

Flooding in the Desert: Walker River

Grade Level: 6th - 8th

During this 60-minute classroom lesson, students learn about the cause of most of the flooding events in the Walker River watershed by creating watershed models and simulating different rain events. Then, they will analyze the causes and effects of historical floods. The students will return to their watershed models to design and test solutions that reduce the risk of flooding.

Materials

Invitation

- Walker River Handout

Explore

- Spray bottle
 - Cold water
 - Warm water
- 1 set of each per group:
- Rocks
 - Tray/container that can hold water
 - Sheet of foil
 - Ice

Concept Invention

- Computer for each student

Application

- Clay for each group
- Spray bottle
- Warm water
- Ice

Essential Questions

- What causes most of the flooding in the Walker River Watershed?
- What solutions can I design to reduce the risk of flooding in the watershed?

Objectives (Integrated Content and Practice)

1. Students will identify the cause of flooding in the Walker River watershed, test and design solutions to reducing flood risk.

NGSS

- MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

Key Vocabulary

- Watershed
- Precipitation

Introducing the Lesson (5 minutes)

1. Explain to the students that they are going to work as scientists by making observations after different rain events have occurred on their watershed models. Then, they will design and test solutions to reduce the risk of flooding in their watershed models.
2. Tell the students they will be recording their ideas on a few handouts throughout the lesson (these may be kept in their notebooks).

Invitation (10 minutes)

1. Ask for a volunteer to read the quote in the invitation section of the Walker River Handout. Give students 5 minutes of independent time to answer the invitation question.

Invitation

"People are afraid now every time they hear of a fast snow melt...they know the shape that the river is in right now and if we don't get that thing dredged out, we could have a worse problem,"
- Douglas Homestead, a resident of the Walker area since 1965

What do you think could cause a fast snow melt? What problems might a fast snow melt cause?

2. Have students share their responses with a partner. Ask for a few volunteers to share their responses with the whole class. and write them down on the board or poster paper.
3. Tell students they are going to be hydrologists. Ask them what they think hydrologists study.
4. Tell them a hydrologist is someone who studies how water moves across the Earth's surface. Hydrologists might study the different parts of the water cycle, the effects of flooding or different ways to help keep our water clean.
5. Tell students that hydrologists use models to learn about natural events that are large or take place over long periods of time.

Exploration (20 minutes)

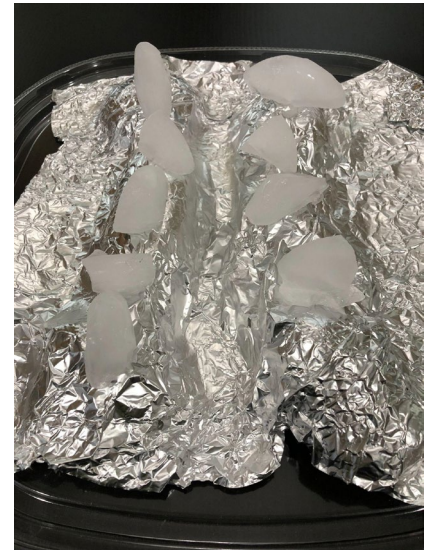
Tips and Tools:

Show students how to create a flattened peak on top of the rocks, this will help keep the ice in place and prevent it from falling down the sides.

You may distribute materials according to the needs of your students. You may have a helper hand out materials or have a representative from each group go to a designated area to get their materials.

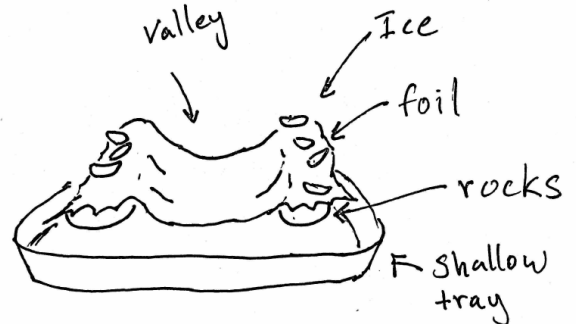
If your students are unfamiliar with making detailed observations, you may want to spend time before this going over how to make observations that are detailed,

1. Tell students they will create models of watersheds in their groups in order to learn about the effects of natural events on the watershed. Tell students a watershed is an area of land where water flows and is stored.



2. Demonstrate for the whole class how they will set up their watersheds using containers, rocks, foil and ice. Place the rocks in two rows in the container, place the foil over the rocks, and put the ice on top of the rocks.

3. Explain to students that they will create this model three times and study it under different conditions - with no rain, cold rain and warm rain. The foil over the rocks represents their watershed, the ice on top of the foil represents snow on the mountains and water from the spray bottle represents rain.



4. Distribute materials to the groups and have them set up their watersheds. After they have set up their initial watersheds they may draw or write descriptions of how their watersheds look after no rain has occurred on their handouts. Have students share their observations with each other in their groups.

Watershed Models

Draw or write descriptions of how the watershed looks after each event.

No rain	Cold rain	Warm rain

accurate and include labels or descriptions if they are drawings.

You will need a bucket or container to collect the water if you do not have a sink in your classroom.

5. The groups should be able to use the same ice since it is unlikely that the ice has melted at this point. Spray each group's watershed with cold water from a spray bottle to represent a cold rain event. Have students draw or write descriptions of how their watersheds look after cold rain has occurred on their handouts. Have students share their observations with each other in their groups.
6. Have each group pour out the water in their watershed models and replace the ice. Spray each group's watershed with warm water from a spray bottle to represent a warm rain event. Have students draw or write descriptions of how their watersheds look after warm rain has occurred on their handouts. Have students share their observations with each other in their groups.
7. Have the groups clean up their watersheds by pouring out the water and setting their watersheds aside since they will be returning to them towards the end of the lesson.
8. Ask for a few volunteers to share the observations from their groups for each natural event. Record the responses on the whiteboard or poster paper.

Concept Invention (15 minutes)

Tips and Tools:

1. Have students go to nevadafloods.org/library.htm and click on "Walker River Flooding" under **STORY MAPS**. Have students scroll down to the section "Chronology of Historical Floods".

A Story Map created by NV ...
Flooding in the Desert:
Walker River

Chronology of Historical Floods

"Heavy snow, followed by heavy rain and unseasonably warm temperatures combined to swell the east and west forks of the Walker River to overflowing." – Two Cents Worth Newspaper, 1997



2. Review the instructions for the Chronology of Historical Floods section of the handout. Read about one the historical flood events together as a class and model how to complete the first row of the table.

Chronology of Historical Floods

Read the Chronology of Historical Floods section of the Flooding in the Desert: Walker River story map and choose 3 historical floods to analyze and record the cause and effect of that flood.

Date of Event	Cause What caused there to be flooding?	Effect What effect or damage did the flooding cause?

Students may also work in pairs to complete the assignment.

3. Have students independently read the section and complete the table as well as the question at the end of the table.
4. Tell students to share their responses to the last question at the end of the table at the groups before asking for a few volunteers to share with the whole class. Students should note that most of the Walker River flood events are caused by rain-on-snow events, especially from warm rain. This is similar to what they should have seen in their watershed models from the warm rain event.

Application (15 minutes)

Tips and Tools:

If the students are unfamiliar with levees, dams or reservoirs you may include photos or diagrams of each to help explain how they work.

Go around to each group and ask about their design to make sure they understand the task and that their design will be feasible on their models with the given materials.

You may add further challenges to the designs by designating areas in the watershed where there are towns or agricultural areas that cannot be flooded.

1. Explain to students that they will be returning to their watershed models to design and test solutions to reduce the risks of floods.
2. Read the “Water Infrastructure: Reduced Flood Risk” section of the story map together as a class. Discuss the solutions mentioned in the reading such as levees, dams and reservoirs.
3. Within their groups, tell the students to discuss possible solutions to reducing flood risk and to choose one they would like to try on their watershed models. It may be one they just read about or a design of their own choosing.
4. After groups have decided on a design, they may build it on their watersheds. Some groups may be able to manipulate the foil to create their designs or you can give them clay to add to their watersheds.
5. Once a group has their modified watershed built, they may add ice to the top. Spray the watersheds with warm water once a group’s watershed design is ready. Have students record their observations in the “Flood Risk Solutions” section of the handout

and answer the follow-up questions about their designs. Have students share their responses to these questions in their groups.

6. Have the students pour out the water, take apart and return all the materials from their watersheds.

Flood Risk Solutions

Write or draw a description of your watershed after testing out your solution.

How does your watershed with your solution compare to the watershed after a warm rain event without your design? How effective was your design at preventing flooding in the watershed? What improvements would you make to your design?

Reflection (5 minutes)

1. Review the recorded responses from the invitation and concept invention.
2. What do we know about fast snow melts and flood risks?
3. Do we have any new questions?