

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 the County might experience were of most concern to the community. This was achieved by assigning values to identified hazard aspects 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.

Table 7-1 Montmorency County, Hazard Evaluation Criteria					
Hazard Aspect	Always Very Important	Usually Important	Sometimes Important	Rarely of Importance	Not worth Considering
Likelihood of Occurrence	X				
Size of Effected Area	X				
Speed of Onset			X		
Casualty Potential	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 Affected		X			
Environmental Impact		X			
Capacity to Cause Damage		X			
Public Awareness			X		
Other Considerations					

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 six evaluation measures as the basis to evaluate each hazard that could be expected to face the community. Those measures are: 1) likelihood of occurrence; 2) size of effected area; 3) potential for casualties; 4) economic effects; 5) collateral damage; 6) ability to mitigate;.

Likelihood of Occurrence, 25%

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.

Size of Effected Area, 15%

Each hazard affects a geographic area. For example, a blizzard might affect an entire state or even several states, while a flood might only affect a portion of a county or municipality. Although size of the affected area is not always indicative of the destructive potential of the hazard (a tornado is a good example), generally the larger the affected area, the more problematic the hazard event is to a community.

Potential for Causing Casualties, 10%

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

Economic Effects, 15%

Economic effects are the monetary damages incurred from a hazard event and include both public and private damage. Direct physical damage costs, as well as indirect impact costs such as lost business and tax revenue, are included as part of the total monetary damages.

Collateral Damagem 25%

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.

Ability to Mitigate, 10%

Ability to Mitigate 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.

Each corresponding benchmark factor was then 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:

Evaluation Measure Benchmark Factors

Likelihood of Occurrence	
Excessive Occurrence	10 pts
High Occurrence	7 pts
Medium Occurrence	4 pts
Low Occurrence	1 pt

Effected Area	
Large Area	10 pts
Small Area	7 pts
Multiple Sites	4 pts
Single Site	1 pt

Causality Potential	
High Potential	10 pts
Medium Potential	7 pts
Low Potential	4 pts
No Potential	1 pt

Economic Impact	
Significant Effect	10 pts
Medium Effect	7 pts
Low Effect	4 pts
Minimal Effect	1 pt

Collateral Damage	
High Possibility	10 pts
Good Possibility	7 pts
Some Possibility	4 pts
No Possibility	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

TABLE 7-2: MONTMORENCY COUNTY HAZARD RATING

Hazard Evaluation Criteria	Likelihood of Occurrence	Area Effected	Potential for Casualties	Negative Economic Effects	Collateral Damage	Ability to Mitigate	Must = 100%	
WEIGHT =====>	25%	15%	10%	15%	25%	10%	100%	RANK
Transport Accident	10	1	7	3	3	7	6.60	1
Winter Weather	10	10	2	4	3	4	6.35	2
Structural Fire	10	1	7	3	3	6	6.30	3
Extreme Temp	9	10	1	6	5	4	6.10	4
Transport Hazmat	8	3	7	5	3	5	5.80	5
Severe Winds	7	7	3	4	5	3	4.95	6
Public Health	3	6	5	7	3	6	4.85	7
Wildfire	5	5	3	4	6	5	4.70	8
Fixed Site Hazmat	3	3	7	5	4	6	4.65	9
Lightning	10	1	2	1	1	3	4.45	10
Oil/Gas Well Incident	8	1	3	2	2	4	4.40	11
Infrastructure Failure	1	6	2	7	7	7	4.30	12
Hail	7	7	1	4	4	1	4.00	13
Riverine Flooding	6	4	1	2	3	4	4.00	14
Drought	2	10	1	8	8	3	3.95	15
Terrorism/WMD	1	8	7	8	8	2	3.95	15
Scrap Tire Fire	1	1	1	2	2	10	3.80	17
Nuclear Attack	0	9	9	9	9	0	3.60	18
Tornados	1	3	7	7	7	3	3.40	19
Civil Disturbance	1	1	1	1	1	8	3.10	20
Pipeline Accident	5	2	1	2	2	3	3.05	21
Dam Failure	1	3	1	2	2	5	2.60	22
Earthquake	1	7	1	3	4	1	2.15	23
Subsidence	3	1	1	2	2	2	2.00	24
Shoreline Flooding	1	2	1	2	1	2	1.50	25

A summary of the hazard rankings derived from the hazard evaluation process is shown in **(Table 7-3)**, below.

Table 7-3, Summary Hazard Rankings for Presque Isle County	
High Rankings	Score
Transportation Accidents	6.60
Severe Winter Weather Hazards	6.35
Structural Fire	6.30
Extreme Temperatures	6.10
Transportation Hazmat	5.80
Severe Winds	4.96
Public Health	4.85
Moderate Ranking	
Wildfire	4.70
Fixed Site Hazmat	4.65
Lightening	4.45
Oil/Gas Incident	4.40
Infrastructure Failure	4.30
Low Ranking	
Hail	4.00
Riverine Flooding	4.00
Drought	3.95
Terror/sabotage/WMD	3.95
Scrap Tire Fire	3.80
Nuclear Attack	3.60
Tornados	3.40
Civil Disturbance	3.10
Pipeline Accident	3.05
Dam Failure	2.60
Earthquakes	2.15
Subsidence	2.00
Shoreline Flooding	1.50

Risk Assessment and Vulnerability Assessment Summary

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 Montmorency 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 Montmorency 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, Montmorency County, Risk and Vulnerability Assessment Summary		
Montmorency County Hazards	Risk Assessment	Vulnerability Assessment
Transportation Accidents	High	Low
Severe Winter Weather Hazards	High	High
Structural Fire	High	Medium
Extreme Temperatures	High	Medium
Transportation Hazmat	Medium	Medium
Severe Winds	High	High
Public Health	Medium	Medium
Wildfire	High	Medium
Fixed Site Hazma	Medium	Medium

Lightening	High	Medium
Oil/Gas Incident	High	Medium
Infrastructure Failure	High	High
Hail	High	Medium
Riverine Flooding	Low	Low
Drought	Medium	Medium
Terror/sabotage/WMD	Medium	Low
Scrap Tire Fire	Low	Low
Nuclear Attack	Low	Low
Tornados	Medium	Medium
Civil Disturbance	Low	Low
Pipeline Accident	Medium	Loqw
Dam Failure	Low	Low
Earthquakes	Low	Low
Subsidence	Low	Low
Shoreline Flooding	Low	Low