NUTRIENTS FOR LIFE
FOUNDATION

STATE SOILS

Level: Middle School/High School
Time: 30-45 minutes with discussion and game

Materials:
Soil Cards
10 NET Soil Samples
Soil Triangle Handout

Corresponding Nutrients for Life education materials:
- Nourishing the Planet in the 21st Century middle and high school curriculum (Lesson 2)
- NPK Soccer Boy Poster
- Flashcards

Procedure:
1. Refer to Lesson 2 in Nourishing the Planet in the 21st Century middle and high school curriculum for background information.

2. Compare and contrast the soil samples given from your NET membership. Notice the differences in color, texture, region. Discuss the differences and similarities. Which states are from the midwest and are they alike or different? Do this with each region of the United States (Note- soil samples might not be the state soil).

3. Discuss the three particle sizes that make up soil: Sand, silt and clay. Explain the soil triangle and that each soil can be classified into the soil types located on the triangle.

4. Give students the state soil cards to review.

5. Have students complete the soil triangle practice worksheet. Note: Some answers could be multiple states.

6. Review with a Kahoot game located:

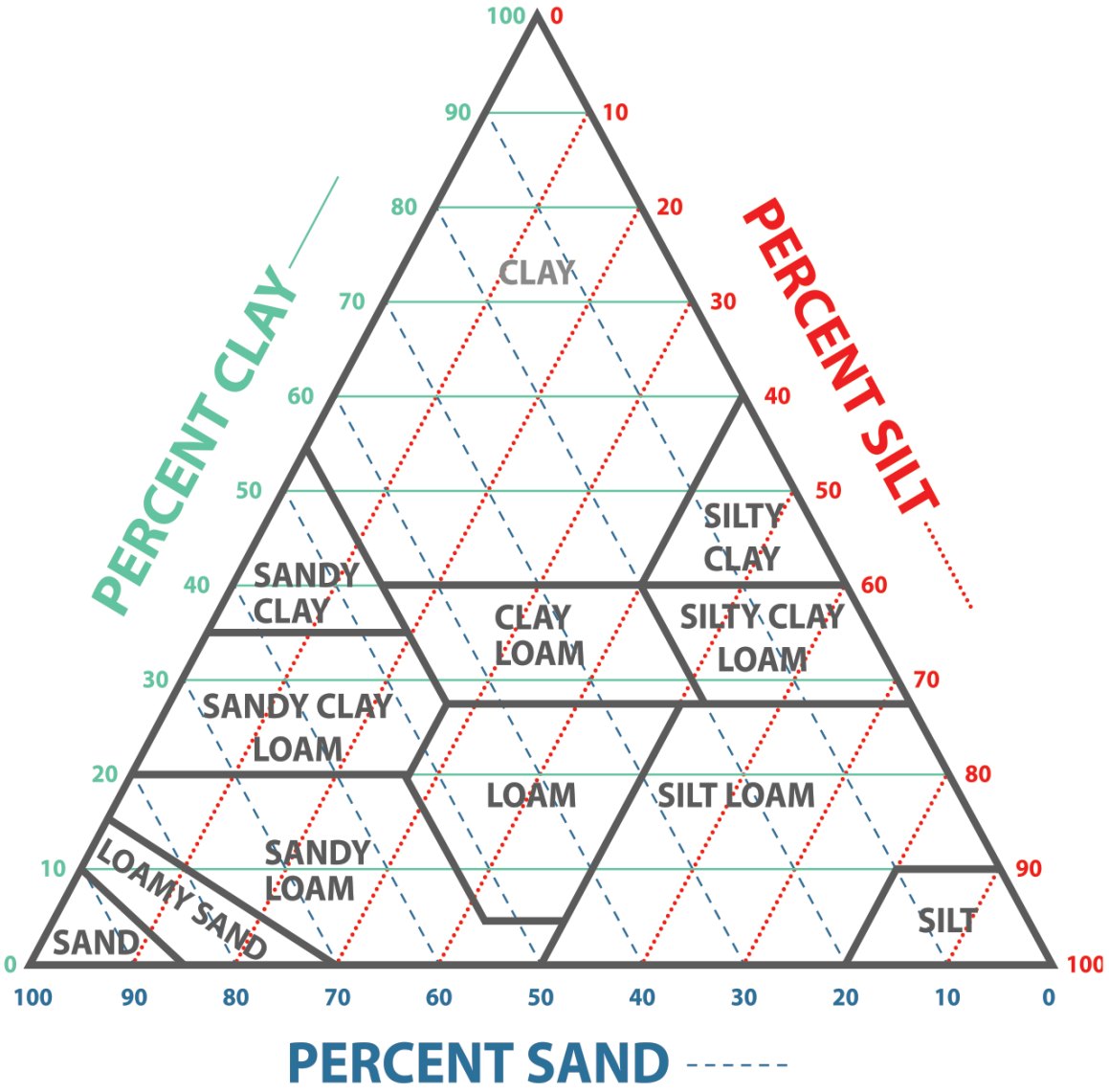

FIGURE 3. THE SOIL TRIANGLE IS USED TO CLASSIFY SOIL TYPES.

STUDENT WORK SHEET

	% SAND	%Silt	%Clay	Texture Name	Name a state
a)	15	35	50	Clay	Texas
b)	92	6	2	_____	_____
c)	20	66	14	_____	_____
d)	63	26	11	_____	_____
e)	14	68	18	_____	_____
f)	18	45	37	_____	_____

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State Soil Cards

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State Soil Cards

Every soil can be separated into three separate mineral soil size fractions called sand, silt and clay. These varying sized particles make up the soil texture. They are present in all soils in different proportions and say a great deal about the character of the soil.

Maine

- State Soil – Chesuncook
- very deep, moderately well drained soils on upland till plains, hills and mountainside slopes.
- These soils formed in dense glacial till, derived from dark metamorphic rocks.
- They are found mostly on forested landscapes with slopes ranging from 3% to 45%.
- Forested Chesuncook soils typically have a 2 inch organic layer on top of a thin (often 2-3 inches) light pinkish gray silt loam mineral soil layer. The subsoil, is typically a silt loam with dark reddish brown to yellowish-brown colors about 14 inches thick. The lower subsoil and substratum, where a seasonal high water table occurs, is usually gravelly loam with light olive brown color to a depth of 65 inches or more.
- Made up of silt loams

Illinois

- State Soil – Drummer
- It is the most common among the dark colored soils or "black dirt" of Illinois.
- The dark color is due to the high amount of organic matter inherited from the decomposition of the prairie vegetation that is growing on the soil.
- Very deep, poorly drained soils that were formed in 40 to 60 inches of loess or other silty material and in the underlying loamy stratified outwash on nearly level or depressional parts of outwash plains, stream terraces, and till plains.
- Drummer's topsoil is more often silty clay loam in texture but sometimes silt loam. The topsoil is black in color and moderately acid to slightly alkaline.
- Soil texture in the lower layers or subsoil is mainly silty clay loam, with occurrence of silt loam, loam, sandy loam, clay loam, and sandy clay loam possible. The subsoil is grayish brown and gray in color.

Iowa

- State Soil – Tama
- Tama soils are very deep, well drained soils.
- The topsoil (the layer of soil that we plow and plant seeds in) can be up to 36 cm (14 inches) thick with 3-4% organic matter.
- It has a soil texture that is usually a silt loam or silty clay loam, and has a very dark grayish brown to black color when moist.
- The subsoil, below where a farmer plows, is silty clay loam or silt loam down to at least 100 cm deep (almost 4 feet). Even at that depth, the soil is home to roots of old prairie plants and grasses.
- The subsoil has a yellowish-brown color, less organic matter than the topsoil and loses some properties which make it good for growing crops. For this reason preventing erosion is important for plant growth! The different horizontal layers of the soil are called soil horizons. Tama soils typically have about 5 horizons.

Kansas

- State Soil – Harney
- The region that Harney soil formed in has loess (wind-blown sediments, pronounced "luss") parent material, an upland landscape position, prairie grasses as native vegetation, and little annual rainfall (see CIORPT below).
- Harney soils are deep, well-drained soils. They are found on upland landscapes with up to 8% slope in some places, but 0-3% is most common.
- In Harney soil, the topsoil or A horizon (the layer of soil that we plow or plant seeds in) is a silt loam. The subsoil or B horizon has an increase in clay, and is a silty clay loam texture.

Nebraska

- State Soil – Holdrege
- The Holdrege soils are very deep with small and medium (clay and silt) sized soil particles that result in excellent water storage but may restrict water movement through the soil.
- The soil particles were originally deposited by wind and stabilized by tall- and mixed grass prairie. Lands that have been cleared for agriculture have great potential for wind erosion.
- The soil is generally found on flat (less than 4%) slopes and has high natural fertility making it excellent for use in agriculture when conservation practices are observed.
- Texture: silt loam, but includes very fine sandy loam, fine sandy loam or loam in the upper part and silt loam or light silty clay loam in the lower part
- Some eroded Holdrege soils have silty clay loam Ap horizons
- Reaction: neutral to moderately acid

Florida

- State Soil – Myakka
- Myakka soils contain mostly sand and is a deep, somewhat poorly to poorly drained, acid soil
- At the surface of Myakka is the A horizon- it is black in color and can be 15 cm thick (6 in). As you dig deeper, the next layer of soil, the E horizon, goes from 15 to 51 cm (6 – 20 in). This horizon is a very pale brown although it may have streaks of many other colors, especially where old roots have died.
- This sandy horizon may be acidic and some of the things that were once found in it have been washed down to the next horizon. This next layer, the B horizon, goes from 51 to 91 cm (20-36 in). It can be black to dark reddish brown, strongly acidic, and sandy. From 91 to 142 cm (36- 56 in) is an in between horizon, the C/B. It has characteristics of both the C and B horizons. It is brown with dark reddish brown spots. Finally, if you dig deeper than 142 cm (56 in), you will find the C horizon which is dark grayish brown, and like the other horizons, is sandy and acidic.
- Roots can be found throughout this soil, although most are found in the upper 81 cm (32 in).
- Not all Myakka soils are exactly the same. Some horizons may be deeper or shallower in different areas. In some cases, these soils may have a layer of muck on the top that is up to 7.5 cm thick (3 in). In areas where this soil is close to limestone, shell deposits, or the beach, Myakka can actually be moderately alkaline (the opposite of being acidic).

Texas

- State Soil – Houston Black
- The first thing you'll notice about this soil is its dark color and how sticky and moldable it is when wet. Because of these qualities, it's often called "black gumbo."
- The Houston Black soil developed from calcareous clays and marls that were deposited during the Cretaceous Age (145 to 66 million years ago) from the receding and advancing shorelines of ancient seas.
- Prairie vegetation contributed to the organic matter and dark color in the surface of these soils. The climate contributed its extreme wetting and drying cycles to the soils shrinks well nature.
- Water will drain through the profile moderately well; however, permeability of water is very slow due to the high clay content (46-60%) in this soil.
- In Houston Black soils, the texture for this series is most commonly clay or silty clay.

Arizona

- State Soil – Casa Grande
- Casa Grande soils are very deep, well-drained, saline-sodic soils located on fan terraces and relict basin floors, at elevations ranging from 700 to 2,000 feet above sea level.
- The slopes of these surfaces range from 0 to 5 percent. These surfaces comprise old alluvium that came from a variety of rocks that include granite, rhyolite, andesite, quartzite, and some limestone and basalt. Alluvium is when clay, silt, sand, and gravel are deposited by flowing streams in a variety of settings. These materials get deposited "downstream," which in this case is at the base of well-worn mountains of southern Arizona.
- These soils are very old and slow in forming since there is very little moisture in the form of precipitation to help with the erosion and deposition of materials needed to create the soils.
- Casa Grande is known taxonomically as a Natrargid which means it is a soil with a lot of salt and silicate clay from a very dry area.
- Breaking down the profile of a Casa Grande soil, the uppermost layer, which is the A horizon, has the texture of fine sandy loam. It is only about an inch deep. The A horizon quickly gives way to a thick clay loam B horizon that gets more and more alkaline with depth, reaching a pH as high as 9.6. This alkalinity can be attributed to an accumulation of salts and carbonates. If an acid, even a weak one like vinegar, is put on this soil it bubbles violently (known in soil science as effervescence). The clay impedes the progress of the salts and carbonates in the soil, compounded by the fact there is very little moisture in the soil profile to allow for leaching. So things like carbonates and salts tend to get stuck in the soil profile.
- Overall the soil profile has a yellow brown to brown color to it, although there can be seen white carbonate coatings as well as a few dark manganese coatings on the surfaces of the soil's structures.

Wyoming

- State Soil – Forkwood
- Originally mapped as Fort Collins, the Forkwood soil was first established in 1980 in Washakie County, in the north central part of the State, to more accurately reflect the climate and geomorphology of Wyoming.
- Forkwood soils are very deep, well-drained soils formed by water washing soil particles downslope and depositing them at or near the bottom. This accumulation of soil particles is called slope alluvium. The parent rocks of Forkwood tend to be shales and sandstones.
- Originally, the land area had developed from older rock formations before the alluvium was deposited over them. These deposits become soil as they are weathered (see CIORPT below) and plants, animals and microorganisms begin to add organic matter to the top layer over thousands of years. They are found on terraces, fans, hills, ridges and piedmonts with up to 15% slope in some places, but less than 5% slope is most common.
- The topsoil or A horizon (the layer of soil that we plow or plant seeds in) of the Forkwood soil is loam in its feel, has a dark grayish brown color and could be up to 15 cm (6 inches) thick (Figure 2). The subsoil or B horizon (the layers below the topsoil) can be clay loam that progressively becomes loam as you go deeper from the 15 cm depth down to the 76 cm (30 inches) depth in the soil. The subsoil colors can include brown, dark grayish-brown, and light olive brown color. The subsoil has a layer of clay accumulation between 13 and 51 cm (5 to 20 inches) and anywhere from 1 to 14 percent calcium carbonate starting around 30 cm (12 inches).

Idaho

- State Soil – Threebear
- Threebear soils consist of three distinct layers know as horizons– a forest litter layer, volcanic ash, and loess (carried by the wind).
- These soils support coniferous forests.
- The uppermost layer or soil horizon (O) is made up of needles and twigs that have accumulated at the surface. The next two horizons, a dark-colored A and reddish-brown B have formed in volcanic ash. The volcanic ash was deposited following a huge eruption of Mount Mazama (now Crater Lake, OR) approximately 7,600 years ago. This volcanic ash ranges in thickness from 14 to 23 inches in Threebear soils. The soil horizons (underneath the volcanic ash) have formed in loess, which is dominantly silt-sized material that has been deposited by wind. A light-colored horizon is present just below the volcanic ash and formed as water has removed organic materials, clays, and other pigmenting agents.
- Over thousands of years, the subsurface silty clay loam horizons have become very dense and are referred to as a fragipan. The fragipan occurs at a depth of 23 to 40 inches, and because of its high density, is not permeable to water and plant roots.

Utah

- State Soil – Mivida
- The Mivida soil is a deep, well-drained soil formed in eolian (wind-blown) sediments and local alluvium (deposited by water) derived dominantly from sandstone.
- The soils are located on structural benches and cuestas on the Colorado Plateau. Mivida soils are at elevations from 5,000 to 6,500 feet and slopes range from 1 to 15 percent. The annual precipitation is 9 to 13 inches with about half of this amount occurring during the growing season. This unique combination of parent material, elevation, precipitation, and landforms are extensive in Southeastern Utah and are significant factors in the formation of the Mivida soil.
- The Mivida soils are correlated to semi-desert ecological sites with potential vegetation of fourwing saltbush, Wyoming big sagebrush, Indian ricegrass, needle and thread, blue grama, galleta, winterfat and other native grasses, shrubs, and forbs. Most of the area is used for grazing of cattle or sheep or for wildlife management.
- In Mivida soil, the topsoil or "A" horizon, is a reddish brown fine sandy loam about 7 inches thick. The fine sandy loam texture enables precipitation to infiltrate and not pond on the surface making the precipitation available to the plants. This is very important in low rainfall areas. The surface layer also includes a low accumulation of organic matter. Although organic matter is relatively low, it is also important for providing plant nutrients and soil structure in this semi-desert climate. The upper part of the subsoil is reddish yellow fine sandy loam about 15 inches thick. At depths starting at 20 to 30 inches is a calcic horizon with visible seams and veins of calcium carbonate. This calcium carbonate is leached from the upper part of the soil and precipitates at these depths.

TEACHER ANSWER KEY

	% SAND	%Silt	%Clay	Texture Name	Name a state
a)	15	35	50	Clay	Texas
b)	92	6	2	Sand	Florida
c)	20	66	14	Silt Loam	KS, IA, ME, NB
d)	63	26	11	Sandy Loam	AZ, Utah
e)	14	68	18	Silt Loam	KS, IA, ME, NB
f)	18	45	37	Silty Clay Loam	IL, ID, IA?