

## Hazus-MH: Flood Global Risk Report

**Region Name:** PA\_Lycoming

**Flood Scenario:** PA\_Lycoming

**Print Date:** December 2020

**Disclaimer:**

*This version of Hazus utilizes 2010 Census Data.  
Totals only reflect data for those census tracts/blocks included in the user's study region.*

*The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.*



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**Table of Contents**

Section	Page #
<b>General Description of the Region</b>	<b>3</b>
<b>Building Inventory</b>	
<b>General Building Stock</b>	<b>4</b>
<b>Essential Facility Inventory</b>	<b>5</b>
<b>Flood Scenario Parameters</b>	<b>6</b>
<b>Building Damage</b>	
<b>General Building Stock</b>	<b>7</b>
<b>Essential Facilities Damage</b>	<b>9</b>
<b>Induced Flood Damage</b>	<b>10</b>
<b>Debris Generation</b>	
<b>Social Impact</b>	<b>10</b>
<b>Shelter Requirements</b>	
<b>Economic Loss</b>	<b>12</b>
<b>Building-Related Losses</b>	
 <b>Appendix A: County Listing for the Region</b>	 <b>15</b>
<b>Appendix B: Regional Population and Building Value Data</b>	<b>16</b>



## General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Pennsylvania

**Note:**

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 20 square miles and contains 6,993 census blocks. The region contains over 47 thousand households and has a total population of 116,111 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 49,663 buildings in the region with a total building replacement value (excluding contents) of 11,882 million dollars (2010 dollars). Approximately 90.66% of the buildings (and 72.24% of the building value) are associated with residential housing.



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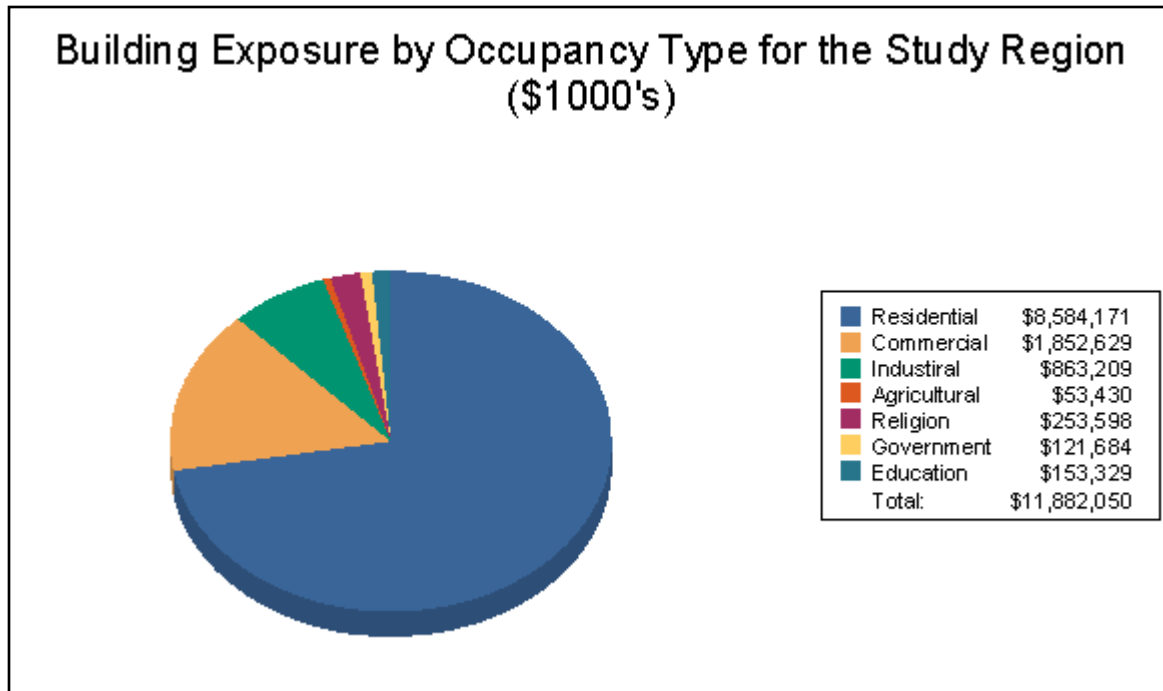
## Building Inventory

### General Building Stock

Hazus estimates that there are 49,663 buildings in the region which have an aggregate total replacement value of 11,882 million (2014 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

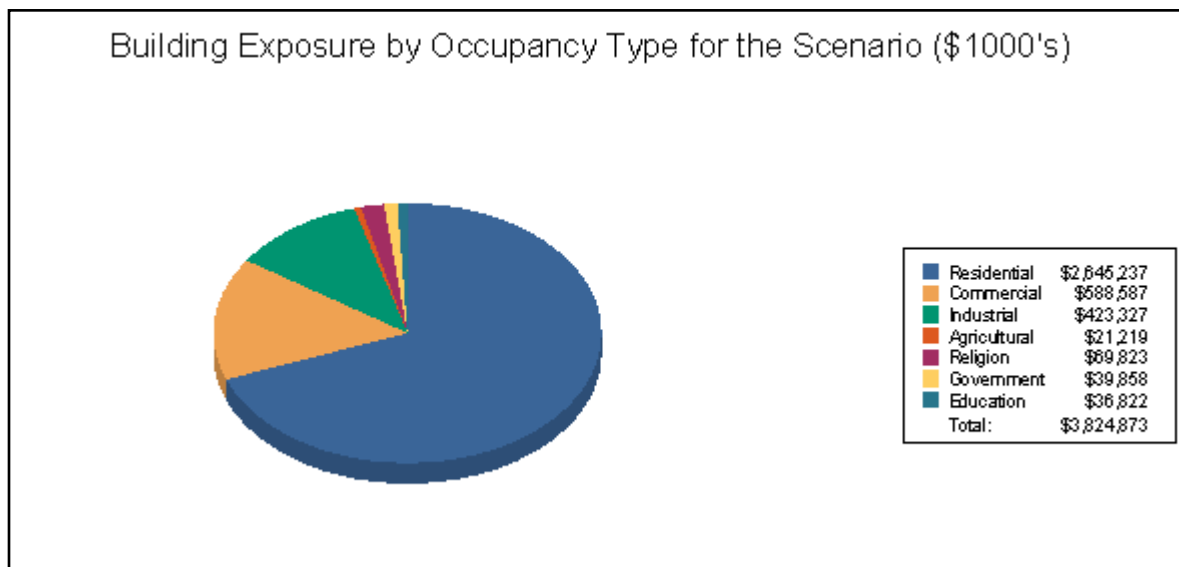
**Table 1  
Building Exposure by Occupancy Type for the Study Region**

Occupancy	Exposure (\$1000)	Percent of Total
Residential	8,584,171	72.2%
Commercial	1,852,629	15.6%
Industrial	863,209	7.3%
Agricultural	53,430	0.4%
Religion	253,598	2.1%
Government	121,684	1.0%
Education	153,329	1.3%
<b>Total</b>	<b>11,882,050</b>	<b>100.0%</b>



**Table 2**  
**Building Exposure by Occupancy Type for the Scenario**

Occupancy	Exposure (\$1000)	Percent of Total
Residential	2,645,237	69.2%
Commercial	588,587	15.4%
Industrial	423,327	11.1%
Agricultural	21,219	0.6%
Religion	69,823	1.8%
Government	39,858	1.0%
Education	36,822	1.0%
<b>Total</b>	<b>3,824,873</b>	<b>100.0%</b>



### Essential Facility Inventory

For essential facilities, there are 4 hospitals, 52 schools, 36 fire stations, 12 police stations and 81 emergency operation centers.

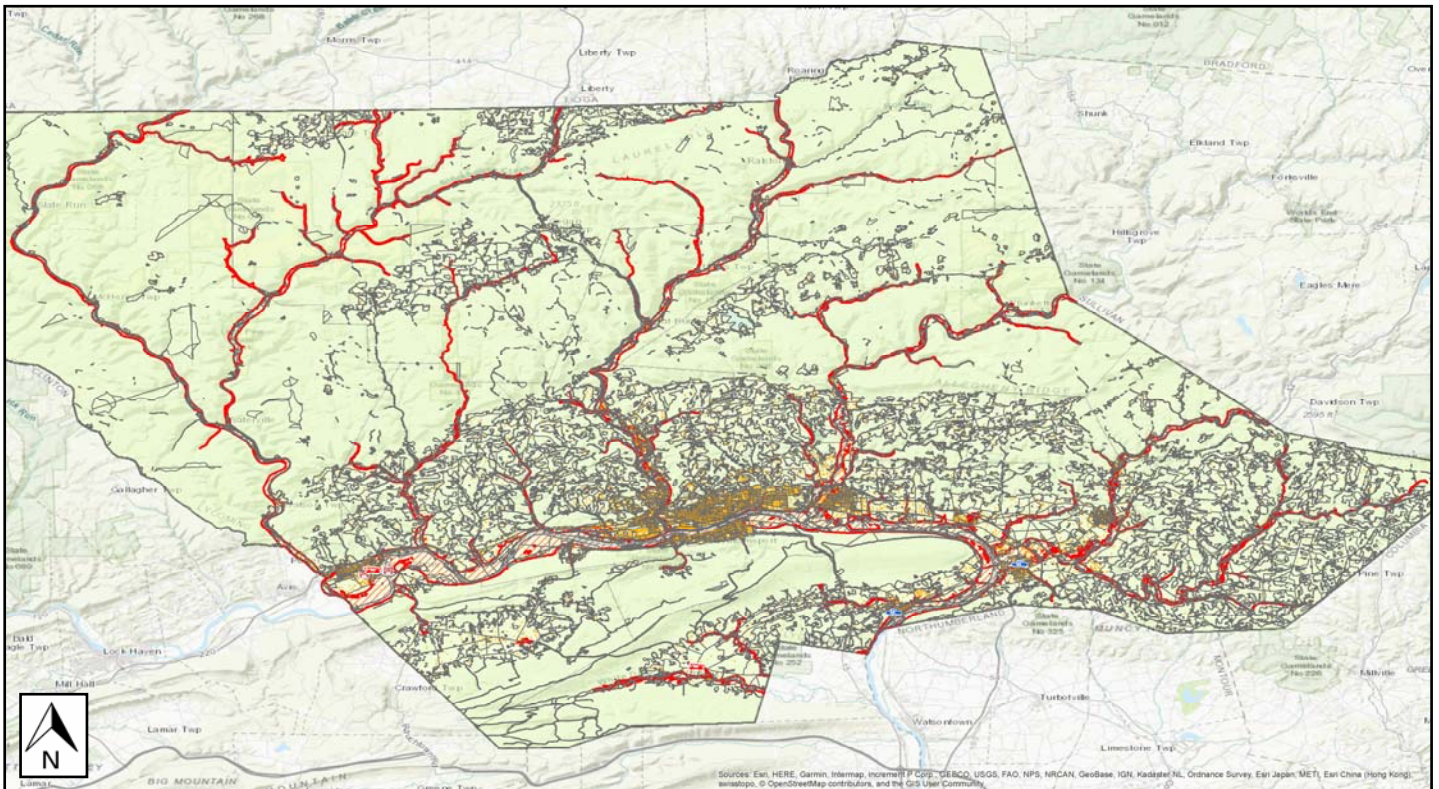
**Flood Scenario Parameters**

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

<b>Study Region Name:</b>	PA_Lycoming
<b>Scenario Name:</b>	PA_Lycoming
<b>Return Period Analyzed:</b>	100
<b>Analysis Options Analyzed:</b>	No What-Ifs

**Study Region Overview Map**

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



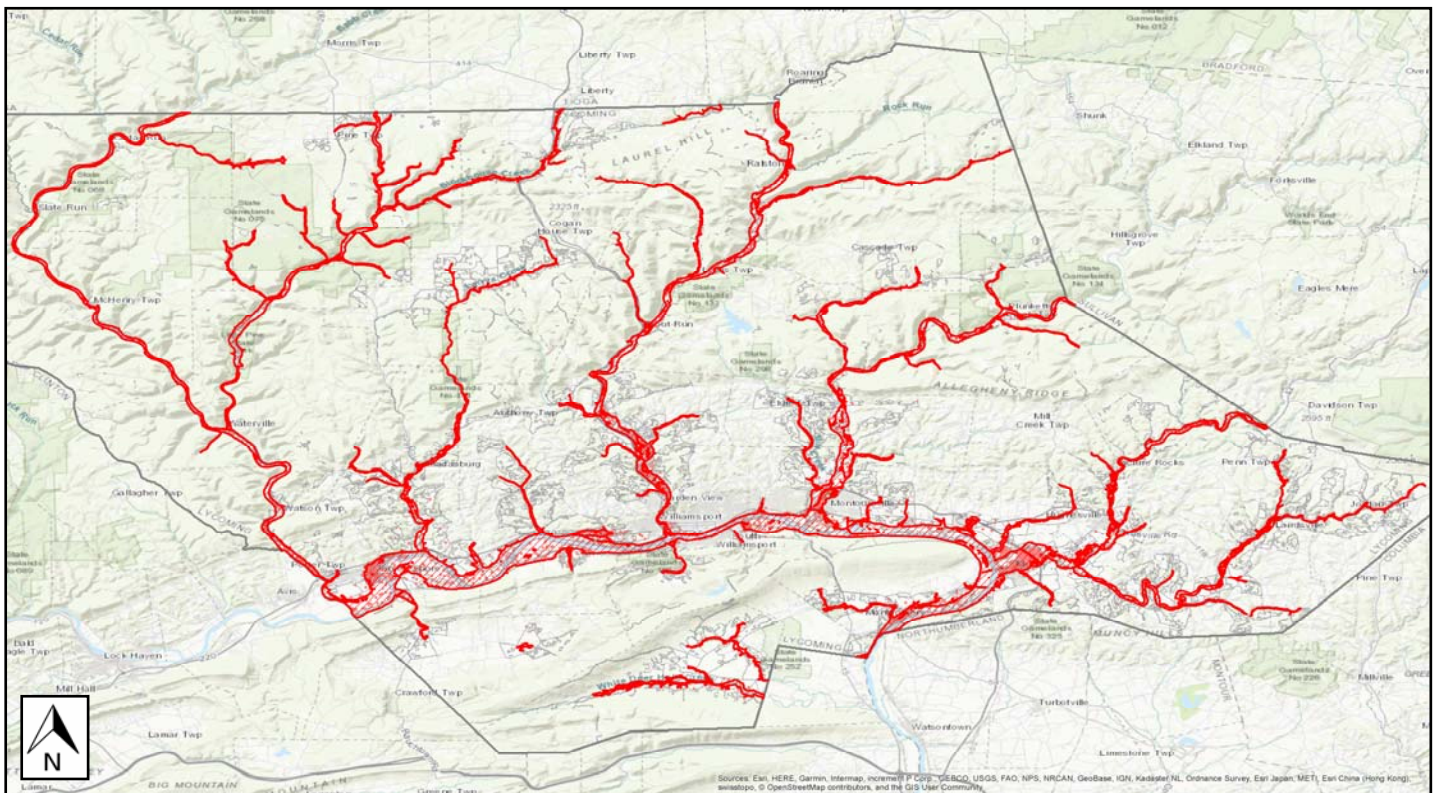


**Building Damage**

**General Building Stock Damage**

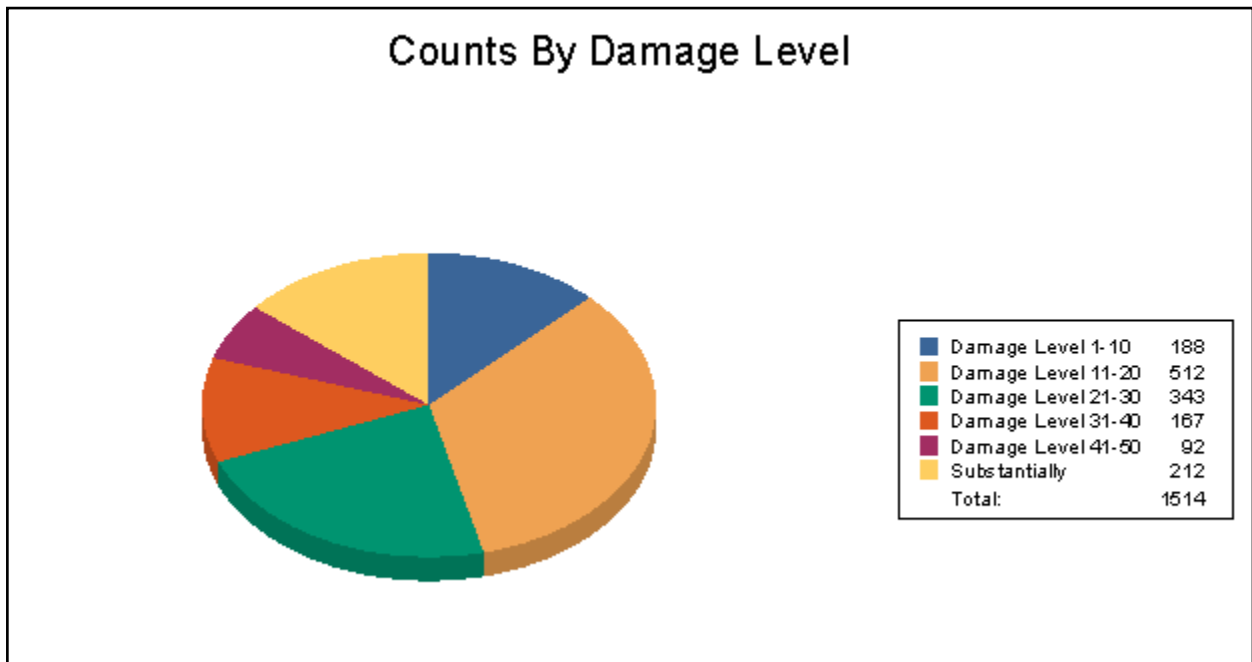
Hazus estimates that about 1,350 buildings will be at least moderately damaged. This is over 68% of the total number of buildings in the scenario. There are an estimated 200 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

**Total Economic Loss (1 dot = \$300K) Overview Map**



**Table 3: Expected Building Damage by Occupancy**

Occupancy	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	2	33.33	3	50.00	1	16.67	0	0.00	0	0.00	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	1	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	0	0.00	0	0.00	1	50.00	0	0.00	1	50.00
Religion	0	0.00	2	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Residential	186	12.38	506	33.67	342	22.75	166	11.04	92	6.12	211	14.04
<b>Total</b>	<b>188</b>		<b>512</b>		<b>343</b>		<b>167</b>		<b>92</b>		<b>212</b>	





**Table 4: Expected Building Damage by Building Type**

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	35	100
Masonry	39	11	137	38	90	25	37	10	17	5	36	10
Steel	2	29	3	43	0	0	1	14	0	0	1	14
Wood	147	13	372	33	252	23	129	12	75	7	140	13

## Essential Facility Damage

Before the flood analyzed in this scenario, the region had 474 hospital beds available for use. On the day of the scenario flood event, the model estimates that 474 hospital beds are available in the region.

**Table 5: Expected Damage to Essential Facilities**

Classification	Total	# Facilities		
		At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	36	3	0	2
Hospitals	4	0	0	0
Police Stations	12	3	0	3
Schools	52	2	0	2
EOCs	81	2	1	1

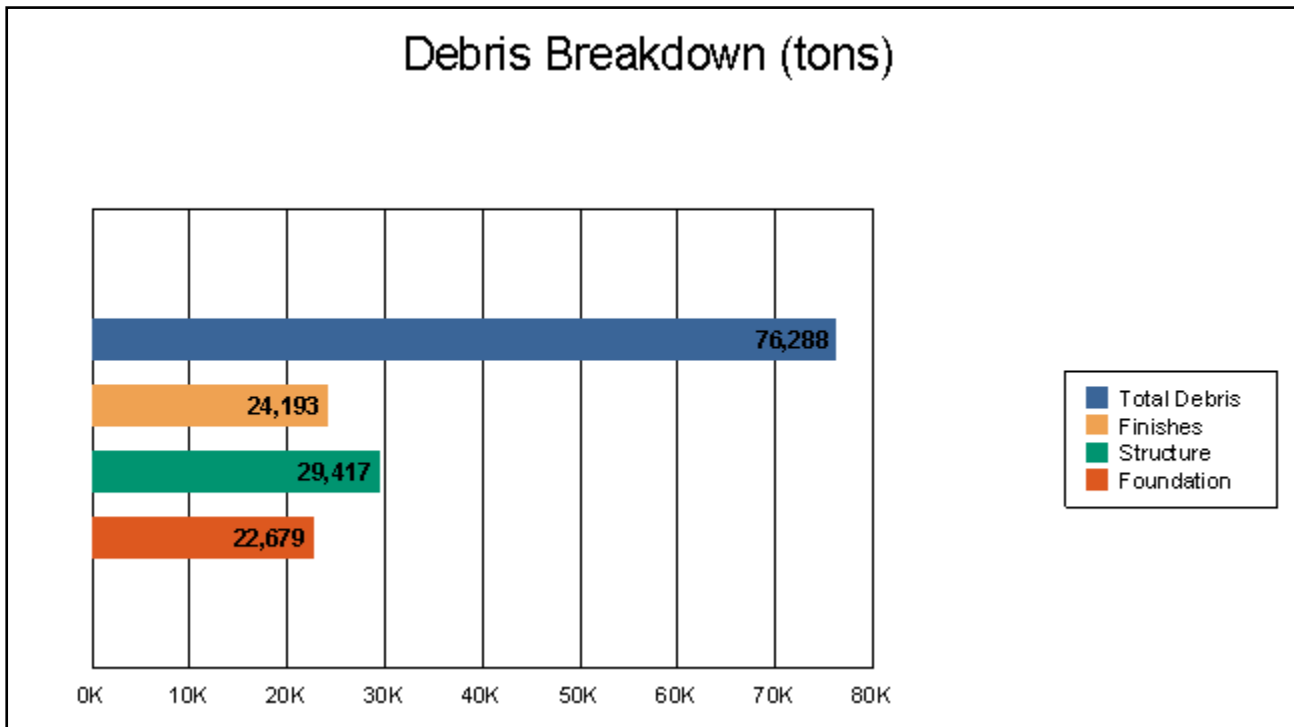
If this report displays all zeros or is blank, two possibilities can explain this.

- (1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.
- (2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.
- (3) EOCs include some municipal offices and county facilities.

**Induced Flood Damage**

**Debris Generation**

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

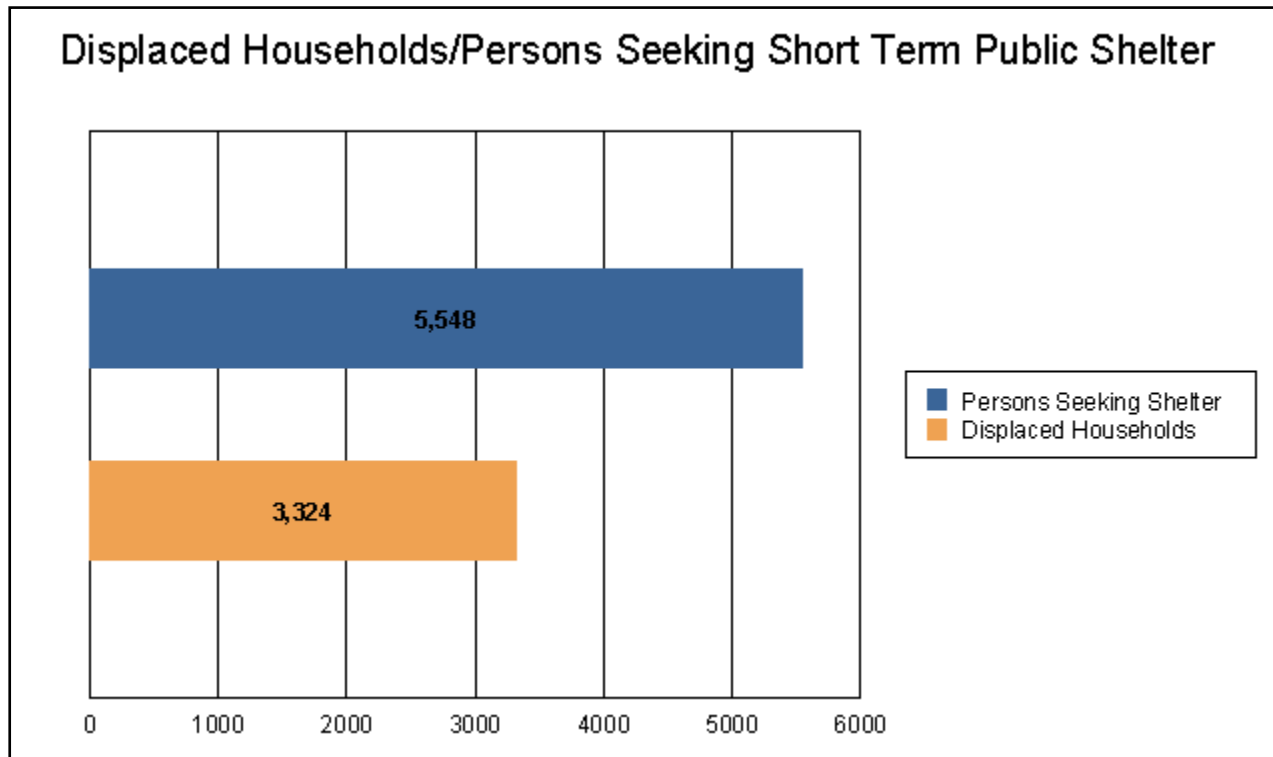


The model estimates that a total of 76,300 tons of debris will be generated. Of the total amount, Finishes comprises 32% of the total, Structure comprises 39% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 3,052 truckloads (@25 tons/truck) to remove the debris generated by the flood.

## Social Impact

### Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 3,324 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 5,548 people (out of a total population of 116,111) will seek temporary shelter in public shelters.



## Economic Loss

The total economic loss estimated for the flood is 743.63 million dollars, which represents 19.44 % of the total replacement value of the scenario buildings.

### **Building-Related Losses**

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

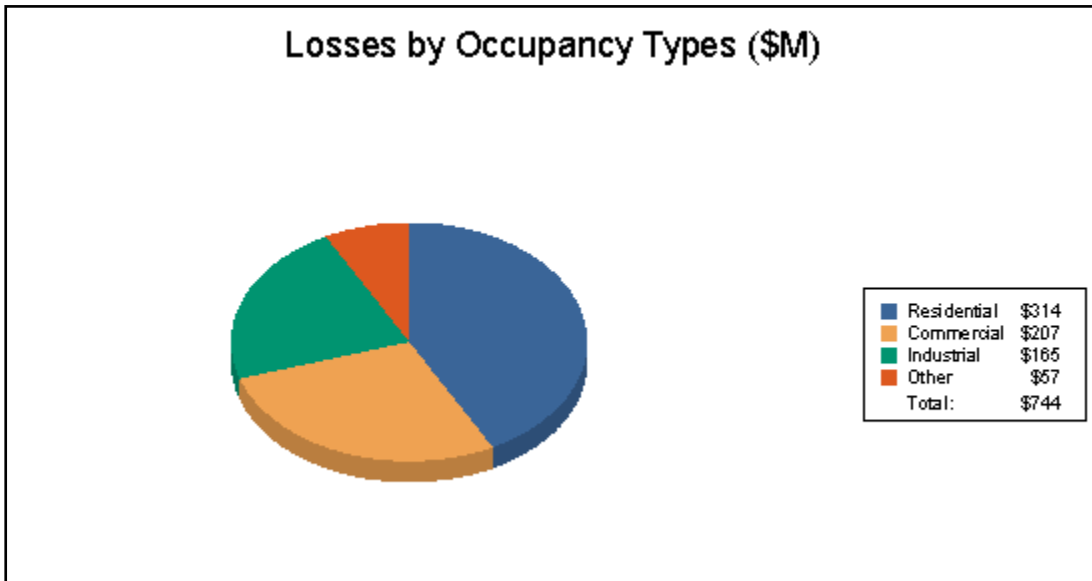
The total building-related losses were 740.38 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 42.26% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.





**Table 6: Building-Related Economic Loss Estimates**  
(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Building Loss</u>						
	Building	212.03	59.67	43.61	12.17	327.48
	Content	102.03	142.25	103.15	43.03	390.45
	Inventory	0.00	3.79	18.14	0.53	22.46
	<b>Subtotal</b>	<b>314.06</b>	<b>205.71</b>	<b>164.89</b>	<b>55.72</b>	<b>740.38</b>
<u>Business Interruption</u>						
	Income	0.00	0.61	0.00	0.07	0.68
	Relocation	0.18	0.07	0.01	0.03	0.29
	Rental Income	0.03	0.04	0.00	0.00	0.07
	Wage	0.02	0.61	0.01	1.57	2.21
	<b>Subtotal</b>	<b>0.23</b>	<b>1.33</b>	<b>0.02</b>	<b>1.67</b>	<b>3.25</b>
<u>ALL</u>	<b>Total</b>	<b>314.29</b>	<b>207.04</b>	<b>164.91</b>	<b>57.39</b>	<b>743.63</b>





## Appendix A: County Listing for the Region

- Pennsylvania
  - Lycoming



**FEMA**

**Appendix B: Regional Population and Building Value Data**

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
<b>Pennsylvania</b>				
Lycoming	116,111	8,584,171	3,297,879	11,882,050
<b>Total</b>	<b>116,111</b>	<b>8,584,171</b>	<b>3,297,879</b>	<b>11,882,050</b>
<b>Total Study Region</b>	<b>116,111</b>	<b>8,584,171</b>	<b>3,297,879</b>	<b>11,882,050</b>