



FEMA



# Oregon Tribal Environmental Forum

## Emergency Planning: Earthquakes & Tsunamis

Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians  
Florence, Oregon – November 2, 2015

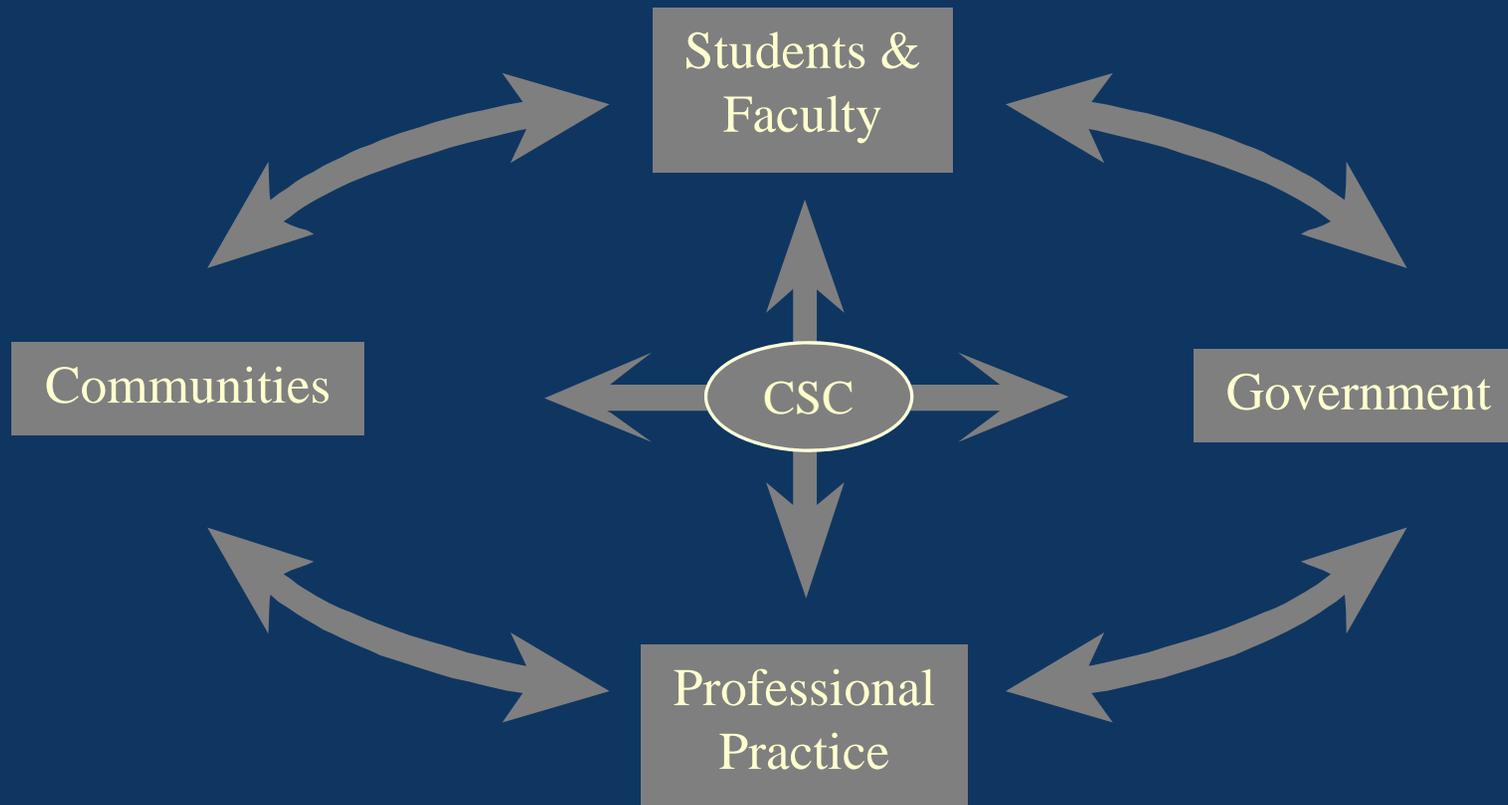
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*Director*

Oregon Partnership for Disaster Resilience  
Community Service Center, University of Oregon  
jdbruce@uoregon.edu



The **CSC** links the energy, expertise and innovation of the University of Oregon with the planning and public policy needs of Oregon communities.



# The Classroom and the Community

- ◆ The classroom provides a foundation for community-based learning
  - ◆ Analytical skills
  - ◆ Theory, history

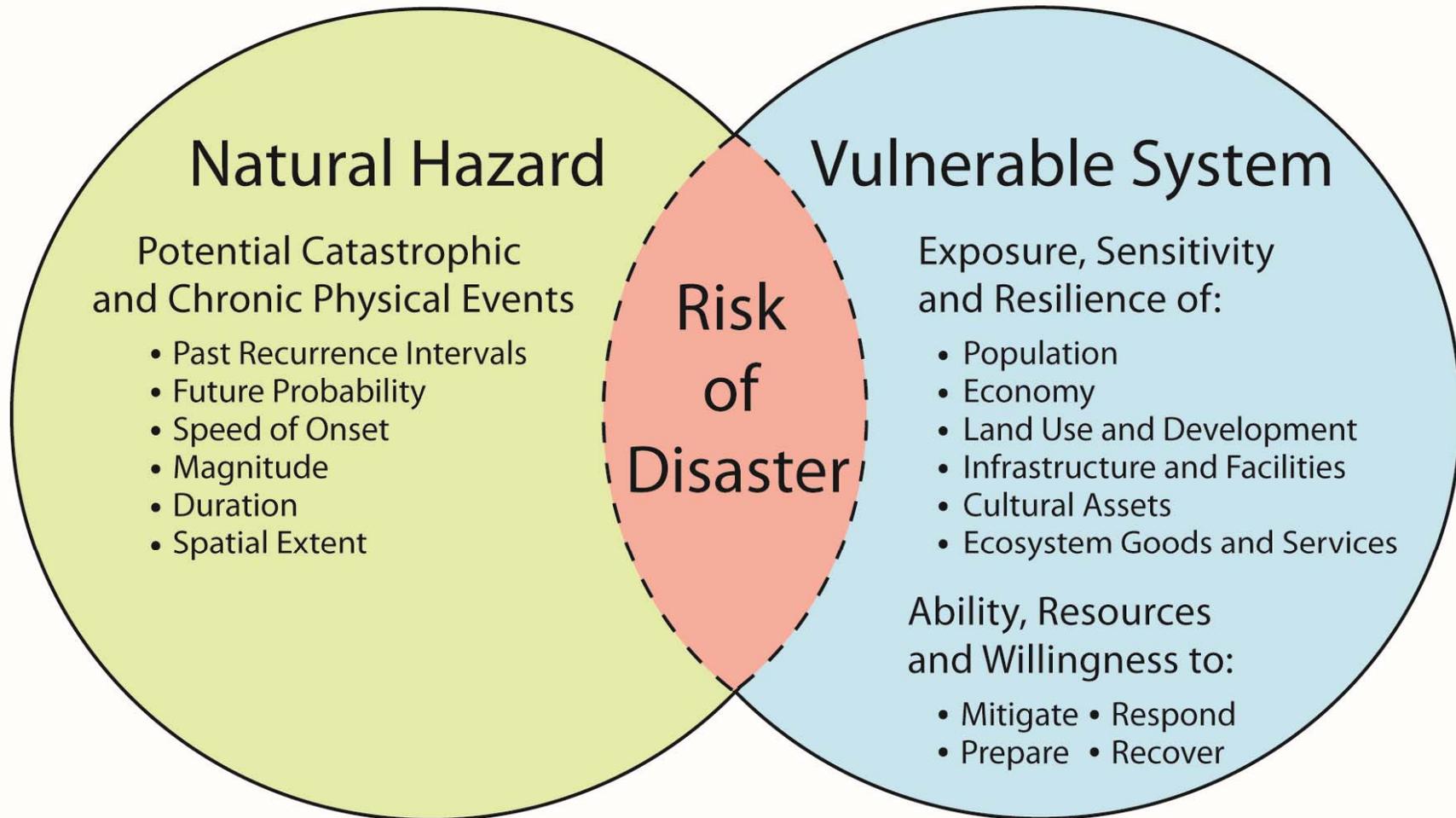


The *community* provides the framework and motivation for learning

- Real problems
- Real people

# CSC Focus Areas:

- ◆ Natural Resources
- ◆ Social Planning
- ◆ Community and Economic Development
- ◆ Energy
- ◆ Food Systems
- ◆ Housing
- ◆ Transportation
- ◆ Parks & Recreation Planning
- ◆ Natural Hazards and Community Resilience



Source: USGS- Oregon Partnership for Disaster Resilience Research Collaboration, 2006

# MITIGATION

- ◆ Hazard Mitigation Planning: Act Before Disaster Strikes
- ◆ Mitigation: any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event



- ◆ Strategies: Policy Changes, Education and Outreach, Capital Projects
- ◆ Yield: Fewer casualties, less disruption, shorter recovery

# MITIGATION ACTION EXAMPLES

## Policy

- The City shall participate in the CRS program
- The City shall develop guidelines for the clearing of snow and placement of snow banks to reduce the likelihood of flooding.

## Project

- Retrofit bridges that are not seismically adequate
- Clean flood prone waterways

## Process

- Establish a hazard mitigation planning committee
- Integrate the Mitigation Plan findings into planning and regulatory documents and programs.

# SOME ISSUES TO CONSIDER

- ◆ Western economic model constrains long-term planning
- ◆ Centralization of infrastructure limits diversity and redundancy
- ◆ Focus on built (engineered systems) limits multi-objective, nature-based options
- ◆ Over-emphasis on scientific knowledge misses lessons from oral history and indigenous knowledge

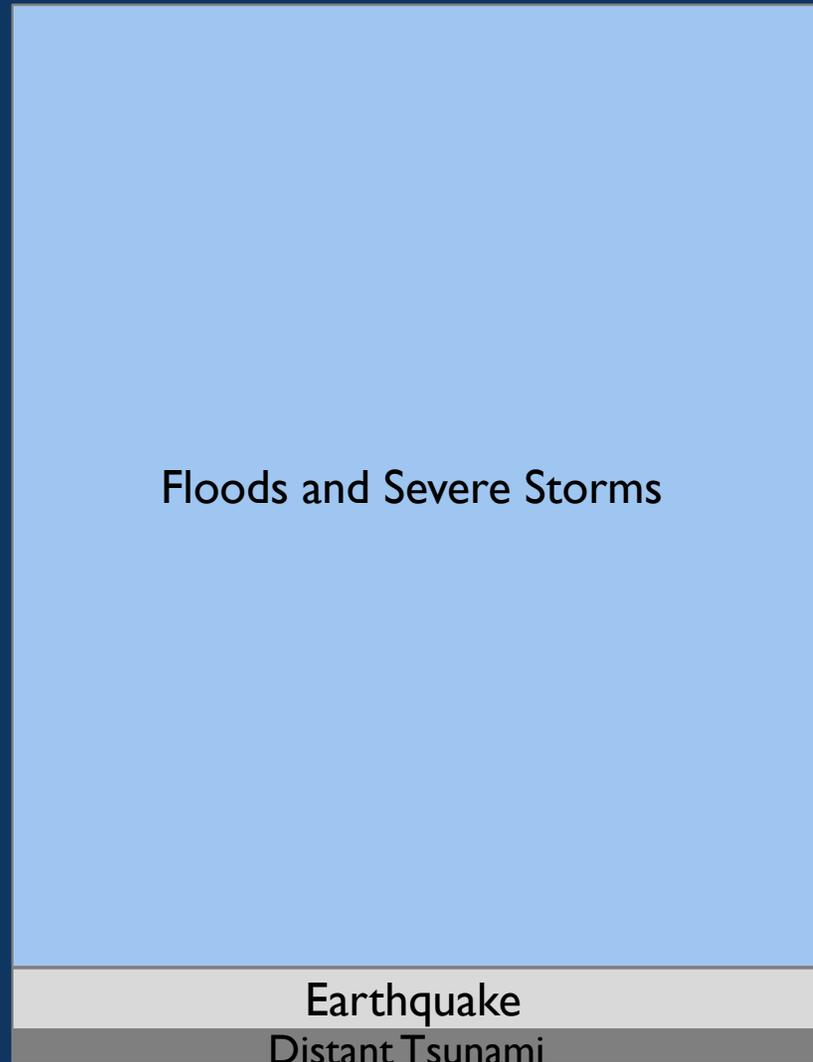
# Oregon Natural Hazards

- ◆ Coastal Erosion
- ◆ Drought
- ◆ Dust Storm
- ◆ Earthquake
- ◆ Wildfire
- ◆ Flood
- ◆ Landslide
- ◆ Tsunami
- ◆ Volcano
- ◆ Windstorm
- ◆ Winter storm



# 29 Oregon Disaster Declarations

Number	Date	Incident Description	Declaration Type
1036	8/2/1994	El Nino Effects (The Salmon Industry)	Major Disaster Declaration
1061	8/3/1995	Flash Flooding	Major Disaster Declaration
69	3/1/1957	FLOOD	Major Disaster Declaration
49	12/29/1955	FLOOD	Major Disaster Declaration
853	1/24/1990	Flooding, Severe Storm	Major Disaster Declaration
144	2/25/1963	FLOODS	Major Disaster Declaration
184	12/24/1964	Heavy Rains & Flooding	Major Disaster Declaration
1221	6/12/1998	Oregon Flooding	Major Disaster Declaration
136	10/16/1962	SEVERE STORMS	Major Disaster Declaration
319	1/21/1972	SEVERE STORMS, FLOODING	Major Disaster Declaration
1733	12/8/2007	Severe Storms, Flooding, Landslides, and Mudslides	Major Disaster Declaration
1672	12/29/2006	Severe Storms, Flooding, Landslides, and Mudslides	Major Disaster Declaration
1632	3/20/2006	Severe Storms, Flooding, Landslides, and Mudslides	Major Disaster Declaration
413	1/25/1974	SEVERE STORMS, SNOWMELT, FLOODING	Major Disaster Declaration
1099	2/9/1996	Severe Storms/Flooding	Major Disaster Declaration
1107	3/19/1996	Severe Storms/High Winds	Major Disaster Declaration
4169	4/4/2014	Severe Winter Storm	Major Disaster Declaration
1683	2/22/2007	Severe Winter Storm and Flooding	Major Disaster Declaration
4055	3/2/2012	Severe Winter Storm, Flooding, Landslides, and Mudslides	Major Disaster Declaration
1956	2/17/2011	Severe Winter Storm, Flooding, Mudslides, Landslides, And Debris Flows	Major Disaster Declaration
1824	3/2/2009	Severe Winter Storm, Record and Near Record Snow, Landslides, and Mudslides	Major Disaster Declaration
1510	2/19/2004	Severe Winter Storms	Major Disaster Declaration
1160	1/23/1997	Severe Winter Storms/Flooding	Major Disaster Declaration
1405	3/12/2002	Severe Winter Windstorm with High Winds	Major Disaster Declaration
60	7/20/1956	STORM, FLOOD	Major Disaster Declaration
301	2/13/1971	STORMS, FLOODING	Major Disaster Declaration
985	4/26/1993	Earthquake	Major Disaster Declaration
1004	10/15/1993	Earthquakes	Major Disaster Declaration
1964	3/25/2011	Tsunami Wave Surge	Major Disaster Declaration



# Or Fire Management Assistance

Number	Date	Incident Description	Declaration Type
5056	6/8/2014	Two Bulls Fire	Fire Management Assistance Declaration
5046	8/18/2013	Government Flats Fire Complex	Fire Management Assistance Declaration
5039	8/2/2013	Brimstone Fire	Fire Management Assistance Declaration
5037	7/28/2013	Douglas Fire Complex	Fire Management Assistance Declaration
5036	7/19/2013	Pacifica Fire	Fire Management Assistance Declaration
2838	9/22/2009	South County Fire Complex	Fire Management Assistance Declaration
2829	8/28/2009	Microwave Fire	Fire Management Assistance Declaration
2787	9/17/2008	Royce Butte Fire	Fire Management Assistance Declaration
2727	9/3/2007	GW Fire	Fire Management Assistance Declaration
2712	7/12/2007	Egley Fire Complex	Fire Management Assistance Declaration
2659	7/27/2006	Black Crater Fire	Fire Management Assistance Declaration
2657	7/25/2006	Foster Gulch Fire Complex	Fire Management Assistance Declaration
2579	8/25/2005	Deer Creek	Fire Management Assistance Declaration
2549	8/21/2004	Bland Mountain #2 Fire	Fire Management Assistance Declaration
2539	8/4/2004	Redwood Highway Fire	Fire Management Assistance Declaration
2496	9/6/2003	Cove Road Fire	Fire Management Assistance Declaration
2495	9/2/2003	Herman Creek Fire	Fire Management Assistance Declaration
2493	8/20/2003	Booth Fire	Fire Management Assistance Declaration
2455	7/29/2002	Cache Mountain Fire	Fire Management Assistance Declaration
2454	7/28/2002	Timbered Rock Fire	Fire Management Assistance Declaration
2453	7/28/2002	Florence Fire	Fire Management Assistance Declaration
2452	7/26/2002	Sheldon Ridge Fire	Fire Management Assistance Declaration
2448	7/19/2002	Flagtail Fire	Fire Management Assistance Declaration
2445	7/17/2002	Squire Peak Fire	Fire Management Assistance Declaration
2444	7/16/2002	Winter Fire	Fire Management Assistance Declaration
2443	7/16/2002	Eyerly Fire	Fire Management Assistance Declaration
2380	8/17/2001	Monument Fire Complex	Fire Management Assistance Declaration
2375	8/15/2001	Bridge Creek Fire	Fire Management Assistance Declaration
2189	8/24/1996	Skelton/Evans West Fire	Fire Management Assistance Declaration
2187	8/12/1996	Wheeler Fire	Fire Management Assistance Declaration
2112	8/24/1994	Hull Mountain Fire	Fire Management Assistance Declaration
2083	8/4/1992	East Evans Creek Fire	Fire Management Assistance Declaration
2084	8/4/1992	Lone Pine Fire	Fire Management Assistance Declaration
2082	6/11/1992	Round Lake Fire	Fire Management Assistance Declaration
2081	6/9/1992	Sage Flats Fire	Fire Management Assistance Declaration
2075	8/5/1990	Aubrey Hall Fire	Fire Management Assistance Declaration
2069	8/26/1988	Walker Mountain Fire	Fire Management Assistance Declaration
2066	10/10/1987	Shady Lane Fire	Fire Management Assistance Declaration
2062	9/2/1987	Frozen Creek Fire	Fire Management Assistance Declaration
2063	9/2/1987	Savage Creek Fire	Fire Management Assistance Declaration
2064	9/2/1987	Sykes Creek Fire	Fire Management Assistance Declaration
2060	7/16/1987	Bland Mountain Fire	Fire Management Assistance Declaration
2046	8/27/1984	La Pine/Wampus Butte Fire	Fire Management Assistance Declaration
2043	9/15/1981	Peavine Peak	Fire Management Assistance Declaration
2041	7/29/1981	Round Lake Fire	Fire Management Assistance Declaration
2036	8/3/1979	Pine Grove Fire	Fire Management Assistance Declaration
2035	7/26/1979	Sisters Fire	Fire Management Assistance Declaration
2034	7/25/1979	Bridge Creek Fire	Fire Management Assistance Declaration
2030	8/11/1978	Grave Creek Fire	Fire Management Assistance Declaration
2014	9/7/1973	Hillsview Fire	Fire Management Assistance Declaration
2013	9/4/1973	Doe Creek Fire	Fire Management Assistance Declaration
2011	8/20/1973	Orindale Draw Fire	Fire Management Assistance Declaration
2010	8/18/1973	Rocky Creek Fire	Fire Management Assistance Declaration
2008	8/17/1973	Perry Canyon Fire	Fire Management Assistance Declaration

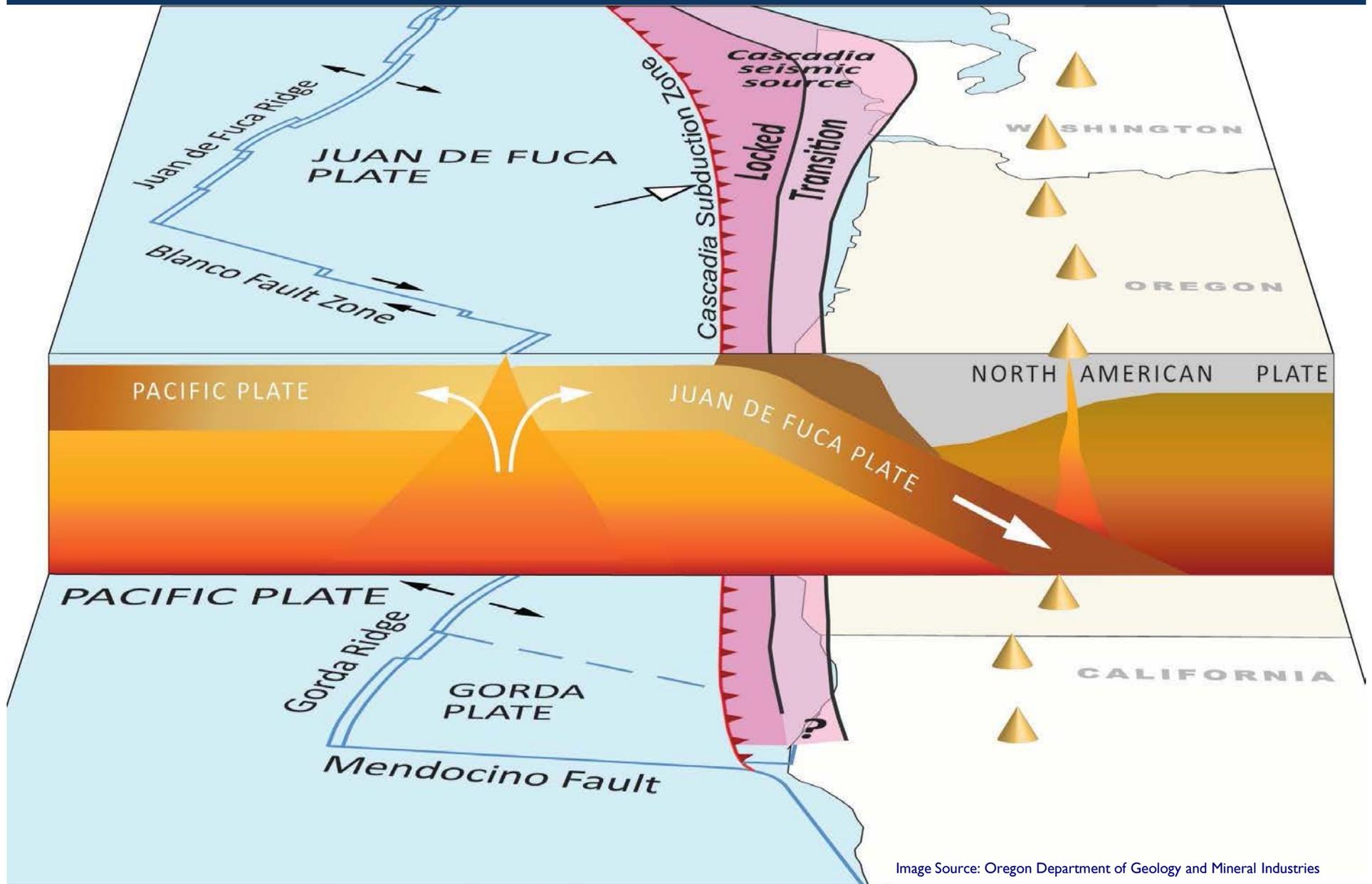
2013 + 2014

2000s (23)

'70s, 80's & '90s (26)

... 54 additional fire management assistance declarations, so far ...

# Cascadia Subduction Zone



# Comparison to 2011 Tohoku earthquake and tsunami

Subduction zone offshore Japan



Subduction zone offshore Oregon



Oregon Department  
of Geology and  
Mineral Industries,  
[http://www.oregon  
geology.com/pubs/c  
ascadia/CascadiaWi  
nter2012.pdf](http://www.oregon<br/>geology.com/pubs/c<br/>ascadia/CascadiaWi<br/>nter2012.pdf)

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

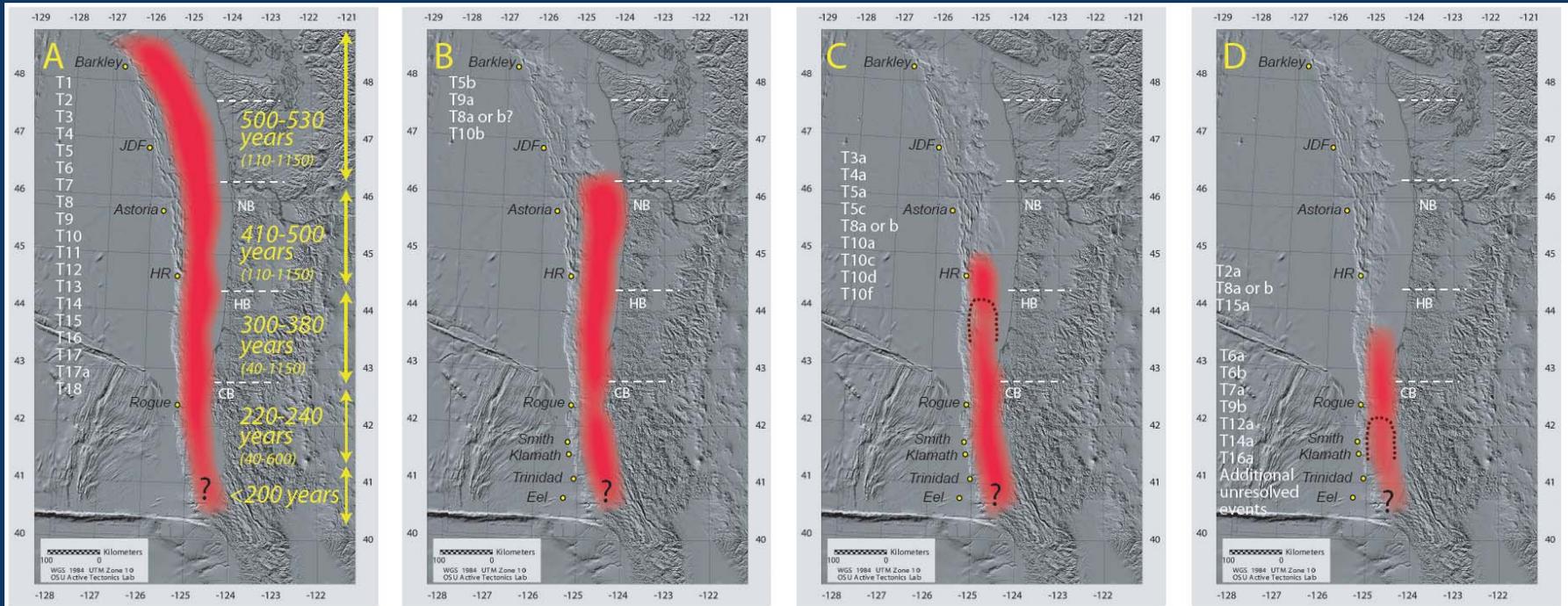


Figure EQ-6: Summary diagram showing Cascadia megathrust earthquake history over the last 10,000 years, “T” numbers identify individual earthquakes. Four distinct modes are seen, ranging from the 19 full-length ruptures in panel A (~M 9) to the 10 smaller ruptures in panel D. Figure from Goldfinger and others, 2011.

# The Oregon Resilience Plan

## The Oregon Resilience Plan

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

Report to the  
77<sup>th</sup> 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

# 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

# Physical Changes during CSZ Earthquake

Ground shaking [central.com](http://central.com)



Liquefaction



Subsidence



Landslides



# Building Impacts

<http://japanpropertycentral.com>



Photo Source: CERA, Ross Becker

Source: University of Washington International Earthquake Clearinghouse



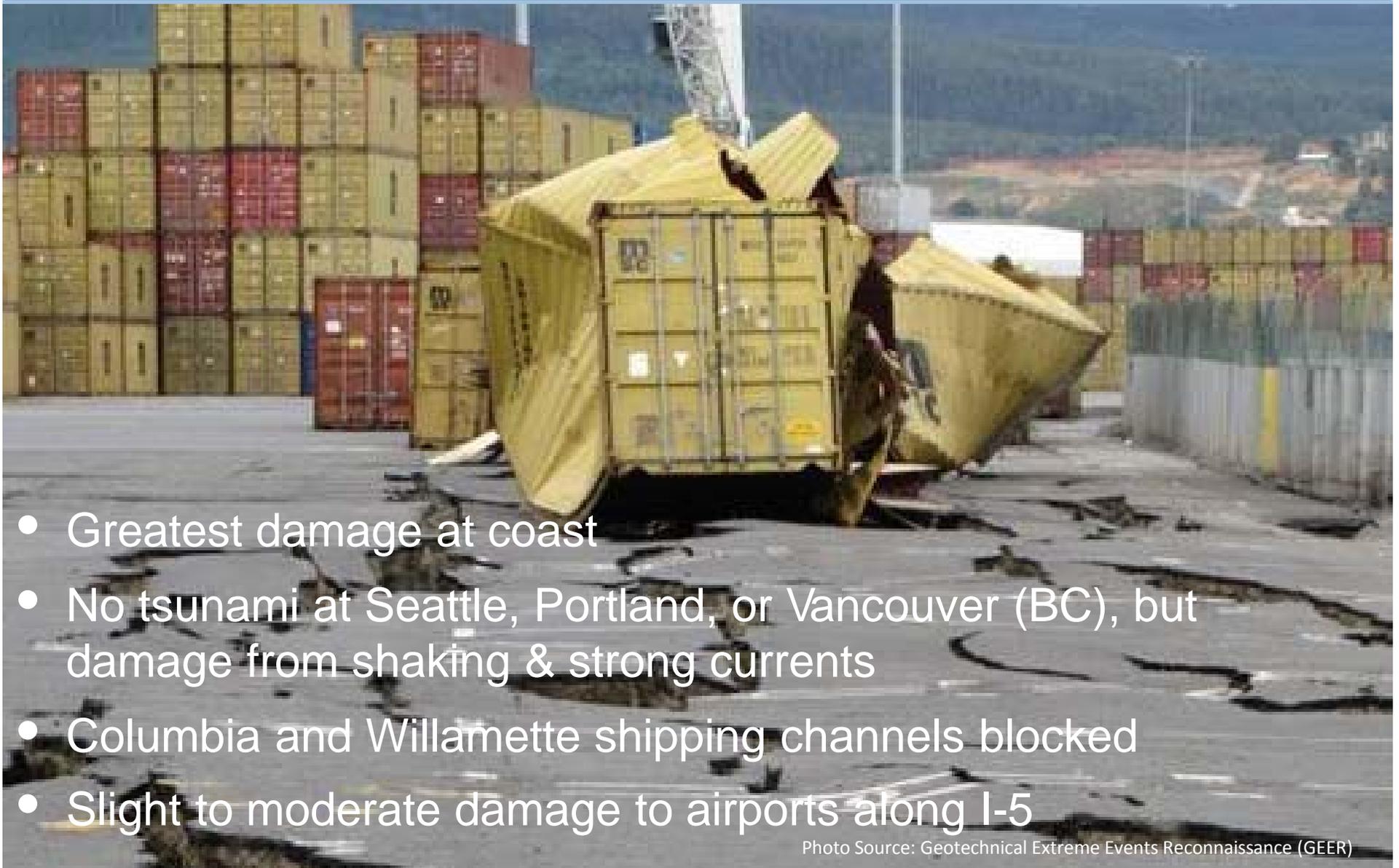
# Impacts to Transportation Networks

- 19 bridges on Oregon's Interstate 5 heavily damaged
- 56 of 135 bridges on U.S. Hwy 101 in Oregon collapse
- Disrupted rail service due to bridge damage (Portland, Olympia, Seattle)



Photo by G.W. Thorsen, Washington Division of Geology and Earth Resources.

# Ports, Shipping Channels, and Airports

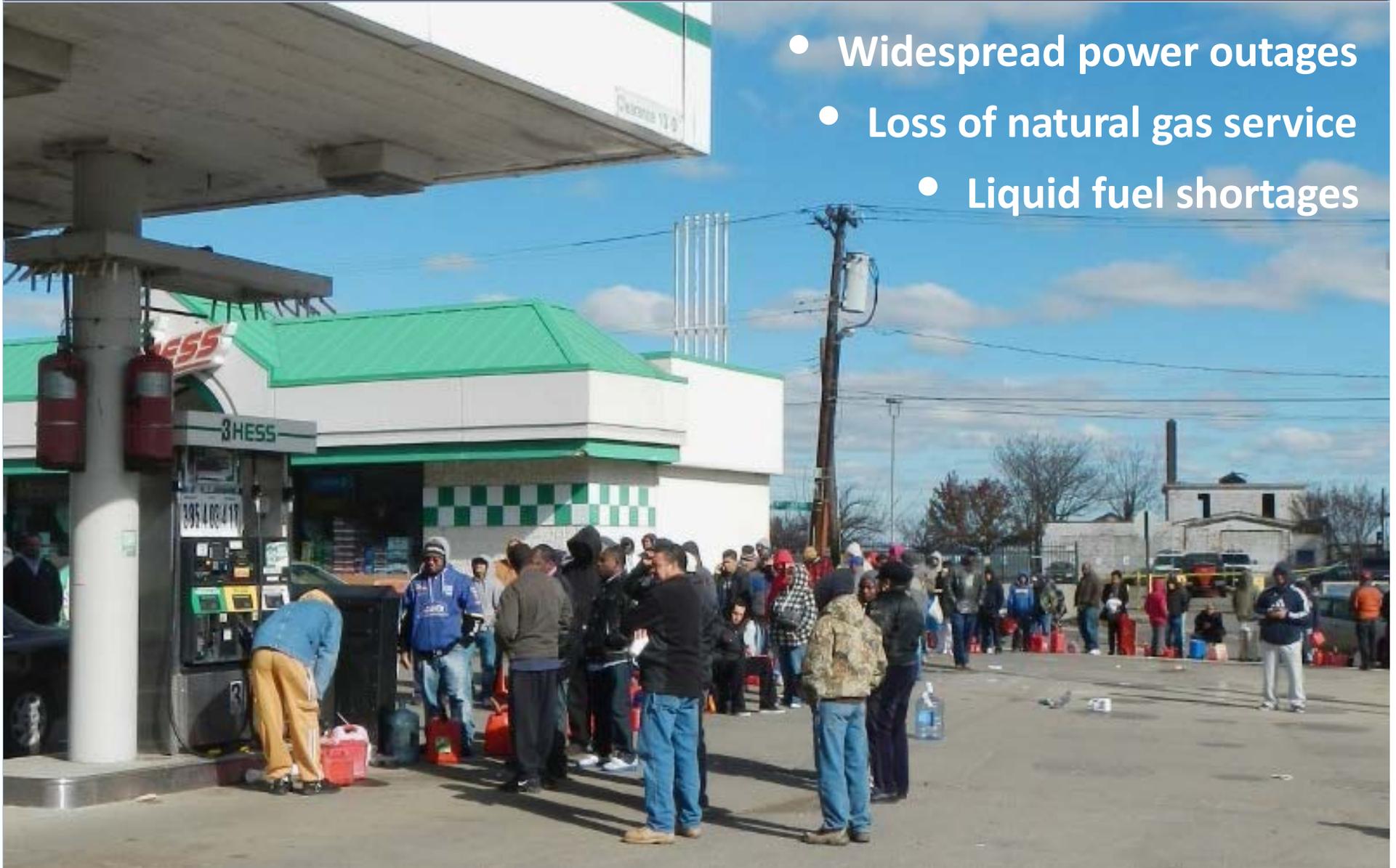


- Greatest damage at coast
- No tsunami at Seattle, Portland, or Vancouver (BC), but damage from shaking & strong currents
- Columbia and Willamette shipping channels blocked
- Slight to moderate damage to airports along I-5

Photo Source: Geotechnical Extreme Events Reconnaissance (GEER)

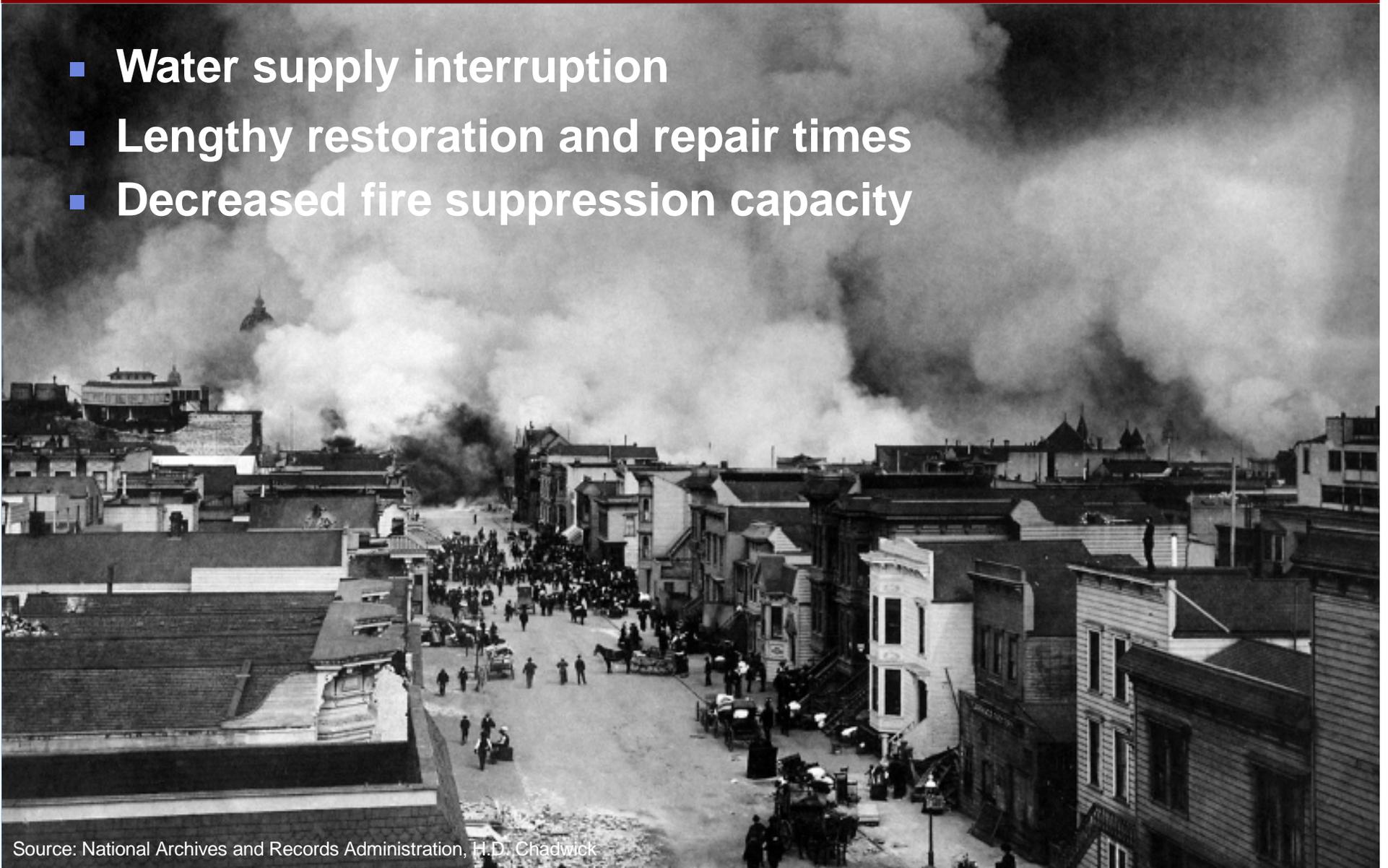
# Electricity, Natural Gas, Liquid Fuel

- Widespread power outages
- Loss of natural gas service
- Liquid fuel shortages



# Water Systems

- Water supply interruption
- Lengthy restoration and repair times
- Decreased fire suppression capacity



Source: National Archives and Records Administration, H.D. Chadwick

# Communication Networks

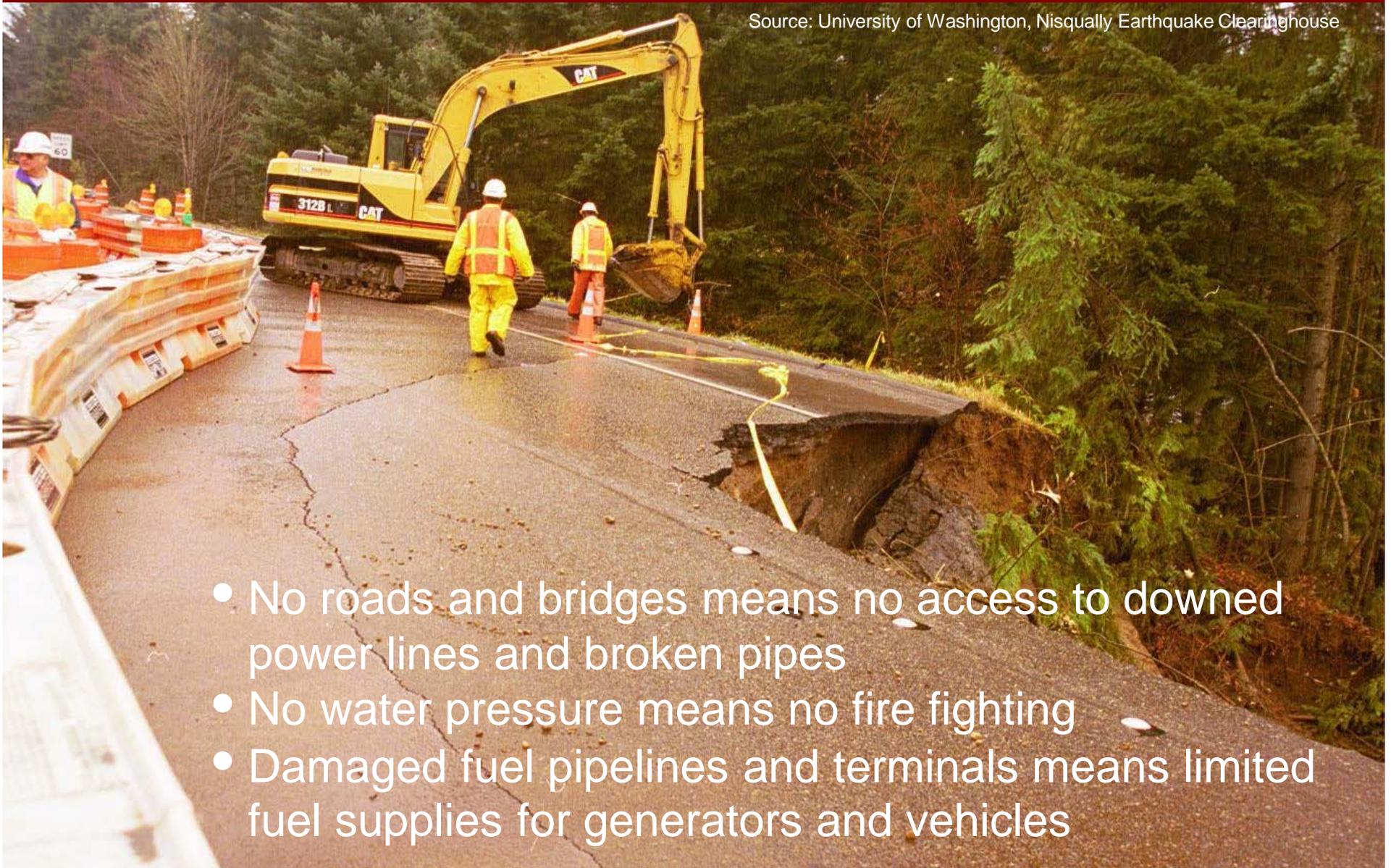
- **Landline & wireless**
  - Broken cables
  - Equipment failures and structural damage
  - Power outages
  - Jamming
- **Undersea transpacific cables severed**



Source: FM News 101KXL

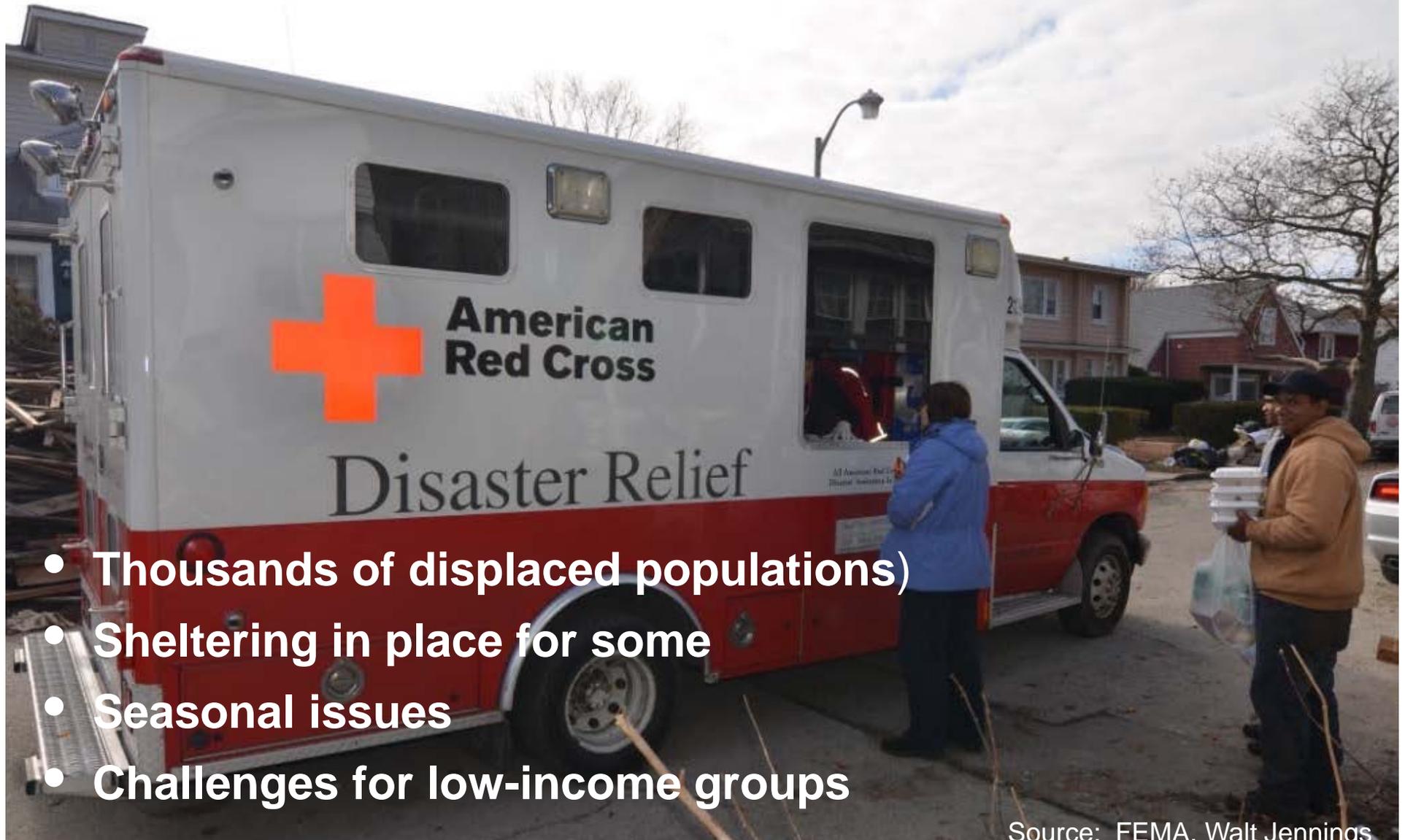
# Interdependence of Infrastructure

Source: University of Washington, Nisqually Earthquake Clearinghouse



- No roads and bridges means no access to downed power lines and broken pipes
- No water pressure means no fire fighting
- Damaged fuel pipelines and terminals means limited fuel supplies for generators and vehicles

# Displaced Populations



- Thousands of displaced populations)
- Sheltering in place for some
- Seasonal issues
- Challenges for low-income groups

Source: FEMA, Walt Jennings

# Tsunami

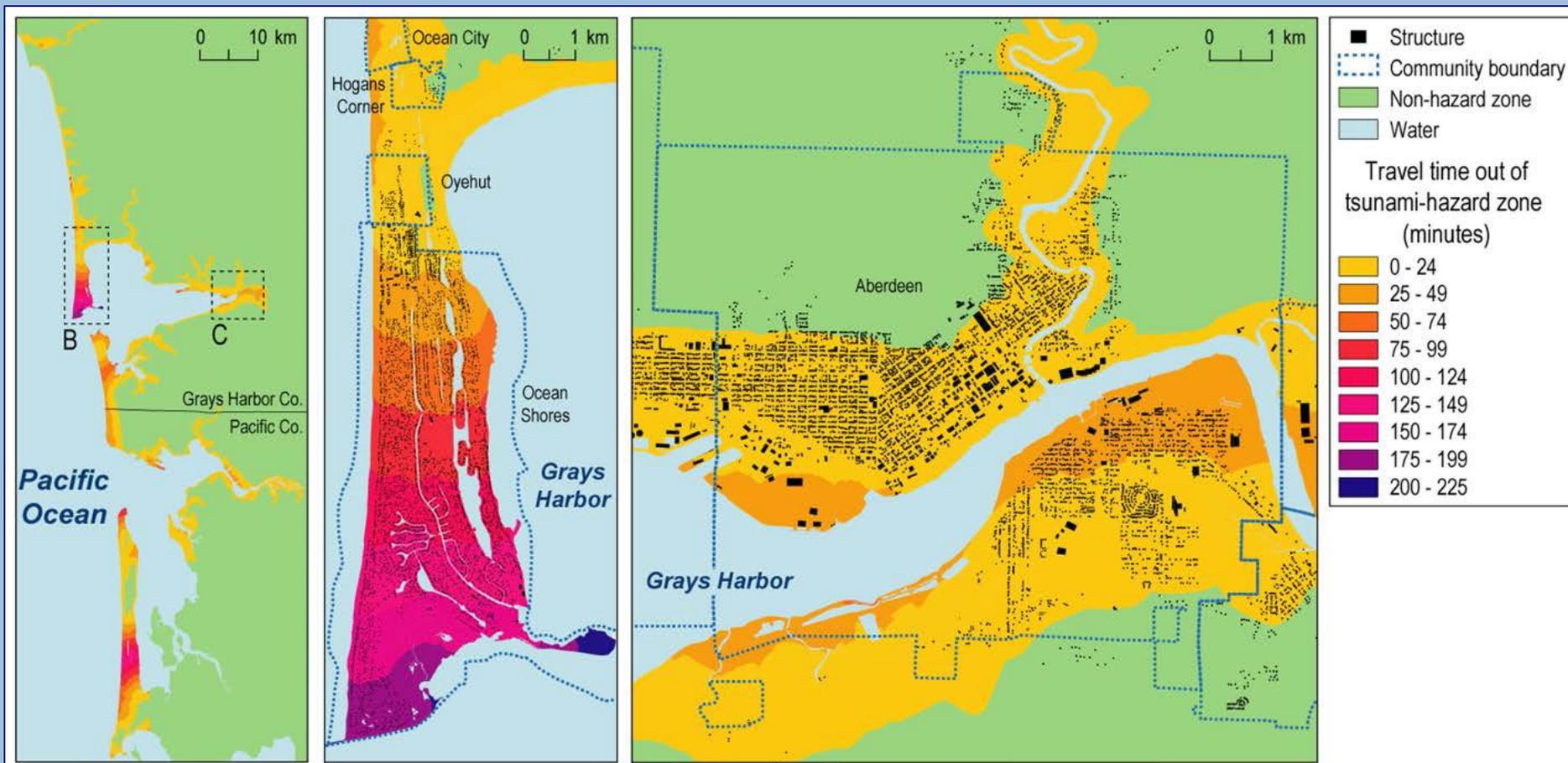
- 15-30 minutes after ground shaking
- Multiple waves
- Variable wave heights

**2011 Tohoku earthquake and tsunami**  
M9.0 earthquake  
~18,000 deaths

Image: Associated Press via New York Times



# Loss of Life and Injuries in Tsunami Impact Zones



Wood and Schmidlein, 2013

# Impacts in Eastern Oregon

- Staging for emergency response
- Wells may go dry
- Influx of hospital patients
- Transfer of administrative functions
- Disruption of business supply chains

*Image – Bloomberg Business Week*

# Damaging Aftershocks

## Earthquake

- M9.2, Prince William Sound, Alaska, 1964
- M9.1, Aceh-Andaman, Sumatra, 2004
- M8.8, Maule, Chile, 2010
- M9.0, Tohoku, Japan, 2011

## Aftershocks (M6+)

- 11 within first day
- 13 within first 4 days
- 21 within first 2 months
- 59 within first 3 months

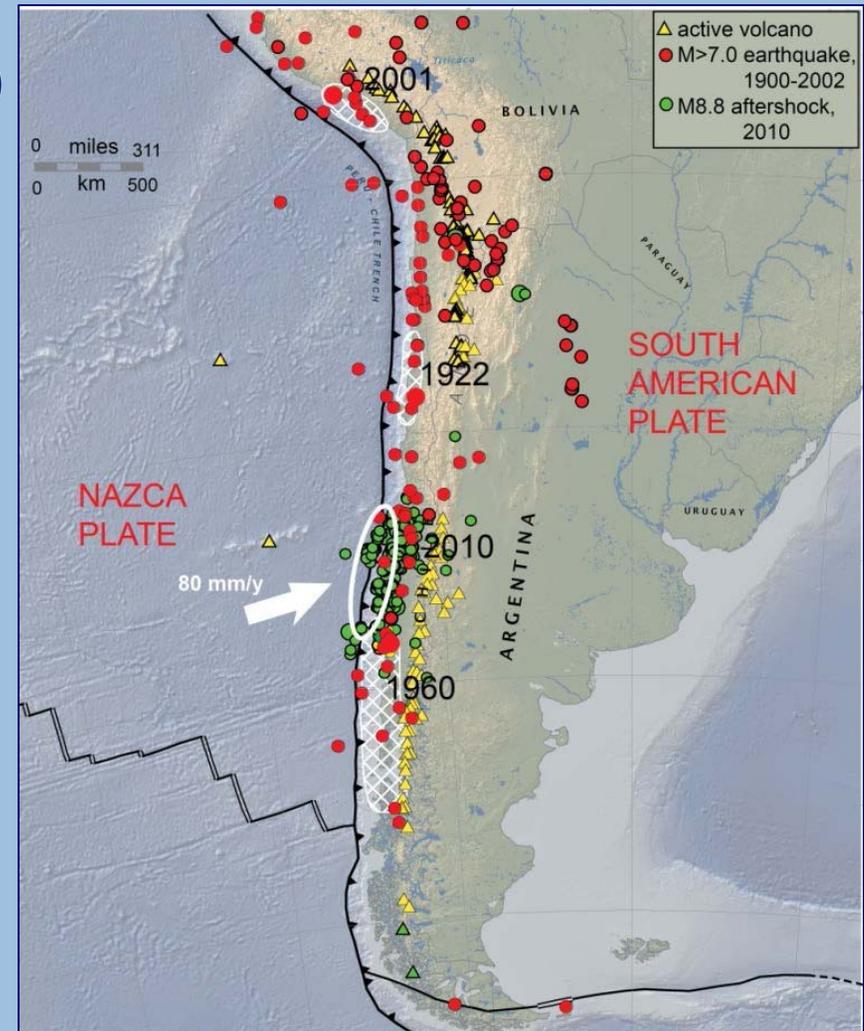
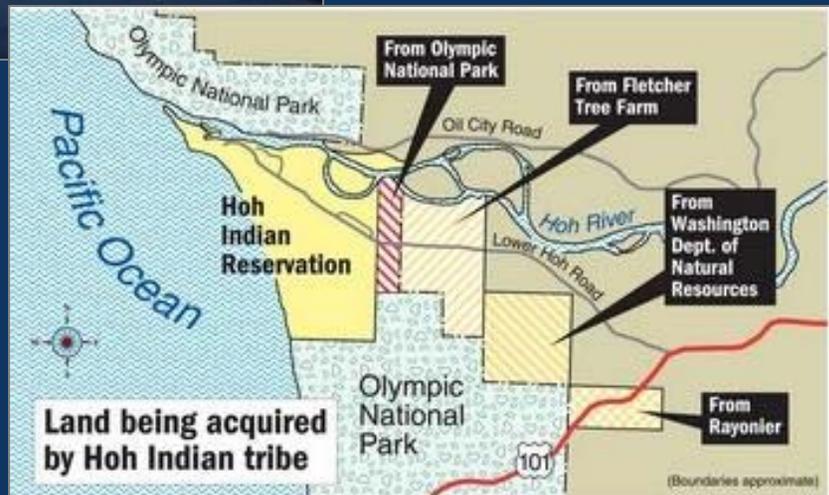


Image Source: USGS

# WHAT'S MISSING?



## Quileute Moving to Higher Ground



## Several local projects, same conclusions:

- ◆ Eugene/Springfield Climate and Hazard Vulnerability Assessment
  - ◆ Water/wastewater off line for months to years
- ◆ Lincoln County NHMP Update
  - ◆ Island communities due to transportation impacts
- ◆ Clatsop County Resilience Framework
  - ◆ Limited local coordination and networking

**Catastrophic impacts to community systems!**

# What IS happening?

- ◆ State Office of Resilience
- ◆ ~\$200,000 added to Seismic Rehab Grants (SRGP)
- ◆ ODOT bridge retrofits
- ◆ Recent updates to tsunami inundation maps
- ◆ Cascadia Rising exercise
- ◆ Greater Eugene/Springfield
  - ◆ EWEB Second Source and other projects
  - ◆ Land Use policy options
  - ◆ Critical facilities assessments
  - ◆ Building improvements

# What is Resilience?



*The ability to anticipate, absorb,  
adapt to, and recover from disruptions*

# One Way to Think About Resilience:

Stockholm Resilience Center - Seven Principles:

- ◆ Maintain diversity and redundancy
- ◆ Manage connectivity
- ◆ Manage slow variables and feedback loops
- ◆ Foster complex, adaptive systems thinking
- ◆ Encourage learning
- ◆ Broaden participation
- ◆ Promote polycentric governance systems

# Diversity and Redundancy

Keep your options open ...



# Connectivity

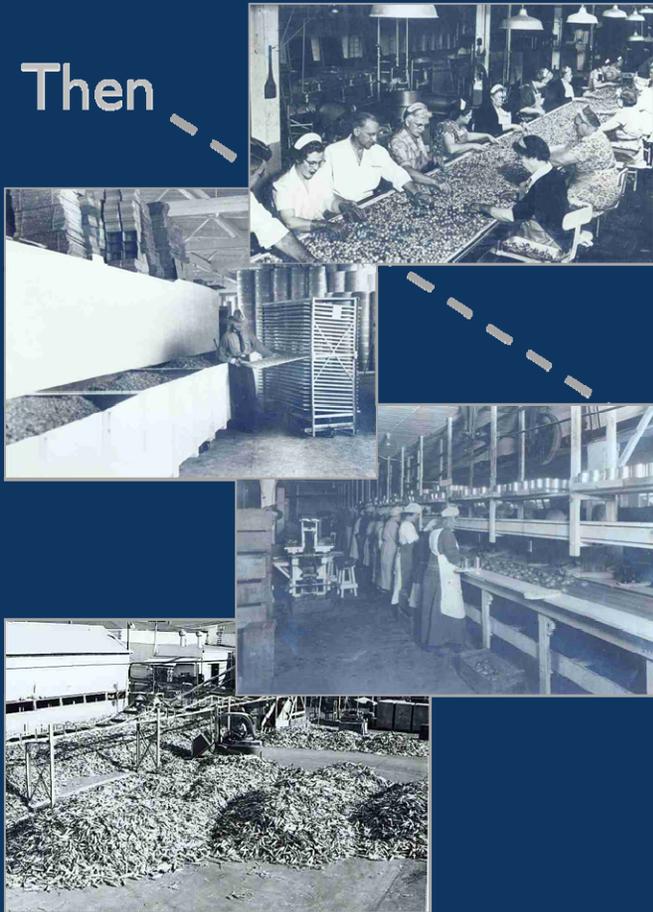
Make friends with different kinds of folks...



# Slow Variables & Feedback Loops

Pay attention to changes over time ...

Then



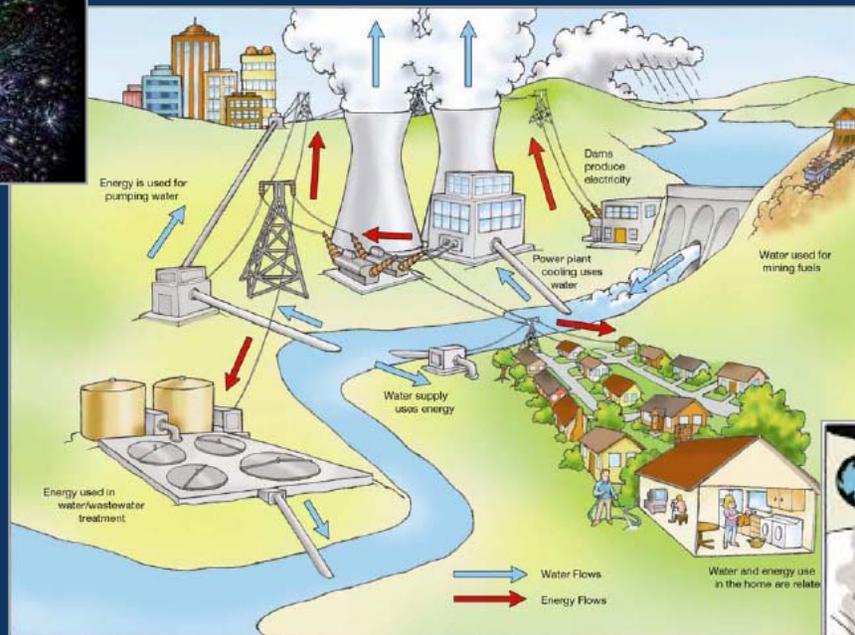
[http://www.salemhistory.net/commerce/cannery\\_photos.htm](http://www.salemhistory.net/commerce/cannery_photos.htm)



Now

# COMPLEX SYSTEMS THINKING

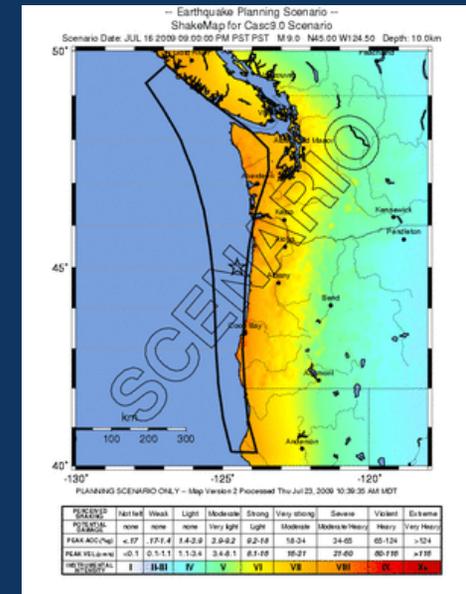
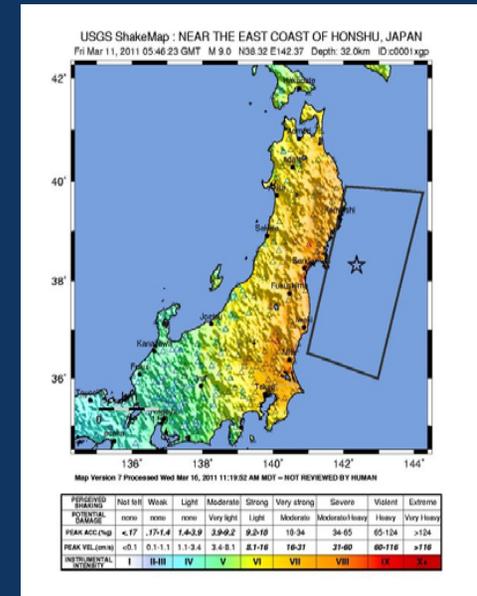
Systems, interdependencies and uncertainties matter ...



# ENCOURAGE LEARNING

- ◆ Basic First Aid and CPR
- ◆ Build a “Go-Kit”
- ◆ Operate a fire extinguisher
- ◆ Evacuation drills at home
- ◆ Text, Tweet and ??
- ◆ Turn off utilities
- ◆ HAM Radio
- ◆ CERT
- ◆ Red Cross Classes

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# Broaden Participation

Expand the depth and diversity of engagement ...

- ◆ Get entire family involved
- ◆ Out of state contact
- ◆ Engage school, church, clubs
- ◆ Neighbors/Neighborhood Group
  - ◆ Map Your Neighborhood
- ◆ Community events
- ◆ Try new things to build skills



# POLYCENTRIC GOVERNANCE

What does that mean?

- ◆ More collaboration, less competition
- ◆ Vertical and horizontal integration (nested institutions)
- ◆ Bottom up informs top down
- ◆ Applies the other resilience principles

# FEMA Mitigation Training for Tribal Governments

- FEMA Hazard Mitigation Training
- November 16-19
- Warm Springs, OR

## FEMA REGION X TRAINING OPPORTUNITY



Course: L0582

Mitigation for Tribal Governments

**Date:**

November 16-19, 2015

**Location:**

Warm Springs, OR

**Time:**

8:30am - 5:00pm



**Course Purpose:**

To give tribal governments a foundation for reducing or preventing potential losses from natural or other hazards.

**Course Description:**

Hosted by FEMA Region X and the Confederated Tribes of Warm Springs. This 4-day course will provide tribal representatives with an understanding of mitigation opportunities and techniques, examples of mitigation success stories to reduce future losses from natural or other hazards, and an overview of available FEMA mitigation programs. Primary emphasis is on helping tribal emergency managers and planners recognize a successful planning process, identifying planning team members, identify mitigation planning requirements and effective mitigation opportunities to improve the sustainability of their tribal community, and better protect tribal citizens, lands, culture, and sovereignty.

**Funding:**

Tuition is free for enrolled students. All incurred costs are the responsibility of the attendee or sending agency.

**Target Audience:**

This course is for tribal emergency managers, tribal community response personnel, tribal leaders, emergency support functions, program directors including education, health, natural resources, transportation, public works, facilities management, security, environmental programs, human resources, and managers for any tribal enterprises.

**Prerequisites:**

Required prerequisites include E/L0580 Emergency Management Framework for Tribal Governments.

Recommended prerequisites include E/L0581 Emergency Operations for Tribal Governments.

**Continuing Education Units:**

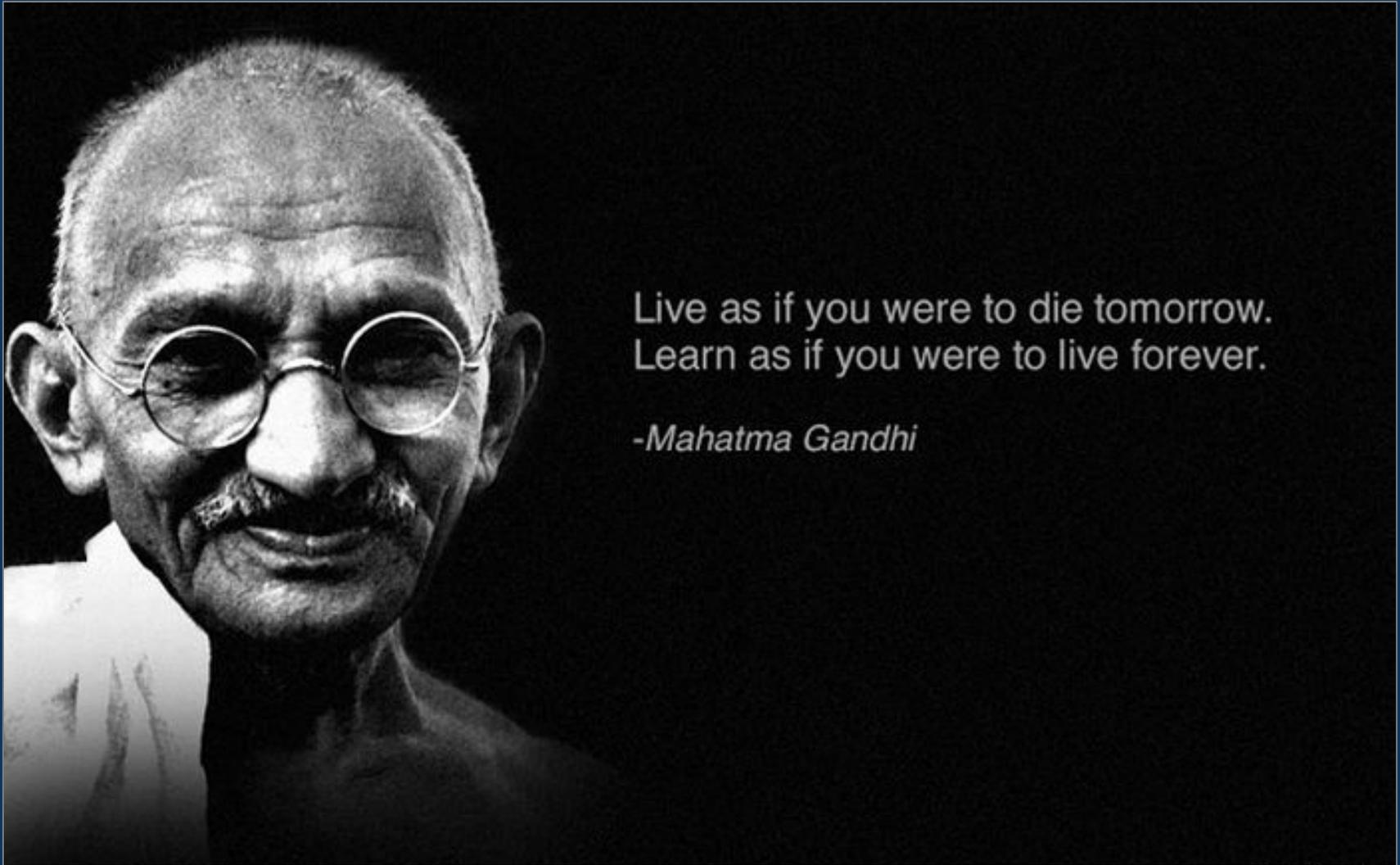
Students completing this course will receive an Emergency Management Institute (EMI) Certificate of Completion for 2.4 CEUs via e-mail after the course is completed.

**Course POC:**

Jay LaPlante  
FEMA Region X  
Tribal Relations Specialist  
Phone: (425) 487- 4540  
Fax: (425) 487- 4622  
[jaylaplante@fema.dhs.gov](mailto:jaylaplante@fema.dhs.gov)

To apply: Please see the next page for the "Enrollment Procedures and Points of Contact"

# Thank You!



Live as if you were to die tomorrow.  
Learn as if you were to live forever.

*-Mahatma Gandhi*