

## SWGEONET Module 2—Hazards

After completing this module, the user should be able to:

- describe landslide and earthquake hazards for Arizona and/or New Mexico
- understand the relationships between geology, topography, landslides, and earthquakes
- apply knowledge gained from these exercises to real life situations

### Hazards

Two of the **hazards** that occur in Arizona are incorporated into the SWGEONET database: **landslides** and **earthquakes**. This lesson will introduce these topics and relevant databases, and guide the reader on a journey of discovery. From the comfort of your chair, you will explore the hazards of Arizona through Digital Elevation Models (DEMs), geologic maps, and landslide and earthquake data; you will analyze the settings, and apply your common sense and newfound knowledge to answer thought provoking questions. Let the journey begin!

### Basics

When beginning any geologic investigation, and especially related to hazards, it is important to place the region of focus in some sort of geological context. In Module 1, you explored the topography and geology of a specific site either in Arizona or New Mexico. You will use the information you obtained from Module 1 to assist you with the exercises presented here, so go ahead and reacquaint yourself with the rock units and topography present in your chosen county.

**Note:** Currently, landslide data are only available for Arizona, so if you chose a county in New Mexico, you will need to choose a county in Arizona that has both landslides and earthquakes present, and go through Module 1 with that county.

### People and Infrastructure

With any hazards research, understanding the roles humans play is vital. Where are people centered? Where is vulnerable infrastructure present?

Are people at risk of these hazards? The following questions refer to the county you have chosen to investigate. Be sure that the county, city, and transportation layers are turned on.

Where are people centered? How many big population centers are present?

What transportation routes are in the county (highway, railroad, etc.), and where are they?

What other infrastructure is present (e.g., reservoirs, sewage systems, landfills, mines), and where?

### **Earthquakes**

For the following questions (which pertain to your chosen county), turn on the Arizona geology, Machette faults, and Arizona seismic layers. The Arizona seismic layer shows the location of earthquake **epicenters**.

Where are faults located?

What age are the rocks that the faults cut through?

Do any of the faults cut through Quaternary material (rock unit begins with "Q")? Where?

Name \_\_\_\_\_

Date \_\_\_\_\_

Which are older: the faults or the rocks? Why?

If a fault cuts through **Quaternary** material, could it be considered a threat to people living in the vicinity? Why?

Where are earthquake epicenters located?

When and where was the oldest earthquake? The youngest?

What and where is the largest magnitude earthquake? The smallest?

Are the faults and earthquakes in the same place, or are they independent of each other? Give one possible reason why.

On what rock units do the faults and earthquakes occur (i.e., what type and age)?

Name\_\_\_\_\_

Date\_\_\_\_\_

What correlations are there between the earthquakes and faults and:

- rock type and age?
- topography (DEM)?
- slope?
- people and infrastructure?

Active faults are classified as faults that have ruptured within the last 10,000 years. Are active faults located within the county, and how close are they to population centers?

### **Landslides**

For the following questions ensure that the Arizona landslides layer is turned on.

How many landslides are located within your county?

Name \_\_\_\_\_

Date \_\_\_\_\_

Describe the landslides that have occurred (i.e., size, type, year, etc.):

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

What reasons could there be for the existence of other, unmapped landslides?

Turn on the Arizona geology layer again, if it is not still on. What correlations can you make between landslide occurrence and the geology? Do the landslides occur dominantly on any one rock type or age, or are they randomly occurring?

Are any of the rock types associated with landslides located near people and/or infrastructure? Describe.

Do you think these landslides occurred naturally, because of people, or both? Why?

Name \_\_\_\_\_

Date \_\_\_\_\_

What correlations can you make between landslides and slope?

Shut off the Arizona geology layer and turn on the Arizona seismic and Machette faults layers. What correlations can you make between landslides and earthquakes (both location and timing) and faults?