

Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the [interactive fault map](#).

Brothers fault zone (Class A) No. 819

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Synopsis

These northwest-trending high-angle faults are located along the southern edge of the Brothers fault zone, a 250- to 300-km-long zone of high-angle faulting that may be the surface manifestation of a regional-scale right-lateral shear zone. The area is underlain by Miocene and Pliocene basalts and welded tuffs. The faults described herein are just a few of the hundreds of fault strands that comprise the Brothers fault zone in central Oregon. No information on the geomorphic expression of these faults has been described, but the faults apparently are mapped on the basis of steep escarpments in Miocene and Pliocene bedrock. The northwestern strand forms northeast-facing bedrock escarpments as much as 80 m high along its middle and southern parts; the northern part forms southwest-facing bedrock escarpments as much as 40 m high and ponds Quaternary sediment in a fault-bounded basin. The southeastern strand forms northeast-facing bedrock escarpments as much as 240 m high. No detailed

	information on Quaternary offset is available, but limited airphoto analysis suggests possible Quaternary displacement.
Name comments	These unnamed faults are some of the hundreds of fault strands in a northwest-trending fault zone located in central Oregon (Piper and others, 1939 #3488; Walker, 1969 #4296; Greene and others, 1972 #3560; Stewart and others, 1975 #3769; Lawrence, 1976 #3506; Brown and others, 1980 #3572; Walker and Nolf, 1981 #4310; 1981 #4311; Pezzopane, 1993 #3544; Geomatrix Consultants Inc., 1995 #3593; Madin and Mabey, 1996 #3575; Weldon and others, 2002 #5648). The fault zone was apparently named after the small community of Brothers, Oregon, by Walker (1969 #4296). The zone is also included in the Oregon-Nevada lineament of Stewart and others (1975 #3769), but "Brothers fault zone" is in common usage and is retained herein.
County(s) and State(s)	HARNEY COUNTY, OREGON
Physiographic province(s)	COLUMBIA PLATEAU BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. <i>Comments:</i> Fault locations are from 1:100,000-scale mapping of Weldon and others (2002 #5648), based on 1:250,000-scale mapping of Greene and others (1972 #3560) and 1:500,000-scale mapping of Pezzopane (1993 #3544).
Geologic setting	These northwest-trending high-angle faults are located along the southern edge of the Brothers fault zone, a 250–300 km long zone of high-angle faulting that may be the surface manifestation of a regional-scale right-lateral shear zone (Walker, 1969 #4296; Stewart and others, 1975 #3769; Lawrence, 1976 #3506; Walker and Nolf, 1981 #4310; 1981 #4311). The area is underlain by Miocene and Pliocene basalts and welded tuffs (Greene and others, 1972 #3560; Brown and others, 1980 #3572; Walker and MacLeod, 1991 #3646).
Length (km)	63 km.
Average strike	N43°W
Sense of movement	Normal, Right lateral

	<p><i>Comments:</i> These structures are depicted as normal or high-angle faults on maps of Piper and others (1939 #3488), Greene and others (1972 #3560), Brown and others (1980 #3572), Hawkins and others (1988 #2946), Walker and MacLeod (1991 #3646), and Pezzopane (1993 #3544). The northwestern strand mapped as down-to-the-northeast by Pezzopane (1993 #3544) is mapped as several fault strands with both down-northeast and down-southwest directions of displacement by Greene and others (1972 #3560) and Walker and MacLeod (1991 #3646). If these faults are part of the Brothers fault zone, they may represent part of the surface manifestations of a regional right-lateral shear zone (Lawrence, 1976 #3506).</p>
Dip Direction	NE; SW
Paleoseismology studies	
Geomorphic expression	<p>No information on the geomorphic expression of these faults has been described, but the faults apparently are mapped on the basis of steep escarpments in Miocene and Pliocene bedrock. The northwestern strand forms northeast-facing bedrock escarpments as much as 80 m high along its middle and southern parts; the northern part forms southwest-facing bedrock escarpments as much as 40 m high and ponds Quaternary sediment in a fault-bounded basin. The southeastern strand forms northeast-facing bedrock escarpments as much as 240 m high.</p>
Age of faulted surficial deposits	<p>The northwestern strand in one place is mapped as juxtaposing volcanic bedrock against undifferentiated Quaternary alluvium, but these faults are otherwise restricted to Miocene and Pliocene bedrock on existing small-scale geologic maps (Greene and others, 1972 #3560; Walker and MacLeod, 1991 #3646). No offset Quaternary deposits have been described.</p>
Historic earthquake	
Most recent prehistoric deformation	<p>undifferentiated Quaternary (<1.6 Ma)</p> <p><i>Comments:</i> Pezzopane (1993 #3544) used airphoto analysis to infer Quaternary displacement. Subsequent compilations (Geomatrix Consultants Inc., 1995 #3593; Madin and Mabey, 1996 #3575; Weldon and others, 2002 #5648) also show these strands of the Brothers fault zone as active in the Quaternary (<1.6–1.8 Ma).</p>

Recurrence interval	
Slip-rate category	<p>Less than 0.2 mm/yr</p> <p><i>Comments:</i> No published slip rates are available for these strands of the Brothers fault zone, but escarpments are 40–240 m high in Miocene and Pliocene bedrock suggest low rates of long-term slip.</p>
Date and Compiler(s)	<p>2002</p> <p>Stephen F. Personius, U.S. Geological Survey</p>
References	<p>#3572 Brown, D.E., Black, G.L., Mclean, G.D., and Petros, J.R., 1980, Preliminary geology and geothermal resource potential of the Powell Buttes Area, Oregon: State of Oregon, Department of Geology and Mineral Industries Open-File Report O-80-8, 117 p., 1 pl., scale 1:62,500.</p> <p>#3593 Geomatrix Consultants, Inc., 1995, Seismic design mapping, State of Oregon: Technical report to Oregon Department of Transportation, Salem, Oregon, under Contract 11688, January 1995, unpaginated, 5 pls., scale 1:1,250,000.</p> <p>#3560 Greene, R.C., Walker, G.W., and Corcoran, R.E., 1972, Geologic map of the Burns quadrangle, Oregon: U.S. Geological Survey Miscellaneous Geologic Investigations I-680, 2 sheet, scale 1:250,000.</p> <p>#2946 Hawkins, F.F., LaForge, R.C., Templeton, M., and Gilbert, J.D., 1988, Seismotectonic study for Arthur R. Bowman and Ochoco Dams, Crooked River Project, Oregon: U.S. Bureau of Reclamation Seismotectonic Report 88-10, 57 p., 2 pls.</p> <p>#3506 Lawrence, R.D., 1976, Strike-slip faulting terminates the Basin and Range province in Oregon: Geological Society of America Bulletin, v. 87, p. 846-850.</p> <p>#3575 Madin, I.P., and Mabey, M.A., 1996, Earthquake hazard maps for Oregon: State of Oregon, Department of Geology and Mineral Industries Geological Map Series GMS-100, 1 sheet.</p> <p>#3544 Pezzopane, S.K., 1993, Active faults and earthquake ground motions in Oregon: Eugene, Oregon, University of Oregon, unpublished Ph.D. dissertation, 208 p.</p>

#3488 Piper, A.M., Robinson, T.W., and Park, C.F., Jr., 1939, Geology and ground-water resources of the Harney Basin, Oregon: U.S. Geological Survey Water-Supply Paper 841, 189 p., 2 pls.

#3769 Stewart, J.H., Walker, G.W., and Kleinhampl, F.J., 1975, Oregon-Nevada lineament: Geology, v. 3, no. 5, p. 265-268.

#4296 Walker, G.W., 1969, Geology of the High Lava Plains Province, *in* Mineral and water resources of Oregon: State of Oregon, Department of Geology and Mineral Industries Bulletin 64, p. 77-79.

#3646 Walker, G.W., and MacLeod, N.S., 1991, Geologic map of Oregon: U.S. Geological Survey, Special Geologic Map, 2 sheets, scale 1:500,000.

#4310 Walker, G.W., and Nolf, B., 1981, High Lava Plains, Brothers fault zone to Harney Basin, Oregon, *in* Johnston, D.A., and Donnelly-Nolan, J., eds., Guides to some volcanic terranes in Washington, Idaho, Oregon, and northern California: U.S. Geological Survey Circular 838, p. 105-111.

#4311 Walker, G.W., and Nolf, B., 1981, Roadlog for High Lava Plains, Brothers fault zone to Harney Basin, Oregon, *in* Johnston, D.A., and Donnelly-Nolan, J., eds., Guides to some volcanic terranes in Washington, Idaho, Oregon, and northern California: U.S. Geological Survey Circular 838, p. 113-140.

#5648 Weldon, R.J., Fletcher, D.K., Weldon, E.M., Scharer, K.M., and McCrory, P.A., 2002, An update of Quaternary faults of central and eastern Oregon: U.S. Geological Survey Open-File Report 02-301 (CD-ROM), 26 sheets, scale 1:100,000.

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