

WSSPC Awards in Excellence 2009

Research

Wasatch and Sevier Faults Paleoseismic Research

Utah Geological Survey

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The Utah Geological Survey (UGS) maintains a long standing paleoseismic research program to investigate Utah's active faults and to determine fault parameters critical to understanding the state's earthquake hazard and reducing earthquake risk to the state's citizens. In 2008 the UGS conducted two fault paleoseismic studies and published the results of that research. The two studies were UGS Special Study 122 *Paleoseismic Reconnaissance of the Sevier Fault, Kane and Garfield Counties, Utah*, and UGS Special Study 124 *Paleoseismic Investigation of the Northern Strand of the Nephi Segment of the Wasatch Fault Zone at Santaquin, Utah*.

Special Study 122 characterized the relative level of activity of the Sevier fault in southwestern Utah. The Sevier fault (known as the Toroweap fault in Arizona) trends generally north-south through southwestern Utah and northern Arizona. Approximately 108 km of the 250-kilometer-long fault are in Utah. This study used aerial-photograph analysis, field reconnaissance, detailed mapping of selected areas, and new geochemical analyses and $^{40}\text{Ar}/^{39}\text{Ar}$ radiometric ages for volcanic flows displaced by the fault. Paleoseismic results of this study include estimates of geologic slip rates and surface-faulting recurrence intervals at two critical locations in Utah, and identifying two possible seismological segment boundaries along the Utah portion of the fault. Determining paleoseismic parameters for the Sevier fault is important because they help the Utah Geological Survey assess the level of seismic hazard presented by the fault to southwestern Utah, and assist the U.S. Geological Survey in updating the Quaternary Fault and Fold Database of the United States and evaluating the Sevier fault's significance to the National Seismic Hazard Maps.

Special Study 124 characterizes the relative activity of the northern part of the Nephi segment of the Wasatch fault zone. The Nephi segment consists of distinct northern and southern strands, and all previous paleoseismic investigations on the segment have been conducted on the southern strand. To resolve issues related to similarities or differences in the timing, displacement, and magnitude of prehistoric surface-faulting earthquakes between the strands, the UGS excavated two trenches on the northern strand at Santaquin. The study includes discussions of (1) previous paleoseismic investigations on the Nephi segment, (2) the geology of the Santaquin trench site and excavations, (3) paleoseismic results, including the timing of the most recent surface-faulting earthquake, fault displacement and slip rate, and surface-faulting recurrence and magnitude, and (4) implications for segmentation of the southern Wasatch fault zone. Determining paleoseismic parameters for the entire Nephi segment is important because the new data help refine segmentation models for the Nephi and Provo segments, which are key components of understanding the past (Holocene) and future behavior of the WFZ, improving WFZ hazard models, and reducing Utah's earthquake-related risk.