



*Preliminary Notes on Later Miocene Volcanism in the
John Day Region, Oregon*

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THE LATER Miocene rocks, including the Columbia River lavas and the Mascall formation and their apparent stratigraphic equivalents, have been traced continuously along the John Day River Valley for a distance of 60 miles east from Picture Gorge. Several good stratigraphic sections were examined on both sides of the valley.

At Picture Gorge the later Miocene section consists of 21 olivine-bearing basalt flows totaling about 1500 ft., conformably overlain by about 2000 ft. of waterlaid ashy beds that constitute the Mascall formation. Twelve miles to the southeast in Flat Creek, the lava section is 6500 ft. thick, andesitic flows occur in the upper part, and the top is faulted off. Numerous large dikes in the Aldrich Mountain area suggest that many flows were erupted from fissures.

The Mascall formation has been traced 22 miles east of Picture Gorge, and is marked by a notable increase in stream gravels and volcanic tuffs toward the east. Twenty miles northeast of Picture Gorge, in Fox Valley, olivine-bearing flows in the upper part of the basalt section wedge out between rhyolitic tuffs similar to those in the Mascall formation. Between Mt. Vernon and Prairie City rhyolitic flows and tuffs and pumice breccias are interbedded with olivine basalts and constitute at least half of the upper part of the section.

The exposed Tertiary section in Strawberry Mountain is at least 6500 ft. thick and covers the range from olivine basalt to rhyolite. The base of the section is exposed farther west, and the lower limit of the Miocene appears to be an unconformity below several olivine basalt flows. In Strawberry Mountain the volcanic succession from oldest to youngest is as follows: at least 750 ft. of basalt and andesite (base not exposed), 1000–1200 ft. of rhyolite,

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1600–1800 ft. of dense platy andesite, and 3000–3500 ft. of olivine basalt and basaltic andesite. Although there are indications of two or more erosional unconformities, no definite evidence of angular unconformities was found in this section. The uppermost member comprises the remains of a basaltic andesite shield volcano that lithologically appears very similar to those in the High Cascades. Parasitic cones of both rhyolitic and basaltic composition were buried by the basaltic andesite flows from the main plug $2\frac{1}{2}$ miles southeast of Strawberry Mountain. The basaltic andesites form the divide between the John Day Valley and the Unity Basin, and extend northward beyond Prairie City.

The close association of olivine basalt, rhyolite, and basaltic andesite suggests much greater magmatic differentiation along the border of the Columbia Plateau than in the central portions.

The later Miocene landscape in this region appears to have been characterized by eruption centers around a broad basin. At the maximum of basaltic eruptions, extensive flows filled the basin to a depth of 1500 ft. or more. Increasing rhyolitic activity appears to have coincided with enough of a decline in basaltic eruptions that basalt flows failed to reach the center of the basin, and the deposition of acidic fragmentals and their erosion derivatives continued until diastrophism destroyed the basin. As the basin deposits interfingered with the volcanic rocks, the Mascall formation, in the broad view, should be regarded as a member of the Columbia River formation, rather than as a distinct and younger formation.