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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.

Cedar Mountain fault system, Stephens Pass section (Class A) No. 2d

Last Review Date: 2000-04-06

Compiled in cooperation with the California Geological Survey

citation for this record: **Bryant, W.A., compiler, 2000, Fault number 2d, Cedar Mountain fault system, Stephens Pass section, 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 02:23 PM.**

Synopsis	**General:** Complex, 44-km-long fault system consisting of north-striking normal faults that offset latest Pleistocene and Holocene volcanic rocks, glacial, and alluvial deposits (Williams, 1949 #4894; Wood, 1960 #4896; Bryant, 1990 #4889). The Cedar Mountain fault system is comprised of the Cedar Mountain, Mahogany Mountain, Mt. Hebron, Meiss Lake, and Ikes Mountain faults. Detailed reconnaissance level mapping by Wood (1960 #4896) and Bryant (1990 #4889) is at 1:62,500 scale. There are no detailed studies for any of these faults. Bryant (1990 #4889) estimated a late Pleistocene slip rate of 0.2 mm/yr for a

	strand of the East Cedar Mountain fault, based on offset late Tioga equivalent outwash deposits. Historic surface fault rupture was associated with the 08/01/1978 Stephens Pass earthquake (Bennett and others, 1979 #3326). **Sections:** This fault has 4 sections. It is proposed in this fault compilation that the Cedar Mountain, Mahogany Mountain, Mt. Hebron fault zones, and Ikes Mountain and Stephens Pass faults be collectively referred to as the Cedar Mountain fault system. Individual sections include the Mahogany Mountain section [2a], Cedar Mountain section [2b], Ikes Mtn.-Mt. Hebron section [2c], and the Stephens Pass section [2d].
Name comments	**General:** Cedar Mountain fault system is a complex group of generally north- to north-northwest-striking normal faults along the boundary between the Cascade Ranges and the Modoc Plateau. First mapped, but not named, by Williams (1949 #4894) and Wood (1960 #4896). Bryant (1990 #4889) first proposed the names Cedar Mountain fault zone, West Cedar Mountain fault, East Cedar Mountain fault, Meiss Lake fault, Mahogany Mountain fault zone, and Mt. Hebron fault zone for structures within this fault system. The Stephens Pass fault was unmapped prior to the ML 4.6 Stephens Pass earthquake of 08/01/1978. This fault system should not be confused with the faults [1324] that were activated in western Nevada during the 12/21/1932 Cedar Mountain earthquake. **Section:** Stephens Pass section principally is delineated by surface fault rupture associated with 08/01/1978 Stephens Pass earthquake (Bennett and others, 1979 #3326). Section extends from about 9.5 km south of Tennant to about 1 km south of the 1978 rupture. Stephens Pass fault was first named by Bennett and others (1979 #3326). **Fault ID:** Refers to Jennings (1994 #2878) fault numbers 1 (Mahogany Mountain fault zone), 2 (Ikes Mountain fault and unnamed faults in Butte Valley), 2A (Meiss Lake fault), 3 (Mt. Hebron fault zone), and 4 (Cedar Mountain fault zone), 11 (Cedar Mountain fault zone, southern part), and 22 (Stephens Pass fault), and fault number NE04 (Cedar Mtn. fault) of Working Group on Northern California Earthquake Potential (1996 #1216).
County(s) and State(s)	SISKIYOU COUNTY, CALIFORNIA
Physiographic	

Physiographic province(s)	CASCADE-SIERRA MOUNTAINS
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Based on digital revisions to Jennings (1994 #2878) using original mapping by Bryant (1990 #4889) at 1:62,500 scale.
Geologic setting	Complex system of generally north-striking normal faults that extends from the Oregon border south to the Stephens Pass area in northeastern California. The northern end of the Cedar Mountain fault system may extend into Oregon as the Sky Lakes fault zone [844]. The southern extent of the fault system is poorly understood and not mapped in detail. The fault zone is the result of east-west extension and is located along the boundary between the Cascade Ranges and the Modoc Plateau. The fault zone bounds Butte Valley, a structurally controlled closed drainage basin. Cumulative vertical displacement is not known, but scarps on late Tertiary bedrock suggest a minimum cumulative Quaternary vertical displacement of 500 m along the Mahogany Mountain fault. Scarp heights on Cedar Mountain, a Pliocene-Pleistocene volcanic cone, suggest a minimum cumulative Pleistocene displacement of 60 m.
Length (km)	This section is 7 km of a total fault length of 69 km.
Average strike	N23°E (for section) versus N16°W (for whole fault)
Sense of movement	Normal *Comments:* Low (1.5-2 m) east-facing scarps and focal mechanisms from 08/01/1978 Stephens Pass earthquake indicate east-dipping normal fault (Bennett, 1979 #3326; Bryant, 1990 #4889).
Dip	35°-45° E *Comments:* Based on focal mechanism of 08/01/1978 Stephens Pass earthquake (Bennett and others, 1979 #3326). Direction based on east-facing scarps (Bryant, 1990 #4889) and east-dipping focal mechanism derived from 08/01/1978 Stephens Pass earthquake (Bennett and others, 1979 #3326).
Paleoseismology	

studies	
Geomorphic expression	A relatively short, north-striking normal fault delineated by moderately to well-defined geomorphic features including scarps on late Quaternary basalt, graben, and open fissures in basaltic bedrock (Bryant, 1990 #4889).
Age of faulted surficial deposits	Modern alluvium and colluvium are offset by historically active traces of Stephens Pass fault during Stephens Pass earthquake (Bennett and others, 1979 #3326). K-Ar age determinations that range from 0.03 Ma to 1.23 Ma on High Cascades basalt west of Stephens Pass fault indicate Quaternary age for faulted basalt (Wagner and Saucedo, 1987 #4893).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* The timing of the most recent paleoevent is unknown. Subtle troughs and graben associated with an east-facing scarp on Quaternary basalt are suggestive of prior latest Pleistocene to Holocene normal displacement.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Scarp heights on basalt of Quaternary age are 1.5 m to 2 m. This suggests that vertical slip rate is less than 0.2 mm/yr.
Date and Compiler(s)	2000 William A. Bryant, California Geological Survey
References	#3326 Bennett, J.H., Sherburne, R.W., Cramer, C.H., Chesterman, C.W., and Chapman, R.H., 1979, Stephens Pass earthquakes, Mount Shasta-August 1978: California Geology, v. 32, p. 27-34. #4889 Bryant, W.A., 1990, Stephens Pass fault and faults in the Butte Valley area, Siskiyou County: California Division of Mines and Geology Fault Evaluation Report FER-210. #2878 Jennings, C.W., 1994, Fault activity map of California and adjacent areas, with locations of recent volcanic eruptions: California Division of Mines and Geology Geologic Data Map 6, 92 p., 2 pls., scale 1:750,000.

#4860 Petersen, M.D., Bryant, W.A., Cramer, C.H., Cao, T., Reichle, M.S., Frankel, A.D., Lienkaemper, J.J., McCrory, P.A., and Schwartz, D.P., 1996, Probabilistic seismic hazard assessment for the State of California: California Department of Conservation, Division of Mines and Geology Open-File Report 96-08 (also U.S. Geological Open-File Report 96-706), 33 p.

#4893 Wagner, D.L., and Saucedo, G.J., 1987, Geologic map of the Weed quadrangle: Department of Conservation, Division of Mines and Geology Regional Geologic Map Series 4A, scale 1:250,000.

#4894 Williams, H., 1949, Geology of the Macdoel quadrangle: California Division of Mines and Geology Bulletin 151, 60 p., scale 1:125,000.

#4896 Wood, P.R., 1960, Geology and ground-water features of the Butte Valley region, Siskiyou County, California: U.S. Geological Survey Water-Supply Paper 1491, 150 p.

#1216 Working Group on Northern California Earthquake Potential (WGNCEP), 1996, Database of potential sources for earthquakes larger than magnitude 6 in northern California: U.S. Geological Survey Open-File Report 96-705, 40 p.