Quaternary Fault and Fold Database of the United States

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White Mountains fault zone, central section (Class A) No. 47c

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Compiled in cooperation with the California Geological Survey

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Synopsis	**General:** This major Basin and Range Holocene active dextral-normal and normal fault zone is located along the western front of the White Mountains and northern Inyo Mountains. The fault zone is divided into 4 sections in this compilation, principally based on by modified from sections delineated by dePolo (1989 #2456). From north to south the sections are Montgomery, Hammil, central, and Inyo-Waucoba. There have been no paleoseismic studies using trenching, but dePolo (1989 #2456) profiled several fault scarps along strands of the fault zone and reported evidence of late Holocene displacement. A late Holocene

	event that dePolo (1989 #2456) termed the Black Mountain paleoseismic rupture occurred at 3 ka (?2 k.y.), based on diffusion modeling. dePolo (1989 #2456) estimated a preferred latest Pleistocene to Holocene vertical slip rate of 0.8-1mm/yr for the northern part of the White Mountains fault zone, based on amounts of offset of alluvial-fan surfaces their soil profile development for age constraints. Slip rates for the southern part of the fault zone are not as well documented due to a significant, but poorly constrained dextral strike-slip component. dePolo (1989 #2456) estimated an average recurrence interval of 3-5 k.y. based on offset Holocene alluvium at Marble Creek and Orchard Springs (Montgomery section). **Sections:** This fault has 4 sections. There is insufficient data to delineate seismogenic segments. dePolo (1989 #2456) proposed that the White Mountains fault zone consists of 5 sections, based on geomorphic expression. From north to south the sections are Montgomery, Hammil, central, Waucoba, and Inyo. These sections are adopted in this compilation with the exception of the Waucoba section. dePolo stated that the boundary between the Waucoba and Inyo sections is arbitrary and so a combined Inyo-Waucoba section is used in this compilation.
Name comments	**General:** The White Mountains fault zone was first mapped in detail by Anderson (1933 #5595) and Taylor (1933 #5607). Anderson, who mapped the northern part of the fault zone, called this part the Montgomery fault zone. Crowder and others (1972 #5600) and Crowder and Sheridan (1972 #5594) first used the name White Mountains fault zone generally for bedrock faults in the Montgomery and Hammil sections of fault zone. Bryant (1984 #5589; 1984 #5597; 1984 #5598) called the fault zone south of Milner Canyon the White Mountains frontal fault zone, whereas dePolo (1989 #2456) proposed the name White Mountains fault system. The name White Mountains fault zone will be used in this compilation. It includes the Benton Valley fault, named by Smith (1984 #5606) and the Aberdeen fault, first named by dePolo (1989 #2456). **Section:** The central section, first proposed by dePolo (1998 #2845), extends from Milner Canyon southeast to near Black Mountain, about 3 km north of the Westgard Pass road. **Fault ID:** Refers to numbers 204 (northern part of White Mountains fault and Benton Valley fault) of Jennings (1994 #2878), and faults MA10 (Benton Valley fault) and MA11A

	(White Mountains fault system) of dePolo (1989 #2456).
County(s) and State(s)	INYO COUNTY, CALIFORNIA MONO COUNTY, CALIFORNIA
Physiographic province(s)	BASIN AND RANGE
Reliability of location	Good Compiled at 1:62,500 scale. *Comments:* Locations are based on digital relocations of Jennings (1994 #2878) mapping. Original mapping by Bateman (1965 #5587), Bryant (1984 #5597; 1984 #5598), and dePolo (1989 #2456) is at 1:62,500 scale; mapping by Bryant (1984 #5589) is at 1:48,000 scale.
Geologic setting	The White Mountains fault zone is a major, north- to northwest-striking zone of normal and dextral strike-slip faults that extend about 115 km along the western front of the White Mountains and northern Inyo Mountains. The fault zone extends from Northern Queen Valley in Nevada along a somewhat arcuate southwest trend. The fault zones intersection of the Benton Valley fault marks a change in strike to generally north-south along the western front of the White Mountains. South of the Waucoba embayment, the fault changes to a southwest trend delineated by the Aberdeen fault, which may complexly link with the Owens Valley [51] fault zone. The White Mountains fault zone is in the western portion of the Basin and Range province, an area characterized by oblique extensional tectonics resulting in both dextral strike-slip and normal dip-slip displacement. Anderson (1933 #5595) estimated 2,433 m of total vertical displacement along the White Mountains fault. Gilbert (1938 #5602; 1941 #5604) reported 1,824-2,134 m of vertical displacement. Total dextral strike-slip displacement has not been documented. Surface fault ruptures of as much as 5 mm dextral-normal displacement occurred along the central section of the White Mountains fault zone [47c] in association with the July 21, 1986 Mw 6.1 Chalfant Valley earthquake (Kahle and others, 1986 #5605; dePolo and Ramelli, 1987 #3339; Lienkaemper and others, 1987 #3371).
Length (km)	This section is 38 km of a total fault length of 109 km.
Average strike	N10°W (for section) versus N7°W (for whole fault)
Sense of	Right lateral

movement	*Comments:* Early workers (Bateman, 1965 #5587; 1984 #5589; Bryant, 1984 #5597; 1984 #5598; Findley, 1984 #5601) considered displacement along the central section as east-side-down, normal and viewed these faults as antithetic to the larger, west-side-down normal fault to the east. dePolo (1989 #2456) concluded that the dominant sense of displacement along the central section is dextral strike-slip, although a normal component is present. The strike-slip component is based on dextrally offset alluvial units, dextrally deflected drainages and other geomorphic features characteristic of strike-slip offset, left-stepping en echelon fault traces, and the overall linear strike of the fault traces in this section (dePolo, 1989 #2456).
Dip	70° W to 90° *Comments:* Data on dip angle are not well constrained. dePolo and Ramelli (1987 #3339) reported a dip of near vertical (90?) to 70? west based on the linear surface expression of the central section. dePolo (1989 #2456) shows a preferred 70?W dip, based on the mainshock and aftershock sequence of the 07/21/1986 Chalfant Valley earthquake. Geophysical surveys suggest a major, relatively simple fault zone bounding the western border of the White Mountains Mountains (Pakiser and others, 1964 #1596; Oliver and Robbins, 1978 #5647). Gravity data indicates the fault zone dips steeply west and locally may be vertical (Oliver and Robbins, 1978 #5647).
Paleoseismology studies	Slip rates were determined from two study localities on this section by Kirby and others (2002 #5645). At Polenta Canyon (site 47c-2, about 10 km east of Bishop), they determined a minimum lateral offset of 450-550 m from an offset shutter ridge. Further north at site 47c-1 near Gunter Creek, the Bishop ash shows 200-300 m of vertical offset. The combined (oblique) slip rate is 0.7-0.8 mm/yr (minimum) for the middle and late Quaternary.
Geomorphic expression	Fault is characterized by well defined geomorphic features indicative of dextral-normal offset, such as prominent, generally east-facing scarps on late Quaternary and Holocene alluvium, closed depressions, ponded alluvium, beheaded drainages, and shutter ridges (1984 #5589; Bryant, 1984 #5597; 1984 #5598; dePolo, 1989 #2456).

Age of faulted surficial deposits	Strands of the central section offset Pleistocene and Holocene alluvium (1984 #5589; Bryant, 1984 #5597; 1984 #5598; dePolo, 1989 #2456). At Sabies Canyon, two debris flow lobes are dextrally offset 4-6 m and a bevel preserved on the fault scarp indicates two probable surface rupturing events. dePolo (1989 #2456) estimated an age of 5-10 ka for these offset debris flow lobes based on soil profile development.
Historic earthquake	
Most recent prehistoric deformation	latest Quaternary (<15 ka) *Comments:* dePolo (1989 #2456) identified probable middle to late Holocene displacement along the southern part of the central section and termed this event the "Black Mountain paleoseismic event". dePolo (1989 #2456) identified this paleoevent based on the youthful geomorphic expression and reported that it extends from the area between Poleta and Silver canyons southeast to just north of Westgard Pass road, a distance of about 16 km. dePolo (1989 #2456) estimated that the Black Mountain paleoseismic event occurred at 3?2 ka, based on diffusion modeling of nine fault scarp profiles.
Recurrence interval	*Comments:* Wesnousky (1986 #5305) estimated a recurrence interval of about 3 k.y. for the entire White Mountains fault zone, based on a preferred vertical slip rate of 0.8 mm/yr and an assumed Mw 7.1 earthquake.
Slip-rate category	Between 0.2 and 1.0 mm/yr *Comments:* dePolo (1989 #2456) calculated a maximum Holocene dip-slip rate of 0.72-3.6 mm/yr (1.2 mm/yr preferred) for the southern part of the central section. This rate is based on a 3.1-m-high scarp (3.6 m dip-slip displacement assuming 60? dip angle) and the time of the Black Mountain paleoseismic event (3?2 ka), which is based on fault-scarp-diffusion modeling. The slip rate is a maximum because the assumed time interval does not represent a full interseismic interval. dePolo (1989 #2456) calculated a Holocene dextral slip rate of 0.4-1.2 mm/yr based on the dextral offset of a Holocene(?) (age poorly constrained) alluvial fan. Slip rates were also determined from two study localites on this section by Kirby and others (2002 #5645). At

	Polenta Canyon (about 10 km east of Bishop), they determined a minimum lateral offset of about 450-550 m from a shutter ridge that lacks granitic material. Using an age of 760 ka for the interbedded Bishop ash, they calculated a minimum lateral-slip rate of 0.6-0.8 mm/yr. Further north, the same ash shows 200-300 m of vertical offset, yielding a vertical slip rate of 0.3-0.4 mm/yr Their combined (oblique) slip rate is 0.7-0.8 mm/yr (minimum) for the middle and late Quaternary (past 760 k.y.).
Date and Compiler(s)	2000 William A. Bryant, California Geological Survey
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