# Earthquake Risk in Oregon; SDAO partners with ShakeAlert

Special Districts Association of Oregon is partnering with ShakeAlert®, the United States earthquake early warning system, to inform members on earthquake risk in Oregon and what they can do to mitigate damage from earthquake shaking. ShakeAlert® is a system that detects significant earthquakes quickly enough so that alerts containing information on magnitude and expected shaking intensity can be delivered to people and automated systems seconds before shaking arrives, allowing folks and systems to take action.

By taking action to save lives and protect critical systems, Oregon's workforce and economy can recover more rapidly from a damaging earthquake. A series of articles will be shared through the end of this year covering topics like basic earthquake education, how earthquake early warning technology works, examples of earthquake early warning alerting solutions in place in Oregon today, and how you can take advantage of the ShakeAlert® earthquake early warning system. These articles will also help to disseminate ShakeAlert® education and training resources prior to the planned, live public test of the ShakeAlert® system across the state, likely occurring in 2021.

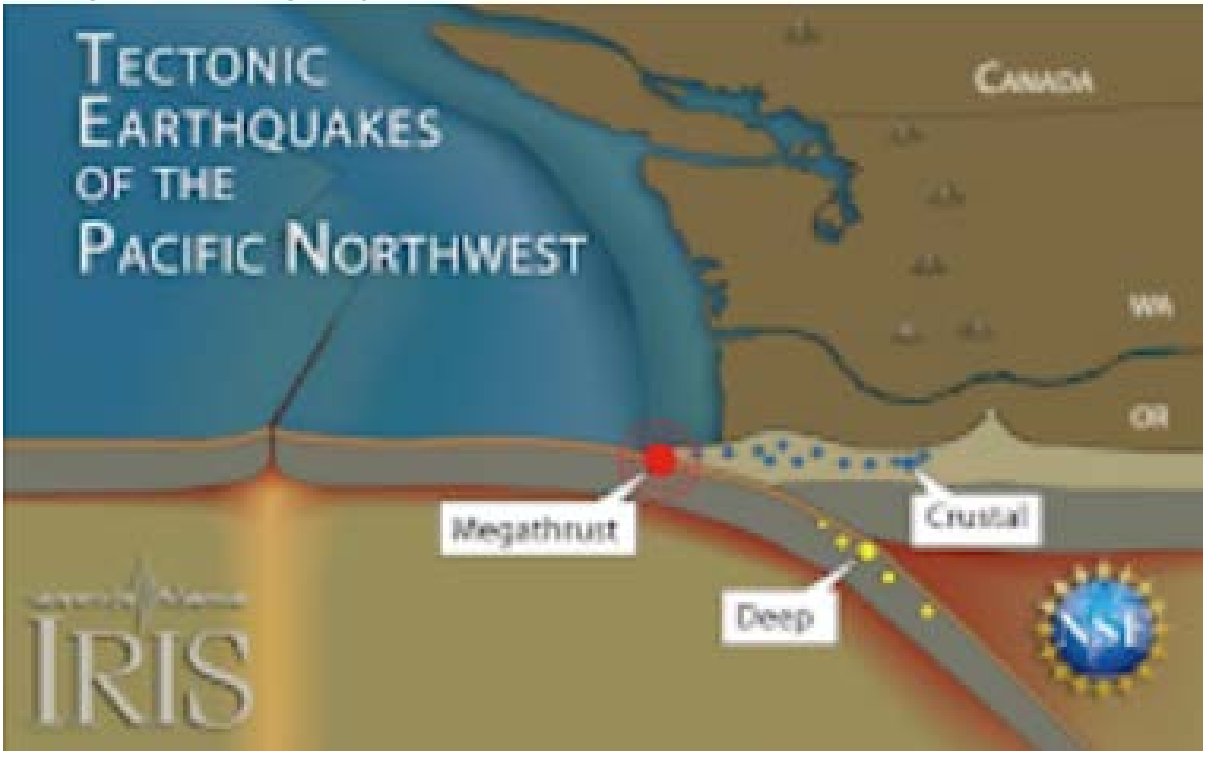
**What is the earthquake risk in Oregon?** We've all heard of the Pacific Ring of Fire - a 25,000 mile-long region that outlines the northern and southern hemispheres of the Pacific Ocean, and also the Pacific Plate. 80% of the world's earthquakes occur along tectonic plate boundaries where tectonic plates come together and build up stress. Earthquake hazards along the West Coast are caused by the interaction of 3 tectonic plates within the Ring of Fire: the Pacific Plate, the Juan de Fuca Plate, and the North American Plate. These motions don't happen easily. Over time, strain builds up along the plate boundaries as they attempt to get by, under, or over one another. Once the strain is too high the plates slip past each other suddenly, releasing the energy in the form of an earthquake.

Just off the Oregon Coast lies the Cascadia Subduction Zone, a major tectonic plate boundary where the Juan de Fuca Plate is being pulled underneath the North American continent[1]. Though these two plates are moving toward each other, they are actually pinned in place between the occurrence of large earthquakes. The North American continent is flexing upwards, absorbing the motion of the two plates coming together. This is what is referred to as a "locked" subduction zone. When the plates do finally

unlock, the resulting earthquake generates powerful shaking that can last for 4-5 minutes, causing extensive damage to homes, buildings, and infrastructure across the state. Subduction zone earthquakes can also generate destructive tsunamis - a series of extremely long ocean waves that forcibly surge onto land and can move across entire oceans in less than a day[2].

As the subducting Juan de Fuca Plate attempts to descend, it also bends and tears. This can generate deep earthquakes, like the **2001 Nisqually earthquake**. These earthquakes happen deep underground - 30 to 50 mi depth. Deep earthquakes produce shaking that can be felt widely, causing damage in a large regional area. Shaking may last 30-60 seconds.

To accommodate the flexing of the North American Plate, the crust on land can tear near the surface along crustal faults and produce shallow, crustal earthquakes. Most notably in Oregon's recent history, the **1993 Scotts Mills** "Spring Break Quake" and the **1993 Klamath Falls** earthquake doublet are both examples of shallow crustal earthquakes. Damage from these earthquakes is concentrated near the earthquake's origin, where shaking is strongest. Shaking may last 5-20 seconds.




In general, the closer you are to the fault along which an earthquake occurs, the more intense the shaking you will likely feel. Intensity is a measurement of the severity of shaking someone experiences during an earthquake and varies

depending on where you are because it depends primarily on magnitude, distance to the fault, and the local soil or rock type... among other things. An earthquake will have only one magnitude but has variable intensity throughout the local or felt area. And a greater magnitude earthquake means greater shaking intensity everywhere and over a larger region.

Geologists tell us there is a 7% to 12% chance over the next 50 years that the Cascadia Subduction Zone will unlock and generate a magnitude 9-plus earthquake that will impact Oregon statewide, as well as northern California, Washington, and British Columbia. Within that same timeframe, there is a nearly 40% chance of the Cascadia Subduction Zone generating a magnitude 8 to 9 earthquake near Southern Oregon and Northern California[3]. The last subduction zone earthquake to occur along the Cascadia Subduction Zone happened in 1700 - it measured a magnitude 9.0 and generated a tsunami that reached Japan (read the interesting discovery of this earthquake through the "**Orphan Tsunami**"). Geologists and Oregon state officials expect the next Cascadia Subduction Zone earthquake to cause 1,250 to more than 10,000 fatalities, tens of thousands of buildings destroyed or damaged, tens of thousands of displaced households, $32 billion in direct and indirect economic losses, and greater than one million dump truck loads of debris[4].

Please watch for more articles from us with information about earthquake risk in Oregon. For more information about the ShakeAlert system, please visit www.shakealert.org.

References:

1 Washington Geological Survey, 2020. **https://www.dnr.wa.gov/publications/ger_homeowners_guide_earthquakes.pdf?44z7d5**

2 Washington Department of Natural Resources 2015. **https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/Tsunamis#understanding-tsunamis.1**

3 Andrew Phelps and Douglas Toomey, 2020. Oregon Live. **https://www.oregonlive.com/opinion/2020/08/opinion-legislators-should-brace-for-next-disaster-with-seismic-preparedness-investments.html**

4 Oregon Seismic Safety Policy Advisory Commission, 2013. **https://www.oregon.gov/gov/policy/orr/Documents/Oregon_Resilience_Plan_Final.pdf**