2023 Cascadia Subduction Zone "Preparing to be Ground Zero"

Discussion topics

- Objective and community mindsets
- Cascadia Subduction Zone (CSZ) – What is it?
- Regional and local impacts from Cascadia
- Building community resiliency through personal preparedness
- Conclusion:

  What mindset are you now?

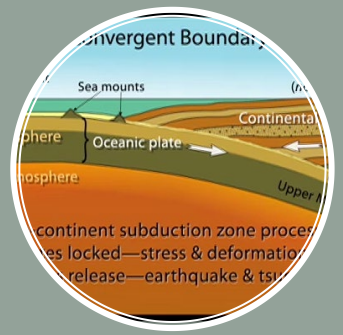
Our objective of inviting you here today?

Building *our* community resiliency through *your* personal preparedness

Community mindsets

- Those "who don't know"
- Those who are in "denial"
- Those who plan to "wait and see"
- Those who are "aware and prepared"

Cascadia Subduction Zone (CSZ)



What is it?

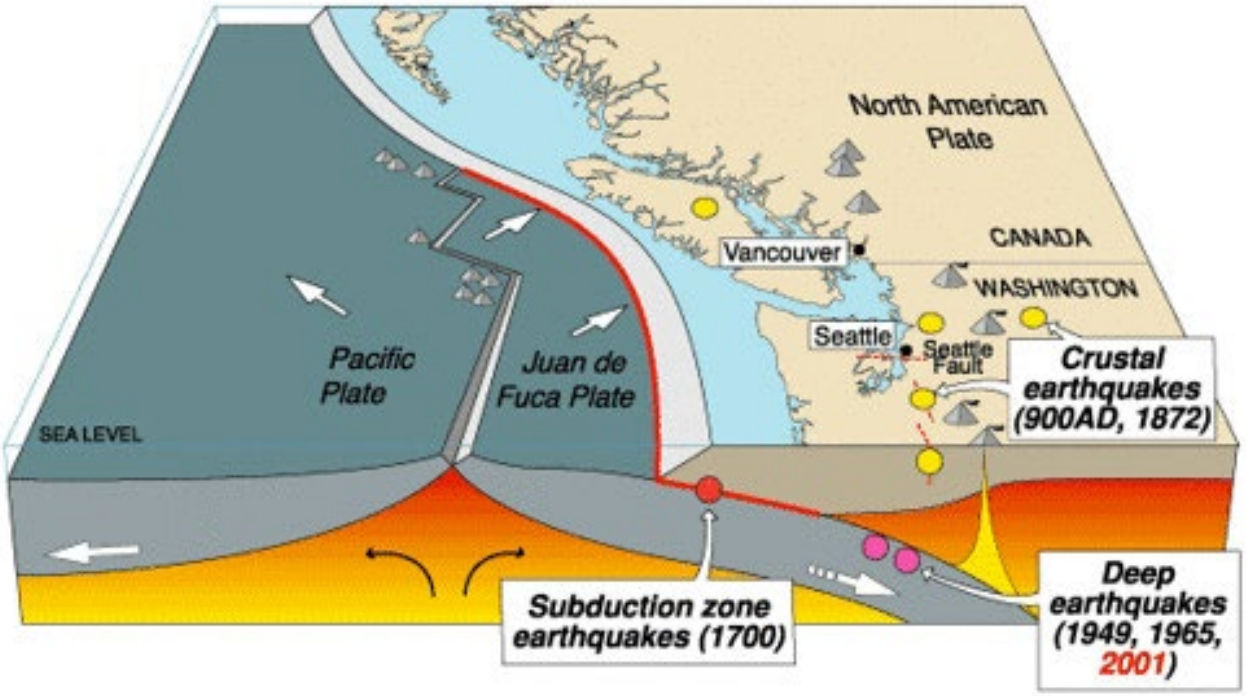
When will it happen?

How will it affect me?

Building community resiliency through personal preparedness

What is CSZ?

Cascadia earthquake sources



Source	Affected area	Max. Size	Recurrence
Subduction Zone	W.WA, OR, CA	M 9	500-600 yr
Deep Juan de Fuca plate	W.WA, OR,	M 7+	30-50 yr
Crustal faults	WA, OR, CA	M 7+	Hundreds of yr?

What do we know about CSZ?

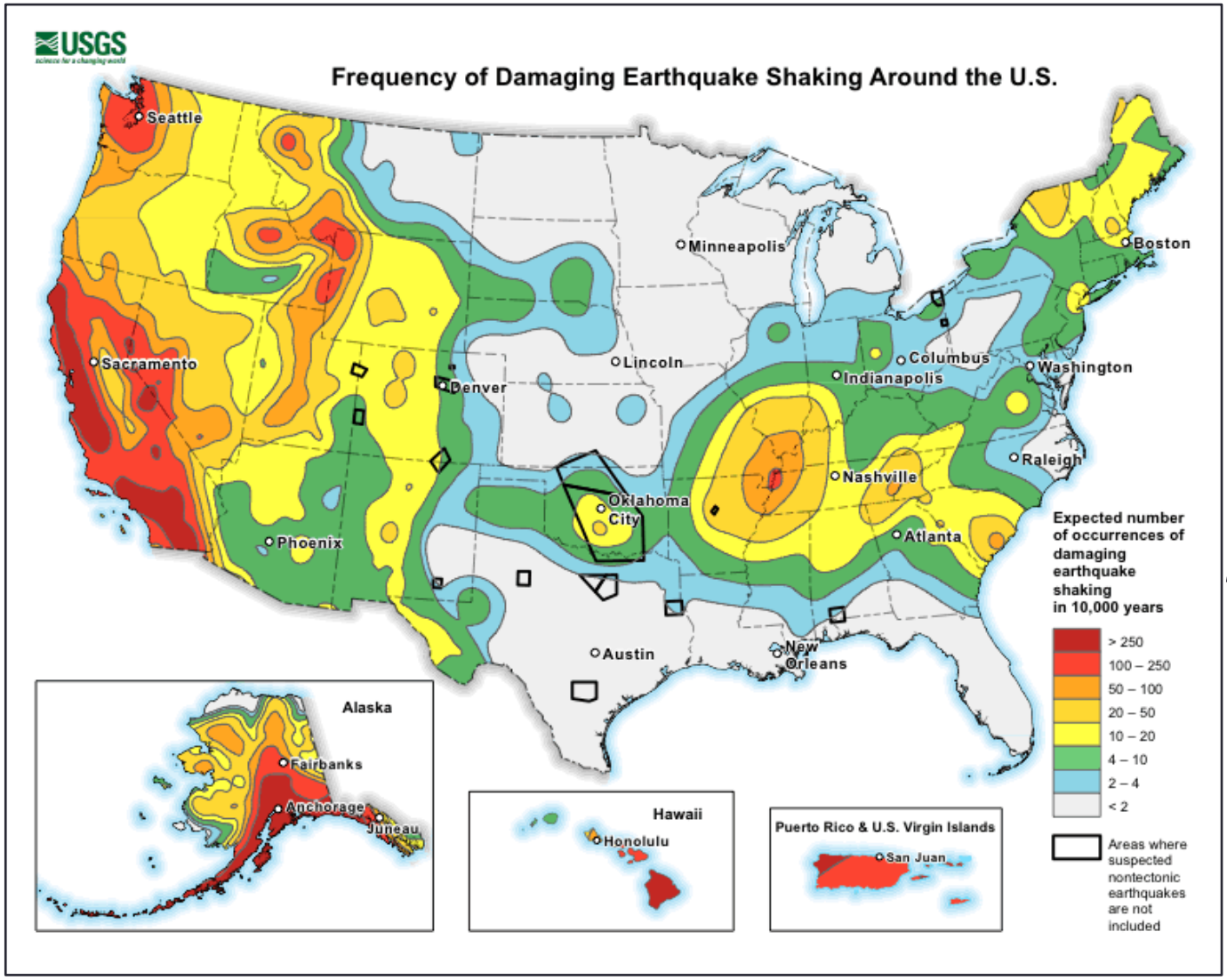
Cascadia 101

- CSZ is a region off the Northwest coast where the Juan de Fuca Plate (oceanic) is pushing beneath the North American Plate (continental)
- Southern region of CSZ is historically more vulnerable to this event
- Similar in size, impact and intensity to the 2004 Sumatra and 2011 Japan earthquake and tsunami
- 15 million people live in the impact zone from Northern California to British Columbia (600 miles long)

Cascadia Reoccurrence

- Last megathrust, 9.0, earthquake was January 26, 1700, submerging and flooding coastal forests
- Average between earthquakes 190 – 1,200 years
- OSU study indicates there is a 40% chance of a major event in the next 50 years
- By 2060, if no event as occurred, we will have exceeded 85% of all the known intervals of reoccurrence in 10,000 years

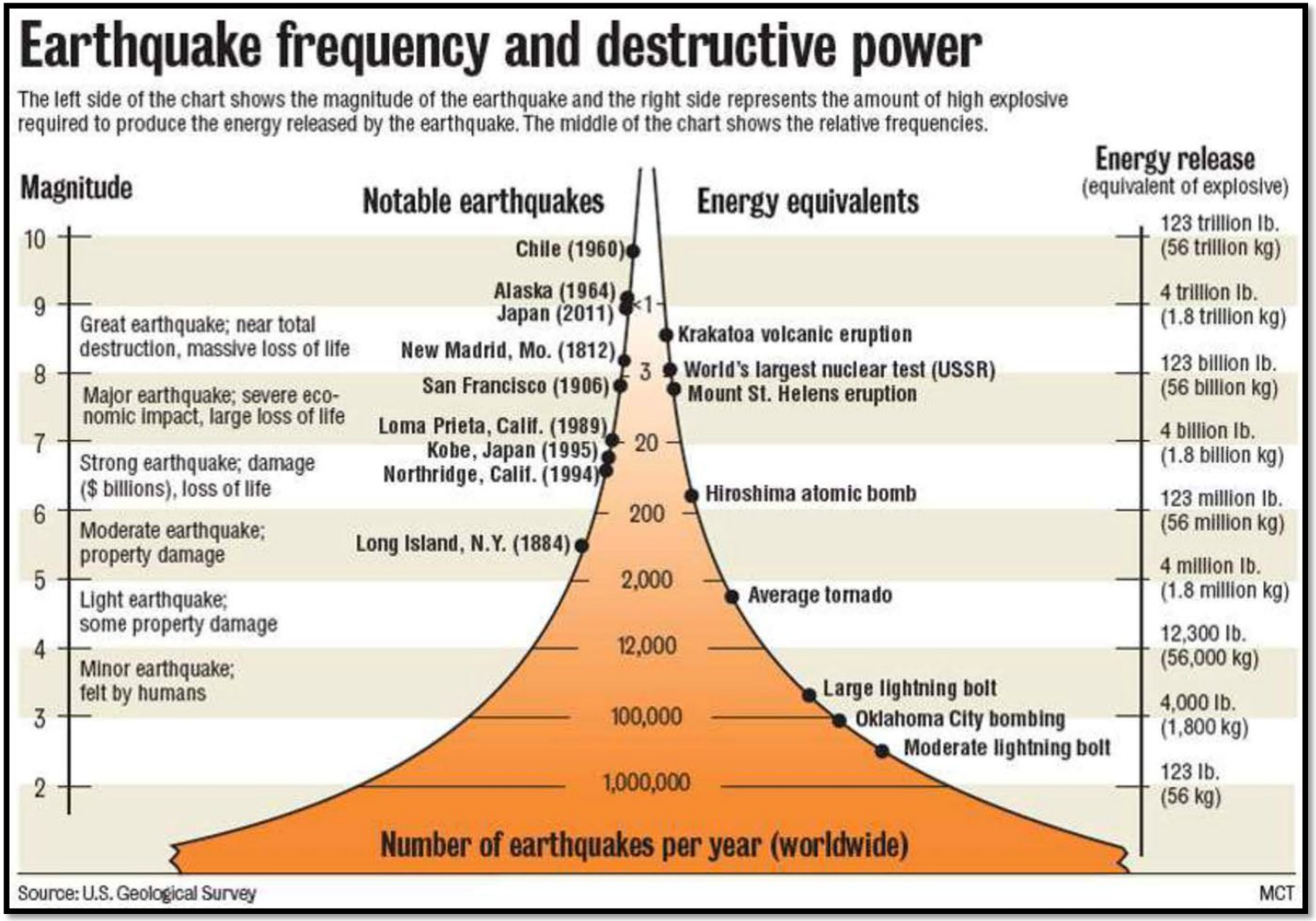
How does the Pacific NW Compare?



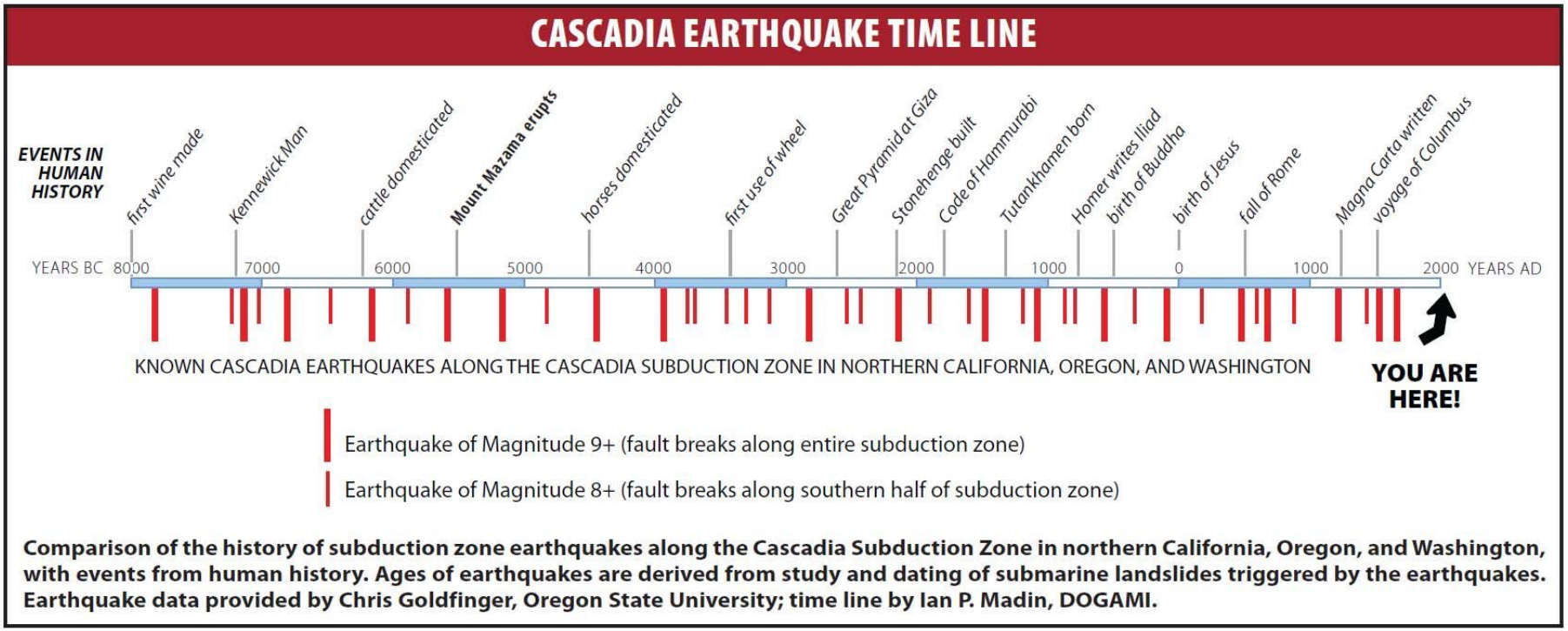
2023
USGS

INSURANCE???
EARTHQUAKE &
NATIONAL
FLOOD

How does Cascadia Rate?

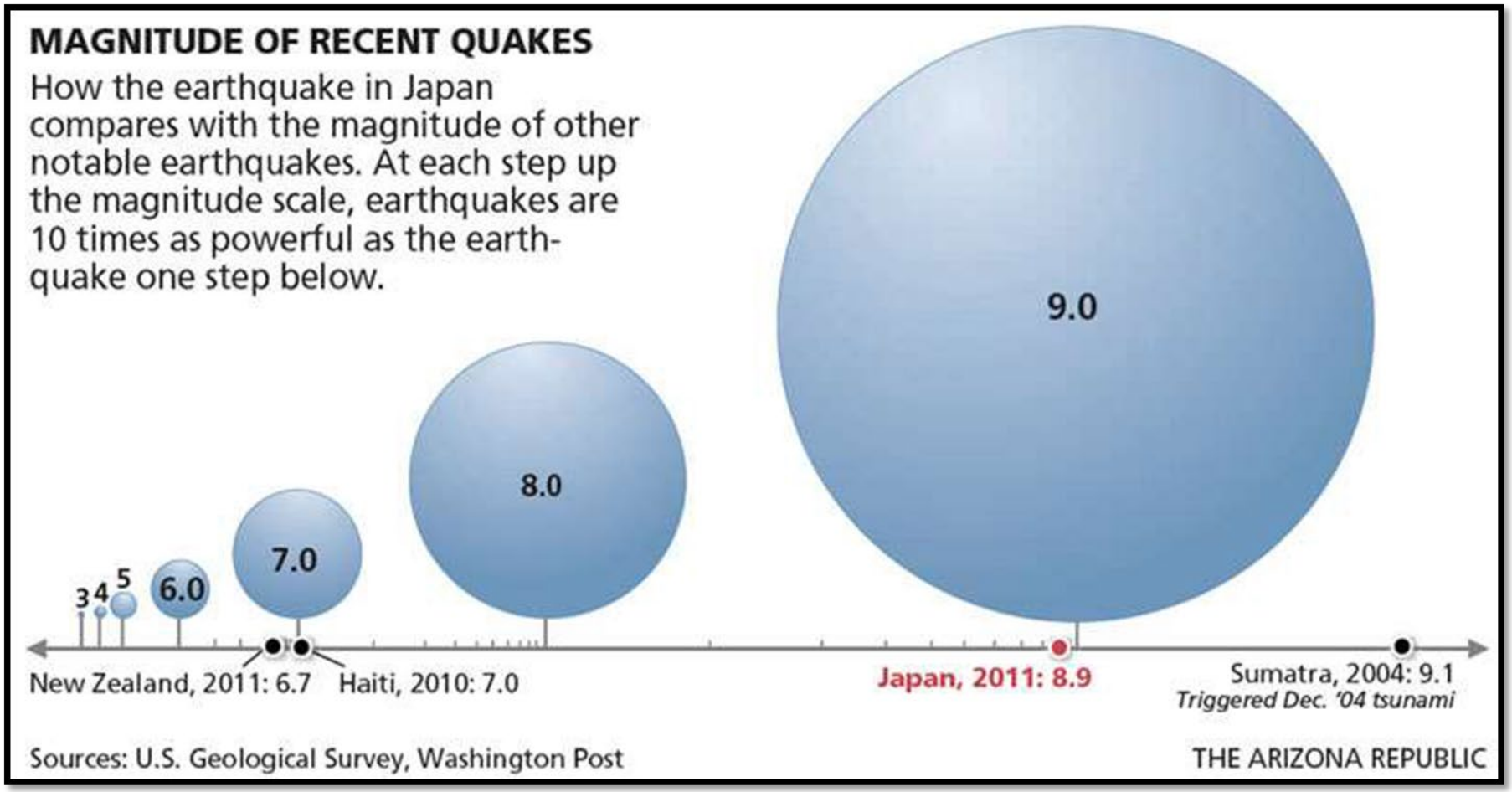


When will it happen? *Timeline*



Last activation of Cascadia was Jan. 26, 1700
40% chance of a mega-thrust earthquake
in the next 50 years *

How big is big? *Magnitude*



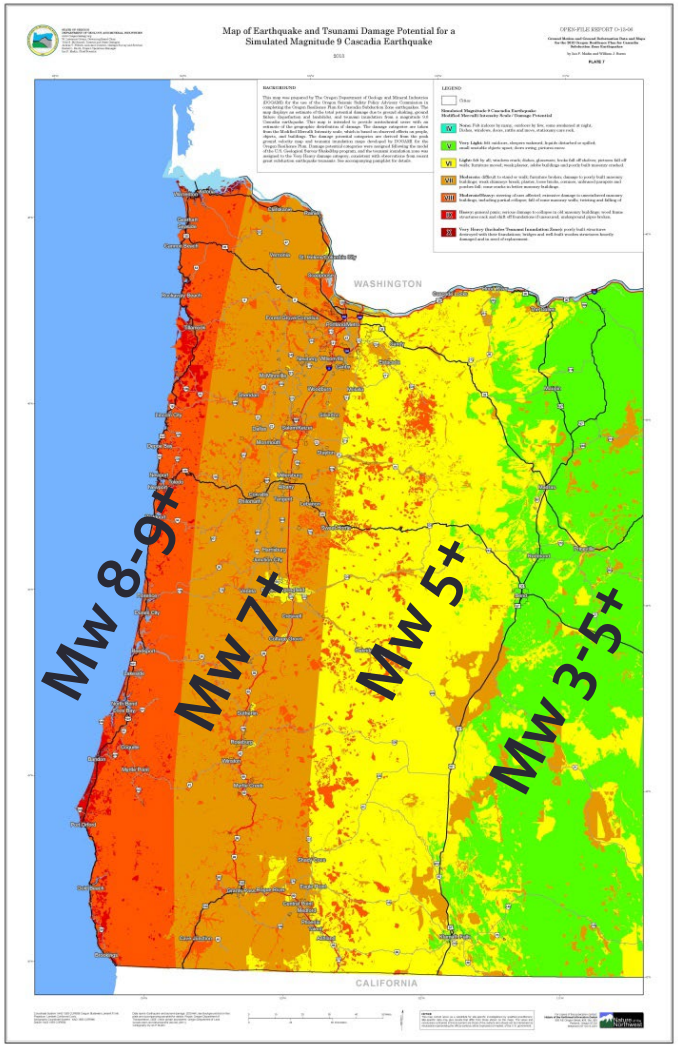
Cascadia 101

Characteristics
▪ Shaking - intense/strong
▪ Liquefaction
▪ Coastal subsidence
▪ Local tsunami
▪ Aftershocks
▪ Landslides

Shaking Intensity

- 9.0 or greater magnitude (Mw)
- Between 4-6 minutes of continued shaking
- Likelihood you will be able to walk during the shaking

Shaking Intensity…by region



LEGEND

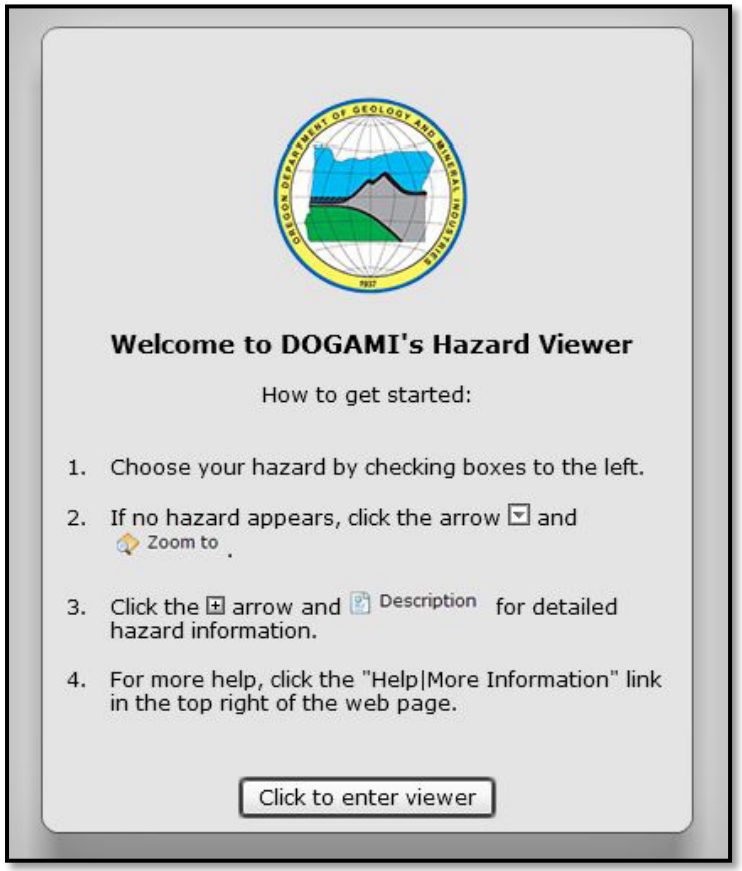
Cities

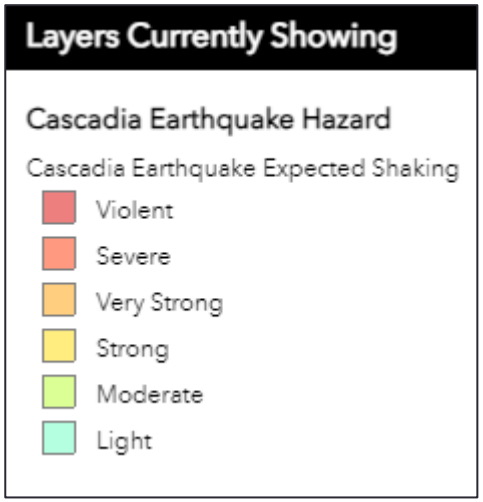
Simulated Magnitude 9 Cascadia Earthquake
Modified Mercalli Intensity Scale / Damage Potential

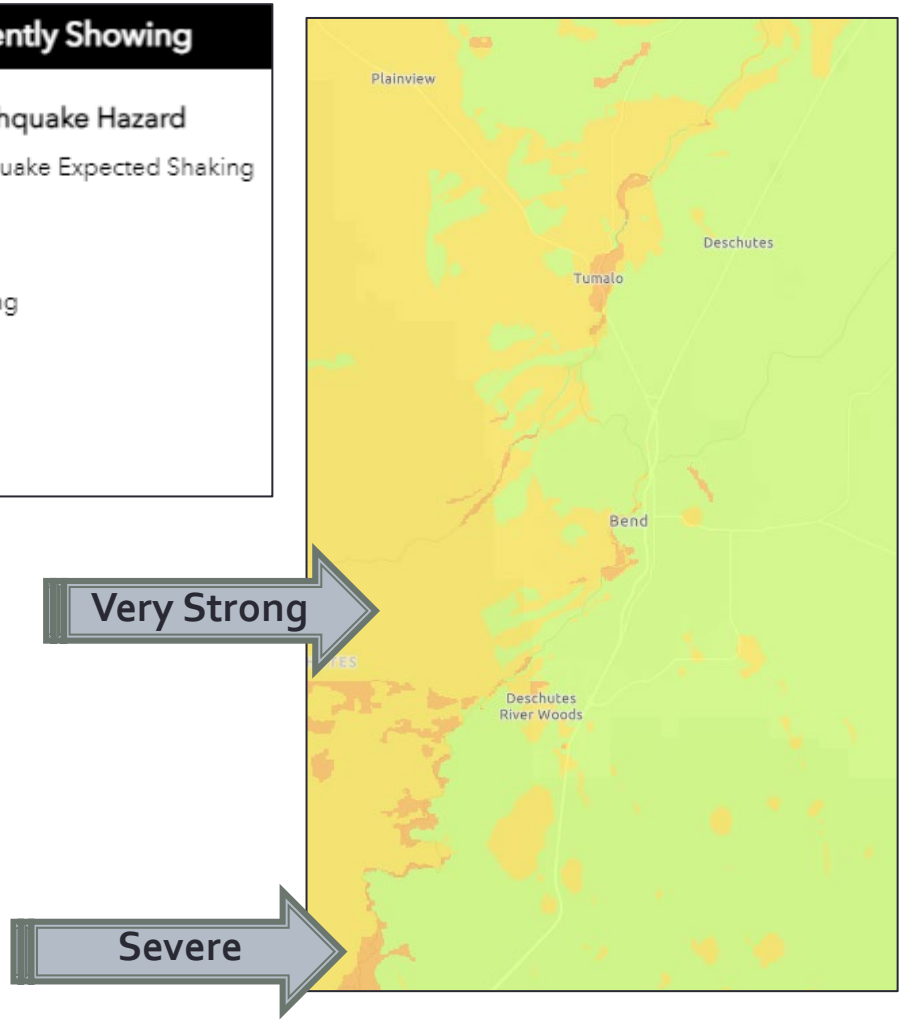
IV	**None:** Felt indoors by many, outdoors by few, some awakened at night, Dishes, windows, doors, rattle and move, stationary cars rock.
V	**Very Light:** felt outdoors, sleepers wakened; liquids disturbed or spilled; small unstable objects upset; doors swing, pictures move.
VI	**Light:** felt by all; windows crack; dishes, glassware, books fall off shelves; pictures fall off walls; furniture moved; weak plaster, adobe buildings and poorly built masonry cracked.
VII	**Moderate:** difficult to stand or walk; furniture broken; damage to poorly built masonry buildings; weak chimneys break; plaster, loose bricks, cornices, unbraced parapets and porches fall; some cracks in better masonry buildings.
VIII	**Moderate/Heavy:** steering of cars affected; extensive damage to unreinforced masonry buildings, including partial collapse; fall of some masonry walls; twisting and falling of
IX	**Heavy:** general panic; serious damage to collapse in old masonry buildings; wood frame structures rack and shift off foundations if unsecured; underground pipes broken.
X	**Very Heavy (Includes Tsunami Inundation Zone):** destroyed with their foundations; bridges and well-built damaged and in need of replacement.

Regional Areas
Tsunami Impact Area
Coastal
Valley
Cascades
Eastern

Shaking Intensity…by region







Strong Intensity…what to expect

DROP, COVER & HOLD ON

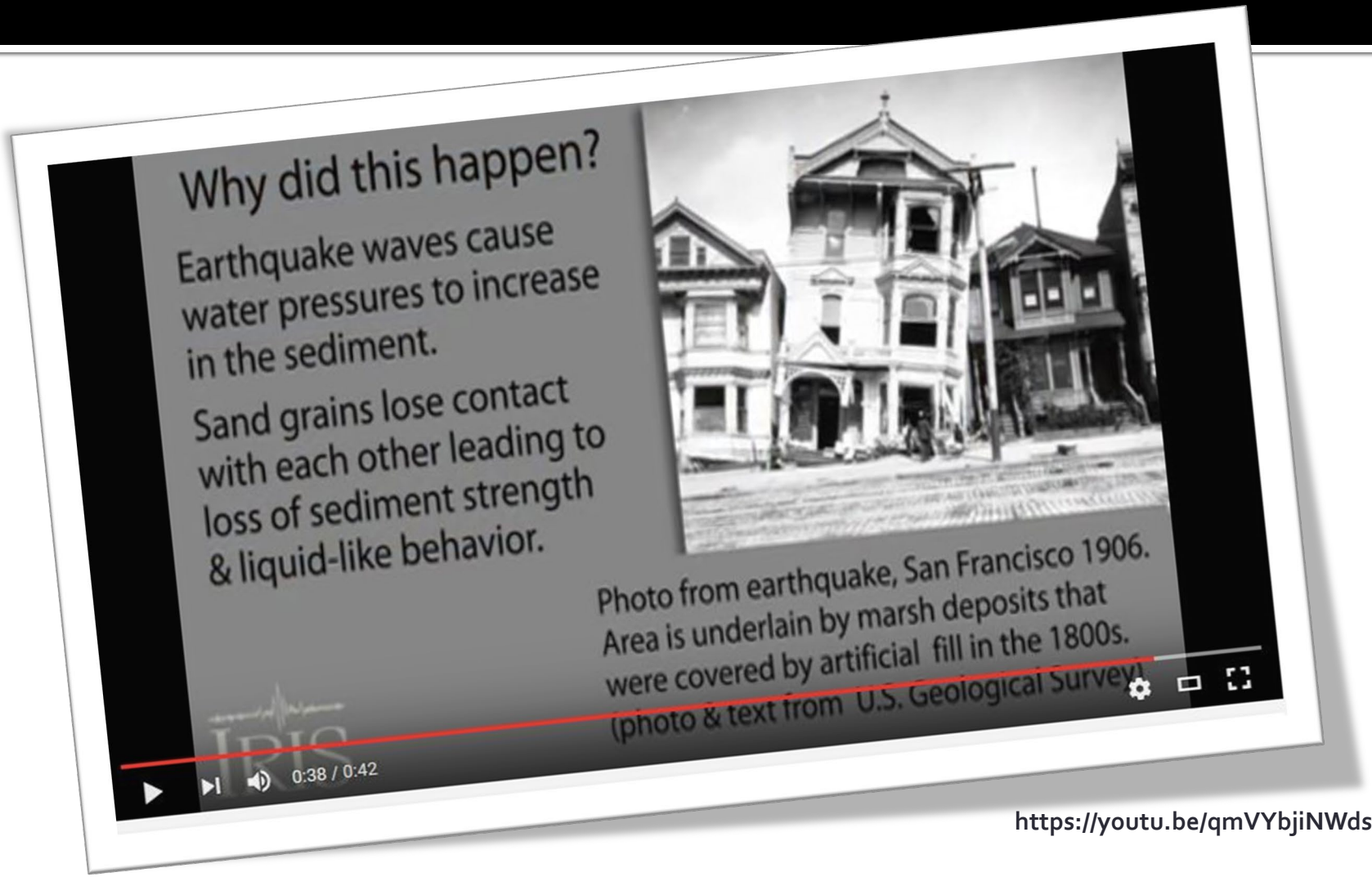
Liquefaction

1964 Alaska

A process by which **water-saturated sediment temporarily loses strength and acts as a fluid,** like when you wiggle your toes in the wet sand near the water at the beach. This effect can be caused by earthquake shaking. USGS

2011 Christchurch

Liquefaction – San Francisco, 1906

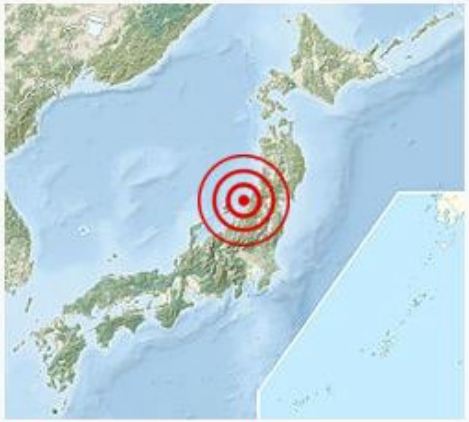


https://youtu.be/qmVYbjiNWds

Graphics and animation by Jenda Johnson, Earth Sciences Animated

Liquefaction – Japan 1964

1964 Niigata earthquake

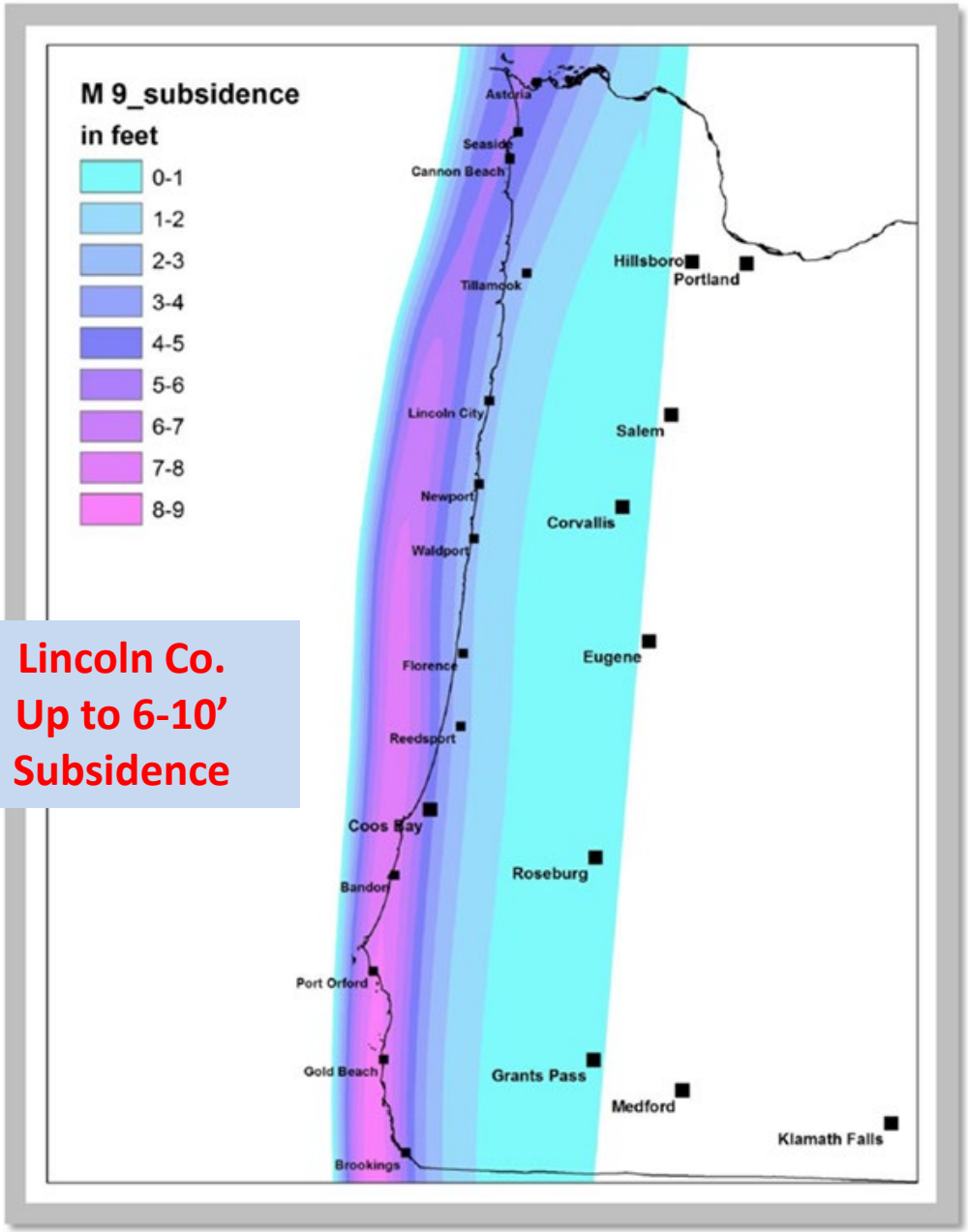


Date	16 June 1964
Magnitude	7.6 M_w
Depth	34 km
Epicenter	38.37°N 139.22°E
Type	Dip-slip
Areas affected	Japan, Niigata Prefecture
Tsunami	yes
Casualties	36 dead or missing (385 injured)[1]

1964 Niigata, Japan Liquefaction, Source: unknown

Coastal Subsidence

People evacuate with small boats down a road flooded by the tsunami waves in the city of Ishinomaki in Miyagi prefecture_JIJI PRESS_AFP_Getty Images



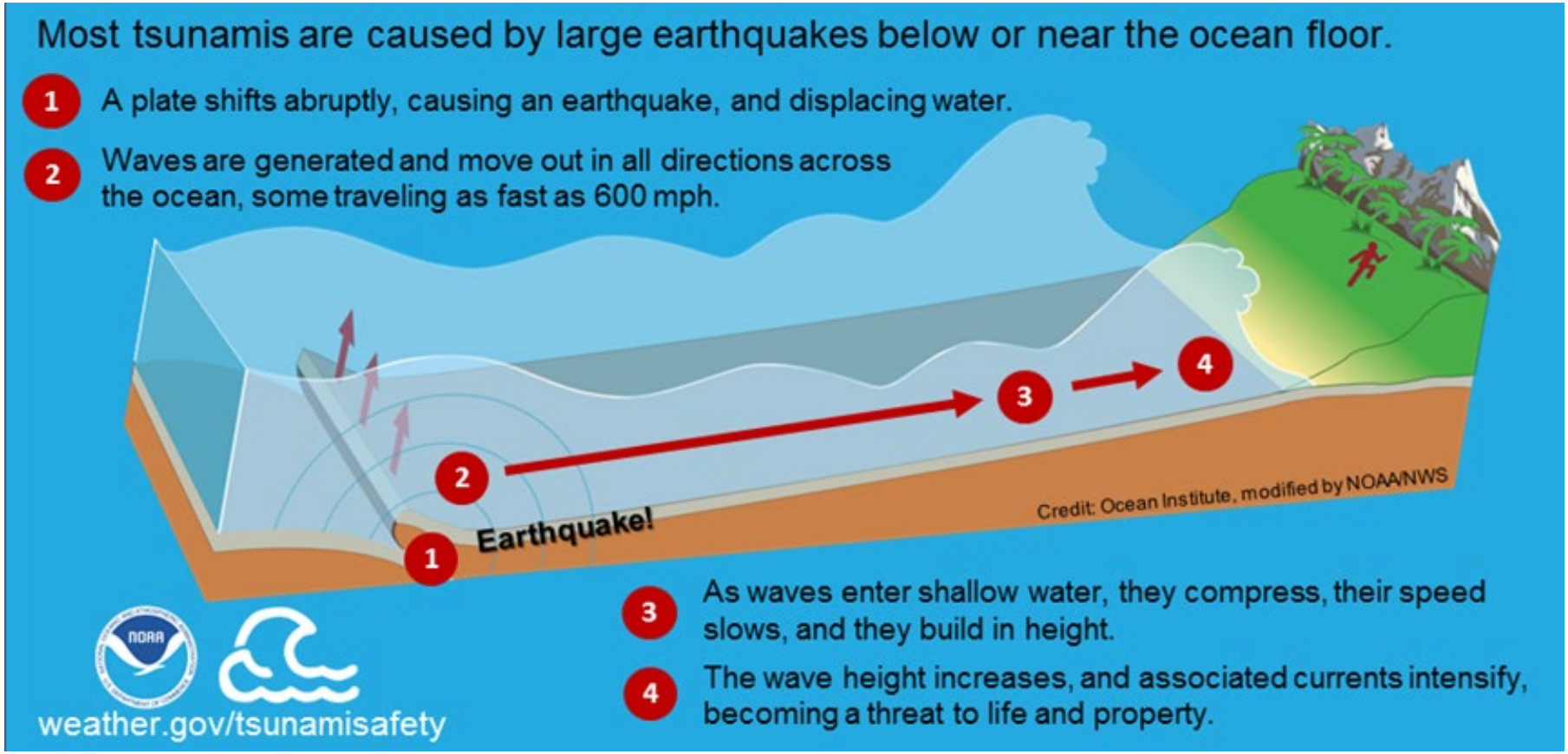
Lincoln Co.
Up to 6-10'
Subsidence

Figure 1.8: Estimated permanent land subsidence from the scenario magnitude 9.0 earthquake for the Oregon Coast. Subsidence would occur during the earthquake.

Coastal subsidence will *create permanent changes* to our everyday physical environment;

- Coastal shorelines, tide levels
- Estuaries, river levels, boat ramps, fishing "spots"
- Marinas, harbors, bay fronts
- Homes, businesses, travel routes

Tsunami…How A Tsunami Works



Tsunamis


Tsunami Education and Outreach Materials
Weather.gov > Safety > Tsunami Education and Outreach Materials
Tsunami Safety
Tsunami Alerts
Before a Tsunami
During a Tsunami
After a Tsunami
Tsunamis: Be Prepared and Stay Safe!
Share
TSUNAMIS!
PRESENTED BY:
NOAA
MORE VIDEOS
0:03 / 1:46
YouTube


DROP!
COVER!
HOLD ON!
Protect Yourself During Earthquakes

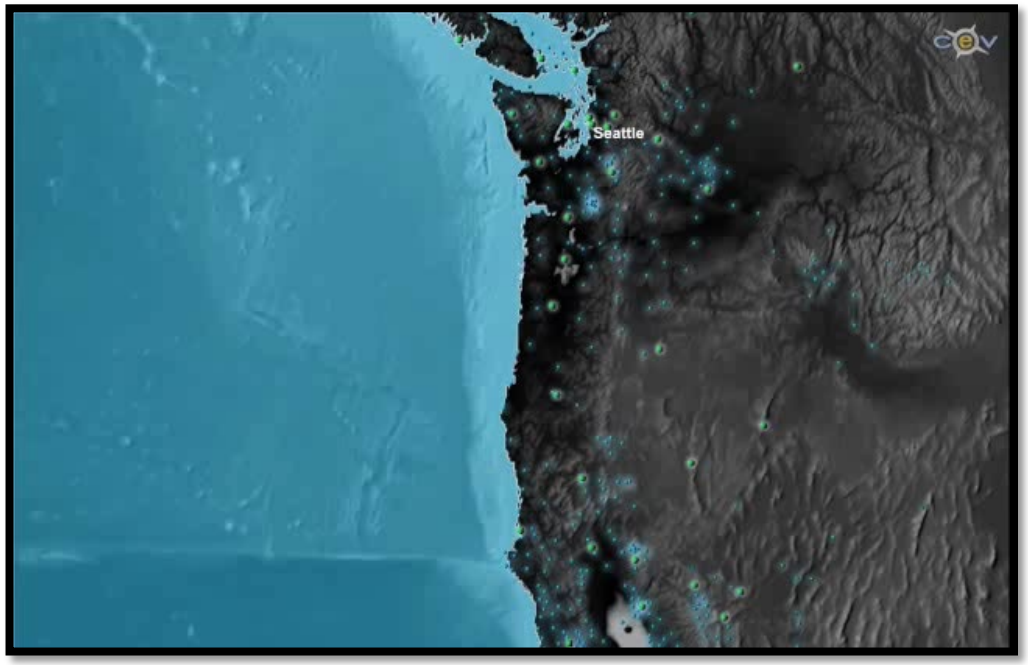

GO TO HIGH GROUND!
The Shaking is Your Tsunami Warning


STAY THERE!
Tsunami Waves May Arrive for Hours

Tsunami – Distant/Local

Know Your Zone!!

A tsunami is a sea wave of **local** or **distant** origin that results from large-scale seafloor displacements associated with large earthquakes, major submarine slides, or exploding volcanic islands. USGS

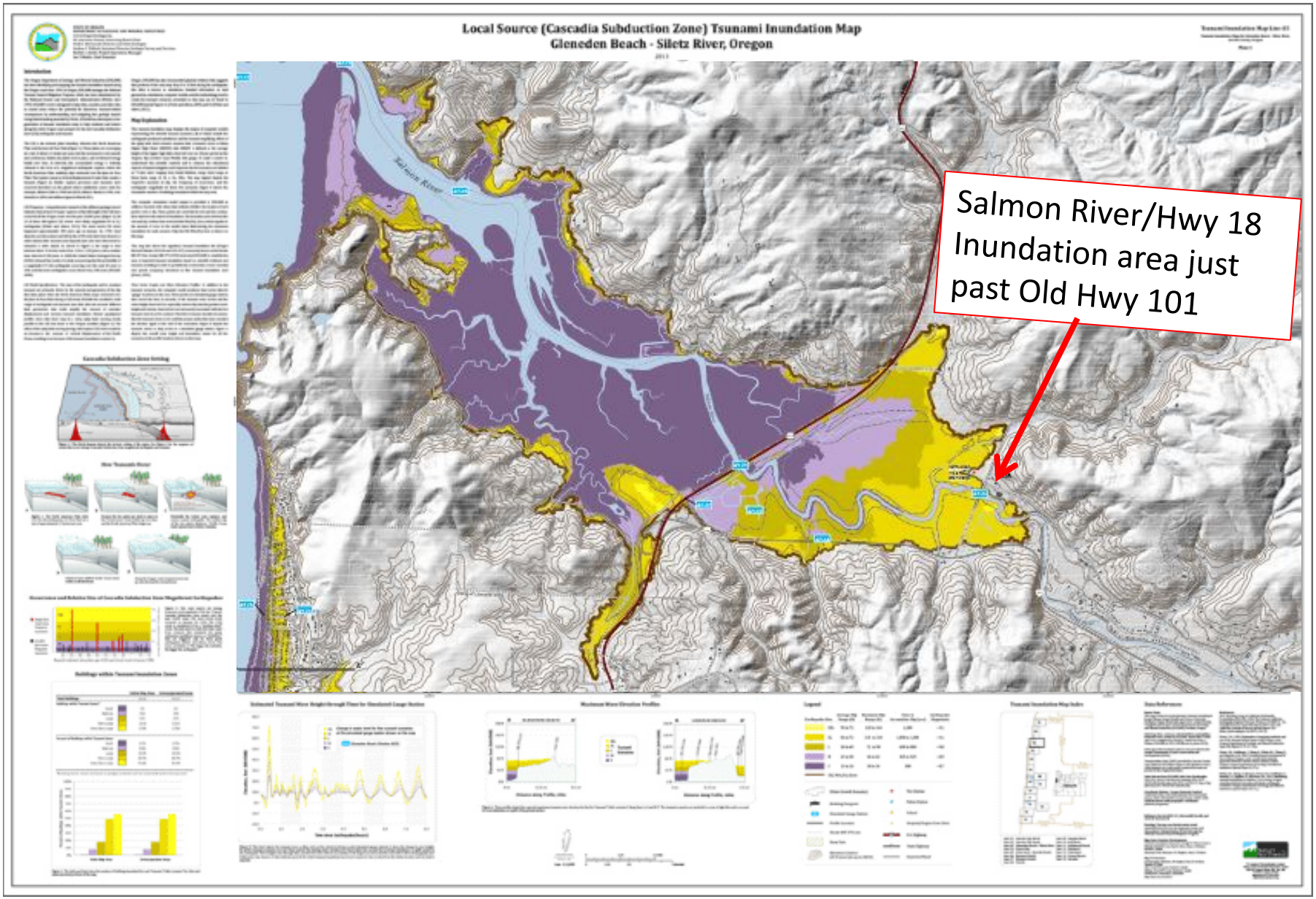


Distant Tsunami vs. Local Tsunami – they are created by the same event but energy travels in different directions.

Local comes on shore nearest the earthquake fault line

Distant travels away from the shoreline until it runs out of energy, generally when it reaches a distant shoreline

Tsunami Inundation Maps (TIMS) - www.oregontsunami.org



www.oregontusunami.org

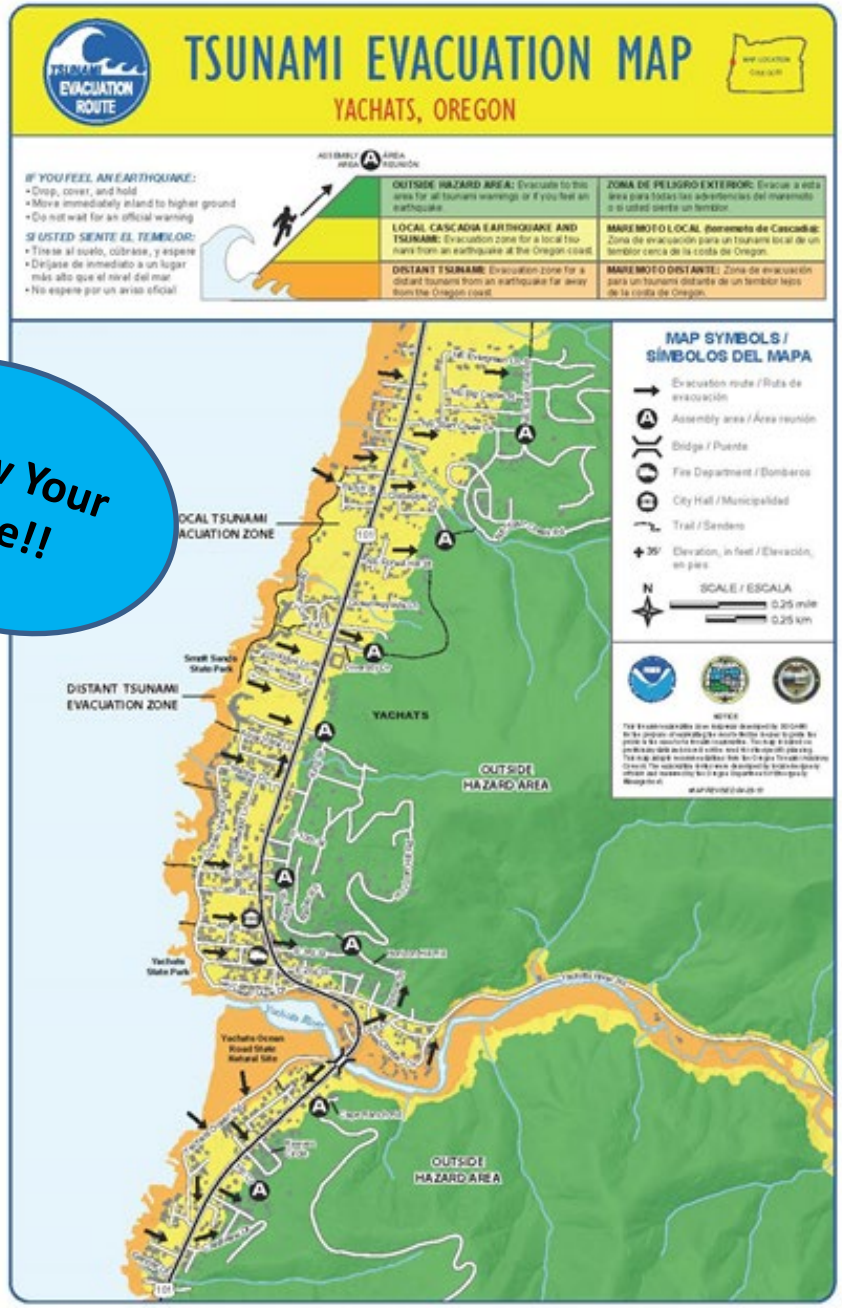
- Neighborhood Maps
- Address Look Up
- Mobile App for Notifications

Green Zone – Safe Zone

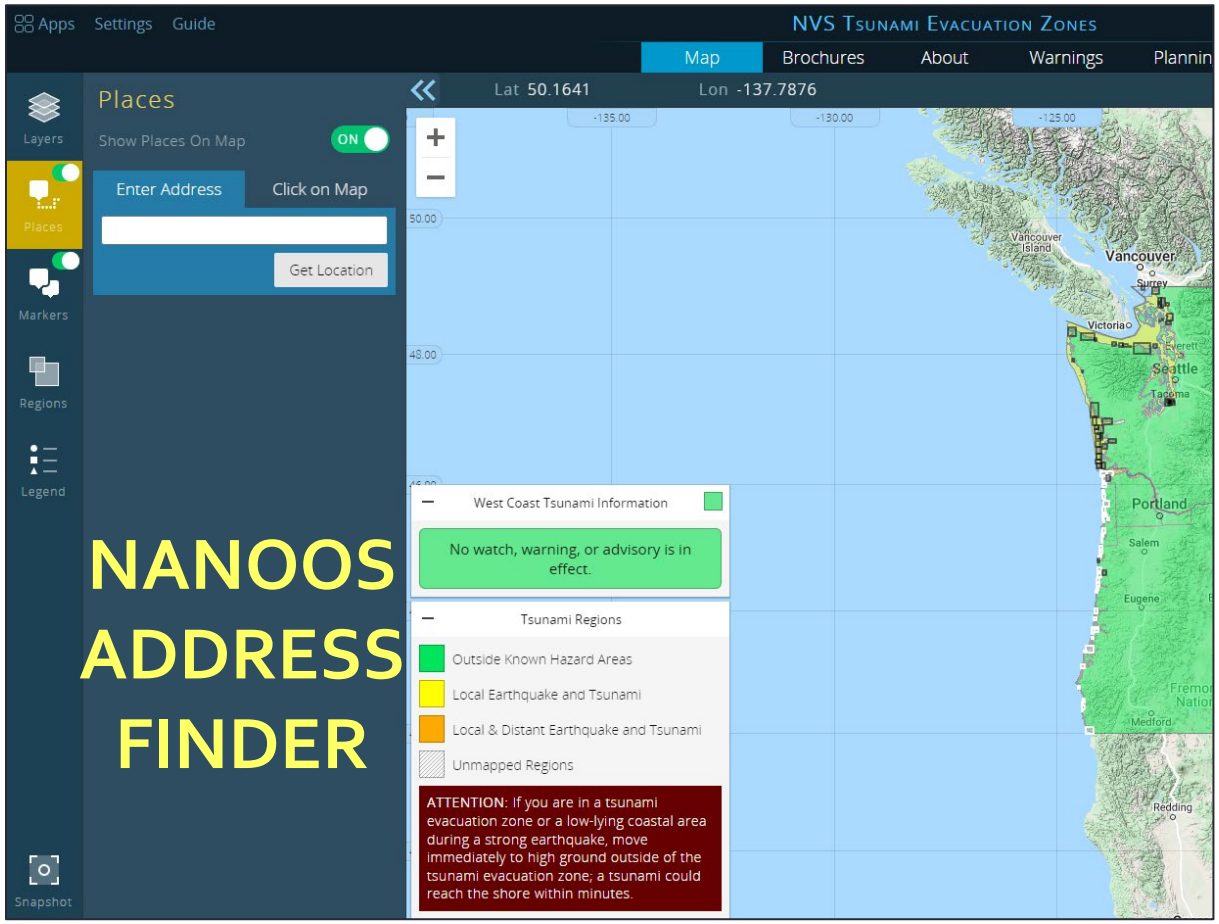
Know Your Zone!!

Orange – Distant

Yellow – Local Zone

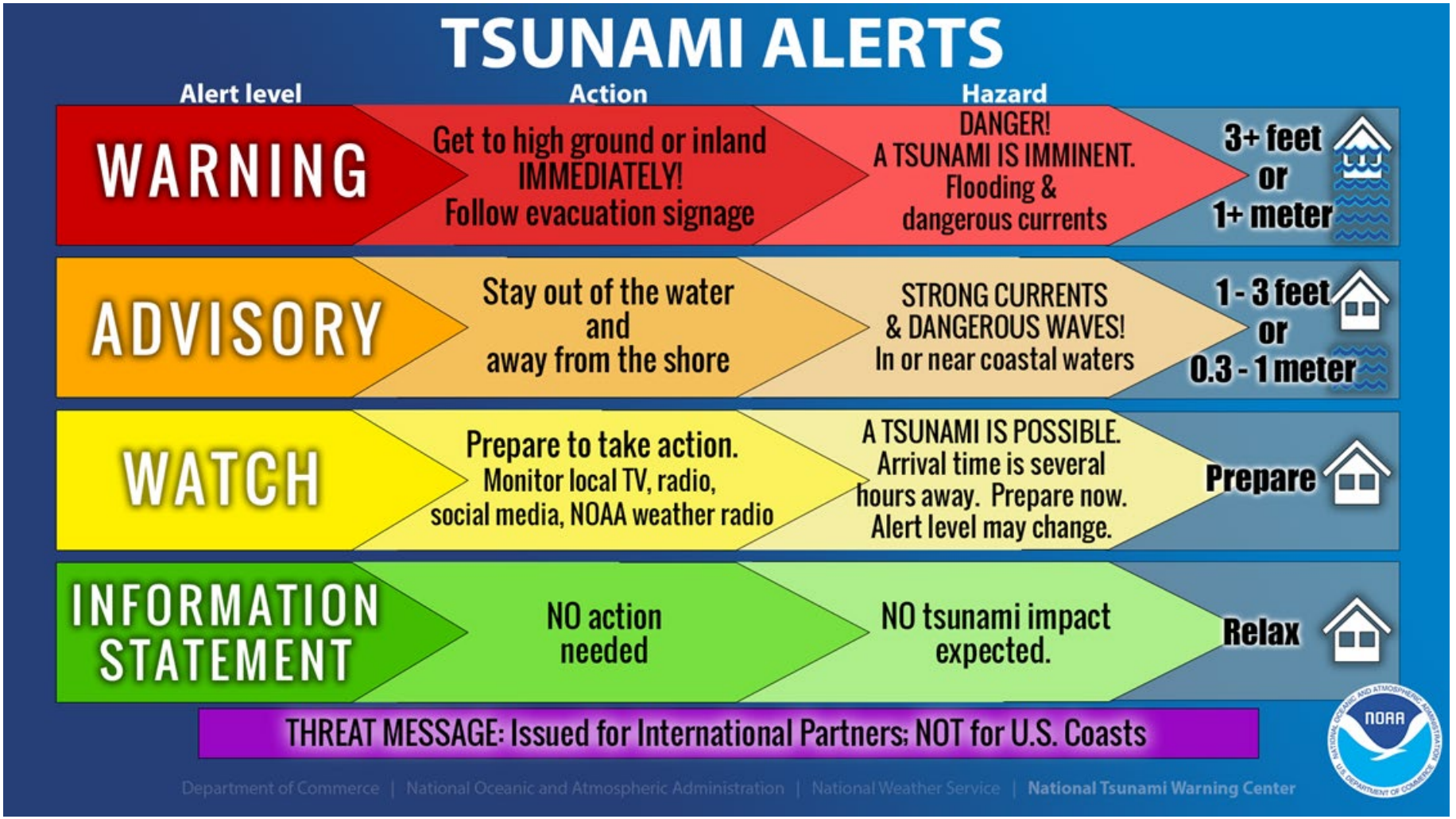


Tsunami…find your zone



Tsunami Warning Signs

Tsunami Alerts & Warnings



Tsunami

Know Your Warnings!

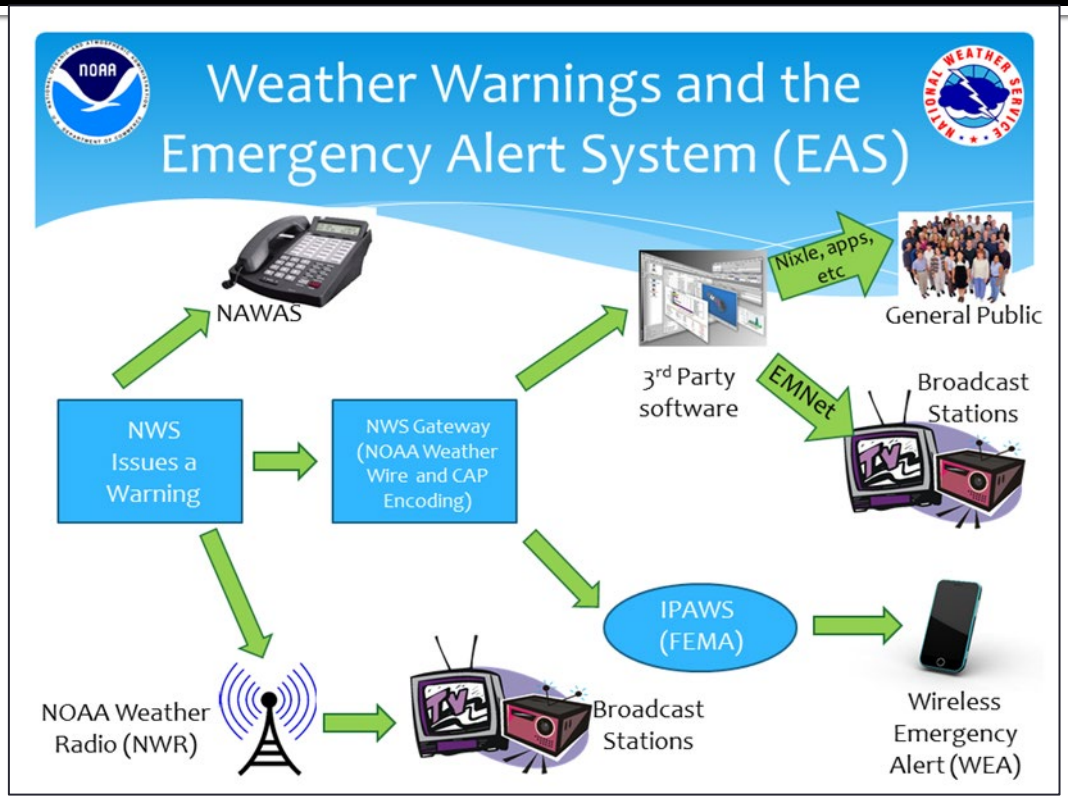
- **Tsunami Warning: Take Action—**Danger! A tsunami that may cause widespread flooding is expected or occurring. Dangerous coastal flooding and powerful currents are possible and may continue for several hours or days after initial arrival.
- **Tsunami Advisory: Take Action—**A tsunami with potential for strong currents or waves dangerous to those in or very near the water is expected or occurring. There may be flooding of beach and harbor areas. **Stay out of the water and away from beaches and waterways. Follow instructions from local officials.**
- **Tsunami Watch: Be Aware—**A distant earthquake has occurred. A tsunami is possible. **Stay tuned for more information. Be prepared to take action if necessary.**
- **Tsunami Information Statement: Stay Informed—**An earthquake has occurred, or a tsunami warning, advisory or watch has been issued for another part of the ocean. Most information statements indicate there is no threat of a destructive tsunami.

Notifications Systems

USGS

Mobile Preparedness App

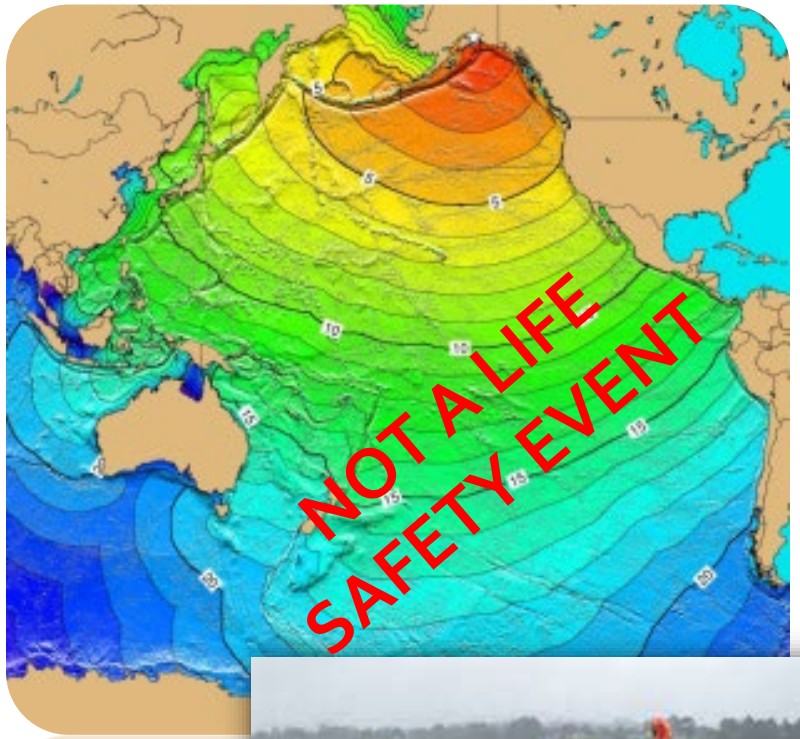
FEMA



Tsunami – Distant (Orange Zone)

Know Your Zone!!

- Can arrive 4 + hours after the earthquake, closest location is from the Gulf of Alaska
- Distant zone is much smaller than local zone, lower damage and flooding
- Warning – YES, National Tsunami Warning System
- Technology available to notify the general public

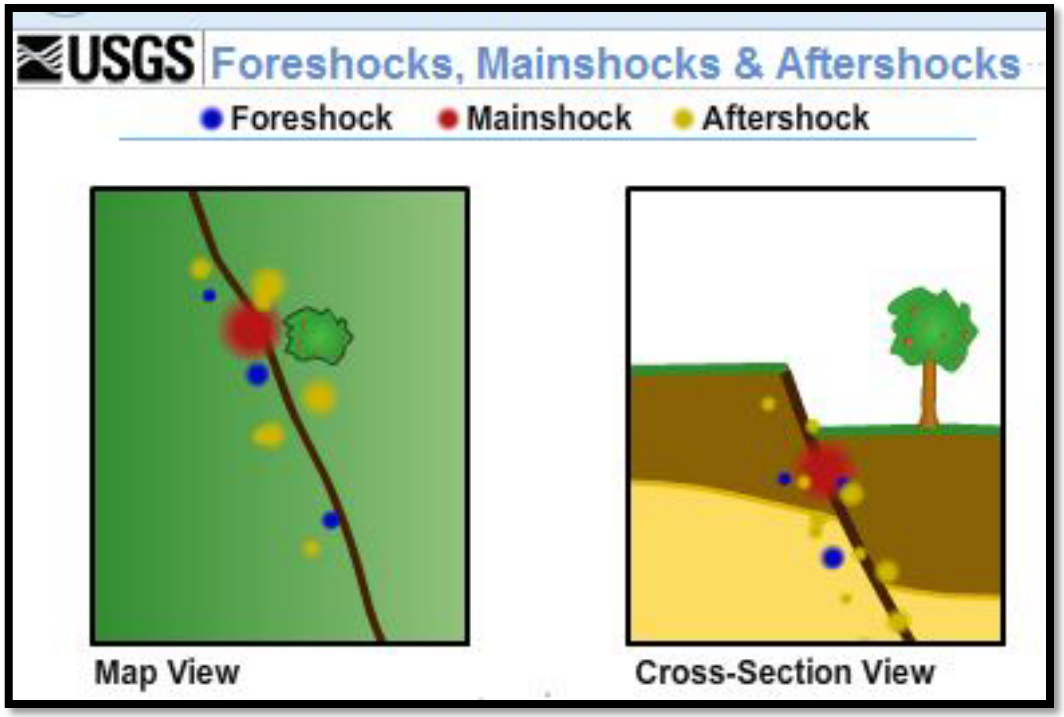


Tsunami – Local (Yellow Zone)

- First Wave of Arrival
  - Beach/shoreline 15 – 25 minutes
  - Upriver, estuaries 30-40 minutes
- Further inland penetration
- Warning – YES, ***Earthquake is the only warning you will receive***
- Tsunamis travel at 500mph on the open ocean

Tsunami – Local, Japan 2011

Aftershocks

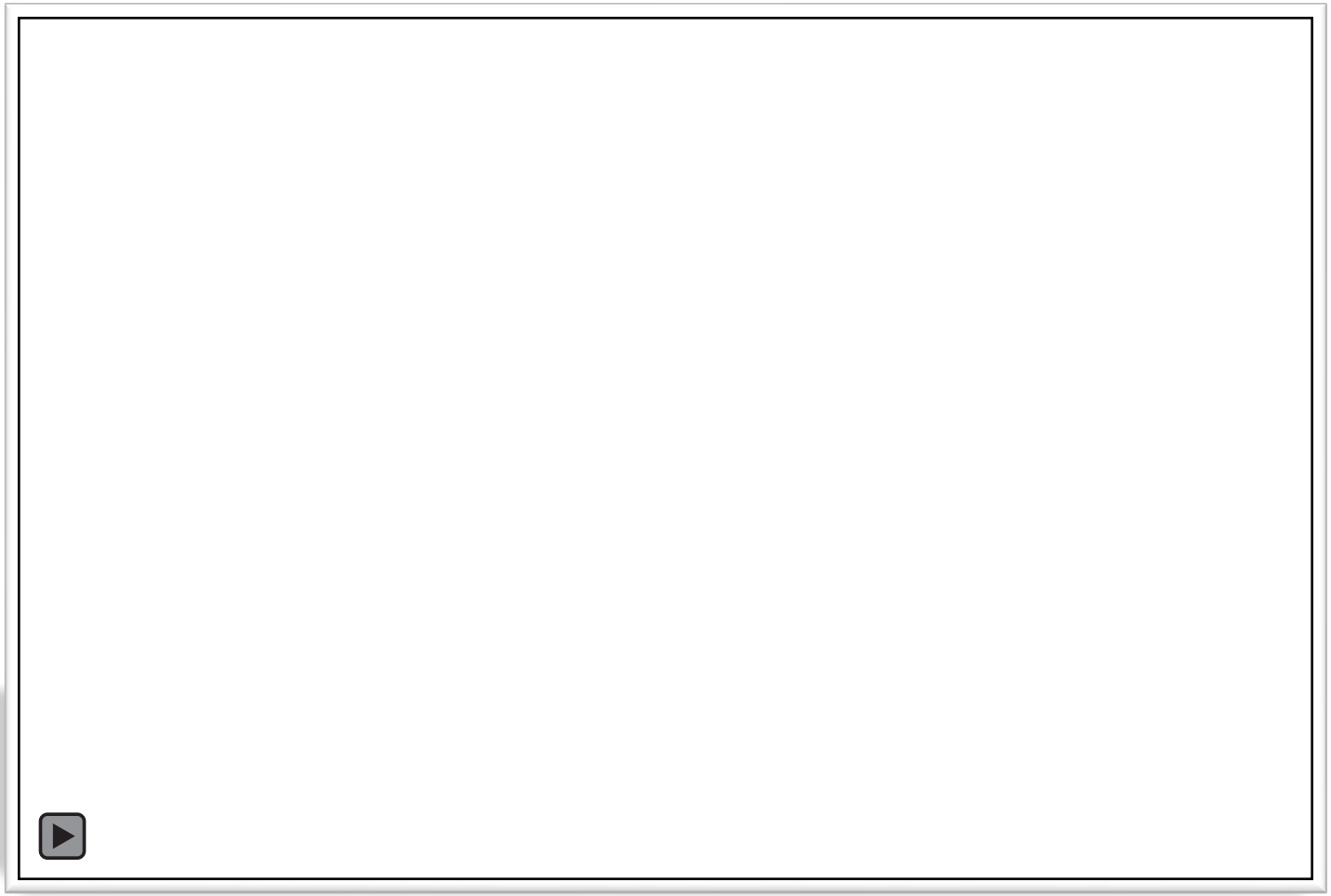


Aftershocks are earthquakes that follow the largest shock of an earthquake sequence. They are smaller than the mainshock and within 1-2 rupture lengths distance from the mainshock. **Aftershocks** can continue over a period of weeks, months, or years.

Foreshocks are relatively smaller earthquakes that precede the largest earthquake in a series, which is termed the mainshock. **Not all mainshocks have foreshocks.**

USGS

Aftershocks – Japan 2011



www.scec.org/scecvdo

Landslides

How will these characteristics affect our communities?

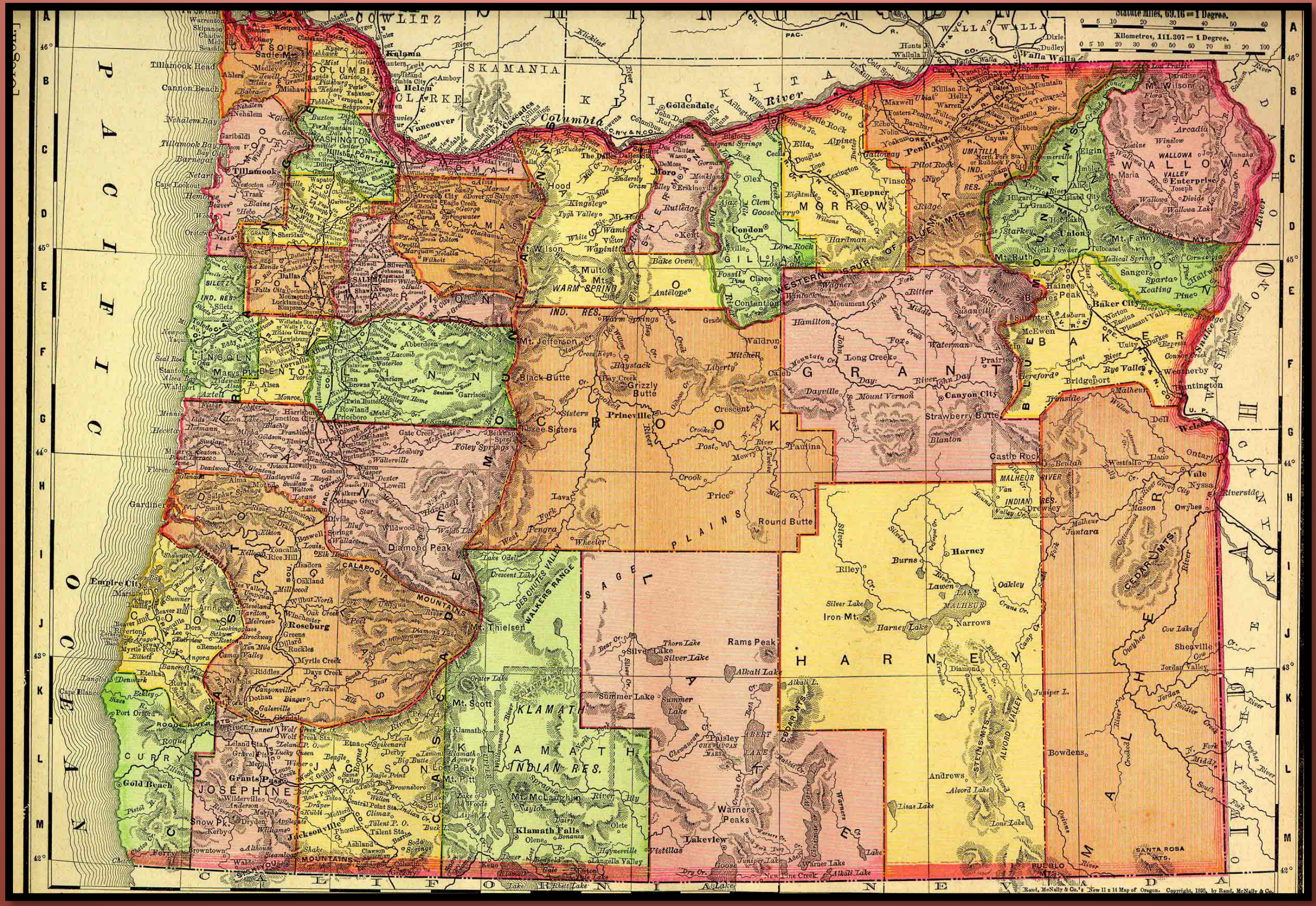
What is the most important failure that will affect YOUR community and YOUR daily life after a catastrophic earthquake?

Damage to homes

Damage to schools

Damage to businesses

What are the implications if Cascadia happens today and what are the planning efforts?



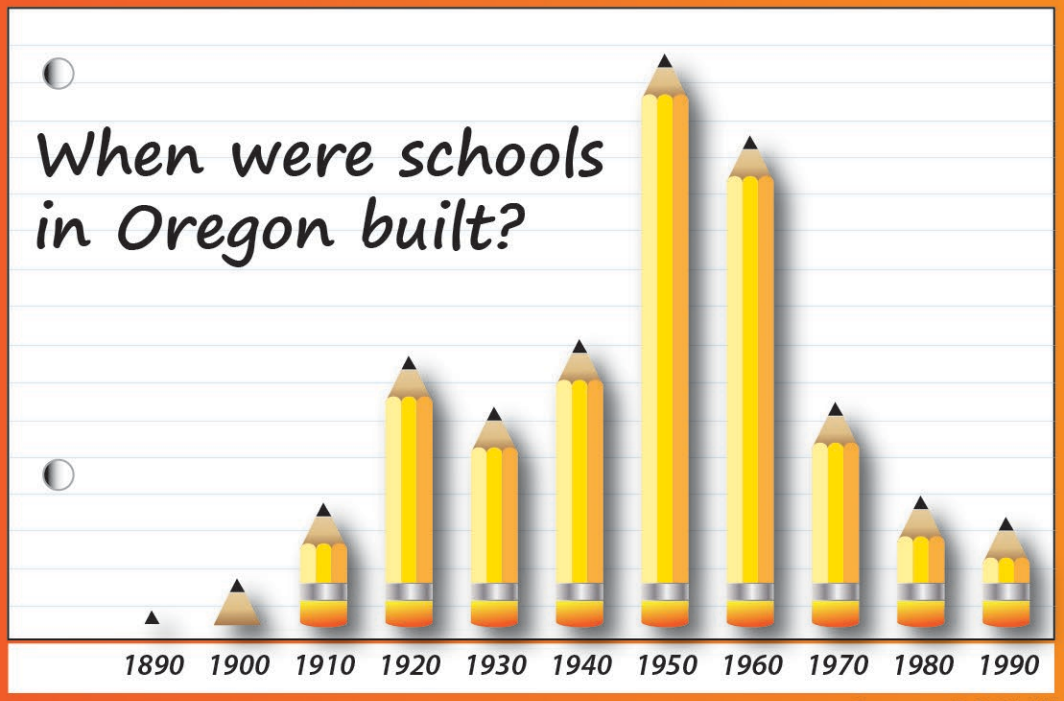
Public Infrastructure – Failures!!

Public Infrastructure - Roads

2023 UPDATE – This is improving across Oregon –
Many Schools have been seismically retrofitted or rebuilt!

When were the first seismic codes adopted in Oregon?

1990



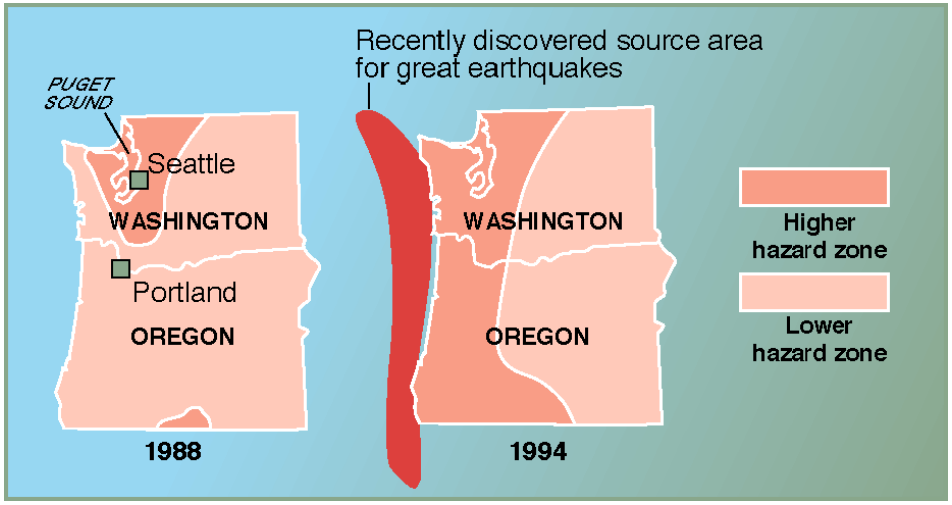
How many school kids go to school in buildings that could collapse in a Cascadia earthquake?

300,000

First Seismic Building Codes

U.S. Geological Survey
Fact Sheet-111-95, 1995
Averting Surprises in the Pacific Northwest
Scientists recently discovered strong evidence that great earthquakes (magnitude 8 to 9) have repeatedly struck the Pacific Northwest in the past several thousand years, most recently about 300 years ago.

This discovery has spurred the reinforcement of existing structures and changes in building codes in the region--measures that will save lives and reduce damage in future earthquakes.

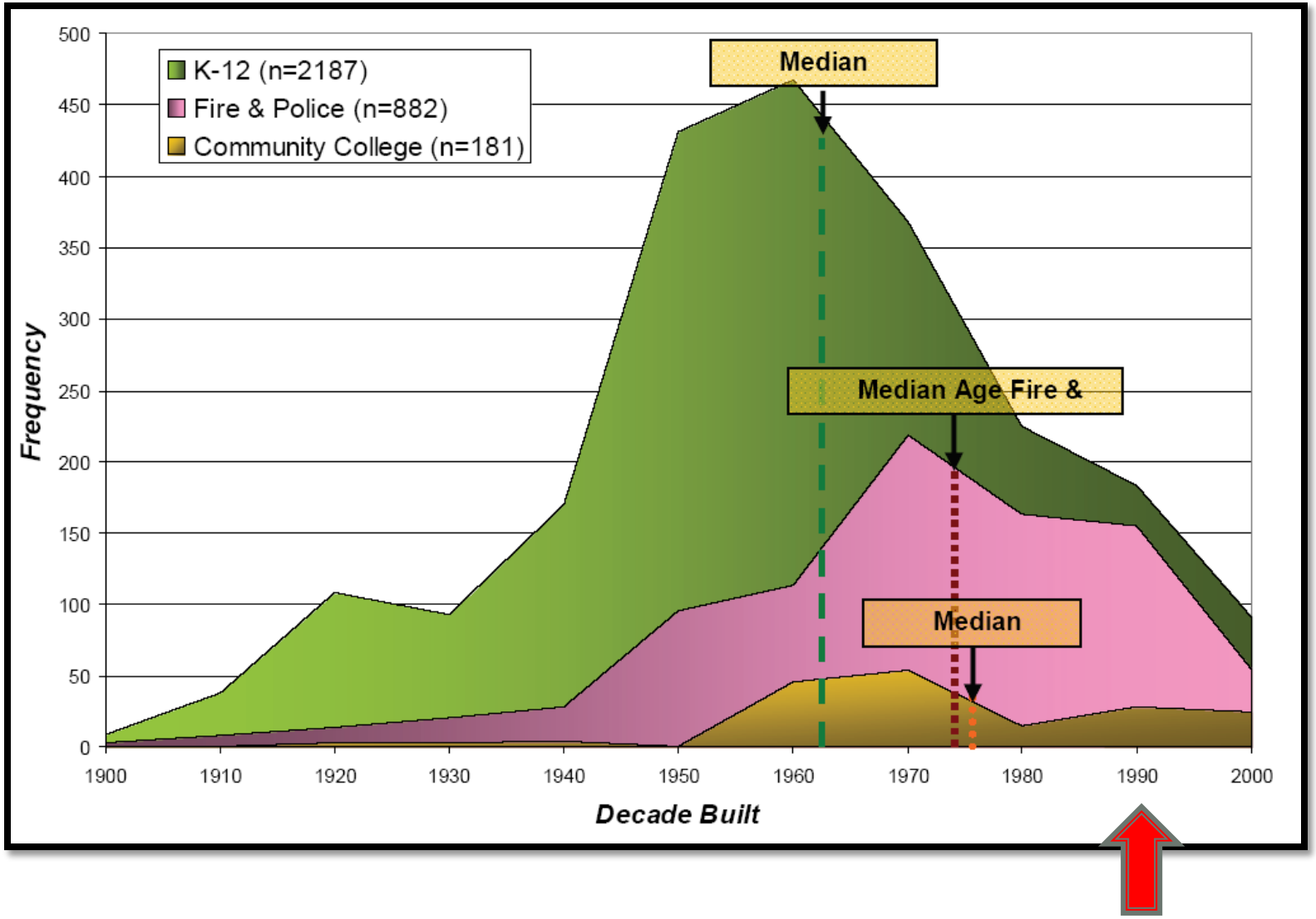


In the early 1990's, engineers and public officials redrew a map of earthquake shaking hazards in the Pacific Northwest, http://pubs.usgs.gov/fs/1995/fs111-95/

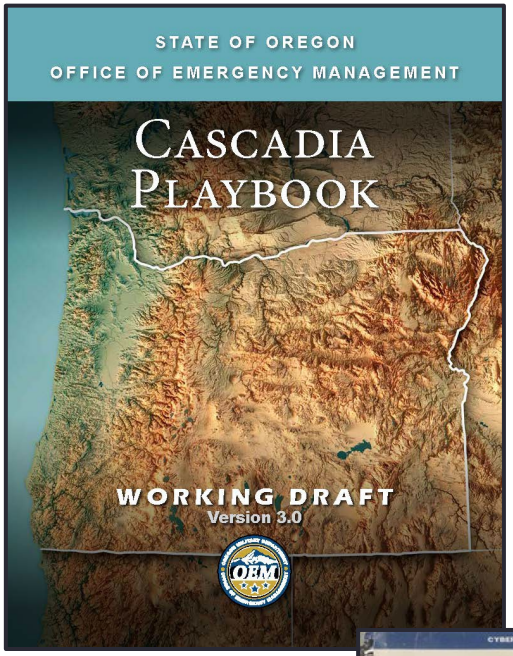
Difficult decisions must still be made about preparing for future earthquakes in the Pacific Northwest:

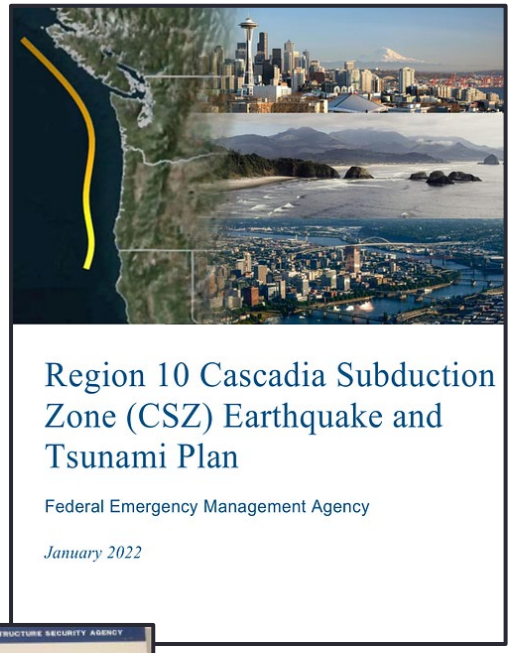
- Should building standards near the Pacific coast be raised even further, to the highest level of earthquake-shaking hazard in the Uniform Building Code?
- Should the zone of this highest hazard level also include much of the Puget Sound area, where a large earthquake occurred 1,000 years ago on a shallow earthquake fault that passes beneath downtown Seattle?
- Should federal and state agencies spend several hundred million dollars on further increasing the earthquake resistance of bridges, as recently proposed by state highway engineers in Oregon and Washington?

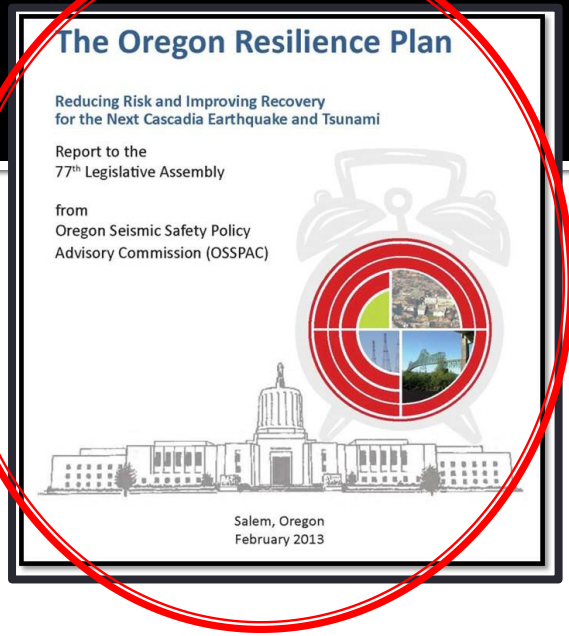
First Seismic Building Codes - 1990

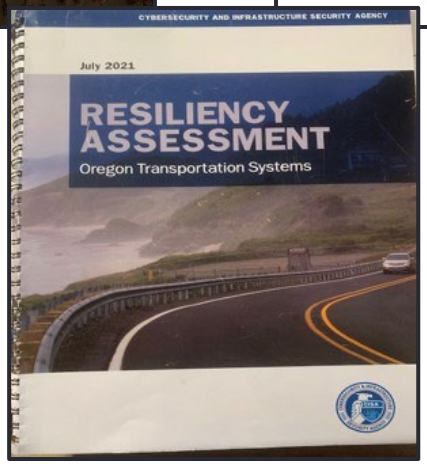


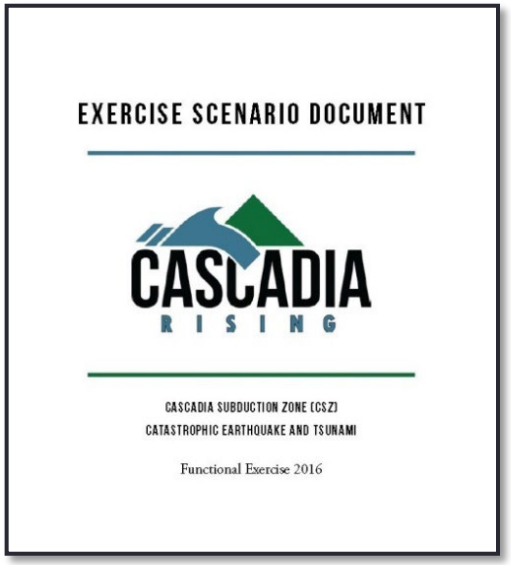
Planning Efforts







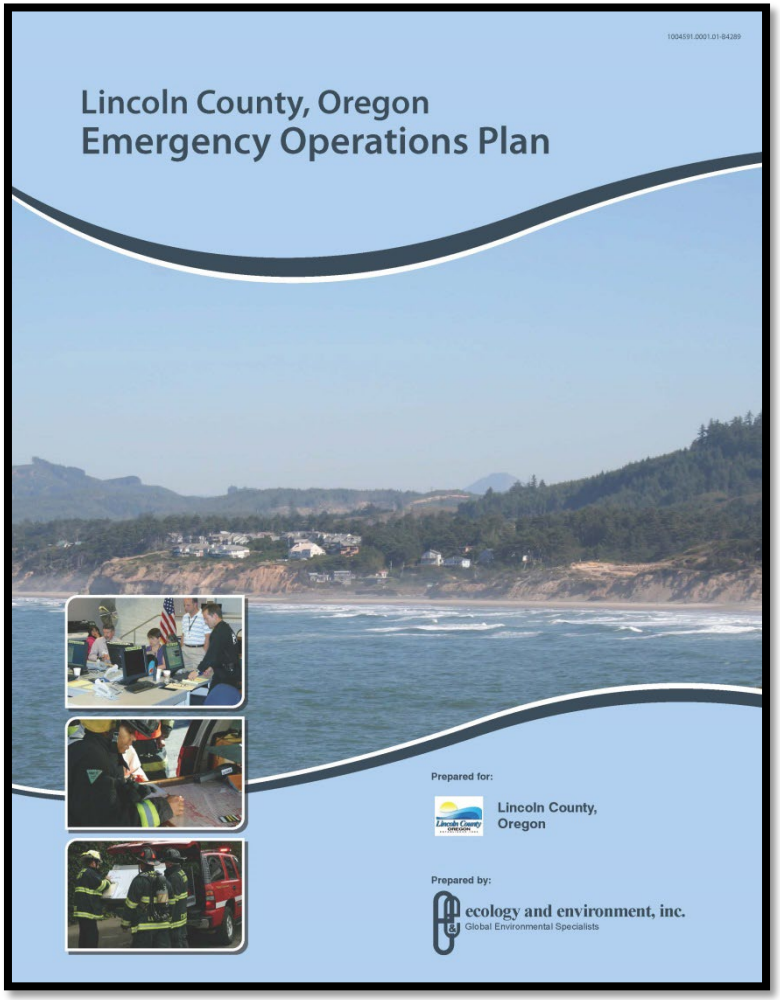




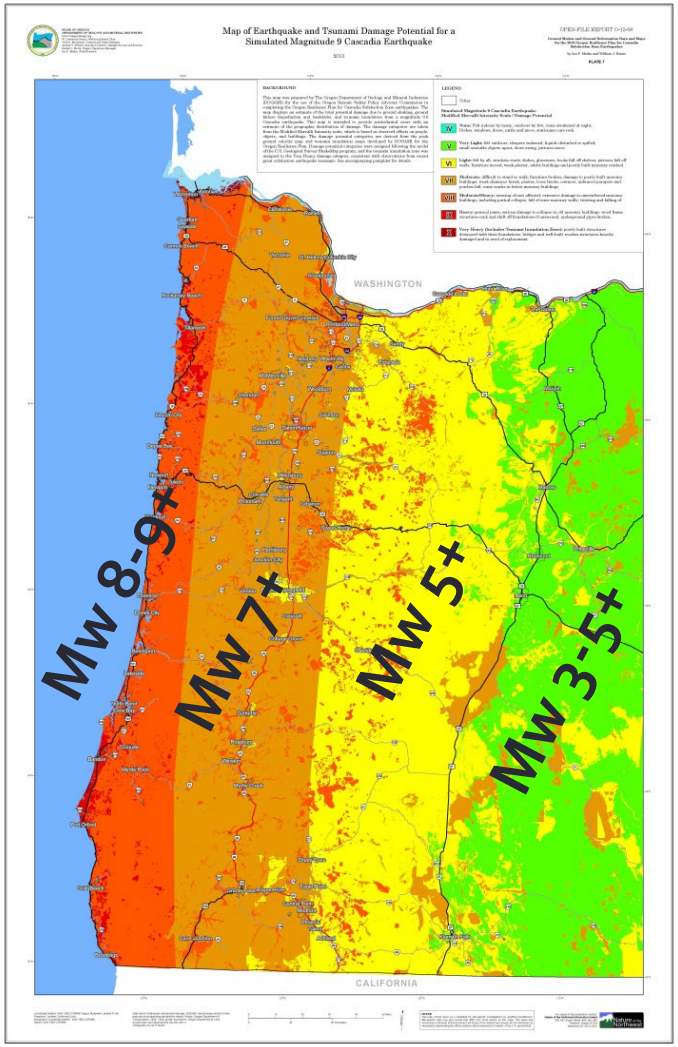
Planning Efforts

Federal, State, Local

- FEMA/Federal Response
  - Cascadia Response Plan
- State of Oregon:
  - Oregon Resiliency Plan
  - Cascadia Playbook
- Local – County
  - Emergency Operations Plan
  - Exercises and Training
  - Community Outreach
- Local – City and Public Safety
  - Emergency Operations Plans
  - Emergency Response Plans



Impact Zones…by region



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Regional Areas
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Coastal
Valley
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Eastern

Planning Assumptions - Impact and Restoration of Services

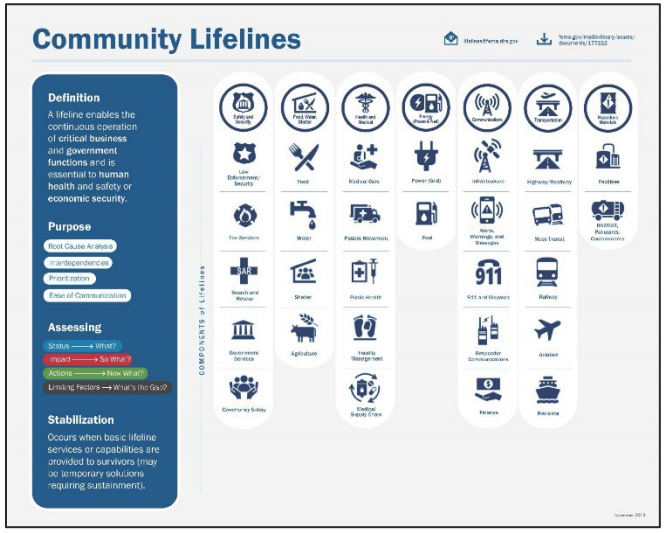
Cascadia Subduction Zone - Mw 9 Scenario, Impact and Restoration of Services Estimation				
Oregon Resilience Plan Cascadia Impact Zone [1]	**Local Tsunami Zone**	**Coastal Zone**	**Valley Zone**	**Eastern Zone**
DOGAMI Map of Simulated Damage Potential [2]	Mw X	Mw IX - VIII	Mw VII – VI	Mw VII - V
Drinking water and sewer service	Restoration of services undetermined due to the magnitude of expected complete damage	1 to 3 years	1 month to 1 year	Minimal impact and loss of services; restoration of services should begin immediately
Electricity		3 to 6 months	1 to 3 months	
Police & Fire Stations		Undetermined	2 to 4 months	
Healthcare facilities		3 years or greater	18 months	
Highways, priority roads		Undetermined	6 to 12 months for partial rest.	

[1] Oregon Resilience Plan - http://www.oregon.gov/OMD/OEM/osspac/docs/Oregon_Resilience_Plan_Final.pdf
[2] Dept. of Geology and Minerals - http://www.oregongeology.org/pubs/ofr/p-O-13-06.htm

2016 – Department of Energy –
Estimate 3-6 weeks before fuel will arrive West of the Cascades

Community Lifelines - Priority

- A lifeline **enables the continuous operation** of **critical government** and business functions and is **essential to** human health and safety or economic security.
- Lifelines are the **most fundamental services** in the community that, when stabilized, enable all other aspects of society to function.
- **Objectives-based response that prioritizes the rapid stabilization** of Community Lifelines after a disaster.



Planning & Immediate Response Assumptions

Communications

Emergency Services

Fuel

Medical

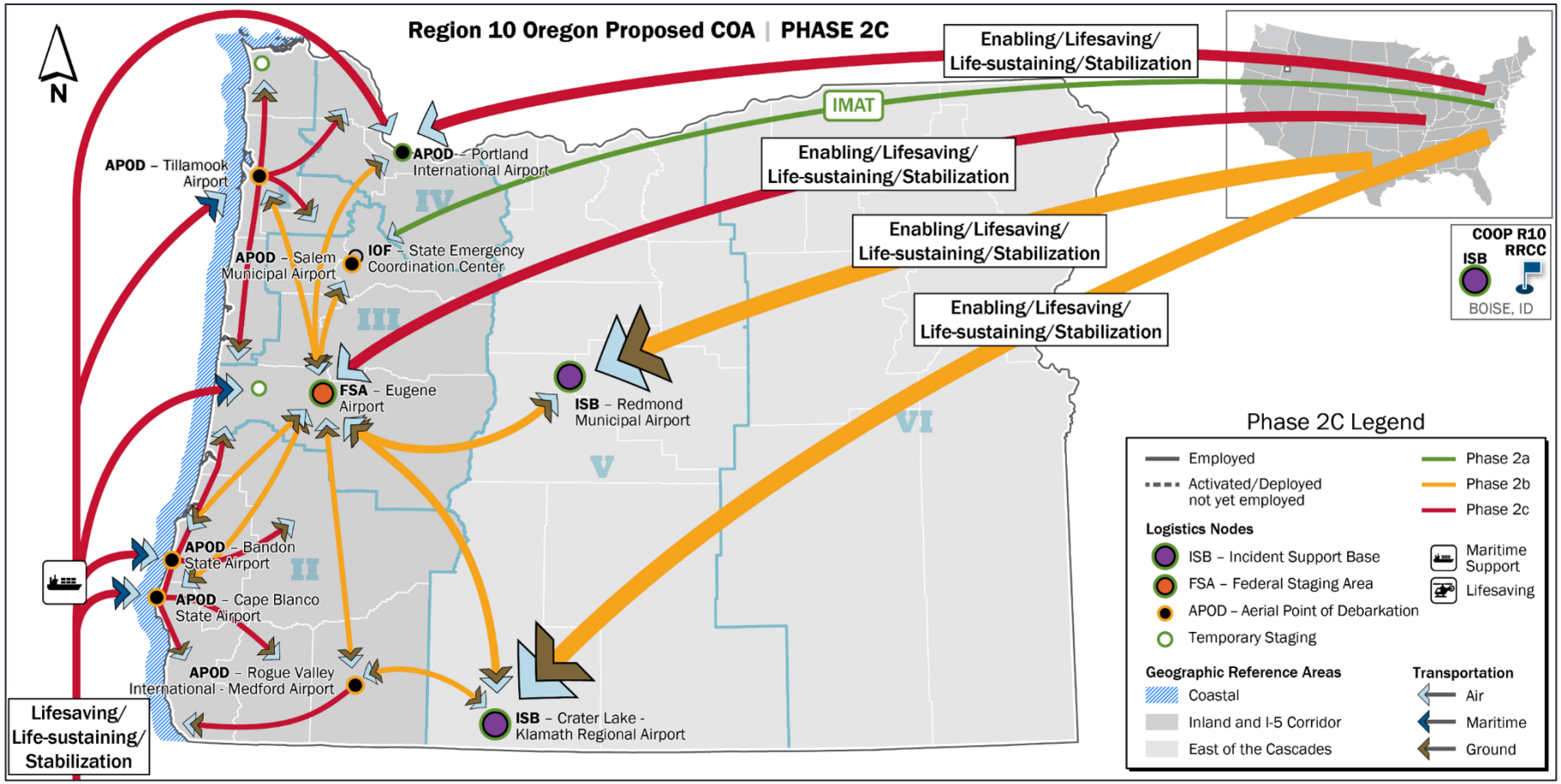
Food/Water

Shelter

Utilities

- Activate emergency/business continuity plans
- Establish communications local/state/federal
- Clear critical routes to services
- Assess critical services
- Assess and establish temporary sheltering
- Establish basic medical assistance
- Establish distribution of food and water
- Prevent cascading effects on at-risk and sheltered populations
- Prepare to receive external support
- Support emergency repairs on lifelines

State and Federal Assistance



2022 FEMA Region 10, Cascadia Response Plan Overview

Positives for Lincoln County

- Catastrophic Mgmt. Services Contract
- Naval Beach Landing Zones
- Fuel Management Plan

A new normal?

Prepare for Island Life

Island Life- Personal Resilience

Psychological

- Communication Plan
- Meeting Place
- Emotional Recovery

Physical

- Shelter & Warmth
- Water & Food
- Medical & Sanitation

Shelter: Protect your home, mitigation saves lives

Survival Priority!!

THE SEVEN STEPS
FOR EARTHQUAKE & TSUNAMI SAFETY

Seven Steps That May Save Your Life

EARTHQUAKES AND TSUNAMIS are inevitable but the damage is not—even in a great earthquake on the Cascadia Subduction Zone. Most damage and loss can be reduced by steps you take before, during, and after. The seven steps that follow include actions to keep you and your loved ones safe, reduce potential damage, and recover quickly. These steps should also be followed in schools, workplaces, and other facilities. By following them, countless casualties can be avoided and millions of dollars saved.

Preparation is the key to surviving a disaster—that much is clear—but where should you start? Start by talking—talk to your family, friends, neighbors, and co-workers about what you've learned in this handbook about earthquakes and tsunamis in Oregon. Then discuss what you have done to prepare and together plan your next steps.

Many people are overwhelmed by the mere prospect of a natural disaster and, as a result, don't prepare at all. Do not fall into that trap. Sit down with friends and work on an emergency kit and plan. Get involved in a local Map Your Neighborhood program. Plus, you can start today by following these seven steps.

Visit **earthquakecountry.org** for instructions and resources.

Start Here!

BEFORE AN EARTHQUAKE OR TSUNAMI—PREPARE

1. Identify hazards (see illustration below, page 13, and page 18)
2. Create a disaster preparedness plan (page 16)
3. Prepare disaster kits (page 17)
4. Identify weaknesses (page 18)

DURING THE EARTHQUAKE—PROTECT

5. Protect yourself during an earthquake (page 20)

AFTER THE EARTHQUAKE—RECOVER

6. Evacuate if necessary—check for injuries and damage (page 21)
7. Follow your plan (page 22)

THIRTY SUGGESTIONS TO MAKE YOUR HOME EARTHQUAKE SAFE

Connect these actions with their locations in the house below and on the previous page.

STEP 1—IDENTIFY HAZARDS

1. Know whether you live, work, or play in a tsunami hazard zone.
2. Hang plants in lightweight pots with closed hooks, well secured to a joist or stud and far away from windows.
3. Store fire extinguisher (type ABC) in easily accessible location.
4. Install strong latches on kitchen cabinets.
5. Use flexible connections where gas lines meet appliances.
6. Remove or lock refrigerator wheels, secure to studs.
7. Keep several flashlights in easily accessible places around the house.
8. Secure valuable electronics items such as computers and televisions.
9. Keep breakables in low or secure cabinets with latches.
10. Move heavy plants and other large items to floor or low shelves.
11. Hang mirrors and pictures on closed hooks.
12. Secure free-standing woodstove or fireplace insert.
13. Keep heavy unstable objects away from doors and exit routes.
14. Place bed away from windows or items that may fall.
15. Secure knick knacks and other small valuables with museum putty.
16. Brace overhead light fixtures.
17. Place only light weight/soft items over bed.
18. Secure top-heavy furniture to studs.
19. Keep wrench or turn-off tool in water-proof wrap near gas meter.
20. Know the location of your main electrical switch (fuse box or circuit breaker).
21. Secure water heater with metal straps attached to studs.
22. Trim hazardous tree limbs.

STEP 2—CREATE A PLAN

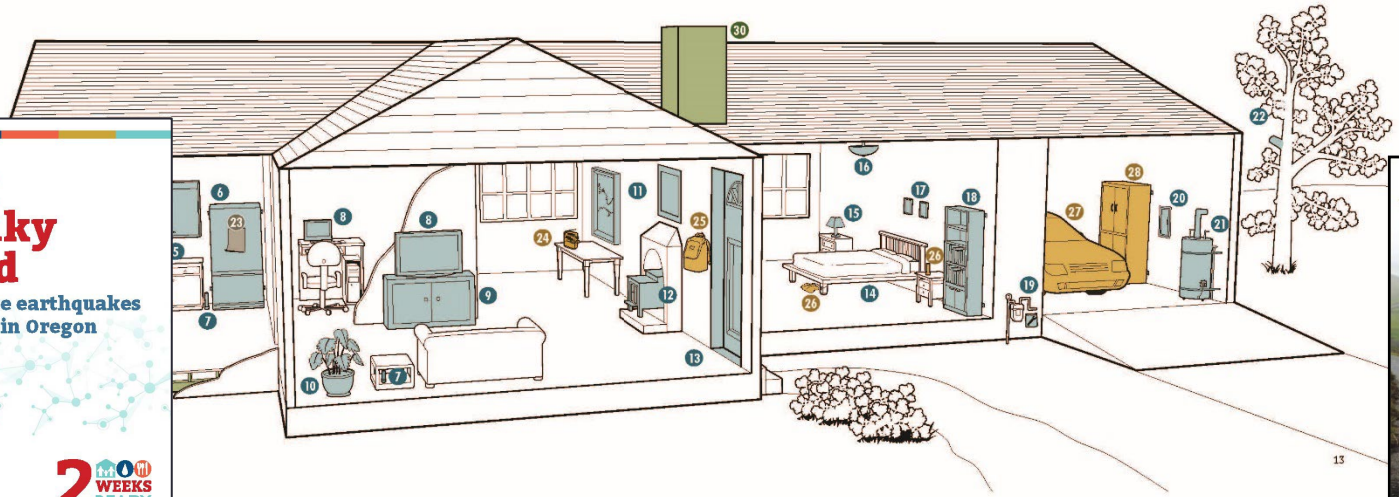
23. Have your emergency plan accessible and discuss with all family members.

STEP 3—PREPARE DISASTER KITS

24. Obtain a NOAA Weather Radio with the Public Alert feature to notify you of tsunamis and other hazards.
25. Keep an emergency backpack with copies of important documents near the door to grab and go.
26. Keep flashlight, slippers and gloves next to beds.
27. Keep gas tank at least half full.
28. Store emergency food and water supplies in a dry accessible area. Include first aid kit, extra cash, portable radio, extra batteries, medications and other necessary supplies.

STEP 4—STRENGTHEN YOUR HOME

29. Use anchor bolts every 4 to 6 feet to secure home to foundation.
30. Reinforce brick chimneys.



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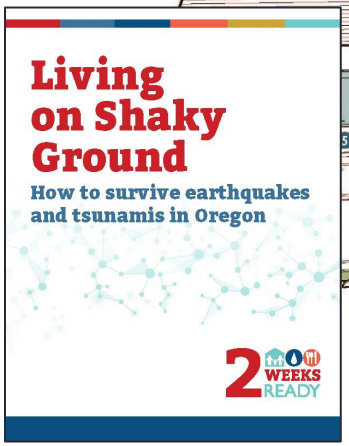
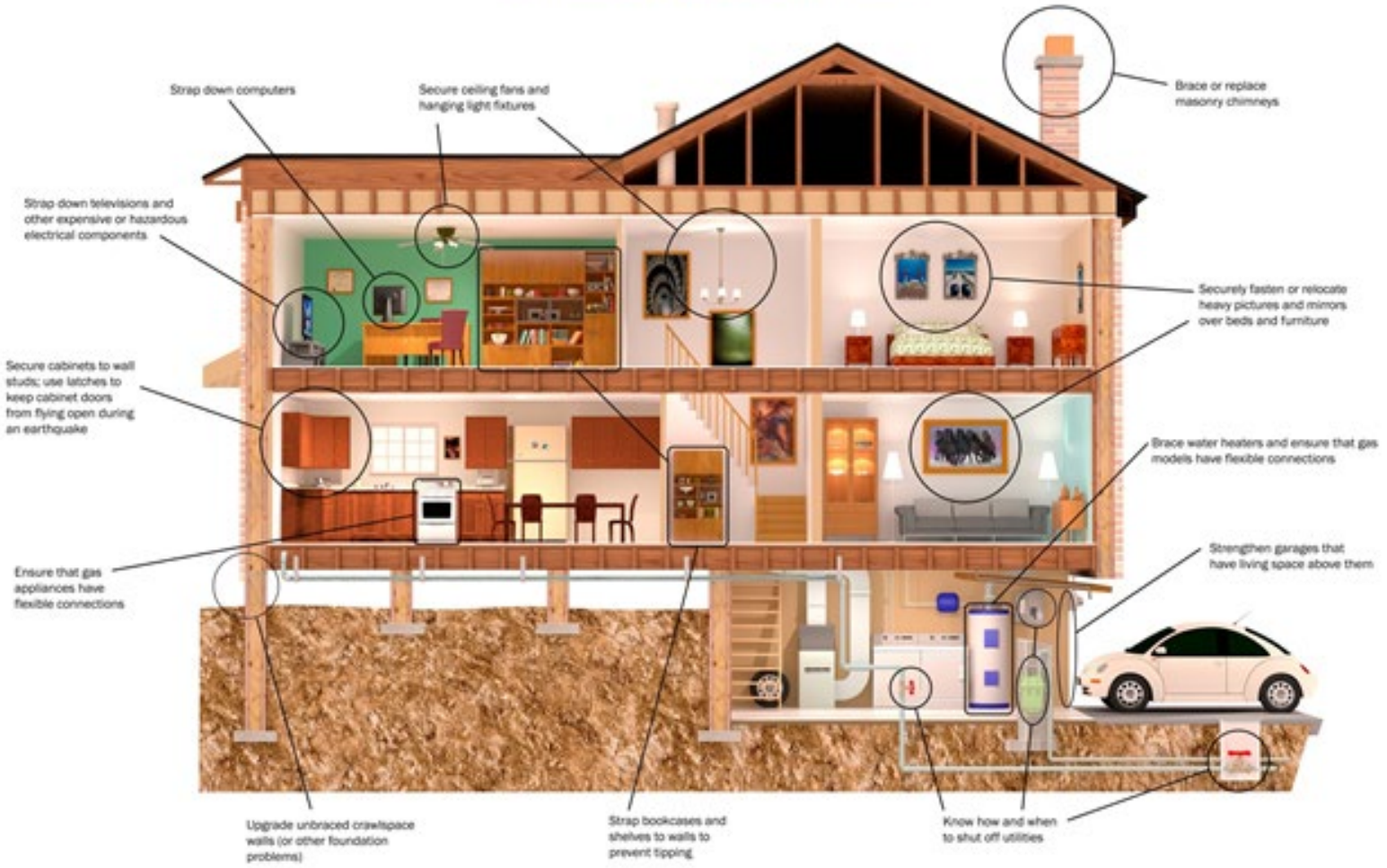


Earthquake Home Hazard Hunt

FEMA 528 10/2014

Recommendations for reducing earthquake hazards in your home are presented on the other side of this poster



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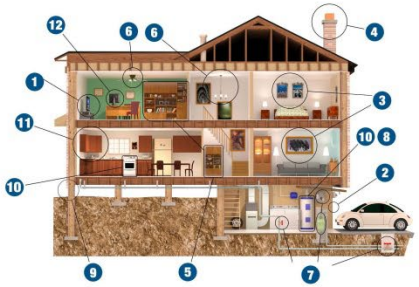
Earthquake Home Hazard Hunt



This poster has information for you and your family to help you find and fix areas of your home that might be damaged in an earthquake and that might injure family members during an earthquake. Information is also provided on planning for an earthquake and safety steps you can take before, during, and after an earthquake.

Your earthquake home hazard hunt should begin with all family members participating. Foresight, imagination, and common sense are all that are needed as you go from room to room imagining what would happen if the earth and house started shaking. Anything that can move, break, or fall when your house starts to shake is a potential hazard.

What would happen to heavy furniture, fixtures, and appliances?

- Look at tall bookcases and shelves. How much would fall off the shelves? Would the whole bookcase topple, or is it anchored to the wall? Anchor bookcases and other top-heavy furniture to wall studs using flexible fasteners (e.g., nylon straps) and lag screws. 5
- Add bracing to support air conditioners, particularly on rooftops.
- Do you have hanging light fixtures or plants? Could they swing and hit a window or swing off their hooks? As a minimum precaution, transfer hanging plants from heavy clay pots to lighter ones and use closed hooks on all hanging items. 6

Check for possible flying glass.

- Replace glass bottles in the medicine cabinet and around the bathtub and shower with plastic containers.
- What kind of latches are on your kitchen cabinets? Consider replacing magnetic "touch" latches with ones that will hold the cabinet doors shut during an earthquake. In some cases, a lip or low barrier across shelves may prevent breakables from sliding out. 11
- Where do you sit or sleep? Anchor heavy mirrors and pictures over beds, chairs, and couches with wire through eye screws into studs. Locate beds away from windows. 3

Think about fire safety.

- Remove all flammable liquids, such as painting and cleaning products, to the garage or outside storage area. Be sure these items are secured on their shelves or stored away from heat sources and appliances, particularly your water heater and furnace.
- Secure gas lines by installing flexible connectors to appliances. 10
- Is your water heater secured? Metal straps can be used to fasten your water heater to the wood studs of the nearest wall. 8

What would happen to the house itself?

- Look at the outside of your home. What about your chimney? Masonry chimneys pose a real hazard in earthquakes, especially the freestanding section above the roof line, as bricks may fall into the house. 4
- Check your roof. Make sure all tiles are secured - loose tiles could fall.
- Check foundation for loose or cracked plaster.
- Secure the wood sill and wall framing to the foundation using anchor bolts.
- Sheath crawlspace walls with plywood to prevent collapse. 9
- Strengthen connections between posts and beams with bracing.

With the knowledge you now have from the information provided above, see about applying these safeguards to your workplace. Check to determine whether your company has an earthquake safety plan.

Children can share their new awareness in the classroom. Determine whether their school has a practical earthquake plan, whether earthquake drills are held, and what the policy is if an earthquake occurs while school is in session.

Correcting Problems

Utilities 7

Teach responsible members of your family how to turn off electricity, gas, and water at main switch and valves. Caution: Do not shut off gas unless an emergency exists. If gas is ever turned off, a professional must restore service. Contact your local utilities for more information.

Label the water shut-off valve, (found where water enters the house) and the main water shut-off valve (found with the meter in a concrete box in the sidewalk or yard)

Weak Crawlspace Walls 9

Wooden floors and stud walls are sometimes built on top of an exterior foundation to support a house and create a crawlspace. These walls carry the weight of the house. During an earthquake, these walls can collapse if they are not braced to resist horizontal movement. If the walls fail, the house may shift or fall.

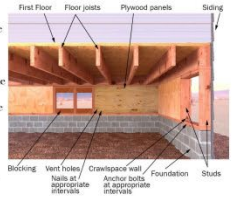


Figure A. Strengthening weak crawlspace walls.

You can look under your house in the crawlspace to see whether there are any wood stud walls supporting the first floor. Check to see whether the stud walls are braced with plywood panels or diagonal wood sheathing. If your house has neither of these, the wood stud crawlspace walls are probably insufficiently braced or are unbraced. Please note that horizontal or vertical wood siding is not strong enough to brace wood stud crawlspace walls.

Plywood or other wood products allowed by code should be nailed to the studs **(see Figure A)** to strengthen your foundation. The type of wood product used, the plywood thickness, and nail size and spacing are all important when making this upgrade.

Many other types of foundation walls are used in the United States that may need upgrading to resist earthquake damage. Check with your local Building Department or a licensed architect or engineer for recommendations on how to determine whether your foundation and walls are likely to be damaged in an earthquake and what upgrades may be needed. Check with local officials for permit requirements before starting work.

Remember, it is very expensive to lift a house, repair the foundation, and walls and put it back on its foundation; upgrading before an earthquake will be much less costly.

Garages With Living Spaces Above 2

The large opening of a garage door and the weight of a second-story room built over the garage can result in the garage walls being too weak to withstand earthquake shaking, resulting in severe damage. If the narrow sections of the wall on each side of the garage door opening are not reinforced or braced, the potential for earthquake damage is greater.

Figure B. Strengthening garage walls below living space.

Look at the area around the garage door opening -are there braces or plywood panels? If not, strengthening may be needed. Consult a licensed architect or engineer to determine the strengthening required to upgrade your garage walls. Your home may need to have plywood paneling or a steel frame designed and installed around the door opening **(see Figure B)**. Remember to obtain a permit from your local Building Department before starting work.

Chimney Bracing 4

To prevent the chimney from breaking away from the house, you should have it secured to the framing of the roof with sheet metal straps and angle bracing **(see Figure C)**. If your roof doesn't have solid sheathing, consider adding plywood panels above the ceiling joists. Have the chimney inspected by a professional to determine whether the chimney should be upgraded or replaced.

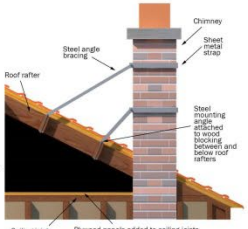


Figure C. Bracing masonry chimneys.

Hanging Objects 3

Prevent wall hangings from bouncing off walls:

- Secure mirrors, pictures, plants, and other objects on closed hooks.
- Secure the bottom corners with earthquake putty or adhesive pads.
- Place only soft art such as tapestries over beds and sofas.

Home Electronics 1 12

Electronics are heavy objects and costly to replace. Secure TVs, stereos, computers, and microwaves with earthquake-resistant flexible nylon straps and buckles for easy removal and relocation **(see Figure D)**.

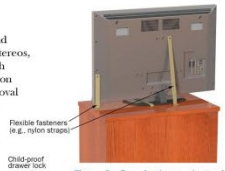


Figure D. Securing home electronics.

Figure E. Securing cabinet doors and drawers.

In the Kitchen 10 11

- First, secure all cabinets above waist level to the wall studs.
- Use latches designed for earthquake, child-proofing, or boat safety to keep cabinet doors from flying open and contents from falling **(see Figure E)**.
- Have a plumber install flexible connectors on gas appliances.

Furniture 5

Follow these important guidelines:

- Secure all tall, top-heavy furniture such as bookcases, wall units, and entertainment centers **(see Figure F)**. Attach them securely to the wall studs with straps.
- Secure the top, on both the right and left sides of the unit, into wall studs, not just into the drywall.
- Use flexible mount fasteners such as nylon straps to allow furniture independent movement from the wall, reducing the strain on studs.
- Secure loose shelving by applying earthquake putty on each corner bracket.
- Store heavy items and breakables on lower shelves.

Figure F. Securing top-heavy furniture.

Water Heaters 8 10

Water heaters should be braced **(see Figure G)**. There are many solutions - all relatively inexpensive.

Purchase and install a strap kit or bracing kit from your local hardware store.

Other options include:

- Have a licensed plumber strap your water heater according to code.
- Use heavy metal strapping and screws to secure the water heater to the wall studs.

The gas and water lines should have flexible connector pipes. These are safer than rigid pipes during an earthquake. Be sure to check the straps once a year. They may come loose as a result of vibrations or other causes.

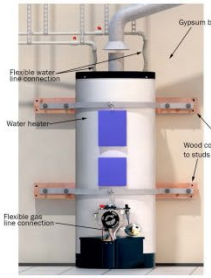


Figure G. Securing water heaters.

Take Action To Protect Yourself and Your Family From Earthquakes

Create and Practice Your Disaster Preparedness Plan

An emergency preparedness plan includes life-critical actions, life saving training, and the advance plans to enable you to respond to earthquakes and treat potential physical injuries no matter where you are.

Life-Critical Actions - Learn how to:

- Drop, Cover and Hold On.
- Signal for help if you are trapped somewhere. Teach children and adults to use an emergency whistle and/or to knock three times repeatedly if trapped. Rescuers searching collapses will be listening for sounds.

Life Saving Training - Consider training in:

- First Aid
- CPR
- How to use a fire extinguisher
- How to shut off gas, water, and electricity

Your Disaster Preparedness Plan Should Include:

- Disaster Supplies Kits for home, workplace, and car
- Practicing Drop, Cover and Hold On
- Financial Plan
- Family Communications that each family member understands
- Needs for all family members, including children, seniors, and pets

Financial Plan

You should store your family's documents, such as insurance policies, deeds, property records, birth certificates, and other important papers, in a safe place away from your home (e.g., safety deposit box). Make copies of important documents for your disaster supplies kit.

Consider saving money in an emergency savings account that could be used in any crisis. Back up critical information on your computer and keep a copy in a safe place away from your home.

Create Your Disaster Supplies Kit

Because you don't know where you and your family will be when an earthquake occurs, prepare a Disaster Supplies Kit for your home, workplace, and car. For detailed information about the items that should be included in your Disaster Supplies Kit, refer to FEMA 526, *Earthquake Safety Checklist.*

Family Earthquake Drill

It's important to know where you should go for protection when your house starts to shake. By planning and practicing what to do before an earthquake occurs, you can condition yourself and your family to react correctly and spontaneously when the first jolt or shaking is felt. An earthquake drill can teach your family what to do in an earthquake.

- Each family member should know safe spots in each room.
- Safe spots: The best places to be are under heavy pieces of furniture, such as a desk or sturdy table and against inside walls.
- Danger spots: Stay away from windows, hanging objects, mirrors, fireplaces, and tall unsecured pieces of furniture.
- Reinforce this knowledge by physically placing yourself in the safe locations. This is especially important for children.
- In the days or weeks after this exercise, hold surprise drills.
- Be prepared to deal with what you may experience after an earthquake - both physically and emotionally.
- Following the Drop, Cover and Hold On procedure is the best way to be safe during an earthquake.
- Take cover under a sturdy desk, table, or bench and hold on to the desk or table leg so that desk or table stays on top of you. Hold on until the earthquake shaking stops.
- Family members should practice Drop, Cover and Hold On in the safe spots that you and your family have identified.

Further Information

For more information about earthquake preparedness and safety, refer to the following publications, which are available from the FEMA Distribution Center at 1-800-480-2520. As noted, some are available for download from the FEMA website.

After Disaster Strikes: How to recover financially from a natural disaster, FEMA 292.

Are You Ready? An In-depth Guide to Citizen Preparedness, IS-22. Full publication and individual sections available online at:
http://www.ready.gov/are-you-ready-guide

Before Disaster Strikes: How to make sure you're financially prepared to deal with a natural disaster, FEMA 291

Earthquake Safety Checklist, FEMA 526.
http://www.fema.gov/media-library/assets/documents/3234

Earthquake Safety Guide for Homeowners, FEMA 530.
https://www.fema.gov/media-library/assets/documents/1017

Food and Water in an Emergency, FEMA 477. Available online at:
http://www.fema.gov/pdf/library/pfd.pdf

Preparinng for Disaster for People with Disabilities and Special Needs, FEMA 476. Available online at:
http://www.ready.gov/individuals-access-functional-needs

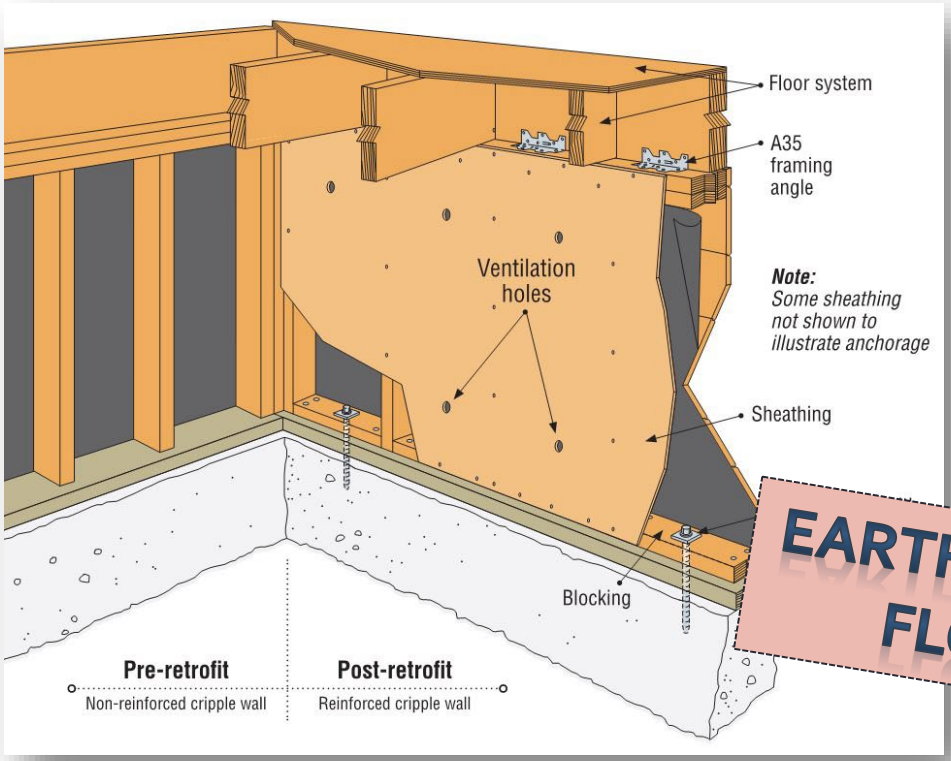
Visit the FEMA website at:
www.fema.gov/national-earthquake-hazards-reduction-program for information about the National Earthquake Hazards Reduction Program (NEHRP) and more ways to address earthquake risks.

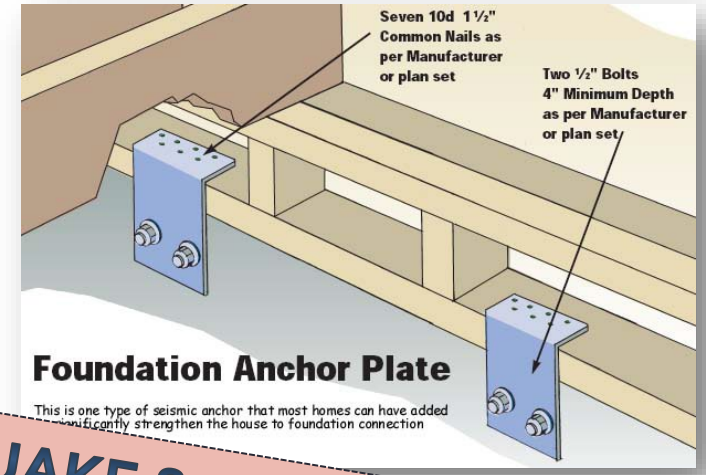
Visit FEMA Ready website at: **http://www.ready.gov** to learn about protective measures to take before, during and after an emergency.

Shelter: Protect your home, mitigation saves lives and money

Continued Operations → Immediate Occupancy → **Life Safety** → Collapse Prevention

0% LOSS 100%





EARTHQUAKE & NATIONAL FLOOD INSURANCE

Shelter:
Keeping warm and dry

Survival Priority!!

Shelter:
What are your alternatives??

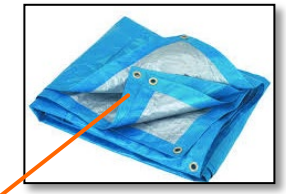
Expect Broken Windows

- *Plastic Sheeting*
- *Duct Tape*

Water…lots of options

Survival Priority!!

1 gal per person per day – Do you have this capability TODAY??



Food…lots of options

Survival Priority!!

What kind of food to use?

- Specialty diet foods
- Everyday foods
- Long term shelf life
- Low sodium, easy preparation

Storage and cooking

- At least 3 weeks in your home
- Rotate through annually
- Heavy duty pots for open flame

Don't forget your pets

- Have food & water for 3 weeks
- Keep extra food in car go kit

Items to consider:

- Beans
- Rice
- Peanut Butter
- Canned and dried meats

FOOD SAFETY BEFORE, DURING AND AFTER A POWER OUTAGE

Know how to keep food safe before during and after emergencies. Hurricanes, tornadoes, winter weather and other events may cause power outages. Follow these tips to help minimize food loss and reduce your risk of foodborne illness.

BEFORE
PLAN AHEAD (IF YOU CAN) ...

Put **appliance thermometers** in your refrigerator and freezer.

Keep **freezer** 0°F or below

Refrigerator 40°F or below

Freeze **containers of water** and **gel packs** to help keep food cold if the power goes out.

Group foods together in the freezer to help food stay colder longer.

Freeze refrigerated items such as leftovers, milk, and fresh meat and poultry that you do not need immediately.

If you think power will be out for an extended period of time, buy **dry or block ice** to keep the fridge or freezer cold.

Store nonperishable foods on higher shelves to avoid flood water.

DURING
WHILE THE POWER IS OUT ...

Keep the refrigerator and freezer doors closed **to maintain cold temperature.**

CLOSED

IF DOORS STAY CLOSED ...

... a full freezer will hold its temperature for **48 HOURS** | **24 HOURS** if half-full

... a fridge will keep food safe for **4 HOURS**

AFTER
ONCE THE POWER IS BACK ON ...

WHEN IN DOUBT, THROW IT OUT!

Check the temperature inside of your refrigerator and freezer. If they're still at safe temperatures, your food should be fine.

Never taste food **to determine its safety!**

WHAT CAN I KEEP?

The following foods are safe if held above 40 °F for more than 2 hours:

Hard cheeses (Cheddar, Colby, Swiss, Parmesan, Provolone, Romano) | Grated Parmesan, Romano, or combination (in can or jar) | Butter or margarine | Opened fruit juices | Opened canned fruits | Jelly, relish, taco sauce, mustard, ketchup, olives, pickles | Worcestershire, soy, barbecue, and hoisin sauces

Peanut butter | Opened vinegar-based dressings | Bread, rolls, cakes, muffins, quick breads, tortillas | Breakfast foods (waffles, pancakes, bagels) | Fruit pies | Fresh mushrooms, herbs, and spices | Uncut raw vegetables and fruit

WHAT SHOULD I THROW OUT?

Meat, poultry or seafood products | Soft cheeses and shredded cheeses | Milk, cream, yogurt, and other dairy products

Opened baby formula | Eggs and egg products

Dough, cooked pasta | Cooked or cut produce

REFREEZE FOOD THAT STILL CONTAINS ICE CRYSTALS OR IS AT 40°F OR BELOW.

AFTER A FLOOD

FOLLOW THESE STEPS AFTER A FLOOD:

- DO NOT EAT any food that may have touched flood water.
- DISCARD FOOD not in waterproof containers; screw-caps, snap lids, pull tops, and crimped tops are not waterproof.
- DISCARD cardboard juice/milk/baby formula boxes and home canned foods
- DISCARD any damaged cans that have swelling, leakage, punctures, holes, fractures, extensive deep rusting, or crushing/denting severe enough to prevent normal stacking or opening.

SANITIZE 1 tbsp. bleach + 1 gallon water

Pots, pans, dishes and utensils

Undamaged all-metal cans after removing labels

USDA | Ad Council

For more food safety tips, go to —FoodSafety.gov—

Is Your Disaster Kit Stocked?

Food in your fridge stays good for approximately four hours without power. Hurricane Sandy knocked out power to 8.5 million customers for seven days. What is your disaster preparedness plan?

Be Prepared	When the Power Goes Out	When the Power Returns
Make sure you have an appliance thermometer.	If the freezer isn't full, group together to form an "igloo."	Check temperature inside fridge and freezer.
Have a few days of ready-to-eat food.	If you anticipate a power outage, put water in the fridge ahead of time, it'll help keep everything cool.	Discard perishables, meats, poultry, seafood, eggs, leftovers. When in doubt, throw it out!
Know where to get dry ice or block ice.	Keep the fridge and freezer door closed.	Unusual odor, color, or texture? Throw it out!

Prepare your Disaster Kit:
What items should you have on-hand for a power outage:


Store at least a three-day supply of non-perishables.


Choose foods your family will eat.


Avoid foods that will make you thirsty.


Remember any special dietary needs.


Choose salt-free crackers, and whole grain cereals.

Following a disaster, there may be power outages that could last for several days. Stock canned foods, dry mixes and other staples that do not require refrigeration, cooking, water or special preparation. Be sure to include a manual can opener and eating utensils.

1 Ready-to-eat canned meats, fruits, vegetables and a can opener 2 Protein or fruit bars 3 Dry cereal or granola 4 Peanut butter 5 Dried fruit 6 Nuts 7 Crackers 8 Canned juices 9 Non-perishable pasteurized milk 10 High energy foods 11 Vitamins

FEMA

This information is only a portion of what you need to be prepared; for more information and resources, visit Ready.gov and FEMA.gov.

Sanitation…lots of options

Survival Priority!!

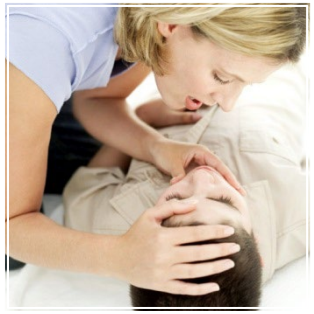
Portable bathrooms will not be available…shovel will be one of the most useful tool; **plan ahead… know where to go!!**

Medical…the basics

Survival Priority!!

You are your own first responder

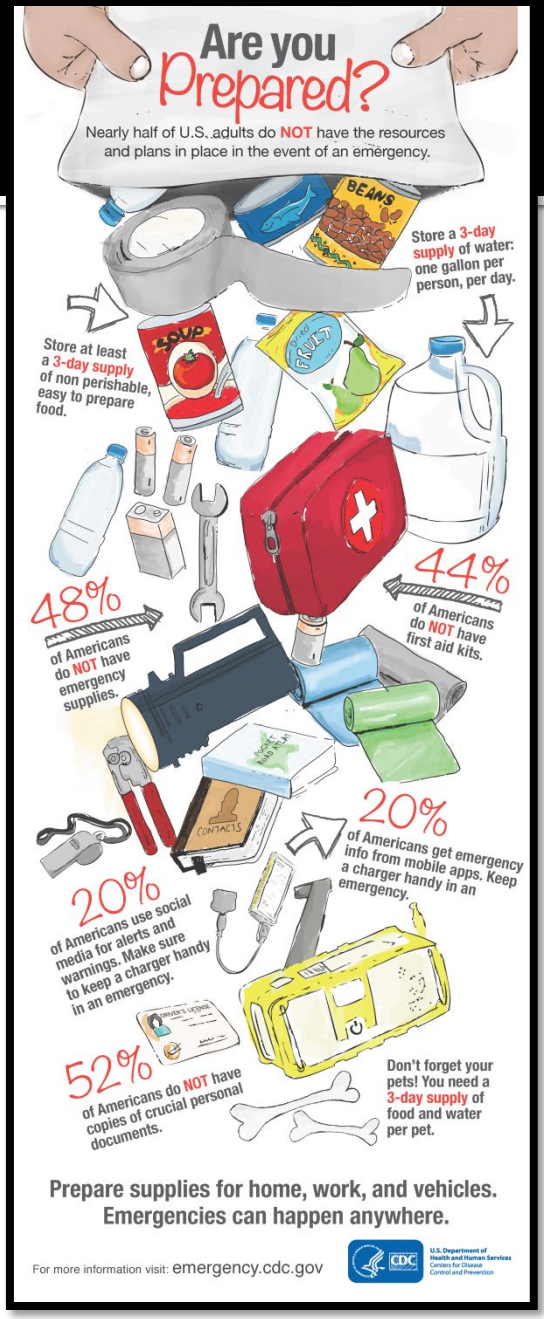
Get trained in first aid, have extra supplies on hand



Kits to GO, Kits to STAY or Neighborhood Caches

Have a kit or cache for all areas of your life

- In your car
- At work
- At home
- For your pets
- For your neighborhood



Build your survival skills…training

- First Aid
- CPR
- American Red Cross
- Amateur Radio (HAM)
- CERT
- Medical Reserve Corps

Lincoln County Auxiliary Communications

Emergency Management

American Red Cross
Cascades Region

CERT
COMMUNITY EMERGENCY RESPONSE TEAM

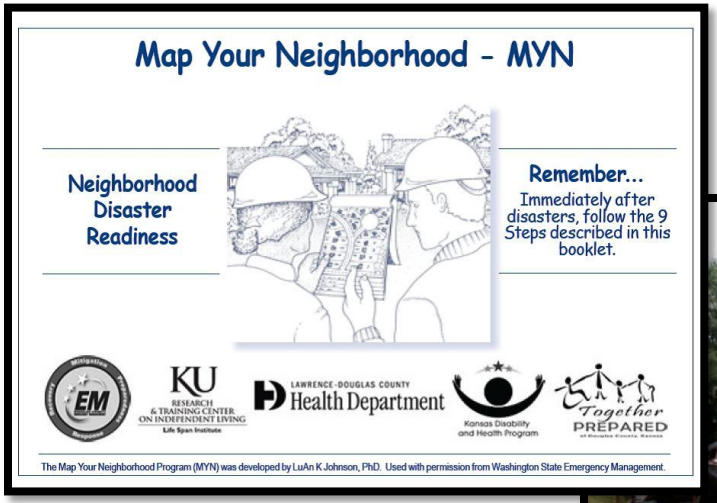
medical reserve corps

Build your survival skills…
practice, practice, practice

Survival Priority!!

Join Us in the World's Largest Earthquake Drill.
October 15, 2020 Register Now at ShakeOut.org
ShakeOut

Build your survival skills…map your neighborhood, spread the word



Survival Priority!!

Emotional Recovery

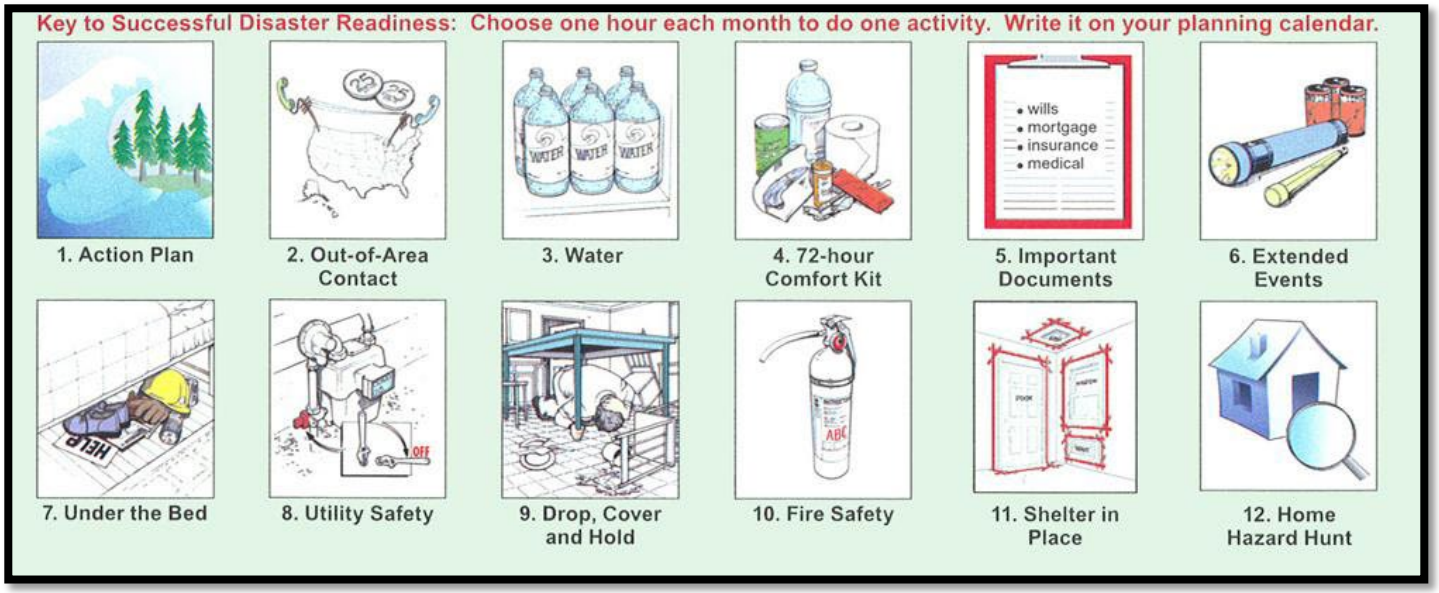
Imagine Extended Camp Life without infrastructure

Give Everyone a Job!

Be ready to go…12 steps to readiness

Prepare in a Year

A 12 step guide of activities to assist you with completing your personal family preparedness plan. www.lincolncountysheriff.net



Be ready to go…

Survival Priority!!

During earthquake, stay in your bed until safe to evacuate

Practice evacuating your house from your bedroom during night time

Secure a bag of key supplies to all beds in your home and go bag for hotel visits

Glasses	Shoes	Poncho
Headlamp (flashlight)	Gloves	Extra set of car keys

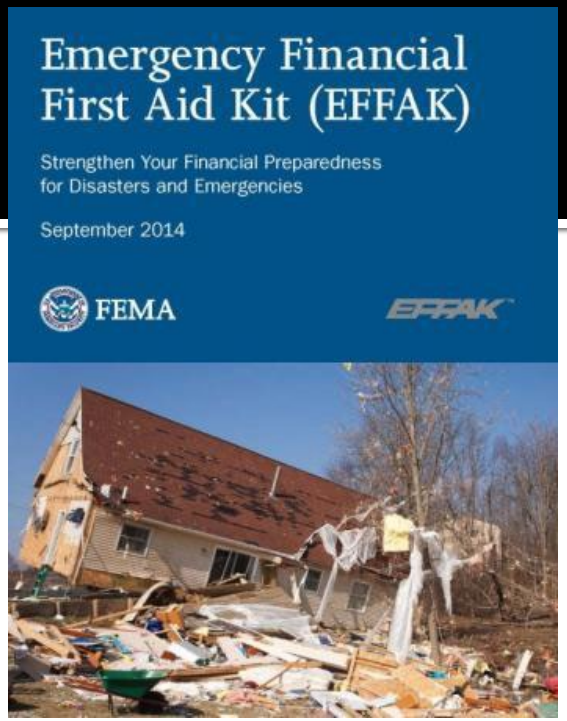
Be ready to recover…

Preparing Your Finances for an Emergency -
Emergency Financial First Aid Kit (EFFAK) Overview
www.ready.gov/financialpreparedness\

Insurance Protection

Inventory – what is important and valued to you

Documents – who are you? How do you recreate who you are; wherever you are?



EARTHQUAKE & NATIONAL FLOOD INSURANCE

Resources…jump start or fast forward your planning efforts

Use your Internet search browser to locate these resources on-line or stop by your local emergency management, government or public safety office for more information

- Ready.Gov
- Lincoln County Emergency Management
- Office of Oregon Emergency Management
- Oregon Resilience Plan
- Oregon Health Authority
- FEMA, Food and Drug Administration, Center for Disease

DOGAMI Fact Sheet – 2022

- Risk next 50 years?
- Foreshock before main shock?
- Type of shaking to expect?
- Estimated # of minutes of main shock shaking?
- # of days of aftershocks & magnitude?
- Speed of incoming tsunami?
- # hours/days of tsunami surge?
- Time tsunami surge inundation will stay in the zone?
- Aftershocks trigger another tsunami?
- Coastal subsidence estimation?
- Estuaries/rivers water levels after tsunami?
- Ocean floor and estuary changes?
- Early earthquake warning and Cascadia?
- Wood frame buildings performance?

DOGAMI Fact Sheet
Cascadia Earthquake Knowledge Points for Emergency Managers and the Public

Oregon Department of Geology and Mineral Industries
Jonathan Allan and Laura Gabel
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Ruarri Day-Stirrat, State Geologist

The Cascadia subduction zone (CSZ) is a 1000 km (620 mile) long "megathrust" fault that stretches from Cape Mendocino, California, to northern Vancouver Island in British Columbia, Canada. The fault zone lies at the interface of the Juan de Fuca plate, moving in an east-northeast direction at a rate of ~1.6 inches/year, and the slower moving North American plate, moving in a west-southwest direction at a rate of ~1 inch/year. At the plate interface, the Juan de Fuca plate dives (subducts) below the North American plate. Part of this region of subduction is locked, causing strain to accumulate as the CSZ builds energy toward the next earthquake. Due to the width of the locked region and length of fault zone, the CSZ has a history of producing very large (Moment magnitude (M_W) >8.7) earthquakes. Full-margin ruptures on the CSZ that trigger tsunamis are estimated to occur on average ~480 to 505 years; partial ruptures that affect southern Oregon and Northern California occur more frequently (~220 years). The last CSZ megathrust earthquake (estimated ~M_W 9.0) occurred on January 26th, 1700, at ~9 pm and produced a tsunami that inundated the Oregon coast. It is not a case of "if" the next great earthquake will occur, but "when". This document provides answers to many frequently asked questions concerning a CSZ earthquake and tsunami.

What is the current estimated risk of a Cascadia earthquake and tsunami occurring in the next 50 years?

The probability of a Cascadia earthquake and tsunami occurring in the next 50 years are calculated at:

- 7–12 percent for a complete rupture (i.e., the entire 600-mile-long fault zone) (Goldfinger and others, 2012);
- 16–22 percent for a partial rupture that impacts the Oregon and northern California coast (Goldfinger and others, 2017); and,
- 37–43 percent for a partial rupture that would affect just the southern Oregon and northern California coast (Goldfinger and others, 2012).

Do we anticipate a foreshock with this event?

It is possible. The recent Tōhoku Japan M_W 9.1 earthquake that occurred on 11 March 2011 was characterized by two foreshocks that occurred respectively 2 days (M_W 7.3) and 1 day (M_W 6.4) prior to the mainshock (Kiser and Ishii, 2013). However, recognizing these as foreshocks leading up to something larger remains the challenge.

What type of shaking should we expect?

It depends on many factors including distance to the fault rupture zone, the local geology below your feet (e.g., soft sediments on hard rock tend to amplify the shaking), whether you are inside or outside a building and the type of building (single versus multistorey). Ground shaking intensity may be qualitatively described using the Modified Mercalli Intensity Scale (MMI, Table 1). The MMI scale reflects increasing levels of intensity that range from shaking that is barely felt to extreme shaking leading to catastrophic destruction.

For a Cascadia event, ground shaking is expected to have a long duration (lasting ~3-5 minutes for the larger events) accompanied by severe shaking (MMI ~VIII – X, Table 1).

In contrast, a crustal earthquake is characterized by shaking that is short lived (~5-30 seconds, ~MMI I - VII); note a small earthquake will feel like a small sharp jolt followed by a few stronger sharp shakes that pass quickly.

Video footage (click here) from the Sendai Plain in Japan (nearest to the fault rupture) indicate that people were able to stand and move about. However, at the peak of the earthquake, standing became difficult in some places and people either sat down, got under desks, or got under other forms of protection. In Tokyo, 190 miles from the rupture zone, the shaking remained severe. Nevertheless, people can be seen (click here) evacuating from buildings at the peak of the earthquake shaking. Strong aftershocks persisted for many days after the main quake.

Resources Specific to Cascadia

- Oregon DOGAMI Cascadia FAQ Sheet
- Oregon DOGAMI Tsunami Clearinghouse
- CREW - Cascadia Region Earthquake Workgroup
- OSSPAC – Oregon Seismic Safety Policy Advisory Commission
- NANOOS – Northwest Association of Networked Observing Systems
- PNSN – Pacific Northwest Seismic Network
- USGS – US Geological Survey
- Video – EERI – Earthquake Engineering Research Institute Japan Tsunami 3/11/2001 Unedited Part 1

How can you stay informed?

Lincoln County Sheriff's Office – Emergency Management Division website

Lincoln Alerts –

- Mobile App – Powered by Everbridge

Lincoln County Oregon Emergency Management

Lincoln County

Public Health
Prevent. Promote. Protect.
Lincoln County

Conclusion, what mindset are you now?

Build your personal and community resiliency

- Develop your response plan
- Build your survival skills
- Mitigate what you can
- Increase your emergency supplies
- Practice your response plans

Aware and Prepared!!

Questions

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Presentation can be viewed at our earthquakes hazard page on our County website - Hazards: Earthquake | Lincoln County Oregon