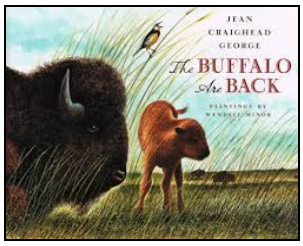
SOIL EROSION LESSON PLAN

Grade / Content Area(s) / Unit of Study	Grade 4 Science
Common Core State Standards **Grade Level Content Expectations** **National Content Standards**	4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or erosion by water, ice, wind, or vegetation. CCSS.MATH.CONTENT.2.MD.C.8 Real-World Math Connection: Money and budgeting
STEAM Integration	**S**cience - Simulate and study effects of air and water on soil erosion **T**echnology - Research through Google Images **E**ngineering - Use design strategies modeled after nature and farmers to minimize soil erosion **M**ath - Design strategies within the cost constraints of a given budget ***R**eading - Build background knowledge by reading aloud a narrative nonfiction picture book about the steps that led to soil erosion in American history
Essential Question / Learning Objective "I can...", "We will...", or "Students will..." statement	We will use engineering strategies inspired by nature and humans to prevent soil erosion by water.
Instructional Methods	1. In order to build a basic understanding of the dangerous consequences of soil erosion, we will read Jean Craighead George's picture book "The Buffalo Are Back".  2. Through discussion of the story, guide students to notice the importance of strong roots in defending against erosion by wind. 3. After that, using their Chromebooks, give students 5 minutes to do a Google Images search of exposed tree roots along the banks of a river. (See the example photograph that follows.) Ask students to identify a favorite image and enlarge it on their screen. Then, invite students to circulate through the classroom "museum" of photos. Once students are seated again, ask what they notice about the tree roots in connection with the soil.

4. Next, ask students to do another search in Google Images, this time of terrace farming in India. Again, allow students to create a "museum" of images and circulate, noticing the soil prevention strategies used by farmers in mountainous areas.

5. Finally, ask students to do one more image search and one more "museum" walk. They should look for photos of sea walls along lake shores.

6. Now, tell students they will be working as a team of farmers to prevent the erosion of their soil into a river during a rainstorm.

Materials needed per group:

- 1 painter's tray
- 4 cups of soil
- Materials list / Budget sheet
- 24 poker chips or construction paper squares–each one representing $0.25

Materials needed for teams to "purchase":

- Straws, pipe cleaners, clay, cotton balls, large popsicle sticks, corks, spoons, aluminum foil, bottle caps
- 8 inches of duct tape

Materials needed for final testing:

- 1 quart of water (yogurt container)
- Small strainer/colander to pour water through (rain)

7. Give students a white board and markers to draw their design. Each student should have a different color marker

	to make participation visible. Teams will need 15 minutes to plan and shop for materials. They will shop using the poker chips. Having to physically set aside "money" for each item is a strong visual and tactile method for practicing counting money and maintaining a budget. 8. Allow students 20 minutes to build. 9. When time is up, invite all teams to watch the testing phase for each project. Each team should describe the strategies they used, along with their reasoning. Then, one student should pour the water through the colander in a back-and-forth pattern over the soil. Teams will look for the loss of soil into the river water well and compare whose strategies seemed to work the best through simple observation.
Check for Understanding / Assessment How will you know if students are meeting the learning objective? What formative/summative assessments will be used?	• Students will demonstrate their learning through the use of strategies when building their project. • They will also demonstrate their learning by presenting their strategies, as well as their reasoning, to their audience during the final testing phase. • Finally, as a whole group, the class will wrap up by identifying which strategies they would recommend to a new farming group attempting to defeat this challenge. Individual teams will also complete a reflection sheet (attached below).
Beyond the lesson…	An excellent extension to this lesson is the video documentary entitled "Wolves Change Rivers". It details the environmental chain reaction that happened in Yellowstone National Park when gray wolves were reintroduced. The video shows the interesting connection between animal life, plant life, and the reduction of soil erosion when the ecosystem is in balance.

NAMES OF TEAM MEMBERS:				
PARTICIPATION POINTS FOR TEAM DISCUSSION:				

CAN YOUR TEAM STOP SOIL EROSION?

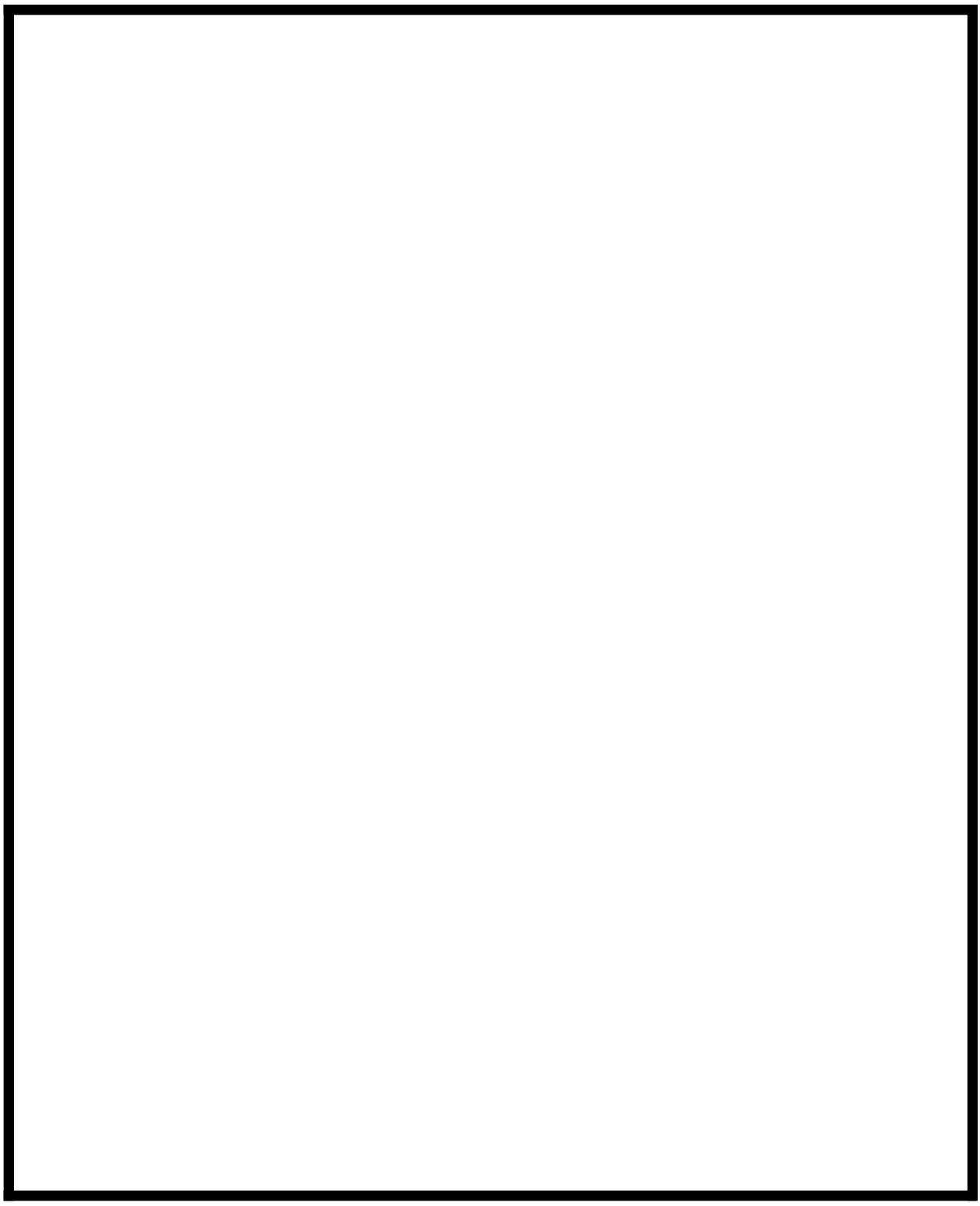
(YOUR TEAM'S BUDGET MUST NOT EXCEED $6.00)

- **OUR PLAN:**

ITEM	PRICE	QTY	TOTAL COST
STRAWS	$0.50	X	=
PIPE CLEANERS	$0.25	X	=
CHUNK OF CLAY	$1.00	X	=
COTTON BALLS	$0.25	X	=
LARGE POPSICLE STICKS	$0.50	X	=
CORKS	$0.75	X	=
PLASTIC FORKS & SPOONS	$0.75	X	=
1 SQUARE OF ALUMINUM FOIL	$0.75	X	=
BOTTLE CAPS	$0.25	X	=

SKETCH YOUR DESIGN. BE SURE TO LABEL ALL MATERIALS. ALSO, PLEASE BE PREPARED TO EXPLAIN THE PURPOSE OF EACH ITEM.

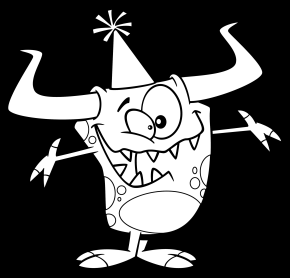
- EXAMPLE: We are planning to use popsicle sticks to _____.
  We think they will protect the soil by _____.



NAMES OF TEAM MEMBERS:_____

HOW SUCCESSFUL WAS YOUR DESIGN?

- **CIRCLE THE DESCRIPTION THAT BEST FITS YOUR PROJECT'S RESULTS:**

		
EXCELLENT! Our project was very successful! We had very little soil erosion. Our strategies reflect very good thinking and planning. Teamwork and effort are obvious!	**GOOD JOB!** Our project was mostly successful. We lost a little more soil than we had hoped. A few tweaks are needed. Our team is already discussing ways to adjust our strategies.	**NEEDS IMPROVEMENT** We're on the right track! Some parts of our project stopped erosion, but we lost a lot more soil than we had hoped. More than a few tweaks are needed. Our team is ready to try again!
NEXT TIME, WE WILL: • •	**NEXT TIME, WE WILL:** • •	**NEXT TIME, WE WILL:** • •