UNDERSTANDING YOUR SOIL

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Soil Texture. The mix of particle sizes in your soil influences almost everything else. For example, finer soils (clay and silt) hold more water and nutrients. Coarser soils (more sand) warm up faster in the spring. Here's three ways to find out what texture you're dealing with.

1. The Jar Test. Heavier soil particles sink first in a jar of soil and water, shaken up. Here's how:

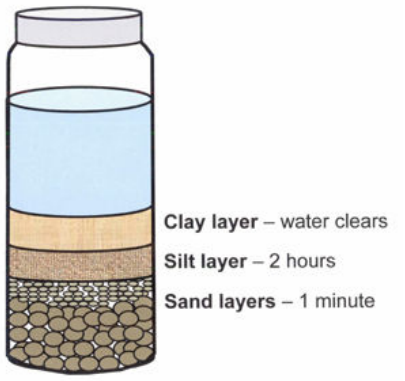
1. Start with a straight-sided large jar, such as a 1-quart Mason jar.
2. Gently crush a dry scoop of soil. Clean out any larger rocks and bits of organic debris (leaves, twigs, etc.). Be sure soil is dry and then completely broken up. Lumps and clumps will lead to inaccurate results.
3. Put soil in jar – about 1/3 full.
4. Add a teaspoon of Calgon, salt, or any non-sudsing detergent to help the particles disaggregate (separate).
5. Fill jar with water to 2/3 full. Put on the lid – tightly!
6. Shake the jar vigorously for at least 5 minutes. (Note: if more water is needed, add more and shake again.)
7. Set the jar down in a place where you can observe the contents, without moving the jar, for at least 1 week.

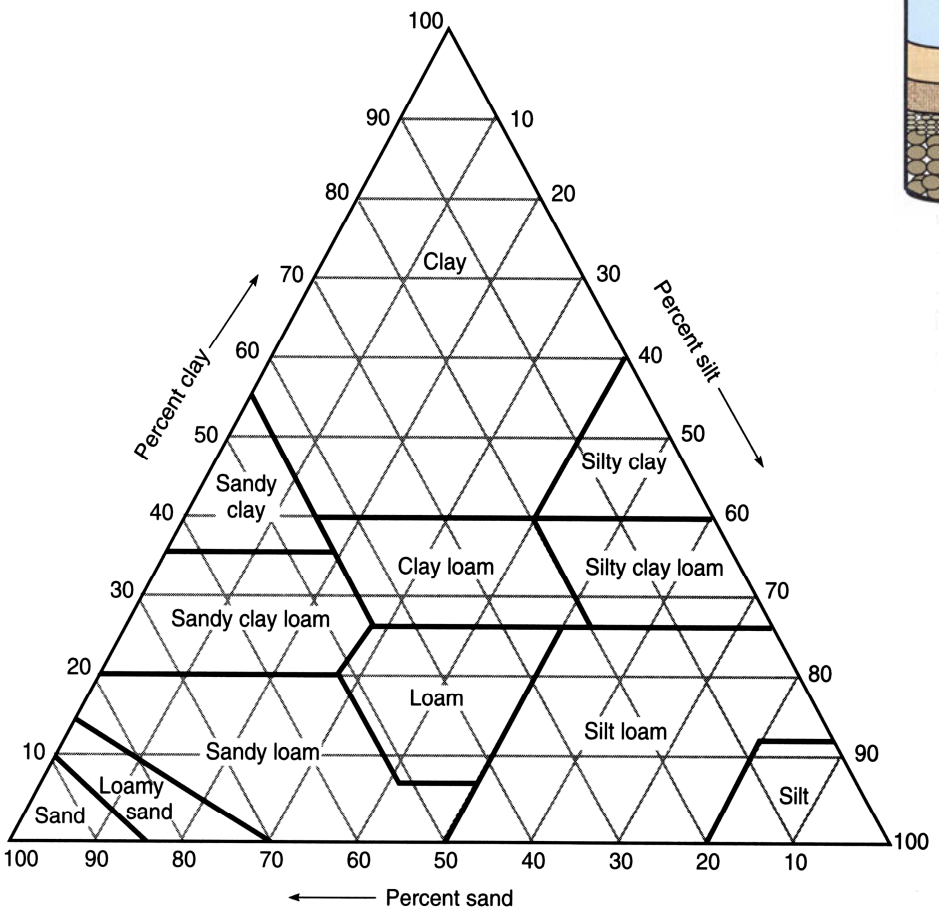
Sand and larger particles will sink in under 1 minute. Silt takes several hours. Clays, the finest particles, may take up to a week. Humus and other organic particles may remain floating on top. When the water begins to clear, use a ruler to measure the thickness of each layer of sand, silt and clay, working from the base of the jar up to the bottom of the water section. Then divide by the entire thickness to discover the percent of each segment, using the form below:

Sand thickness (____ in.) / total thickness (____ in.) = _____ % SAND

Silt thickness (_____ in.) / total = _____ % SILT

Clay thickness (_____ in.) / total = _____ % CLAY





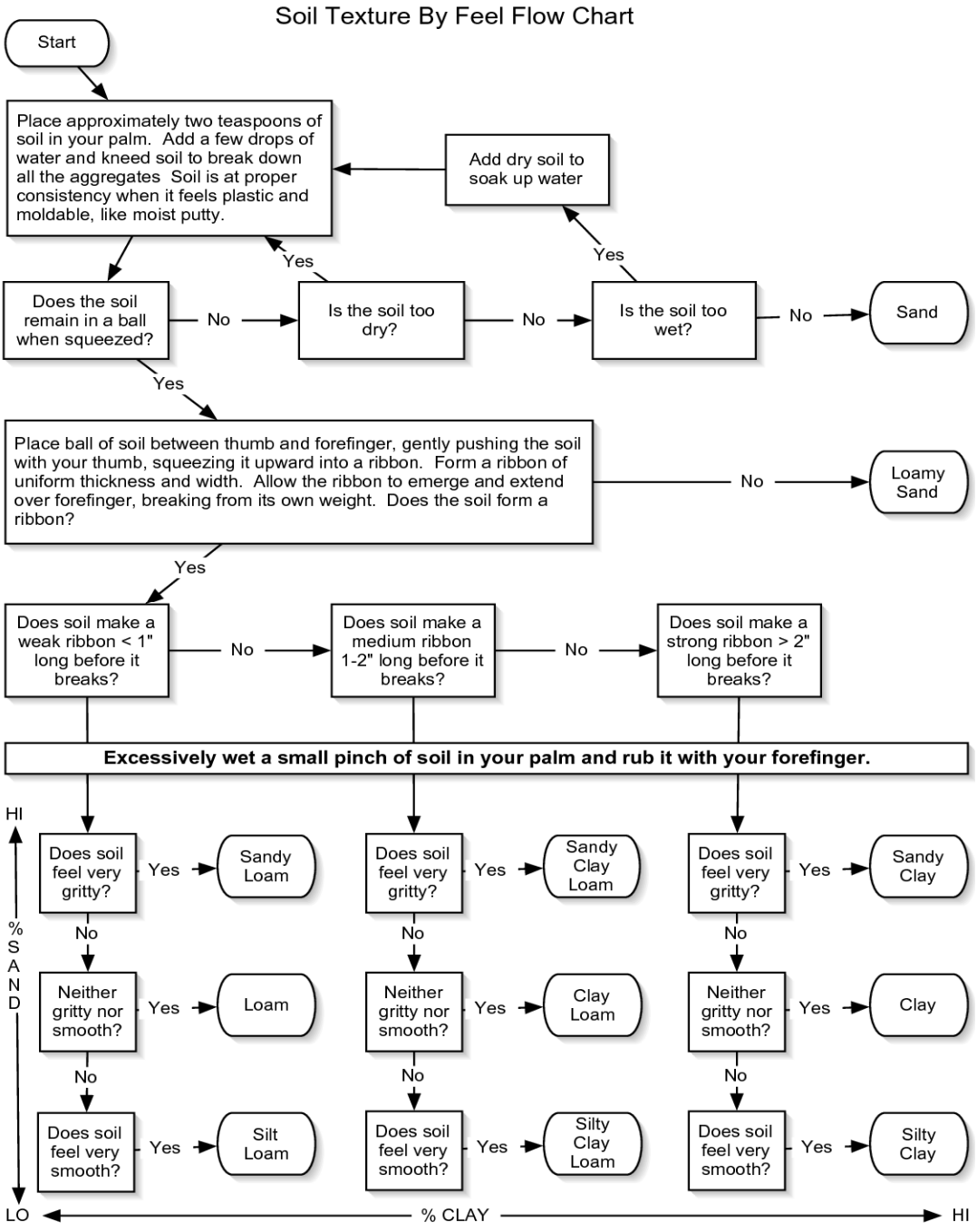
SOIL TEXTURE TRIANGLE

Follow the lines for % sand, then silt, to see which soil texture you have. Loams are very good: the mix of particle sizes gives soil better moisture-holding and nutrient-holding ability, better spaces for roots and microorganisms, and better drainage. Vegetables love sandy and silty loams.

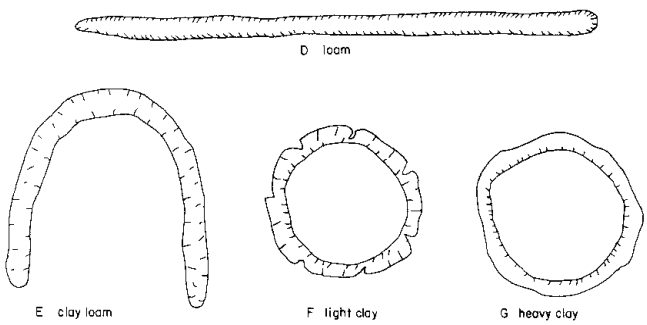
Your soil texture is:

_____

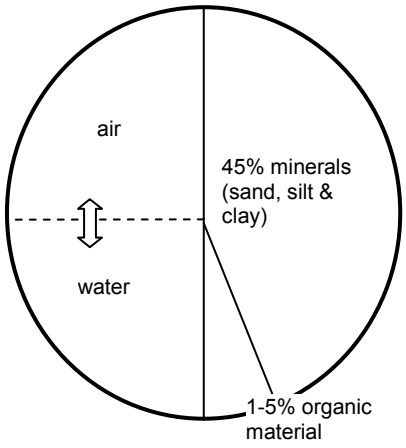
2. The Hand Test. With a little soil and some water, gently squeeze, pinch, feel and even listen to identify the different textures. Compare different spots in your garden, including upper soils versus lower layers.



3. Ropes and Rings. Fun for kids of all ages! Use a spoonful of soil, some water, and your hands. Sand won't form a ball. Loamy sand forms a weak ball; sandy loam a better one. Silt loam can be rolled out into a short, fat "rope" and then breaks (C). Loam (D) rolls out thinner and up to 6" long, but breaks when you bend it. Clay loam (E) will bend –carefully – into a "U" shape. Light clay will join into a circle but with cracks (F). A true, full, round smooth circle is a sign of heavy clay (G).



Soil Composition.



A dynamic mix of lithosphere (minerals), hydrosphere (water), atmosphere (air) and biosphere (living and dead organisms), soil is the ecosystem that combines them all.

Q. How do you make sure you have enough air and water space?
A. Prevent soil compaction. Like a good brownie or a loaf of bread, soil needs its "macropores" and "micropores" to have good structure. The pores hold moisture and air for healthy plant roots, allowing them to fluctuate back and forth. The pores also provide habitat and nourishment for the millions of soil organisms that make soil rich and fertile. To "lighten up" and loosen soil (of any texture), gently add composted organic material into the top few inches of the soil.

Key Terms

Tilth – soil that is moist, fine textured, friable, easily penetrated – ideal for good seed sprouting and emergence. "Something a good farmer can recognize with his boot, but no soil scientist can describe."
Friable – soil that holds together in granules or small clumps, but crumbles easily under light pressure.

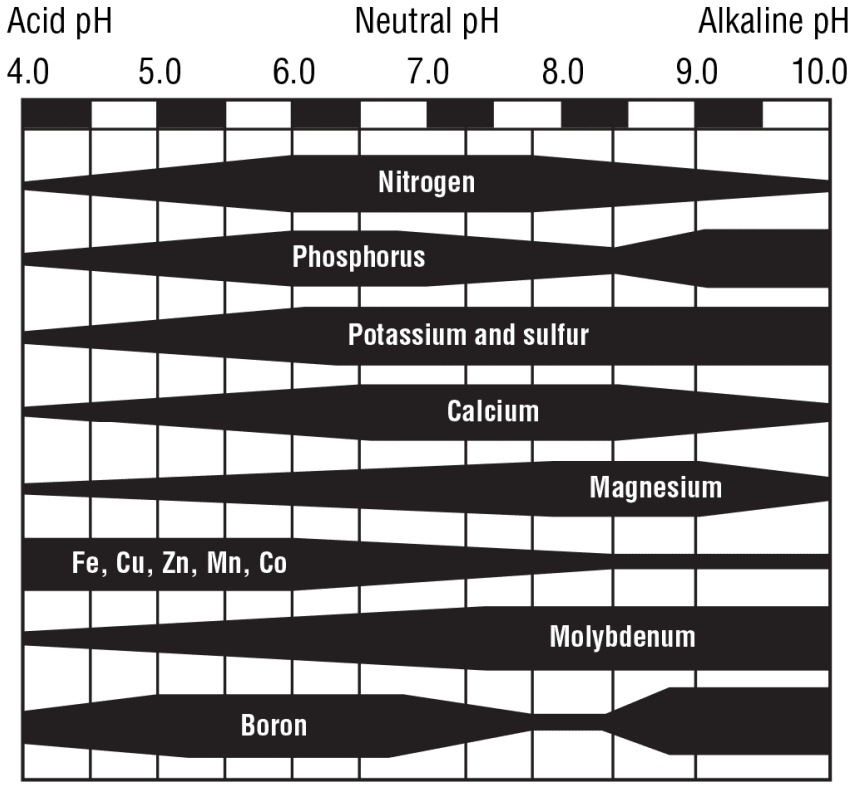
Soil pH – a balance between sour (acid) and sweet (alkaline)

Soil pH results mainly from parent material and centuries of climate. Most of eastern Idaho has alkaline (high pH) soil. You can't change this natural pH. But you can adjust it for each year's crops by adding either (a) compost or (b) sulfur, or even some of both.

The main reason pH matters for plants is shown in the chart: pH affects the solubility of nutrients in the soil. Nutrients must be soluble, that is, available in soil moisture, in order for plant roots to take them in. Low solubility means low availability, which may lead to deficiencies.

A neutral pH is good for most plants, but some vegetables do prefer slightly alkaline soils. Several plant diseases even decrease in higher pH. Lead, toxic metals, and many other contaminants are also less available in alkaline soils.

Soil organisms are also affected by pH. Earthworms prefer more neutral soils. Soil fungi flourish in acid soils, while bacteria predominate in alkaline ones. A pH of 6.6-7.3 is best for microbial activities that help make nitrogen, sulfur, and phosphorus available.



Effect of soil pH on the availability of plant nutrients

Soil has many functions:

(1) sustains most plants, including food crops, with nutrients and a stable rooting base.
(2) regulates the flow and storage of water.
(3) is home to over half the world's organisms.
(4) filters, decontaminates, stores, and recycles water, air, and dead matter.
(5) provides a stable base for houses, roads, dams and other built structures.
(6) is a source for clay, bricks, paints, dyes, life-saving medicines, cosmetics; and more.
(7) holds a record of human history and archaeology.
(8) links humans to their homelands, to nature and our "native soil." "Playing in the dirt" even keeps us healthy and happy by priming our immune systems, and boosting "good mood" regulators in our bodies.

Soil Quality. Helping soil serve its functions well is managing for ***soil health***, or ***soil quality***. There is no single "best" soil; each has its own physical, chemical, and biological properties that can either keep providing abundant food, resilient ecosystems, water and air quality, and human health – or deteriorate.

Soil Quality is the idea that not just scientists, but every person who cares about the land, can easily monitor soil quality to help sustain this vital resource now and into the future.

You can use the 10 soil quality indicators below to assess your eastern Idaho soil. They are quick clues to the fertility, structure, moisture capacity, and more. Carry out the assessment regularly, record the results, and you will see how to sustain and improve your soil quality.

Soil Quality Indicator	When to assess	Poor quality	Medium Quality	Good Quality
Earthworms	*Spring or fall, with moist soil*	0-1 worms in shovelful of top foot of soil. No casts or holes.	2-10 in shovelful. Some casts or holes.	10+ in top foot of soil. Lots of casts and holes in clods.
Organic matter color	*Moist soil*	Topsoil color same as subsoil or non-garden soil	Surface color close to subsoil/non-garden soil	Topsoil color clearly darker; distinct color change
Organic matter residues	*Anytime*	No visible residues, leaf mulch, or other matter	Some residues	Residues on most of soil surface
Root health	*Late spring (rapid growth stage)*	Few, thick roots. No subsoil penetration.	Some roots; off color (staining) inside root	Roots fully branched out, extending into subsoil. Root exterior and interior is white.
Subsurface compaction	*Before working or after harvest, with moist soil.*	Wire pinflag or similar stiff wire breaks or bends when inserting	Have to push hard, need fist to get wire in.	Wire flag goes in easily with fingers to over a foot deep
Soil tilth, mellowness, friability	*Good soil moisture*	Looks dead. Like brick, or clods of concrete. Either blows apart or is hard to pull a tool through.	Somewhat cloddy, lumpy, balls up, rough to pull tool through.	Soil crumbles well, can slice through, like cutting butter. Spongy when you walk on it.
Erosion	*After heavy rainfall*	Rapid runoff the color of soil; gullies over 2 in. deep, gullies join up.	Few rills or gullies. Some swift runoff, colored water	No gullies or rills, clear or no runoff
Water holding capacity	*After rainfall, during growing season*	Plant stress two days after a good rain	Water runs out after a week or so	Holds water for a long period of time without signs of drought stress
Drainage infiltration	*After rainfall or heavy watering*	Water sits for a long time, evaporates more than it drains. Ground is always wet	Water lies for a short period, then eventually drains	No ponding, no runoff, water moves through soil steadily. Soil not too wet, not too dry.
Crop condition / good even growth	*Growing season. Good soil moisture*	Poor or uneven growth, yellow or purple color	Fair growth, spots of better/worse growth, medium green color	Normal healthy dark green color, good growth all season, across entire crop or garden

10 Key Ways to Increase Soil Organism Diversity & Abundance . . .	**. . .or the opposite**
1. Improve drainage & aeration (broadfork, earthworms, compost, roots/residues)	compaction
2. Protect organisms and soil structure by working soil gently, lightly, or not at all	over-tilling
3. No till, low till, or only surface till – and then only when soil is dry	till when wet
4. Composting and surface mulching	bare, with surface erosion
5. Balanced organic fertilizer/nutrient inputs (such as compost and fish emulsion)	pesticides, fumigants
6. Returning residues to surface soil, leaving roots to decompose in place	residue removal or burning
7. Crop rotation	monocropping
8. Broadcast seeding, intercropping, underplanting	row crops
9. Cover crops or mulch between seasons or crops	bare fallows
10. Organic mulches	plastic mulches