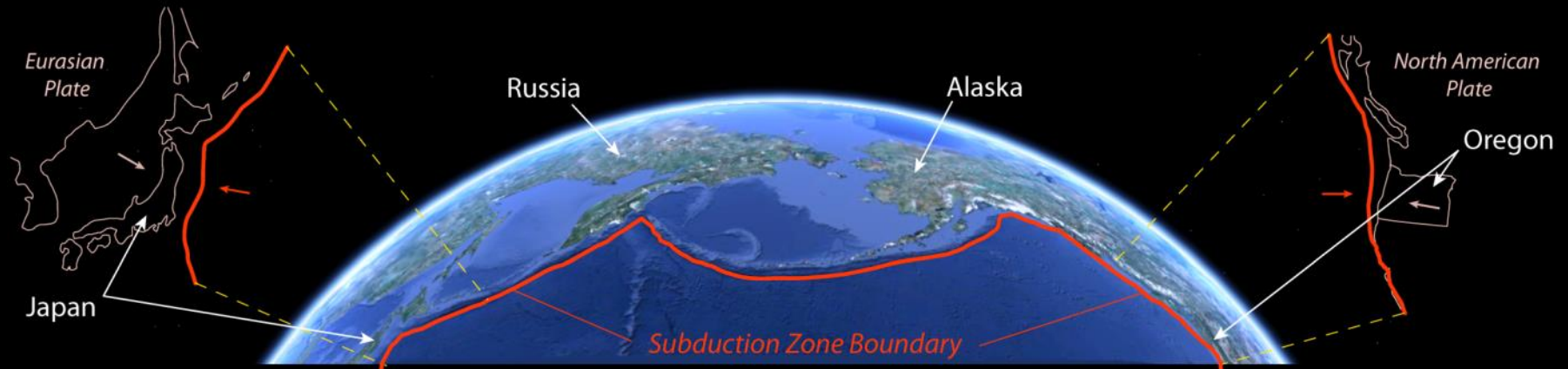
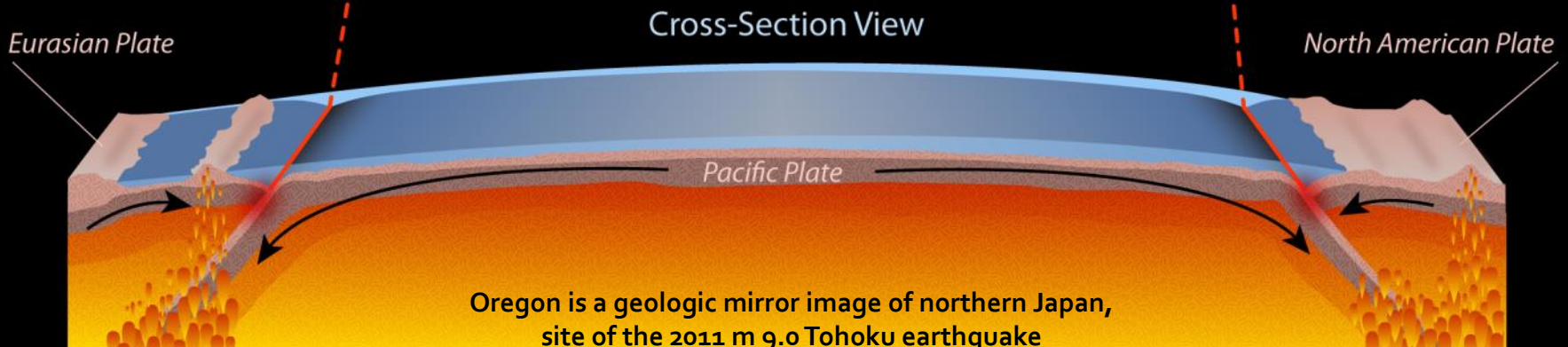
Oregon Resilience Plan, Cascadia Scenario Workgroup overview and recommendations

Senate & House Committees on Veterans' Services and Emergency Preparedness

Dr. Vicki McConnell, Oregon State Geologist
Ian Madin, DOGAMI Chief Scientist
Oregon Department of Geology and Mineral Industries

June 20, 2013
Salem, Oregon





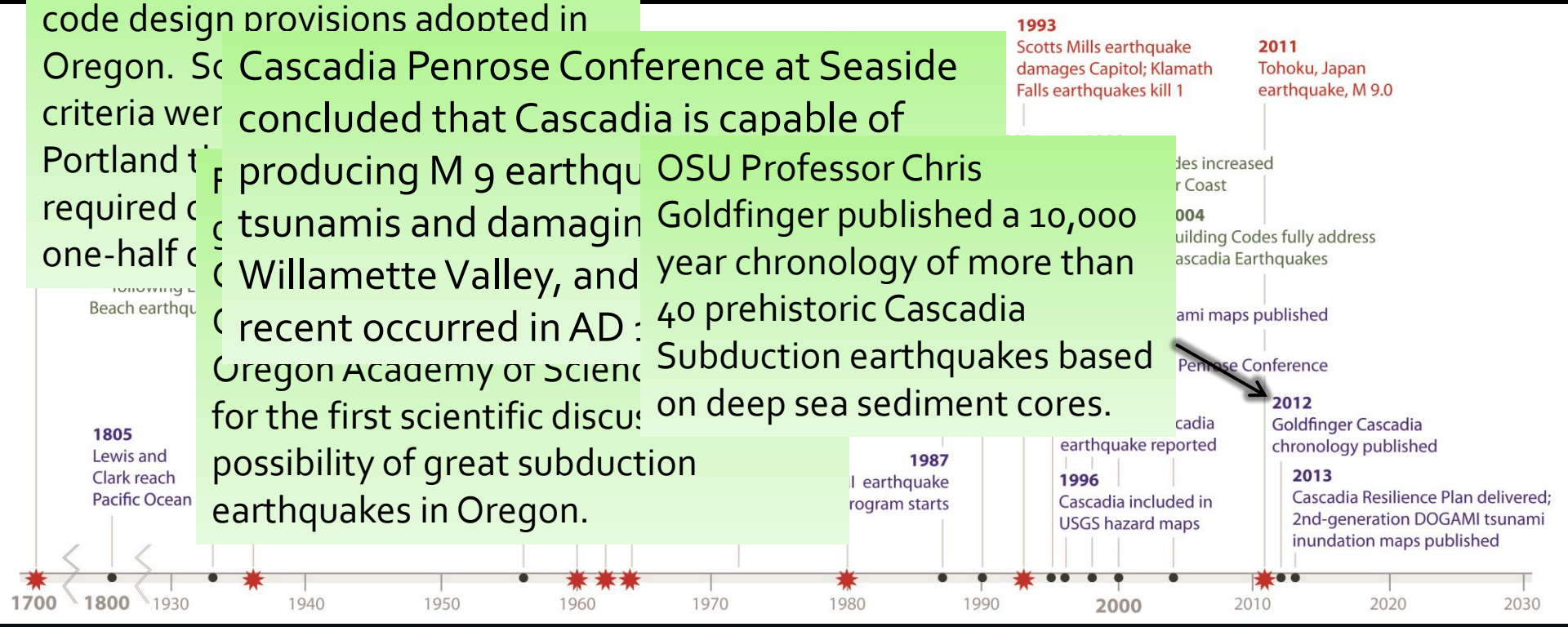
Oregon is a geologic mirror image of northern Japan, site of the 2011 m 9.0 Tohoku earthquake

Cascadia Earthquake Research Timeline

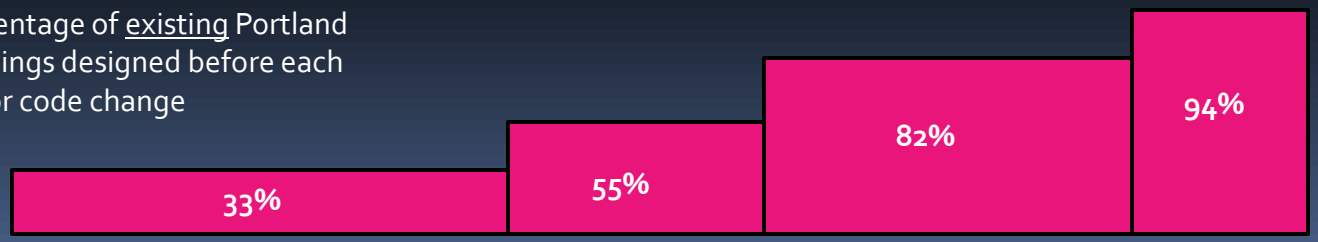
First statewide seismic building code design provisions adopted in Oregon. Sc
criteria wer
Portland t
required c
one-half c

Cascadia Penrose Conference at Seaside concluded that Cascadia is capable of producing M 9 earthqu
tsunamis and damagin
Willamette Valley, and
recent occurred in AD
Oregon Academy of Scienc
for the first scientific discu
possibility of great subduction earthquakes in Oregon.

OSU Professor Chris Goldfinger published a 10,000 year chronology of more than 40 prehistoric Cascadia Subduction earthquakes based on deep sea sediment cores.



Percentage of existing Portland buildings designed before each major code change

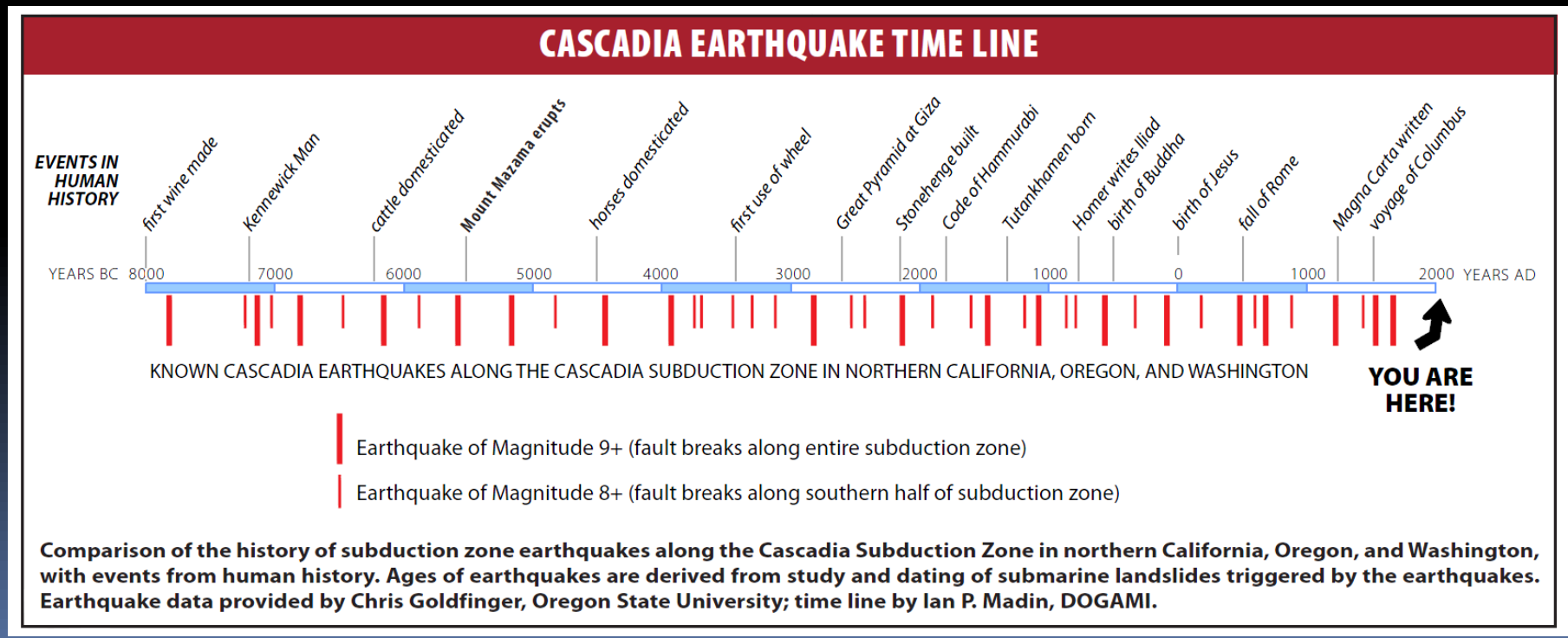


As building codes get tougher to keep up with earthquake science, a larger percentage of existing buildings fails to meet the new code.

What we know:

- About 40 Cascadia Subduction Zone earthquakes in the last 10,000 years
- The most recent occurred on January 26, 1700, and was about M 9.0
- About half of these have been M 8.8-9.2 and affected all of Oregon
- About half have been M 8.1-8.7 and affected Southern Oregon
- The repeat time for all events averages 230 years but ranges from 40 to 600
- The repeat time for M 9.0 events averages 530 years but ranges from 110 to 1150

This variability in timing, size, and location of Cascadia earthquakes cannot be reduced with further research



What we know:

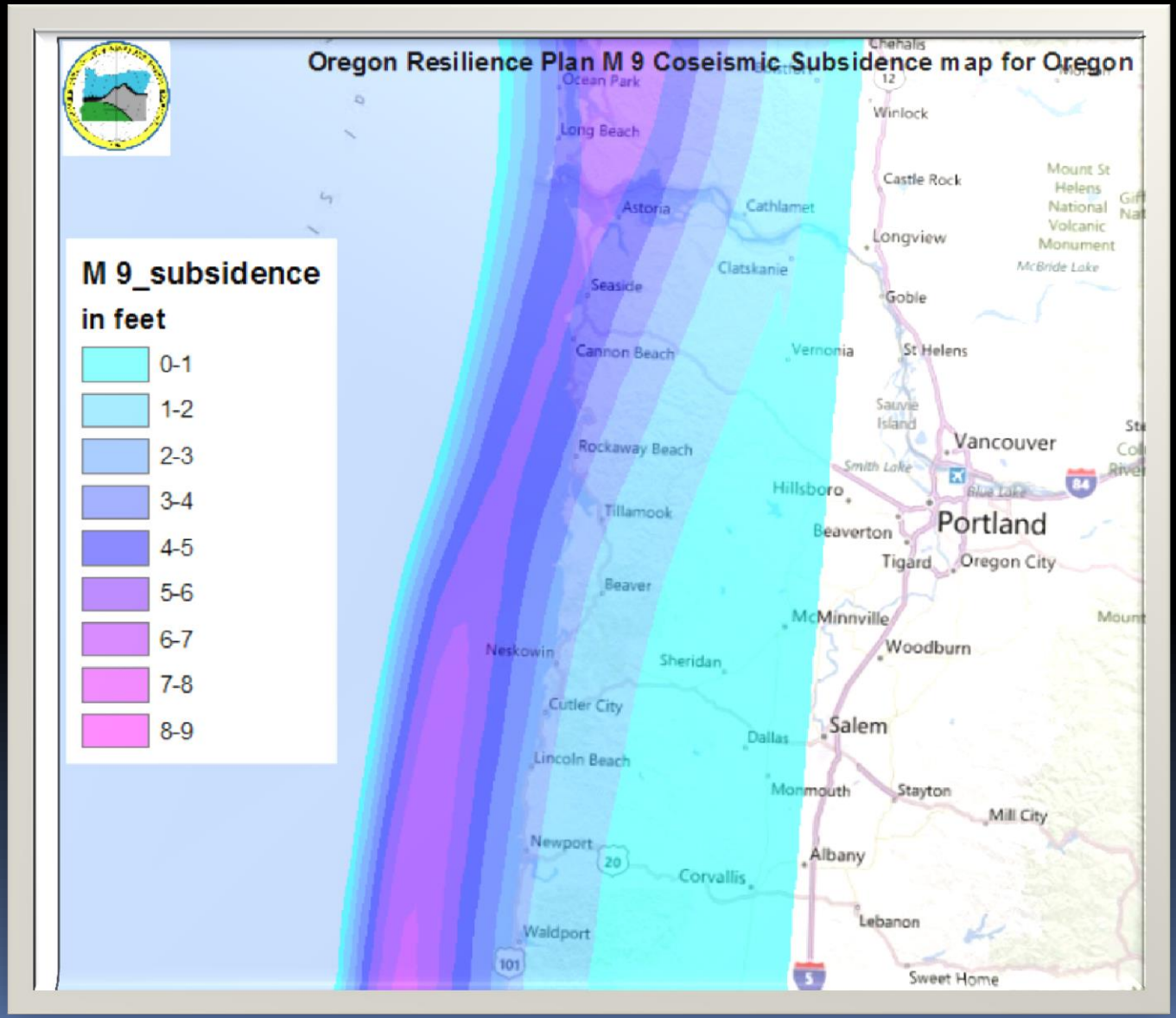
- A tsunami will strike Oregon's coast in 15-20 minutes
- The height of the tsunami will vary widely from place to place
- Damage in the inundation zone will be extreme

Actual tsunami inundation,
2011 Tohoku earthquake

Modeled Cascadia tsunami inundation
at Rockaway Beach

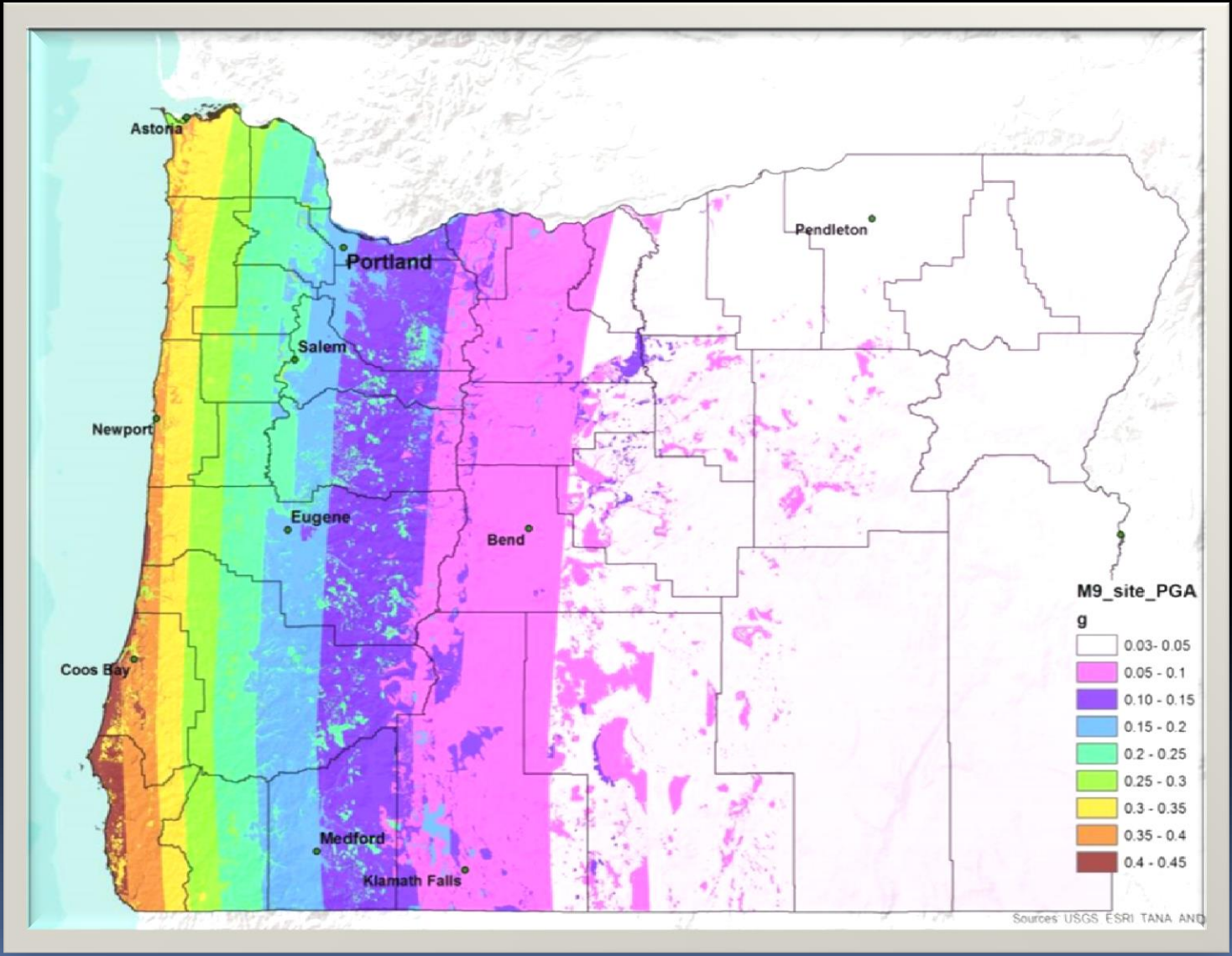
What we know:

- Coseismic subsidence will instantly and permanently change local sea level
- The amount of subsidence will vary from place to place



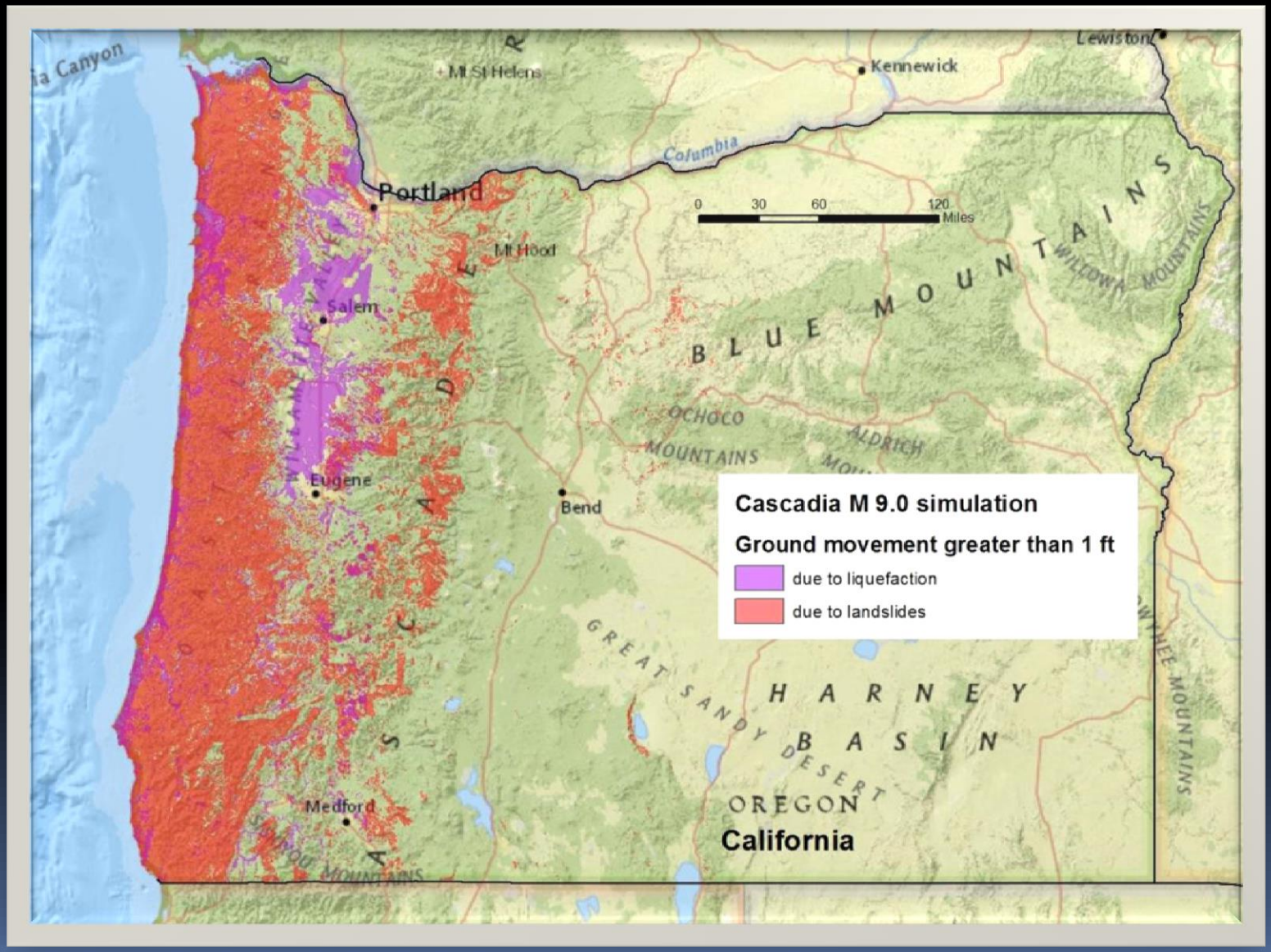
What we know:

- The strength of shaking will vary widely from place to place
- Certain vulnerable soil types can identified in advance
- Shaking will last 3-5 minutes



What we know:

- Liquefaction and coseismic landslides will cause extensive disruption of lifelines
- Areas that are prone to either type of ground failure can be identified in advance



The Cascadia Scenario Workgroup recommends that the State support Oregon universities and state agencies to:

- carry out research into the effects of future Cascadia subduction earthquakes and tsunamis on Oregon's landscape, population, buildings, and lifelines

- prepare more detailed and accurate estimates of damage and loss in Oregon from future Cascadia subduction earthquakes and tsunamis

- provide ready access to the best available Cascadia earthquake information for emergency responders and planners, architects and engineers, and the general public

Oregon state agencies and universities have the capability to:

- Measure, map, and model areas with soft soil that will enhance ground shaking
- Measure, map, and model areas subject to liquefaction or landslides
- Inventory buildings and lifelines and their relation to soft soil, liquefaction, and landslide areas
- Assess the vulnerability of buildings and lifelines at the neighborhood, city, county, and state level and use this information to prioritize mitigation efforts
- We do not have the capacity to accomplish those objectives

Cascadia Research Needs a Coordinated and Comprehensive Effort

- Current federal funding restraints:
  - NSF only funds basic research
  - NEHRP has limited funds available to any region

- Get our arms around research and information needs and the cost

- Compile what is already out there – off the shelf

- Coordinate further research and information

- DOGAMI can coordinate the research planning efforts and compile the information in a resilience-ready format