The Importance Soil Health

Iowa Source Water Protection Partnership Informational Workshop

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USDA-NRCS

4 Cornerstones of Soil Health

1. Little or No Soil Disturbance

2. Diverse Crop Rotations and Multi-species Cover Crop Mixtures

3. Living Roots Growing Most of the Year

4. Year Round Residue on Soil Surface

5. Livestock

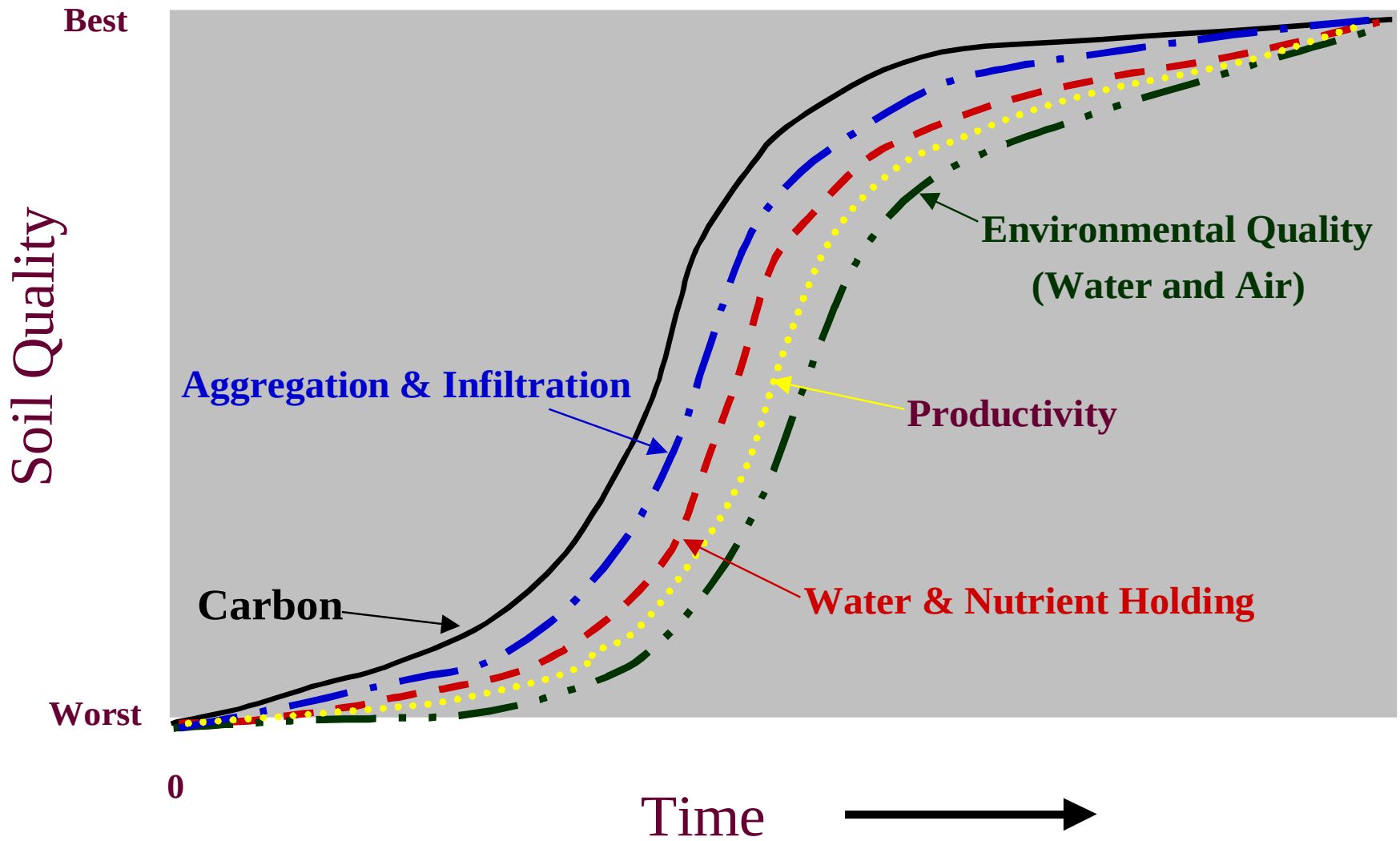
Making No-till Corn Work!

-Why is adoption of No-till Corn so much lower? Expect 10-20% yield decrease.

-What is missing? Takes 7-9 years continuous no-till before soil recovers.

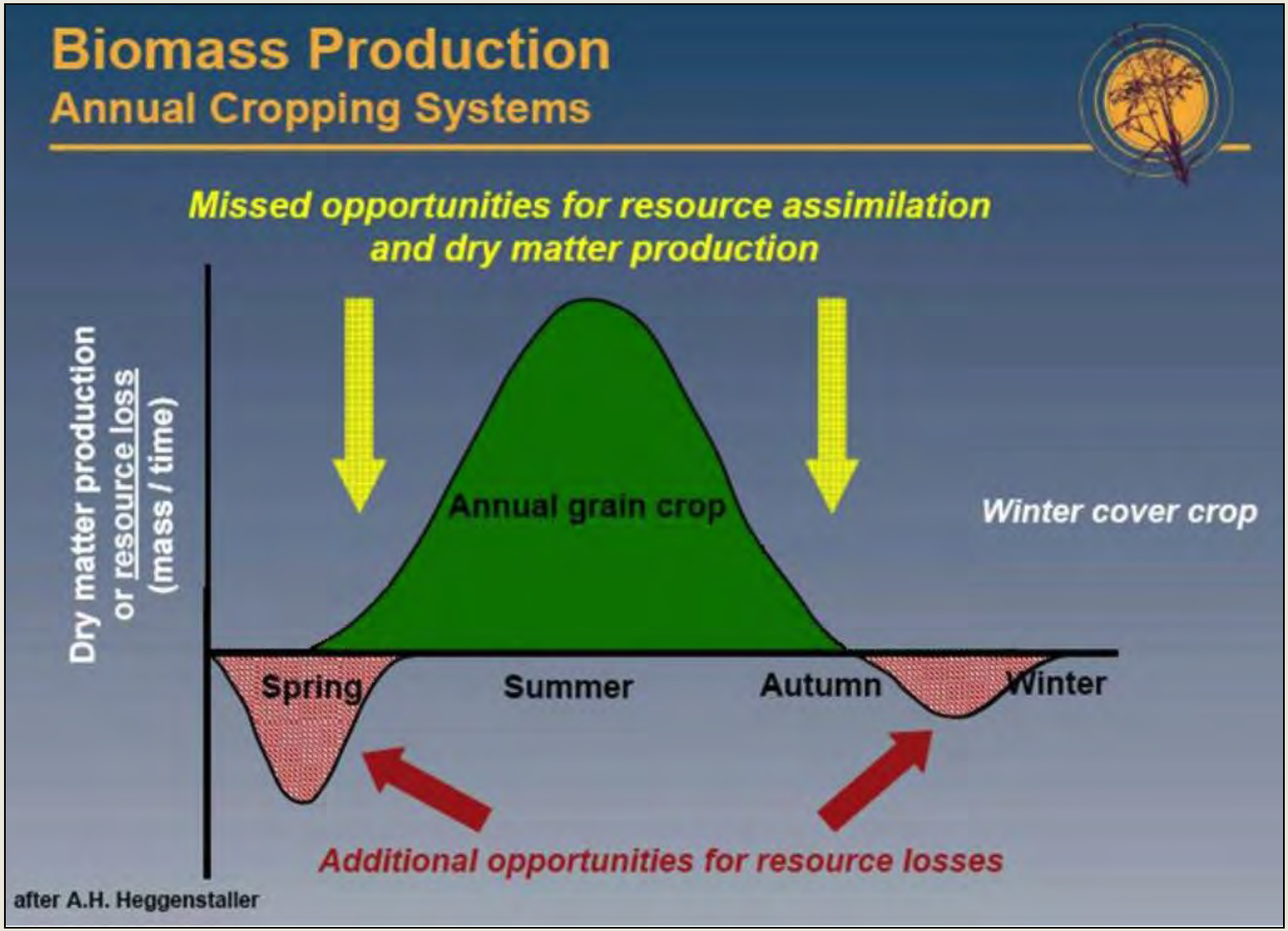
-Takes 2-4 years if add a continuous cover crop? If manure is added, takes even less time.

Clean Water and Air depend on Healthy Soil



“Passive protective blanket”

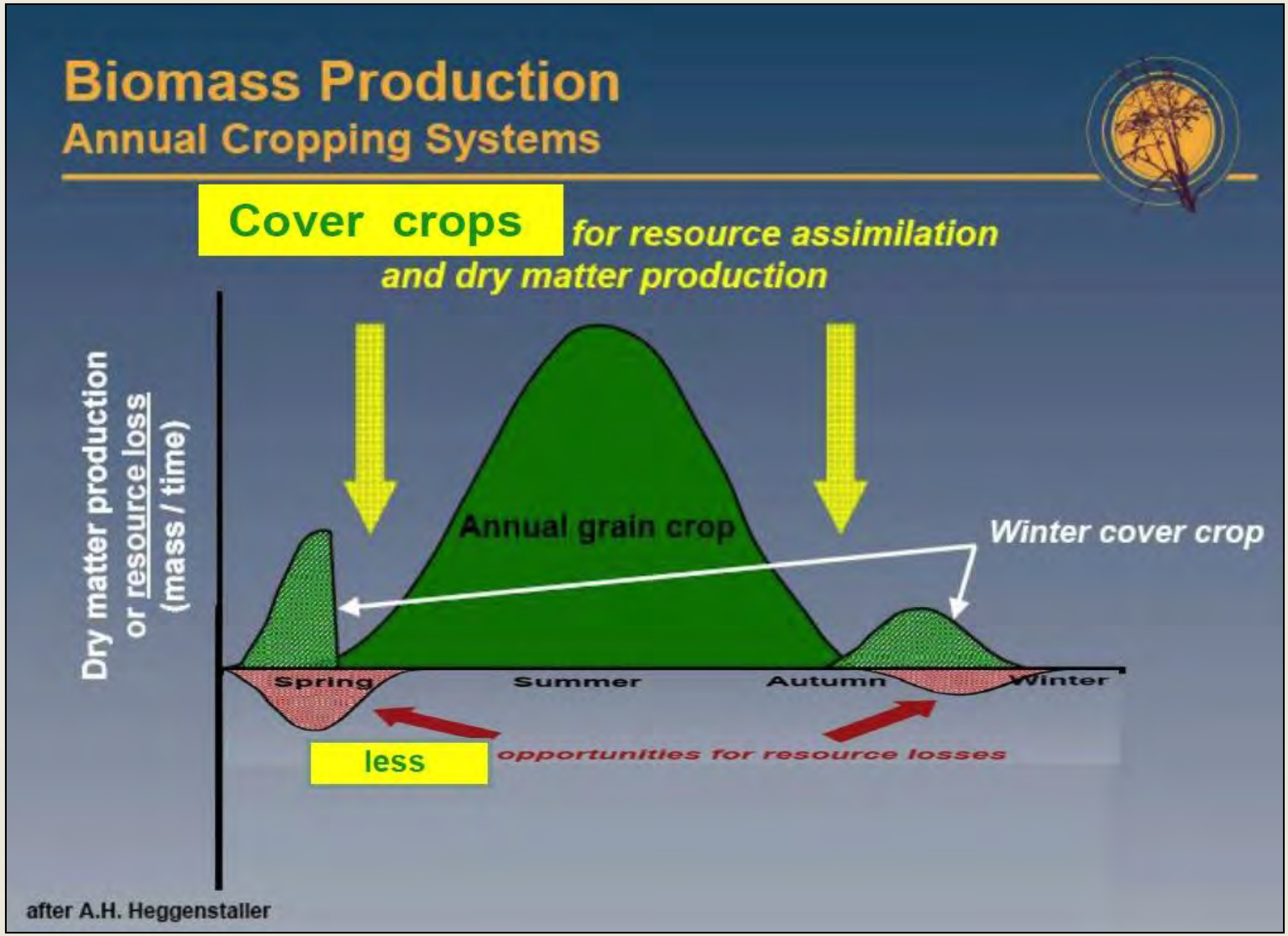
“Active protective blanket”



The Science of Conservation, We Deliver!

NRCS East NTSC

A. H. Heggenstaller, University of Alberta



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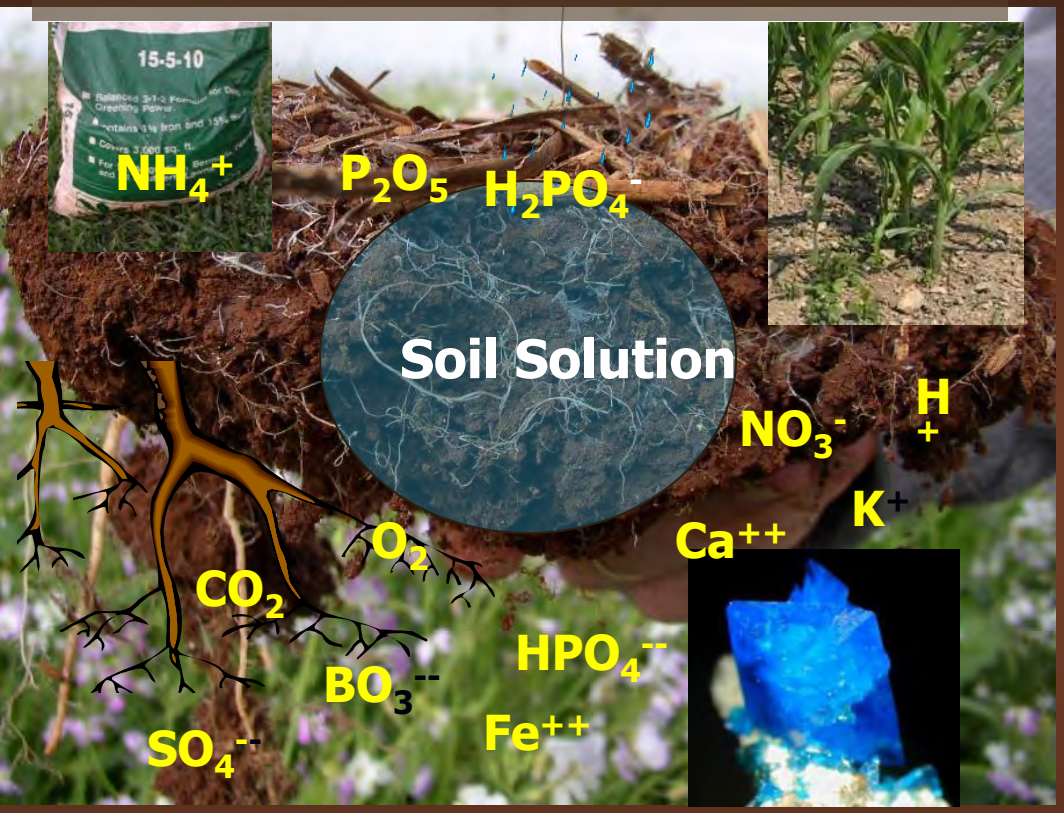
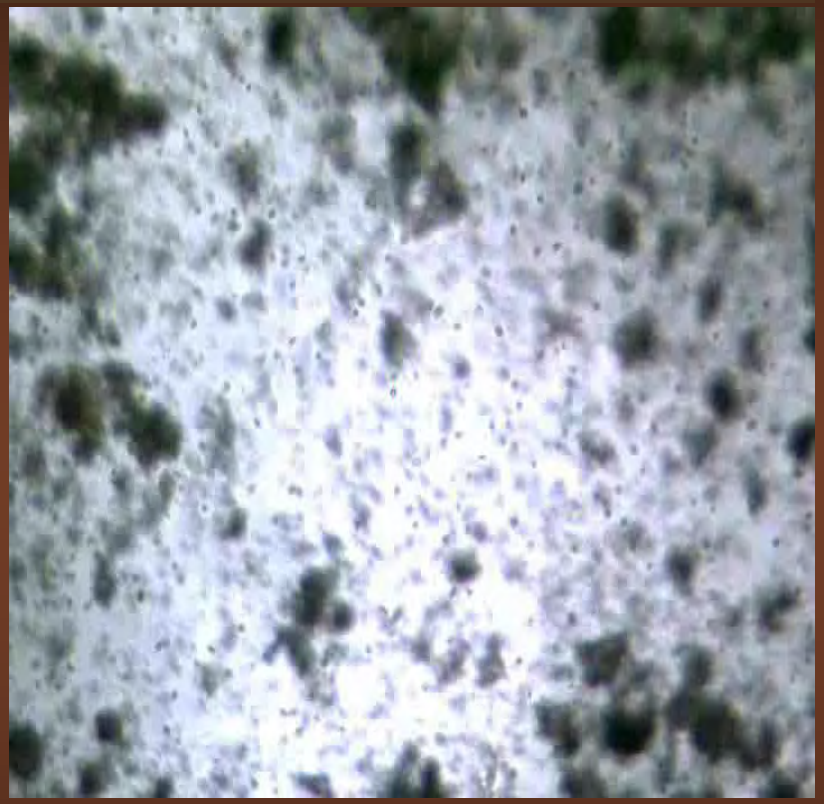
Inorganic Based Soluble State



- 40 to 60 % N and P Loss Cassmen 2002
- Bare fallows 4-8 months
- Decoupled C,N,P cycle

- Dr.Drinkwater, Dr. Swift

Ecologically Based

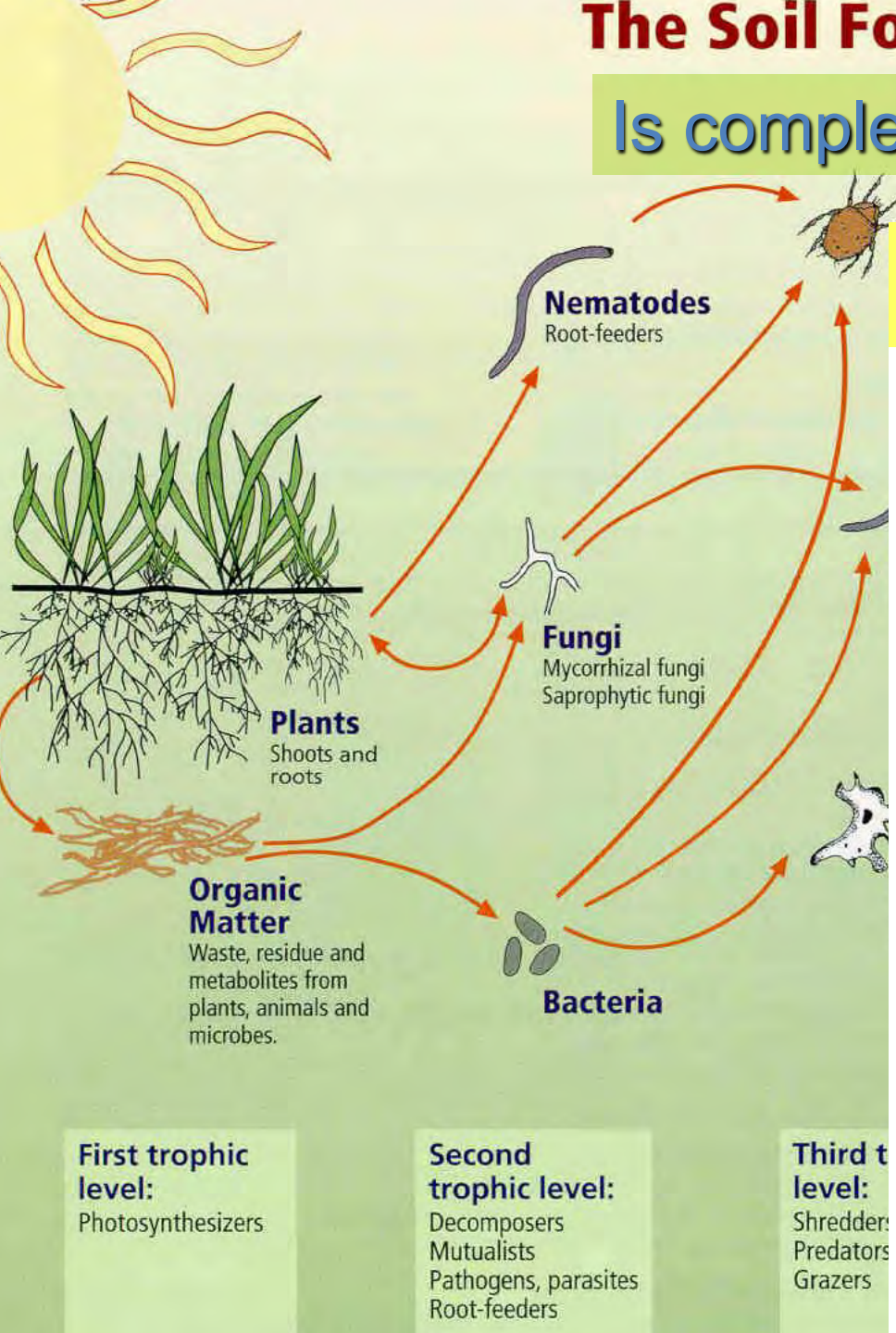


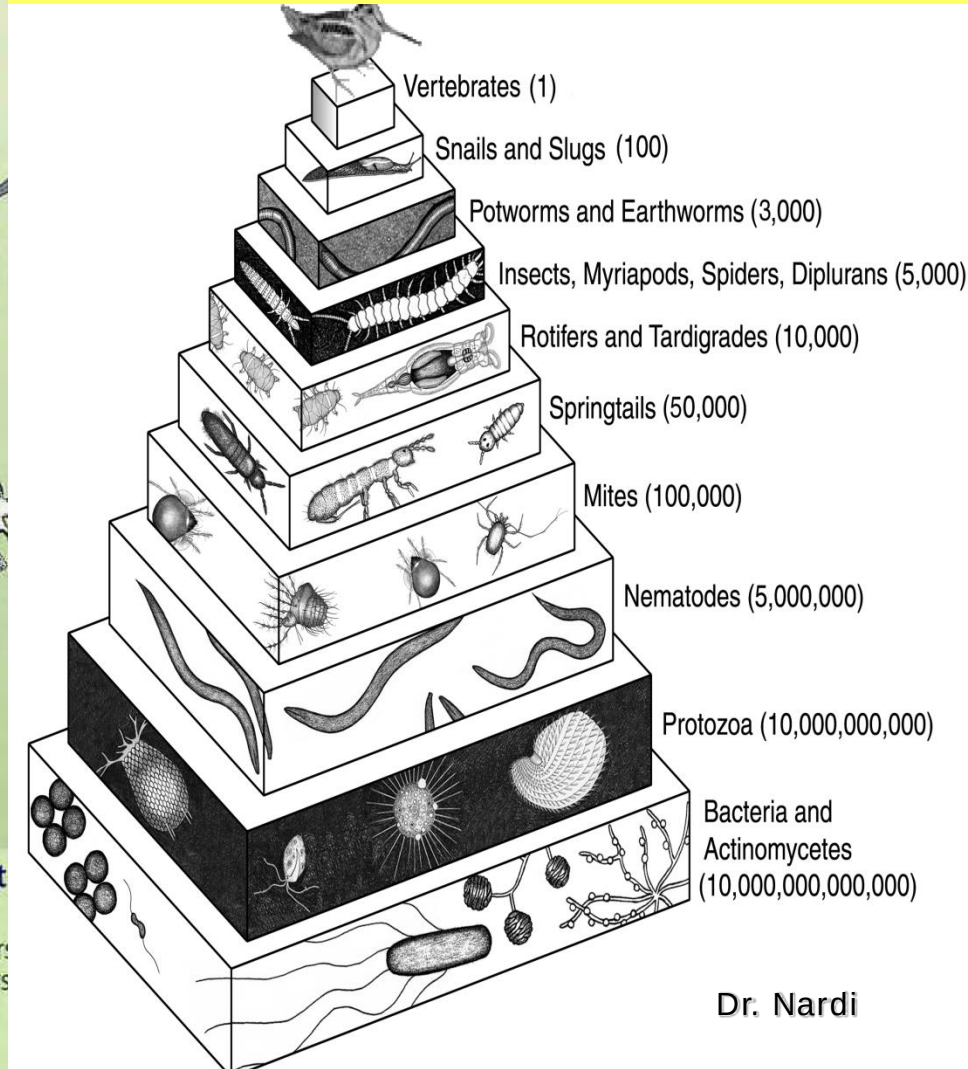
- Organic-mineral pools
- Microbially plant mediated process
- Strategic use of variable nutrients sources

The Soil Food Web

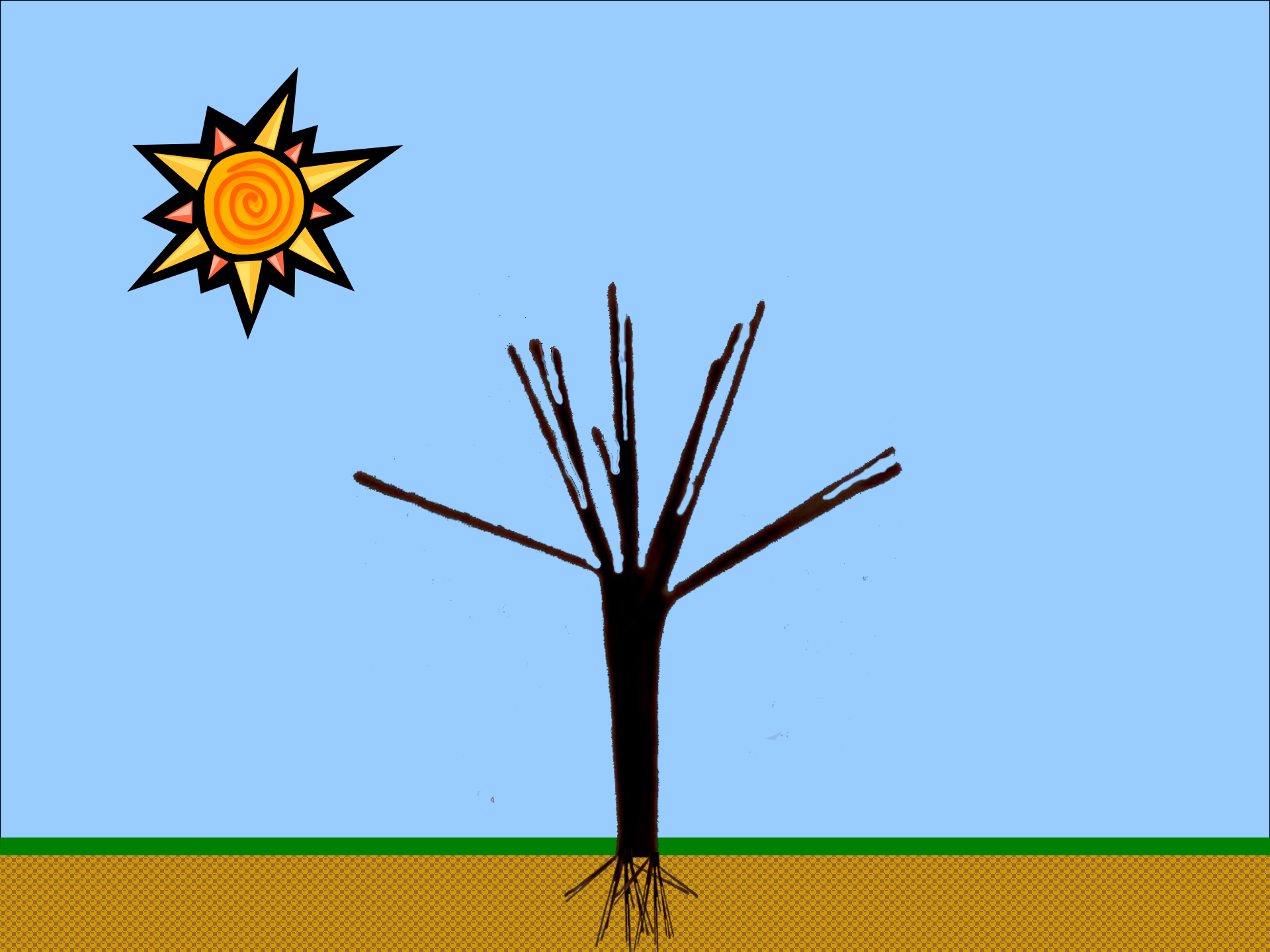
Is complex

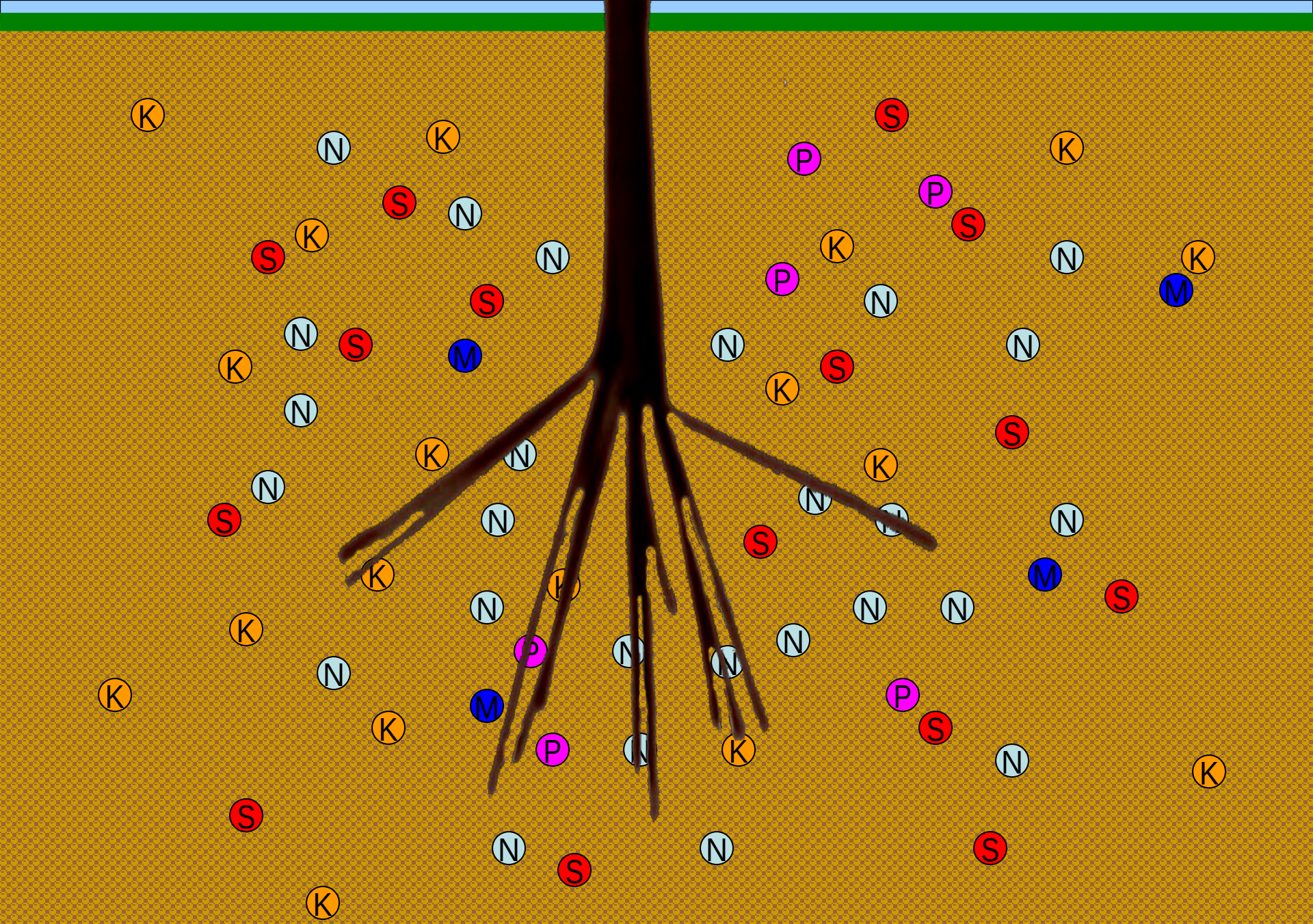
Every trophic level must function for the soil food web to function!



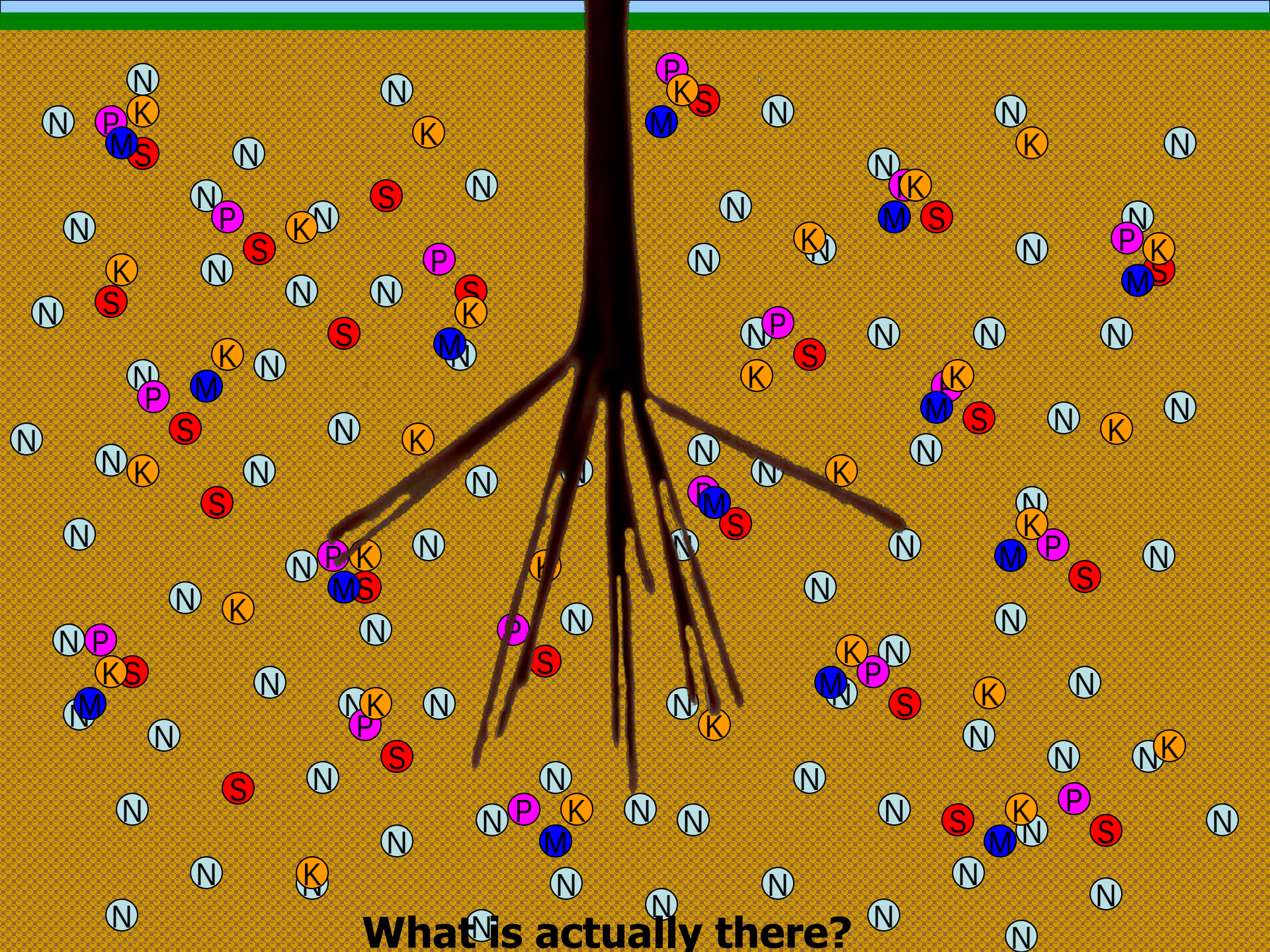


Dr. Nardi

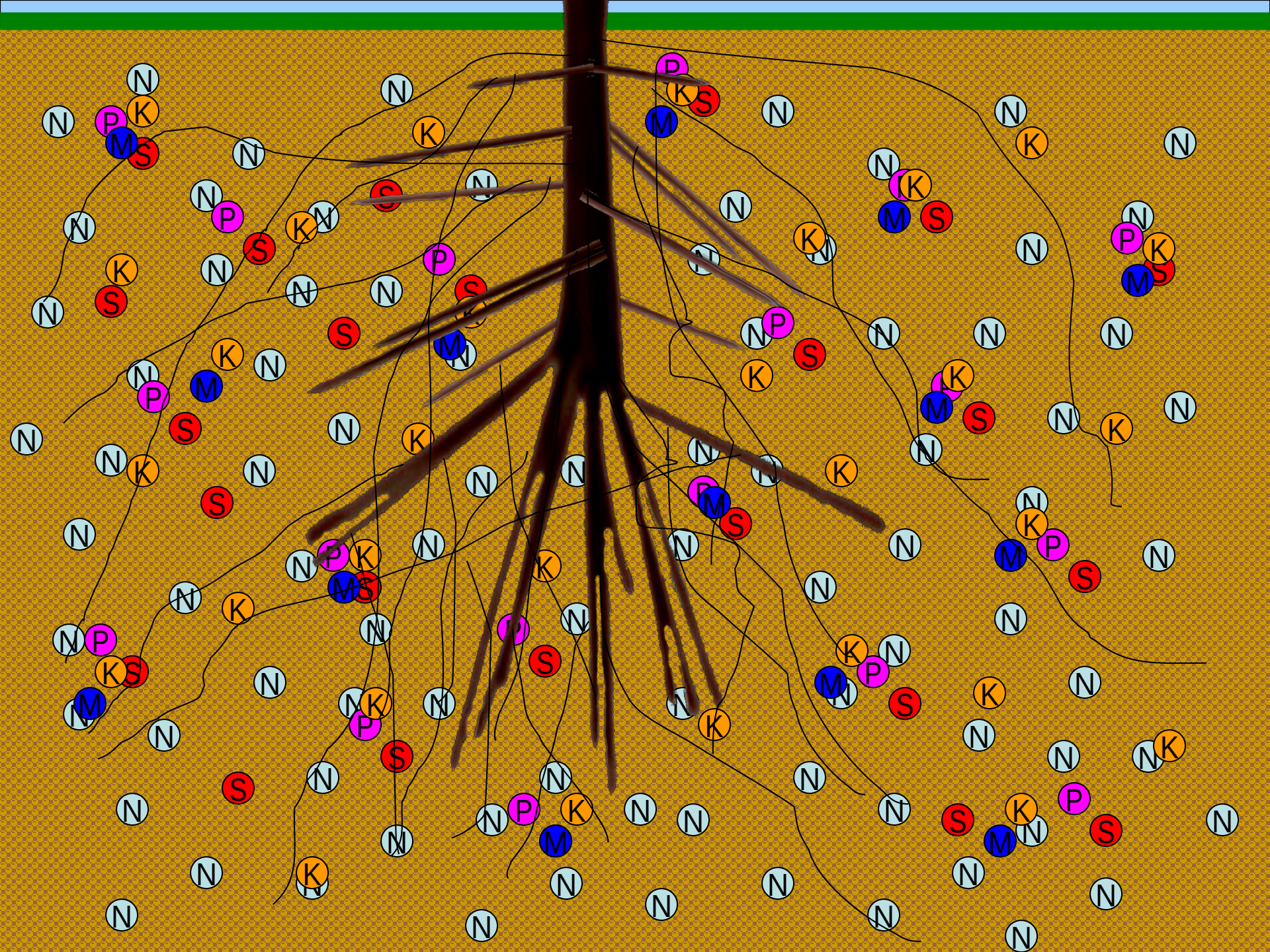




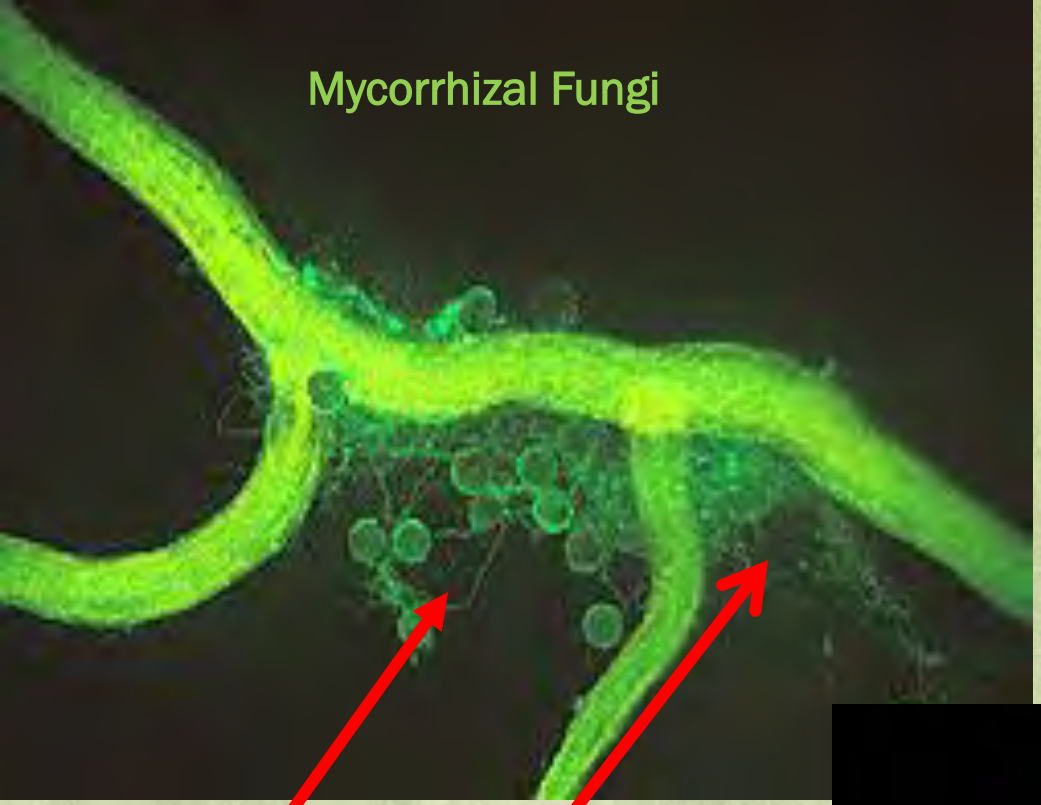
What the plant can access alone?



What is actually there?

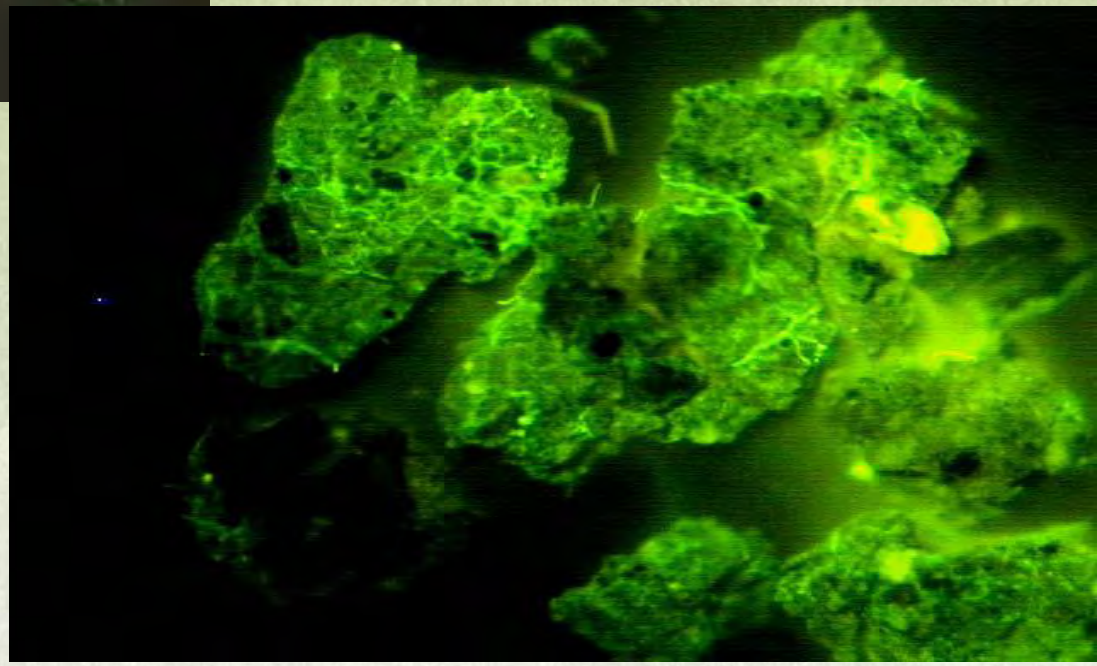

N
P
K
M
S

Mycorrhizal Fungi



Fungal Hyphae

Glomalin is naturally brown. A laboratory procedure reveals glomalin on hypae and soil aggregates as the bright green material shown here.



Dr. Kris Nichols – Microbiologist - USDA ARS

the green mile...

separate strands of mycorrhizal fungi can total more than

1 mile

in just a handful of healthy soil.

did you know?

Arbuscular mycorrhizal fungi (abundant in healthy soils) have a symbiotic relationship with many plants.

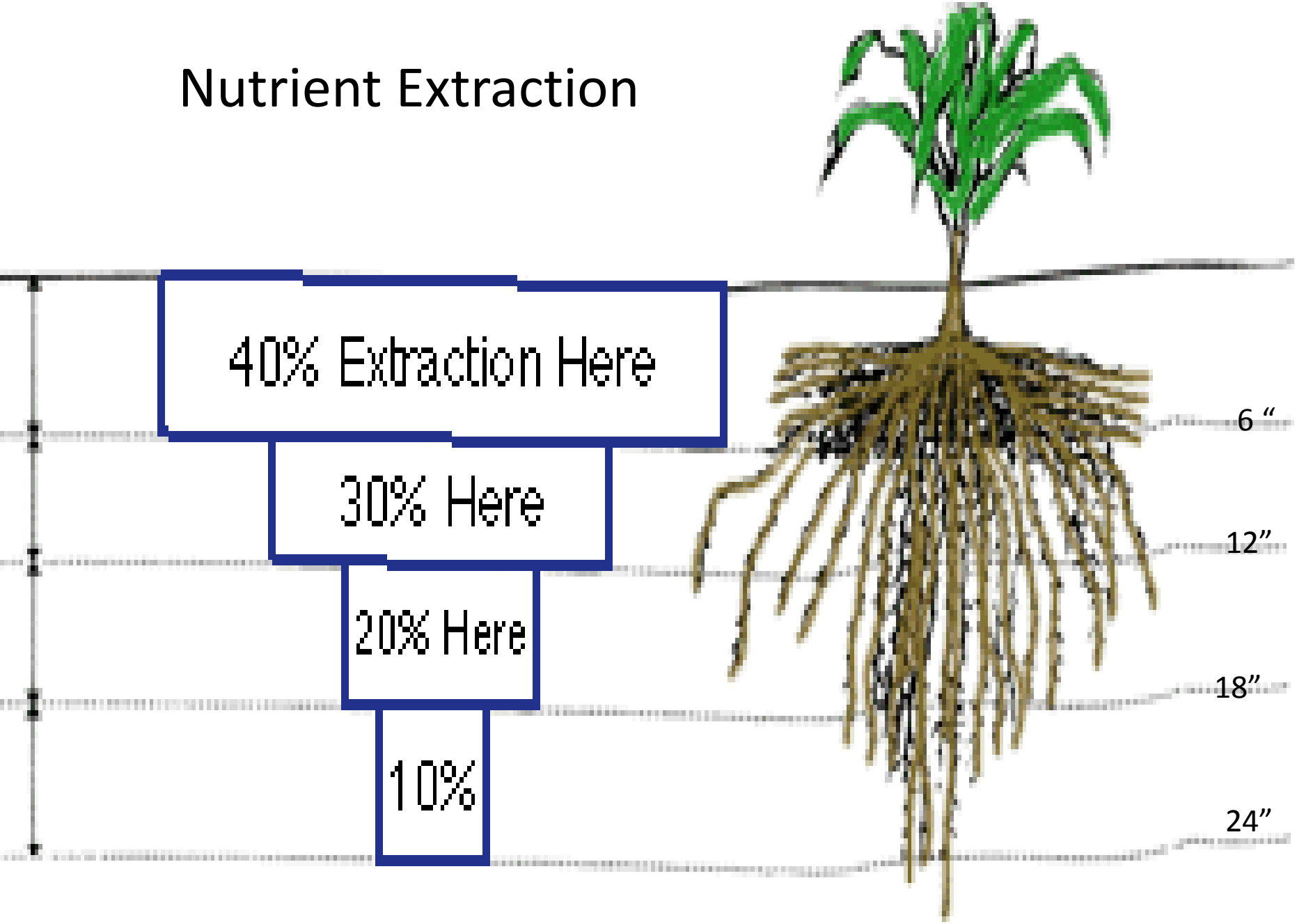
They attach themselves either on or inside plant roots to tap into the carbohydrates transported from the plant leaves. In turn, the fungal hyphae (filaments) grow out from the roots and bring water and soil nutrients back to the plant.

unlock the SECRETS IN THE SOIL

O.M	Gal. Water holding	% held	1" Rain Gallons	% held	2" Rain Gallon	% held	3" Rain Gallons	% held	5" Rain Gallons
1	16500	61%	27143	30%	54286	20%	81429	12%	135715
2	33000	122%	27143	61%	54286	41%	81429	24%	135715
3	49500	182%	27143	91%	54286	61%	81429	36%	135715
4	66000	243%	27143	122%	54286	81%	81429	49%	135715
5	82500	304%	27143	152%	54286	101%	81429	61%	135715
6	99000	365%	27143	182%	54286	122%	81429	73%	135715
7	115500	426%	27143	213%	54286	142%	81429	85%	135715
8	132000	486%	27143	243%	54286	162%	81429	97%	135715

NOTE: % HELD ASSUMES ZERO RUNOFF

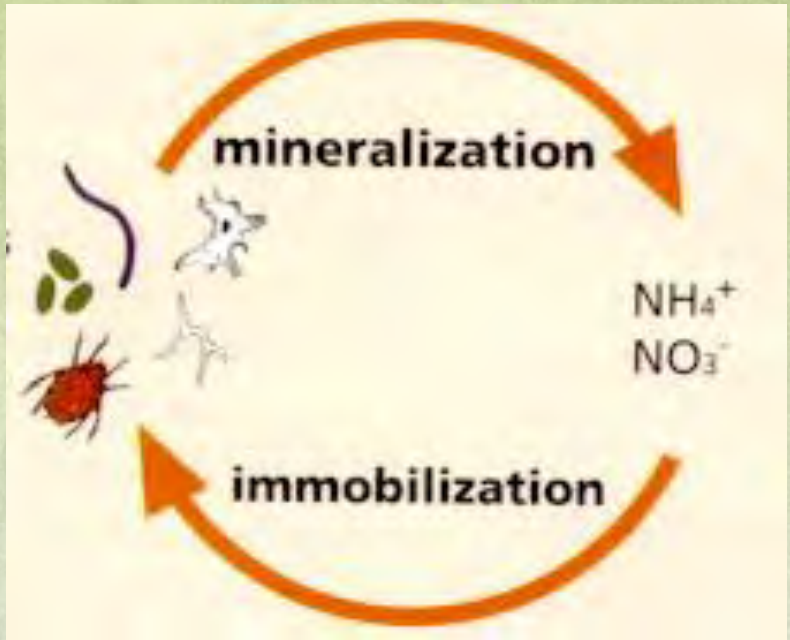
Nutrient Extraction



Mineralization and Immobilization

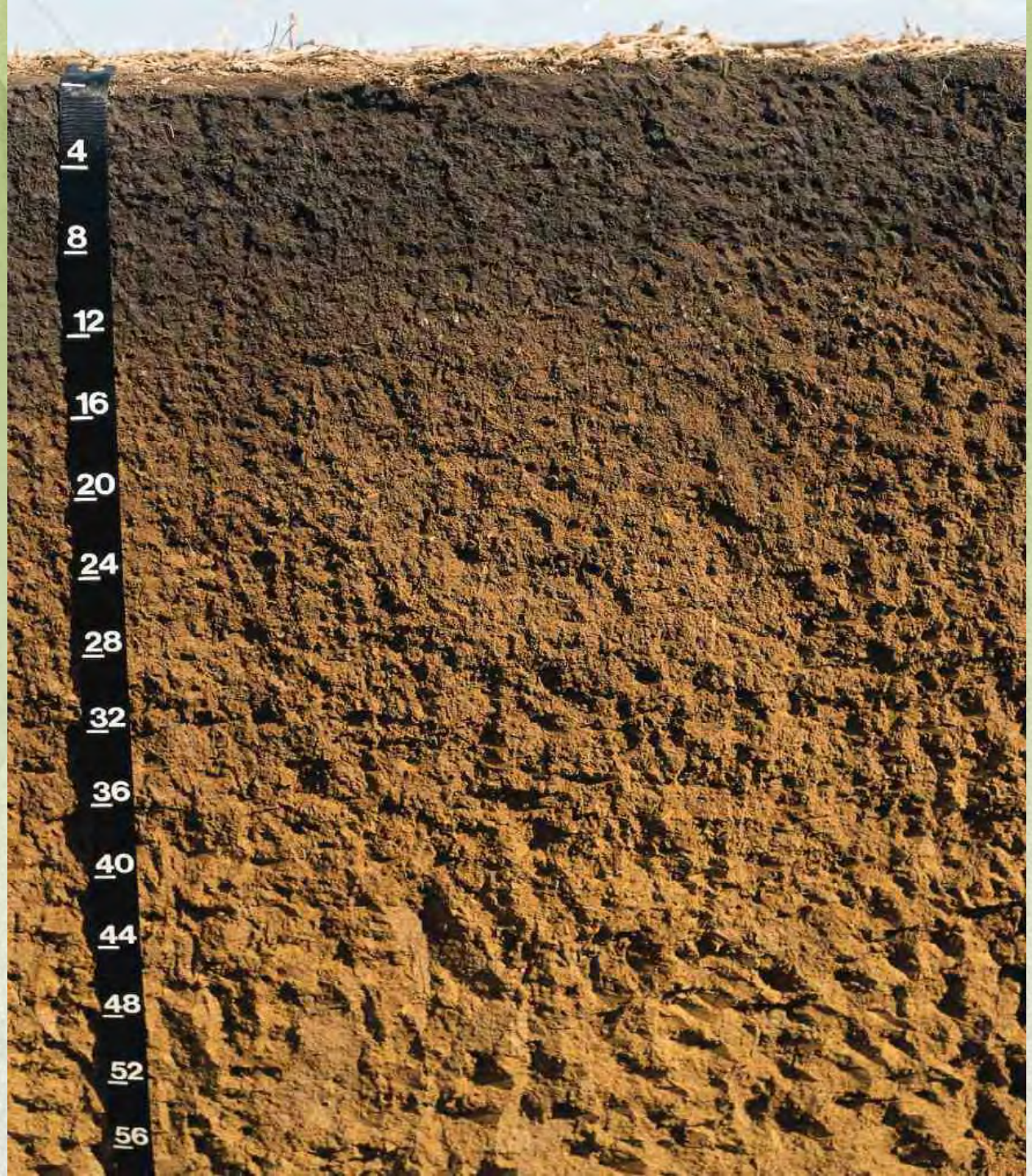
Organisms consume other organisms and excrete inorganic wastes.

Organic nutrients are stored in soil organisms and organic matter.



Inorganic nutrients are usable by plants, and are mobile in soil.

Organisms take up and retain nutrients as they grow.



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