

SUMMARY
Utah Quaternary Fault Parameters Working Group Meeting
Tuesday, February 10, 2015
Utah Department of Natural Resources Building, Room 2000
1594 West North Temple, Salt Lake City

WELCOME AND INTRODUCTION

Bill Lund (Utah Geological Survey [UGS]) called the 2015 Utah Quaternary Fault Parameters Working Group (UQFPWG) meeting to order at 8:20 a.m. After welcoming Working Group members and guests (attachment 1), Bill summarized the UQFPWG's past activities and outlined the Working Group's purpose and goals for the future.

UQFPWG Purpose and Goals

- One of three standing committees created to help set and coordinate Utah's earthquake-hazard research agenda.
- Reviews ongoing paleoseismic research in Utah, and updates the Utah consensus slip-rate and recurrence-interval database as necessary.
- Provides advice/insight regarding technical issues related to fault behavior in Utah and the Basin and Range Province.
- Identifies and priorities future Utah Quaternary fault paleoseismic investigations.

TECHNICAL PRESENTATIONS

The following presentations were made on current paleoseismic research and related activities in Utah, most presentations are available at (http://geology.utah.gov/ghp/workgroups/pdf/uqfpwg/UQFPWG-2015_Presentations.pdf).

- Paleoseismology of the northern segments of the Great Salt Lake fault; David Dinter, University of Utah Department of Geology and Geophysics (UUGG) and Jim Pechmann, University of Utah Seismograph Stations (UUSS)
- Paleoseismology of Utah Lake; David Dinter, UUGG
- Spatial and temporal fault offset patterns derived from LiDAR along the central Wasatch fault zone; Scott Bennett, U.S. Geological Survey (USGS)
- Recent paleoseismic trenching studies along the Provo segment, Wasatch fault zone; Scott Bennett, USGS

- Preliminary results from the Corner Canyon trench site on the Salt Lake City segment on the Wasatch fault zone; Chris DuRoss, USGS
- Remapping of the Warm Springs fault, Salt Lake City segment of the Wasatch fault zone; Adam McKean, UGS
- LiDAR mapping of the Levan and Fayette segments of the Wasatch fault zone; Adam Hiscock and Mike Hylland, UGS
- Fault strip mapping and continued exploration of the existing Traverse Ridge trenches from the Utah Valley University's 2014 summer field experience; Nathan Toke', Utah Valley University (UVU)
- Applying structure from motion techniques to neotectonic investigations—Methods, error analysis, and examples; Michael Bunds, Nathan Toke', Andrew Fletcher, Michael Arnoff, and Brandon Powell, UVU
- New Boise State University NEHRP project: Seismic profiling in downtown Salt Lake City—Mapping the Wasatch fault with seismic velocity and reflection methods from a land streamer; Jim Pechmann, UUSS, and Lee Liberty, Boise State University
- Evidence of a third (barely prehistoric) earthquake on the Bear River fault zone; Suzanne Hecker, David Schwartz, Chris DuRoss, Adam Hiscock (UGS), Tarka Wilcox, USGS
- Update on planned paleoseismic trenching on the Taylorsville fault; Greg McDonald and Adam Hiscock, UGS
- Update on Working Group on Utah Earthquake Probabilities; Patricia Thomas and Ivan Wong, AECOM
- Report on Basin and Range Seismic Hazard Summit III; Bill Lund, UGS (no PowerPoint)

TECHNICAL DISCUSSION ITEMS

No technical discussion items came before the Working Group at this year's meeting.

UQFPWG 2015 FAULT STUDY PRIORITIES

In 2005, the UQFPWG recommended that 20 Quaternary faults/fault segments in Utah be investigated to “adequately characterize Utah’s earthquake hazard to a minimally acceptable level” (Lund, 2005). Since then, the Working Group has added an additional 11 faults/fault segments to the list: five in 2007, one in 2009, one in 2010, four in 2011, and two general recommendations

regarding the five central segments of the Wasatch fault zone and fault zone mapping in 2012 and 2014, respectively (see table 1 below). A new priority to acquire high resolution aerial imagery (LiDAR, Structure from Motion, etc.) and map high-risk (chiefly urban) Utah hazardous faults to identify future paleoseismic trench sites was added this year.

The UQFPWG conducts an annual review of progress made toward investigating the faults/fault segments on their priority list. Based on that review, the Working Group establishes a short list of the highest priority faults/fault segments for future study. The list of highest priority faults/segments is published on the UGS website, which is then referenced by the USGS Earthquake Hazards Program in their annual External Research Support (National Earthquake Hazards Reduction Program [NEHRP]) request for proposals. The Working Group's highest priority list for 2015 includes: (1) Acquire new paleoseismic information to address data gaps for (a) the five central segments of the Wasatch fault zone, (b) the northern segment of the Oquirrh fault zone, and (c) the East and West Cache fault zones. Examples of paleoseismic data to be acquired include surface rupture extent, earthquake timing, displacement, and fault geometry; (2) acquire earthquake timing information for the Utah Lake fault zone to investigate the relation of earthquakes on that fault system to large earthquakes on the adjacent Provo segment of the Wasatch fault zone (coseismic or independent rupture, fault pairs?); (3) 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 previously undiscovered mid-valley Quaternary faults; and (4) acquire high-resolution aerial imagery (LiDAR, Structure from Motion, etc.), and map high-risk (chiefly urban) Utah hazardous faults to identify new paleoseismic trench sites.

Table 2 shows both the 2015 highest priority fault/fault segment recommendations, and the current investigation status for all faults/fault segments identified by the UQFPWG as requiring additional study. Table 3 shows the status of current and complete paleoseismic investigations for Utah priority faults/fault segments. Note that the faults/fault segments listed in table 3 as having received some level of paleoseismic study does not imply that all of the paleoseismic data necessary to fully characterize those faults/fault segments has been acquired; further investigation of those structures may be (is likely) necessary. All of the faults/fault sections listed in table 2 remain priority structures and should be considered for future investigation if a compelling case can be made for the need to acquire additional paleoseismic data.

Table 1. List of Quaternary faults/fault segments identified by the UQFPWG as requiring additional study to adequately characterize Utah's earthquake hazard to a minimally acceptable level.

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

Table 2. UQFPWG 2015 list of highest priority Quaternary faults/fault segments requiring additional study to adequately characterize Utah's earthquake hazard to a minimally acceptable level.

2015 Highest Priority Faults/Fault Sections For Study			
Fault/Fault Section¹	Investigation Status		Investigating Institution²
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.	1. Nephi segment Spring Lake and North Creek sites, ongoing 2. Provo segment Flat Canyon site, ongoing 3. Salt Lake City segment Corner Canyon site, ongoing 4. Provo segment Dry Creek and Maple Canyon sites, ongoing		1. UGS/USGS 2. USGS/UGS 3. UGS/USGS 4. USGS/UGS
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.	The UGS is currently mapping portions of the 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.	No activity		
Other Priority Faults/Fault Sections Requiring Further Study			
Fault/Fault Section	Original UQFPWG Priority	Investigation Status	Investigating Institution
Cedar City-Parowan monocline/Paragonah fault ³	10	No activity	
Enoch graben	11	No activity	
Clarkston fault ³ (West Cache fault zone)	13	Black and others (2000)	
Gunnison fault	17	No activity	
Scipio Valley faults	18	No activity	
Faults beneath Bear Lake	19	No activity	
Eastern Bear Lake fault	20	No activity	
Carrington fault (Great Salt Lake)	2007	No activity	
Rozelle section, Great Salt Lake fault ⁴	2007	No activity	

¹Not in priority order.

²UGS (Utah Geological Survey), USGS (U.S. Geological Survey).

³Earthquake source on the USGS National Seismic Hazard Maps.

⁴Previous highest priority fault/fault segment.

Table 3. Status of current paleoseismic investigations for Utah priority faults/fault segments.

Fault/Fault Section	Original UQFPWG Priority	Investigation Status¹	Investigating Institution²
Nephi segment WFZ	1	UGS Special Study 124 USGS Map 2966 UGS Special Study 151	UGS/USGS
West Valley fault zone (Granger fault)	2	UGS Special Study 149	UGS/USGS
Weber segment WFZ – most recent event	3	UGS Special Study 130	UGS/USGS
Weber segment WFZ – multiple events	4	UGS Special Study 130	UGS/USGS
Utah Lake faults and folds	5	Contract deliverable FTR (UUGG investigation)	UUGG/BYU
Great Salt Lake fault zone	6	Contract deliverable FTR	UUGG
Collinston & Clarkston Mountain segments WFZ	7	UGS Special Study 121	UGS
Sevier/Toroweap fault	8	UGS Special Study 122	UGS
Washington fault zone	9	Contract deliverable FTR	UGS
East Cache fault zone	12	UGS Miscellaneous Publication 13-3	USU
Wasatch Range back-valley fault (Main Canyon fault)	14	UGS Miscellaneous Publication 10-5	USBR
Hurricane fault	15	UGS Special Study 119	UGS
Levan segment WFZ	16	UGS Map 229	UGS
Brigham City segment WFZ – most recent event	2007	Contract deliverable FTR	UGS/USGS
Bear River fault zone	2007	Ongoing	USGS
Salt Lake City segment WFZ – north part	2009	Contract deliverable FTR	UGS/USGS
Hansel Valley fault ³	2011	McCalpin (1985), Robinson (1986), McCalpin and others (1992), UUGG ongoing	UUGG
Long-term earthquake record Nephi segment WFZ – North Creek	2012	Contract deliverable FTR	UGS/USGS
Provo/Salt Lake City/Nephi segments Holocene fault segmentation – Flat Canyon, Alpine, Maple Canyon, and Corner Canyon trench sites	2012	Ongoing	USGS/UGS
Using LiDAR to map portions of the Wasatch and West Valley fault zones	2014	Ongoing	UGS

¹FTR (Final Technical Report) to the U.S. Geological Survey.

²UGS (Utah Geological Survey), USU (Utah State University), USGS (U.S. Geological Survey), UUGG (University of Utah Department of Geology & Geophysics), USBR (U.S. Bureau of Reclamation).

³Earthquake source on the USGS National Seismic Hazard Maps.

ATTACHMENT 1

Meeting Attendees

Utah Quaternary Fault Parameters Working Group Members in Attendance

Steve Bowman, UGS (UGS/UQFPWG Liaison)
Rich Briggs, USGS
Michael Bunds, UVU*
David Dinter, UUGG*
Chris DuRoss, USGS*
Michael Hylland, UGS
Susanne Janecke, USU
William Lund, UGS* (UQFPWG Chair)
Johnny MacLean, SUU
Jim Pechmann, UUSS*
Steve Personius, USGS
Ivan Wong, AECOM
Adolph Yonkee, WSU

Guests

Steve Bartlett, UUCEE
Scott Bennett, USGS*
Don Clark, UGS
Brent Dixon, UDWRi
Carl Ege, UDWR
Rich Giraud, UGS
Ryan Gold, USGS
Adam Hiscock, UGS*
Tyler Knudsen, UGS
Greg McDonald, UGS
Adam McKean, UGS*
Paul McKean, USNORTHCOM/J9
David Simon, Simon Associates LLC
Patricia Thomas, AECOM*
Nathan Toké, UVU*
Chuck Williamson, UDWRi

***Speaker**

SUU (Southern Utah University), UDWR (Utah Division of Water Resources), UDWRi (Utah Division of Water Rights), UGS (Utah Geological Survey), USGS (U.S. Geological Survey), USNORTHCOM/J9 (U.S. Northern Command of the Defense Department), USU (Utah State University), UUCEE (University of Utah Department of Civil and Environmental Engineering), UUGG (University of Utah Department of Geology & Geophysics), UUSS (University of Utah Seismograph Stations), UVU (Utah Valley University), WSU (Weber State University).

ATTACHMENT 2

AGENDA

UTAH QUATERNARY FAULT PARAMETERS WORKING GROUP

Tuesday, February 10, 2015

Utah Department of Natural Resources Building, Room 2000 (2nd floor)

1594 West North Temple, Salt Lake City

- 8:00 Refreshments
- 8:20 Welcome, overview of meeting, and review of last year's activities; Bill Lund, UGS
- 8:30 Technical presentations of work completed or in progress
- 8:30 – Paleoseismology of the northern segments of the Great Salt Lake fault; David Dinter, UUGG and Jim Pechmann, UUSS
 - 9:00 – Paleoseismology of Utah Lake; David Dinter, UUGG
 - 9:30 – Spatial and temporal fault offset patterns derived from LiDAR along the central Wasatch fault zone; Scott Bennett, USGS
 - 10:00 – Recent paleoseismic trenching studies along the Provo segment, Wasatch fault zone; Scott Bennett, USGS
- 10:30 Break
- 11:00 Technical presentations of work completed or in progress
- 11:00 – Preliminary results from the Corner Canyon trench site on the Salt Lake City segment of the Wasatch fault zone; Chris DuRoss, USGS
 - 11:30 – Remapping of the Warm Springs fault, Salt Lake City segment of the Wasatch fault zone; Adam McKean, UGS
- 12:00 Lunch
- 1:00 Technical presentations of work completed or in progress
- 1:00 – LiDAR mapping of the Levan and Fayette segments of the Wasatch fault zone; Adam Hiscock and Mike Hylland, UGS
 - 1:30 – Fault strip mapping and continued exploration of the existing Traverse Ridge trenches from the Utah Valley University's 2014 summer field experience; Nathan Toke', UVU
 - 2:00 – Applying structure from motion techniques to neotectonic investigations—methods, error analysis, and examples; Michael Bunds, Nathan Toke', Andrew Fletcher, Michael Arnoff, and Brandon Powell, UVU
 - 2:30 – New Boise State University NEHRP project: Seismic profiling in downtown Salt Lake City—Mapping the Wasatch fault with seismic velocity and reflection methods from a land streamer; Jim Pechmann, UUSS, and Lee Liberty, BSU
 - 2:45 – Evidence of a third (barely prehistoric) earthquake on the Bear River fault zone; Suzanne Hecker, David Schwartz, Chris DuRoss, Adam Hiscock, Tarka Wilcox, USGS
- 3:00 Break
- 3:30 – Update on planned paleoseismic trenching on the Taylorsville fault; Greg McDonald and Adam Hiscock, UGS
 - 3:45 – Update on Working Group on Utah Earthquake Probabilities; Patricia Thomas and Ivan Wong, AECOM
 - 4:00 – Report on the Basin and Range Province Seismic Hazard Summit III; Bill Lund, UGS

- 4:15 UQFPWG 2015 fault study priorities (see table 1 for UQFPWG list of faults requiring additional study; see table 2 for UQFPWG 2014 fault priority list)
- 5:00 Adjourn