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.

Oatfield fault (Class A) No. 875

Last Review Date: 2002-05-24

citation for this record: **Personius, S.F., compiler, 2002, Fault number 875, Oatfield fault, 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 03:14 PM.**

Synopsis	The northwest-striking Oatfield fault forms northeast-facing escarpments in volca rocks of the Miocene Columbia River Basalt Group in the Tualatin Mountains an northern Willamette Valley. The fault may be part of the Portland Hills-Clackama River structural zone. The Oatfield fault is primarily mapped as a very high-angle reverse fault with apparent down-to-the-southwest displacement, but a few kilom long reach of the fault with down-to-the-northeast displacement is mapped in the vicinity of the Willamette River. This apparent change in displacement direction a strike may reflect a discontinuity in the fault trace, or could reflect the right-latera strike-slip displacement that characterizes other parts of the Portland Hills-Clacka River structural zone. The fault has also been modeled as a 70° east-dipping reve fault. Reverse displacement with a right-lateral strike-slip component is consisten the tectonic setting, mapped geologic relations, and microseismicity in the area. N fault scarps on surficial deposits have been described, but exposures in a light-rai tunnel showing offset of ~1 Ma Boring Lava across the fault indicate Quaternary displacement.
Name	The Oatfield fault was first mapped in part by Hammond and others (1974 #4050)

comments	Schlicker and Finlayson (1979 #4166), and was mapped in detail and presumably named after nearby Oatfield Hill by Beeson and others (1989 #4047; 1991 #4048) Madin (1990 #4067). The fault may be part of the Portland Hills-Clackamas River structural zone of Beeson and others (1985 #4022; 1989 #4023), and is included i Portland Hills fault zone of Blakely and others (1995 #4021). **Fault ID:** The fault is part of fault number 3 of Pezzopane (1993 #3544).
County(s) and State(s)	MULTNOMAH COUNTY, OREGON CLACKAMAS COUNTY, OREGON WASHINGTON COUNTY, OREGON
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:24,000 and 1:50,000 scale. *Comments:* Location of fault from ORActiveFaults (http://www.oregongeology.org/arcgis/rest/services/Public/ORActiveFaults/MapS downloaded 06/02/2016) attributed to Madin (2004 #7877, 2006 #7775, 2009 #7 and Madin and others (2008 #7781).
Geologic setting	The northwest-striking Oatfield fault in places forms linear magnetic anomalies a southwest-facing escarpments in volcanic rocks of the Miocene Columbia River B Group in the Tualatin Mountains and northern Willamette Valley (Beeson and oth 1989 #4047; Madin, 1990 #4067; Beeson and others, 1991 #4048; Blakely and ot 1995 #4021; Burns and others, 1997 #4079; Blakely and others, 2000 #4333). Th fault may be part of the Portland Hills-Clackamas River structural zone of Beeson others (1989 #4023).
Length (km)	29 km.
Average strike	N41°W
Sense of movement	Reverse, Right lateral *Comments:* Schlicker and Finlayson (1979 #4166) show the Oatfield fault as a do southwest normal fault. More recently, the fault is mapped as a high-angle reverse with a down-to-the-southwest displacement direction (Beeson and others, 1989 #4 Madin, 1990 #4067; Beeson and others, 1991 #4048) but these authors also show kilometer long reach of the fault with down-to-the-northeast displacement in the vicinity of the Willamette River. This apparent change in displacement direction a strike may reflect a discontinuity in the fault trace, or could reflect the right-latera strike-slip displacement that characterizes other parts of the Portland Hills-Clacka River structural zone of Beeson and others (1989 #4023). Blakely and others (199

	#4021) used microseismicity data from Yelin (1992 #4017) to infer reverse and st slip displacement on the Oatfield fault, and also use aeromagnetic data to infer a northeast-dipping thrust geometry for the fault. Exposures of several strands of th Oatfield fault in a light-rail tunnel showed faults with both vertical dextral and ea dipping thrust orientations (R.E. Wells, pers. commun., 2000, Blakely and others, #3993). The Oatfield fault is modeled as a 70° east-dipping reverse fault in the earthquake hazards analysis of Wong and others (1999 #4073; 2000 #5137). Reve displacement with a right-lateral strike-slip component is consistent with the tecto setting, mapped geologic relations, and microseismicity in the area (Beeson and c 1989 #4047; Yelin and Patton, 1991 #4020; Blakely and others, 1995 #4021; Blal and others, 2000 #4333).
Dip Direction	NE *Comments:* Blakely and others (1995 #4021) use aeromagnetic data to infer an ea dipping thrust geometry for the fault. Exposures in a light-rail tunnel showed faul with both vertical and east-dipping thrust orientations (R.E. Wells, pers. commun 2000, Blakely and others, 1997 #3993). Wong and others (1999 #4073; 2000 #51 modeled the Oatfield fault as a 70° east-dipping reverse fault in their earthquake hazards analysis of the Portland metropolitan area. The linear fault trace mapped Schlicker and Finlayson (1979 #4166), Beeson and others (1989 #4047; 1991 #4(and Madin (1990 #4067), is more consistent with a steep dip. Dip direction from Beeson and others, (1989 #4047), Wong and others (1999 #4073; 2000 #5137) an Blakely and others (1995 #4021).
Paleoseismology studies	
Geomorphic expression	The Oatfield fault in places forms escarpments in Miocene Columbia River Basal Group volcanic rocks, but no other geomorphic data have been described.
Age of faulted surficial deposits	The Oatfield fault offsets Miocene Columbia River Basalt Group volcanic rocks, (Schlicker and Finlayson, 1979 #4166; Beeson and others, 1989 #4047; Madin, 1 #4067; Beeson and others, 1991 #4048). No fault scarps on surficial Quaternary deposits have been described along the fault trace. However, the mapping and cro sections of Beeson and others (1989 #4047) are somewhat contradictory: their ma shows the Oatfield fault as concealed beneath undifferentiated Pliocene to Holoce sediments and late Pleistocene flood deposits, but their cross sections show the concealed fault cutting these sediments to the surface. This discrepancy reflects drafting errors in the construction of the cross sections (I.P. Madin, pers. commun 2000). Exposures in a light-rail tunnel showed offset of 1-Ma Boring Lava (R.E. pers. commun., 2000, Blakely and others, 1997 #3993). Popowski (1996 #4677) postulated that the Oatfield fault acted as a conduit for emplacement of the Borin Lava, and that the fault offsets Miocene to Pliocene or early Pleistocene sediment

Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* Pezzopane (1993 #3544) mapped the southern part of the Oatfield fau active in the Quaternary (<1.6 Ma); Geomatrix Consultants, Inc. (1995 #3593), a Madin and Mabey (1996 #3575) do not appear to include this fault in their compilations of Quaternary faults. Unruh and others (1994 #3597) mapped part o fault as Tertiary. Wong and others (1999 #4073; 2000 #5137) mapped the Oatfiel as a potentially seismogenic fault. Given the limited evidence for Quaternary displacement, the Oatfield fault is mapped as Quaternary (<1.6 Ma) herein.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Cross sections from Beeson and others (1989 #4047) suggest about 1 of down-to-the-east separation of Miocene Columbia River Basalt Group volcani rocks across the Oatfield fault; such data indicate low rates of long-term slip. Exposures in a light-rail tunnel showed offset of at least 100 m of 1 Ma Boring L which yields a low long-term vertical displacement rate (R.E. Wells, pers. commu 2000, Blakely and others, 1997 #3993). Wong and others (1999 #4073; 2000 #51 used estimated slip rates of 0.05–0.4 mm/yr in their analyses of the earthquake ha associated with the Oatfield fault, but did not document the basis for these estima given the limited evidence of Quaternary displacement, the lower rates are herein considered more likely.
Date and Compiler(s)	2002 Stephen F. Personius, U.S. Geological Survey
References	#4022 Beeson, M.H., Fecht, K.R., Reidel, S.P., and Tolan, T.L., 1985, Regional correlations within the Frenchman Springs member of the Columbia River Basalt Group—New insights into the middle Miocene tectonics of northwestern Oregon Oregon Geology, v. 47, no. 8, p. 87-96. #4023 Beeson, M.H., Tolan, T.L., and Anderson, J.L., 1989, The Columbia River Basalt Group in western Oregon-Geologic structures and other factors that contro flow emplacement patterns, *in* Reidel, S.P., and Hooper, P.R., eds., Volcanism and tectonism in the Columbia River Flood-Basalt Province: Geological Society of America Special Paper 239, p. 223-246. #4047 Beeson, M.H., Tolan, T.L., and Madin, I.P., 1989, Geologic map of the Lal Oswego quadrangle, Clackamas, Multnomah, and Washington Counties, Oregon: of Oregon Geological Map Series GMS-59, 1 sheet, scale 1:24,000.

#4048 Beeson, M.H., Tolan, T.L., and Madin, I.P., 1991, Geologic map of the Por quadrangle, Multnomah and Washington Counties, Oregon, and Clark County, Washington: State of Oregon Geological Map Series GMS-75, 1 sheet, scale 1:24

#3993 Blakely, R.J., Cruikshank, K., Johnson, A., Beeson, M., Walsh, K., and We R.E., 1997, A gravity study through the Tualatin Mountains, Oregon—Understan crustal structure and earthquake hazards in the Portland urban area: Geological So of America Abstracts with Programs, v. 29, no. 5, p. 5.

#4333 Blakely, R.J., Wells, R.E., Tolan, T.L., Beeson, M.H., Trehu, A.M., and Lil L.M., 2000, New aeromagnetic data reveal large strike-slip (?) faults in the northe Willamette Valley, Oregon: Geological Society of America Bulletin, v. 112, p. 12 1233.

#4021 Blakely, R.J., Wells, R.E., Yelin, T.S., Madin, I.P., and Beeson, M.H., 199 Tectonic setting of the Portland-Vancouver area, Oregon and Washington—Const from low-altitude aeromagnetic data: Geological Society of America Bulletin, v. no. 9, p. 1051-1062.

#4079 Burns, S., Lawrence, G., Brett, B., Yeats, R.S., and Popowski, T.A., 1997, showing faults, bedrock geology, and sediment thickness of the western half of th Oregon City 1:100,000 quadrangle, Washington, Multnomah, Clackamas, and Ma Counties, Oregon: State of Oregon, Department of Geology and Mineral Industri Interpretive Map Series IMS-4, 1 sheet, scale 1:100,000.

#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.

#4050 Hammond, P.E., Benson, G.T., Cash, D.J., Palmer, L.A., Donovan, J., and Gannon, B., 1974, A preliminary geological investigation of the ground effects of earthquakes in the Portland metropolitan area, Oregon: Technical report to State o Oregon, Department of Geology and Mineral Industries, Portland, Oregon, under Contract 14-08-0001-13458, 40 p., 3 pls.

#4067 Madin, I.P., 1990, Earthquake-hazard geology maps of the Portland metropolitan area, Oregon—Text and map explanation: State of Oregon, Departm of Geology and Mineral Industries Open-File Report 0-90-2, 21 p., 8 pls., scale 1:24,000.

#7779 Madin, I.P., 2004, Geologic mapping and database for Portland area fault studies: Final technical report: Oregon Department of Geology and Mineral Indus Open-File Report O-04-02, 18 p., 2 plates.

#7877 Madin, I.P., 2004, Preliminary digital geologic compilation map of the Gre
Portland Urban Area, Oregon: Oregon Department of Geology and Mineral Indus
Open-File Report OFR O-04-02.

#7780 Madin, I.P., 2009, Geologic map of the Oregon City 7.5', Clackamas Cour
Oregon: Oregon Department of Geology and Mineral Industries Geologic Map S
GMS-119, 46 p., scale 1:24,000.

#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.

#7781 Madin, I.P., Ma, L., and Niewendorp, C.A., 2008, Preliminary geologic ma
the Linnton 7.5' quadrangle, Multnomah and Washington counties, Oregon: Oreg
Department of Geology and Mineral Industries Open-File Report O-08-06, 35 p.,
plate, scale 1:24,000.

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

#4677 Popowski, T.A., 1996, Geology, structure, and tectonic history of the Tuala
Basin, northwestern Oregon: Corvallis, Oregon State University, M.S. Thesis, 12

#4166 Schlicker, H.G., and Finlayson, C.T., 1979, Geology and geologic hazards
northwestern Clackamas County, Oregon: State of Oregon, Department of Geolog
and Mineral Industries Bulletin 99, 79 p., 10 pls., scale 1:24,000.

#3597 Unruh, J.R., Wong, I.G., Bott, J.D.J., Silva, W.J., and Lettis, W.R., 1994,
Seismotectonic evaluation, Scoggins Dam, Tualatin Project, northwestern Oregon
Final Report prepared for U.S. Department of the Interior, Bureau of Reclamation
p., 4 pls., scale 1:500,000.

#4073 Wong, I., Silva, W., Bott, J., Wright, D., Thomas, P., Gregor, N., Li, S., Ma
M., Sojourner, A., and Wang, Y., 1999, Earthquake scenario and probabilistic gro
shaking maps for the Portland, Oregon metropolitan area: Technical report to U.S
Geological Survey, under Contract 1434-HQ-96-GR-02727, 16 p., 12 pls.

#5137 Wong, I., Silva, W., Bott, J., Wright, D., Thomas, P., Gregor, N., Li, S., Ma
M., Sojourner, A., and Wang, Y., 2000, Earthquake scenario and probabilistic gro
shaking maps for the Portland, Oregon, metropolitan area: State of Oregon,
Department of Geology and Mineral Industries Interpretive Map Series IMS-16,
pamphlet, scale 1:62,500.

	#4017 Yelin, T.S., 1992, An earthquake swarm in the North Portland (Oregon) hi More speculations on the seismotectonics of the Portland Basin: Geological Soci America Abstracts with Programs, v. 24, no. 5, p. 92. #4020 Yelin, T.S., and Patton, H.J., 1991, Seismotectonics of the Portland, Orego region: Bulletin of the Seismological Society of America, v. 81, no. 1, p. 109-130