OREGON DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES

Mission: “Provide Earth Science Information To Make Oregon Safe and Prosperous”

EARTHQUAKES & TSUNAMIS

Lidar
Earthquake/Tsunami Science
Educate & Mitigate
Today’s Presentation

• Earthquake Science
• Two Kinds of Tsunami: Distant vs. Local
• Lessons from Japan
• 10,000-year History of Oregon Earthquakes
• New Tsunami Maps
• How You Can Prepare
Earthquake and Tsunami Science
Earthquake Basics

- Earthquakes occur along a fault or fault system

- Epicenter = the location on the earth’s surface directly above the origin of the earthquake

- Bigger faults make bigger earthquakes

- Bigger earthquakes last a longer time

- Magnitude = a measure of how much energy is released in all directions
Do you know Oregon’s **four** kinds of earthquake sources?

1. **Cascadia Subduction Zone**
   Example: the 1700 earthquake that caused shaking and a tsunami that inundated the OR coast and reached as far as Japan.

2. **Interplate**
   Example: the 2001 Nisqually, WA earthquake that affected Washington and northwestern Oregon.

3. **Volcanic**
   Example: the 1980 Mount St. Helens eruption-related earthquakes.

4. **Crustal**
   Example: the 1993 Scotts Mills and Klamath Falls earthquakes. Crustal earthquakes also occur in SE Oregon where the crust is pulling apart.
Earthquake Frequency & Size

There are many earthquakes each year, only some are felt.

<table>
<thead>
<tr>
<th>Number of Earthquakes per Year (World)</th>
<th>Number of Earthquakes per Year (USA)</th>
<th>Earthquake Magnitude</th>
<th>Energy Released [Number of Atom Bombs]</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,300,000</td>
<td>?</td>
<td>2.0</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>130,000</td>
<td>?</td>
<td>3.0</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>13,000</td>
<td>380</td>
<td>4.0</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>1,319</td>
<td>57</td>
<td>5.0</td>
<td>0.03</td>
<td>Klamath Falls ('93)</td>
</tr>
<tr>
<td>134</td>
<td>6</td>
<td>6.0</td>
<td>0.79</td>
<td>LA ('84) SF ('89) Kobe ('95) Haiti ('10)</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>7.0</td>
<td>25</td>
<td>China ('76)</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>8.0</td>
<td>791</td>
<td>Sumatra ('04), Japan ('11)</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>9.0</td>
<td>25,003</td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>35,005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.3</td>
<td>75,010</td>
<td></td>
<td></td>
<td>Alaska ('64)</td>
</tr>
<tr>
<td>9.5</td>
<td>137,518</td>
<td></td>
<td></td>
<td>Chile ('60)</td>
</tr>
</tbody>
</table>
What Controls the Level of Shaking?

- **Magnitude**: More Energy Released
- **Distance**: Shaking declines with distance
- **Local Soils**: the soil type can amplify the shaking
Possible Shaking Intensity/Effects

<table>
<thead>
<tr>
<th>PERCEIVED SHAKING</th>
<th>Not felt</th>
<th>Weak</th>
<th>Light</th>
<th>Moderate</th>
<th>Strong</th>
<th>Very strong</th>
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<tr>
<td>POTENTIAL DAMAGE</td>
<td>none</td>
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<td>Very light</td>
<td>Light</td>
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<tr>
<td>PEAK ACC.%(g)</td>
<td>&lt;.17</td>
<td>.17-1.4</td>
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<td>65-124</td>
<td>&gt;124</td>
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<td>PEAK VEL.(cm/s)</td>
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<td>8.1-16</td>
<td>16-31</td>
<td>31-60</td>
<td>60-116</td>
<td>&gt;116</td>
</tr>
<tr>
<td>INSTRUMENTAL INTENSITY</td>
<td>I</td>
<td>II-III</td>
<td>IV</td>
<td>V</td>
<td>VI</td>
<td>VII</td>
<td>VIII</td>
<td>IX</td>
<td>X+</td>
</tr>
</tbody>
</table>

III. **Weak** – Felt indoors, especially on upper floors of buildings. Vibrations similar to a passing truck.


V. **Moderate** – Felt by nearly everyone; sleepers awakened. Small, unstable objects overturned. Doors swing. Pictures move. Pendulum clocks stop.

VI. **Strong** – Felt by all. People walk unsteadily. Some heavy furniture moved. Small objects fall off shelves. Pictures off walls.

VII. **Very strong** – Difficult to stand or walk. Noticed by drivers of cars. Slight to moderate damage in well-built structures; considerable damage in poorly built structures.

VIII. **Severe** – Steering of cars affected. Extensive damage to buildings with partial collapse. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Wood-frame houses moved on foundations if not bolted.

IX. **Violent** – General panic. Damage to buildings ranges from collapse to serious damage.
M3.5 Earthquake *Might* be Felt

February 16, 2012

- San Francisco Area
  - Magnitude 3.5
  - 5 miles deep
    - 9:13am local time
    - Reported as *Felt* by 1,912 people

Note the shaking intensity colors
M5+ Earthquake *Usually* Felt

February 13, 2012

• Northern California
  - Magnitude 5.6
  - 17 miles deep
    - 1:07pm local time
    - Reported as *Felt* by 3,028 people

*Note the shaking intensity colors*
M7 Earthquake

- Ground Can Shake *Moderately* For 30 Seconds
- Poor Soils Can *Amplify* Effects
- Damage Can be *Moderate to Heavy* (even with current building codes)

*Note the shaking intensity colors*
Other Earthquake Effects:

- Liquefaction
- Subsidence/Uplift
- Landslides
- Fires
- Tsunamis
Large Earthquake Frequency

A History Of Large Earthquakes

Data: USGS PAGERCAT 1900-2008, USGS-NEIC & gCMT 2008-present

Figure courtesy of Charles Ammon, after Ammon et al., SRL, 2010
A 10,000 year history of great Cascadia earthquakes in Oregon

The last big Cascadia earthquake and local tsunami in the Northwest was on January 26, 1700.
Topography Reflects Tectonic Plates

Plates Move in 3 Ways:
- Slide Past
- Spread Out
- Dive Under (Subduction)
Cascadia Subduction Zone (CSZ)

North American Plate Overrides Juan de Fuca Plate Along Cascadia Subduction Zone at a rate of 1.5 inches/year
What to do: Earthquakes

Indoors: Drop, cover, and hold on. Drop to the floor, take cover under a sturdy desk or table, and hold on to it firmly.

In Bed: Hold on and stay there, protecting your head with a pillow.

Outdoors: Move to a clear area if you can do so safely; avoid power lines, trees, signs, buildings, vehicles, and other hazards.

Driving: Pull over, stop, and set the parking brake. Avoid overpasses, bridges, power lines, signs and other hazards. Stay inside the vehicle until the shaking is over.

At the beach: Drop, cover and hold on until the shaking stops. Evacuate to high ground on foot as quickly as possible.
What is a tsunami?

• A tsunami is a series of waves usually caused by an undersea earthquake that displaces the ocean floor.

• But a tsunami is not really a “wave” that moves up and down; it’s actually the ocean moving sideways as a massive surge or a wall of water. It’s also known as a tidal wave. The Japanese word tsunami means “harbor wave.”

• A tsunami can generate waves for 12 to 24 hours. And the first wave is not always the biggest!

• A tsunami travels across the open ocean at over 500mph, the speed of a jet airplane. As it reaches shallower water and approaches shore, it slows down but grows in height.

• A tsunami can happen at any time of day or year.

Japan, 2011
The Boston Globe
How are tsunamis created?

From Atwater et al., 1999

Tsunami Evacuation Maps
How are tsunamis created?

Between earthquakes
How are tsunamis created?  

During an earthquake

*Earthquake starts tsunami*

Stuck area ruptures, releasing energy in an earthquake
How are tsunamis created?

Minutes later

Tsunami waves spread
Tsunamis are more than a “wave”

- Waves break on shore
- Tsunamis are a higher ocean surface that just keep coming
Two Kinds of Tsunami: Distant vs. Local
Where do tsunamis come from?

- Local Tsunamis
- Distant Tsunamis

Map showing the Ring of Fire and various tectonic plates and trenches.
Two Kinds of Tsunamis

Distant

Your response should be very different, depending which kind of tsunami is coming.

Know where to go (and when!).
In a distant tsunami…

- You won’t feel the far-away earthquake.
- There’s time for an official warning.
- First wave arrives 4 hours or more after earthquake in Alaska or elsewhere around the Pacific Rim.
- If you’re already outside hazard area, please stay there.
- If your area has tsunami sirens, you might hear them. If not, a sudden sea level change is your last-ditch warning.
Distant Tsunami from Alaska, 1964

1964 earthquake, magnitude 9.2. Fourth Avenue in Anchorage, Alaska.

A 2x6 wooden plank driven through a ten-ply tire by the tsunami that hit nearby Whittier, Alaska.
Distant Tsunami from Alaska

Generally smaller waves than from a local earthquake and tsunami.

Nearest source is 4 hours away in Alaska.
Distant Tsunami from Alaska, 1964
Damage in Cannon Beach
Five lives were lost in Oregon, and 11 in northern California.
What to Do: Distant Tsunamis

You’ll have at least four hours to respond, and could be notified by one or more of these methods…
Local Tsunamis
caused by an earthquake near Oregon’s coast

- You will feel shaking: the Big One!
- Drop, cover, and hold on until shaking stops. Protect yourself.
- Waves are larger than from a distant tsunami.
- First wave arrives 15-20 minutes after earthquake. But first wave is not always the biggest!
- Don’t wait for an official warning. Evacuate immediately!
- Evacuate on foot (bridges fail, roads blocked, traffic jams).
- Don’t delay. Have a “grab and go” bag of emergency supplies.
- Tsunami sirens not likely to work.
- Stay on high ground for 12-24 hours until waves are finished!
What to Do: Local Tsunamis

DROP! COVER! HOLD ON!
Protect Yourself During Earthquakes

GO TO HIGH GROUND!
The Shaking is Your Tsunami Warning

STAY THERE!
Tsunami Waves May Arrive for Hours
In review…

Know Where to Go! (or not)

In a **local** tsunami…

- First wave arrives 15-20 minutes after earthquake
- Evacuate *on foot*. Why? Bridges fail, roads blocked, traffic jams.
- Have a “grab and go” bag ready.

In a **distant** tsunami…

- First wave arrives 4 hours or more after earthquake in Alaska or elsewhere on Pacific Rim.
- If already **outside hazard zone**, stay there.
- Time for an official warning
- If your area has sirens, you might hear 3-minute siren blast. If not, sudden sea level change is last-ditch warning.
Lessons from Japan’s Local Tsunami, March 2011
Subduction Zones – Japan vs. Oregon

(left) Green zone is the exact footprint of the Tōhoku rupture zone. (right) Green zone indicates a region where earthquakes can occur in the Pacific Northwest.
ShakeMap Comparison

ShakeMap for March 11, 2011 Tohoku M9 Earthquake

ShakeMap for Simulated M9 Cascadia Earthquake

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How long did the earthquake shaking last?
3-4 minutes!
• First tsunami surges arrived in 15 minutes (Japan, 2011)
Japan’s Local Tsunami
Wave energy across the Pacific Ocean

It was a *local* tsunami for Japan, but a *distant* tsunami for Oregon. Make sense? 😊
Japan’s Local Tsunami
Rivers and creeks are danger zones, too!
Defenses Failed

Pine Forests

Sea Walls
Infrastructure Failed

Overturned and Underwater Central Pier

- Tsunami wave height reached 39 feet
- Six spans of this bridge washed from 1,000 to 1,300 feet away
- Railroads no longer usable
Vertical Evacuation Failed

In this City: 31 of 80 designated tsunami evacuation centers destroyed

**Figure 8.** The approximate inundation zone in Minamisanriku Town. The tsunami surges destroyed the town center and went up the narrow Hachiman River (center) and the Sakura River (on left) and the Oretate River (on right). Black arrow is 2 km long. (A) marks the location of the disaster management building shown in Figure 10 and (B) shows the tsunami evacuation building in the vicinity of the Soma River outlet.
Go to high ground!

Disaster Management HQ

30 officials went to the roof... 11 survived
Wood Buildings Perform Well in Earthquakes, But *Poorly* in Tsunamis

Wood Houses Destroyed By Water Depth & Velocity
- At 6.5 to 8 feet deep: 72% destroyed
- 65% of “destroyed buildings” were simply washed away
Reinforced Concrete Buildings Survive Better Than Wood

…but not always
Tsunami water carries an enormous amount of debris.
Before Tsunami at Sendai
After Tsunami at Sendai
Lessons from Japan

- Prepare your evacuation plan and “go bag” now
- When the ground shakes hard for a long time, evacuate immediately to high ground on foot
- Vertical evacuation is a “last resort” option
- Tsunami waves will arrive for several hours
  - First wave may not be the largest
- Wood buildings will not survive
  - Not all concrete or steel frame buildings will survive
- Help may not arrive for several to many days

You can survive if you prepare and take action!
What should you expect in Oregon?

- **M9.0 Great Earthquake**
  - Western Oregon will experience strong to **violent** shaking lasting for **2 or more** minutes
  - This experience will be **unmistakable**
  - Bridges will fail; Expect to **walk** to high ground
  - 15 to 30 minutes later = **start** of tsunami
  - Tsunami waves will continue for at least 4 hours
10,000 Year History of Earthquakes in the Pacific Northwest
10,000-year History of Oregon Earthquakes

Locations of soil core samples taken off the Oregon coast
Offshore Landslides Record Earthquakes

- Offshore landslides that have been generated from CSZ earthquakes produce turbidites.

- These turbidites can be measured from core samples like the one pictured here.

- The measuring of this mass, in addition to other sand deposits left in onshore estuaries, allow scientists to date and measure historical CSZ events.

- These historical CSZ events are then correlated between samples to create a comprehensive history of Cascadia subduction zone events.
19 CSZ Events in Past 10,000 Years

Occurrence and Relative Size of Cascadia Subduction Zone Megathrust Earthquakes

larger but much less frequent tsunamis

smaller but more frequent tsunamis

Research-indicated radiocarbon age of CSZ event (most recent in January 1700)

Average offshore landslide turbidite mass used as a proxy for earthquake size.

(Modified from Witter and others, 2011; DOGAMI Special Paper 43)
Science Team Modeled Many Tsunami Scenarios

5 Final Local CSZ Scenarios (S, M, L, XL, XXL) = - and - 2 Distant Scenarios (AK64 and AKMax)

Reference:
Simulating tsunami inundation at Bandon, Coos County, Oregon, using hypothetical Cascadia and Alaska earthquake scenarios
Authors: Witter, R.C., Zhang, Y., Wang, K., Priest, G.R., Goldfinger, C., Stimely, L.L., English, J.T., and Ferro, P.A.
Oregon Department of Geology and Mineral Industries Special Paper 43
**DOGAMI Tsunami “T-Shirts”**

<table>
<thead>
<tr>
<th>Earthquake Size</th>
<th>Average Slip Range (ft)</th>
<th>Maximum Slip Range (ft)</th>
<th>Time to Accumulate Slip (yrs)</th>
<th>Earthquake Magnitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXL</td>
<td>59 to 72</td>
<td>118 to 144</td>
<td>1,200</td>
<td>~9.1</td>
</tr>
<tr>
<td>XL</td>
<td>56 to 72</td>
<td>115 to 144</td>
<td>1,050 to 1,200</td>
<td>~9.1</td>
</tr>
<tr>
<td>L</td>
<td>36 to 49</td>
<td>72 to 98</td>
<td>650 to 800</td>
<td>~9.0</td>
</tr>
<tr>
<td>M</td>
<td>23 to 30</td>
<td>46 to 62</td>
<td>425 to 525</td>
<td>~8.9</td>
</tr>
<tr>
<td>S</td>
<td>13 to 16</td>
<td>30 to 36</td>
<td>300</td>
<td>~8.7</td>
</tr>
</tbody>
</table>
Historical Event Size & Frequency Relate to the 5 Scenarios
What the computer model looks like 😊
DOGAMI Turns Models to Maps

- Turn Model Output Into **Inundation Maps**
  - 5 Local CSZ “Tsunami T-Shirt Scenarios”
    - (S, M, L, XL, XXL)
    - Occurs at High Tide
    - Land Subsidence Taken Into Account
    - Maps Include Other Relevant Information such as Wave Time Series, Inundation Exposure, and Wave Elevation Profiles
  - 2 Distant Alaska Scenarios
    - (Alaska 1964 (M9.2) & Alaska Max)

- Use XXL (worst local) and Alaska Max (worst distant) for **Evacuation Brochures**
New Tsunami Maps
Two Kinds of New Tsunami Maps

**Tsunami inundation maps (TIMs)**
- 87 publications for Oregon’s coast, each with two maps (local and distant).
- Available for purchase via www.OregonTsunami.org

**Tsunami evacuation brochures**
- 42 maps for Oregon’s coast, covering population centers. Free maps.
- Do you live outside the map areas? See Evacuation Zone Map Viewer at www.OregonTsunami.org
Evacuation Maps

Show two scenarios:

- Worst-case *local* tsunami (XXL in yellow)
- Worst-case *distant* tsunami (Alaska maximum) in orange
WHAT TO KNOW about tsunamis

A tsunami is a series of sea waves, usually caused by a displacement of the ocean floor by an undersea earthquake. As tsunamis enter shallow water near land, they increase in height and can cause great loss of life and property damage.

Recent research suggests that tsunamis have struck the Oregon coast on a regular basis. They can occur any time, day or night. Typical wave heights from tsunamis occurring in the Pacific Ocean over the last 500 years have been 20–65 feet at the shoreline. However, because of local conditions a few waves may have been much higher — as much as 100 feet.

We distinguish between a tsunami caused by an undersea earthquake near the Oregon coast (a local tsunami) and an undersea earthquake far away from the coast (a distant tsunami).

WHAT TO DO for both local and distant tsunamis

1. Evacuate on foot, if at all possible. Follow evacuation signs and arrows to an Assembly Area.

2. If you need help evacuating, tie something white (sheet or towel) to the front door knob. Make it large enough to be visible from the street. If the emergency is a distant tsunami, then help may arrive. In the event of a local tsunami, it is unlikely that anyone will help you, so make a plan and be prepared!

3. Stay away from potentially hazardous areas until you receive an ALL CLEAR from local officials. Tsunamis often follow river channels, and dangerous waves can persist for several hours. Local officials must inspect all flooded or earthquake-damaged structures before anyone can go back into them.

4. After evacuation, check with local emergency officials if you think you have special skills and can help, or if you need assistance locating lost family members.

*Assembly areas A are shown on the map. Do not confuse Assembly Areas with Evacuation Centers, which are short-term help centers set up after a disaster occurs.

Local tsunamis

A local tsunami can come onshore within 15 to 20 minutes after the earthquake — before there is time for an official warning from the national warning system. Ground shaking from the earthquake may be the only warning you have. Evacuate quickly!

Distant tsunamis

A distant tsunami will take 4 hours or more to come ashore. You will feel no earthquake, and the tsunami will generally be smaller than that from a local earthquake. Typically, there is time for an official warning and evacuation to safety.

Evacuation for a distant tsunami will generally be indicated by a 3-minute siren blast (if your area has sirens) and an announcement over NOAA weather radio that the local area has been put into an official TSUNAMI WARNING. In isolated areas along beaches and bays you may not hear a warning siren. Here, a sudden change of sea level should prompt you to move immediately to high ground. If you hear the 3-minute blast or see a sudden sea level change, first evacuate away from shoreline areas, then turn on your local broadcast media or NOAA weather radio for more information.
Community Determines Evacuation Elements

**MAP SYMBOLS / SÍMBOLOS DEL MAPA**
- Evacuation route / Ruta de evacuación
- Assembly area / Área reunión
- Hospital / Hospital
- School / Escuela
- City Hall / Municipalidad
- Bridge / Puente
- Law enforcement / Policía
- Fire Department / Bomberos
- Tsunami warning siren / Sirena de aviso de tsunami
- Airport / Aeropuerto
- + 35' Elevation, in feet

**IF YOU FEEL AN EARTHQUAKE:**
- Drop, cover, and hold
- Move immediately inland to higher ground
- Do not wait for an official warning

**SI USTED SIENTE EL TEMBLOR:**
- Tirese al suelo, cúbrase, y espere
- Dirijase de inmediato a un lugar más alto que el nivel del mar
- No espere por un aviso oficial

**OUTSIDE HAZARD AREA:** Evacuate to this area for all tsunami warnings or if you feel an earthquake.

**LOCAL CASCADIA EARTHQUAKE AND TSUNAMI:** Evacuation zone for a local tsunami from an earthquake at the Oregon coast.

**DISTANT TSUNAMI:** Evacuation zone for a distant tsunami from an earthquake far away from the Oregon coast.

**ZONA DE PELIGRO EXTERIOR:** Evacue a esta área para todas las advertencias del maremoto o si usted siente un temblor.

**MAREMOTO LOCAL (terremoto de Cascadia):** Zona de evacuación para un tsunami local de un temblor cerca de la costa de Oregon.

**MAREMOTO DISTANTE:** Zona de evacuación para un tsunami distante de un temblor lejos de la costa de Oregon.
We cannot prevent a tsunami but we can prepare for one.

Oregon Tsunami Clearinghouse

Is your family prepared for disaster?

Tsunami Evacuation Zone Map Viewer
Search by address or coastal area.
web map | iPhone app | Android app

Tsunami Evacuation Brochures
For coastal communities.

TsunamiReady, TsunamiPrepared News

DOGAMI Events Calendar

» 05/06/13 - TLM series inundation maps complete for Douglas County
» upcoming: Tsunami Readiness Rallies:
  May 7 - Lincoln City
  May 9 - Waldport
  May 11 - Newport
  May 14 - Florence
  May 21 - Lakeside/Hauser
» 05/01/13 - Evacuation

Tsunami news around the web

Fishing float rides 2 tsunamis -- NBCNews.com (blog)
Geologists are still puzzling over the unusual Haida Gwaii earthquake, which surprised scientists because of its unexpected style. Understanding what caused the quake will help them forecast the region's earthquake and tsunami hazards. Two tectonic...
Evacuation Zone Map Viewer

www.OregonTsunami.org
App for Smartphones
For iPhone and Android. Free!

TsunamiEvac-NW
And now for the good news: You *can survive* if you prepare and take action.

How You Can Prepare
Tsunami Outreach Oregon

- To assist coastal communities in creating a local *culture of preparedness and response*
Tsunami Readiness Rallies Helped to Spread the Word
How You Can Prepare At Home

Free booklet available from
Or by calling Oregon Emergency Management at (503) 378-2911 extension 22237

THE SEVEN STEPS
FOR EARTHQUAKE & TSUNAMI SAFETY

Before an earthquake or tsunami – PREPARE

1. Identify hazards (pg 14)
   a. Identify areas that could be harmed
   b. Review instructions for safe shelter

2. Create a disaster preparedness plan (pg 16)
   a. Prepare “Drop, Cover, and Hold On” drill
   b. Choose a meeting place and set up an out-of-home contact
   c. Recognize the warning and official message of a
      tsunami and know how to respond

3. Prepare survival kits (pg 17)
   a. Create kits for home, work, and car
   b. The prepared kit can withstand the storms

4. Identify weaknesses (pg 18)
   a. Identify weaknesses in your building and vehicles
   b. Contact your local government and find out what
      tsunami plans are in your community

During the earthquake – PROTECT

5. Protect yourself during an earthquake (pg 20)
   a. DUCK, COVER, and HOLD ON
   b. Stay away from high-rise buildings
   c. Avoid the shaky stops

After the earthquake – RECOVER

6. Evacuate if necessary, check for injuries and damage (pg 21)
   a. If you are in a tsunami-hazard area, immediately
      EVACUATE to higher ground or inland away from coast
   b. Check for injuries and damage

7. Follow your plan (pg 22)
   a. If your evacuation, shelter, or rescue safety
      plans were not fully implemented
   b. Be in communication; know your area limits
   c. Expect aftershocks; you may be large enough
      to do additional damage

IMPORTANT INFORMATION

Out-of-Area Contact Name: ____________________________ Phone: __________
Email: ____________________________________________

Neighborhood Meeting Place: _________________________ Phone: __________
Local Meeting Place: ________________________________ Phone: __________

Insurance: _________________________________________ Account No.: ____________________________
Policy No.: ____________________________ Phone: __________

Pharmacy: _________________________________________ Account No.: ____________________________
Policy No.: ____________________________ Phone: __________

Bank: _____________________________________________ Account No.: ____________________________
Policy No.: ____________________________ Phone: __________

Veterinarian/Animal: ________________________________ Account No.: ____________________________
Policy No.: ____________________________ Phone: __________

WEB RESOURCES FOR FURTHER INFORMATION:

Oregon Emergency Management
www.oregon.gov/OMD/OEM/earthquake
Oregon Department of Geology and Mineral Industries
www.oregonstate.edu
www.oregonforecasts.org

US Geological Survey - Earthquake Hazards Preparedness
www.oregon.gov/OMD/OEM
NOAA Tsunami Program
www.noaa.gov
West Coast and Alaska Tsunami Warning Center
www.uaap.org
Three things to keep next to your bed:
1. Headlamp (so you can see when electricity goes out and it's nighttime)
2. Gloves (so you can pick up broken glass and other sharp objects in your way)
3. Boots or shoes (so you can walk safely over all the sharp, broken debris without cutting your feet)

Darth Vader headlamp. Cool!
Assemble **emergency kits** with at least a 3-day supply for each family member:
- Local map showing safe evacuation routes to high ground
- First-aid supplies, prescriptions and non-prescription medication
- Water bottle and filtration or treatment supplies capable of providing 1 gallon per person per day
- Non-perishable food (ready-to-eat meals, canned food, baby food, energy bars)
- Cooking and eating utensils, can opener, Sterno® or other heat source
- Matches in water-proof container or lighter
- Shelter (tent), sleeping bags, blankets
- Portable radio, NOAA weather radio, flashlight, and extra batteries
- Rain gear, sturdy footwear, extra clothing
- Personal hygiene items (toilet paper, soap, toothbrush)
- Tools and supplies (pocket knife, shut off wrench, duct tape, gloves, whistles, plastic bags)
- Cash
How You Can Prepare At Home

Free download at:
How You Can Prepare Your Neighborhood

• An easy 9-step program to get yourself and your neighbors prepared for disaster.

• More info at http://www.preporegon.org/MYN_overview
How You Can Prepare
Join your local CERT group!

- Educates people about disaster preparedness for hazards
- Training in basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations.
- CERT members can assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help.
How You Can Help

• Prepare at home, work, and school
• Talk to your friends, family, and neighbors
• Do the Map Your Neighborhood exercise with your immediate neighbors
• Get emergency notifications via phone, cell, email, text, etc. Sign up at your county government’s website via emergency management department

Thank you!
Shake Out. Don’t Freak Out.

Dropping, Covering, and Holding On... October 17, 10:17 a.m.

Join Us for the Largest Earthquake Drill in Oregon History.

Register at www.ShakeOut.org/oregon
More Information

www.OregonTsunami.org
Oregon Dept. of Geology and Mineral Industries (DOGAMI)
(971) 673-1543

Or from your local fire station or city hall