
CITY of CRANDON

ALL HAZARDS MITIGATION PLAN



CITY OF CRANDON ALL HAZARDS MITIGATION PLAN

prepared for:

City of Crandon

by:

North Central Wisconsin Regional Planning Commission

adopted by Crandon City Board on:
November 7, 2012

This plan was prepared at the request and under the supervision of the Crandon Emergency Management Taskforce by the North Central Wisconsin Regional Planning Commission (NCWRPC). For more information, contact:

NORTH CENTRAL WISCONSIN REGIONAL PLANNING COMMISSION
210 McCLELLAN STREET, SUITE 210
WAUSAU, WI 54403



Telephone: 715-849-5510

FAX: 715-849-5110

email: staff@ncwrpc.org

www.ncwrpc.org

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Part I – Planning Process

INTRODUCTION

Part I of the City of Crandon All Hazards Mitigation Plan (AHMP) Update describes and documents the process used to develop the plan update. This includes how it was prepared and who (committee, organizations, departments, staff, consultants, etc.) was involved in the update process. It also describes the involvement of adjacent units of government, the time period in which the update was prepared, and who to contact to answer questions and make recommendations for future amendments to the plan.

Disaster Mitigation Act of 2000

The development of the City of Crandon All Hazards Mitigation Plan is a response to the passage of the Disaster Mitigation Act of 2000 (DMA2K), an attempt to stem the losses from disasters, reduce future public and private expenditures, and to speed up response and recovery from disasters. On October 30, 2000, DMA2K was signed into law by President Bill Clinton. This Act (Public Law 106-390) amended the Robert T. Stafford Relief and Emergency Assistance Act. The following is a summary of the parts of DMA2K that pertain to local governments and tribal organizations:

- The Act establishes a new requirement for local governments and tribal organizations to prepare an All Hazards Mitigation Plan in order to be eligible for funding from FEMA through the Pre-Disaster Mitigation Assistance Program and Hazard Mitigation Grant Program.
- The Act establishes a requirement that natural hazards such as tornados, floods, wildfires need to be addressed in the risk assessment and vulnerability analysis parts of the All Hazards Mitigation Plan. Manmade hazards, such as hazardous waste spills, are encouraged to be addressed but not required.
- The Act authorizes up to seven percent of Hazard Mitigation Grant Program funds available to a state after a federal disaster to be used for development of state, local, and tribal organization All Hazards Mitigation Plans.
- The Act establishes November 1, 2004 as the date by which local governments and tribal organizations are to prepare and adopt their respective plans in order to be eligible for the FEMA Hazard Mitigation Grant Program and Pre-Disaster Mitigation Program.

Part I – Planning Process

- If a plan is not prepared by November 1, 2004, and a major disaster is declared, in order for a local government or tribal organization to be eligible to receive funding through the Hazard Mitigation Grant Program, they must agree to prepare an All Hazards Mitigation Plan within one year.
- In addition, local governments and tribal organizations cannot utilize funding through the Pre-Disaster Mitigation Grant Program if they do not have an All Hazard Mitigation Plan.
- All Hazard Mitigation Plans must be updated every five years.

Five Parts of All Hazards Mitigation Plan

The Crandon All Hazards Mitigation Plan is divided into five parts to address FEMA's local mitigation plan requirements. The five parts are as follows:

Part I:	Planning Process
Part II:	Planning Area
Part III:	Risk Assessment
Part IV:	Mitigation Strategy
Part V:	Plan Maintenance Process and Adoption

Development of All Hazards Mitigation Plan

The City of Crandon received a Planning Grant in 2010 to update its All Hazards Mitigation Plan through the Pre-Disaster Mitigation (PDM) Program.

In early 2011, the North Central Wisconsin Regional Planning Commission (NCWRPC) finalized a work agreement with City of Crandon and began preparation of the All Hazards Mitigation Plan at the request of the City in March of 2012.

The update process included regular Task Force meetings as well as involvement from the surrounding local units of government, and Forest County. Local and regional agencies were involved in the development of the plan at various stages, and opportunity for public participation was provided including public informational meetings and hearings. All sections of the plan report were reviewed and analyzed by the planning team at subsequent meetings and revised according to the format of the update process for this Plan.

The remainder of this chapter expands on and provides more detail on key aspects of the plan development process.

Part I – Planning Process

Key Elements Of The Update To The Original 2006 Plan

The major enhancements to the City of Crandon All Hazards Mitigation Plan develop through this update are as follows:

- Review of Recommended Revisions - The final review of the original plan approval recommended improving the descriptions of vulnerability in terms of existing and future buildings and infrastructure. The Update expands the level of detail in the inventory of existing facilities and adds a new section on Future Growth and Development in Crandon.
- Review and update of planning area chapter - The planning area description and inventory was expanded and improved with additional information and updated statistics.
- Expanded Hazard Coverage - New hazards addressed in the Update include: lightning, hail, and extreme heat.
- Review and update of risk assessment - The risk assessment was updated with documentation on recent hazard events. The priority level of hazards facing the City was also reviewed and updated.
- Review and update of Mitigation Strategy - The mitigation strategies chapter begins with a complete progress report on the strategies from the 2006 plan, establishment of new set of strategies for the next five-year cycle, and an updated prioritization of projects.

All Hazards Mitigation Plan Taskforce

The City of Crandon All Hazard Mitigation Plan Update was prepared under the guidance of an advisory taskforce that consisted of a cross section of governmental representatives from the City.

Periodic meetings were held with the NCWRPC staff, the City Clerk (Cindy Bradley), and the Task Force to provide input on the types of hazards to be considered, appropriate mitigation strategies, and to review draft reports. Task Force members and their affiliation are as follows:

Rob Jaeger, Mayor
Cindy Bradley, Clerk
Bruce Johnson, Water & Sewer Department
Dan Packard, Police Chief
Mike Smith, Public Works
Mike Childers, Assessor
Darrell Wilson, Fire Chief
Stacy Karcz, Zoning Administrator

Part I – Planning Process

Local Government Involvement

A joint meeting was held on April 16, 2012 between the Mitigation Plan Taskforce and representatives from Forest County and several local agencies, including:

Craig Williams	WisDNR
Megan Statezny	Forest County Rescue
John Christianson	National Forest Service
Gayle Webster	Forest County Commission on Aging
Kathy Marvin	Forest County Nursing Service/Health Dept.
Steve Nelson	UW Extension
Andy Space	Crandon School District
Teresa Erler	Forest County Emergency Management

During the meeting the Plan and its components were introduced to participants. A summary of mitigation strategies was given to each person present. These strategies were discussed with the group.

A number of issues were addressed. The need for NOAA radios was seen as the most effective measure for mitigating the effects of weather-related emergencies. Although notifications are now available through some TV stations and the sirens in Crandon can be heard at some distance from the city these radios were generally considered to be the most effective means for notifying the public of a threat, especially in outlying areas of the county.

The existence of Emergency Shelters within the city was discussed, and it was agreed that the need for such facilities is generally met. There was an extended discussion of the current drought conditions in the area, and how that intensified the threat of forest fires. There was mention of current Forest Service policy on logging and how it could be increasing the fuel load in the National Forest. It was agreed, however, that established communication procedures between the Forest Service, WisDNR, Forest County and the City of Crandon, along with Memorandums of Agreement and Mutual Aid Agreements between local governments and agencies established procedures for dealing with such threats.

Tribal Government Involvement

The Forest County Potawatomi tribal headquarters is located roughly a mile east of Crandon on Highway 8. In the 2010 9.3 percent of residents described themselves as American Indian. Although many of these are members of the Sokaogon Chippewa, whose reservation is about ten miles southwest of the city, a sizable number of Crandon residents are affiliated with the Potawatomi.

Part I – Planning Process

The Crandon Fire Department serves both the Sokaogon Chippewa reservation and the numerous Potawatomi residents in the Towns of Crandon, Lincoln, and Nashville. Collaborative efforts between Forest County, the City of Crandon, the Sokaogon Chippewa, and the Potawatomi offer an effective and cost efficient route to guard against the negative impacts of weather emergencies on these communities.

Forest County Emergency Management (FCEM) and the Forest County Potawatomi Emergency Management Department have been participating in a co-operative effort to provide NOAA Weather Radios to senior citizens throughout the county. Arising out of the respect for elders that is an essential part of native culture, the Forest County Potawatomi Emergency Management Department has been working closely with FCEM to distribute radios at senior citizen's meal sites. A short presentation on emergency planning is made to educate senior citizens on how to prepare for possible weather emergencies. As of this writing, over five hundred Weather Radios have been distributed.

This type of effort to support emergency preparedness will go a long way toward making Forest County a safer place.

Neighboring Community Involvement

One of the requirements of the update process was to include neighboring communities. NCWRPC staff communicated during the update process with officials and staff from the Towns of Crandon and Lincoln, Forest County, and the Potawatomi tribal community. Ideas were exchanged about All Hazards Mitigation planning processes and strategies between the various communities.

Public Review Process

Opportunities for public comment were provided to review the Plan Update during the drafting stage and prior to Plan approval. A copy of the draft was made available on the Internet. Comments and questions about the Plan were directed to the City Clerk.

On June 19, 2012 a public informational meeting was held at the Crandon City Hall. A notice had been published in the Forest County Republican newspaper, along with the web address where the Plan could be viewed. No members of the public attended and no comments were received on the website or by mail.

Part I – Planning Process

Incorporated Plans, Studies, Reports And Technical Data

Many plans, reports, and technical data were referenced and incorporated into the City of Crandon All Hazards Mitigation Plan Update. The following is a comprehensive list of the documents and data used:

Wisconsin Department of Natural Resources, North Central Wisconsin Regional Planning Commission geographic information system databases provided much of the base data for the mapping and analysis within the Plan. Statistical reports and data from the US Census and Wisconsin Departments of Administration, Revenue and Workforce Development were used for the demographic background in Part 2 of this Plan. Land use data in Part 2 was obtained from the Forest County Comprehensive Plan.

Wisconsin Department of Natural Resources Wetlands Inventory and Dams Database were used to identify and map wetlands, and Digital Flood Insurance Rate Maps (DFIRM) for Forest County provided the mapping of 100-year floodplain areas, Map 3 in Part 2.

NOAA National Climatic Data Center severe weather event data was used extensively for the risk assessment in Part 3. The wildfire section of the risk assessment was based on the Wisconsin Department of Natural Resources' fire occurrence database and statewide Communities at Risk (CAR) assessment.

Other plans, reports, and documents were reviewed by staff during the planning process including:

- Forest County Comprehensive Plan
- Forest County Emergency Operations Plan
- Flood Insurance Study...for the City of Crandon
- FIRM Maps for Crandon
- Hazard Analysis for the State of Wisconsin
- Land and Water Resource Management Plan – Forest County
- Zoning Ordinance – City of Crandon
- State of Wisconsin Hazard Mitigation Plan
- Forest County All Hazards Mitigation Plan 2005

Contact Information

Cindy Bradley, Clerk

City of Crandon

P.O. Box 335

Crandon, WI 54520

715-478-2400

ccrandon@newnorth.net

Part II – Planning Area

INTRODUCTION

Part II of the Plan provides political, geographical and demographic information for the City of Crandon. In-depth knowledge of the conditions of the plan area is important in developing mitigation strategies.

GENERAL GEOGRAPHY

Location

The City of Crandon is located in Forest County in the northeastern part of Wisconsin. (See Map 1). The City of Crandon is the largest urban area of Forest County. The City of Crandon is 249 miles north of Milwaukee, 110 miles northwest of Green Bay, 87 miles northeast of Wausau, and 226 miles northeast of Madison. Major urban areas outside of Wisconsin with transportation links to Crandon include Chicago, Illinois (340 miles), Minneapolis, Minnesota (268 miles) and Duluth, Minnesota (222 miles).

DEMOGRAPHIC AND ECONOMIC PROFILE

Population and Households

The 2010 US Census Bureau recorded the population of the City of Crandon at 1,920. The median age of residents is 40 years. Eighteen percent of the population is elderly (65+). The city showed flat population growth from 1990 (1,958) to 2000 (1,961), but declined by 2.1 percent in the last decade.

Population concentrations and trends are important when prioritizing hazard mitigation strategies. The City of Crandon is the most densely populated area in Forest County representing 20 percent of the total county population in 2010.

Employment

The median household income in 2009 was \$33,026. Thirty-eight percent of all households and fifty-five percent of non-family households made less than \$25,000. The unemployment rate as of December, 2011 is 8.2 percent.

Identifying locations of large employers is essential in developing hazard mitigation strategies. Table 1 represents the top employers for residents in the City of Crandon.

Part II – Planning Area

TABLE 1 - Top Employers for City of Crandon		
Company	Product or Service	Size
Forest County Potawatomi	Tribal Employment	570
Sokaogon Chippewa Community	Tribal Employment	200
Crandon School District	Education	139
AGI Healthcare of Crandon	Health	120
Forest County	Government	115
Schaefers Enterprises	Grocery	110
Northern Lakes Services	Environmental Lab	33
Ministry	Health	25
1Prospect Technologies	Wireless Communication	20
City of Crandon	Government	21
Hometown Trolley	Manufacturing	20
Sno River	Wood Products	20

Source: Department of Workforce Development, City of Crandon

Property Value

The value of real estate and personal property represents the potential for damage or loss in each community. The annual equalized value represents the Department of Revenue's estimate of market value for all taxable property. Table 2 lists the equalized values for real estate, personal property and all property.

Municipality	Equalized Value City of Crandon, 2011		
	Real Estate	Personal Property	Total
City of Crandon	\$88,746,200.00	\$1,902,500.00	\$90,648,600.00

As the county seat Crandon also is the site of a substantial amount of tax exempt property owned by Forest County. Below (Table 3) is a listing of the value of County-owned property in the city.

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Name	Value*
Courthouse / Sheriff	\$15,599,882
Asphalt Plant	\$65,635
Fairgrounds	\$199,437
Total	\$15,864,954

*=Includes insured buildings, contents, and property in the open.

Source: Statement of Values State of Wisconsin Local Government Property Insurance Fund.

The City of Crandon also owns a considerable amount of property. (see Table 4) With the City and County owning many critical facilities that are needed in times of disaster, the potential for damages to these could be devastating to local government.



Forest County Courthouse, Crandon, WI

Property	Value*
City Hall	\$253,000
Police Department	\$171,370
Fire Department	\$660,000
Street Department	\$149,751
Library	\$813,341
Old Library	\$97,606
Water/Sewer Plant	\$2,700,742
Well and Pump Houses	\$450,789
Water Tower & Reservoir	\$313,480
Lift Stations 1 -11	\$901,106
Booster Station –Hwy 8	\$80,733
Storage Buildings	\$180,172
Parks and Recreation	\$185,804
Airport Building	\$155,000
Cemetery	\$66,200
Total	\$7,179,094
*includes insured building contents	
Source: Local Government Property Insurance Statement of Values	

Part II – Planning Area

Insert Map 2 Generalized Land Use

Part II – Planning Area

LAND USE/COVER AND DEVELOPMENT PATTERNS

Land use is a relevant factor in mitigation planning. The amount, type and spatial distribution of land uses within the city are important in the development of a mitigation plan because land use is a determinant in the potential impact of a hazard.

The City of Crandon completed a comprehensive plan in 2010, which catalogues land use within the city. Woodlands is the use of over half the land area, followed by water. Residential occupies 14.6 percent of the area, followed by open land (4.4%), transportation (3.9%), agriculture and industrial use (both 2.5%). Commercial uses are primarily concentrated along USH 8, and cover 1.8 percent of land. Governmental uses make up 1.5 percent. See Table 5

Table 5: EXISTING LAND USE		
Land Use	Acres	Percent
Agriculture	98	2.5%
Commercial	72	1.8%
Governmental	58	1.5%
Industrial	97	2.5%
Open Land	175	4.4%
Outdoor Recreation	13	0.3%
Residential	578	14.6%
Transportation	153	3.9%
Woodlands	2,094	52.9%
Water	621	15.7%
Total	3,958	100.0%

Source: Air Photos, City of Crandon, & NCWRPC GIS

The City has a zoning code that includes the following districts: Single-Family and Multi-Family Residential Use, Commercial Use, Industrial Use, General Rural and Conservancy.

Single-Family Residential Development (R1) is intended to provide a quiet, pleasant and relatively spacious living area protected from traffic hazards. Municipal buildings, home occupations, public parks and two family residences are permitted within the R1 zoning district. Multi-Family Development (R2) is intended to provide a living area that is pleasant but not as spacious as R1. Medical and dental clinics, professional home offices, churches, hospitals, museums, and any use permitted in the R1 districts are permitted in the R2 district. The residential districts are

Part II – Planning Area

widespread throughout the city including downtown blocks and the peripheral areas.

The Commercial District is intended to provide an area for businesses within the city. The commercial district accommodates a variety of businesses including retail and service related trades. By conditional use, single or multi-family residences, and nursing homes are allowed within the commercial district. The majority of the commercial district lies along Lake Street (downtown business district) and the USH 8 and STH 32 (Glen & Pioneer Streets) corridors entering and leaving the city.

The Industrial District is intended to provide industrial and manufacturing uses in areas separated from other sections of the city. Residential, commercial and public uses are prohibited, except a dwelling unit may be permitted for a caretaker or superintendent if the industrial use requires constant supervision. The majority of the area zoned industrial includes the Industrial Park Area in the northeast corner of the city.

The General Rural District (GR) is designed to accommodate low-density development and farming or forestry operations in areas located within the city, but outside the urban service area. As the urban service area expands, it will become feasible to rezone some of this district in conformance with the comprehensive plan. The GR district is primarily on the outskirts of the city.

The Conservancy District (W) is intended to preserve the natural state of scenic and environmentally sensitive areas in the city and to discourage intensive development of marginal lands so as to prevent potential hazards to public and private property. Permitted uses in this zone include:

- Management of forestry, wildlife and fish
- Harvesting of wild crops such as marsh hay, ferns, moss, berries, tree fruits and tree seeds
- Hunting, fishing and trapping

Sewage disposal plant, water storage and pumping facilities, golf courses and seasonal public camping grounds require a conditional use permits.

Map 2 shows the land use in Crandon.

Part II – Planning Area

Major Watersheds

Fifteen percent of the total area of Crandon is water (.95 square miles). Watersheds are interconnected areas of land in which water drains to a common point such as a stream, lake or wetland that perform many indispensable roles in the proper function of the hydrologic cycle and local ecological systems, and act as water storage reservoir in times of high water. Wetlands can absorb excess water and release it back into the watershed slowly preventing or minimizing flood damage. With development of more impermeable surfaces, this excess capacity for water runoff storage becomes even more important, and Wisconsin Department of Natural Resources has standards for the regulation of wetlands.

Surface Water

There are four lakes in the City of Crandon: Lake Metonga, Clear Lake, Peshtigo Lake, and Surprise Lake. Map 3 illustrates the watersheds and surface water for the city.

The City of Crandon is part of two watersheds. Roughly the northern half of the city lies within the Upper Peshtigo River watershed, and the southern half lies within the Upper Wolf River watershed. Both of these watersheds drain into Lake Michigan.

Outstanding Resource Waters (ORWs) and Exceptional Resource Waters (ERWs) share many of the same environmental and ecological characteristics. The primary difference between the two is that ORWs typically do not have any direct point sources discharging pollutants directly to the water. Lake Metonga is an ORW and Rocky Siding Creek is an ERW.

Generally, greatest stream flow in the city occurs in late spring and autumn following increased periods of rainfall. Spring flooding is usually most pronounced in the western half of the county, which includes Crandon. All the streams, like the lakes, are important in the hydrological and ecological regime and should be protected by shoreland zoning and physical protective measures.

Floodplains and wetlands are important subsidiary components to the surface water system as described below.

Part II – Planning Area

Floodplains

The primary value of floodplains is their role in natural flood control, and represent areas where excess water can be accommodated whether through drainage by streams or through storage by wetlands and other natural detention/retention areas. Specific areas that will be inundated will depend upon the amount of water, the distance and speed that water travels, and the topography of the area. If uninterrupted by development, the areas shown on a map as floodplains should be able to handle the severest (regional) flood, i.e. those that have a probability of occurring once every one hundred years.

There is a value in preserving and protecting these natural flood control areas from encroachment. First, by preventing development in the floodplain, the cost of building dikes, levees, or other man-made flood control devices will be saved. Second, for each structure that is constructed in a flood-prone area, that area expands, potentially subjecting other structures originally built outside the delineated flood hazard area to the risk of flooding. Each new structure (or modification to existing structures) in the flood plain puts more life and property in danger.

Counties, cities, and villages are required to adopt reasonable and effective floodplain zoning ordinances. The requirement is found in section 87.30 of the Wisconsin Statutes and Chapter NR 116 of the Wisconsin Administrative Code. Floodplain zoning is designed to protect individuals, private property, and public investments from flood damage. Currently, there are no repetitive loss structures, those with multiple flood insurance claims, in Crandon.

Floodplain zoning maps identify areas where major floods occur. Regulations prohibit development in the floodway, the most dangerous flood area. In the flood fringe development that is built above flood levels and otherwise flood-protected is allowed if it is in accordance with local ordinances. For regulatory purposes, a floodplain is generally defined as land where there is a one percent chance of flooding in any year (also known as the 100-year floodplain).

The City of Crandon participates in the National Flood Insurance Program, and has completed a Flood Insurance Study and a Flood Insurance Rate Map (FIRM) that encompasses Crandon. The FIRM delineates the “A” Zones, including the floodway and flood fringe, which are those areas within the city inundated by the 100-year flood.

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Crandon has a studied FIRM with benchmarks. However, over the years, at least four of the benchmarks have been destroyed and need replacing. The City of Crandon also needs to update its ordinance due to the revisions to NR 116.

Wetlands

Wetlands perform many roles in the proper function of the hydrologic cycle and local ecological systems. In terms of hazard mitigation, they act as water storage reservoirs in times of high water. Like sponges, wetlands are able to absorb excess water and release it back into the watershed slowly, preventing flooding and minimizing flood damage. As more imperious surfaces are developed, this capacity for water storage becomes increasingly important.

The DNR has identified the location of wetlands on their WISCLAND database. According to this, Crandon has 240 acres, or six percent of its total area. Map 3 shows these wetland areas. There are concentrations of wetlands in the southwestern section of the city along the shores of Lake Metonga, around the southern tip of Lake Peshtigo and south and east of Surprise Lake, where it drains to Lake Metonga near the center of the city. Cattails and bulrushes in shallow water, and alder, sedges and grasses in the saturated areas dominate wetland communities.

Destruction of wetlands can occur through the use of fill material. This can negate the hydrological function of the site and open the area to improper development. The Wisconsin Department of Natural Resources (DNR) has promulgated minimum standards for managing wetlands.

Future Growth and Development in Crandon

In the most recent population projections (not including the 2010 Census count) Crandon was expected to lose nearly eighteen percent of its 2000 population by 2025. Based on these same projections the city's population was expected to be down by 6.5 percent in 2010, while in the actual count the city lost just over two percent.

The Comprehensive Plan identifies areas for expansion of residential, commercial and industrial land uses, but any significant increase in development will be tied to an increase in population. Although it is likely that population loss in the future will be less severe than projected earlier, growth and development in Crandon will probably be modest in the next twenty years.

Part II – Planning Area

Insert Map 3: Surface Water, Floodplains and Wetlands

Part II – Planning Area

PUBLIC FACILITIES AND SERVICES

Transportation

The transportation system in the City of Crandon provides the basis for movement of people and goods into, out of, through and within Forest County. An effective transportation system is necessary for the social and economic development of the city and county. Major transportation routes should be considered in hazard mitigation planning in the event of a major accident or hazardous materials spill.

Map 4 shows Crandon's transportation system. There is one federal highway (USH 8), and two state highways (STH 32 & 55) that run through the city. Highway 8 runs east to west through downtown Crandon. The main business district of Crandon is known as Lake Avenue (which carries all three highways). Highway 55 runs south to Mole Lake and north to the Michigan border. Highway 32 runs north to Three Lakes and east to Laona.

Rail Transportation

The Canadian National Railroad runs east to west through Forest County and services Crandon. Although trucks transport most of the hazardous materials in the state and the US, rail can carry significantly large and various loads.

Air Transportation

The Crandon Municipal Airport is two miles southwest of the City. The airport has a 3,000-foot hard surface runway that can accommodate small aircraft. This is the public-use airport serving the area. The airport provides general aviation service for private airplanes and daily airfreight. The Crandon Airport is a basic utility airport, which is designed to accommodate aircraft of less than 6,000 pounds gross weight, with approach speeds below 91 knots and wingspans of less than 49 feet.

The Rhinelander-Oneida County Airport, located 32 miles from Crandon, is the closest airport offering commercial service through Frontier Airlines.

Transit

Forest County Commission on Aging coordinates transit services for the elderly and disabled in the county. A mini-bus provides flexible-route service to various areas of the county on a weekly rotation for trips to regional medical centers as well as local service centers for groceries and

Part II – Planning Area

Insert Map 4 Transportation

Part II – Planning Area

other needs. The bus is available for dial-a-ride or specially planned trips when not on one of the scheduled routes. The county also has an accessible van for specialized transportation of disabled residents. A volunteer driver network is also available.

Utilities

Utility systems are important in hazard mitigation planning and must be identified in the plan because of the dependency on water, wastewater treatment, gas service, electricity and communications and the vulnerability of utility systems to hazards.

The City of Crandon has a municipal water and wastewater system servicing households and businesses. The protection of wastewater facilities is an important consideration for hazard mitigation planning because of the potential to contaminate nearby bodies of water in the event of high water. The protection of public water facilities from potential contamination is important in hazard mitigation planning. Also of concern during periods of flooding is the threat of damage to associated facilities and the infrastructure that supports them.

Wisconsin Public Service provides natural gas and electricity to the City. ANR Pipeline Company is the source of this natural gas. Electric and telephone lines should be considered due to their vulnerability to high winds, ice storms, tornados, flooding and fire. Frontier Communications provides telephone service.

Nationwide, cellular radiotelephone systems account for about half of all 911 calls. Service coverage in Forest County may be limited. Service coverage is based upon the handset receiving a direct line-of-sight signal from a system provider's antenna on a tower. Limitations for receiving a signal include topography and the thickness & type of building materials. Signals generally cannot travel well in dense forest cover, over tall hills, or through thick or multiple cement walls.

Emergency Services and Facilities

The type and location of public emergency services are important considerations in hazard mitigation planning because of the potential for direct involvement of such facilities in certain hazard situations. The locations of fire departments, police department and ambulance services in Crandon are shown on Map 5.

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The City of Crandon has a volunteer fire department. There are currently 30 volunteer firefighters. The City of Crandon has a police department with 3 full-time officers and 6 part-time officers. The City Police Department receives mutual aid from the Forest County Sheriff's Department that is also located in the City. The Crandon Area Rescue Squad offers ambulance service to the City and the neighboring Towns of Lincoln and Crandon.

The Forest County Sheriff's Department provides service to all the towns and the city for law enforcement, and has sixteen sworn officers, eighteen jail and dispatch employees, and two other employees. The Forest County Jail in Crandon is the main correctional facility within the County.

The American Red Cross maintains agreements with the owner/operators of various facilities around the County to act as shelters in the event of an emergency. Schools, churches and armories are the most common shelter facilities. Forest is part of a larger chapter of the American Red Cross with seven other counties. The chapter's administrative office is located in Steven Point, but a volunteer disaster action team is maintained locally.

The Red Cross has designated four Emergency Shelters in Crandon:

Crandon Community Building	601 W. Washington St.
Northwoods Recreation Center	400 Crandon Ave. N.
Crandon High School	9750 U.S. Highway 8 W.
New Hope Transitional Housing	601 Summit Ave. N.

Critical Community Facilities

In addition to emergency service facilities, other community facilities are also important in hazard mitigation planning. Government administration buildings serve as the headquarters that link to resources in helping solve potential problems. The location of hospitals and medical facilities is very important to know where injured residents have to be transported and how many people each facility can handle in case of a hazard. Nursing homes are vulnerable because of the level of assistance required by the residents living there. Schools are also important facility since most of the county's children are there for most of the year. Clinic facilities are located in the City of Crandon.

Part II – Planning Area

Insert Map 5: Critical Facilities

Part III – Risk Assessment

INTRODUCTION

Analyzing the hazards facing a community is an important and vital step in the mitigation planning process. Before mitigation strategies can be determined, a risk assessment must be made. Part III of the City of Crandon All Hazards Mitigation Plan will focus on the following:

- Identification of all types of natural hazards that can affect Crandon
- An analysis of each hazard identified as pertinent to Crandon

The hazard analysis will consist of:

- Background information
- History of previous occurrences of hazard events
- An analysis of Crandon's vulnerability to future events
- An estimate of future probability and potential losses from the hazard

HAZARD IDENTIFICATION

The process of identifying those hazards that should be specifically addressed in the City of Crandon All Hazards Mitigation Plan was based on consideration of a number of factors. The process included a review of past hazard events to determine the probability of future occurrences and threat to human safety and property damage.

The most accessible tool in identifying hazards in Crandon is from reports that already exist. In November 2002, Wisconsin Emergency Management (WEM) created the *Hazard Analysis for the State of Wisconsin*. It details the hazards that have caused or are likely to cause disasters in Wisconsin. This report also discusses hazards that threaten public health and safety, but may not be likely to cause a disaster. The descriptions of disasters, hazards and threats include information on frequency, significant occurrences, potential and actual impacts, and related programs.

Worksheets from the Wisconsin Guide to All-Hazards Mitigation Planning were used by the Planning Taskforce to evaluate and rank the listing of possible hazards to help identify which hazards should be included in the Plan according to threat to human safety and possible damage to property. The ranking was compared to the ranking from the original City mitigation plan.

Part III – Risk Assessment

The resulting priority ranking of hazards determined by the Task Force is as follows:

1. Tornado/High Winds	4. Forest/Wild Fires
2. Winter Storms/Ice/Extreme Cold	5. Drought/Extreme Heat
3. Severe Thunderstorms/Lightning/Hail	6. Flooding

This Plan focuses on natural hazards that have or could cause disasters that can be mitigated on a local level. Technological or manmade hazards include things like transportation incidents, explosions and structural fire, civil or prison disturbances, mass casualty events, war, and terrorism, but they are not included in this planning process. Low magnitude earthquakes occur in Wisconsin every few years, most recently in Clintonville, but none have exceeded a magnitude of 3.9, which would have vibrations similar to the passing of a semi-truck, therefore, earthquakes are not covered in this plan. Crandon does not have coastal hazard issues and conditions for landslide or subsidence problems are not significant in the city.

Although a significant concern, human communicable diseases are not addressed in the plan. The City and the Forest County Health Department along with area hospitals work with the Wisconsin Department of Health and Family Services – Division of Public Health (WDHFS) and the CDC to monitor and plan for these situations.

HAZARD ANALYSIS

The hazard analysis for each hazard included in this plan is broken down into four components, as follows:

1. Background on Hazard - The next step after identifying a hazard is to define the hazard and give some general background on it. This can include occurrence of the hazard within the city, county or state. This section may also give some indication of the risk to public health and safety, and to personal and public property.

2. History of Hazards - Past experiences of disasters are an indication of the potential for future vulnerability. A review of past occurrences for each identified hazard in Crandon was completed.

Some disasters have caused damages that exceeded the capabilities of local communities and state agencies. Federal assistance is then

Part III – Risk Assessment

requested, which may be offered through a variety of programs. Assistance may be directed to agricultural producers, individuals and families, businesses, or local governments. There have been four natural disasters in Forest County, where a Presidential Declaration was requested from 1971-2006, and one more recent incident, include the following:

- 1975 Army Worm Infestation
- 1976 Drought – Presidential Emergency Declaration
- 1977 High Winds / Hail – Presidential Emergency Declaration
- 2000 Severe Storms/Flooding/Tornado – Presidential Disaster Declaration
- 2010 – Severe Storms – State Disaster Fund

It should be noted that this underestimates the number of events that have occurred in Forest County. Almost every year there are significant weather events or disasters that cause millions of dollars in damage, and for which no Federal disaster assistance is requested. Major indicators of severity are the deaths, injuries, and economic losses resulting from natural hazards and disasters.

The National Oceanic and Atmospheric Administration (NOAA) and National Climatic Data Center (NCDC) publish the National Weather Service (NWS) data describing recorded weather events and resulting deaths, injuries, and damages. From September 3, 1958 to December 31, 2006, NCDC reported 193 severe weather events for Forest County.

Note that since the earlier NCDC data is somewhat incomplete, this report focuses on the 16-year period from 1996 to 2012 for hazard analysis purposes. Other sources are used to supplement the NCDC data. These sources include Wisconsin Emergency Management, Wisconsin Department of Natural Resources, Forest County Emergency Management, and local news reports.

3. Vulnerability Assessment For Hazards - For each hazard identified, a summary of the impact to the community is given. When possible, existing buildings, infrastructure, and critical facilities located in the hazard areas are identified. Critical facilities are community buildings that are especially important to the health and welfare of the population following hazard events. Examples of such facilities include hospitals, police & fire stations, city hall, and shelters.

Where possible, an estimate of the potential dollar losses to vulnerable structures is given. Values are identified by tax assessments, equalized valuations, or statement of values from insurance companies.

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4. Future Probability and Potential Dollar Losses for Hazard - The historic data and vulnerability assessment for each hazard is used to project the potential future probability of that hazard occurring in the city and the potential damages in dollars that might be reasonably expected, setting the likely cost of mitigation for each hazard.

HAZARD ANALYSIS: TORNADOS/HIGH WIND

Background on Tornado / High Wind Hazard:

A tornado is a relatively short-lived storm composed of an intense rotating column of air, extending from a thunderstorm cloud system. It is nearly always visible as a funnel, although its lower end does not necessarily touch the ground. Average winds in a tornado, although never accurately measured, are between 100 and 200 miles per hour, but some tornados may have winds in excess of 300 miles per hour.

Table 6 Tornado Wind and Damage Scale			
Tornado Scale	Wind Speeds	Damage	Frequency of Occurrence
F0	40 to 72 MPH	Some damage to chimneys, TV antennas, roof shingles, trees, and windows.	29%
F1	73 to 112 MPH	Automobiles overturned, carports destroyed, trees uprooted	40%
F2	113 to 157 MPH	Roofs blown off homes, sheds and outbuildings demolished, mobile homes overturned.	24%
F3	158 to 206 MPH	Exterior walls and roofs blown off homes. Metal buildings collapsed or are severely damaged. Forests and farmland flattened.	6%
F4	207 to 260 MPH	Few walls, if any, standing in well-built homes. Large steel and concrete missiles thrown far distances.	2%
F5	261 to 318 MPH	Homes leveled with all debris removed. Schools, motels, and other larger structures have considerable damage with exterior walls and roofs gone. Top stories demolished.	Less than 1%

Source: National Weather Service

A tornado path averages four miles, but may reach up to 300 miles in length. Widths average 300 to 400 yards, but severe tornados have cut swaths a mile or more in width, sometimes forming groups of two or three funnels traveling together. On average, tornados move between 25 and 45 miles per hour, but speeds over land of up to 70 miles per hour have been recorded. Tornados rarely last more than a couple of minutes in a single location or more than 15 to 20 minutes in a ten-mile area.

Part III – Risk Assessment

U.S. tornados are classified into six intensity categories: F0 to F5. These categories are based upon the estimated maximum winds occurring within the funnel. The Fujita Tornado Scale (or the "F scale") has become the definitive scale for estimating wind speeds within tornados based upon the damage done to structures and vegetation, see Table 6. It is used extensively by the National Weather Service in investigating tornados (all tornados are now assigned an F scale designation), and by engineers in correlating damage to structures. Although the Fujita scale actually ranges up to F12, the strongest tornados are in the F5 range.

Wisconsin lies along the northern edge of the nation's maximum frequency belt for tornados, known as "Tornado Alley". Tornado Alley extends northeast from Oklahoma into Iowa and then across to Michigan and Ohio. Winter, spring and fall tornados are more likely to occur in southern Wisconsin than in northern counties, but tornados have occurred in Wisconsin every month except February.

High wind events, although technically not tornados, are included here due to the similarity of damages. Measured wind speeds are typically in the range of a F0 tornado and may even approach F1 speeds. High or strong wind events can be associated with tornadic episodes, thunderstorms or even winter storms. The effects are often widespread, impacting areas hundreds of miles from the actual areas of thunderstorms or snow. Trees, signs and power poles are the most commonly impacted by high wind events, but significant damage and bodily injury/death can occur.

History of Tornados/ High Winds in Crandon and Forest County:

Forest County has had six verified tornados from 1950 to 2008, including the most recent event which occurred on June 7, 2005. Two super-cell storms moved through the southern part of the county causing significant wind damage and producing a funnel cloud three miles east of Crandon. Three square miles of trees in the Nicolet National Forest were heavily damaged as winds estimated at 90 mph hit the south part of Birch Lake. Large hail was associated with this event.

On June 28, 1994, a waterspout was observed over Lake Metonga, two miles south of Crandon. About one month prior to this sighting Forest County experienced a major F2 tornado that cut a twelve-mile path between Crandon and Leona causing \$5 million in property damage and \$50,000 in crop damage. Three mobile homes were destroyed, injuring three people. Another 25 houses were damaged or destroyed and 600 acres of timber were leveled.

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Table 7 Reported Tornadoes in Forest County							
DATE	TIME	LOCATION	LENGTH (miles)	WIDTH (yards)	DEATHS	INJURIES	F-SCALE
6/7/2005	6:04 PM	T. Lincoln	n/a	n/a	0	0	n/a
6/28/1994	5:20 PM	C. Crandon	n/a	n/a	0	0	n/a
5/30/1994	8:50 PM	C. Crandon T. Lincoln T. Laona	12	800	0	3	F2
9/16/1972	4:05 PM	T. Freedom T. Wabeno	53	200	0	0	F2
6/30/1968	4:00 AM	T. Caswell	1	200	0	0	F2
9/19/1963	6:00 PM	T. Laona	1	33	0	0	F1

Source: National Climatic Data Center

The County also experienced F2 tornadoes in 1972 and 1968. The September 1972 tornado cut a 53 mile long swath causing \$250,000 in property damage. The June 1968 tornado had a 1-mile path with \$25,000 in damages. In September of 1963, there was an F1 tornado also with a 1-mile path and about \$25,000 in property damages.

The National Climatic Data Center database shows 17 high or strong wind events from 1996 to 2010. Each included an area much larger than Forest County alone. In 1977, Forest County was included in a Presidential Emergency Declaration due, in part, to high wind. On June 23, 2010, wind gusts estimated as high as 90 mph. across Forest, Oneida, Langlade, Marinette and Door Counties. Trees were downed with some landing on power lines, which resulted in power outage for nearly 15,000 people in these counties.



Tornado Damage, Forest County

Because of data availability detailed information for the Crandon area exists only from 2006. Since then there have been six instances of high wind, associated with thunderstorms, two of which caused property damage. A mobile home was overturned in the city on August 28, 2007, and the June 23, 2010 storm blew a tree onto a house in Crandon. The same storm damage ten houses with fallen trees in Mole Lake.

Tornado / High Wind Vulnerability Assessment:

Though Forest County is mostly a rural county, there are concentrations of population scattered throughout. The City of Crandon can be regarded as more vulnerable because tornadoes and high winds pose more of a

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threat to human safety and property damage in a more concentrated area.

Mobile homes are of significant concern in assessing the hazard risks from tornados and high winds. In general, it is much easier for a tornado/high wind to damage and destroy a mobile home than a site-built home. Mobile homes comprise 12.7 percent of Forest County's housing units, and slightly less than ten percent of housing units in Crandon, and the vulnerability to the health and safety of occupants along with property damage to these units is much greater. Research by the NWS shows that between 1985 and 1998, 40 percent of all deaths in the nation from tornados were in mobile homes, compared to 29 percent in permanent homes, and 11 percent in vehicles.

There are two mobile home parks in Crandon, and a total of 94 mobile home units in the city with an average assessed value of \$10,000. This compares to an average value of \$42,000 for mobile homes throughout the county. The likely explanation for the considerable difference in value is that most of the mobile home units in the city are within these mobile home parks, and thus there is no land value associated with their assessment. Besides mobile homes, campground patrons are vulnerable to tornados because there usually is little shelter provided.

But the chance of extreme damaging winds of 75 mph and over is only 27 percent. This equates to about once every 4 years.

HAZARD ANALYSIS: WINTER STORMS / EXTREME COLD

Background on Winter Storms/Extreme Cold Hazard:

A variety of weather phenomena and conditions can occur during winter storms. For clarification, the following are National Weather Service approved descriptions of winter storm elements:

Heavy snowfall – the accumulation of six or more inches of snow in a 12-hour period or eight or more inches in a 24-hour period.

Blizzard – the occurrence of sustained wind speeds in excess of 35 miles per hour accompanied by heavy snowfall or large amounts of blowing or drifting snow.

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Ice Storm – an occurrence where rain falls from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and exposed objects near the ground.

Freezing drizzle/freezing rain – the effect of drizzle or rain freezing upon impact on objects that have a temperature of 32 degrees Fahrenheit or below.

Sleet – solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. This ice does not cling to surfaces.

Winter storms can vary in size and strength and include heavy snowfall, blizzards, ice storms, freezing drizzle/freezing rain, sleet, wind chill, and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury such as frostbite and death.

True blizzards are rare in Wisconsin. They are more likely to occur in the northwestern part of the state than in other parts of Wisconsin, even though heavy snowfalls are more frequent in the southeast. However, blizzard-like conditions often exist during heavy snowstorms when gusty winds cause the severe blowing and drifting of snow. Heavy snow and ice storms are part of nearly every winter in Forest County.

Dangerously cold conditions can be the result of the combination of cold temperatures and high winds. The combination of cold temperatures and high wind creates a perceived temperature known as "wind chill". Wind chill is the apparent temperature that describes the combined effect of wind and air temperatures on exposed skin. When wind blows across the skin, it removes the insulating layer of warm air adjacent to the skin. When all factors are the same, the faster the wind blows the greater the heat loss, which results in a colder feeling. As winds increase, heat is carried away from the body at a faster rate, driving down both the skin temperature and eventually the internal body temperature.

The National Weather Service issues wind chill advisories when wind chill readings of -20 to -34 degrees are expected. Wind chill warnings are issued when wind chill values are expected at or below -35 degrees. Extreme cold events are most likely during the months of January and February.

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History of Winter Storms/Extreme Cold in Crandon and Forest County:

The NCDC has reported 70 major winter storm events for Forest County between 1996 and 2010. All of these storms contained some form of snow, sleet, freezing rain, or ice conditions.

A heavy snow was reported on March 10, 2011. A low pressure system moved across Illinois and Iowa, receiving moisture from the Gulf of Mexico. It passed through Wisconsin, producing wet, heavy snow and thundersnow across central and northeast Wisconsin. The high water content of this late season snow caused problem throughout the area.

Totals over fourteen inches of snow were recorded at Crandon. Most recently, 18-inches of wet, heavy snow fell on February 28, 2012. This came as part of a period of unusually warm March weather, and all the snow was melted within a week.

On December 11, 2010 a full blizzard hit central and northeastern Wisconsin, including Forest County. A powerful arctic high pressure system in southern Canada and a low pressure system to the south created high winds and blowing snow along a wide front through Minnesota and Wisconsin. Strong winds gusting as high as 46 mph were measure in Antigo. Over two feet of snow was recorded throughout the area.

From the NCDC, five extreme cold temperature events have affected Forest County from 1996 to 2008. In February 1996, an arctic air mass stalled over Wisconsin bringing extreme cold for an extended period (over five days), wind chills reached 70 degrees below zero in some areas. There was significant damage and disruption, including cancellation of all outdoor events at the Badger State Games. At least one person died of hypothermia, but this was not in Forest County. On February 4, 2007 winds of 10-20 mile per hour caused windchills of 35 to 40 below zero.

Winter Storms / Extreme Cold Vulnerability Assessment:

Winter storms and extreme cold present a serious threat to the health and safety of affected citizens and can result in significant damage to property. Heavy snow or accumulated ice can cause the structural collapse of buildings, down power lines, motor vehicle accidents or isolate people from assistance or services. Extreme cold includes the risk of frostbite and hypothermia.

The following is a list of things that may be adversely affected by a winter storm or extreme cold. Many of these community assets can be referenced in Part II.

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- Infrastructure – operation of emergency services, operation of public facilities and schools
- Utilities – down power and telephone lines
- LP Gas at residences freezing in temps below -40 degrees.
- Septic systems - freezing
- Transportation – automobile accidents, roadway plowing, salting/sanding
- Residential – roofs
- Businesses – commerce
- Agricultural – livestock

Based on review of the historic events of winter storms and extreme cold, there are no specific areas in the county which have unusual risks. The risk for winter storms and extreme cold is relatively uniform and a countywide concern.

HAZARD ANALYSIS: SEVERE THUNDERSTORM/ LIGHTNING/ HAIL

Background on Severe Thunderstorm Hazard:

The National Weather Service definition of a severe thunderstorm is a thunderstorm event that produces any of the following: downbursts with winds of 58 miles per hour or greater (often with gusts of 74 miles per hour or greater), hail 1 inch (increased from $\frac{3}{4}$ inch) in diameter or greater or a tornado. Hail and lightning will be addressed in this section, however tornadoes and strong winds will be referenced as a separate hazard.

Lightning results from discharge of energy between positive and negative areas separated by rising and falling air within a thunderstorm. This discharge heats the surrounding air to 50,000 degrees. Hail results as the warm rising air cools, forming ice crystals which are held by the updrafts until accumulating enough weight to fall. The hail size depends on strength of the updrafts keeping it up.

Thunderstorm frequency is measured in terms of incidence of thunderstorm days or days on which thunderstorms are observed. Wisconsin averages between 30 and 50 thunderstorm days per year depending on location. A given county may experience ten or more thunderstorm days per year. The southwestern area of the state normally has more thunderstorms than the rest of the state.

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History of Severe Thunderstorms in Crandon and Forest County:

The NCDC has reported 44 severe storm events for Forest County between 1999 and 2008, discounting multiple reports for the same event. These storms typically contain some form of heavy rain and strong winds. There were also 6 notable lightning incidents identified. In 1994, lightning injured one person and caused about \$10,000 in damages in Crandon.

About 20 significant hail events, typically related to a severe thunderstorm, were listed during this time period. The historical frequency for the occurrence of hail is much greater. Based on reported events of the past 15 years the county averages 1.3 periods of hail per year. Size ranges from 0.75 to 2.75 inches in diameter. In 2005, hail up to 2.75 inches in diameter caused approximately \$100,000 in damages in the Laona area. On April 10, 2011 two-inch hail was recorded at Lake Metonga. This storm also produced a tornado that struck Argonne and Armstrong Creek, doing \$250,000 damage.

Severe Thunderstorm Vulnerability Assessment:

The National Weather Service can forecast and track a line of thunderstorms likely to produce severe high winds, hail, and lightning, but where these related hazards form or touch down and how powerful they might be remains unpredictable. The distribution of thunderstorms and related hazard events has been widely scattered.

Many thunderstorm events (without tornadoes) have caused substantial property and infrastructure damage, and have the potential to cause future damage. In order to assess the vulnerability of the Crandon area to thunderstorms and related storm hazards, a review of past events indicate significant impacts to:

- Infrastructure – hospitals, schools, street signs, police and fire departments
- Utilities – electric lines/poles/transformers, telephone lines, radio communication
- Transportation – debris clean-up
- Residential – mobile homes, garages, trees and limbs, siding, & windows
- Businesses – signs, windows, siding, & billboards
- Agricultural – buildings, crops, & livestock
- Vehicles – campers, boats, windshields, body, & paint



Based on review of the historic patterns of thunderstorms in Forest County Hail high wind, hail, or lightning, there are no specific municipalities that have unusual risks, but because of its higher residential density damage is likely

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to be more concentrated in the city. The events are relatively uniform and a countywide concern.

Future Probability and Potential Dollar Losses – Severe Thunderstorms:

Based on historical frequency, Forest County can expect 5.1 thunderstorm events per year on average. In other words, the probability is 1.0 or a 100% chance of multiple storms in a given year. The probability of a thunderstorm with damaging hail (0.75 inch diameter or greater) in Forest County is 1.0 or 100% chance in a given year. There is not enough data available regarding lightning events to indicate probability.

According to the NCDC, historic thunderstorm events with associated high wind and reported damages ranged from \$2,000 to \$20,000 in property damage per incident. Historic thunderstorm events with associated hail that reported property damage averaged \$4,208. Historic thunderstorm events with associated lightening that reported property damage averaged \$5,000. Losses in Forest County associated with severe thunderstorms could approach \$1,196,536 over the next ten-year period. It is difficult to separate out effects that might impact Crandon, since thunderstorms tend to range over a wide area and most weather information is assembled at the county level.

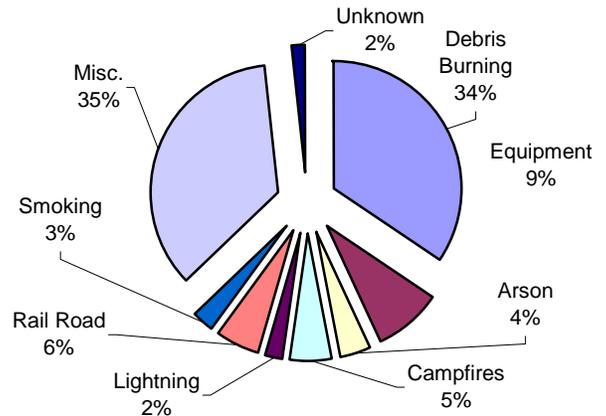
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HAZARD ANALYSIS: FOREST FIRES / WILDFIRES

Background on Forest Fire / Wildfire Hazard:

A wildfire is any instance of uncontrolled burning in brush, marshes, grasslands, or field lands. A forest fire is an uncontrolled fire occurring in a forest or in woodlands outside the limits of incorporated villages or cities. Although in the strictest sense a forest fire, by this definition, cannot take place within Crandon because the city is surrounded by forest such an event is bound to affect it. For the purpose of this analysis, both of these kinds of fires are being considered together.

Fire Causes in Forest Co. 1982-2005



Source: WDNR

Forest fires and wildfires can occur at any time the ground is not completely snow covered. The season length and peak months may vary appreciably from year to year. Land use, vegetation, amount of combustible materials present and weather conditions such as wind, low humidity and lack of precipitation are the chief factors for fire season length.

History of Forest Fires/Wildfires in Crandon and Forest County:

The Wisconsin DNR maintains a database of forest fires for Forest County. From 1982 to 2005, there have been about 13 fires annually. However, there is a significant variability ranging from 5 to 24 fires in a given year. The typical fire in Forest County burns about 1.8 acres.

In 1990, the highest total in a year (between 1982 and 2005) was reached at 142.8 acres burned in 21 fires. The highest number of individual fires in a year in that period was reached at 24 in 1983, however, only 25.4 acres burned.

Forest Fires/Wildfires Vulnerability Assessment:

Forest County has 604,000 acres of forestland, or 90 percent of the county's area. The potential for property damage from fire increases

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each year as more recreational and retirement homes are developed on wooded land.

Rural buildings may be more vulnerable because of lack of access but the same factors affect structures within the city limits especially those on the fringe of the urbanized area. Access driveways off main roads are sometimes long and narrow with minimal vertical clearance and no turn around areas large enough for emergency vehicles making it hard to save individual dwellings. These buildings also may not have adequate clearance between the structure and the forest.

Future Probability and Potential Dollar Losses – Forest Fires/Wildfires:

Forest and wild fires are relatively common occurrences in Forest County. In recent years, an average of about 13 fires per year in the county have burned 24 acres on average each year. In other words, the probability is 1.0 or a 100 % chance of wildfire each year. However, these fires are typically contained rapidly and remain small, so that each has a minimal impact.



Forest Fire Watch Tower, Forest County, WI

Because of the relatively small impact of typical individual fires in the city, loss data is not tracked. This makes it difficult to develop an estimate of potential future dollar losses. However, with 13 fires per year, the County should expect some fires to "get out of hand". And again, if such an event were to impact the more densely developed parts of the city damage could be considerable.

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HAZARD ANALYSIS: DROUGHT/EXTREME HEAT

Background on Drought/Extreme Heat Hazard:

A drought is an extended period of unusually dry weather, which may be accompanied by extreme heat (temperatures which are 10 or more degrees above the normal high temperature for the period). There are basically two types of drought in Wisconsin: agricultural and hydrologic.

Agricultural drought is a dry period of sufficient length and intensity that markedly reduces crop yields. Hydrologic drought is a dry period of length and intensity sufficient to affect lake and stream levels, and the level of the groundwater table. These two types of drought may, but do not necessarily, occur at the same time.

Droughts, both agricultural and hydrologic, are relatively common in the state. Small droughts of shortened duration have occurred at an interval of about every ten years since the 1930's.

Extended periods of warm, humid weather can create significant risks for people, particularly the elderly who may lack air conditioning or proper insulation or ventilation in their homes. Animals are also at risk during extended periods of heat and humidity. The heat index combines the effects of heat and humidity to better reflect the risk of warm weather to people and animals. When heat and humidity combine to reduce the amount of evaporation of sweat from the body, outdoor activity becomes dangerous even for healthy individuals. The index measures the apparent temperature in the shade. People exposed to the sun would experience an even higher apparent temperature. The National Weather Service issues a Heat Advisory when the Heat Index ranges from 105 to 114 degrees daytime and remains at or above 80 degrees at night, during a 24-hour period. A heat index of 105 is considered dangerous and prolonged exposure can result in heat stroke, exhaustion and cramps. People should be reminded to use extreme caution when the heat index is between 95 and 105. A heat index of 95 occurs when the temperature is 90 degrees and the relative humidity is 50 percent.

History of Drought/Extreme Heat in Crandon and Forest County:

The NCDC data shows several drought periods recorded for Forest County: 1976-1977 and 2005. Although another drought period occurred from 1987-1988. NCDC also shows an extended dry spell for the month of March 1999.

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The drought of 1976-1977, affected an area stretching from north to south across the state. Stream flow measuring stations recorded water levels consistent with from 10 to 30 year lows. Numerous private and municipal wells went dry due to the lowered groundwater tables and agricultural losses during this drought were set at \$624 million. Forest County was one of 64 counties that were declared federal drought areas and deemed eligible for assistance under the Disaster Relief Act.

Since August of 2007 NCDC has registered fifteen months that showed evidence of drought, primarily in the fall. The last of these drought periods ended in late August of 2010.

The county has experienced one extreme heat wave from 1996 to 2006. In July of 1999, over a week of extreme temperatures and humid weather swept across the state. In some places it was so hot that concrete roads began to buckle. There was widespread heat related illness, and three deaths resulted outside Forest County.

Drought/Extreme Heat Vulnerability Assessment:

Droughts can have a dramatic effect on Crandon, and can trigger other natural and man-made hazards. They greatly increase the risk of forest fires and wildfires because of extreme dryness. In addition, the loss of vegetation in the absence of sufficient water can result in flooding, even from average rainfall, following drought conditions.

The following is a list of things that may be adversely affected by a drought. Many of these community assets can be referenced in Part II.

- Infrastructure – municipal water supplies
- Surface water –groundwater reserves, recreation, and wildlife
- Forests
- Agricultural – crops, livestock

According to the Wisconsin Emergency Management, excessive heat has become the most deadly hazard in Wisconsin in recent times. Extreme heat can happen anywhere affecting everyone, however the elderly and young are the ones with the highest risk of heat related impacts, which at times can lead to death. Ways to minimize effects of overheating include wearing light-colored clothing, drinking plenty of water, slowing down, and staying out of the sun.

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The area most susceptible to drought conditions would be agricultural communities. Agricultural land is scattered throughout the south and southeast parts of the county near Crandon.

The county has 16,000 acres of farmland. With agriculture being a critical sector of the county's economy, droughts have disastrous effects. Even small droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm income. More substantial events can decimate croplands and result in total loss, hurting the local economy.

Irrigation can negatively impact the environment by drawing water that naturally goes to aquifers and surface water. Drought can exacerbate the problem when high withdrawal rates versus little precipitation deplete water bodies and aquifer supplies, thereby decreasing drinking water supplies, drying streams, and hindering aquatic and terrestrial wildlife. During severe droughts, some wells - mainly private wells - will go dry.

Again, drought and heat waves are widespread weather events, that affect broad areas beyond the city limits but certain impacts, such as the drawdown of the water table can have an effect within the city.

Future Probability and Potential Dollar Losses – Drought/Extreme Heat:

Based on the historic data presented here (frequency of past events), Forest County can expect a drought every ten years on average, which is a probability of 0.10 or a 10 percent chance in a given year. Significant severe drought is somewhat less common, affecting Wisconsin once about every 15 years.

Drought is another hazard lacking good loss figures at the county level. However, a look at aggregate data for the last two major droughts can give some idea of potential impact. The last two major droughts in Wisconsin resulted in losses of \$9.6 million (1976-77) to \$18 million (1987-88) per county on average.

Normally, northern Wisconsin is known for its cold winters, however, extreme heat waves will affect Crandon in the future, which may be increasing, based on available data, going back to 2007 fifteen of sixty months have recorded some level of drought which translates into a 25 percent chance of drought. This may be an unusually dry period or it could indicate a longer-term pattern.

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HAZARD ANALYSIS: FLOODING

Background on Flood Hazard:

There are a variety of classifications for flooding including coastal, dam failure, flash, lake, riverine, stormwater and urban/small stream. Only the last two pose a real threat to Crandon. The following descriptions of the types of flooding that could affect Crandon are compiled from various FEMA and other notable hazard planning sources:

Flash – Involves a rapid rise in water level moving at high velocity with large amounts of debris which can lead to damage including tearing out of trees, undermining buildings and bridges, and scouring new channels. Dam failure, ice jams and obstruction of the waterway can also lead to flash flooding. Urban/built-up areas are increasingly subject to flash flooding due to removal of vegetation, covering of ground with impervious surfaces and construction of drainage systems.

Lake – Prolonged wet weather patterns can induce water-level rises that threaten lakeshore areas.

Riverine – Also known as overbank flooding, this is the most common type of flooding event. The amount of flooding is a function of the size and topography of the watershed, the regional climate, soil and land use characteristics. In steep valleys, flooding is usually rapid and deep, but of short duration, while flooding in flat areas is typically slow, relatively shallow and may last for long periods.

The cause of flooding in rivers is typically prolonged periods of rainfall from weather systems covering large areas. These systems may saturate the ground and overload the streams and reservoirs in the smaller sub-basins that drain into larger rivers. Annual spring floods are typically due to the melting of snowpack.

Stormwater – Water from a storm event that exceeds the capacity of local drainage systems, either man-made or natural, can result in flooding.

Inadequate storm sewers and drainage systems are often the primary factor resulting in this type of flooding.

Urban and Small Stream – Locally heavy rainfall can lead to flooding in smaller rivers and streams. Streams through urban or built-up areas are more susceptible due to increased surface runoff and constricted stream channels.

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The City of Crandon has an average annual rainfall of 32 inches. The majority of the rain comes in late spring and summer (average 20 inches). The City of Crandon has had severally reoccurring instances of flooding. This flooding can be caused spring run-off but is more commonly associated with single events of excessive rainfall. Major floods in Forest County tend to occur either in the spring when melting snow adds to normal runoff or in summer or early fall after intense rainfalls. Flooding which occurs in the spring due to snowmelt and or a prolonged period of heavy rain is characterized by a period of days. The buildup continues until the river or stream overflows its banks, for as long as a week or two and then slowly recedes inch by inch. The timing and location of this type of flooding is fairly predictable and allows ample time for evacuation of people and protection of property.

The floodplain and wetland areas are most vulnerable to flooding in Crandon. These areas are identified on Map 3. The Federal Emergency Management Agency (FEMA) identified these floodplains on Federal Insurance Rate Maps (FIRMs), and the North Central Wisconsin Regional Planning Commission digitized them into a GIS coverage for planning purposes.

There are no dams in Crandon

History of Flooding in Crandon:

Flooding was the principal cause of damage in one of four Presidential Disaster Declarations in Forest County between 1971 and 2005. The most recent declaration as of this Plan occurred when on July 8, 2000 Crandon received heavy rainfall of 2 to 4 inches in 24-hours, leading to road and basement flooding. Forest County was one of thirty counties included in the Disaster Declaration. As a result of the 2000 flooding, heavy rains caused a newly constructed wall at the Crandon Public Library construction site to bow and crack. The City of Crandon received approximately \$37,000 in FEMA funds to make repairs to the site.

The NCDC recorded four flood events from 1996 to 2002. Two of the four events happened in the month of July. Since 1996, the effects of flooding caused \$154,000 in damages throughout the County. These damages were the result of a single event in July 2000. There have been many



Flood Damage. US Hwy 8

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events of localized flooding in the City of Crandon. Although these events are not large in scale or reportable by the NCDC, localized flooding has caused disruption to traffic and damage to infrastructure.

In 2001, the City received FEMA funds (\$110,000.00) for installation of 1,100 feet of storm sewer on Glen Street (starting at N Park) to alleviate street and basement flooding. One resident on Glen Street had flooded 6 times in 6 years resulting in more than \$10,000.00 in replacement of damaged items and cleaning. This resident was displaced from their home because of mold infestation. The installation of the storm sewer rectified the flooding issue.

The City used their own funds to install a storm sewer line on Forest Avenue between Grant and Glen Streets. This extension was done in conjunction with the FEMA funded Glen Street Storm sewer at the cost of \$16,500.00.

There are several streets and intersections throughout the City that flood regularly (3 to 4 times a year). Complaints from residents have been recorded at intersection of Grant Street/Forest Avenue and the intersection of Hazeldell Avenue/Washington Street.

Flood Vulnerability Assessment:

Flood events in the city have caused substantial property and infrastructure damage in the past and have the potential to cause future damage, since a significant number of structures still exist in the floodplain. Looking at past events, the following have been significantly impacted by flooding:

- Infrastructure – flooded public facilities
- Roadways – washouts, inundated roadways, debris clean-up
- Residential structures – flooded basements, damaged septic systems
- Businesses – loss of commerce

To assess the vulnerability of Crandon area to flooding hazards, basic inventory data described in Part II must be analyzed. For this purpose, consideration should be given to structures (specifically critical facilities) and infrastructure.

One of the first reports to reference in assessing vulnerability to structures during flooding is the Wisconsin Repetitive Loss Report. The Repetitive Loss Report provides information to the status of repetitive loss properties by community. FEMA classifies a repetitive loss structure “when more than

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one flood insurance claim of at least \$1,000 is made within a ten-year period". The information is used as a floodplain management tool and to supplement information provided by communities for flood mitigation grants administered by WEM. According to the report, there are no repetitive loss structures within Crandon.

Since no structures are listed in the Repetitive Loss Report, structures within floodplains were analyzed, see methodology outlined below. The floodplain boundaries within Crandon are shown on Map 3. There were a total of 67 structures identified in the designated floodplain boundaries, see Map 3. Estimated value of structures located within the floodplain in Crandon is \$4,824,000. Most of these buildings are along the Lake Metonga shoreline. Since the 1987 *Flood Insurance Study* prepared by FEMA predicts a rise in the lake level of less than four inches in the 500 year flood, the impact of a flood on most of these structures would be minimal. Three homes in the area of Surprise Lake that have been identified as in the recently revised floodplain, according to the City Zoning Administrator, are appealing that designation.

Methodology – Structures within Floodplains:

- 1. NCWRPC digitized (electronically traced) the individual FEMA FIRM floodplain maps into a GIS coverage for the County.*
- 2. A building address point coverage was obtained.*
- 3. The floodplain coverage was then combined with the building point coverage to identify those structures within the floodplain boundary.*
- 4. Total structures with the floodplain were then tabulated.*
- 5. Average assessed value data was used to estimate total value for the identified vulnerable structures by municipality.*

In addition to structural damage from flooding, there has been significant damage to public roadways, particularly to roadway surfaces, culverts and bridges. Such interruptions in the city transportation network can cause travel delays through detours.

The primary impact from damages to roadways is to businesses. The monetary impact is unknown but past floods have restricted public access and even closed businesses. Tourism is an important industry in the city and businesses, including motels and restaurants, may be affected by flooding.

The forest products industry is affected similarly to agriculture. Forestlands become too wet for logging operations and many water logged tree

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plantations suffer high mortality rates. Mill inventories become very low, resulting in increased prices for consumers.

Future Probability and Potential Dollar Losses - Flood

During the 16-year period there have been two recorded floods, one of which resulted in a Presidential Disaster Declaration. Taking this into consideration, the City might expect a significant flood every eight years on average. This equates to a probability of 0.125 or a 12.5 percent chance in a given year.

Historic data is again used to estimate potential future dollar losses due to flood. Based on the 2000 flood event for which we have fairly good loss figures, Crandon suffered \$37,000, between the public and private sector for a significant flood occurrence. Over the next ten-year period, flood losses in Forest County could approach \$46,000.

Part IV – Mitigation Strategies

INTRODUCTION

Hazard mitigation is any action taken to reduce or eliminate the long-term risk to human life and property damage from natural hazards. This chapter describes the mitigation goals and actions by the City of Crandon, Forest County, other local units of government and the tribal nations for each of the hazards identified in Part III – Risk Assessment. The intention is to reduce or avoid long-term vulnerability to the identified hazards.

The mitigation strategies are organized by hazard beginning with some overall strategies that apply to a number of different hazards and are listed under the category, “all hazards.” For each hazard, a goal was established as to what the City intends to achieve by implementing the specific action strategies and is based on the risk assessment findings. Each action strategy is then briefly described and followed by a discussion of the jurisdictions/agencies that will pursue the action including the proposed lead jurisdiction/agency. Where appropriate, a discussion of existing programs and on-going activities are described in order to facilitate coordination.

Part IV of the City of Crandon All Hazards Mitigation Plan will discuss the following factors in establishing the multi-jurisdictional mitigation strategies:

- Benchmark Progress of Previous Plan 2006-2012
- Review of Mitigation Goals
- Prioritize Identified Mitigation Strategies
- Establish Mitigation Action Plan

Forest County All Hazard Mitigation Plan

There were a number of hazard mitigation actions proposed in the Forest County AHMP that primarily addressed issues in the City of Crandon including:

Action 5:

Although the system continues to operate reliably at this time, the City of Crandon emergency warning sirens are dated. Originating in 1941, the system should be updated to include telemetry for remote monitoring and actuation as well as back-up power generators to insure operation in the event of power outage.

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Current Status

There is no back-up generator to power the City's emergency warning sirens in case of an electrical outage. Dispatchers currently trigger fire sirens, but in order to set off the tornado sirens it is necessary for the fire chief or some other local official to physically travel to the sirens and activate them. A connection which allowed for remote triggering of the tornado warning, and provided emergency power to the siren is still needed.

Action 11:

Local governments should require stormwater management plans for new development on the urban fringe. Areas adjacent to the City of Crandon will continue to see the most intensive land use in the County as rural lands are converted to subdivisions and a mixture of other uses. Without adequate design consideration, this development can lead to stormwater run-off issues. By requiring each new development to determine how it will handle its own stormwater, drainage problems are not allowed to build on one another, thereby minimize future flooding.

Action 13:

Although the system continues to operate reliably at this time, the City of Crandon lift stations are in need of updating. Needed updates include supervisory control and data acquisition (SCADA) systems to provide remote monitoring and control and back-up power generators to insure operation in the event of power outage.

Current Status

The City has no control over land use regulation outside its boundaries, but one action taken by the City, improvement to the storm sewers along Glen Street, has greatly increased the capacity and reduces the flooding threat from the area east of Crandon. The lift station that used to serve this part of the stormwater system has been removed, and now in addition to increased capacity this line is entirely gravity fed and not susceptible to failure in a power outage. The overall capacity of the stormwater system to handle runoff has markedly increased in recent years.

Action 15:

The City of Crandon should work with the Wisconsin Department of Transportation to replace the culvert and storm sewer on USH 8/STH 32 (aka Pioneer Road) in the area of Prospect Avenue. Approximately 65-75 % of the City's storm water run-off flows through this bottleneck on its way to wetlands adjacent to Lake Metonga. WisDOT has upgraded a number

Part IV – Mitigation Strategies

of culverts on US 8 leading up to this location but stopped short of this critical area.

Current Status

Forest County Highway Department replaced the culvert on Pioneer Road in 2007. The previous corrugated steel culvert was replaced with a 5-foot smooth concrete culvert that increased capacity. There are subsidence issues on adjacent properties and an ongoing need for maintenance on the ditches downstream from the Highway 8 culvert. The channel narrows downstream from this culvert and, although new culverts have been installed under Prospect Avenue, they have a lower capacity. In cases of heavy rain since the installation the new culvert has been able to accommodate flows with no significant flooding, however, increasing the holding capacity of the area between to two culverts, through the creation of a settling pond, for example, could greatly decrease the possibility of flooding in the future.

PROGRESS REPORT 2006 - 2012

Table 8 identifies the completed, deleted or deferred mitigation actions from the original 2006 Plan. For each action recommendation, a brief status report is provided which describes the progress made on that measure. If an item remains unchanged, a description is provided as to why no action has been taken and whether that item is deferred to the new plan.

The table also provides the new status of each recommendation with regard to the updated plan alongside the original timeframe target for comparison. Many of the recommendations are on-going efforts and are carried over as such in the updated action plan. Some have had significant progress or have been deferred, but are recommended for further action with new target date or on-going status. If the recommendation has been completed with no further specific action anticipated within the next five year planning period, it is shown as "Removed from list" and will not appear in the updated action plan. In some cases, an incomplete action is not selected for various reasons (noted) and is also shown as "Removed from list." In a few cases, related recommendations are combined as indicated. This progress report serves as a benchmark for progress in achieving the mitigation goals of the City of Crandon Plan.

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TABLE 8 BENCHMARK FOR PROGRESS 2006 - 2012 PLAN			
<i>2006-2012 Plan Measure</i>	<i>Progress Report</i>	<i>Original Status</i>	<i>New Status</i>
Continue to promote the increased use of National Oceanic and Atmospheric Administration (NOAA) weather radios	A number of efforts have been undertaken to make NOAA radios available to the public. These efforts continue.	2006	On-going
Maintain active, effective educational and informational programs.	Activities directed at public education and hazard-related information are carried out periodically.	On-going	On-going
Maintain and improve severe weather storm warning system - Promote NOAA radio usage.	Efforts to improve storm warning, including NOAA radios have met with mixed success.	On-going	On-going
Educate the public on the dangers of lightning.	Part of an comprehensive hazard education program.	On-going	On-going
Identify buildings appropriate for winter storm shelters and coordinate all sheltering activities with the American Red Cross.	Four buildings have been designated by the Red Cross as Emergency Shelters. This is generally seen as sufficient to the needs of the city.	On-going	Removed from list
Install an emergency generator at school so that the school can be used as a shelter.	The school is available for emergencies, but not as a long-term shelter. It has a generator.	2006	Removed from list
Identify special-needs population in need of shelter. Where possible, map the location special needs population in order to assist Emergency Service personnel.	Schools, day-care centers, nursing home and senior housing facilities are shown in Map 5 as a means of identifying special needs populations.	2006	Removed from list
Increase public awareness through literature. Literature should include home and travel safety measures such as avoiding travel during winter storms. If travel cannot be avoided sand, warm clothing, food, water and back-up heating system should be encouraged in vehicles.	Part of a comprehensive hazard education program.	As needed	On-going
Tree-trimming: Report problem areas to public utilities.	This is current City policy.	As needed	Removed from list
Make NOAA radios available to residents for free or minimal cost.	These efforts continue.	2006	On-going

Part IV – Mitigation Strategies

Currently, the emergency siren has only a manual trigger with no back-up power. The City of Crandon should hard-wire siren switch to the Sheriff's Department. This would allow the siren to be attached to the Sheriff's Department generator in the event of power loss.	The tornado warning cannot be remotely triggered, and there is no connection to the emergency generator.	2006	2013
Install scanner system for businesses organized through County Emergency Management.	This project is no longer seen as a priority for County Emergency Management.	2009	Removed from list
Review all existing Fire Management Plans for the City, County and Department of Natural Resources.	This is a regular part of communication between the City, the Crandon Fire Department, Forest County, Forest Service, and DNR.	On-going	On-going
A review of building codes and zoning ordinances shall be conducted to determine if revisions need to be made to require sprinkler systems in commercial, institutional and governmental buildings in new construction.	The UBC applies in Crandon. For new construction sprinklers are required based on use (e.g. restaurants) or square footage. Residential uses with four or more units must have sprinklers. Similar standards apply to government buildings.	2009	Removed from list
Further training of fire department. Purchase additional fire equipment.	Training is continuous for firefighters. No equipment has been purchased recently.	On-going	On-going
Identify areas in the floodplain and areas out of the floodplain that are vulnerable to flooding. Update land use and zoning codes to restrict development in these areas.	With the release of new FEMA flood maps for Crandon in 2011 the City revised its floodplain ordinance (adopted 12-16-11), which restrict new development from the floodplain.	In process	Removed from list
Work with property owners with homes inside the 100-year floodplain to improve landscaping to lessen impacts of flooding. An on-going public information program must advise the public of the potential for all types of flooding and what preventative measures they can take to mitigate.	Although there is some dispute about whether several properties are in the floodplain, appeals have been filed and if they are successful there will be no buildings in the floodplain, except along the shoreline of Lake Metonga. Flooding danger should be integrated into a comprehensive hazard education program. Landscaping and green infrastructure measures should be part of comprehensive hazard education.	On-going	Removed from list
Develop a schedule for City utility to inspect manholes.	Regularly scheduled inspections are part of City procedures.	On-going	Removed from list

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Develop a schedule for City utility department to clean streets in order to clear culverts to prevent localized street flooding.	Regularly scheduled street cleanings are part of City procedures.	On-going	Removed from list
The City of Crandon should prevent or reduce hazardous material exposure by separation and buffering between industrial area and other land uses. Industrial areas should be located away from schools, nursing homes and other facilities with large and vulnerable populations.	Crandon currently has no businesses that use a significant amount of hazardous material in their operation. Although there is some physical separation between industrial and residential uses, there is no formal buffer. All uses in the Industrial District are conditional, so such a buffer could be required as part of approval.	On-going	Removed from list
Educate Crandon residents on the proper methods for hazardous materials disposal. Coordinate with County Solid Waste Department to offer residents a schedule for disposal.	Part of a comprehensive hazard education program.	On-going	Removed from list
Train school personnel in the precursors of violence.	Teachers and staff receive non-crisis intervention training.	2006	Removed from list
Enhancing and maintaining ability to lock down schools.	The School District has this capability.	2009	Removed from list
Access screening and control for ingress and egress of schools.	The School District has this capability.	2009	Removed from list
Liaison officer to be stationed in school system.	There is a liaison officer between the District and the Sheriff's Dept.	On-going	Removed from list
Additional security at annual Brush Run. Coordinate event planning with County Sheriff's Department and National Guard.	Security at the Brush Run is handled by a private contractor, with the aid of several on-duty deputies who patrol rather than provide event security.	Annual	Removed from list
Generate awareness for citizens of the potential threat - Education of national color alert system and shelter preparedness.	The federal government has discontinued use of the color alert system.	On-going	Removed from list

Part IV – Mitigation Strategies

LOCAL HAZARD MITIGATION GOALS

The mitigation strategy is based on a set of goals to reduce or avoid long-term vulnerabilities to the hazards identified in the Risk Assessment. The goals were established by the previous Mitigation Plan Taskforce during the development of the original plan. The update Plan Taskforce reviewed the goals and concurred that these goals continue to represent the desired conditions to strive for through the mitigation efforts of the City.

The mitigation goals for reducing or avoiding the long-term vulnerability of Crandon are as follows:

- Prepare and protect residents and visitors from all hazards.
- Protect the health, safety, and welfare of city residents and visitors, and minimize loss of life and property.
- Minimize the threat to human life and property damage caused by associated high wind and lightning.
- Protect the health and safety of Crandon resident from the adverse effects of heavy snow or blizzard, ice and severe cold
- Protect the safety and property of residents from forest and wildfires.
- Minimize crop loss while maintaining water supplies during times of drought.
- Lessen the impact of floods on people, property and the environment.
- Protect people and natural resources from adverse effects of hazardous material incidents.

MITIGATION ACTION PLAN

The mitigation strategies are organized by hazard beginning with some overall strategies that apply to a number of different hazards and are listed under the category, “all hazards”. For each hazard, a goal was established as to what the City intends to achieve by implementing the specific action strategies and is based on the risk assessment findings. Each action strategy is then briefly described and followed by a discussion of the jurisdictions/agencies that will pursue the action including the proposed lead jurisdiction/agency.

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The sections of this part are broken down as follows:

Goal:

Broad, long-term mitigation goals to reduce or avoid vulnerabilities to the identified hazard are stated.

Action:

Each action strategy proposed to aid in achieving the overall goal for the identified hazard is described. A given action strategy may be comprised of a number of related sub-actions.

Participating Jurisdictions:

The lead jurisdiction is generally the City of Crandon, but in cases where agencies or jurisdictions are involved they will be identified. This does not preclude other agencies or jurisdictions from participating in the action.

Existing Programs:

This describes continuing efforts by agencies outside of Crandon to mitigate disaster losses. The National Weather Service, Wisconsin Department of Natural Resources, and Wisconsin Emergency Management are some of the agencies that produce and disseminate regional mitigation action strategies for specific natural hazards.

The chapter concludes with a summary of the recommended mitigation strategies shown in Table 10.

Authorities, Policies, Programs, and Resources

The City of Crandon has a number of programs and resources at its disposal to deal with the threat of hazards. City zoning prevents any new development in floodplains and the City participates in the FEMA national flood insurance program. The Universal Building Code (UBC) is enforced in the city. The State is responsible for enforcing hazardous waste control regulations, and has embarked on an aggressive program of brownfield clean-ups. Both the Crandon Fire Department and the Crandon Area Rescue Squad are trained in dealing with waste spills and weather emergencies.

Forest County Emergency Management is responsible for overall preparedness within the county. A program of distribution of NOAA Weather Radios to senior citizens has recently been initiated in conjunction with the Potawatomi Tribe. Emergency educational programs are also conducted for community groups.

Part IV – Mitigation Strategies

PRIORITIZATION OF STRATEGIES

The Mitigation Planning Committee considered a number of factors in identifying and ranking proposed mitigation strategies. The matrix, below, describes the factors incorporated into the prioritization process. The resulting priority of each strategy is shown in the summary Table 9.

Prioritization Factors for Crandon Mitigation Strategies

<i>Strategy Prioritization Factor</i>	<i>Description of Factor Considerations</i>
Priority of Hazard Type	The ranking of hazard types, tornado, flooding, etc., accounts for threat to human safety and possible property damage and was carried over to groups of strategies by hazard type. Strategies believed to benefit multiple hazards (listed under "All Hazards") were valued higher.
Ease of Implementation	Strategies where existing staff and resources are adequate were valued higher than those where additional resources are necessary. Consideration was also given to strategies that meet other citywide goals or incorporated as part of another city project. Project timing was also a consideration as to when funding such as grant applications might be available and when various activities could be scheduled.
Perceived Cost versus Potential Benefit	Although a detailed cost-benefit analysis was deemed beyond the scope of this study, the Committee weighed the perceived costs of each strategy against the potential benefit anticipated. Proposals that seemed economically unfeasible were rejected.
Multi-jurisdictional Application	Strategies benefiting multiple jurisdictions were valued more than those pertaining to fewer jurisdictions.

ALL HAZARDS

Goal:

Prepare residents and visitors of Crandon for natural hazard events and protect them from the effects of such events to the extent possible.

Action 1:

The City of Crandon should promote the usage of National Oceanic and Atmospheric Administration (NOAA) weather radios. NOAA Weather

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Radio (NWR) is a nationwide network of radio stations broadcasting continuous weather information direct from a nearby National Weather Service office. NWR broadcasts National Weather Service warnings, watches, forecasts and other hazard information 24 hours a day. NWR is a comprehensive weather and emergency information source. It not only broadcasts prior to a potential hazard event, but also broadcasts warning and post-event information for all hazards both natural and environmental (such as chemical releases or oil spills).

Participating Jurisdictions for Action 1:

Lead agency will be Forest County Emergency Management in conjunction with the City of Crandon and the Potawatomi Tribal Government. This is a countywide effort.

Action 2:

Education and public information are important and effective tools the public can use to prepare for and mitigate the effect of any hazard identified in this plan. In areas of this plan that refer to public education or information, it is assumed that these activities will be incorporated under the category of "All-Hazards, Action 2."

Educational material will include disaster preparedness brochures distributed to the City of Crandon residents.

Possible materials include:

- Weather spotter training
- Building, structural standard information for new construction
- Safety awareness information for winter travelers
- Generator fact sheets
- Dangers of lightning
- Wisconsin Irrigation Scheduling Program (WISP)
- Evacuation plans
- Use of smoke detectors
- Importance of homeowner's insurance.

Participating Jurisdictions for Action 2:

Lead agency will be Forest County Emergency Management in conjunction with the City of Crandon and UW Extension. This is a countywide effort.

Hazard Educational Programs:

There are a number of programs that support hazard education, among them:

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STEP is a program sponsored by FEMA that offers resources for educational programs to teachers to inform students on planning and preparing for emergencies.

Ready Wisconsin is the state variant of a national program created by the Department of Homeland Security that provides free educational materials that can be the basis for a comprehensive hazard education effort.

HAZARD: TORNADO/HIGH WINDS

Goal:

Protect health and safety of the City of Crandon residents and tourists, and minimize loss of life and property.

Action 3:

Make NOAA radios available to residents for free or minimal cost

Participating Jurisdictions for Action 3:

Lead agency will be Forest County Emergency Management in conjunction with the City of Crandon, and the Potawatomi Tribal Government. This is a countywide effort.

Action 4:

Currently, the emergency siren has only a manual trigger with no back-up power. The City of Crandon should hard-wire siren switch to the Sheriff's Department. This would allow the siren to be attached to the Sheriff's Department generator in the event of power loss.

Participating Jurisdictions for Action 4:

Lead agency will be City of Crandon in conjunction with the Forest County Emergency Management, and the Sheriff's Department.

HAZARD: WINTER STORMS/ICE/EXTREME COLD

Goal:

Protect the health and safety of City of Crandon residents from the adverse effects of heavy snow or blizzards, ice and severe cold.

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Action 5:

Increase public awareness through education, including home and travel safety measures such as avoiding travel during winter storms. If travel cannot be avoided sand, warm clothing, food, water and back-up heating system should be encouraged in vehicles.

Participating Jurisdictions for Action 5:

Lead agency will be Forest County Emergency Management in conjunction with the City of Crandon, and UW Extension. This is a countywide effort.

HAZARD: SEVERE THUNDERSTORMS/LIGHTNING/HAIL

Goal:

Protect health and safety of City residents and minimize loss of life and property.

Action 6:

Maintain and improve severe weather storm warning system- Promote NOAA radio usage.

Participating Jurisdictions for Action 6:

Lead agency will be City of Crandon in conjunction with the Forest County Emergency Management, the Potawatomi Tribal Government.

Action 7:

Educate the public on the dangers of lightning.

Participating Jurisdictions for Action 7:

Lead agency will be Forest County Emergency Management in conjunction with the City of Crandon, and UW Extension. This is a countywide effort.

HAZARD: FOREST/WILD FIRE

Goal:

Protect the safety and property of residents from forest and wildfires.

Action 8:

Review all existing Fire Management Plans for the City, County and Department of Natural Resources.

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Participating Jurisdictions for Action 8:

Lead agency will be the Crandon Fire Department in communication with Forest County Emergency Management, National Forest Service, and WisDNR.

Action 9:

Support establishment of Firewise Communities in the Crandon area.

Participating Jurisdictions for Action 9:

The most impact on the City of Crandon would result if the Towns of Crandon, Lincoln and Nashville initiated a Firewise program in conjunction with Forest County and WisDNR.

Wildfire Protection Planning Programs:

Firewise Communities is a program of the National Protection Association. It is a voluntary program that provides information and produces wildfire risk assessments and action plans that can mitigate the threat of wildfire at the fringe between forests and residential development. Although there is no funding associated, this provides a framework for community action to lessen the wildfire threat.

DNR has a program that sponsors the preparation of Community Wildfire Protection Plans (CWPP). These plans contain the risk assessments and action plans that are crucial to the Firewise program.

Action 10:

Further training of fire department, purchase additional fire equipment, improve warning system and public education

Participating Jurisdictions for Action 10:

Lead agency will be the Crandon Fire Department.

HAZARD: DROUGHT/EXTREME HEAT

Goal:

Minimize the negative impacts of extreme heat and drought on the health and safety of residents.

Action 11:

To assist the population in reducing heat disorders, the City should promote extreme heat hazard awareness, including safety tips, medical information, and contact information for health officials.

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Participating Jurisdictions for Action 11:

Lead agency will be Forest County Emergency Management in conjunction with the City of Crandon and UW Extension. This is a countywide effort.

HAZARD: FLOODING

Goal:

Lessen the impact floods have on people, property and the environment.

Action 12:

Continue compliance with the National Flood Insurance Program and work to reduce flood risk in the City of Crandon.

Participating Jurisdictions for Action 12:

Lead agency will be City of Crandon in conjunction with the Forest County Emergency Management.

Action 13:

The City should continue to update its Stormwater Management Plan

Participating Jurisdictions for Action 13:

The City of Crandon is responsible for the implementation of this action.

Action 14:

As part of the Stormwater Management Plan, the City should seek funding to expand the overflow area between the culverts on Highway 8 and Prospect Avenue. This area could potentially function as a settling pond for runoff from the highway and protect nearby commercial development in the event of catastrophic flooding.

Participating Jurisdictions for Action 14:

The City of Crandon is responsible for this area, but should seek assistance from the Department of Transportation and Department of Natural Resources.

Table 10 - Summary of Mitigation Strategies

Mitigation Measures (See Expanded Text in Plan)	Cost Estimate	Existing and Potential Resources to Implement	Project** Timeframe	Responsible Management	Priority Level
ALL HAZARDS					
1 Continue to promote the increased use of National Oceanic and Atmospheric Administration (NOAA) weather radios.	\$40,000	Radio sales, grants, gifts	On-going	County EM, City, Tribes	High
2 Education and public information are important and effective tools the public can use to prepare for and mitigate the effect of any hazard identified in this plan.	Staff Time	Dept. Budget,	On-going	County EM, UW Ext	Medium
TORNADO/HIGH WIND					
3 Make NOAA radios available to residents for free or minimal cost	\$40,000	Radio sales, grants, gifts	On-going	County EM, City, Tribes	High
4 Currently, the emergency siren has only a manual trigger with no back-up power. The City of Crandon should hard-wire siren switch to the Sheriff's Department. This would allow the siren to be attached to the Sheriff's Department generator in the event of power loss.	\$5,000 - \$8,000	CDBG community facilities, EMPG	2013	City, Sheriff	Medium
WINTER STORMS/ICE/EXTREME COLD					
5 Increase public awareness through education, including home and travel safety measures such as avoiding travel during winter storms. If travel cannot be avoided sand, warm clothing, food, water and back-up heating system should be encouraged in vehicles.	Staff Time	Dept. Budget	On-going	County EM, UW Ext	Medium
SEVERE THUNDERSTORM/LIGHTNING /HAIL					
6 Maintain and improve severe weather storm warning system- Promote NOAA radio usage.	\$40,000	Radio sales, grants, gifts	On-going	County EM, City, Tribes	High
7 Educate the public on the dangers of lightning.	Staff Time	Dept. Budget	On-going	County EM, UW Ext	Medium
FOREST FIRE/WILDFIRE					
8 Review all existing Fire Management Plans for the City, County and Department of Natural Resources.	Staff Time	Crandon Fire Dept.	On-going	Crandon Fire Dept.	Medium
9 Support establishment of Firewise Communities around the City of Crandon.	Staff Time	WDNR Fire Plan funding	On-going	WDNR, County EM	Low
10 Further training of fire department, purchase additional fire equipment, improve warning system and public education.	Staff Time & funds TBD	Dept. Budget & grants	On-going	Crandon Fire Dept.	Medium

DROUGHT/EXTREME HEAT

11	To assist the population in reducing heat disorders, the City should promote extreme heat hazard awareness, including safety tips, medical information, and contact information for health officials.	Staff Time	Dept. Budget	On-going	County EM, UW Ext	Medium
FLOODING						
12	Continue compliance in the National Flood Insurance Program* and work to reduce flood risk in the City of Crandon.	Staff Time	Dept. Budget	On-going	City, County EM	Medium
13	Continue to update City stormwater management plan.	Staff Time	Dept. Budget	On-going	City	Medium
14	As part of the Stormwater Management Plan, the City should seek funding to expand the overflow area between the culverts on Highway 8 and Prospect Avenue. This area could potentially function as a settling pond for runoff from the highway and protect nearby commercial development in the event of catastrophic flooding.	Unknown	CDBG community facilities			

* Denotes actions related to compliance with NFIP

**Actual project implementation dependant on funding and staff availability

Part V – Plan Maintenance Procedures

INTRODUCTION

Part V of the City of Crandon All Hazards Mitigation Plan describes the plan adoption, implementation, and evaluation and maintenance.

PLAN ADOPTION

The adoption of the City of Crandon All Hazards Mitigation Plan lends itself to serve as a guiding document for all local and tribal government officials. It also certifies to program and grant administrators from the FEMA and WEM that the Plan's recommendations have been properly considered and approved by the governing authority and the jurisdiction's citizens. Finally, it helps to ensure the continuity of mitigation programs and policies over time because elected officials, staff, and other community decision-makers can refer to the official document when making decisions about the community's future.

Before adoption of the Plan by the City, the Plan must be sent to the state and federal level to verify that all DMA2K requirements are met. Once a draft of the Plan has been completed, it is submitted to the State Hazard Mitigation Officer (SHMO) at the state level of WEM. Previous drafts of the Plan have already been reviewed prior to this submittal. The SHMO will determine if the Plan meets DMA2K and/or other state program requirements. Upon approval of the draft by WEM, the SHMO is responsible for forwarding the Plan to the FEMA Region V Office for review.

The Plan must be formally adopted by the City by resolution. Adoption of the Plan gives the jurisdiction a legal basis to enact ordinances, policies, or programs to reduce hazard losses and to implement other mitigation actions. Resolutions of adoption are contained in APPENDIX B.

IMPLEMENTATION OF CITY OF CRANDON & TRIBAL NATION PLANS

As noted earlier, Forest County, the Forest County Potawatomi, and the Sokaogon Chippewa Community have adopted their own independent all hazards mitigation plans. The City of Crandon All Hazards Mitigation Plan recommends and supports the implementation of these separate mitigation planning efforts through their 5-year lifecycle.

As those plans come due for their 5-year update, it is recommended that in the future the City of Crandon, the Potawatomi Tribe and the Sokaogon

Part V – Plan Maintenance Procedures

Chippewa incorporate their mitigation planning efforts into the countywide, multi-jurisdictional program and adopt the Forest County All Hazards Mitigation Plan in the spirit of intergovernmental cooperation and to promote economies-of-scale in the planning effort.

Participation in the development and adoption of the countywide plan would meet mitigation planning requirements for the City and Tribes. This Plan was prepared to include the necessary requirements, such as participation and community specific recommendations, to be approved by FEMA for Forest County, the Potawatomi, and the Sokaogon Chippewa Community.

PLAN IMPLEMENTATION

Administrative Responsibilities

Once the Plan has been approved, stakeholders should be informed. The City should distribute copies to these stakeholders. The City should make the Plan available to the public by linking the Plan on their web site.

Along with monitoring the progress of the action projects, the City should also work to secure funding to implement the Plan. State and federal agencies, nonprofit organizations, and foundations continually make grants available. Emergency Management should research these grant opportunities to determine eligibility for the City.

When implementing this Plan, the staff team should consider innovative ways to involve active participation from nonprofit organizations, businesses, and citizens to implement the Plan. The relationship between these groups will result in greater exposure of the Plan and provide greater probability of implementation of the action projects listed.

The role of elected officials, and local staff are to ensure that adopted actions from Part IV are considered in their budgets. It is understood that projects may not be carried out as they are scheduled in Part IV due to budget constraints. However, since many of these action projects are considered an investment in safeguarding the public's health, safety, and property, they should be carefully considered as a priority.

Coordination with Comprehensive Plans

Crandon adopted a comprehensive plan in 2010, which is required to be updated in ten years, but may be amended before that. As part of any revision incorporation of the All Hazards Mitigation Plan is highly

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recommended. Wisconsin comprehensive planning law includes a detailed description of nine elements. The following concepts should be considered when revising the City comprehensive plan, based on the nine elements of the comprehensive planning law:

- *Issues and Opportunities Element* – a summary of major hazards the city is vulnerable to, and what is proposed to be done to mitigate future losses from the hazards. This could be accomplished by inserting a summary of this Plan.
- *Housing Element* – an inventory of any properties that are in the floodplain boundaries, and the location of mobile homes and shelter opportunities into the critical facilities map (Map 5).
- *Utilities and Community Facilities Element* – identify critical facilities such as shelters, schools, medical facilities, and water infrastructure, etc. (Map 5) and make recommendations on how to mitigate specific risks factors, such as by hard-wiring the emergency siren.
- *Transportation Element* – identify any transportation routes or facilities (e.g. culvert on Highway 8 at Prospect Street) that are more at risk during flooding or winter storms.
- *Agricultural, Natural Resources, and Cultural Resources Element* – floodplains (Map 3) and agricultural areas (Map 8-1) are identified at risk from hazardous events.
- *Economic Development Element* – Describe the impact past hazards have had on City and municipal business.
- *Intergovernmental Cooperation Element* – identify intergovernmental police, fire, and rescue service sharing agreements that are in effect, or which may merit further investigation, consider cost-sharing and resource pooling on government services and facilities.
- *Land Use Element* – areas where there is the potential for flooding, such as the floodplain along Jefferson Street or near Prospect Street and Highway 8, should be identified.
- *Implementation Element* – have action plans from this Plan integrated into the comprehensive plan.

Promote Success of Identified Projects

Upon implementing a project covered by this Plan, it is important to promote the accomplishment to the stakeholders and to the communities. This will help inform people that the Plan is being implemented and is effective.

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PLAN EVALUATION AND MAINTENANCE

Planning is an ongoing process. Because of this, this document should grow and adapt in order to keep pace with growth and change of the City. DMA2K requires that local plans be evaluated and updated at least every five years to remain eligible for assistance.

The Plan will be reviewed and evaluated on an annual basis. Within this period, the City Clerk will evaluate incoming information against the contents of the Plan as needed to prepare for revisions. It is recommended that the Committee discuss evaluation and revisions to the Plan one year from its adoption and annually thereafter as it fits the Committee's scheduling. The Emergency Management Director is encouraged to consult/coordinate with the NCWRPC at the time of revision.

The Plan must also be evaluated and revised following disaster events to determine if the recommended actions are appropriate given the impact of the event. The risk assessment (Part III) should also be reviewed to see if any changes are necessary based on the pattern of disaster damages.

Full updates are required every five years. Every fifth year, the annual review will be expanded to an overall plan update to meet FEMA requirements. All stakeholders and the public must be involved in this update. A survey or open comment meeting is required. This also provides an opportunity to inform on the progress of any projects.

The Emergency Management Committee and County Board must approve all changes and updates to the plan.

Collecting Data To Improve Future Updates

FEMA is challenging local units of government to take a look at how they can ensure that each subsequent version of the plan is an improvement over the last. As the first round of plans comes to a close, data has been one of the biggest issues in the development of these plans. Both the quantity and quality of data needed to create these plans has been called into question. FEMA's challenge in response to these concerns is for the local unit of government to develop some means of collecting data over the course of the five-year period. This data would presumably fill the "gap" in data experienced with the initial plan.

In Forest County, the Emergency Management Director will fill-out an incident/disaster summary report form. These forms will be filed together

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for use in the 5-year plan update. The purpose of the form is to record some pertinent information about a hazard event, which when compiled with other events over the five years, will give a much more accurate picture of the community's actual risk for the risk assessment element of the plan.

RECORDED

NOV 15 2012

RESOLUTION # 05-2012

NORTH SENECA COUNTY, WISCONSIN
REGISTRAR OF DEEDS

ADOPTING THE CITY OF CRANDON ALL HAZARDS MITIGATION PLAN

WHEREAS, the City of Crandon recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required as a condition of future grant funding for mitigation projects; and

WHEREAS, City of Crandon participated in the planning process that included Forest County, the Forest County Potawatomi, and the other local units of government to prepare an All Hazards Mitigation Plan;

NOW, THEREFORE, BE IT RESOLVED, that the City Council of the City of Crandon, hereby adopts the City of Crandon All Hazards Mitigation Plan as an official plan.

PASSED: unanimously - 8 - aye

Aindy Bradley, City Clerk
Certifying Official