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Cedar Ridge fault (Class A) No. 774

Last Review Date: 1999-05-12

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Synopsis	This fault is part of a generally east-west striking, sinuous fault system that lies along the south flank of the Bridger and Bighorn Mountains. The Cedar Ridge fault probably extends about 56 km, from Copper Mountain on the west to Cedar Gap on the east (Geomatrix Consultants, 1988 #2973), where it is intersected by the Dry Fork fault (ca. 24-km long). Both faults are described as part of the 80-km-long Cedar Ridge/Dry Fork fault system, but only a small portion of the Cedar Ridge fault has conclusive evidence of Quaternary displacement. There is no evidence for Quaternary movement along the Dry Fork fault (Geomatrix Consultants, 1988 #2973), even though it lies in Dry Fork Badwater Creek, which is an extremely linear valley (Gard, 1969, unpublished #3466). Although the surficial geology and scarp morphology along the fault system have been investigated at three sites by (Geomatrix Consultants, 1988 #2973), no paleoseismic investigations (i.e., trenching) have been performed along the

	Cedar Ridge fault.
Name comments	Named for Cedar Ridge, a low butte on the south side of Copper Mountain or a linear ridge on the south flank of the Bighorn Mountains. The portion of the fault with evidence for a young (Quaternary) trace is restricted to a 1.3-km-long scarp near East Fork Dry Creek, which is located about 22 km east of Boysen Reservoir and 25 km northeast of Shonshoni, Wyoming. This scarp was first recognized by Thaden (1980 #3443). It is a splay of an older, longer bedrock fault (the Cedar Ridge/Dry Fork fault system). The part of the fault that is discussed herein is equivalent to an unnamed fault (no. 191) of Witkind (1975 #819). **Fault ID:** Referred to as normal fault 1 on figure 2-1 of Geomatrix Consultants (1988 #2973) and fault 191 of Witkind (1975 #819).
County(s) and State(s)	SUBLETTE COUNTY, WYOMING
Physiographic province(s)	MIDDLE ROCKY MOUNTAINS
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* Trace of short (2.5 km) fault scarp (loc. J) from 1:250,000-scale map in Geomatrix Consultants (1988, pl. 2 #2973). Longer (pre-Quaternary) trace of Cedar Ridge/Dry Fork fault system is shown at 1:500,000 scale by Witkind (1975 #819) and at 1:1,000,000 scale by Case and others (1997 #3449). Trace of fault transferred to 1:250,000-scale topographic base map.
Geologic setting	The Cedar Ridge-Dry Fork fault system strikes east-west along the south flank of the Bridger and Bighorn Mountains (respectively) for about 80 km. Witkind (1975 #819) and Case and others (1997 #3449) showed the entire fault system as either late Cenozoic (Witkind) or having sections with evidence for Quaternary movement. The fault system has a moderately sinuous trace within a 3-km-wide zone of folded and faulted Tertiary rocks (Tourtelot, 1955 #3471). Keefer (1970 #3476) and Love (1978 #3444) both suggested that the Cedar Ridge fault may converge with the South Owl Creek Mountains (thrust) fault at depth, and thus be listric. The Cedar Creek fault was apparently active in the latest Early Eocene and initially had down-to-the-

	south normal displacement (Love, 1978 #3444). Miocene rocks along the fault are deformed by down-to-the-north displacement (Conel and others, 1984, cited in Geomatrix Consultants, 1988 #2980).
Length (km)	1 km.
Average strike	N74°E
Sense of movement	Normal
Dip Direction	N
Paleoseismology studies	
Geomorphic expression	Evidence for Quaternary faulting is best displayed in the East Fork Dry Creek area (locality J of Geomatrix Consultants, 1988 #2973). Here, the fault forms a 1.3-km-long north-facing scarp that has 1.8- 2.1 m of normal surface displacement. This scarp is formed on a piedmont surface that is 36 m above local drainage-the highest surface in the immediate area. Lower geomorphic surfaces do not appear to be displaced along the projection of the fault. A 7-km long lineament in bedrock, both east and west of the scarp, shows no clear evidence for Quaternary movement, and this is probably the fault shown as no. 191 of Witkind(1975 #819). At two other localities along the Cedar Ridge-Dry Fork fault system, Geomatrix Consultants (1988 #2973) found no conclusive evidence for Quaternary movement. At locality I, about 1 km southwest of Badwater, Wyoming, there is an east-west trending lineament marked by south-facing scarps, springs, and tonal contrasts (on aerial photographs). Geomatrix Consultants (1988 #2973) found no evidence for displacement of three Quaternary surfaces that cross the lineament, and thus concluded that the lineament is due to differential weathering in bedrock. At locality H, another lineament was also explained to be the result of differential weathering of resistant and nonresistant strata. Thus, of the three localities Geomatrix Consultants (1988 #2973) investigated, only the 1.3-km-long north-facing scarp (locality J) was found to be the result of Quaternary surface rupturing along the Cedar Ridge fault.
Age of faulted	The scarp at locality J is formed on a piedmont surface that is 36

surficial deposits	m above local drainage (quite high), and is the highest surface in the immediate area. This surface is not preserved in many places, which may explain the absence of scarps elsewhere along the fault. Lower geomorphic surfaces do not appear to be displaced along the projection of the scarp. Conel and others (1984) (cited in Geomatrix Consultants, 1988 #2980) estimated the age of the highest surface along the Owl Creek Mountains as 0.5-1.0 Ma, and, based on the 36-m-high surface's expression, Geomatrix Consultants (1988 #2973) considered it to be at least several hundred thousands of years old. The offset piedmont surface has not been dated directly, but is herein considered to be of middle to early(?) Pleistocene age.
Historic earthquake	
Most recent prehistoric deformation	middle and late Quaternary (<750 ka) *Comments:* Timing based on Geomatrix Consultants' (1988 #2973) minimum estimate of several hundred thousand years for the offset 36-m-high surface adjacent to East Fork Dry Creek (locality J).
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* This fault is categorized as having a low-slip rate (<0.2 mm/yr) on the basis of only 1.8-2.1 m net vertical displacement of a probable middle Pleistocene piedmont surface.
Date and Compiler(s)	1999 Michael N. Machette, U.S. Geological Survey, Retired
References	#3449 Case, J.C., Larsen, L.L., Boyd, C.S., and Cannia, J.C., 1997, Earthquake epicenters and suspected active faults with surficial expression in Wyoming: Geological Survey of Wyoming Preliminary Hazards Report 97-1, 1 sheet, scale 1:1,000,000. #3466 Gard, T.M., 1969, unpublished, Tectonics of the Badwater uplift, central Wyoming: University Park, Pennsylvania, Pennsylvania State University, unpublished Ph.D. dissertation, 144 p. #2973 Geomatrix Consultants, Inc., 1988, Northwestern Wind River Basin seismotectonic evaluation: Technical report to U.S.

	Department of Interior, Bureau of Reclamation, Denver, under Contract 6-CS-81-07310, 116 p., 3 pls. #2980 Geomatrix Consultants, Inc., 1988, Wyoming Basin geomorphic province seismotectonic evaluation: Technical report to U.S. Department of Interior, Bureau of Reclamation, Denver, under Contract 6-CS-81-07310, 167 p., 2 pls. #3476 Keefer, W.R., 1970, Structural geology of the Wind River basin, Wyoming: U.S. Geological Survey Professional Paper 495-D, 35 p. #3444 Love, J.D., 1978, Cenozoic thrust and normal faulting, and tectonic history of the Badwater area northeastern margin of Wind River Basin, Wyoming, *in* Boyd, R.G., ed., Resources of the Wind River Basin: Wyoming Geological Association, 30th Annual Field Conference, Casper, Wyoming, September 1978, Guidebook, p. 235-238. #3443 Thaden, R.E., 1980, Geologic map of the Gates Butte quadrangle, showing chromolithofacies and coal beds in the Wind River Formation, Fremont County, Wyoming: U.S. Geological Survey Geologic quadrangle Map GQ-1538, 1 sheet, scale 1:24,000. #3471 Tourtelot, H.A., 1955, Geology of the Badwater area, Wyoming: Oil and Gas Investigations Map OM 124, 2 sheets, scale 1:48,000. #819 Witkind, I.J., 1975, Preliminary map showing known and suspected active faults in Wyoming: U.S. Geological Survey Open-File Report 75-279, 35 p. pamphlet, 1 sheet, scale 1:500,000.