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Quaternary Fault and Fold Database of the United States

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Canby-Molalla fault (Class A) No. 716

Last Review Date: 2002-12-10

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Synopsis	The mapped trace of the north-northwest-striking Canby-Molalla fault is based on a linear series of northeast-trending discontinuous aeromagnetic anomalies that probably represent significant offset of Eocene basement and volcanic rocks of the Miocene Columbia River Basalt beneath Neogene sediments that fill the northern Willamette River basin. The fault has little geomorphic expression across the gently sloping floor of the Willamette Valley, but a small, laterally restricted berm associated with the fault may suggest young deformation. Deformation of probable Missoula flood deposits in a high-resolution seismic reflection survey conducted across the aeromagnetic anomaly east of Canby suggests possible Holocene deformation. Sense of displacement of the Canby-Molalla fault is poorly known, but the fault shows apparent right-lateral separation of several transverse magnetic anomalies, and down-west vertical displacement is also apparent in water well logs.

Name comments	The Canby-Molalla fault was originally named (and misspelled) the "Mollala-Canby lineament", and identified on the basis of a series of discontinuous aeromagnetic anomalies that extend from the vicinity of Tigard south through the towns of Canby and Molalla in northern Oregon (Blakely and others, 1995 #4021). Wong and others (1999 #4073; 2000 #5137) elevated this group of anomalies to the Mollala-Canby or Molalla-Canby fault. Blakely and others (2000 #4333) renamed the structure the Canby-Molalla lineament or fault; this name is used in the most current literature (Blakely and others, 2001 #5044; Blakely and others, 2002 #5147) so is retained herein.
County(s) and State(s)	CLACKAMAS COUNTY, OREGON WASHINGTON COUNTY, OREGON
Physiographic province(s)	PACIFIC BORDER CASCADE-SIERRA MOUNTAINS
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* The fault trace is from 1:100,000-scale compilation of Burns and others (1997 #4079) and 1:62,500-scale compilations of Wong and others (1999 #4073; 2000 #5137); trace is based on 1:100,000-scale aeromagnetic data (Snyder and others, 1993 #4000) interpreted by Blakely and others (1995 #4021; 2000 #4333).
Geologic setting	The mapped trace of the north-northwest-striking Canby-Molalla fault is based on a linear series of northeast-trending discontinuous aeromagnetic anomalies (Snyder and others, 1993 #4000) that probably represent significant offset of Eocene basement and volcanic rocks of the Miocene Columbia River Basalt Group (Blakely and others, 2000 #4333) beneath the Neogene sediments that fill the northern Willamette River basin.
Length (km)	50 km.
Average strike	N34°W
Sense of movement	Right lateral, Reverse *Comments:* The actual sense of displacement of the Canby-Molalla fault is poorly known. The fault shows apparent right-lateral separation of several transverse magnetic anomalies, and

	down-west vertical displacement is also apparent in water well logs (Blakely and others, 2000 #4333; 2001 #5044; 2002 #5147). Given the compressional setting of other faults in the area and lack of significant topographic expression (Blakely and others, 1995 #4021; 2000 #4333), the fault probably is a right-lateral strike-slip fault with lesser amounts of reverse (?) displacement (Blakely and others, 2000 #4333; 2001 #5044; 2002 #5147).
Dip Direction	Unknown
Paleoseismology studies	
Geomorphic expression	The Canby-Molalla fault has little geomorphic expression across the gently sloping floor of the northern Willamette Valley. The fault is not marked by escarpments or higher topography except at its north end where it may project to faults mapped in Columbia River Basalt Group rocks. Blakely and others (2001 #5044; 2002 #5147) describe a small, laterally restricted berm associated with the fault that may suggest young deformation.
Age of faulted surficial deposits	The fault is not shown on most existing geologic maps (Piper, 1942 #4064; Warren and others, 1945 #4076; Hart and Newcomb, 1965 #4063; Schlicker and others, 1967 #4068; Hampton, 1972 #4065; Schlicker and Finlayson, 1979 #4166; Beeson and others, 1989 #4047; Walker and MacLeod, 1991 #3646; Yeats and others, 1996 #4291; Gannett and Caldwell, 1998 #4066), so the age of faulted deposits is poorly known. Blakely and others (2002 #5147) noted deformation of probable Missoula flood deposits in a high-resolution seismic reflection survey conducted across the aeromagnetic anomaly east of Canby.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Blakely and others (2002 #5147) noted deformation of probable Missoula flood deposits in a high-resolution seismic reflection survey conducted across the aeromagnetic anomaly east of Canby, and used this deformation to infer possible Holocene displacement. Pezzopane (1993 #3544), Unruh and others (1994 #3597), Geomatrix Consultants (1995 #3593), and Madin and Mabey (1996 #3575) do not include this fault in their compilations of Quaternary faults in the region. Wong and others (1999 #4073; 2000 #5137) include the Canby-Molalla fault as

	potential seismogenic fault in their analysis of earthquake hazards in the Portland area, and Madin and others (2001 #5051) infer late Quaternary offset on the Canby fault.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Blakely and others (2000 #4333; 2001 #5044; 2002 #5147) infer as much as 4 km of right-lateral separation of aeromagnetic anomalies in the underlying Eocene bedrock, and used water well data to infer a minimum of 150 m of vertical offset of Miocene Columbia River Basalt Group volcanic rocks across the fault. The poor geomorphic expression suggests low rates of slip in the late Quaternary.
Date and Compiler(s)	2002 Stephen F. Personius, U.S. Geological Survey
References	#4047 Beeson, M.H., Tolan, T.L., and Madin, I.P., 1989, Geologic map of the Lake Oswego quadrangle, Clackamas, Multnomah, and Washington Counties, Oregon: State of Oregon Geological Map Series GMS-59, 1 sheet, scale 1:24,000. #5044 Blakely, R.J., Madin, I.P., Stephenson, W.J., and Popowski, T., 2001, The Canby-Molalla fault, Oregon: Eos, Transactions of the American Geophysical Union, Abstract S22D-01, v. 82, no. 47, supplement. #5147 Blakely, R.J., Stephenson, W.J., and Popowski, T., 2002, The Canby-Molalla fault, Oregon: Geological Society of America Abstracts with Programs, v. 34, no. 5, p. A-107. #4333 Blakely, R.J., Wells, R.E., Tolan, T.L., Beeson, M.H., Trehu, A.M., and Liberty, L.M., 2000, New aeromagnetic data reveal large strike-slip (?) faults in the northern Willamette Valley, Oregon: Geological Society of America Bulletin, v. 112, p. 1225-1233. #4021 Blakely, R.J., Wells, R.E., Yelin, T.S., Madin, I.P., and Beeson, M.H., 1995, Tectonic setting of the Portland-Vancouver area, Oregon and Washington—Constraints from low-altitude aeromagnetic data: Geological Society of America Bulletin, v. 107, no. 9, p. 1051-1062.

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

#4066 Gannett, M.W., and Caldwell, R.R., 1998, Geologic framework of the Willamette lowland aquifer system, Oregon and Washington: U.S. Geological Survey Professional Paper 1424-A, 32 p., 8 pls., 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.

#4065 Hampton, E.R., 1972, Geology and ground water of the Molalla-Salem Slope Area, northern Willamette Valley, Oregon: U.S. Geological Survey Water-Supply Paper 1997, 79 p., 3 pls., scale 1:48,000.

#4063 Hart, D.H., and Newcomb, R.C., 1965, Geology and ground water of the Tualatin Valley, Oregon: U.S. Geological Survey Water-Supply Paper 1697, 172 p., 3 pls., scale 1:48,000.

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

#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.

#5051 Madin, I.P., Wang, Z., and Graham, G.B., 2001, Finding Quaternary faults in the Willamette lowland—Are they dead or just hiding?: Seismological Research Letters, v. 72, no. 2, p. 254.

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

#4064 Piper, A.M., 1942, Ground-water resources of the Willamette Valley, Oregon: U.S. Geological Survey Water-Supply Paper 890, 194 p., 2 pls., scale 1:125,000.

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

#4068 Schlicker, H.G., Deacon, R.J., and Newhouse, C.J., 1967, Engineering geology of the Tualatin Valley Region, Oregon: State of Oregon, Department of Geology and Mineral Industries Bulletin 60, 103 p., 4 pls., scale 1:48,000.

#4000 Snyder, S.L., Felger, T.J., Blakely, R.J., and Wells, R.E., 1993, Aeromagnetic map of the Portland-Vancouver metropolitan area, Oregon and Washington: U.S. Geological Survey Open-File Report 93-211, 1 pl., scale 1:100,000.

#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, 206 p., 4 pls., scale 1:500,000.

#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.

#4076 Warren, W.C., Grivetti, R.M., and Norbisrath, H., 1945, Geology of northwestern Oregon, west of Willamette River and north of latitude 45 degrees 15': U.S. Geological Survey Oil and Gas Investigations Map OM-0042, 1 sheet, scale 1:145,728.

#4073 Wong, I., Silva, W., Bott, J., Wright, D., Thomas, P., Gregor, N., Li, S., Mabey, M., Sojourner, A., and Wang, Y., 1999, Earthquake scenario and probabilistic ground 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., Mabey, M., Sojourner, A., and Wang, Y., 2000,

	Earthquake scenario and probabilistic ground shaking maps for the Portland, Oregon, metropolitan area: State of Oregon, Department of Geology and Mineral Industries Interpretive Map Series IMS-16, 16 p. pamphlet, scale 1:62,500.