

# **Earthquake and Tsunami Preparedness**

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The coastal zone of Oregon and Washington is a lovely place to live. The region is also home to large earthquakes and tsunamis. With a little bit of understanding and preparation residents and visitors can learn to live, work, and play more safely in this beautiful region.

## **The Three Things You Need to Know**

### **1. Was it a Local Event or a Distant Event?**

If you **feel** a strong and very long earthquake then it is a **local** event. Duck, cover, and hold-on until the shaking stops. Then immediately run for high ground (above 50 feet). You have less than 30 minutes to evacuate the inundation zone! Do not return to the area for 12 hours. Tsunamis are a series of surges and the first one is often not the biggest. Do not expect to be able to drive anywhere, or to use telephones or cell phones.

If you **hear** a warning on the TV, siren, or NOAA Radio, it is a **distant** event. That means the earthquake happened somewhere else. You have time to evacuate. It takes 3-4 hours for a tsunami to get here from Alaska—the most likely source of a distant tsunami. Evacuate the inundation zones in an orderly manner. You need not go far, simply get out of the inundation zone for 12 hours. Make friends in high places!

### **2. Where are the Danger Zones?**

Everywhere is potentially dangerous during a large earthquake, but especially steep hillsides, masonry buildings, and power lines. For local tsunamis, the danger zones are defined on official tsunami inundation and evacuation maps (available at local fire stations). Identify the dangerous areas where you live, work, shop, and play and note the routes you will need to take to get to safety. The general rule is to get above 50' elevation for local events. For distant events, as a general guideline, consider the inundation to be similar to that of a severe winter storm at high tide.

### **3. How Do I Reconnect with Loved Ones?**

Have a family agreement for what to do if you get separated in a disaster. Teach everyone to get to safety, stay there, and reconnect when it's over. Identify a non-local person for everyone to call as soon as they can. (Non-local means other states, not Portland.) Although it may take a while, family members can reconnect through this common contact. If you live in an inundation zone, do not return home for 12 hours! People too often die when they rush to reenter the inundation zone to look for people and recover possessions. Prepare by having this conversation today.

## **Dangerous Misunderstandings**

**“Sirens mean run!”** Ironically, sirens mean relax. Sirens indicate a distant tsunami in which local residents have four or more hours to evacuate the inundation zone. If you are at home and your home is in an inundation zone, gather your medications and personal items and leave the inundation zone for 12 hours. If you are in an inundation zone when the siren sounds, but you live outside of the zone--simply go home, or visit someone out of the zone. Make friends in high places!

Consider buying a NOAA All Hazards radio. These radios serve as “personal sirens” for distant events, and immediately provide information on where the earthquake occurred and how long it will take to get here. (Think of them as “smoke detectors for the tsunami zone.”) NOAA All Hazards radios are available at local marine supply and electronics stores.

**“We live on a hill, so we’re safe”** First, that’s only true if you’re home. You might live on a hill, but you’re in grave danger if you happen to be working, shopping, recreating, or driving through, an inundation zone when the Big One hits. Second, people on hills need to worry about falling off those hills during the earthquake and subsequent landslides. Don’t forget the quake!

We are residents of the north coast region and most of us travel in and out of inundation zones all day. We need to “develop an eye for the landscape” and understand when we’re in a dangerous zone, and how to get out.

**“We will drive to safety”** After the Big One, you probably won’t be able to drive due to the damage from the earthquake. Your car may well be under the rubble that used to be your garage. Even if your car is ok, the roads will be impassable due to fallen trees and power poles and buildings, damaged bridges and roads, and from the scores of landslides that will occur on all major roadways. Plan on walking to safety. If you live in an inundation zone, practice your evacuation route so you can do it in the dark. In a distant event the traffic will be a mess, but you will have plenty of time to leave the inundation zone.

**“We’ll connect by phone”** In a local event, telephone poles and cell towers will topple, and any working lines will be jammed. Satellite phones will work. Prices on these are coming down. Critical service providers and other key individuals and agency might consider getting satellite phones. Ham radios will work and local operators are prepared. In a distant event, the phone lines will be intact but overwhelmed; the roads will be intact but congested.

**“I have an emergency kit, so we’re covered”** I’m not against emergency kits (I have one), but it is even more important to take a first-aid and CPR

class. In a local event, your house will either be standing and you can get whatever you need from your own pantry and medicine cabinet. Or, your house will be destroyed and your kit will be useless under all of the rubble. However, you will almost certainly need to administer first-aid to yourself, your family, and your neighbors. During a distant event, you won't need your kit.

Note: prescription medications can be a matter of life and death for some people. Consider identifying people in safe areas who take the same medications as you. Evacuate to their house if you're caught without medicines during the Big One. In a distant event, grab your medications as you calmly evacuate the inundation zone. If you're in the area but not at home during a distant event, consider the risk of going home versus staying with friends who have the same prescriptions.

**“We'll have to camp out for a week after the Big One”** Some will, but most probably will not. Residents in outlying areas may be cut-off for several days due to landslides. But in town, it's more likely is that some neighborhoods will be devastated while others will be relatively intact. We should expect that displaced people will go to homes left standing and be taken in by neighbors. We need to prepare for this at the neighborhood level.

**“Someone will come and save us”** As good as our local emergency officials are they will have only a limited ability to help individuals under either scenario. In a distant event, their primary responsibility is facilitating the orderly evacuation of people out of the inundation zone and dealing with the inevitable heart attacks and minor emergencies that always occur. In a local event they will be in the same boat as everyone else—unable to drive their vehicles over destroyed bridges, landslides, and debris.

It is important that residents understand the extent to which we will be on our own following the Big One. While I expect an immediate and vigorous response from neighboring states, our coastal geography will make it difficult for rescuers to evacuate a lot of people quickly. Now is the time for neighborhoods, schools, businesses, civic organizations, etc., to identify their role in earthquake and tsunami preparedness.

**“Tsunamis are waves”** A tsunami is not a “wave” which moves up-and-down, but the ocean moving sideways. Here's an analogy. When your dog laps water in his bowl, he's making “waves.” When he kicks the bowl across the floor and it slams into the refrigerator and the water spills over the side...that's a tsunami. The approaching tsunami looks more like a storm surge. Even small tsunamis carry tremendous power.

**“There's nothing I can do. If it happens, it happens”** Wrong. You just read several things individuals and families can do to improve their odds of surviving an earthquake and tsunami.

## **Earthquake and Tsunami “Geologic Factoids”**

### **Local Event (The Big One—the ground shakes here)**

- The Cascadia Subduction Zone (CSZ) is the area of overlap between two tectonic plates. The CSZ extends north and south over 700 miles from Northern California to Vancouver Is., Canada. Its western edge runs roughly parallel to the PNW coastline about 70-90 miles offshore.
- Essentially, the floor of the Pacific Ocean slowly, but continually, “subducts”, or dives under, the North American continent. The two plates move over each other at about the same rate of growth as a human fingernail. That’s not a lot, but it builds up great pressure over the centuries.
- Science has only recently discovered that the release of pressure along these plates regularly generate massive 9.0 magnitude earthquakes and large tsunamis. In particular, seafloor core samples reveal a regular deposition of sand layers explained only by shaking from large earthquakes.
- Recent research indicates that eruptions don’t always occur along the entire length of the CSZ, and that there have been more events in the south than the north. The north coast has had 34 CSZ quakes in the past 10,000 years. CSZ events tend to occur in clusters, followed by longer gaps. On average, the recurrence interval on the north coast is 300 to 500 years.
- The last CSZ occurred 307 years ago. We know the last CSZ occurred in 1700 based on multiple sources. Excavations in PNW coastal estuaries reveal several tsunami sand deposits carbon-dated to about 300 years ago. Tree ring analysis narrows this to 1699/1700. The most recent seafloor sand layer also dates from about 300 years ago. The most compelling evidence comes from Japanese writers who described a large tsunami hitting them without an earthquake on January 26, 1700. (Our local tsunami hit them as a distant tsunami about ten hours later.) Native stories and place names also reflect an awareness of tsunamis and their cyclical nature.
- It is estimated that we have a 15-20% probability that we will experience a CSZ event in the next 50 years. Thus, the next Big One will very likely occur in our lifetime, or in our children’s lifetime.
- CSZ earthquakes are Big Ones--magnitude 8.5 and higher. The quake will last 4-6 long minutes and will be very destructive—although not necessarily as violent as shallower earthquakes. The long, rolling, earthquake will be survivable by people but tough on buildings. More deaths will likely occur from the tsunamis than the earthquake. Aftershocks will be common.

### **Distant Event (Tsunami coming from elsewhere—Siren, Radio, TV)**

- Tsunamis generated by distant large earthquakes take time to get here and are typically smaller. There will be warnings. Damage occurs typically in areas along the oceanfront, bends in coastal rivers and streams, and wetlands. Inundations will likely be similar to a winter storm at high tide.
- It takes about 4 hours for a tsunami generated by an Alaskan quake to get to Oregon. (Ten hours from Japan, and longer from South America.)
- The 1964 Alaskan quake and distant tsunami killed 122 people mostly in Alaska and Crescent City, CA, and members of one family camping on the beach near Newport. The same distant event today would likely cause more death and damage because there are more people living along the coast.