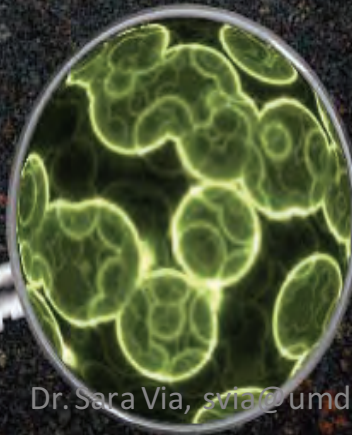


Healthy Soil, Clean Water, Safe Climate

Dr. Sara Via
Professor & Climate
Extension Specialist
svia@umd.edu



Dr. Sara Via, svia@umd.edu

Source: Modern Farmer

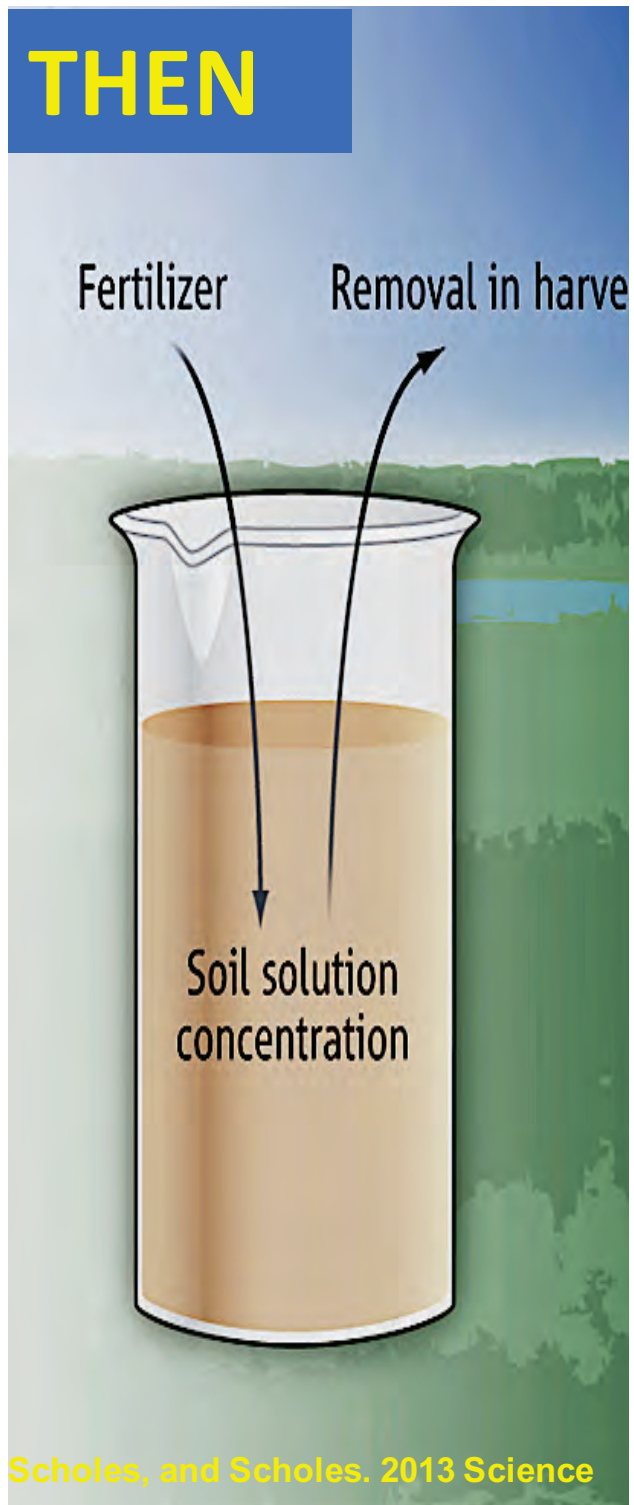


Conventional agriculture has degraded the soil

New view:

- Healthy soil is alive, and it feeds & protects crop plants
- Increasing soil health improves water quality & allows use of less fertilizer & chemicals
- Farmers realizing the benefits & seeing cost savings

Dr. Sara Via, svia@umd.edu

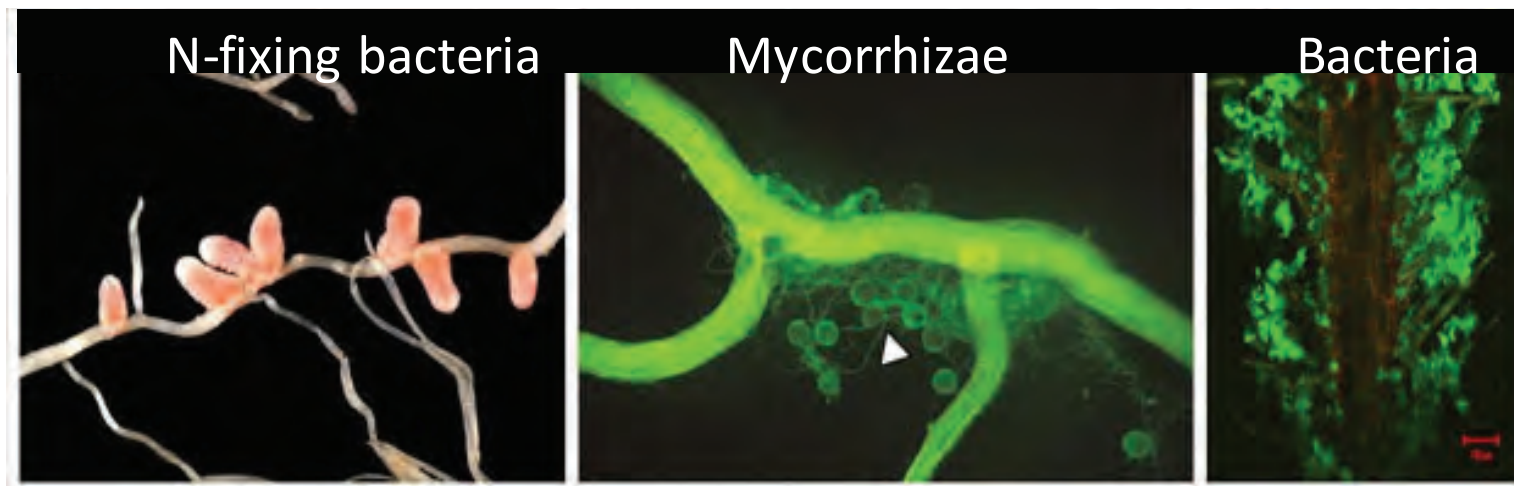


The secret life of healthy soil

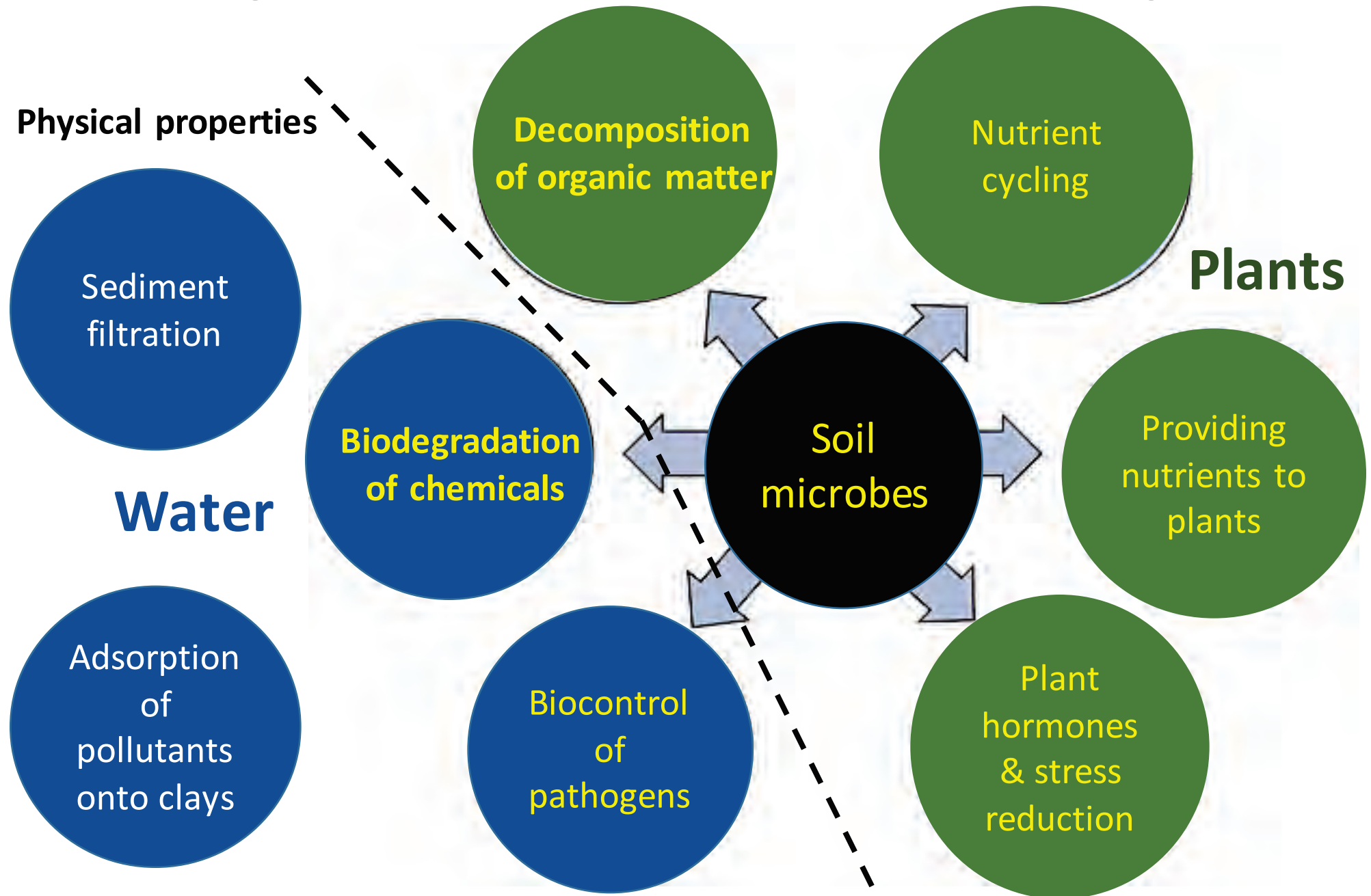


- 1t soil contains >1 BILLION microbes
- **Plants give** up to 40% of the sugar they make from photosynthesis to bacteria & fungi
- **Plants get** nutrients, water, protection from diseases ,predators & abiotic stress

We must boost and protect these interactions



Healthy soil filters water & feeds plants



Stable aggregate structure of healthy soil built by soil organisms

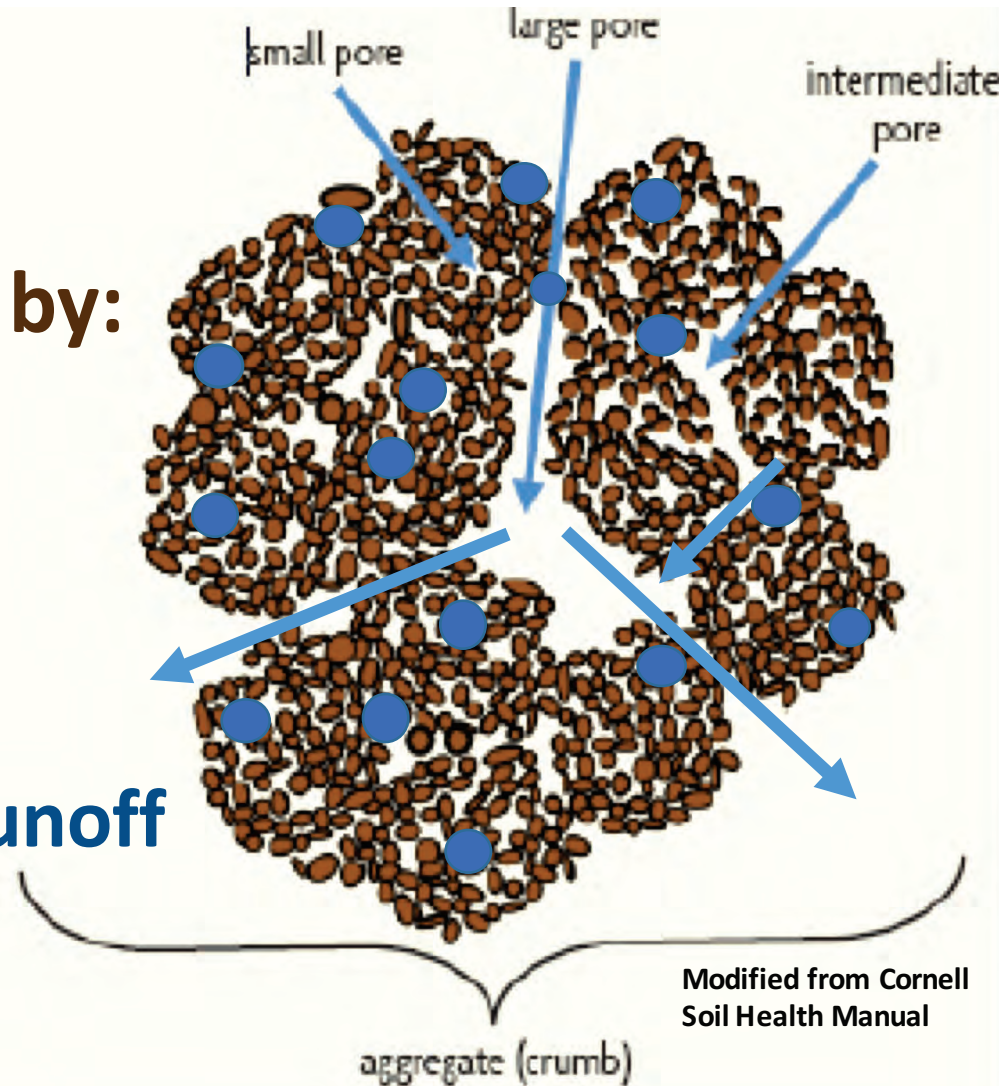
Increases infiltration & holds water



Soil aggregates stabilized by:

- roots & their exudates
- mycorrhizae & "glue"
- other sticky material from soil organisms

Stable aggregates reduce runoff & sediment pollution of waterways



How do we rebuild soil health?

USDA Natural Resource Conservation Service

Soil health principles

1. Limit disturbance
2. Keep the soil covered
3. Increase crop diversity
4. Maintain live roots all year



1. Limit physical disturbance: Tilling

- breaks soil aggregates, destroys habitat
- increases runoff & sediment erosion,
- water & nutrients lost



2. Keep soil covered: Cover crops

Prevent erosion

- protect soil organic matter
- prevent siltation of waterways

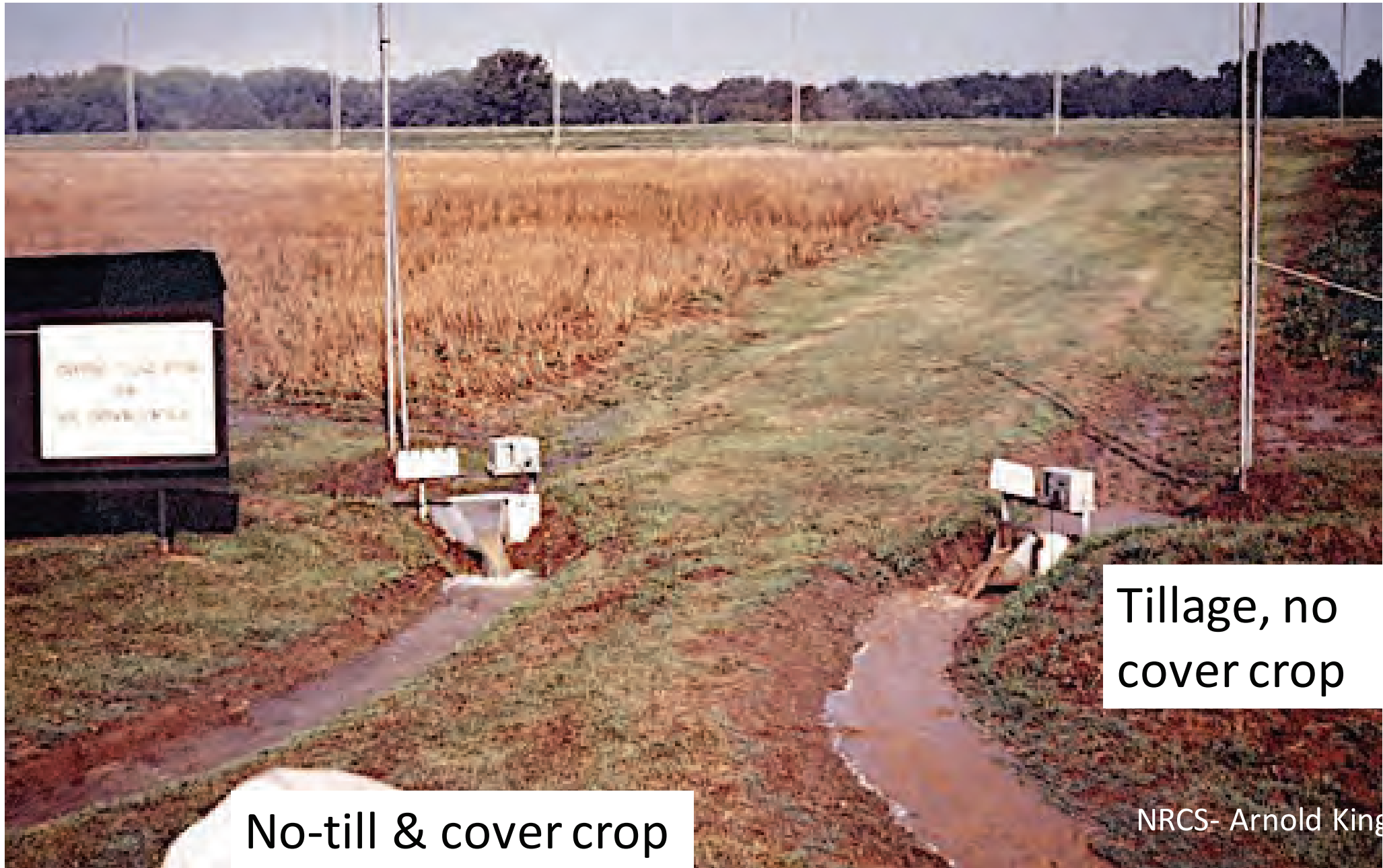


Cover crops clean the water, build the soil

Deep roots bring leftover nutrients to surface,
make deep channels & deposit organic matter



No-till & cover crops together: More water infiltrates, less runoff & erosion



No-till & cover crop

Tillage, no
cover crop

NRCS- Arnold King

No-till & cover crops widely used in MD

No-till (2017):

>950,000 acres

@ 0.31 Mt CO₂e/ac

= 294,500 Mt CO₂e

like removing 64,000 cars
for a year



Cover crops (2017)

560,000 acres @ 0.37 Mt CO₂e/ac

= 207,200 Mt CO₂e

like removing 45,000 cars for a year

3. Increase plant diversity

More plant diversity, more microbial diversity
& more carbon sequestration

Crop rotation (2017)

305,000 acres

@0.22 Mt CO₂e/ac

= 67,200 Mt CO₂e

like 14,600 fewer cars



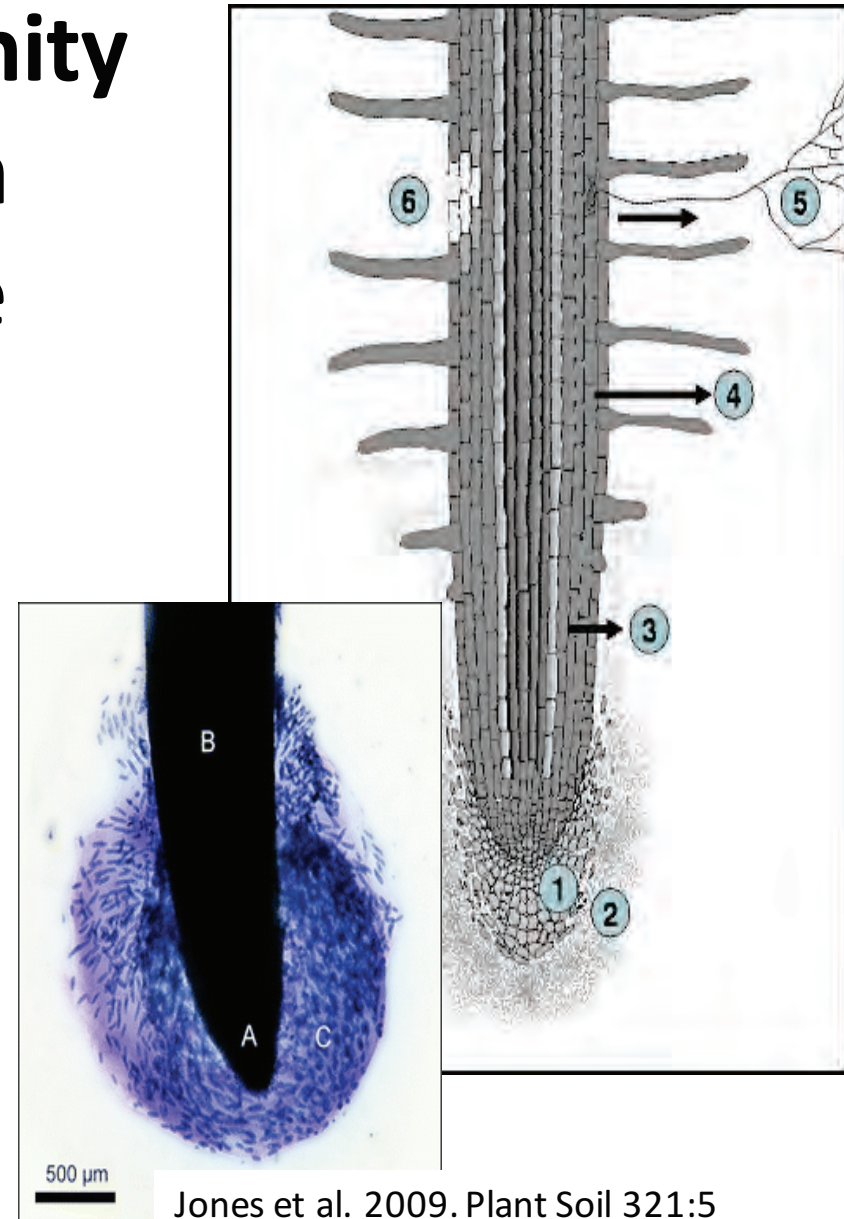
Cover crop mixes

4. Maintain live roots to feed microbes

Healthy microbial community

- improves water filtration
- increases carbon storage

Most stored carbon comes from roots and has been processed by microbes



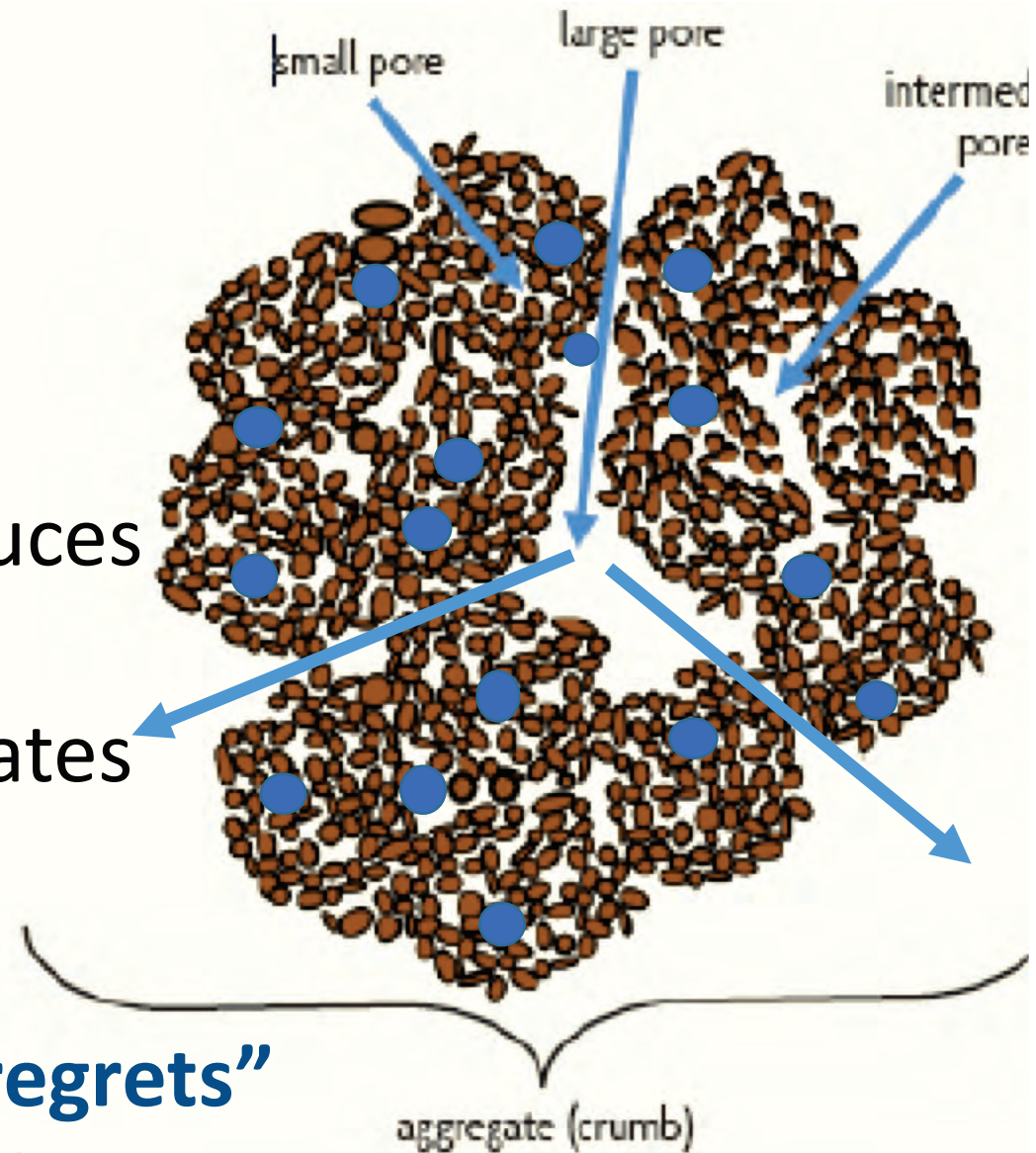
Jones et al. 2009. Plant Soil 321:5

Healthy soil directly reduces climate risk



- increased infiltration reduces flood risk
- water held within aggregates in small pores reduces drought risk

Soil health is the top “no regrets” strategy for climate resilience



Agriculture is not just part of the climate problem: It can be part of the climate solution

Reducing emissions is not enough

- Land-based carbon sequestration is the most practical and effective strategy
 - forests, farms, open space
- Many practices that sequester carbon are already used by Md's farmers to improve soil health & water quality
- Rough estimate: between 2007-2017, these practices reduced GHG in Maryland by 6.9 MMt



US Climate Alliance Natural & Working Lands Challenge (Agriculture & Forestry)

Why not use carbon sequestering practices on non-agricultural land also?

- Howard Co, MD first county to take on the challenge

Develop a collaboration between County, Columbia Association, MDA, DNR to install practices on open space

- conservation cover
- riparian buffers, grassy or wooded
- tree & shrub planting



Healthy Soil Cleans Waterways & Fights Climate Change

- Applaud Maryland's farmers for leading the nation in use of NRCS conservation practices
- Recognize that NRCS conservation practices have both water quality AND carbon benefits
- Develop a joint incentive program to boost use of these conservation practices and add more practices and acres
- Include non-agricultural lands (US Climate Alliance Natural & Working Lands Challenge)



Contact me anytime with questions or comments!

Dr. Sara Via

Professor &

Climate Extension Specialist

svia@umd.edu