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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.

Salem-Eola Hills homocline (Class A) No. 719

Last Review Date: 2016-03-22

citation for this record: **Personius, S.F., compiler, 2002, Fault number 719, Salem-Eola Hills homocline, 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 02:03 PM.**

Synopsis	The northwest-striking Salem-Eola Hills homocline deforms Miocene rocks of the Columbia River Basalt Group along the Salem Hills and Eola Hills in the central Willamette Valley, at the southwestern margin of deposition of these rocks in this part of Oregon. In the late Miocene, the fold acted as a tectonic dam, causing the obstruction of the ancestral Willamette River and deposition of a thick sequence of basin-fill sediment in the southern Willamette Valley. Older undated gravels of probable Quaternary age that occupy a bedrock channel in the Salem water gap slope northward about 25 times steeper than the present channel of the Willamette River; this increase in slope probably reflects uplift or faulting in the Salem Hills and Eola Hills. A broad convexity in the modern channel profile of the Willamette River that is roughly coincident with the location of the Salem and Eola Hills may also be caused by deformation on the Salem-Eola Hills homocline, but the channel convexity could also be

	caused by differential channel incision due to varying channel lithology and be unrelated to ongoing tectonism.
Name comments	The Salem-Eola Hills homocline was originally mapped as two folds, the Eola Hills homocline and the Bunker Hills homocline (Beeson and others, 1989 #4023); these folds were combined and renamed the Salem-Eola Hills homocline after its location near the Salem Hills and Eola Hills in the northern Willamette Valley (Yeats and others, 1993 #5057; Crenna and Yeats, 1994 #4129).
County(s) and State(s)	MARION COUNTY, OREGON POLK COUNTY, OREGON
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Poor Compiled at 1:500,000 scale. *Comments:* The fold traces are from a 1:500,000-scale figure of Crenna and others (1994 #4129).
Geologic setting	The northwest-striking Salem-Eola Hills homocline deforms Miocene rocks of the Columbia River Basalt Group along the Salem Hills and Eola Hills in the central Willamette Valley (Beeson and others, 1989 #4023; Yeats and others, 1993 #5057; Crenna and Yeats, 1994 #4129), and is located at the southwestern margin of deposition of Columbia River Basalt Group rocks in this part of Oregon. In the late Miocene, the fold acted as a tectonic dam, causing the obstruction of the ancestral Willamette River and deposition of a thick sequence of basin-fill sediment in the southern Willamette Valley (Yeats and others, 1993 #5057; Crenna and Yeats, 1994 #4129). The fold is not shown on most geologic maps of the region (Walker and Duncan, 1989 #3581; Walker and MacLeod, 1991 #3646; Yeats and others, 1996 #4291; Gannett and Caldwell, 1998 #4066). The fold appears to be significantly offset across the Mill Creek fault (Yeats and others, 1993 #5057; Crenna and Yeats, 1994 #4129).
Length (km)	32 km.
Average strike	N26°W
Sense of movement	Homocline *Comments:* The Salem-Eola Hills homocline is mapped as a

	northeast-dipping homocline or monocline (Beeson and others, 1989 #4023; Yeats and others, 1993 #5057; Crenna and Yeats, 1994 #4129).
Dip	2–4.5° NE. *Comments:* Dip of Columbia River Basalt Group rocks is from Crenna and others (1994 #4129).
Paleoseismology studies	
Geomorphic expression	The Salem-Eola Hills homocline is coincident with the southwestern margins of the Salem Hills and the Eola Hills. Crenna and others (1994 #4129) describe older undated gravels of probable Quaternary age that occupy a bedrock channel in the Salem water gap that slopes northward about 25 times steeper than the present channel of the Willamette River. This increase in slope probably reflects uplift or faulting in the Salem Hills and Eola Hills (Crenna and Yeats, 1994 #4129). Yeats and others (1993 #5057) and Crenna and others (1994 #4129) also identified a broad convexity in the modern channel profile of the Willamette River that is roughly coincident with the location of the Salem and Eola Hills, and an increase in channel gradient of the river north of Salem. However, the channel convexity could simply be caused by differential channel incision due to varying channel lithology (Crenna and Yeats, 1994 #4129), and the increase in channel gradient is many kilometers downstream of the location of the fold trace.
Age of faulted surficial deposits	The Salem-Eola Hills homocline may deform older Quaternary (?) deposits along the Salem water gap and also may deform the modern channel of the Willamette River (Yeats and others, 1993 #5057; Crenna and Yeats, 1994 #4129).
Historic earthquake	
Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* No prior Quaternary fault compilation in the region includes this structure (Pezzopane, 1993 #3544; Unruh and others, 1994 #3597; Geomatrix Consultants Inc., 1995 #3593; Madin and Mabey, 1996 #3575; Wong and others, 1999 #4073; 2000 #5137). The older gravels that may be deformed by the fold

	are undated, but may be of Quaternary age (Yeats and others, 1993 #5057; Crenna and Yeats, 1994 #4129). The evidence of deformation of the modern channel of the Willamette River is equivocal, so the Salem-Eola Hills homocline is mapped herein as Quaternary (<1.6 Ma).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Crenna and others (1994 #4129) describe 320 m of uplift of Miocene Columbia River Basalt Group rocks across the Salem-Eola Hills homocline; these data suggest low rates of long-term slip.
Date and Compiler(s)	2002 Stephen F. Personius, U.S. Geological Survey
References	#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 controlled 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. #4129 Crenna, P.A., and Yeats, R.S., 1994, Late Cenozoic tectonics and paleogeography of the Salem metropolitan area, central Willamette Valley, Oregon: Oregon Geology, v. 56, no. 6, p. 129-136. #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. #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.

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

#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.

#3581 Walker, G.W., and Duncan, R.A., 1989, Geologic map of the Salem 1 by 2 quadrangle, western Oregon: U.S. Geological Survey Miscellaneous Investigations Map I-1893, 1 sheet, scale 1:250,000.

#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.

#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.

#4291 Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T.A., 1996, Tectonics of the Willamette Valley, Oregon, *in* Rogers, A.M., Walsh, T.J., Kockelman, W.J., and Priest, G.R., eds., Assessing earthquake hazards and reducing risk in the Pacific Northwest: U.S. Geological Survey Professional Paper 1560, v. 1, p. 183-222.

#5057 Yeats, R.S., Levi, S., and Crenna, P., 1993, Active faults and folds in the Salem metropolitan area, Oregon: Technical report to U.S. Geological Survey, Reston, Virginia, under Contract 14-08-0001-G2131, August 14, 1993, 22 p.