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Quaternary Fault and Fold Database of the United States

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Squaw Creek fault (Class A) No. 632

Last Review Date: 2003-06-12

Compiled in cooperation with the Idaho Geological Survey

citation for this record: **Personius, S.F., and Neier, R.S., compilers, 2003, Fault number 632, Squaw Creek 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 03:02 PM.**

Synopsis	The Squaw Creek fault is a north-striking, east-dipping normal fault that separates Ola and Sweet Valleys to the east from a west-tilted fault block underlying a linear ridge between Squaw Butte and Dodson Pass. The fault is part of the western Idaho fault belt. The Squaw Creek fault forms a prominent range front in Miocene Columbia River Basalts, and is marked by intermittent aligned drainages and divides, conspicuous vegetation lineaments, aligned springs, and fault scarps on alluvial deposits. One trench investigation revealed evidence for two Quaternary faulting events, the youngest of which may have occurred about the time of emplacement of the Mazama ash, about 6.7 ka.

Name comments	The presence of the Squaw Creek fault was originally hypothesized by Kirkham (1931 #5899) and later mapped and named the Squaw Butte fault by Anderson (1934 #595). The fault was later mapped and named the Squaw Creek fault by Capps (1941 #5895) and Newcomb (1970 #3761). Fitzgerald (1982 #5886) mapped the northern half of the fault as the Squaw Creek fault and the southern part as the Squaw Butte fault zone. We follow Gilbert and others (1983 #5887) and later reports in using the name Squaw Creek fault for the whole fault zone. **Fault ID:** This fault is fault number 222 in the fault compilation of Witkind (1975 #320).
County(s) and State(s)	WASHINGTON COUNTY, IDAHO GEM COUNTY, IDAHO
Physiographic province(s)	COLUMBIA PLATEAU
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Fault locations are from 1:250,000-scale mapping of Gilbert and others (1983 #5887) and Knudsen and others (1996 #5889).
Geologic setting	The Squaw Creek fault is a north-striking, east-dipping normal fault that separates Ola and Sweet Valleys to the east from a west-tilted fault block underlying a linear ridge between Squaw Butte and Dodson Pass. The fault is part of the western Idaho fault belt of Hamilton (1963 #6040), a system of north-striking normal faults formed along the western margin of the Idaho batholith. The Squaw Creek fault displaces Miocene Columbia River Basalts along most of its length (Newcomb, 1970 #3761; Fitzgerald, 1982 #5886).
Length (km)	47 km.
Average strike	N8°E
Sense of movement	Normal *Comments:* The Squaw Creek fault is mapped as a normal fault by Newcomb (1970 #3761), Fitzgerald (1982 #5886), Gilbert and others (1983 #5887), and Knudsen and others (1996 #5889).

Dip Direction	E *Comments:* No actual dip measurements have been published, but Knudsen and others (1996 #5889) modeled the Squaw Creek fault as a 60? east-dipping normal fault in their analysis of paleo-earthquake magnitudes.
Paleoseismology studies	A trench investigation was conducted along the central part of the Squaw Creek fault near Ola Valley. Site 632-1. The south wall of an 80-m-long trench across a 3.8-m-high fault scarp on Pleistocene fan deposits about 200 m south of Sucker Creek was excavated and logged by Gilbert and others (1983 #5887). The trench exposed a near-vertical fault zone in fan alluvium and scarp-derived colluvial deposits. Evidence for two faulting events is present in the trench, although the timing of these events is not known. The log of the south wall shows hanging wall alluvial sediments (units 1 and 2) overlain by probable scarp colluvial unit 3, which is in fault contact with alluvial sediments (unit 1) in the footwall. These deposits are overlain by alluvial or debris-flow deposit unit 4, which is unfaulted in the south wall, but is marked by steeply inclined zones of oxidation, but no slip planes, in the north wall. The only datable material exposed in the trench was a lens of impure volcanic ash in the upper part of unit 4, which Gilbert and others (1983 #5887) correlated with the 6.7 ka Mazama ash. Gilbert and others (1983 #5887) interpret the zones of oxidation in unit 4, the presence of a thin bed of sandy clay (unit 6) deposited adjacent to a dip in unit 4 at a position above the fault zone in the north wall, and the faulted contact between units 1 and 3 as evidence of a second faulting event. Knudsen and others (1994 #3594) also noted that the basal contact of unit 4 appears to be vertically offset about 0.8 m across the fault zone, although this observation may not be supportive of a second event because unit 4 was deposited across a fault scarp and thus its basal contact should not be a planer surface. Gilbert and others (1983 #5887) use the evidence exposed in the trench to interpret two faulting events, the first with about 1.5 m and the second with about 0.6-0.8 m of vertical displacement. They interpret the equivocal stratigraphic relations as evidence that the youngest event occurred at about the time of deposition of the Mazama ash (6.7 ka) or slightly younger.
Geomorphic expression	The Squaw Creek fault is mapped as several long sections with intervening gaps with little evidence of recent faulting (Gilbert

	and others, 1983 #5887; Knudsen and others, 1996 #5889). The southern part of the fault forms a prominent range front and much of the fault trace is marked by aligned drainages and divides and conspicuous vegetation lineaments. No fault scarps on Quaternary deposits have been described on this part of the fault. Near Ola Valley, the fault is marked by springs and several conspicuous vegetation lineaments associated with 0.5-km-long, 2- to 4-m-high, variably degraded east facing scarps on alluvial deposits. The total length of this zone of scarps and vegetation linears is about 9 km. North of Ola Valley to the vicinity of Dodson Pass, the fault is marked by the continued presence of a prominent west-tilted fault block, aligned springs, and conspicuous, short (0.5- to 2-km-long) vegetation lineaments.
Age of faulted surficial deposits	The Squaw Creek fault offsets Miocene Columbia River basalts along most of its length (Newcomb, 1970 #3761; Fitzgerald, 1982 #5886; Gilbert and others, 1983 #5887). Gilbert and others (1983 #5887) also mapped fault scarps on Pleistocene fan deposits along part of the fault.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Gilbert and others (1983 #5887) use the evidence exposed in the Sucker Creek trench to interpret two faulting events, with the youngest event occurring at about the time of deposition of the Mazama ash (6.7 ka) or slightly younger. The fault is mapped as a major Holocene (<10 ka) structure by Breckenridge and others (2003 #5878).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Gilbert and others (1983 #5887) used total vertical offsets of 900-1,200 m of Miocene Columbia River Basalt rocks to calculate a long-term slip rate of 0.05-0.12 mm/yr. Furthermore, they report an open-interval slip rate since the youngest event in the middle Holocene of 0.09-0.12 mm/yr. Knudsen and others (1994 #3594) used the 2.4 m of vertical displacement measured at the Sucker Creek site by Gilbert and others (1983 #5887) to calculate a minimum Quaternary rate of

	0.0015 mm/yr. However, neither 0.09-0.12 mm/yr or 0.0015 mm/yr should be regarded as a valid as both are based on the time since the most recent event. Wong and others (2000 #5219) assign a preferred slip rate of 0.1 mm/yr to the fault (based on anology) for use in probabilistic hazard assessment. They further infer a minimum slip rate of 0.015 mm/yr and a maximum of 0.3 mm/yr (both with 20% probability).
Date and Compiler(s)	2003 Stephen F. Personius, U.S. Geological Survey Ricky S. Neier, University of Idaho
References	#595 Anderson, A.L., 1934, A preliminary report on recent block faulting in Idaho: Northwest Science, v. 8, p. 17-28. #5878 Breckenridge, R.M., Lewis, R.S., Adema, G.W., and Weisz, D.W., 2003, Miocene and younger faults in Idaho: Idaho Geological Survey Map 8, 1 sheet, scale 1:1,000,000. #5895 Capps, S.R., 1941, Faulting in western Idaho and its relation to the high placer deposits: Idaho Bureau of Mines and Geology Pamphlet 56, 20 p., 1 pl., scale 1:500,000. #5886 Fitzgerald, J.E., 1982, Geology and basalt stratigraphy of the Weiser Embayment, west-central Idaho, *in* Bonnichsen, B., and Breckenridge, R.M., eds., Cenozoic geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 103-128. #5887 Gilbert, J.D., Piety, L., and LaForge, R., 1983, Seismotectonic study for Black Canyon Dam, Boise project, Idaho: U.S. Bureau of Reclamation Seismotectonic Report 83-7, 73 p., 8 pl. #6040 Hamilton, W., 1963, Metamorphism in the Riggins region, western Idaho: U.S. Geological Survey Professional Paper 436, 95 p. #5899 Kirkham, V.R.D., 1931, Igneous geology of southwestern Idaho: Journal of Geology, v. 39, no. 6, p. 564-591. #3594 Knudsen, K.L., Wong, I.G., Bott, J.D.J., Weber, G.E., Silva, W.J., and Lettis, W.R., 1994, Seismotectonic evaluation, Agency Valley and Bully Creek Dams, Vale Project, east-central Oregon: Draft Report prepared for U.S. Department of the Interior, Bureau of Reclamation, 171 p., 4 pls.

	#5889 Knudsen, K.L., Wong, I., Sawyer, T.L., Bott, J., Silva, W., and Lettis, W.R., 1996, Seismotectonic evaluation, Cascade Dam, Boise project, west-central Idaho: Final Report prepared for U.S. Department of the Interior, Bureau of Reclamation, 198 p., 3 pls. #3761 Newcomb, R.C., 1970, Tectonic structure of the main part of the basalt of the Columbia River Group Washington, Oregon, and Idaho: U.S. Geological Survey Miscellaneous Geologic Investigations I-587, 1 sheet, scale 1:500,000. #320 Witkind, I.J., 1975, Preliminary map showing known and suspected active faults in Idaho: U.S. Geological Survey Open-File Report 75-278, 71 p. pamphlet, 1 sheet, scale 1:500,000. #5219 Wong, I., Dober, M., and Hemphill-Hailey, M., 2000, Preliminary probabilistic seismic hazard analyses—Owyhee and Mann Creek Dams, Idaho: Technical report to U.S. Department of the Interior, Bureau of Reclamation, Denver, Colorado.