



Blair County Hazard Mitigation Plan

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Executive Summary

After suffering the effects of floods, tornadoes, winter storms, and other natural hazards, the citizens, business leaders, and officials of Blair County recognized the need to develop a long-term approach to reducing their vulnerability to hazards. In 2006, the Blair County Hazard Mitigation Planning Committee (HMPC), the local leadership for an initiative to promote communities' resistance to natural hazards, began a hazard mitigation planning process to identify the hazards that can affect the County and create a strategy to reduce damage from these hazards. The Committee identified the hazards most threatening to the County and then determined a series of prioritized actions necessary to reduce potential damages from these hazards.

This document, the **Blair County Hazard Mitigation Plan**, represents the work of citizens, elected and appointed government officials, business leaders, and volunteers of non-profit organizations to develop a plan that will serve as a blueprint for protecting community assets, preserving the economic viability of the community, and saving lives. Endorsed by the Federal Emergency Management Agency (FEMA) and the Pennsylvania Emergency Management Agency (PEMA), the hazard mitigation planning process and the plan will help the County implement its mitigation projects.

The hazard mitigation planning process consisted of:

- Public involvement through a series of meetings;
- Identification of hazards that could affect the County;
- Assessment of the County's vulnerability to these hazards in terms of the number of structures, critical facilities, and people affected;
- Identification of mitigation actions that can reduce the risk from these hazards; and
- Development of an implementation strategy identifying roles and responsibilities.

No plan can succeed without the support of the community. Because of the diversity of interests in the County and municipalities, the Committee encouraged public input throughout the planning process, allowing citizens a voice in the decisions that will affect their future.

Section One: Hazard Vulnerability Assessment describes each hazard's occurrence and effects in the State of Pennsylvania and in Blair County and identifies the effects of natural hazard events by estimating the exposure of people, buildings, and infrastructure to hazardous conditions. Natural hazards that can affect Blair County and deserve detailed study are included in the plan as follows:

- Flooding
- Severe Weather (Tornadoes/Wind Storms, Winter Storms, and Other Severe Weather)



The follow table summarizes which municipalities are at greatest risk for the various hazards (listed in descending order of vulnerability within each hazard):

Hazard	Municipalities at Greatest Risk	Basis
Flooding	<ul style="list-style-type: none">• City of Altoona• Allegheny Township (eastern portion)• Antis Township• Blair Township• Catharine Township (northeast portion on Frankstown Branch of Little Juniata River)• Frankstown Township• Hollidaysburg Borough• Logan Township• Snyder Township (near Tyrone Borough)• Tyrone Township (northeast portion on Little Juniata River)	FEMA's HAZUS-MH flood model, and flood insurance rate maps
Severe Weather	All municipalities are essentially at equal risk	Not applicable

Section Two: Mitigation Capability Assessment evaluates the resources that the County goals can access to implement hazard mitigation initiatives.

Section Three: Mitigation Goals and Objectives presents goals and objectives to guide the hazard mitigation activities.

Section Four: Alternative Mitigation Actions evaluates alternative actions to address the identified vulnerability to natural hazards and to achieve the goals and objectives.

Section Five: Mitigation Plan and Implementation Strategy contains prioritized actions accompanied by details about the responsible organizations, estimated costs, possible funding sources and the timeline for implementation. This section concludes with a discussion of Monitoring, Evaluation and Updating which recommends establishing a permanent hazard mitigation team to effectively lead the implementation of the plan and continuation of the hazard mitigation planning process beyond this Plan



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List of Acronyms

\$K	Thousands of dollars
\$M	Millions of dollars
BFE	Base flood elevation
DEP	(Pennsylvania) Department of Environmental Protection
DCNR	(Pennsylvania) Department of Conservation of Natural Resources
DMA	Disaster Mitigation Act of 2000
EMA	Emergency management agency
FEMA	Federal Emergency Management Agency
FIRM	Flood insurance rate map
FMA	Flood Mitigation Assistance Program
GIS	Geographic information system
HMPC	Hazard Mitigation Planning Committee
N/A	(Data) not available
NCDC	National Climatic Data Center
NFIP	National Flood Insurance Program
PA	Pennsylvania
PEMA	Pennsylvania Emergency Management Agency
PGA	Peak ground acceleration
RL	Repetitive (flood) loss
SALDO	Subdivision and Land Development Ordinance
UCC	Uniform Construction Code
USEPA	United States Environmental Protection Agency

Introduction

Purpose

Across the United States, natural disasters have led to increasing levels of deaths, injuries, property damage, and interruption of business and government services. The time, money, and efforts to recover from these disasters exhaust resources, diverting attention from important public programs and private agendas. With 17 statewide or county-specific gubernatorial and presidential disaster declarations since 1963, the emergency management community, citizens, elected officials, and other stakeholders in Blair County, Pennsylvania recognized the impact of disasters on their community and concluded that proactive efforts needed to be taken to reduce the impact of natural hazards.

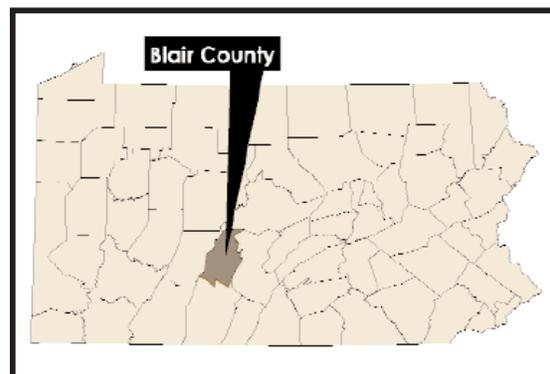
Hazard mitigation is a phrase that describes actions taken to prevent or reduce the long-term risks to life and property from hazards. Pre-disaster mitigation actions are taken in advance of a hazard event and are essential to breaking the typical disaster cycle of damage, reconstruction, and repeated damage. With careful selection, mitigation actions can be long-term, cost-effective means of reducing the risk of loss.

Accordingly, the Blair County HMPC, composed of governmental leaders from Blair County, in cooperation with the elected officials of the County and its municipalities, has sponsored and prepared this Hazard Mitigation Plan. The Plan is the result of many months of work by the citizens of the County to develop a pre-disaster multi-hazard mitigation plan that will not only guide the County towards greater disaster resistance, but will also respect the character and needs of the community.

In order to qualify for federal aid for technical assistance and post-disaster funding, local jurisdictions must comply with the Disaster Mitigation Act of 2000 (DMA) and its implementing regulations (44 CFR §§201.6, published February 26, 2002). The Blair County Hazard Mitigation Plan has been prepared to meet FEMA and PEMA requirements in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs.

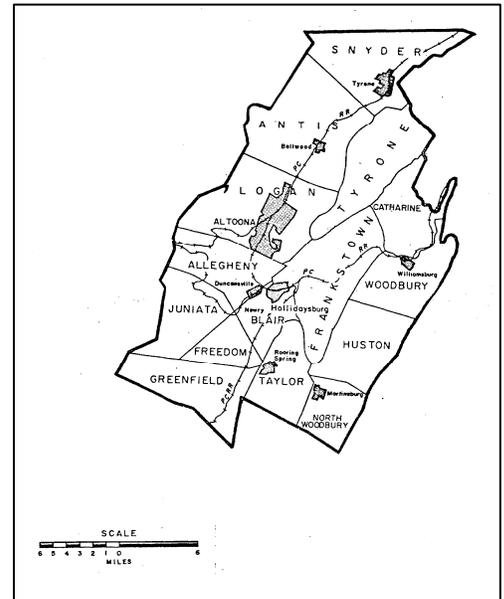
About Blair County

Blair County covers 526 square miles and is located in the south-central portion of the Commonwealth of Pennsylvania. It is bounded by Centre County to the north, Huntingdon County to the east, Bedford County to the south, Cambria County to the west, and Clearfield



County to the northwest. According to the 2000 Census, the population of Blair County was 129,144.

The land use is about 65 percent forest/game lands, 20 percent agricultural, and nine percent residential. Over 65 percent of the population is concentrated in less than six percent of the county's land area. The County is divided into 24 municipalities: the City of Altoona, eight boroughs, and 15 townships¹. The major transportation routes in Blair County include Interstate 99, which runs in a north/south direction and US Route 22 which runs east/west. Health services, manufacturing and the retail trade are the largest employers in the County.



Planning Process

Overview of Planning Process

The first step in the planning process was to establish a HMPC, which consisted of the representatives listed below. Once the HMPC was formed, the following six-step planning process took place:

- *Organize Resources:* The HMPC identified resources that could provide the technical expertise and historical information needed to develop this plan.
- *Profile Hazards:* The HMPC identified the hazards specific to Blair County, and URS developed a hazard analysis for these hazards.
- *Assess Risks:* URS developed a vulnerability analysis for Blair County. The HMPC reviewed the vulnerability analysis results before and during the development of the mitigation strategy.
- *Assess Capabilities:* URS reviewed the current administrative and technical, legal and regulatory, and fiscal capabilities to determine whether existing provisions and requirements adequately address relevant hazards.
- *Develop Mitigation Strategy:* The HMPC reviewed a comprehensive range of potential mitigation goals and actions. Subsequently, the HMPC identified, evaluated, and prioritized the actions to be implemented.
- *Monitor Progress:* An implementation process was developed to ensure the success

¹ Not counted in these figures is Tunnelhill Borough, portions of which fall in both Blair and Cambria Counties.



of an ongoing program to minimize hazard impacts to Blair County.

Blair County HMPC

The County’s HMPC currently consists of the following members:

Gary Dennis, Director	Blair County Department of Emergency Services
Richard Haines, Director	Blair County Planning Commission
Betty Robertson	Blair Township Supervisor
Randy Showwalter	Bellwood Borough Council
Sharon Dannaway	Tyrone Borough Council
David McFarland	Altoona Planning Department

Gary Dennis serves as chairperson of the committee.

The HMPC members identified as one of the most important priorities the development of a hazard mitigation plan to identify the hazards that affect the County, assess the likely damage from those hazards, select actions to address the County’s vulnerability to such hazards, and develop an implementation-strategy action plan to implement these measures. To aid in the development of the plan, HMPC contracted the services of URS Corporation, a consulting firm with expertise in hazard mitigation planning.

The County HMPC met several times from August 2006 to January 2008; all meetings were open to the public. The committee is fully involved in the planning process, and their input has been vital to the success of developing a countywide mitigation plan. The HMPC participated in the planning process as follows:

Table i. HMPC Meetings/Activities

Date	Event
August 21, 2006	First meeting with consultant for hazard mitigation plan
September 10, 2006	Survey mailout to municipalities announcing the plan and requesting inputs
December 7, 2006	Public meeting on draft vulnerability/risk assessment
February 28, 2007	Public meeting draft mitigation actions
January 28, 2008	Public meeting on draft hazard mitigation plan

Source: Blair County DES

Public Involvement

The HMPC hosted a series of meetings during 2006 to educate stakeholders about their risks, involve them in identifying issues, and educate them about alternative mitigation



actions. The meetings and other activities included:

- August 21, 2006: first meeting of HMPC and consultant regarding hazard mitigation plan (sign-in sheet from meeting in Appendix E).
- September 8, 2006: public announcement of project in Altoona Mirror (see Appendix E for a copy of the announcement).
- September 12, 2006: survey mailout to municipalities announcing the plan and requesting inputs (a copy of the letter for the mailout and a tabulation of the inputs received from municipalities is presented in Appendix E).
- December 7, 2006: public meeting on draft vulnerability/risk assessment (copy of announcement of meeting in Altoona Mirror and sign-in sheet from meeting in Appendix E).
- February 28, 2007: public meeting to discuss and vote on the draft mitigation actions assessment (copy of announcement of meeting in Altoona Mirror and sign-in sheet from meeting in Appendix E).
- January 28, 2008: public meeting to discuss the draft hazard mitigation plan (copy of announcement of meeting in Altoona Mirror and sign-in sheet from meeting in Appendix E).

Documentation of these activities can be found in Appendix E. The Blair County HMPC informed residents about these meetings through various means, including announcements in the main local newspaper, the Altoona Mirror.

Local, State and Federal agencies, local businesses, community leaders, educators, and other relevant private and nonprofit interests groups were given the opportunity to participate in the plan development in the same manner as residents – through newspaper announcements and public meetings. Furthermore neighboring communities were notified in writing of the plan development (see Appendix F).

Multi-Jurisdictional Approach

Blair County took a multi-jurisdictional approach to preparing its hazard mitigation plan. The County had resources (e.g., funding, data, GIS, etc.) which local jurisdictions lacked. However, the County could not develop the plan on its own. To undertake such a regional planning effort, the County needed to involve its member municipalities since only they have the legal authority to enforce compliance with land use planning and development issues. The County undertook an intensive effort to involve all 24 municipalities in the planning process.



Note: A portion of Tunnelhill Borough is in Cambria County; this plan only addresses the risks to Blair County residents. Tunnelhill Borough residents will need to adopt both the Blair County and Cambria County hazard mitigation plans.

The following table indicates by a bold “X” in the yellow-shaded column which townships and boroughs have participated in a satisfactory manner in this planning process, per the criteria below. Thus, a municipality must have an “x” in one of the three gray-shaded columns to get a bold “X” in the right-hand column.

1. Attending at least one public meeting,
2. Providing input through completion of the hazard vulnerability questionnaire, or
3. Submitting a mitigation project.

Table ii. Municipal Participation

Jurisdiction	Received request for participation	Attended at least one Public Meeting	Vulnerability/risk assessment input	Submitted mitigation project	Given opportunity to review mitigation plan	Participation Satisfactory	Reviewed & adopted hazard mitigation plan
Altoona City	X	X	X	X	X	X	X
Allegheny Township	X	X		X	X	X	X
Antis Township	X	X		X	X	X	X
Bellwood Borough	X	X	X	X	X	X	X
Blair Township	X	X	X	X	X	X	X
Catharine Township	X	X		X	X	X	X
Duncansville Boro	X	X	X	X	X	X	X
Frankstown Twp	X	X			X	X	
Freedom Township	X	X		X	X	X	X
Greenfield Township	X	X		X	X	X	X
Hollidaysburg Boro	X	X			X	X	
Huston Township	X				X		
Juniata Township	X		X		X	X	
Logan Township	X	X		X	X	X	X
Martinsburg Boro	X	X	X	X	X	X	X
Newry Borough	X	X			X	X	
N. Woodbury Twp	X	X	X	X	X	X	X
Roaring Spring Boro	X				X		



Jurisdiction	Received request for participation	Attended at least one Public Meeting	Vulnerability/risk assessment input	Submitted mitigation project	Given opportunity to review mitigation plan	Participation Satisfactory	Reviewed & adopted hazard mitigation plan
Snyder Township	X		X		X	X	
Taylor Township	X	X	X		X	X	
Tunnelhill Borough	X				X		
Tyrone Borough	X	X	X	X	X	X	X
Tyrone Township	X				X		
Williamsburg Boro	X	X		X	X	X	X
Woodbury Township	X				X		

Total number of municipalities in compliance as of June 2008:20

Regulatory Compliance

The planning process and the plan itself allow Blair County and its participating municipalities to establish a foundation for future mitigation activities, capitalize upon implementation resources and opportunities, and implement life-and property-saving mitigation measures. The plan components address the local hazard mitigation planning requirements of the Disaster Mitigation Act of 2000. The following cross-reference indicates what sections of the plan address specific requirements in the Interim Final Rule, the regulation implementing DMA 2000.

Table iii. FEMA Plan Review Criteria and Corresponding Blair County Plan Sections

FEMA Review Criteria	Blair County Hazard Vulnerability Assessment and Mitigation Plan
<p>Prerequisite</p> <ul style="list-style-type: none"> Adoption by the Local Governing Body (§201.6(c)(5)) Multi-jurisdiction Plan Adoption (§201.6(c)(5)) Multi-jurisdictional Participation (§201.6(a)(3)) 	<ul style="list-style-type: none"> NA (applies to single jurisdiction) Resolutions of Adoption Introduction
<p>Planning Process</p> <p>Documentation of Planning Process (§201.6(c)(1))</p>	<ul style="list-style-type: none"> Introduction

FEMA Review Criteria	Blair County Hazard Vulnerability Assessment and Mitigation Plan
<p>Risk Assessment</p> <ul style="list-style-type: none"> • Identifying Hazards (§201.6(c)(2)(i)) • Profiling Hazard Events (§201.6(c)(2)(i)) • Assessing Vulnerability: Overview (§201.6(c)(2)(ii)) • Assessing Vulnerability: Identifying Assets (§201.6(c)(2)(ii)(a)) • Assessing Vulnerability: Estimating Potential Losses² (§201.6(c)(2)(ii)(b)) • Assessing Vulnerability: Analyzing Development Trends (§201.6(c)(2)(ii)(c)) • Multi-jurisdictional Risk Assessment (§201.6(c)(2)(iii)) 	<ul style="list-style-type: none"> • Section One: Hazard Identification and Vulnerability Assessment
<p>Mitigation Strategy</p> <ul style="list-style-type: none"> • Local Hazard Mitigation Goals (§201.6(c)(3)(i)) • Identification and Analysis of Mitigation Measures (§201.6(c)(3)(ii)) • Implementation of Mitigation Measures (§201.6(c)(3)(iii)) • Multi-jurisdictional Mitigation Strategy (§201.6(c)(3)(iv)) 	<ul style="list-style-type: none"> • Section Three: Mitigation Goals and Objectives • Section Four: Alternative Mitigation Actions • Section Five: Mitigation Plan and Implementation Strategy • Section Five: Mitigation Plan and Implementation Strategy
<p>Plan Maintenance Procedures</p> <ul style="list-style-type: none"> • Monitoring, Evaluating, and Updating the Plan (§201.6(c)(4)(i)) • Implementation Through Existing Programs (§201.6(c)(4)(ii)) • Continued Public Involvement (§201.6(c)(4)(iii)) 	<ul style="list-style-type: none"> • Section Five: Mitigation Plan and Implementation Strategy

Review and Incorporation of Other Documents

This section describes the review and incorporation, as appropriate, of existing plans, policies, and ordinances. The Blair County hazard mitigation plan was developed utilizing existing plans and studies as well as outside information and research. The following documents were reviewed during the preparation of this plan:

- *Areawide Comprehensive Plan for Blair County*, Pashek Associates, Draft, January 2006;
- *Hazards Vulnerability Analysis for Blair County*, Blair County Emergency Management Agency, not dated;

² Criteria highlighted in gray are not required by the DMA 2000 Interim Final Rule; however, FEMA highly encourages communities to address such criteria in the plan. Detailed loss estimation is not included in this plan due to data limitations. Receiving a less than satisfactory score on such elements will not prevent the plan from being approved.



- *Stormwater Management Plan for Beaverdam Branch Watershed*, Chester Engineers, May 2000;
- Climatological data from National Climatic Data Center website www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms;
- Various maps on natural hazards in Pennsylvania;
- Emailed information on repetitive-loss flood properties in Blair County, FEMA Region III;
- Emailed information on high hazard dams in Blair County, Pennsylvania DEP;
- HAZUS-MH Level 1 flood analysis of Blair County, PEMA; and
- Flood insurance rate maps from FEMA Map Service Center.
- Various maps on natural hazards in Pennsylvania:
 - Map of earthquake epicenters from PaDCNR Map 69, *Earthquake Catalog and Epicenter Map of Pennsylvania*, July 2004;
 - Map of ground acceleration from US Geological Survey *National Seismic Hazard Mapping Project*, June 1996, from www.usgs.gov;
 - Map of snowfall from NOAA Satellite and Information Service, *Climate Maps of the United States, Mean Annual Total Snowfall*;
 - Map of landslide hazard susceptibility from Delano, H. L., and Wilshusen, J. P., 2001, *Landslides in Pennsylvania: Pennsylvania Geological Survey*, 4th ser., Educational Series 9, 34 p. <http://www.dcnr.state.pa.us/topogeo/hazards/es9.pdf>;
 - Map of wind zones in the United States from FEMA Publication 386-2, *How-To Guide #2: Understanding Your Risks*, 2001;
 - Map of karst areas from PaDCNR Map 68, *Density of Mapped Karst Features in Pennsylvania*, 2003;

About This Document

Section One: Hazard Identification and Profiles identifies the hazards that may affect Blair County and defines them in terms of their previous events, likelihood of occurrence,



physical characteristics, and the potential severity of such an occurrence.

Hazard identification involves investigating the existence of certain types of natural conditions in and around the County to reveal the hazards that may affect it. Features like topology, soil and rock types, hydrology, and seismology not only determine which hazards the County will experience, but also determine the impact of hazards on people, structures, and infrastructure. The incidence of a past hazard event in the County is a good determinant of future possible incidence. Consequently, hazard identification first determines whether the hazard has occurred previously. Next a hazard profile is developed to determine the frequency or probability of future events, and the characteristics of the hazard as it occurs in the County, including its severity and factors in the County that may exacerbate the severity.

The vulnerability assessment identifies the effects of a natural hazard event by estimating the exposure of people, buildings, and infrastructure to hazardous conditions. The assessment allows the County and its municipalities to focus attention to areas most likely to be damaged or most likely to require early response activity during a hazard event, helping to set mitigation priorities. Depending upon the data available, a vulnerability analysis involves counting the number of structures or people in the path of hazards or describing what these hazards can do to physical, social, and economic assets.

Estimating losses in hazard events requires a full range of information and accurate data. There are a number of site-specific characteristics that determine a structure's ability to withstand hazards like first-floor elevation, the number of stories, construction type, foundation type, and the age and condition of the structure. The County maintains a property tax assessment database that includes some of this information, but this information was not completely accessible at the time that this report was prepared.

Each hazard is discussed in terms of its potential impact on the community, including the types of structures and infrastructure that may be damaged or cause further harm.

Section Two: Mitigation Capabilities and Resources discusses the available resources at the County, State, and Federal levels to address the identified hazard vulnerabilities.

Section Three: Mitigation Goals and Objectives presents a series of goals and objectives to help guide the County in building its disaster resistance and the alternative mitigation measures considered to address its hazard vulnerabilities. These goals and objectives address the vulnerabilities discussed in Section One.

Section Four: Alternative Mitigation Actions reflects the identified potential hazards and areas and facilities in the County with the potential to be damaged by hazards. This section highlights those areas vulnerable to hazards and evaluates mitigation actions to address them.

Section Five: Mitigation Plan and Implementation Strategy contains prioritized



actions accompanied by details about the responsible organizations, estimated costs, possible funding sources and the timeline for implementation. This section concludes with a discussion of Monitoring, Evaluation and Updating which recommends establishing a permanent hazard mitigation team to effectively lead the implementation of the plan and continuation of the hazard mitigation planning process beyond this Plan.

In public meetings held in 2006, citizens and local government representatives discussed the findings of the vulnerability assessment and their implications for mitigation strategies. They expressed the chief desire that mitigation objectives should maintain the rich historic, recreational, and agricultural fabric of the community. Furthermore, objectives should recognize the necessity of commercial interests. First and foremost, however, mitigation objectives should protect people, property, local governments, and the local economy from the effects of hazards.

With regards to the hazard identification approach indicated by §201.6(c)(2)(i) of the DMA 2000 Plan Review Criteria, the table following is a description of the hazards that were identified, how they were identified, and why they were identified. Hazard identification involved a combination of input from concerned residents and preliminary research from Commonwealth of Pennsylvania resources, like PEMA and the Pennsylvania Department of Conservation of Natural Resources (DCNR).

After identifying possible hazards, data available online from the United States National Climatic Data Center (NCDC), United States Geological Survey (USGS), PEMA, and other sources were used to further investigate the possible occurrence of a range of hazards. The data sets used to generate the assessment were sometimes out-of-date; therefore, hazard probabilities and severity in this document were at times discussed in broad terms in light of available information. These data limitations are discussed in the appropriate sections.

Those natural hazards that are likely to affect Blair County considerably are profiled and corresponding vulnerabilities assessed in the following section. These hazards are as follows:

- Flooding
- Severe weather (tornadoes/wind storms, winter storms, and other severe weather)

Other hazards that have little potential to occur are described but were not profiled, and the vulnerability to these hazards was not assessed.

Table iv. Summary of Hazard Identification

Hazard	Why Identified	Source of Information	Disposition
Floods (including dam	Past disaster events in the	FIRMs and digital Q3 data, past disaster	<i>Profile and vulnerability assessment</i>



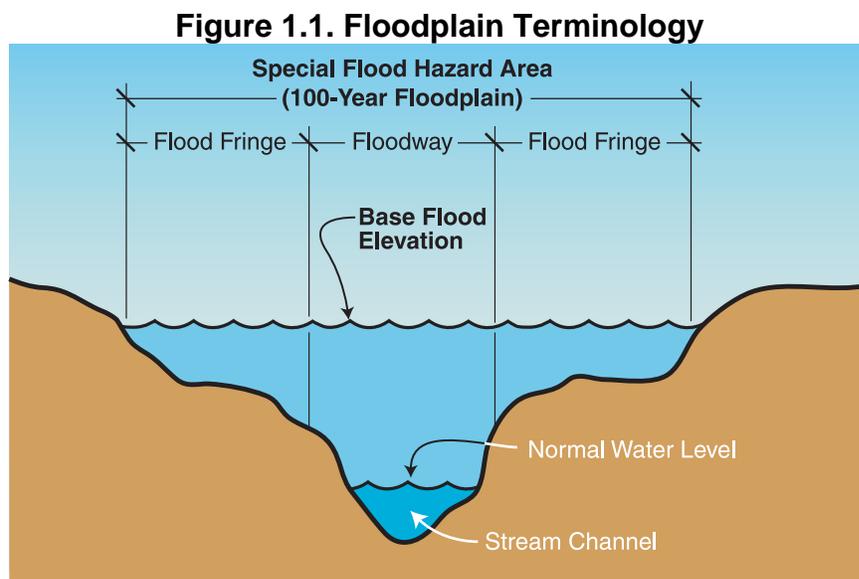
Hazard	Why Identified	Source of Information	Disposition
failure)	County	declarations	
Severe weather (tornadoes, windstorms, winter storms, other types)	Frequent occurrences in the County	Input of HMPC, NCDC data	<i>Profile and vulnerability assessment</i>
Drought	Past disaster declarations in the state	Input of HMPC, PEMA data	<i>Profile and vulnerability assessment</i>
Earthquakes	Past occurrences in the state	Input of HMPC, USGS data	Described and considered low risk, therefore not profiled
Landslides/ subsidence/ expansive soil	Past occurrences in the state	Input of HMPC, DCNR data	Described and considered low risk, therefore not profiled
Wildfires	Past occurrences in the state	DCNR data	Described and considered low risk, therefore not profiled
Radon	Past occurrences in the state	EAP report and website	Described and considered low risk, therefore not profiled
Avalanches	Not applicable in this region; not considered further		
Coastal erosion	Not applicable in this region; not considered further		
Coastal storms	Not applicable in this region; not considered further		
Hurricane	Not directly applicable this far inland; residual effects of hurricanes are discussed under sections for floods and tornadoes/windstorms.		
Tsunamis	Not applicable in this region; not considered further		
Volcanoes	Not applicable in this region; not considered further		

1.0 Hazard Vulnerability Assessment

1.1 Floods

1.1.1 Overview – Floods

A flood is a natural event for rivers and streams. For inland areas like Central Pennsylvania, excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. As illustrated in Figure 1.1, floodplains are lowlands, adjacent to rivers, streams and creeks that are subject to recurring floods.



Floods are considered hazards when people and property are affected. Nationwide, hundreds of floods occur each year, making it one of the most common hazards in all 50 states and U.S. territories. In Pennsylvania, flooding occurs commonly and can occur during any season of the year from a variety of sources. Every two to three years, serious flooding occurs along one or more of Pennsylvania's major rivers or streams, and it is not unusual for this to occur several years in succession. Most injuries and deaths from flooding happen when people are swept away by flood currents and most property damage results from inundation by sediment-filled water.

Several factors determine the severity of floods, including rainfall intensity and duration, topography and ground cover. A large amount of rainfall over a short time span can result in flash flood conditions. A small amount of rain can also result in floods in locations where the soil is frozen or saturated from a previous wet period or if the rain is concentrated in an area of impermeable surfaces such as large parking lots, paved roadways, or other impervious developed areas.



1.1.2 Previous Occurrences – Floods

Blair County has a long history of flooding problems from numerous major floods and localized flash flooding. According to the County’s *Areawide Comprehensive Plan*, historical flooding problem areas include Mill Run, the Frankstown Branch of the Juniata River near Frankstown at Lind’s Crossing and Williamsburg Borough, and the Little Juniata River near Bellwood Borough and Tyrone Borough. Table 1.1 lists some of the significant flood events in Blair County over more than 30 years.

Table 1.1. History of Flooding in Blair County

Location	Date	Type	Death	Injury	Property Damage ³ , \$K
Several counties	June 1972	Flood ⁴	N/A	N/A	N/A ⁵
Countywide	4/16/1993	Flood			5
Countywide	11/27/1993	Flood		3	50
Williamsburg	3/25/1994	Flood			500
Countywide	1/19/1996	Flash Flood	2		N/A
Several counties	July 1996	Flood (Hurricane) ⁴			N/A
Countywide	1/23/1999	Flash Flood			5
Duncansville	5/26/2001	Flash Flood			10
Altoona	8/9/2003	Flash Flood ⁴			250
Several counties	9/18/2004	Flood (Hurricane) ⁴			50,000

Declared disasters
 Sources: NCDC website (www.ncdc.noaa.gov/cgi-win), PEMA website

1.1.3 Hazard Profile – Floods

Hazard Characteristics

In Central Pennsylvania, including Blair County, there are seasonal differences in the causes for floods. In the winter and early spring (February to April), major flooding has occurred as a result of heavy rainfall on dense snowpack throughout contributing watersheds, although the snowpack is generally moderate during most winters. Winter floods also have resulted from runoff of intense rainfall on frozen ground, and local flooding has been exacerbated by ice jams in rivers, streams and creeks.

³ Property damage estimates in this and subsequent tables are based on best available data, but underestimate total damage in the County, as they do not include infrastructure damage.

⁴ Governor's Proclamation and President's Declaration of Major Disaster

⁵ (Data) not available



Summer floods have occurred from intense rainfall on previously saturated soils. Summer thunderstorms that deposited large quantities of rainfall over a short period of time have also produced flash flooding. In addition, as detailed under *Hurricanes* in the *Severe Weather* hazard discussion in this section of the plan, the Commonwealth occasionally receives intense rainfall from hurricanes/tropical storms in late summer and early fall.

The most severe flooding in Central Pennsylvania has been associated with the Susquehanna River Basin, which is the largest watershed on the Atlantic seaboard of the United States and drains directly into the Chesapeake Bay. In addition, the tributaries of the Susquehanna River located within Blair County – the Little Juniata River and the Frankstown Branch – are major sources of flooding within Blair County. The main tributaries of the Little Juniata River include Bald Eagle Creek, Sinking Creek, and Spruce Creek. The main tributaries of the Frankstown Branch include Beaverdam Branch, Blair Gap Run, Canoe Creek, Piney Creek, and Clover Creek. Figure 1.2 (included in this section) indicates the location of the flood hazard areas for these tributaries.

Dam failures can also pose a serious flood threat to communities located downstream from major dams. The worst dam failure to occur in the Commonwealth resulted in the Johnstown flood of 1889, which claimed 2,100 lives. The County has one dam (Mill Run) that is classified by DEP in the highest hazard category (A1), because it poses a potential significant threat to residents and property. Inundation maps for this dam are presented in Appendix K. The county dams are listed below by DEP classification, in descending order of hazard.

The hazard-class letter designation relates to hydraulic potential (height and/or storage), and the number relates to downstream population. Within each classification, the dams are listed below by descending order of hydraulic potential and population. The hazard from these dams is limited by structural integrity and inspection programs (which are regulated by DEP), and thus the relative risk is considered low. There have been no documented dam failures in Blair County for more than 25 years. Note that the vulnerability to dam failure is essentially the same as for other flooding events.

Table 1.2. DEP-Classified Dams in Blair County

Name	Owner	Hazard Class	Municipality
Mill Run	Altoona City Authority	A1	Logan Township
Hollidaysburg Muleshoe Reservoir	Hollidaysburg Borough Authority	B1	Hollidaysburg
Tipton	Altoona City		Antis Township



Name	Owner	Hazard Class	Municipality	
Lake Altoona	Authority		Logan Township	
Bellwood			Antis Township	
William L. Cochran Impounding			Logan Township	
Kettle Dam			Tyrone Township	
Tyrone Reservoir #2			Tyrone Borough	
Plane Nine	Altoona City		Duncansville	
Upper Kittanning	Authority		Logan Township	
Canoe Creek	DCNR		Frankstown Twp	
Blair Gap	Altoona City Authority		B-2	Allegheny Twp
Allegheny Storage			C-1	Logan Township
Homer Gap No 2		C-1	Logan Township	
Lakemont Park	Blair County Commissioners	C-1	Logan Township	

Probability of Occurrence

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. The National Flood Insurance Program (NFIP) uses historical records to determine the probability of occurrence for different extents of flooding. The probability of occurrence is expressed in percentages as the chance of a flood of a specific extent occurring in any given year.

A specific flood that is used for a number of purposes is called the “base flood”, which has a one percent chance of occurring in any particular year. The base flood is often referred to as the “100-year flood” since its probability of occurrence suggests it should reoccur once every 100 years, although this is not the case in practice. Experiencing a 100-year flood does not mean a similar flood cannot happen for the next 99 years; rather it reflects the probability that over a long period of time, a flood of that magnitude has a one percent chance of occurring in any give year.

Smaller floods occur more often than larger (deeper and more widespread) floods. Thus, a “10-year” flood has a greater likelihood of occurring than a “100-year” flood. Table 1.3 shows a range of flood recurrence intervals and their probabilities of occurrence.

The extent of flooding associated with a one percent probability of occurrence – the base flood – is used as a regulatory boundary by a number of federal, state and local agencies. Also referred to as the “special flood hazard area” (see Figure 1.1), this boundary is a convenient tool for assessing vulnerability and risk in flood-prone communities, since many communities like Blair County have maps available that show the extent of the base flood and the likely depths that will be experienced. Figure 1.2 depicts the base



flood area (100-year floodplain) in Blair County.

Table 1.3. Flood Probability Terms

Flood Recurrence Intervals	Chance of Occurrence in Any Given Year, %
10 year	10
50 year	2
100 year	1
500 year	0.2

Source: FEMA 386-2, *Understanding Your Risks*

Severity

Several factors determine the extent or “severity” of floods, including rainfall intensity and duration or volume and rate of snowmelt. The County also has conditions that may exacerbate the effects of floods:

- Topography and ground cover contribute to the location and severity of floods, e.g., water runoff is greater in areas with steep slopes and little or no vegetative ground cover.
 - Steep slopes: the County has sloping terrain (especially along the Allegheny Front in the western county) which can contribute to increased flooding, since runoff reaches the receiving creeks, streams and rivers more rapidly over steeper terrain.
 - Paved surfaces: urbanization leads to replacement of vegetative ground cover with asphalt and concrete, increasing surface runoff of stormwater. This effect may be exacerbated by stormwater drainage systems that are poorly planned, installed, and/or maintained.
- Hazardous materials facilities: Facilities that handle or store hazardous materials are located in the 100-year and 500-year floodplains, presenting potential sources of contamination during flood events.

1.1.4 Hazard Vulnerability – Floods

Existing Community Assets

The flood hazard vulnerability assessment for the County focused on the community assets that are located in the 100-year floodplain. While greater and smaller floods are possible, information about the extent and depth for the 100-year floodplain is available



in a similar format for all Blair County municipalities, providing a consistent basis for analysis. Note that individual structure data was not available for this study, so it was difficult to determine the exact number and types of structures within Blair County that have vulnerability to flood hazards. However, Table 1.4 presents a list of flood-prone areas that were designated by respondents to a survey sent to all municipalities.

Table 1.4. Jurisdiction-Specific Flood Hazard Areas

Jurisdiction	Vulnerable Areas/Assets
Altoona (City of)	Juniata, Maryland Ave - 58th St.
Antis Township	<ol style="list-style-type: none"> 1. Bellwood Borough 2. Lower Johnson Development in Tipton 3. River Road 4. Pinecroft (near the curves) 5. Bellmeade 6. Fuoss Mills
Bellwood Borough	Approx. 12 houses on the North side of town. Stormwater gets into the sanitary sewer system causing backup into the basements of private homes.
Blair Township	Residences in four areas: <ol style="list-style-type: none"> 1. Fort Fetter 2. Independence Place 3. East View St. 4. River Road
Duncansville Boro	Approx. 20 bldgs. from 13th St. Bridge – Park Foot Bridges
Frankstown Twp.	Various properties being acquired
Greenfield Twp.	SR3013 north of Oakdale Road
Hollidaysburg Boro	Various properties
Martinsburg Borough	<ol style="list-style-type: none"> 1. Nicodemus Street, 100-200-300 block 2. 201 W. 300 W. Allegheny Street
N. Woodbury Twp.	Bridges: Central High Rd & SR 164 Fredricksburg Rd
Snyder Township	A great portion of Snyder Twp. is prone to flooding from several rivers and creeks
Taylor Township	Damaged Decker Hollow Bridge isolates the development of new residences
Tyrone Borough	<ol style="list-style-type: none"> 1. 10th St. 2. Pennsylvania Ave. 3. S. Logan Ave. 4. Park Ave. (from 3rd to 9th St.)



Flood insurance rate maps (FIRMs) were used to assess flood vulnerability in the 100-year floodplain. Detailed flood-study data exists for some areas of the County. These areas are in the AE zone according to the FEMA flood maps, which means they have Base Flood Elevations (BFE's). Detailed flood studies are typically done by FEMA for those areas that have a flood hazard and are developed enough to make it cost-effective to do a detailed study. For the buildings in the AE zone, more detailed assessments of vulnerability can be performed.

HAZUS-MH Flood Model

FEMA's HAZUS-MH software was used to quantify flood vulnerability in the 100-year floodplain for Blair County. The HAZUS-MH model lists stream "reaches" (tributaries) that are in the County; due to modeling constraints, all of these were modeled by FEMA at one time as a "study case". The total economic losses from this study case for the 100-year flood are indicated by HAZUS-MH as **\$141 million**. The summary report from this study case is presented in Appendix A, and it indicates the following:

- 17 buildings destroyed,
- 290 buildings damaged,
- 15,100 tons of debris generated, and
- 1,831 people needing shelter.

Although HAZUS-MH does not list the municipalities that are at risk from flooding, a qualitative visual analysis of the floodplain maps and the HAZUS-MH results in Appendix A indicates that the municipalities at the greatest risk from flooding appear to be as follows:

- Allegheny Township (eastern portion)
- Antis Township
- Blair Township
- Catharine Township(northeast portion on Frankstown Branch of Little Juniata River)
- Frankstown Township
- Hollidaysburg Borough
- Logan Township
- Snyder Township (near Tyrone Borough)
- Tyrone Township (northeast portion on Little Juniata River)

For this plan a Level 1 flood analysis, as defined in the HAZUS-MH User Manual, was conducted for Blair County. This analysis is based on the default data (e.g., general building stock data based on census information) provided with the software. When more site-specific data is obtained for properties in the floodplain, a Level 2 HAZUS-MH flood analysis should be done along with digital FIRM data (when it becomes available), and this would likely give more realistic flood loss estimates.



Repetitive-Loss Properties

Repetitive-loss (RL) properties under the NFIP guidelines include any building with two or more flood losses (occurring more than ten days apart) greater than \$1,000 in any 10-year period since 1978. FEMA maintains a national list of such properties, and Table 1.5 indicates the 73 RL properties in Blair County. FEMA has specifically targeted certain RL properties (i.e., those with the greatest number of claims).

Table 1.5. Repetitive Flood-Loss Properties

Municipality	No.
Allegheny Township	1
Altoona	10
Antis Township	1
Blair Township	2
Duncansville Borough	4
Frankstown Township	29
Freedom Township	2
Greenfield Township	3
Hollidaysburg Borough	13
Juniata Township	1
Logan Township	1
Tyrone Borough	2
Tyrone Township	2
Williamsburg Borough	2
Total	73

Source: FEMA Region III (December 2003)

These 73 RL properties represent 202 flood-loss claims for \$3.5 million. One of these properties had nine claims and received more than \$120,000 from NFIP, although the assessed value of the home was only \$63,000. Hazard mitigation actions specific to these RL properties have not yet been developed and implemented by the County for these properties. However, as noted in Section 1.1.5, acquisition of properties in the floodplain has been done by Altoona City and Frankstown Township, and this may have included some of the RL properties.

Critical Facilities

There are likely critical facilities in Blair County (e.g., hospitals, police/fire stations, county/municipal buildings, or schools) that are in the 100-year floodplain. Not enough information is available to determine if any of the facility locations are actually in the floodplain. Note that there are also several dams in the County which are critical



facilities that *are located by design* in the 100-year floodplain.

Hazardous Material Storage

There are likely facilities storing extremely hazardous substances (EHS) that are in the 100-year floodplain. Not enough information is available to determine if the EHS storage location is actually in the floodplain.

Future Development Trends

New structures (including subdivided parcels) in flood-prone areas would be developed per current floodplain-management ordinances. A comparison of existing and future land uses is presented in Appendix J.

1.1.5 Conclusions – Floods

The following summarizes the salient points identified during the hazard identification, profiling and vulnerability assessment portions of the work that are carried forward as part of the planning process.

Summary of Hazard Vulnerability Assessment

Floods have been and will continue to be a significant threat to the economic and social well-being of selected areas of the County. The main sources of flooding in the County, the Susquehanna River and its tributaries (e.g., Little Juniata River), have produced significant flooding several times in the past with great consequences for the County. The County has had four declared disasters since 1972, including significant events in 1996 and 2003.

Exacerbating the effects of flooding in the County are steep slopes and hazardous materials storage in the floodplain. With an estimated \$141 million in losses from the 100-year flood, flooding is the most significant hazard facing Blair County. The municipalities at the greatest risk from flooding (in order of decreasing relative vulnerability) are:

- Allegheny Township
- Antis Township
- Blair Township
- Catharine Township
- Frankstown Township
- Hollidaysburg Borough
- Logan Township
- Snyder Township



- Tyrone Township

What can be Mitigated?

Determining the aspects of Blair County flood vulnerability that can be mitigated requires a review of the causal factors for floods. In Blair County, flooding is primarily caused by human infringement upon natural processes – simply stated, development has been pursued in naturally occurring floodplains. As a result, available alternatives for mitigation actions (discussed in Section Four – *Alternative Mitigation Actions*) focus on property protection measures as opposed to altering water courses or changing land management practices within the contributing watersheds. Future development in floodplains will be limited through appropriate legislative and administrative actions and procedures.

Two municipalities have acquired properties in the floodplain to date:

- Frankstown Township acquired 57 property parcels between the years of 1997 and 2000, demolished all the structures and converted them to open space.
- Altoona City has purchased 20 properties between the years of 1998 and 2006, with 2 more properties ready to close in 2007. All properties have been or will be demolished and will remain open space (deed restricted).

According to the County's *Areawide Comprehensive Plan*, the following flood control projects have been initiated in Blair County:

- Initiated in the 1970's with assistance from the US Army Corps of Engineers, the Tyrone Metropolitan Multi-Agency Development Project is a program designed to address flooding problems along the Little Juniata River in Tyrone Borough. Flood control measures include an earthen dam, diversion tunnel, and pressure conduit.
- A project has been implemented to address flooding along Spring Run, including channel improvements, streambank stabilization, and rock deflectors.

Data Limitations

The flood vulnerability analysis depended upon limited data sources including:

- FIRMs: The dates of the 113 FIRMs for the County varied from 1977 to 1987 (see Appendix B); more than half of these are from 1980 and 1981. Flood studies that are almost 30 years old may severely underestimate the extent of flooding during design events, due to the many changes in the County during the past 30 years.
- Parcel Locations in the Floodplain: The County is currently developing a GIS



database for property parcels that will allow evaluation of which properties lie in the 100-year floodplain. This data was not available from Blair County at the time this plan was developed.

- First-Floor Elevations: The lowest-floor elevation (usually referred to as the first-floor elevation) of structures in a floodplain is an essential element to determining the appropriate flood mitigation measures. However, because structure lowest/first-floor elevation data was not available, further study is needed to determine the exact lowest/first-floor elevations of these structures. This elevation information is necessary to better ascertain the appropriate mitigation measures and to calculate the benefits and costs of this mitigation action.

Note that new structures in floodplains must have certified lowest-floor elevation data in order to obtain flood insurance under NFIP. An Elevation Certificate is a form published by FEMA required to be maintained by communities participating in the NFIP. The NFIP requires local governments to obtain certificates for all new construction, or substantial improvements, in floodplains and to keep the certificates on file

- BFE and Data Other than 100-Year Flood: The BFE used in this plan to determine the exposure to flooding is an acceptable standard for such planning purposes. The GIS analysis that may be used to determine which structures fall within the 100-year floodplains would not account for floods of higher probabilities, for example 10-year, 25-year, and 50-year floods. Consequently, structures that would be affected by such smaller floods are not highlighted; however, these structures are included in the 100-year flood analysis. In addition, the effects of floods of both greater and smaller probabilities will eventually need to be accounted for to obtain funding from federal and state agencies for mitigation projects. Further analysis performed will be limited to the structures in the AE zone, i.e., which have BFE information.
- Structure Data: Some of the information such as the location of structures, number of stories, presence of a basement, and construction type that is necessary to determine damage was not available from Blair County at the time this plan was developed. Estimating the dollar amount of losses in a flood, when coupled with a range of flood probabilities from the 10-year to 500-year flood depths, can help in describing the benefits and costs of mitigation actions in monetary terms.

Note that a mitigation action is presented in Section 4.2 to collect more of the data noted above. Future versions of this plan would hopefully be able to identify the types and numbers of existing buildings (including repetitive loss structures), infrastructure, and critical facilities located in the identified hazard areas, along with an estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.



1.2 Severe Weather

Like other Central Pennsylvania communities, Blair County experiences many significant severe weather events every year. Depending upon the time of year, amount of atmospheric moisture, wind conditions, and global or regional phenomena like “El Nino”, local weather conditions can turn from routine to hazardous. Severe weather conditions such as high winds or extremes in snow depths or lack of precipitation can endanger lives, as well as affect the ability of businesses or the local government to function. In this portion of Section One, several different types of severe weather are discussed:

- Tornadoes and Wind Storms,
- Winter Storms, and
- Other Severe Weather.

Like most states along the eastern seaboard, the Commonwealth of Pennsylvania has had its share of tropical-storm and hurricane-related events, usually in the form of heavy rainfall and winds. Although the Commonwealth does not have coasts along the Atlantic Ocean, tropical storms and hurricanes have traversed the state and affected Blair County. Previous occurrences, including Hurricane Agnes in 1972, Tropical Storm Beryl in 1994, Hurricanes Dennis and Floyd in 1999, and Hurricane Ivan in 2004 have brought intense rainfall, sometimes leading to damaging floods (see the preceding portion of this section regarding *Floods* for more information). These storms also brought strong northeast winds, which, combined with waterlogged soils, caused trees and utility poles to fall.

Although hurricanes can cause flood events consistent with 100- and 500-year levels, their probability of occurrence is measured relative to wind speed. Table 1.6 shows the probability of winds that reach the strength of tropical storms and hurricane conditions in Blair and surrounding counties (based on a statistical sample region of 39,000 square miles for the past 46 years).

Table 1.6. High-Wind Probability for Blair County Area

Wind Speed (mph)	Corresponding Saffir-Simpson Hurricane Categories	Annual Probability of Occurrence (%)
45-77	Tropical Storms	91.592
78-118	Hurricane Categories 1 to 2	8.322
119-138	Hurricane Categories 3 to 4	0.077
139-163	Hurricane Categories 4 to 5	0.009
164-194	Hurricane Category 5	0.001

Source: Tornado & Hurricane Shelter Model of “Benefit Cost Analysis of Hazard Mitigation Projects”, developed by FEMA

The table includes wind speeds for all types of storms, not only storms that are cyclones.

That table shows that in Blair County and surrounding areas, the annual probability for strong winds that equal the strength of tropical storms (over 45 mph) is over 91 percent, and the probability for winds at hurricane strength is more than 8 percent in any given year. However, winds of 119 mph or above have less than 0.1 percent chance of occurring.

As indicated in Table 1.6, the wind speeds with the greatest probabilities of occurrence, 45 to 77 mph and 78 to 118 mph, correspond to tropical storms and hurricane categories one and two. The expected damages of storms of this magnitude can be determined by using the Saffir-Simpson scale as shown in Table 1.7.

Table 1.7. Saffir-Simpson Scale for Wind Speeds

Category	Wind Speed, mph	Expected Damage
1	74-95	Minimal: Damage is done primarily to shrubbery and trees, unanchored mobile homes are damaged, some signs are damaged, no real damage is done to structures.
2	96-110	Moderate: Some trees are toppled, some roof coverings are damaged, and major damage is done to mobile homes.
3	111-130	Extensive: Large trees are toppled, some structural damage is done to roofs, mobile homes are destroyed, and structural damage is done to small homes and utility buildings.
4	131-155	Extreme: Extensive damage is done to roofs, windows, and doors; roof systems on small buildings completely fail; some curtain walls fail.
5	>155	Catastrophic: Roof damage is considerable and widespread, window and door damage is severe, there are extensive glass failures, and entire buildings could fail.

Source: NCDC website (www.nhc.noaa.gov/aboutsshs.shtml)

The expected damages from the wind speeds most likely to be encountered in Blair County are considered under this scale to be “minimal” to “moderate”. However, these events can still topple trees and cause severe damage to manufactured homes.

Because flooding issues that may result from hurricanes and tropical storms have been included in the previous section and due to the similarity of the issues regarding hurricanes and tornadoes (i.e., the incidence of high winds), discussion of vulnerability to hurricanes is handled jointly at the end of the following discussion of Tornadoes and Wind Storms.

1.2.1 Severe Weather – Tornadoes and Wind Storms

1.2.1.1 Overview – Tornadoes and Wind Storms



A tornado, a violently rotating funnel-like vortex, is an extraordinary feature of severe thunderstorms. A condensation funnel does not need to reach to the ground for a tornado to be present; a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even in the total absence of a funnel. While the extent of tornado damage is usually localized, the extreme winds of this vortex can be among the most destructive on earth when they move through populated, developed areas.

Straight-line winds are the movement of air from areas of higher pressure to areas of lower pressure – the greater the difference in pressure, the stronger the winds. Wind storms are generally defined as sustained wind speeds of 40 mph or greater lasting for one hour or longer, or winds of 58 mph or greater for any duration.

The Fujita Tornado Scale (or the “F-Scale”) classifies US tornadoes into six intensity categories, named F0 to F5, based upon the estimated maximum winds occurring within the funnel. The F-Scale has subsequently become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures.

1.2.1.2 Previous Occurrences – Tornadoes and Wind Storms

Tornadoes have occurred in Pennsylvania in all seasons and in all parts of the state, but the western and southeastern portions have been more frequently struck. Tables 1.7 and 1.8 identify reported tornadoes and high winds, respectively, in Blair County over more than half a century.

Table 1.8. History of Tornadoes in Blair County

Location	Date	F-Scale	Death	Injury	Property Damage, \$K
Carson Valley	1949	N/A	N/A	N/A	N/A
Countywide	11/5/1988	F1			2,500
Sickles Corner	7/19/1996	F1			5
Tyrone	6/2/1998	F1			5

Source: NCDC website, County Hazard Vulnerability Analysis



Table 1.9. History of High Winds in Blair County

Location	Date	Death	Injury	Property Damage, \$K
Countywide	4/15/1994			500
Countywide	11/6/1994		3	50
Countywide	11/27/1994			500
Altoona	1/18/1999			10
Martinsburg	6/2/1999			5
Tyrone	7/9/1999			15
Bellwood	7/31/1999			5
Countywide	9/29/1999			100
Altoona	9/29/1999			10
Altoona	10/13/1999			5
Countywide	1/16/2000			20
Duncansville	6/2/2000			10
Bellwood	6/21/2000			2
Countywide	12/12/2000	1	2	500
Countywide	2/10/2001			150
Countywide	3/9/2002			50
Countywide	11/13/2003	3		50
Countywide	9/17/2004			50
Countywide	2/17/2006			20

Source: NCDC website

1.2.1.3 Hazard Profile – Tornadoes and Wind Storms

Hazard Characteristics

Tornadoes can occur at any time during the day or night, but are most frequent during late afternoon into early evening, the warmest hours of the day. Tornado movement is characterized in two ways: direction and speed of the spinning winds, and forward movement of the tornado/storm track. Rotational wind speeds of the vortex can range from 100 mph to more than 250 mph. In addition, the speed of forward motion can be zero to 45 or 50 mph. Therefore, some estimates place the maximum velocity (combination of ground speed, wind speed and upper winds) of tornadoes at about 300 mph.

The forward motion of the tornado path can be a few hundred yards or several hundred miles in length. The width of tornadoes can vary greatly, but generally range in size from less than 100 feet to over a mile in width. Some tornadoes never touch the ground and are short-lived, while others may touch the ground several times.



Probability of Occurrence/Severity

According to the National Weather Service, the Commonwealth of Pennsylvania has an annual average of ten tornadoes with two related deaths. The probability of actually being in the path of a tornado in any given year in Blair County is quite small, on the order of 0.03 percent (see Table 1.10). Another way of visualizing this number is that you would have to stand on the same spot for about 300 years to be reasonably certain of being in the direct path of a tornado.

While the chance is small, the damage that results when the tornado arrives is devastating. A tornado with an “F4” designation can carry a wind velocity of 200 mph resulting in a force of more than 100 pounds per square foot of surface area, a “wind load” that exceeds the design limits of most buildings.

Table 1.10. Tornado Fujita Scale, Associated Damage, and Probability of Occurrence for Blair County and Surrounding Areas

Tornado F-Scale	Wind Speed	Expected Damage	Annual Probability of Occurrence⁶ (%)
F0	40-72 mph	Light damage: Some damage to chimneys; branches break from trees and show-rooted trees pushed over; damage to sign boards.	0.00033
F1	73-112 mph	Moderate damage: Peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off road.	0.00359
F2	113-157 mph	Considerable damage: Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.	0.00454
F3	158-206 mph	Severe damage: Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.	0.00337
F4	207-260 mph	Devastating damage: Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	0.01904
F5	261-318 mph	Incredible damage: Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100 yards; trees debarked; incredible phenomena will occur.	0.00000
Overall Probability			0.03087

Source: Tornado and Hurricane Shelter Model of the “Benefit-Cost Analysis Software for Hurricane and

⁶ Probability of being in the path of the tornado.

Tornado Shelters” developed by FEMA, July 2000.

A useful tool for determining vulnerability to the winds that result from hazard events like tornadoes (and tropical cyclones) is depicted in Figure 1.4. This map of design winds speeds was developed by the American Society of Civil Engineers and identifies wind speeds to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities.

Figure 1.4 shows that three different wind speed zones cover the Commonwealth of Pennsylvania: Zones II, III, and IV with design wind speeds for community shelters of 160, 200, and 250 miles per hour, respectively. Furthermore, Figure 1.4 shows that central Pennsylvania is susceptible to the effects of hurricanes.

1.2.1.4 Hazard Vulnerability – Tornadoes and Wind Storms

Existing Community Assets

Since high wind events may affect the entire County, it is important to identify specific critical facilities and assets that are most vulnerable to the hazard. Evaluation criteria include age of the building (and what building codes may have been in effect at the time), type of construction, and condition of the structure (i.e., how well has the structure been maintained). *Note that individual structure data was not available for this study, so it was difficult to determine the exact number and types of structures within Blair County that have heightened vulnerability to wind hazards.*

Future Development

The *Capability Assessment* portion located in Section 2 discusses that communities have adopted the Uniform Construction Code (UCC) as their building code, which increases the probability that new construction will be able to resist design wind loads. A comparison of existing and future land uses is presented in Appendix J.

1.2.2 Severe Weather – Winter Storms

1.2.2.1 Overview – Winter Storms



Winter storms consist of cold temperatures and heavy snow or ice. Because winter storms are regular, annual occurrences in Pennsylvania, they are considered hazards only when they result in damage to specific structures and/or overwhelm local capabilities to handle disruptions to traffic, communications and electric power.



1.2.2.2 Previous Occurrences – Winter Storms

The Commonwealth of Pennsylvania has a long history of severe winter weather. In the winter of 1993-4, the state was hit by a series of protracted winter storms. The severity and nature of these storms combined with accompanying record-breaking frigid temperatures posed a major threat to the lives, safety and well-being of Commonwealth residents and caused major disruptions to the activities of schools, businesses, hospitals, and nursing homes.

The first of these devastating winter storms occurred in early January with record snowfall depths (in excess of 33 inches in the southwest and south-central portions of the Commonwealth), strong winds and sleet/freezing rains. Numerous storm-related power outages were reported, and as many as 600,000 residents were without electricity, in some cases for several days at a time. A ravaging ice storm followed, affecting the southeastern portion of the Commonwealth, which closed major arterial roads and downed trees and power lines. Utility crews from a five-state area were called to assist in power restoration repairs. Officials from PP&L stated that this was the worst winter storm in the history of the company, and related damage-repair costs exceeded \$5,000,000.

Serious power supply shortages continued through mid-January because of record cold temperatures at many places, causing sporadic power generation outages across the Commonwealth. The entire Pennsylvania-New Jersey-Maryland grid and its partners in the District of Columbia, New York and Virginia experienced 15- to 30-minute rolling blackouts, threatening the lives of people and the safety of the facilities in which they resided. Power and fuel shortages affecting Pennsylvania and the East Coast power grid system required the Governor to recommend power conservation measures be taken by all commercial, residential, and industrial power consumers.

The record cold conditions resulted in numerous water-main breaks and interruptions of service to thousands of municipal and city water customers throughout the Commonwealth. Additionally, the extreme cold in conjunction with accumulations of frozen precipitation resulted in acute shortages of road salt. As a result, trucks were dispatched to haul salt from New York to expedite deliveries to PA Department of Transportation (DOT) storage sites.

During January and February 1994, Pennsylvania experienced at least 17 regional or statewide winter storms. The consequences of these disasters resulted in the need for intervention by the President in an effort to alleviate the severity of the hardship and to aid the recovery of the hardest-hit counties.

In January 1996, another series of severe winter storms with 27- and 24-inch accumulated snow depths was followed by 50 to 60 degree temperatures resulting in rapid melting and flooding (as described in the preceding section on *Flood Hazard Vulnerability*



Assessment). Although County-specific winter-storm data was not available, statewide data is shown in Table 1.11.

Table 1.11. History of Winter Storms in Blair County

Location	Date	Type	Death	Injury	Property Damage, \$K
Several counties	Nov 1950	Ice Storm	N/A	N/A	N/A
Statewide	Jan 1966	Winter Storm ⁷	N/A	N/A	N/A
Statewide	Feb 1972	Winter Storm ⁸	N/A	N/A	N/A
Statewide	Jan 1978	Winter Storm ⁸	N/A	N/A	N/A
Statewide	Feb 1978	Winter Storm ⁸	N/A	N/A	N/A
Statewide	Mar 1993	Blizzard ⁸	N/A	N/A	N/A
Statewide	1/6/1994	Record Snowfall ⁸	0	185	5,000
Several counties	1/27/1994	Ice Storm	0	62	50
Statewide	1/7/1996	Blizzard ⁸	0	0	635
Several counties	3/4/2001	Heavy Snow	0	0	150
Statewide	2/16/2003	Heavy Snow ⁸	0	2	263

Source: NCDC website, PEMA website, County Hazard Vulnerability Analysis

1.2.2.3 Hazard Profile – Winter Storms

Hazard Characteristics

Winter storms begin as low-pressure systems that move through Pennsylvania either following the jet stream or developing as extra-tropical cyclonic weather systems over the Atlantic Ocean called “Nor’esters.” The effects of these storms can sometimes last for weeks, bringing several inches or even feet of snow and ice and cold temperatures.

Probability of Occurrence

Winter storms occur on the average of 35 times a year in Pennsylvania. The NCDC indicates that Blair County annually receives an average of 37.6 inches of snow; however, snowfall varies considerably from one year to the next. For example, there was 17 inches of snowfall in February 2004 in Altoona. The future probability of winter storms is unknown, but it is assumed to be similar to historical winter storms.

Severity

A winter storm can adversely affect roadways, utilities, business activities and can cause loss of life, frostbite, or freezing. Winter storms may contain one or more of the

⁷ Governor's Proclamation of Disaster Emergency

⁸ Governor's Proclamation and President's Declaration of Major Disaster



following hazardous weather events:

- Heavy Snowstorm: Accumulations of four inches or more in a six-hour period, or six inches or more in a twelve-hour period.
- Sleet Storm: Significant accumulations of solid pellets which form from the freezing of raindrops or partially melted snowflakes causing slippery surfaces posing hazards to pedestrians and motorists.
- Ice Storm: Significant accumulations of rain or drizzle freezing on objects (trees, power lines, roadways, etc.) as it strikes them, causing slippery surfaces and damage from the sheer weight of ice accumulation.
- Blizzard: Wind velocity of 35 miles per hour or more, temperatures below freezing, considerable blowing snow with visibility frequently below one-quarter mile prevailing over an extended period of time.
- Severe Blizzard: Wind velocity of 45 miles per hour, temperatures of 10 degrees Fahrenheit or lower, a high density of blowing snow with visibility frequently measured in feet prevailing over an extended period time.

Some rural areas of the county are susceptible to isolation during winter storms due to power and communication loss, as well as road closings. Emergency medical, food, and fuel supplies are sometimes required during these storms. About 80 percent of the County's population lives in such areas. Furthermore winter storms may be more severe at higher altitudes, such as in the various mountains in Blair County.

1.2.2.4 Hazard Vulnerability – Winter Storms

Existing Community Assets

Winter storm events would likely affect the entire County. Wintertime snow accumulations are expected and normal in Blair County. The most common, but potentially serious effect of very heavy snowstorms with accumulations exceeding six or more inches in a 12-hour period are traffic accidents; interruptions in power supply and communications; and the failure of inadequately designed and/or maintained roofing systems. Similar to the discussion under tornadoes and wind storms, vulnerability to the effects of winter storms on buildings is dependent on the age of the building (and what building codes may have been in effect at the time), type of construction, and condition of the structure (i.e., how well has the structure been maintained). *Individual structure data was not available for this study, so it was difficult to determine the exact number and types of structures within Blair County that have heightened vulnerability to winter-storm snow loading.*



Future Development

The *Capability Assessment* portion located in Section 2 discusses that communities have adopted the UCC as their building code, which increases the probability that new construction will be able to resist design snow loads. A comparison of existing and future land uses is presented in Appendix J.

1.2.3 Other Severe Weather

1.2.3.1 Overview – Other Severe Weather

There are many other kinds of severe weather that can impact Blair County, including:

- Lightning,
- Drought,
- Hail, and
- Extreme heat and cold.

Of these, disasters have only been declared for drought for Pennsylvania regions that include Blair County.

Lightning is generated by the buildup of charged ions in a thundercloud; when that buildup interacts with conducting surfaces, the result is an electrical discharge in the form of lightning. When lightning strikes humans, serious burns or death can occur. Lightning strikes can also cause property damage, fires, and power surges.

Hail is a precipitation of frozen ice pellets that are sometimes formed during a thunderstorm. Although hail is generally small (less than ½-inch diameter), hailstones as large as 2-inch diameter have fallen in Blair County. Hail strikes can cause property damage (e.g., building roofs) and occasionally injury.

Extreme temperatures include severe heat and cold, generally occurring during the summer and winter, respectively. These severe temperatures can be dangerous to those who are exposed to the elements for long periods or to the infirm and elderly. Extremely cold temperatures can cause particular problems in Blair County, such as equipment malfunctions due to freezing. In addition, salt is no longer effective at such temperatures, and thus more accidents may occur outdoors from ice.

A drought is a period of prolonged dryness that contributes to depletion of ground-water and surface-water yields. When droughts occur, they can have significant adverse consequences to:

- Public water supplies for human consumption;
- Rural water supplies for livestock consumption and agricultural operations;



- Water quality;
- Natural soil water or irrigation water for agriculture;
- Water for forests and for fighting forest fires; and
- Water for navigation and recreation.

There is not a significant amount of historical data available for Blair County on damages from lightning, hail or extreme temperatures, although these weather events occur periodically.

1.2.3.2 Previous Occurrences – Other Severe Weather

Pennsylvania ranks third nationally in the number of lightning injuries each year. Data on lightning strikes in Blair County was not available from NCDC.

Between 1930 and 1994, the Commonwealth of Pennsylvania experienced five significant droughts: 1930-1934, 1939-1942, 1953-1955, 1961-1967 and 1991-1992. From 1999 through early 2003, the region experienced a drought condition per the PA Department of Environmental Protection (DEP). Although County-specific drought data was not available, statewide drought data is shown in Table 1.12.

Table 1.12. History of Drought in Southeastern Pennsylvania

Location	Date	Crop Damage, \$K
Statewide	Sept 1963 ⁹	N/A
Statewide	July 1991 ¹⁰	N/A
Statewide	December 1998 ¹⁰	N/A
Statewide	July 1999 ¹⁰	500,000
Statewide	Feb 2002 ¹⁰	N/A

Source: NCDC website, PEMA website

The NCDC includes numerous events of hail and extreme temperatures in Blair County in the past 30 years. For example:

- From January 14 to 21, 1994, an arctic air mass caused temperatures to plunge 20 to 40 degrees below normal. On the morning of the 19th, a temperature of -25°F was recorded at Altoona.
- On July 3, 1996, quarter-size hail fell near Martinsburg, causing “significant crop damage and some roof damage”, although no cost estimate of damages is available.

⁹ Governor's Proclamation and President's Declaration of Major Disaster

¹⁰ Governor's Proclamation of Disaster Emergency



- Since 1975, there have been 13 events in the County of 0.75-inch to one-inch-diameter hail.

1.2.3.3 Hazard Profile – Other Severe Weather

Hazard Characteristics

In the US, an average of 73 people are killed each year by lightning, making it deadlier than tornadoes or hurricanes. Lightning is the most constant and widespread threat to people and property during the thunderstorm season. The effects of thunderstorms have been discussed previously under flooding and high winds.

Extreme temperatures affect Central Pennsylvania every year, although the impacts vary considerably from one year to the next.

Drought is a normal part of virtually all climates, the consequence of a natural reduction in the amount of precipitation experienced over a long period of time, usually a season or more in length. High temperatures, prolonged winds, and low relative humidity can exacerbate the severity of drought.

Probability of Occurrence

Lightning strikes the earth about 100 times every second. Each year in the US about 400 people are struck (about one for every 86,000 lightning flashes in the US), and 17,400 fires are caused by lightning. July is the peak month for lightning strikes in the US.

The probability of hail is also greatest in the summer, and the National Weather Service indicates a two percent probability of hail in July in Central Pennsylvania.

Central Pennsylvania has experienced 25 dry periods (months with rainfall three inches or more below the mean precipitation) in the past 100 years.

The future probability of lightning, drought, hail, and extreme temperatures in Blair County is unknown, but it is assumed to be similar to historical events.

Severity

The severity of lightning, drought, hail, and extreme temperatures is difficult to quantify. However, the Commonwealth uses five parameters to assess drought conditions:

- Streamflows (compared to benchmark records);
- Precipitation (measured as the departure from normal, 30 year average precipitation);
- Reservoir storage levels in a variety of locations (especially three New York City



- reservoirs in upper Susquehanna River Basin);
- Groundwater elevations in a number of counties (comparing to past month, past year and historic record); and
- The Palmer Drought Index, a measure of soil moisture computed by the National Weather Service.

Phases of drought preparedness in Pennsylvania are:

- Drought Watch: A period to alert government agencies, public water suppliers, water users and the public regarding the potential for future drought-related problems. The focus is on increased monitoring, awareness and preparation for response if conditions worsen. A request for voluntary water conservation is made. The objective of voluntary water conservation measures during a drought watch is to reduce water uses by 5 percent in the affected areas. Because of varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.
- Drought Warning: This phase involves a coordinated response to imminent drought conditions and potential water supply shortages through concerted voluntary conservation measures to avoid or reduce shortages, relieve stressed sources, develop new sources, and if possible forestall the need to impose mandatory water use restrictions. The objective of voluntary water conservation measures during a drought warning is to reduce overall water uses by 10-15 percent in the affected areas. Because of varying conditions, individual water suppliers or municipalities may be asking for more stringent conservation actions.
- Drought Emergency: This stage is a phase of concerted management operations to marshal all available resources to respond to actual emergency conditions, to avoid depletion of water sources, to assure at least minimum water supplies to protect public health and safety, to support essential and high priority water uses and to avoid unnecessary economic dislocations. It is possible during this phase to impose mandatory restrictions on nonessential water uses that is provided for in 4 PA Code Chapter 119, if deemed necessary and if ordered by the Governor of Pennsylvania. The objective of water use restrictions (mandatory or voluntary) and other conservation measures during this phase is to reduce consumptive water use in the affected area by 15 percent, and to reduce total use to the extent necessary to preserve public water system supplies, to avoid or mitigate local or area shortages, and to assure equitable sharing of limited supplies.
- Local Water Rationing: Although not a drought phase, local municipalities may, with the approval of the PA Emergency Management Council, implement local water rationing to share a rapidly dwindling or severely depleted water supply in designated water supply service areas. These individual water rationing plans, authorized through provisions of 4 PA Code Chapter 120, will require specific limits on individual water



consumption to achieve significant reductions in use. Under both mandatory restrictions imposed by the Commonwealth and local water rationing, procedures are provided for granting of variances to consider individual hardships and economic dislocations. [Source: PEMA, 409 Plan]

1.2.3.4 Hazard Vulnerability – Other Severe Weather

All of Blair County is equally vulnerable to lightning and hail events. Drought and extreme temperatures events would also likely affect the entire County. The impact of lightning and hail would likely be greatest on structures, although there is also risk of injury and death (especially for lightning). The impact of extreme temperatures in Blair County would be greatest on the most vulnerable population (e.g., the elderly and ill).

Drought is a concern for Blair County residents because of the presence of farms and other water-dependent industry and recreation in the area. A prolonged drought could negatively impact these sectors of the local economy, as well as residents who depend on wells for drinking and other personal uses.

The County Comprehensive Plan indicates that the public water systems in the County obtain water supplies primarily from reservoirs (surface waters), supplemented by wells and springs. Freedom Township, Huston Township, and Tyrone Township do not have any areas served with public water. In addition, portions of Snyder Township, Antis Township, Logan Township, Allegheny Township, Frankstown Township, Catharine Township, Juniata Township, Woodbury Township, North Woodbury Township, Taylor Township, and Greenfield Township do not have public water service. In these areas, private wells are the primary source of water. Given the role of agriculture in the local economy, water supply will likely remain a key issue in the future.

1.2.4 Conclusions – Severe Weather

The following summarizes the salient points identified during the hazard identification, profiling and vulnerability assessment portions of the work that are carried forward as part of the planning process.

1.2.4.1 Summary of Hazard Vulnerability Assessment

Blair County is vulnerable to tropical storms from hurricanes coming inland, which can cause heavy rainfall and subsequent flooding. There were several major events in the 1990's that caused record flooding levels and damages. The hazard analysis shows that Blair County is also vulnerable to possible tornado activity. Blair County is vulnerable to thunderstorms which can cause high winds, heavy rainfall and subsequent flooding.

Pennsylvania and Blair County experience several winter storms every year that can create power loss, among other obvious adverse effects. The series of storms in early



1994 and 1996 were Presidential-declared disasters. Heavy snowstorm, sleet storm, ice storm, blizzard and severe blizzard are the types of winter storms possible in Blair County. Due to the frequency of past events and a relatively high annual probability for high snow depths, winter storms are very likely to continue affecting normal activity in the County in the coming years.

A drought is a possible hazard to Blair County, since central Pennsylvania experienced 25 dry periods in the past 100 years. The Commonwealth of Pennsylvania experienced five significant droughts from 1930 to 1994. A drought in Blair County can have significant effect on domestic water supply, agriculture and other water-dependent activities. Furthermore a drought can increase the risk of wildfires.

1.2.4.2 *What Can Be Mitigated?*

The nature of much of the severe weather hazards is that the entire County can be affected. There are no hazard zones, and every area within the County is equally exposed, although weather impacts may vary somewhat according to topography and other factors. For all severe storm events – including tornadoes, and severe winter storms – aged, dilapidated, or buildings not adequately built or not built to applicable building codes are more susceptible to wind and weather hazards. Manufactured housing (mobile homes) are especially susceptible to wind events. Strong winds can rip roofs off houses, overturn manufactured homes, or cause total failure of poorly constructed structures. Gable-ended roofs are also especially vulnerable to strong winds. Aged or otherwise compromised structures are also susceptible to snow loads if their roofing systems are not built to applicable standards. For that reason, vulnerability and determining what can be mitigated are described in terms of *structures* or *infrastructure* that are most vulnerable to the hazard.

1.2.4.3 *Data Limitations*

The severe weather vulnerability analysis depended upon limited data. During the development of this plan, the ability to ascertain information from the property database, necessary to determine which structures were aged/dilapidated or which had basements was affected. Subsequent versions of this plan will need to incorporate and respond to this data deficiency or need.

Note that a mitigation action is presented in Section 4.3 to collect more of the data noted above. Future versions of this plan would hopefully be able to identify the types and numbers of existing buildings (including repetitive loss structures), infrastructure, and critical facilities located in the identified hazard areas, along with an estimate of potential dollar losses to vulnerable structures and the methodology used to prepare the estimate.

1.3 Other Hazards

1.3.1 Earthquakes

Figure 1.5 indicates the earthquake epicenters measured in Pennsylvania before and after 1960; note that there are no records of earthquakes in Blair County. Neighboring Cambria County, however, experienced an earthquake before 1960 between magnitudes 3.0 and 3.9 on the Richter scale. Table 1.13 below indicates the relative frequency worldwide of the various magnitudes of such quakes and their effects.

Table 1.13. Earthquake Effects and Frequency

Richter Magnitudes	Earthquake Effects	Frequency of Occurrence
Less than 2.0	Microearthquakes, not felt.	About 8,000 per day
2.0-2.9	Generally not felt, but recorded.	About 1,000 per day
3.0-3.9	Often felt, but rarely causes damage.	49,000 per year (est.)
4.0-4.9	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely.	6,200 per year (est.)
5.0-5.9	Can cause major damage to poorly constructed buildings over small regions. At most slight damage to well-designed buildings.	800 per year

One way to express an earthquake's severity is to compare its acceleration to the normal acceleration due to gravity. Peak ground acceleration (PGA) measures the strength of ground movements in this manner. PGA represents the rate in change of motion of the earth's surface during an earthquake as a percent of the established rate of acceleration due to gravity.

Figure 1.6 shows earthquake hazard in the eastern United States as a function of PGA. According to the map, Blair County is estimated to have a low earthquake hazard, which means that it has 10 percent exceedance levels (10 percent expectation of being exceeded in a period of 50 years) between 2 and 3 PGA. Roughly, ground acceleration must exceed 15 PGA for significant damage to occur, although soil conditions at local sites are extremely important in controlling how much damage will occur as a consequence of a given amount of ground acceleration. Thus, earthquakes are deemed to be a minor hazard in Blair County.

1.3.2 Landslides/Subsidence

There are several types of land failure hazards; the type with some relevance in Blair

County is rockfalls. A rockfall occurs when smaller rock-mass breaks free and disintegrates into blocks that bounce and roll down steep slopes. .

There have been several land failures reported in Pennsylvania but no substantive failures in Blair County. Rockfalls and other slope failures often occur in areas with moderate to steep slopes, conducive geology and high precipitation. With the appropriate geology and topography, most slope failures are associated with precipitation events – periods of sustained above-average precipitation, specific rainstorms or snowmelt events. Other elements that determine slope stability are vegetative cover and slope. Contributing causes of landslides include erosion, removal of vegetation cover and earthquakes. Human activities that can contribute to slope failure include altering the slope gradient, increasing the soil water content and removing vegetation cover. The DCNR describes landslide susceptibility in Blair County as “generally low, but includes local areas of high to moderate”– see Figure 1.7. Those latter areas would tend to be in areas of steep slopes (see Figure 1.2), such as along the Allegheny Front in the western third of the county and the following mountains:

- Brush
- Bald Eagle
- Canoe
- Dunning
- Loop
- Lock
- Short
- Tussey

Thus, landslides/subsidence is deemed to be a relatively minor hazard in Blair County.

1.3.3 *Wildfires*

A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that can be seen for miles. A wildland fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities. An urban-wildland interface is a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Wildfires can occur at any time of the year, but mostly occur during long, dry hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Most wildfires are caused by human carelessness, negligence and ignorance. However, some are precipitated by lightning strikes and in rare instances, spontaneous combustion.

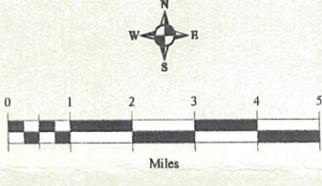
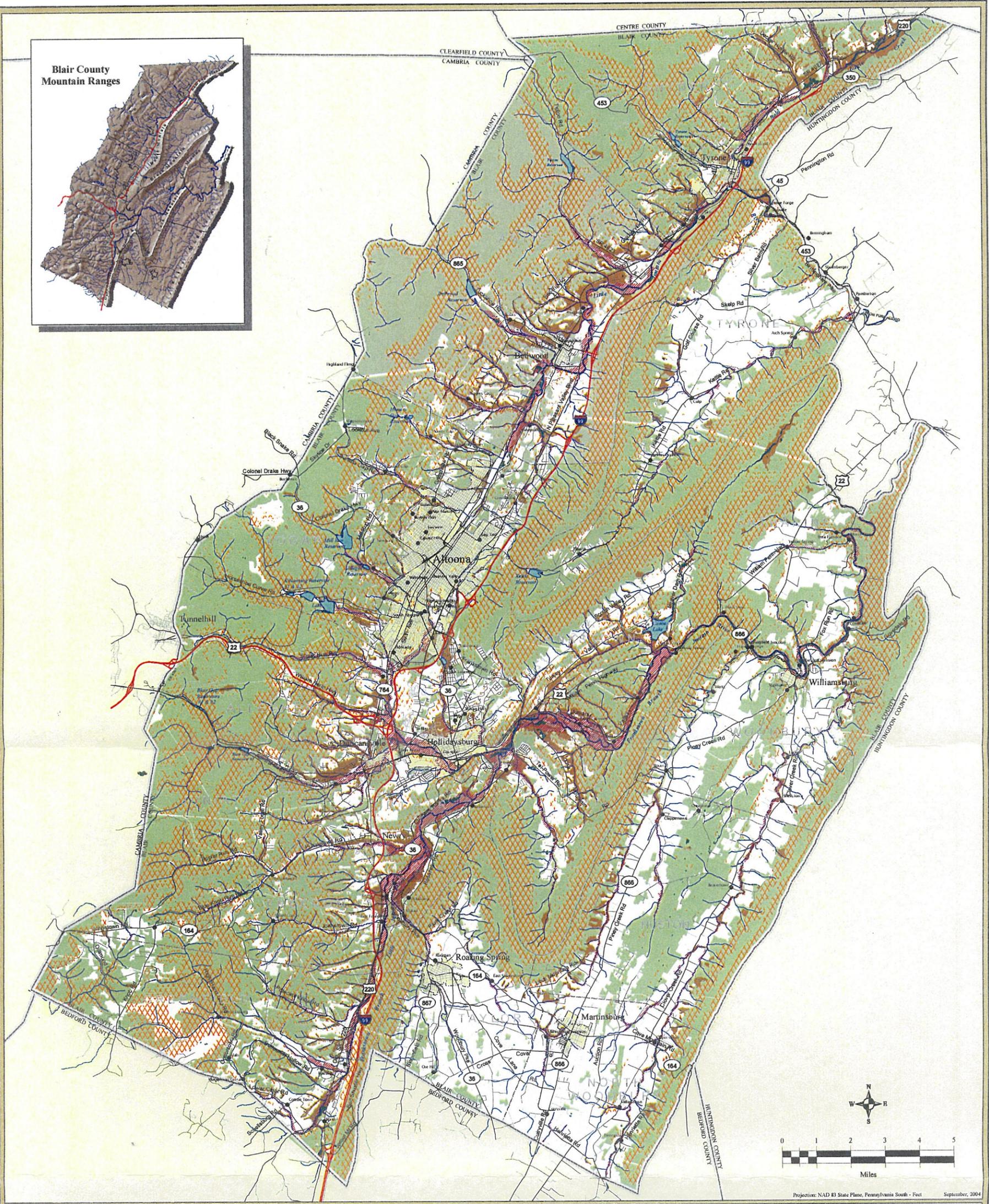
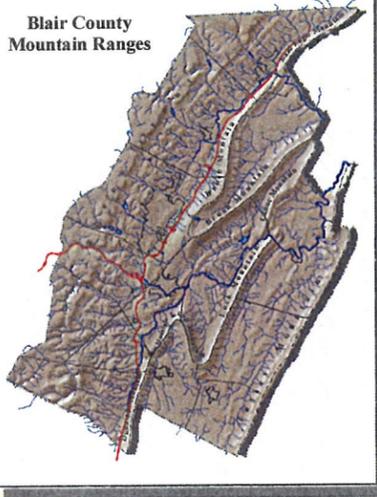


Wildfires in the Commonwealth can occur in fields, grass, and brush as well as in forests. In Blair County, most of the county consists of forested areas and cropland. Under dry conditions or droughts, wildfires have the potential to burn forests as well as croplands.

The greatest potential for wildfires is in the spring months of March, April, and May, and in the autumn months of October and November. In the spring, bare trees allow sunlight to reach the forest floor, warming the ground and drying the previous fall's leaves. In the fall, dried leaves are also fuel for fires. 98 percent of wildfires in Pennsylvania are caused by people, often by debris burns. Several fires have started in a person's backyard and traveled through dead grasses and weeds into bordering woodlands.

Since 1977, there have been more than 230 major wildfires in the Commonwealth resulting in more than 100,000 acres of forest area being destroyed. DCNR Bureau of Forestry maintains data on wildfires on state lands, but data on wildfires on privately owned land was unavailable for review. Relative to other natural hazards, wildfires are deemed to be a low risk to Blair County.

Blair County Mountain Ranges



Projection: NAD 83 State Plane, Pennsylvania South - Feet September, 2004

Legend

- County Boundary
- City/Borough
- Township
- Place
- Interstate
- State Route
- Local Road
- Railroad
- Lake/Reservoir
- River/Creek/Stream
- 100 Year Floodplain
- Wetlands
- Hydric Soils
- Steep Slopes (>25%)
- Forested Areas



BLAIR COUNTY PLANNING COMMISSION



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Map Sources:
Transportation and Boundaries - Blair County 911 Data
Hydrology-ERRI Networked Streams (PASDA)
Floodplains-FEMA Q3 flood data
Steep Slopes-interpreted from USGS National Elevation Dataset
Soils-USDA Digital Soil Survey
Prime and Important Soils-Blair County Conservation District
Wetlands-US Fish & Wildlife Service National Wetlands Inventory
Forested Areas-Existing Land Use

An Areawide Comprehensive Plan
for
Blair County, Pennsylvania

Table 1.2. Countywide Floodplain Map



Figure 1.3. Tornado Activity in the United States

Source: FEMA 386-2, *Understanding Your Risks*

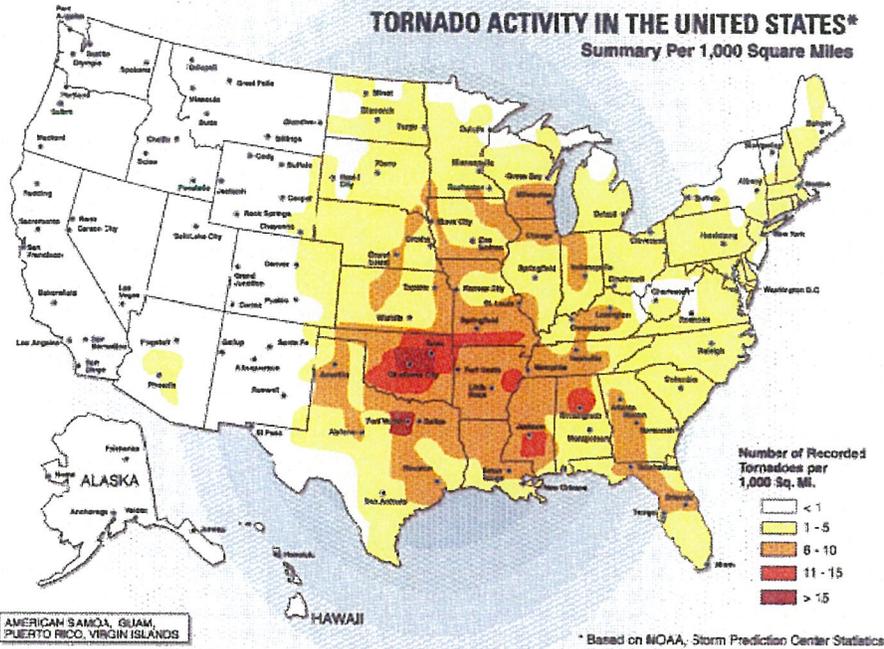


Figure 1.1 The number of tornadoes recorded per 1,000 square miles

Figure 1.4. Wind Zones in the United States

Source: FEMA 386-2, *Understanding Your Risks*

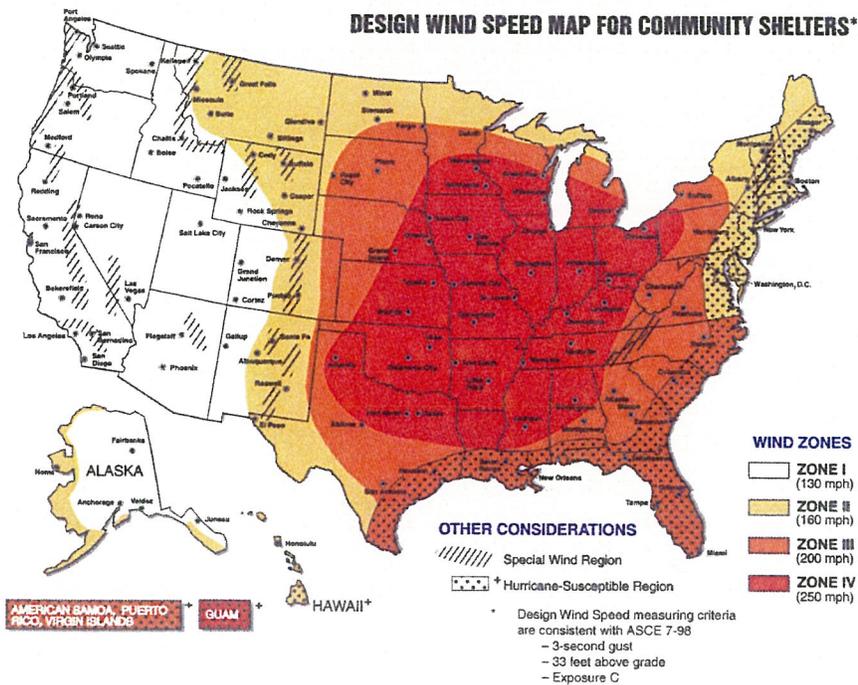


Figure 1.5. Earthquake Epicenters in and Near Pennsylvania

Source: PaDCNR

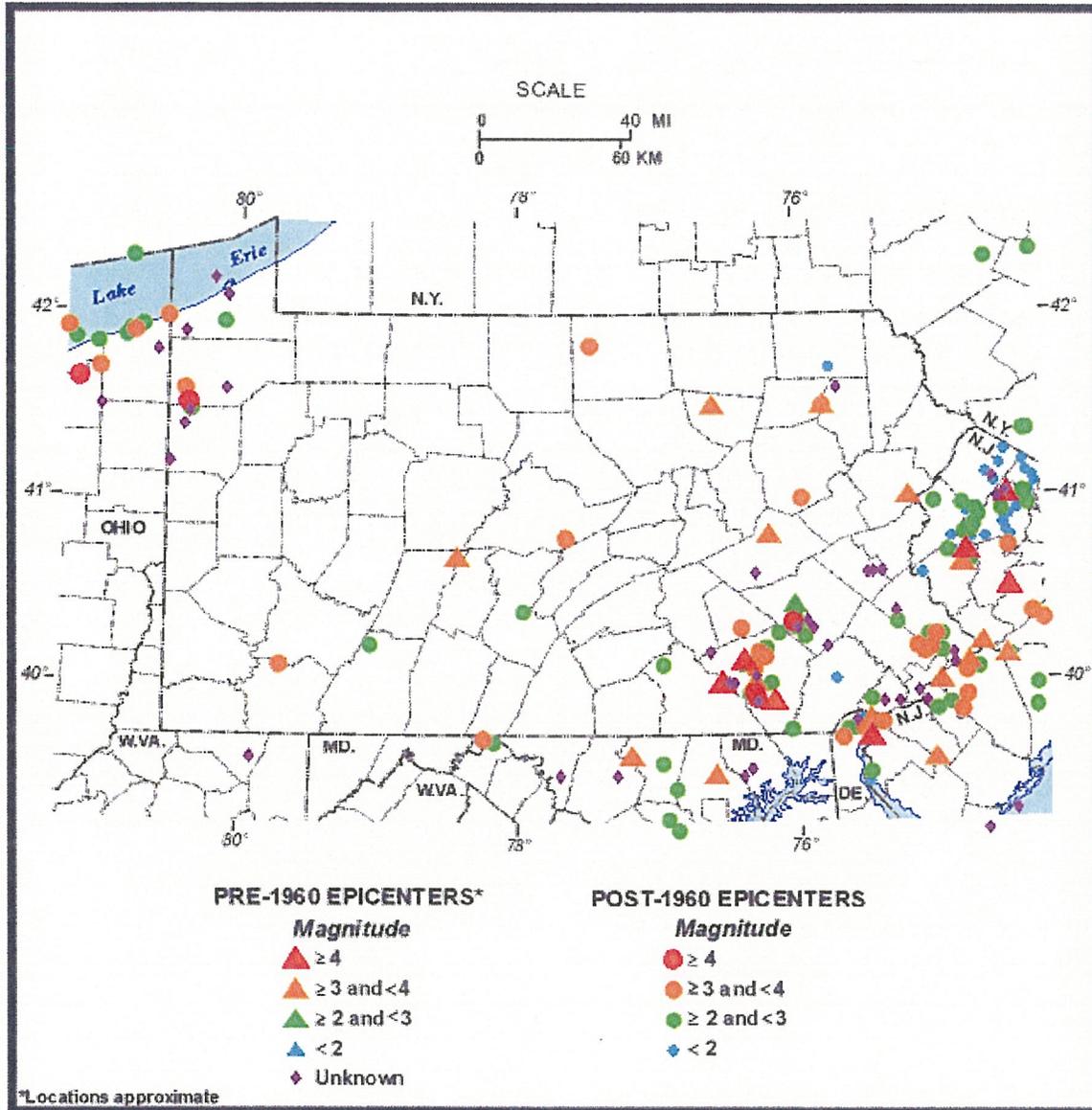
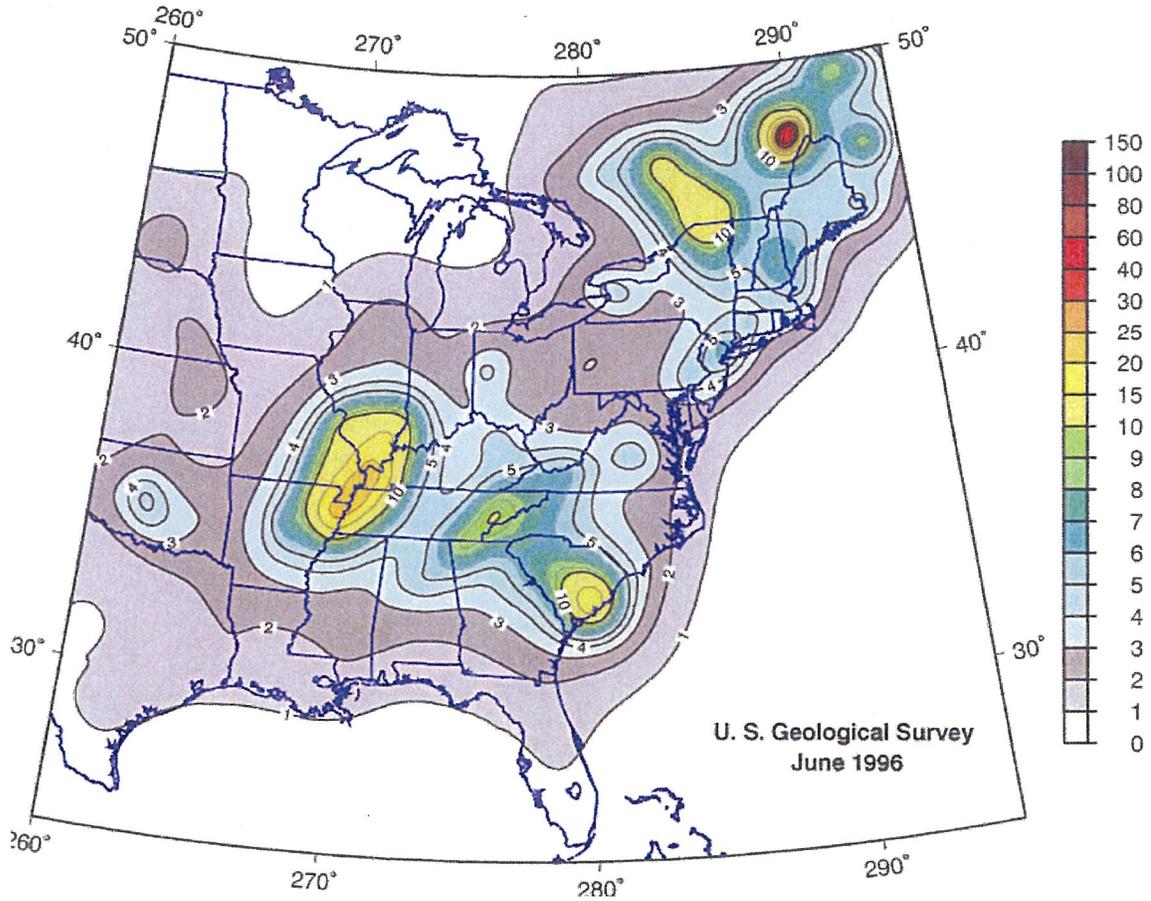


Figure 1.6. Peak Ground Acceleration

Source: USGS





2.0 Mitigation Capabilities and Resources

Blair County has a number of resources that it can access to implement hazard mitigation initiatives. These resources include both private and public assets at the local, state, and federal levels.

2.1 Capabilities and Resources – Blair County

Table 2.1 summarizes the local-government capabilities the County’s municipalities possess that will facilitate implementation of the mitigation strategy. Blair County and the 24 municipalities within its boundaries have a very important relationship in which they share resources to ensure the effective implementation of ordinances and codes.

Table 2.1 Local Mitigation Capability Assessment Matrix

	Comp. Plan	Zoning Ord.	SALDO	Flood Ord. & NFIP
City of Altoona	X	X	X	X
Allegheny Township			X	X
Antis Township	X		X	X
Bellwood Borough				X
Blair Township	X		X	X
Catharine Township	Note 1		X	X
Duncansville Borough		X	X	X
Frankstown Township		X	X	X
Freedom Township			X	X
Greenfield Township			X	X
Hollidaysburg Borough	X	X	X	X
Huston Township			X	X
Juniata Township				X
Logan Township	X	X	X	X
Martinsburg Borough	X	X		X
Newry Borough				X
North Woodbury Twp	X		X	X
Roaring Spring Borough	X	X	X	X
Snyder Township			X	X
Taylor Township			X	X
Tunnelhill Borough				
Tyrone Borough	X	X	X	X
Tyrone Township			X	X
Williamsburg Borough	X	X		X



	Comp. Plan	Zoning Ord.	SALDO	Flood Ord. & NFIP
Woodbury Township	Note 1			X

Note 1 - Part of Williamsburg Borough Joint Comprehensive Plan

Source: Blair County Planning Commission and FEMA

The most important capabilities that the municipalities utilize are zoning, land-use and floodplain-management ordinances and building codes. Through administration of the floodplain ordinances, the municipalities can ensure that all new construction or substantial improvements to existing structures that are located in the 100-year floodplain are built with first-floor elevations above the BFE.

The County, townships, and incorporated municipalities have undertaken several important planning initiatives:

- 12 municipalities have adopted local comprehensive plans. The County comprehensive plan promotes sound land use and regional cooperation among local governments to address planning issues.
- Nine municipalities utilize zoning ordinances, and 18 municipalities use subdivision and land development ordinances (SALDOs).
- All 24 municipalities that are completely in the County have adopted floodplain management ordinances and participate in the NFIP. Tunnelhill Borough, which is partly in Cambria County, has not.

Building codes are important in mitigation, because codes are developed for regions of the country in consideration of the hazards present within that region. Consequently, structures that are built to applicable codes are inherently resistant to many hazards like strong winds, floods, and earthquakes. In 2004 the Commonwealth of Pennsylvania implemented the Uniform Construction Code (UCC), Act 45 of 1999 as amended by Act 43 of 2001 and Acts 13, 92, and 230 of 2004, a comprehensive building code that establishes minimum regulations for most new construction, including additions and renovations to existing structures. Local residential and non-residential code officials must register and obtain certification within three and five years, respectively. While some municipalities in Blair County had already instituted building codes prior to the mandate by the Commonwealth, all municipalities and the County will likely have to spend considerable time and resources retraining and becoming certified in the new requirements and revamping their administrative and enforcement procedures. All municipalities are permitted to enact new ordinances with stricter requirements by going through a review and hearing process. During the initial election period some of the municipalities in Blair County opted to locally administer and enforce the UCC and have third-party agencies conduct inspections.



There are several available means for incorporating the requirements of the hazard mitigation plan into other planning mechanisms, such as local comprehensive plans or capital improvement plans (see Table 2.1 and other text in this section). In addition, there are mitigation strategies and actions in this plan that relate to the aforementioned planning mechanisms as implementation tools (see Sections 4 and 5). Furthermore, this hazard mitigation plan will become a component of the County comprehensive plan, and municipal comprehensive plans are required to be consistent with the County's comprehensive plan. This hazard mitigation plan may also become integrated with the County's emergency operations plan and its watershed management plan.

Other Local Resources

The Southern Alleghenies Planning & Development Commission (SAP&DC) is a regional multi-county development agency dedicated to encouraging the creation and retention of jobs, while actively seeking to improve the quality of life for residents of the region. The SAP&DC provides leadership, expertise and services to communities, businesses, institutions and residents. With their partners, the region's chamber of commerce and industrial development groups, SAP&DC provides services to organizations in the multi-county service area. In the future, Blair County and SAP&DC can partner to implement public awareness actions by helping in bulk mailings, printing brochures, and developing the County's web site to include information about hazard mitigation initiatives.

Other local organizations that could act as partners for future mitigation action include:

- Non-profit environmental organizations like the Susquehanna River Basin Commission, the Merrill Linn Conservancy and local watershed associations;
- Business development organizations like the Chamber of Commerce and Rotary Club; and
- Historical and cultural agencies like the Blair County Historical Society.

2.2 Capabilities and Resources – Commonwealth of Pennsylvania

Blair County may also be able to access several of the resources offered by the Commonwealth of Pennsylvania. One resource that may have particular application to hazard mitigation initiatives is the "Growing Greener" campaign. Growing Greener was signed into law in 1999 investing nearly \$650 million in preserving farmland and protecting open space; eliminating the maintenance backlog in state parks; cleaning up abandoned mines and restoring watersheds; providing funds for recreational trails; helping communities address land use; and providing new and upgraded water and sewer systems. Many counties have received grants to address land-use and open space issues.



Blair County could direct some of these funds (e.g. for recreational trails) towards hazard mitigation objectives like acquisition and demolition of flood-prone structures.

DCNR provides a single point of contact for communities seeking state assistance in support of local conservation initiatives. This assistance can take the form of grants, technical assistance, information exchange and training. A variety of programs are available, like the Pennsylvania Heritage Parks Program, Pennsylvania Recreational Trails Program, and the Technical Assistance Program which can help with public involvement. They have also conducted pre-application workshops for “Growing Greener” and “Keystone” grants through their Community Conservation Partnerships Program.

There are several state training programs available for Blair County and municipal government staff which can better equip them to handle hazard mitigation activities. Some examples include the “Building Code Enforcement: An Intergovernmental Approach,” “Statewide Building Code: Understand Your Options, Make a Choice,” “Basic Course for Zoning Officials,” and “Stormwater Management.” PEMA also offers training in conjunction with FEMA for emergency management and hazard mitigation activities with courses such as the “Hazardous Weather and Flooding Preparedness Course.”

Other potential sources of help from the Commonwealth include:

- Local Government Capital Projects Loan Program: Provides low-interest loans for up to 50 percent of the total cost of purchasing equipment up to a maximum of \$25,000 or 50 percent of the total cost of municipal facility needs up to \$50,000 for small local governments with populations of 12,000 or less;
- Shared Municipal Services: Provides grant funds to promote cooperation among municipalities, encouraging more efficient and effective delivery of municipal services like shared personnel activities or equipment or shared data processing operations;
- Land Use Planning and Technical Assistance Program: Provides grant funds for the preparation of community comprehensive plans and ordinances to implement them;
- Floodplain Land Use Assistance Program: Provides grants and technical assistance to encourage the proper use of land and the management of floodplain lands including the costs for clerical, technical and legal staff as well as advertising, public hearing, and consultant costs; and
- Community Revitalization Program: Provides grant funds to support local initiatives that promote social and economic diversity to ensure a productive tax base and good quality of life with projects like construction or rehabilitation of infrastructure, building rehabilitation, public safety, recreation, and acquisition.



2.3 Capabilities and Resources – Federal Government

The federal government offers a number of mitigation-related funding and training resources. Funding opportunities such as the Pre-Disaster Mitigation Assistance program, the Flood Mitigation Assistance Program, and the Hazard Mitigation Grant Program require local governments to have a hazard mitigation plan in order to be eligible to receive such grants. Other possible funding sources include Community Development Block Grants and the Small Business Administration. The relationship between these funding sources and potential mitigation actions will be explained as part of the implementation strategy for this plan.

Through the Emergency Management Institute, the federal government offers training in all aspects of emergency management, including hazard mitigation. The courses available at the Institute are free to local government staff.

Other federal resources include:

- Weatherization Assistance Program: Minimizes the adverse effects of high energy costs on low-income, elderly, and handicapped citizens through client education activities and weatherization services like heating system modifications and insulation.
- Section 108 Loan Guarantee Programs: Provides loan guarantees as security for federal loans for acquisition, rehabilitation, relocation, clearance, site preparation, special economic development activities, and construction of certain public facilities and housing.
- US Army Corp of Engineers: Provides planning and technical assistance for a wide range of activities including flood-damage reduction, dam safety, and emergency response.
- US Department of Agriculture: Provides disaster assistance through the following:
 - The Emergency Conservation Program provides emergency funding for farmers to rehabilitate farmland damaged by natural disasters and for carrying out emergency water conservation measures during periods of severe drought.
 - The Non-insured Crop Disaster Assistance Program provides financial assistance for non-insurable crop losses and planting prevented by disasters.
- Emergency Watershed Protection Program: Undertake emergency measures, including the purchase of flood plain easements, for runoff retardation and soil



erosion prevention to safeguard lives and property from floods, drought, and the products of erosion on any watershed whenever fire, flood or any other natural occurrence is causing or has caused a sudden impairment of the watershed. It is not necessary for a national emergency to be declared for an area to be eligible for assistance. The program objective is to assist sponsors and individuals in implementing emergency measures to relieve imminent hazards to life and property created by a natural disaster. Activities include providing financial and technical assistance to remove debris from streams, protect destabilized streambanks, establish cover on critically eroding lands, repairing conservation practices, and the purchase of flood plain easements. The program is designed for installation of recovery measures.

Other potential federal resources are listed in Appendix D.

2.4 Conclusion

After conducting the mitigation capability assessment, the conclusion was reached that the County will need to rely on technical and financial assistance from regional, state, and federal resources to effectively implement hazard mitigation actions over the next five years. The constraints facing the County include limited staff resources and funds that can be directed to implementing hazard mitigation.

During the development of this plan and from reviewing other recent planning initiatives, it is readily apparent that the County has the capability to bring together citizens, government representatives, and local officials to work closely together in crafting a better future for their communities. That same cooperative effort, if joined with the appropriate technical and financial assistance from regional, state and federal resources, can be harnessed to implement the priority hazard mitigation actions described in Section Four of this plan. A sustained effort by the citizens, staff, and local officials can create a more sustainable and disaster-resistant future for Blair County.



3.0 Mitigation Goals and Objectives

3.1 Terminology

- **Goals** are general guidelines that explain what you want to achieve. Goals are usually expressed as broad policy statements representing desired long-term results.
- **Objectives** describe strategies or implementation steps to attain the identified goals. Objectives are more specific statements than goals; the described steps are usually measurable and can have a defined completion date.
- **Actions** provide more detailed descriptions of specific work tasks to help a community achieve the goals and objectives. For each objective statement, there are alternatives for mitigation actions that must be evaluated to determine the best choices for each situation (see *Section Four: Alternative Mitigation Actions*).
- **Mitigation Plan** include a listing and description of the preferred mitigation actions and the strategy for implementation, i.e., who is responsible, how will they proceed, when should action be initiated and/or completed, etc. (see *Section Five: Mitigation Plan and Implementation Strategy*).

This section of the **Hazard Vulnerability Assessment and Mitigation Plan for Blair County**, Pennsylvania identifies the goals and objectives for the project.

In meetings held in late 2006, citizens and local government representatives reviewed and prioritized goals and objectives based on the findings of the vulnerability assessment. Participants felt that priority should be given to mitigation actions that protect people, property, local government functions, and the local economy from the effects of hazards.

The Community Goals and Development Objectives from the *Areawide Comprehensive Plan for Blair County* were also reviewed as part of this process. That Plan notes that “maintaining and improving the quality of life and economic vitality are important goals the plan will address”. That Plan includes a thorough discussion of goals and objectives that cover the following topics:

- Land Use
- Housing
- Environment and Natural Resources
- Cultural and Historic Resources
- Agriculture and Farmland Preservation
- Community Facilities and Services
- Economic Conditions
- Parks and Recreation



- Transportation

The following objectives from that Plan are relevant to this hazard mitigation plan:

- Severely restrict development on sensitive environmental features, including wetlands, floodplains, and steep slopes over 25%.
- Protect Blair County communities and the environmental health of waterways and watersheds through flood controls, stormwater management, and reduction of non-point source pollutants throughout the county.

The following hazard mitigation goals for the Commonwealth of Pennsylvania's were also considered in this process:

1. Encourage actions that support: public safety during hazard events; natural hazard identification and awareness; hazard avoidance; damage minimization; environmental historic protection; and the mitigation of future severe and repetitive damage due to natural hazards.
2. Ensure that local and state agencies identify critical buildings, facilities, and infrastructure that are at risk of damage due to natural hazards, and to undertake feasible and cost-effective hazard mitigation measures to minimize future losses and expenditures.
3. Make hazard mitigation a public value.
4. Promote economic development consistent with floodplain management, building codes, and similar guidance.
5. Develop an effective public awareness programs for the natural hazards that Pennsylvania is most likely to experience.
6. Encourage scientific study of natural hazards and the development of data to support mitigation strategies for those hazards that are a threat to the Commonwealth.
7. Promote recognition of the value of hazard mitigation to the health, safety, and welfare of the population.

3.2 Goals

The goals developed for the Blair County Hazard Mitigation Plan as listed below were developed in response to the vulnerability findings presented in Section One and the desires of Blair County citizens.



- Reduce possibility of injury/death to County residents and reduce potential damage to existing community assets (including critical facilities and infrastructure) due to:
 - Flooding, and
 - Severe weather, including tornadoes/wind storms, and winter storms.
- Promote disaster-resistant future development.
- Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population.
- Improve response and recovery capabilities.

3.3 Objectives

The goals in Section 3.2 were used to develop draft objectives. These objectives address in more specific terms the results of the vulnerability assessment and reflect the nature of what can be mitigated for the identified hazards as well as existing limitations in data and information. These draft objectives were presented to the HMPC for review and comment, and shown in final form in Section 4.



4.0 Alternative Mitigation Actions

4.1 Introduction

This section includes an overview of alternative mitigation actions based on the goals and draft objectives identified in Section Two. For Goals 1 to 5, the actions are related to addressing vulnerability of existing facilities and assets. Actions identified for Goals 6 and 7 address future development implications and broader issues of public awareness.

There are six general approaches to reducing hazard risks:

- Preventive measures,
- Property protection,
- Emergency services measures,
- Structural projects,
- Natural resource protection, and
- Public information.

Preventive Measures keep problems from getting started or getting worse. The use of known hazard areas, like floodplains for example, can be limited through planning, land acquisition, or regulation. These activities are usually administered by building, zoning, planning, and/or code enforcement officials:

- Planning and zoning,
- Open space preservation,
- Building codes and enforcement,
- Stormwater management, and
- Drainage system maintenance.

Property Protection measures are those actions which go directly to permanently getting people, property, and businesses out of unsafe areas where, in terms of wise disaster planning, they shouldn't have been in the first place.

The first of these measures is *property acquisition*: public procurement and management of lands that are vulnerable to damage from hazards. For example flood-damaged homes have been purchased by the County and municipalities (using state, federal, and local funds) and removed from flood-prone areas (by demolition or relocation). The acquired land then becomes public property which can only be used as "open space" in the future. Open space use means that future development of the site is restricted to low-impact uses like parks, playing fields, gravel parking lots or agriculture--no permanent or enclosed structures.

Relocation of at-risk structures also achieves the same result as acquisition. The home or



business is moved to a safer location, but it remains the property of the individual owner while the original site is purchased and maintained by the local municipality.

Elevation of structures can be an effective in-place mitigation for some flood-threatened homes. By raising the height of the structure's living area above flood levels, damage and threat to life can be reduced. Retrofitting of homes is another in-place damage reduction method. Utilities, services, systems and appliances in some homes can be raised above flood levels.

Construction techniques to improve structural resistance to high wind or heavy snow accumulation can be incorporated into new homes or retrofitted into existing structures. Private home and business insurance policies and participation in the National Flood Insurance Program can also reduce uninsured losses to properties.

Emergency Services Measures are taken during a disaster to minimize its impact. These measures are the responsibility of city or county emergency management staff, operators of major and critical facilities, and other local emergency service organizations. They include:

- Alert warning systems,
- Monitoring systems,
- Emergency response planning,
- Evacuation,
- Critical facilities protection, and
- Preservation of health and safety.

Structural Projects are usually designed by engineers and managed and maintained by public works staffs. They are designed to reduce or redirect the impact of natural disasters (especially floods) away from at-risk population areas. Examples include:

- Reservoirs
- Levees, floodwalls
- Diversions
- Channel modifications
- Storm sewers

Natural Resource Protection preserves or restores natural areas or their natural functions. Such measures are usually implemented by park & recreation organizations, conservation agencies or wildlife groups. They include:

- Wetland protection,
- Best management practices,
- Erosion and sediment control, and
- Riverine protection.

Public Information Programs advise property owners, potential property owners, and others of hazards and ways to protect people and property from them. They are usually implemented by a public information office. Public information activities can include:

- Flood maps and data
- Library resources
- Outreach projects
- Technical assistance
- Real estate disclosure information
- Environmental education programs

4.2 Alternative Flood Mitigation Actions

In Blair County, damage from flooding is caused by development in naturally occurring floodplains, therefore potential mitigation actions involve various techniques for property protection, e.g., acquisition and removal of structures from flood-prone properties, elevation of flood-prone structures above the base flood elevation, etc. Appendix C describes a variety of property protection actions that can be taken to mitigate hazards and evaluates their feasibility. However, as discussed in earlier sections of this plan, there are fundamental data limitations in Blair County that restrict the ability to determine the most appropriate mitigation actions for most affected properties at this time. Therefore the initial efforts for flood mitigation in Blair County focus on gathering additional information to assist the County HMPC in making more detailed decisions about appropriate mitigation actions in the future.

The following are alternatives for flood mitigation actions organized according to the goals and objectives from Section Two.

Goal 1:	Reduce potential injury/death and damage to existing community assets due to flooding .
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Goal 1 Objectives:

- 1.A Identify by municipality and evaluate protection of existing critical facilities with the highest relative vulnerability in the 100-year floodplain.
- *Action 1: Develop GIS data on property parcels to allow evaluation of which parcels are in the floodplain.*
 - *Action 2: Develop a list of critical facilities for the County (e.g., hospitals, police stations, fire stations, County/municipal buildings) and determine which are in the floodplain.*

- *Action 3: Identify critical facilities with the highest relative vulnerability; conduct cost-benefit analysis of protection of those assets.*
- *Action 4: Collect detailed information on critical facilities using FEMA's National Flood Mitigation Data Collection Tool.*

1.B Identify and evaluate strategies for repetitive-loss properties.

- *Action 1: Conduct cost-benefit analysis of protection of repetitive-loss assets.*
- *Action 2: Collect detailed information on RL properties using FEMA's National Flood Mitigation Data Collection Tool.*

1.C Provide public outreach/education regarding strategies (e.g., floodproofing) for property owners in 100-year floodplain.

- *Action 1: Work with township/borough officials to increase awareness of model floodplain ordinance and with property owners, including informational mailings to property owners in the 100-year floodplain, and sponsoring a series of workshops about costs and benefits of:*
 - *Acquiring and minimizing the cost of flood insurance coverage, and*
 - *Property acquisition, relocation, elevation, dry floodproofing, and wet floodproofing.*
- *Action 2: Evaluate at the township/borough level the suitability of Community Rating System (CRS)¹¹ for insurance premium reduction (and flood damage reduction).*
- *Action 3: Consider using "success stories" from other Pennsylvania communities for flood risk management.*

1.D Address identified data limitations regarding lack of detailed information about individual structures located in the 100-year floodplain.

- *Action 1: Obtain information for structures in the areas with the highest relative vulnerability to determine the best property*

¹¹ The Federal CRS has been developed to provide incentives for communities to go beyond the minimum floodplain management requirements to develop extra measures to provide protection from flooding. The incentives are in the form of insurance premium discounts.

protection methods. Develop a linkage between the County tax assessment records and parcels in the County GIS; information to be obtained includes:

- *Lowest-floor elevation,*
- *Number of stories,*
- *Presence of a basement, and*
- *Market and/or replacement value.*

- *Action 2: Obtain information for all remaining structures in the 100-year floodplain to determine the best property protection methods to promote with individual property owners. Techniques for gathering information over time should include developing and implementing a program for integrated information “capture” at key points in normal township administrative procedures, including applications for building permits at township/borough offices.*

1.E Identify and evaluate protection for hazardous material storage in floodplain.

- *Action 1: Identify all storage of hazardous materials in floodplains (including non-addressable structures, such as propane tanks).*
- *Action 2: Evaluate alternative methods to minimize risk from existing storage areas.*
- *Action 3: Assess means to prevent future storage in floodplain.*

1.F Obtain detailed flood studies and updated FIRMs (including 500-year flood) for areas with the greatest potential damage and threat to residents.

- *Action 1: Apply to PEMA for funding to update the outdated FIRMs and undertake detailed flood studies for County’s high-hazard areas to determine BFE and a full range of flood-recurrence intervals (2, 5, 10, 25, 50, 100, and 500-year events) for use in future refinements of the mitigation plan.*

1.G Continue non-structural measures for mitigation of flood hazards in the County.

- *Action 1: Continue acquisition of property in the 100-year floodplain and demolition/deed restriction to ensure that this property remains “green space”.*

1.H Continue compliance with NFIP for mitigation of flood hazards in the County, and encourage Tunnelhill Borough to participate in NFIP.

4.3 Alternative Severe Weather Mitigations Actions

There are a number of mitigation actions that can be used to mitigate severe weather hazards. Unlike hazards like flood that have limited geographic extents, severe weather potentially affects the entire County. Therefore, strategies for identifying weather mitigation actions usually involve identifying individual structures with known/assumed vulnerability or particular critical facilities. Additional efforts might include actions that can reach the entire County through public education or improving County implementation capabilities and strengthening regulations.

Appendix C includes a list of weather hazard mitigation actions with information about their suitability for use in Blair County. As with the flood hazards in Blair County, additional information is needed in most cases to determine appropriate actions. Therefore, the following alternatives for severe weather mitigation actions include a number of additional data gathering and study efforts to obtain information to use in subsequent refinements and revisions of this mitigation plan.

<p>Goal 2: Reduce potential injury/death and damage to existing community assets due to severe weather.</p>
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Goal 2 Objectives:

- 2.A Identify the most-vulnerable and critical existing structures and infrastructure due to the effects of severe weather.
- *Action 1: Conduct qualitative evaluation process for critical facilities and infrastructure to determine relative vulnerability and gather information for subsequent refinements of this mitigation plan.*
 - *Action 2: Identify critical facilities with the highest relative vulnerability to the effects of power outage (i.e., hospitals, nursing homes, fire, police, rescue, and emergency management).*
 - *Action 3: Develop action plan for reducing potential damage and loss of function at identified critical facilities and infrastructure.*

- 2.B Evaluate communities that require warning systems and storm shelters.
- *Action 1: Identify residents with the highest relative vulnerability to the effects of severe weather and prepare implementation plan.*
 - *Action 2: Conduct qualitative evaluation process for managing stranded rural residents and travelers (e.g., temporary shelters).*
 - *Action 3: If warranted, implement additional storm shelters and warning systems near vulnerable communities, including:*
 - *Identify structures that can be used as tornado safe rooms (some may require structure modifications), or*
 - *NOAA weather radios for vulnerable populace.*
- 2.C Address identified data limitations regarding lack of detailed information about characteristics of individual structures.
- *Action 1: Develop a linkage between the County tax assessment records and parcels in the County GIS to allow future revisions of this plan to more easily incorporate information about construction type, age, condition, presence of basement, etc.*
- 2.D Assess the adequacy of municipal zoning/land-use ordinances and building-code implementation.
- *Action 1: Evaluate means of improving ordinance and code enforcement for existing structures.*
 - *Action 2: Work with township/borough officials to increase awareness among mobile-home owners (i.e., informational mailings, workshops) about requirements for proper anchoring for wind protection.*

4.4 Mitigation Actions to Guide Future Development and Promote Public Awareness

Two of the remaining goals address important aspects of the mitigation planning effort for Blair County that go beyond addressing existing problem areas. These goals are based on the ideas of prevention through appropriate land-use and development controls and increasing the general awareness of the public regarding the potential effectiveness of mitigation actions at the individual, community and county level.

Goal 3:	Promote disaster-resistant future development
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Goal 3 Objectives:

- 3.A Encourage and facilitate the development or revision of comprehensive plans and zoning/land-use ordinances to limit development in high-hazard areas.
- *Action 1: Distribute and promote the inclusion of vulnerability analysis information as part of periodic plan review and revisions at the township/borough level.*
 - *Action 2: Integrate evaluation of snow-removal and emergency access logistics with new development planning.*
 - *Action 3: Evaluate ordinances to standardize hydrant connections and provide sprinkler systems for new development.*
- 3.B Encourage and facilitate the adoption of building codes that provide protection for new construction and substantial renovations from the effects of identified hazards.
- *Action 1: Evaluate adequacy of township/borough building code implementation.*
- 3.C Provide adequate and consistent enforcement of ordinances and codes within and between jurisdictions.
- *Action 1: Train the municipal building inspectors to consistently enforce the building code.*

Goal 4:	Promote hazard mitigation as a public value in recognition of its importance to the health, safety, and welfare of the population
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Goal 4 Objectives:

- 4.A Provide public education to increase awareness of hazards and opportunities for mitigation.
- *Action 1: Identify and publicize success stories as part of an overall consistent public relations program.*
- 4.B Promote partnerships between the municipalities and the County to continue to develop a County-wide approach to identifying and implementing mitigation actions.



- *Action 1: Convene regular meetings of a restructured HMPC to discuss issues and progress related to the implementation of the plan.*

4.C Continue the promotion of disaster resistance in the business community via the hazard mitigation planning initiative.

- *Action 1: Renew and expand commitments to hazard mitigation planning among partner organizations.*

4.5 Related Response and Recovery Issues

The following objectives have been discussed during the development of this plan that relate primarily to Response and Recovery activities and would likely not be “funded” by State or Federal sources as “mitigation”. However, they can be included as part of the mitigation plan recommendations for consideration of future actions by county and township emergency managers.

Goal 5:	Improve Response and Recovery Capabilities
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Goal 5 Objectives:

5.A Increase awareness by residents (i.e., through public outreach/education) of actions to take during an emergency.

- *Action 1: Increase awareness by residents of actions to take during an emergency, including sheltering and evacuation procedures. Methods to be used can include through public outreach (i.e., web site, mailings, workshops, media coverage) and education.*

5.B Enhance response capability of County and municipal fire, police, and emergency medical services personnel to special populations.

- *Action 1: Identify special populations requiring additional emergency response.*
- *Action 2: Evaluate means to enhance response capability for those residents.*

4.6 Conclusions

The preceding includes approximately 30 action items, many of which will require substantial commitments of time by County and municipal staff. It is unrealistic to



assume that the individuals working for these entities will have the time and resources to pursue all of these activities within the planning horizon for this plan, i.e., over the next five years, i.e., the planning horizon for this plan relative to the requirements of DMA 2000. To focus the energies of these individuals and related organizations, it was necessary to determine priorities for actions.

The mitigation options presented in this section were evaluated in light of the expressed desires of the community using the following criteria which assess the suitability of options based on their social effect on the County and municipalities, their technical feasibility, and their support with residents and local officials. The STAPLE+E evaluation method (see table below) categorizes these factors into social, technical, administrative, political, economic, and environmental criteria.

Table 4.1. STAPLE + E Criteria

Criteria	Considerations
Social	<ul style="list-style-type: none"> ● Will it cause any one segment of the population to be treated unfairly? ● Will the action disrupt established neighborhoods, break up voting districts or cause the relocation of low and moderate income people? ● Is the action compatible with present and future community values? ● Will the measures adversely affect cultural values or resources?
Technical	<ul style="list-style-type: none"> ● How effective is the measure in avoiding or reducing future losses? ● Will it create more problems than it solves? ● Does it solve a problem or only a symptom? ● In light of other community goals, is it the most useful?
Administrative	<ul style="list-style-type: none"> ● Does the community have the capability to accomplish the action (i.e. can you implement the mitigation action)? ● Can the community provide any maintenance necessary? ● Is there enough staff, technical experts and funding? ● Can it be accomplished in a timely manner?
Political	<ul style="list-style-type: none"> ● Who are the stakeholders in this proposed action? ● Have all of the stakeholders been offered an opportunity to participate in the planning process? ● How can the mitigation goals be accomplished at the lowest cost to the stakeholders? ● Is there public support both to implement and maintain this measure? ● Is the political leadership willing to propose and support the favored measure?
Legal	<ul style="list-style-type: none"> ● Does the community have the authority to implement the proposed measure?



Criteria	Considerations
	<ul style="list-style-type: none"> ● Is there a clear legal basis for the mitigation action? Is an ordinance or resolution necessary? ● What are the legal side effects? ● Will the community be liable for the actions or support of actions, or lack of action? ● Is it likely to be challenged?
Economic	<ul style="list-style-type: none"> ● What are the costs and benefits of this measure? ● How will the implementation of this measure affect the pocketbook of the community? ● Does the cost seem reasonable for the size of the problem and likely benefits? ● What burden will be placed on the tax base or local economy? ● Does the action contribute to other community economic goals such as capital improvements or economic development? ● What benefits will action provide?
Environmental	<ul style="list-style-type: none"> ● How will this action affect the environment? ● Will this measure comply with local, state and federal environmental regulations? ● Is the action consistent with community environmental goals? ● Are endangered or threatened species likely to be affected?

Source: FEMA publication 386-3, *Developing the Mitigation Plan*

Using STAPLE+E criteria, the mitigation alternatives were scored as shown in Table 4.2. Note that costs and benefits of the various mitigation actions were considered during the prioritization process under the "economic" element of the STAPLE+E criteria, which was weighted more heavily than other criteria. Thus the mitigation strategy emphasizes cost-effective and technically feasible mitigation actions.

As an example of this, note that action 2.B.3 (implementing warning systems) in Table 4.2 is much less cost-effective than action 1.B.1 (evaluating repetitive flood-loss properties), and therefore the former was rated a "0" under the "economic" element as compared to a "2" for the latter (0 = Poor, 1 = Fair, 2 = Good, 3 = Excellent). These ratings from 0 to 3 were assigned by the consultant based on their general knowledge of Blair County.

Section Five of this plan reflects the results of a meeting of the Blair County HMPC on February 28, 2007 at which the committee members identified priority mitigation action items that are included in the resulting implementation strategy.

Table 4.2. Ranking Alternative Mitigation Actions for Blair County

No.	Mitigation Action	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Raw Score	Risk Weighting	Input Weight	Weighted Score	Votes	Ranking
Floods														
1.A.1	<i>Define parcels/buildings and critical facilities in the floodplain.</i> <ul style="list-style-type: none"> Develop GIS data on property parcels to allow evaluation of which parcels are in the floodplain Develop a list of critical facilities for the County (e.g., hospitals, police stations, fire stations, County/municipal buildings) and determine which are in the floodplain. 	3	3	1	3	3	2	3	19	3	1	76	8	2
1.A.2	<ul style="list-style-type: none"> Identify critical facilities with the highest relative vulnerability; conduct cost-benefit analysis of protection of those assets. Collect detailed information on critical facilities using National Flood Mitigation Data Collection Tool. 	3	3	1	3	3	1	3	18	3	1	70		
1.B.1	Identify existing repetitive-loss properties (w/ and w/o insurance); conduct cost-benefit analysis of protection of repetitive-loss assets.	3	3	1	3	3	2	3	19	3	1	76		
1.C.1	<i>Provide public outreach/education:</i> Work with township/borough officials to increase awareness of floodplain ordinances and with property owners including informational mailings to property owners in the 100-year floodplain, and sponsoring a series of workshops about costs and benefits of: <ul style="list-style-type: none"> Acquiring and minimizing the cost of flood insurance coverage, and Property acquisition, relocation, elevation, dry and wet floodproofing. 	3	2	1	2	3	2	3	17	3	1	68	4	3
1.C.2	Evaluate at the township/borough level the suitability of Community Rating System (CRS) for insurance premium reduction (and flood damage reduction); consider using "success stories" from other Pennsylvania communities for flood risk management.	3	2	1	2	3	2	3	17	3	1	68		
1.D.1	<i>Address lack of detailed information on individual structures:</i> Obtain information for structures in the areas with the highest relative vulnerability to determine the best property protection methods. Develop a linkage between the County tax assessment records and parcels in the County GIS to obtain information such as: <ul style="list-style-type: none"> Lowest-floor elevation, Number of stories, Presence of a basement, and Market and/or replacement value 	3	2	0	3	3	0	3	14	3	1	56		
1.D.2	Obtain information for all remaining structures in the 100-year floodplain to determine the best property protection methods to promote with individual property owners. Techniques for gathering information over time should include developing and implementing a program for integrated information "capture" at key points in normal township administrative procedures, including applications for building permits at township/borough offices.	3	2	0	3	3	0	3	14	3	1	56		
1.E	<i>Identify and evaluate protection for hazardous material storage in floodplain.</i> Identify all storage of hazardous materials in floodplains (e.g., propane tanks); evaluate alternative methods to minimize risk from existing storage areas and prevent future storage in floodplain.	3	2	1	3	3	2	3	18	3	1	72		
1.F	<i>Obtain updated detailed flood studies & FIRMs:</i> Apply to PEMA for funding to update the outdated FIRMs and undertake detailed flood studies for County's high-hazard areas to determine BFE and potentially a full range of flood-recurrence intervals (2, 5, 10, 25, 50 and 100-year events) for use in future refinements of the mitigation plan.	3	2	1	3	3	2	3	18	3	1	72	13	1
1.G	<i>Continue non-structural measures for mitigation of flood hazards in the County.</i> Continue acquisition of property in the 100-year floodplain and demolition/deed restriction to ensure that this property remains "green space".	3	2	2	2	3	2	3	18	3	1	72		

No.	Mitigation Action	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Raw Score	Risk Weighting	Input Weight	Weighted Score	Votes	Ranking
Severe Weather														
2.A.1	Conduct qualitative evaluation process for <i>critical facilities and infrastructure</i> to determine relative vulnerability and gather information for subsequent refinements of mitigation plan.	3	2	1	2	3	2	3	17	3	1	68		
2.A.2	Identify critical facilities with the highest relative vulnerability to the effects of power outage (i.e., hospitals, nursing homes, fire, police, rescue, and emergency management).	3	2	1	2	3	2	3	17	3	1	68		
2.A.3	Develop action plan for reducing potential damage and loss of function at identified critical facilities and infrastructure.	3	2	1	2	3	2	3	17	3	1	68		
2.B.1	Identify <i>residents with the highest relative vulnerability</i> to the effects of severe weather and prepare implementation plan.	3	2	1	2	3	2	3	17	3	1	68		
2.B.2	Conduct qualitative evaluation process for managing stranded rural residents and winter travelers (e.g., temporary shelters).	2	2	1	2	3	2	3	16	3	1	64		
2.B.3	If warranted, implement additional storm shelters and warning systems, such as NOAA weather radios for vulnerable populace.	2	2	1	1	3	0	3	12	3	1	48		
2.C	<i>Address lack of detailed information on individual structures:</i> Develop a linkage between the County tax assessment records and parcels in the County GIS to allow future revisions of this plan to more easily incorporate information about construction type, age, condition, presence of basement, etc.	3	2	1	3	3	2	3	18	3	1	72		
2.D	Evaluate means of improving ordinance and code enforcement for existing structures. Work with township/borough officials to increase awareness among mobile-home owners (i.e., informational mailings, workshops) about requirements for proper anchoring for wind protection.	2	3	1	2	3	2	3	17	3	1	68		
Disaster-Resistant Future Development														
3.A	<i>Encourage/facilitate development/revision of comprehensive plans, zoning/land-use ordinances to limit development in high-hazard areas:</i> Distribute and promote the inclusion of vulnerability analysis information as part of periodic plan review and revisions at the township/borough level.	3	3	2	2	3	3	3	21	1	1	41		
3.B	Evaluate adequacy of township/borough building code implementation for new development.	3	2	1	2	2	2	3	16	1	1	32		
3.C	Train the municipal building inspectors to consistently enforce the building code.	3	3	1	2	1	2	3	16	1	1	32		
Promote Haz Mit. as a Public Value														
4.A	Identify and publicize success stories as part of an overall consistent public relations program.	3	3	2	3	3	3	3	22	1	1	43		
4.B	Convene regular meetings of a restructured HMPC to discuss issues and progress related to the implementation of the plan.	3	3	2	3	3	3	3	22	1	1	43		
4.C	Renew and expand commitments to hazard mitigation planning among partner organizations.	3	3	2	2	3	3	3	21	1	1	41		
Improve Response and Recovery														
5.A	Increase awareness by residents of actions to take during an emergency, including sheltering and evacuation procedures. Methods to be used can include through public outreach (i.e., web site, mailings, workshops, media coverage) and education.	2	3	2	3	3	3	3	21	1	1	41		
5.B.1	Identify special populations requiring additional emergency response.	3	3	1	2	3	2	3	18	1	1	36		
5.B.2	Evaluate means to enhance response capability for those residents.	3	3	1	2	3	2	3	18	1	1	36		

Notes

1. Alternate objectives are color-highlighted to facilitate grouping; the objectives within each group are italicized.
2. Ratings: 0 = Poor, 1 = Fair, 2 = Good, 3 = Excellent
3. Weighting based on number of county residents that are affected by hazard and the efficacy of the actions.



5.0 Mitigation Plan & Implementation Strategy

5.1 Implementation Strategy

The implementation strategy is the last step of the planning process and involves prioritizing the mitigation actions developed by the Blair County planning group. This was done by voting. The mitigation actions were discussed with each of the Blair County HMPC members. Each attendee voted on the mitigation actions that they felt were the highest priority. The vote tabulation from the attendees is indicated in Table 4-2.

The actions that received no votes were considered lower priority and therefore are not included in the implementation strategy, but are covered in Section 4 of this plan. The actions presented below are listed in order of priority with the highest priority actions first. This list of actions is the result of the planning effort led by the HMPC and represents what the County and communities consider most important.

Table 5-1 at the end of this section presents a list of municipality-specific flood mitigation actions, based on the responses to a questionnaire sent to each municipality by the Blair County HMPC.

Highest Priority	Obtain updated detailed flood studies and FIRMs
Hazards	Floods
Objectives	Obtain updated detailed flood studies and FIRMs for areas with the greatest potential damage and threat to residents.
Actions	Apply to FEMA for updates of the many outdated FIRMs and undertake detailed flood studies for County's high-hazard areas to determine BFEs and a full range of flood-recurrence intervals (2, 5, 10, 25, 50, 100, and 500-year events) for use in future refinements of the mitigation plan.
Affected Municipalities	All municipalities in County
Responsible Organization	County government and floodplain manager of township or borough ¹²
Estimated Costs	\$15,000 (assume 500 hours of staff time at average \$30/hour); FEMA's costs are not included

¹² All jurisdictions participating in the NFIP must have a "floodplain manager"; this position is often held by the municipal manager or an elected official.



Possible Funding Sources	Federal: HMGP, PDM
Timeline for Implementation	Initiate project within second year after this plan's adoption, finish within five years.

High Priority	Define parcels/buildings and critical facilities in the floodplain.
Hazards	Floods
Actions	<p>Identify by municipality and evaluate protection of existing critical facilities with the highest relative vulnerability in the 100-year floodplain.</p> <ul style="list-style-type: none"> • Develop GIS data on property parcels to allow evaluation of which parcels are in the floodplain. • Develop a list of critical facilities for the County (e.g., hospitals, police stations, fire stations, County/municipal buildings) and determine which are in the floodplain. • Identify critical facilities with the highest relative vulnerability; conduct cost-benefit analysis of protection of those assets.
Affected Municipalities	All municipalities in County
Responsible Organization	County government, township/borough floodplain managers
Estimated Costs	\$15,000 (assume 500 hours of staff time at average \$30/hour)
Possible Funding Sources:	Federal: HMGP, PDM
Timeline for Implementation	Initiate project within first year after this plan's adoption, finish within three years.

High Priority	Public outreach/education regarding floods
Hazards	Floods
Objectives	Provide public outreach/education regarding strategies (e.g., floodproofing) for property owners in 100-year floodplain.

Actions	<p>Work with township/borough officials to increase awareness of model floodplain ordinance and with property owners, including informational mailings to property owners in the 100-year floodplain, and sponsoring a series of workshops about costs and benefits of:</p> <ul style="list-style-type: none"> • Acquiring and minimizing the cost of flood insurance coverage, and • Property acquisitions, relocation, elevation, dry floodproofing, and wet floodproofing.
Affected Municipalities	All municipalities in County
Responsible Organization	Blair County Planning Commission and municipal governments
Estimated Costs	\$9,000 (assume 300 hours of staff time at average \$30/hour)
Possible Funding Sources	Federal: HMGP, PDM
Timeline for Implementation	Initiate project within first year after this plan's adoption, finish within two years.

High Priority	Resolve data deficiencies
Hazards	All hazards
Objectives	Resolve data deficiencies identified in this plan
Actions	Conduct engineering evaluation process to obtain the necessary data for the next review cycle of the hazard mitigation plan
Affected Assets	All
Responsible Organization	Blair County Planning Commission and municipal governments
Estimated Costs	\$100,000
Possible Funding Sources	Federal: HMGP, PDM
Timeline for Implementation	Finish project within five years after this plan's adoption.



5.2 Monitoring and Evaluation of the Plan

Monitoring, evaluation and updating of the Plan is critical to maintaining the relevance of the Plan. Ensuring effective implementation of mitigation activities paves the way for continued momentum in the planning process and gives direction for the future. This section explains who will be responsible for monitoring, evaluation and updating and what those responsibilities entail. The section also lays out the method and schedule of these activities and describes how the public will be involved on a continued basis.

The Plan needs a permanent entity to be in charge and responsible for the plan maintenance processes of monitoring, evaluation and updating. This Plan recommends creating a permanent planning group, the Blair County Hazard Mitigation Committee, with representation from all participating municipalities. The permanent Committee would be an outgrowth of the HMPC, and will represent citizen, municipal, business, educational, volunteer and County interests through a balanced membership. The leadership of the Committee will come from a Mitigation Coordinator, following the HMPC model, in conjunction with the County Director of Emergency Services.

The Committee will oversee the progress made on the implementation of the identified action items and update the plan, as needed, to reflect changing conditions. The Committee will therefore serve as the focal point for coordinating the countywide mitigation efforts. The proposed Hazard Mitigation Committee will meet quarterly to address all its responsibilities. It will serve in an advisory capacity to the Blair County Board of Commissioners.

The Committee will monitor the mitigation activities by reviewing reports from the agencies identified for implementation of the different mitigation actions. The Committee will request that the responsible agency or organization submit a semi-annual report that provides adequate information to assess the status of mitigation activities. The Committee will then provide their feedback to the individual agencies.

Evaluation of the Plan will not only include checking whether mitigation actions are implemented or not, but also assessing their degree of effectiveness. This will be done by reviewing the qualitative and quantitative benefits (or avoided losses) of the mitigation activities. These will then be compared to the goals and objectives the Plan set out to achieve. The Committee will also evaluate mitigation actions if they need to be discontinued, or modified in any way in light of new developments in the community. The progress will be documented by the Committee and submitted to the Board of Commissioners on an annual basis.

The Plan will be updated every five years, as required by the Disaster Mitigation Act, 2000, or after a disaster. The updated Plan will account for any new developments in the community or special circumstances (e.g. post-disaster). Issues that come up during monitoring and evaluation that require changes in mitigation strategies and actions will



be incorporated in the Plan at this stage.

5.3 Public Involvement

The Committee will involve the public during the evaluation and update of the Plan through annual public education projects, public workshops and hearings. The public will also have access to information via newsletters, mailings and the different agencies implementing the plan. The County's website (www.Blaircounty.org) can serve as a means of two-way communication by not only providing information about mitigation initiatives within the County, but also having feedback forms and other means for the public to express their views and comments. The Committee will incorporate the public comments in the next update of the Plan.

5.4 Incorporation into Existing Planning Mechanisms

Mitigation recommendations in this plan will be incorporated by the city, townships, and boroughs into their comprehensive plans, capital improvement plans, zoning and building codes, site reviews, permitting, job descriptions, staff training, and other planning tools as appropriate for implementation.

The Committee during its annual meetings will provide a mechanism for ensuring that the actions identified in this plan are incorporated into ongoing County planning activities. Blair County currently utilizes a countywide comprehensive plan to guide and control development in the County. After the County officially adopts the Hazard Mitigation Plan, this existing mechanism will have hazard mitigation strategies integrated into it. After adoption of the Mitigation Plan, the County will require that local municipalities address hazards in their local comprehensive plans and land-use regulations. Specifically, one of the goals in the Mitigation Plan directs County and local governments to protect life and property from natural disasters. The County Planning Department will conduct periodic reviews of the local comprehensive plans and land-use policies and provide technical assistance to municipalities in implementing these requirements. The capital improvement planning that occurs in the future will also contribute to the goals in the Hazard Mitigation Plan. Within three years of the formal adoption of the Mitigation Plan, the policies listed above will be incorporated into the process of existing planning mechanisms.

5.5 Updating the Plan

Throughout the hazard analysis and vulnerability assessment, descriptions of missing or inadequate data indicate some areas in which the County and municipalities can improve their ability to identify vulnerable structures. As the County and municipal governments work to increase their overall technical capacity and implement their comprehensive planning goals, they will attempt also to improve their ability to respond to identified hazard vulnerability identification and other needs. In short, the County and



municipalities in subsequent versions of this plan will improve upon the hazard identification and vulnerability assessment by actions noted earlier, including:

- Revamping County and municipal building permit and data collection systems to require and keep on file elevation certificates for all new construction, elevated structures, and other substantial improvements within the 100- and 500-year floodplain areas.
- Updating the tax and GIS databases with information like structure location on each parcel, foundation type, construction type, and first-floor elevations for each structure. The updated plan will be better able to identify structures in need of mitigation based on first-floor elevations.

These recommendations are also noted in the action plan. These improvements will produce an even more effective vulnerability assessment and mitigation plan upon revision.



Table 5-1. Municipality-Specific Flood Mitigation Actions

Jurisdiction	Vulnerable Areas	Potential Mitigation Actions
Altoona (City of)	Juniata, Maryland Ave - 58th St.	Property buyout: 58th St. area of Maryland Ave
Antis Township	<ol style="list-style-type: none"> 1. Bellwood Borough 2. Lower Johnson Development in Tipton 3. River Road 4. Pinecroft (near the curves) 5. Bellmeade 6. Fuoss Mills 	Acquisition/elevation of properties
Bellwood Borough	Approx. 12 houses on the North side of town. Stormwater gets into the sanitary sewer system causing backup into the basements of private homes.	Borough is currently working on a corrective action plan to prevent inflow and infiltration.
Blair Township	Residences in four areas: <ol style="list-style-type: none"> 1. Fort Fetter 2. Independence Place 3. East View St. 4. River Road 	Acquisition/elevation of properties
Duncansville Boro	Approx. 20 bldgs. from 13th St. Bridge – Park Foot Bridges	Stabilize stream bank
Frankstown Twp.	Various properties	Property acquisition
Greenfield Twp.	SR 3013 north of Oakdale Road	Property acquisition
Hollidaysburg Boro	Various properties	Acquisition/elevation of properties
Logan Township	Logan Boulevard/Lakemont	Stormwater detention ponds
Martinsburg Borough	<ol style="list-style-type: none"> 1. Nicodemus Street, 100-200-300 block 2. 201 W. and 300 W. Allegheny Street 	<ol style="list-style-type: none"> 1. Bridge has been replaced, dike built around the wastewater plant. 2. Property acquisition



Jurisdiction	Vulnerable Areas	Potential Mitigation Actions
N. Woodbury Twp.	Bridges: Central High Rd & SR 164 Fredricksburg Rd	Central High Road bridge was replaced in 2005
Snyder Township	A great portion of Snyder Twp. is prone to flooding from several rivers and creeks	To be determined
Taylor Township	Damaged Decker Hollow Bridge isolates the development of new residences	Expand bridge structure or replace with larger bridge
Tyrone Borough	<ol style="list-style-type: none"> 1. 10th St. 2. Pennsylvania Ave. 3. S. Logan Ave. 4. Park Ave. (from 3rd to 9th St.) 	Buyout of about 200 flood-prone properties. Install sewer check valves.

- Responsible Organization: floodplain manager of township or borough
- Estimated Costs/Possible Funding Sources: to be determined
- Timeline for Implementation: initiate projects within five years after this plan's adoption