

## Chapter 7: Risk & Vulnerability Assessment

### ***Hazard Ranking Methodology***

After a thorough review of the community profile by the Hazard Mitigation Committee, a county hazard ranking was completed using a three-step process. The first step was selecting evaluation criteria, the second step assigned relative weights to each of the rating criteria, and the third step assigned point values in each of the selected criteria for each of the hazards.

### **Evaluation Criteria**

Selection of evaluation criteria was accomplished by determining what aspects of the potential hazards that might be faced by the County were of most concern to the community. This was achieved by assigning values to respective hazard aspects in order to determine their relative level of importance, ranging from “Always Important” to “Not Worth Considering”. **Table 7.1** shows a complete list of all aspects considered and level of importance assigned by the committee.

<b>Table 7.1: Presque Isle County Hazard Evaluation Criteria</b>					
Hazard Aspect	Always Very Important	Usually Important	Sometimes Important	Rarely of Importance	Not worth Considering
Historical Occurrence	X				
Size of Effected Area		X			
Speed of Onset				X	
Potential for Causalities	X				
Negative Economic effects		X			
Duration of Threat				X	
Seasonal Risk Pattern				X	
Predictability of Hazard			X		
Collateral Damage	X				
Availability of Warning System	X				
Ability to Mitigate	X				
Percent of Population Effected	X				
Environmental Impact	X				
Capacity to Cause Damage	X				
Public Awareness		X			
Other Considerations					

Each of the eight “Always Very Important” evaluation criteria selected by the Committee was then assigned a “weight” to express the level of importance each criteria will have in ranking specific hazards. The sum of weights of all of evaluation criteria must equal 100%.

Each aspect was then assigned a weighting percentage value based on the relative importance that criterion would have in ranking the selected hazards. Point values of 1-10 were assigned using the scoring parameters as outlined in the Evaluation Measure Benchmark Factors shown below. Using a spreadsheet, values were entered and calculated to provide a hazard ranking as shown in **Table 7.2**.

### **Hazard Analysis Evaluation Measures**

The committee chose to use a common set of 8 evaluation measures to evaluate each hazard facing the community. Those measures are: 1) likelihood of occurrence; 2) potential for damage; 3) potential for casualties; 4) percent of population effected; 5) availability of warning systems; 6) ability to mitigate; 7) collateral damage, and 8) environmental impact.

Each corresponding benchmark factor has been assigned a specific point value (10, 7, 4 or 1 point), based on each factor’s relative severity and negative impact. Since some factors need to be given more consideration than others, each criterion was weighted. A percentage value was assigned to each measure based on the relative significance of the measure. The sum of all of measures must equal 100 percent. The following is a synopsis of each hazard evaluation measure, weight and benchmark factor used in this analysis:

#### Likelihood of Occurrence

Likelihood of occurrence measures the frequency with which a particular hazard occurs. The more frequently a hazard event occurs, the more potential there is for damage and negative impact on a community.

#### Capacity to Cause Physical Damages

The capacity to cause physical damages refers to the destructive capacity of the hazard. While destructive capacity of some hazard events, such as floods and tornadoes, is often immediate and readily apparent, some hazards may have significant destructive capacity that is less obvious as it may occur over an extended period of time such as extreme temperatures or drought.

#### Potential for Causing Casualties

Potential for causing casualties refers to the number of casualties (deaths and injuries) that can be expected if a particular hazard event occurs.

#### Percent of Population Affected

Percent of Population affected refers to the percent of the county population that may be effected directly or indirectly by the hazard event.

#### Availability of Warnings

Availability of warnings indicates the ease with which the public can be warned of a hazard. This measure does not address the availability of warning systems in a community, per se. Rather, it looks at overall availability of warning in general for a particular hazard event. For example, a community might receive warning that a flood will occur within 24 hours, but receive no warning when a large structural fire occurs. Generally, hazards that have little or no

availability of warning tend to be more problematic for a community from a population protection and response standpoint.

Ability to Mitigate

Mitigative potential refers to the relative ease with which a particular hazard event can be mitigated against, through application of structural or non-structural (or both) mitigation measures. Generally, the easier a hazard event is to mitigate against, the less future threat it may pose to a community in terms of loss of life and property.

Collateral Damage

Collateral damage refers to the possibility of a particular hazard event causing secondary damage and impacts. For example, blizzards and ice storms can cause power outages, which can cause loss of heat, which can lead to hypothermia and possible death or serious injury. Generally, the more collateral damage a hazard event causes, the more serious a threat the hazard is to a community.

Environmental Impact

Environmental Impact refers to environmental damage that may be caused by a particular hazard event. Effects of a hazard event must be thought through to identify possible environmental impact. For example, a flood event may overwhelm a sewage treatment plant, which then discharges raw sewage thereby contaminating water supplies.

**Evaluation Measure Benchmark Factors**

Likelihood of Occurrence	
Excessive Occurrence	10 pts
High Occurrence	7 pts
Medium Occurrence	4 pts
Low Occurrence	1 pt
Causality Potential	
High Potential	10 pts
Medium Potential	7 pts
Low Potential	4 pts
No Potential	1 pt
Warning Availability	
Warnings Unavailable	10 pts
Generally Not Available	7 pts
Sometimes Available	4 pts
Warnings Available	1 pt
Collateral Damage	
High Possibility	10 pts
Good Possibility	7 pts
Some Possibility	4 pts
No Possibility	1 pt

Damage Capacity	
High Capacity	10 pts
Medium Capacity	7 pts
Low Capacity	4 pts
No Capacity	1 pt
Ability to Mitigate	
Easy to Mitigate	10 pts
Possible to Mitigate	7 pts
Difficult to Mitigate	4 pts
Impossible to Mitigate	1 pt
% Population Affected	
60% to 100%	10 pts
30% to 60%	7 pts
15% to 30%	4 pts
15% or less	1 pt
Environmental Impact	
High Possibility	10 pts
Good Possibility	7 pts
Some Possibility	4 pts
No Possibility	1 pt

**Table 7.2, Presque Isle Hazard Rating**

Hazard Aspect	Likelihood of Occurrence	Capacity to Cause Damage	Potential for Casualties	Percent Population Effected	Warning System Available	Ability to Mitigate	Collateral Damage	Environ-mental Impact	Total Weight Must = 100%	
WEIGHT =====>	20%	20%	20%	15%	10%	5%	5%	5%	100%	
<b>Hazard</b>									<b>Score</b>	<b>Rank</b>
Severe Winds	10	7	4	10	1	7	7	4	6.70	1
Infrastructure Failure	7	7	4	10	4	7	7	4	6.40	2
Structural Fire	7	7	7	1	10	7	4	4	6.10	3
Winter Weather Hazard	10	4	4	10	1	7	4	4	5.95	4
Transportation Accident	7	7	7	4	4	4	4	4	5.80	5
Transportation Hazmat	7	7	4	4	4	7	4	10	5.65	6
Lightning	10	7	4	1	4	7	7	4	5.65	6
Tornados	4	10	4	4	1	7	7	4	5.20	7
Fixed Site Hazmat	7	4	4	4	4	7	4	10	5.05	8
Public Health	7	4	4	4	7	7	4	1	5.05	8
Terrorism/Sabotage/WMD	4	4	4	4	10	4	7	4	4.75	9
Pipeline Accident	7	4	4	1	7	7	1	7	4.60	9
Hail	7	7	1	4	1	4	7	1	4.30	10
Earthquake	1	4	4	4	10	4	4	4	4.00	11
Scrap Tire Fire	4	4	1	4	7	7	7	4	4.00	11
Wildfire	7	4	1	1	4	7	4	7	3.85	12
Drought	10	4	1	1	1	4	4	4	3.85	12
Oil/Gas Well Incident	4	4	1	1	10	4	4	4	3.55	13
Extreme Temperature	4	4	4	4	1	7	1	1	3.55	13
Shoreline Flooding	4	4	1	1	4	7	4	4	3.10	14
Civil Disturbance	4	1	4	1	4	7	4	1	2.95	15
Dam Failure	1	1	1	1	4	7	7	4	2.05	16
Nuclear Attack	1	0	0	0	1	1	10	10	1.35	17
Riverine Flooding	1	1	1	1	1	7	4	4	1.60	18
Subsidence	1	1	1	1	1	1	1	4	1.15	19

A summary of the hazard rankings derived from the hazard evaluation process is shown in **(Table 7.3)**, below.

<b>Table 7.3, Summary Hazard Rankings for Presque Isle County</b>	
<b>High Rankings</b>	<b>Score</b>
Severe Winds	6.70
Infrastructure Failure	6.40
Structural Fire	6.10
Winter Weather Hazards	5.95
Transportation Accidents	5.80
Transportation Hazmat	5.65
Lightening	5.65
<b>Moderate Ranking</b>	
Tornados	5.20
Fixed Site Hazmat	5.05
Public Health	5.00
Terror/sabotage/WMD	4.75
Pipeline Accident	4.60
Hail	4.30
<b>Low Ranking</b>	
Earthquake	
Scrap Tire Fire	
Wildfire	
Drought	
Oil/Gas Incident	
Extreme Temperatures	
Shoreline Flooding	
Civil Disturbance	
Dam Failure	
Nuclear Attack	
Riverine Flooding	
Subsidence	

### ***Risk Assessment and Vulnerability Assessment Summary***

#### **Risk Assessment**

The goals of risk assessment are to determine where hazards exist, and develop an understanding of how often they will arise and how much harm they cause. Based on the weighted hazard ranking process recommended in the Michigan Hazard Analysis workbook, a composite of hazards and their relative risk are presented below. This list will be used as the basis for developing hazard mitigation goals and strategies in subsequent chapters.

- **High Risk:** -- very likely to occur during hazard mitigation planning horizon of 20 years, and/or effect all or most of the county.

- **Medium Risk:** -- somewhat likely to occur during hazard mitigation planning horizon of 20 years, and/or effect a significant area of the County.
- **Low Risk:** -- means it is not likely to occur, or cover only a limited area within county.

### Vulnerability Assessment

This step looks at such points as population concentrations, age-specific populations, development pressures, types of housing (older homes, mobile homes), presence of agriculture, sprawl (spreading resources too thin), and other issues that may make Presque Isle County more vulnerable to specific hazards. The following criteria were used to rank vulnerability as low, medium or high for each hazard. Further, analysis of hazards ranked as high risk, relies on information presented in earlier chapters.

- **High Vulnerability:** -- If an event occurred it would have severe impacts over large geographic areas or more densely populated areas and have a serious financial impact on County residents and businesses.

- **Medium Vulnerability:** -- If an event occurred it would have confined impacts on the safety of residents but would have a financial impact on County residents and businesses.

- **Low Vulnerability:** -- If an event occurred it would have very minimal impact on the safety of County residents and minimal financial impact on County residents and businesses.

Based on the weighted hazard ranking process recommended in the Michigan Hazard Analysis workbook, the Presque Isle County Local Emergency Planning Committee and community leaders, developed a composite of hazards and their relative risk and vulnerability are presented in Table 7.4. This list will be used as the foundation for developing hazard mitigation goals and strategies in subsequent chapters.

**Table 7.4, Presque Isle County, Risk and Vulnerability Assessment Summary**

Presque Isle County Hazards	Risk Assessment	Vulnerability Assessment
Severe Summer Storm Hazards Severe Winds, Tornadoes, Lightening & Hail	High	High
Infrastructure Failure	High	High
Winter Weather Hazards	High	High
Structural Fire	High	Medium
Transportation Hazmat	Medium	Medium
Extreme Temperatures	Medium	Medium
Fixed Site Hazmat	Medium	Medium
Public Health	Medium	Medium
Terror/sabotage/WMD	Medium	Medium
Wildfire	Medium	Medium
Drought	Medium	Medium
Oil/Gas Incident	Medium	Low
Transportation Accidents	Medium	Low
Shoreline Flooding	Medium	Low
Pipeline Accident	Low	Low
Earthquake	Low	Low
Civil Disturbance	Low	Low
Dam Failure	Low	Low
Nuclear Attack	Low	Low
Riverine Flooding	Low	Low
Subsidence	Low	Low
Scrap Tire Fire	Low	Low