



Flooding in the Desert: Nevada's Muddy River

Grade Level: 6th - 8th Grade

During this 60-minute classroom lesson, students make observations on the area surrounding Muddy River. Students then evaluate the effects of past flooding events. They will create solutions that mitigate flood risk and propose them in letters addressed to the Clark County Regional Flood Control District (RFCD).

Materials

Invitation

- Individual computers for each student
- "I notice/I wonder/It reminds me of" handouts

Exploration/Concept Invitation

- "Past Flooding Events" handouts

Application

- "Letter to Clark County Regional Flood Control District" handouts

Essential Questions

- How have past flooding events impacted residents in the Muddy River watershed?
- What can the Clark County Regional Flood Control District (RFCD) do to mitigate the effects of these flooding events for residents?

Objectives (Integrated Content and Practice)

1. Students will evaluate past flooding events and provide suggestions to mitigate the effects of future floods.

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
- flood

Introducing the Lesson (5 minutes)

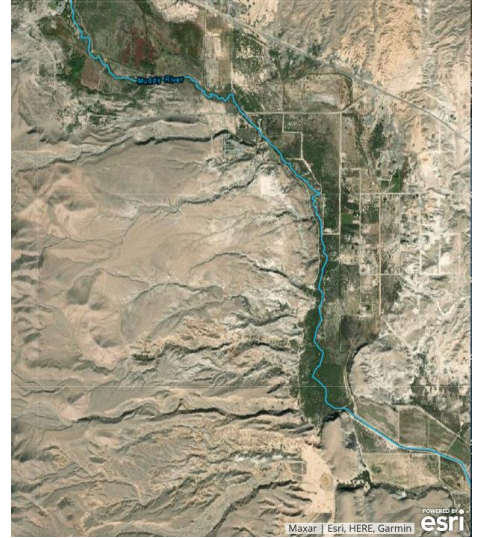
1. Explain to the students that they are going to work as scientists by evaluating past flooding events and then creating solutions to help mitigate the effects of these flooding events.

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 (15 minutes)

Tips and Tools:

1. Have students go to <http://nevadafloods.org/index.php/education-resources/C7> and click on “Muddy River Flooding.” Have students scroll down to the section ‘Climate for Multiple “Flood Seasons”’ and zoom in around the bright blue line until you can see the details of the surrounding land. You may also just project the image for students to see. It should look similar to the image.



2. Tell students the bright blue line represents Muddy River. Ask students what they notice about the map. Use a think, pair, share before asking for a few volunteers.
3. Give students 5 minutes of independent time to write down all the notices/wonderings/reminders they have about the map on their handouts. If the students are not familiar with these prompts, provide some explanations/examples for each prompt.

I notice...	I wonder...	It reminds me of...

4. Tell students to share their ideas with the rest of their table groups. Let them know that they will be sharing their ideas with the whole class after they discuss.
5. Take a few hands and write them down on the board or a large piece of chart paper for each prompt. If students have not mentioned it, prompt them to look at all the green areas next to the river. What are those green areas and why do we find them

The text next to the map provides some of these answers, which some students may have noticed. Students should notice that the

surrounding area is bare soil while there are green ribbons along the river due to agriculture.

Many students may be familiar with the root hydro meaning water.

along the river? How does the surrounding area look? Students should understand that the area surrounding Muddy River is used for agriculture.

6. Tell students they are going to be hydrologists. Ask them what they think hydrologists study. 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, flooding and its effects on the soil or different ways to help keep our water clean.
7. Tell students that hydrologists are good at making observations and evaluating past events in order to provide solutions.

Exploration/Concept Invitation (15 minutes)

Tips and Tools:

This assignment may be adapted for students by reducing the number of past events needed or assigning students specific events to evaluate. You may also choose to have students work in pairs.

Some connections may be drawn between the agricultural use of the land surrounding Muddy River and the damage to the farm lands from flooding events.

1. Explain to students that even though the Muddy River flows through a desert, there is a long-recorded history of flooding that we are going to examine next. Hydrologists often study past events to understand water's interactions with the people and the land.
2. Each student needs a copy of the "Past Flooding Events" handout. Instruct students to choose 3 past flooding events they would like to evaluate on their handout. They will find examples of past flooding events in the sections of the story map: Grit, Early Accounts of Flooding, Infrastructure Damage, Railroad Woes, Flood of 1981, 1981 Flood Rescue by Community Members, Recent History: Winter 2005, 2014 Thunderstorms. Complete one example together as a class before students work independently.

Past Flooding Events

Information can be found in the sections: Grit, Early Accounts of Flooding, Infrastructure Damage, Railroad Woes, Flood of 1981, 1981 Flood Rescue by Community Members, Recent History: Winter 2005, 2014 Thunderstorms

Date of Flooding Event	What happened?	Who was affected by this flood? How were they affected?
1.		

3. Have students share what they learned about past flooding events with the students in their table groups. Return to the map and class "I notice/I wonder/It reminds me of" from the beginning class. Discuss any connections between the flooding events and any observations they made from the map.

Application (20 minutes)

Tips and Tools:

Encourage students to be creative at this point. They are trying to stop water from flooding into an area, what can they propose that would prevent that water from flooding?

Some students may need additional support to write the letter. You may provide sentence starters, have students write a shorter letter, assign them a specific problem to address or have them work in pairs.

1. Tell students they will now propose solutions for some of the flood related issues they learned about.

2. Explain to students that they will be writing to the Clark County Regional Flood Control District (RFCD) to propose their solutions. The RFCD is responsible for providing solutions to flooding problems to help residents in Clark County while protecting the environment.

Letter to Clark County Regional Flood Control District

In your letter be sure to include your solution to a flooding problem. Explain who would be impacted by this solution and how this solution would help them.

Dear Board Members of the CCRFCD,

Sincerely,

3. Provide an example of a solution by reading the section “Flood Risk Management Projects Protect Life and Property” together as a class. Discuss how roads were converted into bridges to mitigate the effects of flooding.

4. Have students discuss possible solutions at their tables. Students may use the example from the test or create their own solutions. Tell them to be prepared to share at least one idea with the whole class. After students have discussed at their tables, ask for a representative from each table to share one of their solutions. Record these ideas on the board.

5. Have students write their own solutions using the “Letter to Clark County Regional Flood Control District” handout.

6. After 10 minutes of independent writing, take a few hands to have students share their solutions.

Reflection (5 minutes)

1. Review I notice/I wonder/It reminds me of chart.
2. Which questions can we answer?
3. Do we have any new questions or observations?