SUMMARY OF THE GEOLOGY OF THE FORT KLAMATH QUADRANGLE, KLAMATH COUNTY, OREGON

For more detailed information, please see the accompanying text and references.

INTRODUCTION

The Fort Klamath quadrangle (Figure 1) is located in southern Oregon's Klamath County about 6 miles south of Crater Lake National Park and 34 miles north-northwest of the city of Klamath Falls. U.S. Highway 97 and Oregon State Highways 62 and 232 provide access to the quadrangle. Before reaching the town of Fort Klamath, State Highway 62 crosses a steep escarpment and drops-off the rounded range of volcanics onto the floor of a flat basin called the Wood River Valley. Several boundary lines of the Winema National Forest cross the eastern half of the quadrangle.

GEOLOGIC HISTORY

The quadrangle straddles the eastern edge of the Klamath graben, which is a north-south trending block of crust that has dropped along faults (Figure 1). The Klamath graben lies in a transition zone between two physiographic provinces in southern Oregon: the arch of the Cascade Range to the west and the Basin and Range to the east.

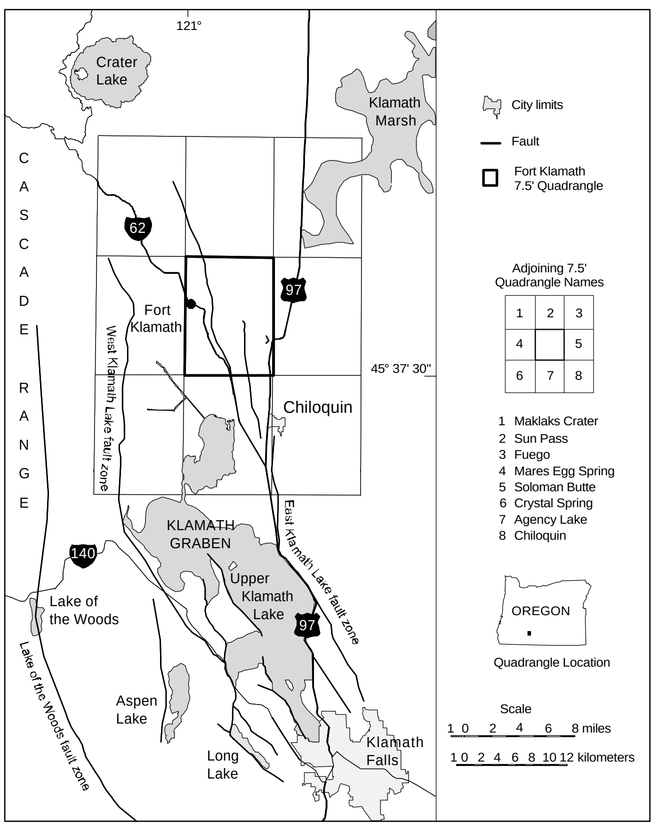

Figure 1. Map showing location of the Fort Klamath quadrangle and its vicinity.

Volcanism in the quadrangle is connected to crustal stretching where the crust broke into blocks along steeply dipping faults, like those along the margin of the Klamath graben. Chemistry of the lavas reveals a history dominated by Pliocene to Pleistocene transitions from Cascada volcanism to extensional volcanism, and back.

The oldest rocks in the quadrangle are five million years old. They are Pliocene mudstones and sandstones and associated basaltic andesite. These rocks are exposed in fault blocks between the Williamson River and Agency Creek along the southern border of the quadrangle. The andesitic lavas in the north-central portion of the quadrangle and the andesitic and basaltic andesite volcanoes at Sugar Hill and Agency Hill are probably of similar age.

A crustal extensional event followed (or perhaps began with) the eruptions at Sugar Hill and Agency Hill, burying parts of the quadrangle in broad sheets of lava. Deposition of sedimentary rocks and faulting accompanied this extenisonal event. Covering the sedimentary rocks are volcanic units that were erupted from (1) Spring Hill in the adjacent Soloman Butte quadrangle to the east, (2) a thick, valley-filling flow in the southeastern part of the quadrangle, and (3) volcanic units that form the base of the volcanic rocks in the forest boundary area to the east of the quadrangle. These volcanic units, together with lavas erupted from Sun Mountain and along the northern part of the ridge that parallels the Winema National Forest boundary, generally signals the transition back to Cascada volcanism.

Nearly 7,000 years ago, the Mount Mazama volcano spewed a tremendous volume of lava, lost its foundation, and sank into an empty magma chamber. Crater Lake now fills half of the 4,000-foot-deep chamber left over from the great cataclysm. Ash flows and block-and-ash flows from the eruption of Mount Mazama followed the topography southward into the quadrangle. The youngest alluvium-fill in the Wood River Valley is Mazama ash that the processes of erosion have reworked.

GEOLOGIC HAZARDS

Seismic Hazard

Historic records of seismicity in the quadrangle include a magnitude (M) 3.7 earthquake that occurred during October 1947. Its epicenter is located in the northwestern corner of the quadrangle near the surface trace of the East Klamath Lake fault zone. Prehistoric seismicity is suggested by the well-developed fault scarps in the southeastern part of the quadrangle and along the eastern side of the Klamath graben at the East Klamath Lake fault zone. Geologic evidence suggests that the East Klamath Lake fault zone is an active zone capable of producing M 7.25 earthquakes. The Klamath Falls region is recognized as one of Oregon's principal areas for damaging earthquakes.

GEOLOGIC RESOURCES

Water

Mapping in the quadrangle indicates that aquifers are interlayered with low-permeability zones (aquitards) in both alluvial and volcanic sequences. Aquifers in the larger valleys are sandy and gravelly zones found in recent and ancient meandering stream facies as well as alluvial talus, and pumice fans at the the valley margins. In volcanic sequences are found interflow zones, lava flows full of open fractures, vesicular flows, and perhaps lava tubes with the capacity to transmit water from one point to another.

The areas underlain by older volcanic may play an important role in determining flow patterns and distribution of ponds, perennial streams, and springs, such as the Reservation Spring and springs at the Klamath State Fish Hatchery. However, the aquifer for the springs at Spring Creek is possibly an ancient stream valley, related to the ancestral Williamson River. Springs in the Fort Klamath quadrangle account for the bulk of the 60,000 acre-ft per month that the Wood and Willimason Rivers deliver to Upper Klamath Lake.

Wells near Fort Klamath have penetrated an artesian aquifer, or possibly several, with water under low pressure. Groundwater movement is clearly influenced by the well-developed north-trending faults along the East Klamath Lake fault zone that formed the Klamath graben. A quantitative water-balance model has not been constructed, but the large spring flows and the quadrangle's geology point to the possibility of significant groundwater resources.

Aggregate and industrial Minerals

The potential for future development of mineral resources in the quadrangle is limited. Aggregate in the form of cinders and scoria is present at mapped cinder localities, but additional testing is need to characterize the full resource potential of these deposits. Crushed-rock has been produced form three quarries along the the East Klamath Lake fault zone. Production of the remaining rock, however, may prove to be more difficult because the rock is not so closely jointed. Sand and gravel in the alluvial sequences are generally interlayered with large amounts of silt, mud, and clay. As a result, commercal quanitities of sand and gravel appear limited. Diatomaceous resources are not of high quality. Pumice could be produced from Mazama ash-flow deposits, but larger, thicker, coarser deposits exist farther north.