

**CITY OF LOGAN, UTAH
RESOLUTION 15-51**

**A RESOLUTION OF ADOPTING THE
2015 PRE-DISASTER MITIGATION PLAN: BEAR RIVER REGION**

WHEREAS, the City of Logan recognizes the threat that natural hazards pose to people and property within the City of Logan; and

WHEREAS, the City of Logan has participated in the creation of a multi-hazard mitigation plan, hereby known as the 2015 PRE-DISASTER MITIGATION PLAN: BEAR RIVER REGION in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, 2015 PRE-DISASTER MITIGATION PLAN: BEAR RIVER REGION identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the City of Logan from the impacts of future hazards and disasters; and

WHEREAS, adoption by the City of Logan demonstrates their commitment to hazard mitigation and achieving the goals outlined in the 2015 PRE-DISASTER MITIGATION PLAN: BEAR RIVER REGION.

NOW THEREFORE, BE IT RESOLVED BY THE LOGAN MUNICIPAL COUNCIL, STATE OF UTAH adopts the 2015 PRE-DISASTER MITIGATION PLAN: BEAR RIVER REGION.

This resolution shall be effective on the date it is adopted DATED this _____ day of _____, 2015/2016 by the following vote:

Ayes:
Nays:
Absent:

Jeannie F. Simmonds, Chair

ATTEST:

Teresa Harris, City Recorder

**SECTION 6: CACHE COUNTY RISK
ASSESSMENT & COMMUNITY SECTIONS**

WILLARD - COMMUNITY MITIGATION STRATEGIES

Protecting Current Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Willard	Flood	Protect current residents and property	Flood control district to protect and identify areas of high flood plain	N/A	High	2015	Property Tax	Willard, Willard Flood Control Board, Utah DEM	\$6,000	DWQ, Dam Safety
Willard	Wildfire	Protect current residents and property	Certify our Fire Dept. in wild lands fire fighting	N/A	High	2015	\$500 per member city budget and grants	Willard, Utah FFSL	\$500 per member	Grants
Willard	Landslide	Protect current residents and property	Work with city engineer and flood control to identify areas of high risk	N/A	High	2016	N/A	Willard, UGS	\$5,000	N/A
Willard	Earthquake	Protect current residents and property	CERT Training program for residences	N/A	High	2015	Participant fee	Willard	\$600	Utah State Govt.
Willard	Steep Slopes	Protect current residents and property	Identify areas with Engineer and classify as sensitive zones	N/A	Medium	2016	City Budget	Willard, UGS	\$200	City Budget

WILLARD - COMMUNITY MITIGATION STRATEGIES

Protecting Future Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Willard	Flood	Protect future residents and property	Keep Willard flood control running and included in future development	N/A	High	2016	Future property taxes and building permit fees	Willard, Willard Flood Control Board, Utah DEM	\$10,000	Property tax
Willard	Wildfire	Protect future residents and property	Annual wild lands firefighting training for new fire fighters	N/A	High	2016	Grants	Willard, Utah FFSL	\$500 per member	County of Box Elder and State of Utah
Willard	Landslide	Protect future residents and property	Once high risk areas are identified put them in the sensitivity zone for protection from development	N/A	High	2016	City budget	Willard, UGS	\$200	City budget
Willard	Earthquake	Protect future residents and property	Ongoing CERT Training scheduled semi annually	N/A	High	2015 and for next 5 years	Participant fee	Willard	\$600	State Emergency Fund
Willard	Steep Slopes	Protect future residents and property	Discourage development of sensitive zones by ordinance	N/A	High	2016	City Budget	Willard, UGS	\$200	City budget

**SECTION 6: CACHE COUNTY RISK
ASSESSMENT & COMMUNITY SECTIONS**

History and Background of Natural Hazards in Cache County

Flooding

Portions of Cache County are at threat from both riverine and flash flooding. The Bear River flows through Cache Valley, which is located on the western side of the County, and is where the majority of residents live. Many small drainages feed the Bear River, with most streams converging at Cutler Marsh before exiting the valley via Cutler Dam, and into Box Elder County. The two main tributaries of the Bear River located in Cache County are the Logan and Blacksmith Fork Rivers. The Logan River is the largest tributary of the Bear. Other tributaries of the Bear that generally enter the valley through the eastern part of the county are Summit Creek, Little Bear River, Spring Creek, Cherry Creek, High Creek and the Cub River. All of these streams and rivers, to some degree, have had some history of flooding.

Phase II of the National Pollutant Discharge Elimination System (NPDES) administered by EPA has requirements for communities to more carefully manage their storm water discharge. While driven more by water quality concerns, this provides an important opportunity for communities to better manage their storm water systems. This is critically important because for many communities an ever increasing threat to residents comes from the potential for man-made canal failure flooding. As more development has occurred, existing irrigation canals have been increasingly relied on to accommodate storm water discharge. Irrigation officials are quick to point out that the canals were never designed for such use. Most canals have lower capacities and a narrowing channel the further you go down the canal. While this design makes sense for irrigation use, it is exactly the opposite of how you would design a canal to accommodate storm water discharge. The positions of many canals in Cache County also make them susceptible to blockage by debris or ice that can result in canal failure outflows. Cache County has had a couple of near misses in this regard. Another consideration is the connection between floods and landslides. As water saturation increases, mud/sediment/debris flows can be catastrophic.

In terms of potential damage to developed residential, commercial and industrial areas, the Logan & Blacksmith Fork Rivers pose the most significant threat for residents of Cache County. Both of these rivers drain large areas and have steep well defined stream channels. Flood level flows are produced when high temperatures occur during the early spring and accelerate the watershed snow melt rate. Often this threat can be escalated when combined with early spring rains.

A number of dams are located on the Logan River in the canyon upstream of the City of Logan. Due to their relatively small size, they do little to moderate flood potential for downstream development.

The Bear River enters Cache County on the north near Preston, Idaho. Winding through the valley it eventually enters Cutler Reservoir. The risk from rising flood waters of the Bear River through Cache County is relatively minor. Land located in the Bear River flood plain has a high water table which makes development difficult. Most of adjacent land near the Bear is used for agricultural purposes. Farmers and ranchers have seemingly adapted their agricultural activities to mitigate the cyclical high flows effects of the Bear River. Much of the adjacent agricultural uses along the Bear are operated under lease agreements with PacifiCorp who owns most of Cutler Reservoir.

In terms of historical flooding impact on development, most events have been documented on streams and rivers that drain the mountainous eastern portion of Cache County and flow into western Cache Valley. Most of the significant flooding that has historically impacted developed land has occurred on the Logan and Blacksmith Fork Rivers. However, noteworthy flooding has occurred on some of the smaller streams and creeks that enter the valley near the towns of Providence, Smithfield, and Richmond.

Localized flooding has been fairly common for many years. Damage from flooding has been relatively minor overall, but devastating to individual home and property owners. The majority of flooding in Cache County has occurred on agricultural land.

Following a development pattern like many other Utah and western communities, many early European settlements in Cache County were located near the mouths of canyons. Early settlers located there for easy access to water that could be diverted for irrigation of crops and pastures as well as fertile soils well suited for agriculture. Richmond, Smithfield, Logan, Providence Millville and Hyrum are all located near the mouths of canyons that drain some portion of the adjacent Bear River Range. The Logan River has the largest drainage basin next to the Bear at 524 square miles. The Blacksmith Fork drainage basin is the next largest at roughly 287 square miles.

Analysis of areas of Cache County mapped by FEMA for communities that participate in the National Flood Insurance Program indicate some conflict related to existing development located in what has been determined to be the 100-year floodplain. These delineated and digitized floodplains were overlaid onto current county parcel data. In this way, parcels with structures in the floodplain could be identified and tallied, and potential losses to life and property could be estimated.

While FEMA floodplains are a great planning tool for hazard mitigation, there is much of Cache County that has never been mapped by FEMA. An August 2003 report entitled *Flood Hazard Identification Study: Bear River Association of Governments* by the US Army Corps of Engineers was completed to help communities without floodplain data. This study generally identified areas of flooding concern for municipalities lacking data (See Appendix B for the full report). However, this report was only intended to give communities very general estimates of where flood risk may exist. Also, many flooding events happen outside of the FEMA 100-year floodplain delineations (around 40%). There are other ways that flooding occurs as well, such as canals, reservoirs/ponds, wildfire, incorrect grading, and plugged sewer and storm water systems (Scott Stoddard, personal communication, 11/13/08). FEMA is currently updating Cache County's floodplain data, which will be useful for communities in identifying their risk to floods. Below is a discussion of flooding risks

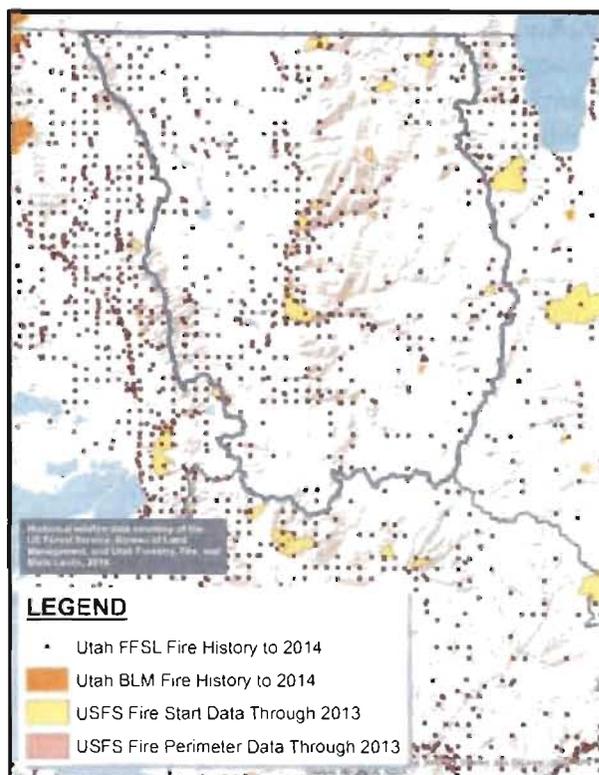
for communities in Cache County. Only those communities thought to be at risk for flooding have been included.

Wildfires

Wildfire has always had an impact on Cache County inhabitants. In August of 2007, four wildfires burned hillsides east of Providence, River Heights, and Logan City fueled by dry grasses and juniper. Some people were evacuated from their homes while others were told to be ready just in case. Luckily, no homes were lost. To a certain extent, living with wildfires will always be a part living in Cache County.

Many of the communities in Cache County are located along the base of the Bear River Mountains in Cache Valley. Paradise, Millville, Providence, River Heights, Logan, North Logan, Hyde Park City, and Richmond all have wild land-urban interface or potential interface with wildfire high risk areas. Wellsville and Mendon on the east side of the valley have potential wildfire-urban conflict for development along the base of the Wellsville Mountains.

Below is a map showing historic wildfire locations in Cache County:



Landslides/Steep Slopes

Landslide occurrences are common for portions of Cache County. The most frequent problems are associated with debris flows on alluvial fans in many of the canyon drainages. Also important to consider is the link between flooding and landslides. Saturated soils only add to the problems associated with landslides, and a combination of the flooding and landslides can be very destructive.

During the wet years of 1982 & 1983 an abnormally high numbers of landslides occurred in Cache County. A rather large land mass slid into the Porcupine Reservoir upstream of the right abutment. A slide near Nibley Road east of Hyrum occurred in the back yard of a residential home. A slide on College Hill below Utah State University blocked the Logan and Northern Irrigation Canal causing some limited flooding. The road up Millville Canyon was displaced 4 feet by a slide. A debris flow from Dry Creek above Smithfield reached the Logan, Hyde Park and Smithfield Canal (south of 300 South).

Debris flows present a significant threat for development located in the mouths of the many steep canyons located in Cache County. The dynamics of this threat changes depending on the upslope drainage conditions. Wildfire that removes sediment stabilizing vegetation can dramatically increase the risk of debris flows. The other indirect threat comes from canal flooding caused by debris flow blockage.

While there is no data that can predict landslide potential completely, the Utah Geological Survey created a landslide susceptibility map for the entire state in 2007. This is the most accurate data set to date, and was used for this analysis. However, the Utah Geological Survey is in the process of finalizing a more accurate geological hazards study specifically for Cache County. In the next update of this plan, the newer data could provide a more accurate potential loss analysis for geological hazards.

Earthquakes

Cache County is located in a seismically active region within the Intermountain Seismic

Belt. The most damaging earthquake in Utah's post-European settlement history occurred near Richmond City. In 1962 a 5.7 magnitude earthquake damaged nearly three-fourths of the homes in the town. Damage to homes and buildings occurred in many surrounding areas of Cache Valley (Christenson, 1992). Some geological evidence suggests that an earthquake of seven plus magnitude has occurred in recent geological history on the West Cache Fault Zone. Logan City also suffered from a smaller earthquake of a 3.7 magnitude on July 21, 1950.

Three important fault zones exist in Cache County. The East Cache Fault bounding the eastern portion of Cache Valley, the West Cache Fault bounding the western valley, and the nearby Wasatch Fault. The majority of Cache County's population is located near the Eastern Cache Fault. Evidence points to the Temple Fork Fault as the most active in Cache County. Although miles away from the epicenter, this fault is thought to be associated with the 1962 Richmond Earthquake.

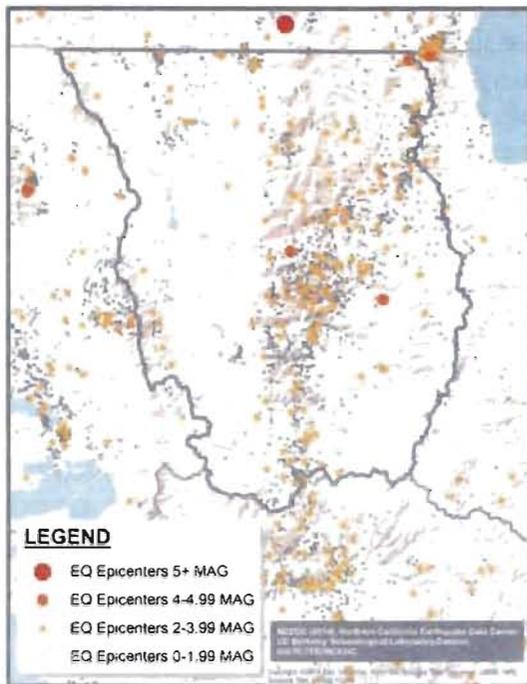
While a geological fault may not be very wide physically, damage around the fault can be detrimental. This is often referred to as the "damage zone (Susanne Janecke, personal communication, 9/25/08)." This damage zone is now thought to be much larger than recognized previously. While geologists used to recommend a general fault buffer of fifty feet on either side of the fault, they now recognize a much larger damage zone. According to the Utah Geological Survey, up thrown sides of well defined quaternary faults require planning for a 250 foot damage zone; while down thrown sides of well defined faults require planning for a 500 foot damage zone. For those faults not well defined, a general 1,000 foot damage zone should be considered (Richard Giraud, personal communication, 10/6/08; Christopher Duross, personal communication, 10/30/08; Christensen et al., 2003). Because of data inaccuracies in geologic fault data, a standard 1,000 foot damage zone was analyzed for all quaternary faults in the region.

Liquefaction is also a major concern for Cache County, as well as much of the Bear River Region. During an earthquake, soils susceptible to liquefaction such as those containing current

or historical stream and lake sandy deposits can threaten lives and damage homes and infrastructure (Utah Geological Survey, 2008). These soils can lift structures, tilt foundations, and cause major damage to infrastructure. Generally speaking, liquefaction susceptible areas in Cache County are along stream drainages and marsh/wetland areas. For this plan, two liquefaction studies were used for determining potential losses. One study was done by Utah State University and the Utah Geological Survey in 1994, and was digitized in 2001, which covered the entire county. The other was done in 2001 by the Utah Geological Survey at a more detailed scale, and only encompassed the more populated areas of the county.

The latter study is titled "Seismic-Hazard Mapping of the Central Cache Valley, Utah - A Digital Pilot Project" by McCalpin and Solomon. It provides more recent analysis and mapping of earthquake hazards for the Newton, Smithfield, Wellsville and Logan 7.5-minute USGS quadrangles. The information contained in this report is considered more accurate and the delineations more defensible.

Below is a map showing historic earthquake locations in Cache County:



Dam Failure

There are 249 regulated dams located in Cache County. Most of these dams are small detention ponds, small agricultural reservoirs, or livestock watering facilities and most pose a minimal threat to human safety or property.

Of the 249 regulated dams most are designated as "low hazard" by the State of Utah Division of Water Rights. As defined by state statute, low hazard dams are those dams which, if they fail, would cause minimal threat to human life, and economic losses would be minor or limited to damage sustained by the owner of the structure.

A total of 3 dams have been designated as "moderate hazard" by the State of Utah in Cache County. Moderate Hazard dams which, if they fail, have a low probability of causing loss of human life, but would cause appreciable property damage, including damage to public utilities.

The State of Utah has rated 7 dams in Cache County as "high hazard" which means that, if they fail, have a high probability of causing loss of human life or extensive economic loss, including damage to critical public utilities.

Dam failure inundation maps and emergency action plans for each of the high risk dams can be found on the Utah Division of Water Right's website at: <http://waterrights.utah.gov/cgi-bin/damview.exe?Startup>.

High Hazard Dams

Hyrum Dam

Hyrum Dam and Reservoir are located directly south of Hyrum City on the Little Bear River. The dam is rated as a high hazard facility and the inundation area flows westerly towards Wellsville five miles away, and then into Cutler Marsh.

Logan City – Dry Canyon

This dam was newly constructed to mitigate flooding and potential from the Dry Canyon drainage. Many newer homes were constructed at the bottom of this canyon which can become flooded in the spring months. It is high risk, and many homes west of the dam could be damaged if

the dam was breached.

Logan First Dam

This facility located near the mouth of Logan Canyon has a high hazard rating. The inundation area consists of most of the Island area, much of the landscape around the Logan River Golf Course and County Fairgrounds, and continuing west towards Cutler Reservoir. There is a significant population as well as large numbers of homes and businesses within the inundation area.

Porcupine Dam

Porcupine Dam is located about eight miles upriver from the town of Paradise on the east fork of the Little Bear River. The dam has a high hazard rating. There is no inundation map associated with this dam. This dam was recently drained and some reinforcement work performed.

Newton Dam

Newton dam was constructed by the Bureau of Reclamation on Clarkston Creek three miles north of the town of Newton. This facility has a high hazard rating. There is no inundation map associated with this dam.

Tony Grove Lake Dam

This dam was renovated several years ago for seismic retrofitting and inlet/outlet construction. It has a high hazard rating, but would not likely affect any residential or commercial structures in the event of a failure.

Blacksmith Fork Upper Dam

No information available

Natural Hazard Profiles

Table 49: Cache County Flood Hazard Profile

Frequency	Some flooding occurs nearly every year in Cache County
Severity	Moderate
Location	Generally along rivers, streams, and canals.
Seasonal Pattern	Spring flooding as a result of snowmelt. Mid-late summer cloudburst events.
Duration	A few hours or up to three weeks for snowmelt flooding
Speed of Onset	1-6 hours
Probability of Future Occurrences	High - for delineated floodplains there is a 1% chance of flooding in any given year.

Table 50: Cache County Wildfire Hazard Profile

Frequency	Annually (to some extent)
Severity	Severe
Location	Mostly along the Bear River Mountains east of Cache Valley or the Wellsville Mountains west of Cache Valley.
Seasonal Pattern	Generally the worst from early July to mid September (depends on drought conditions)
Duration	A few hours to two weeks
Speed of Onset	1-12 hours
Probability of Future Occurrences	High (Based on data from 1973-2008, there is an 11.4% chance a fire of at least 1,000 acres will occur every year)

Table 51: Cache County Landslide/Steep Slopes Hazard Profile

Frequency	Periodic
Severity	Moderate
Location	Generally located in areas with steeper slopes. Debris flows mostly occur at the mouth of canyon drainages.
Seasonal Pattern	Generally the worst in the wetter spring months.
Duration	Up to two weeks
Speed of Onset	No warning
Probability of Future Occurrences	High

Table 52: Cache County Earthquake Hazard Profile

Frequency	Low magnitude events occur frequently. Larger magnitude events are rare (although not necessarily on geological time).
Severity	Potentially Catastrophic
Location	Entire county with highest frequency in the Bear River Mountain Range. Surface fault rupture is likely to occur in fault zones, and liquefaction would impact large areas of land in the lower elevations.
Seasonal Pattern	None
Duration	A few minutes with potential aftershocks
Speed of Onset	No warning
Probability of Future Occurrences	Based on 1962-2001 data, there is a 20.5% chance every year of an earthquake of 3.0 magnitude or greater.

Table 53: Cache County Dam Failure Hazard Profile

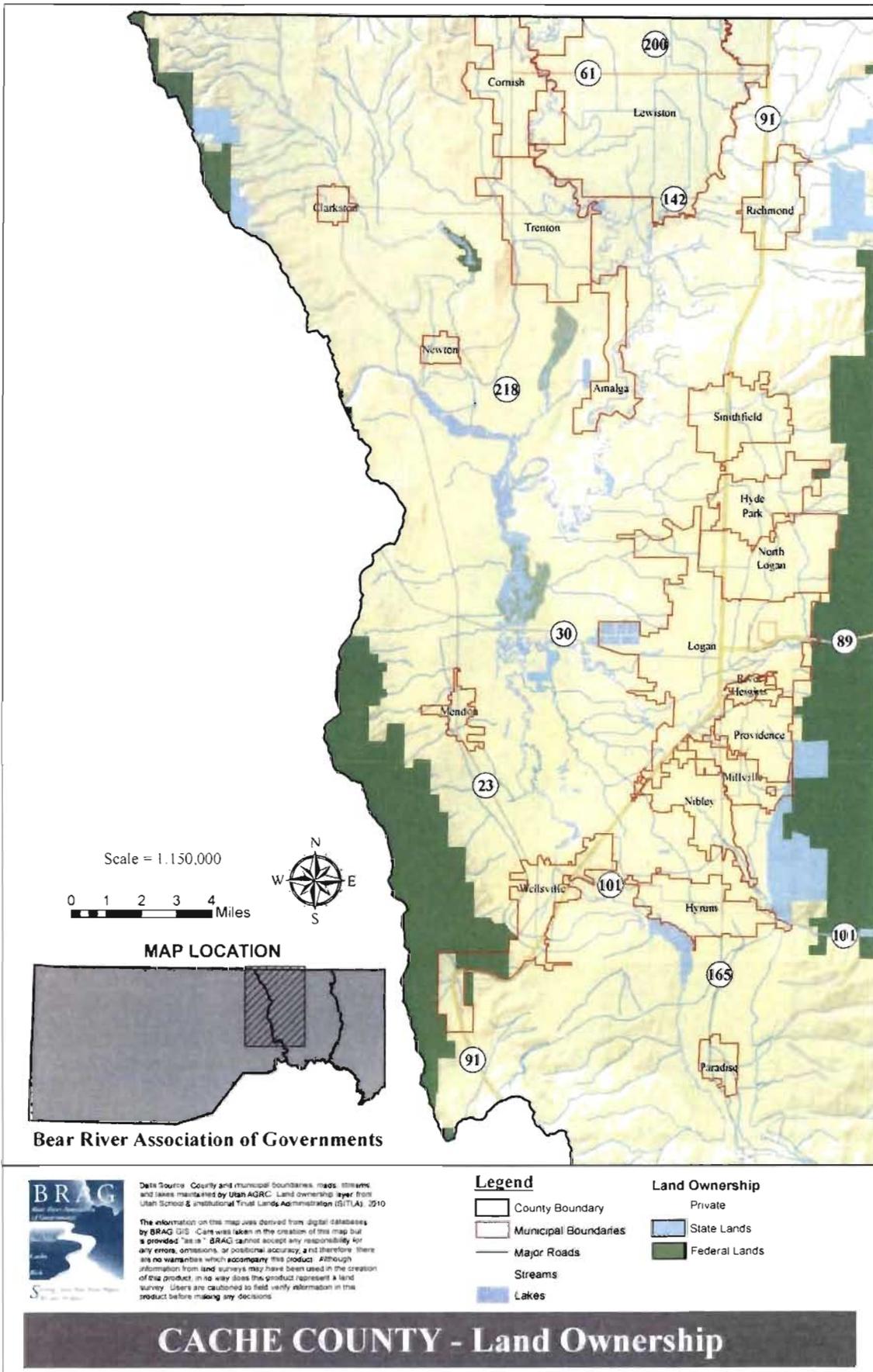
Frequency	Rare
Severity	Potentially Catastrophic
Location	Areas downstream of failed dam.
Seasonal Pattern	Anytime. Highest risk in spring during snowmelt.
Duration	A few hours
Speed of Onset	No warning
Probability of Future Occurrences	Low

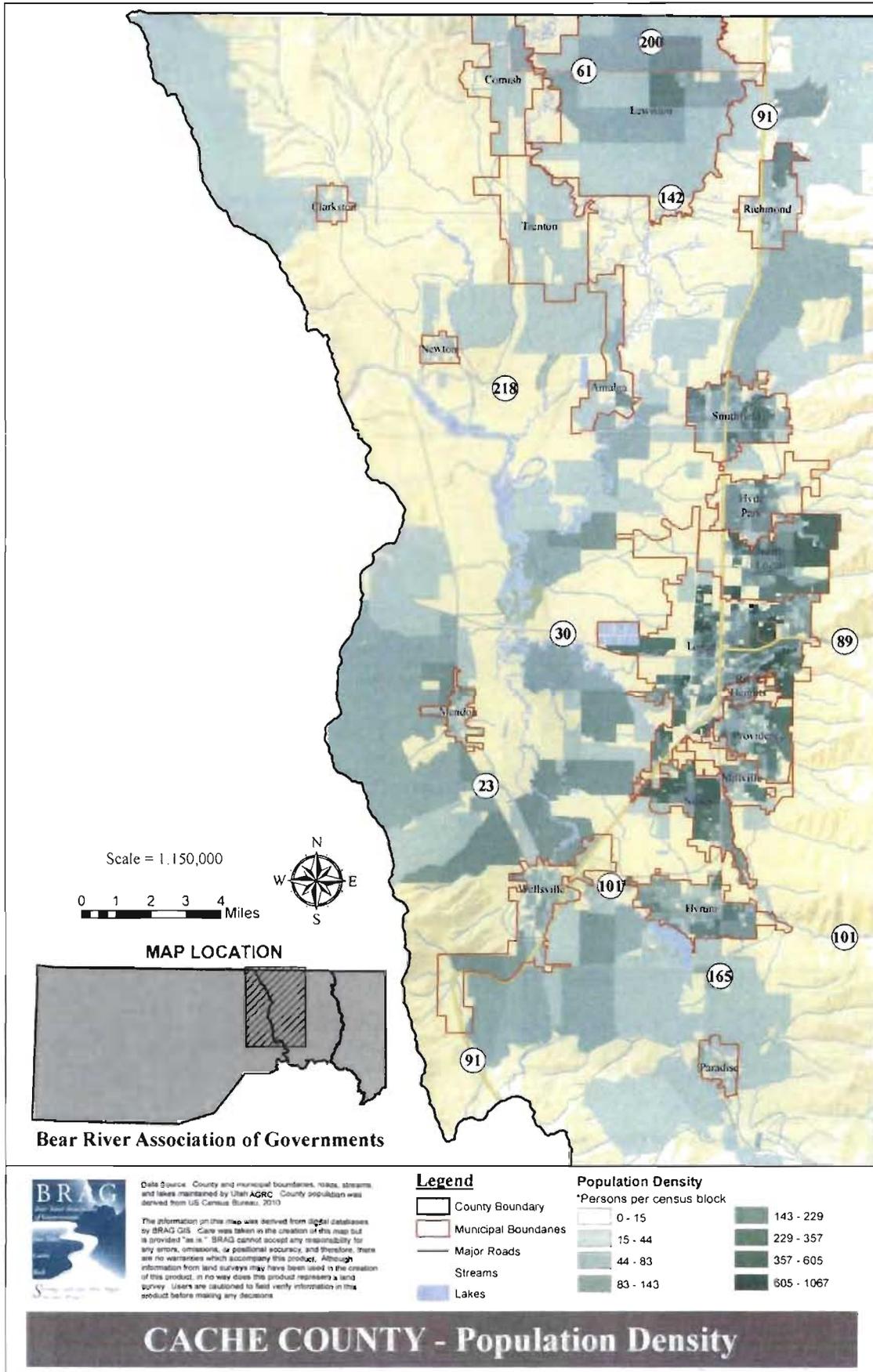
Repetitive Loss Properties

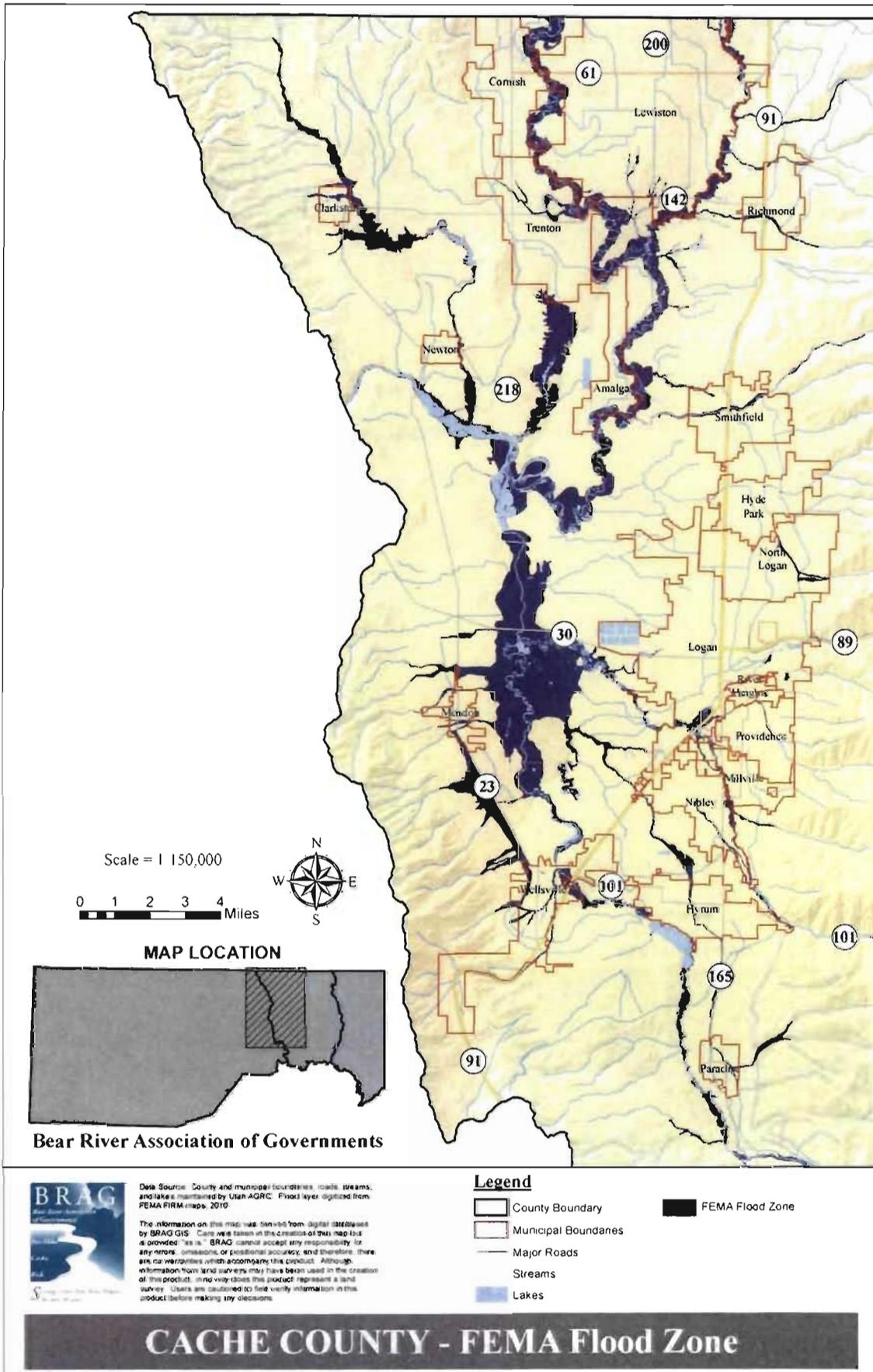
As of February 4, 2015, there were seven repetitive loss properties in the unincorporated area of Cache County, five of which were BCX Claims (FEMA, 2015). **Type of losses?**

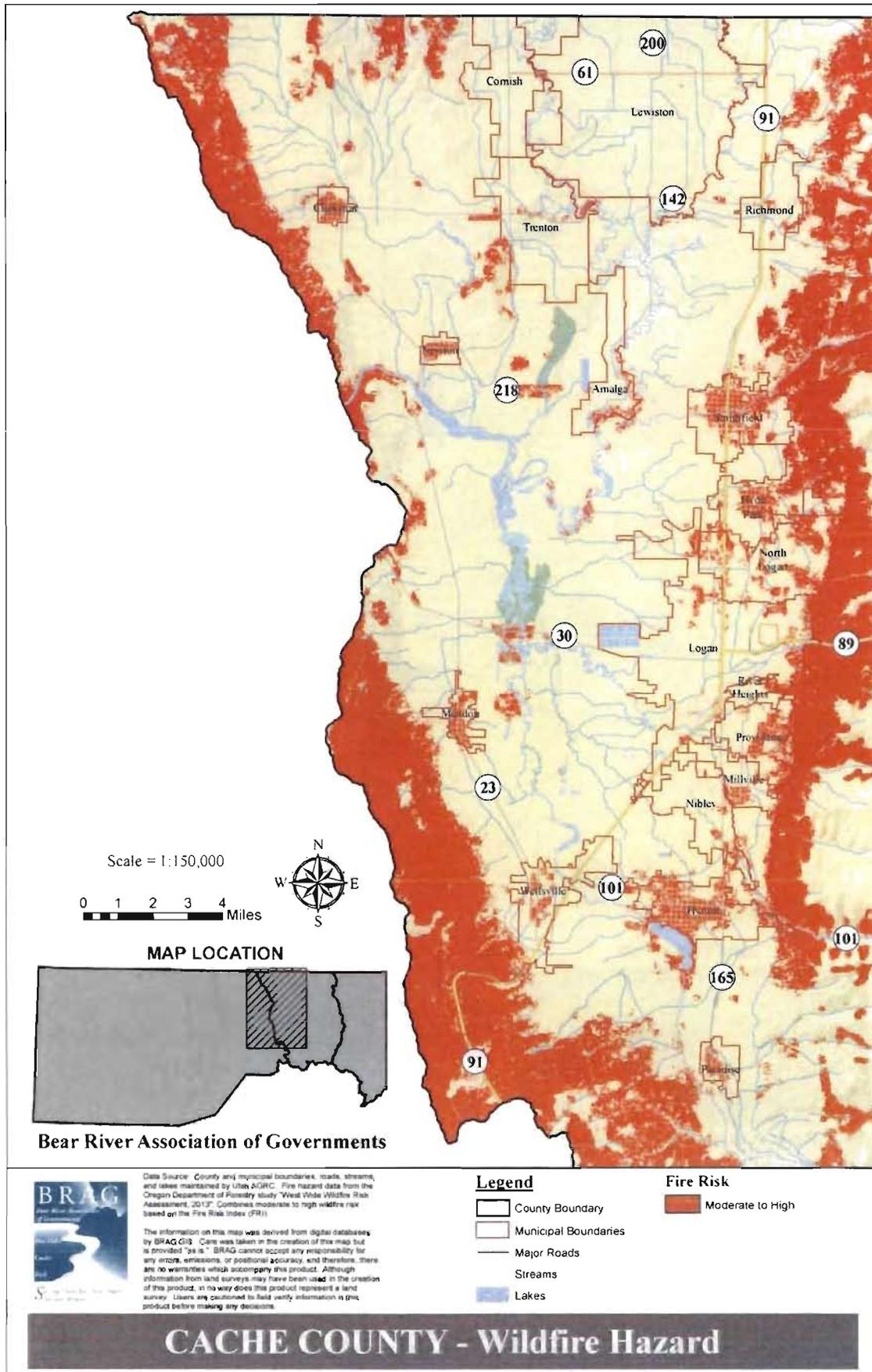
COUNTY-WIDE NATURAL HAZARD MAPS

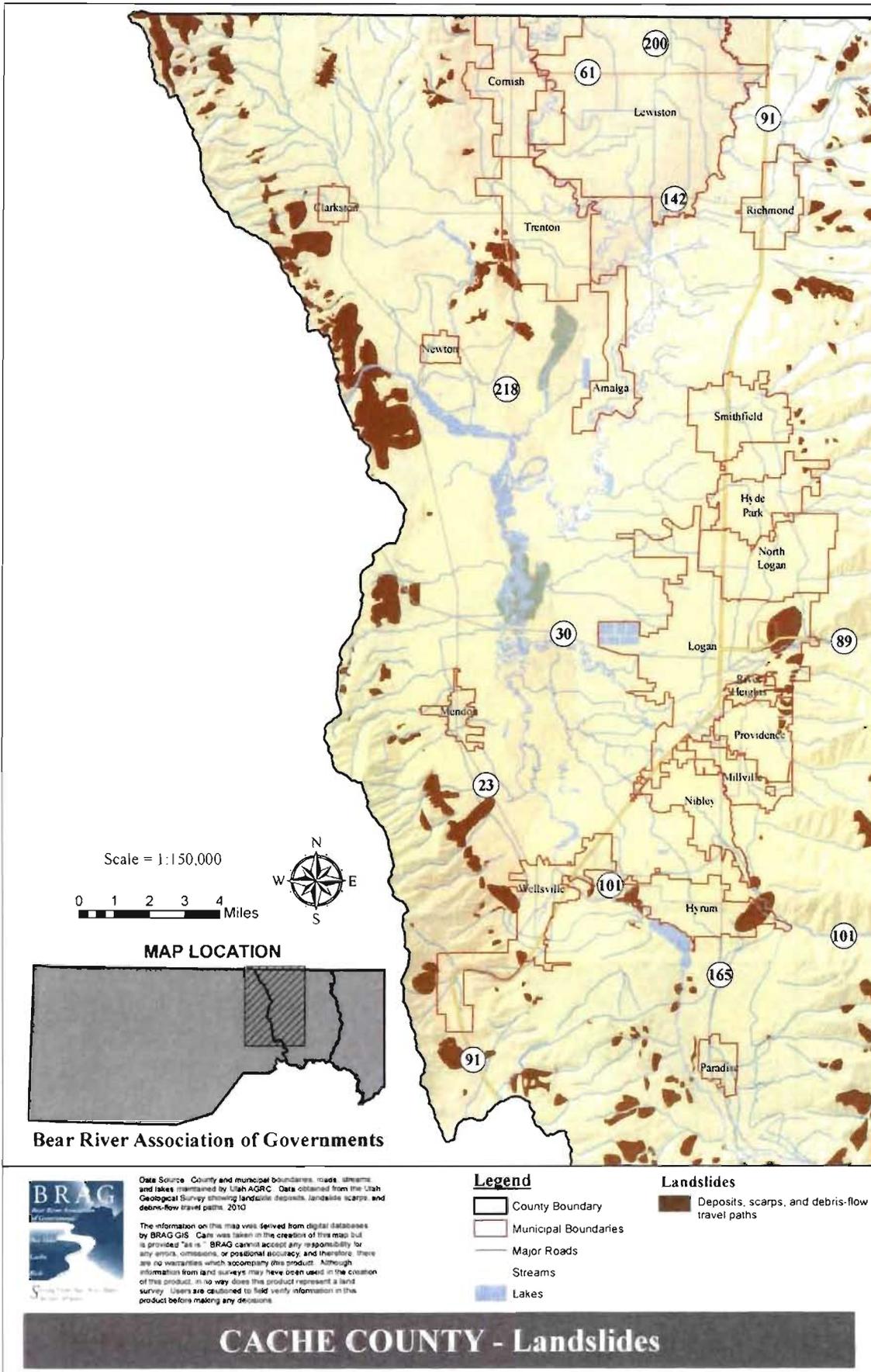
(Please see pages 6-140 to 6-148)

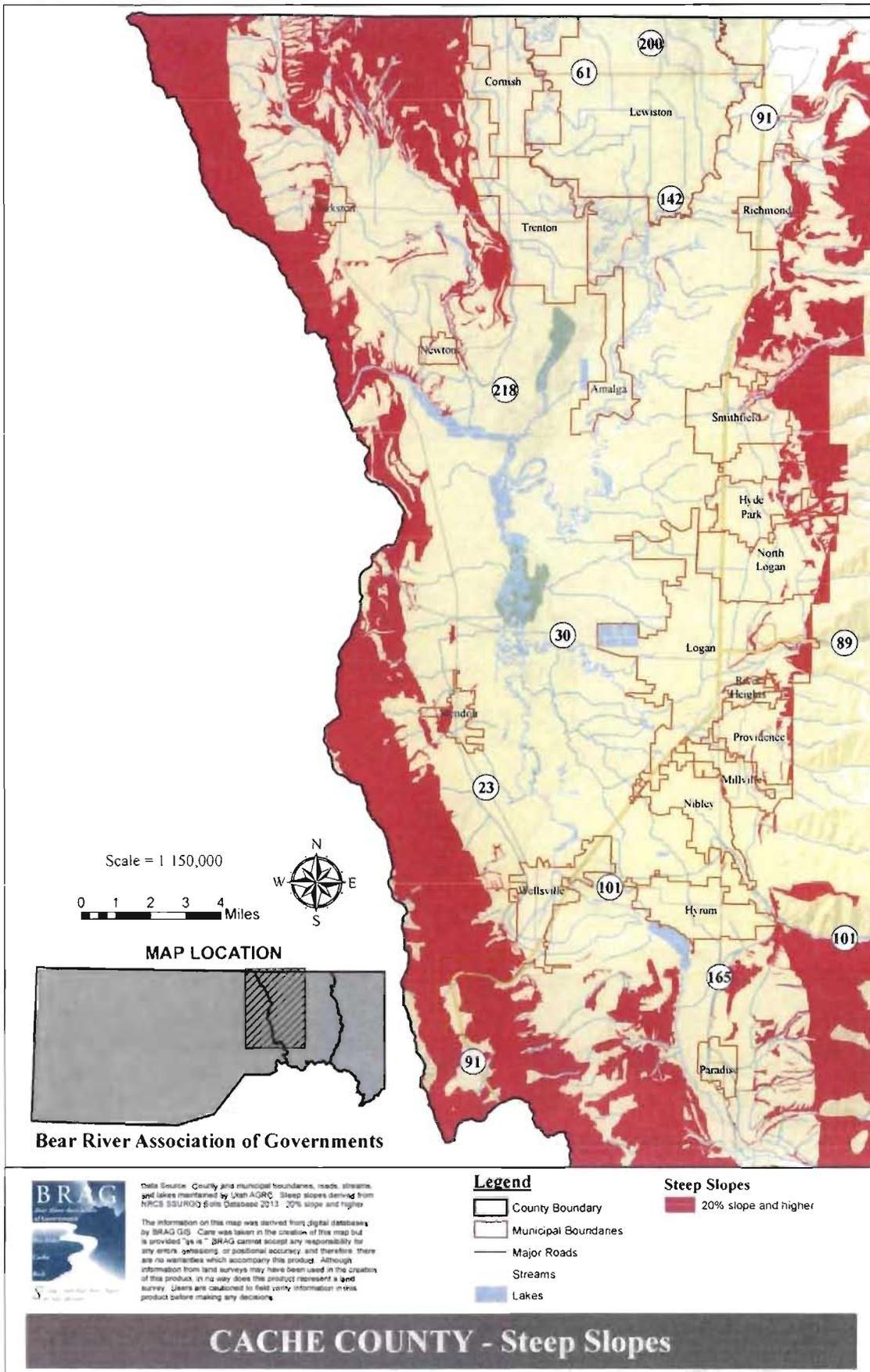


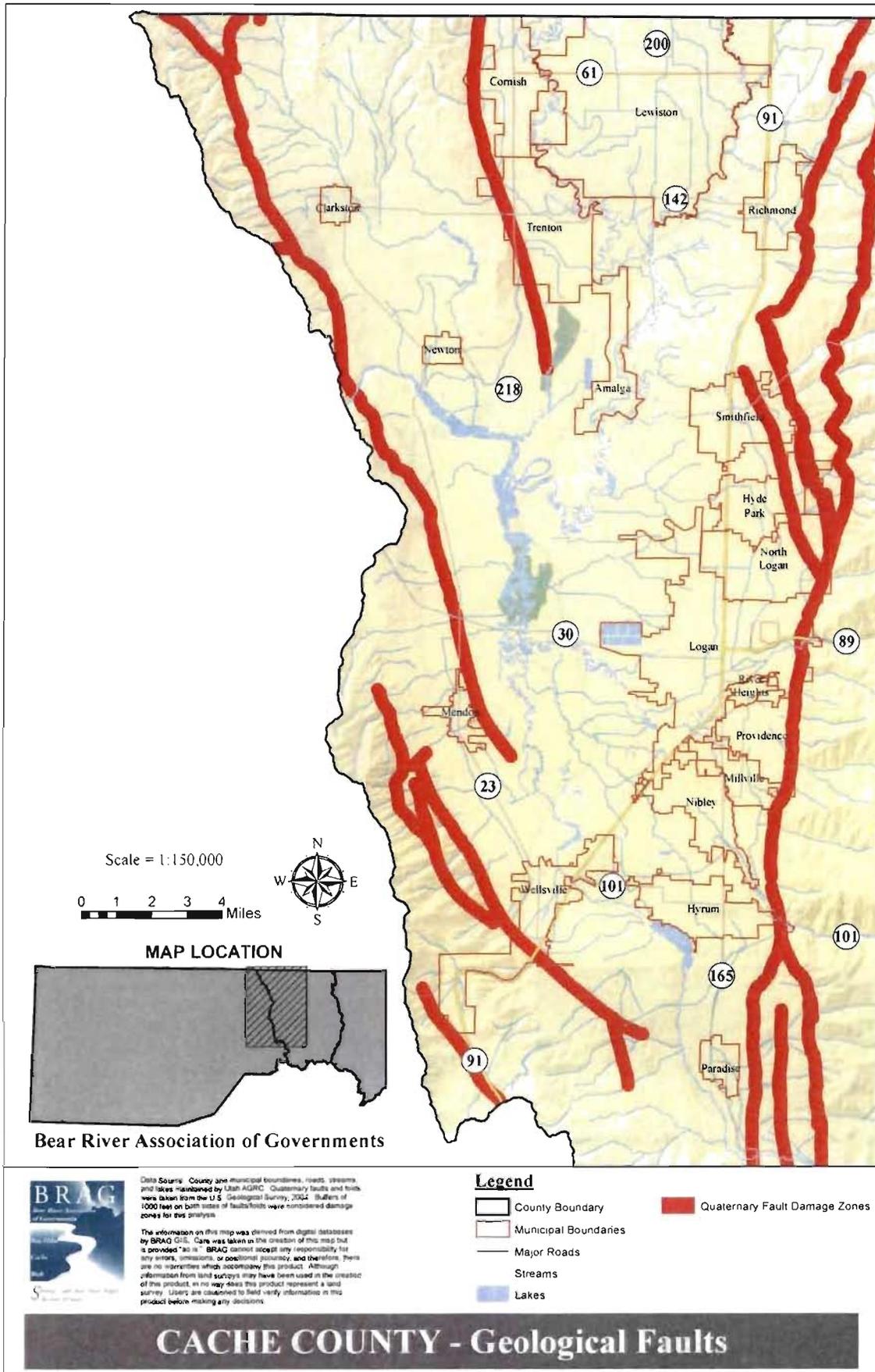


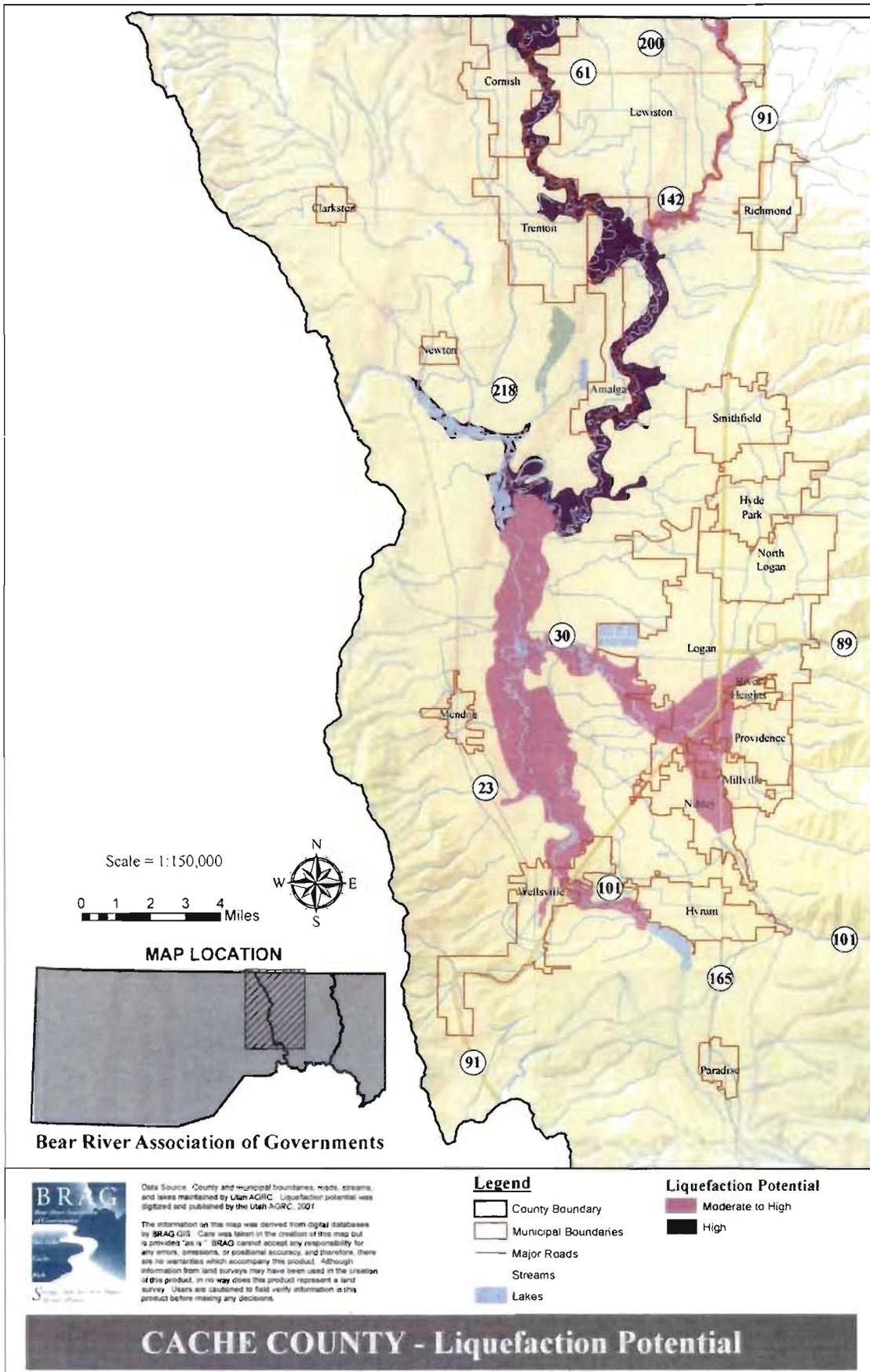


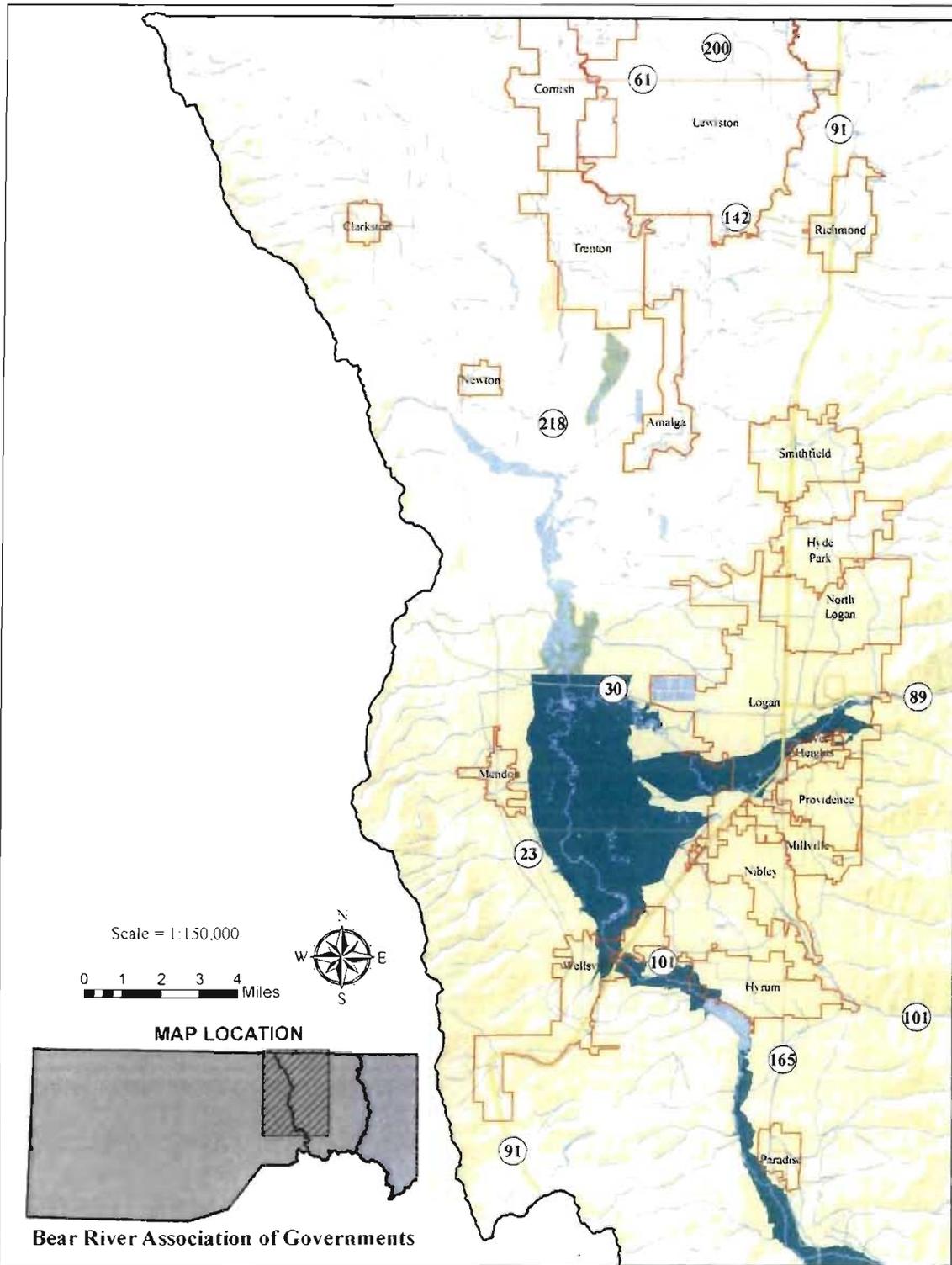












Bear River Association of Governments



Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGWC. Dam inundation areas provided by Utah Division of Water Rights, 2008.

The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to treat any information on this product before making any decisions.

Legend

- County Boundary
- Municipal Boundaries
- Major Roads
- Streams
- Lakes

Dam Inundation Areas

- Probable Maximum Flood area resulting from complete dam failure

CACHE COUNTY - Dam Failure

LOGAN

Analysis of hazard risk involving the community of Logan revealed that there is potential risk resulting from **dam failure, earthquake, flood, landslides, liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and environmental features within the municipal boundary. See *the following tables* for more detailed descriptions of potential losses associated with each natural hazard analyzed in the risk assessment.

Natural Hazards

Current Development

Dam Failure. Hazard mapping identifies dam failure risk to several structures below First Dam, particularly in “The Island” area of town, and west along the Logan River drainage to and past 1000 West. A dam breach in this area would likely fill the entire valley bottom of “The Island” that has several structures, critical facilities and municipal infrastructure.

Table 67: Logan City Potential Loss Figures

Table -- : Logan, UT, Residential & Commercial Development at Risk						
Hazard Type	Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	\$ Value**	# Units	\$ Value**	\$ Potential Revenue Loss***
Dam Failure	7,653	2,362	450,733,610	100	138,212,345	68,871,700
Faults	927	286	95,951,688	1	3,314,300	688,717
Wildfire	2,411	744	218,643,420	140	328,459,827	96,420,380
Flood	674	208	51,441,021	31	75,900,333	21,350,227
Liquefaction	8,097	2,499	373,244,552	158	218,504,478	108,817,286
Landslide	2,735	844	187,254,417	11	5,254,164	7,575,887
Slope	975	301	111,181,098	4	247,080	2,754,868
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Cache County from 2013 American Community Survey, which is 3.24.
 ** Current Market Value per parcel, including building and land values. Data was provided by Cache County IT personnel.
 *** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$688,717 per firm). Derived from 2007 Survey of Business Owners for Cache County, US Census Bureau.

Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	\$ Value ¹	# of Miles	\$ Value ²	# of Miles	\$ Value ³	# of Miles	\$ Value ⁴	# of Miles	\$ Value ⁵
Dam Failure	1.17	1,755,000	1.57	2,198,000	0.28	35,560	34.18	17,944,500	4.21	6,315,000
Faults	0	0	0	0	2.38	302,260	6.41	3,365,250	1.28	1,920,000
Wildfire	0.72	1,080,000	0	0	2.21	280,670	12.94	6,793,500	1.48	2,220,000
Flood	0.2	300,000	0.31	434,000	0	0	2.15	1,128,750	0.57	855,000
Liquefaction	6.81	10,215,000	1.9	2,660,000	2.83	359,410	193.5	101,598,000	6.57	9,855,000
Landslide	0	0	0	0	2.37	300,990	22.64	11,886,000	3.75	5,625,000
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.

² Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).

³ Based on estimates from Logan Light and Power, 2015.

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.

⁵ Based recent Cache County and regional project cost estimates, 2015.

Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	Logan Fire and EMS Station	Riverside Preschool, Wilson Elementary, Riverwood		6 places of worship	9 bridges, 5 broadband anchors, 2 dams
Faults					3 dams
Wildfire	UWCNF Logan Ranger District Office	Logan River Academy	USU Student Health Services, Logan Regional Hospital Transitional Care, Logan Nursing and Rehab Center		10 broadband anchors, 1 dam
Flood					4 bridges
Liquefaction	4 fire stations, 3 EMS stations, 3 correctional facilities, 1 law enforcement station	33 schools, 1 heliport, Riverwood Conference Center, CVD Transit Center	26 health care centers	39 places of worship	22 bridges, 79 broadband anchors, 7 dam, 1 airport
Landslide	Logan Fire and EMS Station, UWCNF-Logan Ranger District Office	Edith Bowen Laboratory School, Hillcrest School		4 places of worship	9 broadband anchors, 1 dam
Slope				2 places of worship	2 bridges, 3 dams
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Table -- : Logan, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	163.48	1,534.38	0.00	2.00	0.00
Faults	21.58	306.01	0.00	0.00	1.00
Wildfire	77.75	540.41	0.00	0.00	0.00
Flood	62.66	329.56	0.00	0.00	0.00
Liquefaction	225.27	1,871.10	0.00	2.00	0.00
Landslide	28.49	591.34	0.00	0.00	0.00
Slope	33.03	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
 **Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
 *** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
 **** Based on data compiled by the Bear River Association of Governments.

Table -- : Logan, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	254.86	25.90	10.39	150.78	0.22	3
Faults	7.99	8.00	2.99	20.71	2.5	5
Wildfire	10.54	3.35	4.30	29.26	2.32	6
Flood	163.58	0	7.92	61.20	0.05	1
Liquefaction	261.06	13.80	10.53	141.99	0	0
Landslide	5.16	2.38	6.22	36.57	0.88	6
Slope	0.00	0.00	0.00	17.86	1.98	6
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land and miles of streams and trails were identified using multiple datas sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Earthquake. Hazard mapping identifies several residential structures and infrastructure at risk from surface fault rupture. Areas of concern are located along the fault damage zone which runs north/south along the jurisdiction's eastern boundary.

Flood. Hazard mapping identifies several residential and commercial structures at risk from flooding. There are a number of older homes located in the 100 year floodplain of the Logan River. In addition a number of newer (post 1970) homes have been constructed near the river in the floodplain (along Sumac and Thrushwood Drives). Some homes in the Country Manor Subdivision along the Blacksmith Fork River are located in the 100 year floodplain as well. The Logan City Golf Course is also located in the 100 year floodplain. The golf course can accommodate flooding with a flood water storage device and is designed to moderate flooding downstream.

Landslides. Hazard mapping identifies significant risk from landslides within the jurisdiction. Large portions of the "Island" area and the Utah State University campus are located in potential landslide areas. Landslides on these Lake Bonneville sediments are fairly common, as is evident in the landslide history chart for Cache County. Logan also has several drainages north and south of Dry Canyon where landslides could damage many structures. Some of the largest landslides and those that pose the greatest threat to human life and property in Cache County are the following: Utah State University (USU) and the Island area have a large landslide area which could threaten human life and cause damage to homes and infrastructure. Particularly in the Island area of Logan City, historical landslides have covered roads and damaged homes. On July 11, 2009 a landslide occurred on the hillside along which the Logan and Northern Canal runs, which destroyed a home downhill and took the lives of three individuals. According to USU campus planning, the section of campus at the top of the large landslide prone area at the base of Logan Canyon has not had any major landslide activity throughout most of the Universities history. Edith Bowen and Hillcrest Elementary Schools are both located on the upper end of this slide. While they are listed as potential losses in Table 8-11, they are not thought

by USU campus planning to be at great risk. Logan also has several large landslide areas on the south-east, where homes are being built on the foothills at the base of several small drainages.

Liquefaction. Hazard mapping identifies significant risk in the moderate-to-high liquefaction zone within the jurisdiction. There are several structures, critical facilities, infrastructure and other environmental/recreational amenities in liquefaction prone areas that pose a significant threat to homes and people.

Steep Slopes. Hazard mapping identifies significant risk from steep slopes along much of the jurisdiction's eastern boundary. There are several hundred residential structures in steep slope areas throughout the jurisdiction, primarily located along the eastern boundary, and also running parallel to the Logan River, along the northern edge of "The Island" and leading up to the USU Campus that rests on a high bluff.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk to a significant number of homes along the jurisdiction's eastern bench that parallels the Cache-Wasatch National Forest.

Future Development

No concerns involving potential future development within Logan were reported by city representatives.

Hazard Mitigation Strategies

Table 68: Logan City Mitigation Strategies

LOGAN - COMMUNITY MITIGATION STRATEGIES

Protecting Current Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Logan	Wildfire	Protect current residents and property	Develop educational program for homeowners regarding risk and defensible space.	N/A	High	2016	Federal, State, Local	Logan, Utah FFSL	\$5,000	Utah FFSL
Logan	Flood	Protect current residents and property	Improve flood risk assessment by revising and updating regulatory floodplain maps.	N/A	Medium-high	2017	Local	Logan, Utah DEM	\$100,000	City has retained consultant to model river through Logan
Logan	Landslide	Protect current residents and property	Improve data and mapping on specific landslide prone areas to assess vulnerability	N/A	Medium	2015-2020	Local	Logan, UGS	\$50,000	Use consultant
Logan	Dam Failure	Protect current residents and property	Educate residents located with dam failure impact areas regarding notifications and emergency actions	N/A	Low	2015-2020	Local	Logan, Utah Dam Safety	\$10,000	City staff
Logan	Earthquake	Protect current residents and property	Protect critical facilities and infrastructure by replacing 100 North Logan River Bridge	N/A	High	2015-2020	Local	Logan, Utah DEM	\$2,000,000	City will Use Consultants and Contractors

LOGAN - COMMUNITY MITIGATION STRATEGIES

Protecting Future Residents and Property

Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame (Year)	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Logan	Wildfire	Protect future residents and property	Develop educational program for homeowners regarding risk and defensible space	N/A	High	2016	Federal, State, Local	Logan, Utah FFSL	\$5,000	Utah FFSL
Logan	Flood	Protect future residents and property	Limit or restrict development in floodplain areas	N/A	High	2015-2020	Local	Logan, Utah DEM	\$250,000	City staff through development reviews
Logan	Landslide	Protect future residents and property	Improve data and mapping on specific landslide prone areas to assess vulnerability	N/A	Medium	2015-2020	Local	Logan, UGS	\$50,000	Use consultant
Logan	Dam Failure	Protect future residents and property	Educate residents located with dam failure impact areas regarding notifications and emergency actions	N/A	Low	2015-2020	Local	Logan, Utah Dam Safety	\$10,000	City staff
Logan	Earthquake	Protect future residents and property	Conduct outreach to builders, architects, engineers, and inspectors about seismic code provisions	N/A	Medium	2015-2020	Local, FEMA	Logan, UGS	\$10,000	International Code Council

