

Optimizing Your Site for Strawberries



Site Considerations

- ❑ Compatible with marketing strategy
- ❑ Water availability (quality and quantity)
- ❑ Adequate soil drainage
- ❑ Soil fertility, pH and organic matter
- ❑ Slope
- ❑ Adequate sun
- ❑ Winter temperatures/ Frost pockets/ Microclimates
- ❑ Prior site history/ Solanaceous crops/ Nematodes
- ❑ Land for future expansion and crop rotation
- ❑ PYO parking and customer access



Soil tolerances of berry crops

Strawberries	Raspberries	Blueberries
Not too picky about soil texture	Prefer loamy soils	Prefer sandy loam or sandy soils
Soil depth > 6 inches	Soil depth > 12 inches	Soil depth > 12 inches
Internal soil drainage is important	Internal soil drainage is critical	Can tolerate limited flooding, especially in winter
pH between 5.5 and 7.0	pH between 6.0 and 7.0	pH between 4.3 and 4.8
Fairly tolerant of compaction	Fairly tolerant of compaction	Not tolerant of compaction



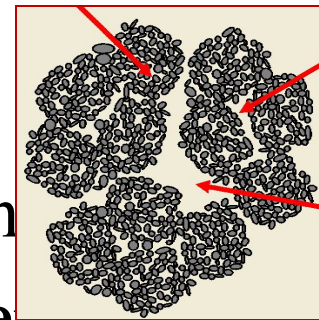
Soil Types

- Ideal soil for most crops is a deep, well-drained, sandy loam soil high in organic matter.

Why?

Sandy loams

- Mixture of pore sizes
 - Allows for root penetration
 - Allows for drainage and aeration
 - Holds some plant-available water



Clays have too much very small pore space, so hold little air and plant-available water

Sands have too much large pore space, so hold little water

- 
-
- How do I discover my soil type?
 - <http://websoilsurvey.nrcs.usda.gov/>

09:38

97



MapMyRun



iNaturalist



AllTrails



Zoom



Photo & Video



Wegmans



Fly Delta



Seek



TheWeatherC...



Swift911 Public



My Spectrum



Calculator



SoilWeb



NYS Wallet



American



PayPal



ReaList



LandGlide



Apple Store



Clips



GarageBand



iMovie



Keynote

Search



How do I discover my soil type?

The screenshot shows the Web Soil Survey (WSS) homepage in a Mozilla Firefox browser. The browser's address bar displays the URL <http://websoilsurvey.nrcs.usda.gov/app/>. The website header features the USDA logo and the text "Web Soil Survey". A navigation menu includes "Home", "About Soils", "Help", and "Contact Us".

The main content area is titled "Welcome to Web Soil Survey (WSS)" and includes a "START WSS" button. Below the welcome message, it states: "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."

The "Three Basic Steps" section is highlighted:

- 1 Define...**
Use the **Area of Interest (AOI)** tab to define your area of interest. A screenshot of the AOI selection interface is shown.
- 2 View/Explore...**
Click the **Soil Map** tab to view or print a soil map, or click the **Soil Data Explorer** tab to access soil data for your area and determine the suitability of the soils for a particular use. The items you want saved in a report can be added to your clipboard.

On the left side, there is a search bar and a "Browse by Subject" menu with categories such as "Soils Home", "National Cooperative Soil Survey (NCSS)", "Archived Soil Surveys", "Status Maps", "Official Soil Series Descriptions (OSD)", "Soil Series Extent Mapping Tool", "Soil Data Mart", "Geospatial Data Gateway", "eFOTG", "National Soil Characterization Data", "Soil Geochemistry Spatial Database", "Soil Quality", "Soil Geography", and "Geospatial One Stop".

On the right side, there are sections for "I Want To..." (listing options like "Start Web Soil Survey (WSS)", "Know the requirements for running Web Soil Survey", etc.), "Announcements/Events" (listing "Web Soil Survey Release History"), and "I Want Help With..." (listing "How to use Web Soil Survey", "How to use Web Soil Survey Online Help", etc.).

The browser's taskbar at the bottom shows several open applications, including "Calendar - Microsoft Out...", "2 Reminders", "Microsoft Office Pow...", and "Web Soil Survey - Ho...". The system clock indicates the time is 4:24 PM.

Area of Interest (AOI)

Soil Map

Soil Data Explorer

Shopping Cart (Free)

Printable Version

Add to

Search

Map Unit Legend

Tompkins County, New York (NY109)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CFB	Conesus gravelly silt loam, 3 to 8 percent slopes	14.8	41.6%
Em	Eel silt loam	1.0	2.9%
KnA	Kendaia and Lyons silt loams, 0 to 3 percent slopes	8.3	23.3%
LbB	Lansing gravelly silt loam, 3 to 8 percent slopes	2.9	8.2%
PaC	Palmyra gravelly loam, 5 to 15 percent simple slopes	1.1	3.0%
RkA	Rhinebeck silt loam, 0 to 2 percent slopes	3.3	9.4%
Ws	Wayland and Sloan silt loams	4.2	11.6%
Totals for Area of Interest		35.7	100.0%

Soil Map

Legend Scale (not to scale)



Warning: Soil Map may not be valid at this scale.

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Mapping is done at a particular scale. The soil surveys that comprise your AOI were mapped at 1:20,000. The map units and the level of detail shown in the resulting soil map are dependent on that map scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of map

http://en-us.www.mozilla.com/en-US/firefox/central/

Start

Calendar - Microsoft Outl... 2 Reminders

4 Microsoft Office Pow...

Web Soil Survey - Mo...

Site preparation

- Weed suppression (while minimizing compaction)
- Drainage
- Ensure water availability
- Soil testing and modification
 - pH modification
 - Nutrient addition
 - Organic matter enhancement
 - Physical properties
 - Biological properties





Weed suppression strategies

- Round-up then cover crop the year before planting
- Sequential cover cropping one year or two before planting
- Follow corn or soybeans or some other crop where weed control was practiced
- Plastic mulch
- Plant strawberries then deal with the weeds later

The most important site modification you can do
is ensure there is adequate drainage . . .



Field Symptoms

- ❑ **Above ground structure stunted, reddened or collapsing**
- ❑ **Wilting of leaves**
- ❑ **Lack of runnering**
- ❑ **Decline of vigor and productivity**

Symptoms of poor soil health from inadequate drainage

- **Patchy-complete blackening of main/perennial roots**
- **Deterioration of perennial & feeder roots**
- **Smaller root systems**






Black root rot

Red Stele





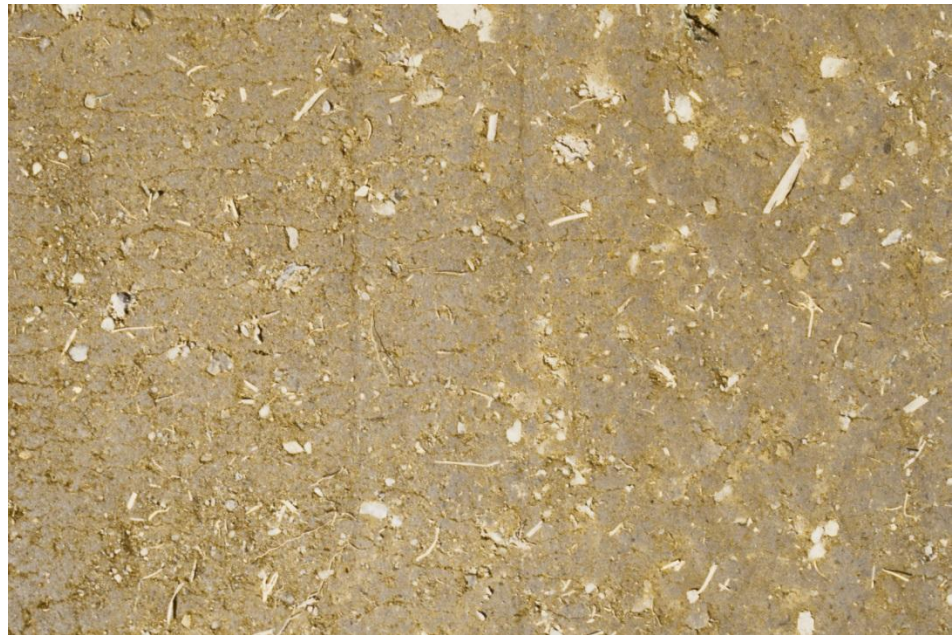
Not all farms have deep, well-drained, sandy loam soils ...

- What is the tolerance of strawberries to variation in soils?










Preplant treatments had an impact on runner production and yield in the first fruiting year.

Treatment	Daughter plants* (#/m)	Yield* (kg/4 m)	Individual fruit weight (g)
Minimum	44.0	7.83	12.0
Moderate	31.0	7.73	12.2
Maximum	28.6	7.19	12.1



A similar trend was continued into the subsequent year but the impact was not large (<10%).

Treatment	Yield* (kg/4 m)	Individual fruit weight* (g)
Minimum	22.0	13.9
Moderate	21.2	12.4
Maximum	20.3	12.7



Principles of chemical soil testing

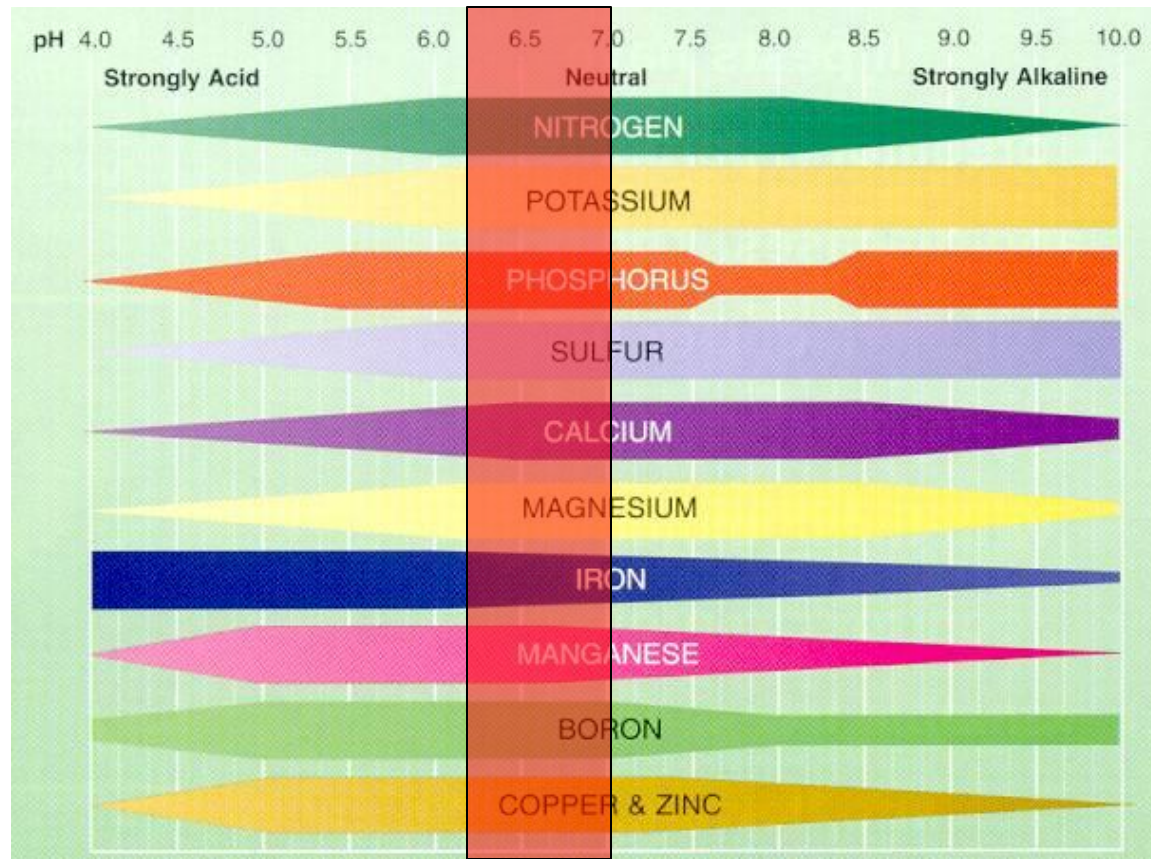
- Soil test prior to planting
 - Adjust pH
 - Adjust nutrient levels

- Leaf analysis once planting is established
 - Mid-summer

Traditional Soil Tests

- Determine optimal nutrient level for crop maximum yield/growth for the
- Use chemical soil test result to determine what is available to the plant from the soil
- Provide fertilizer recommendation to supply the difference via. fertilizer

Soil pH and Nutrient Availability





Note on soil testing:

- Extractants differ between labs
- Recommendations must match the soil extractant

What organic amendments are best?

- Four preplant amendments
 - Straw
 - Wood chips
 - Grass clippings
 - Control
- Two tillage depths
- Measuring growth, yield, PMN, active C, respiration





Unamended



Straw



Sawdust



Plants planted into a straw residue were smaller, slower to establish, and had fewer runners and a lower yield the following year.



- Straw mulch incorporated between rows once plants are established (as would be typically done during renovation) did not impact yield the following year.

How do we evaluate soil potential?



- **Chemical tests (Traditional soil tests)**

- Soil tests, fertilizers, etc.

- **Physical tests**

- Tilt
- Drainage
- Compaction

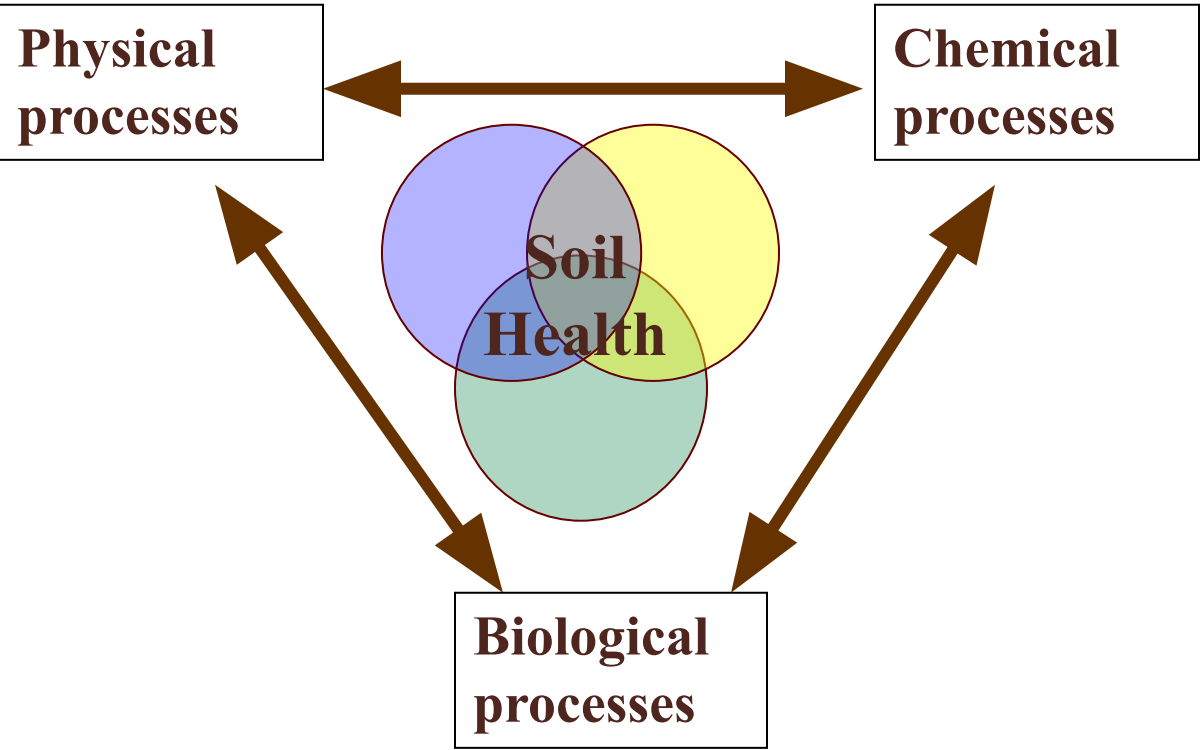
- **Biological tests**

- The living component of soil
- Not yet as well-understood, but can be managed!



- **Biological and physical tests are available through the Cornell Soil Health Test**

Interactions!



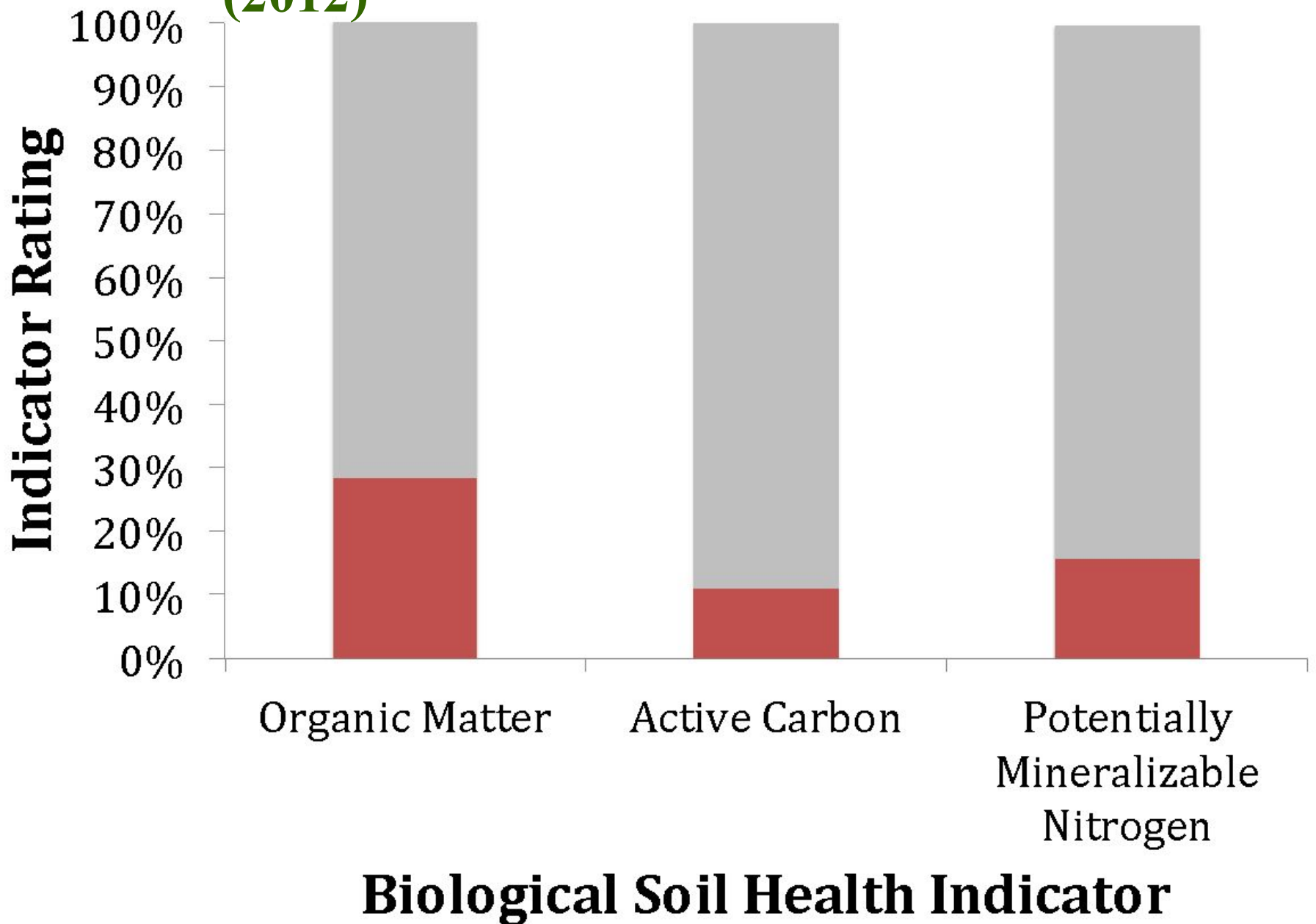
Cornell Soil Health Test

- 1) **Publically available** since 2006, developed for the northeastern USA
- 2) **Measures 15 indicators**
 - a. Represent agronomically essential soil processes
 - b. \$90/sample
- 3) **Identifies soil constraints** using scoring functions
- 4) **Guides management decisions**

<http://soilhealth.cals.cornell.edu/>

CORNELL SOIL HEALTH TEST REPORT (COMPREHENSIVE)				
Name of Farmer: Beth Gugino			Sample ID: E231	
Location: Plant Pathology, 630 W. North St. Geneva NY 14456		Agent: George Abawi		
Field/Treatment: Gates 72		Agent's Email: 0		
Tillage: 9+ INCHES		Given Soil Texture: LOAMY		
Crops Grown: CLE/SWC/BNS		Date Sampled: 5/4/2007		
	Indicators	Value	Rating	Constraint
PHYSICAL	Aggregate Stability (%)	26	32	
	Available Water Capacity (m/m)	0.13	29	water retention
	Surface Hardness (psi)	167	53	
	Subsurface Hardness (psi)	300	46	
BIOLOGICAL	Organic Matter (%)	2.3	18	energy storage, C sequestration, water retention
	Active Carbon (ppm) [Permanganate Oxidizable]	554	38	
	Potentially Mineralizable Nitrogen (µgN/ gdwsoil/week)	7.9	10	N Supply Capacity
	Root Health Rating (1-9)	4.3	63	
CHEMICAL	*pH	7.4	78	
	*Extractable Phosphorus (ppm) [Value <3.5 or >21.5 are downscored]	10.0	100	
	*Extractable Potassium (ppm)	50	72	
	*Minor Elements		100	
OVERALL QUALITY SCORE (OUT OF 100):		53.3	Low	
Measured Soil Textural Class:==> silt loam				
SAND (%): 44.0 SILT (%): 50.0 CLAY (%): 6.0				
Location (GPS): Latitude=> 42.866667 Longitude=> -77.05				

NE SARE survey of strawberry farms (2012)



Comprehensive Assessment of Soil Health

The Cornell Framework



- Overview of Soil Health concepts
- Field sampling
- Description of indicators
- Brief laboratory methodology
- How indicator values are “scored”
- Soil Health Report
- Soil Health Report Interpretation
- Linkages to Management

Available online at <http://soilhealth.cals.cornell.edu>

A good water supply is essential for long-term sustainability



Why worry about water?

- 2/3 of world's fresh water is used for agriculture
- Water quality is poor in many areas (e.g. high salinity, high pH)
- even humid areas (like the Northeast) experience a 20 - 30 day period without significant rainfall during the growing season 3 times per 20 years

Short-term effects of water stress on berries . . .

- reduces net assimilation rate (photosynthesis) by 50%
- reduces leaf expansion rate and leaf area
- increases rate of leaf death
- accelerated ripening

Long-term effects of water stress on berries . . .

- reduced growth of aboveground tissues
- reduced flower bud initiation
- smaller fruit size
- reduced yield

Consequence of too little water after planting



Water supply considerations

- **Frequency of irrigation**
- **Replenishment rate**
- **Efficiency of irrigation (60-75% for overhead)**
 - To supply 0.6 inches of water with an overhead system requires 27,000 gal. $\times 0.6 \text{ in.} / 0.75 = 21,600 \text{ gal per acre.}$
 - Twice a week irrigation during the drought
 - For a 5-acre planting during a 30-day drought, this would lower a pond 100 ft. by 100 ft. by 2.5 feet.
- **Water quality**
 - salts/pH < 2.0 ms
 - microorganisms
 - sediment/algae

Site preparation

- ☑ ✓ Weed suppression
- ☑ ✓ Drainage
- ☑ ✓ Ensure water availability
- ☑ ✓ Soil testing and modification
 - pH modification
 - Nutrient addition
 - Organic matter enhancement
 - Physical properties
 - Biological properties

