

# We Are Gathered Here Today...

- We want to grow edible crops and other plants
- Crops, ornamentals and trees require distinct sets of nutrients for optimal growth and development
- Each nutrient element is essential because no other element can substitute for it
- Plants can't complete their life cycles without these nutrients

# Nutrient refresher

- Some nutrients come from the atmosphere:  
Hydrogen, Carbon and Oxygen
- Most nutrients come from the soil:
  - Nitrogen (stem and leaf growth)
  - Phosphorus (germination, flowering, fruiting)
  - Potassium (roots, disease-resistance, growth)
  - Magnesium (chlorophyll, sugars and starches)
  - Sulfur (chlorophyll production, oil content)
  - Calcium (development of terminal buds and roots)

# Minor and Trace Soil Nutrients

- Chlorine (roots, water retention)
- Iron (chlorophyll)
- Manganese (chlorophyll)
- Boron (solid, well-formed fruit, root crops)
- Zinc (more fruit)
- Cooper (leaf opening)
- Molybdenum (roots)
- Sodium
- Cobalt
- Silicon
- Selenium
- Nickel

# Soil.....Part I

- It's alive, as opposed to “dirt”
- It's the most complex of all habitats
- Composed of:
  - Minerals (rocks, pebbles, sand, silt, clay)
  - Organic Matter (decayed plants, animal matter)
  - Air
  - Water

# From April, 2016



- Layer of organic matter floating atop layers of clay, silt and sand at DCGO

# Where are the Nutrients?

- Most are locked within the mineral components of the soil,
- Some gaseous nutrients are in the air pockets between mineral particles,
- Some are in the water stored between mineral particles,
- Most depend upon microorganisms to convert them to plant-usable forms

# So ??

- All that mineral material contains nutrients but no life,
- The nutrients contained in the minerals aren't in a plant-usable form,
- All the great nutrients and mineral texture in the world won't support satisfactory plant growth.
  
- It's the **ORGANIC MATTER** that brings life to soil and which leads us to.....

# Soil....Part II

## ORGANIC MATTER

- There are an estimated 500,000 to over a billion organisms in each teaspoon of organic matter
- Microfauna include bacteria, fungi and viruses, protozoa, microarthropods and nematodes....really tiny creatures which play the vital role of converting plant and animal debris into nutrients in plant-available forms.



# The magic begins with...

Beneficial bacteria and fungi in the soil, which

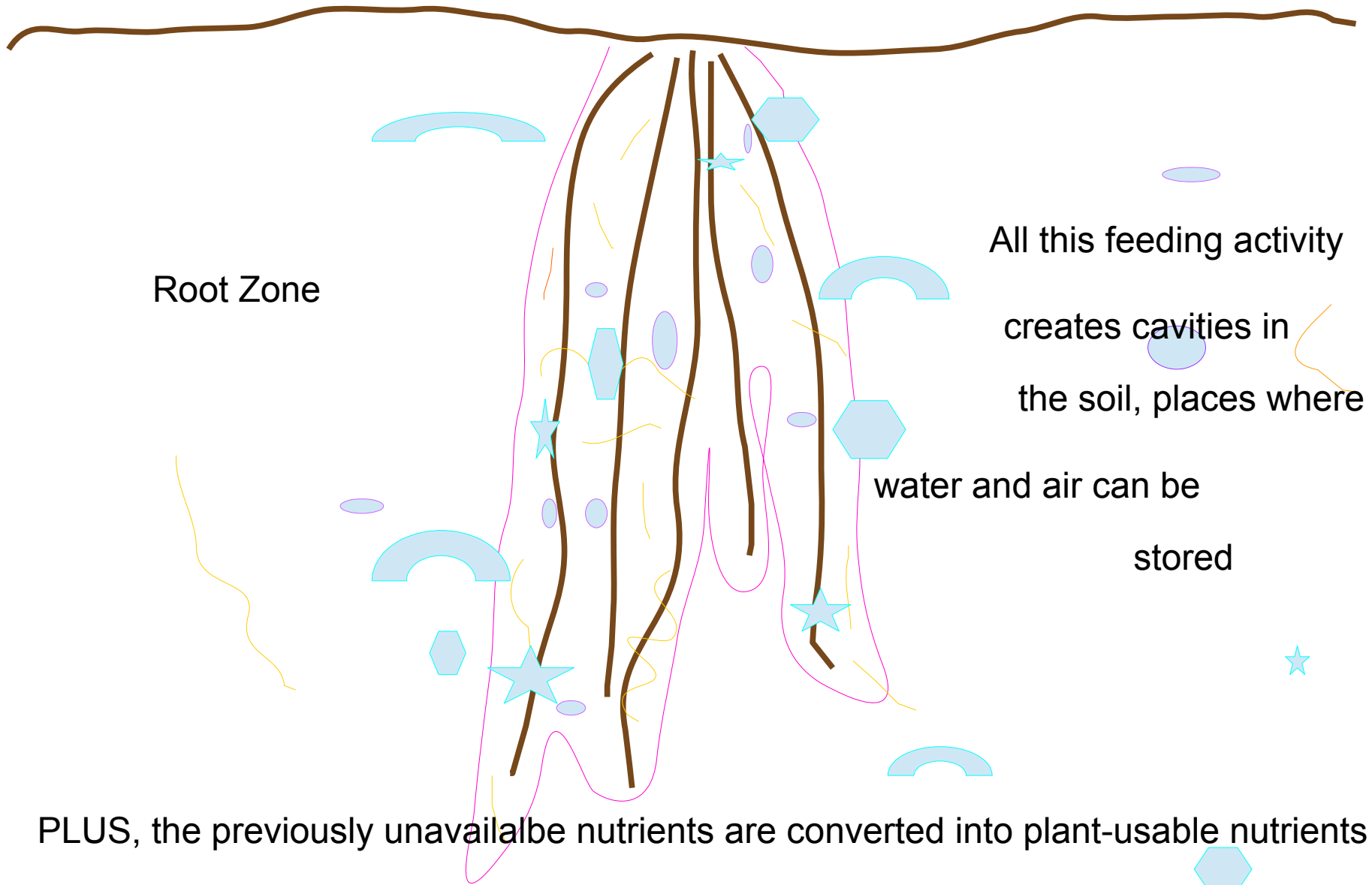
- Degrade residual toxic chemicals
- Tie up nutrients present in the mineral particulate so they are not leachable and lost as water moves through the soil
- Serve as food for protozoa, beneficial nematodes and micor-arthopods which, in turn, release the tied-up nutrients in plant-available form

# The Good News

- All organic matter has some level of bacteria

# The Other News

- Fungi levels vary GREATLY
- What will grow successfully is dependent upon the fungi to bacteria ratio
  - 1 fungi : 10 bacteria = weeds
  - 7 fungi : 10 bacteria = vegetables, grasses
  - 1 to 2 fungi : 1 bacteria = farm crops, high grasses
  - 2.1 to 8.1 fungi : 1 bacteria = shrubs, vines
  - 8.1 to 100 fungi : 1 bacteria = deciduous trees
  - 100 to 1000 fungi : 1 bacteria = old growth forests



Root Zone

All this feeding activity  
creates cavities in  
the soil, places where  
water and air can be  
stored

PLUS, the previously unavailalbe nutrients are converted into plant-usable nutrients  
by the consumers, which squish juices from the consumed bacteria and fungi!

# Soil Food Web

- Plants naturally emit EXUDATES (sugars, carbohydrates and proteins) to attract and feed bacteria and fungi in the immediate root zone.
- The attracted bacteria and fungi soak up all the soluble nutrients in the area and hold them, surrounding the plant roots, exactly where they are needed.
- In turn, the bacteria and fungi attract and are eaten by protozoa, micro-arthropods and nematodes which then excrete the nutrients in plant-friendly form, again, right where they are needed in the root zone.

# Mother Nature's Miracle

- Specific plant exudates attract specific fungi and bacteria,
- Which lock in specific nutrients, attract and are consumed by specific protozoa, microarthropods and beneficial nematodes,
- Which, in turn, are consumed by worms, insects and other animals,
- Which all excrete the consumed nutrients in plant-available forms,
- Which supply the plant with the needed nutrients.

# What Gardeners Can Do

- Boost the Organic Matter in our soil by
  - Working compost into the soil
  - Top and side dressing with compost without disturbing the soil beneath
  - Skipping the mineral matter all together and grow plants in compost (“soil-less potting soil”)
  - Applying compost tea

# Compost and Compost Tea

- Increase the biomass and species diversity of microbes
- Increase the numbers of predator organisms
- Increase the ability of soil to hold nutrients and retain water
- Reduce fertilizer use and leaching into ground water
- Reduce salt accumulation in soils
- Improve the soil pH buffering ability through microbe diversity



# More.....

- Leaving roots of harvested plants in the soil to decompose
- Utilizing “green mulch”, such as sedum, clover, ajuga, creeping jenny and other evergreen groundcovers. These help reduce evaporation, maintain even soil temps, limit erosion and control “weeds”
- Burying composting materials near or under the root zones of established plants (Hügelkultur)

# Hügelkultur

- A composting process using raised beds constructed from decaying wood debris and other compostable biomass.
- The process replicates the natural process of decomposition that occurs on forest floors. Fallen trees become nurse logs; as the wood decays, its porosity increases, storing more water like a sponge.
- The process improves soil fertility, water retention, soil warming.

# Hügelkultur



- One of the paw paw trees in the DCGO orchard in January, 2017



# And Now...



# And now...

- Compost is available free to DeKalb residents at the following locations:
  - Northern Avenue & Memorial Drive (next to the Tax Commissioner's office)
  - North Transfer Station, 4600 Buford Highway, Chamblee 30341
  - Seminole Road Landfill, 4203 Clevefont Rd., Ellenwood 30294
  - East Transfer Station, 1750 Rogers Lake Rd., Lithonia 30058
- Inform the scale attendant that you are a DeKalb County resident and would like to pick up compost.
- Residents are responsible for collecting and placing compost in their designated container.

# Even easier...

- Delivery of Compost: Compost can be purchased and delivered to your location at a cost of \$7.50 per cubic yard.
- Additional information on compost is available by calling (404) 687-4030 or at [www.dekalbcountyga.gov/sanitation/mulch-and-compost](http://www.dekalbcountyga.gov/sanitation/mulch-and-compost)