

Chapter 2

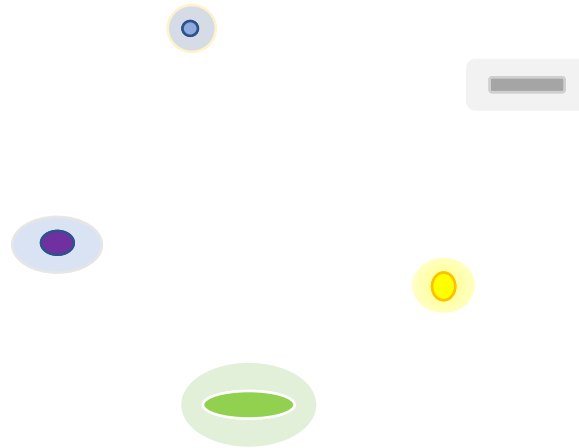
The Benefits of the Soil Food Web

Lecture 9 – Structure (Part 1)

A Healthy Food Web Will:

- Make nutrients Available at rates plants require (eliminate fertilizer) leading to flavor and nutrition for animals and humans
- Retain Nutrients (stop run-off, leaching)
- Suppress Disease (competition, inhibition, consumption; no more pesticides!)
- Build Soil Structure (reduce water use, increase water holding capacity, increase rooting depth, create aerobic conditions)
- Decompose Toxins

Bacteria produce glues



When a mineral particle appears, the Bacteria adhere to its surface

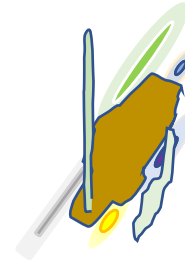
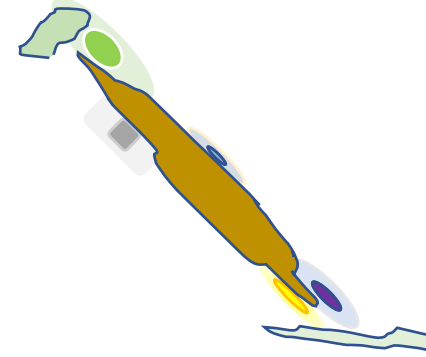
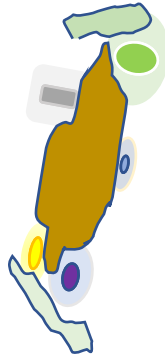


Pieces of Organic Matter also adhere to the Bacterial glues.

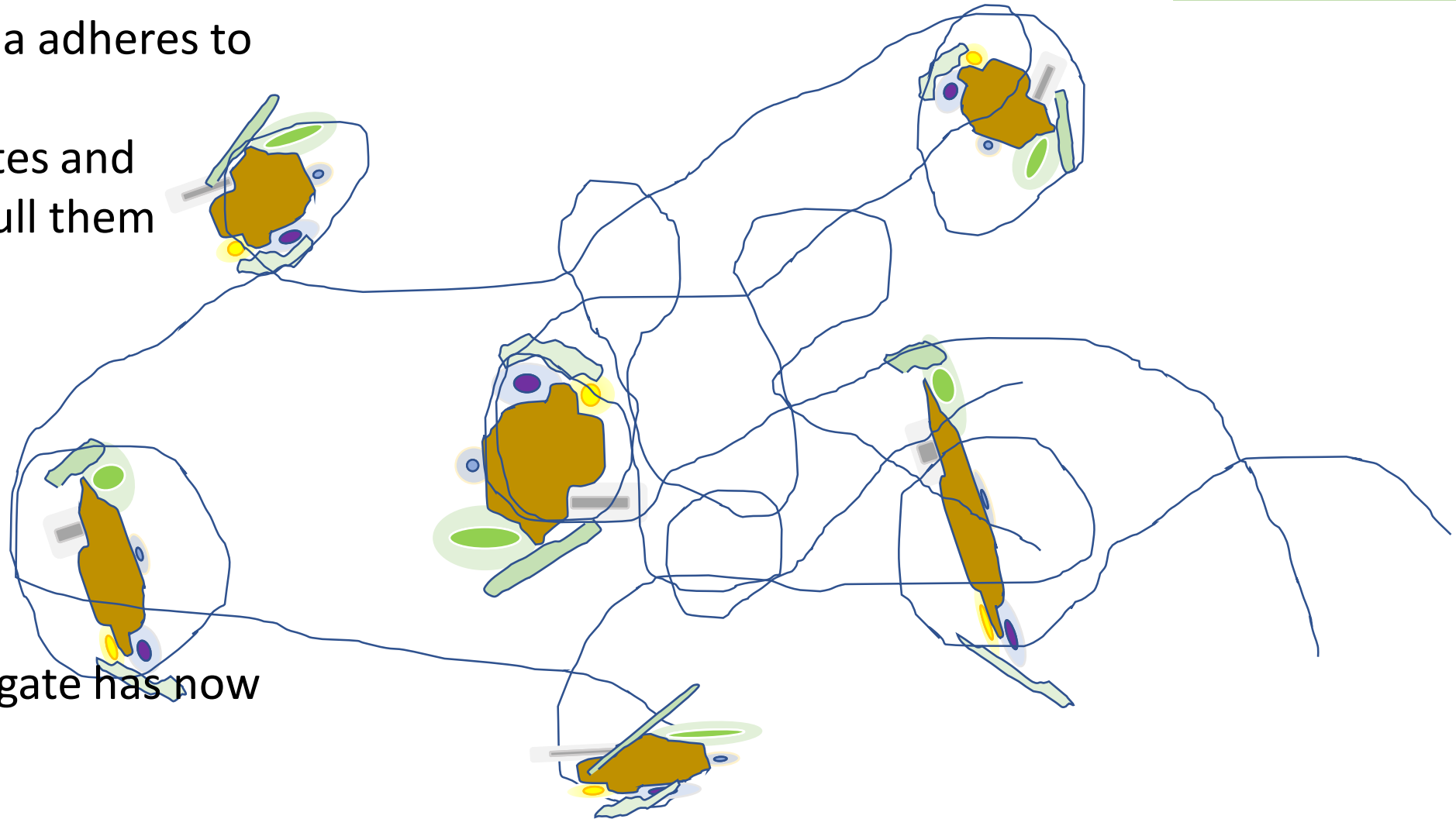


A Microaggregate has now been formed.

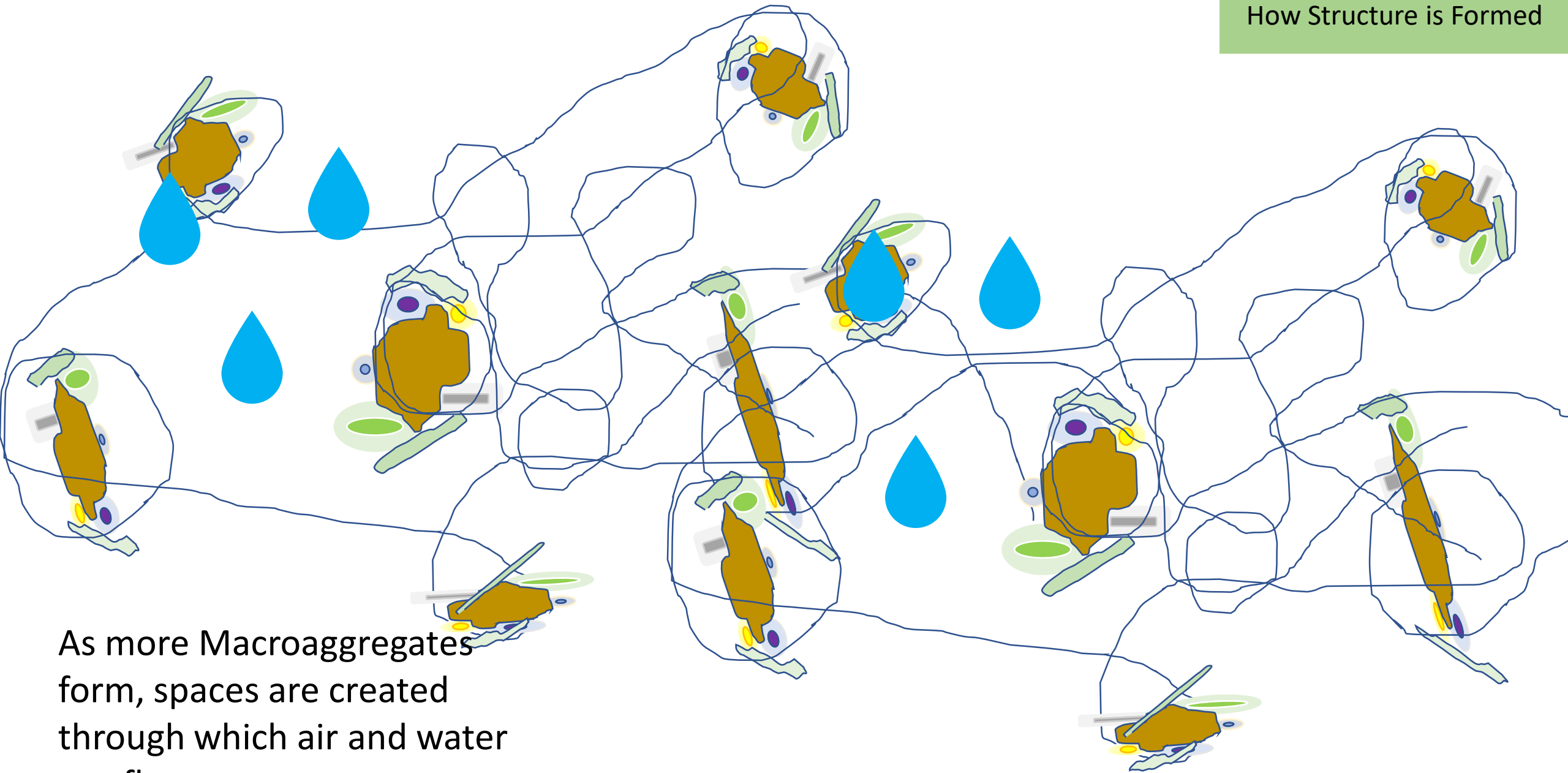
Other Microaggregates of various shapes and sizes are formed



A Fungal Hypha adheres to several of the Microaggregates and proceeds to pull them together...














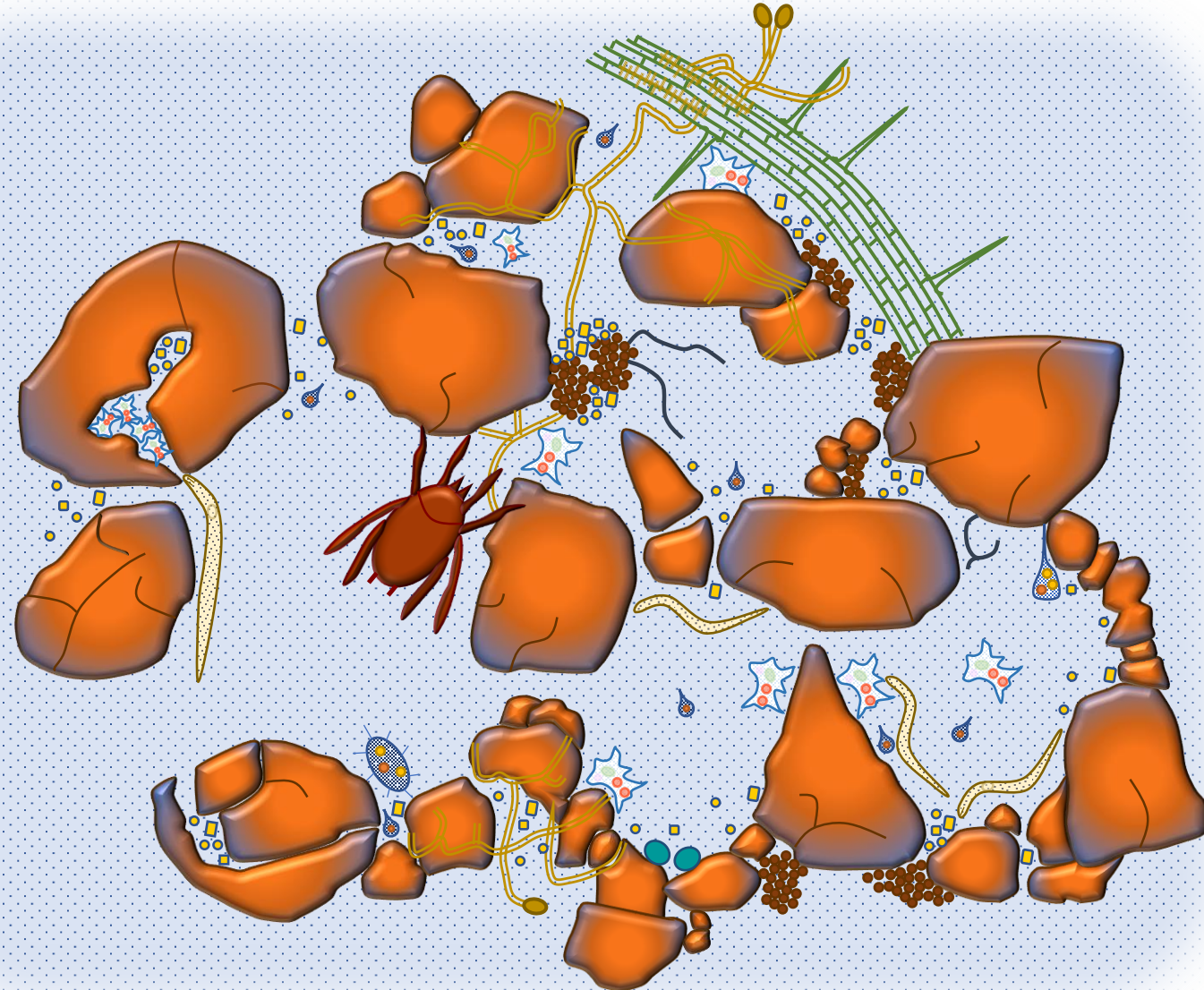
A Macroaggregate has now been formed.





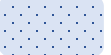


As more Macroaggregates form, spaces are created through which air and water can flow.

Soil Structure

Amoebae	
Cyst	
Bacteria	
Nematode	
Fungal Hyphae	
Fungal Spore	
Arbuscule	
Actinomycete	
Microarthropod	
Ciliate	
Flagellate	



Aggregate	
Clay / Silt	
Plant Root	
Root Hair	
Water	

Soil Horizons



O1 Horizon: Recognizable plant debris

The diagram illustrates the vertical layers of soil horizons. From top to bottom: a thin grey layer (O1), a dark brown layer (OH), a thick tan layer (A), a yellow layer (B), and a bright yellow layer (C). Each layer is separated by a wavy black line. The text for each horizon is centered within its respective layer.

OH Horizon: Dark brown humus (OM, organism)

A Horizon: Add sand, silt clay to OM, organisms; color and depth depends on how much humus moves into top layer of soil

B Horizon: Less humus movement by water, fewer organisms, roots

C Horizon: Much less OM, but is this sterile?

The USDA wrongly discovered that tilling deeper was beneficial

1940 – 1950 Soil depth defined as going to 4 to 6 inch depth



Late 1970's Soil depth defined as going 12 to 18 inches

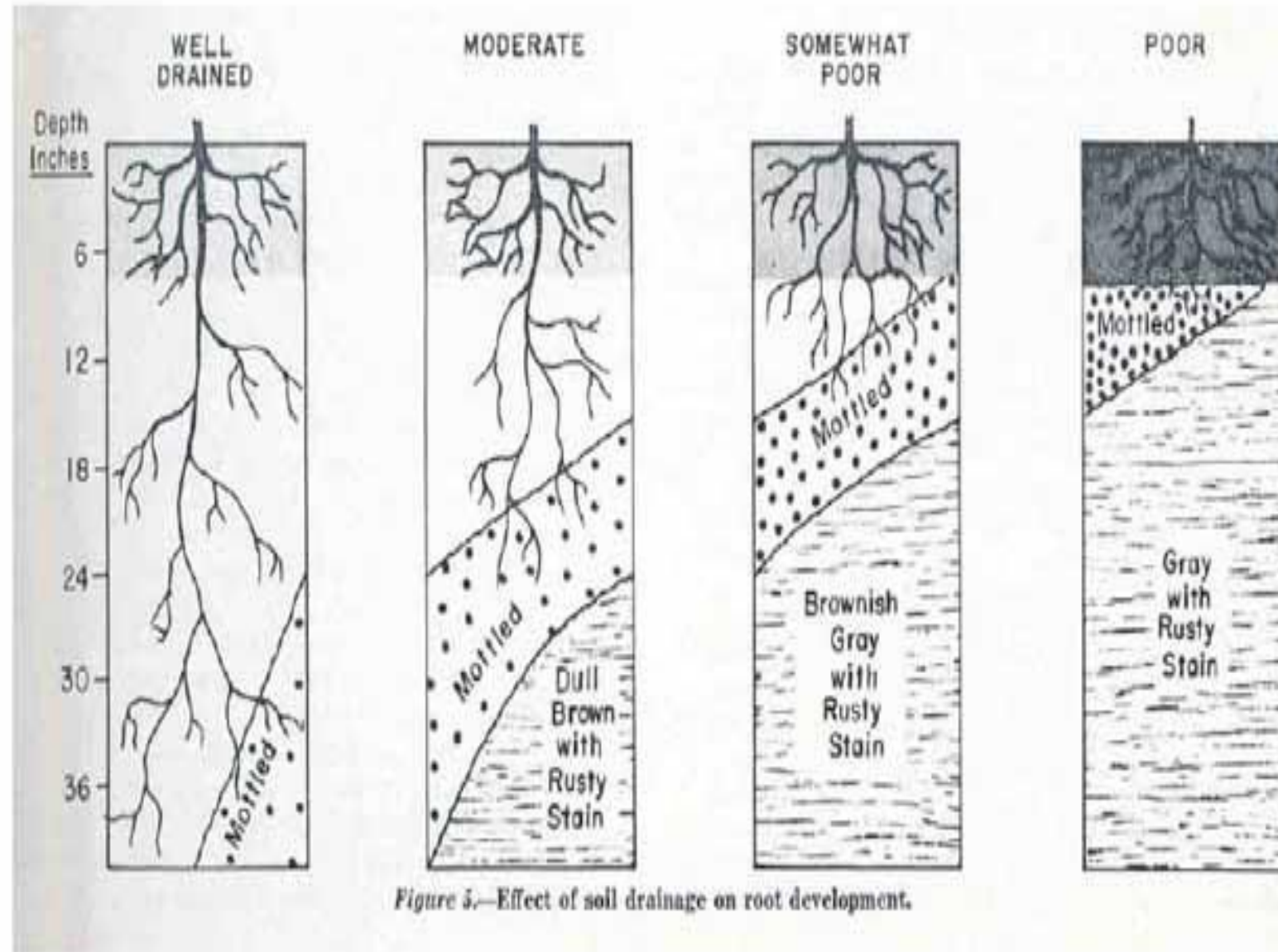


1994 - Soil depth defined as going down 4 feet



How can this be?

Effect of soil drainage on root development



Water Infiltration and Structure

- In a Sandy ‘soil’(dirt)
 - Infiltration is very rapid
 - There is no structure to hold the water
 - This results in high watering requirements
- In a Clay ‘soil’ (dirt)
 - Infiltration happens very slowly
 - There is no structure and therefore no spaces for the water to move into
 - This can result in surface puddling and anaerobic conditions
- In a well Structure Soil
 - Infiltration happens slowly
 - Water is held in the spaces created by the biology and in organic matter
 - This results in reduced watering requirements

Soil results in clean water; dirt results in problems



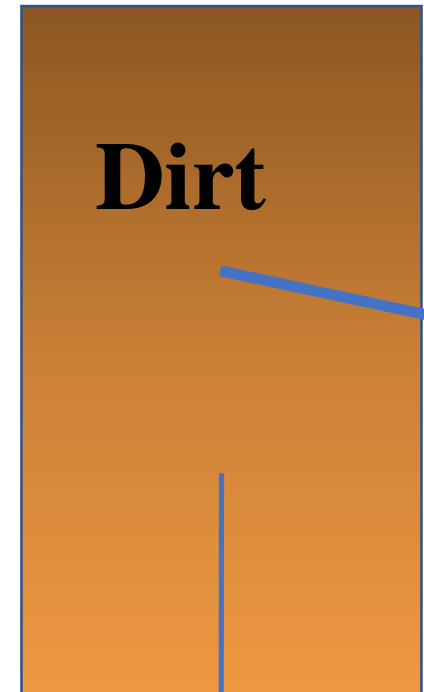
Rainfall

Organisms build structure
Nutrients held
Water is retained and moves slowly through the soil



Soil

Clean Water

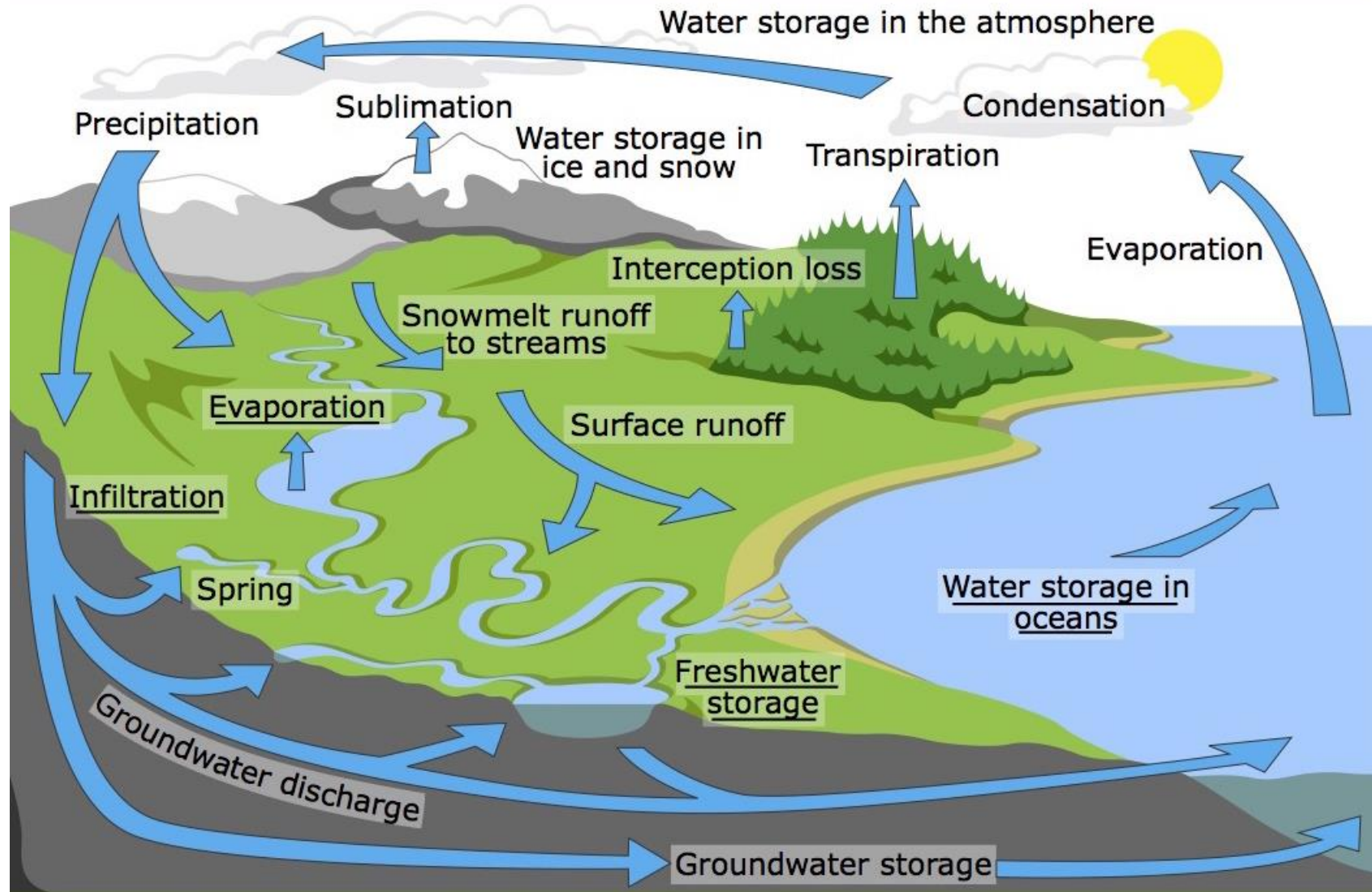


Dirt

Water moves clay, silt and inorganic chemicals so no "cleaning" process

No organisms, no structure
Nutrients move with the water
Water not held in soil pores, moves rapidly thru soil
Leaching, erosion and run-off are problems

Dynamic and Complex: The Global Water Cycle



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