

# Soil Health Management in Organic Agroecosystems



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# Presentation Outline

- **What is soil health and why is it important?**
- **Managing for healthy soils in organic systems**
- **How to assess the soil health status in your system?**



Soils in Mediterranean and semi-arid regions are prone to increased soil **degradation**



**What is soil health and why is it important?**



# Soil Health

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***“the capacity of soil to function as a vital living system, within ecosystem and land-use boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and promote plant and animal health”***  
(Doran and Zeiss, 2000)



# What is a healthy soil?

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***A healthy soil, with its thriving biological activity, creates a living system of air and water pores that allows for greater water infiltration and storage as well as greater soil carbon storage and permanence.***

*Organic agriculture builds resilience and stabilizes our food supply in the face of drought and other extreme weather conditions that will occur with increasing frequency in a changing climate.*





Photo credit: Ceres Imaging

Drought

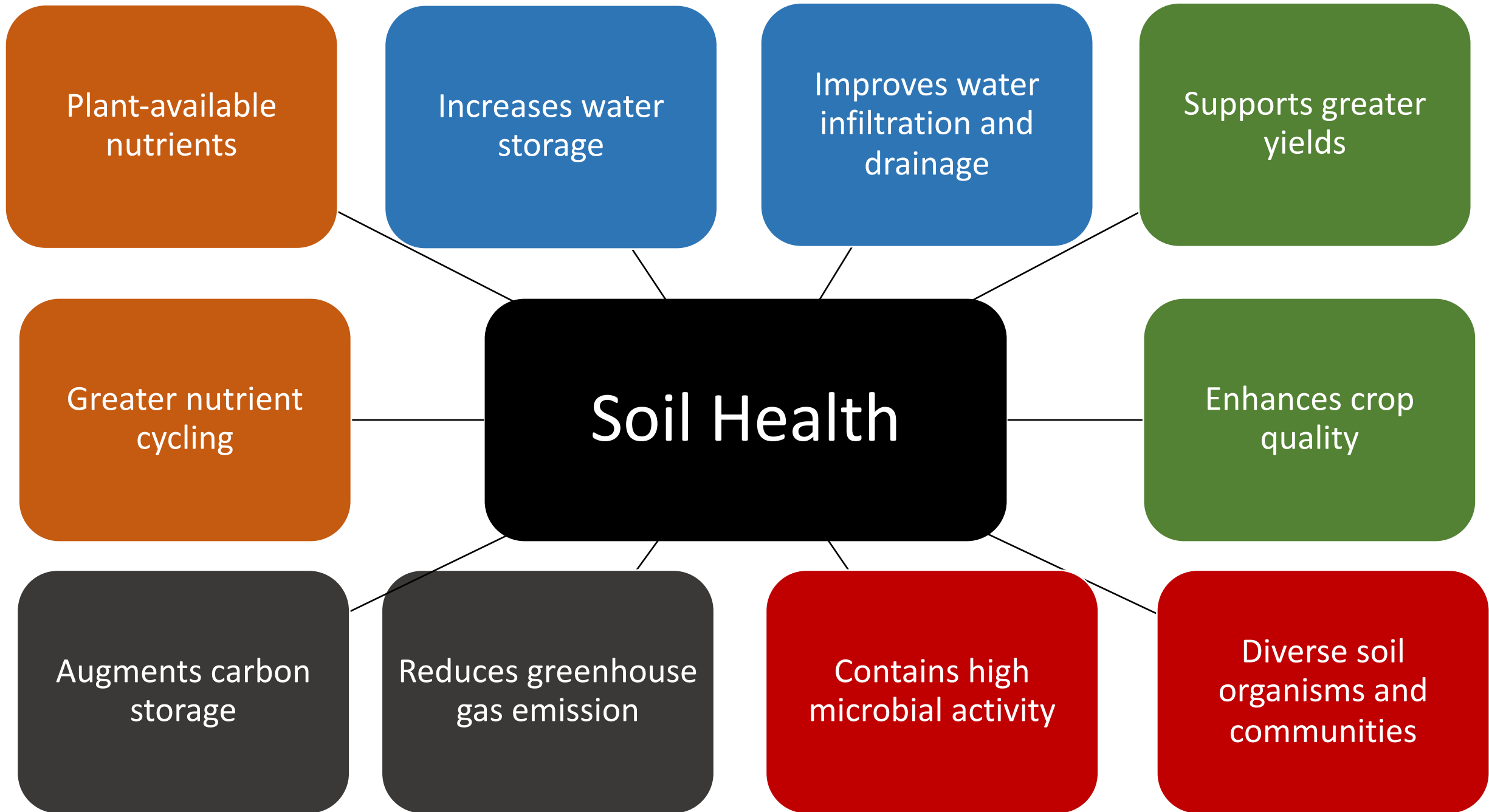


Photo credit: Justin Sullivan, Getty Images

Flood



**Healthy soils create resilient agroecosystems!**



Adapted from Lazcano et al. (2020)





# Managing for healthy soils in organic systems





## Pillars of Soil Health Management

1. Protect the soil surface
2. Minimize soil disturbance of all kinds
3. Continuous living plants/ roots in the soil
4. Optimize biodiversity
5. Integrate livestock
6. Use of carbon-based amendments

# Protect the Soil Surface



# Minimize Soil Disturbance



# Continuous Living Plants/Roots in the Soil



# Optimize Biodiversity





**Integrate Livestock**



# Use of carbon-based amendments





# Opportunities for “Stacking” Soil Conservation Management Practices



Reduced/ no-tillage

Cover crop/  
vegetative cover

Mulching

Crop Rotation

Organic amendments

Animal integration

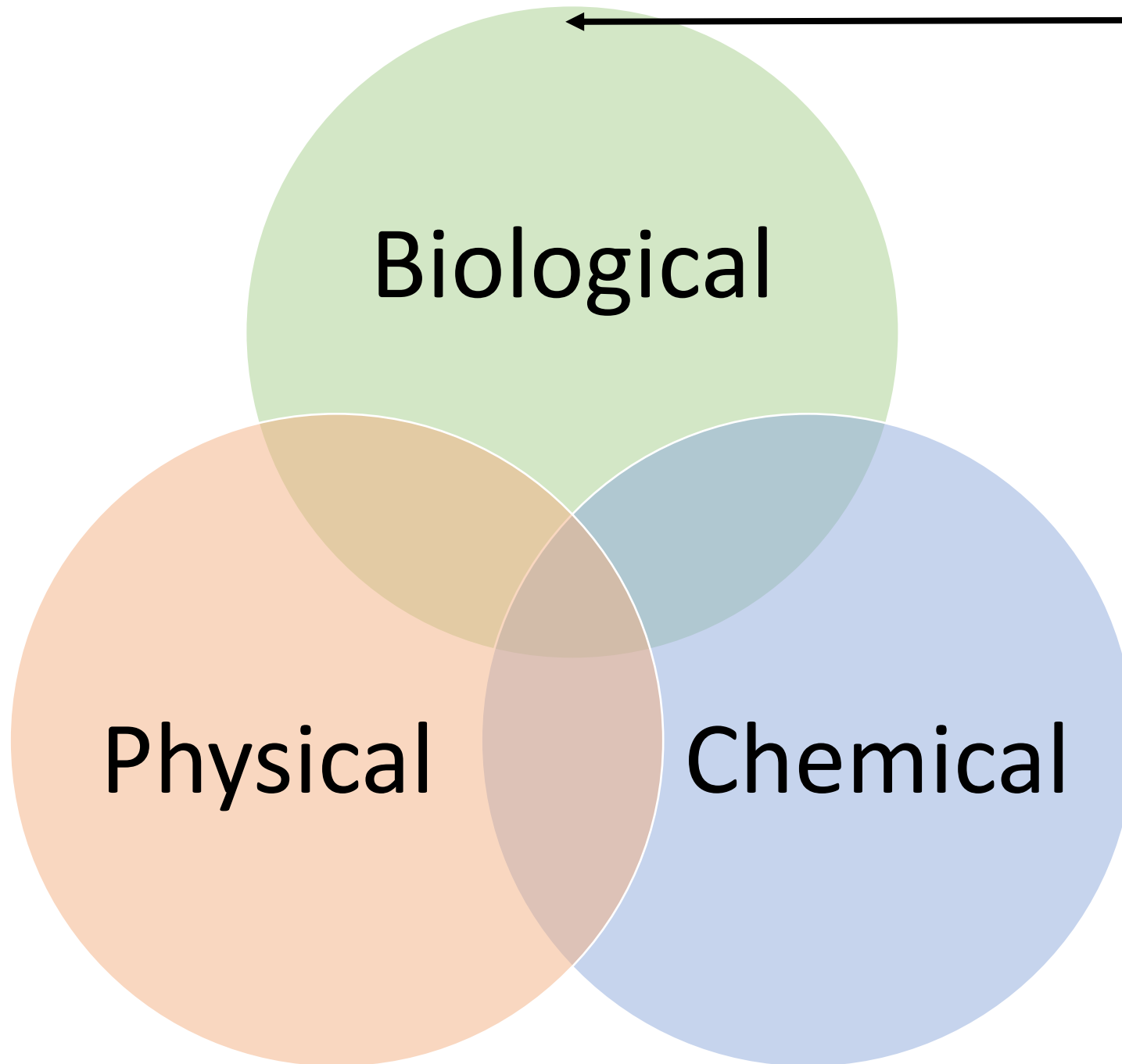
The results of interactions between multiple management tactics can be *additive*, *synergistic*, *opposing*, or *neutral*.



# Assessing soil health in your system



Soil Health



# Physical

Soil Texture



Bulk Density



Penetration Resistance



Water Infiltration



Soil water retention



Aggregate Stability



# Aggregation and Aggregate Stability





Rainfall simulator demonstration with intact soil pedons



Surface Runoff Collections Jars (foreground)  
Infiltration Collection Jars (background)



# Chemical

Soil pH

Soil electrical conductivity

Macronutrients and Micronutrients (N, P, K, +)

Visual deficiencies in the plant

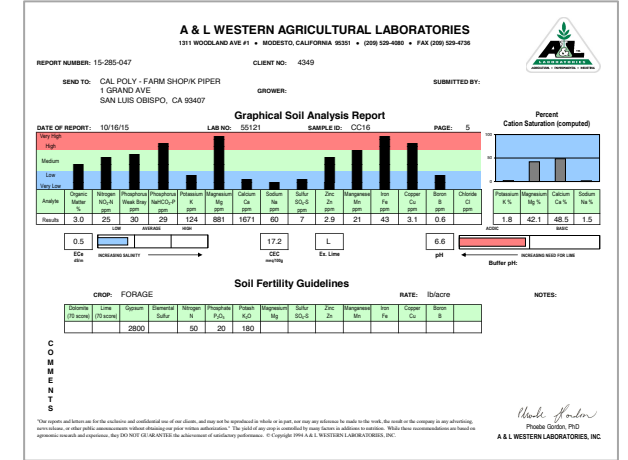
Salinity presence in the soil



Photo credit: N. Gonzalez-Maldonado



Photo credit: UC-ANR





# Biological

Microbial respiration

Extracellular enzymes

Microbial diversity

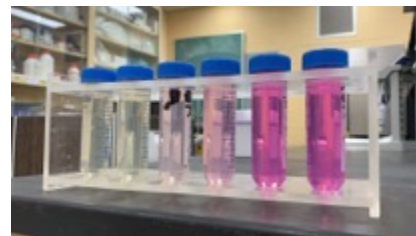


Soil organic carbon + fractionations



Soil organic matter (SOM)  
concentration (%)

Photo credit: N. Gonzalez-Maldonado



Permanganate Oxidizable  
carbon (POX-C)



Particulate organic carbon  
(POM-C) and mineral-  
associated organic carbon  
(MAOM-C)



Photo credit: N. Gonzalez-Maldonado



## Takeaways and benefits of managing for soil health

1. Enhances agroecosystem resiliency
2. Greater soil ecosystem services
3. Reduces inorganic inputs + promotes greater nutrient cycling
4. Robust microbial diversity and community
5. Enhances soil structure and reduces erosion



**Thank You!**

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