Compost
And
Hornsby Bend

Soil and Compost

- Soil Formation, horizons and ecosystem
- Organic Matter
- Mulch, Compost and Humus
- Compost – the basics
- Hornsby Bend

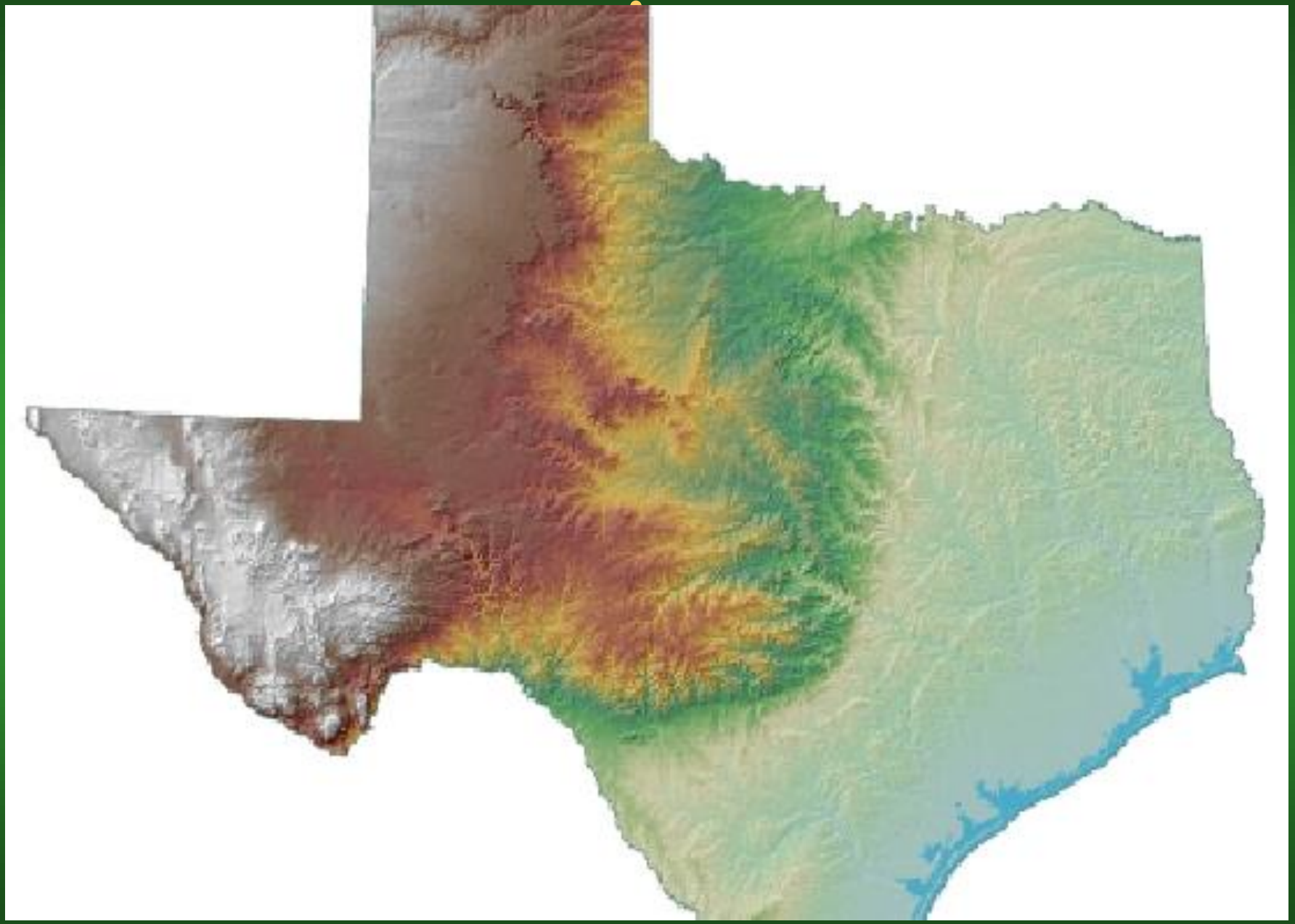
Why Worry About Soil?

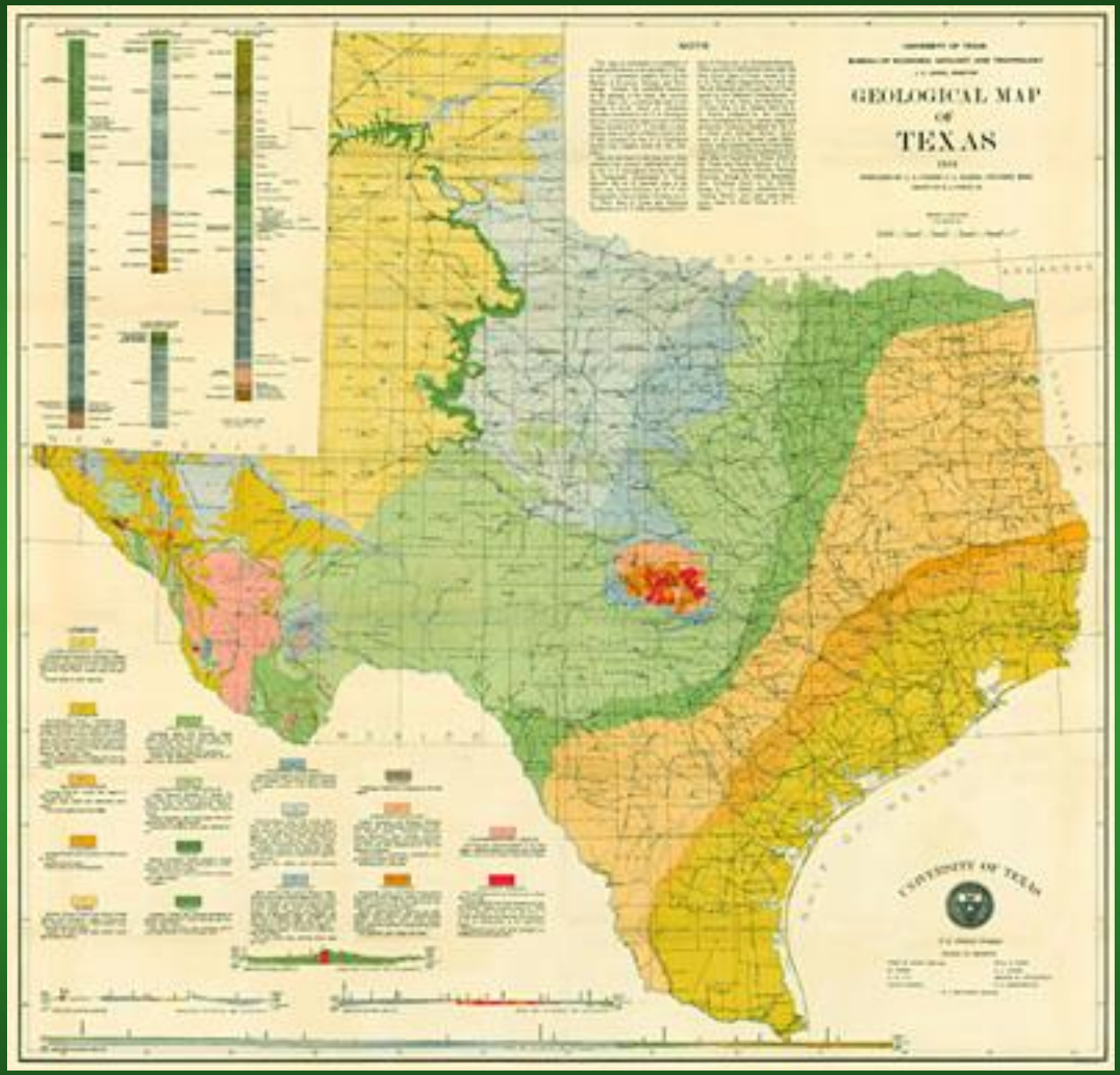
- It’s the basis for crop production
- It cycles most of the nutrients and is a huge C sink
- It can be degraded or lost easily
- It takes hundreds to thousands of years to make an inch of soil

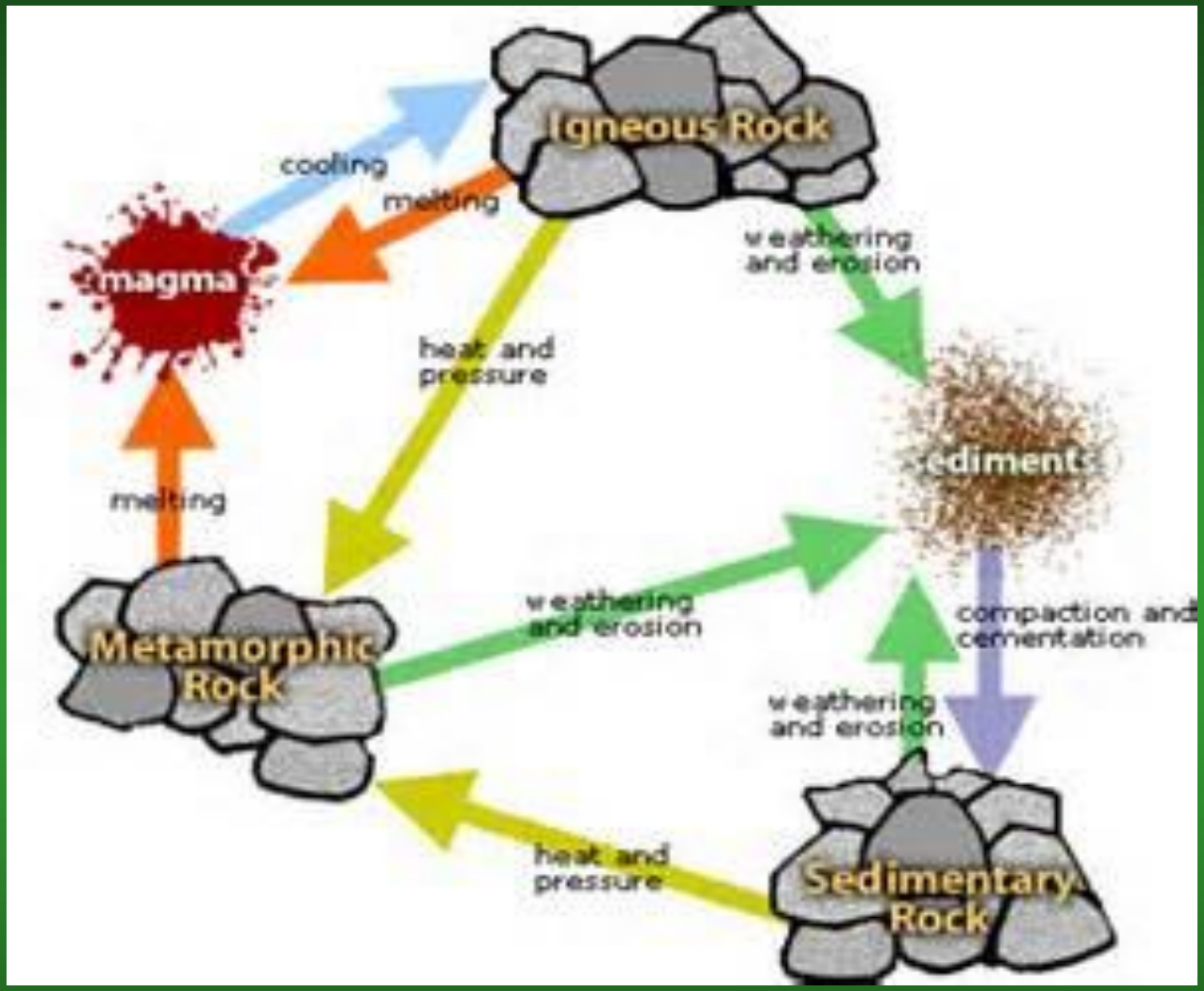
Formation of Soil

- Climate
- Parent Material (rock)
- Topography
- Time
- Living organisms

- “Nature and Properties of Soil”

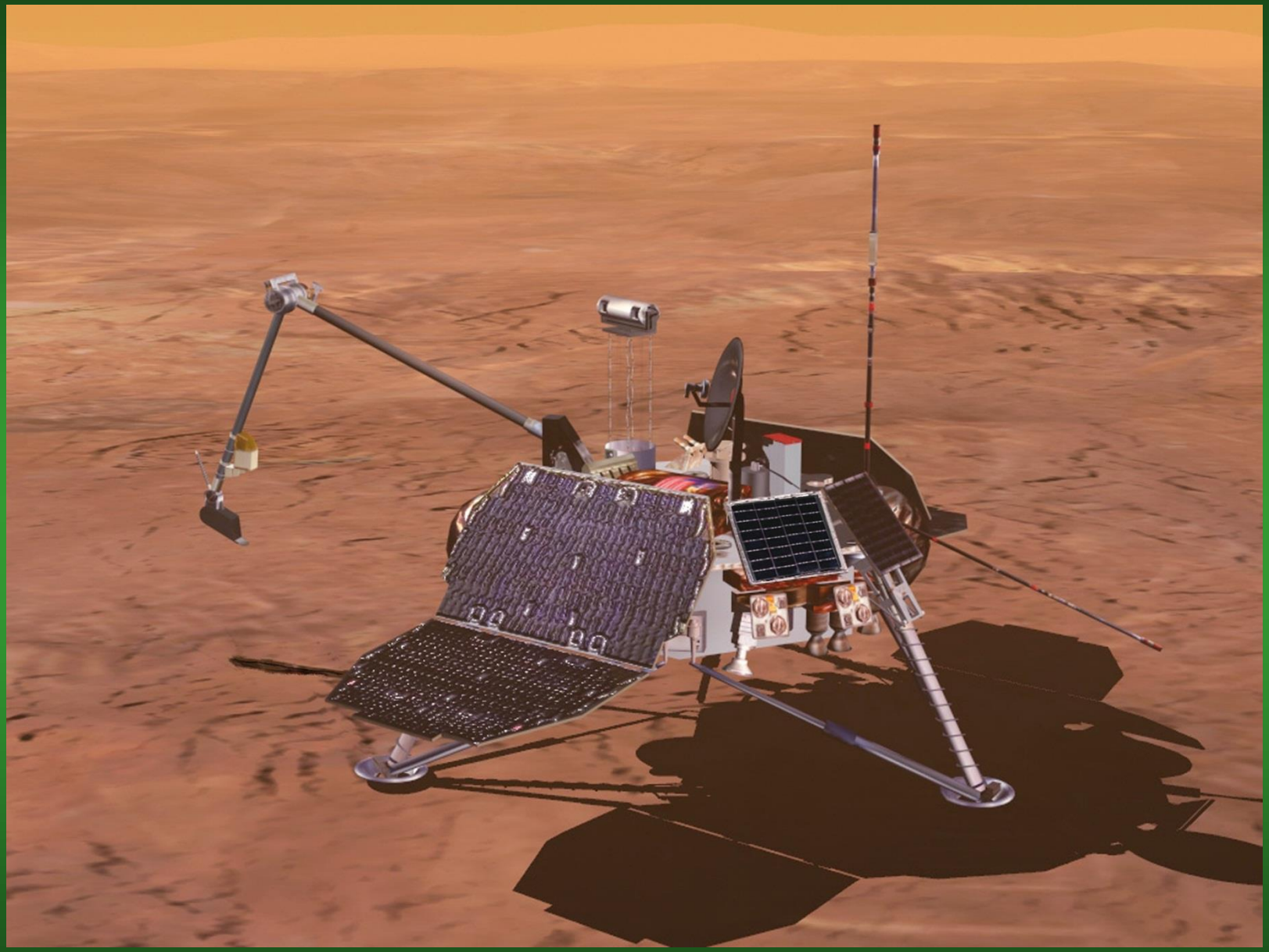


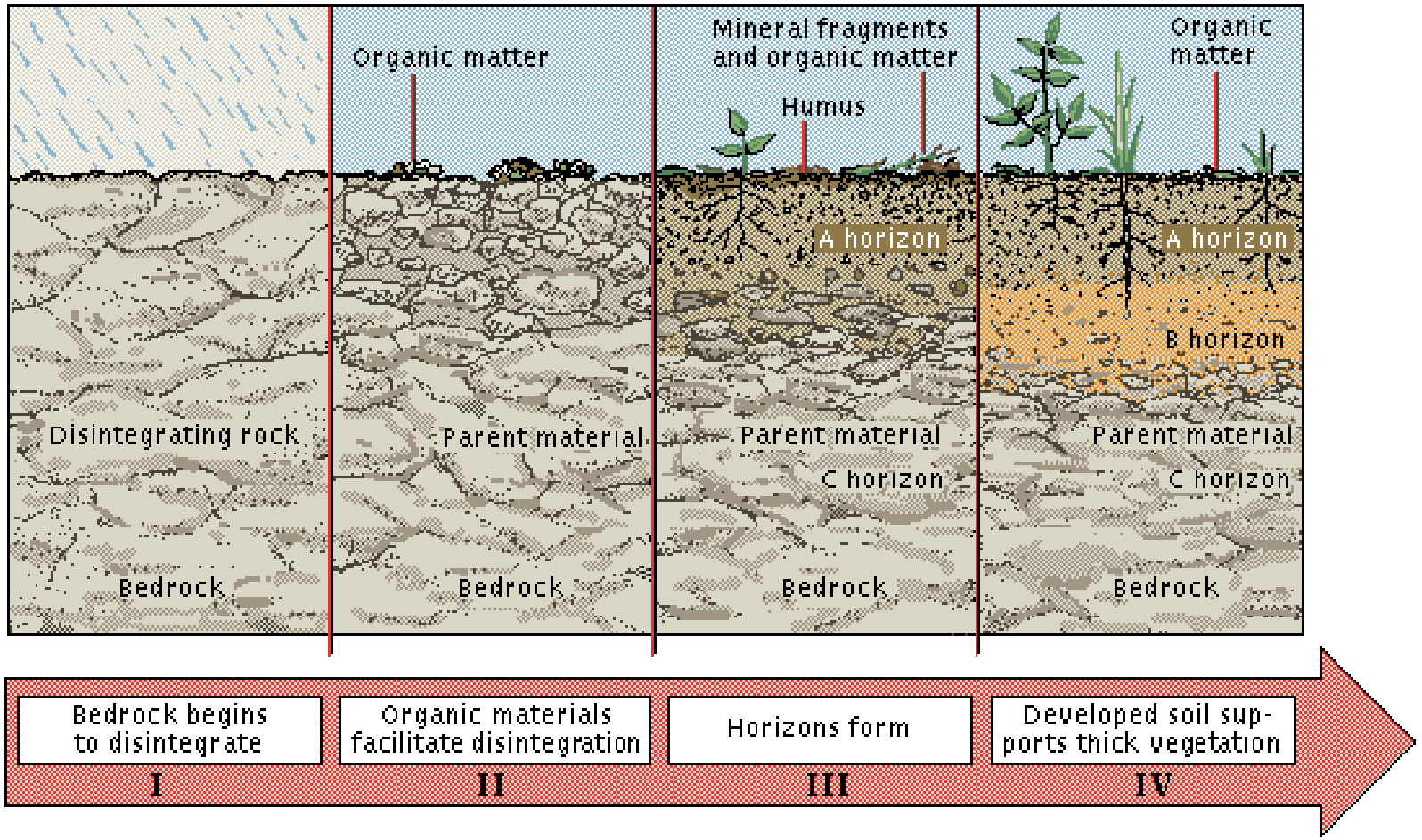

GEOLOGICAL MAP
OF
TEXAS
1918
NOTE
UNIVERSITY OF TEXAS

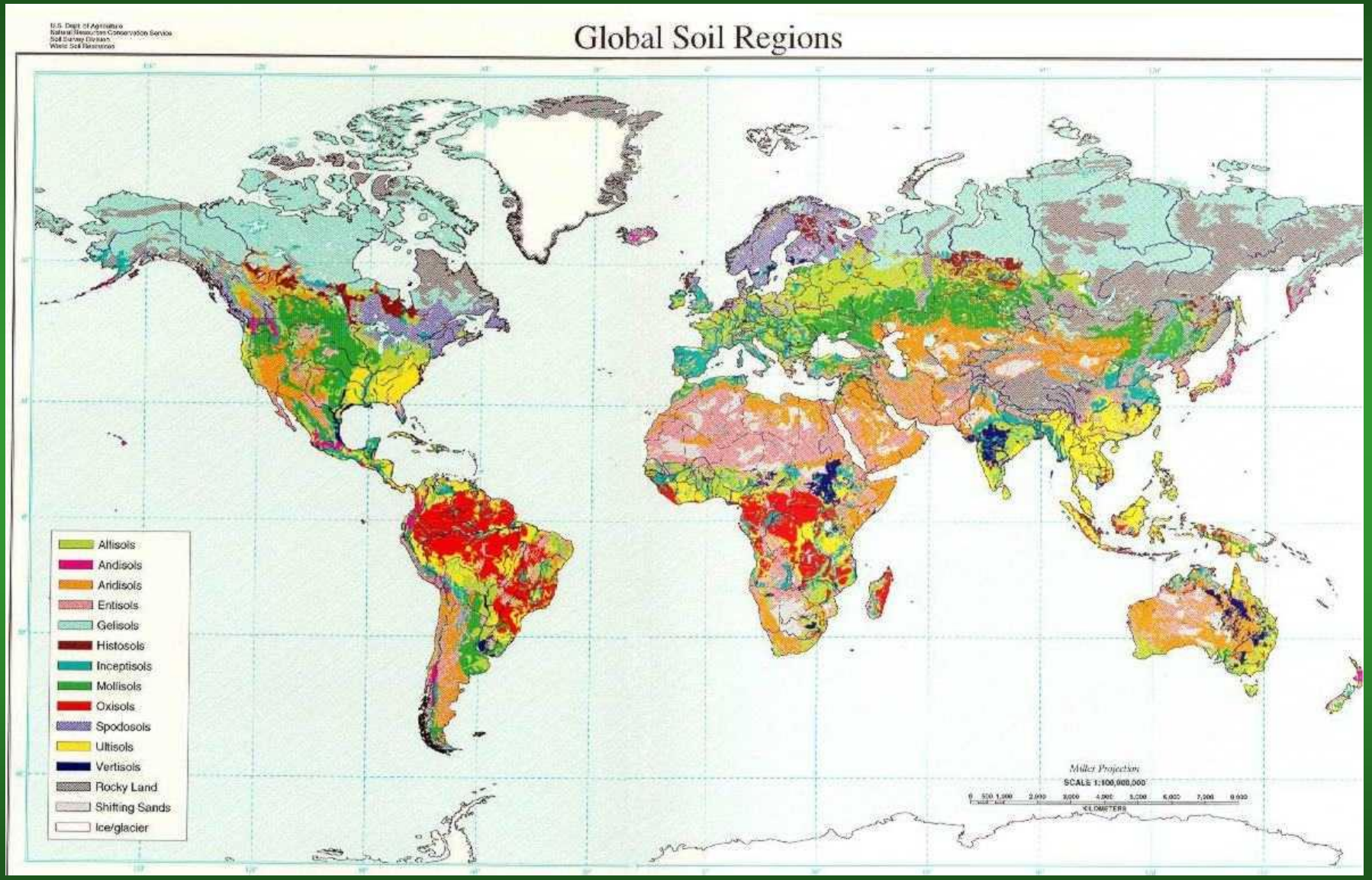

Igneous Rock
cooling
melting
magma
weathering
and erosion
heat and
pressure
Sediment
melting
weathering
and erosion
compaction and
cementation
Metamorphic
Rock
weathering
and erosion
heat and
pressure
Sedimentary
Rock

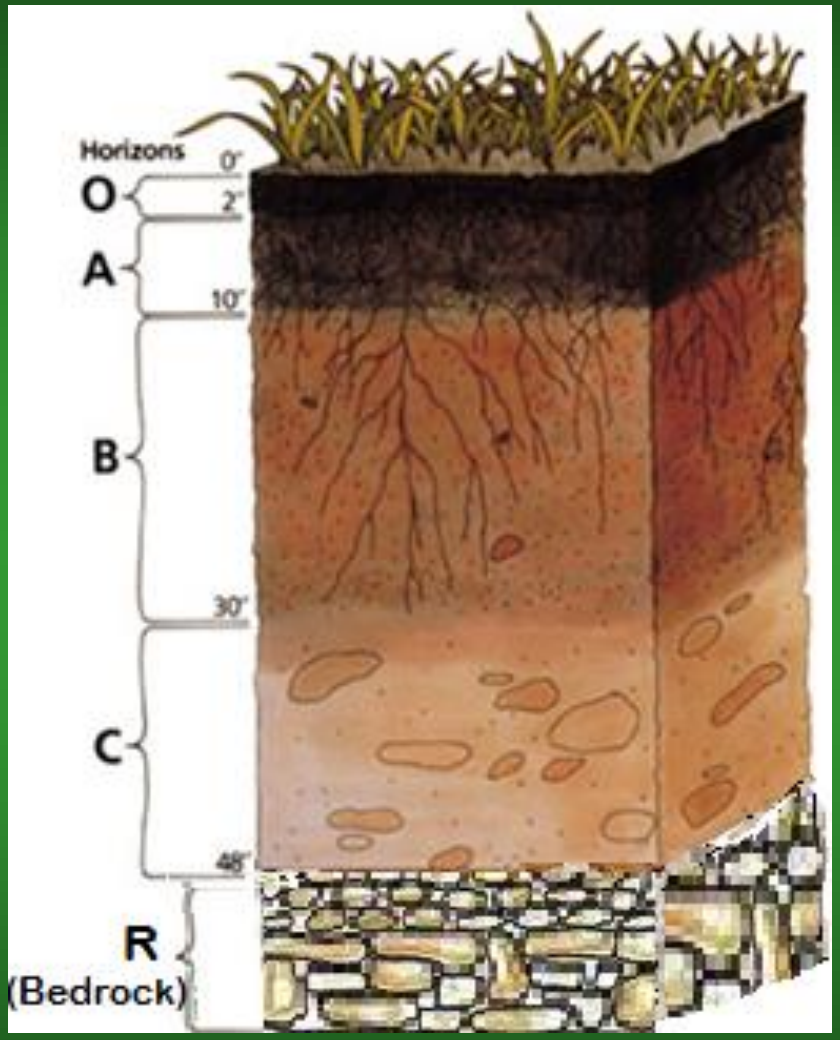
Soil Building Blocks

- Sand – largest particle, lots of pore space
- Silt – small particles, moderates effects of sand and clay
- Clay – very small particles, sticky, doesn’t breath well




Organic matter
Mineral fragments and organic matter
Humus
Organic matter
A horizon
A horizon
B horizon
Disintegrating rock
Parent material
Parent material
Parent material
C horizon
C horizon
Bedrock
Bedrock
Bedrock
Bedrock
Bedrock begins to disintegrate
I
Organic materials facilitate disintegration
II
Horizons form
III
Developed soil supports thick vegetation
IV


U.S. Dept of Agriculture
Natural Resources Conservation Service
Soil Survey Division
World Soil Resources
Global Soil Regions
Alfisols
Andisols
Aridisols
Entisols
Gelisols
Histosols
Inceptisols
Mollisols
Oxisols
Spodosols
Ultisols
Vertisols
Rocky Land
Shifting Sands
Ice/glacier
Miller Projection
SCALE 1:100,000,000
KILOMETERS


Horizons
0"
O
2"
A
10"
B
30"
C
48"
R
(Bedrock)

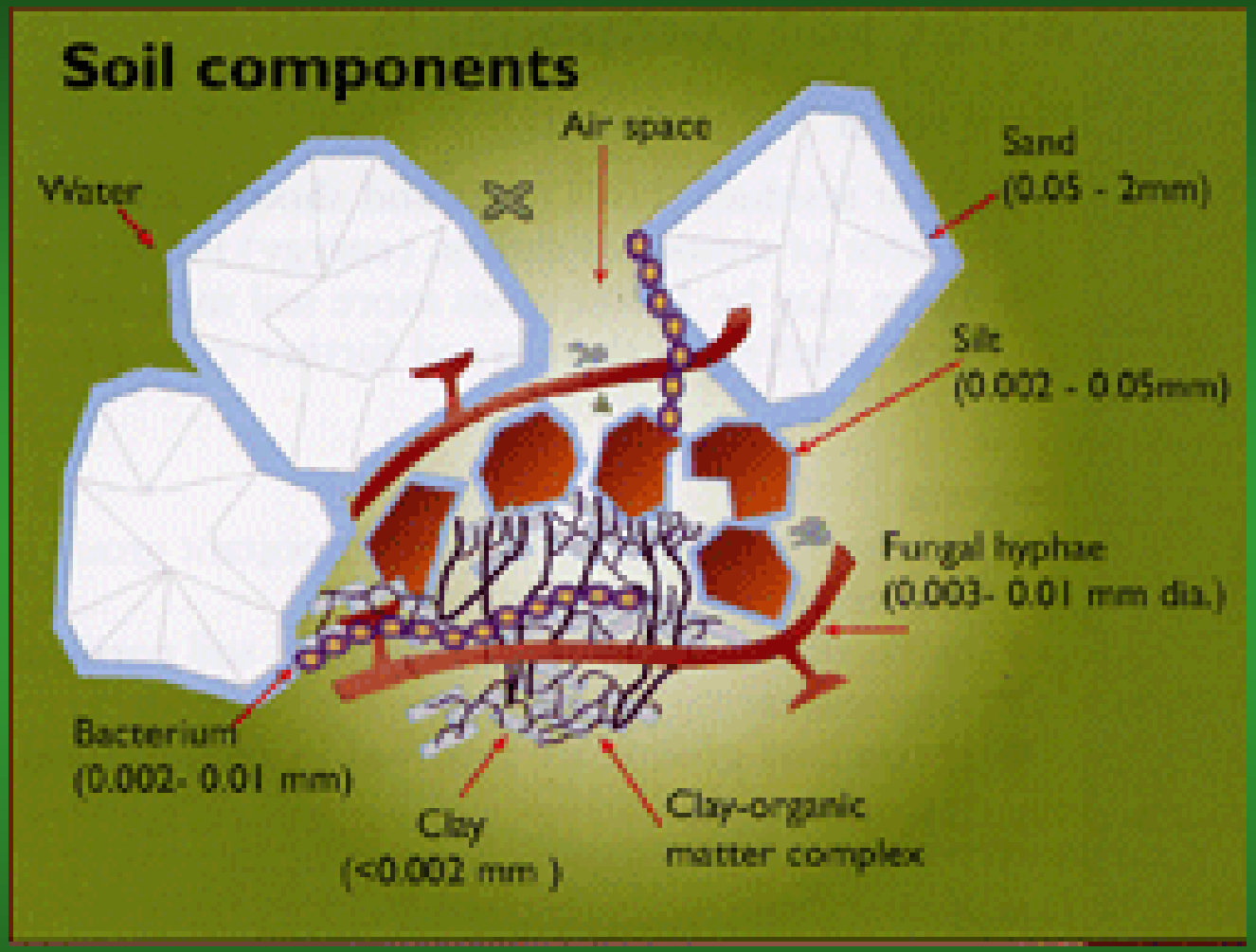
Soil Depth

- Defined by depth to restrictive layer – rock, heavy clay, etc
- Shallow – 10 to 20 inches deep
- Deep – 36 to 60 inches

Per Arizona Extension

How much water will my soil hold?

Soil Type	In 2 Feet	In 3 Feet
Sand	1.25”	1.75”
Silt Loam	2.2”	3.4”
Clay Loam	2.0”	3.0”
Clay	1.9”	2.8”

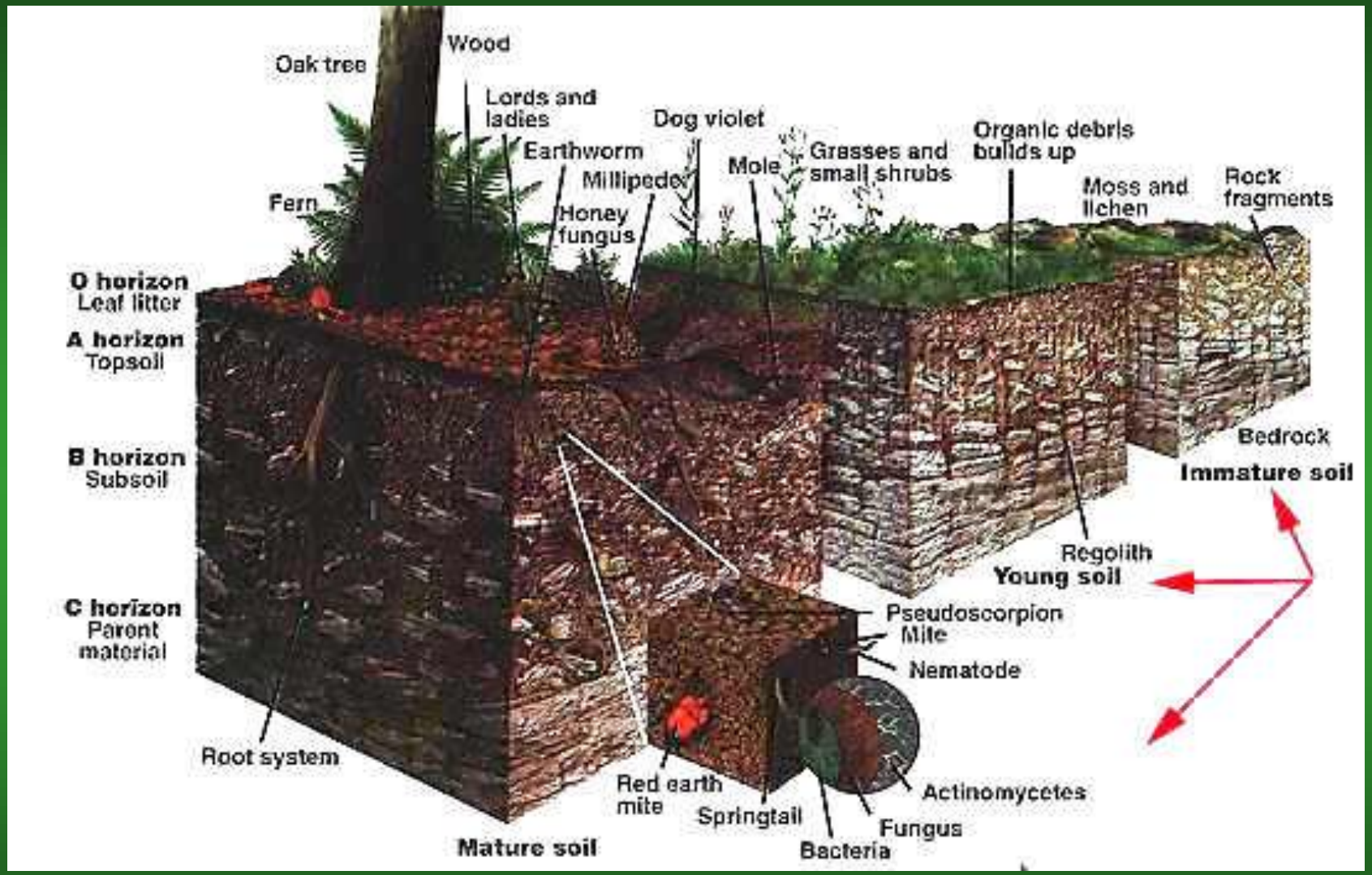

Soil components
Air space
Water
Sand
(0.05 - 2mm)
Silt
(0.002 - 0.05mm)
Fungal hyphae
(0.003- 0.01 mm dia.)
Bacterium
(0.002- 0.01 mm)
Clay
(<0.002 mm)
Clay-organic
matter complex

The Micro Living Room

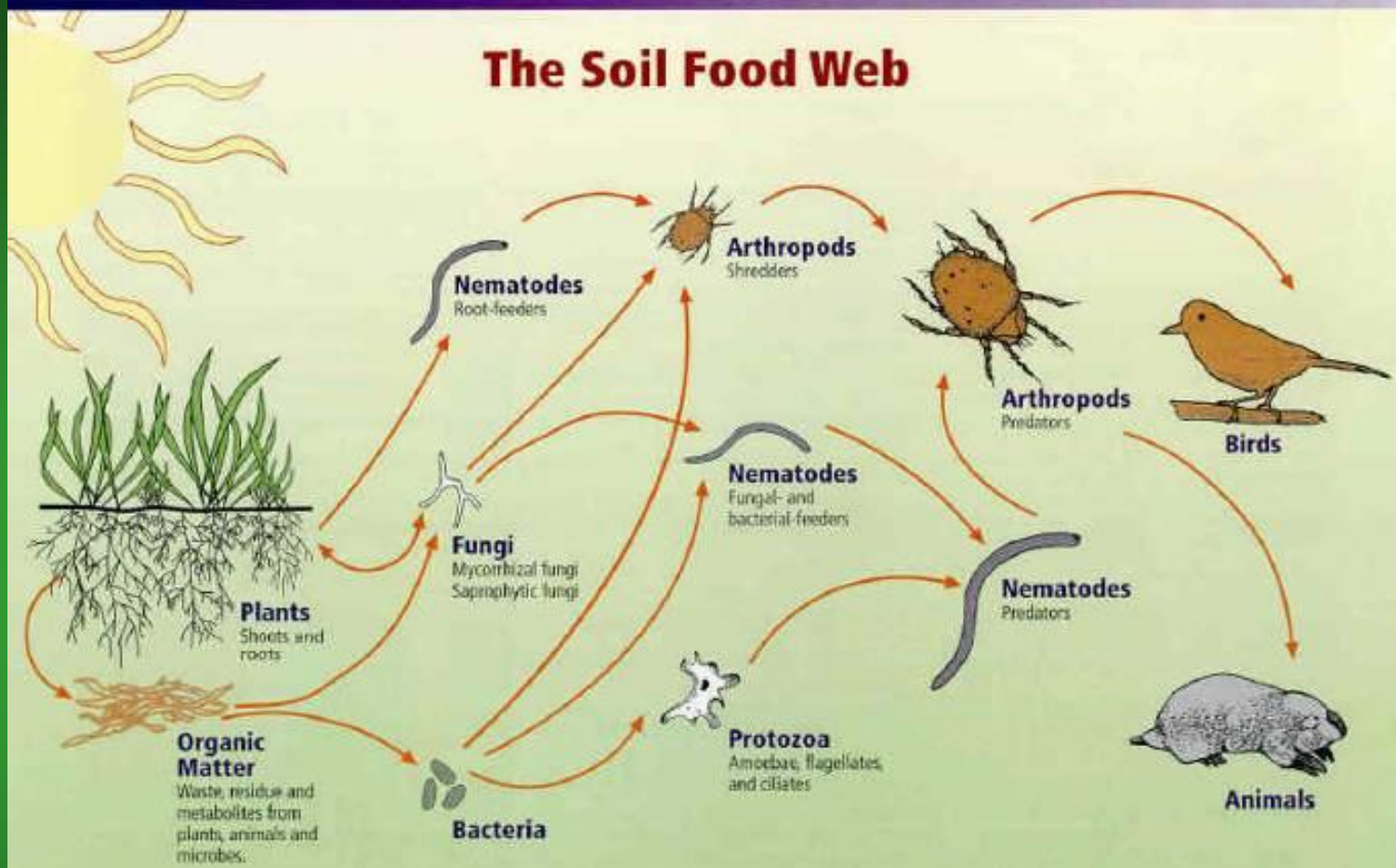
SURFACE AREA IN 2 TABLESPOONS OF SOIL EQUALS ONE CITY BLOCK

It’s Alive!!!!!

Soil Ecosystem


Oak tree
Wood
Lords and ladies
Dog violet
Earthworm
Millipede
Mole
Grasses and small shrubs
Organic debris builds up
Moss and lichen
Rock fragments
Fern
Honey fungus
O horizon
Leaf litter
A horizon
Topsoil
B horizon
Subsoil
C horizon
Parent material
Bedrock
Immature soil
Regolith
Young soil
Pseudoscorpion
Mite
Nematode
Root system
Red earth mite
Springtail
Actinomycetes
Fungus
Bacteria
Mature soil

The Soil Food Web



First trophic level:
Photosynthesizers

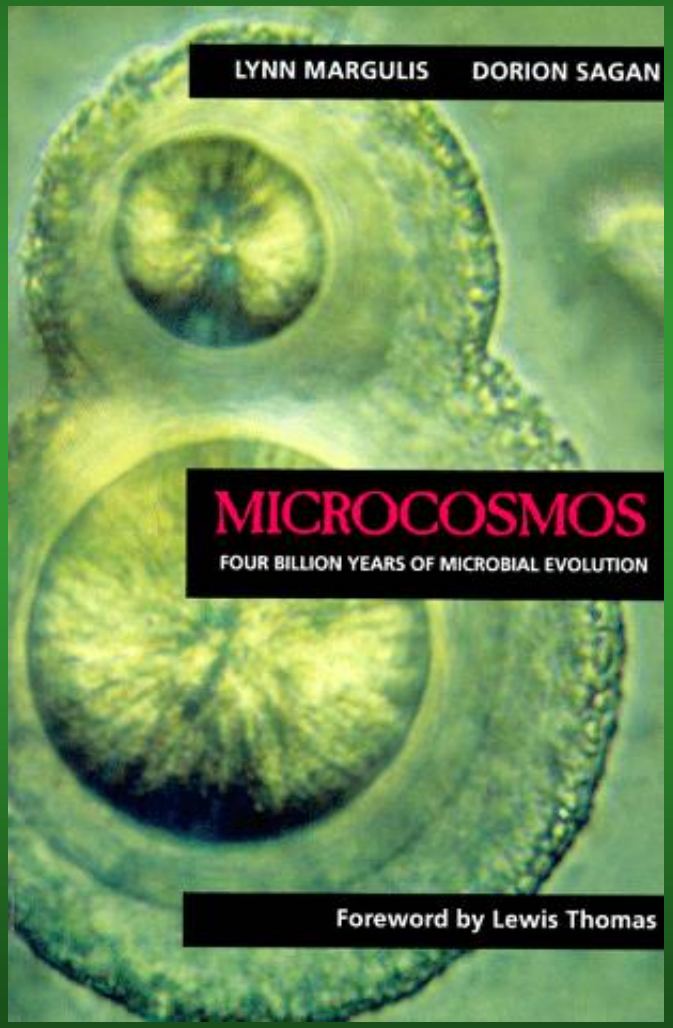
Second trophic level:
Decomposers
Mutualists
Pathogens, parasites
Root-feeders

Third trophic level:
Shredders
Predators
Grazers

Fourth trophic level:
Higher level predators

Fifth and higher trophic levels:
Higher level predators

Symbiosis

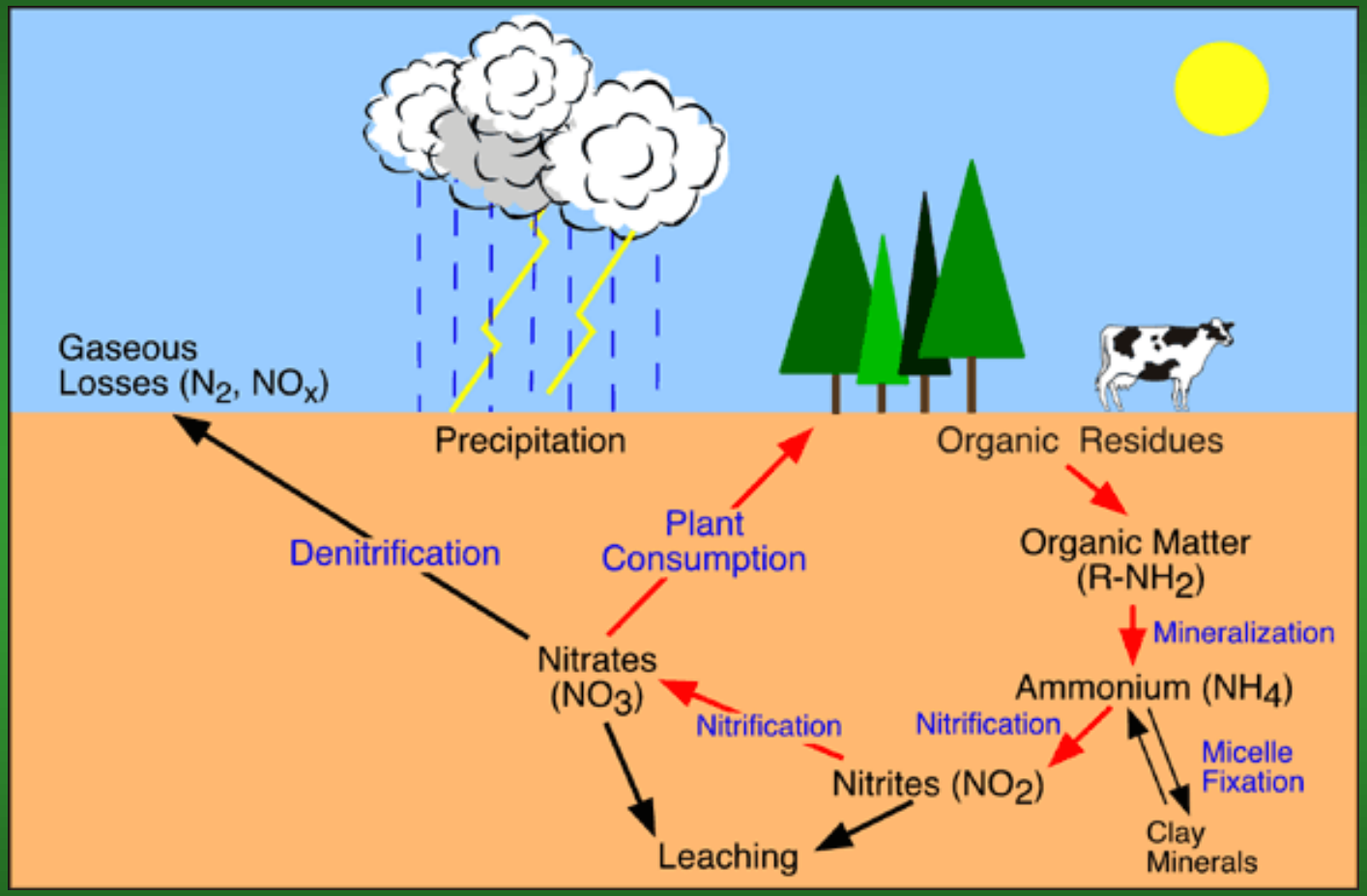


- The idea of evolution driven by competition may be incomplete and is instead based on cooperation, interaction, and mutual dependence among organisms

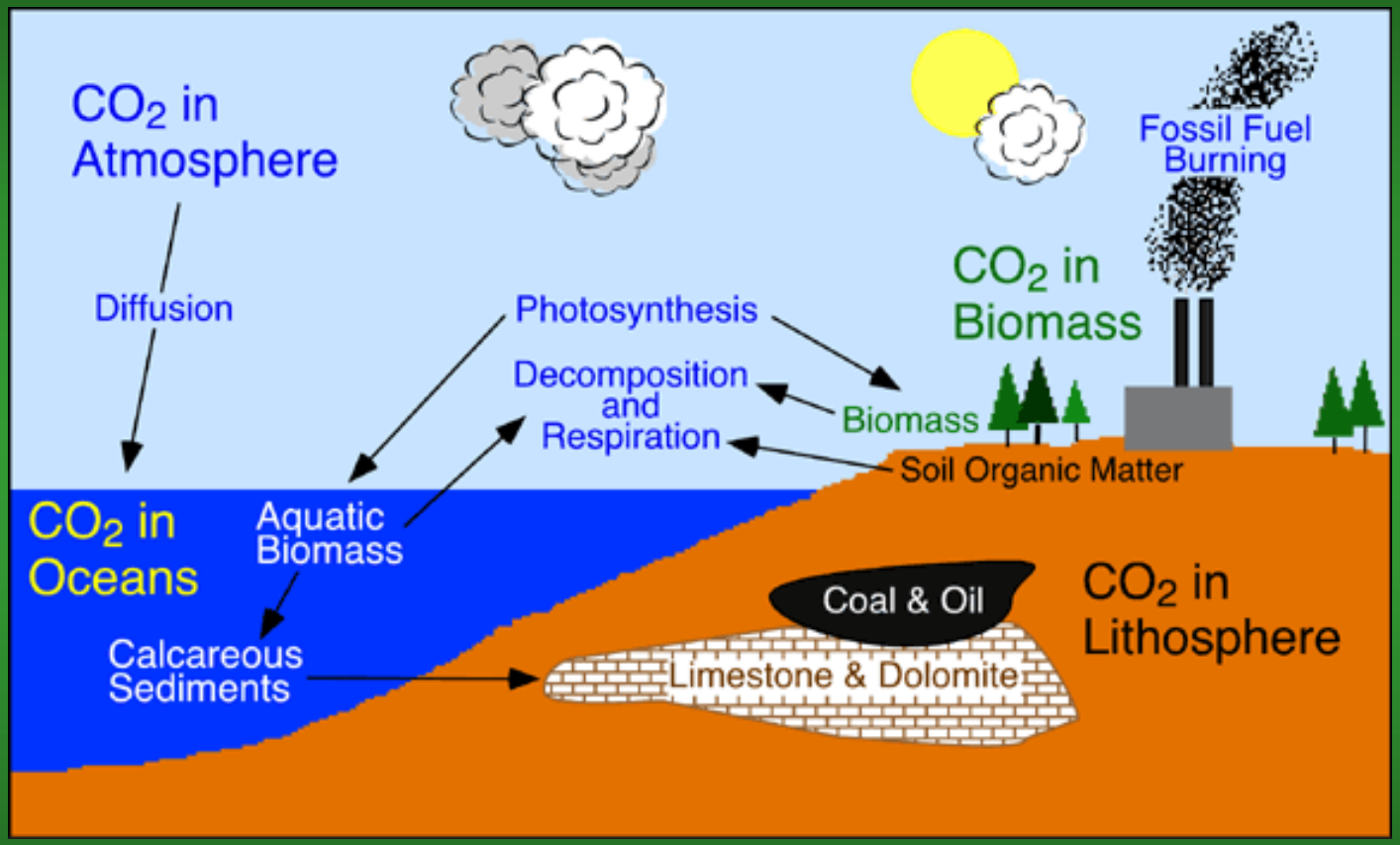
An Acre Beneath Our Feet

Organism	Numbers	Pounds
Bacteria	Trillions	2,600
Fungi	Trillions	2,600
Actinomycetes	Billions	1,300
Insects/Athropods	thousands	830
Earthworms	thousands	445
Protozoa	billions	90
Algae	billions	90
Nematodes	millions	45
Total		7,800
Elaine Ingham, Soil Foodweb.com		

The Nitrogen Cycle



The Carbon Cycle

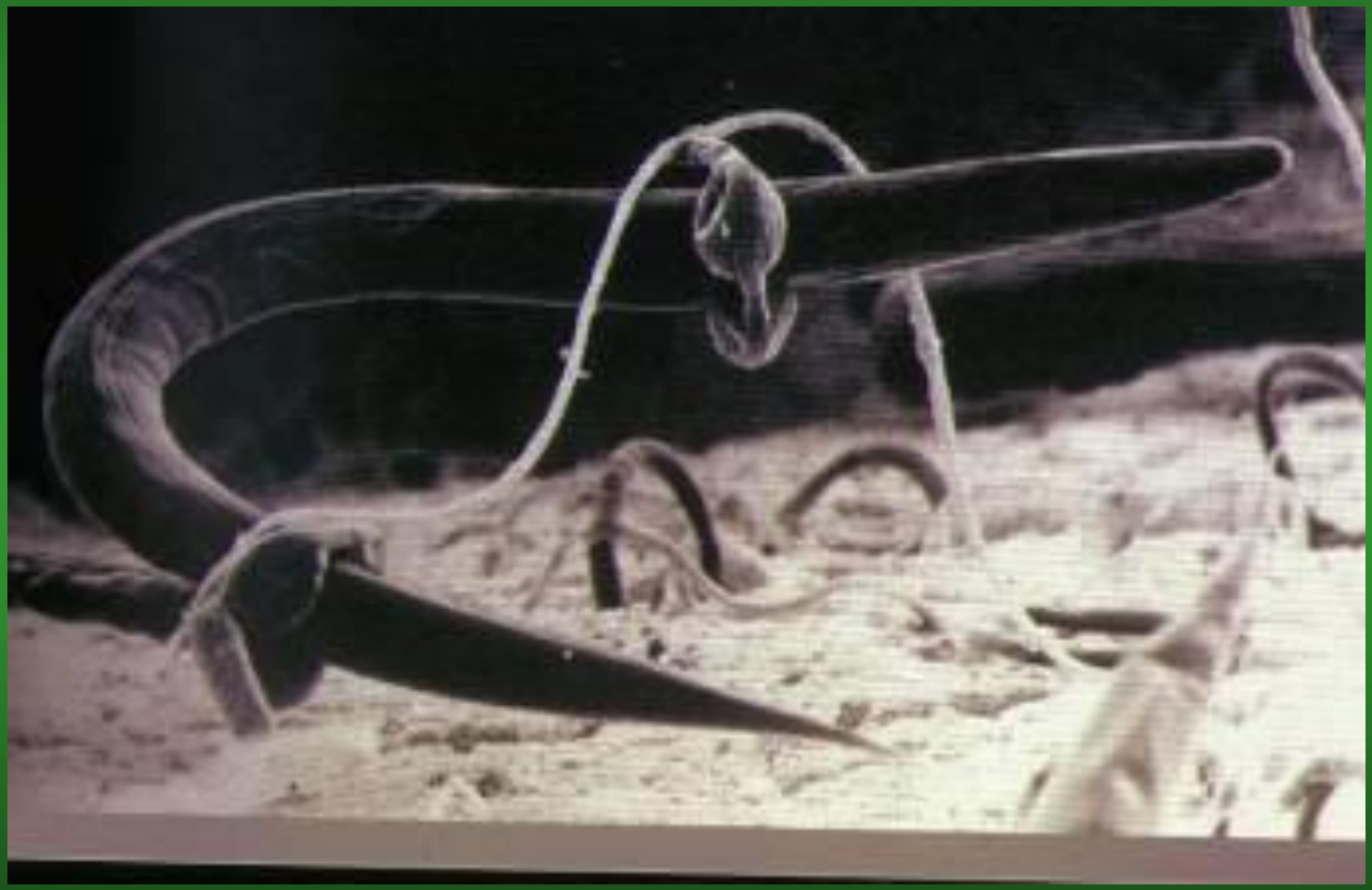


Dung Beetles

Burrowing creatures can greatly enhance fertility, air and water infiltration

Collembola - Springtails

Nematode trapping fungi



Mycorrhizae fungi greatly extend root systems

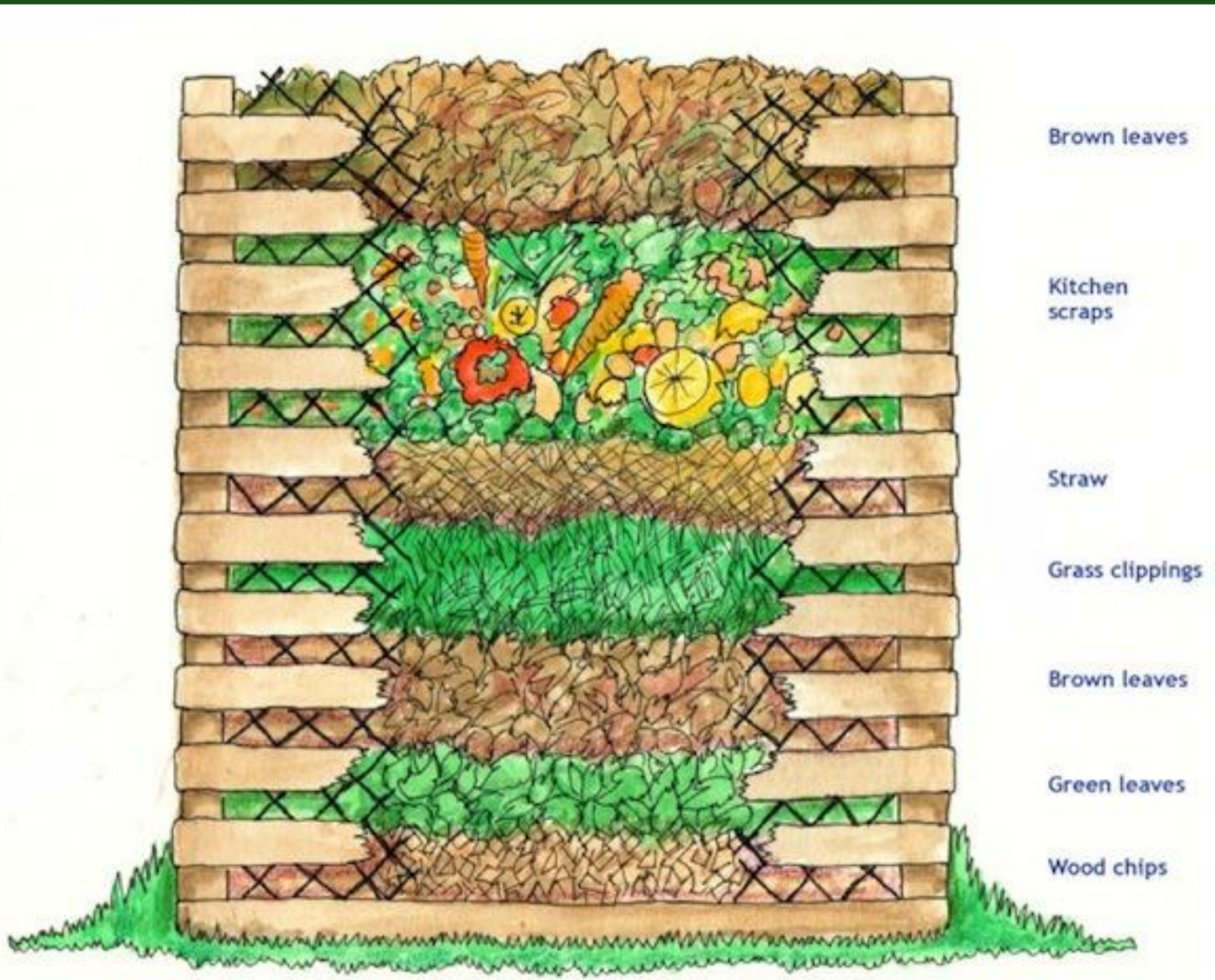
Compost

- Decomposition of organic materials with cycling of nutrients

Benefits of Compost

- Recycles organic materials
- Builds soil structure and improves aeration and moisture properties
- Cycles and releases nutrients for plant use
- Foundation for life in the soil

Compost Methods

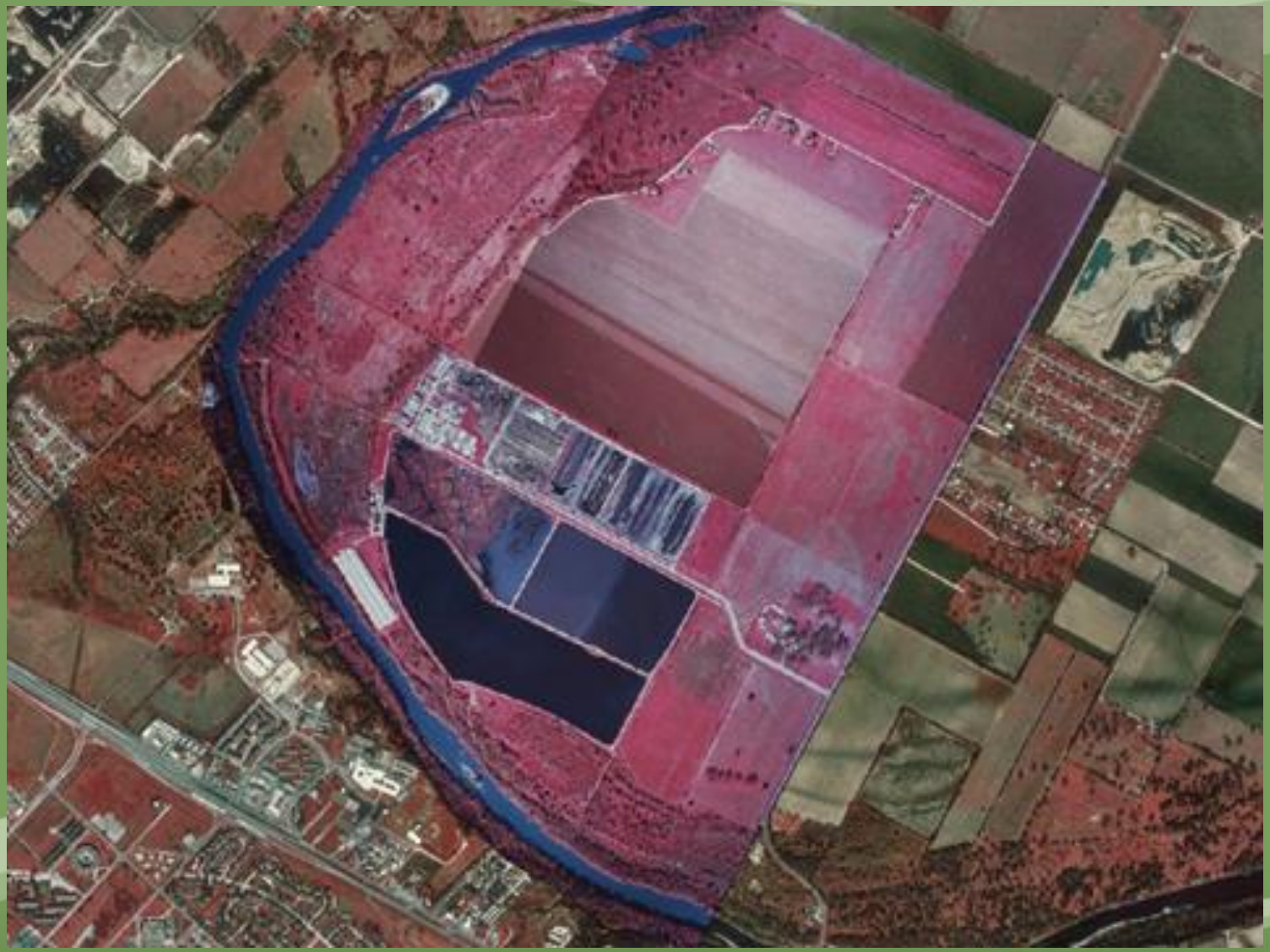

Brown leaves
Kitchen scraps
Straw
Grass clippings
Brown leaves
Green leaves
Wood chips

Or Large Scale

At Hornsby Bend

Hornsby Bend
Biosolids Management Plant

1,200 acres, 3 miles of river, 180 acres of ponds, 500+ acres of farm fields



Process Area footprint

Centralized Biosolids Processing

- Thickening
- Anaerobic Digestion
- Belt Pressing
- Land Application
- Composting
- Cogen

0 100 200
Feet

City of Austin
Austin Water Utility
June, 2013

Hornsby Bend
Biosolids Management Plant
Processing Areas and Pads

Produced by GIS Services (3725)

Gas Holder and refurbished digesters

New Cogeneration

875 kW cogenerator

Electricity and Heat

Net Zero energy facility

Partnered with Austin Resource Recovery in mid- 1990s yard and tree trimmings 12 – 15% of Austin's curbside waste

Composting to make "Dillo Dirt" Since 1989

Hornsby Bend and the Urban soil ecosystem

Inputs – N and C drawn from soils – food, landscaping

Outputs - N rich “wastes” and C “wastes”

City of Austin
Austin Water Utility

Austin Water Utility
Hornsby Bend Biosolids Management Plant

Microbe "Farming" for Recycling - Working with Ecosystem Cycles

City of Austin
Austin Water Utility

Final Belt Press Thickening

All Curbside Yard Waste

15% of Austin's Solid Waste

100,000+ cubic yards per year

Composting

Yard Waste and Biosolids =

Composting – aerobic process – 130 - 170 degrees F

Kills pathogens, weed seeds, breaks down chemical compounds

“Scarab”

windrow turner

COMPOSTING

Curing 3-6 Months

Screening

Sales through area vendors

DILLO DIRT
City of Austin Water and Wastewater Utility

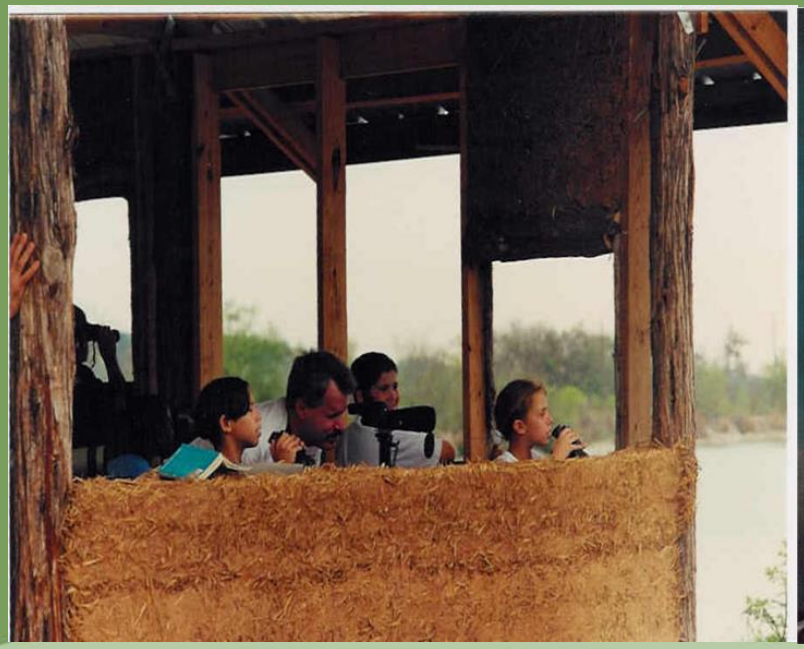
First Biosolids Composting Program in Texas 1987

Twice honored with EPA National First Place Award

City of Austin
Zero Waste Initiative

- Progressive reduction in waste
- 90% reduction by 2040
- Food waste
- FOG

Hornsby Bend Bird Observatory
A cooperative partnership promoting the study and understanding of birds in Central Texas
almost 400 species identified



The Center for Environmental Research

MISSION

- Urban Sustainability and Ecology
- Research and Education

PARTNERS

- The City of Austin Water and Wastewater Utility
- University of Texas
- Texas A&M University


PLANT OPEN TO VISITORS
SUN UP TO SUN DOWN
GATES WILL BE CLOSED
DURING OTHER HOURS
NO UNAUTHORIZED PERSONS
ARE ALLOWED ON THE
GROUNDS AT NIGHT
HORNSBY
BEND
TRAILS

“Sustainability”

- “meets the needs of the present without compromising the ability of future generations to meet their own needs.”

- The Brundtland Report

Questions?