



# Michigan Hazard Mitigation Success Stories

**Outstanding accomplishments in reducing loss of life, property and environmental damage associated with hazards in Michigan**



Prepared by:

Emergency Management and Homeland Security Division  
Michigan Department of State Police

And

The Michigan Citizen-Community Emergency Response Coordinating Council

This document was prepared under a grant from FEMA's Grant Programs Directorate, U.S. Department of Homeland Security. Points of view or opinions expressed in this document are those of the authors and do not necessarily represent the official position or policies of FEMA's Grant Programs Directorate or the U.S. Department of Homeland Security.

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### Hazard Mitigation Assistance in Action: Recent Examples of Successful Mitigation Projects



**Photos L-R:** Culvert upgrade project in Rose City, Michigan. (The project involved the removal of inadequately sized culverts and replacement with a single, appropriately sized box culvert to prevent area flooding.) Standby power source project in the City of Alpena, Michigan. (The project involved the installation of an emergency generator at the city's wastewater treatment plant so that raw sewage will not back-up into basements in the event of a power outage.) Culvert upgrade project in Iosco County. (The project involved the removal of two inadequately sized culverts and replacement with a single, appropriately sized culvert, and enlargement of the drainage ditch to prevent the roadway from flooding and septic systems in the area from failing.)

# Michigan Hazard Mitigation Success Stories

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## Acronyms Used in this Document

CDBG	Community Development Block Grant
CUPPAD	Central Upper Peninsula Planning and Development
DMA or DMA 2000	Disaster Mitigation Act of 2000
DR	Disaster Recovery
EM	Emergency Management
EMAP	Emergency Management Accreditation Program
EMS	Emergency Medical Service
EOC	Emergency Operations Center
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
FMA	Fire Management Assistance
FMA	Flood Mitigation Assistance Program
FIRM	Flood Insurance Rate Map
GIS	Geographic Information System
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HS	Homeland Security
ICS	Incident Command System
MCCERCC	Michigan Citizen-Community Emergency Response Coordinating Council
MDNR	Michigan Department of Natural Resources***
MDOT	Michigan Department of Transportation
MEMP	Michigan Emergency Management Plan
MHMCC	Michigan Hazard Mitigation Coordinating Council
MHMP	Michigan Hazard Mitigation Plan
MI	Michigan
MSP/EMHSD	Michigan State Police / Emergency Management and Homeland Security Division
MSU	Michigan State University
NFIP	National Flood Insurance Program
NIBS	National Institute of Building Sciences
NOAA	National Oceanic and Atmospheric Administration
PA	Public Assistance
PA	Public Act (when used in Michigan legal citation, e.g., 1976 PA 390)
PDM	Pre-Disaster Mitigation Program
RFCP	Repetitive Flood Claims Program
RPO	Regional Planning Office
SBA	(U.S.) Small Business Administration
SEOC	State Emergency Operations Center

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# Hazard Mitigation Primer: Basic Principles and Practices

## Introduction to Hazard Mitigation

### ***What is Hazard Mitigation?***

Hazard mitigation is defined as any action taken before, during or after a disaster or emergency to permanently eliminate or reduce the long-term risk to human life and property from natural, technological and human-related hazards. It is an essential element of emergency management, along with preparedness, response and recovery. When successful, mitigation will lessen the need for a community to respond to succeeding hazard events; that is, incidents will remain incidents and not become disasters.

### ***State Government Role***

Hazard mitigation strives to reduce the impact of hazards on people and property through the coordination of resources, programs, initiatives and authorities. State government has a vital coordinating role to play in this effort. Laws and processes governing the use of land and development of property originate at the state level. In addition, state agencies administer a wide variety of programs that affect – either directly or indirectly – the development and use of land. For these reasons, state government is the logical level of origination for hazard mitigation measures that have statewide application and/or implications.

### ***Local Government Role***

The implementation of hazard mitigation measures is inherently a local government function since that is the level at which development occurs, and most of the land use / development tools available to implement mitigation measures are applied at the local level. Therefore, successful implementation of a program to reduce or eliminate the negative consequences of Michigan's hazards will, out of necessity, be a joint cooperative effort between the State, local governments, and the private sector (since most land development is undertaken by private entities).

### ***Hazard Mitigation: National Perspective and Federal Government Role***

Catastrophic disasters across the United States have resulted in devastation, suffering and economic loss. These events have highlighted the fact that the U.S. continues to be on a collision course with our natural environment. Increased development in hazard prone areas has put an ever-increasing number of people and structures in harm's way, greatly exacerbating the negative consequences associated with our risk and vulnerability to natural, technological and human-related hazards. As a result, when disasters occur they increasingly cause tremendous economic, social and physical losses to the communities and people they affect.

The National Mitigation Framework, National Flood Insurance Program (NFIP), Flood Mitigation Assistance Program (FMA), Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), and Building Resilient Infrastructure and Communities are the most prominent of the federal government's recent efforts to reduce or eliminate the nation's risk and vulnerability to hazards. The Federal Emergency Management Agency (FEMA) is spearheading these and many other similar efforts, in partnership with federal agencies, Congress, states, local governments, academia, the private sector and individual citizens.

### ***Hazard Mitigation Makes Financial Sense***

FEMA invests millions annually in hazard mitigation programs. With the general belief that mitigation saves money but with limited hard evidence as to the magnitude of the long-term benefits, Congress mandated that FEMA commission an independent study to ensure that its investments are paying off. The study, which was conducted by the Applied Technology Council and overseen by the Multi-Hazard Mitigation Council of the National Institute of Building Sciences (NIBS), began in 2000 and was delivered to Congress in December 2005.

The NIBS study results are impressive and overwhelmingly demonstrate that hazard mitigation is worth the investment. On average, the study found that hazard mitigation activities pay off to the tune of **\$4 of savings for every \$1 invested**. In 2019, NIBS released a follow up report, "Natural Hazard Mitigation Saves" that expanded on

the 2005 study and demonstrates that certain mitigation activities have even greater returns on investment in mitigation.

The study quantified future savings from mitigation activities related to natural hazards. The activities assessed in the study were funded through three FEMA mitigation programs (i.e., the Hazard Mitigation Grant Program, “Project Impact,” and Flood Mitigation Assistance Program). Eight communities from across the country that have participated in the FEMA grant programs since 1988 were studied. The community studies looked at direct benefits from the projects as well as “synergistic activities – other mitigation efforts that would not have occurred had it not been for the original FEMA grant.” The benefits considered in the report included reduced property damage, reduced business interruption, reduced environmental damage, reduced human losses (deaths, injuries, homelessness, etc.), and reduced costs for emergency response.

### ***Coordination of Ongoing Efforts***

Coordination is probably the most critical factor in a successful mitigation effort or program. Many state and local agencies (as well as some private sector organizations) are already performing functions or administering programs that in some way contribute to mitigating hazards. Examples of existing, ongoing activities that promote or can contribute to hazard mitigation include but are not limited to:

- Capital improvements planning
- Budgeting
- Site-specific hazardous material emergency planning (through Local Emergency Planning Committees)
- Watershed management planning
- Solid waste management planning
- Local community planning and zoning activities
- Building / construction codes and development standards
- Regional planning
- Transportation planning
- Recreation planning
- Forest management
- Coastal zone management
- Infrastructure design, regulation and permitting
- Floodplain management
- Public facility design and construction review

Unfortunately, coordination of these programs and activities for the purpose of achieving widespread hazard risk and vulnerability reduction is often limited, if it occurs at all.

## **State-Level Hazard Mitigation Coordination**

### ***1998-2007: Michigan Hazard Mitigation Coordinating Council***

For many years, the lack of a central focus and coordinating element for hazard mitigation in Michigan hampered the development of an effective statewide program of hazard risk and vulnerability reduction. In response to that problem, Governor John Engler signed Executive Order 1998-5 on July 29, 1998, creating the Michigan Hazard Mitigation Coordinating Council (MHMCC) to fill the void of hazard mitigation coordination at the state level. The MHMCC existed for nine years and officially met a total of 31 times. The MHMCC had many noteworthy accomplishments, the most prominent of which included:

- Selection of over 160 mitigation projects, totaling in excess of \$45 million in project costs, for four federal hazard mitigation grant programs. This included projects related to three federally-declared major disasters under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), Public Law 93-288, as amended.

- Assisting in the development of Michigan Executive Directive 2001-5 (State Flood Hazard Mitigation), signed by Governor John Engler on September 11, 2001.
- Assisting in the development of the initial Michigan Hazard Mitigation Plan in 2004 (certified as federal Disaster Mitigation Act of 2000 compliant on March 23, 2005).
- Assisting in the development of Michigan's "Most Wanted Hazard Mitigation Measures" list as a component element of the Council's Annual Report of Activities to the Governor and Michigan Legislature.
- Assisting in the development of post-incident Hazard Mitigation Strategies for three federally-declared major disasters (1346-DR-MI; 1413-DR-MI; and 1527-DR-MI).
- Selection / coordination of four "Project Impact" communities in Michigan (City of Midland – 1998; Ottawa County – 1999; City of Dearborn – 2000; and Ingham County – 2001) as part of the federal Project Impact Initiative that existed from 1997 to 2002.
- Assisting in the development of a statewide repetitive flood loss reduction project (a pilot effort is currently ongoing in the Village of Estral Beach, Monroe County).
- Assisting in the development of a statewide local mitigation planning project to develop and maintain plans covering all 83 counties (currently ongoing).
- Assisting in the development of a statewide hazard mitigation marketing and education campaign for seven targeted professional groups (currently ongoing).

### ***2007-Present: Michigan Citizen-Community Emergency Response Coordinating Council***

On May 2, 2007, the MHMCC was abolished by Governor Jennifer Granholm's Executive Order 2007-18 and replaced by the new Michigan Citizen-Community Emergency Response Coordinating Council (MCCERCC). This new advisory body combines the MHMCC with the Michigan Citizen Corps Council and the Michigan Emergency Planning and Community Right-to-Know Commission (which were also abolished) to form a single entity chaired by the Department of State Police. The new Council is responsible for developing and implementing emergency response and hazard mitigation plans for the state. Executive Order 2007-18 transferred the MHMCC's hazard mitigation responsibilities intact to the new MCCERCC. The MCCERCC membership was announced on August 29, 2007, and its first meeting was held on January 29, 2008.

The MCCERCC is chaired by the Emergency Management and Homeland Security Division of the Michigan Department of State Police (MSP/EMHSD) and is composed of 19 representatives including the Directors of (or a designee) from the Michigan Departments of State Police, Agriculture and Rural Development, Health and Human Services, Environment, Great Lakes, and Energy, Military and Veterans Affairs, and Transportation; the State Fire Marshal; the Executive Director (or a designee) of the Michigan Community Service Commission; plus 11 other representatives appointed by the Governor. Provisions in the Executive Order allow for the hiring or retention of contractors, subcontractors, advisors, consultants, and agents, as required when specific issues are addressed that require specialized expertise or technical knowledge.

### ***MCCERCC Hazard Mitigation Responsibilities***

Executive Order 2007-18 charges the MCCERCC with four primary hazard mitigation responsibilities:

- Assisting in the development, maintenance and implementation of a state hazard mitigation plan.
- Assisting in the development, maintenance and implementation of guidance and informational materials to support hazard mitigation efforts of local and state government and private entities.
- Soliciting, reviewing and identifying hazard mitigation projects for funding including but not limited to, federal funding under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 USC 5170c, and Sections 553 and 554 of the National Flood Insurance Reform Act of 1994, 42 USC 4104c and 42 USC 4014d.
- Fostering and promoting, where appropriate, hazard mitigation principles and practices within local and state government and with the general public.

The MCCERCC has three standing committees: Hazard Mitigation; Citizen Corps; and Emergency Planning and Community Right-to-Know. The Hazard Mitigation Committee oversees and carries out the Council's four hazard mitigation responsibilities.

One of the MCCERCC's primary roles is to support and promote hazard mitigation concepts, principles, strategies and practices within governmental agencies and private sector organizations in Michigan. This can be accomplished in a variety of ways including but not limited to:



- Amendments to laws, rules, regulations, plans, and procedures
- Changes in governmental and business practices and processes
- Public education and awareness campaigns
- Coordination of programs, information, initiatives and resources
- Development of structural and non-structural projects to mitigate location-specific hazard vulnerabilities
- Establishment of collaborative public / private partnerships to identify, develop and implement specific mitigation opportunities for local, regional or statewide application

### ***MCCERCC Provides Many Benefits***

The primary advantage of the MCCERCC is that it fosters improved coordination of ideas, expertise, talent, programs, laws, rules and regulations, philosophies, and material resources. Such coordination manifests itself in many ways including but not limited to:

- Better and faster delivery of hazard mitigation programs and services (during disaster and non-disaster times)
- Less overlap and duplication of actions and activities
- Improved information flow among departments / agencies and levels of government, and between public and private entities
- Development and implementation of multi-objective projects with fewer resources expended
- Greater understanding of mitigation issues and concerns (issues are addressed by multiple agencies with multiple perspectives)
- Greater cost savings to the taxpayers due to reduced future damages from disasters, reduced response and recovery costs, and the preceding reasons listed above

The MCCERCC provides the structure and coordination mechanism necessary to bring together the many disparate yet interrelated programs and activities that affect Michigan's ability to achieve an effective, meaningful hazard risk and vulnerability reduction strategy for the state.

## **Mitigation: Unlocking the Disaster Equation**

Perhaps the best way to understand hazard mitigation is to first understand the nature of disasters themselves. The basic equation for a disaster is simple: **Hazards + People and Structures = Disaster**. Disasters only occur because people and structures are in harm's way. The key to preventing or limiting disaster damage and impact is to unlock and separate the key components of this equation. Controlling the hazard is often difficult if not impossible (a tornado is a good example), but there are situations in which the hazard can be effectively controlled. (See Strategy 1, Modification of the Hazard, in the table on page 6.) Modifying the other part of the equation – the people and structures – is in most cases easier and more effective in reducing or eliminating the negative consequences of hazards because these elements are more closely under our control. (See Strategies 2-4 in the table on page 6.) However, even that can be a daunting proposition at times given our desire to live near water, in the woods, on hillsides or in valleys, or near / in other hazard-prone areas.

Table 1 on page 6 provides an overview of the five basic hazard mitigation strategies that can be utilized to reduce or prevent the harmful interaction between hazards, people and development that results in a disaster. For each strategy, examples are provided of specific mitigation measures that can be employed to correct past practices that have increased hazard vulnerability ("corrective mitigation") and/or to prevent future problems from occurring in the first place ("preventive mitigation") through proactive public education, wise decision-making and disaster-resistant building and development practices.

The five hazard mitigation strategies can be grouped into two broad categories of work: 1) **corrective mitigation** – correcting past practices that have increased hazard vulnerability; and 2) **preventive mitigation** – preventing future problems from occurring in the first place through public education, wise decision-making and disaster-resistant building and development practices.

**Corrective mitigation** can be expensive, resource intensive, time consuming and sometimes only marginally effective. Structural protection measures, hazard modification and large-scale retrofitting fall under this category. Attempting to go back and fix something that is problematic is almost always more difficult than doing it right the first time. However, when dealing with hazard prone property (e.g., non-mitigated "legacy" development in a floodway, floodplain or other hazard area), it is often necessary to go back and try to correct the problem in order to protect the

affected community and individual property owners from future harm. Corrective mitigation measures also help reduce future response and recovery costs by reducing community vulnerability to hazards.

**Preventive mitigation** is desirable because it seeks to prevent future problems from occurring in the first place. Wise land use planning, building design and construction practices, small-scale retrofitting, and early warning and public education fall under this category. When it comes to reducing the negative consequences of hazards on a community, the old adage “an ounce of prevention is worth a pound of cure” certainly rings true. (Or, perhaps it is more realistic to say “a dollar’s worth of mitigation is worth four dollars of recovery” in recognition of the 2005 National Institute of Building Sciences study on the value of mitigation.) Doing something right the first time is almost always preferable to going back and trying to correct recurring problems at a later date.

To create and maintain safe, sustainable communities, both preventive and corrective mitigation must occur at the state and local levels. An example of **preventive mitigation** at the local level would be a policy requiring that all future development occur in such a way as to avoid or reduce, to the extent possible, community exposure and vulnerability to hazards. That would **prevent** the scope and magnitude of the problem from increasing. **Corrective mitigation** measures could be applied in those areas that have a high degree of exposure and vulnerability to certain hazards and that suffer severe and/or repetitive damage as a result (thus **correcting** current problems caused by unwise and/or outdated land development patterns and building practices).

## Management of Federal Hazard Mitigation Assistance






The State of Michigan, through the MSP/EMHSD, provides “cradle to grave” (from initial grant application development to final closeout) management of four federal hazard mitigation grant programs and is responsible for issuing all grant agreements as well as disbursing grant funding to eligible governmental and nongovernmental applicants. The five programs are:

- Building Resilient Infrastructure and Communities (BRIC)
- Flood Mitigation Assistance Program (FMA)
- Hazard Mitigation Grant Program (HMGP)
- Pre-Disaster Mitigation Program (PDM)

The PDM, FMA, and BRIC are annual, pre-disaster grant programs, while the HMGP is only implemented subsequent to a federal major disaster declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), Public Law 93-288, as amended. Collectively, these four federal grant programs are referred to as “Hazard Mitigation Assistance” or “HMA.” Table 2 on page 7 provides summaries of the major provisions of each program.

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**Table 1 – Basic Hazard Mitigation Strategies**

Mitigation Strategy	Description	Examples of Measures	Advantages / Limitations	Photo Example
<p><b>1 – MODIFYING THE HAZARD</b></p>	<p>Modifying the hazard itself, which involves removing or eliminating the hazard, reducing its size or amount, or controlling the rate of release of the hazard. In the right circumstances, this strategy can be successful but it is often difficult to do.</p>	<ul style="list-style-type: none"> <li>• Cloud seeding to modify precipitation</li> <li>• Slope planting to prevent erosion or collapse</li> <li>• Stream modification or widening to divert or improve water flow</li> <li>• Dredging to deepen water channel or body to improve water flow and capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Can be cost-effective in many situations</li> <li>• Application is limited and therefore may not be as effective as other strategies</li> <li>• Does not always reduce or eliminate damage on a wide scale</li> <li>• Some hazards simply cannot be modified</li> </ul>	
<p><b>2 – SEGREGATING THE HAZARD</b></p>	<p>Attempts to "keep the hazard away from people." Primarily for flood hazards but also has applicability to other hazards. Measures are designed to redirect the impacts of a hazard away from people and development.</p>	<ul style="list-style-type: none"> <li>• Dams</li> <li>• Dikes / Levees</li> <li>• Floodwalls</li> <li>• Flood drainage channels</li> <li>• Debris basins</li> <li>• Designated routes for hazardous transport</li> <li>• Buffer zones around hazard sites</li> <li>• Defensible space around development</li> <li>• Safe rooms (indoor shelter space) to protect building occupants from harm</li> </ul>	<ul style="list-style-type: none"> <li>• Can be effective for some hazard situations</li> <li>• Some measures can be expensive</li> <li>• Some measures may cause or exacerbate environmental problems</li> <li>• May protect one community but cause problems for adjacent communities</li> <li>• Economically marginal for many situations and locations</li> </ul>	
<p><b>3 – PREVENTING OR LIMITING DEVELOPMENT</b></p>	<p>Preventing or limiting development in locations where people and development would be at risk. This strategy is based on "keeping the people away from the hazard" and includes a variety of land use planning and development regulation tools. Attempts to reduce or eliminate community hazard vulnerability through wise and prudent land use and development decision-making.</p>	<ul style="list-style-type: none"> <li>• Comprehensive planning</li> <li>• Zoning ordinances</li> <li>• Building codes</li> <li>• Subdivision regulations</li> <li>• Floodplain management ordinances and other special area, use and design regulations</li> <li>• Capital improvements planning</li> <li>• Disclosure laws</li> <li>• Acquisition and relocation of hazard prone properties</li> </ul>	<ul style="list-style-type: none"> <li>• Can be highly effective in promoting safe, sustainable development</li> <li>• Widespread application (i.e., statewide, regional, local)</li> <li>• Proactive – seeks to prevent or reduce future vulnerabilities</li> <li>• Reduces future incident response / recovery costs</li> <li>• Administrative tools have minimal associated costs</li> <li>• May in some cases reduce future tax revenue if development does not occur</li> </ul>	
<p><b>4 – ALTERING DESIGN OR CONSTRUCTION</b></p>	<p>Altering the design or construction of development to make it less vulnerable (more resilient) to disaster damage. This strategy allows hazards to interact with human systems that have been designed and planned to withstand potentially destructive impacts. This strategy allows development in hazard prone areas, but requires that the development meet stringent disaster resistant performance criteria.</p>	<ul style="list-style-type: none"> <li>• Elevating flood-prone structures</li> <li>• Wet / dry flood proofing to improve flood damage resistance</li> <li>• Defensible space (vegetation buffer zones) in urban / wildland intermix areas</li> <li>• Wind bracing to improve wind damage resistance</li> <li>• Insulating water and sewer lines to prevent ground freeze damage</li> </ul>	<ul style="list-style-type: none"> <li>• Balances the dual needs of enhancing a community's economic base while at the same time reducing community hazard vulnerability</li> <li>• Can result in safe, sustainable development if done properly</li> <li>• Reduces future incident response / recovery costs</li> <li>• Allows for maximum land use potential</li> <li>• Resilient structures "rebound" better from incident impacts</li> </ul>	
<p><b>5 – EARLY WARNING AND PUBLIC EDUCATION</b></p>	<p>Seeks to ensure that the public is aware of the hazards it faces, and that proper warning and communication systems and practices are in place to save lives and protect property.</p>	<ul style="list-style-type: none"> <li>• Community hazard identification / analysis</li> <li>• Early warning systems (indoor and outdoor)</li> <li>• Tailored public awareness / education campaigns regarding hazards, warning systems and protective actions</li> <li>• Warning devices in congregate facilities</li> <li>• Special needs population warning systems</li> </ul>	<ul style="list-style-type: none"> <li>• Universal strategy – should be applied in all communities</li> <li>• Typically the last line of defense against serious disaster related injury, loss of life and property damage</li> <li>• Recognizes that some hazards cannot be prevented and therefore must be dealt with using proper safety precautions</li> <li>• Enhances community awareness of and support for emergency management efforts</li> </ul>	

**Table 2 – Hazard Mitigation Assistance: Program Descriptions**

<b>Program</b>	<b>Description</b>	<b>Authorization / Eligibility*</b>	<b>Eligible Activities</b>	<b>Program Type / Cost Share</b>
<b>HAZARD MITIGATION GRANT PROGRAM (HMGP)</b>	HMGP grants are provided to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster.	Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended (the Stafford Act), Title 42, USC 5170c  Eligible Subapplicants: <ul style="list-style-type: none"> <li>• State agencies</li> <li>• Tribal governments</li> <li>• Local governments</li> <li>• Private nonprofit organizations</li> </ul>	<ul style="list-style-type: none"> <li>• Property acquisition / structure demolition or relocation</li> <li>• Structure elevation</li> <li>• Dry floodproofing of historic residential structures</li> <li>• Dry floodproofing of non-residential structures</li> <li>• Minor localized flood reduction projects</li> <li>• Structural / non-structural retrofitting</li> <li>• Safe room construction</li> <li>• Infrastructure retrofitting</li> <li>• Soil stabilization</li> <li>• Wildfire mitigation</li> <li>• Post-disaster code enforcement</li> <li>• Hazard mitigation planning</li> </ul>	<p style="text-align: center;"><b>Disaster Based</b> (Stafford Act Major Disaster Declaration Required)</p> <p style="text-align: center;">75% Federal / 25% Non-Federal</p>
<b>PRE-DISASTER MITIGATION PROGRAM (PDM)</b>	PDM funds are provided for hazard mitigation planning and the implementation of mitigation projects prior to a disaster. Funding these plans and projects reduces overall risks to the population and structures from future hazard events, while also reducing reliance on federal funding from future major disaster declarations.	Section 203 of the Stafford Act, Title 42, USC 5133  Eligible Subapplicants: <ul style="list-style-type: none"> <li>• State agencies</li> <li>• Tribal governments</li> <li>• Local governments</li> <li>• Universities</li> </ul>	<ul style="list-style-type: none"> <li>• Property acquisition / structure demolition or relocation</li> <li>• Structure elevation</li> <li>• Dry floodproofing of historic residential structures</li> <li>• Dry floodproofing of non-residential structures</li> <li>• Minor localized flood reduction projects</li> <li>• Structural / non-structural retrofitting</li> <li>• Safe room construction</li> <li>• Infrastructure retrofitting</li> <li>• Soil stabilization</li> <li>• Wildfire mitigation</li> <li>• Hazard mitigation planning</li> </ul>	<p style="text-align: center;">Annual Appropriation</p> <p style="text-align: center;">75% Federal / 25% Non-Federal</p> <p style="text-align: center;">90% Federal / 10% Non-Federal if subgrantee is a small impoverished community</p>
<b>FLOOD MITIGATION ASSISTANCE PROGRAM (FMA)</b>	FMA funds are provided to implement measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program (NFIP). The goal of the FMA is to reduce or eliminate claims under the NFIP.	Section 1366 of the National Flood Insurance Act of 1968, as amended, Title 42, USC 4104c  Eligible Subapplicants: <ul style="list-style-type: none"> <li>• State agencies</li> <li>• Tribal governments</li> <li>• Local governments</li> </ul>	<ul style="list-style-type: none"> <li>• Property acquisition / structure demolition or relocation</li> <li>• Structure elevation</li> <li>• Dry floodproofing of historic residential structures</li> <li>• Dry floodproofing of non-residential structures</li> <li>• Minor localized flood reduction projects</li> <li>• Hazard mitigation planning</li> </ul>	<p style="text-align: center;">Annual Appropriation</p> <p style="text-align: center;">75% Federal / 25% Non-Federal</p>
<b>Building Resilient Infrastructure and Communities (BRIC)</b>	BRIC makes federal funds available to states, local communities, tribes and territories for pre-disaster mitigation activities. The BRIC priorities are to: <ul style="list-style-type: none"> <li>• incentivize public infrastructure projects;</li> <li>• incentivize projects that mitigate risk to one or more lifelines;</li> <li>• incentivize projects that incorporate nature-based solutions; and,</li> <li>• incentivize adoption and enforcement of modern building codes.</li> </ul>	Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended  Eligible Subapplicants: <ul style="list-style-type: none"> <li>• State agencies</li> <li>• Tribal governments</li> <li>• Local governments</li> </ul>	<ul style="list-style-type: none"> <li>• Capability- and Capacity-Building</li> <li>• Hazard mitigation projects</li> <li>• Hazard mitigation planning</li> </ul>	<p style="text-align: center;">Annually Funded by a 6% set-aside from federal post-disaster grant funding</p> <p style="text-align: center;">75% Federal / 25% Non-Federal</p> <p style="text-align: center;">90% Federal / 10% Non-Federal if subgrantee is a small impoverished community</p>

\*States, Territories and Indian Tribal Governments are eligible HMA applicants. Interested and eligible subapplicants must apply to the applicant for HMA funding consideration. Individuals and businesses are not eligible to apply for HMA funds; however, an eligible subapplicant may apply for funding to mitigate private structures.

**Hazard Mitigation Assistance Grants Create Mitigation Success Stories**

As the tables below and on the following page indicate, four of these grant programs have been used successfully in Michigan to fund a wide variety of mitigation projects aimed at permanently reducing or eliminating long-term risk to human life and property from hazards. These projects range from small, localized measures up to and including statewide initiatives. The mitigation success stories that follow these tables provide a snapshot of selected mitigation projects in Michigan funded under these grant programs. Although space will not allow each of the 439 projects to be highlighted, the ones that are featured provide excellent representative examples of how well thought out and designed measures can greatly reduce or eliminate the negative consequences of hazards on the implementing community:

**Table 3 – Summary of Hazard Mitigation Grant Programs in Michigan: 1994-2020**

Program	# of Projects	Total Expenditure	Federal Share	Match	Comments
HMGP (1028)	18	\$ 1,134,648	\$ 600,424	\$ 534,224	
HMGP (1128)	15	\$ 2,672,704	\$ 1,722,955	\$ 949,749	
HMGP (1181)	34	\$ 5,245,124	\$ 3,869,035	\$ 1,376,089	
HMGP (1226)	35	\$ 3,602,800	\$ 2,513,313	\$ 1,089,487	
HMGP (1237)	10	\$ 737,277	\$ 502,523	\$ 234,754	
HMGP (1346)	141	\$35,775,457	\$25,034,636	\$10,740,821	
HMGP (1413)	9	\$ 1,345,782	\$ 738,776	\$ 607,006	
HMGP (1527)	13	\$ 1,536,742	\$ 1,136,634	\$ 400,108	
HMGP (1777)	13	\$ 1,557,763	\$ 1,175,153	\$ 382,610	
HMGP (4121)	2	\$ 369,676	\$ 282,365	\$ 87,311	
HMGP (4195)	29	\$33,377,116	\$23,889,981	\$ 9,487,135	Grants in progress – amounts are not final
HMGP (4326)	3	\$ 1,152,377	\$ 361,559	\$ 790,818	Grants in progress – amounts are not final
FMA	33	\$ 1,595,418	\$ 1,343,797	\$ 251,621	
PDM	82	\$25,090,196	\$18,635,794	\$ 6,454,402	This includes completed and active projects.
RFCP	2	\$ 224,959	\$ 224,959	0	
<b>TOTALS:</b>	<b>439</b>	<b>\$115,418,039</b>	<b>\$82,031,904</b>	<b>\$33,386,135</b>	

\*Does not include projects funded under Federal Disasters 4381-DR-MI and 4547-DR-MI which were still under development at the time of this writing.

**Table 4 – Summary of Hazard Mitigation Grant Programs in Michigan: Project Type / Federal Share Expenditure (1994-2020)**

Project Type	# of Projects All Programs	% Project Type Base on # of Projects	Total Spent per Type	% Project Type Based on Total Spent
Acquisition of flood-prone structures	47	10.7%	\$22,492,394	19.5%
Elevation of flood-prone structures	21	4.8%	\$ 4,735,625	4.1%
Culvert Upgrade	23	5.2%	\$ 4,539,648	3.9%
Detention/Retention	5	1.1%	\$ 2,532,661	2.2%
Early Warning	73	16.6%	\$ 3,487,733	3.0%
Erosion Stabilization	19	4.3%	\$12,832,235	11.1%
Flood Control	9	2.1%	\$11,905,680	10.3%
Generators	14	3.2%	\$ 3,535,268	3.1%
Management Costs	18	4.1%	\$ 3,738,426	3.2%
Miscellaneous	32	7.3%	\$ 3,548,770	3.1%
Hazard Mitigation Planning	110	25.1%	\$ 7,442,315	6.4%
Safe Room	5	1.1%	\$ 9,710,552	8.4%
Stormwater Improvement	38	8.7%	\$22,761,061	19.7%
Water and Sewer Freeze Mitigation	20	4.6%	\$ 1,798,536	1.6%
Wind Retrofit Mitigation	5	1.1%	\$ 357,139	0.3%
<b>TOTALS:</b>	<b>439</b>	<b>100%</b>	<b>\$115,418,039</b>	<b>100%</b>

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### Local Hazard Mitigation Plan Development in Michigan

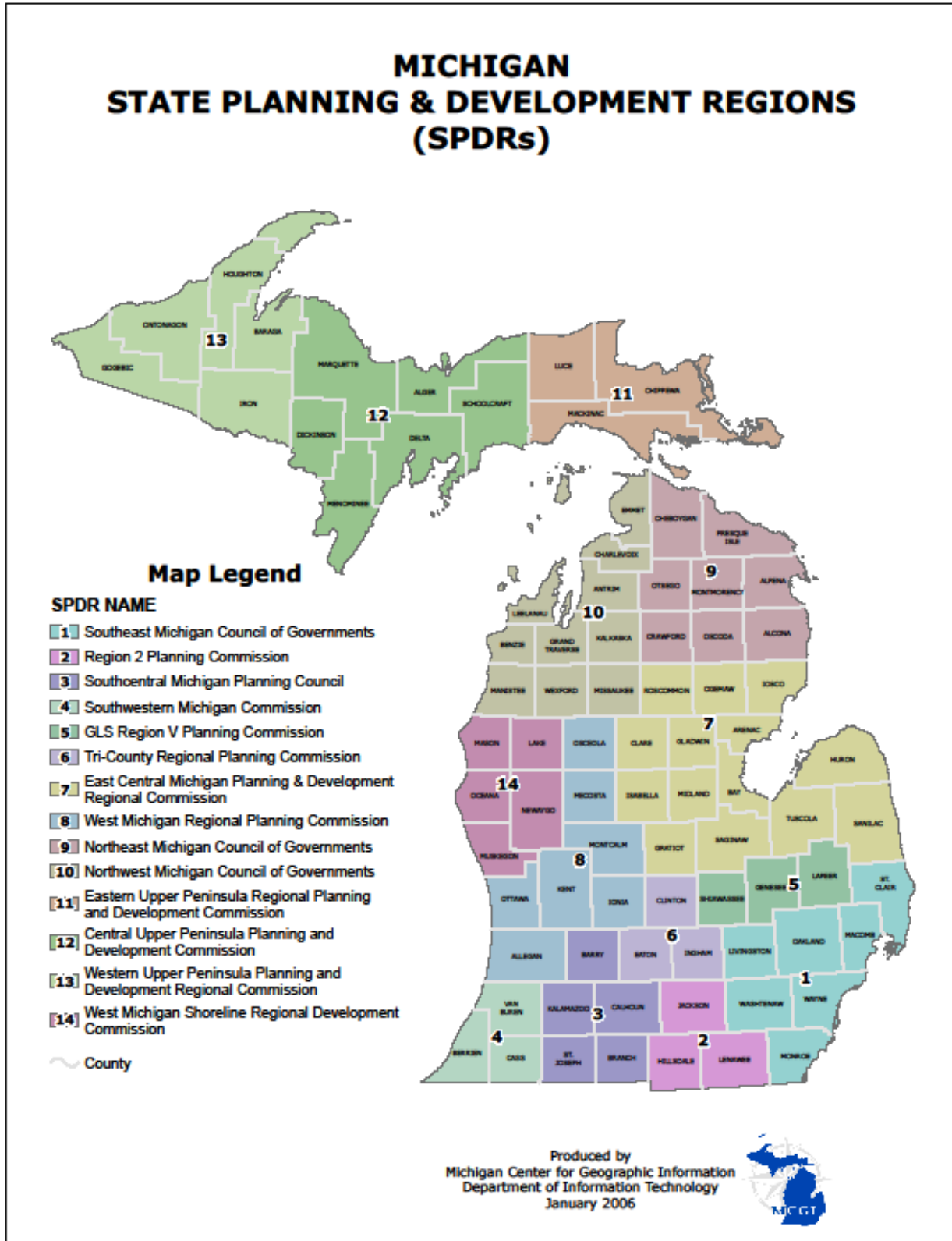
The Disaster Mitigation Act of 2000 created new and demanding federal requirements for the development of local hazard mitigation plans. As a result, most Michigan communities required special funding assistance to complete such plans. Arrangements were made with FEMA to make use of hazard mitigation grant funds to develop local hazard mitigation plans on a scale that was unprecedented in Michigan, for that type of planning. The MSP/EMHSD spearheaded the process of arranging for dozens of counties to receive funds through the HMGP under Federal Disaster 1346-DR-MI. Most grant recipients agreed to pool their funds to jointly hire the services of their Regional Planning Office (RPO) to develop their local hazard mitigation plan. A pilot program with the Central Upper Peninsula Planning and Development (CUPPAD) Region had already been underway since October 30, 2001 and had provided a model for how similar regional coordination might be performed throughout the state.

Michigan is divided into 14 planning regions, each with an RPO (see map on page 12). Most of the RPOs have regional transportation planning as their primary planning responsibility, but they have grown over the years to encompass numerous additional forms of planning and information processing activities. Unlike consulting firms, the RPOs are dedicated to serving their geographic region and its constituent communities and stakeholders in a nonprofit manner. This enduring and dedicated quality provides the RPOs with real advantages for long-term planning tasks. In addition, their awareness of and role in local comprehensive planning processes facilitates the eventual integration of hazard mitigation elements into local comprehensive plans.

Michigan's initial approach to widescale all-hazards local hazard mitigation planning was to work primarily with RPOs as planning partners in the manner of the initial pilot with CUPPAD. This process involved 14 separate subgrant awards for \$1.9 million (including matching funds) to develop multi-jurisdictional plans for 64 counties. From the 1346-DR-MI planning funds, another \$1 million was awarded for 16 separate grants that resulted in 14 multi-jurisdictional county plans and two single jurisdiction plans. Since the 1346-DR-MI hazard mitigation planning efforts, Michigan has successfully implemented 51 separate hazard mitigation planning grants. Some jurisdictions are working on their 3<sup>rd</sup> hazard mitigation plan update at the time of this writing.

On page 11 is a map which displays the current status (at the time of this writing) of the statewide mitigation planning effort. Although a number of plans have expired, all but four Michigan counties have developed a mitigation plan and at the time of this writing, there are 16 on-going mitigation planning grants which will result in updated plans for 30 counties.





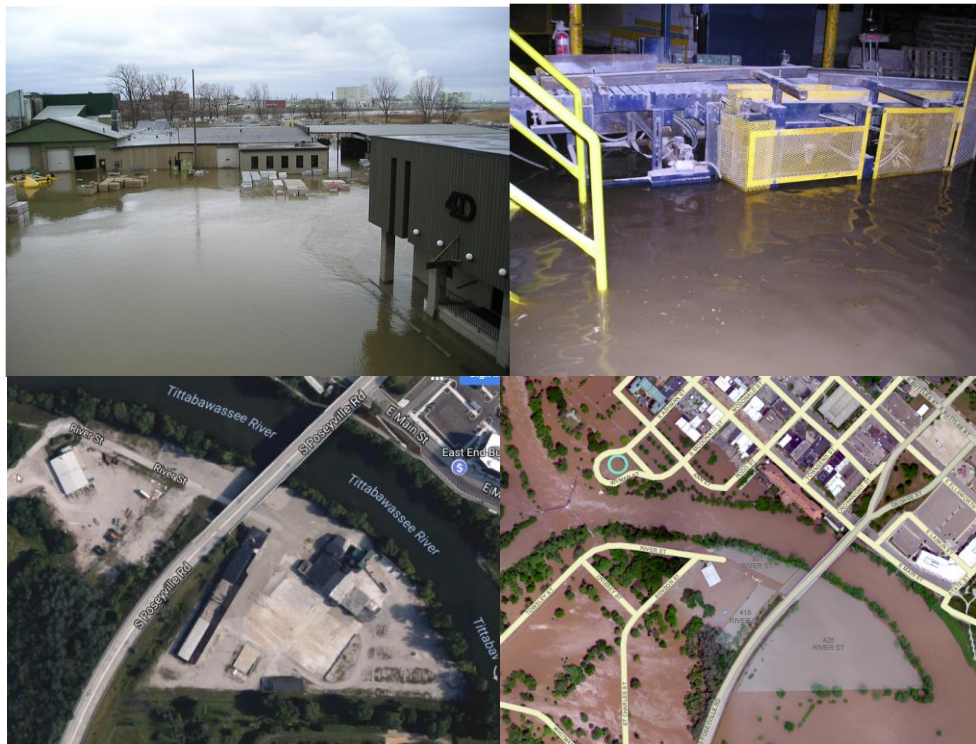
### Midland Property Acquisition Yields Early Return on Investment

The City of Midland implemented a hazard mitigation project that has proven successful twice in recent years (May 2020 and June 2017). The city is home to the confluence of two rivers, the Tittabawassee and Chippewa. Much of the early housing and industrial uses were built in what is now the mapped floodplain. Midland has experienced severe flooding a number of times over the years. As a result the city has been proactive about hazard mitigation. Through foundation grants and local funding, the city has purchased and removed more than 100 structures from the flood plain. Properties in the flood plain have been turned into parks, recreation facilities and open space.

A three-parcel property at 426 River Street, home of 4D Oldcastle Company, also known as 4D Builder's is one property which sustained significant losses (nearly \$2 million) over a 26-year period. After attempting to acquire the property for flood mitigation purposes several times over the year, in 2013 the city pursued a Flood Mitigation Assistance grant which was awarded in 2014. The property was acquired for \$556,000.00 and the buildings were demolished by December 2015. The city planned to create an open space area with wetlands. However, there was too much pavement and subsurface rubble on the property to implement this plan. Together with local partners, the city developed an alternate plan for park and formally requested reuse approval from FEMA in August 2019. The concept was approved by FEMA in October 2019. At the time of this writing, the park development is not yet complete.

It didn't take long for this project to pay dividends. In June of 2017 significant flooding occurred in Midland and several neighboring counties resulting in disaster 4326-DR-MI. During that event the parcels were submerged by several feet of water. Had the company still been located on the site many thousands in damage would have occurred. The location was again the subject of a disaster declaration, 4547-DR-MI from flooding that occurred in May 2020. It is a safe bet that in just a few short years this hazard mitigation project has paid for itself.

Project Quick Facts	
County:	Midland
Community:	City of Midland
Hazard Type:	Severe Storms / Flooding
Activity / Project Type:	Acquisition of Flood-Property
Activity / Project Start Date:	September 2014
Activity / Project Completion Date:	March 2018
Total Cost:	\$687,300





**Top Row L-R:** Prior to the project, 4D Building Supplies flooded in 2004. **Bottom Row L-R:** Areal image of 4D Building Supplies prior to the project; Areal image of the project location post mitigation during the June 2017 flood.

### Hazard Mitigation Success Stories from February 2018 Storms and Flooding

The February 2018 severe weather and intense rain coinciding with snow melt struck lower Michigan resulting in widespread flooding damage and a Governor's disaster declaration for 17 counties and two cities. The flooding caused widespread and severe damage to infrastructure, homes, businesses, and public facilities. Without prior hazard mitigation actions taken by some jurisdictions the damage would have been worse. Past hazard mitigation efforts undertaken by some of the impacted jurisdictions served to reduce the impacts from February's flooding. Sixteen of the 19 jurisdictions have implemented hazard mitigation plans (13 had current FEMA approved plans and three others had past plans). Hazard mitigation projects intended to reduce impacts from this type of event were implemented in 13 of the 19 jurisdictions with the help of FEMA HMA programs. In total, \$12.6 million had been invested prior to the event in 36 separate flood hazard mitigation projects throughout the impacted areas. While we don't know the full extent of the damages these projects prevented, they undoubtedly had a significant influence on reducing flood impacts across the state. Two specific examples include:

**City of Lansing:** The city used acquisition of flood prone homes and the erection of a temporary flood barrier to mitigate significant losses from this event. Through a series of HMA grants from 2008 through 2017 the city acquired and demolished 27 homes. Other city efforts outside of HMA grants were also used for clearing floodplains. To compliment those efforts, the city also worked with the US Army Corps of engineers to complete a study of actions the city could take to mitigate flood losses. The study determined that a temporary flood wall could be erected at an underpass to protect one neighborhood from floods up to the 10 percent annual chance flood (previously known as a "10-year" storm event). The city employed the plan to put a barrier in place for the February 2018 flood. The city estimates these proactive decisions and actions mitigated more than \$2.2 million in damages.



**Photo:** Workers in Lansing build a temporary flood barrier at the Kalamazoo Street underpass of US-127.

**Plainfield Township.** Similar to Lansing, Plainfield Township in Kent County acquired 20 homes through a series of HMA grants from 2009 through 2019. The township's lowest lying areas were impacted by this event. Though no specific estimates were determined, the township's commitment to implementing hazard mitigation surely mitigated losses from this flood. According to the township planning director, all of the acquired properties in the township would have been impacted and the township was, "just a ton better prepared this time around."

### Bay County Stormwater Flood Mitigation Improvements

In October 2008, the Bay County Drain Commissioner completed a stormwater flood mitigation project with funding from the HMGP under Federal Disaster 1346-DR-MI. This project has successfully minimized flood impacts from stormwater flooding for more than 70 residences in the Garfield and Walter’s Subdivision in Auburn, Michigan. The mitigation project involved the construction of a large detention basin (approximately 23 acres in size), more than a mile of drain channel improvements, replacement / installation of four culverts, construction of low level berms along portions of the drain system, and placement of rip-rap to control erosion. On at least three occasions since completion, the project has done its job to protect the homes.

The previous capacity of the drainage system through this neighborhood could handle a 10 percent annual chance flood (previously known as a “10-year” storm event). The new system is designed to handle in excess of the one percent annual chance flood (previously known as a “100-year” storm event). Prior to completion of the project, the neighborhood was typically impacted by flood damages approximately every 10 years. Major floods caused damage in this area in 1986 and 1996.

In June of 2017 significant flooding occurred in Bay and several neighboring counties resulting in disaster 4326-DR-MI. As depicted in areal images on page 16, the detention basis stored excess flood water and spared these homes from damage. The county drain commissioner says it is difficult to assess the exact savings from this event but impacts would likely have exceeded damages from presidential disaster 1128-DR-MI in 1996 which caused millions of dollars in damage. The project also provided benefits soon after completion from the annual “spring thaw” and a significant rain event in May 2009 which resulted in excess surface water runoff and caused a substantial increase in the volume of water entering the drain system. According to county staff, that event would normally have resulted in calls from neighborhood residents to complain of flooding but the phones were silent this time around.

It should be emphasized that flood control measures are not always the preferred means of minimizing flood damages. Acquisition and removal of flood-prone homes is a better alternative, when feasible, because it completely eliminates the possibility of future flood damages. However, in some instances, like that of the Garfield and Walter’s Subdivision Drainage Improvement Project, it is more practical to implement a flood control project than to purchase all the homes. In this case, cost was a major consideration. The project was constructed for approximately \$1.3 million. It would have cost approximately \$10 million to purchase and remove all the homes in the subdivision. Cost is not the only factor to consider when looking at alternatives to resolve a flooding problem. Flood control was a reasonable alternative in this situation because the source of flooding is a drain where a solution was able to be engineered that is expected to more than adequately control flooding in the long term. An engineered solution is not always the safest or most reliable option, especially along major watercourses, but for this project it worked.

Project Quick Facts	
County:	Bay
Community:	Auburn
Hazard Type:	Severe Storms; Flooding
Activity / Project Type:	Flood Control Improvements
Activity / Project Start Date:	June 2008
Activity / Project Completion Date:	October 2008
Total Cost:	\$1,294,968



**Photos L-R:** View of new culvert with wing walls; improved drain channel with rip-rap overflow; view of detention pond; inlet channel with erosion control.



# Mitigation Site: Bay County Retention Pond June 23, 2017



Michigan State Police  
Emergency Management and  
Homeland Security Division

This information is being provided by the Michigan State Police, Emergency Management and Homeland Security Division (MSP/EMHSD). This image was created from video captured with the FLIR SS380-HD HDEO video camera aboard the Trooper 2 helicopter.

Author: chomentowski@michigan.gov  
Created: 08:46 AM, 07 Aug 17

**Allegan County / Salem Township Community Safe Rooms**

Salem Township in Allegan County is home to Sandy Pines Campground. This is a popular summer recreation destination in Michigan and hosts as many as 25,000 people on busy summer weekends. While this is a fun location and revered by many for recreation, local officials and campground administration were concerned about the safety of parkgoers in the event of severe weather. The park is located in a high-risk wind area according to NOAA Storm Prediction Center. Township, county and park officials set out to work together and come up with a solution to these concerns. The concept of building community safe rooms in locations around the park was developed and included as a Salem Township project in the Allegan County Hazard Mitigation Plan.

Because the park is spread over a large geographic area and sometimes hosts thousands of people, it was not feasible to build one safe room to adequately protect everyone. The park has a number of convenience centers location throughout the grounds that have restrooms, shower and laundry facilities. The ultimate goal is to turn these centers into community safe rooms capable of withstanding an EF-4 tornado. To implement their long-term plan, Salem Township applied for an HMGP grant from disaster 4195-DR-MI in 2016. The initial application was for the construction of two safe rooms with the goal of applying for future HMA grants for other locations around the park.

Implementation of the project involved designing the facilities to comply with FEMA P-361, Guidance for Community and Residential Saferooms. Two structures (convenience centers #5 and #6) of approximately 50 feet by 54 feet were built, with a total footprint of 2,400sqf per shelter. FEMA guidance requires a minimum of 5 square feet per person for short term sheltering. One facility has 1,311 usable square feet for sheltering a population of 261 people, and the other has 1,054 useable square feet for a population of 210 people. The structures were built as multi-use facilities laundry/vending room, restrooms, and mechanical room. HMGP grant funds were only used for the hardening of the facility while Sandy Pines paid for items related to the non-shelter uses.

Implementation of the grant also involved the installation of a warning siren so that park residents can be warned in the event of severe weather and know to take shelter in the facilities. FEMA's design requirements called for locating the facilities where people have no more than five minutes travel time to get to the facility in the event of a warning. As part of the project an operations and maintenance plan was also developed so the park operators will be sure to maintain the facility in a manner to allow for proper sheltering for many years to come.

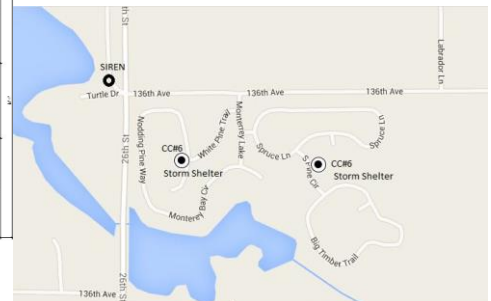
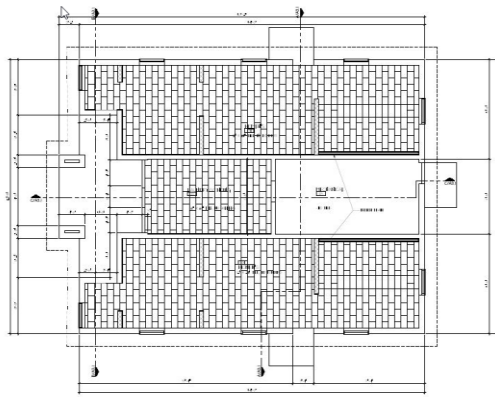
<b>Project Quick Facts</b>	
County:	Allegan
Community:	Salem Township
Hazard Type:	Severe Winds / Tornados
Activity / Project Type:	Community Safe Room
Activity / Project Start Date:	November 2016
Activity / Project Completion Date:	January 2019
Total Cost:	\$1,090,104





Operations and Maintenance Plan for Safe Rooms, Hopkins, Michigan

10/11/2018



**Top Row L-R:** Completed shelter; Sign signifying shelter location. **Middle Row L-R:** Inside sheltering space, dual use sheltering space with restroom, installation of early warning siren. **Bottom Row L-R:** Cover of Operations and Maintenance plan for facility; floor plan layout of shelter; overview map showing proximity of shelters and warning siren.

### **Tuscola County / City of Vassar Flood Drainage Improvements**

In July 2007, the City of Vassar and the Tuscola County Drain Commissioner completed a flood control project in downtown Vassar with funding from the HMGP under Federal Disaster 1346-DR-MI. Over the years, Vassar had been a city plagued by flooding from the Cass River and the Moore Drain passing through the center of town. According to city records, Vassar has flooded more than 40 times since 1904, typically about once every two years. This project was designed to eliminate approximately 85 percent of such flood events.

Completion of this project represented the culmination of many years of cooperative effort between residents, private businesses and government at the local, state and federal levels. The U.S. Army Corps of Engineers, the Michigan Department of Environmental Quality, and private companies started working with Vassar in the 1980s to study the flood problem and design a solution. As is often the case, funding for the implementation of a solution had been an obstacle to completion of the project until a federal HMGP grant under Federal Disaster 1346-DR-MI came along. Vassar applied for the HMGP grant in April of 2001. The required Environmental Assessment took several years to complete. FEMA finally approved the project on December 23, 2003. Once approved, it took two more years for Tuscola County and Vassar to finalize design work and put local match financing in place. Construction on the project began during the summer of 2006 and was completed in July 2007.

This project represents a mitigation success story in that it will help minimize the repetitive impacts of flooding on the residents of Vassar. It is important to note that flooding in Vassar will never be totally eliminated. The downtown area is in the heart of the floodplain, with the Moore Drain and Cass River running parallel through town and converging just west of M-15. When the waters rise too high it is not possible to contain the flood. However, the Moore Drain mitigation project was designed to help alleviate the impacts of smaller scale flood events. The project should handle floods up to a 10-year event (a flood with a 10 percent chance of occurring in a given year) and reduce the impacts of floods of larger magnitude.

Sometimes in Vassar the Cass River rises and backs up in the Moore Drain, causing the downtown to flood. This three-part project involved modification of an existing berm along the Cass River, hydraulic improvements to the Moore Drain, and diversion of part of the flow of the Moore Drain. The berm along the Cass River was increased in height and extended. Additionally, sheet pile was placed in line with the berm to fill in gaps where space would not allow for the construction of a berm. The hydraulic improvements to the Moore Drain involved increasing the capacity of the drain through the city by replacing several culverts with larger ones and preventing backflow of the Cass River into the drain by installing a flap gate at the outlet. Additionally, a diversion conduit was constructed to head off some of the water from the Moore Drain and route it out to the Cass River instead of passing it through town.

Fortunately, the project did not face its first test for nearly two years but when it did it performed as expected in minimizing damage and impacts. On February 13, 2009, the Cass River crested at 17.27 feet, more than two feet above moderate flood stage. According to the Tuscola County Emergency Manager, in the past a flood of this depth would have left several feet of water in downtown businesses and all traffic, including first responders, would have had to be rerouted around the downtown area. In this event, there was "some minor flood issues in a couple of stores" and only truck traffic was rerouted. According to a local news report during the event, floodwaters were 6-12 inches in as many as six stores but all business were able to remain open. In a television interview, the City Manager for Vassar at the time indicated that he estimates floodwaters from this event would have been approximately three times deeper prior to the mitigation project.

In addition to the Moore Drain flood control project, the MSP/EMHSD has also partnered with the City of Vassar on a number of other flood mitigation projects. These projects include the elevation of five flood-prone homes, the development of a flood study for the Moore Drain, and the development of the City of Vassar Flood Mitigation Plan. Following the September 1986 federally declared flood disaster (774-DR-MI) in central Lower Michigan, which included Tuscola County and the City of Vassar, the MSP/EMHSD partnered with the (since renamed) Michigan Department of Commerce and the City of Vassar to make available Community Development Block Grant (CDBG) funds for the acquisition and removal of flood-prone residences and businesses. The 1986 flood resulted in extensive damage to 92 residences and 19 businesses, and 53 of the residences were located within the floodway portion of the floodplain. The city used \$1 million in CDBG funds and \$134,000 from the Farmers Home Administration to relocate 27 homes and four businesses.

The MSP/EMHSD will continue to partner with the City of Vassar, as time, resources and circumstances permit, to further reduce the city's vulnerability to flooding.



Project Quick Facts	
County:	Tuscola
Community:	City of Vassar
Hazard Type:	Severe Storms / Flooding
Activity / Project Type:	Flood Control / Drainage Improvements
Activity / Project Start Date:	June 2006
Activity / Project Completion Date:	July 2007
Total Cost:	\$2,910,253



**Top Row L-R:** Pre-construction – Moore Drain outlet to Cass River with no outlet structure; Post-construction – Moore Drain outlet to Cass River (new) with backflow flap gate; **Bottom Row L-R:** Pre-construction – Moore Drain downtown parking lot culvert (inadequate); Post-construction – Moore Drain downtown parking lot culvert (improved).

**Ottawa County / Robinson Township Flood Mitigation Planning and Flood-Prone Properties Acquisition**

Robinson Township is a small rural community in west-central Ottawa County consisting of 5,588 residents. The northern boundary of the township is defined by the Grand River. Since 1994, two subdivisions in Robinson Township – Van Lopik Avenue and Limberlost Lane, which collectively have 40 structures and 20 vacant parcels – have experienced 12 different flooding events. The majority of these flooding events were caused when ice dams forced the Grand River to back-up. The flood stage for the Grand River in Robinson Township is 13.3 feet. The flooding events since 1994 have ranged from 13.3 feet to 18.3 feet, the highest recorded flood being in January 2005. The January 2005 flooding event forced the residents of Van Lopik Avenue and Limberlost Lane to relocate from their homes. Due to the extent of the flooding, the loss of utilities, the damage incurred and lingering health and safety risks, some of the residents were not able to inhabit their homes for up to six months.

Seeing the hardships the flooding caused for the residents of Van Lopik Avenue and Limberlost Lane, officials of Robinson Township, the Ottawa County Emergency Management Office, and the Ottawa County Planning and Grants Office inquired with the MSP/EMHSD about the availability of grants to assist in the elevation or acquisition of these

structures. Fortunately for Robinson Township, luck and timing was on their side. In November 2004, a few months before the flooding event, FEMA announced the open application period for the PDM, a nationally competitive grant program intended to provide funding for mitigation measures identified in local hazard mitigation plans. For Robinson Township, securing a competitive grant for this project looked like an uphill battle. First, there was the looming application deadline which was only a few weeks away. The second and perhaps most daunting challenge was the fact that a FEMA-approved local hazard mitigation plan was required in order for the project to be eligible for PDM funding – and Robinson Township didn't have such a plan.

Understanding the time-sensitive challenges faced by Robinson Township, the MSP/EMHSD offered to provide significant technical assistance to the township and Ottawa County in developing the PDM project application and a hazard mitigation plan. The first major issue that had to be tackled was how to develop the grant application. Since the estimated project cost exceeded the funding cap of the grant, it was decided early on that the project had to be broken up into two separate but related segments – each with its own application. With assistance provided by the MSP/EMHSD, the township was able to successfully develop its two applications within the federal government's "eGrants" online grant management system.

The more difficult issue was how to develop a high-quality hazard mitigation plan that met both the immediate grant application needs as well as the longer-term hazard mitigation needs of the township. One option was to include Robinson Township in the Ottawa County plan; however, that plan was still several months away from being completed. Therefore, it would be necessary to develop a separate plan for Robinson Township in order to meet the looming grant application deadline. (Later, the township merged its planning process into that of the county.)

Developing a high-quality plan in such a short timeframe would require significant technical assistance from the MSP/EMHSD. For the long-term benefit of the Robinson Township residents affected by the flooding, the MSP/EMHSD agreed to put many of its other work priorities temporarily on hold in order to assist the township with its plan development. By working long hours and getting considerable cooperation and assistance from the township (staff and citizens) and Ottawa County, the MSP/EMHSD was successful in developing the Robinson Township hazard mitigation plan within the required timeframe. This was a significant accomplishment since it often takes a year or more to complete a plan from start to finish in the best of circumstances. Fortunately, the right combination of factors came together to make the Robinson Township planning effort a timely success – including the professional knowledge and skill of the MSP/EMHSD planning staff (Mike Sobocinski, in particular), the ready availability of needed data, engaged and informed citizens willing to provide input, and the cooperation and assistance of local officials.

In March 2005, the two Robinson Township grant applications, along with nine other grant applications from other Michigan jurisdictions, were submitted to FEMA for funding consideration. In October 2005, the grants were awarded to the township to acquire 60 flood-prone properties.

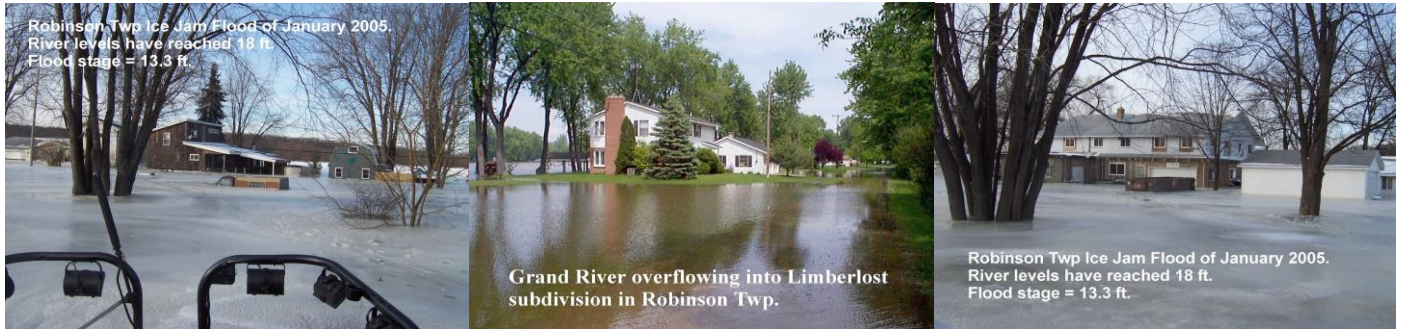
In all, 18 of the 60 parcels were acquired with the PDM grants. Separately from the grants, six other parcels were acquired by the Michigan Department of Transportation (MDOT) for a future transportation project. Another six property owners elevated their homes with no financial assistance. In all, 30 of the 60 properties were mitigated in one way or another. Twenty-one homes remain un-elevated in the floodplain and eight of the remaining parcels are vacant. Although not all of the 60 flood-prone parcels were acquired, the combination of the planning effort and the good percentage of parcels that were mitigated using grant funding and other means made this project a tremendous success. (Because the parcel acquisitions were strictly voluntary – as is the case in almost all flood-prone property acquisitions – it is not uncommon for some property owners to decline participation.)

<b>Project Quick Facts</b>	
County:	Ottawa
Community:	Robinson Township
Hazard Type:	Severe Storms / Flooding
Activity / Project Type:	Acquisition of Flood-Prone Homes
Activity / Project Start Date:	October 2005
Activity / Project Completion Date:	August 2008
Total Cost:	\$1,824,007



## Ottawa County / Robinson Township Flood Mitigation Planning and Flood-Prone Properties Acquisition (cont.)

### Robinson Township – Then



L-R: Robinson Township is at risk from flooding of the Grand River at all times of the year. The January 2005 flood was particularly severe and was the result of ice dams on the river. Damage to homes and personal property was significant, and many homes could not be occupied due to lingering public health and safety threats.

### Robinson Township – Now



L-R: Some of the flood-prone properties that have been acquired, cleared and restored as open space along the Grand River in Robinson Township using FY 05 PDM funding.

### Flint River Dike Flood Control

After 20 years of sustained reconstruction efforts along the Flint River, a 16-mile dike system was finally completed in September 2010 thanks to a \$1.84 million federal HMGP grant authorized by FEMA and provided through the MSP/EMHSD. The Flint River Flood Control dike system protects in excess of 11,000 acres encompassing 340 households, 72 farms and six businesses in four Saginaw County townships – Spaulding, Albee, Taymouth and Bridgeport.

The initial Flint River Flood Control dike system consisted of “push up” farm dikes at the river’s edge, but the dikes eventually aged and became susceptible to erosion and failure when water levels are high. Over twenty years ago, residents and local officials began efforts to remove the push up dikes and replace them with engineered dikes that provide enhanced flood protection and are less vulnerable to erosion. Residents of the flood-prone area established a special assessment district in the early 1980s to fund dike maintenance and system reconstruction over time. The Flint River Erosion Control Board had been successful in pulling together federal, state and local funding sources for reconstruction, and partnered with the MSP/EMHSD and MHMCC on three occasions to fund the reconstruction of various sections of the dike system. The system had been progressively reconstructed over the years, and this final grant allowed for the project’s long-awaited completion.

This latest effort was the culmination of over five years of work by the Flint River Erosion Control Board and the MSP/EMHSD to develop the project, conduct the federally required benefit/cost and environmental analyses, obtain the necessary project approvals and secure funding. In 2005, a federal and state required archeological reconnaissance operation temporarily delayed project approval and implementation until issues related to the possible presence of artifacts could be addressed.

Homeowners, farmers and business owners contributed the \$565,000 local share of the project.

Project Quick Facts	
County:	Saginaw
Community:	Several Townships
Hazard Type:	Severe Storms / Flooding
Activity / Project Type:	Flood Control
Activity / Project Start Date:	June 2006
Activity / Project Completion Date:	September 2010
Total Cost:	\$2,350,694



**Photos L-R:** A section of the dike under construction in Saginaw County; a reconstructed section of the dike, before final grading and reseeding. The new dike is constructed to modern standards with a wider course, 1:4 slope setbacks, and a series of detention areas and flood spillways to accommodate excessive flow.

### Hazard Mitigation Success Stories from May-June 2004 Storms and Flooding (Federal Disaster 1527-DR-MI)

The May-June 2004 storms and flooding in central and southern Lower Michigan (which resulted in Federal Disaster 1527-DR-MI) brought to light several hazard mitigation success stories – instances where the efforts and grant funding provided by the MSP/EMHSD helped to reduce or eliminate damage to homes or public buildings and saved hundreds of thousands of tax dollars and private insurance claims in disaster relief expenditures.

**Sewage backflow prevention.** A Wayne County mitigation project under Federal Disaster 1346-DR-MI, for basement backflow prevention, saw an increase in interest after the May-June 2004 flooding. The county submitted 149 new properties to be included in the project. Many of these residents declined to participate in the project initially, but the flooding resulted in a change of heart on the part of these residents. A revised benefit / cost analysis for the additional properties was completed by the MSP/EMHSD and the project expansion was ultimately approved by FEMA.

**Sewage backflow prevention.** A City of Birmingham basement backflow prevention project under Federal Disaster 1181-DR-MI (similar to the Wayne County project above) was a huge success. The city installed backflow prevention valves in a total of 77 homes. The city’s Engineering Director indicated that they only received two calls about basement back-ups during the May-June 2004 flooding – and those calls were from homeowners that chose not to participate in the project. The Engineering Director further indicated that if this flooding had occurred prior to the HMGP project, the city would have expected the telephone to “ring off the hook” with calls from angry residents.

**Flood protection.** The Daycroft Montessori School in Oakland County built a floodwall using hazard mitigation funds from Federal Disaster 1346-DR-MI. On May 21, 2004 the floodwater rose on the new wall nearly to the top. According to school officials, if the wall had not been in place the school would have been inundated with approximately 1.5 feet of water – likely causing significant damage to the school building and its contents.

**Acquisition / removal of flood-prone homes.** In Grand Blanc, the city acquired five homes using hazard mitigation funds from Federal Disaster 1346-DR-MI. During the May-June 2004 storms, all five homes were flooded. The homes



had not yet been demolished, but fortunately the residents had vacated the properties before the time of the flooding. (See a more comprehensive story on this project on the following page.)

In Livingston County, six flood-prone mobile homes that sat on a small peninsula near the Hi-Land Lake and Portage River in Putnam Township were also purchased using hazard mitigation funds from Federal Disaster 1346-DR-MI. The wisdom of undertaking this project was evident in the aftermath of the May-June 2004 storms when the six homes (which had already been purchased but not yet removed) were severely damaged or destroyed when the Hi-Land Lake Outlet Dam flooded. (See a more comprehensive story on this project on page 28.)



**Photos L-R:** A floodwall at the Daycroft Montessori School in Oakland County protected the school from flood damage. A flood-prone home in Putnam Township in Livingston County prior to being acquired and removed. The cleared site of that same home in Livingston County after the property flooded in a recent storm event. Fortunately, the home had been removed so there was no damage to repair and the open land was available to help absorb the floodwater.

### **Genesee County / City of Grand Blanc Flood-Prone Properties Acquisition\***

When severe storms, tornadoes and flooding struck the lower part of the state in late May 2004 (resulting in Federal Disaster 1527-DR-MI), few had any idea that it would affect tens of thousands of Michigan families and that more than \$51 million in grants and low-interest loans would be provided in disaster assistance. For one Grand Blanc family the storms and flooding had the opposite affect. They were sitting high and dry and didn't need any disaster assistance, while what used to be their home was flooded again.

Karen Minard couldn't believe her eyes when she returned to her old neighborhood near Thread Creek and discovered nine feet of water in the structure she had once called "home." In fact, she said that the flooding was as bad, if not worse, than the most damaging flood her family had endured. "I was tired of getting flooded out," Minard exclaimed. When the Thread Creek flooded, homes in that area experienced sewer back-ups. The double threat of flooding and sewage back-up led the Minard family to participate in a buyout project. The Minards were one of five families who had participated in a voluntary buyout program just seven months earlier. Four of the acquired homes were still awaiting demolition in May 2004 when flooding struck again.

In 2000 a flood inundated the City of Grand Blanc, located 10 miles south of Flint, severely damaging many homes and leaving roads impassible. Flooding from Thread Creek together with poor drainage caused major flooding that left homeowners helpless and city officials unable to control the rising creek. Together, they took a proactive approach to deal with the repeated flooding in their area.

Federal Disaster 1346-DR-MI made HMGP funds available for mitigation projects throughout the state. Grand Blanc decided to pursue an HMGP project for the acquisition of homes damaged repeatedly from flooding. According to Randy Byrne, City Manager of Grand Blanc, city officials were getting tired of repairing the same damage after every flood and thought a proposal to acquire these homes at a cost share of 75 percent federal, 25 percent non-federal match could help to solve the problem.

The community submitted its proposal and the project was selected by the MSP/EMHSD and the (since renamed) MHMCC. When FEMA approved the funding, city officials provided homeowners with specific criteria for participation that included an appraisal and offer to buy out the property at pre-flood fair market value. Five homeowners decided to participate in the voluntary project.

In addition to the families who occupied the acquired homes, the community also benefited from the buyout. A major provision of the HMGP is that ownership of the acquired land reverts to the city with a deed restriction stating it must remain as open space. The city, demonstrating a conscientious approach to floodplain management, incorporated the

land into Rusk Park. The 20-acre recreational park, containing footpaths, baseball diamonds, and tennis courts, was expanded by two acres as a result of this project. When Thread Creek floods in the future, there is no maintenance required for the park. Costs to the city and risk to homeowners have been greatly reduced.

When asked if he would pursue this type of project again, Byrne said, “It just depends on the number of times homeowners go through this before action is taken to get them out of harm’s way.” The key to involving the community in this type of project, according to Byrne, “is having a casual meeting and getting everyone on the same page.” Informing potential participants about available options is imperative.

Most mitigation projects are a joint initiative involving local, state and federal levels of government. This project demonstrates how efforts on each level can contribute to fewer damages and lower risk. By being part of this project, the city no longer has to sandbag and call out public works crews to clean up flood damage. Instead, the city has a larger park, a smaller risk of flooding and happier residents.

(\*Base information from August 2004 FEMA – MSP/EMHSD Press Release; edited for formatting and update purposes and addition of photos and photo narrative)

Project Quick Facts	
County:	Genesee
Community:	City of Grand Blanc
Hazard Type:	Severe Storms / Flooding
Activity / Project Type:	Acquisition of Flood-Prone Homes
Activity / Project Start Date:	October 2003
Activity / Project Completion Date:	October 2005
Total Cost:	\$1,640,067

**Genesee County / City of Grand Blanc Flood-Prone Properties Acquisition (cont.)**



**Top Row L-R:** Three of the five homes that were acquired in the buyout project, prior to removal. **Bottom Row L-R:** The acquired properties are now part of a community park and will remain in recreational open space in perpetuity.

**Safe Rooms at Michigan State University Child Care Center\***

Safe rooms are increasingly recognized as an inexpensive and highly effective means of providing protection against tornadoes and other severe wind events in facilities that do not have basements or other adequate shelter. Storm rooms are generally constructed of properly anchored, reinforced concrete or masonry with steel doors and reinforced steel door frames, although other combinations of materials and construction methods can also provide an acceptable



level of protection. Storm rooms are designed to withstand the direct wind forces, fluctuating wind pressures and flying debris caused by a tornado or severe windstorm, enabling the occupants to survive with little or no injury.

In October 2000, the MSP/EMHSD and Michigan State University (MSU) began a partnership that would ultimately result in MSU constructing eight storm rooms in a new child care facility in the Spartan Village housing complex on the west side of the MSU campus. The child care facility, completed in October 2002, is a one-story wood frame structure of residential character built on a concrete slab. Using HMGP funds from Federal Disaster 1346-DR-MI, MSU opted to construct the storm rooms as a vestibule between the main corridor and each classroom, thereby assuring close proximity to the shelters at all times. The storm room space contains children’s lockers with a bench in front of each locker for the child to sit and remove boots or shoes. Each storm room provides enough space to accommodate 20-25 children and adults, and has an emergency kit and emergency lighting and ventilation in case of a power failure. The storm rooms are designed to resist wind speeds in excess of 250 miles per hour.

The total cost of the eight storm rooms was \$165,000, which represented 7.4 percent of the total building cost. The cost of each individual storm room was \$20,625. This project was very successful and will serve as a demonstration model for future storm room projects in Michigan and elsewhere.

(\*Contains excerpts from September 2007 FEMA Mitigation Success Story; edited for formatting purposes and addition of photos and new narrative)

Project Quick Facts	
County:	Ingham
Community:	Michigan State University
Hazard Type:	Severe Storms / Tornadoes
Activity / Project Type:	Storm Shelters
Activity / Project Start Date:	November 2001
Activity / Project Completion Date:	April 2003
Total Cost:	\$165,000



**Top Row L-R:** Storm rooms during construction. **Bottom Row L-R:** Storm rooms as they appear today in their completed form (disguised as coat rooms).

### Wayne County Early Warning Enhancements\*

Located in southeast Michigan, Wayne County frequently experiences severe weather and tornadoes. In July 1997, a dangerous tornado swept through parts of Detroit and the nearby cities of Highland Park and Hamtramck, injuring 90 persons. It was the most costly tornado the State had experienced, with total damages estimated at \$90 million. The tornado, which traveled nearly five miles and was 2,500 yards wide, was part of an outbreak of 13 tornadoes in southeastern Michigan, the largest number for a single day in Michigan since records have been kept.

With over two million residents at the time, the county needed effective mitigation measures to adequately warn people of the potentially severe weather, and particularly those in congregate settings. Using HMGP funds from Federal Disaster 1181-DR-MI, Wayne County Emergency Management purchased 860 National Oceanic and Atmospheric Administration (NOAA) weather radios and had them installed at every school, hospital and nursing care facility in the county.

The county also conducted an all-day tornado shelter and spotter workshop for employees of those facilities. The workshop enabled the employees, especially those representing schools, to plan and prepare for severe weather. The workshop was videotaped and used as a training video on tornado spotting for police, fire, and public service personnel in jurisdictions throughout the county. The video also became part of in-service training for Wayne County personnel, and was telecast on the statewide school Internet site during the Severe Weather Awareness Week campaign in March 1999. The telecast allowed all schools with Internet capabilities to watch the video and begin to plan and prepare for severe weather in their school district.

This project helps ensure that adequate early warning for severe weather and other incidents will be available to persons in the radio-equipped facilities in Wayne County, thereby reducing the potential for injuries and loss of life.

(\*September 2007 FEMA Mitigation Success Story; edited for formatting and update purposes)

Project Quick Facts	
County:	Wayne
Community:	Countywide
Hazard Type:	Severe Storms / Tornadoes
Activity / Project Type:	Early Warning; Public Education
Activity / Project Start Date:	March 1998
Activity / Project Completion Date:	October 1998
Total Cost:	\$21,000

### Oakland County Stream Bank Stabilization\*

Thanks to a two-phase grant Bloomfield Township applied for through the HMGP, the Franklin Branch stream bank is now a highlight of the community rather than a safety concern.

The Rouge River in Southeast Michigan drains over 438 square miles of the most heavily populated areas of the region. When one of its four main river branches, the Franklin Branch, began to show signs of serious deterioration and erosion, businesses and residents near the river were threatened. Bloomfield Township applied for the two-phase grant to study hydraulics and repair the stream bank.

The Franklin Stream Bank Stabilization Project focused on four areas of stream bank erosion along a one-mile stretch of the Branch. Each site was ranked in priority based on the threat to infrastructure. The project focused on the use of innovative engineering alternatives that included brush mattresses, live staking, fascines, pools and riffles, and vegetated geocell retaining walls. The 100-year floodplain elevation was not increased at any of the project sites. In addition, this project included an extensive reforestation phase. Collectively at all four sites, a total of 911 new trees were planted.

At the onset of the project, significant effort was taken to ensure that resident concerns were addressed during the project design. The engineering innovation and cooperation of all stakeholders involved in the project bears witness to the project's success. The stream bank was stabilized and the safety of the buildings and residents in Bloomfield Township has been ensured in a cost-efficient, community-friendly manner.

(\*September 2007 FEMA Mitigation Success Story; edited for formatting and update purposes and addition of photos and photo narrative)

Project Quick Facts	
County:	Oakland
Community:	Bloomfield Township
Hazard Type:	Severe Storms / Flooding
Activity / Project Type:	Stream Bank Stabilization
Activity / Project Start Date:	March 2003



Activity / Project Completion Date:	November 2006
Total Cost:	\$2,143,512



**Top Row L-R:** Prior to the project, major sections of the Franklin Branch suffered severe erosion and deterioration which threatened homes, businesses and infrastructure. **Bottom Row L-R:** The new stream bank stabilization measures will help prevent bank erosion, improve water quality, and protect nearby homes, businesses and infrastructure.

### Marquette County Roadway Restructuring\*

A 1,320-foot stretch of M-35 in Marquette County was restructured in 2006 using federal HMGP funds. The roadway, which had a history of flooding, posed a safety risk to the traveling public and was a maintenance problem for the Michigan Department of Transportation (MDOT) due to the need for repetitive repairs and restoration.

The project was implemented in two phases. First, two 24-foot culverts were replaced with 36-foot and 48-foot culverts. This allowed necessary drainage between the wetlands bisected by the roadway. The second phase consisted of an aggregate grade lift that was placed on the existing road surface to allow sufficient drainage to stop the continued erosion during high water runoff periods. The roadway was then repaved to provide acceptable traffic conditions for travelers. Now, the runoff during peak rain events no longer saturates the sub-base and degrades the structural integrity of the roadway.

Decreased flooding, along with faster drainage when flooding does occur, means safer conditions for travelers. The repetitive road repair and restoration work that had previously been required was also drastically reduced. With an estimated benefit of over \$600,000 during the project’s 20-year expected life, the MDOT will save at least \$30,000 annually in repair and restoration costs.

This project was clearly a “win-win” for all involved because it not only made this stretch of M-35 more disaster resistant and cost-effective, but also, more importantly, safer.

(\*September 2007 FEMA Mitigation Success Story; edited for formatting and update purposes and the addition of photos and photo narrative)

Project Quick Facts	
County:	Marquette
Community:	Forsyth Township
Hazard Type:	Flooding
Activity / Project Type:	Roadway Flood Proofing
Activity / Project Start Date:	August 2005
Activity / Project Completion Date:	July 2006
Total Cost:	\$205,980





Photos L-R show completed culvert replacement, bank stabilization and road resurfacing.

**Livingston County / Putnam Township Flood-Prone Properties Acquisition\***

Six flood-prone mobile homes that sat on a small peninsula near the Hi-Land Lake and Portage River in Putnam Township, Livingston County, were purchased and removed using HMPG funds from Federal Disaster 1346-DR-MI. The occupants of these homes had suffered years of emotional and financial hardships due to the frequent flooding that caused significant structural as well as content damage. The wisdom of undertaking this project and the effectiveness of flood mitigation were evident in the aftermath of the May-June 2004 storms (which resulted in Federal Disaster 1527-DR-MI) when the six homes, which had already been purchased but not yet removed, were severely damaged or destroyed when the Hi-Land Lake Outlet Dam flooded.

The residents of the six homes worked cooperatively with FEMA and the Livingston County Drain Commission office in order to improve their way of life. Their decision to relocate from their homes was certainly not an easy one despite the damage they and their property had incurred over time. Several were resistant to the idea at first, but after careful consideration and clear explanation by both agencies of the risks involved with their current location, the residents agreed to cooperate.

The Livingston County Drain Commission acquired the six homes in the Portage River floodplain, just downstream of the Hi-Land Lake Outlet Dam (which is listed under the National Dam Inventory as a high-hazard dam). The area has a history of flooding, including significant floods in 1982, 2000 and again in 2004. When the floods occurred, considerable damage to the homes would result from sewer back-ups caused by short-term power failure at pumping stations and the capacity of the stormwater collection system being exceeded. As a result, raw sewage would back-up in the homes, creating serious public health and safety concerns and causing significant property loss. This project enabled the affected properties to be purchased, the homes removed and sites restored to open space, and the sewer system secured to prevent future back-ups of sewage into neighboring homes and waterways.

(\*September 2007 FEMA Mitigation Success Story; edited for formatting purposes and the addition of photos and photo narrative)

Project Quick Facts	
County:	Livingston
Community:	Putnam Township
Hazard Type:	Flooding
Activity / Project Type:	Acquisition of Flood-Prone Homes
Activity / Project Start Date:	December 2001
Activity / Project Completion Date:	July 2007
Total Cost:	\$584,887



**Photos L-R:** One of six homes acquired and removed as part of the buyout project. Former home site as it appeared prior to restoration and reseeding. The same site with significant flooding after it was restored. Thankfully, no damage occurred because the home had been removed and the open space was available to help absorb the floodwater.

### Charlevoix County Overpass Culvert Restructuring\*

With a 2,700+ vehicle count per day, Thumb Lake Road is the second busiest road in Charlevoix County. Formerly, the road’s overpass of the Boyne River was a site of continual flooding due to inadequate culverts and poor drainage atop the road. However, in 2005 a culvert restructuring and roadway flood proofing project was completed using HMGP funds available under Federal Disaster 1346-DR-MI. The project reduced future flood damage risk, helped ensure safer travel for the public, and eliminated the repetitive repairs previously required to make the roadway useable after damaging flooding.

The overpass project utilized several mitigation techniques. The primary focus was on replacing two 48-inch pipe culverts which had inadequate capacity to accommodate stormwater flow during significant precipitation events. Additionally, erosion had caused sediment to build up in the culverts and stormwater runoff had left debris in the inlet, further exacerbating the problem. The project replaced the twin culverts with a 22-foot wide concrete box culvert. Concrete headwalls were also installed, and stream bank stabilization measures, such as rip-rap, were used.

The project solved various issues related to the previous design of the overpass. Reducing the amount of water overtopping the structure was particularly important because this prevented approximately \$10,000 in repair costs per flood event and greatly increased the safety of the thousands of people who cross the overpass daily. Problems with the hydraulics of the water flowing under the roadway, which frequently resulted in debris back-ups, were also resolved with the new, larger culvert. The Thumb Lake Road flood mitigation project will result in a greater than 95 percent reduction in future flood damages and a much safer road for travelers to use.

(\*September 2007 FEMA Mitigation Success Story; edited for formatting and update purposes and the addition of photos and photo narrative)

Project Quick Facts	
County:	Charlevoix
Community:	Boyne Valley Township
Hazard Type:	Storms (Severe / Winter); Flooding
Activity / Project Type:	Roadway Flood Proofing
Activity / Project Start Date:	November 2001
Activity / Project Completion Date:	October 2005
Total Cost:	\$280,000





Photos L-R show the new 22-foot box culvert which replaced an inadequate twin culvert system. Concrete headwalls were also installed and stream bank stabilization measures, such as rip-rap, were taken.

### Newaygo County / Bridgeton Township Flood-Prone Home Elevation

In October 2006, Bridgeton Township in Newaygo County completed a home elevation project with funding from the HMGP under Federal Disaster 1527-DR-MI. This cost-effective project represents a mitigation success story in that it has helped minimize the impacts of flooding on an individual family and a community. For the Bridgeton Township project, a single home was elevated, but a community could implement a project to elevate a number of flood-prone homes. While home elevation does not eliminate all of the negative impacts of flooding, it does dramatically reduce them. The first floor of the selected Bridgeton Township home was nearly seven feet below the 100-year flood elevation of the Muskegon River, and more than three feet below the 10-year flood elevation. Now that the home is elevated, the finished first floor is more than three feet above the 500-year flood elevation, a dramatic reduction in the risk of property damage to the home. The photos on the following page show the elevated home and illustrate how the elevation has been successful in protecting the home from rising river levels. When the Muskegon River flooded in Bridgeton Township in late April and early May of 2011 (see far right photo), the home was temporarily surrounded by floodwater but damage to the home was minimal. As this project demonstrates, a properly elevated home can be very effective at mitigating the most serious impacts of flooding.

Project Quick Facts	
County:	Newaygo
Community:	Bridgeton Township
Hazard Type:	Flooding
Activity / Project Type:	Elevation of Flood-Prone Home
Activity / Project Start Date:	April 2006
Activity / Project Completion Date:	October 2006
Total Cost:	\$18,638



Photos L-R: The west and south sides of the elevated home; note the proximity of the Muskegon River. The elevated home during the late April-early May 2011 flooding of the Muskegon River. The home was surrounded by floodwater but suffered minimal damage.

### **Wayne County / City of Wyandotte Restricted Flow Catch Basin Covers**

In February 2004, the City of Wyandotte in Wayne County completed a flood control project with funding from the HMGP under Federal Disaster 1346-DR-MI. This project represents a mitigation success story in that it will help minimize the repetitive impacts of flooding on the residents of Wyandotte. It is important to note that flooding in Wyandotte will most likely never be totally eliminated. The City of Wyandotte has a combined sewer system that is especially vulnerable to high-intensity rainstorm events. The extreme rainfall typically inundates the system, causing basement flooding throughout the city.

The mitigation project involved the installation of approximately 2,300 restricted catch basin covers throughout the city. The restricted covers replaced those located in the street right-of way and only in locations where a catch basin was in existence. The project was completed using the city's own employees to install the catch basin covers. The restricted covers allow water during heavy rainstorms to be detained on the street and slow down the intensity of the stormwater entering the combined sewer system.

Since its completion in 2004, the project has been tested several times – the most recent (at the time of this writing) being the high intensity rainfall that occurred during the week of June 21-27, 2009. According to the City Engineer, Mark Kowalewski, there have not been any reports of basement flooding since installing the restricted basin covers. He added that the project has been so successful in eliminating the basement flooding, the city has enacted a new ordinance that requires the restricted covers on any newly constructed parking lots (even if located on private property). Mr. Kowalewski cautioned that while this project has been very successful for the City of Wyandotte, its design concept makes it adaptable only for municipalities with a combined sewer system. It is a possible consideration for those situations where a combined sewer separation project is not feasible.

Project Quick Facts	
County:	Wayne
Community:	City of Wyandotte
Hazard Type:	Severe Storms; Flooding
Activity / Project Type:	Stormwater / Flood Control
Activity / Project Start Date:	February 2002
Activity / Project Completion Date:	February 2004
Total Cost:	\$216,093



**Photos L-R:** Pre-construction – non-restricted catch basin cover. Post Construction – example of one of the 2,300 restricted catch basin covers installed throughout the City of Wyandotte.

### Gratiot County Culvert Replacement

A hazard mitigation success story from Federal Disaster 1346-DR-MI involved a culvert replacement project undertaken by the Gratiot County Road Commission. Just prior to the application and project selection period for the HMGP under Federal Disaster 1346-DR-MI, the Road Commission discovered a threatening situation with potential catastrophic impacts. One of two culverts in a twin culvert system on Otter Creek had buckled and the undersized system was doomed to imminent failure. Failure of the system would result in the washing of 3,800 cubic feet of road fill into Rainbow Lake and the collapse of two sewer mains (serving 420 hookups, including residential structures, schools and an adult foster care facility) that would dump raw sewage into the creek and Rainbow Lake.

The Gratiot County Road Commission applied for a project to replace the twin culvert system with a single span concrete box culvert. The MHMCC selected the Gratiot County project and asked FEMA to make it a priority project in the approval process. The MSP/EMHSD worked with FEMA and Congressman Dave Camp’s office to keep the project moving forward in a timely manner. FEMA gave final approval for the grant in March 2002 and the project was completed in October 2002.

Project Quick Facts	
County:	Gratiot
Community:	Fulton Township
Hazard Type:	Severe Storms; Flooding
Activity / Project Type:	Drainage Improvements
Activity / Project Start Date:	April 2002
Activity / Project Completion Date:	October 2002
Total Cost:	\$384,012





**Photos L-R** show the new box culvert, stream bank stabilization measures, and roadway enhancements which are designed to improve drainage and better protect the roadway infrastructure.

### Marquette County Hazardous Dam Removal

A successful hazardous dam removal project in Marquette County was completed in September 2005 using HMGP funding under Federal Disaster 1346-DR-MI. The project involved the removal of the Collinsville Dam on the Dead River – a 200-foot long dam that was about 120 years old and held back approximately five acres of water. This project is a definite hazard mitigation success story because the aging dam posed a significant threat to life, property and the environment. Removal of the dam eliminated flood risk to four downstream homes and a downstream electrical substation (and imminent power failure for the 1,850 residences and 150 businesses served by it), threat of loss of life to downstream fishermen and people participating in recreation activities in a city park, and damaging siltation of the downstream fishery and a public beach.

The removal of the dam was a complex, multi-phase engineering and construction effort that involved: 1) construction of a coffer dam (a temporary structure that allows water to be pumped out to create a dry work environment); 2) installation of 250 feet of temporary diversion pipe (to handle stream flow); 3) construction of a downstream silt trap; 4) demolition of the dam and removal of debris; 5) removal of 1,500 cubic yards of non-contaminated silt; 6) installation of 600 cubic yards of fabric and rip-rap to stabilize the bank; and 7) mulching and re-vegetation of four acres of reclaimed land with native plant and tree species.

Project Quick Facts	
County:	Marquette
Community:	Marquette Township
Hazard Type:	Infrastructure Failure; Flooding
Activity / Project Type:	Removal of Hazardous Dam
Activity / Project Start Date:	October 2003
Activity / Project Completion Date:	September 2005
Total Cost:	\$126,628





**Top Row:** Aerial photo depicts the old impoundment and new river channel. **Bottom Row L-R:** Collinsville Dam before removal; excavators removing the dam; re-vegetation and rip-rap along the river after dam removal.



**Lake / Mason / Osceola County NOAA Weather Early Warning Enhancement**

In August 2005, the counties of Lake, Mason and Osceola completed a joint project to install a NOAA weather transmitter with funding from the HMGP under Federal Disaster 1346-DR-MI. This project represents a mitigation success story in that it will help minimize the impacts of severe weather by providing advance warning to residents. In the three counties, like in many other rural areas of Michigan, providing early warning of approaching severe weather can be challenging. Warning sirens are not always effective because the population is often disbursed over a larger geographic area than the audible signal can reach. This NOAA transmitter, installed in Lake County near the Osceola County line, has a signal that reaches approximately 60,000 residents and can even be picked up at Lake Michigan. Because a NOAA alert radio is required to hear the warning signal, a project such as this requires an extensive public education campaign for the project to be optimally successful. Once residences, businesses, schools, institutions and other public facilities are equipped with NOAA alert radios, residents will know to take cover when severe weather is approaching. In support of this early warning enhancement project, the three counties are working to purchase and distribute NOAA alert radios for residents that cannot afford one.

Project Quick Facts	
County:	Lake / Mason / Osceola
Community:	All Local Communities
Hazard Type:	Severe Weather / Storms
Activity / Project Type:	Early Warning Enhancement
Activity / Project Start Date:	December 2001
Activity / Project Completion Date:	August 2005
Total Cost:	\$83,821



Photos L-R: Transmitter equipment building with back-up generator; transmission equipment inside transmitter equipment building.

**Michigan Hazard Mitigation Plan Certified Under Federal Disaster Mitigation Act of 2000**

The federal Disaster Mitigation Act (DMA) of 2000 requires states to develop and maintain a FEMA-approved, comprehensive state hazard mitigation plan as a condition of being eligible to receive federal Hazard Mitigation Assistance (HMA) funding, federal Public Assistance (PA) funding for permanent disaster relief work (Categories C-G), and federal Fire Management Assistance (FMA) funding to fight large-scale, escalating wildland fires. Both individually and collectively, these three funding streams can result in millions of dollars in federal assistance for the State of Michigan and its local jurisdictions. This made the successful and timely completion of a state hazard mitigation plan a critically important undertaking.

Initial Edition

The State’s initial edition of the Michigan Hazard Mitigation Plan (MHMP) was completed in 2004 by a dedicated planning team which consisted of several members of the MSP/EMHSD Planning Section, the MHMCC, 14 state departments (and numerous sub-units within), and over 20 nongovernmental organizations. This initial planning effort focused on mitigation of the 12 natural hazards specified in federal guidelines.

The DMA 2000 requires that a rigorous risk assessment process be carried out as a foundation for the mitigation planning effort. Part of that risk assessment process involves the examination of hazard losses for “state owned / operated critical facilities.” The planning team identified 503 state facilities that met that definition. Loss estimations for the natural hazards were calculated for all 503 facilities, as well as the 4.2+ million residential structures in Michigan’s 83 counties.

The plan also featured a comprehensive capability assessment section that addressed both natural and technological hazards. (Technological hazards were included in the capability assessment to lay the groundwork for a future plan expansion that would include technological as well as human-related hazards, in addition to the natural hazards required by federal guidelines. The expansion occurred in the 2011 plan edition; see details below.) Most importantly, the plan proposed a total of 185 specific mitigation actions designed to address the vulnerabilities identified in the risk assessment and capability assessment sections. These actions were prioritized by the MHMCC and MSP/EMHSD for implementation under the plan’s four major goals and 68 strategic objectives.

The initial MHMP was developed using the “best available data” at the time. The primary sources for the natural hazard damage data included the National Weather Service, the National Climatic Data Center, the U.S. Geological Survey, and the National Flood Insurance Program. Several state departments provided geo-spatial data (from which location-specific hazard areas were determined) and/or critical facility data (from which loss estimations were made).

The MHMCC formally adopted the initial MHMP on October 19, 2004, and the State of Michigan adopted it on December 15, 2004. The 1,357-page plan was submitted to FEMA for federal certification under the DMA 2000. FEMA approved the plan on March 27, 2005, as a “Standard State Mitigation Plan” under the federal DMA 2000, thereby ensuring that the State and its local jurisdictions remained eligible for federal HMA, PA and FMA funding for the next three years. More importantly, the federally-approved plan provided an excellent roadmap for the development and implementation of needed hazard mitigation measures within the State of Michigan that have regional and/or statewide applicability or impact.

Federally-Required Plan Updates (2008, 2011, 2014, and 2019)

The DMA 2000 mandated that state hazard mitigation plans be updated every three years as a requirement for continued federal hazard mitigation and disaster relief assistance. In 2014 the requirement changed to mandating state hazard mitigation plan updates every five years. The State completed comprehensive plan updates in 2008, 2011, 2014, and 2019.

Project Quick Facts	
County:	State of Michigan
Community:	Statewide
Hazard Type:	All Hazards
Activity / Project Type:	Planning
Activity / Project Start Date:	2003 for initial version of plan
Activity / Project Completion Date:	Ongoing; revised every three years
Total Cost:	\$N/A – staff time only

MSP/EMHSD Pub. 106  
April 2019  
EMERGENCY MANAGEMENT AND  
HOMELAND SECURITY DIVISION  
Michigan Department of State Police



# Michigan Hazard Mitigation Plan

(Updated April 2019 edition)

Reducing hazard risks and vulnerabilities through  
education, planning, physical improvements,  
early warning, and coordination of programs and resources.



Prepared by:

Emergency Management and Homeland Security Division  
Michigan Department of State Police

And

The Michigan Citizen-Community Emergency Response Coordinating Council



**St. Clair County / City of Port Huron Standby Power Source for Water Treatment Plant**

In 2002-03, the City of Port Huron purchased and installed a standby generator for its water treatment plant using HMGP funding under Federal Disaster 1346-DR-MI. The city undertook this critical infrastructure failure mitigation project to ensure the continued operation of the water treatment plant for an extended time period during an electric power failure. As luck might have it, the new generator was put to the test shortly after it was installed. On August 14, 2003, much of the northeast United States and Ontario was hit by the largest electrical blackout in North America’s history. Electricity was cut to 50 million people, bringing darkness to customers from New York to Michigan. When the Port Huron water treatment plant lost primary power on August 14, the new generator was activated and provided reliable power to allow the plant to continue operating.

The success of this mitigation measure was perhaps best summed up by the plant’s superintendent, Thomas C. Deaner, in his September 22, 2003 letter to the MSP/EMHSD. In that letter, Mr. Deaner said, “The timing for completion (of the project) couldn’t have been better. When the Blackout of 2003 hit on August 14<sup>th</sup> this was the exact scenario we contemplated to warrant back-up power. Our new generator operated flawlessly for the next 39 hours, enabling us to provide potable water to the citizens of Port Huron and the townships of Port Huron, Fort Gratiot, Clyde and Kimball until power was restored and we transferred back to our Edison feed.”

This mitigation project will help protect the health of the citizens of Port Huron and surrounding communities in future electric power failures by providing a reliable, uninterrupted power source for the Port Huron water treatment plant, thereby assuring the availability of clean and safe drinking water for the duration of the outage.

Project Quick Facts	
County:	St. Clair
Community:	City of Port Huron
Hazard Type:	All Hazards
Activity / Project Type:	Mitigation of Infrastructure Failure
Activity / Project Start Date:	December 2001
Activity / Project Completion Date:	July 2003
Total Cost:	\$233,671





**Photo:** The standby generator installed at the City of Port Huron water treatment plant in 2003.

**Underground Storm Shelters for the Grand Traverse Band of Ottawa and Chippewa Indians**

In 2008, the Grand Traverse Band of Ottawa and Chippewa Indians completed construction on six underground severe storm “safe rooms” (shelters) located on tribal lands in the counties of Antrim, Benzie and Charlevoix. This \$76,800 project provides protection for 192 individuals. Each shelter can accommodate up to 32 individuals and their pets and belongings. The shelters were designed and installed for the safety and protection of residents without basements in their homes during severe storms and tornadoes. The six shelters are located in close proximity to tribal residences, community centers, and recreational areas.

The shelters were prefabricated and lowered into excavated areas. The units were then covered with dirt, graded and planted with grass to stabilize the soil and blend the site into the surrounding landscape. The only noticeable features are the ingress and egress hatch and the ventilation nubs. For this reason, signs have been installed advising residents of the location and operation of the shelters. Public meetings and instructional sessions were also held by the tribal fire department to advise residents of the locations and operation of the shelters and how to react during periods of severe weather. These public education sessions also stressed the need for each household to have an emergency kit readily available within their home that they could take with them to the designated shelter. This eliminates the need to stock large quantities of supplies within the shelters. The shelters are open during the severe weather months (April-September) and are locked for the late fall and winter months.

This project provided a unique and economical solution to the problem of providing shelter from severe weather for tribal members without basements or other adequate forms of protection. In addition, locating the shelters near areas where large numbers of people are likely to gather during the spring and summer months for tribal and/or recreational activities also maximizes the level of protection provided. The prefabricated construction technique and underground placement also provide a model for other communities to follow when searching for economical storm shelter alternatives for small, vulnerable populations. Although this solution may not work in all locations, its positive attributes definitely provide a success story to consider when determining appropriate solutions for outdoor storm shelter space.

Project Quick Facts	
County:	Antrim, Benzie and Charlevoix
Community:	Tribal Lands (Six Locations)
Hazard Type:	Severe Storms; Tornadoes
Activity / Project Type:	Storm Shelters
Activity / Project Start Date:	May 2005
Activity / Project Completion Date:	August 2008
Total Cost:	\$76,800



**Photo:** The storm shelter pictured above is located near the Tribe's Benzie County satellite office. In this photo, the finished dirt work has been completed and the site has been seeded with grass. The instructional signage had not yet been installed when the photo was taken.

### Sebewaing River Emergency Floodway

The Village of Sebewaing, in Huron County, is located in an extremely vulnerable location at the outlet of two major drainage systems – the State Intercounty Drain and the Columbia Intercounty Drain. As a result, damaging flooding has been a persistent problem. To prevent flooding in the village, prior to the 1930s the U.S. Army Corps of Engineers had constructed the State and Columbia Intercounty Drains and deepened the Sebewaing River to aid in the passage by increasing the flow of stormwater into Saginaw Bay. However, increasing the river's capacity contributed to the formation of ice jams at the mouth of the river and also upstream at the confluence of the State and Columbia Drains. Ice jams have been the cause of repeated flood events since the mid-1930s.

In the spring of 2005, the Sebewaing River Intercounty Drainage Board completed an emergency floodway project using HMGP funds under Federal Disaster 1346-DR-MI. The mitigation project consisted of the re-establishment of the Old North Floodway Channel at the entrance to the Sebewaing County Park as an emergency overflow channel, allowing the diversion of excess floodwater. This required the construction of an 86-foot by 27-foot rip-rap weir at the mouth of the Old North Floodway Channel and the reconstruction of the existing two-lane Union Street Bridge, which passes over the Old North Channel. The bridge reconstruction replaced the existing 24-inch channel culvert at Union Street with a 70-foot long, 35-foot wide and six-foot high single-span steel truss bridge. These improvements allow stormwater from both drains to flow more easily into Saginaw Bay. During periods of heavy rain, or when ice jams occur at the mouth of the river, water is redirected through the Old North Channel before reaching its final destination.

The Sebewaing River emergency floodway has solved a variety of flood-related problems in the Village of Sebewaing. Since its completion in 2005, the project has been tested several times by conditions which in the past would have resulted in flooding. With the project now in place, the annual ice jams and "spring thaw" flooding have not presented a problem. Not only has the project alleviated flooding, according to the Michigan Department of Environmental Quality, this project also helps to prevent environmental pollutants from entering Saginaw Bay. Before the emergency floodway was put in place, a flood causing significant property damage had occurred approximately every ten years in the village. The most recent, in 1997, caused considerable damage to 13 dwellings. Three residents had to be evacuated from their homes and six insurance claims were filed resulting in \$144,832 in damages. Now, with the project in place, the village, once plagued with a history of flooding, can rest a little easier.

Project Quick Facts	
County:	Huron
Community:	Village of Sebewaing
Hazard Type:	Severe Storms; Flooding
Activity / Project Type:	Channel / Culvert Improvements
Activity / Project Start Date:	November 2004
Activity / Project Completion Date:	July 2005
Total Cost:	\$379,381



**Photos L-R:** The New Union Street Bridge replaced an undersized culvert to improve water flow; the emergency floodway with the Union Street Bridge in the background; rip-rap slope protection in the Intercounty Drain.

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## Presidential Declarations in Michigan: 1953-2019\*

Date of Incident	Type of Incident	Affected Area	Type of Declaration / Federal ID Number**
6/16/18-6/18/18	Severe storms, flooding, landslides, mudslides	3 counties: Gogebic, Houghton, Menominee	Major Disaster (4381)
6/22/17-6/27/17	Flooding	4 counties: Bay, Gladwin, Isabella, and Midland	Major Disaster (4326)
8/11-13/14	Urban flooding	3 counties: Macomb, Oakland, and Wayne Co.	Major Disaster (4195)
4/25/14	Contaminated water	City of Flint (Genesee Co.)	Emergency (3375)
4/16/13-5/14/13	Flooding	16 counties: Allegan, Baraga, Barry, Gogebic, Houghton, Ionia, Kent, Keweenaw, Marquette, Midland, Muskegon, Newaygo, Ontonagon, Osceola, Ottawa, and Saginaw Co.	Major Disaster (4121)
7/14/08	Thunderstorms, flooding	12 counties: Allegan, Barry, Eaton, Ingham, Lake, Manistee, Mason, Missaukee, Osceola, Ottawa, Saginaw, and Wexford Co.	Major Disaster (1777)
9/07/05	Hurricane evacuation	All 83 counties	Emergency (3225)
5/20/04-6/8/04	Thunderstorms, flooding	23 counties: Barry, Berrien, Cass, Eaton, Genesee, Gladwin, Ingham, Ionia, Jackson, Kent, Livingston, Macomb, Mecosta, Muskegon, Oakland, Ottawa, Saginaw, Sanilac, Shiawassee, St. Clair, St. Joseph, Washtenaw, and Wayne Co.	Major Disaster (1527)
8/14-17/03	Electric power failure	14 counties: Calhoun, Eaton, Genesee, Hillsdale, Ingham, Kalamazoo, Lapeer, Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne Co.	Emergency (3189)
4/10/02-5/9/02	Flooding	6 counties: Baraga, Gogebic, Houghton, Iron, Marquette, and Ontonagon Co.; plus the Keweenaw Bay Indian Community	Major Disaster (1413)
12/11-31/00	Blizzard, snowstorm	39 counties: Allegan, Barry, Bay, Berrien, Branch, Calhoun, Cass, Clare, Clinton, Eaton, Genesee, Gladwin, Gratiot, Hillsdale, Huron, Ingham, Ionia, Isabella, Jackson, Kalamazoo, Kent, Lapeer, Livingston, Macomb, Mecosta, Midland, Montcalm, Muskegon, Oakland, Osceola, Ottawa, Saginaw, St. Clair, St. Joseph, Sanilac, Shiawassee, Tuscola, Van Buren, and Washtenaw Co.	Emergency (3160)
9/10-11/00	Urban flooding	2 counties: Oakland and Wayne Co.	Major Disaster (1346)
5/2-10/99	Wildfire	2 counties: Marquette and Mackinac Co.; (Grant Recipient: Michigan Dept. of Natural Resources)	Fire Suppression
1/2-15/99	Blizzard, snowstorm	31 counties: Alcona, Allegan, Arenac, Barry, Berrien, Cass, Crawford, Ionia, Iosco, Jackson, Kalamazoo, Kent, Lenawee, Macomb, Marquette, Mecosta, Monroe, Montmorency, Muskegon, Newaygo, Oakland, Oceana, Ogemaw, Osceola, Oscoda, Otsego, Ottawa, St. Joseph, Van Buren, Washtenaw, and Wayne Co.	Emergency (3137)
7/21/98	Thunderstorms, severe winds	2 counties: Macomb and Wayne Co.	Major Disaster (1237)
5/31/98	Thunderstorms, severe winds	13 counties: Bay, Clinton, Gratiot, Ionia, Kent, Mason, Montcalm, Muskegon, Newaygo, Oceana, Ottawa, Saginaw, and Shiawassee Co.	Major Disaster (1226)
7/2/97	Tornadoes, flooding	5 counties: Genesee, Macomb, Oakland, Saginaw, and Wayne Co.	Major Disaster (1181)
6/21-7/1/96	Rainstorms, flooding, tornado	7 counties: Bay, Lapeer, Midland, Saginaw, Sanilac, St. Clair, and Tuscola Co.	Major Disaster (1128)
12/93-5/94	Underground freeze	10 counties: Charlevoix, Cheboygan, Chippewa, Delta, Gogebic, Houghton, Mackinac, Marquette, Ontonagon, and Schoolcraft Co.	Major Disaster (1028)
9/10-19/86	Flooding	30 counties: Allegan, Arenac, Bay, Clare, Clinton, Genesee, Gladwin, Gratiot, Huron, Ionia, Isabella, Kent, Lake, Lapeer, Macomb, Manistee, Mason, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oceana, Osceola, Ottawa, Saginaw, Sanilac, Shiawassee, Tuscola, and Van Buren Co.	Major Disaster (774)
9/5-6/85	Flooding	6 counties: Alcona, Genesee, Iosco, Lapeer, Saginaw and Shiawassee Co.	Major Disaster (744)
3/12-20/82	Flooding	2 counties: Berrien and Monroe Co.	Major Disaster (654)
7/15-20/80	Severe winds	10 counties: Allegan, Berrien, Calhoun, Cass, Jackson, Ottawa, St. Joseph, Van Buren, Washtenaw, and Wayne Co.	Major Disaster (631)
5/13/80	Tornado	2 counties: Kalamazoo and Van Buren Co.	Major Disaster (621)
1/26-27/78	Blizzard, snowstorm	Statewide	Emergency (3057)

**Presidential Declarations in Michigan: 1953-2019\* (cont.)**

<b>Date of Incident</b>	<b>Type of Incident</b>	<b>Affected Area</b>	<b>Type of Declaration / Federal ID Number**</b>
3/2/77	Drought	44 counties: Alcona, Alger, Alpena, Antrim, Arenac, Baraga, Benzie, Charlevoix, Cheboygan, Chippewa, Clare, Crawford, Delta, Dickinson, Emmet, Gladwin, Gogebic, Grand Traverse, Houghton, Iosco, Iron, Isabella, Kalkaska, Lake, Leelanau, Luce, Mackinac, Manistee, Marquette, Mason, Mecosta, Menominee, Missaukee, Montmorency, Oceana, Ogemaw, Ontonagon, Osceola, Oscoda, Otsego, Presque Isle, Roscommon, Schoolcraft, and Wexford Co.	Emergency (3035)
1/26-31/77	Blizzard, snowstorm	15 counties: Allegan, Barry, Berrien, Cass, Chippewa, Hillsdale, Kalamazoo, Kent, Monroe, Muskegon, Newaygo, Oceana, Ottawa, St. Joseph, and Van Buren Co.	Emergency (3030)
3/20/76, 3/2-7/76	Ice storm, tornadoes	29 counties: Allegan, Bay, Clare, Clinton, Genesee, Gladwin, Gratiot, Ionia, Isabella, Jackson, Kent, Lapeer, Macomb, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oakland, Oceana, Osceola, Ottawa, Roscommon, Saginaw, St. Clair, Sanilac, Shiawassee, Tuscola, and Wayne Co.	Major Disaster (495)
8/20/75-9/6/75	Rainstorms, severe winds, flooding	16 counties: Allegan, Clare, Genesee, Gratiot, Ingham, Isabella, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oceana, Osceola, Ottawa, Saginaw, and Shiawassee Co.	Major Disaster (486)
4/18-30/75	Flooding, rain, tornadoes	21 counties: Allegan, Barry, Berrien, Calhoun, Clinton, Crawford, Eaton, Genesee, Ingham, Ionia, Kalamazoo, Kent, Lapeer, Livingston, Macomb, Oakland, Ottawa, Saginaw, St. Clair, Shiawassee, and Van Buren Co.	Major Disaster (465)
4/3/74	Tornado	1 county: Hillsdale Co.	Major Disaster (429)
4/12/73	Severe storms, flooding	14 counties: Arenac, Bay, Berrien, Huron, Iosco, Macomb, Menominee, Monroe, Saginaw, Sanilac, St. Clair, Tuscola, Van Buren, and Wayne Co.	Major Disaster (371)
12/1/72	Severe storms, flooding	9 counties: Arenac, Bay, Berrien, Iosco, Macomb, Monroe, St. Clair, Tuscola, and Wayne Co.	Major Disaster (363)
4/5/72	Snowstorm, freezing rain	9 counties: Allegan, Barry, Calhoun, Clinton, Eaton, Ingham, Ionia, Jackson, and Kalamazoo Co.	Major Disaster (330)
4/11/65	Tornadoes, severe storms	16 counties: Allegan, Barry, Bay, Branch, Clinton, Eaton, Gratiot, Hillsdale, Kalamazoo, Kent, Lenawee, Monroe, Montcalm, Ottawa, Shiawassee, and Washtenaw Co.	Major Disaster (190)
4/5/56	Tornado	4 counties: Benzie, Leelanau, Manistee, and Ottawa Co.	Major Disaster (53)
6/8/53	Tornado	3 counties: Genesee, Iosco, and Monroe Co.	Major Disaster (6)
5/21/53	Tornado	1 county: St. Clair Co.	Major Disaster (4)
<b>Totals for 1953-2019:</b>	<b>38 Incidents</b>		<b>29 Major Disasters; 8 Emergencies; 1 Fire Suppression</b>

**Notes**

\*Does not include separate Secretary of Agriculture or Small Business Administration (SBA) disaster declarations, which are issued under other authorities. Declarations after 1974 were issued under PL 93-288 (Disaster Relief Act), as amended by the Robert T. Stafford Disaster Relief and Emergency Assistance Act (1988) and the Disaster Mitigation Act (2000).

\*\*Indicates federal declaration number assigned by FEMA and its predecessor agencies



**Governor's Declarations in Michigan: 1977-2019**

<b>Date of Incident</b>	<b>Type of Incident</b>	<b>Affected Area</b>	<b>Type of Declaration**</b>
3/14/19	Flooding	Newaygo County	Emergency
2/7/2019	Severe Winter Weather	City of Grand Rapids	Emergency
2/7/2019	Flooding	Ionia County	Emergency
1/29/2019	Extreme Cold	All 83 counties	Emergency
7/26/2018	Drinking Water Contamination	Kalamazoo County	Disaster
7/25/2018	Flooding	Houghton County	Disaster
7/12/2018	Flooding	Houghton County	Disaster
6/16/2018	Flooding	Gogebic, Houghton, and Menominee Co.	Disaster
2/19/2018	Flooding	City of Grand Rapids and City of Lansing; Allegan, Arenac, Barry, Berrien, Cass, Clare, Eaton, Ingham, Ionia, Kalamazoo, Kent, Newaygo, Mecosta, Ogemaw, Oscoda, Ottawa, and St. Joseph Co.	Disaster
6/22/17	Flooding	Bay, Gladwin, Isabella and Midland Counties	Disaster
12/24/16	Sewer Collapse/Sinkhole	City of Fraser; Macomb County	Emergency
10/16/16	Flooding	Chocoday, Skandia, and West Branch Townships; Marquette County	Disaster
7/12/16	Severe weather	City of Wakefield (Gogebic Co.), Township of Bessemer (Gogebic Co.), Township of Erwin (Gogebic Co.); Gogebic Co.	Disaster
8/2/15	Thunderstorms	City of Traverse City (Grand Traverse Co.), Township of Acme (Grand Traverse Co.), Township of East Bay (Grand Traverse Co.), Township of Garfield (Grand Traverse Co.), Township of Long Lake (Grand Traverse Co.), Township of Peninsula (Grand Traverse Co.), and Township of Whitewater (Grand Traverse Co.); Grand Traverse, and Leelanau Co.	Disaster
6/22/15	Tornado	City of Portland, Orange Township, and Portland Township (Ionia Co.)	Disaster
9/26/14	Bridge collapse	City of Detroit (Wayne Co.)	Emergency
8/11/14	Urban flooding	Macomb, Oakland, and Wayne Co.	Disaster
4/25/14	Contaminated water	City of Flint (Genesee Co.)	Emergency
4/12/14	Flooding	Isabella, Mecosta, Missaukee, Muskegon, Newaygo, Osceola, Roscommon, and Wexford Co.	Disaster
2/13/14	Deep frost	Charlevoix, Cheboygan, Chippewa, Delta, Emmet, Gogebic, Luce, Mackinac, and Marquette Co.	Emergency
6/18/13 5/7/13	Flooding	Allegan, Baraga, Barry, Benzie, Genesee, Gogebic, Gratiot, Houghton, Ionia, Iron, Kent, Keweenaw, Marquette, Mecosta, Midland, Muskegon, Newaygo, Ontonagon, Osceola, Ottawa and Saginaw Co.; City of Grand Rapids (Kent Co.); City of Ionia (Ionia Co.)	Disaster
5/25/12	Wildfire	Luce and Schoolcraft Co.	Disaster
5/11/12	Flooding	Genesee County	Emergency
5/31/11	Thunderstorms	City of Battle Creek (Calhoun Co.); Calhoun Co.	Emergency
7/27/10	Oil pipeline spill	Calhoun Co.	Disaster
6/9/10	Thunderstorms, tornadoes	Monroe Co.	Emergency
7/21/09	Tanker truck explosion, fire	Oakland Co.	Emergency
6/19/08	Thunderstorms	Lake, Manistee, Osceola, Ottawa, and Wexford Co.	Emergency*
6/13/08	Thunderstorms	City of Saginaw and City of Lansing (Ingham Co.); Allegan, Eaton, and Mason Co.	Emergency*
8/27/07	Tornado	City of Fenton (Genesee Co.)	Emergency
8/9-10/07	Wildfire	Luce Co.	Emergency
7/28/06	Thunderstorms, heavy rain	Oscoda Co.	Emergency
2/27/06	Severe winds, ice storm	Montcalm Co.	Emergency
9/4/05	Hurricane evacuation	All 83 counties	Disaster
6/3/04	Thunderstorms, flooding	Arenac, Barry, Berrien, Cass, Genesee, Gladwin, Ingham, Ionia, Jackson, Kent, Livingston, Macomb, Mecosta, Newaygo, Oakland, Ottawa, Saginaw, St. Clair, St. Joseph, Sanilac, Shiawassee, Van Buren and Wayne Co.	Disaster

## Governor's Declarations in Michigan: 1977-2019 (cont.)

Date of Incident	Type of Incident	Affected Area	Type of Declaration**
4/30/04	Insect infestation (Emerald Ash Borer)	Genesee, Ingham, Jackson, Lapeer, Livingston, Macomb, Monroe, Oakland, Washtenaw and Wayne Co.; Cities of Fraser, Sterling Heights, and Warren (Macomb Co.); Cities of Birmingham, Lathrup Village, and Southfield (Oakland Co.); City of Ann Arbor (Washtenaw Co.); Cities of Allen Park, Dearborn, Dearborn Heights, Detroit, Livonia, River Rouge, Romulus, Trenton, and Wayne (Wayne Co.); Bloomfield Township (Oakland Co.); Canton and Plymouth Townships (Wayne Co.)	Emergency
8/15/03	Power failure	Macomb, Monroe, Oakland, Washtenaw, and Wayne Co.	Emergency
5/15/03	Flooding	City of Marquette, Marquette Township, and Negaunee Township (Marquette Co.)	Emergency
5/10/02 4/30/02 4/16/02	Flooding	Baraga, Houghton, Iron, Marquette, and Ontonagon Co.; City of Ironwood (Gogebic Co.)	Disaster
12/29/01	Heavy snow	Emmet Co.	Emergency
10/26/01	Severe winds	Kalamazoo Co.	Disaster
3/9/01	Flooding	Genesee Co.	Disaster
9/20/00	Urban flooding	Wayne Co.	Disaster
6/7/00	Gasoline pipeline rupture	Blackman Twp. (Jackson Co.)	Emergency
8/5/99	Subsidence (mine shaft cave-in)	Dickinson Co.	Emergency
7/5/99	Tornado	Oscoda Co.	Disaster
1/15/99	Blizzard, snowstorm	City of Detroit (Wayne Co.)	Emergency
9/27/98	Severe winds	Otsego Co.	Emergency
9/1/98	Thunderstorms, severe winds	City of Niles (Berrien Co.)	Emergency
7/24/98 7/23/98	Thunderstorms, severe winds	Wayne Co.; City of Dearborn (Wayne Co.); City of Warren (Macomb Co.)	Disaster
6/5/98 6/4/98 6/3/98	Thunderstorms, severe winds	Bay, Clinton, Gratiot, Ionia, Kent, Mason, Mecosta, Montcalm, Muskegon, Newaygo, Oceana, Ottawa, Saginaw, and Shiawassee Co.; Village of Armada (Macomb Co.)	Disaster
4/1/98	Flooding	Alpena Co.	Emergency
7/6/97 7/3/97	Tornadoes, flooding	Genesee, Macomb, Oakland and Wayne Co.; City of Detroit (Wayne Co.); Village of Chesaning (Saginaw Co.)	Disaster
6/27/97	Rainstorms, flooding	Allegan and Ottawa Co.	Disaster
6/26/96 6/21/96	Rainstorms, flooding, tornado	Bay, Lapeer, Saginaw, Sanilac, St. Clair, and Tuscola Co.; City of Midland (Midland Co.)	Disaster
5/22/96	Flooding	Berrien Co.	Disaster
12/13/95	Snowstorm	City of Sault St. Marie (Chippewa Co.)	Emergency
7/8/94	Flooding	Lapeer, Tuscola and Sanilac Co.	Disaster
3/10/94 3/4/94 2/23/94, 2/25/94	Underground freeze	Charlevoix, Cheboygan, Chippewa, Delta, Gogebic, Houghton, Mackinac, Marquette, Ontonagon, and Schoolcraft Co.	Emergency
4/20/93	Flash flood	Shiawassee Co.	Disaster
7/16/92	Heavy rain	Gogebic Co.	Disaster
7/14/92	Tornado	Cass Co.	Disaster
10/6/90	Tornado	Genesee Co.	Disaster
9/16/90	Ship explosion, fire	Bay Co.	Emergency
5/9/90	Wildfire	Crawford Co.	Emergency
6/8/89	Flooding, severe winds	Branch, Kalamazoo and St. Joseph Co.; Village of Manchester (Washtenaw Co.)	Disaster
6/9/88	Fire	City of Corunna (Shiawassee Co.)	Disaster
8/18/87	Airline crash	City of Romulus (Wayne Co.)	Disaster
10/28/86 9/15/86 9/12/86	Flooding, heavy rain	Allegan, Arenac, Bay, Clare, Clinton, Genesee, Gladwin, Gratiot, Huron, Ionia, Isabella, Kent, Lake, Lapeer, Macomb, Manistee, Mason, Mecosta, Midland, Montcalm, Muskegon, Newaygo, Oceana, Osceola, Ottawa, Saginaw, Shiawassee, Tuscola, and Van Buren Co.	Disaster
2/21/86	Great Lakes flooding, wave action	Allegan, Arenac, Bay, Berrien, Grand Traverse, Iosco, Macomb, Marquette, Menominee, Monroe, Muskegon, Ottawa, Saginaw, St. Clair, Tuscola, Van Buren, and Wayne Co.	Disaster
9/13/85	Heavy rain, flash flood	Alcona Co.	Disaster
9/10/85	Heavy rain, flooding	Genesee, Lapeer, and Saginaw Co.	Disaster

**Governor’s Declarations in Michigan: 1977-2019 (cont.)**

<b>Date of Incident</b>	<b>Type of Incident</b>	<b>Affected Area</b>	<b>Type of Declaration**</b>
4/13/85	Great Lakes flooding, wave action	Arenac, Bay, Macomb, Monroe, Saginaw, St. Clair, Tuscola, and Wayne Co.	Disaster
1/15/85	Ice storm	Allegan, Barry, Berrien, Calhoun, Eaton, Genesee, Ingham, Jackson, Kalamazoo, Lapeer, Livingston, Oakland, and Van Buren Co.	Disaster***
7/15/83	Wildfire	Schoolcraft Co.	Disaster
3/19/82	Flooding	Berrien and Monroe Co.	Disaster
7/21/80	Thunderstorms, severe winds	Allegan, Berrien, Calhoun, Cass, Jackson, St. Joseph, Van Buren, Washtenaw, and Wayne Co.; City of Grand Haven and Village of Spring Lake (Ottawa Co.)	Disaster
5/13/80	Tornado	Kalamazoo and Van Buren Co.	Disaster
8/9/78	Sewer main break	Macomb Co.	Disaster
6/30/78	Thunderstorms, severe winds, hail, rain	Berrien Co.	Disaster
6/28/78	Thunderstorms	Allegan Co.	Disaster
1/26/78	Blizzard, snowstorm	Statewide	Disaster
12/10/77	Snowstorm	City of Hamtramck (Wayne Co.)	Disaster
4/6/77	Tornado, severe winds	Clinton, Eaton, Kalamazoo, and Livingston Co.	Disaster
1/28/77	Blizzard	Allegan, Barry, Berrien, Cass, Chippewa, Eaton, Hillsdale, Ionia, Muskegon, Newaygo, Oceana, Ottawa, Sanilac, Shiawassee, and Van Buren Co.	Disaster
<b>Totals for 1977-2019</b>	<b>83 Incidents</b>		<b>52 Disaster Declarations; 31 Emergency Declarations</b>