Chapter 6:
Flood

Floods can, and have, caused significant damage in Fremont County and are one of the more significant natural hazards in the state. They can cause millions of dollars in damage in just a few hours or days. A flood, as defined by the National Flood Insurance Program (NFIP), is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from: overflow of waters; unusual and rapid accumulation or runoff of surface waters from any source; or, a mudflow. Floods can be slow or fast rising, but generally develop over a period of many hours or days.

Floods can also occur with little or no warning and can reach full peak in only a few minutes. Such floods are called flash floods. A flash flood usually results from intense storms dropping large amounts of rain within a brief period. Floods can occur for reasons other than precipitation or rapidly melting snow. They can also occur because of ice jams or natural and man-made dam failures, both of which have occurred in Fremont County.

History

The documented flood history for Fremont County extends back to June 1917. Bridge damages were noted across the county including bridges in Lander, Kinnear, Shoshoni, Arapaho and Dubois. Damages to bridges ranged from the approach to the bridge being damaged to bridges impassable. Damage was also noted to the Taylor and Table Mountain irrigation ditch head gates.

In July 1919, Dubois was again in the news for flooding. The flood caused a flash flood along Horse Creek in Dubois. Barns, fences and everything close to the creek was destroyed. The event took six lives, including the town doctor. The Dubois bridge across Horse Creek was also destroyed.

In July, 1923, widespread thunderstorms caused a 25- to a greater than 100-year flood resulting in $1,000,000 in damage to the Chicago and Northwestern Railway along the Wind River. The event took two lives. This converts to $12.6 million in 2009 dollars using the Consumer Price Index.

"In June 1963, a partial failure of Worthen Reservoir, which is Lander's water source, coupled with heavy spring snowmelt and a three (3) inch rainfall, caused the Big (Middle) Popo Agie River to overflow its banks into Dickinson Creek. This overflow into the creek caused the most severe flooding recorded in the city to that time."

Source: Popo Agie Conservation District on flooding events that have newspaper accounts on file

Further research on the 1963 event done by the Popo Agie Conservation District documents that Mr. Miller said his firm was the contractor who installed the original outlet works when the dam was constructed in 1957. Mr. Miller indicated that after the flood of 1963, a large portion of the

downstream side of the dam east of the outlet pipe was washed out. The majority section of the downstream side west of the outlet were also washed out. In 1963, he helped with the emergency repairs on the east side of the outlet. [Phase 1 Geotechnical Investigation Existing Worthen Meadows Dam and Reservoir - Shoshone National Forest GCE Job No. 02-85-2 by Greguras Consulting Engineers, Inc. (May 21, 1985)].

On March 2, 1974, a rapid snow melt combined with rain caused flooding along the Popo Agie River. There was an ice jam in the Hudson area that intensified flooding and forced 60 families from their homes. Damage was estimated at $500,000. Damage from this event in 2009 dollars would be $2,170,000 (Source: Consumer Price Index 2011).

On June 7, 1991, flooding of the Wind River at Riverton resulted in 12 homes being flooded and the loss of crops along the river. Damage was estimated at $247,500. This damage today (2009) would be $390,000. (Source: Consumer Price Index 2011).

During the incident period of June 4 thru 18, 2010, Chinook winds and spring rains caused the late heavy snows to rapidly melt resulting in overland flooding and high velocity water flows county- wide. A disaster situation was declared at the county level which resulted in a Presidential Disaster Declaration DR-1923-WY; the first presidential disaster declaration in Fremont County. Forced accounting of labor and equipment for county employees and equipment amounted to $196,835 outside of regular working hours. At the height of the event 32 square miles were affected in the flooded area. Structural damage during this event is estimated to be $2 million reported by Commissioner Pat Hickerson during the 2011 Fremont County Fire Awards Banquet (2-26-11). Further information was obtained through the NOAA Satellite and information Service, National Environmental Satellite, Data and Information Service (NESDIS) of property damage at $12 million. This information was from storm data gathered from public officials and newspapers by local weather service personnel.

An agricultural disaster was also declared during this event. Approximately 150 farms were damaged with estimates being over $2 million dollars. These damages were assessed by Fremont County Emergency Board, August 25, 2010 at a meeting acting on behalf of the agriculture community as directed by the Wyoming State Farm Service Office and at the request of the County Office per Governor Dave Freudenthal:

Fremont County Emergency Board Meeting
508 N. Broadway Ave.
Riverton, WY 82501

Time: 9:00 A.M.

Date: August 25, 2010

Place: Riverton USDA Service Center

Persons Present: Andrea Warren, CED, Farm Service Agency – Chairman
/s/ Andrea Warren

Mary Lou Wickstrom, PT, Farm Service Agency
Nick Biltoft, Natural Resources Conservation Service- Riverton DC
Kevin Edinger, Natural Resources Conservation Service – Lander DC
Cathy Meyer, Lower Wind River Conservation District - Riverton
Jeri Trebelcock, Popo Agie Conservation District - Lander

I. INTRODUCTION

A. Chairman Warren informed the County Emergency Board (CEB) that the Fremont County Commissioners, per the attached disaster flow chart, had submitted a request to Governor Dave Freudenthal. The Wyoming State Farm Service Office (STO) then received the request for the County Office (COF) to hold an Emergency Board Meeting and determine losses for the County.

B. The CEB was then presented with the procedure that must be followed in order to receive a designation. Warren presented the Board with a Disaster Process Quick Reference, Disaster Designation Fact Sheet, and a copy of the initial Loss Assessment Report (LAR), sometimes referred to as a Disaster Assessment Report (DAR), completed by Warren via the Systematic Tracking of Optimal Risk Management (STORM) System. She informed the Board that having received the request from the Disaster Assistance Branch/Emergencies Section (DAB/ES), per Governor Freudenthal's Office; the CEB must further complete/refine a 2010 LAR/DAR. The CEB will specifically be establishing losses for the attached flood zone areas.

C. Warren explained that while the County had received a Governor's Disaster Designation and a Presidential Disaster Designation, the County should still seek a Secretary of Agriculture Designation in order to make the County eligible for any and all future agriculture programs; however, the CEB was made aware that the availability of future programs is unknown by the COF.

1. DISCUSSION

A. The CEB was presented with a Federal Emergency Management Agency (FEMA) spreadsheet which documented the various losses they have seen throughout the flood zone and the current Emergency Conservation Program (ECP) applications.

B. The CEB reviewed the FEMA identified losses and the reported ECP requests for assistance and concurred that the affected farms in the flood affected areas was as high as 150 farms affected, all of which incurred physical damages.

C. The CEB then reviewed the commodity loss information. They determined that debris and irrigation structure damage caused significant crop losses in the affected flood zones. In some areas ditch companies were able to redirect water through other ditches in order to irrigate their crops, but in other areas this growing season was a total loss as they were unable to irrigate.

Crop	Acres	Loss
Alfalfa, Fg	150	100%
Mixfg, AGM, Fg	150	100%
Mixfg, GMA, Fg	150	100%
Mixfg, IGS, Fg	500	100%
Oat, SPR, Fg	150	100%

D. The CEB also discussed the structures and equipment losses for the County. It was determined that the greatest losses caused by the flood were structure losses which included, but were not limited to barns, corrals, roads, bridges, wells, headgates, ditches and fences. The CED determined, again, 150 farms were affected and the damages could easily be over $2,000,000.

E. Warren presented the CEB with an ECP fact sheet and an Emergency Loan fact sheet. She explains that ECP eligibility does not require any designation; moreover, that the COF applied for funds in the amount of $500,000 and received $239,000 of that request. Again, looking at current applications on file, she explained that the County Committee (COC) would be approving funding for applicants at their September 9, 2010 meeting. Warren also explained that Emergency Loans were made available with the Presidential Designation. She explained that these loans could become very useful to flood affected producers who sustained ineligible ECP practices and/or to assist with the applicant's portion of the cost-shared practices.

F. The Board then began discussion on the County's current grasshopper infestation. It was determined that the COF should complete a LAR for the 2010 grasshopper season; moreover, the County Commissioners need to be contacted in order to request an additional designation for Fremont County grasshopper losses/infestation. Chairman Warren agreed to complete a LAR for grasshoppers.

2. CLOSING

A. Chairman Warren will update the current flood LAR with the CEB's assessed loss numbers. Minutes of this meeting will accompany their determination.

B. The Fremont COF will complete a LAR for the 2010 grasshopper season.

II. ADJOURNMENT

There being no further business, the meeting was adjourned at 10:30 A.M.

_____

Emergency Board Chairman
Andrea Warren

Further research has been done by Popo Agie Conservation District on flooding events that have newspaper accounts on file. The following list denotes the eleven floods during a 93 year period from 1917 to 2010.

1917	1952
1923	1963
1924	1991
1944	1995
1947 (2 events)	2010

In 1947, the first flood was mid-June and consisted entirely of snowmelt (no rain). The second flood was late July and occurred because of rain. Further documentation and newspaper articles are on file at the Popo Agie Conservation District in Lander, WY.

A more extensive listing of Fremont County flooding is in **Table 6.1** below. Other than those events listed above no newspaper coverage was found in the archives to substantiate other events listed. Historic flood accounts are still being sought. Sources for this information was obtained from the Wyoming Office of Homeland Security and the Wyoming State Geological Survey.

Table 6.1 Fremont County Flood Data (Pg. 2)								
County	Location	Start Date	Deaths	Injuries	Property Damage	Crop Damage	Total Damage	Information
Fremont	Lander, Shoshoni, Arapaho, Dubois	1917					Unknown	1. Water reached highest of Monday June 25, 1917. 2. Second Street Bridge in Lander needed repair. 3. Forest Service Bridge out. 4. Approach on the west side of the steel bridge at Lenora across Wind River went out June 19,1917. 5. Kinnear Bridge approach west side flooded for several days, bank washing away. 6. Bridges impassable in Shoshoni, Arapaho and Dubois. 7. Irrigation Ditch head gates gone for Taylor and Table Mountain.
Fremont	Dubois	July 1919	7	Unknown				The flood caused a flash flood along Horse Creek in Dubois. Barns, fences, and everything close to the creek were destroyed. The Dubois bridge across Horse Creek was also destroyed. Seven flood victims reported in newspaper 8/8/1919.
Fremont	Big Horn River, Wind River	23-Jul-1923	2	0	1,000,000.00	0	1,000,000.00	Widespread thunderstorms caused a 25- to a greater than 100-year flood resulting in $1 million in damage to Chicago and Northwestern Railway. The event took two lives. Lander Update: 1. A house was moved several blocks 2. No trains for one week 3. On Memorial Day 1923, Lander was covered with a foot of snow that was melted by June 1st. Water was running down Main Street and some boats were used to navigate Main Street. Basements were flooded and some buildings were washed away. (page 617, Thelma Kiesel Bloxham Collection)
Fremont		1924						Flood documentation in local newspaper discovered by Popo Agie Conservation during research. No factual data listed.
Fremont		1944						Flood documentation in local newspaper discovered by Popo Agie Conservation during research. No factual data listed.
Fremont		June-1947						Snow melt. Flood documentation in local newspaper discovered by Popo Agie Conservation during research. No factual data listed.
Fremont		July-1947						All rain caused. Flood documentation in local newspaper discovered by Popo Agie Conservation during research. No factual data listed.
Fremont		1952						Flood documentation in local newspaper discovered by Popo Agie Conservation during research. No factual data listed.
Fremont	Hudson, Popo Agie River, Little Popo Agie River	10-Feb-1962	0	0	0	0	0	Heavy spring runoff, breakup of ice, and ice jamming at old bridge caused major flood damage. Muskrat Creek near Shoshoni had a discharge of 13,300 CFS.
Fremont	Lander, Middle Popo Agie	15-Jun-1963	0	0	90,000.00 Est. 300-400 homes damaged	0	90,000.00	A greater than 500-year flood from a combination of heavy rain (3 inches) and failure* to an earthen reservoir caused minor damage to homes, inundated part of the city, resulting in an estimated $90,000 in damage according to city officials. * Later investigation suggests that there was no partial breach of the reservoir that embellished the amount of water exiting the structure. However, further investigation indicated 300-400 homes were damaged.
Fremont		20-Sep-1963	0	0	22,500.00	0	22,500.00	Heavy rains in the Crowheart-Dubois area caused flash flooding with considerable damage to roads, bridges, crops and the irrigation system.
Fremont	Crowheart, Dubois	20-Sep-1963	0	0	0	0	0	Heavy rains caused flooding, resulting in damage to roads, bridges, crops, and irrigation systems.
Fremont	Riverton/Lander area	8-Sep-1973	0	0	22,500.00	0	22,500.00	Rain and hail from a series of thunderstorms, hail mostly small but some to 1 1/4", along with high water, caused damage primarily to crops but also to some structures, cars and materials.
Fremont	Hudson	2-Mar-1974	0	0	500,000.00	0	500,000.00	A combination of abnormally high temperatures, rain, and strong Chinook-type winds in late February and early March resulted in rapid snow melt and flooding along the Popo-Agie River. Hardest hit was the southern portion of Hudson where an ice jam against a highway bridge intensified the flooding and forced nearly 60 families from their homes. Damage was estimated at $500,000.
Fremont	North & South Forks of Shoshone and Wind Rivers, Shoshone River, and Upper Snake River	7-Jun-1981	0	0	0	0	0	Widespread rainfall combined with snowmelt runoff. Damage to rural property. 40- to 100-year flood (Wyoming Floods and Droughts, National Weather Summary 1988-89). Bridges, campgrounds, highways, personal property damaged (WEMA Storm Data).

Table 6.1 Fremont County Flood Data								
County	**Location**	**Start Date**	**Deaths**	**Injuries**	**Property Damage**	**Crop Damage**	**Total Damage**	**Information**
Fremont	Dubois	24-Jul-1982	0	0	225	0	225	A cloudburst caused Tappon Creek north of Dubois to flood and overflow into Pony and Horse Creeks. Mud and debris covered parts of Highway 287 and caused some damage to two homes in the area.
Fremont	North Portal Area	27-Jul-1982	0	0	22,500.00	0	22,500.00	Thunderstorms dumped up to three inches of rain in the North Portal Area of Northern Fremont County during the evening causing flash flooding and road washouts in some places.
Fremont	17 SE Riverton	29-Jul-1990	0	0	22,500.00	0	22,500.00	A slow-moving thunderstorm produced over 2 inches of rain about 17 miles southeast of Riverton between 1500 and 2000 MST. Flash flooding occurred along State Highway 135, covering the road to a depth of around 4 feet and washing out two sections of the road.
Fremont	Riverton	7-Jun-1991	0	0	225,000.00	22,500.00	247,500.00	Flooding of the Wind River at Riverton resulted in 12 homes being flooded and loss to crops along the river. High water due to past rains and snow melt.
Fremont		14-Jun-1995	1	0	0	0	0	A prolonged episode of flooding occurred in Fremont County as warm temperatures in the mountains brought a rapid snowmelt. The Big Wind River, the Little Wind River, and the Popo Agie River overflowed their banks and caused considerable flooding. The town of Hudson (10 miles northeast of Lander) had some lowland flooding that did some damage to a few homes. Flooding occurred at the Lander City Park as well as at other locations. Five mobile homes had severe damage due to flood waters. The worst flooding at Riverton occurred on the far south side of town and at the Wind River Indian Reservation. A total of 11 homes were damaged with four of them seriously damaged. Some roads were under water for three or four days and some bridge damage was also reported. About 40 people had to be evacuated in Fremont County due to the flooding. As of August 10th, no damage figures were available. There was one fatality due to the flooding.
Fremont	Crowheart to Riverton, Big Wind River	14-Jul-1995	0	0	9,000.00	0	9,000.00	Rain and snowmelt pushed the Big Wind River over flood stage from Crowheart to Riverton. A section of dirt berm gave way in the early morning, allowing water to cross the highways south of Riverton. Trailer homes to the south of Riverton were also flooded.
Fremont	5 S Riverton	8-Jun-1997	0	0	0	0	0	Portion of Highway 789 closed due to water and debris over road. Two homes flooded. Water over Highway 134. Basements flooded.
Fremont	Dubois	12-Sep-1998	0	0	0	0	0	Street flooding and some basements flooded in and around Dubois. Intense, slow-moving thunderstorms.
Fremont	Riverton	12-Sep-1998	0	0	0	0	0	Some streets and sidewalks near downtown under 1 foot of water. Intense, slow-moving thunderstorms.
Fremont	Lander	14-Sep-2001	0	0	0	0	0	One foot of water reported on Main street, between 1st and 9th streets.
Fremont	4 W Shoshoni	17-Jun-2003	0	0	0	0	0	Water flowing over US Highway 20/26.
Fremont	Countywide affecting Lander, Hudson, Riverton, Ft. Washakie and Arapahoe	4 June 2010	0	0	$ 2,000,000	$2,000,000	$4,000,000	During the incident period of June 4 thru June 18, 2010, Chinook winds and spring rains caused the late heavy snows to rapidly melt resulting in overland flooding and high velocity water flows county wide. Disaster situation was declared at the county level which resulted in a Presidential Disaster Declaration DR-1923-WY. Crop damage was determined to affect 150 farms which included crop loss as well as physical damages to irrigation structures and system.

Source: Wyoming State Geological Survey
Popo Agie Conservation District
Local newspapers

The National flood Insurance Program and Fremont County

FEMA conducts a Flood Insurance Study (FIS) of a region to identify the community's risk levels. The FIS includes statistical data for river flow, rainfall, topographic surveys, as well as hydrologic and hydraulic analyses. After examining the FIS data, FEMA creates Flood Insurance Rate Maps (FIRMSs) delineating the different areas of flood risk. Wyoming Office of Homeland Security provided the following information regarding Fremont County, and its municipalities' participation in the NFIP.

Table 6.3 - National Flood Insurance Program Status - Fremont County

Community	NFIP Participation	No. of Policy Holders	Program Entry	Current Map	Repetitive Loss Buildings
Fremont County	Yes	27	07/08/75	09/16/11	0
Lander	Yes	34	08/23/74	09/16/11	0
Dubois	Yes	15	05/09/97	09/16/11	0
Riverton	Yes	1	05/18/99	09/16/11	0
Shoshoni	Yes	Not Listed	07/05/83	09/16/11	0
Hudson	Yes	6	09/06/74	09/16/11	0
Pavillion	No	0	N/A	09/16/11	0

Source: FEMA.gov, Isource, August 26, 2011

There have been residential insurance losses in the county due to flooding, however, those losses have not met the threshold criteria set forth by the NFIP.

Fremont County Flood Analysis 2010

Flood Analysis

Planning level flood loss estimates were made available for every county in Wyoming with the 2010 update to the Wyoming Hazard Mitigation Plan. FEMA used HAZUS-MH MR2 to model the 100-year floodplain and perform associated building and population risk assessments. HAZUS-MH is FEMA's GIS-based natural hazard loss estimation software. The HAZUS-MH flood model results include analysis for Fremont County, modeling streams draining a 10 square mile minimum drainage area, using 30 meter (1 arc second) Digital Elevation Models (DEM). Hydrology and hydraulic processes utilize the DEMs, along with flows from USGS regional regression equations and stream gauge data, to determine reach discharges and to model the floodplain. Losses are then calculated using HAZUS-MH national baseline inventories (buildings and population) at the census block level.

HAZUS-MH produces a flood polygon and flood-depth grid that represents the 100-year floodplain. The 100-year floodplain represents a flood that has a 1% chance of being equaled or exceeded in any single year. While not as accurate as official flood maps, these floodplain boundaries are available for use in GIS and could be valuable to communities that have not been mapped by the National Flood Insurance Program. HAZUS-MH generated damage estimates are directly related to depth of flooding and are based on FEMA's depth-damage functions. For

example, a two-foot flood generally results in about 20% damage to the structure (which translates to 20% of the structure's replacement value). The HAZUS-MH flood analysis results provide number of buildings impacted, estimates of the building repair costs, and the associated loss of building contents and business inventory. Building damage can cause additional losses to a community as a whole by restricting the building's ability to function properly. Income loss data accounts for losses such as business interruption and rental income losses as well as the resources associated with damage repair and job and housing losses.

Potential losses derived from HAZUS-MH used default national databases and may contain inaccuracies; loss estimates should be used for planning level applications only. The damaged building counts generated are susceptible to rounding errors and are likely the weakest output of the model due to the use of census blocks for analysis. There could also be errors and inadequacies associated with the hydrologic and hydraulic modeling of the HAZUS-MH model. In rural Wyoming, census blocks are large and often sparsely populated or developed; this may create inaccurate loss estimates. HAZUS-MH assumes population and building inventory to be evenly distributed over a census block; flooding may occur in a small section of the census block where there are not actually any buildings or people, but the model assumes that there is damage to that block. In addition, excessive flood depths may occur due to problems with a DEM or with modeling lake flooding. Errors in the extent and depth of the floodplain may also be present from the use of 30 meter digital elevation models. HAZUS Level II analyses based on local building inventory, higher resolution terrain models, and DFIRMs could be used in the future to refine and improve the accuracy of the results.

Reports, Maps and Results

A series of maps and analysis results were compiled for Fremont County **Tables 1** and **2** (shown below) in Fremont Flood Loss by Municipality.xls contain the results of the HAZUS loss estimation. Building and contents value loss estimates, income-related loss estimates, and displaced population and shelter needs estimates are included in **Table 1**: Flood Loss by Municipality. These loss estimates have been grouped by municipality to demonstrate how the risk varies across the county. Per Capita Loss was calculated using total building loss and Census 2009 estimates to the municipal and county –level population. Percent Building Loss and Percent Contents Loss were calculated using building and contents loss estimates, and HAZUS building and contents exposure data. **Table 2**: HAZUS Loss Estimation Additional Analysis shows these estimates, also grouped by municipality.

Wyoming Flood Insurance Rate Map (FIRM) coverage is documented in **Figure 6.1**.

The following 18 maps (**Figures 6.2** through **6.19**) are provided at the county scale and for each municipality: the ***Flood Hazards*** map shows the HAZUS floodplain boundary, the ***Flood Depth*** map shows HAZUS flood depth data, and the ***Building Loss*** map shows total building loss, in dollars, by census block. It is important to note that the highest flood depth in the municipality maps indicates the maximum depth for the county and is not representative of the highest depth in that municipality. Areas addressed in these maps include Fremont County, Lander, Riverton, Dubois, Hudson and Shoshoni.

According to the HAZUS model output, Fremont County would suffer $58,223,000 in total direct economic loss to buildings and 2,445 people would be displaced in the event of a countywide 100-year flood. There would be a total of 221 damaged buildings, 48 of which would be substantially damaged (>50% damaged). The Wind River flows southeast across the county through the Wind River Indian Reservation and Riverton, Boysen Reservoir. The Popo Agie River flows from the southwest through Lander and drains into the Wind River. The City of Lander would suffer the most damage of jurisdictions in the county, with a total direct economic loss for buildings of $14,781,000 and 685 displaced people. The Town of Hudson has the greatest Percent Building Loss (4.2%), Percent Contents Loss (8.8%), and Per Capita Loss ($6,274) of the jurisdictions in the county. The unincorporated county would suffer $31,592,000 of total direct economic building loss. The total county, incorporated and unincorporated, would suffer 1.3% Building Loss, 2.2% Contents Loss, and $1,504 Per Capita Loss.

Source: Wyoming Office of Homeland Security

Contents Loss ($K)	Inventory Loss ($K)	Relocation Loss ($K)	Capital Related Loss ($K)	Wages Loss ($K)	Rental Income Loss ($K)	Total Loss ($K)	# of Displaced People	# of People Needing Short Term Shelter
4,528	187	9	16	104	7	8,224	104	42
1,535	40	4	5	21	2	2,729	107	18
8,419	251	25	46	342	13	14,781	685	344
-	-	-	-	-	-	-	-	-
396	15	1	1	2	-	727	35	7
61	-	-	-	-	-	170	8	1
15,002	658	34	37	231	5	31,592	1,506	728
29,941	**1,151**	**73**	**105**	**700**	**27**	**58,223**	**2,445**	**1,140**

Additional Analysis

Total Exposure ($K)	Building Loss ($K)	Building Exposure ($K)	% Building Loss	Contents Loss ($K)	Contents Exposure ($K)	% Contents Loss	Total Loss ($K)	Per Capita Loss ($)
144,353	3,373	87,363	3.9%	4,528	56,990	7.9%	8,224	7,559
44,328	1,122	26,930	4.2%	1,535	17,398	8.8%	2,729	6,274
704,218	5,685	420,176	1.4%	8,419	284,042	3.0%	14,781	2,001
15,148	-	9,298	0.0%	-	5,850	0.0%	-	-
1,007,301	312	594,374	0.1%	396	412,927	0.1%	727	71
59,406	109	37,759	0.3%	61	21,647	0.3%	170	239
1,445,025	15,625	878,045	1.8%	15,002	566,980	2.6%	31,592	1,692
3,419,779	**26,226**	**2,053,945**	**1.3%**	**29,941**	**1,365,834**	**2.2%**	**58,223**	**1,504**

Source: Wyoming Office of Homeland Security

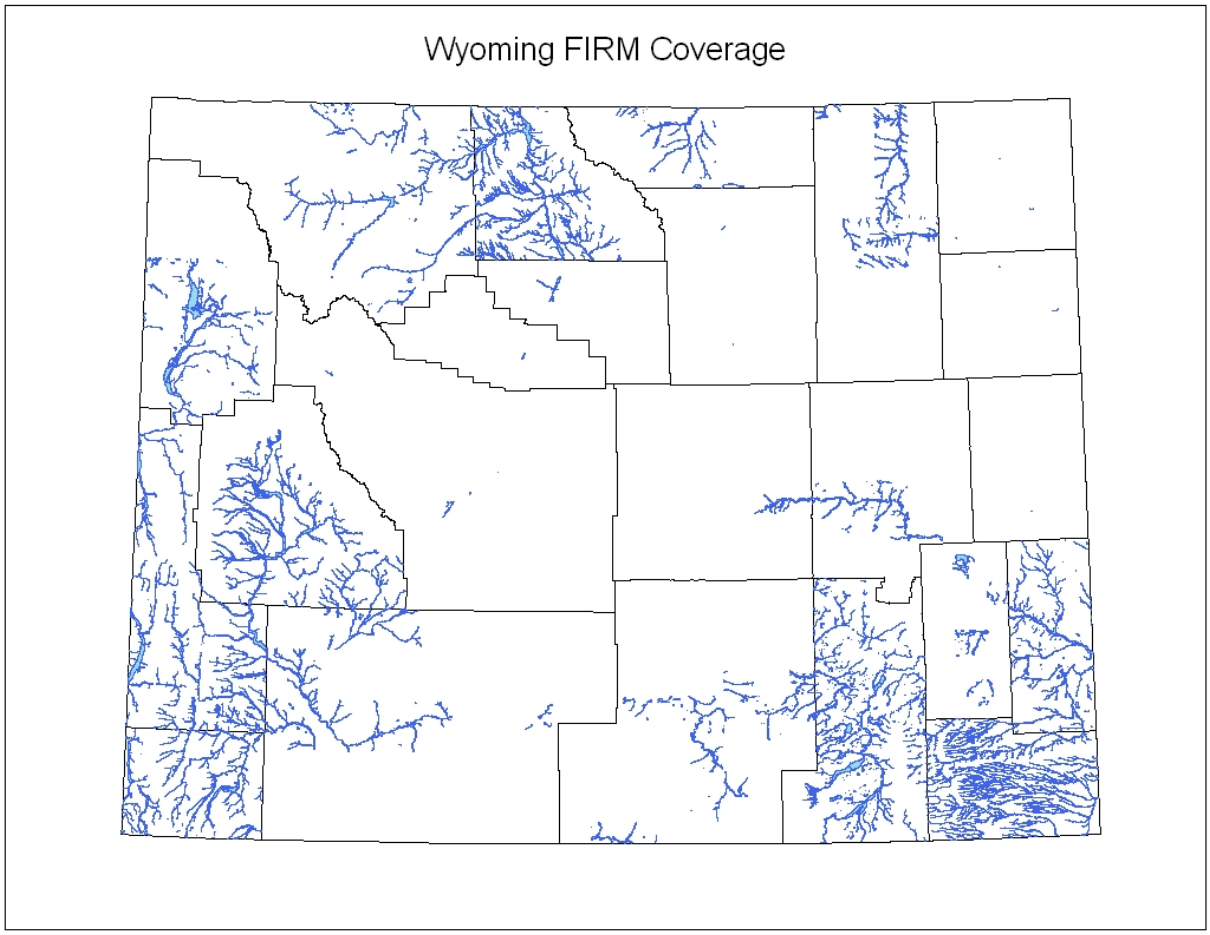

Figure 6.1 Wyoming Flood Insurance Rate Map (FIRM) Coverage

Flood Hazard By Jurisdiction

Flash Flooding - Flash flooding can occur in every area of Fremont County when the weather conditions are "perfect" (i.e., heavy precipitation in the upper areas of the drainage, heavy rain over an area, region or specific point.) This can create losses because of properties with basements flooding, erosion and hail damage.) Soil can determine whether or not water is absorbed or left standing.

River Flooding - Lander, Hudson, Riverton, Dubois and Wind River Reservation can, and have experienced flooding. This is generally attributed to rapid snow melt conditions, rain-on-snow melt or schnook winds. Any issue precipitating river flooding can develop within a short period of time. The speed at which this can occur is dependent upon soil and weather conditions. If the soil is wet, water becomes runoff and is too much too fast to be absorbed. Those conditions will occur in Riverton, Lander and Dubois. the unique location of these communities, in conjunction with the location of the Popo Agie (most rapid influx), Little and Big Wind Rivers. The 2011 flood precipitated the closure of Highway 26 in approximately 18 hours from first signs that the Big Wind River was rising.

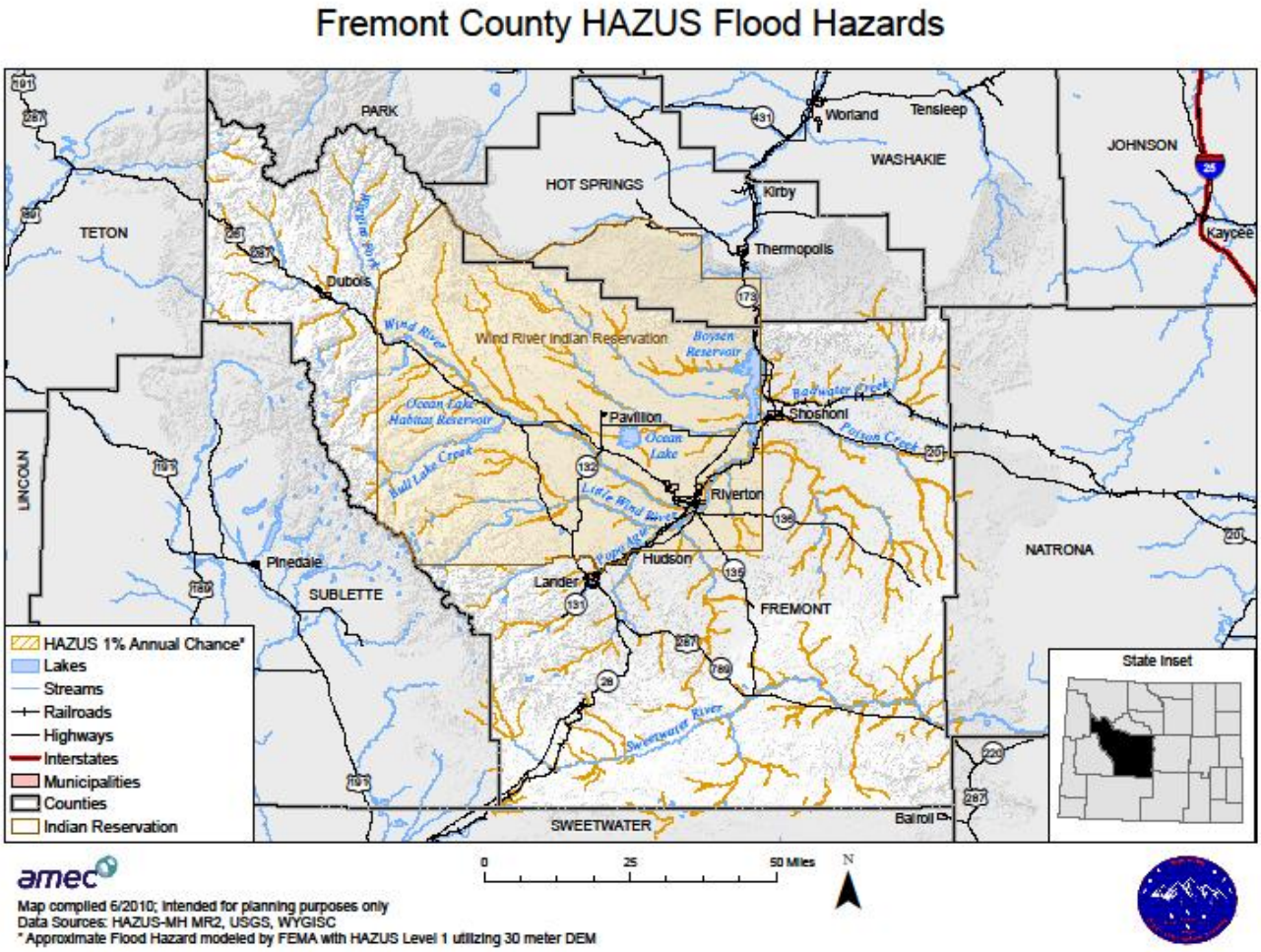

Figure 6.2 Fremont County HAZUS Flood Hazards

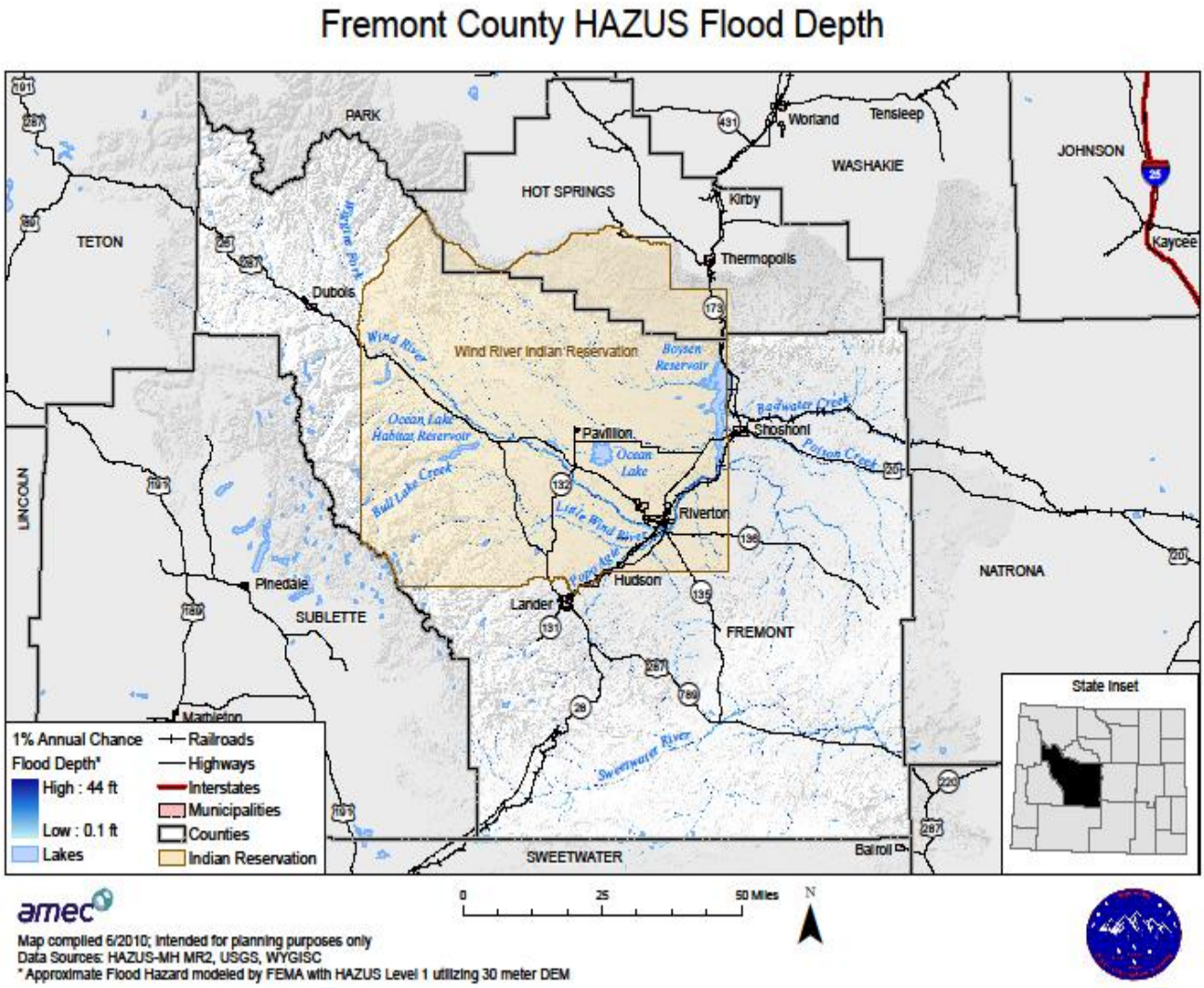

Figure 6.3 Fremont County HAZUS Flood Depth

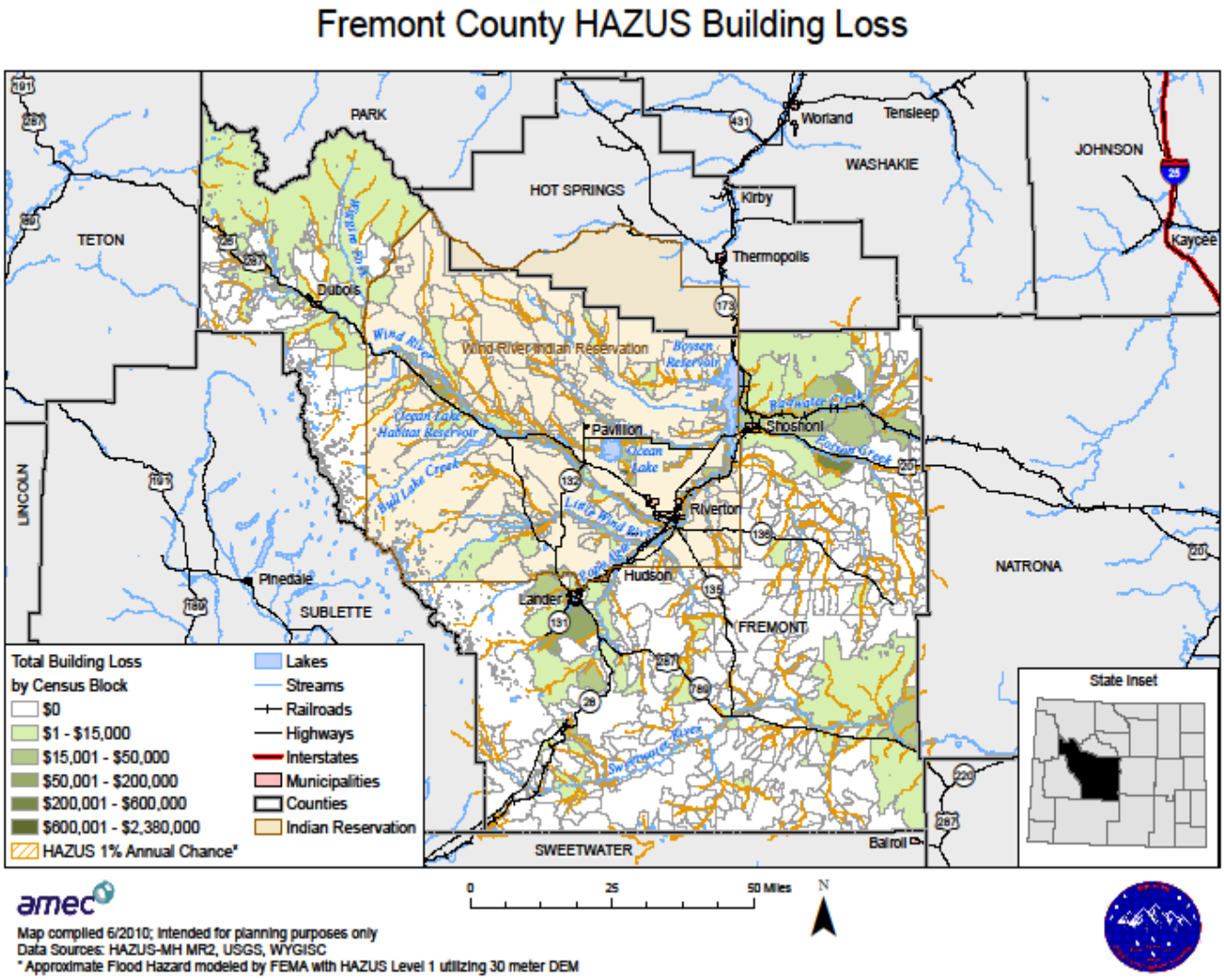

Figure 6.4 Fremont County HAZUS Building Loss

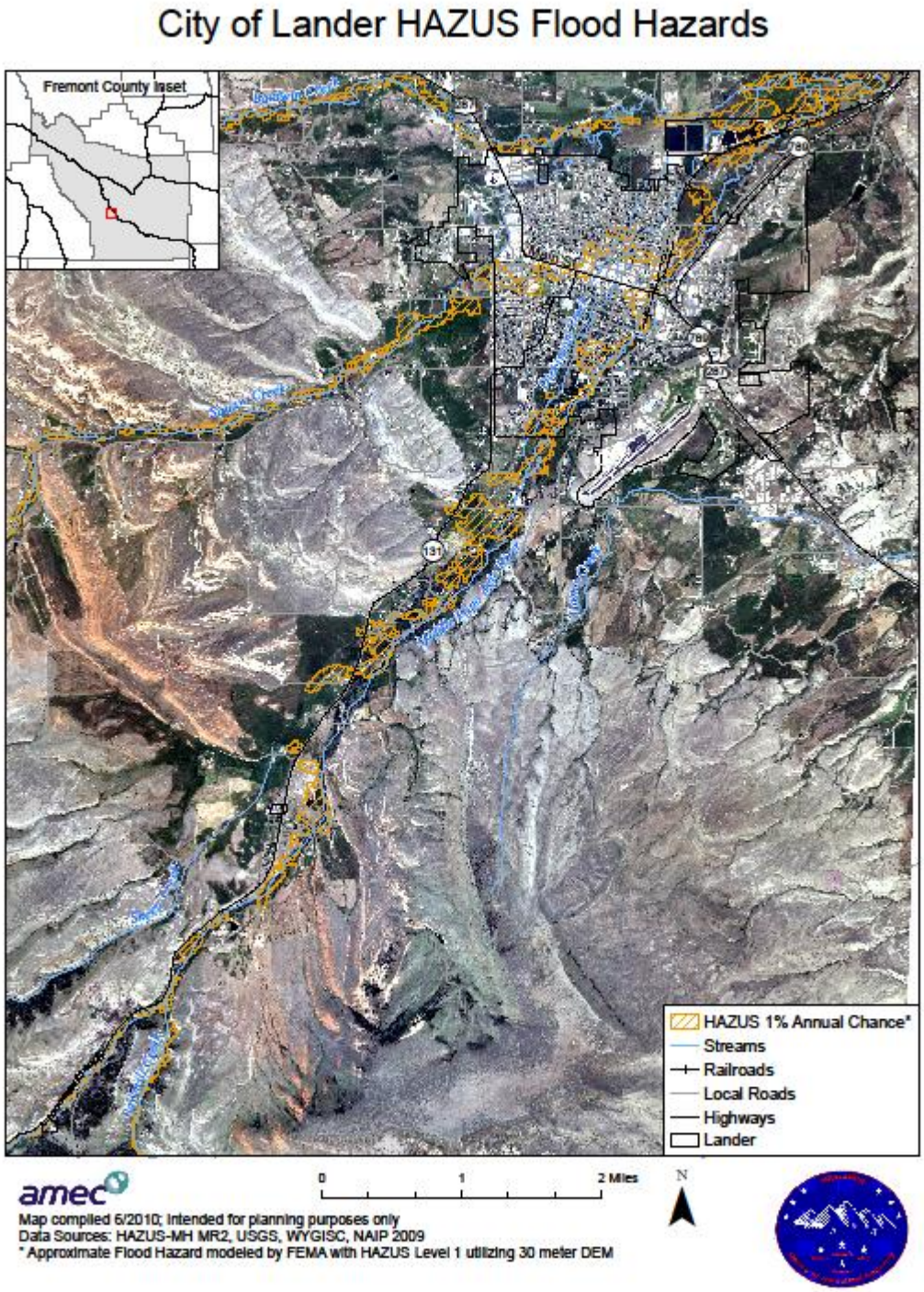

Figure 6.5 Lander HAZUS Flood Hazards

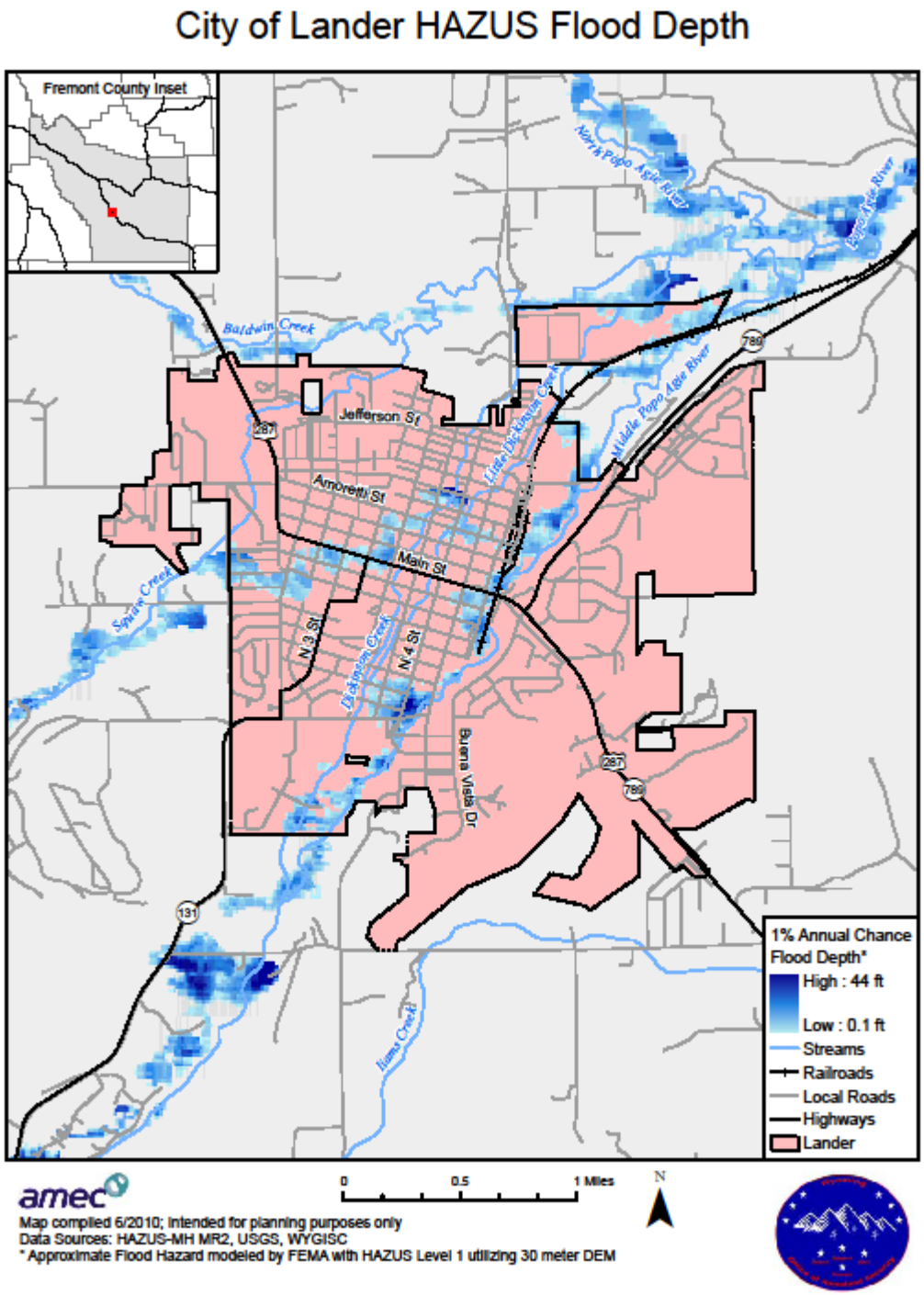

Figure 6.6 Lander HAZUS Flood Depth

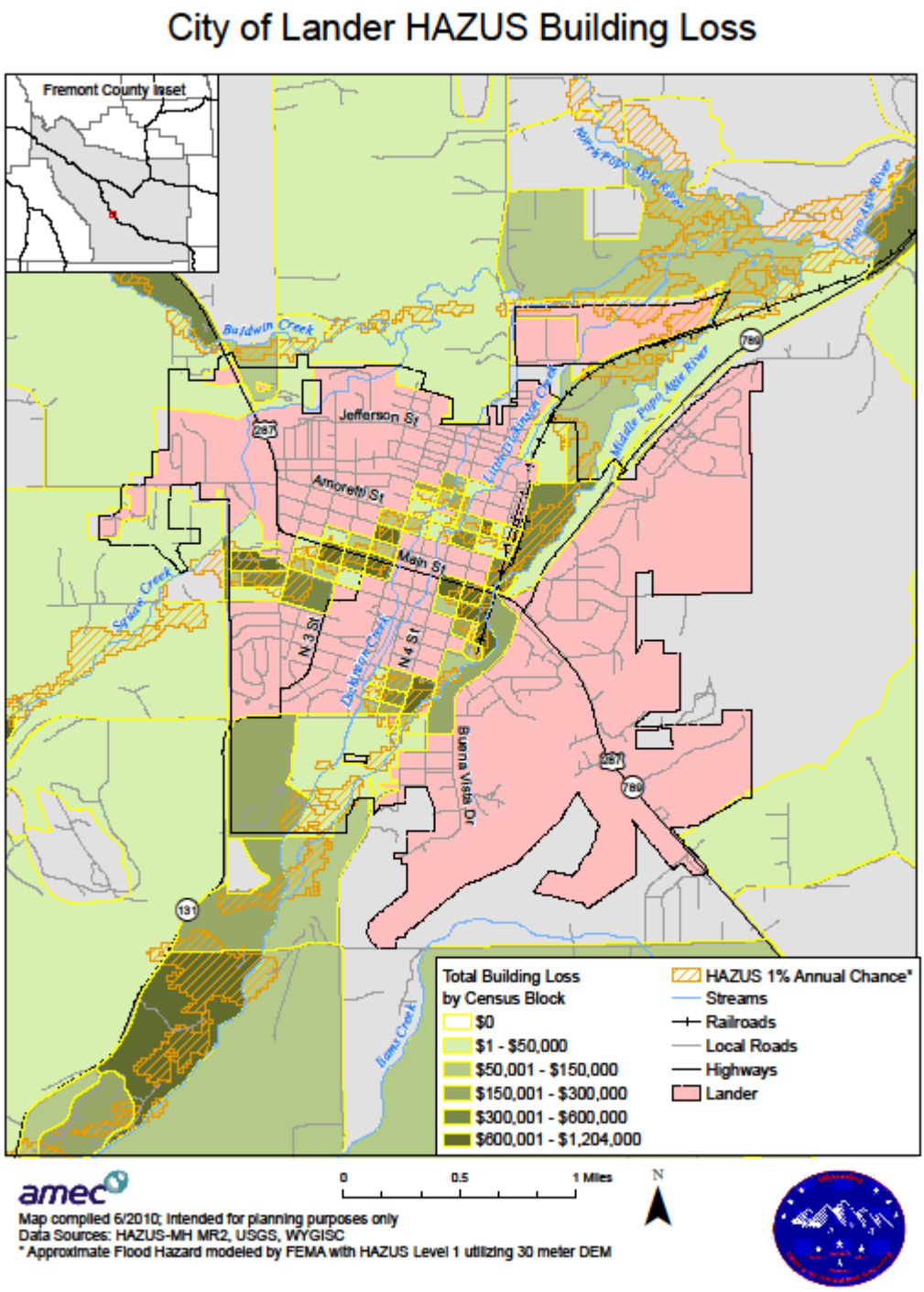

Figure 6.7 Lander HAZUS Building Loss

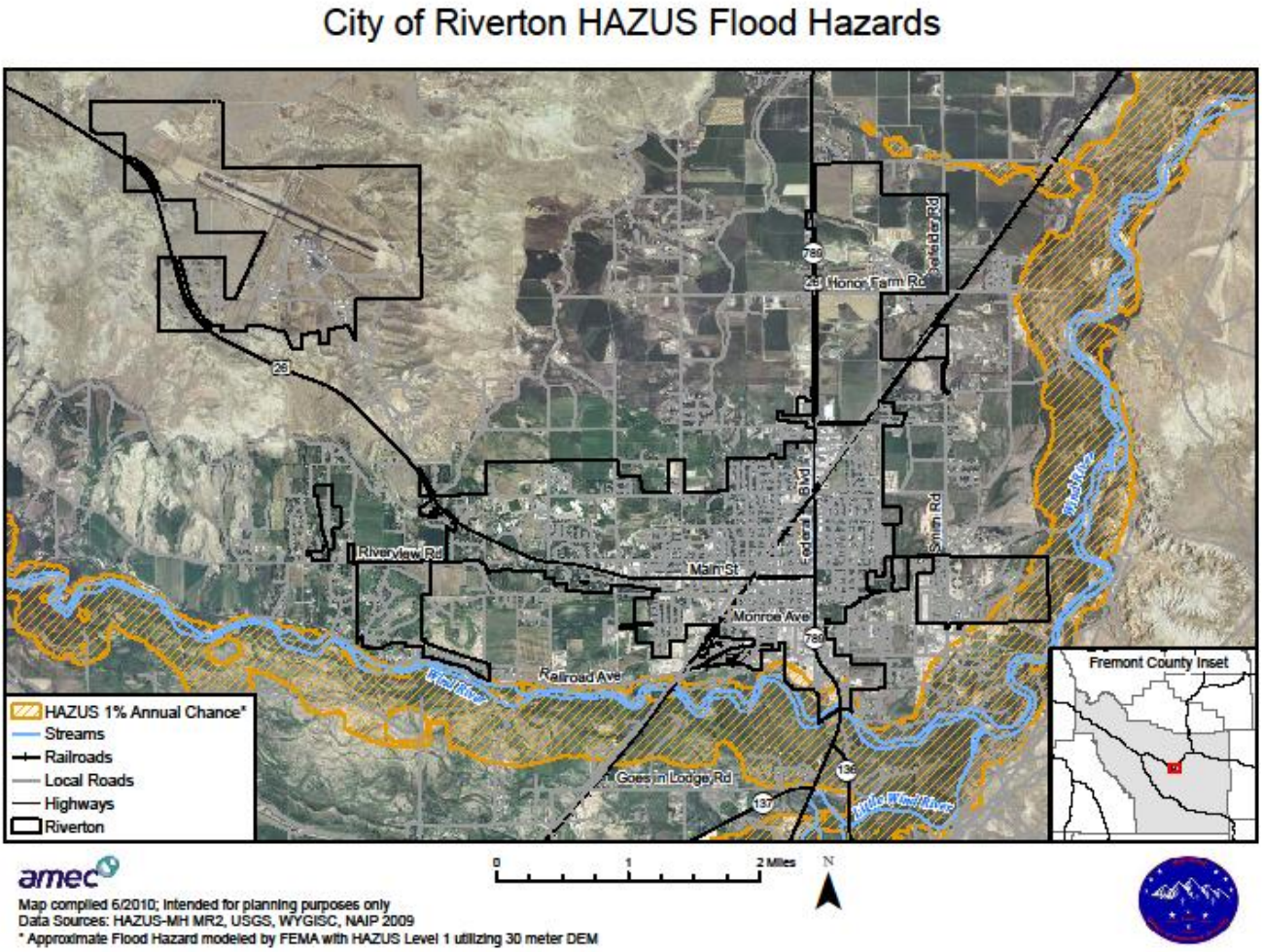

Figure 6.8 Riverton HAZUS Flood Hazards

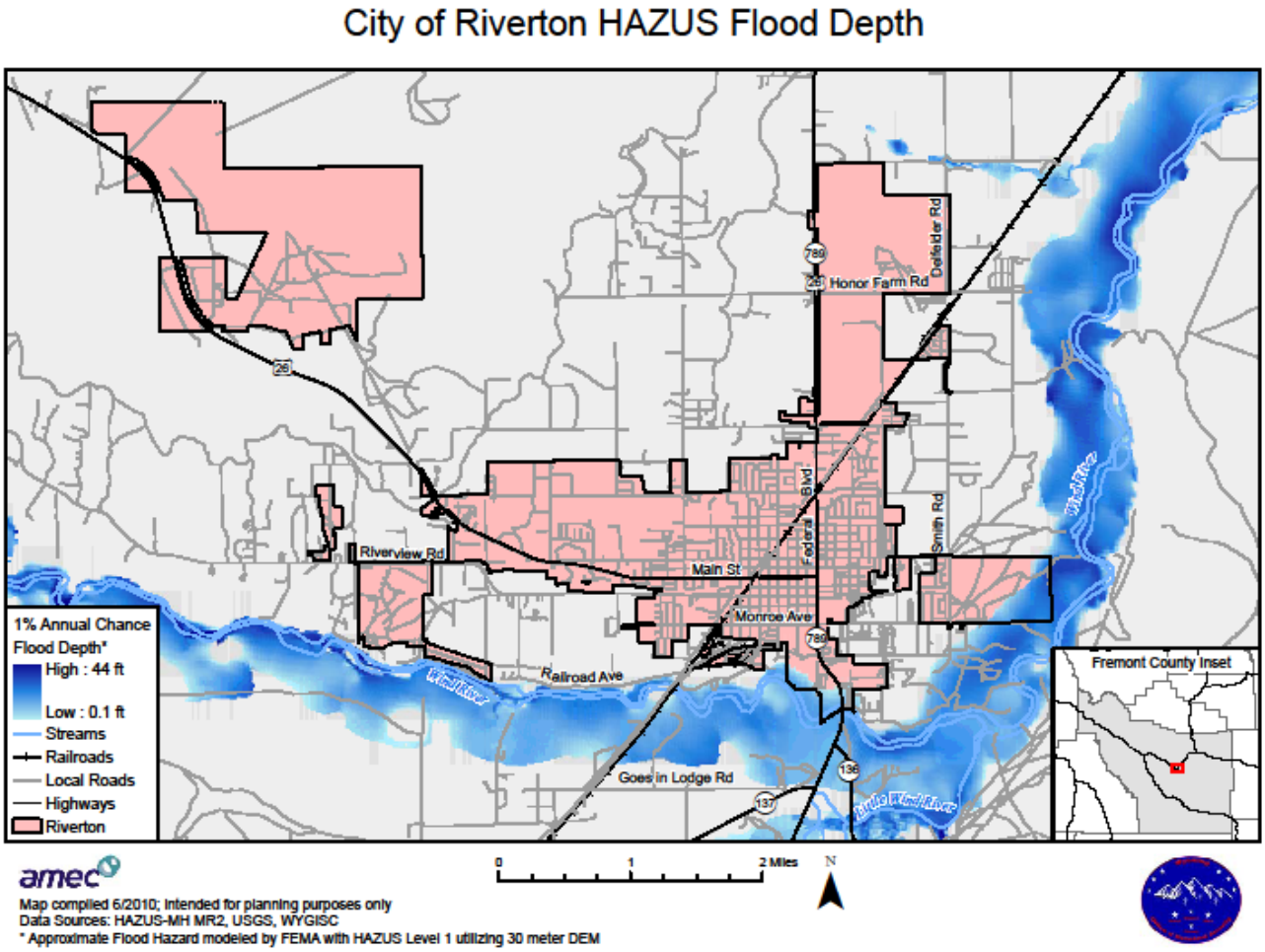

Figure 6.9 Riverton HAZUS Flood Depth

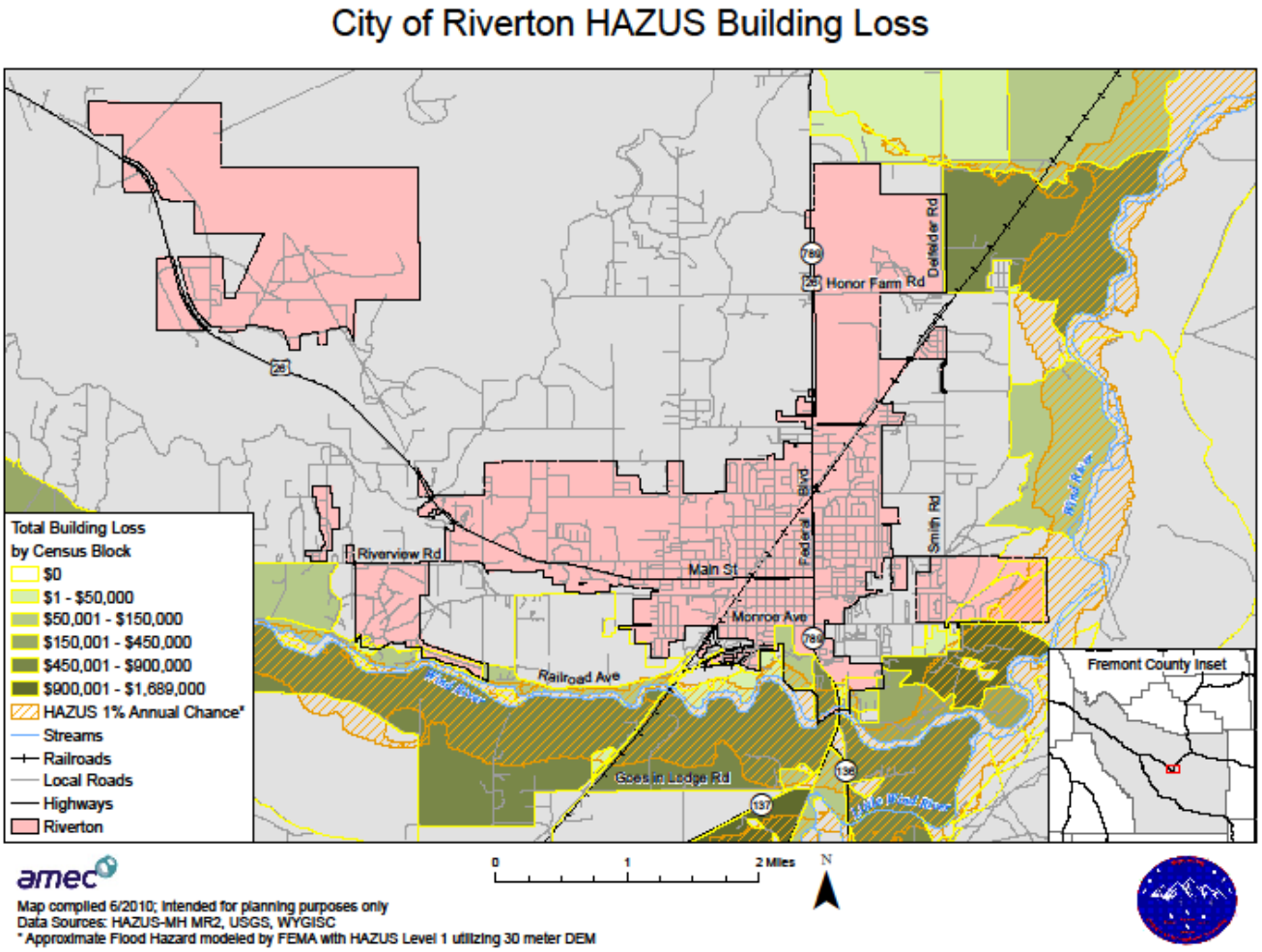

Figure 6.10 Riverton HAZUS Building Loss

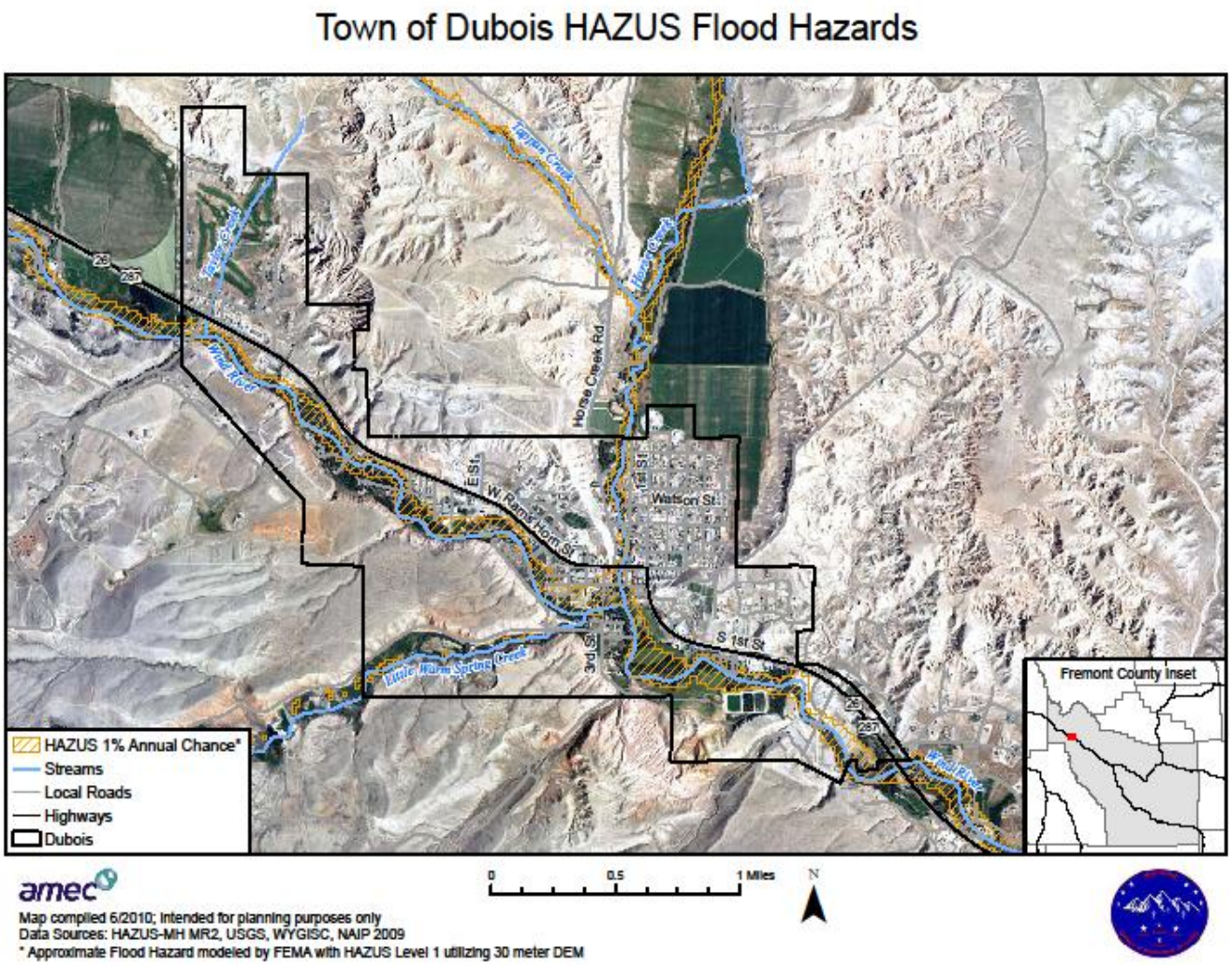

Figure 6.11 Dubois HAZUS Flood Hazards

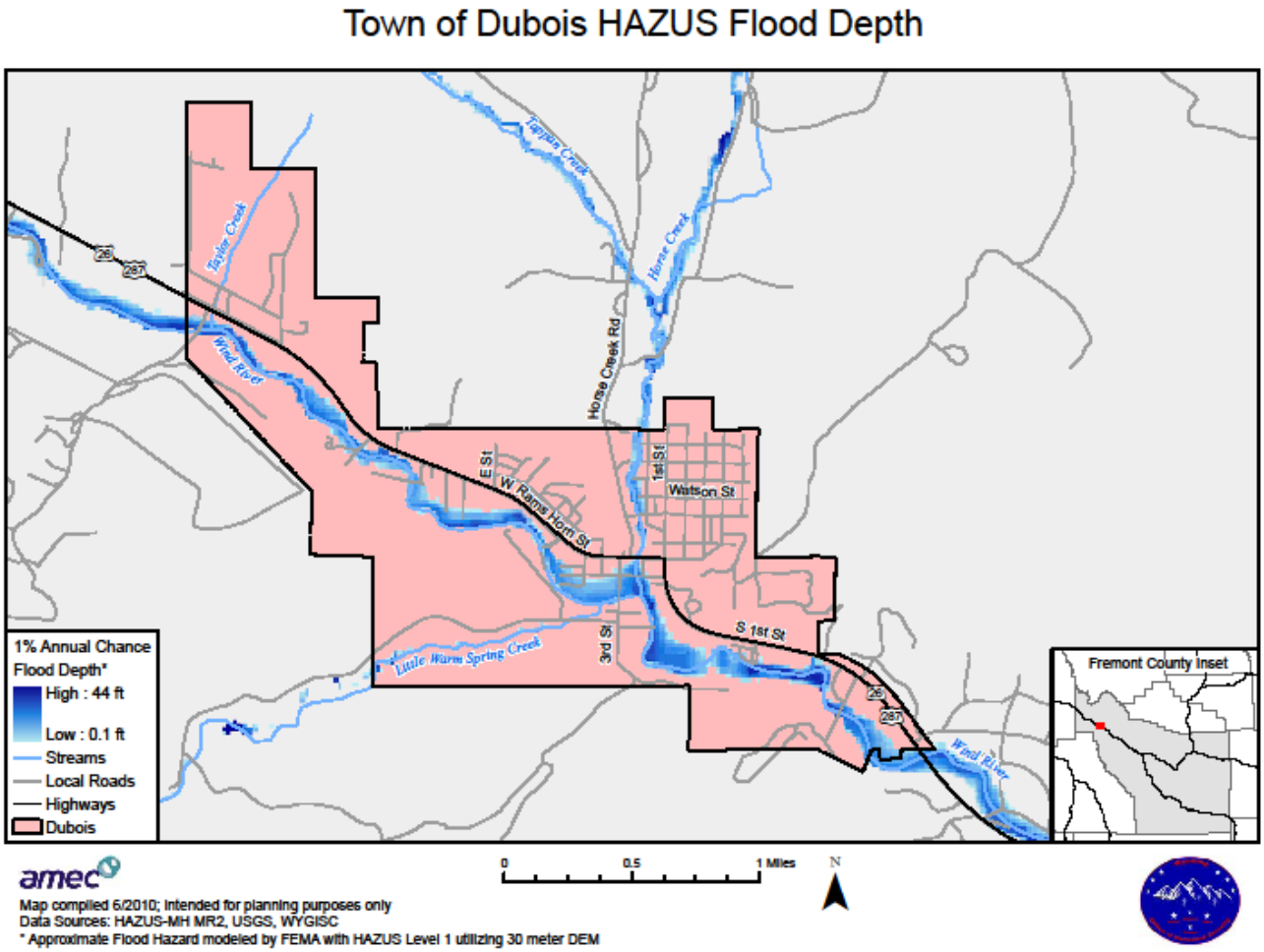

Figure 6.12 Dubois HAZUS Flood Depth

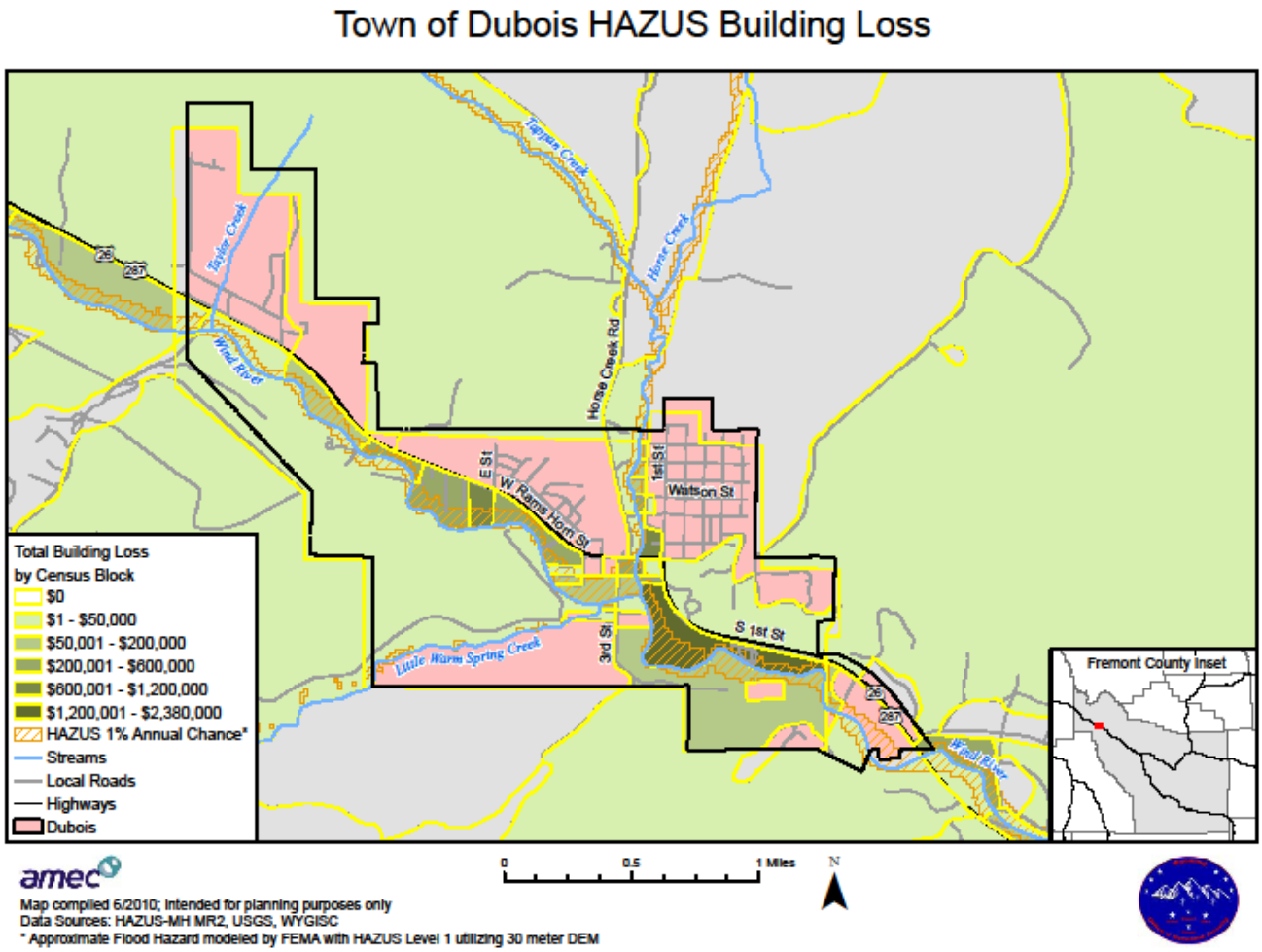

Figure 6.13 Dubois HAZUS Building Loss

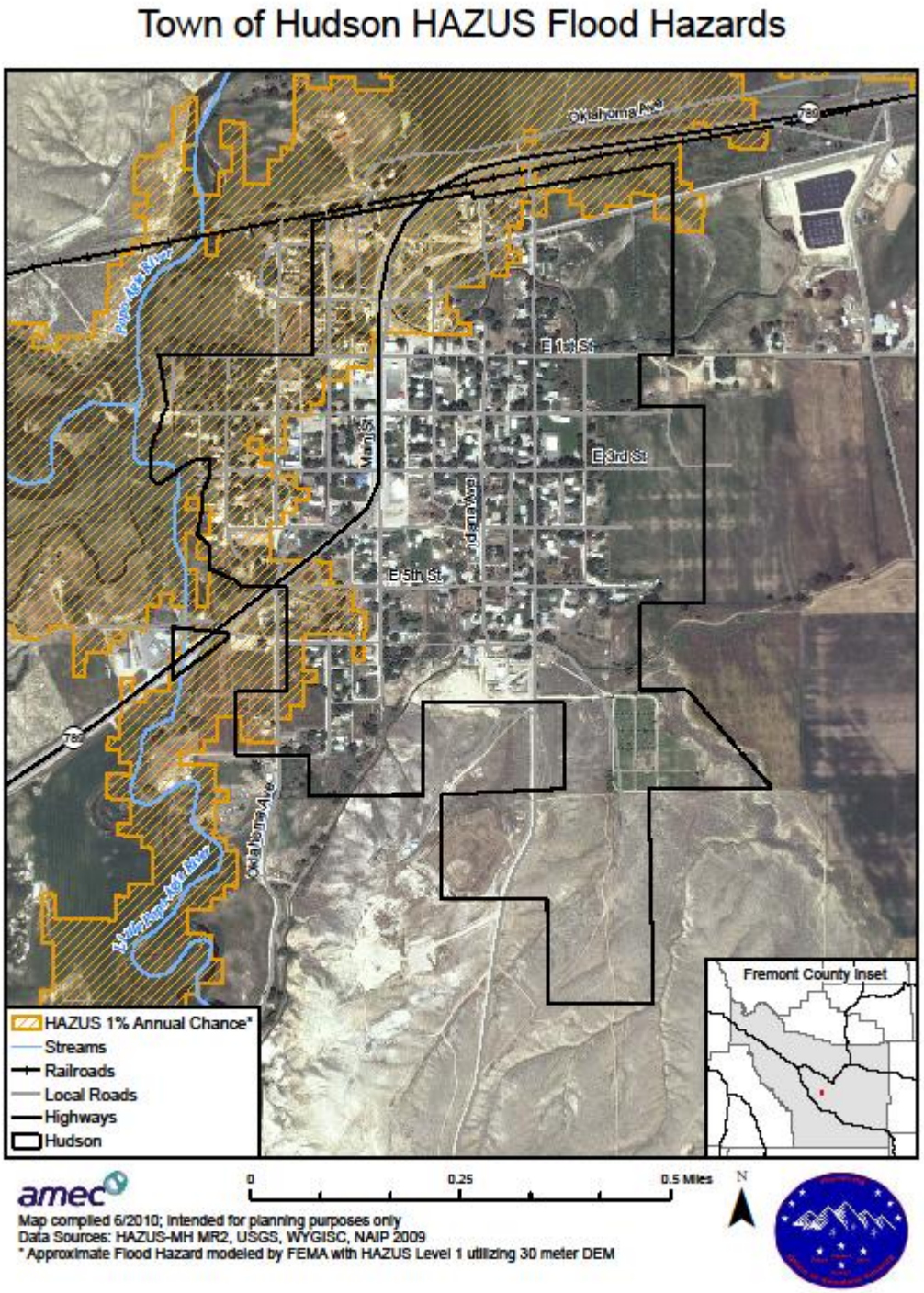

Figure 6.14 Hudson HAZUS Flood Hazard

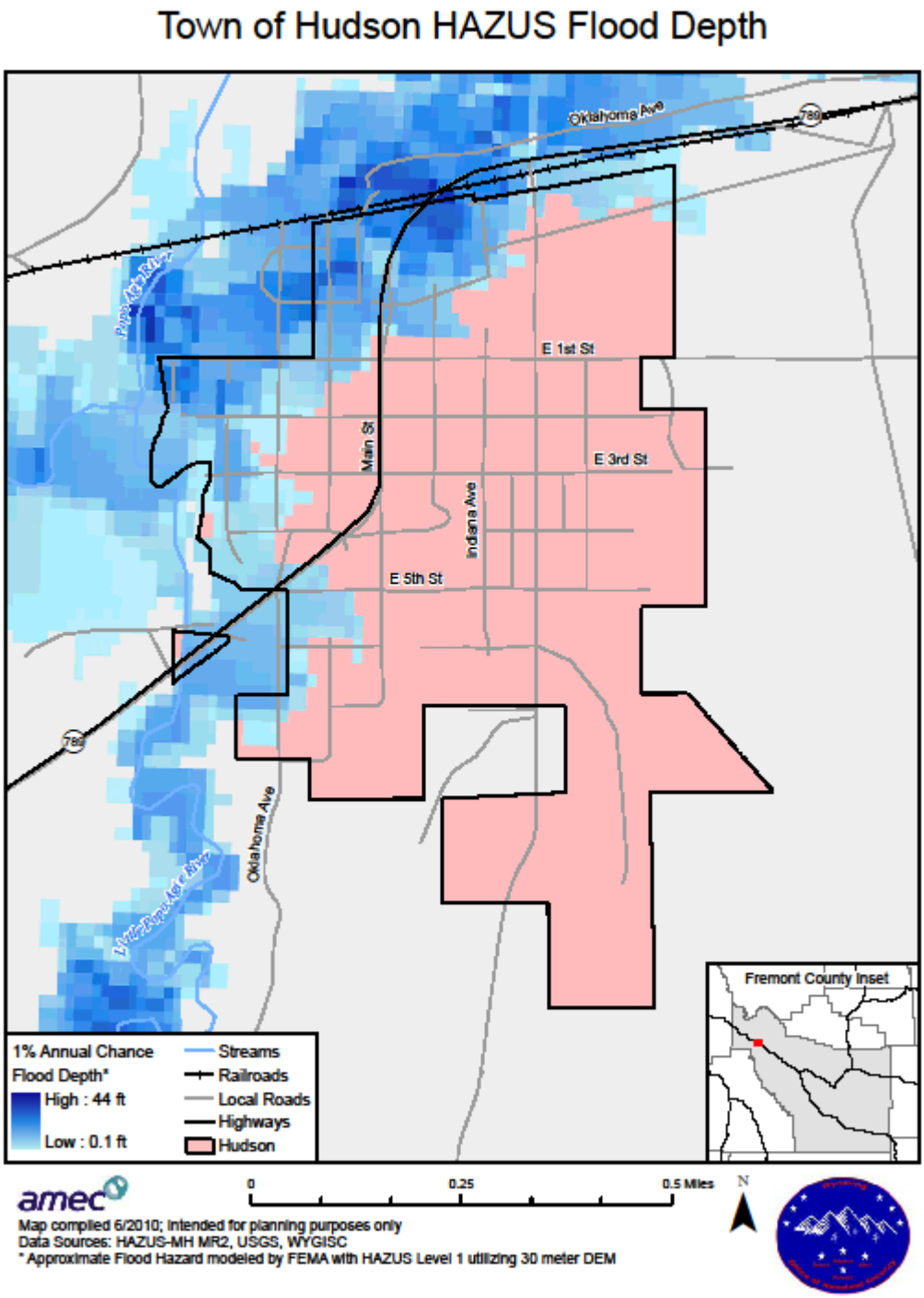

Figure 6.15 Hudson HAZUS Flood Depth

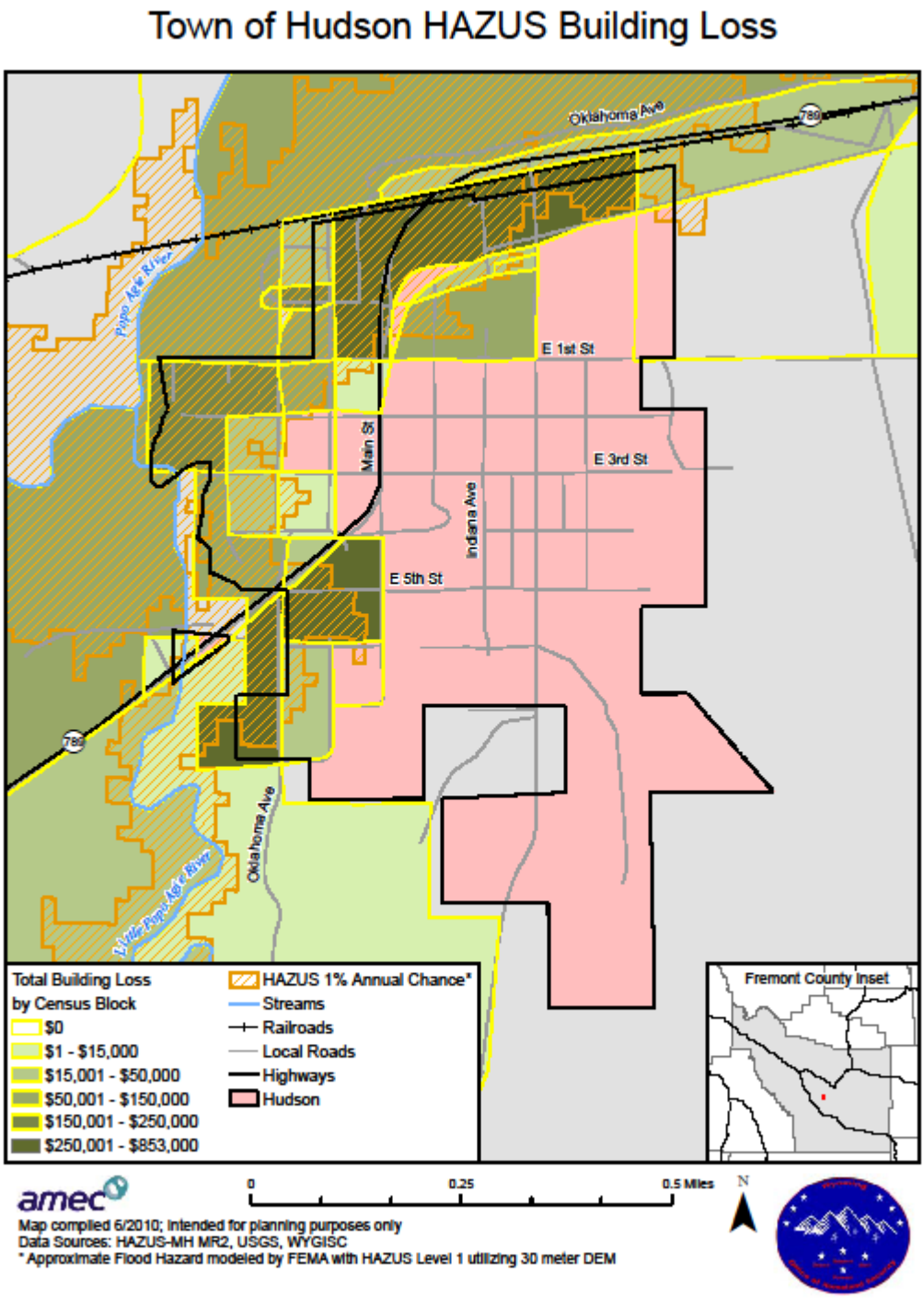

Figure 6.16 Hudson HAZUS Building Loss

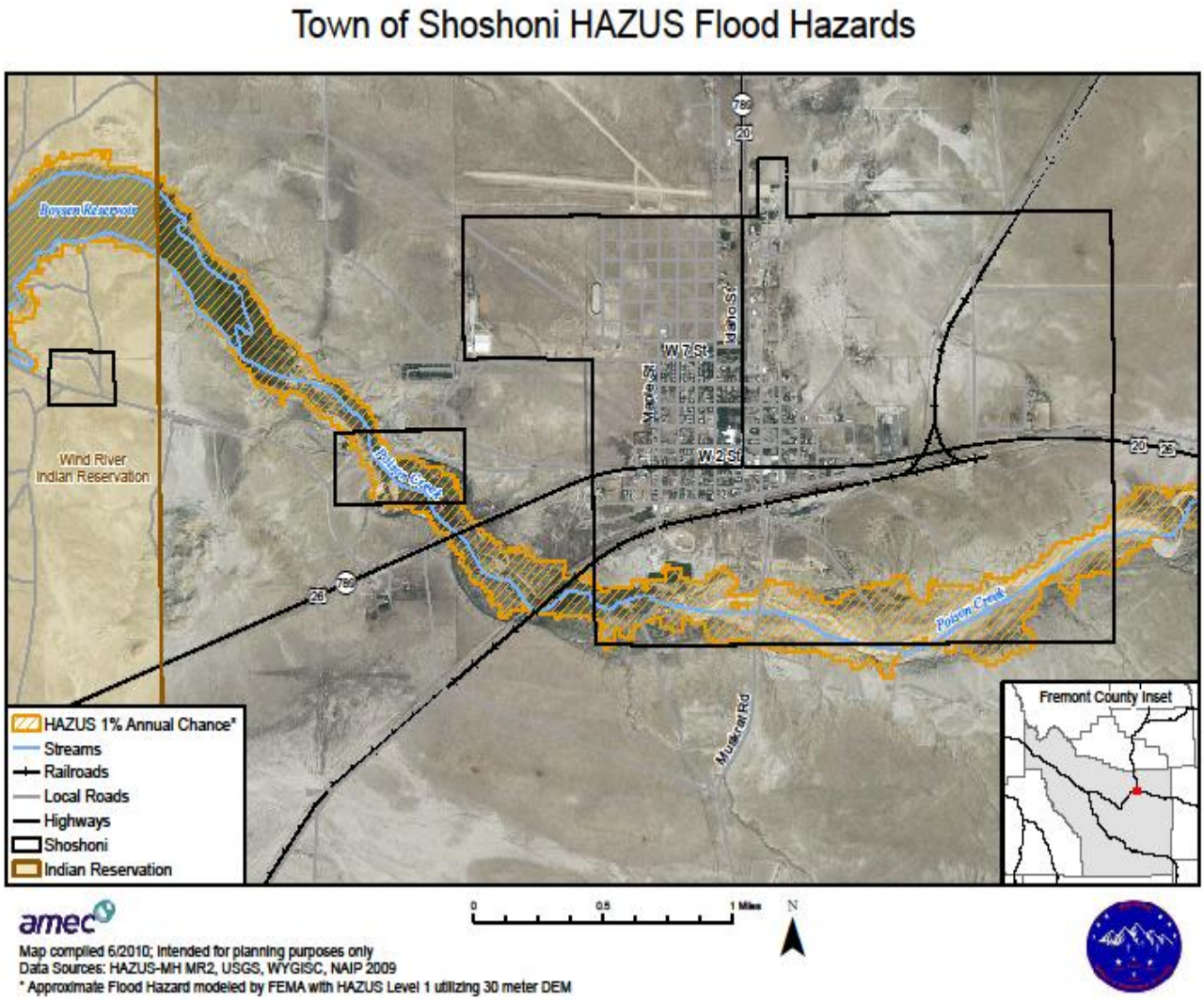

Figure 6.17 Shoshoni HAZUS Flood Hazard

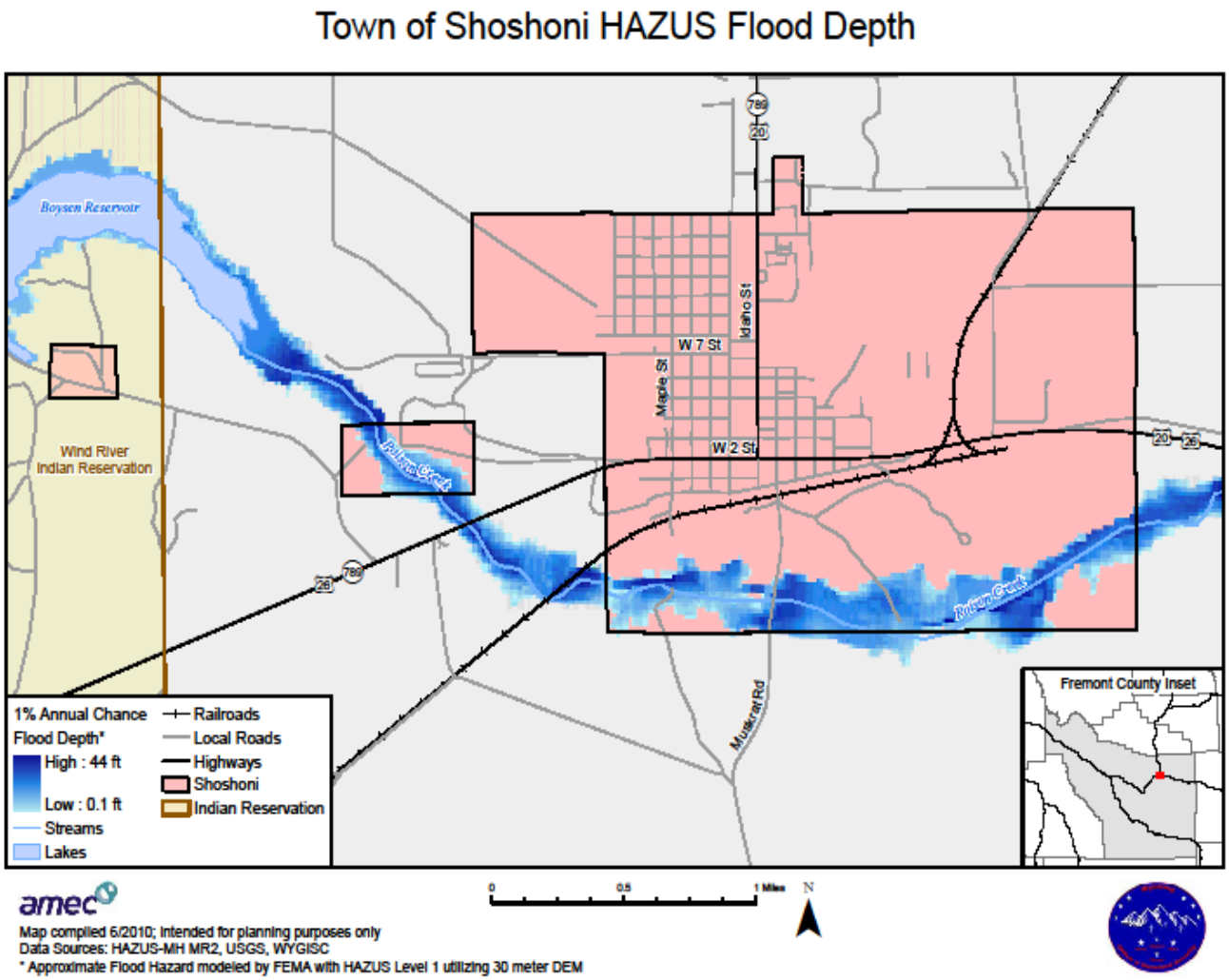

Figure 6.18 Shoshoni HAZUS Flood Depth

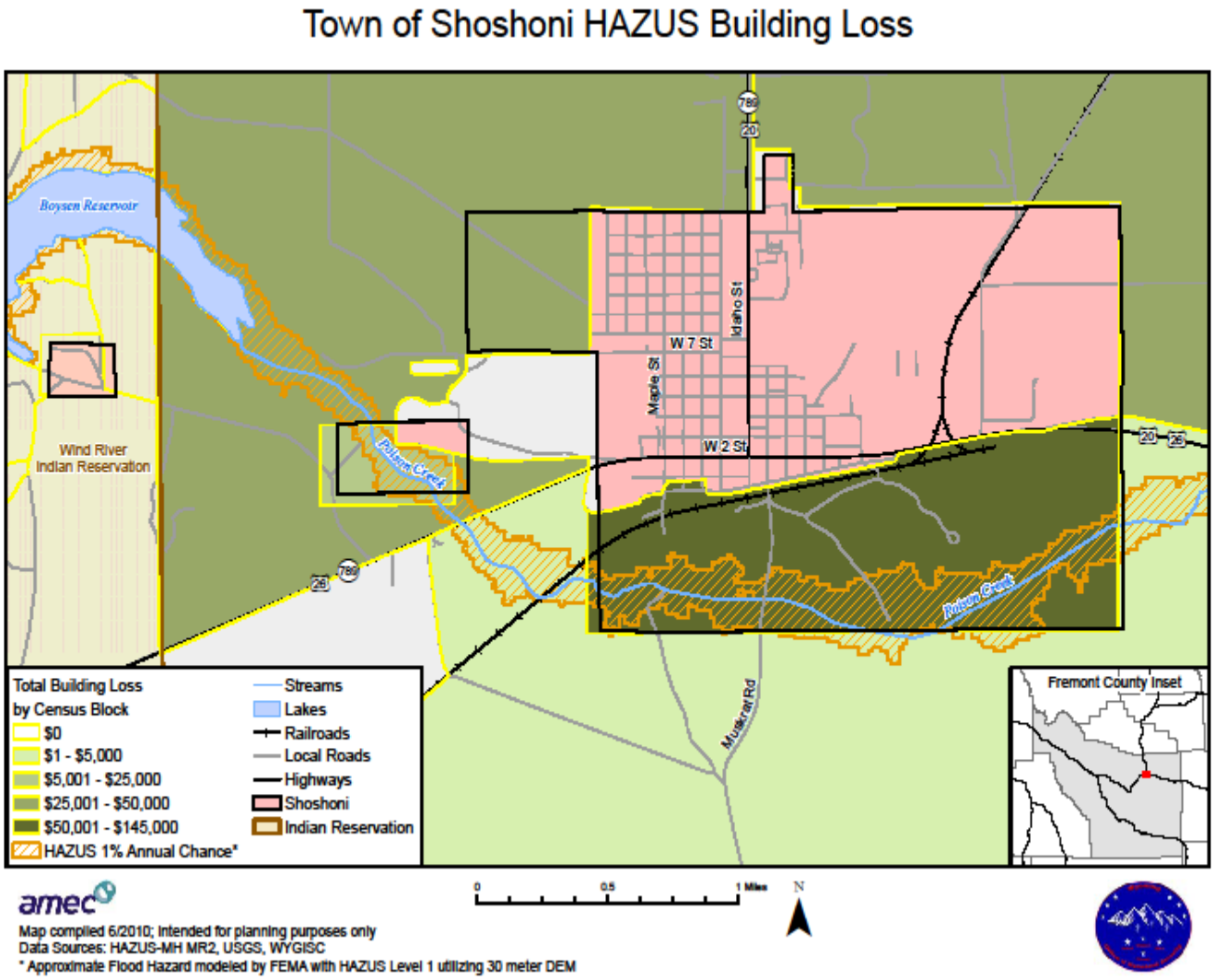

Figure 6.19 Shoshoni HAZUS Building Loss

Impacts

Floods and flood damage have occurred throughout Fremont County. Over the 93 years of historic data available, $5,936,725.00 has been recorded in damages. There have been 27 damaging floods from 1917 to 2010, which equates to a damaging flood every 4 years.

These figures are from the State of Wyoming Office of Homeland Security and the most current information obtainable.

Building Values within Floodplains

There is another method that can be used to rank counties for their flood impact potential. The Wyoming State Geological Survey has estimated the building exposure value for buildings that may occur within a floodplain. All Flood Insurance Rate Maps (FIRMs) for Wyoming have been digitized (**Figure 6.1**). The 100-year flood boundaries on the maps have been digitally crossed with Census block building values. In some cases, a floodplain boundary will dissect a census block. In that case the proportional value of buildings in the census block will be assigned to the floodplain. If a census block is within a floodplain, then the values of all the buildings in the census block is assigned.

Total value for all structures as of 2010 in Fremont County is $1,953,224,631.61. Individual census blocks property value is shown in Chapter 5 following the census block numbering system. No reference map of census blocks have been included for reference and location of each census block due to the size of the county and the inability to print the reference map in a readable size. Further information is available on each census block location in the county through Fremont County Assessor's Office. Values presented are as of 2010 assessments.

Percentage of Structural Loss

Potential dollar losses to an area could also be determined by the percentage of damage to the area, i.e. 10%, 50% or 100% loss and taking that percentage of loss against the structural value in the specific census block to determine structural loss value.

Example:

Census Block #	560130001001085
Value of	$ 1,118,503

10% damage in this census block would equal $ 111,850.30 value loss to structures.

50% damage in this census block would equal $ 559,251.50 value loss to structures.

100% damage in this census block would equal $ 1,118,503 value loss to structures.

This concept of figuring damage would at least give an approximate value in dollars to the structures lost. A percentage of damage could be estimated to assist with property loss. No value is assigned to the loss of ground due to erosion due to no value assigned to the land.

Figure 6.1 shows the floodplains that have been mapped on Flood Insurance Rate Maps in the State of Wyoming. It is not likely that all buildings across the county would be damaged at once. Therefore, the potential future damage from a single flood in Fremont County could reach $12.6 million or greater in 2009 dollars. The $12,600,000 is derived from the 1923 flood that had $1,000,000 in damage. $1,000,000 in 1923 dollars equates to $12,600,000 in 2009. These values have been converted using the Consumer Price Index. Development has been significant since 1923, meaning future dollar losses could well exceed $13 million dollars for an event such as the flood occurring in 1923.

Figures 6.2 through **6.19** are provided at the county scale and for each municipality: the ***Flood Hazards*** map shows the HAZUS floodplain boundary, the ***Flood Depth*** map shows HAZUS flood depth data, and the ***Building Loss*** map shows total building loss, in dollars, by census block. It is important to note that the highest flood depth in the municipality maps indicates the maximum depth for the county and is not representative of the highest depth in that municipality. Areas addressed in these maps include Fremont County, Lander, Riverton, Dubois, Hudson and Shoshoni.

Floodplain Zoning from Fremont County

"All low lying areas near rivers and streams are subject to flood hazards. Specific flood plain regulations are in force in the unincorporated areas of the county near Lander, Hudson, Dubois and Riverton where the elevation of the 100 year flood has been determined. Construction is prohibited in some areas and restricted in others. Permits for construction must be obtained before the project is begun. In other areas of the county flood hazards can be spatially defined but depth estimates are not available. It is extremely important that property owners and prospective buyers be informed of flood hazards and building requirements in designated floodplains before site preparation of construction is begun. The municipalities of Lander, Hudson, Dubois and Riverton also have designated floodplains and building regulations specific to those areas".

Source: Flood Plain Administrator: Ray Price
http://fremontcountywy.org/planning/flood-plains/

Flood Fighting Resource Directory

Currently various emergency flood fighting resources are available through the Fremont County Emergency Management Agency and the current governmental resource listings document attached to the Fremont County Emergency Operations Plan. This document is continually updated as information become available. The resource classification has been documented to national standards per the National Response Program and updated in 2008 to the National Response Framework.

Fremont County Emergency Management Agency will assist with support and response to any or all emergencies. Public education to the population of the county will continue for all hazards the citizens may encounter. Notification to the population will continue to expand through the NOAA Weather Alert Radio notifications and through the local media of all emergencies or hazards.

Summary

PROPERTY AFFECTED:	specific areas
POPULATION AFFECTED:	medium (10,000)
PROBABILITY:	high
JURISDICTION AFFECTED:	specific areas in county