

The Oregon Resilience Plan

Presentation for

***House Committee on Veterans' Services and Emergency
Preparedness***

and

Senate Veterans and Emergency Preparedness

Kent Yu, PhD, Chair

Jay Wilson, Vice Chair

Oregon Seismic Safety Policy Advisory Commission

March 14, 2013

Salem, Oregon

The Oregon Resilience Plan

The Oregon Resilience Plan

Reducing Risk and Improving Recovery
for the Next Cascadia Earthquake and Tsunami

Report to the
77th Legislative Assembly

from
Oregon Seismic Safety Policy
Advisory Commission (OSSPAC)



Salem, Oregon
February 2013

50-year Comprehensive Plan

☐ Save Lives

☐ Protect our Economy

☐ Preserve our Communities

☐ 169 volunteers

☐ \$0 Funding

☐ One-year Schedule

OSSPAC

- ☐ Kent Yu – Chair, Structural Engineer, Degenkolb Engineers
- ☐ Jay Wilson – Vice Chair, Public Member, Clackamas County Emergency Management
- ☐ Deborah Boone – Representative, Legislative Assembly
- ☐ Greg Ek-Collins – Oregon DOT
- ☐ Carl Farrington – Multifamily House Stakeholder
- ☐ Fred Girod – Senator, Legislative Assembly
- ☐ David Holton/Francisco Ianni – American Red Cross
- ☐ Iann Madin – DOGAMI
- ☐ Mike Mumaw Local Government Stakeholder, City of Beaverton
- ☐ Jay Raskin Public Member, Ecola Architects
- ☐ Althea Rizzo – Oregon Emergency Management (OEM)
- ☐ Richard Rogers – Building Codes Division
- ☐ Steve Lucker – Dept. of Land Conservation and Development
- ☐ Susan Steward – Building Owners Stakeholder, BOMA
- ☐ Mark Tyler – Schools Stakeholder
- ☐ Bryce Ward – Banking Stakeholder, ECONorthwest
- ☐ Stan Watters – Utilities Stakeholder, Port of Portland
- ☐ Gerry Williams – Public Member, C&EMR
- ☐ Bev Hall – OSSPAC Secretary, OEM

Acknowledgments

- Honorable Rep. Deborah Boone
- Governor John Kitzhaber
- Richard Reed/White House
- OSSPAC Steering Committee: Jay Wilson, Ian Madin, Althea Rizzo, and Stan Watters

Advisory Panel

- ☐ Prof. Scott Ashford (Oregon State Univ.)
- ☐ Sen. Lee Beyer (Legislature)
- ☐ Sen. Peter Courtney (Legislature)
- ☐ Ed Dennis (formerly Dept. of Education)
- ☐ JR Gonzalez (formerly Oregon PUC)
- ☐ Prof. Chris Goldfinger (Oregon State Univ.)
- ☐ Dave Harlan (Business Oregon/Ports)
- ☐ Onno Husing (formerly OCZMA)
- ☐ Bruce Johnson (ODOT)
- ☐ Dr. Leon Kempner, Jr. (BPA)
- ☐ Prof. Andre LeDuc (Univ. of Oregon)
- ☐ Dr. Vicki McConnell (DOGAMI/WSSPC)
- ☐ Jean O'Connor (Oregon Health Authority)
- ☐ Cameron Smith (Governor's office)
- ☐ Jeff Soulages (Intel)
- ☐ Yumei Wang (DOGAMI/NEHRP)
- ☐ Edward Wolf (Oregon citizen)
- ☐ Dr. Nate Wood (USGS)

Eight Task Groups

- Earthquake and Tsunami Scenario: **Ian Madin** (DOGAMI, OSSPAC)
- Business/Work Force Continuity: **Susan Steward** (BOMA, OSSPAC) & **Gerry Williams** (OSSPAC)
- Coastal Communities: **Jay Wilson** (vice Chair, OSSPAC) & **Jay Raskin** (OSSPAC)
- Critical/Essential Buildings: **Ed Quesenberry** (SEAO) & **Trent Nagele** (SEAO)
- Transportation: **Bruce Johnson** (ODOT)
- Energy: **JR Gonzalez** (formerly OPUC) & **Stan Watters** (Port of Portland, OSSPAC)
- Information and Communications: **Mike Mumaw** (OSSPAC)
- Water and Wastewater: **Mike Stuhr** (City of Portland PWB) & **Mark Knudson** (TVWD)

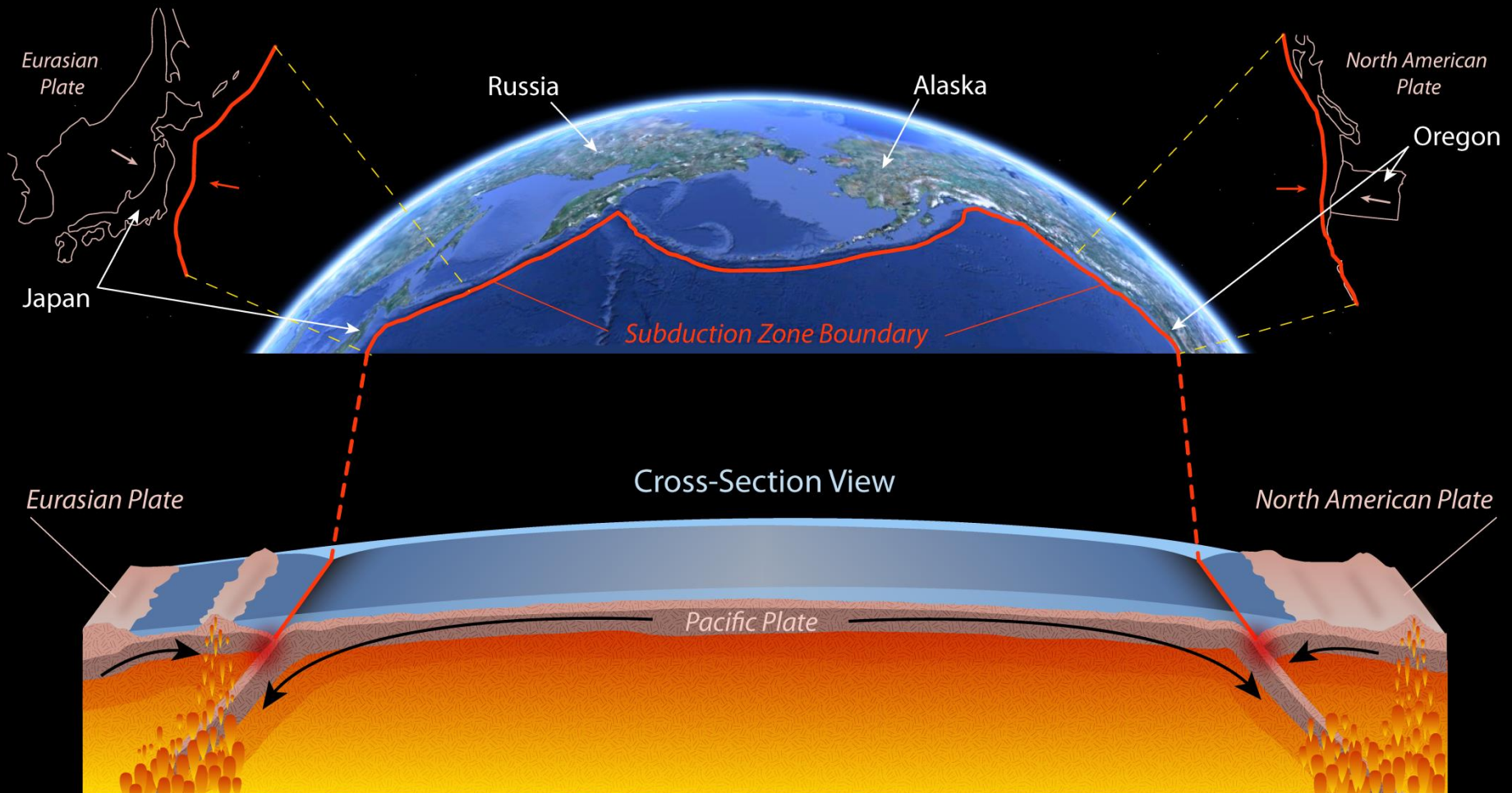
Broad Participation

- Governor's office
- (1) Indian Tribe: Coquille Tribe
- (3) Ports: Port of Portland, Port of Astoria, Port of Coos Bay
- (4) Federal Agencies: BPA, USGS, US Army Corps, USCG
- (4) State Legislators: Beyer, Boone, Courtney, Kruse
- (5) Universities (UO, OSU, PSU, UP, UTA)
- (6) Private utilities providers
- (10+) Local Government (Astoria to Brookings, Pendleton to Cannon Beach)
- (11) Public utilities providers
- (11) State Agencies/(2)Commissions/(2)Boards
- Earthquake professionals: SEAO, ASCE, EERI, CREW
- Oregon businesses: High tech, healthcare, insurance, food retail, construction...
- Professional associations, NGOs, citizens,...



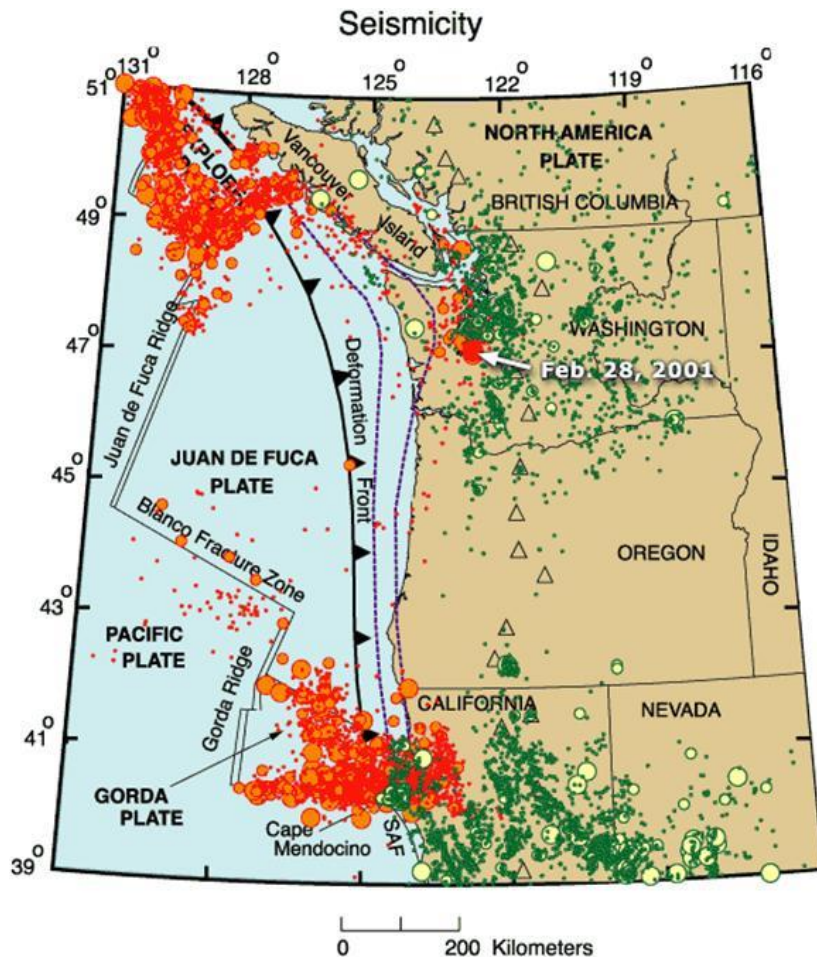


Cascadia Subduction Earthquake



Strong Shaking and Tsunami

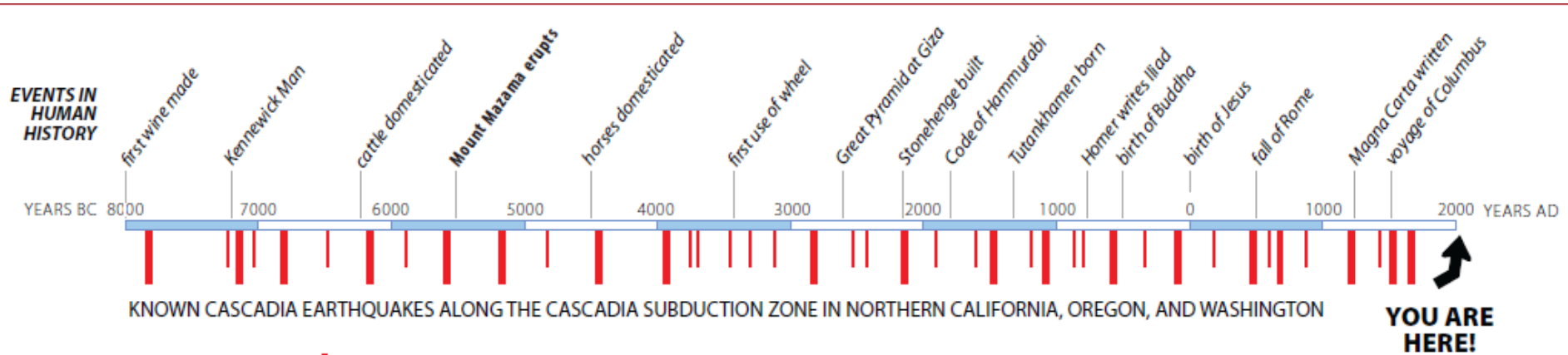
- Strong Ground Shaking (M9 w/ 2 - 4 min shaking)
- Tsunami within 15 to 25 minutes



modified from Weaver and Shedlock, 1996

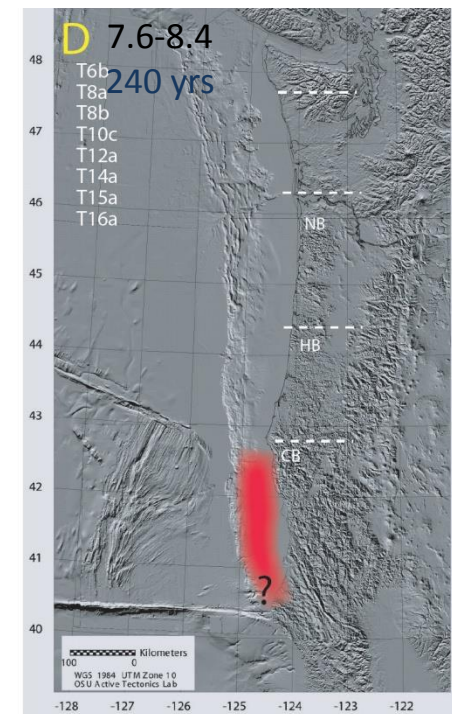
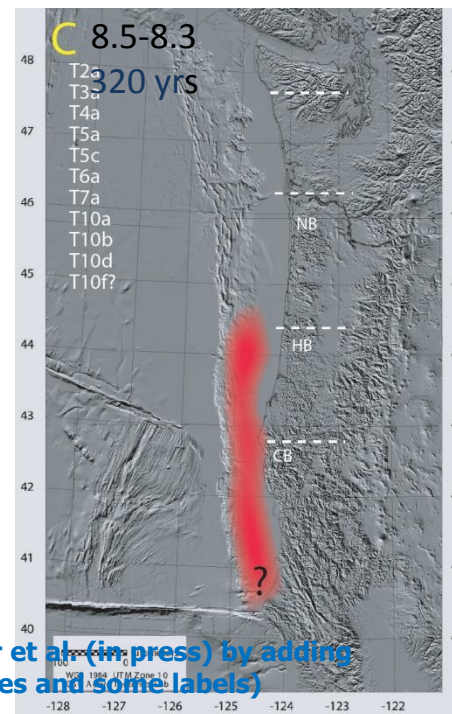
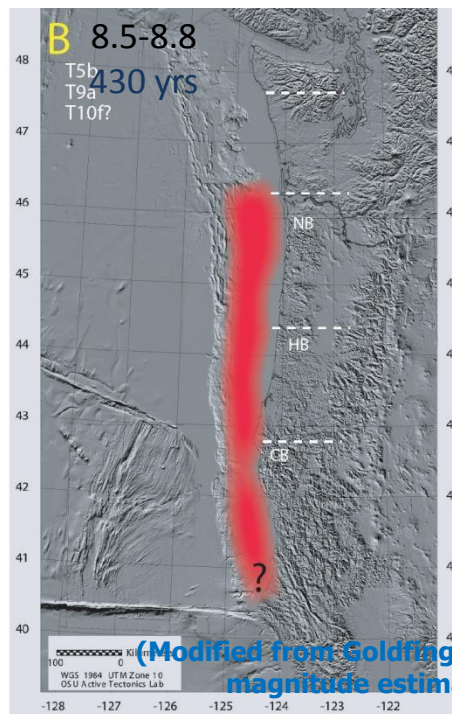
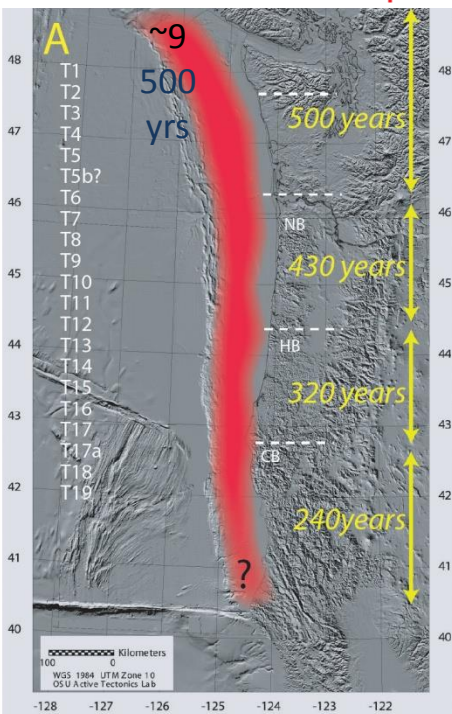


Cascadia Subduction Zone Earthquakes



Earthquake of Magnitude 9+ (fault breaks along entire subduction zone)

Earthquake of Magnitude 8+ (fault breaks along southern half of subduction zone)



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

Cascadia Earthquake Hazards and Risk



March 25, 1993 Scotts Mills Spring Break Earthquake

The Seattle Times
Winner of Nine Pulitzer Prizes

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Thursday, March 25, 1993 - Page updated at 12:00 AM

[E-mail article](#) [Print](#)

Quake Cracks Oregon Capitol -- Temblor Registers 5.4, Causes Minor Injuries

AP: Times Staff

PORTLAND - An earthquake centered in the Cascade foothills east of Silverton rattled northwest Oregon and parts of Western Washington early today, cracking the rotunda of the Oregon Capitol in Salem and causing minor injuries.

The quake, focused about 12 miles deep and about 30 miles southeast of Portland, registered 5.4 on the Richter scale of ground motion at 5:34 a.m. and lasted about 45 seconds.

"It felt like I was on a boat going down rapids. It woke me right up," said Bill Holder, a cook at Rod's Lafayette Restaurant in Lafayette, near the epicenter.

The original wing of the state Capitol in Salem was closed after serious cracks were found in the rotunda, House Speaker Larry Campbell said. A newer wing remained open. Engineers were considering removing the gold-plated pioneer statue on top of the Capitol.

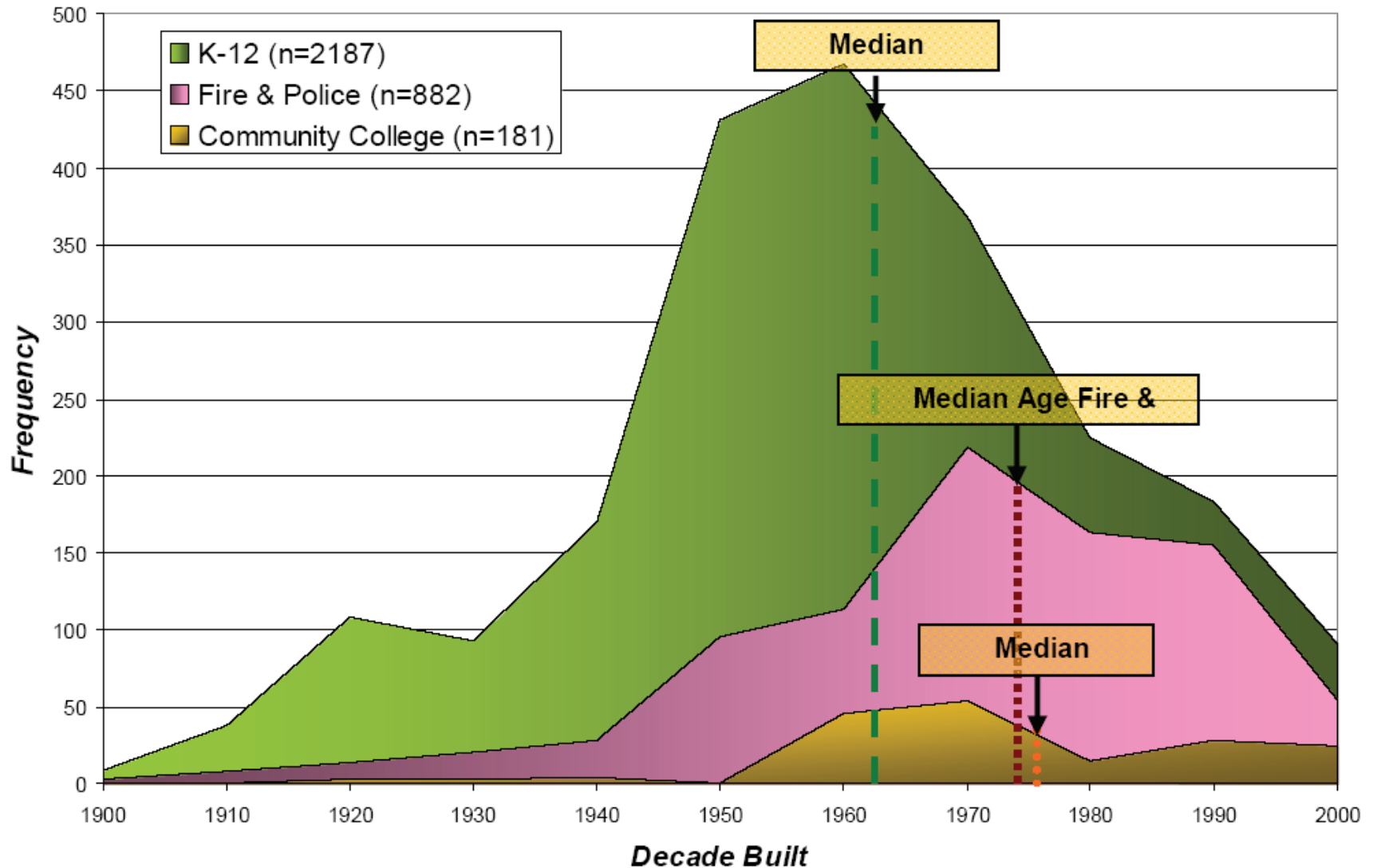
Two people came to the emergency room at Salem Hospital with minor cuts from falling glass.

In Molalla, 27 miles southeast of Portland, two walls at the high school partially collapsed. Bricks and a chimney fell from the school, which was built in 1925.

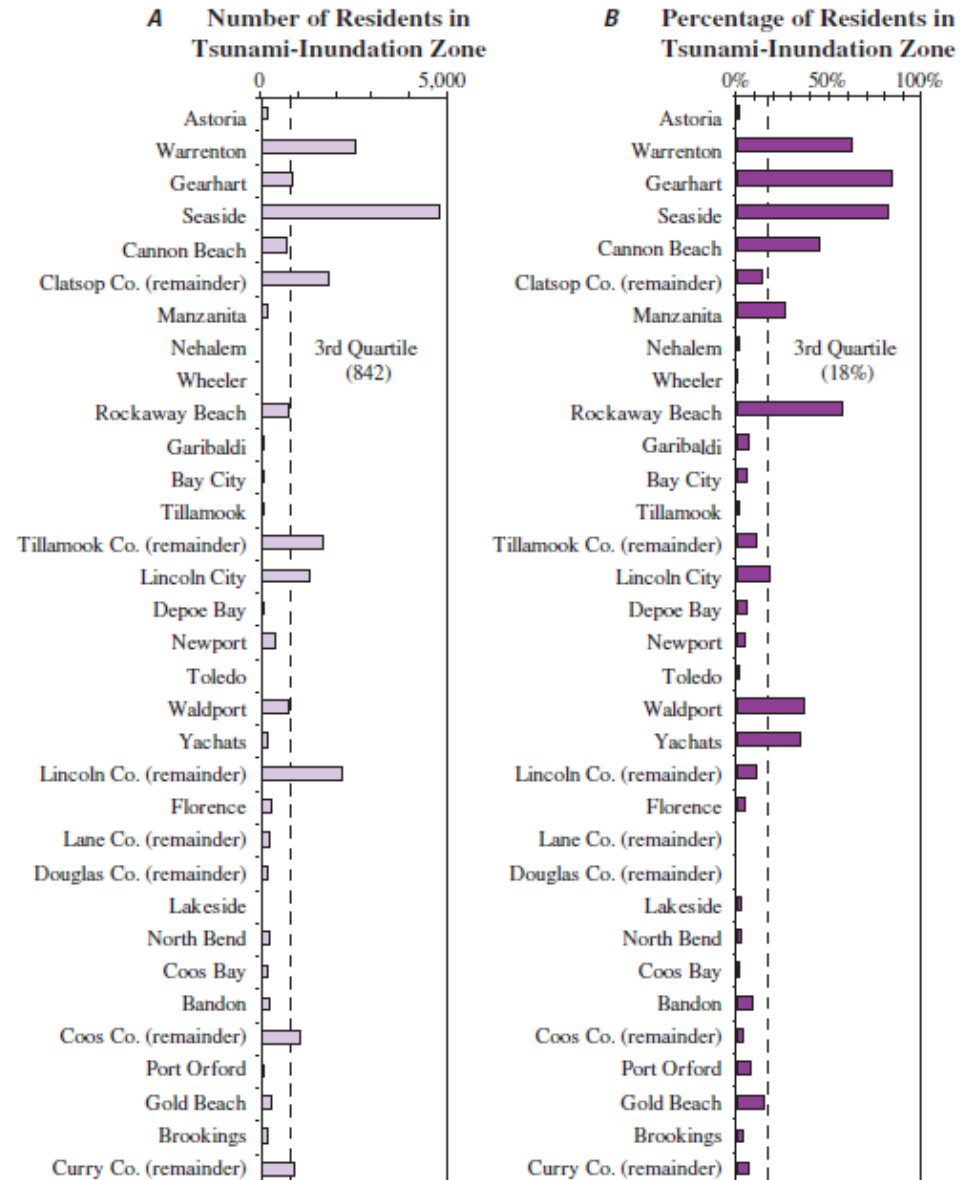
Brick planters and windows also were broken at some homes and businesses in the town of 3,800, and goods were knocked off grocery store shelves.



Oregon Education & Emergency Facilities



Oregon Tsunami Exposure



(Source: Nate Wood/2007, USGS)

Seismic Concerns

- Inadequate seismic knowledge + inadequate codes = widespread deficiencies
- Focus on Schools and Critical Facilities
- Disappointing performance of lifelines in 2007 Oregon Winter Storm
- OR ASCE Lifeline Workshop (2008)
- FEMA/Tsunami Workshop (2009)



House Resolution 3

THE SUNDAY OREGONIAN • JANUARY 9, 2011

LETTERS



D3

THE OREGONIAN'S READERS ON ISSUES

10-YEAR PLAN

State should make itself resilient for a big quake

One year ago this Wednesday, a powerful earthquake devastated Haiti, collapsing homes, schools and businesses and killing at least 230,000 people.

Burdened by poverty, most Haitians had given little thought to earthquakes. After all, none had struck western Haiti since 1842. Though Haiti's agony may seem a world apart from our lives in the Pacific Northwest, Oregon is vulnerable to even stronger earthquakes and the tsunamis they generate.

Our situation is in some respects eerily similar to Haiti's. The most recent quake on the Cascadia fault just off our coast, a huge event about 1,000 times more powerful than the Haitian temblor, struck Jan. 26, 1700. No Oregonian alive today has experienced anything comparable.

Like Haiti, we're not ready for the next big one. Unlike Haiti, we cannot blame poverty for our failure to prepare.

It's time for Oregon to face the risk of earthquakes and tsunamis and build capacity to withstand Cascadia's next mega-quake.

We propose a 10-year, \$1.5 billion Plan for Resilience to strengthen Oregon's schools, bridges and coastal towns. Addressing these priorities now will save lives and keep commerce flowing in the aftermath of a quake and tsunami, en-



YUMEI WANG



JAY RASKIN



EDWARD WOLF

IN OUR OPINION

suring that an inevitable disaster does not also become an unparalleled catastrophe. Here's how:

First, make 1,000 Oregon schools quake-safe. A high proportion of Oregon's 1,306 K-12 schools were built decades before the state's first seismic building code, and many are at high risk of collapse in a strong quake. Each year that we fix 100 schools (at a cost of \$75 million), we will protect 40,000 more children from collapse-prone classrooms.

Second, reinforce 250 critical bridges. An estimated 1,000 bridges on Oregon's highways may fail in a powerful earthquake, disrupting both emergency response and normal commerce. Strengthening the most vulnerable while reduc-

ing imminent risks from landslides and other hazards, at an annual cost of \$70 million, will ensure a minimal transportation backbone in the immediate aftermath of the disaster, and provide a framework for recovery.

Third, construct 10 tsunami evacuation buildings in at-risk coastal towns. Roughly 10 Oregon towns lie within tsunami inundation zones, and some neighborhoods in these communities have no easy route to safe high ground. We can build one new evacuation building—an accessible, elevated platform strengthened to withstand wave forces—each year for \$5 million. Each such well-sited building can potentially save hundreds of residents and visitors in these towns.

Can Oregon afford to invest \$150 million per year in resilience, while we're still struggling in recession? Our answer is yes, if the state's business and philanthropic communities step up as partners with Oregon taxpayers. These critical investments are steppingstones on the path past the state's shortfalls. It's a matter of priorities.

Consider Chile, a nation whose \$165 billion economy matches Oregon's in size. Oregon's income per person of \$40,000 is almost three times Chile's. Yet that country has advanced building codes, a well-maintained infrastructure and a population highly attuned to earthquake risks.

From a modest base, Chile has invested carefully in seismic resilience. Although last year's massive magnitude 8.8 earthquake there caused at least \$30 billion in economic losses, fewer than 500 Chileans died. A comparable quake and tsunami here could cost \$100 billion or more and kill thousands of Oregonians. Investing in resilience now will save both lives and money.

Our 10-year plan for Oregon's schools, bridges and coastal towns would yield other benefits, too, including good jobs in most school districts, as well as expertise that the state could export to other quake- and tsunami-prone regions, much as we now trade on the state's reputation as a leader in sustainability and clean energy.

Implementing this Plan for Resilience would show Oregon at its best, tackling a risk with imagination and resourcefulness while sharing the knowledge gained. The next Cascadia quake will not wait for us. Let's begin this year.

Yumei Wang, an earthquake risk engineer for the state of Oregon, is featured in the Nova documentary "Deadliest Earthquakes," scheduled for broadcast on OPB on Wednesday. Jay Raskin is an architect and the former mayor of Cannon Beach. Edward Wolf is a Portland writer and school safety advocate.

House Resolution 3

76th OREGON LEGISLATIVE ASSEMBLY--2011 Regular Session

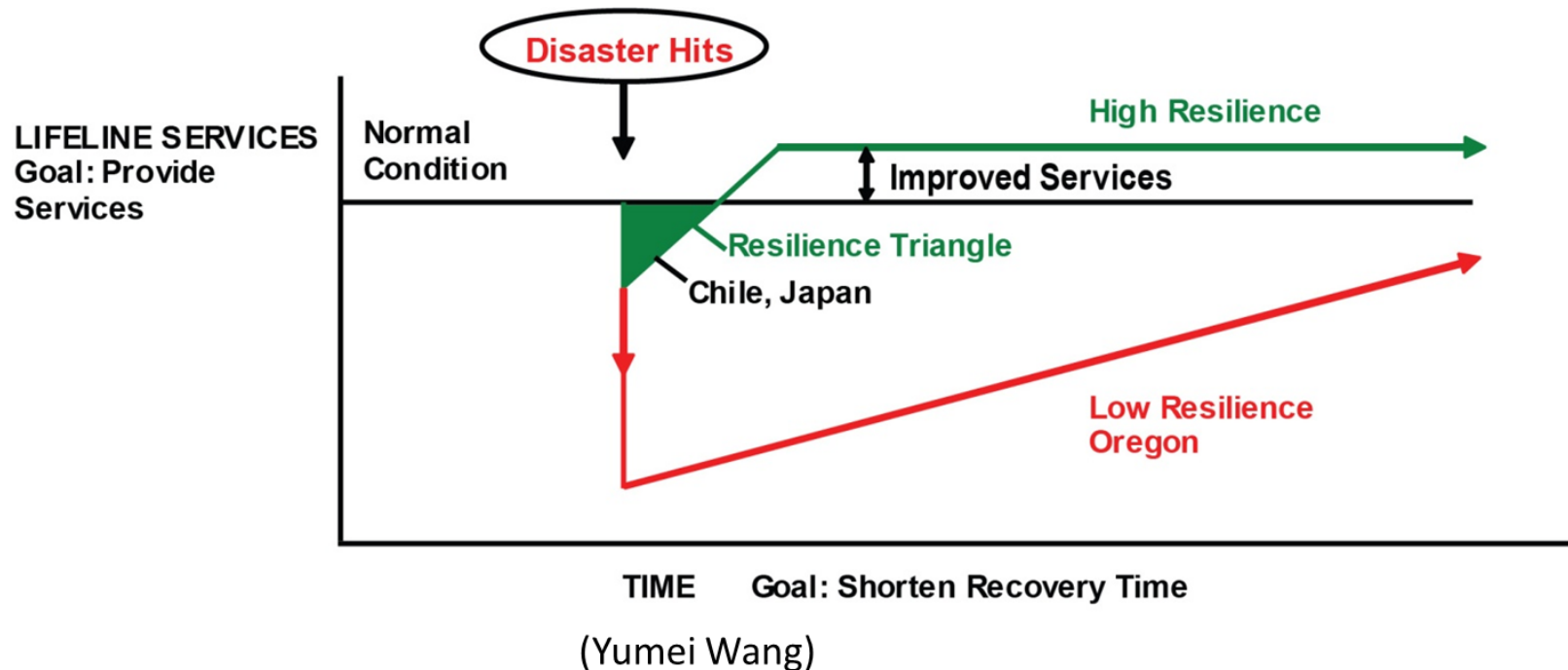
Enrolled

House Resolution 3

Sponsored by Representative BOONE; Representatives COWAN, KRIEGER, ROBLAN, WITT, Senators COURTNEY, JOHNSON, KRUSE, VERGER, WHITSETT

- Directs (OSSPAC) to “lead and coordinate preparation of an Oregon Resilience Plan that . . . makes recommendations on policy direction to protect lives and keep commerce flowing during and after a Cascadia (megathrust) earthquake and tsunami.”

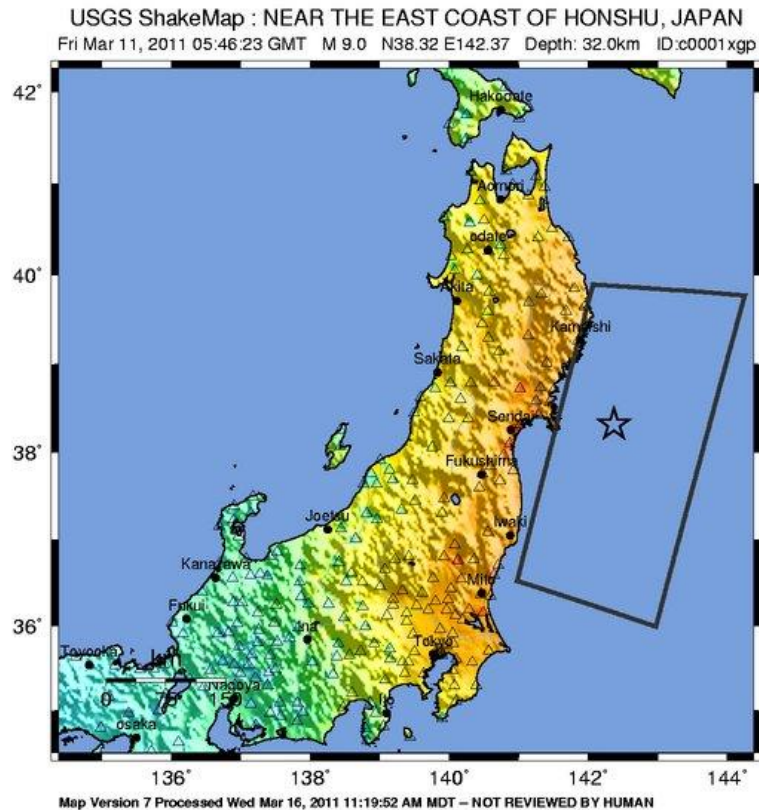
Our Definition of Resilience



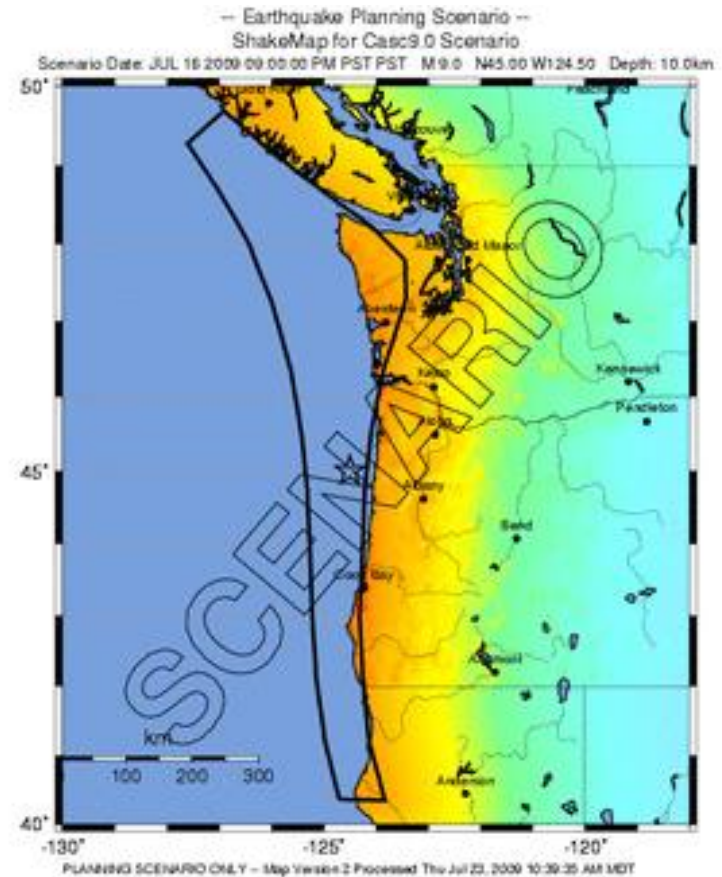
- **Resilience:** Save lives, Reduce Losses, Speed Recovery, & Rebuild Better
- Sustainability without **Resilience** is NOT sustainable!

Magnitude 9.0 Paradigm Shift

Can we learn from other similar events or do we have to learn the hard way?

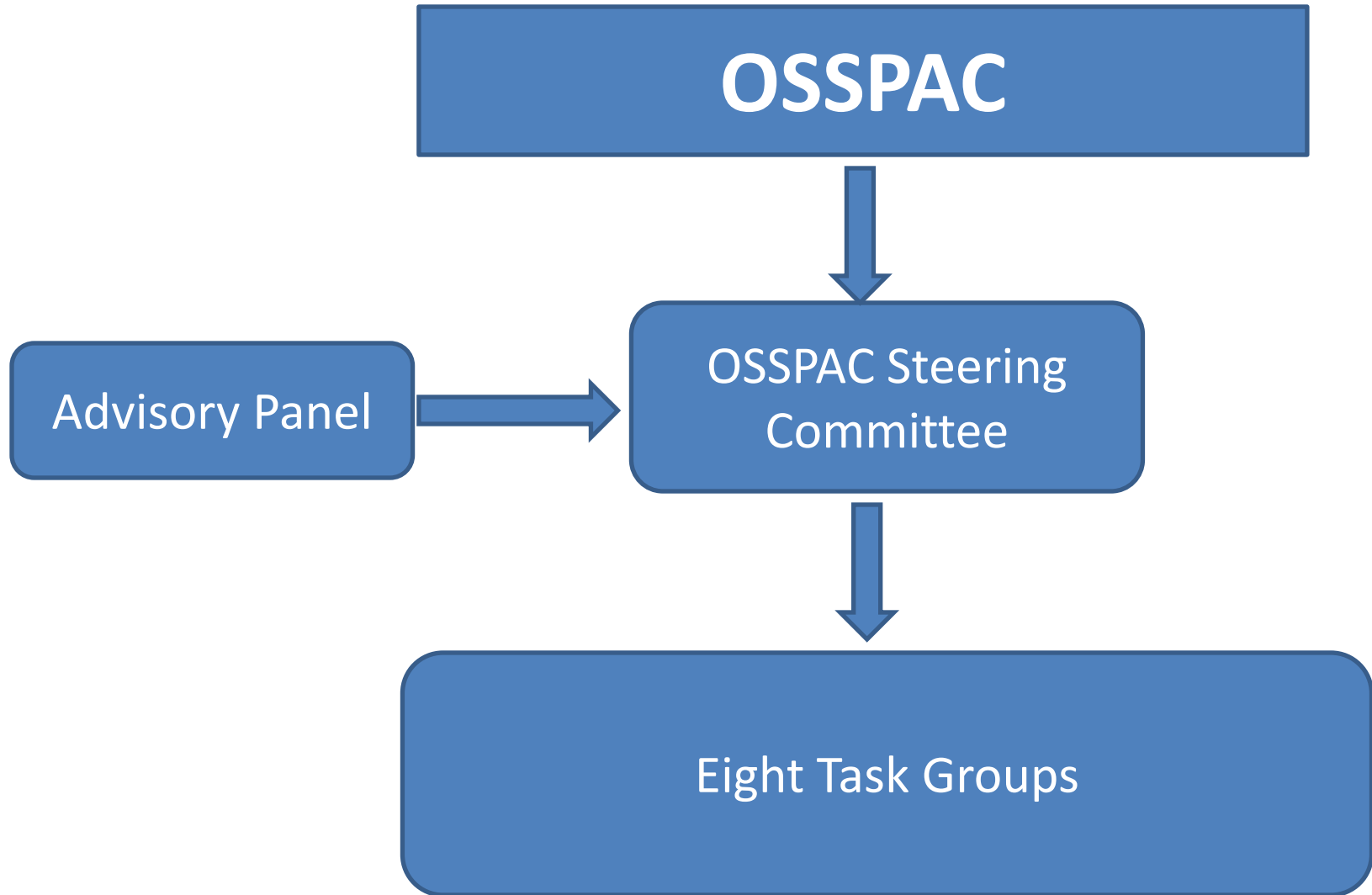


PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
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PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Organizational Structure



Eight Task Groups

Business and Work force
Continuity

Coastal Communities

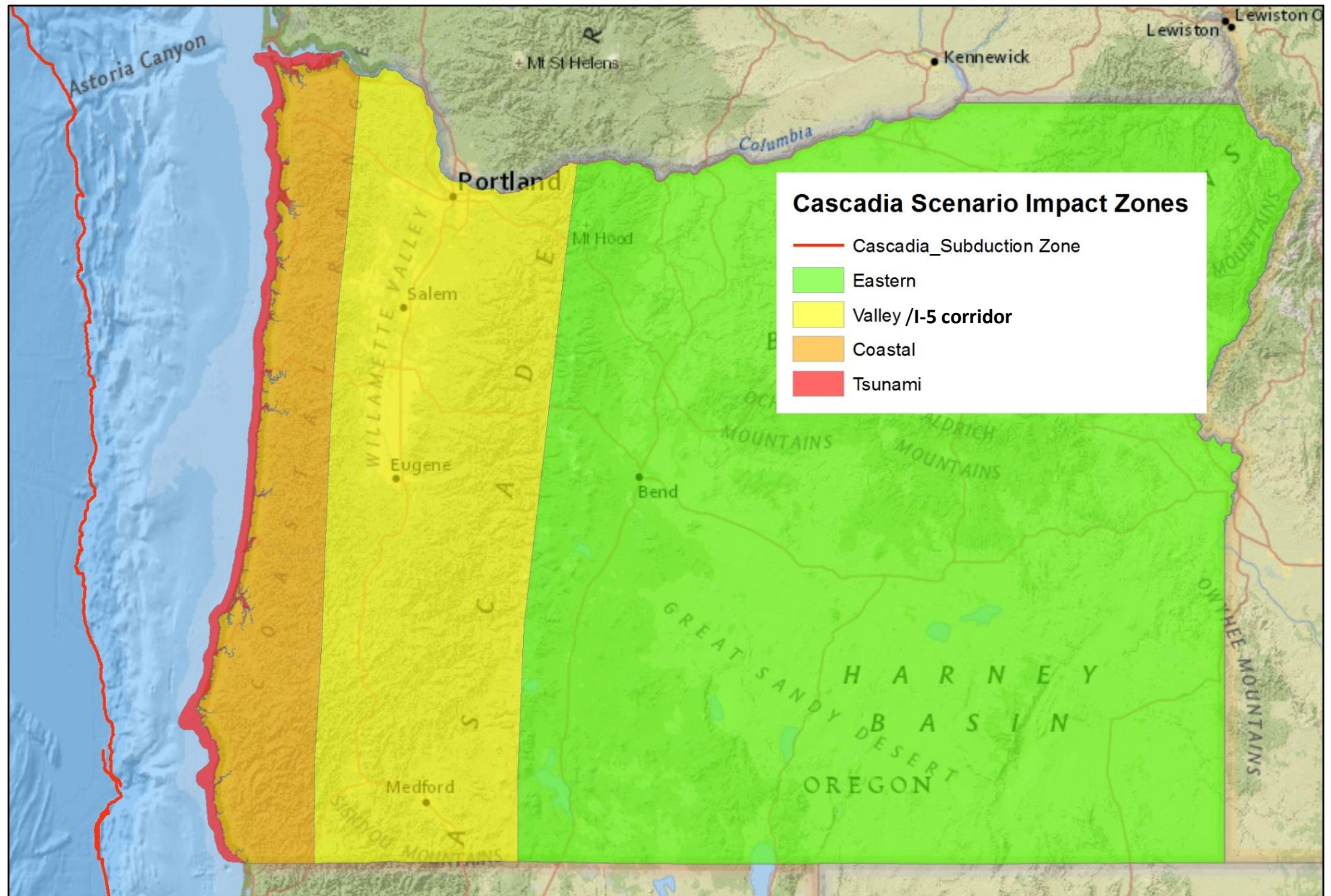


- Critical/Essential Buildings
- Energy
- Information and Communications
- Transportation
- Water and Waste Water



Magnitude 9.0
Earthquake/Tsunami Scenario

Four Zones

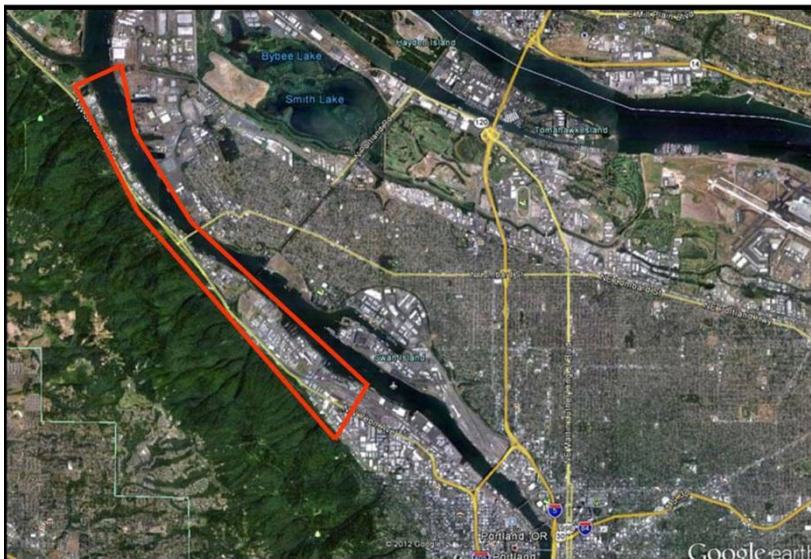


Oregon Resilience Planning Steps

- Assess **performance** of existing critical facilities and lifeline systems, and estimate timeframes required to restore functions at present conditions;
- Develop resilience goals based on business and community needs for each zone;
- Define acceptable target timeframes to restore functions to meet resilience goals; and
- Prepare **recommendations** for statewide policies and actions to achieve the desired performance targets.

Key Findings

- Oregon is far from resilient to the impact of a great Cascadia earthquake today
 - Casualties (1,250 to more than 10,000)
 - Economic Loss (close to 20% state GDP)
 - More than one million truck loads of debris
- Liquid Fuel vulnerability



Key Findings

- Business can only tolerate two to four weeks of disruption of essential services
- Significant resilience gap

Current Resilience Gap

- Business can only tolerate two to four weeks of disruption of essential services

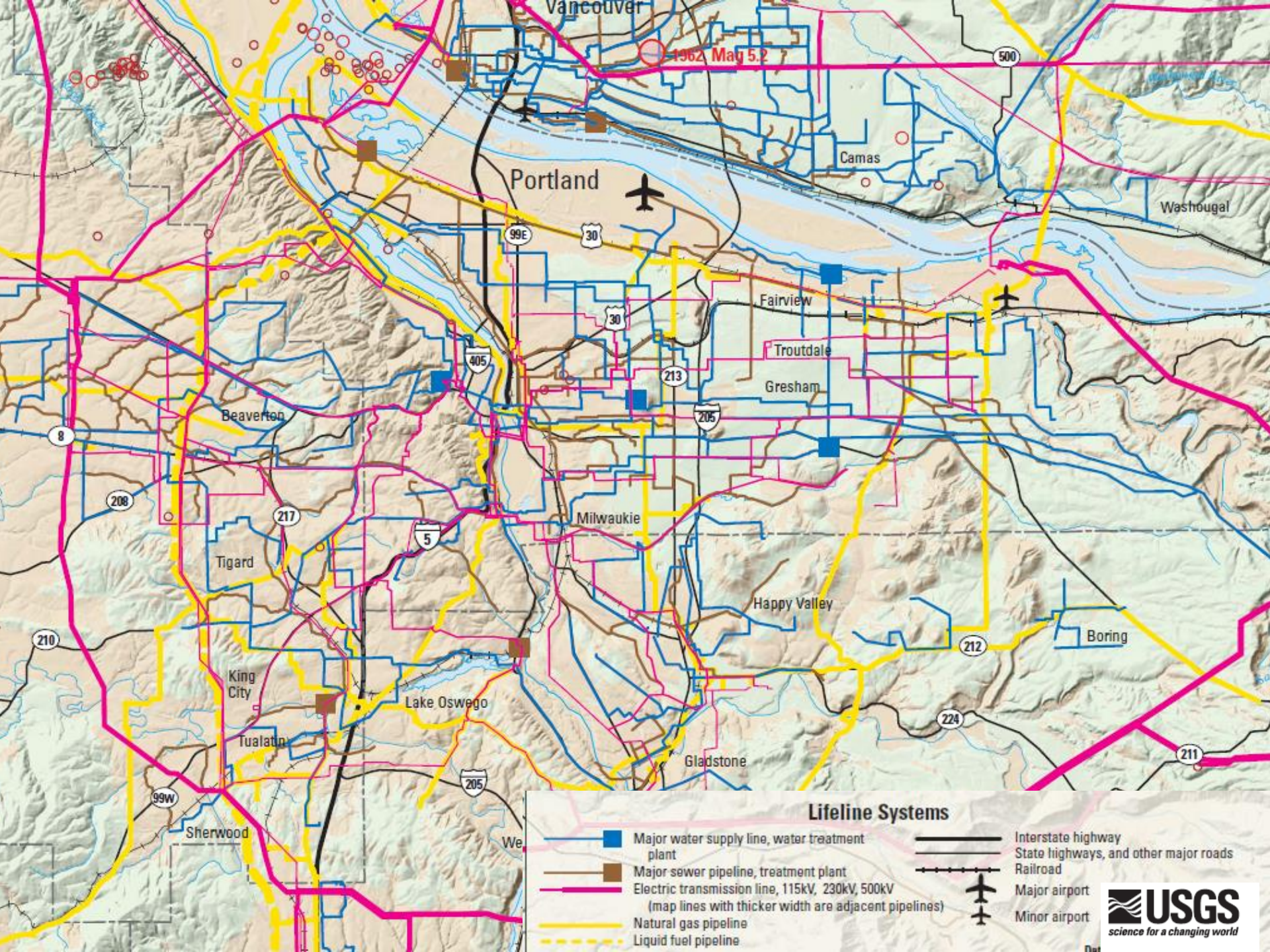
Critical Service	Zone	Estimated Time to Restore Service
Electricity	Valley	1 to 3 months
Electricity	Coast	3 to 6 months
Police and fire stations	Valley	2 to 4 months
Drinking water and sewer	Valley	1 month to 1 year
Drinking water and sewer	Coast	1 to 3 years
Top-priority highways (partial restoration)	Valley	6 to 12 months
Healthcare facilities	Valley	18 months
Healthcare facilities	Coast	3 years

What do the findings mean?

- ❑ Complex Inter-dependencies
- ❑ Damage vs. Impacts
 - ❖ Costs - Replace & Rehabilitate
 - ❖ Capacity - Loss of Service
 - ❖ Value - Society & Economy



Aftermath of an earthquake in Japan, 2004
Photograph by Kimimasa Mayama/Reuters



1962 Mag 5.2

Portland

Camas

Washougal

Fairview

Troutdale

Gresham

Beaverton

Milwaukie

Happy Valley

Boring

Lake Oswego

Gladstone

King City

Tualatin

Sherwood

Lifeline Systems

- Major water supply line, water treatment plant
- Major sewer pipeline, treatment plant
- Electric transmission line, 115kV, 230kV, 500kV
(map lines with thicker width are adjacent pipelines)
- Natural gas pipeline
- Liquid fuel pipeline

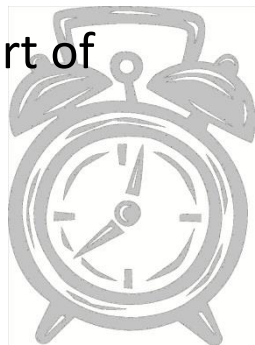
- Interstate highway
- State highways, and other major roads
- Railroad
- Major airport
- Minor airport

Slow and Frustrating Recovery



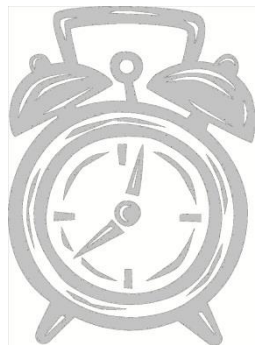
Overarching Recommendations

- Establish a State Resilience Office to provide leadership, resources, advocacy, and expertise in implementing statewide resilience plans
- Undertake comprehensive seismic assessments of the key structures and systems that underpin Oregon's economy;
 - Statewide inventory of critical buildings for emergency response and economic recovery in public and private sectors
 - Transportation (Ports, Railroads, and local bridges)
 - Energy and information and communications sectors
 - Seismic risk assessment/mitigation of Water and Wastewater as part of periodic updates to facility plans



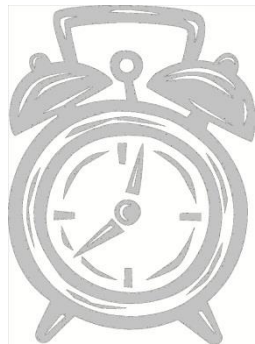
Overarching Recommendations

- Launch a sustained program of capital improvement in Oregon's public structures;
 - Fully funding Oregon's grant program for schools and emergency facilities
 - Seismically upgrade lifeline transportation routes into and out of major business centers statewide by 2030
- Craft a package of incentives to engage Oregon's private sector to advance seismic resilience;
- Update Oregon's public policies

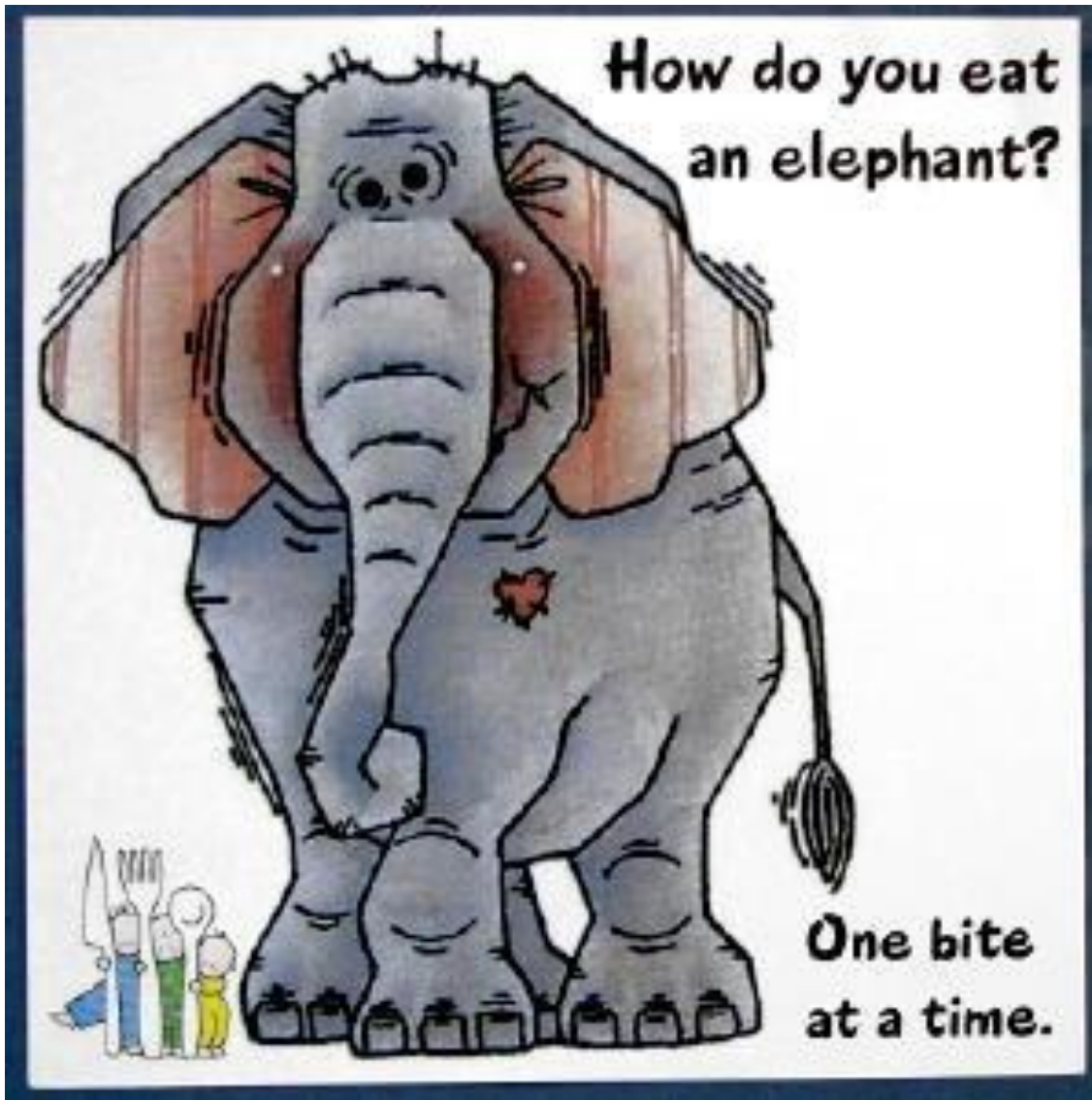


Looking Ahead

- Propose to work with Oregon's Legislative Assembly to keep the 50-year goal in view
- Community-level Planning
- Joint regional planning with Washington State
- Human Resilience
- Civic infrastructure



How to Implement it?



Resilience in Action - Coast

- ❖ Waldport High School is the first FEMA tsunami acquisition project in the country. Lincoln County School District secured a bond to rebuild a new high school on the hill above the city.
- ❖ As of December 19, 2012, the Seaside School Board approved a resolution to authorize the superintendent to hire an architect to begin designing a new school campus, which would be constructed above the tsunami inundation zone. A long-anticipated bond measure to support this effort is expected to be on the ballot in May 2013.
- ❖ As of December 12, 2012, the Cannon Beach City Council agreed to acquire 55 acres to expand the city limits for a new school site above the tsunami inundation zone.

Resilience in Action - Schools

❖ State Seismic Rehabilitation Grant Program

- Funded 25 schools throughout the state
- Will save lives of more than 8000 students

❖ Portland Public Schools

❖ Oregon University Systems: Many universities buildings have been retrofitted or will be retrofitted in the near future.

❖ Private Universities: Some private university buildings have been renovated.

Resilience in Action – Emergency Facilities

❖ State Seismic Rehabilitation Grant Program

- Funded 18 Facilities

Emergency Services	
<u>Entity</u>	<u>Project</u>
Tuality Healthcare	Tuality Hospital, Building A
City of Dallas Fire Department	Dallas Fire Station
City of Albany Fire Department	Station 12
City of Gresham Fire & Emergency Services	Stations 71 (Public Safety Building) & 72
Netarts Oceanside Fire District	Station 61
City of St. Helens Police Department	St. Helens Police Station
Klamath County Fire District No. 1	Station 6
City of Eugene	Danebo Fire Station Number 8
Silverton Fire District	Scotts Mills Station
Oregon Health & Science University	University Hospital South
City of Coos Bay	Coos Bay City Hall

Awarded in 2009
to 2010

Emergency Services	
<u>Entity</u>	<u>Project</u>
Langlois RFPD	Langlois Fire Station
City of Garibaldi	Garibaldi Fire Station
City of Grants Pass	Hillcrest Public Safety Building
City of Astoria	Public Safety Building
Santa Clara Fire District	Station 1
City of Hood River	Hood River Fire Department
Woodburn RFPD	Station 22

Awarded in 2010
to 2011

Resilience in Action – Emergency Facilities

❖ City of Portland:

- Renovated nearly all of their fire stations
- Constructing a new Emergency Communication Center

❖ TVFR

- On going program to renovated their fire stations



Resilience in Action – Transportation



1947 original and 1999 detour



Tsunami Resistant Bridge: US 101
Spencer Creek Bridge

<http://www.slayden.com/us-101-spencer-creek-bridge/>

Resilience in Action – Water



50 MG Powell Butte Reservoir
City of Portland PWB



Thank You

Earthquake/Tsunami Group

- Led by Ian Madin (DOGAMI)
- Magnitude 9.0 Earthquake/Tsunami Scenario Group will develop:
 - 1) Ground shaking intensity maps
 - 2) Tsunami Inundation maps
 - 3) Landslide and liquefaction maps



Liquefaction



Source: EERI, 2001

Lateral Spreading

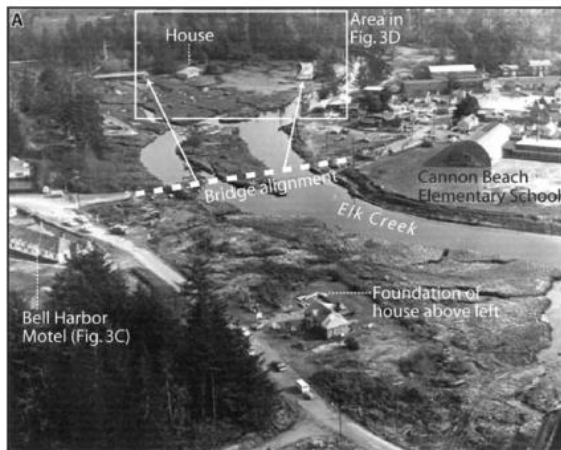


Business/Community Continuity Group

- Led by Susan Stewart (BOMA) and Gerry Williams (OSSPAC)
- Goals:
 - Raise Earthquake/Tsunami Awareness
 - Gauge Earthquake/Tsunami Preparedness
 - Gather input/ideas from Business for other workgroups to define resilience targets and improve resilience plan

Coastal Communities Group

- Led by Jay Wilson/Jay Raskin
- Tsunami Risk Mitigation Group will address the following:
 - Tsunami evacuation
 - Zoning and Land use policy
 - Critical facilities
 - Re-building community
 - Debris management



Critical Building Group

- Led by Ed Quesenberry and Trent Nagele (SEAO)
- The Critical Building Task Group will address the buildings listed below:
 - Emergency Operations Centers
 - Education facilities (K-12, College and University);
 - Healthcare facilities (Hospitals and MOBs)
 - Police and Fire Stations
 - Critical government administration/services facilities
 - Emergency sheltering facilities
 - Community retail centers
 - Financial/banking Buildings
 - Residential Housing
 - Killer buildings (URM and non-ductile RC buildings)

URMs and Non-ductile Concrete



Energy Group

- Led by Stan Watters (OSSPAC/Port of Portland) and JR Gonzalez (formerly OPUC)
- The Energy Task Group will address the systems listed below:

Electricity

Natural Gas

Liquid Fuel

Alternate Energy – Solar, Wind and others

Dams



Transportation Group

- Led by Bruce Johnson (ODOT)
- The Transportation Task Group will address the systems listed below:

Bridges (owned by ODOT, Counties or Cities)

Airports and Seaports

Railroads

Mass Transit (Trimet)

Columbia River



Lifeline Routes



Information and Communications Group

- Led by Mike Mumaw (OSSPAC/Beaverton)
- The Information and Communications Task Group will address the systems listed below:

Communication Network and Database
Telecommunication Infrastructure

Water and Waste Water Group

- Led by Mike Stuhr (PWB) and Mark Knudson (TVWD)
- The Water and Wastewater Task Group will address the systems listed below:

Water storage, transmission, and distribution systems (including Dams)

Wastewater collection systems and treatment plants

