Flood Maps Tell Stories

Compare map layers to investigate flooding in Houston.

OKH.P.2.3.B "Compare and analyze complex maps and mapping technologies to analyze spatial patterns of human and physical environments, explaining relationships between the environment and events, past and present."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the change in land use, circle physical features linked to flooding, and number the two layers that show predicted and observed flood areas so you can compare their patterns.

Reading Houston's Flood Layers

1 In August 2017, Hurricane Harvey brought record-breaking rain to the Houston area. Water spread far beyond riverbanks, closing roads and entering homes. A researcher studying the flood opens three map layers in a geographic information system, or GIS. A land-use map from 1970 shows fields and open ground west of central Houston. A recent land-use layer shows many more streets and buildings in the same area. A terrain layer marks low ground along bayous, the slow-moving waterways that cross the city. Lining up the layers lets the researcher compare changes in human land use with the shape of the land.

2 The researcher next compares a flood-risk map made before Harvey with a radar satellite image taken during the storm. The risk map estimates where flooding is likely, using information such as elevation and past floods. The radar image records water detected at one moment, not all the water that reached an area during the storm. Both layers show water near bayous, but the image also shows flooded places outside the risk zones. The mismatch does not prove the risk map was useless. It shows why an estimate of possible flooding and an observation from one day answer different questions.

3 Adding a road layer reveals that some flooded streets connect neighborhoods to hospitals and stores. Adding a population layer shows where many people live, but it cannot show who stayed home during the storm. The land-use layers suggest that more buildings and paved surfaces now occupy parts of the area that once had open ground. Pavement can reduce how much rain soaks into soil, while exceptional rainfall, low terrain, and overflowing bayous also shaped Harvey's flood. To study present-day risk, the researcher would compare updated land use, terrain, roads, and flood observations rather than rely on any single map.

2 ANSWER WITH EVIDENCE

Use the passage

1. What spatial relationship appears when the terrain layer is compared with the storm image?

2. How do the flood-risk map and radar satellite image differ in what they reveal about Harvey's flooding?

3. What does combining the road and population layers add to the flood analysis, and what can the layers not show?

4. How could the 1970 and recent land-use layers help explain flood risk without showing that pavement caused every flooded area?

3 YOUR TURN

Your own words

A city wants to place a new emergency clinic in the Houston area. In four sentences, explain how you would compare at least three layers from the passage to choose a site, describe one trade-off, and name one conclusion the maps alone cannot support.

ANSWER KEY

Flood Maps Tell Stories

HIGH SCHOOL · OKH.P.2.3.B

PART 1 · READ AND MARK

Underline the change in land use, circle physical features linked to flooding, and number the two layers that show predicted and observed flood areas so you can compare their patterns. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What spatial relationship appears when the terrain layer is compared with the storm image?	**The terrain layer marks low ground along bayous, and the storm image shows flooding near bayous.**
2	How do the flood-risk map and radar satellite image differ in what they reveal about Harvey's flooding?	**The risk map estimates where flooding is likely. The radar image detects water at one moment during Harvey, including flooded places outside the mapped risk zones.**
3	What does combining the road and population layers add to the flood analysis, and what can the layers not show?	**The layers identify flooded streets that connect neighborhoods to services and areas where many people live. They cannot show who stayed home during the storm.**
4	How could the 1970 and recent land-use layers help explain flood risk without showing that pavement caused every flooded area?	**They show that streets and buildings replaced some open ground. Pavement can reduce how much rain soaks into soil, but exceptional rainfall, low terrain, and overflowing bayous also shaped the flood.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would compare the terrain, flood-risk, road, and population layers to find a site on higher ground near neighborhoods with many residents. I would also check the storm image to see whether the site or its main access roads flooded during Harvey. A site close to more people might have worse road access in a flood, so I would favor one reachable by several routes. These maps alone cannot prove that the clinic will remain open in the next storm.

Accept other supported relationships among the layers. For Part 3, look for a clear site-selection method, a realistic trade-off, and a limitation of map evidence.