Jump to Navigation

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.

Metolius fault zone, Green Ridge section (Class A) No. 853a

Last Review Date: 2016-04-12

citation for this record: **Personius, S.F., compiler, 2002, Fault number 853a, Metolius fault zone, Green Ridge 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 03:16 PM.**

Synopsis	**General:** The Metolius fault zone is comprised of several mostly southwest-dipp northwest-trending normal faults that offset volcanic rocks and sediments along t eastern margin of the Cascade Range in central Oregon. The structural setting of Metolius fault zone is open to interpretation, but the fault zone probably forms pa the eastern boundary of the Cascades graben in a structural transition zone at the northern end of the right-lateral (?) Brothers fault zone. **Sections:** This fault has 3 sections. Following Hawkins and others (1988 #2946, #2947), the Metolius fault zone is divided into the Green Ridge, the Rimrock-Tur and the Northwest Rift zone sections.
Name comments	**General:** The Metolius fault zone of Hawkins and others (1988 #2946, 1989 #29 a zone of primarily down to the west and southwest normal faults that extend fro Green Ridge on the north to Newberry Volcano on the south. Named faults in this zone are, from north to south, the Green Ridge, Rimrock, and Tumalo faults and t

	Northwest Rift zone near Newberry volcano (Peterson and others, 1976 #3735; U Army Corps of Engineers, 1983 #3484; 1983 #3485; Hawkins and others, 1988 # Goles and Lambert, 1990 #3763; Mimura, 1992 #3590; Taylor and Ferns, 1994 # MacLeod and others, 1995 #3557; Sherrod and others, 2004 #5172; Wellik, 2008 #7383). This fault zone should not be confused with the Metolius fault located al the Metolius River northeast of Green Ridge (U.S. Army Corps of Engineers, 19 #3485), which has not been included in recent Quaternary fault compilations (Ha and others, 1988 #2946; Pezzopane, 1993 #3544; Geomatrix Consultants Inc., 19 #3593). Fault strands in the Metolius fault zone are parallel to and have been incl by various authors in the nearby Sisters and Brothers fault zones [852 and 819, respectively], but we include these faults in the Metolius fault zone of Hawkins a others (1988 #2946) because of their consistent slip direction. **Section:** This section consists of the Green Ridge fault and several other small fa near Green Ridge and Black Butte. **Fault ID:** This fault zone is comprised of fault numbers 24, 25, and 26 of Pezzop (1993 #3544), fault numbers 44, 46, and 47 of Geomatrix Consultants, Inc. (1995 #3593), and NWR1–NWR9 of Wellik (2008 #7383).
County(s) and State(s)	JEFFERSON COUNTY, OREGON DESCHUTES COUNTY, OREGON
Physiographic province(s)	CASCADE-SIERRA MOUNTAINS COLUMBIA PLATEAU
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Location of fault from ORActiveFaults (http://www.oregongeology.org/arcgis/rest/services/Public/ORActiveFaults/MapS downloaded 06/02/2016). Fault traces are from 1:100,000-scale mapping of Sher and others (2004 #5172) 1:100,000-scale compilation of Weldon and others (200 #5648), based on 1:500,000-scale compilation of Pezzopane (1993 #3544).
Geologic setting	The Metolius fault zone of Hawkins and others (1988 #2946) is comprised of sev mostly southwest-dipping, northwest-trending normal faults (Peterson and others #3735; U.S. Army Corps of Engineers, 1983 #3484; Hawkins and others, 1988 # Geomatrix Consultants Inc., 1990 #3550; Walker and MacLeod, 1991 #3646, 19 #3593; Sherrod and others, 2004 #5172; Wellik, 2008 #7383) that offset volcanic and sediments along the eastern margin of the Cascade Range in central Oregon. Individual faults are closely associated with cinder cones (Wellik, 2008 #7383) a cumulative vertical displacement across the entire zone is likely 20 m (Geomatrix Consultants Inc., 1990 #3550). The structural setting of the Metolius fault zone is to interpretation, but the fault zone probably forms part of the eastern boundary o

	Cascades graben (Taylor, 1981 #4306; 1981 #4307; Sherrod and Smith, 2000 #51 in a structural transition zone at the northern end of the right lateral (?) Brothers f zone (Lawrence, 1976 #3506; Hawkins and others, 1988 #2946).
Length (km)	This section is 29 km of a total fault length of 94 km.
Average strike	N11°W (for section) versus N22°W (for whole fault)
Sense of movement	Normal *Comments:* Faults in the Green Ridge section are mapped as high angle or norma faults by most workers (Williams, 1957 #3740; Peterson and others, 1976 #3735; Taylor, 1981 #4306; 1981 #4307; U.S. Army Corps of Engineers, 1983 #3485; W and MacLeod, 1991 #3646; Hill, 1992 #3736; Pezzopane, 1993 #3544; Sherrod a Smith, 2000 #5165; Sherrod and others, in press #5172), but if these faults are pa the Sisters fault zone [852], then some oblique slip may also be present (Geomatr Consultants Inc., 1995 #3593; Sherrod and others, 2004 #5172).
Dip Direction	SW
Paleoseismology studies	
Geomorphic expression	The most prominent fault in this section, the Green Ridge fault, parallels a 750-m linear escarpment in Miocene volcanic rocks on the western margin of Green Rid Despite its height and linearity, little geomorphic evidence of Quaternary faulting been found along this escarpment (Hawkins and others, 1988 #2946; Geomatrix Consultants Inc., 1995 #3593). Pezzopane (1993 #3544) used air photo analysis t infer Quaternary activity on several faults in the Green Ridge section, and Weldo others (2002 #5648) observed lineaments across Quaternary deposits on 1:100,00 scale DEMs of the area.
Age of faulted surficial deposits	The Green Ridge fault offsets upper Miocene (5.27±0.04 Ma) volcanic rocks of t Deschutes Formation (Smith and others, 1987 #3780) >1000 m (Taylor, 1981; Sh 2004 #5172). Some faults in the Green Ridge section may be buried by early or n Pleistocene basalts of Black Butte near the southern end of the section (Taylor, 19 #4306; 1981 #4307; Hill, 1992 #3736), but U.S. Army Corps of Engineers (1983 #3484), Pezzopane (1993 #3544), Sherrod and Smith (2000 #5165), Sherrod and (2004 #5172), and Weldon and others (2002 #5648) show Quaternary faults in th area.
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) *Comments:* Pezzopane (1993 #3544) used airphoto analysis to infer Quaternary

	displacement on the Green Ridge fault, despite the conclusions of other studies th this structure has not been active in the Quaternary (Hawkins and others, 1988 #2 Pezzopane (1993 #3544) and subsequent compilations (Geomatrix Consultants In 1995 #3593; Madin and Mabey, 1996 #3575; Weldon and others, 2002 #5648) in middle and late Quaternary (<700–780 ka) displacement on the rest of the faults i Green Ridge section.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* No detailed fault slip data have been documented, but the lack of significant geomorphic evidence of Quaternary displacement on most faults in the Green Ridge section suggest low rates of slip.
Date and Compiler(s)	2002 Stephen F. Personius, U.S. Geological Survey
References	#3550 Geomatrix Consultants, Inc., 1990, Seismotectonic evaluation of Wasco D site: Technical report to U.S. Department of Interior, Bureau of Reclamation, Den under Contract 6-CS-81-07310, 115 p., 2 pls., scale 1:250,000. #3593 Geomatrix Consultants, Inc., 1995, Seismic design mapping, State of Oreg Technical report to Oregon Department of Transportation, Salem, Oregon, under Contract 11688, January 1995, unpaginated, 5 pls., scale 1:1,250,000. #3763 Goles, G., and Lambert, R.S.J., 1990, A strontium isotopic study of Newbe volcano, central Oregon—Structural and thermal implications: Journal of Volcano and Geothermal Research, v. 43, p. 159-174. #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. pls. #3736 Hill, B.E., 1992, Geology and geothermal resources of the Santiam Pass A the Oregon Cascade Range, Deschutes, Jefferson and Linn Counties, Oregon: Sta Oregon, Department of Geology and Mineral Industries Open-File Report O-92-3 p., 1 pl., scale 1:62,500. #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. #3557 MacLeod, N.S., Sherrod, D.R., Chitwood, L.A., and Jensen, R.A., 1995,

Geologic map of Newberry Volcano, Deschutes, Klamath, and Lake Counties, Or
U.S. Geological Survey Miscellaneous Investigations Map I-2455, 2 sheets, scale
1:24,000 and 1:62,500.

#3575 Madin, I.P., and Mabey, M.A., 1996, Earthquake hazard maps for Oregon:
of Oregon, Department of Geology and Mineral Industries Geological Map Serie
GMS-100, 1 sheet.

#3590 Mimura, K., 1992, Reconnaissance geologic map of the west half of the be
and the east half of the Shevlin park 7 1/2 quadrangles, Deschutes County, Orego
U.S. Geological Survey Miscellaneous Field Studies Map MF-2189, 1 sheet, scal
1:24,000.

#3735 Peterson, N.V., Groh, E.A., Taylor, E.M., and Stensland, D.E., 1976, Geol
and mineral resources of Deschutes County, Oregon: State of Oregon, Departmen
Geology and Mineral Industries Bulletin 89, 66 p., 4 pls.

#3544 Pezzopane, S.K., 1993, Active faults and earthquake ground motions in Or
Eugene, Oregon, University of Oregon, unpublished Ph.D. dissertation, 208 p.

#5165 Sherrod, D.R., and Smith, J.G., 2000, Geologic map of upper Eocene to
Holocene volcanic and related rocks of the Cascade Range, Oregon: U.S. Geolog
Survey Geologic Investigations Map I-2569, 2 sheets, scale 1:500,000.

#5172 Sherrod, D.R., Taylor, E.M., Ferns, M.L., Scott, W.E., Conrey, R.M., and S
G.A., 2004, Geologic map of the Bend 30' x 60' quadrangle, central Oregon: U.S.
Geological Survey Geologic Investigations Map I-2683, 44 p. pamphlet, 2 sheets
1:100,000.

#3780 Smith, G.A., Snee, L.W., and Taylor, E.M., 1987, Stratigraphic, sedimento
and petrologic record of late Miocene subsidence of the central Oregon High Cas
Geology, v. 15, p. 389-392.

#4306 Taylor, E.M., 1981, Central High Cascade roadside geology, Bend, Sisters
McKenzie Pass, and Santiam Pass, Oregon, *in* Johnston, D.A., and Donnelly-Nol
eds., Guides to some volcanic terranes in Washington, Idaho, Oregon, and northe
California: U.S. Geological Survey Circular 838, p. 55-58.

#4307 Taylor, E.M., 1981, Roadlog for Central High Cascade geology, Bend, Sist
McKenzie Pass, and Santiam Pass, Oregon, *in* Johnston, D.A., and Donnelly-Nol
eds., Guides to some volcanic terranes in Washington, Idaho, Oregon, and northe
California: U.S. Geological Survey Circular 838, p. 59-83.

#3759 Taylor, E.M., and Ferns, M.L., 1994, Geology and mineral resource map o

Tumalo Dam quadrangle, Deschutes County, Oregon: State of Oregon, Departme Geology and Mineral Industries GMS-81, 1 sheet, scale 1:24,000.

#3484 U.S. Army Corps of Engineers, 1983, Cougar and Blue River Lakes earthc and fault study—Design memorandum 19: U.S. Army Corps of Engineers, Portla District, v. 19, 90 p., 11 pls.

#3485 U.S. Army Corps of Engineers, 1983, Detroit and Big Cliff Lakes earthqua and fault study—Design memorandum 4: U.S. Army Corps of Engineers, Portlan District, 93 p., 13 pls.

#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.

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

#3740 Williams, H., 1957, A geologic map of the Bend quadrangle, Oregon and a reconnaissance geologic map of the central portion of the High Cascade Mountai State of Oregon, Department of Geology and Mineral Industries, 1 sheet, scale 1:250,000.