

# Earthquakes: A Unit Overview



## **District Standard**

- Understands basic features of the Earth and the Earth Processes.

## **Benchmark**

1.18

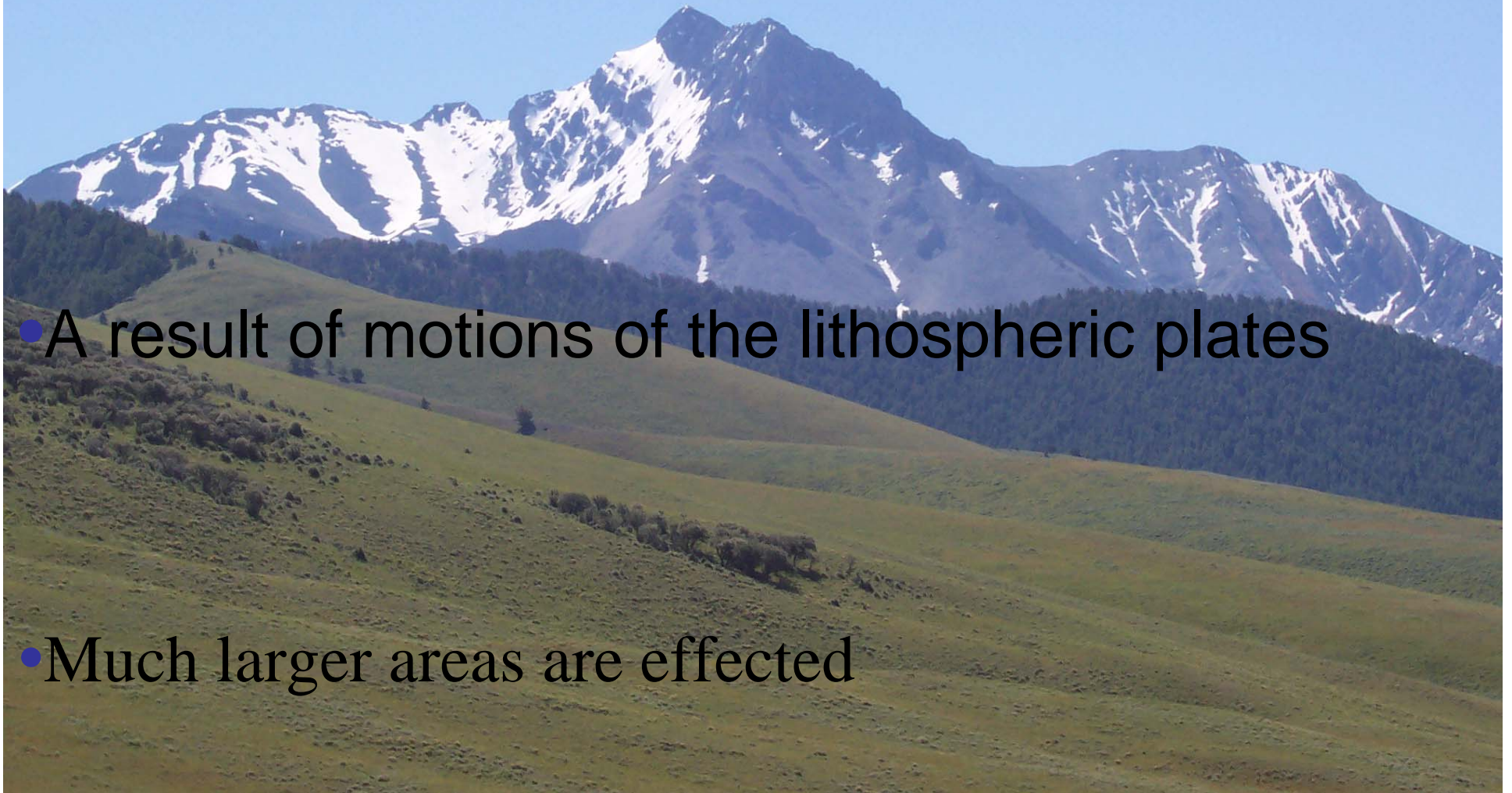
Knows effect of the movement of crustal plates (e.g., earthquakes occur along the boundaries between colliding plates; sea floor spreading occurs where plates are moving apart; mountain building occurs where plates are moving together; volcanic eruptions release pressure created by molten rock beneath the Earth's surface.

## **Objective**

Understands process of earthquakes in relation to plate tectonics.

# What is an Earthquake?

- An earthquake is a shaking of the earth crust caused by a release of energy.
- A result of motions of the lithospheric plates
- Much larger areas are effected



# What causes earthquakes?

- The major cause is the stress build up of two lithospheric plates.

- Volcanism

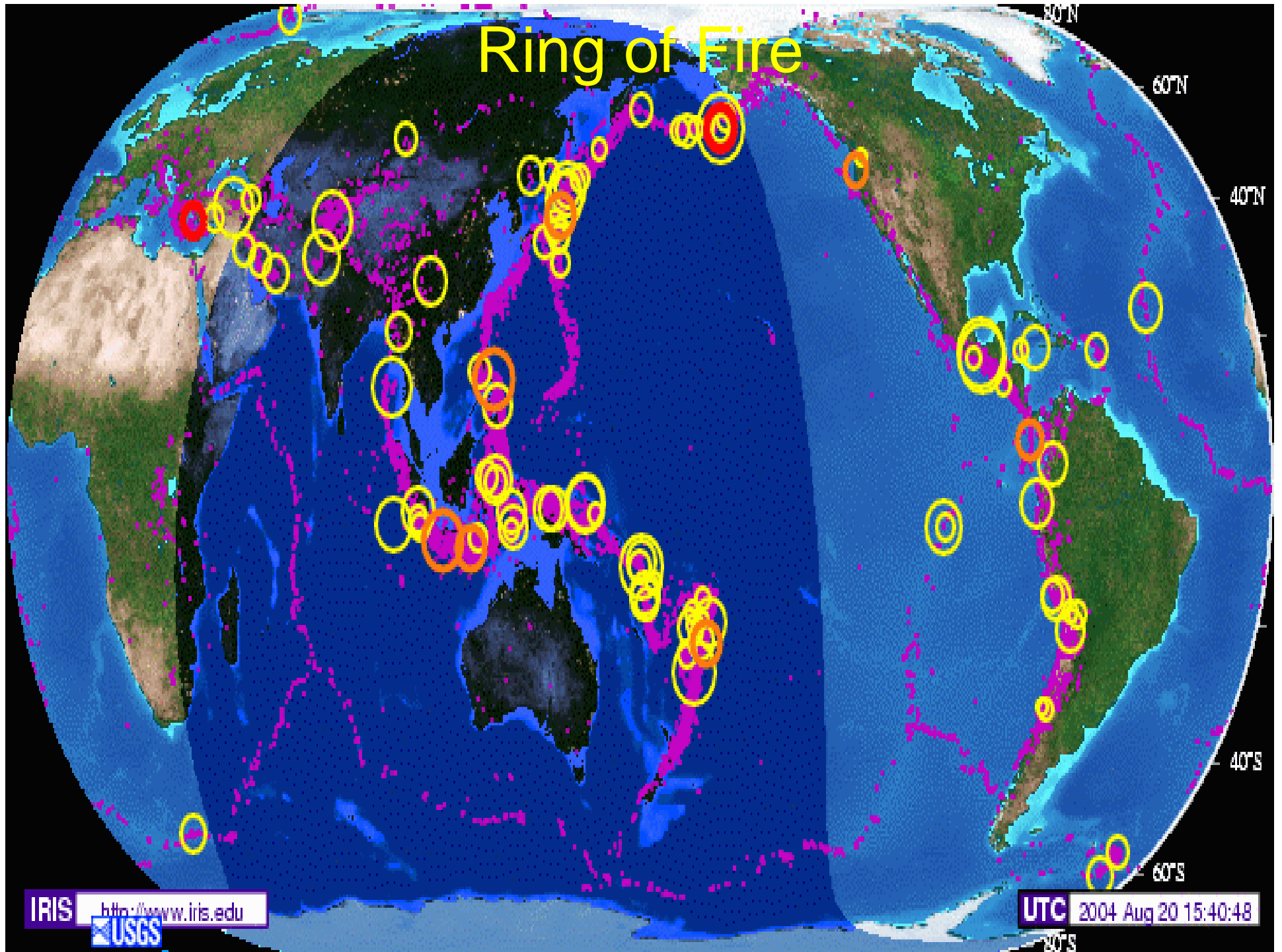
- The collapse of a cavern



**WHERE DO WE HAVE EARTHQUAKES?**



# Ring of Fire



# Map of plate tectonics



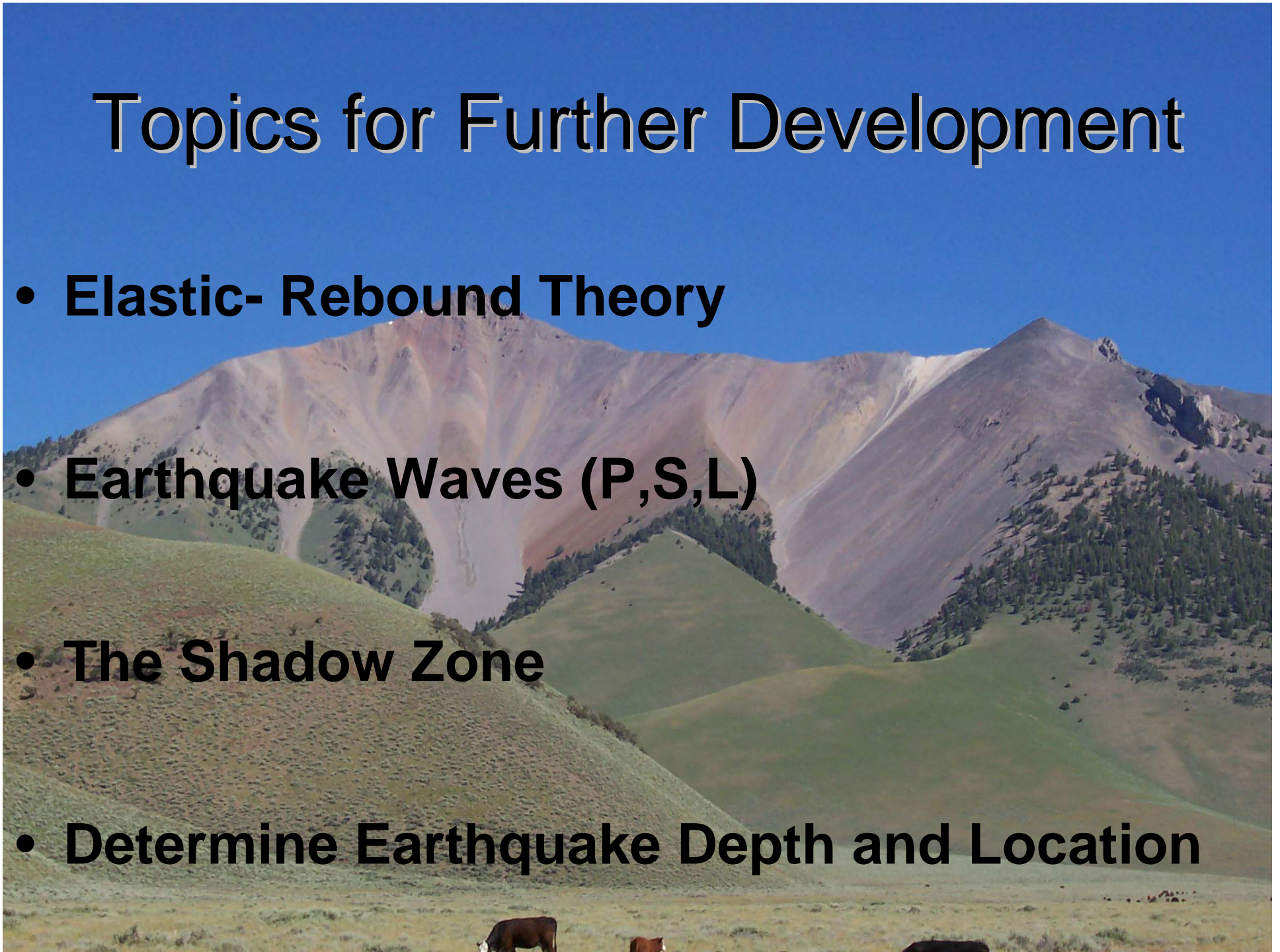
# KEY VOCABULARY

*Convergent plates	*Compression	*Richter scale
*Divergent plates	*Elastic Rebound	*S - waves
*Earthquake	*Extention	*Scarp
*Epicenter	*Lithosphere	*Seismogram
*Faults	*Mercalli scale	*Seismograph
*Focus	*P - waves	*Seismologist
*L - waves	*Plate boundaries	*Shear
*Magnitude	*Rapid Visual Survey	*Stress
*Subduction zone	*Transform plates	



# Topics for Further Development

- **Elastic- Rebound Theory**
- **Earthquake Waves (P,S,L)**
- **The Shadow Zone**
- **Determine Earthquake Depth and Location**



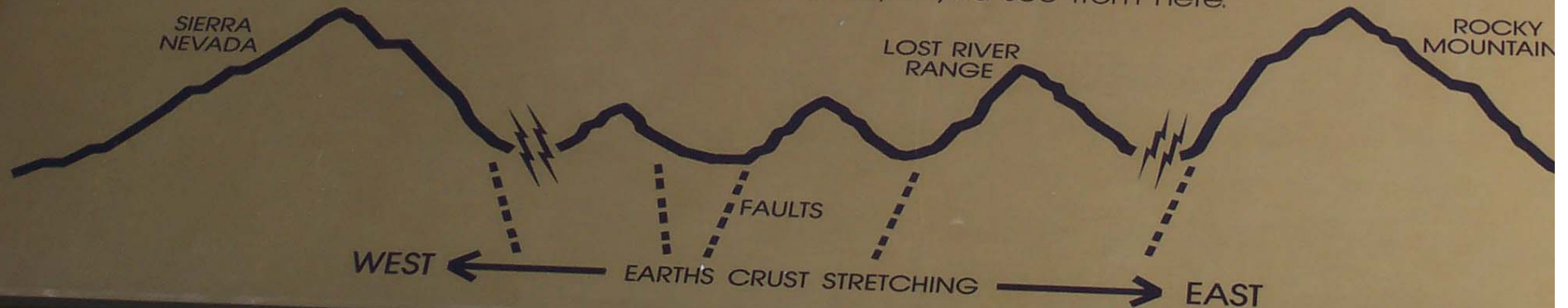
# Past Earthquakes

## **EARTHQUAKE!**

### *The Stage*

Idaho is part of the world's longest mountain chain above sea level. This chain extends from the tip of South America to Alaska's north coast. The widest section is in the western United States—from the Sierra Nevada to the Rocky Mountains. The Lost River Range is one of many smaller mountain ranges between the Rockies and the Sierra Nevadas.

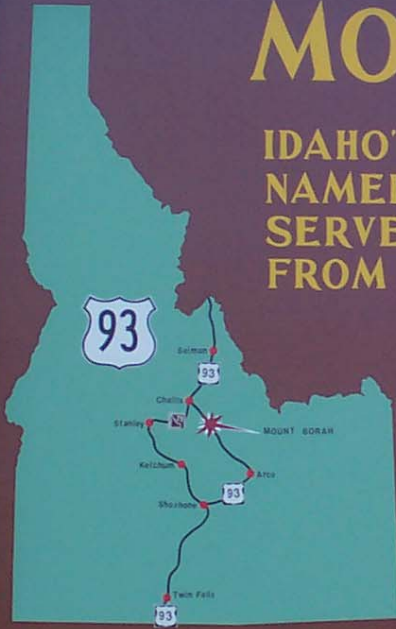
The earth's crust between the Sierra Nevada and Rocky Mountains, including the Great Basin, is stretching about ½ inch per year. And, it's getting thinner. Every so often—a few hundred to a few thousand years—the crust breaks along old fracture lines known as "faults." The valleys drop and the mountains rise, creating the "Basin and Range" landscape you see from here.



# BORAH PEAK EARTHQUAKE

## MOUNT BORAH

IDAHO'S HIGHEST PEAK, 12,662 FEET, IS NAMED FOR WILLIAM E. BORAH, WHO SERVED IN THE UNITED STATES SENATE FROM 1907 UNTIL HIS DEATH IN 1940.



Ten or a dozen large but shallow inland seas have covered this area in the past billion years. They became a graveyard for countless generations of sea creatures: bones, shells, coral, and microscopic remains piled up through the eons into a clay-and-limestone deposit thousands of feet thick. During the past 10 or 20 million years, part of this deposit has been thrust upward into the towering ridge which you see before you.

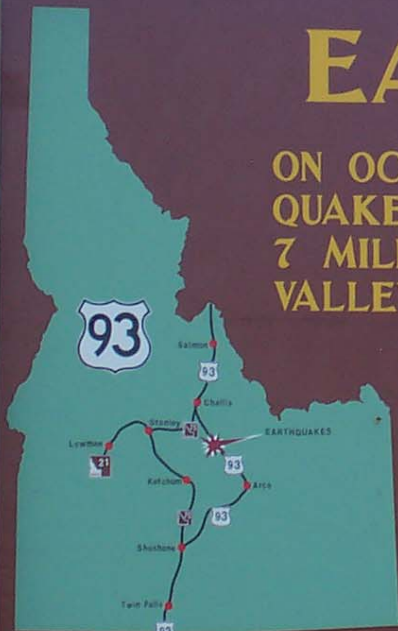


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# FEATURES OF THE BORAH PEAK EARTHQUAKE

## EARTHQUAKES

ON OCTOBER 28, 1983, A MAJOR EARTHQUAKE FRACTURE, 26 MILES LONG AND 7 MILES DEEP, SURFACED AS LOST RIVER VALLEY SLID AWAY FROM MOUNT BORAH.



During that rock shift, Mount Borah's ridge front rose about 6 inches, while this valley subsided 9 feet. This kind of movement has been going on here for 10 to 20 million years as subsurface rock has been pulled apart during gradual but persistent range and valley building. You can drive to a spectacular fracture that shattered this side road 2-1/2 miles from here.

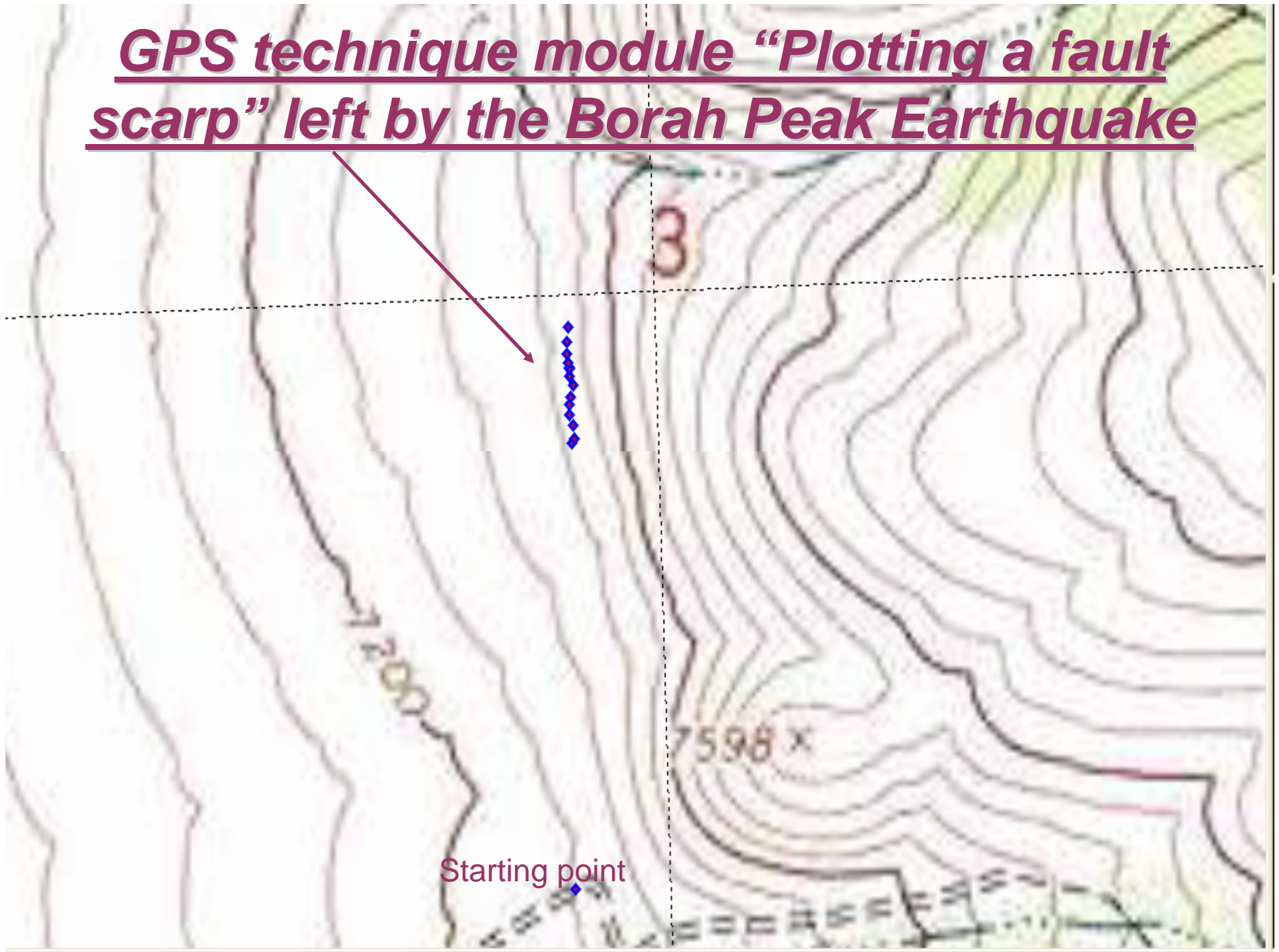
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# What did we see after the Borah Earthquake? “Fault Scarps”



**GPS technique module “Plotting a fault scarp” left by the Borah Peak Earthquake**



Starting point

# San Andreas “Loma Prieta”

M 7.1 – October 17, 1989, \$5.9 billion in damage  
63 deaths – 3,757 injuries -



# San Andreas “Northridge”

M6.7 – January 17, 1994, *57 deaths – more than 11,000 injuries - \$40 + billion in damage*





# San Andreas “San Francisco”

M8.5 – April 18, 1906, 700-800 deaths – \$400 million in damage



# Kobe

- M7.2-- ,January 17, 1995, --5,500 deaths, 26,000 injured, \$200 billion (US dollars)



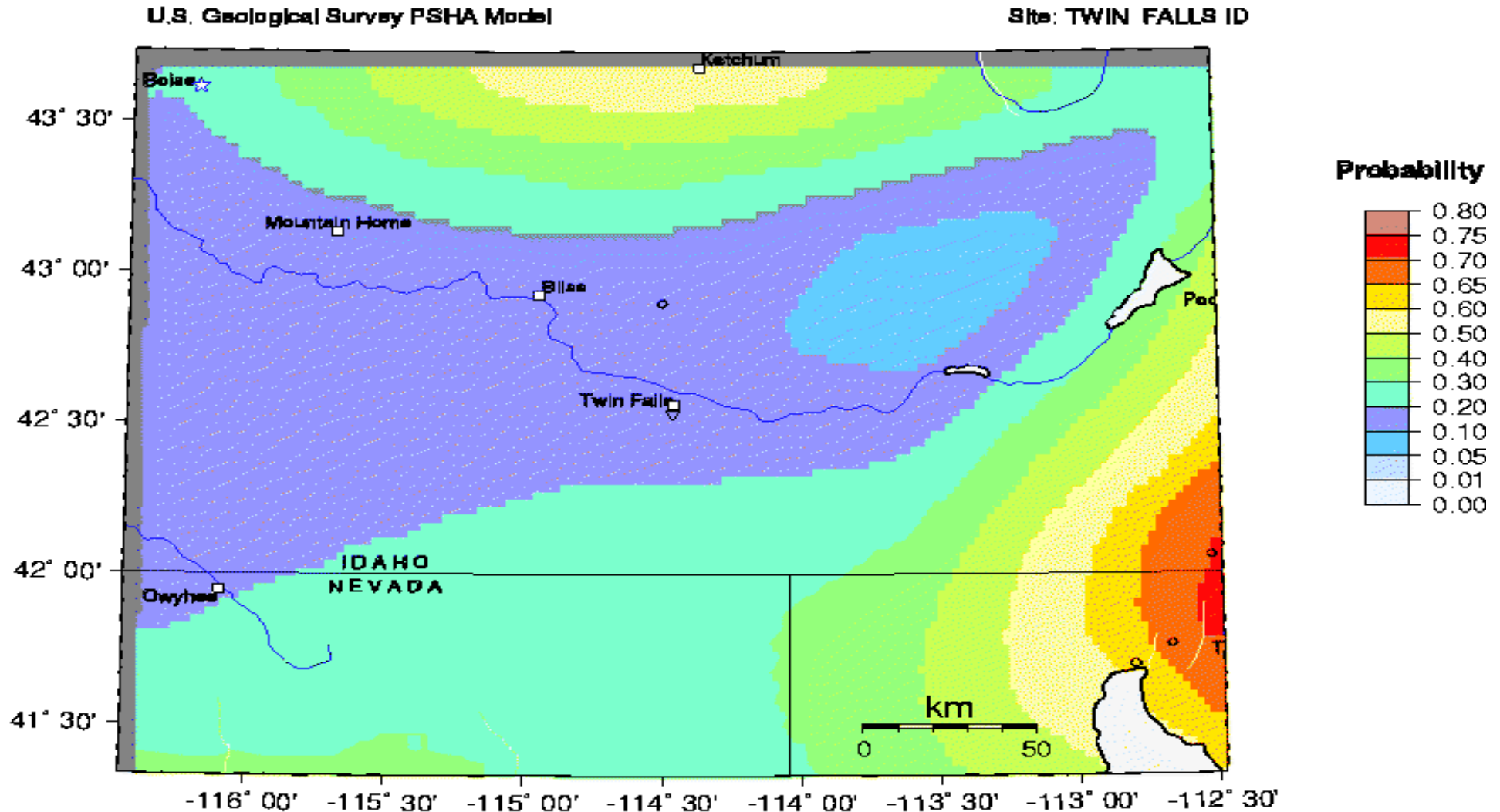
# Mexico City

- M 8.1 -- September 19, 1985, --10,000 deaths, 50,000 injured -- \$4 billion dollars in damage



# So what's in your future?

Probability of earthquake with  $M \geq 5.0$  within 50 years & 50 km

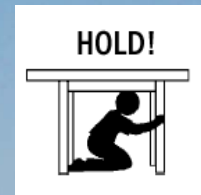


# WHAT SHOULD YOU DO IN CASE OF AN EARTHQUAKE?

## Four Rules For Earthquake Survival

**Rule 1 (inside): Look for a safe place**

**Rule 2 (inside):**



**Rule 3 (inside): Once the shaking has stopped, get out.**

**Rule 4 (outside): Get away from the sides of buildings.**

# Student Activities

- **WATTSVILLE**
- **RAPID SURVEY OF SCHOOL**
- **SEISMOGRAMS - SIMPLIFIED**
- **TRIANGULATION**
- **BORAH EARTHQUAKE ACTIVITY**
- **HOME SURVEY EARTHQUAKE SAFETY**
- **HISTORICAL EARTHQUAKES OF IDAHO**
- **HISTORICAL EARTHQUAKES OF UNITED STATES**
- **HISTORICAL EARTHQUAKES OF THE WORLD**
- **CURRENT SEISMIC ACTIVITY?**
- **NAME THAT FEATURE?**
- **EARTHQUAKE DAMAGE POWER-POINT PRESENTATION**
- **READINGS OF FIRST HAND ACCOUNTS OF EARTHQUAKES**

# Assessments

- **Daily entrance and exit Quizzes**
- **Key Concept Quizzes**
- **Key Vocabulary Quizzes**
- **Lab / Activities**
- **District Unit Summative assessments**
- **Idaho Standardized Assessment Test**

Questions?????





# Special Thanks To:

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