Rooted in Change

A Journey of Soil, People, and Possibility at Menoken Farm

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Burleigh County Soil Conservation District

State Of Agriculture In The Great Plains
The last 5 Decades

Ronald Reagan 1981-1989

- Soil Conservation Service
- HEL and Wetland Inventories Plus CRP
- First Office Computers (1983). Cell phones late 80's.
- Full Tillage Cropping Systems – Start of Concord System
- Early No-till Attempts Failed – Lack of Diversity
- Season Long Grazing Was Dominant
- Built Structures – Waterways, Diversions, Land Leveling (symptoms)
- No Cover Crops
- Dominant Crop – Spring Wheat
- Breaking Native Grasslands Ongoing
- Carbon?
- **Erosion Control – Poor**

Conservation Tillage
1980 - 1992

George H Bush 1989-1993
Bill Clinton 1993-2001

- Soil Conservation Service to NRCS
- First Presidential email - 1994
- Start of No-till Systems With Diversity – 1993
- Tillage Was Still The Dominant Cropping System
- Stopped Building Structures On Cropland By End of 90's
- Cover Crops – First Producer 1-3 Species
- Major Crop Spring Wheat – Corn & Beans (GMO Mid 90's)
- Formed a Soil Health Team
- Grazing Systems With 10+ Paddocks
- Breaking Native Grassland Ongoing
- Started Monitoring Carbon
- **Erosion Control - Fair**

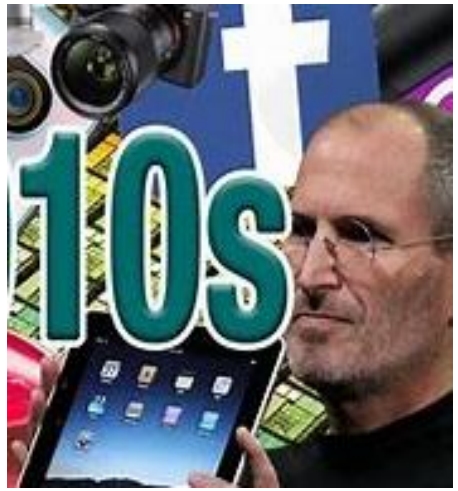
No-Till
1993 - 2005

George W Bush 2001-2009

- Writing Soil Health Principle Descriptions
- Cover Crops – 2006 First Poly Culture Mixes
- Cover Crops Become Common On Mixed Operations
- Cover Crops Become The Bridge - Cropland & Grassland
- Spring Wheat Still Dominant Crop – Corn & Beans Gain Big
- Menoken Farm Established - 2009
- YouTube - 2005
- Golden Era of No-till Crop Diversity – Major System
- Grazing Systems With High Recovery 40+ Paddocks
- Breaking Native Grasslands Ongoing
- Carbon – Building Soil Aggregates Deep
- **Erosion Control - Good**

Soil Health
2006 - 2014

Barack Obama 2009 – 2017
Donald Trump 2017 - 2021



- Rewriting Soil Health Principle Descriptions
- Soybean Acres Rival Spring Wheat Acres
- Salinity
- Wind Erosion on No-till Acres (No-till Is Not Enough)
- Cover Crops - Planting Green With Soybean
- Direct Marketing
- Stacking Enterprises
- Grazing Systems With Infinite Pasture/Recovery Time
- Grazing Systems Include Cover Crop Mixtures
- Breaking Native Grasslands Ongoing
- The 4 Parts Of Carbon
- **Erosion Control – Fair to Good**

Regeneration
2015 - Present

Joseph Biden 2021 – 2024
Donald Trump 2025 - Present

- Rewriting Soil Health Principle Descriptions (yes, again!)
- Red Trail Ethanol Injects CO2 Emissions, First In Nation
- Summit PLine CO2 Proposal – 5 States/32 Ethanol Plants
- Soybean Dominant Crop
- Salinity Increasing
- Gardening – High Tunnels – Greenhouses
- Food Security and Nutrient Density
- Breaking Native Grassland Ongoing– 58,737 Easement Acs
- Future of Carbon - Nestle, General Mills, Pepsico, Walmart
- Regeneration Traction – Carbon, Cover Crops, No-till, Etc
- **Erosion Control – Poor to Fair**

Regeneration
2015 - Present

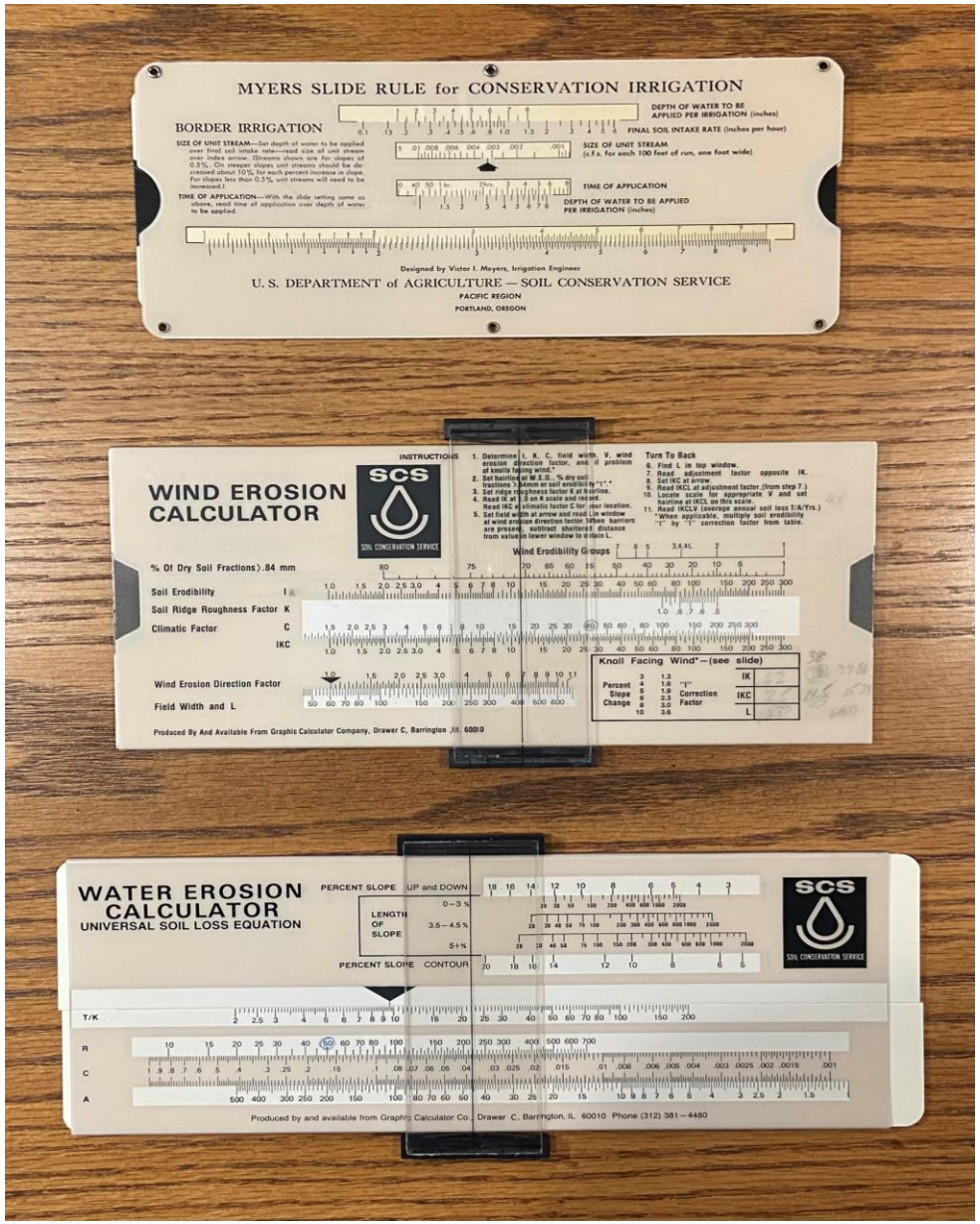
Northern Plains

Decade	Erosion Control Grade
1980's	Poor
1990's	Fair
2000's	Good
2010's	Fair to Good
2020's	Poor to Fair

Poor – Fair – Good - Excellent

The Start

What I Started With Versus What I Needed



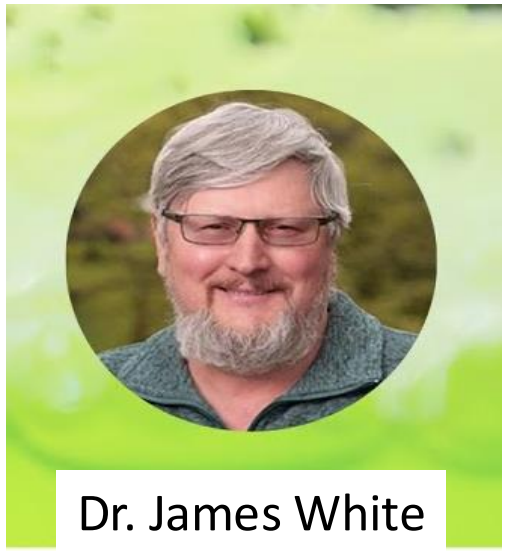
Better Understanding of the Conservation Planning 9 Step Planning Process

After 10 Years Of Treating Symptoms

Burleigh County Soil Health Team

Team Members

Dr. Dwayne Beck
Systems Approach to
No-till & Resource Mgt

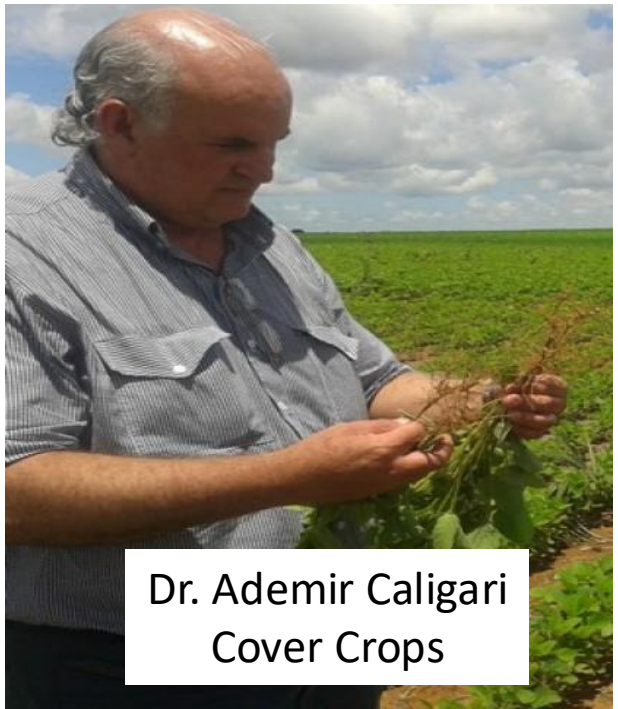


Dr. James White
Rhizophagy

Dr Elaine Ingham

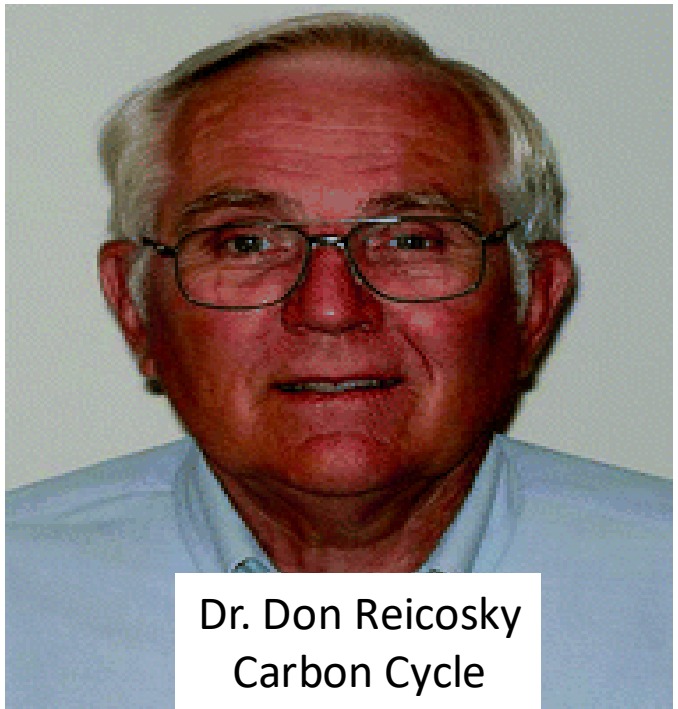
Dr. Kris Nichols
Soil Food Web

Mentors



Dr. Ademir Caligari
Cover Crops

Dr. Jonathan Lundgren
Entomology



Dr. Don Reicosky
Carbon Cycle

Practitioners

Ken Miller

Todd McPeak

Gabe Brown

Jerry Doan

Going Forward – Where To Start – Top 5
No Particular Order

1. Monitoring
2. Carbon Stewardship
3. 17 Elements A Green Plant Uses
4. Carbon, Hydrogen, and Oxygen
5. Soil Health Principle Descriptions

1. Monitoring

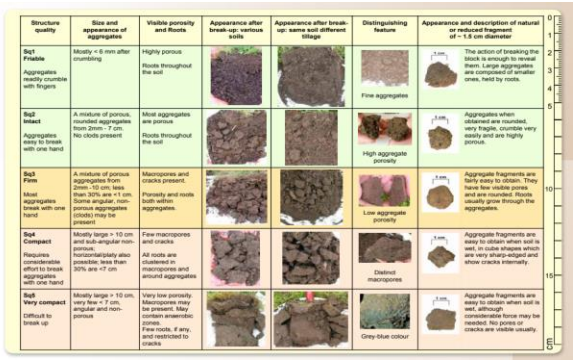
(1) Total Mineral

(2) Soil Health Assessment (Inorganic & Organic)

(3) Leaf Analysis

(4) PLFA (Soil Food Web)

(5) VESS



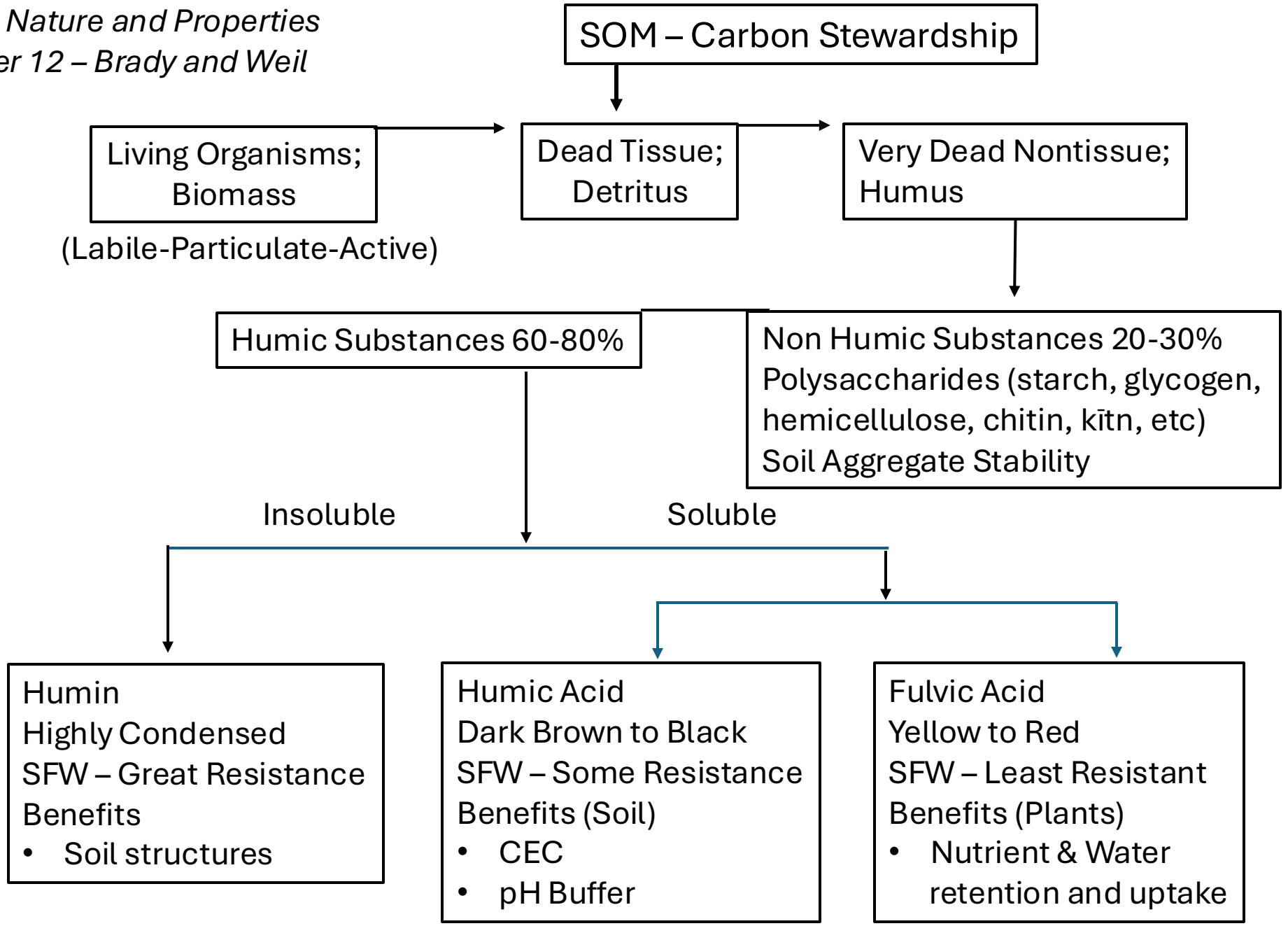
2. Carbon Stewardship

Soil Carbon Sequestration vs Soil Carbon Stewardship

Soil carbon stewardship: Thinking in circles
H. Henry Janzen

Soil Organic Matter “I favour the most inclusive definition, whereby SOM encompasses all C – containing material, originally of photosynthetic origin, whether living or dead, within the soil or lying upon its surface.” Henry Janzen

Reference: The Nature and Properties of Soils. Chapter 12 – Brady and Weil



3. 17 Elements

C B HOPKiNS CaFe

Closed **Mo**n**d**ay **Mo**rning and **Ni**ght

See you Zoo**n**, the **Mg**

"Of the 92 naturally occurring chemical elements, 17 have been shown to be essential elements, meaning that plants cannot grow and complete their life cycles without them."

Source: The Nature and Properties of Soils, Table 1.1

Pigweed
Kochia
Dandelion
Cereal Rye
Lettuce
Tomato
Cabbage
Pasture
Bone
Oyster Shell
Alfalfa

Fermented Plant Juice and AC Vinegar Extracts

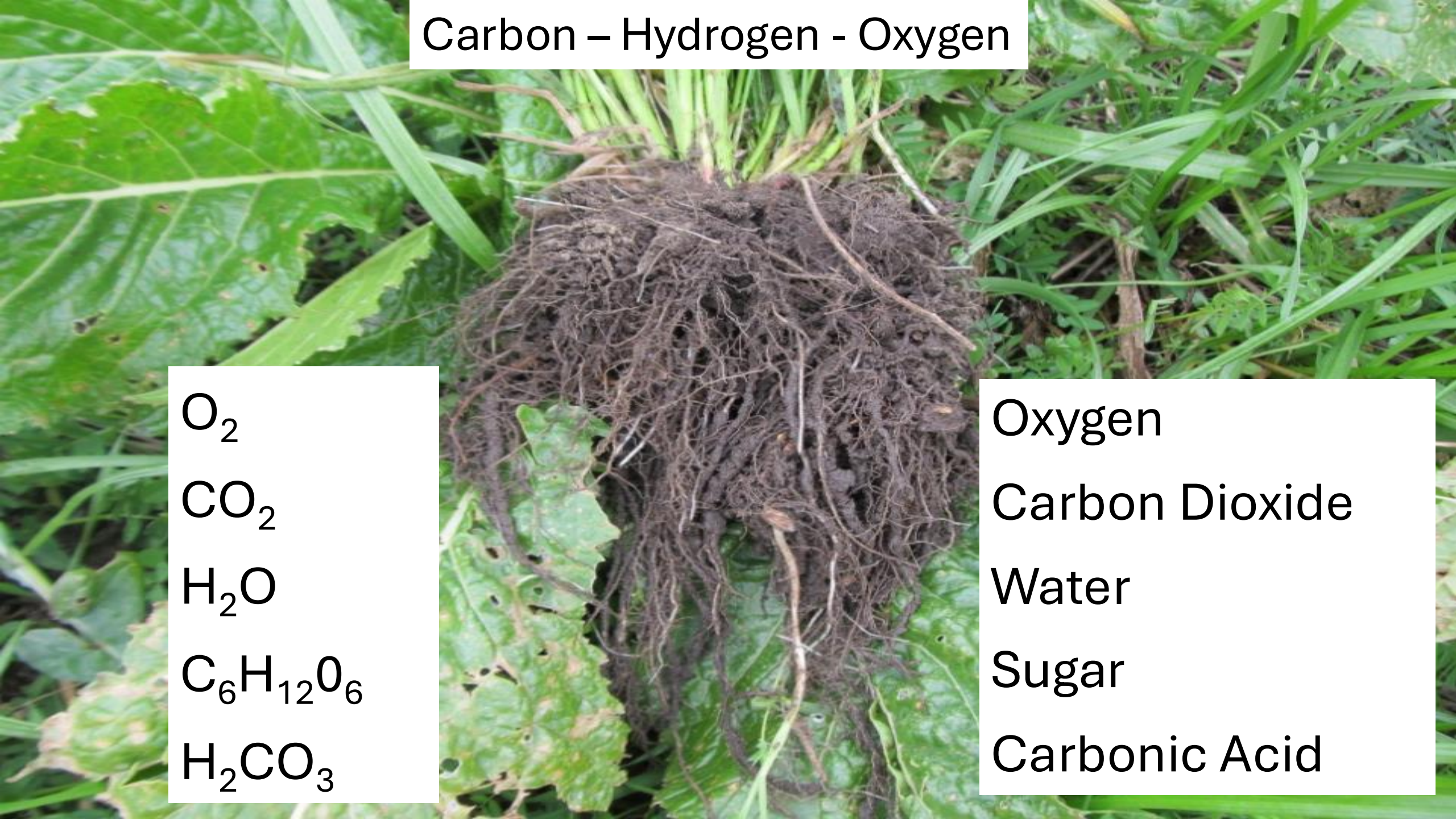
The Regenerative Grower's Guide to Garden Amendments
By Nigel Palmer

Menoken Farm – Fermented Plant Juice and Vinegar Bone Extraction - 2025

Sample Sent 5/27/25	Cl -	S -	P -	Ca +	Mg +	K +	Na +	B -	Fe +	Mn +	Cu +	Zn +	Al +	Co +	Mo -	Si -	Se -	Ni +	pH	Cations	Anions
Tomato	235	62	105	564	58	1325	31	0.44	3.01	1.57	0.23	0.66			0.001				4.4	68.4	10.7
Lettuce	304	50	83	422	64	1124	53	0.39	3.13	1.12	0.07	0.44			0.001				4.3	57.6	18.9
Dandelion	1104	119	88	260	135	2319	27	0.74	2.31	2.49	0.28	0.47			0.001				4	84.9	39.3
Cabbage	206	159	92	146	57	1200	65	0.28	4.01	1.51	0.12	0.34			0.001				4.6	45.6	15.8
Cereal Rye	769	92	26	121	76	1981	27	0.46	2.8	0.78	0.31	0.14			0.001				4.5	64.4	28.3
Bone (19 Days)	37	47	1733	4616	202	1073	272	2	0.95	1.27	0.03	0.45			0.001				4	287	23
Sample Sent 8/4/25																					
Kochia	478	69	47.48	64	41	913	104	0.1	3.82	0.8	0.15	0.17			0.017				4.3	34.5	20.7
Pigweed	758	97	261.08	34	126	2937	18	0.2	5.72	1.15	0.14	0.32			0.022				4.3	88.4	47.3
Pigweed & Kochia	816	60	52.62	52	51	1304	47	0.13	6.97	1.18	0.14	0.16			0.012				4.4	42.3	33.7
Bone (88 days total)	60	51	757.84	5277	469	1130	550	1.36	3.83	0.39	0.04	0.1			0.003				4.1	355.9	2.9
Pasture	816	81	222.19	410	164	2617	14	0.44	3.29	4.17	0.13	0.81			0.015				3.4	103.3	28.9
Leachate	34	27	6.28	41	29	347	33	0.56	0.18	0.11	0.03	0.02			0.02				7.5	14.8	10.5
Sample Sent																					

4.

Macronutrients		Micronutrients
Most from air and water	**Mostly from soil solids**	**From soil solids**
Carbon - C	**Cations: (+)**	**Cations: (+)**
Hydrogen - H	Calcium - Ca	Copper - Cu
Oxygen - O	Magnesium - Mg	Cobalt - Co
	Nitrogen (Ammonium) NH4	Iron - Fe
	Potassium - K	Manganese - Mn
		Nickel - Ni
	Anions: (-)	Sodium - Na
	Nitrogen (Nitrate) NO3	Zinc - Zn
	Phosphorous - P	
	Sulfur - S	**Anions: (-)**
	Silicon - Si	Boron - B
		Chlorine - Cl
		Molybdenum - Mo
Source: The Nature and Properties of Soils, Table 1.1		



Carbon – Hydrogen - Oxygen

O_2

CO_2

H_2O

$C_6H_{12}0_6$

H_2CO_3

Oxygen

Carbon Dioxide

Water

Sugar

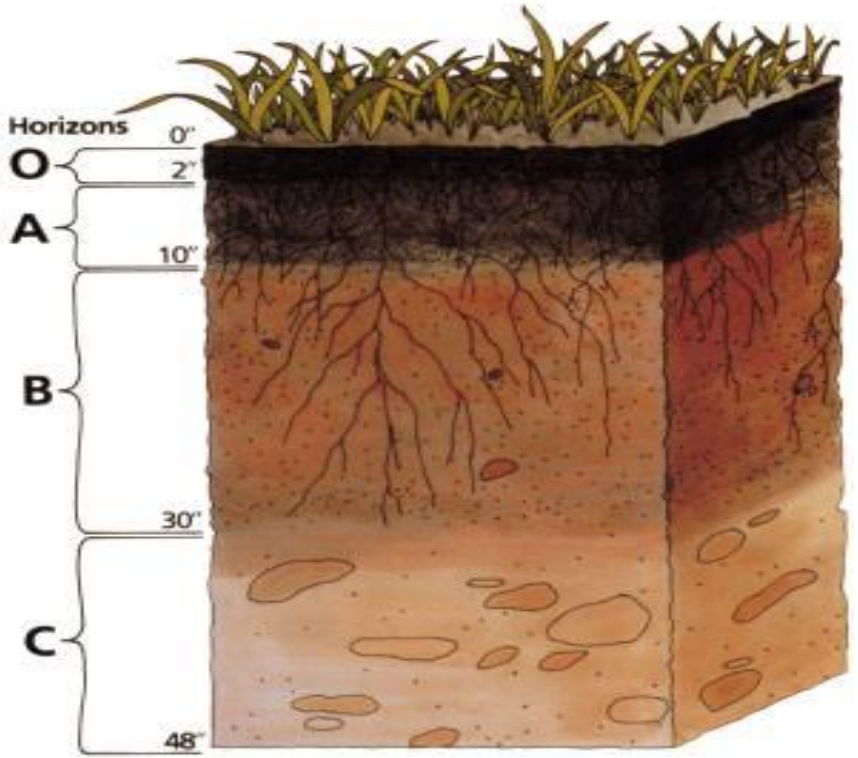
Carbonic Acid

$C_6H_{12}0_6$ (sugar)

- Sunlight (energy)
- Chlorophyll (green plant)
- CO_2 (atmosphere)
- H_2O (soil)
- Giving off oxygen O_2
- Giving off water vapor H_2O

H_2CO_3 (carbonic acid)

- Soil Function
- CO_2
- H_2O



Potential Hydrogen References

- The Ideal Soil v2.0 “perfect plant sap and soil pH is 6.4
- GrowerExperts “most plants need a pH of 6.5-7.0
- Michigan State University

Lowering **High pH** (alkaline/basic)

- Carbon Sources – Compost, Manure, Sugar, Molasses, Residue, Leonardite
- Commercial Fertilizers - Nitrification
- Elemental Sulphur – Sulphuric Acid dense soil
- Acidifying Mulches – Peat Moss, Pine Needles, Oak Leaves
- Cover Crops – ie Cereal Rye
- (2” Depth-Brown 7.1 vs Green 6.6)
- Humic Acid (buffers)
- Used Coffee Grounds – 6.8 pH
- Coffee – 4.5 pH
- White Vinegar – 2.4 (1 C/Gal of Water)

Raising **Low pH** (acidic)

- Lime (calcium carbonate)
- Potassium Carbonate (drip Ir)
- Wood Ash
- Baking Soda - Gentle
- Eggshells – 2 Lbs/Sq Ft

Lime sources

- Dolomitic
- Oyster Shell (39% Ca,
- Agricultural -(Beet Lime) 55% Ca + 10% O Matter
- Hydrated
- Ground

Note: Gypsum (calcium sulfate) does not significantly alter pH. It does improve soil structure, particularly in sodic and heavy clay soils

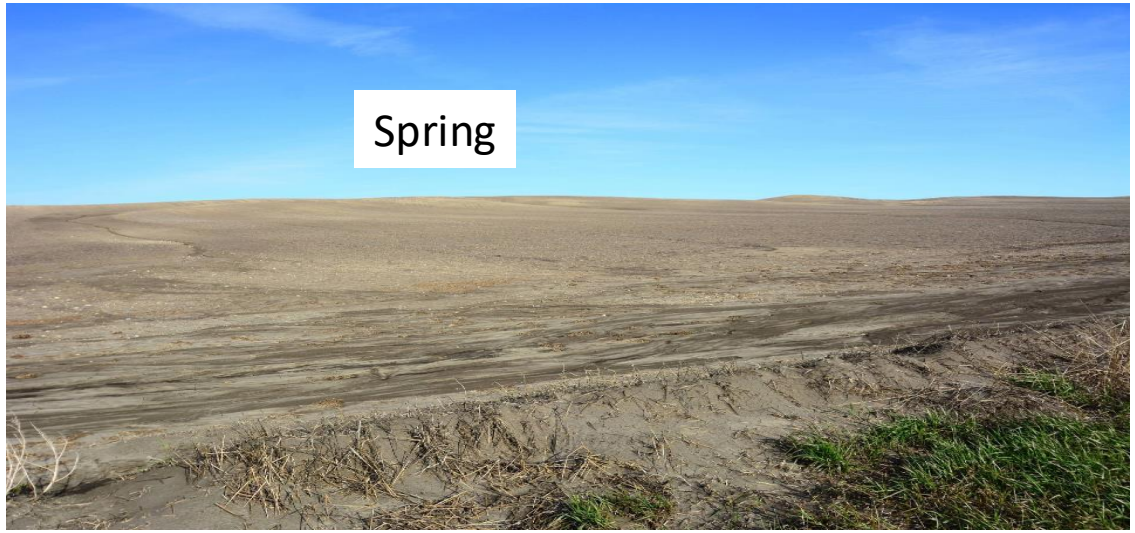
5. Soil Health Principle Descriptions

Armor – Minimize Disturbance – Diversity – Continual Live Plant – Livestock Integration

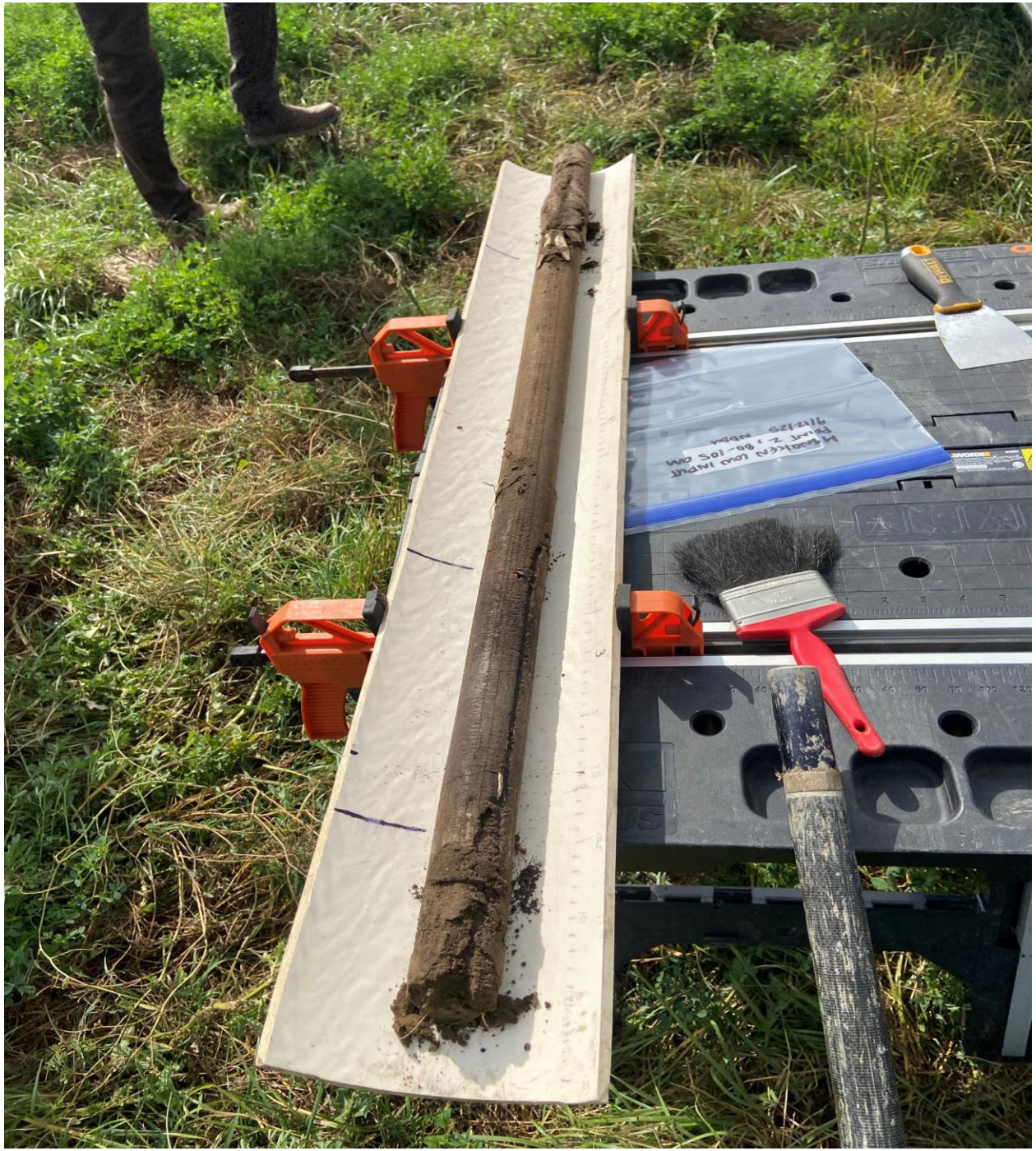
Indicators

Landscapes

Bare Soil



Armor



What’s at the bottom of your 4’ profile?

Menoken Farm

Prior to the Menoken Farm
5 Acre Farm Plots 1990 - 2000
Conservation Demonstration Plot 1999 - 2013

What Does The Menoken Farm Consist Of?

1. Local Indigenous Language: You reap what you sow
2. Soil health principles as the operating foundation for all land uses
3. Cropland fields each 12 acres in size
4. Outdoor Garden
5. High Tunnel Garden
6. Beetle/Pollinator Bank
7. Turned and Static Compost
8. Tree Arboretum
9. Rain Garden
10. Learning Center
11. Video Library www.menokenfarm.com
12. YouTube: Menoken Farm

Menoken Farm 2025

Conservation is the Foundation of Agriculture

Self Education

- A Soil Owner's Manual: Jon Stika
- The Buffalo Harvest: Frank Mayer
- Sapiens: Yuval Noah Harari
- Grow Your Soil: Diane Miessler
- Growing A Revolution: David Montgomery
- Dirt to Soil: Gabe Brown
- The Light Eaters: Zoe Schlanger
- The Soil Will Save Us: Kristin Ohlson
- The Nature and Properties of Soils – 14th Edition : Brady and Weil
- Journals of Lewis and Clark
- Buffalo Bird Women's Garden : Gilbert Wilson
- The One Straw Revolution: Masanobu Fukuoka
- Managing Cover Crops Profitably 3rd Edition
- A Sand County Almanac: Aldo Leopold
- Soil Biology Primer: by Elaine Ingham
- Life in the Soil: James Nardi
- An Agricultural Testament: Sir Albert Howard
- Dirt – The Erosion of Civilizations: David Montgomery
- Not Just Dirt: Kevin R. Elmy
- A Road To Fossil Fuel Free Farming: David Rourke
- Early Settlement of North Dakota: Clement Lounsberry
- 1491: Charles Mann
- The Soil – Human Health Nexus: Rattan Lal
- Civilization Critical: by Darrin Qualman
- What Your Food Ate: David Montgomery & Anne Bikle

www.menokenfarm.com

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