Jump to Navigation

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West Grande Ronde Valley fault zone, Craig Mountain section (Class A) No. 802c

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Synopsis	**General:** The West Grande Ronde Valley fault forms the western margin of a larg graben system that confines the Grande Ronde Valley in northeastern Oregon. Th graben is formed in Miocene and Pliocene volcanic rocks, and is floored by a thic sequence of Neogene and Quaternary alluvial sediments. The Grande Ronde Vall may be a pull apart basin related to displacement along a regional scale right-late strike-slip fault system. The West Grande Ronde Valley fault zone is divided into sections herein; from north to south, these are the Mount Emily, La Grande, and C Mountain sections. All of these sections form steep, en echelon range fronts, whi intermittently marked by tonal contrasts, linear depressions, range front facets, sp and scarps. Most fault studies in the region infer late Pleistocene and perhaps Hol displacement on the Mount Emily and La Grande sections, and somewhat older l Quaternary displacement on the Craig Mountain section.

	Sections: This fault has 3 sections. The West Grande Ronde Valley fault zone is divided into three sections herein, slightly modified from the divisions of Simpso others (1993 #3596); from north to south, these are the Mount Emily section, the Grande section, and the Craig Mountain section.
Name comments	**General:** The fault zone along the western margin of the Grande Ronde Valley w originally mapped by Hampton and Brown (1964 #3491), and later summarized b Walker (1979 #3576). Parts of the fault zone north of La Grande were named the Ruckel Ridge and Indian Rock faults (Kienle and others, 1979 #3728); faults nea Grande were named the Mount Emily, La Grande, Foothill Road, and Hot Lake fa (Barrash and others, 1980 #3570), and the La Grande fault (Geomatrix Consultan Inc., 1989 #1310). The fault traces included herein were informally grouped as th West Grande Ronde Valley fault by Simpson and others (1993 #3596). Faults alo west side of the Grande Ronde Valley have been included in numerous reconnais Quaternary fault investigations and compilations (Kienle and others, 1979 #3728 Army Corps of Engineers, 1983 #3480; Geomatrix Consultants Inc., 1989 #1310; and others, 1990 #3733; Pezzopane and Weldon, 1993 #149; Pezzopane, 1993 #3 Simpson and others, 1993 #3596; 1995 #3593; Madin and Mabey, 1996 #3575; Personius, 1998 #3508; Wood, 1999 #4042). **Section:** This section consists of the Craig Mountain segment of the West Grande Ronde Valley fault zone of Simpson and others (1993 #3596) and Personius (199 #3508) and the Hot Lake fault of Barrash and others (1980 #3570). **Fault ID:** This structure is part of fault number 13 of Pezzopane (1993 #3544) an fault number 68a of Geomatrix Consultants, Inc. (1995 #3593).
County(s) and State(s)	UNION COUNTY, OREGON
Physiographic province(s)	COLUMBIA PLATEAU
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Location of fault from ORActiveFaults (http://www.oregongeology.org/arcgis/rest/services/Public/ORActiveFaults/MapS downloaded 06/02/2016) attributed to 1:100,000-scale compilation of Ferns and c (2001 #5135).
Geologic setting	The West Grande Ronde Valley fault zone forms the western margin of a large gr system that forms the Grande Ronde Valley. The graben is formed in volcanic roc the Miocene Columbia River Group and the Mio-Pliocene Powder River volcanic and is floored by a thick sequence of Neogene and Quaternary alluvial sediments (Hampton and Brown, 1964 #3491; Walker, 1979 #3576; Barrash and others, 198

	#3570; Ferns and Madin, 1999 #5160, Ferns, 2001 #5135; Van Tassell and others 2000 #5166). Numerous northwest-trending faults are present throughout the regi some workers attribute graben formation to a pull apart basin related to displacem along a regional scale right-lateral strike-slip fault system (Gehrels and others, 19 #3774). However, no evidence of significant lateral displacement in the Quaterna been found along the West Grande Ronde Valley fault zone (Ferns and Madin, 19 #5160).
Length (km)	This section is 10 km of a total fault length of 48 km.
Average strike	N49°W (for section) versus N19°W (for whole fault)
Sense of movement	Normal, Right lateral *Comments:* Faults in this section are mapped as a normal or high-angle faults (Hampton and Brown, 1964 #3491; Walker, 1979 #3576; Barrash and others, 198 #3570; Walker and MacLeod, 1991 #3646; Pezzopane, 1993 #3544; Simpson and others, 1993 #3596; Ferns and others, 2001 #5135). Some workers attribute form of the Grande Ronde graben to a pull apart basin related to displacement along a regional scale right-lateral strike-slip fault system, and horizontal striations have observed on some faults in the area (Gehrels and others, 1980 #3774). However, evidence of significant lateral displacement in the Quaternary has been found alo West Grande Ronde Valley fault zone (Ferns and Madin, 1999 #5160).
Dip Direction	NE; SW *Comments:* No dip measurements have been published, but Ferns and Madin (19 #5160) used mapped outcrop patterns to estimate dips of 60-70° E. on the Mount Emily section [802a]. Simpson and others (1993 #3596) and Geomatrix Consulta Inc. (1995 #3593) modeled the West Grande Ronde Valley fault as a 70° dipping normal fault in their analyses of paleo-earthquake magnitudes. Dip can be estima from the mapped trace of the fault and the intersection of the fault in the Magma-LaGrande No. 1 well near Hot Lake. The fault is intersected in the well at a depth 503 m (Barrash and others, 1980 #3570), suggesting a dip of 68–70°.
Paleoseismology studies	
Geomorphic expression	The Craig Mountain section forms a steep, en echelon, linear range front along th flank of Craig Mountain. The fault is intermittently marked by linear fronts and numerous springs; Hot Lake hot springs is located near the northern end of the se The geomorphic expression of the Craig Mountain section may suggest a lower r faulting than the La Grande section faults (Simpson and others, 1993 #3596), but numerous landslide complexes bury the mountain front (I.P. Madin, pers. commu 2001), which may mask evidence of young faulting.

Age of faulted surficial deposits	Faults in the Craig Mountain section offset volcanic rocks of the Miocene Colum River Group and Mio-Pliocene Powder River volcanic field (Ferns and others, 20 #5135). Offsets in Quaternary surficial deposits have not been clearly demonstrat but scarps may be present in landslide deposits of unknown age (Simpson and oth 1993 #3596; Ferns and others, 2001 #5135) at the northern end of the section.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Simpson and others (1993 #3596) did not find evidence of repeated la Quaternary displacement on the Craig Mountain section. Pezzopane (1993 #3544 Geomatrix Consultants, Inc. (1995 #3593) infer middle and late Quaternary (<70(ka) displacement on the Craig Mountain section. Weldon and others (2002 #5648 latest Quaternary displacement on this part of the West Grande Ronde Valley faul zone; their age estimate is reported herein until further studies are conducted.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Displacement of Miocene Columbia River basalts across the Craig Mountain section is about 730 m southeast of Hot Lake (Barrash and others, 198(#3570); such offset data suggest low rates of long-term slip. Geomatrix Consultar Inc. (1995 #3593) use offset data from Simpson and others (1993 #3596) to estim rates of 0.01–0.05 mm/yr for all of the West Grande Ronde Valley fault zone. Rat may be higher than those estimated by Geomatrix Consultants, Inc. (1995 #3593) because Van Tassell and others (2000 #5161) used regional mapping and well dat calculate a subsidence rate of 0.2 mm/yr for the last 9 Ma for the southwestern pa the La Grande basin.
Date and Compiler(s)	2002 Stephen F. Personius, U.S. Geological Survey Kathleen M. Haller, U.S. Geological Survey
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