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Quaternary Fault and Fold Database of the United States

As of January 12, 2017, the USGS maintains a limited number of metadata fields that characterize the Quaternary faults and folds of the United States. For the most up-to-date information, please refer to the interactive fault map.

Mallard Lake resurgent dome faults (Class B) No. 753

Last Review Date: 1998-03-19

citation for this record: **Pierce, K.L., compiler, 1998, Fault number 753, Mallard Lake resurgent dome faults, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, https://earthquakes.usgs.gov/hazards/qfaults, accessed 12/14/2020 01:59 PM.**

Synopsis	The Mallard Lake resurgent dome is broken by an anastomosing band of about eight northwest-trending faults that offset the 150- to 160-ka Mallard Lake rhyolite flow. Based on ages of faulted and unfaulted rhyolite flows, faulting occurred at about 160 ka; a time that is considerably younger than that when the caldera erupted resulting in the Lava Creek Tuff approximately 630 ka. Owing to the thickness of the brittle layer of the crust (only 3-5 km) inside the caldera, earthquakes of only limited magnitude may be generated on these faults (Smith and Braile, 1993 #2271). We assign these faults to Class B, since they may be largely volcanic in origin and may be incapable of generating large magnitude (M>6.5) earthquakes.
Name	Name derived from one of two resurgent domes of the 0.63-Ma

comments	Yellowstone caldera. Shown by U.S. Geological Survey (1972 #639) as group of about eight anastomosing faults. Referred to as the Mallard Lake faults by Case (1997 #3449; 1997 #3450) and the "zone of faults near Shoshone and Mallard Lakes, Wyoming" by Wong and others (2000 #4484).
County(s) and State(s)	TETON COUNTY, WYOMING
Physiographic province(s)	MIDDLE ROCKY MOUNTAINS
Reliability of location	Good Compiled at 1:125,000 scale. *Comments:* Mapped at 1:62,500 scale by Christiansen and Blank (1974 #2264; 1974 #2265), Christiansen (1974 #2266; 1975 #2267), and also published at 1:125,000 scale by U.S. Geological Survey (1972 #639).
Geologic setting	One of two resurgent domes of the Yellowstone caldera that erupted the 630 ka Lava Creek Tuff. Discussion of chronology of doming is in Christiansen (2001 #1784).
Length (km)	12 km.
Average strike	N43°W
Sense of movement	Normal
Dip Direction	NE; SW
Paleoseismology studies	
Geomorphic expression	Fault scarps are well expressed on the 150- to 160-ka Mallard Lake flow (rhyolitic bedrock).
Age of faulted surficial deposits	The faults are present in the Mallard Lake flow, which is about 150-160 ka based on age determinations from the flow and ages from stratigrapically related rhyolite flows (Obradovich, 1992 #2268). The faults do not extend into slightly younger rhyolite flows, suggesting they have not been active in the past 150 k.y.
Historic earthquake	
Most recent	middle and late Quaternary (<750 ka)

prehistoric deformation	*Comments:* Uplift and faulting of the Mallard Lake dome occurred about 160 ka (Christiansen, 2001 #1784). Some low level(?) minor fracturing on these faults may be important to upward movement of geothermal waters in the Midway Geyser Basin immediately to the northwest of the Mallard Lake dome (R.B. Smith, oral commun. to compiler, 1998).
Recurrence interval	*Comments:* The faults associated with the resurgent doming were active about 160 ka (Christiansen, 2001 #1784), and are now inactive or much less active than previously. Based on interpretation of drill holes where the Lava Creek Tuff is structurally high, Christiansen (2001 #1784) concluded that an earlier phase of resurgent doming probably also occurred about 500 ka.
Slip-rate category	Less than 0.2 mm/yr *Comments:* The faults associated with the resurgent doming were active about 160 ka, and are inactive or much less active now. Wong and others (2000 #4484) suggested a slip rate of 0.08 mm/yr based on an assumption that the faults had the same activity as the Polecat Creek faults (part of the Snake River caldera faults [765]). Low slip-rate category is inferred from the relative inactivity of the faults.
Date and Compiler(s)	1998 Kenneth L. Pierce, U.S. Geological Survey, Emeritus
References	#3450 Case, J.C., 1997, Earthquakes and active faults in Wyoming: Geological Survey of Wyoming Preliminary Hazard Report 97-2, 58 p. #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. #2266 Christiansen, R.L., 1974, Geologic map of the West Thumb quadrangle, Yellowstone National Park, Wyoming: U.S. Geological Survey Geologic quadrangle Map GQ-1191, scale 1:62,500. #1784 Christiansen, R.L., 2001, The Quaternary and Pliocene

Yellowstone Plateau volcanic field of Wyoming, Idaho, and Montana: U.S. Geological Survey Professional Paper 729-G, 145 p., 3 pls., scale 1:125,000.

#2264 Christiansen, R.L., and Blank, H.R., Jr., 1974, Geologic map of the Old Faithful quadrangle, Yellowstone, National Park, Wyoming: U.S. Geological Survey Geologic quadrangle Map GQ-1189, scale 1:62,500.

#2265 Christiansen, R.L., and Blank, H.R., Jr., 1974, Geologic map of the Madison Junction quadrangle, Yellowstone National Park, Wyoming: U.S. Geological Survey Geologic quadrangle Map GQ-1190, scale 1:62,500.

#2267 Christiansen, R.L., and Blank, H.R., Jr., 1975, Geologic map of the Norris Junction quadrangle, Yellowstone National Park, Wyoming: U.S. Geological Survey Geologic quadrangle Map GQ-1193, scale 1:62,500.

#2268 Obradovich, J.D., 1992, Geochronology of the late Cenozoic volcanism of Yellowstone National Park and adjoining areas, Wyoming and Idaho: U.S. Geological Survey Open-File Report 92-408, 45 p.

#2271 Smith, R.B., and Braile, L.W., 1993, Topographic signature, space-time evolution, and physical properties of the Yellowstone-Snake River plain volcanic system—the Yellowstone hotspot, *in* Snoke, A.W., Steidtmann, J.R., and Roberts, S.M., eds., Geology of Wyoming: Geological Survey of Wyoming, Memoir No. 5, p. 694-754.

#639 U.S. Geological Survey, 1972, Geologic map of Yellowstone National Park: U.S. Geological Survey Miscellaneous Geologic Investigations I-711, 1 sheet, scale 1:125,000.

#4484 Wong, I., Olig, S., and Dober, M., 2000, Preliminary probabilistic seismic hazard analyses—Island Park, Grassy Lake, Jackson Lake, Palisades, and Ririe Dams: U.S. Department of the Interior, Bureau of Reclamation Technical Memorandum D8330-2000-17.

Questions or comments?