



Managing for Soil Health

Collaborators: Jeana Myers, Janel Ohletz



Small Farm Bootcamp Information



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Small Farm Bootcamp is an eight module program helping small-scale farmers gain knowledge in production on their land. This curriculum was developed by the Growing Farm Capacity Work Group of the North Carolina Cooperative Extension Local Food Program Team. This program was developed and piloted in 2021.

Learning Objectives

1. Understand how to soil test and interpret the report.
2. Describe the basic soil characteristics and find soil type using Web Soil Survey.
3. Determine fertilizer needs based on soil results and management goals (organic vs. conventional).
4. Explain the role of soil macronutrients and pH in plant health and development.
5. State the importance and role organic matter.
6. Identify organic matter sources and describe practices for building organic matter.

Introduction to North Carolina Cooperative Extension

**We Grow
North
Carolina
through
Education and
Research**



AGRICULTURE &
FOOD



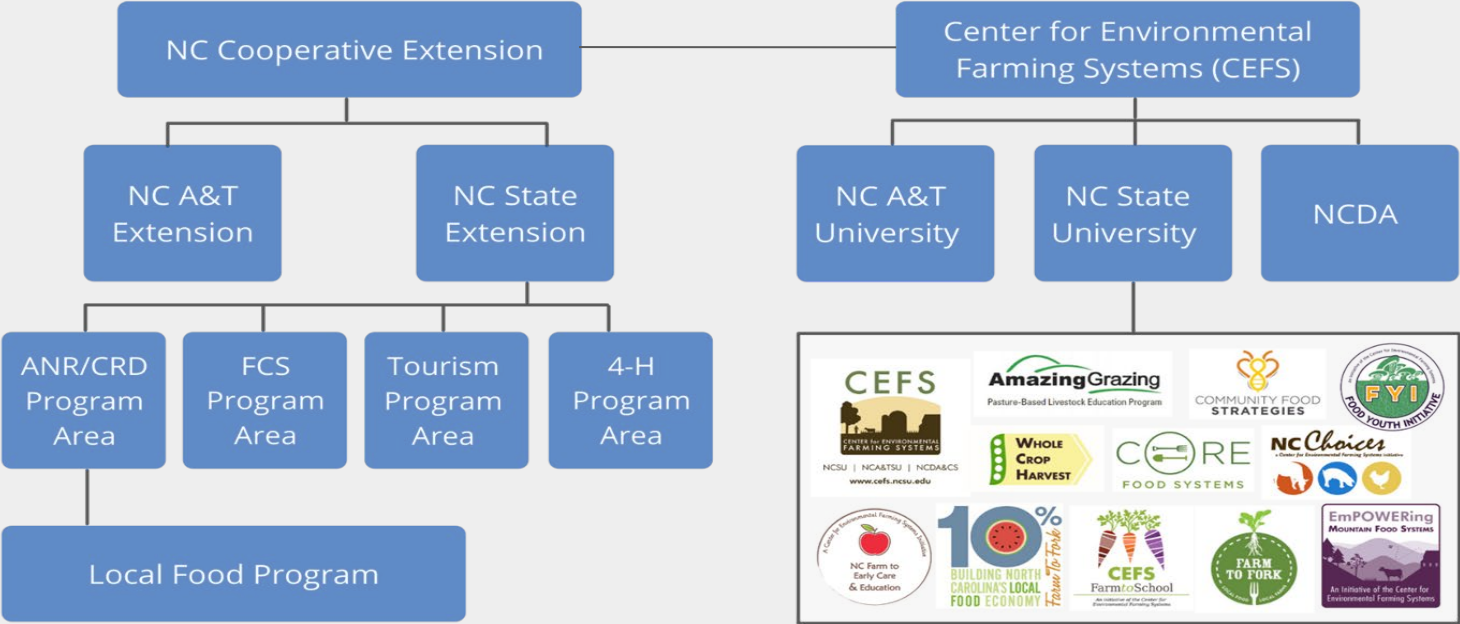
HEALTH &
NUTRITION



4-H YOUTH
DEVELOPMENT



Extension Organization



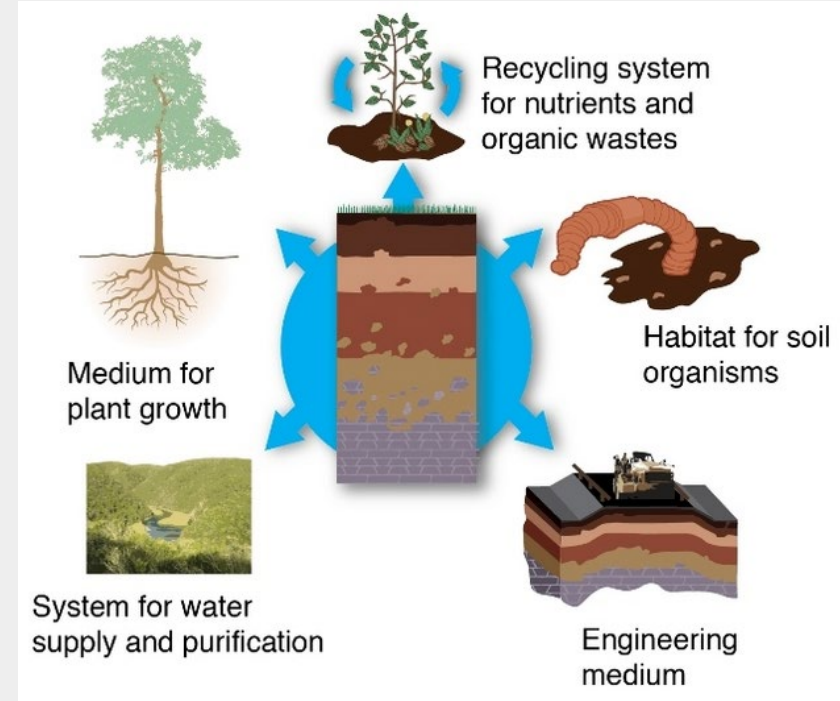
Importance of Soil Health

What soil provides

Medium for Life!

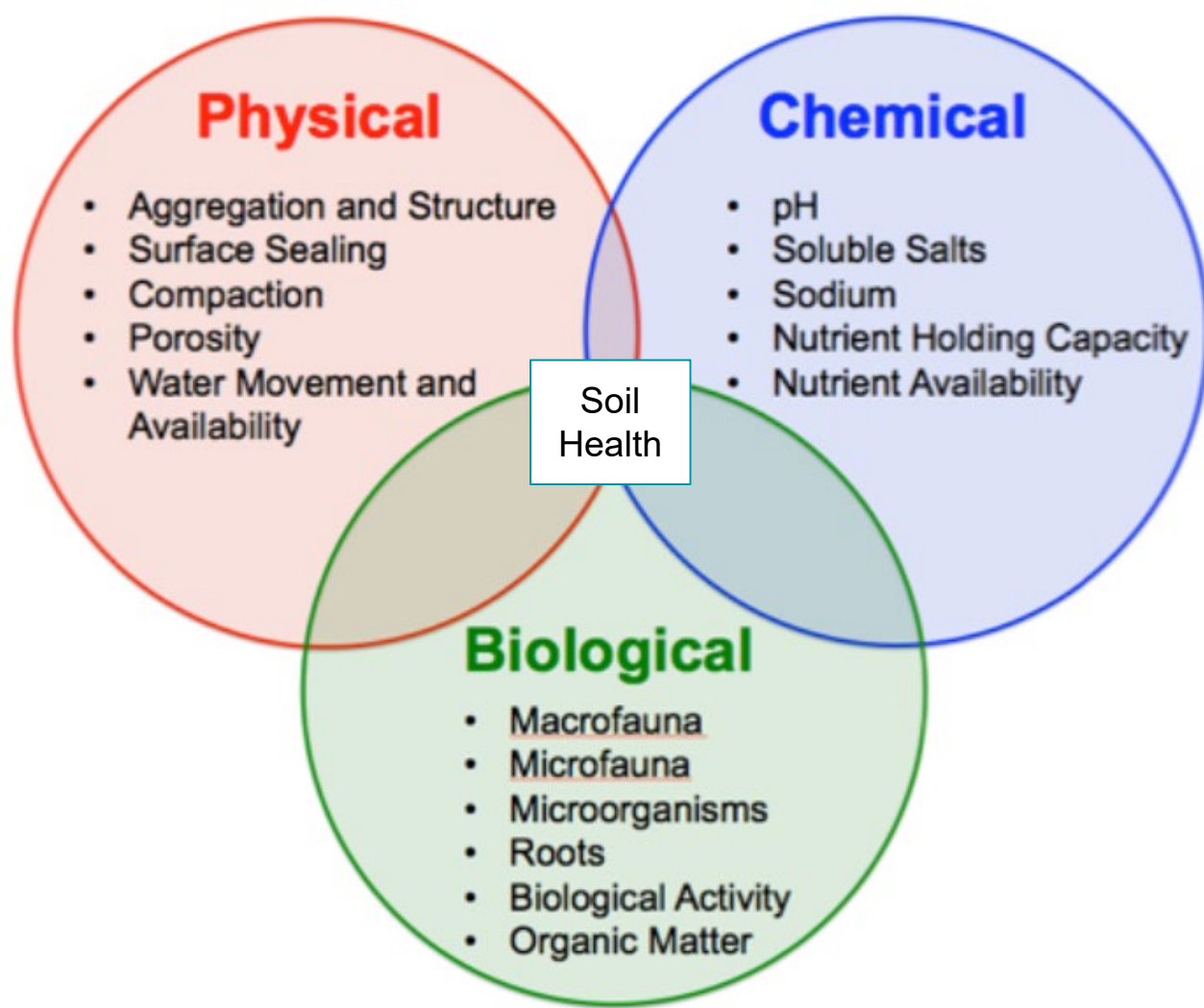
Soil provides many resources

- Food
- Timber
- Fiber
- Fuel
- Ecosystem support



nature.com

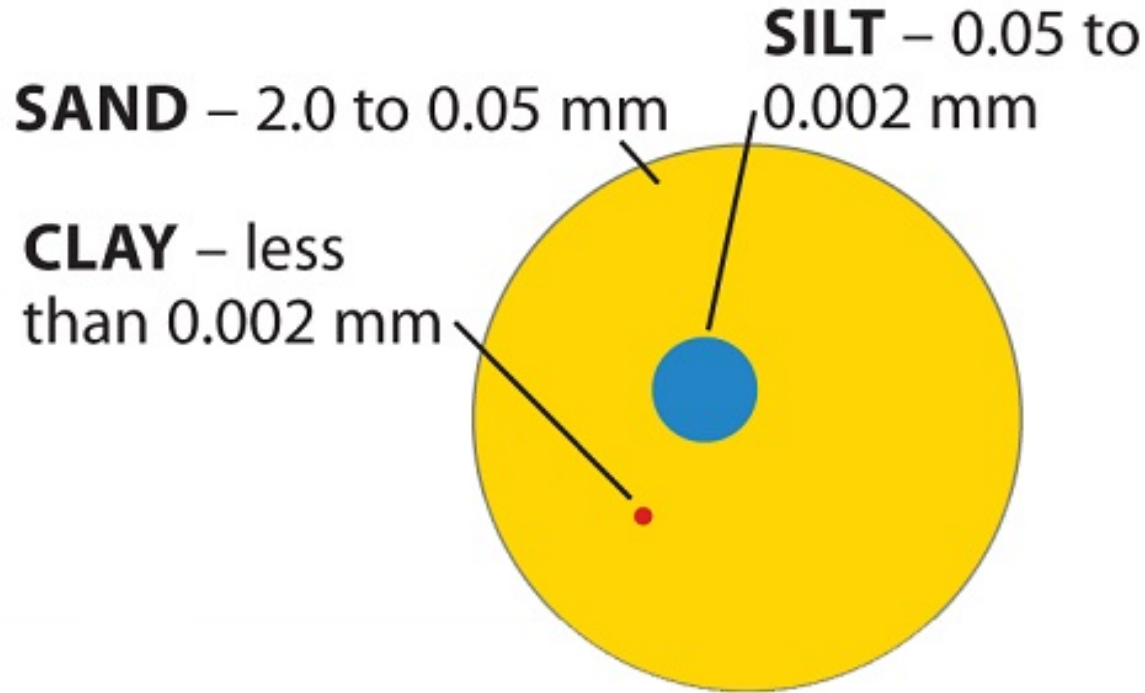
Soil Properties



Getting to know your soils

Texture and Structure

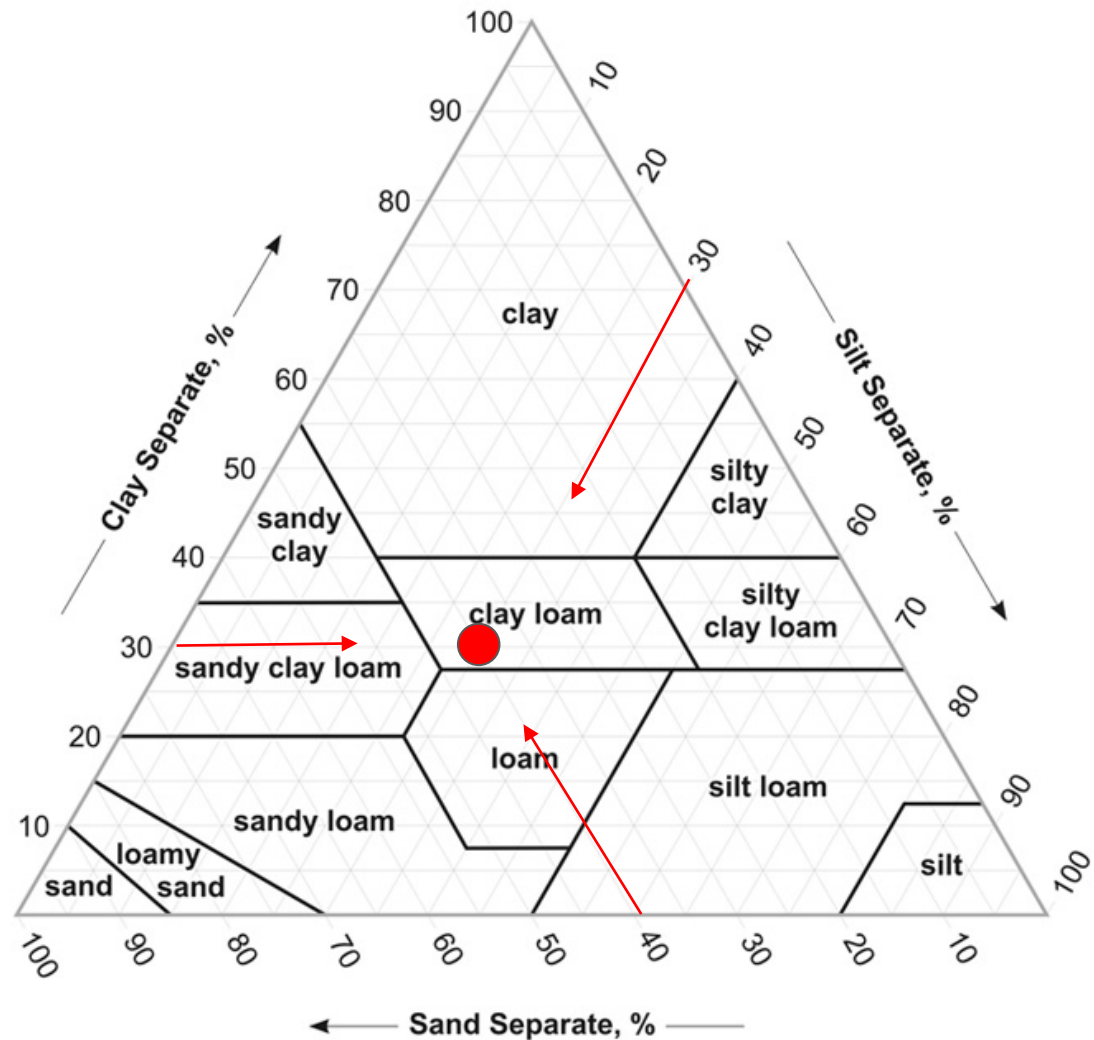
Soil Texture - How much sand, silt, clay



SIZE
of soil
particles
can be
very
different!

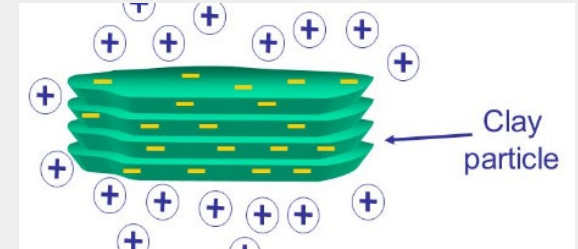
Texture Triangle -

How much sand, silt, clay

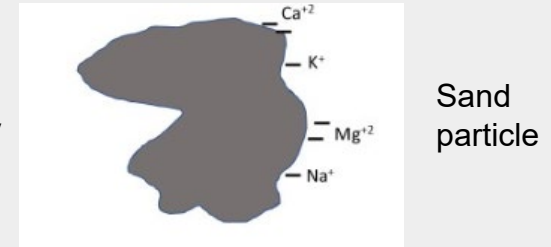


But, it's more than SIZE of soil particles that influences soil qualities....

Clay has a platy structure, with many more electrically charged sites to hold onto nutrients and water.



Sand is more like solid, tiny rocks, with fewer electrically charged sites to hold nutrients and water.



Cation Exchange Capacity (CEC) is the amount of cations (like K, Ca, Mg, etc) that a soil can hold onto. Clay, and organic matter, have high CEC's. Sand has a low CEC.

CEC	Soil Texture
0-8	Sand
9-12	Loamy Sand
13-20	Sandy/Silty Loam
21-28	Loam
29-40	Clay Loam
>40	Clay

Texture Impacts Management

- Nutrient holding - higher in clay vs sand
- CEC - higher in clay soils or organic matter
- Water infiltration - slower in clay soils
- Water holding - higher in clay soil and organic matter

Texture - Can't be changed!

You have just so much sand, silt and clay in your soil...

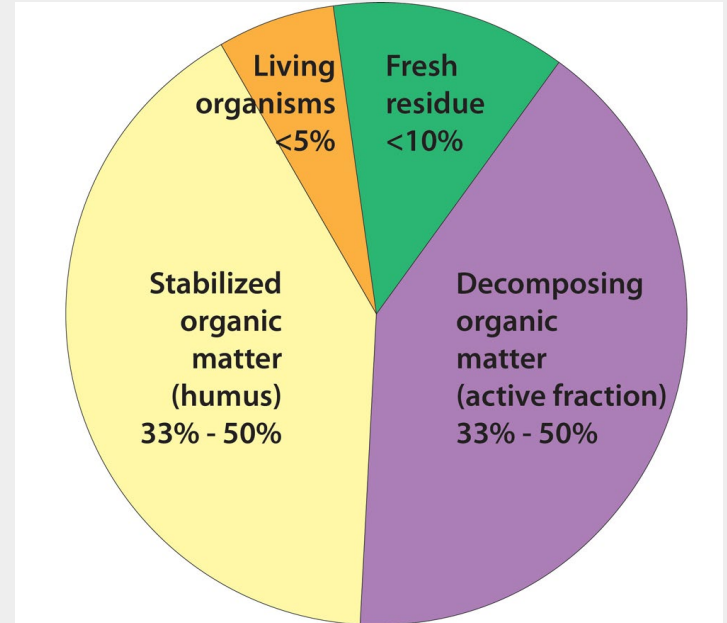
How to improve?

STRUCTURE  with Organic Matter

What is Organic Matter?

Organic matter in the soil is

- living organisms
- fresh (newly dead) materials
- decomposing matter
- fully decomposed materials

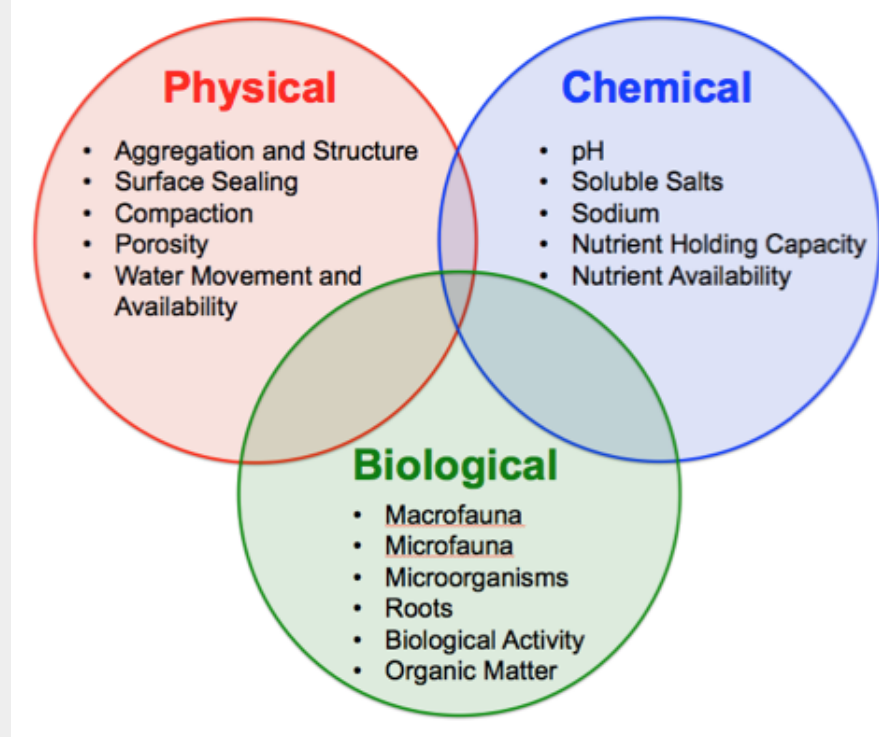


NRCS

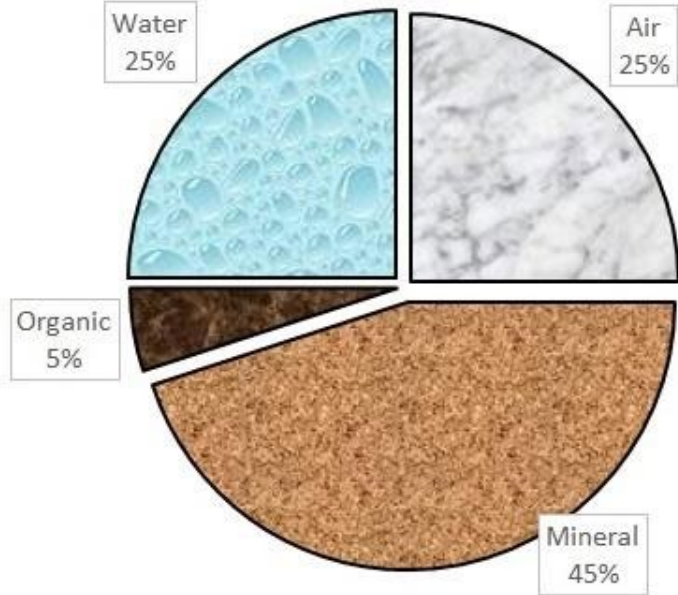
Organic matter!

Improves
physical,
biological,
chemical nature of soil –

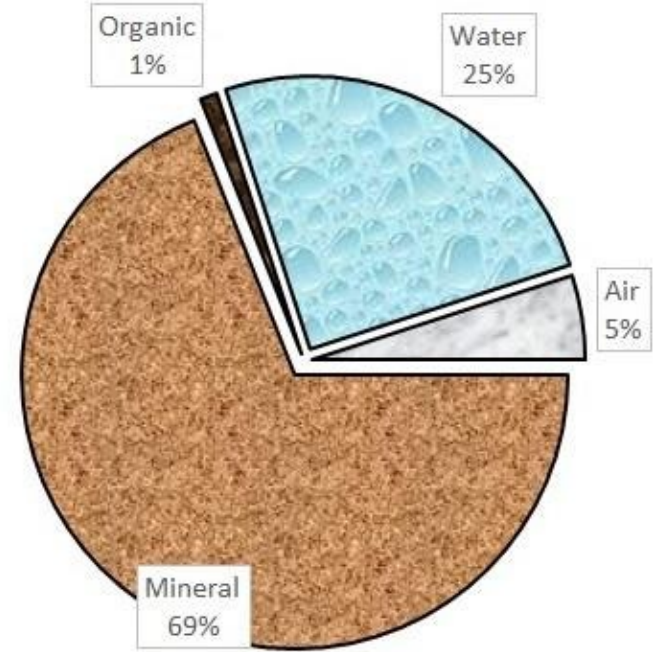
holds nutrients, improves moisture management and air availability, supports microbial populations.



Soil Structure - air is important



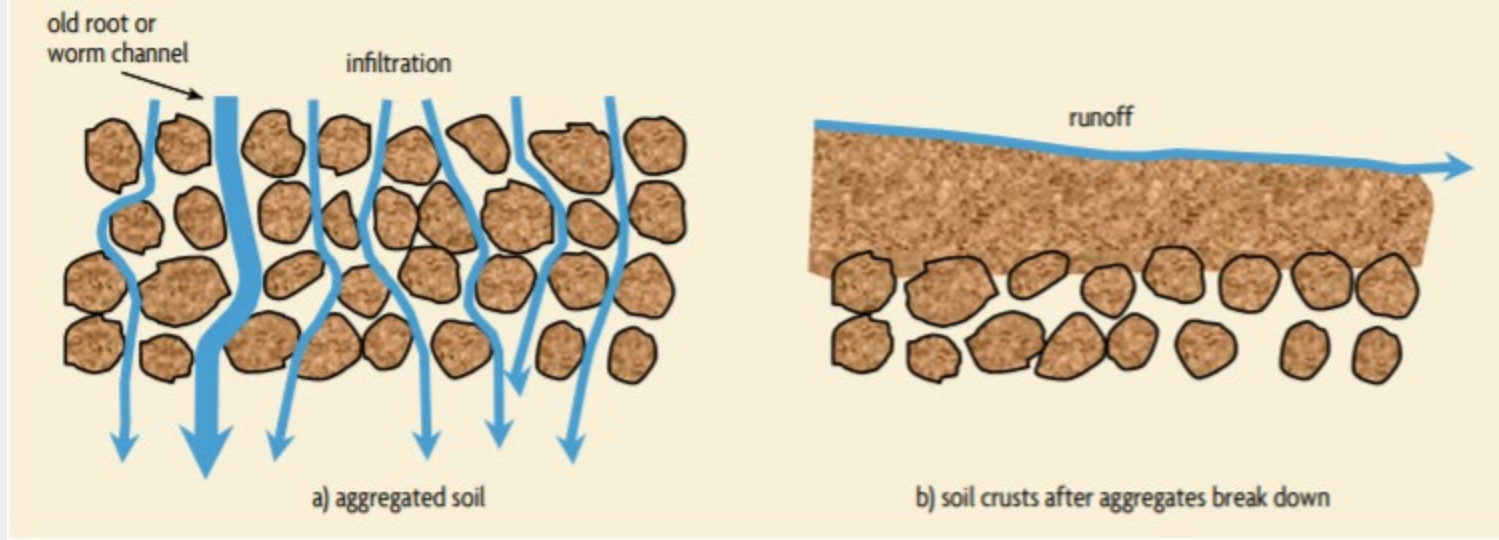
Ideal



Compacted

Soil Structure

Particles of soil are grouped together into aggregates - cemented or bound together by organic matter residues... “Tilth”



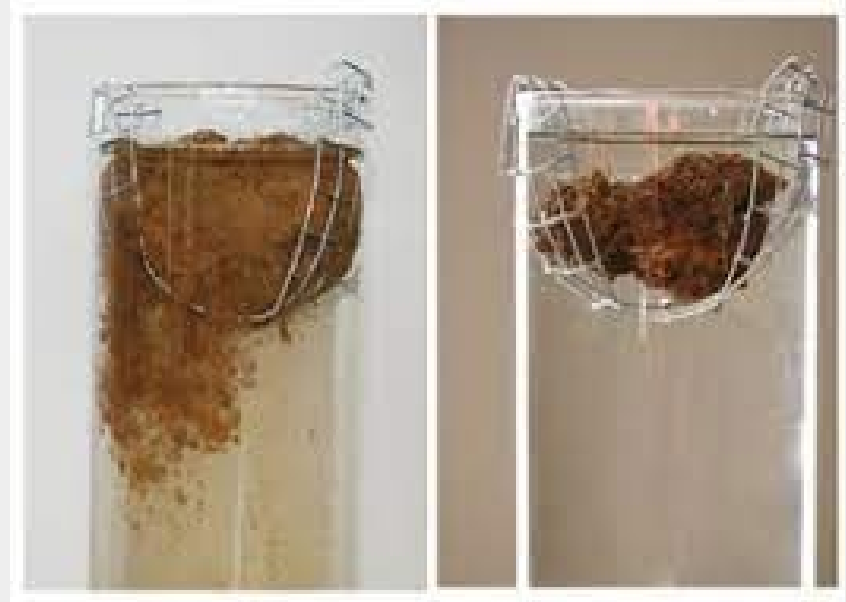
Soil Structure - Aggregates

Soil stability

Microbial community

Erosion potential

Which soil was tilled?



Tilled

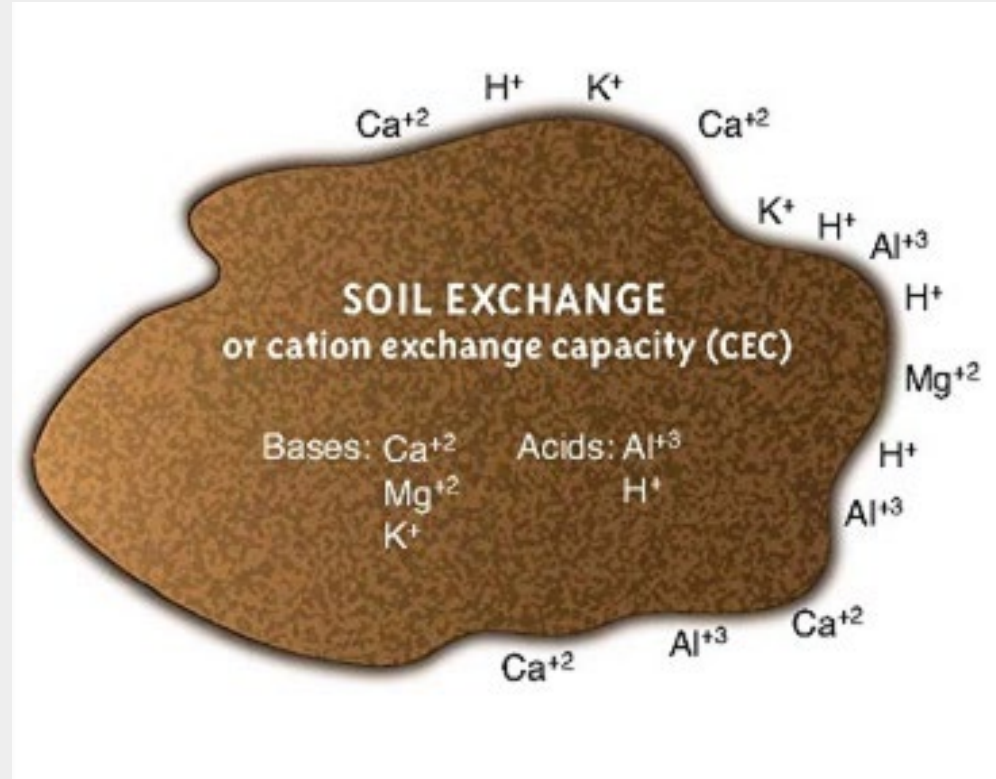
No-till

Chemical

pH = measure of acidity

CEC = cation exchange capacity

Controls nutrient availability
and ability to hold nutrients



Biological

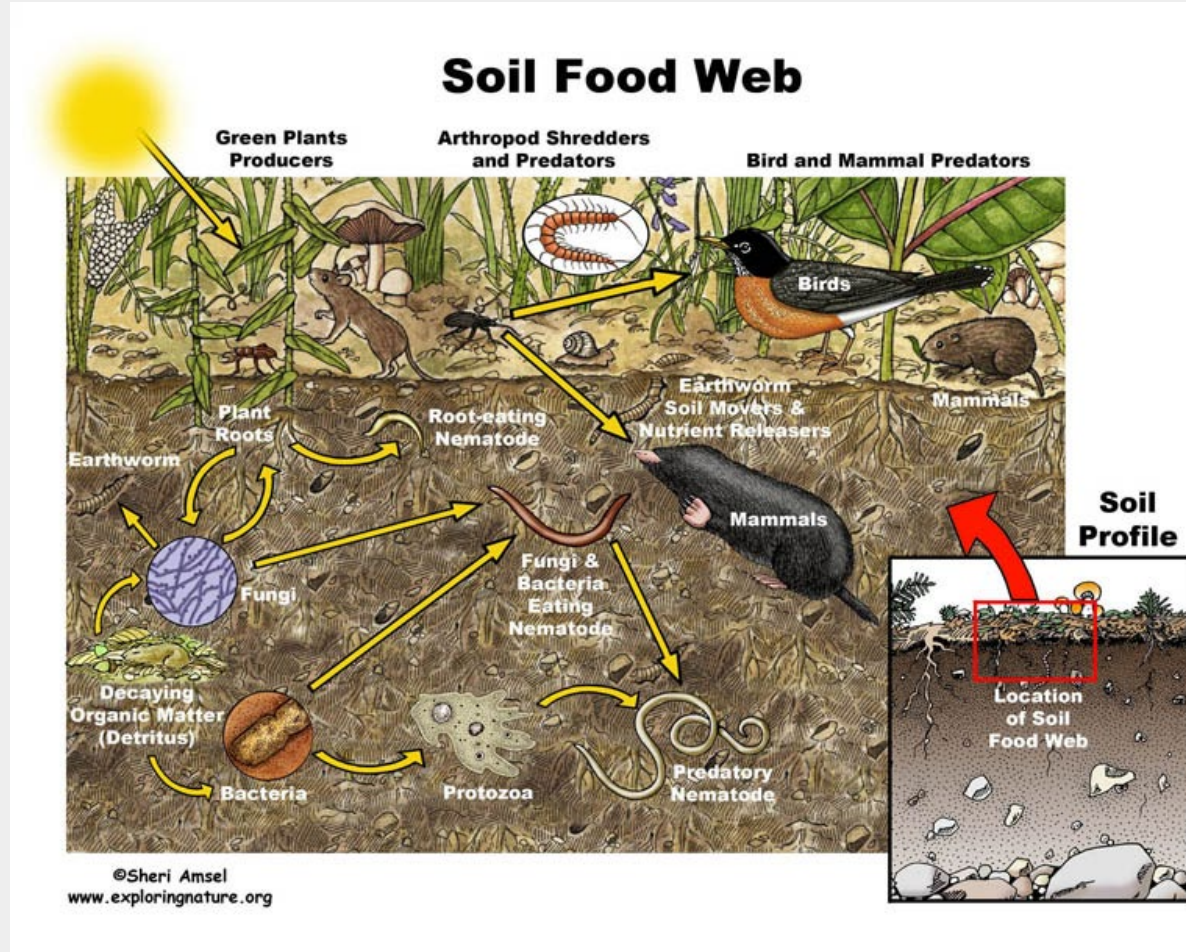
Organic matter

Microbial community

Roots

Macrofauna (animals)

Macroflora (plants)



Getting to know your soil

Soil Survey



United States Department of Agriculture
Natural Resources Conservation Service

Web Soil Survey

[Home](#)[About Soils](#)[Help](#)[Contact Us](#)

You are here: [Web Soil Survey Home](#)

Search

All NRCS Sites

Browse by Subject

- [Soils Home](#)
- [National Cooperative Soil Survey \(NCSS\)](#)
- [Archived Soil Surveys](#)
- [Status Maps](#)

The simple yet powerful way
to access and use soil data.

**START
WSS**

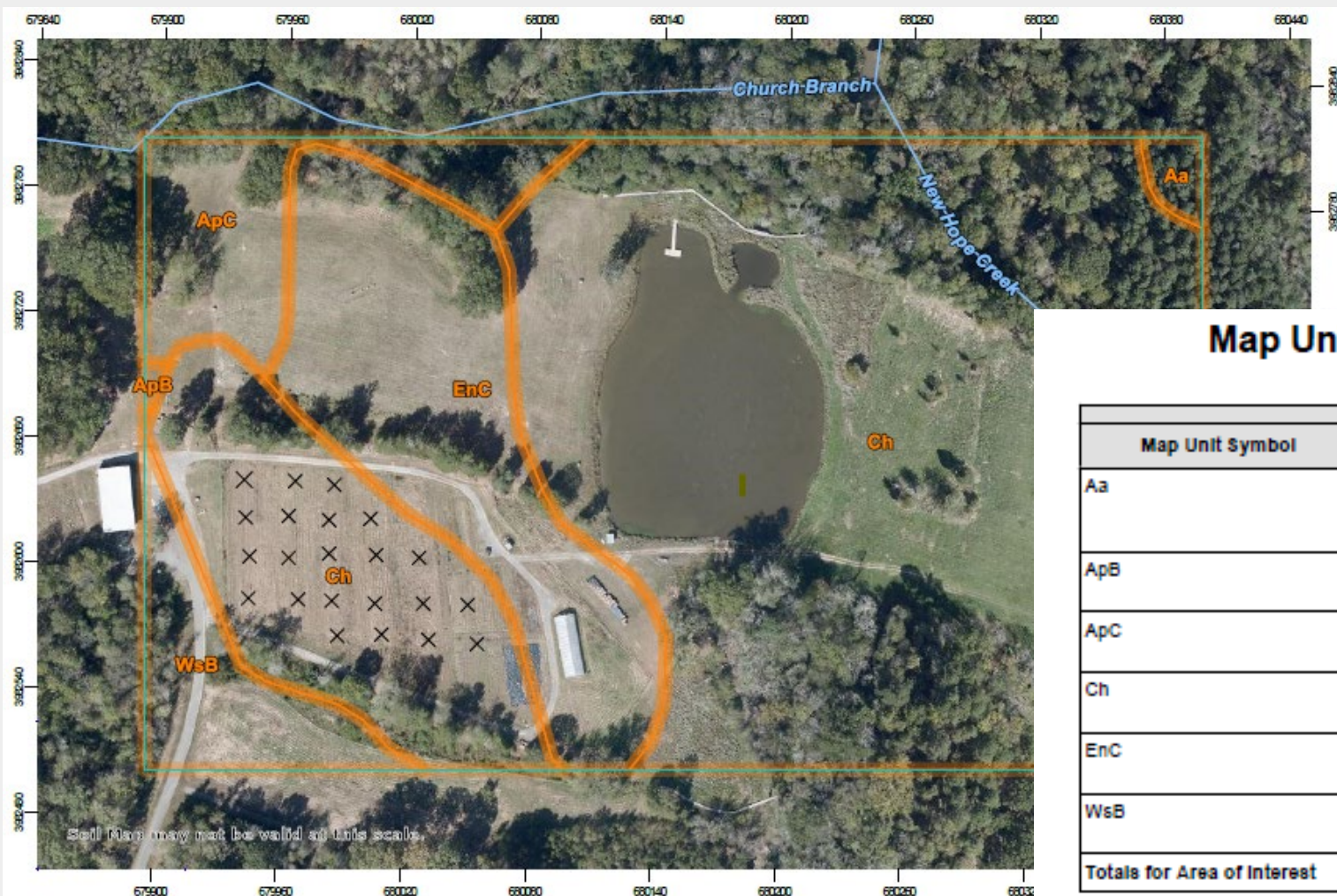
Welcome to Web Soil Survey (WSS)



Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural

I Want To...

- [Start Web Soil Survey \(WSS\)](#)
- [Know Web Soil Survey Requirements](#)
- [Know Web Soil Survey operation hours](#)
- [Find what areas of the U.S. have soil data](#)
- [Find information by topic](#)



Map Unit Legend

Map Unit Symbol	Map Unit Name
Aa	Altavista fine sandy loam, 0 to 3 percent slopes, occasionally flooded
ApB	Appling sandy loam, 2 to 6 percent slopes
ApC	Appling sandy loam, 6 to 10 percent slopes
Ch	Chewacla loam, 0 to 2 percent slopes, frequently flooded
EnC	Enon loam, 6 to 12 percent slopes
WsB	White Store loam, 2 to 6 percent slopes
Totals for Area of Interest	

Soil Testing

Why, How, Understanding Results

Why Soil Test?

To improve plant growth

To protect the environment



Best time to sample?

April through November- Free

December through March- \$4 (Peak)

AFTER adding compost

BEFORE adding lime & fertilizer!



How often?

- Test annually for 2-3 years, then only every 2-3 years
- Keep map of soil test locations to track changes
- Keep sample ID consistent



Taking Representative Samples

Sample by management area

Depth: Established areas: 4
in.

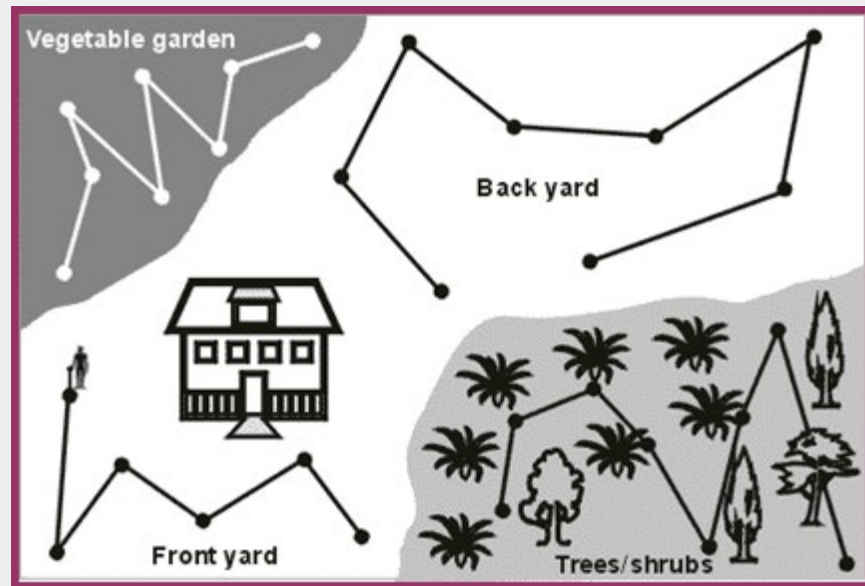
Tilled areas: 6 to 8 in.

Take 15-20 cores

Mix soil up well

Fill the box to red line

FOR LAB USE ONLY				
↓ FILL BOX TO THIS LINE ↓				
Print in Permanent Ink				
NAME: _____				
ADDRESS: _____				
Farm ID: _____				
Sample ID				





Mix all samples



Fill the box

Label the box



NO TAPE!
NO BAGS!

ROUTINE / PREDICTIVE SAMPLES

April ~ Thanksgiving: NO FEE
 December—March: \$4.00 / sample
 Check online for exact dates

SOIL SAMPLE SUBMISSION FORM - NC Soil Only**NCDA&CS Agronomic Division Soil Testing Section**

Mailing Address: 1040 Mail Service Center, Raleigh NC 27699-1040

Physical Address (UPS/FedEx/DHS): 4300 Reedy Creek Rd, Raleigh NC 27607

Phone: (919) 733-2655 For lab results go to: www.ncagr.gov/agronomi/pals

OFFICE USE ONLY

REPORT #

DATE REC'D

INITIAL

**SAMPLE INFORMATION PAYMENT****GROWER INFORMATION** (please print legibly)**AGENT OR ADVISOR**

FARM ID (optional)	FEE TOTAL \$ _____	LAST NAME FIRST NAME		LAST NAME FIRST NAME	
SAMPLING DATE (optional)	AMT PAID \$ _____	ADDRESS		ADDRESS	
SAMPLE METHOD <input type="checkbox"/> GPS Grid <input type="checkbox"/> Management Zone	METHOD OF PAYMENT: <input type="checkbox"/> CASH / CHECK <input type="checkbox"/> INVOICE <input type="radio"/> Grower <input type="radio"/> Advisor / Consultant <input type="radio"/> _____	CITY STATE ZIP		CITY STATE ZIP	
	<input type="checkbox"/> ESCROW ACCOUNT: (provide Account Name or Number)	EMAIL ADDRESS (REQUIRED)		EMAIL ADDRESS	
COUNTY (WHERE COLLECTED)		PHONE (____) _____		PHONE (____) _____	
NUMBER OF SAMPLES	"Reports will appear as "Pay Now" until Payment is applied"	PALS # (if known) _____		PALS # (if known) _____	

By submitting this form to the NCDA&CS Agronomic Division, I attest that the accompanying samples were collected in North Carolina.

Samples cannot be received without necessary paperwork. Use NCDA&CS sample boxes only. Bags from other labs are not accepted.

LAB NUMBER (LEAVE BLANK)	SAMPLE ID required	LIME APPLIED WITHIN PAST 12 MONTHS			FIRST CROP	CROP CODE (see side 2)	SECOND CROP	CROP CODE (see side 2)
		Tons/Acre	Month	Year				
1								
2								
3								
4								
5								
6								
7								

LAWN AND GARDEN SOIL SAMPLE INFORMATION- NC SOIL ONLY**ROUTINE / PREDICTIVE SAMPLES**

April ~ Thanksgiving: NO FEE
 December ~ March: \$4 / sample
 Check online for exact dates

NCDA&CS Agronomic Division Soil Testing Section
 Mailing Address: 1040 Mail Service Ctr. Raleigh, NC 27699-1040
 Physical Address (UPS/FedEx): 4300 Reedy Creek Rd. Raleigh, NC 27607
 Phone: (919) 733-2655 Website: www.ncagr.gov/agronomi



For laboratory results, go to www.ncagr.gov/agronomi/pals

SAMPLE INFORMATION		PAYMENT	CLIENT INFORMATION (PLEASE PRINT LEGIBLY)		OTHER RECIPIENT/SERVICE PROVIDER	
SAMPLE DATE		FEE TOTAL _____	LAST NAME FIRST NAME		LAST NAME FIRST NAME	
NC COUNTY (WHERE COLLECTED)*		Check preferred- payable to NCDA&CS	ADDRESS		ADDRESS	
		Please NO CASH	CITY STATE ZIP		CITY STATE ZIP	
		Reminders	CITY STATE ZIP		CITY STATE ZIP	
NUMBER OF SAMPLES		Use NCDA&CS sample boxes only. Fill box with soil to red line. Bags of any type not accepted.	E-MAIL ADDRESS (needed for report notification)		E-MAIL ADDRESS	
		Acquire boxes at our lab or NC Cooperative Extension office.	PHONE (best contact number)	PALS # (if known)	PHONE	PALS # (if known)

By submitting this form to the NCDA&CS Agronomic Division, I attest that the accompanying samples were collected in North Carolina.

LAB NUMBER (LEAVE BLANK - LAB USE ONLY)	YOUR SAMPLE IDENTIFICATION (maximum of 5 characters- same as box)					LIME APPLIED WITHIN PAST 12 MONTHS			LAWN / GARDEN PLANTING CODE (Please see page 2)	Quick Tips
						lb / 1000 sq ft	Month	Year		
									<ul style="list-style-type: none"> Please use only the planting codes on page 2. A bag of lime weighs 40 lb. If lime was applied over one year ago, leave the lime information blank. Please make sure your email address is correct and legible. You will be notified when the report is complete by email. 	

Choosing Crop Codes

Crop Codes for Commercial Production

Homeowner Form (http://www.ncagr.gov/agronomi/documents/FormAD-15_corrected_logo.pdf)

Abbreviations

E = establishment (1st year)
M= Maintenance
SG = small grain

Field Crops

001 Corn, grain
002 Corn, silage
003 Cotton
004 Small Grain (SG)
005 Millet, pearl
006 Grain Sorghum
007 Peanut
008 Rice
009 Sorghum, syrup
010 Soybean
011 Sunflower
012 Tobacco, burley
013 Tobacco, flue-cured
015 SG silage / Soybean
016 SG silage / Corn silage
018 SG/Soybean (double crop)

Christmas Trees

034 Leyland Cypress
035 Line-out/Seed beds
036 Fir/N.Spruce/Hem, E
037 Fir/N.Spruce/Hem, M
038 White/VA Pine
039 Blue Spruce/Red Cedar

Specialty Crops

101 Canola / Rape
301 Clary Sage
310 Hemp
119 Hops
017 Kenaf
311 Truffles

Forage and Pasture

040 Alfalfa, E
041 Alfalfa, M
042 Common Bermuda /Bahia
043 Bermuda hay/pasture, E
044 Bermuda, hay/ pasture M
047 Bluegrass
048 Bluegrass/White Clover
049 Clover/Grass, E
050 Clover/Grass, M
051 Gamagrass
053 Legumes, various
054 Fescue/Orch/Timothy, E
055 Fescue/Orch/Timothy, M
056 Prairiegrass
057 Switchgrass
059 Sudan/Sorghum pasture
060 Sudan/Sorghum silage

Roadside Areas

061 Critical area
062 Grass, E
063 Grass, M

Commercial Horticultural Crops

070 Asparagus, E	088 Grape, E	103 Black/Raspberry, M
071 Asparagus, M	089 Grape, M	107 Squash/Pumpkin
072 Beans/Peas	175 Grape, Vinifera	108 Strawberry, E
073 Beans, Pole	090 Kale/Mustard/Spinach	109 Strawberry, M
074 Beet	093 Okra	118 Strawberry, plastic
075 Blueberry, E	095 Pea, Southern	110 Tomato
076 Blueberry, M	096 Pepper	111 Tomato, greenhouse
077 Brocc/BSprouts/Caul	097 Plant bed, vegetables	115 Turnip
079 Cabbage	098 Potato, Irish	116 Vegetables, other
080 Cantalope/Melons	099 Sweetpotato	
084 Corn, Sweet	100 Radish	
085 Cucumber	102 Black/Raspberry, E	

Commercial Turf & Sod Production

150 Fairway/Athletic Field
151 Tee
152 Greens
153 Centipedegrass
154 Hybrid Bermudagrass
155 St. Augustinegrass
156 Tall Fescue
157 Zoysiagrass

Commercial Nursery & Flowers

120 Dahlia
121 Gladiolus
123 Gypsophila (baby's breath)
124 Flowers, bulbs
125 Flower, roots
126 Container, nursery
132 Rhod/Ginseng/Natives
136 Tree nursery

Orchard, Fruit & Nut

130 Apple, E
131 Apple, M
138 Peach, E
139 Peach, M
140 Pecan, E
141 Pecan, M

Forestry

133 Hardwood, E
134 Hardwood, M
137 Pine, nursery
142 Pine, E
143 Pine, M
144 Hardwood, seed
145 Fir/Spruce, seed
146 Pine, seed

Wildlife Food Plots

066 Deer/Turkey
067 Upland Game
068 Waterfowl
069 Fish Pond

Stormwater

200 Bioretention cell

Farmer options

Homeowner options

Lawn and Garden Planting Codes

020 Azalea / Camelia

022 Lawn, Centipede

023 Flower Garden

024 Vegetable Garden

025 Mtn. Laurel / Rhododendron

026 Lawn (not centipede)

028 Rose

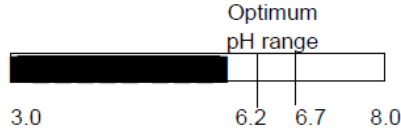

029 Shrubs

030 Berries / Fruits / Nuts (except blueberries)

031 Landscape Tree (deciduous and evergreen)


032 Blueberries

Homeowner versus Farmer Report

Sample ID: Veg1B	Lime Recommendations		N-P-K Fertilizer Recommendations *						
Crop 1- Vegetable garden	130.0 lb per 1,000 sq ft		7 lbs per 1,000 sq ft 15-0-14 Group C						
Crop 2-	0.0 lb per 1,000 sq ft								
Lime History:	Test Results:		Phosphorus Index (P-I) =164						
	pH = 5.8		Potassium Index (K-I) =38						
									
	3.0 6.2 6.7 8.0		Below Optimum Optimum Above Optimum						
Jeana Myers									
Additional Test Results:			<i>*If you cannot find the fertilizer recommended here, choose one from the same Group (A, B, C or D) listed on the last page of this report.</i>						
Soil Class	HM%	W/V	CEC	Mn-I	Zn-I	Cu-I	S-I	<i>Note: This soil test does not measure nitrogen (N) levels. N fertilizer recommendations are based only on needs of the designated crop.</i>	
Mineral	0.56	0.67	19.4	249	927	91	44		
		g/cm ³	meq/100 cm ³						

Sample ID: BC2 Lime History:			Recommendations:		Lime		Nutrients (lb/acre)										More Information Note: 3					
					(tons/acre)	N	P2O5	K2O	Mg	S	Mn	Zn	Cu	B								
			1 - Corn, silage	0.0	180-220	80	100	0	20	0	0	0	0									
2 -	0.0																					
Test Results [units - W/V in g/cm³; CEC and Na in meq/100 cm³; NO3-N in mg/dm³]:																				Soil Class: Mineral		
HM%	W/V	CEC	BS%	Ac	pH	P-I	K-I	Ca%	Mg%	S-I	Mn-I	Mn-Al1	Mn-Al2	Zn-I	Zn-Al	Cu-I	Na	ESP	SS-I	NO3-N		
0.46	1.01	7.0	83	1.2	6.1	31	46	58	21	19	109	81		700	700	52	0.0					

Farmer Report

NCDA&CS Agronomic Division		Phone: (919) 733-2655		Website: www.ncagr.gov/agronomi/		Report No. FY21-SL028159														
	Predictive Soil Report		Mehlich-3 Extraction Client: [REDACTED] Sampled County : Durham Client ID: [REDACTED]		Advisor: Janel Ohletz Durham County AG Agent Cooperative Extension 721 Foster Street Durham, NC 27701 Advisor ID: 516004															
	Links to Helpful Information																			
	Sampled: 03/25/2021 Received: 03/29/2021 Completed: 04/05/2021 Farm: [REDACTED]																			
Sample ID: N2021 Lime History:	Recommendations: Crop 1 - Black/Raspberry, E 2 -	Lime (tons/acre) 0.6 0.0	N 30-60	P ₂ O ₅ 110	K ₂ O 10	Mg 0	S 20	Mn 0	Zn 0	Cu 0	B 0	More Information Note: 18								
Test Results [units - W/V in g/cm ³ ; CEC and Na in meq/100 cm ³ ; NO ₃ -N in mg/dm ³]:												Soil Class: Mineral								
HM%	W/V	CEC	BS%	Ac	pH	P-I	K-I	Ca%	Mg%	S-I	Mn-I	Mn-Al1	Mn-Al2	Zn-I	Zn-Al	Cu-I	Na	ESP	SS-I	NO ₃ -N
0.18	1.18	4.4	75	1.1	5.4	36	43	47	24	20	290	191		33	33	50	0.0			

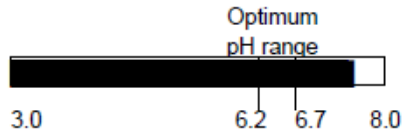

Low pH

Low P and K

Low S

Nutrient recommendations

Homeowner Report

Sample ID: BED9			Lime Recommendations		N-P-K Fertilizer Recommendations *		
Lime History:	Crop 1- Vegetable garden		0.0 lb per 1,000 sq ft		5 lbs per 1000 sq ft 21-0-0 Group D		
	Crop 2-		0.0 lb per 1,000 sq ft				
	Test Results:		Optimum pH range		Phosphorus Index (P-I) =482		
	pH = 7.5			Potassium Index (K-I) =61			
Cristine Clemons					Below Optimum Optimum Above Optimum		
Additional Test Results:							
Soil Class	HM%	W/V	CEC	Mn-I	Zn-I	Cu-I	S-I
Mineral	0.81	0.81	32.2	185	698	167	83
		g/cm ³	meq/100 cm ³				
				*If you cannot find the fertilizer recommended here, choose one from the same Group (A, B, C or D) listed on the last page of this report.			
				Note: This soil test does not measure nitrogen (N) levels. N fertilizer recommendations are based only on needs of the designated crop.			

High pH

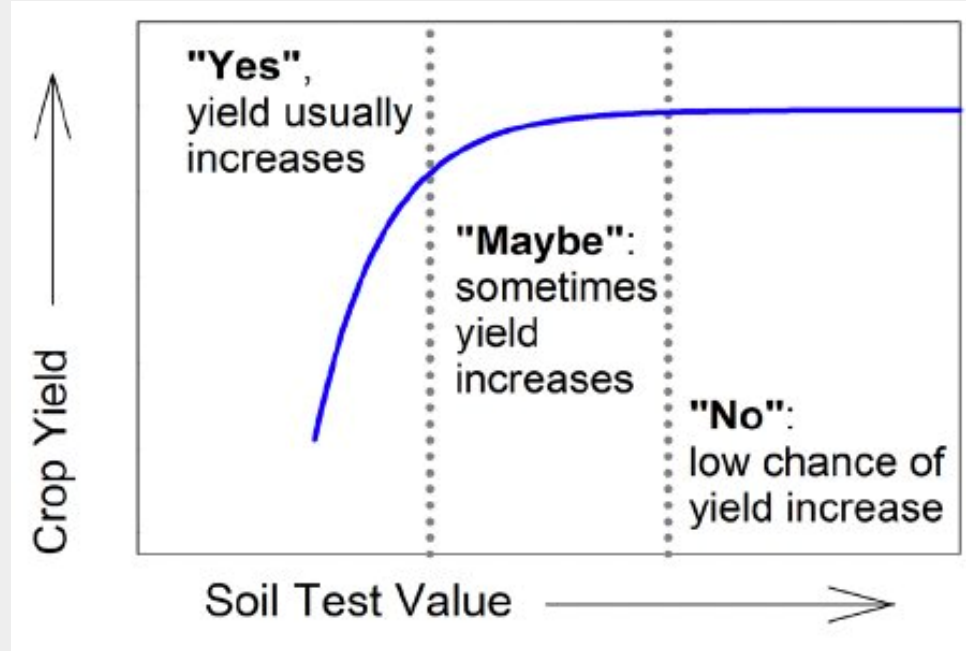
Super high phosphorus

Very high zinc levels

Likely due to compost additions

Nutrient Index

- Ranges 0-100
- Nutrient needed ~ 0-40
- Maybe needed ~ 40-60
- Not needed >75



© Oregon State University. Prepared by Dan M. Sullivan.

Mixed Fertilizer Options on the Back

Table 1. Groups of equivalent fertilizers that supply 1 lb of N per 1,000 sq ft *

<u>Group A: low P-I + low K-I</u>	<u>Group B: low P-I + high K-I</u>	<u>Group C: high P-I + low K-I</u>	<u>Group D: N only</u>
5-10-10 @ 20 lb	5-10-5 @ 20 lb	8-0-24 @ 12 lb	15-0-0 @ 7 lb
3-9-9 @ 30 lb	18-46-0 @ 6 lb	15-0-14 @ 7 lb	21-0-0 @ 5 lb
10-10-10 @ 10 lb	18-24-10 @ 6 lb	6-6-18 @ 18 lb	16-0-0 @ 6 lb
11-15-11 @ 10 lb	9-13-7 @ 11 lb	5-5-15 @ 20 lb	28-0-4 @ 4 lb
8-10-8 @ 12 lb	9-17-8 @ 11 lb	10-0-14 @ 10 lb	12-6-6 @ 8 lb

* Since these rates supply 1 lb N per 1,000 sq ft, use half the rate if centipede is the grass type.

Using your Soil Test Results

Lime and Nutrients

Adjusting pH

East coast naturally has acidic soils

- Lime to raise pH

Did you over do it, pH too high?

- Need to lower, use elemental sulfur.



Both take a while to work ~ 6 months

Lime

Calcitic Lime:calcium carbonate

Dolomitic Lime:calcium carbonate and magnesium

Powdered vs. Pelleted



Limestone - size matters

Very slow reacting (“stone”)

Not soluble

Stays near surface of soil

Best mixed in if possible!!!



researchgate.net/nationalstoneassociation

Let's Practice

This exercise will help you to better understand what your results are and how to address them for your soil.

1. What is the pH?
2. What is the level of phosphorus and potassium?
3. Is there a lime recommendation given?
4. How much do you need to apply to your field.

Basics of Nutrients

- Macro & micronutrients
- Plant tissue vs. soil levels
- Types of fertilizer (what, why, and how)
- Organic vs. manufactured

Essential plant nutrients

Macronutrients: nitrogen, phosphorus, potassium, calcium, magnesium, sulfur

Micronutrients: manganese, zinc, iron, copper, boron, molybdenum, selenium, chlorine, silicon, sodium

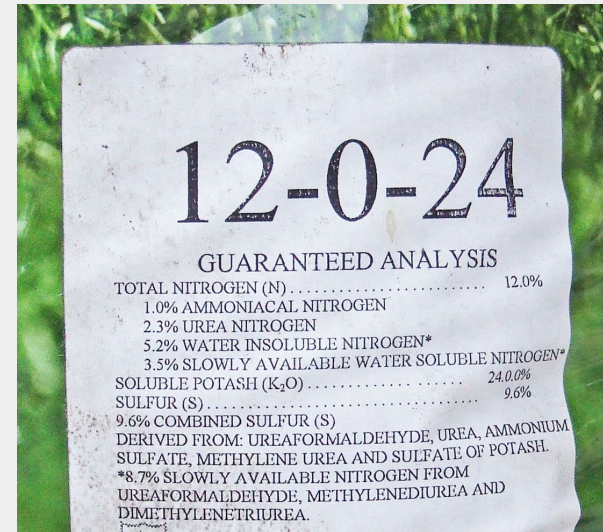
Fertilizers have different formulations - different content



GARDEN FOOD
5-10-5

RECOMMENDED FOR FLOWERS, SHRUBS,
VEGETABLES AND ORNAMENTALS

A GRANULAR PLANT FOOD TO PRODUCE STRONG,
VIGOROUS ROOT SYSTEMS AND STURDY PLANTS



Macronutrients

Nitrogen (N) - Protein structure

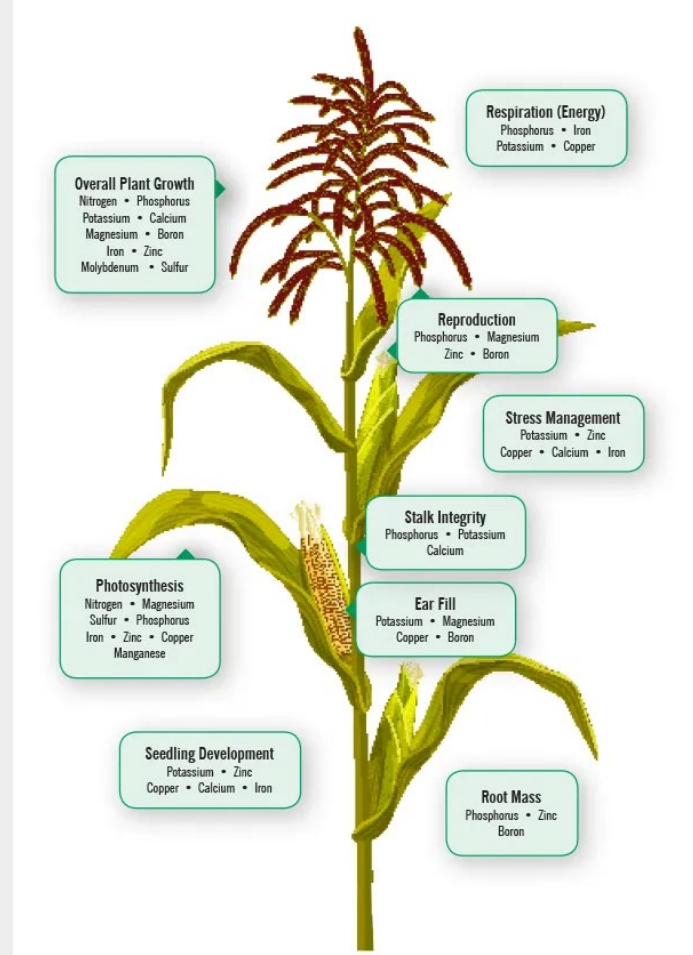
Phosphorus (P) - Metabolism & Cell Structure

Potassium (K) - Enzyme Carrier & Regulation

Calcium (Ca) - Root Permeability & Enzyme Activity

Magnesium (Mg) - Chlorophyll & Metabolism

Sulfur (S) - Protein & Cell Component



Micronutrients

Iron (Fe) - chlorophyll function

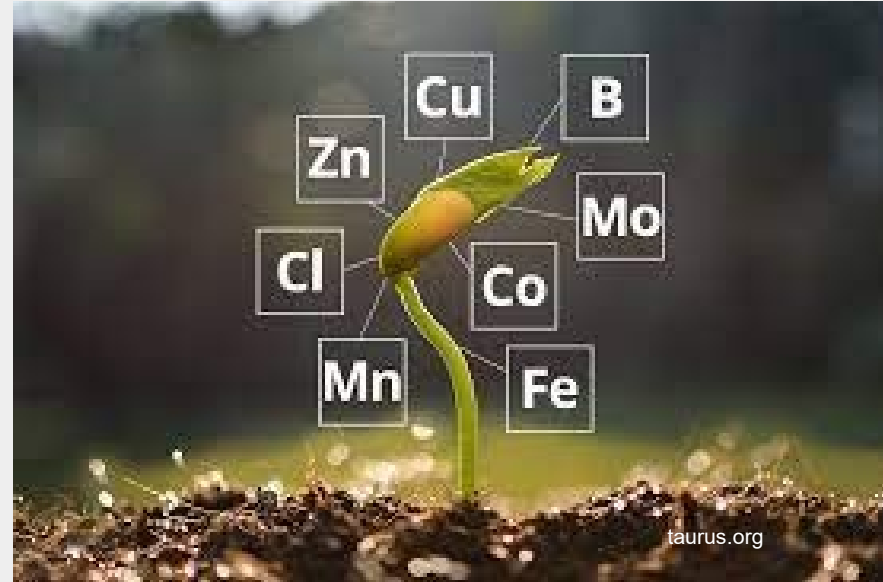
Manganese (Mn) - enzyme activity

Copper (Cu) - enzyme function

Zinc (Zn) - enzyme regulation

Boron (B) - cell growth

Molybdenum (Mo) - nitrogen function

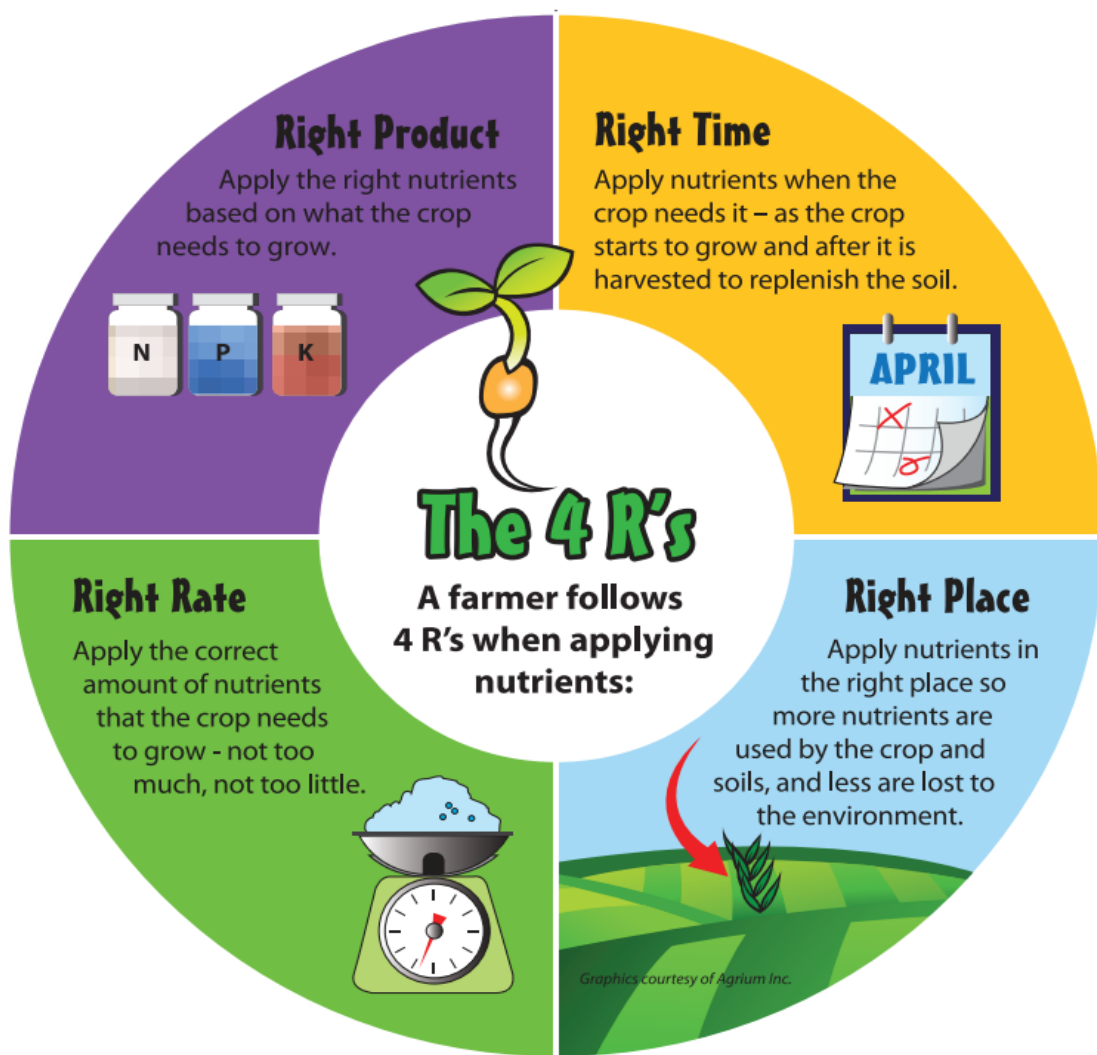


Tissue vs. Soil nutrient levels

- Soil tests = what is available
- Tissue tests = what the plant takes up



Best Use of Fertilizer



Organic Matter Management

Compost, cover crops, and soil organic matter

Types of Organic Matter

- Cover crops
- Mulches
- Compost
- Animal Manures

What are the Pros and Cons of each type?



Cover Crops

Improved soil infiltration

Crop diversity

Increased organic matter

Supports soil microbial community

Improves water holding capacity

Reduce water and wind erosion



Cover Crop Chart

GROWTH CYCLE	PLANT ARCHITECTURE	RELATIVE WATER USE
A = Annual	Y = Upright	☹ = Low
B = Biennial	* = Upright-Spreading	☹☹ = Medium
P = Perennial	≡ = Prostrate	☹☹☹ = High

--GRASS--			--COOL--						--BROADLEAF--						--WARM--			--GRASS--	
ANNUAL FESCUE																		BROWNTOP MILLET	
BARLEY															AMARANTH			FOXTAIL MILLET	
			LEGUME																
OAT	CAMELINA	MUSTARD	BALANSA CLOVER	CHICKPEA	MEDIC	COWPEA	CLUSTER BEAN	PEARL MILLET											
SPELT	PHACELIA	CANOLA	BERSEEM CLOVER	PEA	LUPIN	LABLAB	JACK BEAN	PROSO MILLET											
WHEAT	FLAX	RADISH	CRIMSON CLOVER	LENTIL	FABA BEAN	FENUGREEK	VELVET BEAN	CHICORY											
CEREAL RYE	KALE	TURNIP	RED CLOVER	LESPEDEZA	SWEET CLOVER	PIGEONPEA	MUNG BEAN	CUCURBITA											
TRITICALE	SPINACH	BEET	WHITE CLOVER	BIRDSFOOT TREFOIL	ALFALFA	PARTRIDGE PEA	SOYBEAN	SAFFLOWER											
SALINE TOLERANT	CHARD	CARROT	KURA CLOVER	VETCH	SAINFOIN	SUNNHEMP	PEANUT	SUNFLOWER									CORN		

Mulches

Two types: plastic and organic

1. Reduces water loss
2. Weed control
3. Increased organic matter
4. Soil temperature regulation
5. Reduced rainfall energy impact



Compost

Know the source

- Certifications
- Possible legacy herbicides
- Animal waste, biosolids, food waste
- Pathogens and weeds seeds



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Management Methods

Conventional

- No-till and reduced till
- Weed management through herbicides
- Synthetic fertilizers

Organic

- Soil disturbance with weeding
- Compost and organic fertilizers
- Focus on building organic matter
- Cover crops

For more information on Soils:



NCDA&CS Soil Testing Lab

<https://www.ncagr.gov/agronomi/uyrst.htm>

Soils Chapter Extension Gardener Handbook

<https://content.ces.ncsu.edu/extension-gardener-handbook/1-soils-and-plant-nutrients>

List of Resources

<https://gardening.ces.ncsu.edu/soils/>