

Soil Properties and Bed Preparation



Soil & Nutrient Management in Vegetable Gardens

Module I

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COVID-19 Resources and Information

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News and Updates



NC 4-H Daily SPARK - April 6-10 Schedule

We are excited to announce the line up for NC 4-H Daily Spark for the week of April 6th. ...

North Carolina 4-H **FEATURED**



NCDA&CS Taking Preventive Measures to Help Farmers and Agribusinesses

The N.C. Department of Agriculture and Consumer Services (NCDA&CS) is taking preventive measures to help farmers and



COVID-19: Farming Resources

PAGE TOPICS (This page is updated every Wednesday evening. Last update 04/01/2020) Introduction General COVID-19 Knowledge How Can I Help My Community? Food Safety Staff ...

<https://covid19.ces.ncsu.edu/>

NC STATE

EXTENSION

Vegetable Gardening Resources

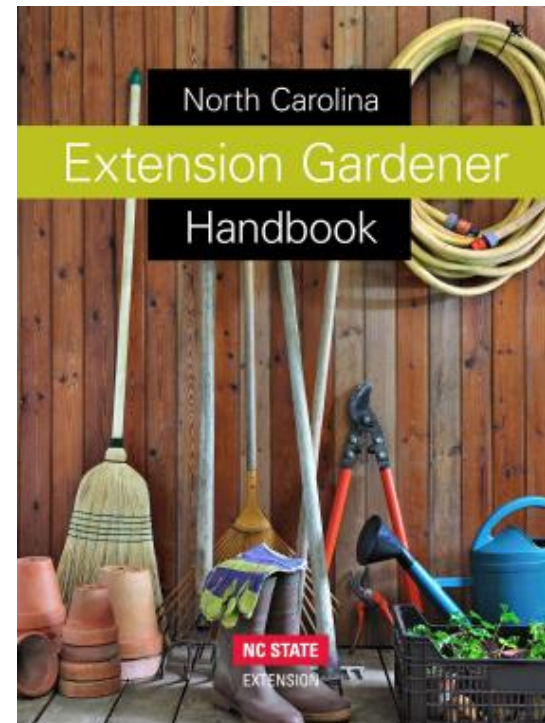
- **For this class:** <https://go.ncsu.edu/chathamveggies>
- **Gardening Portal:** <https://gardening.ces.ncsu.edu/>
- **Extension Gardener Portal:**
<https://extensiongardener.ces.ncsu.edu/>

Subscribe to the Chatham Gardener Newsletter

- Sustainable gardening information
- Monthly articles written by Master GardenerSM Volunteers
- Upcoming classes and events
- **To subscribe:** <http://go.ncsu.edu/subscribecg>

Extension Gardener Handbook

- Available online for FREE
<https://content.ces.ncsu.edu/extension-gardener-handbook>
- Full-color, hardback copy available from UNC Press (\$60)
- See chapters on Soils, Vegetable Gardening, Organic Gardening, and Composting



Upcoming Workshops

Many more Extension Gardener workshops to come!

<https://go.ncsu.edu/chathamgardening>

More will move online as the pandemic proceeds

Workshop	Date (2020)	Time	Cost
Tree Identification in Winter	Jan. 21	9:30 a.m.-noon	\$10
Tree Identification in Winter	Jan. 22	6-8:30 p.m.	\$10
Growing Vegetables from Seed	Feb. 5	6-8:30 p.m.	\$10
Growing Vegetables from Seed	Feb. 6	9:30 a.m.-noon	\$10
Soil & Nutrient Management in Vegetable Gardens	Mar. 18	9:30 a.m.-noon	\$6
Soil & Nutrient Management in Vegetable Gardens	Mar. 19	6-8:30 p.m.	\$6
Warm Season Crops for Vegetable Gardens	Apr. 7	9:30 a.m.-noon	\$6
Warm Season Crops for Vegetable Gardens	Apr. 8	6-8:30 p.m.	\$6
Pest, Disease, & Weed Management in Vegetable Gardens	Jun. 2	9:30 a.m.-noon	\$6
Pest, Disease, & Weed Management in Vegetable Gardens	Jun. 4	6-8:30 p.m.	\$6
Carolina Lawn Care	Jun. 9	6-8:30 p.m.	\$6
Carolina Lawn Care	Jun. 10	9:30 a.m.-noon	\$6
What's the Matter with my 'Mater?	Jul. 7	9:30 a.m.-noon	\$6
What's the Matter with my 'Mater?	Jul. 9	6-8:30 p.m.	\$6
Cool Season Crops for Vegetable Gardens	Aug. 11	9:30 a.m.-noon	\$6
Cool Season Crops for Vegetable Gardens	Aug. 12	6-8:30 p.m.	\$6
Native Tree Identification	Sep. 1	9:30 a.m.-noon	\$10
Native Tree Identification	Sep. 3	6-8:30 p.m.	\$10
Fundamentals of Composting	Nov. 5	9:30 a.m.-noon	\$6

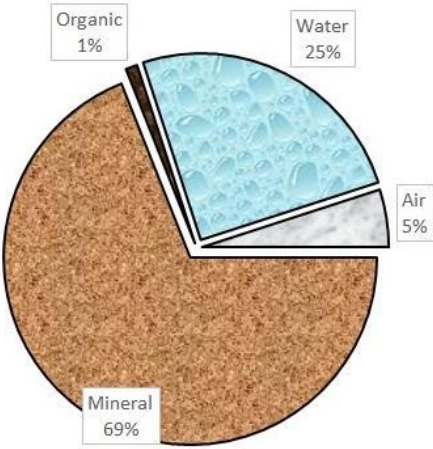
What is soil?

- Weathered rock (mineral)
- Air
- Water
- Organic matter
- Microorganisms

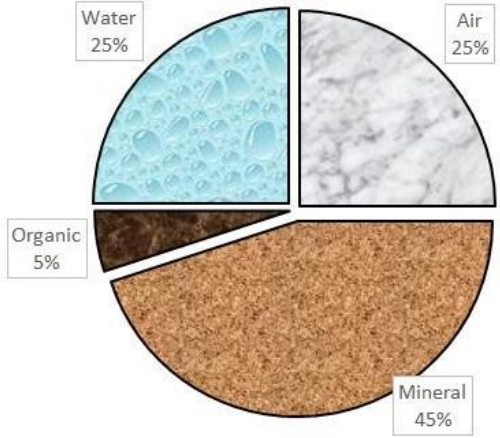


Soil is not dirt!

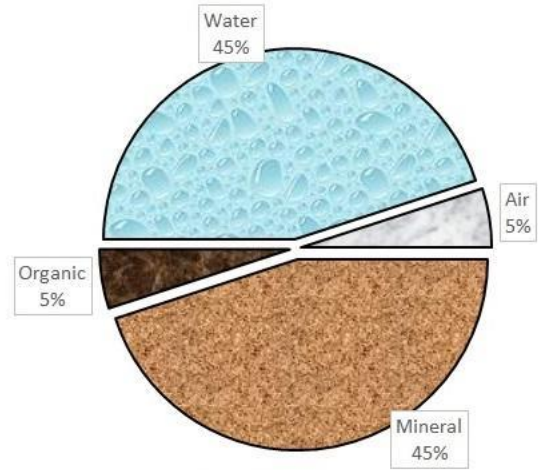
Soil Composition



Compacted

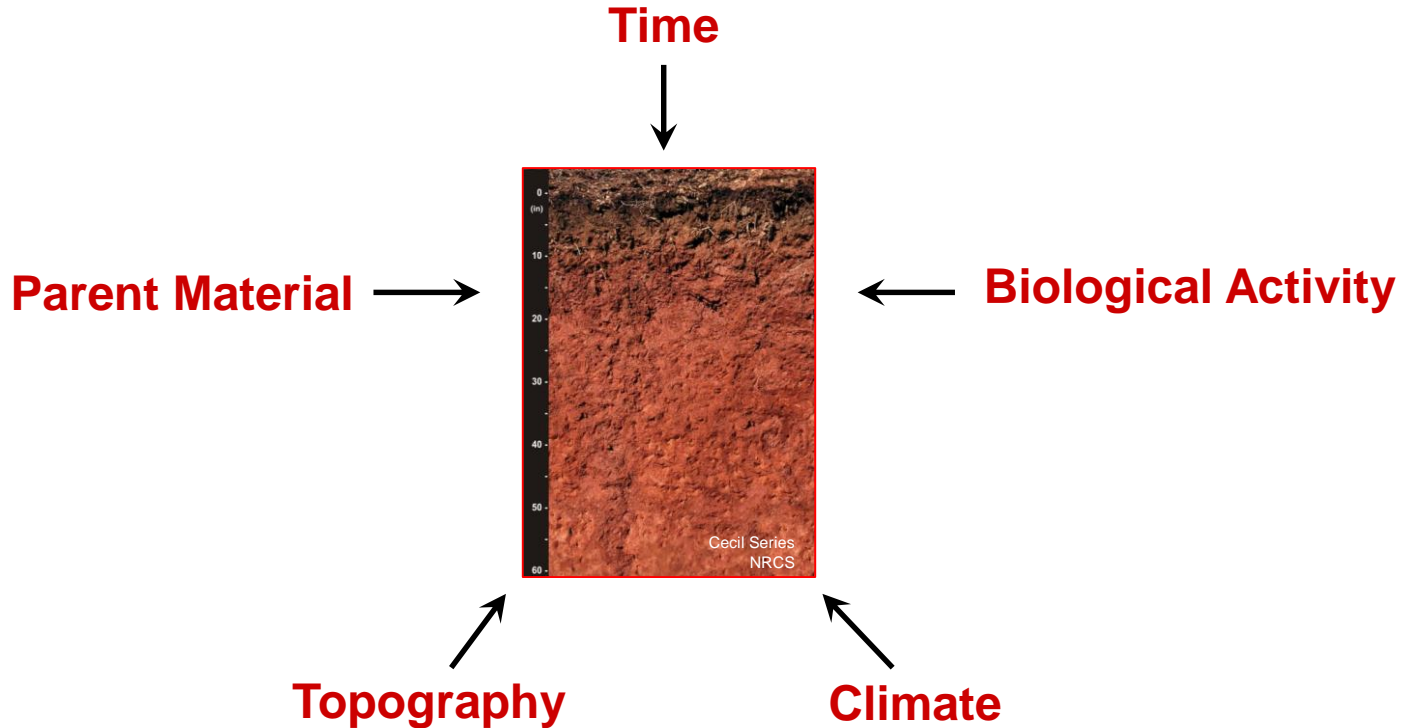


Ideal



Poorly Drained

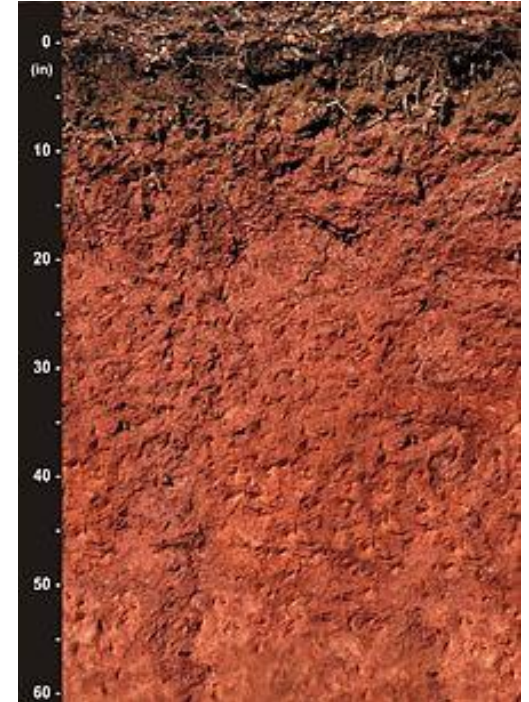
Soil Formation



Piedmont Soils

- Ultisols – humid, warm environments
- Sandy loam and red clays
- Acidic, $\text{pH} \leq 5$
- Great for forests
- Susceptible to compaction
- Some poorly drained

<https://chathamncgardening.com/new-to-area/new-to-area-2/>



Exploring Soil Types

- USDA NRCS Web Soil Survey
- <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

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 resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

Soil surveys can be used for general farm, local, and wider area planning. Onsite investigation is needed in some cases, such as soil quality assessments and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center at the following link: [USDA Service Center](#) or your NRCS State Soil Scientist at the following link: [NRCS State Soil Scientist](#).

Four Basic Steps

1. Define...

Area of Interest (AOI) Use the Area of Interest tab to define your area of interest.

Click or Press the Enter or Spacebar key to view the larger image. Press the Escape key to close.

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
- Know how to hyperlink from other documents to Web Soil Survey
- Know the SSURGO data structure
- Use Web Soil Survey on a mobile device

Announcements/Events

- Web Soil Survey 3.3 has been released! View new features and fixes.
- Web Soil Survey Release History
- Sign up for e-mail updates via GovDelivery

I Want Help With...

- Getting Started With Web Soil Survey

Physical Properties of Soils

Soil Texture

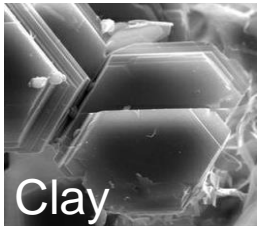
The Size and Shape of Soil Particles



- Course texture
- Feel gritty
- Quartz, calcium carbonate



- Medium texture
- Feel like flour, slick
- Quartz, feldspar



- Fine texture
- Plate like structure
- Negatively charged (nutrients positively charged)
- Aluminum silicate sheets



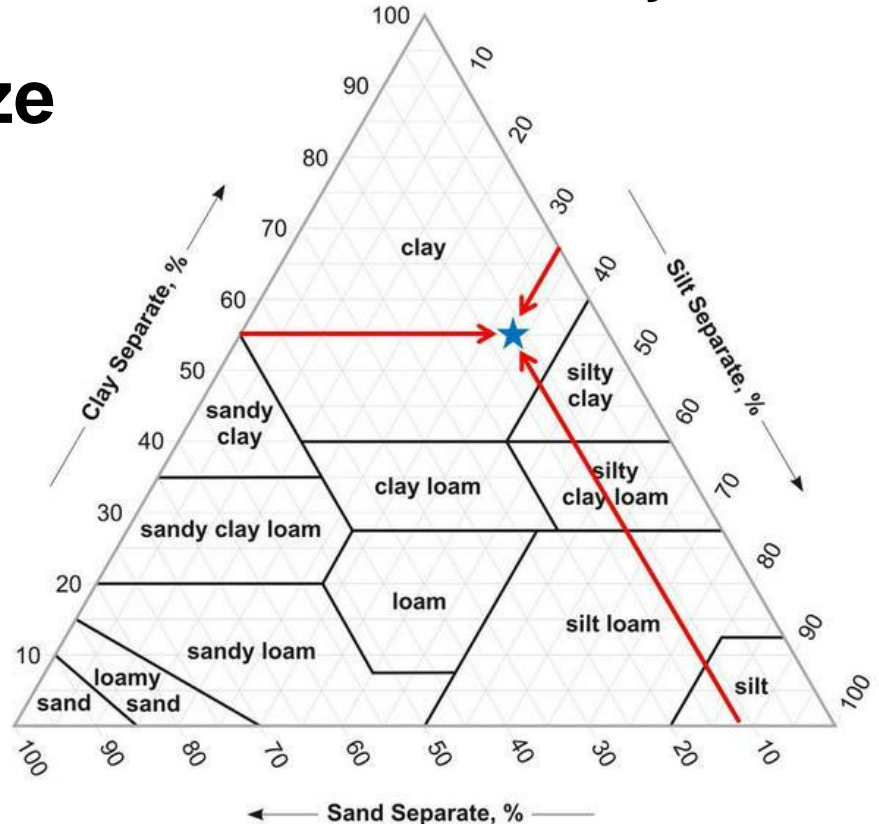
Soil Textural Class Proportion of Sand, Silt & Clay

Proportion effects pore size

- Water retention
- Nutrient retention

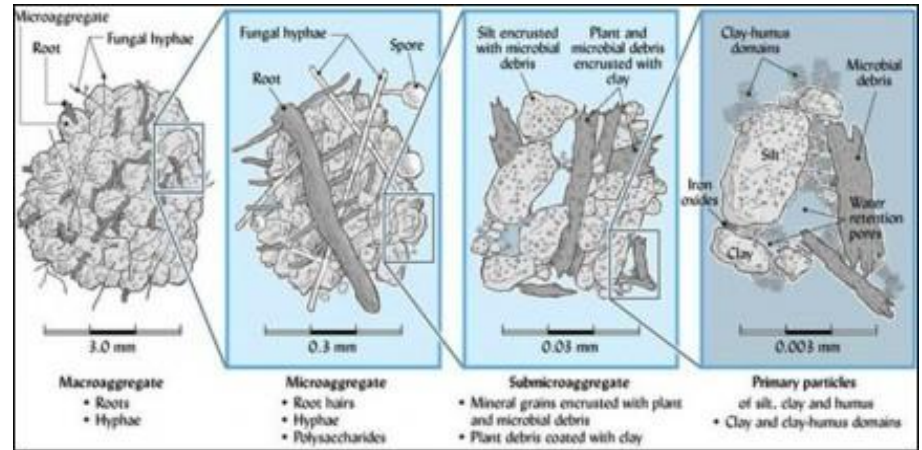
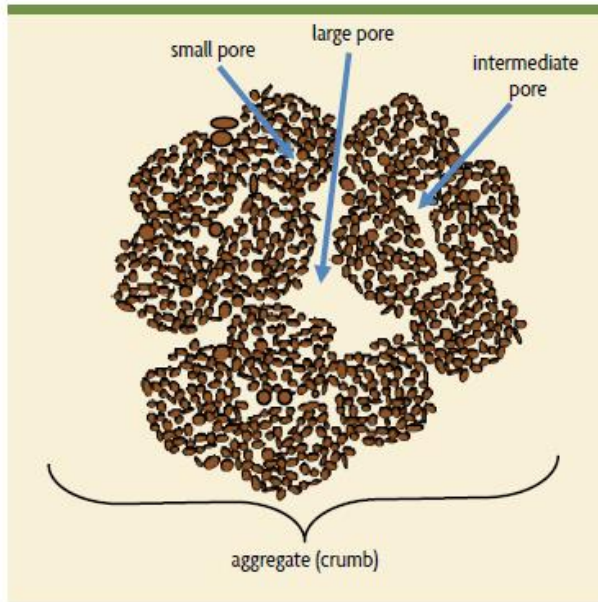
Jar Test

<https://hgic.clemson.edu/factsheet/soil-texture-analysis-the-jar-test/>



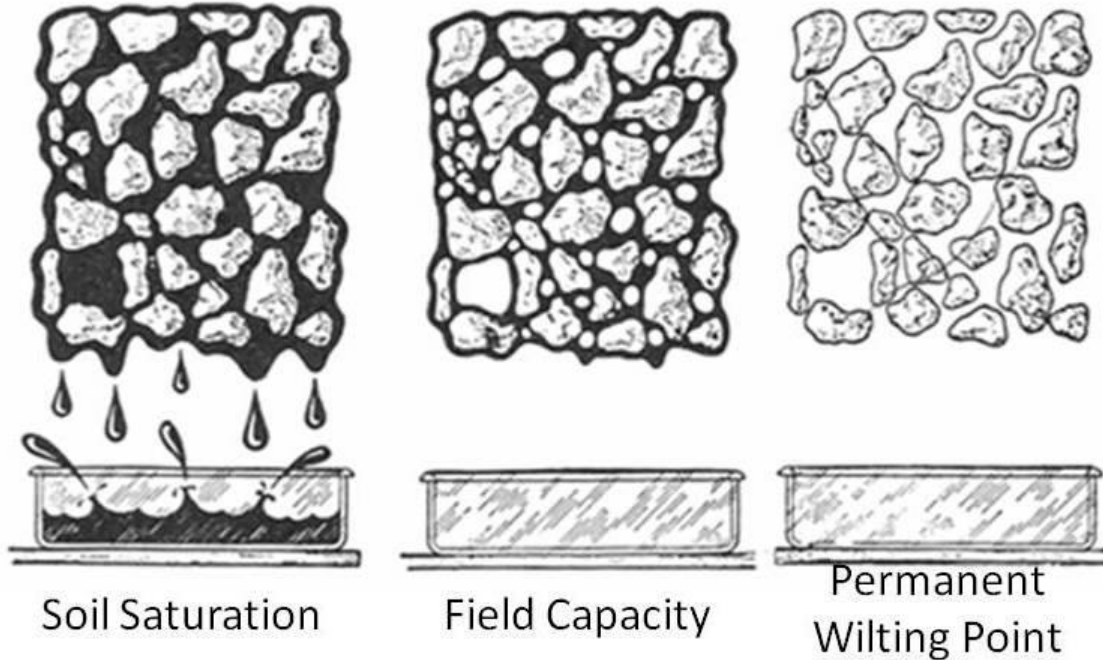
Soil Structure Aggregation of Soil Particles

Organic matter binds soil particles together into aggregates & creates pore spaces for water, air, and roots.



Brady and Weil 2010
Elements of the nature and properties of soils

Water Holding Capacity



Soil Saturation

Field Capacity

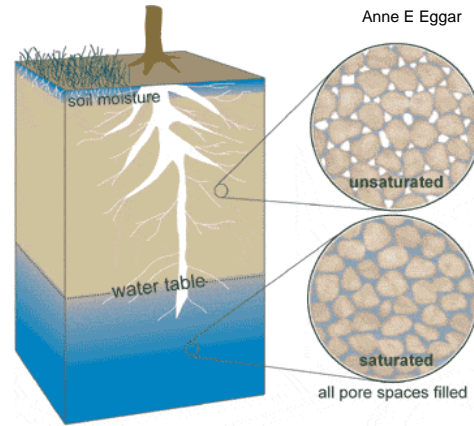
Permanent
Wilting Point

Soil Depth

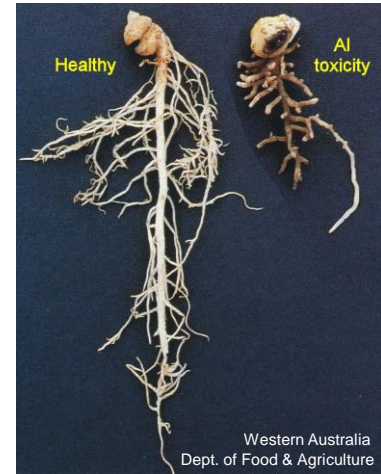
Barriers to Root Growth



Hardpans



High Water Tables

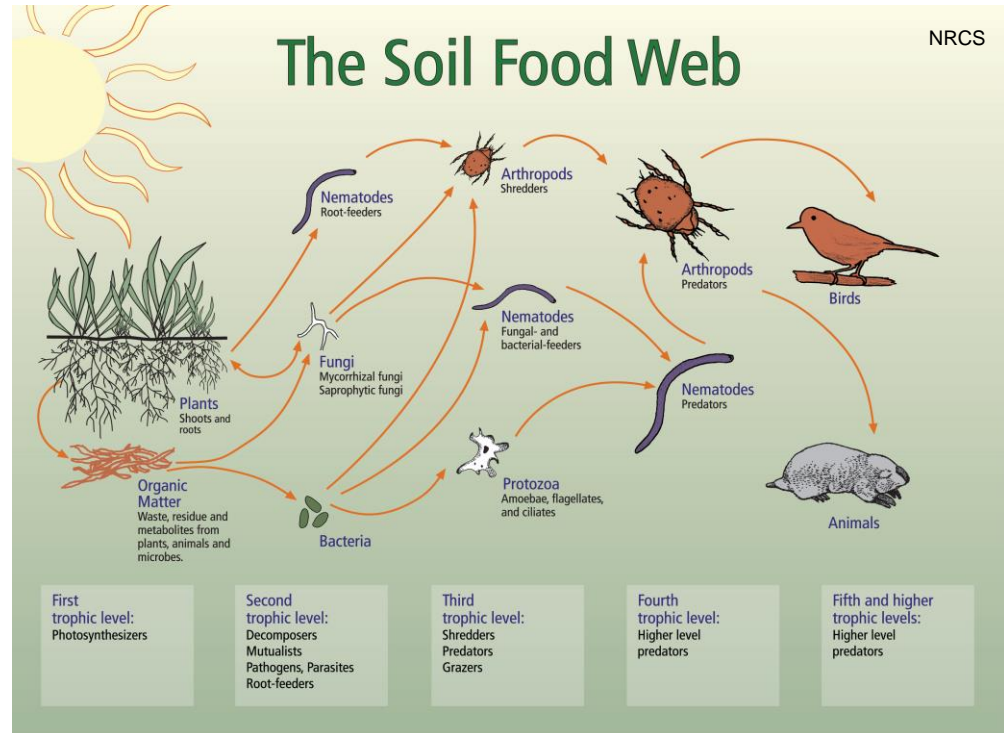


Low pH

Deeper soils provide better root anchorage and hold more water & nutrients

Healthy soils have complex ecosystems

- Produce organic matter & pores
- Improve structure and nutrient cycling



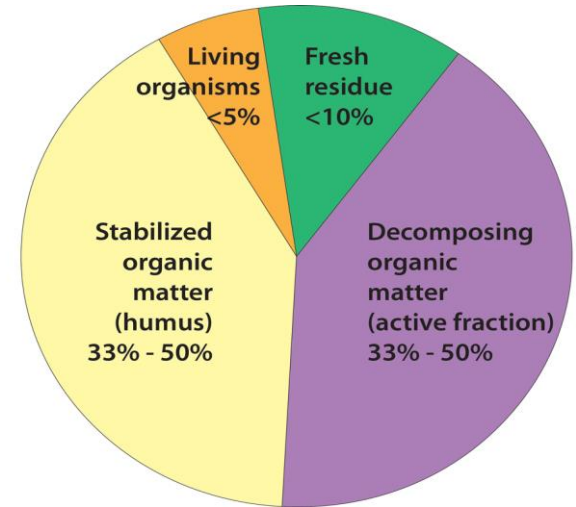
Soil Organic Matter

Fraction of soil composed of biological material

Improves Soil structure

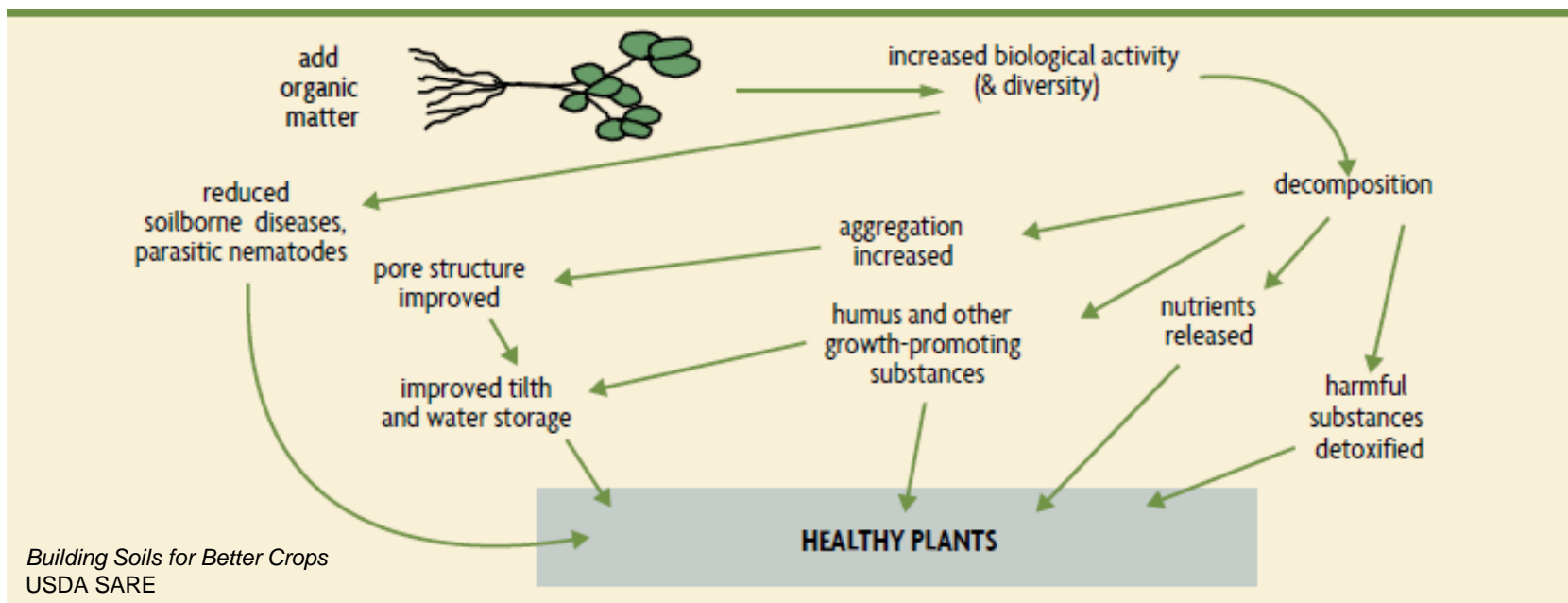
- Nutrient cycling & capacity
- Water holding capacity
- Improves sands and clays!

Promotes soil microbes that improve aggregation and nutrient cycling

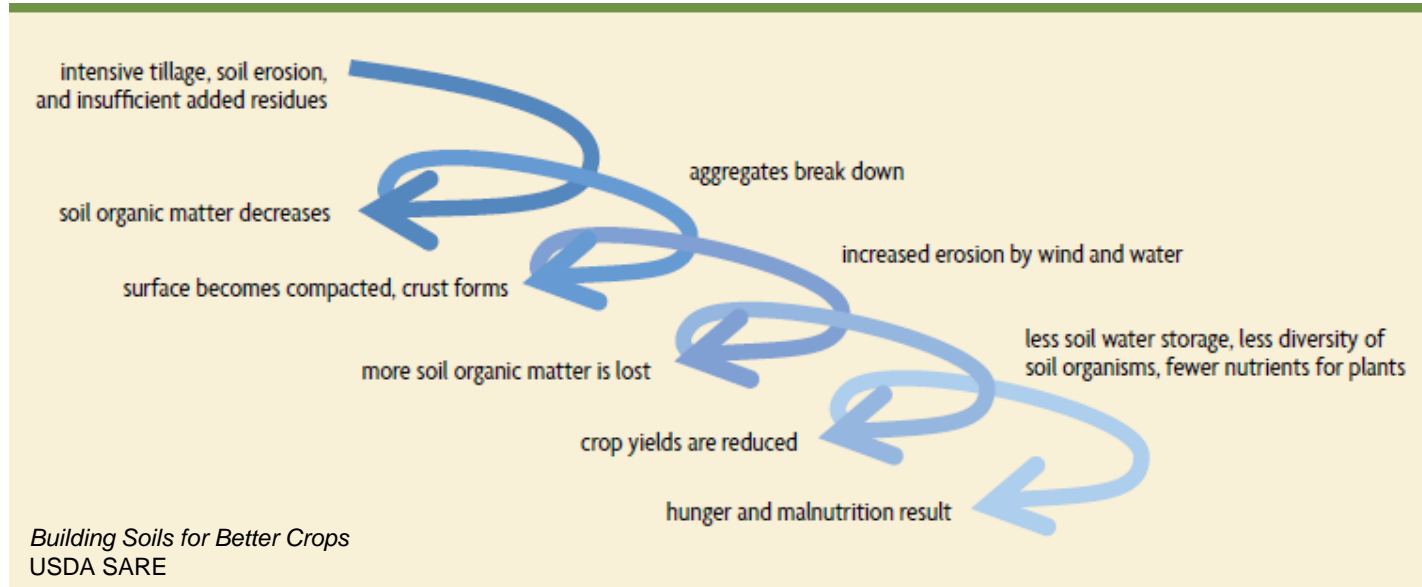


NRCS

Benefits of Organic Matter



Soil Degradation

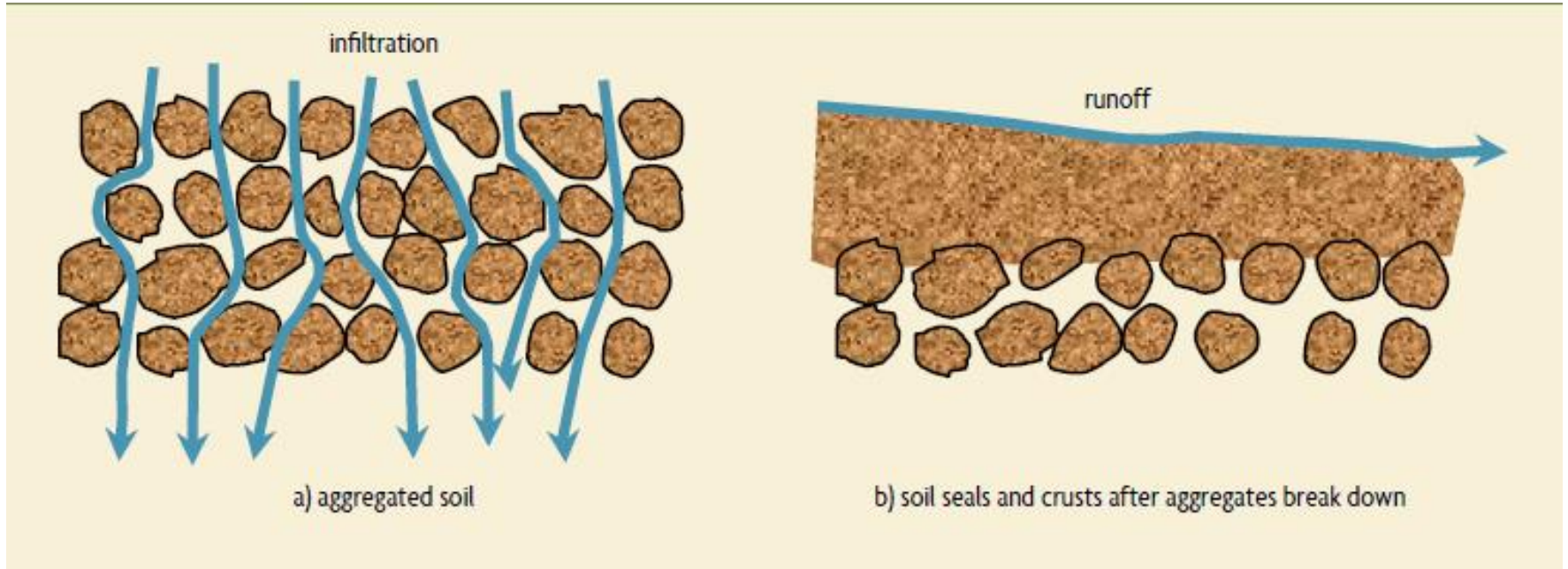


Soil Crusts

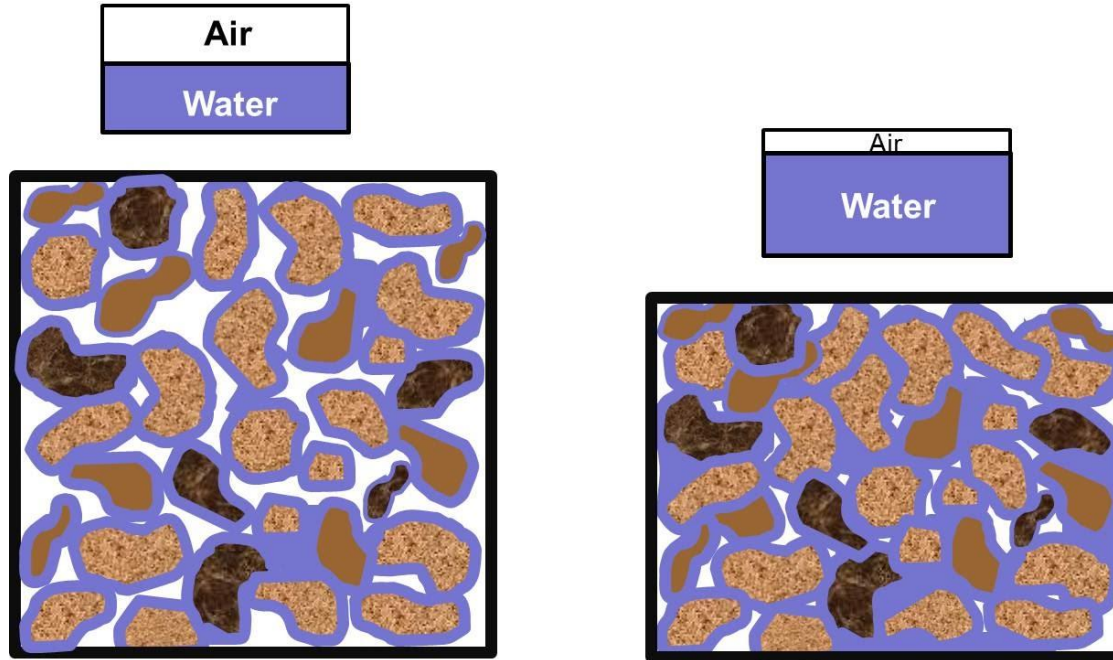


Nail Moonfall
Soil Science Society of America

Building Soils for Better Crops
USDA SARE



Soil Compaction



University of Minnesota Extension

Many residential soils are compacted

Adding Organic Matter

- Till in compost when garden is *first created*
 - 25% by volume
 - See Table 1-2 of Extension Gardener Handbook
 - https://content.ces.ncsu.edu/extension-gardener-handbook/1-soils-and-plant-nutrients#section_heading_7239
- Apply thin layers (1-3 in.) of organic matter or compost to the soil surface each year



Types of Organic Matter to Add

Clay Soils

- Compost
- Composted leaf mold
- Pine bark (<0.5 in. diameter)

Avoid

- Peat moss, sand, hardwood bark, wood chips, and pine straw for incorporation



Composting Resources

NC State Extension Composting Portal

<https://composting.ces.ncsu.edu/>

- Home Composting
- Large Scale Composting
- Worm Composting

Composting Chapter from the NC Ext. Gardener

Handbook: <https://content.ces.ncsu.edu/extension-gardener-handbook/2-composting>

Fundamentals of Composting Workshop in Pittsboro Nov. 5



Rhonda Sherman
Dept. of Hort. Sci., NCSU
Solid Waste Specialist

Bed Preparation and Site Selection

Site Preparation

Remove weeds and grass

- Smother
- Sod cutter
- Herbicides



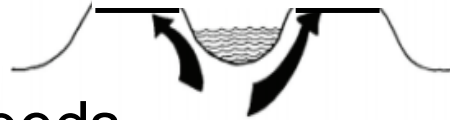
Uncontained Raised Beds

- Superior drainage
- Warm-up faster in spring
- Easy access
- No compaction in root zone



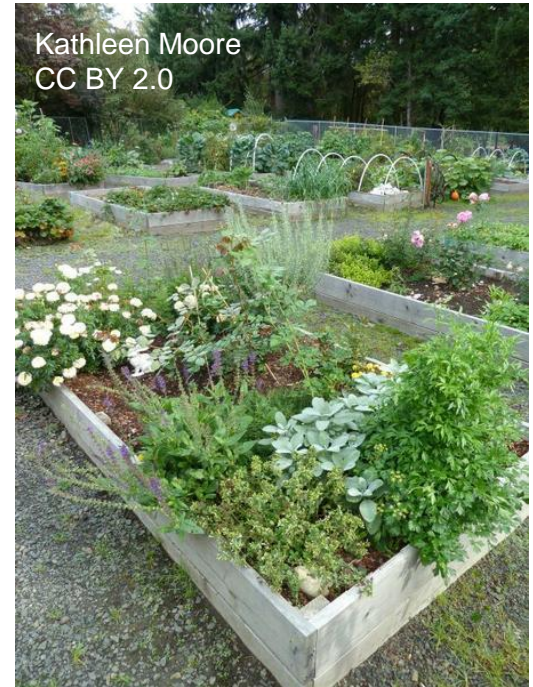
Uncontained Raised Beds

- Use soil from paths and incorporate organic matter to build mounds
- 4-8" high, 45° slopes
- 3-4' wide
- 1.5-3' between beds
- Flat top
- Mulch between beds



Contained Raised Beds

- **At least 8” deep**
 - Till or loosen soil underneath before filling
- **4’ wide** or less
- **Length** – depends on material available space
- Fill with **mix** of soil and compost (25-50%)
 - Pinebark fines, purchased topsoil mixes, etc.
 - In Chatham Co., Brooks Contractor BR-4 50:50 mix available at many garden centers



Contained Raised Beds



Texas A&M Agrilife Extension

Treated or Untreated Wood



windowbox.com

Wood-Plastic Composites

Contained Raised Beds



UF IFAS Extension

Concrete Blocks



Washington State University Extension

Corrugated Metal



Corrugated Sheet Metal



Concrete Blocks

Easy to build



Why garden in containers?



Grow Food in Small Spaces



Flexibility & Accessibility



Avoid Soil Problems

Other Considerations

- More frequent watering
- More frequent fertilization
- Don't use native soil



Choosing Containers



RHS

Containers can be made of many different materials

Containers must be able to:

- 1) Hold soil media
- 2) Drain water



Mrs. Northfarm

Add drainage holes if needed

Container Materials



Porous

- Clay
- Terracotta
- Unglazed ceramic



Semi-porous

- Wood
- Pressed fiber



Non-porous

- Plastic
- Metal
- Fiberglass
- Glazed ceramic

Container Size

- Need space for roots
- **Shallow rooted veg. crops:**
Min. 4-8 in. depth
- **Root or fruit crops:**
Min. 10-12 in. depth
- Larger = better moisture retention
- Penn State Extension Study
 - 14"- 20" diameter

Vegetable	Minimum Size Container	Spacing	Minimum Container Depth
Beans	2 gallon	2-3 inches	8-10 inches
Beets	2 quart	2-3 inches	8 inches
Bok choy	1 gallon	6 inches	20 inches
Carrots	2 quart	2-3 inches	10 inches
Collards	3 gallon	12 inches	12 inches
Cucumbers	1 gallon	1 plant per container or 12-16 inches	8 inches
Eggplant	5 gallon	1 plant per container	12-16 inches
Green garlic	2 quart	4 inches	4-6 inches
Kale	3 gallon	6 inches	8 inches
Lettuce	2 quart	4-5 inches	6-8 inches
Mustard greens	3 gallon	6 inches	4-6 inches
Peas	2 gallon	2-3 inches	12 inches
Peppers	2 gallon	1 plant per container or 14-18 inches	12-16 inches
Potatoes	30 gallon	5-6 inches	
Radishes	2 quart	2-3 inches	4-6 inches
Scallions	2 quart	2-3 inches	6 inches
Spinach	1 gallon	2-3 inches	4-6 inches
Squash	2 gallon	1 plant per container	12-24 inches
Swiss chard	2 quart	4-5 inches	8 inches
Tomatoes	5 gallon	1 plant per container	12-24 inches

Table 18.1 *NC Extension Gardener Handbook*

<https://content.ces.ncsu.edu/extension-gardener-handbook>

Adding Gravel to the Bottom of Pots?

- Does not improve drainage
- Creates a perched water table
- Fill entire container with uniform media



The wettest soil is at the bottom.



Gravel moves the wettest soil up in the pot, closer to the roots, which can lead to rot.

Growing Media



Peat Moss



Coconut Coir



Vermiculite



Perlite

Simple Seed Starting Mix (Rutgers University)

Shredded sphagnum peat moss	10 gallons
No. 2, 3, or 4 domestic or African vermiculite ^b (horticultural grade, dust screened)	10 gallons
Pulverized Limestone	1 1/4 cups
Dolomitic Lime for mixes with domestic vermiculite	or 3/4 cups
or Calcitic Lime for mixes with African vermiculite	
Superphosphate (20% P)	1/2 cup
or	or
Triple superphosphate (46%)	1/4 cup
Fertilizer (5-10-10)	10 gallons 1 cup

Commercial Container Media

- Many variants available
- Combination of peat moss, perlite, vermiculite
- Easy to find and purchase
- Look for 'Mix' or 'Media'
- Avoid “topsoil” or “garden soil” etc.
for containers
- May contain fertilizers – not enough!



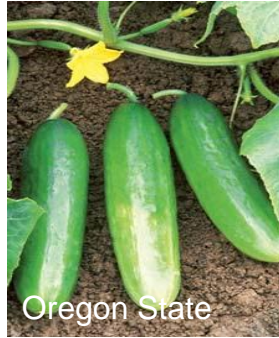
Want more information on container gardening?

go.ncsu.edu/chathamfallveggies

Light Requirements

Hours of Direct
Sun per Day

8-10



Fruit Crops

6-8+



**Leaf and
Root Crops**

All vegetables need at least 6-8 hours of direct sunlight per day

Other Site Considerations

Accessibility

- Foot Traffic
- Tools
- Water Sources



Drainage

- Avoid low areas where water pools after rain



Near Water Source

- Vegetables need consistent water supply
- **1" water per week**, May-Sept.
- Water soil, not the plant
 - Soaker hose
 - Drip lines

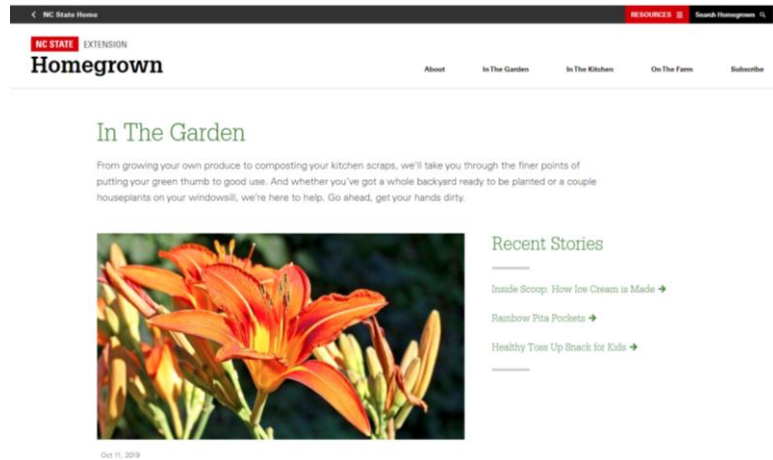


Resources

NC State Extension Homegrown

<https://homegrown.extension.ncsu.edu>

- In the Garden Videos
- In the Kitchen Videos
- On the Farm Videos



Questions from this class?

Need help interpreting soil report?

Matt Jones

matt_jones@ncsu.edu

919-542-8243

Other gardening questions?

NC STATE EXTENSION

Master Gardener | Chatham County

Plant Clinic: MW 1:00-4:00, F 9:00-12:00

chathamemgv@gmail.com

919-545-2715 (Except during COVID-19)

Please Complete the Evaluation!

<https://go.ncsu.edu/veggie-evaluation1>