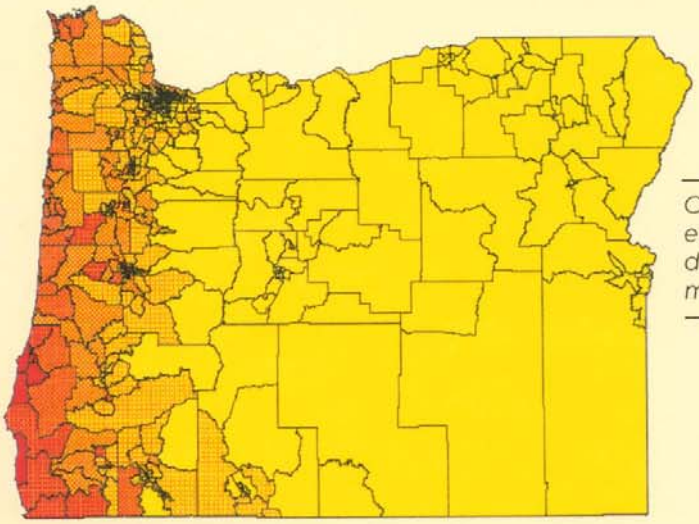
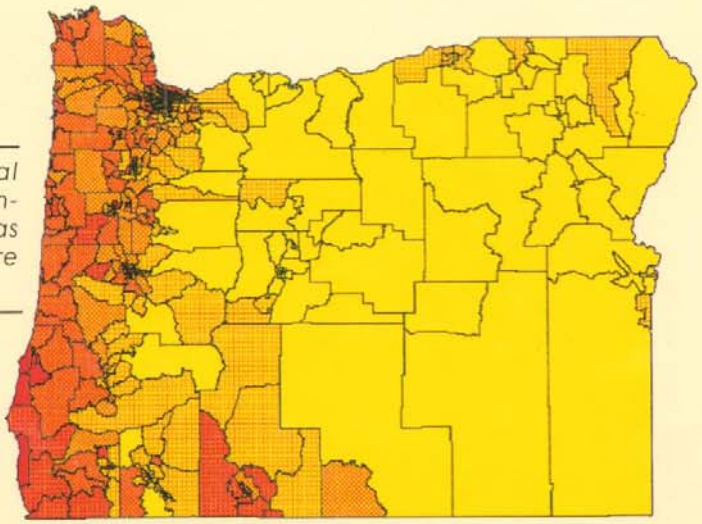
Earthquake damage in Oregon:

Preliminary estimates of future earthquake losses



Cascadia Subduction Zone earthquake model: Least dangerous areas are yellow, most dangerous are darkest red.

500 year recurrence interval model (including many earthquakes): Least dangerous areas are yellow, most dangerous are darkest red.



Special Paper 29

by Yumei Wang and J. L. Clark
Oregon Department of Geology and Mineral Industries

1999

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This report is a summary of a more complete description of a Department of Geology and Mineral Industries study, Open-File Report O–98–3, which contains details about various types of acceleration and ground motion and is targeted to scientific and engineering users, as well as emergency planners.

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SPECIAL PAPER 29

EARTHQUAKE DAMAGE IN OREGON:
Preliminary estimates of future earthquake losses

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STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Donald A. Hull, State Geologist

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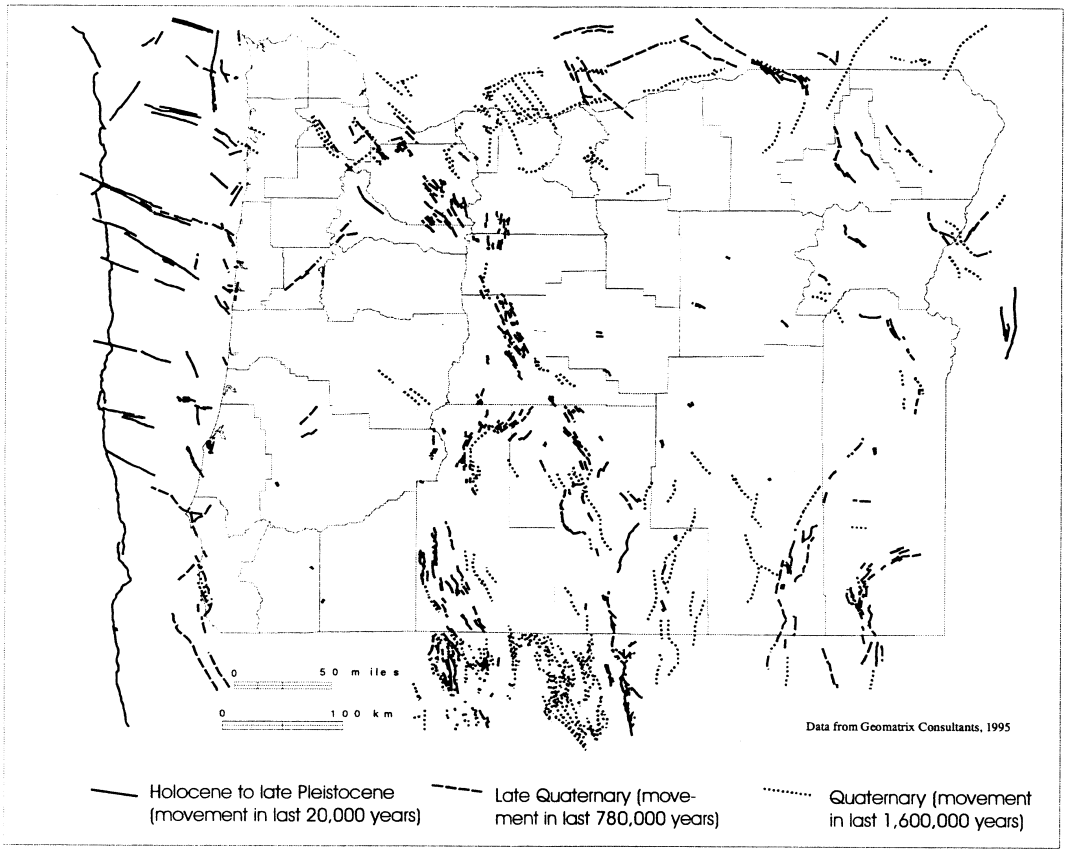


Map showing young faults in Oregon and offshore to the Cascadia subduction zone. Published originally 1995 by Geomatrix Consultants, Inc., for Oregon Department of Transportation.

Executive Summary

Earthquakes are a fact of life in Oregon. They come in a variety of sizes, from only measurable by machines to magnitude 9 events that generate tsunamis.

Because Oregon's recorded history is so short, and destructive earthquakes happen so seldom, we have previously underestimated the danger. In fact, Oregon has infrequent large earthquakes, but they can be very dangerous when they happen.

For the first time, we now have estimates of what future damages from earthquakes might be. Using a state of the art computer model, and extensive research about Oregon's geology, the Oregon Department of Geology and Mineral Industries (DOGAMI) estimated future earthquake damage in a number of categories.

Two different studies are included in this report: a M8.5 Cascadia subduction zone earthquake off the coast of Oregon; and statewide earthquakes within a 500 year return interval.

These figures actually underestimate the amount of damage for two important reasons. The default inventory in the computer model did not include old-style brick buildings (called unreinforced masonry buildings, or URMs), which do not fare well in earthquakes. A major source of casualties is the collapse of these buildings.

Earthquake damages will probably be much higher because the computer model did not take into account the tsunami which would follow the earthquake. A tsunami is a series of waves striking the coast over several hours and can be deadly.

1993 Oregon earthquakes

Scotts Mills (the "Spring Break Quake"):
- magnitude (M)5.6
- $30 million in damage

Klamath Falls:
- M5.9 and M6.0
- $10 million in damage

Cascadia subduction zone model

Expected losses from the magnitude 8.5 Cascadia earthquake include:
- Almost 8,000 casualties
- Over 30,000 buildings destroyed
- Over $12 billion of economic damage

Counties at highest risk from this event include:

Lane	Coos	Benton
Lincoln	Josephine	Clatsop
Jackson	Linn	Curry

Cascadia subduction zone

This offshore fault runs from northern California to Vancouver Island. It's less than 100 miles off the coast of Oregon, and is capable of generating magnitude 9 earthquakes and tsunamis.

500 year return interval model

Expected losses from the 500 year model include:
- Over 25,000 casualties
- Over 80,000 buildings destroyed
- Over $31 billion of economic damage

Counties at highest risk from this event include:

Multnomah	Washington	Lane
Marion	Clackamas	Coos
Benton	Linn	Klamath

500 year return interval

This study uses faults across Oregon and projects an average earthquake on each one. Every county in Oregon is at risk of earthquake damage.

Introduction

Magnitudes

- Each increase in magnitude means 30 times more energy is released.
- A M8 quake releases 30 times as much energy as a M7, which releases 30 times as much as a M6.
- The Loma Prieta earthquake was a M7.1. A M9 Cascadia earthquake would release almost 900 times as much energy as the Loma Prieta event, with strong shaking lasting several minutes instead of 15 seconds.

Earthquakes occur in Oregon every day; every few years an earthquake is large enough for people to feel; and every few decades there is an earthquake that causes damage.

We have not had hugely destructive earthquakes in Oregon's limited written history. But we have seen earthquakes devastate other cities around the world. Large earthquakes in urban areas have produced extensive damage, including:

- $100 billion in Kobe, Japan (1995, M6.9)
- $42 billion in Northridge, California (1994, M6.7)
- $10 billion in Loma Prieta, California (1989, M7.1)

Damage depends on the specific geology, building standards, and preparation of each area. Preparation on state, community, and personal levels can significantly reduce the amount of damage from earthquakes.

This study is an attempt to quantify potential damage and loss to Oregon, and help point out areas of greatest need. Planners and policy makers can use this information to reduce future loss of life and property.

This is a preliminary study, using a newly developed computer model and years of research into Oregon's geology. The figures presented have a large margin of error and should be taken as relative indicators of potential damage, not absolute expected losses.

Molalla High School was condemned after the 1993 Scotts Mills earthquake (M5.6). A new high school was built on another site.

Cascadia subduction zone model

Research at Nestucca Bay suggests there have been at least 12 great (M8–9) Cascadia subduction earthquakes and tsunamis to strike Oregon in the last 5,000 years.

The Cascadia subduction zone is the most dangerous fault in Oregon. On average, it produces an earthquake every 300 to 600 years. However, as with any natural process, the average time between events may be misleading. Some of the earthquakes may have been 150 years apart, some were closer to a 1,000 years apart.

For this fault, the entire coastline is essentially the epicenter. The earthquake might last as long as four minutes, severely testing structures along the coast. Within a few minutes, a tsunami would follow.

Tsunamis are sometimes called tidal waves, but they have nothing to do with tides. They are the result of an undersea earthquake. The waves along the Oregon coast might be 30 feet high, sweeping up anything in their path.

Tsunami damages are not included in the estimates for this earthquake, and would seriously increase losses for coastal counties.

An earthquake of this magnitude is unprecedented in a large, industrialized, urban area and is the single most threatening geologic hazard in Oregon. Part of the danger is in the size of the area affected. If the entire fault ruptures, destruction could occur from northern California to Canada, making it difficult to bring in emergency supplies.

This study uses a magnitude 8.5 earthquake, considered to be an average event.

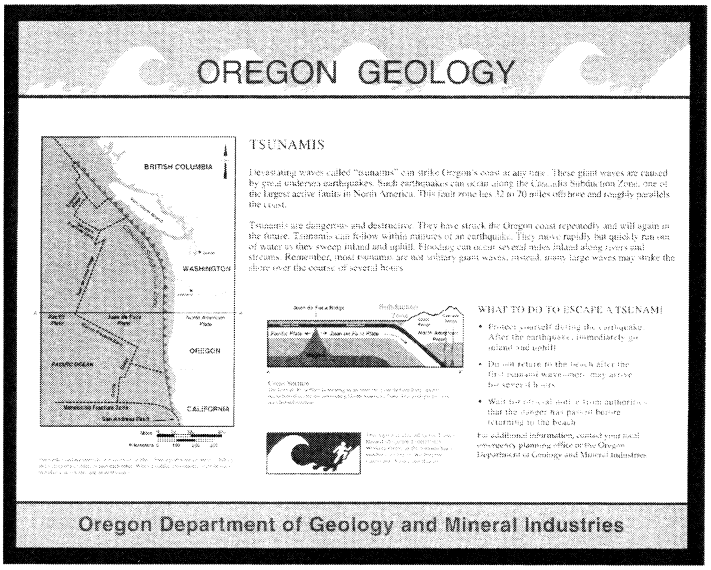
January 26, 1700

The last great Cascadia earthquake happened in 1700. This event was confirmed by several lines of evidence, including:

- Native American legends;
- Liquefaction features;
- Carbon dating;
- Tree-ring dating;
- Japanese records of a tsunami generated from a large earthquake across the Pacific.

Individual county estimates

A summary of statewide and individual county losses is in the Appendix.



The Cascadia subduction zone runs along the Pacific Northwest coast. It is the result of the Juan de Fuca plate sliding, or subducting, under the North American plate. Subduction zone earthquakes are usually very large and produce tsunamis.

Copies of this interpretive sign are being placed along the Oregon coast to warn residents and tourists.

Injuries and time of day

The number of deaths and injuries depends on the time of day, building type, occupancy class, and traffic pattern.

- Highest injuries are at 2 PM, mostly because of damages to commercial and industrial buildings.
- At 2 AM and 5 PM, casualties are higher in residential buildings.

Deaths and injuries

Deaths and injuries are estimated at 7,800, including:

- 6,300 injuries needing first aid
- 1,200 injuries needing hospitalization
- 200 life-threatening injuries
- 100 immediate deaths

Displaced households

Displaced households are estimated at 17,300.

Short-term shelter needs

Short-term shelter needs are estimated at 12,400.

In Kobe, 48,000 of these prefab units were needed for shelter for months after the earthquake.

Inspections by qualified staff are important because not all structural damage is evident to the untrained eye.

Building damage

Building damage can be assessed only after a qualified inspector has surveyed the structure. The following categories of damage are expected:

- 885,000 green-tagged (no restrictions)
- 55,000 yellow-tagged (need permission to enter)
- 37,000 red-tagged (cannot be used)

Properties along rivers, like port facilities, are especially vulnerable in an earthquake.

Direct economic losses

The total direct economic losses to buildings are estimated at $12 billion. These losses include both capital stock losses and income losses:

- Structural damage
  $2.0 billion
- Nonstructural damage
  $4.3 billion
- Contents
  $1.0 billion
- Inventory damage
  $0.1 billion
- Relocation
  $1.2 billion
- Capital-related loss
  $1.4 billion
- Wages
  $1.2 billion
- Rental income
  $0.7 billion

Residential, commercial, and industrial buildings are damaged in earthquakes. Losses include not only rebuilding costs, but also lost wages and income.

Essential facilities and schools

Essential facilities are police stations, fire stations, and emergency operation centers. These are facilities that provide services to the community and need to be functional after an earthquake. Only an estimated 65 percent of essential facilities and 66 percent of schools will be usable the day after the earthquake.

This high school chemistry lab was damaged in an earthquake. Chemical spills from hospitals, industrial facilities, and schools can be an additional hazard for cleanup crews.

The Oregon Department of Transportation is on a 100-year schedule to upgrade state-owned bridges.

Transportation

It is important to have usable highways and airports after an earthquake, to allow rescue, recovery, and rebuilding efforts. Damage estimates include:

- $370 million in highways, including major and urban roadways and bridges
- $120 million in airports, including control towers, runways, terminal buildings, parking structures, fuel facilities, and maintenance and hangar facilities

Bridges are a vital transportation link. Damage to bridges can make some areas inaccessible. An estimated 18 percent of highway bridges will not be usable the day of the earthquake.

Bridge damage

■ No damage	67%
■ Slight	21%
■ Moderate	9%
■ Extensive	1%
■ Complete	7%

Broadcasting stations

An estimated 29 percent of broadcasting stations would not be functioning the day after an earthquake. Total expected losses are $100 million.

Debris

An estimated 9.3 million tons of debris is expected to be generated. This includes brick, wood, glass, building contents, steel members or reinforced concrete elements, and other materials.

Oregon has over 4,000 bridges. This Costa Rican bridge failed during an earthquake.

County Rankings

Oregon's 36 counties have been ranked in a variety of ways to better understand the relative risks.

There is a level of uncertainty in all results of the study. However, the uncertainty is so high in counties with losses less than $20 million and loss ratios of less than 1 percent, that for them the results have limited application. Baker, Crook, Deschutes, Gilliam, Grant, Harney, Hood River, Jefferson, Lake, Malheur, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler Counties are in this group.

"Highest" loss can be calculated in several ways. The table below shows the counties with the largest economic base, the greatest absolute losses, and the highest ratio of losses to base. The counties with the highest loss ratios have the highest "relative" impact to the county.

A combination of absolute loss and relative loss (shown in the sidebar) is one way of determining the most vulnerable counties.

The listing of coastal counties as having the highest loss ratios indicated their relative closeness to the Cascadia subduction zone. However, their losses would probably be substantially higher with the inclusion of tsunami damages.

Highest combined economic loss and loss ratio

Lane
Coos
Benton
Lincoln
Josephine
Clatsop
Jackson
Linn
Curry

Largest economic base	Highest economic losses	Highest loss ratio
Multnomah	Multnomah	Coos
Washington	Lane	Curry
Lane	Coos	Clatsop
Clackamas	Washington	Lincoln
Marion	Marion	Josephine
Jackson	Benton	Benton
Linn	Lincoln	Tillamook
Deschutes	Josephine	Polk
Douglas	Clatsop	Lane
Benton	Jackson	Linn

Small businesses in older unreinforced brick or masonry buildings are among the hardest hit in an earthquake.

500 year model

Every part of Oregon has earthquakes. The 500 year model is an attempt to quantify the risk across the state.

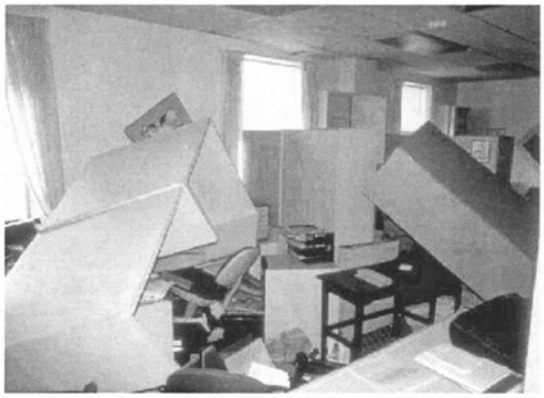
This estimate does not look at a single earthquake. Instead, this study includes many faults, each with a 10 percent chance of producing an earthquake in the next 50 years. It assumes each fault will produce a single "average" earthquake during this time. More and higher magnitude earthquakes than used in this study may occur.

Klamath County is building a new courthouse to replace the one destroyed in 1993.

Individual county estimates
A summary of statewide and individual county losses is in the Appendix.

This model underrepresents losses, because a single fault might produce the "average" event, and also larger or smaller events, but only the average magnitude event is counted. So, if all expected earthquakes were included, the cumulative losses over the next 500 years would be higher than the estimated losses reported in this study.

Collapsed buildings mean immediate injuries, as well as longer term housing needs for those who cannot return to their own homes.



Even when there is no structural damage, disruption occurs because of falling shelves, cabinets, equipment, and glass.

Deaths and injuries

Deaths and injuries are estimated at 24,600, including:

- 19,700 injuries needing first aid
- 3,800 injuries needing hospitalization
- 600 life-threatening injuries
- 500 immediate deaths

Displaced households

Displaced households are estimated at 47,400.

This house was shifted off its foundation. The best protection for homes against earthquake damage is to make sure the house is bolted to the foundation, and the water heater is strapped to a wall.

Short-term shelter needs

Short-term shelter needs are estimated at 32,700.

Building damage

Building damage can be assessed only after a qualified inspector has surveyed the structure. The following categories of damage are expected:

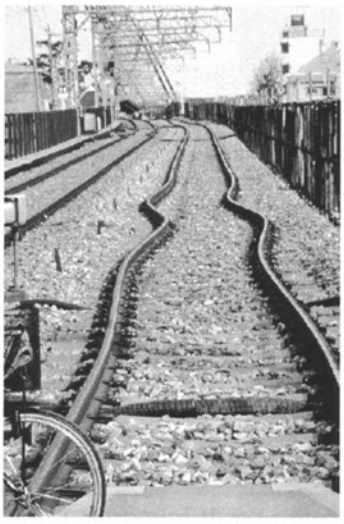
- 769,000 green-tagged (no restrictions)
- 129,000 yellow-tagged (need permission to enter)
- 79,000 red-tagged (cannot be used)

Earthquake losses can include not only structures but inventory and personal property on streets and in parking lots.

Direct economic losses

The total direct economic losses to buildings are estimated at $32 billion. These losses include both capital stock losses and income losses:

■ Structural damage	$5.1 billion
■ Nonstructural damage	$12.2 billion
■ Contents	$2.8 billion
■ Inventory damage	$0.1 billion
■ Relocation	$3.0 billion
■ Capital-related loss	$3.8 billion
■ Wages	$3.0 billion
■ Rental income	$1.8 billion



Railroads, airports, and water ports can be disrupted after an earthquake. This can make bringing in supplies for rescue and recovery more difficult.

Essential facilities and schools

Police stations, fire stations, emergency operation centers, and schools will certainly be damaged in earthquakes around Oregon. However, since the figures in this model are a compilation of damages from many earthquakes, no estimate can be made of facilities operational the day after a specific earthquake. It is still important that local communities look at their facilities which are at greatest risk.

There are many nonstructural hazards after an earthquake, like twisted staircases, cracks in walls, and broken utility pipes.

Freeways, major highways, and local roads may be disrupted in a variety of ways.

Transportation

It's important to have usable highways and airports after an earthquake to allow rescue, recovery, and rebuilding efforts. Projected damages include:

- $1.26 billion in highways, including major and urban roadways and bridges
- $0.32 billion in airports, including control towers, runways, terminal buildings, parking structures, fuel facilities, and maintenance and hangar facilities

Oregon has many bridges on our highways, and damage to bridges can make some areas inaccessible. Damage levels include:

- No damage 31%
- Slight 32%
- Moderate 26%
- Extensive 4%
- Complete 6%

Broadcasting stations

Expected losses for broadcasting stations are $210 million.

Debris

An estimated 23.3 million tons of debris is expected to be generated. This includes brick, wood, glass, building contents, steel members or reinforced concrete elements, and other materials.

Freeway overpasses collapsed in Kobe, leaving this bus and other cars stranded.

Highest combined economic loss and loss ratio

Multnomah
Washington
Lane
Marion
Clackamas
Coos
Benton
Linn
Klamath

County Rankings

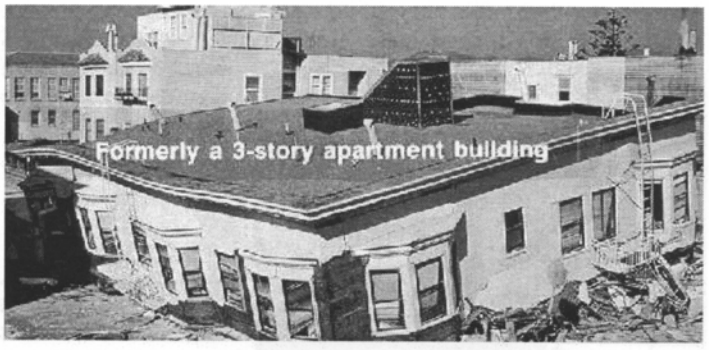
Oregon's 36 counties have been ranked in a variety of ways to better understand the relative risks.

There is a level of uncertainty in all results of the study. However, the uncertainty is so high in counties with losses less than $20 million and loss ratios of less than 1 percent, that for them the results have limited application. Baker, Crook, Gilliam, Grant, Harney, Sherman, Union, Wallowa, and Wheeler Counties are in this group.

"Highest" loss can be calculated in several ways. The table below shows the counties with the largest economic base, the greatest absolute losses, and the highest ratio of losses to base. The counties with the highest loss ratios have the highest "relative" impact to the county. Because of the expected tsunami after a Cascadia subduction zone earthquake, losses for coastal counties would be substantially higher than shown.

A combination of absolute loss and relative loss (shown in the sidebar) is one way of determining the most vulnerable counties.

Largest economic base	Highest economic losses	Highest loss ratio
Multnomah	Multnomah	Coos
Washington	Washington	Curry
Lane	Lane	Clatsop
Clackamas	Marion	Klamath
Marion	Clackamas	Lincoln
Jackson	Coos	Benton
Linn	Jackson	Josephine
Deschutes	Benton	Tillamook
Douglas	Linn	Polk
Benton	Klamath	Yamhill



Entire floors may collapse in buildings not designed to current code standards.

Significant historical earthquakes affecting Oregon

Earthquake history

Because we do not have a complete history of Oregon earthquakes, we cannot fully assess the future risk. In western Oregon, the high rainfall promotes high erosion rates and dense ground cover, both of which tend to hide faults.

The written history of Oregon covers a short time, particularly in the context of geologic processes. Because of that short time frame, we do not have a complete earthquake record of the area.

In addition, much of Oregon has been sparsely populated, so that some earthquakes have been felt by only a few people, which makes it difficult to get an accurate reading on the strength and epicenter of the quakes.

Even today, we do not have complete seismograph coverage of Oregon. This means we do not have a complete record of the very small earthquakes that are important in understanding the earthquake potential of an area.

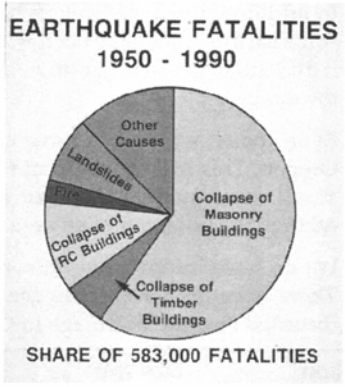
We do have information on some previous earthquakes, however. There have been several in the last hundred years that have been recorded or caused damage in Oregon.

Date	Location	Size (M)	Comments
Approximate years: 1400 BCE 1050 BCE 600 BCE 400 750 900	Offshore, Cascadia subduction zone	Probably 8-9	Researchers Brian Atwater and Eileen Hemphill-Haley have dated earthquakes and tsunamis at Willapa Bay, Washington; these are the midpoints of the age ranges for these six events.
January 26, 1700	Offshore, Cascadia subduction zone	Approx-imately 9	Generated a tsunami that struck Oregon, Washington and Japan; destroyed Native American villages along the coast.
November 23, 1873	Oregon/California border, near Brookings	6.8	Felt as far away as Portland and San Francisco; may have been an intraplate event because of lack of aftershocks.
April 13, 1949	Milton-Freewater	6.4	Two foreshocks and many aftershocks felt; $100,000 damage (in 1936 dollars).
April 13, 1949	Olympia, Washington	7.1	Eight deaths and $25 million damage (in 1949 dollars); cracked plaster, other minor damage in northwest Oregon.
November 5, 1962	Portland/Vancouver	5.5	Shaking lasted up to 30 seconds; chimneys cracked, windows broke, furniture moved.
1968	Adel	Swarm, largest 5.1	Swarm lasted May through July, decreasing in intensity; increased flow at a hot spring was reported.
April 12, 1976	Near Maupin	4.8	Sounds described as distant thunder, sonic booms, and strong wind.
April 25, 1992	Cape Mendocino, California	7.0	Subduction earthquake at the triple junction of the Cascadia subduction zone and the San Andreas and Mendocino faults.
March 25, 1993	Scotts Mills	5.6	On Mount Angel-Gales Creek fault; $30 million damage, including Molalla High School and Mount Angel church.
September 20, 1993	Klamath Falls	5.9 and 6.0	Two deaths, $10 million damage, including county courthouse; rockfalls induced by ground motion.

Special hazards

Earthquake damage in localized areas can be intensified in a variety of situations. The way the ground responds to earthquake waves and the type of buildings around are the two most important factors in how much damage an earthquake will cause. In addition, damage can be caused by secondary factors, like fire or tsunamis, after an earthquake.

The following hazards can substantially increase losses and injuries from earthquakes. Of these hazards, only amplification was included in the computer models used to estimate future damages.

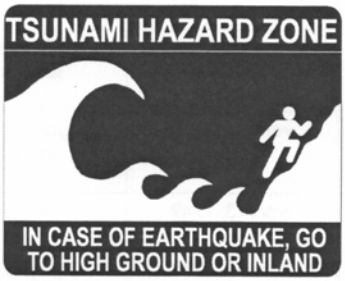


Building collapse is the greatest cause of earthquake deaths. When URMs are greatly damaged, an average of one out of five people in an older brick building die.

This chart does not include deaths from tsunamis.

Tsunamis

A subduction zone earthquake off the Oregon coast would generate a tsunami, a series of waves perhaps 30 feet or higher that would sweep away everything in their path. Tsunami damage is not included in the estimates in this paper, and would substantially increase casualties and damage in coastal counties. Deaths can be minimized if people immediately evacuate to higher ground, or at least inland, after an earthquake.



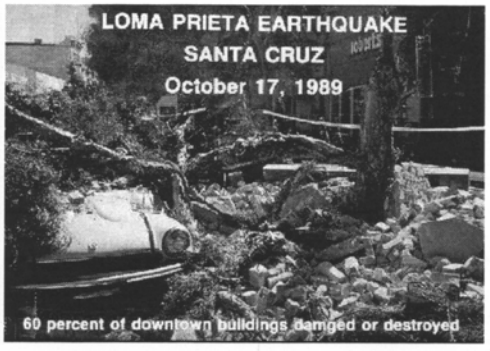
These signs along the coast show what to do in case a tsunami strikes the Oregon coast.

Unreinforced brick or masonry buildings (URMs)

Most injuries in an earthquake are from building failures. Some types of structures withstand earthquakes better than others. In general, wood frame houses can withstand a moderate earthquake without collapsing.

The most dangerous buildings are constructed of unreinforced brick or masonry (URM). URMs are typically older brick buildings, often concentrated in a downtown area.

The computer model underestimates potential building damage (and casualties), since it does not include these older brick buildings.



There are about 1,500 URMs in the Portland area. That is about 3 percent of all the commercial, industrial, and apartment buildings in the metropolitan area.

Earthquakes can trigger landslides, especially on steep slopes.

This landslide was triggered by a 1993 Klamath Falls earthquake, and caused one of the two deaths from that event.

Liquefaction

Certain types of fine-grained, unconsolidated soils behave like a liquid during an earthquake, and cannot support buildings. Liquefaction is a major source of damage. These soils are particularly prevalent along flood plains and on land that was artificially filled before construction, like San Francisco's Marina District.

Amplification

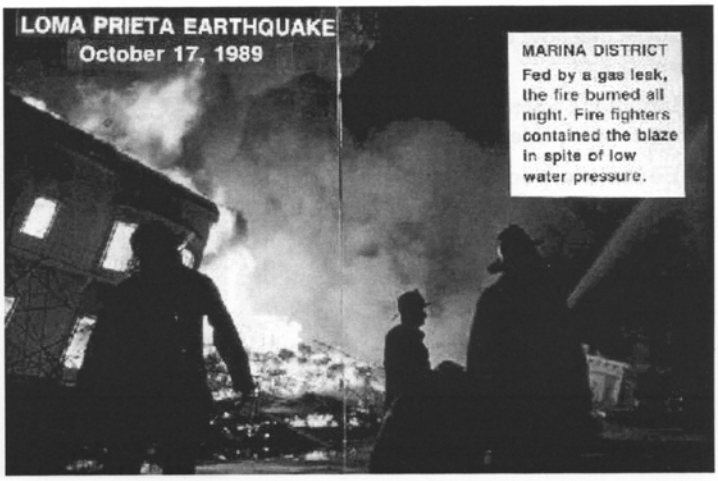
Some soil types cause the earthquake waves to amplify, causing increased shaking and damage. The risk of amplification decreases when you are on bedrock, like the basalt that covers much of Oregon, and increases when you are on certain fine-grained soils. In some cases, these soils will also liquefy.

Landslides

Although we typically think of landslides as a hazard from high rainfall, earthquakes can also trigger landslides. In 1993, many rockfalls were generated by the Klamath Falls earthquakes.

Fire

A serious hazard after earthquakes is fire. Most of the damage from the 1906 San Francisco quake was from out-of-control fires. More recently, fire did millions of dollars of damage in Kobe after the 1995 earthquake.



The Marina District in San Francisco was hard hit by fires.

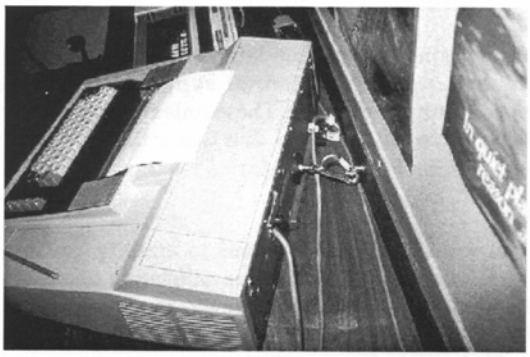
Earthquake preparation

Because earthquakes do not happen often in Oregon, we have only recently learned the extent of our earthquake hazard. For example, a Cascadia subduction earthquake happens only every 300 to 600 years, but it can devastate large portions of our state if we are not prepared when it does happen.

And we do not need the huge earthquake for destruction. Earthquakes can shake us any time and anywhere in Oregon, and all communities need to be prepared.

How prepared is Oregon?

A California Emergency Services official said he'd rather be in Los Angeles than Portland for a big earthquake because Portland is less prepared.



Equipment and inventory damage (and resulting injuries) can be minimized be using simple mitigation techniques, like bolting and wiring computers and other material to tables or walls.

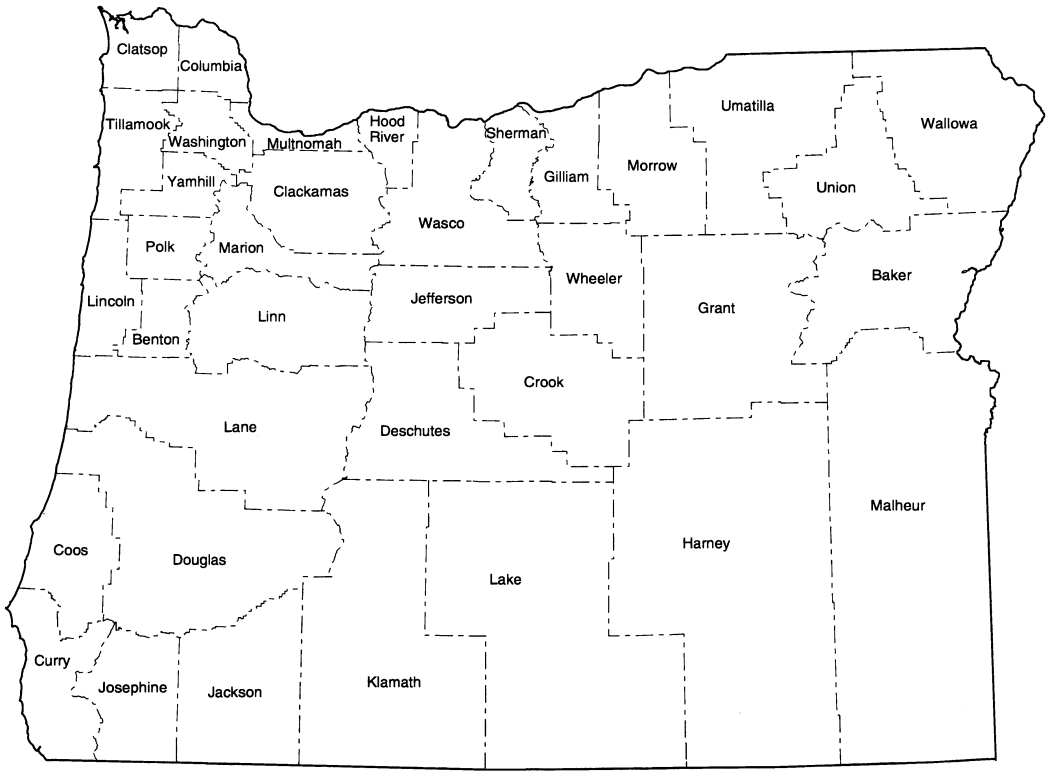
We can do much to prepare, including:

- Continuing to improve building standards
- Identifying and strengthening weak, existing buildings so they will not collapse from earthquakes, especially
  - Schools
  - Fire and police stations
  - Hospitals
  - Historical buildings
- Teaching children and adults about personal earthquake safety steps, like how to duck, cover, and hold, and preparing 72-hour safety kits
- Improving water, sewer, electric, gas, and other utility lines
- Educating people about the risk of earthquakes, particularly in their own neighborhoods
- Educating people about the dangers of tsunamis

Downtown core areas, with historic buildings, are among the most vulnerable. Seismic upgrade of these buildings can save lives and property.

Appendix: Summaries of damages

State of Oregon and its counties



If you are at home when an earthquake strikes, get under a table to protect yourself from falling objects. Turn off the stove immediately to help prevent fires.

Although wood-frame houses generally withstand shaking fairly well, chimneys can fall in any structure. Stay away from brick walls or chimneys in an earthquake.

Statewide Summary

	M8.5 Cascadia subduction zone event	500 year model
Injuries	7,700	24,180
Deaths	100	500
Displaced households	17,300	47,400
Short-term shelter needs	12,400	32,700
Economic losses for buildings	$12 billion	$32 billion
Operational the day after the quake:		
Essential facilities	65%	NA
Schools	66%	NA
Bridges	85%	NA
Economic losses to:		
Highways	$370 million	$1.3 billion
Airports	$120 million	$320 million
Communication systems:		
Economic losses	$100 million	$210 million
Operating the day of the quake	71%	NA
Debris generated (thousands of tons)	9,300	23,300
Percentage of buildings in damage categories		
None	52%	24%
Slight	10%	13%
Moderate	12%	19%
Extensive	9%	18%
Complete	7%	16%

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannoi be calculated.

County economic base	
County	**Value (in thousands)**
Multnomah	$37,264,000
Washington	$16,552,000
Lane	$15,418,000
Clackamas	$14,279,000
Marion	$11,812,000
Jackson	$7,829,000
Linn	$4,724,000
Deschutes	$4,673,000
Douglas	$4,631,000
Benton	$3,693,000
Coos	$3,263,000
Josephine	$3,240,000
Klamath	$3,134,000
Yamhill	$3,038,000
Umatilla	$2,998,000
Lincoln	$2,668,000
Polk	$2,330,000
Clatsop	$2,198,000
Columbia	$1,664,000
Tillamook	$1,539,000
Malheur	$1,356,000
Wasco	$1,260,000
Union	$1,237,000
Curry	$1,093,000
Hood River	$1,029,000
Baker	$943,000
Crook	$733,000
Jefferson	$707,000
Wallowa	$444,000
Grant	$415,000
Harney	$401,000
Lake	$393,000
Morrow	$365,000
Gilliam	$112,000
Sherman	$97,000
Wheeler	$82,000

M8.5 Cascadia subduction zone model

County	Total losses (in thousands)
Multnomah	$1,943,000
Lane	$1,614,000
Coos	$1,339,000
Washington	$931,000
Marion	$776,000
Benton	$632,000
Lincoln	$624,000
Josephine	$593,000
Clatsop	$549,000
Jackson	$538,000
Linn	$443,000
Curry	$371,000
Clackamas	$317,000
Douglas	$275,000
Yamhill	$259,000
Polk	$249,000
Tillamook	$226,000
Columbia	$72,000
Klamath	$41,000
Deschutes	$5,000
Hood River	$3,000
Jefferson	<$1,000
Grant	<$1,000
Gilliam	<$1,000
Harney	<$1,000
Lake	<$1,000
Umatilla	<$1,000
Baker	<$1,000
Crook	<$1,000
Malheur	<$1,000
Morrow	<$1,000
Sherman	<$1,000
Union	<$1,000
Wallowa	<$1,000
Wasco	<$1,000
Wheeler	<$1,000

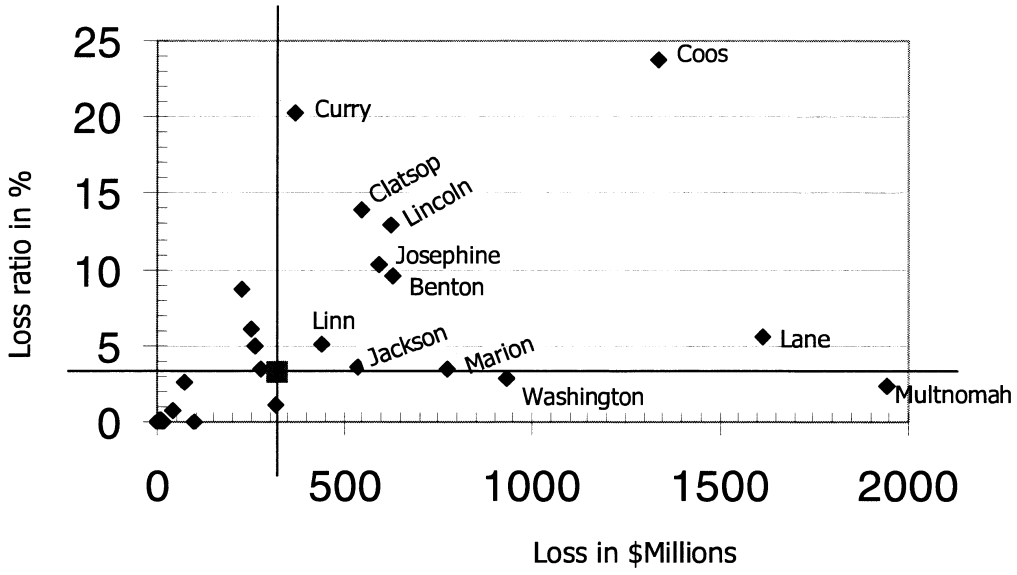
County	Loss ratio
Coos	24%
Curry	20%
Clatsop	14%
Lincoln	13%
Josephine	10%
Benton	10%
Tillamook	9%
Polk	6%
Lane	6%
Linn	5%
Yamhill	5%
Jackson	4%
Douglas	4%
Marion	3%
Washington	3%
Columbia	3%
Multnomah	2%
Clackamas	1%
Klamath	<1%
Hood River	<1%
Jefferson	<1%
Deschutes	<1%
Wasco	<1%
Lake	<1%
Crook	<1%
Morrow	<1%
Umatilla	<1%
Malheur	<1%
Sherman	<1%
Wheeler	<1%
Baker	<1%
Wallowa	<1%
Union	<1%
Grant	<1%
Gilliam	<1%
Harney	<1%

500 year model

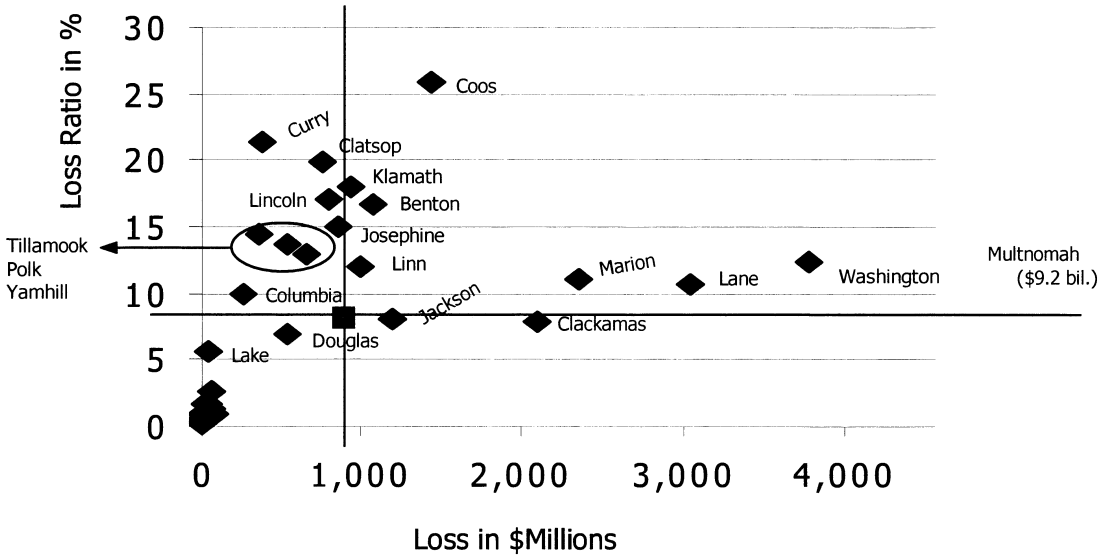
County	Total losses (in thousands)
Multnomah	$9,219,000
Washington	$3,779,000
Lane	$3,044,000
Marion	$2,342,000
Clackamas	$2,099,000
Coos	$1,429,000
Jackson	$1,191,000
Benton	$1,073,000
Linn	$998,000
Klamath	$939,000
Josephine	$848,000
Lincoln	$793,000
Clatsop	$760,000
Yamhill	$655,000
Douglas	$546,000
Polk	$529,000
Curry	$388,000
Tillamook	$364,000
Columbia	$267,000
Deschutes	$71,000
Umatilla	$68,000
Hood River	$62,000
Malheur	$43,000
Lake	$40,000
Wasco	$25,000
Jefferson	$14,000
Baker	$13,000
Morrow	$10,000
Union	$9,000
Wallowa	$8,000
Crook	$6,000
Grant	$3,000
Harney	$2,000
Sherman	$1,000
Wheeler	$1,000
Gilliam	$1,000

County	Loss ratio
Coos	26%
Curry	21%
Clatsop	20%
Klamath	18%
Lincoln	17%
Benton	17%
Josephine	15%
Tillamook	14%
Polk	14%
Yamhill	13%
Multnomah	13%
Washington	12%
Linn	12%
Marion	11%
Lane	11%
Columbia	10%
Jackson	8%
Clackamas	8%
Douglas	7%
Lake	6%
Hood River	3%
Morrow	2%
Malheur	2%
Umatilla	1%
Jefferson	1%
Wasco	1%
Wallowa	<1%
Deschutes	<1%
Baker	<1%
Sherman	<1%
Wheeler	<1%
Crook	<1%
Union	<1%
Grant	<1%
Gilliam	<1%
Harney	<1%

Loss ratio vs. value loss for Cascadia subduction zone model



Loss ratio vs. value loss for 500 year model



Baker County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	3
Deaths	0	0
Displaced households	0	10
Short term shelter needs	0	8
Economic losses for buildings	$15,000	$13 million
Operational the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	0	$5 million
Airports	0	$2 million
Communication systems:		
Economic losses	0	$1,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	8

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	100	0	0	0	0
Industrial	100	0	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	85	7	5	2	0
Commercial	82	8	7	3	0
Education	85	7	6	2	0
Government	83	8	7	2	0
Industrial	82	9	7	3	0
Residential	90	8	3	1	0

Benton County	8.5 Cascadia subduction zone event	500 year model
Injuries	398	682
Deaths	8	15
Displaced households	1,223	2,082
Short term shelter needs	1,122	1,855
Economic losses for buildings	$632 million	$1.1 billion
Operational the day after the quake:		
Fire stations	46%	NA
Police stations	38%	NA
Schools	40%	NA
Bridges	61%	NA
Economic losses to:		
Highways	$5 million	$11 million
Airports	$5 million	$11 million
Communication systems:		
Economic losses	$4 million	$10 million
Operating the day of the quake	52%	NA
Debris generated (thousands of tons)	544	802

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	33	15	17	17	18
Commercial	16	12	25	24	23
Education	22	12	19	21	21
Government	14	10	23	26	26
Industrial	15	11	23	25	26
Residential	53	22	13	6	5

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	18	17	21	19	26
Commercial	8	9	23	27	34
Education	12	12	19	22	30
Government	7	7	20	28	38
Industrial	7	8	19	27	38
Residential	30	29	23	9	8

Clackamas County	8.5 Cascadia subduction zone event	500 year model
Injuries	128	1,402
Deaths	2	29
Displaced households	426	2,525
Short term shelter needs	262	1,550
Economic losses for buildings	$316 million	$2.1 billion
Operational the day after the quake:		
Fire stations	84%	NA
Police stations	84%	NA
Schools	84%	NA
Bridges	90%	NA
Economic losses to:		
Highways	$6 million	$74 million
Airports	$3 million	$32 million
Communication systems:		
Economic losses	$232,000	$4 million
Operating the day of the quake	89%	NA
Debris generated (thousands of tons)	237	1,588

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	75	9	8	3	1
Commercial	76	11	9	3	1
Education	67	9	8	3	1
Government	72	12	11	4	1
Industrial	71	12	11	4	1
Residential	88	8	3	1	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	32	18	20	16	10
Commercial	23	15	27	22	12
Education	26	14	20	17	9
Government	23	14	26	23	13
Industrial	22	14	27	23	14
Residential	50	28	16	5	2

Clatsop County	8.5 Cascadia subduction zone event	500 year model
Injuries	298	397
Deaths	6	8
Displaced households	788	1,182
Short term shelter needs	543	821
Economic losses for buildings	$548 million	$760 million
Operational the day after the quake:		
Fire stations	16%	NA
Police stations	15%	NA
Schools	16%	NA
Bridges	58%	NA
Economic losses to:		
Highways	$18 million	$33 million
Airports	$5 million	$7 million
Communication systems:		
Economic losses	$6 million	$8 million
Operating the day of the quake	26%	NA
Debris generated (thousands of tons)	383	474

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	6	8	10	10	19
Commercial	2	4	14	23	36
Education	5	6	11	14	24
Government	3	4	15	26	46
Industrial	2	4	13	21	35
Residential	24	28	23	10	9

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	4	8	11	11	20
Commercial	2	4	14	23	37
Education	4	6	11	14	24
Government	2	4	14	26	47
Industrial	2	3	13	20	35
Residential	15	27	28	12	10

Columbia County	8.5 Cascadia subduction zone event	500 year model
Injuries	36	150
Deaths	0	3
Displaced households	94	326
Short term shelter needs	65	233
Economic losses for buildings	$71 million	$267 million
Operational the day after the quake:		
Fire stations	unknown	NA
Police stations	45%	NA
Schools	63%	NA
Bridges	82%	NA
Economic losses to:		
Highways	$2 million	$10 million
Airports	$2 million	$8 million
Communication systems:		
Economic losses	$97,000	$950,000
Operating the day of the quake	82%	NA
Debris generated (thousands of tons)	57	184

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	48	12	13	11	7
Commercial	41	15	19	12	5
Education	43	11	14	9	4
Government	37	14	21	17	11
Industrial	36	14	20	14	7
Residential	70	16	8	4	2

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	20	16	19	17	18
Commercial	12	10	23	24	21
Education	16	12	19	18	17
Government	12	10	23	27	29
Industrial	11	9	23	25	24
Residential	34	30	22	9	5

Coos County	8.5 Cascadia subduction zone event	500 year model
Injuries	854	845
Deaths	16	16
Displaced households	2,069	2,521
Short term shelter needs	1,548	1,885
Economic losses for buildings	$1.3 billion	$1.4 billion
Operating the day after the quake:		
Fire stations	10%	NA
Police stations	6%	NA
Schools	8%	NA
Bridges	44%	NA
Economic losses to:		
Highways	$44 million	$49 million
Airports	$20 million	$20 million
Communication systems:		
Economic losses	$25 million	$22 million
Operating the day of the quake	19%	NA
Debris generated (thousands of tons)	853	864

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	3	8	16	16	42
Commercial	0	1	8	18	57
Education	1	4	10	14	47
Government	0	1	6	17	67
Industrial	0	1	6	17	60
Residential	6	16	30	20	21

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	5	10	19	19	31
Commercial	2	3	15	24	41
Education	3	6	14	20	34
Government	1	3	12	25	51
Industrial	1	2	13	24	44
Residential	9	21	31	17	15

Crook County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	1
Deaths	0	0
Displaced households	0	0
Short term shelter needs	0	0
Economic losses for buildings	$156,000	$5.5 million
Operating the day after the quake:		
Fire stations	96%	NA
Police stations	96%	NA
Schools	97%	NA
Bridges	100%	NA
Economic losses to:		
Highways	$6,000	$879,000
Airports	0	$316,000
Communication systems:		
Economic losses	$8,000	$498,000
Operating the day of the quake	97%	NA
Debris generated (thousands of tons)	0	3

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	99	1	0	0	0
Commercial	99	1	0	0	0
Education	99	1	0	0	0
Government	99	1	0	0	0
Industrial	99	1	0	0	0
Residential	99	1	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	87	8	5	1	0
Commercial	86	9	5	1	0
Education	87	8	5	1	0
Government	86	9	5	1	0
Industrial	84	10	6	1	0
Residential	86	9	5	0	0

Curry County	8.5 Cascadia subduction zone event	500 year model
Injuries	221	212
Deaths	3	3
Displaced households	430	486
Short term shelter needs	292	328
Economic losses for buildings	$371 million	$388 million
Operating the day after the quake:		
Fire stations	9%	NA
Police stations	5%	NA
Schools	6%	NA
Bridges	34%	NA
Economic losses to:		
Highways	$48 million	$44 million
Airports	$11 million	$12 million
Communication systems:		
Economic losses	$18 million	$15 million
Operating the day of the quake	17%	NA
Debris generated (thousands of tons)	267	261

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	3	7	13	13	24
Commercial	1	2	12	21	44
Education	2	5	11	14	28
Government	1	2	9	21	47
Industrial	1	2	10	21	47
Residential	5	16	25	17	18

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	5	10	15	15	15
Commercial	4	6	20	25	25
Education	5	7	15	17	16
Government	4	5	18	27	27
Industrial	3	5	19	26	27
Residential	10	20	24	15	10

Deschutes County	8.5 Cascadia subduction zone event	500 year model
Injuries	1	17
Deaths	0	0
Displaced households	0	5
Short term shelter needs	0	3
Economic losses for buildings	$5 million	$71 million
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	99%	NA
Schools	99%	NA
Bridges	100%	NA
Economic losses to:		
Highways	$17,000	$572,000
Airports	$40,000	$2 million
Communication systems:		
Economic losses	$2,000	$1 million
Operating the day of the quake	99%	NA
Debris generated (thousands of tons)	3	47

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	93	1	0	0	0
Commercial	93	1	0	0	0
Education	89	1	0	0	0
Government	98	1	0	0	0
Industrial	93	2	0	0	0
Residential	98	1	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	75	10	7	2	0
Commercial	72	11	9	3	0
Education	71	10	7	2	0
Government	75	12	9	3	1
Industrial	69	12	10	3	1
Residential	83	10	5	1	0

Douglas County	8.5 Cascadia subduction zone event	500 year model
Injuries	151	294
Deaths	2	4
Displaced households	255	534
Short term shelter needs	193	410
Economic losses for buildings	$275 million	$546 million
Operating the day after the quake:		
Fire stations	66%	NA
Police stations	57%	NA
Schools	44%	NA
Bridges	74%	NA
Economic losses to:		
Highways	$43 million	$69 million
Airports	$5 million	$9 million
Communication systems:		
Economic losses	$7 million	$12 million
Operating the day of the quake	61%	NA
Debris generated (thousands of tons)	222	411

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	28	8	9	7	4
Commercial	21	9	13	9	6
Education	25	8	10	7	4
Government	20	8	13	10	6
Industrial	19	8	13	10	7
Residential	36	10	6	3	2

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	19	10	12	9	6
Commercial	12	9	16	12	7
Education	17	9	13	10	6
Government	12	8	15	13	8
Industrial	11	8	16	13	9
Residential	27	14	9	4	2

Gilliam County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	0
Deaths	0	0
Displaced households	0	0
Short term shelter needs	0	0
Economic losses for buildings	$5,000	$705,000
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	0	$350,000
Airports	0	$440,000
Communication systems:		
Economic losses	0	$29,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	0

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	100	0	0	0	0
Industrial	100	0	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	88	8	4	1	0
Commercial	86	9	5	1	0
Education	88	8	4	1	0
Government	86	9	5	1	0
Industrial	84	10	5	1	0
Residential	92	7	2	0	0

Grant County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	0
Deaths	0	0
Displaced households	0	0
Short term shelter needs	0	0
Economic losses for buildings	$6,000	$3 million
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	0	$3 million0
Airports	$8,000	$2 million0
Communication systems:		
Economic losses	0	$469,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	1

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	100	0	0	0	0
Industrial	100	0	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	90	7	4	1	0
Commercial	89	7	4	1	0
Education	91	7	3	0	0
Government	90	7	4	1	0
Industrial	88	8	4	1	0
Residential	90	7	3	0	0

Harney County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	0
Deaths	0	0
Displaced households	0	0
Short term shelter needs	0	0
Economic losses for buildings	$4,000	$2 million
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	0	$7 million
Airports	0	$5 million
Communication systems:		
Economic losses	0	$2 million
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	1

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	100	0	0	0	0
Industrial	100	0	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	90	7	3	1	0
Commercial	89	8	4	1	0
Education	90	7	3	1	0
Government	89	8	4	1	0
Industrial	89	8	4	1	0
Residential	89	7	3	0	0

Hood River County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	30
Deaths	0	1
Displaced households	0	56
Short term shelter needs	0	40
Economic losses for buildings	$3 million	$62 million
Operating the day after the quake:		
Fire stations	99%	NA
Police stations	100%	NA
Schools	98%	NA
Bridges	95%	NA
Economic losses to:		
Highways	$704,000	$12 million
Airports	$76,000	$3 million
Communication systems:		
Economic losses	$17,000	$1 million
Operating the day of the quake	96%	NA
Debris generated (thousands of tons)	1	41

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	97	3	1	0	0
Commercial	96	3	1	0	0
Education	97	3	1	0	0
Government	97	3	1	0	0
Industrial	96	3	1	0	0
Residential	98	2	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	65	15	13	6	1
Commercial	57	17	17	8	1
Education	63	15	15	6	1
Government	57	16	17	7	2
Industrial	55	16	18	9	2
Residential	77	15	6	1	0

Jackson County	8.5 Cascadia subduction zone event	500 year model
Injuries	428	930
Deaths	8	18
Displaced households	650	1,458
Short term shelter needs	489	1,080
Economic losses for buildings	$538 million	$1.2 billion
Operational the day after the quake:		
Fire stations	75%	NA
Police stations	62%	NA
Schools	70%	NA
Bridges	84%	NA
Economic losses to:		
Highways	$10 million	$34 million
Airports	$2 million	$8 million
Communication systems:		
Economic losses	$2 million	$9 million
Operating the day of the quake	81%	NA
Debris generated (thousands of tons)	434	889

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	61	10	10	7	5
Commercial	58	11	13	9	6
Education	51	9	10	8	5
Government	55	11	14	10	7
Industrial	54	11	14	10	7
Residential	75	12	6	3	1

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	39	15	17	13	10
Commercial	29	15	23	18	13
Education	29	12	17	14	11
Government	29	14	22	18	14
Industrial	27	14	23	19	14
Residential	54	21	13	5	3

Jefferson County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	7
Deaths	0	0
Displaced households	0	12
Short term shelter needs	0	15
Economic losses for buildings	$764,000	$14 million
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	99%	NA
Bridges	100%	NA
Economic losses to:		
Highways	$9,000	$698,000
Airports	0	$395,000
Communication systems:		
Economic losses	0	$104,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	1	10

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	98	2	0	0	0
Commercial	97	2	0	0	0
Education	98	2	0	0	0
Government	97	2	0	0	0
Industrial	97	2	0	0	0
Residential	98	2	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	74	11	10	4	1
Commercial	69	14	13	5	1
Education	72	12	11	4	1
Government	67	14	14	6	1
Industrial	65	14	15	6	1
Residential	78	12	7	2	1

Josephine County	8.5 Cascadia subduction zone event	500 year model
Injuries	418	585
Deaths	7	11
Displaced households	573	872
Short term shelter needs	433	662
Economic losses for buildings	$593 million	$847 million
Operational the day after the quake:		
Fire stations	22%	NA
Police stations	45%	NA
Schools	34%	NA
Bridges	73%	NA
Economic losses to:		
Highways	$16 million	$29 million
Airports	$5 million	$10 million
Communication systems:		
Economic losses	$4 million	$8 million
Operating the day of the quake	49%	NA
Debris generated (thousands of tons)	476	614

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	36	15	17	15	17
Commercial	23	11	21	21	23
Education	26	11	16	16	19
Government	23	12	21	21	23
Industrial	21	11	21	21	26
Residential	50	22	15	7	6

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	27	17	20	16	19
Commercial	17	12	23	23	26
Education	19	12	18	17	21
Government	18	12	22	22	26
Industrial	16	11	22	22	29
Residential	38	26	21	9	7

Klamath County	8.5 Cascadia subduction zone event	500 year model
Injuries	14	630
Deaths	0	12
Displaced households	37	1,409
Short term shelter needs	30	1,061
Economic losses for buildings	$41 million	$939 million
Operating the day after the quake:		
Fire stations	99%	NA
Police stations	99%	NA
Schools	97%	NA
Bridges	98%	NA
Economic losses to:		
Highways	$339,000	$28 million
Airports	$642,000	$15 million
Communication systems:		
Economic losses	$141,000	$14 million
Operating the day of the quake	96%	NA
Debris generated (thousands of tons)	28	610

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	81	7	5	2	0
Commercial	85	8	5	1	0
Education	74	6	4	1	0
Government	83	8	7	2	0
Industrial	82	8	7	2	0
Residential	91	6	3	1	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	16	15	20	16	28
Commercial	11	8	18	22	40
Education	13	10	17	17	29
Government	11	7	17	22	43
Industrial	10	7	17	22	43
Residential	23	27	29	13	9

Lake County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	19
Deaths	0	0
Displaced households	0	18
Short term shelter needs	0	13
Economic losses for buildings	$231,000	$40 million
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	99%	NA
Bridges	100%	NA
Economic losses to:		
Highways	$32,000	$20 million
Airports	$96,000	$8 million
Communication systems:		
Economic losses	$10,000	$4 million
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	30

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	99	1	0	0	0
Commercial	99	1	0	0	0
Education	99	1	0	0	0
Government	99	1	0	0	0
Industrial	99	1	0	0	0
Residential	99	1	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	55	15	15	11	5
Commercial	45	16	22	14	5
Education	51	15	18	13	5
Government	44	15	22	16	6
Industrial	43	14	21	15	7
Residential	62	21	13	4	1

Lane County	8.5 Cascadia subduction zone event	500 year model
Injuries	1,036	2,254
Deaths	19	45
Displaced households	2,345	4,543
Short term shelter needs	1,734	3,350
Economic losses for buildings	$1.6 billion	$3.0 billion
Operational the day after the quake:		
Fire stations	49%	NA
Police stations	42%	NA
Schools	46%	NA
Bridges	76%	NA
Economic losses to:		
Highways	$39 million	$74 million
Airports	$11 million	$20 million
Communication systems:		
Economic losses	$11 million	$20 million
Operating the day of the quake	54%	NA
Debris generated (thousands of tons)	1,341	2,424

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	37	11	13	12	9
Commercial	26	12	19	16	11
Education	29	9	14	12	8
Government	23	10	19	18	13
Industrial	23	11	20	18	13
Residential	55	15	8	4	2

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	22	14	16	16	15
Commercial	10	9	22	23	20
Education	15	10	16	17	15
Government	10	8	21	24	21
Industrial	9	8	21	24	22
Residential	38	22	14	6	4

Lincoln County	8.5 Cascadia subduction zone event	500 year model
Injuries	358	436
Deaths	7	9
Displaced households	592	847
Short term shelter needs	401	577
Economic losses for buildings	$624 million	$792 million
Operational the day after the quake:		
Fire stations	26%	NA
Police stations	22%	NA
Schools	19%	NA
Bridges	51%	NA
Economic losses to:		
Highways	$16 million	$22 million
Airports	$9 million	$12 million
Communication systems:		
Economic losses	$9 million	$10 million
Operating the day of the quake	26%	NA
Debris generated (thousands of tons)	446	525

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	10	13	17	17	26
Commercial	3	5	20	30	42
Education	7	9	16	21	30
Government	4	6	17	29	44
Industrial	3	5	19	29	44
Residential	22	30	26	12	10

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	10	14	19	18	22
Commercial	4	7	23	31	35
Education	7	10	18	22	26
Government	5	7	21	31	37
Industrial	4	6	22	30	36
Residential	20	30	28	13	9

Linn County	8.5 Cascadia subduction zone event	500 year model
Injuries	281	736
Deaths	5	15
Displaced households	615	1,372
Short term shelter needs	445	1,005
Economic losses for buildings	$443 million	$1 billion
Operational the day after the quake:		
Fire stations	62%	NA
Police stations	60%	NA
Schools	53%	NA
Bridges	79%	NA
Economic losses to:		
Highways	$11 million	$34 million
Airports	$9 million	$24 million
Communication systems:		
Economic losses	$1 million	$4 million
Operating the day of the quake	69%	NA
Debris generated (thousands of tons)	400	818

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	40	10	13	12	8
Commercial	29	12	20	17	9
Education	36	11	16	15	9
Government	26	10	21	20	13
Industrial	25	11	21	19	12
Residential	60	15	8	5	4

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	20	13	16	16	16
Commercial	10	8	22	24	22
Education	17	11	19	21	19
Government	9	8	21	26	27
Industrial	8	7	21	25	25
Residential	35	24	17	8	7

Malheur County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	15
Deaths	0	0
Displaced households	0	43
Short term shelter needs	0	38
Economic losses for buildings	$96,000	$43 million
Operational the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	0	$4 million
Airports	0	$4 million
Communication systems:		
Economic losses	0	$2 million
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	31

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	100	0	0	0	0
Industrial	100	0	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	76	11	9	4	1
Commercial	70	13	12	5	1
Education	74	11	10	4	1
Government	71	12	12	4	1
Industrial	Unknown				
Residential	83	11	5	1	0

Marion County	8.5 Cascadia subduction zone event	500 year model
Injuries	499	1,951
Deaths	9	41
Displaced households	1,241	3,356
Short term shelter needs	912	2,484
Economic losses for buildings	$776 million	$2.3 billion
Operational the day after the quake:		
Fire stations	68%	NA
Police stations	56%	NA
Schools	64%	NA
Bridges	81%	NA
Economic losses to:		
Highways	$13 million	$59 million
Airports	$5 million	$23 million
Communication systems:		
Economic losses	$2 million	$8 million
Operating the day of the quake	62%	NA
Debris generated (thousands of tons)	664	1,855

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	43	10	12	9	5
Commercial	36	13	17	11	5
Education	38	10	14	10	4
Government	31	11	18	14	7
Industrial	31	11	17	13	7
Residential	60	12	6	3	1

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	20	14	16	15	13
Commercial	11	9	21	21	18
Education	16	11	17	18	14
Government	11	8	20	23	20
Industrial	10	8	19	21	19
Residential	32	23	16	7	4

Morrow County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	3
Deaths	0	0
Displaced households	0	10
Short term shelter needs	0	9
Economic losses for buildings	$97,000	$10 million
Operational the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	0	$550,000
Airports	0	$392,000
Communication systems:		
Economic losses	0	$46,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	8

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	99	1	0	0	0
Commercial	99	1	0	0	0
Education	99	1	0	0	0
Government	99	1	0	0	0
Industrial	99	1	0	0	0
Residential	99	1	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	75	12	10	4	1
Commercial	68	14	13	5	1
Education	73	12	11	4	1
Government	67	14	14	5	1
Industrial	67	13	15	6	1
Residential	76	12	10	3	0

Multnomah County	8.5 Cascadia subduction zone event	500 year model
Injuries	1,521	8,659
Deaths	28	186
Displaced households	2,803	13,777
Short term shelter needs	1,801	8,860
Economic losses for buildings	$1.9 billion	$9.2 billion
Operational the day after the quake:		
Fire stations	78%	NA
Police stations	76%	NA
Schools	81%	NA
Bridges	94%	NA
Economic losses to:		
Highways	$21 million	$437 million
Airports	$2 million	$12 million
Communication systems:		
Economic losses	$3 million	$31 million
Operating the day of the quake	77%	NA
Debris generated (thousands of tons)	1,598	6,745

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	55	10	10	5	2
Commercial	62	14	14	6	2
Education	56	11	11	5	2
Government	56	15	17	8	3
Industrial	55	14	17	8	3
Residential	83	10	4	1	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	18	15	18	17	14
Commercial	10	11	27	28	21
Education	14	12	20	22	16
Government	10	9	25	30	24
Industrial	9	9	25	29	24
Residential	36	31	20	7	3

Polk County	8.5 Cascadia subduction zone event	500 year model
Injuries	124	266
Deaths	2	6
Displaced households	538	1,064
Short term shelter needs	419	825
Economic losses for buildings	$249 million	$529 million
Operational the day after the quake:		
Fire stations	55%	NA
Police stations	46%	NA
Schools	45%	NA
Bridges	72%	NA
Economic losses to:		
Highways	$28 million	$72 million
Airports	$6 million	$13 million
Communication systems:		
Economic losses	$688,000	$2 million
Operating the day of the quake	55%	NA
Debris generated (thousands of tons)	219	378

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	37	15	17	18	14
Commercial	19	12	26	25	18
Education	30	13	20	21	16
Government	18	11	25	27	20
Industrial	17	11	25	27	21
Residential	60	22	10	5	3

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	18	17	21	20	24
Commercial	9	9	24	28	31
Education	15	14	22	24	27
Government	8	8	22	28	34
Industrial	7	8	22	28	35
Residential	31	31	24	9	6

Sherman County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	0
Deaths	0	0
Displaced households	0	0
Short term shelter needs	0	0
Economic losses for buildings	$17,000	$923,000
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	99%	NA
Economic losses to:		
Highways	$29,000	$3 million
Airports	0	$423,000
Communication systems:		
Economic losses	0	$61,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	0

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	99	1	0	0	0
Industrial	99	1	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	85	9	5	1	0
Commercial	82	10	6	1	0
Education	85	9	5	1	0
Government	82	11	6	1	0
Industrial	81	11	7	1	0
Residential	86	10	4	0	0

Tillamook County	8.5 Cascadia subduction zone event	500 year model
Injuries	132	181
Deaths	3	4
Displaced households	158	275
Short term shelter needs	114	198
Economic losses for buildings	$226 million	$364 million
Operational the day after the quake:		
Fire stations	31%	NA
Police stations	44%	NA
Schools	32%	NA
Bridges	58%	NA
Economic losses to:		
Highways	$25 million	$39 million
Airports	$7 million	$8 million
Communication systems:		
Economic losses	$5 million	$6 million
Operating the day of the quake	24%	NA
Debris generated (thousands of tons)	158	224

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	24	16	20	17	23
Commercial	12	10	23	25	31
Education	16	10	16	14	19
Government	11	9	21	25	34
Industrial	11	10	22	24	33
Residential	40	26	20	8	6

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	15	17	23	20	25
Commercial	8	9	23	27	33
Education	10	10	18	17	20
Government	7	8	21	28	36
Industrial	7	8	23	27	36
Residential	24	31	28	11	7

Umatilla County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	19
Deaths	0	0
Displaced households	0	81
Short term shelter needs	0	64
Economic losses for buildings	$236,000	$67,000
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	0	$6 million
Airports	0	$3 million
Communication systems:		
Economic losses	0	$3 million
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	45

These figures have a high degree of uncertainty and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	100	0	0	0	0
Industrial	100	0	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	70	11	9	4	1
Commercial	59	13	12	4	1
Education	58	11	10	4	1
Government	69	13	13	5	1
Industrial	57	12	13	5	1
Residential	81	12	6	1	0

Union County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	1
Deaths	0	0
Displaced households	0	1
Short term shelter needs	0	1
Economic losses for buildings	$6,000	$9 million
Operating the day after the quake:		
Fire stations	100%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	0	$1 million
Airports	0	$618,000
Communication systems:		
Economic losses	0	$479,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	5

These figures have a high degree of uncertaintly and should be used only for general planning purposes. Because of rounding, numbers may not add up to 100%.

Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	100	0	0	0	0
Industrial	100	0	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	87	8	4	1	0
Commercial	86	9	5	1	0
Education	88	8	4	1	0
Government	86	9	5	1	0
Industrial	85	9	5	1	0
Residential	90	7	3	0	0

Wallowa County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	1
Deaths	0	0
Displaced households	0	1
Short term shelter needs	0	1
Economic losses for buildings	$12,000	$8 million
Operating the day after the quake:		
Fire stations	No data	NA
Police stations	No data	NA
Schools	100%	NA
Bridges	No data	NA
Economic losses to:		
Highways	0	0
Airports	0	$3 million
Communication systems:		
Economic losses	0	$116,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	4

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Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	100	0	0	0	0
Industrial	100	0	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	77	10	9	4	1
Commercial	72	11	11	5	1
Education	76	10	10	4	1
Government	72	11	12	4	1
Industrial	71	11	12	5	1
Residential	84	10	5	1	0

Wasco County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	6
Deaths	0	0
Displaced households	0	23
Short term shelter needs	0	17
Economic losses for buildings	$795,000	$25 million
Operating the day after the quake:		
Fire stations	99%	NA
Police stations	100%	NA
Schools	100%	NA
Bridges	99%	NA
Economic losses to:		
Highways	$71,000	$3 million
Airports	0	$2 million
Communication systems:		
Economic losses	$6,000	$1 million
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	1	16

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Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	98	1	1	0	0
Commercial	98	1	1	0	0
Education			Unknown		
Government	98	1	0	0	0
Industrial	98	2	0	0	0
Residential	99	1	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	74	13	10	3	0
Commercial	68	16	12	3	0
Education	56	10	7	2	0
Government	66	16	14	4	1
Industrial	65	16	15	5	0
Residential	80	12	6	1	0

Washington County	8.5 Cascadia subduction zone event	500 year model
Injuries	555	2,910
Deaths	10	62
Displaced households	2,062	7,666
Short term shelter needs	1,284	4,660
Economic losses for buildings	$931 million	$3.8 billion
Operational the day after the quake:		
Fire stations	66%	NA
Police stations	64%	NA
Schools	64%	NA
Bridges	79%	NA
Economic losses to:		
Highways	$15 million	$61 million
Airports	$5 million	$23 million
Communication systems:		
Economic losses	$752,000	$4 million
Operating the day of the quake	60%	NA
Debris generated (thousands of tons)	763	2,817

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Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	53	12	15	10	5
Commercial	46	17	21	12	4
Education	47	13	17	11	4
Government	40	16	23	15	6
Industrial	39	16	23	15	6
Residential	78	13	5	2	1

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	18	17	21	21	19
Commercial	8	10	27	30	25
Education	13	13	21	24	21
Government	8	8	24	32	28
Industrial	7	8	25	31	29
Residential	34	33	23	8	3

Wheeler County	8.5 Cascadia subduction zone event	500 year model
Injuries	0	0
Deaths	0	0
Displaced households	0	0
Short term shelter needs	0	0
Economic losses for buildings	$11,000	$708,000
Operating the day after the quake:		
Fire stations	No data	NA
Police stations	No data	NA
Schools	100%	NA
Bridges	100%	NA
Economic losses to:		
Highways	$1,000	$338,000
Airports	$8,000	$688,000
Communication systems:		
Economic losses	0	$123,000
Operating the day of the quake	100%	NA
Debris generated (thousands of tons)	0	0

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Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	100	0	0	0	0
Commercial	100	0	0	0	0
Education	100	0	0	0	0
Government	99	1	0	0	0
Industrial	99	1	0	0	0
Residential	100	0	0	0	0

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	85	9	6	1	0
Commercial	83	10	6	1	0
Education	85	9	5	1	0
Government	82	11	6	1	0
Industrial	81	11	7	1	0
Residential	87	8	4	0	0

Yamhill County	8.5 Cascadia subduction zone event	500 year model
Injuries	148	427
Deaths	3	9
Displaced households	385	871
Short term shelter needs	310	696
Economic losses for buildings	$259 million	$654 million
Operational the day after the quake:		
Fire stations	52%	NA
Police stations	45%	NA
Schools	45%	NA
Bridges	63%	NA
Economic losses to:		
Highways	$5 million	$11 million
Airports	$8 million	$20 million
Communication systems:		
Economic losses	$946,000	$3 million
Operating the day of the quake	53%	NA
Debris generated (thousands of tons)	247	532

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Because the 500 year model includes several earthquakes, the number of facilities operational the "day after" cannot be calculated.

8.5 Cascadia event	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	47	13	17	14	8
Commercial	32	15	25	19	9
Education	33	13	19	17	9
Government	29	14	25	21	11
Industrial	27	14	25	22	12
Residential	68	16	9	5	3

500 year model	Percentage of buildings in damage categories				
Building type	None	Slight	Moderate	Extensive	Complete
Agriculture	20	18	21	22	19
Commercial	8	10	27	30	25
Education	12	12	21	25	21
Government	9	10	25	31	26
Industrial	7	9	25	31	29
Residential	34	30	21	9	5