

CRAWFORD COUNTY HAZARD MITIGATION PLAN



PREPARED FOR:

Crawford County Office of Emergency Services
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Certification of Annual Review Meetings

The Crawford County Mitigation Planning Committee (MPC) has reviewed this Hazard Mitigation Plan (HMP). See *Section 8* of the Crawford County HMP for further details regarding this form. Allen Clark, Director of the Crawford County Office of Emergency Services, hereby certifies the review.

YEAR	DATE	PUBLIC OUTREACH ADDRESSED	SIGNATURE
2011			
2012			
2013			
2014			
2015			

Record of Changes

[illegible]

REMINDER: Please attach all associated meeting agendas, sign-in forms, handouts, and meeting minutes.

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1. INTRODUCTION

1.1 BACKGROUND

Emergency Management is the discipline of identifying, managing, and avoiding risks. It is a discipline that involves preparing for a disaster before it occurs, supporting those affected by the disaster, as well as rebuilding after the natural or man-made disaster event. Emergency Management is an ever changing process by which all individuals, groups, and communities attempt to manage hazards in an effort to avoid or reduce the impact of disasters. One method to attempt to prevent hazards from developing into disasters all together is Hazard Mitigation Planning. Hazard Mitigation Planning is a process to identify policies, capabilities, activities, and tools necessary to implement successful and sustainable mitigation actions.

Why undertake mitigation planning? Mitigation planning offers many benefits, including:

- Saving lives and property;
- Saving money;
- Speeding recovery following disasters;
- Reducing future vulnerability through wise development and post-disaster recovery and reconstruction;
- Enhancing coordination within and across participating jurisdictions;
- Expediting the receipt of pre-disaster and post-disaster grant funding; and demonstrating a firm commitment to improving community health and safety.

Typically, mitigation planning is described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that pre-disaster investments will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery and reconstruction. Furthermore, mitigation practices will enable local residents, businesses and industries to re establish themselves in the wake of a disaster, getting the community economy back on track sooner and with less interruption.

The benefits of mitigation planning go beyond reducing hazard vulnerability. Measures such as the acquisition of regulation of land in known hazard areas can help achieve multiple community goals, such as preserving open space, improving water quality, maintaining environmental health and enhancing recreational opportunities. Thus, it is vitally important that any local mitigation planning process be integrated with other concurrent local planning efforts, and any proposed mitigation strategies must take into account other existing community goals or initiatives that will help complement or hinder their future implementation. Crawford County and participating jurisdictions have embraced this approach, identifying multiple opportunities to link the Plan with preexisting programs, policies, plans and initiatives.

During the last two decades, the approach to the emergency management cycle has evolved considerably. A renewed emphasis has been placed on planning for disasters before they occur as a complement to effective response and recovery. As a result, hazard mitigation has gained increasing prominence as a critical part of emergency management. By mitigating hazards through sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards, risks can be proactively combated in a systematic manner, rather than being reacted to once they occur.

Hazard mitigation in Pennsylvania has been and will continue to be important for the same reasons it is nationally. By anticipating the nature and extent of hazards and the way they affect our communities locally, life and property has been preserved on an impressive scale. Measures aimed at mitigating the impacts of flooding have predominated in Pennsylvania due to the Commonwealth's particularly high exposure to this hazard. From acquisitions to structural elevations to flood control projects, mitigation actions pay dividends for Pennsylvanians every year. And in the process, mitigation activities have positive effects throughout the emergency management cycle. As mitigation actions reduce or eliminate losses once a disaster occurs, response and recovery assets can be better focused.

Since anticipating hazards along with a communities' exposure to those hazards is such a critical part of hazard mitigation, hazard mitigation plans must regularly be reevaluated and revised. This is done through the plan update process mandated by the Federal Emergency Management Agency (FEMA) every five years.

In order to qualify for federal aid for technical assistance and post-disaster funding, local municipalities must comply with the Disaster Mitigation Act of 2000 (DMA) and its implementing regulations (44CFR, Parts 201 and 206). The Crawford County Hazard Risk Assessment (previously known as the Hazard Vulnerability Assessment) and 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.

The 2010 Plan is the result of continuing 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.

1.2 PURPOSE

The general purpose of the 2010 Crawford County Hazard Mitigation Plan is to:

- Protect life and property by reducing the potential for future damages and economic losses that result from natural hazards;
- Qualify for additional grant funding, in both the pre-disaster and post-disaster environment;
- Quick recovery and redevelopment following future disasters;
- Integrate existing flood mitigation documents;
- Demonstrate a firm local commitment to hazard mitigation principles; and

- Comply with state and federal legislative requirements tied to local hazard mitigation planning

1.3 SCOPE

The Crawford County 2010 Hazard Mitigation Plan has been prepared to meet requirements set forth by the Federal Emergency Management Agency (FEMA) and Pennsylvania Emergency Management Agency (PEMA) in order for the County to be eligible for funding and technical assistance from state and federal hazard mitigation programs. It will be updated and maintained to continually address those natural hazards and man-made and technological hazards determined to be of high and moderate risk as defined by the results of the risk assessment (see “Hazard Vulnerability Summary” located in Chapter 4: Risk Assessment). Other natural hazards that pose a low or negligible risk will continue to be evaluated during future updates to the Plan in order to determine if they warrant additional attention, including the development of specific mitigation measures intended to reduce their impact. This plan will be updated and FEMA approved within the five year cycle.

1.4 AUTHORITY AND REFERENCE

Authority for this guide originates from the following federal sources:

- Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C., Section 322, as amended;
- Code of Federal Regulations (CFR), Title 44, Parts 201 and 206; and
- Disaster Mitigation Act of 2000, Public Law 106-390, as amended.

Authority for this guide originates from the following Commonwealth of Pennsylvania sources:

- Pennsylvania Emergency Management Services Code. Title 35, Pa C.S. Section 101.
- Pennsylvania Municipalities Planning Code of 1968, Act 247 as reenacted and amended by Act 170 of 1988.
- Commonwealth of Pennsylvania Standard All-Hazard Mitigation Plan, revised October 2007.

The following Federal Emergency Management Agency (FEMA) guides and reference documents were used to prepare this document:

- FEMA. 386-1: Getting Started. September 2002.
- FEMA. 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001.
- FEMA. 386-3: Developing the Mitigation Plan. April 2003.
- FEMA. 386-4: Bringing the Plan to Life. August 2003.
- FEMA. 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007.
- FEMA. 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005.
- FEMA. 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003.

- FEMA. 386-8: Multi-Municipality Mitigation Planning. August 2006.
FEMA. 386-9: Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects. August 2008.
- FEMA. Local Multi-Hazard Mitigation Planning Guidance. July 1, 2008.
- FEMA. National Fire Incident Reporting System 5.0: Complete Reference Guide. January 2008.

The following Pennsylvania Emergency Management Agency (PEMA) guides and reference documents were used prepare this document:

- PEMA. Hazard Mitigation Planning Made Easy!
- PEMA. Mitigation Ideas: Potential Mitigation Measures by Hazard Type; A Mitigation Planning Tool for Communities. March 6, 2009.

The following additional guidance document produced by the National Fire Protection Association (NFPA) was used to update this plan:

- NFPA. NFPA 1600: Standard on Disaster/Emergency Management and Business Continuity Programs. 2007.

2. COMMUNITY PROFILE

This section of the Plan provides general overview of Crawford County and its municipal jurisdictions. This section consists of the following five subsections:

- Geography and Environment
- Community Facts
- Populations and Demographics
- Land Use and Development
- Data Sources

Crawford County was created on March 12, 1800, from part of Allegheny County and named for Colonel William Crawford. According to the Penn State Cooperative Extension Website (www.extension.psu.edu) Crawford County was a frontier trading center in the 1700's through the efforts of traders like David Mead, for whom Meadville, the County seat is named. The next millennium will be celebrated by events such as reliving George Washington's trek down French Creek after seeking the French Governor's surrender at Ft. LeBeouf, which is commemorated in Erie County. Millennium celebrations will abound with history and welcome to highlight the County's unique features.

Many visit Conneaut Lake, the commonwealth's largest natural inland lake, and a long-standing resort community. Allegheny College, oldest college in continuous use west of the Allegheny River, founded in 1815, continues to provide a prestigious art and environmental educational resource to the region.

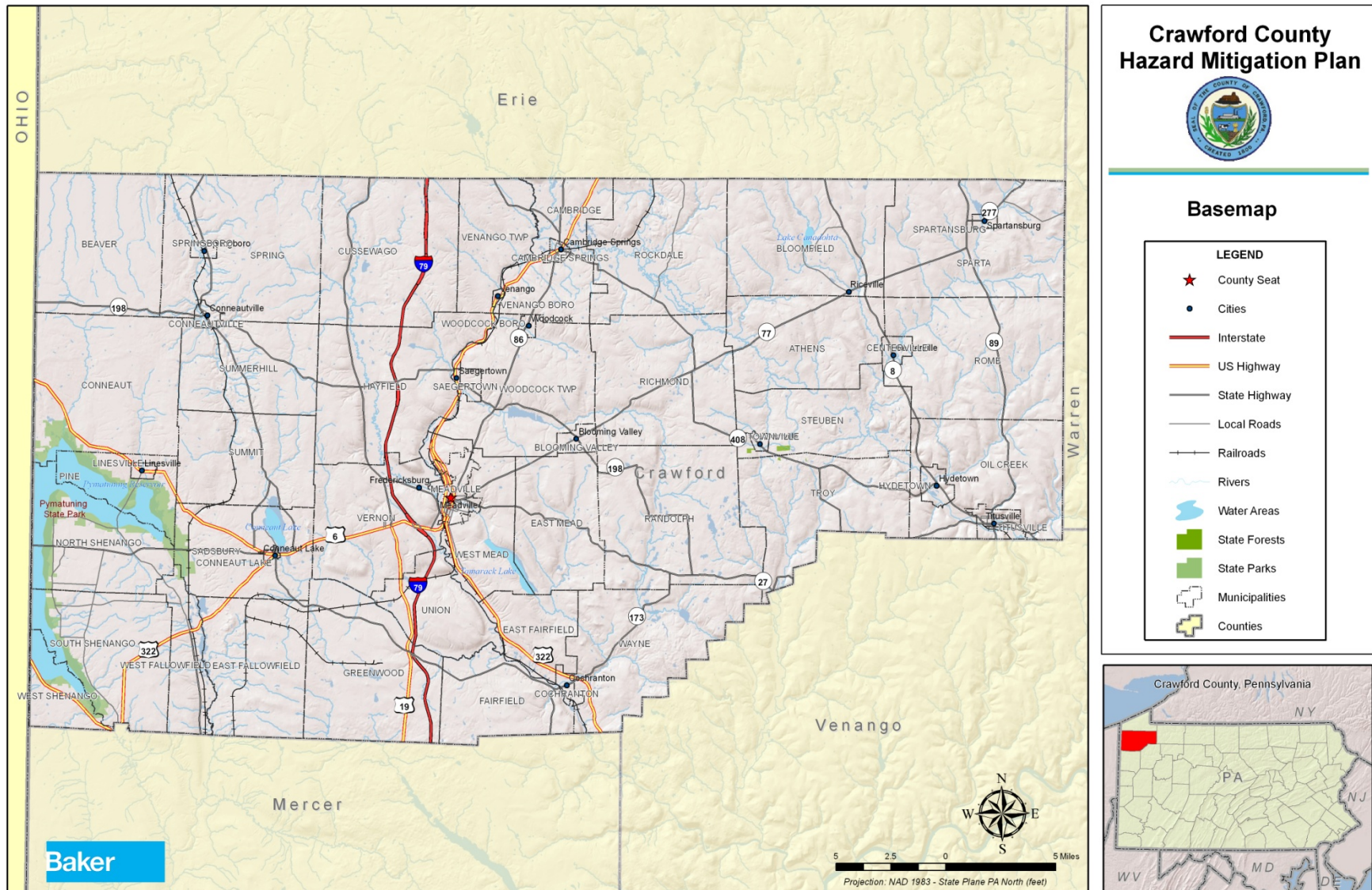
Crawford County's labor force is similar to that of many non-metropolitan counties in western Pennsylvania. The County has many workers in relatively low-skill manufacturing positions and in the agricultural sectors. It has relatively few workers in high-skill occupations and in high-growth sectors of the economy. The high unemployment rate suggests that the growth of good, year round jobs have not kept up with the growth of the labor force. The low percentage of people with college degrees is a concern, especially as the changing economy is reducing the demand for unskilled and semi-skilled workers in relatively high paying manufacturing industries. These characteristics combine to generate relatively low household incomes.

Some of these characteristics may be seen as opportunities. The fact that the County is a net exporter of workers to Warren and Mercer Counties in Pennsylvania, and Trumbull and Ashtabula Counties in Ohio, suggests that the potential labor force for jobs in the County is fairly high. Furthermore, prevailing wages are quite low and the County is in a good competitive position to lure industries seeking an abundant pool of inexpensive labor.

2.1 GEOGRAPHY AND ENVIRONMENT

Crawford County lies adjacent to Ohio, with quick travel to Pittsburgh, Erie, Cleveland, and Buffalo. The County supports a robust agricultural community, tourist opportunity and major tool and die trade. Crawford County covers an area of 1,038 square miles. The eastern part of the County is wooded, while the western part shares glacial farmland with lakes, drainage and marsh. Overall, the County is rural, with corridors of development and small stable Victorian era communities. Water area is an additional 25 square miles primarily centered in Pymatuning and Conneaut Lakes.

According to Crawford County's Comprehensive Plan, the County has a humid, continental climate. It lies in one of the coolest, snowiest regions of the Commonwealth; however, it has warm, pleasant summers. The County's highest point has an elevation of over 1,910 feet above sea level, while its lowest point has an elevation of just 850 feet. The County's topography differs widely between its eastern and western halves. The east is formed from a deeply incised high plateau, while the west is formed from a gentle plain. The entire surface has been extensively glaciated, which has severely impacted its drainage, topography, and soils. The County contains five different soil associations. Four of these associations, which collectively cover about 78% of the County's surface, frequently exhibit restricted permeability and a high water table.



2.2 COMMUNITY FACTS

Under Pennsylvania law, there are four types of incorporated municipalities: cities, boroughs, townships, and, in at most two cases, towns. The following cities, boroughs and townships are located in Crawford County:

Meadville, City of

Meadville is a city in and the county seat of Crawford County. The city was founded on May 12, 1788 by a party of settlers lead by David Mead. Its location was chosen well, for it lies at the confluence of Cussewago Creek and French Creek. The city is generally considered part of the Pittsburgh Tri-State and is within 40 miles of Erie, Pennsylvania. It was the first permanent establishment in northwest Pennsylvania.

Around 1800, many of the settlers to the Meadville area came after receiving land bounties for service in the Revolutionary War. Allegheny College, the second oldest college west of the Allegheny Mountains, was founded in Meadville in 1815 and is the oldest college west of the Allegheny Mountains that has kept the same name from when it was founded. Meadville became an important transportation center after construction of the French Creek Feeder Canal in 1837 and of the Beaver and Erie Canal it connected to at Conneaut Lake and subsequent railroad development.

The city has a total area of 4.4 square miles, all land. As of the census of 2000, there were 13,685 people, 5,436 households, and 2,891 families residing in the city. (U.S. Census Bureau)

Titusville, City of

Titusville is a city in Crawford County. The area was first settled in 1796 by Jonathan Titus. Titusville remained a slow-growing community until the 1850's, when petroleum was discovered. On August 27, 1859 at the site of an oil spring just south of Titusville, oil was successfully drilled and extracted resulting in the birth of the modern oil industry. The city has a total area of 2.9 square miles, all land. As of the census of 2000, there were 6,146 people, 2,523 households, and 1,541 families residing in the city. (U.S. Census Bureau)

Blooming Valley Borough

Blooming Valley Borough has a total area of 2.0 square miles of which, 1.9 square miles of it is land and 0.04 square miles of it (1.02%) is water. As of the census of 2000, there were 378 people, 144 households, and 109 families residing in the borough. (U.S. Census Bureau)

Cambridge Springs Borough

Cambridge Springs Borough has a total area of 0.9 square miles, all land. As of the census of 2000, there were 2,363 people, 701 households, and 433 families residing in the borough. (U.S. Census Bureau)

From the late nineteenth into the early twentieth century, Cambridge Springs was known for its mineral springs. It was a resort town featuring a variety of hotels including the Rider Hotel, which burned down

in 1931. Only one of these hotels, the Riverside Inn, remains in active use today and has been listed in the National Register of Historic Places since 1978.

Centerville Borough

Centerville Borough has a total area of 1.8 square miles, all land. As of the census of 2000, there were 247 people, 99 households, and 67 families residing in the borough. (U.S. Census Bureau)

Conneaut Lake Borough

Conneaut Lake Borough has a total area of 0.4 square miles, all of it land. As of the census of 2000, there were 708 people, 331 households, and 187 families residing in the borough. (U.S. Census Bureau)

The area was founded in 1799 as Evansburg, named for Abner Evans, a local farmer. It took the name of the neighboring lake in 1892. Conneaut Lake's largest attraction is Conneaut Lake Park, which opened in 1892, closed in 2007, but reopened in the summer of 2009. Conneaut Lake is off of Pennsylvania Route 6 and close to the Ohio border and Lake Pymatuning.

Conneautville Borough

Conneautville Borough has a total area of 1.1 square miles, of which 1.1 square miles of it is land and 0.92% is water. As of the census of 2000, there were 848 people, 352 households, and 229 families residing in the borough. (U.S. Census Bureau) Conneautville was founded in 1814 by Alexander Power, a surveyor and engineer. Conneautville was first called Powerstown or made reference to as Power's Tract. Power wanted it called Conneautville after the Indian name Conneaut or Conneauttee, meaning Snow Place.

Cochranon Borough

Cochranon Borough has a total area of 1.2 square miles, all land. As of the census of 2000, there were 1,148 people, 478 households, and 335 families residing in the borough. (U.S. Census Bureau)

Hydetown Borough

Hydetown Borough was established in 1862 and has a total area of 2.2 square miles, all land. As of the census of 2000, there were 605 people, 251 households, and 157 families residing in the borough. (U.S. Census Bureau)

Linesville Borough

Linesville Borough has a total area of 0.8 square miles, all land. As of the census of 2000, there were 1,155 people, 470 households, and 306 families residing in the borough. (U.S. Census Bureau)

Linesville was settled by Amos Line who established a mill at the site in 1820. The area was laid out in 1825 and was first known as Line's Mills, but the name was changed to Linesville Station in 1864. It was not known as Linesville until 1883 and was incorporated from Pine Township on March 22, 1862. One chief point of interest in the area is Pymatuning Lake which is said to be the largest man-made lake in Pennsylvania. It was created in the 1930's as a Depression-era Civilian Conservation Corps (CCC) project.

Saegertown Borough

Saegertown Borough has a total area of 1.4 square miles, all land. As of the census of 2000, there were 1,071 people, 361 households, and 251 families residing in the borough. (U.S. Census Bureau)

Spartansburg Borough

Spartansburg Borough has a total area of 0.7 square miles, of which, 0.7 square miles of it is land and 0.04 square miles of it is water. As of the census of 2000, there were 333 people, 130 households, and 93 families residing in the borough. (U.S. Census Bureau)

Springboro Borough

Springboro Borough was incorporated in 1866 and has a total area of 0.9 square miles, all land. As of the census of 2000, there were 491 people, 183 households, and 133 families residing in the borough. (U.S. Census Bureau)

Townville Borough

Townville Borough was established in 1831 and has a total area of 0.6 square miles, all land. As of the census of 2000, there were 306 people, 119 households, and 94 families residing in the borough. (U.S. Census Bureau)

Venango Borough

Venango Borough has a total area of 0.3 square miles, all land. As of the 2000 census, there were 288 people, 104 households, and 79 families residing in the borough. (U.S. Census Bureau)

Woodcock Borough

Woodcock Borough has a total area of 0.6 square miles, all land. As of the census of 2000, there were 146 people, 55 households, and 44 families residing in the borough. (U.S. Census Bureau)

Athens Township

Athens Township has a total area of 28.3 square miles of which, 28.3 square miles of it is land and 0.04 square miles of it (0.11%) is water. As of the census of 2000, there were 775 people, 265 households, and 209 families residing in the township. (U.S. Census Bureau)

Beaver Township

Beaver Township has a total area of 36.7 square miles, all land. As of the census of 2000, there were 903 people, 316 households, and 241 families residing in the township. (U.S. Census Bureau)

Bloomfield Township

Bloomfield Township has a total area of 38.3 square miles, of which, 38 square miles of it is land and 0.3 square miles (0.81%) is water. As of the census of 2000, there were 2,051 people, 757 households, and 560 families residing in the township. (U.S. Census Bureau)

Cambridge Township

Cambridge Township has a total area of 21.6 square miles, of which, 21.5 square miles of it is land and 0.1 square miles (0.65%) is water. As of the census of 2000, there were 1,487 people, 594 households, and 443 families residing in the township. (U.S. Census Bureau)

Conneaut Township

Conneaut Township has a total area of 41.7 square miles, of which, 40.9 square miles of it is land and 0.8 square miles (1.80 %) is water. As of the census of 2000, there were 1,550 people, 569 households, and 434 families residing in the township. (U.S. Census Bureau)

Cussewago Township

Cussewago Township has a total area of 41.2 square miles, of which, 41.1 square miles of it is land and 0.1 square miles (0.22 %) is water. As of the census of 2000, there were 1,597 people, 591 households, and 437 families residing in the township. (U.S. Census Bureau)

East Fairfield Township

East Fairfield Township has a total area of 12.8 square miles, all land. As of the census of 2000, there were 848 people, 339 households, and 250 families residing in the township. (U.S. Census Bureau)

East Fallowfield Township

East Fallowfield Township has a total area of 28.1 square miles, of which, 28 square miles of it is land and 0.1 square miles (0.18 %) is water. As of the census of 2000, there were 1,434 people, 436 households, and 365 families residing in the township. (U.S. Census Bureau)

East Mead Township

East Mead Township has a total area of 23.4 square miles, of which, 22.9 square miles of it is land and 0.6 square miles (2.48 %) is water. As of the census of 2000, there were 1,485 people, 558 households, and 414 families residing in the township. (U.S. Census Bureau)

Fairfield Township

Fairfield Township has a total area of 19.4 square miles, of which, 19.4 square miles of it is land and 0.4 square miles (0.15 %) is water. As of the census of 2000, there were 1,104 people, 423 households, and 321 families residing in the township. (U.S. Census Bureau)

Greenwood Township

Greenwood Township has a total area of 36.5 square miles, of which, 36.2 square miles of it is land and 0.3 square miles (0.66 %) is water. As of the census of 2000, there were 1,487 people, 560 households, and 427 families residing in the township. (U.S. Census Bureau)

Hayfield Township

Hayfield Township has a total area of 38.9 square miles, of which, 38.9 square miles of it is land and 0.1 square miles (0.15 %) is water. As of the census of 2000, there were 3,092 people, 1,155 households, and 890 families residing in the township. (U.S. Census Bureau)

North Shenango Township

North Shenango Township has a total area of 26.2 square miles, of which, 18.8 square miles of it is land and 7.4 square miles (28.15%) is water. As of the census of 2000, there were 1,387 people, 619 households, and 420 families residing in the township. (U.S. Census Bureau)

Oil Creek Township

Oil Creek Township has a total area of 32.3 square miles, all land. As of the census of 2000, there were 1,880 people, 748 households, and 551 families residing in the township. (U.S. Census Bureau)

Pine Township

Pine Township has a total area of 12.6 square miles, of which, 6.6 square miles of it is land and 6.0 square miles (47.54%) is water. As of the census of 2000, there were 531 people, 224 households, and 152 families residing in the township. (U.S. Census Bureau)

Randolph Township

Randolph Township has a total area of 43.4 square miles, of which, 43.1 square miles of it is land and 0.3 square miles (0.76%) is water. As of the census of 2000, there were 1,838 people, 651 households, and 511 families residing in the township. (U.S. Census Bureau)

Richmond Township

Richmond Township has a total area of 36.7 square miles, of which, 36.6 square miles of it is land and 0.1 square miles (0.19%) is water. As of the census of 2000, there were 1,379 people, 515 households, and 397 families residing in the township. (U.S. Census Bureau)

Rockdale Township

Rockdale Township has a total area of 36.2 square miles, of which, 36.0 square miles of it is land and 0.2 square miles (0.55%) is water. As of the census of 2000, there were 1,343 people, 454 households, and 349 families residing in the township. (U.S. Census Bureau)

Rome Township

Rome Township has a total area of 41.2 square miles, all land. As of the census of 2000, there were 1,745 people, 532 households, and 422 families residing in the township. (U.S. Census Bureau)

Sadsbury Township

Sadsbury Township has a total area of 25.1 square miles, of which, 23.7 square miles of it is land and 1.4 square miles (5.42 %) is water. As of the census of 2000, there were 2,941 people, 1,274 households, and 845 families residing in the township. (U.S. Census Bureau)

South Shenango Township

South Shenango Township has a total area of 30 square miles, of which, 26.6 square miles of it is land and 3.4 square miles (11.39 %) is water. As of the census of 2000, there were 2,047 people, 854 households, and 603 families residing in the township. (U.S. Census Bureau)

Sparta Township

Sparta Township has a total area of 42.1 square miles, of which, 42 square miles of it is land and 0.1 square miles (0.45%) is water. As of the census of 2000, there were 1,740 people, 485 households, and 408 families residing in the township. (U.S. Census Bureau)

Spring Township

Spring Township has a total area of 45.6 square miles, of which, 45.6 square miles of it is land and 0.02 square miles is water. As of the census of 2000, there were 1,571 people, 577 households, and 443 families residing in the township. (U.S. Census Bureau)

Steuben Township

Steuben Township has a total area of 24.6 square miles, of which, 24.5 square miles of it is land and 0.1 square miles is (0.04%) water. As of the census of 2000, there were 908 people, 336 households, and 237 families residing in the township. (U.S. Census Bureau)

Summerhill Township

Summerhill Township has a total area of 25.5 square miles, of which, 25.4 square miles of it is land and 0.04 square miles is (0.08%) water. As of the census of 2000, there were 1,350 people, 427 households, and 315 families residing in the township. (U.S. Census Bureau)

Summit Township

Summit Township has a total area of 26.0 square miles, of which, 25.8 square miles of it is land and 0.2 square miles is (0.77%) water. As of the census of 2000, there were 2,172 people, 902 households, and 640 families residing in the township. (U.S. Census Bureau)

Troy Township

Troy Township has a total area of 31.6 square miles, of which, 31.5 square miles of it is land and 0.1 square miles is (0.16%) water. As of the census of 2000, there were 1,339 people, 471 households, and 384 families residing in the township. (U.S. Census Bureau)

Union Township

Union Township has a total area of 15.9 square miles, of which, 15.8 square miles of it is land and 0.1 square miles is (0.50%) water. As of the census of 2000, there were 1,049 people, 412 households, and 294 families residing in the township. (U.S. Census Bureau)

Venango Township

Venango Township has a total area of 16.9 square miles, of which, 16.9 square miles of it is land and 0.04 square miles is (0.18%) water. As of the census of 2000, there were 956 people, 340 households, and 247 families residing in the township. (U.S. Census Bureau)

Vernon Township

Vernon Township has a total area of 29.6 square miles, of which, 29.5 square miles of it is land and 0.1 square miles is (0.03%) water. As of the census of 2000, there were 5,499 people, 2,395 households, and 1,599 families residing in the township. (U.S. Census Bureau)

The township is known as the “Golden Link” for its central location between Meadville and Conneaut Lake. Vernon Township is the business center of Crawford County and is home to many major stores, hotels, restaurants, and other various businesses.

Wayne Township

Wayne Township has a total area of 35.2 square miles, of which, 35.0 square miles of it is land and 0.2 square miles is (0.74%) water. As of the census of 2000, there were 1,558 people, 551 households, and 446 families residing in the township. (U.S. Census Bureau)

West Fallowfield Township

West Fallowfield Township has a total area of 11.7 square miles, of which, 11.5 square miles of it is land and 0.2 square miles is (1.11 %) water. As of the census of 2000, there were 659 people, 264 households, and 190 families residing in the township. (U.S. Census Bureau)

West Mead Township

West Mead Township has a total area of 18.6 square miles, of which, 18.2 square miles of it is land and 0.4 square miles is (1.83%) water. As of the census of 2000, there were 5,227 people, 2,098 households, and 1,525 families residing in the township. (U.S. Census Bureau)

West Shenango Township

West Shenango Township has a total area of 8.9 square miles, of which, 6.8 square miles of it is land and 2.1 square miles is (23.31%) water. As of the census of 2000, there were 541 people, 221 households, and 152 families residing in the township. (U.S. Census Bureau)

Woodcock Township

Woodcock Township has a total area of 33.1 square miles, of which, 32.5 square miles of it is land and 0.6 square miles is (1.63%) water. As of the census of 2000, there were 2,976 people, 1,028 households, and 773 families residing in the township. (U.S. Census Bureau)

2.3 POPULATION AND DEMOGRAPHICS

As of the census of 2000, there were 90,366 people, 34,678 households, and 23,858 families residing in the county. The population density was 89 people per square mile (34/km²). There were 42,416 housing units at an average density of 42 per square mile (16/km²). The racial makeup of the county was 97.00% White, 1.59% Black or African American, 0.20% Native American, 0.28% Asian, 0.03% Pacific Islander, 0.13% from other races, and 0.77% from two or more races. 0.59% of the population was Hispanic or Latino of any race. 26.7% were of German, 11.7% American, 11.3% Irish, 10.8% English, 7.6% Italian and 5.4% Polish ancestry according to Census 2000.

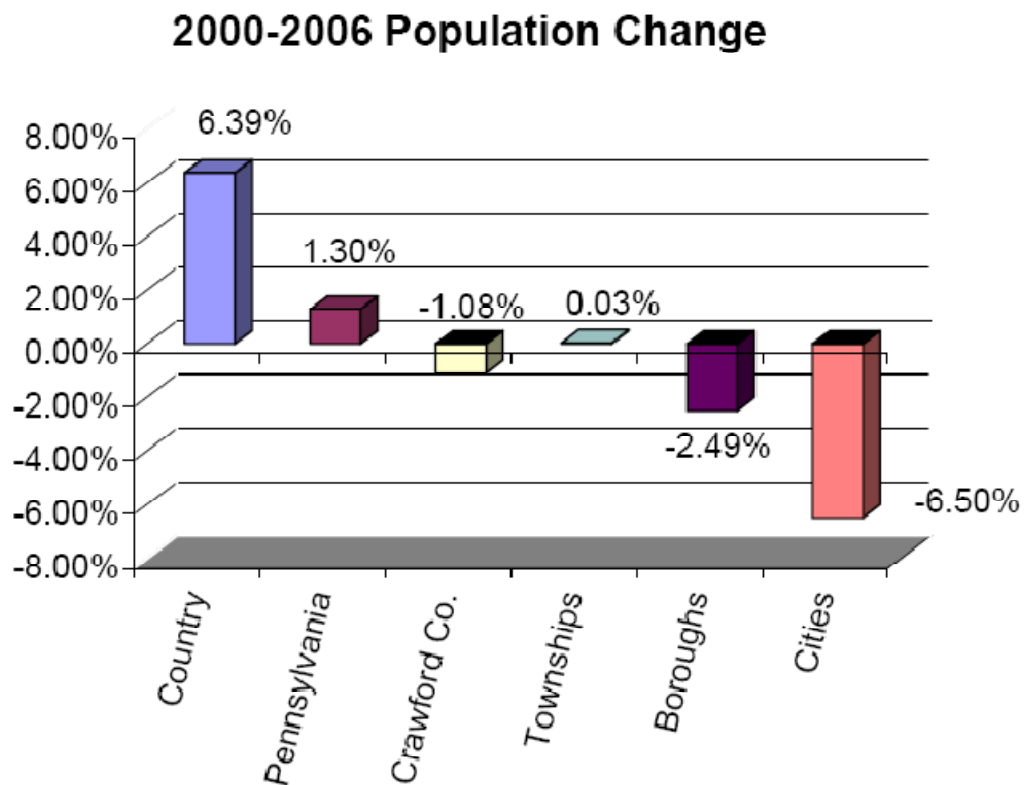
There were 34,678 households out of which 30.40% had children under the age of 18 living with them, 55.60% were married couples living together, 9.20% had a female householder with no husband present, and 31.20% were non-families. 26.20% of all households were made up of individuals and

11.60% had someone living alone who was 65 years of age or older. The average household size was 2.50 and the average family size was 3.01.

In the county, the population was spread out with 24.70% under the age of 18, 9.20% from 18 to 24, 26.60% from 25 to 44, 23.90% from 45 to 64, and 15.60% who were 65 years of age or older. The median age was 38 years. For every 100 females there were 94.80 males. For every 100 females age 18 and over, there were 90.80 males.

Table 2-1 shows the population changes between the years 2000 and 2006 amongst townships, boroughs, and cities of Crawford County. While the United States as well as Pennsylvania is showing increases in population, there is a significant decrease in population in the county's two cities: Meadville and Titusville (Titusville leads the county with the highest number of repetitive loss properties). There also appears to be a minor decrease in the population to the county's boroughs.

Table 2-1: Crawford County Population Change



2.4 LAND USE AND DEVELOPMENT

In Crawford County, there are 3 types of incorporated municipalities: cities, boroughs, and townships. The county is composed of 51 municipalities, which break down to:

- 2 cities
- 14 boroughs
- 35 townships

Many factors contributed to the existing land use pattern throughout the county, among the most significant are: topography, slope, natural cover, suitability of soil for agriculture or building purposes, the course of rivers and waterways, floodplains, former trails, existing roadways, and early settlement patterns. All of these factors are also important to future land development in Crawford County. Those factors, which should be considered to a greater degree in future development, include:

- Land use and interrelationships
- Existing development
- Infrastructure such as sewer and water
- Underlying geologic structure
- Depth to bedrock
- Soil characteristics – suitability for development
- Slope
- Seasonal depth of water table
- Subsurface drainage
- Floodplain areas
- Wetlands and marshlands
- Large water bodies
- Environmental factors; e.g., fire hazards, heavily traveled thoroughfares, surface water pollution, etc.
- Utilities, mass transportation, and major highways

Land use activities include forestry, farming, industrial/commercial and residential. According to the Crawford County Comprehensive Plan, agriculture makes up approximately 60 % of the County. Development is controlled by zoning, subdivision ordinances and determination of conformity to a comprehensive plan.

According to the Crawford County Comprehensive Plan, Crawford County does not have land management ordinances in place. In order for the County Land Use Plan to be effective in not only managing future growth, but managing future growth away from areas prone to hazards, the county planning office, planning commission, elected and municipal officials must implement incentives to encourage boroughs and townships developing a new zoning or subdivision ordinance, updating existing

ordinances, to cooperate and adhere to the Crawford County Land Use Plan. One such incentive, which is described later in this plan, is participation in the National Flood Insurance Program's Community Rating System.

Twenty-six out of fifty-one municipalities are zoned; eighteen have zoning and subdivision ordinances, seven have subdivision ordinances only (two in draft form, 2003) and thirty have comprehensive plans in addition to ordinances. Hayfield Township is the only municipality to adopt a zoning ordinance since the publication of the 2000 Crawford County Comprehensive Plan. Residential/commercial growth is occurring in municipalities surrounding Meadville, and the Route 19 and 322 corridors north and west of the city.

Figure 2-2, found on the following page, displays future land use and development areas in Crawford County.

2.5 ANALYZING DEVELOPMENT TRENDS

Based on future development areas per the 2008 Crawford County Comprehensive Plan, few designated areas are located in potentially hazard prone areas. The primary hazard affecting these future development areas would be flood based on the location and extent of low-lying areas and special flood hazard areas throughout the county and its municipalities. The areas highlighted in the 2008 countywide comprehensive plan that may be of concern include the area between East Fallowfield and West Fallowfield south of Route 322 along Route 18. Another area of concern is near Conneaut Lake in Sadsbury Township. Future development areas and trends should be monitored closely so that appropriate measures can be taken to lessen the risk of impact from hazards in these areas.

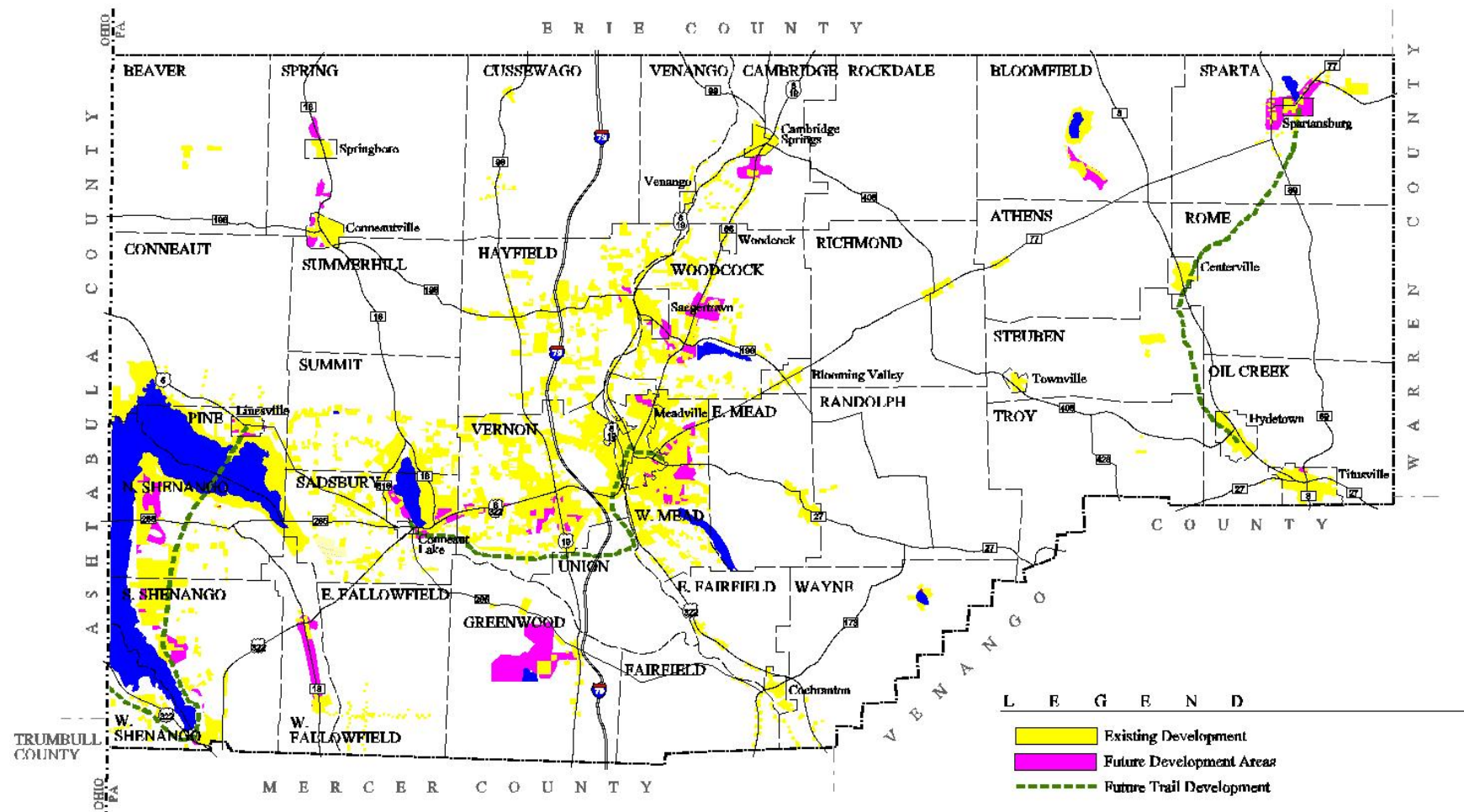
2.6 DATA SOURCES

United States Census Bureau: American Community Survey and QuickFacts

2000 Crawford County Comprehensive Plan; Crawford County Planning Commission

2008 Crawford County Comprehensive Plan Update; Crawford County Planning Commission

Figure 2-2: Crawford County Future Land Use Map



Source: Crawford County Comprehensive Plan (2008 Update)

3. PLANNING PROCESS

3.1. OVERVIEW OF HAZARD MITIGATION PLANNING

Local hazard mitigation planning is the process of organizing community resources, identifying and assessing hazard risks, and determining how to best minimize or manage those risks. This process results in a hazard mitigation plan that identifies specific mitigation actions, each designed to achieve both short term planning objectives and a long-term community vision. To ensure the functionality of each mitigation action, responsibility is assigned to a specific individual, department or agency along with a schedule for its implementation. Plan maintenance procedures are established to implement, as well as evaluate and enhance the plan as necessary. Developing clear plan maintenance procedures ensures that Crawford County's Hazard Mitigation Plan remains a current, dynamic and effective planning document over time.

3.2. UPDATE PROCESS AND PARTICIPATION SUMMARY

The planning process used in Crawford County was based on Section 322 of the Disaster Mitigation Act of 2000 and supporting guidance developed by FEMA and PEMA. The planning process included the following steps:

- Establish a core planning team
- Conduct 5-Year Plan Review
- Review and update the Hazard Vulnerability Assessment
- Develop Capabilities Assessment
- Update the Mitigation Strategy
- Complete mitigation plan
- Provide to FEMA/PEMA for review
- Advertise opportunity for public comment
- Present to municipalities for adoption
- Adopt and implement mitigation plan

The 2004 process was originally initiated by the Northwest Regional Planning and Development Commission and supported by the Crawford County Mitigation Planning Committee, PEMA and FEMA representatives.

An update to the 2004 HMP was initiated in August of 2009. With funding support from the Pennsylvania Emergency Management Agency and the Federal Emergency Management Agency, Michael Baker Jr., Inc., a full-service engineering firm that provides hazard mitigation planning guidance and technical support, assisted the County through the update process. The 2010 HMP follows an outline developed by the Pennsylvania Emergency Management Agency in 2009, which provides a standardized format for all local hazard mitigation plans in the Commonwealth of Pennsylvania. As a

result, the format of the 2010 Crawford County HMP contrasts significantly with the 2004 Crawford County HMP. A summary of the update process used for each section of this plan included in Sections 4.1, 5.1, 6.1, and 7.1. 42 out of 51 municipalities participated in the plan update. The 2010 Hazard Mitigation Plan Update was completed in May, 2010.

3.3. THE PLANNING TEAM

During development of the 2004 Crawford County HMP, the following individuals served as members of the Mitigation Planning Committee (MPC):

- Allen Clark, Chairman, Crawford County OES
- Steve Watt, Crawford County OES
- Jack Preston, Crawford County Commissioner
- Dan Holler, PA Dept. of EPA
- Michelle Hughes, PA Dept. of Health
- Brian Hill, French Creek Water Project & Meadville City Council
- Carl Pelino, U.S. Dept. of Agriculture
- Lynn Sandieson, Crawford County Conservation Office
- Richard Reitz, Generant Company
- Matt Walters, Crawford County Planning Dept.
- Mark Territo, Crawford County Planning Dept.
- Penny Gledhill, Crawford County LEPC
- Matt Comi, Crawford County LEPC
- Doug Mehan, PPG Industry
- Matt Gilara, Northwest Planning Commission
- Barb Fleming, PEMA
- Marilyn Kerns, FEMA Region II
- Tess Grubb, FEMA Region III

The Core MPC for the 2010 HMP Update included:

- Allen Clark, Crawford County OES, *Secondary POC for MPC*
- Don Bovard, Crawford County OES, *Primary POC for MPC*
- Marissa Gerkey, Crawford County Planning Dept., *Secondary POC for MPC*
- Drew Whitehair, Michael Baker Jr., Inc., *MPC Facilitator*

Due to the lack of participation in the 2004 HMP (17/51 municipalities), all 51 municipalities were formally invited to participate at each planning meeting and provide comment and feedback regarding the 2010 update. Therefore, each participating jurisdiction served as a planning team member in this HMP update.

3.4. MEETINGS AND DOCUMENTATION

The following meetings were held during the plan update process. Invitations, agendas, sign-in sheets, and minutes for these meetings are included in Appendix A. The meetings were led by Don Bovard, Deputy Director, Crawford County EMA and Drew Whitehair, Michael Baker Jr., Inc.

November 27, 2009: Community kickoff meeting was held at the East Mead Volunteer Fire Department to introduce the project to local municipalities, inform community representatives of the HMP update process and schedule, and make a formal request for response to the Capability Assessment Surveys and 5-Year Hazard Mitigation Plan Review Worksheets. This meeting was used to review the 2004 goals and objectives to improve the plan. Invitation letters were sent out to all 51 municipalities inviting them to attend and participate in the planning process.

December 4, 2009: Mitigation Solutions Workshop was held at the East Mead Volunteer Fire Department to review the update process and current actions (identified in the 2004 plan) completed/implemented to date. The results of the capability assessment and risk assessment were presented and an invitation. Invitation letters were sent out to all 51 municipalities inviting them to attend and participate in the planning process.

December 16, 2009: Mitigation Solutions Workshop II was held at the East Mead Volunteer Fire Department to discuss and brainstorm new mitigation actions with the Crawford County MPC to be included in the 2010 plan update. Communities and meeting attendees were provided with an opportunity to comment on results of the risk assessment during the last meeting and these comments were evaluated by the core committee and incorporated into the plan, if found appropriate, and the risk assessment was then finalized and presented to the MPC. Invitation letters were sent out to all 51 municipalities inviting them to attend and participate in the planning process.

Date, 2010: Following review and approval by PEMA and FEMA, Crawford County adopted the plan. All further comments will be incorporated as appropriate into the plan when next reviewed.

3.5. PUBLIC, STAKEHOLDER & JURISDICTION PARTICIPATION

Each municipality was given multiple opportunities to participate in the HMP update process through direct invitation to all meetings held, as well as an opportunity to comment on a final draft of the HMP. The three actions/tools listed below were distributed with meeting invitations and at meetings to solicit data, information, and comments from all 51 local municipalities in Crawford County.

- 1) Capability Assessment Survey: Collects information on local planning, regulatory, administrative, technical, fiscal, political, and resiliency capabilities that can be included in the countywide mitigation strategy.
- 2) Risk Assessment Survey: Identifies hazards, assesses risk by hazard, and analyzes vulnerability by hazard.

- 3) 5-Year Hazard Mitigation Plan Review Worksheet: Evaluates previous mitigation goals, objectives, actions, and projects for deciding whether to continue, modify, or remove items from the updated plan. This worksheet also aims to record progress made on actions contained in the 2004 HMP.

Public comment was encouraged throughout the planning process. A public notice was posted in the Meadville Tribune on August 9th, 2010. A news release was also published and distributed to the Meadville Tribune, Erie Times, Titusville Herald, and Corry Journal on August 12, 2010. The preparation of this plan update involved surveys and a planning meeting as an opportunity for neighboring communities, agencies, businesses, academia, non-profits, and other interested parties to be involved in the planning process.

A draft version of the plan was made available at the Crawford County OES and was posted on the Crawford County OES website from August 9, 2010 to August 30, 2010 to increase public exposure.

3.6. MULTI-JURISDICTIONAL PLANNING

This hazard mitigation plan was developed using a multi-jurisdictional approach. With funding support from PEMA, county-level departments had resources such as technical expertise and data which local jurisdictions lacked. However, the county could not develop the plan on its own. To undertake this county-wide planning effort, involvement from local municipalities was critical to the collection of local knowledge related to hazard events. Local municipalities also have the legal authority to enforce compliance with land use planning and development issues. The county undertook an intensive effort to involve all municipalities in the planning process through invitations, phone calls, surveys, and multiple meeting times. **Table 3-1** lists the participating municipality and the date each adopted the 2010 HMP (see APPENDIX A for Participation Matrix). The 2004 HMP included 17 municipalities, and the 2010 update includes 42 out of 51 municipalities.

You can comment on county hazard plan

Crawford County Office of Emergency Services is seeking public comment on the proposed update to the Crawford County Hazard Mitigation Plan, which addresses the types, location, severity and probability of various natural and technological hazards that may impact the infrastructure, environment and citizens of the county.

Crawford County citizens are invited to provide comments and information that will be considered for incorporation into the plan. The plan has been posted at crawfordcountypa.net/emergency-services.

The document is also available for review and/or purchase at the Crawford County Planning Commission office, Crawford County Courthouse, third floor, 903 Diamond Park, Meadville.

Comments and information should be directed to Don Bovard by Friday.

Meadville Tribune Article, August 9, 2010

Table 3-1: Municipal Adoption Dates				
Jurisdiction	Participated in 2004 Plan	2004 Adoption Date	Participated in 2010 Plan Update	2010 Adoption Date
Athens TWP	Yes	06/14/2005	No	Pending
Beaver TWP	No	n/a	Yes	Pending
Bloomfield TWP	No	n/a	No	Pending
Blooming Valley Borough	No	n/a	Yes	Pending

Crawford County Hazard Mitigation Plan 2010

Cambridge Springs Borough	No	n/a	Yes	Pending
Cambridge TWP	No	n/a	No	Pending
Centerville Borough	No	n/a	Yes	Pending
Cochranton Borough	Yes	10/01/2007	Yes	Pending
Coneautville Borough	No	n/a	Yes	Pending
Conneaut Lake Borough	No	n/a	Yes	Pending
Conneaut TWP	Yes	10/12/2004	Yes	Pending
Cussewago TWP	Yes	06/06/2005	Yes	Pending
East Fairfield TWP	No	n/a	Yes	Pending
East Fallowfield TWP	Yes	10/08/2007	No	Pending
East Mead TWP	Yes	06/13/2005	Yes	Pending
Fairfield TWP	Yes	10/02/2007	Yes	Pending
Greenwood TWP	No	n/a	Yes	Pending
Hayfield TWP	Yes	10/08/2007	Yes	Pending
Hydetown Borough	No	n/a	Yes	Pending
Linesville Borough	Yes	07/01/2005	Yes	Pending
Meadville, City of	No	n/a	Yes	Pending
North Shenango TWP	Yes	06/25/2005	Yes	Pending
Oil Creek TWP	No	n/a	Yes	Pending
Pine TWP	Yes	06/27/2005	Yes	Pending
Randolph TWP	No	n/a	Yes	Pending
Richmond TWP	No	n/a	No	Pending
Rockdale TWP	No	n/a	Yes	Pending
Rome TWP	No	n/a	No	Pending
Sadsbury TWP	No	n/a	Yes	Pending
Saegertown Borough	No	n/a	Yes	Pending
South Shenango TWP	No	n/a	Yes	Pending
Sparta TWP	No	n/a	No	Pending
Spartansburg Borough	No	n/a	Yes	Pending
Spring TWP	Yes	10/11/2004	Yes	Pending
Springboro Borough	Yes	10/05/2004	No	Pending
Steuben TWP	No	n/a	Yes	Pending
Summerhill TWP	Yes	09/02/2004	Yes	Pending
Summit TWP	No	n/a	Yes	Pending
Titusville, City of	No	n/a	Yes	Pending
Townville Borough	No	n/a	No	Pending
Troy TWP	No	n/a	Yes	Pending
Union TWP	No	n/a	Yes	Pending
Venango Borough	No	n/a	Yes	Pending
Venango TWP	No	n/a	Yes	Pending
Vernon TWP	No	n/a	Yes	Pending
Wayne TWP	Yes	10/08/2007	Yes	Pending
West Fallowfield TWP	No	n/a	Yes	Pending
West Mead TWP	Yes	07/12/2005	Yes	Pending

West Shenango TWP	Yes	11/08/2007	Yes	Pending
Woodcock Borough	No	n/a	Yes	Pending
Woodcock TWP	No	n/a	Yes	Pending

In total, there are nine (9) municipalities that did not participate in this Plan update. Crawford County OES extended formal invitations, e-mails, and telephone calls in an attempt to coordinate with the nine municipalities to assist them with participation. Although Crawford County is prone to natural and technological hazards, the nine non-participating municipalities chose to remain absent from the mitigation planning participation process. Invitations were extended to all 51 of Crawford County's municipalities for each meeting. Copies of the letters can be found in APPENDIX A.

3.7. EXISTING PLANNING MECHANISMS

There are numerous existing regulatory and planning mechanisms in place at the state, county, and municipal level s of government which support hazard mitigation planning efforts. These tools include the Commonwealth of Pennsylvania Standard All-Hazard Mitigation Plan, local floodplain management ordinances, the Crawford County Emergency Operation Plans, and local zoning ordinances. These mechanisms were discussed at community meetings and are described in Section 5.2. In addition to the discussion at the community meetings, the Crawford MPC reviewed all available technical information provided within these planning mechanisms. These planning mechanisms enhance the county's mitigation strategy and are therefore incorporated into several of the mitigation actions identified in Section 6.4.

4. RISK ASSESSMENT

4.1. RISK ASSESSMENT OVERVIEW AND UPDATE SUMMARY

A key step in preventing disaster losses in Crawford County is developing a comprehensive understanding of the hazards that pose risks to the communities. The following terms can be found throughout this plan.

Hazard:	Event or physical conditions that have the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, other types of harm or loss
Risk:	Product of a hazard's likelihood of occurrence and its consequences to society
Vulnerability:	Degree of susceptibility and resilience of the community and environment to hazards

Source: Federal Emergency Management Agency, 2001.

A risk assessment provides a factual basis for activities proposed by the County in their mitigation strategy. Hazards that may affect Crawford County are identified and defined in terms of location and geographic extent, magnitude of impact, previous events, and likelihood of future occurrence. In this 2010 HMP Update, the hazard profile structure differs from what was used in the 2004 Crawford County HMP; however all information from the previous plan has been included or updated in the 2010 HMPU unless otherwise indicated.

A risk assessment is conducted to address requirements of the Disaster and Mitigation Act of 2000 (DMA 2000) for evaluating the risk to the community of the highest priority hazards. DMA 2000 requires measuring potential losses to critical facilities and property resulting from natural hazards by assessing the vulnerability of buildings and critical infrastructure to natural hazards. In addition to the requirements of DMA 2000, the risk assessment approach taken in this plan evaluates risks to the population and other values and also examines the risk presented by human-caused hazards. The goal of the risk assessment process is to determine which hazards present the greatest risk and what areas are cumulatively the most vulnerable to hazards.

The hazard identification requires information about what hazards have historically impacted the community and what hazards may present risks in the future. In this plan update, identifying historical

and possible future hazards was primarily accomplished in two phases. The first phase entailed accepting feedback from the mitigation planning committee during the kickoff meeting held on October 27, 2009. The second phase entailed researching government records, news publications, and online databases for records of previous hazard events. The results of this hazard evaluation were used to formulate an update to the 2004 risk assessment of hazards according to those that have historically caused the most problems and those judged as future concerns. Hazard profiles were then updated and/or developed in order to define the characteristics of the hazard as it applies to Crawford County.

The risk assessment approach used for the 2010 Crawford County HMPU entailed using Geographic Information System (GIS) software and statistical data to develop vulnerability maps for people, structures, and critical facilities. This type of approach to risk assessment is dependent on the detail and accuracy of the data used during the analysis. Additionally, some types of hazards are extremely difficult to model. The schedule and resources available for conducting this risk assessment dictated that existing data be used to perform the assessment. The existing information available is extensive but also has many limitations. Results of the updated risk assessment allow hazards to be compared and relative comparisons to be made of areas within the jurisdiction.

This updated all-hazard risk assessment and mitigation strategy serves as an initial source of hazard information for those in Crawford County. Other plans may be referenced and remain vital hazard documents, but what makes this plan unique is that each hazard has its own profile in this plan. As more data becomes available and disasters occur, the individual hazard profiles and mitigation strategies can be expanded or new hazards added. This risk assessment identifies and describes the hazards that most threaten the communities and determines the values at risk from those hazards. The risk assessment is the cornerstone of the mitigation strategy and provides the basis for many of the mitigation goals, objectives, and potential projects.

Each hazard or group of related hazards has its own *hazard profile*. A stand-alone hazard profile allows for the comprehensive analysis of each hazard from many different aspects. Each hazard profile contains a *description* of the hazard containing information from specific hazard experts and a record of the hazard *history* compiled from a wide variety of databases and sources. Available documentation of historic hazards is directly related to their occurrence near populated areas. An extensive search was conducted for hazard data on Crawford County, but due to the rural nature of the county, in some instances, little information exists. The lack of data does not mean there is a lack of hazards or risk from hazards in Crawford County. The hazard information used in the plan is what was available and data specific to the Crawford County.

Mapping of the hazards, where spatial differences exist, allows for hazard analyses by geographic location. Some hazards, such as riverine flooding, can have varying levels of risk based on location (i.e. near the river versus far away from the river). Other hazards, such as winter storms or drought, cover larger geographic areas and the delineation of hazard areas is not typically available or useful on the county scale.

Critical facilities were mapped using data provided by Crawford County. The mapping of the facilities allowed for the comparison of building locations to the hazard areas where such hazards are spatially recognized. Base maps depicting the critical facility locations were compared to available hazard layers to show the proximity of the facilities to the hazard areas. Given the nature of critical facilities, the functional losses and costs for alternate arrangements typically extend beyond the structural and contents losses. These types of losses can be inferred based on the use and function of the facility.

Hazards were ranked in order to provide structure and prioritize the mitigation goals and actions discussed in this plan. Ranking was both quantitative and qualitative. First, the quantitative analysis considered all the GIS and HAZUS data available. Then, a qualitative approach, the Risk Factor (RF) approach, was used to provide additional insights on the specific risks associated with each hazard. This process can also be a valuable cross-check or validation of the quantitative analysis performed.

The RF approach combines historical data, local knowledge, and consensus opinions to produce numerical values that allow identified hazards to be ranked against one another. During the planning process, the Crawford County MPC compared the results of the hazard profile against their local knowledge to generate a set of ranking criteria. These criteria were used to evaluate hazards and identify the highest risk hazard.

The RF approach produces numerical values that allow identified hazards to be ranked against one another (the higher the RF value, the greater the hazard risk). RF values are obtained by assigning varying degrees of risk to five categories for each hazard: *probability*, *impact*, *spatial extent*, *warning time*, and *duration*. Each degree of risk is assigned a value ranging from 1 to 4 and a weighing factor for each category was agreed upon by the MPC. Based upon any unique concerns for the planning area, the MPC may also adjust the RF weighting scheme. To calculate the RF value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final RF value, as demonstrated in the example equation below:

$$\text{RF Value} = [(\text{Probability} \times .30) + (\text{Impact} \times .30) + (\text{Spatial Extent} \times .20) + (\text{Warning Time} \times .10) + (\text{Duration} \times .10)]$$

Risk Factor Criteria

Risk Assessment Category	Level	Degree of Risk Criteria	Index	Weight Value
PROBABILITY What is the likelihood of a hazard event occurring in a given year?	UNLIKELY	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 10 & 100% ANNUAL PROBABILITY	3	

	HIGHLY LIKELY	100% ANNUAL PROBABILITY	4	
IMPACT <i>In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?</i>	MINOR	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE DAY.	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR MORE THAN ONE WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR 30 DAYS OR MORE.	4	
SPATIAL EXTENT <i>How large of an area could be impacted by a hazard event? Are impacts localized or regional?</i>	NEGLECTIBLE	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	3	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	4	
WARNING TIME <i>Is there usually some lead time associated with the hazard event? Have warning measures been implemented?</i>	MORE THAN 24 HRS	SELF DEFINED	1	10%
	12 TO 24 HRS	SELF DEFINED	2	
	6 TO 12 HRS	SELF DEFINED	3	
	LESS THAN 6 HRS	SELF DEFINED	4	
DURATION <i>How long does the hazard event usually last?</i>	LESS THAN 6 HRS	SELF DEFINED	1	10%
	LESS THAN 24 HRS	SELF DEFINED	2	
	LESS THAN 1 WEEK	SELF DEFINED	3	
	MORE THAN 1 WEEK	SELF DEFINED	4	

According to the default weighting scheme applied, the highest possible RF value is 4.0. The methodology illustrated above lists categories that are used to calculate the variables for the RF value. The results of the RF analysis are illustrated in **Table 4-40**.

Due to the inherent errors possible in any disaster risk assessment, the results of the risk assessment should only be used for planning purposes and in developing projects to mitigate potential losses.

4.2. HAZARD IDENTIFICATION

In order to identify all the hazards that present a risk to Crawford County, and to confirm the primary hazards that present the greatest risk to the County, Crawford County began by considering all natural and technological hazards listed in the NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs, 2004 Edition*.

According to NFPA 1600; Section A.5.3.2, hazard identification should include, but is not limited to, the following types of potential hazards:

1. Naturally occurring hazards that can happen without the influence of people and have a potential direct or indirect impact on the entity (people, property, the environment)
 - a. Geological hazards (does not include asteroids, comets, meteors)
 - i. Earthquake
 - ii. Tsunami
 - iii. Volcano
 - iv. Landslide, mudslide, subsidence
 - v. Glacier, iceberg
 - b. Meteorological hazards
 - i. Flood, flash flood, seiche, tidal surge
 - ii. Drought
 - iii. Fire (forest, range, urban)
 - iv. Snow, ice, hail, sleet, avalanche
 - v. Windstorm, tropical cyclone, hurricane, tornado, water spout, dust/sand storm
 - vi. Extreme temperatures (heat, cold)
 - vii. Lightning strikes
 - viii. Famine
 - c. Biological hazards
 - i. Diseases that impact humans and animals (plague, smallpox, anthrax, West Nile virus, foot and mouth disease)
 - ii. Animal or insect infestation
2. Human-caused events
 - a. Accidental
 - i. Hazardous material (chemical, radiological biological) spill or release
 - ii. Explosion/fire
 - iii. Transportation accident

- iv. Building/structure collapse
- v. Energy/power/utility failure
- vi. Fuel/resource shortage
- vii. Air/water pollution, contamination
- viii. Water control structure/dam/levee failure
- ix. Financial issues, economic depression, inflation, financial system collapse
- x. Communications systems interruptions

b. Intentional

- i. Terrorism (conventional, chemical, radiological, biological, cyber)
- ii. Sabotage
- iii. Civil disturbance, public unrest, mass hysteria, riot
- iv. Enemy attack, war
- v. Insurrection
- vi. Strike
- vii. Misinformation
- viii. Crime
- ix. Arson
- x. Electromagnetic pulse

To focus this list on the hazards that pose the greatest risk to Crawford County, the table in section 4.2.1 presents a comprehensive list of all natural disaster declarations that have occurred in Crawford County from 1955 to 2009, according to the Federal Emergency Management Agency (FEMA) and the Pennsylvania Emergency Management Agency (PEMA). This list presents the foundation for identifying what hazards pose the greatest risk within Crawford County.

4.2.1. TABLE OF PRESIDENTIAL DECLARATIONS

Presidential Disaster and Emergency Declarations are issued when it has been determined that state and local governments need assistance in responding to a disaster event. **Table 4-1** identifies Presidential Disaster and Emergency Declarations issued between 1955 through 2009 that have affected Crawford County. Additional declarations beyond 2009 can be found on the Federal Emergency Management Agency website at: http://www.fema.gov/news/disasters_state.fema?id=42. Presidential actions provide preliminary information on previous hazard events.

Table 4-1: Presidential Disaster and Emergency Declarations affecting Crawford County.		
DECLARATION NUMBER	DATE	EVENT
FEMA-*3235-EM-PA	09/10/2005	Hurricane Katrina Evacuation Assistance
FEMA-1557-DR-PA	09/19/2004	Tropical Storm Ivan
FEMA-1555-DR-PA	09/19/2004	Severe storms and flooding associated with Tropical Storm Frances

FEMA-1485-DR-PA	08/23/2003	Severe storms, tornadoes and flooding
FEMA-1330-DR-PA	07/26/1996	Flooding
FEMA-1120-DR-PA	06/18/1996	Flooding
FEMA-1093-DR-PA	01/21/1996	Flooding
FEMA-1085-DR-PA	01/13/1996	Blizzard
FEMA-737-DR-PA	06/03/1985	Severe storms, high winds and tornadoes
FEMA-641-DR-PA	06/15/1981	Severe storms and flooding
FEMA-537-DR-PA	07/21/1977	Severe storms and flooding
FEMA-340-DR-PA	06/23/1972	Tropical Storm Agnes
FEMA-58-DR-PA	05/21/1956	Severe storms
* Presidential Emergency Declaration		
Sources: Federal Emergency Management Agency & Pennsylvania Emergency Management Agency		

Since 1955, declarations have been issued for various hazard events including hurricanes or tropical storms, severe summer and winter storms, mudslides, flooding, and drought. A unique Presidential Emergency Declaration was issued in September 2005. Through Emergency Declaration 3235, President George W. Bush declared that a state of emergency existed in the Commonwealth of Pennsylvania and ordered federal aid to supplement Commonwealth and local response efforts to help people evacuated from their homes due to Hurricane Katrina. All counties within the Commonwealth, including Crawford County, were indirectly affected by Hurricane Katrina as a result of evacuee assistance.

4.2.2. SUMMARY OF HAZARDS

Hazards are continuously being identified and modified to reflect the needs of the communities. In 2004, ten hazards were identified and analyzed. The hazards most likely to affect Crawford County were derived from a number of sources. Hazard information was compiled by examining data from local, state, and federal agencies, including the Pennsylvania Emergency Management Agency, the Federal Emergency Management Agency, and the National Weather Service.

A comprehensive list of hazards ensures that no hazard has been omitted, and all potential hazards have been given consideration. In this 2010 plan update, the hazards from the 2004 FEMA approved plan were reconsidered; all remained, others were modified to include additional information, and four new hazards were added. Most of the hazards listed prior in Section 4.2 either have not affected Crawford County's communities, or have affected them in such a minor way that the Crawford County Mitigation Planning Committee considers them of such low risk that they will not be addressed in this plan update.

The following matrix bridges the 2004 identified hazards with the 2010 identified hazards. Of the ten hazards identified in 2004, only six were transitioned into the 2010 update. It was decided by the MPC that the earthquake, oil and gas, additional hazards, and unique hazards were to not be included in the 2010 update because of the low probability of hazard frequency and the capability to realistically implement actions based on these hazards. However, for the 2010 update, four new hazards were

identified by the MPC. These hazards are lightning strikes/thunderstorms, pandemic, dam failure, and terrorism.

2004 Hazards	Status	2010 Hazards	Status
Flooding	Remain in 2010	Flooding	No Change from 2004
Tornadoes	Remain in 2010	Tornadoes/Windstorms	Now Includes "Windstorms"
Winter Weather	Remain in 2010	Lightning Strikes/Thunderstorms	New Hazard Identified
Earthquakes	Deleted	Drought	No Change from 2004
Landslides	Remain in 2010	Landslides	No Change from 2004
Drought	Remain in 2010	Pandemic	New Hazard Identified
Hazardous Materials	Remain in 2010	Dam Failure	New Hazard Identified
Oil and Gas	Deleted	Hazardous Materials	No Change from 2004
Additional Hazards	Deleted	Terrorism	New Hazard Identified
Unique Hazards	Deleted	Severe Winter Weather	No Change from 2004

4.3. HAZARD PROFILES

Disaster frequency and its effects or severity are an important basis for planning emergency response and mitigation. Natural hazards tend to reoccur on a predictable seasonal basis, where human-caused or technological events tend to change over time with advancements in technology and methods of operation. Five criteria were selected to assure a systematic and comprehensive approach to analyze each hazard:

- **Location and Extent:** The location and extent of the county's vulnerability to a certain hazard can vary throughout the county. The maximum threat or worst-case disaster should be considered for each hazard. However, secondary effects cause many hazards to be regional hazards affecting many areas with differing impacts.
- **Range and Magnitude:** Each individual hazard poses certain threats to the county and its municipalities. It is important to identify what hazards pose the greatest threat and focus mitigation actions toward those hazards.
- **Past Occurrence:** A record of past events is particularly helpful to evaluate hazards. Past records of the County's hazards also offer valuable information when tempered with the knowledge of preventative efforts, changes in preventative efforts, and advancements in technology that may reduce the frequency or severity of such an event.
- **Future Occurrence:** The probability of an occurrence in the future is another important factor to consider when preparing for an all-hazards response. An event that occurs annually with relatively minor impact may deserve more emphasis than a major event that occurs once every 50 to 100 years.

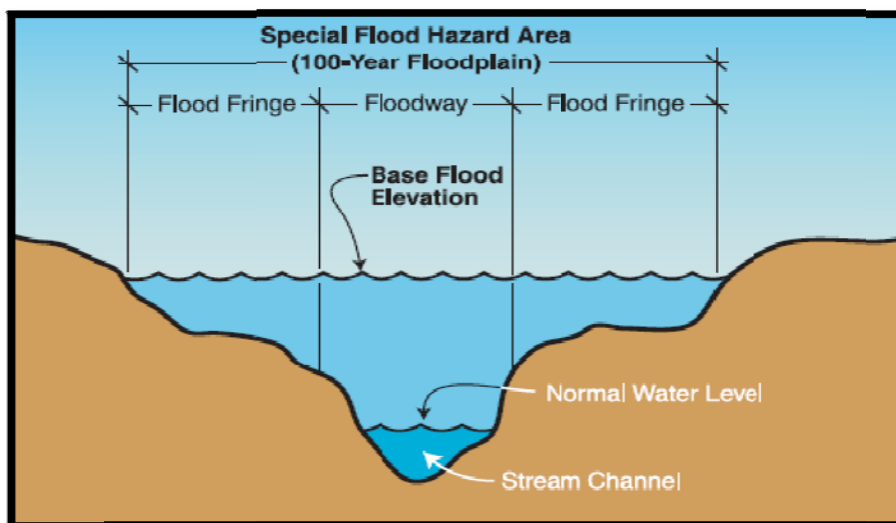
- **Vulnerability Assessment:** The susceptibility of a community to destruction, injury, or death resulting from a hazard event defines the degree of vulnerability. The degree of vulnerability may be related to geographic location, as with floodplains, the type of facilities or structure, or the socioeconomics of a given area. Additionally, certain population groups may be more vulnerable to some hazards because of immobility or their inability to take protective action.

NATURAL HAZARDS

4.3.1. FLOODS, FLASH FLOODS, URBAN FLOODS, AND ICE JAMS

A flood is a natural event for rivers and streams and occurs when a normally dry area is inundated with water. For inland areas like Western Pennsylvania, excess water from snowmelt or rainfall accumulates and overflows onto the stream banks and adjacent floodplains. As illustrated in **Figure 4-1**, floodplains are lowlands, adjacent to rivers, streams and creeks that are subject to recurring floods. Flash floods, usually resulting from heavy rains or rapid snowmelt, can flood areas not typically subject to flooding, including urban areas. Extreme cold temperatures can cause streams and rivers to freeze, causing ice jams and creating flood conditions.

Figure 4-1: Floodplain Terminology



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. Fast-moving water can wash buildings off their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can cause extensive damage. Flooding can cause extensive damage to crop lands and bring about the loss of livestock. Several factors determine the severity of floods, including rainfall intensity and duration, topography and ground cover.

Riverine flooding originates from a body of water, typically a river, creek, or stream, as water levels rise onto normally dry land. Water from snowmelt, rainfall, freezing streams, ice flows, or a combination thereof, causes the river or stream to overflow its banks into adjacent floodplains. Winter flooding usually occurs when ice in the rivers creates dams or streams freeze from the bottom up during extreme cold spells. Spring flooding is usually the direct result of melting winter snow packs, heavy spring rains, or a combination of the two.

Flash floods can occur anywhere when a large volume of water flows or melts over a short time period, usually from slow moving thunderstorms or rapid snowmelt. Because of the localized nature of flash floods, clear definitions of hazard areas do not exist. These types of floods often occur rapidly with significant impacts. Rapidly moving water, only a few inches deep, can lift people off their feet, and only a depth of a foot or two, is needed to sweep cars away. Most flood deaths result from flash floods.

Urban flooding is the result of development and the ground's decreased ability to absorb excess water without adequate drainage systems in place. Typically, this type of flooding occurs when land uses change from fields or woodlands to roads and parking lots. Urbanization can increase runoff two to six times more than natural terrain. (National Oceanic and Atmospheric Administration, 1992) The flooding of developed areas may occur when the amount of water generated from rainfall and runoff exceeds a storm water system's capability to remove it.

Ice Jams are stationary accumulations of ice that restricts flow. Ice jams can cause considerable increases in upstream water levels, while at the same time, downstream water levels may drop. Types of ice jams include freeze up jams, breakup jams, or combinations of both. When an ice jam releases, the effects downstream can be similar to that of a flash flood or dam failure. Ice jam flooding generally occurs in the late winter or spring.



The Commonwealth of Pennsylvania leads the nation in flood related losses and over 94% of Pennsylvania's municipalities have been designated as flood prone. In Western Pennsylvania, including Crawford 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. In addition, the Commonwealth occasionally receives intense rainfall from tropical storms in late summer and early fall. Most of the municipalities in Crawford County have flood prone areas. The streams prone to flooding include: French Creek, Cussewago Creek, Conneaut Creek, Oil Creek, and Mill Run.

4.3.1.1. LOCATION AND EXTENT

Most of Crawford County's municipalities are flood prone. Some of the more low lying areas where the floodplain is most prevalent exist in Rockdale Township, Steuben Township, Vernon Township, Pine Township, North Shenango Township, South Shenango Township, Conneaut Township, Cussewago Township, Hayfield Township, and the City of Meadville.

Figure 4-2 illustrates a complete map depicting the flood prone areas for the county. The Federal Emergency Management Agency (FEMA) has mapped flooding hazards in Crawford County's low-lying areas.

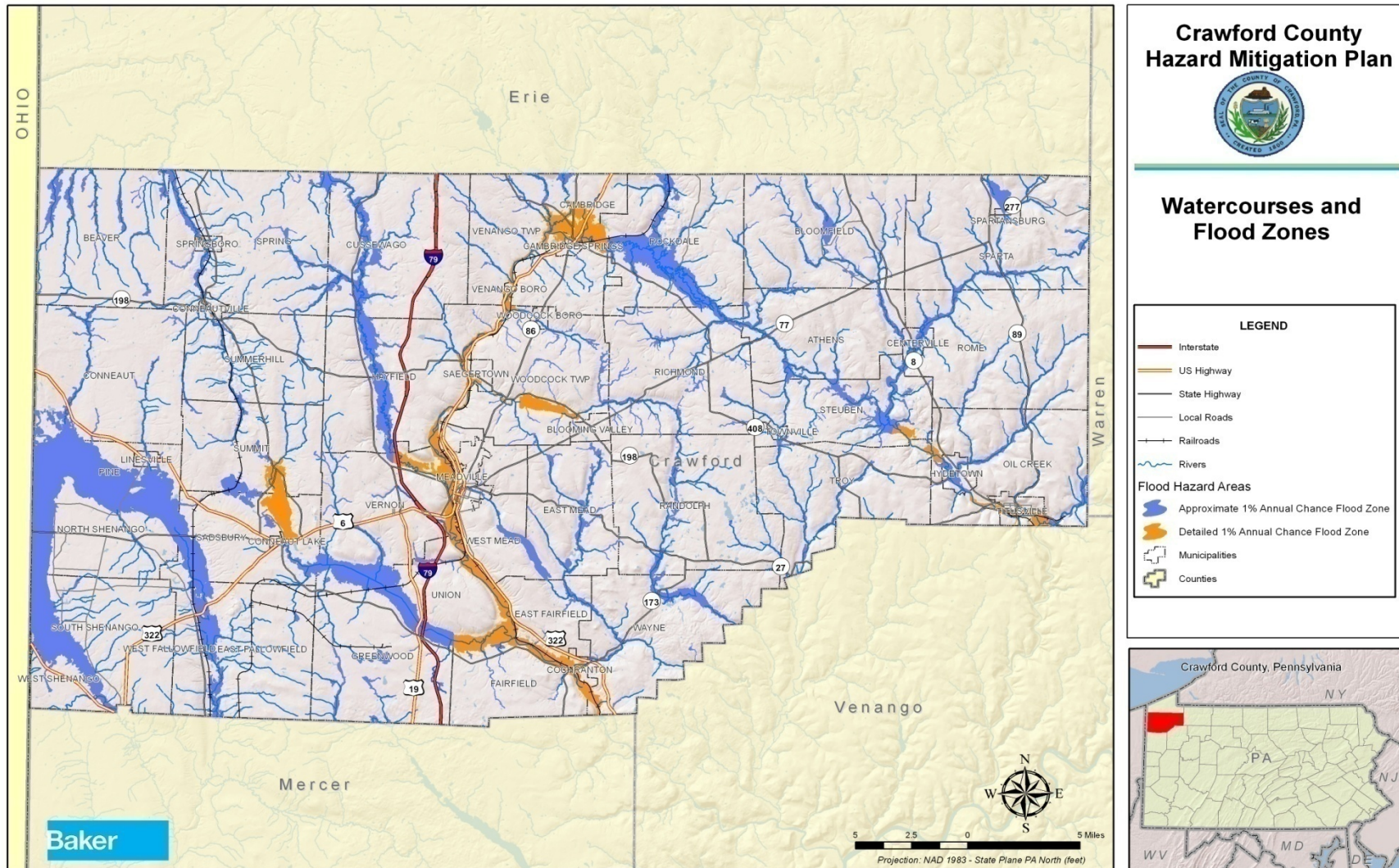
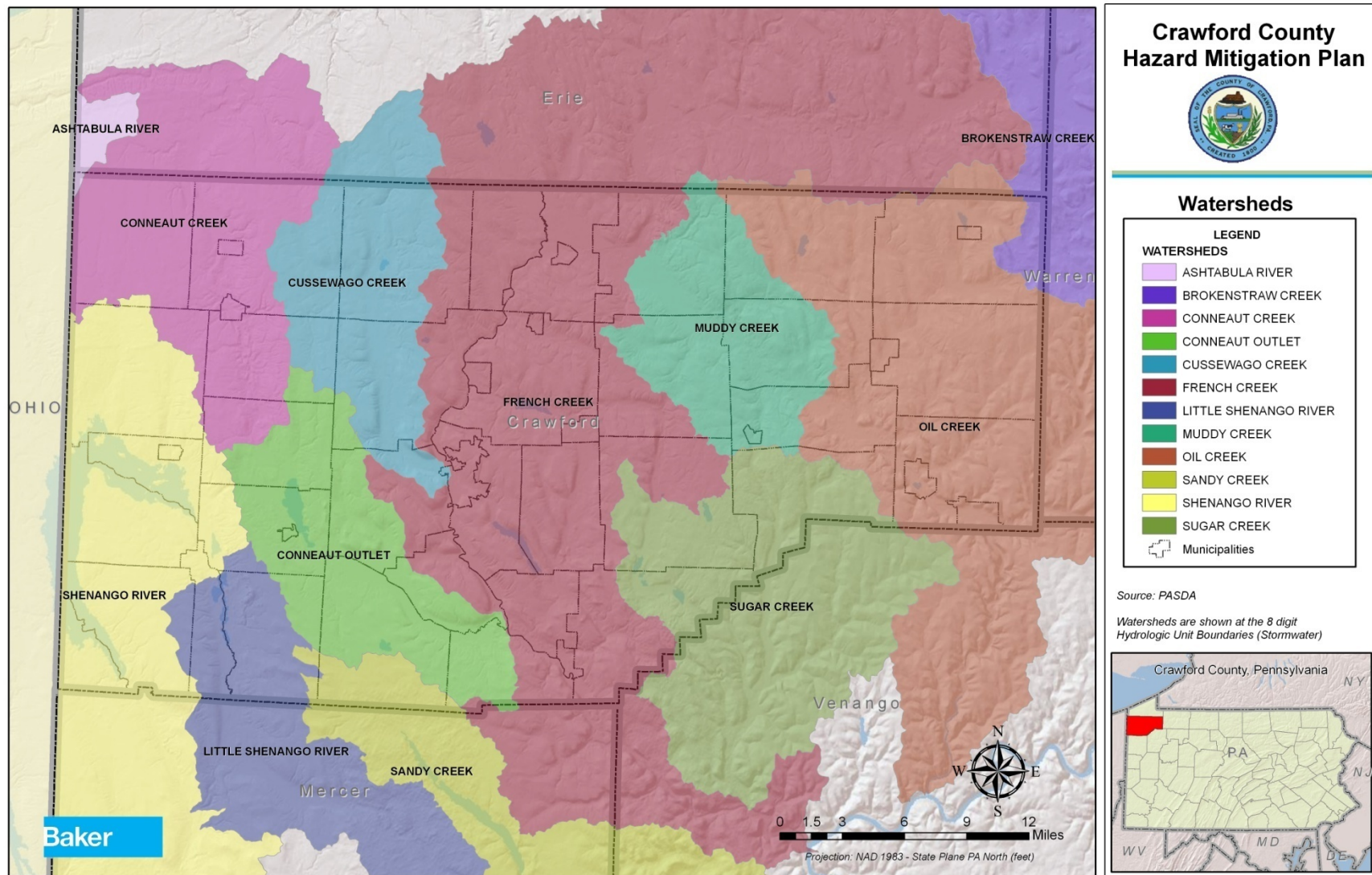


Figure 4-3 illustrates the watershed boundaries located within Crawford County



4.3.1.2. RANGE OF MAGNITUDE

The severity of flooding in Crawford County is determined by a number of local factors, including river basin topography, precipitation patterns, recent soil moisture conditions, and groundcover/vegetative state. Crawford County and its municipalities have many river and small tributaries that are highly susceptible to flooding. The properties in and near the identified floodplains of Crawford County are subject to flooding events on an almost annual basis. Floodplain management, flood control structures, hazard mitigation, and flood relief funds are strategies that have reduced Crawford County's annual flood damages.

Crawford County and its municipalities are susceptible to seasonal differences. In the winter and early spring (February to April), 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.

The largest flood to impact Crawford County in recent years occurred on July 21, 2003. Its impact to the county was unprecedented resulting in approximately \$40,000,000 in property damage.

4.3.1.3. PAST OCCURRENCE

Crawford County has a long history of flooding problems, suffering damage from numerous major floods and localized flash flooding. The following table contains information on Crawford County's flooding-related events that date back to 1892. **Table 4-2** provides information on 49 significant flood events that are known to have occurred between 1892 and 2009 in Crawford County. Based on historical and anecdotal evidence, it is clear that there is a relatively high frequency of flooding in the county. The flood events documented here resulted in a total of approximately \$81.1 million in total reported property damages. The most significant property damage reported for these events was on July 21, 2003 when widespread flooding affected communities throughout Crawford County.

Table 4-2: Past Recorded Flood Events			
LOCATION	DATE	DETAILS	PROPERTY DAMAGE
Venango	08/10/2009	3" rainfall in 2 hours caused flash flood conditions	\$50,000
Southwest Crawford County	07/31/2009	4" rainfall due to severe thunderstorm caused flash flood conditions; both private & public property significantly impacted	\$750,000
Countywide	07/28/2006	4" rainfall due to severe thunderstorms caused flash flood conditions; several evacuations throughout the county; hundreds of homes and public infrastructure sustained damages	\$1,500,000
Southern Crawford County	07/27/2006	3" rainfall due to severe thunderstorms caused overland/riverine flooding that resulting in private &	\$250,000

		public property damage	
Countywide	01/01/2005	Flooding caused by snow/ice melt & rainfall	\$800,000
Countywide	09/19/2004	Tropical Storm Ivan	\$2,575,000
Countywide	09/19/2004	Tropical Storm Frances	\$11,500,000
Countywide	05/22/2004	Heavy rainfall caused flash flood conditions that resulted in private & public property damage	\$1,800,000
Countywide	05/21/2004	Severe thunderstorms resulted in heavy rainfall that caused flash flood conditions; significant private and public property damage	\$4,100,000
Countywide	07/21/2003	Heavy rainfall averaged 2" per hour throughout the day resulting severe flooding; several evacuations; significant private & public property damage	\$40,000,000
Countywide	07/19/1996	Flooding caused by heavy rainfall; significant debris, road closures, public/private infrastructure damage; residential basement cave-in in Saegertown Borough; evacuations along French Creek near Cochranon Borough; 50 evacuations in Conneautville; 80 homes damaged in Meadville & Meadville Medical Center had severe damage reported; 100 homes, 16 businesses impacted countywide	\$1,500,000
Springboro Borough; Conneautville Borough	06/19/1996	Flooding caused by heavy rainfall; few evacuations; Springboro sustained severe damages; St. Rt. 18 sustained severe damages; South Center Road was completely washed out	\$1,170,000
Saegertown Borough	06/07/1996	Flooding caused by heavy rainfall	\$15,000
Countywide	05/09/1996	Flooding caused by heavy rainfall	\$30,000
Meadville, City of	02/21/1996	Flooding caused by heavy rainfall combined with snowmelt & ice jamming resulted in localized flooding along French Creek & Hare Creek	Unknown
Saegertown Borough	08/15/1995	3" rainfall in less than 2 hours resulted in flash flood conditions	\$3,000
Springboro Borough	07/25/1995	Flooding caused by heavy rainfall	\$10,000
Countywide	06/25/1995	Flooding caused by heavy rainfall	\$20,000
Countywide	08/28/1994	Flooding caused by heavy rainfall; Route 27 was closed; Damages reported at Conneaut Lake Park; injuries reported in Fallowfield Township; Countywide power outages	\$50,000
Countywide	08/13/1994	Flooding caused by heavy rainfall	\$500,000
Spartansburg Borough	06/13/1994	3" of rainfall in less than 3 hours resulting in flash flood conditions near Canadohta Lake; 20 campers rescued by first responders; basements flooded	\$50,000
Countywide	04/13/1994	Widespread small stream flooding	None
Meadville, City of	12/31/1990	Riverine flooding from French Creek resulted in evacuations in Meadville's fifth ward	Unknown
Titusville, City of	07/15/1990	Flash flood resulting in damages reported	Unknown

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		throughout the business district & residential area along Church Run	
Northern Crawford County	07/02/1987	Residential basement flooding resulting in minor damages; roads in the area were closed	Unknown
Conneautville Borough; Cambridge Springs Borough	07/07/1986	Flash flooding washed away roads and damaged bridges in the area	Unknown
Countywide	03/30/1960	Flooding caused by snow/ice melt; 210 evacuated	\$1,601,000
Countywide	01/21/1959	Flooding caused by snow/ice melt; 2000 evacuated	\$5,651,637
Countywide	03/07/1956	Flooding caused by heavy rainfall	\$1,206,666
Countywide	10/16/1954	Flooding caused by heavy rainfall	\$1,173,333
Countywide	01/04/1951	Flooding caused by snow/ice melt; some evacuated	\$776,000
Countywide	12/04/1950	Flooding caused by snow/ice melt	\$1,380,000
Countywide	03/21/1948	Flooding caused by heavy rainfall; many evacuated	\$1,473,333
Unknown (Isolated)	04/06/1947	Flooding caused by heavy rainfall; 150 evacuated; 1 death	Unknown
Countywide	12/29/1942	Flooding caused by snow/ice melt	\$776,000
Countywide	01/24/1937	Flooding caused by snow/ice melt	\$259,000
Unknown	03/25/1939	Research indicates date flood occurred but no other data recorded	Unknown
Unknown	02/27/1936	Research indicates date flood occurred but no other data recorded	Unknown
Unknown	01/18/1929	Research indicates date flood occurred but no other data recorded	Unknown
Unknown	03/12/1920	Research indicates date flood occurred but no other data recorded	Unknown
Unknown	02/20/1918	Research indicates date flood occurred but no other data recorded	Unknown
Unknown	03/28/1916	Research indicates date flood occurred but no other data recorded	Unknown
Unknown	05/14/1914	Research indicates date flood occurred but no other data recorded	Unknown
Unknown (Isolated)	03/25/1913	Flooding resulted in damages to a distillery & to a business area	\$10,000 (Distillery) \$20,000 (Business area)
Countywide	02/15/1908	Flooding caused by snow/ice melt resulting in evacuations	Unknown
Countywide	01/22/1904	Flooding caused by snow/ice melt resulting in evacuations	Unknown
Countywide	02/28/1902	Flooding caused by snow/ice melt	Unknown
Unknown (Isolated)	05/15/1893	Heavy rainfall caused flooding at a racetrack	\$20,000
Countywide	06/04/1892	Unknown	\$125,000
TOTAL			\$81,144,969

Sources: Federal Emergency Management Agency; Pennsylvania Emergency Management Agency; NOAA National Climatic Data Center

4.3.1.4. FUTURE OCCURRENCE

Flooding remains a highly likely occurrence throughout the identified flood hazard areas of Crawford County. Smaller floods caused by heavy rains and inadequate drainage capacity will be more frequent, but not as costly as the large-scale floods which may occur at much less frequent intervals. While the potential for flood is always present, Crawford County does have policies and regulations for development that should help lessen potential damage due to floods.

The Flood Insurance Rate Maps (FIRMs) for Crawford County produced by FEMA have built-in probability information, most notably the 1% annual flood zone. In general, these maps are based on the updated and improved FEMA digital FIRMs (D-FIRMs). In terms of future occurrence and in this case, flood recurrence, most floods are classified based on recurrence interval (probability). **Table 4-3** shows a general range of flood recurrence intervals and their probabilities of occurrence.

Table 4-3: Flood Recurrence Intervals	
FLOOD RECURRENCE INTERVALS	CHANCE OF OCCURRENCE IN ANY GIVEN YEAR (%)
10 Year Event	10% Annual Chance
50 Year Event	2% Annual Chance
100 Year Event	1% Annual Chance
500 Year Event	0.2% Annual Chance

Furthermore, although the probability of a flood can be difficult to quantify, based on historical record of 49 recorded flood events since 1892, it can reasonably be assumed that this type of event has occurred once every 2.4 years from 1892 through 2009.

[(Current Year) 2009] subtracted by [(Historical Year) 1892] = 117 Years on Record

[(Years on Record) 117] divided by [(Number of Historical Events) 49] = 2.39

Furthermore, the historic frequency calculates that there is a 41.88% chance of this type of event occurring each year.

4.3.1.5. VULNERABILITY ASSESSMENT

RISK FACTOR (RF) Value: 2.9

The vulnerability assessment for the flood hazard includes findings of the qualitative assessment conducted, existing vulnerability and future vulnerability. As described above in the *Past Occurrence*

section of this hazard, Crawford County has experienced 49 significant flood events in the past 117 years amounting to \$81.1 million dollars in reported property damage, providing evidence that Crawford County, historically, is vulnerable to the flood hazard and that flood events occur on a fairly frequent basis.

According to the qualitative assessment performed using the RF tool, the flood hazard scored a RF value of 2.9 (from a scale of 0 to 4, with 4 being the highest risk level). **Table 4-4** summarizes the risk levels assigned to each RF category.

Table 4-4: Qualitative Assessment for Flood				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
3	2	4	3	3

EXISTING VULNERABILITY

Several streams in Crawford County are still subject to flooding. The problem areas include: French Creek, Cussewago Creek, Conneaut Creek, Oil Creek, and Mill Run. Intermittent flooding does occur due to low lying areas and seasonal ice jams.

Table 4-5 summarizes for Crawford County (1) the total number of addressable existing structures by municipality, (2) the total number of addressable existing structures located within the 1% annual chance area, and (3) the percent of existing addressable structures located within the 1% annual chance area. In terms of social vulnerability, this alone does not identify specific at-risk populations. However, it does create a base-level understanding of the general number of persons living in or near a Special Flood Hazard Area (SFHA).

Table 4-5: Existing Structures Located in 1% Annual Chance Area			
Municipality	Total Number of Existing Addressable Structures in Municipality	Total Number of Addressable Existing Structures in 1%-Annual-Chance Flood Zone	Percent of Addressable Existing Structures in 1%-Annual-Chance Flood Zone
ATHENS TWP	387	5	1%
BEAVER TWP	407	8	2%
BLOOMFIELD TWP	1,644	358	22%
BLOOMING VALLEY BORO	175	0	0%
CAMBRIDGE SPRINGS BORO	862	38	4%
CAMBRIDGE TWP	788	67	9%
CENTERVILLE BORO	134	10	7%
MEADVILLE, CITY OF	6,428	759	12%
TITUSVILLE, CITY OF	2,860	323	11%

COCHRANTON BORO	591	124	21%
CONNEAUT LAKE BORO	430	2	0%
CONNEAUT TWP	867	3	0%
CONNEAUTVILLE BORO	462	21	5%
CUSSEWAGO TWP	737	2	0%
EAST FAIRFIELD TWP	478	45	9%
EAST FALLOWFIELD TWP	621	2	0%
EAST MEAD TWP	721	2	0%
FAIRFIELD TWP	631	128	20%
GREENWOOD TWP	742	9	1%
HAYFIELD TWP	1,453	46	3%
HYDETOWN BORO	310	40	13%
LINESVILLE BORO	542	7	1%
NORTH SHENANGO TWP	1,888	6	0%
OIL CREEK TWP	1,027	43	4%
PINE TWP	440	3	1%
RANDOLPH TWP	848	2	0%
RICHMOND TWP	671	1	0%
ROCKDALE TWP	687	15	2%
ROME TWP	711	0	0%
SADSBURY TWP	2,691	36	1%
SAEGERTOWN BORO	432	67	16%
SOUTH SHENANGO TWP	1,888	56	3%
SPARTA TWP	676	5	1%
SPARTANSBURG BORO	133	0	0%
SPRING TWP	750	8	1%
SPRINGBORO BORO	221	6	3%
STEBEN TWP	474	38	8%
SUMMERHILL TWP	540	4	1%
SUMMIT TWP	1,513	134	9%
TOWNVILLE BORO	164	1	1%
TROY TWP	642	26	4%
UNION TWP	504	7	1%
VENANGO BORO	125	16	13%
VENANGO TWP	477	52	11%
VERNON TWP	3,217	139	4%
WAYNE TWP	826	53	6%
WEST FALLOWFIELD TWP	370	2	1%
WEST MEAD TWP	2,618	11	0%

WEST SHENANGO TWP	386	3	1%
WOODCOCK BORO	77	1	1%
WOODCOCK TWP	1,295	82	6%
	48,561	2,816	

There are a total of 15 existing critical facilities within the 1% annual chance area. These facilities include 1 EMS/Fire Station, 3 schools, 1 dam, and 10 SARA Title III facilities. **Table 4-6** summarizes this information.

Table 4-6 Existing Critical Facilities in 1% Annual Chance Area		
FACILITY	MUNICIPALITY	TYPE OF FACILITY
EMERGYCARE	CITY OF TITUSVILLE	Fire/EMS
COCHRANTON JR/SR HIGH SCHOOL	COCHRANTON BORO	School
PENNCREST PRESCHOOL	SAEGERTOWN BORO	School
SECOND DISTRICT ELEM SCHOOL	CITY OF MEADVILLE	School
CLEAR LAKE DAM	SPARTANSBURG BORO	Dam
LINESVILLE WASTE WATER TREATMENT PLANT at 120 E ERIE ST	LINESVILLE BORO	SARA Title III Facility
PETER'S HEAT TREATING INC. at 215 RACE ST	CITY OF MEADVILLE	SARA Title III Facility
CAMBRIDGE SPRINGS WTP at SNOW ALY	CAMBRIDGE SPRINGS BORO	SARA Title III Facility
CAMBRIDGE SPRINGS WWTP at GRANT ST	CAMBRIDGE SPRINGS BORO	SARA Title III Facility
CONNEAUT LAKE WTP at 201 N SECOND ST	CONNEAUT LAKE BORO	SARA Title III Facility
LINESVILLE MUN WATER AUTH BUND at 120 E ERIE ST	LINESVILLE BORO	SARA Title III Facility
SAEGERTOWN WWTP at 180 PARK AVE	SAEGERTOWN BORO	SARA Title III Facility
NW CRAWFORD CO SEWER AUTHORITY at 194 BEAVER ST	SPRINGBORO BORO	SARA Title III Facility
VERIZON at 217 W SPRING ST	CITY OF TITUSVILLE	SARA Title III Facility
TITUSVILLE WWTP at 107 N FRANKLIN ST	CITY OF TITUSVILLE	SARA Title III Facility

Figure 4-4: Critical Facilities located in the 1% Annual Chance Area

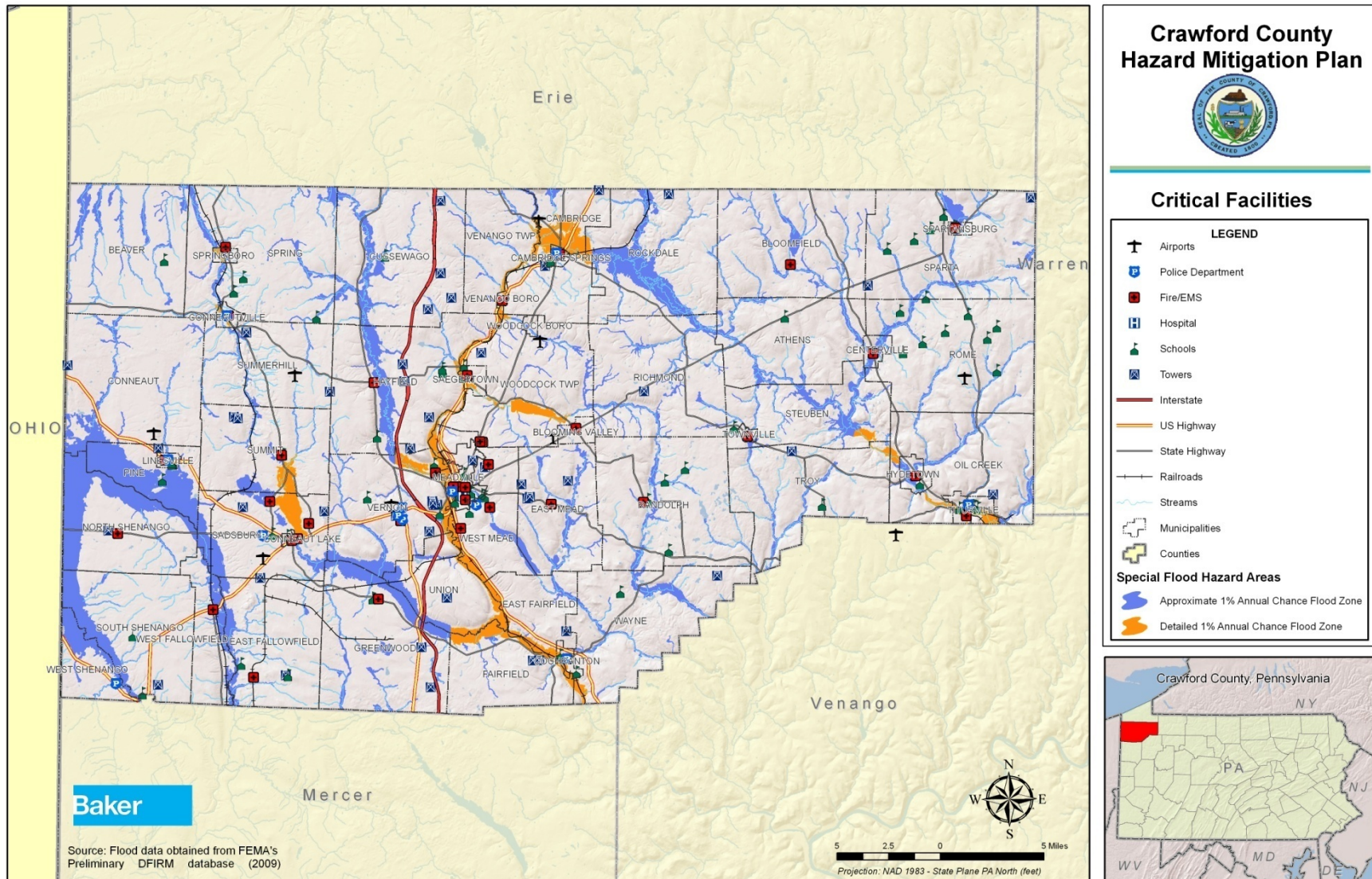


Table 4-7 illustrates the repetitive loss claims from FEMA’s Community Information Survey. A total of 54 repetitive loss claims have been recorded since 1989. The City of Titusville has had a total of 16 claims, which is the highest number of claims in Crawford County. While specific addresses cannot be released due to the privacy act, the goal of identifying these properties is determine what locations flood repetitively and seek to mitigate the problem therefore reducing flood damage.

Table 4-7: Summary of the number and type of Repetitive Loss properties by municipality (FEMA, 2010).

Community Name	No. of Rep Losses	No. of Policies	Structure Type			Sum of Rep Loss Properties
			2-4 Family	Non-Resident	Single Family	
COCHRANTON, BOROUGH	2	24			1	1
CONEAUVILLE BOROUGH	2	9		1		1
FAIRFIELD, TOWNSHIP OF	n/a	n/a			1	1
MEADVILLE, CITY OF	4	169	1			1
OIL CREEK, TOWNSHIP OF	3	9			1	1
SADSBURY, TOWNSHIP OF	6	6			1	1
STEBEN, TOWNSHIP OF	8	8			6	6
SUMMIT, TOWNSHIP OF	2	14			2	2
TITUSVILLE, CITY OF	16	77		3	4	7
TROY, TOWNSHIP OF	4	4			1	1
VENANGO, TOWNSHIP OF	2	14			1	1
VERNON, TOWNSHIP OF	2	47			1	1
WOODCOCK, TOWNSHIP OF	3	14			1	1
TOTAL	54	395	1	4	21	26

No severe repetitive loss properties identified in Crawford County as of April 2010

The use of his National Flood Insurance Program (NFIP) repetitive loss information is limited because the data available are not geo-located. Thus, no map these properties can be produced and no assessment of the location of these properties versus either Q3 or D-FIRM flood hazard maps can be generated.

Infrastructure systems such as transportation, water systems, sewer systems and businesses located in the 1% annual chance area are vulnerable to flooding. Sewer, stormwater and underground well water infrastructure are vulnerable to riverine, stormwater and seepage floods. Currently, there are 36 permitted public water systems, 57 non-municipal and 12 municipal sanitary sewer systems within Crawford County. Not uncommon, severe flooding may shut down arterial parts of transportation systems. This could isolate neighborhoods, potentially limiting first response, or access to major population centers like Meadville and Titusville. Businesses may be forced to close temporarily due to lack of patronage and/or employee absences. The disruption of delivery would also have negative impacts on the local economy. Small businesses are particularly vulnerable to temporary closures and property damage.

Aside from structures and infrastructure, flooding can have a substantial impact on the natural environment. The most significant threat posed by floods to the natural environment is the potential damage to the fish and wildlife habitat. A low frequency flood event occurring in French Creek, Cussewago Creek, Conneaut Creek, Oil Creek, and/or Mill Run may result in significant damages to delicate riparian vegetation. The runoff associated with development and increased impervious surfaces has increased the occurrence of flooding in populated areas within the county. Building in the floodplain may damage ecosystems, a flood induced by encroachment on the floodplain may further this damage by introducing toxins, debris, and significant amounts of sediment to the system. In turn, this could affect a watercourse's flow velocity or discharge which may further increase losses to the ecosystem by removing riparian vegetation and result in new problems downstream to both natural environment and manmade infrastructure.

FEMA HAZUS Case Study: HAZUS is a regional multi-hazard loss estimation model that was developed by FEMA and the National Institute for Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates are used by local, state, and regional officials to plan and simulate efforts to reduce risks from multi-hazards and prepare for emergency response and recovery.

A case study was recently completed on December 17, 2009 for Crawford County of a 1% annual chance flood event using FEMA's HAZUS-MH risk analysis software. The base study looked at streams with a drainage area of at least 10 square miles. The study computed damages in dollars for total economic loss, building and content damage, and other economic impacts. The study also estimated the number of damaged homes and the degree of damage to those homes.

Building Damage: In summarizing the case study results, HAZUS estimates that about 525 buildings throughout the county will be at least moderately damaged in a 1% annual chance flood event. This is over 5% of the total number of buildings in the case study. There are an estimated 249 buildings that will be completely destroyed. **Table 4-8** summarizes the expected damage by general building type.

Table 4-8: Expected General Building Stock Damage by Occupancy						
	1-10	11-20	21-30	31-40	41-50	SUBSTANTIALLY
OCCUPANCY	COUNT (%)	COUNT (%)	COUNT (%)	COUNT (%)	COUNT (%)	COUNT (%)
Agriculture	0	0	0	0	0	0
Commercial	0	14 (82.35%)	1 (5.88%)	1 (5.88%)	1 (5.88%)	0
Education	1 (100%)	0	0	0	0	0
Government	0	0	0	0	0	0
Industrial	0	10 (83.33%)	0	0	1 (8.33%)	1 (8.33%)
Religion	0	1 (100%)	0	0	0	0
Residential	0	11 (2.22%)	33 (6.67%)	87 (17.58%)	116 (23.43%)	248 (50.10%)
TOTAL	1	36	34	88	118	249

Table 4-9 summarizes the expected damage by building type.

Table 4-9: Expected General Building Stock Damage by Building Type						
	1-10	11-20	21-30	31-40	41-50	SUBSTANTIALLY
BUILDING TYPE	COUNT (%)	COUNT (%)	COUNT (%)	COUNT (%)	COUNT (%)	COUNT (%)
Concrete	0	2 (100%)	0	0	0	0
Manuf. Housing	0	0	0	0	0	124 (100%)
Masonry	0	8 (7.77%)	6 (5.83%)	22 (21.36%)	33 (32.04%)	34 (33.01%)
Steel	0	15 (88.24%)	0	0	1 (5.88%)	1 (5.88%)
Wood	0	10 (3.61%)	27 (9.75%)	65 (23.47%)	84 (30.32%)	91 (32.85%)

Table 4-10 summarizes expected damage to essential facilities.

Table 4-10: Expected Damage to Essential Facilities				
CLASSIFICATION	TOTAL	AT LEAST MODERATE	AT LEAST SUBSTANTIAL	LOSS OF USE
Fire Stations	25	No Damages	No Damages	No Damages
Hospitals	2	No Damages	No Damages	No Damages
Police Stations	10	No Damages	No Damages	No Damages
Schools	61	4	No Damages	No Damages

Debris Generation: HAZUS estimates the amount of debris that will be generated by the flood. The model breaks debris into three categories: (1) Finishes (dry wall, insulation, etc.), (2) Structural (wood, brick, etc.), (3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris. The model estimates that a total of 41,575 tons of debris will be generated. Of the total amount, finishes comprises 30% of the total, structural comprises of 38% of the total. If the debris tonnage is converted into an estimated number of truckloads, it will require 1,663 truckloads (25 tons per truck) to remove the debris generated by the flood.

Shelter Requirements: HAZUS estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 1,942 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3,601 people (out of a total population of 90,366) will seek temporary shelter in public shelters.

Economic Loss: The total economic loss estimated for the flood is 413.62 million dollars, which represents 23.01% of the total replacement value of the scenario buildings.

Building-Related Losses: The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses

associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood. The total building-related losses were 406.06 million dollars. 1% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 28.38% of the total loss. **Table 4-11** below provides a summary of the losses associated with the building damage.

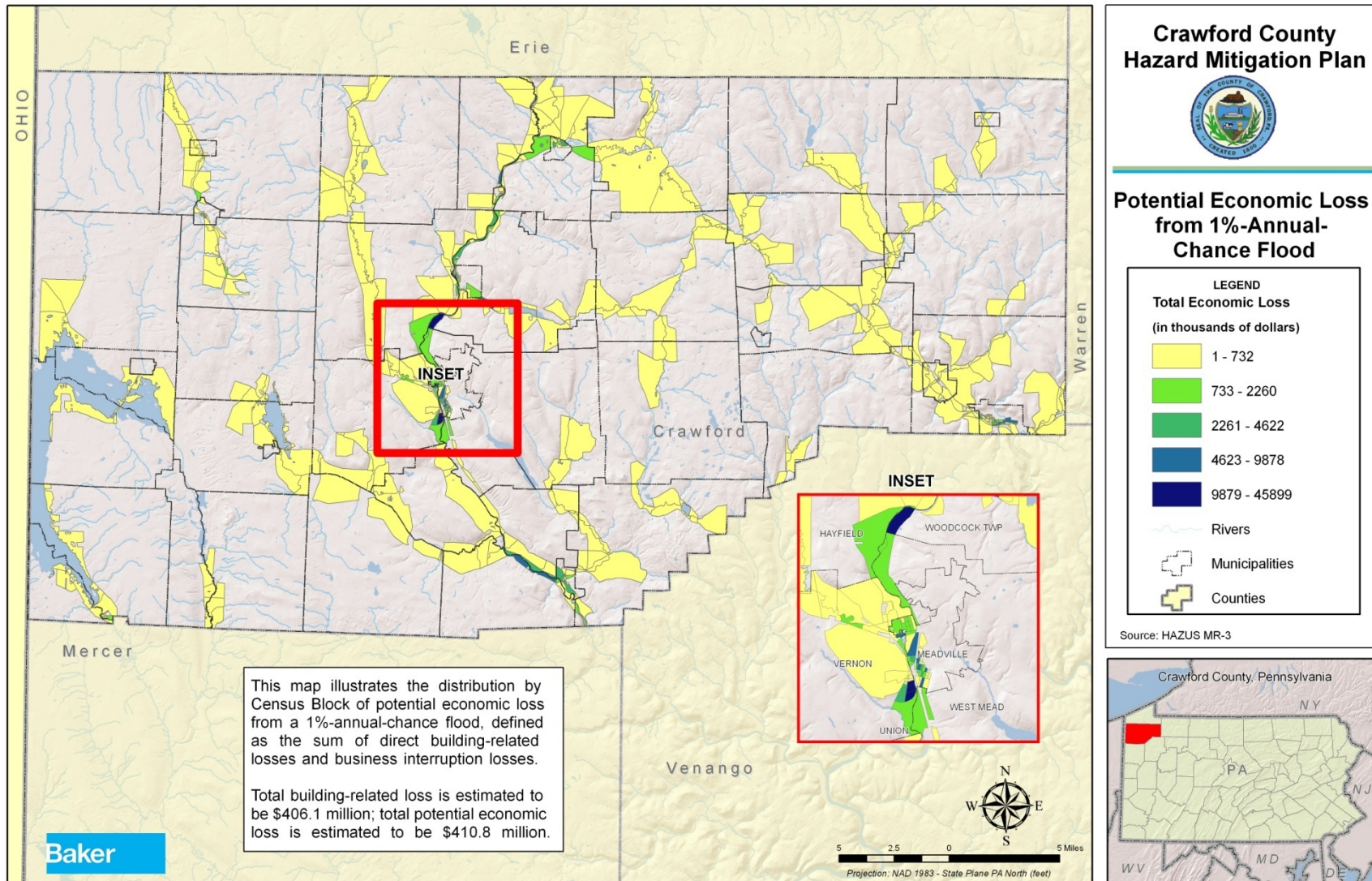
Table 4-11: Building-Related Economic Loss Estimates (Millions of Dollars)						
CATEGORY	AREA	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	OTHERS	TOTAL
BUILDING LOSS	Building	73.00	42.49	27.98	4.32	147.79
	Content	44.14	102.10	71.12	23.62	240.97
	Inventory	0	3.00	14.18	0.11	17.29
	Subtotal	117.14	147.60	113.28	28.04	406.06
BUILDING INTERRUPTION	Income	0.01	0.64	0.03	0.05	0.73
	Relocation	0.17	0.20	0.02	0.01	0.40
	Rental Income	0.05	0.14	0.01	0	0.20
	Wage	0.03	0.63	0.02	2.69	3.37
	Subtotal	0.26	1.61	0.08	2.75	4.70
ALL	TOTAL	117.40	149.21	113.36	30.79	410.76

FUTURE VULNERABILITY

Crawford County, along with all 51 municipalities, participates in the National Flood Insurance Program (NFIP) and has ordinances regulating development in floodplain areas. The NFIP provides flood insurance to individuals in communities that are members of the program. Membership in the program is contingent on the community adopting and enforcing floodplain management and development regulations. New development in unmapped areas could potentially occur in areas prone to flooding and increase vulnerabilities and potential losses; however, most of the current land use regulations require the consideration of flood hazards during the development review process.

Currently, all 51 municipalities in Crawford County participate in the NFIP. Further information regarding the Crawford County and the NFIP can be found in the Capability Assessment section of this plan.

Figure 4-5: HAZUS CASE STUDY: Potential Economic Loss from 1%-Annual Chance Flood



4.3.2. TORNADOES/WIND STORMS

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes or tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of high wind velocities and wind-blown debris. According to the National Weather Service, tornado wind speeds can range between 30 to more than 300 miles per hour. They are more likely to occur during the spring and early summer months of March through June and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touchdown briefly, but even small, short-lived tornadoes can inflict tremendous damage. Destruction ranges from minor to catastrophic depending on the intensity, size, and duration of the storm. Structures made of light materials such as mobile homes are most susceptible to damage. Waterspouts are weak tornadoes that form over warm water and are relatively uncommon in Pennsylvania. Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). Based on NOAA Storm Prediction Center Statistics, the number of recorded F3, F4, & F5 tornadoes between 1950- 1998 ranges from <1 to 15 per 3,700 square mile area across Pennsylvania (FEMA, 2009).

Strong winds can also occur outside of tornadoes, severe thunderstorms, and winter storms. These winds typically develop with strong pressure gradients and gusty frontal passages. The closer and stronger two systems (one high pressure, one low pressure) are, the stronger the pressure gradient, and therefore, the stronger the winds are.

Downburst winds, which can cause more widespread damage than a tornado, occur when air is carried into a storm's updraft, cools rapidly, and comes rushing to the ground. Cold air is denser than warm air, and therefore, wants to fall to the surface. On warm summer days, when the cold air can no longer be supported up by the storm's updraft, or an exceptional downdraft develops, the air crashes to the ground in the form of strong winds. These winds are forced horizontally when they reach the ground and can cause significant damage. These types of strong winds can also be referred to as straight-line winds. Downbursts with a diameter of less than 2.5 miles are called microbursts and those with a diameter of 2.5 miles or greater are called macrobursts. A derecho, or bow echo, is a series of downbursts associated with a line of thunderstorms. This type of phenomenon can extend for hundreds of miles and contain wind speeds in excess of 100 mph.

Based on 40 years of tornado history and over 100 years of hurricane history, FEMA identifies western and central Pennsylvania as being more susceptible to higher winds than eastern Pennsylvania (FEMA, 1997).

4.3.2.1. LOCATION AND EXTENT

Tornadoes and windstorms pose a potential threat to all of Crawford County and its municipalities as well as throughout the entire Commonwealth of Pennsylvania. **Figure 4-6** details the tornado history

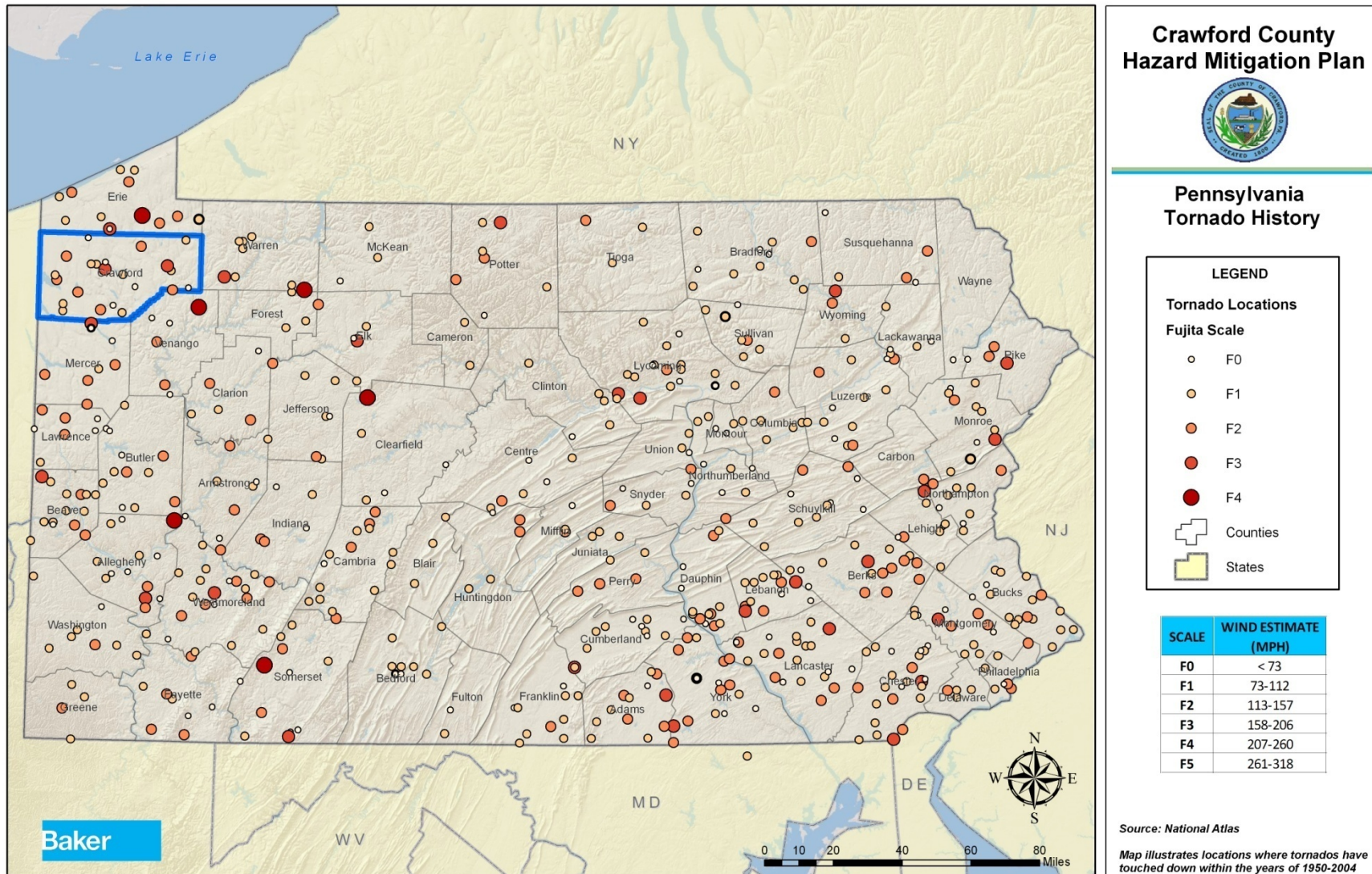
within Pennsylvania and Crawford County. Windstorms are usually associated with hurricanes, tropical storms, and tornadoes, but may also include thunderstorms and less violent storm systems. The destruction from these storms can be tremendous, destroying buildings, uprooting trees and injuring people.

4.3.2.2. RANGE OF MAGNITUDE

Damages and deaths can be especially significant when tornadoes move through populated, developed areas. The destruction caused by tornadoes ranges from minor to extreme depending on the intensity, size and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light construction such as residential homes (particularly mobile homes), and tend to remain localized in impact. The Enhanced Fujita Scale, also known as the “EF-Scale,” measures tornado strength and associated damages. The EF-Scale is an update to the earlier Fujita scale that was published in 1971. It classifies United States tornadoes into six intensity categories, as shown in **Table 4-12**, based upon the estimated maximum winds occurring within the wind vortex. The EF-Scale has become the definitive metric for estimating wind speeds within tornadoes based upon the damage done to buildings and structures since it was implemented through the National Weather Service in 2007.

Table 4-12 Enhanced Fujita Scale and Associated Damage		
EF-SCALE NUMBER	WIND SPEED (MPH)	TYPE OF DAMAGE POSSIBLE
EFO	65-85	Minor damage: Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.
EF1	86-110	Moderate damage: Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF2	111-135	Considerable damage: Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	136-165	Severe damage: Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	166-200	Devastating damage: Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
EF5	>200	Extreme damage: Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m (300 ft); steel reinforced concrete structure badly damaged; high-rise buildings have significant structural deformation.

Figure 4-6: Illustrates a History of Tornado Events in Pennsylvania



Figures 4-7, 4-8, 4-9, 4-10 and 4-11 below depict the Enhanced Fujita Scale as described in Table 4-x above.

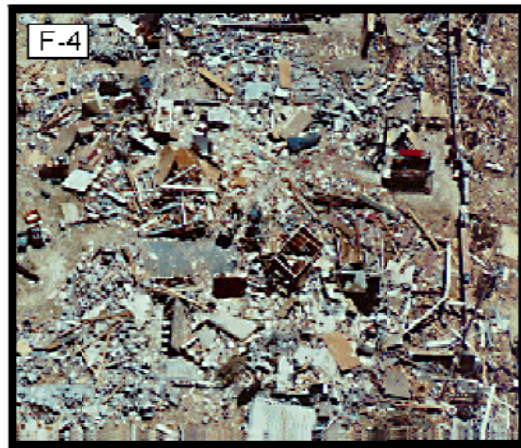
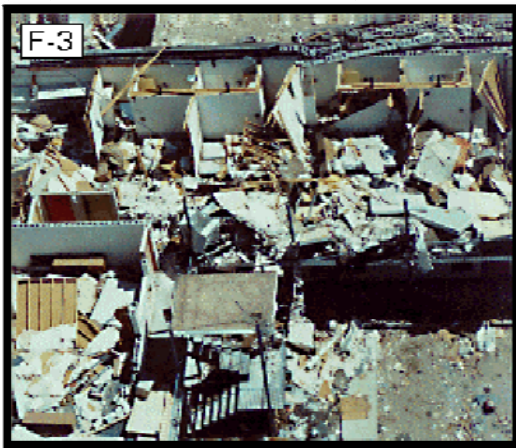
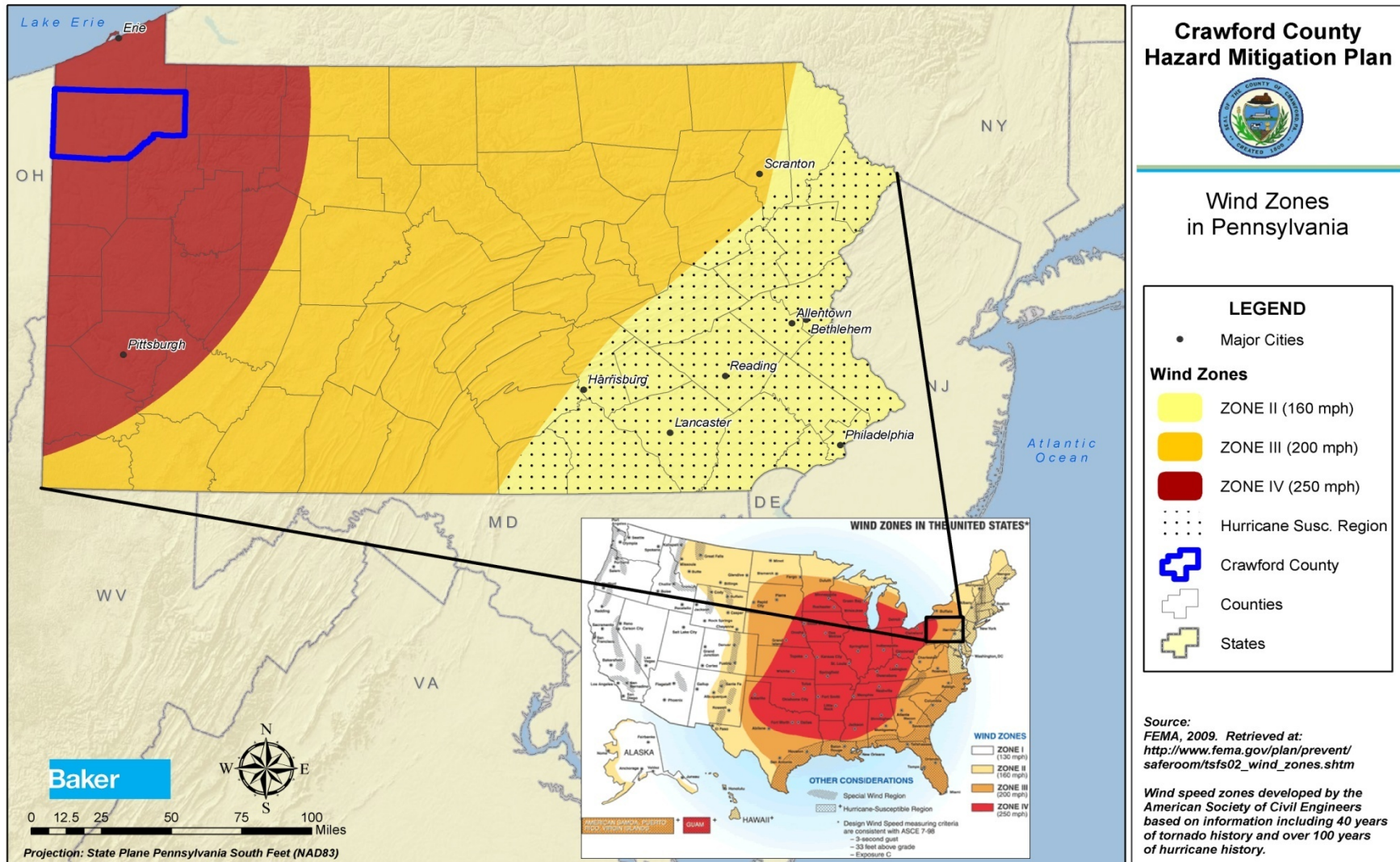


Figure 4-12 shown below illustrates wind speed zones developed by the American Society of Civil Engineers based on information including 40 years of tornado history and over 100 years of hurricane history. It identifies wind speeds that could occur across the United States to be used as the basis for design and evaluation of the structural integrity of shelters and critical facilities. Crawford County falls within Zone IV, meaning design wind speeds for shelters and critical facilities should be able to withstand a 3-second gust of up to 250 mph, regardless of whether the gust is the result of a tornado, hurricane, tropical storm, or windstorm event. Therefore, these structures should be able to withstand speeds experienced in an EF5 tornado.

Figure 4-12: U.S. Wind Zones (Pennsylvania with Crawford County Highlighted in Blue)



4.3.2.3. PAST OCCURRENCE

Historical evidence shows that Crawford County has experienced 31 tornadoes between 1950 and 2009. As a result of these violent events, 85 injuries and 11 deaths have been recorded. The most powerful tornado to strike Crawford County occurred on May 31, 1985 and was responsible for 8 deaths, 75 injuries and 25 million dollars in property damage. **Table 4-13** summarizes these past occurrences.



Figure 4-14 Crawford County: An F2 tornado touched down 3 miles west of Custards and then tracked east for 7 miles

#	Location	Date	Magnitude	Death	Injury	Property Damage
1	CRAWFORD COUNTY	07/24/1950	F0	0	0	\$3,000
2	CRAWFORD COUNTY	01/17/1952	F2	0	0	\$250,000
3	CRAWFORD COUNTY	07/01/1955	F2	0	0	\$25,000
4	CRAWFORD COUNTY	07/24/1968	F1	0	0	\$250,000
5	CRAWFORD COUNTY	05/02/1972	F3	0	0	\$25,000
6	CRAWFORD COUNTY	04/02/1979	F1	0	0	\$25,000
7	CRAWFORD COUNTY	06/15/1980	F0	0	0	\$3,000
8	CRAWFORD COUNTY	07/21/1980	F1	0	1	\$250,000
9	CRAWFORD COUNTY	07/28/1981	F2	0	4	\$250,000
10	CRAWFORD COUNTY	09/01/1981	F1	0	0	\$25,000
11	CRAWFORD COUNTY	05/02/1983	F0	0	0	\$25,000
12	CRAWFORD COUNTY	05/31/1985	F2	1	0	\$0
13	CRAWFORD COUNTY	05/31/1985	F3	2	0	\$0
14	CRAWFORD COUNTY	05/31/1985	F4	8	75	\$25,000,000
15	CRAWFORD COUNTY	05/31/1985	F2	0	0	\$0
16	CRAWFORD COUNTY	05/31/1985	F3	0	0	\$2,500,000
17	CRAWFORD COUNTY	06/22/1985	F2	0	0	\$250,000
18	CRAWFORD COUNTY	06/22/1985	F1	0	0	\$25,000
19	CRAWFORD COUNTY	06/22/1985	F1	0	0	\$25,000
20	CRAWFORD COUNTY	09/30/1986	F2	0	1	\$2,500,000
21	TITUSVILLE	09/02/1993	F0	0	0	\$5,000

22	BLOOMING VALLEY	06/11/1994	F1	0	1	\$500,000
23	SAEGERTOWN	05/24/1995	F0	0	0	\$50,000
24	LINESVILLE	07/20/1998	F1	0	0	\$75,000
25	CUSTARDS	06/01/2001	F0	0	0	\$100,000
26	LINESVILLE	06/05/2002	F1	0	0	\$50,000
27	CROSSINGSVILLE	07/27/2002	F0	0	0	\$50,000
28	COCHRANTON	11/10/2002	F1	0	0	\$325,000
29	GUY'S MILLS	05/20/2004	F0	0	0	\$50,000
30	CUSTARDS	05/25/2004	F2	0	0	\$3,500,000
31	MEADVILLE	05/01/2007	F1	0	0	\$500,000
TOTAL				11	85	\$36.636 Million

Crawford County has experienced power failures in limited areas, minor loss of communication networks and sustained significant loss during the 1985 tornado outbreak that affected 10 counties (including Crawford).

4.3.2.4. FUTURE OCCURRENCE

The probability of the county and its municipalities experiencing severe winds is difficult to quantify. The highest probability of a tornado or high wind event exists between the months of May, June, and July, although a moderate amount of tornadoes have occurred in Crawford County during the month of September. Crawford County is located in a high wind zone area that can produce high winds and tornadoes capable of 250 MPH or greater. The probability of a tornado striking is difficult to determine but based on historical record of 31 high wind/tornado events since 1950, it can reasonably be assumed that this type of event has occurred once every 1.9 years from 1950 through 2009.

[(Current Year) 2009] subtracted by [(Historical Year) 1950] = 59 Years on Record

[(Years on Record) 59] divided by [(Number of Historical Events) 31] = 1.903225

Furthermore, the historic frequency calculates that there is a 52.54% chance of this type of event occurring each year.

Most of Pennsylvania is susceptible to tornadoes of a magnitude of at most an EF-3. However, historical record (05/31/1985) clearly dictates that these weather phenomena can exceed the norm.

4.3.2.5. VULNERABILITY ASSESSMENT

RISK FACTOR (RF) Value: 2.2

According to the qualitative assessment performed using the RF tool, the tornado/high wind hazard scored a RF value of 2.2 (from a scale of 0 to 4, with 4 being the highest risk level). **Table 4-14** summarizes the risk levels assigned to each RF category.

Table 4-14: Qualitative Assessment for Tornado/High Wind Events				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
1	3	3	4	1

The potential for tornadoes always exists. The topography in Crawford County offers little protection due to it being relatively flat and the National Weather Service cannot accurately predict smaller funnels, so there is difficulty in alerting the populace in a timely manner. While the frequency of these severe weather events has been moderately high based on historical record, the damage that results from a tornado can be devastating. A tornado with an “EF4” designation (which occurred on 05/31/1985) 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 within Crawford County.

The Storm Prediction Center has developed damage indicators to be used with the Enhanced Fujita Scale for different types of buildings. Some of the indicators for different building types are shown in Tables 4-15, 4-16, and 4-17.

Table 4-15: Institutional Buildings	
DAMAGE DESCRIPTION	WIND SPEED RANGE (Expected in Parentheses)
Threshold of visible damage	59-88 MPH (72 MPH)
Loss of roof covering (<20%)	72-109 MPH (86 MPH)
Damage to penthouse roof & walls, loss of rooftop HVAC equipment	75-111 MPH (92 MPH)
Broken glass in windows or doors	78-115 MPH (95 MPH)
Uplift of lightweight roof deck & insulation, significant loss of roofing material (>20%)	95-136 MPH (114 MPH)
Façade components torn from structure	97-140 MPH (118 MPH)
Damage to curtain walls or other wall cladding	110-152 MPH (131 MPH)
Uplift of pre-cast concrete roof slabs	119-163 MPH (142 MPH)
Uplift of metal deck with concrete fill slab	118-170 MPH (146 MPH)
Collapse of some top building envelope	127-172 MPH (148 MPH)
Significant damage to building envelope	178-268 MPH (210 MPH)

Source: Storm Prediction Center, 2009

Table 4-16: School Building (Junior or Senior High School)	
DAMAGE DESCRIPTION	WIND SPEED RANGE (Expected in Parentheses)
Threshold of visible damage	55-83 MPH (68 MPH)
Loss of roof covering (<20%)	66-99 MPH (79 MPH)
Broken windows	71-106 MPH (87 MPH)
Exterior door failures	83-121 MPH (101 MPH)
Uplift of metal roof decking; significant loss of roofing material (>20%); loss of rooftop HVAC	85-119 MPH (101 MPH)
Damage to or loss of wall cladding	92-127 MPH (108 MPH)
Collapse of tall masonry walls at gym, cafeteria, or auditorium	94-136 MPH (114 MPH)

Uplift or collapse of light steel roof structure	108-148 MPH (125 MPH)
Collapse of exterior walls in top floor	121-153 MPH (139 MPH)
Most interior walls of top floor collapsed	133-186 MPH (158 MPH)
Total destruction of a large section of building envelope	163-224 MPH (192 MPH)

Source: Storm Prediction Center, 2009

Table 4-17: Metal Building System	
DAMAGE DESCRIPTION	WIND SPEED RANGE (Expected in Parentheses)
Threshold of visible damage	54-83 MPH (67 MPH)
Inward or outward collapsed of overhead doors	75-108 MPH (89 MPH)
Metal roof or wall panels pulled from the building	78-120 MPH (95 MPH)
Column anchorage failed	96-135 MPH (117 MPH)
Buckling of roof purlins	95-138 MPH (118 MPH)
Failure of X-braces in the lateral load resisting system	118-158 MPH (138 MPH)
Progressive collapse of rigid frames	120-168 MPH (143 MPH)
Total destruction of building	132-178 MPH (155 MPH)

Source: Storm Prediction Center, 2009

Since the probability of a tornado is relatively the same across the Crawford County, the vulnerabilities to structures depend on the building types and their susceptibility to sustain damages in a severe weather event. Even if a structure performs well in the high winds, flying debris and falling trees may result in damages to a building.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Critical functional losses
- Critical data losses

Above ground infrastructure, namely overhead power lines, communications towers and lines, and structures, are very susceptible to severe weather. High winds and falling trees can damage this type of infrastructure and disrupt services. **Table 4-18** shows the Enhanced Fujita Scale Damage Indicators for electric transmission lines.

Table 4-18: Electric Transmission Lines	
DAMAGE DESCRIPTION	WIND SPEED RANGE (Expected in Parentheses)
Threshold of visible damage	70-98 MPH (83 MPH)
Broken wood cross member	80-114 MPH (99 MPH)
Wood poles leaning	85-130 MPH (108 MPH)
Broken wood poles	98-142 MPH (118 MPH)
Broken or bent steel or concrete poles	115-149 MPH (138 MPH)
Collapsed metal truss towers	116-165 MPH (141 MPH)

Source: Storm Prediction Center, 2009

The most difficult network to maintain is the road infrastructure. Debris may block roadways making transportation and commerce difficult if not impossible.

4.3.3. LIGHTNING STRIKES/THUNDERSTORMS

Extreme weather conditions can exist during any season in northwest Pennsylvania. Thunderstorms, associated with strong winds, heavy precipitation, and lightning strikes can all be hazardous under the right conditions and locations. Strong winds and tornadoes can take down trees, damage structures, tip high profile vehicles, and create high velocity flying debris. Large hail can damage crops, dent vehicles, break windows, and injure or kill livestock, pets, and people.

Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. Despite their small size, all thunderstorms are dangerous. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe. The National Weather Service considers a thunderstorm severe if it produces hail at least 3/4 inch in diameter, winds of 58 MPH or stronger, or a tornado. Every thunderstorm needs three basic components: (1) moisture to form clouds and rain (2) unstable air which is warm air that rise rapidly and (3) lift, which is a cold or warm front capable of lifting air to help form thunderstorms.

Lightning, although not considered severe by the National Weather Service definition, can accompany heavy rain during thunderstorms. Lightning develops when ice particles in a cloud move around, colliding with other particles. These collisions cause a separation of electrical charges. Positively charged ice particles rise to the top of the cloud and negatively charged ones fall to the middle and lower sections of the cloud. The negative charges at the base of the cloud attract positive charges at the surface of the Earth. Invisible to the human eye, the negatively charged area of the cloud sends a charge called a stepped leader toward the ground. Once it gets close enough, a channel develops between the cloud and the ground. Lightning is the electrical transfer through this channel. The channel rapidly heats to 50,000 degrees Fahrenheit and contains approximately 100 million electrical volts. The rapid expansion of the heated air causes thunder. (National Weather Service, 2009)

Hail develops when a super cooled droplet collects a layer of ice and continues to grow, sustained by the updraft. Once the hail stone cannot be held up any longer by the updraft, it falls to the ground. Hail up to 3.80 inches in diameter, nearly the size of a large apple or grapefruit, was reported seven miles northwest of Meadville on September 25, 1994.

Nationally, hailstorms cause nearly \$1 billion in property and crop damage annually, as peak activity coincides with peak agricultural seasons. Severe hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life.



Figure 4-15 Aggregate hailstone approximately 6 centimeters in diameter (roughly the size of a baseball)

To protect people and property, the National Weather Service issues informational products alerting the public to varying degrees of hazardous weather.

The following may be issued for severe thunderstorm events:

- Hazardous Weather Outlook: Hazardous weather outlooks alert the public to the possibility for severe weather in the area from one to seven days in advance.
- Severe Thunderstorm Watch: Severe thunderstorm watches are issued by the Storm Prediction Center when conditions for severe thunderstorms appear favorable for an area over the next several hours. Watches are typically in effect for 4-6 hours.
- Severe Thunderstorm Warning: Severe thunderstorm warnings are issued when Doppler radar indicates or the public reports a thunderstorm with wind gusts of 58 mph or greater and/or hail $\frac{3}{4}$ inch or larger in diameter. The warning is usually valid for 30-60 minutes.
- Tornado Watch: Tornado watches are issued by the Storm Prediction Center when conditions for tornadoes appear especially favorable for an area over the next several hours. Watches are typically in effect for 4-6 hours.
- Tornado Warning: Tornado warnings are issued when Doppler radar indicates or the public reports a tornado. The warning is usually valid for 15-45 minutes.

4.3.3.1. LOCATION AND EXTENT

The science of meteorology and records of severe weather are not quite sophisticated enough to identify what areas of the county are at greater risk for damages. Therefore, all areas of the county are assumed to have the same severe weather risk, countywide.

4.3.3.2. RANGE OF MAGNITUDE

Reported severe weather events over the past 54 years provide an acceptable framework for determining the magnitude of such storms that can be expected and planned for accordingly. FEMA places this region in Zone IV (250 MPH) for structural wind design (Federal Emergency Management Agency, 2004b). Large hail can damage structures, break windows, dent vehicles, ruin crops, and kill or injure people and livestock. Based on past occurrences, hail sizes greater than 3 inches in diameter are possible and should be accounted for in future planning activities. Non-tornadic, thunderstorm and non-thunderstorm winds over 100 mph should also be considered in future planning initiatives. These types of winds can remove roofs, move mobile homes, topple trees, take down utility lines, and destroy poorly-built or weak structures.

4.3.3.3. PAST OCCURRENCE

Thunderstorms and lightning events occur many times each year. According to the National Climatic Data Center, lightning has been responsible for 24 deaths and 232 injuries in Pennsylvania between the years of 1993-2009. More specifically, lightning alone has caused 2 injuries in Crawford County since 1993 and resulted in \$61,000 in property damage. On record, Crawford County has had 277 thunderstorm events from 1955-2009 resulting in 1 death, 5 injuries, and totaling \$12.6 million dollars in property damage. Due to the high volume of thunderstorm events in Crawford County, many of which resulted in no damage, summarized in **Table 4-19** are the ten most severe (in terms of property damage, death, and injury) thunderstorm events to strike Crawford County since 1955.

Table 4-19: Ten Most Severe Thunderstorms in Crawford County (1955-2009) in terms of Death, Injury, & Property Damage						
#	Location	Date	Magnitude (Wind Speed)	Death	Injury	Property Damage
1	Conneaut Lake	06/10/1999	Unknown	1	1	\$10,000
2	Countywide	02/12	60 MPH	0	0	\$1,500,000
3	Linesville, Meadville	07/09/1999	85 MPH	0	0	\$1,400,000
4	Countywide	11/12/2003	72 MPH	0	0	\$800,000
5	Conneautville/Countywide	07/14/2004	75 MPH	0	0	\$750,000
6	Meadville/Countywide	03/09/2002	60 MPH	0	0	\$550,000
7	Conneaut Lake/Countywide	12/12/2000	103 MPH	0	0	\$550,000
8	Countywide	11/28/1994	75 MPH	0	0	\$500,000
9	Venango	08/10/2009	70 MPH	0	0	\$500,000
10	Meadville/Countywide	02/04/2003	53 MPH	0	0	\$350,000
11-277	Countywide	N/A	N/A	0	4	\$5,687,000
TOTAL				1	5	\$12.597 Million

Table 4-20 summarizes recorded lightning strikes in Crawford County since 1993.

Table 4-20: Lightning Strikes on Record						
#	Location	Date	Magnitude	Death	Injury	Property Damage
1	Westford	09/02/1993	N/A	0	0	\$5,000
2	Meadville	09/02/1993	N/A	0	0	\$1,000
3	Meadville	06/11/1994	N/A	0	0	\$50,000
4	Meadville	06/12/1998	N/A	0	0	\$5,000
5	Cochranon	06/10/1999	N/A	0	2	\$0
TOTAL						\$61,000

Since 1970, there have been 104 recorded hail events in Crawford County. **Table 4-21** summarizes the then most severe hail events based on property damage.

Table 4-21: Ten Most Severe Hail Events in Crawford County (1970-2009) in terms of Property Damage						
#	Location	Date	Magnitude (Diameter)	Death	Injury	Property Damage
1	Meadville	09/25/1994	3.80 in	0	0	\$500,000
2	Titusville	07/26/2008	1.75 in	0	0	\$250,000
3	Hydetown	07/26/2008	1.75 in	0	0	\$150,000
4	Titusville	07/26/2008	1.75 in	0	0	\$75,000
5	Titusville	06/09/2004	1.75 in	0	0	\$50,000
6	Cambridge Springs	04/28/2002	1.75 in	0	0	\$35,000
7	Guys Mills	07/07/1996	2.00 in	0	0	\$30,000
8	Saegertown	06/25/2009	1.00 in	0	0	\$15,000
9	Springboro	05/25/2002	1.00 in	0	0	\$10,000
10	Meadville	04/15/2002	1.00 in	0	0	\$10,000
11-104	Countywide	N/A	N/A	0	0	\$53,000
TOTAL				0	0	\$1,178,000

4.3.3.1. FUTURE OCCURRENCE

Within Pennsylvania, the annual average number of thunder and lightning events, in a given area, can expect ranges between 40-70 events per year (FEMA, 1997). The probability of the county and its municipalities experiencing lightning and thunderstorms, although frequent, can be difficult to quantify, but based on historical record of 277 thunderstorm events since 1955, it can reasonably be assumed that this type of event has occurred once every 0.19 years from 1955 through 2009.

[(Current Year) 2009] subtracted by [(Historical Year) 1950] = 54 Years on Record

[(Years on Record) 54] divided by [(Number of Historical Events) 277] = 0.19

Furthermore, the historic frequency calculates that there is a 512.96% chance of this type of event occurring each year.

The probability of the county and its municipalities experiencing hail is, like most severe weather, difficult to predict and/or quantify, but based on historical record of 104 hail events since 1970, it can be reasonably assumed that this type of event has occurred once every 0.38 years from 1970 through 2009.

[(Current Year) 2009] subtracted by [(Historical Year) 1970] = 39 Years on Record

[(Years on Record) 39] divided by [(Number of Historical Events) 104] = 0.38

Furthermore, the historic frequency calculates that there is a 266.67% chance of a hail event occurring each year.

A timely forecast may not be able to mitigate the property loss, but could reduce the casualties. It appears possible to forecast these extreme events with some skill, but further research needs to be done to test the existing hypothesis about the interaction between the convective storm and its environment that produces the extensive swath of high winds. Severe thunderstorms will remain a highly likely occurrence for Crawford County. Lightning and hail may also be experienced in the area due to such storms.

4.3.3.1. VULNERABILITY ASSESSMENT

RISK FACTOR (RF) Value: 2.4

According to the qualitative assessment performed using the RF tool, the lightning/severe thunderstorm hazard scored a RF value of 2.4 (from a scale of 0 to 4, with 4 being the highest risk level). **Table 4-22** summarizes the risk levels assigned to each RF category.

Table 4-22: Qualitative Assessment for Lightning/Severe Thunderstorm				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
3	2	3	2	1

Historical evidence shows Crawford County is vulnerable to severe thunderstorm activity, including related hazardous elements such as lightning and hail that often accompany these severe weather events. Many of the critical facilities, although adequate for most events may not be able to withstand 160 MPH winds, as recommended by FEMA. Most structures should be able to provide adequate protection from hail but the structures could suffer broken windows and dented exteriors. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out.

FUTURE VULNERABILITY

All future structures built in Crawford County will likely be exposed to severe thunderstorms, lightning and hail and may experience damage. Since the previous statement is assumed to be uniform countywide, the location of development does not increase or reduce the risk necessarily. Crawford County and its jurisdictions need to adhere to building codes, and therefore, new development can be built to current standards for wind resistance. Additionally, as homes go up in more remote parts of the county, accessing those rural residents may become impossible should sheltering or emergency services be needed in an extreme event.

4.3.4. SEVERE WINTER WEATHER

Crawford County has been impacted by varying degrees of winter weather over the last century; however; the occurrence of severe winter weather in the county is relatively common during winter months. Severe winter weather can cause hazardous driving conditions, communications and electrical power failure, community isolation and can adversely affect business continuity. This type of severe weather may include one or more of the following winter factors:

Blizzards, as defined by the National Weather Service, are a combination of sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling or blowing snow for 3 hours or more. A blizzard, by definition, does not indicate heavy amounts of snow, although they can happen together. The falling or blowing snow usually creates large drifts from the strong winds. The reduced visibilities make travel, even on foot, particularly treacherous. The strong winds may also support dangerous wind chills. Ground blizzards can develop when strong winds lift snow off the ground and severely reduce visibilities.

Heavy snow, in large quantities, may fall during winter storms. Six inches or more in 12 hours or eight inches or more in 24 hours constitutes conditions that may significantly hamper travel or create hazardous conditions. The National Weather Service issues warnings for such events. Smaller amounts can also make travel hazardous, but in most cases, only results in minor inconveniences. Heavy wet snow before the leaves fall from the trees in the fall or after the trees have leafed out in the spring may cause problems with broken tree branches and power outages.

Ice storms develop when a layer of warm (above freezing), moist air aloft coincides with a shallow cold (below freezing) pool of air at the surface. As snow falls into the warm layer of air, it melts to rain, and then freezes on contact when hitting the frozen ground or cold objects at the surface, creating a smooth layer of ice. This phenomenon is called freezing rain. Similarly, sleet occurs when the rain in the warm layer subsequently freezes into pellets while falling through a cold layer of air at or near the Earth's surface.



Extended periods of freezing rain can lead to accumulations of ice on roadways, walkways, power lines, trees, and buildings. Almost any accumulation can make driving and walking hazardous. Thick accumulations can bring down trees and power lines.

Extreme Cold, in extended periods, frequently occurs throughout the winter months in Crawford County. Heating systems compensate for the cold outside. Most people limit their time outside during

extreme cold conditions, but common complaints usually include pipes freezing and cars refusing to start. When cold temperatures and wind combine, dangerous wind chills can develop.

Wind chill is how cold it “feels” and is based on the rate of heat loss on exposed skin from wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature, and eventually, internal body temperature. Therefore, the wind makes it feel much colder than the actual temperature. For example, if the temperature is 0°F and the wind is blowing at 15 mph, the wind chill is -19°F. At this wind chill, exposed skin can freeze in 30 minutes. Wind chill does not affect inanimate objects. (National Weather Service)

To protect people and property, the National Weather Service issues informational products alerting the public to varying degrees of hazardous weather. The following products can be issued during hazardous winter weather:

- Winter Storm Watch: Winter storm watches are issued to give the public 12-48 hours of advance notice of the potential for snow 6 inches or more in 12 hours or 8 inches or more in 24 hours AND sustained or frequent wind gusts of 25-34 mph occasionally reducing visibilities to ¼ mile or less for three hours or more.
- Winter Weather Advisory: Winter weather advisories are issued when a combination of winter weather elements that may cause significant inconveniences are occurring, imminent, or have a high probability of occurring.
- Winter Storm Warning: Winter storm warnings are generally issued when snow 6 inches or more in 12 hours or 8 inches or more in 24 hours AND sustained or frequent wind gusts of 25-34 mph occasionally reducing visibilities to ¼ mile or less for three hours or more are occurring, imminent, or have a high probability of occurring.
- Blizzard Watch: Blizzard watches are issued to give the public 12-48 hours of advance notice of possible blizzard conditions (sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling and/or blowing snow for 3 hours or more).
- Blowing Snow Advisory: Blowing snow advisories are issued for visibilities intermittently at or below ½ mile because of blowing snow.
- Blizzard Warning: Blizzard warnings are issued when blizzard conditions (sustained winds or frequent gusts of 35 mph or greater and visibilities of less than a quarter mile from falling and/or blowing snow for 3 hours or more) are occurring, imminent, or have a high probability of occurring.
- Freezing Rain Advisory: Freezing rain advisories are issued when an accumulation of ice will make roads and sidewalks slippery, but significant and damaging accumulations of ice are not expected.

- Ice Storm Warning: Ice storm warnings are issued when a significant and damaging accumulation of ice is occurring, imminent, or has a high probability of occurring.
- Snow Advisory: Snow advisories are issued when snow accumulations of 2-5 inches in 12 hours are expected.
- Sleet Advisory: Sleet advisories are issued when sleet accumulations causing hazardous conditions are expected.
- Heavy Snow Warning: Heavy snow warnings are issued when snow accumulations of 6 inches or more in 12 hours or 8 inches or more in 24 hours are expected.
- Wind Chill Watch: Wind chill watches are issued to give the public 12-48 hours advanced notice of the potential for wind chills of -40°F or colder with a wind speed of 10 mph or higher and a duration of 6 hours or more.
- Wind Chill Advisory: Wind chill advisories are issued when wind chills of -20°F to -39°F with a wind speed of 10 mph or higher and a duration of 6 hours or more are expected.
- Wind Chill Warning: Wind chill warnings are issued when wind chills of -40°F or colder with a wind speed of 10 mph or higher and duration of 6 hours or more are expected.

4.3.4.1. LOCATION AND EXTENT

The science of meteorology and records of severe weather are not quite sophisticated enough to identify what areas of the county are at greater risk for damages. Therefore, all areas of the county are assumed to have the same severe weather risk countywide.

4.3.4.2. RANGE OF MAGNITUDE

Severe winter weather can result in the closing of primary and secondary roads, particularly in rural locations, loss of utility services, and depletion of oil heating supplies. Environmental impacts often include damage to shrubbery and trees due to heavy snow loading, ice build-up, and/or high winds which can break limbs or even bring down large trees. Gradual melting of snow and ice provides excellent groundwater recharge; however, high temperatures following a heavy snowfall can cause rapid surface water runoff and severe flooding.

4.3.4.3. PAST OCCURRENCE

The Commonwealth of Pennsylvania has a long history of severe winter weather. In the winter of 1993-1994, 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.

More specifically, winter weather is a common occurrence in Crawford County throughout the late fall, winter, and early spring months. According to the National Climatic Data Center, there have been 113 winter events in Crawford County since 1950. Data indicates that one death has occurred as a result of winter storm activity since 1950. Details surrounding the death could not be found in the data used to compile the listing below.

Table 4-23: Crawford County's Winter Events since 1950 (in terms of Property Damage)						
#	Location	Date	Type	Death	Injury	Property Damage
1	County (West)	01/21/1993	Ice	0	0	0
2	Countywide	02/16/1993	Heavy Snow	0	0	\$5,000
3	County (West)	02/23/1993	Heavy Snow	0	0	0
4	Countywide	03/04/1993	Heavy Snow	0	0	0
5	Countywide	10/31/1993	Heavy Snow	0	0	\$5,000
6	County (North)	12/21/1993	Heavy Snow	0	0	0
7	County (North)	12/25/1993	Heavy Snow	0	0	0
8	Countywide	01/04/1994	Heavy Snow	0	185	\$5,000,000
9	Countywide	01/17/1994	Heavy Snow	0	0	\$500,000
10	Countywide	03/02/1994	Heavy Snow	0	1	\$5,000,000
11	Countywide	03/10/1994	Heavy Snow	0	0	0
12	Countywide	11/23/1994	Heavy Snow	0	0	0
13	Countywide	01/04/1995	Heavy Snow	0	0	0
14	Countywide	01/07/1995	Ice	0	0	0
15	Countywide	02/05/1995	Heavy Snow	0	0	0
16	Countywide	02/15/1995	Ice	0	0	0
17	County (North)	11/04/1995	Heavy Snow	0	0	\$5,000
18	County (North)	11/15/1995	Heavy Snow	0	0	\$10,000
19	County (North)	11/21/1995	Heavy Snow	0	0	0
20	Countywide	12/10/1995	Heavy Snow	0	0	0
21	County (North)	12/13/1995	Ice Storm	0	0	\$5,000
22	Meadville	12/16/1995	Snow/Ice	0	0	\$30,000
23	County (North)	12/19/1995	Heavy Snow	0	0	\$80,000
24	County (North)	12/20/1995	Heavy Snow	0	0	\$4,000
25	County (North)	12/25/1995	Heavy Snow	0	0	\$3,000
26	Countywide	01/02/1996	Heavy Snow	1	0	\$210,000
27	Countywide	01/09/1996	Heavy Snow	0	0	\$8,000
28	Countywide	03/02/1996	Heavy Snow	0	0	\$15,000

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29	Countywide	11/09/1996	Heavy Snow	0	0	\$4,000,000
30	Countywide	11/26/1996	Heavy Snow	0	0	0
31	Countywide	12/24/1996	Heavy Snow	0	0	0
32	Countywide	01/06/1997	Heavy Snow	0	0	0
33	Countywide	01/16/1997	Heavy Snow	0	0	0
34	Countywide	01/26/1997	Heavy Snow	0	0	0
35	Countywide	02/13/1997	Heavy Snow	0	0	0
36	Countywide	03/06/1997	Heavy Snow	0	0	0
37	Countywide	03/07/1997	Heavy Snow	0	0	0
38	Countywide	10/22/1997	Heavy Snow	0	0	\$50,000
39	Countywide	11/14/1997	Ice Storm	0	0	\$30,000
40	Countywide	11/15/1997	Heavy Snow	0	0	0
41	Countywide	12/05/1997	Heavy Snow	0	0	\$225,000
42	Countywide	12/30/1997	Heavy Snow	0	0	0
43	Countywide	01/13/1998	Glaze	0	13	0
44	Countywide	03/10/1998	Heavy Snow	0	0	0
45	Countywide	03/14/1998	Heavy Snow	0	0	0
46	Countywide	12/16/1998	Heavy Snow	0	0	0
47	Countywide	12/21/1998	Heavy Snow	0	0	0
48	Countywide	12/30/1998	Heavy Snow	0	0	0
49	Countywide	01/02/1999	Winter Storm	0	14	\$90,000
50	Countywide	01/08/1999	Winter Storm	0	0	0
51	Countywide	01/13/1999	Winter Storm	0	0	\$15,000
52	Countywide	01/14/1999	Heavy Snow	0	0	0
53	Countywide	01/16/1999	Heavy Snow	0	0	\$150,000
54	Countywide	02/12/1999	Heavy Snow	0	0	0
55	Countywide	03/03/1999	Heavy Snow	0	0	0
56	Countywide	03/05/1999	Heavy Snow	0	0	\$60,000
57	Countywide	12/23/1999	Heavy Snow	0	0	\$450,000
58	Countywide	12/27/1999	Heavy Snow	0	0	0
59	Countywide	01/21/2000	Heavy Snow	0	0	\$40,000
60	Countywide	11/20/2000	Heavy Snow	0	0	\$500,000
61	Countywide	11/21/2000	Heavy Snow	0	0	\$900,000
62	Countywide	12/05/2000	Heavy Snow	0	0	\$35,000
63	Countywide	12/06/2000	Heavy Snow	0	0	\$60,000
64	Countywide	12/12/2000	Heavy Snow	0	0	\$100,000
65	Countywide	12/13/2000	Heavy Snow	0	0	\$350,000
66	Countywide	12/24/2000	Heavy Snow	0	0	\$130,000
67	Countywide	12/27/2000	Heavy Snow	0	0	\$120,000
68	Countywide	01/05/2001	Heavy Snow	0	0	\$40,000
69	Countywide	01/27/2001	Heavy Snow	0	0	\$20,000
70	Countywide	02/02/2001	Heavy Snow	0	0	\$30,000
71	Countywide	03/05/2001	Heavy Snow	0	0	\$125,000
72	Countywide	03/26/2001	Heavy Snow	0	0	\$180,000
73	Countywide	12/20/2001	Heavy Snow	0	0	0

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74	Countywide	12/28/2001	Heavy Snow	0	0	\$850,000
75	Countywide	02/04/2002	Heavy Snow	0	0	0
76	Countywide	02/27/2002	Heavy Snow	0	0	\$1, 200,000
77	Countywide	03/03/2002	Heavy Snow	0	0	\$225,000
78	Countywide	03/22/2003	Heavy Snow	0	0	\$300,000
79	Countywide	03/24/2004	Heavy Snow	0	0	\$200,000
80	Countywide	11/30/2004	Heavy Snow	0	0	\$250,000
81	Countywide	12/01/2004	Heavy Snow	0	0	\$225,000
82	Countywide	12/24/2002	Heavy Snow	0	0	\$500,000
83	Countywide	01/10/2003	Heavy Snow	0	0	\$60,000
84	Countywide	12/05/2004	Winter Storm	0	0	\$150,000
85	Countywide	12/17/2003	Heavy Snow	0	0	\$1,000,000
86	Countywide	01/06/2004	Heavy Snow	0	0	\$1,100,000
87	Countywide	01/14/2004	Winter Storm	0	0	\$900,000
88	Countywide	01/19/2004	Heavy Snow	0	0	\$500,000
89	Countywide	01/27/2004	Winter Storm	0	0	\$800,000
90	Countywide	03/12/2004	Heavy Snow	0	0	\$125,000
91	Countywide	03/16/2004	Heavy Snow	0	0	\$900,000
92	Countywide	04/04/2004	Heavy Snow	0	0	\$275,000
93	Countywide	12/13/2004	Heavy Snow	0	0	\$550,000
94	Countywide	12/22/2004	Winter Storm	0	0	\$2,600,000
95	Countywide	01/05/2005	Winter Storm	0	0	\$1,700,000
96	Countywide	01/22/2005	Winter Storm	0	0	\$650,000
97	Countywide	02/20/2005	Heavy Snow	0	0	\$15,000
98	Countywide	03/01/2005	Winter Storm	0	0	\$600,000
99	Countywide	04/02/2005	Winter Storm	0	0	\$1,100,000
100	Countywide	11/24/2005	Winter Storm	0	0	\$300,000
101	Countywide	02/05/2006	Heavy Snow	0	0	\$225,000
102	Countywide	02/13/2006	Heavy Snow	0	0	\$300,000
103	Countywide	02/05/2006	Winter Storm	0	0	\$300,000
104	Countywide	02/13/2007	Winter Storm	0	0	\$30,000
105	Countywide	03/16/2007	Heavy Snow	0	0	\$50,000
106	Countywide	12/15/2007	Winter Storm	0	0	\$200,000
107	Countywide	01/01/2008	Winter Storm	0	0	\$50,000
108	Countywide	02/12/2008	Winter Storm	0	0	\$50,000
109	Countywide	02/26/2008	Winter Storm	0	0	\$200,000
110	Countywide	03/04/2008	Winter Storm	0	0	\$1,000,000
111	Countywide	03/07/2008	Winter Storm	0	0	\$600,000
112	Countywide	12/19/2008	Winter Storm	0	0	\$30,000
113	Countywide	01/27/2007	Winter Storm	0	0	\$700,000
TOTAL				1	213	\$38,190,000

4.3.4.4. FUTURE OCCURRENCE

Reported severe winter weather events over the past 60 years provide an acceptable framework for determining the future occurrence in terms of frequency for such events. The probability of the county and its municipalities experiencing severe winter weather, although frequent, can be difficult to quantify, but based on historical record of 113 winter events since 1950, it can reasonably be assumed that this type of event has occurred once every 0.52 years from 1950 through 2009.

[(Current Year) 2009] subtracted by [(Historical Year) 1950] = 59 Years on Record

[(Years on Record) 59] divided by [(Number of Historical Events) 113] = 0.52

Furthermore, the historic frequency calculates that there is a 191.53% chance of this type of event occurring each year.

4.3.4.5. VULNERABILITY ASSESSMENT

RISK FACTOR (RF) Value: 3.0

According to the qualitative assessment performed using the RF tool, the severe winter weather hazard scored a RF value of 3.0 (from a scale of 0 to 4, with 4 being the highest risk level). **Table 4-24** summarizes the risk levels assigned to each RF category.

Table 4-24: Qualitative Assessment for Severe Winter Weather				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
4	2	4	1	3

EXISTING VULNERABILITY

Similar to the vulnerability assessment discussion for tornadoes and severe wind, vulnerability to the effects of winter storms on buildings is dependent on the age of the building type, construction material used, and condition of the structure. Heavy snow loads on roofs, particularly large span roofs, can cause roofs to leak or even collapse depending on their construction. Extremely cold temperatures may cause pipes to freeze and subsequently burst, causing water damage.

Probably the greatest issue for critical facilities during significant winter weather is the inaccessibility of such facilities due to poor roadways, utility outages, or dangerous wind chills. During periods of heavy snow, ice, or blizzards, roads can quickly become impassable, stranding motorists and isolating communities. Long term road closures during an extended cold period may diminish and threaten propane and fuel supplies. Possible losses to critical infrastructure include:

- Electric power disruption
- Communication disruption
- Water and fuel shortages

- Road closures
- Damaged infrastructure components, such as sewer lift stations and treatment plants

Debris may also block roadways making transportation and commerce difficult if not impossible. Those facilities with back-up generators are better equipped to handle a severe weather situation should the power go out.

An extended power outage during winter may make many homes and offices unbearably cold. Additionally, during extended winter-time power outages, people often make the mistake of bringing portable generators inside or not venting them properly, leading to carbon monoxide poisoning. With poor road conditions, sheltering residents may present significant logistical challenges with getting people to heated facilities, feeding, and providing medical care. These situations, accompanied by stranded motorists that need to be rescued, represent significant threats to the population.

Additional information on construction type and building codes enforced at time of construction would allow a more thorough assessment of the vulnerability of structures to winter storm impacts such as severe wind and heavy snow loading. Based on the information available, all communities in Crawford County are essentially equally vulnerable to the direct impacts of winter storms.

FUTURE VULNERABILITY

All future structures built in Crawford County will likely be exposed to severe winter weather damage. Since the previous statement is assumed to be uniform countywide, the location of development does not increase or reduce the risk necessarily. Crawford County and its jurisdictions need to adhere to building codes, and therefore, new development can be built to current standards to account for heavy snow loads. Additionally, as homes go up in more remote parts of the county, accessing those rural residents may become impossible should sheltering or emergency services be needed in an extreme event.

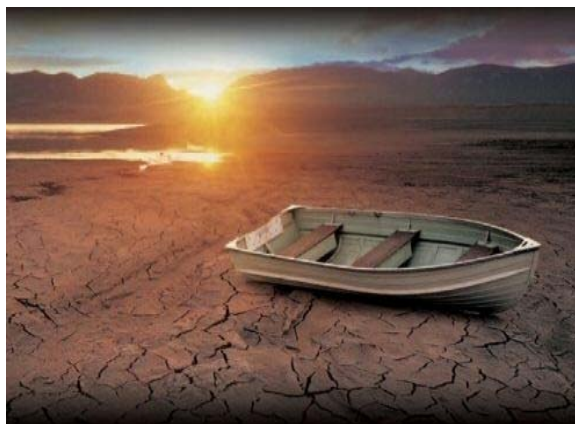
4.3.5. DROUGHT

Drought is one of the most complicated and least understood of all natural hazards.

Drought is defined as an extended period of unusually dry weather. Drought is a special type of disaster because its occurrence does not require evacuation of an area nor does it constitute an immediate threat to life or property. People are not suddenly rendered homeless or without food and clothing. The primary impact of a drought is economic hardship, but it does, in the end, resemble other types of disasters in that victims can be deprived of their livelihoods, and communities can suffer economic decline.

The following is an excerpt from the National Drought Mitigation Center: *Drought is an insidious hazard of nature. Although it has scores of definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as “normal”. It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity.* (National Drought Mitigation Center, 2009)

Droughts can range from minor to severe, short-term to long-term with a variety of determining factors such as precipitation, soil moisture, and river levels. A minor, short-term drought can slip by unnoticed while a long-term severe drought can impact the agricultural economy, natural resources, and even public water supplies. Monitoring of drought conditions occurs nationally, and various indices, such as the Palmer Index, indicate the level of drought.



The effects of drought become apparent with a longer duration because more and more moisture related activities are affected. Non-irrigated croplands are most susceptible to moisture shortages. Rangeland and irrigated agricultural lands do not feel the effects as quickly as the non-irrigated, cultivated acreage, but their yields can also be greatly reduced due to drought. Reductions in yields due to moisture shortages are often aggravated by wind-induced soil erosion.

In periods of severe drought, forest and range fires can destroy the economic potential of the livestock industry and wildlife habitat in and adjacent to the fire areas. Under extreme drought conditions, lakes, reservoirs, and rivers can be subject to severe water shortages, which greatly restrict the use of their water supplies. An additional hazard resulting from drought conditions can be insect infestation.

Related to drought-like conditions, the National Weather Service can issue the following products:

- **Blowing Dust Advisory**: Blowing dust advisories are issued for widespread or localized blowing dust reducing visibilities to less than a mile but greater than ¼ mile with sustained winds of 25 mph or greater.
- **Dust Storm Warning**: Dust storm warnings are issued when widespread or localized blowing dust reduces visibilities to less than ¼ mile with sustained winds of 25 mph or greater.
- **Heat Advisory**: A heat advisory is issued when conditions are favorable for heat index values reaching 105 or greater for three days or more.
- **Heat Warning**: A heat warning is issued when high temperatures are expected to be over 105°F and low temperatures are expected to be over 80°F for three days or more.

4.3.5.1. LOCATION AND EXTENT

Drought risk is based on a combination of the frequency, severity, and spatial extent of drought (the physical nature of drought) and the degree to which a population or activity is vulnerable to the effects of drought. The degree of a Crawford County's vulnerability to drought depends on the environmental and social characteristics of the region and is measured by its ability to anticipate, cope with, resist, and recover from drought.

Because drought is usually considered a regional hazard, it is not enhanced or analyzed by county-level mapping. All county areas are assumed to have the same risk level within Crawford County. Mapping of the current drought status is published by the National Integrated Drought Information System (NIDIS): U.S. Drought Portal which can be found online at: www.drought.gov

The Pennsylvania Department of Environmental Protection also publishes up-to-date status information on drought and can be found online at:

http://www.portal.state.pa.us/portal/server.pt/community/drought_information/10606

4.3.5.2. RANGE OF MAGNITUDE

Drought is a normal part of virtually every climate on the planet, even rainy ones. It is the most complex of all natural hazards, and it affects more people than any other hazard. Analysis shows that it can be as expensive as floods and hurricanes. The impacts of drought are greater than the impacts of any other natural hazard. They are estimated to be \$6-8 billion annually in the United States and occur primarily

in agriculture, transportation, recreation and tourism, forestry, and energy sectors (FEMA Multi-Hazard Risk Assessment Report, 1997). Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts. (National Drought Mitigation Center, 2006)

The Standardized Precipitation Index (SPI) is a drought index based on the probability of an observed precipitation deficit occurring over a given prior time period. The assessment periods considered range from 1 to 36 months. The variable time scale allows the SPI to describe drought conditions important for a range of meteorological, agricultural, and hydrological applications. For example, soil moisture conditions respond to precipitation deficits occurring on a relatively short time scale, whereas groundwater, streamflow, and reservoir storage respond to precipitation deficits arising over many months.

The Palmer Drought Severity Index (PDSI) was developed by Wayne Palmer in the 1960s and uses temperature and rainfall information in a formula to determine dryness. It has become the semi-official drought index. The Palmer Index is most effective in determining long term drought—a matter of several months—and is not as good with short-term forecasts (a matter of weeks). It uses a 0 as normal, and drought is shown in terms of minus numbers; for example, minus 2 is moderate drought, minus 3 is severe drought, and minus 4 is extreme drought. At present (December 2009), northwest Pennsylvania is at positive 3.0 to 3.9 (very moist spell).

The Palmer Index can also reflect excess rain using a corresponding level reflected by plus figures; i.e., 0 is normal, plus 2 is moderate rainfall, etc. The advantage of the Palmer Index is that it is standardized to local climate, so it can be applied to any part of the country to demonstrate relative drought or rainfall conditions. The negative is that it is not as good for short term forecasts, and is not particularly useful in calculating supplies of water locked up in snow, so it works best east of the Continental Divide.

Table 4-25: Drought Severity Classification					
DROUGHT SEVERITY	RETURN PERIOD (YEARS)	DESCRIPTION OF POSSIBLE IMPACTS	DROUGHT MONITORING INDICES		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme	18 to 43	Major crop and pasture losses; extreme fire	-1.6 to -1.9	D3	-4.0 to -4.9

Drought		danger; widespread water shortages or restrictions			
Exceptional Drought	44 +	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies	Less than -2	D4	-5.0 or less

*NDMC: National Drought Mitigation Center

4.3.5.3. PAST OCCURRENCE

According to the National Climatic Data Center, drought has caused no significant property damage loss since 1950. Summarized in **Table 4-26** are drought events that have occurred since 1950.

Table 4-26: Drought Events in Crawford County since 1950						
#	Location	Date	Type	Death	Injury	Agricultural Damage
1	Northwest Pennsylvania	09/01/1995	Drought	0	0	\$0
2	Northwest Pennsylvania	10/01/1995	Drought	0	0	\$0
3	Northwest Pennsylvania	08/01/1996	Drought	0	0	\$0
4	Northwest Pennsylvania	06/01/1999	Drought	0	0	\$0
5	Northwest Pennsylvania	07/01/1999	Drought	0	0	\$0
6	Northwest Pennsylvania	08/01/1999	Drought	0	0	\$0
7	Northwest Pennsylvania	09/01/1999	Drought	0	0	\$0
TOTAL				0	0	\$0.00

4.3.5.4. FUTURE OCCURENCE

Because there is no single definition for drought, its onset and termination are difficult to determine. We can, however, identify various indicators of drought, and tracking these indicators provides us with a crucial means of monitoring drought.

The National Oceanic and Atmospheric Administration Paleoclimatology Program studies drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical documents, and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, "...paleoclimatic data suggest that droughts as severe as the 1950's drought have occurred in central North America several times a century over the past 300-400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have occurred in parts of North America as recently as 500 years ago." Based on this research, the 1950's drought situation could be expected approximately once every 50 years or a 20% chance every ten years. An extreme drought, worse than the 1930's "Dust Bowl," has an approximate probability of occurring once every 500 years or a 2% chance of occurring each decade. (National Oceanic and Atmospheric Administration, 2003)

A 500-year drought with a magnitude similar to that of the 1930's that destroys the agricultural economy and leads to wildfires is an example of a high magnitude event. The Palmer Index, an index used by the Climate Prediction Center to measure long-term drought, has frequently had southwest Montana in the "extreme drought" category over the past several years.

Understanding the historical frequency, duration, and spatial extent of drought assists in determining the likelihood and potential severity of future droughts. The characteristics of past droughts provide benchmarks for projecting similar conditions into the future. Based on historical record of 7 drought events since 1950, it can reasonably be assumed that this type of event has occurred once every 8.43 years from 1950 through 2009.

[(Current Year) 2009] subtracted by [(Historical Year) 1950] = 59 Years on Record

[(Years on Record) 59] divided by [(Number of Historical Events) 7] = 8.43

Furthermore, the historic frequency calculates that there is a 11.86% chance of this type of event occurring each year.

4.3.5.5. VULNERABILITY ASSESSMENT

Risk Factor (RF) Value: 2.1

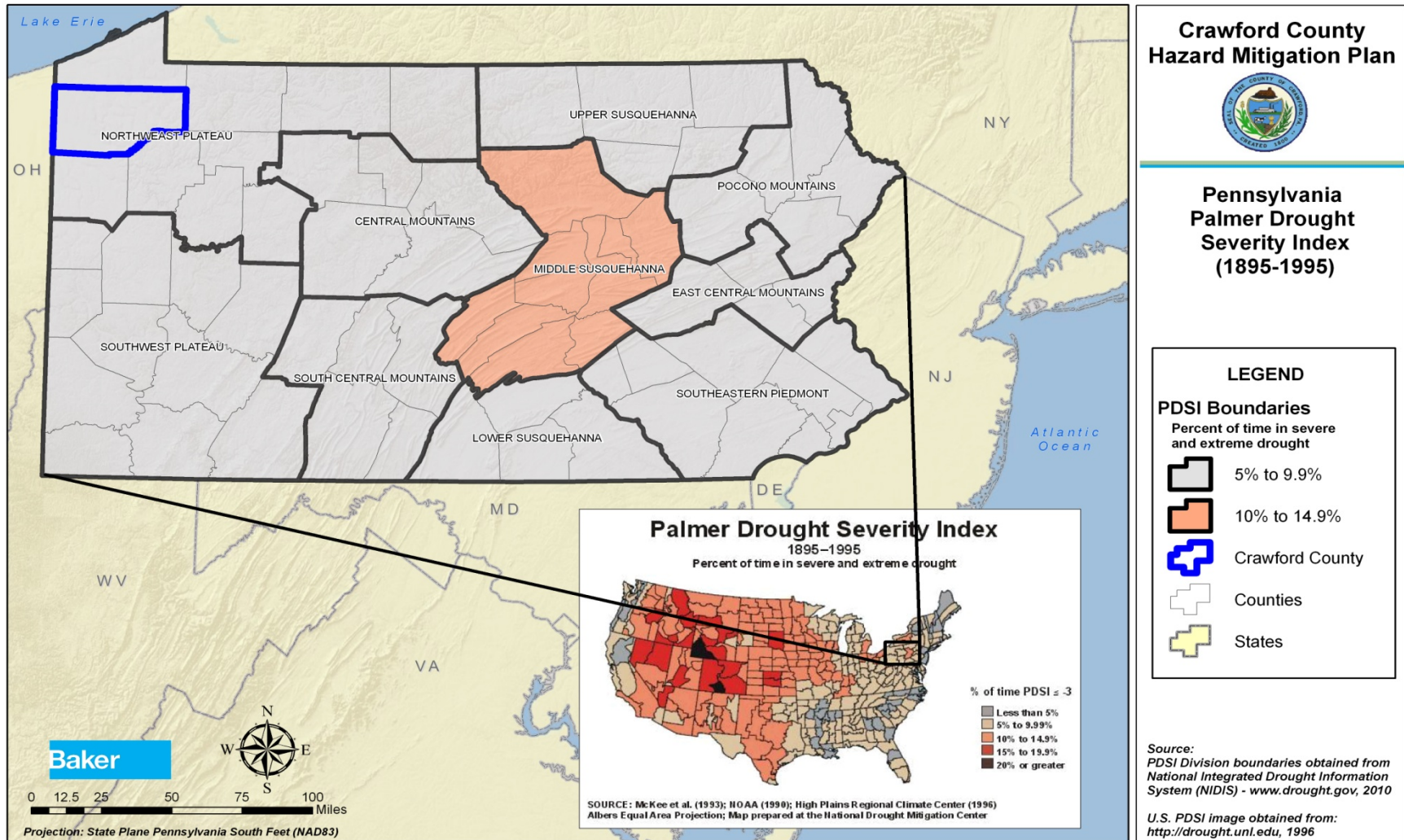
According to the qualitative assessment performed using the RF tool, the drought hazard scored a RF value of 2.1. **Table 4-27** summarizes the risk levels assigned to each RF category.

Table 4-27: Qualitative Assessment for Drought				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
2	1	4	1	4

EXISTING VULNERABILITY

Based on data ranging from 1895 to 1995, Crawford County is in severe or extreme drought approximately 5 to 9.99% of the time (see **Figure 4-16**)

Figure 4-16: Pennsylvania Palmer Drought Severity Index (Crawford County Highlighted in Blue)



Drought typically does not have a direct impact on critical facilities or structures. However possible losses/impacts to critical facilities include the loss of critical function due to low water supplies. Severe droughts can negatively affect drinking water supplies. Should a public water system be affected, the losses could total into the millions of dollars if outside water is shipped in. Private springs/wells could also dry up. Possible losses to infrastructure include the loss of potable water.

Society's vulnerability to drought is affected by (among other things) population growth and shifts, urbanization, demographic characteristics, technology, water use trends, government policy, social behavior, and environmental awareness. These factors are continually changing, and society's vulnerability to drought may rise or fall in response to these changes. For example, increasing and shifting populations put increasing pressure on water and other natural resources—more people need more water.

But a drought evolves slowly over time and the population typically has ample time to prepare for its effects. Should a drought affect the water available for public water systems or individual wells, the availability of clean drinking water could be compromised. This situation would require emergency actions and could possibly overwhelm the local government and financial resources.

FUTURE VULNERABILITY

Future development's greatest impact on the drought hazard would possibly be to ground water resources. New water and sewer systems or significant well and septic sites could use up more of the water available, particularly during periods of drought. Fortunately, public water systems are monitored, but individual wells and septic systems are not as strictly regulated. Therefore, future development could have an impact on the drought vulnerabilities.

4.3.6. LANDSLIDES

A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation, which is driven by gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, volcanic eruptions, and changes in groundwater levels.

There are several types of landslides: rock falls, rock topple, slides, and flows. Rock falls are rapid movements of bedrock, which result in bouncing or rolling. A topple is a section or block of rock that rotates or tilts before falling to the slope below. Slides are movements of soil or rock along a distinct surface of rupture, which separates the slide material from the more stable underlying material.

Mudflows, sometimes referred to as mudslides, mudflows, lahars or debris avalanches, are fast-moving rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as heavy rainfall or rapid snowmelt, changing the soil into a flowing river of mud or "slurry." Slurry can flow rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way. As the flows reach flatter ground, the mudflow spreads over a broad area where it can accumulate in thick deposits.



Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Among the most destructive types of debris flows are those that accompany volcanic eruptions. A spectacular example in the United States was a massive debris flow resulting from the 1980 eruptions of Mount St. Helens, Washington. Areas near the bases of many volcanoes in the Cascade Mountain Range of California, Oregon and Washington are at risk from the same types of flows during future volcanic eruptions.

Areas that are generally prone to landslide hazards include previous landslide areas; the bases of steep slopes; the bases of drainage channels; and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved in the past; relatively flat-lying areas away from sudden changes in slope; and areas at the top or along ridges, set back from the tops of slopes. In the United States, it is estimated that landslides cause up to \$2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

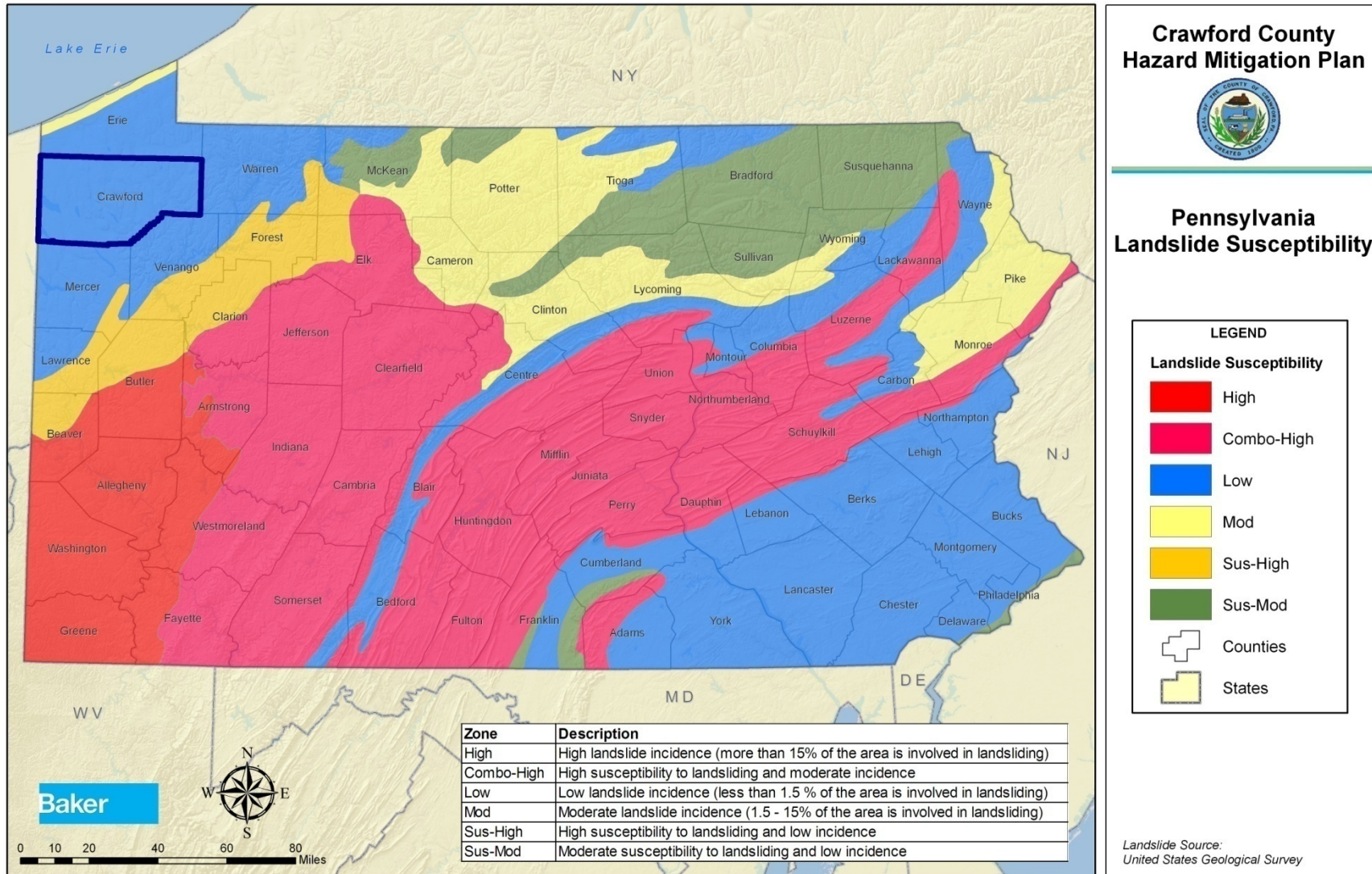
4.3.6.1. LOCATION AND EXTENT

Crawford County, located in Northwest Pennsylvania, has low susceptibility to the landslide hazard. However, southwestern Pennsylvania has by far the highest concentration of landslides throughout the commonwealth. Landslides occur primarily in colluvial (loose) soil and old landslide debris on steep slopes. Most major and minor highways have sections cut in rock or soil that can fail. Steep mountain slopes across the state have experienced debris avalanches associated with extreme rainfall or rain-on-snow events. Glacial and glacial-lake sediments underlie stream bank and lake bluff slumps and other failure areas across the much of the northern part of the state.

Urban and rural land development is increasing both the number of landslides and the economic effects of natural slides. Major highway construction with large excavations and fills located in mountainous areas creates potential for many landslides.

According to the United States Geological Survey (USGS), less than 1.5% of Crawford County is involved in landslide (see **Figure 4-17** below).

Figure 4-17 Illustrates Pennsylvania's Landslide Susceptibility



4.3.6.2. RANGE OF MAGNITUDE

Areas of the Commonwealth that have underlying mines are subject to subsidence and constitute a potential threat to people living in those areas. Isolated incidents throughout the coal regions over the years have been houses, garages, and trees swallowed up by subsidence holes. Lengths of local streets, highways, and countless building foundations have been damaged.

Landslides cause damage to transportation routes, utilities, and buildings, create travel delays and other side effects. Fortunately, deaths and injuries due to landslides are rare in Pennsylvania. Almost all of the known deaths due to landslides have occurred when boulders/rocks fall along highways and involve vehicles. Storm induced debris flows are the only other type of landslide likely to cause death and injury. Most landslides that do occur in Pennsylvania are moderate to slow moving and damage infrastructure rather than people.

The Pennsylvania Department of Transportation and large municipalities incur substantial costs due to landslide damage and to extra construction costs for new roads in known landslide-prone areas. A 1991 estimate showed an average of \$10 million per year is spent on landslide repair contracts across the Commonwealth and a similar amount is spent on mitigation costs for grading projects (DCNR, 2009).

4.3.6.3. PAST OCCURRENCE

There have been several landslides in the Commonwealth, but no other significant events of record in Crawford County. Landslide inventory maps were created in late 1970s and early 1980s by the U.S. Geological Survey as part of an Appalachians-wide study of landslides. These maps show landslides and related features that were identified mainly from aerial photographs; however, Crawford County was not included in this inventory (DCNR, 2009).

4.3.6.4. FUTURE OCCURRENCE

Landslides remain a possible occurrence in localized areas of Crawford County, but impacts from such an event would likely cause minimal localized damage and are unlikely. The USGS continues to devote fewer resources to landslide mapping (and no resources to landslide probability modeling) because landslides tend to have much more isolated impacts. Thus, according to **Figure 4-17**, the probability of Crawford County experiencing a landslide in a given year is low and would be typically localized.

4.3.6.5. VULNERABILITY ASSESSMENT

Most communities in Crawford County are not vulnerable to landslides. Any events that do occur would take place in steeply sloped areas. In addition, places where landforms have been altered for purposes of highway construction or other development may be uniquely vulnerable to landslide hazards. This is especially true if development is located at the base or crest of cliffs or near large highway cut-outs. Although considered low, the susceptibility of landslide is greatest in the southeastern area of the

county (Oil Creek Township, Troy Township, and Wayne Township). These areas should be considered vulnerable to landslides, particularly if mitigation measures have not been implemented.

Risk Factor (RF) Value: 1.1

According to the qualitative assessment performed using the RF tool, the landslide hazard scored a RF value of 1.1. **Table 4-29** summarizes the risk levels assigned to each RF category.

Table 4-29: Qualitative Assessment for Landslide				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
1	1	1	2	1

4.3.7. PANDEMIC

A disease epidemic occurs when there are more cases of that disease than normal. A pandemic is a worldwide epidemic of a disease. An influenza pandemic may occur when a new influenza virus appears against which the human population has no immunity. With the increase in global transport, as well as urbanization and overcrowded conditions in some areas, epidemics due to a new influenza virus are likely to take hold around the world, and become a pandemic faster than before. Pandemics can be either mild or severe in the illness and death they cause, and the severity of a pandemic can change over the course of that pandemic.

4.3.7.1. LOCATION AND EXTENT

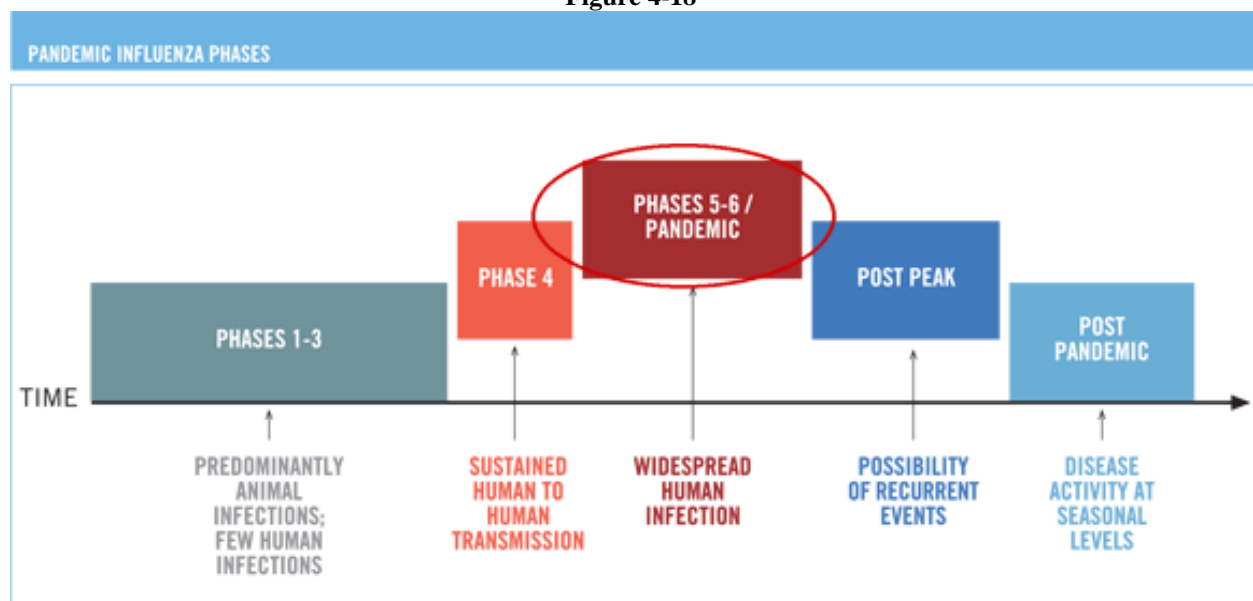
Pandemic events cover a wide geographical area and affect a large population. The exact size and extent of an infected population is dependent upon how easily the illness is spread, mode of transmission, and the amount of contact between infected and uninfected individuals. Crawford County is primarily concerned with the possibility of a pandemic flu outbreak. The H1N1 virus, colloquially known as swine flu, is of particular concern. This virus was first detected in people in the United States in April 2009. On June 11, 2009, the World Health Organization (WHO) signaled that a pandemic of 2009 H1N1 flu was underway (CDC, 2009).

4.3.7.2. RANGE OF MAGNITUDE

In the 2009 revision of the pandemic influenza phase descriptions, the World Health Organization has retained the use of a six-phased approach for easy incorporation of new recommendations and approaches into existing national preparedness and response plans. The grouping and description of pandemic phases have been revised to make them easier to understand, more precise, and based upon observable phenomena. See **Figure 4-18**.

Phases 1–3 correlate with preparedness, including capacity development and response planning activities, while Phases 4–6 clearly signal the need for response and mitigation efforts. Furthermore, periods after the first pandemic wave are elaborated to facilitate post pandemic recovery activities.

Figure 4-18



Source: World Health Organization (WHO), 2009

In nature, influenza viruses circulate continuously among animals, especially birds. Even though such viruses might theoretically develop into pandemic viruses, in **Phase 1**, no viruses circulating among animals have been reported to cause infections in humans.

In **Phase 2**, an animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans, and is therefore considered a potential pandemic threat.

In **Phase 3**, an animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver. However, limited transmission under such restricted circumstances does not indicate that the virus has gained the level of transmissibility among humans necessary to cause a pandemic.

Phase 4 is characterized by verified human-to-human transmission of an animal or human-animal influenza reassortant virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upwards shift in the risk for a pandemic. Any country that suspects or has verified such an event should urgently consult with WHO so that the situation can be jointly assessed and a decision made by the affected country if implementation of a rapid pandemic containment operation is warranted. **Phase 4** indicates a significant increase in risk of a pandemic but does not necessarily mean that a pandemic is a foregone conclusion.

Phase 5 is characterized by human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.

Phase 6, the pandemic phase, is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in **Phase 5**. Designation of this phase will indicate that a global pandemic is under way.

During the post-peak period, pandemic disease levels in most countries with adequate surveillance will have dropped below peak observed levels. The post-peak period signifies that pandemic activity appears to be decreasing; however, it is uncertain if additional waves will occur and countries will need to be prepared for a second wave.

Previous pandemics have been characterized by waves of activity spread over months. Once the level of disease activity drops, a critical communications task will be to balance this information with the possibility of another wave. Pandemic waves can be separated by months and an immediate “at-ease” signal may be premature.

In the post-pandemic period, influenza disease activity will have returned to levels normally seen for seasonal influenza. It is expected that the pandemic virus will behave as a seasonal influenza “A” virus. At this stage, it is important to maintain surveillance and update pandemic preparedness and response plans accordingly. An intensive phase of recovery and evaluation may be required.

4.3.7.3. PAST OCCURRENCE

There have been no prior events that have involved pandemic in Crawford County. However, throughout the past, influenza pandemics have resulted in increased death and disease and great social disruption. According to the Pennsylvania Department of Health, Crawford County has had 30 confirmed cases of H1N1 since April 2009. As of February 2010, the number of confirmed cases jumped to 53 with one reported death as a result of the virus.

In the 20th century, the most severe influenza pandemic occurred in 1918-1919 and caused an estimated 40 to 50 million deaths worldwide. A list of events worldwide is shown in **Table 4-30**.

Table 4-30: Previous Pandemic Outbreaks		
DATE	PANDEMIC NAME/SUBTYPE	WORLDWIDE DEATHS (APPROX)
1918-1920	Spanish Flu / H1N1	50 Million
1957-1958	Asian Flu / H2N2	1.5 to 2 Million
1968-1969	Hong Kong Flu / H3N2	1 Million
November 2009	Swine Flu / H1N1	6000 (As of November 2009)

4.3.7.4. FUTURE OCCURRENCE

Current epidemiological models project that a pandemic could result in 2 to 7.4 million deaths globally. Effective pandemic preparedness around the world is essential to mitigate the effects of a pandemic, particularly if it becomes severe.

4.3.7.5. VULNERABILITY ASSESSMENT

Risk Factor (RF) Value: 2.2

According to the qualitative assessment performed using the RF tool, the pandemic hazard scored a RF value of 2.2 (from a scale of 0 to 4, with 4 being the highest risk level). **Table 4-31** summarizes the risk levels assigned to each RF category.

Table 4-31: Qualitative Assessment for Pandemic				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
1	2	4	1	4

EXISTING VULNERABILITY

Certain population groups are at higher risk of swine flu infection. This population group includes people 65 years and older, children younger than 5 years old, pregnant women, and people of any age with certain chronic medical conditions. Such conditions include but are not limited to diabetes, heart disease, asthma, and kidney disease (CDC, 2009). Schools, convalescent centers, and other institutions serving those younger than 5 years old and older than 65 years old are locations conducive to faster transmission of the 2009 H1N1 virus since populations identified as being at high risk are concentrated at these facilities.

FUTURE VULNERABILITY

According to the World Health Organization and the Pennsylvania Department of Health, if an influenza pandemic were to occur today, we could expect the virus to spread rapidly due to the interconnected nature of the world and the high level of global travel. If the pandemic evolved to become severe and widespread over time, we could also expect:

- Vaccines, antiviral agents and antibiotics to treat secondary infections to be in high demand, and potentially in short supply;
- Medical facilities to be strained with demands to care for both influenza and non-influenza patients;
- Potentially significant shortages of personnel to provide essential community services.

TECHNOLOGICAL OR HUMAN-MADE HAZARDS

FEMA defines human-caused hazards as technological hazards and terrorism. These hazards are distinct from natural hazards in that they are induced by human activity. While risks presented by natural hazards may be increased or decreased as a result of human activity, they are not inherently human induced. The term technological hazard refers to incidents that can arise from human activities such as the manufacturing, transportation, storage, and use of hazardous materials. Technological hazards are assumed to be accidental and their consequences unintended.

This section addresses three types of technological hazards:

- Dam/Levee Failure
- Terrorism
- Hazardous Materials Release

4.3.8. DAM/LEEVE FAILURE

A dam is a barrier across flowing water that obstructs, directs, or slows down water flow. Dams provide benefits such as flood protection, power generation, drinking water, irrigation, and recreation. Failure of these structures results in an uncontrolled release of impounded water. A dam failure is defined as an uncontrolled release of the reservoir. The causes of dam failures can be divided into three groups: dam

overtopping, excessive seepage, and structural failure of a component. Despite efforts to provide sufficient structural integrity and to perform inspection and maintenance, problems can develop that can lead to failure. While most dams have storage volumes small enough that failures have little or no repercussions, dams with large storage amounts can cause significant flooding downstream. Failures are relatively rare, but immense damage and loss of life is possible in downstream communities when such events occur. Dam failures can result from any one or a combination of the following causes:

- Prolonged periods of rainfall and flooding, which cause most failures;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;



Figure 4-19 Waves break over an industrial canal levee in New Orleans when Hurricane Gustav strikes in September 2008

- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway;
- Landslides into reservoirs, which cause surges that result in overtopping;
- High winds, which can cause significant wave action and result in substantial erosion; and
- Earthquakes, which typically cause longitudinal cracks at the tops of the embankments, which can weaken entire structures.

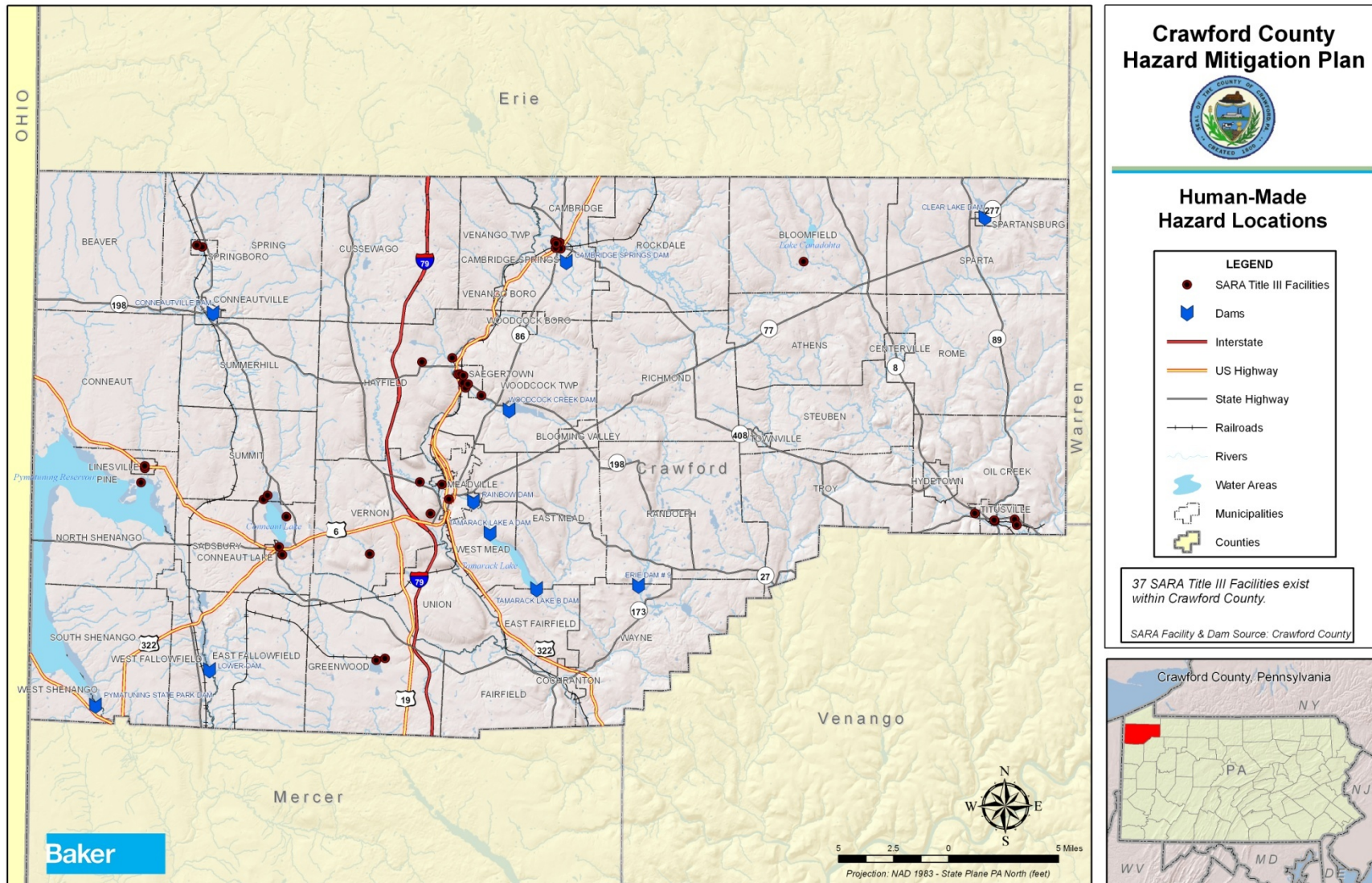
The failure of the South Fork Dam, located in Johnstown, PA, was the deadliest dam failure ever experienced in the United States. It took place in 1889 and resulted in the Johnstown Flood which claimed 2,209 lives (FEMA, 1997). Today there are approximately 3,200 dams and reservoirs throughout Pennsylvania (Pennsylvania Department of Environmental Protection, 2009). A levee is a human-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water so as to provide protection from temporary flooding (Interagency Levee Policy Review Committee, 2006). A levee failure or breach occurs when a levee fails to contain the floodwaters for which it is designed to control or floodwaters exceed the height of the constructed levee. Fifty-one of Pennsylvania's 67 counties have been identified as having at least one levee (FEMA Region III, 2009).

4.3.8.1. LOCATION AND EXTENT

There are eleven dams located in Crawford County that could impact population and structures within the county in the event of failure. Further information on the location of these dams can be found in **Table 4-32.**

NAME	CLASSIFICATION	LOCATION
Woodcock Creek Dam	N/A	Woodcock Township
Meadville Dam (Rainbow Lake Dam)	C-1 (High Hazard)	Meadville, City of
Tamarack Lake Dam "A"	B-1 (High Hazard)	West Mead Township
Tamarack Lake Dam "B"	N/A	East Fairfield Township
Erie Wildlife Refuge Pool #9 Dam	N/A	Wayne Township
Clear Lake Dam	C-1 (High Hazard)	Spartansburg Borough
Upper & Lower Dams	C-1 (High Hazard)	East Fallowfield Township
Pymatuning State Park Reservoir Dam	A-1 (High Hazard)	West Shenango & South Shenango Township
Conneautville Dam	B-1 (High Hazard)	Conneautville Borough
N/A	C-1 (High Hazard)	Cambridge Township
N/A	C-2 (High Hazard)	Cussewago Township
N/A	B-1 (High Hazard)	Fairfield Township
N/A	C-2 (High Hazard)	Rockdale Township
N/A	C-1 (High Hazard)	Hayfield Township
N/A	C-1 (High Hazard)	Union Township (Located In Erie County)
N/A	B-1 (High Hazard)	Edinboro Borough (Located in Erie County)

Figure 4-20 illustrates the locations of dams throughout Crawford County



4.3.8.2. RANGE OF MAGNITUDE

Dam safety laws are embodied in the Dam Safety and Encroachments Act ("DSE Act") -enacted July 1, 1979 and last amended in 1985. Rules pertaining to dam safety are found in Title 25-Rules and Regulations; Part I-Department of Environmental Resources; Subpart C-Protection of Natural Resources; Article II-Water Resources; Chapter 105-Dam Safety and Waterway Management ("the Rules")-adopted Sept. 16, 1980. (www.damsafety.org)

Rules have been supplemented by subsequent policy statements, which are incorporated into Chapter 105. Note: A complete revision of the rules was completed in 1991 and 2001. Dam height is the measurement expressed in feet as measured from the downstream toe of the dam at its lowest point to the elevation of the top of the dam (Rule 105.1).

Dam classifications, found in the Rule 105.91, are based on size and hazard potential. **Table 4-33** and **Table 4-34** illustrate the size classification and hazard potential category for dams.

Table 4-33: Size Classification		
CLASS	IMPOUNDMENT STORAGE (AC-FT)	DAM HEIGHT (FT)
A	50,000 or more	100 or more
B	< 50,000 but > 1000	< 100 but > 40
C	1000 or less	40 or less

Table 4-34: Hazard Potential Classification		
CATEGORY	LOSS OF LIFE	ECONOMIC LOSS
1	Substantial	Excessive
2	Few	Appreciable
3	None Expected	Minimal

The Pennsylvania Department of Environmental Protection's (DEP) Dam Safety Program oversees approximately 3,250 dams and reservoirs throughout the commonwealth in order to protect the health, safety, and welfare of citizens and properties downstream. Pennsylvania enacted the first known dam safety legislation in the U.S. and the current law, Pennsylvania's Dam Safety and Encroachments Act (Act 325 of 1978), stems from the 1977 Johnstown flood disaster in which very heavy rains caused flooding and dam failures that killed 85 people.

The designation of a high hazard dam does not suggest the dam is danger of failing but rather indicates that should the dam fail, homes, businesses, schools, hospitals and assisted-living care facilities, or important infrastructure would be at risk.

There are approximately 780 high hazard dams in the DEP's regulatory jurisdiction. These dams receive two inspections each year – once by a professional engineer on behalf of the owner and once by a DEP inspector. In addition to annual inspections, owners of high-hazard dams must prepare and maintain an

emergency action plan (EAP) to protect downstream communities in the unlikely event of a dam failure. EAPs define responsibilities of dam owners, government agencies and emergency personnel in response to various threats or concerns ranging from forecasts of heavy rain to the discovery of structural problems. These documents identify structures such as homes, businesses, schools, hospitals, assisted-living care facilities and roads that could be inundated by a dam failure. For each individual action plan, flood inundation maps are also incorporated into each respective plan. The EAP's for Crawford County are currently maintained by Crawford County OES. While not available for all dams, downstream inundation maps can be obtained from the Pennsylvania Department of Environmental Protection.

4.3.8.3. PAST OCCURRENCE

Crawford County has not been affected by dam failure.

4.3.8.4. FUTURE OCCURRENCE

For reasons previously mentioned in this section and uncontrollable by humans, it is highly possible a dam can fail at any time, given the right circumstances. However the probability of future occurrence is for regulated dams is reduced due to proactive preventative action on the part of the Pennsylvania Department of Environmental Protection (DEP) – Dam Safety Program. The Division of Dam Safety provides for the regulation and safety of high hazard dams and reservoirs throughout the Commonwealth in order to protect the health, safety, and welfare of its citizens and their property.

This division is required to assure proper planning, design review, construction review, maintenance monitoring and supervision of regulated dams and reservoirs. This requirement is mandated by the Dam Safety and Encroachments Act, as amended, and the Pennsylvania Code. The division directs and coordinates field investigations with regional offices on authorized projects during construction; provides program guidance and coordination to regional program staff in the periodic inspection of all existing dams to determine their condition and safety; and directs, coordinates and develops policies and technical standards in the area of dam safety for the Department.

4.3.8.5. VULNERABILITY ASSESSMENT

The DEP's classification of eleven high hazard dams in Crawford County indicates that in the case of a failure, there would be a likely loss of life and significant property damage. However, exact impacts are difficult to quantify without access to dam break or inundation maps. The Pennsylvania Department of Environmental Protection houses information such as inundation areas downstream from high hazard dams as well as the emergency action plans. Due to the sensitive nature of this data, it has not been included in this plan.

Risk Factor (RF) Value: 2.5

According to the qualitative assessment performed using the RF tool, the dam failure hazard scored a RF value of 2.5 (from a scale of 0 to 4, with 4 being the highest risk level). **Table 4-35** summarizes the risk levels assigned to each RF category.

Table 4-35: Qualitative Assessment for Dam Failure				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
1	3	3	4	3

EXISTING VULNERABILITY

Dam or levee failures can have a greater environmental impact than that associated with a flood event. Large amounts of sediment from erosion would alter the landscape changing the ecosystem. Hazardous materials are carried away from flooded out properties and distributed throughout the floodplain. Industrial and agricultural chemicals and wastes, solid wastes, raw sewage, and common household chemicals comprise the majority of hazardous materials spread by flood waters along the flood zone, polluting the environment and contaminating everything they come in contact with, including the community's water supply.

The soil loss from erosion and scouring would be significantly greater because of a large amount of fast moving water affecting a small localized area, which would likely change the ecosystem.



Figure 4-21 Pymatuning Dam in Crawford County

FUTURE VULNERABILITY

As dams continue to age, the likelihood for failure increases as undesirable woody vegetation on the embankment, deteriorated concrete, inoperable gates, and corroded outlet pipes become problems. Since dam failures are often exacerbated by flooding, the probability of dam failures can be associated with projected flood frequencies.

Property and populations located downstream from any dam are vulnerable to dam failure. However, communities downstream of high hazard dams should pay particular attention to inspection and maintenance activities that keep their communities safe. Without these activities and oversight from the Pennsylvania Department of Environmental Protection, vulnerability increases significantly. The possibility of a dam failure within Crawford County should remain low with continued maintenance of dams. Additionally, warning plans in place for designated high hazard dams will continue to decrease the danger for those residents in potential risk areas.

4.3.9. HAZARDOUS MATERIALS

A hazardous material release is the contamination of the environment (i.e. air, water, soil) by any material that because of its quantity, concentration, physical characteristics, or chemical characteristics threatens human, animal, or plant health, the environment, or property. Hazardous material spills are usually accidental events that arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. The consequences of such spills are usually unintended. An accidental or intentional release of materials could produce a health hazard to those in the area, downwind, and/or downstream with immediate, prolonged, and/or delayed effects. The spread of the material may additionally be defined by weather conditions and topography of the area. A hazardous material release can come from a fixed facility, via its transportation, or intentionally in the case of terrorism.

Fixed facilities housing hazardous substances in Crawford County include the usual facilities within communities such as water treatment plants, swimming pools, gas stations, and supply stores containing substances such as fuel, farm chemicals, propane, fuel oil, paint, and small amounts of chlorine.

A hazardous material release may also occur due to a transportation accident. The most likely locations for a transportation-related hazardous material release are along the interstate, highways, and the railroad (see page 97 for list of major routes). Gas, propane, and other hazardous materials are delivered throughout the county year round, creating a potential disaster every time one of the delivery trucks goes on the road. The need for gas, propane, fertilizers, and other toxic materials is very high in agricultural communities.



Facilities that use, manufacture, or store hazardous materials in Pennsylvania must comply with Title III of the federal Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (EPCRA), and the Commonwealth's reporting requirements under the Hazardous Materials Emergency Planning and Response Act (1990-165), as amended. The community right-to-know reporting requirements keep communities abreast of the presence and release of chemicals at individual facilities. Key

information about the chemicals handled by manufacturing or processing facilities is contained in the US Environmental Protection Agency's (USEPA's) Toxic Release Inventory (TRI) database. Facilities which employ ten or more full-time employees and which manufacture or process 25,000 pounds or more, or otherwise use 10,000 pounds or more, of any SARA Section 313-listed toxic chemical in the course of a

calendar year are required to report TRI information to the USEPA, the federal enforcement agency for SARA Title III, and PEMA. Also, transportation carriers must have response plans in place to address accidents. Otherwise the local emergency response team will step in to secure and restore the area. For example, in May 1998, a truck carrying hazardous waste spilled its load, prompting the Pennsylvania North-Central Region Emergency Response Team of the PADEP to respond. The cyanide-containing waste was quickly cleaned up with no injuries, property damage or environmental damage reported.

In the event of a hazardous material release, the National Weather Service has the ability to issue a variety of warnings or statements. For example, a Hazardous Materials Warning, a warning of the release of a non-radioactive hazardous material that may recommend evacuation or shelter in place, may be issued using information reported by state or local officials. Other warnings and statements for civil danger, civil emergency, evacuation immediate, local area emergency, radiological hazard, and shelter in place are also available to state and local emergency officials if needed. (National Weather Service, 2009)

4.3.9.1. LOCATION AND EXTENT

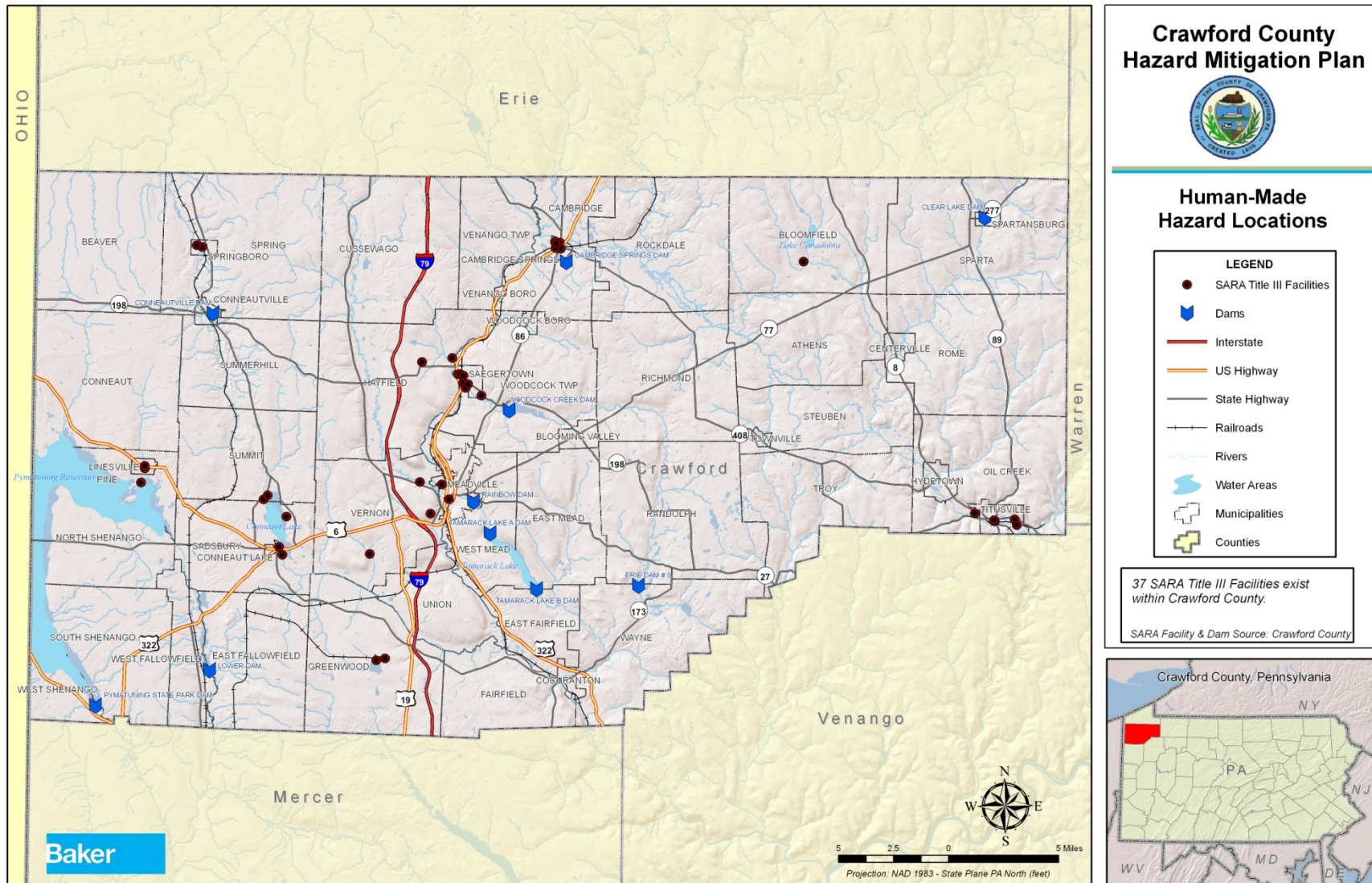
According to the Crawford County Annual Report on Hazardous Materials and Emergency Response Planning, published in June 2009, there are 151 Tier II facilities located in Crawford County. Thirty-six of these facilities are classified as extremely hazardous substances as defined by the United States Environmental Protection Agency (USEPA).

The USEPA also indicates that as of 2009, within Crawford County, there are:

- 69 facilities that produce and release air pollutants
- 32 facilities that have reported toxic releases
- 233 facilities that have reported hazardous waste activities
- 244 facilities that were issued permits to discharge to waters of the United States

When a hazardous material incident occurs in Crawford County, there is a chance it will not only involve dirt or surface material but will also involve flowing water in ditches, rivers, or small streams. Other potential concerns for spills/leaks are icy road conditions during winter months, sabotage, and terrorism.

Figure 4-22 illustrates approximate locations of SARA Title III facilities within Crawford County



4.3.9.2. RANGE OF MAGNITUDE

Hazardous material releases can contaminate air, water, and soils and create death and injuries. Dispersion can take place rapidly when transported by water and wind. While often accidental, releases can occur as a result of human carelessness, intentional acts, or natural hazards. When caused by natural hazards, these incidents are known as secondary events. Hazardous materials can include toxic chemicals, radioactive materials, infectious substances, and hazardous wastes. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas.

With a hazardous material release, whether accidental or intentional, there is potentially exacerbating or mitigating circumstances that will affect its severity or impact. Mitigating conditions are precautionary measures taken in advance to reduce the impact of a release on the surrounding environment. Primary and secondary containment or shielding by sheltering-in-place protects people and property from the harmful effects of a hazardous material release. Exacerbating conditions, characteristics that can enhance or magnify the effects of a hazardous material release include:

- **Weather conditions:** affects how the hazard occurs and develops
- **Micro-meteorological effects of buildings and terrain:** alters dispersion of hazardous materials
- **Non-compliance with applicable codes (e.g. building or fire codes) and maintenance failures (e.g. fire protection and containment features):** can substantially increase the damage to the facility itself and to surrounding buildings

The severity of the incident is dependent not only on the circumstances described above, but also with the type of material released and the distance and related response time for emergency response teams. The areas within closest proximity to the releases are generally at greatest risk, yet depending on the agent, a release can travel great distances or remain present in the environment for a long period of time (e.g. centuries to millennia for radioactive materials), resulting in extensive impacts on people and the environment.

4.3.9.3. PAST OCCURRENCE

Since the passage of SARA, Title III, facilities which produce, use, or store hazardous chemicals must notify the public through the county emergency dispatch center and PEMA if an accidental release of a hazardous substance meets or exceeds a designated reportable quantity, and affects or has the potential to affect persons and/or the environment outside the plant. SARA, Title III and Pennsylvania Act 165 also require a written follow-up report to PEMA and the County. These written follow-up reports include any known or anticipated health risks associated with the release, and actions to be taken to mitigate potential future incidents. In addition, Section 204(a)(10) of Act 165 requires PEMA to staff and operate a 24-hour State Emergency Operations Center (SEOC) to provide effective emergency response coordination.

The USEPA Toxic Release Inventory reports that as of 2008, 93,592 pounds of chemicals were released from facilities located in Crawford County. The Toxics Release Inventory is a publicly available EPA database that contains information on toxic chemicals releases and waste management activities reported annually by certain industries as well as federal facilities.

4.3.9.4. **FUTURE OCCURRENCE**

While many hazardous material release incidents have occurred in Crawford County in the past, they are generally considered difficult to predict. An occurrence is largely dependent upon the accidental or intentional actions of a person or group.

4.3.9.5. **VULNERABILITY ASSESSMENT**

Risk Factor (RF) Value: 2.2

According to the qualitative assessment performed using the RF tool, the hazardous materials hazard scored a RF value of 2.2 (from a scale of 0 to 4, with 4 being the highest risk level). **Table 4-36** summarizes the risk levels assigned to each RF category.

Table 4-36: Qualitative Assessment for Hazardous Materials				
PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
2	2	2	4	2

EXISTING VULNERABILITY

Transportation accidents/incidents remain a major concern and vulnerability for Crawford County. The continued increase in the number of shipments also brings the potential increase in frequency of accidents/incidents. The county has approximately, 2,353 miles of roadway, of which 54 miles are interstate highway, 1,016 are state and federal highway, and 1,310 are secondary and municipal roadway. The major routes used for the transportation of hazardous materials are Interstate 79, route(s) 6, 18, 19, 102, 285, 322, and 408.



Crawford County is also served by an extensive rail system (see rail map on page 95) which includes the Bessemer/Lake Erie, Norfolk Southern, and Western New York (Meadville to Corry).

Most hazardous material releases do not usually have an effect on infrastructure, particularly underground infrastructure. Some critical infrastructure uses hazardous materials to operate such as chlorine for water treatment and PCB's for electric transformers. Similarly, the contamination of the water supply may be treated like a hazardous material release. Propane, oil, and natural gas, necessary

fuels for heating, can also be hazardous if released during their delivery due to their explosive potential. Transportation may be limited if a key roadway or railway is blocked by an incident.

Possible losses to critical facilities include:

- Critical functional losses
- Contamination
- Structural and contents losses, if an explosion is present

Possible losses to structures include:

- Inaccessibility
- Contamination
- Structural and contents losses, if an explosion is present

The population impacts are often greater than the structural impacts during a hazardous material release. Depending on the material, the health impacts to humans can be long and short term. A release in Crawford County could threaten the population. Greater population concentrations may be found in communities, special needs facilities, and businesses. Generally, an incident will affect only a subset of the total population at risk. In a hazardous material release, those in the immediate isolation area would have little to no warning, whereas, the population further away in the dispersion path may have some time to evacuate, depending on the weather conditions, material released, and public notification.

Possible economic losses include:

- Business closures and associated business disruption losses

Possible ecologic losses include:

- Loss of wildlife
- Habitat damage
- Reduced air and water quality

Possible social losses include:

- Cancelled activities
- Emotional impacts of significant population losses and illnesses

FUTURE VULNERABILITY

Crawford County and the surrounding areas are rich in natural resources and the continued development of industries related to these natural resources is a distinct possibility. New development may increase the number of people and facilities exposed to hazardous material releases.

4.3.10. TERRORISM

Acts of terrorism are human-caused hazard that are intentional and often planned. Terrorism, both domestic and international, is a violent act done to try and influence government or the population of some political or social objective. Terrorist acts can come in many recognized forms or may be more subtle using untraditional methods. The primary recognized forms of terrorism are chemical, explosive, biological, radiological, and cyber; however, terrorism's only limitation is the human imagination.

Chemical terrorism is the use of chemical agents to poison, kill, or incapacitate the population or animals, destroy crops or natural resources, or deny access to certain areas. Chemical agents can be broken into five different categories: nerve agents, vesicants, cyanide, pulmonary agents, and incapacitating agents.

Terrorism using **explosive** and incendiary devices includes bombs and any other technique that creates an explosive, destructive effect. Bombs can take many forms from a car bomb to a mail bomb. They can be remotely detonated using a variety of devices or directly detonated in the case of a suicide bomb.

Bioterrorism is the use of biological agents, such as Anthrax, Ricin, and Smallpox, to infect the population, plants, or animals with disease or illness.

Radiological terrorism involves the use of radiological dispersal devices or nuclear facilities to attack the population. Exposure to radiation can cause radiation sickness, long-term illness, and even death. Terrorism experts fear the use of explosive and radiological devices in the form of a "dirty bomb" to attack the population. A "dirty bomb" is a low-tech, easily assembled and transported device made up of simple explosives combined with a suitable radioactive agent.

Cyberterrorism is the attack or hijack of the information technology infrastructure that is critical to the US economy through financial networks, government systems, mass media, or other systems. Any cyber attack that creates national unrest or instability would be considered cyberterrorism.

Most times, terrorist acts, both domestic and international, are driven by a terrorist group or hate organization. Occasionally, individuals, as was the case in the Oklahoma City bombing, perform independent acts. Usually, the perpetrators have an underlying belief that drives the act.

When notified by a government official, the National Weather Service has the ability to send alert messages through the Emergency Alert System and over NOAA Weather Radio. Examples include the following:

- **Local Area Emergency Message:** This message defines an event that by itself does not pose a significant threat to public safety and/or property, but the event could escalate, contribute to other more serious events, or disrupt critical public safety services. Instructions, other than public protective actions, may be provided by authorized officials. Examples of when this

message may be used include: utility disruptions, road closures, or a potential terrorist threat where the public is asked to remain alert.

- Civil Emergency Message: This message outlines a significant threat or threats to public safety and/or property that is imminent or in progress. The hazard is usually less specific or severe than those requiring a Civil Danger Warning.
- Law Enforcement Warning: This warning is issued for a bomb explosion, riot, or other criminal event. An authorized law enforcement agency may block roads, waterways, or facilities, evacuate or deny access to affected areas, and arrest violators or suspicious persons.
- Radiological Hazard Warning: This warning warns of the loss, discovery, or release of a radiological hazard such as the theft of a radiological isotope used for medical, seismic, or other purposes, discovery of radioactive materials, or a transportation accident involving nuclear weapons, nuclear fuel, or radioactive wastes. Authorized officials may recommend protective actions be taken if a radioactive hazard is discovered.
- Civil Danger Warning: This warning is issued when an event presents a danger to a significant civilian population. The message usually warns of a specific hazard and outlines specific protective actions such as evacuation or shelter in place.
- Shelter In Place Warning: This warning is issued when the public is recommended to shelter in place (go inside, close doors and windows, turn off air conditioning or heating systems, and turn on the radio or TV for more information). Examples include hazardous material releases or radioactive fallout.

4.3.10.1. LOCATION AND EXTENT

The probability of terrorism occurring cannot be quantified with as great a level of accuracy as that of many natural hazards. Furthermore, these incidents generally occur at a specific location, such as a government building, rather than encompassing an area such as a floodplain. Thus planning should be asset-specific, identifying potentially at-risk critical facilities and systems in the community. Once a comprehensive list of critical assets has been developed, it should be prioritized so that efforts can be directed to protect the most important assets first. Then, beginning with the highest-priority assets, the vulnerabilities of each facility or system to each type of hazard should be assessed.

For the purpose of developing a realistic prioritization of terrorism hazard mitigation projects, three elements should be considered:

- Relative importance of the various facilities and systems in the asset inventory
- Vulnerabilities of those facilities
- Threats that are known to exist.

This plan update identifies critical facilities located in Crawford County and the hazards to which these facilities are susceptible. A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the county, or fulfills important public safety, emergency response, and/or disaster recovery functions.

Critical facilities identified in the county are shelters; gas, electric and communication utilities; hospitals and other health care facilities; water and wastewater treatment plants, hazardous waste sites; and schools. In addition to critical facilities, the county contains at risk populations that should be factored into a vulnerability assessment. Critical assets and infrastructure are systems whose incapacity or destruction would have a devastating effect on the county; this includes:

- Government services
- Emergency services
- Water supply systems
- Transportation networks
- Telecommunications infrastructure
- Electrical power systems
- Gas and oil facilities

4.3.10.2. *RANGE OF MAGNITUDE*

Terrorism refers to the use of WMD, including biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional hazardous materials releases; and “cyber-terrorism”. Within these general categories, however, there are many variations. Particularly in the area of biological and chemical weapons, there are a wide variety of agents and ways for them to be disseminated.

Terrorist methods can take many forms, including:

- Agri-terrorism
- Arson/incendiary attack
- Armed attack
- Biological agent
- Chemical agent
- Cyberterrorism
- Conventional bomb or bomb threat
- Hazardous material release (intentional)
- Nuclear/Dirty bomb
- Radiological agent

4.3.10.3. PAST OCCURRENCE

Like just about every other county in the nation, Crawford County has had its share of domestic terrorism incidents. The table below indicates the number of previous occurrences of terrorism, criminal activity, and potential civil disorder through 2007. Those incidents are shown in **Table 4-37**.

Table 4-37: Terrorism Related Activity since 2007		
DATE	INCIDENTS	NUMBER OF INCIDENTS
2009	School Bomb Threat	5
	Civil Disturbance	1
2008	School Bomb Threat	2
	Suspicious Activity	3
	Suspicious Device	1
2007	Suspicious Substance	1

Source: Crawford County Sheriff's Department, 2009

4.3.10.4. FUTURE OCCURRENCE

Crawford County has a minimum risk of terrorism, but the potential certainly exists. There are a number of critical facilities within the county, as well as nuclear facilities in due south in Beaver County, Pennsylvania (approx. 71 miles) and northwest in Lake County, Ohio (approx. 66 miles) that could affect Crawford County in the event of a terrorist attack. Because of the close proximity to the risk area, all of Crawford County may be vulnerable to levels of radioactive fallout.

Development should have little to no impact on the terrorism hazard; except for the increase in population and the associated increase in potential for life and property losses should an event occur.

Although the probability of Crawford County being the target of a direct domestic terrorist attack is greater than being the direct target of an international terrorist attack, it should be equally prepared for both. It is hard to determine at this point what the actual probability of a terrorist attack occurring within the county is. However, it is safe to assume that it is much greater than it was before September 11, 2001.

4.3.10.5. VULNERABILITY ASSESSMENT

The severity of terrorist incidents depends upon the type of method used, the proximity of the device to people, animals, or other assets and the duration of exposure to the incident or device.

Risk Factor (RF) Value: 1.5

According to the qualitative assessment performed using the RF tool, the terrorism hazard scored a RF value of 1.5 (from a scale of 0 to 4, with 4 being the highest risk level). **Table 4-38** summarizes the risk levels assigned to each RF category.

Table 4-38: Qualitative Assessment for Terrorism

PROBABILITY	IMPACT	SPATIAL EXTENT	WARNING TIME	DURATION
1	2	1	3	1

EXISTING VULNERABILITY

It is critical that the local law enforcement and government officials ask the following the questions regarding vulnerability to terrorism:

- Inherent vulnerability
 - ✓ Visibility: How aware is the public of the existence of the facility?
 - ✓ Utility: How valuable might the place be in meeting the objectives of a potential terrorist?
 - ✓ Accessibility: How accessible is the place to the public?
 - ✓ Asset mobility: Is the asset's location fixed or mobile?
 - ✓ Presence of hazardous materials: Flammable, explosive, biological, chemical, and/or radiological? Present on site? If so, are they well secured?
 - ✓ Potential for collateral damage: What are the potential consequences for the surrounding area if the asset is attacked or damaged?
 - ✓ Occupancy: What is the potential for mass casualties based on the maximum number of individuals on site at a given time?
- Tactical vulnerability
 - ✓ Site perimeter
 - Site planning and landscape design: Is the facility designed with security in mind (both site-specific and with regard to adjacent land uses)?
 - Parking security: Are vehicle access and parking managed in a way that separates vehicles and structures?
 - ✓ Building envelope
 - Structural engineering: Is the building's envelope designed to blast-resistant? Does it provide collective protection against chemical, biological, and radiological contaminants?
 - ✓ Facility interior
 - Architectural and interior space planning: Does security screening cover all public and private areas?
 - Mechanical engineering: Are utilities and HVAC systems protected and/or backed up with redundant systems?
 - Electrical engineering: Are emergency power and telecommunications available? Are alarm systems operational? Is lighting sufficient?
 - Fire protection engineering: Are the buildings water supply and fire suppression systems adequate, code-complaint, and protected? Are on-site personnel

trained appropriately? Are local first responders aware of the nature of the operations at the facility?

- Electronic and organized security: Are systems and personnel in place to monitor and protect the facility?

Critical facilities play prominent roles in Crawford County. Often, terrorists target facilities that are highly important for government services and community stability. Threat data is not specific enough to identify what facilities are most vulnerable, therefore, all critical facilities are considered to have the same risk countywide. Given the rural nature of the region, a major terrorist attack making a direct impact in Crawford County is not expected. Perhaps the greatest threat to the communities is a disgruntled student, employee, or resident threatening others with violence. The extreme example of a bomb, depending on its size, could cause structural losses to a critical facility.

Possible losses to critical facilities include:

- Structural losses
- Contents losses
- Critical functional losses
- Critical data losses

Terrorism officials emphasize that potential targets include our nation's delicate infrastructure. Should an attack occur, Crawford County could locally lose electricity, telephone, or internet services. More localized incidents could disrupt water or sewer services. Other attacks could limit fuel or propane supplies and affect transportation and heating capabilities.

Possible losses to critical infrastructure include:

- Electric power disruption
- Telephone service disruption
- Fuel shortages

Structure losses are possible from terrorism and civil unrest but are not likely. Looting, however, can be associated with these types of events. Therefore, this hazard places both the population and property at risk. Communities and places of public gathering are generally going to be the areas of greatest risk.

Possible losses to structures include:

- Structural losses
- Contents losses
- Vehicle losses
- Displacement losses

The effects of terrorism are usually felt by the population. During times of unrest, the greatest risk is to human lives. Terrorists typically try to make a dramatic statement that will generate media interest. Attacking the population through a large loss of life is a common tactic. Depending on the type of attack, casualties could be light or involve much of the Crawford County population.

Possible economic losses include:

- General national economic slowdowns
- Livestock losses through intentional disease spread
- Tourism losses during terrorism fears

Possible ecologic losses include:

- Environmental contamination

Possible social losses include:

- Cancelled activities
- Emotional impacts of significant population losses
- Loss of sense of security

4.4. HAZARD VULNERABILITY SUMMARY

A vulnerability assessment applies the information collected through hazard profiling to Crawford County's assets, potentially at-risk populations and development trends to summarize the impacts from hazards on the community and its vulnerable structures. These impacts are represented by measures such as population at risk, percent damages, and dollar loss estimation. The purpose of this analysis is to identify weaknesses or vulnerabilities prior to an event so that mitigation action plans may prevent or reduce the predicted impact of disasters. The primary objective of the vulnerability assessment is to prioritize hazards of concern to provide a framework for the mitigation strategy and policy development.

To complete the vulnerability assessment, best available data was collected from a variety of sources, including local, state, and federal agencies, and multiple analyses were applied through qualitative and quantitative means. Additional work will be done on an ongoing basis to enhance, expand, and further improve the accuracy of baseline results, and it is expected that this vulnerability assessment will continue to be refined through future plan updates as new data and loss estimation methods available.

4.4.1. HAZARD VULNERABILITY METHODOLOGY

A strong analysis includes both quantitative and qualitative methodologies. For instance, geographic information systems (GIS)-based analysis and local knowledge are both important inputs to identifying vulnerabilities. As part of this hazard vulnerability analysis, the Crawford County Mitigation Planning Committee conducted the following steps:

- ✓ Inventory and summarize vulnerable assets
- ✓ Characterize repetitive flood loss properties
- ✓ Estimate loss
- ✓ Develop risk factor for each profiled hazard
- ✓ Describe asset vulnerability to future development

4.4.2. RANKING RESULTS

Table 4-40: Risk Factor Results

	Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	RF Factor
Natural Hazards	Flooding	3	2	4	3	3	2.9
	Tornado/Wind Storm	1	3	3	4	1	2.2
	Lightning Strike/Thunderstorms	3	2	3	2	1	2.4
	Severe Winter Weather	4	2	4	1	3	3.0
	Drought	2	1	4	1	4	2.1
	Landslide	1	1	1	2	1	1.1

	Pandemic	1	2	4	1	4	2.2
Tech. Hazards	Dam Failure	1	3	3	4	3	2.5
	Hazardous Materials	2	2	2	4	2	2.2
	Terrorism	1	2	1	3	1	1.5

Based on the RF analysis, the natural hazard with the highest risk potential is “Severe Winter Weather”, which has a value of 3.0. This is primarily due to the probability of the hazard occurring and the spatial extent of the potential widespread damage within the affected areas of the county. “Flooding” was qualitatively calculated as second in risk potential, with a value of 2.9.

The technological or human-made hazard with the highest risk potential was found to be “Dam Failure”, with a value of 2.5. This is primarily due to a lack of warning time and the high level of impact upon infrastructure failure. This event could result in injury and death and severely damage or destroy public and private infrastructure. “Hazardous Materials” release was qualitatively calculated as the second in risk potential, with a value of 2.2.

The top three risks identified through the vulnerability assessment in the 2004 Crawford County Hazard Mitigation Plan were (1) Tornado/Wind Storm, (2) Severe Winter Weather, and (3) Flooding. The qualitative calculations produced by the RF tool in this plan update generally reflect the findings of the original 2004 plan and the Crawford County MPC. However, the RF analysis demonstrated that the Dam Failure hazard may represent a higher risk than the Lightning Strike/Thunderstorms hazard.

The conclusions drawn from the qualitative and quantitative assessments, combined with final determinations from the MPC, were fitted into three categories for a final summary of hazard risk for Crawford County based on High, Moderate or Low risk designations (**Table 4-41**). It should be noted that although some hazards are classified as posing Low risk, their occurrence of varying or unprecedented magnitudes is possible and will continue to be reevaluated during future updates of this plan.

Table 4-41: Conclusions on Hazard Risk for Crawford County	
HIGH RISK (3.0 or higher)	Severe Winter Weather (3.0)
MODERATE RISK (2.0 – 2.9)	Flooding (2.9) Dam Failure (2.5) Lightning Strikes / Thunderstorms (2.4) Tornado / Windstorm (2.2) Pandemic (2.2) Hazardous Materials (2.2) Drought (2.1)
LOW RISK (0.1 – 1.9)	Terrorism (1.5) Landslide (1.1)

5. CAPABILITY ASSESSMENT

5.1. CAPABILITY ASSESSMENT UPDATE SUMMARY

Crawford County has a number of resources it can access to implement hazard mitigation initiatives including emergency response measures, local planning and regulatory tools, administrative assistance and technical expertise, fiscal capabilities, and participation in local, regional, state, and federal programs. The presence of these resources enables community resiliency through actions taken before, during, and after a hazard event.

The 2004 HMP identified the presence of local plans, ordinances, and codes in each jurisdiction. It also specified local, state, and federal resources available for mitigation efforts. Through responses to the *Capability Assessment Survey* distributed to all municipalities and input from the Mitigation Planning Committee, the 2010 Hazard Mitigation Plan Update provides an updated inventory of the most critical local planning tools available within each participating jurisdiction and a summary of the fiscal and technical capabilities available through programs and organizations outside of the County. It also identifies emergency management capabilities and the processes used for implementation of the National Flood Insurance Program.

While the capability assessment serves as a good instrument for identifying local capabilities for, it also provides a means for recognizing gaps and weaknesses that can be resolved through future mitigation actions. The results of this assessment lend critical information for developing an effective mitigation strategy.

5.1.1. WHAT IS A CAPABILITY ASSESSMENT?

The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy, and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs or projects. As in any planning process, it is important to try to establish which goals and actions are feasible, based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation.

A capability assessment helps to determine which mitigation actions are practical and likely to be implemented over time given a local government's planning and regulatory framework, level of administrative and technical support, amount of fiscal resources, and current political climate. A capability assessment has two primary components: an inventory of a local jurisdiction's relevant plans, ordinances or programs already in place and an analysis of its capacity to carry them out. A careful examination of local capabilities will detect any existing gaps, shortfalls or weaknesses associated with ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate hazard vulnerability. A capability assessment also highlights the positive mitigation measures already in

place or being implemented at the local government level, which should continue to be supported and enhanced if possible through future mitigation efforts.

The capability assessment serves as a critical part of the planning process, including the development of an effective multi-jurisdictional hazard mitigation strategy. Coupled with the Risk Assessment, the Capability Assessment section helps identify and target meaningful mitigation actions for incorporation into the Mitigation Strategy. It not only helps establish the goals for Crawford County to pursue under this Plan, but also ensures that those goals and the mitigation actions that follow are realistically achievable given local conditions.

5.1.2. CONDUCTING THE CAPABILITY ASSESSMENT

In order to facilitate the inventory and analysis of local government capabilities throughout Crawford County, a detailed *Capability Assessment Survey* was distributed to Crawford County's departments and local municipal jurisdictions. The survey questionnaire, which was completed by local government officials, requested information on a variety of "capability indicators" such as existing local plans, policies, programs or ordinances that may reduce, or in some circumstances, increase the community's hazard vulnerability. Other indicators included information related to each jurisdiction's fiscal, administrative and technical capabilities such as access to local budgetary and personnel resources necessary to implement mitigation measures. Survey respondents were also asked to comment on the current political climate in their jurisdiction to implement mitigation actions, an important consideration for any local planning or decision making process.

At a minimum, survey results provide an extensive inventory of existing local plans, ordinances, programs and resources in place or under development in addition to their overall effect on hazard loss reduction. Local officials were also required to conduct a self-assessment of their jurisdiction's specific capabilities. The survey instrument thereby not only helps to accurately assess each jurisdiction's degree of local capability, but also serves as a good source of introspection for those jurisdictions wishing to improve their capability as identified gaps, weaknesses or conflicts can be recast as opportunities to implement specific mitigation actions.

The information provided by participating jurisdictions was incorporated into a database for further analysis. A general scoring methodology was then applied to quantify and rank each jurisdiction's overall capability relative to one another. According to the scoring system, each indicator was assigned a point value based on its relevance to hazard mitigation. Additional points were added based on each jurisdiction's self assessment of their own planning and regulatory capability, administrative and technical capability, fiscal capability and political capability.

A general capability rating of "High," "Moderate" or "Limited" was then determined for each jurisdiction according to the total number of points received. These classifications are designed to provide a general assessment of each individual jurisdiction's local capability relative to one another. In combination with

the narrative responses provided by local officials, the results of this multi-jurisdictional capability assessment lend critical information for developing an effective and meaningful mitigation strategy.

5.2. CAPABILITY ASSESSMENT FINDINGS

The findings of the capability assessment are summarized in this Plan in order to provide insight into the abilities of participating jurisdictions to implement a feasible hazard mitigation strategy. All information is based upon the input provided by local government officials through the *Capability Assessment Survey* and during meetings of the Mitigation Planning Committee.

5.2.1 PLANNING AND REGULATORY CAPABILITY

Planning and regulatory capability is based on the implementation of plans, ordinances and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, including reconstruction following a disaster. Examples include emergency response, mitigation and recovery planning, comprehensive land use planning, transportation planning and capital improvements planning. Additional examples include the enforcement of zoning or subdivision ordinances and building codes that regulate how land is developed and structures are built. These planning initiatives present significant opportunities to integrate hazard mitigation principles and practices into the local decision making process.

This assessment is designed to provide a general overview of the key planning and regulatory tools in place or under development for jurisdictions in Crawford County, along with their potential effect on hazard loss reduction. This information will help identify opportunities to address existing gaps, weaknesses or conflicts with other initiatives in addition to integrating the implementation of this Plan with existing planning mechanisms, where appropriate. Please note that no assumptions were made in the results of the Capability Assessment Survey. All answers are straightforward from the participant.

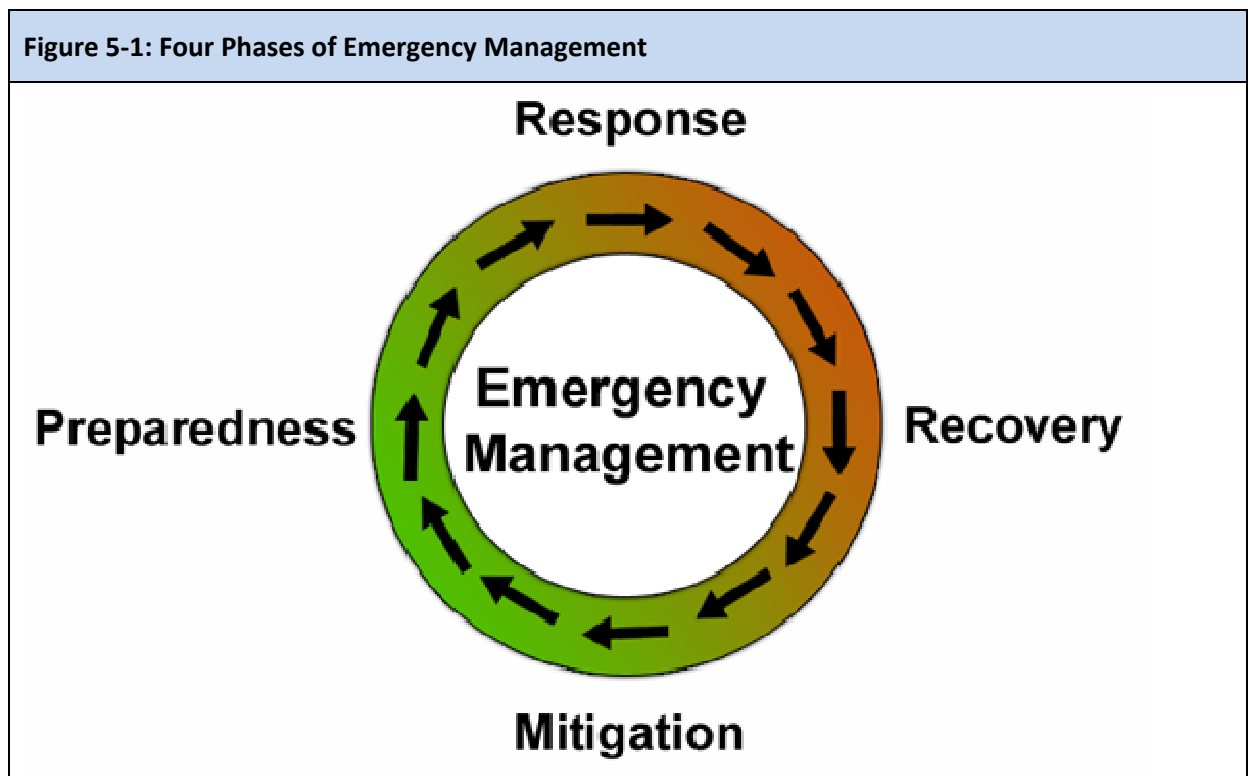
Table 5-1 provides a summary of the relevant local plans, ordinances and programs already in place or under development for Crawford County's participating local governments. An "X" indicates that the item is currently in place and being implemented and integrated by the local jurisdiction (or in some cases by the County on behalf of that jurisdiction), or that is currently under development.

JURISDICTION	Hazard Mitigation Plan	Comprehensive Land Use Plan	Flood plain Management Plan	Open Space Management Plan	Stormwater Management Plan/Ordinance	Emergency Operations Plan	Capital Improvement Plan	Historic Preservation Plan	Zoning Regulations	Subdivision Regulations	Floodplain Regulations	Building Code	Fire Code	NFIP	NFIP – Community Rating System	Economic Development Plan
Crawford County	X	X	X	X		X								X		X
Beaver TWP									X	X	X	X		X		
Cochranon Borough	X		X		X	X								X		
Conneaut Lake Borough		X			X				X	X	X	X		X		
City of Meadville	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
East Fairfield TWP	X	X	X			X			X	X	X	X		X		
East Mead TWP	X	X			X					X	X			X		
Fairfield TWP	X		X		X	X						X		X		
Greenwood TWP		X	X							X		X		X		X
Hayfield TWP	X	X	X		X	X			X	X		X		X		
Hydetown Borough		X	X		X	X			X	X	X			X		
Linesville Borough			X			X			X	X		X		X		
North Shenango TWP	X	X	X	X	X		X		X	X	X	X	X	X		
Oil Creek TWP	X	X	X		X	X			X	X	X	X		X		
Rockdale TWP			X			X					X	X		X		
Saegertown Borough	X	X	X			X	X		X	X	X	X	X	X		
South Shenango Borough						X				X	X	X	X	X		
Spartansburg Borough										X				X		
Spring TWP	X	X	X			X				X	X	X		X		
Steuben TWP						X					X			X		
Summerhill TWP		X				X			X		X	X	X	X		
Summit TWP	X	X		X	X	X			X	X	X	X	X	X		
Titusville, City of	X	X	X	X	X	X			X	X	X	X	X	X		X
Union TWP			X		X									X		
Venango Borough	X	X	X						X	X		X		X		
Venango Township					X	X							X	X		
Vernon TWP		X	X	X	X	X	X		X	X	X	X	X	X		
West Mead TWP	X	X	X			X			X	X		X		X		
West Shenango TWP										X	X	X		X		
Woodcock TWP		X	X			X			X	X	X	X		X		

A more detailed discussion of each jurisdiction’s planning and regulatory capability follows, along with the incorporation of additional information based on narrative comments provided by local officials in response to the survey questionnaire.

5.2.1a EMERGENCY MANAGEMENT

Hazard mitigation is widely recognized as one of the four primary phases of emergency management. The three other phases include preparedness, response and recovery. In reality, each phase is interconnected with hazard mitigation as **Figure 5-1** suggests. Opportunities to reduce potential losses through mitigation practices are ideally implemented before a disaster strikes. Examples include the acquisition or elevation of flood-prone structures or the enforcement of regulatory policies that prevent construction in known hazard areas. In reality, the post-disaster environment provides another important “window of opportunity” to implement hazard mitigation projects and policies. During this time period, federal disaster assistance, including the Hazard Mitigation Grant Program (HMGP), may be available. In addition, elected officials and disaster victims may be more willing to implement mitigation measures in order to avoid similar events occurring in the future.



Planning for each phase is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions. As a result, the *Capability Assessment*

Survey asked several questions across a range of emergency management plans in order to assess each jurisdiction's willingness to plan and their level of technical planning proficiency.

Hazard Mitigation Plan: A hazard mitigation plan represents a community's blueprint for how it intends to reduce the impact of natural and human-caused hazards on people and the built environment. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment and mitigation strategy.

- Crawford County along with 18 other municipalities has prepared and adopted Floodplain Management Plans. While the Floodplain Management Plans do not meet the requirements established by the Disaster Mitigation Act of 2000, they have been incorporated into this hazard mitigation plan update, which is designed to meet all federal and state hazard mitigation planning rules and regulations. The actions and activities identified in the Floodplain Management Plans represent a strong commitment to flood loss reduction in the county. This HMPU will build on the work already completed to include an assessment of natural and technological hazards and the identification of specific measures intended to reduce their impact.

Emergency Operations Plan: An emergency operations plan outlines responsibilities and the means by which resources are deployed during and following an emergency or disaster.

- The Emergency Management Services Code (PA Title 35) requires that all municipalities in the Commonwealth have a Local Emergency Operations Plan (EOP) which is updated every two years. All jurisdictions in Crawford County have or are in the process of updating their local EOP. A countywide EOP also exists. Jurisdictions are not required to sign on to the County EOP because county staff prefers to keep municipal emergency management coordinators actively engaged at a more local level.

5.2.1b GENERAL PLANNING

The implementation of hazard mitigation activities involves departments and individuals beyond the emergency management profession. Stakeholders may include local planners, public works officials, economic development specialists and others. In many instances, concurrent local planning efforts may complement hazard mitigation goals even though they are not designed as such. Therefore, the *Capability Assessment Survey* also asked questions regarding each jurisdiction's general planning capabilities and the degree to which hazard mitigation is integrated into other planning efforts.

Comprehensive Land Use Plan: A comprehensive land use plan establishes the overall vision for what a community wants to be and a guide to future governmental decision making. Typically a comprehensive plan is comprised of demographic conditions, land use patterns, transportation elements and proposed community facilities. Given the broad nature of the plan and its regulatory standing in many

communities, the integration of hazard mitigation measures into the comprehensive plan can serve as a far reaching, long-term risk reduction tool.

- The Crawford County Planning Commission reports that as of December 2009, thirty-seven (37) jurisdictions possess a comprehensive land use plan. All participating jurisdictions that returned a completed survey specified that their land use plans had a positive impact or are helping facilitate hazard loss reduction. Crawford County indicated that the plans are periodically updated.

Historic Preservation Plan: A historic preservation plan is intended to preserve historic structures or districts within a community. An often overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards to include the identification of the most effective way to reduce future damages. This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards, or are within a historic district that cannot easily be relocated out of harm's way.

- Survey results indicate that two (2) jurisdictions have completed or are developing a stand-alone historic preservation plan.

Subdivision Ordinances: A subdivision ordinance is intended to regulate the development of housing, commercial, industrial or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development.

- The Crawford County Planning Commission reports that as of December 2009, thirty (30) jurisdictions have a Subdivision and Land Development Ordinance. There is no County-wide Subdivision and Land Development Ordinance to cover the jurisdictions that do not have such an ordinance.

Zoning Ordinances: Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety and welfare of those in a given area. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type and density of development, it can serve as a powerful tool when applied in identified hazard areas.

- The Crawford County Planning Commission reports that as of December 2009, twenty-six (26) jurisdictions have zoning ordinances in place.

5.2.1c FLOODPLAIN MANAGEMENT

Flooding represents the greatest natural hazard facing the nation. At the same time, the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards, such as

education, outreach, and the training of local officials, the National Flood Insurance Program (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary, but is promoted by FEMA as a crucial means to implement and sustain an effective hazard mitigation program.

In order for a county or municipality to join the NFIP, they must adopt a local flood damage prevention ordinance that requires jurisdictions to follow established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by the 1% annual chance flood, and that new floodplain development will not aggravate existing flood problems or increase damage to other properties.

In addition, NFIP communities are eligible to participate in the NFIP's Community Rating System (CRS). Under the CRS, policyholders can receive premium discounts of 5 to 45 percent as their municipalities adopt more comprehensive flood mitigation measures.

Another key service provided by the NFIP is the mapping of identified flood hazard areas. Once prepared, the Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices and set flood insurance rates. FIRMs are an important source of information to educate residents, government officials and the private sector about the likelihood of flooding in their community.

Table 5-2 summarizes NFIP participation for each of Crawford County's local jurisdictions along with general NFIP policy data.

Table 5-2: NFIP Participation in Crawford County			
JURISDICTION	INITIAL FIRM IDENTIFIED	CURRENT EFFECTIVE MAP DATE	TRIBAL
Athens TWP	07/02/1982	07/02/1982 (M)	No
Beaver TWP	09/10/1982	09/10/1982 (M)	No
Bloomfield TWP	09/01/1986	09/01/1986 (L)	No
Blooming Valley Borough	NSFHA	NSFHA	No
Cambridge Springs Borough	08/02/1990	08/02/1990	No
Cambridge TWP	09/10/1984	06/04/1990	No
Centerville Borough	05/01/1986	05/01/1986 (L)	No
Cochranon Borough	06/04/1990	06/04/1990	No
Coneautville Borough	09/18/1987	09/18/1987	No
Conneaut Lake Borough	08/10/1979	06/05/1981 (M)	No
Conneaut TWP	09/10/1984	09/10/1984 (M)	No
Cussewago TWP	09/10/1984	09/10/1984 (M)	No

East Fairfield TWP	06/18/1990	06/18/1990	No
East Fallowfield TWP	09/24/1984	09/24/1984 (M)	No
East Mead TWP	09/01/1986	09/01/1986 (L)	No
Fairfield TWP	08/02/1990	08/02/1990	No
Greenwood TWP	09/10/1984	09/10/1984 (M)	No
Hayfield TWP	08/02/1990	08/02/1990	No
Hydetown Borough	04/17/1985	04/17/1985 (M)	No
Linesville Borough	06/05/1985	06/05/1985 (M)	No
Meadville, City of	06/01/1977	06/01/1977	No
North Shenango TWP	10/01/1986	10/01/1986 (L)	No
Oil Creek TWP	08/15/1990	08/15/1990	No
Pine TWP	06/19/1985	06/19/1985 (M)	No
Randolph TWP	07/18/1985	07/18/1985 (M)	No
Richmond TWP	09/01/1986	09/01/1986 (L)	No
Rockdale TWP	05/01/1986	05/01/1986 (L)	No
Rome TWP	01/07/1983	01/07/1983 (M)	No
Sadsbury TWP	08/19/1991	08/19/1991	No
Saegertown Borough	06/18/1990	06/18/1990	No
South Shenango TWP	07/03/1985	07/03/1985 (M)	No
Sparta TWP	01/28/1983	01/28/1983 (M)	No
Spartansburg Borough	11/23/1979	11/23/1979 (M)	No
Spring TWP	09/01/1986	09/01/1986 (L)	No
Springboro Borough	09/30/1987	09/30/1987	No
Steuben TWP	07/16/1990	07/16/1990	No
Summerhill TWP	06/25/1982	06/25/1982 (M)	No
Summit TWP	05/19/1987	05/19/1987	No
Titusville, City of	02/15/1978	02/15/1978	No
Townville Borough	02/15/1985	02/15/1985 (M)	No
Troy TWP	06/18/1990	06/18/1990	No
Union TWP	02/15/1985	02/15/1985 (M)	No
Venango Borough	06/18/1990	06/18/1990	No
Venango TWP	02/01/1985	02/01/1985 (M)	No
Vernon TWP	07/16/1990	07/16/1990	No
Wayne TWP	07/16/1990	07/16/1990	No
West Fallowfield TWP	07/03/1985	07/03/1985 (M)	No
West Mead TWP	06/15/1977	06/15/1977	No
West Shenango TWP	02/01/1985	02/01/1985 (M)	No
Woodcock Borough	01/17/1985	01/17/1985 (M)	No
Woodcock TWP	03/18/1990	06/18/1990	No

	(E)	Indicates Entry in Emergency Program
	NSFHA	No Special Flood Hazard Area – All Zone C
	N/A	Not Applicable At This Time
	(S)	Suspended Community
	(W)	Withdrawn Community
	(M)	No Elevation Determined – All Zone A,C,X
	(L)	Original FIRM by Letter – All Zone A,C,X

Sources: Federal Emergency Management Agency; Pennsylvania Emergency Management Agency

Floodplain Management Plan: A floodplain management plan (or a flood mitigation plan) provides framework for the identification and implementation of corrective and preventative measures designed to reduce flood-related impacts.

- Survey results indicate that six (6) jurisdictions in Crawford County have prepared a floodplain management plan that supports flood loss reduction efforts. The jurisdictions also cited flood damage prevention ordinances, policies and codes that are in place or under development as part of other community planning and regulatory programs.

In addition, all 51 municipalities in Crawford County participate in the NFIP. The program is managed by local municipalities participating in the program through ordinance adoption and floodplain regulation while the Crawford County Planning Commission provides an oversight and coordination role.

FEMA Region III makes available to communities, an ordinance review checklist which lists required provisions for floodplain management ordinances. This checklist helps communities develop an effective floodplain management ordinance that meets federal requirements for participation in the NFIP. The Pennsylvania Department of Community and Economic Development (DCED) provides communities, based on their 44 CFR 60.3 level of regulations, with a suggested ordinance document to assist municipalities in meeting the minimum requirements of the NFIP and the Pennsylvania Flood Plain Management Act (Act 166). Act 166 mandates municipal participation in and compliance with the NFIP. It also establishes higher regulatory standards for hazardous materials and high risk land uses. As new Digital Flood Insurance Rate Maps (DFIRMs) are published, the Pennsylvania State NFIP Coordinator at DCED works with communities to ensure the timely and successful adoption of an updated floodplain management ordinance by reviewing and providing feedback on existing and draft ordinances. In addition, DCED provides guidance and technical support through Community Assistance Contacts (CAC) and Community Assistance Visits (CAV).

Open Space Management Plan: An open space management an open space management plan is designed to preserve, protect and restore largely undeveloped lands, and to expand or connect areas in the public domain, including parks, greenways and other outdoor recreation areas. In many instances

open space management practices are consistent with the goals of reducing hazard losses, such as the preservation of wetlands or other floodprone areas in their natural state.

- Survey results indicate that four (4) jurisdictions in the county have prepared or are preparing an open space management plan or a similar plan (i.e., Greenway Master Plan or Conservation, Parks/Recreation Plan) that addresses open space.

Stormwater Management Plan: A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

- Survey results indicate that two (2) jurisdictions have prepared a stormwater management plan and two (2) are currently under development.

5.2.2 ADMINISTRATIVE AND TECHNICAL CAPABILITY

Administrative capability is described by an adequacy of departmental and personnel resources for the implementation of mitigation-related activities. Technical capability relates to an adequacy of knowledge and technical expertise of local government employees or the ability to contract outside resources for this expertise in order to effectively execute mitigation activities. Common examples of skill sets and technical personnel needed for hazard mitigation include: planners with knowledge of land development/management practices, engineers or professionals trained in construction practices related to buildings and/or infrastructure (e.g. building inspectors), planners or engineers with an understanding of natural and/or human caused hazards, emergency managers, floodplain managers, land surveyors, scientists familiar with hazards in the community, staff with the education or expertise to assess community vulnerability to hazards, personnel skilled in geographic information systems, resource development staff or grant writers, fiscal staff to handle complex grant application processes.

The *Capability Assessment Survey* was used to capture information on administrative and technical capability through the identification of available staff and personnel resources. **Table 5-3** provides a summary of the results for each participating jurisdiction in Crawford County. An “X” indicates that local staff members are tasked with the services listed. Additional information on administrative and technical capability is provided in the completed surveys.

Table 5-3: Relevant Staff and Personal Resources

JURISDICTION	Planners with knowledge of land development/management practices	Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Planners or engineers with an understanding of natural/manmade hazards	Emergency Manager	Floodplain Manager	Land Surveyor	Scientist familiar with the hazards of the community	Staff with the education or expertise to assess the community's vulnerability to hazards	Personnel skilled in Geographic Information Systems and/or HAZUS	Resource development staff or grant writer
Crawford County	X	X		X				X	X	X
Beaver TWP	X	X	X	X	X					
Cochranon Borough				X				X		
Conneaut Lake Borough				X						
City of Meadville	X	X	X	X	X			X	X	
East Fairfield TWP		X		X						
East Mead TWP	X			X						
Fairfield TWP		X		X						
Greenwood TWP	X	X	X	X	X				X	
Hayfield TWP	X	X	X	X	X	X				
Hydetown Borough				X				X		
Linesville Borough		X		X		X				X
North Shenango TWP	X	X		X	X					
Oil Creek TWP	X	X	X	X	X			X		X
Rockdale TWP				X						
Saegertown Borough	X	X	X	X			X	X		X
South Shenango Borough	X									
Spartansburg Borough										
Spring TWP		X								
Steuben TWP										
Summerhill TWP				X						
Summit TWP										
Titusville, City of	X		X	X	X			X		X
Union TWP										
Venango Borough				X						
Venango TWP				X						
Vernon TWP	X	X	X	X				X	X	X
West Mead TWP	X	X	X	X	X	X		X	X	X
West Shenango TWP		X		X						

Woodcock TWP	X	X	X	X						
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Communities listed above with no data in the columns did not check any of the items due to lack of capability

Based on assessment results in **Table 5.2-5**, jurisdictions in Crawford County have adequate administrative and technical staff needed to conduct hazard mitigation-activities. However, there seems to be a common lack of personnel for land surveying and scientific work related to community hazards. This result is not necessarily surprising since these tasks would typically be contracted to outside providers. All municipalities in the County have an identified emergency management coordinator.

5.2.3 FISCAL CAPABILITY

The ability of a local government to take action is often closely associated with the amount of money available to implement policies and projects. This may take the form of grant funding or locally-based revenue and financing. The costs associated with mitigation policy and project implementation vary widely. In some cases, policies are tied to staff time or administrative costs associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to an actual project such as the acquisition of flood-prone homes, which can require a substantial commitment from local, state and federal funding sources.

The *Capability Assessment Survey* was used to capture information on each jurisdiction's fiscal capability through the identification of locally available financial resources. **Table 5-4** provides a summary of the results for each participating jurisdiction in Crawford County. An "X" indicates that the listed fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds). Additional information on fiscal capability is provided in the completed surveys, which can be obtained through Crawford County Office of Emergency Services.

Table 5-4: Relevant Fiscal Sources									
JURISDICTION	Capital Improvement Programming	Community Development Block Grants	Special Purpose Taxes	Gas/Electric Utility Fees	Water/Sewer Fees	Stormwater Utility Fees	Development Impact Fees	General Obligation Bonds	Partnering Arrangements or Intergovernmental Agreements
Crawford County		X						X	X
Beaver TWP		X							
Cochranon Borough		X			X				X
Conneaut Lake Borough			X		X				
City of Meadville	X	X			X			X	X
East Fairfield TWP									

East Mead TWP									
Fairfield TWP			X						X
Greenwood TWP									
Hayfield TWP									X
Hydetown Borough	X	X						X	X
Linesville Borough		X							
North Shenango TWP	X				X				
Oil Creek TWP	X	X			X			X	X
Rockdale TWP	X	X	X				X	X	X
Saegertown Borough	X		X		X				X
South Shenango Borough									X
Spartansburg Borough									
Spring TWP									
Steuben TWP									
Summerhill TWP		X							X
Summit TWP									
Titusville, City of	X	X	X		X				X
Union TWP									
Venango Borough		X							
Venango TWP									
Vernon TWP	X	X							
West Mead TWP	X							X	X
West Shenango TWP		X							
Woodcock TWP							X	X	X

Communities listed above with no data in the columns did not check any of the items due to lack of capability

Based on survey results, most municipalities within the County perceive fiscal capability to be limited.

5.2.4 COUNTY AND MUNICIPAL SELF ASSESSMENT

In addition to the inventory and analysis of specific local capabilities, the Capability Assessment Survey required each local jurisdiction to conduct its own self assessment of its capability to implement hazard mitigation activities. As part of this process, county and municipal officials were encouraged to consider the barriers to implementing proposed mitigation strategies in addition to the mechanisms that could enhance or further such strategies. In response to the survey questionnaire, local officials classified each of the capabilities as either “limited,” “moderate” or “high.”

Table 5.2-7 summarizes the results of the self assessment process for each participating jurisdiction in Crawford County. An “**L**” indicates limited capability; an “**M**” indicates moderate capability; and an “**H**” indicates high capability.

Table 5-5: Self Assessment of Capability

JURISDICTION	Planning and Regulatory Capability	Administrative and Technical Capability	Fiscal Capability	Community Political Capability	Community Resiliency Capability
Crawford County	M	M	L	M	H
Beaver TWP	M	M	L	M	H
Cochran Borough	L	L	L	L	L
Conneaut Lake Borough	L	L	L	L	L
East Fairfield TWP	L	L	L	L	L
East Mead TWP	M	M	L	H	M
Fairfield TWP	M	M	L	M	M
Greenwood TWP	M	M	M	M	M
Hayfield TWP	M	M	L	M	M
Hydetown Borough	L	M	M	L	L
Linesville Borough	L	L	L	L	L
Meadville, City of	M	M	M	M	M
North Shenango TWP	L	L	M	M	L
Oil Creek TWP	L	M	M	L	L
Rockdale TWP	L	L	M	L	N/A
Saegertown Borough	H	H	M	H	M
South Shenango Borough	M	L	L	M	M
Spartansburg Borough	L	L	L	L	L
Spring TWP	L	L	L	L	L
Summerhill TWP	M	M	L	M	H
Summit TWP	M	L	L	M	M
Steuben TWP	L	L	L	L	L
Titusville, City of	M	M	L	M	M
Union TWP	L	L	L	L	L
Venango Borough	L	L	L	L	L
Venango TWP	M	M	M	M	M
Vernon TWP	H	H	M	M	H
West Mead TWP	H	H	M	M	M
West Shenango TWP	M	M	L	M	M
Woodcock TWP	L	L	L	L	L

5.2.5 CONCLUSIONS ON LOCAL CAPABILITY

In order to form meaningful conclusions on the assessment of local capability, a scoring system was designed and applied to the results of the *Capability Assessment Survey*. This approach, further described below, assesses the level of capability for each participating jurisdiction in Crawford County. It is important to note that the score received by each participating jurisdiction is not intended to compare one to the other. Rather, the scoring system is intended to assist each jurisdiction develop mitigation actions that reflect their abilities and help to identify areas that can be improved through the adoption of specific mitigation actions addressing these weaknesses.

Points System for Capability Ranking

SCORING
0-26 POINTS = LIMITED OVERALL CAPABILITY
27-52 POINTS = MODERATE OVERALL CAPABILITY
53-79 POINTS = HIGH OVERALL CAPABILITY

I. Planning and Regulatory Capability (up to 44 points)

Yes = 3 points Under Development or Under County Jurisdiction = 1 No = 0 points

- Hazard Mitigation Plan
- Comprehensive Land Use Plan
- Floodplain Management Plan
- Participate in CRS Program

Yes = 2 points Under Development or County Jurisdiction = 1 No = 0 points

- Open Space Management / Parks & Recreation Plan
- Stormwater Management Plan
- Emergency Operations Plan
- Continuity of Operations Plan
- Evacuation Plan
- Disaster Recovery Plan
- Natural Resource Protection Plan
- Flood Response Plan
- Flood Damage Prevention Ordinance

Yes = 1 point No = 0 points

- Capital Improvement Plan
- Economic Development Plan
- Historic Preservation Plan
- Zoning Regulations
- Subdivision Regulations
- Unified Development Ordinance

- Post Disaster Redevelopment/Reconstruction Ordinance
- Building Code
- Fire Code
- Participate in NFIP Program
- Floodplain Regulations
- Firewise
- Storm Ready

II. Administrative and Technical Capability (Up to 16 points)

Yes = 2 points No = 0 points

- Planners with knowledge of land development/management practices
- Engineers or professionals trained in construction practices related to buildings and/or infrastructure (including building inspectors)
- Planners or engineers with an understanding of natural and/or human caused hazards
- Emergency Manager
- Floodplain Manager

Yes = 1 points No = 0 points

- Land Surveyors
- Scientist familiar with the hazards of the community
- Staff with the education or expertise to assess the community's vulnerability to hazards
- Personnel skilled in Geographic Information Systems (GIS) and/or FEMA's HAZUS program
- Resource development staff or grant writers
- Fiscal staff to handle large/complex grants

III. Fiscal Capability (up to 9 points)

Yes = 1 point No = 0 points

- Capital Improvement Programming
- Community Development Block Grants (CDBG)
- Special purpose taxes
- Gas/electric utility fees
- Water/sewer fees
- Stormwater utility fees
- Development impact fees
- General obligation, revenue, and/or special tax bonds
- Partnering arrangements or intergovernmental agreements

IV. Self-Assessment of Capability (up to 10 points)

High = 2 points Moderate = 1 point Low = 0 points

- Planning and Regulatory Capability

- Administrative and Technical Capability
- Fiscal Capability
- Community Political Capability
- Community Resiliency Capability

Note: This methodology is based on best available information. If a jurisdiction does not provide information on any of the above items, a point value of zero (0) will be assessed for that item.

Table 5-6 shows the results of the capability assessment using the designed scoring system. According to the assessment, the average score for all participating jurisdictions in Crawford County is X.

Table 5-6: Capability Assessment Results		
JURISDICTION	CAPABILITY SCORE	CAPABILITY RATING
Crawford County	28	Moderate
Beaver Township	24	Low
Cochranon Borough	16	Low
Conneaut Lake Borough	13	Low
East Fairfield Township	25	Low
East Mead Township	19	Low
Fairfield Township	20	Low
Greenwood Township	27	Moderate
Hayfield Township	33	Moderate
Hydetown Borough	25	Low
Linesville Borough	13	Low
Meadville, City Of	50	Moderate
North Shenango Township	36	Moderate
Rockdale Township	17	Low
Oil Creek Township	36	Moderate
Saegertown Borough	46	Moderate
South Shenango Township	14	Low
Spartansburg Township	1	Low
Spring Township	18	Low
Steuben Township	4	Low
Summerhill Township	19	Low
Summit Township	21	Low
Titusville, City Of	40	Moderate
Union Township	5	Low

Venango Borough	9	Low
Venango Township	13	Low
Vernon Township	43	Moderate
West Mead Township	44	Moderate
West Shenango Township	13	Low
Woodcock Township	19	Low

The capability of local governments in Crawford County to implement mitigation actions is determined to be low to moderate. No jurisdictions in the county received a high capability rating. The scoring methodology used to conduct this assessment is meant to provide a general understanding of local capability for each jurisdiction. The results are based on the information provided by local officials in response to the *Capability Assessment Survey*, an instrument designed to measure local capability based on those indicators determined to be most relevant for mitigation purposes and referenced in FEMA planning guidance.

According to the assessment, local capability does vary between the local jurisdictions. While some municipalities have significant “in-house” capability, like the City of Meadville, Saegertown Borough, Vernon Township and West Mead Township, others depend on outside sources such as Crawford County, the Crawford County Planning Commission or private contractors to perform certain local functions or services such as floodplain management and code enforcement. Smaller local governments typically combine multiple job responsibilities, such as a emergency management director serving as the floodplain manager, or the city manager serving as the local emergency manager.

Perhaps one of the most significant findings of the assessment is the widespread existence of several planning initiatives already in place across Crawford County. As a result, jurisdictions understand the importance of intergovernmental coordination and how it applies to multijurisdictional planning. Crawford County’s local governments coordinate on a number of issues and strategies related to future land use planning and standards for regulating development, in addition to the provision of infrastructure such as sewer and water or public services such as police and fire protection.

Crawford County’s local governments should apply this same level of coordination to hazard mitigation practices, building on the work already being done in flood plain management and emergency management preparedness initiatives. This Hazard Mitigation Plan provides a vehicle to begin and institutionalize this process. However, in order to succeed, it will require clearly articulating the benefits of participating in and sustaining the countywide mitigation planning process. One of the best ways to obtain local buy-in and long-term success is to identify and implement achievable mitigation actions (as listed in each jurisdictions’ individual Mitigation Action Plans) that will facilitate continued intergovernmental coordination not only across the county, but with state and federal agencies as well.

5.2.6 LINKING THE CAPABILITY ASSESSMENT WITH THE RISK ASSESSMENT AND THE MITIGATION STRATEGY

The conclusions of the risk assessment and capability assessment serve as the foundation for a meaningful hazard mitigation strategy. During the process of identifying specific mitigation actions to pursue, each jurisdiction must consider not only their level of hazard risk but also their existing capability to minimize or eliminate that risk. **Figure 5-2** shows a *Risk vs. Capability Matrix* that is used to illustrate each jurisdiction's overall hazard risk in comparison to their overall capability. This matrix has been completed for each of Crawford County's participating jurisdiction that turned in a capability assessment and is included in each jurisdiction's separate and distinct Mitigation Action Plan.

Figure 5-2: Risk vs. Capability Matrix				
		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low			

In jurisdictions where the overall hazard risk is considered to be HIGH, and local capability is considered LOW, then specific mitigation actions that account for these conditions should be considered. For example, this may include less costly and less technically complex actions such as minor ordinance revisions or public awareness activities. If more complex activities are contemplated, such as a project for retrofitting buildings from hazards such as floods or earthquake, the mitigation strategy should reflect an entity other than the community to provide technical assistance and/or identify funding sources other than community funds (if a capability limitation is funding). Usually, where overall capability is low, mitigation action types such as public education, outreach and prevention are common action items. In cases where the hazard vulnerability is HIGH and overall capability is HIGH, more emphasis can be placed on actions that are more complex and/or costly as the community should have the capability to implement them. Mitigation actions such as property protection, natural resource protection and structural projects are more common to high capability communities. These statements are generalizations and each community should look at the capability and hazard risk in detail to provide further insight as to what appropriate mitigation actions can be implemented. In Section 6, for each participating community, a risk vs. capability matrix is displayed. Please note that the hazard risk referred to in the matrix is a composite hazard risk (including all hazards profiled).

6. MITIGATION STRATEGY

6.1. UPDATE PROCESS SUMMARY

The intent of the Mitigation Strategy is to provide Crawford County and participating municipalities with the goals that will serve as the guiding principles for future mitigation policy and project administration, along with a list of proposed actions deemed necessary to meet those goals and reduce the impact of natural hazards. It is designed to be comprehensive and strategic in nature. The development of the strategy included a thorough review of all natural hazards and identified policies and projects intended to not only reduce the future impacts of hazards, but also to assist Crawford County and participating municipalities achieve compatible economic, environmental and social goals. The development of this section is also intended to be strategic, in that all policies and projects are linked to establish priorities assigned to specific departments or individuals responsible for their implementation and assigned target completion deadlines. Funding sources are identified that can be used to assist in project implementation.

Mitigation goals are general guidelines that explain what the county wants to achieve. Goals are usually expressed as broad policy statements representing desired long-term results. Mitigation 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. There were six goals and nineteen objectives identified in the 2004 Crawford County Hazard Mitigation Plan. The goals address the hazards facing Crawford County by organizing around the categories of mitigation. A list of these goals and objectives as well as a review summary based on comments received from stakeholders who participated in the Hazard Mitigation Plan update process is included in **Table 6–1**. These reviews are based on responses received from communities to the 5-Year Hazard Mitigation Plan Review and comments received from county officials.

Actions provide more detailed descriptions of specific work tasks to help the county and its municipalities achieve prescribed goals and objectives. There were fifty actions identified in the 2004 Crawford County Hazard Mitigation Plan. A list of these actions as well as a review and summary of their progress based on comments received from stakeholders involved in the Hazard Mitigation Plan update process is included in **Table 6–2**. The 2004 Plan did not identify other parameters of the mitigation action (priority, estimated cost, funding sources, or time frames) and as such, these data are not included in **Table 6–2**.

Based on stakeholder participation from the Crawford County MPC, the mitigation strategy was modified and updated. Objectives were clarified to better document roles and responsibilities. Completed actions were deleted. New actions have been added to address particular hazards facing Crawford County and the consensus achieved in how to address those actions. The updated mitigation strategy is presented in **Section 6.4**.

Table 6-1: Five-Year Mitigation Plan Review of Goals and Objectives for 2004 Mitigation Plan						
Goal #1	Objective		Continue	Change	Delete	Reason / Comment
Improve upon the protection of citizens of Crawford County from all natural and man-made hazards	1.1.	Develop and distribute public awareness materials about natural hazard risks, preparedness, and mitigation		X		Goal statement seems to be overall goal of the plan. Combine 1.1. with 1.4. to read “ <i>Ensure adequate training and resources for emergency organizations and personnel by developing and distributing public awareness materials about natural hazard risks, preparedness, and mitigation</i> ”
	1.2.	Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness	X			Deferred
	1.3.	Evaluate existing shelters to determine adequacy for current and future populations			X	Deleted. Repetitive of Objective 1.1
	1.4.	Ensure adequate training and resources for emergency organizations and personnel			X	Deleted. Repetitive of Objective 1.1
Goal #2	Objective		Continue	Change	Delete	Reason / Comment
Reduce the current and future risks from hazards in Crawford County	2.1.	Direct new development away from high hazard areas		X		Change current goal to read “ <i>Mitigate existing structures and infrastructure located in high hazard areas</i> ”

	2.2.	Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards	X			Deferred
	2.3.	Improve the enforcement of existing floodplain regulations	X			Deferred
	2.4.	Ensure that flood insurance policies remain affordable through county and municipal government programs	X			Deferred
Goal #3 (Delete)	Objective		Continue	Change	Delete	Reason / Comment
Improve emergency preparedness in Crawford County and its incorporated municipalities (This goal was deleted due to its focus on emergency preparedness rather than hazard mitigation)	3.1.	Update Emergency Operations Plan (EOP)			X	No direct focus on hazard mitigation
	3.2.	Improve coordination and communication among disaster response organizations, local, and county governments			X	No direct focus on hazard mitigation
	3.3.	Update equipment at the E911 Communications Center			X	No direct focus on hazard mitigation
Goal #4 (Delete)	Objective		Continue	Change	Delete	Reason / Comment
Reduce the potential impact of natural and man-made disasters on private property (This goal is being deleted)	4.1.	Encourage participation in the National Flood Insurance Program (NFIP)			X	Eliminate objective and goal statement. All jurisdictions within the county participate in the NFIP.
	4.2.	Develop public/private partnerships toward the protection of private	X			Moving this objective to Goal #2.

from the plan due to the goal being repetitive of Goal #2)		properties				
	4.3.	Identify all repetitive loss structures throughout the county			X	Deleted due to the NFIP's current tracking of rep-loss properties. Therefore, no longer considered a priority for Crawford County.
Goal #5 (Delete)	Objective		Continue	Change	Delete	Reason / Comment
Reduce the potential impact of natural and man-made disasters on the county's historic treasures (This goal is being deleted from the plan due to the goal being repetitive of Goal #2)	5.1.	Improve coordination of mitigation efforts of the county's historic treasures			X	No longer applicable as the goal was deleted. Also repetitive of Objective 2.1
	5.2.	Identify and protect other historic structures throughout the county that are at risk from hazards			X	No longer applicable as the goal was deleted. Also repetitive of Objective 2.1
Goal #6	Objective		Continue	Change	Delete	Reason / Comment
Develop better hazard data for Crawford County and the municipalities	6.1.	Update flood hazard mapping			X	County FIRM's were recently updated and realistically, the county will not undertake additional efforts within the next five years
	6.2.	Assess vulnerability of transportation systems and assets located in hazard areas	X			Defer red

	6.3.	Conduct a hazardous materials survey to better understand the nature and extent of hazardous materials risks throughout the county	X			Deferred
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Table 6-2: Five-Year Mitigation Plan Review of Actions for 2004 Mitigation Plan		
Action #	Goal 1: Objective 1.1.	Review Comments
1.1.1.	Create displays for use at public events (health fair, public awareness day, and county fair)	Ongoing
1.1.2.	Create materials that are targeted towards tourist population	Ongoing
1.1.3.	Utilize the media for distribution and publication of hazard information	Ongoing
1.1.4.	Create a public speaking series on hazard related topics	Ongoing
1.1.5.	Ensure that the Red Cross citizen's disaster course is held on a frequent basis	Ongoing
1.1.6.	Update the county website to provide hazard related information that is easily accessible	Ongoing
1.1.7.	Continue to work with the Crawford County school district system to promote hazard mitigation education, awareness, and discuss ways to better integrate mitigation into the curriculum	Ongoing
1.1.8.	Continue to work with non-government organizations (youth, professional, religious) to promote mitigation education and awareness	Ongoing
Action #	Goal 1: Objective 1.2.	Review Comments
1.2.1.	Distribute letters to all property owners in the county regarding potential flood hazards as required for participation in the Community Rating System (CRS)	Ongoing
1.2.2.	Establish all-hazard resource centers to be located in the main office of the county and cities. The centers will act as a repository for information on local hazard identification, preparedness, and mitigation strategies for use by citizens, realtors, and lenders	Ongoing
1.2.3.	Continue to hold local course on National Flood Insurance Program (NFIP) for realtors, bankers, and insurers	Ongoing
Action #	Goal 1: Objective 1.3.	Review Comments
1.3.1.	Ensure that all shelters have adequate emergency power resources	Deleted. The objective 1.3 was deleted from this Plan update. Rationale is explained in the previous

		table.
1.3.2.	Establish a protocol for the sharing of annual shelter survey information between the local Red Cross chapter and the Crawford County OES	Deleted. The objective 1.3 was deleted from this Plan update. Rationale is explained in the previous table.
1.3.3.	Develop adequate emergency shelter and evacuation plans for animals (domestic pets, livestock, and wildlife)	Deleted. The objective 1.3 was deleted from this Plan update. Rationale is explained in the previous table.
1.3.4.	Increase education and awareness about shelter-in-place opportunities.	Deleted. The objective 1.3 was deleted from this Plan update. Rationale is explained in the previous table.
Action #	Goal 1: Objective 1.4.	Review Comments
1.4.1.	Teach Community Emergency Response Team (CERT) classes in Crawford County	Deleted. The objective 1.4 was deleted from this Plan update. Rationale is explained in the previous table.
1.4.2.	Increase the number of trained citizen emergency responders	Deleted. The objective 1.4 was deleted from this Plan update. Rationale is explained in the previous table.
1.4.3.	Conduct annual tabletop disaster exercises with local law enforcement, emergency managers, city and county officials, and other disaster response agencies	Deleted. The objective 1.4 was deleted from this Plan update. Rationale is explained in the previous table.
1.4.4.	Provide information about local, regional, state, and federal training opportunities to fire departments, EMS, ambulance services, and other emergency responders	Deleted. The objective 1.4 was deleted from this Plan update. Rationale is explained in the previous table.
1.4.5.	Continue to conduct National Weather Service Storm Spotter classes	Deleted. The objective 1.4 was deleted from this Plan update. Rationale is explained in the previous table.
Action #	Goal 2: Objective 2.1.	Review Comments
2.1.1.	Review existing regulations to ensure adequacy in reducing	Ongoing

	the amount of future development in identified hazard areas	
2.1.2.	Review all comprehensive plans to ensure that designated growth areas are not in hazard areas	Ongoing
2.1.3.	Review all capital improvement plans to ensure that infrastructure improvements are not directed towards hazardous areas	Ongoing
Action #	Goal 2: Objective 2.2.	Review Comments
2.2.1.	Work with the municipalities to update all floodplain ordinances adopted prior to 1987	Ongoing
Action #	Goal 2: Objective 2.3.	Review Comments
2.3.1.	Provide additional training to county and municipal development officials on NFIP requirements	Ongoing
Action #	Goal 2: Objective 2.4.	Review Comments
2.4.1.	Support Crawford County's efforts to enter the CRS program	Ongoing
2.4.2.	Provide training to municipalities on the CRS program and encourage them to participate. (Short Term)	Ongoing
Action #	Goal 3: Objective 3.1.	Review Comments
3.1.1.	Review the existing Crawford County EOP and update where necessary based on the recommendations of the Crawford County Hazard Mitigation Plan	Deleted. The objective 3.1 was deleted from this Plan update. Rationale is explained in the previous table.
3.1.2.	Ensure that the county and all municipalities adopt the revised EOP	Deleted. The objective 3.1 was deleted from this Plan update. Rationale is explained in the previous table.
Action #	Goal 3: Objective 3.2.	Review Comments
3.2.1.	Expand the mission and membership of the Crawford County Local Emergency Planning Committee (LEPC) to act as a countywide disaster task force.	Deleted. The objective 3.2 was deleted from this Plan update. Rationale is explained in the previous table.
Action #	Goal 3: Objective 3.3.	Review Comments
3.3.1.	Develop a plan to implement the Needs Assessment recommendations developed by the Public Safety System Consultant	Deleted. The objective 3.3 was deleted from this Plan update. Rationale is explained in the previous table.
Action #	Goal 4: Objective 4.1.	Review Comments
4.1.1.	Conduct outreach efforts to educate municipalities about the NFIP and its requirements	Deferred.

4.1.2.	Obtain updated information on the number of NFIP policyholders in Crawford County and its municipalities	Deleted. The objective 4.1 was deleted from this Plan update. Rationale is explained in the previous table.
Action #	Goal 4: Objective 4.2.	Review Comments
4.2.1.	Continue to support initiatives established under the Crawford County Project Impact	Deferred
4.2.2.	Evaluate the feasibility of the continuation of a funded Project Impact Coordinator position in Crawford County	Deleted. The county no longer has interest in this action for funding another employee.
Action #	Goal 4: Objective 4.3.	Review Comments
4.3.1.	Collect updated information of the number and location of all repetitive loss properties throughout the county and the municipalities	Deleted due to the NFIP's current tracking of rep-loss properties. Therefore, no longer considered a priority for Crawford County.
4.3.2.	Develop a database of information on all repetitive loss properties including maps	Deleted due to the NFIP's current tracking of rep-loss properties. Therefore, no longer considered a priority for Crawford County.
4.3.3.	Identify owners of repetitive loss properties who are interested in participating in future property acquisition and relocation projects	Deleted due to the NFIP's current tracking of rep-loss properties. Therefore, no longer considered a priority for Crawford County.
Action #	Goal 5: Objective 5.1.	Review Comments
5.1.1.	Establish a formal process for the municipalities to coordinate disaster related efforts, which will include defining boundaries and establishing responsibilities	Deleted due to the goal being repetitive of Goal #2. The actions are not considered a priority nor will they be realistically completed.
5.1.2.	Conduct training exercises that include representatives from municipalities and first responders to facilitate increased coordination	Deleted due to the goal being repetitive of Goal #2. The actions are not considered a priority nor will they be realistically completed.

Action #	Goal 5: Objective 5.2.	Review Comments
5.2.1.	Conduct a survey of all historic sites that are located in hazard areas	Deleted due to the goal being repetitive of Goal #2. The actions are not considered a priority nor will they be realistically completed.
5.2.2.	Develop mitigation strategies to protect any at-risk historic properties	Deleted due to the goal being repetitive of Goal #2. The actions are not considered a priority nor will they be realistically completed.
Action #	Goal 6: Objective 6.1.	Review Comments
6.1.1.	Work with FEMA and PEMA on the Map Modernization Program to improve FIRMS	Deleted. New DFIRM data has been produced and distributed to Crawford County.
Action #	Goal 6: Objective 6.2.	Review Comments
6.2.1.	Work with PA Department of Highways to identify areas of frequent roadway flooding and develop mitigation strategies	Ongoing
6.2.2.	Contact commercial and commuter rail lines to ensure that measures are being taken to address hazard risks	Ongoing
Action #	Goal 6: Objective 6.3.	Review Comments
6.3.1.	Apply for Hazardous Materials Emergency Preparedness (HMEP) grant from PEMA to finance the development of a hazardous materials survey for Crawford County	Ongoing
6.3.2.	Identify strategies to mitigate risks from the transportation and/or storage of hazardous materials in Crawford County	Ongoing

6.2. MITIGATION GOALS AND OBJECTIVES

Hazard mitigation goals and objectives for the 2010 plan were developed after the Crawford County MPC reviewed the results of the updated Risk Assessment and Capability Analysis. The following tables identify the goals and objectives established for the 2010 HMP.

Table 6-3: Goals and Objectives for 2010 HMP	
Goal	Objective
1.0 Improve upon the protection of citizens of Crawford County from all natural and man-made hazards	1.1. Ensure adequate training and resources for emergency organizations and personnel by developing and distributing public awareness materials about natural hazard risks, preparedness, and mitigation
	1.2. Target owners of properties within identified hazard areas for additional outreach regarding mitigation and disaster preparedness
2.0 Reduce the current and future risks from hazards in Crawford County	2.1. Mitigate existing structures and infrastructure located in high hazard areas
	2.2. Evaluate and update existing floodplain ordinances to meet or exceed the NFIP standards
	2.3. Improve the enforcement of existing floodplain regulations
	2.4. Ensure that flood insurance policies remain affordable through county and municipal government programs
3.0 Develop better hazard data for Crawford County and its municipalities	3.1. Assess vulnerability of transportation systems and assets located in hazard areas
	3.2. Conduct a hazardous materials survey to better understand the nature and extent of hazardous materials risk throughout the county

6.3. IDENTIFICATION AND ANALYSIS OF MITIGATION TECHNIQUES

In order to ensure that a broad range of mitigation actions were considered, the Crawford County MPC analyzed a comprehensive range of specific mitigation actions for each hazard after it had completed the risk assessment and capability analysis. This was done by developing a matrix of mitigation planning techniques (described below) versus the priority hazards in the county. This helped to ensure that there was sufficient breadth and creativity in the mitigation actions considered.

There are six categories of mitigation actions which Crawford County considered in developing its mitigation action plan. Those categories include:

- **Prevention:** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning, zoning, building codes, subdivision regulations, hazard specific regulations (such as floodplain regulations), capital improvement programs, and open-space preservation and stormwater regulations.
- **Property Protection:** Actions that involve modifying or removing existing buildings or infrastructure to protect them from a hazard. Examples include the acquisition, elevation and relocation of structures, structural retrofits, flood-proofing, storm shutters, and shatter resistant glass. Most of these property protection techniques are considered to involve “sticks and bricks;” however, this category also includes insurance.
- **Public Education and Awareness:** Actions to inform and educate citizens, elected officials, and property owners about potential risks from hazards and potential ways to mitigate them. Such actions include hazard mapping, outreach projects, library materials dissemination, real estate disclosures, the creation of hazard information centers, and school age / adult education programs.
- **Natural Resource Protection:** Actions that, in addition to minimizing hazard losses also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, forest and vegetation management, wetlands restoration or preservation, slope stabilization, and historic property and archeological site preservation.
- **Structural Project Implementation:** Mitigation projects intended to lessen the impact of a hazard by using structures to modify the environment. Structures include stormwater controls (culverts); dams, dikes, and levees; and safe rooms.
- **Emergency Services:** Actions that typically are not considered mitigation techniques but reduce the impacts of a hazard event on people and property. These actions are often taken prior to,

during, or in response to an emergency or disaster. Examples include warning systems, evacuation planning and management, emergency response training and exercises, and emergency flood protection procedures.

To cross-reference possible categories of mitigation actions with hazards that pose the greatest threat (high and moderate risk hazards), the following matrix was completed by participating jurisdictions during the mitigation solutions workshop. The matrix below is the completed Crawford County Strategy Technique Matrix.

Mitigation Technique Matrix									
Mitigation Technique	High and Moderate Risk Hazards								Description of how technique can protect new and existing buildings and infrastructure?
	Flooding	Tornado	Winter Weather	Drought	Dam Failure	Thunderstorms			
Prevention	X	X	X	X	X	X			For Flood, join and participate in the CRS
Property Protection	X								For Winter Weather, bury power lines
Natural Resource Protection	X								For Flood, enact conservation easements
Structural Projects	X	X							For Tornado, construct saferooms
Emergency Services			X			X			For Summer Storms, install early warning systems
Public Education / Awareness	X	X	X	X	X	X			For Flood, update floodplain mapping

The matrix above is verbatim from what was received from Crawford County. Although ten hazards were identified in this plan, all hazards were not identified and analyzed on this technique matrix. However, the purpose of this matrix is to help generate ideas about future and potential mitigation actions.

6.4. MITIGATION ACTION PLAN

The mitigation actions proposed by the county and its participating jurisdictions are listed in forty-two (42) individual *Mitigation Action Plans (MAPs)* on the pages that follow **Table 6-4**. Each MAP has been designed to address the established countywide goals of this updated HMP, in addition to the particular goals and objectives of each individual jurisdiction. During the development process, it was determined by the MPC that no mitigation actions were completed by the county or any jurisdiction as a result of the 2004 plan. The primary factor for zero implementation since 2004 according to participants was funding and knowledge of mitigation strategies. All actions from the 2004 plan were deferred to this 2010 update. They will be maintained on a regular basis according to the plan maintenance procedures established for the Crawford County Hazard Mitigation Plan in Section 7: *Plan Maintenance*.

Table 6-4: Summary of Mitigation Action Plans (1 County, 42 Municipal)		
	Jurisdiction	Number of Mitigation Actions
1C	Crawford County	18
n/a	Athens TWP	Did Not Participate in Planning Process
1M	Beaver TWP	2
n/a	Bloomfield TWP	Did Not Participate in Planning Process
2M	Blooming Valley Borough	2
3M	Cambridge Springs Borough	1
n/a	Cambridge TWP	Did Not Participate in Planning Process
4M	Centerville Borough	1
5M	Cochranon Borough	2
6M	Conneautville Borough	1
7M	Conneaut Lake Borough	2
8M	Conneaut TWP	2
9M	Cussewago TWP	1
10M	East Fairfield TWP	2
n/a	East Fallowfield TWP	Did Not Participate in Planning Process
11M	East Mead TWP	2
12M	Fairfield TWP	1
13M	Greenwood TWP	2
14M	Hayfield TWP	1
15M	Hydetown Borough	1
16M	Linesville Borough	1
17M	Meadville, City of	1
18M	North Shenango TWP	3
19M	Oil Creek TWP	2
20M	Pine TWP	1
21M	Randolph TWP	1
n/a	Richmond TWP	Did Not Participate in Planning Process
22M	Rockdale TWP	2
n/a	Rome TWP	Did Not Participate in Planning Process

23M	Sadsbury TWP	1
24M	Saegertown Borough	5
25M	South Shenango TWP	1
n/a	Sparta TWP	Did Not Participate in Planning Process
26M	Spartansburg Borough	1
27M	Spring TWP	2
n/a	Springboro Borough	Did Not Participate in Planning Process
28M	Steuben TWP	1
29M	Summerhill TWP	2
30M	Summit TWP	1
31M	Titusville, City of	2
n/a	Townville Borough	Did Not Participate in Planning Process
32M	Troy TWP	2
33M	Union TWP	2
34M	Venango Borough	1
35M	Venango TWP	1
36M	Vernon TWP	1
37M	Wayne TWP	1
38M	West Fallowfield TWP	1
39M	West Mead TWP	2
40M	West Shenango TWP	2
41M	Woodcock Borough	1
42M	Woodcock TWP	1

Following the risk assessment stage of the update process, a mitigation solutions workshop was held on December 7, 2009 to develop a framework for the Crawford County Mitigation Action Plan. The following tables' list actions which were developed and/or updated at this workshop, during the MPC meetings, and at other times during the update process, comments were received and analyzed. At least one mitigation action was established for a moderate and/or high risk hazard in Crawford County. More than one action is identified for several hazards.

After reviewing the mitigation actions items from the 2004 plan, the Crawford County MPC evaluated the actions using the PASTEEL approach. The PASTEEL approach allows for a careful review of the feasibility of mitigation actions by using seven criteria. The criteria are described below:

- P Political
- A Administrative
- S Social
- T Technical
- E Economic
- E Environmental
- L Legal

FEMA mitigation planning requirements indicate that any prioritization system used shall include a special emphasis on the extent to which benefits are maximized according to a cost-benefit review of the proposed projects. To do this in an efficient manner that is consistent with FEMA’s guidance on using cost-benefit review in mitigation planning, the PASTEEL method was adapted to include a higher weighting for two elements of the economic feasibility factor – Benefits of Action and Costs of Action. This method incorporates concepts similar to those described in Method C of FEMA 386-5: Using Benefit Cost Review in Mitigation Planning (FEMA, 2007).

For the individual action plans (below), a PASTEEL score was calculated based on the number of favorable considerations that can be found on the PASTEEL document. Up to 23 considerations can be used to prioritize each action using this evaluation methodology. Some of the PASTEEL evaluations were not returned with comments and therefore did not constitute a score. Therefore, a second method of prioritization, the community preference priority, was used. This qualitative approach uses priority of LOW, MODERATE, and HIGH which were determined by the community in terms of preference. This community preference priority was completed by participating jurisdictions when they submitted the Mitigation Strategy Action Plan Template Job-Aid as seen below.

<i>Community: Action No:</i>	<i>Action:</i>
<i>Mitigation Technique Category</i>	
<i>Hazard(s) Addressed</i>	
<i>Priority (High, Medium, Low)</i>	
<i>Estimated Cost</i>	
<i>Potential Funding Sources:</i>	
<i>Lead Agency/Department</i>	
<i>Implementation Schedule</i>	
<i>Progress Report</i>	

6.4.1.1C CRAWFORD COUNTY MITIGATION ACTION PLAN

Due to the limited capability of resources available to Crawford County, the county's identified actions fall under the categories of "Public Education & Awareness" and "Prevention". These categories of mitigation actions are easy to implement and can also be implemented at a relatively low cost and at little burden to staff resources. For this reason, the county selected these actions.

CRAWFORD COUNTY CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			X
	Low			

Crawford County Mitigation Action #1		Create a "How To" hazard mitigation display board containing pictures and information, such as acquiring, elevating and/or retrofitting residential homes and information on the NFIP and CRS programs. This board will be used at special events (health fair, public awareness day, county fair).	
Goal / Objective Met:		Goal #1 / Objective 1.1.	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:		All Hazards (Natural & Technological)	
Priority (High, Moderate, Low):		Moderate	
PASTEEL Score:		10	
Estimated Cost:		Staff Time & Resources	
Potential Funding Sources:		Unknown	
Lead Agency/Department Responsible:		Crawford County OES	
Implementation Schedule:		24 months (March 2012)	

Crawford County Mitigation Action #2	Create a "facts" hazard mitigation brochure which will include information on the types of hazard mitigation projects that can be implemented due to natural and technological hazards that affect Crawford County. This will be distributed by the Crawford County Convention & Visitors Bureau.	
Goal / Objective Met:	Goal #1 / Objective 1.1	
Category:	Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:	All Hazards (Natural & Technological)	
Priority (High, Moderate, Low):	Moderate	
PASTEEL Score:	10	
Estimated Cost:	Staff Time & Resources	
Potential Funding Sources:	Unknown	
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Convention & Visitors Bureau	
Implementation Schedule:	24 Months (March 2012)	

Crawford County Mitigation Action #3	Use media outlets for the distribution and publication of hazard information. This includes news releases on pre- and post-disaster awareness information.	
Goal / Objective Met:	Goal #1 / Objective 1.1	
Category:	Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:	All Hazards (Natural & Technological)	
Priority (High, Moderate, Low):	High	
PASTEEL Score:	10	
Estimated Cost:	Staff Time & Resources	
Potential Funding Sources:	N/A	
Lead Agency/Department Responsible:	Crawford County OES	
Implementation Schedule:	As needed basis	

Crawford County Mitigation Action #4	Create public speaking series on hazard related topics. The series is to include topics on natural/man-made hazards, how to develop a family disaster plan/family supply kit, how to develop a business continuity plan and mitigation projects for homeowners. These speaking engagements will be offered to civic and religious organizations as well as schools throughout the county.	
Goal / Objective Met:	Goal #1 / Objective 1.1	
Category:	Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:	All Hazards (Natural & Technological)	
Priority (High, Moderate, Low):	Moderate	
PASTEEL Score:	10	
Estimated Cost:	Staff Time & Resources	
Potential Funding Sources:	N/A	
Lead Agency/Department Responsible:	Crawford County OES	
Implementation Schedule:	36 Months (March 2013)	

Crawford County Mitigation Action #5	Promote the local Red Cross's "Citizen Disaster Courses". These courses include: Child CPR, Basic First Aid, Intro to Disaster Services, Mass Care, and Shelter Operations.	
Goal / Objective Met:	Goal #1 / Objective 1.1	
Category:	Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:	All Hazards (Natural & Technological)	
Priority (High, Moderate, Low):	Moderate	
PASTEEL Score:	10	
Estimated Cost:	Staff Time & Resources	
Potential Funding Sources:	N/A	
Lead Agency/Department Responsible:	Crawford County OES, Crawford County American Red Cross Chapter	
Implementation Schedule:	As needed basis	

Crawford County Hazard Mitigation Plan 2010

Crawford County Mitigation Action #6	Update the Crawford County OES website with hazard related information and current issues/projects to include preparedness, mitigation, response, and recovery.	
Goal / Objective Met:	Goal #1 / Objective 1.1	
Category:	Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:	All Hazards (Natural & Technological)	
Priority (High, Moderate, Low):	High	
PASTEEL Score:	10	
Estimated Cost:	Staff Time & Resources	
Potential Funding Sources:	N/A	
Lead Agency/Department Responsible:	Crawford County OES, Crawford County IT	
Implementation Schedule:	Department As needed basis	

Crawford County Mitigation Action #7	Work with the Crawford County School Districts to promote hazard mitigation education & awareness. This includes conducting meetings to brainstorm ways to integrate hazard mitigation into programs such as the science curriculum, mathematics, and social studies.	
Goal / Objective Met:	Goal #1 / Objective 1.1	
Category:	Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:	All Hazards (Natural & Technological)	
Priority (High, Moderate, Low):	Moderate	
PASTEEL Score:	10	
Estimated Cost:	Staff Time & Resources	
Potential Funding Sources:	N/A	
Lead Agency/Department Responsible:	Crawford County OES	
Implementation Schedule:	As needed basis	

Crawford County Mitigation Action #8	Assist municipalities in Community Rating System (CRS) participation by distributing correspondence to all property owners within identified flood hazard areas. The content of these letters will address specific requirements in accordance with the NFIP's CRS program to include: Local flood hazard, flood safety, flood insurance information, property protection measures, natural & beneficial functions of the local floodplain, local FIRM, NOAA weather radio information, floodplain development permit requirements, and substantial damage/improvement requirements.
Goal / Objective Met:	Goal #1 / Objective 1.2
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	11
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	Unknown
Lead Agency/Department Responsible:	Crawford County OES, Municipality OES
Implementation Schedule:	As needed basis per the municipality's request for assistance

Crawford County Mitigation Action #9	Establish all-hazard resource centers to be located in each municipality's community center. The centers will act as a repository for information on local hazard identification, preparedness, and mitigation strategies for use by citizens, realtors, and financial lenders.
Goal / Objective Met:	Goal #1 / Objective 1.2
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	All Hazards (Natural & Technological)
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	10
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Municipality OES
Implementation Schedule:	36 months (March 2013)

Crawford County Mitigation Action #10	Conduct course on the overview of the National Flood Insurance Program (NFIP) directed towards realtors, bankers, and insurers
Goal / Objective Met:	Goal #1 / Objective 1.2
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	10
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES
Implementation Schedule:	Annual basis

Crawford County Mitigation Action #11	Review existing county and municipal zoning regulations (if applicable) to ensure adequacy in reducing future development in identified flood hazard areas.
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:	36 Months (March 2013)

Crawford County Mitigation Action #12	Review existing county and municipal comprehensive plans (if applicable) to ensure that designated growth and development areas are not within an identified flood hazard area.
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:	36 Months (March 2013)

Crawford County Mitigation Action #13	Review existing county and municipal capital improvement plans (if applicable) to ensure that infrastructure improvements are not directed in hazardous areas.
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	All hazards (Natural & Technological)
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:	36 Months (March 2013)

Crawford County Mitigation Action #14	Work with all 51 municipalities to update floodplain ordinances adopted prior to 1987. This is to ensure that full compliance is being met in regard to the NFIP.
Goal / Objective Met:	Goal #2 / Objective 2.2
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:	60 Months (March 2015)

Crawford County Mitigation Action #15	Improve the enforcement of existing floodplain regulations by providing additional training to county and municipal officials on the NFIP.
Goal / Objective Met:	Goal #2 / Objective 2.3
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:	36 Months (March 2012)

Crawford County Mitigation Action #16 Join the NFIP's Community Rating System (CRS).	
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	11
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

Crawford County Mitigation Action #17 Provide training and support to local municipalities on the NFIP's Community Rating System (CRS) and encourage them to join the program.	
Goal / Objective Met:	Goal #2 / Objective 2.4
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	11
Estimated Cost:	N/A
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:	60 Months (March 2015)

Crawford County Mitigation Action #18		Conduct a Hazardous Materials Commodity Flow Study along Interstate 79 .
Goal / Objective Met:		Goal #3 / Objective 3.1, 3.2
Category:		Hazardous Materials
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
PASTEEL Score:		14
Estimated Cost:		N/A
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:		60 Months (March 2015)

Crawford County Mitigation Action #19		Conduct outreach efforts to educate municipalities about the NFIP and its requirements
Goal / Objective Met:		Goal #2 / Objective 2.2
Category:		Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
PASTEEL Score:		13
Estimated Cost:		N/A
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:		60 Months (March 2015)

Crawford County Mitigation Action #20		Develop a monitoring program for identifying hazardous areas of concern in order to lessen the impact of future development in hazard prone areas (i.e. floodplains, landslide prone areas)
Goal / Objective Met:		Goal #1 / Objective 1.2
Category:		Prevention
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		All Hazards
Priority (High, Moderate, Low):		High
PASTEEL Score:		13
Estimated Cost:		N/A
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Crawford County OES, Crawford County Planning Department, Municipal Planning Departments

Implementation Schedule:	60 Months (March 2015)
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Crawford County Mitigation Action #21	Review and analyze current regulations and ordinances and investigate amending current codes to incorporate that new development be built to withstand EF5 (Enhanced Fujita Scale) wind speeds.
Goal / Objective Met:	Goal #1 / Objective 1.2
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Tornadoes, Thunderstorms/High Winds
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	18
Estimated Cost:	N/A
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:	60 Months (March 2015)

Crawford County Mitigation Action #22	Conduct and/or review soil survey's for the county and map vulnerable areas prone to landslide
Goal / Objective Met:	Goal #1 / Objective 1.2
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Landslide
Priority (High, Moderate, Low):	Low
PASTEEL Score:	15
Estimated Cost:	N/A
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Crawford County OES, Crawford County Planning Department, Municipal Planning Departments
Implementation Schedule:	60 Months (March 2015)

6.4.2.1M BEAVER TOWNSHIP MITIGATION ACTION PLAN

BEAVER TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL	High			

CAPABILITY	Moderate			
	Low		X	

Beaver Township Mitigation Action #1	Roadway elevations in low lying areas (overland flood prone areas) throughout the township
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Property Protection
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	12
Estimated Cost:	\$200,000
Potential Funding Sources:	FEMA HMA Grant Program, Crawford County Conservation Agency Grant Funding
Lead Agency/Department Responsible:	Beaver Township Supervisors
Implementation Schedule:	60 Months (March 2015)

Beaver Township Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Beaver Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.3.2M BLOOMING VALLEY BOROUGH MITIGATION ACTION PLAN

Blooming Valley Borough did not submit a capability assessment; therefore a capability vs. matrix cannot be completed.

Blooming Valley Borough Mitigation Action #1	Install stormwater drainage controls and create ditches throughout the borough's low lying areas to lessen the impact of overland flooding on public and private infrastructure
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation

Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	17
Estimated Cost:	\$70,000
Potential Funding Sources:	FEMA HMA Grant Program, Local funds
Lead Agency/Department Responsible:	Blooming Valley Borough Council
Implementation Schedule:	60 Months (March 2015)

Blooming Valley Borough Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	N/A
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Blooming Valley Borough Council, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.4.3M CAMBRIDGE SPRINGS BOROUGH MITIGATION ACTION PLAN

Cambridge Springs Borough did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Cambridge Springs Borough Mitigation Action #1	Structural elevations of residential homes along Poplar Street. During severe precipitation and snowmelt events, the French Creek is inundated with water which causes flash flood conditions for this area impacting several residential structure throughout the borough.
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Property Protection
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	5
Estimated Cost:	\$2,000,000
Potential Funding Sources:	FEMA HMA Grant Program

Lead Agency/Department Responsible:	Cambridge Springs Borough Council
Implementation Schedule:	60 Months (March 2015)

6.4.5.4M CENTERVILLE BOROUGH MITIGATION ACTION PLAN

Centerville Borough did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Centerville Borough Mitigation Action #1	Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.4
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Centerville Borough Council, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

6.4.6.5M COCHRANTON BOROUGH MITIGATION ACTION PLAN

COCHRANTON BOROUGH CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Cochranton Borough Mitigation Action #1	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	7
Estimated Cost:	Staff Time and Resources

Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Cochranton Borough Council, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

Cochranton Borough Mitigation Action #2	Improve and upsize stormwater drainage infrastructure controls along North Road. Due to the general topography of the specific area, during heavy precipitation events (which can cause flash flood conditions), the current system becomes inundated and backs up due to the heavy discharge of water. This impacts both private residents and public infrastructure, in particular a residential apartment complex.
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	8
Estimated Cost:	\$150,000
Potential Funding Sources:	FEMA HMA Grant Program
Lead Agency/Department Responsible:	Cochranton Borough Manager
Implementation Schedule:	60 Months (March 2015)

6.4.7.6M CONNEAUTVILLE BOROUGH MITIGATION ACTION PLAN

Conneautville Borough did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Conneautville Borough Mitigation Action #1	Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.4
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Conneautville Borough Council, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

6.4.8.7M CONNEAUT LAKE BOROUGH MITIGATION ACTION PLAN

COCHRANTON BOROUGH CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Conneaut Lake Borough Mitigation Action #1	Installation of new traffic signal poles to reduce the number of hazardous materials/transportation accidents within the borough
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Property Protection
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Hazardous Materials
Priority (High, Moderate, Low):	High
PASTEEL Score:	13
Estimated Cost:	\$70,000
Potential Funding Sources:	Unknown
Lead Agency/Department Responsible:	Conneaut Lake Borough Council
Implementation Schedule:	60 Months (March 2015)

Conneaut Lake Borough Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Conneaut Lake Borough Council, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.9.8M CONNEAUT TOWNSHIP MITIGATION ACTION PLAN

Conneaut Township did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Conneaut Township Mitigation Action #1	Wallace Avenue Bridge Replacement
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	16
Estimated Cost:	\$400,000
Potential Funding Sources:	Unknown
Lead Agency/Department Responsible:	Conneaut Township Supervisors
Implementation Schedule:	60 Months (March 2015)

Conneaut Township Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Conneaut Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.10.9M CUSSEWAGO TOWNSHIP MITIGATION ACTION PLAN

Cussewago Township did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Cussewago Township Mitigation Action #1		Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:		Goal #2 / Objective 2.2, 2.3, 2.4
Category:		Prevention
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
Estimated Cost:		Staff Time and Resources
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Cussewago Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:		36 Months (March 2012)

6.4.11.10M EAST FAIRFIELD TOWNSHIP MITIGATION ACTION PLAN

EAST FAIRFIELD TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

East Fairfield Township Mitigation Action #1	Roadway elevation (approximately 500-600 ft) along Schaffer Road (near the intersection of Schaffer Road & Griffin Road). The primary source of flooding is the Little Sugar Creek.
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Property Protection
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	21
Estimated Cost:	\$40,000
Potential Funding Sources:	FEMA HMA Grant Program, Township Road Program
Lead Agency/Department Responsible:	East Fairfield Township Supervisors
Implementation Schedule:	60 Months (March 2015)

East Fairfield Township Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	East Fairfield Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.12.11M

EAST MEAD TOWNSHIP MITIGATION ACTION PLAN

EAST MEAD TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

East Mead Township Mitigation Action #1		Stormwater drainage system controls enhancement on North Wayland Road (between Rt. 27 and Rt. 22)
Goal / Objective Met:		Goal #2 / Objective 2.1
Category:		Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
PASTEEL Score:		10
Estimated Cost:		Unknown
Potential Funding Sources:		FEMA HMA Grant Program
Lead Agency/Department Responsible:		East Mead Township Supervisors
Implementation Schedule:		12 Months (March 2011)

East Mead Township Mitigation Action #2		Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:		Goal #2 / Objective 2.2, 2.3, 2.4
Category:		Prevention
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
Estimated Cost:		Staff Time and Resources
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		East Mead Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:		36 Months (March 2012)

6.4.13.12M

FAIRFIELD TOWNSHIP MITIGATION ACTION PLAN

FAIRFIELD TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Fairfield Township Mitigation Action #1 Join the NFIP's Community Rating System (CRS)	
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Fairfield Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.14.13M **GREENWOOD TOWNSHIP MITIGATION ACTION PLAN**

GREENWOOD TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

Greenwood Township Mitigation Action #1		Improve stormwater drainage infrastructure controls near the intersection of State Route 19 and 285. Other areas of concern are Delano Road and Rock Creek Road.
Goal / Objective Met:	Goal #2 / Objective 2.1	
Category:	Structural Project Implementation	
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:	Flood	
Priority (High, Moderate, Low):	High	
PASTEEL Score:	19	
Estimated Cost:	Unknown	
Potential Funding Sources:	FEMA HMA Grant Program, PennDot, Crawford County Conservation Office	
Lead Agency/Department Responsible:	Greenwood Township Supervisors	
Implementation Schedule:	60 Months (March 2015)	

Greenwood Township Mitigation Action #2		Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:		Goal #2 / Objective 2.2, 2.3, 2.4
Category:		Prevention
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
Estimated Cost:		Staff Time and Resources
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Greenwood Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:		36 Months (March 2012)

6.4.15.14M

HAYFIELD TOWNSHIP MITIGATION ACTION PLAN

HAYFIELD TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

Hayfield Township Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)
Goal / Objective Met:		Goal #2 / Objective 2.4
Category:		Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
Estimated Cost:		Staff Time and Resources
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Hayfield Township Supervisors, Crawford County OES
Implementation Schedule:		60 Months (March 2015)

6.4.16.15M

HYDETOWN BOROUGH MITIGATION ACTION PLAN

HYDETOWN BOROUGH CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Hydetown Borough Mitigation Action #1		Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:		Goal #2 / Objective 2.2, 2.3, 2.4
Category:		Prevention
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
PASTEEL Score:		14
Estimated Cost:		Staff Time and Resources
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Hydetown Borough Council, Crawford County OES, Crawford County Planning Department
Implementation Schedule:		36 Months (March 2012)

6.4.17.16M

LINESVILLE BOROUGH MITIGATION ACTION PLAN

LINESVILLE BOROUGH CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Linesville Borough Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		Linesville Borough Council, Crawford County OES	
Implementation Schedule:		60 Months (March 2015)	

6.4.18.17M

CITY OF MEADVILLE MITIGATION ACTION PLAN

CITY OF MEADVILLE CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

City of Meadville Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		City of Meadville: City Manager, Crawford County OES	
Implementation Schedule:		60 Months (March 2015)	

6.4.19.18M

NORTH SHENANGO TOWNSHIP MITIGATION ACTION PLAN

NORTH SHENANGO TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

North Shenango Township Mitigation Action #1	Re-grade (deepen) ditches along South Lake Road to lessen the impact of overland flooding onto public and private infrastructure
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	23
Estimated Cost:	\$500,000
Potential Funding Sources:	FEMA HMA Grant Program, Township Funds
Lead Agency/Department Responsible:	North Shenango Township Supervisors
Implementation Schedule:	60 Months (March 2015)

North Shenango Township Mitigation Action #2	Installation of new stormwater system along South Lake Road to significantly minimize the impact of overland flooding onto public and private infrastructure
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	22
Estimated Cost:	\$5 Million
Potential Funding Sources:	FEMA HMA Grant Program, Township Funds
Lead Agency/Department Responsible:	North Shenango Township Supervisors
Implementation Schedule:	60 Months (March 2015)

North Shenango Township Mitigation Action #3		Join the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.2, 2.3, 2.4	
Category:		Prevention	
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		North Shenango Township Supervisors, Crawford County OES, Crawford County Planning Department	
Implementation Schedule:		36 Months (March 2012)	

6.4.20.19M

OIL CREEK TOWNSHIP MITIGATION ACTION PLAN

OIL CREEK TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

Oil Creek Township Mitigation Action #1		Improve (upsized) stormwater drainage system along Duncan Road	
Goal / Objective Met:		Goal #2 / Objective 2.1	
Category:		Structural Project Implementation	
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
Continued Compliance with the NFIP		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
PASTEEL Score:		14	
Estimated Cost:		\$75,000	
Potential Funding Sources:		FEMA HMA Grant Program	
Lead Agency/Department Responsible:		Oil Creek Township Supervisors	
Implementation Schedule:		24 Months (March 2012)	

Oil Creek Township Mitigation Action #2 Join the NFIP's Community Rating System (CRS)	
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	14
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Oil Creek Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.21.20M

PINE TOWNSHIP MITIGATION ACTION PLAN

Pine Township did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Pine Township Mitigation Action #1 Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:	Goal #2 / Objective 2.4
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Pine Township Supervisors, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

6.4.22.21M

RANDOLPH TOWNSHIP MITIGATION ACTION PLAN

Randolph Township did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Randolph Township Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Continued Compliance with the NFIP		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		Randolph Township Supervisors, Crawford County	
Implementation Schedule:		OES 60 Months (March 2015)	

6.4.23.22M

ROCKDALE TOWNSHIP MITIGATION ACTION PLAN

ROCKDALE TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Rockdale Township Mitigation Action #1 Strengthen township floodplain ordinances (NFIP)	
Goal / Objective Met:	Goal #2 / Objective 2.2
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	17
Estimated Cost:	Staff Time & Resources
Potential Funding Sources:	FEMA HMA Grant Program
Lead Agency/Department Responsible:	Rockdale Township Supervisors, Crawford County Planning Department
Implementation Schedule:	12 Months (March 2011)

Rockdale Township Mitigation Action #2 Join the NFIP's Community Rating System (CRS)	
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	17
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Rockdale Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.24.23M

SADSBURY TOWNSHIP MITIGATION ACTION PLAN

Sadsbury Township did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Sadsbury Township Mitigation Action #1		Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:		Goal #2 / Objective 2.2, 2.3, 2.4
Category:		Prevention
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		Moderate
PASTEEL Score:		12
Estimated Cost:		Staff Time and Resources
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Sadsbury Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:		36 Months (March 2012)

6.4.25.24M

SAEGERTOWN BOROUGH MITIGATION ACTION PLAN

SAEGERTOWN BOROUGH CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

Saegertown Borough Mitigation Action #1		Storm sewer upgrade/upsized on 200 block of Grant Street
Goal / Objective Met:		Goal #2 / Objective 2.1
Category:		Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		High
PASTEEL Score:		19
Estimated Cost:		\$100,000
Potential Funding Sources:		FEMA HMA Grant Programs / CDBG Funding
Lead Agency/Department Responsible:		Saegertown Borough Council, Crawford County OES
Implementation Schedule:		60 Months (March 2015)

Saegertown Borough Mitigation Action #2	Upsize culvert on Erie Street at Beck Run
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	13
Estimated Cost:	\$100,000
Potential Funding Sources:	FEMA HMA Grant Programs / CDBG Funding
Lead Agency/Department Responsible:	Saegertown Borough Council, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

Saegertown Borough Mitigation Action #3	Installation of backup water/spring wells & monitoring system for ground water levels
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Drought
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	20
Estimated Cost:	\$418,000
Potential Funding Sources:	Safe Water Grant, U.S.D.A. Loan or Grant
Lead Agency/Department Responsible:	Saegertown Borough Council, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

Saegertown Borough Mitigation Action #4	Provide generators for critical facilities, emergency shelters, and water wells
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	All hazards
Priority (High, Moderate, Low):	High
PASTEEL Score:	16
Estimated Cost:	\$125,000
Potential Funding Sources:	FEMA HMA Grant Programs / DHS Grants
Lead Agency/Department Responsible:	Saegertown Borough Council, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

Saegertown Borough Mitigation Action #5		Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:		Goal #2 / Objective 2.2, 2.3, 2.4
Category:		Prevention
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		Moderate
Estimated Cost:		Staff Time and Resources
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		Saegertown Borough Council, Crawford County OES,, Crawford County Planning Department
Implementation Schedule:		36 Months (March 2012)

6.4.26.25M **SOUTH SHENANGO TOWNSHIP MITIGATION ACTION PLAN**

SOUTH SHENANGO TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

South Shenango Township Mitigation Action #1		Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:		Goal #2 / Objective 2.2, 2.3, 2.4
Category:		Prevention
Reduce Effects on All New Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:		Flood
Priority (High, Moderate, Low):		Moderate
PASTEEL Score:		15
Estimated Cost:		Staff Time and Resources
Potential Funding Sources:		N/A
Lead Agency/Department Responsible:		South Shenango Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:		36 Months (March 2012)

6.4.27.26M

SPARTANSBURG BOROUGH MITIGATION ACTION PLAN

SPARTANSBURG BOROUGH CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Spartansburg Borough Mitigation Action #1	Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.4
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Spartansburg Borough Council, Crawford County
Implementation Schedule:	OES 60 Months (March 2015)

6.4.28.27M

SPRING TOWNSHIP MITIGATION ACTION PLAN

SPRING TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Spring Township Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		Spring Township Supervisors, Crawford County OES	
Implementation Schedule:		60 Months (March 2015)	

6.4.29.28M

STEUBEN TOWNSHIP MITIGATION ACTION PLAN

STEUBEN TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Steuben Township Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
PASTEEL Score:		16	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		Steuben Township Supervisors, Crawford County OES	
Implementation Schedule:		60 Months (March 2015)	

6.4.30.29M

SUMMERHILL TOWNSHIP MITIGATION ACTION PLAN

SUMMIT TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Summerhill Township Mitigation Action #1	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	15
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Summerhill Township Supervisors, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

Summerhill Township Mitigation Action #2	Pipe replacement with Box Culvert
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	15
Estimated Cost:	\$200,000
Potential Funding Sources:	FEMA HMA Grant Programs / CDBG Funding
Lead Agency/Department Responsible:	Summerhill Township Supervisors, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

6.4.31.30M

SUMMIT TOWNSHIP MITIGATION ACTION PLAN

SUMMIT TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Summit Township Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Continued Compliance with the NFIP		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		Summit Township Supervisors, Crawford County OES	
Implementation Schedule:		60 Months (March 2015)	

6.4.32.31M

CITY OF TITUSVILLE MITIGATION ACTION PLAN

CITY OF TITUSVILLE CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

City of Titusville Mitigation Action #1	Construct culvert system to alleviate Church Run Creek flooding near Franklin Street Bridge and discharge water into Oil Creek near Brown Street (Confluence of Church Run Creek and Oil Creek is located at Brown Street)
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	15
Estimated Cost:	\$3 Million
Potential Funding Sources:	FEMA HMA Grant Program
Lead Agency/Department Responsible:	City of Titusville: City Manager
Implementation Schedule:	12 Months (March 2011)

City of Titusville Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
PASTEEL Score:	12
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	City of Titusville: City Manager, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.33.32M

TROY TOWNSHIP MITIGATION ACTION PLAN

Troy Township did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Troy Township Mitigation Action #1	Retrofit two existing structures or sections of (Chapmanville Fire Department and the Troy Township Hall) to serve as a tornado community safe room for immediate vicinity of residents and business owners
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Medium
PASTEEL Score:	10
Estimated Cost:	\$50,000
Potential Funding Sources:	FEMA HMA Grant Program
Lead Agency/Department Responsible:	Troy Township Supervisors
Implementation Schedule:	60 Months (March 2015)

Troy Township Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Troy Township, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.34.33M

UNION TOWNSHIP MITIGATION ACTION PLAN

UNION TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Union Township Mitigation Action #1	Installing, re-routing, and increasing capacity of culverts throughout the township
Goal / Objective Met:	Goal #2 / Objective 2.1
Category:	Structural Project Implementation
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Low
PASTEEL Score:	11
Estimated Cost:	\$1 Million (per culvert)
Potential Funding Sources:	FEMA HMA Grant Program, PennDot, Township Funds
Lead Agency/Department Responsible:	Union Township Supervisors
Implementation Schedule:	60 Months (March 2015)

Union Township Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Union Township, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.35.34M

VENANGO BOROUGH MITIGATION ACTION PLAN

VENANGO BOROUGH CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Venango Borough Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		Venango Borough Council, Crawford County OES	
Implementation Schedule:		60 Months (March 2015)	

6.4.36.35M

VENANGO TOWNSHIP MITIGATION ACTION PLAN

SUMMIT TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Venango Township Mitigation Action #1 Join the NFIP's Community Rating System (CRS)	
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	15
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Venango Township Supervisors, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.37.36M

VERNON TOWNSHIP MITIGATION ACTION PLAN

VERNON TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

Vernon Township Mitigation Action #1 Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:	Goal #2 / Objective 2.4
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Vernon Township Supervisors, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

6.4.38.37M

WAYNE TOWNSHIP MITIGATION ACTION PLAN

Wayne Township did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Wayne Township Mitigation Action #1	Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.4
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	Wayne Township Supervisors, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

6.4.39.38M

WEST FALLOWFIELD TOWNSHIP MITIGATION ACTION PLAN

West Fallowfield Township did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

West Fallowfield Township Mitigation Action #1	Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.4
Category:	Public Education & Awareness
Reduce Effects on All New Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	High
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	West Fallowfield Township Supervisors, Crawford County OES
Implementation Schedule:	60 Months (March 2015)

6.4.40.39M

WEST MEAD TOWNSHIP MITIGATION ACTION PLAN

WEST MEAD TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate		X	
	Low			

West Mead Township Mitigation Action #1	Upsizing and installation of new stormwater drainage system components to lessen the impact of overland flooding onto public and private infrastructure along Pettis, Thurston, and Townline Roads	
Goal / Objective Met:	Goal #2 / Objective 2.1	
Category:	Structural Project Implementation	
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:	Flood	
Priority (High, Moderate, Low):	Moderate	
PASTEEL Score:	11	
Estimated Cost:	Unknown	
Potential Funding Sources:	FEMA HMA Grant Program, PennDot, Township Funds	
Lead Agency/Department Responsible:	West Mead Township Supervisors	
Implementation Schedule:	36 Months (March 2013)	

West Mead Township Mitigation Action #2	Join the NFIP's Community Rating System (CRS)	
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4	
Category:	Prevention	
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Hazard(s) Addressed:	Flood	
Priority (High, Moderate, Low):	Moderate	
PASTEEL Score:	12	
Estimated Cost:	Staff Time and Resources	
Potential Funding Sources:	N/A	
Lead Agency/Department Responsible:	West Mead Township, Crawford County OES, Crawford County Planning Department	
Implementation Schedule:	36 Months (March 2012)	

6.4.41.40M

WEST SHENANGO TOWNSHIP MITIGATION ACTION PLAN

WEST SHENANGO TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

West Shenango Township Mitigation Action #1	Implement a drainage easement along Adams Road
Goal / Objective Met:	Goal ?
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Continued Compliance with the NFIP	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
PASTEEL Score:	14
Estimated Cost:	\$10,000
Potential Funding Sources:	Crawford County, Township Funds
Lead Agency/Department Responsible:	West Shenango Township Supervisors
Implementation Schedule:	24 Months (March 2012)

West Shenango Township Mitigation Action #2	Join the NFIP's Community Rating System (CRS)
Goal / Objective Met:	Goal #2 / Objective 2.2, 2.3, 2.4
Category:	Prevention
Reduce Effects on All New Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Reduce Effects on All Existing Structures / Infrastructure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Continued Compliance with the NFIP	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Hazard(s) Addressed:	Flood
Priority (High, Moderate, Low):	Moderate
Estimated Cost:	Staff Time and Resources
Potential Funding Sources:	N/A
Lead Agency/Department Responsible:	West Shenango Township, Crawford County OES, Crawford County Planning Department
Implementation Schedule:	36 Months (March 2012)

6.4.42.41M

WOODCOCK BOROUGH MITIGATION ACTION PLAN

Woodcock Borough did not submit a capability assessment; therefore a capability vs. risk matrix cannot be completed.

Woodcock Borough Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		Woodcock Borough Council, Crawford County OES	
Implementation Schedule:		60 Months (March 2015)	

6.4.43.42M

WOODCOCK TOWNSHIP MITIGATION ACTION PLAN

WOODCOCK TOWNSHIP CAPABILITY VS. RISK MATRIX		HAZARD RISK		
		Limited	Moderate	High
OVERALL CAPABILITY	High			
	Moderate			
	Low		X	

Woodcock Township Mitigation Action #1		Attend county facilitated training workshop on the NFIP's Community Rating System (CRS)	
Goal / Objective Met:		Goal #2 / Objective 2.4	
Category:		Public Education & Awareness	
Reduce Effects on All New Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Reduce Effects on All Existing Structures / Infrastructure		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Continued Compliance with the NFIP		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
Hazard(s) Addressed:		Flood	
Priority (High, Moderate, Low):		High	
Estimated Cost:		Staff Time and Resources	
Potential Funding Sources:		N/A	
Lead Agency/Department Responsible:		Woodcock Township Supervisors, Crawford County OES	
Implementation Schedule:		60 Months (March 2015)	

7. PLAN MAINTENANCE

7.1. UPDATE PROCESS SUMMARY

Monitoring, evaluating, and updating this plan is critical to maintaining its value and success in Crawford County's hazard mitigation efforts. 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 maintenance activities and what those responsibilities entail. It also provides a methodology and schedule of maintenance activities including a description of how the public will be involved on a continued basis. While the methodology and schedule are similar to what is outlined in the 2004 HMP, slight revisions were made based on the county's experience with actually maintaining the existing plan between 2004 and 2009.

7.2. MONITORING, EVALUATING AND UPDATING THE PLAN

The Crawford County MPC established for the 2010 HMP is designated to lead plan maintenance processes of monitoring, evaluation and updating with support and representation from all participating municipalities. The MPC will coordinate maintenance efforts, but the input needed for effective periodic evaluations will come from community representatives, local emergency management coordinators and planners, the general public, and other important stakeholders. In addition, the MPC will serve in an advisory capacity to the Crawford County Board of Commissioners and the Office of Emergency Services (OES).

Each municipality will designate a community representative to monitor implementation of mitigation activities and hazard events within their respective communities. The local emergency management coordinator would be suitable for this role. This individual will be asked to work with the MPC to provide updates on applicable mitigation actions and feedback on changing hazard vulnerabilities within their community.

In addition, the municipal monitor will be responsible for reviewing the planning and land use regulatory element of the municipality's capability assessment to identify potential opportunities for incorporating appropriate elements of the Mitigation Plan into local planning mechanisms and will also identify locally generated plans, information, reports, etc. that may be capable of being incorporated into the update of the 2010 Mitigation Plan.

The MPC will oversee the progress made on the implementation of action items identified in the 2010 HMP and modify actions, as needed, to reflect changing conditions. The Crawford County MPC will meet annually to evaluate the plan and discuss specific coordination efforts that may be needed with participating jurisdictions and other stakeholders. The annual evaluation may include the participation of individual municipal monitors, or at least will include reports prepared by them.

The annual evaluation of the 2010 HMP will not only include an investigation of whether mitigation actions were completed, but also an assessment of how effective those actions were in mitigating losses. A review of the qualitative and quantitative benefits (or avoided losses) of mitigation activities will support this assessment. Results of the evaluation will then be compared to the goals and objectives established in the plan and decisions will be made regarding whether actions should be discontinued, or modified in any way in light of new developments in the community. Progress will be documented by the MPC for use in the next Hazard Mitigation Plan Update and submitted to the Office of Emergency Services. Finally, the MPC will monitor incorporation elements of the Mitigation Plan into other planning mechanisms. The annual reviews will be lead by Allen Clark, Director of the Crawford County OES.

The 2010 HMP will be updated by the FEMA approved five year anniversary date, as required by the Disaster Mitigation Act of 2000, or following a disaster event. Future plan updates will account for any new hazard vulnerabilities, special circumstances, or new information that becomes available. During the five-year review process, the following questions will be considered as criteria for assessing the effectiveness of the Crawford County Hazard Mitigation Plan.

- Has the nature or magnitude of hazards affecting the county changed?
- Are there new hazards that have the potential to impact the county?
- Do the identified goals and actions address current and expected conditions?
- Have mitigation actions been implemented or completed?
- Has the implementation of identified mitigation actions resulted in expected outcomes?
- Are current resources adequate to implement the plan?
- Should additional local resources be committed to address identified hazards?

Issues that arise during monitoring and evaluation which require changes to the risk assessment, mitigation strategy, and other components of the plan will be incorporated during future updates.

Update process for plan prior to 5-year update. Any interested party wishing for an update of the Mitigation Plan sooner than the 5-year update will submit such a request to the MPC for consideration through Allen Clark, Director of the Crawford County OES. The request shall be accompanied by a detailed rationale. The MPC will evaluate all such requests and determine whether the update request should be acted upon. If the decision is in the affirmative, an assignment will be made for an individual to author the update. The draft updated section along with a detailed rationale will be submitted to the MPC. The MPC will circulate the draft updated section to every jurisdiction participating in the plan for comment and after an appropriate period of time, the MPC shall make a decision to update the plan at least partially based on the feedback received from the other jurisdiction. County and municipal adoptions will then occur.

7.3. INCORPORATION OF OTHER PLANNING MECHANISMS

As identified in Section 5, the jurisdictions participating in this plan feel they have limited to moderate capability to implement many of the mitigation actions necessary to achieve a hazard resilient community. Based upon this review and the review of the 2004 HMP, municipalities agreed that minimal action was taken in incorporating the HMP findings into other planning mechanisms. To address this deficiency several actions aim at reviewing existing zoning ordinances, floodplain ordinances, land-use ordinances, and building codes to incorporate findings of the 2010 HMP and evaluate whether local planning tools adequately address risk assessment results. During the annual evaluation of the plan, the Crawford County MPC will encourage further incorporation and monitor results of this process. Based on the results of these evaluations, communities are expected to revise existing local planning and regulatory tools to address local vulnerability to the high and moderate risk hazards identified in this plan. Results of the 2010 HMP update process will also be incorporated into future updates to the County and municipal comprehensive plans and emergency operations plans.

7.4. CONTINUED PUBLIC INVOLVEMENT

As was done during the development of the 2010 HMP, the Crawford County MPC will involve the public during the evaluation and update of the HMP through various workshops and meetings. The public will have access to the current HMP through their local municipal office and the Crawford County Office of Emergency Services. Information on upcoming events related to the HMP or solicitation for comments will be announced via newsletters, newspapers, mailings, and the county website. The public is encouraged to submit comments on the HMP at any time. The Crawford County MPC will incorporate all relevant comments during the next update of the hazard mitigation plan.

8. PLAN ADOPTION

This section of the plan includes copies of the local adoption resolutions passed by Crawford County and its municipal governments including the participating municipalities listed below.

Table 8-1: Participating Jurisdictions and Adoption Dates		
#	Jurisdiction	2010 Adoption Date
1C	Crawford County	
1	Beaver Township	
2	Blooming Valley Borough	
3	Cambridge Springs Borough	
4	Centerville Borough	
5	Cochranon Borough	
6	Conneautville Borough	
7	Conneaut Lake Borough	
8	Conneaut Township	
9	Cussewago Township	
10	East Fairfield Township	
11	East Mead Township	
12	Fairfield Township	
13	Greenwood Township	
14	Hayfield Township	
15	Hydetown Borough	
16	Linesville Borough	
17	Meadville, City of	
18	North Shenango Township	
19	Oil Creek Township	
20	Pine Township	
21	Randolph Township	
22	Rockdale Township	
23	Sadsbury Township	
24	Saegertown Borough	
25	South Shenango Township	
26	Spartansburg Borough	
27	Spring Township	
28	Steuben Township	
29	Summerhill Township	
30	Summit Township	
31	Titusville, City of	
32	Troy Township	
33	Union Township	
34	Venango Borough	
35	Venango Township	

36	Vernon Township	
37	Wayne Township	
38	West Fallowfield Township	
39	West Mead Township	
40	West Shenango Township	
41	Woodcock Borough	
42	Woodcock Township	

Table 8-2: Jurisdictions Not Qualified under the 2010 Crawford County Hazard Mitigation Plan		
#	Jurisdiction	
1	Athens Township	
2	Bloomfield Township	
3	Cambridge Township	
4	East Fallowfield Township	
5	Richmond Township	
6	Rome Township	
7	Sparta Township	
8	Springboro Borough	
9	Townville Borough	

The plan was submitted to the Pennsylvania State Hazard Mitigation Officer on May 26, 2010. It was forwarded to the Federal Emergency Management Agency for final review and approval on **Date, 2010**. FEMA granted approval-pending-adoption on **Date, 2010**. Full approval from FEMA was received on **Date, 2010**. A copy of the resolutions executed by Crawford County and the participating municipalities are included in this section.