Jump to Navigation

Quaternary Fault and Fold Database of the United States

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unnamed fault along Barnes Creek (Class B) No. 557

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Synopsis	The unnamed fault along Barnes Creek occurs along the northern flank of the Olympic Mountains in deformed Tertiary rocks that are peripheral to more complexly deformed rocks of the Olympic subduction zone that forms the core of this mountain range. Based on geologic maps and on discussions of this fault and other structures of the Olympic Mountains, it appears that this fault may have an ancestry that dates back to Paleogene subduction in this region. Tabor (1975 #6220) illustrated and described aligned facets in Tertiary bedrock along the fault, which occur on the north side of the valley of Barnes Creek directly east of Lake Crescent. He suggested that these features probably indicated recent faulting. He noted, however, that the evidence and this interpretation are equivocal. No other evidence for Quaternary activity along this fault has been reported and based on the lack of unequivocal evidence for Quaternary activity along the fault, it is

	classified herein as a Class B structure until more detailed studies are conducted
Name comments	This unnamed fault along Barnes Creek is a down-to-the-south, west-northwest striking fault that occurs along the northern flank of the Olympic Mountains, in the north-central part of the Olympic Peninsula, about 25 km west-southwest of Port Angeles. Early geologic maps of this region by Brown and others (1960 #6213) and Brown (1970 #6212) do not show this fault. The fault is shown on a 1:125,000-scale geologic map by Tabor and Cady (1978 #6221) and on a later 1:250,000-scale geologic map by Dragovich and others (2002 #5715). The fault is not shown on the 1:2,000,000-scale map of known or suspected Quaternary faults in the Pacific Northwest by Rogers and others (1996 #4191). Tabor (1975 #6220) briefly discussed this fault, but did not refer to it by a name. No other discussions of the fault are known, and the fault is herein referred to as the "unnamed fault along Barnes Creek," based on its occurrence along the north side of that creek. As mapped by Tabor and Cady (1978 #6221), the fault extends east-southeast from the mouth of Barnes Creek at the west shore of Lake Crescent to the valley of the Elwha River, a distance of about 15 km. Dragovich and others (2002 #5715) extend the fault about another 14 km east of the Elwha River to the southeast flank of Mount Angeles; and, they map the fault as inferred beneath Lake Crescent and glacial deposits, which extends the fault about another 22 km west of Lake Crescent.
County(s) and State(s)	CLALLAM COUNTY, WASHINGTON
Physiographic province(s)	PACIFIC BORDER
Reliability of location	Good Compiled at 1:250,000 scale. *Comments:* Fault trace is from the 1:250,000-scale geologic map compilation by Dragovich and others (2002 #5715); the trace was transferred directly onto a registered mylar overlay and digitized at 1:250,000 scale. Much of the inferred western part of the trace, as shown by Dragovich and others in the region west of Lake Crescent, is not shown herein.
Geologic setting	This unnamed fault occurs along the northern flank of the Olympic Mountains near the physiographic boundary between the

	Olympic Mountains and the Straight of Juan de Fuca and Puget lowlands to the north and east, respectively. This boundary also marks the approximate limit of a region to the north and east that was occupied several times during the Pleistocene by the Puget lobe of continental ice sheets (e.g., Gower and others, 1985 #4725). The Olympic Mountains are comprised of complexly deformed Eocene and younger Tertiary rocks. Rocks in the core of the Olympic Mountains are part of the Olympic subduction complex that formed during Paleogene subduction of the Juan de Fuca plate to the west (Tabor and Cady, 1978 #6221; 1978 #6222; Dragovich and others, 2002 #5715). In map view, rock units of the Olympic Mountains now show a map pattern that suggests they define a large, east plunging anticline that is superimposed on earlier formed thrust faults and folds related to subduction. The origin of this anticlinal form and pattern of the deformed rock units and thrust faults and folds is not fully understood, but it may have resulted from Neogene isostatic rebound and doming of the structurally thickened subduction complex (Tabor and Cady, 1978 #6222). Regardless of the origin of the apparently younger anticlinal form, the result is an east-plunging antiformal core of underplated, more highly deformed deep-marine siliciclastic rocks that are bordered by an open-to-the-west, horseshoe-shaped fringe of basalt and marginal marine rocks. The fault along Barnes Creek occurs in the peripheral rocks of the horseshoe-shaped fringe of the Olympic Mountains and these peripheral rocks also include horseshoe-shaped thrust faults and are in contact with the core rocks along a prominent horseshoe-shaped thrust fault called the Hurricane Ridge fault. Dragovich and others (2002 #5715) show the fault along Barnes Creek as a north-dipping, down-to-the-south, thrust fault that appears to be part of the horseshoe-shaped system of deformed(?) thrust faults. Tabor (1975 #6220) discusses geomorphic expression of this fault along the north side of Barnes Creek, which may indicate Quaternary activation or reactivation of this fault.
Length (km)	40 km.
Average strike	N75°W
Sense of movement	Thrust *Comments:* Fault is shown as a north-dipping, down-to-the-south, thrust fault on the geologic map by Dragovich and others (2002 #5715). Tabor and Cady (1978 #6221) also show the fault as down-to-the south, but they do not specifically indicate or discuss

	its dip direction or sense of movement. In describing the structural geology of the Olympic Mountains, Tabor and Cady (1978 #6222) appear to suggest that the fault is a steeply north-dipping thrust fault, however, they do not specifically discuss this fault. Tabor (1975 #6220) illustrates and describes aligned, south-facing facets along the fault, and notes that if these features are tectonic facets, they indicate down-to-the-south movement that probably is late Quaternary in age.
Dip Direction	N *Comments:* Not reported. On the geologic map by Dragovich and others (2002 #5715), the fault is indicated to be a north-dipping thrust fault, which suggests that the fault probably dips moderately to steeply to the north.
Paleoseismology studies	
Geomorphic expression	Tabor (1975 #6220) illustrates and describes faceted spurs that are aligned in a common plane along the north side of Barnes Creek. He also notes that bedrock below the facets is broken and crushed; based on his illustration, the bedrock below the facets forms a topographic shoulder in which the modern channel of Barnes Creek is incised. Based partly on Indian folklore accounted in Reagan (1909 #6272), Tabor (1975 #6220) speculated that a late Pleistocene to Holocene landslide deposit, which now separates Lake Crescent from Lake Sutherland, may have been triggered by seismic activity associated with movement along this fault.
Age of faulted surficial deposits	Deformation of Quaternary deposits along this fault has not been reported, however, much of the fault occurs in Tertiary bedrock. Where the fault is mapped with certainty, along Barnes Creek and farther east, it is shown to cut late Paleocene to Eocene rocks (Tabor and Cady, 1978 #6221; Dragovich and others, 2002 #5715). The geologic map by Dragovich and others (2002 #5715) suggests that the fault continues farther to the west, where its inferred map trace suggests it is buried by late Pleistocene to Holcene glacial deposits.
Historic earthquake	
Most recent	undifferentiated Quaternary (<1.6 Ma)

prehistoric deformation	*Comments:* Tabor (1975 #6220) described and illustrated facets along the north side of Barnes Creek and suggested that these features may reflect recent faulting. He speculated that recent movement and seismic activity along the fault might have triggered a nearby landslide that is mapped as late Pleistocene to Holocene in age. He noted, however, that "the story is equivocal". No other evidence for Quaternary activity along this fault has been reported and based on the lack of unequivocal evidence for Quaternary activity along the fault, it is classified herein as a Class B structure until more detailed studies are conducted.
Recurrence interval	*Comments:* Tabor (1975 #6220) described and illustrated equivocal geomorphic evidence that may indicate late Pleistocene or younger movement along the fault. Evidence for possible multiple Quaternary events has not been reported.
Slip-rate category	Less than 0.2 mm/yr *Comments:* Existing data and interpretations do not specifically address or constrain the slip-rate(s) of the unnamed fault along Barnes Creek. Based mostly on this lack of information, a conservative <0.2 mm/yr slip-rate is assigned herein for possible Quaternary slip.
Date and Compiler(s)	2003 David J. Lidke, U.S. Geological Survey
References	#6212 Brown, R.D., Jr., 1970, Geologic map of the north-central part of the Olympic Peninsula, Washington: U.S. Geological Survey Open-File Report 70-43, 2 sheets, scale 1:62,500. #6213 Brown, R.D., Jr., Gower, H.D., and Snavely, P.D., Jr., 1960, Geology of the Port Angeles-Lake Crescent area, Clallam County, Washington: U.S. Geological Survey Oil and Gas Investigations Map OM-203, 1 sheet, scale 1:62,500. #5715 Dragovich, J.D., Logan, R.L., Schasse, H.W., Walsh, T.J., Lingley, W.S., Jr., Norman, D.K., Gerstel, W.J., Lapen, T.J., Schuster, J.E., and Meyers, K.D., 2002, Geologic map of Washington—Northwest quadrant: Washington Division of Geology and Earth Resources Geologic Map GM-50, 72 p. pamphlet, 3 sheets, scale 1:250,000.

	#4725 Gower, H.D., Yount, J.C., and Crosson, R.S., 1985, Seismotectonic map of the Puget Sound region, Washington: U.S. Geological Survey Miscellaneous Investigations Map I-1613, scale 1:250,000. #6272 Reagan, A.B., 1909, Some notes on the Olympic Peninsula, Washington: Kansas Academy of Science Transactions 22, p. 131-238. #4191 Rogers, A.M., Walsh, T.J., Kockelman, W.J., and Priest, G.R., 1996, Assessing earthquake hazards and reducing risk in the Pacific Northwest—Volume 1:U.S. Geological Survey Professional Paper 1560, 306 p. #6220 Tabor, R.W., 1975, Guide to the geology of Olympic National Park: Seattle, Washington, University of Washington Press, 144 p. #6221 Tabor, R.W., and Cady, W.M., 1978, Geologic map of the Olympic Peninsula, Washington: U.S. Geological Survey Miscellaneous Investigations Map I-994, scale 1:125,000. #6222 Tabor, R.W., and Cady, W.M., 1978, The structure of the Olympic Mountains; analysis of a subduction zone: U.S. Geological Survey Professional Paper 1033, 39 p.