# LESSON 3: FLOODING

Youth Preparedness Initiative

## MATERIALS NEEDED:

- Blue plastic tablecloths (10 or so depending on room size)
- Projector
- White board
- Dry-erase markers

Have each of the following available for each group of two to three students:

- Masking tape
- Water soluble markers
- 9-by-13-inch aluminum tray or plastic container
- (8) foam cups (4-12 ounces)
- (2) 2-cup measuring cups
- (2) plastic cups (1-6 ounces)
- (2) Graduated cylinders to measure 50 mL of water
- (2) 1 cup of polyester fiberfill for pillows
- (2) Kitchen sponge piece, cut in fourths
- (2) Microfiber towel pieces (large towel bag size)
- (8) Plastic straws
- (4) Rolls of toilet paper
- (2) Rolls of paper towels
- (2) Small paper bags
- Water

*Quantity of materials has been doubled as a precaution.*

## PROJECT AREA:

Disaster Preparedness

## LESSON # IN BOOK:

Three out of six

## TARGET AGE/GRADES:

Fourth through eighth grade

## TIME LENGTH REQUIRED:

60 minutes

*"Denotes instructor statements to class."*

## LESSON OBJECTIVES:

- Youth will be able to identify what a flood is.
- Youth will be able to understand the importance of levees and barriers to prevent flooding.
- Youth will be able to experiment with a flood barrier STEM challenge.

## VOCABULARY WORDS:

- **Flood:** Overflowing of a large amount of water beyond its normal confines.
- **Levee:** An embankment built to prevent the overflow of water.
- **Flood barriers:** A specific type of floodgate designed to prevent a storm surge from flooding the protected area behind the barrier.

## INTRODUCTION TO LESSON:

*Have blue tablecloths unwrapped and ready for class.*

"Oh no, it looks like it's raining in here!"

*Unfold a tablecloth and throw it around a few desks. Wait a few seconds.*

"Wow, it is still raining!"

*Throw another tablecloth around some different desks.*

"What is all this water going to do? It has been raining, and the water is not able to go anywhere!"

*Unfold all the tablecloths and place them all over the room, even on top of desks.*

"Oh no, our classroom is starting to flood! Even some structures (desks) have been taken over by all the water. Looks like there's no place for the water to go, so it's taking over our class. Hurry, pick your feet up before it sweeps you away too!"

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*Denotes instructor statements to class.*

NOTES

VIDEO LINK:
https://youtu.be/4PXj7bOD7IY

"The natural disaster that we will be talking about today is flooding. As we can see, flooding can happen quickly. When there is not enough room for the water to go, it consumes our properties, including desks, chairs, classrooms, etc.

This was just a quick demonstration of what flooding is like and how it can take over the property. Let's dig deeper into this natural disaster."

## EDUCATIONAL BACKGROUND:

"Floods can be just a few inches or a couple of feet. They are the rise of water with nowhere for it to go. It can arise within just a few hours, leaving no room to prepare. Although it is just water, floods can be quite destructive and cause severe damage to homes, cars and other structures. It can also lead to deaths since some people get trapped in the water and are unable to get out. They happen all over the world and can occur with hurricanes when lots of rain has fallen for hours. Tsunamis and storm surges can also be causes of flooding. Broken dams and levees also cause flooding. These barriers are made to keep the water out, but sometimes they can fail. Thawing ice can also cause flooding in big rivers, streams and other bodies of water. There is no place for the water to go. To get a better understanding, watch this video to see how severe flooding can get. *(Link to YouTube video listed to the left)*

Floods can also be harmful to our water supply for drinking and other purposes. Flood water often carries a lot of debris as it sweeps away things in its way. Therefore, the water is not clean. Sometimes water advisories might be in effect for a while until it is safe to use again.

However, not all flooding is bad. In fact, flooding can bring silt (soil with nutritious vitamins) into fields for farming. The Mississippi River is a good example. Although most of the river is surrounded by levees and barriers to prevent flooding, the water still must go somewhere when there is too much. Some of the water seeps underground and can get into fields on the other side of the levee. A great example of this is in New Roads, Louisiana, where the Mississippi River is still able to supply great nutrients for sugarcane, a big commodity in Louisiana."

## ACTIVITY:

**Flood Barrier Design Challenge**

*In advance, prepare the foam cups for each group for absorbency testing by making a pencil-sized hole in the bottom of one of the cups. Measure out polyester fiberfill into 1-cup quantities. Cut the masking tape into 12-inch strips. Cut large kitchen sponges into fourths. Cut the microfiber towel in half. Write the absorbency test procedure shown below on the board.*

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*"Denotes instructor statements to class."*

"Today you will be engineers tasked with designing a way to keep your house in the yard from being flooded. So, what kinds of materials might be helpful to keep water away from the house?"

*Expected student response may be "materials that soak up or block the water."*

"Good absorbent materials mean they take in or soak up the water like a paper towel absorbs the water from a spill. In this challenge, you will have the chance to select different materials and test their absorbency."

*The following materials are to test for absorbency.*
**Absorbent Materials:**

- Polyester fiberfill (1 cup)
- Sponge piece (1)
- Paper towel sheet (1)
- Microfiber towel piece (1)

"You will now get into groups of two to three to test the procedure that is written on the board. You should test each absorbent material separately."

**Absorbency Test Procedure:**

1. Measure 50 mL of water into a graduated cylinder.
2. Choose an absorbent material and place it inside the foam cup with a hole in the bottom, being sure to cover the hole with the material to be tested.
3. Place that cup inside a second foam cup that does not have a hole in it.
4. Using a clock with a second hand or a timer, pour 50 mL of water into the top foam cup, and wait for exactly 15 seconds.
5. Lift the top foam cup out of the bottom cup and set it aside in a plastic cup or container to catch any excess water.
6. Measure the amount of water that you collected in the bottom foam cup by pouring it into the graduated cylinder. Record this amount on the worksheet along with any observations.
7. Remove the tested material and water and repeat for each of the other absorbent materials.

"Now that we are all done testing absorbency materials, what did your group think was the best material to absorb water? Why? What other results can we determine from this test? After writing down the results on the worksheet, I will now distribute small paper bags for you to create a house. If you like, you may decorate your house using markers in preparation for the next part."

*Distribute small paper bags and give students some time to decorate their house.*

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NOTES

"Denotes instructor statements to class."

"After decorating your house, you will use what you have learned about the absorbency of materials to help design a way to keep your house dry in a flood."

*Show students the 9-by-13-inch container that will represent their yard.*

**Requirements:**

1. The house must be placed on the bottom and in the center of the container.
2. You must build a barrier to protect your house from flood waters.
3. The materials cannot be more than half the height of the house.
4. You may choose only one of the absorbent materials we tested.
5. The house must not be wet for 10 seconds after 2 cups of water are poured rapidly into the container outside of the barrier.

**Absorbent Materials:**

- You may choose one of the absorbent materials tested in the quantities shown below:
- Polyester fiberfill (1 cup)
- Sponge pieces (2)
- Paper towel sheets (2)
- Microfiber towel piece (1)

**Other Building Materials Choices and Quantities Available:**

- Toilet paper rolls (2)
- 12-inch strip of masking tape
- Plastic straws (4)
- Foam cups (2)

"You will now work in groups to design your flood barrier and record the materials to be used on the "Save the House" worksheet. You should make a drawing of the design and label each component. After this, you will then gather the materials and build the flood barrier."

*Ensure that teams have properly documented their designs and provided explanations on their worksheets. Divide the design teams into equal groups. For instance, if there are nine students, have them gather into three equal groups.*

*Each team in the group will explain their design, followed by conducting testing according to the procedure outlined below. Meanwhile, the remaining teams will act as observers.*

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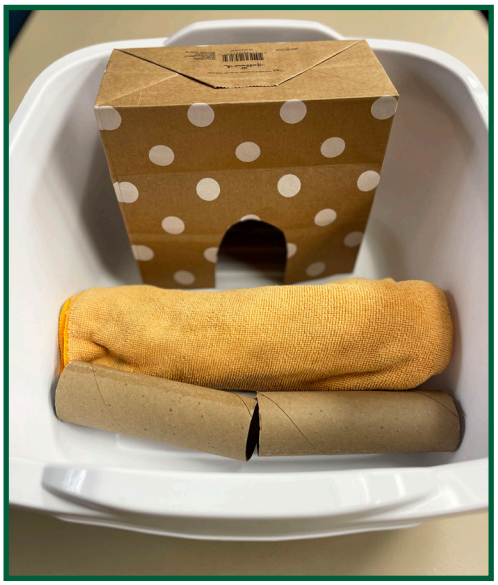
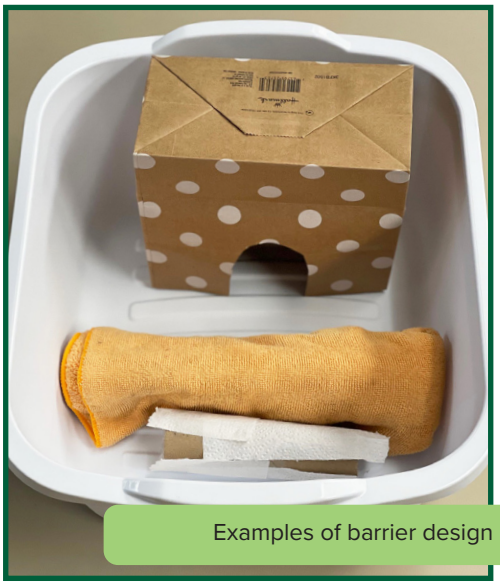
**Flood Barrier Testing Procedure:**

1. Fill the measuring cup with 2 cups of water.
2. Pour the 2 cups of water along one end of the pan outside the barrier as quickly as possible.
3. Leave the set-up undisturbed for 10 seconds.
4. Remove the house from the container and check to see if it is wet.
5. Record results and observations on the worksheet.





Examples of barrier design

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NOTES

## REFLECTION AND EVALUATION:

Have questions written on the board.

After testing the procedure, ask the students to get back into their original groups and think about the questions on the board. Call each group to explain.

1. What do the designs that worked have in common?
2. What characteristics of the materials used were the most important? Why?
3. Do the designs that did not work have anything in common?
4. Why do you think these designs were not successful?
5. If the constraints were removed, would you change any materials?
6. Would you change the design?

NAME: _____

GROUP #: _____

# SAVE THE HOUSE

**TESTING PROCESS:**

1. What material absorbed the best? Why? _____

_____

_____

_____

**DESIGN PROCESS:**

1. Materials used to build barrier to protect the house: _____

_____

_____

_____

2. Design:

3. Explained thinking for design: _____

_____

_____

_____

## NOTES

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