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Geologic Map of the Upper Grande Ronde River Basin, Union County, Oregon

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Geology of the Upper Grande Ronde River Basin, Union County, Oregon

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PLATE 1

NOTICE

These maps cannot serve as a substitute for site-specific investigations by qualified practitioners. Site-specific data may give results that differ from those shown on the maps.

INTRODUCTION

The upper Grande Ronde River hydrologic basin encompasses an area of more than 4,200 km² in the north-central part of the Blue Mountains Province of northeastern Oregon (Figure 1). The watershed includes the Grande Ronde River and all tributaries upstream from the confluence with the Wallowa River. The Grande Ronde River and its main tributary, Catherine Creek, begin in the south, flowing from glaciated uplands through forested canyon lands to meet in the fault-bounded plain of Grande Ronde Valley. Grande Ronde Valley is a nearly flat, alluvial plain fringed by gently sloping alluvial fans and forms a 570-km² fertile basin (Figure 2).

The main headwaters to the basin lie in the Wallowa Mountains to the east and in the Elkhorn Mountains to the south. Both mountainous regions are structural highlands cored with pre-Miocene basement rocks. Northwest-trending, fault-bounded ridgos and valleys separate the Wallowa and Elkhorn mountains (Figure 3).

The oldest rocks include exotic Paleozoic and Mesozoic oceanic and island arc fragments, Late Jurassic and Cretaceous intrusions, Paleocene and Eocene continental sedimentary rocks, and late Oligocene to early Miocene bimodal volcanic rocks. Early- to mid-Miocene, tholeiitic flood basalt flows lap onto highly eroded older basement rocks. Many middle Cenozoic stratigraphic units are discontinuous and commonly interbedded. Widely separated units are grouped on the basis of apparent stratigraphic position, lithology, and chemical composition derived from geochemical data and radiometric age determinations of surface samples (Figure 4).

The bulk of the bedrock in the Upper Grande Ronde basin comprises three distinct Cenozoic volcanic suites: the Powder River Volcanic Field, the Columbia River Basalt Group, and the Tower Mountain caldera. The Powder River Volcanic Field, centered on Grande Ronde Valley, includes calc-alkaline and alkaline lava erupted from small shield volcanoes and stratovolcanoes. Columbia River Basalt, the oldest rock exposed in most of the middle and northern parts of the basin, is a regionally extensive series of tholeiitic flood lavas that extend across northern Oregon and southern Washington from the Snake River to the Pacific coastline. The Tower Mountain caldera is a large rhyolite eruptive center that forms the part of the highlands along the southwestern margin of the basin.

For full descriptions of rock units and geologic history, as well as geologic resources and hazards, see the accompanying text report.

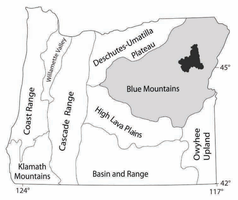


Figure 1. Regional context of the upper Grande Ronde River hydrologic basin in northeastern Oregon.

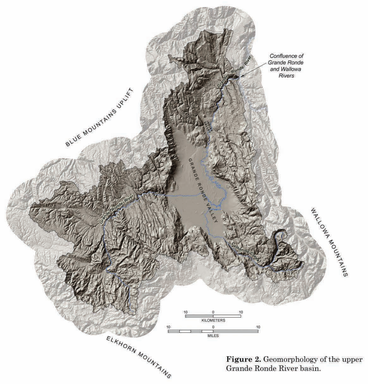


Figure 2. Geomorphology of the upper Grande Ronde River basin.

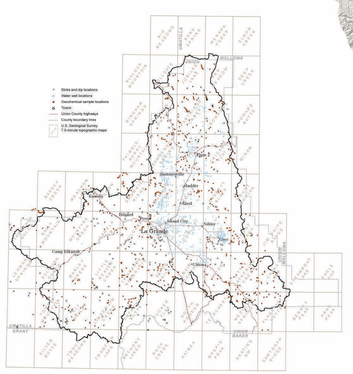


Figure 4. U.S. Geological Survey 7.5' topographic map coverage, Union County boundary, and locations of structure measurements, water wells, and whole-rock samples used in this study (see accompanying text). The locations of some structure measurements taken west of the map area are not shown in this figure.

MAP SYMBOLS

- Geochemical analysis point
- Cross section line
- Union County boundary line
- Dam
- Summit

Population Centers

- La Grande
- All other towns

Union County Roads

- Roads
- Union County highway
- Union County railroad

Water Features

- Perennial stream or river
- Intermittent stream or river
- Canal or ditch
- Waterbody
- Marsh or wetland
- Spring

Fault Certainty and Style

- Approximate, normal
- Approximate, reverse
- Approximate, unknown
- Inferred, normal
- Inferred, reverse
- Inferred unknown
- Concealed, normal
- Concealed, unknown

EXPLANATION OF MAP UNITS

See accompanying text for full descriptions.

UPPER CENOZOIC SURFICIAL AND VALLEY-FILL DEPOSITS

- Qa — Alluvium (Holocene and upper Pleistocene)
- Qe — Eolian sand, loess, and ash (Holocene and upper Pleistocene)
- Qal — Lacustrine and alluvial plain deposits (Holocene?) and upper Pleistocene)
- Qfd — Fluvial fan delta deposits (Holocene and upper Pleistocene)
- Qf — Alluvial fan deposits (Holocene and Pleistocene)
- Qcf — Colluvium and talus (Holocene and upper Pleistocene)
- Qls — Landslide deposits (Holocene and Pleistocene)
- Qg — Glacial deposits (upper and middle Pleistocene)
- QTt — Terrace deposits (Pleistocene and Pliocene(?))
- Tms — Fluviatile and lacustrine deposits (Pleistocene, Pliocene, and upper Miocene)

CENOZOIC VOLCANIC AND SEDIMENTARY ROCKS

Powder River Volcanic Field (middle Miocene to early Pleistocene(?))

- Tpvr — Andesite and dacite (Pliocene and early Pleistocene(?))
- Tpla — Trachyandesite and andesite (upper Miocene)
- Tptb — Basaltic trachyandesite (upper Miocene)
- Tpbs — Basanite and trachybasalt (upper or middle Miocene)
- Tpv — Basaltic andesite and andesite cinder and scoria (upper or middle Miocene)
- Tpa — Andesite and basaltic andesite (middle Miocene)
- Tpd — Dacite (middle Miocene)
- Tplc — Basalt of Little Catherine Creek (middle Miocene)
- Tpi — Basalt, andesite, dacite, and basanite intrusions (middle Miocene)

Neogene sedimentary rocks

- Tms — Sedimentary rocks (early Pliocene(?) to middle Miocene)

Columbia River Basalt Group (middle and late Miocene)

- Tcs — Saddle Mountains Basalt (upper and middle Miocene)
- Tcw — Wanapum Basalt (middle Miocene)
- Tcg — Grande Ronde Basalt (middle and lower Miocene)
- Tci — Imnaha Basalt (lower Miocene)
- Tcv — Vent and hydrovolcanic deposits (middle Miocene)
- Tcd — Columbia River Basalt dikes (middle and lower Miocene)

Tower Mountain caldera (lower Miocene and Oligocene)

- Tta — Andesite and dacite flows (lower Miocene)
- Ttr — Rhyolite (upper Oligocene)
- Ttt — Welded ash-flow tuff (upper Oligocene)
- Ttd — Porphyritic lava of Chicken Creek (upper Oligocene)
- Ttba — Basalt, basaltic andesite, and andesite (upper Oligocene)
- Ttvs — Volcaniclastic deposits of Limber Jim Creek (upper Oligocene)
- Ttb — Basalt and basaltic andesite (Oligocene)

Tertiary subvolcanic intrusions

- Tbi — Mafic intrusions (lower Miocene to upper Oligocene)
- Tri — Rhyolite intrusions (lower Miocene to upper Oligocene)
- Tdi — Dacite and andesite intrusions (lower Miocene to upper Oligocene)

Lower Cenozoic sedimentary rocks

- Teg — Conglomerate, sandstone, and siltstone (lower Oligocene(?), Eocene, or Paleocene(?))

MESOZOIC INTRUSIVE ROCKS

Wallowa batholith (Early Cretaceous and Late Jurassic(?))

- Kwt — Tonalite and granodiorite of the Wallowa Batholith (Early Cretaceous)
- Kwi — Trondjemite of Catherine Creek (Early Cretaceous or Late Jurassic)

Bald Mountain batholith (Early Cretaceous and Late Jurassic)

- KJbt — Granodiorite and tonalite (Early Cretaceous and Late Jurassic)
- KJbg — Granite (Early Cretaceous or Late Jurassic)
- KJbi — Mafic and intermediate intrusions (Early Cretaceous and Late Jurassic)
- KJm — Metamorphosed inclusions (Early Cretaceous and Late Jurassic)

MESOZOIC AND PALEOZOIC ROCKS

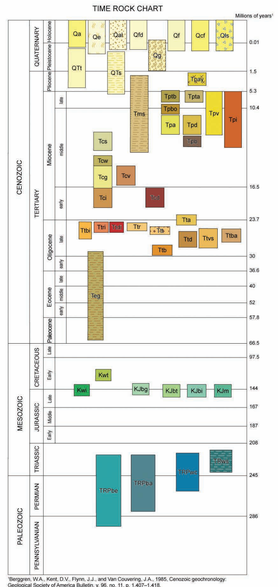
Wallowa terrane (Early Jurassic, Triassic, and Permian)

- TRes — Undifferentiated volcaniclastic and clastic sedimentary rocks (Triassic(?))
- TRPec — Clover Creek Greenstone (Triassic or Permian)

Baker terrane (Triassic, Permian, Pennsylvanian, and Devonian(?))

- TRPbe — Elkhorn Ridge Argillite (Triassic, Permian, Pennsylvanian and Devonian(?))
- TRPba — Amphibolite and metamorphosed intrusive rocks (Triassic and Permian)

TIME ROCK CHART



¹Berggren, W.A., Kent, D.V., Flynn, J.J., and Van Couvering, J.A., 1985, Cenozoic geochronology: Geological Society of America Bulletin, v. 96, no. 11, p. 1,407–1,418.

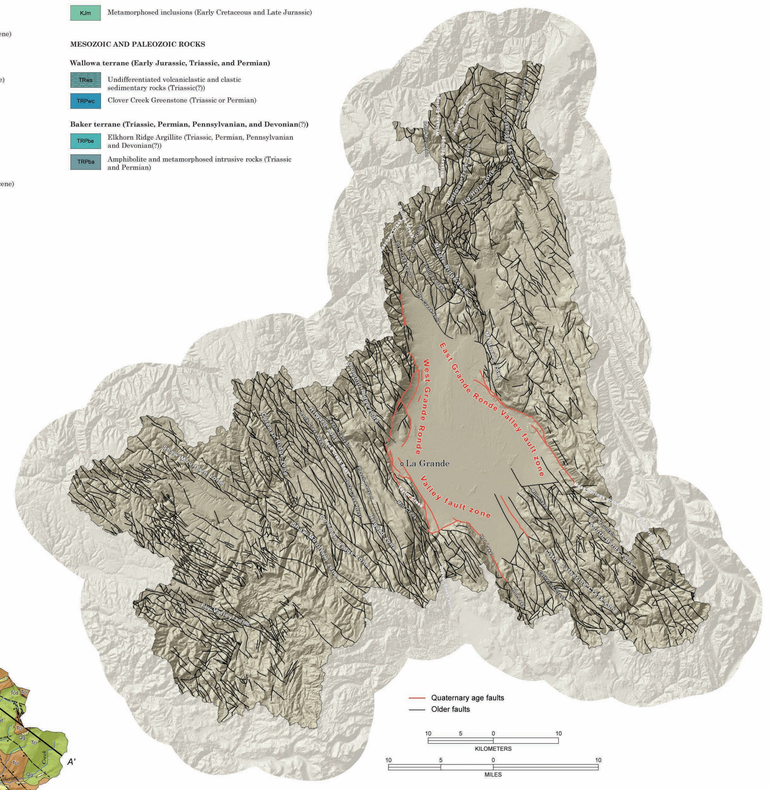
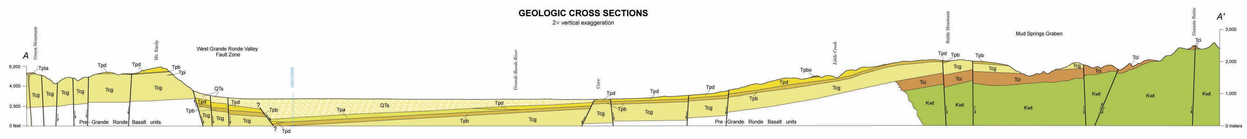
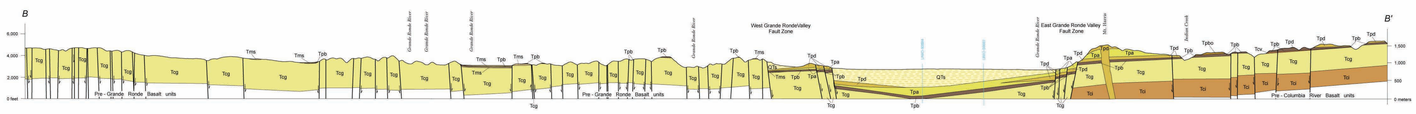


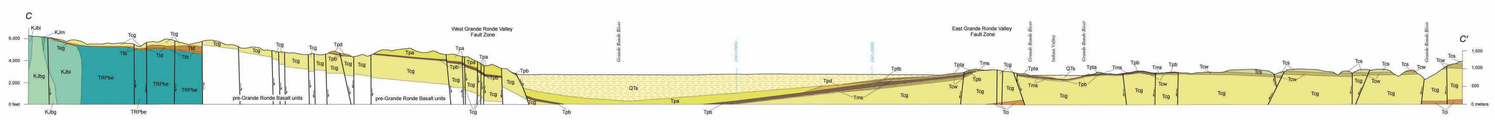
Figure 3. Grande Ronde Valley is bordered to the east and west by steep, northwest-trending, fault-bounded escarpments.

GEOLOGIC CROSS SECTIONS

2× vertical exaggeration







Geology by Mark L. Ferns, Vicki S. McConnell, and Ian P. Madin, Oregon Department of Geology and Mineral Industries; and Jenda A. Johnson, Portland, Oregon.

Field work conducted 1993–2001.
Cartography by Sarah A. Robinson, 2010.

Geologic map reviewed by Jim Evans, U.S. Geological Survey, Bob Carson, Whitman University, and Jay Van Tassell, Eastern Oregon University.

Software used: MapInfo Professional 8.0, ArcGIS 9.3, Adobe Illustrator CS5, Adobe Acrobat 9.3.4. Source file: ... \Publications\Bulletin 107\

Base map by Oregon Department of Geology and Mineral Industries (DOGAMI) from 10-m USGS DEM.

Map projection: Universal Transverse Mercator, North American Datum 1927, Zone 11.
Latitude and longitude ticks at 15-minute increments apply to main map only.

SCALE: 1:100,000

KILOMETERS 5 2.5 0 5 10
METERS 1000 0 1000 2000
MILES 2.5 0 2.5 5

APPROXIMATE MEAN DECLINATION, 2005

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