

Utah Quaternary Fault Parameter Working Group
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Key Words: Neotectonics, Quaternary Fault Behavior, Paleoseismology

INVESTIGATIONS UNDERTAKEN

The Utah Geological Survey (UGS) convened a Utah Quaternary Fault Parameter Working Group, hereafter referred to as the Working Group, composed of experts in paleoseismology, seismology, and engineering, to critically review Utah's existing Quaternary fault paleoseismic data derived from fault trenching studies. The Working Group is charged with using the reviewed paleoseismic data to establish consensus recurrence-interval and slip-rate estimates for the six active segments of the Wasatch fault zone and Utah's other Quaternary faults where trenching data are available.

Consensus recurrence-interval and slip-rate data are critical to reducing losses from earthquakes in Utah for: (1) updating the National Seismic Hazard Maps for the Utah region, (2) providing peer-reviewed, consensus paleoseismic data for the debate regarding global positioning system (GPS) horizontal extension rates versus vertical paleoseismic slip rates and fault behavior (clustering, contagion, triggering) in the Basin and Range Province, (3) characterizing seismic sources in Utah, and (4) performing probabilistic seismic hazard analyses (PSHAs) for critical facilities, particularly along Utah's densely populated Wasatch Front. Additionally, once the reliability of the existing paleoseismic data is established, gaps in the data set can be identified and decisions made regarding where and what kinds of new paleoseismic data to collect to better understand and characterize Utah's earthquake hazard.

The Working Group

The Working Group consists of two categories of experts, all serving in a volunteer capacity. The first category consists of paleoseismic researchers having direct knowledge of Utah's Quaternary fault data set. The majority of these Working Group members have conducted research on one or more of Utah's Quaternary faults, and are in large measure responsible for the paleoseismic data being reviewed by the Working Group as a whole. The second category consists of knowledgeable individuals capable of providing critical analysis of the paleoseismic data, but who have not conducted paleoseismic studies in Utah and therefore have no vested interest in the Utah data. This group contains paleoseismologists, seismologists, and engineers.

The members of the Utah Quaternary Fault Parameter Working Group and their affiliations are listed in table 1.

Table 1. Members of the Utah Quaternary Fault Parameter Working Group and their affiliations.

Category 1: Paleoseismologists having Utah paleoseismic experience.

Suzanne Hecker – U.S. Geological Survey; Menlo Park, California
Michael Hylland – Utah Geological Survey; Salt Lake City, Utah
William Lund, Utah Geological Survey; Cedar City, Utah
Michael Machette – U.S. Geological Survey; Denver, Colorado
James McCalpin – GEO-HAZ Consulting; Crestone, Colorado
Alan Nelson – U.S. Geological Survey; Denver, Colorado
Craig Nelson – Western GeoLogic; Salt Lake City, Utah
Susan Olig – URS Corporation; Oakland, California
Dean Ostenaar – U.S. Bureau of Reclamation; Denver, Colorado
Stephen Personius – U.S. Geological Survey; Denver, Colorado
David Schwartz – U.S. Geological Survey; Menlo Park, California

Category 2: Subject matter experts who have not conducted paleoseismic studies in Utah.

Craig dePolo – Nevada Bureau of Mines and Geology; Reno, Nevada
Kathleen Haller – U.S. Geological Survey; Denver, Colorado
Philip Pearthree – Arizona Geological Survey; Tucson, Arizona
James Pechmann – University of Utah Seismograph Stations; Salt Lake City, Utah
Mark Peterson – U.S. Geological Survey; Denver, Colorado
Robert Smith – University of Utah Dept. of Geology and Geophysics; Salt Lake City, Utah
Ivan Wong – URS Corporation; Oakland, California

Utah Paleoseismic Database

There are 212 potentially active faults or fault sections recognized in Utah (Hecker, 1993; Black and others, 2003). Of that number, 31 have had one or more paleoseismic trenching studies performed on them, and have some or all of the following kinds of paleoseismic fault parameter data: event timing, mean repeat times, net displacement, and slip rate.

Although used extensively by a wide variety of researchers and geologic and engineering practitioners, Utah's current Quaternary fault parameter database has not been critically reviewed to determine data quality or the uncertainty limits associated with the data. The current database consists of data from nearly 60 studies representing the work of more than 40 researchers with varying levels of expertise and experience, and covering a time span from the inception of paleoseismic investigations on normal-slip faults approximately 25 years ago to the present. As a result, considerable variation exists in the quality and completeness of the data, variations that are not always apparent to researchers

from other fields that may use these data without recognizing important limitations associated with the data.

Table 2 lists the faults or fault sections reviewed by the Working Group.

Table 2. Quaternary faults and fault sections in Utah that have had paleoseismic trenching studies (Black and others, 2003).

Bear River fault zone	Washington fault zone, northern section
Hansel Valley fault	Wasatch fault zone, Brigham City segment
North Promontory fault	Wasatch fault zone, Weber segment
James Peak fault	Wasatch fault zone, Salt Lake City segment
Bald Mountain fault	Wasatch fault zone, Provo segment
Oquirrh fault zone	Wasatch fault zone, Nephi segment
Southern Oquirrh Mountains fault zone	Wasatch fault zone, Levan segment
Strawberry fault	East Cache fault zone, central section
Fish Springs fault	Morgan fault, central section
Sugarville area faults	East Bear Lake fault, southern section
Joes Valley fault zone (west fault)	West Valley fault zone, Taylorsville fault
Joes Valley fault zone (intragraben faults)	West Valley fault zone, Granger fault
Joes Valley fault zone (east fault)	West Cache fault, Clarkston fault
Towanta Flat graben	West Cache fault, Junction Hills fault
Hogsback fault, unnamed (southern) section	West Cache fault, Wellsville fault
Hurricane fault zone, Anderson Junction section	

Review Process

The Working Group review process consists of the following sequential tasks:

1. Preliminary Working Group meeting to establish review parameters and process. Due to delays in approval of the Federal FY 2003 budget, this initial meeting was replaced by e-mail, regular mail, and telephone contacts to facilitate project start-up.
2. Detailed review of published and unpublished paleoseismic data pertaining to the six active, central segments of the Wasatch fault zone and preparation of summary data sheets for each segment and the paleoseismic data sources (trenching studies) associated with them.
3. Distribution of summary data sheets to Working Group members for review and comment.
4. First Working Group meeting in Salt Lake City, Utah, on June 4 & 5, 2003, to evaluate the paleoseismic data for the six active central segments of the Wasatch fault zone.

5. Detailed review of published and unpublished paleoseismic data pertaining to the remaining Quaternary faults or fault sections in Utah for which paleoseismic trenching data are available, and preparation of summary data sheets for each of those structures and for the paleoseismic data sources associated with them.
6. Distribution of data sheets to Working Group members for review and comment.
7. Second Working Group meeting in Salt Lake City, Utah, on September 4 & 5, 2003, to evaluate the paleoseismic trenching data available for Utah's Quaternary faults, exclusive of the Wasatch fault zone.
8. Incorporation of the Working Group's recommendations regarding event timing, recurrence intervals, mean repeat times, and slip rates into a summary document for each fault or fault section.
9. Distribution of the draft summary documents to the Working Group for final review and comment.
10. Preparation of a Final Technical Report presenting the Working Group's results and recommendations.
11. Presentation of the Working Group's results and recommendations at a UGS-hosted symposium in Salt Lake City, and at appropriate professional society meetings.
12. Release of the Final Technical Report as a UGS publication to make consensus recurrence-interval and slip-rate data widely available to the interested user community.

RESULTS

As of September 30, 2003, review process tasks 1 through 7 have been completed and task 8 is in progress. Draft summary paleoseismic documents have been prepared for the five Wasatch fault zone segments on which repeated surface-faulting earthquakes have been identified. Similar documents are in preparation for the remaining faults and fault sections evaluated by the Working Group. Completion of tasks 2 and 5 resulted in an approximately 230-page, three-ring-binder volume of paleoseismic source document summary sheets covering all of Utah's Quaternary faults or fault sections for which trenching data are available.

NON-TECHNICAL SUMMARY

An expert panel is reviewing Utah's active fault database to determine the quality and completeness of the data, and to arrive at consensus values for the timing of past surface-faulting earthquakes, the lengths of the intervals between those earthquakes, and amount of earthquake fault displacement. The panel will then determine average repeat times between large potentially damaging earthquakes and/or the rate of slip on Utah's earthquake faults. That information will be used to help update the National Seismic Hazard Maps, provide consensus fault data for other researchers not familiar with Utah's active faults, and characterize seismic sources for earthquake-hazard studies.

REPORTS PUBLISHED

No reports have been published on the Working Group's activities as of September 30, 2003. However, limited copies of the paleoseismic data summary sheets prepared as part of the review process for each of Utah's Quaternary faults or fault sections for which paleoseismic trenching data are available can be obtained from the Utah Geological Survey at the address shown in the title above.

REFERENCES

- Black, B.D., Hecker, Suzanne, Hylland, M.D., Christenson, G.E., and McDonald, G.N., 2003, Quaternary fault and fold database and map of Utah: Utah Geological Survey Map 193DM, scale 1:50,000.
- Hecker, Suzanne, 1993, Quaternary tectonics of Utah with emphasis on earthquake-hazard characterization: Utah Geological Survey Bulletin 127, 157 p., 2 plates, scale 1:500,000.