



Compost Tea and the Soil Food Web

Brandon Merchant

- Arizona Native
- Owner of Southwest Victory Gardens
- Former Pima County Certified Master Gardener
- Former President of Tucson Organic Gardeners
- SmartScape Certified

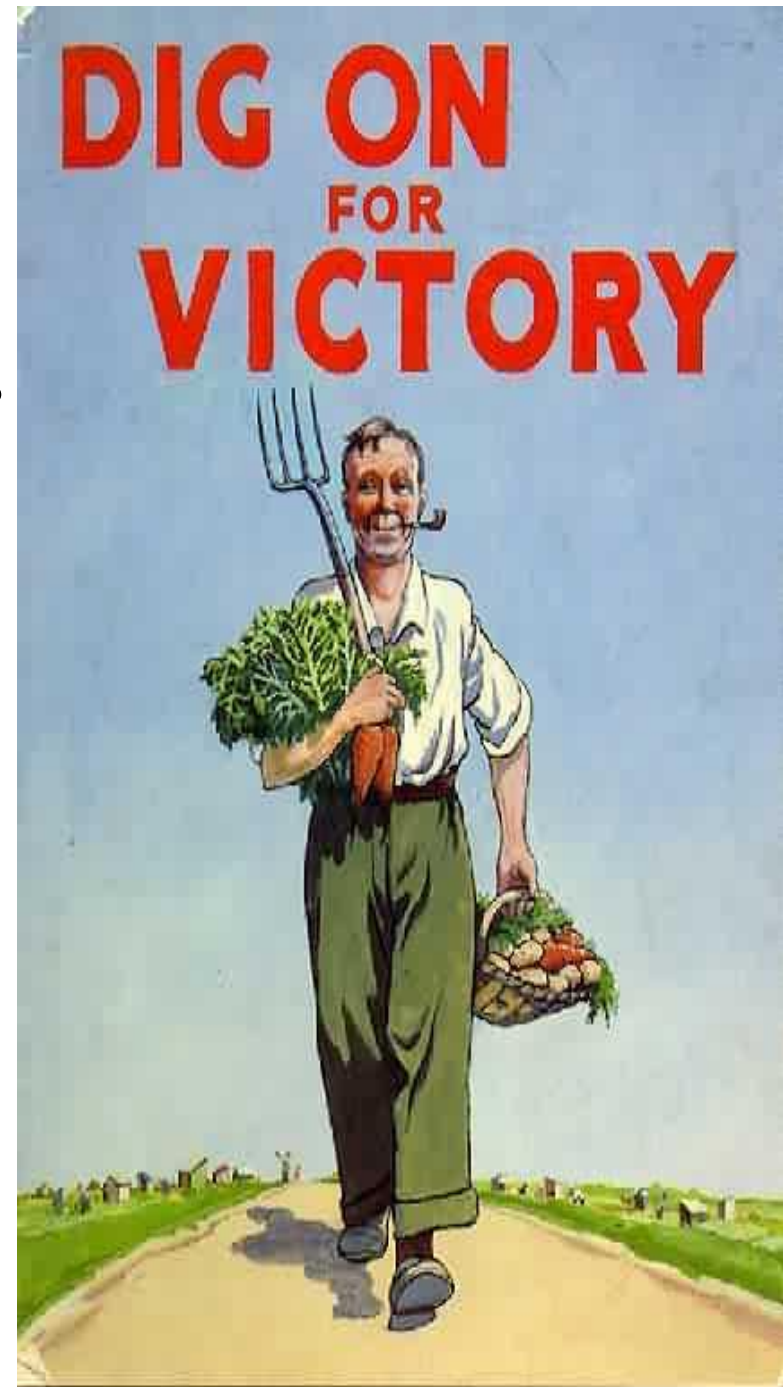




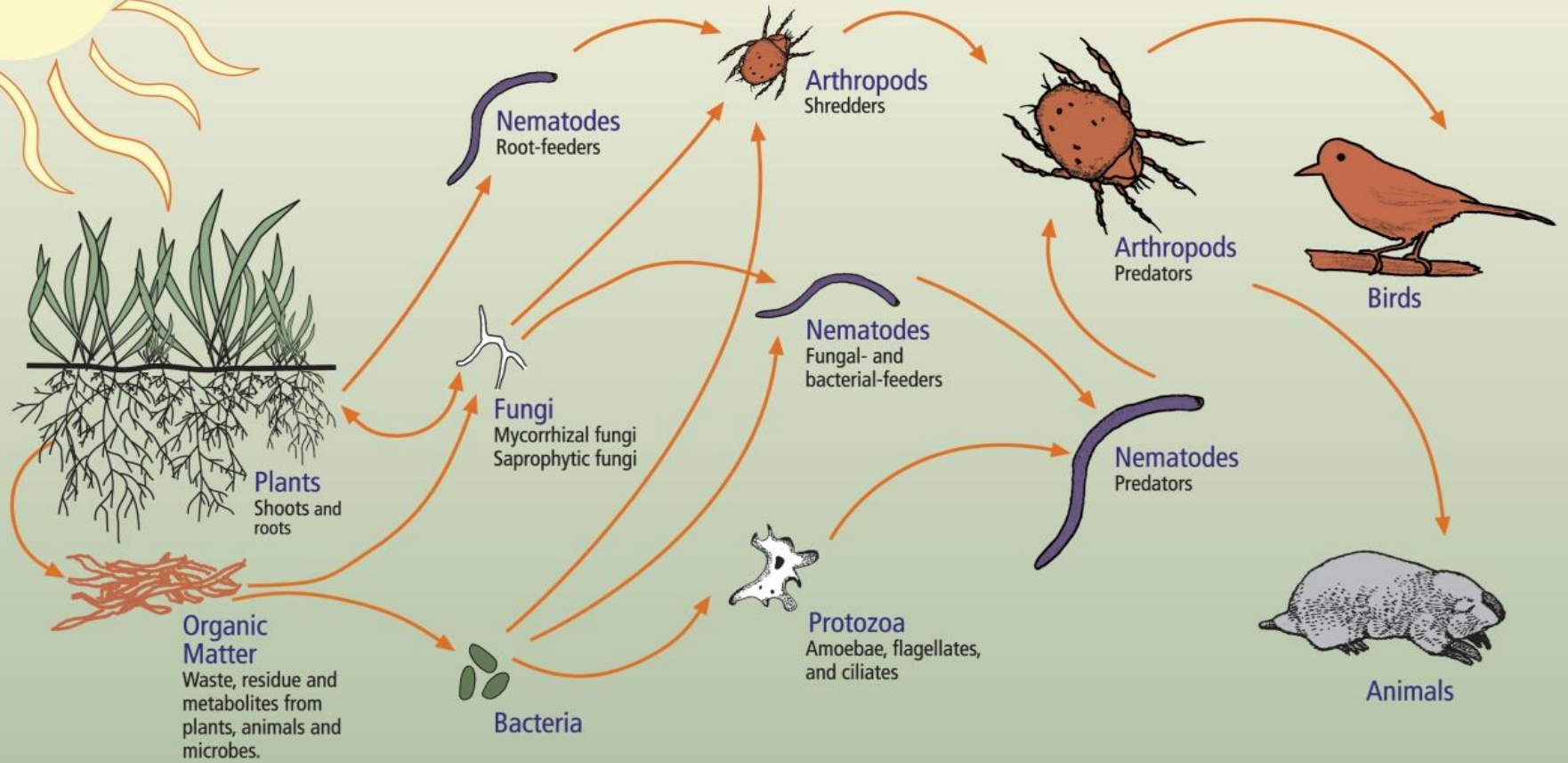
WWW.SOUTHWESTVICTORYGARDENS.COM/DOCUMENTS

Our Philosophy

- Healthy soil encourages healthy plants
- Healthy plants care for themselves
- Limit external inputs
- Reduce water usage
- Garden with our climate not against it
- Encourage a natural ecosystem
- Build community through gardening



The Soil Food Web



First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

Carl was
not a bear,

or a beaver.

Carl was ...



Why Healthy Soil?



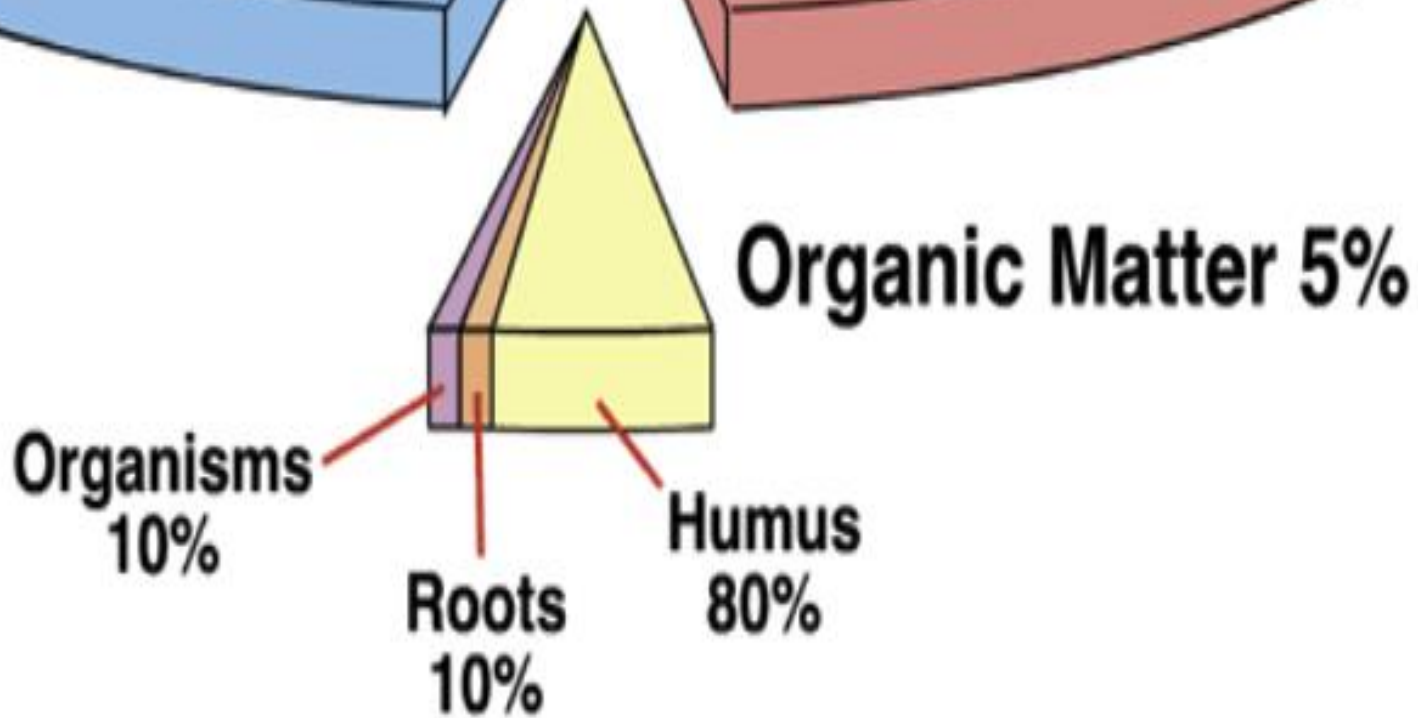
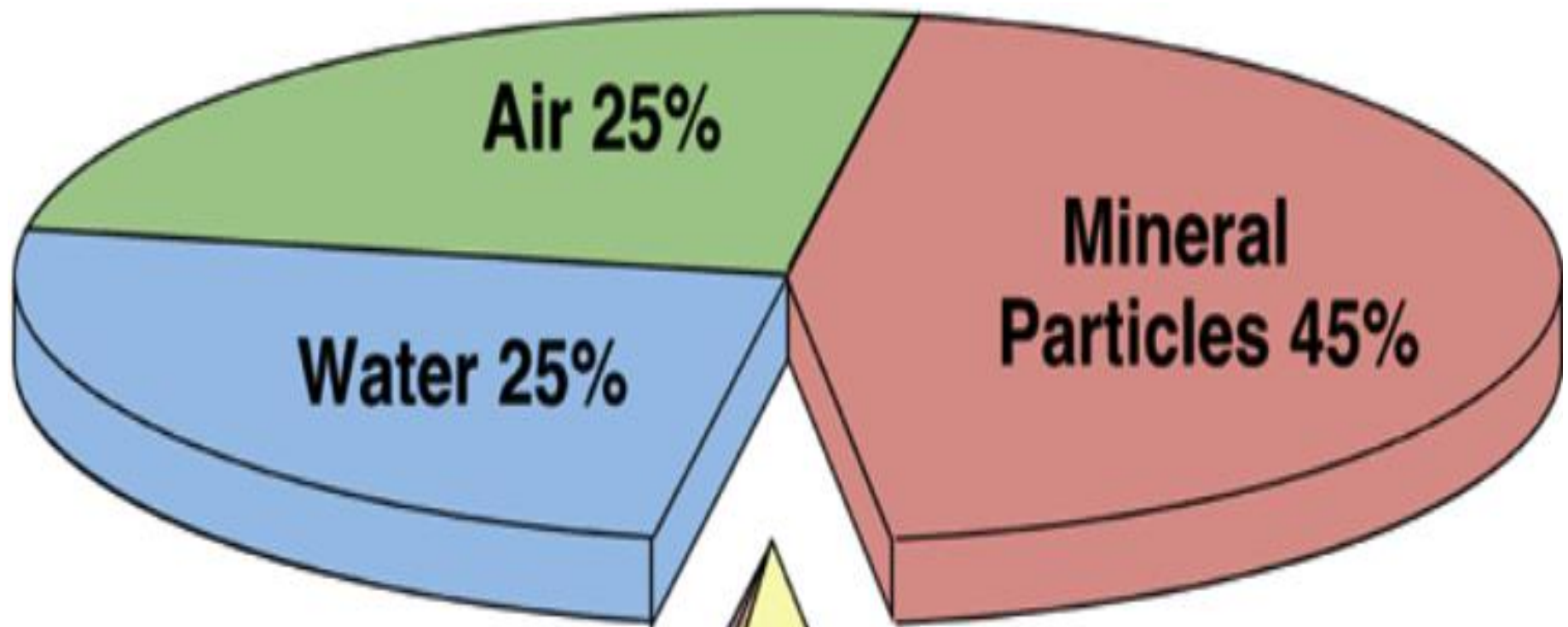
- 2nd Largest Carbon Reservoir on the Planet.
- Holds 4x More Carbon than Trees and Plants.
- In last 40 years, 1/3rd of World's Farmland has been Destroyed
- 40% of World's Soils are Classed as "Degraded" or "Seriously Degraded"



Food Waste from Modern Agriculture

- 40% of all food in the US is wasted
- 365 Million lbs. per day
- 1/8 Americans lack access to food
- Major contributor to global climate emissions





Characteristics of Soil

Desert Soil

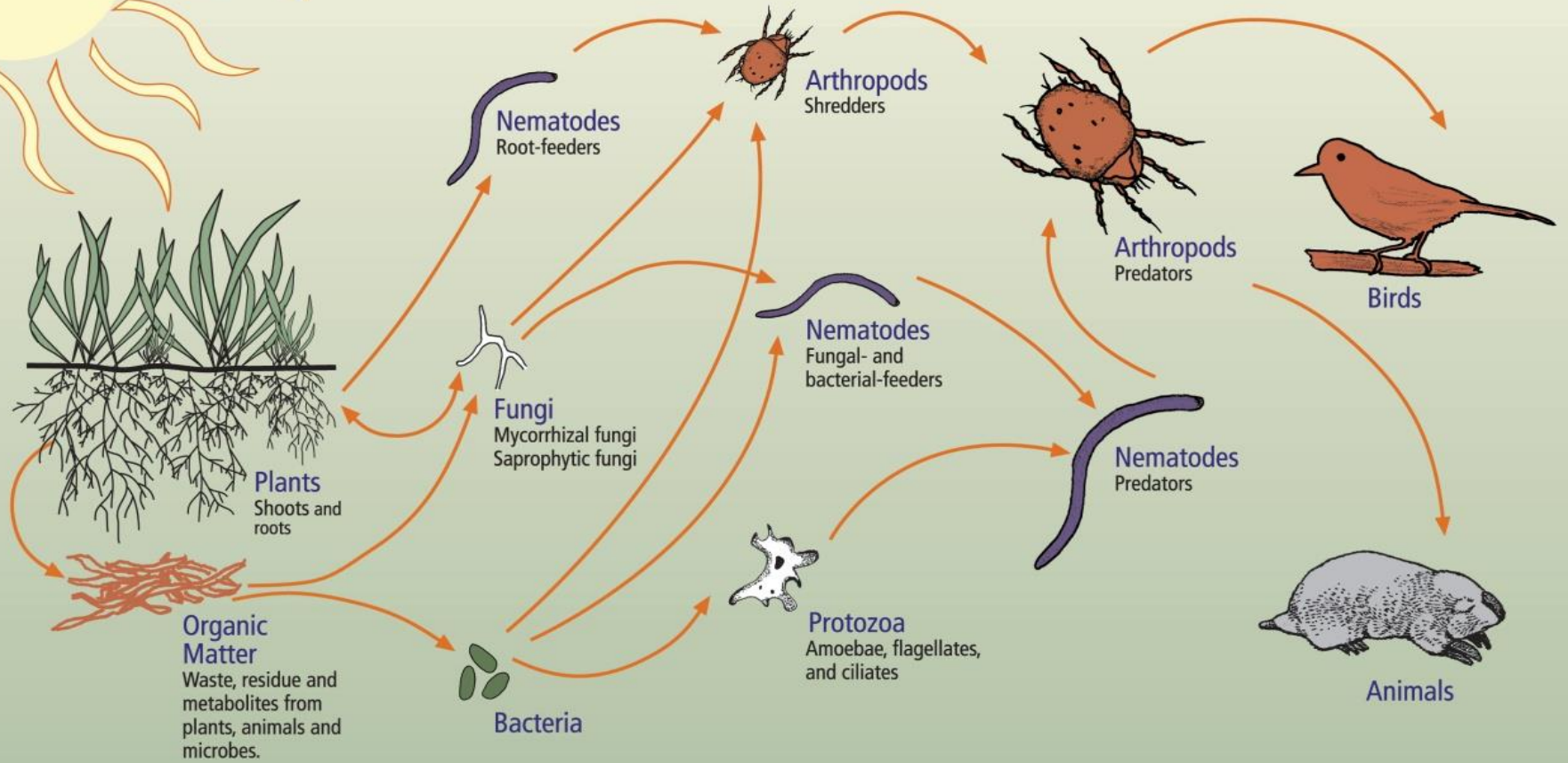
- Low Populations of Micro-Organisms
- Low in Organic Matter
- Lacks Nutrients
- Compacted
- High Ph

Healthy Soil

- High Population of Micro-Organisms
- High in Organic Matter
- No Toxins/Pesticides
- Balanced Nutrients/Ph
- Porous
- Good Tilth/Structure



The Soil Food Web



First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

Characteristics of Soil

Desert Soils

- Low Populations of Micro-Organisms
- Low in Organic Matter
- Lacks Nutrients
- Compacted
- High Ph

Healthy Soils

- High Population of Micro-Organisms
- High in Organic Matter
- No Toxins/Pesticides
- Balanced Nutrients/Ph
- Porous/Permeable
- Good Tilth/Structure

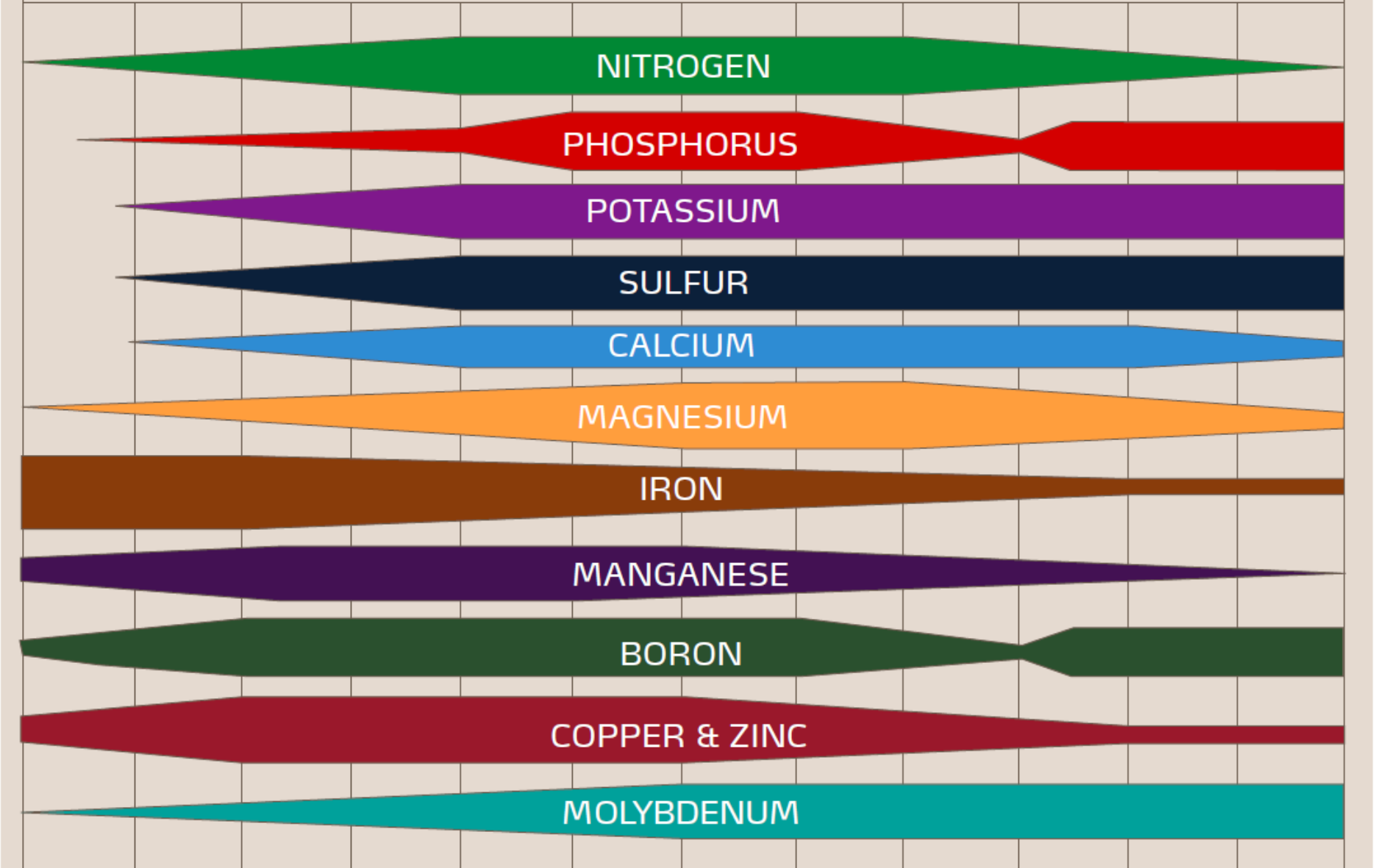


The Influence of Soil pH on Nutrient Availability

4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0

RANGE OF ACIDITY

RANGE OF ALKALINITY



Characteristics of Soil

Desert Soils

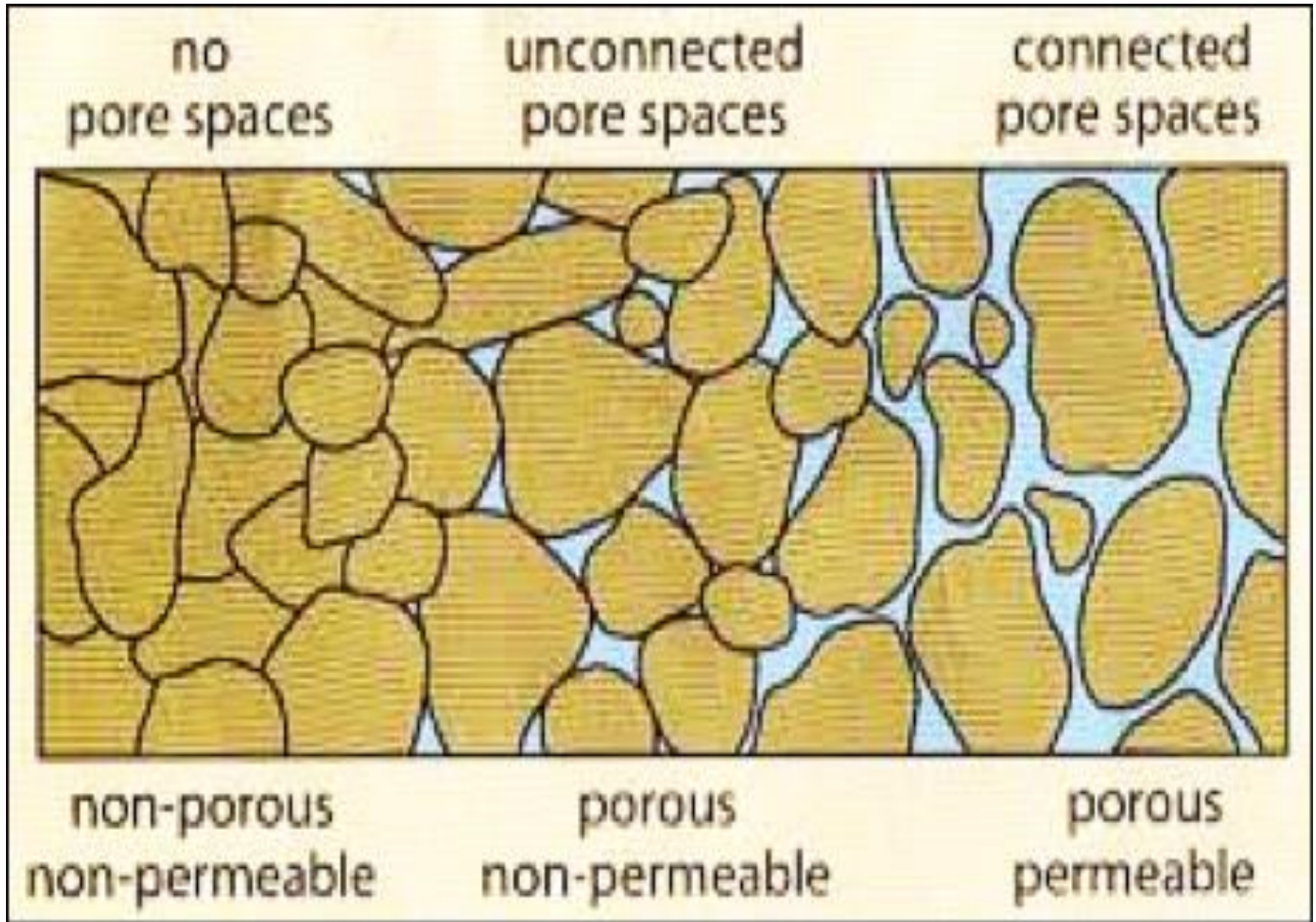
- Low Populations of Micro-Organisms
- Low in Organic Matter
- Lacks Nutrients
- Compacted
- High Ph

Healthy Soils

- High Population of Micro-Organisms
- High in Organic Matter
- No Toxins/Pesticides
- Balanced Nutrients/Ph
- Porous/Permeable
- Good Tilth/Texture



Tilling Destroys Soil Tilth



How to Build Healthy Soils

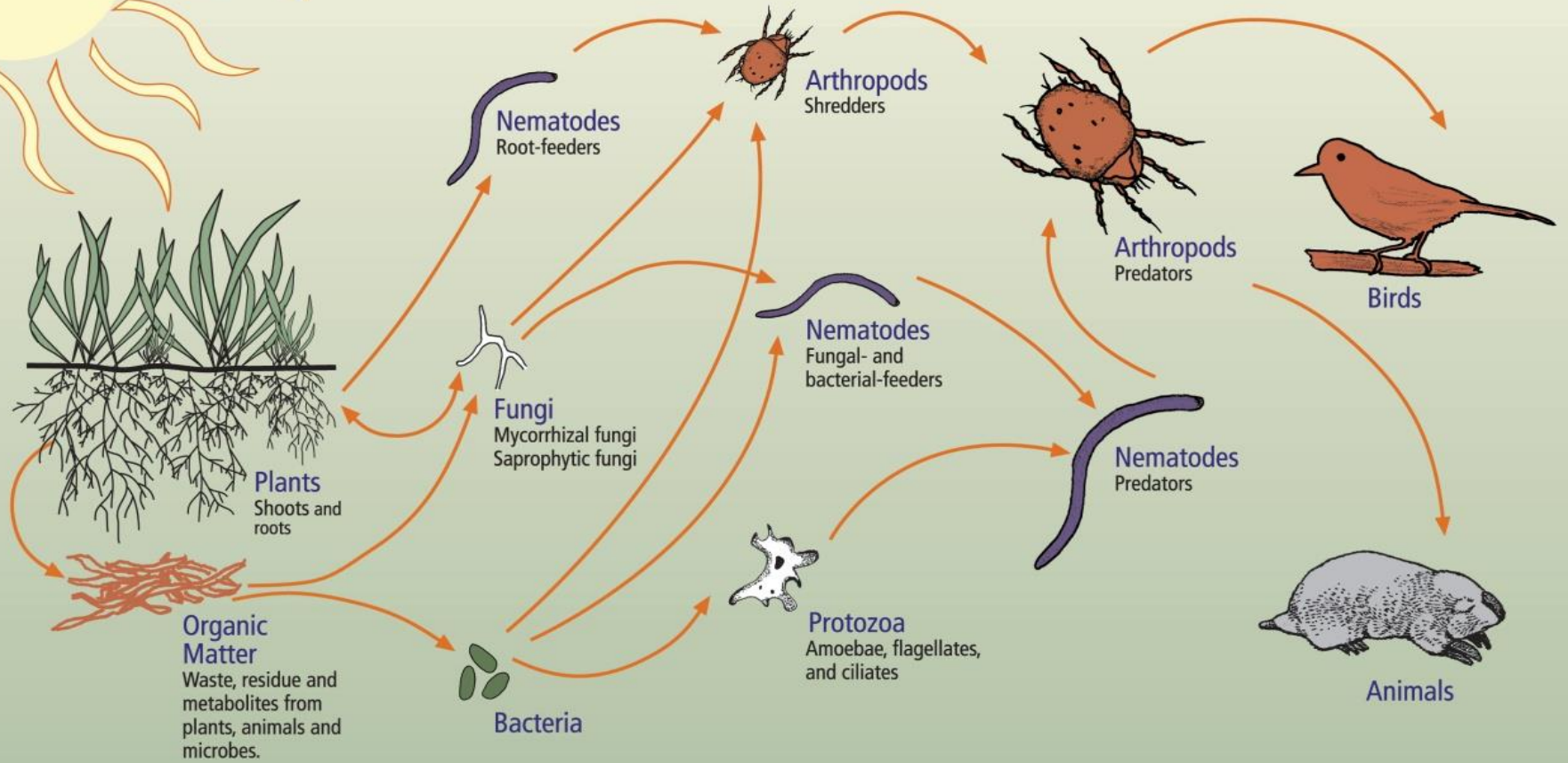
- Eliminate Synthetic Pesticides/Fertilizers
- Encourage the Soil Food Web
- Use Compost and Compost Teas
- No Till or Low Till
- Use Supplements if Needed
- Grow Roots Not Plants



Soil Food Web Gardening Rules:

1. Some plants prefer soils dominated by fungi; others prefer soils dominated by bacteria.
2. Most vegetables, annuals, and grasses prefer their nitrogen in nitrate form and do best in bacterially dominated soils.
3. Most trees, shrubs, and perennials prefer their nitrogen in ammonium form and do best in fungally dominated soils.

The Soil Food Web



First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

Soil Food Web Gardening Rules:

4. Compost can be used to inoculate beneficial microbes and life into soils around your yard and introduce, maintain, or alter the soil food web in a particular area.
5. Adding compost and its soil food web to the surface of the soil will inoculate the soil with the same soil food web.

Build the Soil – Compost

- Adds Soil Life
- Improves Tilth and Water Holding Capacity
- Balances Ph
- Eliminates Food Waste
- For New Gardens, Replace 50% of Native Soil with Compost.



Build the Soil – Compost



Be A “Microbe” Manager

- Traditional Composting
- Worm Composting
- Fermentation Methods

Build the Soil – Compost

Traditional Composting

- Bins, Heaps, Piles
- Hot or Cold
- Mixed Ratio of “Greens and Browns”
- Must be turned, and sifted
- Keep moist for best results



Build the Soil – Compost



Worm Bin Composting

- Nutrient Dense Fertilizer
- Indoors or Outdoors
- Can be Very Efficient

Build the Soil – Compost

Fermentation Composting

- Bokashi
- KNF
- Takakura



Soil Food Web Gardening Rules:

6. Aged, brown organic materials support fungi; fresh green organic materials support bacteria.
7. Mulch laid on the surface tends to support fungi; mulch worked into the soil tends to support bacteria.
8. If you wet and grind mulch thoroughly, it speeds up bacterial colonization.
9. Coarse, dryer mulches support fungal activity.

Build the Soil – Mulch and Cover Crop



- Mulch, Mulch, Mulch
- Wood Chips for Trees and Shrubs
- Alfalfa Hay for Vegetable Gardens
- Avoid Straw
- Biologic not Geologic

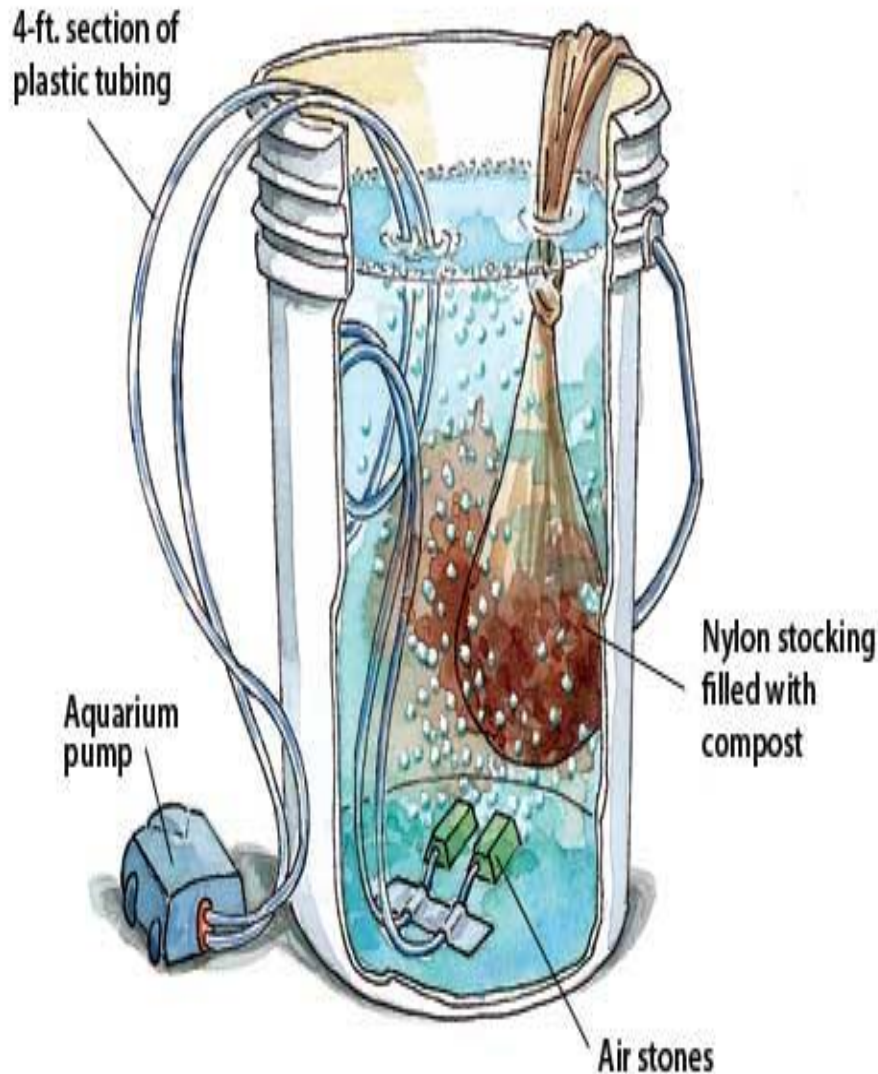
Soil Food Web Gardening Rules:

10. Sugars help bacteria multiply and grow; kelp, humic and fulvic acids, and phosphate rock dusts help fungi grow.

11. By choosing the compost you begin with and what nutrients you add to it, you can make teas that are heavily fungal, bacterially dominated or balanced.

12. Compost teas are very sensitive to chlorine and preservatives in the brewing water and ingredients.

Build the Soil – Compost Teas



Active Aerated Compost Teas (AACT)

- Soak Compost in water and use as soil amendment
- Adding Aeration and Sugars Increases effectiveness
- Add Supplemental Ingredients to Boost Micro-Biology Diversity

What AACT is Not:

- Compost Leachate
- Compost Extract
- Manure Tea
- Full of Bad Guys



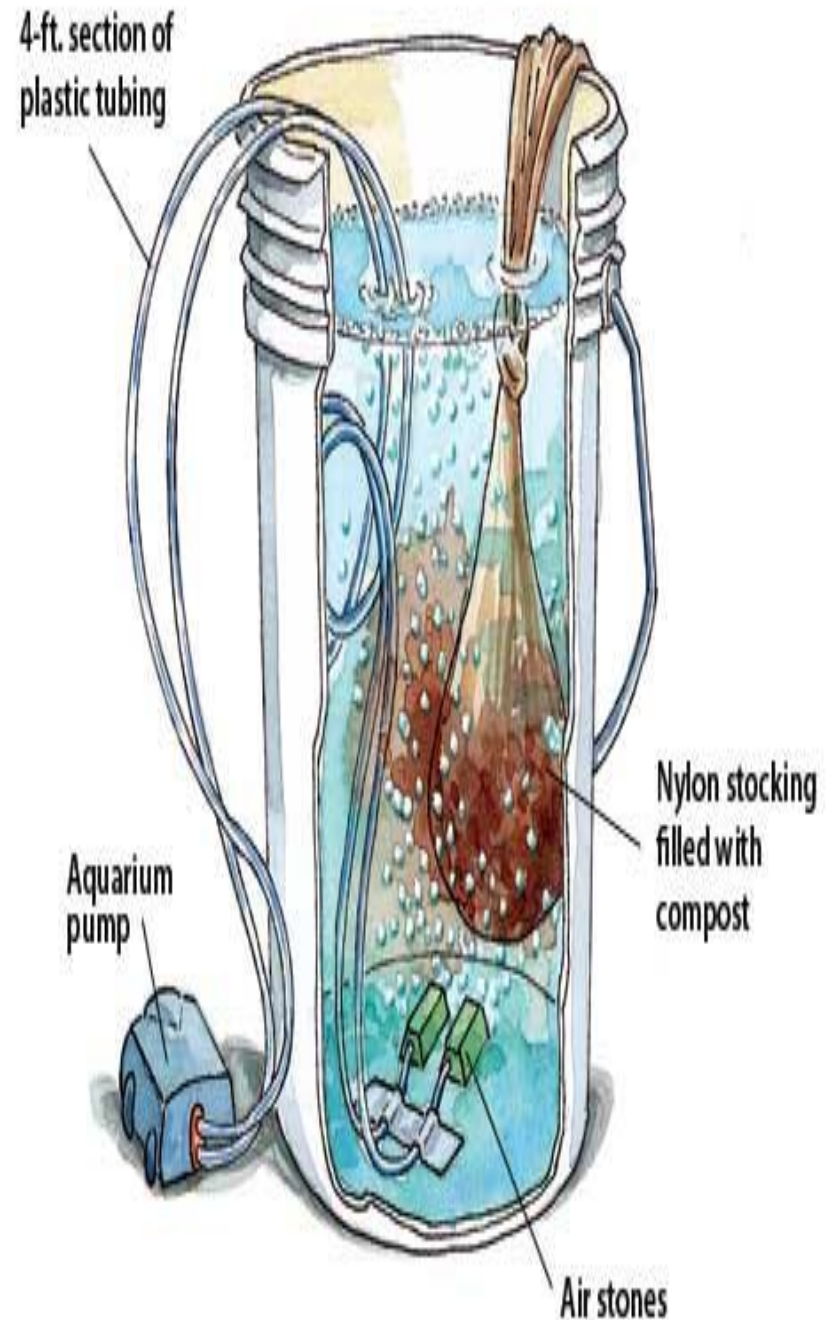


Modern Compost Tea

- Aerobic
- Safe
- Specialized

The Brewer

- 5 Gallon Bucket
- 2 Outlet Air Pump (min)
- ¼" Tubing (about 10')
- Air Stones or Soaker Hose
- Nylon Bag or Stocking



Setting Up the Brewer



- Bleach Everything
- Dechlorinated Water
- Room Temperature
- Brew in Shade
- Spillage
- Clean up Immediately when Finished

The Ingredients

- SFW Rule #10
- SFW Rule #11
- SFW Rule #12

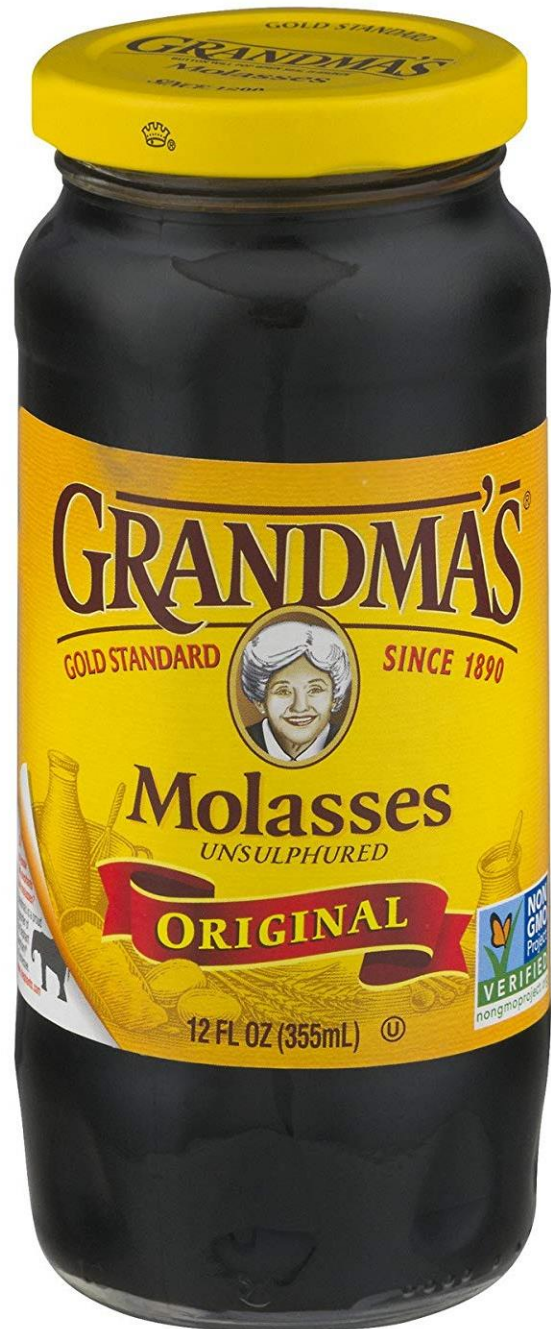


Soil Food Web Gardening Rules:

10. Sugars help bacteria multiply and grow; kelp, humic and fulvic acids, and phosphate rock dusts help fungi grow.

11. By choosing the compost you begin with and what nutrients you add to it, you can make teas that are heavily fungal, bacterially dominated or balanced.

12. Compost teas are very sensitive to chlorine and preservatives in the brewing water and ingredients.



Feed Bacteria

- Worm Castings
- Simple Sugars:
Molasses, Cane Syrup,
Maple Syrup, Fruit Juices
- Complex Sugars
- Fish Emulsion

Feed Fungi

- Kelp
- Fish Hydrolysate
- Fulvic and Humic Acids
- Rock Dusts
- Fruit Pulp
- Aloe Extract
- Yucca Extract



Give Fungi a Head Start



- Add Fungal Foods to Compost 1 Week Prior
- Soybean Meal, Powdered Malt, Oatmeal, Oat Bran, Powdered Baby Oatmeal
- Wet Compost and Store in Warm Dark Place

Teatime

- 12-48 Hour Brew
- Look for Bubbles
- Sweet Smell
- Add Mycorrhizal Fungi at the End of Brew
- Add Yucca Extract at End of Brew



Use Compost Teas Effectively

Type of Plant

- Cabbage Family
- Other Vegetables
- Berries & Shrubs
- Deciduous Trees
- Coniferous Trees

Type of Tea

- Highly Bacterial
- Moderately Bacterial
- Balanced
- Moderately Fungal
- Highly Fungal

Use as Foliar Spray



- Mildews
- Fungal Disease
- Leaf Spot
- Blight

Soil Food Web Gardening Rules:

13. Applications of synthetic fertilizers kill off most or all of the soil food web microbes.

14. Stay away from additives that have high NPK numbers.

15. Follow any chemical spraying or soil drenching with an application of compost tea

REDUCE YOUR IMPACT



- Eliminate pesticide use
- Substitute native landscapes for lawns and other high water use plants



Soil Food Web Gardening Rules:

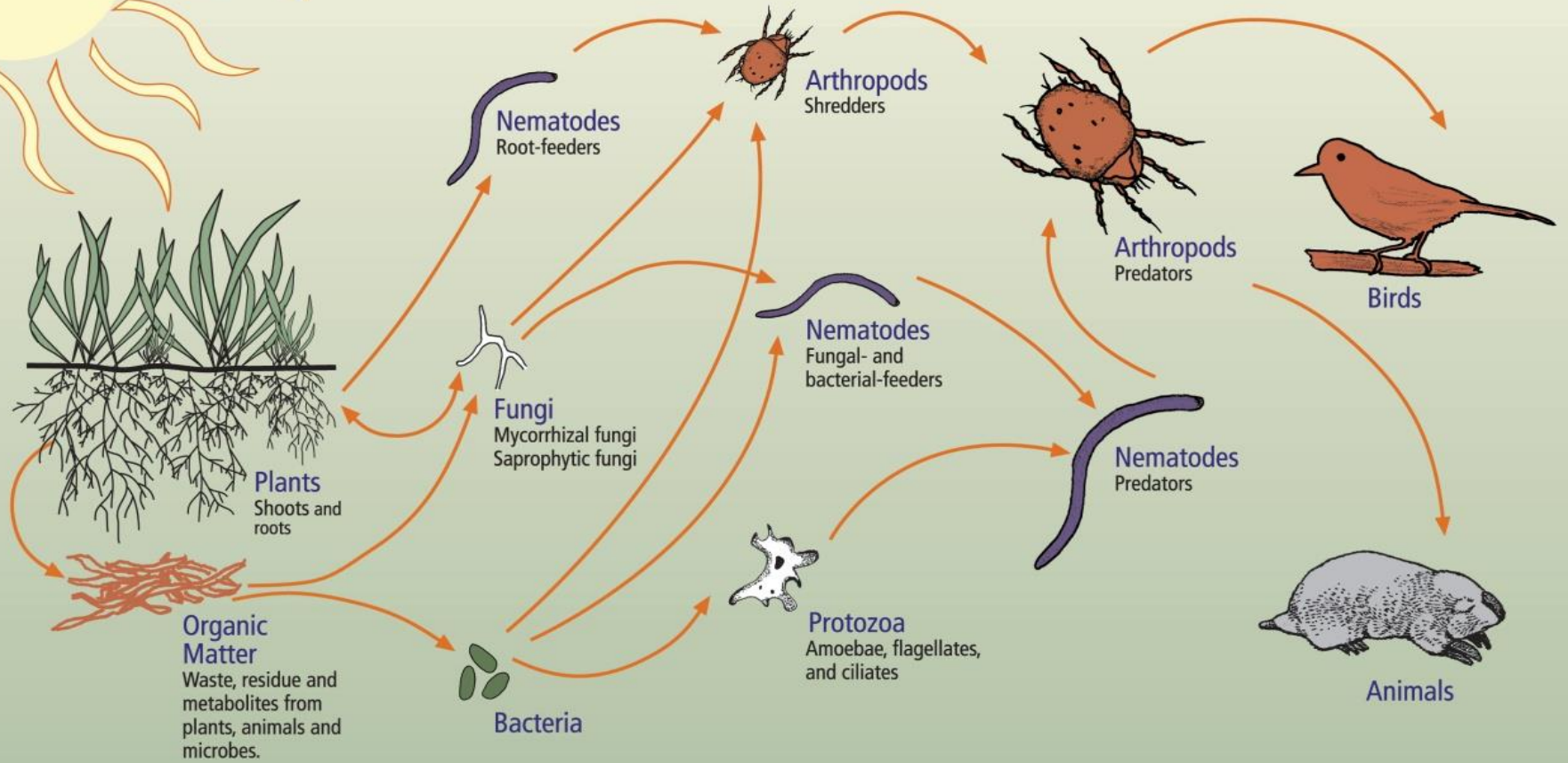
16. Most conifers and hardwood trees (birch, oak, beech, hickory) form micorrhizae with ectomycorrhizal fungi.
17. Most vegetables, annuals, grasses, shrubs, softwood trees, and perennials form mycorrhizae with endomycorrhizal fungi.
18. Rototilling and excessive soil disturbance destroy or severely damage the soil food web.
19. Always mix endomycorrhizal fungi with the seeds of annuals and vegetables at planting time or apply them to roots at transplanting.



Soil Inoculants and Mycorrhiza



The Soil Food Web



First trophic level:
Photosynthesizers

Second trophic level:
Decomposers
Mutualists
Pathogens, Parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

RESOURCES

- Community Food Bank
- Tanks Green Stuff
- EcoGro
- Reading List
- Gardening Clubs
- Local Businesses
- Friends and Family





Thank you!

www.southwestvictorygardens.com/Documents

(520) 576-7085