

Earthquake Occurrence in Southeast Idaho

A project of the Idaho Seismic Technical Working Group, this fact sheet conveys the frequency of earthquakes in the Intermountain Seismic Belt in Southeastern Idaho. This region shares major faults with the neighboring state of Utah. In particular, the Wasatch, Eastern Bear Lake, and West Cache Fault zones are highlighted, in addition to other faults noted for a high frequency of earthquakes in the region.



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Idaho's Seismic History

Geologic evidence shows that movement on Idaho's faults could produce magnitude (M) 7.0 and higher earthquakes, which could have catastrophic effects on the region. Meanwhile, knowledge is limited about Idaho's extensive fault systems, most of which are prehistoric and have not experienced activity for tens of thousands of years. Still, there are areas in Idaho that experience seismic activity regularly. Knowing little about Idaho's oldest fault systems makes it nearly impossible to calculate earthquake probability in Idaho. However, historical earthquake data shows the occurrence of earthquakes in the state, which is very useful for understanding risk.

Idaho Seismic Zones

Idaho's seismic zones consist of the north-south Intermountain Seismic Belt and the east-west Central Idaho (Centennial) Seismic Zone, making up one of the most seismically active regions in the state. Situated on the borders of Wyoming and Utah, the region has experienced earthquakes greater than M6.5 over an extended historical period. In 1884, Paris and Bear Lake Valley experienced a M6.0 earthquake that caused shaking and damage in the area. In 1934 in Utah, just 20 miles south of the Idaho border, a record M6.6 earthquake in Hansel Valley shook the region and caused widespread damage in both states.

The most active faults in the Belt are the Eastern Bear Lake, Wasatch, and West Cache Fault Zones, all located along the Utah-Idaho border (Figure 1). The notable M5.7 Richmond Earthquake occurred at the West Cache Fault in 1962. The northern portion of the Wasatch fault extends into Idaho, and is the most dangerous fault in the Intermountain Seismic Belt. Located near Malad City and within 30 miles of Pocatello, geologic studies indicate that M7.0 earthquakes occur along the Wasatch fault every 300-400 years.

The seismic region near the volcanic areas west of of Yellowstone National Park contains many active faults, including the Sawtooth, Lost River, and Lemhi faults. Most of the faults in this region are not well known, and are considered "prehistoric," or formed before recorded history. Notably, a M6.9 earthquake occurred along the Lost River Fault in 1983, causing surface ruptures typical of earthquakes in this region as well as extensive aftershocks.

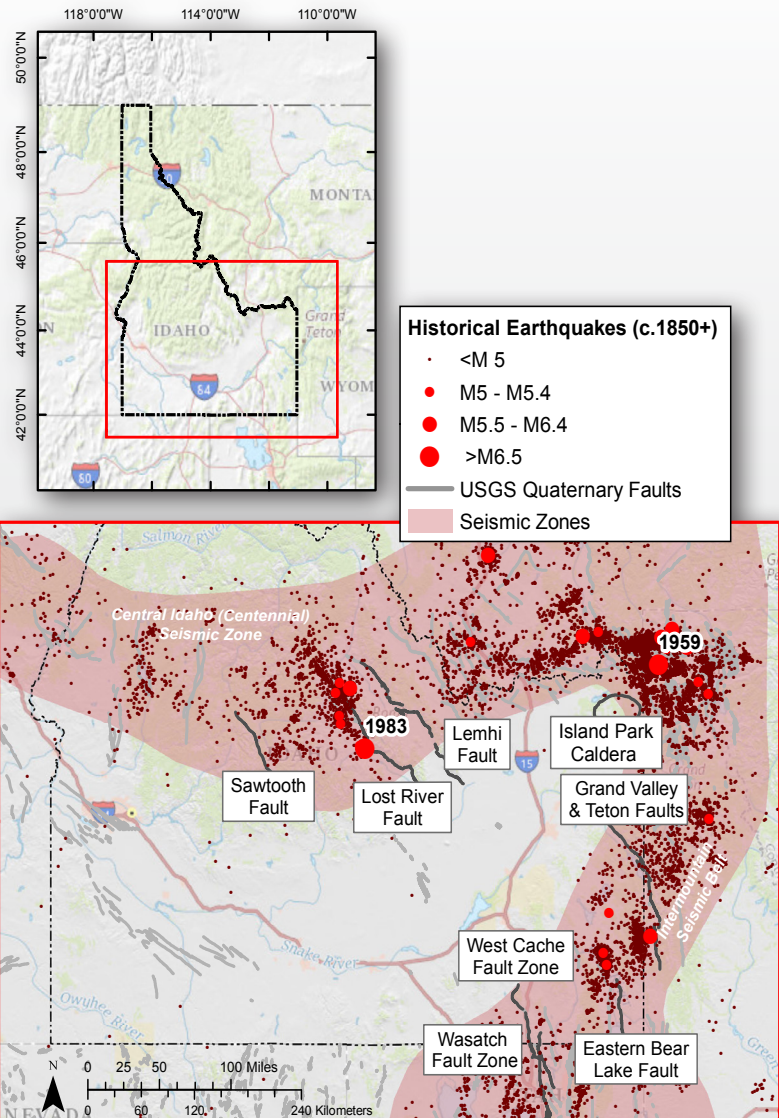


Figure 1. Historical Earthquakes in Idaho

Earthquakes in Idaho

Faults	Number of Earthquakes c.1925+
Eastern Bear Lake Fault	4
Grand Valley & Teton Fault	19
Lemhi Fault	7
Lost River Fault	13
Sawtooth fault	1
Wasatch Fault Zone	27
West Cache Fault Zone	7

Occurrence of Earthquakes

Based on earthquake frequency, we know Idaho is susceptible to two types of threats from earthquakes. The first threat includes infrequent, but large scale ($>M6.5$) earthquakes in Idaho's seismic zones over a time scale of hundreds to thousands of years. These events are predicted to be catastrophic, similar to the 1983 Borah Peak $M6.9$, or the 1934 Hansel Valley earthquakes, with strong shaking, fatalities, and major structural damage. Idaho's most active faults occur in the broader seismic zones amid a complex fault system (Figure 2).

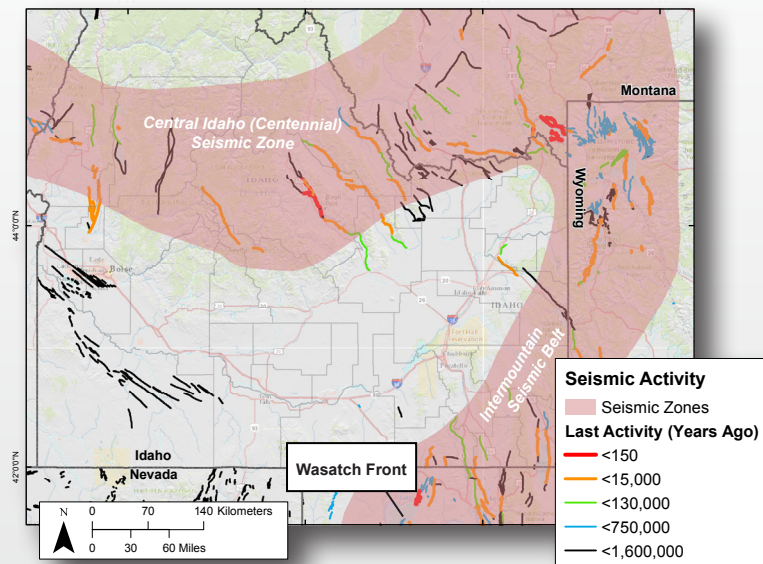


Figure 2. Major Fault Systems in Idaho

The second threat includes more frequent, but smaller scale ($<M3.5$) earthquakes that occur in swarms over many days, such as the 2005 Alpha Swarm near Cascade, Idaho, and most recently the 2017 Soda Springs swarm, which occurred over several weeks and shook buildings and residents, but produced little to no damage. While there is a low likelihood, there is a chance that swarms like these could lead to a much larger earthquake, causing considerable damage to developed areas. (Figure 3).

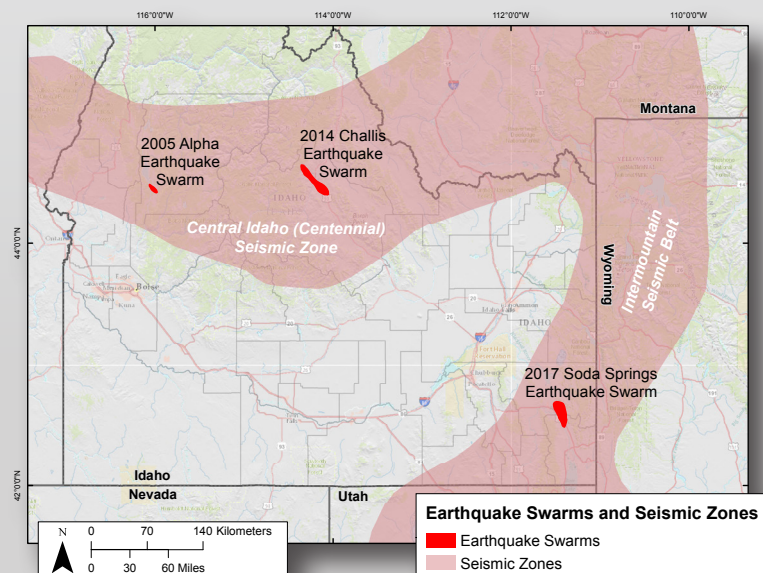


Figure 3. Earthquake Swarms in Idaho

The Importance of Preparation

Idaho's seismic zones are susceptible to high magnitude earthquakes, with many of the regions cities and small towns located near active faults. The Wasatch Front region is especially susceptible to strong shaking that affects large areas, including areas with higher population concentrations in both Utah and Idaho. Individuals should work to be prepared, and communities can advocate for more resilient earthquake design and disaster planning.

Shaking Intensity Depends on 3 main factors:

1. Magnitude

Larger magnitudes means stronger shaking. Bigger earthquakes have higher magnitudes and affect larger areas.

2. Distance

Shaking closer to the epicenter (source) of the earthquake, will be much stronger.

3. Ground Material

Shaking will be changed and amplified by soils, versus solid bedrock which is hard and less responsive to shaking.

Further Information

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References

Idaho Bureau of Homeland Security, 2009, *Putting Down Roots in Earthquake Country - Your Handbook for Earthquakes in Idaho*
<https://ioem.idaho.gov/Pages/Preparedness/Hazards/NaturalHazards/Earthquake.aspx>

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