STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
BRAD AVY, STATE GEOLOGIST
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Perceived Shaking and Damage Potential, Probabilistic Earthquake Model

Highest level of shaking and damage expected with a 2% chance of occurring in the next 50 years from all earthquake sources

2021

Oregon Seismic Hazard Database (OSHD) Release 1.0

By Ian P. Madin[1], Jon J. Franczyk[1], John M. Bauer[2], and Carlie J.M. Azzopardi[1]

[1]Oregon Department of Geology and Mineral Industries, Portland Office, 800 NE Oregon Street, Suite 965, Portland, OR 97232
[2]Principal, Bauer GIS Solutions

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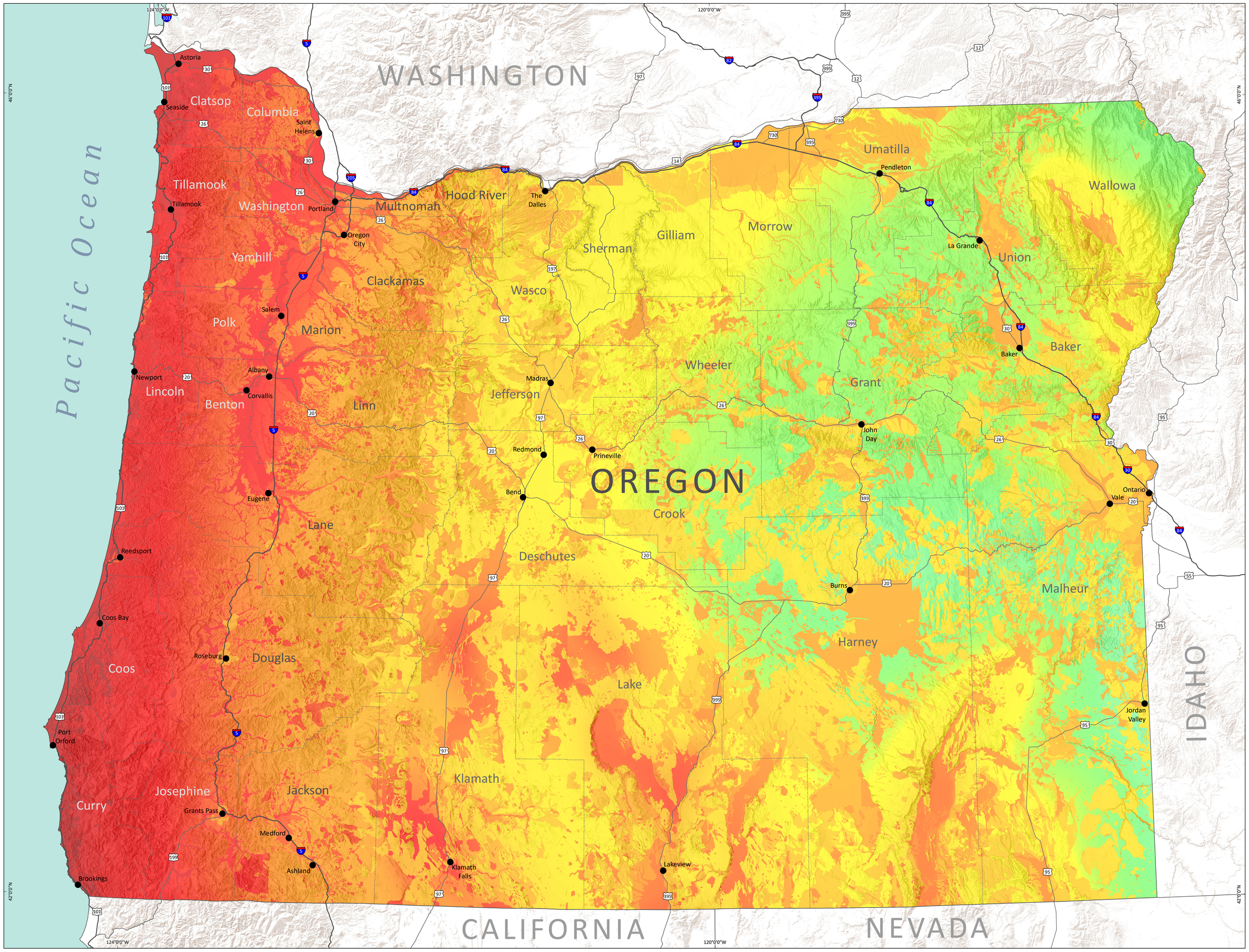
PLATE 1



Background
This map is part of a new database of seismic hazard data for Oregon published by the Oregon Department of Geology and Mineral Industries. It shows the highest level of earthquake shaking (expressed as peak ground velocity [PGV]) expected to occur with a 2% chance in the next 50 years. This is equivalent to the most severe shaking likely to occur once in 2,475 years. These shaking levels are the basis for seismic design of buildings in Oregon. In this map, the PGV values are shown in units of instrumental intensity (Worden and others, 2020), which are based on the Modified Mercalli Intensity scale (USGS, 2021a, b). The Modified Mercalli Intensity scale describes shaking strength based on effects on people, objects, and buildings. Instrumental intensity links Modified Mercalli Intensity to specific levels of recorded or modeled ground shaking and adds simple descriptions of perceived shaking and damage potential. Shaking levels are based on 2018 U.S. Geological Survey National Seismic Hazard Map data (Rukstales and Petersen, 2019), with local amplification of shaking added according to the updated National Earthquake Hazards Reduction Program (NEHRP) site class map included in the report. See accompanying report for details.

Source Data
Shaking and damage potential data from this report is based on a 2018 USGS 2% in 50-year probabilistic shaking model (Rukstales and Petersen, 2019). State and county boundaries and city locations are from the U.S. Census and U.S. Geological Survey (USGS). Base map imagery is from the Environmental Systems Research Institute (Esri), USGS, and National Oceanic and Atmospheric Administration (NOAA).

References

Rukstales, K.S., and Petersen, M.D., 2019, Data release for 2018 update of the U.S. National Seismic Hazard Model: U.S. Geological Survey data release, https://doi.org/10.5066/P9WT50VB.

U.S. Geological Survey (USGS), 2021a, The Modified Mercalli Intensity (MMI) scale assigns intensities as ... [web page], https://www.usgs.gov/media/images/modified-mercalli-intensity-mmi-scale-assigns-intensities, accessed 1/21/21.

U.S. Geological Survey (USGS), 2021b, Modified Mercalli Intensity Scale ... [web page], https://www.usgs.gov/media/images/modified-mercalli-intensity-scale, accessed 5/28/21.

Worden, C.B., Thompson, E.M., Hearne, M., and Wald, D.J., 2020, ShakeMap Manual Online: technical manual, user's guide, and software guide: U. S. Geological Survey. http://usgs.github.io/shakemap/. https://doi.org/10.5066/F7D21VPQ.

Projection: Oregon Statewide Lambert Conformal Conic, Unit: International Feet, Horizontal Datum: NAD 1983; 2011.

Software: Esri ArcGIS® 10.7.1 and Adobe® Illustrator® 2021.

Cartography: Jon J. Franczyk

SCALE 1:825,000

0 25 50 100 Miles

0 25 50 100 Km

City
State Boundary
US Interstate
US Highway

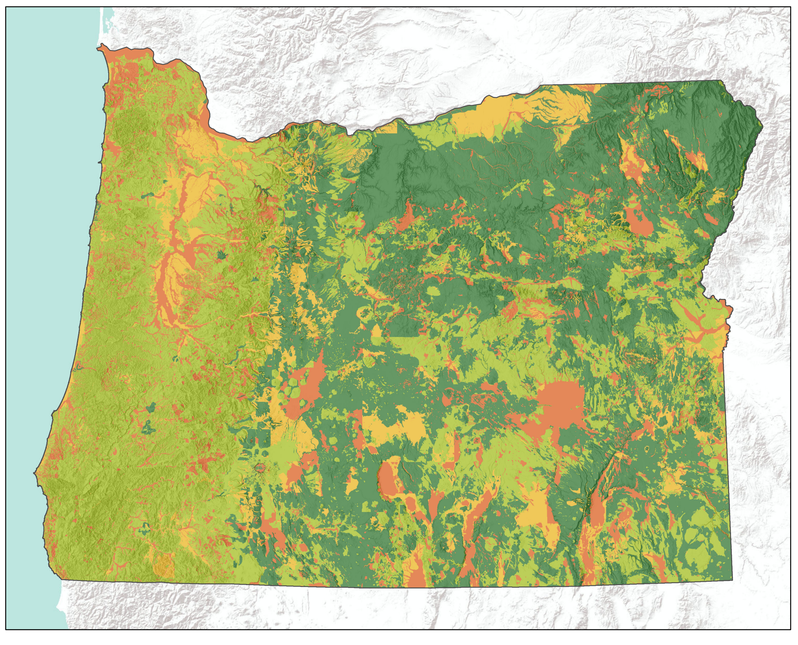
TRUE NORTH
MAGNETIC NORTH
14.4°
APPROXIMATE MEAN DECLINATION, 2021

DISCLAIMER: This publication cannot substitute for site-specific investigations by qualified practitioners. Site-specific data may give results that differ from the results shown in the publication. See the accompanying text report for more details on the limitations of the methods and data used to prepare this publication. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Location Map

Modified Mercalli Intensity Scale (modified from USGS, 2021a, b)

Intensity Scale	Perceived Shaking	Potential Damage	Effects on People	Effects on Objects	Effects on Buildings	Effects on Environment
I	Not felt	None	Felt only by very few under especially favorable conditions.			
II	Weak	None	Felt by a few at rest, especially on upper floors of buildings.	Delicately suspended objects may swing.		
III	Weak	None	Felt by some indoors, especially on upper floors of buildings, vibrations similar to passing of a truck, duration estimated.	Parked cars may rock slightly, hanging objects may swing appreciably.		
IV	Llght	None	Felt indoors by many, outdoors by few, some awakened at night. Sensation like heavy truck striking building.	Dishes, windows, and doors disturbed, parked cars rock noticeably.	Walls creak, windows rattle.	
V	Moderate	Very Light	Felt by nearly everyone, many awakened, frightens a few.	Pictures swing, some dishes and windows broken, unstable objects overturned.	Some cracked walls and windows.	Trees and bushes noticeably shaken.
VI	Strong	Light	Felt by all, many frightened, some move unsteadily.	Many objects fall from shelves; some heavy furniture moved.	Damage slight, some fallen plaster, broken windows, and damaged chimneys.	Some fall of tree limbs and tops, isolated rockfalls, landslides, and liquefaction.
VII	Very Strong	Moderate	Frightens most; some lose balance.	Heavy furniture overturned.	Damage negligible in buildings of good design and construction; slight to moderate damage in well-built ordinary structures; considerable damage in poorly-built structures, weak chimneys broken at roofline, unbraced parapets fall.	Tree damage, rockfalls, landslides, and liquefaction more severe and widespread.
VIII	Severe	Moderate/ Heavy	Many find it difficult to stand.	Fall of chimneys, factory stacks, columns, monuments, walls. Very heavy furniture moves conspicuously.	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures.	
IX	Violent	Heavy	Some forcibly thrown to the ground.		Damage considerable in specially designed structures, well-designed frame structures thrown out of plumb. Damage is great in substantial buildings, with partial collapse. Buildings shifted off foundations.	
X	Extreme	Very Heavy			Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.	



National Earthquake Hazard Reduction Program (NEHRP) Soil Classes

This map shows the distribution of NEHRP site classes (see report, Section 2) used to make the Perceived Shaking and Damage Potential map. Different geologic materials are assigned to one of four NEHRP classes (B, C, D, or E) which determine how ground shaking will be amplified during an earthquake. The fine-scale and sharp changes in the Perceived Shaking and Damage Potential map result from changes in the geology that is used to assign the NEHRP classes.

General Description (Soil Classes in Parentheses)

Rock (B)
Stiff Soil (D)
Dense Soil or Soft Rock (C)
Soft Clay or Soil (E)