

THE WESTERN WASHINGTON EARTHQUAKE

OF APRIL 13, 1949

by

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CHAPTER I

INTRODUCTION

On April 13, 1949 the western half of the state of Washington was shaken by the most destructive earthquake known to the region. The earthquake, which occurred at approximately noon Pacific Standard Time, was responsible for the death of eight persons and damage measured in tens of millions of dollars. Eastern Washington, northern Idaho, Oregon, and British Columbia were also slightly shaken by the earth tremor. Its maximum intensity, as reported by the United States Coast and Geodetic Survey, was VIII on the Wood-Neumann modified Mercalli scale.

Seismicity and Geology of Region

The Puget Sound area, in which the epicenter of the earthquake lies, is a seismically active region. From 1833 to 1934 approximately one hundred and ninety quakes have had their source in this vicinity (2)*. Of these, only one series of quakes could be classified as destructive, the earthquakes of December 14-16, 1872. Their epicenters were reported to lie in a northeast-southwest direction from Olympia. More recently, on

*For this and future references please see the bibliographic entry of like number.

February 14, 1946, the region was subjected to another severe earthquake. Barksdale and Coombs (1, pg. 349) reported the intensity to be VII. Its epicenter, as determined by the United States Coast and Geodetic Survey, was placed at 47.3 degrees north latitude and 122.7 degrees west longitude, which is approximately eighteen miles north of Olympia, fifteen miles west of Tacoma, and thirty-six miles southwest of Seattle.

Little is known of the structural geology of the region. Barksdale and Coombs (1, pp. 353-354) have described the underlying rocks of the Puget Sound Trough as Tertiary sediments of both marine and nonmarine origin with intercalated lava flows. This stratigraphic sequence of rocks, about ten thousand feet in thickness, has been folded into anticlines and synclines having axes trending in a northwest-southeast direction. A mantle of glacial drift and alluvium attaining a maximum thickness of more than one thousand feet unconformably overlies this folded series.

Intensity of the Earthquake

The Bulletin of the Seismological Society of America (30) gives the following report of the damage wrought by the earthquake of April 13, 1949:

It [the earthquake] was felt over a 500-mile-long area of the coastal Northwest, hitting hardest the Puget Sound cities of Olympia, Tacoma, and Seattle. Eastern Washington, Oregon, British Columbia, and Northern Idaho felt it slightly.

Eight persons were killed and 62 were hospitalized. Damage in Washington was estimated to be at least \$15,000,000. The earthquake struck violently in Olympia, damaging eight major State Capitol buildings. Two were ordered vacated immediately. An official said damage to State structures alone would amount to millions of dollars. Cars were damaged by falling masonry. A child was killed by the falling roof of a Tacoma school, and a high school athlete was injured fatally when a Castle Rock school building toppled. A workman was killed by falling bricks at Olympia. In Centralia a man was killed when the entire front of a business building collapsed. Approximately 40 feet of the top of the 573-foot radio tower of station KJR in Seattle was snapped off. At Cooper's Point, seven miles north of Olympia, Washington, 150 feet of the sandspit crumbled and disappeared into Puget Sound during the shock. At high tide on April 15 the spit was found to be 50 feet below the surface. On April 20, Governor Langlie urged the 300 residents of Salmon Beach to move out from under a 400-foot earthquake-loosened cliff. One University of Washington football practice field, which had been made by filling in marshy ground bordering Lake Washington, was damaged so badly as to be declared unusable. Two adjoining fields were still usable. A 35,000-gallon water tank on a downtown department store in Seattle burst and showered the street. At Seattle's port of embarkation a cold-storage plant was shut down after a huge water tank fell into an elevator shaft and water breaks and ammonia leaks occurred throughout the plant. This resulted in unestimated damage to valuable perishables stored in the huge freezers. Five miles south of Port Orchard, Washington, highway traffic was temporarily tied up when the earth sank an estimated three feet over a distance of several hundred feet along the road.

Estimates of the damage varied considerably; the most reliable figure seems to be between thirty million and fifty million dollars. The extent of damage is best illustrated by figure 1, which is an isoseismal map of the region. This map was prepared by the Seismological Field Survey of the United States

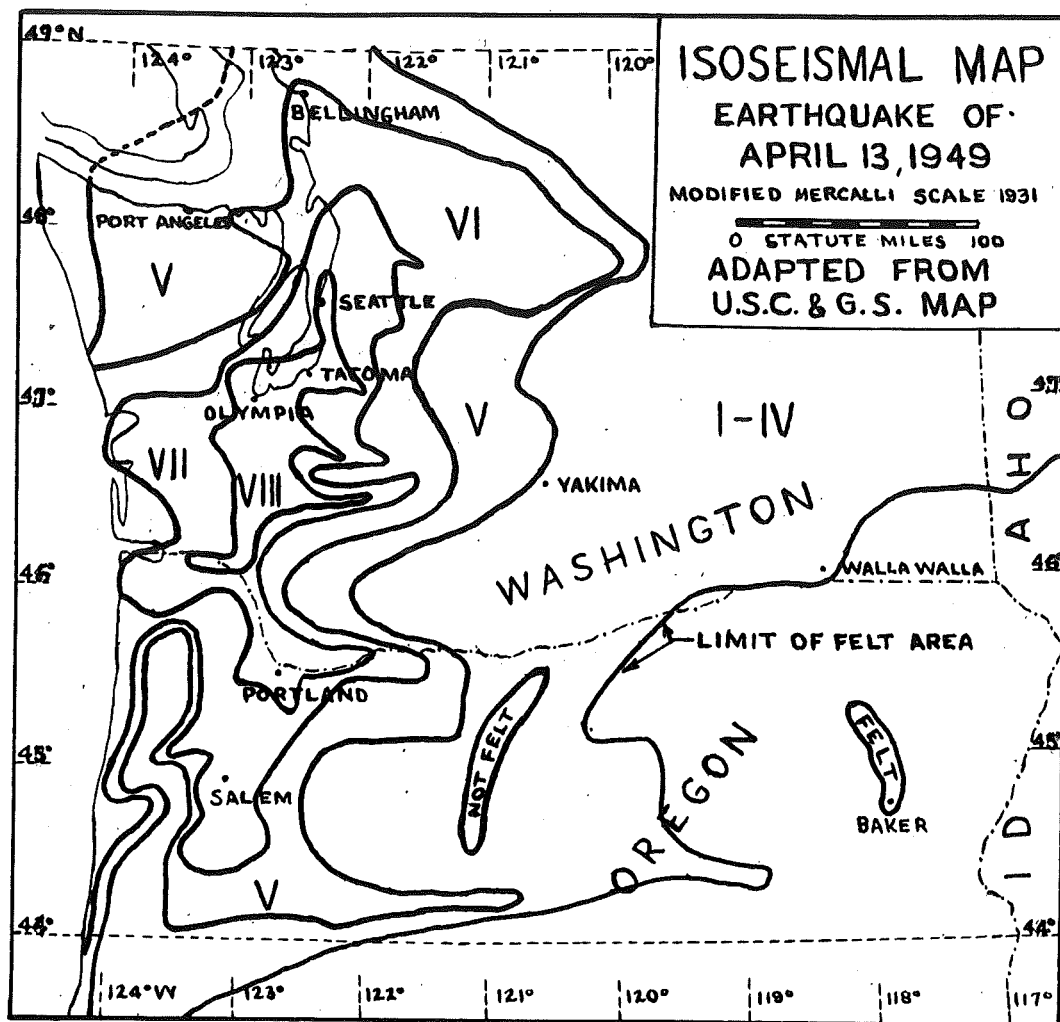


Figure 1.--Isoseismal Map

Coast and Geodetic Survey under the direction of Mr. Franklin P. Ulrich (32, pg. 8). The scale of intensity used is the Wood-Neumann modified Mercalli scale, with a maximum possible intensity of XII.

Purpose of Study

An earthquake of such large intensity offers many opportunities for research. A study of the relation between the damage done to structures and their location and construction would provide valuable data for the use of structural engineers and the improvement of the building code and thus would tend to lessen the destruction which would result from future earthquakes in the region. A geologic investigation of the hypocentral region to determine the tectonic relations responsible for the earthquake would be very difficult because of the scarcity of exposures but would be invaluable. Numerous other problems present themselves.

This study is based upon an investigation of the seismograms obtained by observatories throughout the world in an attempt to determine the location of the epicenter, the depth of focus, and the origin time of the earthquake. An accurate knowledge of these quantities is necessary for any further study of the structure of the earth or other allied problems which utilize the data from this earthquake.