

Soil Health (Quality)

Success in Your Soils

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What is Soil Health?

- The ability of the soil to function
- Functions of the soil
 - Regulate water (infiltrate and hold onto)
 - Nutrient cycling
 - Physical support
 - Support living organisms
 - Filter and buffer





What Happens When We Disturb the Soil

- Break apart soil aggregates
- Release & burns carbon (organic matter)
- Cut off pores & channels
- Compaction
- Reduce infiltration
- Breaks good fungi
- Cause soil organisms to rebuild instead of benefitting crops
- Increases soil crusting & sealing
- Increases erosion potential

Erosion

Wind & Water Erosion in Minnesota

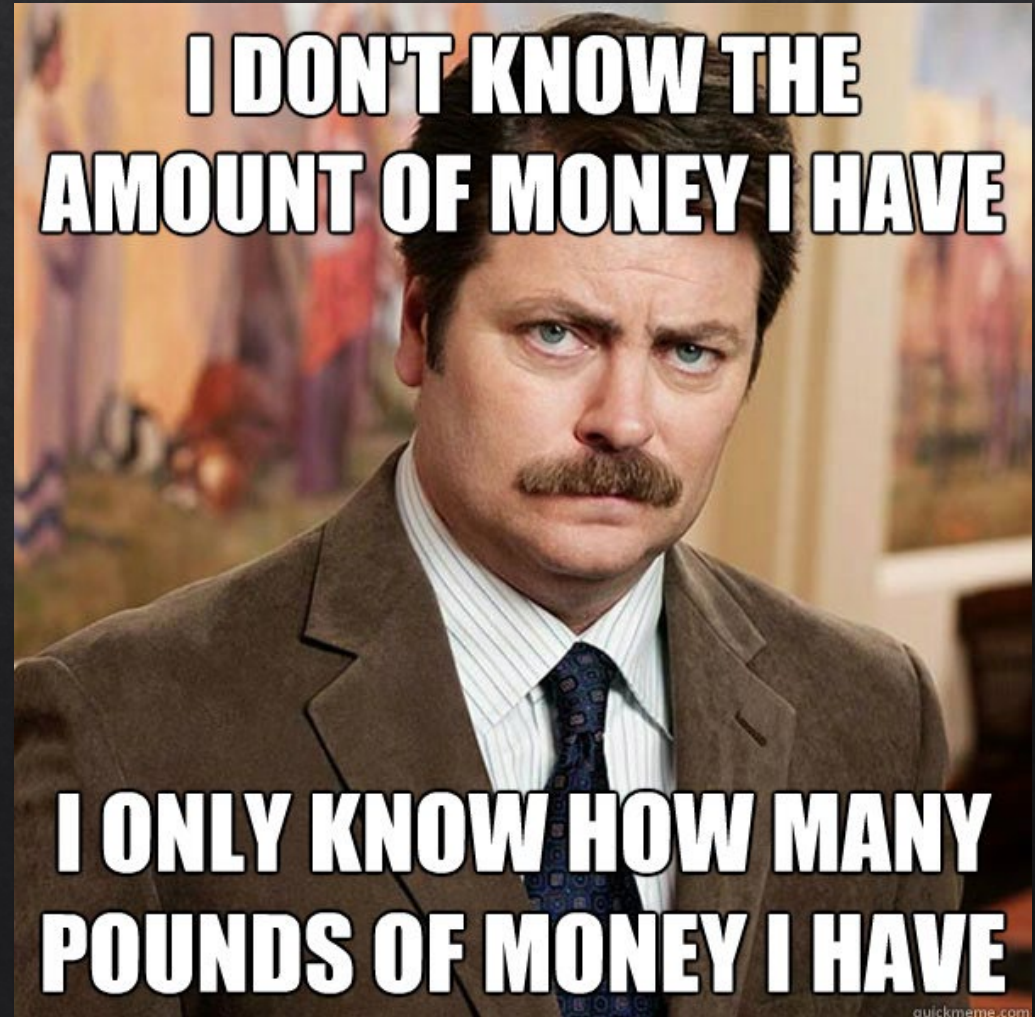
- Ave 5.2 tons/ac/yr (not including gully erosion)
- No-Till & Cover Crops Ave erosion 0.1/tons/ac/yr

Nutrients in Soil Lost with Erosion

- 14.6 lbs/ac/yr N
- 65.7 lbs/ac/yr P
- 21.9 lbs/ac/yr K

Value of Nutrients Lost to Erosion

- \$45 - \$70/ac/yr



Economics of Management

Total Cost of Production (without land costs)

<u>Management</u>	<u>Producers In PZM</u>	<u>Producers Statewide</u>
Conventional	\$545.38/ac	\$535.19/ac
Strip Till		\$480.35/ac
No-till and CC	\$457.45/ac	\$477.11/ac

Net Returns/Ac

<u>Management</u>	<u>Producers in PZM</u>	<u>Producers Statewide</u>
Conventional	\$5.25	-\$50.95
Strip Till		-\$12.84
No-Till and CC	\$112.89	\$6.52

What About Yields?

<u>Management</u>	<u>Producers in PZM</u>	<u>Producers Statewide</u>
• Conventional	195.0bu/ac	206.0bu/ac
• Strip Till		193.87bu/ac
• No-Till and CC	196.4bu/ac	195.5bu/ac

<u>Ave Yield Increase Using CC's</u>	<u>Ave Yield Increase Using No-Till and CC's</u>
• Corn 2% / ac	Corn 6% / ac
• SB 4% /ac	SB 8% / ac

Fallow Syndrome

- Why is this something we're concerned about?
 - Phosphorous deficiency
 - Reduction of nutrient cycling & availability
 - Stunted growth, weak, and uneven stands
- Why does having bare soil impact crop health?
 - The lack of living roots
 - Mycorrhiza fungi





Benefits of SH Practices

- Reduce Erosion
- Increase Soil Organic Matter (SOM)
- Increase Nutrient Cycling Efficiency
- Increase Infiltration
- Increase Plant Available Water
- Reduce Compaction
- Benefit Pest Management
- Benefit Weed Control Management
- Increase Profitability
- Improved Handling of Extreme Temp/Precip
- Improve Trafficability

Biology

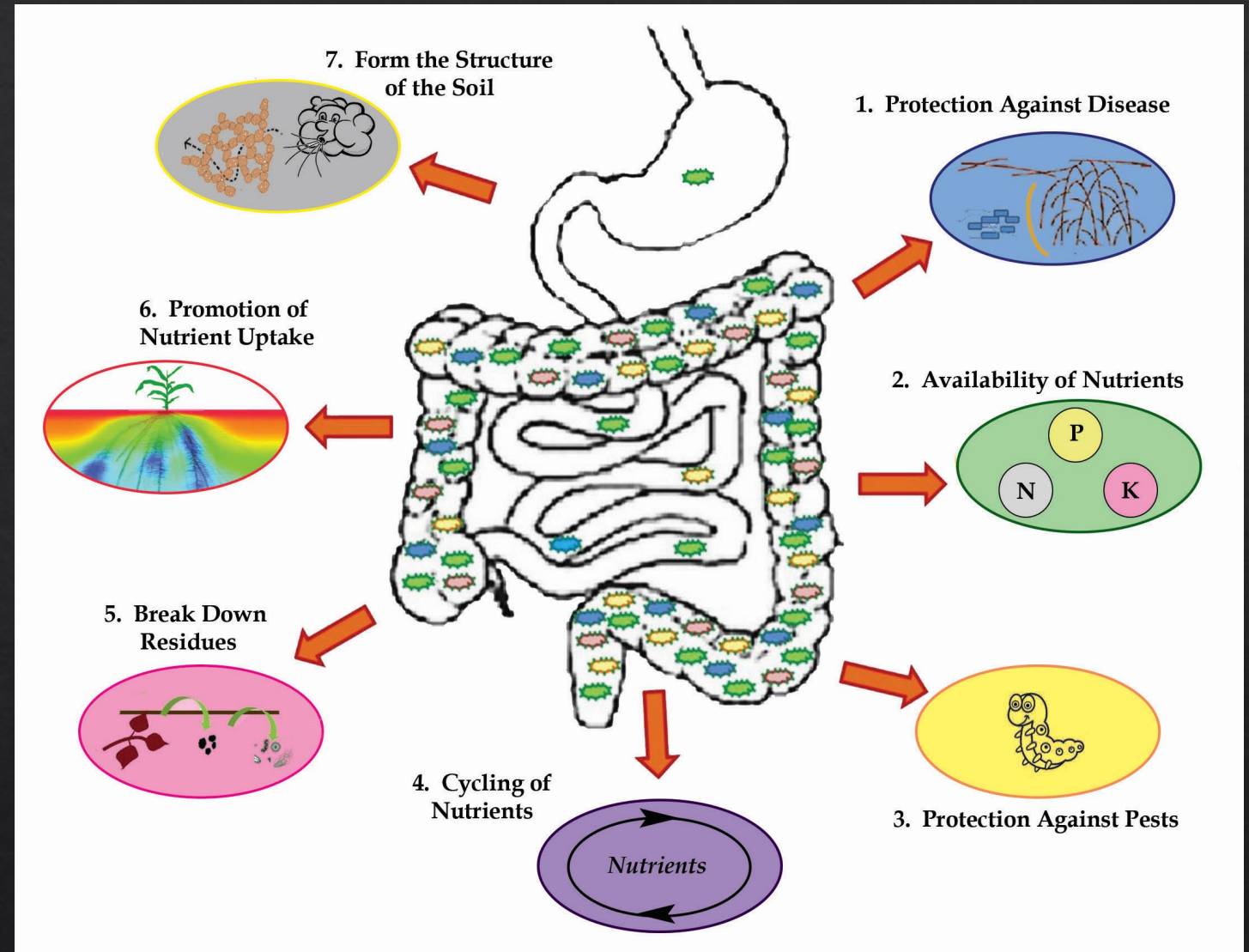
- Helps create soil structure & aggregates
- Decomposes residues
- Provides plants with nutrients
- Cycles nutrients making them plant available
- Battles pests & diseases
- Holds and clean water
- Creates various states of organic matter



Berry Hill Limited

The Importance of Soil Biology

- Mirrors our gut biology
- Symbiotic relationships
- The topsoil is alive
- Benefits crops
- Balance matters
- Create an environment for them

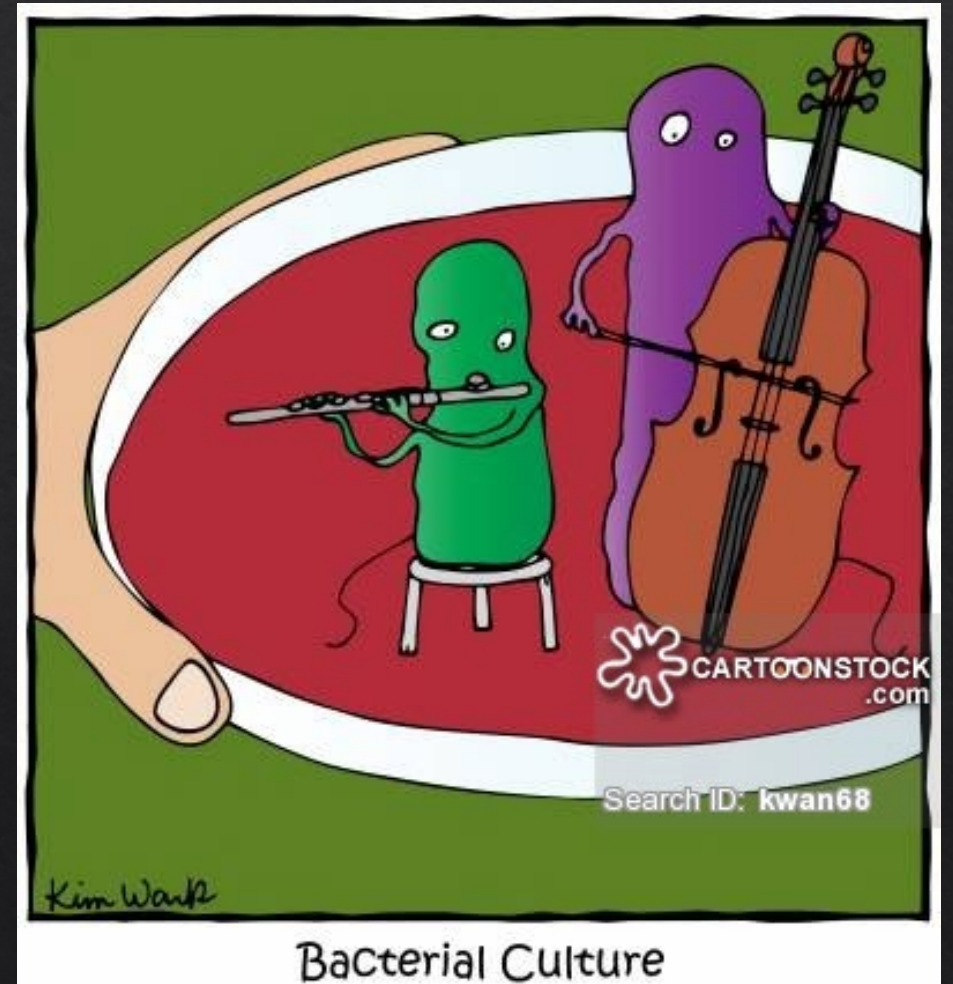


Modified from ADC Education & Practice

Residue Management and Nutrients

C:N Ratio

- Microbes 8:1
- Ideal soil ration for releasing nutrients 24:1
- Utilize cover crops to manage the C:N ratio
 - Increase decomposition rate of residue
 - Fix N to reduce C:N ratio
 - Use high carbon species to increase residue
 - Use to tie up and/or release nutrients



Organic Matter

1% of OM Can Provide

- 25 lbs N per year that is plant available
- 5.5 lbs of P per year that is plant available
- 2.5 lbs Sulfur per year that is plant available
- Holds 16,500 gallons of plant available water

3 Year Timeframe

- Increased OM by 1% with No-Till and CC on sandy soils
- Increased OM by 0.6% with No-Till
- Increased infiltration from 2.5"/hr to 20"/hr with no-till & cc (decreasing erosion by 26%)



Cover Crops

Unharvested crops grown to meet objectives

- Reduce erosion
- Reduce compaction
- Increase organic matter
- Weed pressure
- Fix nitrogen
- Manage residue
- Increase infiltration
- Forage



Increasing Soil Health

- Tools
 - Cover crops
 - Reducing tilling → Strip Till → No-Till
 - Small grains
 - Conversion to pasture/hayland
 - Avoiding traffic on wet soils
 - Nutrient management
 - Integrated pest management
 - Grazing cover crops and/or crop residues



Questions

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