

# 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](#).

## Sugarloaf fault zone (Class A) No. 945

Last Review Date: 1996-09-20

### Compiled in cooperation with the Arizona Geological Survey

*citation for this record:* Pearthree, P.A., compiler, 1996, Fault number 945, Sugarloaf fault zone, 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 03:14 PM.

#### Synopsis

This low, fairly continuous fault scarp on bedrock trends north to northwest for about 10 km along the western margin of small sedimentary basin on the flank of the Mazatzal Mountains. The Sugarloaf fault zone continues for about 10 km further north, but minimal topographic relief across this part of the fault implies little or no Quaternary displacement. Detailed surficial geologic mapping shows almost no scarps on alluvium along the fault zone. However, interpretation of natural exposures and two fault trenches indicate that late to latest Pleistocene alluvium is faulted and Holocene alluvium is not faulted. The long-term slip rate is quite low, but there is insufficient evidence to estimate recurrence intervals.

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| <b>Name comments</b>             | Initially identified by Fugro (1981 #2136); named by Menges and Pearthree (1983 #2073); mapped and investigated by Anderson and others (1986 #1313); mapped and investigated by Pearthree and others (1995 #2138).   |
| <b>County(s) and State(s)</b>    | MARICOPA COUNTY, ARIZONA   |
| <b>Physiographic province(s)</b> | BASIN AND RANGE  |
| <b>Reliability of location</b>   | Good<br>Compiled at 1:250,000 scale.<br><br><i>Comments:</i> Trace based on detailed mapping at 1:12,000 (Anderson and others, 1986 #1313) and 1:24,000 scale by Skotnicki (1992 #2139; 1992 #2140) and Pearthree and others (1995 #2138).   |
| <b>Geologic setting</b>          | The Sugarloaf fault is located in the Transition Zone between the Colorado Plateau and the Basin and Range provinces. This normal fault defines the western margin of a small basin that represents a shallow (<200-m-deep), asymmetric graben, just west of the Mazatzal Mountains.     |
| <b>Length (km)</b>               | 8 km.  |
| <b>Average strike</b>            | N40°W  |
| <b>Sense of movement</b>         | Normal<br><br><i>Comments:</i> Fault planes are exposed in trenches, stream cuts, and road cuts; the sense of movement is inferred from interpretation of drag deformation in fault sediment exposed in the hanging wall, and regional relationships (Pearthree and others, 1995 #2138). |
| <b>Dip</b>                       | 70° to 80° E<br><br><i>Comments:</i> Fault dips have been measured in roadcut, gully, and trench exposures.  |
| <b>Paleoseismology studies</b>   | Site 945-1. Three trenches were excavated across the fault and a natural fault exposure was cleaned off and interpreted (Pearthree   |

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|  | and others, 1995 #2138). Detailed study of these exposures indicates that upper and probably uppermost Pleistocene alluvium is faulted against granite; middle to upper Holocene deposits are not faulted. A small trench excavated across an apparent middle to late Holocene fault scarp reported by Pearthree and Scarborough (1984 #2137) and Anderson and others (1986 #1313) revealed no fault deformation of strata beneath the scarp, and archeological evidence that the undeformed strata below the scarp are 1 ka or less in age. Thus, this scarp is not a fault-related feature, and may be anthropogenic in origin (Pearthree and others, 1995 #2138). |
| <b>Geomorphic expression</b>               | Fault forms low but fairly sharply-defined, east-facing scarps as much as 5 m high at the boundary between weathered Precambrian granite and Tertiary basin-fill sediment. The bedrock escarpment associated with the fault is not high, but it is quite linear and fairly steep. Fault scarps formed on alluvium are rare and poorly preserved.   |
| <b>Age of faulted surficial deposits</b>   | Late to latest Pleistocene. Age based on soil development and regional correlations.   |
| <b>Historic earthquake</b>                 |  |
| <b>Most recent prehistoric deformation</b> | late Quaternary (<130 ka)<br><br><i>Comments:</i> The estimated age of faulted deposits is upper to uppermost Pleistocene thereby indicating late Quaternary activity; however, middle Holocene and younger deposits are not faulted.  |
| <b>Recurrence interval</b>                 | <i>Comments:</i> Evidence for more than one Quaternary fault movement is strong; but the timing of faulting events prior to the latest event is very poorly constrained.   |
| <b>Slip-rate category</b>                  | Less than 0.2 mm/yr<br><br><i>Comments:</i> A low slip rate is inferred based on less than than 1 m of vertical displacement occurring in the past 50-100 ka. However, calculation of slip rates from this information are problematic, because there is no evidence of earlier Quaternary displacement on the fault zone.   |

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| <b>Date and Compiler(s)</b> | 1996<br>Philip A. Pearthree, Arizona Geological Survey   |
| <b>References</b>           | <p>#1313 Anderson, L.W., Piety, L.A., and Hansen, R.A., 1986, Seismotectonic investigation Stewart Mountain Dam Salt River Project, Arizona: U.S. Bureau of Reclamation Seismotectonic Report 86-2, 41 p., 4 pls.</p> <p>#2136 Fugro National, Inc., 1981, Seismotectonic study, Stewart Mountain Dam, Arizona: Report prepared for Water and Power Services, U.S. Bureau of Reclamation, Denver, Colorado, 39 p.</p> <p>#2073 Menges, C.M., and Pearthree, P.A., 1983, Map of neotectonic (latest Pliocene-Quaternary) deformation in Arizona: Arizona Geological Survey Open-File Report 83-22, 48 p., scale 1:500,000.</p> <p>#2137 Pearthree, P.A., and Scarborough, R.B., 1984, Reconnaissance analysis of possible Quaternary faulting in central Arizona: Arizona Bureau of Geology and Mineral Technology Open-File Report 85-4, 75 p., scale 1:250,000.</p> <p>#2138 Pearthree, P.A., Vincent, K.R., Brazzier, R., Fellows, L.D., and Davis, O.K., 1995, Seismic hazard posed by the Sugarloaf fault, central Arizona: Arizona Bureau of Geology and Mineral Technology Open-File Report 95-7, 41 p., scale 1:12,350.</p> <p>#2139 Skotnicki, S., 1992, Geology of the Sycamore Creek region, Maricopa County, Arizona: Tempe, Arizona State University, unpublished M.S. thesis, 126 p., scale 1:24,000.</p> <p>#2140 Skotnicki, S., 1992, Geologic map of the Sycamore Creek region, Maricopa County, Arizona: Arizona Geological Survey Contributed Map 92-D, 1 sheet, scale 1:24,000.</p> |

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