Magnitude vs. Intensity: Why is the Shaking Different in Different Places?

Geology Mr. Traeger

Name: _____ Period: ____ Date: _____

Purpose

The purpose of this activity is to understand the difference between earthquake magnitude and earthquake intensity by analyzing reports received during the Northridge Earthquake. It will also serve as a way to assess the earthquake hazards of the local area by using a geologic map of Pasadena.

Materials

- Geologic Map of Pasadena
- Geologic Map of California (paper or Google Earth®)
- Handout Map of Northridge and vicinity
- Modified Mercalli Earthquake Intensity Scale
- Sheet with reports of earthquake effects
- Colored Pencils

Part I: Making an Earthquake Intensity Shake Map of the Northridge Earthquake

1. Look at the *Did you Feel It?* map of the Northridge Earthquake on page 31 of the *Putting Down Roots in Earthquake Country* booklet. Was the *intensity* of the earthquake at the epicenter in Northridge more or less than the *intensity* felt in La Cañada (area code 91011)? Why? Give at least three reasons.

2. Did areas near Santa Monica encounter more shaking? Is so, then why?

3. What was the *magnitude* of the Northridge Earthquake measured by a seismograph station in the following locations?

Seismograph Station	Northridge, CA	La Cañada, CA	New York City
Magnitude?			

4. What is the difference between magnitude and intensity?

5. How many times more energy do the larger magnitude earthquakes have compared to the smaller magnitude earthquakes?

	Mag 3 compared to Mag 4?	Mag 3 compared to Mag 5?	Mag 3 compared to Mag 6?
How many times more energy?			

Part II: Analyzing a Pasadena Geologic Map to Determine Earthquake Hazards in La Cañada

1. What kinds of things does a geologic map show?

2. Sand and sediments (especially when they are wet) amplify earthquake waves, which is less desirable for building. The geologic map refers to sand/sediment as *alluvium* or *alluvial* deposits. Determine what areas on the Pasadena map are less desirable for building. Name these areas.

3. Granitic type rocks (bedrock) are usually better for building because they do not amplify earthquake waves as much. Determine what areas on the Pasadena map are most desirable for building. Name these areas.

4. How many earthquake faults run through the map area? What are their names? *Extra Credit*: Determine what type of fault each fault is (Normal, Reverse/Thrust, Strike-Slip).

5. Find where you live on the map. What kind of soil/rock do you live on?

6. How old is the soil/rock that you live on?

7. Is the soil/rock that you live on good or bad when it comes to amplifying earthquake waves? Why?

8. What is the closest earthquake fault to your house? Do you think this fault is capable of producing a large earthquake? *Extra Credit*: Determine what type of fault it is (Normal, Reverse, Strike/Slip).

Part III: Analyzing a California Geologic Map for Earthquake Hazards.

1. Look at the Geologic Map of California. Identify all of the geologic regions in California at risk for earthquakes, liquefaction, and landslides. You can also do this in Google Earth®. What are the criteria for determining risk?

2. Conclusion: How does this analysis help you to understand the hazards associated with living in California, especially Southern California?