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Faults near Walla Walla, Buroker faults (Class A) No. 578a

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Synopsis	**General:** Faults east of Walla, Washington, consist of both northeast- and northwest-striking features (Kienle and others, 1979 #3728; Foundation Sciences, Inc., 1980 #5722; Schuster, 1994 #4655; Schuster and others, 1997 #3760). The most studied of these features are the northeast-striking Buroker faults. The Buroker faults are mostly covered by Pleistocene to Holocene loess deposits but are exposed in cuts along Russell Road, where a reverse fault in this set of five faults shows evidence for Quaternary offset (Myers and others, 1979 #5175; Foundation Sciences, Inc., 1980 #5722; Farooqui and Thoms, 1980 #5824). The northwest-striking Promontory Point fault was previously inferred and mapped directly south of the Buroker faults (Newcomb, 1965 #5825; Kienle and others, 1979 #3728; Foundation Sciences, Inc., 1980 #5722). The Promontory Point fault, however, is not shown on later geologic maps and fault

	maps of this region, which instead show and emphasize an unnamed northwest-striking fault northeast of the Buroker faults (Tolan and Reidel, 1989 #3765; Schuster, 1994 #4655; Rogers and others, 1996 #4191; Schuster and others, 1997 #3760). There seems to be some confusion regarding this unnamed northwest-striking fault and the northwest-striking Promontory Point fault. Regional fault maps (Tolan and Reidel, 1989 #3765; Rogers and others, 1996 #4191) show the unnamed northwest-striking fault, but these maps cite source information for this fault, which suggests that they consider it to be the Promontory Point fault. The source information cited is the U.S. Department of Energy (1988 #5820), which cites Kienle and others (1979 #3728) and Foundation Sciences, Inc. (1980 #5722) for their information, presumably, on the Promontory Point fault. These studies by Kienle and others (1979 #3728) and Foundation Sciences, Inc. (1980 #5722) did not identify or discuss the unnamed, northwest-trending fault north of the Buroker faults. Because the Promontory Point fault is not shown on recent geologic maps of this region (Schuster, 1994 #4655; Schuster and others, 1997 #3760), and because evidence for its existence and for Quaternary activity along it are speculative (Kienle and others, 1979 #3728; Foundation Sciences, Inc., 1980 #5722), it is classified and discussed herein as a Class C structure until further studies and clarifications are made. The unnamed northwest-striking fault is shown on recent regional fault maps as a known or possible Quaternary fault; however, evidence for Quaternary activity along this fault is also speculative. Consequently, this unnamed northwest-striking fault is classified as a Class B structure herein, and it is discussed as a separate section from the Buroker faults that include one fault (Buroker fault) that shows clear evidence of Quaternary activity. **Sections:** This fault has 2 sections. Faults near Walla are subdivided herein as two sections. The northeast-striking Buroker faults show evidence for Quaternary offsets and are discussed as section a of the faults near Walla Walla. An unnamed northwest-striking fault, north of the Buroker faults, is not known to have direct evidence for Quaternary activity. This unnamed northwest-striking fault, however, is shown as a possible Quaternary fault on some regional structure maps (Tolan and Reidel, 1989 #3765; Rogers and others, 1996 #4191) and it is discussed as section b of the faults near Walla Walla.
Name	**General:**

comments	**Section:** The Buroker fault is one of five, close-spaced faults exposed in cuts along Russel Creek Road southeast of Walla Walla, Washington (Foundation Sciences, Inc., 1980 #5722). The Buroker fault is a reverse fault, in this set of five faults. Farooqui and Thoms (1980 #5824) discussed and applied the name Buroker fault to this reverse fault. Later reports have used the names Buroker fault and Buroker faults for this fault and for all five of the closely spaced faults, respectively (Foundation Sciences, Inc., 1980 #5722). Except where exposed in road cuts or borrow pits, the Buroker faults are covered by Pleistocene-Holocene loess deposits (Foundation Sciences, Inc., 1980 #5722; Schuster, 1994 #4655; Schuster and others, 1997 #3760). Foundation Sciences, Inc. (1980 #5722) show the Buroker fault (reverse fault) and at least one other of the five Buroker faults on a 1:125,000-scale map. Schuster (1994 #4655) and Schuster and others (1997 #3760) show a single, northeast-striking, down-to-the-west, concealed fault in the area of the Buroker faults. The Buroker faults are located about 4 km southeast of Walla Walla, Washington and exposed in cuts along and near the Russel Creek Road.
County(s) and State(s)	WALLA WALLA COUNTY, WASHINGTON
Physiographic province(s)	COLUMBIA PLATEAU
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* The single, concealed fault shown herein to represent the Buroker faults is from the 1:250,000-scale geologic map by Schuster and others (1997 #3760); the trace was transferred directly onto a registered mylar overlay and digitized at 1:250,000 scale. This part of that 1:250,000-scale geologic map was compiled from the 1:100,000 scale geologic map by Schuster (1994 #4655).
Geologic setting	The faults near Walla Walla are northwest- and northeast-striking faults that occur in the southwestern part of the Palouse subprovince of the Columbia Plateaus province, near the southern boundary of this subprovince with the Blue Mountains subprovince to the southeast. This part of the Palouse subprovince is also called the Palouse slope. The region of the Palouse slope is

	characterized by sparse faults and low-amplitude, long wavelength folds that locally deform Miocene basalts of the Columbia River Basalt Group, which otherwise dip very gently westward above a similarly dipping paleoslope (Swanson and others, 1980 #3574; Reidel and others, 1994 #3539). The Blue Mountains subprovince directly to the southeast, is a 250-km-long anticlinorium that forms the southern margin of the Columbia basin and the Columbia Plateaus province (Reidel and others, 1994 #3539). The prominent, northwest-striking Wallula fault zone [846] is present about 20-25 km to the west-southwest of the faults near Walla Walla. Several investigators have suggested that the northeast- and northwest-striking faults near Walla Walla may be similar in age and tectonic environment to the faults of the Wallula fault zone (Kienle, 1977 #4665; Foundation Sciences, Inc., 1980 #5722; Piety and others, 1990 #3733).
Length (km)	This section is 4 km of a total fault length of 19 km.
Average strike	N51°E (for section) versus N69°W (for whole fault)
Sense of movement	Thrust *Comments:* The Buroker faults are mostly described by Foundation Sciences, Inc. (1980 #5722) as oblique slip faults, in that individual faults show throws and slickenlines, which suggest significant components of normal or reverse-thrust offsets combined with components of lateral offset (both sinistral and dextral). Farooqui and Thoms (1980 #5824) and Foundation Sciences, Inc. (1980 #5722) describe one of the faults, the Buroker fault of Farooqui and Thoms (1980 #5824), as showing principally an up-to-the-west, thrust sense of movement.
Dip	26°-49° NW. *Comments:* Farooqui and Thoms (1980 #5824) report that the Buroker fault dips 26? to the west. Foundation Sciences, Inc. (1980 #5722) reported dips of 49? NW, 31? WNW, and 30? ESE along individual faults of the Buroker faults. Piety and others (1990 #3733), however, referred to the Buroker fault of Farooqui and Thoms (1980 #5824) as a high-angle reverse fault but they did not report a dip amount.
Paleoseismology studies	

Geomorphic expression	The Buroker faults are known and identified from cuts along and near Russell Creek Road (Foundation Sciences, Inc., 1980 #5722; Farooqui and Thoms, 1980 #5824). No scarps, lineaments, or other geomorphic expression of these faults have been reported. The Buroker faults are largely covered by Pleistocene-Holocene loess deposits, which may obscure geomorphic expression of these faults. Farooqui and Thoms (1980 #5824) and Foundation Sciences, Inc. (1980 #5722) describe the character of individual fault and shear zones where they are exposed in cuts along and near Russell Creek Road.
Age of faulted surficial deposits	Foundation Sciences, Inc. (1980 #5722) report that four of the five Buroker faults only show evidence that they cut Miocene basalt that is overlain by "young" light-tan loess that is not cut by these faults. The light tan loess is inferred to be latest Pleistocene to Holocene in age, based on its character and stratigraphic position (Foundation Sciences, Inc., 1980 #5722; Farooqui and Thoms, 1980 #5824; Piety and others, 1990 #3733). The road cut that exposes the Buroker fault of Farooqui and Thoms (1980 #5824), shows a more detailed Pleistocene stratigraphic sequence (Foundation Sciences, Inc., 1980 #5722; Farooqui and Thoms, 1980 #5824; Piety and others, 1990 #3733); however, there is some disagreement on whether the upper part of this sequence (latest Pleistocene to Holocene) is cut by the fault. The cut exposing the Buroker fault shows Miocene basalt overlain by Pleistocene gravel that is overlain by red-brown loess that is overlain by the light-tan loess. According to Farooqui and Thoms (1980 #5824) and Foundation Sciences, Inc. (1980 #5722), the red-brown loess is probably the Palouse loess that Busacca (1991 #3598) reports spans at least the last 1 m.y. However, Piety and others (1990 #3733) suggest an age of about 100 ka for this red-brown loess. Based on the exposure of the "Buroker fault," in the road cut along Russell Creek Road, Farooqui and Thoms (1980 #5824) report that the Buroker fault offsets the Miocene basalt and the red-brown loess (Palouse), but does not offset the overlying light-tan loess. Based on examination of this same exposure, Foundation Sciences, Inc. (1980 #5722) report essentially the same relations, except they report that the bottom part of the light-tan loess is also offset. Based on examination of the same exposure, Piety and others (1990 #3733) report that they were not able to determine if the light-tan loess was also offset.
Historic earthquake	

Most recent prehistoric deformation	undifferentiated Quaternary (<1.6 Ma) *Comments:* The timing of the most recent prehistoric faulting event along the Buroker faults is not tightly constrained. The Buroker fault (reverse fault) shows evidence for at least one Quaternary event that may be as young as latest Pleistocene to Holocene in age, based on assignment of this age range to light-tan loess deposits that Foundation Sciences, Inc. (1980 #5722) report show offset in their basal part. Farooqui and Thoms (1980 #5824), however, report that these light tan loess deposits are not offset by the Buroker fault, and Piety and others (1990 #3733) report that they were unable to determine if the light-tan loess deposits are offset by the Buroker fault. All investigators agree that red-brown loess, which underlies the light-tan loess, probably correlates with the Palouse loess and is offset by the Buroker fault. The age of this red-brown loess, however, is not tightly constrained. According to Busacca (1991 #3598), the Palouse loess is known to span at least the last 1 m.y., however, Piety and others (1990 #3733) suggest an age of about 100 ka for the red-brown loess. The U.S. Department of Energy (1988 #5820) report the age of the Buroker fault as Pleistocene to early Holocene. Based on the reported information, a Quaternary age range is assigned to the latest faulting event along the Buroker fault and Buroker faults herein.
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* Little slip data is available for the Buroker faults. The Buroker fault of Farooqui and Thoms (1980 #5824), shows Quaternary offset of about 1 m (Foundation Sciences, Inc., 1980 #5722; Farooqui and Thoms, 1980 #5824; U.S. Department of Energy, 1988 #5820; Piety and others, 1990 #3733). According to relations discussed by Foundation Sciences, Inc. (1980 #5722), the 1 m offset might be as young as early Holocene in age. Assuming an age as young as 7 ka for the most recent event, would yield and suggest a maximum slip rate of about 0.14 mm/yr for the Buroker fault. Consequently a relatively low slip-rate category of <0.2 mm/yr is assigned herein to the Buroker fault and Buroker faults.
Date and Compiler(s)	2003 David J. Lidke, U.S. Geological Survey

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