

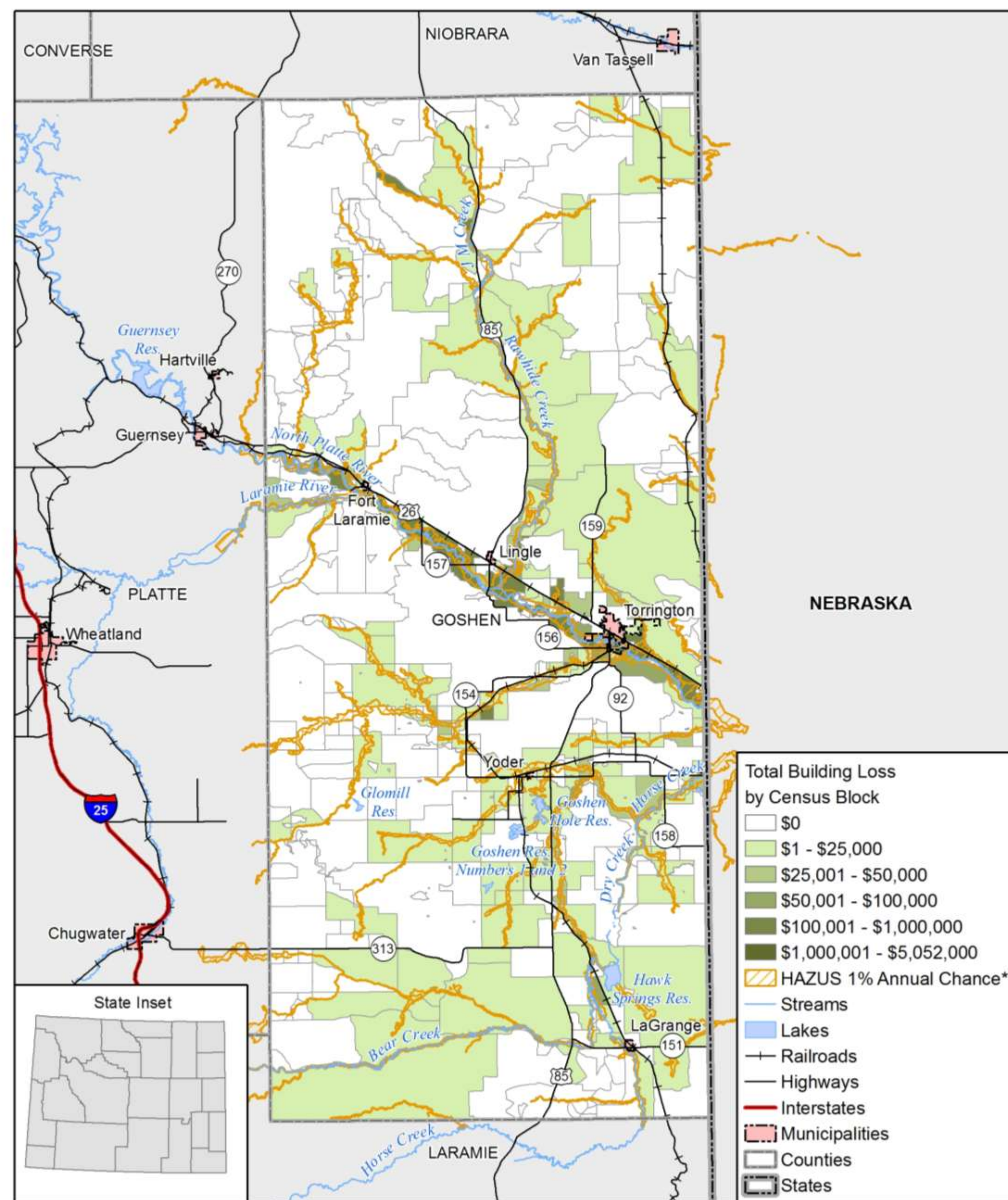
# Using FEMA Level 1 HAZUS-MH Flood Regions for State and Local Hazard Mitigation Planning

FEMA Region VIII used HAZUS-MH MR2 to model the 100-year floodplain and perform associated building and population risk assessments for each county in Wyoming. AMEC prepared maps, analysis results and narratives for each of the state's 23 counties and 100 municipalities, both for inclusion in the Wyoming State Hazard Mitigation Plan Update and for counties and communities to include in local mitigation planning efforts.

## Maps

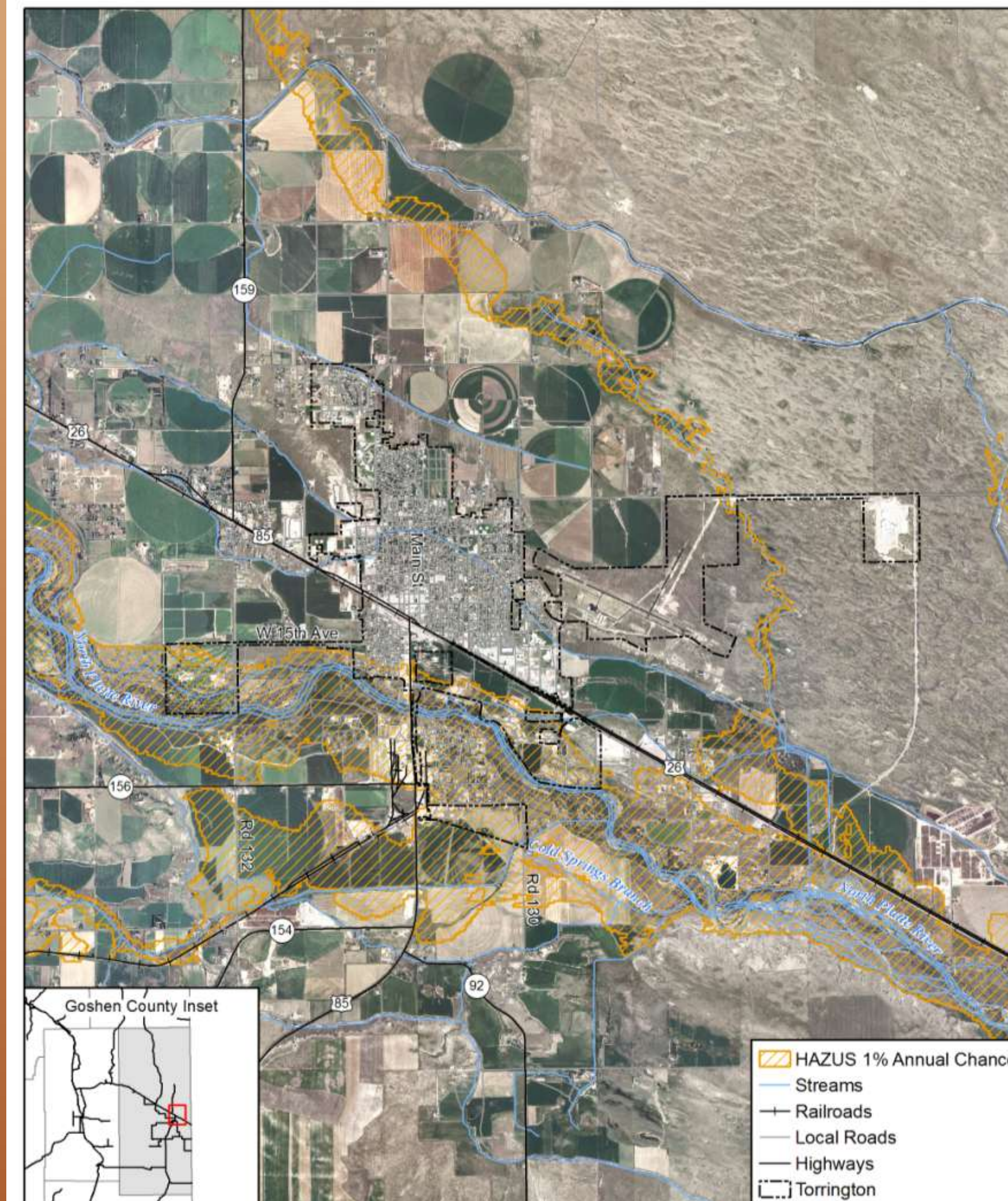
The following 3 maps are provided for each county and each municipality: **Flood Hazards** map showing the floodplain boundary, **Flood Depth** map showing the flood depth grid, and a **Building Loss** map showing the total building loss, in dollars, by census block. There are 10 counties in Wyoming that have been partially or completely mapped by the National Flood Insurance Program and have available Digital Flood Insurance Rate Maps (DFIRMs). For those counties, the 1% Annual Chance and .2% Annual Chance are represented on the Flood Hazards map.

### Goshen County HAZUS Building Loss



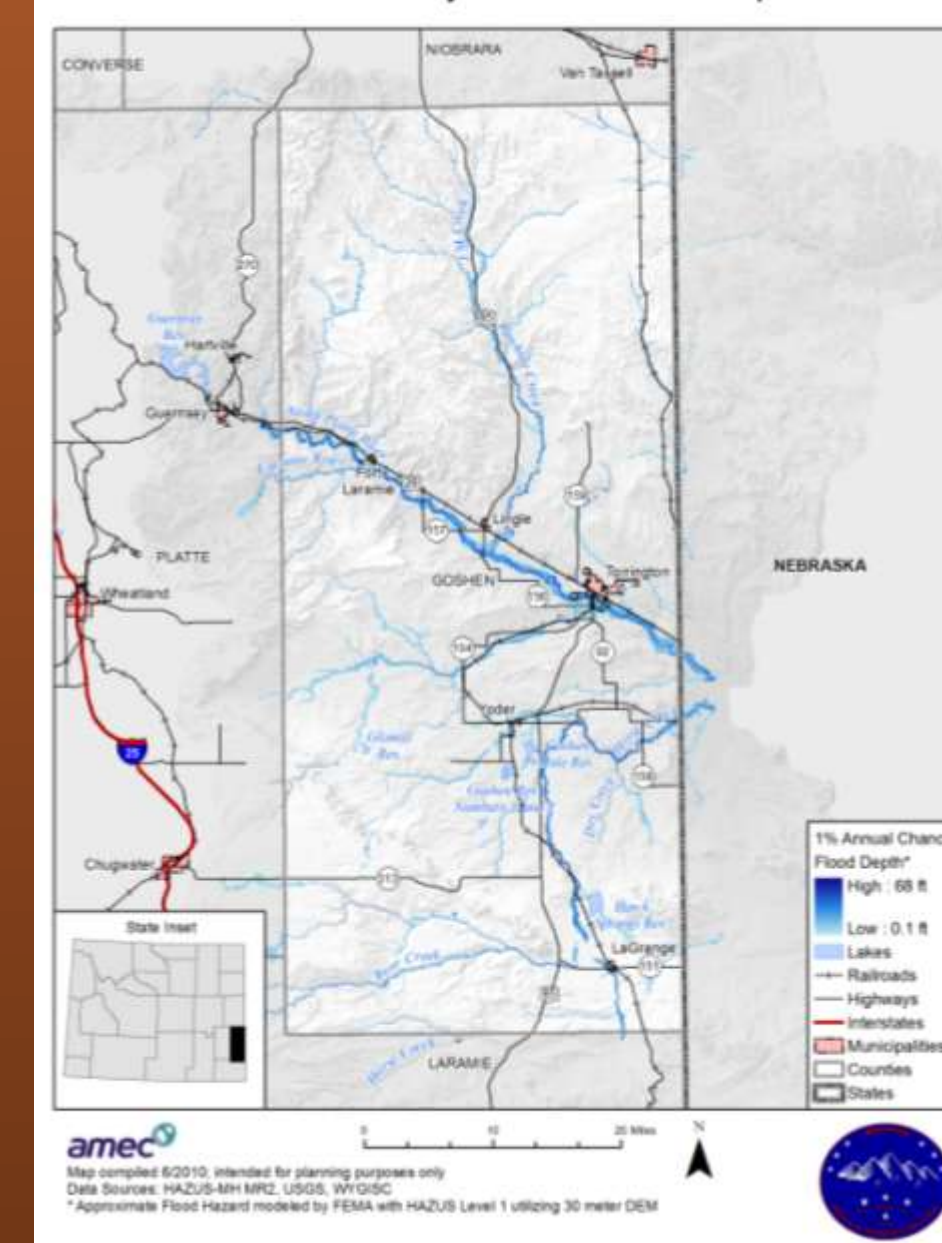
amec  
Map compiled 6/2010; intended for planning purposes only  
Data Sources: HAZUS-MH MR2, USGS, WYGISC  
\* Approximate Flood Hazard modeled by FEMA with HAZUS Level 1 utilizing 30 meter DEM

### Town of Torrington HAZUS Flood Hazards



amec  
Map compiled 6/2010; intended for planning purposes only  
Data Sources: HAZUS-MH MR2, USGS, WYGISC, NAIP 2009  
\* Approximate Flood Hazard modeled by FEMA with HAZUS Level 1 utilizing 30 meter DEM

### Goshen County HAZUS Flood Depth



amec  
Map compiled 6/2010; intended for planning purposes only  
Data Sources: HAZUS-MH MR2, USGS, WYGISC  
\* Approximate Flood Hazard modeled by FEMA with HAZUS Level 1 utilizing 30 meter DEM

## Analysis Tables and Narratives

The building inventory loss and population needing shelter estimates (which are linked to census block geography) were sorted by each county's incorporated cities, as well as the unincorporated county, to illustrate how the potential for loss varies across that county. The HAZUS Flood Loss Detail by Municipality and the HAZUS Flood Per Capita and % Loss by Municipality tables were compiled for each county. Narratives were also developed for the state and for each county, detailing HAZUS-MH methodologies and discussion of the flood hazard vulnerability and how risk varies across the planning area.

### Goshen 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 Goshen 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 cost).

Table 1: HAZUS Loss Estimation

Municipality	Building Loss (\$K)	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
Fort Laramie	-	-	-	-	-	-	-	-	-	-
LaGrange	156	90	-	-	-	-	-	247	23	6
Lingle	-	-	-	-	-	-	-	-	-	-
Torrington	2,646	6,014	723	10	9	42	4	9,448	156	102
Yoder	106	149	-	-	4	11	-	270	43	7
Unincorporated	12,266	9,734	300	36	13	199	9	22,557	1,075	655
<b>TOTAL</b>	<b>15,174</b>	<b>15,987</b>	<b>1,023</b>	<b>47</b>	<b>26</b>	<b>252</b>	<b>13</b>	<b>32,522</b>	<b>1,297</b>	<b>770</b>

Table 2: HAZUS Loss Estimation Additional Analysis

Municipality	2009 Population*	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 (\$)
Fort Laramie	235	31,468	-	19,301	0.0%	-	12,167	0.0%	-	-
LaGrange	335	29,646	156	18,065	0.9%	90	11,581	0.8%	247	737
Lingle	496	58,611	-	35,820	0.0%	-	22,791	0.0%	-	-
Torrington	5,688	691,907	2,646	404,331	0.7%	6,014	287,576	2.1%	9,448	1,661
Yoder	164	20,624	106	11,618	0.9%	149	9,006	1.7%	270	1,646
Unincorporated	5,401	456,746	12,266	288,997	4.2%	9,734	167,749	5.8%	22,557	4,176
<b>TOTAL</b>	<b>12,319</b>	<b>1,289,002</b>	<b>15,174</b>	<b>778,132</b>	<b>2.0%</b>	<b>15,987</b>	<b>510,870</b>	<b>3.1%</b>	<b>32,522</b>	<b>2,640</b>

\* U.S. Census Bureau