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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.

Mount Angel fault (Class A) No. 873

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Synopsis	The northwest-striking Mount Angel fault offsets Miocene rocks of the Columbia River Basalt Group in the subsurface of the central Willamette Valley. The fault appears to have controlled emplacement of the Frenchman Spring Member of the Wanapum Basalt and thus must have a history that predates the Miocene age of th rocks. The Mount Angel fault is near earthquake swarms in 1990 near Woodburn the M_L5.6–5.7 1993 Scotts Mills earthquake. The Mount Angel fault has only bee identified in the subsurface, but historic seismicity and possible deformation of la Pleistocene (?) fluvial surfaces and changes in stream patterns across the conceale trace of the fault near Mount Angel suggests latest Quaternary displacement.
Name comments	The Mount Angel fault was first mapped by Hampton (1972 #4065) during groundwater investigations of the central Willamette Valley. The fault is probably named after the topographic feature or town of Mount Angel, and is included in t southeastern end of the Gales Creek-Mount Angel structural zone of Beeson and (1985 #4022; 1989 #4023).

	Fault ID: This is fault number 6 of Pezzopane (1993 #3544) and fault number 29 Geomatrix Consultants, Inc. (1995 #3593).
County(s) and State(s)	MARION COUNTY, OREGON
Physiographic province(s)	PACIFIC BORDER CASCADE-SIERRA MOUNTAINS
Reliability of location	Poor Compiled at 1:24,000 scale. *Comments:* Location of fault from ORActiveFaults (http://www.oregongeology.org/arcgis/rest/services/Public/ORActiveFaults/MapS downloaded 06/02/2016) attributed to 1:24,000-scale mapping of Tolan and other (1999 #4001).
Geologic setting	The northwest-striking Mount Angel fault offsets Miocene rocks of the Columbia River Basalt Group and forms a linear magnetic anomaly in the central Willamett Valley (Hampton, 1972 #4065; Werner, 1990 #3946; Werner and others, 1992 #3 Yeats and others, 1996 #4291; Burns and others, 1997 #4079; Tolan and others, 1 #4001; Blakely and others, 2000 #4333). The fault appears to have controlled emplacement of the Frenchman Spring Member of the Wanapum Basalt (Beeson others, 1985 #4022; Beeson and others, 1989 #4023), and thus must have a histor predates the Miocene age of these rocks. The Mount Angel fault is near earthqua swarms in 1990 near Woodburn (Werner, 1990 #3946; Werner and others, 1992 # and the M_L5.6–5.7 1993 Scotts Mills earthquake (Madin and others, 1993 #5120 Thomas and others, 1996 #4002).
Length (km)	30 km.
Average strike	N°43E
Sense of movement	Reverse, Right lateral *Comments:* The Mount Angel fault is mapped as a high-angle reverse-oblique fau Werner (1990 #3946), Werner and others (1992 #3986) Yeats and others (1996 #4 and Blakely and others (2000 #4333). M.H. Beeson (pers. commun., in Yeats and others, 1996 #4291) described 1 km of right lateral offset of an intracanyon flow Columbia River Basalt Group in the Waldo Hills, near the southern end of the Mo Angel fault. Beeson and others (1989 #4023) describe their Gales Creek-Mount A structural zone as faults with dip slip and right-lateral strike slip. Earthquake foca mechanisms from the 1993 Scotts Mills earthquake indicate subequal reverse and right-lateral strike slip on the Mount Angel fault (Thomas and others, 1996 #400
Dip	60–70° NE.

	Comments: Earthquake focal mechanisms from the 1993 Scotts Mills earthquake indicate slip on a northwest-striking, 60° northeast-dipping fault plane (Thomas a others, 1996 #4002). Seismic reflection and aeromagnetic data indicate a northeas of 60–70° (Werner, 1990 #3946; Werner and others, 1992 #3986; Yeats and other 1996 #4291; Liberty and others, 1999 #4006; Blakely and others, 2000 #4333). T Mount Angel fault was modeled as a 70°-dipping reverse fault in the earthquake hazards analysis of Geomatrix Consultants, Inc. (1995 #3593).
Paleoseismology studies	
Geomorphic expression	The Mount Angel fault has mostly been identified in the subsurface, so it has usu been described as having little geomorphic expression (Yeats and others, 1996 #4 but exposure of Columbia River Basalt Group rocks in Mount Angel are geologic expression of faulting (Werner, 1990 #3946; Werner and others, 1992 #3986). Wi possible exception of the topographic scarp discussed below (Madin and others, 2 #7168), no fault scarps on surficial Quaternary deposits have been described alon fault trace, but Unruh and others (1994 #3597) inferred possible deformation of la Pleistocene (?) fluvial surfaces and changes in stream patterns across the conceale trace of the fault near Mount Angel. Wang and Madin (2001 #5055; 2001 #5063) describe an anomalous bend and probable tectonic deformation in Quaternary sediments where the fault crosses the Pudding River, and offsets of Quaternary deposits in shallow seismic reflection profiles at several locations across the fault Madin and others (2007 #7168) report that recent ground magnetic and detailed topographic surveys identify a subtle (0.1–0.2 m) scarp and a linear 60-nT magne anomaly that coincide with the mapped trace of the fault, and that despite the agreement of results from their topographic and magnetic surveys, GPR profiles a the identified scarp/magnetic anomaly show no evidence for fault-related deforma within less than 10 m of the surface. Geophysical investigation by Witter and others (2009 #) across the inferred trace fault where Dominic and Miller Roads cross the fault did not result in compelling evidence for near-surface coseismic deformation, and interpretation of LiDAR da not expose any tectonic geomorphology.
Age of faulted surficial deposits	The Mount Angel fault offsets Miocene Columbia River Basalt Group volcanic ro and Miocene and Pliocene sedimentary rocks (Hampton, 1972 #4065; Werner, 19 #3946; Werner and others, 1992 #3986; Yeats and others, 1996 #4291; Tolan and others, 1999 #4001; Liberty and others, 1999 #4006). No fault scarps on surficial Quaternary deposits have been described along the fault trace, but Unruh and oth (1994 #3597) inferred possible deformation of late Pleistocene (?) fluvial surface across the concealed trace of the fault near Mount Angel. If these surfaces are deformed, then offset along the Mount Angel fault occurred during the late Pleist

	or Holocene (Unruh and others, 1994 #3597). Wang and Madin (2001 #5063) anc Wang and others (2001 #5055; 2003 #7166) describe probable tectonic deformati late Pleistocene or Holocene alluvium near projections of the fault in cutbanks of Pudding River, and observed 0-19 m of southeastward increasing offset of inferre Pleistocene (22–34 ka) Linn gravel across the fault in shallow seismic reflection profiles.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Pezzopane (1993 #3544) mapped the Mount Angel fault as active in t Quaternary (<1.6 Ma); subsequent compilations (Geomatrix Consultants Inc., 19 #3593; Madin and Mabey, 1996 #3575) inferred latest Pleistocene or Holocene (< 20 ka) displacement, based on historic seismicity and evidence of possible late Quaternary displacement of Unruh and others (1994 #3597). Madin and others (2 #5051) infer late Quaternary offset. Results of Wang and Madin (2001 #5063), W and others (2001 #5055; 2003 #7166), and Madin and others (2007 #7168) may a support a young age of movement.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* The vertical displacement rate on the Mount Angel fault remains poo constrained with estimates that vary widely (Yeats and others, 1996; Liberty and others., 1999; Wang and others., 2003; Madin and others, 2007); see figure 2 in W and others (2009 #) for compilation of published deformation rates. The poor geomorphic expression of this fault is consistent with generally low rate of deformation.
Date and Compiler(s)	2014 Stephen F. Personius, U.S. Geological Survey David J. Lidke, U.S. Geological Survey Kathleen M. Haller, U.S. Geological Survey
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