

Avoiding Earthquake Surprises in the Pacific Northwest

This StepRead is based on an article provided by the American Museum of Natural History.

How Big Is the Earthquake Threat in the Pacific Northwest?

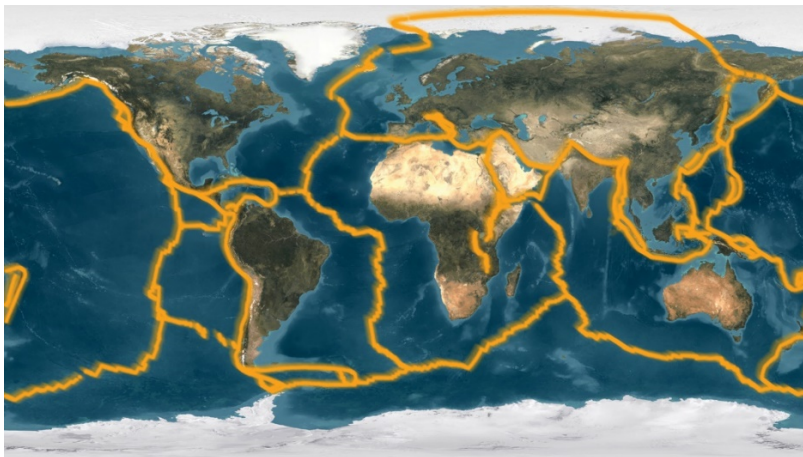
Cascadia is a region in the Pacific Northwest. It includes parts of southern Canada and the northwestern United States.

This region is at risk of being hit by earthquakes. Until the mid-1980s, scientists thought that Cascadia could only be hit by earthquakes of magnitude 7 or below. An earthquake's magnitude number reflects its size. Earthquakes of magnitude 7 are not the biggest earthquakes, so scientists thought the earthquake threat in Cascadia was limited.

But recently, scientists found evidence that Cascadia could be hit by much bigger earthquakes. They found clues that earthquakes of magnitude 8 and 9 had hit Cascadia in the past. An earthquake of magnitude 8 releases thirty times more energy than an earthquake of magnitude 7. And an earthquake of magnitude 9 lets out even more energy. Earthquakes of magnitudes 8 and 9 are very dangerous. And they are likely to happen again in Cascadia.

What Causes Earthquakes?

Earth's outer layer is broken up into huge rocky pieces called tectonic plates. These plates move as slowly as fingernails grow. Some plates move apart from each other, or move towards each other. Others grind against each other at their boundaries. Plate boundaries are the places where their edges meet.



Earth's outer layer is broken into rocky pieces called tectonic plates.

Where plates grind against each other, pressure builds up. The pressure builds until the rocks break and suddenly move. This movement sends energy rushing through Earth. This energy causes earthquakes, making the ground shake.

Why Cascadia Is at Risk

Most earthquakes happen at a kind of plate boundary called a subduction zone. At this kind of boundary, a denser oceanic plate sinks below a less dense continental plate. One subduction zone runs along part of the coast in the Pacific Northwest. It's called the Cascadia subduction zone. Because Cascadia is near a subduction zone, it may be hit by large earthquakes.

Clues of Ancient Earthquakes in Cascadia

The two largest earthquakes since 1900 happened along subduction zones. One was an earthquake of magnitude 9.5 in Chile. The other was an earthquake of magnitude 9.2 in Alaska. During each of these earthquakes, the continental plate suddenly moved more than 60 feet toward the sea. This movement stretched the rocks of the plate, which made the plate thinner. Because the plate was thinner than before, the land by the ocean was low enough for water from the ocean to wash over it. The water drowned trees along the coasts. Today, the dead trees are clues that the huge earthquakes happened.

Scientists have found drowned trees in Cascadia, too. These trees are much older than the ones in Alaska and Chile. Scientists also found sheets of sand that were left behind by floods from the sea. And they found cracks in the ground that were filled with quicksand. All of these clues are evidence of strong earthquakes. They show that earthquakes of magnitude 8 or larger have hit Cascadia many times in the past several thousand years.

Learning About a More Recent Earthquake

Scientists from North America and Japan worked together to learn the date and size of the most recent earthquake to come from the Cascadia subduction zone.

Their work started when American scientists found some drowned trees in Cascadia. The trees had drowned when the land they were on suddenly got lower. This was a result of the most recent Cascadia earthquake. The scientists figured out that the trees died between 1680 and 1720. This meant the earthquake had happened during that time.

Scientists in Japan were paying attention to these findings about the earthquake in Cascadia. They knew that if the earthquake was big enough, it would have started a giant wave called a tsunami in the Pacific Ocean. The Japanese scientists knew that a tsunami from the Pacific Ocean had hit Japan in January 1700. And they had been looking for the cause of this tsunami. Based on this evidence, they suggested that a huge earthquake happened in Cascadia on January 26, 1700. They estimated that the earthquake's size was magnitude 9.

American scientists tested the date and size that the Japanese scientists suggested. To do this, they went back to the trees that had been killed by the Cascadia earthquake. They measured the rings in the tree trunks to find the date each ring formed. This helped them figure out that the earthquake must have happened between August 1699 and May 1700. These dates supported the date suggested by the Japanese scientists. Together, all of these clues helped scientists learn the date and size of the 1700 Cascadia earthquake.



Scientists study dead trees along the coast in the Pacific Northwest. The trees are evidence that a large earthquake happened in January 1700.

People in the Pacific Northwest Respond to the Earthquake Risk

People can't stop earthquakes from happening. But they can take measures to make sure earthquakes cause less damage. For example, they can make the structures that already exist stronger. They can also build new buildings that can stand safely through earthquakes.

To make sure that buildings would stand safely through earthquakes, people in the Pacific Northwest had to follow a set of rules. This set of rules was called the Uniform Building Code. Before 1994, buildings in parts of the Pacific Northwest did not have to be strong enough to last through the largest earthquakes. But in 1994, the Uniform Building Code was changed. The new rules made sure that buildings in the Pacific Northwest could stay safe even during the very largest earthquakes.

This change helped people prepare for the threat of very large earthquakes.

How Safe Are Other Parts of the United States?

Earthquakes can also happen in other areas of the United States. People in these areas started asking whether they were well-prepared for future earthquakes. To help find out, scientists need to do research to find out more about past earthquakes. This is one way scientists can help to protect people from the damage and death earthquakes can cause.

This reading was adapted from a 1995 USGS Fact Sheet, "Averting Surprises in the Pacific Northwest," by Brian F. Atwater, Thomas S. Yelin, Craig S. Weaver, James W. Hendley, II.