

Soil Health & Management Strategies

Hensley's SEED CO. – DENVER · COLORADO –

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PRESENTED BY THE HENSLEY’S TEAM

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the original research farm

Original farm was purchased in 1976 and still functions as our “home farm”.

Dedicated to:

- **Breeding:** Development of new vegetable and flower varieties
- **Seed production:** Foundation, stock, and commercial seed productions
- **Product trialing:** Field and high tunnel trials of the original source and partner products

Every product in the original source catalog and website is field-tested on the research farm.



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Soil-health growing resources



The Farm

Consists of:

- 31 Farm Operations Staff
- 10 farm locations (4 owned, 6 leased)
- 203 acres total, 50-75 in active production
- 50% or more of acreage in cover crops annually

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Today’s Discussion

What Is Soil Health?

Physical, Chemical, and Biological Aspects of Soil

Building Better Soil Through Management

Soil Health in Practice



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What Is Soil Health?

Soil health is the continued capacity of soil to function as a living ecosystem that sustains plants, animals, and humans.



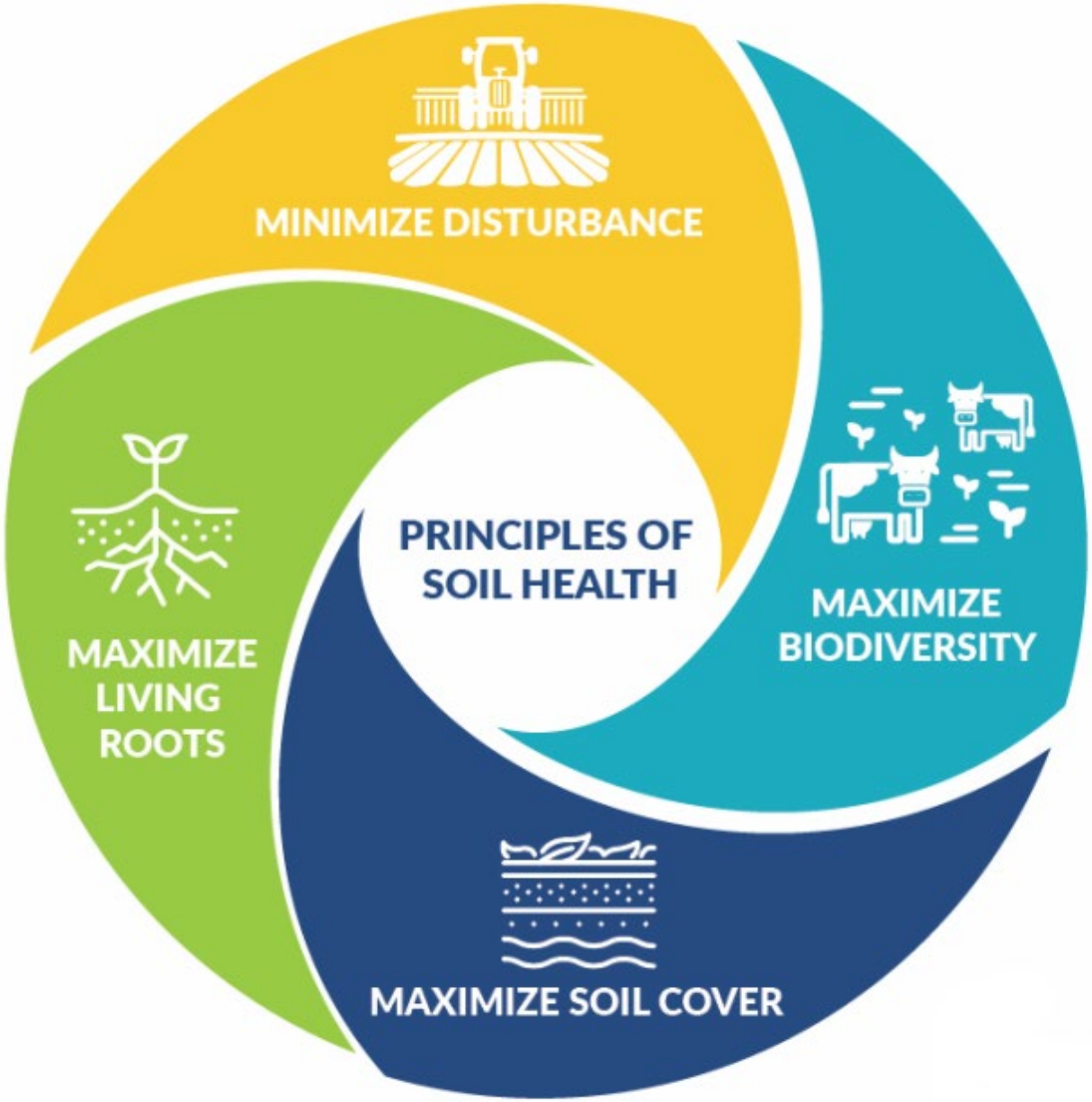
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Why It Matters

- Supports plant growth/enhances nutrient density
- Enhances water retention and drainage
- Builds resilience against pests and diseases
- Carbon sequestration and climate impacts
- Foundation of the **Soil Food Web**

Key Properties:

- Physical – texture, structure, compaction
- Chemical – pH, nutrient levels
- Biological – microorganisms, small invertebrates, fungi

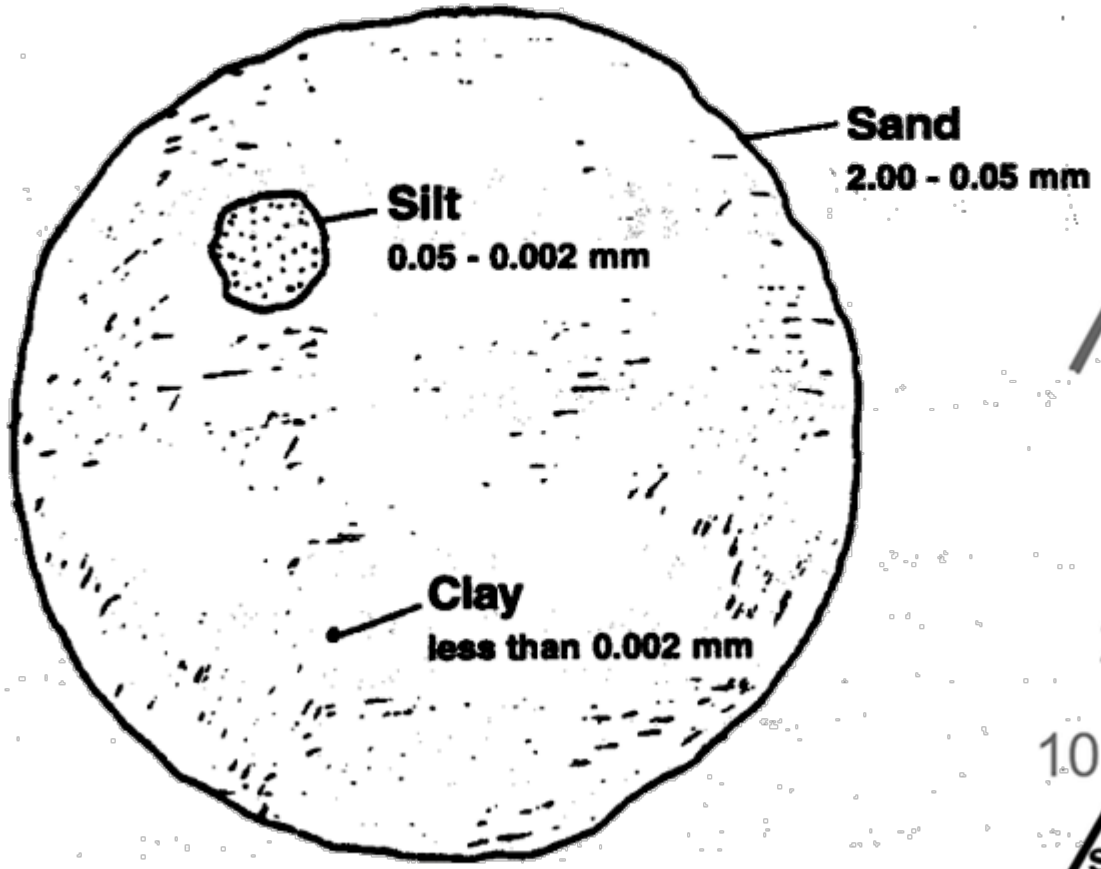


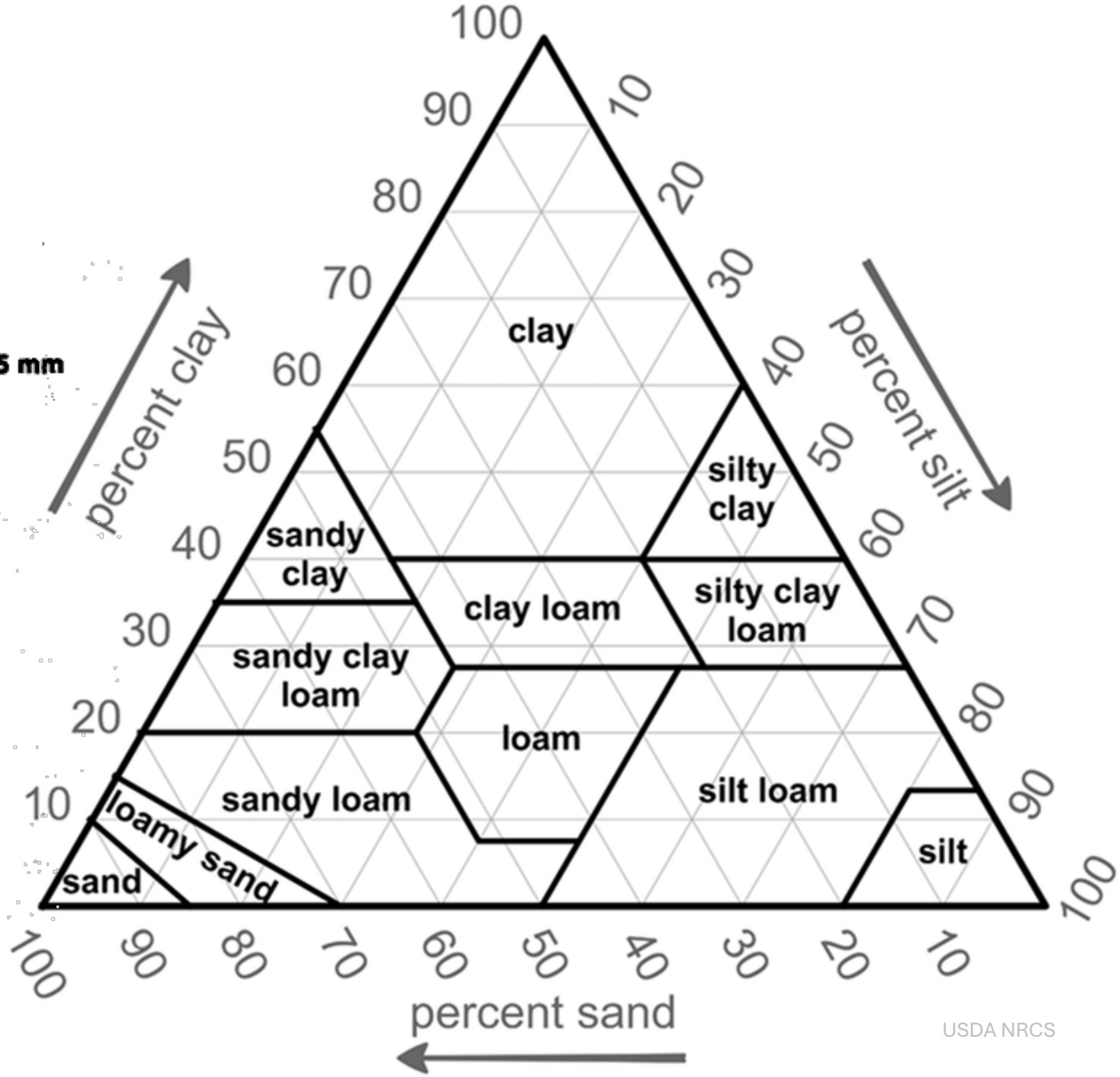
USDA NRCS

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Physical Characteristics

Soil Texture





USDA NRCS

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Physical Characteristics

Jar Test

1. Collect soil sample and sift
2. Fill jar 1/3 full of soil
3. Fill remainder of jar with water
4. Cap and shake
5. Set on a level surface for 1 minute, measure and mark **sand** layer
6. Return after two hours, measure and mark **silt** layer
7. Return after 48 hours, measure and mark **clay** layer
8. Measure the layers and the total of all layers to determine percentage of each



Clemson Cooperative Extension

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Chemical Characteristics

Professional Soil Testing

What you'll get:

- pH
  - Soil acidity (scale of 0-14)
- Macronutrients
  - Primary - Phosphorus (P) and Potassium (K)
  - Secondary – Calcium (Ca), Magnesium (Mg), Sulfur (S)
- Micronutrients
  - Iron (Fe), Manganese (Mn), Zinc (Zn), Copper (Cu), Boron (B), *and maybe Molybdenum (Mo), Chlorine (Cl), and Nickel (Ni)*
- Organic matter %
- Cation exchange capacity (CEC)
  - *How well soil can hold and exchange nutrients*
- Amendment recommendations
- Optional tests – nitrate, microbial activity, soluble salts, heavy metals

PRINT DATE	LAB NO.	SAMPLE IDENTIFICATION	COUNTY	ACRES OR SQ. FT.
1/16/2024	84		KENNEBEC	19 Acres

•SOIL TEST REPORT FOR:

Source trial sample

MAINE SOIL TESTING SERVICE
UNIVERSITY OF MAINE
5722 DEERING HALL
ORONO,MAINE 04469-5722

•**SOIL TEST SUMMARY & INTERPRETATION**
(see Numerical Results section for more information)

LOW — MEDIUM — OPTIMUM — ABOVE OPTIMUM

	Level Found
Soil pH	6.8
Organic Matter(%)	5.9
Major nutrients	
Phosphorus (lb/A)	250
Potassium (% Sat)	5.2
Calcium (% Sat)	82.5
Magnesium (% Sat)	12.2
Sulfur (ppm)	14
Micronutrients	
Boron (ppm)	0.8
Copper (ppm)	0.14
Iron (ppm)	2.8
Manganese (ppm)	6.9
Zinc (ppm)	2.4

•**RECOMMENDED ADDITIONS FOR ORGANIC GROWING - Crop Code # 392**

No lime recommended. Soil pH is at or above the optimum level for this crop.

To meet major nutrient requirements, apply (on each 1000 sq. ft.):
Nitrogen(2.5 lb) - from 20 lb bloodmeal or feathermeal or 35 lb soybean meal.

If you are using wood ash, discontinue until lime is needed again.
Excessive potassium: If you are using wood ash, discontinue.
Provisional organic matter credit: 1/2 of recommended N should be sufficient.

Apply fertilizer in spring. Apply 1/2 Nitrogen at planting time, 1/2 3-4 weeks later.

For information on micronutrient management and recommendations, see enclosed form.

•**NUMERICAL RESULTS** (Test methodology: pH in water and Mehlich buffer, available nutrients by modified Morgan extract) (Organic matter measured by LOI, P determined colorimetrically, all others measured by ICP-OES)

CEC and nutrient balance calculations are based on present pH of 6.8

	Soil pH	Lime Index 2	Phosphorus (lb/A)	Potassium (lb/A)	Magnesium (lb/A)	Calcium (lb/A)	CEC (me/100 g)	K (% Saturation)	Mg (% Saturation)	Ca (% Saturation)	Acidity
Level Found	6.8	6.31	250	437	319	5412	10.7(A)	5.2	12.2	82.5	0.0
Optimum Range	6.0-7.0	N/A	20-40	see % Saturation levels			> 5	3.5-5.0	10-20	60-80	< 10

	Organic Matter(%)	Sulfur (ppm)	Copper (ppm)	Iron (ppm)	Manganese (ppm)	Zinc (ppm)
Level Found	5.9	14	0.14	2.8	6.9	2.4
Normal Range	5 - 8	> 15	.25-.60	6 - 10	4 - 8	1 - 2

(Extras)	Boron (ppm)	Sodium (ppm)	Soluble Salts (mmhos/cm)	Nitrate-N (ppm)	Ammonium-N (ppm)
Level Found	0.8	N/A	N/A	N/A	N/A
Normal Range	0.5-1.2				

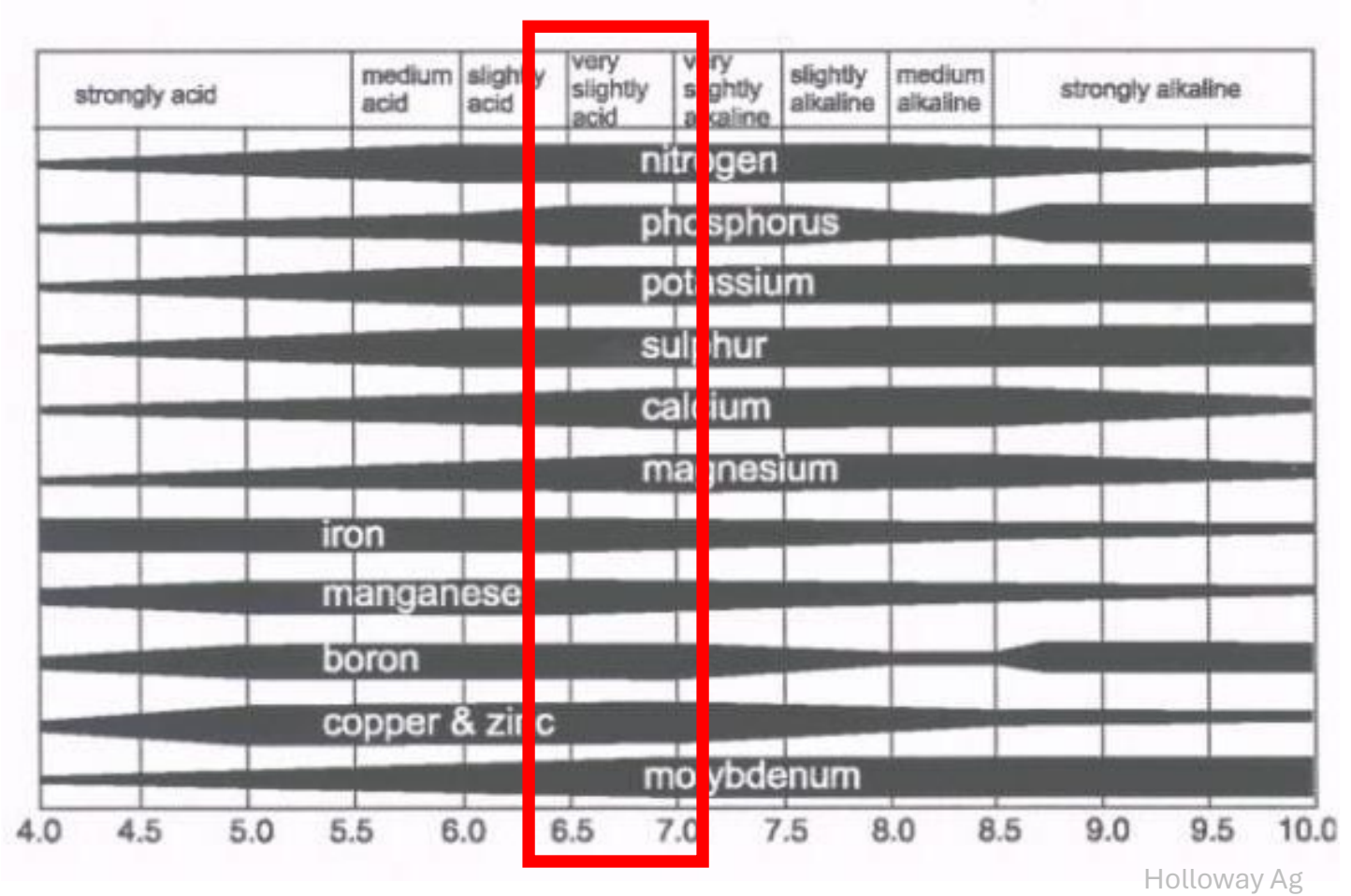
Additional Results or Comments:
Metals scan:
NORMAL BACKGROUND LEVEL - no health risk.
Till in 5 lb yellow sulfur/1000 sq ft.
This rate will cause only minor acidity.

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Chemical Characteristics

Understanding and Managing pH

- pH is a measure of soil acidity
  - < 7.0 is acidic
  - > 7.0 is alkaline
  - 7.0 is neutral
- Most plants and soil microorganisms prefer near neutral pH (6.5-7.0)
- pH can have impact on chemical, biological, and physical properties of soil
- Can be adjusted with soil amendents:
  - Raise pH – agricultural lime
  - Lower pH – elemental sulfur, peat moss, pine needles



Holloway Ag

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Building Better Soil

Fertility Management

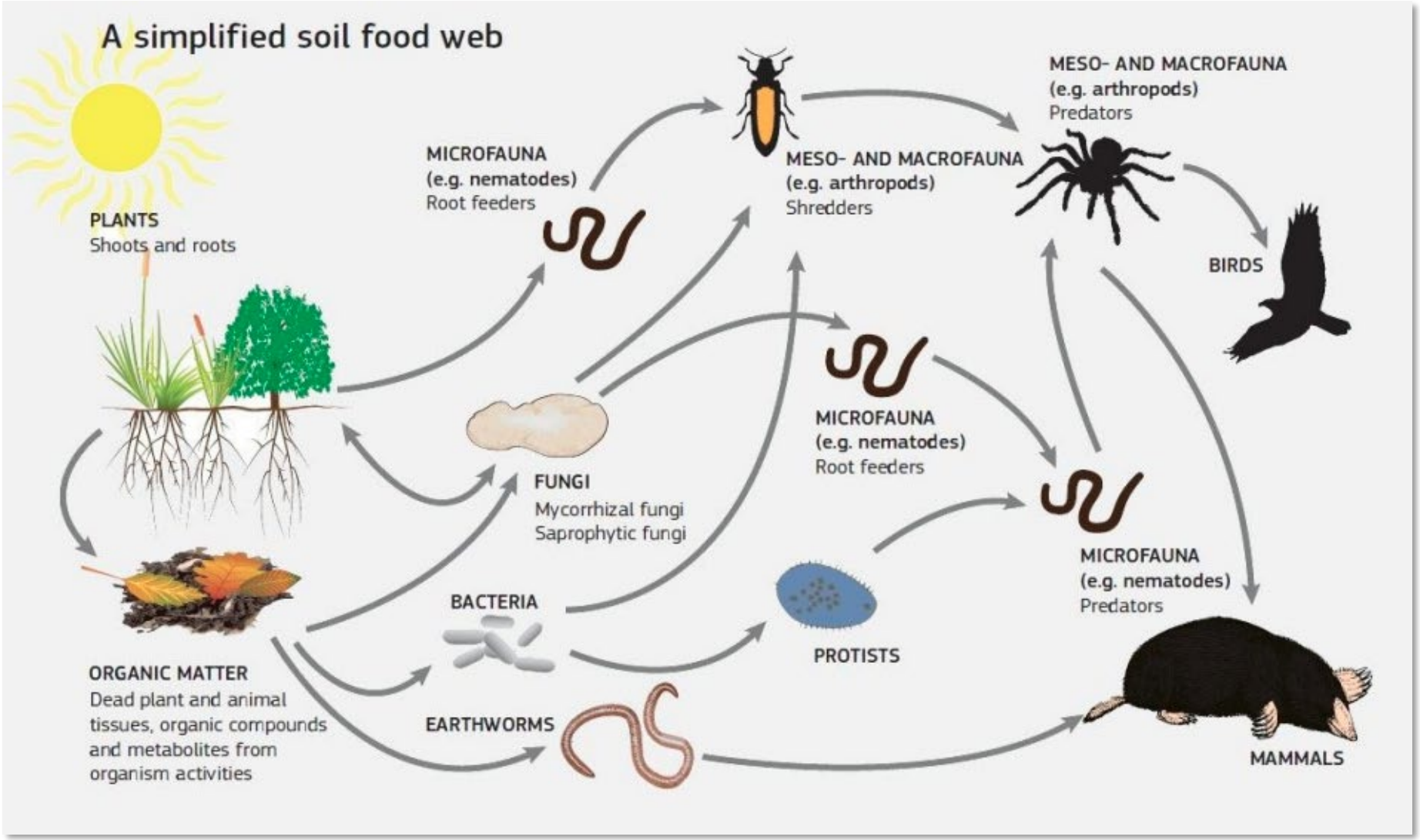
- First test, then amend
- Every soil is different – understand your context
  - Sandy soils vs. clay soils
  - High SOM vs low SOM
  - Climate and weather
  - Crop(s) and their nutritional demands
- Primarily aim to increase biological activity – “feed the soil, not the plant”



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Biological Characteristics

Soil Food Web



Global Soil Biodiversity Atlas. 2016. Orgiazzi, Bardgett, Barrios et al. Luxembourg, European Commission, Publications Office of the European Union: 176p.

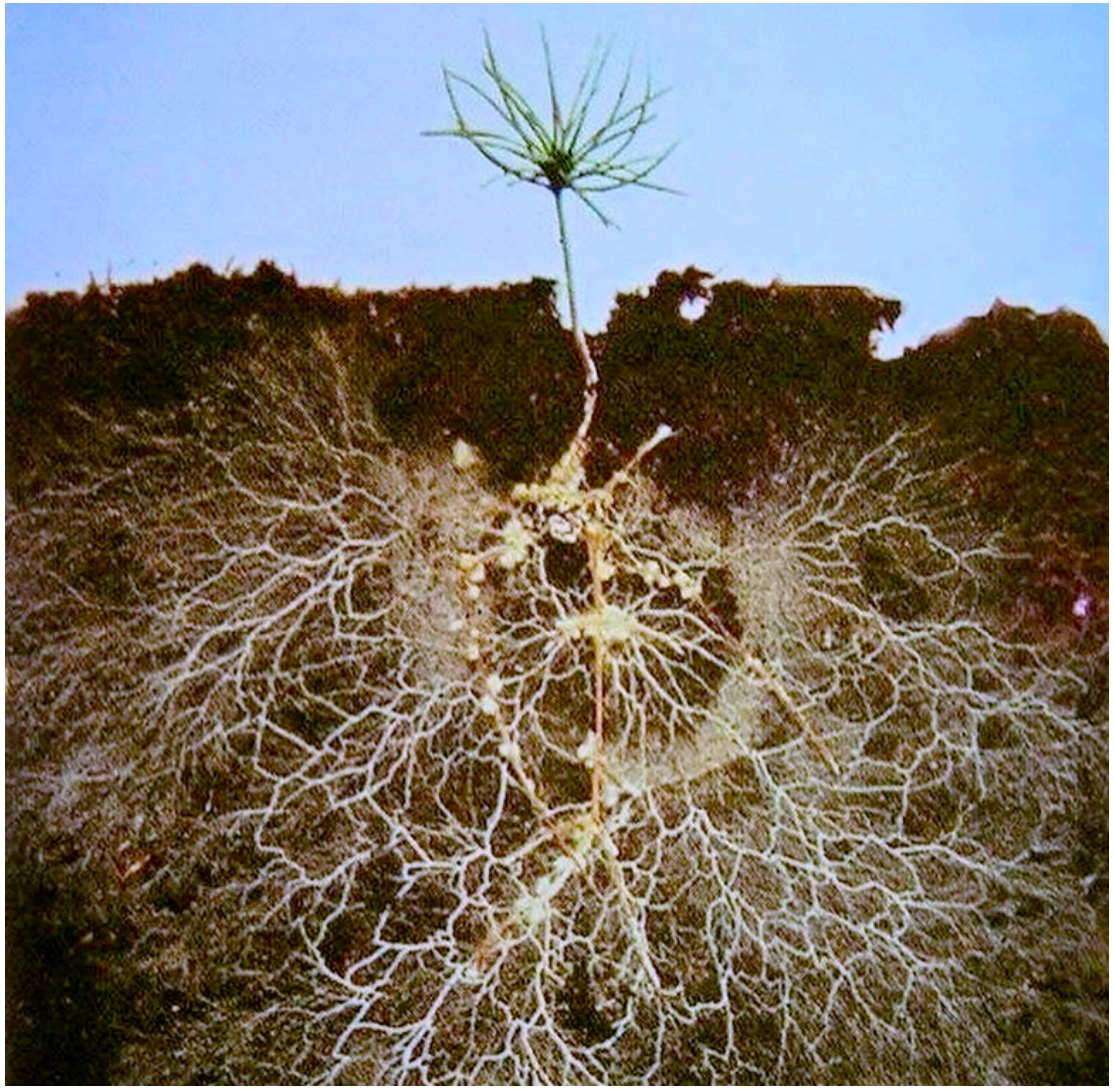
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Biological Characteristics

Soil Food Web



Julie Grossman, NC State University



Sheryl Karas, CSU Chico

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Building Better Soil

SOM Savings Account









Withdrawals

Tillage

Removing residues

Erosion

Deposits

Carbon based amendments

Cover cropping

Keeping soil covered

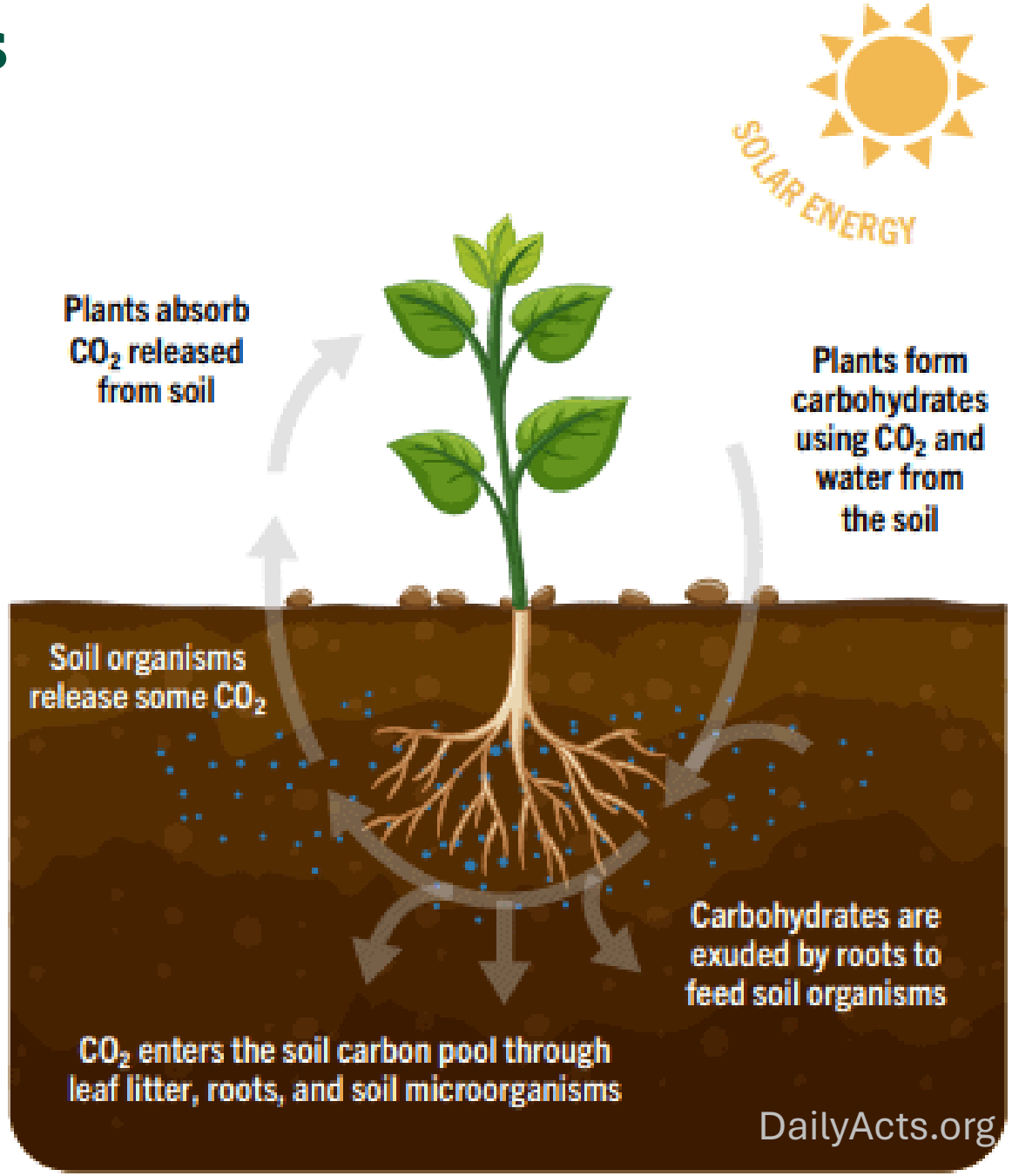
Root exudates

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Biological Characteristics

Soil Organic Matter (SOM)





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Soil Health In Practice

Reduced Till Production System







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Soil Health In Practice

No-Till Brassica Trial

Goals:

- Improve soil health
- Reduce plastic use
- Suppress weeds

Trial Setup:

- **Cover Crop:** Spring Green Manure planted in spring
- **Termination:** Crimped in summer
- **Tarping:** Silage tarp used to suppress regrowth and warm soil
- **Transplanting:** Brassicas planted directly into residue







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Soil Health In Practice

No-Till Brassica Trial

Challenges:

- Increased slug pressure
- Mulch complicates transplanting slightly
- Timing is critical
- Not ideal for all crops

Broader Applications:

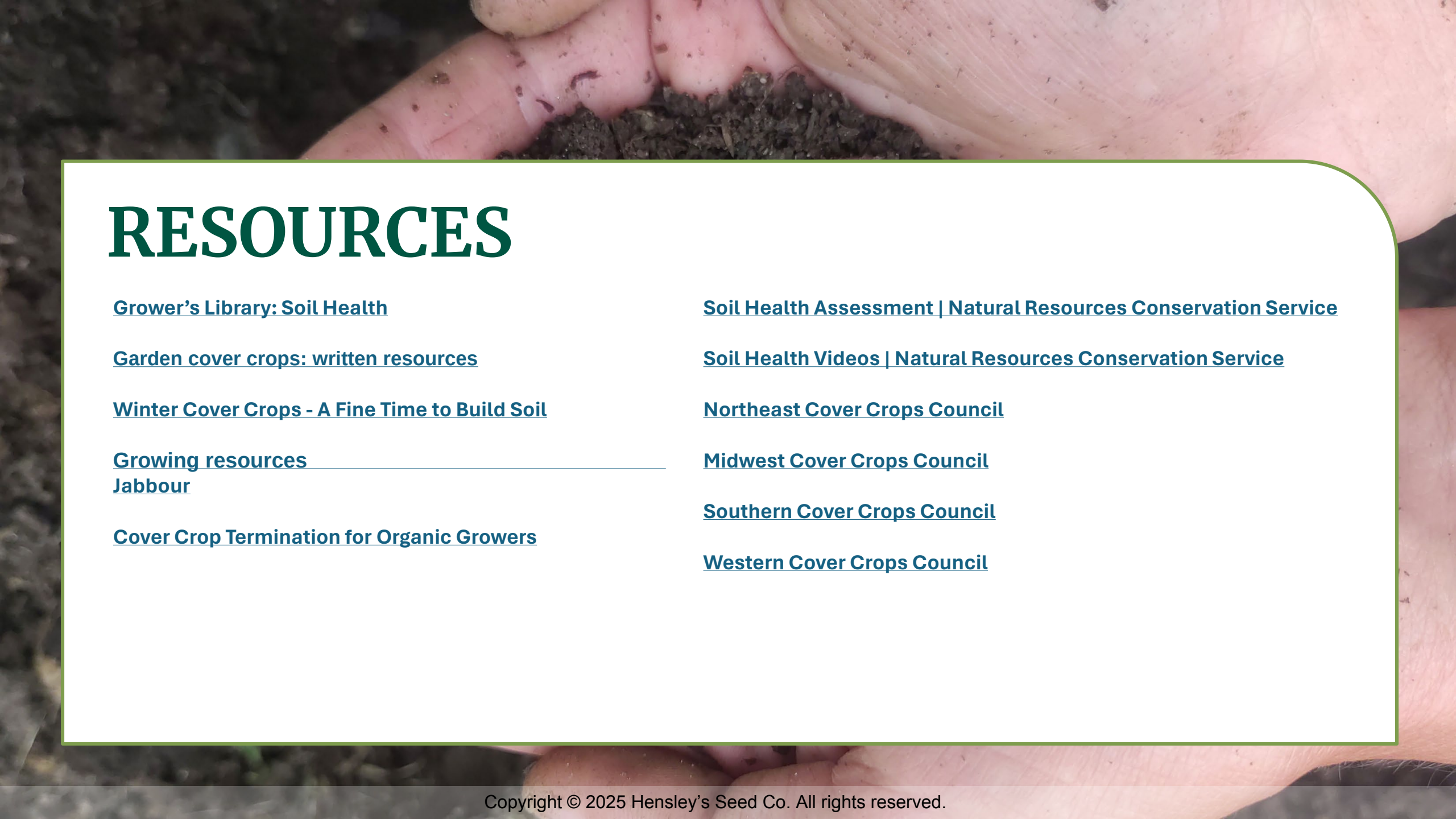
- **Works well for** tomatoes, peppers, squash, garlic
- **Less suitable for** carrots, lettuce, small-seeded crops
- Choose cover crops carefully and plan ahead







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RESOURCES

Grower's Library: Soil Health

Garden cover crops: written resources

Winter Cover Crops - A Fine Time to Build Soil

Growing resources
Jabbour

Cover Crop Termination for Organic Growers

Soil Health Assessment | Natural Resources Conservation Service

Soil Health Videos | Natural Resources Conservation Service

Northeast Cover Crops Council

Midwest Cover Crops Council

Southern Cover Crops Council

Western Cover Crops Council

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