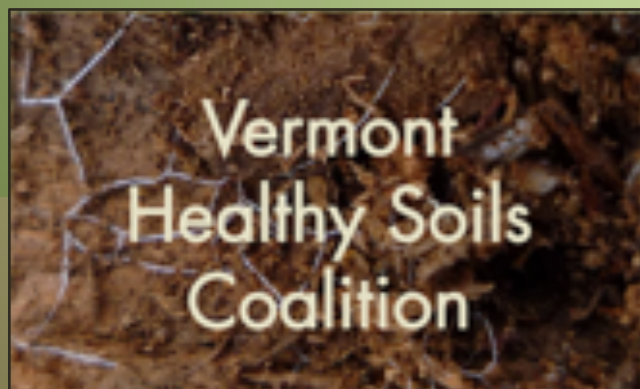
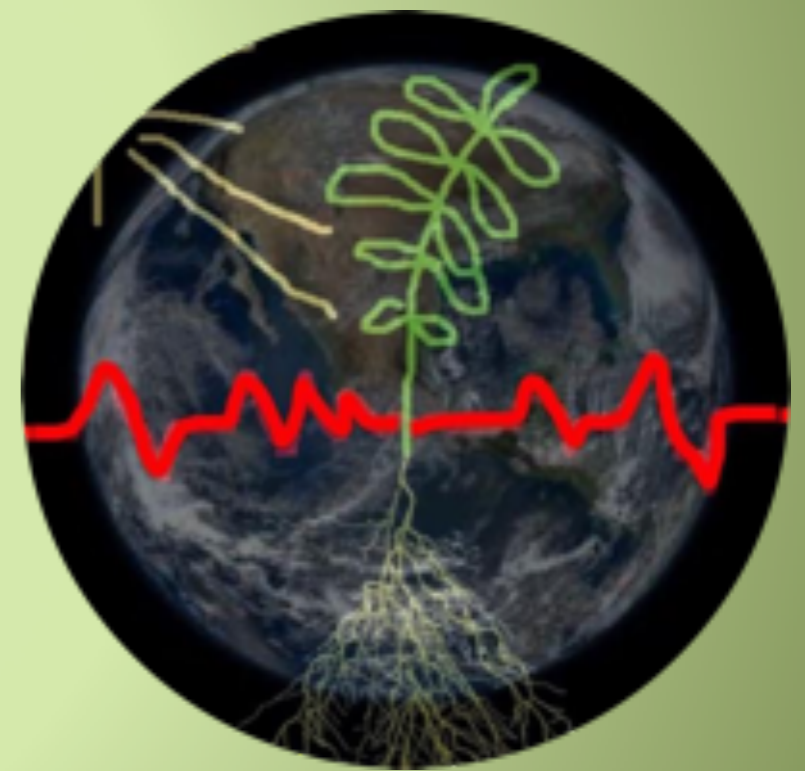


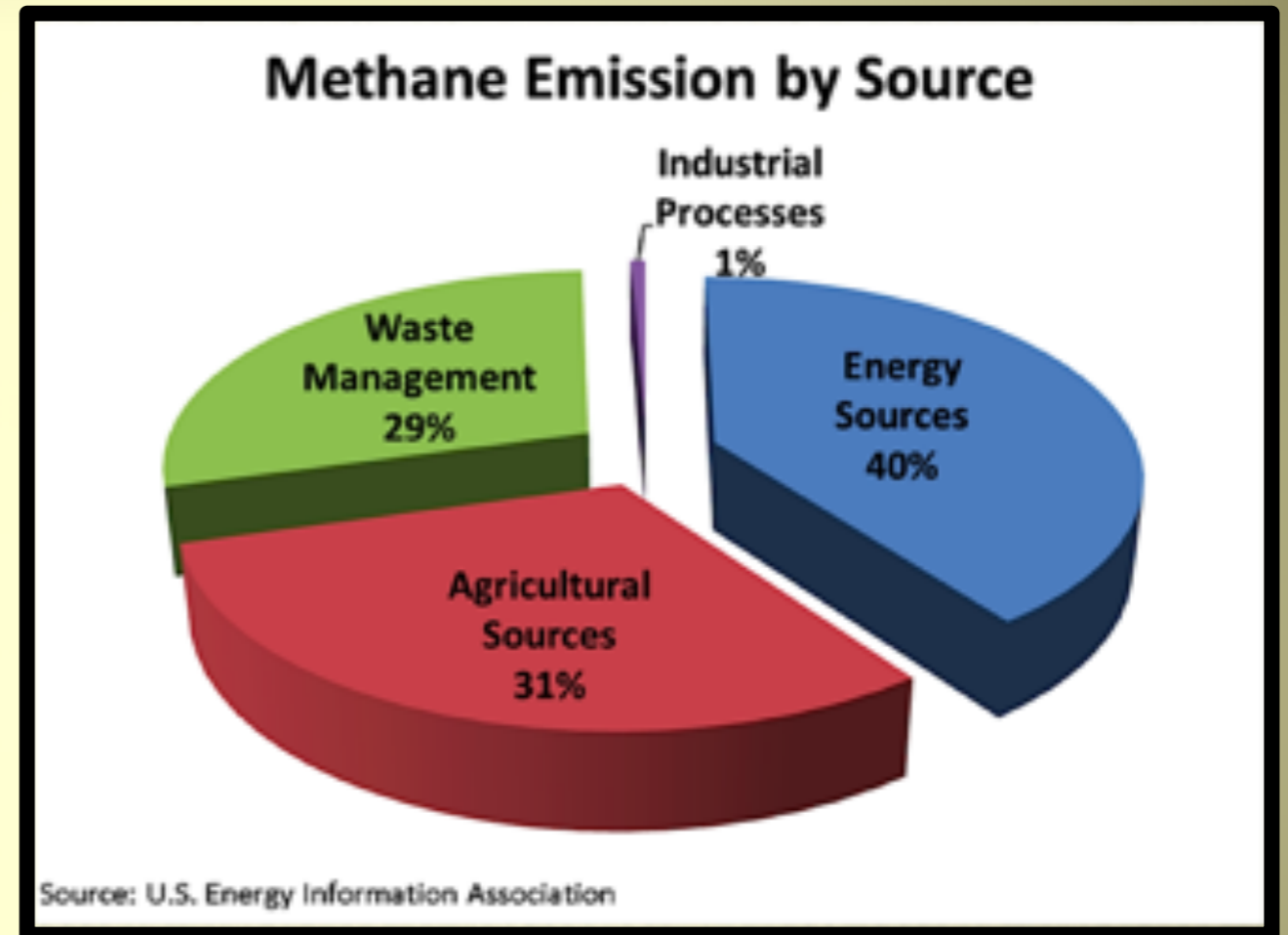
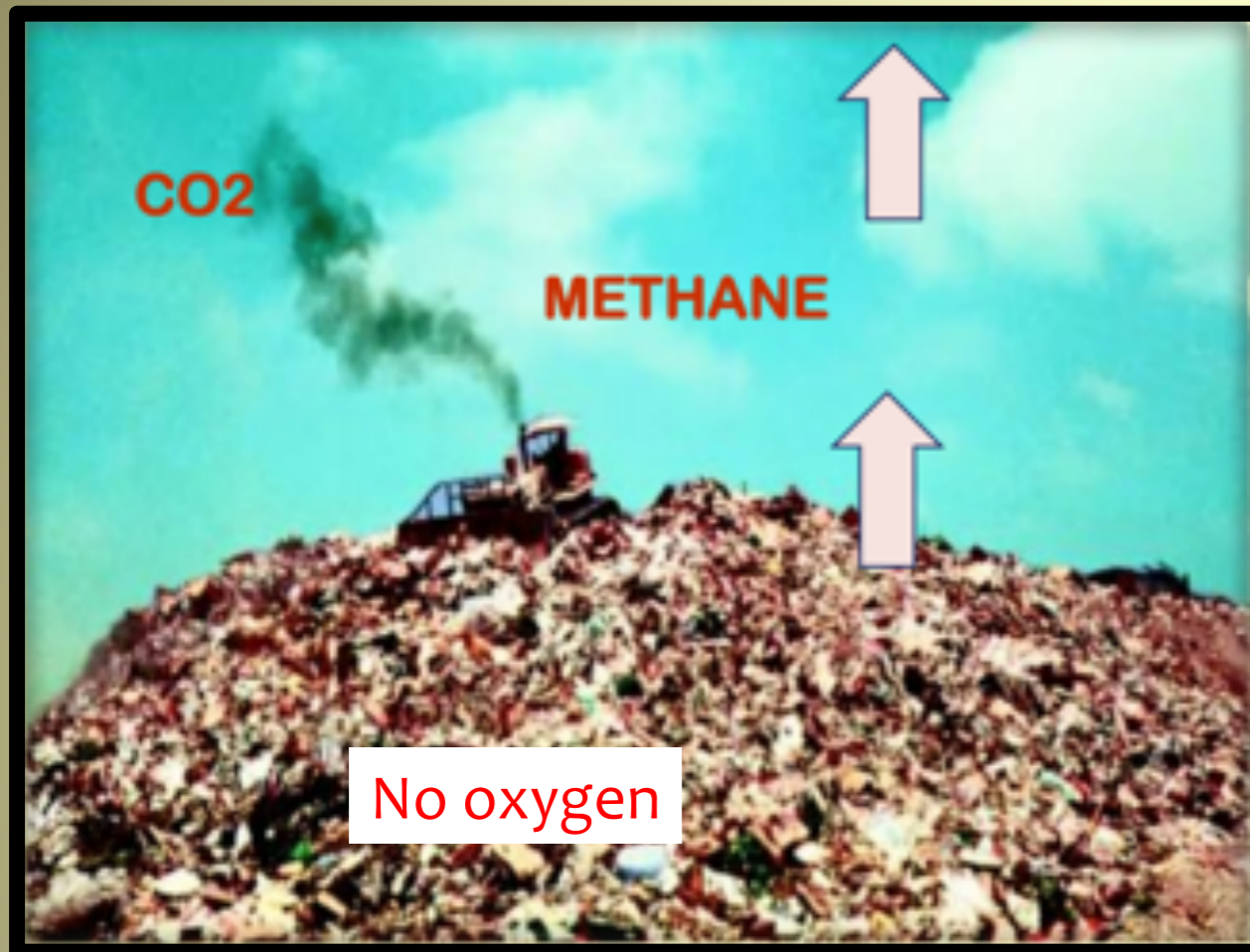
# Composting , Soil Health & Climate Change



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# Waste Problems Are Mounding Up!



Adding organic matter to the anaerobic conditions found in landfills attracts only the decomposer organisms that can live with very little oxygen. These critters outgas methane, ammonia, and sulfur.

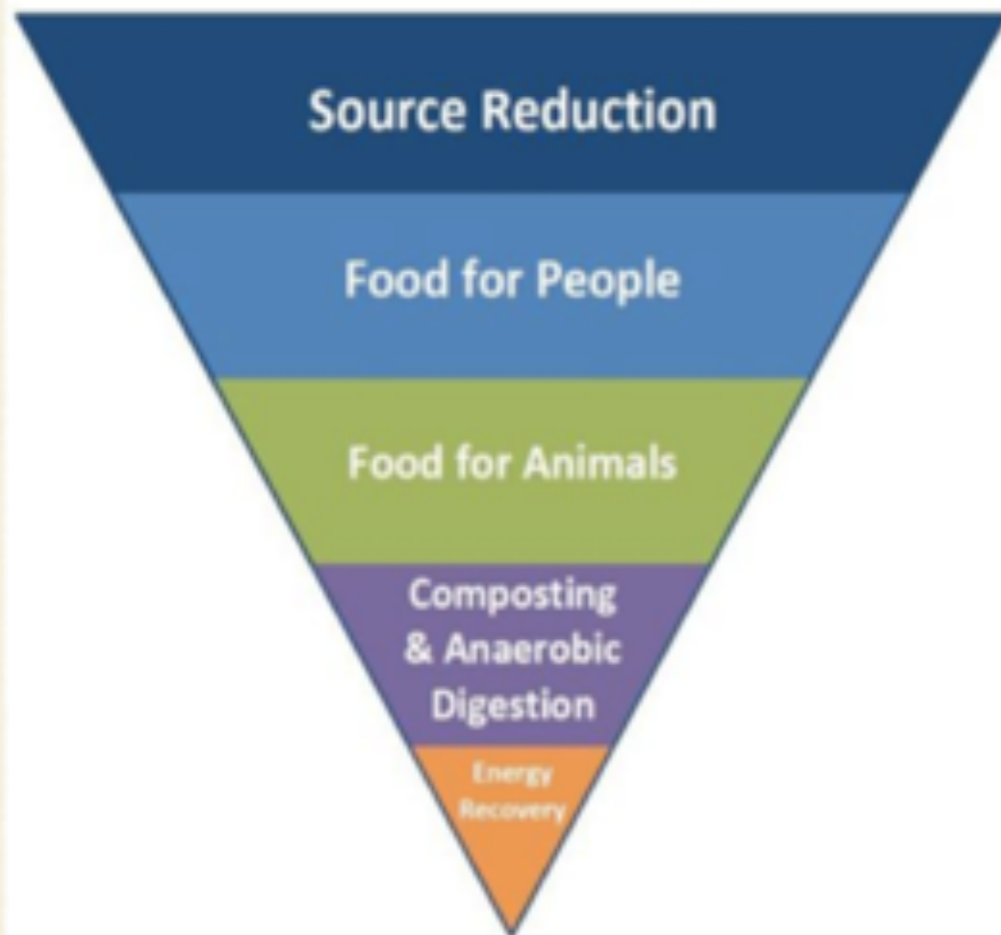
Methane has a global warming potential (GWP) of 21, which means it's 21 times more effective trapping heat than CO<sub>2</sub>.

What's missing? **Aerobic organisms!**

# Reducing Waste from Farm to Fridge

Changing Behavior One Household at a Time.  
Speak up! Tell your retailer your expectations.

## Vermont Food Recovery Hierarchy



- Buy Only What You Need
- Feed People & Livestock
- Close the Loop (compost)
- Harvest Energy



- Reduce Packaging
- Encourage Reuse
- Encourage Producer Responsibility
- Encourage BYO Culture
- Recycle (as a last resort)



- Reduce Waste (**use less**)
- Reduce Trash (compost & recycle)

A close-up photograph of a person's hand holding a large quantity of dark, rich, moist soil. The soil is piled high, overflowing from the hand. The background is a soft, out-of-focus green, suggesting a natural outdoor setting.

**DESPITE ALL OF  
OUR ACCOMPLISHMENTS  
WE OWE OUR EXISTENCE TO  
A SIX-INCH LAYER OF TOPSOIL  
AND THE FACT THAT  
IT RAINS.**



# Global Soil Health Decline



What's missing? **Aerobic organisms!**



LEFT  
Crops and fields destroyed by TS Irene  
in Waitsfield, VT.

BOTTOM LEFT  
Standing floodwater after TS Irene in  
Pittsford, VT

BOTTOM RIGHT  
Schoolyard flooding on July 1 2017  
Thetford VT



# Soil Loss (runoff) from Tropical Storm Irene, 2011

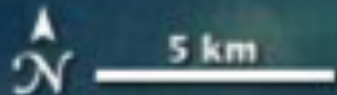
**\$800 million in infrastructure damage**

[climatechange.vermont.gov](http://climatechange.vermont.gov)

Connecticut River

Thames River

Long Island Sound



# Holding Landscapes in Place

Creating conditions for healthy soil will decrease flooding and drought and increase transpiration and global cooling.

**Soil carbon is the living** (soil organic matter [SOM] including plants & animals), **the dead** (decaying SOM) and **the very dead** (stable humus, glomalin, fossil fuels, coal).

**SOM holds 18-20 times its weight in water and recycles nutrients for plants to use.**

**The first meter of soil contains three times as much carbon (in SOM) as is found in either the atmosphere or in living plants.**

**Living soil can absorb and store greenhouse gases AND retain and cycle water.**

**A 1% increase of organic matter in the top 6 inches of soil per acre can hold over 20,000 gallons of water.**





# Soil Health Principles

1. **Living roots In the ground**
2. **Maximized diversity**
3. **Minimized disturbance**
4. **Minimized bare soil**
5. **Animals in contact with soil**

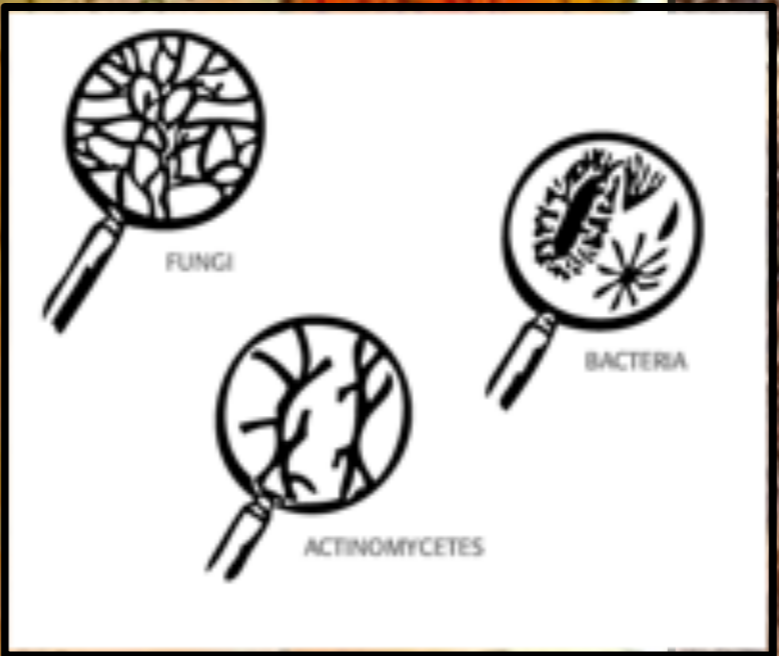
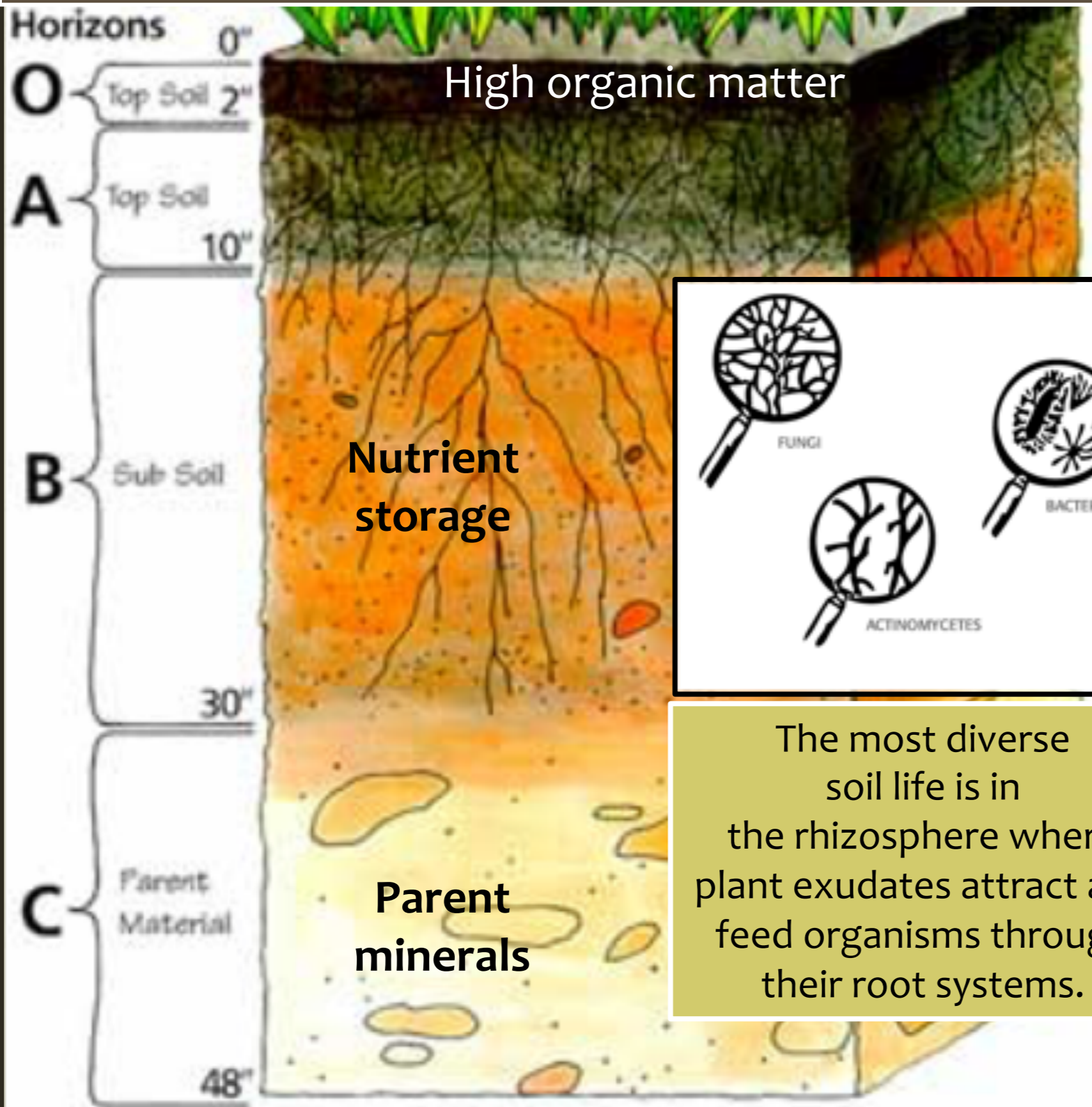
Compost enables conditions this principle

Good compost is an inoculant, bringing billions microbes into the ecosystem.

Compost can be used as a mulch. Let the soil life work in down into the soil.

**Topsoil is the layer of soil that contains the greatest concentration of nutrients, organic matter and microorganisms.**

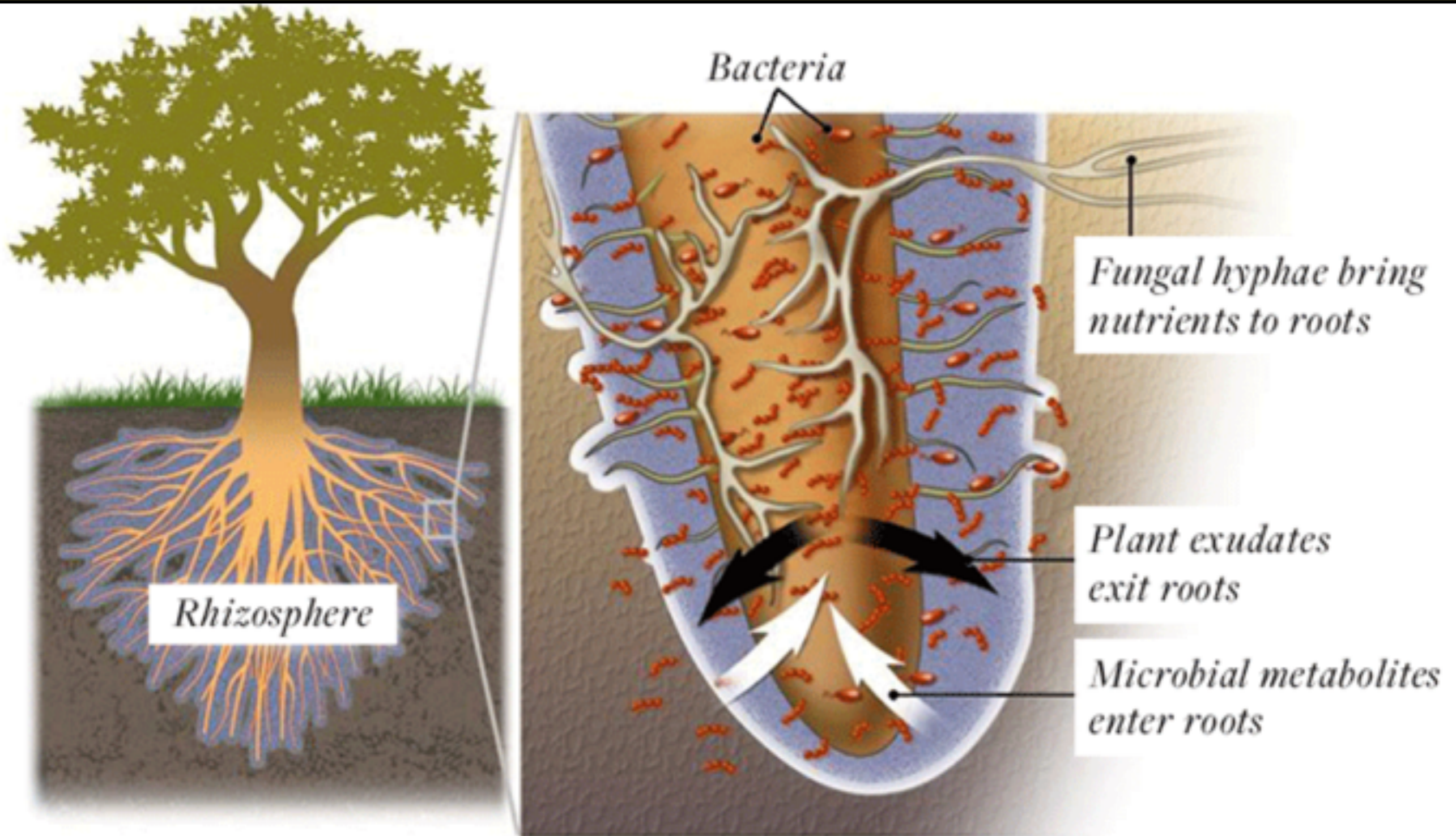
**One teaspoon of healthy soil/compost can hold over one billion bacteria, several yards of fungal filaments, several thousand protozoa, and scores of nematodes.**



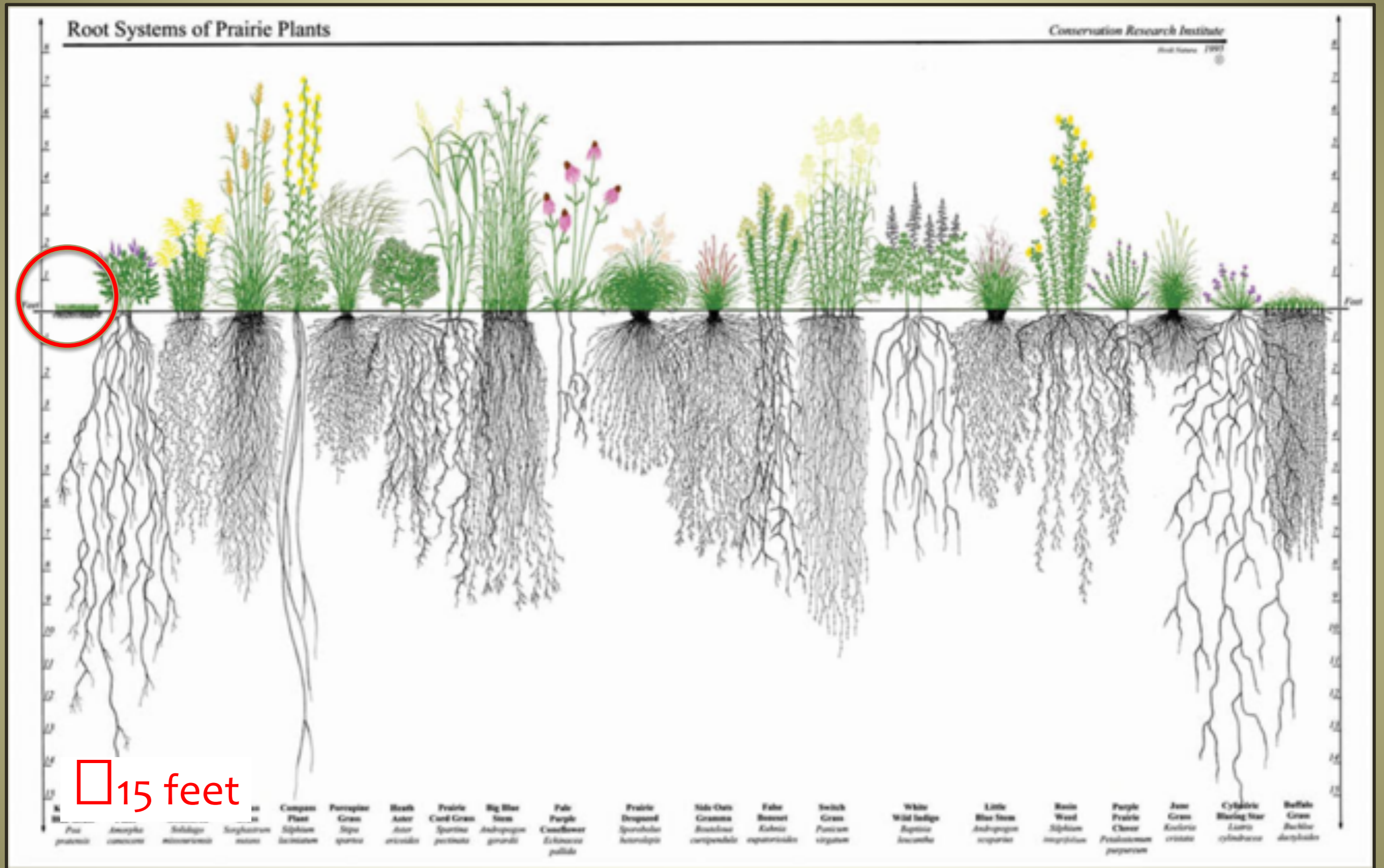
The most diverse soil life is in the rhizosphere where plant exudates attract and feed organisms through their root systems.



Nutrient exchange happens in the rhizosphere. It's a dynamic interaction between the sun, atmosphere, living plants, soil life, and substrate (sand, silt and clay).

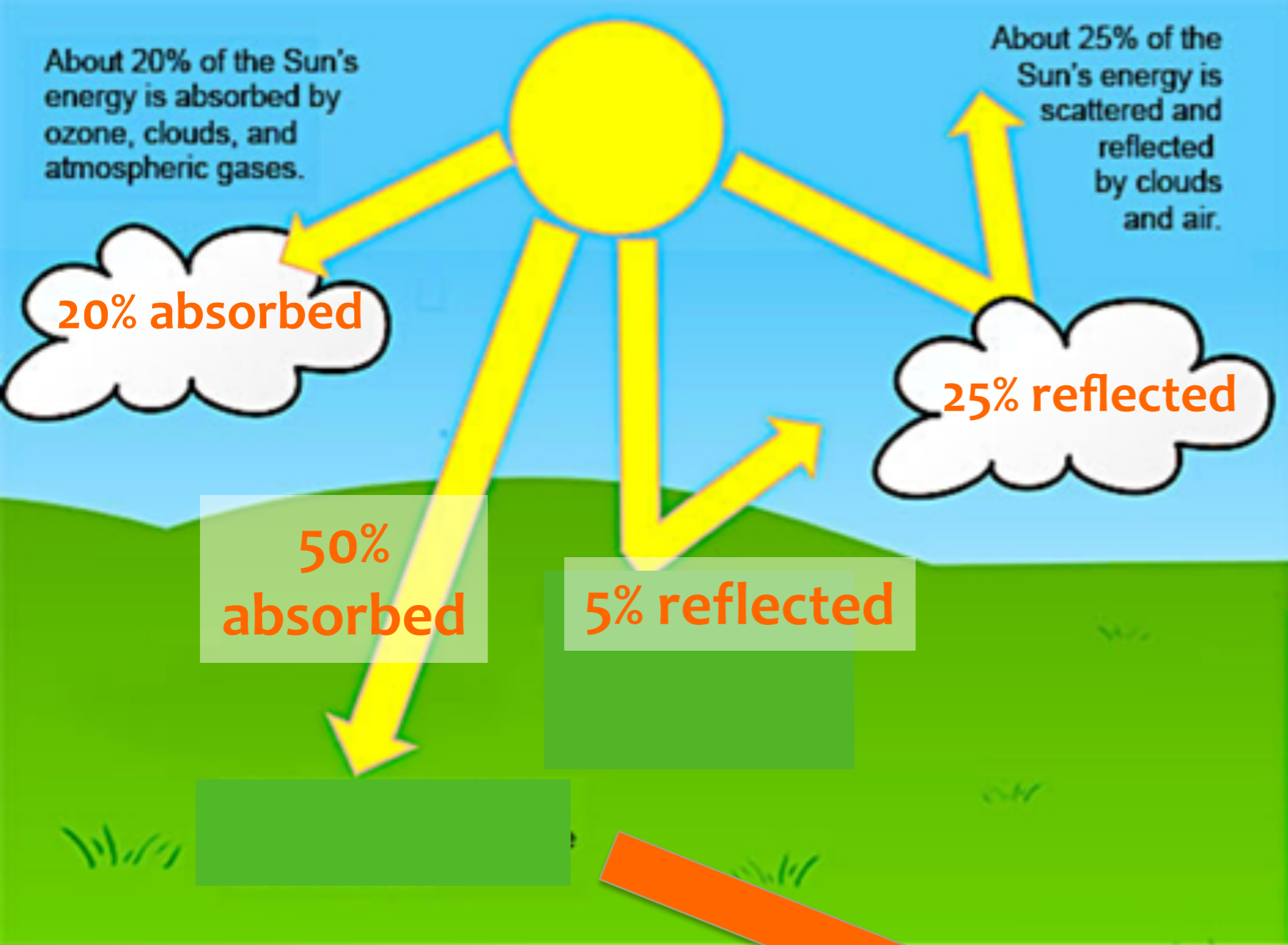


The rhizosphere can be vast!



Standard lawn

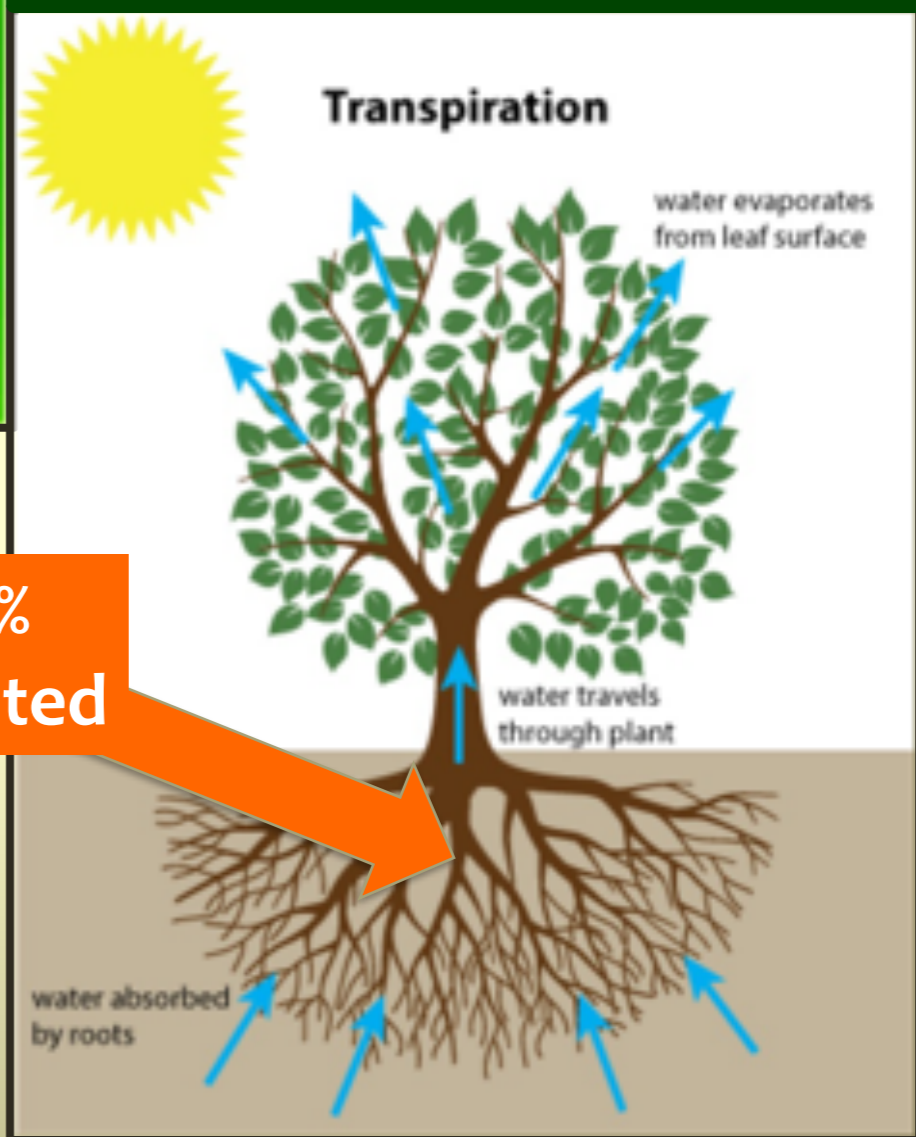
USA: 40 million acres of lawns (residential, commercial, and institutional lawns, parks, golf courses and athletic fields)



50% of the sun's energy is absorbed by Earth's surface (land and oceans).

40% of THAT energy is invested by plants into the soil to feed the underground zoo.

**A great investment!**



**Maximize:**  
 Biodiversity  
 Photosynthesis  
 Transpiration

**40% invested**

# Karoo, South Africa

Grassland

Desert

Carbon

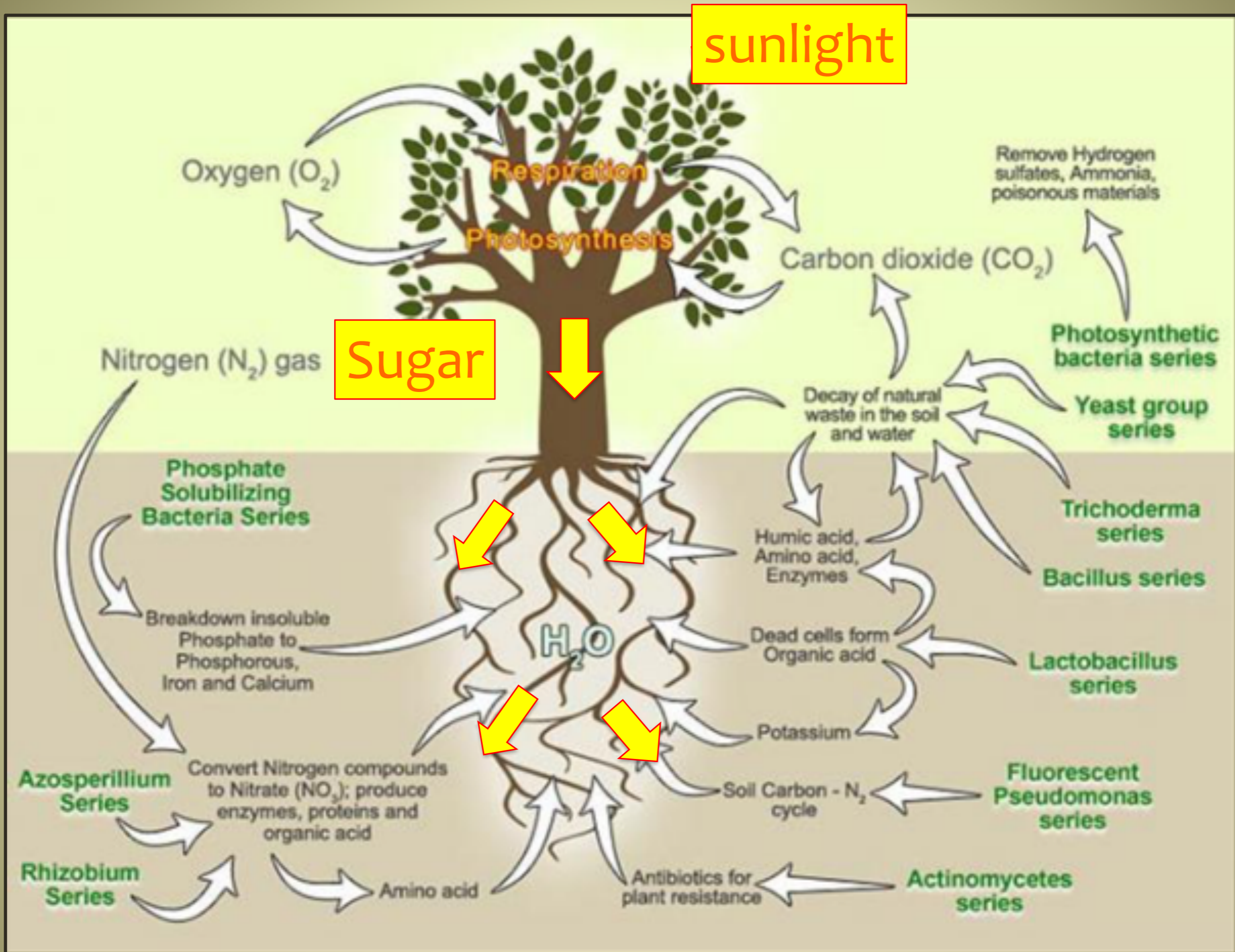
Water

Carbon

Water



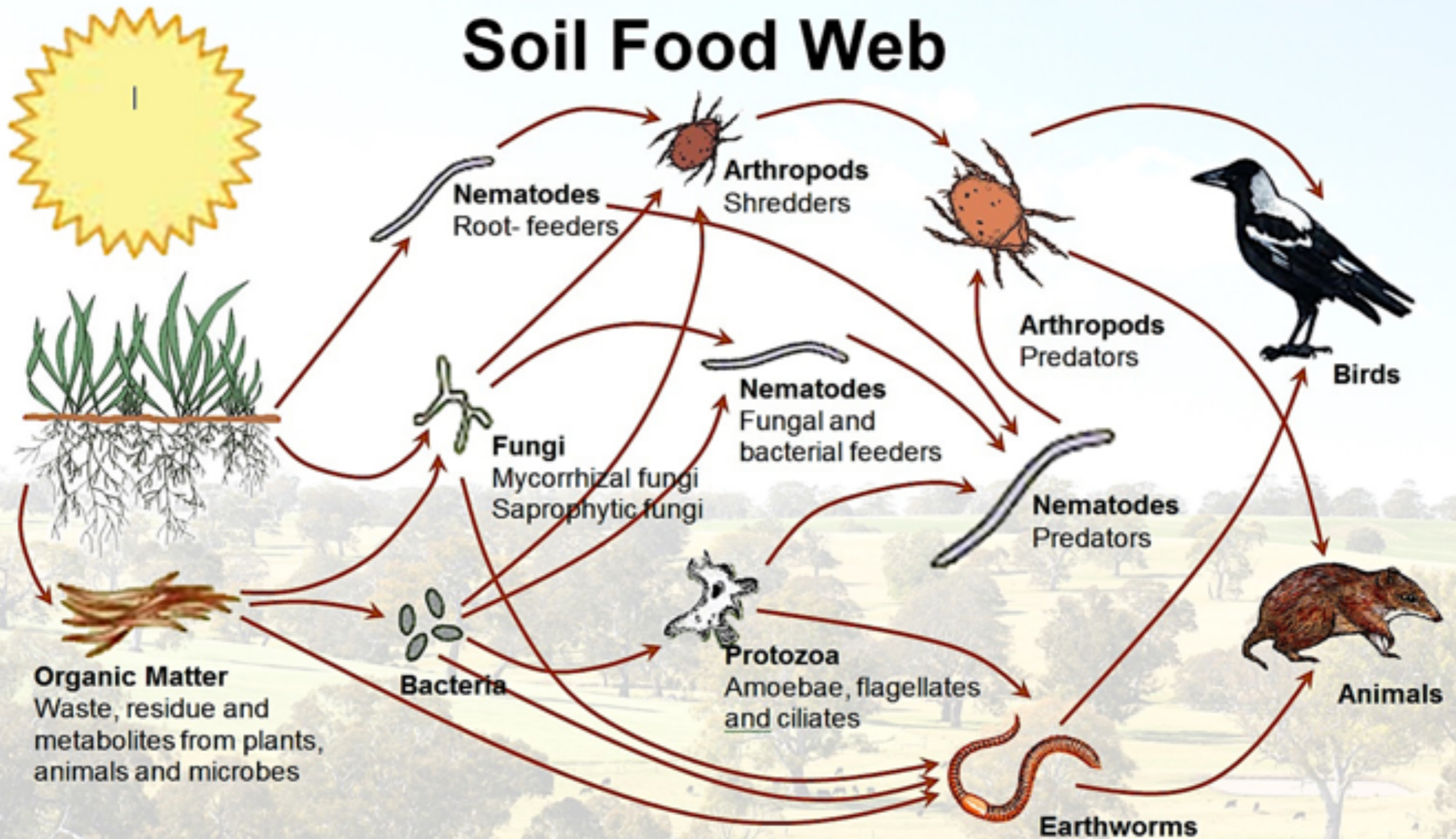
**Infiltration & Transpiration, or Evaporation?**



## Making the Connection: sunlight, carbon and water

# COMPOST BUFFET: Get the menu right if you want these expert decomposers to attend.

## Soil Food Web



First trophic level	Second trophic level	Third trophic level	Fourth trophic level	Fifth trophic level
Photo synthesisers	Decomposing Mutualists, Pathogens, Parasites, Root-feeders	Shredders Predators Grazers	High level predators	Higher level predators



## Not cured



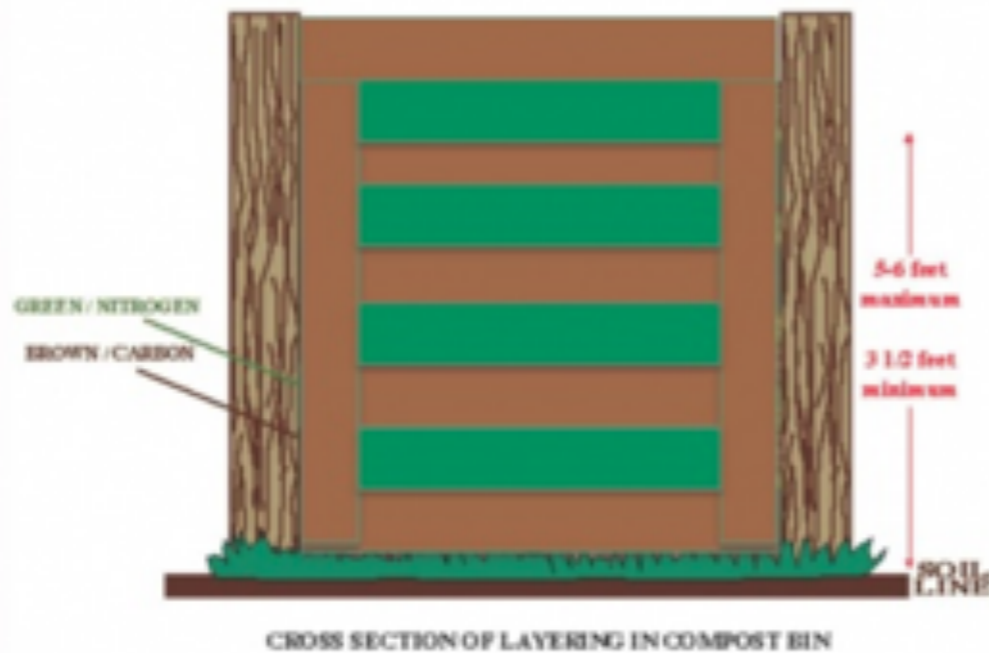
## Finished compost



# BUILD STRUCTURE - Air is Critical!

Whatever system you choose...

Layer and Encase your Food Scraps



**Highfields**  
CENTER FOR  
COMPOSTING

YOUR PARTNER IN *community composting*





## ***NOT HAVING ENOUGH CARBON STINKS!***

### **CARBON PROVIDES**

- √ Energy (sugars) for microorganisms*
- √ Oxygen and moisture throughout pile*

### **Carbon Matters**

- 50-60% Moisture
- Bulk density
- Size and shape of particles
- Diversity promotes diversity





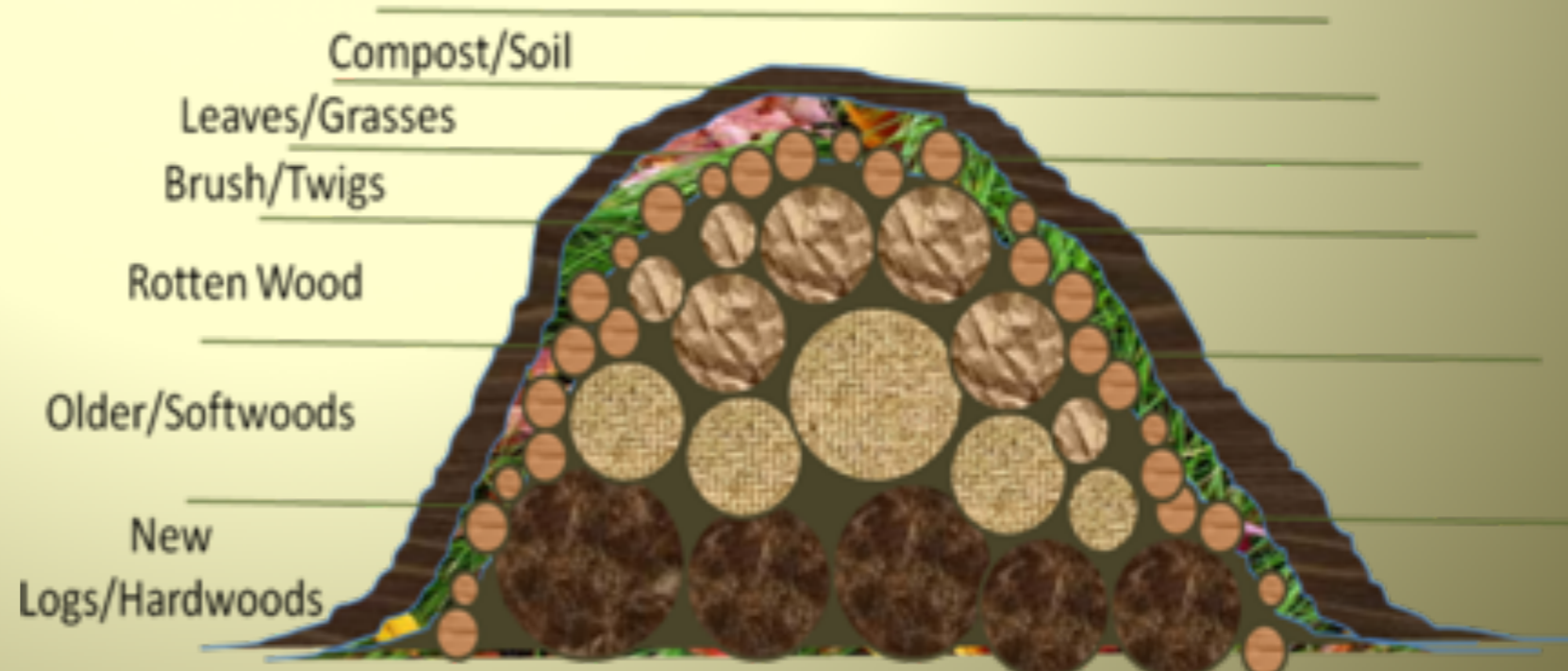
# Hugelkultur:

No-dig raised beds that utilize yard waste, hold moisture, build fertility, maximize surface volume and are great spaces for growing fruit, vegetables and herbs.



Hugelkultur:  
Pronounced Hoo-gul-culture.  
Means hill culture or hill mound.

## Time Stacking with Hugelkultur



Hugel mounds at Canallis Community Garden

# Build the Soil Carbon Sponge.

Turn this



and this!  
and this!



Jack and Anne Lazor's perennial pasture Butterworks Farm, Westfield VT

To this!



Nicole Masters photo: New Zealand