



Van Buren County Hazard Mitigation Plan



**Van Buren County Office of
Domestic Preparedness**

**January 2005
Updated 2015**

**PREPARED WITH ASSISTANCE FROM THE
Southwest Michigan Planning Commission**

CONTENTS

Introduction.....	1
Planning Approach.....	3
Plan Participation.....	3
Public Involvement.....	4
Coordination	5
Plan Components	5
Adoption	6
Community Profile.....	7
History and Community Character.....	7
Demographics and County Political Units	7
Vulnerable Populations.....	15
Housing and Economics	19
Environment and Land Use	26
Public Facilities	28
Critical Facilities/Warning System	30
Hazard Ranking	35
Hazard Analysis Evaluation Criteria	35
Hazards	38
Risk Assessment and Vulnerability Assessment Summary	39
Hazard Analysis	41
CIVIL DISTURBANCE.....	41
DROUGHT.....	41
EARTHQUAKE/SUBSIDENCE	45
Subsidence.....	46
EXTREME TEMPERATURE	47
FIRE HAZARDS.....	51
Structural Fires	51
Wildfires.....	52
Scrap Tire Fires	55
FLOODING HAZARDS	56
Dam Failure.....	56
Riverine and Urban Flooding.....	59
Shoreline Flooding and Erosion.....	73

HAZARDOUS MATERIALS INCIDENT.....	79
Fixed Site.....	79
Transportation	84
INFRASTRUCTURE FAILURE	89
NUCLEAR POWER PLANT INCIDENT.....	92
PETROLEUM AND NATURAL GAS PIPELINE/WELL ACCIDENT.....	94
PUBLIC HEALTH EMERGENCIES	96
TERRORISM RELATED HAZARDS	97
THUNDERSTORM HAZARDS	99
Hail	99
Lightning	102
Severe Winds (Windstorms)	104
Tornadoes	106
TRANSPORTATION ACCIDENTS	110
SEVERE WINTER WEATHER	113
Ice and Sleet Storms	113
Snowstorms	113
Goals and Objectives	117
Mitigation Strategies.....	118
Action Plan.....	119
Accomplishments Since the 2005 Plan	119
Appendix A.....	137
Appendix B	139
Appendix C	140

INTRODUCTION

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

Van Buren County is vulnerable to a wide range of hazards. Periodic disasters resulting from severe winter weather, windstorms, flooding, and other similar events can cause significant property damage, interruption of services, personal injury, loss of life, and can disrupt the stability of the local economy.

To address the threat these hazards pose to residents, Van Buren County has developed the *Van Buren County Hazard Mitigation Plan*. This *Plan* will help Van Buren County develop into a Disaster Resistant Community able to help residents of the local communities protect themselves from the effects of disasters by encouraging damage prevention and preparation before a disaster occurs.

Managing varied threats, to protect life and property, is the challenge faced by emergency management officials at all levels of government. In order to maintain an effective emergency management capability to mitigate, prepare for, respond to, and recover from all types of hazardous events, an understanding of the variety of possible hazards that confront the County must first be obtained. When coupled with relevant land use and demographic information, this analysis becomes a powerful planning tool that enables emergency management officials to coordinate with the County and local community planners to set priorities and goals for resource allocation and mitigation and preparedness activities. It also allows the Office of Domestic Preparedness to provide input on the possible effects of certain kinds of land uses and development projects.

“Hazard mitigation” does not mean that all hazards are stopped or prevented, nor does it mean complete elimination of damage or disruption caused by such incidents. Natural forces are powerful and most natural hazards are well beyond our ability to control. Hazard Mitigation is not a quick fix; it is a long-term approach to reduce hazard vulnerability.

“Hazard mitigation” is defined as any sustained action taken to reduce or eliminate long-term risk to life and property from a hazard event. – FEMA

Why plan? Each community faces different hazards, and each community has different resources and interests relative to those hazards. Because there are many ways to deal with natural hazards, and many agencies that can help, there is no one solution or cookbook for managing or mitigating all disastrous effects.

Planning is the first step to correct these shortcomings by producing a program of activities that will best mitigate the impact of hazards as well as meet other needs. A well-prepared plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. A plan can also ensure that activities are coordinated with each other and with other goals and activities, thereby preventing conflicts and reducing the costs of implementing each individual activity.

Mitigation activities need funding. A mitigation plan is now a requirement for federal mitigation funds. Section 104 of the Disaster Mitigation Act of 2000 (42 USC 5165) states that after November 1, 2004, local governments applying for *pre*-disaster mitigation funds must have an approved local mitigation plan. After November 1, 2004, a plan will also be needed for *post*-disaster mitigation funds under the Hazard Mitigation Grant Program. These requirements are spelled out in 44 CFR (Code of Federal Regulations) Part 201. Therefore, a mitigation plan will guide the best use of mitigation funding and meet the prerequisite for obtaining such funds from the Federal Emergency Management Agency (FEMA).

The Plan: This plan was developed for Van Buren County and all the cities, villages and townships within Van Buren County. This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by hazards. This plan fulfills the federal mitigation planning requirements of FEMA and provides the County and its municipalities with a blueprint for reducing the impacts of hazards on people and property.

This document's format consists of a narrative description in the following sections: 1) Planning Approach; 2) Community Profile; 3) Hazard Ranking; 4) Hazard Analysis; 5) Goals and Objectives; 6) Mitigation Strategies; and 7) Action Plan.

The Community Profile provides geographic, economic, social, and land use information that is relevant to how Van Buren County is affected by, and responds to, hazard events. The Hazard Ranking shows the overall ranking of hazards affecting Van Buren County and also explains the methodology the County utilized to rank them. The Hazard Analysis section describes in detail the hazards that have the potential to occur in Van Buren County. The Goals and Objectives section establishes the County's overall direction for hazard mitigation planning and actions. The Mitigation Strategies section explains the structural and managerial actions that should be pursued to lessen the impacts of hazards. In the Action Plan, the mitigation strategies are prioritized and each action is assigned a responsible party and timeline for implementation.

In Van Buren County, the Office of Domestic Preparedness is the coordinating agency for local emergency management activities. This office is responsible for continually monitoring and updating this plan, the Van Buren County Emergency Plan as well as many other disaster-related activities.

Questions and comments concerning this document should be addressed to Wayne Polomcak, Director of the Van Buren County Office of Domestic Preparedness, 205 South Kalamazoo Street, Paw Paw, Michigan 49079, telephone number (269) 657-7786.

PLANNING APPROACH

This *Plan* is the product of a rational thought process that reviews alternatives then selects and designs those that will work best for the situation. This process is an attempt to avoid making quick decisions based on inadequate information and provides carefully considered directions to the County government and to the participating municipalities by studying the overall damage potential and ensuring that public funds are well spent.

For the 2005 plan development, the Van Buren County Office of Domestic Preparedness formed a Hazard Mitigation Committee. The Committee consisted of members from local, state and federal agencies, businesses, and local government representatives. The committee followed a standard planning process based on guidance from the Michigan State Police - Emergency Management Division. The committee met several times throughout the planning process. Each municipality within Van Buren County was involved in the planning process and was invited to participate in the Hazard Mitigation Committee meetings. Each municipality passed a resolution stating their commitment to the plan development, completed worksheets that identified critical facilities and any specific hazards unique to their community and had the opportunity to rank the hazards differently than the County. At the end of the planning process, municipalities were asked to submit mitigation projects for inclusion in the plan.

The Hazard Mitigation Committee reviewed the hazards and subsequent effects on people and property, considered a variety of ways to reduce and prevent damage, and recommended the most appropriate and feasible measures for implementation. The Van Buren County Planning and GIS Department, Van Buren County's Office of Domestic Preparedness, the Southwestern Michigan Commission (SWMC), and the Michigan State Police - Emergency Management Division provided technical and planning support.

For the 2014 plan update, the Southwest Michigan Planning Commission led the planning process. Several stakeholders and municipalities participated throughout the planning process through meetings and updating information from the previous plan. The Local Emergency Planning Committee served as the stakeholder group overseeing and informing the update.

Plan Participation

Several local municipalities in Van Buren County participated in the development of this plan. All municipalities were invited to attend all meetings held to discuss the plan development. Further municipalities completed worksheets detailing specific hazards and situations in their communities that may be unique from the County as a whole. This information was collected again for the plan update. In addition, participating municipalities ranked hazards for their community and each was invited to submit projects for the Action Plan for both the 2005 and 2015 update. The following table indicates the amount of participation from each local unit in the County.

Municipality	Completed community profile worksheet (2015)	Completed hazard identification worksheet (2015)	Completed hazard ranking worksheet (2015)	Signed resolution for plan adoption* (2015)
<i>Cities</i>				
Bangor	x	x	x	
Gobles				
Hartford	x	x	x	
South Haven	x	x	x	
<i>Villages</i>				
Bloomington	x	x	x	
Breedsville				
Decatur	x	x	x	
Lawrence	x	x	x	
Lawton	x	x	x	
Mattawan	x	x	x	
Paw Paw	x	x	x	
<i>Townships</i>				
Almena	x	x	x	
Antwerp	x	x	x	
Arlington	x	x	x	
Bangor	x	x	x	
Bloomington	x	x	x	
Columbia	x	x	x	
Covert	x	x	x	
Decatur	x	x	x	
Geneva	x	x	x	
Hamilton	x	x	x	
Hartford	x	x	x	
Keeler	x	x	x	
Lawrence				
Paw Paw	x	x	x	
Pine Grove				
Porter				
South Haven	x	x	x	
Waverly	x	x	x	

*Resolutions will be signed after FEMA approval of plan and adoption by Van Buren County Board of Commissioners.

Public Involvement

Public involvement during the planning process is very important. Many opportunities were provided to obtain input from the public, particularly residents and businesses that have been affected by hazards. For the 2005 plan and the 2015 update, the public was invited to participate through several concurrent means, including:

- Contact with Hazard Mitigation Committee and LEPC members and their organizations
- Information available on Southwest Michigan Planning Commission's website (including a fact sheet) (www.swmpc.org)

For the plan update, a meeting for local officials was held on September 8, 2014 to receive comments on the draft plan. The following information gathering activities were conducted to receive input from each municipality in the planning process for the 2005 and 2015 update:

- Cover letter (explaining Hazard Mitigation Plans and importance of municipal input)
- Hazard Mitigation Planning Fact Sheet
- Community Profile Worksheet
- Hazard Identification Worksheet
- Hazard Ranking Worksheet
- Call for Projects soliciting Specific Hazard Mitigation Projects
- Sample Resolution for Adopting Hazard Mitigation Plan Update

A list of LEPC members is included in Appendix B. In addition, a letter was sent to neighboring counties notifying them that the Draft Hazard Mitigation Plan was on the SWMPC's website and inviting their comments about the plan. **No comments were received.** A copy of the letter is included in Appendix C.

Coordination

Existing plans and programs were reviewed during the planning process. It should be underscored that this plan does not replace other planning efforts such as the County's General Development Plan or the work of the Local Emergency Planning Committee (LEPC), which focuses on hazardous materials. This plan complements these efforts and builds on their recommendations. During the planning process, contacts were made with regional, state, and federal agencies and organizations.

This Van Buren County Hazard Mitigation Plan update is consistent with the State of Michigan's 2011 Hazard Mitigation Plan (MHMP) update as it relates to the development of risk and vulnerability assessments, identification and ranking of potential hazards, and recommendations for mitigation strategies. Also consistent with the MHMP, are the presence of clearly stated goals, measurable objectives, and a thorough list of implementation strategies for fulfilling the stated objectives.

Plan Components

Community Profile: This portion of the plan is based on Van Buren County's General Development Plan and was adapted for hazard mitigation purposes.

Hazard Analysis and Ranking: Van Buren County Office of Emergency Preparedness compiled an initial hazard identification document. This document was used as the basis for the Hazard Analysis. The Southwest Michigan Planning Commission and the Office of Domestic Preparedness collected information from the municipalities, local state and federal

agencies, schools, businesses and non-profit organizations to complete the hazard analysis. The Van Buren County Office of Emergency Preparedness with input from the LEPC members was responsible for updating the ranking of the hazards (see more detail in the Hazard Ranking section of the plan).

Goals: The Southwest Michigan Planning Commission conducted a goal setting exercise at a Hazard Mitigation Committee meeting to develop draft goals and objectives. The Committee at subsequent meetings revised the goals. For the plan update, the LEPC reviewed the goals and decided not to make any changes to them.

Mitigation Strategies: The Hazard Mitigation Committee considered everything that could affect the impact of the hazards and reviewed a wide range of alternatives. The Committee's work and the subsequent plan document explored six general strategies for reaching the goals.

1. Preventive – e.g., zoning, building codes, and other development regulations
2. Property protection – e.g., relocation out of harm's way, retrofitting buildings, insurance
3. Resource protection – e.g., wetlands protection, urban forestry programs
4. Emergency services – e.g., warning, sandbagging, evacuation
5. Structural projects – e.g., levees, reservoirs, channel improvements
6. Public information – e.g., outreach projects, technical assistance to property owners

The mitigation strategies were not changed for the plan update.

Action plan: After the many alternatives were reviewed, the Committee drafted an "action plan" that specifies recommended projects, the individual responsible for implementing them, and the time when they are to be done. For the plan update, the Action Plan was reviewed by the Office of Domestic Preparedness, Southwest Michigan Planning Commission and the LEPC. Action items that were completed were removed from the list and new priority actions that were identified were added to the list.

It should be noted that this plan serves only to *recommend* mitigation measures. Implementation of these recommendations depends on adoption of this plan by the Van Buren County Board and the city council or board of trustees of each participating municipality. It also depends on the cooperation and support of the offices designated as responsible for each action item.

Adoption

The Van Buren County Board of Commissioners adopted the Van Buren County Hazard Mitigation Plan on the date shown on the adoption resolution accompanying the plan or on file at the Van Buren County Office of Domestic Preparedness. Several municipalities in the county also adopted the *Plan*. These resolutions of adoption are also on file at the Van Buren County Office of Domestic Preparedness.

COMMUNITY PROFILE

This portion of the plan is based on Van Buren County's General Development Plan and was adapted for hazard mitigation purposes.

History and Community Character

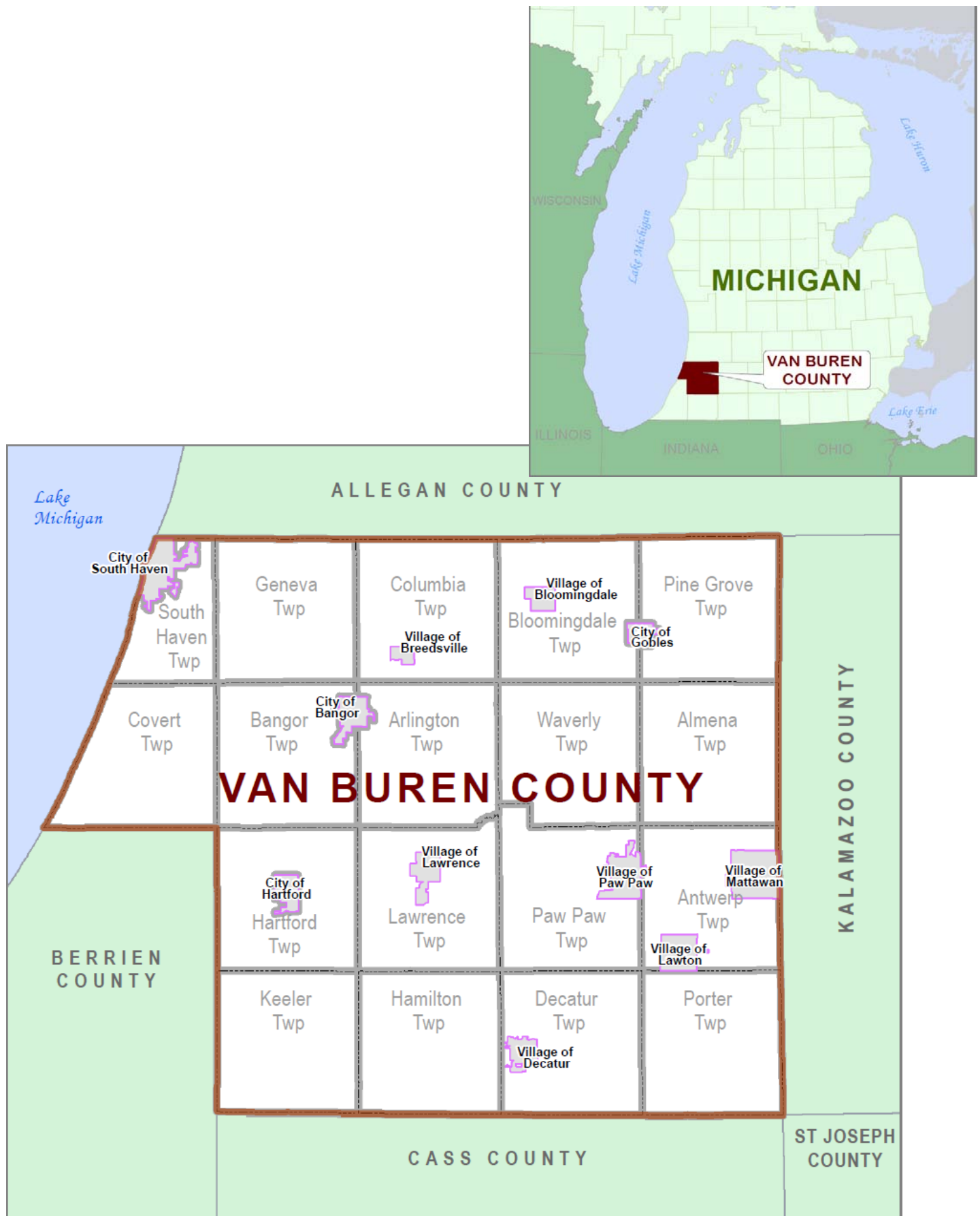
Van Buren County has a proud history paralleling that of the State of Michigan. Settled for the most part by New York Dutch and New Englanders, Van Buren was formed into a county by an act of the Legislative Council of Michigan that was approved on October 29, 1829. This was the same act that created Cass, Berrien, and Kalamazoo counties. In 1837 the people of Van Buren County were deemed sufficiently numerous to justify assuming the responsibilities of local self-government. On March 18, 1837, the governor of Michigan approved an Act organizing the jurisdiction of Van Buren County.

Van Buren County is located in southwest Michigan, bordering Lake Michigan. Berrien County is to the southwest, Allegan County to the north, to the east is Kalamazoo County, and to the south is Cass County. The southern boundary of the county is 21 miles from the Indiana State Line. Interstate 94, which connects Detroit and Chicago, traverses the county at the midway point between these two major metropolitan areas. The county also lies between, and is in close proximity to, the four urbanizing areas of Kalamazoo to the east, Benton Harbor/St. Joseph to the southwest, and Holland and Grand Rapids to the north. Census figures indicate that Van Buren County's population is growing at a faster rate than adjacent counties, and so there is increasing demand for residential land.

Because of its location east of Lake Michigan, Van Buren County experiences a moderate climate suitable for agriculture. In particular, the county is known for its fruit production. Other vital natural resources are Lake Michigan, and several inland lakes. As a result, major economic forces include agriculture, the resultant food processing, and tourism. The features that make the land agriculturally productive and attractive to tourists are also well suited for urban development (i.e. relatively flat land, well-drained soils, plentiful inland lakes, and access to urban markets). Thus, Van Buren County's location makes it susceptible to development pressures with the potential for negative impacts on crucial natural resources as well as the historically important agriculturally driven economic sectors.

Demographics and County Political Units

In 1960, 48,395 people lived in Van Buren County. This figure increased significantly over the decades that followed, reaching a high point of 76,263 in 2000; however, the County's population growth remained essentially flat at 76,258 persons by the 2010 Census. The recent trend in the County's population is similar to that of the State of Michigan as a whole, which was the only state in the nation's 2010 Census to lose population (0.6% population loss statewide). Estimates from the 2012 American Community survey indicate the population is continuing its declining trend; dropping to 75,454 for an approximate 1% loss from 2010.



The following table shows Van Buren County's population, which saw significant increases from the period of 1960-1990.

Van Buren County Hazard Mitigation Plan

Table 1. Van Buren County Municipalities Historic Population Trends, 1960-1990

Jurisdiction	1960	1970	1980	1990	% Change: 1960-1990
<i>Townships</i>					
Almena	1,288	1,845	2,956	3,581	178%
Antwerp	2,456	2,312	3,910	5,039	105%
Arlington	1,392	1,645	1,884	1,929	39%
Bangor	1,443	1,708	1,993	1,948	35%
Bloomington	1,176	1,493	1,953	2,351	100%
Columbia	1,374	1,657	2,004	2,339	70%
Covert	2,323	2,659	2,706	2,855	23%
Decatur	1,275	1,603	1,684	1,856	46%
Geneva	1,850	2,392	2,984	3,162	71%
Hamilton	1,023	1,167	1,586	1,515	48%
Hartford	1,746	2,211	2,707	3,032	74%
Keeler	2,109	2,234	2,638	2,344	11%
Lawrence	1,421	1,555	2,114	2,115	49%
Paw Paw	2,067	2,592	3,207	3,645	76%
Pine Grove	1,528	1,835	2,379	2,594	70%
Porter	1,047	1,360	2,041	2,086	99%
South Haven	2,766	3,416	4,174	4,185	51%
Waverly	1,044	1,313	2,130	2,188	110%
Subtotal	29,328	34,997	45,050	48,764	66%
<i>Villages</i>					
Bloomington	471	496	537	503	7%
Breedsville	245	209	244	213	-13%
Decatur	1,827	1,764	1,915	1,760	-4%
Lawrence	773	790	903	915	18%
Lawton	1,402	1,358	1,558	1,685	20%
Mattawan		1,569	2,143	2,456	57%
Paw Paw	2,970	3,160	3,211	3,169	7%
Subtotal	7,688	9,346	10,511	10,701	39%
<i>Cities</i>					
Bangor	2,109	2,050	2,001	1,922	-9%
Gobles	816	801	816	769	-6%
Hartford	2,305	2,508	2,493	2,341	2%
South Haven	6,149	6,471	5,943	5,563	-10%
Subtotal	11,379	11,830	11,253	10,595	-7%
COUNTY TOTAL	48,395	56,173	66,814	70,060	45%

(Source: U.S. Census Bureau)

However, this period of rapid growth that dominated previous decades is no longer present, showing a similar story as much of the State. Following is a table that shows Van Buren County's population change from the last decade.

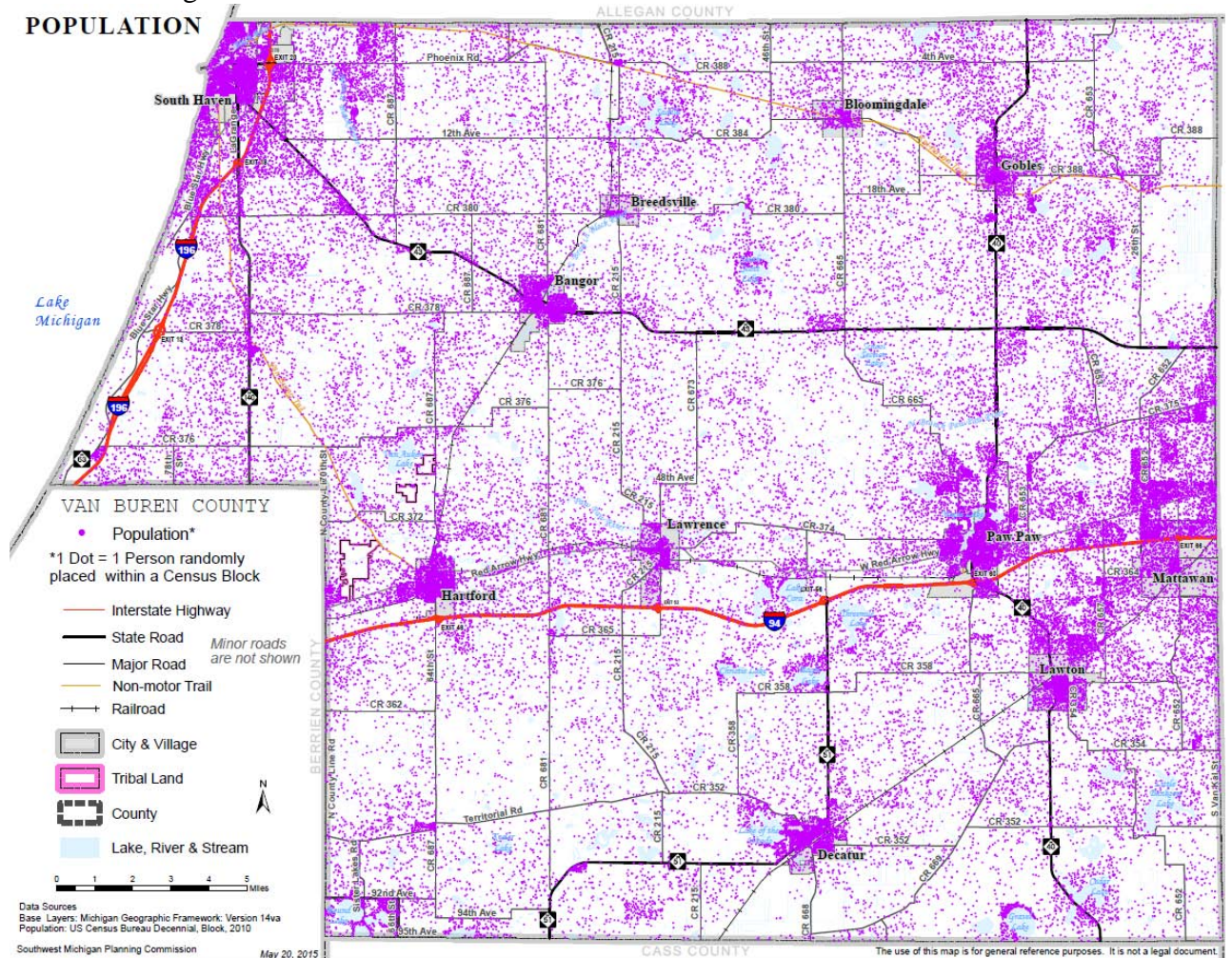
Table 2. Van Buren County Municipalities Recent Population Trends, 2000-2010

Jurisdiction	2000 Population	2010 Population	% Change 2000-2010
Van Buren County, Overall	76,263	76,258	0%
<i>Townships</i>			
Almena Township	4226	4992	18.1%
Antwerp Township	10813	12182	12.7%
Arlington Township	2075	2073	0%
Bangor Township	2121	2147	1.2%
Bloomington Township	3364	3103	-7.8%
Columbia Township	2714	2588	-4.7%
Covert Township	3141	2888	-8.1%
Decatur Township	3916	3726	-4.9%
Geneva Township	3975	3573	-10.1%
Hamilton Township	1797	1489	-17.1%
Hartford Township	3159	3274	3.6%
Keeler Township	2601	2169	-16.6%
Lawrence Township	3341	3259	-2.5%
Paw Paw Township	7091	7041	-0.7%
Pine Grove Township	2773	2949	6.3%
Porter Township	2406	2466	2.5%
South Haven Township	4046	3983	-1.6%
Waverly Township	2467	2554	3.5%
Subtotal	66026	66456	0.6%
<i>Cities</i>			
City of Bangor	1933	1885	-2.5%
City of Gobles	815	829	1.7%
City of Hartford	2476	2688	8.6%
City of South Haven	5013	4400	-12.2%
Subtotal	10237	9802	-4.4%
<i>Census population figures for the following villages have been included in the figures (above) for the townships in which they are located.</i>			
<i>Villages</i>			
Bloomington	528	454	-14%
Breedsville	235	199	-15.3%
Decatur	1838	1819	-1%
Lawrence	1059	996	-6%
Lawton	1859	1900	2.2%
Mattawan	2536	1997	-21.3%
Paw Paw	3363	3534	4.8%

(Source: U.S. Census Bureau)

The county has two major centers of population density - the northwestern portion of the county surrounding South Haven and the eastern portion of the county surrounding the communities of Mattawan, Lawton and Paw Paw. Other smaller concentrations occur in the cities and villages.

POPULATION



The two youngest age brackets (ages 0-19 and 20-44) saw declining populations between 2000 and 2010, while the two older age brackets (ages 45-64 and 65 and over) saw an increase. Given the pattern of negative migration numbers from the County in recent years, it can be reasonably assumed that the residents of Van Buren County (primarily those considered the “Baby Boomer” generation) have grown older in place since the 2000 Census and that senior residents are living longer lives. This shift to an aging society indicates that in the future, there may be an increased demand for services pertaining to older residents, such as housing support services and less of a demand for those targeting families with children.

Table 3. Van Buren County, Age of Population, 2000-2010

Age Group	2000 Population	2010 Population	% Change 2000-2010
0-19 Years	23,553 (30.9%)	21,402 (28.1%)	-2.8%
20-44 Years	25,287 (33.2%)	22,017 (29%)	-4.2%
45-64 Years	18,050 (23.7%)	22,316 (29.3%)	+5.6%
65 Years and Over	9,373 (12.3%)	10,523 (13.8%)	+1.5%

The following table offers a detailed breakdown of age by municipality (data from villages are included in the statistics for the township in which they reside).

Table 4. Van Buren County, Age of Population by Municipality, 2010

Jurisdiction	2010 Population	Percent Age 0-19	Percent Age 20-44	Percent Age 45-64	Percent Age 65 and Over
<i>Townships</i>					
Almena Township	4992	27.7%	28.2%	32.9%	11.4%
Antwerp Township	12182	30%	31.2%	27.4%	11.4%
Arlington Township	2073	26.4%	27.1%	31%	15.2%
Bangor Township	2147	26.2%	28.6%	29.1%	16.1%
Bloomington Township	3103	25.4%	26.3%	32.1%	16.1%
Columbia Township	2588	28.1%	28.4%	28.9%	14.6%
Covert Township	2888	33.6%	27.8%	26.3%	12.4%
Decatur Township	3726	28.6%	30%	27.2%	14.1%
Geneva Township	3573	28.4%	29.7%	29%	13.1%
Hamilton Township	1489	26.7%	28.6%	30.3%	14.5%
Hartford Township	3274	30.8%	31%	26.9%	12.3%
Keeler Township	2169	25.9%	28.4%	29.4%	16.6%
Lawrence Township	3259	29.1%	28.3%	29.8%	12.8%
Paw Paw Township	7041	25.6%	29.9%	29.9%	14.8%
Pine Grove Township	2949	26.6%	27.6%	33.3%	12.3%
Porter Township	2466	24.7%	24.1%	35.6%	15.7%
South Haven Township	3983	27%	26.7%	30%	16.3%
Waverly Township	2554	29.3%	27.7%	31.1%	11.7%
<i>Cities</i>					
City of Bangor	1885	32.4%	30.9%	24.9%	11.8%
City of Gobles	829	30.2%	30.3%	26.7%	12.7%
City of Hartford	2688	34.1%	33.5%	22.4%	9.9%
City of South Haven	4400	22.5%	24.7%	30.3%	22.5%

The following table details race and Hispanic/Latino ethnicity by municipality (village data is included in the statistics for the township in which they reside).

Table 5. Van Buren County, Race and Hispanic or Latino Ethnicity of Population by Municipality, 2010

Jurisdiction	2010 Population	% Asian	% Black	% Native American	% White	%Multi-Racial	% Other Race	% Hispanic or Latino
<i>Townships</i>								
Almena Township	4992	0.9%	1.2%	0.5%	94.3%	2%	0.9%	2.4%
Antwerp Township	12182	0.4%	1.1%	0.5%	94%	2.1%	2%	5.2%
Arlington Township	2073	0.4%	2.6%	1.1%	87.5%	2.2%	6.2%	12.2%
Bangor Township	2147	0.2%	4.1%	1.3%	84.5%	2.4%	7.3%	14.3%
Bloomington Township	3103	0.2%	1.8%	0.8%	93.7%	1.9%	1.6%	3.1%
Columbia Township	2588	0.1%	2.6%	1.2%	85.6%	2%	8.4%	14.4%
Covert Township	2888	0.3%	24.2%	1.7%	50.2%	4.4%	19.2%	30.5%
Decatur Township	3726	0.3%	2.3%	1.3%	89%	3.6%	3.5%	8.3%
Geneva Township	3573	0.2%	7%	1.4%	80.4%	2.9%	8.1%	13.5%
Hamilton Township	1489	0.8%	2.1%	1.4%	87%	1.9%	6.8%	11%
Hartford Township	3274	0.1%	1.1%	1.4%	82.3%	3.5%	11.6%	22.2%
Keeler Township	2169	0.2%	0.2%	1.8%	84.6%	1.6%	11.5%	22%
Lawrence Township	3259	0.3%	1.9%	0.9%	85%	2.5%	9.3%	17.9%
Paw Paw Township	7041	0.5%	2.1%	0.3%	92.3%	1.9%	2.9%	5.5%
Pine Grove Township	2949	0%	0.9%	0.5%	96.5%	1.8%	0.3%	1.6%
Porter Township	2466	0.2%	1%	0.4%	95.5%	1.5%	1.4%	4.7%
South Haven Township	3983	0.9%	10%	0.7%	80.5%	2.8%	5.1%	10.2%
Waverly Township	2554	0.3%	0.9%	0.4%	94.4%	2.1%	1.9%	4.8%

Jurisdiction	2010 Population	% Asian	% Black	% Native American	% White	% Multi-Racial	% Other Race	% Hispanic or Latino
<i>Cities</i>								
Bangor	1885	0.7%	11.8%	0.5%	72.9%	5.4%	8.6%	14.4%
Gobles	829	0%	0.6%	0.2%	93.1%	4.3%	1.7%	4.9%
Hartford	2688	0.5%	1.6%	2.8%	71.9%	4.5%	18.7%	29.5%
South Haven	4400	0.5%	13.3%	0.7%	81.7%	2.9%	0.9%	3.8%

Over 22% of the population in Covert Township, Hartford Township and City and Keeler Township identify as Hispanic or Latino. The population of Hispanic or Latino residents in Van Buren County is significant enough to warrant a multi-lingual approach to disaster preparedness. While the statistics in the table above present the composition of year round residents, it does not take into account the short-term increase in migrant and seasonal workers (primarily Hispanic or Latino), during active farming months. The 2013 Michigan Migrant Seasonal Farmworker Report indicates that the population of seasonal and migrant workers increases by 6,524 farmworkers and an additional 6,003 for non-farm workers; a total estimated migrant and seasonal increase of 12,527 persons. This increase places Van Buren County second among all Michigan counties for Migrant and Seasonal farmworker growth.

Table 6. Van Buren County Migrant and Seasonal Farmworker Enumeration Profile, 2013

Migrant and Seasonal Farmworker Estimate	Migrant Workers	Seasonal Workers	Non-Farmworkers in Migrant Households	Non-Farmworkers in Seasonal Households	Total Migrant and Seasonal Farmworkers and Non-Farmworkers
6,524	4,463	2,062	4,064	1,938	12,527

Source: 2013 Michigan Migrant Seasonal Farmworker Report

(http://www.mi.gov/documents/dhs/FarmworkerReport_430130_7.pdf)

According to the Census Bureau's 2010 American Community Survey, Van Buren County's poverty rate (15.8 percent) was one percentage point higher than the state of Michigan as a whole (14.8 percent). As is typical for a poverty analysis based on age differences, there is a greater percentage of children living in poverty (22.3 percent) than adults 18 years and over (13.7 percent). The poverty rates for families with children are also higher (11.8 percent), especially those with female heads of household (36%). There are geographic areas within the County that have substantially higher poverty rates than the County as a whole (which has a rate of 15.8 percent), and other areas that have a significantly lower poverty rate. The following table presents this information by jurisdiction.

Table 7. Comparison of the State of Michigan and Van Buren County Poverty Rates, 2010

Geography	Overall Poverty Rate	Children in Poverty	18 Years and Over in Poverty	Families in Poverty	Families with Female Head of Household in Poverty
-----------	----------------------	---------------------	------------------------------	---------------------	---

Michigan	14.8%	20.5%	13%	10.6%	31.8%
----------	-------	-------	-----	-------	-------

Van Buren County	15.8%	22.3%	13.7%	11.8%	36%
------------------	-------	-------	-------	-------	-----

Source: U.S Census Bureau, 2010 American Community Survey 5-year Estimates

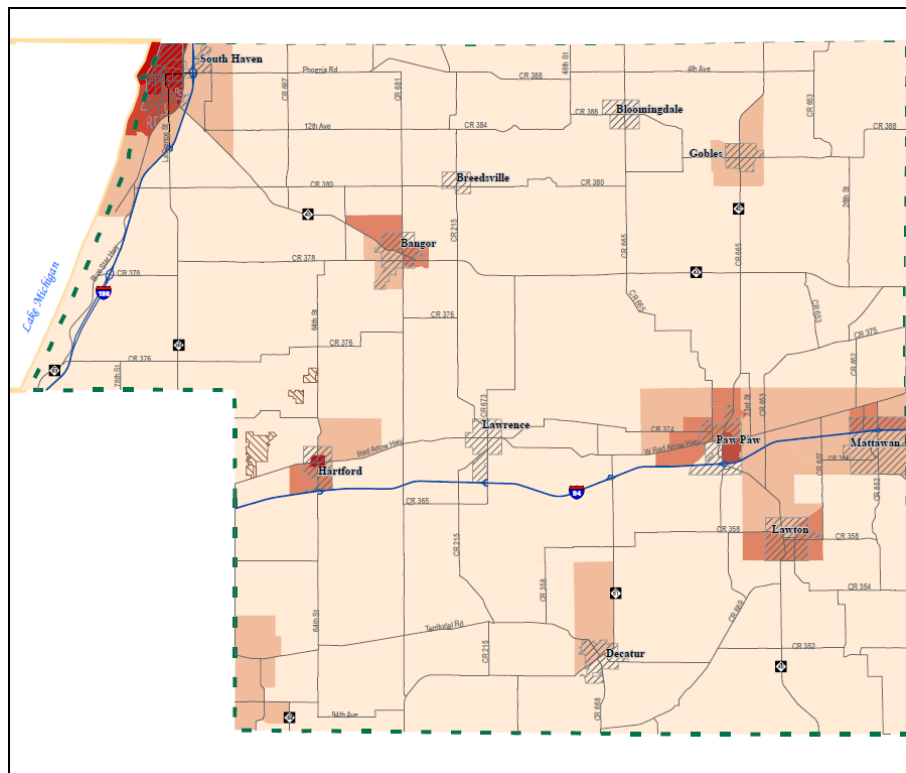
Table 8. Van Buren County Municipalities Poverty Rate Estimate, 2010

Almena Twp.	6.2%	Hartford Twp.	30.9%	City of Hartford	24.4 %
Antwerp Twp.	8.6%	Keeler Twp.	12.4%	City of South Haven	13.9 %
Arlington Twp.	11.2%	Lawrence Twp.	15.4%	Village of Lawton	19.4 %
Bangor Twp.	20.2%	Paw Paw Twp.	29.8%	Village of Mattawan	5.9%
Bloomingtondale Twp.	16.5%	Pine Grove Twp.	15.4%	Village of Bloomingtondale	42.5 %
Columbia Twp.	18.1%	Porter Twp.	11.2%	Village of Breedsville	3.8%
Covert Twp.	29.7%	South Haven Twp.	13.5%	Village of Decatur	20.4 %
Decatur Twp.	12.2%	Waverly Twp.	17.2%	Village of Lawrence	22.1 %
Geneva Twp.	24.9%	City of Bangor	18.5%	Village of Paw Paw	29.8 %
Hamilton Twp.	16.4%	City of Gobles	16.6%	VAN BUREN CO.	15.8 %

Source: U.S Census Bureau, 2010 American Community Survey 5-year Estimates

Vulnerable Populations

The following maps are based on the 2010 US Census and show vulnerable populations that planners can consider when planning for hazard mitigation and response activities.

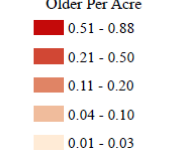


VAN BUREN COUNTY

Population Density*

Legend

Population 65 Years and Older Per Acre



*Population Density analyzed by census block group

Base Layers



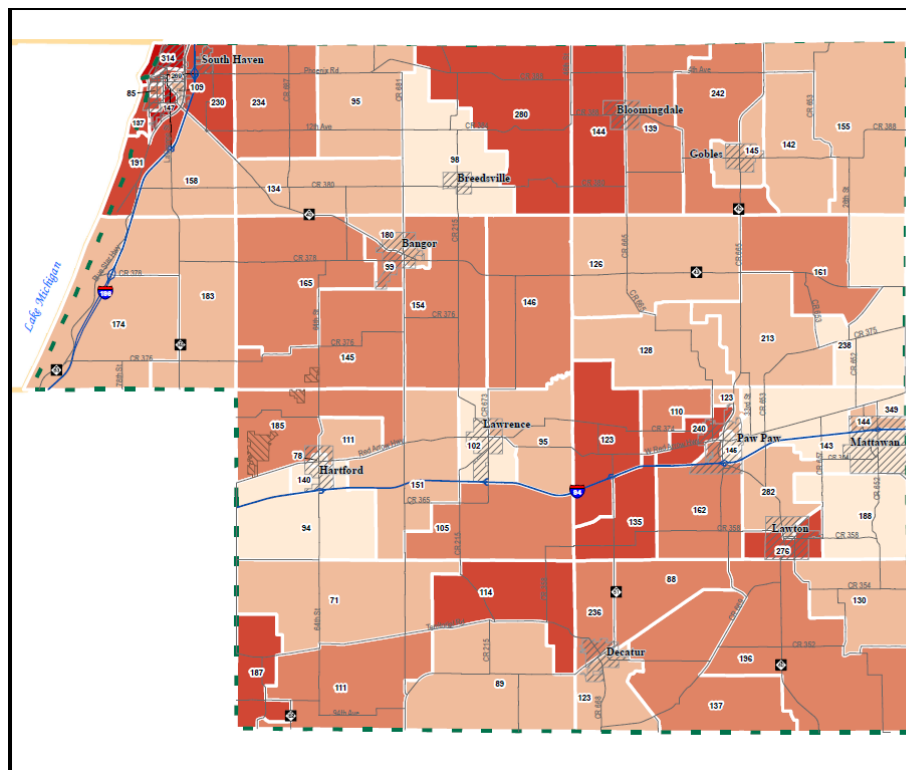
Data Sources:
Census Data: TIGER Line Shapefile, U.S. Department of Commerce, U.S. Census Bureau, Geography Division, 2010.
Population: Summary File (SF1), Decennial Census, U.S. Census Bureau, 2010.
Base Layers: Michigan Geographic Framework, Berrien County, Version 10a
Tribal Land: Pokagon Band of Potawatomi Indians, Natural Resources Department, 2010

The use of this map is for general reference purposes and is not a legal document.
Southwest Michigan Planning Commission
185 East Main Street, Suite 701
Benton Harbor, MI 49022
Website: <http://www.swmpco.org/>
Telephone: 269.925.1137
Email: swmpco@swmpco.org



December 12, 2011

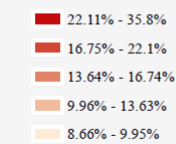
1136_PopAcr.pdf



VAN BUREN COUNTY

Population*

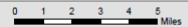
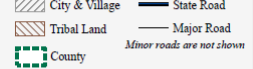
Percent Population 65 Years and Older



01 Labels Represent Population 65 Years and Older Per Census Block Group

*Population analyzed by census block group

Base Layers



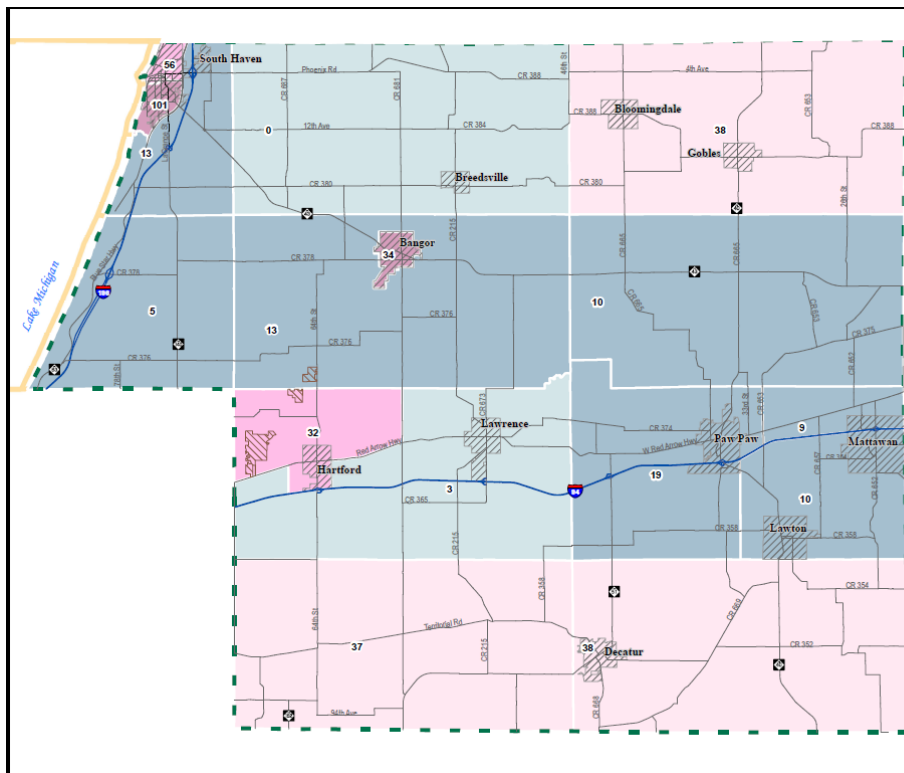
Data Sources:
Census Data: TIGER Line Shapefile, U.S. Department of Commerce, U.S. Census Bureau, Geography Division, 2010.
Population: Summary File (SF1), Decennial Census, U.S. Census Bureau, 2010.
Base Layers: Michigan Geographic Framework, Berrien County, Version 10a
Tribal Land: Pokagon Band of Potawatomi Indians, Natural Resources Department, 2010

The use of this map is for general reference purposes and is not a legal document.
Southwest Michigan Planning Commission
185 East Main Street, Suite 701
Benton Harbor, MI 49022
Website: <http://www.swmpco.org/>
Telephone: 269.925.1137
Email: swmpco@swmpco.org



December 12, 2011

1136_PopAcr.pdf



VAN BUREN COUNTY

Census Data*

Percent of the Households 65 Years and Older without Cars

- 15.01% - 28.06%
- 10.01% - 15%
- 5.01% - 10%
- 1.01% - 5%
- 0% - 1%

01 Label Represent Number of Households 65 Years and Older without Cars by Census Tract

*Census data analyzed by census tract.

Base Layers

- City & Village
- Tribal Land
- County
- State Road
- Major Road
- Minor roads are not shown

0 1 2 3 4 5 Miles

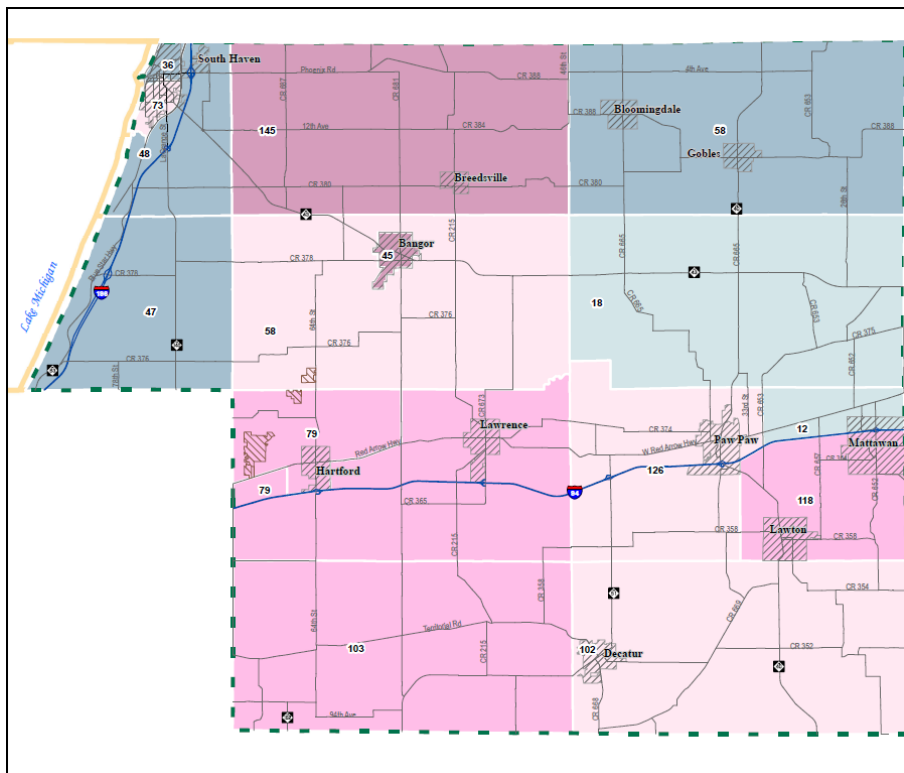
Data Sources:
Households & Population: American Community Survey (ACS) 2005-2009
(5-Year Estimates) U.S. Census Bureau Geography Division, 2010
Base Layers: Michigan Geographic Framework, Berrien County, Version 10a
Tribal Land: Pokagon Band of Potawatomi Indians, Natural Resources Department, 2010

The use of this map is for general reference purposes and is not a legal document.
Southwest Michigan Planning Commission
185 East Main Street, Suite 701
Benton Harbor, MI 49022
Website: <http://www.swmpc.org/>
Telephone: 269.625.1137
Email: swmpc@swmpc.org



December 12, 2011

1106_FigAgePopLab



VAN BUREN COUNTY

Census Data*

Poverty Rate for Population 65 Years and Older, 2005-2009

- 17.6% - 21.7%
- 15.1% - 17.5%
- 10.1% - 15.0%
- 5.1% - 10.0%
- 2.5% - 5.0%

01 Label Represent Population 65 Years and Older In Poverty

*Census data analyzed by census tract.

Base Layers

- City & Village
- Tribal Land
- County
- State Road
- Major Road
- Minor roads are not shown

0 1 2 3 4 5 Miles

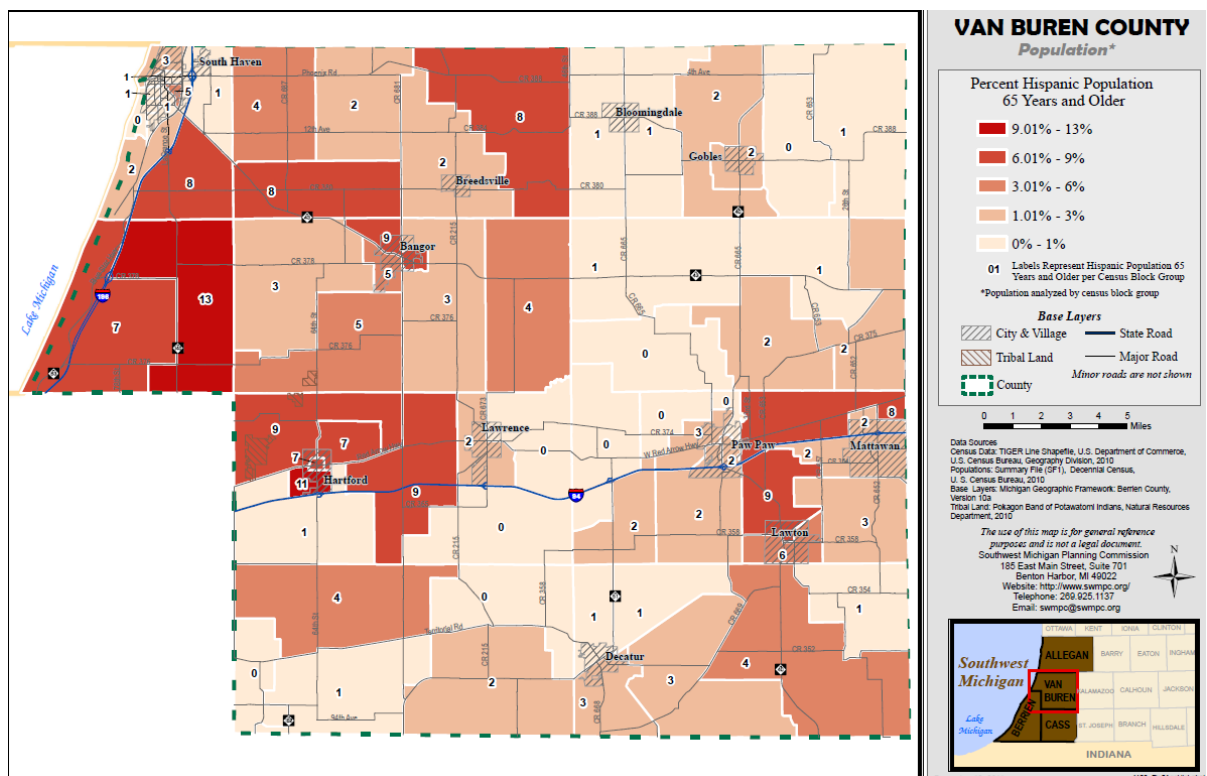
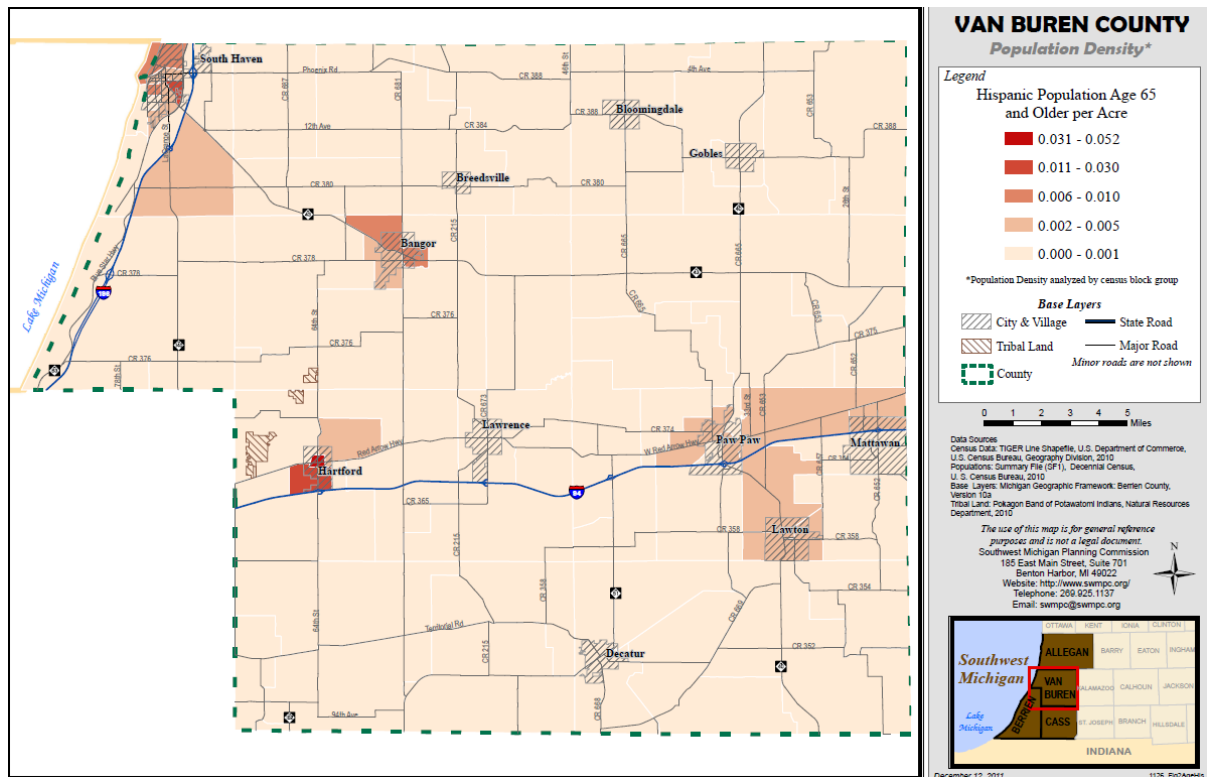
Data Sources:
Population: American Community Survey (ACS) 2005-2009
(5-Year Estimates) U.S. Census Bureau Geography Division, 2010
Base Layers: Michigan Geographic Framework, Berrien County, Version 10a
Tribal Land: Pokagon Band of Potawatomi Indians, Natural Resources Department, 2010

The use of this map is for general reference purposes and is not a legal document.
Southwest Michigan Planning Commission
185 East Main Street, Suite 701
Benton Harbor, MI 49022
Website: <http://www.swmpc.org/>
Telephone: 269.625.1137
Email: swmpc@swmpc.org



December 12, 2011

1106_FigAgePopLab



Housing and Economics

According to the 2010 U.S. Census, the average household in Van Buren County is decreasing in size. This decline is due to societal trends in the County as well as in the state and the nation as a whole. As household size decreases, existing housing units may not be adequate to meet this new demand. This greater demand for new housing options may push the construction to take place in unincorporated areas as the availability of buildable land within cities is limited. Typically, these new units will be single-family dwellings that are moderately to high-priced. This leaves the low-income population with fewer housing opportunities. In addition, a significant number of existing housing units within cities are in need of repair. Consequently, different types of housing needs will have to be considered including home rehabilitation, construction or renovation of multi-family units, subsidized rents, and supportive housing for the aged and/or disabled.

Table 9. Van Buren Co & Municipalities, Percent Owner-occupied Household Size 2000-2010

Jurisdiction	1-person households		2-person households		3-person households		4-person households		5 or more person households	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Van Buren County	19.2 %	20.7 %	36.9 %	38.7 %	16.9 %	15.9 %	15.5 %	13.7 %	11.4 %	11%
<i>Townships</i>										
Almena Township	14.9 %	15.7 %	38.1 %	40.6 %	18.3 %	16.4 %	20.1 %	17.8 %	8.6%	9.5%
Antwerp Township	14.4 %	16.7 %	33.3 %	36.1 %	20.2 %	18.4 %	19.7 %	17.8 %	12.4 %	11.1 %
Arlington Township	17%	18.9 %	38.9 %	37.2 %	15.4 %	20.7 %	15.4 %	12.5 %	13.3 %	10.7 %
Bangor Township	16.9 %	19.2 %	38.6 %	41.9 %	17.9 %	15.2 %	13%	14.4 %	13.6 %	9.3%
Bloomington Township	17.4 %	22.7 %	38.6 %	41.3 %	18.1 %	14%	14.7 %	11%	11.3 %	10.9 %
Columbia Township	20.4 %	22%	40.5 %	39.1 %	14.6 %	15.8 %	13.3 %	11.9 %	11.2 %	11.3 %
Covert Township	25.7 %	22.8 %	32%	32.4 %	14.1 %	15.4 %	13.7 %	11.3 %	14.4 %	18.1 %
Decatur Township	20%	22.3 %	35.2 %	37.3 %	18%	15.1 %	15.5 %	12.8 %	11.5 %	12.4 %
Geneva Township	21.9 %	20.3 %	32.5 %	38.4 %	16.6 %	16.8 %	16.6 %	12.3 %	12.5 %	12.2 %
Hamilton Township	19.7 %	21.9 %	37.1 %	37.1 %	16.6 %	15.2 %	13.3 %	14%	13.3 %	11.9 %
Hartford Township	18.1 %	21.1 %	36.3 %	34.6 %	17.7 %	17.2 %	15.6 %	12.6 %	12.2 %	14.4 %
Keeler Township	22.9 %	25%	42.1 %	42.7 %	15.7 %	13.5 %	9.6%	10.1 %	9.8%	8.7%
Lawrence Township	16.4 %	22%	36.8 %	37.9 %	15.9 %	14.6 %	16.9 %	12.8 %	14%	12.7 %
Paw Paw Township	19.3 %	21.4 %	37.5 %	40.9 %	17.4 %	17.1 %	15.6 %	11.7 %	10.3 %	8.8%
Pine Grove Township	16.9 %	19.2 %	39.5 %	41.6 %	17.6 %	14.7 %	14.4 %	14.1 %	11.7 %	10.3 %
Porter Township	19.8 %	20.4 %	40%	44.5 %	15.4 %	13.4 %	15.8 %	12.3 %	9%	9.4%
South Haven Township	23.7 %	25.5 %	38.6 %	40.2 %	14.9 %	13.8 %	13.7 %	12.6 %	9.1%	8%
Waverly Township	16.8 %	18.8 %	39.2 %	40.0 %	17.4 %	15.4 %	14.9 %	15.3 %	11.8 %	10.5 %

Jurisdiction	1-person households		2-person households		3-person households		4-person households		5 or more person households	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
<i>Cities</i>										
City of Bangor	20.2%	24.2%	33.9%	32.3%	18%	13.1%	12%	14.5%	15.9%	16%
City of Gobles	20.6%	24.5%	38.7%	32.7%	11.6%	14.9%	16.1%	12%	13%	15.8%
City of Hartford	22.5%	17.9%	31.3%	28.8%	16.3%	17.2%	14.1%	14.9%	15.7%	21.3%
City of South Haven	26.7%	28.7%	40.1%	43.5%	13.5%	12.7%	11.3%	9.1%	8.4%	5.9%

Source: U.S Census Bureau, 2000 and 2010 Census

The following table uses 2011 American Community Survey data from the U.S. Census Bureau and reflects characteristics of occupied and vacant housing in the County. Estimated seasonal population increases are based on the number of seasonal housing units in the area and the average number of persons per occupied housing unit in the County. This may be difficult to ascertain because a significant amount of the seasonal population increase is due to migrant and seasonal farm workers (nearly 12,000 for the County). Calculating this based on the percent of seasonally vacant units and average household size may give a good picture for “tourist communities”, but may not be an overall effective measure in Van Buren because of the migrant population.

Table 10. Van Buren County Municipalities Selected Housing Characteristics, 2011 Estimates

Jurisdiction	Population	Total housing units	Occupied Housing %	Vacant Housing %	Of occupied housing		% of population in group quarters
					Owner-occupied %	Renter-occupied %	
Van Buren County, overall	76258	36722	76.3%	23.7%	77.4%	22.6%	1.2%
<i>Townships</i>							
Almena Township	4992	1930	89.8%	10.2%	97.2%	2.8%	0%
Antwerp Township	12182	4628	95.4%	4.6%	83.7%	16.3%	1.2%
Arlington Township	2073	928	80.7%	19.3%	88.5%	11.5%	1.9%
Bangor Township	2147	956	66.2%	33.8%	75.2%	24.8%	3.5%
Bloomington Township	3103	1551	78.6%	21.4%	86.9%	13.1%	1.9%
Columbia Township	2588	1380	58%	42%	85.9%	14.1%	1.1%
Covert Township	2888	1595	66.7%	33.3%	76.3%	23.7%	0.4%
Decatur Township	3726	1743	83.4%	16.6%	81.3%	18.7%	1.2%
Geneva Township	3573	1358	84.8%	15.2%	84.6%	15.4%	0.2%
Hamilton Township	1489	819	78.3%	21.7%	92.2%	7.8%	0.7%
Hartford Township	3274	1377	89%	11%	77.1%	22.9%	1%
Keeler Township	2169	1536	48.2%	51.8%	81.6%	18.4%	3.7%
Lawrence Township	3259	1710	80.9%	19.1%	77.7%	22.3%	0.3%
Paw Paw Township	7041	3362	81%	19%	61.6%	38.4%	2%
Pine Grove Township	2949	1405	88.5%	11.5%	88.5%	11.5%	0.2%
Porter Township	2466	1397	67.3%	32.7%	88.1%	11.9%	0%
South Haven Township	3983	2307	77.3%	22.7%	73.8%	26.2%	0.2%
Waverly Township	2554	1051	85.8%	14.2%	92.1%	7.9%	0%

Jurisdiction	Population	Total housing units	Occupied Housing %	Vacant Housing %	Of occupied housing		% of population in group quarters
					Owner-occupied %	Renter-occupied %	
Cities							
City of Bangor	1885	941	82.1%	17.9%	63.9%	36.1%	0.2%
City of Gobles	829	391	87.5%	12.5%	60.2%	39.8%	0%
City of Hartford	2688	1004	93.4%	6.6%	67.9%	32.1%	0.5%
City of South Haven	4400	3397	58.6%	41.4%	65.7%	34.3%	3.5%
Villages							
Village of Bloomingdale	572	238	87.4%	12.6%	76.9%	23.1%	0%
Village of Breedsville	125	61	73.8%	26.2%	88.9%	11.1%	0%
Village of Decatur	1870	858	86.4%	13.6%	69.2%	30.8%	0%
Village of Lawrence	1098	525	85.5%	14.5%	59.9%	40.1%	0%
Village of Lawton	2011	711	93.8%	6.2%	66.4%	33.6%	10.1%
Village of Mattawan	2017	855	88.4%	11.6%	80.8%	19.2%	0%
Village of Paw Paw	3511	1751	85.3%	14.7%	39.1%	60.9%	4.8%

Table 11. Van Buren County Municipalities Vacant Units and Seasonal Housing, 2011 Estimates

Jurisdiction	Total Housing Units	Vacant Units	Seasonal Units	Seasonal Units as % of Vacant Units	Seasonal Units as % of Total Units
Van Buren County, overall	36722	7920	4911	62%	13.4%
<i>Townships</i>					
Almena Township	1930	197	72	36.5%	3.7%
Antwerp Township	4628	211	39	18.5%	0.8%
Arlington Township	928	179	125	69.8%	13.5%
Bangor Township	956	323	138	41.6%	14.4%
Bloomingdale Township	1551	332	198	59.6%	12.8%

Jurisdiction	Total Housing Units	Vacant Units	Seasonal Units	Seasonal Units as % of Vacant Units	Seasonal Units as % of Total Units
Columbia Township	1380	579	294	50.8%	21.3%
Covert Township	1595	531	418	78.7%	26.2%
Decatur Township	1743	290	137	47.2%	7.9%
Geneva Township	1358	207	78	37.7%	5.7%
Hamilton Township	819	178	94	52.8%	11.5%
Hartford Township	1377	151	43	28.5%	3.1%
Keeler Township	1536	795	638	80.3%	41.5%
Lawrence Township	1710	327	240	73.4%	14%
Paw Paw Township	3362	639	291	45.5%	8.7%
Pine Grove Township	1405	161	46	28.6%	3.3%
Porter Township	1397	457	381	83.4%	27.3%
South Haven Township	2307	524	272	51.9%	11.8%
Waverly Township	1051	149	40	26.9%	3.8%
<i>Cities</i>					
City of Bangor	941	168	63	37.5%	6.7%
City of Gobles	391	49	0	0%	0%
City of Hartford	1004	66	0	0%	0%
City of South Haven	3397	1407	1304	92.7%	38.4%
<i>Villages</i>					
Village of Bloomingdale	238	30	0	0%	0%
Village of Breedsville	61	16	2	12.5%	3.3%
Village of Decatur	858	117	10	8.6%	1.2%
Village of Lawrence	525	76	18	23.7%	3.4%
Village of Lawton	711	44	4	2.3%	0.6%
Village of Mattawan	855	99	0	0%	0%
Village of Paw Paw	1751	258	0	0%	0%

Some group quarters are specifically identified on the community profile map in this document, along with various important community facilities such as hospitals, schools, emergency responders, and government offices. 2011 American Community Survey estimates on persons with disabilities suggests that about 12.3 percent of persons age 18-64 years or over have a mobility or self-care limitation. Of senior citizens age 65 years and over, approximately 37.8 percent have a mobility or self-care limitation. Given the growing share of the senior resident demographic in Van Buren County, it may be reasonably assumed that the County will also see an increase in the population of persons with mobility or self care limitations in the future.

Van Buren County has the potential for significant economic development and growth. Strong points include a historically diverse agricultural sector, available land in industrial parks, a strong manufacturing and food-processing base, a steady commercial foundation, and an expanding tourism industry. The real property-equalized tax values are primarily residential (\$2,332,135,787), followed by industrial (\$453,830,000), agriculture (\$349,381,232), and commercial (\$280,621,309). It should be noted that Consumers Power in Covert Township serves a vast majority of the industrial base. The County's principle manufacturing employers are listed in Table 12.

Table 12. Principle Manufacturing Employers, Van Buren County

Company	Location	Product
Engineered Plastic Components	Mattawan	Plastic electrical engine equipment
Minute Maid Co.	Paw Paw	Bottled juices
Welch's	Lawton	Juices, jellies, jams
PRO-FAC	Lawton	Fruit fillings, canned fruits & vegetables
Pullman Industries	South Haven	Metal rolling, forming & stamping
Honee Bear Canning Co.	Lawton	Canned fruits and vegetables
Knouse Foods Co-op Inc.	Paw Paw	Applesauce, juice, and pie filling
Trellborg YSH Inc.	South Haven	Custom molded rubber product
Albemarle Corporation	South Haven	Organic chemicals & pharmaceuticals
Mol-Son Inc.	Mattawan	Tooling design & manufacturing
Special Lite Inc.	Decatur	Doors & frames
Klett Construction Co.	Hartford	Asphalt paving material
St. Julian Wine Co.	Paw Paw	Wines, champagnes, and juices
DeGrandchamp's Blueberries	South Haven	Grow & package blueberries
Bangor Electronics Co.	Bangor	Plastic magnetic TV components

The service sector is the largest employment sector in the county, covering 41.5% of all employment. This includes health, legal, and educational fields among others. The retail trade sector comes in second with 15.9% and transportation in third with 10.2%. With the ebbing of the era of manufacturing's dominance during the 2000's the manufacturing sector (which was the leader for employment in the County prior to 2002) saw a 16.2% drop in its employment share; from 26.1% in 2002 to 9.9% in 2012. This is followed by agriculture & mining at 6.2% (not accounting for migrant and seasonal labor), construction at 4.7%, government at 3.4%, finance at 2.9%, wholesale trade at 2.8%, and utilities at 2.3%.

The majority of people who work in Van Buren County are residents of the County. However, there are a substantial number of residents who commute to other counties (mostly Kalamazoo and Berrien) to work. On the east side of the County especially these commuters reside in recently developed subdivisions. As the area develops into a "bedroom" community, the economic patterns of the region greatly impact Van Buren County. The County also has a large agricultural sector, producing cucumbers, pickles, asparagus, pumpkins, tomatoes, squash, and sweet peppers.

Van Buren County agricultural statistics:

- Number of farms: 1,113
- Land in farms: 175,121 acres
- Average farm size: 157 acres
- \$194.6 million from crops of all kinds (12% increase from 2007)
- \$33.2 million from livestock (24% increase from 2007)

Source: 2012 Census of Agriculture

Michigan Rank of Van Buren County's Agricultural Commodities:

- 1st in production of fruits, tree nuts, and berries
- 1st in production of blueberries
- 5th in production of vegetables, melons, potatoes, and sweet potatoes
- 5th in aquaculture (farm-raised fish)
- 6th in production of Christmas trees
- 8th in turkey production
- 8th in broiler chickens

Source: 2012 Census of Agriculture

Environment and Land Use

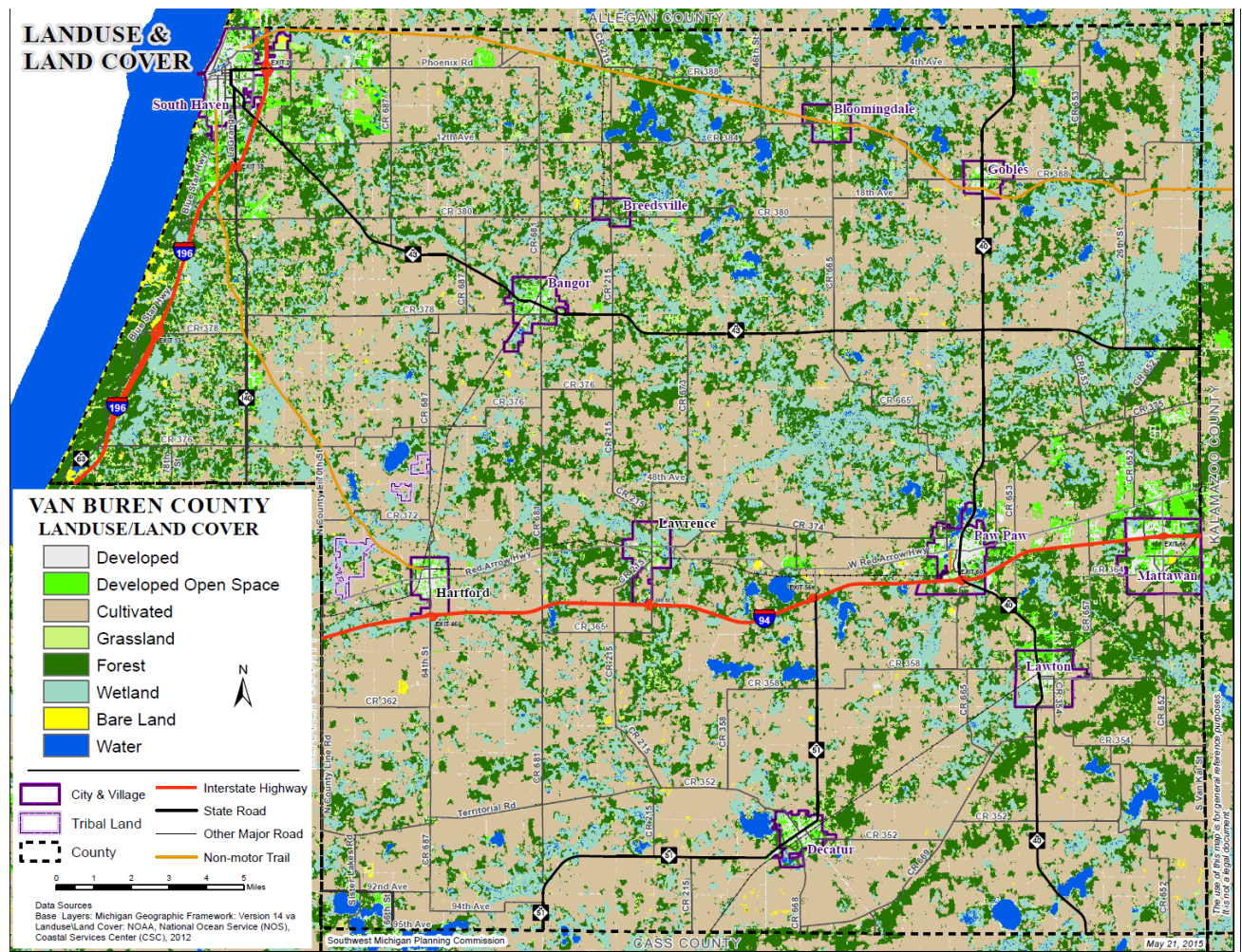
Van Buren County consists of many environmentally sensitive areas. These include lakes, rivers, streams, wetlands, steep slopes, and floodplains. Also, there are unique lands such as prime farmland, muck land, and soils suitable for horticulture, all of which support the important agriculture and food-processing industries. Furthermore, Lake Michigan, numerous inland lakes, and the sand dunes are a major tourist attraction. The challenge facing Van Buren County is how to create sustainable development; that is, to encourage growth that will not take away future generations' enjoyment of natural resources. In addition, an essential component of sustainability will be encouraging conditions of being disaster-resistant by not building in sensitive areas and by implementing other preventative measures.

Land use policies are made with a simple goal in mind. They attempt to encourage land uses that provide citizens with the highest quality of life. This includes economic vitality, easy access to community services, and a pleasant environment, while protecting precious and productive natural resources. As defined by tax assessments, land use is becoming increasingly residential. This trend has direct impacts on the demand for government services. Planning for these services is essential for sustainable development. Since the County has no authority over local zoning ordinances, it can act by encouraging intergovernmental cooperation and common planning principles through its planning document so that there is a consistent and desirable land use plan.

Most of Van Buren County is in agricultural land use/cover (50%) and natural lands, such as forests, grasslands, wetlands and water (44%). Only 5.8% of the land is developed in the county.

Table 13. Land Use/Cover in Van Buren County, 2010

CATEGORY	SUB CATEGORY	ACRES	%
DEVELOPED		23,411	5.8
	High Intensity Developed	698	
	Medium Intensity Developed	2,517	
	Low Intensity Developed	13,668	
	Developed Open Space	6,526	
AGRICULTURE		19,8891	49.9
	Cultivated	169,511	
	Pasture/Hay	29,380	
FOREST/SHRUB/GRASSLANDS		10,3701	26
	Grassland	10,810	
	Deciduous Forest	77,570	
	Evergreen Forest	3,881	
	Mixed Forest	4,253	
	Scrub/Shrub	7,186	
WETLANDS		63,766	16
	Palustrine Forested Wetland	43,453	
	Palustrine Scrub/Shrub Wetland	17,682	
	Palustrine Emergent Wetland	2,332	
	Unconsolidated Shore	297	
OTHER	Bare Land	1,327	0.3
WATER	Water/ Palustrine Aquatic Bed	7,705	2
TOTAL		398,803	



Public Facilities

Public facilities such as municipal headquarters and public libraries serve a critical role in disaster response efforts. These facilities may provide helpful resources to those affected by disaster, including: contact information and resources for getting lives back on track, power and internet access, as well as a central location for coordinating and communicating response efforts. The addresses for all of Van Buren County's municipal government offices and libraries are listed in the two tables below.

Table 14. Van Buren County Jurisdictions, Addresses of Municipal Government Offices

Jurisdiction	Address
Almena Township	42125 County Road 653, Paw Paw
Antwerp Township	24821 Front Avenue, Mattawan
Arlington Township	46818 48 th Street, Lawrence
Bangor Township	26779 66 th Street, Bangor
Bloomington Township	109 E. Kalamazoo, Bloomington
Columbia Township	53053 County Road 388, Grand Junction
Covert Township	73943 Lake Street, Covert
Decatur Township	103 E. Delaware, Decatur
Geneva Township	63133 16 th Avenue, Bangor
Hamilton Township	89861 54 th Street, Decatur

Hartford Township	58826 Butcher Road, Hartford
Keeler Township	64418 Territorial Road, Hartford
Lawrence Township	122 W. St. Joseph Street, Lawrence
Paw Paw Township	114 N. Gremps Street, Paw Paw
Pine Grove Township	26520 County Road 388, Kendall
Porter Township	28235 Shaw Road, Lawton
South Haven Township	09761 Blue Star Highway, South Haven
Waverly Township	42114 M-43, Paw Paw
City of Bangor	257 W. Monroe Street, Bangor
City of Gobles	105 E. Main Street, Gobles
City of Hartford	19 W. Main Street, Hartford
City of South Haven	539 Phoenix Street, South Haven
Village of Bloomingdale	109 E. Kalamazoo Street, Bloomingdale
Village of Breedsville	53053 County Road 388, Breedsville
Village of Decatur	114 North Phelps, Decatur
Village of Lawrence	157 N. Paw Paw, Lawrence
Village of Lawton	125 S. Main Street, Lawton
Village of Mattawan	24221 Front Avenue, Mattawan
Village of Paw Paw	111 E. Michigan, Paw Paw

Table 15. Public Libraries in Van Buren County

Name	Address	Nearest Municipality
Antwerp Sunshine Library	24823 FRONT AVE MATTAWAN, MI 49071	Mattawan
Bangor Branch Library	420 DIVISION ST BANGOR, MI 49013	Bangor
Bloomingdale Branch Library	109 EAST KALAMAZOO ST BLOOMINGDALE, MI 49026	Bloomingdale
Covert Branch Library	33880 M140 HWY COVERT, MI 49043	Covert
Gobles Branch Library	105 EAST MAIN ST GOBLES, MI 49055	Gobles
Hartford Public Library	15 FRANKLIN ST HARTFORD, MI 49057	Hartford
Lawton Public Library	125 SOUTH MAIN ST LAWTON, MI 49065	Lawton
Lawrence Branch Community Library	212 NORTH PAW PAW ST LAWRENCE, MI 49064	Lawrence
Paw Paw District Library	609 WEST MICHIGAN AVE PAW PAW, MI 49079	Paw Paw
South Haven Memorial Library	314 BROADWAY ST SOUTH HAVEN, MI 49090	South Haven
Van Buren District Library	200 NORTH PHELPS ST DECATUR, MI 49045	Decatur

CRITICAL FACILITIES/WARNING SYSTEM

In recent years, Van Buren County has increased its public facility capabilities and taken steps toward excellence. The administrator, in cooperation with the Board of Commissioners and other elected officials, runs the County with efficiency comparable to a business, keeping the budget balanced but also maintaining a high level of service to the citizens. The County has a well-developed interstate, state highway, and a Class "A" railroad network. There is also a county-wide public transportation system. There are three rail lines in the County: Pioneer, Penn Central, and the Chesapeake & Ohio. Passenger rail is accessible in Bangor, Kalamazoo, and the Benton Harbor/St. Joseph area. Regional airports include Grand Rapids, Kalamazoo, and South Bend. The closest international airports are in Detroit and Chicago. A municipal airport is located near South Haven and there are numerous, but smaller airstrips for private aircraft. There are two hospitals, one at 955 South Bailey in South Haven (South Haven Community Hospital), and the other at 408 Hazen in Paw Paw (Lakeview Hospital). Kalamazoo, Holland and St. Joseph have larger hospitals. The area has numerous colleges and universities in the near vicinity. The state parks within the County include Van Buren State Park and the Kal-Haven and Van Buren State Park Linear Trails. There are also many other public and private recreational facilities throughout the county. A Parks and Recreation Plan has been developed by the County to assess any specific recreational needs and to identify potential facilities, which would increase opportunities for all residents.

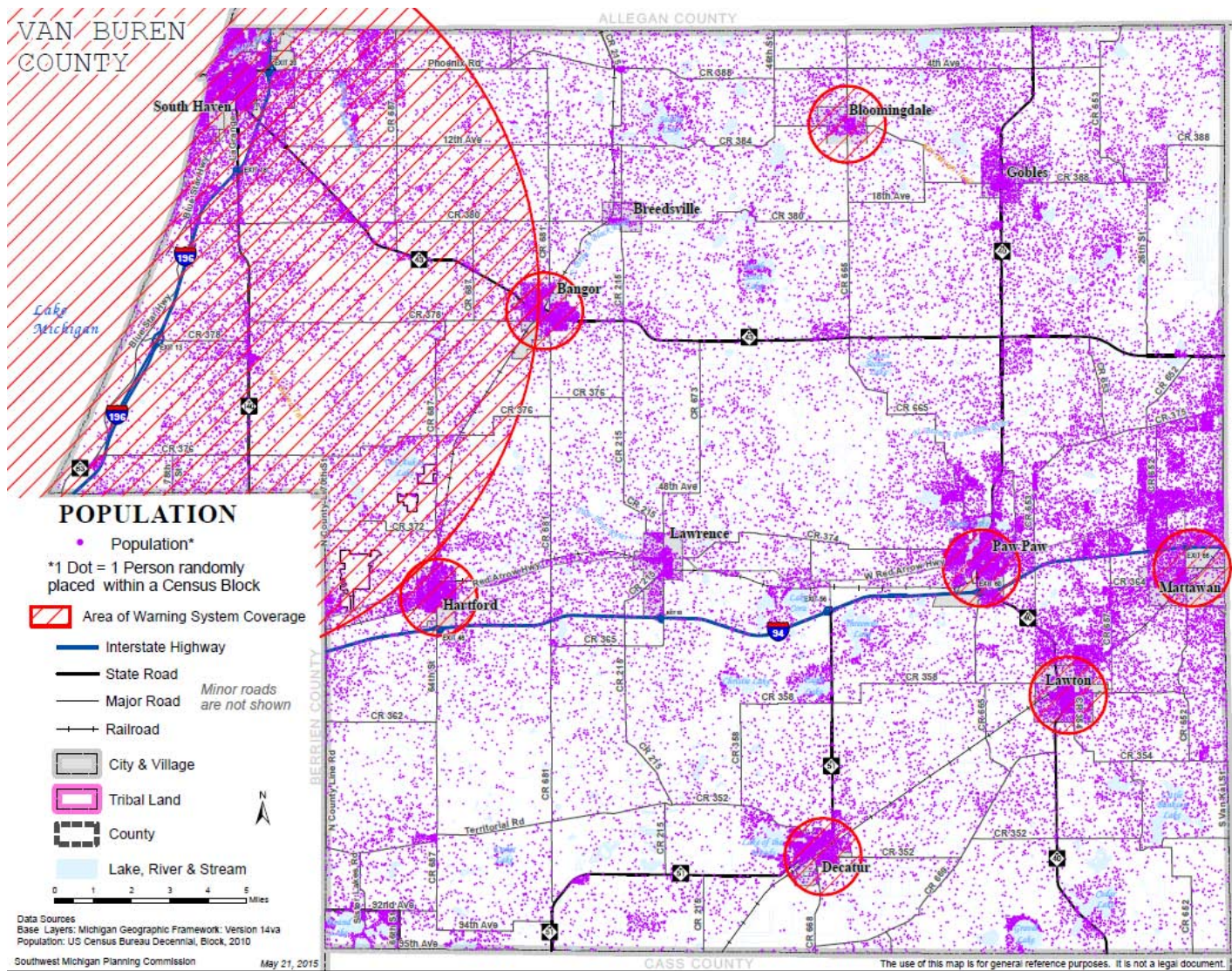
Critical facilities are defined in the FEMA planning guide as those facilities that "are essential to the health and welfare of the whole population and are especially important following hazard events". Critical facilities are defined as fire stations, police/law enforcement facilities, hospitals, shelters, administration buildings, airports, and nursing home/assisted care facilities. County staff and municipal officials provided information regarding the number and location of these facilities within Van Buren County. The following table lists the type and number of Critical Facilities as reported by each participating municipality.

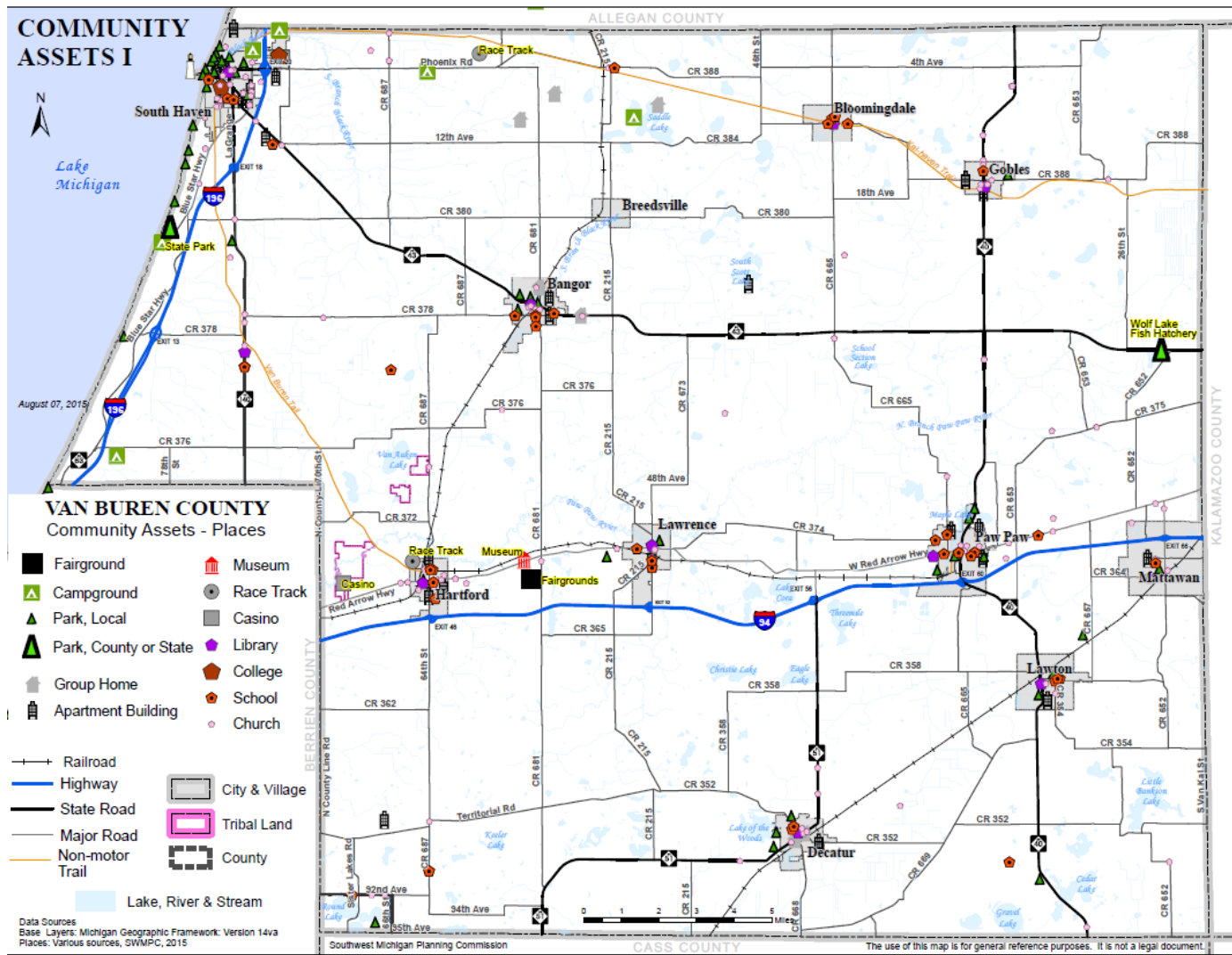
Several of these critical facilities are mapped in this section. In addition the warning system coverage for Van Buren County is mapped. The map shows that the western part of the county is covered with warning systems because of Palisades Nuclear Plant in Covert Township.

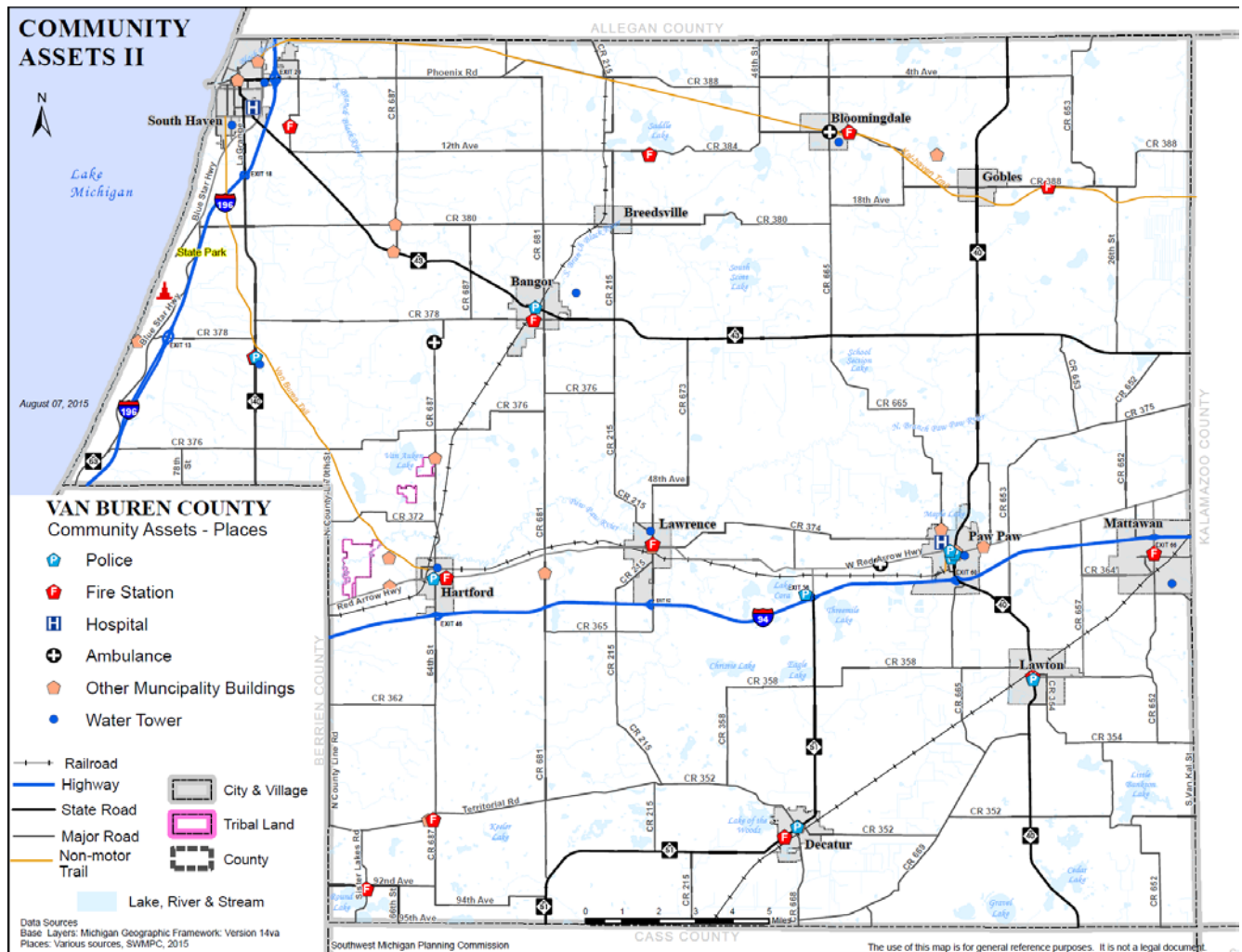
Table16. Critical Facilities, Van Buren County 2015 (source: worksheets completed by participating municipalities)

	Unit Name	Group Homes	Apt. Bldgs.	Schools	Large Office Bldgs.	Assembly Areas	Emergency Units	Public Works	Pumping Stations	Treatment Plants	Lift Stations	Water Wells	Sub-Stations	Community Shelters	Medical Facilities	Bridges	Railroads	Dams	Airfields/ Airports	Total	Unit Name
1	Almena Twp.															1			1	2	Almena Twp.
2	Antwerp Twp.	2	3	3			1									1	1		1	12	Antwerp Twp.
3	Arlington Twp.																			0	Arlington Twp.
4	Bangor City	1	6	6	3		2	2		1	5	6	1		1	4	1			39	Bangor City
5	Bangor Twp.	3		1		3										1	1			9	Bangor Twp.
6	Bloomingtondale Twp.	1	2	3		2	1	2		1									1	13	Bloomingtondale Twp.
7	Bloomingtondale Vil.		2	2			2	2		1	2									11	Bloomingtondale Vil.
8	Breedsville Vil.					1			2							1	1	1		6	Breedsville Vil.
9	Columbia Twp.	2		1			2							3		3		3		14	Columbia Twp.
10	Covert Twp.	1	1	1	4		2	1	1		3			2	1	2				19	Covert Twp.
11	Decatur Twp.	3					1			1							1			5	Decatur Twp.
12	Decatur Vil.	2	2	2	2	1	2	1			2	3	1	1	1		1			21	Decatur Vil.
13	Geneva Twp.		1			1	1		1											4	Geneva Twp.
14	Gobles City		4	1			2	1	1						2	1				12	Gobles City
15	Hamilton Twp.																1			1	Hamilton Twp.
16	Hartford City	1	4	3	2**	1	2	1	1	1	4	5		1	1		1			27	Hartford City
17	Hartford Twp.		1		1	2*					3					4				10	Hartford Twp.
18	Keeler Twp.			1	1		1													3	Keeler Twp.
19	Lawrence Twp.		2	2			1	1	1	1	2									10	Lawrence Twp.
20	Lawrence Vil.	2	4	5	4		2	1		1	4			1		2	1			27	Lawrence Vil.
21	Lawton Vil.	2	2	3	2	1	3	1	1	1	2	5	1	2			1			27	Lawton Vil.
22	Mattawan Vil.	2	3	3	4	1	2	1		2	5	2			1	3	1			30	Mattawan Vil.
23	Paw Paw Twp.		1		4	2	1				7					4				19	Paw Paw Twp.
24	Paw Paw Vil.	1	6	7	10		4	1	5		5	2		5	2	4		2		54	Paw Paw Vil.
25	Pinegrove Twp.			1		4	2									4				11	Pinegrove Twp.
26	Porter Twp.																		2	2	Porter Twp.
27	South Haven City		3	6		1	1	1	2	1	8				2	1				26	South Haven City
28	South Haven Twp.		3	1			1				22					4			1	32	South Haven Twp.
29	Waverly Twp.		4													9			3	16	Waverly Twp.
	County Total	23	54	52	32	19	36	16	15	11	72	23	3	15	11	49	11	6	9	462	County Total

*Hartford Township - Van Buren County Fairgrounds 55670 Co rd 681 Hartford, MI
**Hartford Township - VB Social Services and Van Cass Health Depts. 57418 Co Rd 681, Hartford, MI







HAZARD RANKING

After a thorough review of the Van Buren County community profile, a County hazard ranking was completed using a three-step process. The first step was the selection of evaluation criteria, the second step was assigning relative weights to each of the rating criteria and the third step was assigning point values in each of the selected criteria for each of the hazards.

The selection of the evaluation criteria was done after determining which aspects of the hazards were of most concern to the community. Six evaluation criteria (explained below) were selected. Each of the evaluation criteria was then assigned a “weight” to express the level of importance each of the criteria will have in ranking hazards. The sum of the weights of all of the evaluation criteria must equal 100 percent. Then point values between 0-5 were assigned as indicated below. Using a spreadsheet, values were input and calculated to provide a hazard score and ranking as shown in the following tables.

Hazard Analysis Evaluation Criteria

The following is a list of six evaluation measures that were used to evaluate each hazard facing the community:

Occurrence

1. Likelihood 1 = rare (0-30%); 2 = unlikely (31-50%); 3 = possible (51-70%), 4 = likely (71-90%); 5 = almost certain (>90%)

2. Frequency 1 = once every 20 years or more; 2 = once every 10 -20 years; 3 = once every 5-10 years; 4 = once every 1-5 years; 5 = once per year

Significance of Impact

3. Potential for causing casualties 1= none to minor; 2= moderate; 3 = high; 4 = very high; 5 = catastrophic

4. Potential for causing negative economic effects 1= none to minor; 2= moderate; 3 = high; 4 = very high; 5 = catastrophic

5. Potential Size of Affected Area 1 = very limited (0-10% of county); 2 – limited (11-20% of county); 3 = significant (21-50% of the county); 4 = widespread (51-90%); 5 = entire county (>90%)

6. Potential Population Impacted 1 = very limited (0-10% of county); 2 – limited (11-20% of county); 3 = significant (21-50% of the county); 4 = widespread (51-90%); 5 = entire county (>90%)

Table 17. All-Hazard Ranking and Scoring Summary, Van Buren County, 2015

Hazard	Rank	Score
Winter Weather Hazards	1	4.3
Severe Weather - Winds	2	3.7
Severe Weather - Lightning	3	3.6
Structure Fire	4	3.5
Fixed Site Hazmat	5	3.4
Transportation Hazmat	5	3.4
Drought	6	3.2
Infrastructure Failure	7	3.15
Riverine/Urban Flooding	8	2.8
Extreme Temperatures	8	2.8
Nuclear Plant Accident	9	2.7
Earthquake	10	2.55
Public Health	10	2.55
Tornadoes	11	2.5
Hail	12	2.45
Transportation Accident	13	2.2
Pipeline Accident	14	2
Shoreline Flooding/Erosion	15	1.9
Wild Fire	16	1.7
Oil/Gas Well Incident	17	1.4
Terrorism/Sabotage/WMD	18	1.3
Dam Failure	19	1.1
Civil Disturbance	20	1

Table 18. Hazard Rating and Evaluation Criteria, Van Buren County 2015

	Occurrence		Significance of Impact				TOTAL SCORE	RANK
	Likelihood	Frequency	Potential for causing casualties	Potential for causing negative economic effects	Potential Size of Affected Area	Potential Population Impacted		
WEIGHT	40%	20%	20%	10%	5%	5%		
Winter Weather Hazards	5	5	2	4	5	5	4.3	1
Severe Weather - Winds	5	5	1	3	2	2	3.7	2
Severe Weather - Lightning	5	5	1	2	2	2	3.6	3
Structure Fire	5	5	1	2	1	1	3.5	4
Fixed Site Hazmat	5	5	1	1	1	1	3.4	5
Transportation Hazmat	5	4	1	3	1	1	3.4	5
Drought	4	3	1	4	5	3	3.2	6
Infrastructure Failure	3	5	1	4	3	4	3.15	7
Riverine/Urban Flooding	4	4	1	1	1	1	2.8	8
Extreme Temperatures	3	4	1	3	5	1	2.8	8
Nuclear Plant Accident	2	1	4	4	5	5	2.7	9
Earthquake	3	4	1	1	4	1	2.55	10
Public Health	3	2	2	3	2	3	2.55	10
Tornadoes	3	4	1	2	1	1	2.5	11
Hail	3	4	1	1	2	1	2.45	12
Transportation Accident	3	2	2	1	1	1	2.2	13
Pipeline Accident	3	1	1	3	1	1	2	14
Shoreline Flooding/Erosion	3	1	1	2	1	1	1.9	15
Wild Fire	2	2	1	2	1	1	1.7	16
Oil/Gas Well Incident	2	1	1	1	1	1	1.4	17
Terrorism/Sabotage/ WMD	1	1	2	2	1	1	1.3	18
Dam Failure	1	1	1	2	1	1	1.1	19
Civil Disturbance	1	1	1	1	1	1	1	20

Each municipality was given the opportunity to either accept the County's ranking of the hazards or to rank the hazards differently for their community. The rankings are presented in the following table.

Table 19. Municipality Ranking of Hazards, 2015

County Rank	HAZARDS	City of Hartford	Village of Paw Paw	Columbia Twp	Lawton Village	Mattawan Village	City of South Haven	South Haven Twp	Waverly Twp
1	Winter Weather Hazards	1	2	1	1	1	1	9	1
2	Severe Weather - Winds	2	2	1	2	1	2	10	2
3	Severe Weather - Lightning	2	3	8	3	8	3	14	3
4	Structure Fire	4	4	4	4	4	4	13	7
5	Fixed Site Hazmat	5	5	10	11	10	8	12	20
5	Transportation Hazmat	5	4	10	7	10	6	11	8
6	Drought	5	7	10	12	10	12	5	4
7	Infrastructure Failure	6	2	4	5	4	7	8	9
8	Riverine/Urban Flooding	10	3	10	13	10	5	1	10
8	Extreme Temperatures	7	8	4	10	4	15	15	5
9	Nuclear Plant Accident	8	9	8	11	8	10	3	11
10	Earthquake	10	12	21	16	21	17	20	19
10	Public Health	10	8	17	9	17	11	7	18
11	Tornadoes	8	10	3	8	3	14	17	5
12	Hail	10	12	10	14	10	13	16	6
13	Transportation Accident	12	12	16	6	16	18	6	16
14	Pipeline Accident	14	15	7	12	7	16	NA	17
15	Shoreline Flooding/Erosion	15	4	17	17	17	8	2	24
16	Wild Fire	17	12	10	15	10	21	4	6
17	Oil/Gas Well Incident	15	18	17	18	17	21	NA	15
18	Terrorism/Sabotage/ WMD	18	18	21	16	21	20	19	23
19	Dam Failure	19	3	21	19	21	21	NA	22
20	Civil Disturbance	20	15	17	20	17	19	18	21

The following municipalities accepted the County's 2015 ranking of the hazards:

Almena Township
 Antwerp Township
 Arlington Township
 Bangor City
 Bangor Township
 Bloomingdale Township
 Bloomingdale Village
 Covert Township

Decatur Township
Geneva Township
Hamilton Township
Keeler Township
Paw Paw Township
Village of Decatur
Village of Lawrence

Risk Assessment and Vulnerability Assessment Summary

Based on the weighted hazard ranking process recommended in the Michigan Hazard Analysis workbook, and the updated Van Buren County Hazard Analysis, a composite of hazards and their relative risk are presented below. This list will be used as the foundation for developing hazard mitigation goals and strategies in subsequent sections. For risk assessment:

High Risk means it is very likely to occur over the hazard mitigation-planning horizon of 20 years.

Medium Risk means it is somewhat likely to occur.

Low Risk means it is not likely to occur.

The vulnerability assessment looks at such points as population concentrations, age-specific populations, development pressures, types of housing (older homes, mobile homes), presence of agriculture, sprawl (spreading resources too thin), and other issues that may make Van Buren County more vulnerable to specific hazards. The basic criteria are:

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

Medium Vulnerability, meaning if an event occurred it would have confined impacts on the safety of residents, but would have a financial impact on County residents and businesses.

Low Vulnerability, meaning if an event occurred it would have very minimal impact on the safety of County residents and minimal financial impact on County residents and businesses.

The combination of these two factors (risk and vulnerability assessment), result in the composite hazard ranking of either *high*, *moderate*, *low* or a combination.

Table 20. Risk and Vulnerability Assessment Summary, Van Buren County, 2015

Hazard	Risk Assessment	Vulnerability Assessment	Composite Hazard Ranking
Winter Weather Hazards	High	High	Very High
Severe Weather - Winds	High	Medium – High	Very High
Infrastructure Failure	High	Medium – High	Very High
Severe Weather - Lightning	High	Medium	High
Structure Fire	High	Medium	High
Transportation Hazmat	High	Medium	High
Drought	Medium	Medium-High	Moderate - High
Extreme Temperatures	Medium	Medium-High	Moderate – High
Public Health	Medium	Medium-High	Moderate – High
Fixed Site Hazmat	High	Low- Medium	Moderate
Riverine/Urban Flooding	High	Low-Medium	Moderate
Nuclear Plant Accident	Low	High	Moderate
Earthquake	Medium	Medium	Moderate
Tornadoes	Medium	Medium	Moderate
Hail	Medium	Medium	Moderate
Transportation Accident	Medium	Medium	Moderate
Pipeline Accident	Low	Medium	Moderate
Shoreline Flooding/Erosion	Low	Medium	Moderate
Wild Fire	Low	Medium	Moderate
Terrorism/Sabotage/ WMD	Low	Medium	Moderate
Dam Failure	Low	Medium	Moderate
Oil/Gas Well Incident	Low	Low	Low
Civil Disturbance	Low	Low	Low

HAZARD ANALYSIS

This section is an overview of the hazards that pose some element of risk to Michigan communities. Each hazard has a general description and an estimate of how seriously that hazard is expected to affect Van Buren County. There is usually more detail for the hazards that are considered to be higher priority levels and less information with those hazards that are not a high or moderate priority. Data collection and mapping continue on an on-going basis to better understand the different hazards.

CIVIL DISTURBANCE

A civil disturbance is a public demonstration or gathering (such as a sports event), or a prison uprising, which results in a disruption of essential functions, or causes rioting, looting, arson or other unlawful behavior. Large-scale civil disturbances rarely occur, but when they do they are usually an offshoot or result of one or more of the following events: 1) labor disputes where there is a high degree of animosity between the two dissenting parties; 2) high profile/controversial judicial proceedings; 3) the implementation of controversial laws or other governmental actions; 4) resource shortages caused by a catastrophic event; 5) disagreements between special interest groups over a particular issue or cause; or 6) a perceived unjust death or injury to a person held in high esteem or regard by a particular segment of society. Areas subject to civil disturbances may encompass large portions of a community. Types of facilities that may be subject to, or adversely impacted by, civil disturbances may include government buildings, prisons, military bases, nuclear power plants, universities, businesses, and critical service facilities such as police and fire stations.

In a survey of local governments in Van Buren County, these municipalities raised the following concerns regarding civil disturbance:

- **Hamilton Township** has summer camps with high concentrations of children and it is concerned about the potential for random shootings in those areas.
- **Mattawan Consolidated School** is a Class A high school and may be subject to acts of civil disturbance or terrorism.
- **Pine Grove Township** gets large crowds at Timber Ridge Ski Area, which could cause a problem.

Van Buren County has only one lock-up facility, and with no large cities the risk of any large-scale civil disturbance is rather small. The capacity of the county jail is just over 100 persons. Because there have been no past disturbances or any expected in the future, **civil disturbances are not considered a significant hazard for Van Buren County** at this time.

DROUGHT

Drought is defined as a prolonged period of time with no rain, particularly during the planting and growing seasons in agricultural areas. Drought can also adversely affect urban areas - particularly those dependent on reservoirs for drinking water. Decreased water levels due to insufficient rain can lead to restriction of water uses and amounts. It is difficult to

predict or forecast when a drought will begin, and how long it will last. Increased pumping of groundwater and surface irrigation in drought periods can result in land subsidence problems in some areas of the country. Virtually all areas of the country are subject to impact from drought - whether it be reduced agricultural outputs, reduced water supply, land subsidence, power outages caused by excessive energy use, increased numbers of wildfires, reduced marine navigation capabilities, etc. The most vulnerable regions of the country for drought are the arid southwest and the Great Plains.

Table 21. Two Significant Droughts Affecting Michigan

Date of Drought	Areas Primarily Affected	Summary of Impacts
1976-77	Great Plains; Upper Midwest (including Michigan); West	The 1976-77 drought in the Great Plains, Upper Midwest, and West also severely impacted Michigan. In fact, extreme drought conditions in the Upper Peninsula contributed heavily to the large wildfire that struck the Seney area in July of 1976. That fire, which was started by a lightning strike that ignited dry grasslands, eventually burned over 74,000 acres over a 1 1/2 month period and cost \$8 million to contain. The drought had led to a significant reduction in rainfall (6-8 inches below normal) in the area. In addition, the water table in the 95,455-acre Seney National Wildlife Refuge had dropped one foot, exposing old vegetation, peat and muck to the drying forces of the intense sunlight. Eventually, that material became a tinderbox that helped fuel the destructive fire. Fortunately, injuries and damage to improved property were minimal, although the loss of forest resources was staggering.
1987-89	Central U.S. (including Michigan); Eastern U.S.	The 1988 drought/heat wave in the Central and Eastern U.S. (an event that greatly impacted Michigan) caused an estimated \$40 billion in damages from agricultural losses, disruption of river transportation, water supply shortages, wildfires, and related economic impacts. In response to the drought, Michigan took several steps to combat the impact of the drought on businesses, natural resources, and individual citizens. Numerous Michigan communities instituted temporary water use restrictions to ensure an adequate water supply for human consumption and other essential uses such as firefighting. To stem the potential of wildfires in Michigan, the Governor issued (June, 1988) a statewide outdoor burning ban, which remained in effect until the end of July 1988 (and longer in some Upper Peninsula counties). The State also formed a task force to study issues related to the drought and formulate appropriate strategies for dealing with those drought-related concerns. The drought conditions began to improve in late summer, although the impacts of the drought on Michigan's agricultural industry were still felt for some time.

In 2015, Great Lakes levels have recovered from being extremely low over the past 10 years. Low water levels negatively affected pleasure boating on the Black River in South Haven resulting in some economic loss. High water levels are causing beaches and shorelines to erode.

Frequency

To date, there has not been a significant recorded incident of drought within Van Buren County. There has been, however, several periods of below normal precipitation and above average temperatures, which have had a limited effect on the community at large. Because a large portion of the economy in Van Buren County is based upon agriculture and industry, a drought could negatively alter the quality and quantity of crops, livestock, and other agricultural activities, resulting in severe economic and social hardships throughout the community. South Haven Township did identify in its community survey that 80 percent of the township's non-tourism economic base is related to agriculture and could be significantly affected by drought or extreme temperatures. This is true for most of Van Buren County. A prolonged drought was experienced in the summer of 2012 which resulted in agricultural losses.

Safety/Health

A drought could result in loss of human life due to extremely high temperatures, food shortages, fire, and other heat and health related problems such as increased pollutant concentrations in surface water.

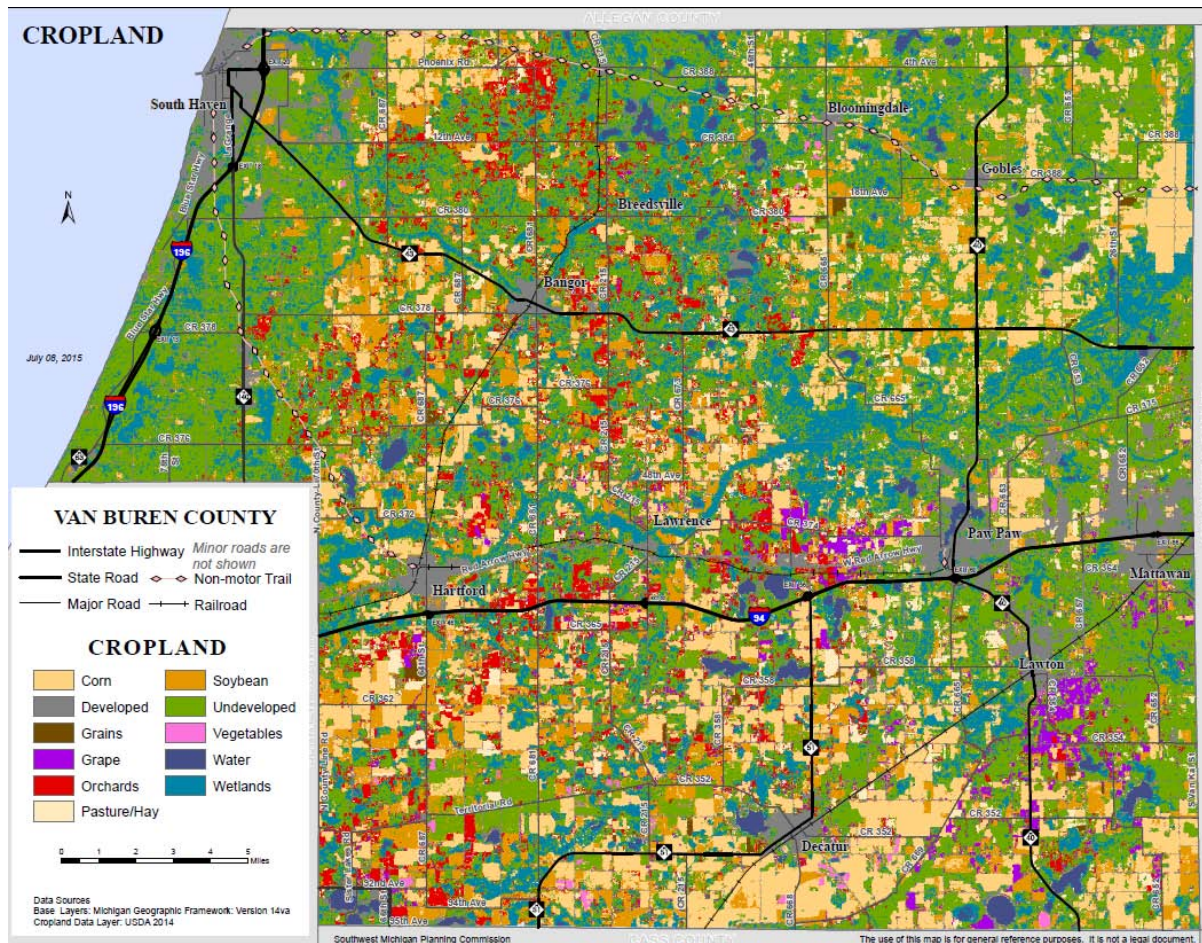
Damage/Critical Facilities

Other negative impacts that can be attributed to a drought include water shortages for human consumption, industrial, business, and agricultural uses, power generation, recreation and navigation; declines in water quality in lakes, rivers, streams, and other bodies of water; malnourishment of wildlife and livestock; increases in fires and wildfire related losses to timber, homes, and other property; increases in wind erosion; and declines in tourism in areas dependent on water-related activities.

Drought also increases the threat of wildfires, especially in forested and vegetated areas found throughout Van Buren County. A drought-impacted landscape can quickly turn a small fire into an inferno. Wildfires could destroy homes, business, and other property located in the county's rural residential areas.

Economic Impact

A drought can cause many severe hardships and impacts on communities and regions. One of the most common and severe impacts to a community like Van Buren County would be the drop in quantity and quality of agricultural crops. With over 50% of the county in agricultural production (almost 20,000 acres), farmland is an important part of the County's history, culture, and economic structure. Van Buren County agriculture market value of crops was \$194.6 million in 2012 (12% increase from 2007) and \$33.2 million from livestock (24% increase from 2007). The map below shows the diversity of farming in Van Buren County. Farmland and its economic bearing are so important to the County; the County is taking steps to preserve farmland through a *purchase of development rights program*.



The direct impacts of drought can further result in indirect impacts to a community, such as reduced revenue due to income losses in agriculture, retail, tourism, and other economic sectors; declines in land values due to physical damage from the drought conditions and decreased functional use of the property. Even though much of the farmland is irrigated, water use by agriculture during a drought could result in water use conflicts between users, lowering of lake levels or impacts to flows of streams (especially groundwater dependant cold water streams such as those found in the southern and eastern part of the county).

Van Buren County's 13 miles of Lake Michigan shoreline, scenic sand dunes, and inland lakes and streams make it an attractive tourist location. A drought could adversely affect the economic infrastructure of the community resulting in loss of tourism related revenue, increased unemployment, and population decreases.

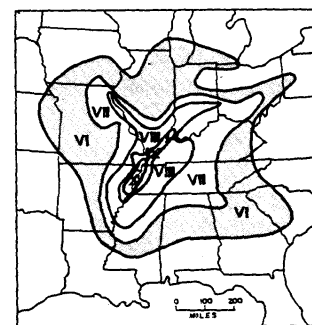
Drought has been given moderate to high priority (for mitigation planning considerations) compared with other assessed hazards.

EARTHQUAKE/SUBSIDENCE

An earthquake is a sudden motion or trembling in the earth caused by an abrupt release of slowly accumulating strain which results in ground shaking, surface faulting, or ground failures. Most areas of the United States are subject to earthquakes (including parts of Michigan), and they occur literally thousands of times per year. Most earthquake occurrences result in little or no damage. However, when moderate or severe earthquakes occur, the results can be devastating in terms of loss of life, property and essential services. One of the most dangerous characteristics of earthquakes is the ability to cause severe and sudden loss. Within one or two minutes, an earthquake can devastate an area through ground shaking, surface fault ruptures, and ground failures. Most deaths and injuries are not directly caused by the earthquake itself, but rather indirectly through the collapse of structures.

Earthquakes are measured by their magnitude and intensity. Magnitude is a measure of the amount of energy released at the epicenter or origin of the event. The Richter Magnitude Scale is commonly used to determine earthquake magnitude. An earthquake of 5.0 is a moderate event, 6.0 characterizes a strong event, 7.0 is a major earthquake, and 8.0 is a catastrophic earthquake. Earthquake intensity is the measure of damage done at a given location. In the United States, the most commonly used intensity scale is the Modified Mercalli Intensity Scale, which describes 12 increasing levels of intensity ranging from I which is imperceptible to XII which is catastrophic.

On August 9, 1947, Michigan's most powerful earthquake was centered southeast of Kalamazoo (near Three Rivers) and measured a 4.7 on the Richter scale. This was an intensity VI earthquake that produced slight damage over a significant area of southwestern Michigan including cracks and breaks in plaster and windows, chimney damage, etc. In eastern Van Buren County, this quake was felt by many who were inside their homes and a few who were outside at the time (intensity IV). In the western part of the county, the quake could be felt only by those on upper floors of buildings (intensity II to III). In 2011, there was a 3.0 earthquake centered in Sturgis. In 2015 there have been 2 earthquakes in southern Michigan.



Regional map of maximum intensities that would result from a magnitude $M_s=7.6$, maximum intensity earthquake anywhere along the New Madrid Seismic Zone.

One centered in Battle Creek was 3.3 and the other centered in Portage was 4.2. According to the U.S. Geological Survey, although Michigan is in an area in which there is a low probability of earthquake occurrences, distant earthquakes that occur in the New Madrid Seismic Zone or in upstate New York may affect the area. The New Madrid Seismic Zone poses the most significant threat. Based on recent scientific studies, portions of southern Michigan could be expected to receive minor damage if such an earthquake occurred (see map below).

The greatest impact in Michigan could come from damage to natural gas and petroleum pipelines. If the earthquake occurred in the winter, many areas of the state could be severely impacted by fuel shortages. Damage would probably be negligible in well-designed and constructed buildings; however, buildings in poor condition could suffer considerable damage under the right circumstances.

Loss estimation for Van Buren County for earthquakes the relative risk is medium and 100% of the population is at risk. Residential structures in potential earthquake impact area estimated are 33,975 and the have residential home value is \$92,400. Contents damage for earthquake event is estimated to be \$4,708,935 with the expected annual losses of \$10,454. (Source: State of Michigan Hazard Mitigation Plan)

Earthquakes are currently considered a moderate priority hazard for Van Buren County, but it is recommended that because of the possibility of intensity VI effects from a major New Madrid seismic event, that residents secure important computer equipment or fragile displays on shelving and furniture and keep aware of potential structural weakening in poorly built (or old and deteriorated) structures. Utility providers should be aware of possible weakening or damage to natural gas and petroleum pipelines.

Subsidence

Subsidence involves depressions, cracks, and sinkholes in the ground surface, which can threaten people and property. Subsidence depressions, which can occur over either days or even years, may damage structures with low strain tolerances, such as dams, and utility infrastructure. The sudden collapsing of the ground surface to form sinkholes poses an immediate threat to life and property. Such ground movements may continue for several days, weeks, months or even years, until the walls stabilize. The population most at risk would be in areas where development has occurred above active or abandoned mines and where underground cavities are present near the surface, as well as areas where an extensive amount of groundwater has been withdrawn. **Subsidence is not considered a significant hazard in Van Buren County.**

EXTREME TEMPERATURE

Extreme temperatures are defined as a prolonged period of very high or very low temperatures, often accompanied by other extreme meteorological conditions such as high humidity, lack of rain (drought), high winds, etc. Extreme temperatures - whether it is extreme heat or extreme cold - share a commonality in that they both primarily affect the most vulnerable segments of society such as the elderly, children, impoverished individuals, and people in poor health. Michigan is subject to both temperature extremes.

The Van Buren County Health Department does not have an official definition for extreme cold temperatures. The definitions for extreme heat are stated in the table below.

Table 22. Heat Advisory Levels, Van Buren County

Level	Definition
Level 1 – Heat Watch	Heat Index = 90 ⁰ or more
Level 2 – Heat Warning	Heat Index = 90 ⁰ or more for 3 or more days
Level 3 – Heat Emergency	Heat Index = 105 ⁰ or more
Level 4 – Heat Disaster	Heat Index = 105 ⁰ or more and power outages

(Source: Van Buren/Cass County District Health Department)

- **City of Hartford** experiences extreme temperatures-whether it is extreme heat or cold both share a commonality in that they primarily affect the most vulnerable segments of society such as elderly, children, impoverished individuals and people in poor health.

In Van Buren County, the average winter temperature is 25.5⁰ F, and the average daily minimum temperature is 17.8⁰F. The lowest temperature on record was recorded at the Bloomingdale station where the temperature was –22⁰F on February 10, 1912, February 5, 1918 and February 7, 1978. In Van Buren County, the summer average temperature is 69.1⁰F, and the average daily maximum temperature is 81.1⁰F. The highest recorded temperature was recorded in Bloomingdale as 105⁰F on July 5, 1911.

Frequency

Van Buren County experiences unusual temperature extremes about once per decade. The “lake effect” on Van Buren County’s climate is quite strong throughout much of the year. The prevailing westerly winds, in combination with Lake Michigan to the west, produce this unique effect. The lake effect moderates temperature in the County through all four seasons. Because the movement of pressure systems controls the day-to-day weather across the nation, Van Buren County seldom experiences prolonged periods of hot, humid weather in the summer or extreme cold during the winter. However, days of extreme heat and cold have been recorded periodically. Therefore, residents of Van Buren County must be aware of the dangers and be prepared to respond when these extreme temperatures occur.

The MSU Climatology Program report of the South Haven station, showed summers are dominated by moderately warm temperatures with an average of only three days exceeding the 90⁰F mark between 1951-1980. During that same period, only one day was 100⁰F or higher. The lake effect influence was also reflected in the minimum temperatures; an average of 132 days were recorded at 32⁰F or lower, an average of two days were 0⁰F or

lower, and for a period of seven years temperatures stayed above 0⁰F. The highest average monthly temperature of 88.3⁰F was recorded July 1955, and the lowest average monthly temperature of 5.4⁰F was recorded January 1977. The following temperature extremes, based on the time period of this station's published record, are:

Maximum	100° F.	June 20, 1953
Minimum	-22° F.	February 11, 1899
Warmest monthly mean	77.6°F.	July 1955
Coldest monthly mean	13.4°F.	January 1977

Further east in the County, there were more days exceeding 90⁰F and more days below 0⁰F than along the lake shore in South Haven. The MSU Climatology Program reported at the Bloomingdale station that summers are dominated by moderately warm temperatures with an average of 13 days exceeding the 90⁰F mark between 1951-1980. During the same period, only one day was 100⁰F or higher. The lake influence was reflected in the minimum temperatures; an average of 148 days was 32⁰F or lower, an average of eight days was 0⁰F or lower, and only two years stayed above 0⁰F. The highest average monthly maximum temperature of 90.4⁰F was recorded July 1955, and the lowest average monthly minimum temperature of -1.4⁰F was recorded February 1978. The following temperature extremes, based on the time period of this station's published record, are:

Maximum	105° F.	July 13, 1936
Minimum	-22° F.	February 7, 1978
Warmest monthly mean	78.0°F.	July 1955
Coldest monthly mean	12.8°F.	February 1978

Table 23. Daily Average Temperatures For Van Buren County, 1951-1980 (degrees F)

Month	Bloomingdale	South Haven
	Maximum/Minimum	Maximum/Minimum
January	30.2 / 15.7	31.6/ 18.1
February	33.9 / 16.4	34.1/ 19.7
March	43.6 / 24.7	43.3/ 27.1
April	58.6 / 36.0	55.6/ 37.0
May	70.7 / 46.0	66.2/ 46.3
June	79.0 / 54.9	75.9/ 55.8
July	83.0 / 58.8	79.3/61.0
August	81.3 / 57.3	78.5/ 59.9
September	74.4 / 50.6	73.4/ 53.4
October	62.6 / 40.7	62.7/ 44.0
November	47.5 / 31.2	48.5/ 33.9
December	35.3 / 21.3	36.5/ 23.6
Annual Average	58.3 / 37.8	57.1/ 40.0

Table 24. Record Temperatures For Van Buren County, 1951-1980 (degrees F)

Month	Bloomington		South Haven	
	High/Year	Low/Year	High/Year	Low/Year
January	60 / 1965	-15 / 1979	64 / 1967	-11 / 1972
February	69 / 1976	-22 / 1978	64 / 1976	-13 / 1979
March	78 / 1963	-9 / 1962	79 / 1967	-8 / 1969
April	89 / 1962	5 / 1972	84 / 1970	16 / 1979
May	93 / 1962	24 / 1978	90 / 1962	24 / 1979
June	98 / 1971	31 / 1972	100 / 1953	36 / 1977
July	100 / 1955	39 / 1972	97 / 1955	39 / 1979
August	99 / 1964	38 / 1967	97 / 1955	38 / 1979
September	98 / 1953	30 / 1973	95 / 1954	30 / 1976
October	89 / 1971	16 / 1972	86 / 1951	17 / 1976
November	78 / 1975	5 / 1964	78 / 1961	5 / 1976
December	67 / 1970	-18 / 1976	65 / 1970	-5 / 1976
Annual Bests	100 / 1955	-22 / 1978	100 / 1953	-13 / 1979

(Source: MSU Climatology Program)

According to the State of Michigan Hazard Mitigation Plan, extreme hot temperatures for Van Buren County is a relative high risk. The number of days annually that are greater than 90 °F is 11.2 and the probability of occurrence is 3.1%. Extreme cold temperature for Van Buren County is a relatively low risk. The number of days annually days that are below 0 °F is 2.6 with the probability of occurrence of 0.7%. In addition, on January 1-15, 1999, a frost-freeze disaster was declared in Van Buren County. (Source: State of Michigan Hazard Mitigation Plan)

Safety/Health

The major threats of extreme heat are heatstroke (a major medical emergency), and heat exhaustion. Extreme heat is a more serious problem in urban areas, where the combined effects of high temperature and high humidity are more intense. The major threats of extreme cold are hypothermia (also a major medical emergency) and frostbite. Each year in the United States, approximately 700 people die as a result of severe cold related causes. It should be noted that a significant number of cold weather-related deaths are not the direct result of “freezing” conditions. Rather, many deaths are the result of illnesses and diseases that are negatively impacted by severe cold weather, such as stroke, heart disease and pneumonia.

Extreme cold often accompanies winter storms, but can also occur without precipitation. Prolonged exposure to cold can cause frostbite or hypothermia and become life threatening. Infants and elderly people are most susceptible, as are those who take part in outdoor activities during extreme cold events. Insufficient home heating and/or poor insulation may create health problems for the elderly, ill, and infants and may cause water pipes to freeze and burst resulting in damage to the home. People with mobility limitations may find it difficult to leave home and become more dependent on outside assistance.

Damages/Critical Facilities

Power failures often occur during peak usage times in extremely hot weather. A new gas-fired electric plant is being built near the Palisades Nuclear Plant to increase the supply of electricity during peak usage times. The plant will use the same transmission lines as Palisades, and will use lake water for cooling. Extreme cold may cause ice jams on local rivers and streams, which could lead to flooding during the spring thaw. The American Red Cross has coordinated assistance during extreme temperatures. In 1999, a Hartford school was used as a warming shelter due to a power outage and cold temperatures. The costs associated with this temporary shelter operation were not estimated.

Economic Impact

Extreme cold temperatures that occur during the growing season for local agricultural products may lead to crop failure and reduced yields. Extreme heat could damage sensitive crops and produce drought conditions. Either circumstance could cause economic hardships for both the farmers and the communities at large. Specific costs to deal with human illness and problems are not easily obtainable because most mitigation and response efforts are carried out by several volunteer and government agencies.

Extreme temperatures are considered a moderate to high priority in the County.

FIRE HAZARDS

Structural Fires

Structural fires are any instance of uncontrolled burning which results in structural damage to residential, commercial, industrial, institutional, or other properties in developed areas. In terms of average annual loss of life and property, structural fires, often referred to as the “universal hazard” because they occur in virtually every community, are by far the biggest hazard facing most communities in Michigan and across the country. Each year in the United States, fires result in approximately 5,000 deaths and 300,000 injuries requiring medical treatment. According to some sources, structural fires cause more loss of life and property damage than all types of natural disasters combined. Particularly devastating are large urban conflagrations, in which multiple structures are damaged or destroyed.

Many structural fire events are addressed by individual efforts of property owners to maintain safety or by larger-scale policies and requirements from insurance companies and building codes. However, there are some areas of traditional "Main Street" arrangements, which may make fire events harder to contain because of the high density of attached and multi-story structures; some of which may need renovation or updating to higher fire-safety requirements. No study has been done on this topic for the current hazard analysis, but municipalities with older-style districts such as Paw Paw, Lawton, Lawrence, Hartford, South Haven, Decatur, Bangor, and Gobles should be inspected and assessed for possible fire risks.

In the municipal surveys, both Lawrence Township and Paw Paw Village expressed concerns with structural fires.

- **Lawrence Township** has had lightning strikes cause structural fires and damage to communication towers.
- **Paw Paw** is concerned about structural fires due to the age (mid 1800s to early 1900s) and wood composition of many of the village structures.
- In 2012, a fire destroyed 3 businesses in downtown **Gobles**.

Frequency

The State Fire Marshall estimates that a structural fire occurs in Michigan approximately every 24 minutes. Van Buren County experienced a total of 387 fires (127 were structural fires) in 2002 and 495 fires (102 were structural fires) in 2003. In Van Buren County, for the two-year period of 2002-2003, the average number of structural fires was 114 with an average of five injuries, one death and a reported loss of \$2,111,427 per year.

Table 25. Structural Fires Reported in Van Buren County, 2002-2003

Year	Number of Structural Fires	Injuries	Deaths	Total Reported Losses
2002	127	7	0	\$1,338,041
2003	102	3	2	\$2,884,814
Total	229	10	2	\$4,222,855

(Source: NFIRS 5.0 National Reporting)

Safety/Health

Structural fires can result in the injury, or death, of citizens and responders. A major fire in a downtown area could result in more lives lost and a higher number of injuries.

Damage/Critical Facilities

Most of the identified critical facilities are located in city and village centers or other densely populated areas. This increases the risk of these critical facilities to structural fires. Another consideration is the possible loss of historic structures in downtown areas. These structures may not conform to newer building standards designed to limit the effects of structural fires.

Economic Impact

The economic impact of structural fires includes, but is not limited to the loss of the structure, displaced citizen housing needs, disruption to utilities, and loss of economic activity if a commercial or industrial area is affected.

Structural fires are given high-level priority in Van Buren County.

Wildfires

A wildfire is an uncontrolled fire in grass or brush lands, or forested areas. The most immediate dangers from wildfires are the destruction of homes and timber, loss of life or injury to persons who live in the affected area or who are using recreational facilities in the area, and loss of life or injury to wildlife. Long-term effects are numerous and include scorched and barren land, soil erosion, landslides/mudflows, water sedimentation, loss of wildlife habitat, and loss of recreational opportunities. Forests cover approximately one-half of Michigan's total land base. As a result, much of the state is vulnerable to wildfire. In addition, development in and around forests and grasslands is increasing rapidly, making public safety a primary consideration in wildfire mitigation and suppression efforts.

Van Buren County has wild land/urban interface areas adjacent to the Allegan County forest, and although the County has experienced grass fires, no major damage has occurred as a result of those fires. Van Buren County has no major state or national forest areas; however, the southern part of the County has an area that can experience muck fires. These fires occur in old moraine areas that have rich, black, loamy soil types. Once ignited, a muck fire may burn for extremely long periods of time, and require heavy equipment to extinguish. The area of the County that is most likely to experience muck fires is the area between Mattawan and Decatur. See maps for forested areas and muck soil areas with wildfire potential. The following municipalities raised concerns with wildfires:

- **Covert Township** has large areas of dune grass along the lakeshore, and the houses tend to be close together and heavily wooded.
- **Decatur Public Schools** owns 130 acres of mostly pine-wooded land.
- **Hamilton Township** occasionally has small "hot" fires on vacant woodlots and swampland (muck soils).
- **South Haven Township** raised a concern with dune fires during droughts and use of fireworks.

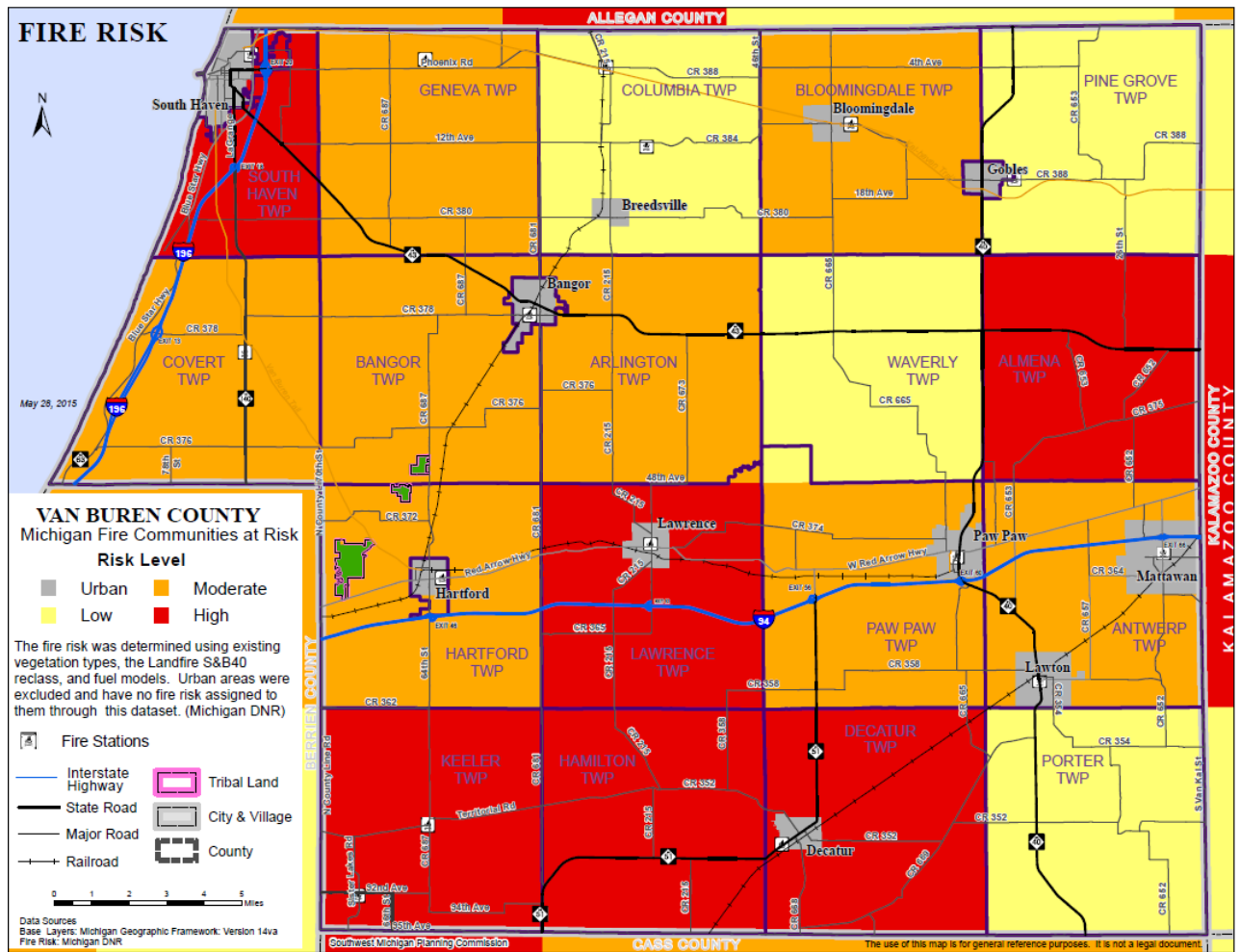
Frequency

The Michigan Department Of Natural Resources (MDNR) reported 18 wildfires in Van Buren County between 1981 and 2000. It should be noted that the figures shown on the maps do not include those wildfires suppressed by local volunteer fire departments. To date, there has not been a significant wildfire reported in Van Buren County although local jurisdictions throughout the County respond to hundreds of smaller grass and wildfires every year.

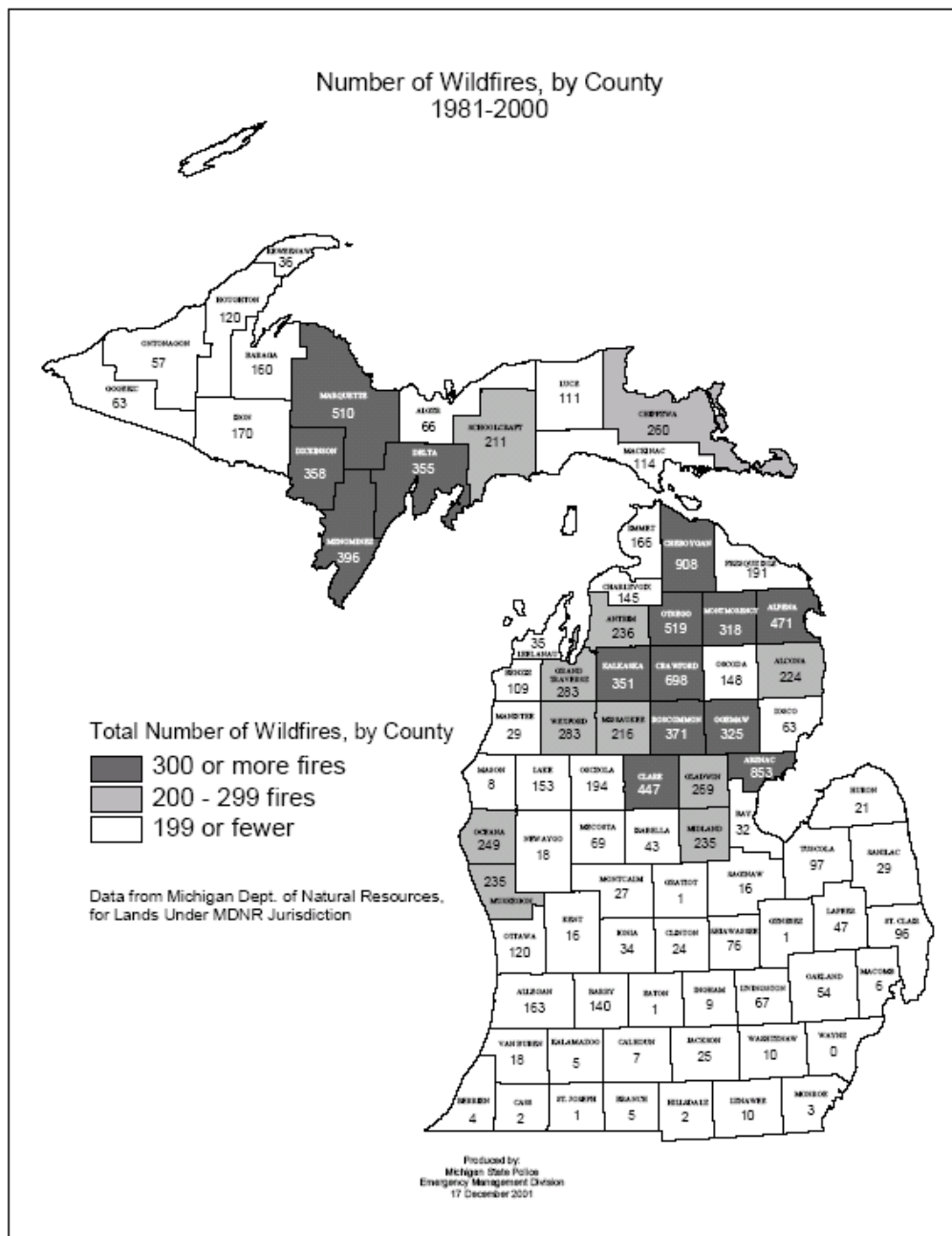
Table 26. Wildfires Reported in Van Buren County, 2002-2003

Year	# of Wildfires	Injuries	Deaths	Damages Reported
2002	104	0	0	\$0
2003	219	0	0	\$352,601
Total	323	0	0	\$352,601

(Source: NFIRS 5.0 National Reporting)



Total Number of Wildfires by County, Michigan



Safety/Health

The dangers of wildfires cannot be underestimated. Wildfires pose threats to civilians, firefighters, and the environment. With more and more people moving into rural areas, brush and grass fires will increase problems for people who suffer from asthma and other breathing related medical conditions.

Damage/Critical Facilities

With increased numbers of people living in wooded and rural areas, their activities can lead to more wildfires. Debris burning accounts for over one-third of the fire starts in Michigan. These fires, by their nature, occur in close proximity to homes and other structures increasing the potential for injury or loss of life and property. Properties that have not been planted with fire resistant vegetation, have not been properly maintained or cleared of leaf and tree debris increase the hazard. Carelessness and inattentiveness to a debris fire can also allow a contained fire to get out of hand.

Economic Impact

Even though the damages reported from wildfires have not yet been very high, responding to these wildfires is costly to the jurisdictions involved.

Overall, the wildfire hazard is given low to moderate priority in Van Buren County.

Scrap Tire Fires

A scrap tire fire is an uncontrolled burning of tires at a scrap tire storage or recycling site. Each year in the United States, an estimated 250 million vehicle tires are disposed of. Michigan alone generates 7.5-9 million scrap tires annually. Many of these scrap tires end up in disposal sites (legal or illegal), some of which may have several hundred thousand tires. Michigan currently has more than 24 million scrap tires at disposal sites scattered across the state. Tire disposal sites can be fire hazards due to the large quantity of “fuel” onsite, coupled with the fact that the shape of a tire allows air to flow into the interior of a tire pile, rendering standard firefighting practices nearly useless. Burning oil released by the burning tires flows and spreads the fire to adjacent areas. Some scrap tire fires have burned for months, creating acrid smoke and an oily residue, which can leach into the soil creating long-term environmental problems. Scrap tire fires differ from conventional fires in several respects: 1) even relatively small scrap tire fires can require significant resources to control and extinguish; 2) the costs of fire management are often far beyond that which local government can absorb; 3) the environmental consequences of a major tire fire can be significant; and 4) the extreme heat from the fire converts a standard passenger vehicle tire into about two gallons of oily residue, which can then leach into the soil or migrate to streams.

Van Buren County does not contain any official scrap tire piles or storage sites. Although Allegan County does have a site that could cause smoke and environmental impacts to drift across the county line, **risks in Van Buren County are considered very low, and this is not considered a significant threat at this time.**

FLOODING HAZARDS

Dam Failure

A dam failure is the collapse or failure of an impoundment resulting in downstream flooding. Dam failures can result in loss of life and extensive property or natural resource damage. Dam failure is not limited to flood events, which may cause overtopping of a dam; failure can also result from poor operation, lack of maintenance and repair, and vandalism. Such failures can be catastrophic because they occur unexpectedly, with no time for evacuation. Michigan has experienced over 260 dam failures in its history.

The worst recorded dam failure in U.S. history occurred in Johnstown, Pennsylvania, in 1889. More than 2,200 people were killed when a dam upstream from Johnstown failed, sending a huge wall of water downstream which completely inundated the town.

In Michigan, all dams over six feet tall that create an impoundment with a surface area of more than five acres are regulated by Part 315, Dam Safety, of the Natural Resources and Environmental Protection Act, (451 P.A. 1994), as amended. This regulation requires that the Michigan Department of Environmental Quality (MDEQ) rates each dam as either a *low*, *significant*, or *high hazard* potential. This rating system is based solely on the potential downstream impact if the dam were to fail and not according to the physical condition of the dam. The potential downstream impact is figured by assessing the population concentration and economic activities located downstream from the dam.

In Van Buren County, there are a total of 35 dams on record with the Michigan Department of Environmental Quality. One dam has a *high hazard* rating and one has a *significant hazard* rating. The remaining 33 dams are assigned a *low hazard* potential rating because their failure would result in no probable loss of human life and low economic and environmental impacts. Dams assigned the *significant hazard* potential rating are those dams where failure results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, and other impact concerns. Dams assigned the *high hazard* potential rating are those where failure will most likely cause loss of human life.

Table 27. Dams in Van Buren County

Dam Name	Hazard Ranking	River
Adams Dam	Low	East Branch Paw Paw River
Almena Diversion Dam	Low	Hayden Creek
Almena Hatchery Dam #1	Low	Hayden Creek
Almena Hatchery Dam #2	Low	Hayden Creek
Almena Hatchery Dam #3	Low	Hayden Creek
Almena Hatchery Dam #4	Low	Hayden Creek
Almena Hatchery Dam #5	Low	Hayden Creek
Arndt Dams (3 Dams)	Low	
Bangor Dam		S Branch Black River
Blocker's Pond Dam	Low	Blocker's Pond Outlet
Brandywine Lake Level Control Structure	Low	Brandywine Creek
Briggs Dam	Significant	South Branch Paw Paw River
E W Fisk Dam	Low	Tributary to Ritter Creek
Effner Dam	Low	Tributary to Great Bear Lake
Gravel Lake Level Control Structure	Low	Gravel Lake Outlet
Great Bear Lake Level Control Structure	Low	Black River
Heuser Dam	Low	Paw Paw River
Lafler Dam	Low	Tributary to Black River
Lake of the Woods Level Control Structure	Low	Lake of the Woods Drain
Maple Lake Dam	High	S Br Paw Paw River
Meyer Dam	Low	Tributary to Dowagiac Creek
Old Masonry Dam	Low	Hayden Creek
Paw Paw Lumber Co Dam	Low	East Branch Paw Paw River
Pugsley Lake Level Control Structure	Low	Pugsley Lake Outlet
Reynolds Lake Level Control Structure	Low	Tributary to Red Creek
Saddle Lake Level Control Structure	Low	Barber Creek
Schafer Lake Level Control Structure	Low	Shafer Lake Outlet
Scott Lake Level Control Structure	Low	Tributary to Black River
Van Auken Lake Level Control Structure	Low	Tributary to Paw Paw River
Village Association Dam	Low	Tributary To Fish Lake
Vorick Dams (2 Dams)	Low	Tributary To Ritter Creek
Wolf Lake Fish Hatchery Dams	Low	Tributary to Campbell Creek

(Source: Michigan Department of Environmental Quality, Dam Safety Program)

Dam owners are required to maintain an Emergency Action Plan (EAP) for *significant* and *high hazard* potential dams. Owners are also required to coordinate with local emergency management officials for consistency with local emergency operations. There are emergency plans for both the Briggs and Maple Lake dams on file at the Van Buren County Office of Domestic Preparedness. Since the hazard level of dams is based upon the potential downstream impacts if the dam were to fail, it is possible for the hazard status of a dam to change over time. As Van Buren County becomes more developed and more people and businesses locate downstream from dams, the potential human and economic impact from a catastrophic dam failure is increased.

The development of an emergency management plan for each dam in Van Buren County may help lessen the catastrophic impacts in the event of a dam failure. An effective emergency plan requires accurate measurement and prediction of water levels and times at a given location. These plans examine the potential downstream impacts if a dam were to fail and are crucial to characterizing and reducing threats due to potential dam failures.

Frequency

Although there are numerous earthen dams throughout Van Buren County, which require maintenance, and other dams that have had water seepage, there have been only four-recorded dam failures in the County. Privately owned earthen dams in Van Buren County have the most potential of failure which would result in flooding and property damage. Many of these earthen embankments cross small ravines and, if not properly maintained, could weaken or leak due to tree roots growing on or near the dams. These roots weaken the integrity of the embankment as they wind their way through the earthen structure. In most instances, the resultant flooding of one of these earthen dams would be limited to the surrounding property and would not pose a serious threat to other portions of the County. In 2008, the Breedsville Dam on the Black River failed due to heavy rain. A park downstream was flooded and no other damage was caused. The dam was removed and the area was restored.

Safety/Health

A dam failure can result in loss of life and extensive property or natural resource damage for miles downstream from the dam. There is one *high* hazard rated dam, Maple Lake Dam, in Van Buren County that has the potential to cause loss of human life.

Damage/Critical Facilities

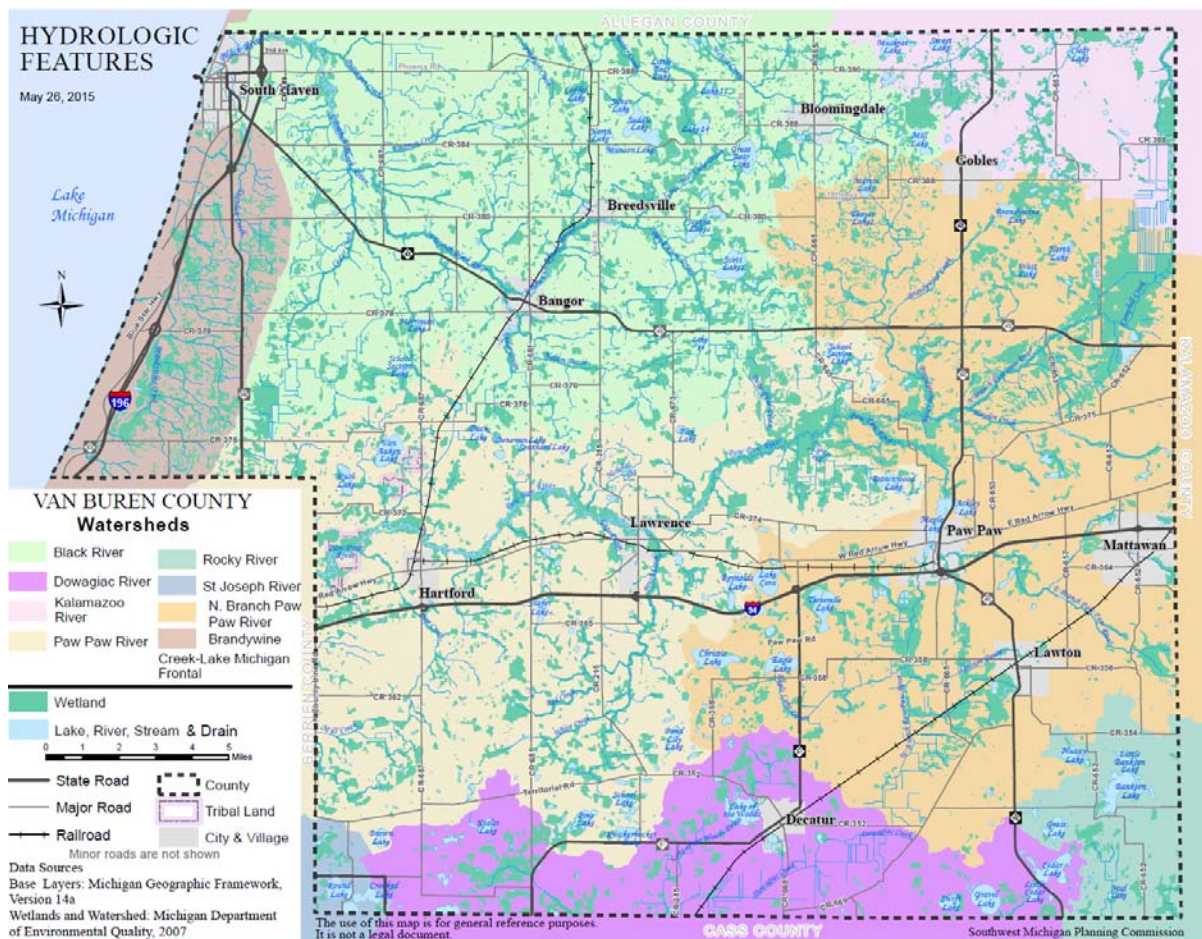
Dam failures can result in property damage ranging in scope from limited to massive. Failure of *low* hazard rated dams will most likely result in losses limited to the owner's property. There are 34 dams in Van Buren County with a *low* hazard rating, whereas the failure of *significant* and *high* hazard dams could result in major damage to homes, businesses, infrastructure and critical facilities. There is one *high* hazard (Maple Lake Dam) and one *significant* hazard dam (Briggs Dam) in Van Buren County.

Economic Impact

The economic impact from dam failure will be minimal for *low* hazard dams, but great for *significant* or *high* hazard dams. **Dam failure, compared to other hazards in Van Buren County, is considered a moderate hazard.**

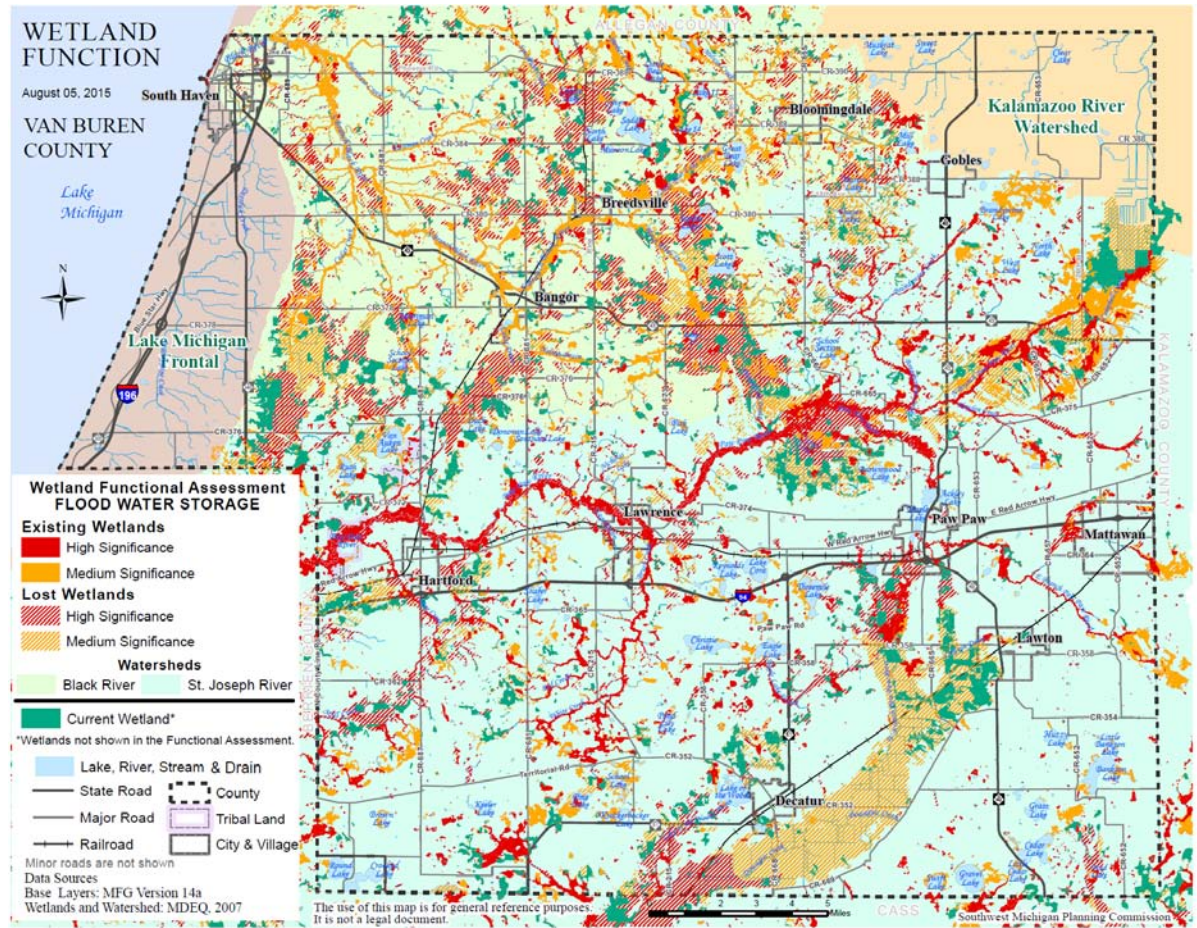
Riverine and Urban Flooding

Riverine flooding is defined as the periodic occurrence of over bank flows of rivers and streams resulting in partial or complete inundation of the adjacent floodplain. Riverine floods are generally caused by prolonged, intense rainfall, snowmelt, ice jams, dam failures, or any combination of these factors. Such over bank flows are natural events that may occur on a regular basis. Riverine floods occur on river systems whose tributaries may drain large geographic areas and encompass many independent river basins. Floods on large river systems may continue for several days. Many areas of Michigan are subject to riverine flooding. A map shows the major watersheds, rivers and streams in Van Buren County which include the Black, Dowagiac, Paw Paw, Rocky and Kalamazoo River Watersheds. **Riverine and urban flooding is currently considered moderate priority in Van Buren County.**



Wetlands are low areas characterized by the presence of water at a frequency that is sufficient to support wetland vegetation or aquatic life. Wetlands also serve as a transition

between land and water and are important for mitigating floods. Other than providing overflow areas for flooding, wetlands provide a variety of other benefits that include soil erosion prevention, improved water quality, and habitats for a variety of vegetation and wildlife. Van Buren County has lost 50% of its wetlands to draining or filling. The wetland function map shows which existing and lost wetlands are critical for floodwater storage. This map can be used to help direct wetland protection and restoration efforts.

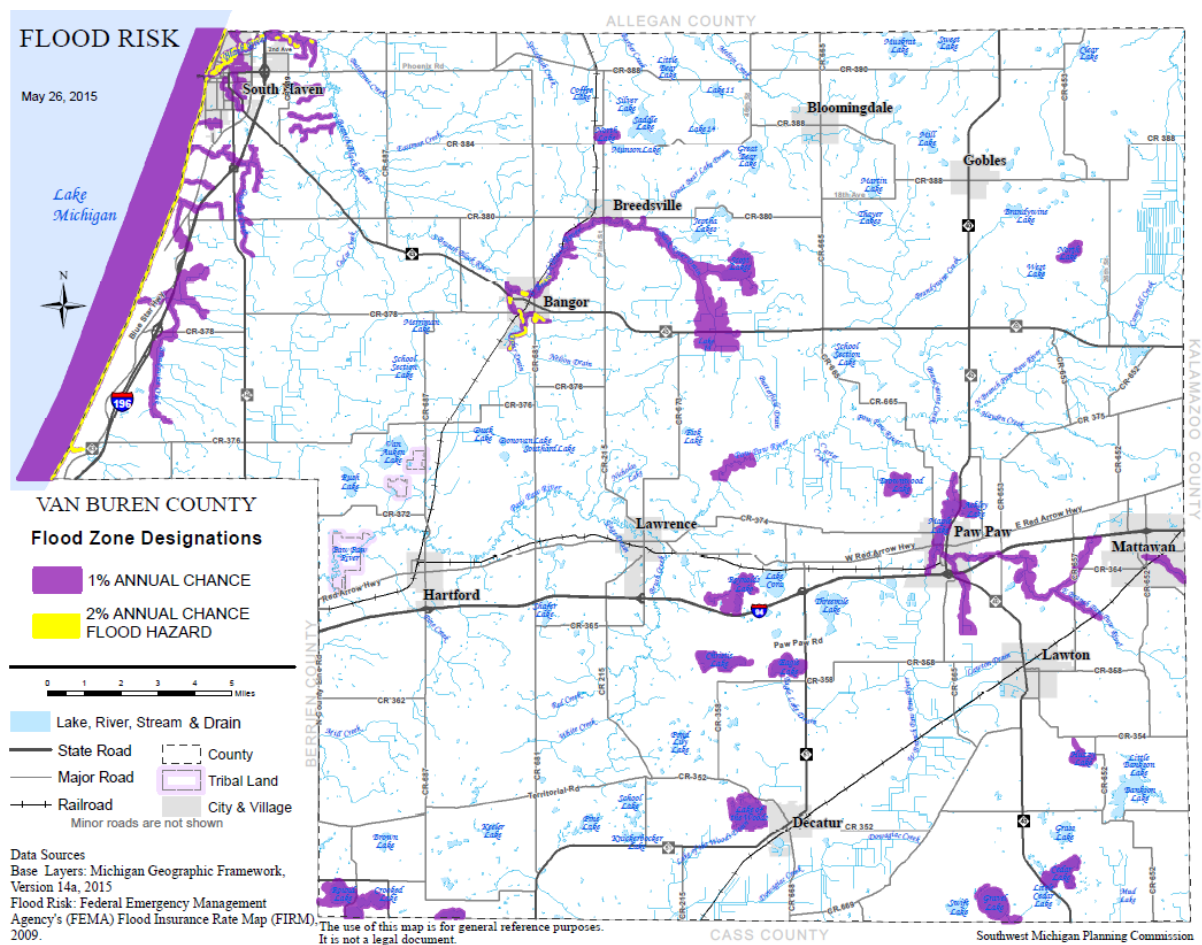


Flash flooding differs from riverine flooding in extent and duration. Flash floods are typically characterized by high velocity water; often carrying large amounts of debris, flowing through small streams or normally dry creeks. Flash floods are normally the result of intense thunderstorms resulting in significant localized rainfall. Urban flooding involves the overflow of storm sewer systems associated with heavy rainfall or rapid snowmelt, and is usually caused by inadequate drainage.

Van Buren County often experiences flooding that results in damaged and/or blocked roadways. In a 1997 event, road damages occurred at the intersection of CR 388 and 46th Street. Large rain events often leave water on roadways for days. The northern part of the County experiences more flood effects than the south. South Haven City experiences flooding in town, affecting portions of schools and the downtown. Some sea walls along the

Black River provide limited flood protection for nearby properties. City of Bangor, Bangor Township, Waverly Township, and Almena Township also have flooding problems.

The 100-year floodplain is the measure used to gauge flood risk. The definition of the 100-year flood is the “flood level which has a one-percent chance of being reached in any given year”. The map identifies the flood-prone areas for the Van Buren County municipalities that are participating in the flood insurance rate program. The Federal Emergency Management Agency (FEMA) Federal Insurance Rate Maps (FIRMs) are the basis for floodplain management, mitigation, and insurance activities for the National Flood Insurance Program.



Most flood-prone communities in the United States have chosen to participate in the National Flood Insurance Program (NFIP) as a condition for the availability of federal flood insurance funds. The NFIP provides basic flood hazard data and a flood hazard management framework for every flood-prone community in the United States. The NFIP offers insurance coverage and other benefits to local communities with conditions dependent on the communities undertaking certain flood hazard mitigation steps. The NFIP is implemented through the Federal Insurance Administration, which is a component of the Federal Emergency Management Agency (FEMA). Anyone with questions about the program should either contact FEMA by telephone at 877-336-2627, or the offices of their local

municipality. Eight communities in Van Buren County participate in the NFIP, and six of these have NFIP maps of their flood risks (Arlington Township, City of Bangor, Covert Township, Village of Paw Paw, City of South Haven, South Haven Township).

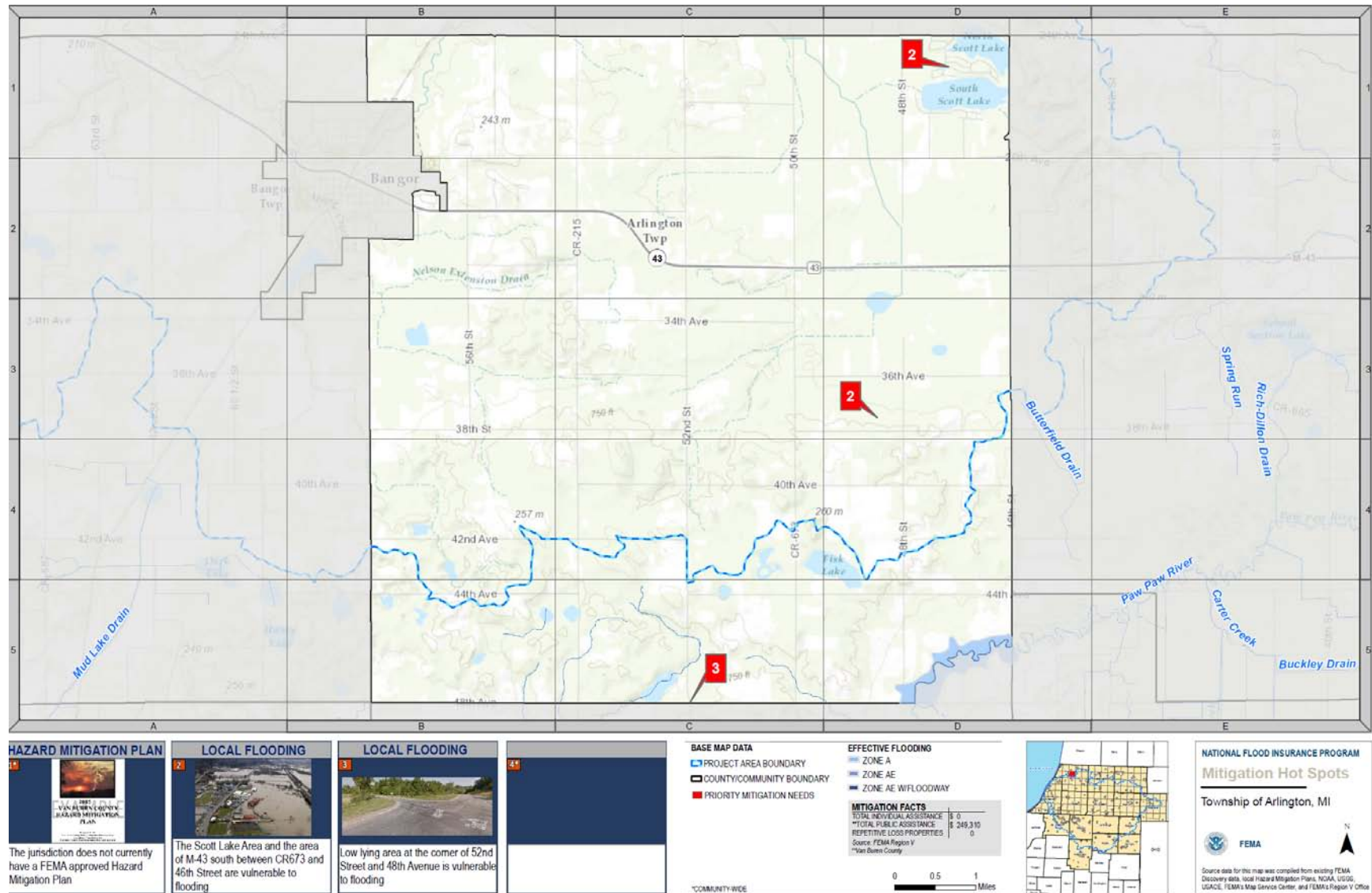
Land development can increase the amount of flooding by changing the natural hydrology of an area. Covering the ground with streets, buildings, parking lots, and other impervious surfaces increases riverine flooding by increasing runoff. These impervious surfaces do not absorb the stormwater; therefore, more water flows directly and swiftly into storm sewers and ultimately nearby rivers or lakes.

Continued development in the 100-year floodplain and surrounding areas also increases the potential for flood damage to homes, businesses, and the infrastructure. Flooding has become especially significant in portions of Van Buren County where development has disrupted the ability of natural land areas such as open fields, woodlands, marshes, and wetlands to absorb water and properly drain and disperse the water flow. Developed areas have more impervious surfaces that generate increased volumes of water runoff causing rivers to rise to higher levels and increasing the impact of flooding. The proximity of structures and inhabitants to floodplains increases the potential for personal injury and property damage during floods.

Controlling floodplain development is widely accepted as the key to reducing flood-related damages. Although there are state and local floodplain regulations designed to manage new development in flood prone areas, floodplain development continues to increase resulting in increased potential for flood-related damage. Proper land use management and strict enforcement of zoning ordinances and building codes can make communities safer from flood hazards and help reduce the high costs of flood losses.

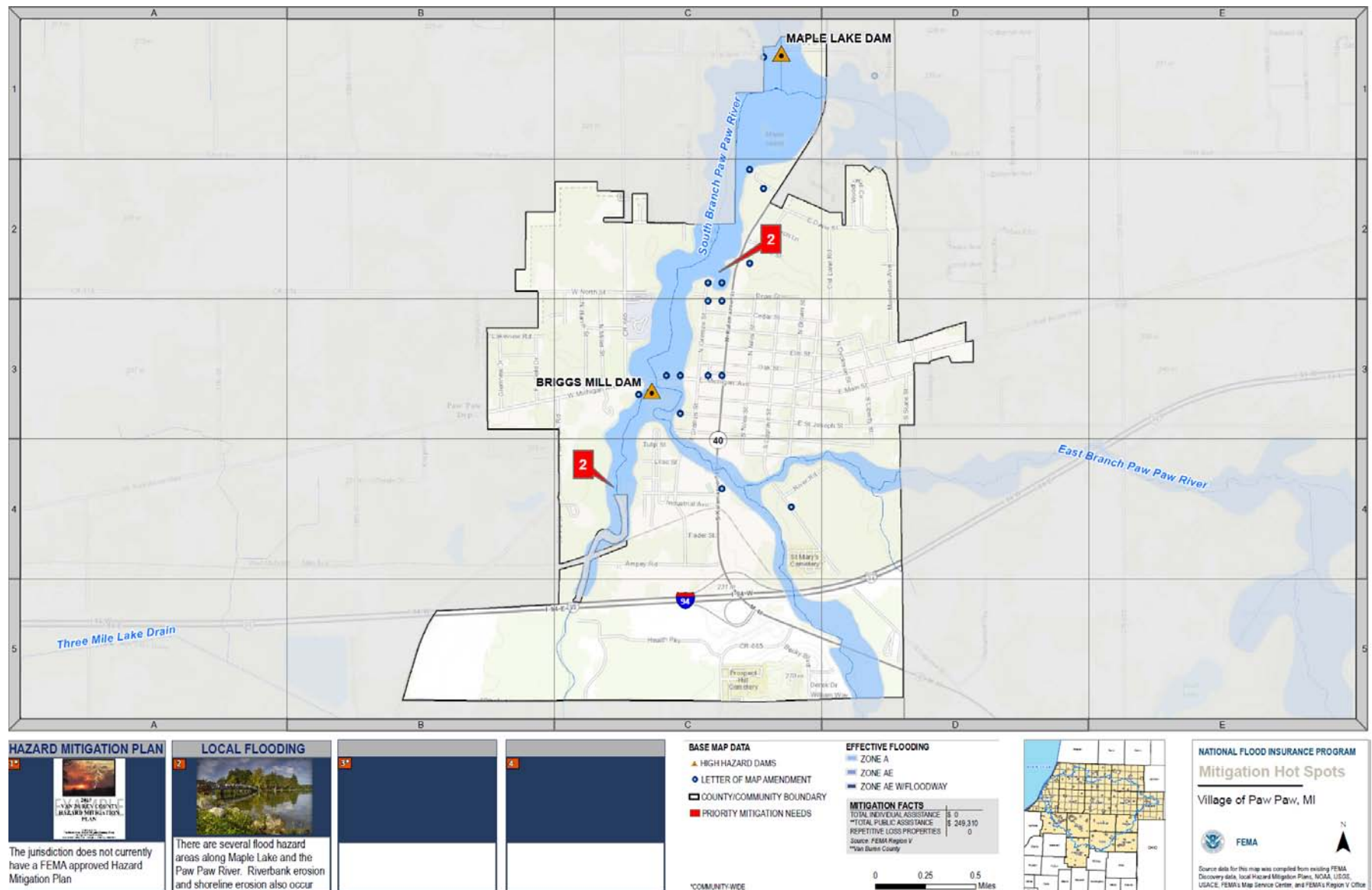
The best way to limit flood losses is to avoid building in flood hazard areas; however, this is not always an easy or viable option, especially when economic and political pressures make floodplain development attractive for some communities. Methods must be found to mitigate the impacts of development and reduce flood losses while still allowing property owners reasonable use of their land.

The Village of Paw Paw, Arlington Township and Covert Township participated in a local flood mapping exercise with FEMA in 2015. These maps were the result of those efforts.





Van Buren County Hazard Mitigation Plan



Frequency

According to the National Flood Insurance Program (NFIP), the risk of flood is much greater than the risk of fire. For structures located in the 100-year floodplain, there is a 26 percent chance of experiencing a flood during the life of a 30-year mortgage compared to a 4 percent chance of experiencing a fire. Ten flood events were reported in **Van Buren County, Michigan** between **01/01/1950** and **04/30/2015**. See the table for details and the following narrative for details of some significant events.

Table 28. Flood Events in Van Buren County, 1950-2015

Number of County/Zone areas affected:					2				
Number of Days with Event:					10				
Number of Days with Event and Death:					0				
Number of Days with Event and Death or Injury:					0				
Number of Days with Event and Property Damage:					9				
Number of Days with Event and Crop Damage:					2				
Number of Event Types reported:					2				
<i>If viewing on-line, click on Location or County to display details.</i>					Mag:		Magnitude		
					Dth:		Deaths		
					Inj:		Injuries		
					PrD:		Property Damage		
					CrD:		Crop Damage		
Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD	
1 <u>South Haven</u>	06/17/1996	06:05 PM	Flash Flood	N/A	0	0	8.00K	.0	
2 <u>Lawton</u>	02/21/1997	08:00 AM	Flash Flood	N/A	0	0	0	.0	
3 <u>County-wide</u>	06/20/1997	10:00 PM	Flash Flood	N/A	0	0	125K	0	
4 <u>Countywide</u>	05/18/2000	07:00 AM	Flood	N/A	0	0	100K	50K	
5 <u>Countywide</u>	02/09/2001	09:00 AM	Flood	N/A	0	0	100K	0	
6 <u>Van Buren (Zone)</u>	02/24/2001	09:00 PM	Flood	N/A	0	0	10K	0	
7 <u>Countywide</u>	08/22/2001	10:30 AM	Flood	N/A	0	0	50K	0	
8 <u>Van Buren (Zone)</u>	05/21/2004	11:32 PM	Flood	N/A	0	0	1.000M	200.00K	
9 <u>Van Buren Bluffs</u>	08/13/2011	11:30 AM	Flash Flood	N/A	0	0	100.00k	0	
10 <u>South Haven</u>	04/17/2013	4:00 PM	Flood	N/A	0	0	3.000M	.0	
TOTALS:						0	0	4.493K	250.00K

(Source: <http://www.ncdc.noaa.gov/stormevents/listevents.jsp>)

What are the odds of a flood? The term “100-year flood” has caused much confusion for people not familiar with statistics. Another way of looking at it is to think of the odds that a base flood will happen sometime during the life of a 30-year mortgage (26% chance). Even these numbers do not convey the true flood risk because they focus on the larger, less frequent, floods. If a house is low enough, it may be subject to the 10- or 25-year flood. During the proverbial 30-year mortgage, it may have a 26% chance of being hit by the 100-year flood, but the odds are 96% (nearly guaranteed) that a 10-year flood will occur during the 30-year period. Compare those odds to the only 5% chance that the house will catch fire during the same 30-year mortgage.

Chance of Flooding Over a Period of Years				
Time Period	Flood Size			
	10-year	25-year	50-year	100-Year
1 year	10%	4%	2%	1%
10 years	65%	34%	18%	10%
20 years	88%	56%	33%	18%
30 years	96%	71%	45%	26%
50 years	99%	87%	64%	39%

Significant Flooding Events in Van Buren County

South Haven/Bangor - Flash Flood – June 17, 1996

Extensive flash flooding was reported across the northern half of Van Buren County. Rainfall totals in the South Haven area were reported to be between 4 and 5 inches, and totals of 3-4 inches were common across the remainder of the affected area. Flooding at the M-43 overpass halted traffic on I-196, in one direction. Bangor had city drains overflowing. South Haven reported 20 residences with flooded basements. The intersection of 12th Avenue and 26th Street in Pine Grove Township, near Kendall, was washed away. Over \$8,000 in reported property damages. The Road Commission spent almost \$3,900 to replace culverts and to repair washouts.

County-wide – Flash Flood – June 20, 1997

Van Buren County officials reported damage from flash flooding late Friday night and early Saturday morning, June 20 and 21, respectively. The flooding caused 8 road washouts and 35 additional roads were impassable for a time due to water flowing across them. A 15-foot section of the Kal-Haven Trail (a bike and nature trail) was washed out, leaving a gully 8-feet deep. Baer Park in downtown South Haven was also flooded. Unofficially, 5-7 inches of rain fell in the 5-hour time period ending 4:00 a.m. EDT in Lawrence. Throughout Friday, June 20, very warm, moist, and unstable air was in place across much of Michigan's Lower Peninsula ahead of a strong, slow-moving cold front across the western Great Lakes region. Atmospheric conditions were ripe for the development of strong to severe thunderstorms containing wind gusts up to 70 mph and very heavy rain. Numerous thunderstorms reached severe level criteria due to damaging wind gusts. The most significant damage however, was

caused by flash flooding across Allegan and Ottawa Counties. This flooding was caused by the effect of slow-moving thunderstorms during the day, which were then followed by a line of severe thunderstorms that moved through during the early evening hours. Thunderstorms during the day saturated the soil across the counties, and then heavy rainfall of 1-5 inches in a 2-hour period from a line of severe thunderstorms during the evening created extensive runoff, resulting in extensive flash flood damage. \$125,000 in property damage was reported. Van Buren County had 25-30 locations with road damages and/or standing water over the roads (the worst was in the South Haven, Almena, Columbia, Pine Grove, Geneva, and Bloomingdale areas). This amounted to \$50,000-\$75,000 in road damages. The Small Business Association granted several disaster loans to businesses due to this flooding event.

County-wide – February 9, 2001

Extensive flooding began February 9 from the combination of heavy rain and melting snow. One road was washed out in Columbia Township resulting in damages of \$100,000.

Countywide – August 22, 2001

Flooding became a problem during the late morning and afternoon hours across eastern Van Buren and Kalamazoo counties. Doppler radar estimates indicated that 3-5 inches of rain fell across that area in less than 6 hours.

Bangor Township - June 2004

The culvert under County Road 378 in Bangor Township washed out due to a large rain event.

Van Buren Bluffs – July 2011

Numerous roads were washed out as reported by road commission. Flash flooding occurred on 2nd avenue in South Haven and forced the cancellation of the National Blueberry Festival.

South Haven – April 2013

Significant flooding occurred on rivers and streams across Van Buren County due to heavy rainfall from early to mid-April.

The following communities reported concerns with flooding.

- In **Almena Township**, Wolf Lake Fish Hatchery Pumping Area is a flooding concern.
- In **Arlington Township**, the Scott Lake Area and the area of M-43 south between CR 673 and 46th Street are in flood plains.
- **Bangor** has Maple Creek and the Black River running through it.
- **Bloomingdale Township**: For property damage, interruption of services, impact to critical facilities, personal injury, deaths and business closures. They are at the origin of three watersheds; one draining South into the Paw Paw River, one draining into the Black River, and one draining NE into the Kalamazoo River.
- In **Bloomingdale**, Willow Street has poor run-off and the drain overflows.
- **Covert Township** has erosion along the Lake Michigan Shoreline.

- **Decatur** has several lakes with the potential to flood, notably Mud Lake and Lake of the Woods.
- In **Geneva Township**, the Black River has some low areas that are susceptible to flooding.
- **Gobles** has a state-owned (MDOT) drain on the intersection of M-40 and CR-388 that is prone to flooding.
- **Hamilton Township** has seasonal flooding on the South County Road 215 at bridge crossing severe issue the last 10 years. Programs with Van Buren County Conservation Districts for drain buffers on farmland programs for watershed protection would be great.
- **Lawrence Village** has the Paw Paw River running through the town, has a poor drainage system that is inadequate during heavy rains, and the storm drains run directly into the Paw Paw River.
- **Lawrence Township** has numerous issues with road washout caused by the Paw Paw River, Nelson Lake, Christie Lake and Brush Creek. There are also issues with flooding on some of the bridges. Further, **Lawrence Township** has some problems with erosion from overuse of farmland causing sediment to flow into creeks resulting in a change of the flow of the creeks. **Lawrence Township** has had many of the drainage ditches filled in, which causes flooding during severe storms.
- **Mattawan Village** flooding of the creek over roadway which happens at least once per year.
- **Paw Paw** has two branches of the Paw Paw River that merge to form Maple Lake, a flooding risk. **Paw Paw** has areas where riverbank erosion and shoreline erosion can impact dam structures, bridges and roadways.
- In **Porter Township**, the north side of Gravel Lake has had flooding problems.
- **South Haven Township's** flooding hazards are the Black River and its tributaries, Deerlick Creek and its tributaries, Crooked Creek and Shaffer County Drain and tributaries. **South Haven Township** has erosion problems on the Lake Michigan coastline.

Safety/Health

Lives are at risk during flood events. Floods may leave people stranded in their homes for several days without power or heat, or they may be unable to reach their homes at all. Fortunately, to date there have been no reported deaths or injuries related to flooding in Van Buren County.

Damage/Critical Facilities

Floods can damage or destroy public and private property, disable utilities, make roads and bridges impassable, destroy crops and agricultural lands, cause disruption to emergency services, and result in fatalities. Long-term collateral dangers include the outbreak of disease, widespread animal death, broken sewer lines causing water supply pollution, downed power lines, broken gas lines, fires, and the release of hazardous materials.

The map below shows the parcels located within five feet of the flood prone areas in NFIP participating communities. The structures that may be at risk of flooding are listed with their associated values.

Parcels within Five Feet of Flood Prone Areas



Van Buren County
GIS, 2004
(269) 657-8243
www.vbco.org

0 5 10 Miles

Number of Structures and Values within Flood Prone Areas, Van Buren County, 2004

Number of Structures and Values Within Flood Prone Areas Van Buren County

Class Codes	Description
90	Exempt
101	Agricultural Improved
102	Agricultural Vacant
201	Commercial Improved
202	Commercial Vacant
301	Industrial Improved
302	Industrial Vacant
401	Residential Improved
402	Residential Vacant

Almena Township

Class Code	Acreage	Assessed Value	Ag # Buildings	Ag Est. TCV	Com # Buildings	Com Est. TCV	Res # Buildings	Res Est. TCV
90	637.65		0					
98	1.21		0					
101	2,715.54	5,127,700		17	192,819		39	3,943,782
102	1,552.94	1,588,200						
201	260.98	1,580,500	2	14,757	7	665,983	2	141,478
301	53.23	29,000						
401	4,022.46	29,769,000	70	485,038			400	37,227,883
402	3,041.58	5,007,600	12	105,931			15	1,762,808
Other	229.56		0					
Total	12,515.15	43,102,000.00	101	798,545	7.00	665,983.00	456.00	43,075,951.00

Arlington Township

Class Code	Acreage	Assessed Value	# of buildings	Est. TCV
101	714	981,700	278	7,166,540
102	671	606,000		
401	372	7,880,500		
402	147	488,700		
Other	3		0	
Total	1,906	9,956,900	278	7,166,540

Village of Paw Paw

Class Code	Acreage	Assessed Value	Ag # Buildings	Ag Est. TCV	Com # Buildings	Com Est. TCV	Res # Buildings	Res Est. TCV
90	114.15		0				3	282,534
201	52.05	5,381,600			18	4,433,423		
301	25.35	2,259,400			10	1,836,901		
401	100.03	8,636,600	6	26,919			134	9,991,406
402	58.76	292,600					1	0
Total	350.75	16,570,200	6	26,919	28	6,270,324	138	10,273,940

City of Bangor

Class Code	Acreage	Assessed Value	Ag # Buildings	Ag Est. TCV	Com # Buildings	Com Est. TCV	Res # Buildings	Res Est. TCV
90	170.57		0					
201	4.77	35,000						
301	31.68	1,176,400	1	1,352	10	498,813		
401	119.86	1,812,200	2	16,285			43	2,596,788
402	48.32	80,000						
Total	375.18	3,103,600	3	17,637	10	498,813	43	2,596,788

City of South Haven

Class Code	Acreage	Assessed Value	Ag # Buildings	Ag Est. TCV	Com # Buildings	Com Est. TCV	Res # Buildings	Res Est. TCV
90	98.94		0					
201	84.15	16,490,200	1	3,478	61	15,368,152	9	251,383
202	50.51	1,236,700						
401	97.74	16,349,700	5	12,996	1	20,778	202	21,330,901
402	22.14	592,600						
Other	3.39		0					
Total	356.87	34,669,200	6	16,474	62	15,388,930	211	21,582,284

South Haven Township									
Class Code	Acreage	Assessed Value	Ag # Buildings	Ag Est. TCV	Com # Buildings	Com Est. TCV	Res # Buildings	Res Est. TCV	
90	193	0							
101	197	331,500		6	35,375		6	265,469	
102	377	10,396,000							
201	94	1,560,500	1	18,478	11	1,178,520	5	218,543	
301	25	46,700			1	39,356			
401	1,064	26,999,200	53	327,740			164	16,464,860	
402	381	2,152,600							
Other	10	0							
Total	2,341	41,486,500	60	381,593	12	1,217,876	175	16,948,872	

Covert Twp									
Class Code	Acreage	Assessed Value	Ag # Buildings	Ag Est. TCV	Com # Buildings	Com Est. TCV	Res # Buildings	Res Est. TCV	
90	904.5	0							
101	28.04	822,200					1	15462	
102	21.22	22,800							
201	27.02	529,300					2	308,291	
202	85.78	1,063,000							
301	516.37	345,921,300			3	3,371,454	1	23,476	
302	90.75	160,300							
401	1,504	48,599,700	3	21,135			202	29,444,908	
402	459.87	6,055,500	1	9,980			2	425,910	
Other	91.89	0							
Total	3,729	403,174,100	4	31,115	3	3,371,454	208	30,218,047	

Data for Waverly Township was not accumulated due to no Flood Zone Map

Sources:

National Flood Insurance Program; FEMA Flood Insurance Rate Map
Department of Housing and Urban Development; Federal Insurance Administration (Almena Township only)
Structure and Value Data from Municipalities Assessor Database

Because almost no property is 100 percent safe from flooding, residents in Van Buren County should consider purchasing flood insurance from the National Flood Insurance Program (NFIP), especially if those homes or businesses are located within flood prone areas. Most homeowner's and business insurance policies do not cover losses in the event of a flood, which often means that the owner is responsible for the costs of cleanup, replacement, and repair work associated with the flood disaster. Individuals living in flood prone areas often assume the federal government will provide financial assistance to help recover from a flood. However, for a community to receive federal assistance monies, a federal disaster area must be declared, which only happens in a small percentage of all flood events. Federal assistance is usually offered in the form of a loan, which must be paid back with interest.

Enforcing floodplain regulations, implementing strict building ordinances, preserving valuable land resources, elevating flood prone structures, installing sewer backflow devices, maintaining stream buffers, and ensuring retention ponds and man-made lakes are properly designed are just some of the ways Van Buren County can help keep flood damage and losses to a minimum. As stated earlier, there is no 100 percent protection from a flood or flood-related event anywhere within the county.

Economic Impact

From the ten recorded flood events in Van Buren County, \$4,743,000 in property and crop damages was reported. With structures in flood prone areas, economic damages are a real concern for Van Buren County residents and businesses. Insurance claims to the National Flood Insurance Program since 1978 can be seen in Table 29. Damages to roadways and other infrastructure due to flooding is also a financial concern for local municipalities and the county.

Table 29. National Flood Insurance Program Report by Community, Van Buren County

CID	Community Name	Total Premium	V- Zone	A- Zone	Current Total	Coverage Total	Claims since 1978 Total	Doll since 1978 Total
260528	Almena, Township of	0	0	0	0	0	1	0
260705	Arlington, Township of	10084	0	13	14	1132900	0	0
260529	Bangor, City of	406	0	1	1	168900	0	0
260259	Covert, Township of	6353	0	1	14	3393500	7	28156
260598	Paw Paw, Village of	9413	0	10	12	1361600	0	0
260211	South Haven, City of	7193	0	23	29	2696500	5	3548
260212	South Haven, Township of	1038	0	1	2	450000	7	36300
260678	Waverly, Township of	397	0	0	1	45000	0	0
	County Total	34,884	0	49	73	9,248,400	20	68,004

Shoreline Flooding and Erosion

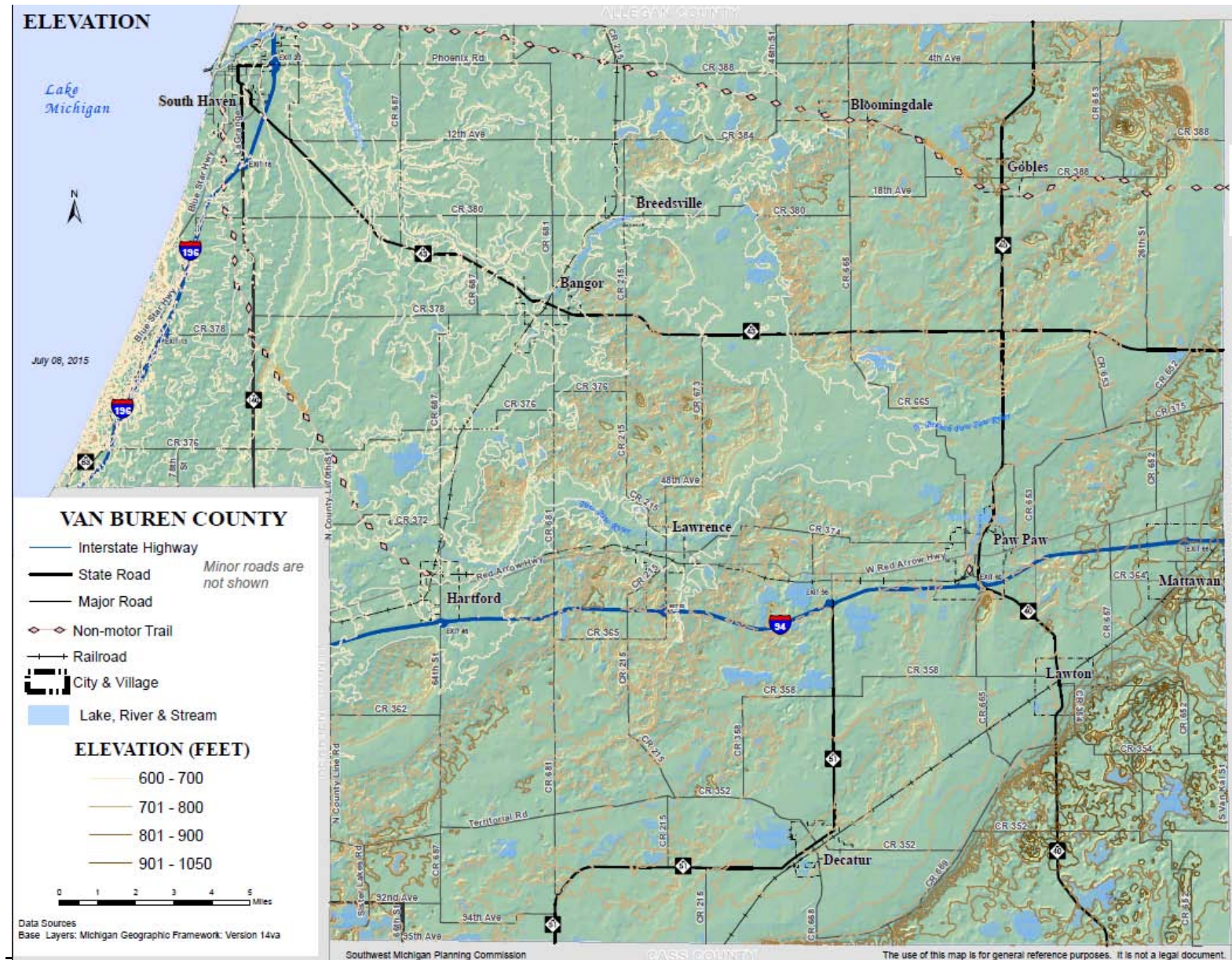
High water levels in the Great Lakes, storm surges, or high winds typically cause the flooding and erosion along Michigan's 3,200-mile shoreline. Shoreline flooding and erosion are natural processes that occur at normal and even low Great Lakes water levels. During periods of high water however, flooding and erosion are more frequent and serious, causing damage to homes, businesses, roads, water distribution and wastewater treatment facilities, and other structures in coastal communities. Windstorms and differences in barometric pressure can temporarily tilt the surface of a lake up at one end as much as eight feet. This phenomenon is called a storm surge and can drive lake water inland covering large areas of land. If the water levels of Lake Michigan return to former peaks, then significant shoreline flooding can be expected again.

Countywide, this hazard is currently given moderate priority. However, for the shoreline communities of South Haven and Covert Township this hazard is a higher priority. The flooding in South Haven (mentioned in the preceding subsection) often has a shoreline source. In addition, shoreline erosion threatens some houses built on bluffs above Lake Michigan. See High Risk Erosion maps for South Haven and Covert Townships. Almost all of the shoreline south of the City of South Haven is designated as high-risk erosion. Many homes and other structures have been destroyed along areas of the Great Lakes due to shore erosion processes. This destruction has resulted in severe financial loss to property owners. Public losses to recreation facilities, roads, and other public works have also occurred. Structures threatened by erosion must be moved landward (where possible), protected by costly shore protection, or risk being lost.

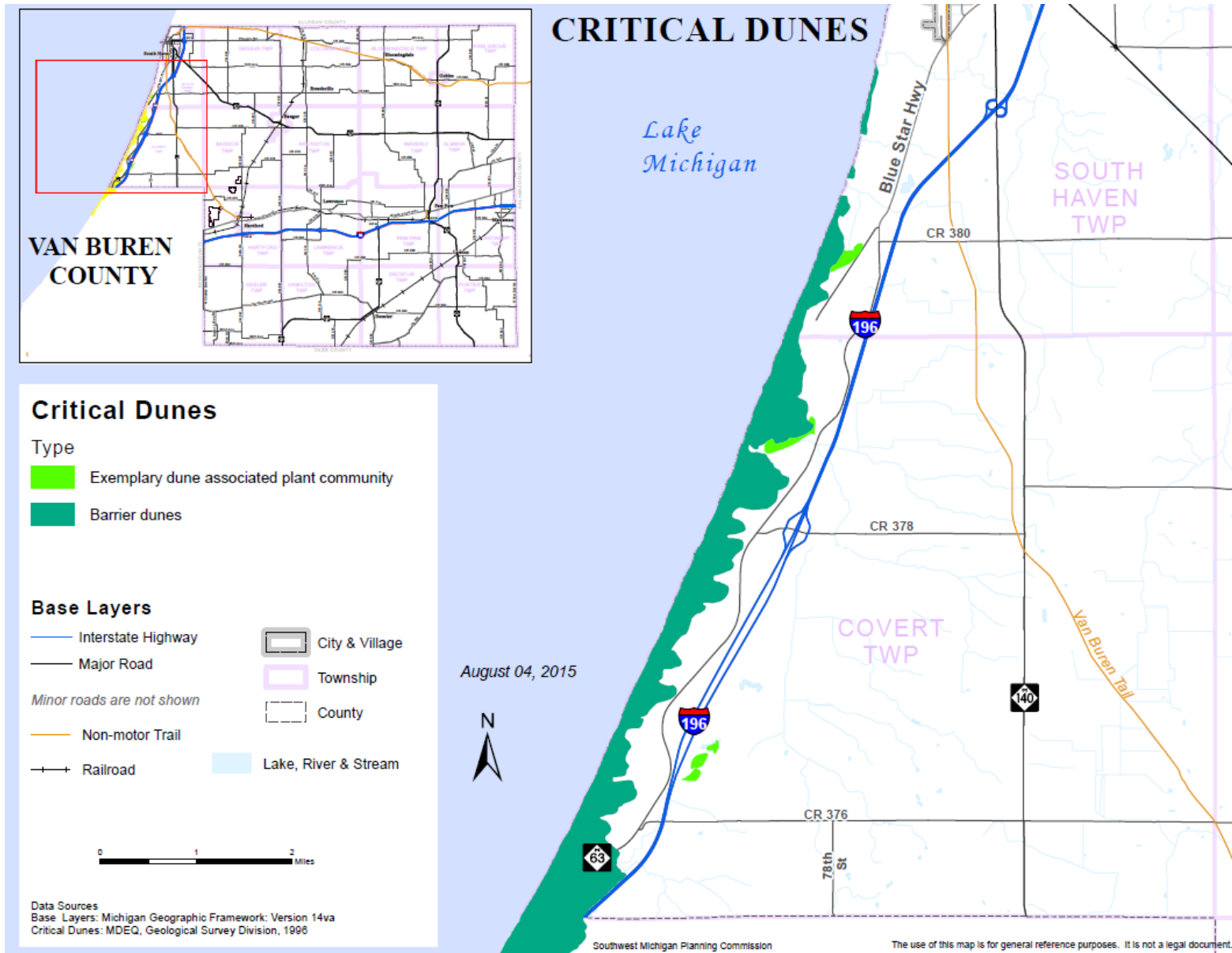
High-risk erosion areas are those shoreline areas of the Great Lakes and connecting waters where active erosion has been occurring at a long-term average rate of one foot or more per year. High water levels, storms, wind, ground water seepage, surface water runoff, and frost are important factors causing erosion. The high-risk erosion area regulations establish required setback distances to protect new structures from erosion for a period of 30 to 60 years, depending on the size, number of living units, and type of construction. Other setback requirements are applicable for home restorations and additions to existing structures. Any person or local government agency proposing to erect, install, move, or enlarge a permanent structure on a parcel must obtain a permit prior to the commencement of construction.

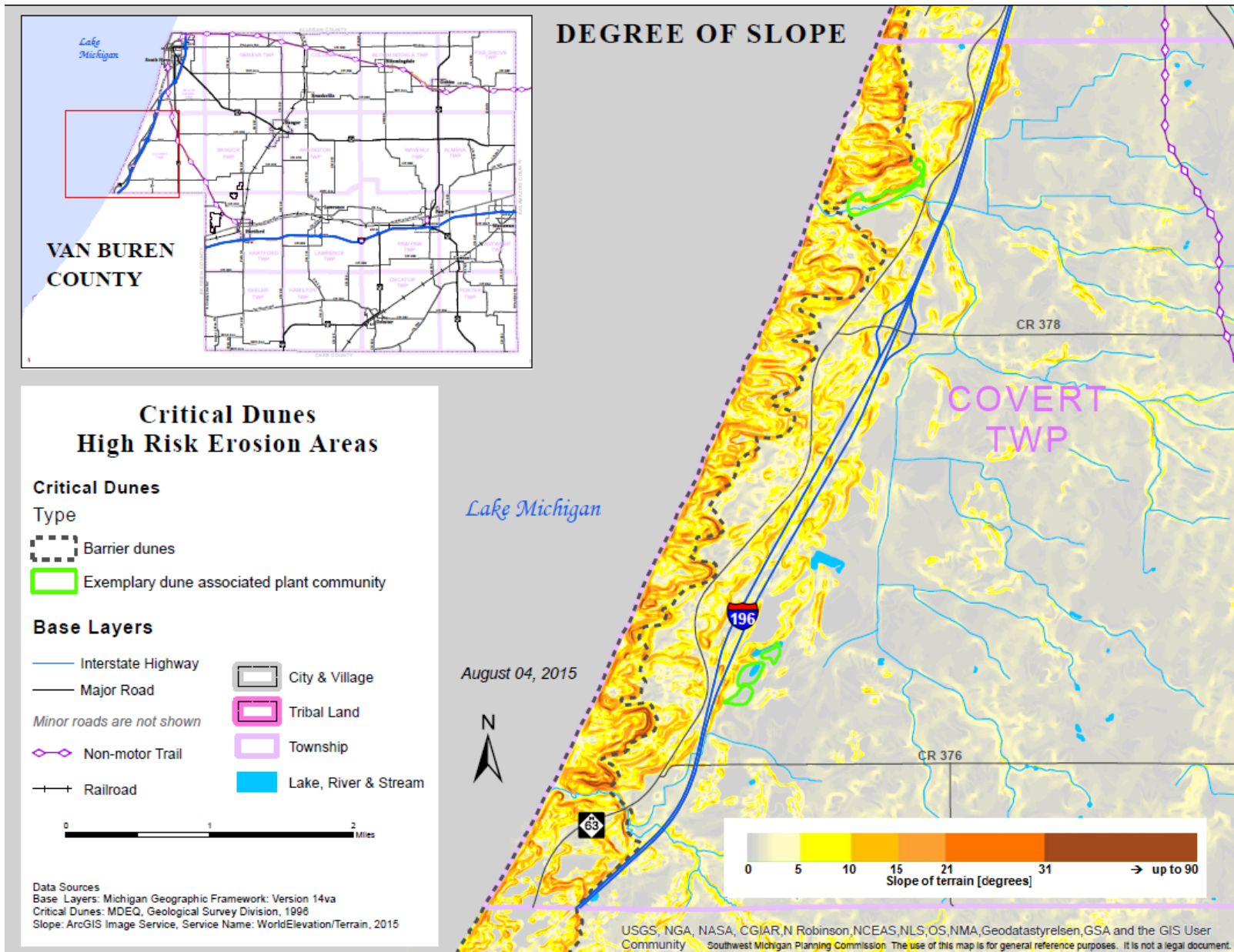
In the spring of 1999, Lake Michigan water levels were the lowest since 1990. The average monthly water level in March 1999 was 20 inches below the 1998 level, and 5 inches below the long-term monthly mean measured from 1918 to 1998. These low water levels have been the result of low rainfall levels and below normal snowfall. Shoreline managers fear that the several years of low water levels will lull property owners into a false sense of security. Even though shoreline erosion can occur at any water level, most severe short-term damage occurs at high water levels and during storms. With the low water levels in recent years, the Department of Environmental Quality has received a larger number of requests to build closer to the shoreline than in past years.

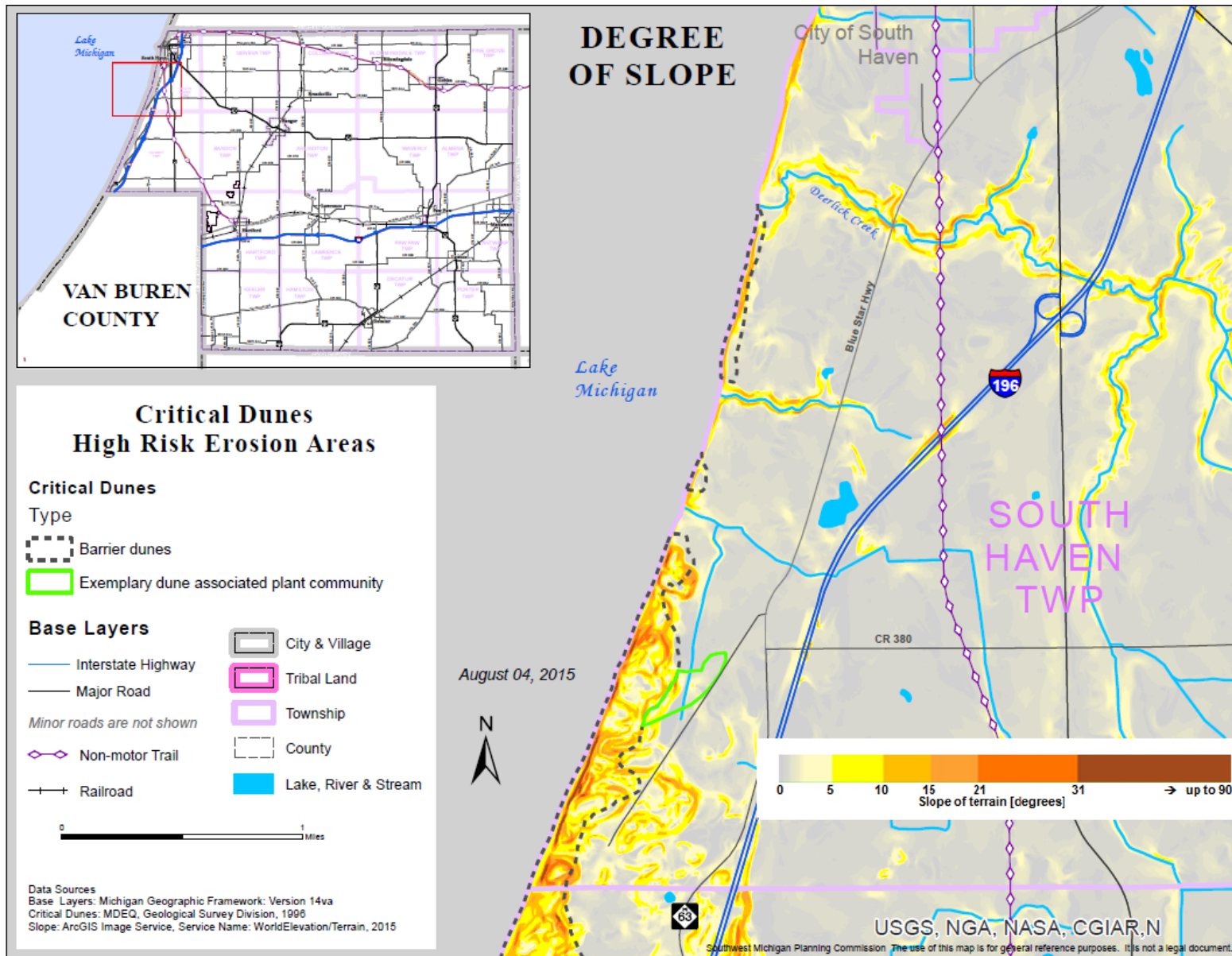
The elevation map for Van Buren County shows areas with steep slopes. These areas are subject to erosion because of the steep slopes. As evident, the Lake Michigan shoreline in Covert Township and the southern part of South Haven Township with critical dunes and bluffs have extremely steep slopes.



Van Buren County Hazard Mitigation Plan







Loss estimation for Van Buren County for high risk erosion the relative risk was rated high. The number of residential units in high risk area is estimated to be 104. The length of shoreline at risk is 7.25 miles and the total shoreline length is 13.2 miles. The percent of shoreline at risk is 54.9%. The average residential home value is \$94,200. The waterfront multiplier is 1.85 and the total at risk is \$18,124,080. The expected annual losses are \$335,966. (Sourced: State of Michigan Hazard Mitigation Plan)

Although natural wind and water processes cause erosion, the rate and severity can be intensified by human activity. It should be remembered that it is humans that place themselves in harm's way by building structures in dynamic coastal regions. If that did not occur, there would not be a significant shoreline flooding or erosion problem in Van Buren County. Pedestrian and vehicle traffic destroy vegetation, degrade dunes, and weaken bluffs and banks. Docks, jetties, and other structures interrupt the natural shoreline movement of water and redirect erosive forces, possibly in undesirable directions. Inappropriate building practices in high bluff areas can seriously reduce bluff stability. In particular, drainage patterns from new building construction can cause infiltration of runoff directly into a bluff and can weaken its normal cohesive forces. Wise management of shoreline construction and land uses can significantly reduce economic losses due to erosion. Further, dune dredging and bulldozing remove natural protection against wind and waves.

HAZARDOUS MATERIALS INCIDENT

Fixed Site

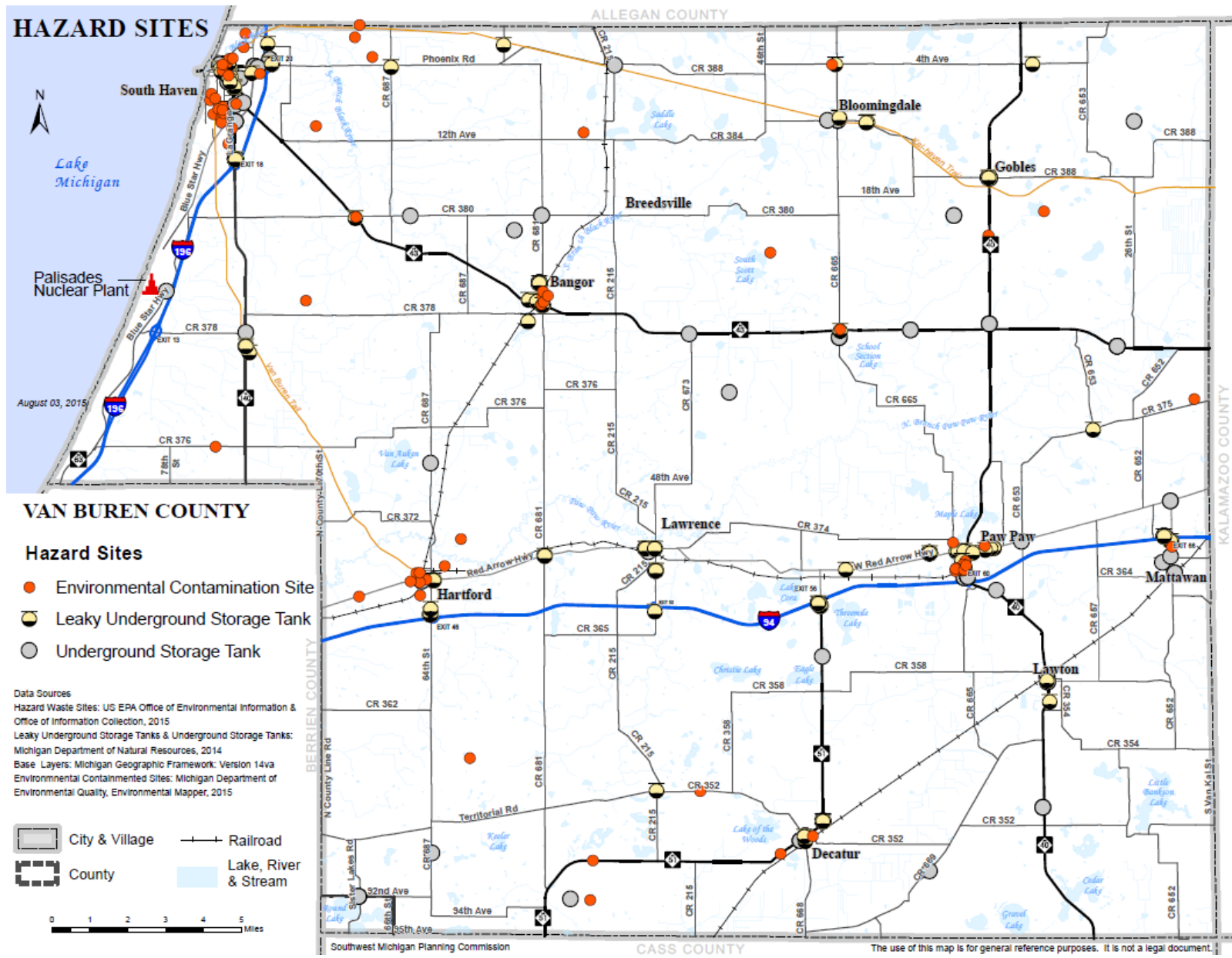
A fixed site incident is an uncontrolled release of hazardous materials from a fixed site that is capable of posing a risk to health, safety, property, and the environment. Hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities, and other community facilities. Hazardous materials are materials or substances, which, because of their chemical, physical, or biological nature, pose a potential threat to life, health, property, and the environment if they are released. Examples of hazardous materials include corrosives, explosives, flammable materials, radioactive materials, poisons, oxidizers, and dangerous gases.

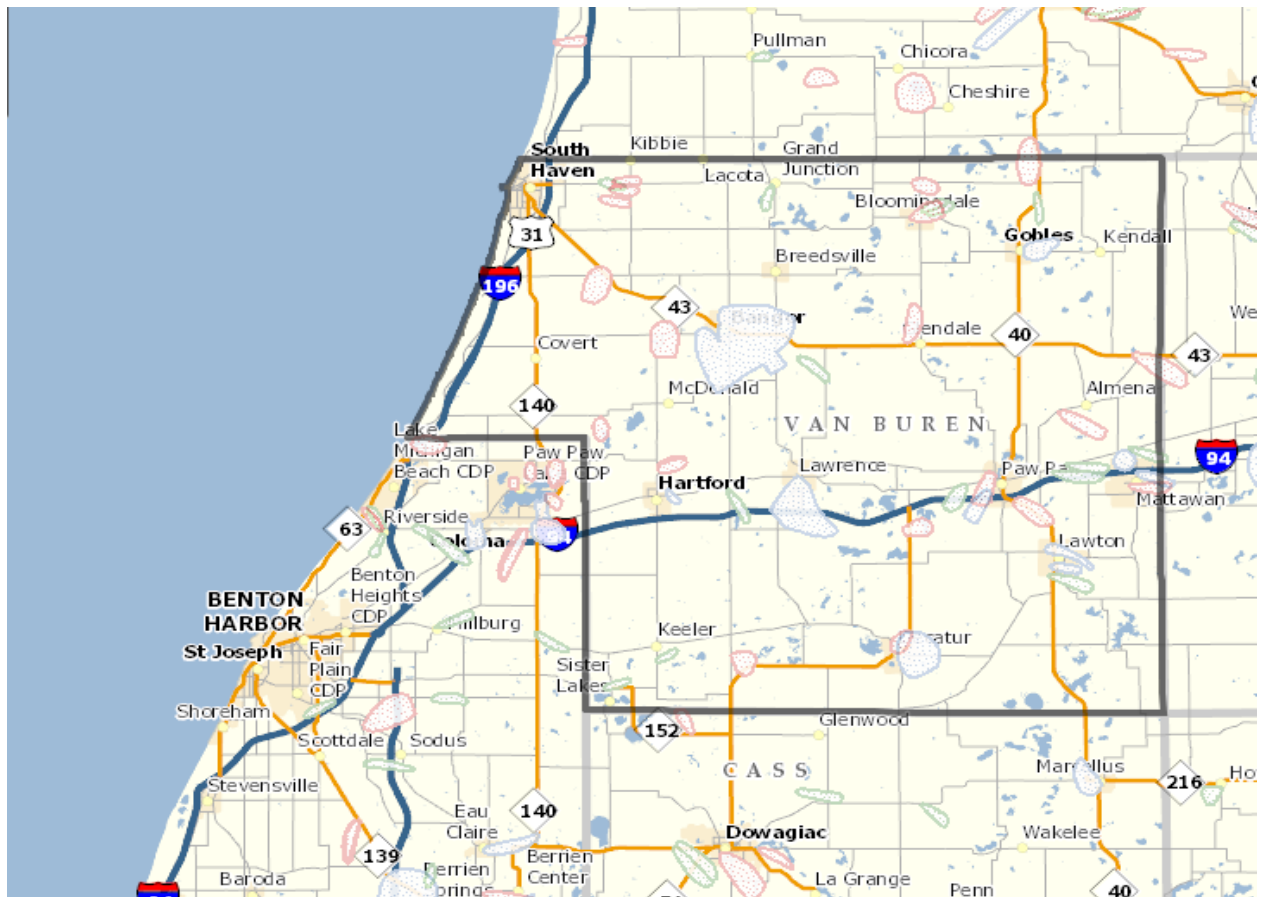
Hazardous materials are highly regulated by the government to reduce risk to the general public, property and the environment. Despite precautions taken to ensure careful handling during the manufacture, transport, storage, use, and disposal of these materials, accidental releases do occur. Areas with the most risk are within a 1-5 mile radius of identified hazardous material sites. Many communities have detailed plans and procedures in place for responding to incidents at these sites, but releases can still cause severe harm to people, property, and the environment if proper mitigation action is not taken in a timely manner.

The world's deadliest hazardous material incident occurred on December 4, 1984 in Bhopal, India. A cloud of methyl isocyanate gas, an extremely toxic chemical, escaped from a Union Carbide chemical plant, killing 2,500 people and injuring tens of thousands more. This incident triggered historic federal legislation intended to minimize such disasters from occurring in the United States.

The map below shows the general location of contaminated sites and facilities or businesses that may have hazardous materials on-site. Several of the sites are near downtown areas (Paw Paw, Lawton, South Haven, Mattawan, and Lawrence) and therefore may pose risks if certain types of accidents were to occur. Many of these communities also have wellhead protection areas for their municipal water supplies that could be vulnerable to contamination from these sites. There are 64 SARA Title III sites in Van Buren County. The following municipalities expressed concerns with hazardous material fixed site incidents:

- **Decatur Village and Hamilton Township** report several hazardous material and fuel storage sites within their boundaries. In addition, the transportation and storage of anhydrous ammonia is an issue within the farming community. This material causes many concerns connected with the illegal production of methamphetamines in the area.
- **Lawrence Township** has several anhydrous ammonia operations within three miles of a public school and administrative offices. In addition, **Lawrence Township** has plastic manufacturing and storage in close proximity to the Paw Paw River and wetlands.
- **Lawton Village** reports two facilities using anhydrous ammonia.
- **Mattawan** reports an adhesive manufacturer on Main Street that could pose a risk to the Village's businesses and residents if an incident were to occur.
- **Paw Paw Village and Township** report that several industries use hazardous materials.
- **Breedsville** has a downtown business that fills propane tanks.
- **Covert Township** has a natural gas power plant.





Wellhead Protection Areas	
 Type 1 Traditional WHPA	<input checked="" type="checkbox"/>
 Type 1 Provisional WHPA	<input checked="" type="checkbox"/>
 Type 2 Provisional WHPA	<input checked="" type="checkbox"/>
 Low Vulnerability WHPA	<input checked="" type="checkbox"/>

transported to hospitals for further treatment. There were 5 injuries reported. In February 2011, an incident occurred at Palisades Nuclear Plant where sodium bisulfite was released into Lake Michigan (6.9 gallons over the allowable limit of 23.9 gallons). No action was taken and no injuries resulted.

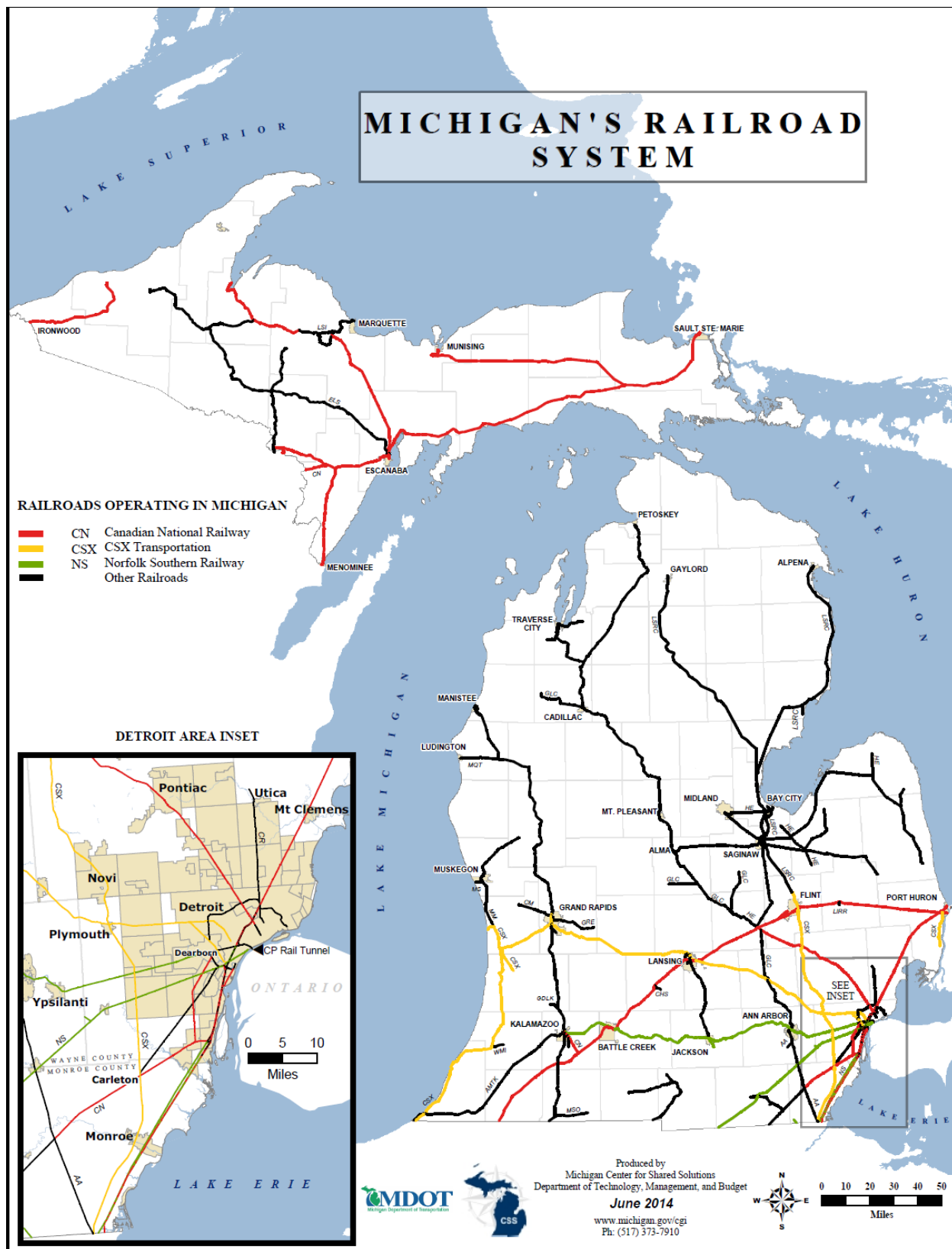
In Van Buren County, there were five incidents from 200-2005 that have resulted in two injuries and response costs over \$7,500.

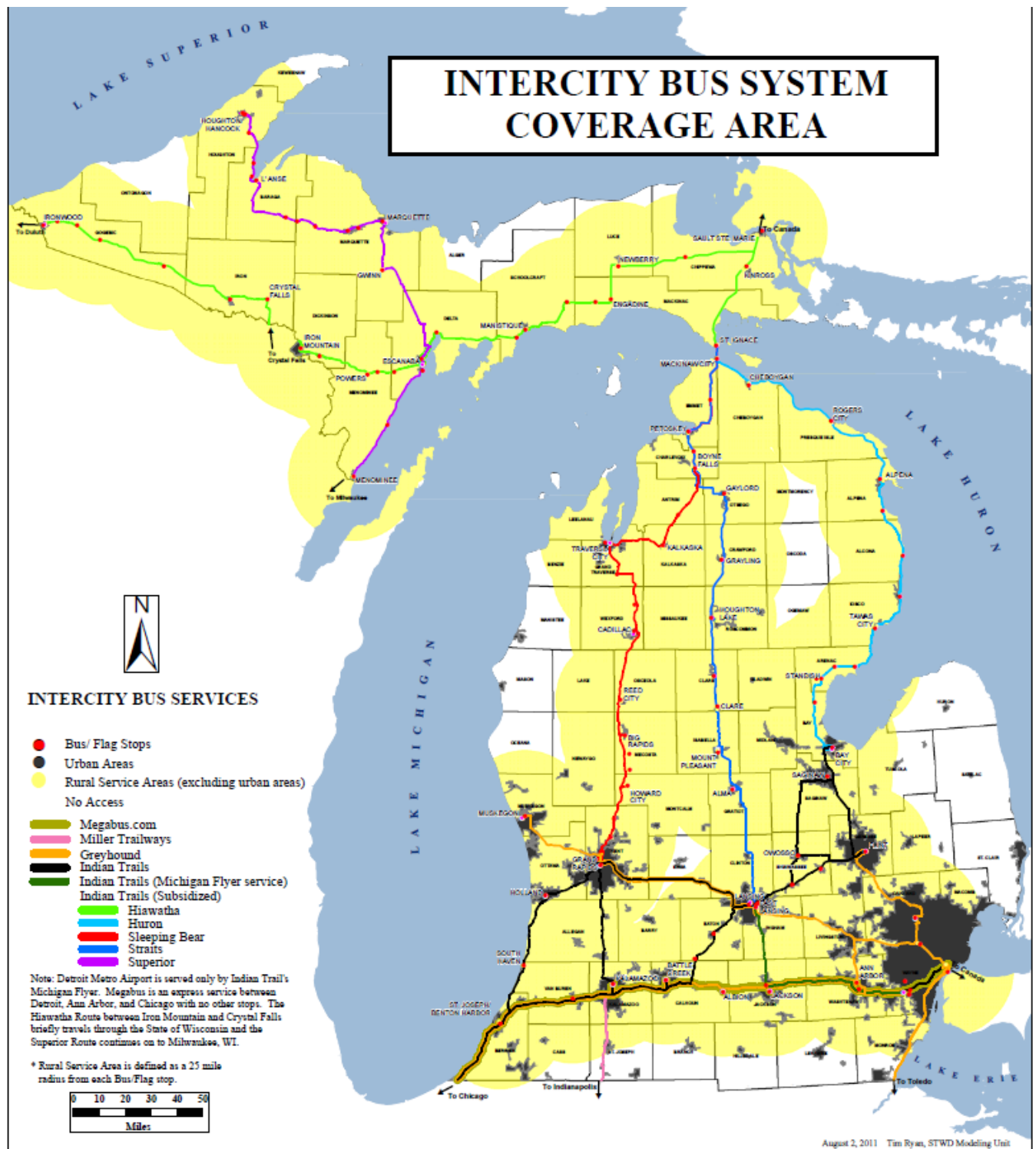
This hazard is given moderate priority in Van Buren County.

Transportation

A transportation incident involves an uncontrolled release of hazardous materials during transport, capable of posing a risk to health, safety, property or the environment. All modes of transportation - highway, railroad, seaway, airway, and pipeline - are carrying thousands of hazardous material shipments on a daily basis through local communities. A transportation accident involving any one of those hazardous material shipments could cause a local emergency affecting many people. The U.S. Department of Transportation regulates the transportation and shipping of over 18,000 different materials. Areas most at risk are within a 1 to 5 mile radius of a major transportation route along which hazardous material shipments move. All areas in Michigan are potentially vulnerable to a hazardous material transportation incident; however, the heavily urbanized and industrialized areas in southern Michigan are particularly vulnerable due to a highly concentrated population, the large number of transportation routes, and the large number of hazardous material shipments that occur on a daily basis.

There are currently three active rail lines in Van Buren County creating the possibility of a worst-case scenario in which a major rail accident could occur with immediate casualties and the release of hazardous materials in a populated area. In addition, the I-94 freeway bisects the Village of Mattawan and the I-196 freeway is near the City of South Haven. (Both of these municipalities have mobile home parks in close proximity to these freeways.) Due to severe winter weather often causing dangerous conditions on I-94, I-196 and other major highways in the County, transportation-related hazardous materials accidents are a likely possibility. Area hospitals are capable of responding to this type of event. All major highways and railroads are identified on a map in the Transportation Accidents section.





Map of Michigan showing county boundaries and major highways. The map includes labels for all 83 Michigan counties. Major highways are highlighted with thick black lines. A legend in the bottom left corner shows a thick black line and the text "Major Highways".

In January 2004, a semi-truck loaded with ethyl alcohol was involved in an accident on I-94, in Antwerp Township, that resulted in a vehicular death and the evacuation of nearly 400 area

residents in a ½ mile area of the spill. The southeast portion of Paw Paw Village and the surrounding township was evacuated. A heating station was opened in Paw Paw for people who had been evacuated. It was estimated that at least \$7,500 was spent to respond to this accident. In August 2007, I-94 was impacted at mile marker 59 for 4 hours due to an accident and hazardous material release. In July 2011 a farm tractor and semi truck accident led to a 400 gallons of pesticide leaking and the closing M-51 in both directions.

The following communities reported concerns with transportation related incidents:

- **Almena Township** has M-43 running through it.
- **City of Bangor** has an active railroad line running through town.
- **Bangor Township** has concerns about trains and trucks hauling hazardous material and the need for properly trained emergency personnel to aid in containment and cleanup.
- **Bloomington Township** has M-40 on its east side, which carries a considerable amount of truck traffic and potentially hazardous materials.
- **Breedsville** has a railroad that runs through the village and may transport hazardous materials.
- **Columbia Township** has railroad tracks and trucking that may carry hazardous materials.
- **Covert Township** has a considerable amount of commercial traffic traveling on its roads, including I-196 and M-140.
- **Decatur** has M-51 running directly through the village.
- **Gobles** has M-40, which is a corridor for commercial traffic from I-94 to northwest destinations, running through it.
- **City of Hartford** is given a moderate to high priority because transportation incident involves an uncontrolled release of hazardous materials during transportation, capable of posing a risk to health, safety, property or the environment. All modes of transportation-highway, railroad, airway and pipeline are carrying thousands of hazardous materials shipments on a daily basis through the City.
- **Hartford Township** has I-94 and a railway running through it.
- **Lawton's** nursing home is located next to the railroad tracks and **Lawton** has M-40 running through it.
- **Mattawan** is intersected by I-94.
- **Paw Paw** has several industries that use hazardous materials, and the transportation of those materials on I-94 and M-40 is a concern.
- **Paw Paw Township** has I-94 running through it.

This hazard is currently given high priority in Van Buren County.

INFRASTRUCTURE FAILURE

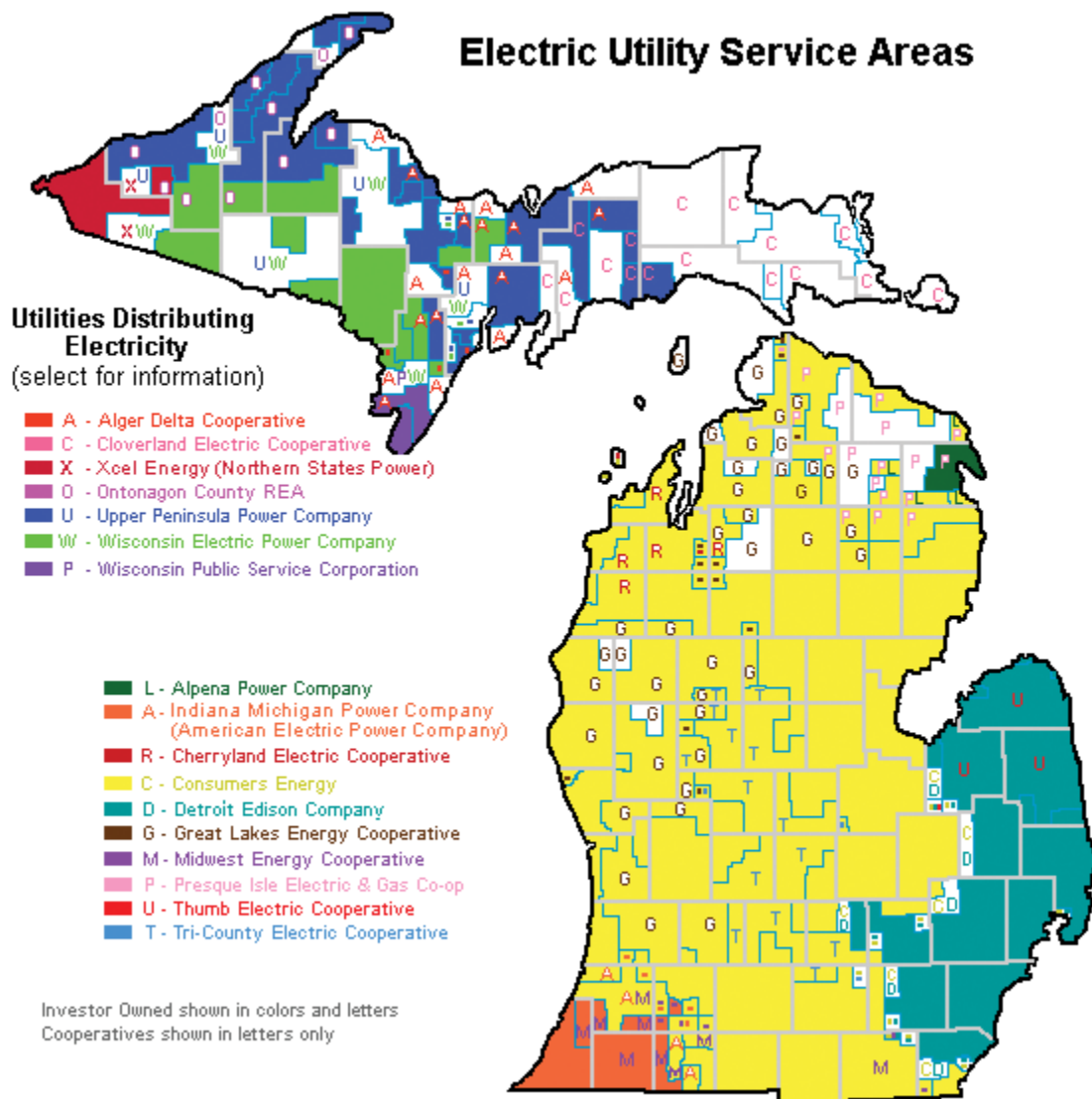
This hazard entails a failure of critical public or private utility infrastructure resulting in a temporary loss of essential functions and/or services. Such interruptions could last for periods of a few minutes to several days or more. Public and private utility infrastructure provides essential life supporting services such as electric power, heating and air conditioning, water, sewage disposal and treatment, storm drainage, communications, and transportation. When one or more of these independent, yet inter-related, systems fails due to disaster or other cause - even for a short period of time - it can have devastating consequences. For example, when power is lost during periods of extreme heat or cold, people can literally die in their homes. When the water or wastewater treatment systems in a community are inoperable, serious public health problems arise and must be addressed immediately to prevent outbreaks of disease. When storm drainage systems fail due to damage or an overload of capacity, serious flooding can occur. All of these situations can lead to disastrous public health and safety consequences if immediate mitigation steps are not taken. Typically, it is the most vulnerable segments of society - the elderly, children, ill or frail individuals, etc., that are most heavily impacted by an infrastructure failure. If the failure involves more than one system, or is large enough in scope and magnitude, whole communities and even regions can be negatively impacted.

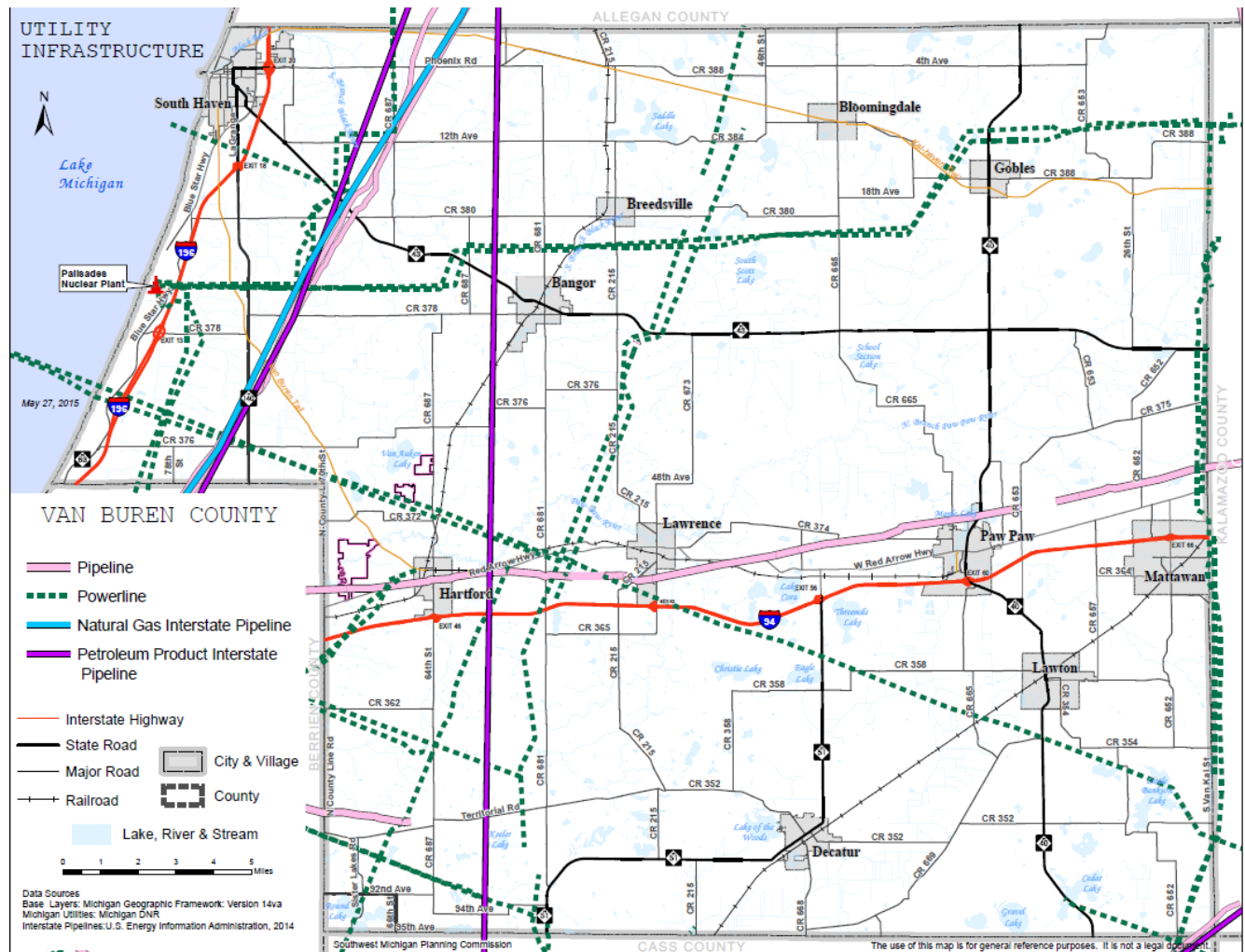
As Michigan's villages, towns and cities have grown, the drains that were designed to serve primarily agricultural uses have also been used to carry storm water from municipalities and subdivisions, as well as serve as outlets for industrial operations and a variety of other permitted discharges. Increasing demands on the drainage system in many areas of Michigan requires that continuous improvements be made to enhance drain capacity and flow characteristics, reduce sedimentation, and improve structural integrity.

The Michigan Drain Code allows for landowners and/or municipalities to petition for regular maintenance or improvement of the drainage systems. Drain commissioners or drainage boards, in the absence of a petition, are allowed to maintain the drainage systems but are limited by law in the amount of money they are allowed to expend. The maintenance limit is equal to \$2,500 per mile of established drain. This amount is generally sufficient for ordinary operation and maintenance, but is inadequate during times of widespread damage due to unusual disasters. Because drainage districts are independent of one another, money or the maintenance limit cannot be shared between districts. This greatly limits flexibility and can severely constrict drain reconstruction, improvement, and damage mitigation efforts in a post-disaster setting. Efforts are underway to amend the Michigan Drain Code to more adequately address current and anticipated future problems and concerns, and to make it more applicable to modern development circumstances.

The drain commissioner and road commission have been dealing with several culverts failing during heavy rain events, sometimes closing roads for several months. Undersized or misaligned culverts not only pose a safety risk, but also cause erosion and sedimentation of waterways. The County Drain and Road Commission are partnering with the Southwest Michigan Planning Commission and the Van Buren Conservation District to begin inventorying road/stream crossings for safety and erosion/fish passage issues with a grant from the MDEQ.

The main problem with infrastructure failure from a county emergency management perspective has involved the loss of phone systems and 9-1-1 service (which was interrupted twice in the last decade due to miss digs and a vehicular accident). Another issue with infrastructure failure is widespread power outages. A new gas-fired electric plant has been built near Palisades Nuclear Plant to increase the supply of electricity during peak-usage periods. The plant will use the same transmission lines as Palisades, and will use lake water for cooling. There are four power companies that supply the County with its power.





Municipalities in Van Buren County reported the following concerns with infrastructure failures:

- **Bangor Township** is concerned about long-term electrical outages rendering private water wells inoperable.
- **Bloomingdale Village** has no auxiliary generators in case of a power loss.
- **Decatur** has an AEP substation on South Street.
- **Lawrence Township** has experienced widespread power outages lasting as long as 10 days.
- **Lawrence** has a poor drainage system that is inadequate during heavy rains. The biggest problem is on 68th Avenue and Territorial Road where the road is currently closed due to flooding problems. Further, in **Lawrence Township**, severe rain and storms cause the septic and drain fields to be filled with sand from eroding fields.
- **South Haven Township** stated that sewer system failure could lead to health issues.

Another problem facing Van Buren County is aging infrastructures such as municipal sewer and water systems. More research is needed to assess the risk and vulnerability associated with this aspect of the hazard.

Van Buren County currently gives this hazard very high priority.

NUCLEAR POWER PLANT INCIDENT

This hazard involves an actual or potential release of radioactive material at a commercial nuclear power plant, or other nuclear facility, in sufficient quantity to constitute a threat to the health and safety of the off-site population. Such an occurrence, though not probable, could affect the short and long-term health and safety of the public living near the nuclear power plant, and cause long-term environmental contamination around the plant. As a result, the construction and operation of nuclear power plants are closely monitored and regulated by the federal government. Communities with a nuclear power plant must develop detailed plans for responding to and recovering from such an incident, focusing on the 10-mile Primary Emergency Planning Zone (EPZ) around the plant, and a 50-mile Secondary EPZ that exists to prevent the introduction of radioactive contamination into the food chain. Michigan has three active and one in-active commercial nuclear power plants, in addition to four small nuclear testing/research facilities located at three state universities and within the city limits of Midland.

Van Buren County is an active participant in ensuring that the Palisades Plant operates safely and, in addition to a high level of preparedness, provides confidence that risks from this hazard can be treated as low priority for purposes of mitigation planning. The County is also situated within the 50-mile Emergency Planning Zone for the D.C. Cook Plant in Berrien County, but that plant practices similarly diligent standards of preparedness for its facility. Security has also been enhanced due to recent terrorist activities. There were two incidents in May 2003 and with one, the County's EOC (Emergency Operations Center) was activated. Neither incident resulted in any release of nuclear materials.

Although the Palisades Nuclear Plant is located in Covert Township, all municipalities in Van Buren County reported concerns with the danger posed by a meltdown or explosion at Palisades Nuclear Plant. Overall the County views **this hazard as a moderate priority** for mitigation planning at the local level because the federal and state government requires mitigation activities. The County is an active participant in many of these mitigation activities.

Nuclear Power Plants in Michigan

Nuclear Power Plants in Michigan



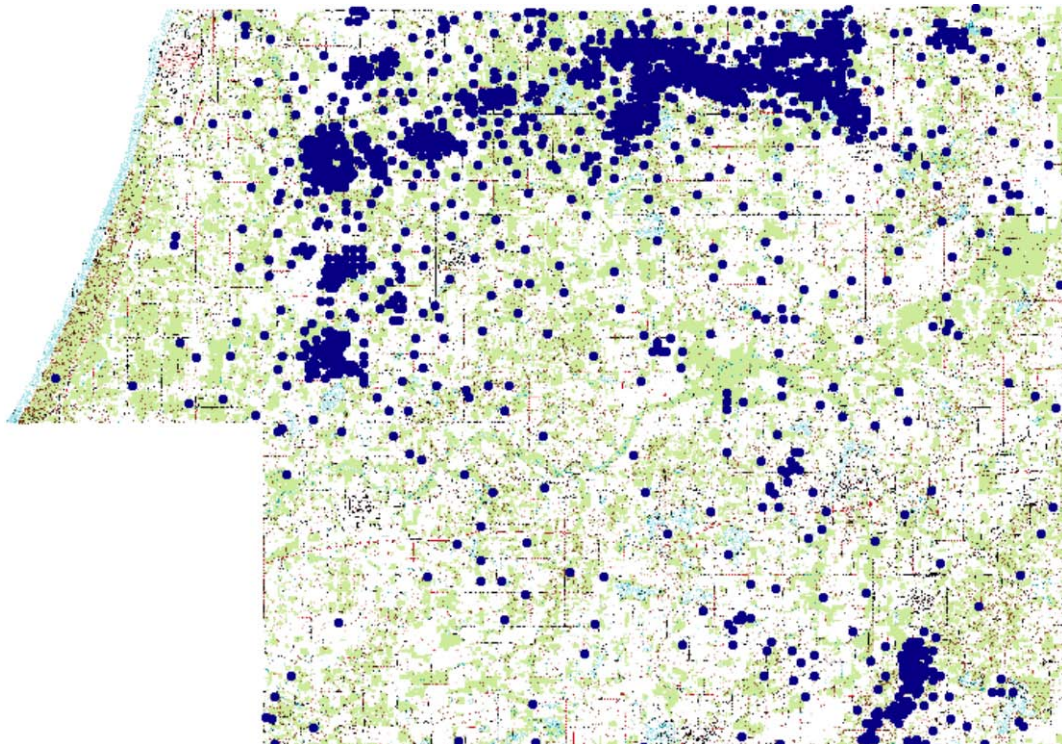
Produced by:
Michigan State Police
Emergency Management Division
16 November 2000

PETROLEUM AND NATURAL GAS PIPELINE/WELL ACCIDENT

An oil and gas accident involves an uncontrolled release of oil or gas from wells or a pipeline, or its poisonous by-product, hydrogen sulfide. Oil and gas are produced from fields in over 60 counties in the Lower Peninsula of Michigan. Over 40,000 wells have been drilled in these counties. Of that total, approximately one-half (20,000) have produced oil or gas. Over 1.1 billion barrels of crude oil and 3.6 trillion cubic feet of gas have been withdrawn from these wells.

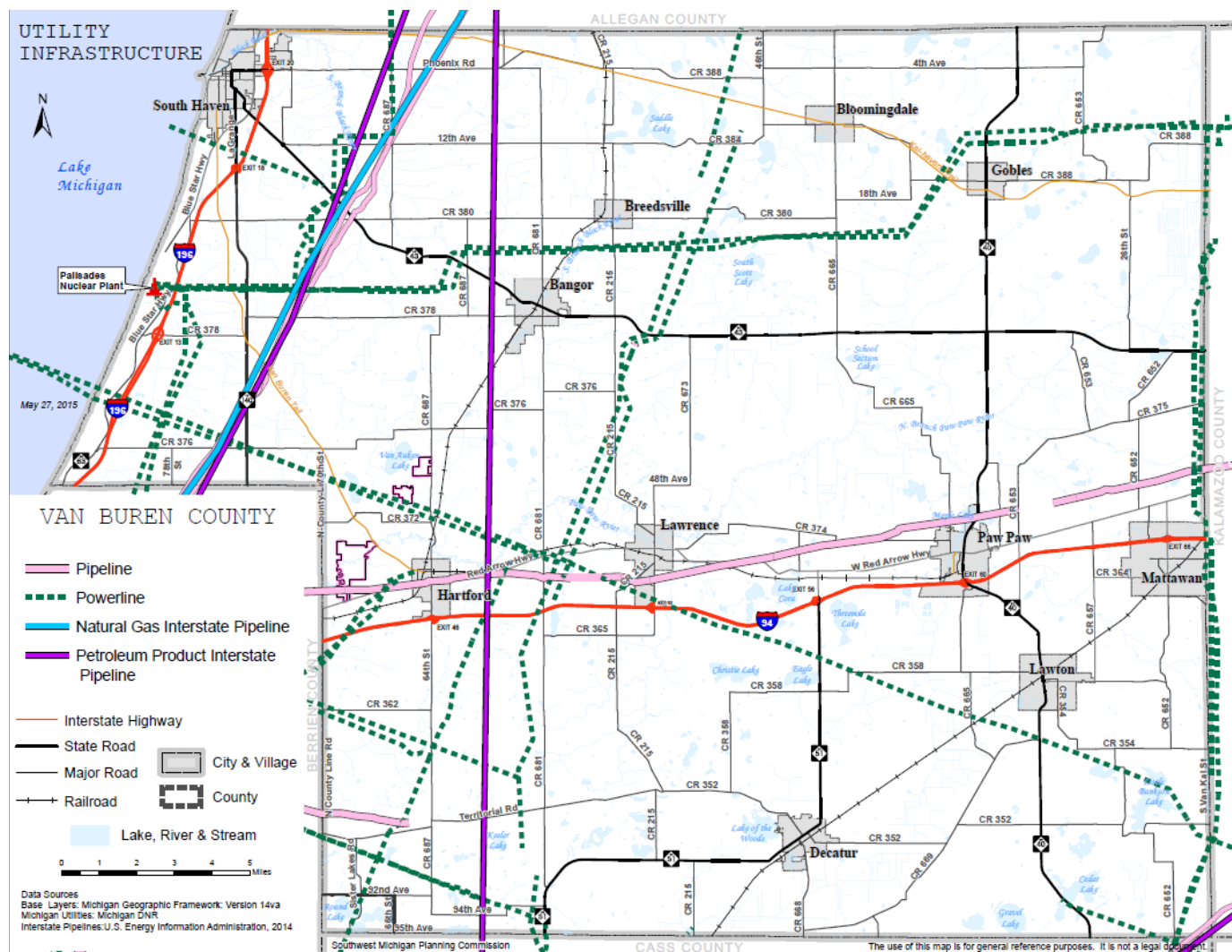
Van Buren has 1,866 permitted well locations; some of these were never drilled, and not all that were are still in operation. In addition, many do not produce harmful H₂S gases. A map in this analysis suggests that the Bloomingdale and Breedsville areas have the highest risk in County from this hazard, but until the locations and types of wells can be plotted and compared with existing and future land uses, this hazard is given very low priority because no dangerous incident with wells is known to have occurred in the county.

Oil and Gas Well Permit Locations and Forest Cover, Van Buren County



As a major petroleum and natural gas consumer in the United States, vast quantities of petroleum and natural gas are transported through and stored in Michigan. Though often overlooked as a threat because much of the petroleum and gas infrastructure in the state is located underground, petroleum and gas pipelines can leak, erupt or explode, causing property damage, environmental contamination, injuries and loss of life. In addition to these hazards, there is also a danger of hydrogen sulfide release. Hydrogen sulfide is an extremely poisonous gas that is also explosive when mixed with air temperatures of 500 degrees or above. In addition to pipelines, these dangers can be found around oil and gas wells, pipeline terminals, storage facilities, and transportation facilities where the gas or oil has high sulfur content.

Major Pipelines



The following municipalities reported concerns with pipeline accidents:

- In **Breedsville**, Consumer's Power has a large exposed gas line next to a bridge.
- **Lawrence Township** has old high-pressure natural gas pipelines traversing the township.

Pipeline locations do pass through or near some densely developed areas. There have been no past problems in the County associated with pipelines. Therefore, **this hazard has currently been given moderate priority in Van Buren County** and security has been increased to guard against the possibility of deliberate sabotage.

PUBLIC HEALTH EMERGENCIES

A public health emergency is defined as a widespread and/or severe epidemic, incident of contamination, or other situation that presents a danger to or otherwise negatively impacts the general health and well being of the public. Public health emergencies can take many forms: 1) disease epidemics; 2) large-scale incidents of food or water contamination; 3) extended periods without adequate water and sewer services; 4) harmful exposure to chemical, radiological or biological agents; or 5) large-scale infestations of disease-carrying insects or rodents. Public health emergencies can occur as primary events by themselves, or they may be secondary events associated with another disaster or emergency, such as a flood, tornado, or hazardous material incident. The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. Public health emergencies can be statewide, regional, or localized in scope and magnitude.

In Van Buren County, many densely populated lake communities are located in rural areas where no municipal sewer and water is available. These areas are vulnerable to surface and ground water quality problems due to failing septic systems. A sewer project in the Sister Lakes area (in the southwest corner of Keeler Township) is complete and will help keep the lakes safe for human contact. However, failing septic systems and illicit connections to storm sewers continue to pollute inland lakes, streams and rivers in the county. In March 2009, Palisades reported a sanitary sewage spill between 50 and 100 gallons which was captured before entering Lake Michigan.

The following municipalities reported concerns in regards to public health emergencies:

- **Bloomington Township** has no local physicians, hospitals or health clinics in the township. Any emergency would have to be addressed by outside resources.
- **Hamilton Township** does not have an emergency warning system or a system for communication during an emergency.
- **Lawrence Township** is not equipped to prevent or mitigate a public health emergency.
- **Lawton** is not equipped to deal with a large-scale emergency event of any kind.
- **South Haven Township** raised a concern with septic system failure due to the heavy clay soils in the township and age of the systems.

Although public health emergencies have typically been a low-priority hazard in Van Buren County, recent political events have directed extra attention toward preparedness and mitigation efforts regarding it. The monitoring of public health has been enhanced due to the terrorist attacks and threats since September 11, 2001. However, the Van Buren County Health Department does not have the resources for a full surveillance program that would help to track and mitigate public health emergencies related to disease epidemics. In addition, more public education is needed about vaccinations and other preventive measures.

Public health emergencies are now considered to be moderate to high priority.

TERRORISM RELATED HAZARDS

This hazard is any intentional, unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political, social, or religious objectives. Sabotage/terrorism can take many forms or have many vehicles for delivery, including: 1) bombings (WMD – weapons of mass destruction); 2) assassinations; 3) organized extortion; 4) use of nuclear, chemical and biological weapons; 5) information warfare; 6) ethnic/religious/gender intimidation (hate crimes); 7) state and local militia groups that advocate overthrow of the U.S. Government; 8) eco-extremism designed to destroy or disrupt specific research or resource-related activities; and 9) widespread and organized narcotics smuggling and distribution organizations. Because sabotage/terrorism objectives are so widely varied, so to are the potential targets of such actions. Virtually any public facility or infrastructure, or place of public assembly, can be considered a potential target.

In addition, certain types of businesses engaged in controversial activities are also potential targets, as are large computer systems operated by government agencies, banks, financial institutions, large businesses, health care facilities, and colleges/universities.

One of the first acts of domestic sabotage/terrorism in Michigan occurred on May 18, 1927, in Bath. A disgruntled taxpayer and farmer detonated 1,000 pounds of explosives under the newly constructed Bath Consolidated School, killing 38 students and 3 teachers and injuring 58 others. The perpetrator then blew himself up, along with the school superintendent. As tragic as that event was, it could have been worse were it not for the fact that half of the explosives failed to detonate as planned, which certainly would have killed many more students and teachers.

In Van Buren County, the possibility of sabotage to the power plant is the primary security concern and extra vigilance and precautions are being taken, with assistance from the Sheriff's Office, Covert Township Police, and State Police. After September 11, there was a general increase in the number of bomb threats made against schools, government buildings, and a hospital. So far, the threats have been found to be either hoaxes or unfounded concerns.

The following municipalities reported concerns with sabotage/terrorism/WMDs:

- **Bloomington** has no bomb shelters in the village.
- **Bloomington Township** has only one central siren as its warning system in the event of a severe storm or tornado.

- **Lawton** is not equipped to deal with a large-scale emergency event of any kind.
- **Mattawan's** MPI Research is a contract research facility, which could be subject to acts of sabotage or terrorism.
- **Paw Paw** has several bomb threats every year at the Van Buren County Courthouse. Further, **Paw Paw** has had packages left at the Post Office with notes indicating the threat of a bomb.
- **Pine Grove Township** gets large crowds at Timber Ridge Ski Area, which could be a target.

Nuclear Attack or WMD (Weapons of Mass Destruction)

This refers to any hostile attack against the United States, using nuclear weapons, which results in destruction of military and/or civilian targets. All areas of the United States are conceivably subject to the threat of nuclear attack. However, the strategic importance of military bases, population centers and certain types of industries places some areas at greater risk than others. The nature of the nuclear attack threat against the U.S. has changed dramatically with the end of the "Cold War" and with the conversion of previous adversaries to more democratic forms of government. Even so, the threat still exists for a nuclear attack against this country. Despite the dismantling of thousands of nuclear warheads aimed at U.S. targets, there are still a large number of nuclear weapons in the world capable of destroying multiple locations simultaneously. In addition, controls on nuclear weapons, and weapons components, are sporadic at best in the former Soviet Union, and the number of countries capable of developing nuclear weapons continues to grow despite the ratification of an international nuclear non-proliferation treaty. It seems highly plausible that the threat of nuclear attack will continue to be a hazard in this country for some time in the future.

At this point, attack-planning guidance prepared by the federal government in the late 1980s still provides the best basis for a population protection strategy for Michigan. That guidance has identified 25 potential target areas in Michigan, and 4 in Ohio and Indiana that would impact Michigan communities, classified as follows: 1) commercial power plants; 2) chemical facilities; 3) counterforce military installations; 4) other military bases; 5) military support industries; 6) refineries; and 7) political targets.

For each of these target areas, detailed plans have been developed for evacuating and sheltering the impacted population, protecting critical resources, and resuming vital governmental functions in the post-attack environment.

Although sabotage, terrorism and weapons of mass destruction have typically been a very low priority in Van Buren County, recent political events have changed the amount of attention devoted to it. The terrorist acts on September 11, 2001 have brought the County to a new level of awareness and security. The EOC was opened soon after the September 11 attack and stayed fully operational for three days afterward. The County now considers this hazard a moderate priority.

Van Buren County has been treating nuclear attack threat as a low priority, since it is more of a national issue and is generally addressed on that level.

THUNDERSTORM HAZARDS

Thunderstorms occur about 36 times each year. **The components of thunderstorms (hail, lightning, severe winds and tornadoes) are considered moderate to very high hazards for Van Buren County.** Because of this high to moderate ranking, the County promotes the Skywarn program and each year hosts the training in a different location in the county. Currently there are about 240 people in the Skywarn program with approximately 60 persons per year being either retrained as weather spotters or being newly admitted to the program. In addition, schools in the county are assisted every year with planning for tornado events.

The following section describes each component of severe thunderstorms (hail, lightning, severe winds and tornadoes).

Hail

Hail is a condition where atmospheric water particles from thunderstorms form into rounded or irregular lumps of ice that fall to the earth. Hail is a product of the strong thunderstorms that frequently move across Michigan. Hail usually falls near the center of the storm, along with the heaviest rain; however, strong winds occurring at high altitudes in the thunderstorm can also blow the hailstones away from the storm center, causing an unexpected hazard at places that otherwise might not appear threatened. Hailstones range in size from a pea to a golf ball, but hailstones larger than baseballs have occurred in the most severe thunderstorms.

Hail is formed when strong updrafts within the storm carry water droplets above the freezing level where they remain suspended and continue to grow larger until their weight can no longer be supported by the winds. Eventually these frozen droplets fall to the ground battering crops, denting vehicles, and injuring wildlife and people. Large hail is a characteristic of severe thunderstorms, and it often precedes the occurrence of a tornado.

Frequency

In Van Buren County, 60 hail events were reported from 1/1/1950 to 8/1/2015. It should be noted that this is only a small number of the actual events, as many others go unreported due to more serious threatening severe weather.

Table 30. Hail Events, Van Buren County, 1950-2015

					Mag:	Magnitude			
					Dth:	Deaths			
					Inj:	Injuries			
					PrD:	Property Damage			
					CrD:	Crop Damage			
<i>If viewing on line, click on Location or County to display details.</i>									
Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD	
VAN BUREN CO.	07/02/1970	17:00	Hail	0.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/15/1974	06:35	Hail	1.00 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	05/21/1975	12:15	Hail	1.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/18/1975	16:30	Hail	1.00 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	07/12/1975	11:45	Hail	0.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	07/12/1975	12:00	Hail	0.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	03/20/1976	14:30	Hail	1.00 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	04/15/1976	13:45	Hail	1.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/15/1976	14:45	Hail	1.00 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/28/1976	20:25	Hail	1.00 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	04/02/1977	13:20	Hail	1.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/28/1977	16:45	Hail	0.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	05/13/1980	13:25	Hail	1.00 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/07/1980	09:30	Hail	1.50 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/07/1980	14:40	Hail	0.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	07/12/1980	11:30	Hail	2.00 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	08/02/1980	03:34	Hail	1.00 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	05/30/1985	22:35	Hail	1.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	07/04/1985	23:50	Hail	0.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	04/23/1988	19:45	Hail	1.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	07/15/1988	15:15	Hail	0.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/26/1989	14:39	Hail	0.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	06/28/1990	16:43	Hail	1.75 in.	0	0	0.00K	0.00K	
VAN BUREN CO.	03/27/1991	18:15	Hail	2.00 in.	0	0	0.00K	0.00K	
Paw Paw	04/12/1994	18:05	Hail	0.50 in.	0	0	0.00K	0.00K	
Decatur	04/26/1994	22:15	Hail	0.75 in.	0	0	0.00K	0.00K	

Decatur	04/26/1994	22:30	Hail	1.00 in.	0	0	0.50K	0.00K
Dimondale	04/26/1994	22:42	Hail	0.75 in.	0	0	0.00K	0.00K
Lawrence	06/13/1994	15:30	Hail	1.50 in.	0	0	0.00K	0.00K
MATTAWAN	05/05/1997	16:23	Hail	0.75 in.	0	0	0.00K	0.00K
HARTFORD	05/18/2000	14:10	Hail	1.00 in.	0	0	50.00K	25.00K
PAW PAW	05/18/2000	17:00	Hail	1.00 in.	0	0	50.00K	25.00K
BANGOR	04/09/2001	00:53	Hail	1.00 in.	0	0	25.00K	10.00K
GOBLES	04/09/2001	01:15	Hail	0.75 in.	0	0	25.00K	10.00K
DECATUR	05/15/2001	19:10	Hail	0.75 in.	0	0	10.00K	10.00K
PAW PAW	06/28/2003	14:26	Hail	0.88 in.	0	0	25.00K	25.00K
PAW PAW	07/06/2003	17:30	Hail	2.00 in.	0	0	50.00K	50.00K
GRAND JCT	08/03/2003	14:15	Hail	1.75 in.	0	0	25.00K	10.00K
GOBLES	08/03/2003	14:49	Hail	1.00 in.	0	0	15.00K	5.00K
MATTAWAN	05/07/2004	03:40	Hail	0.75 in.	0	0	10.00K	10.00K
PAW PAW	05/08/2004	08:59	Hail	0.88 in.	0	0	15.00K	15.00K
BLOOMINGDALE	06/14/2004	11:57	Hail	1.00 in.	0	0	5.00K	5.00K
GOBLES	05/13/2005	15:04	Hail	0.88 in.	0	0	5.00K	5.00K
BLOOMINGDALE	05/30/2006	15:45	Hail	0.75 in.	0	0	10.00K	5.00K
LAWTON	06/28/2006	11:00	Hail	0.75 in.	0	0	5.00K	5.00K
GRAND JCT	08/24/2006	00:15	Hail	3.00 in.	0	0	25.00K	10.00K
COVERT	10/02/2006	06:40	Hail	1.00 in.	0	0	10.00K	10.00K
COVERT	10/02/2006	06:40	Hail	1.00 in.	0	0	10.00K	10.00K
COVERT	10/02/2006	06:40	Hail	1.00 in.	0	0	10.00K	10.00K
COVERT	10/02/2006	06:50	Hail	1.75 in.	0	0	20.00K	20.00K
COVERT	06/02/2007	14:55	Hail	0.75 in.	0	0	0.00K	0.00K
MATTAWAN ARPK	06/27/2007	17:47	Hail	0.75 in.	0	0	0.00K	0.00K
SOUTH HAVEN	04/11/2008	12:01	Hail	1.00 in.	0	0	5.00K	5.00K
GOBLES WESLER ARPT	06/15/2008	14:55	Hail	1.00 in.	0	0	0.00K	0.00K
LAWTON	06/15/2008	15:10	Hail	0.75 in.	0	0	0.00K	0.00K
LAWTON	04/05/2010	22:30	Hail	1.25 in.	0	0	50.000M	0.00K
BREEDSVILLE	04/06/2010	09:10	Hail	1.00 in.	0	0	0.00K	0.00K

HARTFORD	06/21/2011	16:58	Hail	2.00 in.	0	0	0.00K	0.00K
GOBLES WIDNERS ARPT	05/03/2012	17:30	Hail	0.75 in.	0	0	0.00K	0.00K
ARMSTRONG CORNERS	05/20/2014	22:24	Hail	1.00 in.	0	0	0.00K	0.00K
Totals:							50.406M	280.00k

(Source: <http://www.ncdc.noaa.gov/stormevents>)

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	49
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	17
Number of Days with Event and Crop Damage:	15
Number of Event Types reported:	1

The loss estimation for Van Buren County from thunderstorm/hail is ranked high for relative risk. The number of damaging hailstorms from 1993-2010 from (NCDC) are 14. The average numbers of damaging hailstorms per year are 0.79. The historic hailstorm damage from (NCDC) is \$27,189,430 with the expected annual losses of \$1,527,496. (Sourced: State of Michigan Hazard Mitigation Plan)

In Van Buren County, no deaths or injuries have been reported due to hail. Usually injuries and deaths are a result of another aspect of a thunderstorm such as lightning and tornadoes. Hail can however, inflict severe damage to roofs, windows, siding, and depending on hailstone size and winds, hail can also be very damaging to crops. Since 2015, hail has caused a reported \$50,686,000 in property and crop damages in Van Buren County. **Overall, hail is considered a moderate hazard in Van Buren County.**

Lightning

Lightning is the discharge of electricity from within a thunderstorm. Although lightning is often perceived as a minor hazard, it damages many structures and kills and injures more people in the U.S. per year, on average, than tornadoes or hurricanes. Many lightning deaths and injuries could be avoided if people would have more respect for the threat that lightning presents. Michigan ranks second in the nation in both lightning-related deaths and lightning-related injuries. Southwestern Michigan has the highest rate of lightning strikes in the state with a strike ratio of 4.0 flashes/km²/year according to Global Atmospheric, Inc. In Van Buren County, lightning has caused muck wildfires in the Decatur area. (See section on wildfires for more information.)

Significant Lightning Events in Van Buren County

Late 1970s

In Paw Paw Township, two children were killed in the woods due to a lightning strike.

March 21, 1994

In Lacota, lightning hit a pole barn located at 722 Country Road 681. The lightning caused a fire that resulted in \$30,000 worth of damage to the pole barn. The barn had no electrical wiring, so the fire could not be attributed to an electrical short.

June 13, 1994

In Paw Paw, two golfers were struck by lightning while seated on a golf cart and were hospitalized in critical condition.

September 19, 1997

The South Haven Community Hospital received a direct lightning strike on the northwest corner of the building. The radio tower for the HERN radio, which is the communications link with area ambulances, sustained the strike, which then grounded through the building directly through the telephone communications center on the basement level. The entire telephone system was disabled beyond repair - \$200,000 in damages was reported.

July 27, 2011

Two men were injured by a lightning strike while picking blueberries east of South Haven in Lacota.

Table 31. Lightning Events, Van Buren County, 1950-2015

Mag: Magnitude
Dth: Deaths
Inj: Injuries
PrD: Property Damage
CrD: Crop Damage

*If viewing on-line, click on **Location or County** to display details.*

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1 Lacota	03/21/1994	02:55	Lightning	N/A	0	0	5K	0
2 Paw Paw	06/13/1994	08:00	Lightning	N/A	0	2	0	0
3 South Haven	09/19/1997	03:00	Lightning	N/A	0	0	200K	0
4 Lacota	07/27/2011	11:00	N/A	0	2	0	0	
TOTALS:					0	2	205K	0

(Source: <http://www.ncdc.noaa.gov/stormevents>)

Lawrence Township reported that lightning had caused structural fires and damage to communication towers. No date or cost estimates were given.

Lightning events can cause structural and wildfires, extensive property damage (especially buildings without lightning protection systems), injuries, and even death. In the United States, between 75 and 100 people are hit and killed by lightning each year. The National Lightning Safety Institute estimates that 85 percent of lightning victims are children and young men (ages 10-35) engaged in recreation or work-related activities. Approximately 20 percent of lightning strike victims die, and 70 percent of those who survive suffer long-term effects such as memory loss, attention deficits, sleep disturbance, fatigue, dizziness, and numbness.

Table 32. Lightning Strike Injuries and Deaths, Michigan and U.S., 1959-1994

Location	Michigan (injury)	Michigan (death)	United States (injury and death)
Open field and recreation areas (non-golf course)	34 percent	27 percent	27 percent
Under a tree (non-golf course)	15 percent	28 percent	14 percent
On or near water (boating, swimming, fishing, etc.)	4 percent	12 percent	8 percent
Golf Course	5 percent	11 percent	5 percent
On or near equipment and machinery	3 percent	2 percent	3 percent
At a telephone	3 percent	2 percent	2.4 percent
Other or unspecified	36 percent	18 percent	40.6 percent

(Source: National Lightning Safety Institute)

Loss estimation for Van Buren County for thunderstorms/lightning the relative risk was rated medium. The number of damaging lightning events 1993-2002 reported by the (NCDC) is 1.57. The average number of damaging lightning events per year is 0.09. The historic lightning damage is \$211,444 reported by the (NCDC) and the expected annual losses are \$11,879. (Sourced: State of Michigan Hazard Mitigation Plan)

Overall, lightning is considered a high hazard in Van Buren County.

Severe Winds (Windstorms)

According to the National Weather Service, wind speeds of 58 miles per hour, or greater, are classified as a windstorm. Windstorms are a fairly common occurrence in many areas in Michigan. Along the Great Lakes shoreline, strong winds occur with regularity, and gusts of over 74 miles per hour (hurricane velocity) occasionally occur in conjunction with a storm front. Severe windstorms can cause damage to homes and businesses, power lines, trees and agricultural crops, and may require temporary sheltering of individuals without power for extended periods of time. Windstorms occur in all areas of Michigan, although more often along the lakeshore and in central and southern Lower Michigan. According to the National Severe Storms Laboratory, southwest Michigan has at least 14-16 days per year with possible straight-line winds.

In Van Buren County, the prevailing wind is southwesterly, averaging 10 mph. The strongest one-minute wind speed, 58 mph, was recorded in June 1964.

Between 01/01/1950 and 08/03/2015, 152 thunderstorm and high wind events were reported in Van Buren County, Michigan.

Summary Info:

Number of County/Zone areas affected:	2
Number of Days with Event:	114
Number of Days with Event and Death:	1
Number of Days with Event and Death or Injury:	2
Number of Days with Event and Property Damage:	51
Number of Days with Event and Crop Damage:	4
Number of Event Types reported:	2

(Source: <http://www.ncdc.noaa.gov/stormevents>) These storms caused two deaths and six injuries. The storms also resulted in over \$1,623,000 in property damages and \$40,000 in crop damages.

The loss estimation for Van Buren County for severe winds its relative risk is rated at medium. The number of damaging thunderstorm/wind events from 1993-2010 reported by the (NCDC) is 67. The average number of damaging thunderstorm/wind events per year is 3.76. The adjusted historical thunderstorm/wind events damage reported by the (NCDC) is \$1,356,880. The expected annual losses are \$76,229. (Sourced: State of Michigan Hazard Mitigation Plan)

In the past, straight-line winds have caused property damage, such as trees falling on houses. South Haven Township reports experiencing severe wind damages from gales off of Lake Michigan. At the Mattawan airfield, hangars collapsed on the planes that were inside them. The storm in June 2004 produced straight-line winds affecting Keeler Township (Magician Lake area). The community was without power for six to seven days. The fire department supplied water to homeowners during this time. During the initial investigation, one home had extensive damage and four homes had minor damage. The road commission estimates it spent \$75,000 to \$150,000 for road clean-up efforts. In July of 2006, strong winds resulted in numerous trees down blocking roads. This incident impacted the entire county with damage in South Haven Township to Mattawan. In 2013, gusts of 77 mph were recorded at the South Haven buoy during a straightline wind event that caused extensive damage in the county including long term power outages.

Many of the effects of severe winds such as health, safety, damages, critical facilities and economic impacts, are the same as those for tornadoes, and are explained in the following section focusing on tornadoes.

Severe winds are given a very high priority in Van Buren County.

Tornadoes

A tornado is a violently whirling column of air extending downward to the ground from a cumulonimbus cloud. The funnel cloud associated with a tornado may have winds up to 300 miles per hour and an interior air pressure that is 10-20 percent below that of the surrounding atmosphere. The typical length of a tornado path is approximately 16 miles, but tornado paths of up to 200 miles have been reported. Tornado path widths are generally less than one-quarter mile wide. Historically, tornadoes have resulted in the greatest loss of life of any natural hazard, with the mean national annual death toll being 111 persons. Property damage from tornadoes is in the hundreds of millions of dollars every year.

Table 33. Expected Damage from Tornadoes

Scale	Wind Speed (mph)	Expected Damage
F-0	40-72	Light Damage - Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; signboards damaged.
F-1	73-112	Moderate Damage - Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off road.
F-2	113-157	Considerable Damage – Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F-3	158-206	Severe Damage - Roofs and some walls torn off well-constructed houses, trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown.
F-4	207-260	Devastating Damage - Well-constructed houses leveled; structure with weak foundations blown off some distance; cars thrown and large missiles generated.
F-5	261-318	Incredible Damage - Strong frame houses lifted off foundations and swept away; automobile sized missiles fly through the air in excess of 100 meters (109 yards); trees debarked; incredible phenomena will occur.

Table 34. Tornadoes, Van Buren County, 1950-2015

*If viewing on-line, click on **Location or County** to display details.*

Mag:
Dth:
Inj:
PrD:
CrD:

Magnitude
Deaths
Injuries
Property Damage
Crop Damage

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
VAN BUREN CO.	05/31/1954	16:00	Tornado	F2	0	0	250.00K	0.00K
VAN BUREN CO.	04/03/1956	18:15	Tornado	F3	0	9	2.500M	0.00K
VAN BUREN CO.	04/03/1956	18:39	Tornado	F3	0	0	2.500M	0.00K
VAN BUREN CO.	05/09/1956	09:15	Tornado	F2	0	0	25.00K	0.00K
VAN BUREN CO.	05/23/1966	20:45	Tornado	F1	0	0	2.50K	0.00K
VAN BUREN CO.	03/04/1976	21:30	Tornado	F2	0	0	250.00K	0.00K
VAN BUREN CO.	06/28/1977	16:55	Tornado	F1	0	0	2.50K	0.00K
VAN BUREN CO.	06/07/1979	14:20	Tornado	F2	0	1	25.00K	0.00K
VAN BUREN CO.	05/13/1980	13:28	Tornado	F3	0	15	2.500M	0.00K
VAN BUREN CO.	09/29/1986	15:30	Tornado	F2	0	1	250.00K	0.00K
VAN BUREN CO.	07/15/1988	15:30	Tornado	F0	0	0	25.00K	0.00K
VAN BUREN CO.	05/30/1989	16:04	Tornado	F1	0	0	2.50K	0.00K
VAN BUREN CO.	05/30/1989	16:25	Tornado	F2	0	0	25.00K	0.00K
VAN BUREN CO.	05/30/1989	16:30	Tornado	F2	0	0	250.00K	0.00K
VAN BUREN CO.	05/30/1989	18:04	Tornado	F1	0	0	0.25K	0.00K
GOBLES	05/12/2000	18:43	Tornado	F0	0	0	10.00K	10.00K
PAW PAW	09/13/2008	15:25	Tornado	EF1	0	0	0.00K	0.00K
MATTAWAN ARPK	09/13/2008	15:33	Tornado	EF0	0	0	0.00K	0.00K
GOBLES WESLER ARPT	06/27/2010	12:08	Tornado	EF0	0	0	100.00K	0.00K
Totals:					0	26	8.718M	10.00K

(Source: <http://www.ncdc.noaa.gov/stormevents>)

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	14
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	4
Number of Days with Event and Property Damage:	13
Number of Days with Event and Crop Damage:	1
Number of Event Types reported:	1

Frequency

Tornadoes in Michigan occur most frequently in spring and early summer (April- June) when warm, moist air from the Gulf of Mexico collides with cold air from the Polar Regions to generate severe thunderstorms. These thunderstorms often produce tornadoes. Although there are no official recurrence intervals calculated for tornadoes, over half of all tornadoes hit between 3:00 p.m. and 7:00 p.m. Michigan lies at the northeastern edge of the Midwest's tornado belt. Michigan averages approximately 18 tornadoes per year, with tornadoes occurring more frequently in the southern half of the Lower Peninsula than any other area of the state. The majority of tornadoes in Michigan come from the southwest and travel to the northeast. The low frequency of tornadoes occurring in Michigan may be, in part, the result of the cold Lake Michigan waters during the spring and early summer months, which is the prime period of tornado activity. **19 TORNADOES** were reported in **Van Buren County, Michigan** between **01/01/1950** and **08/04/2015**. Based on the 65 years of recorded tornado history, the likelihood of a tornado hitting somewhere in the County is 0.315 percent in any given year.

Safety/Health

In 1980, an F3 tornado struck east of Bangor. This was the same tornado that hit Kalamazoo and killed five people. There is only one designated emergency shelter in Paw Paw, so there is a need for safe rooms. There are several mobile home parks in the county and many have been visited about installing safe rooms, at their request. There have been no deaths reported in Van Buren County, but there have been 26 injuries associated with the seven reported tornadoes from 1950 to 2004. Improved surveillance and warning systems implemented by the National Weather Service and emergency management agencies, coupled with public education, have been effective in preventing deaths due to tornadoes in recent years. However, if a strong tornado should strike a highly populated area of Van Buren County, a number of deaths could still occur. Tornadoes must always be considered with the utmost of caution.

The major health hazard caused by tornadoes is physical injury from flying debris or being trapped in a collapsed building or mobile home. Based on national statistics for 1970-1980, for every person killed by a tornado, 25 people were injured and 1,000 people received some sort of emergency care. Within a building, flying debris or missiles are generally stopped by interior walls. If a building has no partitions however, any glass, brick, or other debris blown into the interior can be life threatening. Following a tornado, damaged buildings are a potential health

hazard due to instability, electrical system damage, and gas leaks. Sewage and water lines may also be damaged.

Damage/Critical Facilities

In Van Buren County, one of the worst problems from these hazards is the possibility of severe weather to cause power and infrastructure failures which can affect large numbers of people. Although some improvements have been made to prevent these events from affecting the entire county, the inconvenience and risks that some residents experience from loss of power and phone service should be addressed further.

Although tornadoes strike at random, making all buildings vulnerable, three types of structures are more likely to suffer damage:

1. Mobile homes (see map for location of mobile home parks),
2. Homes on crawlspaces (more susceptible to lift),
3. Buildings with large spans, such as airplane hangers, gymnasiums and factories.

Structures within the direct path of a tornado vortex are often reduced to rubble. However, structures adjacent to the tornadoes path are often severely damaged by high winds flowing into the tornado vortex, known as inflow winds. It is here, adjacent to the tornado's path where the building type and construction techniques are critical to the structures survival.

In 1999, FEMA conducted an extensive damage survey of residential and non-residential buildings in Oklahoma and Kansas following an outbreak of tornadoes on May 3, 1999, which killed 49 people. The assessment showed the following:

- The failure of many residential structures occurred where the framing was attached to the foundation or when nails were the primary connectors between the roofing and the walls. A home in Kansas was lifted from its foundation where the addition of nuts to the bolts anchoring the wood framing to the foundation may have been all that was needed to have kept this from happening.
- Roof geometry also played a significant role in a building's performance.
- Failure of garage doors, commercial overhead doors, residential entry doors or large windows caused a significant number of catastrophic building failures.
- Manufactured homes on permanent foundations were found to perform better than those that were not on solid walls.

Because a tornado can hit anywhere in the county, all critical facilities are susceptible to being hit. Schools however, are a particular concern for two reasons:

- They have large numbers of people present, either during school or as a storm shelter
- They have large span areas, such as gyms and theaters

The September 2008 tornado from Lawrence to Paw Paw did not result in any deaths or injuries, but did damage 5 homes and 2 businesses, destroyed one business and damaged secondary power lines.

Economic Impact

The major impact of a tornado on the local economy is damage to businesses and infrastructure. A heavily damaged business, especially one that was barely making a profit, often has to be closed. Infrastructure damage is usually limited to aboveground utilities, such as power lines. Damage to utility lines can usually be repaired or replaced relatively quickly. Damage to roads and railroads are also localized, and if the damage cannot be repaired promptly, alternate transportation routes are usually available. Public expenditures include search and rescue, shelters, and emergency protection measures. The large expenses are for repairs to public facilities and clean up and disposal of debris. Most public facilities are insured, which may limit the economic impact on the local treasury. Disaster clean up and debris disposal often present a much larger problem.

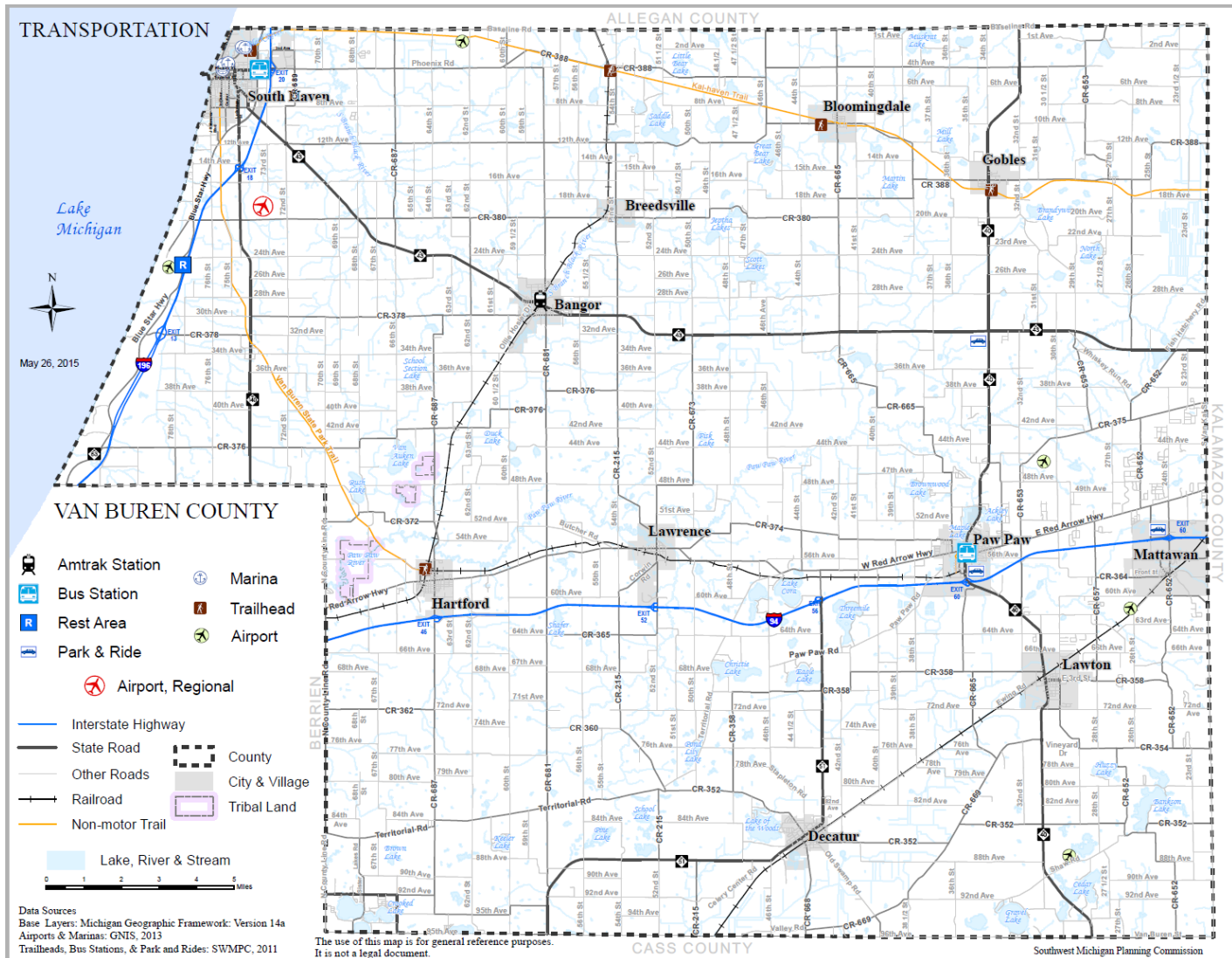
The loss estimation for Van Buren County the relative risk is rated at medium for tornadoes in the county. The number of tornadoes: 1951-2009 reported from the (NWS) was 18. The expected annual events are 0.30. National Climatic Data Center (NCDC) total historical tornado \$8.62 million with expected annual losses of \$143,633. (Source: State of Michigan Hazard Mitigation Plan)

Over \$8.7 million worth of property and crop damages can be attributed to the 19 tornadoes hitting Van Buren County since 1950. **Tornadoes are considered a moderate priority in Van Buren County.**

TRANSPORTATION ACCIDENTS

This hazard is described as a crash or accident involving an air, land, or water-based commercial passenger carrier resulting in death or serious injury. Vulnerable areas would include: 1) communities with, or near, an airport offering commercial passenger service; 2) communities with railroad tracks on which commercial rail passenger service is provided; 3) communities in which commercial intercity passenger bus or local transit bus service is provided; 4) communities with school bus service; and 5) communities in which commercial marine passenger ferry service is provided. A serious accident involving any of the above modes of passenger transportation could result in a mass casualty incident, requiring immediate life-saving community response. In addition, a marine transportation accident would require a water rescue operation, possibly under dangerous conditions on the Great Lakes.

There is a full-service airport facility south of the city of South Haven, and two major highways (1-196 and I-94) that cross the county as well. Amtrak offers passenger rail service in Van Buren County with a stop in Bangor. The County also operates the Van Buren County Public Transportation Service out of Bangor. This is a rural service with buses that only carry 1-10 passengers at a time. School buses operate in every part of the county transporting students to and from school and other after school activities. There are currently no passenger vessels (ferries) operating in Van Buren County and there is no commercial marine traffic in the South Haven harbor.



In April 2007, a single engine cesna 150 plane crashed in a field in Waverly Township.

The following municipalities reported concerns with transportation incidents:

- **Almena Township** has M-43 running through it.
- **Bloomington Township** is on the Detroit/Chicago aircraft corridor and has M-40 on its east side, which carries a considerable amount of truck traffic.
- **Breedsville** has a railroad that runs through the village.
- **Covert Township** has a considerable amount of commercial traffic traveling on its roads, including I-196 and M-140.
- **Decatur** has M-51 running directly through the village and has an Amtrak railway running through it.
- **Gobles** has M-40, a corridor for commercial traffic from I-94 to northwest destinations, running through it.
- **Hamilton Township** has I-94 running through the township and is on the Detroit/Chicago flight path.

- **Hartford Township** has I-94 and a railway running through it.
- **Lawrence** has I-94 and train tracks in the town. The train tracks run very close to two of the village's drinking water wells.
- **Lawrence Township** has I-94 running through it and it is in the Detroit/Chicago flight path, as well as flight paths from Grand Rapids and South Bend.
- **Lawton** has M-40 and an Amtrak railway the "high speed" train travels through the middle of downtown at 110 mph. A nursing home is located next to the railroad tracks and the village is located on a major airline corridor between Detroit and Chicago.
- **Mattawan** is intersected by I-94 and has Amtrak rail lines intersecting the Village at several locations.
- **Paw Paw Village and Township** has I-94.
- **South Haven Township** has an airport, I-196 and M-140.

Only the most severe mass casualty incidents would require county level emergency management response. **This hazard is currently a moderate priority compared to others faced by Van Buren County.**

SEVERE WINTER WEATHER

The following aspects of **severe winter weather** are considered a very high priority in **Van Buren County**:

Ice and Sleet Storms

Ice and sleet storms generate sufficient quantities of ice or sleet to result in hazardous conditions and/or property damage. Sleet storms differ from ice storms in that sleet is similar to hail (only smaller) and can be easily identified as frozen raindrops (ice pellets) when hitting the ground or other objects. Sleet does not stick to trees and wires, but sleet in sufficient depth does cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surface, coating the ground, trees, buildings, overhead wires, etc. with ice, sometimes causing extensive damage. When electric lines are downed, economic loss and disruption of essential services is often experienced in the affected communities. Michigan has had numerous damaging ice storms over the past few decades.

Snowstorms

A snowstorm is a period of rapid accumulation of snow often accompanied by high winds, cold temperatures, and low visibility. Blizzards are the most dramatic and perilous of all snowstorms and are characterized by low temperatures and strong winds bearing enormous amounts of snow. Most of the snow accompanying a blizzard is in the form of fine, powdery particles of snow, which are wind-blown in such great quantities that, at times, visibility is reduced to only a few feet. Blizzards have the potential to result in property damage and loss of life. The cost of clearing and removing the snow can be enormous. As a result of being surrounded by the Great Lakes, Michigan experiences large differences in snowfall in relatively short distances. The annual mean accumulation of snow ranges from 30 to 170 inches. The highest accumulations are in the northern and western parts of the Upper Peninsula. Since winter storms tend to move from

west to east, the western parts of the state usually have greater amounts of snow than the eastern parts.

All municipalities in Van Buren County are concerned with the usual risks associated with severe winter weather. These municipalities reported specific concerns related to severe winter weather:

- **Arlington Township's** roads can take longer than average to clear in heavy winter weather.
- **Bangor's** storm response would be taxed beyond short-term resolution.
- **City of Hartford** experience extreme temperatures-weather it is extreme heat or extreme cold share a commonality in that they both primarily affect the most vulnerable segments of society such as elderly, children, impoverished individuals and people in poor health.
- **Lawton** has the potential to be cut off from the rest of the county by severe winter storms. This is a concern primarily in long-term situations.
- The **Mattawan** public works department has difficulty servicing the north side of the village during severe winter weather because of hazards on the I-94 overpass.

Frequency

Van Buren County is in the heart of the "Lake Snow Belt" and at least one severe winter storm event is likely to happen every year. The average seasonal snowfall in Van Buren County is 91.4 inches and the greatest snow depth on record was 45 inches on December 12, 1962. Depending on the geographic location in the county, 66-84 days of the year averaged at least 1 inch of snow on the ground. The number of such days varies greatly from year to year. The highest seasonal snowfall was 158.8 inches, recorded during the winter of 1962-1963. The lowest seasonal snowfall was 21.2 inches, recorded during the winter of 1905-1906. The heaviest 1-day snowfall on record was 20 inches, on December 10, 1962.

Comparing the South Haven and Bloomingdale weather stations, there is quite a difference in the amounts of snowfall between the two locations. Because of the lake effect, the coastal area does not receive as much snow as the inland portion of the county.

Table 35. Snowfall Averages, Van Buren County (in inches)

Weather Stations in Van Buren County	Average seasonal snowfall (1950-1980)	Number of days averaging one or more inches of snowfall	Greatest observed daily total	Greatest monthly total	Greatest seasonal total	Least seasonal total	Greatest snow depth
South Haven	60.7"	66	14"	60"	101.5"	14.3"	38"
Bloomingdale	92.6"	84	20"	80.7"	158.8"	21.2"	45"

Eighty-six blizzard, ice storm, lake-effect snow, winter storm, winter weather was reported in Van Buren County between 01/01/1950 and 08/03/2015. No injuries or lives lost were reported to the NCDC for these events.

Summary Info:

Number of County/Zone areas affected:	1
Number of Days with Event:	86
Number of Days with Event and Death:	0
Number of Days with Event and Death or Injury:	0
Number of Days with Event and Property Damage:	2
Number of Days with Event and Crop Damage:	0
Number of Event Types reported:	5

(Source: <http://www.ncdc.noaa.gov/stormevents>)

A snow emergency has been declared twice as described below.

1. November 11 to December 31, 2001. Twenty-four agencies received \$91,000 in reimbursements from FEMA for damage and response efforts.
2. January 2-15, 1999. The County received \$90,190 in reimbursement from FEMA for response efforts and damages during this storm.

Safety/Health

Severe winter weather takes a number of lives around the county each year. Winter storms are known as “deceptive killers” because most deaths are indirectly related to the actual storms in the form of traffic accidents, heart attacks, hypothermia, etc. One of the biggest concerns is travel safety in severe winter weather. Road conditions can become extremely hazardous during snow and ice events, especially when coupled with high winds. Heavy snow can immobilize a region and paralyze a community by stranding motorists, stopping the flow of supplies and commodities, and disrupting emergency and medical services. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. The County has some snow fences to help mitigate the effects of blowing and drifting snow across roadways.

Another stated concern is for the elderly, and other vulnerable populations, being stranded without electricity and heat for extended periods of time. An amateur radio network is in place to help contact and assist the homebound.

Damage/Critical Facilities

The major impacts of snow and ice storms on property are to utilities and roads. Strong winds, accumulations of heavy snow and ice can bring down trees, electrical wires, telephone lines, communications towers, and can even collapse buildings. Communications and power can be disrupted for days while utilities work to repair the extensive damage. Damages can create high infrastructure costs for government and private industry. Small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces.

Economic Impact

The economic impact of winter storms can be quite significant resulting from transportation delays, school closings (which result in extensions of the school year), lost work time, and

decreased productivity. The cost of snow removal, repairing damage, and loss of business can have a significant impact on the economy. In rural areas, homes and farms may be isolated for days and unprotected livestock may be lost. Ice or severe freezing during the growing season can also damage crops, resulting in lost revenue.

The loss estimation for the Van Buren County winter storms it relative risk is ranked medium. The number of winter storms from 1993-2010 reported from the (NCDC) is 105. The average numbers of winter storms per year are 5.9. The adjusted historic winter storm damage reported from (NCDC) is \$127,747 and the expected annual losses are \$7,177. (Source: State of Michigan Hazard Mitigation Plan)

GOALS AND OBJECTIVES

The Hazard Mitigation Committee developed these goals and objectives. The goals were developed to reflect current community priorities, to be consistent with current countywide planning efforts, and in consideration of the impact of each hazard that affects Van Buren County. The goals and objectives guided the County in the development and prioritization of the mitigation strategies. Each mitigation action must help accomplish one or more of the following goals and objectives:

1. Minimize loss of life and protect public health and safety during hazard events.
 - Improve warning systems to adequately warn the public in high-risk areas.
 - Improve communication systems to better respond to disasters.
 - Better serve the elderly, disabled and LEP (Limited English Proficiency) populations.
2. Increase awareness of hazards and of existing and potential mitigation activities.
 - Encourage people to assume some responsibility for their own protection.
 - Develop public outreach campaigns about priority hazards to make people aware of hazards and mitigation activities.
 - Involve local municipalities and general public in hazard mitigation planning.
3. Reduce the risk and effects of hazards on public and private property.
 - Maintain and protect essential public services, critical facilities and public infrastructure.
 - Focus on preventive measures (Require new development to pay the full cost of protection measures, protect floodplains, wetlands and other important natural areas, limit building in high-risk areas, and improve building construction.)
4. Explore funding options for priority mitigation activities.
 - Use a cost-benefit review of mitigation activities to evaluate impact and feasibility.
 - Develop public/private partnerships to implement mitigation activities.
 - Leverage grant dollars for county/municipal agencies to implement mitigation activities.

Mitigation Strategies

The next step in the hazard mitigation planning process is to identify mitigation actions suitable to the community, evaluate the effect the action will have on the specified mitigation objective and prioritize actions to decide what sequence or order these actions should be pursued.

Mitigation actions can be grouped into six broad categories:

1. **Prevention.** Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building codes, capital improvement programs, open space preservation, and storm water management regulations.
2. **Property Protection.** Actions that involve the modification of existing buildings or structures to protect them from a hazard, or removal from the hazard area. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
3. **Public Education and Awareness.** Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school age and adult education programs.
4. **Natural Resource Protection.** Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. These actions include sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
5. **Emergency Services.** Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
6. **Structural Projects.** Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

Action Plan

Action items are identified for; addressing general program items and projects at the county and municipal levels, addressing public information and awareness activities, and for administering and supporting plan implementation. A “Call for Projects” was sent to each municipality in Van Buren County, several County departments, and non-profit organizations that solicited mitigation actions. Each municipality and organization was asked to prioritize the mitigation actions. Prioritization considered the costs and benefits and cost effectiveness (shown in the last column of Table 36) of each action. Further, prioritization was based on the hazard ranking and also evaluating if the action item helped to meet the overall plan’s goals and objectives. Table 36 summarizes the priority actions, hazards to be mitigated, location or jurisdiction, responsible agencies, funding sources and estimated timeline. Each action item can be tied to the goals and objectives found previously in the plan. The Van Buren County Office of Domestic Preparedness will be responsible for monitoring the implementation of the *Plan*, reporting to the participating municipalities on its progress, and recommending revisions to this *Plan* as needed.

Accomplishments Since the 2005 Plan

- NOAA weather radios provided to public schools, public buildings, state buildings, campgrounds, hospitals, libraries with a federal grant.
 - Every year the SkyWarn Program is offered to train residents.
 - An Emergency Alert System was installed and tested. Two satellite systems are installed and operational.
 - MDOT is planning to install message boards on I-94 for westbound traffic at Hartford and Kalamazoo.
 - Van Buren County Office of Domestic Preparedness has 5 mobile traffic signs.
 - Code Red – Reverse 911 is up and running in Van Buren County.
 - Every year press releases are sent to media about hazards and citizen preparedness.
 - Van Buren County Emergency Preparedness webpage is updated.
 - Homeland Security training for responders and local officials continues.
 - LEPC is active developing local emergency plans and responding to chemical emergencies. LEPC and OPD updates 302 list and plans.
 - Generators have been purchased and installed at Decatur Fire Department and County Building.
 - The Emergency Operation Center is in operation and available for training.
 - County GIS system has been improved to assess critical facilities.
 - The County Road Commission has replaced several undersized or failed culverts and addressed some roads that flood.
 - FEMA flood maps have been updated for Van Buren County.
 - Breedsville dam failed and area is restored.
 - Current sirens are maintained and kept functioning.
 - Weather forecasting has improved with the installation of a buoy off shore of South Haven.
 - OPD has assisted schools in the County with planning and preparing for emergencies.
 - SWMPC has held several educational events addressing watersheds, wetlands, low impact development, etc.
 - Municipalities have been advised to include hazard mitigation actions in local master plans.
- (Note: Some of these actions are still listed in the Action Plan (Table 36) as they are on-going activities.)

Hazard Abbreviations used in Table 36:

SWW – Severe Winter Weather
NPP – Nuclear Power Plant Accident
EXT – Extreme Temperatures
SSW – Severe Summer Weather
IF – Infrastructure Failure
FI- Fires
TE – Terrorism/Sabotage/WMD
FL – Flooding
HM – Hazardous Materials Accidents
TA – Transportation Accidents
PH – Public Health Emergencies
PN – Petroleum/Natural Gas Pipeline/Well
D – Drought
CD – Civil Disturbance

Other acronyms used in Table 36:

HLS – Homeland Security Grant
FEMA – Federal Emergency Management Agency
SWMC – Southwest Michigan Planning Commission
EPA – Environmental Protection Agency
MDEQ – MI Dept. of Environmental Quality
MDOT – MI Dept of Transportation
MSP – Michigan State Police
MSUE – MI State University Extension
NRCS – Natural Resource Conservation Service
GIS Dept. – County GIS Department
ODP – Van Buren County Office of Domestic Preparedness

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Keep current siren systems functioning and in good repair.	High	All	Palisades 10 mile radius, Bloomingdale, Bangor, Paw Paw, Hartford, Mattawan, Decatur, Lawton	Palisades Nuclear Plant, Bloomingdale, Bangor, Paw Paw, Hartford, Mattawan, Decatur, Lawton	Palisades, local municipalities	On-going	Y
Continue to support and increase participation in SkyWarn Program.	High	SWW, SSW	County-wide	ODP, National Weather Service	ODP Staff	On-going	Y
Continue to improve weather forecasting abilities.	Medium	SWW, SSW, FL	County-wide	Weather forecasters	National Weather Service	On-going	?
Municipal officials should encourage new developments (especially in densely populated areas) to bury utility lines.	High	SSW, SSW	County-wide	Local municipalities (planning commissions), County Planning Commission	Developers	On-going	Y
Encourage municipalities to become members of Tree City USA with tree trimming and maintenance programs.	Medium	SWW, SSW, IF	County-wide	ODP, County Planning Commission	Staff and committee time	On-going	Y
Maintain adequate road and debris clearing capabilities. Explore opportunities for coordinated debris management efforts between municipalities and County Road Commission that follows post disaster bidding regulations.	High	SWW, SSW	County-wide	ODP, Road Commission, Local Municipalities	County Road Commission, Local Municipalities, ODP staff time	2016-2018	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Continue to use snow fences to limit drifting on critical roadways. Continue to evaluate the need for additional coverage.	High	SWW, TA	County-wide	County Road Commission	County Road Commission	On-going	Y
Each season provide severe weather press releases that explain citizen preparedness activities.	High	SWW, SSW	County-wide (could combine efforts with Cass and Berrien Counties)	ODP, Public Health Department	Staff and committee time	On-going	Y
Encourage home and business owners to secure roofs, walls and foundations with adequate fasteners or tie downs, strengthen garage doors and other large openings, install storm shutters and storm windows, install/incorporate backup power supplies. Proper building site design and code enforcement for snow loads, roof slope, etc. Home and public building maintenance to prevent roof and wall damage from ice dams.	High	SSW, SSW	County-wide	ODP, Red Cross, Economic Development staff, Municipal Officials, code enforcers	Homeowners	On-going	Y
Continue to produce and distribute family preparedness information. Also, place information on county website.	High	All	County-wide	ODP, Red Cross, County GIS Dept	Van Buren County, local grants	On-going	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Translate family preparedness information into Spanish and include on website.	High	All	County-wide	ODP, Red Cross, Student Intern, County GIS Dept	Unknown	On-going	Y
Distribute Red Cross brochure on the need for homeowners and renters to purchase adequate insurance coverage.	Medium	All	County-wide	Red Cross, ODP	Staff time	On-going	Y
Distribute Red Cross information regarding the need for home disaster plans.	Medium	All	County-wide	Red Cross, ODP	Staff time	On-going	Y
Work with partners to develop methods for disseminating multi lingual hazard warnings for non-English speaking residents of the County.	High	All	County-wide	ODP, Red Cross	Staff time	2016-2020	Y
Help partner agencies to publicize existing services for special populations (elderly, LEP, etc).	High	All	County-wide	Public Health Dept, Area Agency on Aging, ODP, Red Cross	Staff time	On-going	Y
Assist schools and local businesses in planning for and responding to natural hazard events when they do occur.	Medium	All	Identify vulnerable businesses county-wide	County Economic Development, Red Cross, ODP	Staff time	On-going	Y
Develop partnerships with business associations to develop a mechanism for assessing damages, estimating indirect losses and reporting information about local businesses after a disaster.	Medium	All	County-wide	County Economic Development, ODP	Staff time	2016-2018	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County

Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Investigate building codes/incentives for adequacy for tornadoes, high winds and other natural disasters.	Medium	SSW, SWW, EXT	County-wide (priority faster growing communities)	SWMC, ODP, municipal officials, County Planning	Staff time	2016-2020	Y
Encourage housing codes requiring and enforcing heating requirements.	Medium	EXT	County-wide	Local municipalities, Area Agency on Aging, County Planning	Staff time	2016	Y
Examine local government master plans, zoning ordinances and policies for level of preventative and other measures to be a disaster resistant community.	Medium	All	County-wide (priority faster growing communities)	SWMC, ODP, municipal officials, County Planning	Staff time	2016 - 2020	Y
Ensure that adequate shelters (including warming/cooling places) are available to county residents.	High	All	County-wide (Lawton is a priority)	Red Cross, ODP, Department of Public Health, Area Agency of Aging	Staff time	On-going	Y
If not already in place, encourage local governments to require that mobile home parks have storm shelters with enough capacity to adequately protect all residents of the development. Assist local governments in applying for pre-disaster mitigation funds to construct tornado shelters in mobile home parks when needed.	Medium	SSW	County-wide (see Figure ___ for locations of mobile home parks)	ODP, Red Cross, local municipalities, County Planning	Staff time	2015-2020	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Construct a shelter at the County Fairgrounds. Assist local governments in applying for funds to construct storm shelters in public facilities (parks, fairgrounds or other vulnerable public areas). Inventory all parks, fairground and public areas in the County without storm shelters and determine the needed size and location of storm shelters within parks. Acquire funding or assist local units of government in acquiring funding to help finance storm shelters in parks.	High	SSW	County-wide	ODP, local parks departments, County Planning, SWMC	Mitigation grants, local	2015-2020	Y
Encourage farmer preparedness to address livestock needs.	Low	SWW, SSW, D, EXT	County-wide	MSUE, NRCS	Staff time	2016-2020	Y
Include safety strategies for severe weather in driver education classes.	Medium	SWW, SSW, TA	County-wide	Driver Education Teacher	Staff time	2016-2020	Y
Continue special arrangements for heating bill assistance for low income and elderly.	Medium	EX, SWW	County-wide	SW MI Community Action Agency (SMCAA), Utility Companies, Area Agency on Aging	SMCAA	On-going	Y
Install back flow prevention devices on fire hydrants.	Low	TE, PH	County-wide (in populated areas)	Fire Departments, Local Municipalities	Fire departments, HLS grants	2016-2020	?

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Encourage and promote homeland security training of responders and government officials.	High	All	County-wide (partner with Berrien County)	ODP, Lake Michigan College	Responders, HLS grants	On-going	Y
Encourage assessment training for local officials and others in need of training.	High	All	County-wide (partner with Berrien County)	ODP, Disaster Committee, Local Municipalities	HLS grants	On-going	Y
Encourage and promote training of waste water treatment and water treatment plant operators (take advantage of free private sector annual training opportunities such as that offered by Alexander Chemical).	High	HM, TE	All municipalities with public water and wastewater treatment plants	Water and Wastewater Treatment Plants, ODP	Treatment Plants, private sector	On-going	Y
Purchase and install generators for essential critical facilities.	High	IF, SSW, SWW,	County-wide (Lawton is a priority)	To Be Determined	Hazard Mitigation grant, local	2015-2020	Y
Maintain and expand an active LEPC (Local Emergency Planning Committee) to develop emergency plans for preparing for and responding to chemical emergencies.	High	HM	County-wide	ODP, Co. Board of Commissioners, municipalities, responders, health dept, etc	Staff time	On-going	Y
Continue to update the 302 list to ensure plans are developed for all locations.	High	HM	County-wide	ODP, MDEQ, County GIS Dept.	Staff time	On-going	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Maintain Emergency Operation Center and continue to provide adequate technology and training opportunities.	High	HM	County-wide	ODP	HLS grants	On-going	Y
Encourage Brownfield clean-up and redevelopment	High	HM, PH	County-wide	Economic Development, MDEQ, EPA, private industry	Brownfield redevelopment grants	On-going	Y
Encourage local governments to include hazard mitigation concepts in the development of their comprehensive plans. Distribute progress report to all units of government, encouraging further involvement in mitigation planning. Integrate report into a comprehensive biannual plan evaluation. Assist interested local governments in pursuing hazard mitigation plans.	High	All	County-wide	ODP, local municipalities, County Planning	Staff time	On-going	Y
The County should encourage local units of government to apply structural hazard mitigation and sustainability concepts when building or remodeling their facilities.	Medium	All	County-wide	ODP, County Planning Dept.	Unknown	On-going	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Encourage all critical facilities to employ hazard mitigation and sustainability concepts when building or remodeling their facilities. Encourage critical facilities to plan for power outages and install back up power supplies. This should include an assessment of the applicability of renewable energy sources as a potential power supply.	Medium	All	County-wide	ODP, County Administration	Unknown	On-going	Y
Continue to determine the feasibility of reducing the flow of floodwaters over roads by evaluating road elevation and culvert sizing standards for construction and upgrade for all County roads, but especially for roads in low lying or flood prone areas.	High	FL	County-wide	Road Commission, local road agencies, drain commissioner, ODP	Road agency funding, hazard mitigation grant	2015-2010	Y
Develop comprehensive watershed management plans and policies for Van Buren County, considering the connections between land-use, urban growth, and surface water, and ground water issues.	Medium	FL, PH	County-wide	Van Buren County, local municipalities, drain commissioner, MDEQ, watershed groups, SWMC	MDEQ, Van Buren County, local municipalities, SWMC	2015-2020	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Utilize wetland function map for floodwater storage to target wetland protection and restoration.	HIGH	FL	County-wide	MDEQ, MDOT, Van Buren Conservation District, SWMC	MDEQ	On-going	Y
Discuss formation of a policy that guides or further restricts development around flood prone areas and areas of high flood mitigation value. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, and areas of high infiltration potential.	Medium	FL	County-wide	County Planning, local municipalities, drain commissioner, MDEQ, watershed groups	MDEQ grants, FEMA, County, local	2015-2020	Y
Evaluate the County's and local units' erosion control and stormwater management, floodplain zoning, and shore land zoning ordinances, and NFIP status to determine regulatory deficiencies, necessary improvements, enforcement shortcomings in order to bring governments into compliance and to strengthen and maximize the benefits of current regulations.	High	FL	County-wide	SWMC, local municipalities, county planning, FEMA, MDEQ, watershed groups	MDEQ, SWMC, Local Municipalities	2015-2020	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Promote low impact development techniques that reduce stormwater run-off and lessens flooding.	High	FL, PH	County-wide	SWMC, watershed groups, drain commissioner, local municipalities, MDEQ	MDEQ, local	On-going	Y
Improve citizen and local elected officials understanding of floodplain maps and floodplain regulations, flood proofing options, development and stormwater management considerations, and other information to assist in good decision-making.	High	FL	County-wide	SWMC, local municipalities, county planning dept., FEMA, MDEQ, watershed groups	Staff time	On-going	Y
Examine and if needed replace undersized culverts to reduce flooding, increase accessibility for emergency vehicles and to lessen erosion and possible future failure of the road.	High	FL	County-wide	Drain Commission, Road Commission, ODP	Drain Commission, Road Commission, ODP, hazard mitigation grants	2015-2020	Y
Repair road and alleviate flooding problems .	High	FL	Lawrence Township – 68 th and Territorial Roads	Drain Commission, Lawrence Township, Road Commission	Drain Commission, Road Commission, hazard mitigation grants (\$150,000)	2015-2018	Y
Ensure that emergency plans are maintained for significant and high rated dams in Van Buren County.	High	FL	Significant and High rated dams	ODP, Dam owners, MDEQ	Dam owners	On-going	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Improve County Health Department surveillance program.	High	PH	County-wide	Health Department, ODP	Unknown	Unknown	Y
Evaluate the need for expanded warning siren coverage.	Low	All	County-wide	ODP, Local Municipalities	ODP staff time, local officials	2015-2020	?
Explore the feasibility and funding sources of installing a Radio Broadcast System for I-94 and I-196 (includes amber alert, weather advisory, accident and detour routes, evacuation for nuclear power plant incident, tourism messages).	Medium	SWW, SSW, NPP, TE, HM, TA	County-wide (maybe even partner with Berrien County)	ODP, MDOT, MSP, Cook and Palisades Nuclear Plants, Tourist Agencies	Message board now installed for West bound traffic on I-94 around Hartford.	2016	?
Install stormwater relief drains in Hartford City to mitigate serious flooding of several houses in an older neighborhood.	High	FL, PH	City of Hartford, along Hillsboro Street	City of Hartford, ODP	Hazard Mitigation Grant(50%), City of Hartford (50%)	2015-2020	Y
Identify (map), conserve, and restore land of potential flood mitigation value. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, and areas of high infiltration potential.	Medium	FL	County-wide	GIS Dept., local municipalities, drain commissioner, MDEQ, watershed groups Van Buren Conservation District	MDEQ grants, FEMA, County, local	On-going	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Improve regional stormwater management practices to minimize localized flooding. Flood management and stormwater management should form a single integrated system over the entire watershed. The streams and waterways of a watershed must be capable of carrying present and future runoff loads generated by all of the existing and future planned development patterns within the watershed. The County is uniquely situated to coordinate and facilitate projects that involve watershed or multi-jurisdictional efforts.	High	FL	County-wide	Drain commissioner, MDEQ, local municipalities, watershed groups	County, local, grants for innovative stormwater management practices (Great Lakes Basin, etc.)	On-going	Y
Enact a county-wide point of sale ordinance for wells and septic systems to be inspected and repaired/replaced if needed when property transfers.	High	PH	County-wide	Health Department, watershed groups	MDEQ	On-going	Y

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Identify cause(s) of flooding and alternatives for mitigation 1) Conduct an analysis to determine cause(s) of flooding and potential solutions to mitigate the flooding. Coordinate with MDOT as necessary. 2) Select feasible solution(s) and secure funding. 3) Develop and execute implementation plan for selected mitigation solution(s).	High	FL	Arlington Township - Scott Lake Area, the area of M-43 south between CR673 and 46th Street, and north of the corner of 52nd and 48th streets	FEMA, MDOT	FEMA	2015-2020	?
Assess the need for warning sirens for dam failure emergencies 1) Analyze if installation of sirens is feasible and cost-effective 2) If deemed feasible, secure funding and install sirens at appropriate locations.	HIGH	FL	Paw Paw Village	FEMA	FEMA	2015-2020	?

Table 36. Priority Hazard Mitigation Actions, Van Buren County							
Action	Priority	Hazard(s) Mitigated*	Jurisdiction(s)	Partnering Agencies	Potential Funding Sources	Time Frame	Action is Cost Effective Y=yes, n=no ?=more research needed
Remove sediments to hold emergency water flow for locally owned dams 1) Research potential funding sources, including MI DEQ, MI DNR and USACE 2) Determine scope of work and cost estimate. 3) Secure funding and implement project.	HIGH	FL	Paw Paw Village	FEMA, MDNR, MDEQ, USACE	FEMA, MDNR, MDEQ, USACE	2015-2020	?
Join Community Rating System (CSR) and adopt/enforce accompanying higher floodplain mgt standards.	HIGH	FL	Paw Paw Village	MDEQ, FEMA	Village	2015-2020	Y

After adoption of this plan, Van Buren County and its local jurisdictions will begin to incorporate mitigation recommendations into comprehensive plans, capital improvement schedules, zoning ordinances, building codes, site plan reviews, permitting and other planning tools. Many of the mitigation actions are already listed in local plans. Further, each municipality, with signing the resolution adopting the hazard mitigation plan, will also commit to incorporating mitigation activities into their plans when appropriate. The Van Buren County Planning Commission will review the Hazard Mitigation Plan and ensure that the County's Comprehensive Plan includes the relevant mitigation priority activities (many are already included in the County's General Development Plan). The County has no local land use authority, but the County Planning Commission does have the opportunity to review and comment on local plans and ordinances. During this County review process, the County Planning Commission will recommend that local jurisdictions include hazard mitigation actions into their planning and zoning documents when appropriate. Further, the Southwest Michigan Planning Commission receives copies of draft plans and ordinances for the municipalities in Van Buren County and will help to ensure that mitigation strategies are included in these local plans.

Van Buren County has developed a method to ensure that an annual review and an update every five years of the Hazard Mitigation Plan occur. The Van Buren County Office of Domestic Preparedness will lead the evaluation and updating process. This process should start by 2019 to ensure that is completed within a five-year cycle as required by FEMA. The Van Buren County Office of Domestic Preparedness will review the risk assessment portion of the plan to determine if this information should be updated or modified. The Office of Domestic Preparedness (ODP) will monitor and evaluate the progress of hazard mitigation strategies in the plan. The ODP will review each goal and objective to determine their relevance to changing situations in the County, as well as changes in state or federal policy, and to ensure that the plan addresses current and expected conditions. The ODP will determine if the responsible agencies or municipalities have implemented the priority actions listed in the action plan. The ODP will report on the status of the mitigation actions and which actions should be revised if necessary.

If needed, the Office of Domestic Preparedness will update the plan with assistance from the Southwest Michigan Planning Commission, LEPC, the County Planning Commission, local jurisdictions and the State. The County Planning Commission review will ensure that the plan is consistent with other planning efforts in the County. Any comments received will be incorporated into the final plan and the adoption process will follow.

The LEPC and local government officials will represent the public to some extent; however, there will be opportunities for public involvement. For further public input, the current *Plan* and any updates will be posted on the Van Buren County website (www.vbco.org) along with a contact name and phone number for people to direct their comments or concerns. The website version of the *Plan* may be edited to ensure that information that brings attention to specific vulnerabilities will not be included if public safety may be compromised.

CONCLUSION

A variety of hazards pose a threat to the people, communities, and economic stability of Van Buren County. Some hazards, such as drought, develop over a matter of months and are nearly impossible to avoid. Other hazards, such as flooding or tornadoes, can create a disaster situation in a matter of minutes, but are potentially manageable through preparation and a variety of structural and non-structural mitigation measures.

As the human and economic cost of disasters continues to rise across the nation, government, business, and individuals are beginning to realize the need to work together to find feasible solutions to make communities more resistant to disasters. This includes ensuring that redevelopment or policies in the aftermath of devastating disasters continue to lessen the community's vulnerability to future impacts.

Hazard mitigation, preparation, and response are not the sole responsibility of the agencies and organizations that have been described in this document. It is the responsibility of communities and individuals. Citizens must take personal responsibility to protect themselves, their families, and others in their community.

The first step in preventing disaster losses is obtaining knowledge of the risks. Effective risk management requires an informed citizenry. This *Plan* has presented findings of various hazard situations that have affected the lives and economies in Van Buren County in the past, and the potential impact of these hazards in the future. This *Plan* goes a step further and prioritizes strategies to lessen the impacts of the hazards facing the County. This *Plan* can guide local and county actions to ensure that our communities are more resistant to disasters. The County looks forward to working with the cities, townships, villages, residents, non-profits organizations and local state and federal agencies to mitigate disasters.

APPENDIX A

Sample Resolution of Plan Adoption

RESOLUTION

_____(municipality)
Van Buren County, Michigan

Van Buren County Hazard Mitigation Plan Adoption

WHEREAS, _____, Michigan is aware of the damages, lives lost and costs associated with disasters and recognizes the need to plan for and mitigate disasters in Van Buren County. Disasters in Van Buren County have damaged commercial, residential, and public properties, displaced citizens and businesses, closed streets and bridges and presented general public health and safety concerns; and

WHEREAS, Van Buren County in cooperation with each local unit has updated the Hazard Mitigation Plan that outlines options to reduce overall damage and impact from hazards affecting Van Buren County and its local units; and

WHEREAS, the Hazard Mitigation Plan update has been made available to the general public, business owners and federal, state and local agencies and has been revised to reflect their concerns;

NOW, THEREFORE, BE IT RESOLVED THAT

1. _____, Michigan adopts the 2015 Van Buren County Hazard Mitigation Plan as an official plan.
2. _____, Michigan will update its own plans and capital improvement schedules to include recommendations of the hazard mitigation plan when appropriate.
3. _____, Michigan will continue to provide information to the Van Buren County Office of Domestic Preparedness for future updates of the Hazard Mitigation Plan.

Adopted:

Date _____ Signed _____

APPENDIX B

List of Meeting Attendees and LEPC Members

September 8th, 2014 Van Buren Hazard Mitigation Meeting

<u>Name</u>	<u>Representing</u>	<u>Position</u>	<u>Email</u>
Marcy Colclough	SWMPC	-	colcloughm@swmpc.org
Kevin Kusmack	Decatur Twp.	-	ksumack5@comcast.net
Barry Nilson	Red Cross	-	kbnilson@comcast.net
Patrick Hudson	South Haven Twp	Planner/Zoning	mtsallegan@frontier.com
David McLeese	Village of Decatur	Police Chief	-
Mike Grabbe	Village of Lawton	Superintendent of Public Works	lawtondpw@frontier.com
Thomas Verburg	Village of Lawton	Police Chief	-
Dan Staunton	City of Hartford	Public Works Director	
Regina Hoover	Bangor Township		reginahover52@yahoo.com
Richard Godfrey	Van Buren County	Board of Commissioners	GodfreyR@vbco.org
Craig Pease	Bloomingtondale Twp.		craig.pease@yahoo.com
James Krizan	Village of Decatur	Village Manager	jkrizanvm@comcast.net
Al Svilpe	Van Buren County	ODP	svilpea@vbco.org
Richard Vreeland	City of Gobles	Director of Public Works	CityofGobbes1@frontier.com

APPENDIX C

Letter Sent to Adjacent Counties

To: Adjacent Counties (Kalamazoo, Cass, Berrien, Allegan, St. Joseph)

From: Southwest Michigan Planning Commission
(for Van Buren County Office of Domestic Preparedness)

Date: August 25, 2015

Re: Van Buren County Hazard Mitigation Plan

Please be advised that the Van Buren County Office of Domestic Preparedness will soon submit a draft updated Hazard Mitigation Plan to Michigan State Police for review. The plan is available for review on the Southwest Michigan Planning Commission's website at www.swmpc.org/hazmit.asp. You must have Adobe Reader installed on your computer to download and view the plan. If you would like a printed copy of the plan, please contact me at (269) 925-1137 x1525 or colcloughm@swmpc.org.

If you have any comments or suggestions regarding the plan, please contact me as soon as possible.

Thank you,

Marcy Colclough
Senior Planner
(269) 925-1137 x1525
colcloughm@swmpc.org