

## Tsunami

How many of us visit the beautiful Oregon, Washington or Northern California coast for weekends, business trips or vacations throughout the year? While we may be vaguely familiar with the coastal tsunami (soo-nam-ee) hazard, would you and your family know what to do if there was an earthquake or tsunami alert while you were there? People who live on the coast are generally more familiar with the tsunami hazard and what to do than are the rest of us who live inland and far from the danger. Because of this, it is wise for we "inlanders" to review:

A tsunami is a series of waves usually caused by displacement of the ocean floor by an undersea earthquake. The waves travel at speeds up to 600 miles per hour. As tsunamis enter shallow water near land, they increase in height and can cause great loss of life and property damage when they come ashore. Remember, a tsunami is not one wave, but a series of waves.

Tsunamis can occur any time of day or night after an undersea earthquake. Experts believe that a tsunami caused by an undersea earthquake near the Oregon coast could strike the Oregon coast within 5-30 minutes and before any official warning may be possible. Undersea earthquakes, thousands of miles away, can cause smaller tsunamis on the Oregon coast, but generally take several hours to arrive, allowing time for an official warning. On March 27, 1964, the Alaskan "Good Friday" earthquake, moment magnitude 9.2, created a tsunami that struck the Oregon coastline killing four people and causing \$1 million in damage (1964 dollars). The same wave later struck Crescent City, CA and killed 11 more people and caused \$8 million in damages.

Tsunamis are most common in the Pacific Ocean. People on open beaches, low-lying areas of the beach, by bay mouths or tidal flats, in low parts of coastal towns and cities, and near the mouths of rivers draining into the ocean are in greatest danger from tsunamis.

Warnings are issued by the West Coast and Alaska Tsunami Warning Center for tsunamis generated by earthquakes off the West Coast of the U.S. and Canada (<http://wcatwc.arh.noaa.gov/>). The Pacific Tsunami Warning Center issues warnings for tsunamis generated by earthquakes around the rest of the Pacific (<http://www.prh.noaa.gov/pr/ptwc/>).

Here are some quick tips on how to survive the tsunami hazard on the coast:

- Become familiar with the Tsunami Hazard Zone, Tsunami Evacuation Route and Tsunami Shelter logo and signs posted along our coast. Visit: <http://wcatwc.arh.noaa.gov/tsunamiready/tready.htm> to see examples.
- Always have a readily accessible and portable emergency kit with you, even when you travel or vacation.
- If you feel an earthquake when you are on the Pacific Northwest coast, protect yourself from the earthquake until it is over (Drop, Cover and Hold On - beneath or along side something sturdy and clear of falling objects), then

- Quickly move inland or to higher ground, away from low-lying areas that could be affected by tsunamis. Do not wait for an official warning. It is recommended that you go up to two miles inland, or 100 feet above sea level. Tsunamis can travel upstream in coastal estuaries and rivers. Evacuate on foot, if possible, to avoid traffic jams and probable earthquake damage to roads and bridges.
- Take your disaster or emergency kit if you can do so quickly. Do not delay your evacuation to higher ground to gather or find emergency supplies.
- Do not return to the shore after the first wave. Additional waves may arrive later, be higher, and go farther inland. Wait until officials announce that the danger has passed.
- Never visit the coast to watch a tsunami. Tsunamis move faster than a person can run. Incoming traffic also hinders evacuation efforts in an emergency.
- If you see an unexpected rise or fall in coastal water, a tsunami may be approaching. Do not wait to investigate, the next wave may be larger. Move inland or uphill as quickly as possible.
- Stay tuned to your radio, marine radio, NOAA weather radio or television station during a tsunami emergency. Bulletins issued through your local emergency management and National Weather Service offices can save your life.

Tsunami information from Oregon Department of Geology and Mineral Industries, the OSU Extension Sea Grant Program, FEMA Region X and National Oceanic and Atmospheric Administration and Benton County Emergency Management.

Following is an interesting article that appeared in the Seattle Post-Intelligencer June 19, 2002 about some of the research and corroboration with first American stories about great tsunamis and earthquakes in the Pacific Northwest. Visit: [http://seattlepi.nwsourc.com/local/75177\\_whaletale19.shtml](http://seattlepi.nwsourc.com/local/75177_whaletale19.shtml) for the complete story and Seattle Post-Intelligencer photographs.

### **Tale of a whale in the river and the tide that never left**

Ancient tribal stories may tell of quakes, tsunamis

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By **[TOM PAULSON <mailto:tompaulson@seattlepi.com>](mailto:tompaulson@seattlepi.com)**

SEATTLE POST-INTELLIGENCER REPORTER

BOW, Skagit County -- Many years ago, when her children were in middle school, Makah elder Helma Ward refused to let them catch the school bus at the stop near the mouth of a creek on the Pacific Ocean side of the reservation.

"I knew the stories," 83-year-old Ward told tribal representatives from Washington and Oregon gathered here yesterday for a meeting with federal emergency-management officials.

Some of the emergencies they came to discuss were earthquakes and tsunamis -- threats Pacific Northwest tribes have dealt with for thousands of years.

(Photo of Helma Ward)

The stories Ward shared are part of a complex web of ancient tales often involving mythic creatures, such as the all-powerful thunderbird and a supernatural whale that would occasionally do battle -- breaking mountains, flooding villages and shattering communities in the process.

Her grandfather had told her of one such story, a massive flooding event that had happened near where her children waited every day to catch the bus.

"The tide came in but never left," Ward said. "There was a whale in the river, and the people couldn't figure out how it got there."

The traditional story, she said, told of a winter when the thunderbird saw that the Makah were starving and held at bay by an exceptionally long stretch of terrible weather. The thunderbird decided to help the Makah and attacked the whale in an earth-shaking battle before delivering it into the river on a large wave.

Scientists today would call that wave a tsunami -- the waterborne signature of a massive coastal earthquake. The tale of the tsunami said it struck where Ward's children met the bus.

"I gave the school principal the dickens about it and told him my kids are not going to take the bus; I'll take them to school myself," Ward said. "The stories say this has happened before and will happen again."

For many years, Ward has struggled in her community to pass on the oral traditions of her people and teach young Makah their natural language. Many express little interest in the stories, she said, contending that they are just fanciful tales of no use in the modern world.

Ruth Ludwin, a University of Washington earthquake scientist, begs to differ.

In the mid-1990s, scientists discovered the Northwest had been hit in 1700 by a massive quake produced from the offshore Cascadia subduction zone -- where two of the planet's massive "tectonic plates," the Juan de Fuca and the North American plates, run into each other and build up ungodly amounts of geologic strain.

Brian Atwater, a U.S. Geological Survey scientist studied ancient drowned forests, coastal geology and even Japanese samurai records to show -- despite widespread skepticism at the time -- that the Northwest had been hit by a magnitude 9 quake that produced a tsunami powerful enough to cause damage in Japan.

"The tribal stories provide a line of evidence from the only people who were here to witness it," said Ludwin, who also spoke at the two-day conference at the Skagit Valley Casino and Resort. The meeting was sponsored by the Federal Emergency Management Agency to train tribal emergency managers.

Scientists couldn't agree on what caused earthquakes until the 1960s, Ludwin noted, when the theory of plate tectonics came to the fore. The modern seismic network for tracking quakes, she said, didn't exist until the 1970s.

Ludwin has taken it upon herself to dig deeper into the stories of Northwest tribes to see if science has more to learn about the so-called mega-thrust quakes, such as the one in 1700, from traditional folk tales.

Yesterday, she presented scientific evidence to the tribal representatives, showing slides of trenches dug to identify tsunami deposits or methods for dating the sudden deaths of entire coastal forests caused by the land suddenly dropping into a salt marsh during a quake.

"The evidence indicates that we've had seven of these (mega-thrust quakes) in the last 3,500 years," she said. Given this, Ludwin said, it would be a surprise if the tribes didn't have stories about such traumatic events.

"That was one of the criticisms of my work early on," said Atwater. Critics of his theory that a major quake occurred 300 years ago said the lack of tribal stories about such events indicated his science was wrong.

But absence of evidence, Ludwin said, is not evidence of absence.

The reason there were no known tribal stories of quakes was primarily because few had looked hard enough or tried to interpret the tales as representative of real events. While the experts knew of stories of great floods, she said there were no clear stories about earthquakes.

"You have to know what you're looking for," Ludwin said. Once she started looking, the evidence came pouring out.

The Hoh and Quileute tribes talk of a thunderbird-whale battle featuring a "trembling of the earth beneath and a rolling up of the great waters." The Makah talk of canoes in trees, homes destroyed and lives lost. The Kwakiutl in the Queen Charlotte Islands of British Columbia speak of thunder, flooding and how "the ground was made bad."

Ludwin has found different tribal versions of similar stories all along the Pacific Coast down to the Yurok tribe of Northern California, who tell about the time "the prairie became an ocean" after a catastrophic event -- indicating both land subsiding and being flooded, perhaps by a tsunami.

Scientists have more to learn from the Native American stories, Ludwin believes.

She's compiling the tribal stories and cross-referencing them, dating them when they provide time elements. Some of the stories, as well as some tribal art, seem to clearly refer to the last megathrust event in this region, which experts now believe occurred on Jan. 27, 1700.

Others are less specific. But several stories seem to converge on places and events as yet unknown to the scientific community. Ludwin calls such evidence a "story locus."

"There's a story locus in Alert Bay" off the northern tip of Vancouver Island, she said. "Maybe there's something going on there."

But even though Ludwin's explorations into tribal folklore may not produce the kind of hard data seismic scientists desire, Ward says the researcher's interest in the stories may help preserve and even reinvigorate the Makah culture.

"We've had a hard time getting the kids interested in this," Ward said. Now they see big-shot scientists coming in to learn the Makah stories. "That helps," the tribal elder said.

Ludwin's interest even works with the older set. After hearing Ward and Ludwin talk about the potential scientific value of the stories, the not-so-young Ron Brainard,

chairman of the Coos Tribal Council in Coos Bay, Ore., planned to ask his elderly mother to tell him the stories again.

"She would always tell us these stories," he said, "but we never listened."

(Image) Many Pacific Northwest tribes depict an epic battle between a thunderbird and a whale that scientists believe describe a massive earthquake and tsunami. A Quileute drawing includes a waxing moon in the center, which would coincide with the lunar phase on the night of the Cascadia quake of Jan. 27, 1700.

## **THE LEGEND**

Many Pacific Northwest tribes depict an epic battle between a thunderbird and a whale that scientists believe describe a massive earthquake and tsunami. A Quileute drawing includes a waxing moon in the center, which would coincide with the lunar phase on the night of the Cascadia quake of Jan. 27, 1700.

*P-I reporter Tom Paulson can be reached at 206-448-8318 or [tompaulson@seattlepi.com](mailto:tompaulson@seattlepi.com) <<mailto:tompaulson@seattlepi.com>>*

Benton County Sheriff's Office, Emergency Management Division, 180 NW 5th Street, Corvallis, OR 97330  
(541) 766-6864, 766-6052 - fax  
[www.co.benton.or.us/sheriff/ems](http://www.co.benton.or.us/sheriff/ems)

***Together*** we're building a disaster resilient community!

**"Life is not measured by the number of breaths we take, but by the moments that take our breath away." -- unknown**