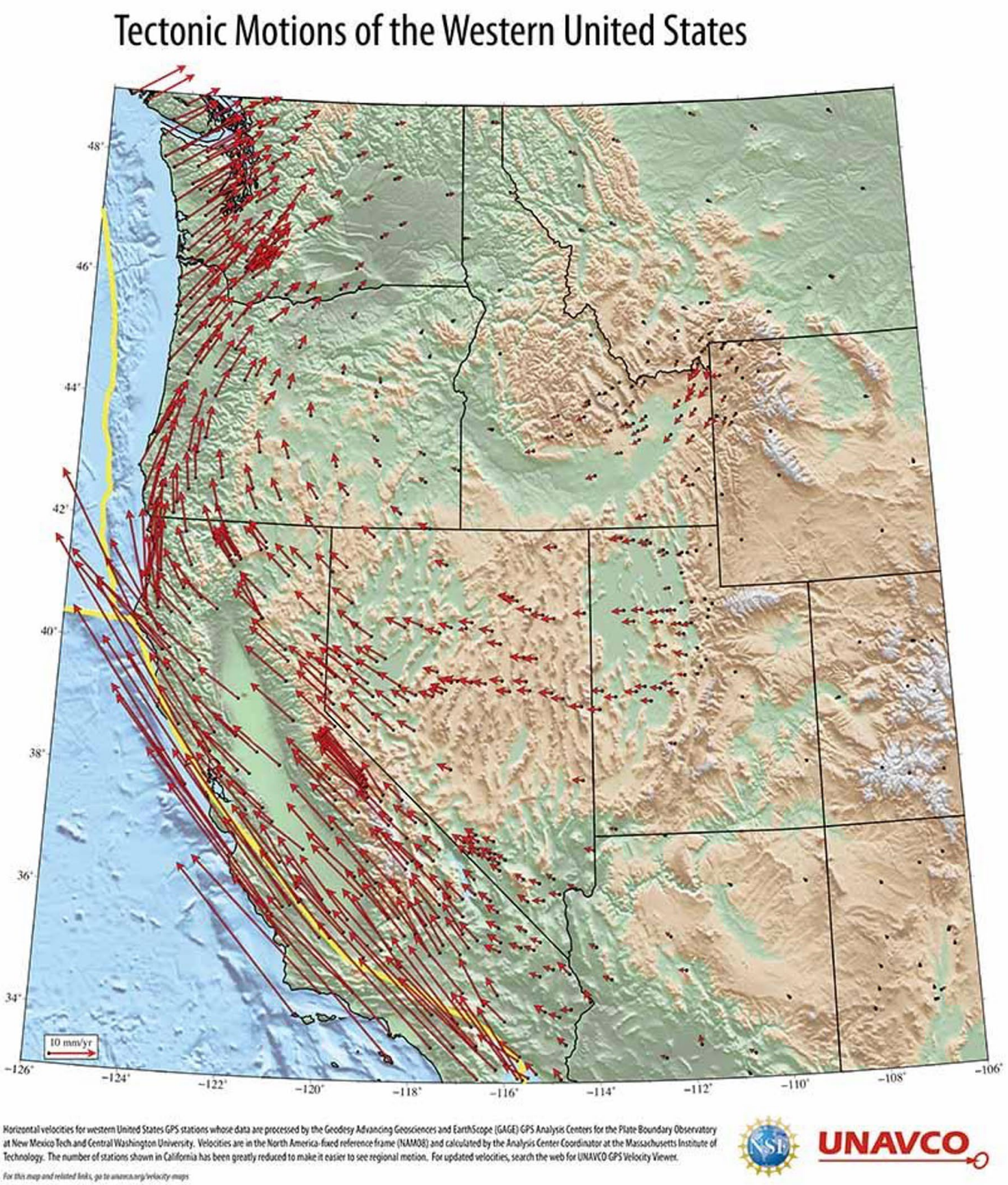
APPENDIX J: Full GPS Vector Maps of the Western United States: California, Oregon, and Washington



Earthquake Shaking Potential for California

2016

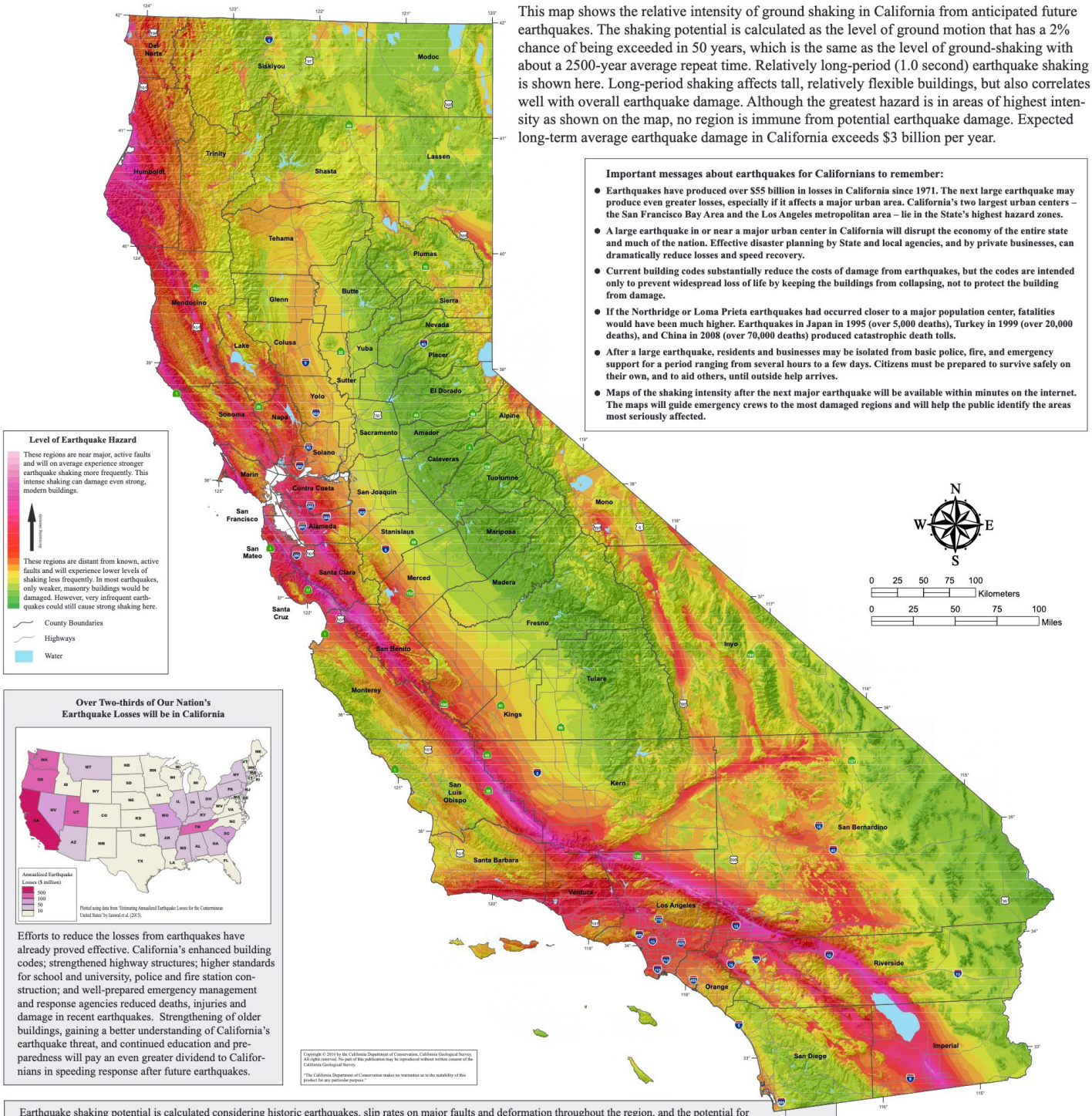
D. Branum[1], R. Chen[1], M. Petersen[2] and C. Wills[1]

[1]California Geological Survey, [2]United States Geological Survey

This map shows the relative intensity of ground shaking in California from anticipated future earthquakes. The shaking potential is calculated as the level of ground motion that has a 2% chance of being exceeded in 50 years, which is the same as the level of ground-shaking with about a 2500-year average repeat time. Relatively long-period (1.0 second) earthquake shaking is shown here. Long-period shaking affects tall, relatively flexible buildings, but also correlates well with overall earthquake damage. Although the greatest hazard is in areas of highest intensity as shown on the map, no region is immune from potential earthquake damage. Expected long-term average earthquake damage in California exceeds $3 billion per year.

Important messages about earthquakes for Californians to remember:

- **Earthquakes have produced over $55 billion in losses in California since 1971. The next large earthquake may produce even greater losses, especially if it affects a major urban area. California's two largest urban centers – the San Francisco Bay Area and the Los Angeles metropolitan area – lie in the State's highest hazard zones.**
- **A large earthquake in or near a major urban center in California will disrupt the economy of the entire state and much of the nation. Effective disaster planning by State and local agencies, and by private businesses, can dramatically reduce losses and speed recovery.**
- **Current building codes substantially reduce the costs of damage from earthquakes, but the codes are intended only to prevent widespread loss of life by keeping the buildings from collapsing, not to protect the building from damage.**
- **If the Northridge or Loma Prieta earthquakes had occurred closer to a major population center, fatalities would have been much higher. Earthquakes in Japan in 1995 (over 5,000 deaths), Turkey in 1999 (over 20,000 deaths), and China in 2008 (over 70,000 deaths) produced catastrophic death tolls.**
- **After a large earthquake, residents and businesses may be isolated from basic police, fire, and emergency support for a period ranging from several hours to a few days. Citizens must be prepared to survive safely on their own, and to aid others, until outside help arrives.**
- **Maps of the shaking intensity after the next major earthquake will be available within minutes on the internet. The maps will guide emergency crews to the most damaged regions and will help the public identify the areas most seriously affected.**



Level of Earthquake Hazard

These regions are near major, active faults and will on average experience stronger earthquake shaking more frequently. This intense shaking can damage even strong, modern buildings.

Increasing intensity

These regions are distant from known, active faults and will experience lower levels of shaking less frequently. In most earthquakes, only weaker, masonry buildings would be damaged. However, very infrequent earthquakes could still cause strong shaking here.

County Boundaries

Highways

Water

Over Two-thirds of Our Nation's Earthquake Losses will be in California

Plotted using data from "Estimating Annualized Earthquake Losses for the Conterminous United States" by Jaiswal et al. (2015).

Efforts to reduce the losses from earthquakes have already proved effective. California's enhanced building codes; strengthened highway structures; higher standards for school and university, police and fire station construction; and well-prepared emergency management and response agencies reduced deaths, injuries and damage in recent earthquakes. Strengthening of older buildings, gaining a better understanding of California's earthquake threat, and continued education and preparedness will pay an even greater dividend to Californians in speeding response after future earthquakes.

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Earthquake shaking potential is calculated considering historic earthquakes, slip rates on major faults and deformation throughout the region, and the potential for amplification of seismic waves by near-surface geologic materials. The complete analysis is called a Probabilistic Seismic Hazard Analysis. The resulting earthquake shaking potential is used in developing building code design values, estimating future earthquake losses and prioritizing earthquake retrofit.

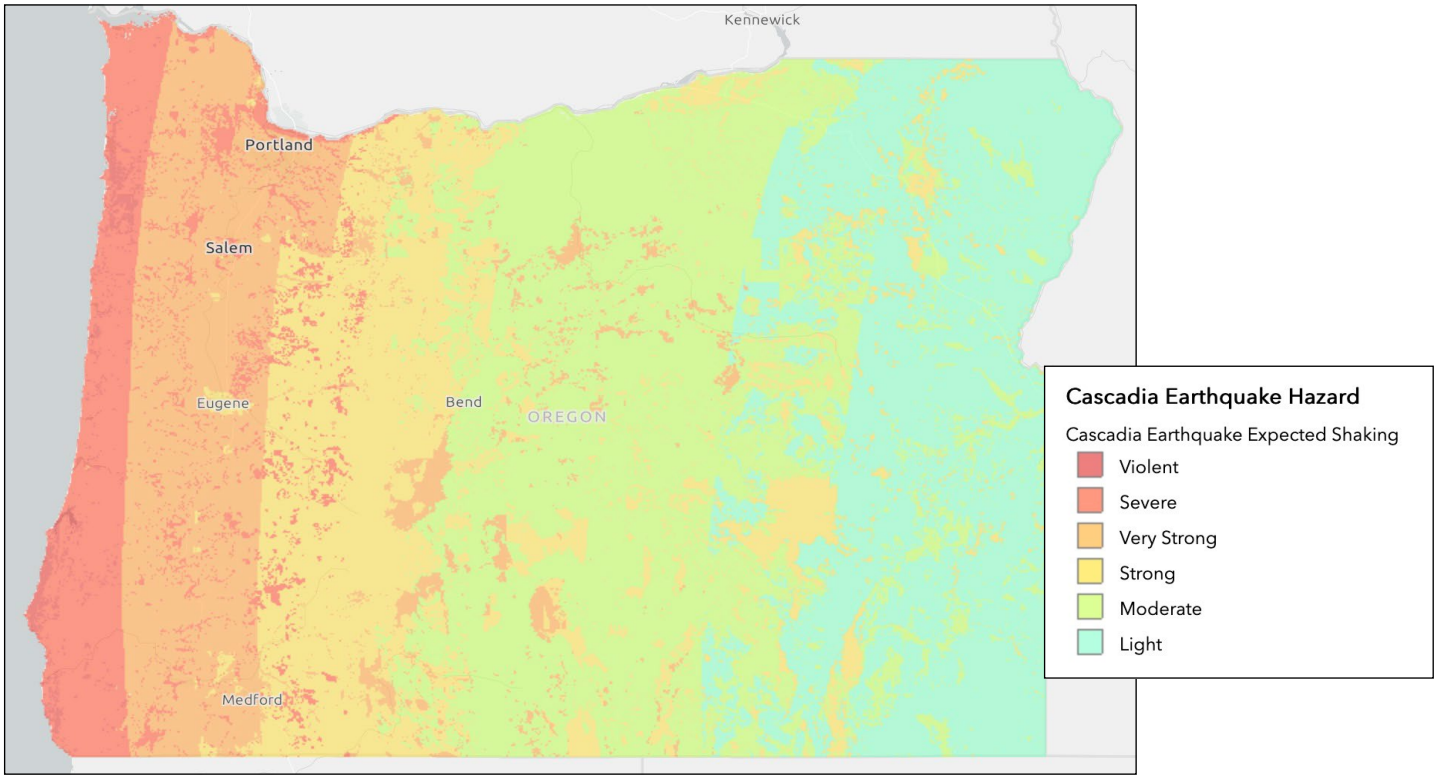
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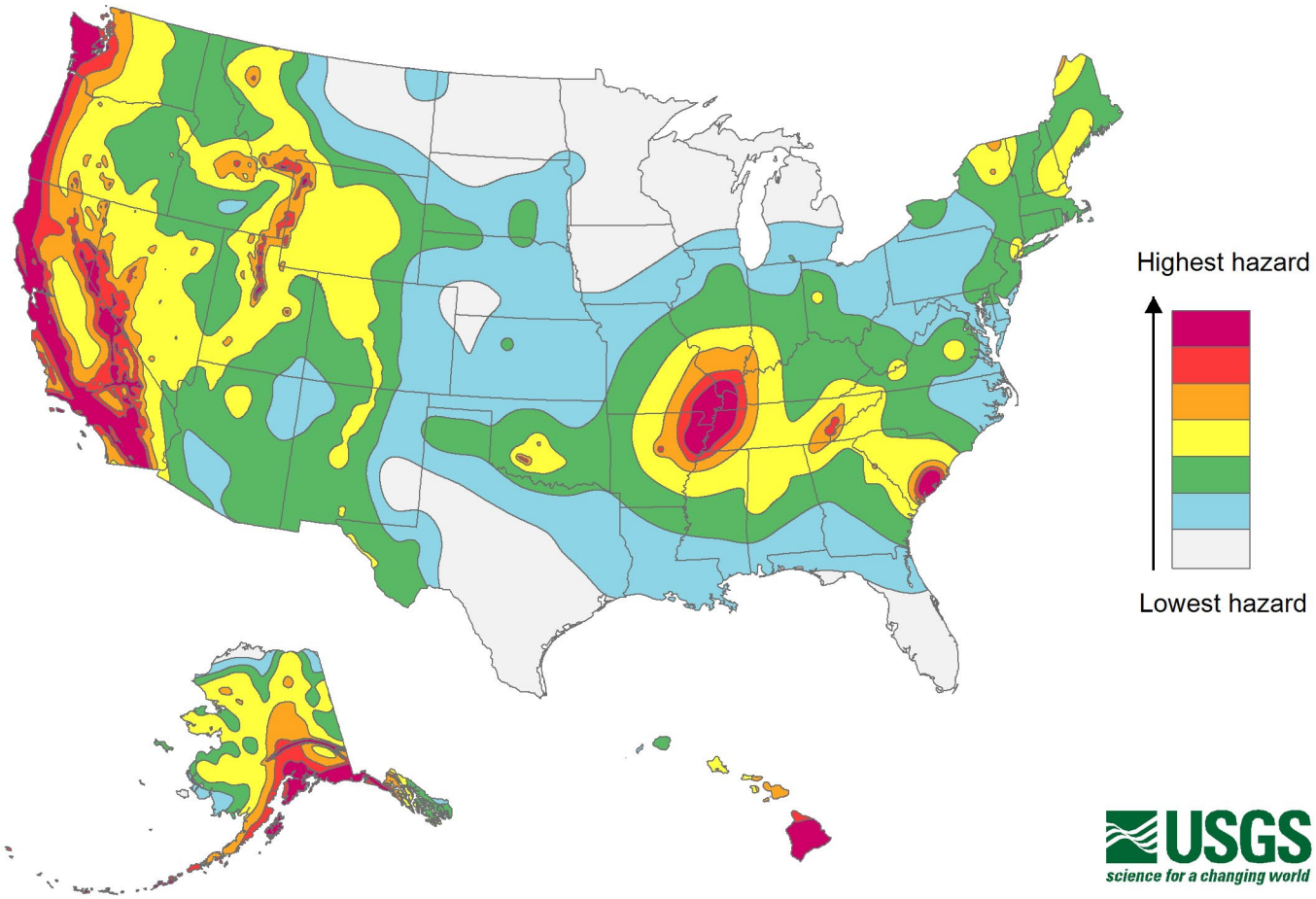
Washington shaking hazard map can be downloaded from the Washington State Department of Natural Resources. Warmer colors indicate greater shaking hazard potential from a Cascadia subduction zone earthquake



Oregon shaking hazard map can be downloaded from the Oregon Department of Geology and Mineral Resources. Warmer colors indicate greater shaking hazard potential from a Cascadia subduction zone earthquake



This seismic hazard map of the United States can be downloaded from the U.S. Geological Survey



Earthquake hazard map showing peak ground accelerations having a 2 percent probability of being exceeded in 50 years, for a firm rock site. The map is based on the most recent USGS models for the conterminous U.S. (2018), Hawaii (1998), and Alaska (2007). The models are based on seismicity and fault-slip rates, and take into account the frequency of earthquakes of various magnitudes. Locally, the hazard may be greater than shown, because site geology may amplify ground motions.