

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](#).

Strawberry Point fault (Class A) No. 571

Last Review Date: 2017-01-17

citation for this record: Johnson, S.Y., compiler, 2001, Fault number 571, Strawberry Point 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 03:03 PM.

Synopsis

The west-northwest-trending, subvertical Strawberry Point fault cuts across northern Whidbey Island and has a minimum length of about 22 km. On the west coast of Whidbey Island and in the Strait of Juan de Fuca, the fault has south-side-up offset and forms the northern boundary of an uplift of pre-Tertiary basement rock. Exposures and subsurface logs of upper Pleistocene strata from Strawberry Point on the east coast of Whidbey Island indicate that the fault bifurcates into a 2-kilometer-wide zone as it crosses Whidbey Island. Each of the four fault splays within this zone has apparent north-side-up offset, and upper Pleistocene strata between the faults exhibit considerable shortening (dips as steep as 45°). The vertical fault trace, reversal of offset along strike, and evidence for associated contractional deformation suggest that the Strawberry Point fault is an oblique-slip, transpressional fault.

Name comments	<p>Gower (1980 #6229) first proposed the presence of a west-northwest-trending fault in the northern Whidbey Island region ("northern Whidbey Island fault") based on gravity and magnetic anomalies. Johnson and others (2001 #4749) showed that this part of northern Whidbey Island is cut by two faults, neither of which coincides with the fault trace shown by Gower (1980 #6229) and Gower and others (1985 #4725). Johnson and others (2001 #4749) designated the two structures the "Strawberry Point fault" and the "Utsalady Point fault," and recommended that the name "northern Whidbey Island fault" be abandoned. The Strawberry Point fault and the Utsalady Point fault [#573] are shown and discussed herein as separate faults that cross the northern part of Whidbey Island.</p>
County(s) and State(s)	<p>ISLAND COUNTY, WASHINGTON</p>
Physiographic province(s)	<p>PACIFIC BORDER</p>
Reliability of location	<p>Good Compiled at 1:100,000 scale.</p> <p><i>Comments:</i> Location in the eastern Strait of Juan de Fuca and Skagit Bay (west and east of Whidbey Island, respectively) is based on interpretation of high-resolution seismic-reflection profiles and is well documented (Dadisman and others, 2000 #4748; Johnson and others, 2000 #4750; 2001 #4749). Location on northeastern Whidbey Island is based on stratigraphic analysis of water well logs and mapping of coastal outcrops along Strawberry Point (Johnson and others, 2001 #4749) and is similarly well constrained. Location across north-central and northwestern Whidbey Island is based largely on projection from the east and west, and on weak aeromagnetic anomalies (Blakely and others, 1999 #4747; Johnson and others, 2001 #4749). Fault trace has not been shown on a published geologic map. Compilation based on Johnson and others (2001 #4749).</p>
Geologic setting	<p>The west-trending Strawberry Point fault occurs 2.5 to 8 km south of the Devils Mountain fault, near the northern boundary of the northward-migrating portion of the forearc region of the Cascadia convergent margin (Wells and others, 1998 #4742; Miller and others, 2001 #4732). The fault cuts across the northern part of the Tertiary-to-Quaternary Everett basin (Johnson and others, 1996 #4751; 2001 #4749).</p>

Length (km)	26 km.
Average strike	N81°W
Sense of movement	<p>Left lateral, Reverse</p> <p><i>Comments:</i> Vertical sense of slip changes across northern Whidbey Island from south-side-up (western Whidbey Island, Strait of Juan de Fuca) to north-side-up (eastern Whidbey Island, Skagit Bay). Folded late Quaternary strata also occur within the fault zone at Strawberry Point on northeastern Whidbey Island. Such slip reversals and evidence for contractional deformation are characteristic of transpressional strike-slip faults, hence oblique slip is inferred on the Strawberry Point fault (Johnson and others, 2001 #4749). The lateral component of slip is probably left lateral and dominant over the contractional component.</p>
Dip Direction	<p>V</p> <p><i>Comments:</i> Fault dip documented by offshore seismic-reflection profiles (Johnson and others, 2001 #4749).</p>
Paleoseismology studies	<p>Johnson and others (2001 #4749) present information from marine high-resolution and conventional seismic-reflection surveys, aeromagnetic mapping, coastal exposures of Pleistocene strata, and lithologic logs of water wells to document the Strawberry Point fault.</p>
Geomorphic expression	<p>There is no obvious geomorphic expression of the Strawberry Point fault. Washington's Puget Lowland was occupied at least five times during the Pleistocene by lobes of the continental ice sheet, with the most recent ice retreat occurring about 16 ka (Porter and Swanson, 1998 #6237). Most of the present landscape reflects this dynamic glacial history (Booth, 1994 #4719) and, as a result, tectonic landforms are generally buried or otherwise obscured.</p>
Age of faulted surficial deposits	<p>Strata assigned to the Whidbey Formation (stage 5 interglacial; ~ 80-125 ka) are faulted at Strawberry Point on northeastern Whidbey Island (Johnson and others, 2001 #4749). On offshore seismic-reflection data, inferred Quaternary strata are both folded and faulted by strands of the Strawberry Point fault (Johnson and others, 2001 #4749).</p>

Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) <i>Comments:</i> Strata inferred to be part of the Whidbey Formation (stage 5 interglacial; ~ 80-125 ka) are faulted and folded at Strawberry Point on northeastern Whidbey Island.
Recurrence interval	 <i>Comments:</i> At this time, there is no information on prehistoric earthquakes or recurrence interval for the Strawberry Point fault.
Slip-rate category	Between 0.2 and 1.0 mm/yr <i>Comments:</i> Preferred rate is 0.25 mm/yr. Sense of slip changes along strike. West of Whidbey Island, interpretations of seismic-reflection profiles suggest a minimum slip rate of 0.04 to 0.10 mm/yr for the Quaternary. Stratigraphic and structural analysis of outcrops at Strawberry Point suggest minimum slip rates of 0.25 mm/yr over the last ~100 ka (Johnson and others, 2001 #4749).
Date and Compiler(s)	2001 Samuel Y. Johnson, U.S. Geological Survey
References	#4747 Blakely, R.J., Wells, R.E., and Weaver, C.S., 1999, Puget Sound aeromagnetic maps and data: U.S. Geological Survey Open-File Report 99-514. #4719 Booth, D.B., 1994, Glaciofluvial infilling and scour of the Puget Lowland, Washington, during ice-sheet glaciation: <i>Geology</i> , v. 22, p. 695-698. #4748 Dadisman, S.V., Childs, J.R., Johnson, S.Y., and Rhea, S.V., 2000, Data Report for Cruise G#-95-PS, June, 1995, <i>in</i> Mosher, D.C., Johnson, S.Y., Rathwell, G.J., Kung, R.B., and Rhea, S.B., eds., Neotectonics of the eastern Strait of Juan de Fuca; a digital geological and geophysical atlas: Geological Survey of Canada Open File Report 3931, (CD digital product), 1 sheet. #6229 Gower, H.D., 1980, Bedrock geologic and Quaternary tectonic map of the Port Townsend area, Washington: U.S. Geological Survey Open-File Report 80-1174, 19 p., 1 sheet, scale 1:100,000.

#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.

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#4732 Miller, M.M., Miller, D.J., Rubin, C.M., Dragert, H., Wang, Kelin, Qamar, Anthony, and Goldfinger, C., 2001, GPS-determination of along-strike variation in Cascadia margin kinematics—Implications for relative pl. motion, subduction zone coupling, and permanent deformation: Tectonics, v. 20, p. 161-176.

#6237 Porter, S.C., and Swanson, T.W., 1998, Radiocarbon age constraints on rates of advance and retreat of the Puget lobe of the Cordilleran ice sheet during the last glaciation: Quaternary Research, v. 50, p. 205-213.

#4742 Wells, R.E., Weaver, C.S., and Blakely, R.J., 1998, Forearc migration in Cascadia and its neotectonic significance: Geology, v. 26, p. 759-762.

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