*Soil Basics

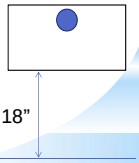
Connecticut Department of Public Health
Keeping Connecticut Healthy

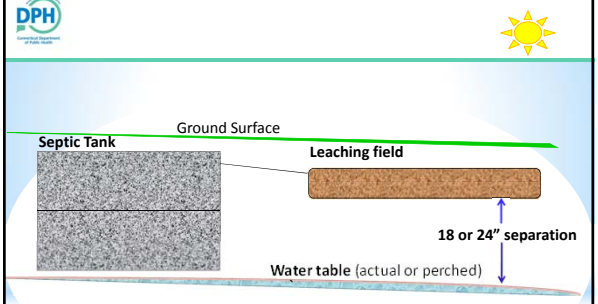
*Soils

- *To determine systems placement and size, soils testing is needed.
- *For residential buildings, size is based on number of bedrooms
- * Utilize soil-based identification to determine restrictive conditions in the soil that could restrict the flow and treatment of effluent.
  - *Groundwater
  - *Ledge rock
  - *Compact soils

Vertical Separation Distances

- *Bottom of the Leaching
  - *18" above water, redox or compact layer (restrictive layer)
    - *24" if a large system over 2000 GPD, located in a tidally impacted groundwater table or perc quicker than 5.0 minutes per inch
  - *4' over ledge rock, 24" of which is naturally occurring soil.



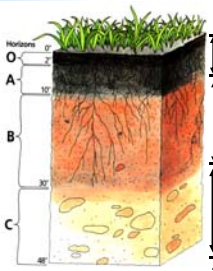


Deep Test Pits

https://www.youtube.com/watch?v=oINAI0gmCos

Soil Profile

Soil Profile



0-12” Topsoil

12 - 30” Orange/Br Fine silt loam

30 - 48” Tan Fine Silt Loam

48 - 77” Gray Compact Sand w/ Gravel (Hardpan)

https://www.youtube.com/watch?v=6ZibUOYUMbE

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*Deep Test Pits

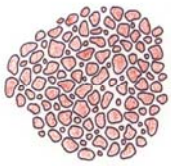
*Maximum Groundwater
  *the level to which groundwater rises for a duration of one month or longer during the wettest season of the year.

*Groundwater

Credit: Peter Fletcher

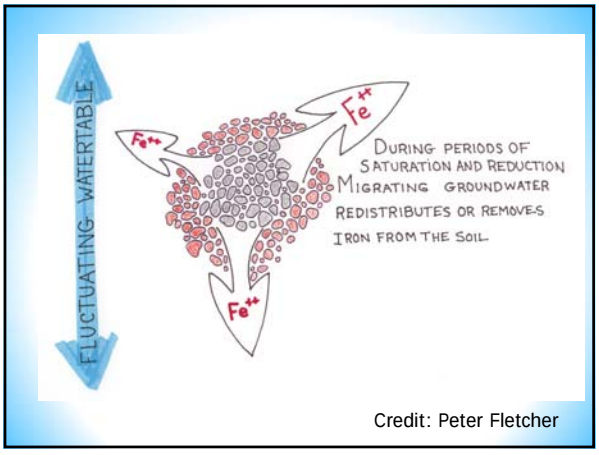
*Redoximorphic (redox) features
  * redox- discoloration of the soil indicative to the seasonal high groundwater table
*Redox features form by the biogeochemical processes of reduction, movement, and oxidation of iron and manganese.

*How Redox Features Form

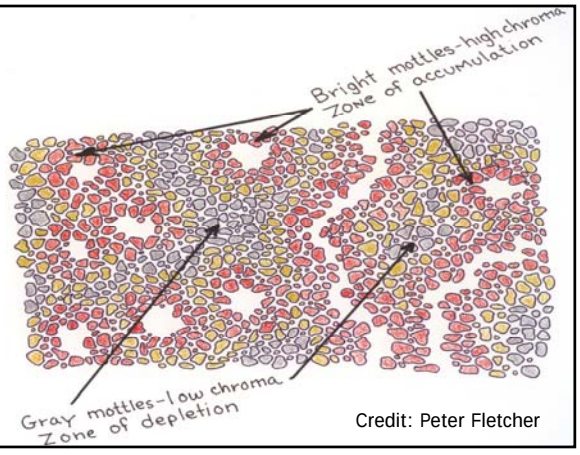


In well drained, upland soils the bright color in the subsoil is due to iron oxide stains coating the individual soil particles.

Credit: Peter Fletcher

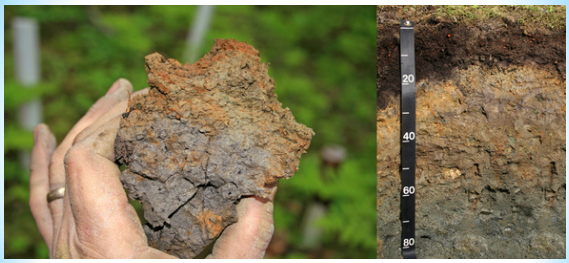


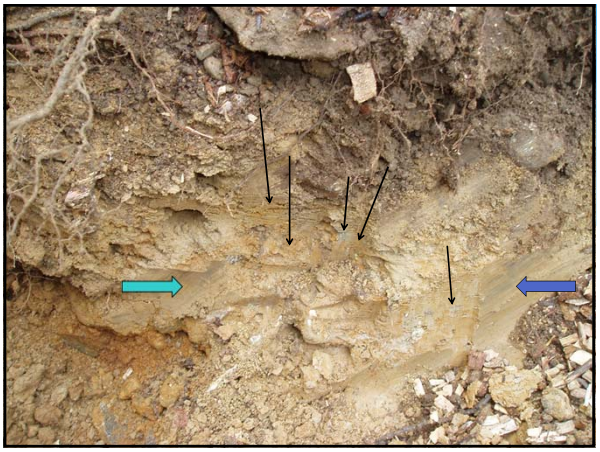
Credit: Peter Fletcher



Credit: Peter Fletcher

Seasonal High Groundwater





Generally speaking, the longer the period of soil saturation and reduction the greater the % gray colors

Credit: Peter Fletcher

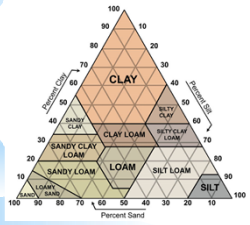
*Ledge Rock

*Ledge rock

B103 a-e 18

*Soil texture

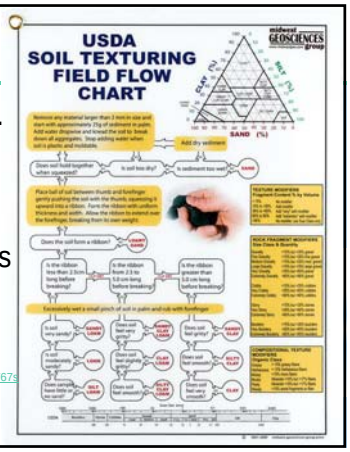
*Various combination of different size of mineral particles form soil texture.



Different textures based on their particle sizes.

- Fine textured soil
- Moderately fine textured soil
- Medium textured soil
- Coarse textured soil

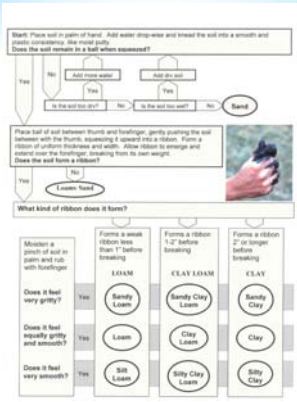
USDA SOIL TEXTURING FIELD FLOW CHART



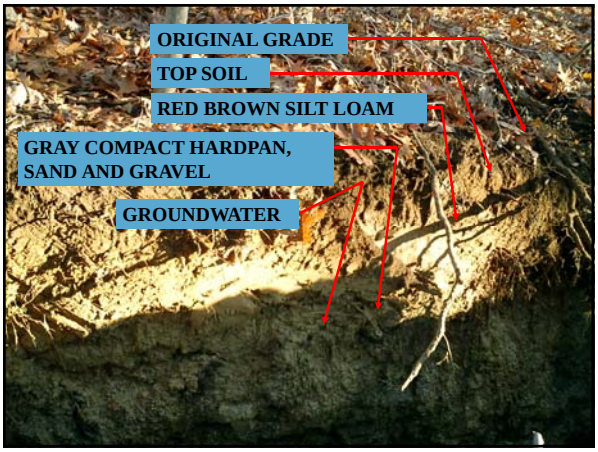
Tools of the trade.
-Field flow chart
-Tape measure
-Water bottle
-Filed book or soils form and pencil

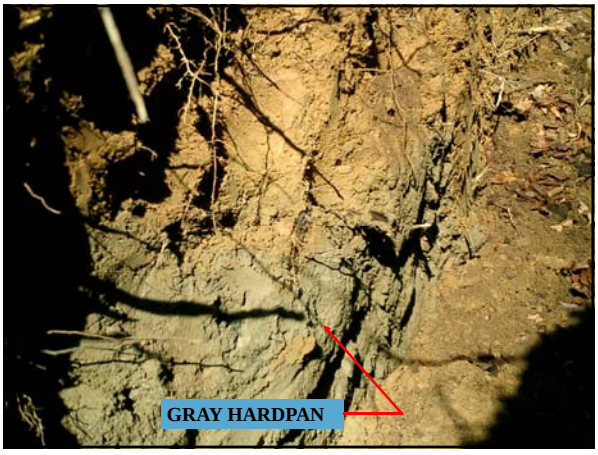
Texture by feel

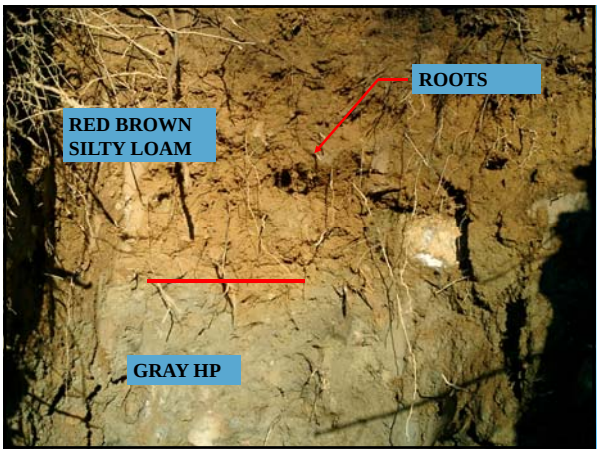
https://www.youtube.com/watch?v=IOyaBxj767s

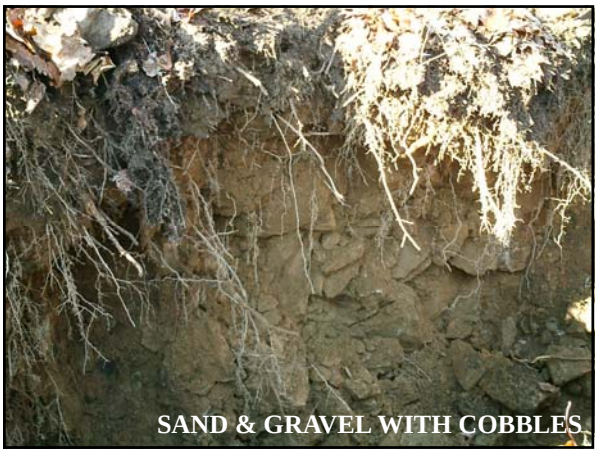


http://www.ext.colostate.edu/mg/Gardennotes/images/214-4.jpg







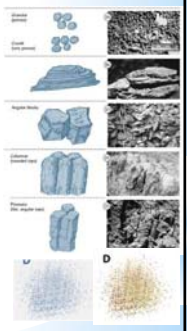


*Soil structure

Arrangement of soil particles is called **soil structure.**

Types of aggregates-

- ***Granular** – small , spherical, non porous (< 0.5 cm), found in horizons, roots growth
- ***Platy** – thin, flat plates that lie horizontally; usually found in compacted soil
- ***Blocky** – irregular blocks, may be aggregated (1.5 – 5.0 cm)
- ***Columnar** – vertical columns of soil having salt 'caps' at the top; found in soils of arid climates
- ***Prismatic** – vertical columns of soil; usually found in lower horizons
- ***Single grained** – soil is broken into individual particles that do not stick together; loose consistency; commonly found in sandy soil



*Soil Coloring Agents

- *Organic matter: brown to black
- *Iron: yellow, orange, and red
- *Manganese: purplish black
- *Saturated soils: gray and blue

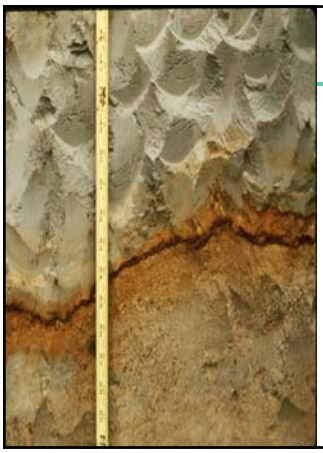
Organic Matter

Credit: Peter Fletcher

Typical Colors of an Upland Soil

- Topsoil, typically brown color, mix of organic and mineral
- Subsoil, dark yellowish brown color, iron oxide (rust) coatings on sand and silt particles
- Substratum, color of mineral soil particles (unweathered geologic sediments)

Credit: Peter Fletcher



There are several different forms of iron within the soil that range in color from yellow, orange, to brick red

Credit: Peter Fletcher

Manganese
Purplish black color

Credit: Peter Fletcher

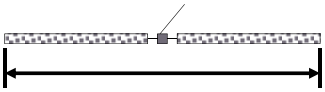
*Site Hydraulics

- *Important factor when designing a septic system
- *The naturally occurring soil surrounding leaching systems should be capable of dispersing the entire volume of sewage effluent discharged on a continuous basis
- *Minimum Leaching System Spread (MLSS)
- *Percolation Test (Perc) measures the rate at which water moves into a saturated soil.

Minimum Leaching System Spread

*MLSS

Calculation to determine how long a leaching system needs to be. (more to come…)



Soil Basics

https://www.youtube.com/watch?v=uimJY25uMR8

stop at 4:31

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* NRCS Web Soil Survey

To start, go to

https://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

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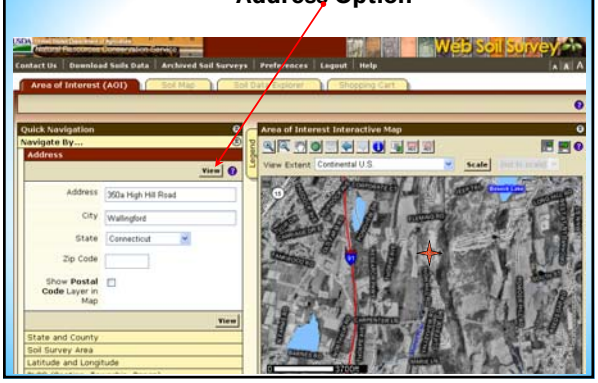
Keeping Connecticut Healthy

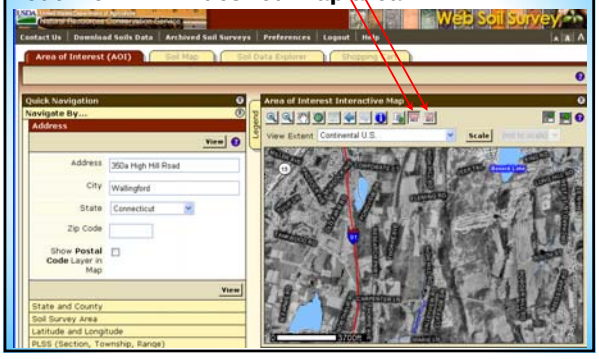
Click on the green "start" button to proceed

Step One: Area of Interest
Find your location

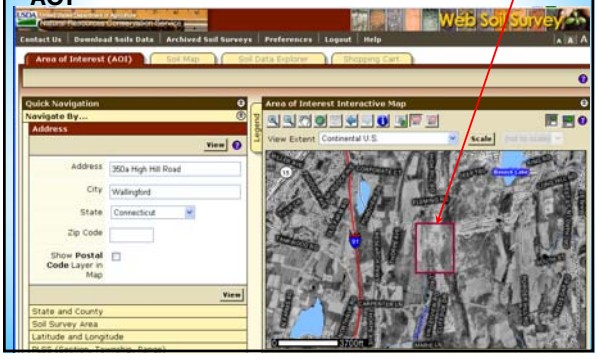
Step One: Area of Interest
Address Option



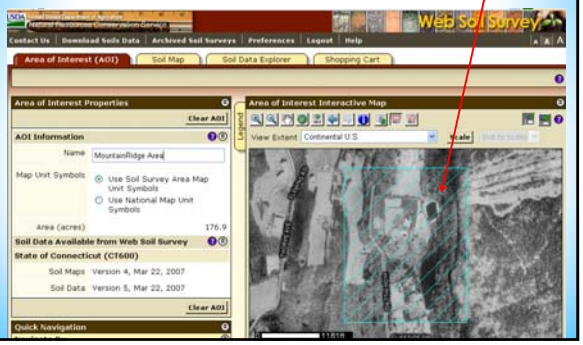
Step One: Area of Interest
Use one of the "AOI" buttons to outline desired map area.



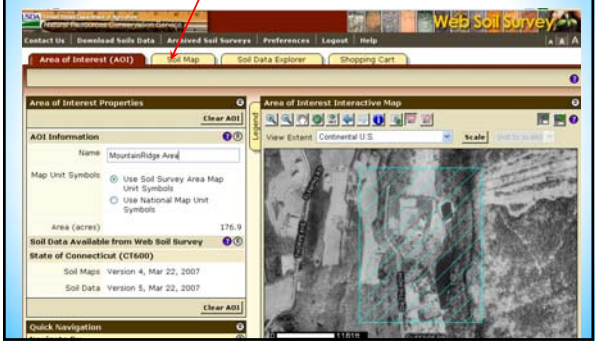
Step One: Area of Interest
Click and drag to form boundaries of "AOI"



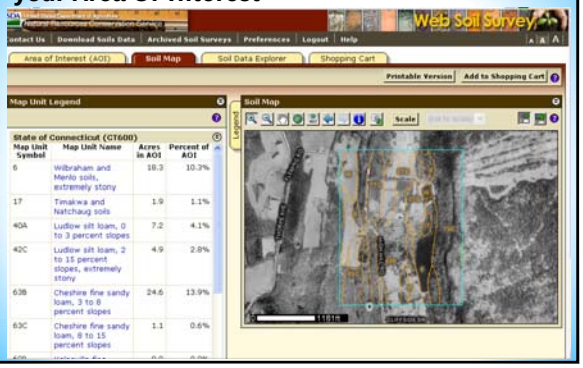
Step One: Area of Interest
Web Soil Survey generates "AOI"



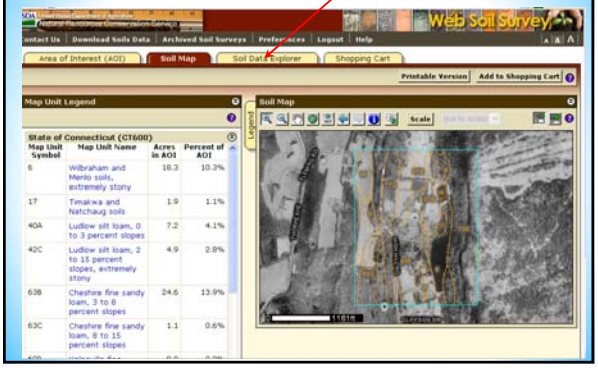
Step Two: Create Soil Map
Click on Soil Map Tab



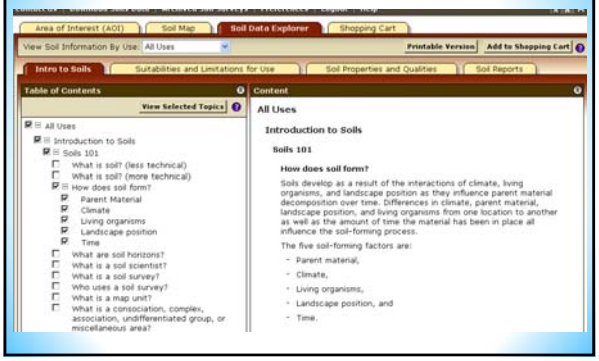
Step Two: Create Soil Map
Web Soil Survey Creates a Soil Map for your Area Of Interest



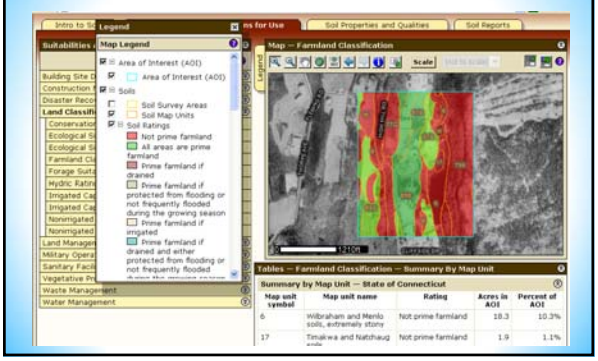
Step Three: Explore Data
Click on Soil Data Explorer Tab



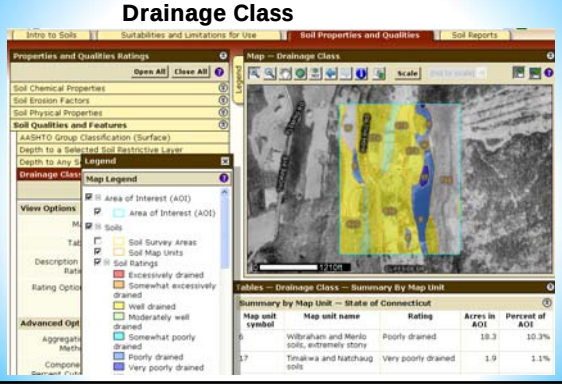
Intro to Soils
Access Basic Soils Information



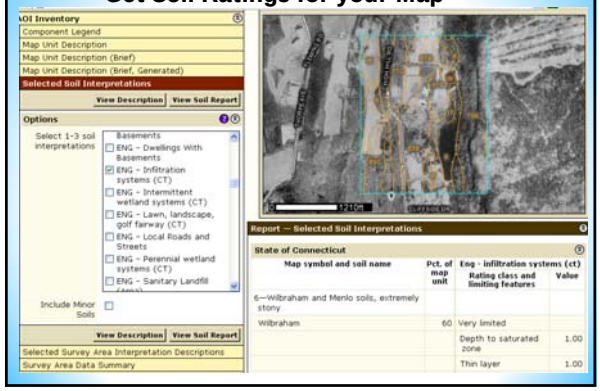
Step Three: Explore Data
Suitabilities and Limitations for use / Farmland Classification



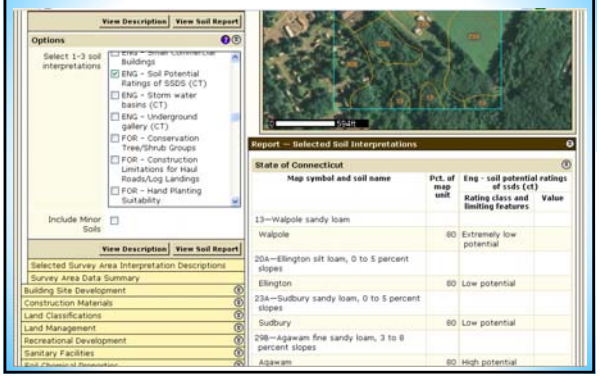
Step Three: Explore DataSoil Properties and Qualities / Drainage Class



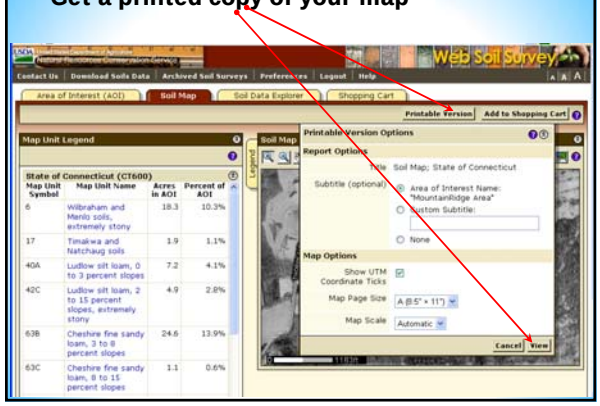
Soil Reports
Get Soil Ratings for your Map



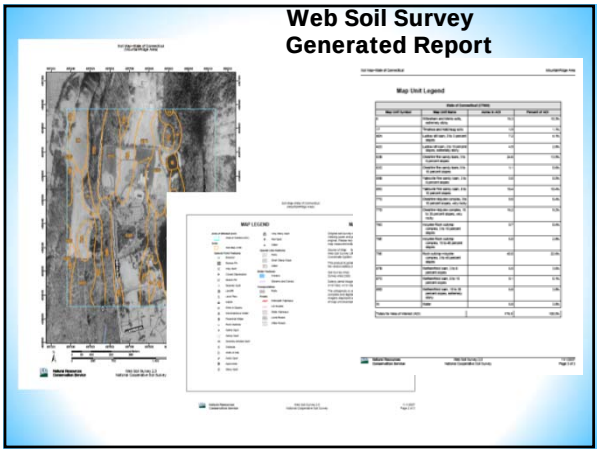
Soil Potential Ratings of Subsurface Sewage Disposal Systems for Single Family Residences



Get a printed copy of your map



Web Soil Survey Generated Report



VIDEO: Evaluating Soils For Onsite Septic Systems

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Site Evaluation

* gathering detailed information about the site
* topography
* physical properties
* depth to restrictive layers
* accurate assessment of site hydrology

Soil Testing Discussion

* Natural soil vs fill. Note fill is fill regardless of how long its been there
  * Fill is discounted in a soil profile.

Buried top soil with vegetation

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Natural soil vs fill

Soil Testing Discussion

* Down gradient soils: Where will the sewage go?
* Wet season testing
* Hydraulic analyses
* Plan info: Test locations, contours, wells, watercourses, drains, soil data, etc.
* Additional testing requests: sieve tests, permeability sampling, soil scientist assessments.

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Test Pit Safety

Entering deep test pits above the waist can result in bodily harm or death in the event of a cave in

According to OSHA, the fatality rate for excavation work is 112% higher than the rate for general construction

Many of these fatalities occur due to soil collapses from excavations

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Always enter and exit any test pit safely!

- ✓ Use care while descending the ramp into any test pit, especially if the soil is loose or wet
- ✓ Never jump down into a test pit
- ✓ Have a plan of escape in the event of a sudden collapse
- ✓ Avoid entering any test pit that is not ramped

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Never enter a test pit if:

- ✓ You see any underground utility lines present
- ✓ There is heavy equipment or machinery within two feet of the pit's edge
- ✓ Heavy machinery is creating vibration near the pit. Wait until all equipment is finished running before entering pit.
- ✓ Any loose rocks or other hazards are visible
- ✓ It looks unsafe.

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Promptly backfill test pits after site evaluation is complete

Open test pits can pose dangers

- Children Playing
- Pets
- Other workers on site

In addition, test pits may provide breeding grounds for mosquitoes when they contain standing water for long periods of time.

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What's wrong with this picture?

Trenching and Excavation Resources

- MMWR Occupational Fatalities During Trenching and Excavation Work United States, 1992 - 2001. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5315a2.htm
- Trenching and Excavation OSHA Standards http://www.osha.gov/SLTC/trenchingexcavation/standards.html
- OSHA Construction e-Tool; Trenching and Excavation http://www.osha.gov/SLTC/etools/construction/trenching/mainpage.html

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