

## Volcanic Hazards and Risks

**Overview:**

In this activity students will assign a risk level to five areas on the Big Island of Hawai`i. By looking at maps indicating kona winds, recent lava flows, volcanic vents and schools on the island of Hawai`i, students will for each area (1) assign a hazard level, (2) find the school density, (3) assign a level of risk by multiplying the hazard level by the school density and (4) establish a color code based on risk level.

**Objectives:**

The student will:

- interpret a map to establish hazard levels associated with volcanic events;
- interpret a map to determine school density;
- calculate risk levels associated with volcanic events in populated areas; and
- assign a color-coded risk level based on both volcanic hazards and school (population) density and apply understanding of risk levels to answer questions.

**Answers to Student Worksheet:**

Table 1:

	Downwind of a vent	Presence of a vent	Presence of recent lava flows	Total hazard level (sum of threats)
Area A	1	1	1	3
Area B	1	1	0	2
Area C	1	1	1	3
Area D	0	1	1	2
Area E	0	1	1	2

Table 2:

	No. of Schools in the Area	School Density Rating
Area A	3	1
Area B	2	1
Area C	12	3
Area D	6	2
Area E	1	0

1. A, C
2. C
3. Many nearby volcanic hazards, high population
4. Area C (Hilo), it has high population density and hazard level.
5. North of Area C. It would be away from recent lava and further from vents that would carry gases on Kona winds. Another good place would be between areas C and D. It would be in a somewhat higher hazard level, but it would be closer to more people who might need a hospital.
6. Answers will vary

Table 3:

	Hazard Level from Table 1	School Density from Table 2	Risk (hazard x density)	Color Code
Area A	3	1	3	yellow
Area B	2	1	2	green
Area C	3	3	9	red
Area D	2	2	4	yellow
Area E	2	0	0	green

## Volcanic Hazards and Risks

### **Materials:**

- Student Information Sheet: “Lava Flows and Vents”
- Student Information Sheet: “Winds and School Locations”
- Student Worksheet: “Volcanic Hazards and Risks”

### **Activity Procedure:**

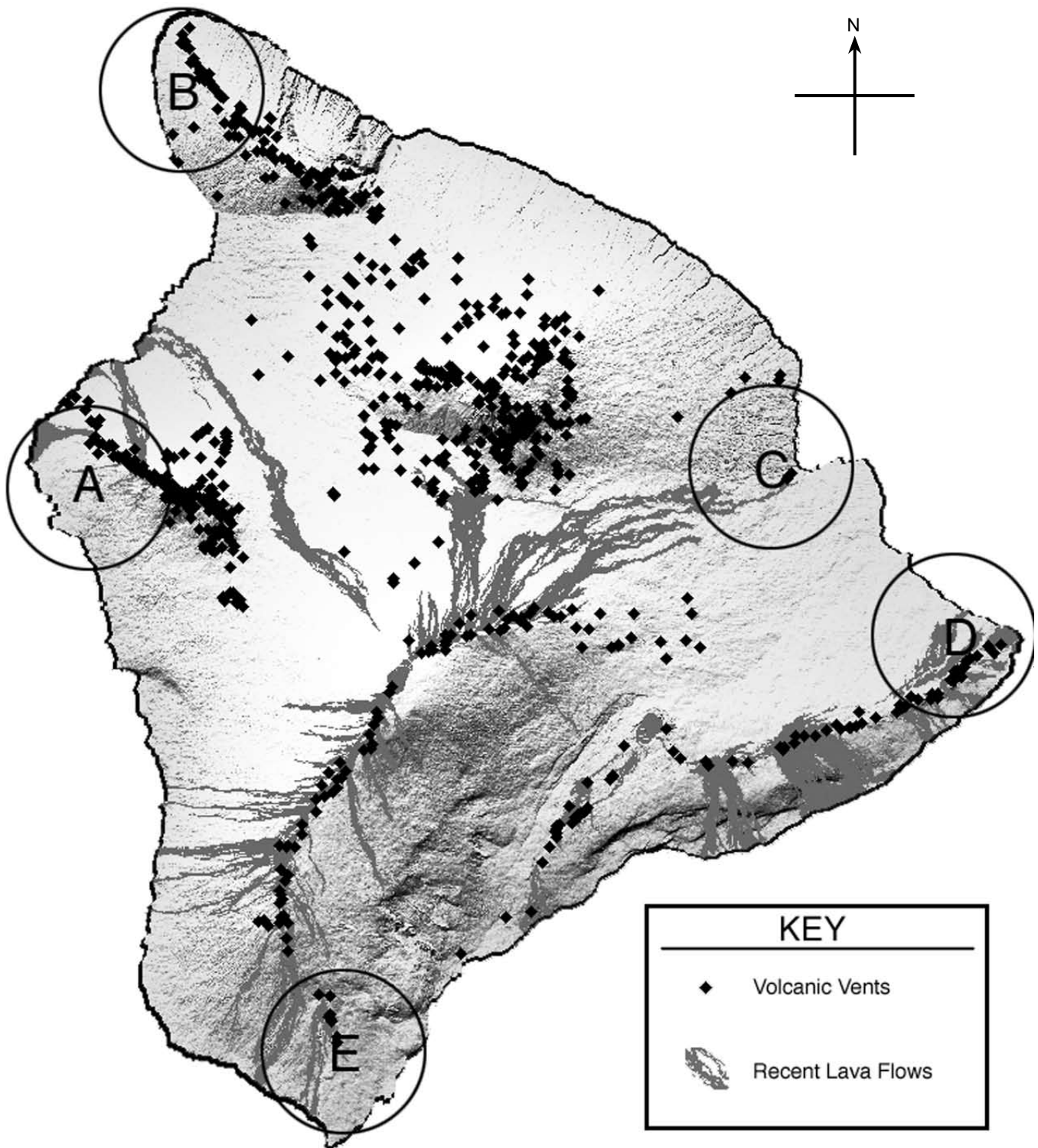
1. Explain that volcanoes present a variety of dangers. In this activity students will look at two maps of the island of Hawai‘i and use the information on the maps to assign a risk level to five different areas on the island. The first map shows lava flows that have occurred in the past 200 years and known volcanic vents. The second map shows kona winds and schools on Hawai‘i.
2. Distribute the Student Information Sheets: “Lava Flows and Vents” and “Winds and School Locations” and the double-sided Student Worksheet: “Volcanic Hazards and Risks.” Make sure students can identify the key features on each map.
3. To assign a level of risk, ask students to consider the hazards that are indicated on the maps and the proximity of these hazards to the areas that have large populations. Two areas may have similar hazard levels, but the one with a larger population is at a higher risk.
4. Ask students to begin by completing Table 1 on the Student Worksheet: “Volcanic Hazards and Risks” to find the hazard level of each area. Explain that an area is considered downwind of a vent if the wind is likely to carry gas from vents outside the area into the area. Explain that it is unhealthy to be downwind of a vent because the gases that are released can be harmful to people and animals.
5. After students have completed Table 1, ask them to complete Table 2 to find the school density rating for each area. Students will need to count the number of schools in the area and use the School Density chart to convert this number to a density rating.
6. After students complete Table 2, explain that they will use what they have learned to complete Table 3 and establish a risk level for each of the five areas. The risk level is calculated by multiplying the hazard level of an area by the school density rating for the area. Ask students to identify the color associated with each risk level.
7. Ask students to use Tables 1 through 3 to answer the questions on the Student Worksheet: “Volcanic Hazards and Risks.”
8. Discuss student responses to each question and make sure students understand that population and hazards must be considered together when calculating risk.



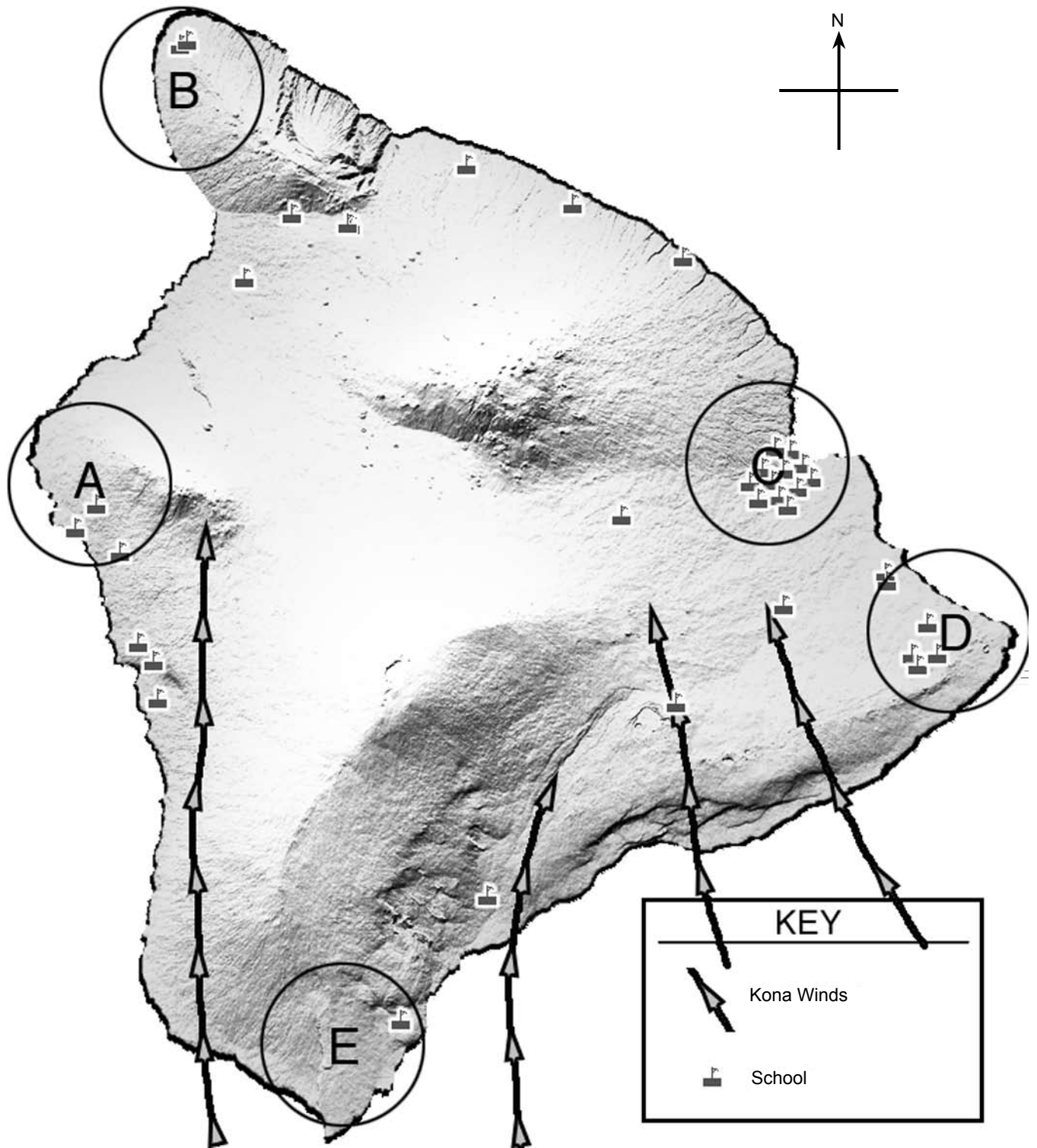
#### Cultural Tie

In 1868, the island of Hawai‘i was devastated by two powerful earthquakes, a large eruption, a tsunami, and a mudflow. Many people were killed and many villages destroyed. Kamehameha V, who reigned as king at the time, instantly provided food and supplies to the areas of greatest damage, reducing the suffering of his people.

Lava Flows and Vents



# Winds and School Locations



## Volcanic Hazards and Risks

**Table 1:** Use the Student Information Sheets provided with this lesson to assign a hazard level for each threat and each area listed in the table. Fill in a 1 if the threat listed is present, and a 0 if the threat is not present. When you are done, find the total hazard level for each area.

Table 1:

	Downwind of a vent	Presence of a vent	Presence of recent lava flows	Total hazard level (sum of threats)
Area A				
Area B				
Area C				
Area D				
Area E				

**Table 2:** Write the number of schools (including those touching area boundaries) in the first column. Use the School Density chart to find a density ratings and complete the second column.

Table 2:

	Number of Schools in the Area	School Density Rating
Area A		
Area B		
Area C		
Area D		
Area E		

School Density	
Number of Schools	Density Rating
0 to 1	0
2 to 4	1
5 to 10	2
10 or more	3

**Table 3:** Write the hazard and risk information you gathered for Tables 1 and 2 in the spaces in Table 3. Calculate the risk by multiplying the two numbers together. In the last column assign the color red to risk levels from 6-9, yellow to risk levels from 3-5, and green to risk levels from 0-2.

Table 3:

	Hazard Level from Table 1	School Density from Table 2	Risk (hazard x school density)	Color Code
Area A				
Area B				
Area C				
Area D				
Area E				

## Volcanic Hazards and Risks

**Directions:** Use the Student Information Sheets provided with this lesson and Tables 1-3 from the first page of this worksheet to answer the following questions.

1. Mark the two areas that have the highest hazard level.  
\_\_\_\_ Area A      \_\_\_\_ Area B      \_\_\_\_ Area C      \_\_\_\_ Area D      \_\_\_\_ Area E
2. Mark the area that has the highest population (represented by the number of schools shown).  
\_\_\_\_ Area A      \_\_\_\_ Area B      \_\_\_\_ Area C      \_\_\_\_ Area D      \_\_\_\_ Area E
3. Mark two factors that place an area at high risk of volcanic disaster.  
\_\_\_\_ Many nearby volcanic hazards                          \_\_\_\_ High population  
\_\_\_\_ Few nearby volcanic hazards                                  \_\_\_\_ Low population
4. If you were in charge of safety for residents of the Big Island, which area would you concentrate on preparing first? Why?

---

---

5. If you were going to put a new hospital on the Hilo (Area C) side of the island, where would you put it? Why?

---

---

On the map, mark the area you suggest for a hospital with an H. *Remember: Hospitals should be located in areas that would be least affected by a volcanic event, and that are easily accessible to residents of the area in case of an emergency.*

6. If you were going to build a house on the Big Island, name three factors you would consider in choosing the location. Why?

---

---

---

---

