Geologically active faults are shown on this map (Geomatrix Consultants, 1995). Active mainshocks, sometimes preceded by foreshocks, and almost always followed by aftershocks, are plotted at different sizes so as to provide a scale. Filled diamonds correspond to an Oregon Department of Geology and Mineral Resources-produced map of the epicenters of historic earthquakes originating throughout the Pacific Northwest. For this reason, the Oregon Department of Geology and Mineral Resources purchased this map from Geomatrix Consultants, a consulting firm based in Seattle, Washington. Individual events are color-coded to denote the age of the last earthquake that occurred in a fault zone. Faults that moved between 1050 and 20,000 years are color-coded red. Faults that moved between 20,000 and 780,000 years are color-coded orange. Faults active in the last 780,000 years are color-coded yellow. Faults that moved in the last 780,000 years are color-coded green. Faults that moved in the last 20,000 years but have not moved in the last 780,000 years are color-coded blue. Moving up through the Cascades into the Willamette Valley, movement of the blocks induces earthquakes along northwest- and northeast-trending fault systems. The 5.6 magnitude March 25, 1993, Scotts Mills (near Silverton and Woodburn in Marion County, Oregon) earthquake may be associated with this activity.

Three sources cause earthquakes in Oregon (Mabey and others, 1993). First, shallow earthquakes occur along active faults in the crust. The Juan de Fuca plate is a slab of ocean floor moving eastward from the Juan de Fuca ridge on the Pacific Ocean floor and subducting below the western margin of the Pacific Plate and the North American Plate. Where the subduction zone is shallow and the subducting plate is thick, earthquakes occur. The Juan de Fuca plate subducts beneath the coast of Oregon from the Three Capes area to the area just south of the mouth of the Columbia River. The subduction zone here is a relatively young subduction zone, and so there are no deep earthquakes to the south south of the mouth of the Columbia River. This area is a young subduction zone and is likely to become a young earthquake zone.

The second source of earthquakes is the volcanic arc. The Cascades volcanic arc is a long belt of volcanoes that extend north from California through Oregon to British Columbia, Canada. The Cascade volcanic arc includes the Willamette Valley and the Portland-Vancouver metropolitan area (Blakely and others, 1995). Notable volcanic eruptions in the Portland-Vancouver metropolitan area include Mount St. Helens eruptions in 1980, which caused billions of dollars in damage and loss of life in Washington and Oregon.

The third source of earthquakes is sedimentary rock. The Cascadia subduction zone is a fault line where two plates of the earth’s lithosphere slide past each other in a process called subduction. The subducting plate is the Juan de Fuca plate, and the overriding plate is the North American Plate. The Cascadia subduction zone extends from offshore Oregon to offshore中部 of the Bering Sea, a distance of approximately 1,500 km. The Cascadia subduction zone is a plate boundary where the Juan de Fuca plate is being subducted beneath the North American Plate at a rate of about 7 cm per year. This process causes the build-up of stress in the upper part of the Earth’s crust, which eventually leads to the release of energy in the form of an earthquake. The Cascadia subduction zone is known for producing large earthquakes, and there is a significant risk of a large earthquake occurring here in the near future.