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Quaternary Fault and Fold Database of the United States

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Pine Valley graben fault system, Halfway-Posey Valley section (Class A) No. 809b

Last Review Date: 2016-04-06

citation for this record: **Personius, S.F., and Haller, K.M., compilers, 2016, Fault number 809b, Pine Valley graben fault system, Halfway-Posey Valley 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 01:59 PM.**

Synopsis	**General:** The Pine Valley graben fault system forms a complex northwest-trending graben that confines Pine Valley. The graben is formed in Miocene Columbia River basalts, and is floored by Quaternary alluvial sediments. Numerous northwest-trending faults are present throughout the region; some workers attribute graben formation to a pull apart basin related to displacement along a regional scale right-lateral strike-slip fault system, but others see little evidence for late Cenozoic strike-slip faulting in this area. **Sections:** This fault has 2 sections. The Pine Valley graben fault system is divided into two sections herein. The Brownlee section consists of the Brownlee fault, and defines the northern margin of

	the graben. The Halfway-Posey Valley section consists of the Halfway-Deer Creek and Posey Valley faults and defines the southern margin of the graben.
Name comments	**General:** **Section:** This section includes the Pine Valley (Geomatrix Consultants Inc., 1989 #1310; Simpson and others, 1993 #3596), Halfway (Mann, 1989 #3542), or Halfway-Deer Creek (Zollweg and Wood, 1993 #780) faults, and the Posey Valley fault (Zollweg and Wood, 1993 #780). These faults form the southern margin of the Pine Valley graben. **Fault ID:** These structures are part of fault number 16 of Pezzopane (1993 #3544) and fault numbers 70 and 71 of Geomatrix Consultants, Inc. (1995 #3593).
County(s) and State(s)	BAKER COUNTY, OREGON WASHINGTON COUNTY, IDAHO
Physiographic province(s)	COLUMBIA PLATEAU
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault locations are from 1:100,000-scale mapping of Weldon and others (2002 #5648), based on 1:500,000-scale mapping of Pezzopane (1993 #3544). Location of faults between -117° and -117.125° long further constrained by 1:24,000-scale mapping of Essman (2003 #7369).
Geologic setting	The Pine Valley graben fault system forms a complex northwest-trending graben that confines Pine Valley. The graben is formed in Miocene Columbia River basalts, and is floored by Quaternary alluvial sediments (Brooks and others, 1976 #3573; Swanson and others, 1981 #3496; Walker and MacLeod, 1991 #3646). Numerous northwest-trending faults are present throughout the region; some workers attribute graben formation to a pull apart basin related to displacement along a regional scale right-lateral strike-slip fault system (Mann, 1989 #3542; Mann and Meyer, 1993 #3535), but others see little evidence for late Cenozoic strike-slip faulting in this area (Simpson and others, 1993 #3596; Knudsen and others, 1996 #3529).

Length (km)	This section is 38 km of a total fault length of 38 km.
Average strike	N43°W (for section) versus N44°W (for whole fault)
Sense of movement	Normal *Comments:* Faults in this section are mapped as normal or high-angle faults (Swanson and others, 1981 #3496; Walker and MacLeod, 1991 #3646; Pezzopane, 1993 #3544; Simpson and others, 1993 #3596). Some workers attribute formation of the Pine Valley graben to a pull apart basin related to displacement along a regional scale right-lateral strike-slip fault system (Mann, 1989 #3542; Mann and Meyer, 1993 #3535), but others see little evidence for late Cenozoic strike-slip faulting in this area (Simpson and others, 1993 #3596; Knudsen and others, 1996 #3529).
Dip Direction	NE *Comments:* Zollweg and Jacobson (1986 #3518) determined focal mechanisms from the 1981-1984 earthquake sequence that yielded a likely dip of 70° on northwest-trending faults that may be part of the Halfway-Posey Valley section. Simpson and others (1993 #3596) and Geomatrix Consultants, Inc. (1995 #3593) modeled faults in the Halfway-Posey Valley section as 70° dipping normal or normal-oblique faults in their analyses of paleo-earthquake magnitudes.
Paleoseismology studies	
Geomorphic expression	The faults form several 200–500 m high escarpments in rocks of the Miocene Columbia River Basalt Group; most of the traces have poor geomorphic expression of Quaternary faulting, and no evidence of fault scarps in Quaternary deposits has been described (Zollweg and Wood, 1993 #780; Simpson and others, 1993 #3596; Geomatrix Consultants Inc., 1995 #3593; Wood, 1999 #4042). The best geomorphic expression of late Cenozoic faulting is found west of Halfway on the Halfway fault and south of Pine on the Posey Valley fault; in both places the faults are marked by linear range fronts, and the Posey Valley strand is also marked by well developed facets and spring lines in Miocene basalts (Zollweg and Wood, 1993 #780; Simpson and others, 1993 #3596).

Age of faulted surficial deposits	Faults in the Halfway-Posey Valley section offset Miocene Columbia River basalts, but no offsets in Quaternary surficial deposits have been described (Zollweg and Wood, 1993 #780; Simpson and others, 1993 #3596; Geomatrix Consultants Inc., 1995 #3593).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* No detailed information on age of most recent faulting has been published. However, Simpson and others (1993 #3596) used the geomorphic expression of the Posey fault to infer possible late Quaternary activity on this part of the section. Pezzopane (1993 #3544) used airphoto analysis to infer Holocene movement on the Posey fault and the Halfway-Deer Creek fault southeast of Pine, and middle and late Quaternary deformation (<700 ka) on the rest of the section. Weldon and others (2002 #5648) inferred Holocene and latest Pleistocene, middle and late Quaternary, and Quaternary displacement on various parts of the Halfway-Posey Valley section. Zollweg and Jacobson (1986 #3518) used the 1981–1984 earthquake sequence to infer recent activity on northwest-trending faults that may be part of the Halfway-Posey Valley section. Herein we use the most recent age classifications of Weldon and others (2002 #5648) to infer latest Quaternary, middle and late Quaternary, and Quaternary displacements on various parts of the Pine Valley graben fault system.
Recurrence interval	10–100 k.y. *Comments:* The average recurrence time estimate on most active faults in the southern Hells Canyon region is based on low rates of Quaternary slip (Zollweg and Wood, 1993 #780).
Slip-rate category	Less than 0.2 mm/yr *Comments:* No published slip rates are available, but displacements across the Halfway and Posey Valley faults in Miocene Columbia River basalts is 200–400 m (Zollweg and Wood, 1993 #780) suggest low long-term rates of slip. Geomatrix Consultants, Inc. (1995 #3593) use the offset data to estimate slip rates of 0.005–0.05 mm/yr for the Halfway-Posey Valley section.
Date and	2016

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