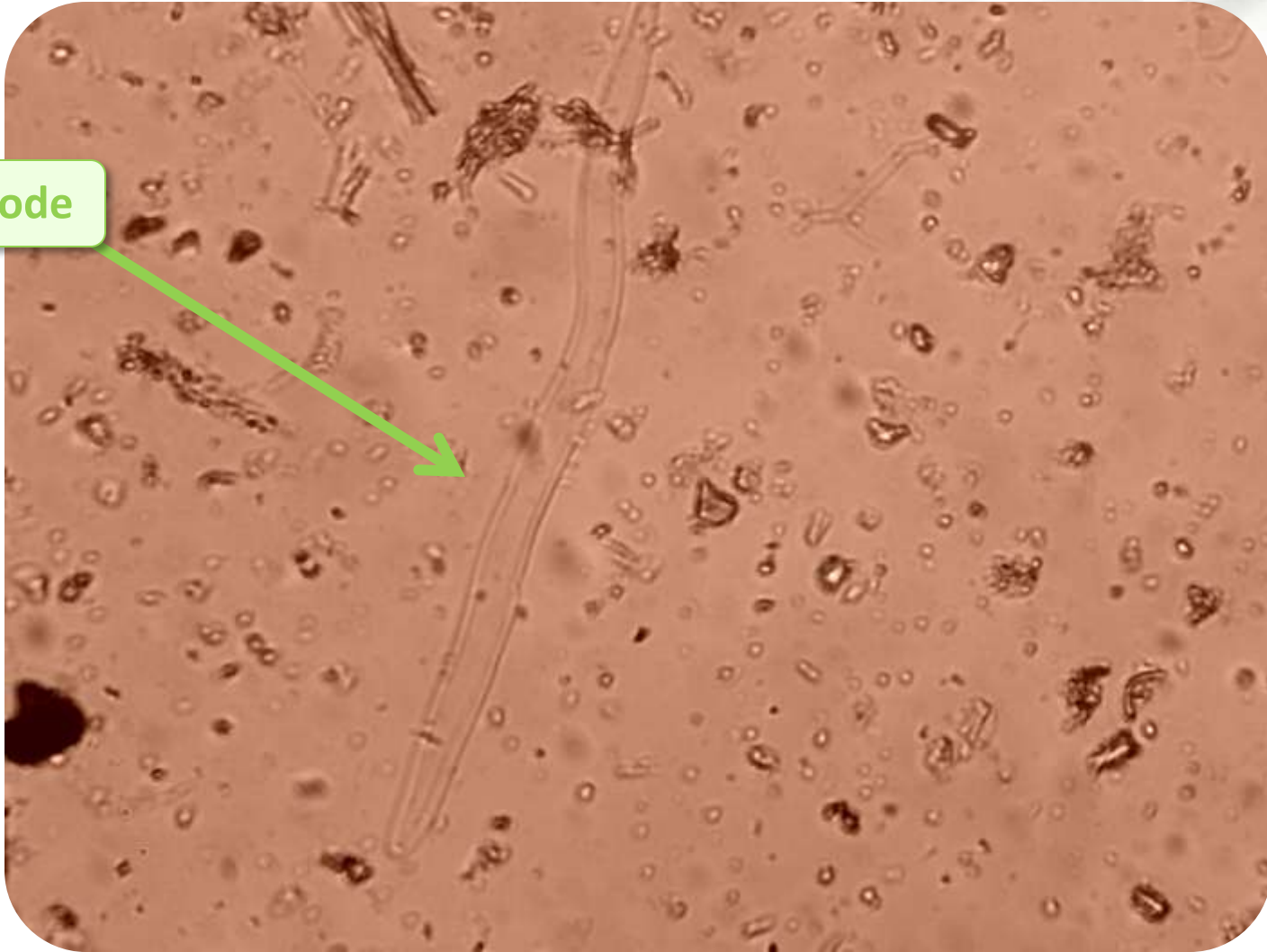
Notes

good Bacteria, Amoeba, protists levels
low Fungal. Bag did not fully
get extracted for some reason

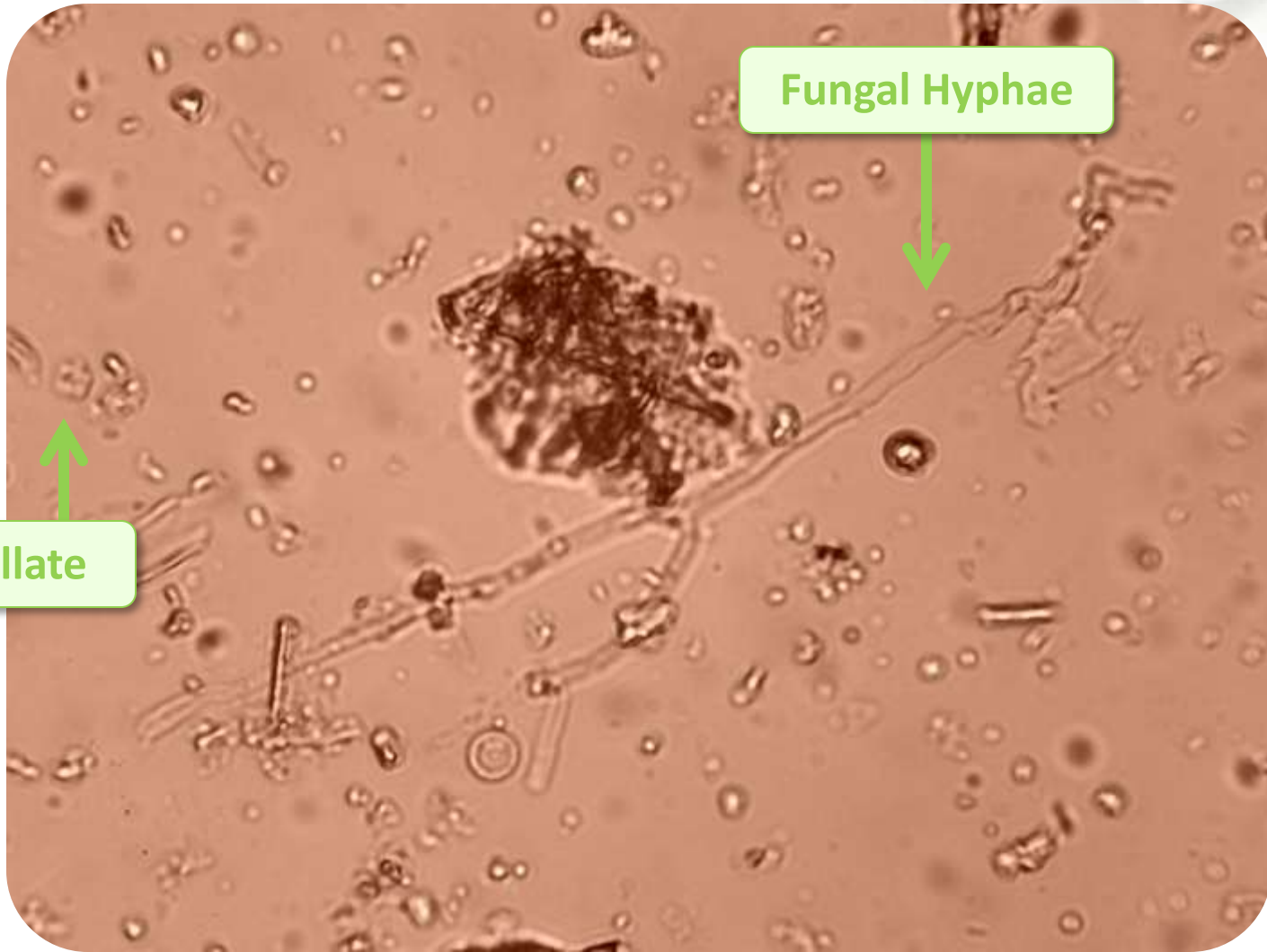
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Microscope Images

Nematode



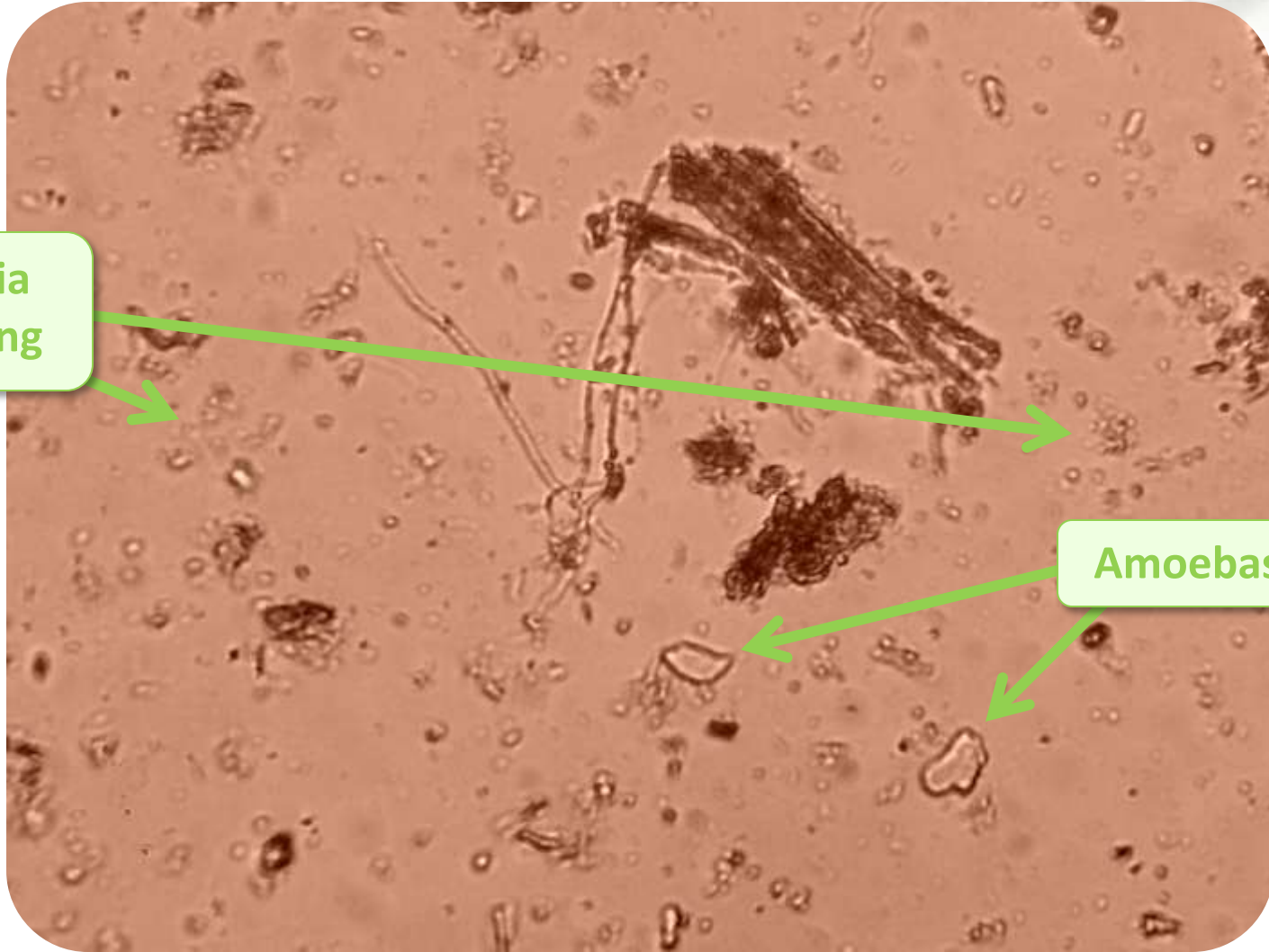
Microscope Images



Fungal Hyphae

Flagellate

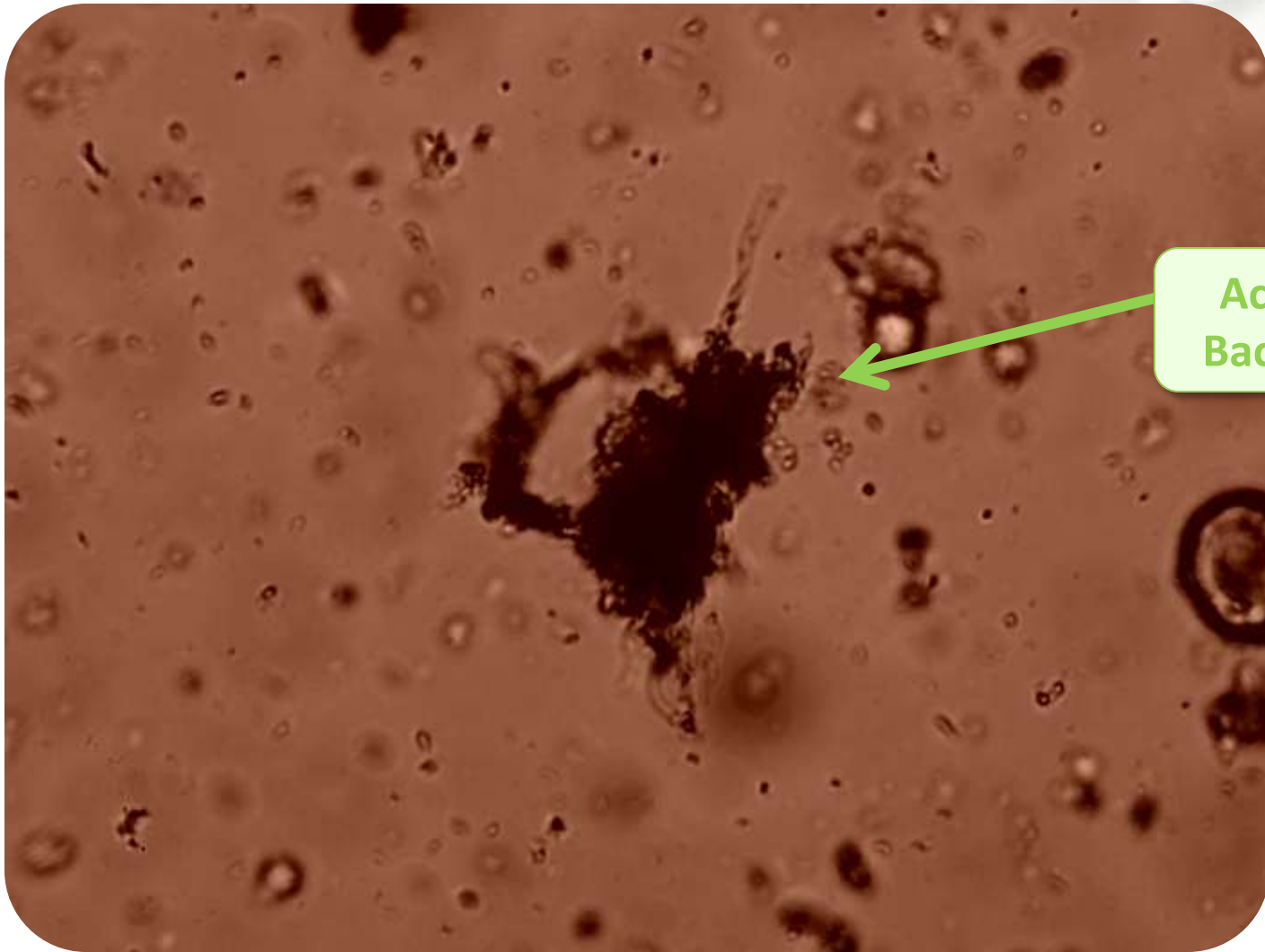
Microscope Images



Bacteria
Clumping

Amoebas

Microscope Images

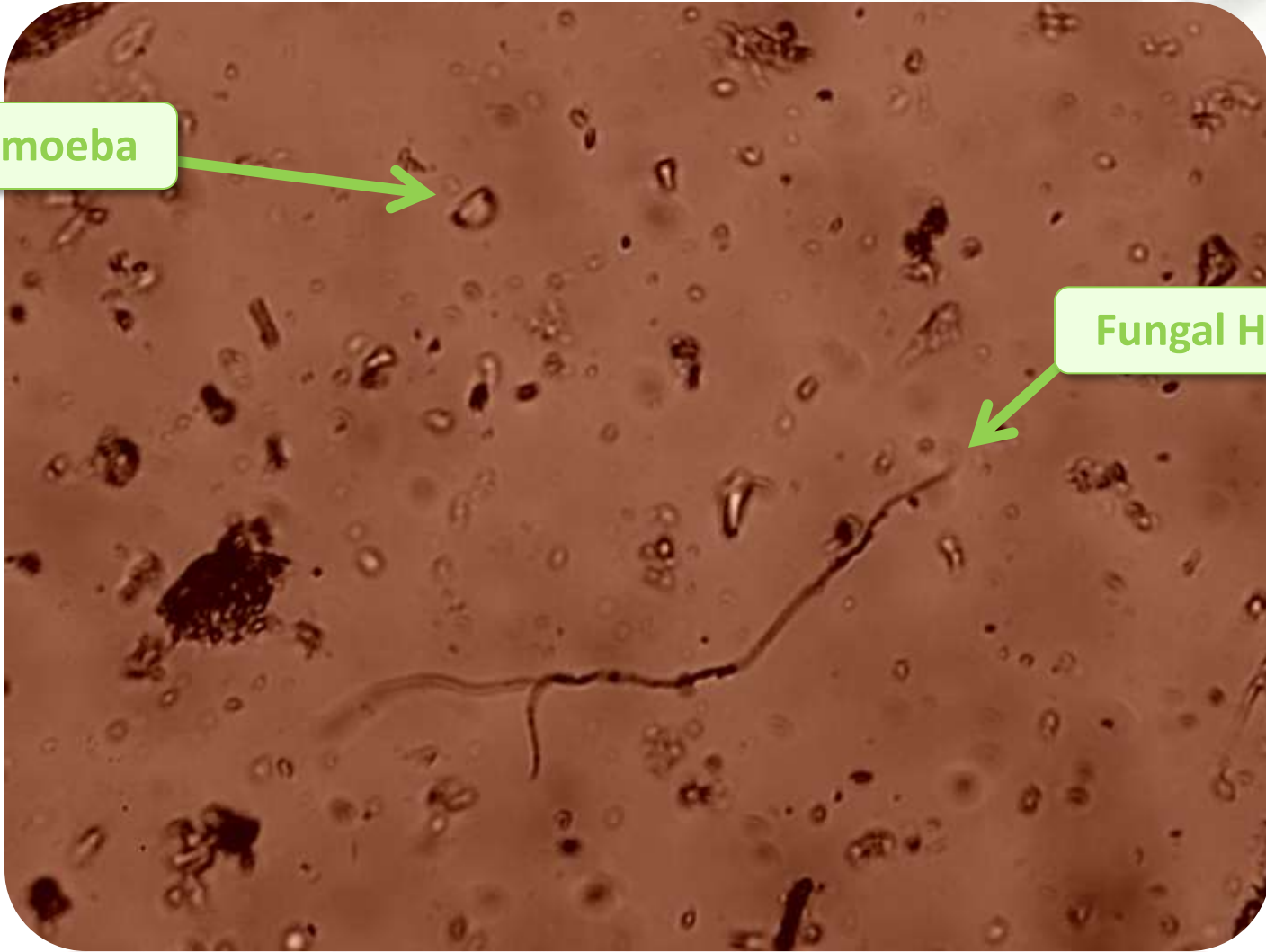


Actino
Bacteria

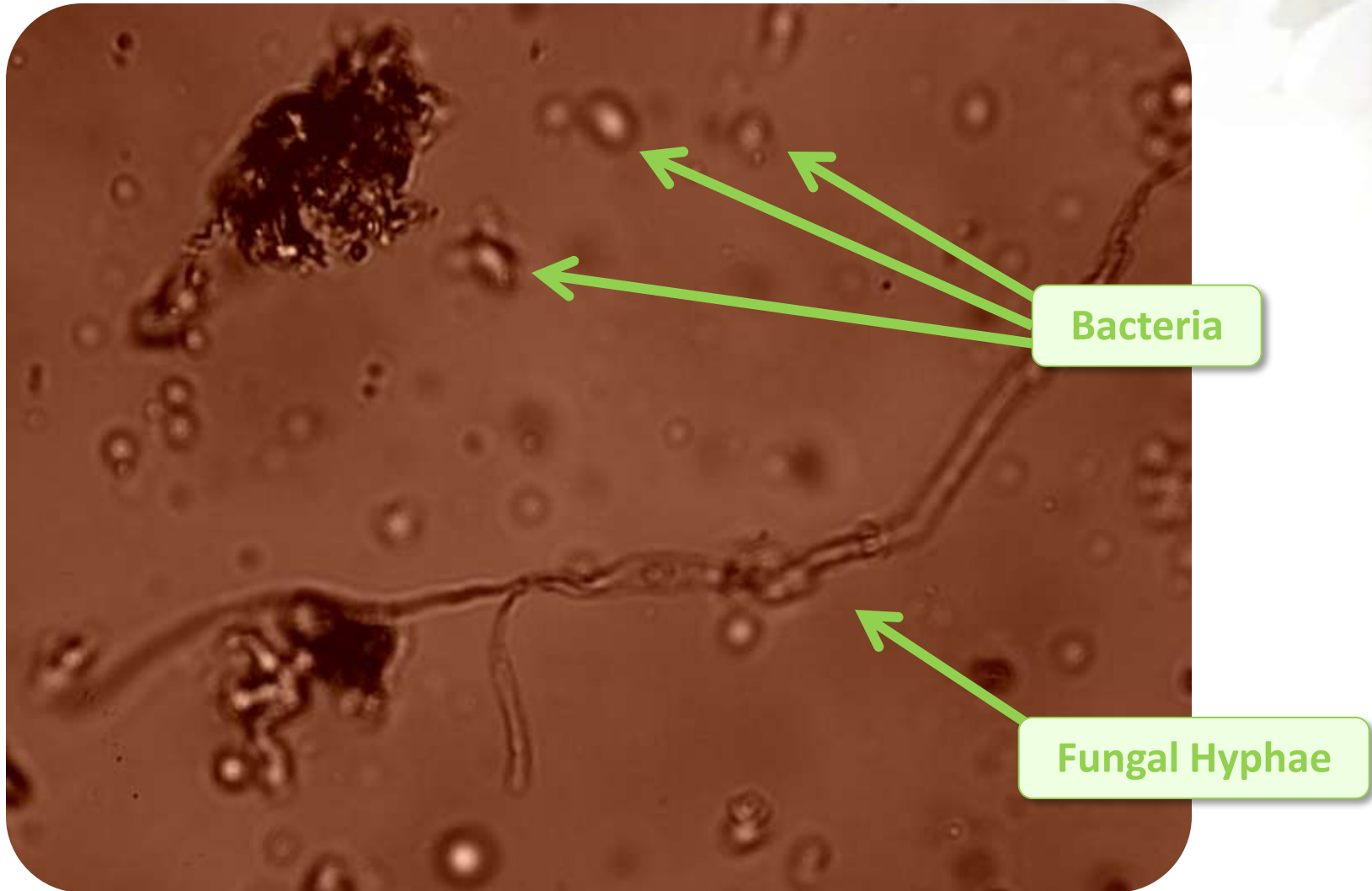
Microscope Images

Amoeba

Fungal Hyphae



Microscope Images



BACTERIA AND PROTOZOA

Summary and Final Thoughts



Importance of Quality Control

- Soil Foodweb Tests
- Understanding microscope work
- Training new staff
- Be willing to cancel a route and start over if the brew isn't working

The background of the image is a clear, bright blue sky filled with soft, white, fluffy clouds. The clouds are scattered across the frame, with some appearing more prominent than others. The overall tone is cheerful and airy.

Let's Go Outside!