

Boosting soil health in your garden

Master Gardeners Webinar
April 21, 2022

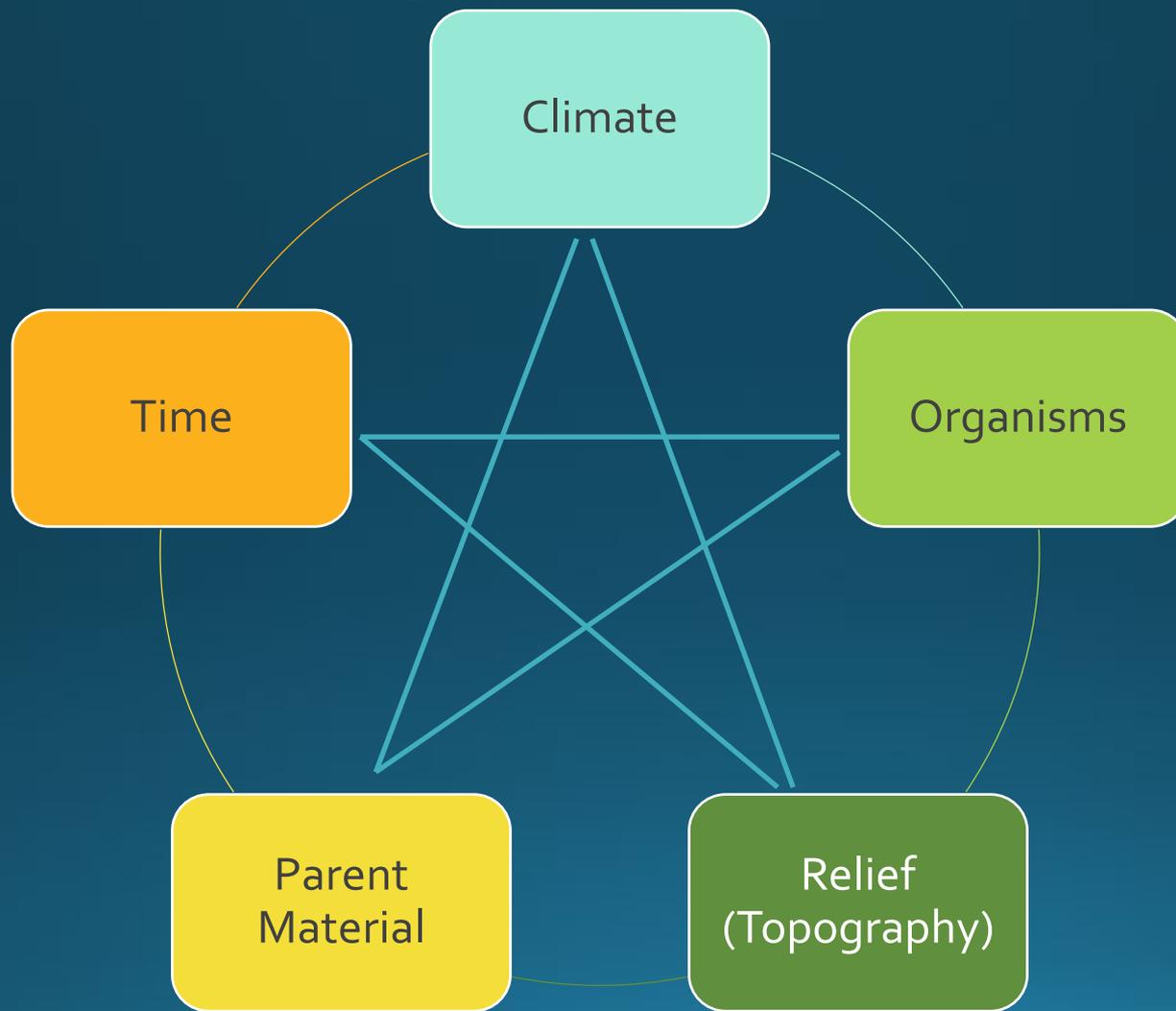


What is soil?

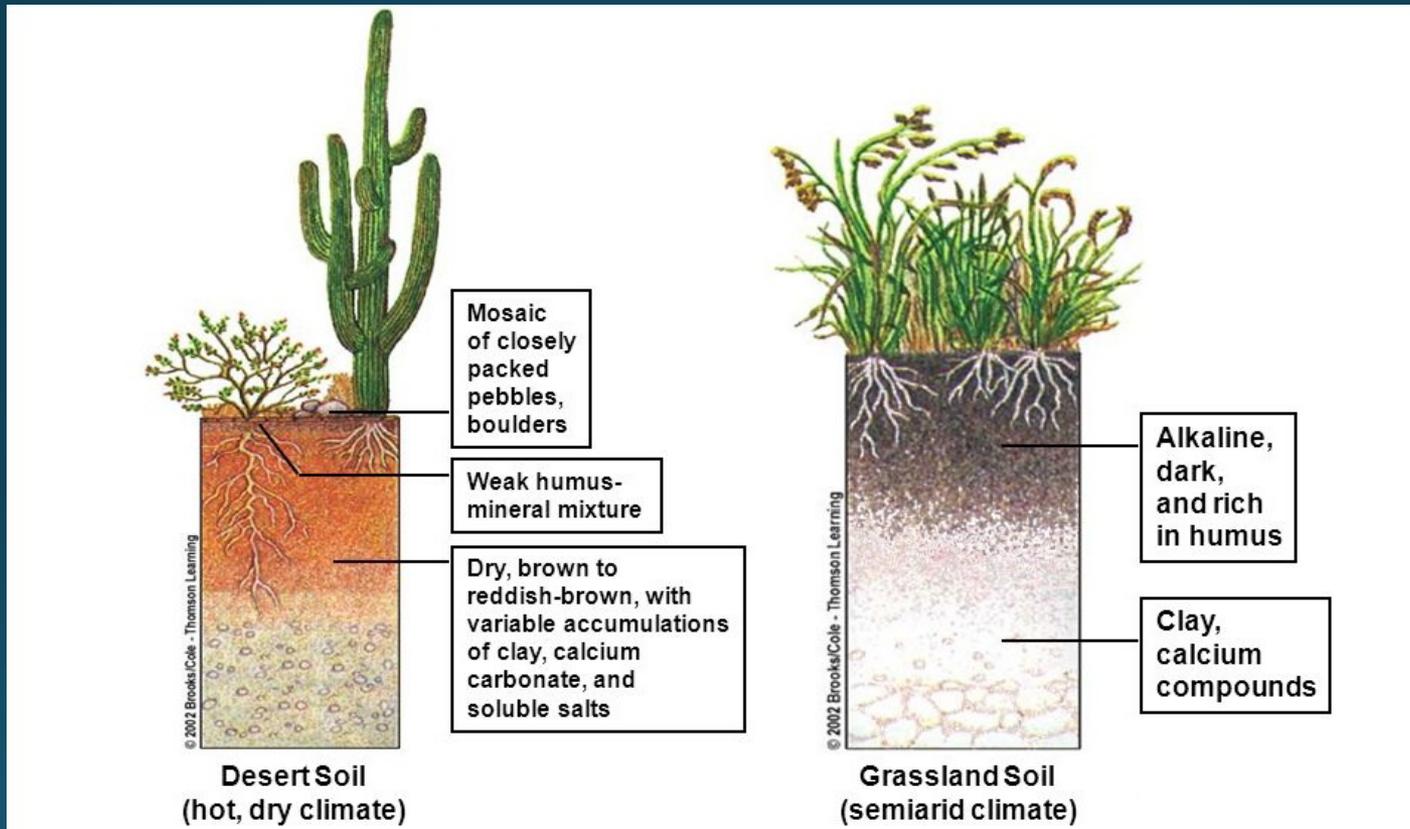
- Today we are talking about natural soil, not a purchased landscape material or “potting soil”
- Think of soil as a natural resource, that varies from place to place



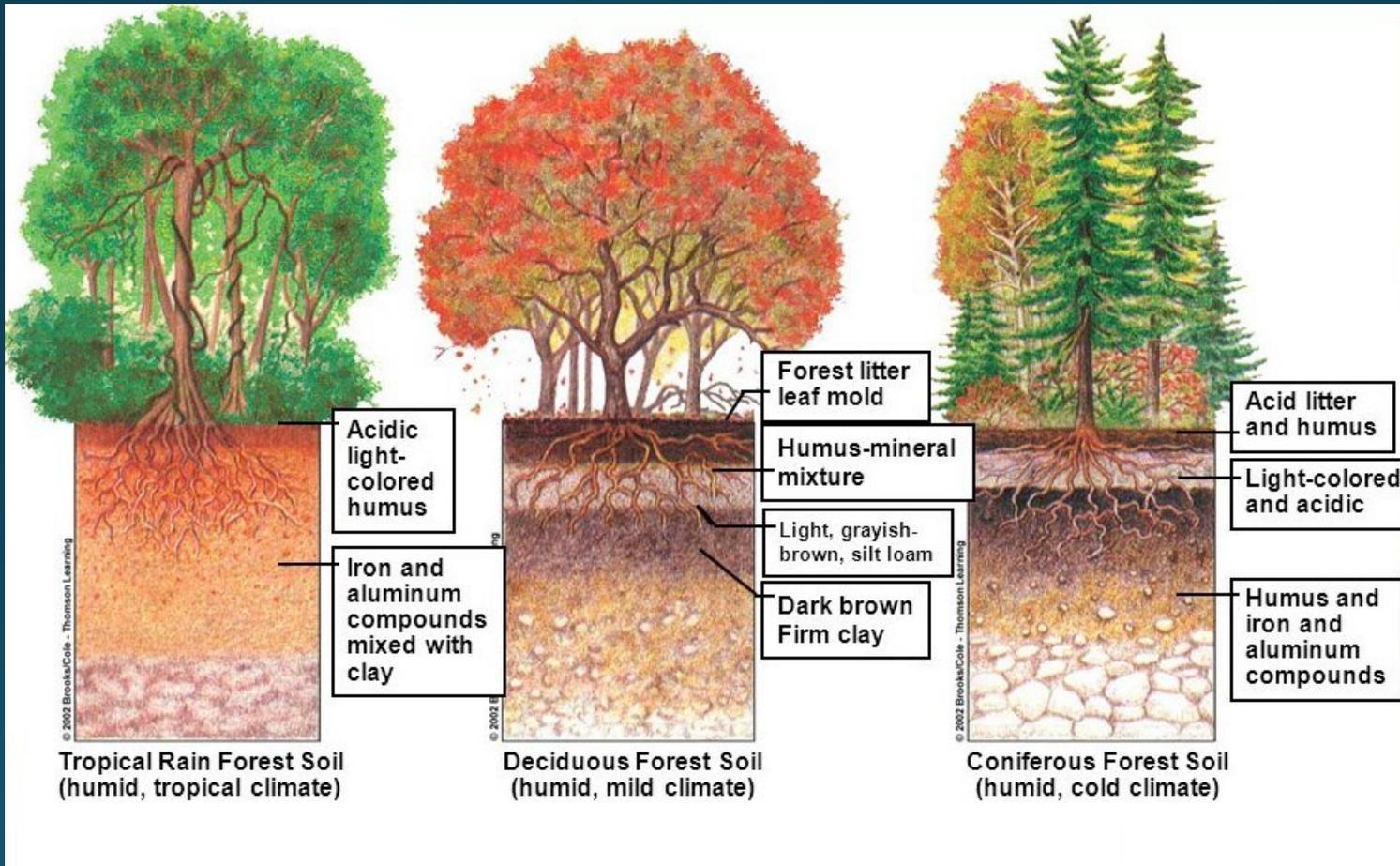
Soil Forming Factors



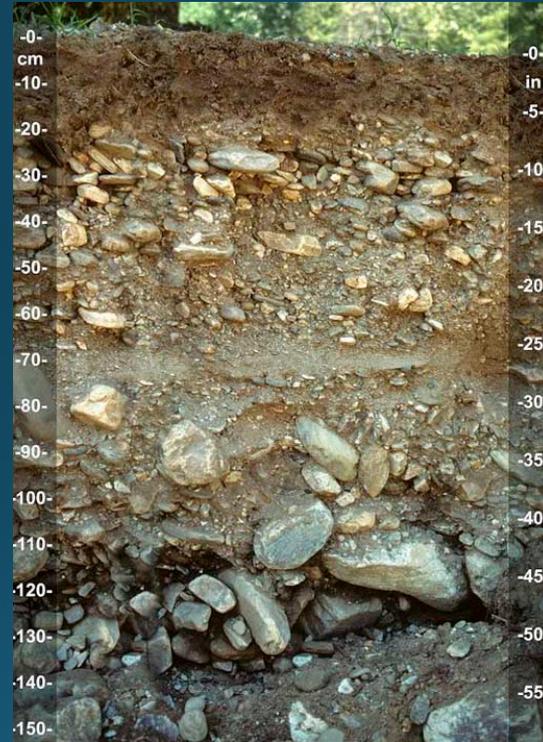
Soils are unique to their place

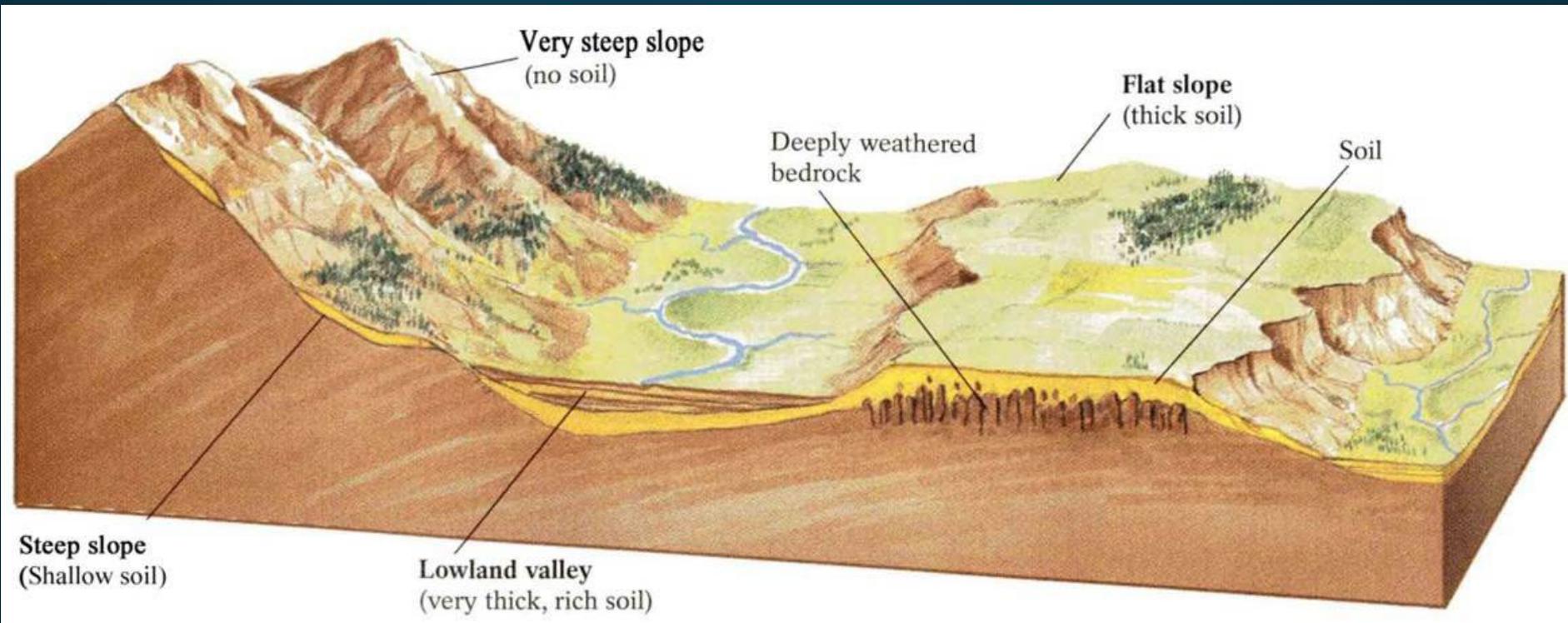


Soils are unique to their place



Soil Profiles





Soil properties affect function

- Soils are a product of their environment
- Soil characteristics vary across landscapes
- Functions (Soil Health) vary across landscapes



Wendy, aren't we here to talk about soil health and our gardens?

Healthy Soil: How does it...

Put your
ideas in the
chat!

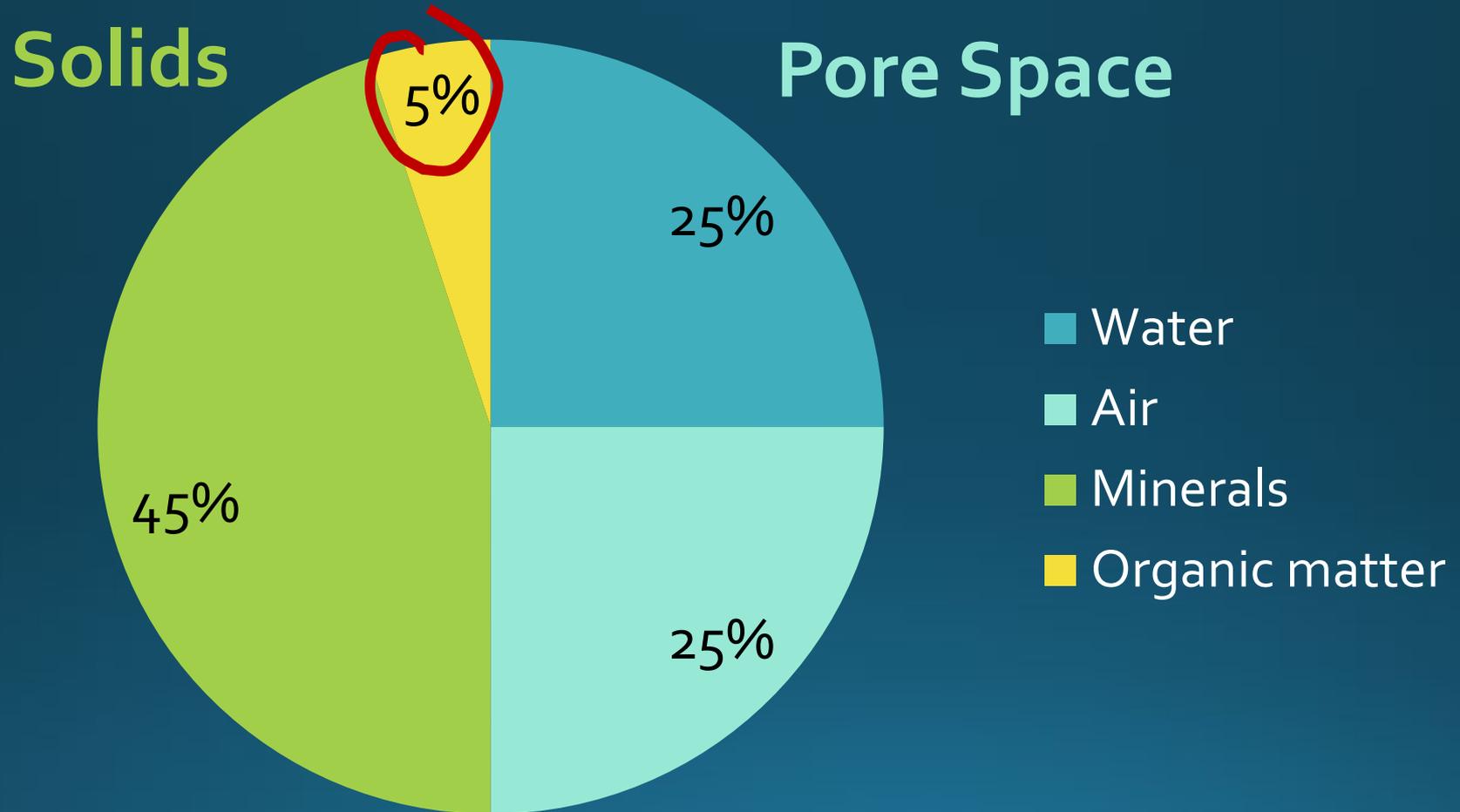




What is Soil Health?

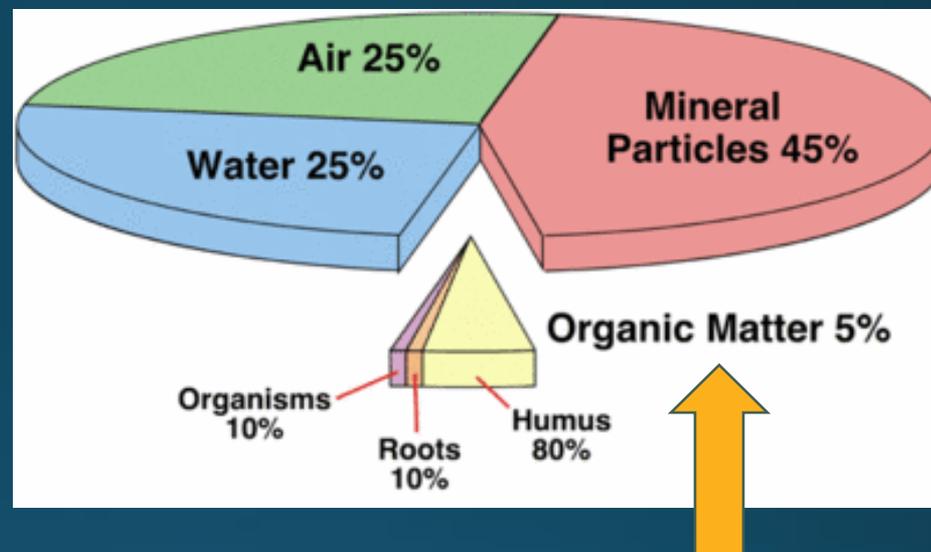
...the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.

What is soil made of?



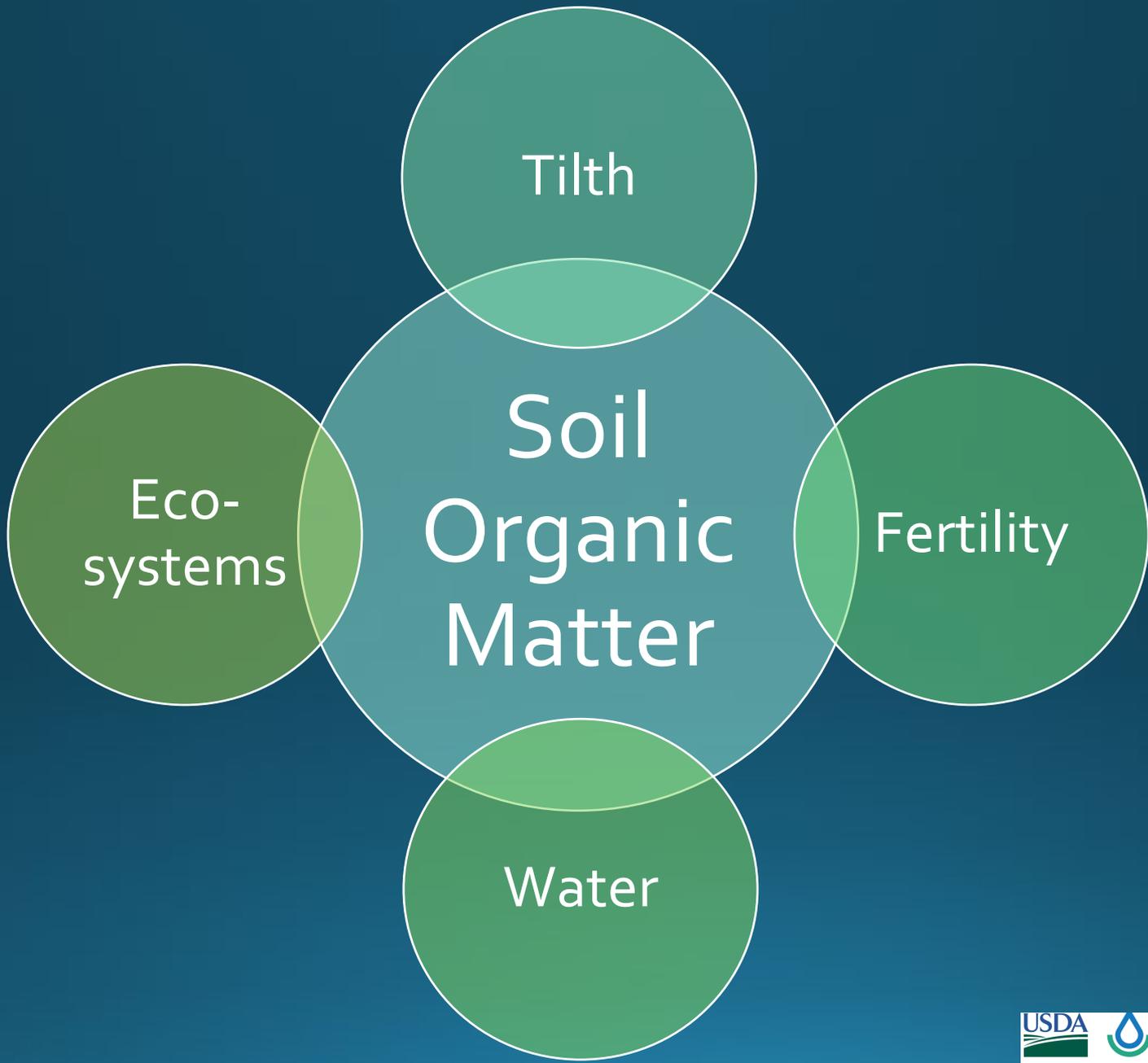
Soil Organic Matter

- “Dead” Soil Organic Matter (SOM) measured in soils (Humus)
- Hot, dry climate = low % organic matter



Small increases in organic matter can have HUGE impacts on soil function!

In California, SOM tends to be lower than this ideal.



Would you rather have sandy soil or clay soil? Why?

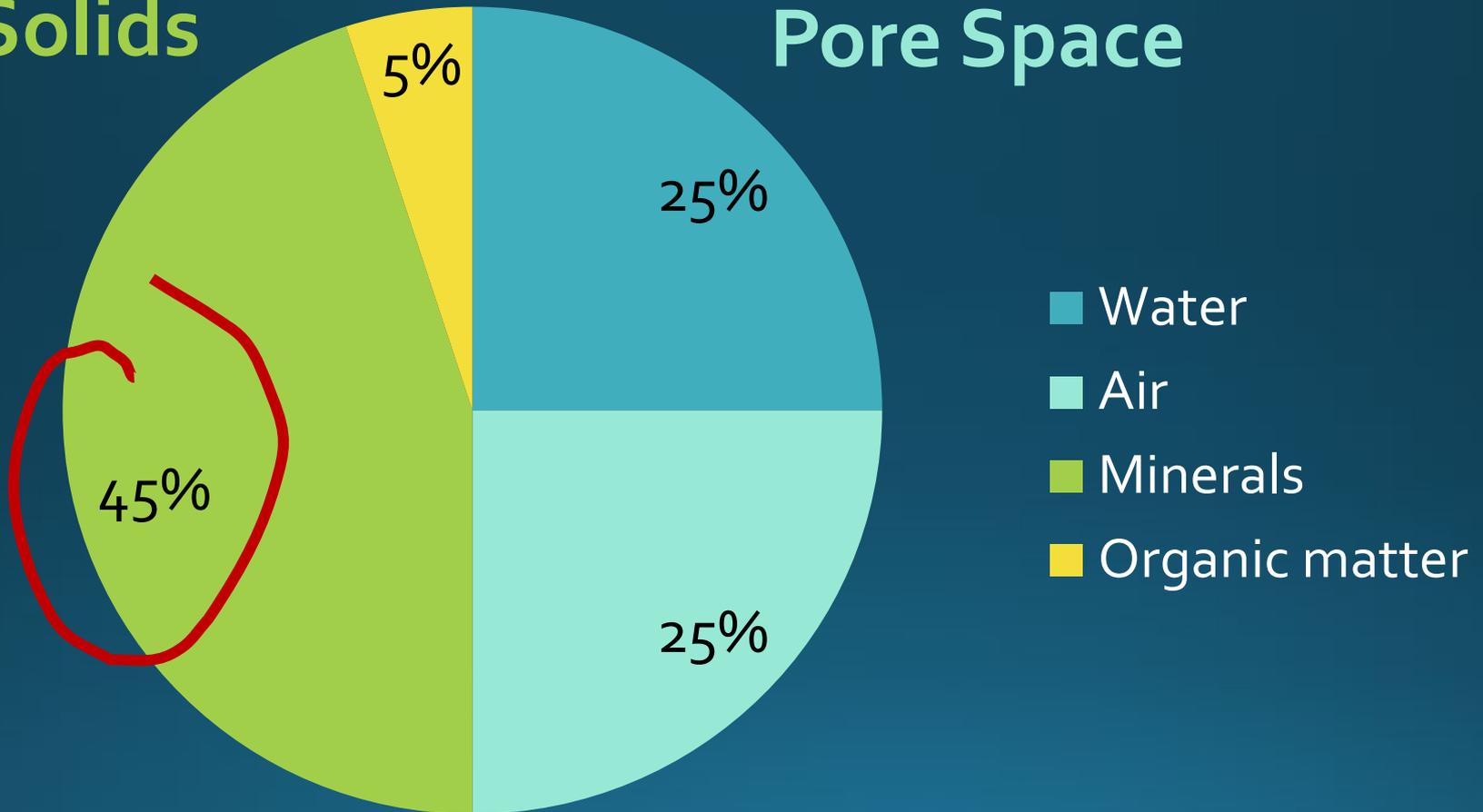


Raise
hand or
chat

What is soil made of?

Solids

Pore Space



Soil Texture

The relative proportion of sand, silt and clay particles in a soil

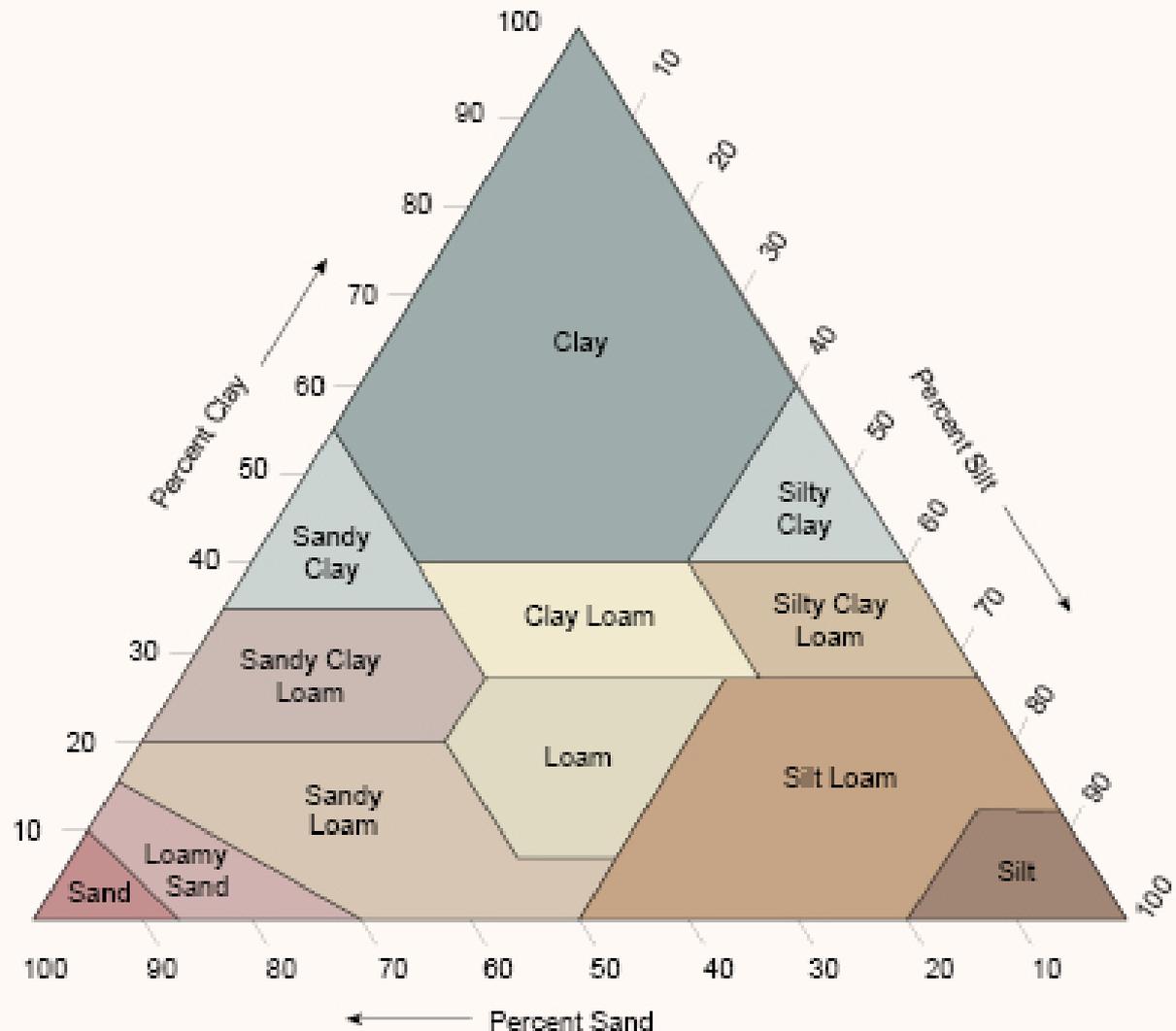
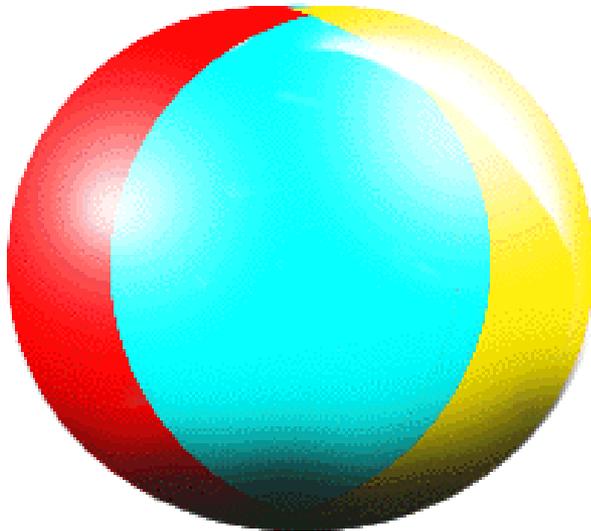


Figure 6.3: The percentage of sand, silt, and clay in the basic textural classes. (Source: USDA Soil Textural Triangle courtesy of United States Department of Agriculture, Natural Resources Conservation Service).

Mineral particle size classes

USDA Standard Relative Particle Size

Beachball



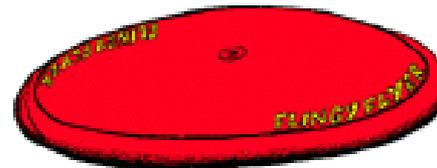
Sand

Sand (2.00 - 0.05 mm)

Silt (0.05 mm - 0.002 mm)

Clay (< 0.002 mm)

Frisbee



Silt

Dime



Clay

2 mm = width of a nickel

0.05 mm = width of a baby hair

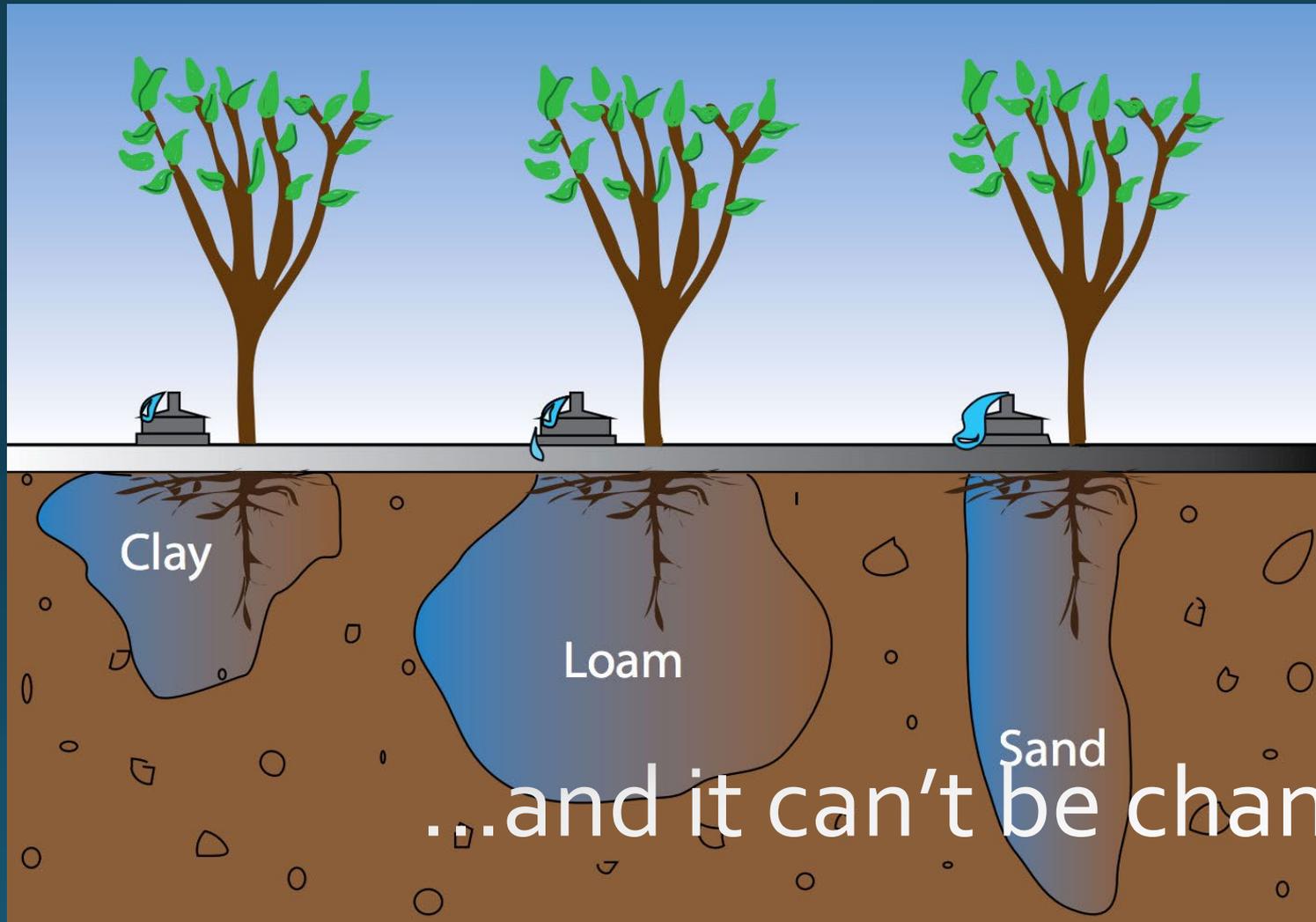
0.002 mm = electron microscope
needed!



Texture is important

Because it has a big impact on many soil functions

Texture is important



Texture is important

- Big impact on many soil functions
- It can't be changed
- It can be mitigated- with



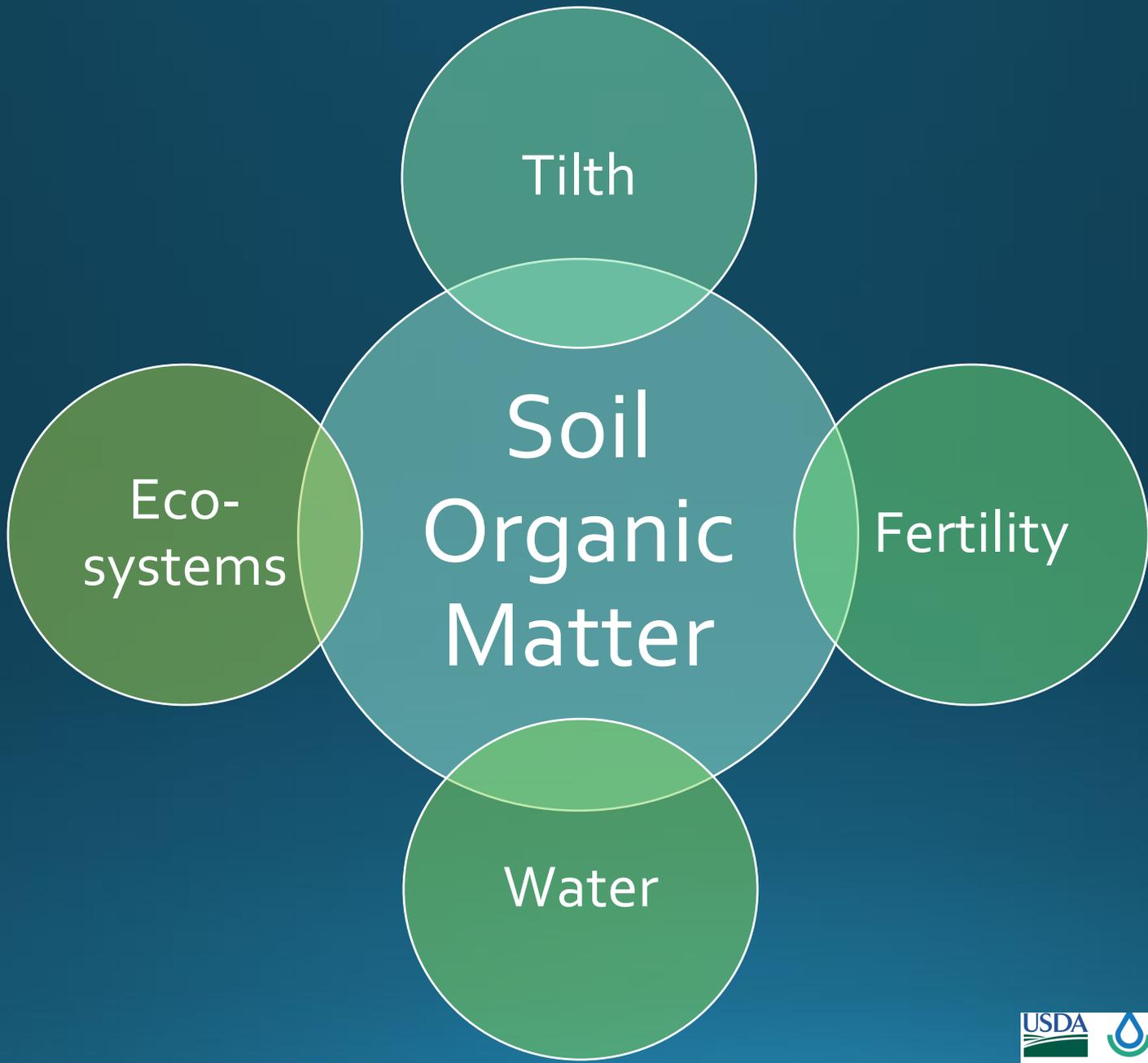
Soil
Organic
Matter

“Tilth”

How easy is it to work this soil?

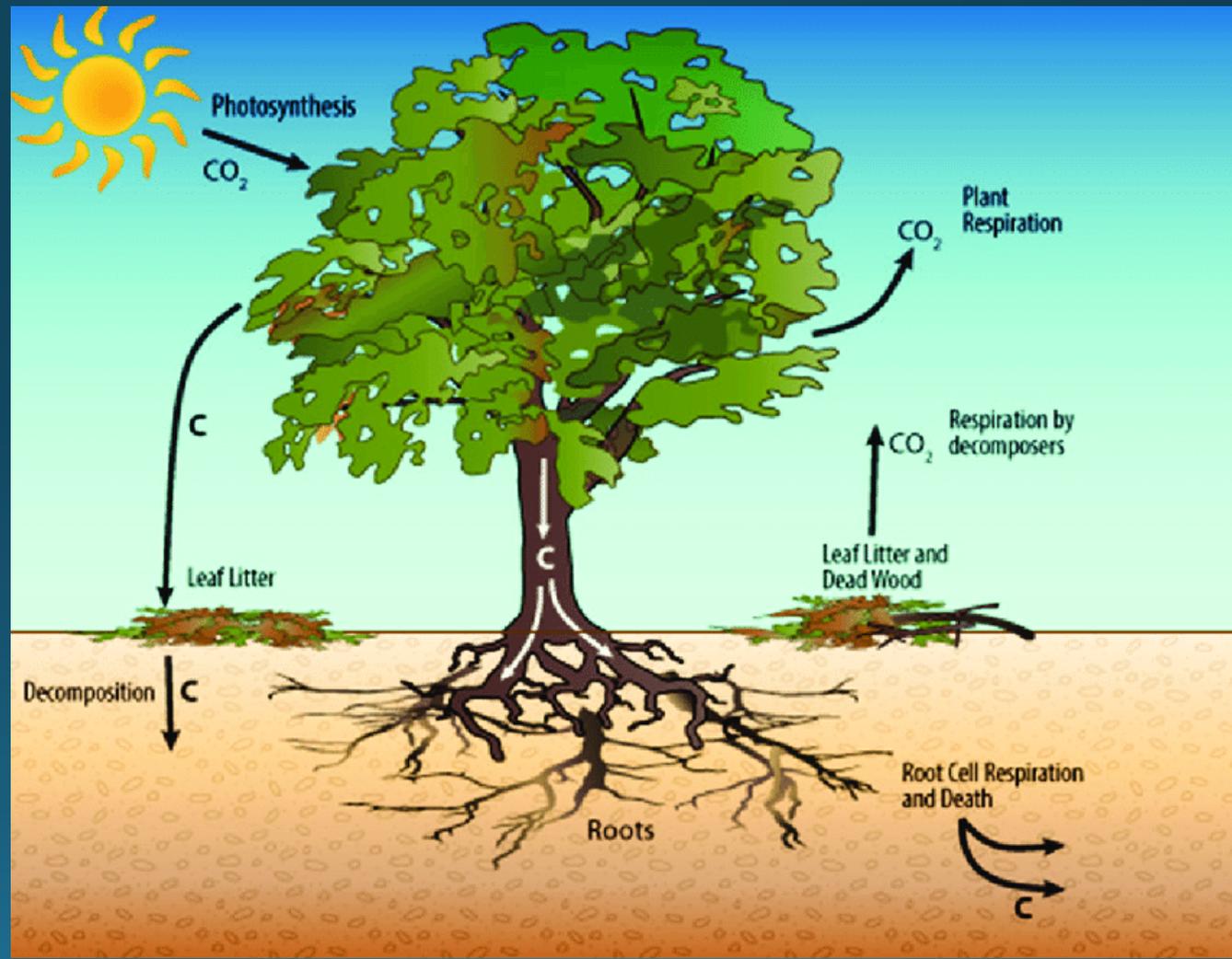
Organic matter loosens clay soil, gives body to sands and silts





Circle of (soil) Life

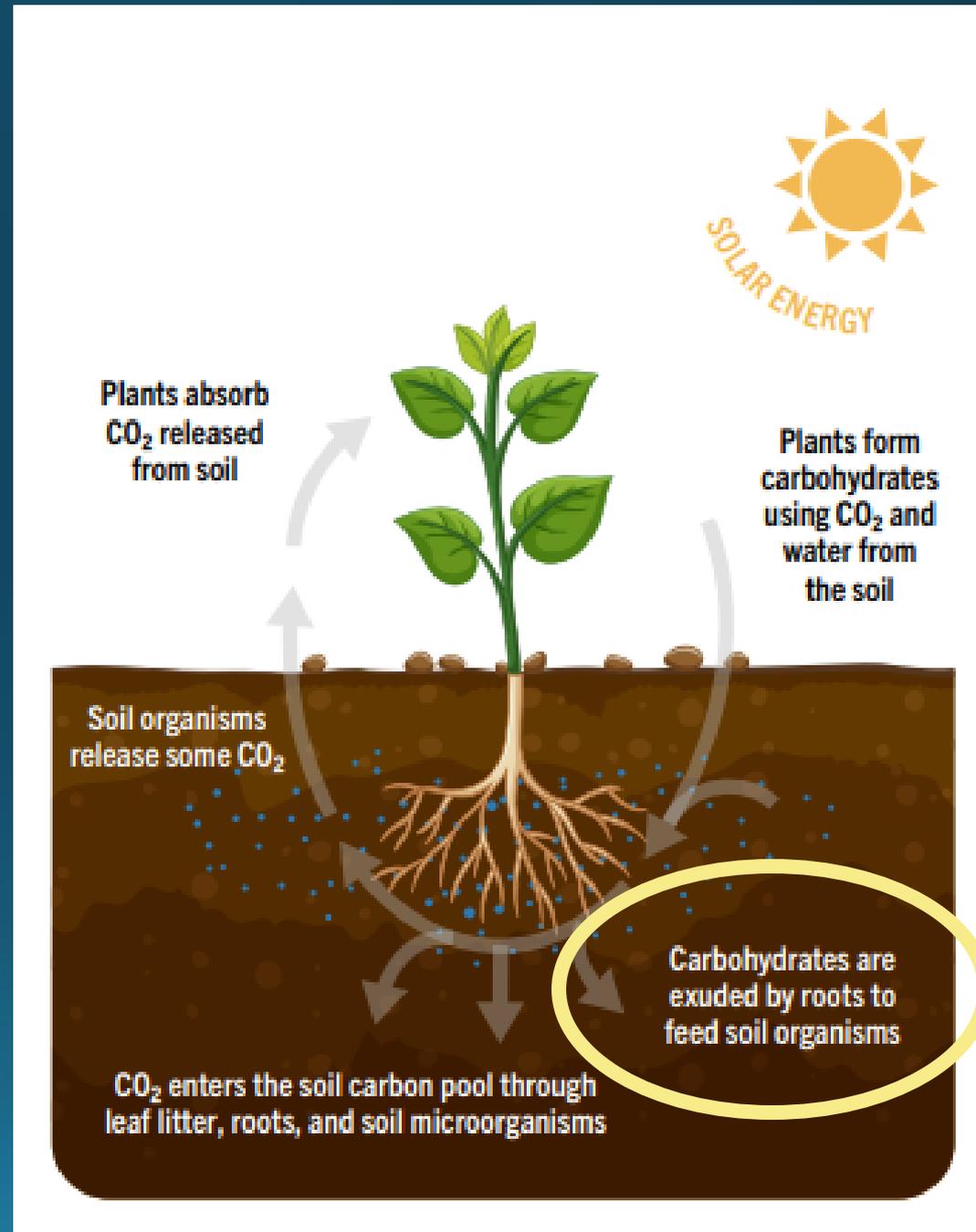
- Plants Grow
- Plants Die
- Dead plant materials become Soil Organic Matter



Circle of (soil) Life- Living organisms

Plants release **UP TO 20%** of the sugars they make through their roots!

Why?



Soil Ecosystem- Players

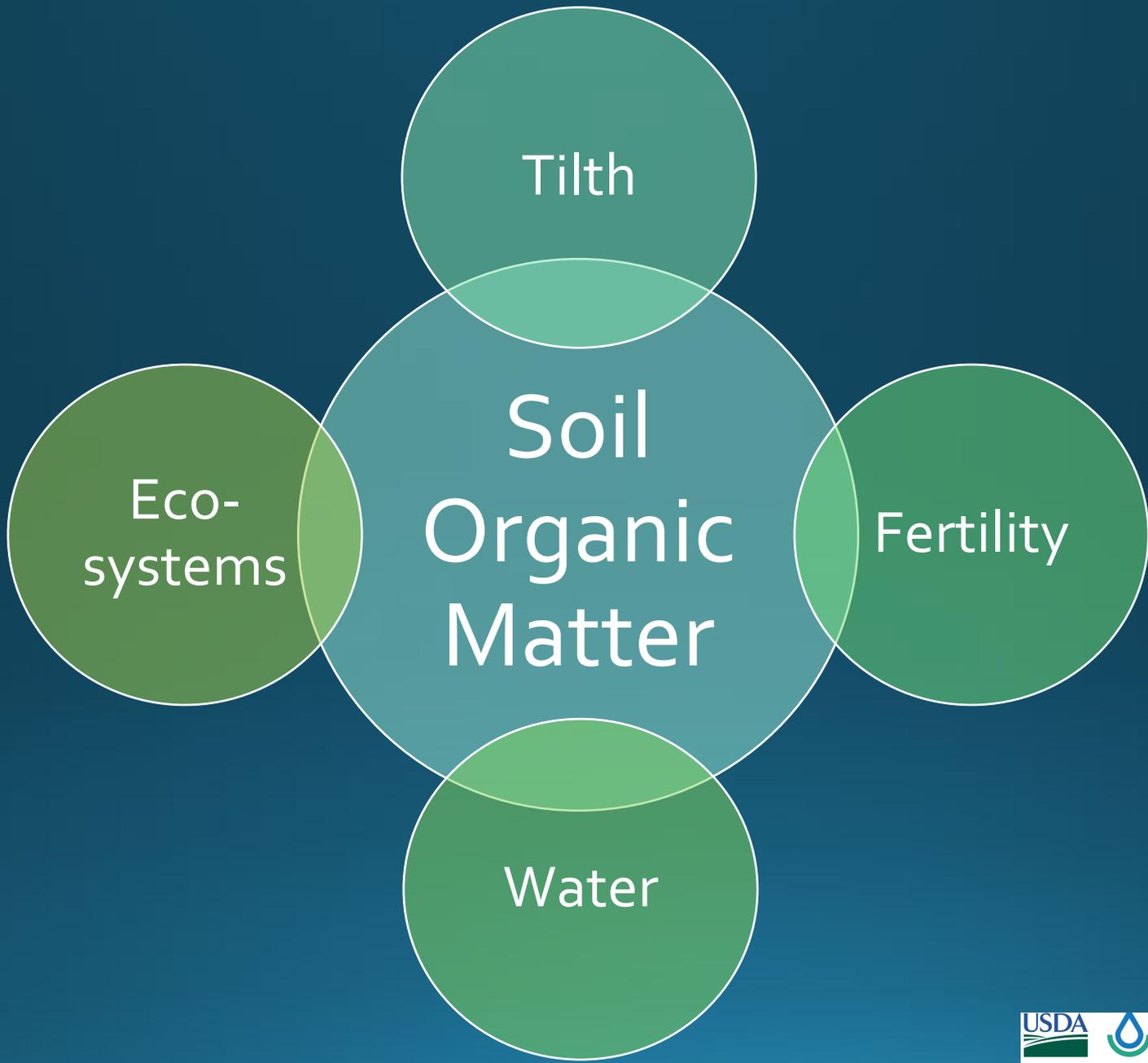


- Living roots, root hairs
- “Shredders”
 - Earthworms
 - Arthropods
- Microorganisms
 - Fungi
 - Bacteria
 - Actinomycetes

Soil Ecosystem- Actions

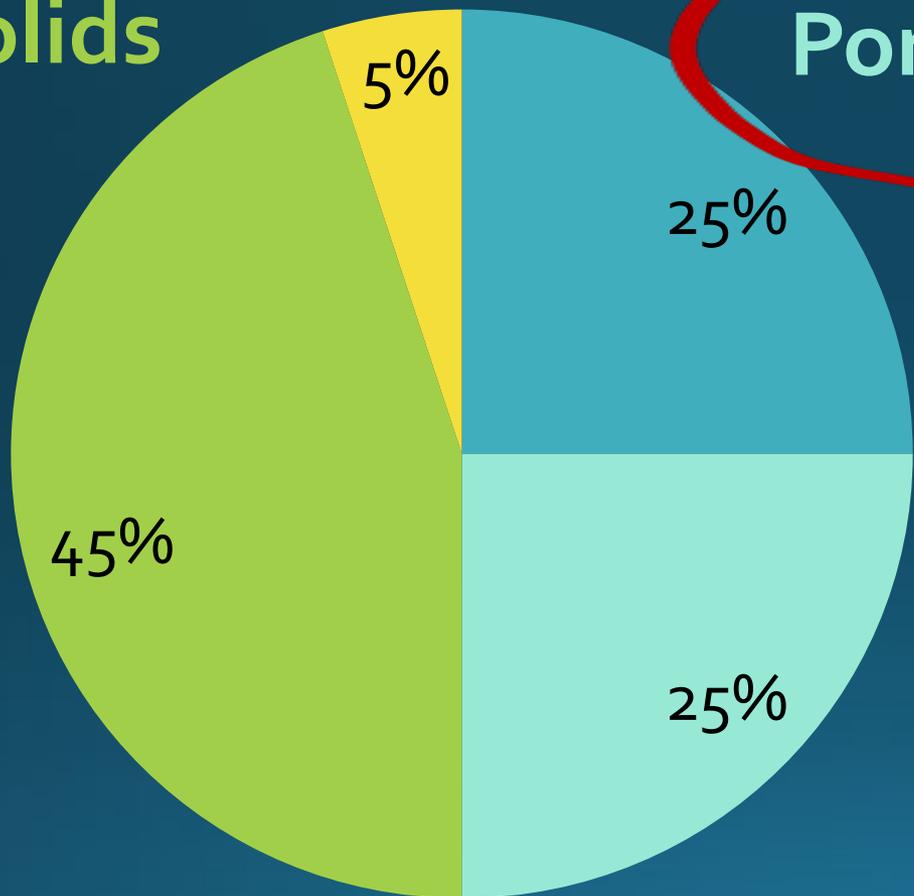


- Decompose organic materials
 - Release soluble nutrients
 - “Exhale” CO₂
- Symbiosis between plants and microbes
 - Mycorrhizae
 - Rhizobia
- Pests and pathogens



What is soil made of?

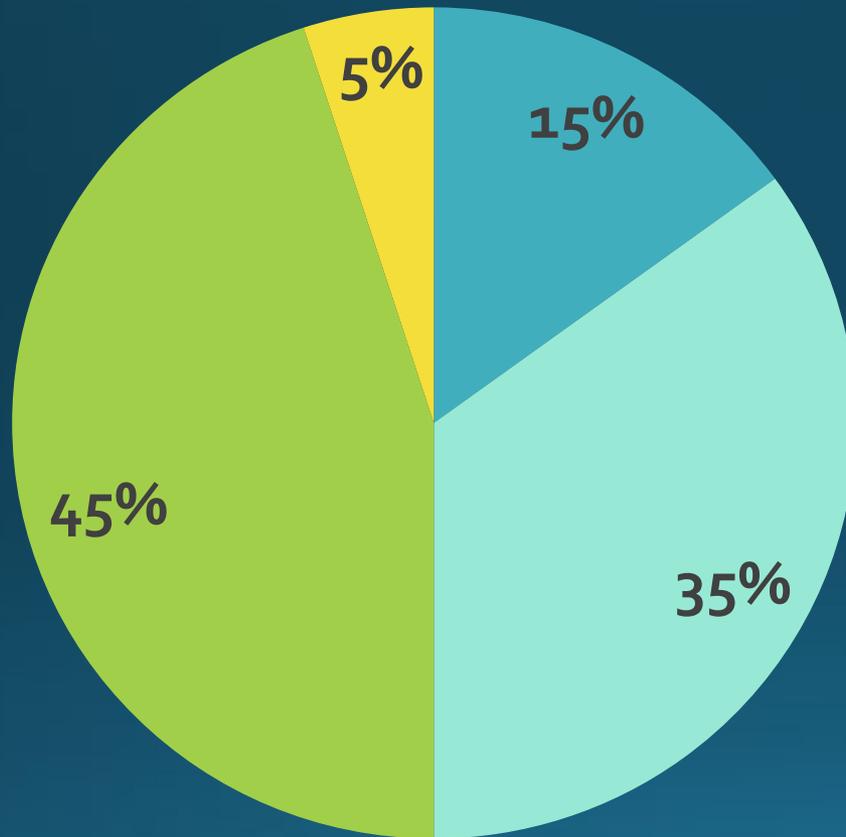
Solids



Pore Space

- Water
- Air
- Minerals
- Organic matter

Soil Components

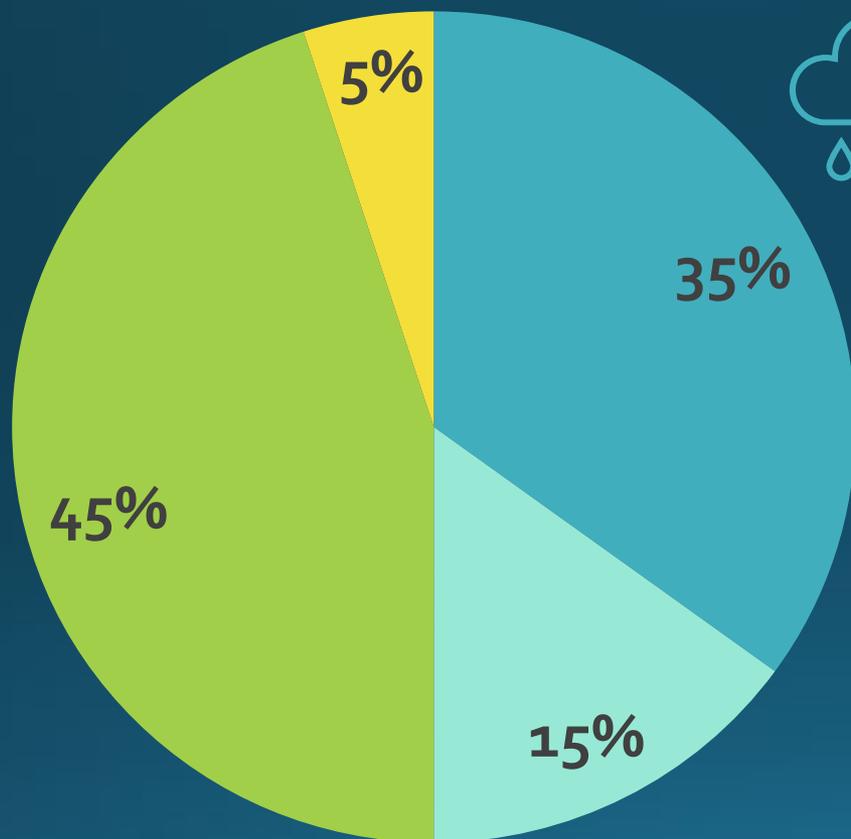


- Water
- Air
- Minerals
- Organic matter



Dry soil

Soil Components

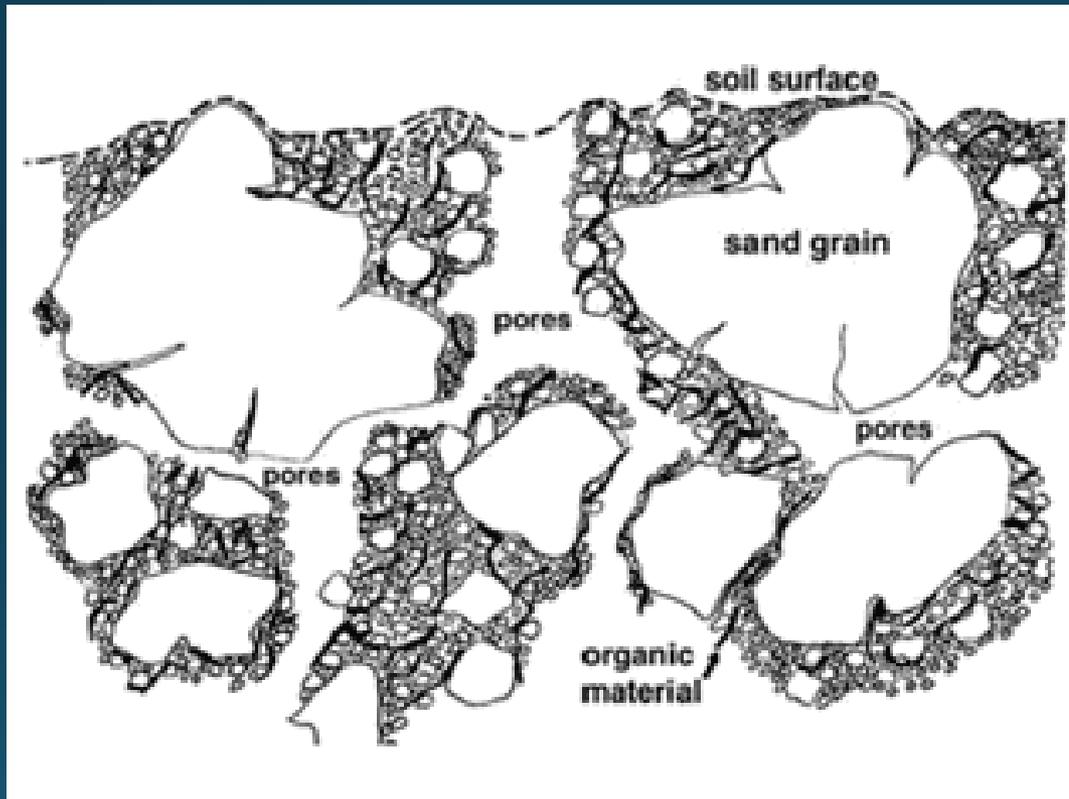


Wet soil

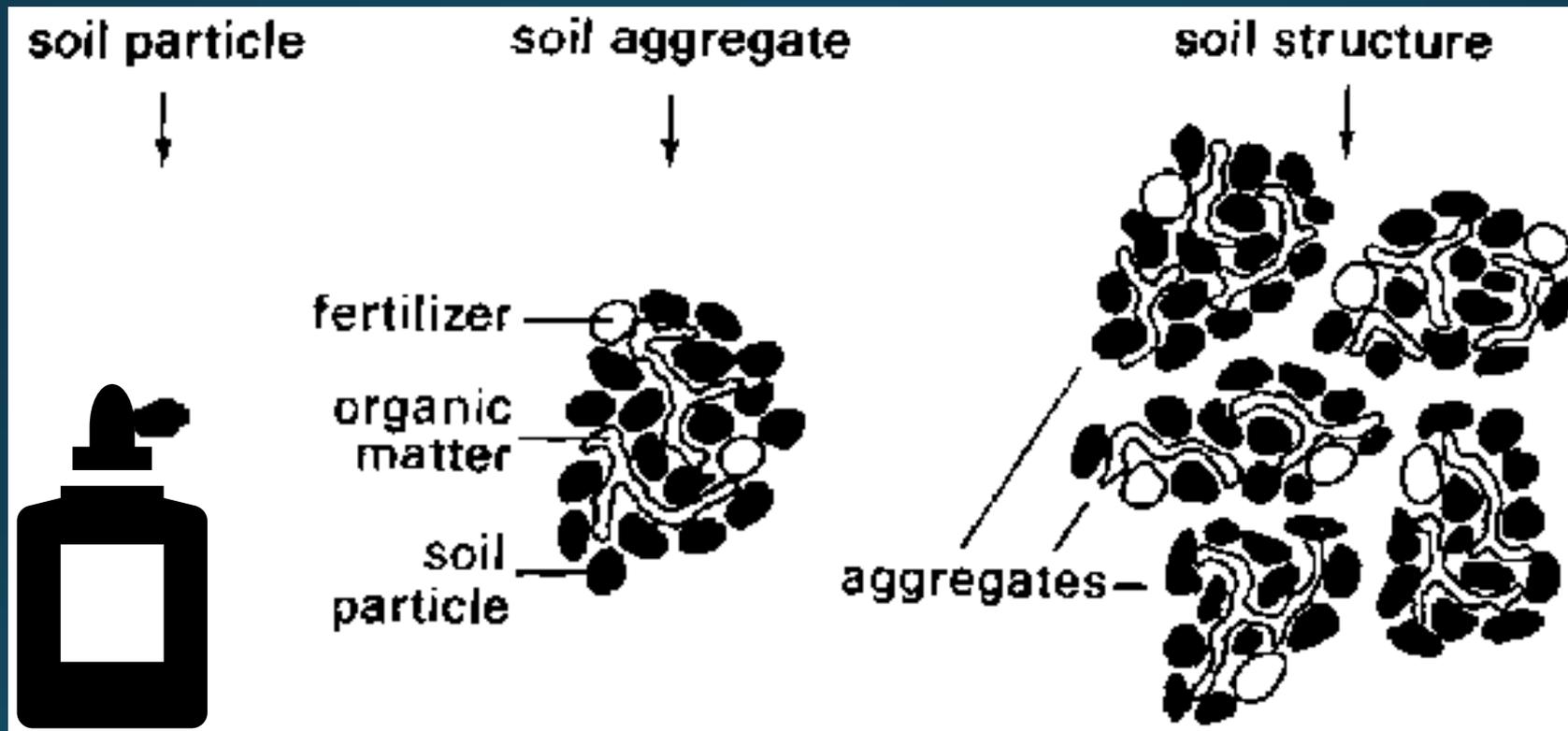
- Water
- Air
- Minerals
- Organic matter

Pore Space

Pores are defined by soil aggregates



Soil Structure



Soil aggregates are held together by organic glues

Soil Structure

Soil aggregate shape, size, and strength determine soil structure

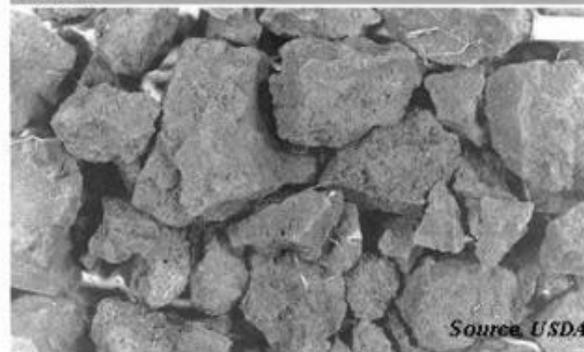
Soil structure

FIGURE 3-28



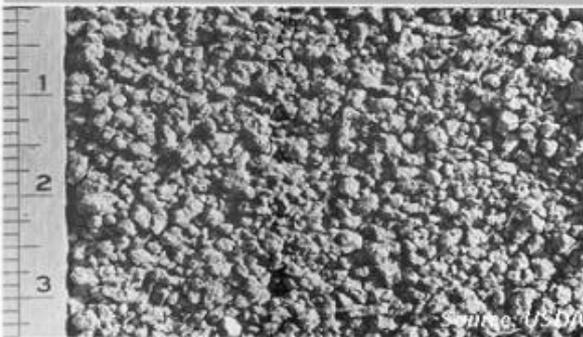
A cluster of strong medium columnar peds. The cluster is about 135 mm across.

FIGURE 3-29



Strong medium and coarse blocky peds.

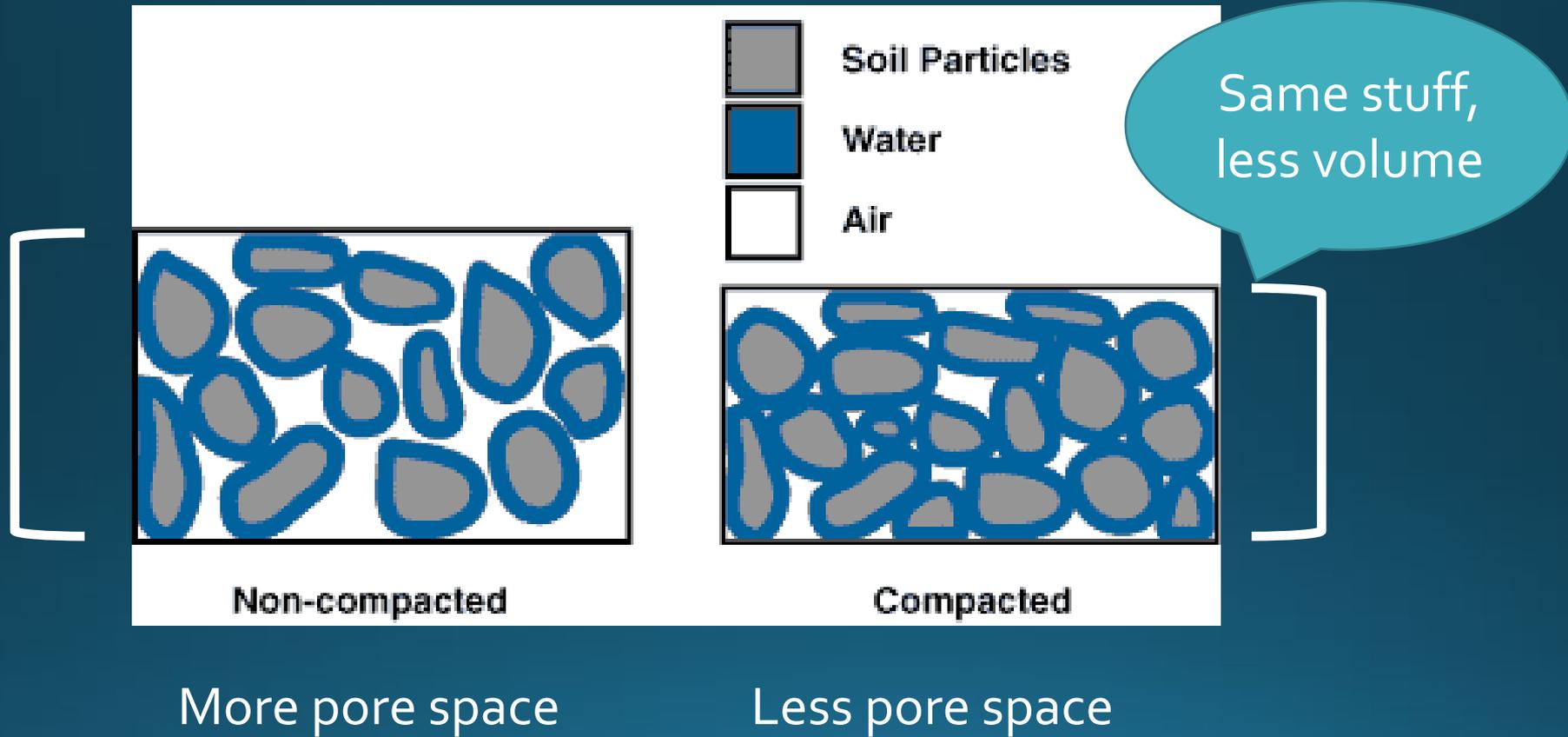
FIGURE 3-30



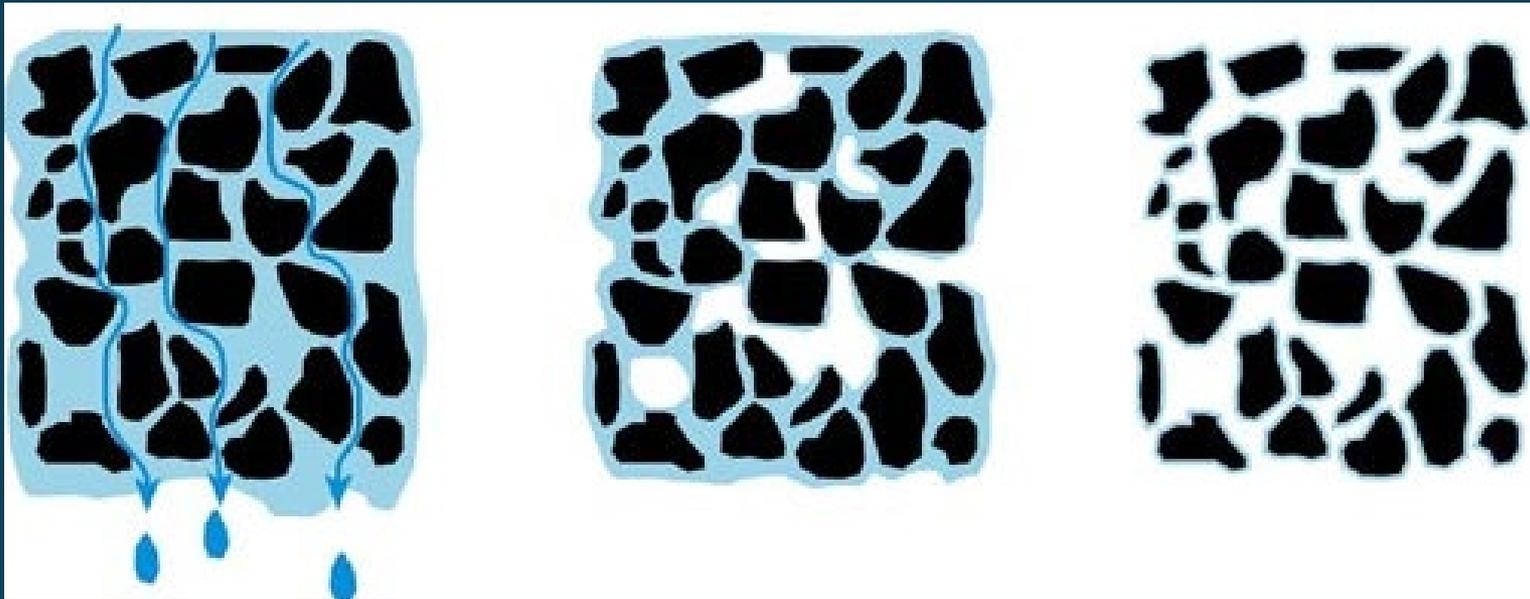
Strong fine and medium granular peds.

In the public domain.

Pore Space- Compaction



Water Holding Capacity





Stable aggregates

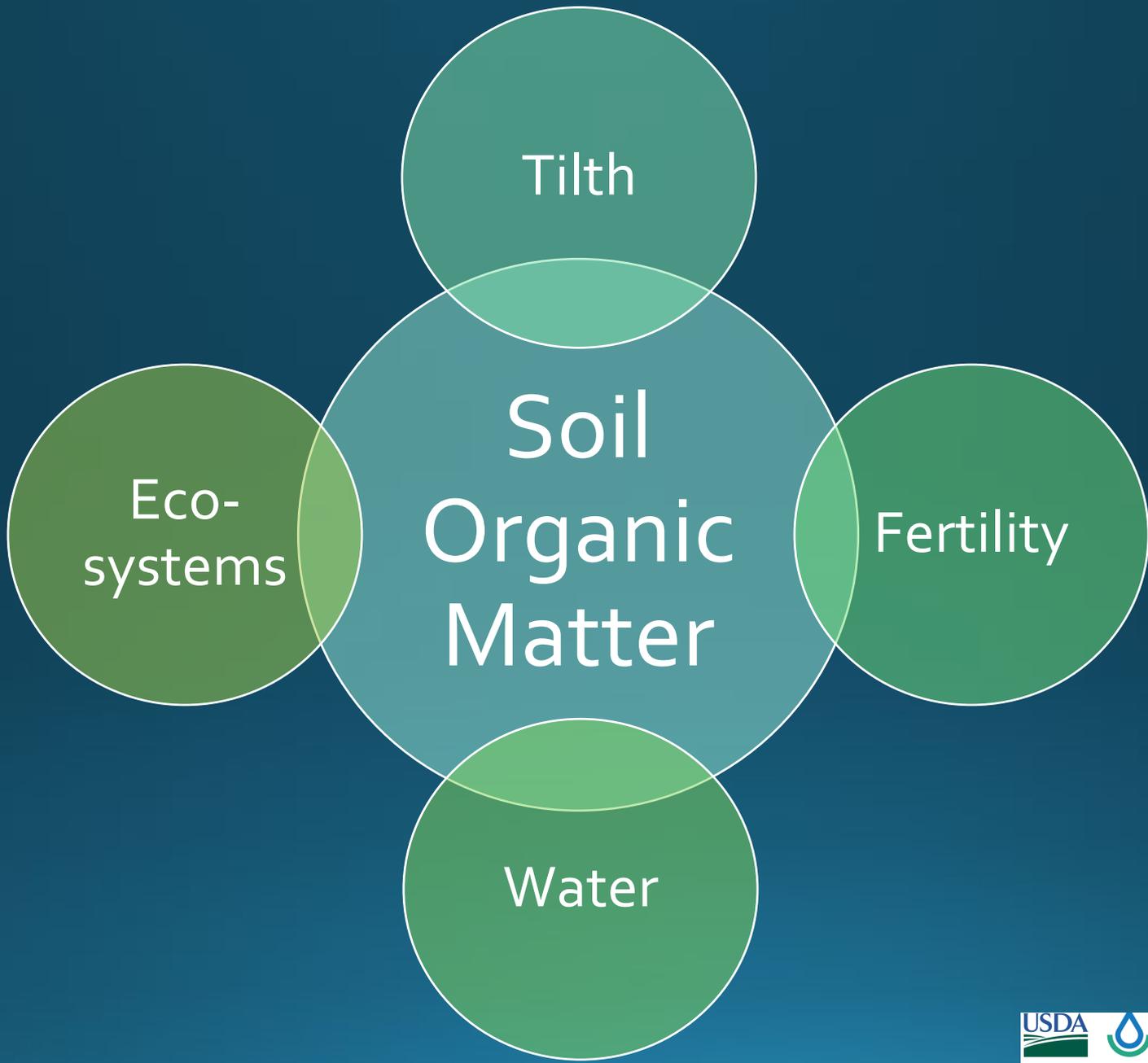
Stable pores

Less compaction

Resists erosion
Good infiltration

Water holding capacity
Aeration and drainage

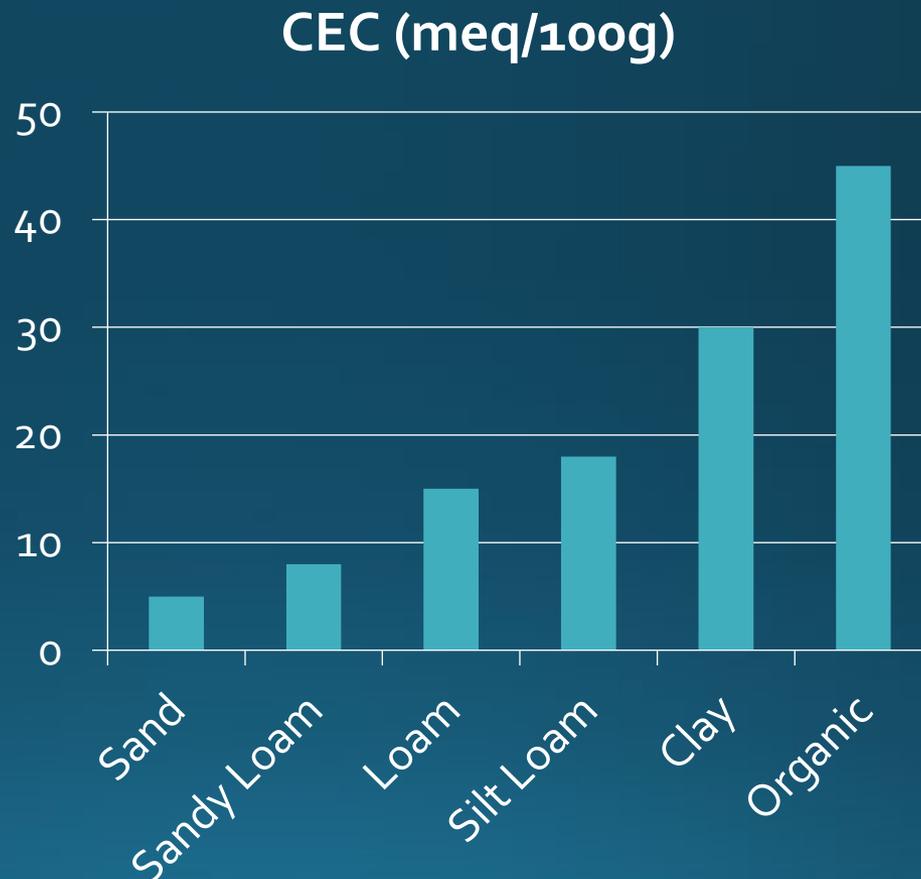
Root penetration
Easy to work



Native Soil Fertility

Influenced by:

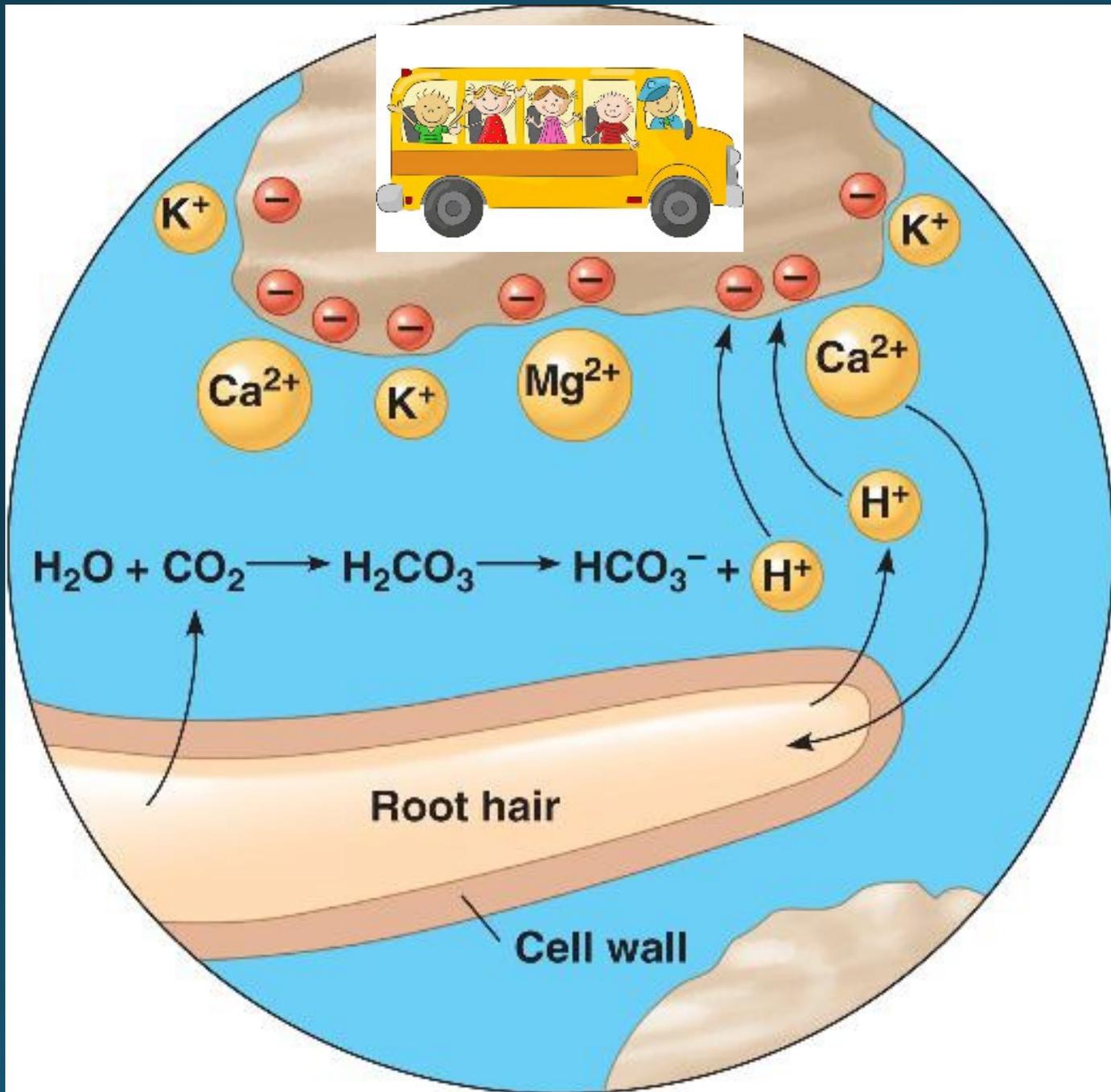
- Minerals present in rocks
- Ability of soil to hold nutrients
- Cation Exchange Capacity
 - Clays (amount and type)
 - Soil Organic Matter



Native Soil Fertility

CEC (meq/100g)





*What is the ideal way to
get the healthiest
possible soil?*



Build organic matter!



*How do I build
Organic Matter?*



Management principles for soil health

Disturb the soil less:

Reduce tillage to preserve organic matter

Feed the soil food web:

Add organic matter and keep living roots in the soil



Cover the soil more:

Grow vegetation and leave mulch on the surface

Diversify the system:

Add different kinds of plants to the system in open times or spaces



Don't dig or till (and maybe don't walk on it) when it's wet!



Reduce
compaction

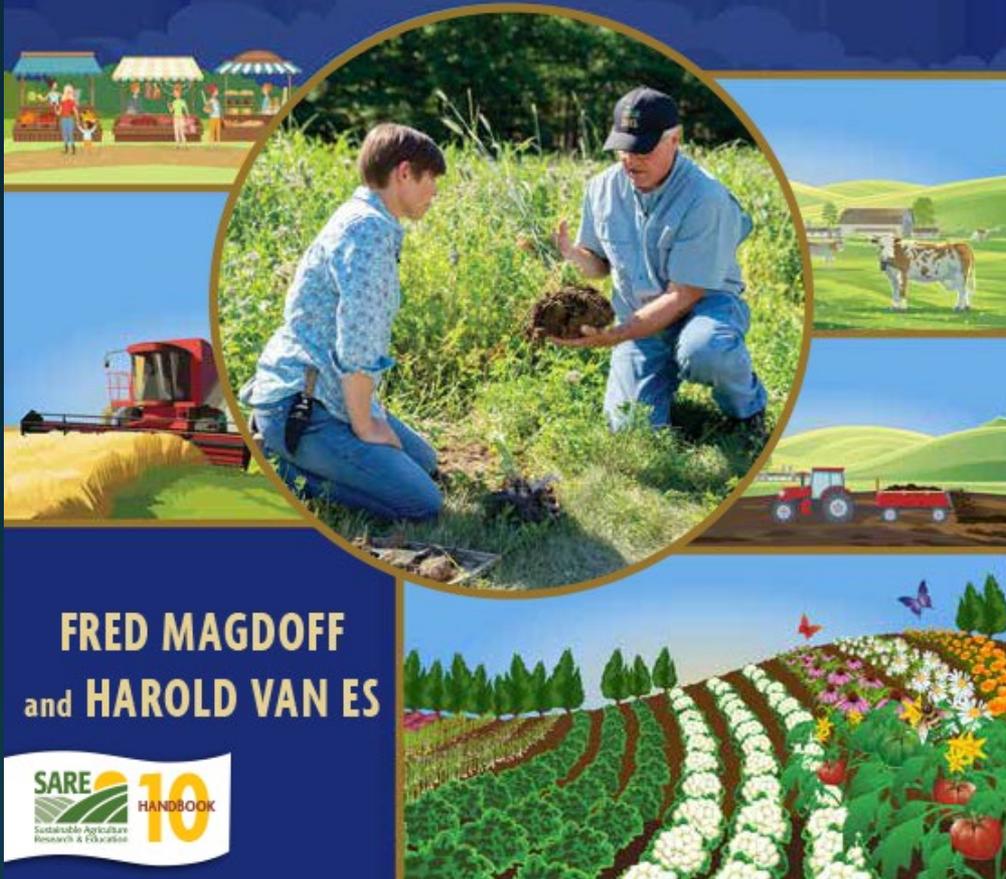
“If you want your soil to be healthy,
you shouldn’t see it very often.”



FOURTH EDITION

BUILDING SOILS FOR BETTER CROPS

ECOLOGICAL MANAGEMENT FOR HEALTHY SOILS



FRED MAGDOFF
and HAROLD VAN ES



Resource:

<https://www.sare.org/resources/building-soils-for-better-crops/>

Free as pdf

\$23 for print copy
(not including tax
and shipping)

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SOIL HEALTH

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Soil is not an inert growing medium – it is a living and life-giving natural resource. It is teeming with billions of bacteria, fungi, and other microbes that are the foundation of an elegant symbiotic ecosystem.

Soil health is defined as the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans. Healthy soil gives us clean air and water, bountiful crops and forests, productive grazing lands, diverse wildlife, and beautiful landscapes. Soil does all this by performing five essential functions:

[Soil Health | NRCS \(usda.gov\)](https://www.nrcs.usda.gov)

Resource:

<https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/soils/health/?cid=stelprdb1048783>

Thank you!

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