Downstream: How humans interact with watersheds

Earth and Human Activity

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Grade Level	3rd – 5th Grade	**Time Frame**	1-3 class period(s)
Subject	Science	**Duration**	120 minutes

Essential Question

How does the flow of water affect the Earth's geography, people, and communities?

Summary

Students will construct a watershed and discover how water flow impacts humans. IMPORTANT NOTE: Parts of the lesson are adjusted to meet each grade level's specific standard, so be sure to do the parts that correlate with your grade level.

Snapshot

Engage

Students observe a model watershed and make predictions about how significant rain will affect a watershed.

Explore

Students build a watershed system and make observations about water flow.

Explain

Students explain their discoveries related to human impacts on the watershed system.

Extend

Students extend their thinking about water systems to include downstream effects and prevention.

Evaluate

Students reflect on how they feel and what they think about the information they have learned.

Standards

Next Generation Science Standards (Grade 3)

3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

Next Generation Science Standards (Grade 3)

4-ESS3-2: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

Next Generation Science Standards (Grade 3)

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Oklahoma Academic Standards (3rd Grade)

3.LS4.3.2: Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful.

Oklahoma Academic Standards (3rd Grade)

4.ESS2.1.1: Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.

Oklahoma Academic Standards (3rd Grade)

ESS2: Earth's Systems

Attachments

- Floodgate and Sandbag Photos.docx
- Floodgate and Sandbag Photos.pdf
- Grade 3 Teacher Slides.pptx
- Grade 4 Teacher Slides.pptx
- Grade 5 Teacher Slides.pptx
- GramIt Template.docx
- GramIt Template.pdf
- I Notice, I Wonder.docx
- I Notice, I Wonder.pdf
- Watershed Activity - Grade 3.docx
- Watershed Activity - Grade 3.pdf
- Watershed Activity - Grade 4.docx
- Watershed Activity - Grade 4.pdf
- Watershed Activity - Grade 5.docx
- Watershed Activity - Grade 5.pdf
- Watershed Teacher's Guide.docx
- Watershed Teacher's Guide.pdf

Materials

- Watershed guide
- Student sheets (by grade level)
- Teacher slides (by grade level, optional)
- One tray per group (something to build the watershed on top of)
- Assortment of cups, bottles, bowls, etc. to create varying heights
- Plastic grocery bags (1-2 per group)
- Building bricks (3rd/4th grade)
- Snack bags filled with sand (3rd/4th grade)

- Miscellaneous materials to design flood prevention (4th grade)
- Glitter, dirt, paper pieces (5th grade)
- Sticky notes

Engage

To begin the lesson, the teacher demonstrates how water flows in a watershed by using a model. Quickly build a model of a watershed using cups, bowls, etc and a plastic grocery bag to create the varying heights and landscape. Spray water over the bag to imitate rain.

Important Note

Activities throughout this lesson have been adapted to meet specific grade level standards. Be sure to use the activities that are are directed for your grade level. Consider printing the lesson and highlighting the elements needed for your grade level.

Note

Use the "Watershed Teacher's Guide" attachment to help with setup.

Ask students to sketch a picture of the model and draw how the water flows.

Using the Think-Pair-Share strategy, ask students to think about the following question. 3rd/4th Grade: What do you think would happen if there was a bunch of rain at one time? 5th Grade: What do you think would happen if there were pollutants (chemicals, trash, etc) in the area that got picked up by the water?

Explore

In the Explore part of this lesson, students will build their own watershed models to demonstrate what will happen when there is too much water and the watershed floods.

Pass out copies of the Watershed Activity handout for your grade level. Students will use this handout to help guide them through the upcoming activities.

1. Break students into groups of approximately 4.
2. Students will build a watershed by arranging varieties of bottles, cups, and other materials to change the shape/height of the landscape and then covering the landscape with a plastic bag.
3. Students will draw a picture of their models. On the picture, they should use arrows to predict how the water will flow and use circles to predict where the water will pool.
4. Students will use spray bottles to imitate significant rainfall over the watershed.
5. Students will observe of how the water flows and record their observations on their pictures using a different color than they used in step 2.

Teacher's Note: Explore Step 3

Step three depends on the grade level. Go to the grade that applies to you for the specific activity.

Third grade: Display the attached pictures of floodgates and sandbagging. In a modified Photo Deconstruction activity, students will examine the picture for evidence of why the floodgate or the sandbags were installed and what other information they might need to determine if the floodgate or sandbag was effective. Using their observations and questions from the photo, students will use interlocking blocks and sand in snack baggies (our 'sandbags') to try to replicate the structures in their watershed.

Fourth grade: Give students the challenge that they need to prevent any flooding (pools of water) in their watershed. Provide a variety of supplies and let them investigate ways to prevent flooding. Below their models, students should write what things they tried that worked and what things they tried that didn't work.

Teacher's Note

Students' first reaction will probably be to move the cups, bottles, etc. around. If so, point out what that would look like in real life—moving mountains. Allow students time to go observe other attempts to get multiple ideas of what works and what doesn't.

Fifth grade: Provide students with glitter, confetti, oil, or other materials that could simulate pollution. Have students put their 'pollutants' in various places within their watershed and repeat a rainfall via the spray bottle. Have students write down what they observe on the same paper where they drew their model. Provide the link to the Oceans of Trash article on Scholastic.com. Present the questions, "Why is watershed pollution an issue?" and "What can communities do to decrease watershed pollution?" so that students are reading the article for the purpose of answering the questions. After students read the article, present the questions again. Have students use the observations in their model as well as the article to brainstorm an answer to the questions.

Explain

Using their observations from the Explore phase and the Claim-Evidence-Reasoning strategy, ask students to write a few sentences to answer the questions below.

Teacher's Note

CER statements will be challenging for some students, but sentence starters can help them find success. Here are some suggested examples. Claim: "I believe the best design is _____." Evidence: "From our model, I observed _____ ." (This needs to be an observation from their model, like a piece of data.) Reason: "This would prevent flooding by _____. " All together an example response might be, "I believe the best design is sandbagging. From our model I observed that sandbags only let a little water through. They would prevent flooding by allowing very little water downstream."

- **Third grade:** “What is the best way to prevent damage from flooding?”
- **Fourth grade:** “Which group's design is the best to prevent damage from flooding and why?” After reviewing others models, have students redesign their prevention tools and test their re-designs.
- **Fifth grade:** “How can communities protect water resources?”

After preparing an initial answer, students will share their thinking with a partner, gather feedback, and then revise their answers as needed. Select a few students to share their ideas with the class. Use their answers to build discussion about how water affects the land/people.

Extend

Third/fourth grade: Watch a minute or so of the Emergency water discharge video. What do students Notice and Wonder? For this strategy, consider drawing a T-chart on the board with the first column labeled "I Notice" and the second labeled "I Wonder." A template is also provided in the students' Watershed Activity handouts. After the video is concluded, students will record at least two observations they notice and at least two observations they wonder. Hold a whole-class discussion about observations and wonderings inspired by the video. Discuss for a few minutes about why the water would be released from the dam and what kind of impact it might have downstream.

Fifth grade: Show the "Plastics Breakdown" infographic from this site, which describes how pollution affects oceans and animal life. Have students analyze the infographic and record what they Notice and Wonder. For this strategy, consider drawing a T-chart on the board with the first column labeled "I Notice" and the second labeled "I Wonder." A template is also provided in the students' Watershed Activity handouts. After analyzing the infographic, students will record at least four things that they notice and at least four things that they wonder about. Engage in a whole-class discussion about observations and wonderings inspired by the infographic. What surprised students? What questions do they still have?

Fifth grade: Ask students to write a GramIt post about one thing they can do to decrease watershed pollution, using information from the "Plastics Breakdown" infographic and this lesson as a resource. This activity uses the GramIt strategy in which students are challenged to synthesize their ideas in a concise statement. As part of their GramIt post, students should create a hashtag phrase that would promote their idea (for example, #savethewhales). Students might consider using and expanding on their ideas from the Explore phase. GramIt posts can be published either on sticky notes or on the attached GramIt template.

Embedded video

https://www.youtube.com/watch?v=o3E4s59OSLQ

Evaluate

Give each student a sticky note to complete an "How I am Feeling? What I am Thinking?" exit ticket.

1. Ask students to draw a line down the sticky note to split it in half.
2. On one half, have the students draw a picture of how they feel about what they have learned. (Example feelings: Overwhelmed by the power of water. Excited to prevent pollution.)
3. On the other half, have students write about what they are thinking about what they have learned.

Resources

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- Fox. (2016, Aug. 29). Emergency water discharge from the dam TOP 25 -=HD=- [Video file]. Retrieved from https://www.youtube.com/watch?time_continue=17&v=o3E4s59OSLQ
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