Soil Genesis and Development, Lesson 1: Rocks, Minerals, and Soils

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Abstract: Most soil parent materials were rocks at some time in their history. The minerals in rocks may contribute to soil fertility and other soil properties long after the original rock is gone. Consequently, it is a valuable skill to be able to identify broad categories of rock. This lesson will discuss igneous, metamorphic, and sedimentary rocks and the minerals found in them. The lesson will also provide opportunities for students to identify rocks based on given characteristics.

At the completion of this lesson, students will be able to do the following:

1. Classify rocks based on visual characteristics according to the major types: igneous, metamorphic, and sedimentary.
2. Predict the influence of "parent" rock on soil properties.

The lesson uses an interactive approach, embedding questions in each section of the lesson. The lesson is written to target educational needs of lower-level undergraduate students and is open for use by the public and educational institutions.

Key Words: minerals, rocks, soil, weathering.

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Soil Genesis and Development, Lesson 2: Weathering Processes of Rocks and Minerals

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Abstract: Weathering of rocks and minerals, which include physical, chemical, and biological processes, contributes to the development of soil. The degree of weathering depends not only on the rock and mineral composition but also on climate and biological activities. Experiential learning activities for different global regions support the learning objectives.

At the completion of this lesson, students will be able to do the following:

1. Describe how climatic factors influence the weathering of rocks and minerals.
2. Define and distinguish physical, chemical, and biological weathering processes.

The lesson is written to target educational needs of lower-level undergraduate students in earth and environmental sciences and is available for use by the public and educational institutions

Key Words: minerals, rocks, soil, weathering.

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Soil Genesis and Development, Lesson 3: Soil Forming Factors

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Abstract: This lesson explores the five major factors of soil formation—(1) climate, (2) organisms, (3) time, (4) topography, and (5) parent material—and their influence in forming soil. The distinction between active and passive factors, moisture and temperature regimes, organism and topographic influences, and parent material sources are described.

At the completion of this lesson, students will be able to do the following:

1. Identify the five factors of soil formation.
2. Explain the effects of each of the factors on soil formation.
3. Explain how types of parent material differ in terms of mode of deposition and degree of sorting.

The lesson is written to target educational needs of lower-level undergraduate students and is available for use by the public and educational institutions.

Key Words: climate, parent material, soil formation, topography, vegetation, weathering.

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Soil Genesis and Development, Lesson 4: Soil Profile Development

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Abstract: The processes occurring over time in a soil are reflected in vertical and lateral physical and chemical characteristics of that soil. The four soil forming processes, in conjunction with the five factors of soil formation, organize parent material into a soil profile that consists of soil horizons. These processes can occur over millennia; however, they can also be influenced by short-term variables such as human use. Understanding the processes enables interpretation of the natural history of a soil and provides a starting point to evaluate how future changes will affect the soil resource. Combining landscape history with knowledge of principles of soil profile development allows for more precise and effective land use planning, from residential development to precision agricultural practices.

At the completion of this lesson, students will be able to do the following:

1. Describe the four major soil forming processes.
2. Describe how these four processes redistribute soil materials in vertical and horizontal dimensions.
3. Explain which soil processes are dominant in each soil horizon.
4. Develop a profile horizon sequence based on given soil properties and a set of soil forming factors
5. Describe the general soil forming processes based on the soil forming factors that led to the development of a given soil profile.

The lesson is written to target educational needs of lower-level undergraduate students and is open for use by the public and educational institutions.

Key Words: horizon, soil formation, soil processes, soil profile, weathering.

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Soil Genesis and Development, Lesson 5: Soil Classification and Geography

By: Timothy Kettler, William Zanner, Martha Mamo*, James Ippolito, Ronald Reuter, Dennis McCallister, Patricia Morner, and Jody Soester

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Abstract: The system of soil classification developed by the United States Department of Agriculture (USDA) is called Soil Taxonomy. This lesson focuses on broad descriptions of soils at the Order level of classification.

At the completion of this lesson, students will be able to do the following:

1. Describe the structure of the USDA soil taxonomic system.
2. Describe the defining characteristic(s) of each of the 12 soil Orders.
3. Apply the concept of soil forming factors to the formation and occurrence of each of the 12 soil Orders.
4. Identify regional scale occurrences of soil orders in the USA.

The lesson is written to target educational needs of lower-level undergraduate students and is open for use by the public and educational institutions.

Key Words: soil forming factors, soil orders, soil taxonomy.

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The work demonstrates that process of residual soils formation, depending on zonal and phased regularities, is not only a unit of geological cycle of matters, but it plays a considerable role in soil formation and development of skeletal soils.Â mineral-resistance, their composition and proportion in fine earth of primary soils. Quite important achievement was determination of biological uptake lines and a leaching degree of ash constituents.Â A certain effect of the dense rocks on weathering and soil formation depends upon climatic conditions. In humid zones weathering rate and as a result occurrence in the soil solution of R2O u R2O3 is much higher, what grounds soil formation with undifferentiated profile on either calcareous or basic rocks. Physical Weathering: This is the geological process when rocks get fragmented into smaller particles, without changing the chemical composition of the rocks. This primarily happens due to fluctuating temperatures causing the rocks to break apart. Chemical Weathering: This is the erosion of rocks and other surface materials caused due to chemical reactions. The rocks react with substances in the atmosphere, such as moisture, air, water etc.Â Hopefully, this lesson has helped you understand the significance of soil in our atmosphere, and the importance of minerals in the soil. By following these practices let us ensure that these minerals stay in the soil, and we greatly reduce the erosion and pollution of soil. Solved Example for You. Q: The holding capacity is highest in. UNIT I. SOIL GENESIS, COMPOSITION AND DEVELOPMENT 1.1 Soil as a Natural Resources 1.2 Soil Definition 1.3 Composition of Soil 2. Soil Genesis 2.1 Factors of Soil Formation 2.1.1 Parent material 2.1.2 Living organisms 2.1.3 Climate 2.1.4 Topography 2.1.5 Time 2.2 Classes of Rocks 2.3 The Weathering. Process 2.4 Stages of Weathering 2.5 The Soil Profile 2.6 Effects of Vegetation on Soil Development 2.7 Effects of Climate on Soil Development 2.8 Effects of Soil erosion and Deposition on Soil Development 2.9 Effects of Drainage on Soil Development. Unit II. Physical properties of the soil.Â from the weathering or rocks and minerals and whose properties are conditioned in various...