



Using Compost to Improve Soil Health

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USU Urban & Small Farms Conference

Microfarm Session

3/1/2021 @ 10:00 am MST



Today's Topics

- Soil health + importance of soil organic matter
- Compost types
- Figuring out how much to add and considering alternatives.



Soil health (quality)

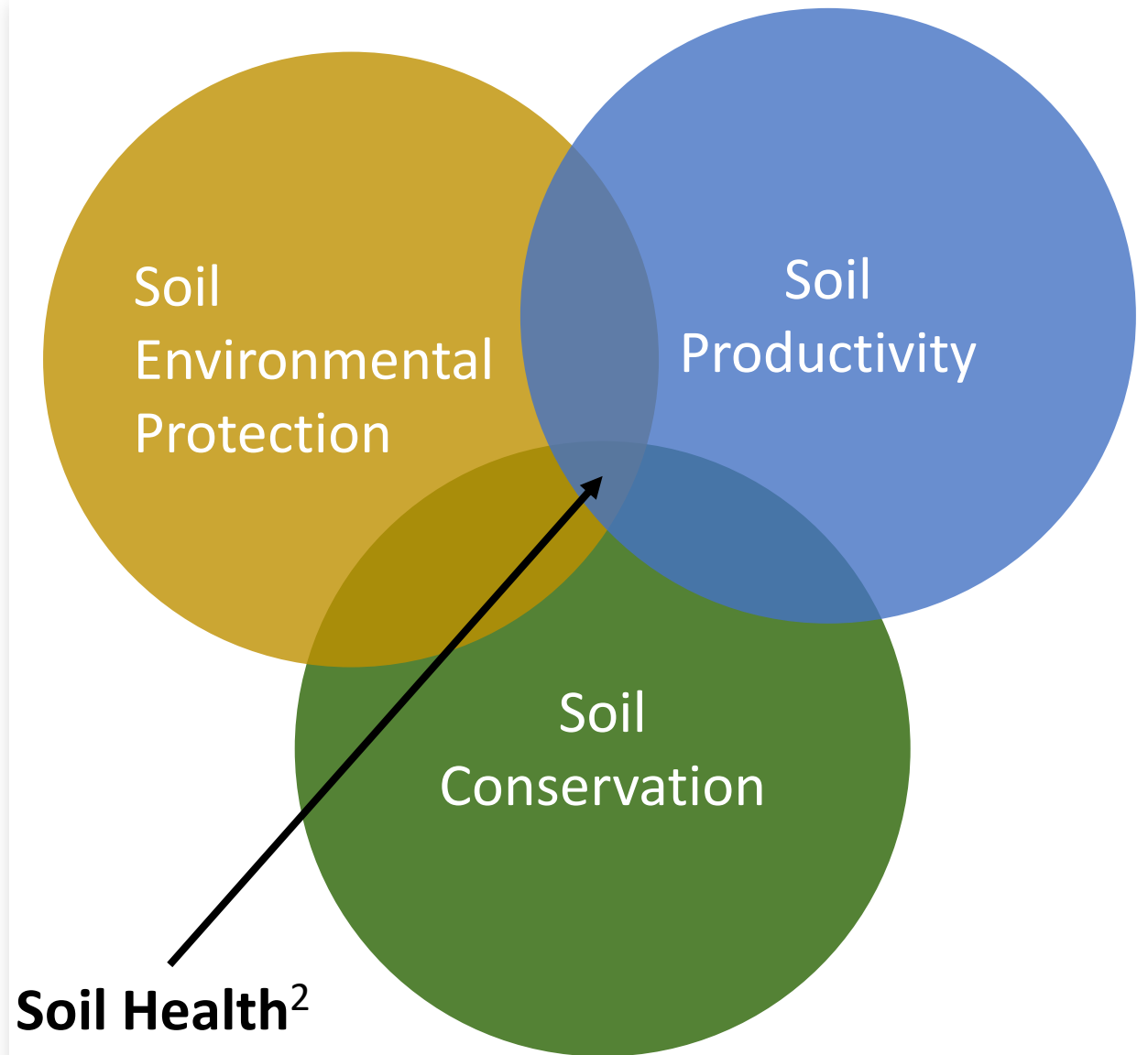
- NRCS¹: “...the **continued capacity of soil** to function as a vital living ecosystem that **sustains plants, animals, and humans.**”
- “...**managing soils** so they are **sustainable for future generations.**”



¹nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

Let's take a sec to get excited about soil

- Soil sustains diverse plant and animal life¹
- Soil controls where rain, snowmelt, & irrigation water go¹
- Soil filters and buffers potential pollutants¹
- Soil stores and cycles nutrients¹
- Soil structure provides a stability and support for plant roots¹



¹nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

²Adapted from Dr. Kristen Veum

What is organic matter (OM)?

- The remains of decomposed plants and animals in the soil.
- This is what gives topsoil its dark color.
- Most organic matter additions happen at the soil surface.



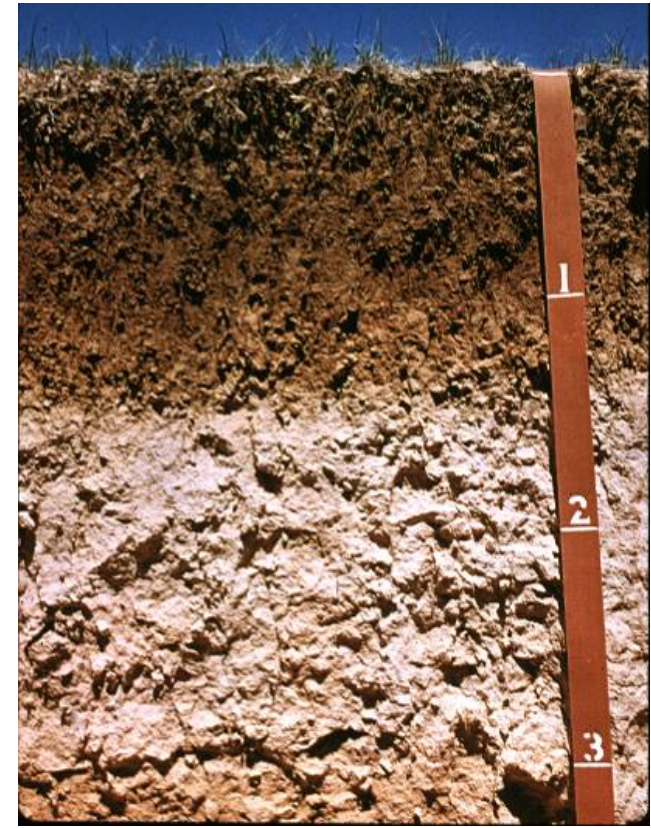
Now a quick tour of **soil diversity**: our soils naturally have less organic matter (OM)



Midwest, tall grass prairie soil



Eastern CO, short-grass prairie soil



Central Utah, semi-arid grassland

OM benefits and considerations

Benefits

- Improves soil structure
- Reduces crusting and compaction
- Improves infiltration
- Improves water-holding capacity and drainage
- Provides and holds nutrients

Considerations (more later)

- Annual additions of OM to *maintain* levels. More to increase levels.
- Sources of OM vary – consider nutrient content, salinity, and pH.





How much compost
should I add each year?
It depends.

Compost is NOT created equally.
 Ideal source: more N, pH ~7, low salinity

Compost Type		N	P ₂ O ₅	K ₂ O	pH	Salinity
		----- % -----				[dS/m]
Manure-Based	Beef	1.1	0.9	1.3	8.5	4
	Chicken	1.4	5.8	2.8	8.2	16
	Dairy	1.0	0.7	1.5	8.5	8
	Goat	1.0	0.9	1.9	8.4	5
	Horse	0.7	0.3	0.9	8.6	4
	Mink	1.1	3.0	0.3	6.4	6
	Sheep	1.0	1.1	1.3	8.0	3
	Turkey	2.2	5.3	2.2	8.2	11
Other	Biosolids	1.8	1.5	0.2	6.9	5
	Commercial	1.3	0.9	1.0	7.8	5
	Municipal	1.2	1.1	0.7	7.8	5
	Plant-Based	1.4	0.9	0.9	7.9	3

Horticulture



EXTENSION
Utah State University



extension.usu.edu

October 2019 Horticulture/Soils/2019-01pr

**Sustainable Manure and Compost Application:
Garden and Micro Farm Guidelines**

Melanie Stock, Tiffany Maughan, and Rhonda Miller



A note on soil salinity

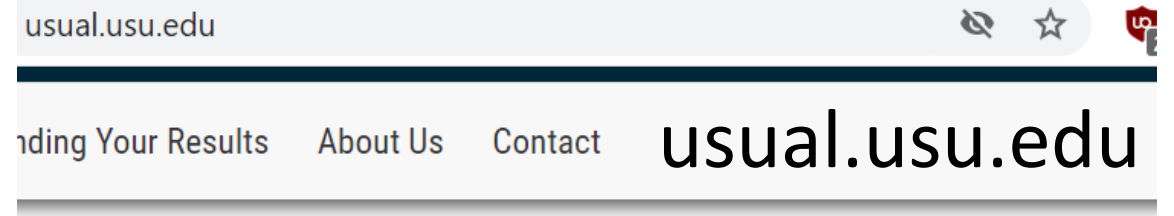
- Salts reduce plant growth and yield – and can cause plant death if levels are too high
- Soil rule of thumb: >2 dS/m is saline for fruits, veggies, nuts, flowers
- Many plant nutrients are also salts. Important to have sufficient levels and no more - **watch compost use!**



The **best** way to sustainably add compost.

Step 1 – get a soil test.

- Compost increases soil OM, as well as nutrients and salts
- Get your soil tested.
- Find a lab in your state.
- Prioritize these tests:
 - Salinity and pH
 - Phosphorus and Potassium



University Analytical Laboratories (USUAL) provides testing and analysis for plant tissue, and irrigation/livestock water. Information about process and payment options is listed below.



Home Soil Test



Agriculture and Construction

Times to not add compost.

Step 2 – read and interpret the soil test results.

- Salinity or pH are becoming a concern.
- Your soil test phosphorus and potassium levels are high.

Example soil test report in Utah

pH		7.8	Normal
Salinity - ECe	dS/m	2.00	High
Phosphorus - P	mg/kg	246	Very High
Potassium - K	mg/kg	424	High

Test result key in Utah

Test Category	Soil Test Value (ppm)	
	Phosphorus (P)	Potassium (K)
Very Low	0-10	0-70
Low	11-20	70-125
Optimum	21-30	126-300
High	31-60	300+
Very High	60+	>400

A very basic *Rule of Thumb*

- Single application
 - 1 inch per year for annuals
 - 2-3 inches of low salt material *if* you are in dire need of OM (e.g. a new site needs significant improvement) and will not create excessive P and K levels
- Note: 1" = 27 wheelbarrows spread over 1000 ft²



Or add based on your P and K needs

If a soil test recommends **1 lb** of P and K per 1000 ft²:

- Estimate the nutrient content of the compost or get it tested. *Ex.*
- Divide **test recommendation** by the **% of P or K of the compost**. Then multiply by 100.
- **Ex:** $1 \text{ lb} / 0.9 \times 100 = 111 \text{ lbs}$ of compost per 1000 sq ft. (1 wheelbarrow holds ~100 lbs)

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	Mink	1.1	3.0	0.3
	Sheep	1.0	1.1	1.3
	Turkey	2.2	5.3	2.2
Other	Biosolids	1.8	1.5	0.2
	Commercial	1.3	0.9	1.0
	Municipal	1.2	1.1	0.7
	Plant-Based	1.4	0.9	0.9

Other options for increasing OM

- Cover crops!
- Incorporating crop residue that is not diseased.
- Mulches – hay/straw, leaves, grass clippings, leafy green residues, etc.



Summary


- Soil health = managing for **long term sustainability** to balance:
 - environmental protection
 - crop productivity
 - soil conservation
- Adding lots of compost can lead to excess P, K, and salinity.
- Know what you're adding and diversify your options.
- Managing soil is a marathon, not a sprint.





Thank you!
(please fill out my eval)

Dr. Melanie Stock

 @usu_smallfarms

