

Essential Question: Why is soil important to all living things?

"Essentially, all life depends upon the soil ... There can be no life without soil and no soil without life; they have evolved together." -Charles E. Kellogg

Overview: Soil makes up the outermost layer of our planet and is formed from rocks and decaying plants and animals. Soil is the naturally occurring, loose mineral and/or organic material at the surface of the earth that is capable of supporting plant growth. Soil is synonymous to the word 'earth', the word from which our planet derives its name.

Soil Composition: An average soil sample is composed of 45 percent minerals, 25 percent water, 25 percent air, and 5 percent organic matter. Different-sized mineral particles, such as sand, silt, and clay, give soil texture. Each soil type has varying amounts of organic matter (living and dead organisms), minerals, and nutrients. In addition, soil stores 10% of the world's potential carbon dioxide emissions.

Soil Formation: - Soil forms by the process of physical or chemical weathering (breaking down) of rocks. Microorganisms in the soil also help breakdown the organic matter in the soil. This decaying of plants and animals helps form healthy soil. In addition, earthworms recycle nutrients and make the soil richer. Soil formation is a lengthy process. Natural processes can take more than 500 years to form 2 centimeters of topsoil.

Types of soil: -Clay, silt and sand are the three types of soil. Most soils are a blend of all three types. The texture and appearance of soil depends on the content of each type of soil in the sample.

- **Sand** is mainly granular and is composed of rock particles and minerals.
- **Clay** has fine-grained minerals and high water content.
- **Silt** is a granular material derived from rock. It may occur as a deposition in water. Silt is also known as stone-dust.

Layers of soil: The topmost layer of soil is called the **Organic, or O** layer (or the Litter layer in the forest), and is also known as humus. **Topsoil, or A horizon**, is the next layer. Topsoil contains high amounts of humus and microorganisms. Of all the soil layers, topsoil is the most biologically active. Plants get the most nutrients from topsoil. The **B-horizon** layer is found just below the topsoil layer. The **B-horizon** has a small amount of humus and is mainly made of minerals in the form of sand, rocks, and clay. The bottom-most layer the **C horizon** is just above bedrock. The C-horizon is mainly weathered rock. A small amount of nutrients leak down into the B and C layers. This happens when rainwater dissolves mineral nutrients from the O and A soil layers into B and C layers below.

Soil erosion is a widespread problem throughout the world. Erosion, the wearing away and transport of soil by wind and water, is a natural process. However the amount of

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erosion has been accelerated by poor land use by humans. Factors increasing soil erosion include cutting down forests, improper farming practices, overgrazing and construction activities. Erosion removes the most fertile soil, the topsoil, and reduces soil productivity. Where soils are shallow, erosion can lead to an irreversible loss of natural farmland.

An example of severe environmental damage caused by erosion is in the expanding “dead zone” in the Gulf of Mexico. Storm water in the Midwest carries fertile soil and fertilizer from the local farms and washes these down the Mississippi River into the Gulf of Mexico. The fertilizer causes algae to bloom in the Gulf. Next the algae dies off, because the blooming algae uses up all of the nutrients in the water. Large amounts of the oxygen dissolved in the water is used up when the algae decomposes. Finally, the oxygen level in the affected Gulf areas drops below what fish and other organisms, like shrimp need to live. Eventually all higher level life dies out in the affected area.

There is a dead zone in our own area! This dead zone is in Hood Canal, just west of Seattle. This dead zone seems to be caused by fertilizer run off and from old septic systems leaking sewage, over fertilizing this part of Puget Sound. We have had large fish die offs as a result in the past 7 years.

Soil sealing is the loss of soil due to humans covering the land for housing, roads or other construction work. This is causing an interesting problem. While on one hand the world’s rapidly increasing population requires more and more housing, on the other hand more land is needed to produce food to feed all these new people. Current studies suggest soil sealing is nearly irreversible, as a result, the world’s population faces some tough choices in the not so far distant future.

Soil is a non-renewable natural resource. This should make us think of how much we actually value this resource. Soil is where crops grow and we obtain much of our food and forest products. Many of the antibiotics used as remedies for infections were obtained from microorganisms in the soil. Thus damage to the soil can disturb nature’s balance and prove a threat to life. **In the words of the Greek philosopher, poet Xenophanes, "For all things come from earth, and all things end by becoming earth."**

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Activity 4 - Everything begins and ends with Soil

schmied@2010 refs: http://eussoils.jrc.ec.europa.eu/projects/soil_atlas/Key_Factors.html

www.Buzzle.com

Please read the article (Projects -> Soil Unit -> "Research Everything begins and ends with soil.") & watch this video: <https://www.youtube.com/watch?v=qMFo5fxE8Bs>

Finally write the answers to these questions in complete, quality and correct sentences => IPQ.



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1. Tell how soil is formed.

2. Explain what an average sample of soil is composed of.

3. Describe two types of soil organisms **AND** tell what each does to make soil healthy and richer.

4. Tell the three types of soil **AND** describe each briefly.

5. Explain which layer of soil is the most important to life **AND** tell two reasons why this is so.

6. Tell three ways humans are increasing soil erosion.

a.

b.

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c.

7. Describe the five steps of the formation of a oceanic dead zone.

a.

b.

c.

d.

e.

8. Explain what soil sealing is **AND** tell what causes soil sealing.

9. Tell why soil sealing is getting to be a problem.

Challenge/HC or Bonus Extra Credit Opportunity for Science Superstars !!!!

Do an internet search on worldwide dead zones. Then tell me the location of at least three other dead zones around the world.