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Quaternary Fault and Fold Database of the United States

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Madison fault, southern section (Class A) No. 655c

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Compiled in cooperation with the Idaho Geological Survey

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Synopsis	**General:** Detailed mapping and reconnaissance studies of the morphology of scarps along the fault are the primary source of data for this fault; segmentation models have been proposed based on these data. However, no detailed trenching has been conducted. Short parts of the fault ruptured during the 1959 Hebgen Lake earthquake resulting in displacements of less than 1 m. The southern part of the fault seems to have higher rates of activity than the northern part, where extension appears to be partitioned on sub-parallel faults at the surface.

	Sections: This fault has 3 sections. Several reports discuss the right-stepping echelon nature of this fault as evidence of separate tectonic blocks with Pardee (1950 #46) being the earliest, and later discussed by Shelden (1960 #478). Young (1985 #690) describes 12 segments along the northern 10-12 km of the fault, but each is defined by parts of the fault having a similar strike. Johns and others (1982 #259) and Schneider (1985 #319) defined three segments; the latter discussed the northern two in detail. These previously published boundaries roughly coincide with the section boundaries shown here. Ruleman and Lageson (2002 #7030) indicate that the fault is composed of five segments. The sections shown in this compilation are nearly coincident with the parts of the fault defined by Johns and others (1982 #259); they do not distinguish any difference in timing of paleoearthquakes and assign a single age (Holocene) to the whole fault based on the short ruptures from the 1959 Hebgen Lake earthquake south of Madison Canyon (Witkind, 1964 #247; Myers and Hamilton, 1964 #250). Available data suggest that the timing of the most-recent faulting event does differ along strike.
Name comments	**General:** Pardee (1950 #46) is an early reference to this fault and referred to it as the Madison Range fault. Most of the early literature followed this nomenclature; however, the name "Madison fault" is commonly used now. The fault is also shown on a map as the "Madison Valley fault" (U.S. Coast and Geodetic Survey, 1959 #630). The fault extends from north of Saint Joe Creek southwestward to Garner Canyon. Witkind and others (1964 #629) described the fault as extending farther south to near Big Springs, but they did not show it as such on their map. Young (1985 #690) shows this fault extending farther north (at least another 2 km) to the edge of her map and states that its trace may coincide with the Madison River near the Madison Powerhouse. **Section:** Although Schneider (1985 #319) discusses and defines segments of the Madison fault based on morphologic studies, he did not assign names. This informally named section as defined here extends from Mile Creek southwestward to Garner Canyon. This section is shorter than the southern segment of Schneider and likewise, Johns and others (1982 #259), which extends from Madison Canyon southwestward to possibly west of Reas Pass. **Fault ID:** Refers to fault number 5 (Madison Range fault) of Witkind (1975 #317); fault numbers 45 (Madison Range fault-southern segment), 46 (Madison Range fault-middle segment), and 47 (Madison Range fault-northern segment) of Johns and

	others (1982 #259); fault number 11 (Madison fault) of Stickney and Bartholomew (1987 #85); Jack Creek, Cedar Creek, Burger Creek, Bear Creek, and Indian Creek scarps and Madison Canyon segment of the Madison fault of Stickney and Bartholomew (1987 #242); and Jordan Creek, Jack Creek, Cedar Creek, Burger Creek, Bear Creek, Indian Creek, Madison Canyon, and Northern Henrys Lake segments of the Madison fault of Stickney and Bartholomew (written commun., 1992 #556).
County(s) and State(s)	FREMONT COUNTY, IDAHO
Physiographic province(s)	NORTHERN ROCKY MOUNTAINS
Reliability of location	Poor Compiled at 1:250,000 scale. *Comments:* Fault trace based 1:62,500-scale geologic map showing inferred location (Witkind, 1972 #534).
Geologic setting	The Madison fault is a high-angle, down-to-the-west, range-front normal fault bounding the western side of Madison Range. Maximum depth to basement in northern Madison Valley is about 2.1 km, in central Madison Valley the depth may exceed 4.5 km, and in southern Madison Valley about 1.2 km (Schofield, 1981 #314; Rasmussen and Fields, 1985 #481). Maximum total throw is probably more than 8 km according to Locke and Schneider (1990 #253).
Length (km)	This section is 6 km of a total fault length of 98 km.
Average strike	N44°W (for section) versus N20°W,N26°W (for whole fault)
Sense of movement	Normal *Comments:* (Witkind, 1975 #317)
Dip Direction	SW *Comments:* Dip is inferred to be steep or possibly vertical (Johns and others, 1982 #259); however, Rasmussen and Fields (1985 #481) suggest fault is listric and soles into a Laramide thrust based on seismic data.
Paleoseismology	

studies	
Geomorphic expression	
Age of faulted surficial deposits	
Historic earthquake	
Most recent prehistoric deformation	late Quaternary (<130 ka) *Comments:* Age is from Stickney and Bartholomew (1987 #85; written commun. 1992 #556) based on three scarps on deposits inferred to be late Pleistocene (Pinedale to post-Bull Lake and Bull Lake to pre-Bull Lake) in age. Pierce and Morgan (1992 #539) also indicate late Pleistocene age. The Holocene faulting documented by Johns and others (1982 #259) is along the part of the fault included in the Madison section [655b].
Recurrence interval	
Slip-rate category	Less than 0.2 mm/yr *Comments:* No published slip rate is known for this section. Inferred low slip rate based on lack of evidence to indicate otherwise. Comparison of 1923 second-order and 1960 first-order leveling data indicate uplift rate of 3 to >5 mm/yr in this area, with the higher rates to the north of this section (Reilinger and others, 1977 #479).
Date and Compiler(s)	1994 Kathleen M. Haller, U.S. Geological Survey
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