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| **Lesson Title : Exploring Soil Profiles and The Composition/Properties of Soil Horizons** | **Unit #:**  **1** | **Lesson #:**  **1** | **Activity #:**  **2** |
| **Activity Title: The infiltration of Water Through a Soil Profile.** |

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| **Estimated Lesson Duration:** | **7 Days** |
| **Estimated Activity Duration:** | **5 Days** |

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| **Setting:** | **Classroom (Science Lab)** |

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| **Activity Objectives: Identify and describe the composition and properties of a soil profile/horizons. Explain how water infiltrates through soil and the underground water systems they create. Compare the infiltration of water through each soil horizon.** |

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| **Activity Guiding Questions: What is leaching? What is infiltration? Which soil horizons contain the most organic material. Which soil horizons contain the most inorganic material? How is water able to infiltrate through the different soil horizons?** |

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| Asking questions (for science) and defining problems (for engineering) | Patterns |
| Developing and using models | Cause and effect |
| Planning and carrying out investigations | Scale, proportion, and quantity |
| Analyzing and interpreting data | Systems and system models |
| Using mathematics and computational thinking | Energy and matter: Flows, cycles, and conservation |
| Constructing explanations (for science) and designing solutions (for engineering) | Structure and function. |
| Engaging in argument from evidence | Stability and change. |
| Obtaining, evaluating, and communicating information |  |

| **Ohio’s Learning Standards for Science (OLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| Demonstrating Science Knowledge **(D)** |
| Interpreting and Communicating Science Concepts **(C)** |
| Recalling Accurate Science **(R)** |

| **Ohio’s Learning Standards for Math (OLS) and/or**  **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice (Check all that apply)** | |
| Make sense of problems and persevere in solving them | Useappropriate tools strategically |
| Reason abstractly and quantitatively | Attendto precision |
| Construct viable arguments and critique the reasoning of others | Look for and make use of structure |
| Model with mathematics | Look for and express regularity in repeated reasoning |

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| * **Unit Academic Standards (NGSS, OLS and/or CCSS):** * **Rocks, minerals, and soil have common and practical uses (SC.6.ESS.5)** * **Minerals have specific quantifiable properties (SC.6.ESS.2)** |

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies)  [**http://forces.si.edu/soils/05\_00\_00.html**](http://forces.si.edu/soils/05_00_00.html)  [**https://resources.illuminateed.com/playlist/resource-sview/rid/525b08a513131c542d8f3a7c/id/51f04f2b07121c060eab06e3/bc0/user/bc1/playlist/bc0\_id/519ad0c5efea657621000013**](https://resources.illuminateed.com/playlist/resource-sview/rid/525b08a513131c542d8f3a7c/id/51f04f2b07121c060eab06e3/bc0/user/bc1/playlist/bc0_id/519ad0c5efea657621000013)  **Infiltration quick lab**  [**http://www.doctordirt.org/teachingresources/sponge/runoff**](http://www.doctordirt.org/teachingresources/sponge/runoff)  **Soil web base**  [**http://www.soils4teachers.org/lessons-and-activities**](http://www.soils4teachers.org/lessons-and-activities) |

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| **Teacher Advance Preparation:**   * **Make sure soil profile jars are undisturbed and ready for observation** * **Colored maps** |

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| **Activity Procedures:**  **Day 3: Introduction to composition of soil horizons**   * **Students are placed into groups of 3.** * **Each group receives the soil profile jar from previous lesson.** * **Students are asked to discuss with their groups what they see in the jar. What changed? Why are there layers? What are the layers of?** * **Students share whole class what they observed in the now settled soil profile jars.** * **Soil profile interactive notes passed out to class.** * **Students retrieve their note sheets from the previous class to aid them in the activity.** * **Students make inference on what they believe is in each layer of the profile based on what they observed in the soil before it was placed in the jar.** * **Students write their inferences in the “What I Think” box.** * **Students are then directed to a video (Brain Pop; Soil Horizons)** * **Students re-evaluate the “What I Think” box. What did you get right? What could you adjust?** * **Students are directed to the soil horizon slides to fill out the general composition of each horizon.** * **Students compare the composition of each horizon in their notes to the soil jar.** * **Exit ticket**   **Day 4-5: Composition of soil horizons across the U.S.**   * **Students complete a warm up. “Do you think soil is the same everywhere? If not give an example of how soil could be different in other regions or countries?** * **Have students access “Soils Across the U.S.” online activity.** * **Students are assigned a region to complete a mini poster on. Students are to fill out topography, agriculture, and climate information for each region on their poster.** * **Distribute the “Soil Regions” handout.** * **Have students do a gallery walk to fill out information on each region.**   **Day 6: Composition and properties of soil horizons across the U.S.**   * **Students get out their “Soil Regions” handout from previous lesson.** * **Students discuss and answer the following questions “What regions have the smallest or no “O” horizon? Why do you think this is? What regions have the largest “O” horizons? Why do you think this is?** * **Students are asked to compare and contrast regions by similarities only in groups of 2-3.** * **Students come back whole group to discuss soil regions that are similar to one another.** * **Students compare soil regions by climate.** * **Students are asked to infer why they think some regions are good for agriculture while others are not.** * **Students watch the video “Agriculture Across the U.S.”** * **Exit Ticket**   **Day 7: Composition and properties of soil horizons across the U.S. and underlying water systems.**   * **Students are welcomed with a warm up “What regions do you think received the most precipitation?” “Why do you think this?”** * **Students retrieve their “Soil Region” handout.** * **Have students retrieve frayer charts for unit.** * **Students are to fill out frayer charts for terms (aquifer and underground river)** * **Distribute “Ground Water Storage” and “Percent of Normal Rainfall” maps.** * **Have students evaluate only the Normal Rainfall map. Ask: How do you think water gets into the ground? Based on what you know about soil regions and your Ground Water Storage map. What regions do you think have the most water underground?** * **Have students infer which regions they believe would have the most aquifers and underground rivers.** * **Have students retrieve the Ground Water Storage maps. Explain what the maps are representing to the students. (or have students lead the discussion).** * **In groups of 2-3, have students compare the Soil Regions handout, Percent Normal Rainfall and Ground Water Storage maps.** * **Have students identify and describe regions they believed would have less or more ground water storage.** * **Students color in their Soil Regions handout to identify underground water systems.** * **Exit Ticket** |
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**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

<https://schoology.cps-k12.org/assignment/1385509289>

**Summative Assessments:** These are optional; there may be summative assessments at the end of a set of Activities or only at the end of the entire Unit.

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners.  Refer to Activity Template for details.   * When grouping, students are placed in high, medium, low groups. * In class ESL teacher supports ESL students with the reading and writing of each activity. * Each activity is modeled on the board, giving the students an example of the activity expectations. |

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| **Reflection:** Reflect upon the successes and shortcomings of the lesson.   * Aquifer maps at this age might be a hard concept to understand. It was difficult for the students to understand the relationship of precipitation and underground aquifers/rivers. Students found it hard to conceive that some arid areas still contain a lot of underground water. * Lesson would have been more efficient if students concentrated on precipitation in and around the Cincinnati area. This would have allowed for deeper discussion about concepts like runoff, infiltration, water purification, etc. Students would have been able to refer to things like the Miami and Ohio River, water treatment plants, natural landmarks, and precipitation trends. * Take a few lessons to teach map skills with students. Some students had difficulty analyzing precipitation and climate maps. * If students had good pre-knowledge with reading and analyzing maps the lesson would have been stronger for students to make a connection between precipitation and infiltration into soil. * Students showed stronger discussion and developed better short answer questions when just asked about local precipitation and soil. |
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