

Water—Too Much

Overview

Students are introduced to the effects of too much water and how it causes flooding in an area, usually as a result of a hurricane or consistent rainfall.

Estimated Time

Part 1 Flooding—20 minutes and Part 2 Investigation—one full class period.

Materials

Powerpoint “Too Much Water” (slides 1-24)

Visuals on flooding:

- [Then and Now photos show how Harvey flooded Houston neighborhoods.](#)
Houston Chronicle
- [When the roads turned to rivers: Texas in the aftermath of Hurricane Harvey.](#)
The Washington Post. 11:38 minutes
- [Harvey: Into the Deluge. Times Documentary.](#) *The New York Times*. 8:42 minutes.

Worksheet 1: O.S.A.E. Water—Too Much

Chart paper/markers to make a class copy of Worksheet 1: O.S.A.E.

Strips of paper with names of hurricanes/storms to be used for random student assignment

Folders with articles on selected hurricanes/storms for JigSaw Activity.

Worksheet 2: Notes on Hurricane/Storm _____ for note taking by groups to be used in expert groups

Worksheet 3: Summary Notes on Hurricanes/Storms for note taking by recipients of presentations by experts

Poster paper for group reports/markers/tacks/tape

Worksheet 4: World Map; United States Map (Teacher can select these)

Learning Objectives

After completing the lesson, students will be able to:

- Use maps and other geographical representations to understand and communicate information about hurricanes and major storms;
- Analyze the physical and human characteristics of locations in Texas;
- Use O.S.A.E. method with visuals of flooding incidents;
- Gather notes pertinent to the study of a specified storm;
- Summarize salient facts about seven storms.

Vocabulary: (still needs to be completed)

GIS Tools and Functions: N/A

Additional Resources

These resources can be used for Part 2 when students investigate different hurricanes:

- [Hurricane Allison 2001](#)
- [Hurricane Claudette 2003](#)
- [Hurricane Rita 2005](#)
- [Hurricane Humberto 2007](#)
- [Hurricane Ike 2008](#)
- Hurricane Isaac 2012: Tropical Cyclone Isaac, USA, August 2012, JRC Technical Reports
- [Tropical Storm Imelda 2019](#)

Opening the Lesson: (Part I) Flooding

You may use the Power Point on Water: Too Much to guide you through these steps.

1. **(PPT Slide 1: Title)** Use Section 1 of the visuals of flooding to introduce the lesson. **(PPT Slide 2)** Simply tell students they will see a short film (or several photos) that they will look at before you make any comments about the day's lesson. Make no comments as students view the visuals.
2. Ask students to speculate on the content of the visuals.
3. Tell students they will record what they see when they view the visuals a second time. **(Show PPT Slide 4)**

Distribute **Worksheet 1: O.S.A.E.—Water: Too Much (Materials)**

Explain what students will write in each quadrant. Show **PPT Slide 5 Worksheet 1**.

O Observations

S Speculation

A Analysis

E Evaluation

4. Show visuals again. Instruct students to take notes as they see the visuals. Give them a minute or two after seeing the visuals to complete their writing.
5. **Pair-Share.** After students have viewed the visuals a second time and recorded their notes on **Worksheet 1**, instruct them to pair up with a student neighbor and share notes. (**PPT Slide 6**)

They are to add notes of their own if partner had noted something different. (5 minutes)
6. Use a **teacher-made chart of Worksheet 1** to record words or phrases students supply. Summarize their observations. (5 minutes)

Developing the Lesson: (Part 2) Investigation

7. Open the lesson with a recap of Part 1 (Seeing the visuals of floods, observation notes)
8. Present the lesson with a focus on the Essential Questions. Use **PPT Slide 7: Essential Questions**
 - What are the major effects of flooding in the Greater Houston area?
 - Can we control or plan for too much water flooding the city and its environs?
 - How do climatologists relate climate change to the more frequent flooding in the area?
9. Use **PPT Slides 8-17** from the Power Point to describe what happened in the Greater Houston area when Hurricane Harvey made landfall in 2017.

Explain the path of the hurricane and explain the immensity of the storm.
10. **Jig Saw Activity Show PPT Slide 18 Becoming an Expert.** Assign students to groups of four. After students are in their groups, tell them they will become experts on hurricanes/storms. Randomly assign past hurricanes/storms to groups. To allow for “Luck of the draw,” put storm names on strips of paper and have one student from each group draw for the group. (**Materials**)**Hurricane/Storm Names:** Allison 2001, Claudette 2003, Rita 2005, Humberto 2007, Ike 2008, Isaac 2012, Imelda 2019. Use **Worksheet 2: Notes on Hurricane/Storm _____ (Materials)** for students to record

information they will use to share as an expert. (Distribute before you model, Step 12)

11. Teacher will model what the students are to learn about their storm using **Worksheet 2: Notes on Hurricane/Storm**_____ using Hurricane Harvey as an example. Distribute the handout to the students. Use **PPT Slide 19**, your completed notes on Harvey.
12. Distribute **folders of readings** on storms to groups (Allison 2001; Claudette 2003; Rita 2005; Humberto 2007; Ike 2008; Isaac 2012; Imelda 2019). Include a map of the path of the storm in the folder of articles. Need maps of paths for folders (**Materials**) Allow 15 minutes for groups to learn about their storm and take notes.
13. After learning about their storm and recording notes on **Worksheet 2**, each group member will move to a new group to relate their findings to the new group. This process will continue until everyone has notes on 4 storms (their own and 3 new ones). **PPT Slide 20 Group Movements**
14. Have the first 4 groups call out their letter: A, B, C, D at each table/group of desks. Each of the first 4 groups will be made up of A-D members. Then have the remaining 3 or 4 groups call out their letter: E, F, G, H.
15. Assign the letters to tables/desk groups so there are up to 8 groups (A-H). All A's will be in one group; all B's in another group, until all letters are assigned. There will be up to 8 new groups with letter designations depending on class size.
16. Show **PPT 21 Group Movement**. Have students move to new groups.
17. Teacher will distribute **Worksheet 3: Summary Notes on Hurricanes/Storms** to all students. (**Materials**) Direct students to use Worksheet 3 to take notes as each expert tells about their storm. Give students about 10 minutes to tell their new group about their storm. In expert groups, students will learn about 2-3 storms. (10 minutes)
18. **PPT Slide 21**. Directions to students. Students will only get to learn about 3-4 storms. Later they will learn about the others through a gallery walk of posters. See Step 20.
19. At the end of 10 minutes, tell students to return to their original groups (Allison, Claudette, Rita, Humberto, Ike, Isaac, Imelda). **PPT Slide 22**. Each group will create a poster that contains the basic (brief) information about their storm that they related as experts. Have students post their work around the room. Materials Needed: Half-sheet poster paper, markers, tacks/tape/ other material to hang posters. (10-15 minutes)
20. **PPT 23 Gallery Walk**. Since students did not get the chance to rotate among all groups, use a gallery walk for students to complete **Worksheet 3: Summary Notes on Hurricanes/Storms**. Students in groups A, B, C, D will go to

posters E, F, G, H while students in groups E, F, G, H will go to posters A, B, C, D. Set timer for 10-15 minutes for students to complete Worksheet 3.

Concluding the Lesson

21. **PPT Slide 24 Path Maps.** Back in original (storm) groups, give each group **Worksheet 4: World Map and U.S. Map (Materials)**. Need to select these maps. Each group will map the path of their storm and post the 2 maps on walls in order of the storms by year (Allison 2001 to Imelda 2019). On the world map students will show the path of the storm from its origins (most are Africa) to Texas. On the U. S. map students will show the storm's path as it came onshore (landfall) and finally dissipated.

Worksheet I:

O. S. A. E. (Observation, Speculation, Analysis, Evaluation)

Name _____ **Date** _____ **Period** _____

As you look at the images on flooding, use the following thinking skills to record what you see.

<p>Observation: <i>What do you see?</i></p>	<p>Speculation: <i>What is happening?</i></p>
<p>Analysis: <i>What are impacts on the environment?</i></p>	<p>Evaluation: <i>Which impacts have the most significant effects on the environment seen?</i></p>

Worksheet 2:
Notes on Hurricane/Storm _____

Name _____ **Date** _____ **Period** _____

<p style="text-align: center;">Background</p> <p>Date: _____ Category: _____</p> <p>Origin/End: _____</p> <p>Rainfall/Winds: _____</p> <p>Geographic Areas Affected: _____</p> <p>Environmental Factors: _____</p>	<p style="text-align: center;">Meteorological History (Origin/Movement) (Starting Point/Movement West or East)</p>
<p style="text-align: center;">Preparation</p> <p>Storm Warnings: _____</p> <p>Evacuation Orders: _____</p> <p>Shelters: _____</p> <p>Other: _____</p>	<p style="text-align: center;">Aftermath/Impact</p> <p>Deaths: _____ Damage: \$ _____</p> <p>Types of Damage:</p> <ul style="list-style-type: none"> • Land— • Property— • Infrastructure— • Businesses—
<p style="text-align: center;">Federal/State Help</p>	<p style="text-align: center;">Additional Notes</p>

Worksheet 2:

Notes on Hurricane/Storm

Harvey 2017

Teacher Example

<p style="text-align: center;">Background</p> <p>Date: August 25, 2017 Category: 4 Origin/End: West Africa/Louisiana Rainfall/Winds: 40+inches/130-135 MPH Geographic Areas Affected: Windward Islands, Suriname, Guyana, Nicaragua, Honduras, Belize, Cayman Islands, Yucatan Peninsula, South and East United States Environmental Factors: Clay-based soils drain poorly, slowly; Heavy rainfall April-October; Storms move slowly over the region; Rapid urban development; Wetlands replaced by hard surfaces; Climate change—increase in rainfall; warm waters; sea level rise</p>	<p style="text-align: center;">Meteorological History (Origin/Movement) (Starting Point/Movement West or East) Developed from a tropical wave—Lesser Antilles Africa—August 12, 2017 Barbados, St. Vincent, Caribbean Sea, Yucatan Peninsula, Bay of Campeche/Gulf of Mexico August 24 became a hurricane August 26 landfall at Rockport Stalled inland; heavy rain; flooding August 30 landfall in Cameron, LA Traveled east eventually dissipating</p>
<p style="text-align: center;">Preparation</p> <p>Storm Warnings: Tropical storm watch; Tropical Storm warning; Hurricane warning</p> <p>Evacuation Orders: Mandatory in Brazoria, Calhoun, Jackson, Rufugio, Victoria and 20 more</p> <p>Shelters: 32,000 people; George R. Brown-8,000, NRG Center, churches, schools</p> <p>Other: 13,000 rescued; 30,000 displaced</p>	<p style="text-align: center;">Aftermath/Impact</p> <p>Deaths: 68 Damage: \$ \$125 Billion</p> <p>Types of Damage:</p> <ul style="list-style-type: none"> • Land—25-30% submerged; slow draining water • Property—300,000 homes damaged; 500,000 vehicles damaged • Infrastructure—336,000 lost electricity; Roads submerged • Businesses—oil refineries reduced fuel; shortages; contaminants in water
<p style="text-align: center;">Federal/State Help</p> <p>FEMA/Coast Guard; Customs and Border Protection; State of emergency August 30; National Guard for search and rescue; Red Cross, Salvation Army; Humane Society; Knights of Columbus; Corporations; Singapore offered helicopters for humanitarian operations; Mexican Red Cross; Venezuela donated \$5 million; Cajun Navy</p>	<p style="text-align: center;">Additional Notes</p> <p>Wettest tropical cyclone on record in U.S. 800 flights cancelled/closed Water released from Lake Conroe Dam Other controlled water releases Curfew in Houston August 29</p>

Worksheet 3:
Summary Notes on Hurricanes/Storms

Name _____ **Date** _____ **Period** _____

Storm/Date	Origin/Path	Rainfall/Winds/ Category	Geographic Areas Affected	Preparations	Aftermath/Impact	Federal/State Help
Allison 2001						
Claudette 2003						
Rita 2005						
Humberto 2007						
Ike 2008						
Isaac 2012						
Imelda 2019						

Additional Notes: