2016 UTAH EARTHQUAKE WORKING GROUP MEETINGS
UTAH QUATERNARY FAULT PARAMETERS WORKING GROUP
AGENDA

Wednesday, February 10, 2016
Utah Department of Natural Resources Building, Room 2000 (2nd floor)
1594 West North Temple, Salt Lake City, Utah

8:00 Refreshments

8:15 Welcome, Overview of Meeting, and Review of Last Year's Activities: Steve Bowman, Utah Geological Survey

8:30 Technical Presentations of Work Completed or In Progress

- 8:30 – Active Faulting, Soil and Rock Type, and Groundwater Elevations Beneath Salt Lake City – Vp, Vs, and Reflection Images from a Seismic Land Streamer System: Lee Liberty, Boise State University

- 9:00 – Late Holocene Earthquake Record at the Corner Canyon Site on the Salt Lake City Segment of the Wasatch Fault Zone: Chris DuRoss, U.S. Geological Survey

- 9:30 – West Valley Fault Zone, Taylorsville Fault Paleoseismic Investigation: Adam Hiscock, Utah Geological Survey

- 10:00 – New Insight into the Late Cretaceous-Paleocene Cedar City-Parowan Monocline: Bob Biek, Utah Geological Survey

10:30 Break (15 minutes)

10:45 Technical Presentations of Work Completed or In Progress

- 10:45 – Field Investigations of Active Faulting in the Sevier Desert Region – Methods and Preliminary Results: Tim Stahl, University of Michigan, National Science Foundation Post-Doctoral Researcher

- 11:30 – Revisiting Utah Quaternary Faults – Moab, Joes Valley, and the Wasatch Fault Zone Segment Boundaries: Jim McCalpin, GEO-HAZ Consulting, Inc.

12:00 Lunch (1 hour)

1:00 Technical Presentations of Work Completed or In Progress

- 1:00 – Updated Utah Geological Survey Surface-Fault-Rupture and Other Geologic-Hazard Investigation and Report Guidelines: William Lund, Utah Geological Survey, Emeritus

- 1:30 – Characterization of Segmentation and Long Term Slip Rates of Wasatch Front Fault Systems, Utah: Julia Howe, University of Utah, Graduate Student

1:45 – Utah Quaternary Fault and Fold Database Status and Updates: Mike Hylland, Utah Geological Survey

2:15 – New Utah Earthquake and Quaternary Fault Map: Steve Bowman, Utah Geological Survey

2:30 – Paleoseismic Investigation within the Traverse Ridge Segment Boundary: Initial Plans for Summer 2016 Field Work: Nathan Toke, Utah Valley University

2:45 – Reconnaissance Mapping of the Pots Creek Fault, Northeastern Utah: Joanna Redwine and Lucy Piety, U.S. Bureau of Reclamation

3:00 Break (15 minutes)

3:15 Technical Presentations of Work Completed or In Progress

3:15 – The Great Salt Lake Fault and Its Microbial Mounds: Susanne Janecke, Utah State University

UAV-Survey and Photogrammetry Produce LiDAR-Like DEM of Scarps in Logan, Utah: Susanne Janecke, Utah State University and Michael Bunds, Jeremy Andreini, and Jack Wells, Utah Valley University

3:30 – New Data on Holocene Offsets and Slip Rates for the Oquirrh Fault from DEMs Made with Structure-from-Motion Methods: Michael Bunds, Jeremy Andreini, Michael Arnold, Kenneth Larsen, and Nathan Toke, Utah Valley University

4:00 – Update on the Working Group on Utah Earthquake Probabilities (WGUEP) Report, Data Developed, and Outreach: Ivan Wong, AECOM (WGUEP Chair)

4:15 – Basin and Range Province Seismic Hazard Summit III Summary: William Lund/Steve Bowman, Utah Geological Survey

4:30 Working Group 2017 Fault Investigation Priorities Discussion

See table 1 for the Utah Quaternary Fault Parameters Working Group (UQFPWG) list of faults requiring additional study, table 2 for the list of faults included in the USGS National Seismic Hazard Maps and/or the UGS Hazus Utah fault database, table 3 for a status of current paleoseismic investigations for Utah priority faults and fault segments, and tables 4 and 5 for the UQFPWG 2016 fault priority list.

5:00 Adjourn

Working Group Members

Steve Bowman	Utah Geological Survey (UQFPWG Chair)
Rich Briggs	U.S. Geological Survey, Earthquake Hazards Program
Michael Bunds	Utah Valley University
David Dinter	University of Utah, Department of Geology & Geophysics
Chris DuRoss	U.S. Geological Survey, Earthquake Hazards Program
Adam Hiscock	Utah Geological Survey (UQFPWG UGS Liaison)
Michael Hylland	Utah Geological Survey
Susanne Janecke	Utah State University
William Lund	Utah Geological Survey, Emeritus
Johnny MacLean	Southern Utah University
Jim Pechmann	University of Utah Seismograph Stations
Steve Personius	U.S. Geological Survey, Earthquake Hazards Program
Joanna Redwine	U.S. Bureau of Reclamation
Nathan Toke	Utah Valley University
Ivan Wong	AECOM
Adolph Yonkee	Weber State University

Publications

Paleoseismic investigations published by the Utah Geological Survey (UGS) are found in the Paleoseismology of Utah Series (http://geology.utah.gov/hazards/technical-information/paleoseismology-of-utah-series/). Most of the U.S. Geological Survey (USGS) National Earthquake Hazards Reduction Program funded investigations for Utah that were not published by the UGS are compiled in UGS Miscellaneous Publication 13-03 (http://files.geology.utah.gov/online/mp/mp13-03/mp13-03.pdf).

Utah Quaternary Fault and Fold Database

The UGS updated the *Utah Quaternary Fault and Fold Database* on July 1, 2015, incorporating new data and a complete review of previously published data through the end of 2013. Users of any Quaternary fault trace and related data acquired from the UGS or the Utah Automated Geographic Reference Center (AGRC) State Geographic Information Database (SGID) in the past are advised to use the updated database available from the AGRC SGID (http://gis.utah.gov/data/how-to-connect-to-the-sgid-via-sde/) as the SGID10.GEOSCIENCE.QuaternaryFaults feature class. This single, comprehensive feature class will be periodically updated as new/updated data become available (anticipated several times per year) and replaces the six previously available feature classes of variable completeness. A web map application for the database is available at http://geology.utah.gov/resources/data-databases/qfaults/.

Working Group Fault Study Priorities

In 2005, the UQFPWG developed a list of Quaternary faults and fault segments (table 1) that the working group identified as requiring additional investigation to adequately characterize Utah's earthquake hazard to a minimally acceptable level. The list was expanded during subsequent UQFPWG meetings in 2007, 2009, 2010, 2011, 2012, 2014, and 2015. Table 2 lists the faults and fault segments (earthquake sources) incorporated in the USGS National Seismic Hazard Maps and/or the UGS Hazus Utah fault database (updated through 2013, UGS Open-File Report 631) not listed in table 1 that may need additional investigation. Table 3 lists the current status of paleoseismic investigations for priority faults and fault segments in table 1. Tables 4 and 5 list the 2016 UQFPWG priority faults and fault segments. The UQFPWG will review the 2016 fault-investigation priorities and make changes as necessary for the 2017 priority list.

Table 1. *Current list of Quaternary faults and fault segments identified by the UQFPWG as requiring additional investigation to adequately characterize Utah's earthquake hazard to a minimally acceptable level.*

Utah Fault or Fault Segment	UQFPWG Priorities	
	2005[1]	Additions
Nephi segment, Wasatch fault zone[2,3]	1	--
West Valley fault zone[2,3]	2	--
Weber segment, Wasatch fault zone[2,3] – most recent event	3	--
Weber segment, Wasatch fault zone[2,3] – multiple events	4	--
Utah Lake faults and folds[3]	5	--
Great Salt Lake fault zone[2,3]	6	--
Collinston and Clarkston Mountain segments, Wasatch fault zone[3]	7	--
Sevier and Toroweap faults[2,3]	8	--
Washington fault zone[3] (includes Dutchman Draw fault[2])	9	--
Cedar City-Parowan monocline[3] and Paragonah fault[2,3]	10	--
Enoch graben[3]	11	--
East Cache fault zone[2,3]	12	--
Clarkston fault[2,3]	13	--
Wasatch Range back-valley faults (includes Morgan fault[2] and Main Canyon fault[3])	14	--
Hurricane fault zone[2,3]	15	--
Levan segment, Wasatch fault zone[2,3]	16	--
Gunnison fault[3]	17	--
Scipio Valley faults[3]	18	--
Faults beneath Bear Lake	19	--
Eastern Bear Lake fault zone[2,3]	20	--
Bear River fault zone[2,3]	--	2007
Brigham City segment, Wasatch fault zone[2,3] – most recent event	--	2007
Carrington fault, Great Salt Lake fault zone[3]	--	2007
Provo segment, Wasatch fault zone[2,3] – penultimate event	--	2007
Rozelle section, East Great Salt Lake fault[3]	--	2007
Salt Lake City segment, Wasatch fault zone[2,3] – northern part	--	2009
Warm Springs fault/East Bench fault[2,3] subsurface geometry and connection	--	2010
Brigham City segment, Wasatch fault zone[2,3] rupture extent (north and south ends)	--	2011
Northern Provo segment, Wasatch fault zone[2,3] – long-term earthquake record	--	2011
Taylorsville fault, West Valley fault zone[3]	--	2011
Hansel Valley fault[2,3]	--	2011
Acquire new paleoseismic information to address paleoseismic data gaps for the five central segments of the Wasatch fault zone.	--	2012
Use recently acquired LiDAR data to more accurately map the traces of the Wasatch, West Valley, and Hurricane fault zones, and search for and map as appropriate previously undiscovered mid-valley Quaternary faults.	--	2014
Acquire high resolution aerial imagery (LiDAR, Structure from Motion, etc.) and map high-risk (chiefly urban) Utah hazardous faults. Identify future paleoseismic trench sites.	--	2015

[1] Original priorities from the 2005 UQFPWG meeting.
[2] Earthquake source on the USGS National Seismic Hazard Maps.
[3] Earthquake source listed in the UGS Hazus Utah fault database (UGS Open-File Report 631).

Table 2. *Earthquake sources (faults and fault segments) in the USGS National Seismic Hazard Maps (NSHM) or the UGS Hazus Utah fault database (UGS Open-File Report 631) not listed in table 1 and that may warrant additional investigation.*

Utah Fault or Fault Segment	Included In	
	NSHM	Utah Hazus
Beaver Basin intrabasin/eastern margin faults	--	Yes
Crater Bench/Drum Mountains fault zone	--	Yes
Crawford Mountains (west side)	--	Yes
Cricket Mountains fault (west side)	--	Yes
Fish Springs fault	--	Yes
House Range (west side) fault	--	Yes
Joes Valley fault zone	Yes	Yes
Little Valley faults	--	Yes
Malad segment, Wasatch fault zone	--	Yes
Mineral Mountains (west side) faults	--	Yes
North Promontory fault	Yes	Yes
Oquirrh fault zone	--	Yes
Oquirrh-Southern Oquirrh Mountains fault zone	Yes	Yes
Parowan Valley faults	--	Yes
Pavant/Tabernacle/Beaver Ridge/Meadow-Hatton/White Sage Flat faults	--	Yes
Porcupine Mountain faults	--	Yes
Scipio/Pavant Range/Maple Canyon/Red Canyon faults	--	Yes
Skull Valley faults (southern part)	--	Yes
Snake Valley faults	--	Yes
Snow Lake graben	--	Yes
Stansbury fault zone	Yes	Yes
Strawberry fault	Yes	Yes
Wah Wah Mountains (south end)	--	Yes
West Cache fault, Wellsville section	Yes	Yes
Western Bear Lake fault	--	Yes

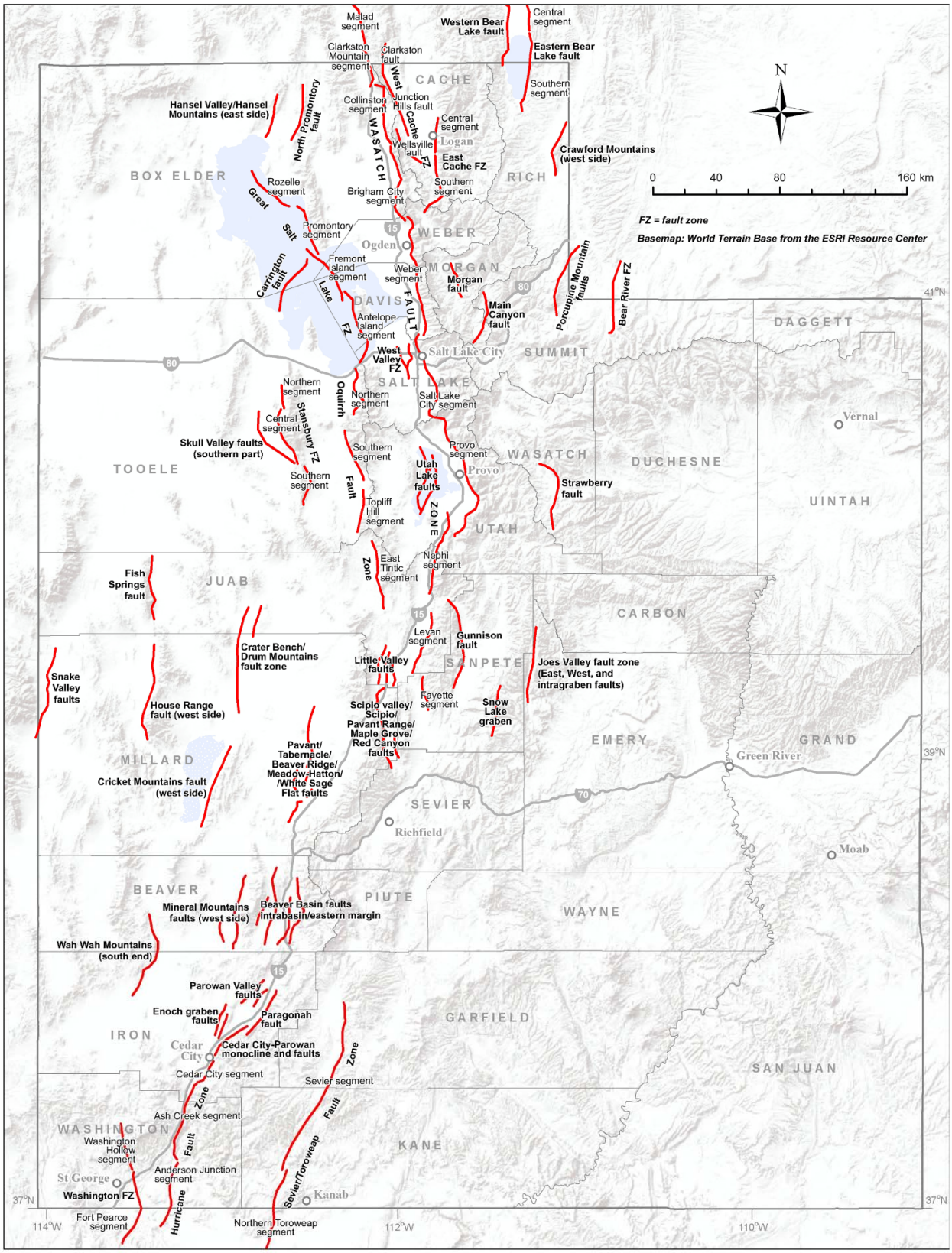

Figure 1. *Faults included in the UGS Hazus Utah fault database (updated through 2013, [UGS Open-File Report 631](#)).*

Table 3. *Current status of paleoseismic investigations for Utah priority faults and fault segments identified by the UQFPWG as requiring additional investigation to adequately characterize Utah's earthquake hazard to a minimally acceptable level.*

Fault or Fault Segment	UQFPWG Priority[1]	Investigations	
		Status[2,3] (as of 2/2016)	Institution[4]
Nephi segment, Wasatch fault zone[5,6]	1	UGS Special Study 124 and 151 USGS SI Map 2966 UGS FTR Report	UGS/USGS
Granger fault, West Valley fault zone[5,6]	2	UGS Special Study 149	UGS/USGS
Weber segment, Wasatch fault zone[5,6] – most recent event	3	UGS Special Study 130	UGS/USGS
Weber segment, Wasatch fault zone[5,6] – multiple events	4	UGS Special Study 130	UGS/USGS
Utah Lake faults and folds[6]	5	UUGG FTR Report	UUGG/BYU
Great Salt Lake fault zone[5,6]	6	UUGG FTR Report	UUGG
Collinston and Clarkston Mountain segments, Wasatch fault zone[6]	7	UGS Special Study 121 Map: UGS Open-File Report 638	UGS
Sevier and Toroweap faults[5,6]	8	UGS Special Study 122	UGS
Washington fault zone[6]	9	UGS Miscellaneous Publication 15-6	UGS
East Cache fault zone[5,6]	12	USU FTR Report	USU
Wasatch Range back-valley faults	14	No activity	--
Main Canyon fault[6]		UGS Miscellaneous Publication 10-5	USBR
Hurricane fault zone[5,6]	15	UGS Special Study 119	UGS
Levan segment, Wasatch fault zone[5,6]	16	UGS Map 229 Map: UGS Open-File Report 640	UGS
Brigham City segment, Wasatch fault zone[5,6] – most recent event	2007	UGS Special Study 142	UGS/USGS
Bear River fault zone[5,6]	2007	AGU Abstracts: 2012 and 2013 USGS ongoing	USGS/UGS
Salt Lake City segment, Wasatch fault zone[5,6] – north part	2009	UGS Special Study 149	UGS/USGS
Hansel Valley fault zone[5,6]	2011	McCalpin (1985), Robinson (1986), McCalpin and others (1992) UUGG ongoing	UUGG
Nephi segment, Wasatch fault zone[5,6] – long-term earthquake record	2012	UGS FTR Report	UGS/USGS
Provo, Salt Lake City and Nephi segments, Wasatch fault zone[5,6] segmentation	2012		
Flat, Maple, and Corner Canyons, and Alpine sites		USGS work ongoing UGS FTR Report	USGS/UGS
Fort Canyon fault, Traverse Mountains salient		Ongoing	UVU
Using LiDAR to map portions of the Hurricane[5,6], Wasatch[5,6], and West Valley[5,6] fault zones	2014	UGS Open-File Reports 638 and 640 Additional work ongoing	UGS
Acquire high resolution imagery and map Utah hazardous faults.	2015	One proposal funded (3DEP), second proposal not funded.	UGS/State of Utah

[1] See table 1 for complete working group priority list.
[2] FTR (Final Technical Report) to the USGS, Earthquake Hazards Program.
[3] Click on URL links to investigation report files available online.
[4] BYU (Brigham Young University), USBR (U.S. Bureau of Reclamation), USGS (U.S. Geological Survey, Earthquake Hazards Program), UGS (Utah Geological Survey), USU (Utah State University), UUGG (University of Utah Department of Geology & Geophysics), UVU (Utah Valley University).
[5] Earthquake source on the USGS National Seismic Hazard Maps.
[6] Earthquake source listed in the UGS Hazus Utah fault database (UGS Open-File Report 631).

Table 4. *Utah Quaternary Fault Parameters Working Group 2016 list of highest priority Quaternary faults or fault segments requiring additional investigation to adequately characterize Utah's earthquake hazard to a minimally acceptable level. The list will be reviewed at this meeting and revised as needed to develop the 2017 priority list.*

Fault or Fault Segment (Not in Priority Order)	Investigations	
	Status (as of 2/2016)[1,2]	**Institution**
Acquire paleoseismic information to address paleoseismic data gaps for (1) the five central segments of the Wasatch fault zone, (2) the Oquirrh fault zone, and (3) the East and West Cache fault zones. Examples of paleoseismic data to acquire include extent of surface-faulting rupture, earthquake timing, displacement, and subsurface fault geometry.	Nephi segment, Spring Lake and North Creek sites: UGS FTR Report, Special Study ongoing	UGS/USGS
	Provo segment, Flat Canyon site: USGS ongoing, UGS FTR Report	USGS/UGS
	Salt Lake City segment, Corner Canyon site: ongoing	UGS/USGS
	Provo segment, Dry Creek and Maple Canyon sites: USGS ongoing, UGS FTR Report	USGS/UGS
	Fort Canyon fault, Traverse Mountains salient: ongoing	UVU
Use recently acquired LiDAR data to more accurately map the traces of the Wasatch, West Valley, and Hurricane fault zones, and search for and map as appropriate previously undiscovered mid-valley Quaternary faults.	UGS Open-File Reports 638 and 640 The UGS is currently mapping portions of the Hurricane, Wasatch, and West Valley fault zones.	UGS
Acquire earthquake timing information for the Utah Lake faults to investigate the relation of earthquakes on that fault system to large earthquakes on the adjacent Provo segment of the Wasatch fault zone (independent or coseismic ruptures, fault pairs?).	No activity	--
Acquire high resolution aerial imagery (LiDAR, Structure from Motion, etc.) and map high-risk (chiefly urban) Utah hazardous faults. Identify future paleoseismic trench sites.	One proposal funded (3DEP), second proposal not funded.	UGS/State of Utah

[1] FTR (Final Technical Report) to the USGS, Earthquake Hazards Program.
[2] Click on URL link to investigation report files available online.

Table 5. *Utah Quaternary Fault Parameters Working Group 2016 list of other priority faults or fault segments requiring further investigation to adequately characterize Utah's earthquake hazard to a minimally acceptable level. The list will be reviewed at this meeting and revised as needed to develop the 2017 priority list.*

Fault or Fault Segment	UQFPWG Priority[1]	Investigations	
		Status (as of 2/2016)[2]	**Institution**
Cedar City-Parowan monocline and Paragonah fault[3,4]	10	Map: UGS Map 270	UGS
Enoch graben[5]	11	Map: UGS Open-File Report 628	UGS
Clarkston fault, West Cache fault zone[3,4]	13	UGS Special Study 98 Fault trace mapping proposal not funded.	UGS
Gunnison fault[4]	17	No activity	--
Scipio Valley faults[4]	18	No activity	--
Faults beneath Bear Lake	19	No activity	--
Eastern Bear Lake fault zone[4]	20	Fault trace mapping proposal not funded.	UGS
Carrington fault, Great Salt Lake fault zone[4]	2007	No activity	--
Rozelle section, Great Salt Lake fault zone[4,5]	2007	No activity	--

[1] See table 1 for complete working group priority list.
[2] Click on URL link to investigation report files available online.
[3] Earthquake source on the USGS National Seismic Hazard Maps.
[4] Earthquake source listed in the UGS Hazus Utah fault database (UGS Open-File Report 631).
[5] Previous highest priority fault or fault segment.