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Quaternary Fault and Fold Database of the United States

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Hoppin Peaks fault zone, Oregon Canyon Mountains section (Class A) No. 1507a

Last Review Date: 2016-07-12

citation for this record: **Adams, K., and Personius, S.F., compilers, 2002, Fault number 1507a, Hoppin Peaks fault zone, Oregon Canyon Mountains section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 02:50 PM.**

Synopsis	**General:** This down-to-the-east fault zone forms an abrupt topographic escarpment between the eastern margins of the Double H Mountains, Montana Mountains, Hoppin Peaks, and the Oregon Canyon Mountains, and the western margin of the Quinn River Valley. Quaternary fault traces have been mapped from Twelvemile Summit at the north end of the Quinn River Valley, south across the Oregon-Nevada border to about 10 km south of Moonshine Canyon. The footwall block comprised of the Montana Mountains, Double H Mountains, Hoppin Peaks, and the Oregon Canyon Mountains forms a major east-tilted fault block in the northern Basin and Range; the adjacent Quinn River Valley is a graben filled with thousands of meters of Tertiary-Quaternary fill. The Hoppin Peaks fault zone is divided into two sections

	herein, a northern Oregon Canyon Mountains section and a southern Hoppin Peaks section. As is common along other faults in the Quinn River Valley, both sections of the fault zone have piedmont and range-front fault scarps, but fault scarps are more continuous along the Hoppin Peaks section. No detailed fault studies have been conducted, but most of the fault zone is mapped as having youngest movement in the middle to late Quaternary. Short piedmont scarps at the northern ends of the Hoppin Peak and Oregon Canyon Mountains sections appear to have been active in the latest Pleistocene or Holocene, but the short lengths of these scarps suggest that they may be related to paleoearthquakes on the more-recently active Santa Rosa Range fault system [1508] located on the east side of the Quinn River Valley. **Sections:** This fault has 2 sections. Although detailed studies along the entire fault zone have not been completed, two sections herein are inferred based on geometry of the zone, a northern Oregon Canyon Mountains section and a southern Hoppin Peaks section. The two sections are separated by an echelon 4-km-wide left step in the range front near Washburn Creek, 7 km south of the Oregon-Nevada border. Range front and piedmont fault scarps are more consistently present along the Hoppin Peaks section.
Name comments	**General:** **Section:** This section is herein informally named after the Oregon Canyon Mountains, which form the footwall of this part of the fault zone. **Fault ID:** These structures are included in fault number 50 of Pezzopane (1993 #3544), fault number 63 of Geomatrix Consultants, Inc. (1995 #3593), and fault numbers MD1A and MD1B of dePolo (1998 #2845).
County(s) and State(s)	MALHEUR COUNTY, OREGON HUMBOLDT COUNTY, NEVADA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault locations are based on 1:48,000-scale mapping of Narwold (2001 #3010) and 1:100,000-scale mapping of

	Weldon and others (2002 #5648), based on 1:500,000-scale mapping of Pezzopane (1993 #3544).
Geologic setting	This down-to-the-east fault zone forms abrupt eastern topographic escarpments between the Double H Mountains, Montana Mountains, Hoppin Peaks, and the Oregon Canyon Mountains, and the western margin of the northern Quinn River Valley. The footwall block forms a major east-tilted fault block in the northern Basin and Range (Stewart, 1978 #2866); the adjacent Quinn River Valley is a graben filled with 1,200 to 2,450 m of Tertiary-Quaternary fill (Erwin and others, 1985 #3009; Erwin, 1988 #3008).
Length (km)	This section is 44 km of a total fault length of 91 km.
Average strike	N14°W (for section) versus N4°E (for whole fault)
Sense of movement	Normal *Comments:* Structures in this zone are mapped as normal or high-angle faults by Walker and Repenning (1966 #3586), Greene (1972 #3007), Walker (1991 #3646), Michetti and Wesnousky (1993 #2540), Pezzopane (1993 #3544), and Narwold (2001 #3010).
Dip Direction	E
Paleoseismology studies	
Geomorphic expression	Faults in this section are primarily expressed as intermittent, echelon, mostly east-facing range front and piedmont fault scarps (Narwold, 2001 #3010). Piedmont and range-front scarps in this section are less continuous that those in the Hoppin Peaks section to the south.
Age of faulted surficial deposits	Faults in this section offset Miocene volcanic rocks (Walker and Repenning, 1966 #3586; Walker and MacLeod, 1991 #3646); piedmont scarps at the northern end of the section offset middle to late Pleistocene alluvium
Historic earthquake	
Most recent prehistoric	middle and late Quaternary (<750 ka)

deformation	*Comments:* The timing of the most recent event is not well constrained on the Oregon Canyon Mountains section. Narwold (2001 #3010) maps most fault traces in the section as early to middle Pleistocene (0.13-1.5 Ma), which is consistent with Madin and others (1996 #3479) mapping of most of the same fault strands as pre-Holocene Quaternary. Some piedmont traces at the northern end of the section are mapped as latest Quaternary by Pezzopane (1993 #3544), Narwold (2001 #3010), and Weldon and others (2002 #5648). Given the lack of a continuously mapped range-front fault along most of the eastern margin of the Oregon Canyon Mountains, the young scarps at the northern end of the section may be related to fault rupture on the more-recently active Santa Rosa Range fault system [1508] on the eastern side of the Quinn River Valley.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* No detailed slip data have been obtained on faults in the Oregon Canyon Mountains section. Pezzopane (1993 #3544) and Pezzopane and Weldon (1993 #149) used airphoto and limited reconnaissance to infer a slip rate of 0.5-1.0 mm/yr across a broad zone of faulting from the Steens Mountain/Alvord desert area across the Santa Rosa Range fault system, but how this slip is partitioned on the numerous faults in this area is unknown. Walker and Repenning (1966 #3586) show about 1 km of throw in Miocene volcanic rocks across the Oregon Canyon Mountains section near Rock Creek. Perhaps a better estimate of fault throw can be obtained by combining the topographic relief across the fault zone (about 650 m) with estimates of the thickness of valley-fill deposits in the Quinn River Valley (1200-2450 m, Erwin and others, 1985 #3009; Erwin, 1988 #3008). These data yield a vertical separation of 1850-3100 m in Miocene bedrock that is probably correlative with the 15-17 Ma (Sherrod and Johnson, 1994 #3563) Steens Basalt (Walker and Repenning, 1966 #3586; Walker and MacLeod, 1991 #3646). Such data yield low rates of long-term slip. The Hoppin Peaks fault zone is clearly less active than the nearby Santa Rosa Range fault system [1508], which has a recently determined Quaternary slip rate of <0.1 mm/yr (Personius and others, 2002 #5651; 2002 #5652).
Date and Compiler(s)	2002 Kenneth Adams, Piedmont Geosciences, Inc.

	Stephen F. Personius, U.S. Geological Survey
References	#2845 dePolo, C.M., 1998, A reconnaissance technique for estimating the slip rate of normal-slip faults in the Great Basin, and application to faults in Nevada, U.S.A.: Reno, University of Nevada, unpublished Ph.D. dissertation, 199 p. #3008 Erwin, J.W., 1988, Discussion of the McDermitt gravity sheet, Map#86: Nevada Bureau of Mines and Geology, Open File Report 88-2, 4 p. #3009 Erwin, J.W., Ponce, D.A., and Wagini, A., 1985, Bouguer gravity map of Nevada, McDermitt sheet: Nevada Bureau of Mines and Geology, Map 86, scale 1:250,000. #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. #3007 Greene, R.C., 1972, Preliminary geologic map of the Jordan Meadows quadrangle, Nevada-Oregon: U.S. Geological Survey Miscellaneous Field Studies Map MF-341, scale 1:48,000. #3479 Madin, I.P., Ferns, M.F., Langridge, R., Jellinek, A.M., and Priebe, K., 1996, Final report to Bonneville Power Administration U.S. Department of Energy Portland General Electric Company—Geothermal resources of southeast Oregon: State of Oregon, Department of Geology and Mineral Industries Open-File Report OFR-0-96-4, 41 p., 6 pls. #2540 Michetti, A.M., and Wesnousky, S.G., 1993, Holocene surface faulting along the west flank of the Santa Rosa Range (Nevada-Oregon) and the possible northern extension of the central Nevada seismic belt: Geological Society of America Abstracts with Programs, v. 25, no. 5, p. 120-121. #4035 Narwold, C.F., 1999, Late Quaternary faulting along the Quinn River fault zone—A soils investigation, *in* Quaternary geology of the northern Quinn River and Alvord Valleys, southeastern Oregon: Friends of the Pleistocene field trip guide, September 24-26, 1999, Appendix 1, p. 1–18. #3010 Narwold, C.F., 2001, Late Quaternary soils and faulting along the Quinn River fault zone, northern Nevada, southeastern

Oregon: Arcata, California, Humboldt State University, unpublished M.S. thesis, 76 p., 4, scale 1:48,000.

#5651 Personius, S.F., Anderson, R.E., Okumura, K., and Hancock, D.A., 2002, Preliminary results of a trench investigation of the Santa Rosa Range fault zone, Humboldt County, Nevada: Geological Society of America Abstracts with Programs, v. 34, no. 4, p. A-11.

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#149 Pezzopane, S.K., and Weldon, R.J., II, 1993, Tectonic role of active faulting in central Oregon: Tectonics, v. 12, p. 1140-1169.

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	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.