Jump to Navigation

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Winter Rim fault system, Slide Mountain section (Class A) No. 831a

Last Review Date: 2015-12-05

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Synopsis	**General:** This north and northwest trending, down-to-the-east normal fault system forms the western margin of a large graben or half graben that confines the Chewaucan-Summer Lake basin. The fault is marked by prominent escarpments (Winter Rim) in Miocene volcanic and volcaniclastic sedimentary rocks. The Winter Rim fault system is divided into three sections herein, a southern section, the Slide Mountain section, and two northern sections, the Winter Ridge section and the Ana River section. All sections show evidence of latest Quaternary displacement. **Sections:** This fault has 3 sections. The Winter Rim fault system is divided into three sections herein, primarily based on mapping of Pezzopane (1993 #3544)—a southern section, the Slide Mountain section, and two northern sections, the Winter Ridge section and the Ana River section; all sections in part show evidence of latest Quaternary displacement.

Name comments	**General:** The Winter Rim fault system is a group of normal faults that bound the western flank of the Chewaucan-Summer Lake basin; parts of these faults were originally mapped by Walker (1963 #3565) and Walker and others (1967 #3564). Pezzopane (1993 #3544) named the northern parts of this fault system the Winter Ridge and Ana River faults, and the southern part the Slide Mountain fault. Klinger and others (1996 #3729) used the names Winter Ridge and Summer Lake faults for the northern and southern parts of this system. Herein we retain the names of Pezzopane (1993 #3544) as sections of the informally named Winter Rim fault system of Simpson (1990 #3504). **Section:** This part of the fault was informally named the Slide Mountain fault by Pezzopane (1993 #3544). The southern part of the fault zone was informally referred to as the Hot Springs fault by Weldon and others (2002 #5648). **Fault ID:** This group of structures consists of fault numbers 34, 35, and 36 of Pezzopane (1993 #3544) and fault number 57 of Geomatrix Consultants, Inc. (1995 #3593). This section is fault number 35 of Pezzopane (1993 #3544).
County(s) and State(s)	LAKE COUNTY, OREGON
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:100,000 scale. *Comments:* Fault traces are from 1:100,000-scale mapping of Weldon and others (2002 #5648), based on 1:250,000-scale mapping of Walker (1963 #3565) and 1:500,000-scale mapping of Pezzopane (1993 #3544).
Geologic setting	This north and northwest trending, down-to-the-east normal fault system forms the western margin of a graben or half graben that confines the Chewaucan-Summer Lake basin in the Basin and Range of south-central Oregon. The fault zone is marked by prominent escarpments (Winter Rim) in Miocene volcanic and volcaniclastic sedimentary rocks (Walker, 1963 #3565; Walker and others, 1967 #3564; Walker and MacLeod, 1991 #3646).
Length (km)	This section is 33 km of a total fault length of 58 km.
Average strike	N57°W (for section) versus N38°W (for whole fault)
Sense of movement	Normal, Left lateral *Comments:* This section is mapped as a normal or high-angle fault by Walker

	(1963 #3565) and Walker and MacLeod (1991 #3646). Pezzopane (1993 #3544) and Pezzopane and Weldon (1993 #149) note fault patterns that suggest a small component of left-lateral motion.
Dip Direction	NE; SW *Comments:* No structural data on the dip of this fault have been published, but Geomatrix Consultants, Inc. (1995 #3593) used an estimated dip of 70° in their modeling of earthquake potential of the Winter Rim fault system.
Paleoseismology studies	Pezzopane (1993 #3544) and Pezzopane and Weldon (1993 #149) conducted trench investigations along the Slide Mountain section between Wooley Creek and Kelley Creek, about 1.5 km south of the south shore of Summer Lake. The following description is from Pezzopane (1993 #3544) and Pezzopane and Weldon (1993 #149). Sites 831-1 and 831-2. The trench located about 100 m west of Kelly Creek (831-1) was logged and described; apparently no log of the trench located about 100 m east of Wooley Creek (831-2) was published (Pezzopane, 1993 #3544). These trenches exposed a fault zone in late Quaternary pluvial lake deposits, fluvial and debris-flow deposits, and colluvium. The lowermost deposits in the hanging wall were intensely folded, faulted, and interlayered with fault-derived colluvium; they probably represent evidence of multiple events that occurred while pluvial Lake Chewaucan stood at a level above the trench site. At least two units of post-lacustrine colluvium suggest multiple late Quaternary events. No datable materials were obtained from the Kelley Creek trench, but an exposure of an alluvial-fan deposit that buried the fault scarp at Kelley Creek yielded a radiocarbon age on charcoal of 2,130±90 yr BP. A radiocarbon age of 35,920±820 yr BP on carbon from near the base of the lacustrine section in the footwall block of the Wooley Creek trench provides a maximum age for the offset lacustrine deposits.
Geomorphic expression	The range-bounding Slide Mountain section of the Winter Rim fault system is coincident with a prominent 1000-m-high escarpment (Winter Rim) in Miocene bedrock along its length. This part of the mountain front is disrupted by numerous large landslides, some of which may have been seismically generated (Badger and Watters, 2002 #5148). The fault exhibits intermittent 6- to 7-m-high fault scarps on latest Pleistocene pluvial lake deposits and younger (Holocene ?) deposits along the northern part of the section near Slide Mountain (Pezzopane and Weldon, 1993 #149; Pezzopane, 1993 #3544). The section has a curving form: the northern part strikes generally east-west, and then curves to a generally north strike at it southern end. Youngest fault movement is restricted to the northern part of the section

	(Pezzopane, 1993 #3544; Weldon and others, 2002 #5648). Scarp heights range from 1.2 m to 27.4 m, with an average of 6.0 m, along this part of the fault (Egger, 2015 #7766); estimate of average slip is 4.8 m, assuming the fault dips 60°.
Age of faulted surficial deposits	No radiometric ages have been obtained on faulted deposits along the Slide Mountain section, but regional relations indicate that the fault offsets latest Pleistocene (approximately 16 ka) pluvial lake sediments (Pezzopane and Weldon, 1993 #149; Pezzopane, 1993 #3544).
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* Fresh fault scarps that offset latest Pleistocene pluvial shorelines and deposits support a Holocene age of most-recent movement on the Slide Mountain section of the Winter Rim fault system; the latest event predates 2130±90 yr BP, the radiocarbon-dated age of alluvial-fan deposits that bury the youngest scarps (Pezzopane and Weldon, 1993 #149; Pezzopane, 1993 #3544). Sherrod (1993 #3510) assigned an age of < less than 35 ka for activity on the Slide Mountain section, but did not discuss the basis for this age assignment.
Recurrence interval	
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* Pezzopane (1993 #3544) and Pezzopane and Weldon (1993 #149) used an estimated age of 16 ka and offset estimates of 6–10 m in latest Pleistocene pluvial deposits to calculate an average slip rate of 0.4–0.6 mm/yr for the Slide Mountain section of the Winter Rim fault system. Geomatrix Consultants, Inc. (1995 #3593) used slip rates of 0.3–0.6 mm/yr in their analysis of earthquake hazards associated with the Slide Mountain section.
Date and Compiler(s)	2015 Stephen F. Personius, U.S. Geological Survey Kathleen M. Haller, U.S. Geological Survey
References	#5148 Badger, T.C., and Watters, R.J., 2002, Seismogenic landslide modification of fault scarps, Summer Lake basin, Lake County, Oregon: Geological Society of America Abstracts with Programs, v. 34, no. 5, p. A-107. #7796 Badger, T.C., and Watters, R.J., 2004, Gigantic seismogenic landslides

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#3544 Pezzopane, S.K., 1993, Active faults and earthquake ground motions in Oregon: Eugene, Oregon, University of Oregon, unpublished Ph.D. dissertation, 208 p.

#149 Pezzopane, S.K., and Weldon, R.J., II, 1993, Tectonic role of active faulting in central Oregon: Tectonics, v. 12, p. 1140-1169.

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#3565 Walker, G.W., 1963, Reconnaissance geologic map of the eastern half of the Klamath Falls (AMS) quadrangle, Lake and Klamath Counties, Oregon: U.S. Geological Survey Mineral Investigations Field Studies Map MF-260, 1 sheet, scale 1:250,000.

	#3646 Walker, G.W., and MacLeod, N.S., 1991, Geologic map of Oregon: U.S. Geological Survey, Special Geologic Map, 2 sheets, scale 1:500,000. #3564 Walker, G.W., Peterson, N.V., and Greene, R.C., 1967, Reconnaissance geologic map of the east half of the Crescent quadrangle Lake, Deschutes, and Crook Counties, Oregon: U.S. Geological Survey Miscellaneous Geologic Investigations I-493, 1 sheet, scale 1:250,000. #5648 Weldon, R.J., Fletcher, D.K., Weldon, E.M., Scharer, K.M., and McCrory, P.A., 2002, An update of Quaternary faults of central and eastern Oregon: U.S. Geological Survey Open-File Report 02-301 (CD-ROM), 26 sheets, scale 1:100,000.