

SEISMIC SCIENCE



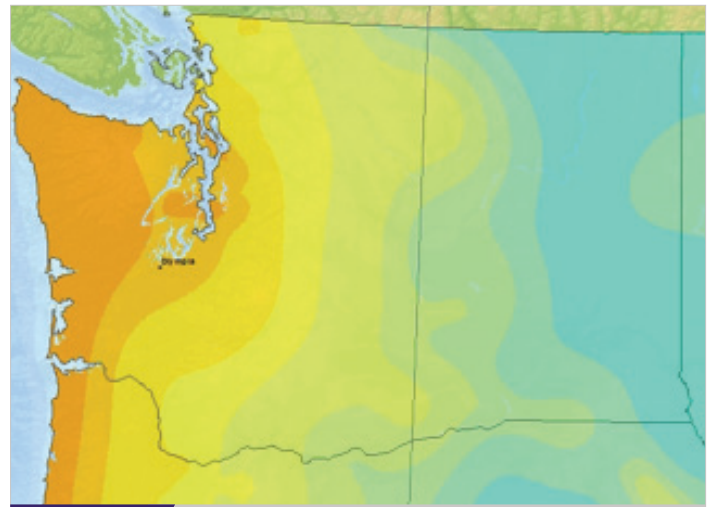
Washington state is home to a substantial number of geologic hazards, including seismic activity from volcanoes and earthquakes. These pose a significant threat to nearby cities and communities, which could affect millions of people in the Pacific Northwest. University of Washington researchers are leaders in seismic research, advancing our understanding of the science behind eruptions and earthquakes, and connecting that information to managers and policymakers in order to minimize the loss of life and property.

UNDERSTANDING SEISMIC ACTIVITY

The Pacific Northwest is embedded within the Ring of Fire, a geologic feature which drives a disproportionate share of the world's largest earthquakes and volcanic eruptions. These threats loom large in our region, with visual markers dotting the landscape from past major events. A worst-case-scenario earthquake—a magnitude 9.0 or greater—would result in thousands of fatalities, destroy infrastructure, disrupt the state's economy, and put jobs at risk as companies flee to seek a more stable business environment. The Cascadia Subduction Zone, sitting just off the Oregon and Washington coasts, is the source of large destructive earthquakes in our region. Scientists estimate there is a 10-14% chance a magnitude 9.0 earthquake will occur within the next 50 years, and the likelihood for a magnitude 8.0 is even greater with a 25-40% chance of occurring in the next several decades.

THE COLLEGE OF THE ENVIRONMENT'S ROLE

Led by the Department of Earth and Space Sciences, the UW is a powerhouse for research when it comes to understanding and planning for destructive seismic activity. Through both independent research and expansive networks, College scientists are finding new ways to better understand the science behind seismic activity, and make it part of the lifesaving information that all of us depend upon.



Financial costs associated with earthquakes can be substantial, disrupting the economy and lives of those within the affected region. Map colors indicate seismic risk in the Pacific Northwest, with orange being more hazardous and blue being less.

EARTHQUAKE HAZARDS

REGIONAL IMPACTS AND STATISTICS

Financial Costs Comparisons

2001 M6.8 Nisqually Earthquake	\$2-4 billion
2011 M6.3 Christchurch, NZ	\$18 billion
2012 M9 Tohoku, Japan	\$210 billion (estimated)
Cascadia M9 (WA only)	\$49 billion (projected)
Cascadia M9 (OR only)	\$32 billion (projected)

ADVANCING THE SCIENCE

Breadth and depth of expertise in the geophysical sciences at the University of Washington are what push the boundaries of discovery. A cadre of faculty, staff, and students engage in multiple disciplines that relate to seismic activity, ranging from studying the physics of how magma moves, to detecting the numerous tiny earthquakes that occur regularly in our region, to uncovering historic natural disasters, like past tsunamis that have lashed our coasts. Current research centers around questions related to determining which faults pose the greatest threats, to what ground-shaking might occur in our urban areas, to how the public and our infrastructure will respond to a large, catastrophic event.

Leveraging expertise from within the College of the Environment and across our region, the Pacific Northwest Seismic Network consists of approximately 250 seismic stations throughout our region. This network is being upgraded and strengthened, with new sensors, communication technologies, and acquisition and processing software and hardware, to meet the region's public safety and scientific needs well into the 21st century. Part of this work includes developing the underpinnings of an early earthquake warning system, which will include not only technologies to detect seismic threats and determine the length of time needed to achieve accuracy in forecasts and predictions, but also an assessment of the channels used to issue warnings to the public and an understanding of how people will respond to such information.

BUILDING STRONG PARTNERSHIPS

In order to understand seismic threats more thoroughly, College of the Environment scientists have developed a strong network of partners throughout the region and the world. Here at home, partnerships range from federal (FEMA, USGS, Army Corps of Engineers) to state (Emergency Management Division, Department of Natural Resources, State Building Code Council, Department of Transportation) to local municipalities and industry (City of Seattle, Boeing, Microsoft).

Academic partnerships—both on and off campus—are crucial, and add to the College's depth of understanding of the science of and policy response to seismic threats. College scientists routinely work with the University of California at Berkeley, the Earthquake Engineering Research Institute, the Pacific Earthquake Engineering Research Center, and the Structural Engineers Association of Washington. On-campus partnerships between Earth and Space Sciences, Civil and Environmental Engineering, Applied Mathematics, the Evans School of Public Affairs, and the Department of Urban Design bring multiple perspectives to the table, strengthening research and its applicability to real-world scenarios.

FOSTERING NEW LEADERS

Core to advancing the science is mentoring students who excel in seismic studies. UW students routinely impact their field and society, often taking the helm on projects that have real-world relevance. For example, students are leading a major portion of research focused on mapping the magma chambers and internal piping of Mount St. Helens, a project in which numerous partners across academia and government agencies are participating. In other studies, students have combined geologic maps with building maps from the City of Seattle in order to better understand which areas of the city are prone to earthquake-induced landslides.