Does Organic Matter, Matter?

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Compost Association Meeting
August 2018

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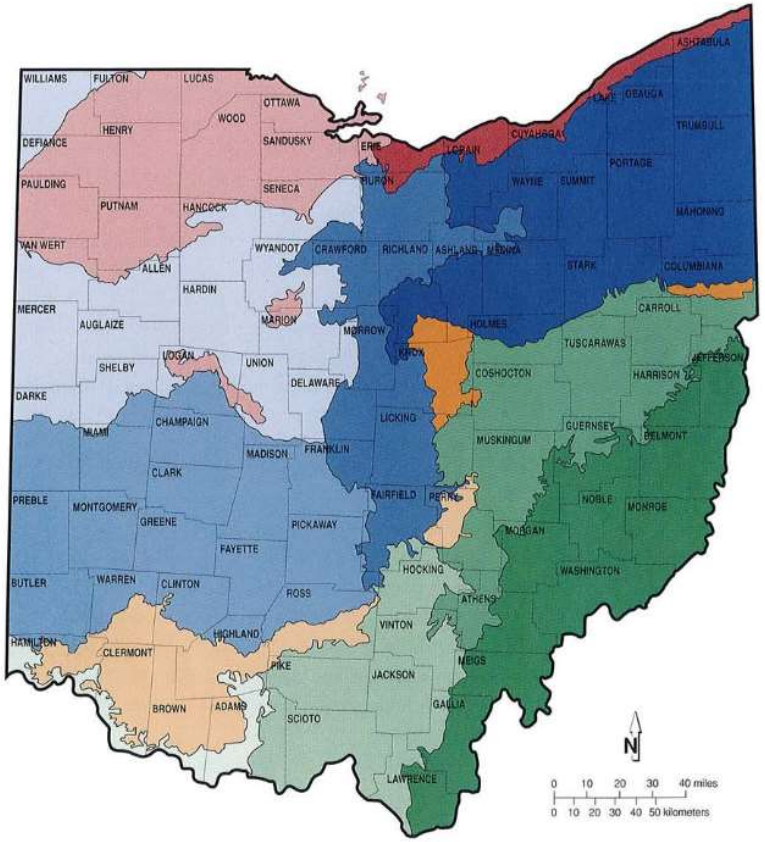
The Ohio State University
College of Food, Agricultural, and Environmental Sciences

Topics

- OM Defined
- OM in soil
- Do Ohio soil need it?
- Functions



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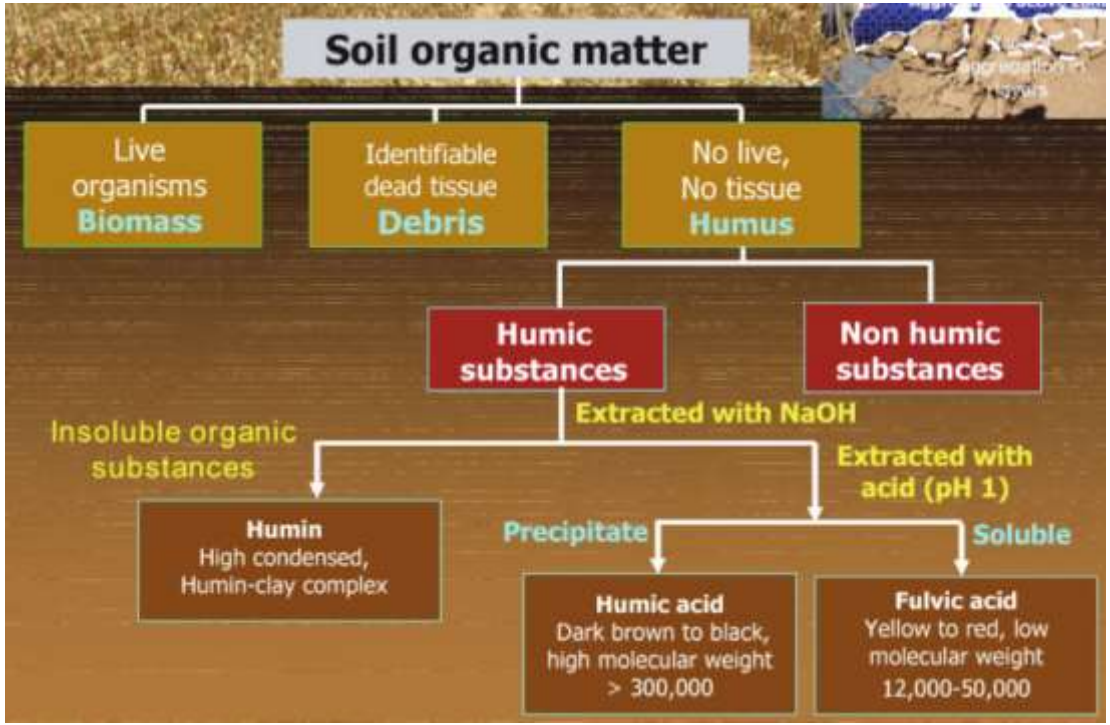
What is soil organic matter?

Soil fraction that consist of plant and animal tissue in various stages of breakdown.

Three types:

1. Plant residue and microbes
2. Active organic matter (detritus)
3. Stable organic matter (humus)



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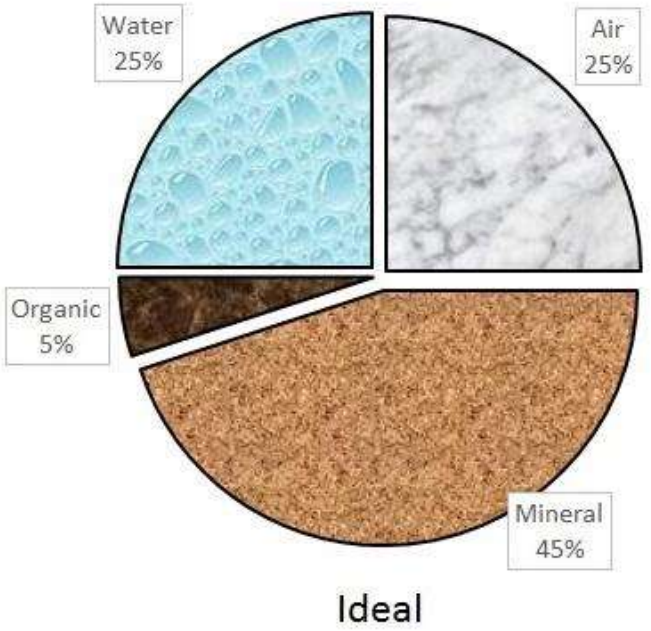
What does soil organic matter mean to soil?

Most productive agriculture soils are between 3-6% organic matter.

- Physical
- Chemical
- Biological



Ideal

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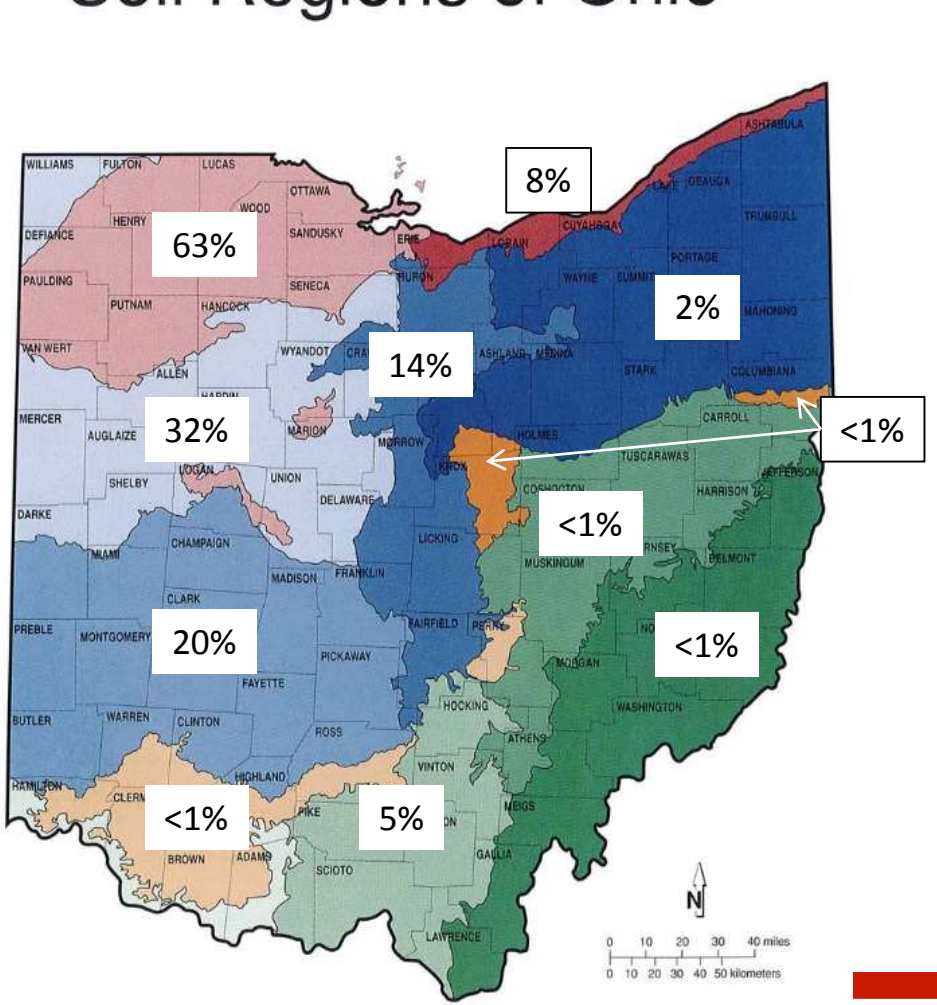
Are there Ohio soils that would benefit for increased OM?

Percentage of soils with more than 3% organic matter in upper 10 inches



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Compost in stable OM source

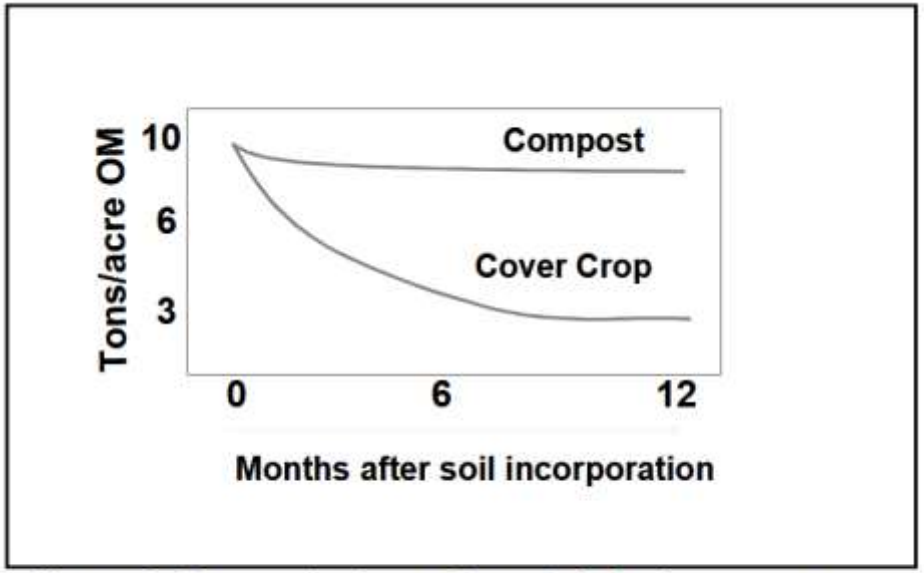


Figure 2. Composted organic materials decompose more slowly than fresh organic matter because they have already undergone a significant amount of decomposition.

Source: Cooperband, University Wisconsin, 2002

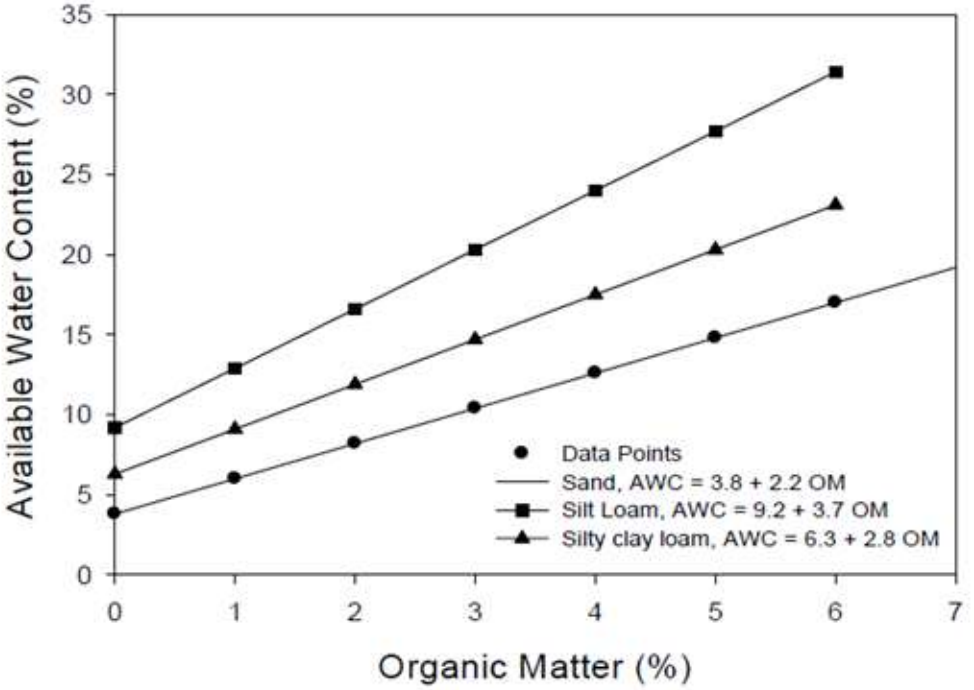
Improve physical characteristics of soils?

- Aggregate stability leading to better infiltration and aeration
- Increase water holding capacity
- Reduce surface crusting

Pictures from NRCS

Improve available water of soils?

- Regardless of soil type OM improve Water Holding capacity
- Rule of thumb
  - 1%=0.75 inches of water



Source: Hudson, 1994

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What does that mean?

3 predominate soils Fulton County, OH

Soil	Texture	Depth (Inches)	Permeability (In/hr)	Available Water Holding Capacity(In/In)	Maximum Water Based on depth (Inches)	Organic Matter (%)
Hoytville	Clay loam	0-8	0.2-2.0	0.16-0.21	1.68	3-6
		8-29	0.2-0.6	0.11-0.15	4.35	
Mermill	Loam	0-9	0.6-0.20	0.16-0.20	1.80	3-6
		9-32	0.6-0.20	0.12-0.16	5.12	
Ottokee	Fine sand	0-8	6.0-20	0.07-0.11	0.88	0.5-2
		8-60	6.0-20	0.06-0.10	6.00	

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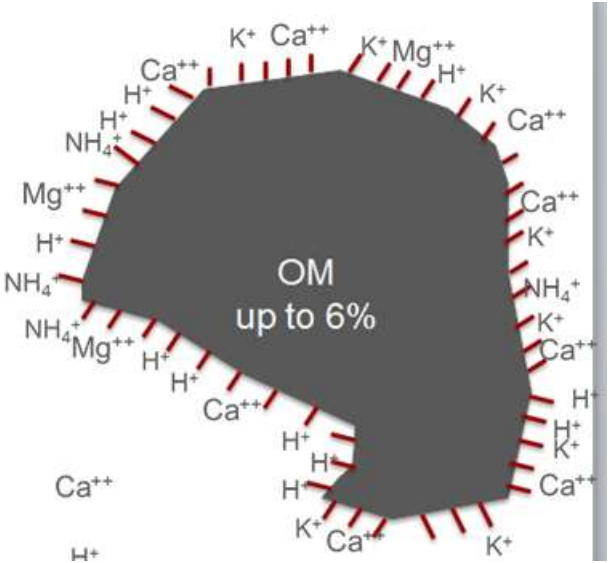
Improve chemical characteristics of soils?



- Increase Cation Exchange Capacity (CEC) ability to hold nutrient
- Improve soil buffering capacity to pH changes
- More active soil in cycling nutrients

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17 essential nutrients for crop production?

	Nutrient	Symbol	Analysis (pounds per ton)
1	Carbon	C	air
2	Hydrogen	H	air
3	Oxygen	O	air
4	Nitrogen	N	27.7 (2.4 NH_4)
5	Phosphorus	P	5.5
6	Potassium	K	13
7	Calcium	Ca	37.5
8	Magnesium	Mg	10.7

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17 essential nutrients for crop production?

	Nutrient	Symbol	Analysis (pounds per ton)
9	Sulfur	S	
10	Chloride	Cl	
11	Zinc	Zn	0.2
12	Iron	Fe	
13	Manganese	Mn	
14	Copper	Cu	<0.1
15	Boron	B	<0.1
16	Molybdenum	Mo	<0.1
17	Nickel	Ni	<0.1

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Improve biological characteristics of soils?

- Food for microbial community
- Enhance biodiversity of and activity of microbial community
- Microbes provide biofilms and other compounds that improve soil structure

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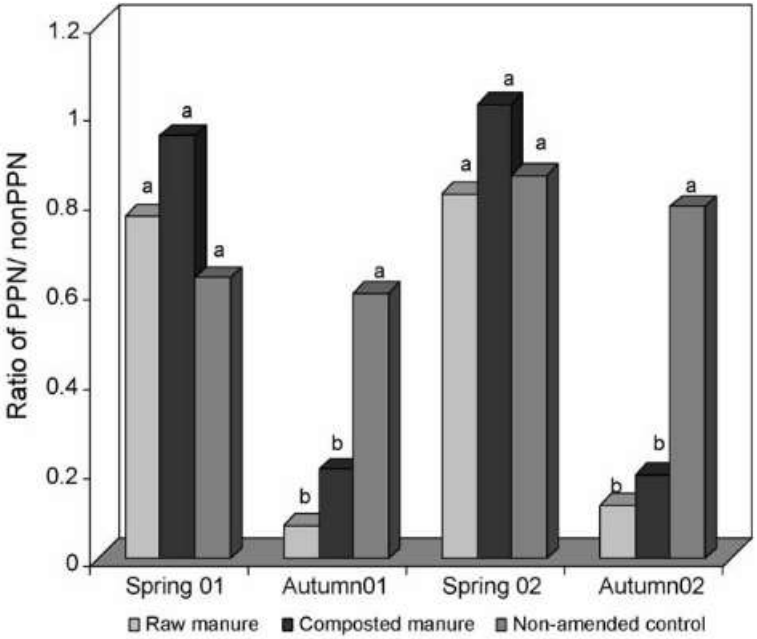
Improve biological characteristics of soils?

- Compost and raw manure increased diversity
- Reduce Plant Parasitic Nematode (PPN) prevalence



Source: Nahar, et.al., 2006

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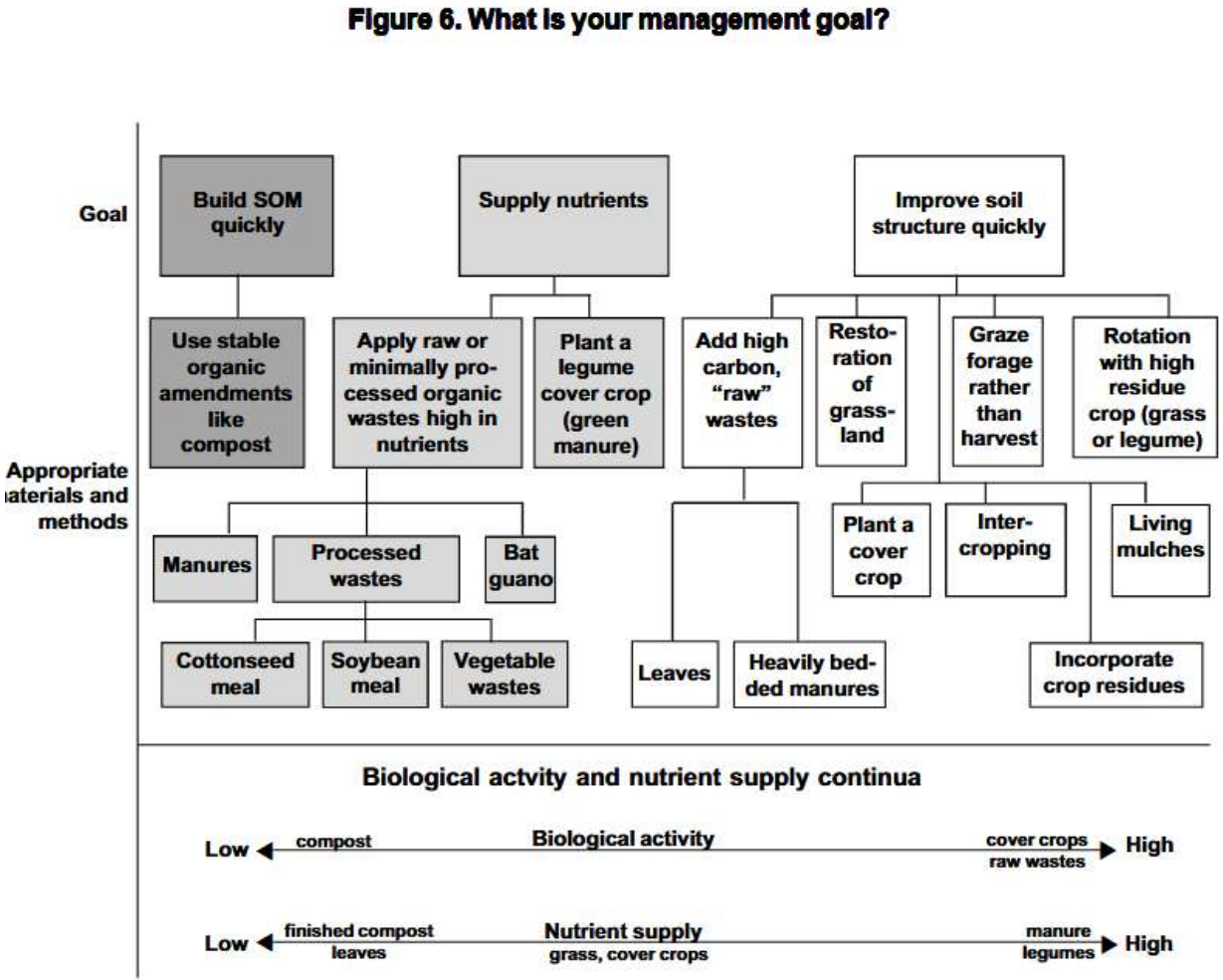
Modeling can give us some perspective on BMP adoption needed



Source: Cooperband, University Wisconsin, 2002

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Lake Erie-2018

07/15/2018

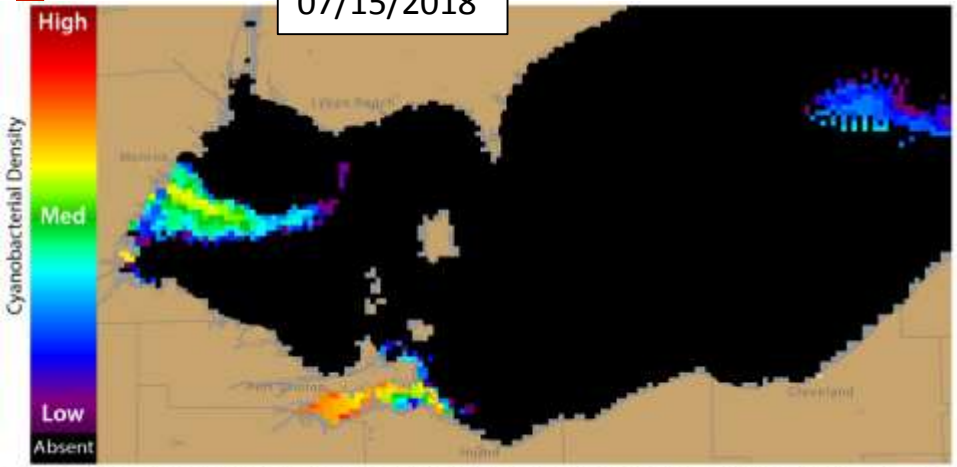

Figure 1. Cyanobacterial Index from NASA MODIS-Terra data collected 15 July, 2018 at 11:19 EST. Grey indicates clouds or missing data. The estimated threshold for cyanobacteria detection is 20,000 cells/mL.

08/05/2018

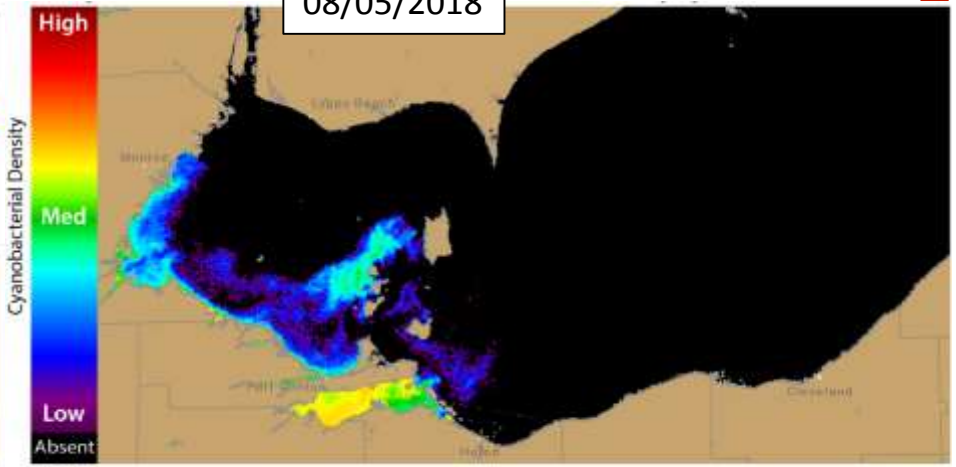

Figure 1. Cyanobacterial Index from modified Copernicus Sentinel 3 data collected 05 August, 2018 at 11:38 EST. Grey indicates clouds or missing data. The estimated threshold for cyanobacteria detection is 20,000 ce

8/5-Toxin Levels below recreational threshold

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Grand Lake St Mary's-2018

Grand Lake - Grand Lake St. Marys - Main West

Auglaize County

Details | Advisories | Sampling Results | Monitoring | Surveys

BEACH DESCRIPTION

COUNTY
Auglaize

FACILITIES

TOWNSHIP

ACCESSIBILITY
Public Owned, Public Access

OWNERSHIP TYPE
State

OTHER INFORMATION
Please contact 419-394-3611 for more info.

PARK NAME

CENTRAL LATITUDE/LONGITUDE
40.54267/-84.42623

EPA PRAWN BEACH ID

EPA STORET NUMBER

HYDROLOGICAL UNIT CODE (HUC)

Details | Advisories | Sampling Results | Monitoring | Surveys

Year	Start Date	End Date	Days Under Advisory	Advisory Type	Reason	Pollution Source
2018						
	2/1/2018 11:52 AM		186	Elevated Recreational Public Health Advisory	Algal Bloom/Toxin	

2/1/2018	186

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What determines loss potential in a field?

Source + Transport = Loss

Source	Transport	Loss
• Soil Test Level (P) • Nutrient additions	• Soil Type • Drainage • Management • Cover • Distance to water	• Pounds of loss per acre

- For P, Ohio P Index revision will be released in August
- For soil erosion, RUSLE 2
- For N, Loss Potential based on subsurface drainage

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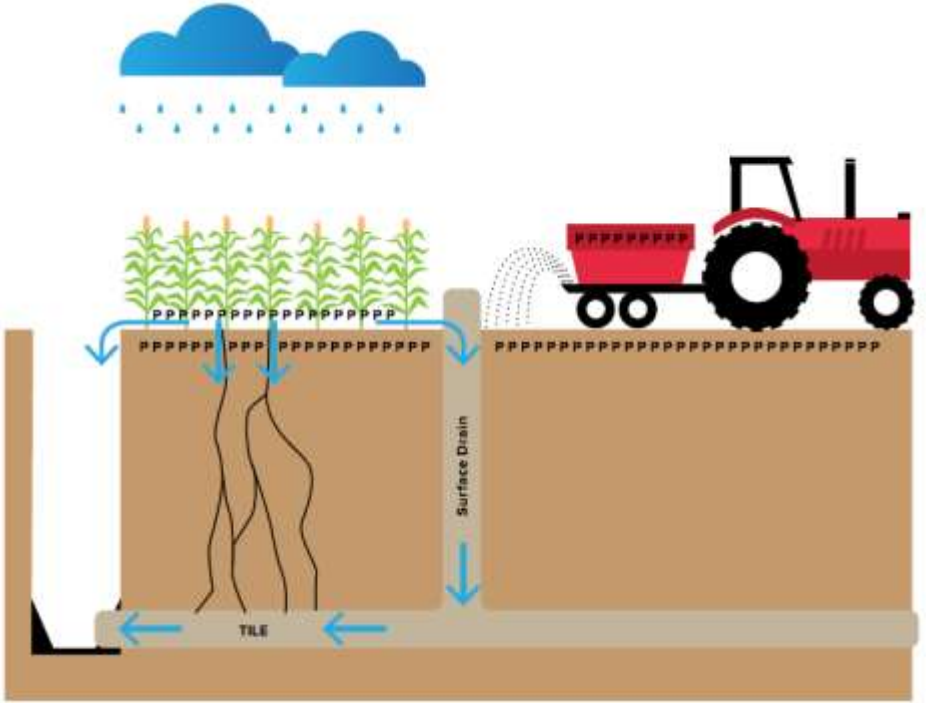
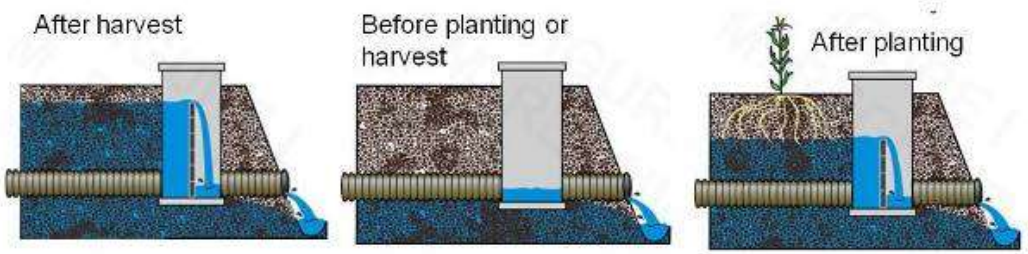
Placement below Surface Reduces Risk of Loss



Water management will be necessary

Increasing OM

Physical barriers



Cover crops

Summary

- Organic matter (OM) is important to the physical and chemical characteristics of soil
- Compost is an already stable OM source, increases OM immediately
- Water quality issues in Ohio will require water management, OM serves a role
- OM = Soil Life!!

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