

## **APPENDIX K: BEST PRACTICES AND LOSS AVOIDANCE STUDIES (DETAILED)**

### **L.1 Loss Avoidance Studies**

#### Gays Mills

Gays Mills has experienced a long history of large flooding disasters over its existence. After its highest ever recorded river crest in 2008, WEM worked closely on a focused campaign to implement acquisition projects in the community. Using \$3.2 million funding from the Hazard Mitigation Grant Program (HMGP), Gays Mills acquired and demolished 35 properties. WEM hired a GIS analyst in 2017 to conduct an initial Loss Avoidance Study replicating methods used and promoted by FEMA. Following another historic river crest in 2018, WEM hired additional GIS analysts to update the study and create additional outreach tools to share

The output was a nearly 50-page Loss Avoidance Study and extensive Story Map showcasing the analysis. After modeling the boundaries and depths of flood events observed in the last eleven years and by using the attributes and locations of the properties acquired and demolished, the total damages avoided were calculated and converted into a return on investment for evaluation. In the case of Gays Mills, WI, there has been an estimated 277% return on investment for mitigation acquisition projects. These efforts have saved federal, state, and local agencies nearly \$6 million. Additionally, a linear regression analysis was conducted to determine if any residential building characteristics had a strong relationship with a structure's return on investment. Evidence suggests that selecting future projects in this community that have a lower first floor elevation may maximize potential return on investment. Overall, mitigation efforts in this community appear to have already been successful in the relatively short time frame in which they have been completed. Furthermore, the return on investment will only increase as years go by and more flood events impact the area.

The rest of the report discussed the project conceptualization and implementation and details the methodology used. Also discussed are the results and an analysis of the output, as well as any potential limitations of the methods used. Finally, the project outcomes are addressed with respect to the original project goals in the conclusion and any research that should potentially be considered for future iterations of this study is discussed.

This report will be available on the newly updated WEM Hazard Mitigation website (at time of plan publishing in November 2021, DMA/WEM website update is being deployed and not live).

#### Kenosha, Jefferson, and Crawford Counties

In 2009 the Loss Avoidance Study: Wisconsin Property Acquisition and Structure Demolition was completed for three frequently flooded rivers in Wisconsin: the Fox River in Kenosha County, the Rock River in Jefferson County, and the Kickapoo River in Crawford County. Each county had

acquired flood-prone structures after previous significant flood events. To calculate losses avoided through mitigation actions, a formula was used based on actual flood events that occurred after the acquisitions and previous flood damages including physical losses, losses of function, and emergency management costs. The return on investment (ROI) was calculated using the losses avoided and the project costs. The results were encouraging.

The Fox River floods at least once a year and sometimes two or three times in a year. Between 1993 and 2003, five local emergency declarations were issued for the Fox River floodplain. With the emergency declaration of May 2004, when the Fox River again overflowed its banks, many fewer homes and residents were at risk because over that ten year period, 56 property owners had participated in the Fox River Flood Mitigation Program, administered by the Kenosha County Housing Authority, with staff support provided by the Southeastern Wisconsin Regional Planning Commission. Damages were averted where mitigation measures had been undertaken. By 2008, 75 flood-prone properties had been acquired along the Fox River using HMGP, FMA, PDM, and CDBG funds. Between 1996 and 2009, the ROI for the acquisitions was 102%.

Blackhawk Island, at the mouth of the Rock River, in Jefferson County is another area that is plagued with annual flooding. The Island is a peninsula surrounded on either side by Lake Koshkonong and Mud Lake. When the lakes swell, the two bodies of water merge into one, covering the low-lying areas of the peninsula. The road on the Island becomes submerged, and as the water rises it flows into homes. After the Great Flood of 1993, the County applied for and received HMGP funds to implement their Flood Mitigation Buyout Program. Along with HMGP, the County has utilized FMA funds, CDBG funds, and grant funds from the Department of Natural Resources to continue to acquire structures on and near Blackhawk Island. By 2008, 35 properties had been acquired and demolished. Between 1993 and 2009, the ROI for Jefferson County's program was 107%. Since the area experiences flooding annually, the ROI has certainly increased since 2008 and will continue to do so in the future.

Crawford County has also been active in flood mitigation. The Kickapoo River floods regularly and has caused damage to numerous buildings in several Crawford County villages. Of particular concern to County officials was the Crawford County Highway Shop. Whenever the Shop flooded, the staff could not access equipment. This was a significant problem because the staff performs many duties during flood events including the following: floodwater rescues, closing roads, building temporary dikes, and constructing safety devices. In 2002, Crawford County utilized HMGP funds to relocate the facility to higher ground. Although it was an expensive project, the ROI was calculated to be 592% after only two flood events (2007 and 2008). This mitigation project can certainly be considered a success.

#### *Milwaukee County*

In 2010, a loss avoidance study of acquisition projects in Milwaukee County was compiled titled Evaluating Losses Avoided through Acquisition Projects. WEM requested a report with a methodology that could easily be replicated. The study included properties mitigated in

Wauwatosa, Milwaukee, Brown Deer, and Oak Creek. FEMA used their Hazus and BCA<sup>1</sup> software programs to determine losses avoided due to mitigation actions.

In 1998 and 1999, the City of Wauwatosa, using HMGP and CDBG funds, acquired and demolished 23 floodway structures in the Valley Park area along the Menomonee River. Calculated for individual properties, the ROIs ranged from 35% to 143% with an average of 77%. This may seem low, but the computations were done for only one potential flood event. The Menomonee River at Wauwatosa has experienced five historic crests since August 1998. Clearly, considerable losses have been avoided as a result of this project.

The Lincoln Creek area in the City of Milwaukee experienced over 4,000 flood events between 1960 and 1997. It was targeted for mitigation activity prior to the June 1997 flood. Using HMGP funds from the 1997 flood, WEM and the City of Milwaukee worked together to acquire and demolish 21 properties. The Milwaukee Metropolitan Sewerage District (MMSD) also completed a flood mitigation project in the area involving two detention basins and channel modifications. The area was remapped after the MMSD project, so only six of the mitigated properties remained in the floodplain. The ROIs for these six properties ranged from 28.7% to 35.0% with an average of 31.7%. These figures were again calculated for only one potential flood event.

After Root River flooding in May and July 2000, a repetitive loss property in the City of Oak Creek was determined to be uninhabitable. Without mitigation, the property would continue to incur damages and have flood insurance claims paid. WEM and the City used HMGP funds to purchase and demolish the structure. The ROI calculated by FEMA for one potential flood event was 61%.

After devastating floods in 1997 and 1998, the Village of Brown Deer initiated an acquisition and demolition project for nine repetitive loss properties along South Branch Creek using HMGP and CDBG funds. The ROIs for the properties ranged from 42.0% to 52.4% with an average of 45.8%. Again, the ROIs were calculated for only one flood event and would be much greater if several events occurred. After the project was completed, MMSD used the acquired properties to create a detention basin along the South Branch Creek which has helped mitigate flood damage in much of the County. The benefits from the detention basin are not included in the loss avoidance calculation.

Evaluation of the benefits of a mitigation project really cannot be documented until the area of the project is impacted by another similar disaster. The following method will be used after an event has occurred:

- Identify whether a previous mitigation project has been implemented in the affected area. This could include mitigation measures such as acquisition and demolition, elevation, floodproofing, reinforcement of structures, safe room construction, protection

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<sup>1</sup> Hazus is a GIS-based program developed by FEMA for estimating losses from natural hazards; BCA stands for Benefit-Cost Analysis.

of utilities, retention and detention ponds, stormwater projects, or other structural measures to protect property and infrastructure.

- If so, contact local officials to solicit information about the effectiveness of the mitigation measures and the impact of the event in the project area.
- Identify what data is available to support a loss avoidance study or best practices story. This could include pictures, newspaper articles, flood levels, damages to mitigated and unmitigated structures, etc.
- Using the above documentation as well as information on mitigated properties such as past damages and benefit-cost analysis inputs, begin to identify if there is sufficient data to complete a loss avoidance study.

For acquisition projects the following is one method that can be utilized to document loss avoidance if there is adequate data available:

#### Phase 1: Data Collection

- Evaluate available data for inclusion in the study.
  - Address
  - Structure and content values
  - Project costs
  - FIS reports – specific event data
  - Acquisition date
  - Stream gauge data – depth and/or stream flow
  - Insurance payout data

#### Phase 2: Analysis

- Establish the values of structure and contents potentially at risk during an event.
- Establish which event(s) occurring after the completion of an acquisition project would have affected the acquisition properties.
- Establish the level of damages associated with the event(s) above.
- HAZUS-MH analysis: Used in the event of incomplete or inadequate data for either the events or property. Using the current state provided flood boundary, a HAZUS-MH model can be run for a typical 100-year flood event. This process will produce an estimated damage projection for each property.

#### Phase 3: Reporting

- The reporting phase involves taking the damage curves established in the analysis phase and applying them to the potential loss values established.
- The results would then be applied to the cost of the acquisition to determine a return on investment.

- Additional reporting on the presence of location maps for properties and stream gauges if available offers background to support conclusions.

If there is not sufficient data to support a loss avoidance study, best practices or success stories could be developed that would encourage communities and individuals to develop hazard mitigation strategies and implement mitigation measures to reduce or eliminate future disaster losses.

## **L.2 Other Mitigation Successes**

### ***GIS Story Maps***

#### *Gays Mills Story Map*

In 2020 WEM hired two GIS analysts to research and create a story map featuring the Village of Gays Mills. Gays Mills has experienced 34 “action stage” flood events since 1950 and has received funding for mitigation measures under five federally declared disasters. Initial mitigation measures included elevation of 17 properties, however back-to-back flooding events made it clear that acquisition demolition would be a more effective mitigation project for this community. Additionally, information from the Loss Avoidance Study indicated that mitigation projects from 2007-2018 had an estimated 533% return on investment. Due to the location of the community, Gays Mills will inevitably need to continue flood mitigation projects to protect their residents. This story map showcases the need for each community to understand their flood risk so that they can continue to be resilient. This [story map](#) was published to the public on March 31, 2021.

#### *Rock Springs Story Map*

After completing the first story map, WEM’s GIS analysts wanted to tackle a new location. The Village of Rock Springs, formally known as Ableman, is a prime location for rising waters. It’s located at the merging of two rivers and receives much of its flood water from northern counties including Monroe, Vernon, and Juneau County. In the most recent flood, the Baraboo River experienced a historic crest of 28.73 feet and damaged about 26 residences and 7 businesses. The Rock Springs Memorial Community Center was one of the buildings damaged and its effects devastated the community. The building housed the library, community center, village hall, and Department of Public Works and experienced over 7 feet of flood water. Although this building was repaired in 2008, it was struck again in 2018. It is currently in the process of being acquired and demolished under the HMGP; however, the Village has decided to keep portions of the historic building in a re-use project that would use some green space to create an outdoor pavilion. Our GIS analysts shared this story with other local communities and stakeholders even before it was published in August 2021. This has generated great interest from local communities, and we’ve received requests to create more story maps to show the history of flooding in these small communities, as well as their ability to mitigate and adapt

under the harsh circumstances of flooding. Find additional information in the ["Road to Recovery" story map](#).

### ***FEMA Best Practice Library***

Many mitigation projects in Wisconsin have been profiled by FEMA as "best practices." Below are descriptions of recent best practices projects that represent a variety of mitigation action types. Following the descriptions in Table 6.5.2-1 are the other mitigation best practices projects in Wisconsin. The full-length best practices articles can be found on [FEMA's website](#). Success stories will continue to be developed for future events to demonstrate the success and economic benefits of effective mitigation measures.

#### *Town of Lakeside*

A couple purchased a home in 1991 next to a small stream. In 2000 there was a tremendous amount of snow and the in-laws mentioned the potential for spring flooding. The couple purchased flood insurance which included an ICC (Increase of Compliance) clause that could provide up to \$30,000 to bring structures into compliance with local floodplain regulations in the event the structure was substantially damaged from a flood. Only months later the Amnicon River did exceed its banks backing up the small stream where they lived causing substantial damage to the structure. Since the damage exceeded 50% of the equalized assessed value, the home was considered substantially damaged and the ICC clause went into effect. Since the structure was located in the floodway, the only option was to demolish the structure. Douglas County applied to WEM for a grant through the Hazard Mitigation Grant Program to acquire and demolish the structure. ICC provided the cost for demolition, reducing the County's local share for the grant. If the property owners had not participated in the buyout program, their former home would have been flooded again in 2012 when three severe floods occurred in the area between May and June.

#### *Village of Oliver*

In August 2002 several homes in the Village of Oliver was experiencing earth mass-movement referred to as a "slump", which is common in the area, put several structures in imminent danger. The ground failure was due in part of an underlay of red clay, which contains significant amount of mineral, smectite. Smectite absorbs water and expands to many times its original volume, shrinking back again when it dries. This contributes to the instability of the red clay especially when saturated. The spring and summer of 2012 the area received a lot of rain which added to the weight. The water also acted as a lubricant which facilitated down-slope movement. Through WEM, the Village received funds through the Hazard Mitigation Grant Program to acquire and demolish three structures that were in imminent danger from ground failure. In June 2012 a severe storm occurred in Oliver which caused extensive flooding throughout the area and led to a federal disaster declaration. The same three properties purchased by mitigation funds experienced further slumping. By previously acquiring the three properties, additional losses were avoided.

City of Superior

In 1999, a 100-year storm inundated the city with more than five inches of rain in two hours and caused extensive damages. The City received a Hazard Mitigation Program grant to construct a stormwater detention basin and a 7,000 foot storm water interceptor sewer to connect to the existing storm sewer system. HMGP funded the storm sewer interceptor sewer. The project was determined a success after significant flooding occurred in October 2005. Officials estimated that 284 structures, both residential and commercial benefited from the project with an estimated \$1.42 million in damages avoided. In 2009 the City constructed a 3,000 foot storm water inceptor sewer t connect to the previous project with funds provided by the American Recovery and Reinvestment Act. The mitigation efforts were again tested in June 2012 when a severe thunderstorm dropped 8 to 10 inches of rain over the Superior area resulting in flash flooding. Public Works officials estimated that prior to the completion of the project, a storm of that magnitude would have yielded about 150 calls, but they only received 15 reports of flooded basements.

Town of Clover

The Town of Clover is located near Lake Superior in Northern Wisconsin, and experiences periods of seasonal flooding each year, particularly on Nicoletti Road, a town roadway located on an unnamed perennial tributary to Lake Superior, locally referred to as "Horseshoe Creek." Clay soil near Lake Superior limits infiltration, resulting in large volumes of stormwater runoff during heavy rain events. This runoff, as well as snow melt in the spring, regularly flooded the wetlands and waterways near Nicoletti Road, rendering it and other area roads impassable during any rain event of 2 inches or greater (approximately a 1-year storm). The section of the roadway near the Horseshoe Creek culvert was particularly prone to washing out, requiring repeated annual repairs. Because the culvert was not large enough to allow the flow from a 1-year storm to pass through, the wetland area upstream would overflow and inundate nearby Bark Bay Road as well. Flooded roads routinely presented public safety threats by endangering drivers and creating obstacles to EMS and fire response in the area. Washouts also carried gravel and sediment from the roadways to the wetlands, estuary, and lake within the Bark Bay Slough Natural Area. In 2013, the Town of Clover applied for funding under FEMA's Hazard Mitigation Grant Program (HMGP) to install a large culvert in Horseshoe Creek at Nicoletti Road. The grant was awarded in 2014, and the project was completed in October 2015. During the July 11-12, 2016, storms, three to four inches of rain fell on the Town of Clover in a 24-hour period (approximately a 5- or 10-year storm). Many roads and culverts in the area washed out, including part of Nicoletti Road to the east of the culvert mitigation project. At this point of the road, 11 streams from the hills to the south drain into a ditch on the south side of the roadway. During the storms, this ditch filled beyond its capacity and overtopped Nicoletti Road, resulting in a quarter mile of roadbed erosion and subsequent closure of the road. However, the road damage stopped short of the culvert mitigation project; the upsized culvert was able to handle the runoff from this event, and Nicoletti Road at Horseshoe Creek held.

Bayfield County

Bayfield County, Wisconsin is located on the shores of Lake Superior in Northwestern Wisconsin. A 65-person staff provides services to the County's 15,000 residents from the Bayfield County Courthouse in the City of Washburn. In the past, the courthouse experienced power outages at least five times each year, ranging in duration from a few minutes to several hours on average. Originally, the sole back-up power source was the Uninterruptible Power Supply (UPS), which only provided short-term back-up power to individual electronics. This left the HVAC system and power to the county offices, county telephone system, county vehicle fueling station, and cooling system for phone and computer equipment unprotected in the event of an outage. In 2013, Bayfield County submitted an application for funding for a 200 kW generator under the Hazard Mitigation Grant Program. The grant was awarded in August 2013, and the generator installation was completed in October 2014. On July 11-12, 2016 northwestern Wisconsin was ravaged by multiple rounds of severe thunderstorms, including heavy rains, high winds, and extensive flooding. While County and local first responders worked to cope with damage to roads, harbors, homes, and businesses, another round of storms on July 21 caused thousands of power outages across Bayfield County and the surrounding area, including the County courthouse and jail. The outages also coincided with one of the hottest days of the year, with temperatures reaching over 90°F. Although the courthouse lost power, the generator provided back-up power until electricity was restored on the 22<sup>nd</sup>. This allowed County staff to continue providing essential emergency response services during the outage, including using the courthouse as a cooling and equipment charging center for Bayfield County residents without power.

**Table 6.5.2-1: Wisconsin Mitigation Best Practices Articles**

<b>Year</b>	<b>Project Type</b>	<b>Municipality</b>	<b>County</b>	<b>Title</b>
1978-1983	Flood control; Floodproofing; Relocation	Soldiers Grove, Village	Crawford	Village Locals Reflect: Moving Was Best Flood Protection
1978-1983	Flood Control; Floodproofing; Relocation	Soldiers Grove, Village	Crawford	Small Wisconsin Village Leads the Nation: Rebuilds Above Floodwaters
1993-ongoing	Acquisition/Buyouts; Flood Control; Retrofitting, Structural	Darlington, City	Lafayette	Multiple Mitigation Measures Give Darlington and Elevating Experience
1994-97	Acquisition/Buyouts; Elevation, Structural; Flood Control	Black River Falls, City	Jackson	Freeboard Saves Town from Additional Flood Losses
1993-ongoing	Floodproofing	Darlington, City of	Lafayette	Mitigation Leads to Preservation and Economic Recovery for One Community
1994-98	Acquisition/Buyouts	Eau Claire, City	Eau Claire	City of Eau Claire: Acquisition

State of Wisconsin Hazard Mitigation Plan

<b>Year</b>	<b>Project Type</b>	<b>Municipality</b>	<b>County</b>	<b>Title</b>
1994-ongoing	Acquisition/Buyouts; Building Codes	Kenosha County	Kenosha	Moving People Out of Harm's Way
1994-ongoing	Acquisition/Buyouts	Kenosha County	Kenosha	Fighting Floods, Saving Property and Protecting Lives in Kenosha
1994-ongoing	Acquisition/Buyouts	Jefferson County	Jefferson	Program Cooperation Alleviates Repetitive Flooding Burden
1994-1997	Acquisition/Buyouts	Trenton Island	Pierce	Mitigation Success, Trenton Island
1996-97	Acquisition/Buyouts	Trenton Island	Pierce	Floodways and Wetlands of the Mighty Mississippi: Trenton Island, Wisconsin
1996-97	Education/Outreach/ Public Awareness; Land Use/Planning	Wisconsin State	All	Wisconsin Mitigation Video: An Education and Training Tool
1996-98	Acquisition/Buyouts	Oakfield, Village	Fond du Lac	New School Building Hardened Against the Wind
1997-ongoing	Education/Outreach/ Public Awareness	Milwaukee County	Milwaukee	The Dry Facts: Protecting Homes From Damage
1997-ongoing	Acquisition/Buyouts; Floodproofing; Land Use/Planning	Darlington, City	Lafayette	City of Darlington Honored: Acquisition and Floodproofing
1998-2001	Acquisition/Buyouts; Flood Control	Brown Deer, Village	Milwaukee	Detention Ponds, Not Homes, Played Host to Recent Flood Event
1998-2001	Acquisition/Buyouts	Wauwatosa, City	Milwaukee	Acquisition Project Proves Beneficial as Safety Measure and Recreational Avenue
1999-2006	Acquisition/Buyouts; Elevation, Structural; Flood Control	Elm Grove, Village	Waukesha	Small Village Executes Large Mitigation Project
2001	Education/Outreach/ Public Awareness	Milwaukee County	Milwaukee	Community Outreach: Milwaukee County at the Wisconsin State Fair
2001-03	Flood Control; Floodproofing; Relocation	Crawford County	Crawford	Moving Highway Shop Improves Disaster Response
2003	Warning Systems	Portage County	Portage	Enabling Residents to Hear and Heed Severe Weather Warnings
2004	Storm Shelters	Juneau County	Juneau	Providing Shelter from the Storm
2005	Flood Control	Cambria, Village	Columbia	Mitigation Project Reunites a Town Divided

*State of Wisconsin Hazard Mitigation Plan*

<b>Year</b>	<b>Project Type</b>	<b>Municipality</b>	<b>County</b>	<b>Title</b>
2005-ongoing	Flood Control	Monroe, City	Green	Pulling the Plug on Monroe's Water Problems
2005-ongoing	HAZUS-MH	Wisconsin State	All	Wisconsin Emergency Management-HAZUS Used to Evaluate Flood Risk and Losses
2006-10	Flood Control	Thiensville, Village	Ozaukee	Village of Thiensville Channelization Project
2007-08	Elevation, Structural	Gays Mills, Village	Crawford	Higher and Drier in Wisconsin
2008-10	Mitigation Planning	Clark County	Clark	Teamwork Gives Rise to a Comprehensive All-hazards mitigation Plan
2012	Acquisition/Buyouts	Lakeside	Douglas	When a Homeowner's Dream Becomes a Flooding Nightmare ... Flood Insurance Comes to the Rescue
2012	Acquisition/Buyouts	Oliver	Douglas	Slump Forces Owners out of Home
2012	Flood Control	Superior	Douglas	Improved Sewer System Prevents Damages
2012-2016	Generator	Bayfield County	Bayfield	Generator Keeps the Lights on at the Bayfield County Courthouse
2012-2016	Culvert	Clover	Bayfield	Mitigation Prevents Road Damage in the Town of Clover

### **L.3 Mitigation Successes with Other State Agencies**

The totals in the table above do not reflect the mitigation efforts undertaken by other agencies and local governments. The Department of Commerce (now the Department of Administration) through Community Development Block Grant (CDBG) funds has provided mitigation assistance to many communities by acquiring and demolishing numerous floodplain properties (see Appendix C). Notable mitigation successes using this funding strategy include Kenosha and Jefferson counties, the villages of Gays Mills and Rock Springs, and the Town of Spring Green.

Kenosha County has purchased or is in the process of purchasing 108 properties along the Fox River in the towns of Salem and Wheatland and in the Village of Silver Lake. These acquisitions were made using CDBG funds as well as HMGP, FMA, and PDM funds. The County's mitigation goal is to acquire and demolish up to 160 flood-prone properties, as funds become available.

Another example of successful flood mitigation is the Rock River/Lake Koshkonong area in Jefferson County. In addition to CDBG, HMGP, and FMA funds, the county received Urban Rivers Grant Program funds through the Department of Natural Resources. These funds combined have enabled the county to purchase 115 properties, many of which were in the floodway. Both counties continue to apply for funding to reach their mitigation goals.

There are also mitigation projects occurring in Wisconsin through local initiatives using mostly local funding. The Milwaukee Metropolitan Sewerage District (MMSD) has been implementing a floodplain and stormwater management strategy for over fifteen years. Their strategy involves engineered flood management structures and acquisition to protect structures that are vulnerable to a 1% probability flood according to flood hazard models. Through their Flood Management Program they have completed several projects including the County Grounds (\$90 million,) Hart Park (\$48 million,) Kinnickinnic River, Valley Park (\$12 million) and Lincoln Creek (\$120 million) with two more projects underway; Menomonee Concrete Removal (\$5.4 million) and Western Milwaukee (<http://www.mmsd.com/floodmanagement/>). The projects have reduced flood damages to thousands of homes and to public infrastructure as well as provided environmental and recreational benefits. MMSD's Greenseams program helps prevent future flooding and water pollution. Greenseams is an innovative flood management program that permanently protects key lands contains water-absorbing soils. The program makes voluntary purchases of undeveloped privately-owned properties in areas expected to have major growth in the next 20 years and open space along streams, shorelines, and wetlands. All land acquired will remain undeveloped. Wetland maintenance and restoration at these sites will provide further water storage. Another benefit of the program is that it also preserves wildlife habitat and creates recreational opportunities for the people living in the area.

One of the more well-known mitigation projects was the relocation of Soldiers Grove. The Village experienced flooding in 1907, 1912, 1917, 1935, 1951, the "big one" in 1978, and lesser floods after that. The August 2007 and June 2008 floods were some of the biggest floods to hit the Village. The Village began to debate about what to do about the flooding in the mid-60's when the construction of a dam was considered. In 1975 a relocation coordinator was hired, and in 1976 the Village passed a resolution that supported relocation to avoid future flood damages.

After the 1978 flood Village officials convinced state and federal officials that moving the town was the best floodproofing. By 1983 the project costing \$6 million in public funds was completed. The Soldiers Grove central riverside municipal park and campgrounds stand where the downtown once stood. The park received little damage in 2007, however, was substantially damaged in the 2008 event. It is not hard to imagine the devastation that would have occurred if the downtown had not relocated. The Solar Village uphill was unscathed. At the time of the Soldiers Grove relocation, there were no FEMA mitigation programs available. The relocation was completed through various funding sources and from several state and federal agencies all working together in a partnership over a period of years. As a result of the 2007 disaster, the Village received HMGP funds to elevate four structures and acquire another.

The Village of Gays Mills is the next town downstream of Soldiers Grove. Like Soldiers Grove it has experienced the same flooding over the years. However, unlike Soldiers Grove the Village had not relocated to higher ground. The Village was struck by back-to-back floods in August 2007 and June 2008, both greater than 500-year flood events which resulted in substantial losses within the Village. As a result of the federal declaration in 2008, the Long-Term Community Recovery (LTCR) was activated, which integrated assistance from state and federal partners to address recovery needs for the Village. Through many community meetings a Long Term Recovery Plan was completed. The Village considered several alternatives and partial relocation was selected.

The Village developed two sites north of downtown as relocation sites. The site known as North Mills contains both commercial and residential uses. The Village constructed a mercantile center for business relocation as well as a new Community Commerce Center that houses the village hall, library and community center with a commercial community kitchen. Single and multiple family housing were also constructed at the site as well as other commercial properties. A second site north of North Mills was developed and the EMS and Public Works Department relocated to that site. The Village would like to build a new fire department at the location and hopes to attract additional businesses.

The Wisconsin Hazard Mitigation Team through the Wisconsin Recovery Task Force worked together to assist the Village in reaching its goals. Multiple agencies and funding sources were utilized in the Village's recovery efforts. Funding was provided through the HMGP for acquisition/demolition and elevation. The Economic Development Administration provided funding for the infrastructure in the commercial area. Community Development Block Grant (CDBG) funding was provided by the state Department of Commerce (now provided by the Department of Administration) for the local match to the HMGP and for the Community Commerce Center. The state Department of Transportation provided funding for highway improvements at the relocation site. Coulee CAP (Community Action Program) provided financing and sponsorship of the multi-family housing units, and USDA Rural Development assisted low-income and elderly population with housing needs. The state Department of Health Services provided Social Service Block Grant (SSBG) to assist homeowners whose income exceeded the LMI requirements of the CDBG program, and funded a Flood Recovery Coordinator. In addition, there were private investments. The Kickapoo River in the Village once

again exceeded its bank from rains that occurred on September 21-22, 2016. Flood damages were significantly reduced by the mitigation actions implemented after 2008.

The Community Development Block Grant-Emergency Assistance Program (CDBG-EAP) is administered by the Wisconsin Department of Administration. CDBG-EAP funds are used to assist local units of government in addressing emergency housing, public facility, infrastructure, and business assistance needs that occur as a result of natural or manmade disasters. Such assistance may include, but is not limited to, housing rehabilitation, acquisition/demolition, housing replacement, road repairs, stormwater drainage, and public facilities. A local unit of government interested in applying for CDBG-EAP funds must do so within 90 days of the disaster event.

CDBG-EAP funds may be used to address damage caused by the disaster, including repair of disaster-related damage to the dwelling unit, including repair or replacement of plumbing, heating, and electrical systems; acquisition and demolition of dwellings unable to be repaired; down payment and closing cost assistance for the purchase of replacement dwellings (assistance is limited to 50% of the pre-disaster equalized assessed value); publicly-owned utility system repairs; streets and sidewalks; and community centers.

The DOA is a major partner to WEM after disaster events. The CDBG-EAP programs can assist in mitigating damages after a disaster, and staff works closely with WEM through the WSJHMT as well as the WRTF. The funds can be used to acquire and demolish or elevate structures damaged by floods. CDBG has provided the local match on many HMA projects. Without those funds, communities would not have been able to implement their mitigation projects. After the 2008 floods, CDBG-EAP funds provided the local match on all of the HMGP grants, and provided additional funds to assist communities in their recovery efforts. They are especially instrumental in non-declared events, as they may be the only source of funding for recovery activities after an event. WEM coordinated with DOA in developing proposals for the HUD National Disaster Resiliency Competition. Appendix C identifies projects completed with CDBG-EAP funding.

As a part of the state hazard mitigation effort, WEM maintains close coordination with the Department of Natural Resources (DNR). The DNR, as the state's lead floodplain management agency, plays a key role in providing technical assistance for mitigation programs and in developing the hazard mitigation action plan in flood disasters. The DNR administers the Municipal Flood Control program as defined by Ch. NR 199, Wisconsin Administrative Code. The program helps local governments minimize flooding and flood-related damages through various types of projects. Projects shall minimize harm to existing beneficial functions of water bodies and wetlands, maintain natural aquatic and riparian environments, use stormwater detention and retention structures and natural storage to the greatest extent possible, and provide opportunities for public access to water bodies and to the floodplain. The program provides grants to cities, villages, towns, tribes, and metropolitan sewerage districts for projects such as property acquisition and removal of structures for permanent open space or flood water storage; acquisition of vacant land or flood water flowage easement to facilitate more efficient flood flows to the water body; floodproofing and flood elevation of public and private structures; flood water control detention ponds; riparian restoration project on a watercourse;

and flood mapping. The grants are offered every other year with the application date usually in the spring of even years. The state share may not be greater than 50% of the eligible project cost and no single recipient can receive more than 20% of the funding available. Since the goals of the program are very similar to the HMA programs, DNR and WEM work closely in funding mitigation projects particularly acquisition and demolition of floodplain properties. Since the program is state funds, it can be used as local match to the HMA programs, and vice versa. The two agencies coordinate together to stretch the limited available dollars to fund as many eligible projects as possible. Appendix C identifies projects funded and completed through the DNR Municipal Flood Control program.

The Disaster Damage Aids (DDA) program provides financial assistance to local governments to repair any highway under its jurisdiction which is not part of the State Trunk Highway system and that has had significant damage caused by a disaster event. The program is governed by §86.34, Wisconsin Statutes. Funds may be used to repair a highway to match its pre-disaster condition (replacement) and to make changes to a highway, its drainage facilities, etc., to prevent similar damage from occurring in the future (improvements). The applicant pays a share of these replacement and improvement costs. DDA is a biennial program with annual appropriation levels. It is categorized as a sum sufficient appropriation which means if further funding is needed it can be allocated in the amounts necessary. The DDA becomes the primary source of funding for road repairs and improvements (mitigation) after a disaster when there is no federal declaration.

In a federal declaration, the FEMA Public Assistance program provides financial assistance to state, tribal, and local governments, and certain private non-profit organizations (PNPs). Through the PA program, FEMA provides supplemental federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly-owned facilities and the facilities of certain PNPs. The PA program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process (Section 406). The WEM Mitigation staff works closely with the state PA staff and State Coordinating Officer in identifying and pursuing mitigation opportunities through Section 406 of the PA Program. The federal share of assistance is not less than 75% of the eligible cost for emergency measures and permanent restoration. The state through WEM will provide up to 12.5% of the local match.

At a WHMT meeting on December 4, 2012, USGS made a presentation on Flood Inundation Mapping. The USGS gauges and NWS flood warning locations in AHPS play a critical role in development of the product. Inundation maps translate flood data (flood gauge information) into operational data (inundation maps) that can communicate risk and consequences of forecasted flooding. Utilizing stream gauge information, hydraulic modeling is conducted which is then intersected with LiDAR elevation information to create the map library. You can then combine the map library with the USGS streamflow data and NWS flood forecast information to create a flood inundation map. The product does not show the FEMA floodplain map as that is a regulatory product and USGS is a non-regulatory agency. It can be a great tool for not only emergency preparedness and response, but also communicating risk to the public. WEM looked

at funding this type of project through the HMGP after the 2008 floods, but was advised that it was not an eligible activity. Identifying funding was an issue.

After that WHMT meeting, WEM, DNR, and USGS met to discuss the possibility of trying to fund a pilot study in Wisconsin. Due to flood risk, LiDAR, flood modeling and past mitigation activities, the group selected the Rock River for a potential pilot project. In February 2013, the USACE put a call out for proposals for the Flood Risk Management program with the proposals due in April. A proposal developed by WEM, DNR, USGS, USACE, and NWS for flood inundation mapping for five stretches consisting of 38 miles on the Rock River was submitted. The proposal was shared with all of the stakeholders at a meeting in April 2013. Stakeholders consisted of officials from Dodge, Jefferson, and Rock counties; Department of Transportation; Department of Administration; Wisconsin Economic Development Corporation; US Army Corps of Engineers; National Weather Service; Association of State Floodplain Managers; FEMA; USGS; DNR; and WEM. The state was notified in April 2014 that the project was selected.

The majority of the work was completed by the DNR and USACE. The maps were completed and went live on the NWS website in August 2015. The final product was presented to the stakeholders. In addition, a press release was issued and the DNR developed a tutorial video. The counties put a link to the maps on their webpages. In addition, the product was presented at several forums including the Wetlands, Wildlife Habitat and Flood Hazards in the Rock River Basin webinar series; Wisconsin Association for Floodplain, Stormwater and Coastal Management annual conference; WEM's annual All-Hands Meeting with all of the county and tribal emergency management directors in the state; and the Annual Governor's Conference on Emergency Management and Homeland Security. The promotion of the maps has generated a great deal of interest.

As a result of the effort, the DNR is presently developing flood inundation maps for the Upper Fox River in Racine and Kenosha Counties. WEM and the DNR will be developing a strategy for developing additional flood inundation maps throughout the state.

With the success of obtaining funding through the USACE Flood Risk Management program, WEM, DNR, USACE, and Columbia County developed and submitted a proposal in April 2014 to develop a floodplain structure inventory on the Wisconsin River in Columbia County. The state was notified in December 2014 that the project had been selected. A meeting was held with WEM, DNR, USACE, and Columbia County in February 2015 to discuss the scope of the project. That meeting was followed by a meeting with the local stakeholders in March. A Fact Sheet and Press Release were developed for the project. The USACE completed the field work over the summer and presented a draft report in December 2015. The USACE provided a presentation and the final report at a meeting in August 2016. Due to funds remaining in the project, the group has requested additional work on the project, in addition to completing a flood inundation map for the river gauge in the City of Portage.

## **L.4 Wisconsin Recovery Task Force After 2008 Floods**

It was obvious early in the administration of the 2008 flood declaration that additional outside resources would be required to assist the state and its communities in the recovery. Upon direction of Governor Doyle, WEM created the Wisconsin Recovery Task Force (WRTF) to assist individuals, businesses, and communities to recover quickly, safely, and with more resilience from future disasters. Six subcommittees were formed with a focus on mitigation, agriculture, business, housing, human needs, and infrastructure. The WRTF was comprised of many state and federal agencies. The primary goal of the WRTF was to identify the unmet needs of the communities and citizens of Wisconsin. The WRTF met bi-weekly. One of the outcomes from the report submitted to the Governor was that the WRTF be a standing task force and meet semi-annually to ensure preparedness and facilitate effective operational readiness following a disaster.

The Wisconsin Hazard Mitigation Team (WHMT) played an integral part in identifying the key players that comprise the WRTF. Many of the WHMT members actively participated in and led WRTF subgroups. Without the WHMT, it is very likely that the WRTF would not have been created and activated as quickly as it was.

The State Hazard Mitigation Officer was assigned to chair the Mitigation Subcommittee. The Subcommittee consisted of 11 state agencies (all which were members of the WHMT); seven federal agencies (five of which were members of the WHMT); and five other organizations (four of which were members of the WHMT). The mission of the committee was to "[a]ssist communities during the recovery process to make their communities more disaster resistant." The goals of the committee were based on the goals of the State of Wisconsin Hazard Mitigation Plan and were identified as:

1. Minimize human, economic, and environmental disruption from natural hazards.
2. Improve the disaster resistance of buildings, structures, and infrastructure, whether new construction, expansion, or renovation.
3. Support and assist the intergovernmental coordination and cooperation among the federal, state, and local agencies regarding hazard mitigation activities.

The Subcommittee identified challenges, issues, and roadblocks that the State and communities faced during the recovery process. They included:

1. Communities lack capability (resources and staff) to develop and implement long-term mitigation solutions to reduce future flooding.
2. NFIP sanctioned and non-participating communities are not eligible for FEMA mitigation funding.
3. Lack of funding to complete identified mitigation and recovery needs, particularly the lack of funds for local match required for various grants.

4. Lack of resources to develop good, well-thought out project applications to obtain federal and state funding to implement viable and necessary mitigation and recovery projects.
5. Potential contamination of project sites could delay the actual implementation and funding of projects.

In addition, FEMA activated Emergency Support Function (ESF) 14 for the declaration. ESF 14 provided support for to the state for long-term recovery by assisting the WRTF, and in developing a Long Term Recovery Plan for the Village of Gays Mills. In addition, they worked with the Village of Rock Springs and developed the Rock Springs Flood Recovery Report to address recovery issues in that community. The information gathered from these planning efforts also assisted with the recovery in other impacted communities.

Two additional reports were completed (Hydrogeological and NFIP Interpretations of Terrace Flooding Northwest of Spring Green, Wisconsin and Possible Mitigation; and Flooding Conditions at Clark Creek and Possible Mitigation) were completed to address flooding in the towns of Spring Green and Greenfield in Sauk County.

The US Geological Survey developed flood-peak inundation maps and water-surface profiles for nine communities along the Baraboo, Kickapoo, Crawfish, and Rock Rivers in GIS by combining flood high-water marks with available 1-10-meter resolution digital elevation model data. The high-water marks were those surveyed during the flood by communities, counties, and federal agencies and hundreds of additional marks surveyed by the USGS. The flood maps and profiles outline the extent and depth of flooding through the communities and are being used in recovery efforts. The information also provides documentation for future loss avoidance studies in Gays Mills and Jefferson County.

The Subcommittee worked together to identify needs and match the needs with the appropriate agency and funding source(s). In addition, members worked together to try and package funding where possible. As a result of this Subcommittee and the Wisconsin Hazard Mitigation Team, the Department of Commerce committed Community Development Block Grant funds to cover the 12.5% local match to the Hazard Mitigation Grant Program subgrants. This provided 100% funding to those communities implementing buyout and elevation projects.

One of the goals of the Short- and Long-Term Recovery Committee of the Comprehensive Response Work Group was to reconvene the WRTF as a standing task force as identified in the 2008 WRTF report. Based on the National Disaster Recovery Framework, the subcommittees of the original WRTF were realigned to more closely match those in the national Recovery Support Functions (RSF). The six RSF Subcommittees are identified as: Economic, Health and Social Services, Housing, Infrastructure, Agriculture, and Mitigation. Due to the unique recovery issues associated with a radiological incident at the nuclear power plants, a Radiological Emergency Preparedness (REP) Recovery Ad Hoc Working Group was established under the Agriculture RSF Subcommittee. Chairs were identified for the RSF Subcommittees and a meeting was held in February 2015. The Chairs identified members for their subcommittees and a WTRF meeting was

held in April 2015. The SHMO chairs the RSF Mitigation Subcommittee with membership consisting of the WSJHMT. Two of the several tasks identified for the WRTF were 1) to develop a State Recovery Plan; and 2) to develop Rapid Assessment Strike Teams (RASTs). The individual RSF Subcommittees met throughout the past year and are still identifying mission, goals and objectives.