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| **Lesson Title : Intro to Destructive Earth processes** | **Unit #:****1** | **Lesson #:****1** | **Activity #:****2** |
| **Activity Title: Erosion Factors** |

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| **Estimated Lesson Duration:** | **4-5 days (50 minute classes)** |
| **Estimated Activity Duration:** | **2-3 days (50 minute classes)** |

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| **Setting:** | **Classroom** |

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| **Activity Objectives:** |

1. Students will be able to identify several factors that affect erosion and describe the affect

 that they have.

1. Given a combination of erosion factors, students will predict the level of erosion that will

 occur.

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| **Activity Guiding Questions:** |

 1. Which factors can expedite the erosion process?

 2. Which factors can reduce or slow down erosion?

 3. How does slope angle affect erosion by water?

 4. How does vegetation affect erosion by water?

 5. How is erosion affected by the presence of vegetation?

 6. How is erosion affected by obstacles (fence posts, boulders, etc.)?

| **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):** |

 OLS: ESS: A combination of constructive and destructive geologic processes formed

 Earth’s surface.

 PS: Forces have magnitude and direction.

 NGSS: - Demonstrating science knowledge

 - Interpreting and communicating science concepts

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies) |

1. Materials for the Stream Lab

2. Computers or computer lab for the interactive activity:

 http://www.glencoe.com/sites/common\_assets/science/virtual\_labs/ES08/ES08.html

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| **Teacher Advance Preparation:** |

Stream Lab: - Make student copies of directions and worksheets

 - Gather all materials needed for the lab

Interactive lab activity: -Make student copies of answer sheets

 - Make sure laptops are charged or that computer lab is reserved

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| **Activity Procedures:** |

 **Days 1&2:** Students work in groups to complete the Stream Lab. This lab consists of a rain

 splash block filled with moist sand into which the students can carve a stream bed.

 The stream bed is then elevated at one end, where a tube supplies a stream of water

 at a constant flow for a prescribed amount of time. During this time, students will

 observe the amount of erosion via sand runoff from the splash block. Variables to be

 investigated in further trials include steeper slope, obstacles in the stream bed,

 meandering stream path, and higher water flow. The lab instructions can be found in

 the attachments. On Day 1, students will learn how to set up the stream bed and will

 complete a few variable trials. On Day 2, students will finish any remaining variable

 trials and make conclusions about their findings.

 **Day 3:** Students will work individually or in pairs to complete all parts of the

 interactive activity at the Glencoe website. Results should be recorded on the

 accompanying worksheet. This program simulates a hillside that receives a rainstorm,

 and it allows the student to adjust several variables before starting the storm. After the

 simulated storm, this program measures the amount of soil that was eroded and gives

 the student a visual representation of the damage done to the hill.

**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

1. Stream Lab: lab results and conclusions can be collected for review and a daily grade based on completion; results can also be discussed in class and grade can be taken for participation in the discussion.

2. Interactive activity: Student results can be treated in the same way as the Stream Lab results described above. A review of some type will be used to gauge level of student awareness and as a second chance to expose students to the content as a way to make sure all students received the concept.

**Summative Assessments: None at this point**.

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| **Differentiation:**  |

 Student grouping will be done in a way that maximizes student success. Lab questions may also be modified and/or reduced as needed by individual students. During discussion times in class, students will be set up for success by asking struggling students a question that they are sure to answer successfully.

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| **Reflection:**  The interactive lab activity went well and was completed in one class period with a minimum of issues. To make sure that students were gaining educational value from its content, I quickly reviewed key points from the activity at the beginning of class the following day.  The stream lab also went well and took two whole class periods to complete. If a group finished with a few extra minutes left, they were allowed to complete the extra trial with a combination of variables of their own choice. This lab is messy, but it gets students interacting with materials and I was glad to hear students teaching each other some of the concepts as they answered conclusion questions together. I surveyed my classes after they completed both the online lab activity and the hands-on lab. While they admitted that information was learned from both modalities, an overwhelming majority of students reported that they preferred the hands-on stream lab as a method of learning to the interactive online lab. If I reteach this project in the future, I will consider leaving out the interactive lab to save a day of instructional time for something more valuable. |