

Unit Title: *Landforms and Erosion*

Grade Level: 5

Subject Area: *Science: Earth Systems*

Duration/Length/Number of class periods: 5 class periods

Description: Students will build, use, describe and revise models to demonstrate how water interacts with the land, with an emphasis on erosion. They will design and test solutions to prevent, repair or reduce the destructive effects of flooding and erosion.

Established Goals Current MN State Science Standards:

5.1.1.1.4 Understand that different models can be used to represent natural phenomena and these models have limitations about what they can explain.

5.1.1.2.1 Generate a scientific question and plan an appropriate scientific investigation, such as systematic observations, field studies, open-ended exploration or controlled experiments to answer the question.

5.1.3.4.1 Use appropriate tools and techniques in gathering, analyzing and interpreting data.

5.3.1.2.2 Explain how slow processes, such as water erosion, and rapid processes, such as landslides and volcanic eruptions, form features of the Earth's surface.

5.3.4.1.3 Compare the impact of individual decisions on natural systems.

What Enduring Understandings are desired?

We use models to help us learn and understand, but models are not the same as the real thing.

Erosion happens when water changes the shape of the land.

People and their communities can be hurt by flooding and erosion, but people can also work to repair, reduce or prevent the damage.

What Essential Questions will be considered?

How does water change the shape of the land?

How do these changes affect people?

How can humans affect the way water changes the land?

Students will know / be able to:

- Build, use and revise models to represent events and design solutions.
- Identify common landforms and explain how they can be formed.
- Explain how water erosion can be harmful to people.
- Propose and test ideas to prevent or reduce problems caused by water erosion.

Description <i>Units must include at least one of each formative, summative, introductory activity and learning activity. Check the appropriate box; one per row.</i>	Formative	Summative	Introductory Activity	Learning Activity	Student Technology Used	Teacher Technology Used	Standards
Day One: Did any of you ever play in a sandbox? What did you do? Use responses to intro models. How did your sandbox models look or feel “real”? How were they not very real? Which were models of natural objects? Use responses to intro landforms. Share <i>Landforms pictures w/terms++</i> and <i>Mr. DeMaio’s intro video</i> https://www.youtube.com/watch?v=KWTDmg8OI_Y (4:40). Let students know they will have time to play in their own sandboxes today. Set criteria: Each group should build at least 5 different landforms. Each landform should be labeled using the cut-apart <i>Landform Labels++</i>. Note that we don’t have water today, so lakes, rivers, etc. can be made using the green of the tray as a model of where the water should be. *(share example if needed). When ready, each student will take at least 2 photos of their team sandbox. One photo will be from the side, one from a bird’s eye view. Labels should be clearly visible in both photos. As most are finished, structure teams to circulate from table to table observing and recording landform models built, Which landforms were most popular? Least? Why do you think that is? If time permits, allow changes and new photos. Circulate to ask students why they are/are not making changes (no right answers). Remove paper labels and discard. Stack trays crisscross to store.	Photo showing at least 5 landform models correctly labeled Photos of other teams landforms oral Rationale for changes /no changes to models		Share, paper pics, video	Build and photograph model landforms	Watch video (on ipads if possible) Take photos with ipads Share w/ teacher and/or peers	Ipad LCD projector	1c 2b 5b 6a
Day Two: What landform models did you make last time? Which models were easy to build or seemed to work well? Why do you think that is? How were our lake and river models different from our model mountains or valleys? Use	2 Photos - edited in Seesaw		Compare landforms (models)			Ipad	1c 2a 5b 6c

responses to note that there was no real water in our trays. We used our personal force to create landforms last time. Today we will see what kinds of landforms the water will make on its own. (Stress hands-off the sand/gravel for today) How might water affect the shape of our land? Distribute trays and kindly remind them about hands off. Together, we will photograph, identify and label any landforms we have so far (mountain or hill, ocean...), using Seesaw® and the <i>Landforms pictures w/terms++</i>. Students will videotape what happens as we add water. While videotaping, tell the story of what you see happening. You will get bonus points for naming any landforms formed as you film. Tell students they will be taking an after photo of the tray. They will label and show movement using SeeSaw. Demo setting up a streamtable w/ water source. Note that the hole should be uncovered during the experiment, then dried and recovered during clean-up Students should check in when set-up is complete to get water. *(share example if needed). As most teams finish, structure groups to circulate from table to table observing landforms generated at each table. Circulate with students to ask, Which landforms were most common? Least? Why do you think that is? Try to preserve landforms generated. Stack trays crisscross to store.	showing before and after water, w/all landforms correctly labeled and arrows showing path of water Video showing water entering and moving through the tray with accurate student narration		made last time Most/least effective	Set up stream tables Run water through Film and narrate Photograph before and after. Annotate after photo with Seesaw	Take photos, video with ipads Annotate with Seesaw Share w/ teacher and/or peers	LCD projector	
Day Three: What happened when we added water to the land? Invite a few students to share their streamtable videos. Use responses to get at the idea of water pushing or pulling the land away. Intro the term erosion. How do you think our model erosion might be different from erosion in the real world? Share https://www.youtube.com/watch?v=N8C9OaBRW2g (:27), comparing initial with final frames. How was this like your models? Different? Share https://www.youtube.com/watch?v=MFpCJsc_k64 (1:14) When finished, return to 1:08. Ask students to notice the walls of the canyon. Why do they look striped? Share photos of the <i>Mississippi River Valley in St. Paul</i> (attached). Note that we can't see the plain rock here. Can we tell if there was any erosion? How? How long did that take in our models? How long do you think that might take in the real world? Use the <i>Waters to the Sea/ Earth Science/Waterfall on the Move</i> video to show a virtual erosion model of the St. Anthony Falls. (Before running the video, use the interactive map on the gateway page to find our school, note the former placement of the falls in St. Paul, and find the present location of the falls today.)	<i>Erosion can make BIG changes</i> recording page Team decides where to place elements of the model village in the tray		Student-made and teacher-chosen videos that make a connection to last time and set up for today.	Compare our models w/virtual models and real-world photos/ videos. Intro and practice the term erosion. Build a village in the tray Make predictions	Share ipad videos Watch videos on ipads and LCD projector	Ipad LCD projector	2b 5b

https://www.arcgis.com/apps/MapSeries/index.html?appid=37dcc0e020624bd082caf2f2c8c5583f (1:00) So what could happen to people like us who live or work or go to school near the river? We will set up an experiment to find out. Display one of the bags of monopoly houses, small animals and people. Explain that each team will create a village in their tray. They can use the toothpicks to add bridges, fences, whatever they would like. Note that the water coming into our village will be double what we had last time. Display a picture or set up an example to help students in making their predictions. As they finish, students will begin the <i>Erosion can make BIG Changes</i> recording page (attached). Then they can choose one of the word searches (attached) to work on when finished. Teacher will call teams to circulate and observe each other's towns. Students may add details and/or make changes as time permits.						
Day Four: Help students find the book <i>Erosion: Changing Earth's Surface</i> by Robin Koontz on their ipads by typing "erosion" in the search box at https://library.biblioboard.com/module/minnesota-young-readers. Find a connection in the book with something that we have modeled. Share your connection with someone not at your team. So what do we think will happen when double the water comes through our town? What would we call that - when lots of water comes into a place. Intro flood/flash flood. Students should photograph their villages when they are ready and have their predictions on <i>Erosion can make BIG Changes</i> out. As before, students will videotape what happens as we add water. While videotaping, tell the story of what they see happening. Remind students they will be taking an after photo of the tray. They will also measure how much water flowed through their system into the collection bucket. They will label and note changes using SeeSaw - or any other app they already have, such as Schoology or Notability. Then they will complete <i>Erosion can make BIG Changes</i>. Review setting up a streamtable w/water source. Note that the hole should be uncovered during the experiment, then dried and recovered during clean-up. Students should check in when set-up is complete to get water. *(share example if needed). Remind students to let the water do the land forming. As teams finish, invite groups to circulate from table to table observing how the flood affect the other villages. Circulate with students to ask, How did the flood affect your town?	Photos showing before and after water, After photo includes annotation that shows what happened Video showing water entering and moving through the tray with accurate student narration		Review terms: erosion, land-forms Intro flood CCK video	Take before and after pics Check tray. Run water through Film Annotate after photo with chosen app	ipads Annotate with Seesaw Share w/ teacher and/or peers, parents	ipad LCD 1c 2b 3d 5b 6a

Day Five: Pick a moment in your video from yesterday that you would like to share. Find someone not from your team to share with. How are our models different from how water erosion might happen in the real world? Share videos of real-world flooding/erosion events to compare. What are some problems that flooding/erosion can cause for people or their property? What can people do to solve or prevent these problems? Share 3 <i>Waters to the Sea</i> videos from the <i>History and Geography</i> section: <i>1927 Flood: the Great Betrayal</i> (3:04), <i>Damming the Mississippi</i> and <i>St. Anthony Falls Panorama</i> to intro levee, dam and lock. Your task today is to explore how you might protect your village from flood damage. Use your videos and “after” photos to decide in which part of the river or the town your team will work to best protect the people, animals and property from flooding and erosion. To be continued!							1a,c 3a,d 4abc 6b,c

Materials, tools and resources:

For the whole class:

All video URLs are given either within the daily lessons or in the Supplemental Section.

It's best to cue them up before class begins to avoid advertisements.

Students can also be given urls to access videos on their ipads.

Pictures, example photos and drawings can be found on the last pages of this unit.

Materials needed for each streamtable group:

Streamtable tray, 2 liter cups, 2 cups with holes, water source, ruler, tape, bucket or pan to catch water coming out of the tray, sand/gravel mixture (2 cups of each), scissors, a box of flat toothpicks, landform labels++

a mixed bag of monopoly houses (or something similar) that also contains some small Playschool® animals and/or Lego® people (or something similar)

Special Streamtable Instructions:

Day 1: Sand/gravel should already be in the trays. Holes should be covered with strong tape.

Day 2: Sand/gravel should already be in the trays and be gently sloped along lines inside of trays. Holes covered with strong tape.

If time is limited, it is helpful to make sure the sand/gravel is already moist all the way through. This accelerates the erosion process.

Day 3: Either before class, or when trays are distributed, students or the teacher may need to dredge/resculpt the river channels formed on day two, as the sand and gravel often slump together.

Day 4:

++Documents: 1 per Group:

Day One: *Landforms Labels*

Materials to add for each engineering group:

Foam and wood blocks, rocks/pebbles around 2-5 cm long, paper towels, cloth/fabric scraps, at least 10 cm square, straws, plastic and paper cups, string.

Materials needed for each student:

ipad

++Documents: 1 per student:

Day One: *Landform pictures w/terms*

Day Three: *Erosion can make BIG Changes*

Easy/Tricky Erosion Wordsearches (back to back)

Day Four:

++Supplemental Section attached at the end.

Unit Plan Author (name, school and optional email address or hyperlink to teacher's web page) Ann Oubaha

annoubaha@gmail.com

++Supplemental Section

Landform Pictures w/terms



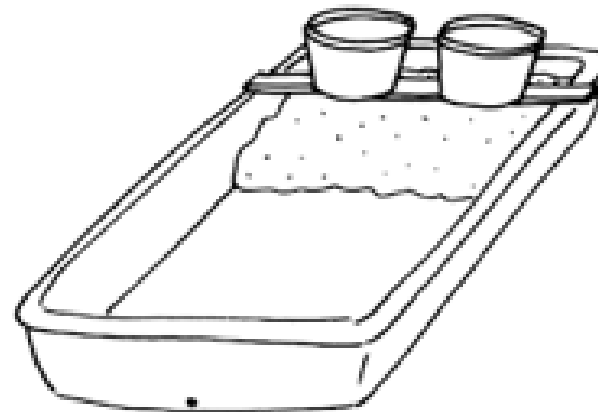
Day One labeling example



Day Two Set-up example



Day Four Set-Up example



Landforms Labels

canyon	mountain	canyon	mountain
cave	ocean	cave	ocean
delta	peninsula	delta	peninsula
glacier	plateau	glacier	plateau
hill	river	hill	river
island	valley	island	valley
lake	volcano	lake	volcano
mesa	waterfall	mesa	waterfall

Photos showing the Mississippi River valley at St. Paul



Videos to compare Models with Real World Flooding Events

Flash flood ca news :40 https://www.youtube.com/watch?v=_ayeEIC313o

California, aerial mudflood :30 <https://www.youtube.com/watch?v=HALHkKcFbg8>

Dash cam flood as car backs up 2:00 <https://www.youtube.com/watch?v=48LEIIQUkS8>

Flood erosion car in flow stop sound by :45 at least to avoid some inappropriate language (or just leave sound off) 1:13
<https://www.youtube.com/watch?v=bBQ4TKOR-9E>

St. Paul flooding 2014 keep sound off to avoid some mildly inappropriate language 2:00

<https://www.youtube.com/watch?v=FFvHsRcsyEU>

Freeschool 3:12 includes glaciers, <https://www.youtube.com/watch?v=qqsTS67BKmA>

Share *Crash Course Kids Landforms* video <https://www.youtube.com/watch?v=FN6QX43QB4g&t=33s> (3:57).

Lego steve and erosion stop at 1:03 <https://www.youtube.com/watch?v=5bqJo5ze3Bk>

Name _____

Date _____

Erosion can make big Changes

1. What are forces? FORCES are _____ or _____ .

2. What put a force on the land in our tray last time?

The force from the _____ changed the shape of the _____ .

3. Use words from above to write a definition of the word Erosion.

Erosion is when _____

***Raise hands to check in with the teacher.

4. What do we think will happen to the land, the houses, the people or the animals when the water comes through our village?

***Raise hands to check in with the teacher.

(To be completed NEXT time)

5. What DID happen to the land, the houses, the people or the animals when the water came through our village?

***Raise hands to check in with the teacher.
teacher signs off

Tape into your notebooks after the

Erosion: easy to find words

p u l l p l a t e a u y c i l l
a r l a m o u n t a i n h u f
r i v e r m e s i p l a n c
m i s s i f a i l p a n g u l i
w a t e r y i l l f o r c e h i f
v a l l e y l a n d a n y o n l f
s h a p e l a n c a n y o n l f
e r o s i o n c a n y o n l f

canyon	lake	pull
change	landform	push
cliff	Mississippi	river
erosion	mountain	shape
forces	plateau	valley
hill	plain	waterfall

Erosion: tricky to find words

y t s e n a r m n u r l p i v i h
t e l k o a o i u i o a y u a i p
s p l a y u p s e c r o f c s l p
i a d l n l e g n a h c r l a h l
a h i t a d m i s s i p p i
p s a t c v f e s p u s m f n e l
l i e r o s i o n v a l l i h a r
n a e m w a t e r f a l l c o s l
u s o r n p u l m e f l c o s l

canyon
change
cliff
erosion
forces
hill

lake
landform
Mississippi
mountain
plateau
plain

pull
push
river
shape
valley
waterfall