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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.

unnamed offshore fault set near Grays Canyon (Class A) No. 593

Last Review Date: 2003-07-03

citation for this record: **McCrory, P.A., compiler, 2003, Fault number 593, unnamed offshore fault set near Grays Canyon, 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 03:04 PM.**

Synopsis	The unnamed offshore fault set near Grays Canyon was mapped using both publicly available and proprietary multi-channel, seismic reflection profiles. McNeill and others (1997 #4101) interpret these faults as normal faults. Many appear to be listric normal faults that flatten to sub-horizontal dips at about 3-km depth. McNeill and others (1997 #4101) suggest that these faults reflect west-directed brittle extension of late Miocene to Holocene overlap strata concurrent with ductile extension in underlying subduction-complex basement rocks. The faults apparently do no reach seismogenic depths, thus are not considered seismic sources. Some of the fault traces offset the seafloor indicating recent movement, and a submersible dive confirmed the disruption of Holocene sediment along one fault scarp (McNeill and others, 1997 #4101).

Name comments	McNeill and others (1997 #4101) mapped a series of short, listric normal faults on the outer shelf and upper slope regions offshore southern Washington in water depths deeper than 70 m. Cranswick and Piper (1992 #6301) had previously mapped portions of these faults. McNeill and others (1997 #4101) mapped several additional Quaternary normal faults along the Washington continental shelf edge to the north. However, they offer no data to support these interpretations, so those fault traces are not included in this compilation. This unnamed fault set includes several northerly striking faults that are clustered in a broad area in the vicinity of Grays Canyon that is a submarine canyon of this region.
County(s) and State(s)	GRAYS HARBOR COUNTY, WASHINGTON (offshore) PACIFIC COUNTY, WASHINGTON (offshore)
Physiographic province(s)	PACIFIC BORDER (offshore)
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* The fault-trace locations are based on mapping of McNeill and others (1997 #4101) who primarily used proprietary, low-resolution (deep penetration) industry seismic reflection data.
Geologic setting	The unnamed offshore fault set near Grays Canyon is composed of a series of listric normal faults found near shelf edge, offshore Washington within Eocene to middle Miocene subduction-complex basement rocks. Movement on these faults began in the late Miocene based on the inferred age of strata that onlap the faults beneath the continental shelf (McNeill and others, 1997 #4101). Fault activity has apparently has been continuous rather than episodic based on the lack of angular unconformities within the onlap strata. Many faults in seismic reflection profiles appear to flatten at the top of the basement rocks suggesting that they might be large-scale gravity failures along a zone of weakness between major rock units. Some of these faults displace inferred late Quaternary strata. Some faults displace the seafloor as much as 25 m. Available publications offer no systematic discussion of the mapped faults, so age assignments cannot be reviewed for many of the fault traces.
Length (km)	57 km.
Average strike	N7°W

Sense of movement	Normal *Comments:* McNeill and others (1997 #4101) interpret these faults as normal faults and report that many appear to be listric normal faults.
Dip Direction	W; E *Comments:* McNeill and others (1997 #4101) report that many of these faults appear to be listric normal faults, which flatten to sub-horizontal dips at about 3-km depth. Presumably many of these faults dip steeply near the seafloor surface, but actual dip measurements are not available for these offshore faults. The majority of these faults dip to the west (seaward), but some dip to the east.
Paleoseismology studies	
Geomorphic expression	A seafloor scarp 0.5-1.0-m high was observed along one fault strand during a Delta submersible dive (McNeill and others, 1997 #4101). Seafloor offsets up to 25 m are depicted in seismic reflection profiles in mid-shelf to upper-slope region along two other strands.
Age of faulted surficial deposits	Deposits at the seafloor are inferred to be latest Quaternary (<20 ka) in age based on their proximity to the Columbia River which actively debouches sediment onto the shelf. Visual inspection of a scarp along one strand during a submersible dive revealed grayish sediments (inferred Pleistocene age) overlain by greenish sediments (inferred Holocene age) within the scarp face (McNeill and others, 1997 #4101). Faults that offset the seafloor in areas of ongoing marine sediment accumulation are considered active in the Holocene.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Visual inspection of a scarp along one strand during a submersible dive revealed inferred Holocene age sediments within the scarp face (McNeill and others, 1997 #4101). Two other fault strands offset the seafloor in areas of ongoing marine sediment accumulation and are considered active in the Holocene

	(McNeill and others, 1997 #4101). The age assignments deduced from descriptions presented by McNeill and others (1997 #4101) are latest Quaternary (<20 ka) for three strands, and late Quaternary (<150 ka) for the other strands. Herein these strands are also assigned, respectively, to latest Quaternary and Quaternary age categories. However, the upper age limits of these categories as shown herein are, respectively, <15 ka and <130 ka.
Recurrence interval	
Slip-rate category	Between 1.0 and 5.0 mm/yr *Comments:* 1-5 mm/y geologic slip rate for the three strands that show evidence for latest Quaternary (<15 ka) activity; the two southern strands of these three strands may have slip rates as high as 2.5 mm/y (McNeill and others, 1997 #4101). Slip rates have not been reported for the other strands that lack evidence for latest Quaternary activity; by association it seems likely that their rates of slip exceed 0.2 mm/yr and they are tentatively assigned the 0.2-1 mm/yr slip-rate category herein.
Date and Compiler(s)	2003 Patricia A. McCrory, U.S. Geological Survey
References	#6301 Cranswick, D.J., and Piper, K.A., 1992, Geologic framework of the Washington-Oregon continental shelf—Preliminary findings, *in* Lockwood, M., and McGregor, B.A., eds., Proceedings of the 1991 Exclusive Economic Zone Symposium on Mapping and Research: Working Together in the Pacific EEZ, U.S. Geological Survey Circular 1092, p. 146-151. #4101 McNeill, L.C., Piper, K.A., Goldfinger, C., Kulm, L.D., and Yeats, R.S., 1997, Listric normal faulting on the Cascadia continental margin: Journal of Geophysical Research, v. 102, no. B6, p. 12,123-12,138.