THE WASATCH FAULT ZONE

The Wasatch fault zone extends about 240 miles along the Wasatch Front from Malad City, Idaho, on the north to Fayette, Utah, on the south. The fault is divided into 10 segments based on various geologic criteria; fault movement on a given segment is capable of generating earthquakes as large as M 6.5–7.5. Geologic evidence indicates that the five central segments between Brigham City and Nephi are the most active. These five segments coincide with the most densely populated part of Utah.

Even though no large earthquakes have ruptured the Wasatch fault in the 163 years since Mormon settlers first arrived in Utah, abundant geologic evidence shows that the central Wasatch fault has generated more than two dozen large (M ~7) earthquakes in the recent geological past. An earthquake of this size is a serious threat to the citizens of Utah and has the potential to be extremely destructive.

WHAT ARE WE DOING HERE?

At this site, the Utah Geological Survey (UGS) and the U.S. Geological Survey (USGS) are collaborating in a detailed research study of the Wasatch fault to determine the history of prehistoric, but geologically young movements on the fault. Each of these movements was caused by a large earthquake. Several strands of the Wasatch fault extend through the city, including one that lies beneath the East Bench. Because of extensive development, we have very little information about past large earthquakes for the part of the fault near Salt Lake City. Previous geologic mapping shows that the fault is close to and generally parallel to this site, and our search for possible research sites in Salt Lake Valley has shown that this site is one of the last opportunities to study the fault in the Salt Lake City area.

To determine the history of these past movements, we have excavated this trench across the trace of the fault at the ground surface. The UGS and USGS have conducted more than a dozen similar fault studies throughout the Wasatch Front in recent years, and we can use this information to better understand the pattern of past large earthquakes along the entire fault system.

HOW WILL WE CONDUCT OUR STUDY?

We have excavated this trench using a backhoe to expose layers of sediment in the hillslope at the site. The slope was formed by past fault movements (see examples from previous trench studies below), and by exposing the sediment, we can “read” the geologic record of past displacements on the fault. After the trench has been excavated, we will carefully clean the walls, set up a grid using string lines, and thoroughly photograph each square in the grid. We will also use colored flagging to mark out significant geologic
features including faults, different sediment layers, and locations where we will collect samples to date the age of the deposits. We will then use electronic distance measuring instruments to accurately measure and map each layer and fault. The result will be a very accurate and complete map of the trench wall. When we have completed our mapping and sampling, we will backfill the trench, regrade the slope, and lay grass seed and mulch to enhance revegetation. We expect to complete our work by the end of May or early June.

![Oblique aerial view from Google Earth of the study site (yellow marker) and location of mapped young faults (orange lines). More information on mapped faults in Utah is available at http://earthquake.usgs.gov/hazards/qfaults/.](image)

**WHAT WILL HAPPEN WHEN WE FINISH OUR STUDY?**

Following this field-based phase of our study, we will compile a detailed map of the site and the trench wall, measure displacements across faults exposed in the trench, and prepare samples to determine the age of various geologic deposits; we will likely use two dating methods, radiocarbon and luminescence dating. When we have the results of the dating and have completed our interpretation of the faulting history, all of this will be released in a written report by the UGS. You can see an example of one of these reports for a study we recently conducted in North Ogden at [http://ugspub.nr.utah.gov/publications/special_studies/ SS130.pdf](http://ugspub.nr.utah.gov/publications/special_studies/ SS130.pdf).
WHY ARE WE DOING THIS STUDY?

For more than thirty years, geologists have been conducting similar studies at numerous locations along the fault zone, and through these studies we have been able to develop a general picture of the patterns of large earthquakes along the entire Wasatch Front. The pattern of earthquakes in the geologically recent past is a reasonable guide to what we might expect in the future. The information from our study and the other similar studies helps define the rate of earthquake activity on the fault and can be used to reduce Utah’s risk to seismic hazards, for example, by providing updated information for seismic provisions in building codes.

View of the Wasatch fault exposed in a trench during a study conducted in 2005 near Santaquin, Utah. A large (M ~7) earthquake occurred after the soil formed (dated to 500–550 years ago) but before deposition of the scarp colluvium (sediment shed from a surface break or scarp formed in the earthquake and dated to about 425 years ago). The orange horizontal string lines are 1 meter (about 3 feet) apart. More information about this fault study can be found at http://ugspub.nr.utah.gov/publications/special_studies/SS-124.pdf.

Diagram showing deposits and faults exposed in a trench across the Wasatch fault zone at Willow Creek, near Mona, Utah. The deposits in this trench indicate that three large earthquakes have caused the fault to move and break the ground surface in the past few thousand years. More information about this study can be found at http://pubs.usgs.gov/sim/2007/2966/.
WHERE CAN I GET MORE INFORMATION ABOUT EARTHQUAKES IN UTAH?

The best source of information and valuable advice about earthquake preparation is available in an easy-to-read booklet prepared by the Utah Seismic Safety Commission (USSC) titled *Putting Down Roots in Earthquake Country*. It can be downloaded from the USSC Web site at [http://ussc.utah.gov/putting_down_roots.html](http://ussc.utah.gov/putting_down_roots.html).


MORE ONLINE RESOURCES

**Why should I care about earthquakes in Utah?**

Recent Earthquakes in Utah: [http://quake.utah.edu/](http://quake.utah.edu/)
Earthquake Information Center: [http://quake.utah.edu/EQCENTER/eqcenter.htm](http://quake.utah.edu/EQCENTER/eqcenter.htm)
University of Utah Seismograph Stations: [http://quake.utah.edu](http://quake.utah.edu)

**Why should I prepare? and What should I do?**

American Red Cross: [http://utahredcross.org](http://utahredcross.org)
Be Ready Utah: [http://beready.utah.gov](http://beready.utah.gov)
Citizen Corps: [http://citizencorps.utah.gov](http://citizencorps.utah.gov)
Structural Engineers Association of Utah: [http://www.seau.org](http://www.seau.org)
Utah Association of Contingency Planners: [http://www.acputah.org](http://www.acputah.org)

**What else should I know?**

Utah ShakeMaps: [http://quake.utah.edu/shake/](http://quake.utah.edu/shake/)