Benefits and Challenges to Compost Use on LI

Sandra Menasha
Vegetable/Potato Specialist
Cornell Cooperative Extension – Suffolk County
srm45@cornell.edu

Outline

- Soils of Long Island
- Benefits of Compost
- Challenges of Compost
- Alternatives to Compost

North Fork Soils

- **Haven-Riverhead Association**: These soils are characteristically deep and somewhat level and are located further inland on the North Fork. They are well-drained and have a medium texture. Most of these soils have a moderate to high water holding capacity and crops respond well to lime and fertilizer when grown on these soils. This soil association is the predominant one of the North Fork.

South Fork Soils

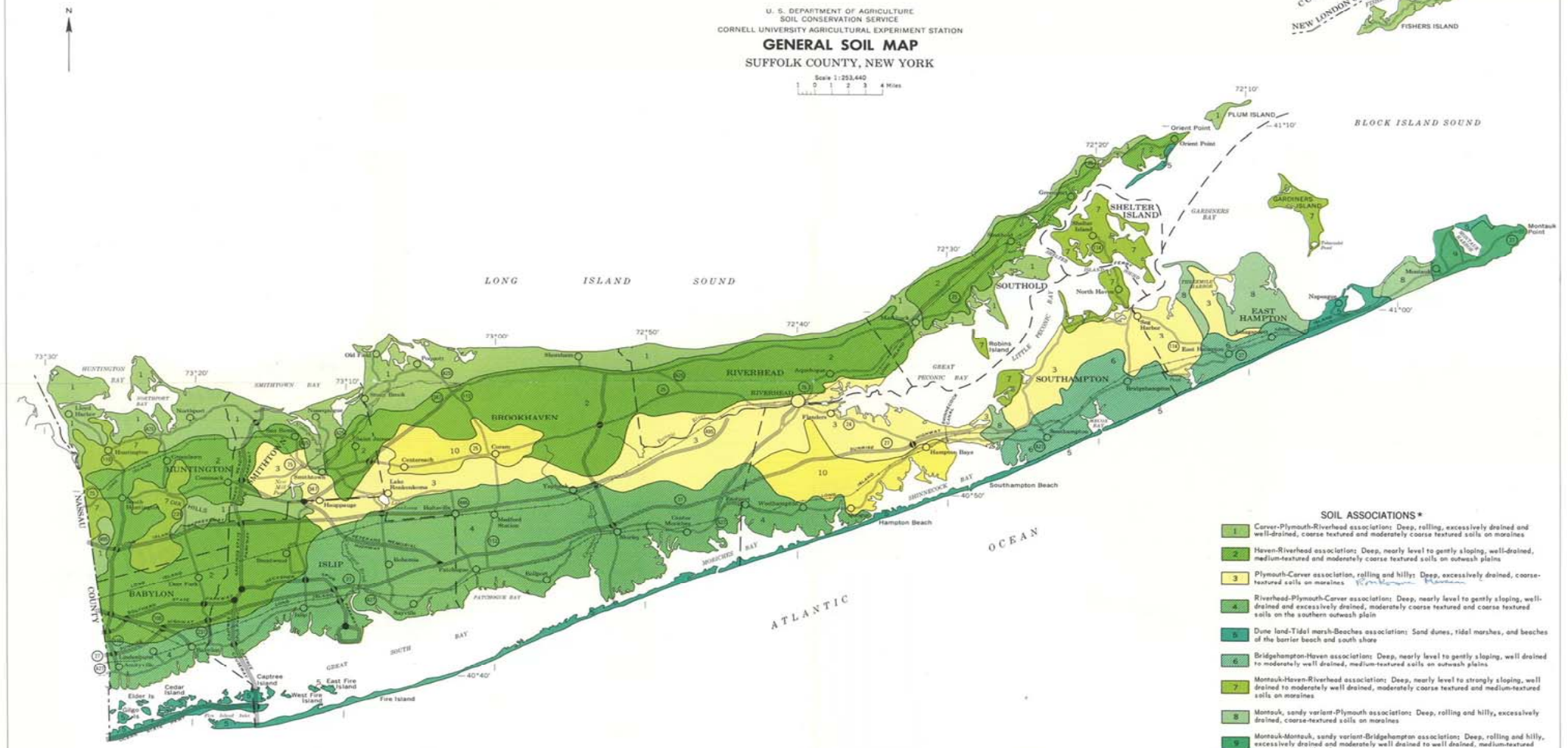
- **Bridgehampton-Haven Association:** These soils are deep and excessively drained and have a medium texture. It is its depth, good drainage and moderate to high available water-holding capacity that make this soil well-suited to farming. Most of these areas are currently under cultivation of potatoes and vegetables. Irrigation is typically used less or not at all on the South Fork compared to the North Fork.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

SUFFOLK COUNTY, NEW YORK

Scale 1:253,440
1 0 1 2 3 4 Miles



SOIL ASSOCIATIONS *

1. Carver-Plymouth-Riverhead association: Deep, rolling, excessively drained and well-drained, coarse textured and moderately coarse textured soils on moraines
2. Haven-Riverhead association: Deep, nearly level to gently sloping, well-drained, medium-textured and moderately coarse textured soils on outwash plains
3. Plymouth-Carver association, rolling and hilly: Deep, excessively drained, coarse-textured soils on moraines
4. Riverhead-Plymouth-Carver association: Deep, nearly level to gently sloping, well-drained and excessively drained, moderately coarse textured and coarse textured soils on the southern outwash plain
5. Dune land-Tidal marsh-Beaches association: Sand dunes, tidal marshes, and beaches of the barrier beach and south shore
6. Bridgehampton-Haven association: Deep, nearly level to gently sloping, well drained to moderately well drained, medium-textured soils on outwash plains
7. Montauk-Haven-Riverhead association: Deep, nearly level to strongly sloping, well drained to moderately well drained, moderately coarse textured and medium-textured soils on moraines
8. Montauk, sandy variant-Plymouth association: Deep, rolling and hilly, excessively drained, coarse-textured soils on moraines
9. Montauk-Montauk, sandy variant-Bridgehampton association: Deep, rolling and hilly, excessively drained and moderately well drained to well drained, medium-textured to coarse-textured soils on moraines
10. Plymouth-Carver association, nearly level and undulating: Deep, excessively drained, coarse-textured soils on outwash plains

* Texture refers to surface layer in major soils of each association.

Compiled 1972

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

Key Characteristics of LI Soils

- **Low to moderate organic matter levels**
- Well-drained
- Low Nutrient retention
- Respond well to fertilizer and lime
- Deep
- Good water holding capacity

Building Soil Health and Productivity

- Increase organic matter
  - #1 thing you can do to enhance long-term soil performance and health

Benefits of Organic Matter

- Increases water holding ability
- Increases soil biological activity
- Improves drainage
- Increases cation exchange capacity (nutrient holding ability)
- Source of nutrients
- Improves aggregate stability
- Improves water infiltration
- Reduces compaction and soil crusting
- Suppression of some soil-borne disease

A1

Soils will release between 10 and 40 lb. N/A for each 1% organic matter

- A study of soils in Michigan demonstrated potential crop-yield increases of about 12% for every 1% organic matter.
- In a Maryland experiment, researchers saw an increase of approximately 80 bushels of corn per acre when organic matter increased from 0.8% to 2%.

Table 1. Effect of decreasing organic matter content on nutrient holding capacity for two soil textures.

Soil texture	If organic matter decreases from	Nutrient holding capacity may decrease by
	percent (%)	
Loamy sand (5% clay)	2 to 1.5	14
Silt loam (20% clay)	4 to 3.5	4

Slide 9

A1 Author, 10/18/2017

Ways to Increase Organic Matter

- Compost
- Cover crops and Green manure crops
- Manure
- Crop debris
- Leaves, straw, woodchips
- Control Erosion
- Reducing Tillage

Benefits of Compost

- Make your own
- Biologically stable (finished compost)
- Easier to handle than raw organic wastes
- Has many uses on the farm
  - soil amendment, mulch, container mix ingredient, natural fertilizer
- Improves physical and biological soil properties
  - Increases microbial activity
  - Increases organic matter
  - Increases cation exchange capacity
  - Improves water retention in sandy soils
  - Enhances plant disease suppression
- Recycling/Cycling

Compost Application Rates

- Depends on costs and
- Depends on available quantities
- 5-20 tons/A

Mature compost builds long term-fertility, not a source of readily available nutrients

- General guidelines suggest that about 10-20% of compost N will be plant-available during the first year of application.
- Estimates for P and K availability in the first year are higher, 40% and 60% respectively.
- Rates can be calculated based on compost analysis
- All nutrient sources should be considered and accounted for when determining a nutrient management plan for a particular crop.

Washington State University Trials

- 2012 pumpkin trial: Carleton Farm, compost applied years 2011-2012, ~20 dt/a, 28% increase in yield
- 2013 sweet corn trial: Carleton Farm, compost applied 2011- 2013, ~15 dt/a (2013), 24% increase in yield
- 2014: green beans: Darrell Hagerty Farms, 6.5 dt/a, 19% increase in yield
- 2014: beet seed: Williams Farm, 20 dt/a, 21% increase in yield

Challenges to Using Compost

- Costs
- Equipment
- Quality/Contamination
- Availability
- Proper Management
- Land
- Neighbor issues?
- Sourcing Materials?

Alternatives to Compost

- Cover Crops and Green Manures
  - A crop grown for the protection and enrichment of the soil.

Benefits of Cover Crops

- Suppresses weeds
- Protecting soil from rain/runoff/erosion
- Improving soil aggregate stability
- Reducing surface crusting
- Adding active organic matter to soil
- Breaking hardpan
- Fix nitrogen
- Scavenging soil nutrients
- Suppressing soil diseases and pests
- Supplies nutrients

Cover Crop Options for LI

- Grasses and Cereal Grains
  - Rye
  - Oats
  - Wheat
  - Barley
  - Sorghum
  - Ryegrass
- Legumes
  - Peas
  - Vetch
  - Clover
  - Cowpeas
  - Sunhemp
- Others
  - Buckwheat
  - Mustard
  - Radish
  - Canola
  - Phacelia

Cover Crops and Organic Matter

- Contribution of Organic matter to the soil from a green manure crop is comparable to the addition of 9 to 13 tons/A or farmyard manure or 1.8-2.2 tons dry matter/A

- Approximately 2.2 tons per acre per year of crop residue considered adequate to maintain soil organic matter levels in continuously cropped soils

Average Biomass and Nitrogen Yields of Several Legumes		
Cover Crop	**Biomass**	**Nitrogen**
	Tons/A	**Tons/A**
Sweet Clover	1.7	120
Berseem Clover	1.1	70
Crimson Clover	1.4	100
Hairy Vetch	1.75	110

Organic Matter from Cover Crops

- **Plant materials that are succulent** and rich in proteins and sugars will release nutrients rapidly but leave behind little long-term organic matter.

- **Plant materials that are woodier or more fibrous** will release nutrients much more slowly, perhaps even tie up nutrients temporarily but will promote more stable organic matter, or humus, leading to better soil physical conditions, increased nutrient-holding capacity and higher cation exchange capacity.

Challenges – Cover crops

- Equipment
  - Seeding, termination
- Management
  - Winter-kill, fertility, irrigation
- Delayed Plantings in wet spring
  - Cant get in to kill cover crop
- Timing and Rotations
  - When and where
- Cost
  - Less common = more expensive (Shipping)

Compost vs Cover Crops

- Assess your management goals
- Select based on goals
- Availability
- Costs
- Equipment

Take Home

- Aim to increase your Soil Organic Matter (SOM) levels, as this can have multiple benefits for soil health.
- Adding compost and/or cover crops to your soil are effective ways of increasing SOM.

Useful Resources

- On-Farm Composting Handbook
- Rodale Book of Composting
- Managing Cover Crops Profitably
  - http://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition
- Building Soils for Better Health
  - http://www.sare.org/Learning-Center/Books/Building-Soils-for-Better-Crops-3rd-Edition
- Cornell Cover Crop Decision Tool
  - http://covercrops.cals.cornell.edu/decision-tool.php
- Cornell Soil Health Test
  - https://soilhealth.cals.cornell.edu/