Colossal Compost
Miraculous Mulch
Spectacular Soil

CITRUS HEIGHTS WATER DISTRICT

Thank you for joining us
The webinar will begin soon

Colossal Compost Miraculous Mulch Spectacular Soil

- WaterSmart Classes posted on our YouTube
- Programs
  - Water Wise house calls for a free smart irrigation controller and water audit
- Rebates
  - Ultra-Low Flush Toilet
  - Pressure Reducing Valve
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For more information contact us
Waterefficiency@chwd.org
(916) 725-6873
Or
Go to our website https://chwd.org/rebates/

Colossal Compost
Miraculous Mulch
Spectacular Soil

Steven Zien, TNS

University Of Wisconsin - Soil Science

Wisconsin Certified Soil Tester

Pedologist

California Certified Nursery Professional

Managed local nursery organically

River-Friendly EcoLandscaper™

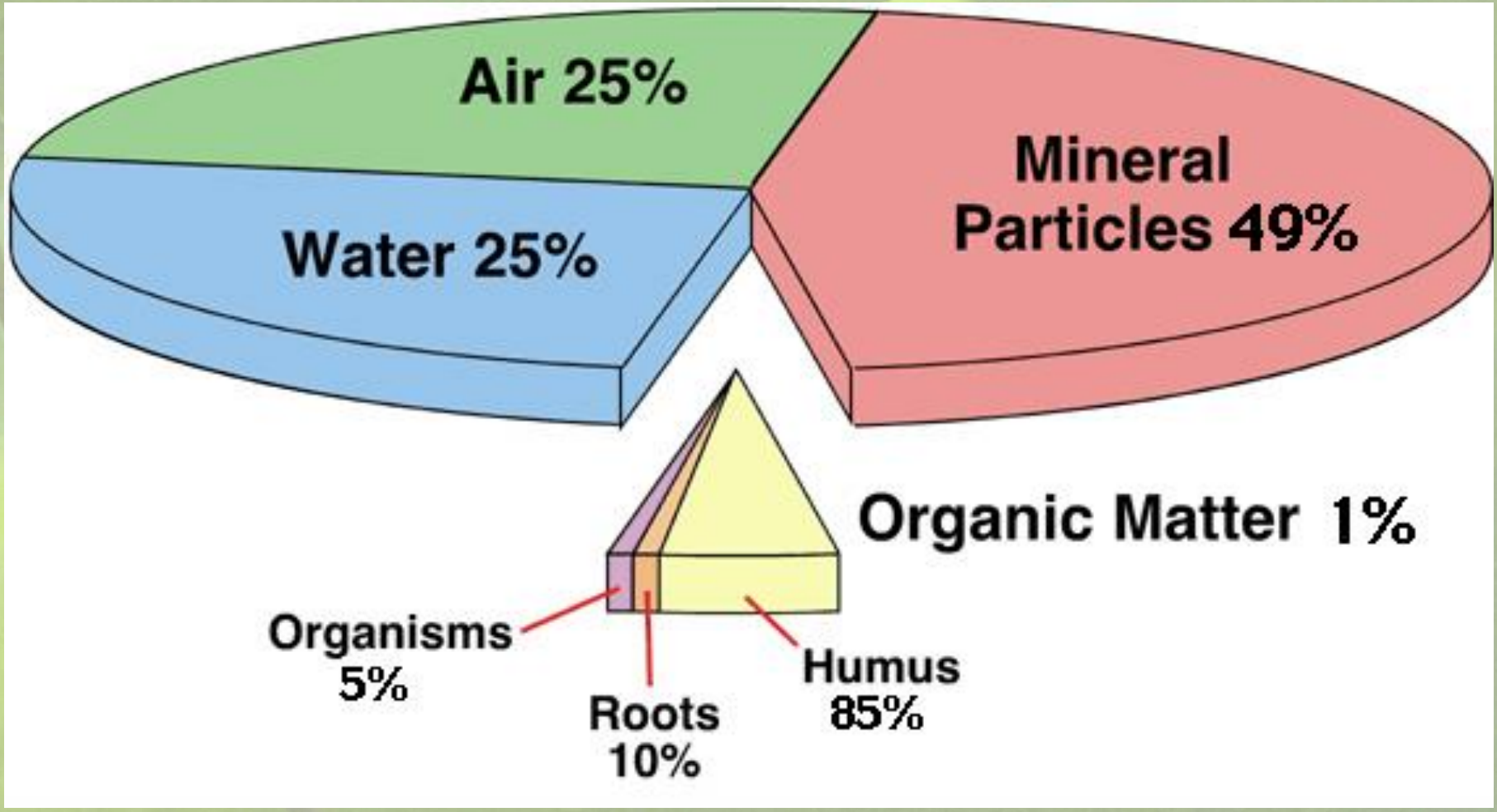
Living Resources Company: owner

Retired

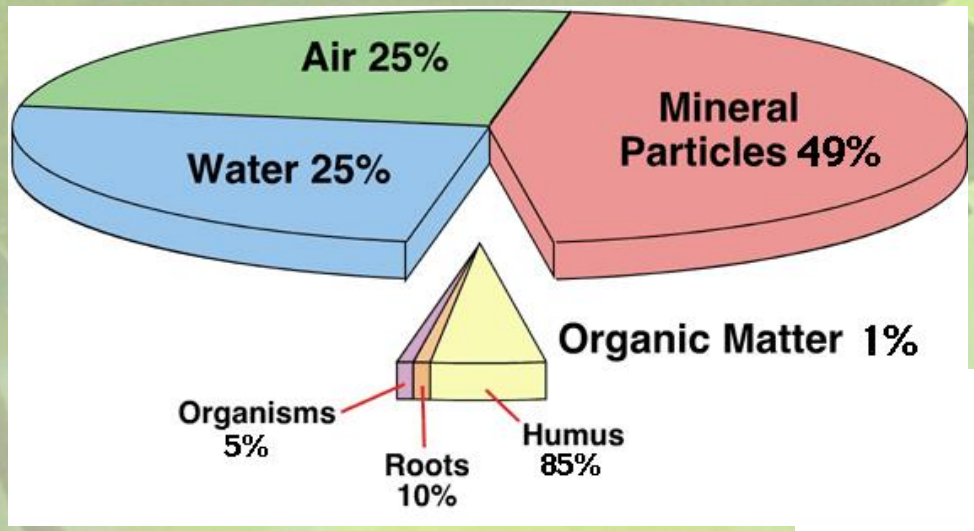
River-Friendly Green Gardener Instructor

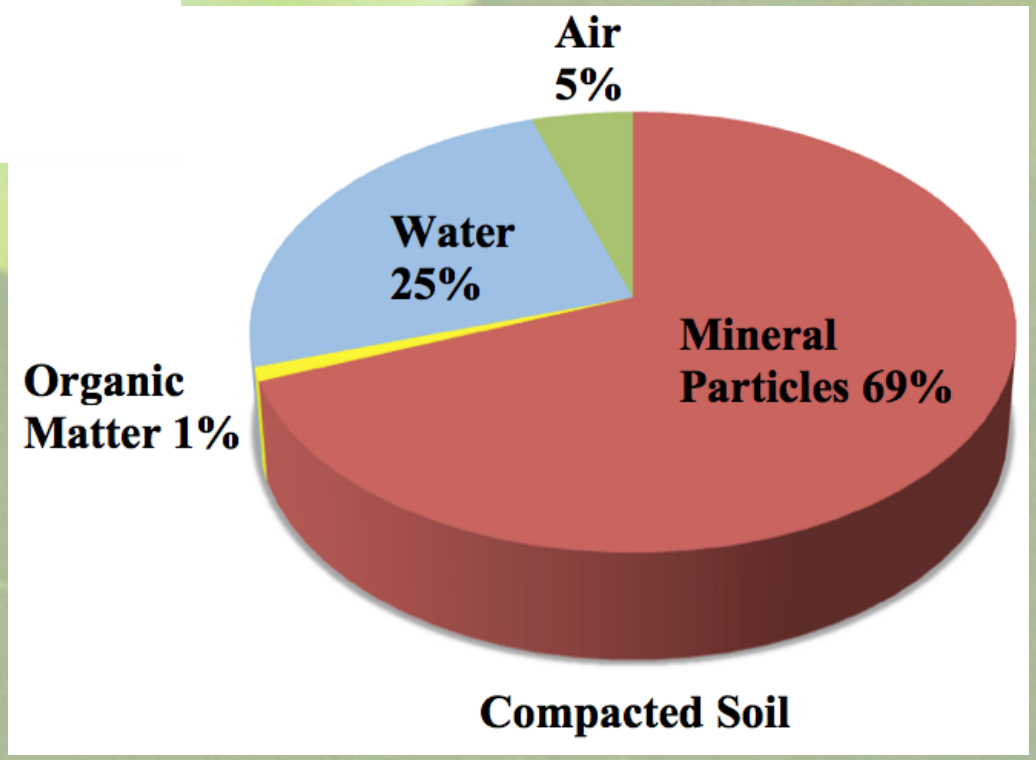

The simple truth is...
it all starts with
the soil.

What Is Soil


Air 25%
Water 25%
Mineral Particles 49%
Organic Matter 1%
Organisms 5%
Roots 10%
Humus 85%

What Is Soil





Compacted clay soils are poor in pore space

Mineral Materials

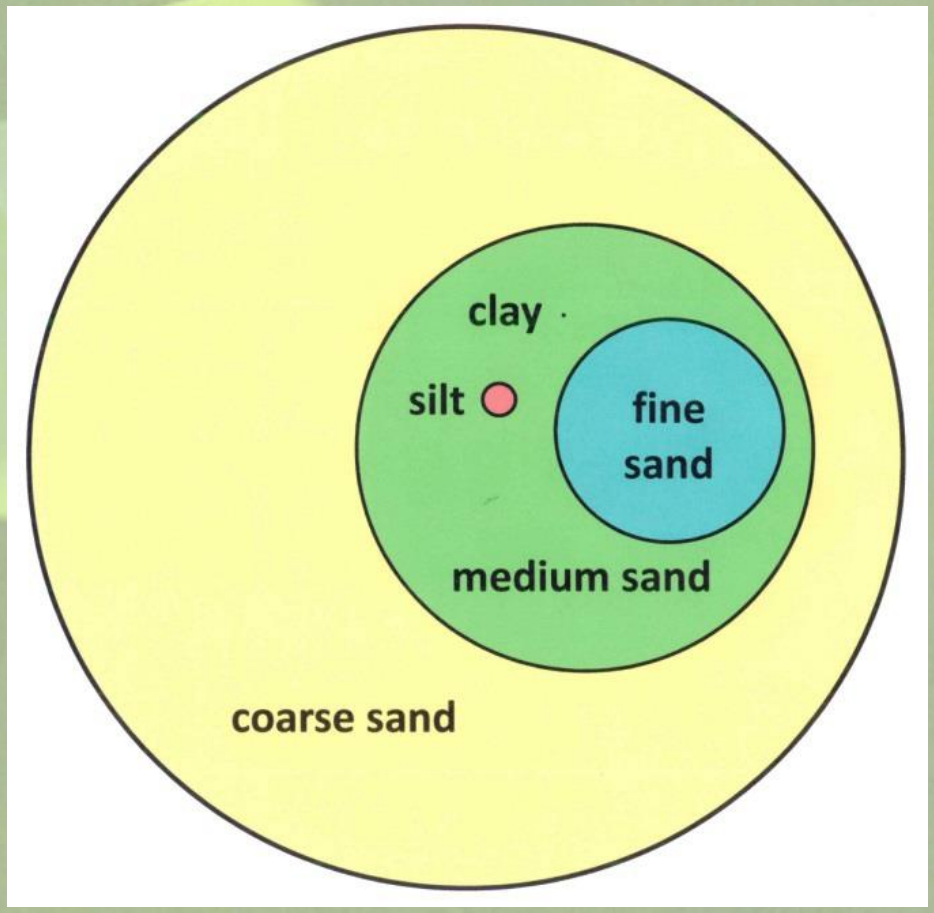
Sand, silt, and clay

Size only difference

Sand: 0.05 – 2.0 mm

Silt: 0.002 – 0.05 mm

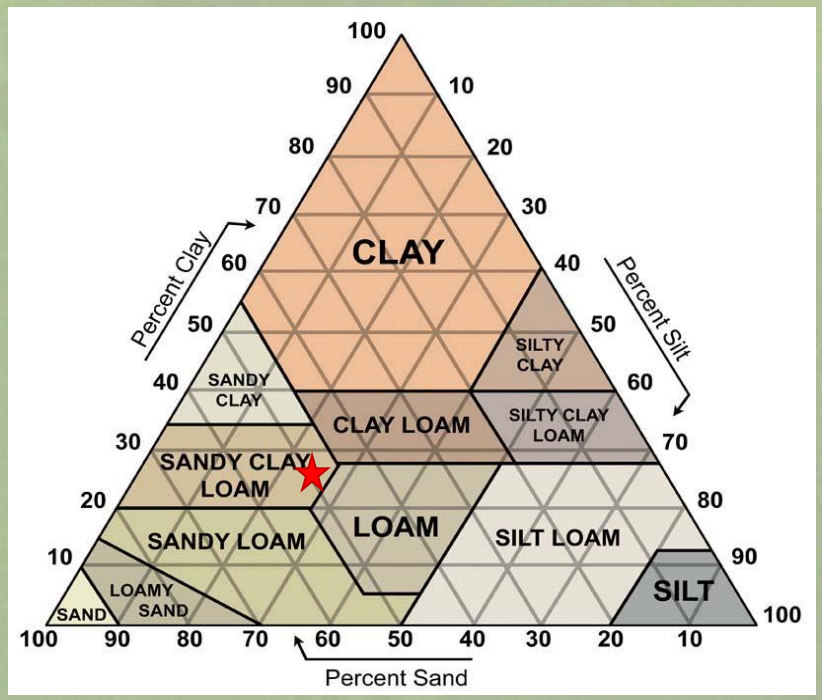
Clay: < 0.002 mm



Mineral Materials: Texture

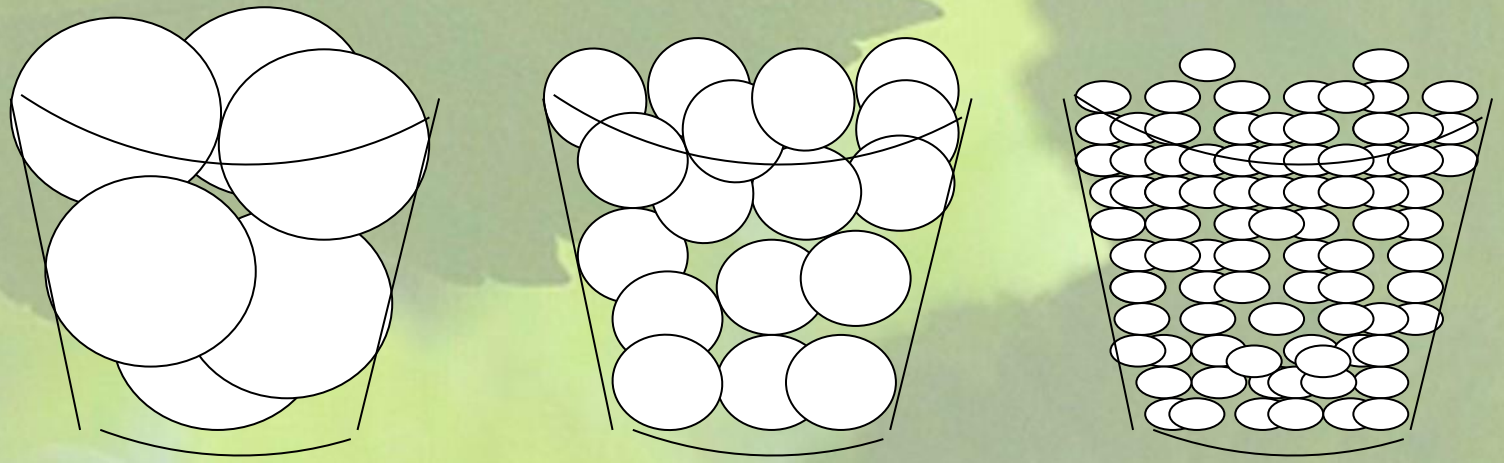
- Soil texture
  - Proportion of sand, slit, clay
  - Feel of the soil
- Soil texture evaluation
  - Hand test - how it feels
    - Sand - gritty
    - Silt - floury
    - Clay - hard/slippery
  - Soil texture Jar Test

Sand Silt Clay



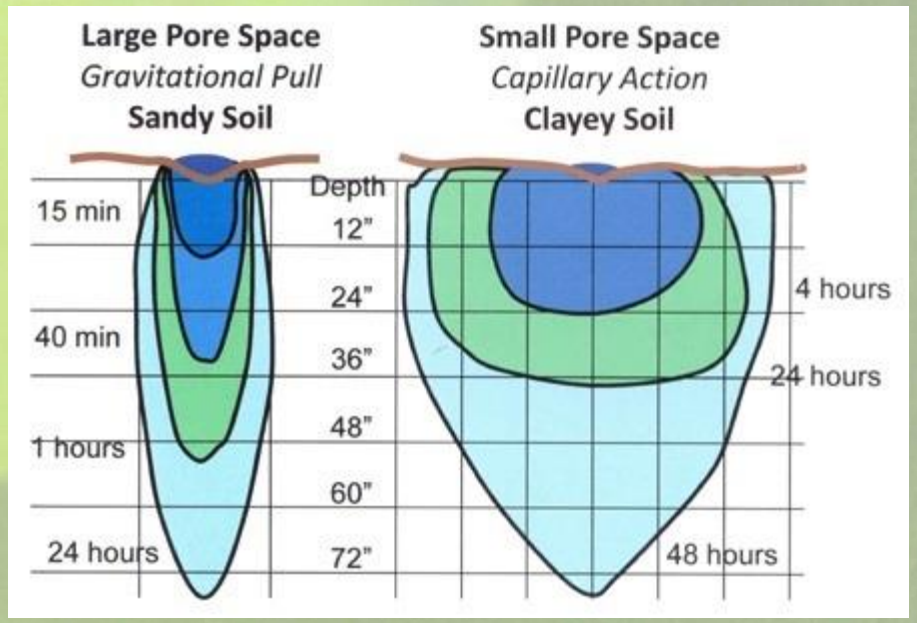
Influence Of Soil Texture

Sand: Basketballs Watermelon	Silt: Softballs Grapefruit	Clay: Golf balls Eggs



- Which one has more pore space? Clay
- Which one holds more water? Clay
- Size of pore spaces are smaller in clay
- Why is this important? It determines:
  - Frequency, amount and application rate of irrigation
- Which has more surface area? Clay

Soil Texture Influences Water Movement



Altering Soil Texture?

- Don’t like your soil texture?
- What happens to your clay soil when you add sand?



Cement!

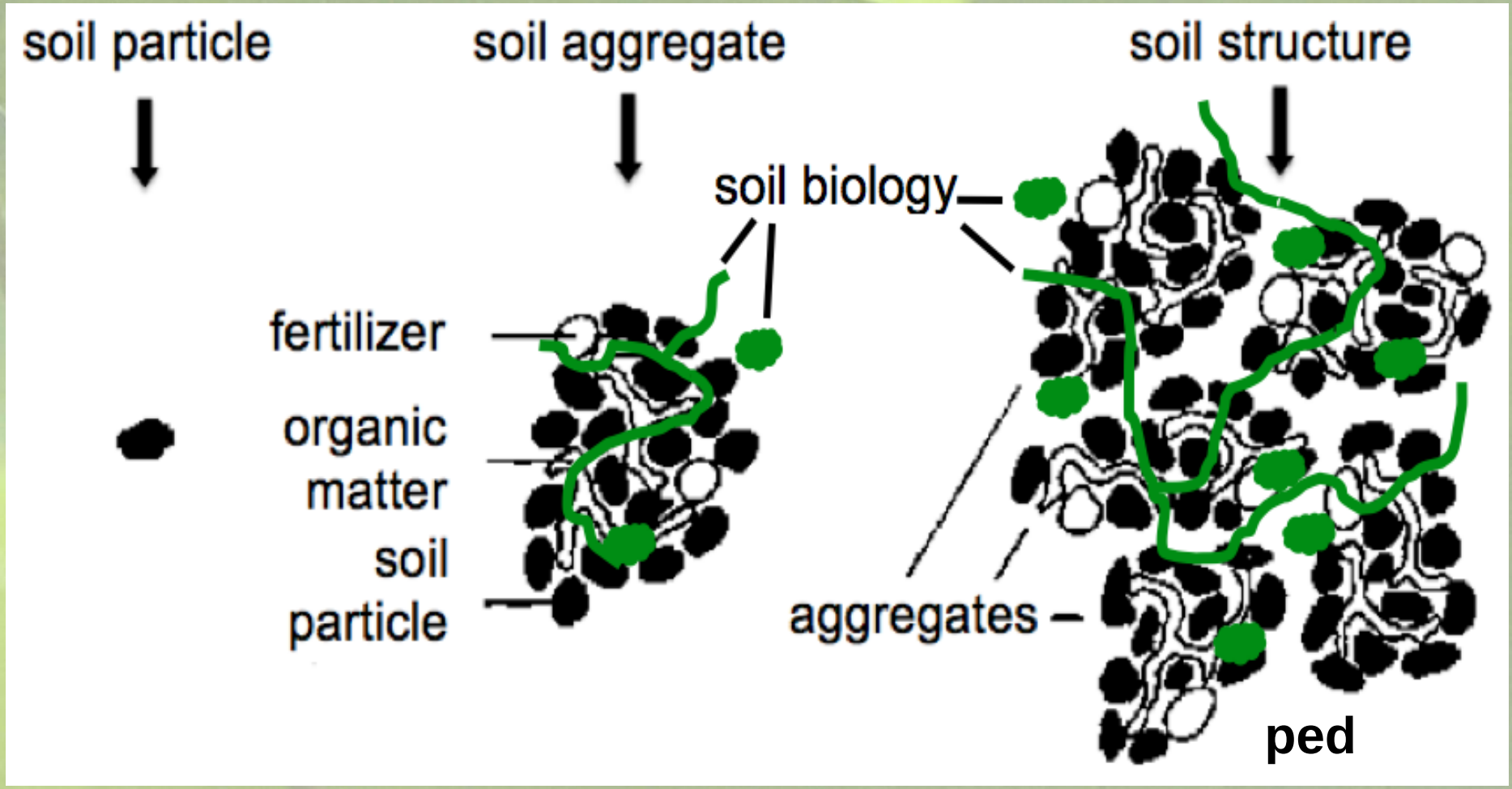
Do not alter soil texture!

How Improve Soil Function?

By improving soil structure

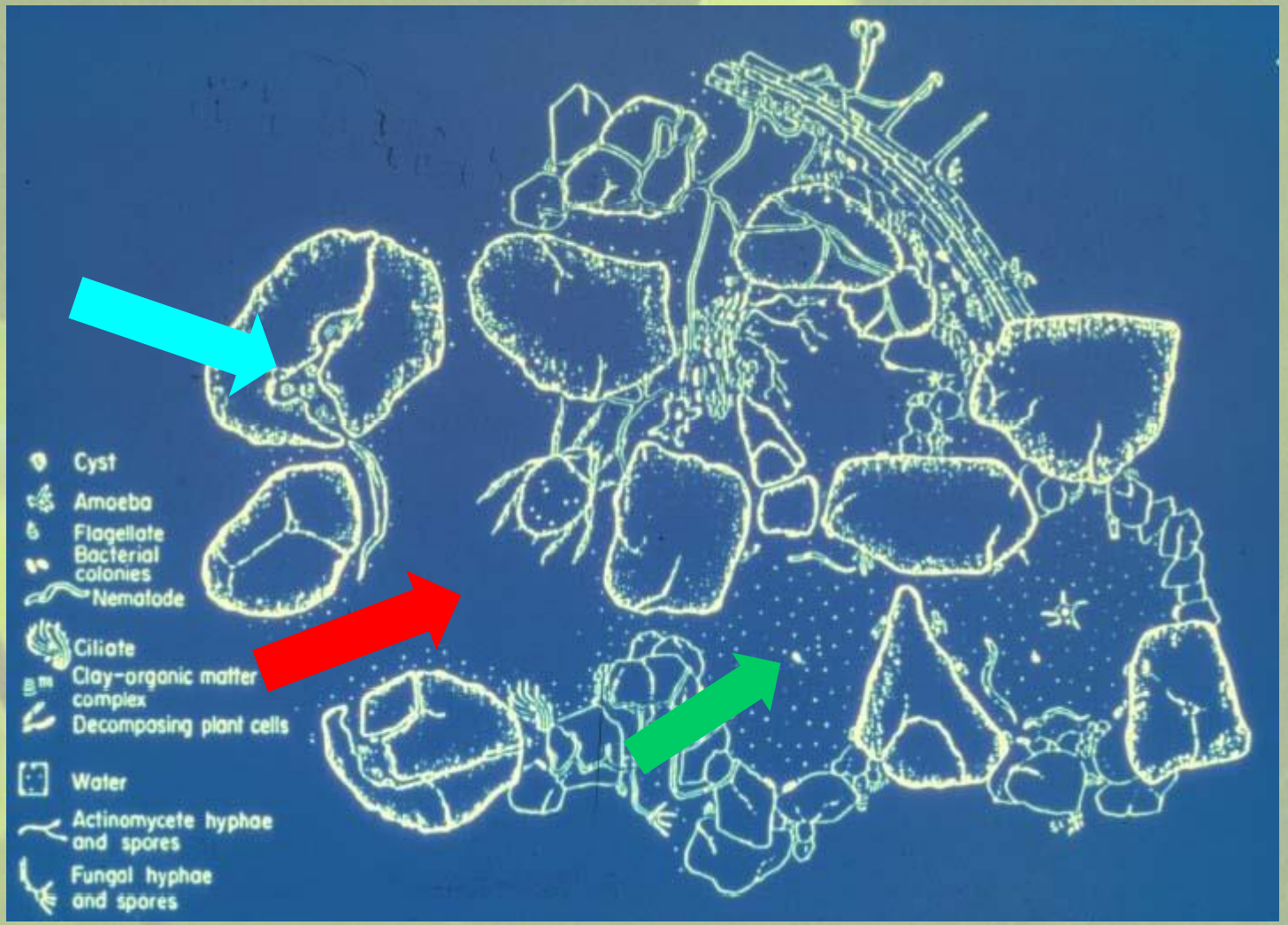
Soil Structure
Construction Of Soil Aggregates

Soil Biology Build Soil Aggregates Creating Soil Structure

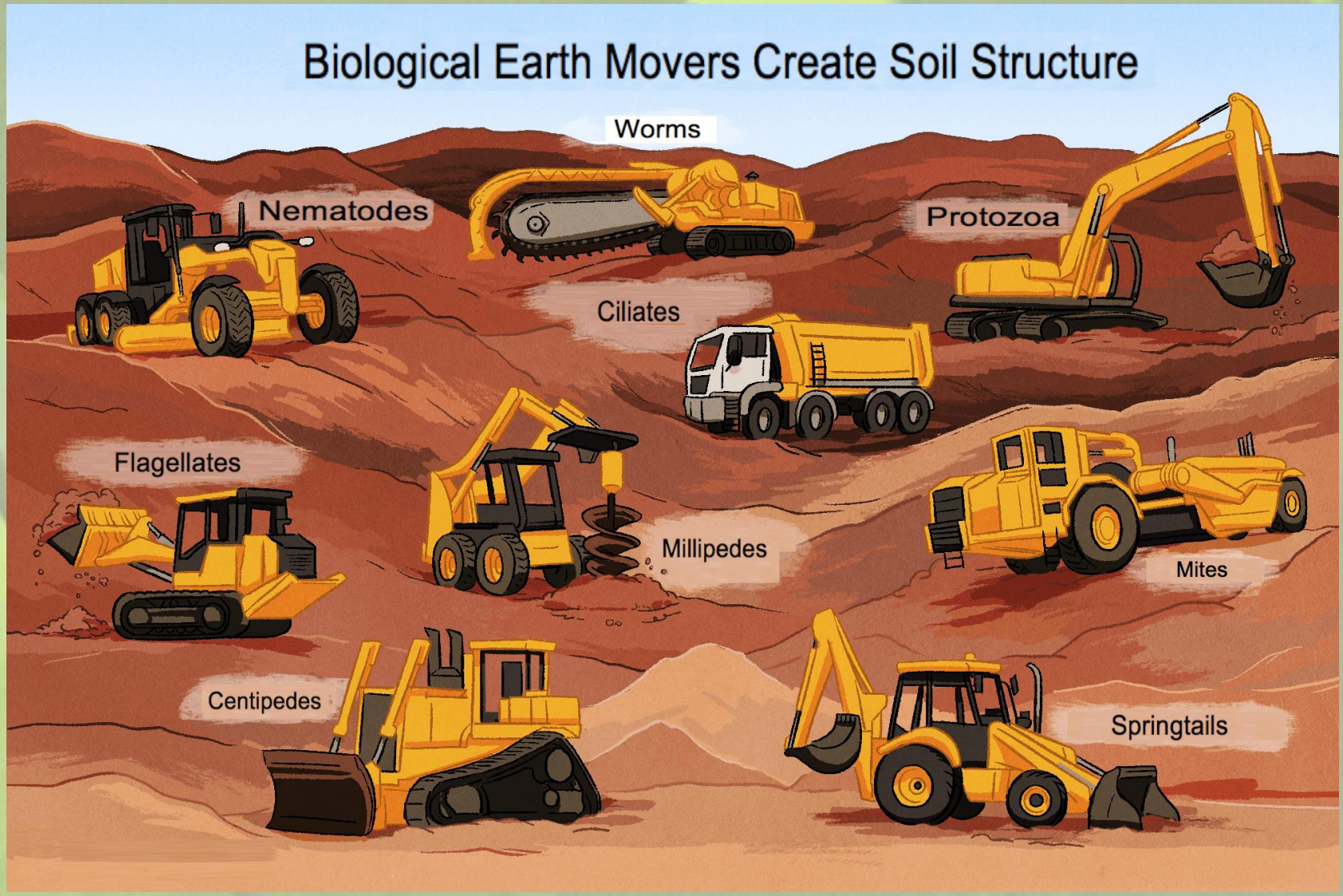


Soil Structure: Particle Aggregation

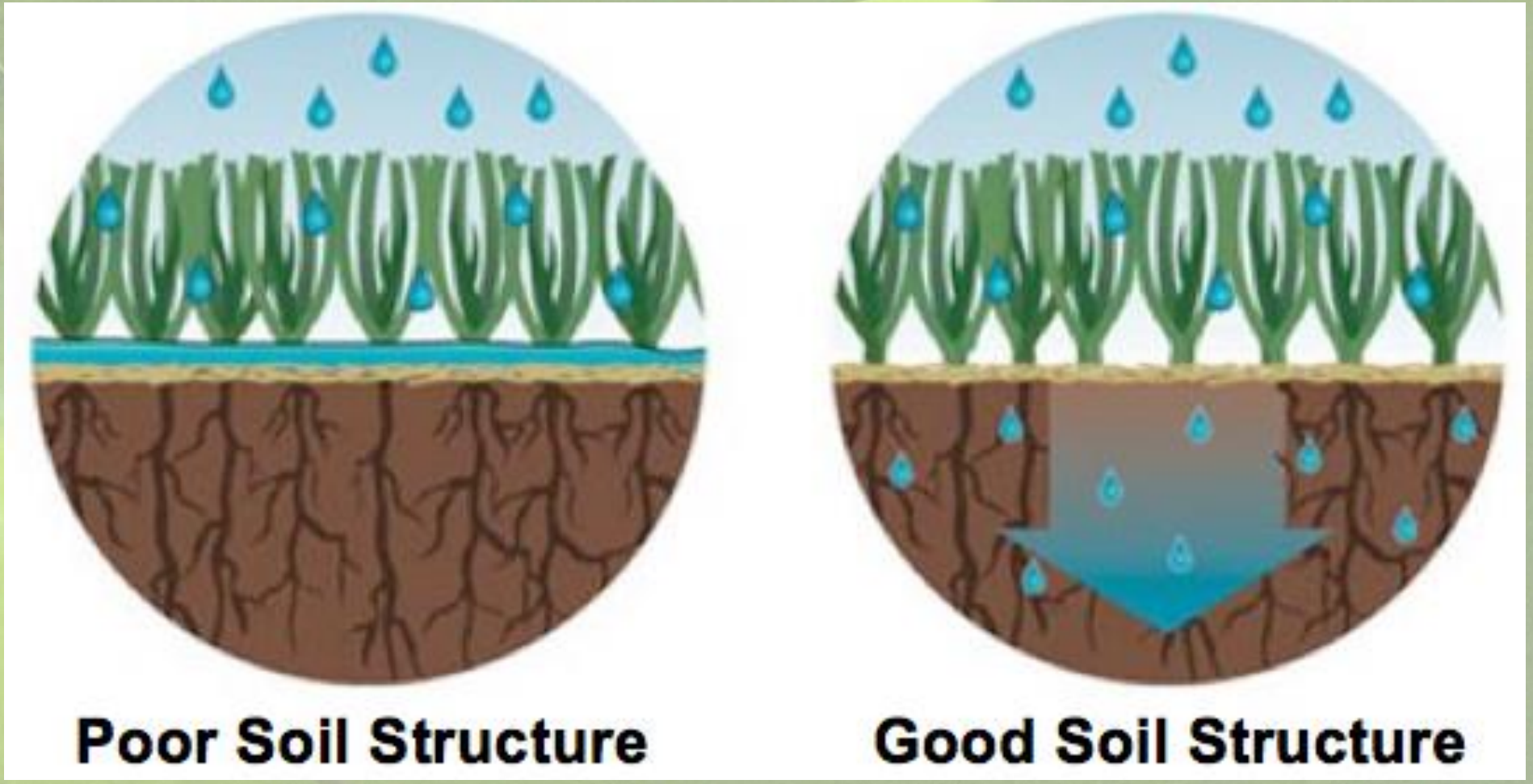
Importance of Soil Structure Is Diversity Of Poor Space Size

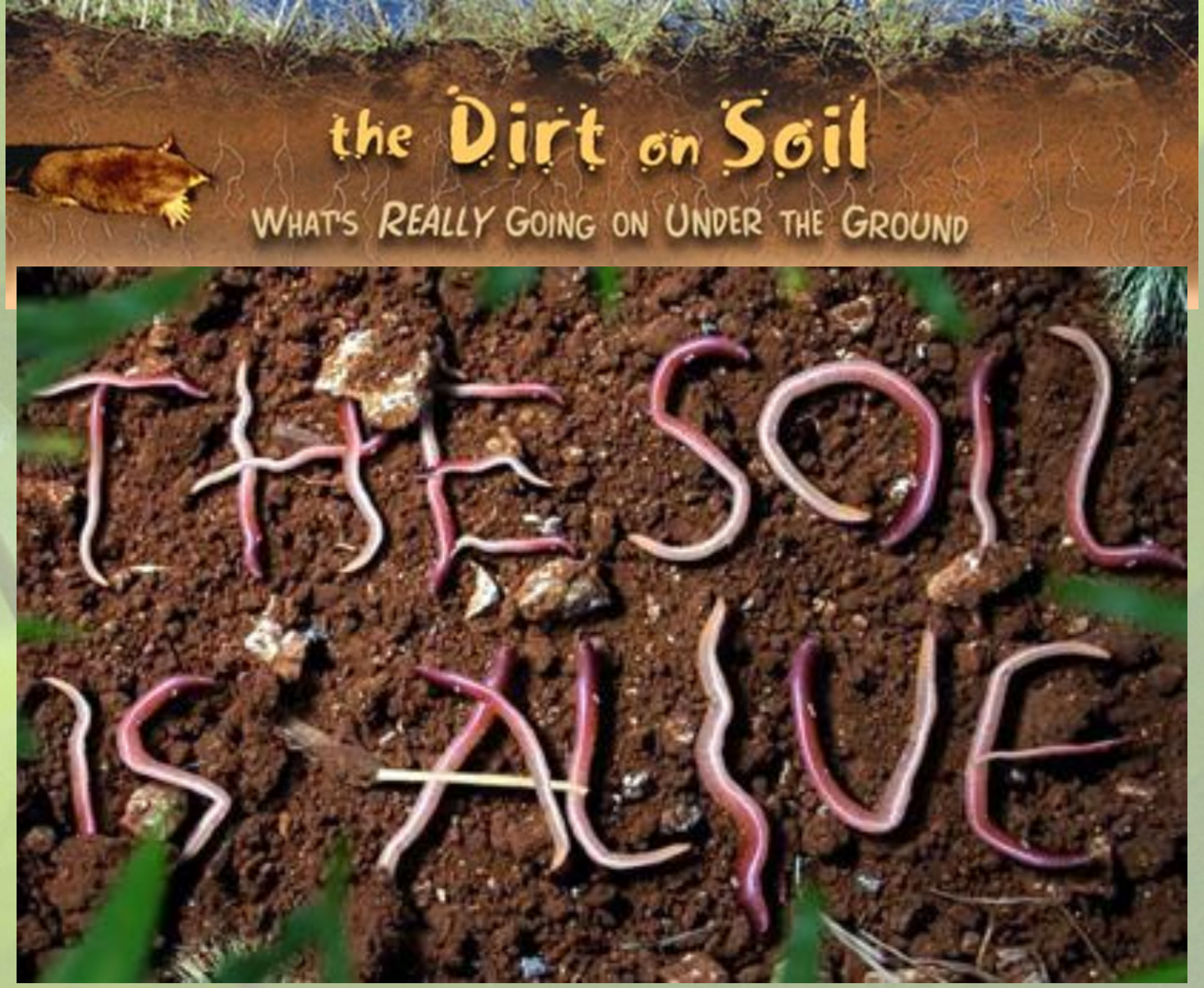


Construction Of Large Pore Spaces



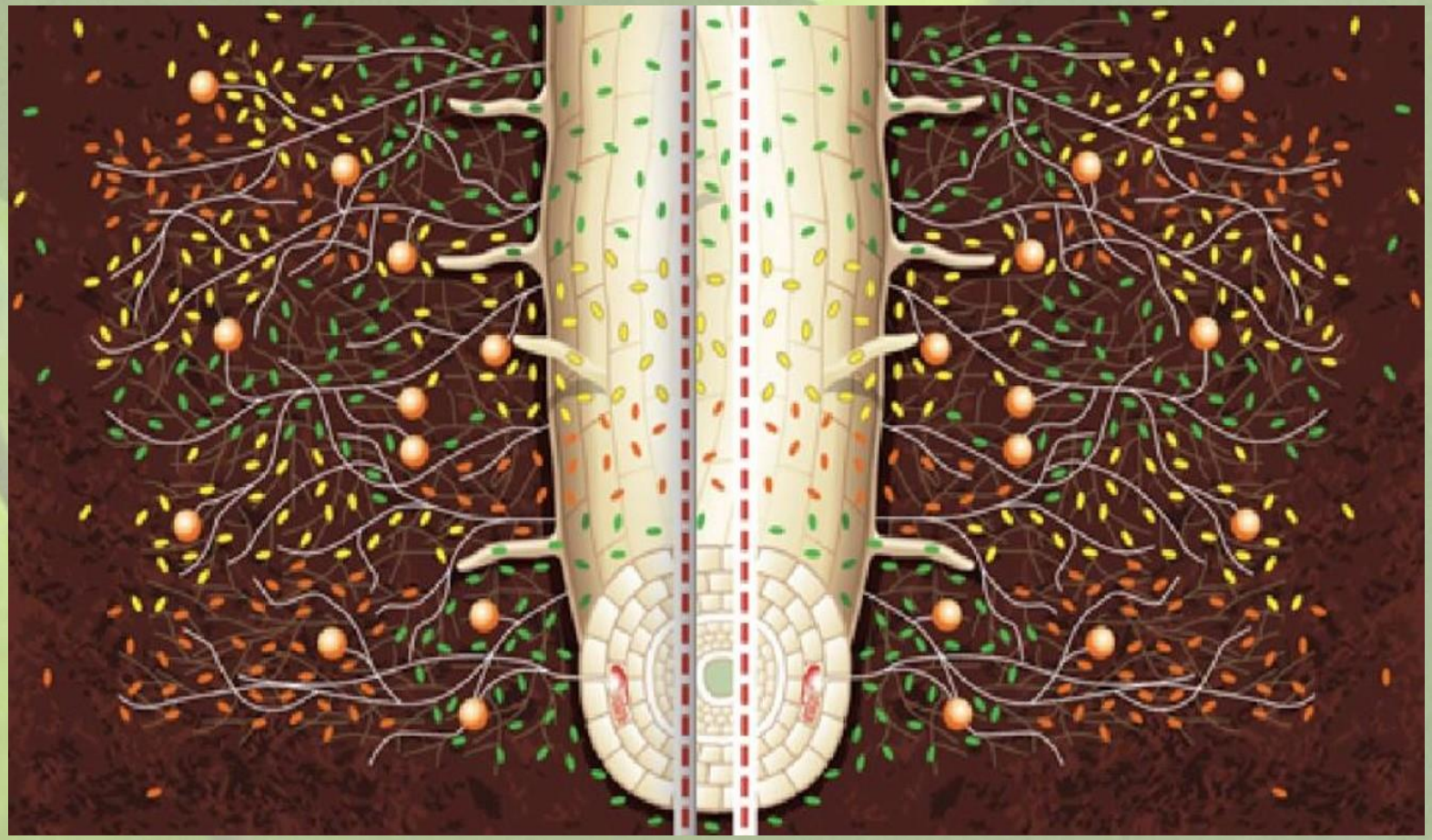
Soil Structure Influences Water Movement



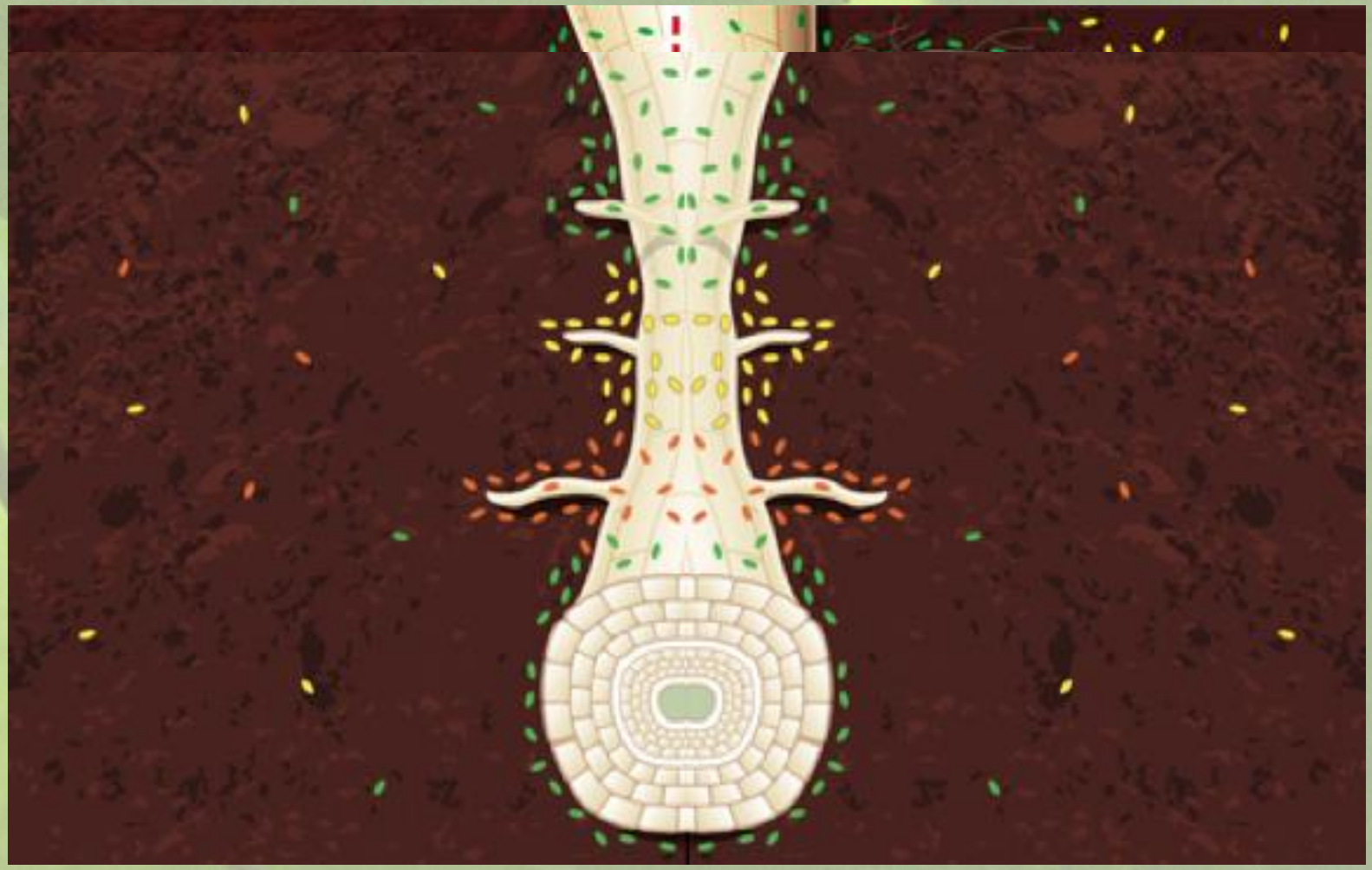

the Dirt on Soil
WHAT'S REALLY GOING ON UNDER THE GROUND
THE SOIL IS ALIVE


A single teaspoon of soil contains more microorganisms than there are people on Earth.

Rhizosphere
Healthy Living Soil

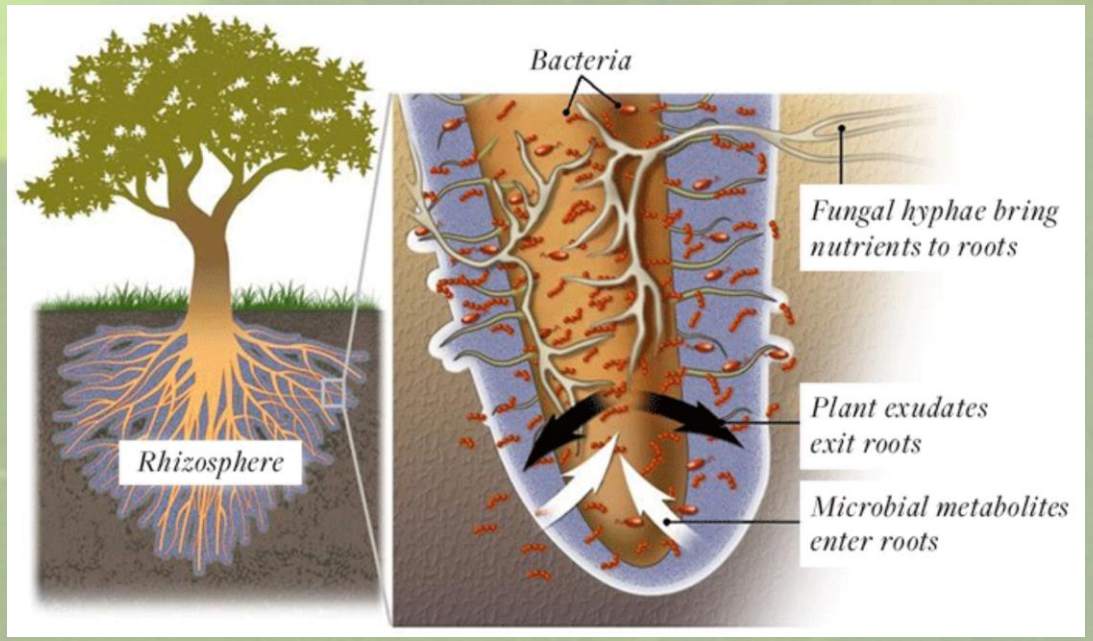


Rhizosphere
Dead Soil



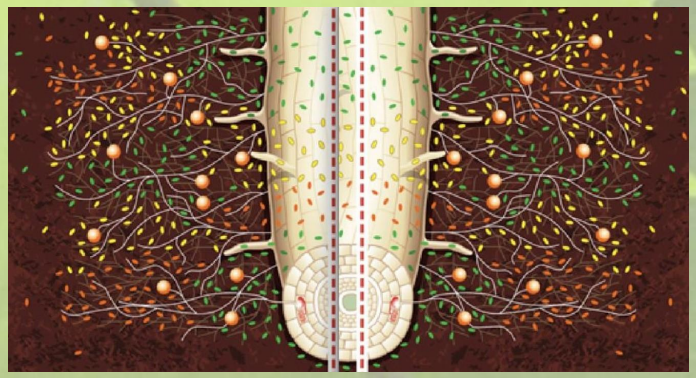
Rhizosphere Interactions

In a Healthy Soil plant roots & soil biology live together in an ASSISTED LIVING RHIZOSPHERE



Rhizosphere

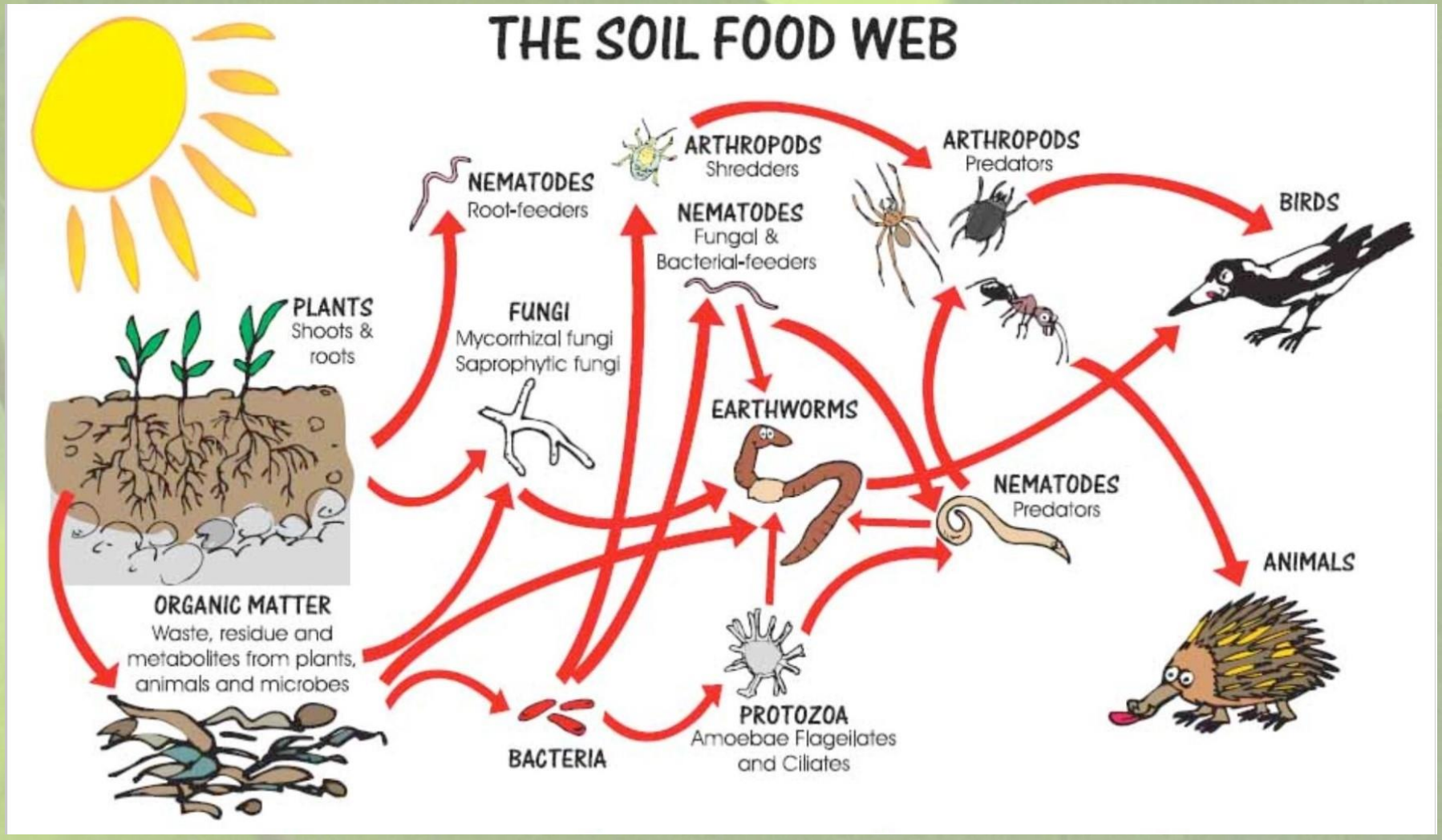
- **Plants and soil biology have a symbiotic relationship**
- Rhizosphere: Area of soil surrounding plant roots
  - Alive with beneficial soil organisms that provide plants
    - Water & nutrients
    - Plant growth regulators
    - Pest management
    - Help plants communicate via wood wide web (www)



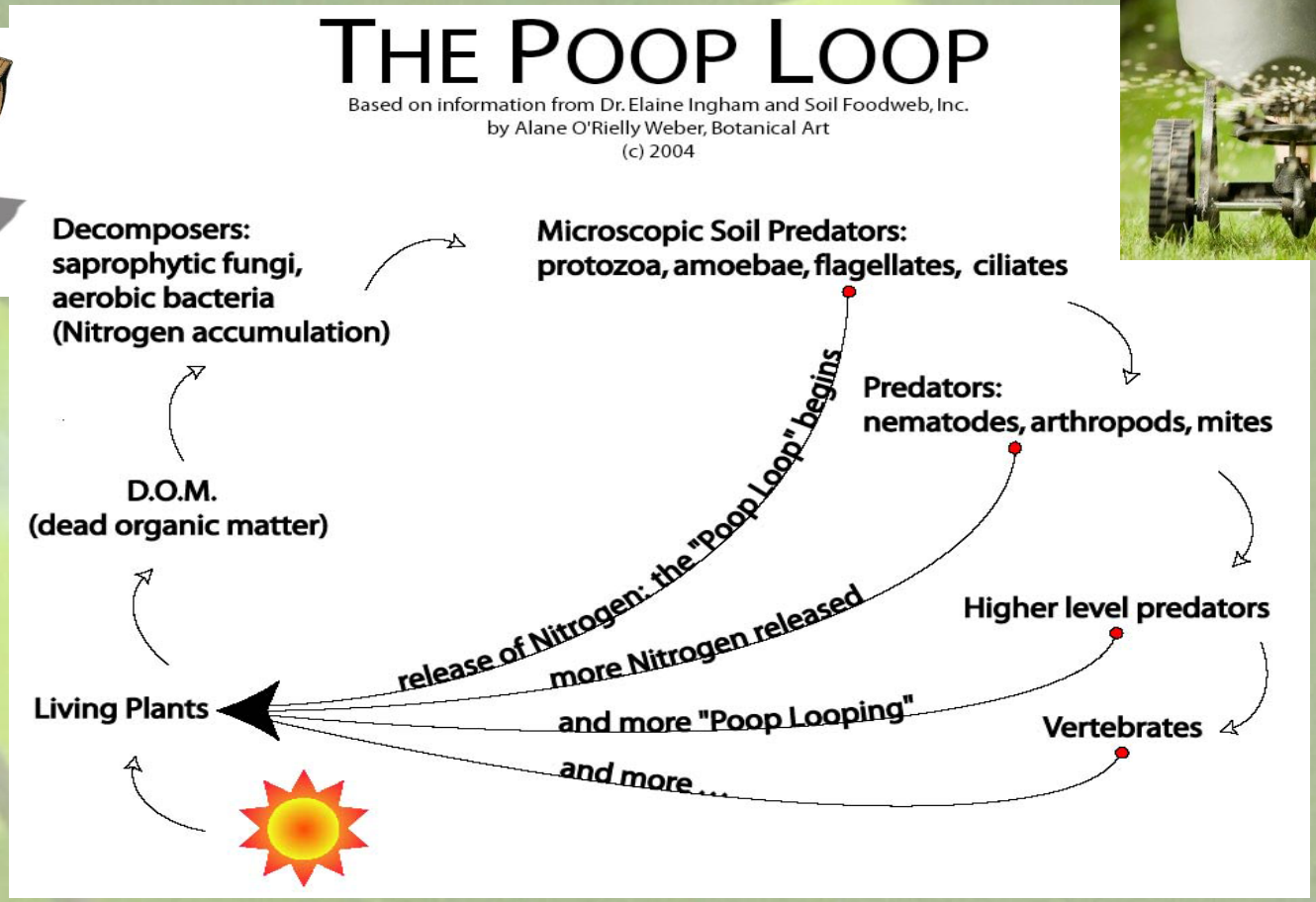
Rhizosphere

- **Plants perceive and respond to environmental changes**
- By producing root exudates that regulate soil biology
  - For plant health, protection, food & water
  - 10-40% plant energy feeds soil biology
  - Proteins, sugars, carbohydrates
  - Attract, communicate & regulate biology
    - Stimulate beneficial microbes
    - Discourage pest microbes
  - Whatever they need at the time
  - Varies through seasons
  - All life is dependent on this relationship

Biodiversity & Function

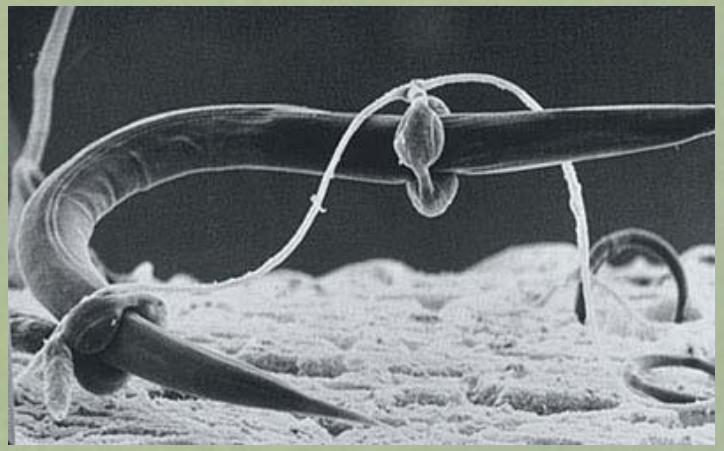


Soil Life And Nutrient Cycling



Healthy “Living” Soil

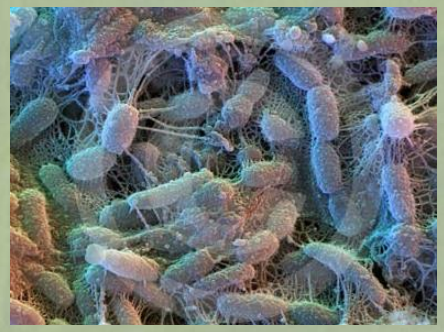
- Soil Food Web
  - Improves
    - Soil structure
    - Plant growth
    - Plant health
    - Water quality
    - Water storage
    - Water availability
    - Drought resistance
    - Erosion control
    - Pest management




unlock the
SECRETS
IN THE SOIL

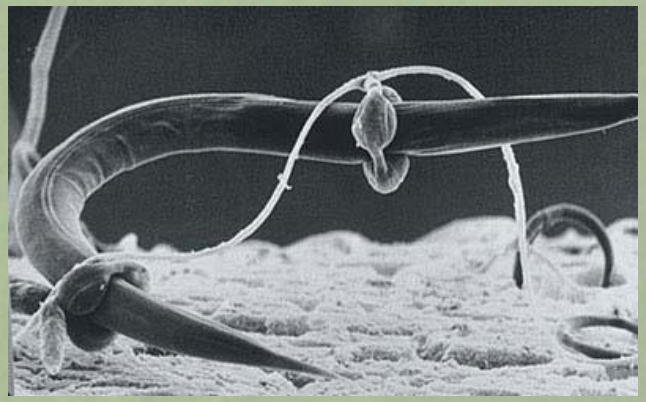
Bacteria

- Nitrogen factories
  - Nitrogen fixers & decomposers
- Make nutrients available
- Nutrient accumulator
  - Dissolve nutrients
- Produce plant growth hormones
- Make glues to remain in soil profile
  - Glues soil particles together
    - Creating soil structure
    - Improves air/water/root movement
    - Improves water holding capacity
- Produce alkaline slime that raises soil pH
- Suppress disease
- Decompose toxins



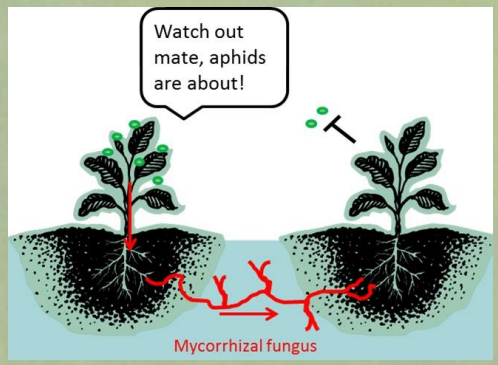
Fungi

- Most beneficial
- Improve soil structure
  - Hyphae tie soil particles together
- Nutrient accumulator
- Decompose OM
- Produce acidic enzymes
  - Lowers soil pH
- Pest suppression

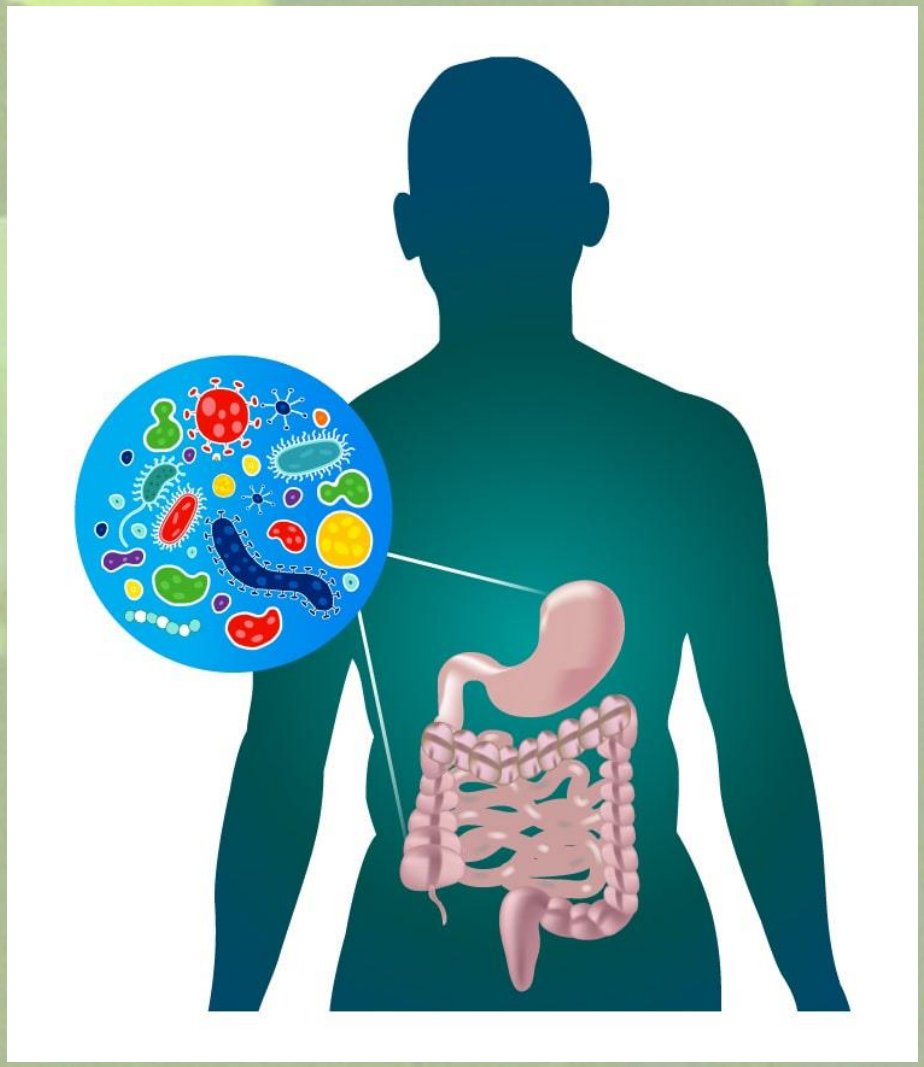


Mycorrhizal Fungi

- Extend area of water & nutrient absorption
- Create soil structure
- Symbiotic relationship with plants
- Wood wide web
  - Plants communicate with each other
  - Plants care for each other
- Help plants out compete weeds
- Can add mycorrhizal fungi



Spectacular Soil



Spectacular Soil

Spectacular Soil

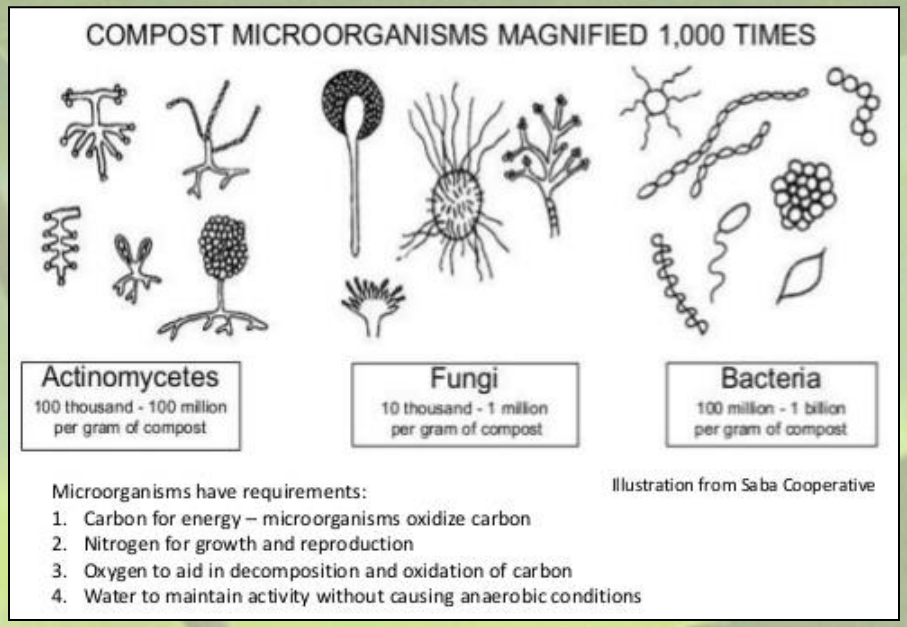

Compost is a key ingredient to creating healthy soil and healthy drought and pest resistant plants while mitigating climate change

What is Compost

Appropriate organic materials placed in a pile where soil organisms turn waste into a resource that nurtures the soil food web and plants

Who Makes Compost

- Gardeners build compost piles
- Soil biology makes compost



MICROORGANISMS IN COMPOST

Actinomycetes	Fungi	Bacteria
Actinobifida chromogena	*Aspergillus fumigatus*	*Alcaligenes faecalis*
Microbispora bispora	*Humicola grisea*	*Bacillus brevis*
Micropolyspora faeni	*H. insolens*	*B. circulans* complex
Nocardia sp.	*H. lanuginosa*	*B. coagulans* type A
Pseudocardia thermophilia	*Malbranchea pulchella*	*B. coagulans* type B
Streptomyces rectus	*Myriococcum themophilum*	*B. licheniformis*
S. thermofuscus	*Paecilomyces variotti*	*B. megaterium*
S. thermoviolaceus	*Papulaspora thermophila*	*B. pumilus*
S. thermovulgaris	*Scytalidium thermophilim*	*B. sphaericus*
S. violaceus-ruber	*Sporotrichum thermophile*	*B. stearothermophilus*
Thermoactinomyces sac chari		*B. subtilis*
T. vulgaris		*Clostridium thermocellum*
Thermomonospora curvata		*Escherichia coli*
T. viridis		*Flavobacterium* sp.
		Pseudomonas sp.
		Serratia sp.
		Thermus sp.

Source: Palmisano, Anna C. and Barlaz, Morton A. (Eds.) (1996). Microbiology of Solid Waste. Pp. 125-127. CRC Press, Inc., 2000 Corporate Blvd., N.W., Boca Raton, FL 33431 USA.

- For compost to happen
- Gardeners must create favorable conditions for the decomposters

Construct Compost Pile

brown
leaves, stew,
woody materials...

+

green
grass, food scraps,
manures...

=

compost

water —— **COMPOST HAPPENS** —— **air**

macro-organisms
earthworms, Insects, etc.

micro-organisms
Bacteria, fungi, microbes

Compost Ingredients

- Separate but equal amounts of
  - Brown & green material
- Diversity of ingredients
- Reduce particle size
- Moisture
- Microbial inoculants

Compost Ingredients					
Green (high nitrogen)	**Brown (high carbon)**	**Microbe Inoculators**	**Other**	**Avoid**	
Kitchen plant waste	Fallen leaves	Finished compost	Water	Dairy	Wood ash
Fresh grass clippings	Straw	Soil		Bones	Aromatic leaves
Fresh vegetative material	Chipped woody debris	Fresh manure (non-carnavor)		Meat & fish	Pet waste
Fresh manure (non-carnavor)	Shredded newspaper	Products w/microbes	Optional:	Synthetic fertilizer	Greese and fat
Fish emulsion	Sawdust		Rock phosphate	Mayonnaise	Plants w/pests
Coffee grounds/filters	Dry vegitative material		Greensand	Peanut butter	Weeds w/seeds
Alfalfa & cottonseed meal	Pine needles			Salad dressing	Persistant weeds
Blood and soybean meal	Paper products			Fat & oils	Horse manure
Feathers, fur, hair	Tea bags			Lime	Human waste
Seaweed	Dried grass clippings			Plant waste containing pesticides	

Compost Construction

- In a 3’x3’x3’ area
  - Thin brown layer and add moisture
  - Thin layer of inoculant (biology)
    - Finished compost, soil, manure
  - Layer:
    - 4-6” brown
    - 4-6” green
    - Moisture (40% moisture = squeezed out sponge)
    - Sprinkle of inoculant
    - Repeat until 3’ high (save some brown for cover)
- Mix together well in a 3’x3’x3’ pile or bin
- Need heat to kill pests
- Turn when gets to 160˚ F

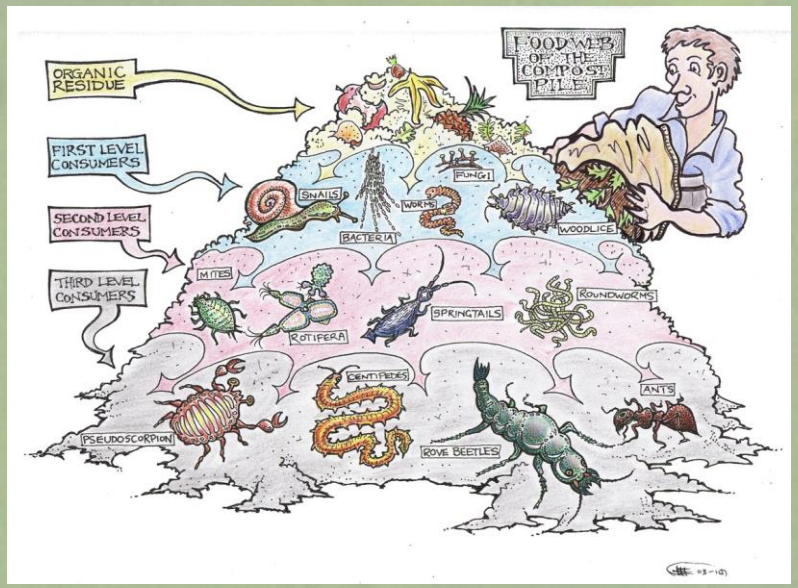
Compost Bins/Piles

- Should be 3’x3’x3’

- Small commercial bins
  - Will not heat up
  - Will not destroy pests
    - Do not add
      - Weed reproductive parts
      - Insect pests
      - Diseased plant material

Properties of Finished Compost

- Earthy smell
- Not hot
- Spongy
- Does not resemble original material
- Contains live & dead microbes and their manure
- Feeds & nourishes soil life

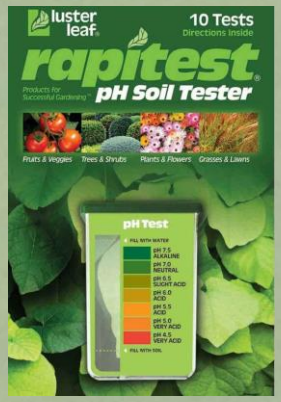


Worm Compost is Best

- Greater biological diversity

Purchasing Compost: Buyer Beware

- Compost from waste recyclers has quality issues
- Bagged compost can have quality issues
  - Read ingredients on package
  - Visually inspect, test pH
- Landscape yard compost has quality issues
  - Visually inspect, test pH
  - Watch them load
  - Follow to site



Using Compost

- Application methods
  - Apply to soil surface as topdressing or mulch
  - Apply after aerating the soil (removal of soil cores)
  - Incorporate small amount into backfill when transplanting
  - Brew and apply liquid compost or worm casting tea

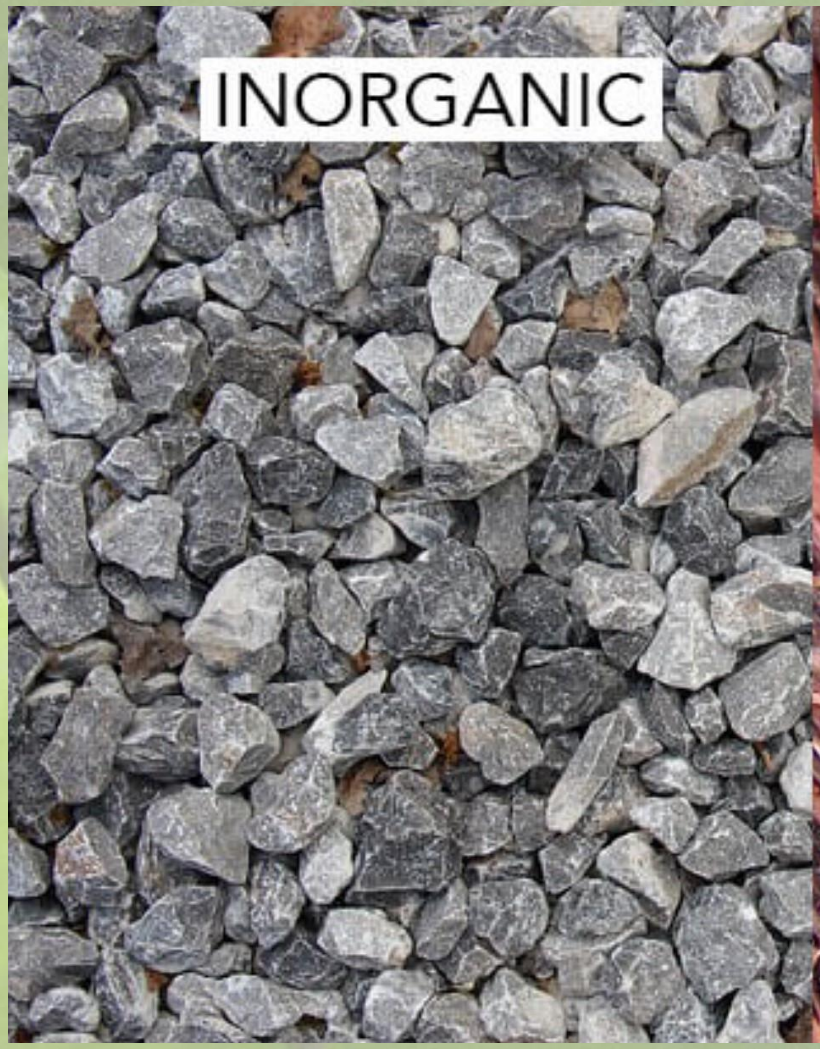
Compost Benefits

- Strengthens the soil food web
- Food source for soil biology and plants
- Improves
  - Soil structure
  - Nutrient availability
  - Water movement, availability, quality
  - Biological diversity
  - Plant health, pest resistance, and drought tolerance

- Reduces
  - Soil compaction and erosion (soil loss)
  - Fertilizer & irrigation needs

- Waste becomes a resource
- Conserves water, time, and money
- Increases soil organic matter sequestering carbon helping to mitigate climate change

Mulch Options
Not All Are Created Equal



Miraculous Mulch

- **Organic** material placed on soil surface
- Why is organic mulch miraculous?
  - Improves soil health
    - Increases biodiversity in soil
      - Worms aerate soil
    - Adds organic matter & nutrients
  - Suppresses weeds
  - Conserves soil moisture
    - Reduces need for irrigation
  - Moderates soil and plant temperature
  - Reduces soil compaction
  - Prevents erosion, runoff and pollution

Organic Mulch Options

- Wood chips
  - Different sized particles
  - Good for woody plants
  - Free – chip drop/arborist mulch

- Materials on site, shredded, chipped or composted
  - Fallen leaves
  - Branches
  - Grass clippings – thin and/or dry

- Other options
  - Bark (colored can be toxic)
  - Newspaper, straw
  - Compost, worm castings

Sheet Mulching

- Kills and prevents weeds
- Converts lawn or weed patch into water wise garden
- Without pesticides

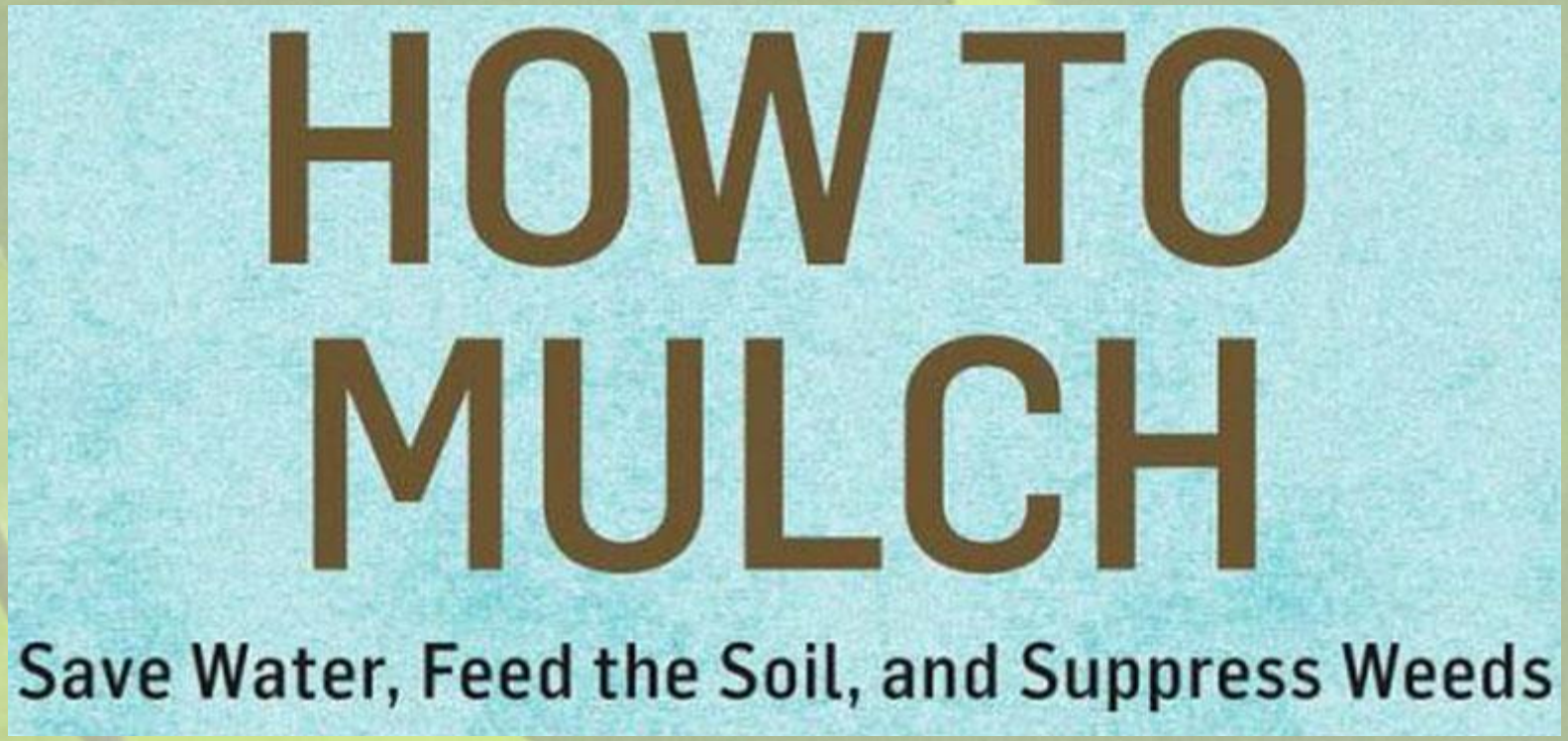
Inorganic Mulches Not Miraculous

- Mineral and synthetic materials
  - Rock/stone/gravel
  - Sheet plastic
  - Landscape fabrics/geotextiles
    - Limit water, air & fertilizer penetration
  - Rubber
- **Not miraculous**
  - Does not improve soil health
  - Damages soil health – cooks soil
    - Damages soil biology and plant roots
  - Does not absorb/hold water
  - Prevents & restricts air, water & nutrient penetration
  - Potentially toxic

Organic Fabric Alternatives

- Biodegradable:
  - Weed block paper
  - WeedGuard Plus
- Cardboard & newspaper
  - Sheet mulching

Miraculous Mulch

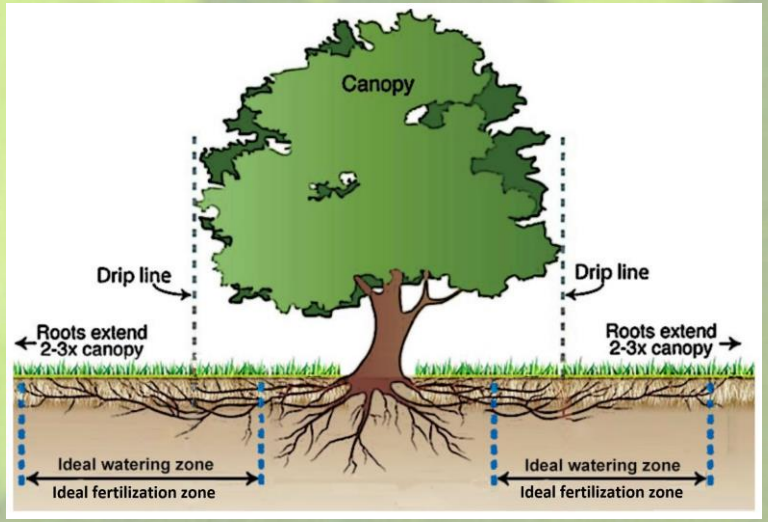


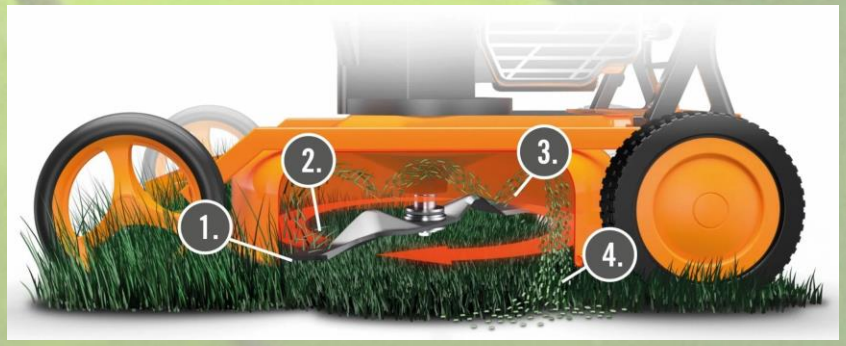
Mulch Application

- Before applying mulch break up surface crust
- Particle size determines thickness
  - Small particle size: 2” deep
  - Large particle size: 3-6” deep
- Wet mulch after applying
- Apply more as it becomes incorporated into the soil

Mulch Application

- Mulch placement
  - Avoid volcanoes
  - Away from plants & buildings
- Mulching mower
- Maintenance – add more

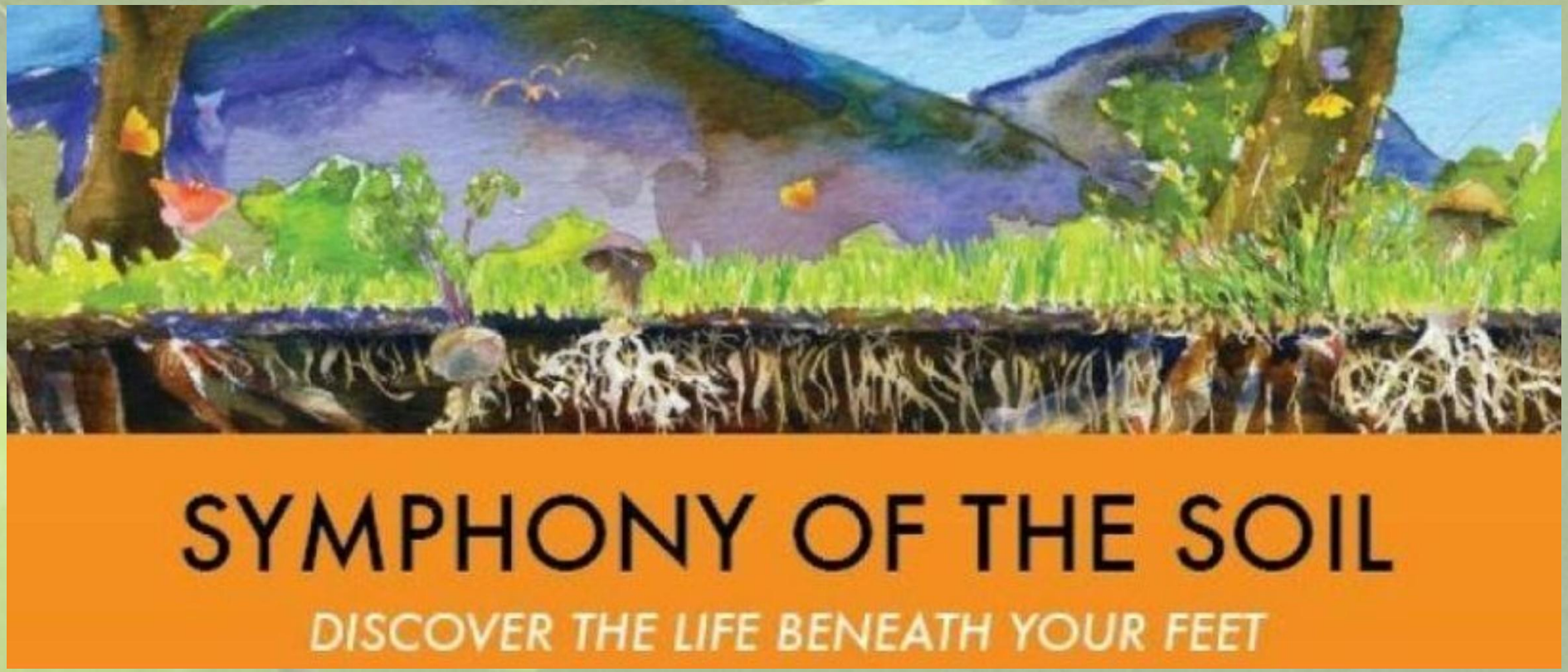




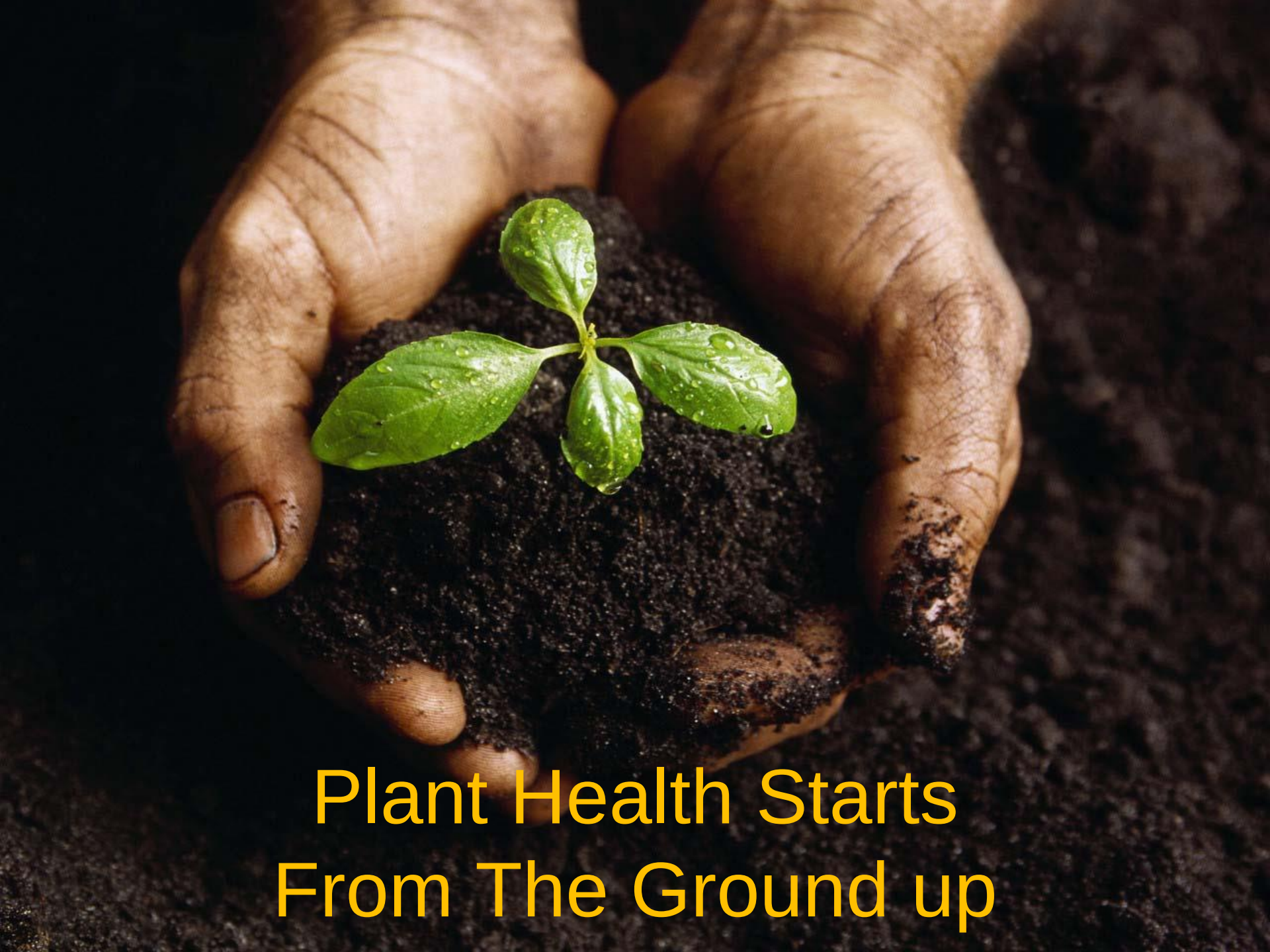
Tips to Create Spectacular Soil

- Use only organic fertilizers
- Avoid or minimize tillage
- Practice Integrated Pest Management
  - Eliminate/minimize pesticide use
  - Only use organic & least toxic pesticides
- Keep off wet soils
- Beware bad advice (know source)
- **<u>Keep the soil covered !!!</u>**
  - Living plants
  - **Mulch, compost, worm castings**
    - Worms: Mother Natures rototillers

Colossal Compost And Miraculous Mulch Make Spectacular Soil



https://symphonyofthesoil.com/


Plant Health Starts
From The Ground up

Colossal Compost & Miraculous Mulch Yields Spectacular "*Living*" Soil

Thank You For Your Attention

https://chwd.org/community

CITRUS HEIGHTS WATER DISTRICT