Preparing for the Big One:
Cascadia Subduction Zone

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Objectives

Local Event

- Survive a Cascadia Earthquake
- Escape a Local Tsunami
- Prepare for Island Life

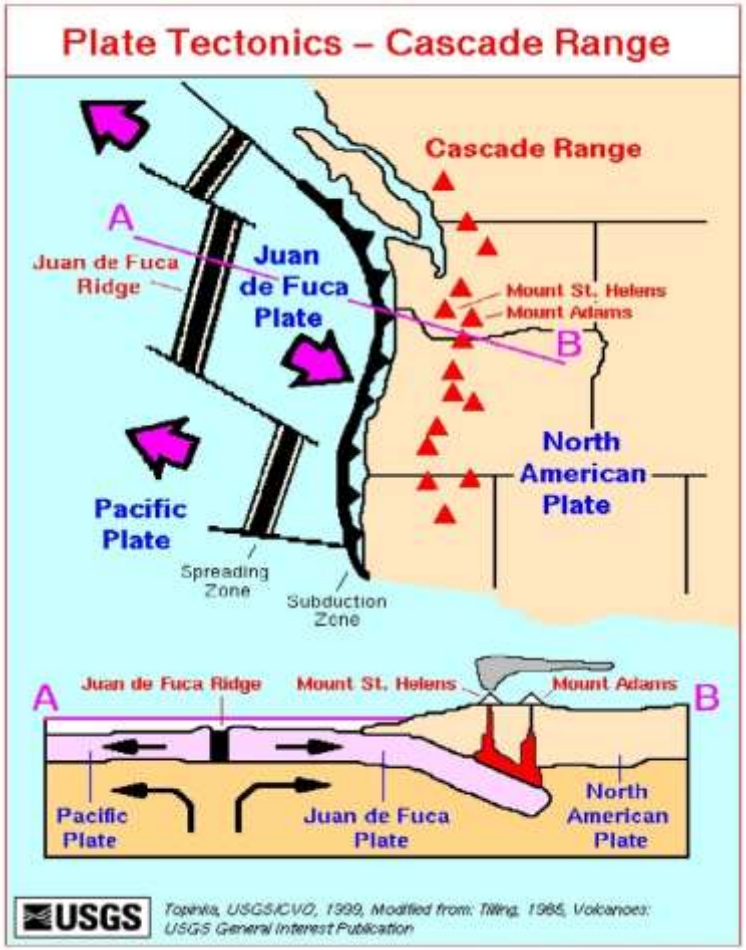
Distant Event

- Understand Distant Tsunami
- Plan for Before, During & After

What are the geologic hazards in Oregon?

- Volcanoes
- Earthquakes
  - Cascadia Subduction Zone
  - Crustal
  - Deep Intraplate
  - Volcanic
- Tsunami
  - Local (from subduction zone off our coast)
  - Distant (from subduction zone elsewhere)

Know your Cascadia Subduction Zone



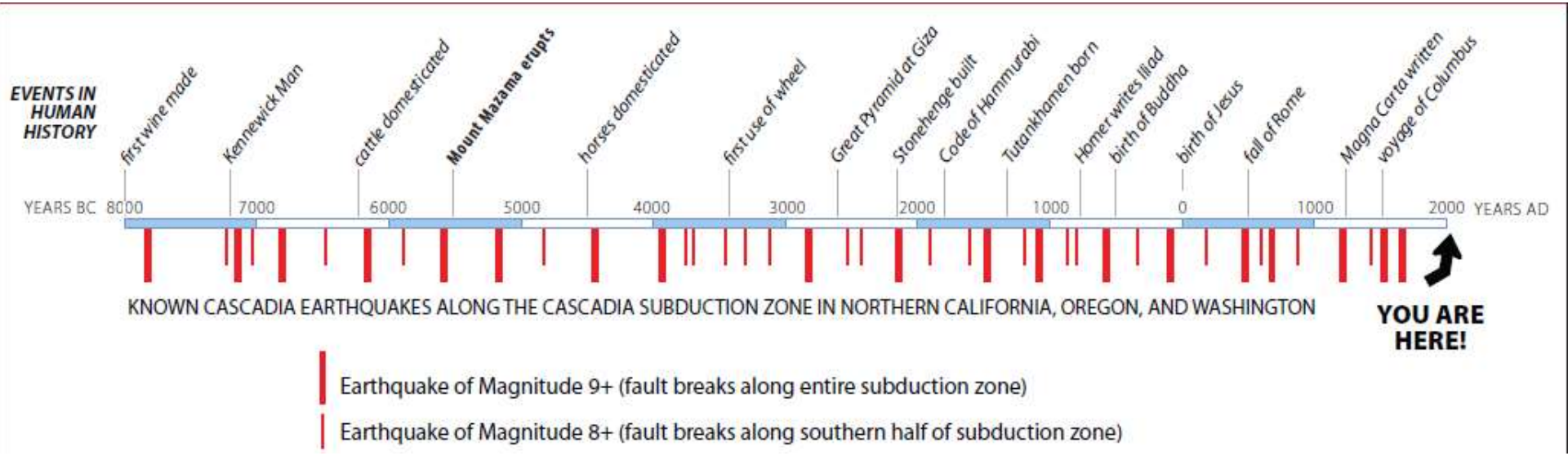
- 600 miles long, from northern California to British Columbia
- Capable of producing very large earthquakes (M9+) that impact a wide area
- Similar in size and impact to the 2004 Sumatra earthquake
- Can produce devastating tsunamis
- 37% chance of a mega-thrust earthquake in the next 50 years

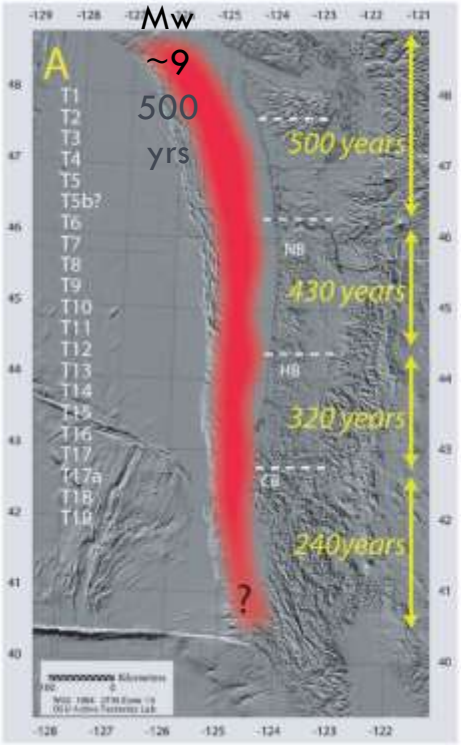
Know your Cascadia Subduction Zone

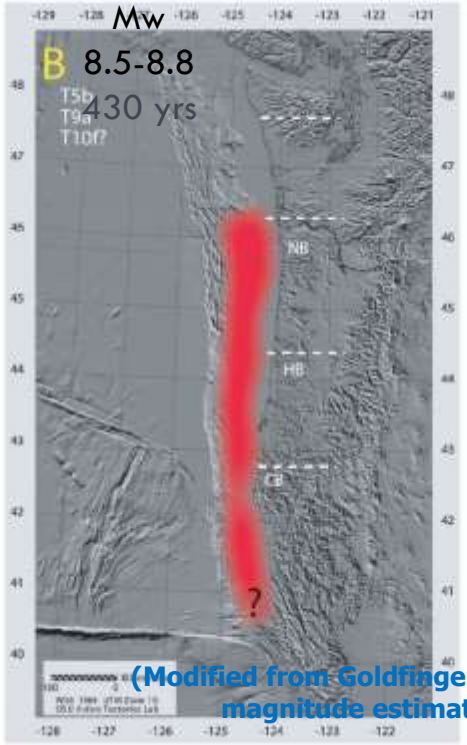
Ghost forest at Copalis River, WA

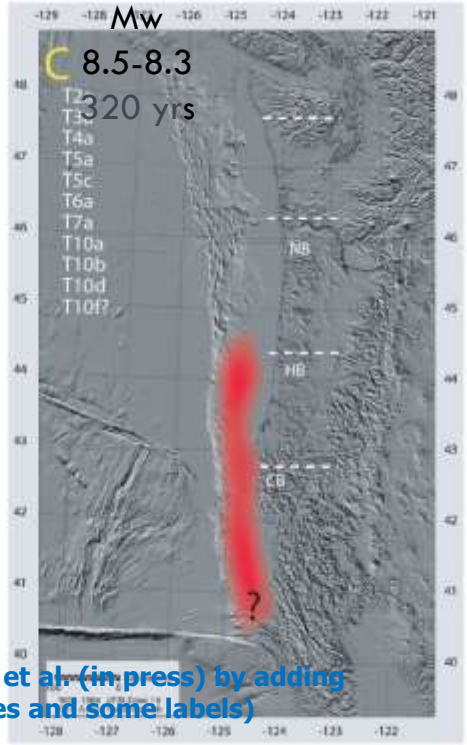
- Last Cascadia Subduction Zone earthquake occurred in 1700
- When will the next one occur?
  - We just don't know
- Average recurrence:
  - 240 years (south of Cape Blanco)
  - 5-600 years (entire length)
  - 190-1,200 years between EQ

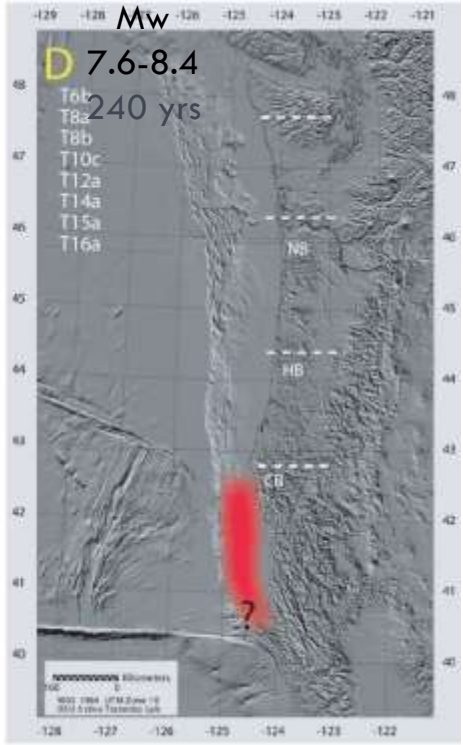
Cascadia Subduction Zone Earthquakes











(Modified from Goldfinger et al. (in press) by adding magnitude estimates and some labels)

- Past 10,000 years
  - 19 earthquakes that extended along most of the margin, stretching from southern Vancouver Island to the Oregon-California border
  - 8.7 to 9.2 – really huge earthquakes.

- 22 additional earthquakes that involved just the southern end of the fault
  - slightly smaller – more like 8.0 – 8.2

We're in the Zone
And it WILL happen again

What are the hazards?

Strong ground shaking

2010 Haiti earthquake

2011 Tohoku earthquake

What are the hazards?

Coastal subsidence

2004 Sumatra

Mainichi Shimbun, Reuters

What are the hazards?
Landslides

Landslides in Ferndale, WA

2010 Taiwan

What are the hazards?

Liquefaction

1964 Alaska

2011 Christchurch, New Zealand

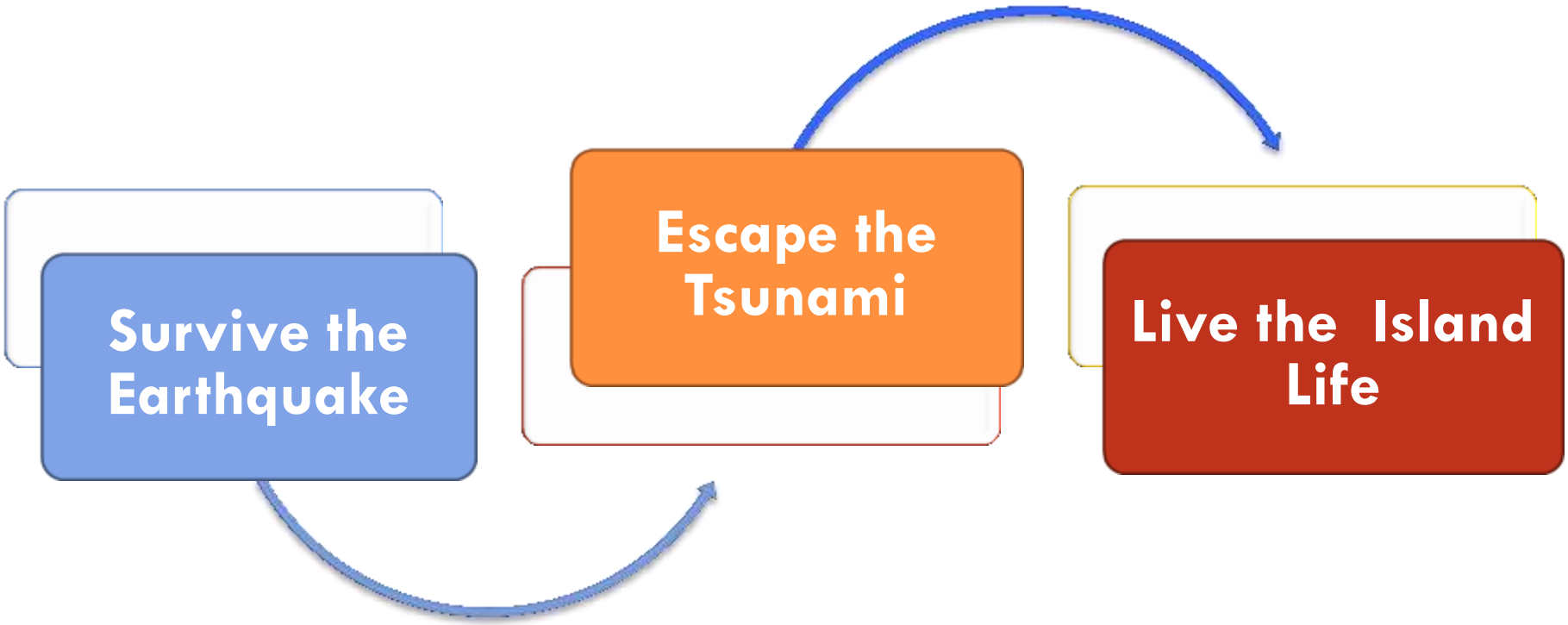
What are the hazards?

Tsunami

2004 Indonesian tsunami

2011 Tohoku tsunami

Local Cascadia Event



Local Cascadia Earthquake

- Cascadia Subduction Zone
- Magnitude 8 to 9.0+ Earthquake
- **4-6 minutes of intense shaking**
- **15 million people in impact zone**

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What are the Implications?

Aftershocks

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Injuries

Hypothermia

- Hypothermia is a significant risk
- Rainy Coastal Environment

Survive the Earthquake

Prevention

- Modify Your Environment

Protection

- Modify Your Behavior

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Secure Heavy Furniture

- *Velcro straps*
- *L brackets*

Nothing Above Bed

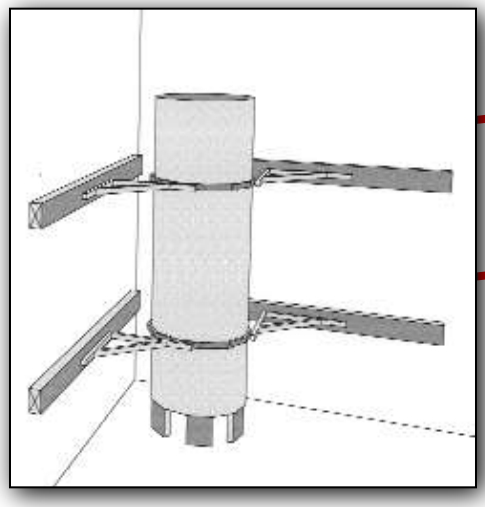
Tie Supplies to Bed

- *Flashlight/Head-Lamp*
- *Sturdy Shoes*
- *Leather Gloves*

What if you're in bed when the ground shakes?

Secure Water Heater

- *Source of Drinking Water*
- *Prevent Damage*
- *Gas leaks - fire*



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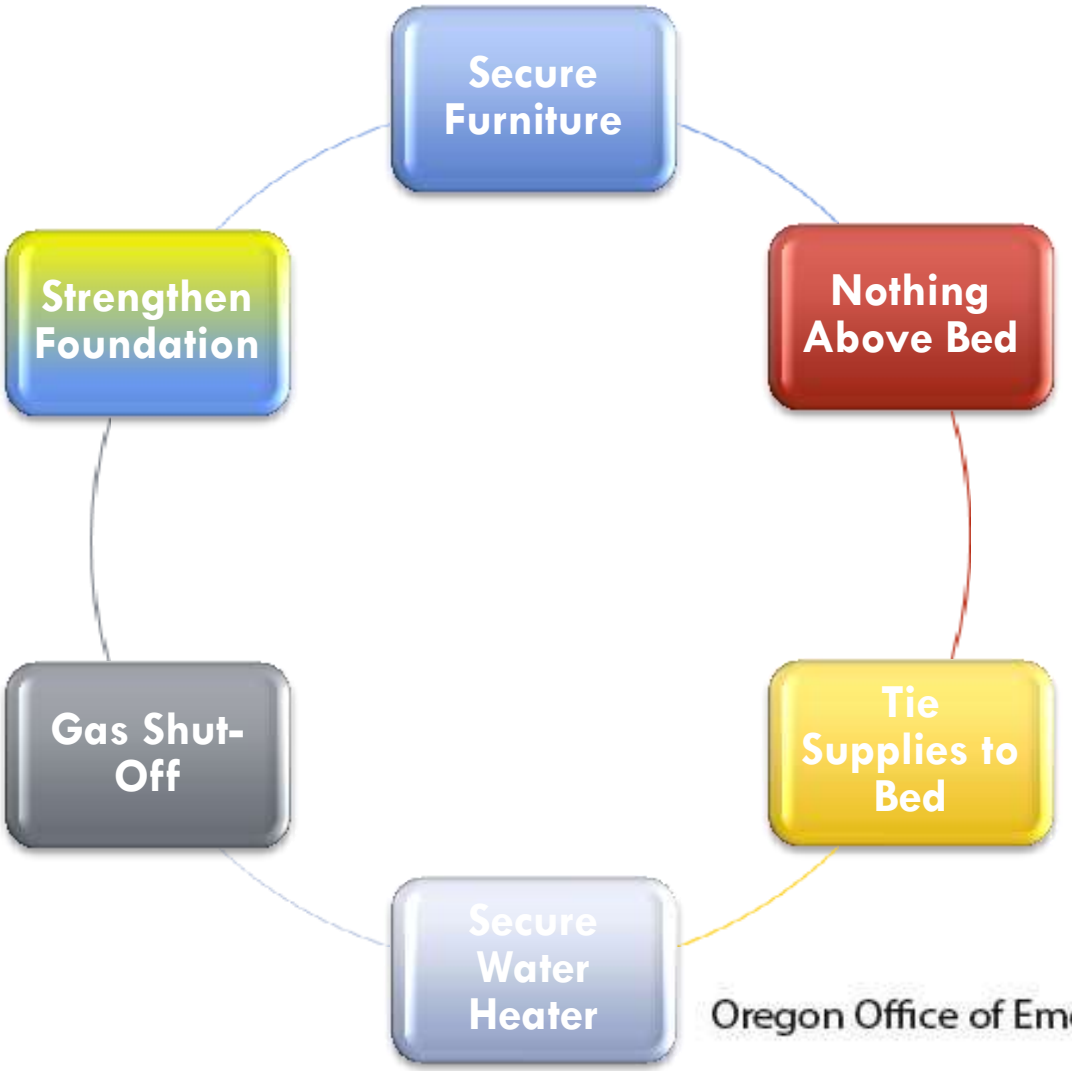
Gas Shut-Off

Secure House to Foundation

Earthquake Resistant Bracing System
(for mobile homes)

Take Action!



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Be a SMALL Target

Body Position

- On knees
- Protecting neck/head
- Hold onto furniture
- Curl into a ball

Face Position

- Turn away from windows
- Close eyes

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During the Shaking

If Inside, Stay Inside

- Classroom
- Gymnasium
- Band Room

If Outside, Stay Outside

Get away from buildings, trees, light poles, power lines, utilities

In a Car or Bus

- Pull over to a safe location
- Stop & stay there
- Keep seat belt on
- After shaking stops, assess your situation

Wheel Chair Bound

- Roll into area with structural protection
- Apply brakes
- Cover head and eyes to best of ability
- **Be Advised:** rescuers need to drop, cover, and hold on, too!

3 Common MISTAKES

- ***DO NOT*** run out of the building!

Run

- ***DO NOT*** get in a doorway!

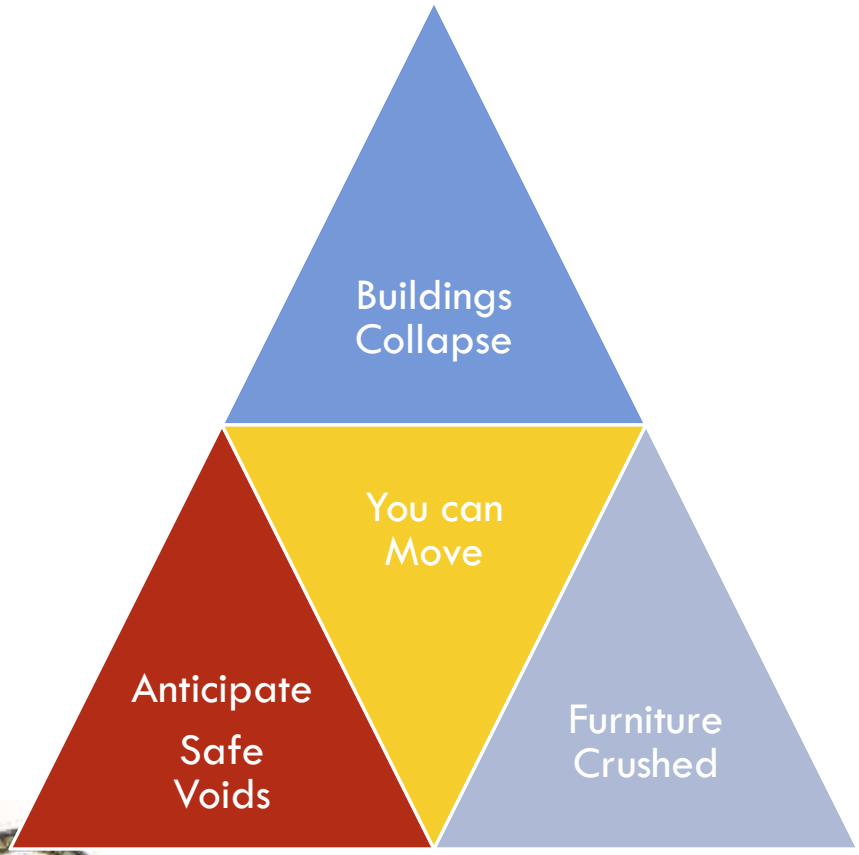
Doorway

- ***DO NOT*** believe the triangle of life!

Triangle of Life

The Triangle of Life MYTHS

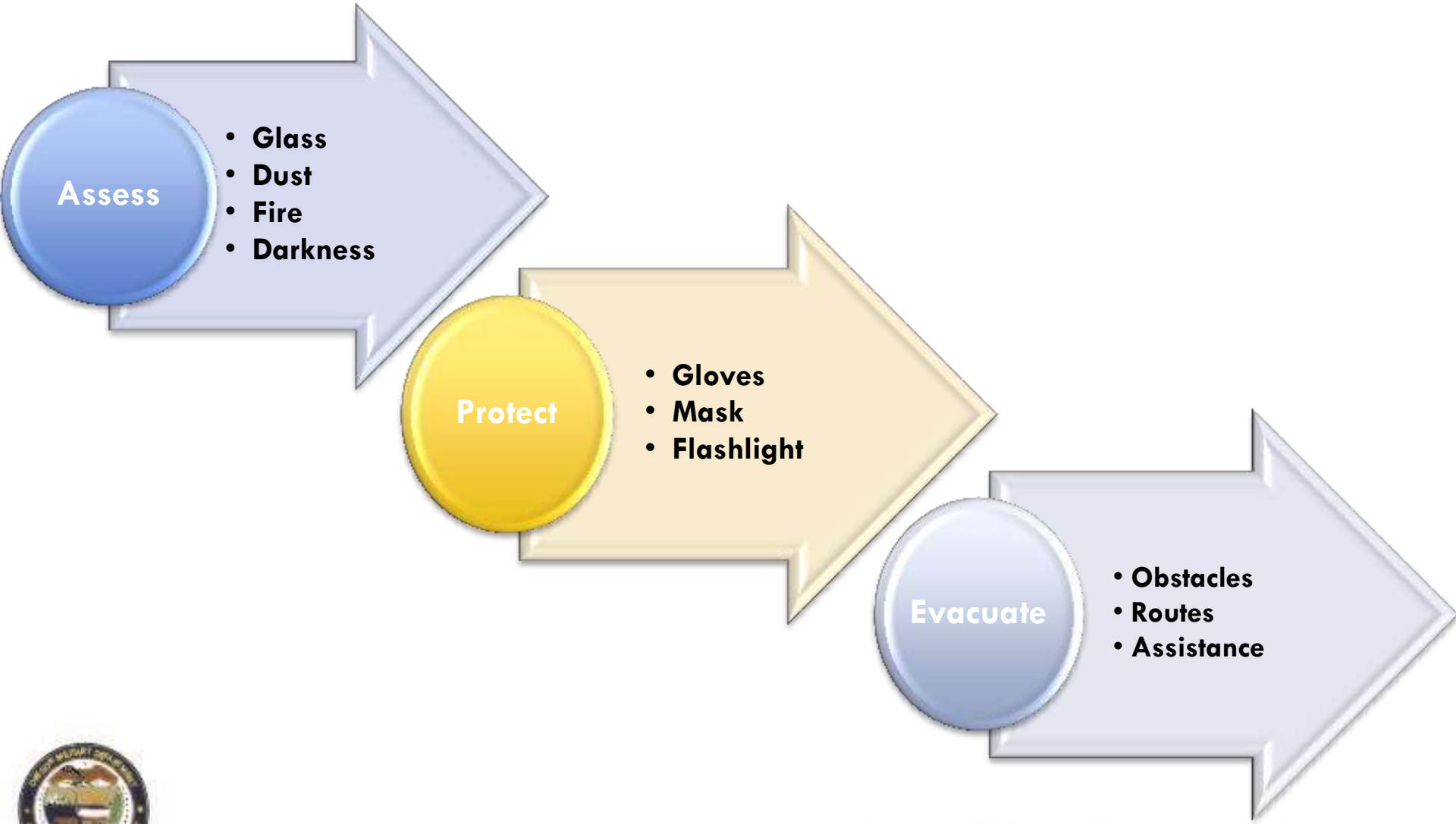
MYTHS



TRUTH

1. **Collapse:** Most buildings do not collapse
2. **Moving:** Strong shaking makes moving very difficult and dangerous
3. **Voids:** The direction of shaking and unique structural aspects of the building make this impossible.
4. **Furniture:** People DO survive under furniture or other shelters.

After the Earthquake



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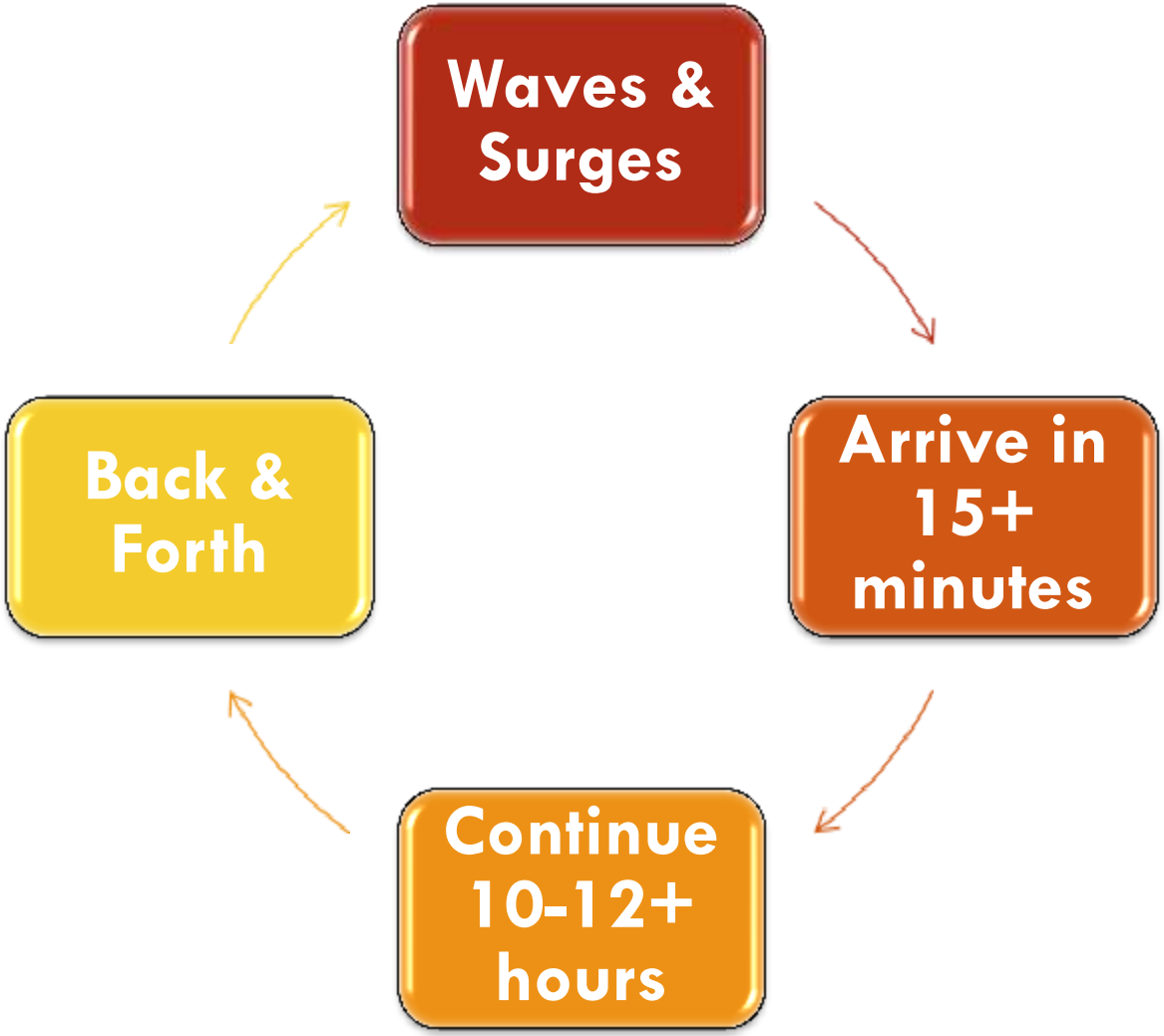
Local (Cascadia) Tsunami



Islands

Separated by…

- Failed Bridges
- Landslides
- Debris
- Hazardous Materials

Broken Communication

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New Tidal Level

Escape the Tsunami

Learn

- Tsunami zones
- Evacuation Routes
- Safe Areas

Practice

- Go on Foot
- Assist Others
- Consider Options

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Know the Zones
Tsunami Evacuation Maps

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Identify High Ground

- Signs
- Evacuation Routes
- Safe Areas
  - Temporary Assembly Areas
  - Vertical Evacuation Options

Practice

Go On Foot → **Assist Others** → **Consider Options**

To Carry or Not To Carry Supplies

Situation

Ability

Time

Distance

The Discipline to STAY PUT!

WHEN DO YOU RETURN

to the

Tsunami Hazard Zone?

Distant Tsunami

- Earthquake Far Away
- You won't feel the ground shake
- 4+ hours before waves arrive
- Limited Inundation

Know the "Distant" Zone

- Beaches
- Harbors
- Rivers, Inlets
- Other low-lying areas

Tsunami Alert Messages

West Coast & Alaska Tsunami Warning Center

Alert Level	Threat	Action
Information Statement	Minor waves at most	No action suggested
Watch	Danger level not yet known	Stay alert for more info
Advisory	Strong currents likely	Stay away from the shore
Warning	Inundating waves possible	Full evacuation suggested

Evacuation
Before a Distant Tsunami

- **WHO**: Only those in the distant tsunami zone
- **HOW**: Probably by car
- **WHERE**: ???

Re-entry
After a Distant Tsunami

- Cancellation Message
- Re-enter with Caution
- Damage
  - Harbors
  - Beaches
  - Low-lying areas
  - Roads, Bridges
- Clean up

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SHOULD ANYONE DIE

FROM A DISTANT TSUNAMI?

NO

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Prepare for Island Life

Psychological

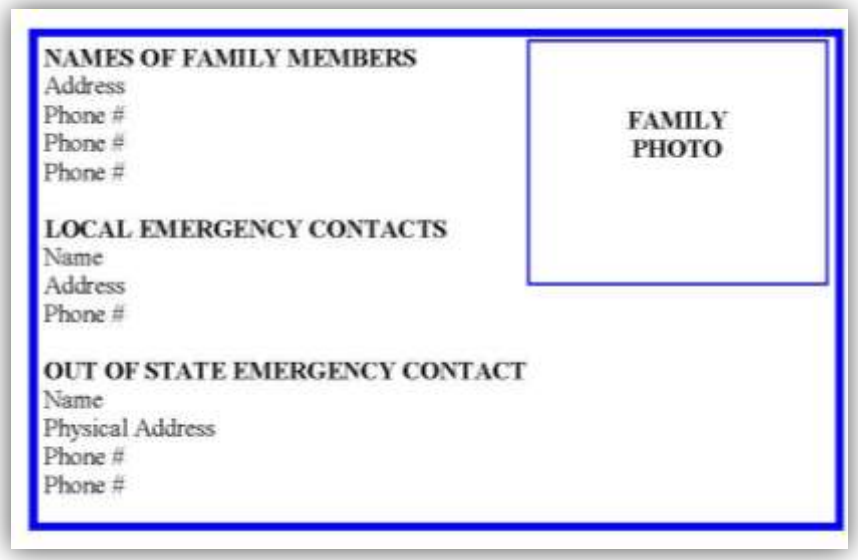
- Communication Plan
- Meeting Place
- Emotional Recovery

Physical

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

Family Plan

- Communication Plan
  - Out of State Contact
  - Photo
  - Insurance Info
- Update School Info
- Identify Meeting Places



Emotional Recovery

Imagine Extended Camp Life

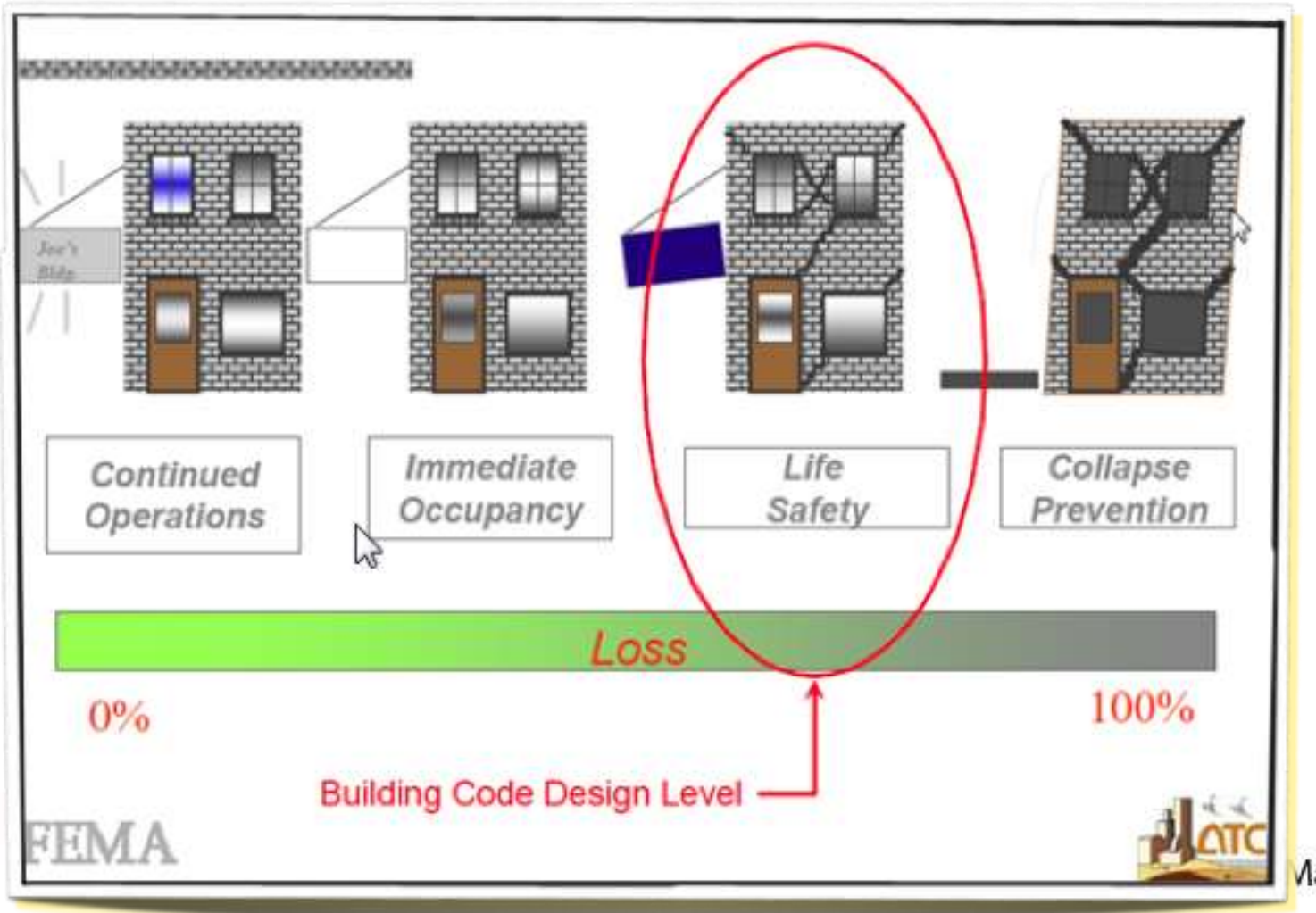
without infrastructure

Give Everyone a Job!

Without Utilities

- No Running Water
- No Electricity
- No Communications
- No Sewer System
- No Garbage Pick-up
- No Fuel
- No Groceries in the Store
- No Pharmacy

Living Outside (…in Oregon)



Management

Protection from the Rain

Make-shift Shelter

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This is not a viable solution on the Oregon Coast – WIND!

Shelter & Warmth

Tube Tent

High Occupancy Tent

Water

Water Filter Straw

55-Gallon Barrel of Water

Food

Sanitation

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First Aid & Medications

Expect Broken Windows

- ***Plastic Sheeting***
- ***Duct Tape***

Emergency Kits

- Backpack
- Roller Bag

- Car
- Home
- Friends
- School

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Strengthen Your Community

- Map Your Neighborhood
- Cache of Supplies
  - Neighborhood Caches
  - School Caches
- Vertical Evacuation Options
- Drills
- Seismic Strengthening

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Build Response Capacity

- Community Emergency Response Team
- Red Cross
  - Shelter Ops & Management
  - First Aid
- Amateur Radio Operator
- Post-Earthquake Building Evaluations
- Animals in Disasters

Summary

Local Event

- Survive a Cascadia Earthquake
- Escape a Local Tsunami
- Prepare for Island Life

Distant Event

- Understand Distant Tsunami
- Plan for Before, During & After

Will Your Behavior Change?

- Mass Notification Systems
- Prevention & Mitigation Actions
- Duck, Cover, Hold
- Practice Evacuation Routes
- Communication Plan
- Gather Supplies
- Build Community Capacity

Resiliency CAN be achieved

- After the February 27, 2010 M8.8 Maule Earthquake, Chile was able to restore 90% communication services and 95% power supply within two weeks, and re-start commercial flights after ten days.
- After the March 11, 2011 M9.0 Tohoku Earthquake, Japan was able to restore more than 90% power supply in ten days, 90% telephone lines in two weeks, and 90% cellular base stations in 19 days.

A state-wide
Drop, Cover and Hold On Earthquake drill.
Shakeout.org/Oregon

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