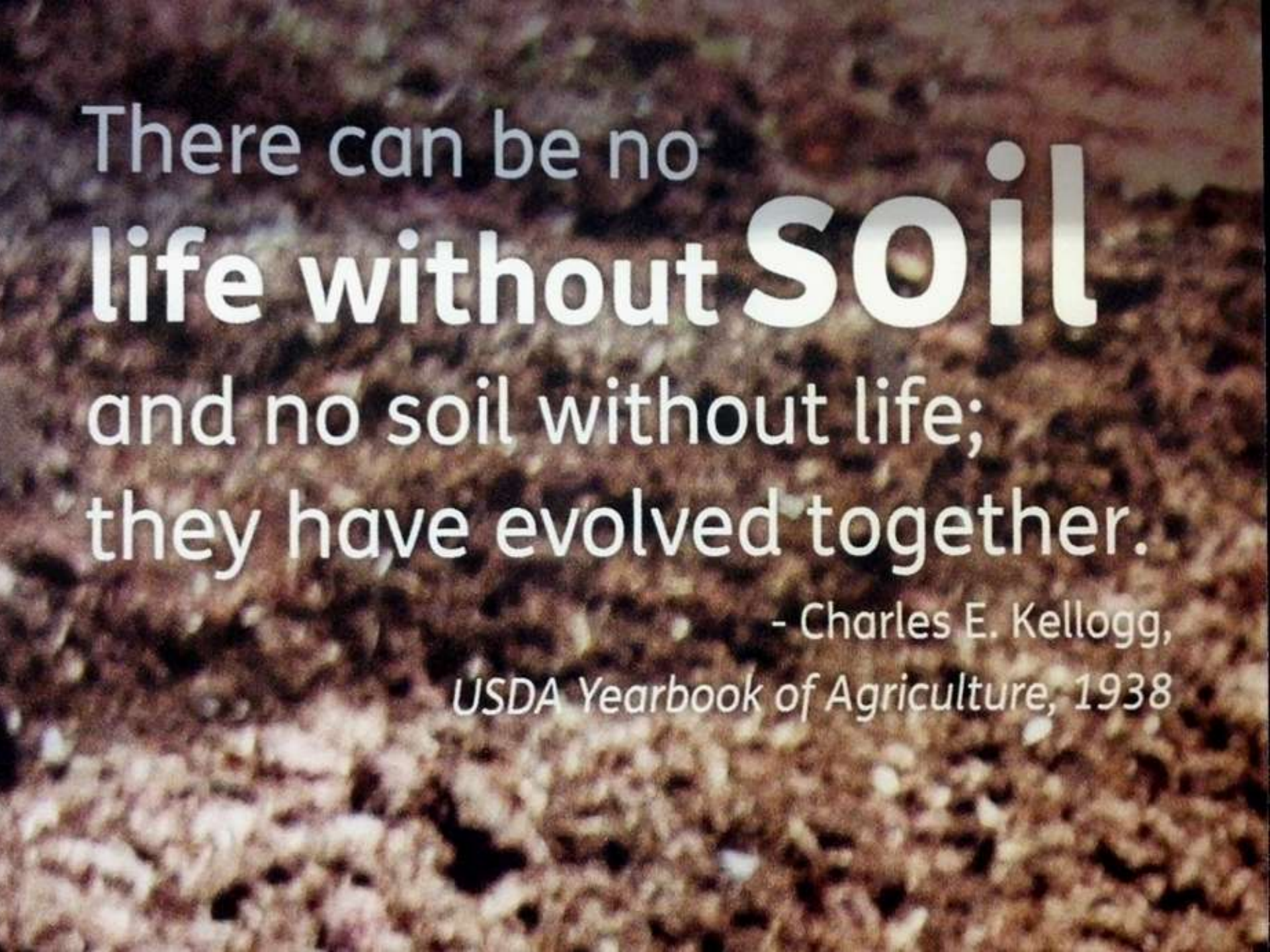


# Soil Health and Fertilizer



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There can be no  
**life without Soil**  
and no soil without life;  
they have evolved together.

- Charles E. Kellogg,  
*USDA Yearbook of Agriculture, 1938*



# What is Soil :

- Weathered rock, formed from a slow and sequential set of processes involving physical, chemical and biological factors



Soil Profile

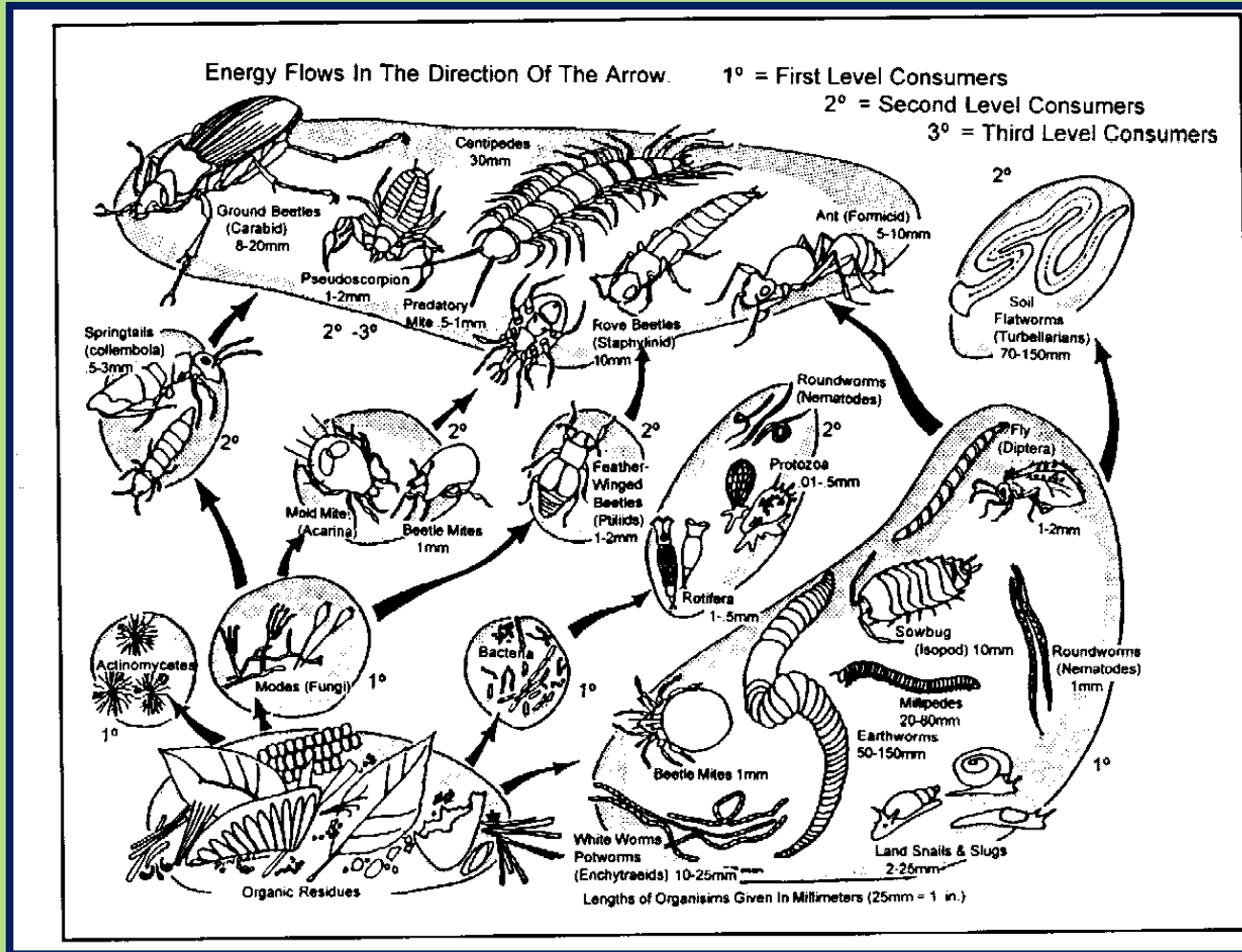
# Florida's Sandy Soil

- Poor water holding capacity
- Poor nutrient holding capacity
- Low in organic matter
- Prone to leaching



# Soil Food Web


Healthy soil is alive with organisms



# Soil Food Web

- In nature, plants grow without the addition of chemical fertilizers
- Earthworms, insects, nematodes, bacteria, and fungi help to decompose organic matter, which:
  - Slowly releases nutrients
  - Dissolves minerals
  - Lowers pH



 Synthetic chemical fertilizers kill the soil food web organisms

# Plant Roots in the Soil

- Respire- break down sugar for energy
- Need oxygen
- Absorb nutrients from the soil solution (thin water layer around soil particles)
- Release sugars into the soil to nurture soil microorganisms



# Soil Bacteria...

- Thrive in the rhizosphere
- Dominate in grasslands and agricultural fields
- Promote plant growth
  - Certain strains of *Pseudomonas* and *Xanthomonas*
    - produce growth factors
    - produce compounds that inhibit pathogens



# Soil Fungi...

- Bind soil particles creating aggregates that improve water holding capacity
- Control damaging organisms
- Form mycorrhizal associations with plant roots
  - Symbiotic association
  - Link root cells to soil particles



# Earthworms & Other Critters

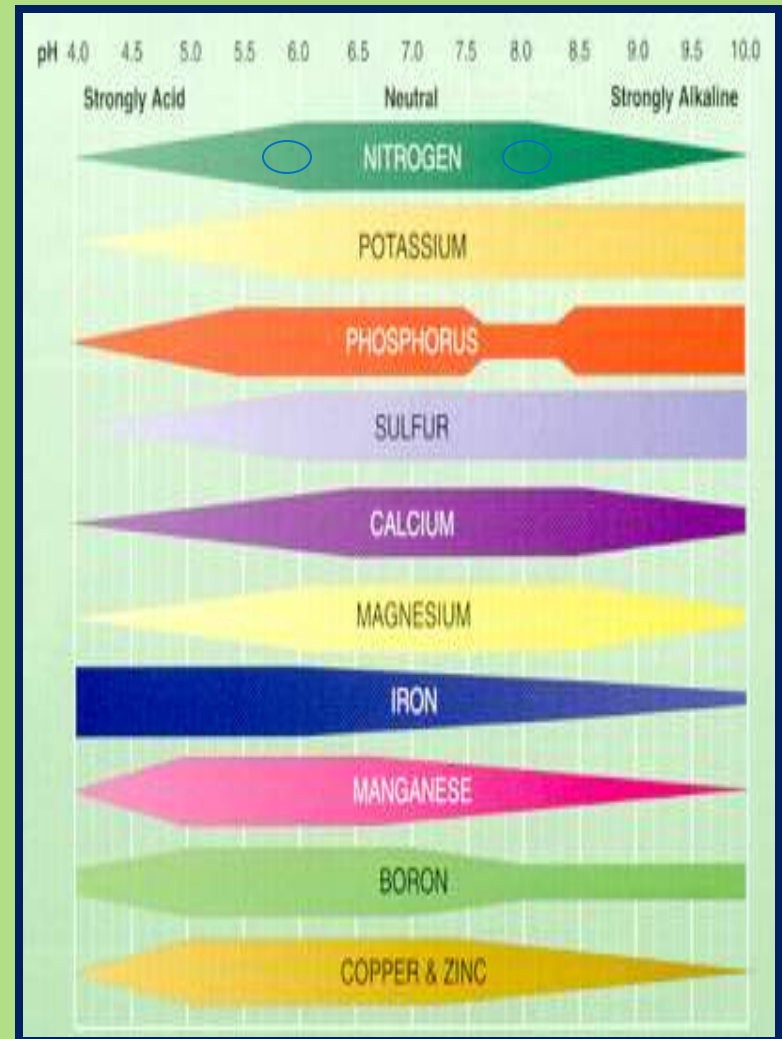
- Mix and aggregate the soil
- Increase infiltration
- Improve water holding capacity
- Provide channels for root growth
- Bury and shred plant residue



# Soil pH and Plant Nutrition

**Vegetable plants grow best in soil pH range of 6.0 – 6.8....**

- Some plants need acid pH to absorb Iron
- Phosphorus and micronutrients might not be available at high pH.



# Soil Testing

Soil pH, and Nutritional analysis  
performed at UF Soils Lab

- Soil Test Supplies
  - Bucket or large container
  - Hand spade
  - Plastic baggies
  - Marker to label baggies





# Soil pH

- **Raising pH (Alkalinity)**
  - Lime – adds Calcium, can help with blossom end rot
- **Lowering pH (Acidity)**
  - Little can be done to lower it permanently
  - Organic matter over time
  - Marginally-alkaline soils – pH can be temporarily lowered with elemental sulfur



# Amendments for Soil

“Feed the soil and the soil will nurture the plants”

## Organic Matter

- Compost
  - Composted in a bin
  - Purchased
  - Composted in the bed
- Seaweed/Kelp
- Manure (compost first)
- Green manure
- Natural minerals
- Molasses ?



# Organic Matter

- Improves soil-
  - water holding capacity
  - condition and structure
  - resistance to erosion
  - pH buffering
- Supports living soil organisms
- Reduces rate of nutrient release
- Provides slow release nutrients
- Suppresses plant disease



# Cover Crops/Green Manure

- Green manure supplies soil organic matter
- Nitrogen protected from leaching
- Legumes fix Nitrogen from air
  - Turn under before they bloom
- High moisture content desirable
- Sunn Hemp (*Crotalaria juncea*) – can reduce Nematode levels
  - <http://edis.ifas.ufl.edu/pdf/VH/VH03700.pdf>



# Soil Solarization

- Performed during hot summer months
- Manage weeds, nematodes, diseases and insects
- Use only clear plastic
- Covered at least 6 weeks
- Reduces pests and weeds for 3 – 4 months



Disadvantage: Damages soil food web, especially mycorrhizae

# Using Mulch

Choose the right type for Veggie gardens

- Organic only
  - Grass clippings
  - Leaves
  - Pine needles
  - Straw



According to research reported in Organic Gardening

# Fertilizers

## Based on Type

- Organic
- Inorganic

## Based on Availability

- Slow/controlled release
- Water soluble



# Fertilizers

## Provides nutrients

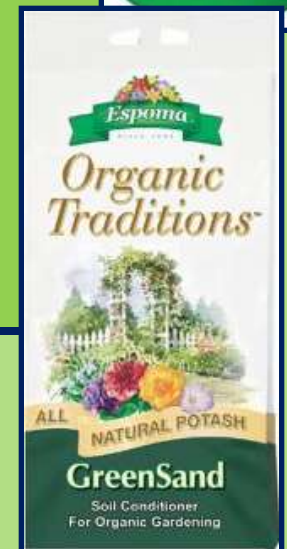
- Plants take up dissolved nutrients, not particulate matter
- **Slow-release nutrients**
  - Manures,
  - Composts,
  - Seaweed/Kelp liquid,
  - Worm castings,
  - Fish emulsion (some controversy).
  - Organic commercial fertilizers
- **Quick-release nutrients**
  - 100% water-soluble
  - Leach rapidly from sandy soils





# Fertilizers

- Natural minerals
  - Seaweed/Kelp
  - Azomite
  - Green sand
  - Bone meal & Blood meal – byproducts of meat slaughter industry



# Basic Principles for Fertilizing

- Is it what you need
- Read all label information
- Is formulation appropriate for targeted plants
- Consider soil pH
- Apply minimum amount needed



# Pinellas County Fertilizer Ordinance

- June 1 through Sept. 30
- Say no to NITROGEN (N) and PHOSPHOROUS (P).
- Bans the sale or use of fertilizer with N or P
- Green up with Iron Sulfate
- Summer blend fertilizers
- **Does not** apply to vegetables and fruit trees



# Containers and Raised Beds

**Both are exempt from summer ban**

- Veggie gardens need complete fertilizer
  - Nitrogen, Phosphorus and Potassium
  - Micro-nutrients





# Why Apply Fertilizer?

- To obtain a desired result:
  - Promote root and shoot growth
  - Enhance flowers or fruit production
  - Correct or prevent nutrient deficiencies



# Selecting Fertilizer

- Don't need a lot of different fertilizers
  - Learn to identify nutritional deficiencies
- If applying N, you need to consider what source to use
  - Water Soluble- rapidly released to plants
  - Water Insoluble- slowly released
  - For landscape must be 50% slow release
- More slow release nutrients the better

# Selecting Fertilizer

## Lawns

- Equal amounts of Nitrogen & Potassium
- 15 – 0 -15 or similar
- No Phosphorus (unless deficient on soil test)

## Shrubs & Trees

- Could get enough from grass fertilizer
- 8 – 0 – 10 or 12 is good ratio



# Water Insoluble Nitrogen

- **Slowly released to plants**
  - Organic N
  - IBDU
  - Ureaform, or nitroform
  - Sulfur coated urea
- **Controlled release**
  - Water soluble N coated with plastic or polymer
  - Drop-type spreaders can damage coating



# Water Soluble Nitrogen

- Rapidly released to plants
  - Nitrate
  - Ammonium nitrate & ammonium sulfate
  - Urea
- Potential for leaching and burning
  - Postpone if rainfall is expected
  - Too much water can move the nutrients past the root zone





# Palms are different:



- Develop nutrient deficiencies if Lawn fertilizer used
- Recommended
  - 8% N – 0% P – 12% K – 4% Mg – 4% Mn
  - 100% Slow release
  - Use for whole landscape
- Micro-nutrient sprays or drench for other minor elements

# Fertilizers – When to Apply?

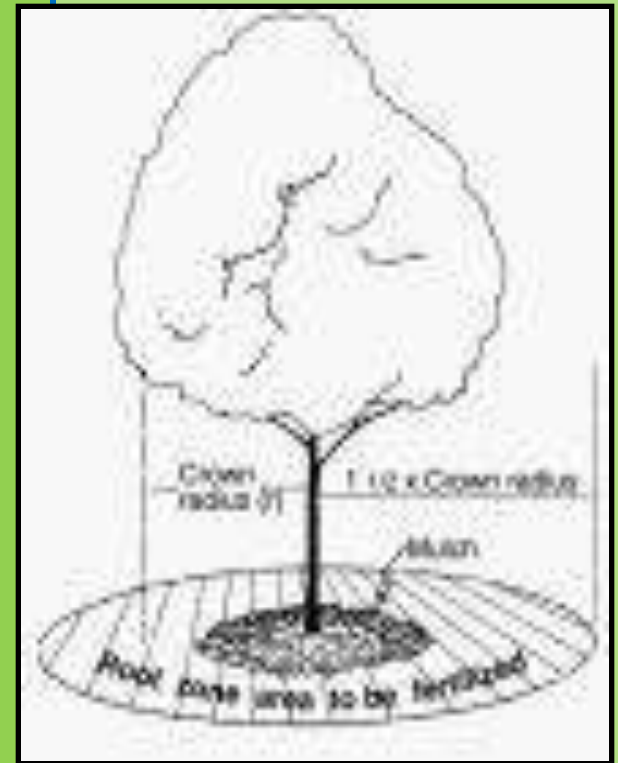
- **During the active growing season**
  - In spring, after danger of frost (March)
  - Before summer ban (End of May)
  - In early fall, before winter dormancy (Oct.)
  - Apply iron to green up lawn in summer
- **During recovery**
  - From drought, wear, insects, disease, freeze

# Fertilizer – How Much?

- **Fertility needs vary due to:**
  - Your preference for low, medium, or high maintenance lawn or landscape
  - Species, season, and location
- **“Spoon Feed”- to avoid over fertilization, apply small amounts more frequently**
- **Choose fertilizers with 50% or more of the nitrogen in slow release form**

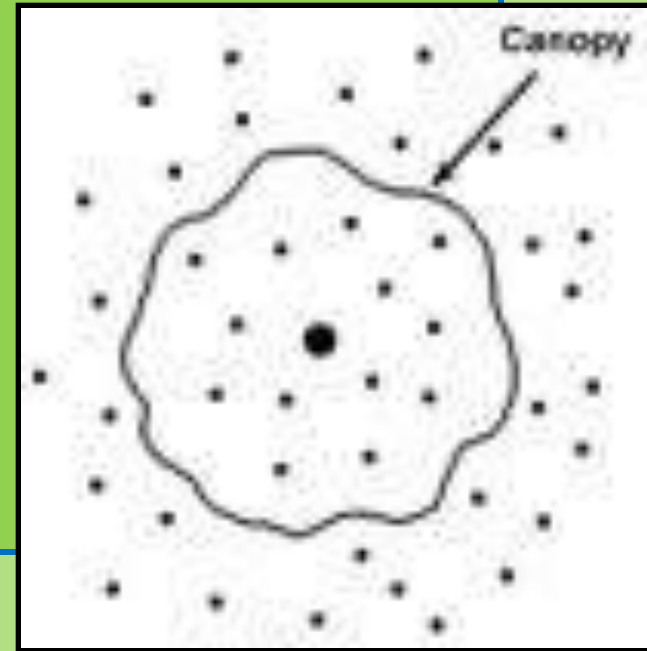
# Fertilizer – How to Apply Trees and Shrubs

- Most established trees & shrubs don't need fertilizer
- Established tree absorbing roots extend 2 to 3 times the canopy
- Spikes, plugs, liquid injections and piles of fertilizer near the trunk are wasteful



# Fertilizer – How to Apply Trees and Shrubs

- Broadcast uniformly over root zone:
  - Trees and shrubs that overlap with lawn will receive adequate nutrients when lawn is fertilized





# Questions?

