The lifespan of minerals

and their inevitable maturation into hard water.

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Eco-Terr Distributing Incorporated
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ProEquus of America
(a partner company of EDI)

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Part 1, Geologic Definitions of the words: gravel, sand, silt and clay.

Geologic Definitions of Stones, Sand, Silt, and Clay, from the largest to the smallest:
(the following classifications refer only to the size of the particles, ***NOT*** to their mineral makeup. ~mar)
Common Names: There are six (6) basic size categories.
Following are the diameters of the six particles.

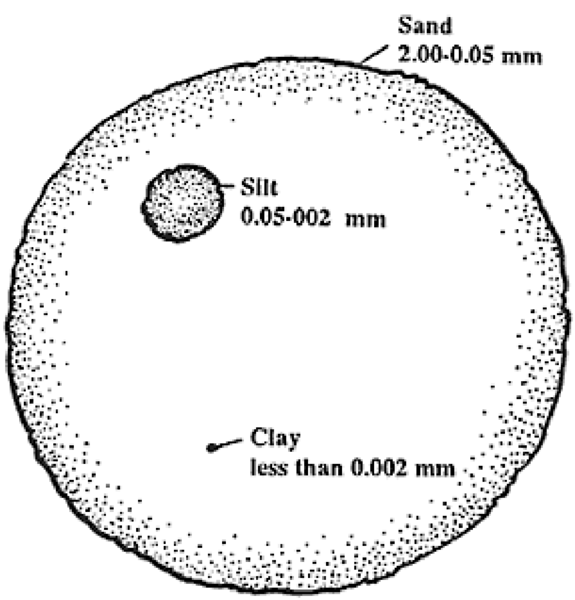
1. **Boulder:** greater than 256mm [app. 10.1" or larger]
2. **Cobble:** from 64 mm, to 256 mm [app. 10.1" to 2.5"]
3. **Gravel**: from "Very Coarse Gravel" = 32 mm–64 mm, down to "very fine gravel" = 2mm to 4 mm [app. 2.5" to 0.079"]
4. **Sand:** from "very coarse sand" = 1-2 mm; down to "very fine sand" = 0.000,625mm to 0.000,125 mm [app. 0.079" to 0.039"]
5. **Silt:** from "0.000,625 mm, down to 0.000,390,625 mm
6. **Clay:** smaller than 0.000,390,625 mm

Each of the above six categories may be further refined into common and scientific (geologi c) terms.
For greater definitions of the sizes, please refer to» http://en.wikipedia.org/wiki/Particle_size_%28grain_size%29

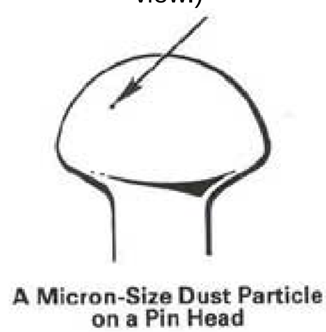
References:
Nasa - http://ltpwww.gsfc.nasa.gov/globe/pvg/prop1.htm
C Mich Un - http://www.cst.cmich.edu/users/Franc1M/esc334/lectures/physical.htm

Small Particulate definitions: As the particles become smaller, at what size does sand become silt, and silt become clay?

Figure 1.



Clay is any particulate size ***down to a Colloidal***, which is a single micron in diameter.
(a micron is one one-millionths of a meter, or app. 39.37 one-millionths of an inch. These require microscopes to view.)



Colloidal refers to mineral particulates which are so small, they are are dissolved into and suspended within liquids. The largest supply of colloidal minerals is the contiguous oceans and seas of the earth, where all these minerals eventually end up as they mature from mountains into boulders, into sand, into silt, into clay, and into "hard water").

Soil types definitions (clay-silt-sand makeup and terminology)
Top 30 cm (7-8 in), typically the "root zone" for natural prairie/meadowland.
[in the N. Indiana-Illinois - "the corn and bean promised land" - this could extend as deeply as 14-18 in, immediately after plowing the color has been described as "black as a field of newly mined coal" - with substantially dense/solid structure, due to root activity + organic decomp which makes it appear almost structureless. ~mar]

The Geotech described the soil as:

"Grey clayey silt, some sand and gravel"

Note (below, Figure 1) the difference between "clayey silt" and "silty clay", "sandy clay" and "loamy sand" etc. The "grey" is an indication of decaying organic matter

This is a good thing, as the soil has more than the minimal requirements, (the "gravel" indicates some vestigial glacial activity remains, hence little if any previous soil disturbances to this soil).

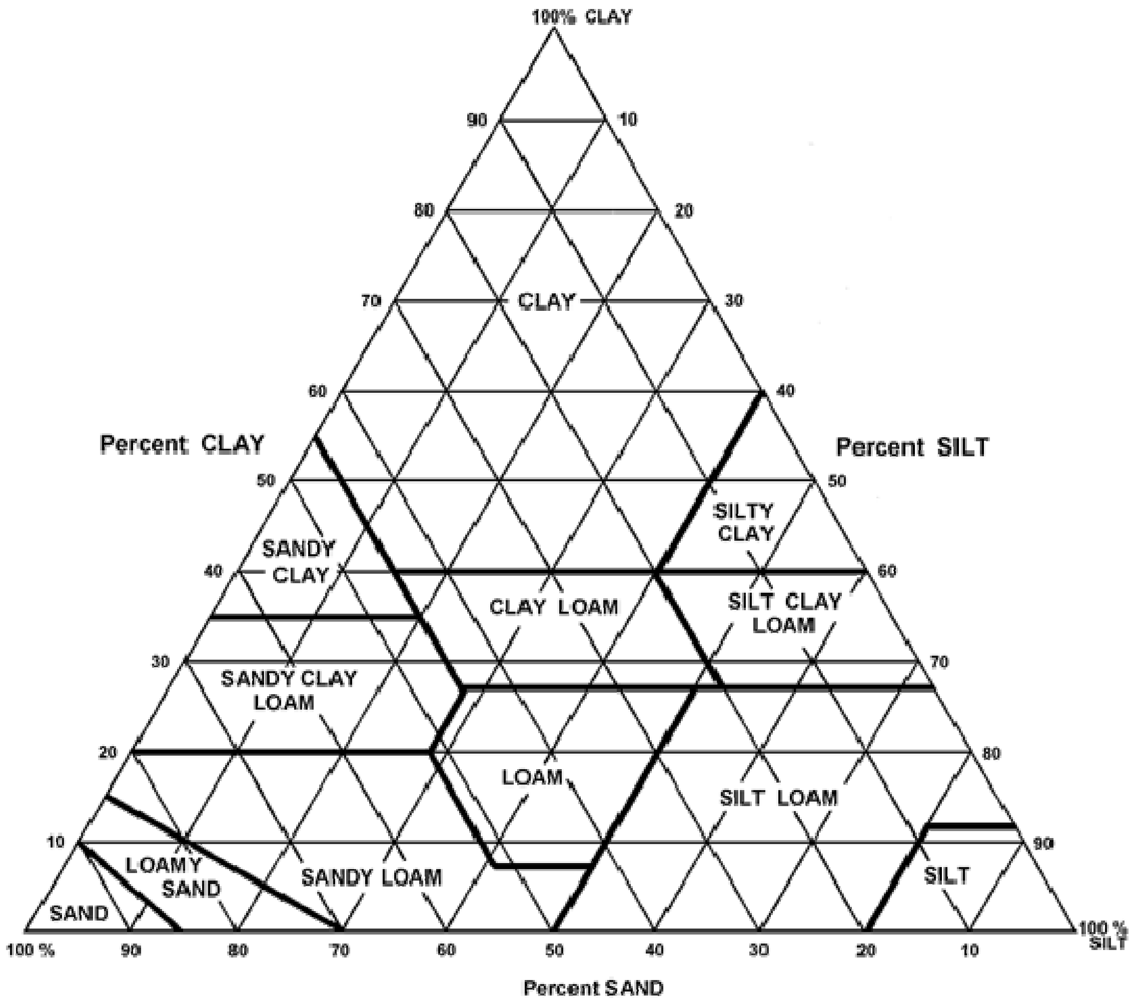
at 30 cm depth:

description changes to***" brown silty sand and gravel"***

Notice he has dropped the "clay" and replaced with "gravel"

This should indicate that the soil is very stable, while being virtually free of previous disturbance. ~mar

Figure 2.

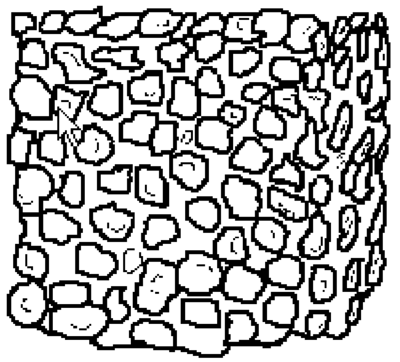
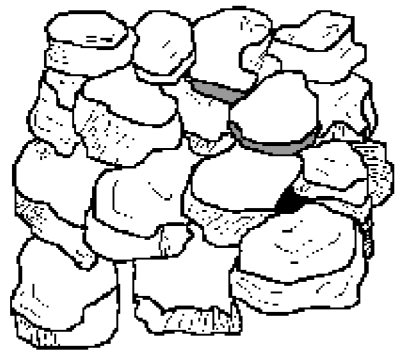
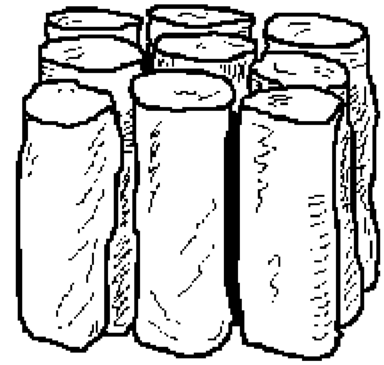
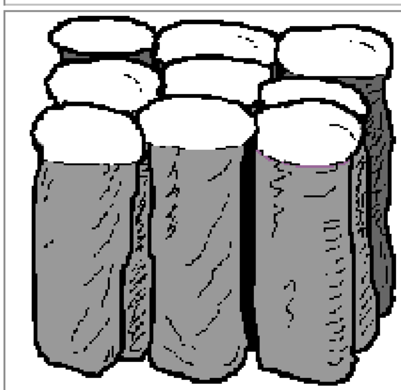
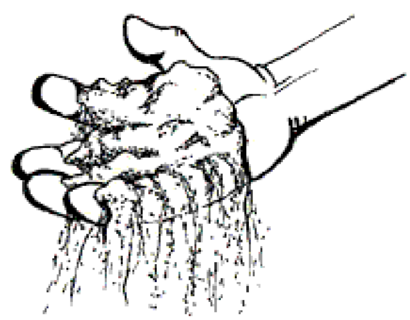


Soil "peds" (L. "pes/ped"="foot")

These are helpful in determining the history of the soil...

Figure 3. graphical drawing

(see also below: photographs in "Figure 4. **Structured soil**")

		
Granular: Resembles cookie crumbs and is usually less than 0.5 cm in diameter. Commonly found in surface horizons where roots have been growing.	**Blocky**: Irregular blocks that are usually 1.5 - 5.0 cm in diameter.	**Prismatic**: Vertical columns of soil that might be a number of cm long. Usually found in lower horizons.
		

Photographs of above diagram: please see Figure 4. Structured Soil on next page

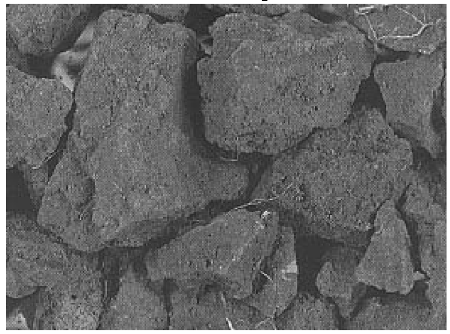
Figure 4. **Structured soil**

Granular Ped

Commonly native vegetated pastures/fields, and meadows.

We believe this >>>> would best describe your site, correct?

Blocky



Prismatic

Columnar

We are hoping this does *NOT* best describe your soil. **>>**

Platy structure commonly indicates previous compaction, probably due to surface traffic.

~mar

Platy

Figure 5. **Structureless Soil**

Part 2, what happens when sand matures?
Where does all the sand go, except for the quartz sand?

About Silica Sand

The Time of Sands: Quartz-rich Sand Deposits as a Renewable Resource

[Abridged, for full article ***goto >>*** http://egj.lib.uidaho.edu/index.php/egj/article/view/3085/3043]

Author: Nelson R. Shaffer
Originally published in: *Nannovations, USA*

... Sand on the Move
Weathering and Transport

The mineral mosaics of rocks degrade and fall apart once subjected to surface conditions that mount a complicated assault of chemical and physical forces collectively known as weathering. Temperature changes, wetting and drying, sunlight, microorganisms, and most importantly freezing and thawing of ice or crystallization of other minerals produce repeated mechanical forces that force originally interlocking mineral grains apart. Chemical reactions especially those involved with water further liberate and modify mineral grains. Weathering is especially severe in high mountains. Over time high mountain ranges are virtually flattened by weathering (Ritter, 1986).

Rock and mineral fragments, once liberated from their igneous origins, move by gravity, ice, water, even air currents toward the lowest points on Earth usually the sea floor. ***Erosion and transport of grains result in destruction of physically weak minerals*** as they cascade down mountains, crash into boulders, and grind against each other. The constant jostling reduces sizes of mineral grains, grinds off corners and eliminates unstable or weaker minerals. The aggregate of weathered and transported grains are called sediments.

Sediments, like humans, reflect the rigors of their experiences. ***Mineral grains that have traveled far*** have ***more refined*** compositions, shapes, sizes, and companions. ***Mature sediments are those which have long experience in traveling. Silica sand deposits are usually mature or supermature.*** Geologists employ sophisticated measurements to characterize sediments. One of the most common is grain size which is determined by the screening process as discussed earlier. Natural deposits contain a range of shapes and grain sizes from fine (Figure 10) to coarse (Figure 11).

Particles that are immature generally are angular in shape (Figure 12), but they become more rounded with transport and maturity. Many sand consumers prefer very round grains (Figure 13) because they flow easily and react completely, but for some uses such as foundry molds, angular grains are preferred because they form a more stable body. Abrasive producers also prefer angular sands. More mature sands are well sorted meaning that they have a relatively limited size range and sedimentologists use sophisticated statistics to quantify size, angularity, and sorting of grains.

Mature sands tend to be made dominantly of one mineral, quartz. Younger sediments often contain relatively unstable minerals such as mica or feldspar or even individual rock fragments containing several different minerals. Very long travel times or multiple transport events can lead to deposits of remarkable purity. Super mature sands often are more than 95% quartz with some natural deposits containing 98% quartz. These high-purity sands have numerous economic applications and are required for glass manufacture (Table 2).

Sediments deposited by glaciers are almost never pure enough nor of proper sizes to be used as industrial sands but most can be used for construction purposes. Moving water or air are great media for sorting and refining raw sand materials . . . (ed. abridged. ~mar)

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