Soil Properties and Bed Preparation




Soil & Nutrient Management in Vegetable Gardens

Module I

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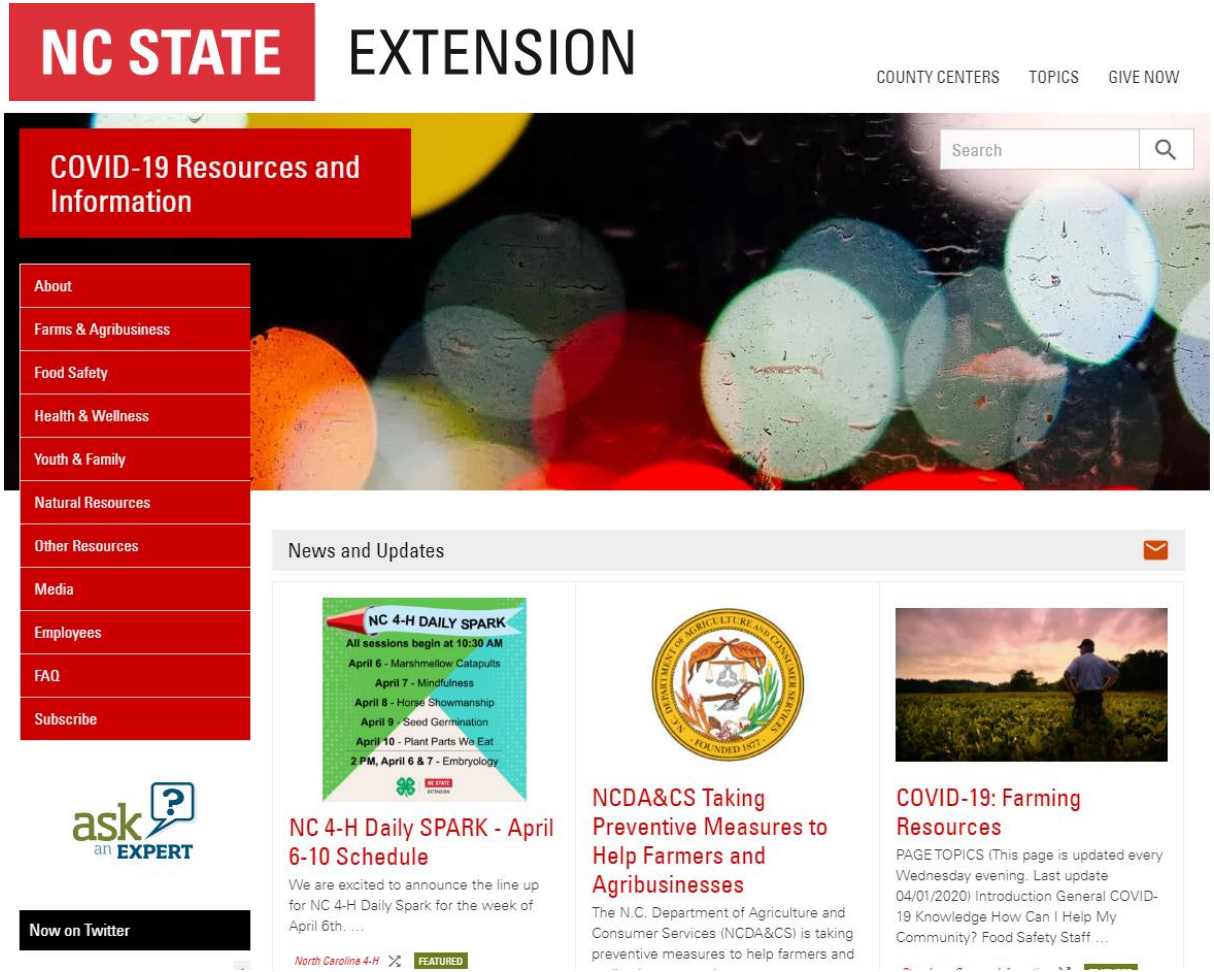

https://covid19.ces.ncsu.edu/

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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/

NC COOPERATIVE EXTENSION

Subscribe to the

Chatham Gardener Newsletter

- Sustainable gardening information
- Monthly articles written by Master Gardener[SM] Volunteers
- Upcoming classes and events
- **To subscribe:** http://go.ncsu.edu/subscribecg

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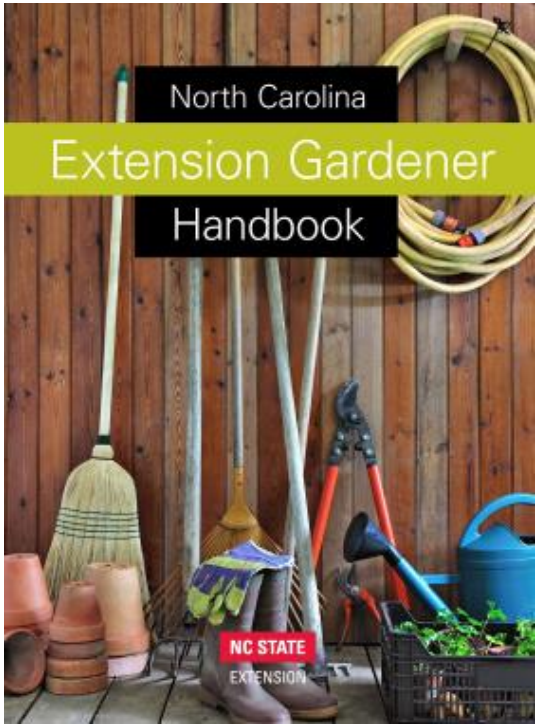
Extension Gardener Handbook

- 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



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Upcoming Workshops

Many more Extension Gardener workshops to come!

https://go.ncsu.edu/chathamgardening

More will move online as the pandemic proceeds

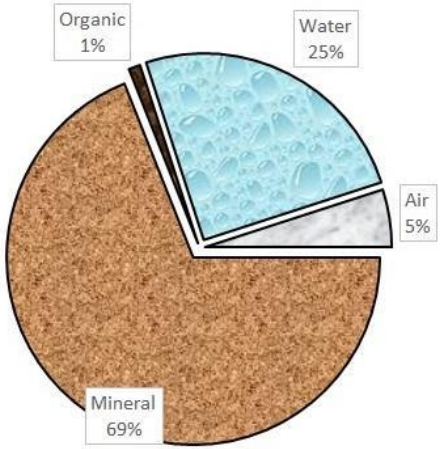
Workshop	Date (2020)	Time	Cost
Tree Identification in Winter	Jan. 21	9:30 a.m.-noon	$10
Tree Identification in Winter	Jan. 22	6-8:30 p.m.	$10
Growing Vegetables from Seed	Feb. 5	6-8:30 p.m.	$10
Growing Vegetables from Seed	Feb. 6	9:30 a.m.-noon	$10
Soil & Nutrient Management in Vegetable Gardens	Mar. 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?

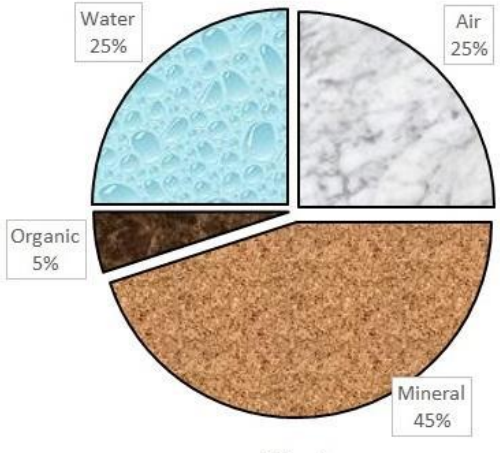
- Weathered rock (mineral)
- Air
- Water
- Organic matter
- Microorganisms

Soil is not dirt!

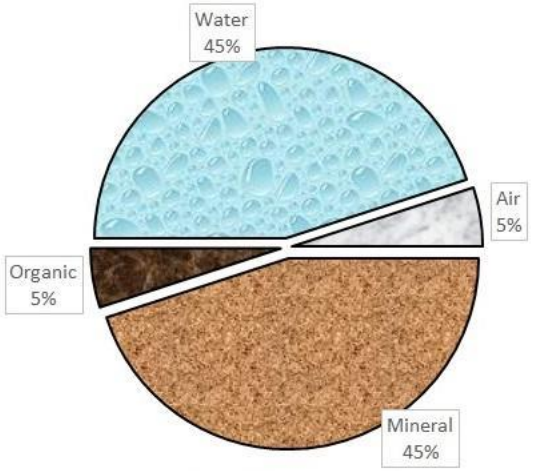
Soil Composition



Compacted



Ideal

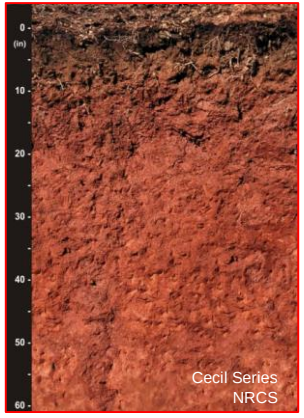


Poorly Drained

Soil Formation

Time

Parent Material



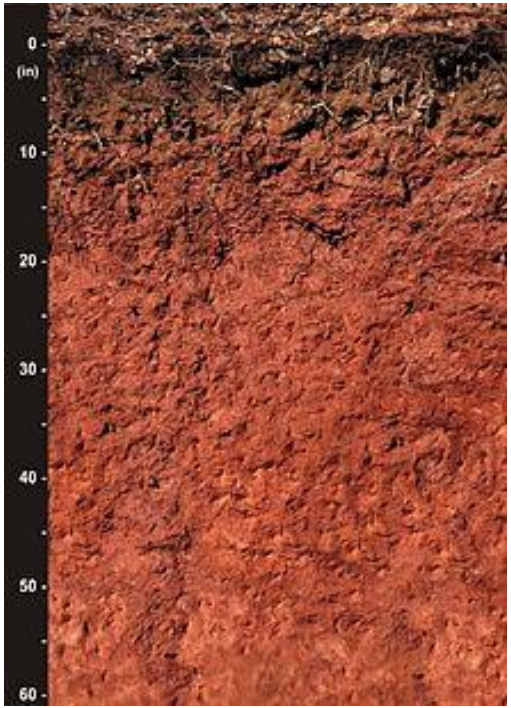
Biological Activity

Topography

Climate

Piedmont Soils

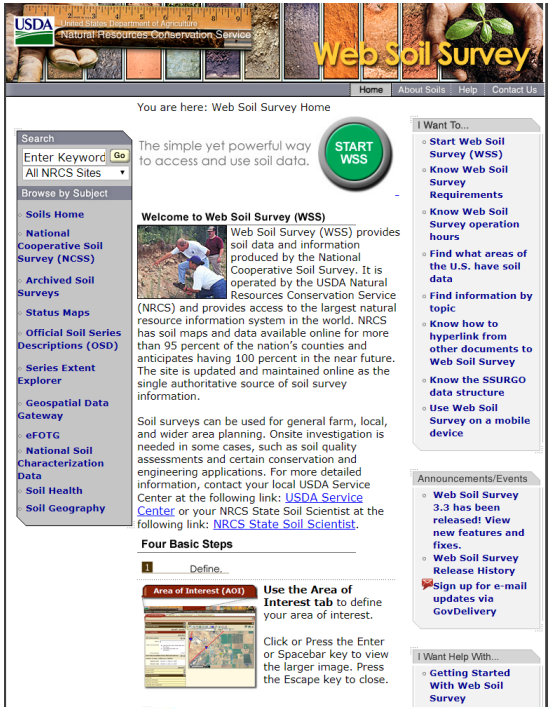
- Ultisols – humid, warm environments
- Sandy loam and red clays
- Acidic, pH ≤ 5
- Great for forests
- Susceptible to compaction
- Some poorly drained



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

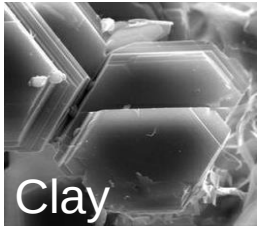


Physical Properties of Soils

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

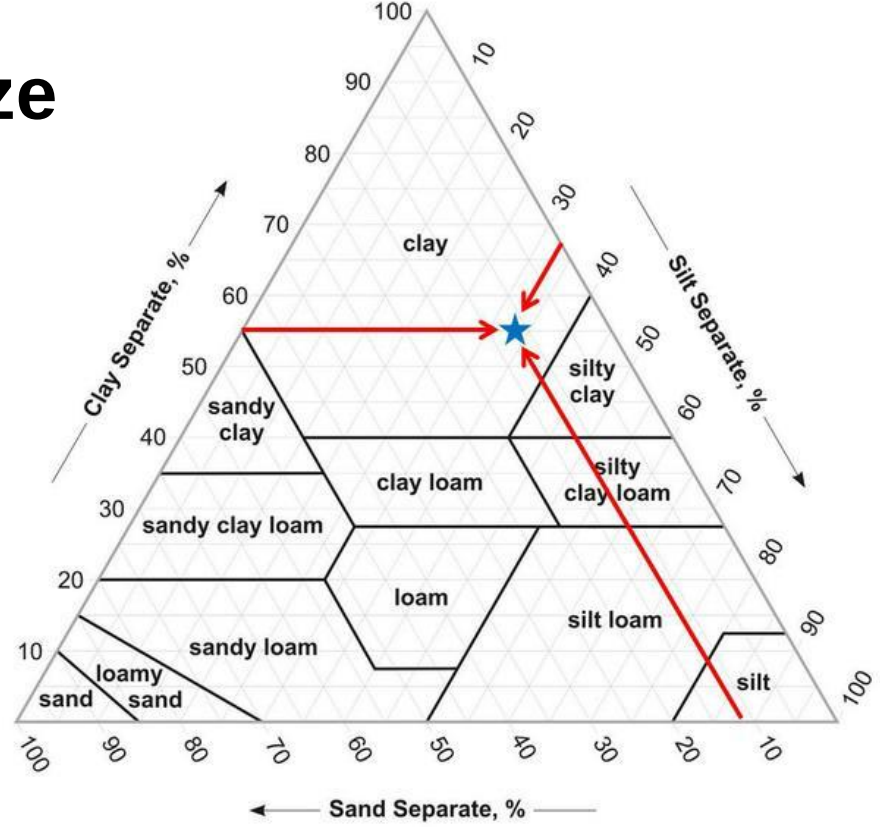
Soil Textural Class Proportion of Sand, Silt & Clay

Proportion effects pore size

- Water retention
- Nutrient retention

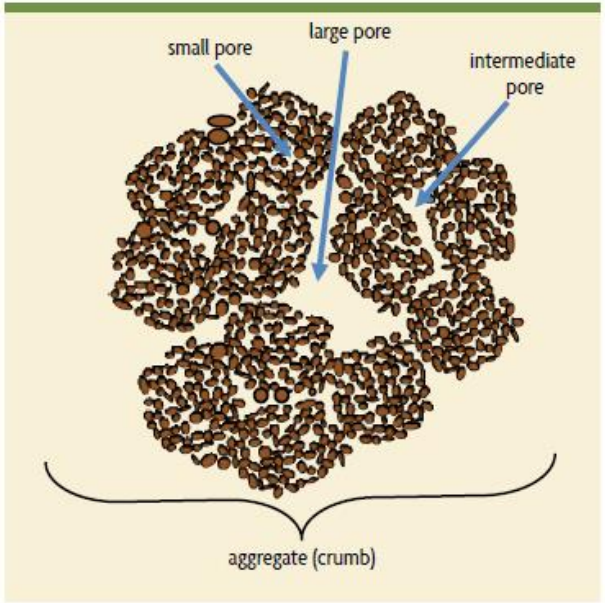
Jar Test

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

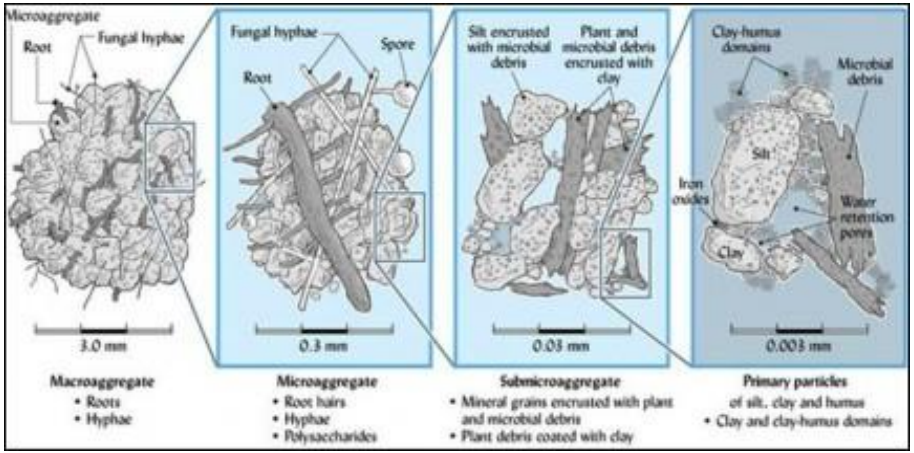


Soil Structure Aggregation of Soil Particles

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



Building Soils for Better Crops USDA SARE



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

Water Holding Capacity

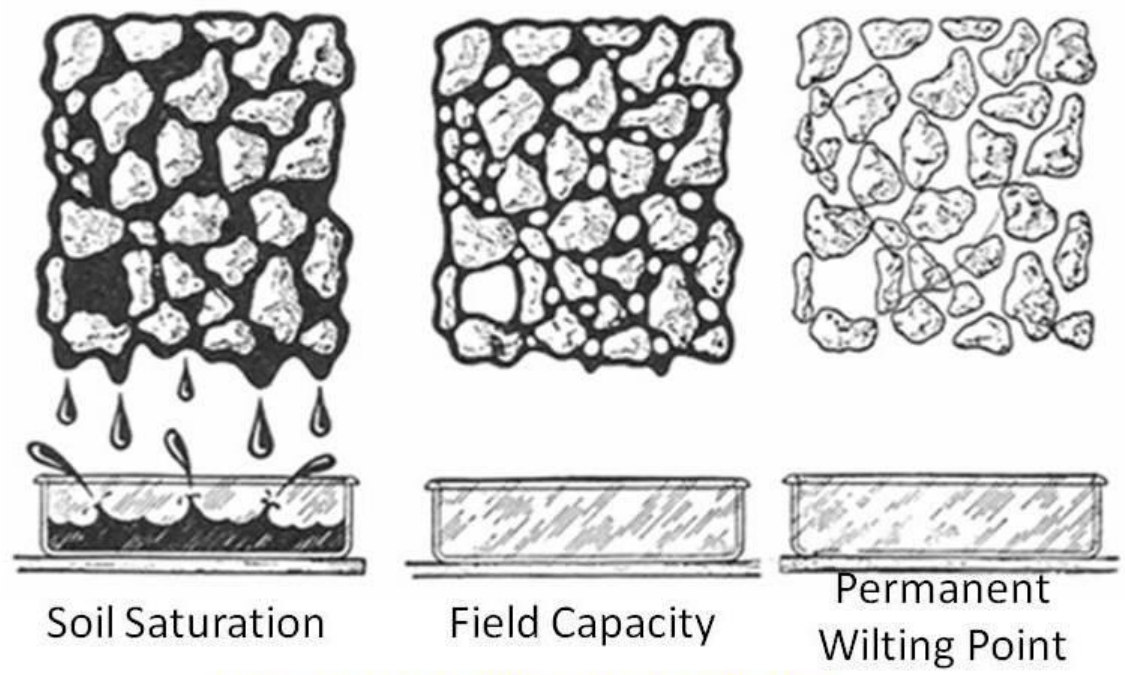
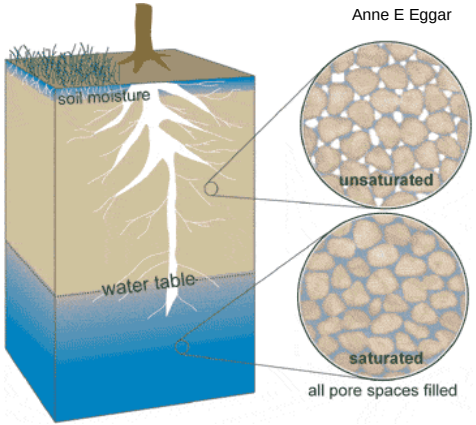


Diagram Provided by http://www.biology.lsu.edu/webfac/dlongstreth/plphys/lecture_4.htm

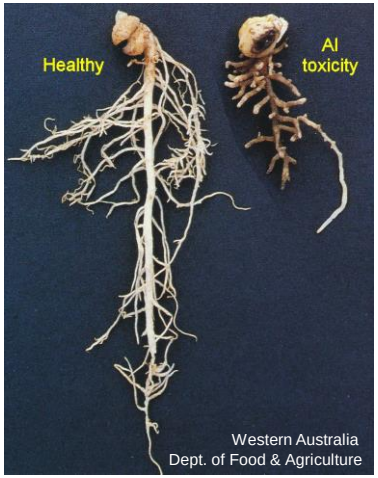
Soil Depth

Barriers to Root Growth

Hardpans



High Water Tables

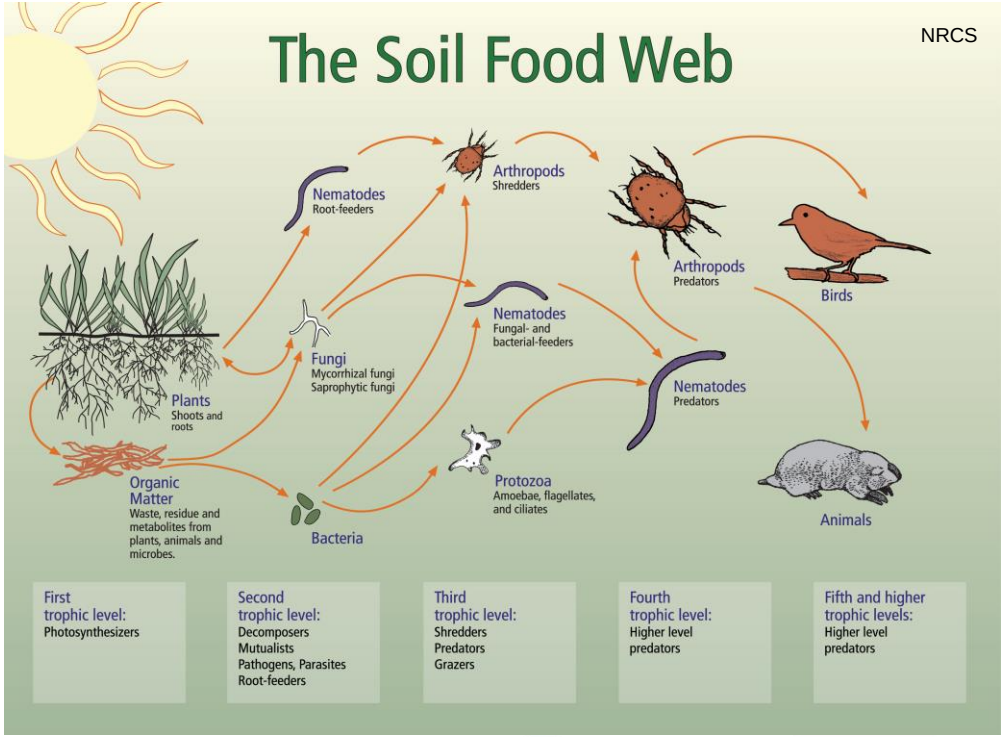


Low pH

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



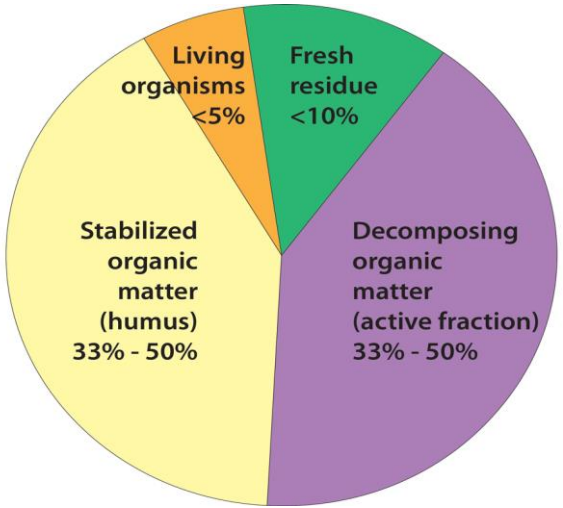
Soil Organic Matter

Fraction of soil composed of biological material

Improves Soil structure

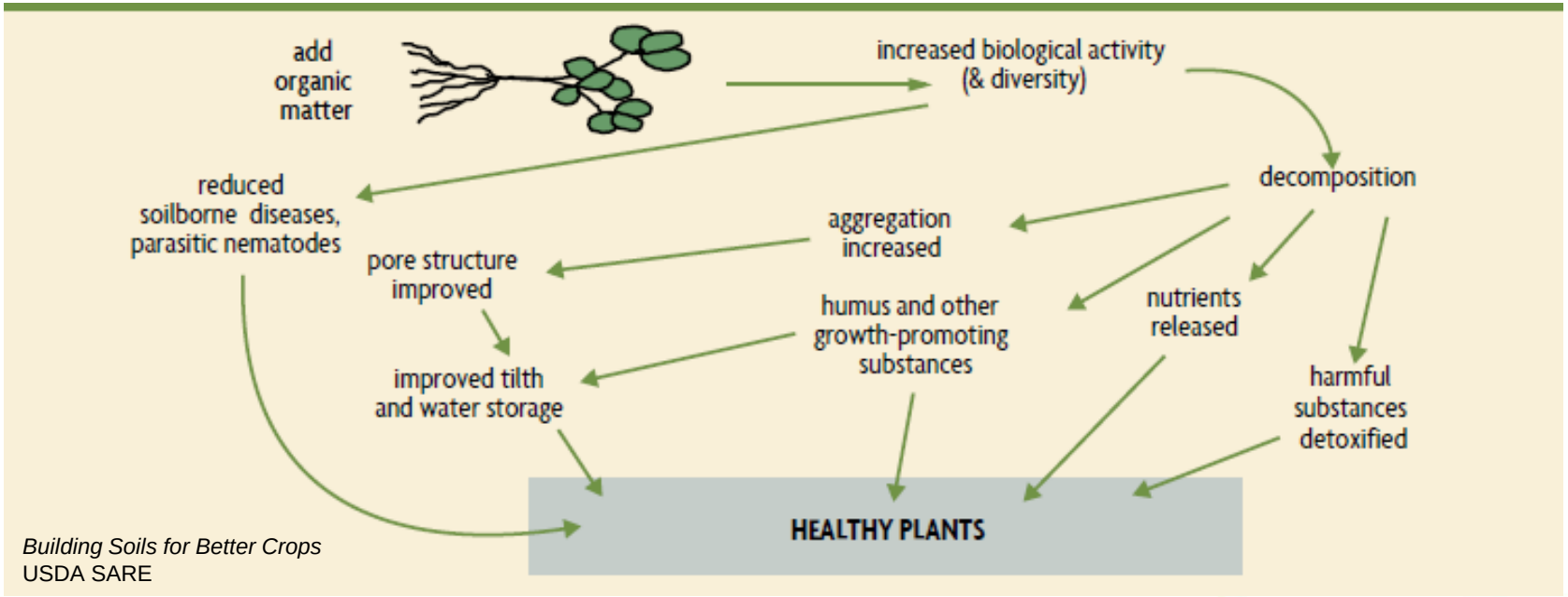
- Nutrient cycling & capacity
- Water holding capacity
- Improves sands and clays!

Promotes soil microbes that improve aggregation and nutrient cycling



NRCS

Benefits of Organic Matter



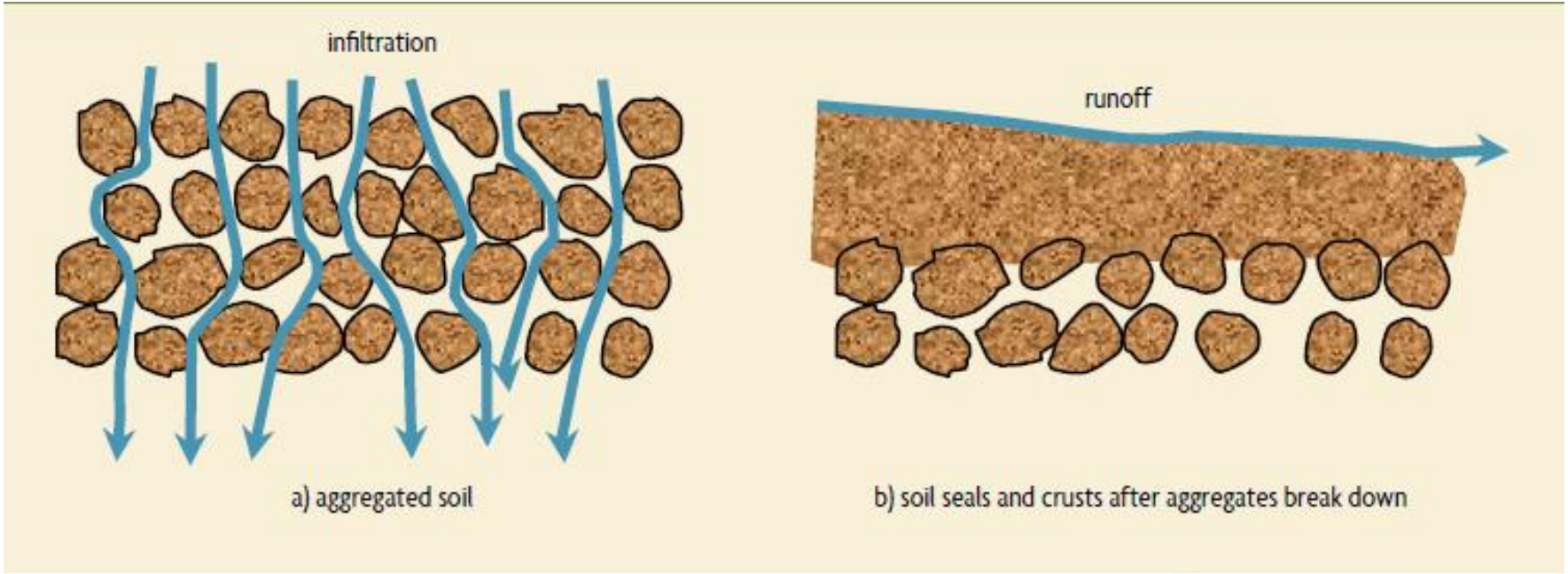
Building Soils for Better Crops
USDA SARE

Soil Degradation

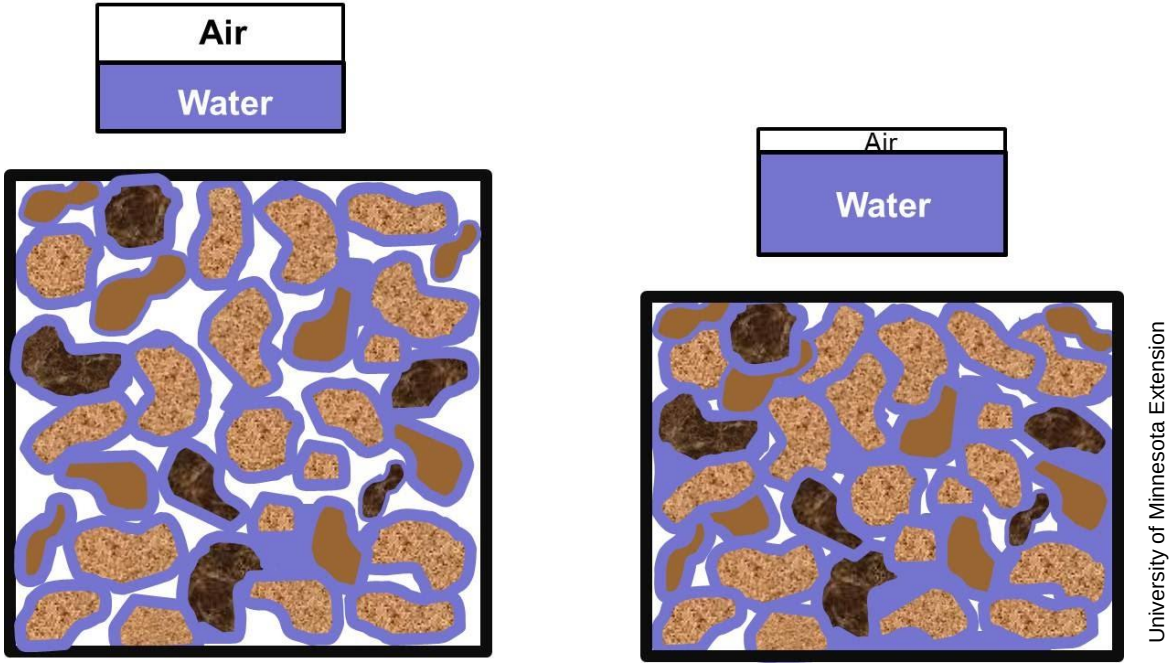
Building Soils for Better Crops
USDA SARE

Soil Crusts

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

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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

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

Fundamentals of Composting Workshop in Pittsboro Nov. 5

Bed Preparation and Site Selection

Site Preparation

Remove weeds and grass

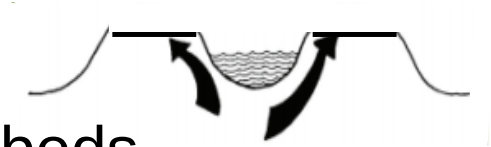
- Smother
- Sod cutter
- Herbicides

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

Treated or Untreated Wood

Wood-Plastic Composites

Contained Raised Beds

Concrete Blocks

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

Containers can be made of many different materials

Containers must be able to:

1) Hold soil media
2) Drain water

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

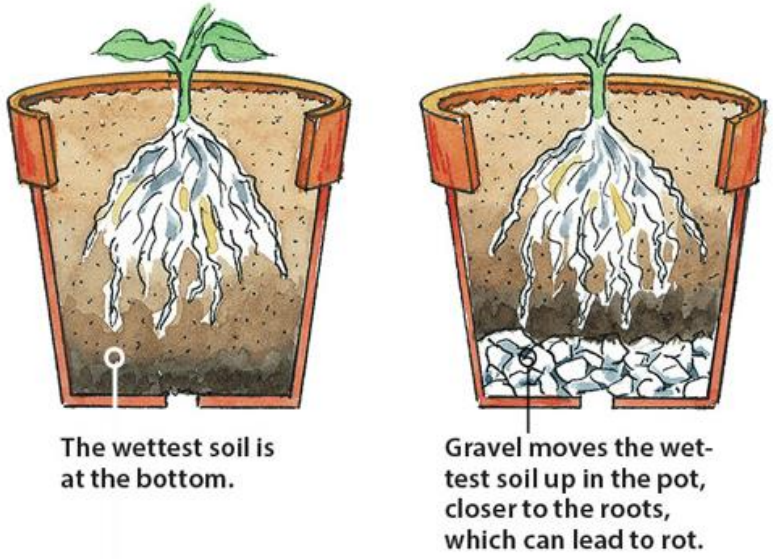
- Larger = better moisture retention
- Penn State Extension Study
  - 14”- 20” diameter

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



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 Dolomitic Lime for mixes with domestic vermiculite or Calcitic Lime for mixes with African vermiculite	1 1/4 cups or 3/4 cups
Superphosphate (20% P) or Triple superphosphate (46%)	1/2 cup or 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!

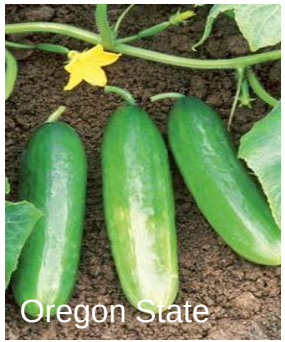
Want more information on container gardening?

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

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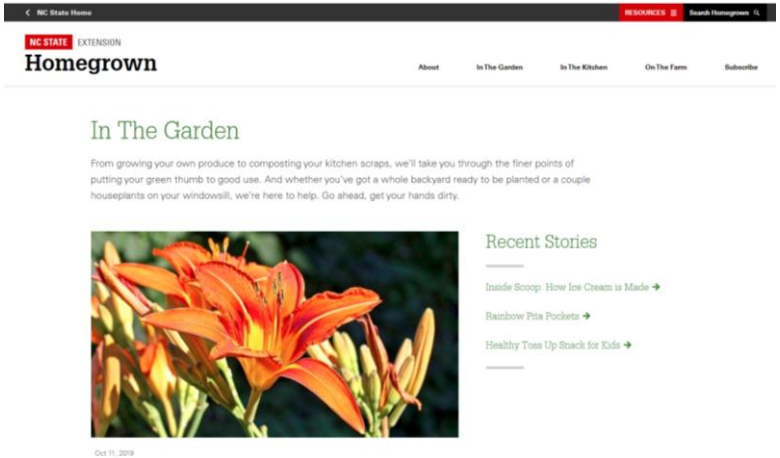
Resources

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

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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)

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Please Complete the Evaluation!

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