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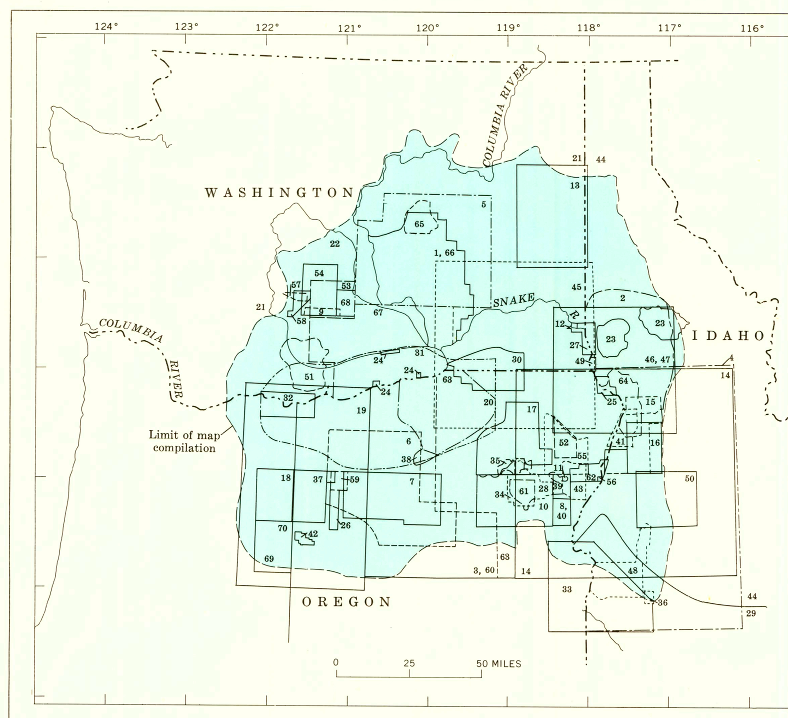

INDEX TO GEOLOGIC MAPPING

NOTE: Numbers refer to serial numbering of published sources of information. Limits of areas are not shown where they follow state boundaries or major rivers

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STRUCTURES IN RELATION TO GROUND WATER

This map was compiled to show the areas in which geologic structure favors the accumulation and storage of ground water in the basalt of the Columbia River Group of Miocene and Pliocene age. Published and unpublished sources of data were used, supplemented in places by field reconnaissance. In addition to folds and faults in the basalt, the map includes a few structures in rocks older than the basalt, where those structures affect the position and water-bearing capabilities of the nearby basalt.

Most of the known folds that show structural relief of more than 100 feet and faults that have more than 50 feet displacement are included. In zones of close and complex deformation, minor structures have been omitted for lack of space or have been generalized. Except in the area south of the Ochoco anticline, where faults and fractures were plotted from aerial photographs without ground checking, nondisplacement breaks of the extension-fracture type, sometimes called regional joints, have been omitted.

The structures that displace the basalt are geologically youthful, Pliocene and Quaternary in age. Most of the anticlines are tectonic mountains, and the synclines are tectonic valleys.

Many of the folds, especially where they are distant from other structures, are smoothly symmetrical in cross section, but within areas of major deformation some of the folds contain all degrees of asymmetry. Within the folds of greatest asymmetry, the shorter limb is turned up steeply, or even overturned and thrust faulted in places. The direction of the oversteepening is consistent in some long asymmetrical folds, such as northward in the Horse Heaven and Aldrich Mountain anticlines and southward in the Cleman Mountain and Tygh Ridge anticlines; but it changes from side to side along other folds, such as the Columbia Hills and the Umtanum anticlines.

Most of the long, prominent faults are normal and dip 60 to 85 degrees. A few high-angle reverse faults have been identified, and low-angle thrust faults are common locally in and near the steeply folded limbs of some of the anticlines. Because of the rock slump and talus cover and the shattered condition of the basalt along those zones of rupture, thrust faults have been observed in only a few places. Strike-slip faults have been observed only along lateral boundaries of large blocks that end in an oversteepened limb of a large anticline.

The vertical displacement of the basalt in the folds ranges approximately from the 100-foot selected minimum to about 3,000 feet. Many of the larger folds have amplitudes of 500 to 2,000 feet. The displacement on faults shown on the map ranges from 50 feet to about 3,000 feet. This greatest displacement occurs along some of the larger faults bounding the Grande Ronde valley, the John Day fault, and the long faults in central Idaho. Most of the faults shown have displacements of less than 500 feet. The horizontal displacement along the few thrust faults identified and the few strike-slip faults shown is less than a few hundred feet.

The structures fall within five main groupings: (1) Basin-and-range type of block faulting, most of which fades northward into longer open-folded structures (Thayer, 1957) or dies out in the southern limb of the (2) Blue Mountain anticline; (3) the long north-south tilt-block faults along the west side of the Idaho batholith; (4) the Cascadian structures, of which the Yakima Ridges are the main elements; and (5) the band of almost horizontal basalt extending along the west side of the northern Rocky Mountains from Grangeville to the Okanogan Highlands (interrupted only by the Lewiston downwarp).

EXPLANATION

Pliocene, Pleistocene, and Holocene — TERTIARY AND QUATERNARY

QTs — Sedimentary deposits

Younger than basalt of the Columbia River Group. Includes continental sedimentary deposits principally the Dalles Formation; Ellensburg Formation and Mascall Formation except for the lowest layers which are interstratified with the basalt; Madras Formation; Rattlesnake Formation; Idaho Group; and Ringold Formation, as well as some glacial, glaciofluvial eolian, alluvial and colluvial deposits. Small amounts of volcanic rocks are intercalated in some of these sedimentary deposits. Deposits that are predominantly of eolian origin are omitted

QTv — Volcanic rocks

Younger than basalt of the Columbia River Group. Basaltic; andesitic and dacitic lavas and cinder cone deposits largely belonging to the Cascade lavas and extensions therefrom but includes small amounts of lava distant from the Cascade Range

Pliocene or Pleistocene — TERTIARY OR QUATERNARY

QTi — Intrusive rocks

Andesitic porphyry intruded into the basalt of the Columbia River Group in the Columbia Gorge. Equivalent to the feeder conduits for some of the Cascade lavas

Miocene and Pliocene — TERTIARY

Tcr — Basalt of the Columbia River Group

Accordantly layered flows of dense basaltic lava. Total thickness ranges from featheredge to more than 5,000 feet; individual flows range generally from 10 to 200 feet thick and average 80 feet. Includes some layers of the lower part of the Ellensburg Formation in the Yakima Valley, some interlayered parts of the Latah Formation at the northeastern edge, the Payette Formation at the southeastern edge, and small parts of the Mascall Formation at the southern edge of the main area of the basalt. Includes small areas of some younger lavas such as the platy andesites of the Baker and La Grande Valleys, (Gilluly, 1937; Hampton and Brown, 1964) not yet differentiated

Ts — Strawberry Volcanics

Basalt, andesite, and rhyolite flows and breccia in part contemporaneous with, and interfingering with, basalt of the Columbia River Group in the John Day River basin. Includes some volcanic rocks younger than the basalt of the Columbia River Group proper near the Paulina basin. Extends beyond boundaries of this mapping

PRECAMBRIAN TO TERTIARY

Tp€r — Rocks older than basalt of the Columbia River Group

Rocks of various types older than the basalt. Includes small areas of sedimentary deposits, such as the Latah Formation, which are partly contemporaneous with the basalt. Shown only where in proximity to the basalt of the Columbia River Group

GEOLOGIC SYMBOLS

Contact
Dashed where approximately located

Fault
Dashed where approximately located, dotted where concealed. Parallel arrows show direction of strike slip. Bar and ball on downthrown side

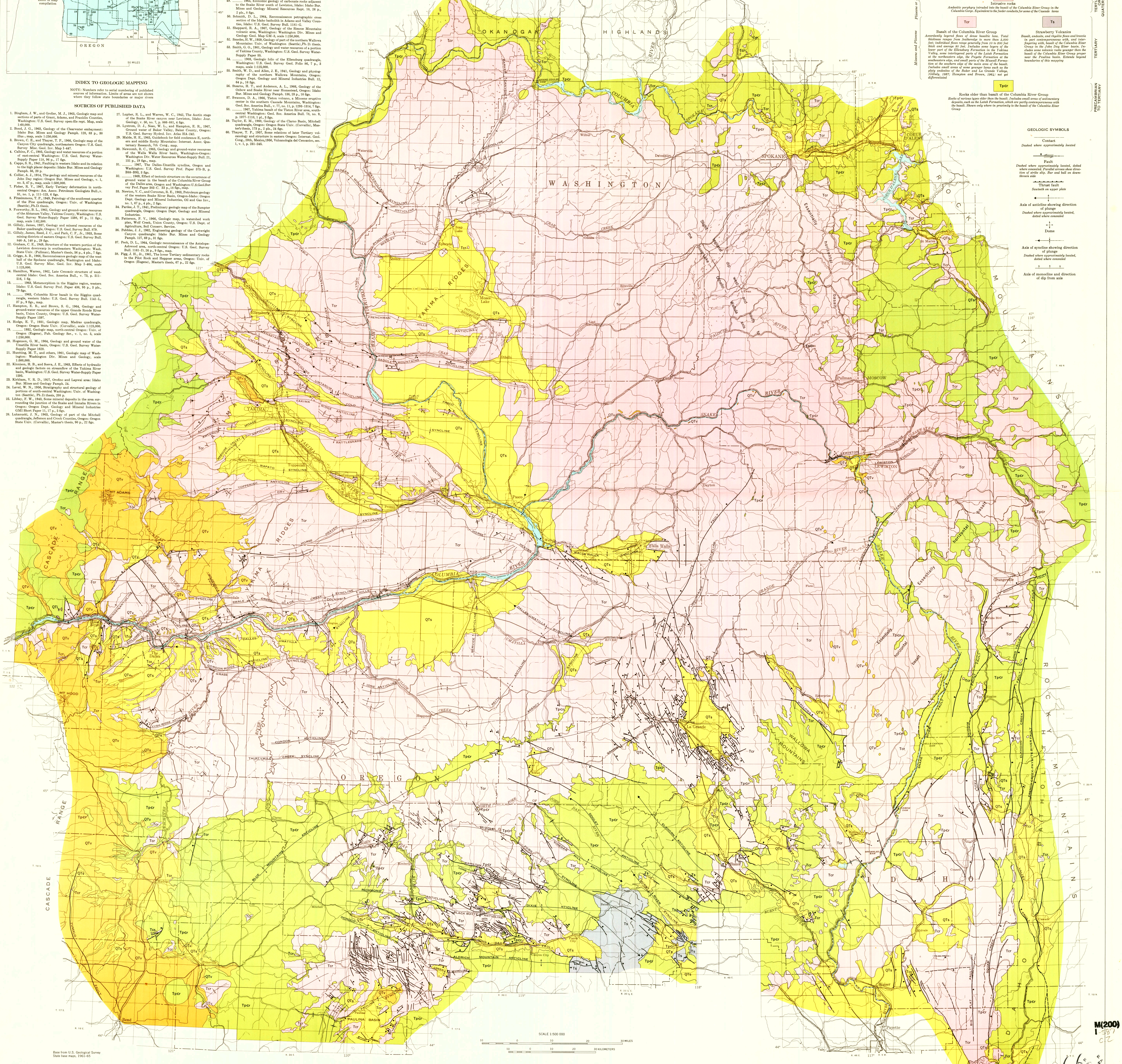
Thrust fault
Sawteeth on upper plate

Axis of anticline showing direction of plunge
Dashed where approximately located, dotted where concealed

Dome

Axis of syncline showing direction of plunge
Dashed where approximately located, dotted where concealed

Axis of monocline and direction of dip from axis



Base from U.S. Geological Survey State base maps, 1961-65

SCALE 1:500 000

10 0 10 20 30 MILES

10 0 10 20 30 KILOMETERS

TECTONIC STRUCTURE OF THE MAIN PART OF THE BASALT OF THE COLUMBIA RIVER GROUP WASHINGTON, OREGON, AND IDAHO

By
R. C. Newcomb

1970

United States (Columbia River basin). Structure 1:500,000. 1970.
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