# Stemming the Flood

## Objective:

Explain effects of floods and design a plan to mitigate flooding damage.

## Overview:

Participants will learn about the causes and effects of flooding, and the impact of human actions.

Each group will build a model community in a floodplain, then design and test a plan to reduce flooding's impact on their community.

## Materials:

Preparation:

- Styrofoam
- Tool to carve Styrofoam (see **Preparation**)
- Aluminum Drip Pan
- Clipboard
- Pitcher of water

Per Group:

- Bag of mitigation items
    - 1 sponge, cut into fourths
    - Clay/Play-doh
- Flood building templates (1 per person)
- Scissors
- Crayons
- Tape
- Observation sheet
- Pencil

**Recommended Ages:** 10+

**Content Areas:** Earth Science, Life Science, Community Planning

**Duration:** 30-60 minutes

**Group Size:** 2-5 participants per group

**Predicted Cost:** $20-$40

**Setting:** Indoor

**NGSS Disciplinary Content:** LS2, ESS2, ESS3, ETS1

**Key Terms:** Flood, Surface Runoff, Green Infrastructure

## Background:

### Natural Hazard: Floods

**Flooding:** Overflowing of water onto dry land.

- Comes from heavy rains, ocean waves, snow melt, or broken dams/levees
- Can be inches deep or over a house roof
- Can last several minutes or several weeks
- Most common and widespread of all weather-related natural disasters
- Floods kill more Americans each year than tornadoes, hurricanes, or lightning

### Floods and Well-Being

Hazards from floods include:

- Physical danger from water, downed power lines, debris, contaminated drinking water, mold, hypothermia, and undernutrition
- Indirect hazards like overwhelmed infrastructure and health systems

### Floods and Infrastructure

Areas with concrete and asphalt are more likely to have **surface runoff**, or the unconfined flow of water over the ground surface when water cannot soak into the ground.

**Green infrastructure** can mitigate flooding effects. This strategy uses natural systems to provide benefits to human communities

- Ex: Maintaining green spaces like forests or wetlands increases reduces flooding through plants holding and slowly releasing water
- Ex: Restoring urban soils improves water retention and drainage

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## Preparation:

1. Prepare the community floodplain. Carve a shallow, curved path into the Styrofoam (*tip: lint rollers pick up loose Styrofoam pieces for easy cleanup!*)
2. Place the clipboard upside down in the aluminum tray and then place the Styrofoam on top of the clipboard so that it is at a slight angle.
3. For best results, cover the Styrofoam and clipboard with cling wrap to prevent water absorption.

*If finances allow, oil-based, non-drying clay allows for longer use and reshaping of floodplain. Play-Doh or wet sand can also be used.

## Procedure:

1. Pass out flood building templates to each group. Allow time to assemble and decorate their paper buildings.
2. As groups finish decorating, bring them up in turns to arrange their buildings in the community floodplain. Run their initial test by pouring water slowly into the top of the river on the model.
3. After a group completes the observation sheet for their initial test, pass out a bag of mitigation items. They are to use the items to reduce the effects of flooding
4. Each group should draw out their plan on their observation sheet. Again, going in turns, call each group up to set up their new community layout and run their second test.
5. As a whole group, discuss their results.

### Whole Group Discussion Questions

- What could the sponges represent?

  *Green spaces, wetlands that absorb water*
- What could the clay represent?

  *Levees, dams that block or redirect water*
- What strategies were the most effective for your group?
- What are other strategies that communities could use to reduce runoff and flooding?

  e.g., *avoid building on floodplains [equity issue], porous pavements, improve drainage, manage runoff, elevated buildings, dredge waterways and reuse sediment*

## Extensions and Modifications

- If materials allow for it, make a separate community model for each group to allow for faster testing. In this scenario, the observation sheet can be removed.
- Popsicle sticks or clay carving tools can be added to the mitigation bag to allow digging in the clay to divert waterflow. This works best with a floodplain that can be reshaped like clay, or if each group has their own model to carve.
- Toothpicks can be added to allow participants to put buildings on stilts.
- Additional items can be added like small blocks to represent cars

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# Flood Testing
# Observation Sheet

What to do: Record observations of the two flood tests

TEST 1

| Draw lines on the image below to show where the water level reached. Use more lines to show different levels. | Record other impacts from floodwater. |
|---|---|
|  | ☐ Check box if any buildings moved. |
| Did you notice anything in common between the items impacted by the water?<br><br>_____<br><br>_____ | |

After you finish writing your observations for Test 1, get a bag of mitigation items. Work with your group to make a plan for how to use these items to reduce the flood's impact on your buildings. Use the key to show what each part of your drawing represents.

Draw your plan below:

| | |
|---|---|
| | **Key**:<br><br>= building<br><br>= clay<br><br>= sponge<br><br>= _____ |

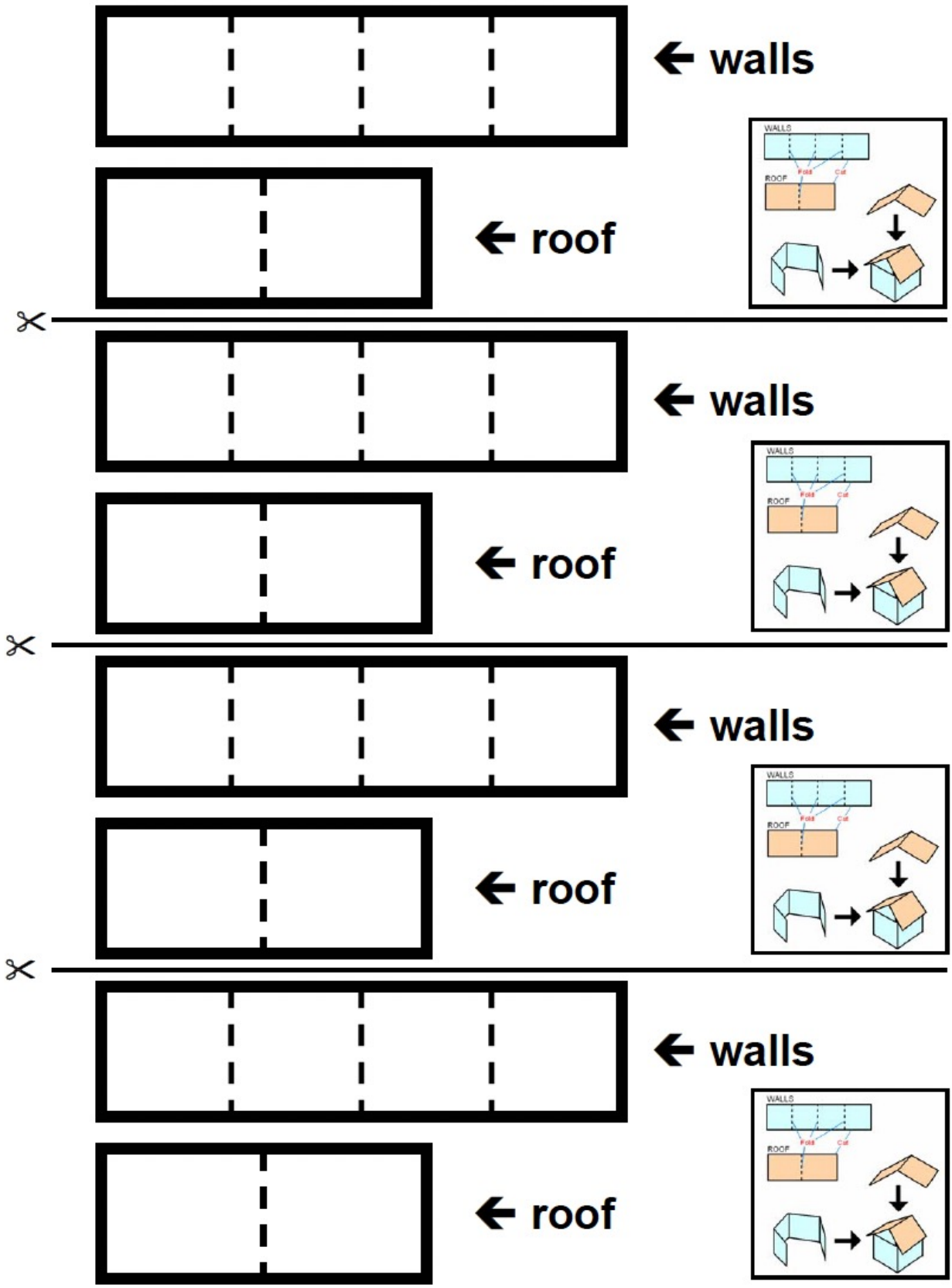
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When it is your group's turn, set up your plan and test its effectiveness. Record your observations below.

TEST 2

| Draw lines on the image below to show where the water level reached. Use more lines to show different levels. | Record other impacts from floodwater. |
|---|---|
|  | ☐ Check box if any buildings moved. |
| Did you notice anything in common between the items impacted by the water?<br><br>_____<br><br>_____ | |

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**Natural Disasters: Lesson 7, Floodplain Modeling Activity — Model House Template**

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