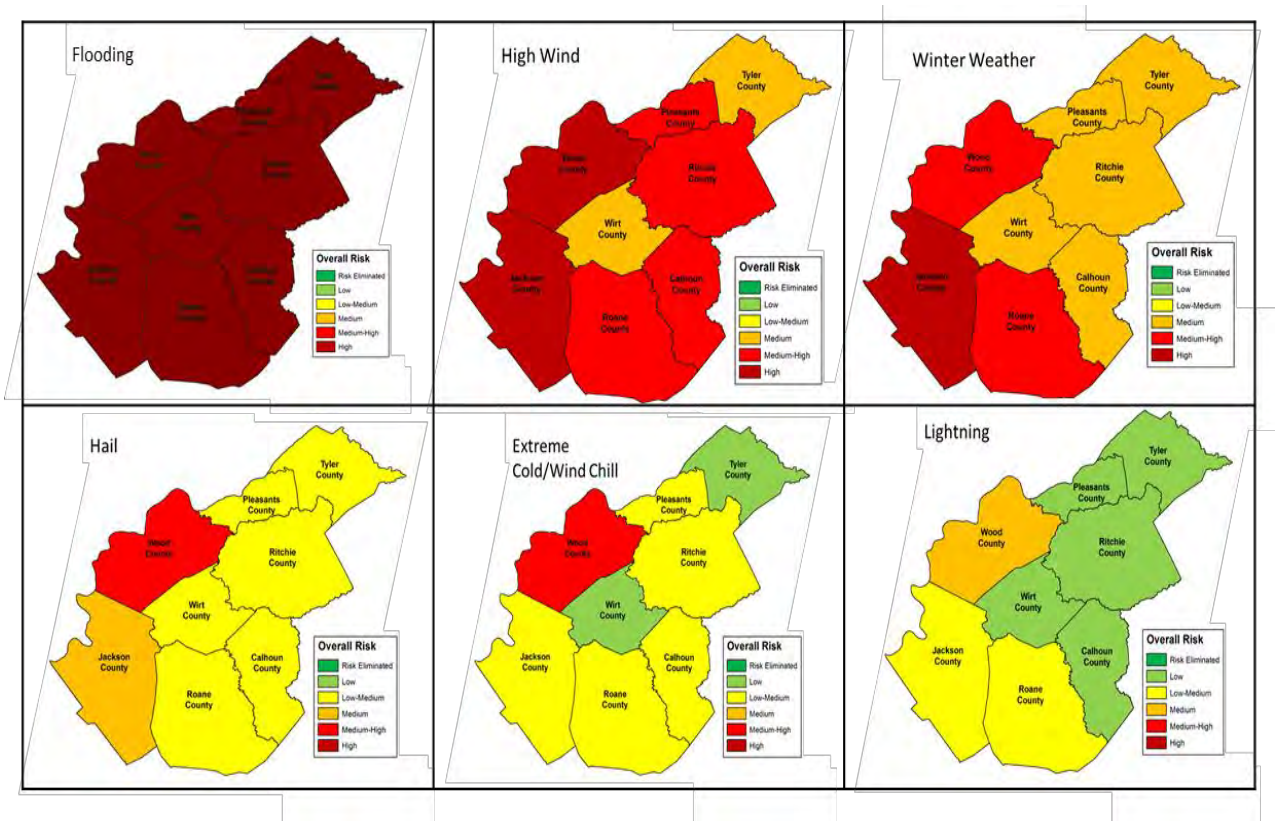
2016 Hazard Mitigation Plan for the Mid-Ohio Valley

Prepared by:

Mid-Ohio Valley Regional Council



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CHAPTER 1: INTRODUCTION

DISASTER MITIGATION ACT OF 2000

44 Code of Federal Regulations

§201.6(c)(1): A local government must have a mitigation plan approved pursuant to this section in order to receive HMGP project grants.

§201.6(a)(4): Multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan

1.1 Purpose of the Regional Hazard Mitigation Plan

The Mid-Ohio Valley Regional Hazard Mitigation Plan provides guidance to reduce loss and prevent injury from natural hazards throughout the region that includes Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood Counties in West Virginia. It reflects an amalgamation of goals, objectives, and strategies developed by the Mid-Ohio Valley Regional Council (MOVRC), with input from the County Emergency Management Representatives, members of Local Government from the region's eight (8) counties and twenty-two (22) municipalities, community stakeholders, and the general citizenry. The process of mitigation planning has been integrated with parts of other planning activities such as the Regional Development Plan and Comprehensive Economic Development Strategy, community strategic plans, and county Emergency Operations Plans. This encourages a holistic effort to reduce risk and better respond to disasters throughout the Mid-Ohio Valley Region.

As is expressed in the body of this plan and explained in chapter 1 this plan addresses only natural hazards and not manmade hazards. However, the planning team feels it is important to note that through the planning process at the multiple public meetings and through the online survey citizens, local officials, and local emergency management staff repeatedly sighted manmade hazards as one of their community's biggest obstacles or concerns.

Two manmade hazards in particular were mentioned most frequently 1) crime and health emergencies relating to the manufacturing, selling, or use of illegal drugs, and 2) hazardous materials being transported through the region either by truck or train and the potential for a spill. While these are not issues covered in this plan, these issues are weighing so heavily on the region an explanation of their exclusion is warranted as well as the listing of resources that may aid citizens, elected

officials, and emergency response personnel in these situations. As explained in section 1.2.2, 44 CFR Part 201§ 201.6 requires localities to complete a natural hazards plan. Ultimately the decision was made to focus this solely on natural hazards. A small list of resources that may help citizen, local officials, and emergency operations personnel manage manmade hazards has been included at the end of Appendix A.

1.2 Federal Authorities

In October 2000, the United States' Congress recognized that the Nation as a whole was ill-prepared to handle the risks and damages associated with natural hazards by adopting the Disaster Mitigation Act of 2000 (DMA 2000; Public Law (PL) 106-390). The law amended the existing 1988 Robert T. Stafford Disaster Relief and Emergency Assistance Act, defining language for 44 Code of Federal Regulations (CFR) Section 201.4. DMA 2000 reinforced the importance of mitigation planning, emphasizing planning before disasters occur. It set an initial standard for a State Hazard Mitigation Plan (HMP). The standard was further defined by the Federal Emergency Management Agency (FEMA) on February 26, 2002. FEMA published an Interim Rule that modified §201 and §206 in the *Federal Register*; the Final Rule was published in October 2009. The Guidance and Standard Plan Crosswalk were revised on November 4, 2006 and further updated to include requirements for 90-10 Federal funding for the Severe Repetitive Loss (SRL) and Flood Mitigation Assistance (FMA) grant programs in January 2009. Most recently, the *Biggert-Waters Flood Insurance Reform Act of 2012* restructured many of the Hazard Mitigation Assistance (HMA) grant programs, including the consolidation of SRL and Repetitive Flood Claims Programs into the Flood Mitigation Assistance program. For more detail on these changes, refer to the portion of Section 1.2.5 that addresses the *Biggert-Waters Flood Insurance Reform Act of 2012*. These changes were reflected in the *2013 Hazard Mitigation Assistance Unified Guidance*.

Mitigation planning is specifically addressed at the State and local levels under the Stafford Act, Section 322 (42 USC 5165). Adherence to the requirements and criteria set forth in Section 322 of the Act qualifies West Virginia to utilize disaster-related assistance, including Categories C through G of the Public Assistance Program, an essential component of disaster recovery.

Since 2004, West Virginia has been eligible to receive non-emergency Stafford Act assistance and Federal mitigation pre-disaster assistance by maintaining an approved Standard State HMP compliant with 44 CFR §201.4 and related FEMA mitigation planning guidance.

The following identifies and describes Federal regulations that have an impact on

mitigation and mitigation planning in the United States.

1.2.1 Disaster Mitigation Act of 2000 and Implementing Regulations

Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 USC 5165) was enacted under Section 104 of the Disaster Mitigation Act of 2000 (DMA 2000), PL 106-390. It was signed into law on October 10, 2000. The intent of DMA 2000 was to facilitate cooperation between state and local authorities. It encourages and rewards local and state disaster planning in advance of disasters in order to promote sustainability of communities and services as a strategy to improve disaster resistance. This enhanced pre-disaster planning effort is intended to support state and local governments' efforts to articulate accurate, targeted, and prioritized needs for hazard mitigation that will reduce exposure to natural hazards. This effort is intended to support timely funding allocation to encourage effective risk reduction strategies and projects.

1.2.2 The Code of Federal Regulations and the Stafford Act

44 CFR Part 201

On February 26, 2002, FEMA promulgated 44 CFR § 201.1 *et seq.* in order to implement DMA 2000. The Interim Final Rule was amended several times to address standard and enhanced State plans during 2007. Guidance for local plans was published on March 28, 2012. The rule addresses local mitigation planning, and specifically in 44 CFR § 201.3 (d) identifies that the key responsibilities for local governments are to:

1. Prepare and adopt a jurisdiction-wide natural hazard mitigation plan as condition of receiving the project grant funds under the HGMP, in accordance with § 201.6.
2. At a minimum, review and update the local mitigation plan every 5 years from date of plan approval of the previous plan in order to continue program eligibility.

Guidance for State standard and enhanced plans and local and multi-jurisdictional plans has been updated several times to incorporate changes from the Katrina Reform Act, new Unified Hazard Mitigation Assistance Grant Programs, and "lessons learned" through the first cycle of state and local mitigation planning. Plan Content, 44 § 201.6 (c), identifies the following elements that must be included in a Local or Multi-Jurisdictional HMP:

1. Documentation of the planning process used to develop the plan, including how it was prepared, who as involved in the process, and how the public was

involved.

2. A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.
3. A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.
4. A plan maintenance process that includes a section a section describing the method and schedule of evaluating and updating the plan, a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms, and discussion on how the community will continue public participation in the plan maintenance process.
5. Documentation that the plan has been formally adopted by the governing body of each jurisdiction requesting approval of the plan

1.2.3 44 CFR Part 206

On February 26, 2002, FEMA also changed 44 CFR Part 206 in order to implement DMA 2000 (See 67 *Federal Register 8844 [*February 26, 2002*]).* Changes to 44 CFR Part 206 authorize hazard mitigation grant program funds for planning activities and increase the amount of Hazard Mitigation Grant Program (HMGP) funds available to States that develop an Enhanced Mitigation Plan. FEMA amended Part 206 in 2006 following the passage of the Katrina Reform Act, which restored HMGP funding to 15 percent of eligible disaster recovery costs for States with approved Standard Mitigation Plans (SMPs).

1.2.4 44 CFR Part 206.400

(a) As a condition of the receipt of any disaster assistance under the Stafford Act, the applicant shall carry out any repair or construction to be financed with the disaster assistance in accordance with applicable standards of safety, decency, and sanitation and in conformity with applicable codes, specifications and standards.

(b) Applicable codes, specifications, and standards shall include any disaster resistant building code that meets the minimum requirements of the National Flood Insurance Program (NFIP) as well as being substantially equivalent to the recommended provisions of the National Earthquake Hazards Reduction Program (NEHRP). In addition, the applicant shall comply with any requirements necessary in regards to Executive Order 11988, Floodplain Management, Executive Order 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building

Construction, and any other applicable Executive orders.

(c) In situations where there are no locally applicable standards of safety, decency and sanitation, or where there are no applicable local codes, specifications and standards governing repair or construction activities, or where the Regional Administrator determines that otherwise applicable codes, specifications, and standards are inadequate, then the Regional Administrator may, after consultation with appropriate State and local officials, require the use of nationally applicable codes, specifications, and standards, as well as safe land use and construction practices in the course of repair or construction activities.

(d) The mitigation planning process that is mandated by section 322 of the Stafford Act and 44 CFR part 201 can assist State and local governments in determining where codes, specifications, and standards are inadequate, and may need to be upgraded.

1.2.5 Post-2010 Federal Policy Updates

Biggert-Water Flood Insurance Reform and Modernization Act of 2012

On July 6, 2012, the Biggert-Waters Flood Insurance Reform and Modernization Act of 2012 (BW12), was signed into law. It represents significant changes to fundamental operation and management of the National Flood Insurance Program (NFIP). Many policyholders will see revised flood insurance rates that more accurately reflect the actuarial rate, or true flood risk, of their insured property. These measures were inserted into the law to help financially stabilize the NFIP. Furthermore, these provisions change how Flood Insurance Rate Maps (FIRM) updates impact policyholders through increased premiums resulting from more accurate predictions of risk. The legislation also eliminated RFC, and SRL programs, while incorporating elements of these programs into FMA. These changes were reflected in the *2013 Hazard Mitigation Assistance Unified Guidance*.

Sandy Recovery Improvement Act of 2013

On January 29, President Obama signed the Sandy Recovery Improvement Act of 2013. The Act sets out certain reconstruction and grant administrative standards that apply to the States that received the Sandy Presidential Declaration of Disaster. Some implications of the Act could be seen in general revised FEMA Hazard Mitigation Assistance Guidance, scheduled for release during summer 2013, and other Federal recovery funds. For example, requirements to complete HMGP and Community Development Block Grant (CDBG) projects funded by the Sandy Act could eventually extend to the programs at large through issuance of new guidance, which would impact West Virginia.

The Federal Hurricane Sandy Rebuilding Task Force has also announced that all Sandy-related rebuilding projects funded by the supplemental spending bill must meet a single uniform flood risk reduction standard. The standard is informed by the best science and best practices, including assessments taken following Hurricane Sandy. It brings the Federal standard into alignment with many existing State and local standards and takes into account the increased risks in the Sandy-effected region caused by extreme weather events, sea level rise, and other impacts of climate change. The standard applies to the rebuilding of structures that were substantially damaged during the storm and will be repaired or rebuilt with Federal funding. As a result, the new standard will require owners of residential, commercial, or infrastructure projects who are applying for Federal dollars to plan for increased flood risk.

Requirements derived from the Sandy Recovery Act do not retroactively effect Federal aid that was previously given to property owners and communities in Sandy-impacted areas. Moving forward, the Federal standard applies to substantial rebuilding projects (i.e., when damage exceeds 50 percent of the value of the structure) that will rely on Federal funding.

The programs which received funding in the supplemental bill and will be impacted by this standard include:

- U.S. Department of Housing and Urban Development (HUD_: Community Development Block Grant Disaster Recovery program
- Department of Health and Human Services (HHS): Construction and reconstruction projects funded by Social Services Block Grants and Head Start
- FEMA: HMGP and Public Assistance Program
- U.S. Environmental Protection Agency (EPA): The State Revolving Fund (SRF) programs
- U.S. Department of Transportation (DOT): Federal Transit Administration's Emergency Relief Program, as well as some Federal Railroad Administration and Federal Highway Administration projects

FEMA Memorandum: Cost Effectiveness Determination for Acquisitions and Elevations in SFHA

Projects applying for mitigation grant funding under the Hazard Mitigation Assistance (HMA) programs must prove that they are cost effective. The cost-effectiveness determination process traditionally utilizes the FEMA Benefit-Cost Analysis software, and requires assessment of the costs of the project in comparison to the projected reduction in damages due to the project's implementation (benefits). This process can be challenging depending upon the nature of the project and availability of data.

In order to simplify this process, FEMA issued the memorandum titled "Cost Effectiveness Determinations for Acquisitions and Elevations in Special Flood Hazard Areas", signed on August 15, 2013 by Roy E. Wright, Deputy Associate Administrator for Mitigation from FEMA's Risk Reduction Division. This memorandum states that if the cost of an acquisition or elevation project is less than $276,000 or $175,000 respectively, then the project is determined to be cost effective. This purpose of this memorandum is to reduce the burden on applicants to develop Benefit Cost Analyses (BCA) as part of the application process.

The cost of elevation and acquisition in West Virginia, however, tends to be lower than the national average. As a result, many projects that have not historically been eligible might now meet this requirement. It also means that there are likely to be more projects that meet all of the eligibility requirements than there are HMA funding opportunities.

In order to address these challenges, DHSEM is reconsidering how it will address prioritization of funding of mitigation projects. While this funding strategy has not been finalized, DHSEM is considering providing Federal mitigation grant funds for elevation and acquisition projects on a first-come, first-serve basis, assuming all other eligibility criteria are met, or potentially still running a BCA on the project and awarding funding based on those that are considered most cost-effective. More information will become available as DHSEM finalizes its prioritization strategy. Contact the State Hazard Mitigation Officer for complete information. See Section 1.2.3 for complete details on the FEMA Memorandum.

1.3 Multi-Jurisdictional Planning in the Mid-Ohio Valley Region

During August 2004, the first Standard State Mitigation Plan was approved by FEMA Region III. The first plan focused on the creation of plans for localities. The 2004 plan was developed under the authority of the West Virginia Office of Emergency Services (WVOES), now known as West Virginia Division of Homeland Security and Emergency Management (DHSEM), and the Governor as established in West Virginia Code §§ 15- 5-1, *et seq*. and Executive Order No. 18-03.

Executive Order No. 18-03

On August 18, 2003 former Governor Bob Wise signed Executive Order No. 18-03. This Order established the West Virginia Hazard Mitigation Council as well as other actions that aided West Virginia's goal of compliance with DMA 2000.

Prior to the initial 2004 West Virginia Standard State Hazard Mitigation Plan (HMP), the West Virginia Office of Emergency Management (OEM), later superseded by

Department of Homeland Security and Emergency Management (DHSEM), cooperated with the Federal Emergency Management Agency (FEMA) Region III to support the development of local HMPs. FEMA Region III provided significant technical support, financial assistance, and outreach to OEM mitigation staff. In order to meet tight deadlines for local mitigation planning, FEMA supported an aggressive campaign to initiate local mitigation plan development. The structured system during 2002 and 2003 allowed State and Federal mitigation program planners to track plan development progress and provide technical assistance and coaching as needed. The Mid-Ohio Valley Regional Council assisted all eight counties in completing their individual HMP at this time. Fifty of the 55 county plans were approved by FEMA and adopted during 2004; the remaining 5 county plans were adopted in subsequent years.

In 2007, the first update to the base plan was adopted. The approach of this update varied from the 2004 plan. It described a proposed process for a staggered update of local HMPs that would allow the State to support updates and reviews of 11 plans annually; thus resulting in updates for all 55 counties over a single 5-year planning cycle. Additionally, its language discussed the development of a regional approach to mitigation planning throughout the State.

In 2010, county plan updates segued to regional updates coordinated through West Virginia's Planning and Development Councils to better ensure regularity in the local plan update process, as well as facilitate vertical integration of local plans into the State plan. As the MOVRC had previously assisted each county in completing its local HMP, instituting a regional planning process was the natural step in improving local HMP management and similarity to the State HMP. This process was started during the 2010 State Plan Update process, and by the time of the 2013 State Plan update all 11 PDCs had developed, approved, and adopted regional plans.

In 2011 the MOVRC completed the Mid-Ohio Valley's first regional hazard mitigation plan which was approved and adopted by all of the region's 22 municipalities and 8 counties. In order to complete the required 2016 plan update, the MOVRC has utilized the 2011 regional plan and the 2013 State Hazard Mitigation plan as resources.

1.4 West Virginia Authorities

Both the 2011 plan and 2016 update to the Regional HMP adhere to the West Virginia Code § 15-5 Public Safety. In Code § 15-5, the West Virginia Legislature declared that it is necessary to establish and implement comprehensive emergency management plans to ensure the State's preparedness for disasters. In addition, legislation states that:

"All emergency services functions of this state be coordinated to the maximum extent with the comparable functions of the federal government including its various departments and agencies, of other states and localities and of private agencies of every type, so that the most effective preparation and use may be made of every type, so that the most effective preparation and use may be made of the nation's manpower, resources and facilities for dealing with any disaster that may occur." (West Virginia Code § 15-5-1)

Under West Virginia Code § 15-5-5(2), the Governor is empowered with the authority to prepare, implement, integrate, and coordinate comprehensive plans and programs for the purpose of providing emergency services in West Virginia.

To prepare and implement a comprehensive plan and program for the provision of emergency services in this state, such plan and program to be integrated into and coordinated with comparable plans of the federal government and of other states to the fullest possible extent, and to coordinate the preparation of such plans and programs by the political subdivisions of this state, such plans to be integrated into and coordinated with the state plan and program to the fullest possible extent. (West Virginia Code § 15-5-1(2))

This excerpt allows for the development of more streamlined and holistic approach to emergency management and recovery. Beyond planning, the Governor, by the statute of West Virginia Code § 15-5-5(3), can authorize to preparatory steps in advance of events.

In accordance with such state plan and program, to procure supplies and equipment, to institute training and public information programs, to take all other preparatory steps including the partial or full mobilization of emergency services organizations in advance of actual disaster and to insure the furnishing of adequately trained and equipped emergency services personnel in time of need. (West Virginia Code § 15-5-5(3))

Furthermore, the Governor is empowered to authorize studies and surveys to verify the capabilities of the State to provide emergency services and to plan as seen in *West Virginia Code § 15-5-5(4),* cited below:

To make such studies and surveys of industries, resources and facilities in this state as may be necessary to ascertain the capabilities of the state for providing emergency services and to plan for the most efficient emergency use thereof. (West Virginia Code § 15-5-5(4)).

The studies contained in this hazard mitigation plan have been undertaken pursuant to this authority and to Executive Order 18-03. Many of the recommendations

contained in this plan are made in concert with the West Virginia Code § 15-5-20(a), which states:

In addition to disaster prevention measures as included in the state, local, regional and inter-jurisdictional disaster plans, the Governor shall consider on a continuing basis steps that could be taken to prevent or reduce the harmful consequences of disasters. At his or her direction, and pursuant to any other authority and competence they have, state agencies, including, but not limited to, those charged with responsibilities in connection with floodplain management, stream encroachment and flow regulation, weather modification, fire prevention and control, air quality, public works, land use and land-use planning and construction standards, shall make studies of disaster prevention-related matters. The Governor, from time to time, shall make such recommendation to the Legislature, political subdivisions and other appropriate public and private entities as may facilitate measures for prevention or reduction of the harmful consequences of disasters. (West Virginia Code § 15-5-20(a))

This alignment of the plan with West Virginia Code allows the hazard mitigation planning process to aid in reaching State goals.

The West Virginia Code, Chapter 15 Public Safety, §53, creates the DHSEM, which supersedes the Office of Emergency Services. This law establishes that emergency services organizations and operations will be structured around the existing constitutional government. The Governor retains control of and provides "general direction" to "the office of emergency services" for the State. West Virginia Code §15-5- 3(a) authorizes the Governor to appoint, with Senate approval, a Director of the DHSEM within the Department of Military Affairs and Public Safety (DMAPS).
The State organization for emergency operations includes:

1. The Governor and his immediate staff.
2. The Secretary of DMAPS and his staff.
3. The West Virginia Office of Emergency Services (WVOES) and State Emergency Operations Center (EOC) located in Charleston.
4. State departments and agencies assigned emergency responsibilities or having the capability to provide needed assistance in an emergency situation.
5. The State Legislature by concurrent resolution of the Senate and House of Delegates to declare a State of Emergency to exist or to be terminated.
6. Personnel from selected Federal agencies and participating public/private organizations.
7. Local governments. Each political subdivision is required to have an emergency services organization. Locally available manpower, materials, equipment, and facilities are to be identified in each local Emergency Operations Plan (EOP). Non-impacted localities can be expected to provide

assistance when requested.
8. Federal agencies upon request within their statutory authority.
9. Non-governmental organizations.

Additional PDC & County Authorities Policies, Programs, and Resources

1. Regional Comprehensive Economic Development Strategy (CEDS)
2. Regional Development Plan (RDP)
3. Jurisdictional Comprehensive or Strategic Plans ** (Currently only Parkersburg, Ravenswood, Vienna, Williamstown, and Wood County have active Comprehensive or Strategic Plans. The MOVRC's planning efforts such as the CEDS and the RDP serve the remaining jurisdictions. More information about this can be found in Section 5.2.1 of this HMP) **
4. Long Range Transportation Plan
5. Source Water Protection Plans

1.5 Assurances & Adoption

As this plan serves as a multi-jurisdictional local mitigation plan, it will comply with the local government key responsibilities described in 44 CFR §201.3 (d): prepare and adopt a jurisdiction-wide natural hazard mitigation plan as a condition of receiving project grant funds under the HMGP, in accordance with §201.6. At a minimum, review and update the local mitigation plan every 5 years from date of plan approval of the previous plan in order to continue program eligibility.

Additionally, according to 44 CFR § 201.6(a)(4) multi-jurisdictional local plans must be adopted by all jurisdictions covered under the plan in order to meet federal requirements. As such, this plan for the Mid-Ohio Valley Region has been approved and adopted by all eight (8) counties comprising of the region as well as all twenty-two (22) municipalities located within the region. The following documents are the signed resolutions of adoption, and assurances from all eight (8) counties and twenty-two (22) municipalities included in this multi-jurisdictional plan created by the MOVRC.

RESOLUTION

Whereas the Calhoun County Commission recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Calhoun County Commission has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Calhoun County Commission hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council on this the 14th day of November 2016. This document will serve as the Commission's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Robert Woods

Commission President

Attest: 11/14/2016

CALHOUN
E-911

Calhoun County E-911
511 Alan B. Mollohan Road
Mt. Zion, WV 26151
Phone (304) 354-9637
FAX (304) 354-9449

11/4/16

Mid- Ohio Valley Regional Hazard Mitigation Plan.

Approved

Date 11/14/2016

Commission Signature Robert Weaver
Robert Weaver

OEM Signature Kathryn Wood
Kathryn Wood

RESOLUTION

Whereas the Town of Grantsville recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Grantsville has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Grantsville hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Jadrey Hupp
Chief Elected Official

Attest: Josh C. Dotson

The Jackson County Commission

Jackson County Courthouse
P.O. Box 800
Ripley, West Virginia 25271
Phone (304) 373-2220
Fax (304) 373-0245

Commissioner
Mike Randolph

Commissioner
Mitch Morrison

Commissioner
Dick Waybright

RESOLUTION

Whereas the Jackson County Commission recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Jackson County Commission has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Jackson County Commission hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Commission's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Dick Waybright 10-26-2016
Chief Elected Official

Attest: Sandra J. Harris

Resolution

Adopting the Mid-Ohio Valley Hazard Mitigation Plan

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

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

WHEREAS, 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order receive Hazard Mitigation Grant Program project grants; and

WHEREAS, 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

WHEREAS, the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

WHEREAS, the City of Ravenswood has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

WHEREAS, The Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form; and

NOW, THEREFORE, BE IT RESOLVED, that the Common Council of the City of Ravenswood, West Virginia, hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. Further, that said document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

The foregoing Resolution was introduced and read at the regular meeting of the Common Council of the City of Ravenswood on October 18, 2016. On that same day, Councilor Tucker moved for the adoption of said Resolution and authorization for the Honorable Joshua Miller, Mayor of the City of Ravenswood, to sign said Resolution. The motion was seconded by - Councilor Hunt. After discussion, the Common Council of the City of Ravenswood adopted the foregoing Resolution and authorization with All voting for the Resolution and authorization and None against.

CITY OF RAVENSWOOD

By: _____

Joshua Miller, Mayor

ATTEST:

Sue Quillen, Recorder

I, the undersigned, being the duly appointed, qualified and acting Clerk of the City of Ravenswood, hereby certify that the foregoing Resolution is a true, correct and accurate copy as duly and lawfully passed and adopted by the governing body of the City on the 18th day of October, 2016.

Kimberly Benson, City Clerk/Treasurer

RESOLUTION

Whereas the City of Ripley recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the City of Ripley has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the City of Ripley hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Carolyn Rader, Mayor
Chief Elected Official

Attest: _____

COUNTY COMMISSION
PLEASANTS COUNTY
301 Court Lane
St. Marys, West Virginia 26170

LARRY O. BARNHART
(304) 684-2868
JIM COTTRILL
(304) 684-2660
JAY POWELL
(304) 488-7905

SUE E. MORGAN
County Clerk
(304) 684-3542
TINA OLDFIELD
County Administrator
(304) 684-1127

RESOLUTION

Whereas the Pleasants County Commission recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(l) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Pleasants County Commission has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Pleasants County Commission hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Commission's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.This 2nd day of November, 2016.

Larry Barnhart
President, Pleasants County Commission

Attest: Sue E. Morgan
Sue Morgan, County Clerk

RESOLUTION

Whereas the City of Belmont recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

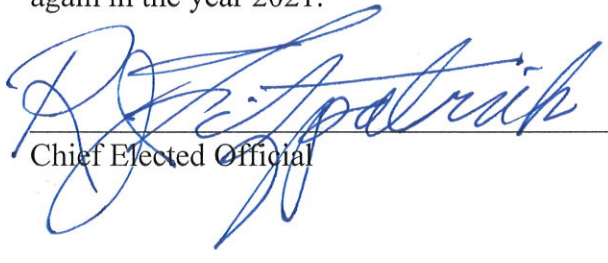
Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the City of Belmont has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the City of Belmont hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.



Chief Elected Official

Attest: _____

City of St. Marys

418 Second Street
ST. MARYS, WEST VIRGINIA 26170
Phone: (304) 684-2401
Fax: (304) 684-2463

RESOLUTION

Whereas the City of St. Marys recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the City of St. Marys has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the City of St. Marys hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Adopted by Council on November 1, 2016

L. Paul Lyon
Chief Elected Official

Attest: Beverly A Bonner

RESOLUTION

Whereas the Ritchie County Commission recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Ritchie County Commission has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Ritchie County Commission hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council on this the 10th day of November 2016. This document will serve as the Commission's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Chief Elected Official

Attest:

Town of Auburn

City Building, P.O. Box 37
Auburn, WV 26325

RESOLUTION

Whereas the Town of Auburn recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Auburn has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Auburn hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council on this 11th day of October 2016. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Robert E. Lowther, Mayor

Attest: Sherry L Combs

TOWN OF CAIRO

285 Main Street, P.O. Box 162
Cairo, WV 26337
Telephone: (304)628-3843 Fax: (304)628-3477
<townofcairo@gmail.com>

RESOLUTION

Whereas the Town of Cairo recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Cairo has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Cairo hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Gary S Haugh
Chief Elected Official

Attest: Laurie M Bell

RESOLUTION

Whereas the Town of Ellenboro recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Ellenboro has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Ellenboro hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Steve Lewis MAYOR

Chief Elected Official

Attest: Teresa Davis, Town Clerk

RESOLUTION

Whereas the Town of Harrisville recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Harrisville has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Harrisville hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Chief Elected Official

Attest: Rhonda K White

RESOLUTION

Whereas the City of Pennsboro recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the City of Pennsboro has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the City of Pennsboro hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council on this the **17th** day of **October 2016**. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Robert Riggs

Chief Elected Official

Attest: _____

Town of Pullman

RESOLUTION

Whereas the Town of Pullman recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Pullman has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Pullman hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council on this the 15th day of 2016. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Shirlene Todd

Chief Elected Official

Attest: Brooke Amos

Roane County Commission

200 Main Street
Spencer, WV 25276
304 927-0078

Melissa O'Brien, President
Gary A. Mace Merlin Shamblin

RESOLUTION

Whereas the Roane County Commission recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Roane County Commission has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Roane County Commission hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Commission's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Oct. 11, 2016

Chief Elected Official

Attest: _____

Town of Reedy

118 Main Street Reedy, WV 25270

RESOLUTION

Whereas the Town of Reedy recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Reedy has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Reedy hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council on this the 17th day of November 2016. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Chief Elected Official

Attest: Richard Bailey

City of Spencer

116 COURT STREET
SPENCER, WEST VIRGINIA 25276

TELEPHONE 304-927-1640

Terry A. Williams, Mayor

RESOLUTION

Whereas the City of Spencer recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the City of Spencer has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the City of Spencer hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Chief Elected Official

Attest: _____

Tyler County Commission

P.O. BOX 66

MIDDLEBOURNE, WEST VIRGINIA 26149

CHARLES A. SMITH
COMMISSIONER

JOHN F. STENDER
COMMISSIONER

ERIC H. VINCENT
COMMISSIONER

TERESEA R. HAMILTON
COUNTY CLERK

TELEPHONE
(304) 758-2102

FACSIMILE
(304) 758-2126

RESOLUTION

Whereas the Tyler County Commission recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Tyler Commission has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Tyler County Commission hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council this 12th Day of October 2016. This document will serve as the Commission's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

_____

Chief Elected Official

Attest: Teresea R. Hamilton

TOWN OF FRIENDLY
P.O. Box 95
Friendly, WV 26146

RESOLUTION

Whereas the Town of Friendly recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Friendly has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Friendly hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council on this 14th day of November 2016. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Mayor Bonnie Hostuttler
Chief Elected Official

Attest: Susan Stoneking

RESOLUTION

Whereas the Town of Middlebourne recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Middlebourne has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Middlebourne hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council on this the 14th day of November, 2016. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Chief Elected Official

Attest: Susan Pelkey

RESOLUTION

Whereas the City of Paden City recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the City of Paden City has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the City of Paden City hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Chief Elected Official

Attest: Tamra Billitu

RESOLUTION

Whereas the City of Sistersville recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the City of Sistersville has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the City of Sistersville hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Mayor

Chief Elected Official

Attest: _____

RESOLUTION

Whereas the Wirt County Commission recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Wirt County Commission has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Wirt County Commission hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Commission's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Robert E Lowe Jr

Chief Elected Official

Attest: Kellen Calaugh

Town of Elizabeth

P.O. Box 478 Elizabeth, WV 26143
ph. (304) 275-3200 fax (304) 275-3038

RESOLUTION

Whereas the Town of Elizabeth recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Elizabeth has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Elizabeth hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Penny McVey

Chief Elected Official

Attest: Brenda Evans

Office of the County Commission of Wood County, West Virginia

Commissioners
Stephen Gainer
David Blair Couch
Robert K. Tebay

No. 1 Court Square
Suite 203
Parkersburg, WV 26101
Phone 304-424-1984

RESOLUTION

Whereas the Wood County Commission recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Wood County Commission has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Wood County Commission hereby adopts the Regional Hazard Mitigation Plan as it has been prepared by the Mid-Ohio Valley Regional Council on this the 3rd day of November 2016. This document will serve as the Commission's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Stephen Gainer
Commission President

Attest: Marty Seufer

Mark Rhodes
WOOD County 08:40:08 AM
Instrument No 0725417
Date Recorded 10/31/2016
Document Type COO
Pages Recorded 2
Book-Page 72-262

OCTOBER 31, 2016

IN THE COUNTY COMMISSION OF WOOD COUNTY, WEST VIRGINIA

IN RE: THE COUNTY COMMISSION DID HEREBY EXECUTE A RESOLUTION ADOPTING THE REGIONAL HAZARD MITIGATION PLAN.

ORDER

On this date, upon a motion made by David Blair Couch, seconded by Robert K. Tebay and made unanimous by Stephen Gainer, did hereby EXECUTE a Resolution adopting the Regional Hazard Mitigation Plan as prepared by the Mid-Ohio Valley Regional Council.

A copy of said Resolution is attached to this Order and should be made a part thereof.

APPROVED:

THE COUNTY COMMISSION OF WOOD COUNTY

Stephen Gainer, President

David Blair Couch, Commissioner

Robert K. Tebay, Commissioner

A/1687

Town of North Hills, West Virginia

RESOLUTION

Whereas the Town of North Hills recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the Town of Hills has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the Town of Hills hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council this 27th day of October 2016. This document will serve as the Town's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Chief Elected Official

Attest: Kathleen McBroom, Recorder

RESOLUTION

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

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

WHEREAS, 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

WHEREAS, 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

WHEREAS, the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

WHEREAS, the City of Parkersburg has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

WHEREAS, the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, Therefore Be It Resolved by the Council of the City of Parkersburg that the City of Parkersburg hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Sponsored by Councilmen:

A copy of the plan can be found on the Mid-Ohio Valley Regional Council's webpage (www.movrc.org). A downloadable PDF file is located on the bottom right hand side of the home page.

8974

Res authorizing the City to adopt the Regional Hazard Mitigation Plan presented by the MOVRC which will serve as the City's plan for Hazard Mitigation issues.

Adopted November 15, 2016

Mayor Jimmy Colombo

R-30-16

City of Vienna

RESOLUTION

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

WHEREAS, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

WHEREAS, 44 CFR §201.6 (c) (1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

WHEREAS, 44 CFR §201.6 (a) (4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

WHEREAS, the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained in Region 5 of West Virginia; and

WHEREAS, the City of Vienna has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

WHEREAS, the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

NOW, THEREFORE, BE IT RESOLVED, the City of Vienna hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Dated this 13th day of October, 2016.

Randall C. Rapp

RANDALL C. RAPP, MAYOR

ATTEST:

Cathy Smith

CATHY SMITH, RECORDER

RESOLUTION

Whereas the City of Williamstown recognizes the threat that natural hazards pose to people and property; and

Whereas, undertaking hazard mitigation actions will reduce the potential for harm to people and property caused by future disasters or severe weather; and

Whereas; 44 CFR §201.6(c)(1) requires local governments to have a mitigation plan approved in order to receive Hazard Mitigation Grant Program project grants; and

Whereas; 44 CFR §201.6(a)(4) establishes that multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process and has officially adopted the plan; and

Whereas; the Mid-Ohio Valley Regional Council has completed a multi-jurisdictional plan to serve the jurisdictions contained within Region 5 of West Virginia; and

Whereas; the City of Williamstown has participated in this planning process and is among the jurisdictions served by the Mid-Ohio Valley Regional Council; and

Whereas; the Federal Emergency Management Agency has deemed the multi-jurisdictional Hazard Mitigation Plan submitted by the Mid-Ohio Valley Regional Council approvable in its current form;

Now, therefore, be it resolved, the City of Williamstown hereby adopts the Regional Hazard Mitigation Plan as it has been presented by the Mid-Ohio Valley Regional Council. This document will serve as the City's plan for Hazard Mitigation issues until the plan is updated again in the year 2021.

Chief Elected Official

Attest: Susan Knopp, City Clerk

October 18, 2016

1.6 Overview of Regional Hazard Mitigation Plan

This regional HMP has been broken into five Chapters and includes 12 appendices in order to fulfil the requirements of the plan and present it in the most efficient way. Each chapter begins with an explanation of the appropriate requirements from DMA 2000 to provide reference and context to the issues discussed within the chapter. A brief introduction to the section is followed by relevant information, charts, tables, and maps, which fulfill regulatory requirements. The main chapters of the plan follow primary requirements of the federal hazard mitigation planning law.

Chapter 1: Introduction

Chapter 1 reviews the region's authority to implement a regional HMP, describes the overall purpose and approach to the development of this plan, provides insight on the development and history of regional HMPs, and presents the official resolutions of adoption from all of the region's local governments.

Chapter 2: Planning Process

Chapter 2 describes the activities and approach the MOVRC took in creating this regional HMP. It describes the steps taken in planning, planning events, participants in the planning process, methods of gaining public involvement, floodplain management in the region, and structures identified as Repetitive Loss and Severe Repetitive Loss.

Chapter 3: Hazard Identification and Risk Assessment

Chapter 3 provides a substantive analysis of the hazards facing the Mid-Ohio Valley. It provides a historical and scientific evaluation of previous disaster occurrences in the region in order to inform the development of the mitigation strategies and ensure that decisions are made based on actual conditions. The risks addressed in this plan are as follows: Flooding, High Wind, Winter Weather, Hail, Extreme Col/Wind Chill, Lightning, Wildfire, Tornado, Heavy Rain, Landslides, Excessive Heat, Drought, Dam failure, Earthquakes, Hurricanes, and Natural Resource Extraction. The plan also discusses natural hazards that have been designated as Eliminated Risks and explains the reasons behind their elimination.

Chapter 4: Hazard Mitigation Strategy

Chapter 4 lays out the specific goals and actions that were developed in order to mitigate the effects of the hazards that were profiled in Chapter 3. This chapter includes a description of the process followed to develop the mitigation strategy, how the goals were prioritized, and of course the identified mitigation actions and the goal served by each of the actions.

Chapter 5: Plan Maintenance, Implementation, and Adoption

Chapter 5 outlines implementation of the plan and development of the next plan update. Processes used to maintain and update data and information contained in the hazard identification and vulnerability assessment databases are described. Plan adoption and revision are also described and augmented with a timeline. This chapter has been expanded to detail an annual progress review.

Appendices

Appendices are located immediately following the plan. These provide additional details and data utilized in the formation of this plan such as the minutes from public meetings, the risk assessment performed in Chapter 3, a list of Critical facilities located in the region, and other critical documentation of the planning process.

CHAPTER 2: PLANNING PROCESS

DISASTER MITIGATION ACT OF 2000

44 Code of Federal Regulations

§201.6(b): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

§201.6(c): Plan Content. The plan shall include the following:

(1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

2.1 Introduction

This chapter details the planning process for the 2016 Regional Hazard Mitigation Plan Update. The process spanned approximately 20 months prior to plan adoption. It included meetings between representatives of various Federal, State, and local agencies and involved the review of existing programs, plans, policies, GIS mapping resources, statutes, and historical hazard data. MOVRC convened a planning team to review information in the early stages of plan development and remained in communication throughout the planning process.

To facilitate broad collaboration from individuals with knowledge of hazards and emergency programs; the update process was coordinated in contact with County Offices of Emergency Management, Local Emergency Planning Commissions (LEPC), and their regular array of community partners and resources. Participation was sought from each municipality and county commission in the region. Contact was also aimed at the general public and persons in local leadership and business roles who may not think about emergency planning on a regular basis.

The Regional Hazard Mitigation Plan public meeting schedule was focused on completing one meeting for each county in the Mid-Ohio Valley Region during the

months of February and March 2016. Because meetings were coordinated with regular monthly or quarterly meetings of LEPC's, the meeting times, dates, and locations were influenced by existing arrangements in some cases. Wirt and Wood Counties have a joint LEPC meeting held in Wood County, so an additional Hazard Mitigation plan was set for Wirt County and hosted by the Wirt County Commission.

County	Date	Time	Location
Pleasants	January 28th	6 PM	Christian Outreach Center
Wood	February 10th	Noon	Parkersburg City Hall – Exec. Conf. Room
Calhoun	February 16th	5 PM	Arnoldsburg Community Center
Roane	February 17th	Noon	Roane VFD building
Ritchie	February 23rd	7 PM	911 Building, Pennsboro
Wirt	March 1st	10 AM	Wirt County Commission Room
Tyler	March 3rd	10 AM	Tyler Senior/OES building (9AM Breakfast)
Jackson	March 21st	6 PM	Ripley Fire Department

Table 2.1 LEPC/Public meetings for Hazard Mitigation Plan 2016

Meetings were publicized in the local newspaper of record for each county. There was also a feature in the Parkersburg News and Sentinel which publicized all of the meeting dates for the region and highlighted the importance of the public meeting process. Attendance varied from county to county, with a high of 35-40 persons in Tyler County, but an average of 15-20 LEPC members at most meetings. Appendix B contains the sign in sheet, meeting agenda, meeting notes, and publication for each of the public meetings held.

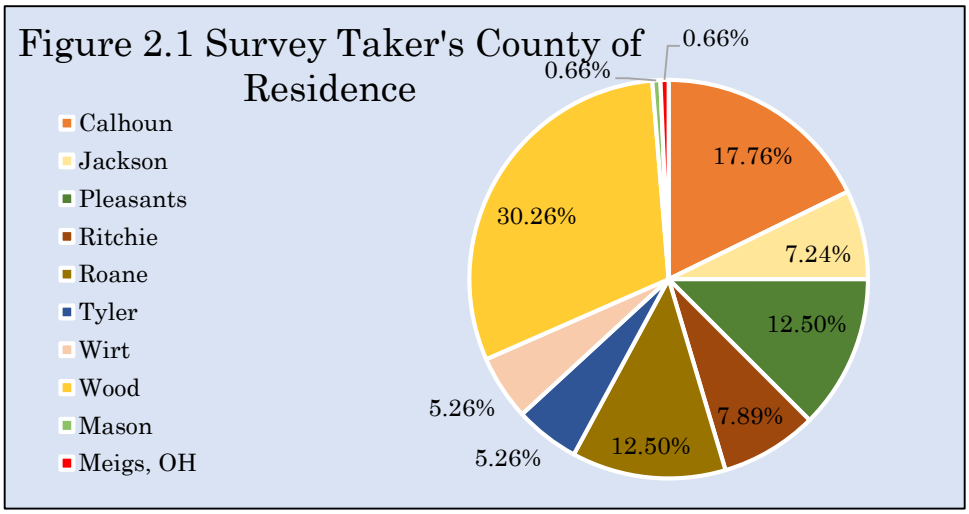
With a goal of reaching a larger segment of the public who may not be able to attend public meetings, obtaining some quantifiable information, and facilitating ease of input, MOVRC developed a Regional Hazard Mitigation Survey at surveymonkey.com. The survey was publicized in the newspaper notices which advertised the public meetings, and also shared on the MOVRC website, with the MOVRC board, and handed out in hardcopy at the public meetings. The news releases sent to a publication in each county to advertise the public planning meetings included the following language to advertise the online citizen survey:

> "*Please consider taking the survey even if you cannot attend the public information meeting. This survey can be found at https://www.surveymonkey.com/r/MOVRC-RiskReduction2016. Help us get feedback by sharing this survey with friends, co-workers, neighbors and family.*"

The survey, which is included in Appendix F, has 15 multiple choice and short answer questions. Responses were used to determine the level of concern about and preparedness for common weather hazards in the Mid-Ohio Valley region. Because respondents identified their county of residence, the survey revealed differences and trends among the eight counties in the plan. As the data gained from the online citizen

survey was quantifiable and county specific, the data was used in part to complete a portion of the risk assessment analysis in Chapter 3. From January 2016 to March 2016 when the survey was primarily marketed, there were 152 responses. A summary of survey results can be found in Appendix G.

Everyone, regardless of their county of residence, wishing to do so was invited to take the online citizen survey. Though a small percentage, this resulted in some survey responses from citizens outside of the region. The online survey provided citizen of the Mid-Ohio Valley Region as well as citizen from neighboring communities an additional opportunity to participate in the hazard mitigation planning process. Figure 2.1 below provides a summary of the percentage of survey takers by county.



After the 1st draft of this HMP was submitted to the State for initial review and posted to the MOVRC webpage, all survey takers that indicated they would like to receive updates regarding the plan were notified via email that the plan was available to them online for their review. The email contained a direct link to the plan, and explained that they would also be notified, unless they indicated otherwise, when the final document would be available for their review. The MOVRC did not receive a response from any of those survey takers that were notified. The MOVRC will proceed with the second notification as planned.

2.2 Floodplain Management in the Mid-Ohio Valley

Provisions for development within the regulated floodplain have typically been addressed by stand-alone ordinances adopted for voluntary participation in the NFIP, established in 1968. Revised floodplain ordinance provisions were recently incorporated into comprehensive zoning ordinances when localities adopted, revised,

or re-codified zoning ordinances.

The West Virginia Legislature enacted the West Virginia Flood Damage Reduction Act of 1989 to comply with the NFIP. This legislation was motivated by the damages incurred by several floods and storm events between 1969 and 1985. In 1987, to improve West Virginia's flood protection programs and consolidate similar programs in one agency, coordination of all State floodplain programs was transferred from the Water Control Board to the DHSEM.

According to FEMA's NFIP Community Status Book, as of May, 2016 278 of WV's 283 communities participate in the NFIP. This means that they have voluntarily adopted and are enforcing local floodplain management ordinances. There are only 5 communities that do not participate; the Town of North Hills, located in Wood County, is the only county in our region that has not adopted and is not enforcing local floodplain ordnances.

At most of the county planning meetings it was revealed that there are issues and public dissatisfaction with the accuracy of current FEMA flood maps. Some homes are in flood zones and are not included in the flood zones defined by flood maps. Others are not physically in the flood zones but are included in the flood map requiring the homeowner to purchase Flood Insurance. This is a financial issue for the homeowners even when they are not needlessly paying for flood insurance, because the procedure to gain a Letter of Map Amendments (LOMA) requires the hiring of a surveyor at what amounts to a big investment for the average homeowner in the region.

Tyler County OES director Tom Cooper was awarded a $35,000 hazard mitigation grant to address the need for LOMA's in the county. This helped defray the cost of the surveyor in part by adding some scale to the contract. It was suggested during the multiple public meetings that the MOVRC explore the prospect of developing a program where multiple surveyors could volunteer to enter a pool where they would be called upon for LOMA work throughout the region. They would be compensated for their work at a negotiated lower price, incentivized by the increase potential for work.

2.2.1 National Flood Insurance Program Survey

As a part of this planning process, the MOVRC distributed a National Flood Insurance Program Survey to all of the region's 30 jurisdictions in order to gain a deeper understand of floodplain management in the Mid-Ohio Valley. Of the 30 jurisdictions, we received completed surveys from 10 which resulted in a 33.34% response rate. Table 2.2 below displays the questions asked on the survey issued to the jurisdictions and the percentage of yes responses for each questions.

NFIP Survey Questions	Response Yes
1. Floodplain Identification and Mapping	
a. Does the municipality Maintain accessible copies of an effective Flood Insurance Rate Map (FIRM)/Digital Flood Insurance Rate Map (DFIRM)? Does the municipality maintain accessible copies of the most recent Flood Insurance Study (FIS)?	90%
b. Has the municipality adopted the most current DRIRM/FIRM and FIS?	90%
c. Does the municipality support request for map updates?	50%
d. Does the municipality share with FEMA any new technical or scientific data that could result in map revisions within 6 months of creation or identification of new data?	70%
e. Dose the municipality provide assistance with local floodplain determinations?	90%
f. Does the municipality maintain a record of approved Letters of Map Change?	100%
2. Floodplain Management	
a. Has the municipality adopted a compliant floodplain management ordinance that, at a minimum, regulates the following:	100%
(1) Does the municipality issue permits for all proposed development in the Special Flood Hazard Areas (SFHAs)?	100%
(2) Does the municipality obtain, review, and utilize any Base Flood Elevation (BFE) and Floodway data, and/or require BFE data for subdivision proposals and other development proposals larger than 50 of 5 acres?	40%
(3) Dose the municipality identify measures to keep all new and substantially improved construction reasonably safe from flooding to or above the BFE, including anchoring, using flood-resistant materials, and designing or locating utilities, and service facilities to prevent water damage?	100%
(4) Dose the municipality document and maintain records of elevation data that document lowest floor elevation for new or substantially improved structures?	100%
b. If a compliant floodplain ordinance was adopted, does the municipality enforce the ordinance by monitoring compliance and taking remedial action to correct violations?	90%
c. Has the municipality considered adopting activities that extend beyond the minimum requirements?	40%
3. Flood Insurance	
a. Does the municipality educate community members about the availability and value of flood insurance?	60%
b. Does the municipality inform community property owners about changes to the DFIRM/FIRM that would impact their insurance rates?	40%
c. Does the municipality provide general assistance to community members regarding insurance issues?	60%

Table 2.2 NFIP Survey questions and Response

Table 2.2 above provides a snap shot of how floodplain management is occurring in the Mid-Ohio Valley Region. For example, it indicates that all municipalities taking the survey have adopted a floodplain management ordinance. It is important to keep in mind that many municipalities in the region have very limited or no full time staff members working in their town offices daily. For this reason, it is not out of the ordinary that only 40% of survey takers indicated that the municipality considered adopting activities that extend beyond the minimum requirements. Additionally, table 2.3 below displays the percentage of survey responses (Yes, No, or Unanswered) for the total survey, and then for each individual section. The percentage of yes responses compared to no response to questions in the flood insurance section indicate that municipalities are less involved in flood insurance education and technical issues as a whole than floodplain identification and mapping or floodplain management issues.

Total Survey	
• Answered	97.50%
• Unanswered	2.50%
Floodplain Identification and Mapping Section	
• Response Yes	81.67%
• Response No	15%
• Unanswered	3.34%
Floodplain Management Section	
• Response Yes	81.43%
• Response No	17.4%
• Unanswered	1.43%
Flood Insurance Section	
• Response Yes	53.34%
• Response No	46.6%
• Unanswered	0%

Table 2.3 Survey Response Summary

This analysis does not discuss any information specific to an individual jurisdiction; when the municipalities and counties were contacted and asked to complete the survey they were assured that information gained from the surveys would not be disseminated on an individual level. However, the survey form does request that the jurisdiction completing the form identify themselves. This was used to aid in documenting each jurisdiction's participation in the planning process in appendix B which indicates which jurisdictions completed the NFIP survey but does not include any specific information contained with the survey. For this reason, the copies of the completed surveys have not been included in this plan. However, appendix B does contain a copy of a blank NFIP survey used to complete this plan.

2.2.2 Repetitive Loss and Sever Repetitive Loss Structures

Prior to modern planning efforts, structures private and commercial alike were

constructed in floodplains. This has resulted in the repetitive flooding of some structures located in the floodplain and the NFIP has instituted grant programs to aid in flood mitigation measures. Properties that experience multiple damages from flooding can be classified as Repetitive Loss (RL) structures and Severe Repetitive Loss (SRL) structures.

In order to meet the requirements for RL the property must have incurred flood-related damage on 2 occasions, in which the cost of the repair, on the average, equaled or exceeded 25% of the market value of the structure at the time of each such flood event. Table 2.4 below displays summary information regarding repetitive loss structures located in the Mid-Ohio Valley.

County (Total)	Community	Number RL	Mitigated?	Number RL Insured	Property Type
Calhoun		1	0	0	Private
	Grantsville	1	0	0	Private
Jackson		5	0	1	
	Unincorporated Territory	5	0	1	Private
Pleasants		0	0	0	
Ritchie		0	0	0	
Roane		2	0	1 SDF	
	Reedy	1	0	0	Private
	Unincorporated Territory	1	0	1 SDF	Private
Tyler		0	0	0	
Wirt		0	0	0	
Wood		21	0	6 Insured, 3 SDF	
	Parkersburg	4	0	3 Insured	Private
	Vienna	2	0	2 Insured	1 Private, 1 Commercial
	Williamstown	2	0	1 SDF	1 Private, 1 Commercial
	Unincorporated Territory	13	0	1 Insured, 2 SDF	

Table 2.4 Repetitive Loss (RL) Structures in the MOV

A property qualifies as SRL when it has met the following criteria: at least 2 separate NFIP claim payments have been made with the cumulative amount of such claims exceeding the market value of the insured structure. Table 2.5 displays summary information for the SRL properties in the Mid-Ohio Valley as provided by the WV

DHSEM.

County (Total)	Community	Number SRL	Mitigated?	Number SRL Insured	Property Type
Calhoun		3	0	0	
	Grantsville	3	0	0	Private
Jackson		3	0	0	
	Ravenswood	1	0	0	Private
	Unincorporated Territory	2	0	0	Private
Pleasants		1	0	0	
	Unincorporated Territory	1	0	0	Private
Ritchie		0	0	0	
Roane		2	0	1 SDF	
	Town of Reedy	1	0	0	Private
	Unincorporated Territory	1	0	1 SDF	Private
Tyler		0	0	0	
Wirt		0	0	0	
Wood		28	0	7 SDF	
	Parkersburg	4	0	2 SDF	Private
	Williamstown	2	0	1 SDF	1 Private, 1 Commercial
	Unincorporated Territory	22	0	4 SDF	21 Private, 1 Commercial

Table 2.5 Severe Repetitive Loss Structures in the MOV Region

2.3 Mitigation Success

A key discussion point in preparing for the 2016 Regional Hazard Mitigation Plan, was an analysis of the priorities and strategies developed in the 2011 plan. The planning team decided planners and members of the public would benefit from a refresher on what priorities came from the previous planning process. Also a review of the previous plan would help to facilitate discussion. The agenda handouts for each public meeting (found in Appendix B), which were primarily held with Local Emergency Planning Commission members, show that the following were the 2011 plan priorities listed for discussion:

- Database of Vulnerable Population
- Flood Mitigation
- Emergency Alert – Public notifications

- Floodplain Ordinance/Building Codes
- Improve Shelter Plans/Equip with generators
- Stream Dredging and Clean-up
- Severe Winds Impact
- Topo/Floodplain map improvements

Minutes of the public meetings show that these subjects were discussed more heavily in some counties than in others, and that some revealed successes while others revealed no real change or improvement. Minutes from each public meeting can be found in Appendix B. The sections below will discuss some of the successes that were noted. Appendix C contains all of the mitigation actions identified in the 2011 Hazard Mitigation plan. Additionally, appendix C provides an update on the status of each of the mitigation actions.

Implementation of Notification Strategies

Discussion and assessment during the 2011 regional plan update determined that many Offices of Emergency Management were not utilizing the best available methods of disseminating public information in cases of emergency or for advance preparation for weather hazards. Therefore, the plan recommended that each county explore and expand their notification strategies. Some of the identified needs focused specifically on vulnerable populations, defined in part as the elderly, those with chronic medical conditions, low mobility, or those otherwise subject to greater impact from natural hazards.

Several counties made progress in implementing new notification strategies; Pleasants County has had the most success in implementing a strategy to reach vulnerable populations. Community Emergency Response Team (CERT) members and other volunteers have been developing and operating a program they call Senior Watch for nearly two years. Due to privacy, participants must volunteer their contact information and when a hazardous weather event is expected, the team makes contact generally by phone. Those types of warning calls can help with preparation, but the contact list is also used during emergencies to determine well-being. When there is no response, or if requested by family, then emergency personnel or team members can do in-person home visits to determine if the individual is in need of assistance or transport.

Pleasants County also is working to upgrade their 911 system to include the capability of Reverse 911 calls. The County already is able to partner with neighboring Wood and Washington (Ohio) Counties to use Everbridge, a mass notification application that can reach landline, cell, text, email and more. The Pleasants County Office of Emergency Services does not currently use Facebook or Twitter but are considering it according to comments at the public meeting. They

have seen those tools used successfully and broadly by the local police.

Calhoun County uses reverse 911; for example, in 2016 the County used it to warn residents to prepare for impending storm "Jonas" and to please restrict their travel to include only necessary trips. Calhoun OES posts emergency tips on Facebook and because they have so many followers, this is a very effective way to spread information. The school board calls the homes of students with emergency messages which is another way of notification. However, the 911 Center also manages CODE RED which can reach text, cell, and email.

Jackson County OES has made previous attempts to list vulnerable populations, but has experienced roadblocks due to privacy concerns from healthcare and community service partners. Instead, they feel that emergency personnel and volunteers are aware of the location of much of the vulnerable populations and know where accessibility challenges might necessitate a planned response during an emergency. Currently, Jackson County is serviced by a couple of emergency communication methods; Integrated Public Alert & Warning System from FEMA which notifies cell phones by geography and the WARN system that notifies landlines and cell phones.

Ritchie County, like Jackson County, had attempted to compile data on its vulnerable population through health providers and were blocked due to privacy concerns. Emergency personnel in Ritchie also feel that their familiarity with individuals and households gives them knowledge of the extent and location of vulnerable populations that might require special or urgent response in case of certain emergencies. The Ritchie OES is working toward implementing the WARN system or reverse 911 in the county. They previously had such a system, but the provider ended service. Roughly half of Ritchie County lacks any reliable cell service, so text alert options are not ideal. Ritchie OES does utilize Facebook, and has a very active following which helps to disseminate information.

Roane County emergency personnel at the public meeting feel that they are aware of many persons who would be included in the vulnerable population. OES is not currently pursuing any changes or upgrades in public notification systems. They have seen recent indications that Facebook is just as successful in reaching residents as Reverse 911 which they also currently utilize.

Tyler County uses a mix of notification tools that do not offer consistent communication to all citizens in the county. The primary means of disseminating emergency information, as reverse 911 is not available, is through School Messenger. The Tyler County Board of Education or superintendent must pre-load a call list so that messages can be sent to phone numbers beyond those of parents or families of students. The caller ID still says Tyler County Schools, which leads some without

school age students to assume the call is not actually directed toward them. The superintendent volunteered to look into changing the caller ID if the system is being used for emergency notifications to the general public.

Wirt County is exploring Nixle, a product of Everbridge, to upgrade their community emergency communications. Wirt County is not included in adjacent Wood County's reverse 911 capabilities and also has different TV channels, so the proximity doesn't result in better communication. IPAWS from FEMA is another option Wirt County is looking into which will require some additional funding. There is no organized response or communication plan related to vulnerable populations, instead the public felt that in Wirt County its neighbors helping neighbors and Emergency Personnel has informal knowledge of where special needs exist.

Wood County has a variety of options for public notifications and emergency communication. Wood County has reverse 911, uses Everbridge, has coordination with the Digital Amateur Radio Emergency Network (DAREN), and Wood County Emergency Communications (WCEC). There is not a designated call list for emergency response for vulnerable populations, but the "RU OK" program will allow for home welfare checks and could be used more specifically for some contact in case of an emergency.

As a result of the regional plan update, some of the county emergency planning leaders have initiated attempts to improve or expand emergency public communication systems and put some particular emphasis on reaching vulnerable populations.

2.3.1 Mitigated Structures

The State of West Virginia has traditionally funded the entire 25% match required for pre- and post-disaster FEMA mitigation grant projects. Typically, in other states, the local community is required to contribute between five and ten percent of the State's share. However, this is difficult if not impossible for most of West Virginia's communities, including most local governments in the Mid-Ohio Valley Region. By picking up the local share of the match, the state has demonstrated its commitment to its citizens.

The WV DHSEM administers DHS/FEMA flood mitigation grants, and MOVRC has applied for and administered three funding cycles since 2011. Funding has been used to mitigate flooding through acquiring and converting properties into open space. Most projects involved acquiring and demolishing flood prone residences.

Wood County's Happy Valley area has been targeted as a repeat flooding concern for

many years and has been funded since 2006 for five rounds of demolition/clearance of fifteen properties effected by the Little Kanawha River. Happy Valley was discussed extensively in the 2011 Regional Hazard Mitigation Plan and is the only area in the region to have an area-wide mitigation plan. MOVRC is currently applying for a sixth round of funding to address an additional five flood prone properties on Point Drive and Nicolette Road in the Happy Valley area just outside of Parkersburg.

Round	Funding Year	$ Amount	Number of Properties Mitigated
III	2011	975,000	5
IV	2012	324,000	3
V	2014	521,000	2
VI (pending)	2016	750,000	5

Table 2.6 Wood County Commission Happy Valley FEMA Flood Migration Since 2011

Each County's mitigation planning meeting involved discussion of proposed flood mitigation projects. Most county's attendees did not feel there was a particular area that suffered from repeat flood damage. In fact, while there are some problem areas to be addressed as pointed out by floodplain managers, there have not been many flood mitigation successes to point out since 2011. Calhoun County, which received MOVRC managed HUD Disaster Recovery Grant flood mitigation for 2 properties in downtown Grantsville, felt some of the properties which rejected offers in that project were still a concern. Twelve or more properties were originally targeted in that 2007 project.

The floodplain manager for Calhoun County mentioned that the Altizer and Stinson communities could be a target for flood mitigation along the Upper West Fork. This, along with a FEMA mitigation grant application for the City of Spencer, are among projects on current action item lists that are hoped to become success stories listed in the next round of planning as we transition from one plan to the next.

2.4 Overview of the 2016 Planning Process

The planning process for the 2016 Mid-Ohio Valley Regional Hazard Mitigation Plan update was initiated by the May 2014 approval of a FEMA Hazard Mitigation Grant through WV DHSEM for MOVRC to act as the author of the multi-jurisdictional Local Hazard Mitigation Plan update. Below is a summary of the planning process carried out by MOVRC.

1. Review of Recommendations for Improvement issued by FEMA after 2011 HMP
2. Kick-off Meeting with region's OES Directors
3. Review of 2011 Regional Plan and 2013 State HMP
4. Begin Data Collection
5. Public Survey Design

6. Public Outreach through press release and Local TV feature
7. Posting of Public Survey online
8. Public Meeting with LEPC in each county
9. Hazard Identification and Assessment
10. Data Analysis
11. Identifying Mitigation Actions
12. Draft Final Plan
13. Draft Plan submitted for review
14. Final Draft Review Meeting
15. Final Plan Submittal and Review
16. Plan Adoption by Local Jurisdictions
17. Plan Distribution and Grant Closeout

After receiving the approval of FEMA to act as the author of the multi-jurisdictional Local Hazard Mitigation Plan, the MOVRC reviewed the Recommendations for Improvement FEMA issued in response the 2011 Mid-Ohio Valley Regional Hazard Mitigation Plan. Specific attention was given to each listed recommendation to ensure this updated plan would be the best document possible. Each enumerated recommendation was evaluated and considered in the creation of this document. A list of the recommendations and the specific pages of the plan addressing each recommendation can be found in Appendix I of this document. If for some reason the recommendation was addressed in a different way than specified, Appendix I contains an explanation and documentation as to why.

2.5 Planning Team

Funding assistance for the preparation and printing of this plan was provided by FEMA through an HMA grant and has been prepared in accordance with appropriate regulations and guidance provided by FEMA. It was completed by MOVRC staff with input from community leaders. The plan was reviewed by the hazard mitigation staff of the West Virginia DHSEM, and additional technical assistance and plan review was provided by FEMA Region III staff.

Critical to the development of the plan was the participation and contributions of more than six dozen representatives of State and Federal agencies, local governments, OES directors, nonprofit organizations and local emergency planning committees in each of the eight counties covered under this plan. These participants will also primarily continue to serve on ongoing hazard mitigation subcommittees that will guide and direct implementation of this plan. In addition, their support will determine continued data and information required for future plans. Below, Table 2.7 provides a list of organizations that contributed valuable input to the plan.

Organization/Affiliation	Organization/Affiliation
Tyler Office of Emergency Management	Ohio Valley University
Tyler County Search and Rescue	Wood County Commission
Town of Middlebourne	Mid-Ohio Valley Regional Airport
Wetzel/Tyler Health Department	Parkersburg Utility Board
Tyler Search and Rescue	Burgess and Niple, Inc. Engineering
Blue Mountain, Inc.	Mid-Ohio Valley Health Department
Real Alloy	Pleasants County CERT
Tyler County Board of Education	Pleasants County Commission
Shirley VFD	First Energy – Pleasants Power Station
Tyler County Public Service District	Pleasants County Office of Emergency
Williams Inc.	St. Marys VFD
Tyler County Schools	Pleasants County Sheriff's Department
Middlebourne VFD	Pleasants County Board of Education
Momentive Inc.	Pleasants County 911/Floodplain Manager
Tyler County LEPC	Pleasants County LEPC
Tyler County Commission	Calhoun County Office of Emergency
Blue Racer Midstream	Calhoun County Floodplain Manager
Tyler County CERT	Region V Threat Preparedness
Doddridge County Office of Emergency	Calhoun County LEPC
Doddridge County Ambulance Authority	Ritchie County Commission
DHSEM Region II Liaison	Ritchie County Office of Emergency
Tyler County Sheriff's Department	Ritchie County LEPC
Statoil	Minnie Hamilton Health Services
Eureka Midstream	West Virginia State Police
City of Sistersville	Ritchie County Development Authority
Proviron Inc.	Ritchie County Sheriff's Department
Wirt County Commission	Ritchie County Ambulance
Wirt County Clerk	Ritchie County Board of Education
Wirt County OES, ex officio	Doddridge/Ritchie 911
Wood County 911	American Red Cross
Vienna Police Department	Armacell LLC
DHSEM Region I Liaison	Roane County Schools
Wood County Office of Emergency	Roane County Emergency Squad
City of Williamstown	Roane County LEPC
City of Vienna	Roane County 911
United Methodist Men's Group	Roane County Office of Emergency Services
DuPont	Little Kanawha CD
Wood/Wirt LEPC	USEPA START, SEE, Techlaw, Inc.
Wood County Emergency Communications	WV Department of Highways District 3
Jackson County Office of Emergency	Jackson General Hospital
Jackson County 911	Ripley Fire Department
Jackson County Commission	Ravenswood Fire Department
Northern Jackson County Public Service	Southern Jackson County VFD
City of Ripley	Jackson County CERT
Jackson County ARC	Haz-Tech Environmental

Table 2.7 Organizations Represented at Public Hazard Mitigation Planning Meetings

Plan Coordination

The 2016 update of the Mid-Ohio Valley Regional Hazard Mitigation Plan was developed through the collaboration of numerous representatives from a wide variety of Local, State and Federal agencies. Table 2.8 includes a list of those primarily responsible for collecting input and data, plan writing, assessment, review, and planning coordination. This list, however, does not reflect all personnel or agencies that participated in the planning process.

Organization	Name
Mid-Ohio Valley Regional Council	Carol Jackson, Executive Director
Mid-Ohio Valley Regional Council	Fred Rader, Community Development
Mid-Ohio Valley Regional Council	Meganne Robinson, Project Coordinator
Mid-Ohio Valley Regional Council	Luke Peters, Project Coordinator
Mid-Ohio Valley Regional Council	Tim Meeks, Project Coordinator
Mid-Ohio Valley Regional Council	Vince Post, GIS / Mapping

Table 2.8 List of Organizations and Personnel Who Coordinated the 2016 Update

The importance of mitigation planning is the process itself. It involves the collaboration of groups, individuals, perceptions, perspectives and priorities. Including these planning process results in meaningful mitigation strategies effectively reduces the impact of hazards.

2.5.1 Stakeholder Involvements

The purpose of mitigation planning is to protect people and their property from harm and public involvement in the planning process is vital to the success of a mitigation plan. Inclusion of representatives from local government, businesses and nonprofit organizations, and the general public is an important part of the process. Their input provides realistic perspectives of how people are impacted by various hazards, as well as how mitigation actions impact them. Furthermore, outreach to stakeholders ideally engenders both confidence in the ability of the government to make meaningful decisions, as well as consideration of the risks facing each person and community. Holistic participation is necessary for the plan to develop the ongoing mitigation movement across the State.

Other State, regional, local, business, non-profit, and other interested stakeholders were encouraged to participate in the planning process through a series of regional outreach meetings. The meetings outlined the objectives of the mitigation plan, current analysis results, and draft mitigation strategies. Stakeholders provided comments relevant to their individual communities that were then integrated into the plan where appropriate.

The online survey developed by MOVRC and used to collect both qualitative and quantifiable information about weather hazards in the Mid-Ohio Valley region served as an added means of stakeholder involvement for this update. The survey was hosted on SurveyMonkey.com and through posting the web link in local newspapers when the public meetings were promoted, placing a link on the MOVRC homepage, and sharing the link at the public meetings, the survey garnered 152 responses. The geographical distribution of respondents was fairly even across the region, and identified some respondents who work in the region but live in border counties. Results of the survey were used primarily in the Risk Assessment portion of the plan.

2.5.2 Municipal Contacts

With many of the 22 municipalities in our region being very small, with limited government resources and functionality, most of them rely primarily on county and state provided services. For the 2016 update, telephone interviews and email correspondence was conducted with municipal officials contributing information and data to the process to supplement data gathered during county public meetings. Each municipality was given a draft of the plan to review and become familiar prior to plan adoption. Appendix B contains a table that explains exactly the ways in which each jurisdiction participated in the planning process.

2.6 Summary of Workgroup Meetings

MOVRC began the Regional Mitigation Planning process realizing that the eight Offices of Emergency Management/Services would be critical in providing feedback, information, and also encouraging citizen involvement. They remained active throughout the planning process by providing data and expertise and also by bringing key stakeholders together with the Local Emergency Planning Committees. The broad geographic and technical expertise represented by participants allowed MOVRC to develop a representative and collaborative mitigation plan. OES Directors provided critical facility data, helped develop mitigation strategies, and provided technical review of the draft plan at the Draft Review Meeting. Local municipal and county leaders who were unable to attend a public meeting, were invited to attend the Draft Review meeting to have their concerns and voices heard directly. Table 2.9 summarizes these group planning meetings held as part of the planning process.

Meeting	Location	Date
Regional Mitigation Plan Kick-off Meeting	MOVRC	November 20, 2014
Regional Mitigation Plan Draft Review and Feedback meeting	MOVRC	June 29, 2016

Table 2.9 Summary of Mitigation Planning Meetings

2.6.1 Project Kick-Off Meeting

On November 20, 2014, a Regional Hazard Mitigation Plan Kickoff meeting was conducted at the MOVRC offices. The meeting established ground rules for the plan update process, identified key players and points of contacts, identified priorities, and defined desired outcomes. The 2011 regional plan was used as a baseline for discussion points and the current WV State plan was used as a formatting guide for the 2016 update. This meeting was attended by six OES directors, two staff members from MOVRC, and a regional representative from the American Red Cross.

2.6.2 Plan Draft Review and Feedback Meeting

On June 29, 2016 the MOVRC hosted a Final Draft Review Meeting at its Parkersburg Offices from 1-3 PM. This meeting was held with the purpose "to provide Local Governments and Local Emergency Directors an overview of the completed draft and offer an additional opportunity to provide feedback and further review of the submitted draft regional Hazard Mitigation Plan." Appendix J contains a meeting agenda, meeting information summary packet, sign-in sheet, and documentation of the advertisement of the meeting.

The June 2016 meeting was very constructive, and served its purpose fully. The attendees came to the meeting very prepared having reviewed the draft plan document extensively. This meeting provided a forum for Local Officials and Local Emergency Directors to ask questions and requests clarification on specifics of the plan. Several comments, suggestions, and edits were proposed by the attendees. The MOVRC took all comments into consideration in the formation of the final draft document. As suggested during the final review meeting, an outline of the edits and changes made to the draft plan in forming the final version can be found in Appendix H of this final document.

CHAPTER 3: HAZARD IDENTIFICATION, RISK ASSESMENT AND VULNERABILITY ANALYSIS

DISASTER MITIGATION ACT OF 2000

44 Code of Federal Regulations

§201.6(c)(2): A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

The risk assessment shall include:

§201.6(c)(2)(i): A description of the type, location, and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events;

§201.6(c)(2)(ii): A description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. All plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods:

- *(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;*
- *(B) An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate;*
- *(C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions;*

§201.6(c)(2)(iii): For multi-jurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area

This chapter serves to identify hazards, perform the risk assessment and vulnerability analysis. For the purposes of compliance with the Disaster Mitigation Act as further specified by Final Rule 44 CFR Section 206.401(c)(2)(i), this Plan addresses the hazards in the above hazard identification subsection. Additional hazards may be added or more comprehensively addressed during future Plan updates as their respective significance emerges. Additional information regarding the hazards addressed in this plan can be found beginning in section 3.4 and continuing throughout Chapter 3.

3.1 Overview of the Hazard Identification & Risk Assessment Process

In developing this comprehensive Regional Hazard Mitigation Plan, the first step was to determine what hazards threaten the Region and the extent of the risk they pose to lives and property. Once identified and analyzed, the hazards were ranked to determine the highest risks to the region by evaluating the history of events, property damage, crop damage, injuries & deaths, population vulnerability, population density, geographic extent, and local input each hazard caused in each individual county. Figures and tables throughout Chapter 3 address the distribution of hazard events by county.

Significant hazards have been evaluated for their impact on the region on a comparative basis and separately for each hazard. This allows for comparison among counties of the relative exposures to hazards. All the hazards addressed in this plan are relative only to the jurisdictions of the Mid-Ohio Valley Region.

A variety of hazards threaten the region and to ensure a comprehensive risk assessment, MOVRC did not disqualify a hazard without conducting a preliminary hazard identification and risk assessment to identify the threat they pose to the region. Hazards were classified as being related to weather, geological in nature, and other types of hazards. Each hazard is summarized and evaluated in sections 3.6-3.20 of this plan. This plan examines:

- Hydrologic hazards – flooding, drought, coastal erosion, tsunami
- Atmospheric hazards – heavy wind, lightning, hail, winter weather, tornadoes, hurricanes, extreme cold/wind chill, heavy rain, and excessive heat
- Geologic hazards – landslides, expansive soils, land subsidence, earthquakes, and volcanoes
- Other hazards – wildfires, land subsidence, natural resource extraction, and dam failures.

3.1.1 Changes and updates in the 2011 Mid-Ohio Valley Regional Hazard Mitigation Plan

The previous regional HMP completed in 2011 was the first multi-jurisdictional plan completed for our region. As described in Chapter 1, prior to the establishment of regional HMPs in 2011, every county in West Virginia was responsible for completing an individual HMP. Prior to the 2011 multi-jurisdictional plan, the Mid-Ohio Valley Regional Council (MOVRC) aided all of the region's jurisdictions in the completion of their individual plans. At the time for this 2016 update the processes and requirements of planning have been standardized. It is for these reasons that this year, the risk assessment and hazard identification process has been completed in a way that mirrors the State Hazard Mitigation Plan completed in 2013. Other

significant changes from the 2011 regional HMP include:

- This 2016 update includes a revised hazard rank methodology that more closely resembles the practices used to complete the State HMP.
- Online Citizen Survey to increase public participation as well as gather data used in risk assessment and the formation of mitigation actions.
- A broader range of data sources were used to conduct the risk assessment.

3.1.2 2011 HAZUS Data

The HAZUS Data used by MOVRC planners to complete the 2011 regional Hazard Mitigation plan has been included in this 2016 plan as appendix N; this data was included in the 2011 plan as appendix G. Appendix N also contains floodplain & topographical maps, and aerial photographs for all of the region's counties; this information was included as appendix H in the 2011 HMP. This information has been included in this 2016 plan update to provide jurisdictions and citizens an additional resource for determining a property or structure's floodplain status and an estimation of the value of the property at risk. This data contains HAZUS reports for Calhoun, Jackson, Pleasants, Ritchie, Roane, Wirt, and Wood Counties. A HAZUS report for Tyler County was not included in the 2011 and for that reason has been omitted from this plan.

Each HAZUS report for each county estimates the impact a 100-year flood scenario would have on the county's population and property. For a 100-year flood scenario the reports evaluate flood caused building damage, induced flood damage, social impact and economic loss. This section provides summary information for the topics fully evaluated in the HAZUS reports. Table 3.1 below displays the number of buildings estimated to be moderately damaged by a 100-year flood, the percentage of the County's total buildings to me moderately damaged and the estimated number of buildings that would be completely destroyed by such an event.

County	Moderately Damaged	Percentage of Total Buildings	Buildings completely Destroyed
Calhoun	38	23%	15
Jackson	680	14%	325
Pleasants	267	5%	192
Ritchie	49	10%	14
Roane	107	29%	9
Wirt	56	15%	34
Wood	1,808	16%	670
Total	**3,005**	**-**	**1,259**

Table 3.1 Expected Building Damage by Occupancy

Table 3.2 below provides summary information for "essential facilities" during a 100-year flooding event. HAZUS deems fire stations, hospitals, police stations, and schools as essential facilities. This list differs slightly from the list of critical facilities in section 3.3.1 of this plan as different criterion for identifying such facilities were used.

County	Total Essential Facilities	At least Moderate Damage	At Least Substantial Damage	Total Loss of Use
Calhoun	7	0	0	0
Jackson	15	2	0	0
Pleasants	7	0	0	0
Ritchie	9	3	0	0
Roane	12	0	0	0
Wirt	2	0	0	0
Wood	45	3	5	0
Total	**97**	**8**	**5**	**0**

Table 3.2 Expected Damage to Essential Facilities

Table 3.3 below provides summary information for estimated shelter requirements if a 100-year flood event were to happen in the 7 counties listed. These estimations were pulled from the narratives under the social impact section of each individual report. The total number of households displaced and the number of people to seek shelters is listed. Additionally, the percentage of the population predicted to need to seek shelter has been identified.

County	Households displaced	People to seek Shelter	Total Population	Population Percentage
Calhoun	130	97	7582	1.28%
Jackson	1204	2,287	28,000	8.17%
Pleasants	406	697	7514	9.28%
Ritchie	194	68	10343	0.66%
Roane	317	340	15446	2.20%
Wirt	149	145	5873	2.47%
Wood	2467	5304	87986	6.03%
Total	**4867**	**8,938**	**162744**	**5.49%**

Table 3.3 Shelter Requirements

Table 3.4 below displays a summary of Building-Related Economic Loss Estimates. The totals for each county are displayed for building loss by the type of building; residential, commercial, industrial, and others. The total estimated building loss in the event of a 100-year flood for each county is displayed. Additionally, the seven county total for each building type has been calculated as well as the estimated total building loss for all building types.

County	Residential	Commercial	Industrial	Others	Total
Calhoun	$12,530,000	$15,890,000	$2,640,000	$2,650,000	$33,710,000
Jackson	$147,350,000	$67,960,000	$75,100,000	$17,750,000	$308,170,000
Pleasants	$60,290,000	$33,250,000	$10,870,000	$12,840,000	$117,260,000
Ritchie	$26,840,000	$420,000	$310,000	$2,940,000	$30,500,000
Roane	$27,260,000	$6,150,000	$3,220,000	$1,970,000	$38,610,000
Wirt	$18,570,000	$1,620,000	$60,000	$710,000	$20,950,000
Wood	$320,000,000	$422,360,000	$145,530,000	$78,770,000	$966,670,000
Total	**$612,840,000**	**$125,290,000**	**$237,730,000**	**$117,630,000**	**$1,515,870,000**

Table 3.4 Building Related Loss

All HAZUS reports for the 2011 HMP were printed between October 20, 2009 and January 25, 2010 which means these estimates are dated. However, the MOV has experienced limited development through the region since 2011 due to the region's decreasing population and the region's economic situation. The limited development suggests that the HAZUS predictions, while not perfect estimates, can provide a general base for estimating the potential flood damage caused by a 100-year flood event.

Striving to Maximize Available Data

Currently, an accurate representation of the value of properties located in the floodplain that are at risk in each county is not available. This is due to the nature of the region; with the exception of the Parkersburg and Vienna area of Wood County the region is vastly rural. More specifically, of the region's 22 municipalities all but two (Parkersburg and Vienna) have a population of less than 5,000. In fact, the Town of Friendly has a total population of only 71 people. Table 3.5 below displays the total populations of all the region's jurisdictions. Furthermore, based on the U.S. Census Bureau 2014 American Community Survey estimates, the Mid-Ohio Valley's total population was 170,871 people. Of the total population only 83,539 individuals live within a municipality leaving 87,206 individuals living in unincorporated county territory. The Mid-Ohio Valley region has a total area of 2,664.31 square miles. Working with the region's total population, this indicates that there are 64.14 citizens living per every square mile of the region. (More information regarding population density can be found in section 3.2.2 of this plan).

County	Population	Municipality	Population
Calhoun	7,583		
		Grantsville	634
Jackson	29,229		
		Ripley	3,259
		Ravenswood	3,853

Pleasants	7,600		
		Belmont	1,118
		St. Marys	1,910
Ritchie	10,221		
		Auburn	126
		Cairo	390
		Ellenboro	482
		Harrisville	2,194
		Pennsboro	1,244
		Pullman	195
Roane	14,749		
		Reedy	165
		Spencer	2,303
Tyler	9,084		
		Friendly	71
		Middlebourne	890
		Paden City	2,528
		Sistersville	1,5833
Wirt	5,810		
		Elizabeth	876
Wood	86,595		
		North Hills	826
		Parkersburg	31,195
		Vienna	10,654
		Williamstown	2,919
Totals	**170,871**		**83,665**

Table 3.5 Jurisdictional Population

Currently, a combination of the region's rural nature and the fiscal capacity of the region has resulted in insufficient mapping of properties and their values across the region. Accurate records of property value and building footprints are only recorded in Wood County at present. As such, the tool developed to aid in estimating property risk in the floodplain for the Mid-Ohio Valley region produced unreliable property estimates. For example, the TEIF tool estimated property values of hunting and fishing cabins along Middle Island Creek in Tyler County upwards of $1,000,000 when in actuality these properties are likely in the $30,000 to $100,000 range. The MOVRC planning staff was able to identify such discrepancies because of their extensive familiarity with the region; for example, the Community Development Director has been serving the region in a community development capacity for 30 plus years.

The MOVRC planning staff recognizes the importance of accurately identifying

property values to identify the level of risk in hazard mitigation planning. It is for this reason in order to correct current issues with the tools available this plan has established mitigation action 2016-40 that will:

> *"Complete GIS Mapping in all of the region's counties that do not currently have it, to better identify the risk to life and property presented by flooding which will be used in the future with TEIF software. Work with County Assessors to identify the actual location and value of properties in each county to assess the value of the property and the risk presented by flooding."*

Working with county officials to complete this mitigation action will enable planners to more accurately estimate the risk of property damage posed by flooding and other hazards in the Mid-Ohio Valley region during the 2022 plan update. For the reasons explained above the MOVRC used a combination of data from previous hazard events from various resources to conduct the risk assessment for all hazards in this plan. A full list of the sources used can be found in appendix D. Section 3.5 of this plan provides more detail on the risk assessment process. Additionally, HAZUS data utilized in the 2011 HMP has been included as appendix N in this plan as an additional resource to better identify risk throughout the region. (HAZUS data was included in the 2011 HMP as appendix G).

Limited Development in the Mid-Ohio Valley

Though this HAZUS data and the floodplain & topographical maps and aerial photographs are dated they are still a very valuable resource because there has been very limited development throughout the region since the adoption of the 2011 plan. There has been some relativity minor development as populations are shifting from place to place however there has not been substantial new development. This is largely due to two factors 1) the region's decreasing population and 2) the economic situation of the region.

The population of the Mid-Ohio Valley Region is in a decline that is expected to continue. According to the U.S. Census Bureau, in 2010 the region's total population was 174,699, in 2014 it is estimated to have fallen to 170,128. Furthermore, according to projections completed by the West Virginia University College of Business and Economics, the Mid-Ohio Valley region's population will decrease to 167,242 by 2020 and to 160,194 in 2030. This is due in part to aging of the region's population. Data from the U.S. Census bureau indicates that the mean age of citizens in the Mid-Ohio Valley is 6.8 years older than the national average. Furthermore, the region's population has 2.5% fewer 18 to 24 year olds than the national average and 3.1% fewer 25 to 44 year olds. This decrease in population is covered in more detail in section 3.2.2 of this document and table 3.8. The decrease in population regionally requires less new development.

As a whole, the economic situation of the Mid-Ohio Valley Region has not inspired significant development since 2011. Currently the Region's composite 24-month unemployment rate is 1.85 points higher than the national average. The 2014 per capita personal money income for the region is 79.59% of the U.S.'s 2014 per capita money income. This means that in the Mid-Ohio Valley per capita money income is 20.41% less than the national per capita money income. Furthermore, this has been the economic trend in the region overtime. In the year 2000 the region's per capita money income was 76.53% of the U.S.'s 2000 per capita money income. This means that in 2000 the region's per capita money income was 23.47% less than the U.S.'s. Table 3.6 below provides further comparative regional economic summary information.

	Region	U.S.
24-month Average Unemployment Rate (BLS) period ending June 2016	7.19	5.34
2014 Per Capita Personal Income (BEA)	$34,636	$46,049
2014 Per Capita Money Income (5-year ACS)	$22,727	$28,555
2000 Per Capita Money Income (Decennial Census)	$16,521	$21,587

Table 3.6 Regional Economic Summary

When the region's economics are broken down by county, it becomes apparent that some counties are less economically sound than others. For example, Calhoun and Roane counties have a 24-month unemployment rate 6.47 and 5.52 points higher than the national rate respectively; both double the national average. While Wood County's 24-month unemployment rate is only 0.72 points higher than the national average. Table 3.7 below provides further regional economic summary information on a county level. To further underscore the economic situation of the Mid-Ohio Valley 2015 County Economy Profiles created by the National Association of Counties have been included for each county in appendix M of this plan.

	24 Month Unemployment	BEA PCPI	Census PCMI (2000)	ACS 5-Year PCMI
U.S.	5.34	$46,049	$21,587	$28,555
Calhoun	11.81	$28,424	$11,491	$18,181
Jackson	6.94	$33,560	$16,205	$22,870
Pleasants	8.09	$38,707	$16,920	$22,308
Ritchie	6.73	$31,314	$15,175	$18,717
Roane	10.86	$30,672	$13,195	$18,124
Tyler	9.09	$31,415	$15,216	$20,900
Wirt	9.81	$26,888	$14,000	$23,240
Wood	6.06	$37,104	$18,073	$24,528

Table 3.7 Regional Economic Summary Information

3.2 Introduction to the Mid-Ohio Valley Region

The Mid-Ohio Valley region of West Virginia occupies over twenty-six hundred square miles, representing an area larger than the state of Rhode Island. It is located in West Virginia between 38° 32" and 39° 36" north latitude and 80° 42" and 81° 55" longitude. The eight counties which comprise the region are situated on the Appalachian Plateau, characterized by relatively level river valleys which abruptly become steeply sloping hills.

This region has a humid continental climate subject to a wide annual temperature range and a fairly uniform distribution of precipitation. Mean annual temperatures range in the mid 50's (°F), while precipitation averages in the 40's (per year). Abrupt changes in the weather are due to the interaction of warm, moist air from the Gulf of Mexico and cold, dry air from the north. Lower elevation along the Ohio River results in slightly more favorable conditions along the western edge of the region.

The region is bordered to the north and west by the Ohio River and stretches to the south to the bedroom communities of Charleston, the state capital. The Ohio River is a unique and valuable asset to the area, providing an abundant water supply, a transportation resource for business and industry as well as a recreation attraction for local residents and tourists alike. The rugged mountain topography that is indicative of Appalachia creates a scarcity of flat land for development and makes it difficult and expensive to construct transportation, utilities, and technology facilities. As a result, even local travel has been historically difficult. However, the terrain can also be a positive attribute as the isolation has resulted in tight knit communities, the challenges of rural life have developed a solid work ethic in the population and the area poses a tremendous physical beauty.

Figure 3.1 below is a map of all 55 West Virginia Counties; the 8 Counties of the Mid-Ohio Valley Region Calhoun, Jackson, Peasants, Ritchie, Roane, Tyler, Wirt, and Wood are shaded in grey. The Mid-Ohio Valley Region contains eight counties in West Virginia and 22 separate municipalities. Table 3.8 below details all of the Region's municipalities along with the county's they are contained in. The two main roadways contained within the region are interstate 77 which runs north to south and U.S. Route 50 which crosses the region from east to west. Other widely traveled routes include U.S. Route 33 and 119 in the southern part of the region, WV Route 2 in the north, WV Route 16 in the east, and WV Route 14 in the west.

Figure 3.1 Outline of the Region's Eight Counties in Relation of the State's Geography

County	Municipalities
Calhoun	• Grantsville
Jackson	• Ravenswood, Ripley
Pleasants	• Belmont, St. Marys
Ritchie	• Auburn, Cairo, Ellenboro, Harrisville, Pennsboro, Pullman
Roane	• Reedy, Spencer
Tyler	• Friendly, Middlebourne, Paden City, Sistersville
Wirt	• Elizabeth
Wood	• North Hills, Parkersburg, Williamstown, Vienna

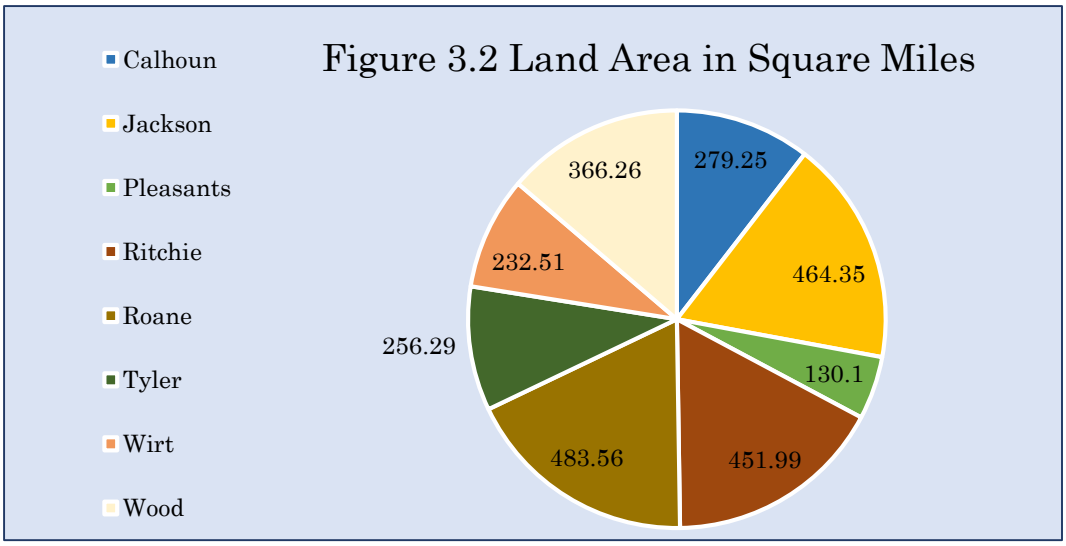
Table 3.8 Municipalities of the Mid-Ohio Valley

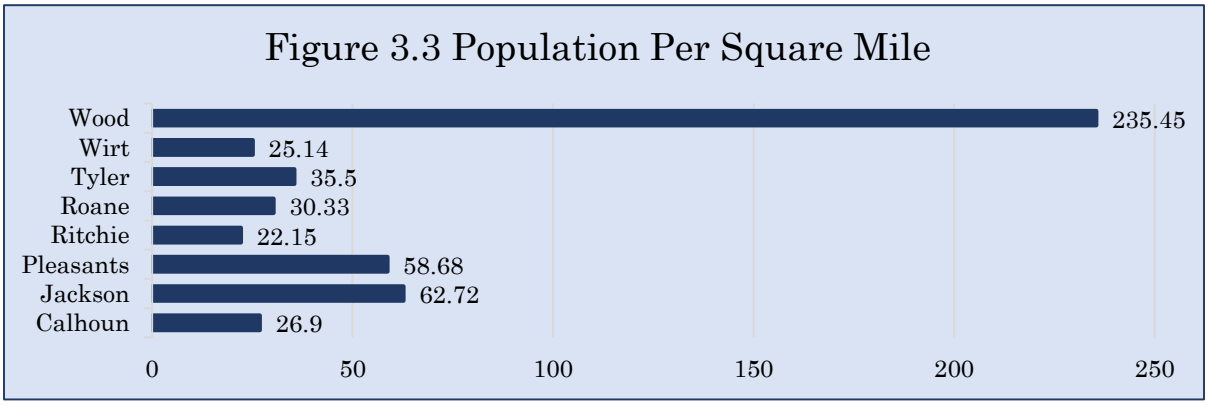
3.2.1 Data Collection

In order to assess the vulnerability of different jurisdictions to the hazards, data on past occurrences of damaging hazard events was gathered. To compare the distribution of events between different hazards, the same data sources were used when possible to create hazard profile maps. Generally, the main source of information used to analyze past hazard events and to rank hazards was the National Climatic Data Center's (NCDC) Storm Events Database. Hazard data was supplemented with various sources such as the West Virginia Division of Forestry (WVDOF) and West Virginia Geological Survey (WVGS). A complete list of data sources used to supplement NCDC data can be found in Appendix D.

3.2.2 Demographics

The Mid-Ohio Valley Region's demographics are a major factor in the risk posed by natural hazards. According to the 2010 Census the total population of the Mid-Ohio Valley Region was 174,699 and the 2014 population estimate purports a total population for the region of 170,128. The region is most densely populated around the City of Parkersburg, the fourth largest City in West Virginia following Charleston, Huntington, and Morgantown respectively. Parkersburg and surrounding communities in West Virginia and Ohio are recognized as a Metropolitan Statistical Area (MSA) by the US Census Bureau and serves as the market core of the region. The region is also close to several major national metropolitan centers that are experiencing a period of positive growth and redevelopment, such as Columbus, Cleveland and Cincinnati, Ohio and Pittsburgh, Pennsylvania making over half of the US population within a day's drive of the Mid-Ohio Valley. Figure 3.2 below displays each county in the region's land area per square mile and figure 3.3 displays each county's population per square mile.





The total population of the Mid-Ohio Valley Region has fallen from 174,699 in 2010 to an estimated 170,128 in 2014 losing 4,571 residents. This estimated decrease in population can be attributed to three factors 1) aging of the population, 2) the region's economic status, and 3) an artificial inflation of the population due to drilling activity. West Virginia has a problem with its young professionals leaving the state to pursue more diverse career options which has contributed to decrease in population. This has resulted in a decrease of WV's population and an increase in the age of the remaining population.

Additionally, the Region's economy has undergone some changes in recent years that have attributed to a decrease in population. A few businesses and industries such as the Willow Island Power Station and the Oil and Gas Industry have either halted all production or slow down production significantly. This decrease in industry and opportunity has contributed to the decrease in population. In the same vein, due to the previous boom of the Oil and Gas industry in our region, the population was likely artificially inflated. As there has been a decrease in the Oil and Gas Industry in recent years, the region's population has been negatively affected. Table 3.8 shows each of the region's counties populations from 1990-2010 and population projections for 2020 and 2030 based on Census data and the West Virginia University College of Business & Economics West Virginia County Population Projections table.

County	1990	2000	2010	2014 (*Estimate*)	2020	2030
Calhoun	7,885	7,582	7,627	7,513	7,362	7,218
Jackson	25,983	28,000	29,211	29,126	28,904	28,305
Pleasants	7,546	7,514	7,605	7,634	7,676	7,746
Ritchie	10,233	10,343	10,449	10,011	9,714	8,515
Roane	15,120	15,446	14,926	14,664	14,029	12,799
Tyler	9,796	9,592	9,208	9,098	8,595	7,831
Wirt	5,192	5,873	5,717	5,845	5,929	6,226
Wood	86,915	87,986	89,956	86,237	84,914	81,554
Mid-Ohio Valley	168,670	172,336	174,699	170,128	167,123	160,194

Table 3.8 Population History and Projections

3.2.3 Social Vulnerability

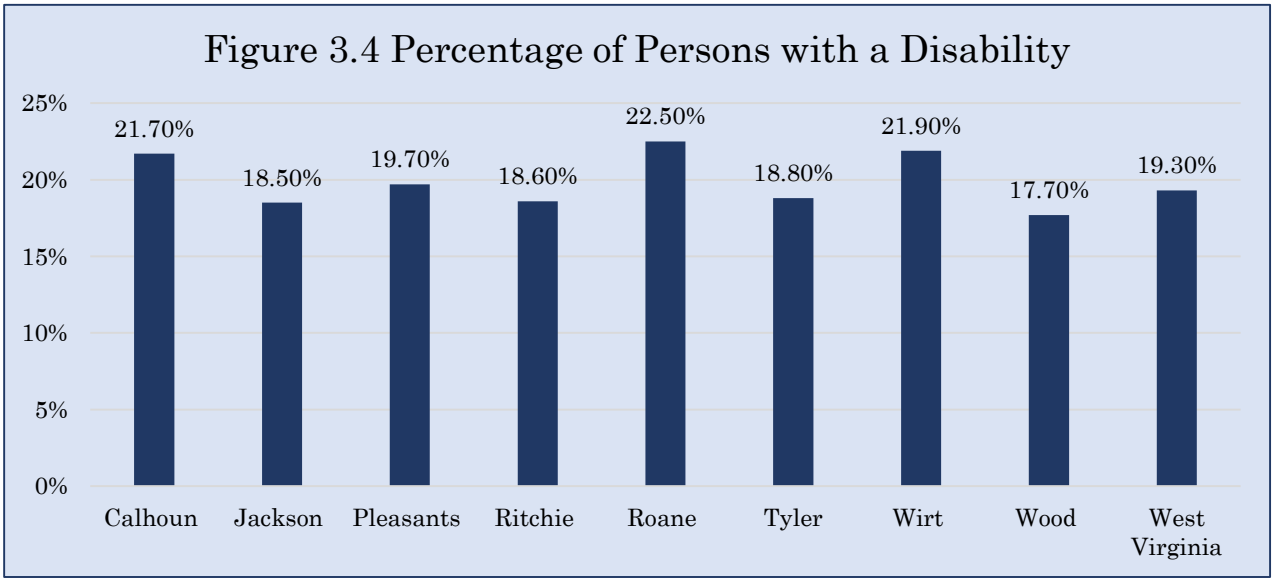
Vulnerability is broadly defined as the potential for loss. It not only applies to landscapes and buildings, but to people as well. The vulnerability of people is termed "social vulnerability" and describes the vulnerability of populations before an event occurs. This pre-existing condition is based on the characteristics of the population and where they live. By determining the most vulnerable populations and identifying what characteristics make them vulnerable, preparedness and recovery programs for hazards may be designed to minimize the impacts on these vulnerable populations.

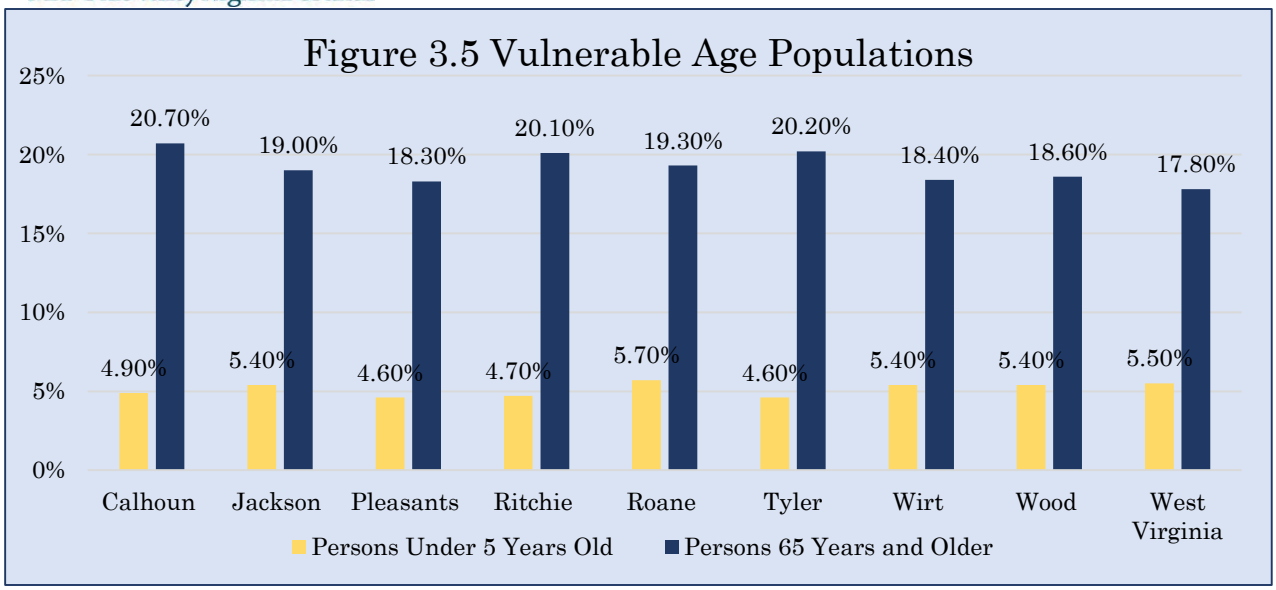
There is no broad consensus as to exactly which characteristics determine vulnerability. For the purposes of this plan, discussion is limited to factors such as income, employment status, age, housing occupancy, and race.

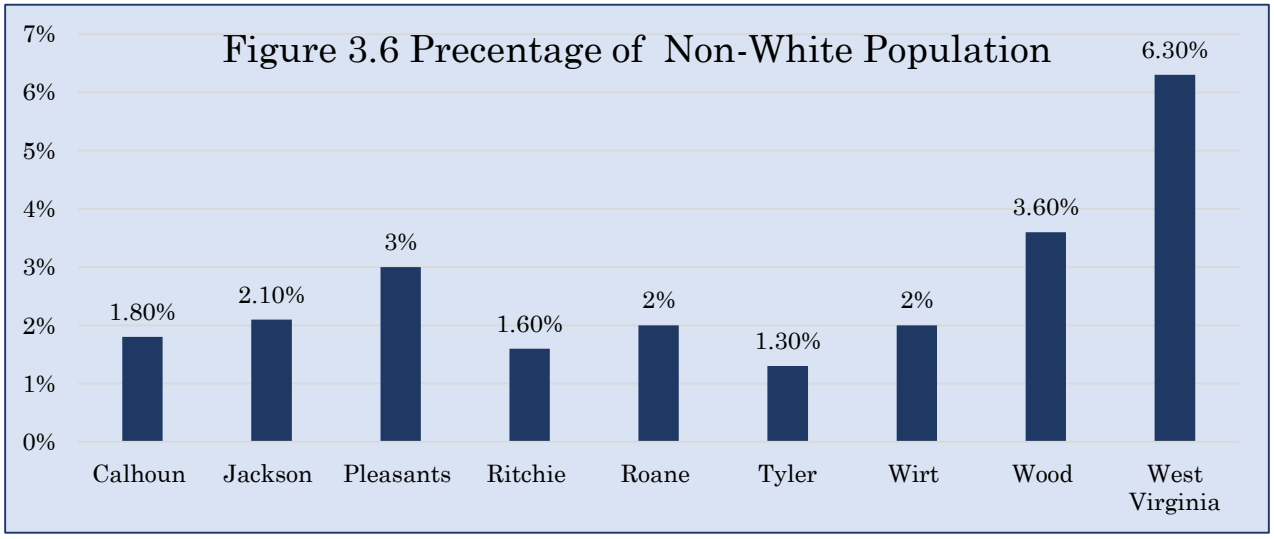
Table 3.9 below displays regional statistics based on economic characteristics of the population such as: the median household income, 24-month average unemployment rate, average number of persons in poverty, and the percent of persons living in rental housing. Figures 3.4, 3.5, and 3.6 depict the physical characteristics of the population that may lead to social vulnerability such as the percent of persons with a disability, percent of persons that are of a vulnerable age, and the percent of persons identifying as a race other than white. These representations also include figures from the state of West Virginia as a whole. In order to enable comparison, all figures except for median household income are represented in percentages.

County	2014 Per Capita Income (5-year ACS)	24-Month Average Unemployment	Average Below Poverty	% in Renter Occupied housing
Calhoun	$18,181	11.61%	21.8%	22.6%
Jackson	$22,870	6.94%	16.7%	22.4%
Pleasants	$22,308	8.02%	16.5%	19.6%
Ritchie	$18,717	6.69%	17.7%	20.7%
Roane	$18,124	10.87%	23.1%	21.7%
Tyler	$20,900	9.16%	15.8%	17.9%
Wirt	$23,240	9.86%	17.2%	18.4%
Wood	$24,528	6.06%	20.3%	28.3%
WV	$23,237	6.63%	18.3%	26.6%

Table 3.9 Regional Economic Descriptive Statistics (Census Bureau & Stats America)







3.2.4 Land Use and Development

The terrain is largely responsible for very evident differences in development between counties which are adjacent to the Ohio River (Jackson, Pleasants, Tyler and Wood) and those which lie to the more rugged interior (Calhoun, Ritchie, Roane, and Wirt). Elevation varies from 570 feet along the Ohio River to 1,300 feet in the eastern portion of the region. Much of the interior is above 1,000 feet with few level areas for development.

The largest low-lying areas are in Wood and Jackson Counties, particularly near the Ohio River. These bottom lands and river terraces are relatively level lands with deep, well drained soils which are well suited for agriculture. As a result, Wood and Jackson

are the only counties with more than 20% of their land devoted to agriculture. Proximity to vital transportation routes and availability of large tracts of land suitable for construction has resulted in residential, commercial, and industrial development in these areas as well. Location in the flood prone areas is the only drawback to development in the river valleys.

Potentially developable sites drastically decrease as one travels eastward in the region. The amount of land with greater than 15-25% slope is the main reason. Thin soils cover the hillsides. This combination results in a high erodibility and requires careful management. The upland terrain further constrains development by hindering transportation and the retention of a water supply.

3.3 Critical Facilities

The analysis of regional critical facility vulnerability was completed using two major sources of facility data: 1) knowledge gathered from local OES operators in each county and 2) the database created by regional planners utilizing available data from other state and national sources including the 2013 State Hazard Mitigation Plan.

3.3.1 Critical Facilities

There is currently no single, standardized critical facility dataset for West Virginia, various plans have used different datasets, based upon the geographic and subject matter scope of each plan. Due to the lack of a standardized list this plan utilized information provided by local LEPC directors and supplemented that information with other various data sets. This plan identifies the following broad types of critical facilities:

Emergency Operation Centers (EOCs)
Law Enforcement
Fire Departments
Hospitals
Schools Pre-K – 12th Grade

This is not a complete representation of all possible types of critical facilities, however this data is a good representation of the critical facilities located in the Mid-Ohio Valley Region. The complete list of critical facilities in the Mid-Ohio Valley has been included in this plan as Appendix A.

EOCS – the Emergency Operation Centers analyzed in this plan were identified through communications with the local EOC operators throughout the completion of

this plan. Communication with these individuals in each county was essential to the completion of this plan.

Law Enforcement: Federal, State, & Local and Corrections Facilities – This data set includes locations of Federal, State, local, and special jurisdiction law enforcement agencies, including but not limited to, municipal police, county sheriffs, State Police, Federal Law Enforcement Agencies, and corrections facilities. It was compiled by researching the addresses of offices and field offices through online portals, the 2014-2015 Emergency Contact Directory, and by utilizing input from county EOC directors. A complete list of references used to this list has also been included in Appendix A. Tables 3.10 and 3.11 below provide summary information for the Critical Facilities identified in each of the region's counties.

Fire Departments – this data set was compiled using information gathered from the West Virginia Fire Commission's list of fire departments, the West Virginia State Treasurer's list of 1st quarter 2016 VFD State Distribution report, the webpage for the Parkersburg Fire Department, and information gathered from Local EOCs. The Floodplain determination was made using the WV flood tool.

Hospitals – data regarding hospitals, nursing homes, and other healthcare facilities was gathered utilizing the Office of Health Facility Licensure & Certification webpage combined with information from local EOCs. To determine the type of health care facility to be included in this assessment, the number of beds at the facility was considered. If the facility contains beds for semi-permanent/permanent residents it was included in the critical facilities list.

Schools – to identify all k-12 schools in the region the webpages of each county's Board of Education were consulted. Also, in order to locate private schools, the "Private Schools Report" was consulted along with information gathered from local EOCs.

Facility Type	Data Source	Date Created	Number of Facilities
EOC	Emergency Contact Directory	2014-2015	8
Law Enforcement	WV State Police Detachment Contact Information; West Virginia Division of Corrections	2016, 2007-2016,	29
Fire Departments	WV State Treasurer, WV Fire Commission, Parkersburg Fire Department	2016, 2012	45
Hospitals	WV Health & Human Resources	2013	45
Schools	County Board of Education webpages, private schools report	2005-2016	75

Table 3.10 Summary of Critical Facilities

County	Emergency Operations Centers	Fire Departments	Hospital/ Healthcare Facility	Law Enforcement	School	Total
Calhoun	1	3	3	3	4	14
Jackson	1	6	5	5	13	30
Pleasants	1	3	3	4	6	17
Ritchie	1	5	2	3	6	17
Roane	1	5	2	3	6	17
Tyler	1	4	3	4	4	16
Wirt	1	1	-	2	3	7
Wood	1	18	27	5	33	84
				Total		**202**

Table 3.11 Critical Facilities Summary by County

3.3.2 Critical Facility Analysis

Appendix A of this plan contains a list of all identified critical facilities and also identifies whether or not the facility is located in the floodplain. The West Virginia Flood Tool was used by MOVRC planners to determine if a facility is located in the floodplain. The West Virginia Flood Tool is designed to provide floodplain managers, insurance agents, developers, real estate agents, local planners and citizens with an effective means by which to make informed decisions about the degree of flood risk for a specific area or property. When using the flood tool, a disclaimer does pop up and read "users of this information should always consult official FEMA flood maps and certified elevation data if there is any doubt of a property's flood risk." When using the floodplain determination indicated in appendix A, this same principle should be applied; always consult FEMA flood maps when there is any doubt concerning a facility's floodplain status. Additionally, in review of the Repetitive Loss (RL) and Severe Repetitive Loss (SRL) structures in the Mid-Ohio Valley as identified by the State's NFIP none of the region's critical facilities are considered to be a RL or SRL structure.

In analysis of the critical facilities identified through this HMP process as well as LEPC and Public input two areas of importance were identified: 1) the Roane County 911 EMS Center is located in the floodplain which has resulted in the disruption of services and 2) some critical facilities are still operating without generators. The remaining portion of this section explains these issues in further details.

As it currently exists the Roane County 911 and EMS building is located in the floodplain and the building has been flooded to the point of evacuating 911 and EMS personnel. The building has suffered damages and more importantly the actions of emergency responders were impeded during a natural hazard event; a time that

emergency services are most needed. It is imperative that the 911 EMS services of Roane County are moved to an alternative location, not at risk of being flooded. Natural hazards in and of themselves present emergency responders with enough challenges when providing care and assistance, the services provided should not be further hindered by an issue with a viable solution. In this case the solution is to relocate the 911 EMS center to a new or repurposed facility. In Chapter 4 of this HMP a mitigation action has been created to address this specific critical facility issue in Roane County.

In the aftermath of the 2012 derecho which left vast areas of the region, including critical facilities, without power for many days, several of the Region's critical facilities obtained generators to prevent similar situations in the future as funds became available. However, some facilities are still without generators leaving the citizens they serve at risk because they have not yet been able to secure or generate the necessary funding. To better prepare critical facilities to function effectively during power outages all Emergency Operation Centers, Fire Departments, Hospital/Healthcare Facilities, Law Enforcement Offices, and Schools that have yet to obtain a generator should be outfitted with the necessary equipment. This has been included as a mitigation action in Chapter 4 of this regional HMP.

3.4 Declared Disasters and NCDC Events

The Mid-Ohio Valley faces some unique challenges due to its geographic location. A large portion of the region is boarded by the Ohio River resulting in lower lying areas to the west. However once traveling though the interior of the region the terrain becomes steep, rugged, and wooded. The region's varying geographies opens up the possibility for diverse disaster possibilities. On occasion, hazards create disastrous situations that Local and State governments are unable to resolve without the assistance of the Federal government. It is for this reason that on November 23, 1988 the Robert T. Stafford Disaster Relief and Emergency Assistance Act was signed into law to establish a process for requesting and obtaining a Presidential Disaster Declaration. This Act amended the Disaster Relief Act of 1974 and gave statutory authority for most federal disaster response activities, particularly to FEMA and its programs.

3.4.1 Disaster Declarations Background

Under the Stafford Act there are two types of disaster declarations 1) Major Disaster Declarations and 2) Emergency Declarations; both declaration types authorize the President to provide supplemental federal disaster assistance. Descriptions of the requirements for each declaration type follow:

Major Disaster Declarations

The President can declare a major disaster for any natural event, including any hurricane, tornado, storm, high water, wind-driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm, or drought, or, regardless of cause, fire, flood, or explosion, that the President determines has caused damage of such severity that it is beyond the combined capabilities of state and local governments to respond. A major disaster declaration provides a wide range of federal assistance programs for individuals and public infrastructure, including funds for both emergency and permanent work. To elicit an Emergency Declaration, the Governor of the effected state or Tribal Chief Executive of the effected Tribe must submit a request to the president through the appropriate Regional Administrator within 30 days of the occurrence of the incident. The request must be based upon a finding that the situation is beyond the capability of the State and effected local governments or Indian Tribal Government and that supplemental federal assistance is necessary.

Emergency Declarations

An Emergency Declaration can be made when the President determines that federal assistance is needed before, during, or after a disaster. The supplemental funds allocated through an Emergency Declaration are to be used in congruence with state, local, or Indian Tribal Government efforts in providing emergency services, such as the protection of lives, property, public health, and safety, or to lesson or avert the threat of a catastrophe in any part of the United States. The amount of supplemental funding is not to exceed $5 million and in the event of an overage the president shall report to Congress. The Governor of the effected State or Tribal Chief Executive of the effected Tribe must submit a request to the President though the appropriate Regional Administrator, within 30 days of the occurrence of the incident. The Request must be based upon finding that the situation is beyond the capability of the State and effected Local Governments or Indian Tribal government and that supplemental federal emergency assistance is necessary to save lives and protect property, public health and safety, or to lessen or avert the threat of a disaster.

3.4.2 Federally Declared Disasters in the Mid-Ohio Valley Region

In order to identify hazards that can and have affected the Mid-Ohio Valley, the record of Federally Declared Major Disasters and Emergency Declarations in the region was used as a source. According to FEMA since 1957 there have been thirty-two (32) Major Disaster Declarations and five (5) Emergency Declarations in the Mid-Ohio Valley. This totals thirty-seven (37) Disaster Declarations affecting one or more of the Mid-Ohio Valley's eight (8) counties. The following is a summary of disasters occurring in the region since the Hazard Mitigation plan was last updated in 2011.

Severe Storms, Major Disaster Declaration on August 7, 2015

Between July 10, 2015 and July 14, 2015 Jackson, Roane, and Wood Counties were effected by a severe storm system that resulted in a Major Disaster Declaration and $788,000 of damage in the three counties. The storm system included straight-line winds, flooding, landslides, and mudslides. Specifically, the areas of Newton in Roane County, Fairplain in Jackson County, and Parkersburg in Wood County experienced flash floods as a result of heavy rain. According to NCDC data around 65 homes in Mineral Wells had some degree of flooding. Furthermore, Gandeeville in Roane County and Vienna and Mineral Wells of Wood County were effected by thunderstorm winds during this period.

Flood, Major Disaster Declaration on May 21, 2015

Calhoun, Jackson, Pleasants, Roane, and Wirt Counties experienced flooding April 13, 2015 through April 15, 2015 that resulted in a Major Disaster Declaration. The flooding was a result of severe storms and also included landslides and mudslides. Particularly, the Town of Reedy in Roane County experienced flooding due to heavy rain. As a result of the flooding several roads were blocked by overflowing small streams and some public school systems were closed for the day. Property damages from this Major Disaster amounted to $160,000.

Flood, Major Disaster Declaration on May 18, 2015

During April 8-11, 2015 Jackson, Pleasants, Ritchie, and Tyler Counties experienced flooding that resulted in a Major Disaster Declaration. The flooding was the result of heavy rainfall during thunderstorms. Most of the area experienced brief wind gusts of 40 to 50 MPH however no evidence of a tornado was found. The Town of Pennsboro experienced heavy rain and flash flooding which resulted in some roadways being blocked by overflowing streams. The community of Prunty experienced hail during this storm that was 1.25 inches in size along route 74 which resulted in $25,000 in damages. The area of Lonetree in Tyler County also faced damages from this storm in the amount of $25,000.

Severe Storms, Major Disaster Declaration on March 31, 2015

Throughout March 3, 2015 to March 14, 2015 Jackson, Ritchie, Roane, Tyler, Wirt, and Wood Counties were among the 32 WV counties that experienced severe winter storms and flooding which resulted in a Major Disaster Declaration. The storms started with heavy rain throughout the state which initially started the rise of water levels. However, as a day past temperatures started to drop turning rain into sleet and eventually snow which accumulated to between 10 and 13 inches in Pleasants, Tyler, and Wood Counties. Temperatures continued to drop during this time, specifically in the Cities of Parkersburg and Spencer it dropped to -3 degree. After the extreme cold weather when temperatures began to rise snow and ice from the storm continued to melt which resulted in further flooding of the area. Total property damages were $200,000 in Jackson County, $200,000 in Ritchie County, $350,000 in

Roane County, $200,000 in Tyler County, $75,000 in Wirt County, and $75,000 in Wood County.

Chemical, Emergency Declaration on January 10, 2014

On January 9, 2014, an estimated 10,000 gallons of an industrial chemical, 4-Methylcyclohexanemethanol (MCHM), spilled into the Elk River just upstream from the Kanawha County municipal water intake in Charleston, West Virginia. This municipal water system serves nearly 300,000 people whose water was effected by the chemical spill. Due to the uncertainty over the chemical levels in the water supply, the Office of the Governor issued a "Do Not Use" order at 6:00 pm on January 9, 2014. Later that evening, the West Virginia Department of Health and Human Resources contacted CDC about the release and requested assistance to review water sampling data and provide a drinking water screening level for MCHM.

Flood, Major Disaster Declaration on July 26, 2013

On July 13, 2013 Roane County experienced a flash food due to heavy rain which resulted in $3 million of property damage and a major disaster declaration. The heaviest rain during the storm resulted in 1.5 to 2 inches of rainfall during the period of an hour. In the City of Spencer, total rainfall accumulated to 2.8 inches during the storm period and severe flooding that effected much of southern Roane County ensued. As a result, 40 individuals were displaced from their homes due to flooding, 1 manufactured home was destroyed, 47 single family homes suffered major damages, and 41 single family homes suffered minor damages. Additionally, 1 multifamily dwelling had major damage and 14 other multifamily suffered minor damages. The severity of the storm was fully demonstrated by the evacuation of the Roane County 911 Center; storm debris blocked a culvert in the nearby creek which obstructed the usual path of water and sent it towards the 911 Center. This evacuation also included both the Office of Emergency Services and the Ambulance Authority building as they were also flooded.

Hurricane, Emergency Declaration on October 29, 2012

A rare consolidation of a strong mid and upper level trough in the polar jet with a tropical hurricane named Sandy resulted in a historical snow storm for the month of October. The entire State of WV was declared to be in a state of emergency during this storm; the hardest hit counties were in central WV and 200,000 people across the state were left without power. A federal emergency was declared at the onset of the storm to allow for direct federal assistance, such as shipments of water, food, and large generators. In some areas of the state the average snow accumulation reached three feet. In the Mid-Ohio Valley snow accumulation was lower than the central Counties however the impact of this storm was felt.

Severe Thunderstorms, Emergency Declaration June 30, 2012 and Major Disaster Declaration on July 23, 2012

On June 29, 2012 the Mid-Ohio Valley Region was struck by a derecho storm system Wind gusted at between 60-65 MPH and wind gusts lasted longer than usual, sometimes as long as 10 minutes. This resulted in many, many broken branches and fallen trees across the region which wreaked havoc with the existing electrical infrastructure. As such, over 94,000 citizens of the Mid-Ohio Valley Region were left without power. Three 40-year-old steel towers carrying 500 kilowatt electric lines collapsed in Ellenboro. In the days after the storm, the devastation was compounded by unusually high temperatures from which there was no reprieve; for example, Parkersburg reached a temperature of 98 degrees. As there was no power to operate fans or air conditioning systems, this extreme heat interrupted the daily lives of many people. Furthermore, the prolonged power outage resulted in the loss of refrigerated foods for both individuals and retailers; water and ice were in high demand. Additionally, many gas stations were without power making them unable to pump gas for customers. This resulted in long lines and wait times for gas at the few stations that did have electricity. After all was said and done, the total damage from the 2012 derecho in the Mid-Ohio Valley was $12.9 million. This incident first resulted in an Emergency Declaration on June 30th and on July 23 President Barack Obama also issued a Major Disaster Declaration due to the severity of the storm and its ability to meet the requirements for both declaration types. By declaring both an Emergency and Major Disaster additional financial assistance was made available to those effected by the storm, particularly hazard mitigation assistance was made available.

Severe Storm, Major Disaster Declaration on March 16, 2012

Beginning on February 29, 2012 through March 5, 2012 elven WV Counties including Ritchie and Roane were effected by severe storms consisting of tornadoes, flooding, mudslides, and landslides. The heaviest rain fell during the late morning into the early afternoon; around .75 inches of rain fell in less than 3 hours which resulted in flooding. Waters from Hushers Run near Ellenboro spilled over the creek bank and surround a number of mobile homes, Bunnell Run flooded southwest of Pennsboro, and the headwaters of Hughes River flooded Route 74 between Pennsboro and Pullman. In Tyler County, small streams flooded resulting in water making its way into the first floors of some homes, debris was left in many yards, and some private bridges sustained minor damages. These events combined with another severe weather events resulted in a Major Disaster Declaration. Total damages from this disaster amounted to $125,000 in the Mid-Ohio Valley.

Tables 3.12 and 3.13 provide a summary of Federal Major Disaster Declarations and Federal Emergency Declarations, respectively, in the Mid-Ohio Valley Region from 1957 through September 2015. Figure 3.7 below displays the number of Emergency

Declarations and Major Disaster declarations by County and figure 3.8 displays the number of Major Disasters Declarations per county by incident type respectively.

Disaster Number	Year	Incident Period	Declaration Date	Disasters Types	Counties Declared
4236	2015	Jul 10 - Jul 14	7-Aug	Severe Storms, Straight-Line Winds, Flooding, Landslides, and Mudslides	3
4221	2015	Apr 13 - Apr 15	21-May	Severe Storm, Flooding. Landslides and Mudslides	5
4220	2015	Apr 8 - Apr 11	18-May	Severe Storm, Flooding. Landslides and Mudslides	4
4210	2015	Mar 3 – Mar 14	31-Mar	Severe Winter Storm, Flooding. Landslides and Mudslides	6
4132	2013	Jun 13 - Jun 13	26-Jul	Severe Storms and Flooding	1
4071	2012	Jun 29 - Jul 8	23-Jul	Severe Storms and Straight-Line Winds	8
4059	2012	Feb 29 - Mar 5	16-Mar	Severe Storms, Tornadoes, Flooding, Mudslides, and Land Slides	2
1903	2010	Feb 5 - Feb 11	23-Apr	Severe Winter Storm and Snow Storms	2
1881	2009	Dec 18 - Dec 20	2-Mar	Severe Winter Storm and Snow Storm	3
1838	2009	May 3 - Jun 8	15-May	Severe Storms, Flooding, Mudslides and Landslides	3
1769	2008	Jun 3 - Jun 7	19-Jun	Severe Storms, Flooding, and Mudslides	5
1574	2005	Jan 4 - Jan 25	1-Feb	Severe Storms, Flooding, and Landslides	1
1558	2004	Sep 16 - Sep 27	20-Sep	Severe Storms, Flooding, and Landslides	5
1522	2004	May 27 - Jun 28	7-Jun	Severe Storms, Flooding, and Landslides	4
1500	2003	Nov 11 - Nov 30	21-Nov	Severe Storms, Flooding, and Landslides	2
1474	2003	Jun 11 - Jul 15	21-Jun	Severe Storms, Flooding, and Landslides	1
1455	2003	Feb 16 - Mar 28	14-Mar	Severe Winter Storms, Record/Near Record snow, Heavy Rains, Flooding, Slides	5
1378	2001	May 15 - Sep 4	3-Jun	Severe Storms, Flooding, Landslides	2
1319	2000	Feb 18 - Feb 22	28-Feb	Flooding, Severe Storms & Flooding	6
1229	1998	Jun 26 - Jul 27	1-Jul	Severe Storms & Flooding	8
1168	1997	Feb 28 - Mar 15	7-Mar	Heavy & wind Driven Rain, High Winds, Flooding Slides	6

1096	1996	Jan 19 - Feb 2	25-Jan	Flooding	3
1084	1996	Jan 6 - Jan 12	13-Jan	Blizzard of 96 (Severe Snow Storm	8
753	1985	Nov 3 - Nov 7	7-Nov	Severe Storms & Flooding	2
628	1980	Aug 15 - Aug 22	15-Aug	Severe Storms & Flooding	1
569	1978	Dec 14 - Dec 14	14-Dec	Severe Storms & Flooding	1
224	1967	Mar 13 - Mar 13	13-Mar	Flooding	2
165	1964	Mar 20 - Mar 20	20-Mar	Severe Storms & Flooding	unknown
147	1963	Mar 13 - Mar 13	13-Mar	Severe Storms & Flooding	unknown
125	1962	Mar 9 - Mar 9	9-Mar	Severe Storm, High Tides & Flooding	unknown
117	1961	Jul 23 - Jul 23	23-Jul	Floods	unknown
67	1957	Jan 31 - Jan 31	31-Jan	Flood	unknown

Table 3.12 Federal Major Disaster Declarations in the Mid-Ohio Valley Region 1957 – Sept, 2015

Disaster Number	Year	Incident Period	Declaration Date	Disaster Types	Counties Declared
3366	2014	Jan 9 - Jan 20	10-Jan	Chemical Spill	2
3358	2012	Oct 29 - Nov 8	29-Oct	Hurricane Sandy	8
3345	2012	Jun 29 - Jul 10	30-Jun	Severe Storms	8
3221	2005	Aug 29 - Oct 1	5-Sep	Hurricane Katrina Evacuation	8
3109	1993	Mar 13 - Mar 17	17-Mar	Severe Snowfall and Winter Storms	8

Table 3.13 Federal Emergency Declarations in the Mid-Ohio Valley 1957 – Sept. 2015

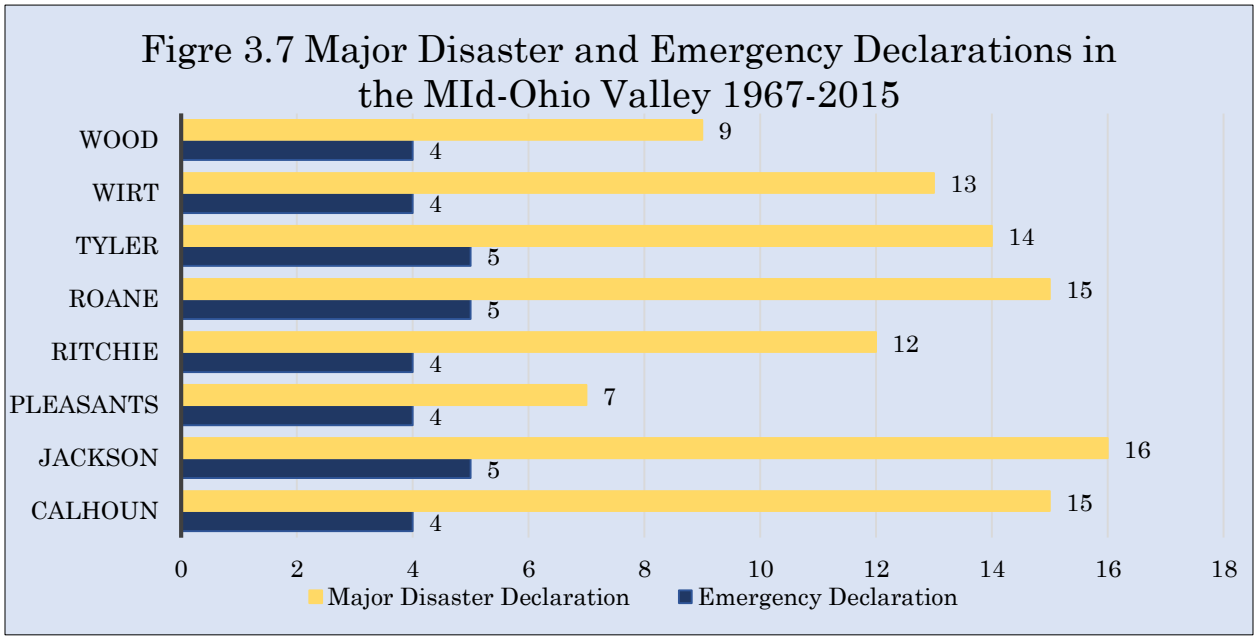
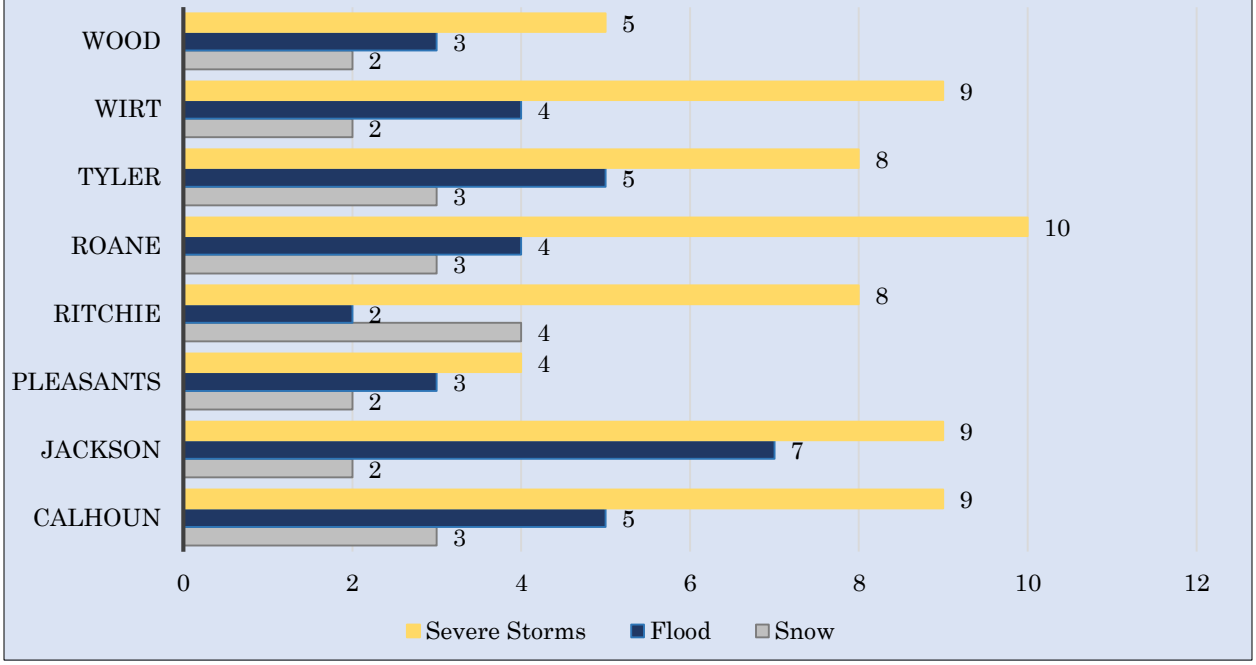


Figure 3.8 Major Disaster Declarations by Incident Type



3.4.3 Federal Disaster Data Compilation

Federally declared disaster data from the 2011 regional mitigation plan completed by the MOVRC and the 2013 State HMP was used to initiate the update to the record of disasters in the Mid-Ohio Valley for this 2016 HMP update. Additionally, new information was gathered from both the FEMA.gov webpage as well as the Storm Events Database found in the National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration. Additionally, due to the nature of the Emergency Declaration in January of 2014, information was gained from the Centers for Disease Control and Prevention Webpage.

3.4.4 National Climatic Data Center (NCDC)

NCDC *Storm Data* is published by the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce, and was used for this update. The storm events database contains information on storms and weather phenomena that have caused loss of life, injuries, significant property damage, and/or disruption to commerce. At the time data collection began, the NOAA's NCDC database provided information about events from 1951 through September 30, 2015. It is important to note that the type of events recorded in the NCDC database has changed significantly over time: from 1950 through 1954 only tornado events were recorded, 1955-1995 tornado, thunderstorm wind, and hail event were recorded, and

1996 – September 2015 the records have been expanded to include 48 event types.

Additionally, efforts are made to collect the best available information, but because of time and resource constraints, information may be unverified by the National Weather Service (NWS). The NWS does not guarantee the accuracy or validity of the information. Some individual rows in NCDC data could include every county and city in WV. Additionally, NCDC is known to have spotty recording of geological hazards (i.e., earthquake, landslide, and karst). Although the historical records in the database often vary widely in their level of detail, the NWS does have a set of guidelines for use in the preparation of event descriptions.

Furthermore, storm data collected by the NCDC are geographically categorized by county or by National Weather Service Forecast Zone (NWSFZ). Events that have a smaller areal coverage such as tornados, thunderstorm winds, flash floods, and hail are collected by each individual county they occur in. Conversely, events that take place on a larger scale, covering more ground, are collected by forecast zone such as excessive heat, extreme cold/wind chill, drought, flood, and winter weather. When search results indicate that the location of the event to be a county zone (example: Calhoun (zone)) this means that the event occurred within that county's NWSFZ and was not exclusive to that particular county. It is due to this nature of the NCDC data that property damages and crop damages are not exact in this representation.

While NCDC data does have some limitations as described above, the MOVRC did use the data to write this plan because it was also used to create the State HMP and a better dataset does not exist. In all cases NCDC records for these events are significant under-representations of what has happened in West Virginia's past.

NCDC Data Collection and Analysis

In order to search the NCDC storm events database the State or area to be examined must first be selected. Next, the start and end date for the time period to be searched must be set. Then, the county or counties must be selected, and finally the event type is chosen. If the results of the search yield over 500 events, the number of events is not accurately represented. It is for this reason data for this HMP was collected by breaking searches down into ten year periods (1950-1959, 1960-1969, 1970-1971, 1980-1981, 1990-1999, 2000-2009, and 2010-September 30, 2015). Each of the time periods were searched by individual counties. For example, searching the database in this manner would show the results for all recorded events in Calhoun County between 1990 and 1999. Next the results from each time period for each county were totaled to generate the number of a certain event in each county of the region.

As stated above, the NCDC Storm Events database uses 48 different event categories.

Of those 48 categories, data analysis indicated that 22 have occurred in the Mid-Ohio Valley Region. For the purposes of this report, the storm events identified to have occurred in the region were grouped into the major hazard types to be addressed by this plan. These groups are represented in table 3.14 below. After organizing the correct NCDC categories for this HMP and collecting the data according to those parameters analysis to identify summary statistics was performed.

HMP Category	NCDC Categories Identified in Mid-Ohio Valley	
Drought	Drought	
Extreme Cold	Extreme Cold/Wind Chill	Cold/Wind Chill
Excessive Heat	Excessive Heat	Heat
Flooding	Flash Flood	Flood
Hail	Hail	
High Wind	High Wind	Thunderstorm Winds
	Strong Wind	
Heavy Rain	Heavy Rain	
Lightning	Lightning	
Tornado	Funnel Cloud	Tornado
Wildfire	Wildfire	
Winter Weather	Blizzard	Ice Storm
	Frost Freeze	Winter Storm
	Heavy Snow	Winter Weather
Hurricane	Hurricane (Typhoon)	

Table 3.14 NCDC Combined Hazard Groups

During the course of this planning process the Nation Climatic Data Center underwent a name change and is now known as the National Centers for Environmental Information (NCEI) of the National Oceanic and Atmospheric Administration. The NCEI are responsible for hosting and proving public access to comprehensive atmospheric, coastal, oceanic, and geophysical data. While this name change occurred prior to the completion of this plan all references to NCEI data, formally NCDC were continually referred to as being collected from NCDC data sources. This is because at the time of the name change the document was partially completed and continual use of the NCDC title was evaluated and found to be the best option for consistency.

NCDC Events and Data Compilation

The NCDC database not only purports the occurrence of an event but also the number of injuries and deaths that happen as a result of that event. The database also lists the amount of property and crop damage incurred by the location due to the event. Table 3.15 below summarizes the number of injuries and deaths as well as the total

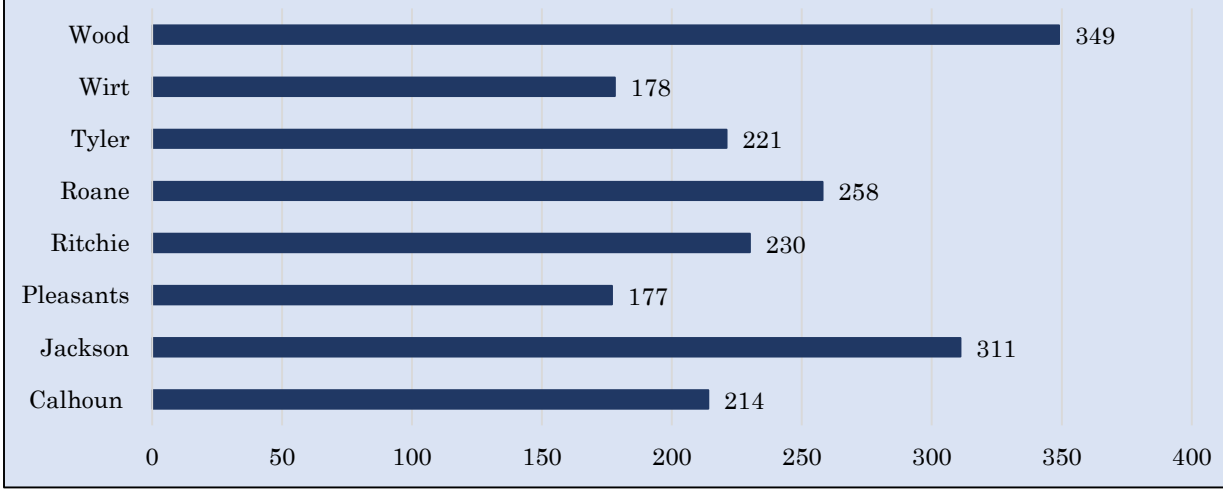
amount of property and crop damage sustained in the Mid-Ohio Valley as a result of each individual event type. When viewing this summary, it is important to keep in mind the period of record for the event types varies. For example, the database has only been recording Flooding events since 1996 and the region has experienced at least 50% more property damage during flooding events than any other event type.

Event Type	Period of Record	Injuries	Deaths	Total Property Damage	Crop Damage
Drought	1996-Sep 2015	0	0	$0	$0
Excessive Heat	1996-Sep 2015	0	0	$0	$0
Extreme Cold/Wind Chill	1996-Sep 2015	0	0	$563,130.93	$0
Flooding	1996-Sep 2015	3	4	$50,075,593.41	$44,302.24
Hail	1955-Sep 2015	3	0	$1,976,586.94	$44,348.82
Heavy Rain	1996-Sep 2015	0	4	$63,686.78	$0
Heavy Wind	1955- Sep 2015	29	0	$20,611,888.46	$0
Lightning	1996- Sep 2015	5	0	$346,923.20	$0
Tornado	1950-Sep 2015	14	1	$6,376,202.90	$0
Wildfire	1996-Sep 2015	0	0	$0	$0
Winter Weather	1996-Sep 2015	0	0	$8,619,579.28	$0
Total		54	9	$88,633,591.90	$88,651.26

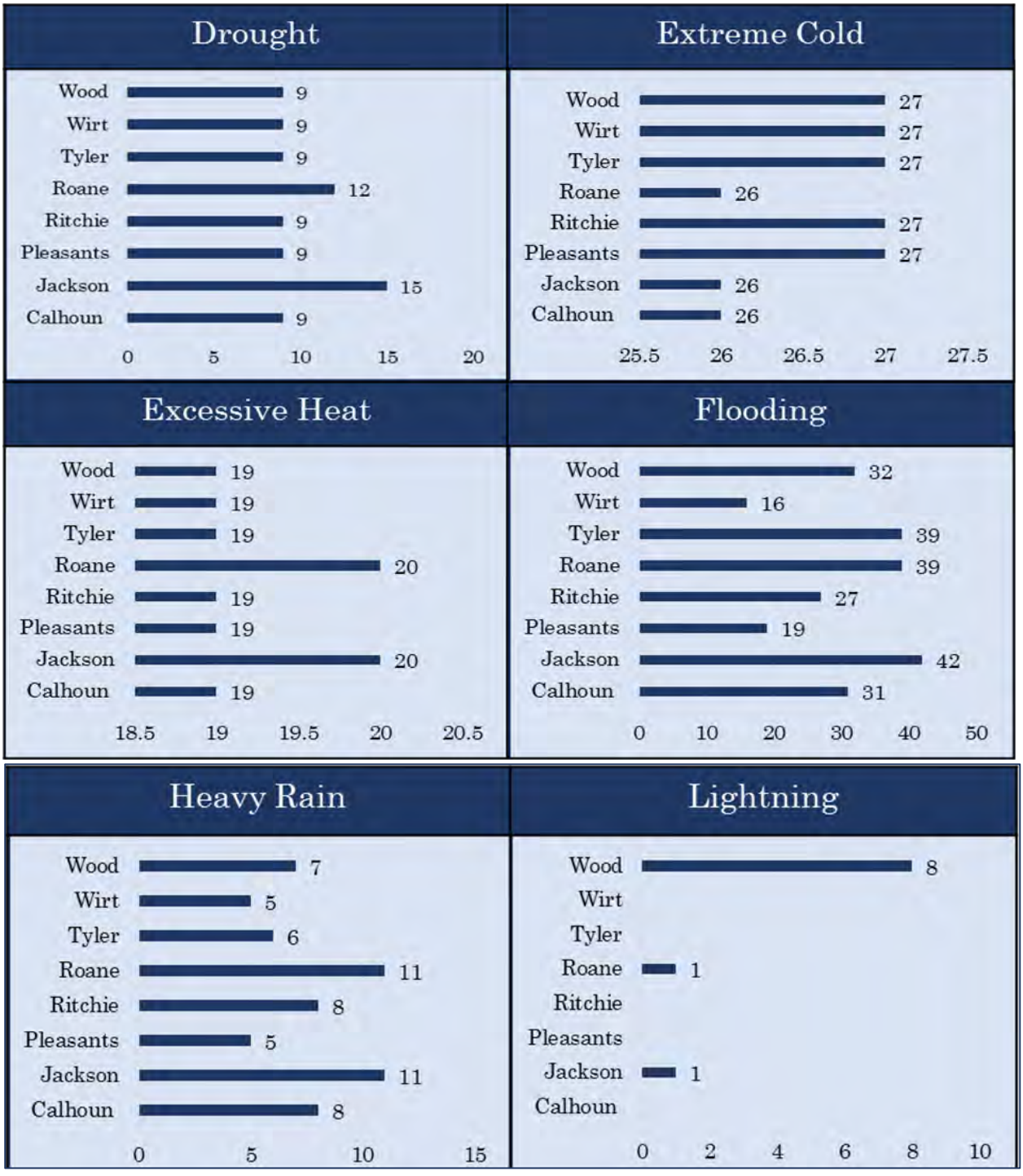
Table 3.15 Summary of Effects of Each Natural Hazard

The counties comprising the Mid-Ohio Valley region vary in topography, elevation, and location relevant to the floodplain. This has resulted in varied experiences with event types; some counties experience more weather events than others. Figure 3.9 below is a representation of the total number of recorded events by county.

Figure 3.9 Total NCDC Events Recorded in the Mid-Ohio Valley 1950-September 2015



Each county's variables also effect the likelihood of specific events occurring. The following figure 3.10 displays the number of times each weather event has happened in each county.



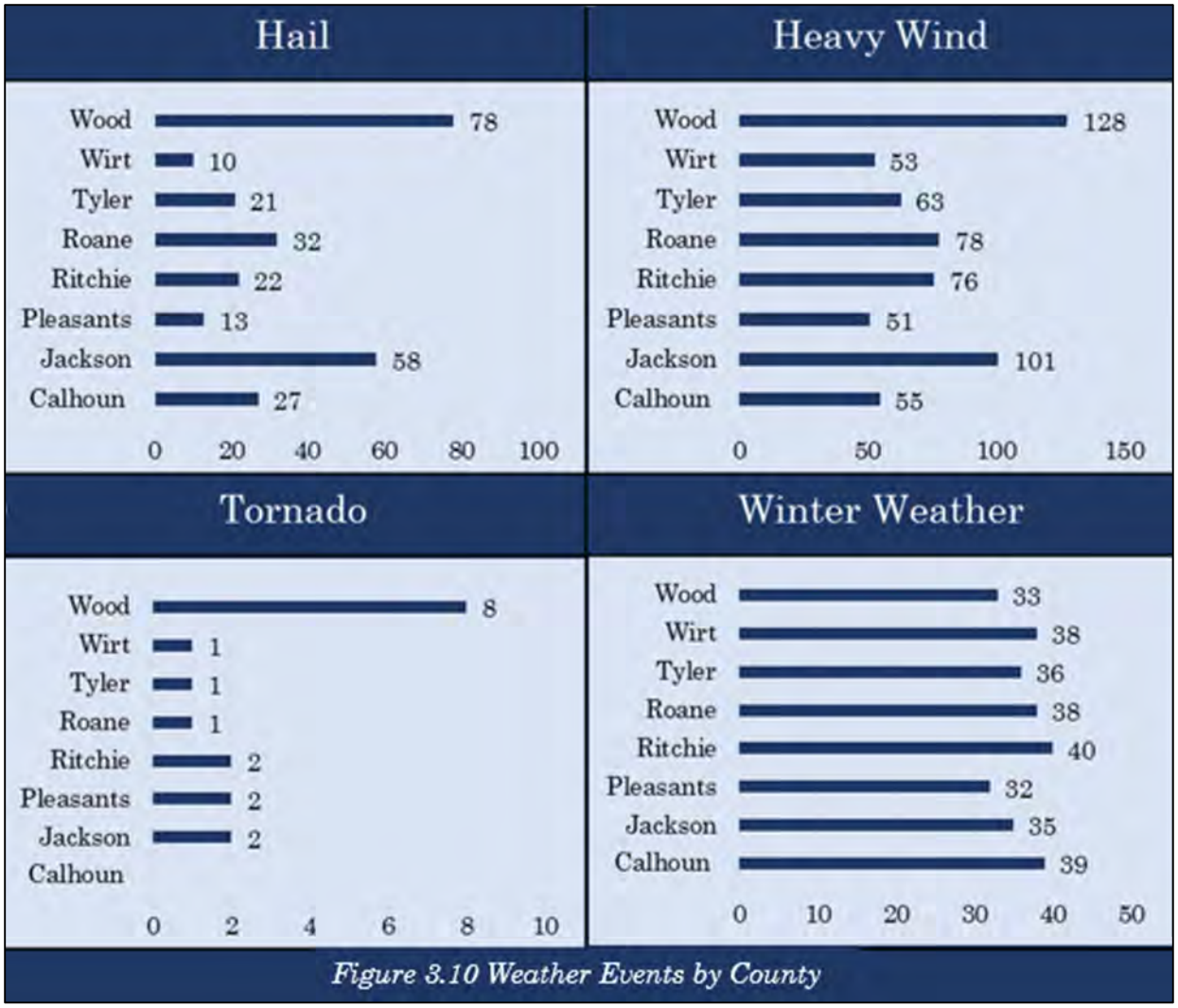


Figure 3.10 Weather Events by County

Weather events recorded by NCDC occur at a much higher frequency than events that require a major disaster declaration. Table 3.16 below displays a comparison of NCDC data and Disaster Declarations.

County	Major Disaster Declaration	NCDC Recorded Event	Percent of NCDC resulting in Disaster Declaration
Calhoun	17	214	7.94%
Jackson	18	311	5.79%
Pleasants	9	177	5.08%
Ritchie	14	230	6.09%
Roane	17	258	5.59%
Tyler	16	221	7.24%
Wirt	15	178	8.43%
Wood	10	349	2.87%
Average	14.5	242.25	(*percent of averaged figures*) 5.99%

Table 3.16 Comparing Disaster Declarations and NCDC Data

3.4.5 Hazards Addressed in Risk Assessment

The purpose of this plan is to analyze only natural hazards that pose a threat to the Mid-Ohio Valley. It should be noted that the above hazards are not a complete listing of hazards that may impact West Virginia. In order to identify the natural hazards to be addressed in this plan, the 2011 Mid-Ohio Valley HMP, the 2013 State HMP, Federally Declared Disasters, and NCDC data were analyzed. The following table 3.17 is a summary of the hazards addressed by each of the aforementioned resources for this plan.

2011 Mid-Ohio Valley HMP	• *Eliminated Risks:* Avalanche, Coastal Erosion, Coastal Storm, Hurricane, Land Subsidence, Tsunami, and Volcano • *Low Risks:* Dam Failure, Earthquake, Expansive Soils, Extreme Heat, Tornado, Landslides • *Significant Risk:* Flooding, Winter Storm, Severe Winds
2013 State HMP	• Flooding, High Wind/Severe Storm, Thunderstorms, Hurricane related wind events, Tornado, Winter Weather, Drought and Extreme Heat, Wildfire, Landslide, Earthquake, Land Subsidence, natural Resource Extraction, Dam and Levee Failure, HazMat, Nuclear Accidents.
Federally Declared Disasters	• Severe Storms, Straight-Line Winds, Flooding, Landslides, Mudslides, Hurricane Sandy, Tornadoes, Severe Winter Storms, Snow Storm, Heavy Rains
NCDC Storm Data	• Drought, Excessive Heat, Extreme Cold/Wind Chill, Flash Flood, Flood Frost Freeze, Hail, heavy Rain, Heavy Snow, Ice Storm, Lightning, Strong Wind, Thunderstorm Wind, Tornado, Wildfire, Winter Storm
Public/LEPC County Meetings	• Flooding, Landslides/slips and slides, Winter Weather, and High Wind
Online Survey Citizen Responses	• Drought, Extreme Cold, Excessive Heat, Flooding, High Wind, Heavy Rain, Lightning, Tornado, Wildfire, Winter Weather, Landslides, Earthquakes

Table 3.17 Hazards Addressed in Planning Resources

Based on review of federally declared Disasters, NCDC data, previous versions of the WV State HMP, the previous Regional HMP for the Mid-Ohio Valley Region, local HMP public meetings, and the online public survey tool, the following hazards (in order based on highest composite score identified through this plan's risk assessment) will be addressed and analyzed in this report:

1. Flooding, Section 3.6
2. High Wind, Section 3.7
3. Winter Weather, Section 3.8
4. Hail, Section 3.9
5. Heavy Rain, Section 3.10
6. Extreme Cold/Wind Chill, Section 3.11
7. Lightning, Section 3.12
8. Wildfire, Section 3.13
9. Tornado, Section 3.14
10. Landslides, Section 3.15
11. Excessive Heat, Section 3.16
12. Drought, Section 3.17
13. Dam Failure, Section 3.18
14. Potential Hazards with Limited Regional Precedent, Section 3.19
    a. Earthquakes, Section 3.19.1
    b. Hurricanes, Section 3.19.2
    c. Natural Resource Extraction, Section 3.19.3
15. Eliminated Risks, Section 3.20
    a. Avalanche, Section 3.20.1
    b. Expansive Soils, Section 3.20.2
    c. Coastal Flood and Erosion, Section 3.20.3
    d. Volcanos, Section 3.20.4
    e. Tsunami, Section 3.20.5
    f. Land Subsidence (Karst), Section 3.20.6

3.5 Hazard Assessment and Ranking Methodology

This plan uses hazard identification and risk assessment to provide a factual basis for developing mitigation strategies and for prioritizing those jurisdictions that are most threatened and vulnerable to natural hazards. For the purposes of compliance with the Disaster Mitigation Act as further specified by final Rule 44 CFR Section 203.401 (c)(2)(i), the plan only fully addresses the hazards identified in Section 3.4. Additional hazards may be more formally addressed during future plan updates as their significance warrants.

It is important to note that after initial review by the WV DHSEM, as counties, municipalities, and OES directors reviewed the plan multiple reviewers indicated their concern in categorizing any of the potential hazards as an "eliminated risk." Reviewers felt that using the term eliminated in reference to any hazard presented citizens with a false sense of security. For example, in the initial plan hazard events resulting from natural resource extraction were classified as an eliminated risk.

However, after discussion with plan reviewers and consideration this risk was revaluated to be included in a new category of "Potential Hazards with Limited Regional Precedent." This reclassification occurred because the potential for the hazard does exists in the region, even though it has never actually happened in the region it is possible. Only hazards that were eliminated geographically remain as an eliminated risk in this plan; because of the geographic location of the Mid-Ohio Valley Region it is an impossibility.

Categorizing hazards as an "eliminated risk" also presented an issue for hazards such as tornados and droughts that were scored as an eliminated for only some counties in the region. For example, through the risk assessment data analysis tornados were found to be an eliminated risk for Roane, Tyler, and Wirt Counties, a Low risk for Calhoun and Ritchie Counties, a Medium-Low for Jackson and Pleasants Counties, and a Medium risk for Wood County. Tornados are still possible in Roane, Tyler, and Wirt counties; the combination of factors evaluated in the risk assessment just indicate that tornados have presented a minimal risk in those counties to this point in time. Tornados can still absolutely occur in those counties and have significant impact, the possibility exists there is just a minimal risk of that happening.

Labeling these hazards as an eliminated risk may present a false sense of security to any citizen or person reading this hazard mitigation plan. At the time this issue was identified, the majority of the graphics and maps were competed for this plan using "eliminated risk" as level of risk distinction. Instead of going back and recreating the very numerous maps and graphics to correct this issue, the MOVRC planners addressed the issue in the following way. For each individual hazard that was evaluated as an eliminated risk for one or more counties an explanation is provided in the risk assessment section; for tornado it is section 3.14.3. It is explained that the hazard is still very much a risk in the each of the region's counties and not to be confused by the terminology used. Each explanation is bolded and apparent to readers.

In future planning efforts, MOVRC planners have decided the phrase minimal risk will be used in place of eliminated risk. Minimal risk implies that the hazard is still present and a possibility in the county however, the risk presented by the hazard is minimal.

3.5.1 Ranking Methodology

For the purposes of this plan, the MOVRC utilized the same standardized methodology developed by the State to compare different hazards' risk on a county basis. This method prioritizes hazard risk based on a blend of quantitative factors

extracted from NCDC and other available data sources. This risk assessment ranking has been structured to identify:

1. Population vulnerability
2. Population density
3. Events
4. Property damage
5. Crop damage
6. Injuries and/or Deaths
7. Local input (public meetings and online citizen survey)
8. Geographic extent

The above eight ranking parameters were used to determine jurisdiction based hazard rankings. Each parameter was rated on a scale of 1 through 4, with those rated 1 considered low risk and those rated 4 considered high risk. These scores were summed at a county level for each hazard separately, allowing for easy comparison between counties for each hazard type. A summation of all the scores for all hazards in each county which provides a composite, "all-hazards" risk prioritization can be found in section 3.5.9.

In order to compare NCDC data simply, events and damages were all annualized. This was accomplished by taking the parameter of interest and dividing by the length of record for each hazard; the total number of occurrences of a particular event type divided by the number of years that event type has been recorded. A summary of the parameters and the period of record used for each hazard can be found in the Section 3.4 where use of NCDC data is further described.

Hazards to be assessed in this risk assessment were identified by evaluating previous State and regional HMPs as well as through public input. If a hazard was addressed in a previous plan, even if listed as an eliminated risk, it was included in the risk assessment. Furthermore, if a hazard was listed on the online public survey or brought up during a public meeting it was evaluated through the risk assessment.

Comparing and prioritizing the risk posed by different hazards requires a system for equalizing the units of analysis. Risk analysis requires reliable estimates of probability and impact data for all comparable hazards. Many of the hazards assessed in this plan did not have quantifiable probability or impact data, so a semi-quantitative scoring system was used to compare hazards. This system allows for greater flexibility and more room for expert judgment. An overview of the eight parameters used in ranking follows.

3.5.2 Population Vulnerability and Density

Population density and vulnerability are important factors in the risk assigned to a county. A hazard event that occurs in a highly populated area generally has a much higher impact compared to an event that takes place in a very rural, sparsely populated area. Two population parameters were used to account for counties with high populations and counties with densely populated areas. Population density was given a weight of 0.5 in an effort to avoid biasing the composite ranking with population data. This 2016 plan update utilized United Sates Census Bureau population estimates for 2014.

Population vulnerability was calculated as the percent of the total population of the region present in each county. The 2014 U.S. Census population estimates for each county were divided by the total population for the Mid-Ohio Valley Region and multiplied by 100; a value between one and four was assigned based on a geometric breaks pattern. By ranking counties this way, those counties with significantly larger populations have effectively been given extra weight.

Population density was based on the population per square mile for each county. The 2014 census population estimates for each county were divided by the total square miles for the county; a value between 1 and 4 was assigned based on geometric intervals. By ranking jurisdictions his way, those counties with densely populated areas have effectively been given extra weight.

3.5.3 Events

Although it lacks a comprehensive dataset for all hazards, the NCDC record of historical occurrences of hazards is an important factor in determining where hazards are likely to occur in the future. Annualizing this database provides a rough estimate of the number of times a county might experience a particular hazard event in any given year. This was accomplished using an approach similar to the other methods described above. For each hazard type in each county, the total number of events in the NCDC database was divided by the total years of record for each hazard to calculate an annualized events value. As stated above the NCDC Storm Events Database is not a complete record of all types of hazard events in WV. Therefore, when applicable, total event data that has not been recorded in the NCDC has been supplemented with addition data from other sources. For example, earthquake, wildfire, landslide, and mining event total were supplemented with data from sources such as the United States Geological Survey (USGS), the West Virginia Geological & Economic Survey (WVGES), and the West Virginia Division of Forestry (WVDOF). A complete list of supplemental resources can be found in Appendix D.

3.5.4 Property and Crop Damage

Property damage and crop damage were analyzed separately and each county was assigned a score of 1 to 4 for each damage parameter. This data was obtained from the NCDC storm events database, inflated into 2015 dollars, and annualized according to the period of record for each event category.

3.5.5 Death and Injuries

NCDC data was utilized to examine natural events that caused deaths or injuries in the Mid-Ohio Valley Region. Due to the critical importance of mitigating the risk to life and health, hazards having no reported deaths or injuries were assigned a ranking of 1 and hazards resulting in at least one death or injury were assigned a 4.

3.5.6 Local Input

The 2013 WV State HMP utilized local plan rankings as a quantitative factor in performing the state risk assessment. As a regional plan this document serves as the local plan for multiple jurisdictions and more localized HMPs do not exist this was not an option for the regional plan. However, to ensure that the opinions and insights of local citizens, emergency personnel, and planners was incorporated into this plan; information gathered at the local level was used to perform the risk assessment. These opinions and insights were gathered through two avenues; first through discussion at public meetings in each of the region's eight counties. These public meetings were held in conjunction with Local Emergency Planning Committees with the exception of Wirt County's which was held in conjunction with a County Commission meeting. The meetings were advertised in local newspapers and those that attended discussed local mitigation hazards and efforts in their community. The second avenue was an online survey, a link to which was included in with the published advertisement for each public meeting. A copy of the meetings notes can be found in Appendix B and questions posed by the online citizen survey can be found in Appendix F at the end of this plan.

The information gained from local public input was included in the risk assessment. First, if during the discussion a hazard type was brought up by a member of the public or by a member of the LEPC during the public meetings it received two points. Secondly, information gained through the online survey was also utilized in completing the risk assessment. The survey requests the taker to select the hazard that they feel presents the largest threat to their community and in the second largest threat to their community. If a hazard was identified by a person in a county as presenting the largest or second largest threat to their community that county received a point. If a hazard was identified by individuals in a county as presenting the largest and second largest threat to their community that county received two points for that hazard.

3.5.7 Geographic Extent

Most hazards have a defined geography where it is more likely the hazard will occur in the future. To be able to include this in the ranking system, each hazard has been assigned individual scores based on the available hazard data. Initial data sources for geographic extent are shown in table 3.18, however an extensive complete list of data sources used in the creation of this risk assessment is included in Appendix D of this document.

Hazard	Data Source
Avalanche	NOAA National Weather Service Winter Preparedness Week NWS
Coastal Erosion	NOAA National Weather Service Instruction, Storm Data Preparation
Dam Failure	Corps Map National Inventory of Dams
Drought	NOAA Climate.gov
Earthquake	USGS Earthquake Hazards Program, earthquake archives
Excessive Heat	NOAA Climate.gov
Expansive Soils	USGS AASG National Geologic Map Database
Extreme Cold/Wind Chill	NOAA Climate.gov
Flooding	Map WV
Hail	NOAA Severe Weather Data Inventory
Heavy Rain	NOAA Severe Weather Data Inventory
Strong Wind	NOAA Severe Weather Data Inventory
Hurricane	NOAA NWS National Hurricane Center
Land Subsidence	USGS Principal Karst Aquifers of the U.S.
Landslides	USGS Landslide Overview Map of the Conterminous U.S.
Lightning	NOAA Severe Weather Data Inventory
Natural Resources Extraction	WVGES Oil and Gas Wells of WV and WVGES Underground and Surface Coal Mines
Tornado	NOAA NCDC Average Annual Number of EF0-EF5 Tornados
Tsunami	NOAA National Weather Service Instruction, Storm Data Preparation
Volcanos	USGS U.S. Volcanoes and Current Activity Alerts
Wildfire	WV Division of Forestry Latest Forest Fire Report
Winter Weather	NOAA National Centers for Environmental Information Snow Cover Maps

Table 3.18 Data Sources Used to Determine Geographic Extent

3.5.8 Limitations of Ranking

The NCDC data, as described in section 3.4, is not a complete data source. It was chosen for use in raking because of its standardized collection of many of the hazards that face the Mid-Ohio Valley Region and also because it was utilized to complete the

hazard risk assessment in the 2013 WV State HMP. Unfortunately, the data set is lacking in terms of geological hazards and was thusly supplemented by information from other sources outlined in table 3.12 above for geographic extent. Furthermore, the NWS does not guarantee the accuracy or validity of the information used for weather-related hazards. Although the historical records in the database often vary widely in their level of detail, the NWS does have a set of guidelines for use in the preparation of event descriptions.

3.5.9 Composite Hazard Ranking

Composite risk for each county was determined by adding the scores for population vulnerability, population density, annualized events, property damage, crop damage, local input, geographic extent, and injuries and deaths together for each hazard. As stated above this risk assessment included all natural hazards, even eliminated hazards, from previous plans and those mentioned in public venues. The composite hazard ranking scores for all hazards were set to a scale: eliminated risk < low < medium-low< medium < medium-high < high. Those hazards achieving a composite hazard ranking below 9.5 were deemed an eliminated risk. This threshold was set because it accounts for the base score in each county determined by population vulnerability, population density, and injuries and deaths. The population factors remain the same in each county for every hazard. The injuries and deaths total is included in the standard score because each hazard scored at least a 1 if the potential for injury or death existed as a results of a hazard, regardless of whether injure or death had actually resulted from the hazard in that particular county.

As explained in each relevant section, some hazards were evaluated as being an eliminated risk for one county in the region while the rest of the region scored a low or even medium-low for that hazard. For example, for heavy rain Calhoun County scored as an eliminated risk while Wood County scored a medium-low risk. Instances like these are not to be interpreted as that hazard not presenting a risk for that county. The reasons for the scoring occurring in these manner is explained in each respective section. **Only hazards in section 3.20 Eliminated Risks should be considered not to pose a threat to the Mid-Ohio Valley Region**. All other hazards must be considered as a possibility in the region.

This section contains a summary table depicting the composite score identified for each hazard in each county identified through the risk assessment. Additionally, the ranking of the risk presented by each hazard is also identified. A detailed explanation of the risk, and its effect on the Mid-Ohio Valley region is contained in sections 3.6 – section 3.20 of this Chapter. Table 3.19 displays the composite hazard ranking for each hazard as identified through the risk assessment for this plan.

Natural Hazard	Calhoun	Jackson	Pleasants	Ritchie	Roane	Tyler	Wirt	Wood
Avalanche	3	4	3.5	3	3	3	3	6.5
Coastal Erosion	3	4	3.5	3	3	3	3	6.5
Dam Failure	3	8	4.5	5.5	5.5	4	3	8.5
Drought	6.5	9	7	6.5	8	6.5	7.5	14
Earthquake	4.5	6.5	4.5	4	4.5	4	4.5	10.5
Excessive Heat	9.5	10.5	12	9.5	9.5	9.5	9.5	14
Expansive Soils	3	4	3.5	3	3	3	3	6.5
Extreme Cold/Wind Chill	12	12	13.5	13	14	11	11	17.5
Flooding	20.5	22.5	19.5	20	21	21	20	24
Hail	12.5	14.5	12.5	12.5	13.5	12.5	13.5	18
Heavy Rain	11.5	13.5	13.5	14.5	14.5	12.5	12.5	17
High Wind	17.5	20.5	17.5	17.5	18.5	16.5	16.5	24.5
Hurricane	6	7	6.5	6	6	6	6	9.5
Land Subsidence	5	6	5.5	5	5	5	5	8.5
Landslides	12.5	10.5	9.5	9.5	9.5	9.5	12.5	11.5
Lightning	11	13	10.5	10	14	10	11	16.5
Natural Resource Extraction	7	7	6.5	7	5	5	4	7.5
Tornado	11	13.5	12.5	11	9	9	9	16.5
Tsunami	3	4	3.5	3	3	3	3	6.5
Volcanos	3	4	3.5	3	3	3	3	6.5
Wildfire	10	11	10.5	10	14	10	11	16.5
Winter Weather	15.5	20	16	15	17.5	16	15.5	18

Table Key	
Eliminated Risk	0 – 9.0
Low	9.5 – 11.5
Medium – Low	12.0 – 14.0
Medium	14.5 – 16.5
Medium – High	17.0 – 19.0
High	19.5 ≤

Table 3.19 Composite Hazard Ranking by County and Table Key

3.6 Flooding

As described in section – this risk assessment has not taken into consideration the estimated potential loss resulting from flooding events due to a lack of data. Accurate estimations of property value are not attainable at this time as mapping has not yet

been completed. To correct this issue MOVRC planners have included mitigation action 2016-40 which reads:

> *Complete GIS Mapping in all of the region's counties that do not currently have it, to better identify the risk to life and property presented by flooding which will be used in the future with TEIF software. Work with County Assessors to identify the actual location and value of properties in each county to assess the value of the property and the risk presented by flooding.*

This mitigation action has been included under mitigation goal three "Improve Understand of Risk and Vulnerability for Planning Purposes." This goal has been included in the plan to establish actions that need to be taken before the next plan update to remedy issues found in the planning process during this update. Gathering more complete and county specific data will enable planners in 2022 to develop a more comprehensive assessment of flooding in the Mid-Ohio Valley. Goal three and the according mitigation actions can be found in section 4.2.2 of this plan.

3.6.1 Description

According to the NWS NCDC Operations and Service Performance document a flood is defined as any high flow, overflow, or inundation by water which causes or threatens damage. In general, this would mean the inundation of a normally dry area caused by an increased water level in an established watercourse, or ponding of water, generally occurring more than 6 hours after the causative event, and posing a threat to life or property. This can be on a widespread or localized basis. During floods, the land area, including watercourse, that is susceptible to partial or complete inundation by water from any source. Figure 3.11 displays an example of the floodplain in the City of St. Marys in Pleasants County. Floodways are the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. An additional resource for citizens and homeowners is the WV Flood Tool which can be found at www.mapwv.gov/flood/. The WV Flood Tool displays the 100-year floodplain overlaid on a map of the state of West Virginia. Using the Tool is similar to

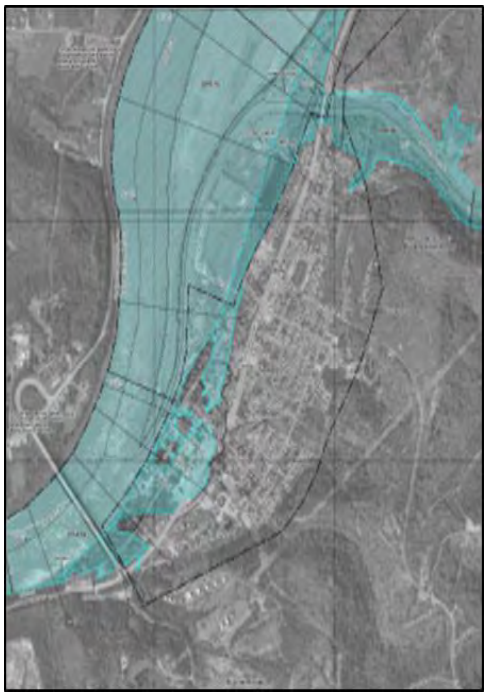


Figure 3.11 FEMA Floodplain in Saint Marys, WV

using google maps and can provide useful information to anyone questioning the floodplain of an area in West Virginia.

Flooding Types

Flash Flooding – For the purposes of this plan, flash floods and flooding have been combined for consideration and analysis. Flash floods are defined as a rapid and extreme flow of high water into a normally dry area, or a rapid water level rise in a stream or creek above a predetermined flood level, beginning within six hours of the causative event, on a widespread or localized bases. In some cases, flooding may even occur well away from where heavy rain initially fell, though this is more common in the western United States. While flash floods can be caused in many ways, the most common is the result of copious amounts of rainfall from thunderstorms that cause flash flooding. This can also occur when slow-moving or multiple thunderstorms move over the same area. The sudden downpours can cause water levels to rapidly change in streams or creeks and turn the usually small waterways into raging rivers. Additionally, steep, hilly or mountainous terrain produces rapid runoff and quick stream response because water can travel downhill at greater speeds into rivers and over land. After a time, ongoing flooding can intensify to flash flooding in cases where intense rainfall results in a rapid surge of rising flood waters.

River Flooding – According to the NWS NOAA river flooding occurs when river levels rise and overflow their banks or the edges of their main channel and inundate areas that are normally dry. River flooding is classified as Minor, Moderate, or Major based on water height and impacts along the river that have been coordinated with the NWS and local officials. Minor river flooding means that low-lying areas adjacent to the stream or river, mainly rural areas and farmland and secondary roadways near the river flood. Moderate flooding means water levels rise high enough to impact homes and businesses near the river and some evacuations may be needed. Larger roads and highways may also be impacted. Major flooding means that extensive rural and/or urban flooding is expected. Towns may become isolated major traffic routes may be flooded. Evacuation of numerous homes and business may be required. There is an additional level of flooding known as record flooding. In many cases this falls into the major flood category, but it does not have to. A record flood is simply one where the water reaches a level higher than it ever has been recorded before. Therefore, record flooding can cause extensive damage or even no damage or other negative impacts at all.

Flooding Causes

Floods and flash floods can be caused by a variety of different natural events as well as human created events. The following provides a description of some of the causes of flooding.

Ice/Debris Jams – Ice jams, which are more common in more northern states, occur during winter and spring months as ice begins to melt. Debris jams however can occur at any time. Such situations occur when ice or debris move downstream and it gets caught on any sort of obstruction to the water flow. When this occurs, water can be held back, causing upstream flooding and when the jam finally breaks, flash flooding can occur as the water moves downstream. Ice jams are resolved when the ice and snow melt whereas debris jams are corrected by either taking removal actions or simply waiting for the debris to subside naturally.

Snowmelt – Snowmelt flooding occurs when the major source of water involved in a flood is caused by melting snow. Northern states and mountainous areas are particularly susceptible to snowmelt flooding. Unlike rainfall that can reach the soil almost immediately, the snowpack can store the water for an extended amount of time until temperatures rise above freezing and the snow melts. This frozen storage delays the arrival of water to the soil for days, weeks, or even months. Once it begins to melt and does reach the soil, water from snowmelt behaves much as it would if it had come from rain instead of snow by either infiltrating into the soil, running off, or both. Flooding can occur when there is more water than the soil can absorb or can be contained in storage capacities in the soil, rivers, lakes and recovers.

Dry Wash – In dry areas of the U.S. significant rainfall can quickly cause flooding because of the soil's inability to absorb much of the precipitation that does fall. The water from these storms rushes to low-lying areas, often into a canyon or dried up river bed. This is not a common type of flood in the Mid-Ohio Valley due to the region's climate.

Dam Breaks/Levee Failure – Causes of dam failure vary from natural causes such as prolonged rainfall, landslides, earthquakes, or erosion to human causes such as improper maintenance and design, negligent operation, or sabotage and terrorism. More information on dam failure can be found in section 3.18 of this plan.

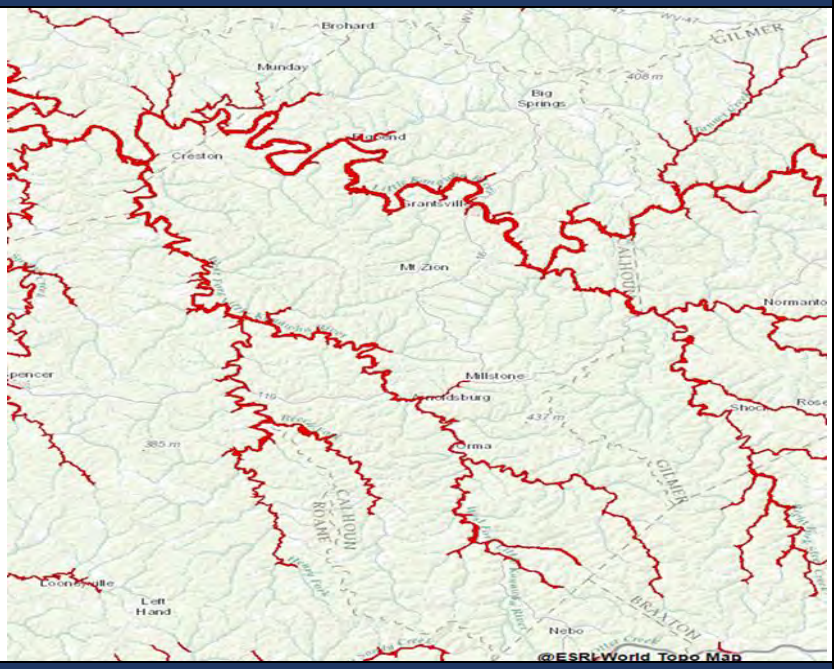
3.6.2 Historic Occurrence

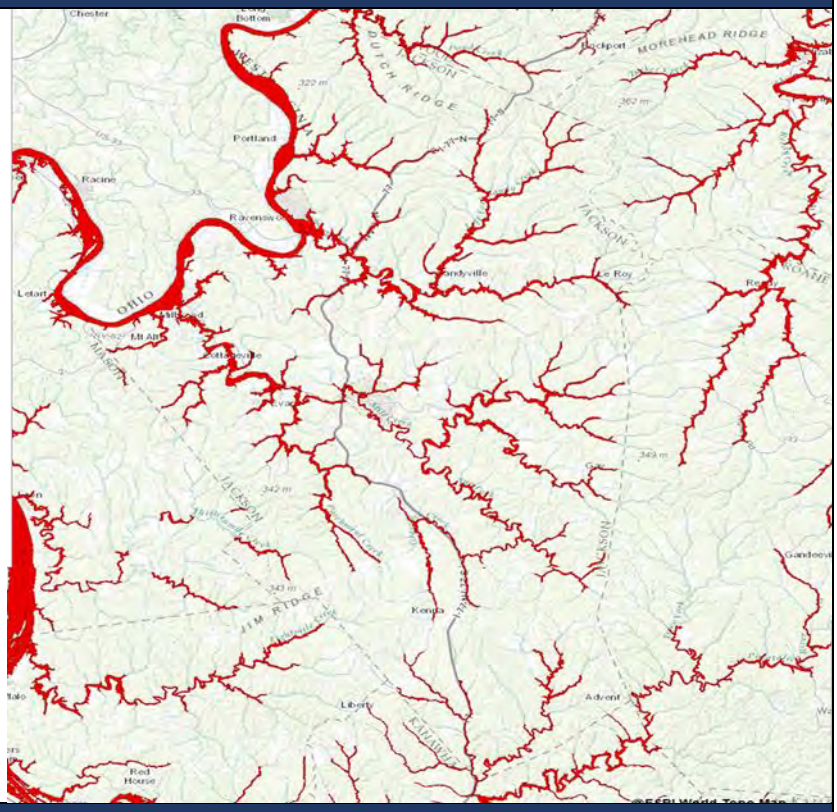
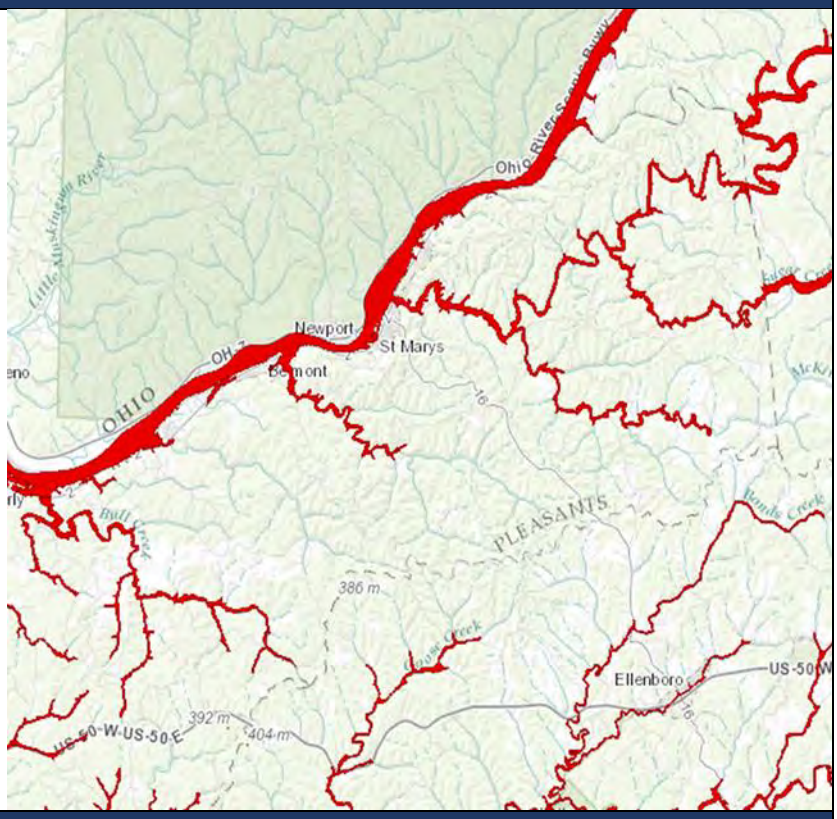
The NCDC Storm Events Database began recording flood events in 1996 and table 3.20 below provides summary information for the recorded flood events in each county. Although some hazards such as tornados, hail, and thunderstorm winds have been recorded in the NCDC database for 60 years or longer, the recorded flood events have resulted in more total property damage than all other hazards covered in this HMP combined. Flood events have resulted in a total of $50,075,593.41 for the Mid-Ohio Valley and all other hazards have combined for a total of $38,557,998.49.

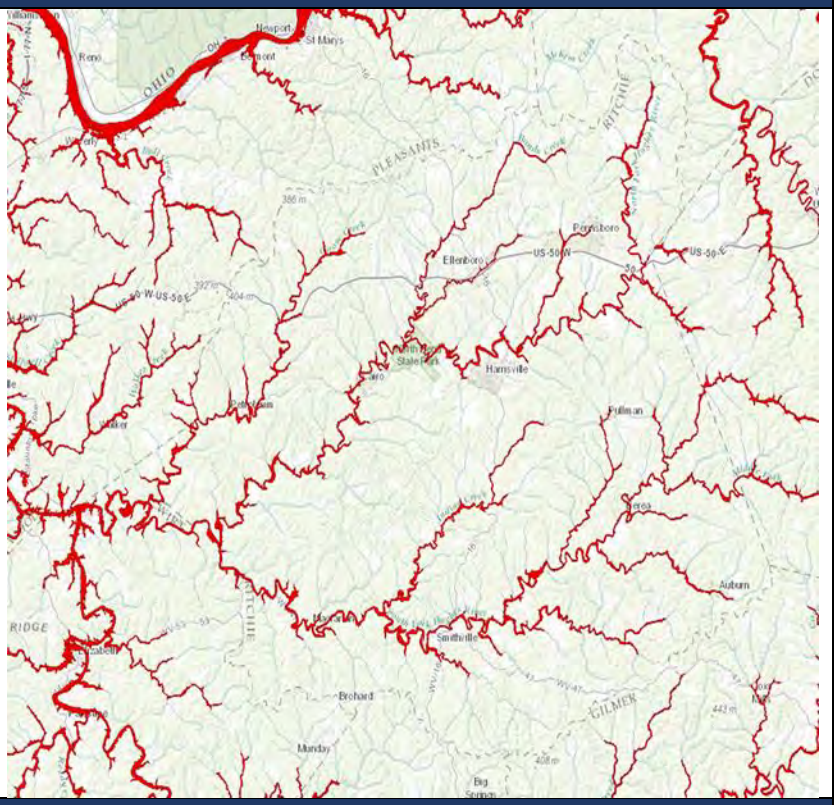
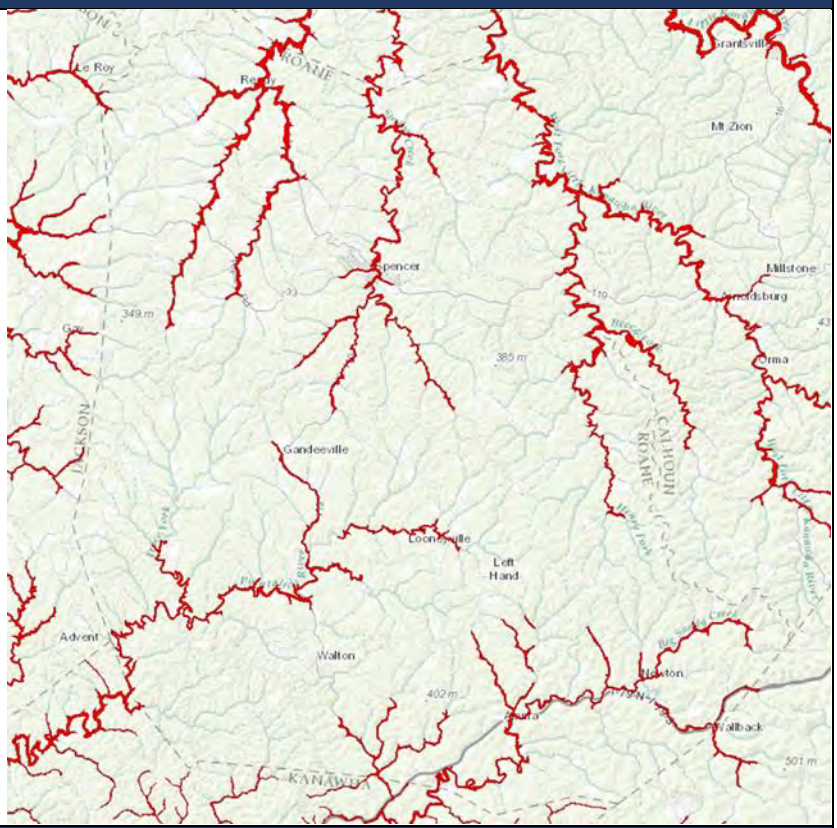
County	Total Events	Property Damage	Average Yearly Property Damage	Total Crop Damage
Calhoun	31	$3,319,029.83	$174,685.78	$0.00
Jackson	42	$3,748,078.52	$197,267.29	$36,918.54
Pleasants	19	$2,783,038.93	$146,475.73	$0.00
Ritchie	27	$4,494,817.51	$236,569.34	$0.00
Roane	39	$16,356,529.43	$860,869.97	$0.00
Tyler	39	$4,076,290.44	$214,541.60	$0.00
Wirt	16	$3,454,125.55	$181,796.08	$7,383.71
Wood	32	$11,843,683.20	$623,351.75	$0.00

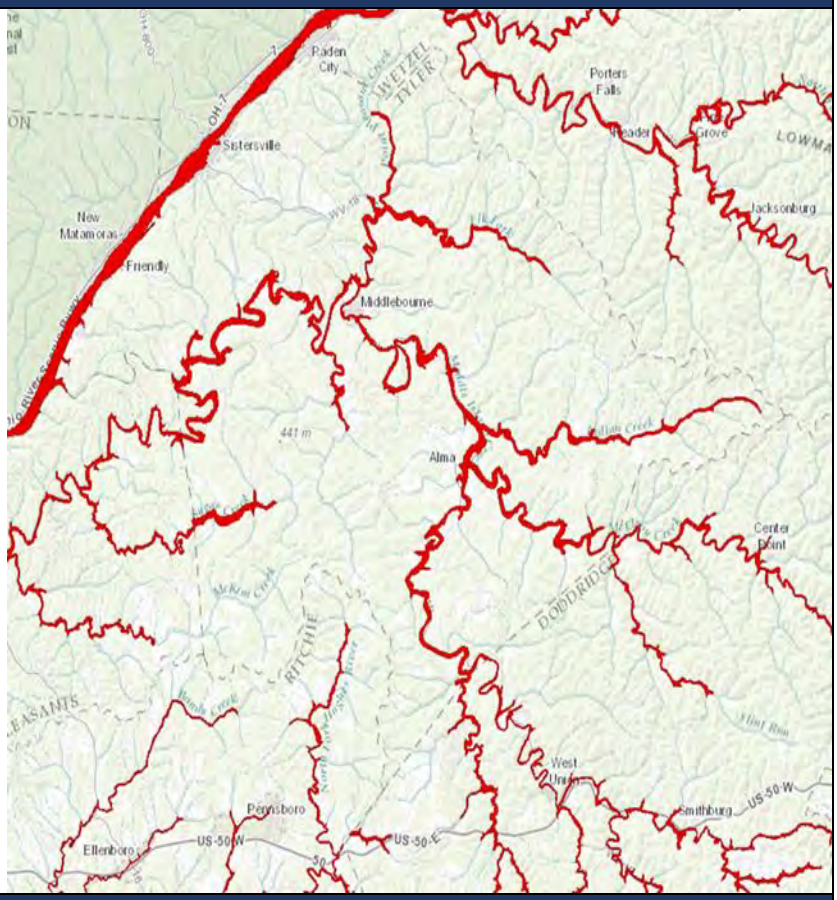
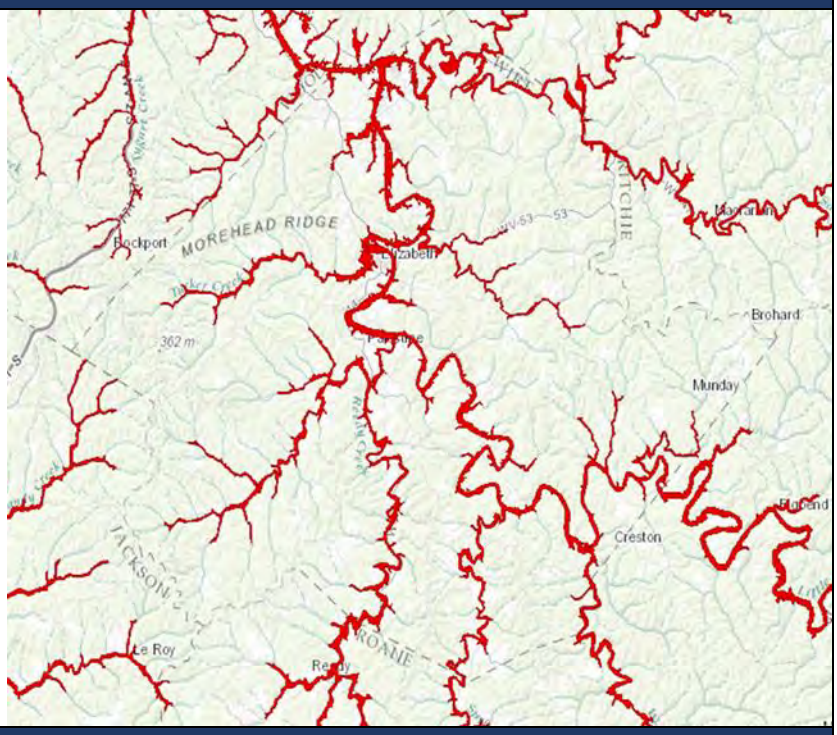
Table 3.20 Summary Statistics for Flooding by County (adjusted for inflation)

While flooding has only been recorded since 1996 it has a much longer history in the Mid-Ohio Valley Region. The region's counties all contain various rivers, streams, and creeks. Table 3.21 below displays topographical maps depicting the rivers and streams within each county with an overlay of the 100-year floodplain as depicted through the West Virginia Flood Tool. The left column lists streams identified in the Region's 2011 HMP as susceptible to flooding. While the region's previous plan did list various details concerning historical floods in each county, those details could not be used in this 2016 Plan's risk assessment for various reasons. Specifically, the information was not filtered with the same restrictions used by the NCDC when recording incidents in the Storm Events Data base. Additionally, not all of the same information used in the risk assessment is present for each incident reported such as injuries, deaths, crop damage, and property damage statistics.

Calhoun	
Little Kanawha River, West Fork of Little Kanawha River, Steer Creek, left For Run, Bull Creek, Walker Creek, Leading Creek	

Jackson	
Ohio River, Mill Creek, Sandy Creek, Pocatalico Creek	
Pleasants	
Ohio River, Middle Island Creek, French Creek, Bull Run	

Ritchie	
Goose Creek, Bonds Creek, Homers Run, Bunnels Run, North Fork of the Hughes River, Right Fork of Bone Creek, Hushers Run, Left Fork of Slab, South Fork of Hughes River	
Roane	
Reedy Creek, Spring Creek, Left-hand Run, Cottentree Run, Little Left-hand Run, Slate Run, Laural Run, Right Fork, Silcott Run, Roost Run, Dog Creek, Granny Creek, Little Pigeon Run, Goff Run, Pocatalico River, Big Lick Run, Boggs Run, Tanner Creek, Tucker Run	

Tyler	
Point Pleasant Creek, Indian Creek, Buffalo Run, Elk Fork, Sancho Creek, Middle Island Creek, Pursley Creek, Gorrell Run, McElroy Creek Sugar Creek, Ohio River	
Wirt	
Hughes River, Little Kanawha River, West Fork, Spring Creek	

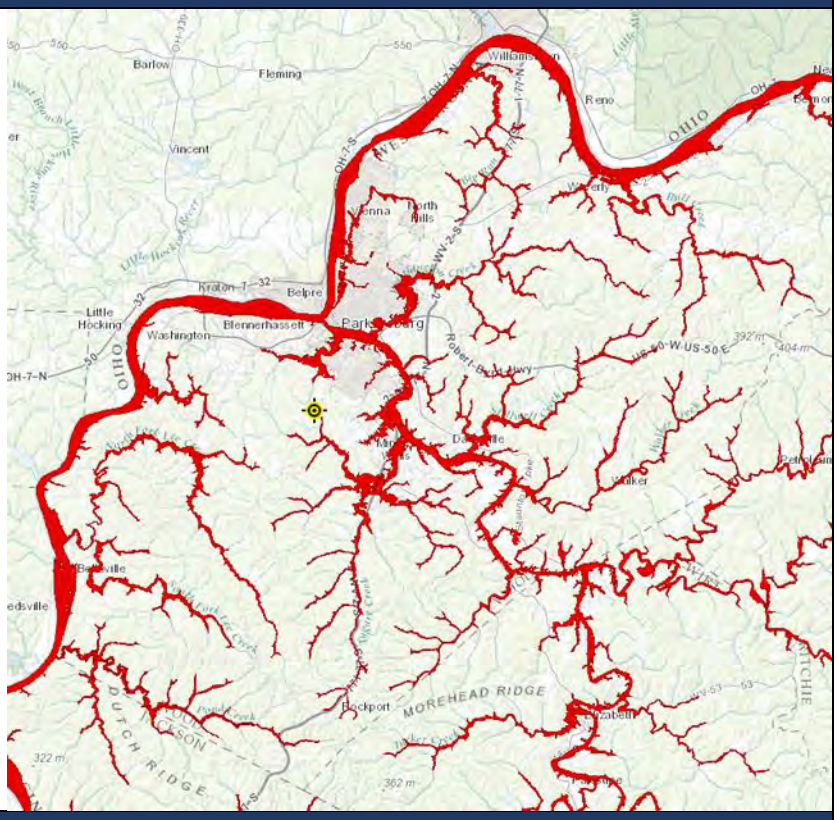
Wood	
Ohio River, Little Kanawha River, Bull Creek, Briscoe Run, Tygart Creek, Walker Creek, Slate Creek, Hughes River	

Table 3.21 Rivers and Streams located in the MOV Region, WV Flood Tool Overlay

Hazard's Impact on Region

The rise and increase flow of floodwaters can completely destroy homes and buildings, damage possessions, and decimate roadways. However, the damage is not complete after floodwaters begin to recede. Standing water hides many dangers including toxins and chemical, floodwater often become contaminated with sewage or chemicals, gas leaks and live power lines can be deadly but are not obvious at first glance. When flood waters overtake a property not only does the property incur water damage, but also everything the floodwaters bring with it and leave such as mud, sludge, animals, and various types of debris.

Flooding impacts the Mid-Ohio Valley region in two main ways 1) damaging structures such as homes, businesses and public buildings and 2) disruptions in transportation. The Mid-Ohio Valley region contains several locations that feature homes or businesses that are considered repetitive loss structures, meaning they have been effected and damaged by floodwaters or flooded on multiple occasions. Not every home or property affected during a flood is considered a repetitive loss structure but properties that have been effected multiple times by multiple floods are considered repetitive loss.

Floodwaters also affect the Mid-Ohio Valley's transportation by blocking roadways with water or debris during a flood, and by structural or physical damage to transportation infrastructure. Flooding can break up or move pavement, block or damage bridges and culverts, wash out banks below and above the road and leaving debris blocking the road. Repairing these types of damages can take various lengths of time, the removal of debris may only take a few days however repairing a roadway that the bank has been washed out from underneath may take months or years depending on the extent of the damage and the capacity of the roadway.

Hazard Extreme in the Mid-Ohio Valley

The following table 3.22 describes examples of the most notable floods identified in the 2011 regional HMP but not occurring in the correct time frame to be counted in this 2016 HMP's risk assessment. While the information regarding historic flooding is not included in the NCDC Storm Events Database and capable of being used in this plan's risk assessment, it is important to note the long history of flooding within the Mid-Ohio Valley Region.

Notable Previous Flood Events in Each County	
Calhoun	• The flood stage for the area is at 23ft in Glenville. Notable floods in the county have occurred in Grantsville the County Seat. Such flood events occurred on March 13, 1918 with a flood stage of 42.7ft, April 16, 1939 with a flood stage of 43.1ft, and March 7, 1967 with a flood stage of 43.7ft.
Jackson	• Backwater flood elevations of the above identified streams are directly affected by the level of the Ohio River and in turn the ability to discharge into the pool from upstream sources. Some of the most notable floods occurring in Jackson County happened on December 10, 1978 which crested at 45.4ft and in 1994 which crested at 46.9ft at the Racine Locks.
Pleasants	• Extensive floodplain lands along the Ohio River and areas lying along tributary streams are subject to Ohio River flooding through the effects of backwater flooding. The U.S. Army Corps of Engineers has established an Intermediate Regional Flood Level of 625.1. Notable flood events in Pleasants County have occurred in February 1884, reaching an elevation of 627.3, March 1913 reaching an elevation of 631.1, and in January 1937 reaching an elevation of 626.9.
Ritchie	• Flooding in Richie County is more localized than in Counties along the Ohio River. The notable flood incidents in the County did not include flood levels however it did include the number and types of properties effected. Notable floods have included a flood in 1950 which effected Cairo, Pullman, Smithville, Auburn, and Berea which effected 90 homes, businesses, and churches.
Roane	• Flooding in Roane County differs from neighboring counties along the Ohio River in that the floods tend to be at times very

	intense and of short duration. Major notable floods have occurred along Reedy Creek, Spring Creek, Goff Run, Hurricane Creek, Big Sandy, and Tanner Run.
Tyler	• The 2011 HMP established a reasonable crest elevation for Tyler County as 630.0. Notable flood events have occurred in March 1913 reaching a flood elevation of 642.3, in March 1936 reaching 640.8 and in January 1943 reaching 638.8.
Wirt	• Flooding in Wirt County differs from neighboring counties along the Ohio River in that the floods tend to be, at times, very localized but can be affected by back water of the Ohio River when a large flood event occurs. The floods stage of the Little Kanawha River in Wirt County is 36ft. Notable floods occurring in Wirt County have included a March 7, 1967 flood reaching 39.14ft, a December 10, 1979 flood reaching 36.37ft, and a January 26, 1978 reaching 35.0ft.
Wood	• Notable past floods have included: two floods in 1907 the first crested at 38.8ft in January and the second crested at 50.5ft in March. Other notable floods included the 1913 flood which crested at 58.7ft in March, the December 1936 through February 1937 floods. During that time frame there were 5 floods in Wood County, one cresting at 35.0ft, on reaching 48.1ft, and on reaching 40.4ft.

Table 3.22 Notable Previous Flood Events in Each County

3.6.3 Risk Assessment

Flood events present a high risk to all counties in the Mid-Ohio Valley Region. Flood events have occurred in each of the region's counties; in fact, some counties average over two flood events each year. Table 3.23 below displays the average number of flood events in each county yearly. The many rivers and streams in each county, as described above, and the amount of average precipitation indicate that flood events will continue to occur in each county.

County	Average Number of Events each year
Calhoun	1.63
Jackson	2.21
Pleasants	1.00
Ritchie	1.42
Roane	2.05
Tyler	2.05
Wirt	0.84
Wood	1.68

Table 3.23 Average Number of Yearly Flood Events

In evaluating the geographic extent that flooding is possible in the region the 100-year floodplain was considered. Table 3.21 above displays the 100 years' floodplain in each county of the Mid-Ohio Valley Region. This representation indicates that all but two of the municipalities in the region are at least in part contained within the floodplain. Also, in each county portions of roadways are contained within the 100-year floodplain. However, not all of the region is contained within the flood plain; in order for flooding to occur there must be a source of water present or a source that develops as precipitation continues and that is not the case for all parcels of land contained within the region. Due to the extent areas of population and roadways are effected every county in the region was awarded 3 of 4 points for the geographic extent to which the county may be affected by flooding. The counties were not awarded full points because not all locations of the county are contained within the floodplain.

As discussed above, flood events have accounted for more total property damage in the Mid-Ohio Valley Region than all other hazard events combined. When considering that property damage has only been recorded since 1996, this truly is a staggering number. Also, flood events have caused crop damage in both Roane and Wirt Counties. As is indicated in the historic occurrence section above, flood events have a very long history in the region. It is however impossible to calculate an exact total in property or crop damage for flood events prior to 1996 to be considered in this HMP.

In the region, flood events have directly caused a total of 4 deaths and 3 injuries as of September 30, 2015. As these incidents have only been recorded since 1996 this indicates that the region averages .37 deaths or injuries resulting from flood events each year. Flood events have resulted in more deaths throughout the region than all other natural hazards combined. For these reasons, through the risk assessment injuries and deaths for flood events were evaluated and found to be an ever present threat. Flood events were identified during each public meeting throughout the region by local LEPC members as presenting a real threat to each county. Additionally, citizens in each county identified flood events has the biggest or second biggest threat to their neighborhoods through the online public survey used in the creation of this plan. Figure 3.12 below is a map indicating the risk level flooding presents to each county of the Mid-Ohio Valley Region.

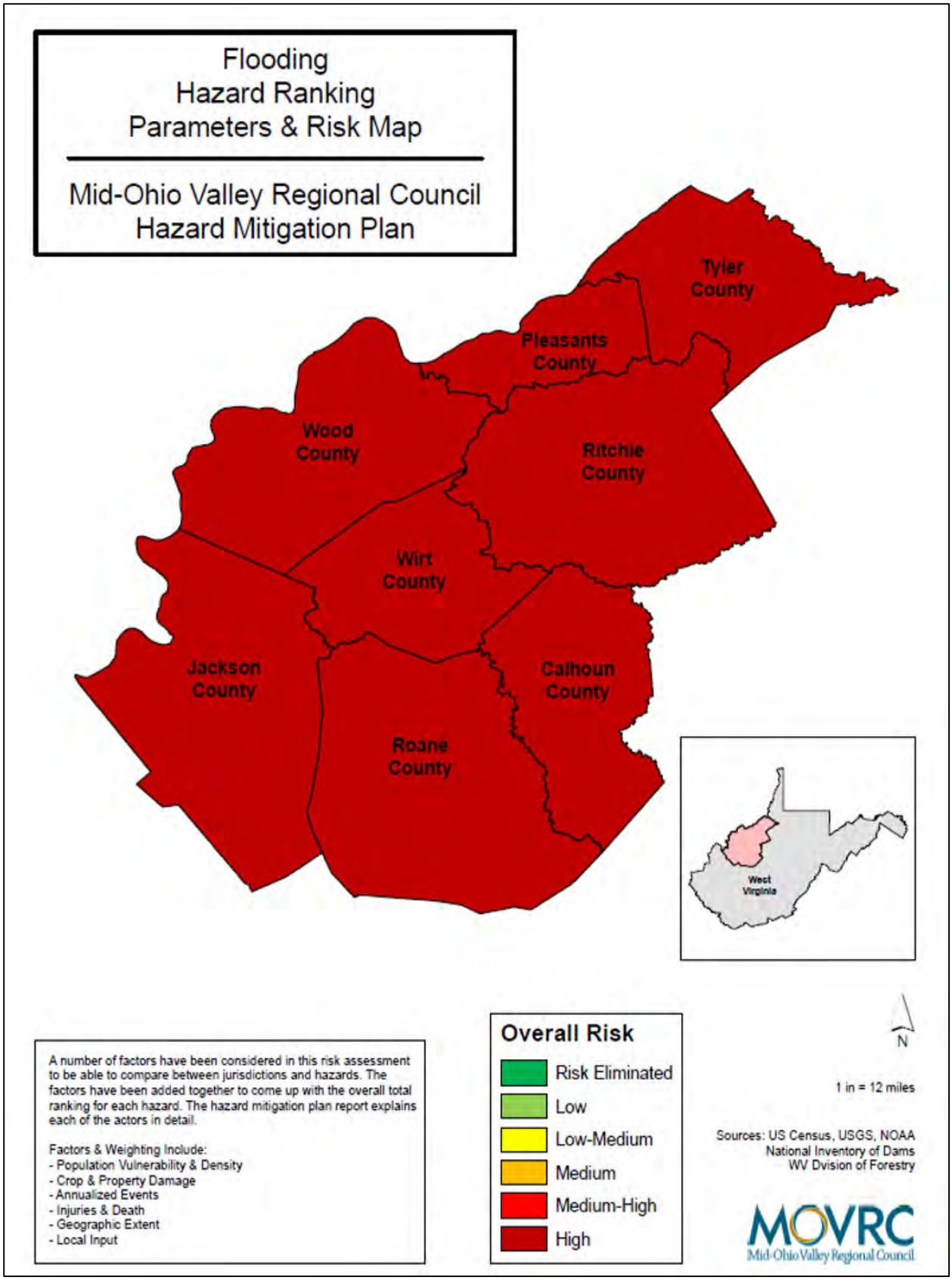


Figure 3.12 Map Indicating the Risk Presented by Flooding to each County in the MOV

3.6.4 Hazard Preparedness

Basic Safety Tips:

- Avoid walking or driving through flood waters; turn around, don't drown. Just 6 inches of moving water can knock you down, and 2 feet of water can sweep your vehicle away.
- If there is a chance of flash flooding, move immediately to higher ground; flash floods are the #1 cause of weather-related deaths in the U.S.
- If floodwater rise around your car but the water is not moving abandon the car and move to higher ground. Do not leave the car and enter moving water.
- Avoid camping or parking along streams, rivers, and creeks during heavy rainfall. These areas can flood quickly and with little warning.

Flood Watch = Be Aware, Conditions are right for flooding to occur in your area.

- Steps to Take
  - Turn on your TV/Radio, you will receive the latest weather updates and emergency instructions.
  - Know where to go, you may need to reach higher ground quickly and on foot.
  - Build or restock your emergency preparedness kit. Include a flashlight, batteries, cash, and first aid supplies.
- Prepare Your Home
  - Bring in outdoor furniture and move important indoor items to the highest possible floor. This will help protect them from flood damage.
  - Disconnect electrical appliances and do not touch electrical equipment if you are wet or standing in water, you could be electrocuted.
  - If instructed, turn your gas and electricity main switch or valve.

Flood warning = Tack Action, flooding is either happening or will happen shortly.

- Steps to take
  - Move immediately to higher ground or stay on high ground
  - Evacuate if directed
  - Avoid walking or driving through flood waters.

After a Flood

- Return home only when authorities say it is safe.
- Be aware or areas where floodwaters have receded and watch out for debris, floodwater often erode roads and walkways.
- Do not attempt to drive through areas that are still flooded.
- Avoid standing water as it may be electrically charged from underground or downed powerlines.
- Photograph damage to your property for insurance purposes.

When it's not Flooding: Make a flood plan

- Know your flood risk
- Make a flood emergency plan
- Build or restock your emergency preparedness kit, including a flashlight, batteries, cash, and first aid supplies.

- Consider buying flood insurance
- Familiarize yourself with local emergency plans.

3.7 High Wind

3.7.1 Description

For the purposes of this HMP the High Wind hazard includes the following types of events recorded in the NCDC storm events Database:

> **High Wind** – Sustained non-convective winds of 40 mph or greater lasting for 1 hour or longer or winds of 58 mph for any duration on a widespread or localized basis. In some mountainous areas, the above numerical values are 50 mph and 75 mph respectively.
>
> **Strong Wind** – Non-convective winds gusting less than 58 mph, or sustained winds less than 40 mph, resulting in a fatality, injury, or damage.
>
> **Thunderstorm Winds** – Wind, arising from convection (occurring within 30 minutes of lighting being observed or detected, with speeds of at least 58 mph, or winds of any speed non-severe thunderstorm winds below 58 mph producing a fatality, injury, or damage.

High winds can occur during a severe Thunderstorm, with a strong weather system, or can flow down a mountain. When winds are sustained at 40 – 50 mph, isolated wind damage is possible, and significant wind damage can occur with higher wind speeds. A common cause of damage during a thunderstorm is downburst which is the result of a strong downdraft, or a small-scale column of air that rapidly sinks toward the ground. A downburst is a strong downdraft with horizontal dimensions larger than 2.5 miles resulting in an outward burst of damaging winds on or near the ground. Downburst winds may begin as a microburst and spread out over a wider area, sometimes production damage similar to a strong tornado. Downburst can reach over 100 mph and are caused by air being dragged down by precipitation. A microburst is a small concentrated downburst that produces an outward burst of damaging winds at the surface. Microbursts are generally small and short-lived, lasting only 5-10 minutes, with maximum wind speeds up to 168 mph. Figure 3.13 was created by the NWS NOAA and depicts how downburst functions.

In addition to regular thunderstorms, derecho events present the possibility of damage from high winds. Derechos are widespread, long-lived wind storms that are associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microburst, downburst and downburst clusters. By definition a

wind event may be classified as a derecho if the wind damage swath extends more than 240 miles and includes wind gusts of at least 58 mph or greater along most of its length.

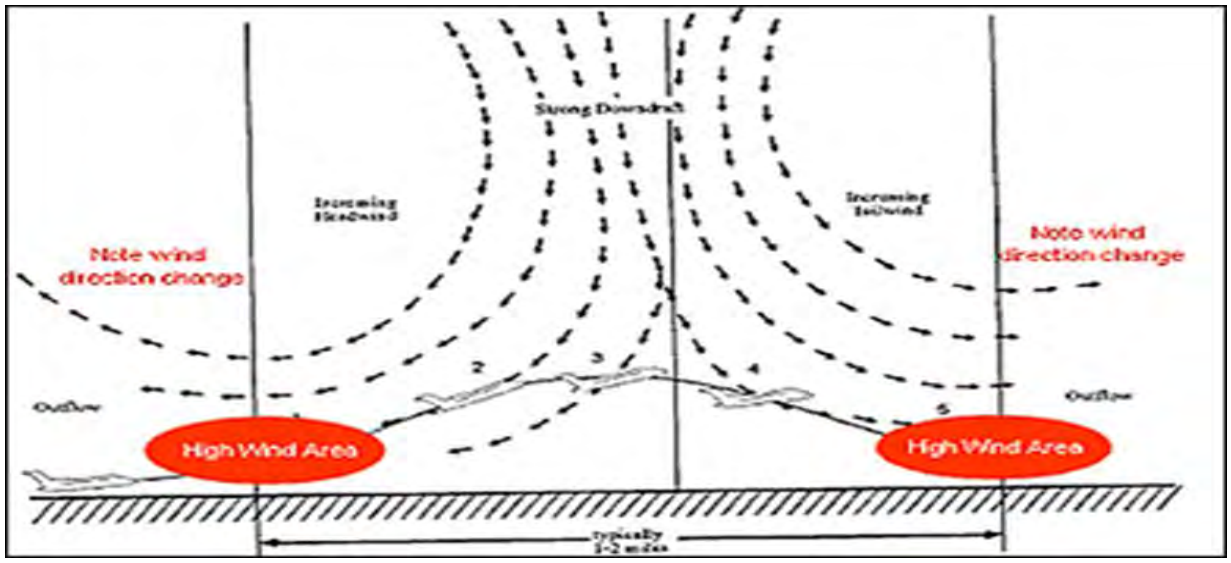


Figure 3.13 Illistrates how Downbursts fucntion, pr pared by theNWS NOAA

3.7.2 Historic Occurrence

As a component of the severe storm incident type, high wind has been a contributing factor in several Major Disaster Declarations in the Mid-Ohio Valley Region. As stated in section 3.4, declared major disasters typically include storm events that take place over a few days and combine together to warrant the declaration. Generally, once such event does not constitute a declaration but a combination of events that caused damage, this is why there are far fewer disasters declarations than total documented high wind events.

High wind events have been record in the NCDC Storm Events Database since 1955, therefore this HMP has examined the 60 years of recorded high wind events spanning from 1955 – September 30, 2015. The data indicates that 5 of the region's 8 counties average one or more high wind events each year. Furthermore, the total property damage $20,611,888.46 indicates that on average the Mid-Ohio Valley Region, as a whole, sustains $343,531.47 in damage resulting from high wind annually. Table 3.18 below displays the total number of high wind events in the region, the average number of yearly events for each county, and the total property damage caused by high wind in each county.

County	Total Number of Events	Total Property damage
Calhoun	55	$1,186,224.23
Jackson	101	$4,435,669.70
Pleasants	51	$865,423.23
Ritchie	76	$2,122,857.27
Roane	78	$2,494,723.32
Tyler	63	$1,063,978.75
Wirt	53	$1,619,374.78
Wood	128	$6,823,637.18

Table 3.24 Summary Statistics for High Wind Events

High wind can occur as a component of severe weather storm cell. Figure 3.14 below represents storm cells recorded in the NOAA Severe Weather Data Inventory with potential for high wind in the section of Tyler County containing the County seat, Middlebourne. This representation displays storm cells that occurred on a date between late May and early June in the years of 2015, 2010, 2005, and 2000. This representation is included because it indicates that severe weather can occur in any area of a set region; storm cells have occurred across all areas of the set location in Tyler County.

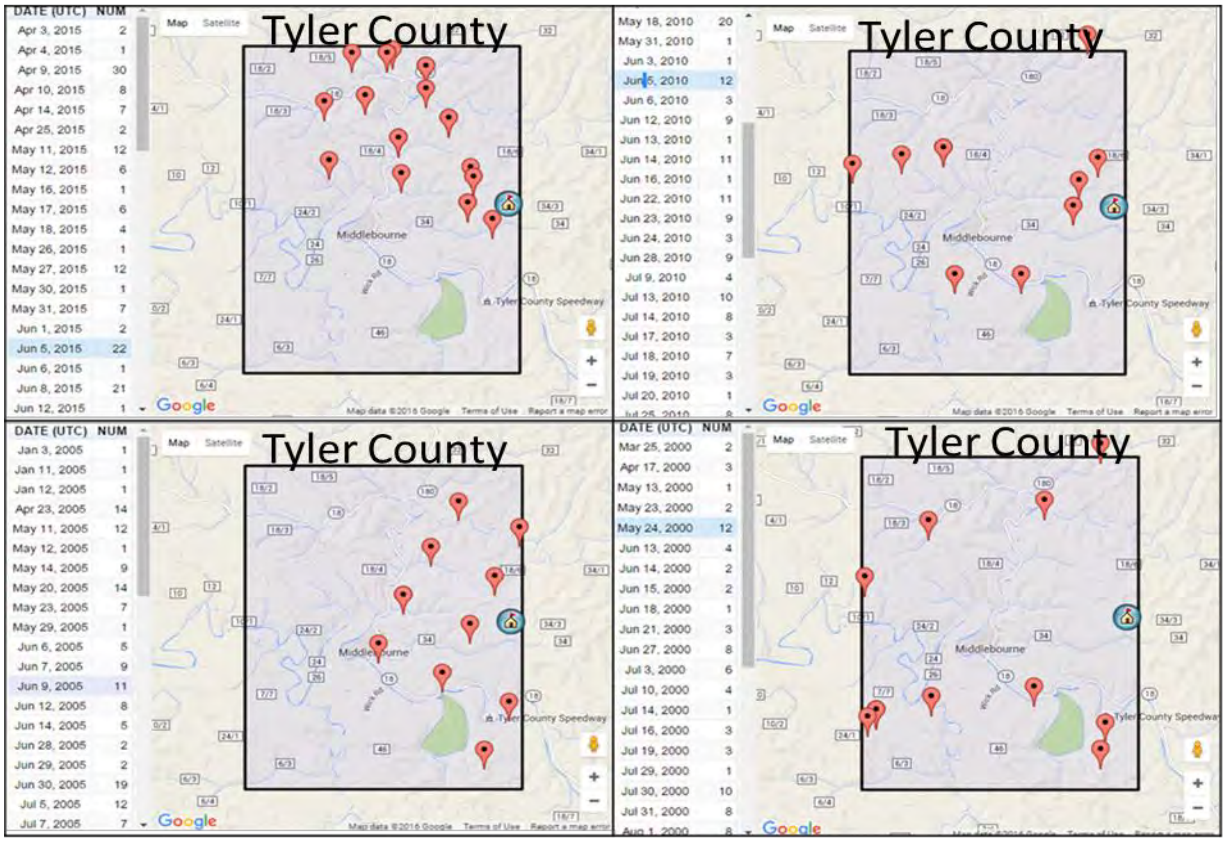


Figure 3.14 Severe Weather Data Inventory Recorded Storm, Cells Middlebourne Area of Tyler County

Hazard's Impact on Region

High wind the Mid-Ohio Valley most severely by causing power outages. The high wind alone can cause power outages if the wind is blowing quickly enough. However, the majority of the Mid-Ohio Valley is very heavily wooded; the blowing around of down limbs and the breaking of new limbs compounds power outage issues caused by high wind. Power outages can not only disrupt the lives of citizen but can also present threats to individual health and safety. For example, the during the June 2012 derecho which is discussed below, many citizens were without power for a few days. The extreme heat felt in the few days following the storm which reached the upper 90s combined with the humidity level made the temperature unbearable and unsafe. Due to the loss of electricity there was no reprieve from the heat making the issue more complicated than simply extreme heat.

Prolonged power outages not only disrupt the lives of the region's citizens but also region's commerce and transportation. Many businesses are not able to operate without electricity; for example, many gas stations are not able to pump gas without being powered by electricity or a generator. This was an issue that arose during the 2012 derecho that hit the Mid-Ohio Valley and caused prolonged wide spread power outages. A prolonged power outage that affects businesses negatively impacts the region's economy as commerce is halted. Additionally, citizens and other business that depend on the services provided by a business that has lost power also suffer.

Hazard Extreme in the Mid-Ohio Valley

The Mid-Ohio Valley Region experienced a destructive derecho event on June 29, 2012 which resulted in a Major Disaster Declaration for entire region. This high wind event is an example of the extreme impact high wind events can have on a location. Figure 3.15 is a radar image from the NOAA depicting the size and path of the 2012 derecho that effected the region. The red circle indicates the location of the Mid-Ohio Valley Region.

Between 6 and 8 P.M. the region experienced multiple thunderstorms and peak wind gusts of 80 – 100 mph. In total, the derecho storm traveled 600 miles in 10 hours with an average speed of 60 mph. The event resulted in $12.87 million in damage across the region and 94,000 citizens without power, some for weeks at a time. This high wind event decimated the region and much of the state's electrical infrastructure. More information regarding the 2012 derecho can be found in section 3.4 which discusses Major Disaster Declarations.

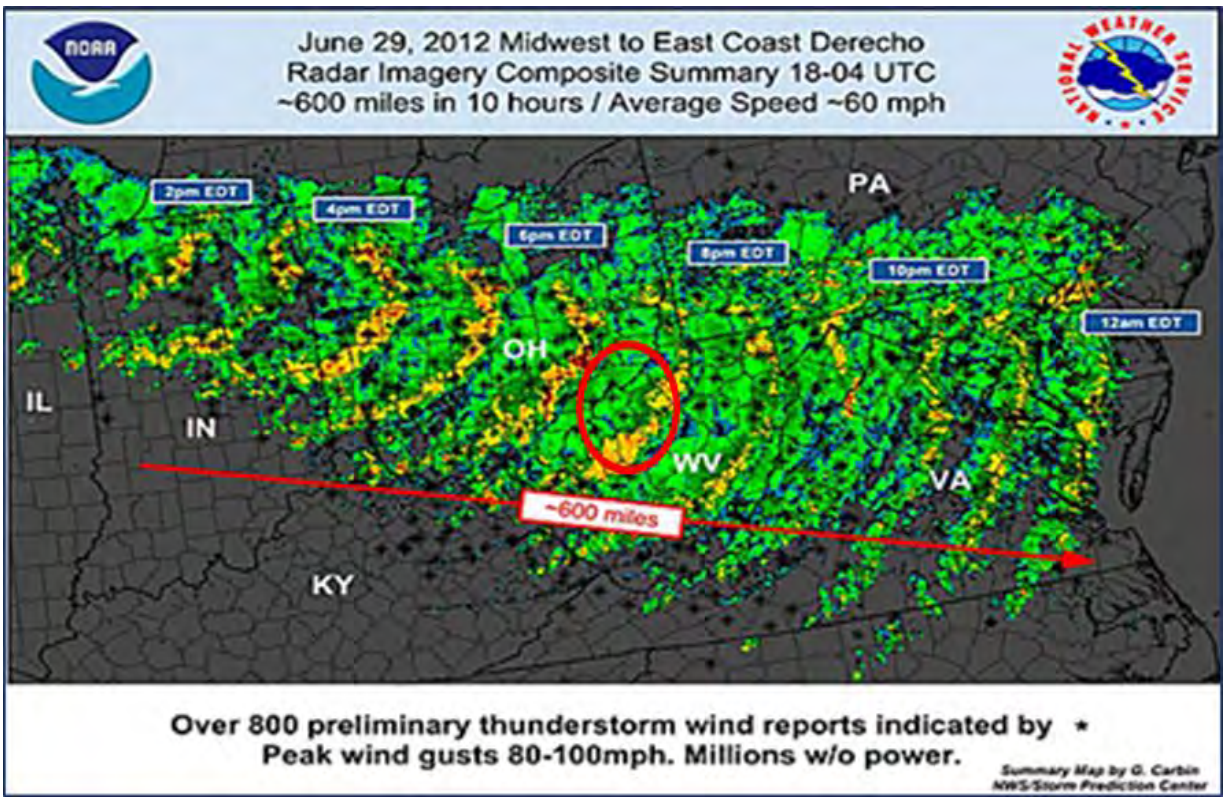


Figure 3.15 Radar Image from the NOAA of the 2012 Derecho

3.7.3 Risk Assessment

High wind presents a significant risk in all counties of the Mid-Ohio Valley Region, however the severity of the risk varies among the region's counties. High wind events have not created any reported crop damage in any of the region's counties, however that is the only element explored through this plan's risk assessment to not report findings for high wind events.

County	Average Annual Damage
Calhoun	$19,770.40
Jackson	$73,927.83
Pleasants	$14,423.72
Ritchie	$35,380.95
Roane	$41,578.72
Tyler	$17,732.98
Wirt	$26,989.58
Wood	$113,727.19

Table 3.25 Average Annual Damage due to Wind Damage

There have been 29 total injuries reported in the Mid-Ohio Valley Region directly resulting from high wind events. Specifically, there have been 11 injuries in Jackson

County, 2 injuries in Roane County, and 16 injuries in Wood County. As discussed above, significant property damage has occurred in region as a result of high wind events. However, the average annual amount of property damage resulting from high wind varies greatly from county to county. Table 3.25 above represents the annual averages for property damage caused by high wind in each county.

As discussed above, each of the region's counties have experienced numerous high wind events in the past 60 years. While 5 of the region's eight counties experience on average 1 or more high wind events each year; Wood County alone averages at least 2 high wind events yearly. Table 3.26 below indicates the average number of high wind events each year. Additionally, the NOAA's Severe Weather Inventory indicates storm cells that cause high wind events are capable of occurring in all areas of the region. Therefore, the geographic extent of high wind events is not limited and such events can occur across the region.

County	Average Number of Events each year
Calhoun	0.92
Jackson	1.68
Pleasants	0.85
Ritchie	1.27
Roane	1.30
Tyler	1.05
Wirt	0.88
Wood	2.13

Table 3.26 Average Number of Yearly High Wind Events

High wind was identified at the public meetings held in Calhoun, Pleasants, Roane, and Wirt counties as presenting a large threat within their counties. High wind was found to be a particular issue in Roane County; a representative from the County's 911 OES operation described a situation in which high wind had blown a mobile home off of its supports and fall on man. Additionally, through the online survey citizens from every county have identified high wind as presenting the biggest and/or the second biggest threat to their neighborhoods. Figure 3.16 below depicts the risk level high wind presents to each county in the region as identified through the risk assessment of this HMP.

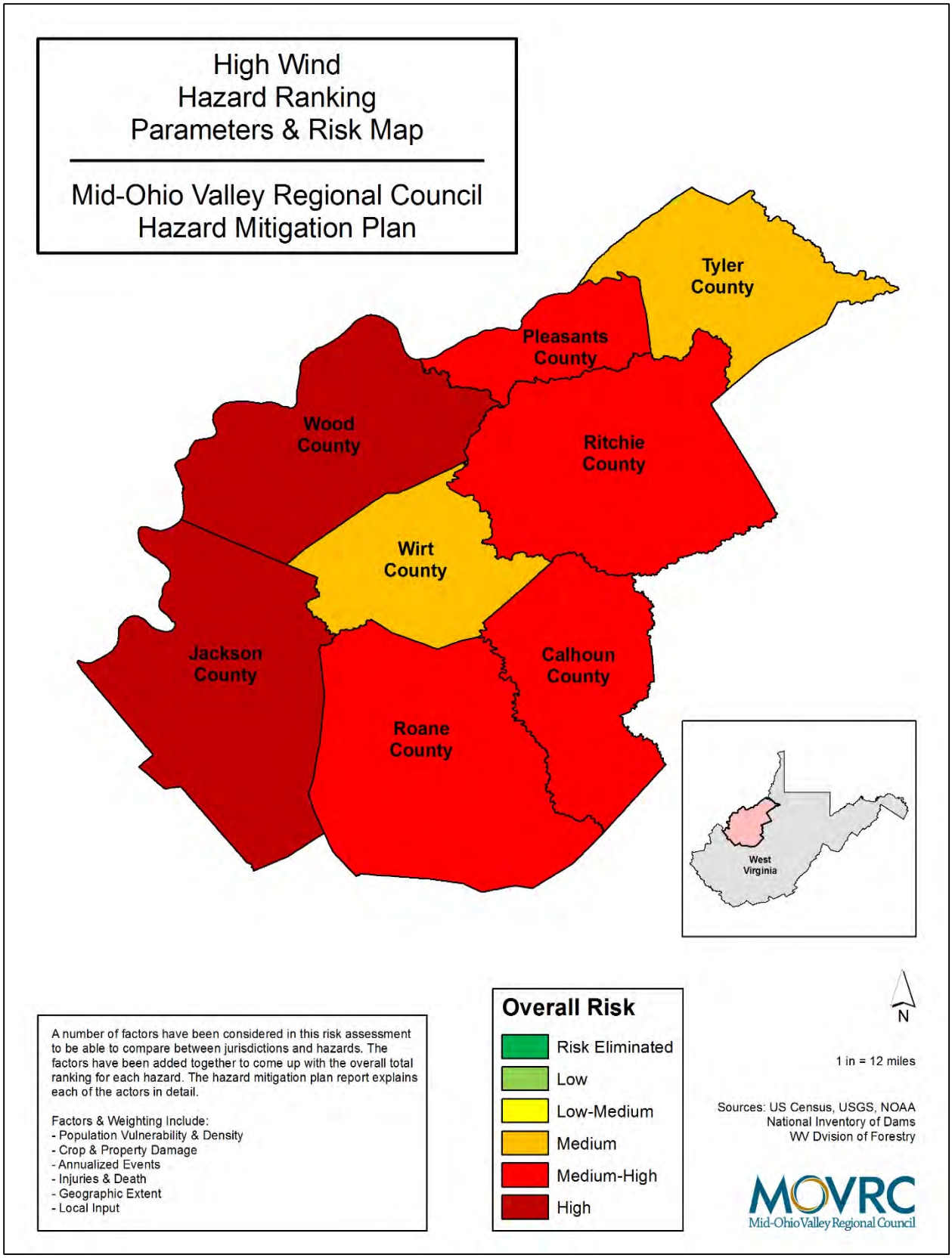


Figure 3.16 Risk Level Presented to Each County by High Wind

3.7.4 Hazard Preparedness

Before Thunderstorm and Lightning

- Remove dead or rotting trees and branches that could fall and cause injury or damage during a severe thunderstorm.
- Postpone outdoor activities
- Secure outdoor objectives that could blow away or cause damage
- Ge inside a home, building, or hard top automobile. Although you may be injured if lightning strikes your car, you are much safer inside a vehicle than outside. Rubber-soled shoes and rubber tires provide NO protection from lightning. However, the steel frame of a hard-topped vehicle provides increased protection if you are not touching metal.
- Shutter windows and secure outside doors, if shutter are not available, close window blinds, shades or curtains.
- Unplug any electronic equipment well before the storm arrives.
- To reduce lighting risk outdoors:
  - In a forest seek shelter in a low area under a thick growth of small trees.
  - In an open area go to a low place such as a ravine or valley, be alert for flash floods.
  - On open water get to land and find shelter immediately.

During Thunderstorms and Lightning

- Avoid contact with corded phones and devices including those plugged into electric for recharging.
- Avoid contact with electrical equipment or cords. Unplug appliances and other electrical items such as computers and turn off air conditioners. Power surges from lightning can cause serious damage.
- Stay away from windows and doors, and stay off porches. Do not lie on concrete floors and do not lean against concrete walls.
- Avoid natural lighting rods such as tall, isolated tree in an open area. Avoid hilltops, open fields, the beach or a boat on the water.
- Take shelter in a sturdy building; avoid isolated sheds or other small structures in open areas.
- Avoid contact with anything metal – tractors, farm equipment, motorcycles, golf carts, gold clubs, and bicycles.
- If you are driving, try to safely exit the roadway and park. Stay in the vehicle and turn on the emergency flashers until the heavy rain ends. Avoid touching metal or other surfaces that conduct electricity in and outside the vehicle.

After A Thunderstorm or Lightning Strike

- If lightning strikes you or someone you know, call 911 for medical assistance as soon as possible. The following are things you should check when you attempt to give aid to a victim of lightning:
  - Breathing – if breathing has stopped, begin mouth-to-mouth resuscitation.
  - Heartbeat – if the heart has stopped, administer CPR.
  - Pulse – if the victim has a pulse and is breathing, look of other possible injuries such as burns where the lightning enters and left the body, nervous system damage, broken bones, and loss of hearing and eyesight.
- Never drive through a flooded roadway.
- Stay away from storm-damaged areas to keep from putting yourself at risk from

the effects of severe thunderstorms.
- Help people who may require special assistance, such as infants, children and the elderly or those with access or function needs.
- Stay away from downed powerlines and report them immediately.
- Watch your animals closely, keep them under your direct control.

3.8 Winter Weather

3.8.1 Description

For the purposes of this HMP the winter weather hazard includes the following types of events: blizzard, frost freeze, heavy snow, ice storm, winter storm, and winter weather. These events are defined by the NCDC storm events database as follows:

Blizzard – A winter storm which produces the following conditions for 3 hours or longer, (1) sustained winds or frequent gusts 35 mph or greater, (2) falling and/or blowing snow reducing visibility frequently to less than ¼ mile, on a widespread or localized basis.

Frost Freeze – A surface air temperature of 32°F or lower, or the formation of ice crystals on the ground or other surfaces, over a widespread or localized area for a period of time long enough to cause human or economic impact, during the locally defined growing season.

Heavy Snow – Snow accumulation meeting or exceeding locally/regionally defined 12 and/or 24-hour warning criteria, on a widespread or localized basis. This could mean such values as 4, 6, or 8 inches or more in 12 hours or less, or 6, 8, or 10 inches in 24 hours or less.

Ice Storm – Ice accretion meeting or exceeding locally/regionally defined warning criteria, on a wide spread or localized basis.

Winter Storm – A winter weather event which has more than one significant hazard and meets or exceeds locally/regionally defined 12 and/or 24-hour warning criteria for at least one of the precipitation elements, on a widespread or localized basis.

Winter Weather – A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation but does not meet locally/regionally defined warning criteria. A winter weather event could result from one or more winter precipitation types such as snow, blowing/drifting snow, or freezing rain/drizzle, on a wide spread or localized basis.

Winter weather consists of various weather elements such as snow, ice, frost, wind, and low temperatures. When these elements combine or present themselves in large quantities they can create threatening situations for humans and cause disruptions in commerce as well as property or crop damage. According to the NWS heavy snow can immobilize a region, stranding commuters, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. The weight of snow can cause roofs to collapse and knock down trees and power lines. In more mountainous regions, heavy snow can lead to avalanches, however that hazard has been eliminated for the reasons enumerated in section 3.20.1. According to figure 3.17 which was prepared by the NWS, the Mid-Ohio Valley Region on average receives between 12.1 inches and 36 inches annually. The red arrow indicates the location of the Mid-Ohio Valley.

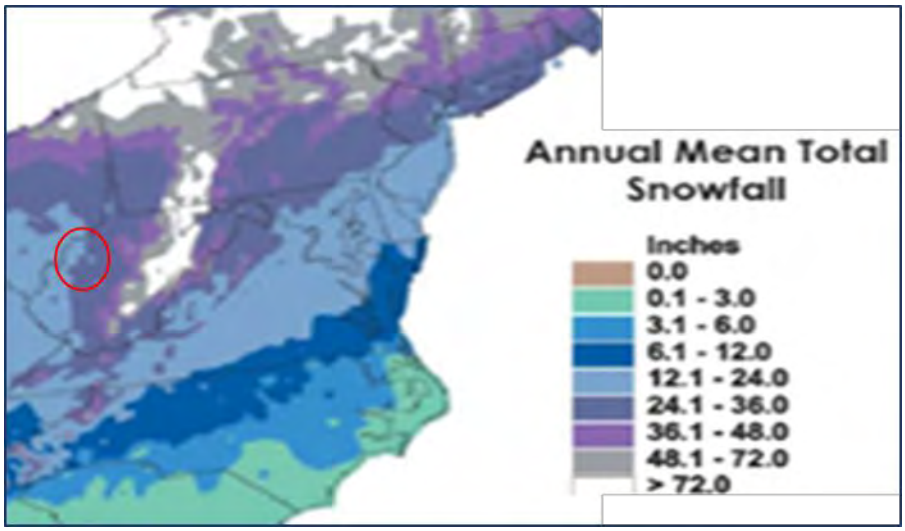


Figure 3.17 Average Annual Snowfall According to the NWS

Accumulation of even small amounts of ice during winter weather events creates hazardous conditions impeding nearly all forms of travel. For example, black ice is a deadly driving hazards defined as patchy ice on roadways or other transportation surfaces that cannot easily be seen. It is often clear with the black road surface visible underneath. Heavy accumulations of ice can topple utility poles and communications towers Ice can disrupt communications and power for days while utility companies repair extensive damages. As some parts of the Mid-Ohio Valley Region are heavily forested a common problem when heavy ice accumulates is the breaking of weighed down limbs and even entire trees with ice frozen on the branches.

According to the NWS, frost describes the formation of thin ice crystals on the ground or other surfaces in the form of scales, needles, feathers, or fans. Frost develops under conditions similar to dew, except the temperatures of the Earth's surface and earthbound objects falls below 32ºF. Frost can be particularly detrimental to crops

and plant life; if a frost period is sufficiently severe to end the growing seasons or delay its beginning, it is commonly referred to as a "killing frost."

3.8.2 Historic Occurrence

Winter weather events are very common in the Mid-Ohio Valley Region; on average each county experiences 1.68 or more such events annually. Table 3.27 below depicts the number of winter weather events in each county as recorded by the NCDC Storm Events Database since 1996. The table breaks the region's past winter weather events down into individual hazards listed in the NCDC Storm Events Database. Blizzard events have been included in the breakdown even though the database does not list one such event to have occurred in the region. This is due to the Major Disaster Declaration in 1996 in the region because of a severe snow storm. This event is referred to as the "Blizzard of 96." Table 3.28 below displays Major Disaster Declarations by county resulting from winter weather.

County	Blizzard	Frost Freeze	Heavy Snow	Ice Storm	Winter Storm	Winter Weather
Calhoun	-	3	19	1	6	10
Jackson	-	3	17	1	5	9
Pleasants	-	3	15	-	5	9
Ritchie	-	3	23	-	5	8
Roane	-	3	19	1	6	9
Tyler	-	3	18	-	5	10
Wirt	-	3	21	1	5	8
Wood	-	3	16	-	5	9

3.27 Summary Statistics Describing Winter Weather

	Calhoun	Jackson	Pleasants	Ritchie	Roane	Tyler	Wirt	Wood
Number of Major Disaster Declarations related to Snow	4	4	2	5	5	5	4	3

Table 3.28 Major Disaster Declarations by County Due in Part to Winter Weather

Winter weather events have created significant property damage in the Mid-Ohio Valley Region. Since 1996, winter weather events have caused a total of $8,619,579.26 in property damage across the Mid-Ohio Valley Region; this averages $453,819.96 each year. Of course, due to differences in the number of structures, their value and durability, and the amount of snow and ice in each county, the amount of property damage in each county has varied greatly. Table 3.29 below displays the average annual property damage due to winter weather in each county.

County	Total Property Damage 1996-Sept. 2015	Average Annual Property Damage
Calhoun	$542,873.94	$28,572.31
Jackson	$4,536,095.13	$238,741.85
Pleasants	$75,454.63	$3,971.30
Ritchie	$86,502.47	$4,552.76
Roane	$2,631,510.93	$138,658.47
Tyler	$75,454.63	$3,971.30
Wirt	$542,873.94	$6,779.66
Wood	$128,813.59	$6,779.66

Table 3.29 Property Damage Due to Winter Weather

Hazard's Impact on Region

As stated above, winter weather events can immobilize a region as transportation avenues become impassable and power outage occur. The frequent winter weather events in the Mid-Ohio Valley Region disrupt the everyday doings for many of the region's residents. At the very least, winter weather can interrupt or alter daily activities. This is true in the Mid-Ohio Valley Region; during winter weather public schools often have delayed start times, early dismissals, or are even closed. Additionally, within the region winter weather conditions may deter people from venturing out to travel to work or to shop. Snow and Ice make roadways impassable and unsafe; black ice often is the cause of automobile accidents. Also, particularly heavy snow fall often results in damage to the roofs of homes, barns, or parking covers. The weight of the accumulated snow can become too cumbersome for the structure and it can buckle or break.

Hazard Extreme in the Mid-Ohio Valley

Though the weather event occurred after data collection was complete, on January 22, 2016 the Mid-Ohio Valley experienced a winter weather event that encapsulated the extreme effects of this hazard. During the snow storm in some places snow fell at rates of two inches per hour. In Roane County the community of Looneyville received 22 inches of snow in total in a 24-hour period. Grantsville in Calhoun County received 18 inches of snow. Communities along the Ohio River saw less snow accumulation however it was still significant enough to cause safety issues and disrupt transportation; Ravenswood, Parkersburg, St. Marys, and Sistersville received between 8 and 12 inches of snow.

The governor declared a state of preparedness 2 days before the storm, followed by as state of emergency during the storm. National Guard personnel and equipment were used in clearing vehicles from the interstates closures. They also transported critical personnel to work during the storm. Despite the milder temperatures and melting, many county school districts were closed through Wednesday the 27th. While there were not deaths or injuries directly related to the storm, the region was immobilized transportation halted and commerce disrupted.

3.8.3 Risk Assessment

To assess the risk level winter weather conditions present to the Mid-Ohio Valley Region, as with all natural hazards, the number of previous events, the amount of property damage, amount of crop damage, the number of resulting injuries and deaths, the geographic extent of the hazard, and local input were all considered. As discussed above, winter weather is a frequent annual occurrence in the region and it has created a considerable amount of property damage. However, there have been no injuries or deaths recorded in the NCDC database directly resulting from winter weather. Nor has there been any reported amount of crop damage directly resulting from winter weather.

Winter weather was identified in detail as a hazard facing communities during the public meetings in Tyler and Pleasants Counties. Through the online survey, winter weather was identified in each of the region's counties by citizens as presetting either the biggest or second biggest threat to their communities. This indicates that winter weather is considered by citizens to be an ever present natural hazard in the Mid-Ohio Valley Region.

Due to the Mid-Ohio Valley's location and the region's climate some degree of snow and ice are expected each year. Specifically, each county of the region is expected to experience at least one winter weather event year; Calhoun Ritchie, Roane, and Wirt Counties, the interior counties average 2 or more events each year. Table 3.30 below displays the average winter weather events for county yearly. It is accepted as a regularly occurring natural hazard, therefore the geographic extent of winter weather includes the entirety of the Mid-Ohio Valley Region. Figure 3.18 below depicts the identified level of risk winter weather presents to each county in the Mid-Ohio Valley Region.

County	Average Number of Events each year
Calhoun	2.05
Jackson	1.84
Pleasants	1.68
Ritchie	2.10
Roane	2.00
Tyler	1.89
Wirt	2.00
Wood	1.74

Table 3.30 Average Number of Yearly Winter Weather Events

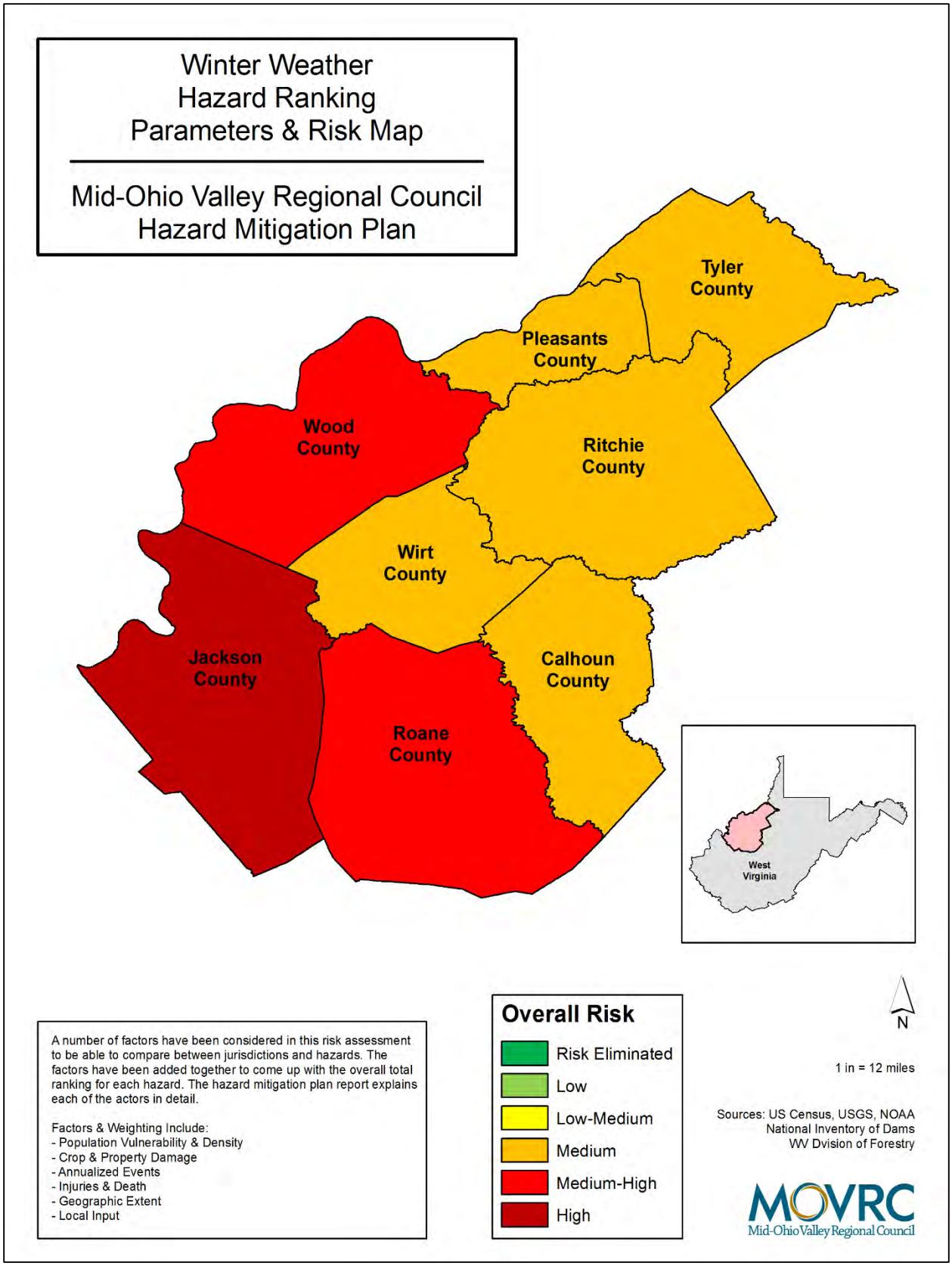


Table 3.18 Risk Presented by Winter Weather Events to Each County

3.8.4 Hazard Preparedness

Before Extreme Cold/Wind Chill

- Add the following supplies to your emergency kit; rock salt, sand to improve traction, snow shovels, sufficient heating fuel, and adequate clothing and blankets.
- Make a family Communications Plan
- Bring pets/companion animals inside during winter weather.
- Minimize travel and winterized your vehicle for when you must travel by checking the following: antifreeze levels, battery and ignition system, brakes, exhaust system, rule and air filters, heater and defroster, lights and flashing hazards, oil, thermostat, windshield wiper equipment, install good winter tires.
- Winterize your home:
  - Extend the life of your fuel supply by insulating walls and attics, caulking and weather-stripping doors and windows, and installing storm windows or covering windows with plastic.
  - Clear rain gutters, repair roof leaks, and cut away tree branches that could fall on a house or another structure.
  - Maintain heating equipment and chimneys
  - Insulate pipes and allow faucets to drip to avoid freezing
  - Ensure fuel-burning equipment has proper ventilation and keep fire extinguishers on hand.
  - Install storm windows
  - Check roof's ability to sustain unusually heavy weight from the accumulation of snow or water.
- Be aware of the risks presented by carbon Monoxide

During Extreme Cold/Wind Chill

- Stay indoors during the storm, when you must be outside walk carefully on snowy, icy walkways and keep dry
- Avoid overexertion when shoveling snow
- Cover up exposed skin to avoid frostbite which occurs when the skin and body tissue just beneath it freezes. Loss of feeling and white or pale appearance in extremities such as fingers, toes, earlobes, face and the tip of the nose.
- Limit exposure to deter hypothermia which occurs when a person has a dangerously low body temperature. Symptoms include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion. If a person is experiencing these symptoms and their temperature is below 95° seek medical attention immediately.
- Drive only if it is absolutely necessary. If driving is unavoidable let someone know your destination, your route, and when you expect to arrive.
- If the pipes freeze, remove any insulation or layers of newspaper and wrap pipes in rags. Completely open all faucets and pour hot water over the pipes, starting where they were most exposed to the cold.
- Maintain ventilation when using kerosene heaters to avoid build-up of toxic fumes. Refuel kerosene heather outside and keep them at least three feet from flammable objects.
- Conserve fuel, if necessary, by keeping your residence cooler than normal.
- If you will be going away during cold weather, leave the heat on in your home,

set to a temperature no lower than 55°F.

- Dress for the Weather: if you must go outside, wear layers of loose-fitting, lightweight, warm clothing rather than one layer of heavy clothing. The outer garments should be tightly woven and water repellent. Wear mittens, which are warmer than gloves, wear a hat to prevent loss of body heat, cover your mouth with a scarf to protect your lungs.

After Extreme Cold/Wind Chill

- If your home loses power or heat for more than a few hours or if you do not have adequate supplies to stay warm in your home overnight, you may want to go to a designated public shelter if you can get there safely.
- Bring any personal items that you would need to spend the night such as toiletries and medicines.
- Continue to protect yourself from frostbite and hypothermia by wearing warm, loose fitting, light weight clothing in several layers. Stay indoors, if possible.
- Learn from every storm
  - Assess how well your supplies and family plan worked. What could you have done better?
  - Take a few minutes to improve your family plan and supplies before the next winter storm hits.
  - Talk to your neighbors and colleagues about their experiences and share tips with each other.

3.9 Hail

3.9.1 Description

Hail is defined by the NCDC Storm Events Database as frozen precipitation in the form of balls or irregular lumps of ice. Hail forms inside of thunderstorms which contain strong updrafts of warm air and downdrafts of cold air. If a water droplet is picked up by the updrafts, it can be carried well above the freezing level. As the frozen droplet begins to fall, carried by the cold downdrafts, it may thaw as it moves into warmer air toward the bottom of the thunderstorm. If the droplet does not fall it may also get picked up again by another updraft which would carry it back into the very cold air and re-freeze it. With each trip above and below the freezing level our frozen droplet adds another layer of ice. Finally, the frozen water droplet, with many layer or ice much like the rings in a tree, falls to the ground as hail. Figure 3.19 is a

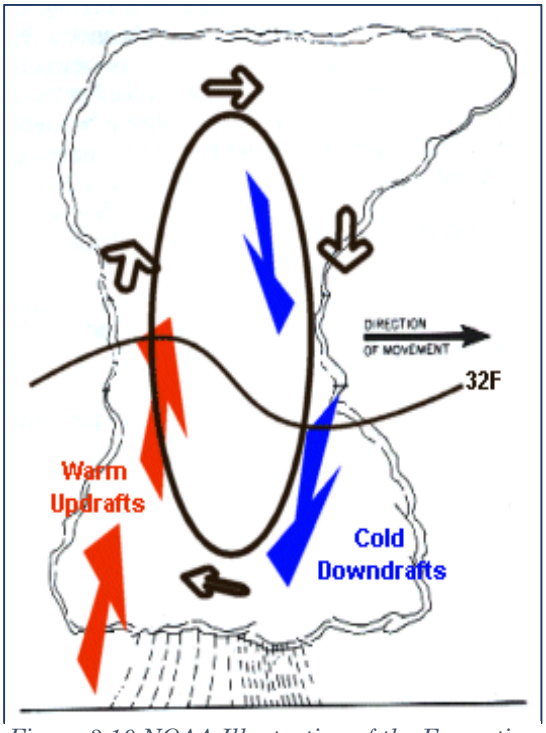


Figure 3.19 NOAA Illustration of the Formation of Hail

depiction prepared by the National Oceanic and Atmospheric Administration (NOAA) to illustrate the formation of hail in a thunderstorm.

The presence of large hail indicates very strong updrafts and downdrafts within a thunderstorm. These are also possible indicators of tornadic activity. Although, large hail is often observed immediately north of a tornado event, the presence of hail does not always mean a tornado event will happen and conversely the absence of hail does not always mean there is not a risk of tornados. It is not possible to look at a thunderstorm in the distance and tell if it will produce hail that will reach the ground. However, meteorologists are able to use radar to look inside thunderstorms and identify hail as hail reflects more energy back to the radar than raindrops. Doppler radar is capable of estimating the size of hail based on the amount of energy reflected back through the radar.

Estimated Size	Actual Size
Pea	¼ inch diameter
Marble/Mothball diameter	½ inch diameter
Dime/Penny	¾ inch diameter * Penny size or greater is considered severe hail
Nickel	7/8-inch diameter
Quarter	1-inch diameter
Ping-Pong Ball	1 ½ inch diameter
Golf Ball	1 ¾ inch diameter
Tennis Ball	2 ½ inch diameter
Baseball	2 ½ inch diameter
Tea Cup	3-inch diameter
Grapefruit	4-inch diameter
Softball	4 ½ inch diameter

Table 3.31 NOAA Hail Size Estimation Chart

Hail can be very destructive to property and crops and is also capable of causing injury or death. According to the NOAA hail causes $1 billion in damage to crops and property each year. As described above, hail forms in layers as it goes through the cycle of falling down with cold downdrafts and up through warm updrafts. This results in varying sizes of hail that falls to the earth's surface. However, even small hail can cause significant damage to young tender plants according to the NOAA. As the size of hail can be difficult to estimate, table 3.31 below provides a table used to estimate the size of hail.

3.9.2 Historic Occurrence

The NCDC database began recording hail events in 1955; therefore, the events data is based on the 60-year period of 1995 – 2015. When annualized, this data indicates that in all counties except for Wood County on average there is less than one hail

event recorded each year. The NCDC database recorded hail events when the size of the hail reached ¾ inch in diameter or greater. The database also records hail events with smaller sized hail if they cause property and/or crop damage or injuries and/or deaths. Therefore, these figures only include such hail events that meet the above criteria. Table 3.32 below provides a summary of the total number of recorded hail events in the Mid-Ohio Valley Region and the resulting property and crop damage (adjusted for inflation) in each county.

County	Events	Total Property Damage	Total Crop Damage
Calhoun	27	$8.429.56	$0.00
Jackson	58	$83,428.84	$0.00
Pleasants	13	$3,021.25	$0.00
Ritchie	22	$93,901.05	$0.00
Roane	32	$9,097.37	$7,996.52
Tyler	21	$21,654.28	$0.00
Wirt	10	$36,652.30	$36,352.30
Wood	78	$1,720,702.29	$0.00

Table 3.32 Summary Statistics for Hail Events

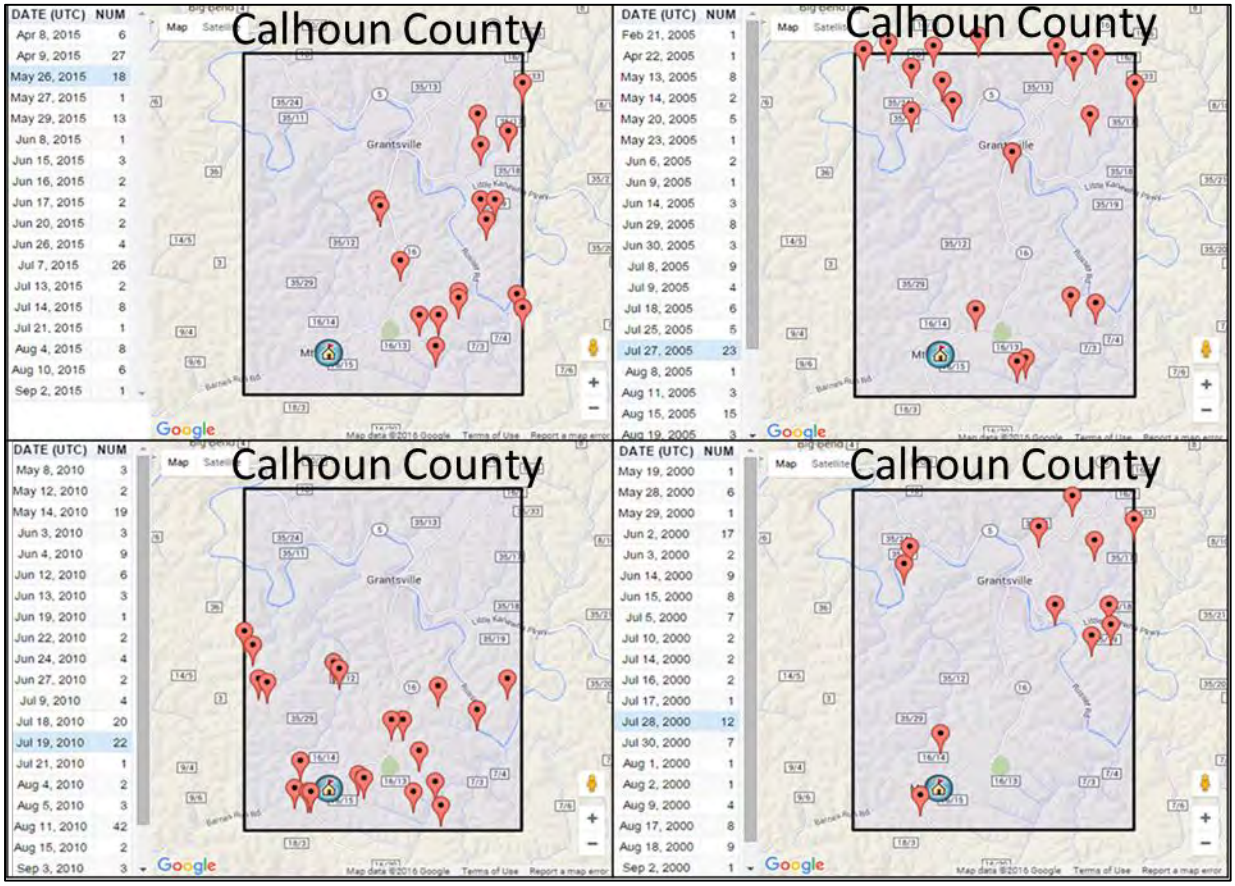


Figure 3.20 Sever Weather Data Inventroy Marking Hail Incidents

Hail events occur sporadically in parts of geographic locations, therefore hail may occur in a location and may not occur in an area in very close proximity. Figure 3.20 above is an example of this from NOAA's Severe Weather Data Inventory. This example depicts all hail incidents in the same area of Calhoun County in the years of 2015, 2010, 2005, 2000. These figure represent all incidents of hail not just the ones meeting the NCDC Storm Events Database requirements for documentation; including hail particles measuring less than ¾ inch in diameter. In the figure below each red pin represents a hail incident. This indicates that hail occurs sporadically throughout a thunderstorm area.

Hazard's Impact on the Region

Hail can affect the Mid-Ohio Valley region in multiple ways; one way is by pieces of hail falling and directly hitting property such as cars, car ports, homes, commercial buildings, and public buildings. The velocity and the weight of the hail combine to create the damage. Hail can crack windshields on cars and cause other body damage. Hail can also damage siding by punching holes through it. Damage from hail can also take the form of dented or warped roofs.

As much of the Mid-Ohio Valley is heavily wooded hail can also cause damage by hitting tree limbs causing them to break and hang dangerously from trees or knocking them down completely on to structures or into roadways. Tree limbs that are broken and left hanging have the potential to all on vehicles or homes after the storm passes which causes lingering safety issues. Hail can also completely break limbs during storms. The downed limbs have potential to land on homes or cars. Downed tree limbs can block roadways making them nearly or completely impassable. This disrupts transportation and can affect the mobility of individuals.

Hazard Extreme in the Mid-Ohio Valley

An extreme instance of hail occurred on Monday, June 16, 2008 in the City of Ravenswood; several rounds of thunderstorms moved through the region and in late afternoon, thunderstorms formed along the cold front in Ohio and moved south east. Most of the severe weather reports were large hail; some was as large as golf balls (1 ¾ inch in diameter). This hail event did $10,000.00 worth of damage in Ravenswood alone. Similarly, on March 23, 2011 the community of Washington in Wood County experienced a hail storm with golf ball size hail resulting in $10,000.00 in damages. On September 9, 1994 the City of Parkersburg experienced a hail storm with quarter sized hail (1 inch in diameter) that resulted in $500,000.00 in property damage. Though the hail in Parkersburg was smaller in size, the amount of damage that occurred was higher than the incidents in Ravenswood and Washington due to the higher quantity of properties located in Parkersburg.

3.9.3 Risk Assessment

Hail presents at least a medium – low level of risk to all of the Mid-Ohio Valley Region's County's. In all of the elements of the risk assessment hail was found to present at least some level of risk except for through local input. Hail was not identified at any county's public meeting as a natural hazard presenting a threat to the community. Additionally, hail was not identified by any of the citizens taking the online risk assessment survey as presenting the biggest or second biggest threat to their neighborhood as a natural hazard.

Table 3.24 above provides the total dollar amount, adjusted for inflation, of property and crop damage created by hail in the Mid-Ohio Valley Region in the past 60 years. These totals indicated that the annualized total property damage in the region varies from $50.00 annually in Wirt County and $28,678.37 annually in Wood County. Also, Roane and Wirt Counties have incurred substantial crop damage resulting from past hail events.

According to the NCDC database there have been three injuries in the Mid-Ohio Valley Region directly resulting from hail events. All three injuries occurred during the same event in Calhoun County on June 24, 1992 which produced hail particles with the magnitude of 1.75 inches in diameter or golf ball size. There have not been any recorded deaths in the region directly resulting from hail events.

The data from the NOAA's Severe Weather Data Inventory indicates that hail can occur anywhere within the region as long as the right conditions for cold downdrafts and warm updrafts occur. Table 3.33 indicates the calculated annualized number of events each county experiences yearly. Though there are a large number of total events for some counties, the annualized number is relatively low due to the larger time frame during which the events were recorded. Figure 3.20 below indicates the level of risk presented by hail as a natural hazard to each county in the region.

County	Average Number of Events each year
Calhoun	0.45
Jackson	0.97
Pleasants	0.22
Ritchie	0.37
Roane	0.53
Tyler	0.35
Wirt	0.17
Wood	1.30

Table 3.33 Average Number of Yearly Hail Events

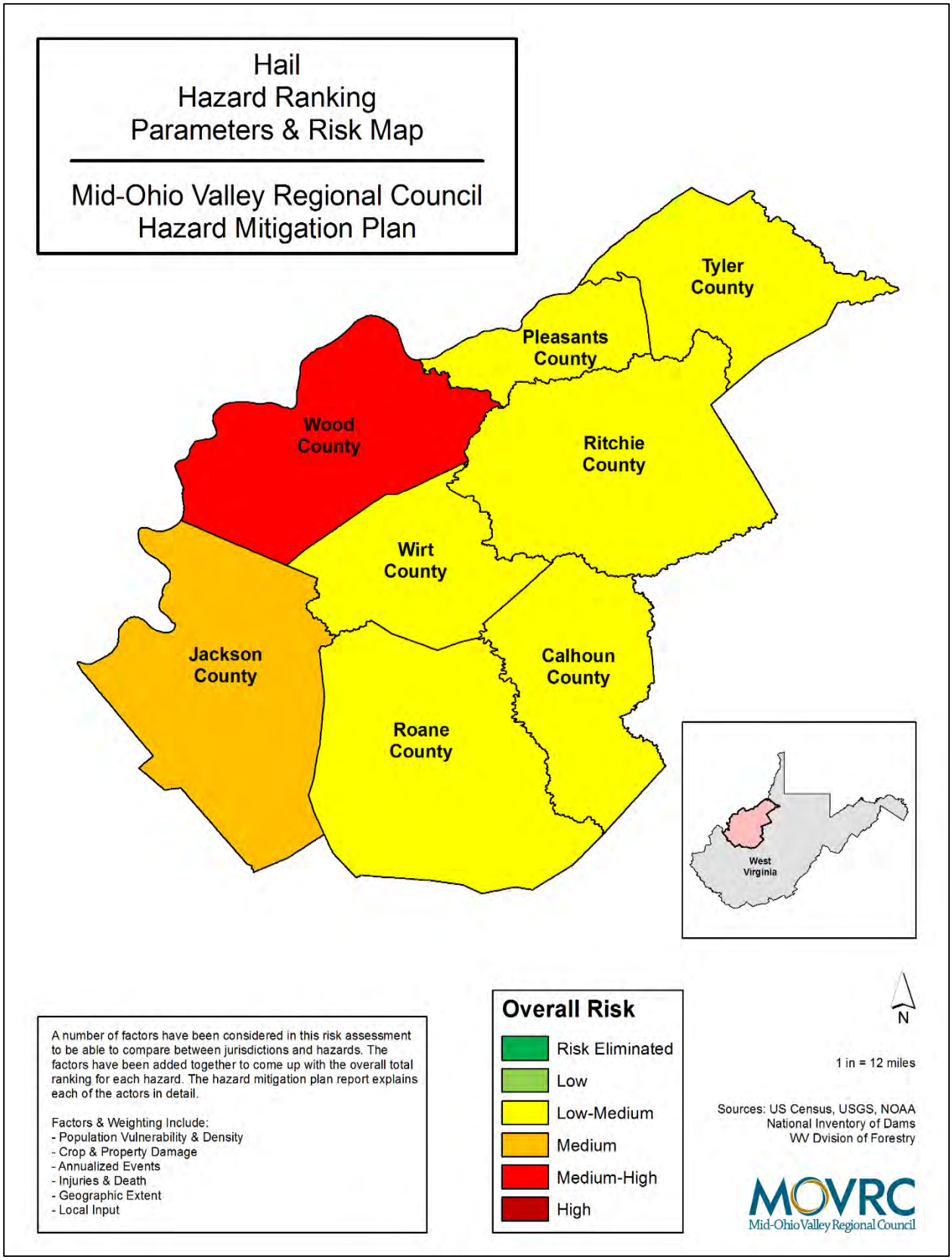


Figure 3.21 Risk Presented by Hail Events in Each County

3.9.4 Hazard Preparedness

For hazard preparedness for hail events, follow the same guidelines as outlined in Section 3.7.4 for high wind events.

3.10 Heavy Rain

3.10.1 Description

Heavy rain is defined by the NCDC storm events database as an unusually large amount of rain which does not cause a flash flood or flood but does cause damage such as a roof collapse or any other human/economic impact. This hazard event was kept separate from Section 3.6 on flooding because the impact of the hazard is caused in a different manner. The damage and impact is caused by the heavy downpour of water not by where the water is backed up and standing or by how it flows once it has collected on the ground.

According to the USGS, precipitation occurs in the following process. Clouds contain water vapor and cloud droplets that are too small to fall as precipitation. Water is continually evaporating and condensing in the sky, which can be seen in a cloud if looking closely. Most of the condensed water in clouds does not fall as precipitation because the fall speed is not large enough to overcome updrafts which support the clouds. For precipitation to happen, first tiny water droplets must condense on even tinier dust, salt, or smoke particles, which act as a nucleus. Water droplets may grow as a result of additional condensation of water vapor when the particles collide. If enough collisions occur to produce a droplet with a fall velocity which exceeds the cloud updraft speed, then it will fall out of the cloud as precipitation; it takes millions of cloud droplets to produce a single raindrop. Precipitation can also be produced by the rapid growth of ice crystals at the expense of the water vapor present in a cloud. These crystals may fall as snow, or melt and fall as rain.

	Intensity inches/hour	Median Diameter millimeters	Velocity of Fall feet/second	Drops per second per square foot
Fog	0.005	0.01	0.01	6,264,000
Mist	.002	.1	.7	2,510
Drizzle	.01	.96	13.5	14
Light Rain	.04	1.24	18.7	46
Heavy Rain	**.60**	**2.05**	**22.0**	**46**
Excessive Rain	1.60	2.40	24.0	76
Cloudburst	4.00	2.85	25.9	113

Table 3.34 USGS's Precipitation Classifications

Precipitation is categorized by the intensity of the rain, the median diameter of rain drops, the velocity of the drop's fall to earth, and the drops per second per square foot.

Table 3.34 above was prepared by the USGS to explain precipitation classifications; the specifications for heavy rain have been bolded. The combination of rain meeting these specifications resulting in damage constitutes heavy rain as a hazard event for the purpose of this HMP.

3.10.2 Historic Occurrence

The NCDC storm events database began recording heavy rain incidents in 1996. The recorded number of events indicate that every county in the region averages less than one heavy rain incident each year. Table 3.32 below displays the total number of heavy rain events, as well as the annualized number of events. While this threat is defined as heavy rain not resulting in flooding but causes damage, it is not necessarily physical damage with a monetary value. The damage done by a heavy rain event may result in some kid of human or economic impact such as impeding transportation. It is for this reason that not all counties that have experienced heavy rain events have incurred reported property damage. However, for those counties that have incurred property damage the total amount of property damage, adjusted for inflation, is also displayed in table 3.35 below.

County	Events	Injuries/Deaths	Property Damage
Calhoun	8	0	$0.00
Jackson	11	0	$32,037.98
Pleasants	5	0	$0.00
Ritchie	8	4	$9,553.12
Roane	11	0	$22,095.68
Tyler	6	0	$0.00
Wirt	5	0	$0.00
Wood	7	0	$0.00

Table 3.35 Total Number of Heavy Rain Events and Property Damage

Hazard's Impact on Region

As described above, the NCDC database records a heavy rain event when an unusually large amount of rain falls but does not cause flooding or flash flooding but does cause damage. The damage impact is caused by the heavy downpour of water not by where the water is backed up and standing or by how it flows once it has collected on the ground. Heavy rain can disrupt the Mid-Ohio Valley by causing a disruption in transportation; for example, during a heavy rain event a person driving a car's ability to see might be impaired or completely obstructed.

Hazard Extreme in the Mid-Ohio Valley

On February 8, 1996 a heavy rain event resulted in the death of 4 individuals all from the same family at a farm along goose creek in Ritchie County. A grandfather and granddaughter were crossing a concrete low water bridge on Goose Creek when their truck turned sideways then ended upon its side in the creek. The granddaughter was

swept away and the grandfather entered the water after her. The granddaughter's father and brother then quickly entered the creek in an attempt to save them, however they were also swept away. Goose Creek had swollen about 6 feet above normal from recent snowmelt and an increasing late afternoon rain. The creek was also filled with large chunks of ice, but still mainly within its banks. This heavy rain event also resulted in $5,000.00 in property damage in Ritchie County.

3.10.3 Risk Assessment

The level of risk presented by heavy rain as a hazard in the Mid-Ohio Valley Region varies from county to county. Heavy rain has not resulted in any recorded crop damage within the region. Heavy rain, as defined by NCDC, was not identified during any county's public meeting as a hazard presenting a threat to any neighborhood. However, heavy rain has resulted in 4 deaths in the Mid-Ohio Valley, the even causing these deaths is described above. Additionally, heavy rain was identified in the online public survey by citizens as presenting the biggest or second biggest natural threat to their neighborhood in Calhoun, Pleasants, Ritchie Roane, Tyler, Wirt and Wood Counties.

County	Average Number of Events each year
Calhoun	0.42
Jackson	0.58
Pleasants	0.26
Ritchie	0.42
Roane	0.58
Tyler	0.32
Wirt	0.26
Wood	0.36

*Table 3.36 Average Number of Yearly Heavy Rain Event**s***

As presented in table 3.36 above, each county has experienced multiple heavy rain events. However, there have been less than half as many heavy rain events as there have been flooding events in the Mid-Ohio valley. This is because most heavy rain that results in damage more often than not also results in flooding. The resulting property damage has resulted in annualized property damage in the amount of $1,686.21 in Jackson County, $502.80 in Ritchie County, and $1,162.93 in Roane County. Although, other uncalculated damage has occurred in each county, either through human or economic impact as is required through the hazard's definition.

In order to analyze the geographic extent of heavy rain, the annual amount of precipitation for the region was examined. Figure 3.33 below is an enlarged portion of an image prepared by the USGS to display the annual amount of precipitation for the world. This figure includes all forms of precipitation, not just heavy rain. Though it

includes all forms of precipitation this figure was still used to determine geographic extent because, the form and amount of precipitation that falls at one time is based on individualized factors of the particular precipitation event. The average annual amount of precipitation would not alter, regardless of the form or amount of precipitation during one hazard event.

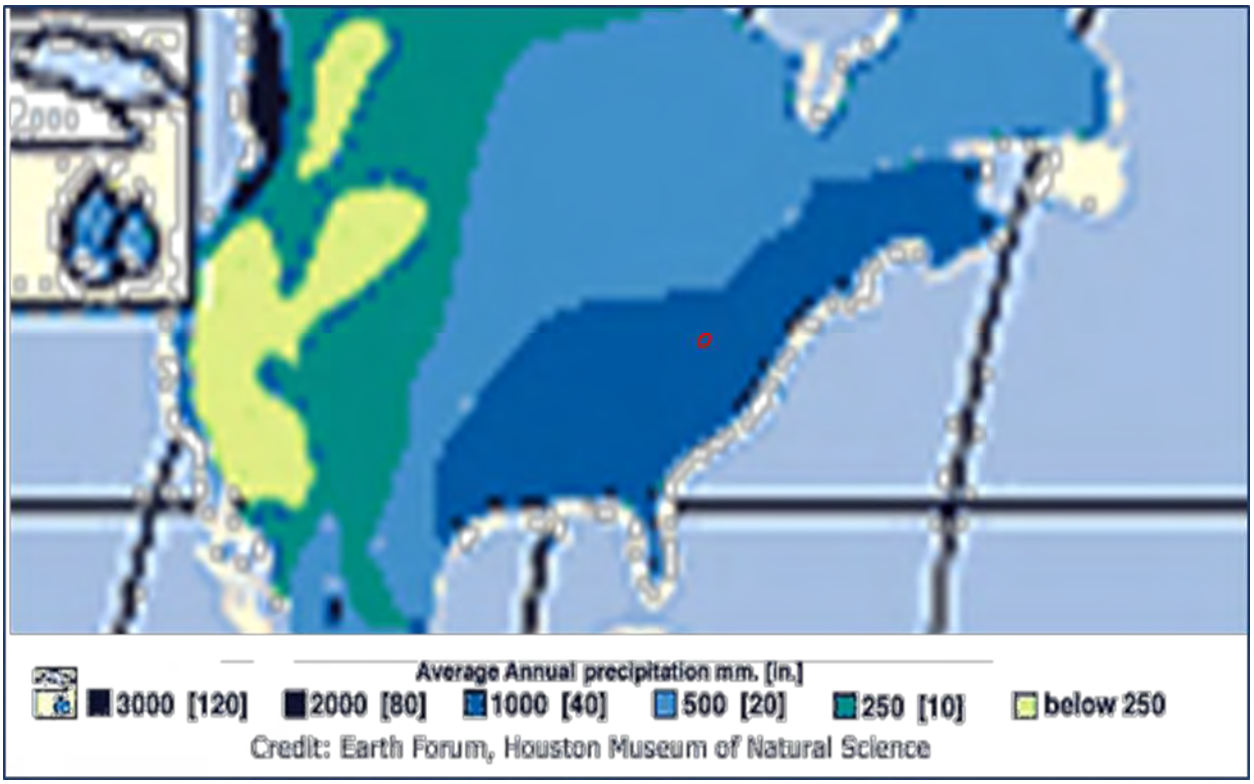


Figure 3.22 USGS Graphic Displaying Annual Amount of Precipitation

As the Mid-Ohio Valley Region is located in the eastern central region of the United States, according to the USGS the region receives on average 40 inches of precipitation annually. This factor determined the geographic extent of heavy rain in the region. Figure 3.23 below represents that level of risk presented to the region by heavy rain events based on the above described factors.

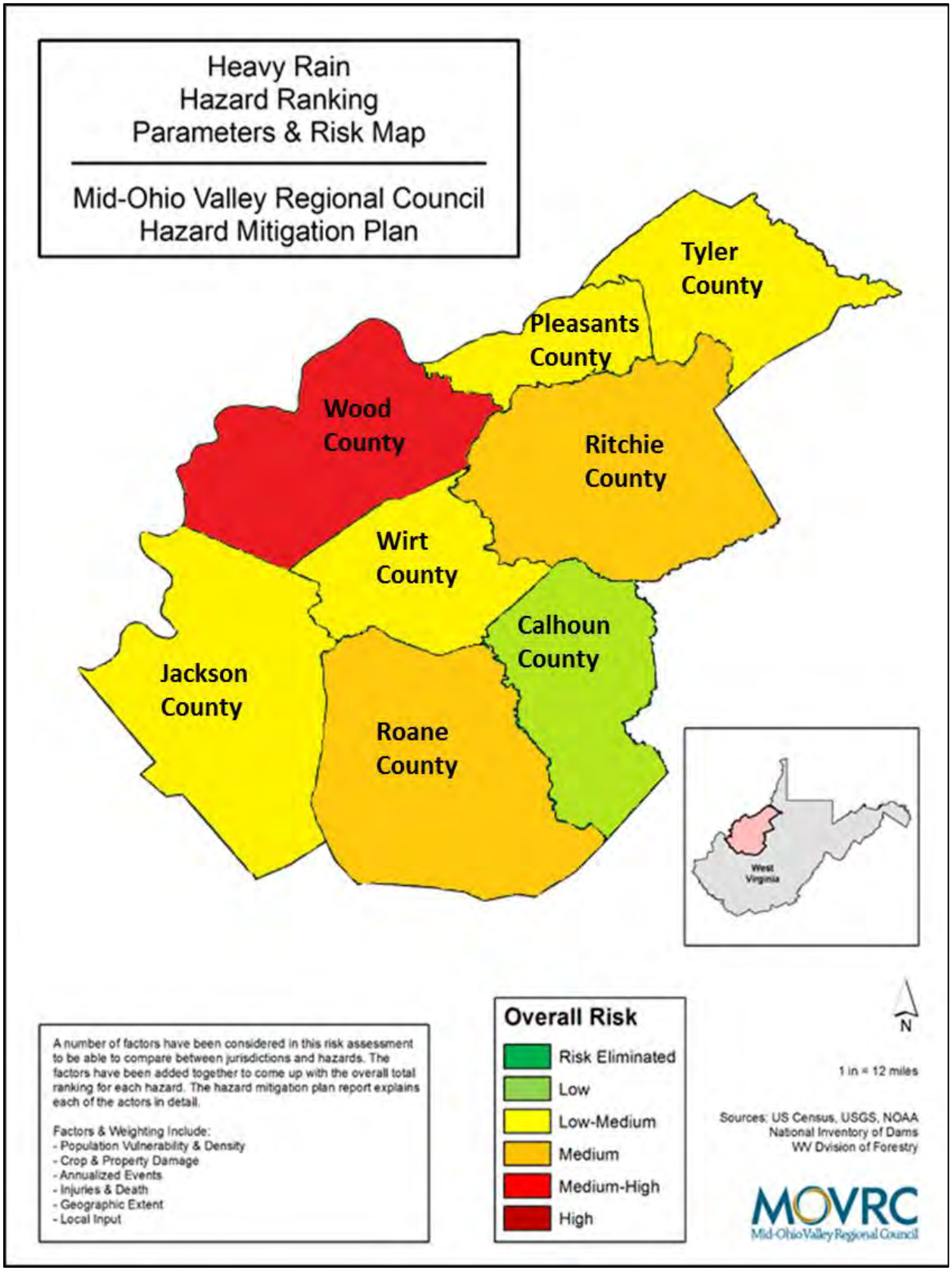


Figure 3.23 Risk Presented by Heavy Rain to the MOV

3.10.4 Hazard Preparedness

For hazard preparedness for hail events, follow the same guidelines as outlined in Section 3.7.4 for high wind events.

3.11 Extreme Cold/Wind Chill

3.11.1 Description

The NOAA NCDC storm data preparation document defines extreme cold/wind chill as a period of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria (typically -35°F or colder), on a widespread or localized basis. According to the National Weather Service (NWS) wind chill temperature is how cold people and animals feel when outside. Wind chill is based on the rate of heat loss from exposed skin caused by wind and cold. As the wind increases, it draws heat from the body, driving down skin temperature and eventually the internal body temperature; therefore, the wind makes it feel much colder. Figure 3.24 below is a chart prepared by the NWS which explains the effect wind's mph has on actual temperature reading. For example, if the actual temperature is 10ºF and the wind is blowing 20 mph then it the temperature actually feels like -9ºF. Therefore, no matter the actual temperature, the more the wind is blowing the colder it feels. Additionally, the table indicates the length of time required for frostbite to occur at particular temperatures.

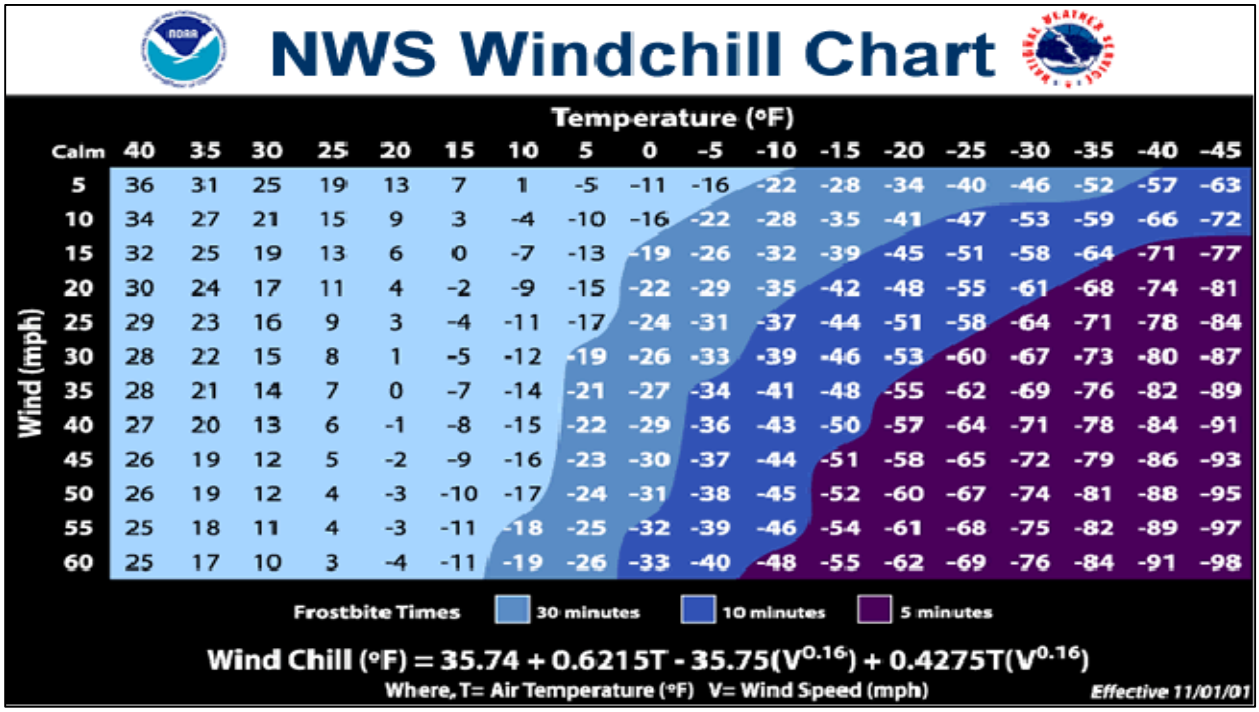


Figure 3.24 NWS Chart Displaying Corolation Between Wind MPH and Actual Temperature

Extreme Cold/Wind Chill presents serious health risks to human life if unprotected from the hazard's conditions, particularly frostbite and hypothermia. Frost bite happens when the body's survival mechanisms kick in during extremely cold weather. To protect the vital inner organs, the body cuts off circulation to your extremities: feet, hands, nose, etc. which eventually freeze. To avoid frostbite, stay inside during severe cold, especially when the wind chill is 50°F or below. Table 3.36 below indicates the degrees of frostbite. Hypothermia occurs when a person has a dangerously low body temperature; 96°F or lower. Symptoms of hypothermia include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion.

First Degree	**Ice crystals form on the skin.**
Second Degree	Skin begins to feel warm even though it is not yet defrosted.
Third Degree	Skin turns red, pale, or white.
Fourth Degree	Pain lasts for more than a few hours and skin may develop dark blue or black. See a doctor immediately if these symptoms arise. Gangrene is a real threat.

Table 3.36 Degree of Frostbite and the Symptoms

According to NWS the only affect wind chill has on inanimate object, such as car radiators and water pipes, is to shorten the amount of time for the object to cool; the object will not cool below the actual air temperature. Therefore, wind chill generally only truly affects humans and animals. Due to the requirement of lower temperatures for winter weather, during times of extreme cold/wind chill the same hazards present during winter weather are present.

3.11.2 Historic Occurrence

The NCDC storm events database indicates that on average there is at least one extreme cold/wind chill event in each county in the Mid-Ohio Valley Region every year. As previously stated the NCDC only began recording such events in 1996; therefore, this figure is based only on the previous 19 years. Extreme cold/wind chill events have occurred in the region in the months of January, February, March, April, May, September, October, November, and December. While temperatures are generally lowest during winter months, extreme cold/wind chill events are possible in all seasons because as wind speed increases the temperature "feels" cooler than it actually is.

Table 3.37 below elaborates on the number of events and the amount of property damage due to extreme cold/wind chill that has been incurred by each county.

County	Total Number of Events	Property Damage
Calhoun	26	$45,000.00
Jackson	26	$45,000.00
Pleasants	27	$45,000.00
Ritchie	27	$45,000.00
Roane	26	$45,000.00
Tyler	27	$45,000.00
Wirt	27	$45,000.00
Wood	27	$240,000.00

Table 3.37 Summary Statistics for Col/Wind Chill Events

Hazard's Impact on Region

In the Mid-Ohio Valley extreme cold/wind chill presents risks to human health and safety as well as to structures and property. The biggest risk to human health and safety presented by extreme cold/wind chill is the threat of frost bite. Section 3.10.1 describes the risks of frostbite in depth. At the highest temperatures of extreme cold/wind chill it only takes 30 minutes for frost bite to set in. Therefore, it is crucial to the safety of citizen that during this hazard people take precautions to keep themselves and their animals safe.

As a natural hazard, extreme cold/wind chill can freeze utility pipes, cause power outages, generate furnace difficulties, and initiate vehicular difficulties. In the Mid-Ohio Valley Region in the last 19 years extreme cold/wind chill has caused a total of $555,000 in reported property damage. As stated above, when the wind chill drops down it does not affect inanimate objects in the same way it affects people and animals. The actual temperature of the object does not drop as low at the wind chill factor; it may however cause the actual temperature to drop more quickly than usual. When temperatures are this low not only can regular home plumbing freeze but also public utility lines are capable of freezing. Additionally, vehicles operated by bio-diesel fuel malfunction as the fuel turns to gel in such low temperatures.

Hazard Extreme in the MOV

On February 4th and 5th 1996 a fresh snow cover combined with an arctic cold wave to drop temperatures well below zero on 2 consecutive mornings. Many rural areas in the western lowlands of WV were 15 to 20 degrees below zero. Along Lockhart Fork in northern Jackson County it was minus 22 and minus 23 on both mornings. Readings of around 10 degrees below zero were common along the Ohio river. In Wood County this weather event caused $10,000.00 in property damage. With temperatures in the -20's, with only 5mph wind the temperature outside feels like -34 degrees. Temperatures that low can result in frostbite within 30 minutes. These extreme temperatures present a health and safety risk to the region's citizens.

3.11.3 Risk Assessment

Extreme cold/wind chill as a hazard presents a continual risk to the Mid-Ohio Valley Region as whole, but presents a varying degree of risk in each individual county. Since 1996 there has not been any reported crop damage or any injuries or deaths directly related to extreme cold/wind chill. However, as represented above on average each county experiences at least one such event a year, and at least one such event has created some degree of property damage in each county. Table 3.38 below displays the average number of extreme cold/wind chill events each county can expect each year.

County	Average Number of Events each year
Calhoun	1.37
Jackson	1.37
Pleasants	1.42
Ritchie	1.42
Roane	1.37
Tyler	1.42
Wirt	1.42
Wood	1.42

Table 3.38 Average Number of Yearly Extreme Cold/Wind Chill Events

According to the NWS NOAA Winter Resources page, extreme cold/wind chill is a daily concern during the winter months for the northern United States. Areas further south may only experience occasional outbreaks of frigid temperatures each winter. Regardless of geographic location, the same cold-related risks exist. The Mid-Ohio Valley region is located in the central eastern region of the United States and therefore located in a geographic location that is susceptible to extreme cold//wind chill hazards.

While extreme cold was not identified as a topic of concern during any of the public meetings for this plan, it was identified as a threatening hazard through the online public survey by 6.08% of the survey takers. Citizens in Calhoun, Pleasants, Ritchie, Roane and Wood counties identified extreme cold/wind chill as presenting the biggest or second biggest threat from a natural hazard to their communities. Figure 3.25 below displays the level of risk extreme cold/wind chill presents in each county of the region as identified through the risk assessment process of this HMP.

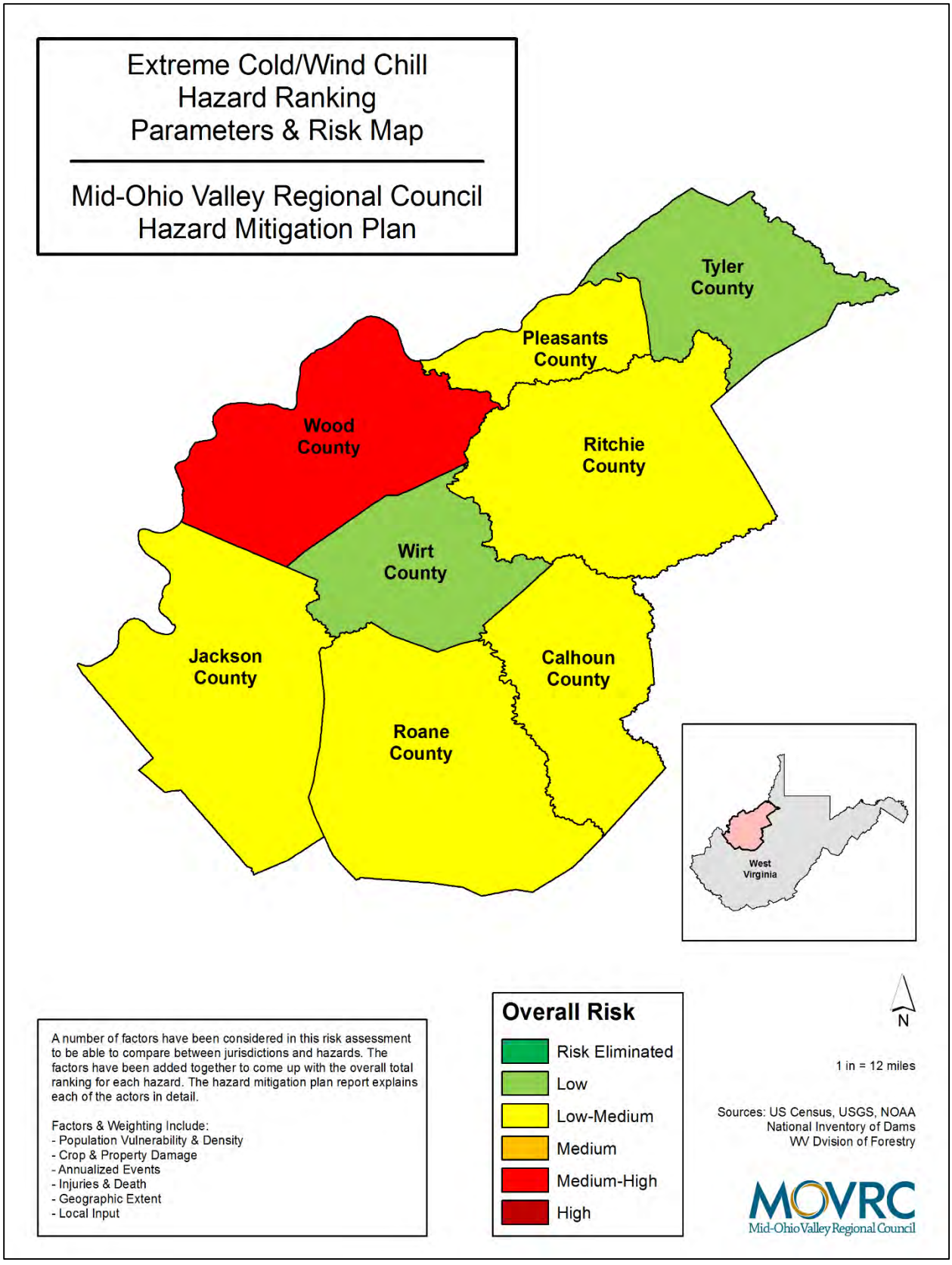


Figure 3.25 Risk Presented by Cold/Wind Chill to Each County

3.11.4 Hazard Preparedness

Before Extreme Cold/Wind Chill

- Add the following supplies to your emergency kit; rock salt, sand to improve traction, snow shovels, sufficient heating fuel, and adequate clothing and blankets.
- Make a family Communications Plan
- Bring pets/companion animals inside during winter weather.
- Minimize travel and winterized your vehicle for when you must travel by checking the following: antifreeze levels, battery and ignition system, brakes, exhaust system, rule and air filters, heater and defroster, lights and flashing hazards, oil, thermostat, windshield wiper equipment, install good winter tires.
- Winterize your home:
  - Extend the life of your fuel supply by insulating walls and attics, caulking and weather-stripping doors and windows, and installing storm windows or covering windows with plastic.
  - Clear rain gutters, repair roof leaks, and cut away tree branches that could fall on a house or another structure.
  - Maintain heating equipment and chimneys
  - Insulate pipes and allow faucets to drip to avoid freezing
  - Ensure fuel-burning equipment has proper ventilation and keep fire extinguishers on hand.
  - Install storm windows
  - Check roof's ability to sustain unusually heavy weight from the accumulation of snow or water.
- Be aware of the risks presented by carbon Monoxide

During Extreme Cold/Wind Chill

- Stay indoors during the storm, when you must be outside walk carefully on snowy, icy walkways and keep dry
- Avoid overexertion when shoveling snow
- Cover up exposed skin to avoid frostbite and hypothermia.
- Drive only if it is absolutely necessary. If driving is unavoidable let someone know your destination, your route, and when you expect to arrive.
- If the pipes freeze, remove any insulation or layers of newspaper and wrap pipes in rags. Completely open all faucets and pour hot water over the pipes, starting where they were most exposed to the cold.
- Maintain ventilation when using kerosene heaters to avoid build-up of toxic fumes. Refuel kerosene heather outside and keep them at least three feet from flammable objects.
- Conserve fuel, if necessary, by keeping your residence cooler than normal.
- If you will be going away during cold weather, leave the heat on in your home, set to a temperature no lower than 55°F.
- Dress for the Weather: if you must go outside, wear layers of loose-fitting, lightweight, warm clothing rather than one layer of heavy clothing. The outer garments should be tightly woven and water repellent. Wear mittens, which are warmer than gloves, wear a hat to prevent loss of body heat, cover your mouth with a scarf to protect your lungs.

After Extreme Cold/Wind Chill

- If your home loses power or heat for more than a few hours or if you do not have adequate supplies to stay warm in your home overnight, you may want to go to a designated public shelter if you can get there safely.
- Bring any personal items that you would need to spend the night such as toiletries and medicines.
- Continue to protect yourself from frostbite and hypothermia by wearing warm, loose fitting, light weight clothing in several layers. Stay indoors, if possible.
- Learn from every storm
  - Assess how well your supplies and family plan worked. What could you have done better?
  - Take a few minutes to improve your family plan and supplies before the next winter storm hits.
  - Talk to your neighbors and colleagues about their experiences and share tips with each other.

3.12 Lightning

3.12.1 Description

As defined by the National Severe Storms Laboratory (NSSL), lightning is a giant spark of electricity in the atmosphere between clouds, the air, or the ground. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground. When the opposite charges build up enough, this insulating capacity or the air breaks down and there is a rapid discharge of electricity that we know as lightning. The flash of lighting temporarily equalizes the charged regions in the atmosphere until the opposite charges build up again. While the conditions needed to produce lightning are generally known, there is debate about exactly how a cloud builds up electrical charges and how lightning forms.

Lightning strikes tall objects such as trees and skyscrapers which are commonly struck by lightning. Mountains also make good targets. This is because their tops are closer to the base of the storm cloud; the less insulation the lightning has to burn through the easier it is for it to strike. This does not always mean that tall objects will be struck, it depends on where the charges accumulate. Lightning can strike the ground in an open field even if the tree line is close by.

Lightning happens as either a cloud flash or as a cloud-to-ground flash; there are roughly 5 to 10 times as many cloud flashes as there are cloud-to-ground flashes. The following contains a description of the paths through which Lightning follows.

Cloud-to-ground Lightning: Triggered lighting goes from ground to cloud, while "natural" lightning is cloud to ground.

Natural – lightning that occurs because normal electrification in the environment.

Artificial – lightning that occurs because it has been artificially initiated or triggered. Includes strikes to very tall structures, airplanes, rockets and towers on mountains.

Cloud-to-Air Lightning:

Sheet lightning – lightning embedded within a cloud that lights up as a sheet of luminosity during the flash.

Heat Lightning – is lightning that is too far away for thunder to be heard.

Cloud-to-Cloud Lightning:

Spider Lightning – long, horizontally traveling flashes often seen on the underside of stratiform clouds.

3.12.2 Historic Occurrence

Lightning is a very common occurrence during thunderstorms, however the data analyzed for this HMP only identified 10 total instances of lighting within the last ten years. This is because the NCDC Storm Events Database used in the risk assessment of this plan only records lightning events that result in a fatality, injury, and/or damage. Table 3.39 below details each recorded lightning incident in the Mid-Ohio Valley since 1996 including the location, date of event, total property damage incurred, and deaths or injuries incurred.

County	Location	Year of Event	Total Property Damage	Deaths or Injuries
Jackson	Ripley	July 27, 1997	$29,534.83	-
Wood	Blennerhassett	July 27, 1997	$73,837.07	-
Wood	Parkersburg	July 22, 1998	$17,449.10	-
Wood	Parkersburg	June 3, 2002	-	3
Wood	Boaz	June 30, 2005	-	1
Wood	Williamstown	July 15, 2005	$30,340.12	-
Roane	Triplet	March 7, 2012	$13,323.31	-
Wood	Boreman	July 11, 2012		1
Wood	Stewart Arpt	July 10, 2013	$2,034.86	-
Wood	Stewart Arpt	May 27, 2014	$125,148.37	-

Table 3.39 Lightning Incidents in the MOV

Of course, the above detailed incidents are not the only times during the last 19 years that lightning has occurred in the Mid-Ohio Valley Region. There have been numerous other instances that were not recorded because they did not result in a fatality, injury, and/or damage. For example, in 2015 in the month of July the NOAA's Severe Weather Data Inventory (SWDI) recorded 305 incidents of Lightning in Wirt County between Elizabeth, Newark, and the Greencastle area. Figure 3.26 below from the SWDI lists the number of Lightning events by date that occurred in the area on the left side of the figure.

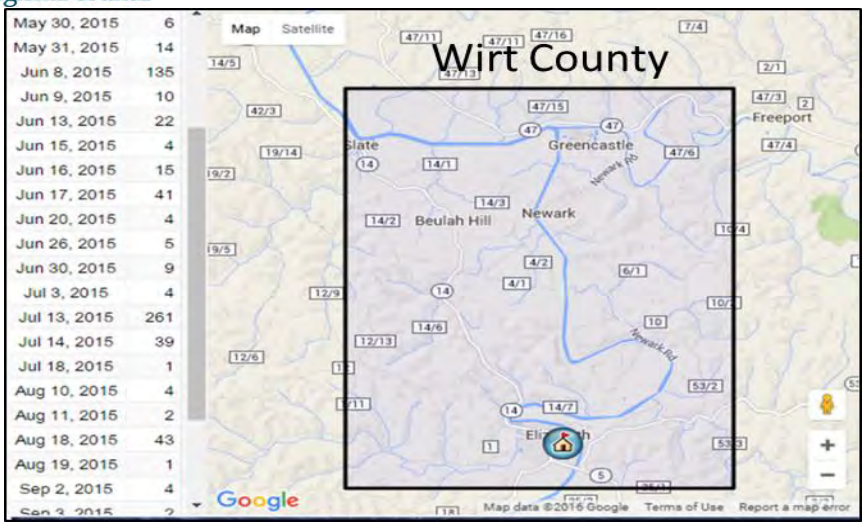


Figure 3.26 Severe Weather Data Inventory List of Lightning Events by Date, Newark Area of Wirt County

Hazard's Impact on Region

Lightning affects the Mid-Ohio Valley by presenting the risk of injury or death to humans and threatening property damage. As lightning is possible in all parts of the region, being outdoors during a lightning storm can be very dangerous. As an individual, being struck by lightning in any way can be deadly. Immediate medical attention, including calling 911, starting CPR, and using an AED, may be critically important to keep the person alive until more advanced medical care arrives.

A typical lighting flash is about 300 million Volts and about 30,000 Amps. In comparison, household current is 120 Volts and 15 Amps. There is enough energy in a typical flash of lighting to light a 100-watt incandescent light bulb for about three months or the equivalent compact fluorescent bulb for about a year. When lightning strikes property it has the potential to send those volts through objects connected to the electricity. Additionally, a lightning strike can start fires.

Hazard Extreme in the Mid-Ohio Valley

At its most extreme level, lightning has caused serious injury in the region. On July 11, 2012 an 18-year-old boy was struck by lightning during a softball game in Wood County outside of Parkersburg. The bolt passed through his entire body knocking him on his back and leaving him without a pulse and not breathing. His teammates performed CPR for about 10 to 15 minutes until EMS arrived and took him to a local hospital. The boy was transferred to a hospital in Morgantown and eventually to a rehabilitation center.

Lightning has also caused significant property damage in the Mid-Ohio Valley. On July 27, 1997 in the City of Ripley in Jackson County lightning hit a transformer near the emergency communication center. The electrical surge travelled into the building,

destroying some of the phone lines, televisions, and computers. In total, this event caused $20,000.00 in property damage in Jackson County. Additionally, this same event caused a fire to ignite and extensively damage a home in the Blennerhassett area of Wood County resulting in $50,000.00 of property damage.

3.12.3 Risk Assessment

The level of risk presented by lightning to the Mid-Ohio Valley Region varies from county to county. Lightning has not directly resulted in any recorded crop damage in the region from 1996 to present. The NOAA's SWDI indicates that lightning is possible in all areas of the region, even though a recorded lightning incident has not occurred in all counties. However, the potential for such an event is existent in all counties, and could happen if the right circumstances fall in line.

As the NCDC database only records lightning events that result in deaths, injuries, and/or property damage, the number of events identified through this risk assessment were dependent upon those other elements of the risk assessment. Depicted in table 3.39 above, 7 of the region's 10 incidents of lightning resulted in thousands of dollars in property damage. The remaining three lightning incidents caused 5 injuries in Wood County. Table 3.40 indicates the average number of lightening events for each county in the Mid-Ohio Valley each. However, these figures at first glance can be misleading. ** These figures only represent the number of lightening incidents that have resulted in deaths, injuries, and/or property damage. Lightening events happen multiple times each year across the entire region; however, lightning to the extent that it causes injurie/death or property damage is much less frequent. **

County	Average Number of Events each year
Calhoun	0
Jackson	0.05
Pleasants	0
Ritchie	0
Roane	0.05
Tyler	0
Wirt	0
Wood	0.42

*Table 3.40 Average Number of Yearly Lightening Events***

Lightning was not identified as a natural hazard threatening the region during any of the public meetings held in each county. However, through the online survey citizens in Calhoun, Roane, Wirt, and Wood Counties identified lightning as presenting the biggest or the second biggest threat to their neighborhood from a natural hazard. Figure 3.27 below displays the level of risk lightning presents in each county as identified through the risk assessment for this plan.

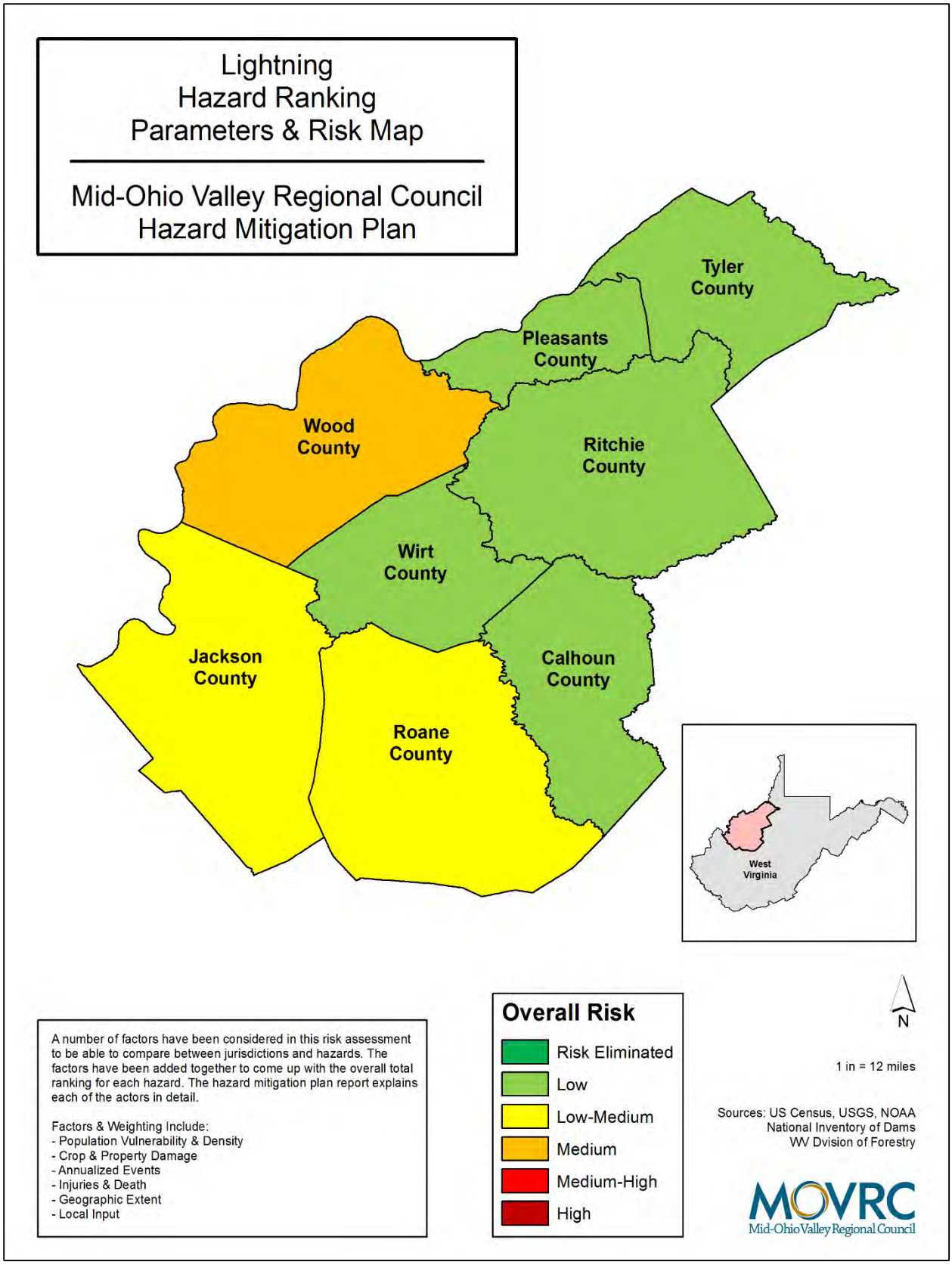


Figure 3.27 Risk Presented by Lightning in Each County

3.12.4 Hazard Preparedness

Before Thunderstorm and Lightning

- Remove dead or rotting trees and branches that could fall and cause injury or damage during a severe thunderstorm.
- Postpone outdoor activities
- Secure outdoor objectives that could blow away or cause damage
- Ge inside a home, building, or hard top automobile. Although you may be injured if lightning strikes your car, you are much safer inside a vehicle than outside. Rubber-soled shoes and rubber tires provide NO protection from lightning. However, the steel frame of a hard-topped vehicle provides increased protection if you are not touching metal.
- Shutter windows and secure outside doors, if shutter are not available, close window blinds, shades or curtains.
- Unplug any electronic equipment well before the storm arrives.
- To reduce lighting risk outdoors:
  - In a forest seek shelter in a low area under a thick growth of small trees.
  - In an open area go to a low place such as a ravine or valley, be alert for flash floods.
  - On open water get to land and find shelter immediately.

During Thunderstorms and Lightning

- Avoid contact with corded phones and devices including those plugged into electric for recharging.
- Avoid contact with electrical equipment or cords. Unplug appliances and other electrical items such as computers and turn off air conditioners. Power surges from lightning can cause serious damage.
- Stay away from windows and doors, and stay off porches. Do not lie on concrete floors and do not lean against concrete walls.
- Avoid natural lighting rods such as tall, isolated tree in an open area. Avoid hilltops, open fields, the beach or a boat on the water.
- Take shelter in a sturdy building; avoid isolated sheds or other small structures in open areas.
- Avoid contact with anything metal – tractors, farm equipment, motorcycles, golf carts, gold clubs, and bicycles.
- If you are driving, try to safely exit the roadway and park. Stay in the vehicle and turn on the emergency flashers until the heavy rain ends. Avoid touching metal or other surfaces that conduct electricity in and outside the vehicle.

After A Thunderstorm or Lightning Strike

- If lightning strikes you or someone you know, call 911 for medical assistance as soon as possible. The following are things you should check when you attempt to give aid to a victim of lightning:
  - Breathing – if breathing has stopped, begin mouth-to-mouth resuscitation.
  - Heartbeat – if the heart has stopped, administer CPR.
  - Pulse – if the victim has a pulse and is breathing, look of other possible injuries such as burns where the lightning enters and left the body, nervous system damage, broken bones, and loss of hearing and eyesight.
- Never drive through a flooded roadway.

- Stay away from storm-damaged areas to keep from putting yourself at risk from the effects of severe thunderstorms.
- Help people who may require special assistance, such as infants, children and the elderly or those with access or function needs.
- Stay away from downed powerlines and report them immediately.
- Watch your animals closely, keep them under your direct control.

3.13 Wildfire

3.13.1 Description

Wildfire is defined by the NOAA as any significant forest fire, grassland fire, rangeland fire, or wildland-urban interface fire which consumes the natural fuels and spreads in response to its environment. Significant here is defined as a wildfire that causes one or more fatalities, one or more injuries, and or property damage (including equipment damaged in fighting the fire).

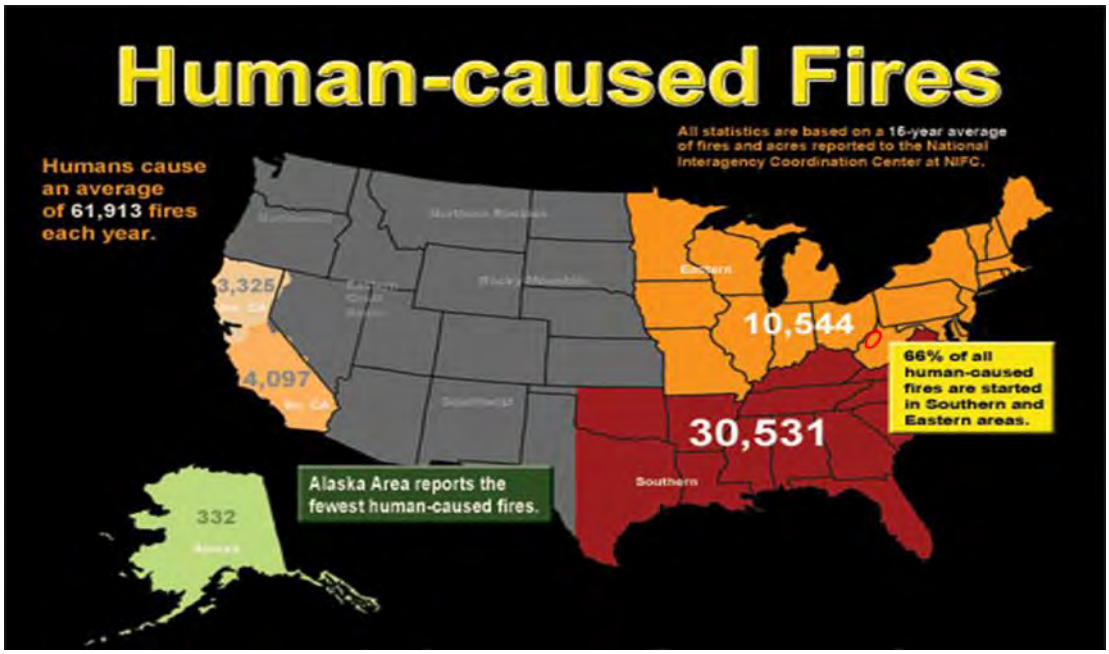


Figure 3.28 NIFC Graphic Statistic Explaining Human-Caused Fires

Wildfires can be caused by nature but most are caused by humans. According to the WV Division of Forestry (WVDF), through carelessness, people cause the majority of forest fires in WV. In the spring of 2015, 43% of all forest fires were the result of escaped debris fires. In fact, according to the National Interagency Fire Center (NIFC) humans cause an average of 61,913 fires each year; the majority of which happen in the eastern United States. Figure 3.28 from the NIFC depicts human caused fires in greater detail. Equipment use was the second highest cause of forest fires in WV causing 29% of all wildfires. Forest fires set purposely accounted for 13% of forest fires

in spring of 2015. Some human-caused fires result from campfires left unattended, the burning of debris, negligently discarded cigarettes and intentional acts of arson.

Naturally occurring fires are generally caused by lightning or flowing lava. Lightning is described as having two components – leaders and strokes. The leader is the probing feeler sent from the cloud. The return streaks of light are a series of strokes that produce the actual lightning bolt or flash that we see. There are two types of lighting – cold lightning and hot lightning. Cold lightning is a return stroke with intense electrical current but of relatively short duration. Hot lightning has currents with less voltage, but these occur for a longer period of time. Fires are usually started by unusually long-lasting hot lightning bolts.

According to the National Park Service (NPS), wildfires are influenced by many factors, like geography, climate, weather, and topography. For example, in WV from March 1 – May 31 and from October 1 – December 31 is considered forest fire season and outdoor burning is restricted. Characteristics of the forest's available "fuel" or the foliage that will burn affects a fire's behavior, specifically: the level of moisture contained within the environment and the chemical makeup of the fuel. Plants containing higher levels of moisture, like live tress decrease the plant's degree of flammability. Also, the soil's moisture content, the amount of organic matter present, and the curation of the fire determine to what extent soil will be affected by fire. Additionally, some plants, shrubs, and trees contain oils or resins that promote combustion causing them to burn more easily, quickly or intensely than those without such oils.

Weather conditions such as wind, temperature and humidity also contribute to fire behavior. NPS describes wind as one of the most important factors because it can bring a fresh supply of oxygen to the fire as well as push the fire toward a new fuel source. Temperature of fuel is determined by the ambient temperature since fuels attain their heat by absorbing surrounding solar radiation. The temperature of a fuel influences its susceptibility to ignition. In general, fuels will ignite more readily at high temperatures than at low temperatures. Humidity, the amount of water vapor in the air, affects the moisture level of a fuel. At low humidity levels, fuels become dry and, therefore, catches fire more easily and burns more quickly than when humidity levels are high.

3.13.2 Historic Occurrence

The NCDC only records "significant" forest fires, grassland fires, rangeland fires, or wildland-urban interface fires which consume the natural fuels and spreads in response to its environment. The database defines significant as a wildfire that causes one or more fatalities, one or more injuries, and/or property damage. Consequently,

the NCDC database reports only one previous wildfire in the region which occurred on April 21, 2014 in Roane County which indirectly caused one injury. One firefighter from the Walton VFD was overcome by heat exhaustion.

While the NCDC purports the singular event, the West Virginia Division of Forestry (WVDF) indicates that numerous more wildfires have occurred. Figure 3.29 below is a copy of the Spring Season Fire Report dated March 14, 2016. However, a database detailing all previous wildfires in the region was not accessible in the creation of this plan. In this representation the Mid-Ohio Valley Region is expanded to also include Doddridge and Gilmer Counties, the Mid-Ohio Valley Region has been filled in with red in the figure below. This report indicates that the Mid-Ohio Valley Region, or region 6, has experienced 6 wildfires already this Spring effecting 6.7 acres. This indicates that the Mid-Ohio Valley experiences a larger number of less significant wildfires each year, thus presenting the potential for "significant" wildfires.

SPRING FIRE SEASON
March 14, 2016

DISTRICT SUMMARY				
DISTRICT	FIRES	P(%)	ACRES	P(%)
D-1	13	17%	10.4	2%
D-2	12	16%	33.0	8%
D-3	3	4%	9.5	2%
D-4	15	20%	39.9	9%
D-5	27	36%	329.0	77%
D-6	6	8%	6.7	2%
Total	76	100%	428.5	100%

FIRE CAUSE SUMMARY		
Cause	Number	P(%)
Campfire	0	0%
Children	2	3%
Debris Burning	31	41%
Equipment Use	28	37%
Incendiary	4	5%
Lightning	0	0%
Railroad	2	3%
Smoker	2	3%
Miscellaneous	5	7%
False Alarm	0	0%
Under Investigation	2	3%
TOTAL	76	100%

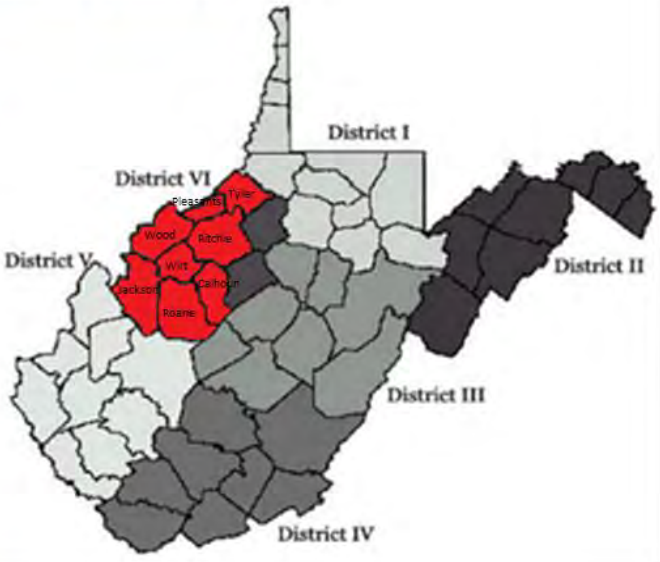


Figure 3.29 Spring Fire Season 2016 Summary Statistics, MOV Counties in Red (Jan 1-Mar 14)

Hazard's Impact on Region

In conducting research for this plan, only statewide data was available for wildfires. Table 3.41below displays the total number of fires and the total number of acres that were burned in the state of West Virginia from 2001 to 2014. Today the West Virginia Division of Forestry is responsible for protecting nearly 12 million acres of forestland across West Virginia. The totals from the chart below that between 2001 and 2014 roughly 2% of West Virginia's forest land was affected by a wildfire.

Year	Number of Fires	Acres Burned
2014	953	13,060
2013	688	8,922
2012	729	15,871
2011	474	5,709
2010	766	22,911
2009	984	14,973
2008	889	13,151
2007	849	13,151
2006	1,022	17,608
2005	757	12,436
2004	632	6,022
2003	669	8,370
2002	959	10,024
2001	887	86,465
Total	**11,258**	**248,673**

Table 3.41 State Wildfire Totals for WV

Hazard Extreme in the MOV

Starting April 21, 2014 and into the 22nd, after several days of dry weather, a few brush fires were observed in southern Roane County. One brush fire caused a firefighter from the Walton Volunteer Fire Department to be overcome by heat exhaustion. The brush fire was in the vicinity of Lewis Station and Payne Ridge Roads. This is the only wildfire incident in the region that has resulted in an injury or death or has caused property damage since 1996.

3.13.3 Risk Assessment

This plan's risk assessment identified that wildfires present varying levels of risk to the counties of the Mid-Ohio Valley Region. Wildfires have caused no reported property or crop damage in any of the region's counties. There has however been one reported injury indirectly resulting from a wildfire event. Additionally, there has only been one reported significant wildfire event in the region from 1996 to September 30, 2015. However, the WV Division of Forestry's spring fire report indicates that many

other less significant wildfires do occur in the region. This therefore indicates that the potential for a significant wildfire exists within the region.

Table 3.42 below displays the average number of wildfire events annually for each county in the region, according to NCDC records. **However, it is important to note that the NCDC only records significant wildfires (ones causes injuries/deaths or property damage). The WVDF indicates that multiple fires have occurred in the region during the spring 2016 fire season; these fires just did not warrant a significant rating by the NCDC.

County	Average Number of Events each year
Calhoun	0
Jackson	0
Pleasants	0
Ritchie	0
Roane	0.05
Tyler	0
Wirt	0
Wood	0

*Table 3.42 Average Number of Yearly Wildfire Events***

Wildfire was not identified as a natural hazard presenting a particular threat to communities during any of the public meetings held to create this plan. However, through the online survey citizen in Roane, Tyler, and Wood Counties identified wildfires as the natural hazard presenting the biggest or second biggest threat to their neighborhoods. Figure 3.30 below depicts the level of threat wildfires present to each county in the Mid-Ohio Valley Region as identified through this HMP's risk assessment.

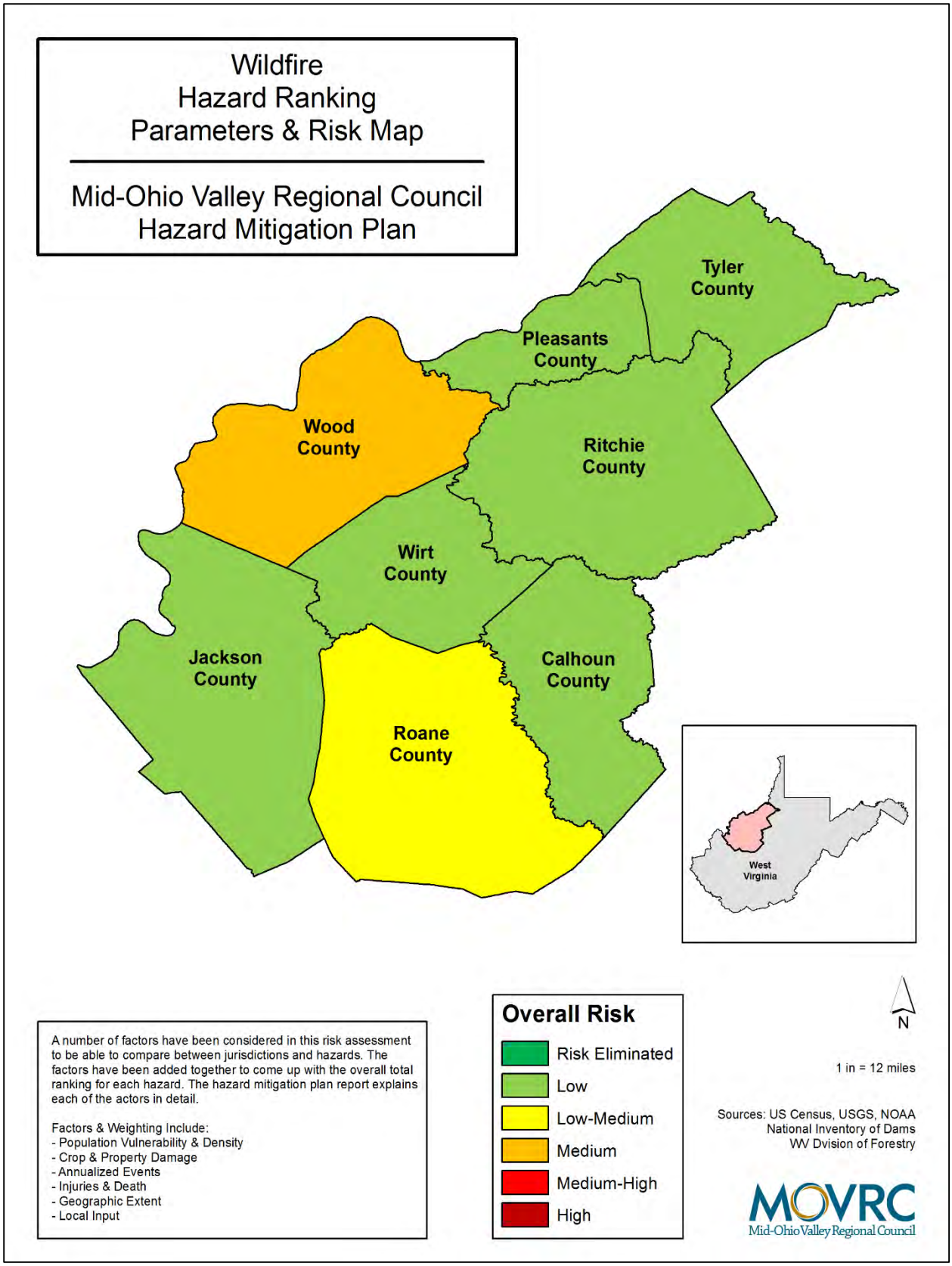


Figure 3.30 Risk Presented by Wildfire to Each County

3.13.4 Hazard Preparedness

Basic Safety Tips

- If you see a wildfire and haven't received evacuation orders yet, call 9-1-1. Don't assume that someone else has already called.
- If ordered to evacuate during a wildfire, do it immediately- make sure and tell someone where you are going and when you have arrived.
- Many communities have text or email alerting systems for emergency notifications. To find out what alerts are available in your area, search the internet with your town, city, or county name and the world "alerts."
- If you or someone you are with has been burned, call 9-1-1 or seek help immediately' cool and cover burns to reduce chance of further injury or infection.

Prepare your home

- Regularly clean the roof and gutters
- Maintain an area approximately 30' away from your home that is free of anything that will burn, such as wood piles, dried leaves, newspaper, and other brush.
- Connect garden hoses long enough to reach any area of the home and fill garbage cans, tubs, or other large containers with water.
- Review your homeowner's insurance policy and also prepare/update a list of your home's contents.

After a Wildfire

- Returning Home –
  - Return home only when authorities say it safe.
  - For several hours after the fire, maintain a "fire watch." Check and re-check for smoke, sparks or hidden embers though out the house, including the roof and the attic.
  - Use caution when entering burned areas as hazards may still exist, including hot spots, which can flare up without warning. Evacuate immediately If you smell smoke.
- Cleaning your home –
  - Wear a NIOSH certified-respirator (dusk mask) and wet debris down to minimize breathing dust particles.
  - Discard any food that has been exposed to heat, smoke or soot.
  - Do not use water you think may be contaminated to wash dishes, brush teeth, prepare food, wash hands, or to make ice or baby formula.
  - Photograph damage to your property for insurance purposes.

3.14 Tornadoes

3.14.1 Description

Spawned from powerful thunderstorms, tornadoes can cause fatalities and devastate a neighborhood in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 300 miles per hour. Damage paths can be in excess of one-mile-wide and 50 miles long. Every state is at some risk from this hazard. Some tornadoes are clearly visible, while rain or nearby low-hanging clouds obscure others. Occasionally, tornadoes develop so

rapidly that little, if any, advance warning is possible. Before a tornado hits, the wind may die down and the air may become very still. A cloud of debris can mark the location of a tornado even if a funnel is not visible. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado.

Tornados may strike quickly, with little or no warning and they any appear nearly transparent until dust and debris are picked up or a cloud forms in the funnel. The average tornado moves southwest to northeast, but they have been known to move in any direction. The average forward speed of a tornado is 30 mph, but may vary from stationary to 70 mph. Tornadoes can accompany tropical storms and hurricanes as they move onto land; waterspouts are tornadoes that form over water.

Tornadoes are most frequently reported east of the Rocky Mountains during spring and summer months. Peak tornado season in the southern states is March through May and in the northern states it is late spring through early summer. Figure 3.31 below displays the average annual number of tornadoes for the United States from 1991 – 2010. The Mid-Ohio Valley Region is indicated by the red star.

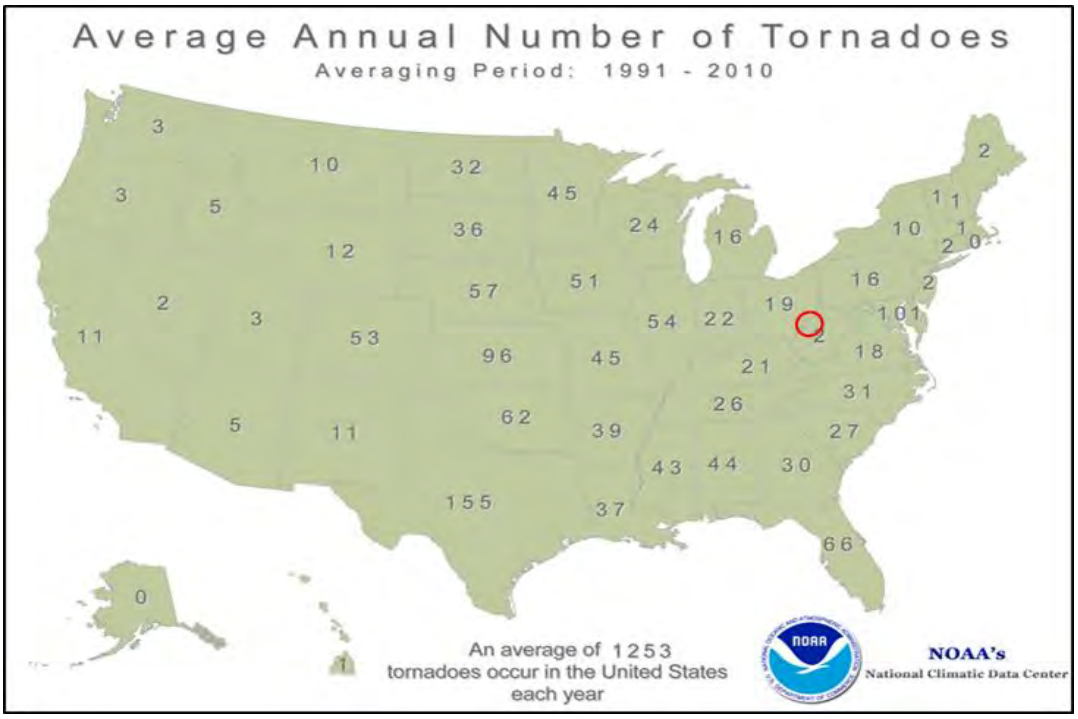


Figure 3.31 Average Annual Tornadoes by State 1991-2010

Figure 3.32 below is a representation of the average number of tornados that occur in each represented state during each month according to the National Center for Environmental Information (NCEI) of the NOAA.

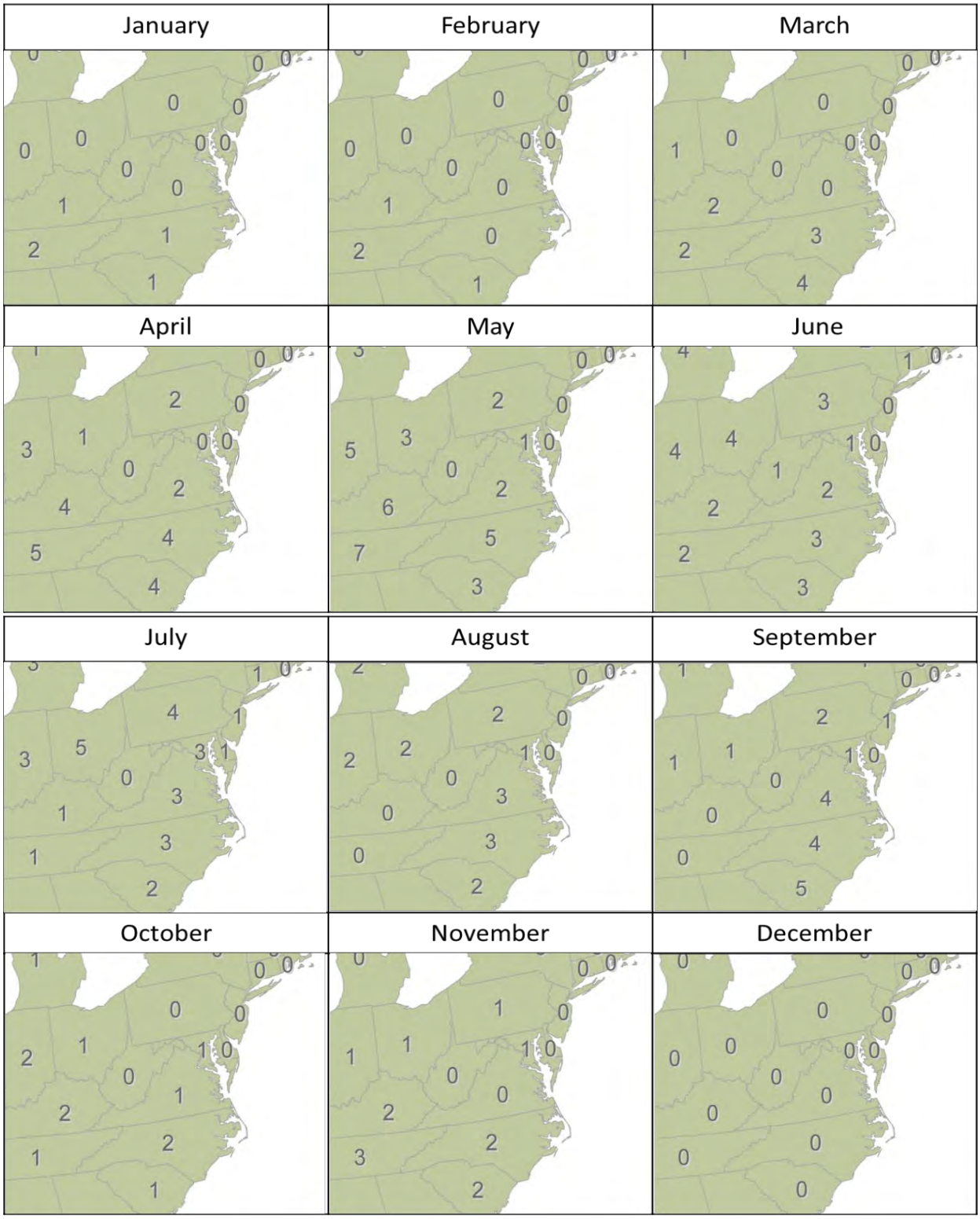


Figure 3.32 Average Tornados by Month, NOAA

Tornadoes are most likely to occur between 3 pm and 9 pm, but can occur at any time. Figure 3.33 below prepared by NOAA depicts the time of day that tornadoes have

occurred across the entire United States from 1950 to 2010. Figure 3.34 depicts the same information for the northeast region of the United States which includes the Mid-Ohio Valley region. When a tornado watch is issued it means tornadoes are possible and individuals should remain alert for approaching storms. A tornado warning indicates that a tornado has been sighted or indicated by the weather radar and individuals should take shelter immediately.

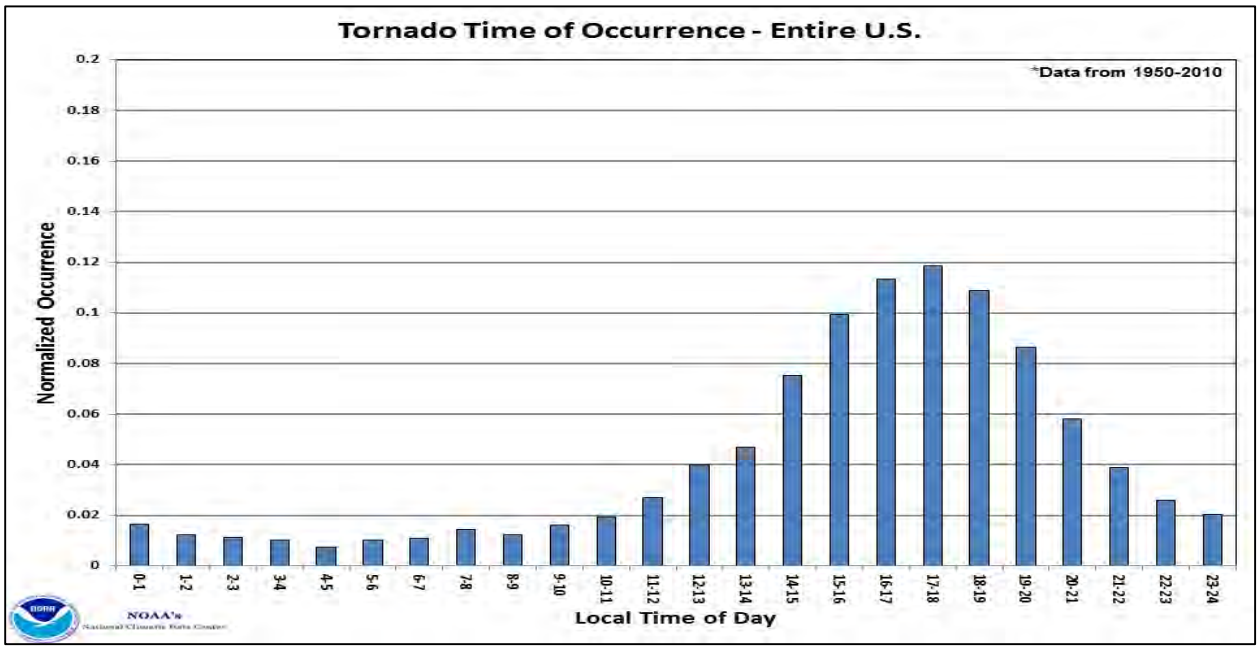


Figure 3.33 Number of Tornado Occurrences by Time of Day Entire U.S.

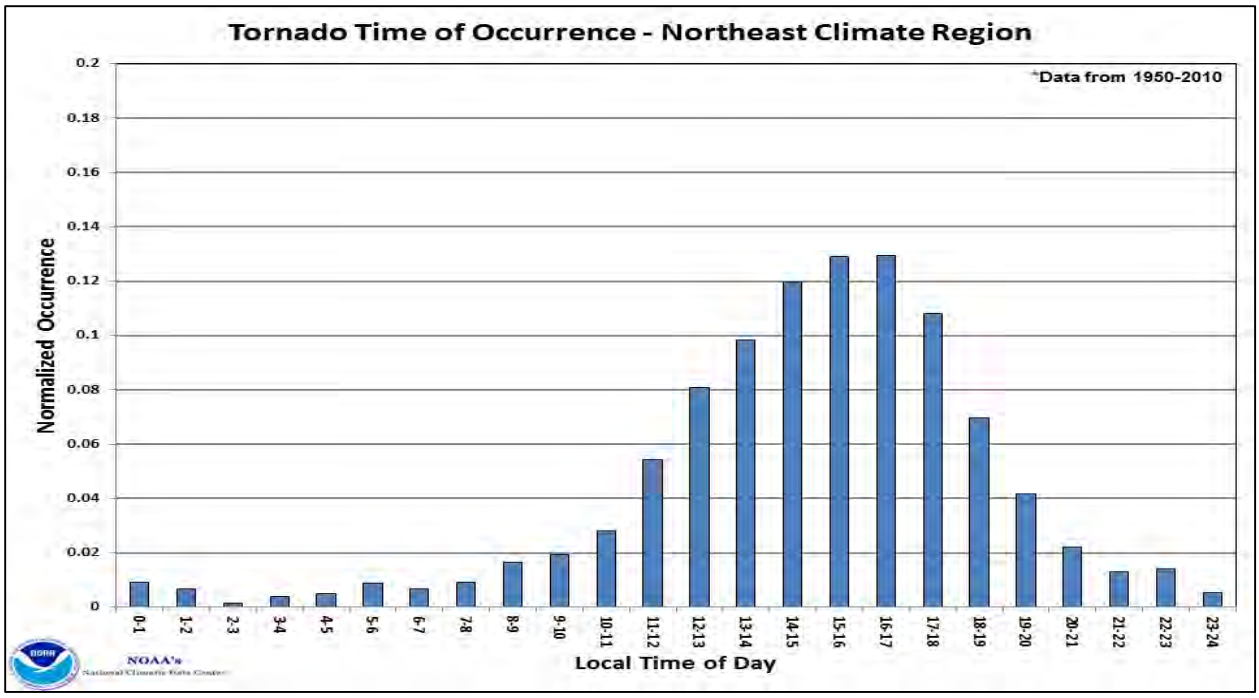


Figure 3.34 Number of Tornados Occurrences by Time of Day for the Northeast Climate Region

Originally, a scale was developed to relate the degree of damage to the intensity of winds such as those that occur during a tornado. The original F-Scale is no longer utilized however because it has never been scientifically tested or proven and tornado wind speeds are still largely unknown. Different winds may be needed to cause the same damage depending on how well-built a structure is, wind direction, wind duration, battering by flying debris, and a bunch of other factors. Also, the process of rating the damage itself is largely a judgement call. In February of 2007 a new enhanced F-scale began being utilized to determine the strength of tornados. The enhanced F-scale classifies F0-F5 damage as calibrated by engineers and meteorologists across 28 different types of damage indicators; mainly various kinds of buildings, but also a few other structures as well as trees. This is because the same wind does different things to different kinds of structures.

Fujita (Original) Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest ¼-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Table 3.43 NOAA Comparison of Original F-Scale and Enhanced F-Scale

Table 3.43 above was created by the NCEI NOAA to compare the original F-scale and the enhanced F-scale used to estimate the intensity and destruction caused by tornadoes. Although, the enhanced F-scale is an improvement to the original, it is important to note that it still is a set of wind estimates based on damage.

3.14.2 Historic Occurrence

The NCDC NOAA storm events database has recorded a total of 16 tornados in the Mid-Ohio Valley Region since 1950. Tornados have been recorded in the database for a longer length of time than any other natural event. Table 3.44 below provides summary statistics that describe all previous tornado events occurring in the region. As described below, the strongest tornado to occur in the region was an EF3 that took place in September of 2010 resulting in 1 death and 10 injuries. The majority of tornado events have occurred between June and September with the exception of one tornado in Murphytwon during the month of January. Additionally, the majority of tornado events have occurred during pm hours; the one exception was happened in Wood County in June 1968 at 1:15am.

Location	County/Zone	Date	Time	EF Scale	Death	Injury	Property Damage
Wood County	Wood	8/9/1950	4:55pm	F1	0	0	0.00K
Wood County	Wood	6/26/1951	2:45pm	F1	0	1	0.00K
Jackson County	Jackson	7/19/1963	6:45pm	F1	0	0	250.00K
Wood County	Wood	6/12/1968	1:15am	F0	0	0	0.03K
Pleasants County	Pleasants	7/28/1981	5:05pm	F2	0	3	250.00K
Roane County	Roane	6/12/1989	4:45pm	F1	0	0	0.00K
Wood County	Wood	6/12/1989	4:55pm	F0	0	0	0.00K
Murphytown	Wood	1/8/1998	11:50pm	F2	0	0	200.00K
Kidwell	Tyler	5/23/2000	6:43pm	F1	0	0	85.00K
Wadeville	Wood	5/21/2001	7:10pm	F0	0	0	175.00K
Lubeck	Wood	7/10/2003	3:29pm	F2	0	0	1.500M
Humphrey	Wood	9/16/2010	7:05pm	EF3	1	10	1.000M
Enterprise	Wirt	9/16/2010	7:25pm	EF1	0	0	75.00K
Wiley	Pleasants	7/27/2014	6:14pm	EF1	0	0	5.00K
Finch	Ritchie	7/27/2014	6:17pm	EF1	0	0	15.00K
Ripley	Jackson	6/26/2015	6:28pm	EF0	0	0	25.00K

Table 3.44 Summary Statistics for Past MOV Tornado Events

Hazard's Impact on Region

Most of the damage from a tornado happens in one of two direct ways; exposure to extreme wind or impact by flying debris. In a developed area, a tornado essentially acts as a giant blender full of millions of small and large projectiles such as boards, broken glass, nails, shingles, gravel, wire, cables, sheet metal, hardware, tree parts, whole trees, rocks, bricks, appliances, furniture, household items, even vehicles and large parts of houses. The strongest tornado in the Mid-Ohio Valley was rated a 3 on the Enhanced Fujita Tornado Scale meaning 3 second wind gusts were between 136-165 mph. There have also been 4 tornados that ranked an EF 0 meaning there were 3 second wind gusts of between 65 and 85 miles per hour; one of which caused $175,000.00 of property damage. Tornados of any magnitude have the potential to cause significant property damage. Furthermore, even though the tornados of greater magnitude have not occurred within the region, does not mean that the possibility does not exist. The Mid-Ohio Valley region is susceptible to tornados capable of higher wind velocity.

Hazard Extreme in the MOV

On September 16, 2010 the Humphrey area of Wood County an EF 3 tornado struck. The tornado originated in northeastern Meigs County Ohio and crossed the Ohio River, just upstream of the lock and dam and the community of Belleville. A small pocket of EF3 damaged located along Route 68 in the valley and floodplain along the river. The maximum wind guest at that location were estimated at 160 mph. Also, the width of the tornado briefly widened to 500 yards at that location. A 57-year-old man was killed during this storm and 10 others sustained minor injuries. Significant structural and tree damage occurred along a river access road and along the South Fork of Lee Creek drainage toward Rockport. The total path length of this tornado from Meigs County, OH into Wood County was over 9 miles. The County reported 10 homes destroyed, 6 homes with major damage, and 27 homes with minor damage. About 15 to 18 outbuildings were damaged or destroyed. Damages from the tornado totaled $1,000,000. Figure 3.35 below displays that path of this tornado event.

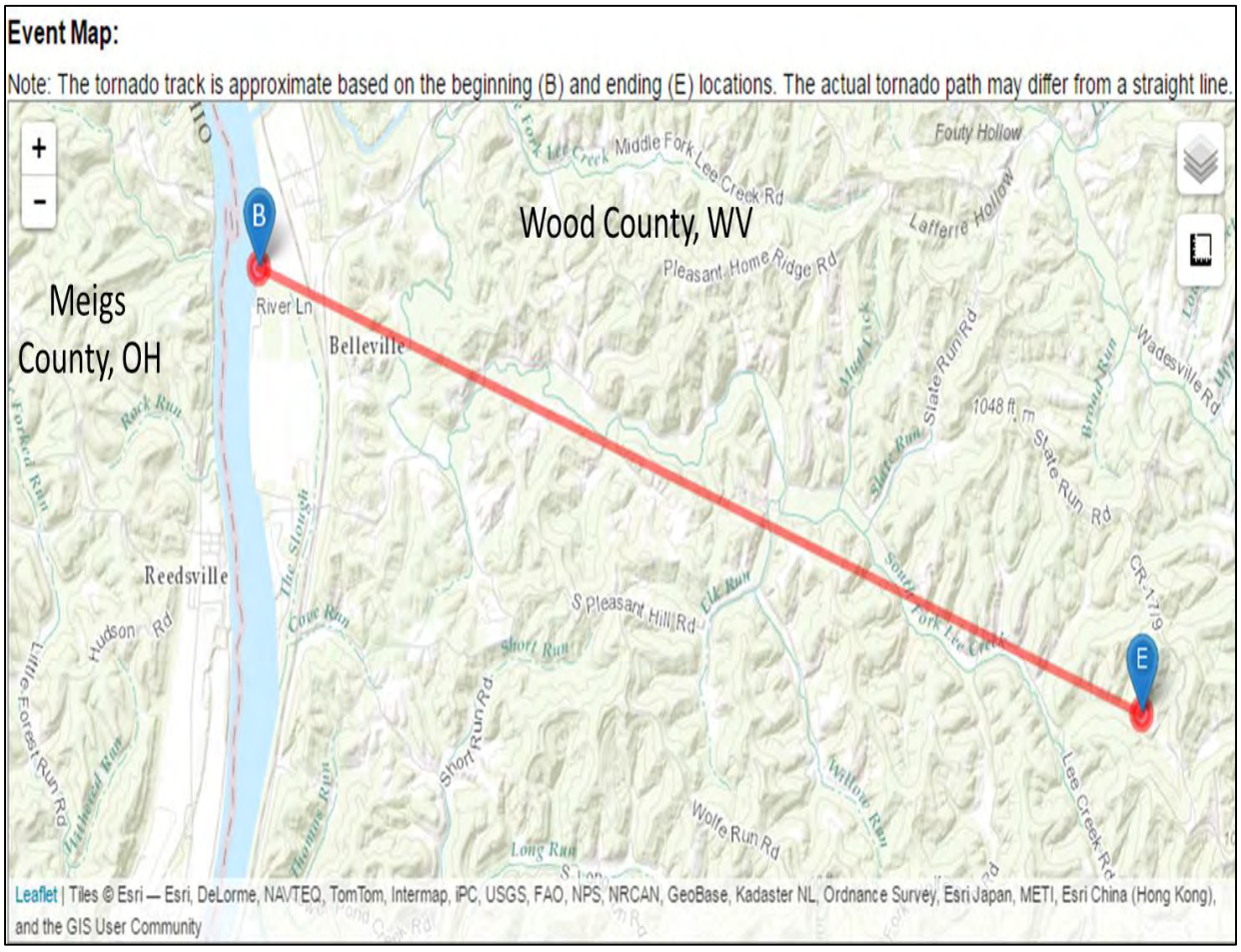


Figure 3.35 Path of the EF3 Tornado in Wood County on September 16, 2010

3.14.3 Risk Assessment

The level of risk presented by tornados varies across the Mid-Ohio Valley Region. As depicted in the chart above tornados have occurred in 7 of the Region's 8 counties and

have had varying degrees of magnitude. In order to carry out a risk assessment for tornados in the region the number of occurrences, resulting injuries and deaths, property and crop damage, geographic extent, and local input were considered. Tornados have caused multiple injuries and one death in the Mid-Ohio Valley although not in every county. However, this hazard was found to present the maximum level of threat to human life because the threat is present and tornados are possible in each county.

According to the NCDC, tornados have caused a total of $3.58 million dollars of property damage in the Mid-Ohio Valley Region since 1950 when the hazard event began being recorded. Though due to the differing severities of force of the storms and the value of the structures located in those counties the level of property damage in each county varies. There has been no recorded crop damage resulting from tornados in the Mid-Ohio Valley Region.

According to the NOAA's National Climatic Data Center (NCDC) from 1991 to 2010 the entire state of West Virginia averaged 2 tornados per year. As described above tornado occurrence is dependent on many factors such as date and time. In the past 65 years every county in the region, with the exception of Calhoun County, has experienced at least one tornado. The annualized number of tornado occurrences were identified and considered in this risk assessment as well as the geographic extent to which a tornado is possible. Table 3.45 below displays the average annual number of tornadoes that occur in each county every year.

County	Average Number of Events each year
Calhoun	0
Jackson	0.03
Pleasants	0.03
Ritchie	0.02
Roane	0.02
Tyler	0.02
Wirt	0.02
Wood	0.12

Table 3.45 Average Number of Yearly Tornado Events

The risk posed by tornados was not brought up for discussed at any of the public meetings held in conjunction with County LEPC meetings. However, 10.81% of all citizens taking our online survey indicated that they felt tornados were the natural hazard the posed either the biggest, or second biggest to their neighborhood. Particularly, citizens in Calhoun, Jackson, Pleasants, Ritchie, and Wood counties felt that tornados posed a substantial threat to their homes.

Figure 3.36 below depicts the level of risk present by tornados in each of the region's counties determined by the findings of this HMP's risk assessment analysis. It is important to note that even though tornados have been identified as an "eliminated risk" for Roane, Tyler, and Wirt Counties, the risk still presents a threat to those counties. As is explained by table 3.46 below, each county except of Calhoun County has experienced at least one tornado. Tornados registered as an eliminated risk because there was limited public concern about tornados in Roane, Tyler, and Wirt Counties. The potential for a tornado exists in each county and mitigation actions were planned accordingly.

County	Population Density	Population Vulnerability	Number Events	Property damage	Crop Damage	Deaths & Injuries	Geographic Extent	Local Input	Total
Calhoun	1	1	0	1	0	4	1	3	11
Jackson	1.5	1.5	1	1.5	0	4	1	3	13.5
Pleasants	1.5	1	1	1	0	4	1	3	12.5
Ritchie	1	1	1	1	0	4	1	2	11
Roane	1	1	1	1	0	4	1	0	9
Tyler	1	1	1	1	0	4	1	0	9
Wirt	1	1	1	1	0	4	1	0	9
Wood	3	2.5	1	2	0	4	1	3	16.5

Table 3.46 Tornado Hazard Ranking Score

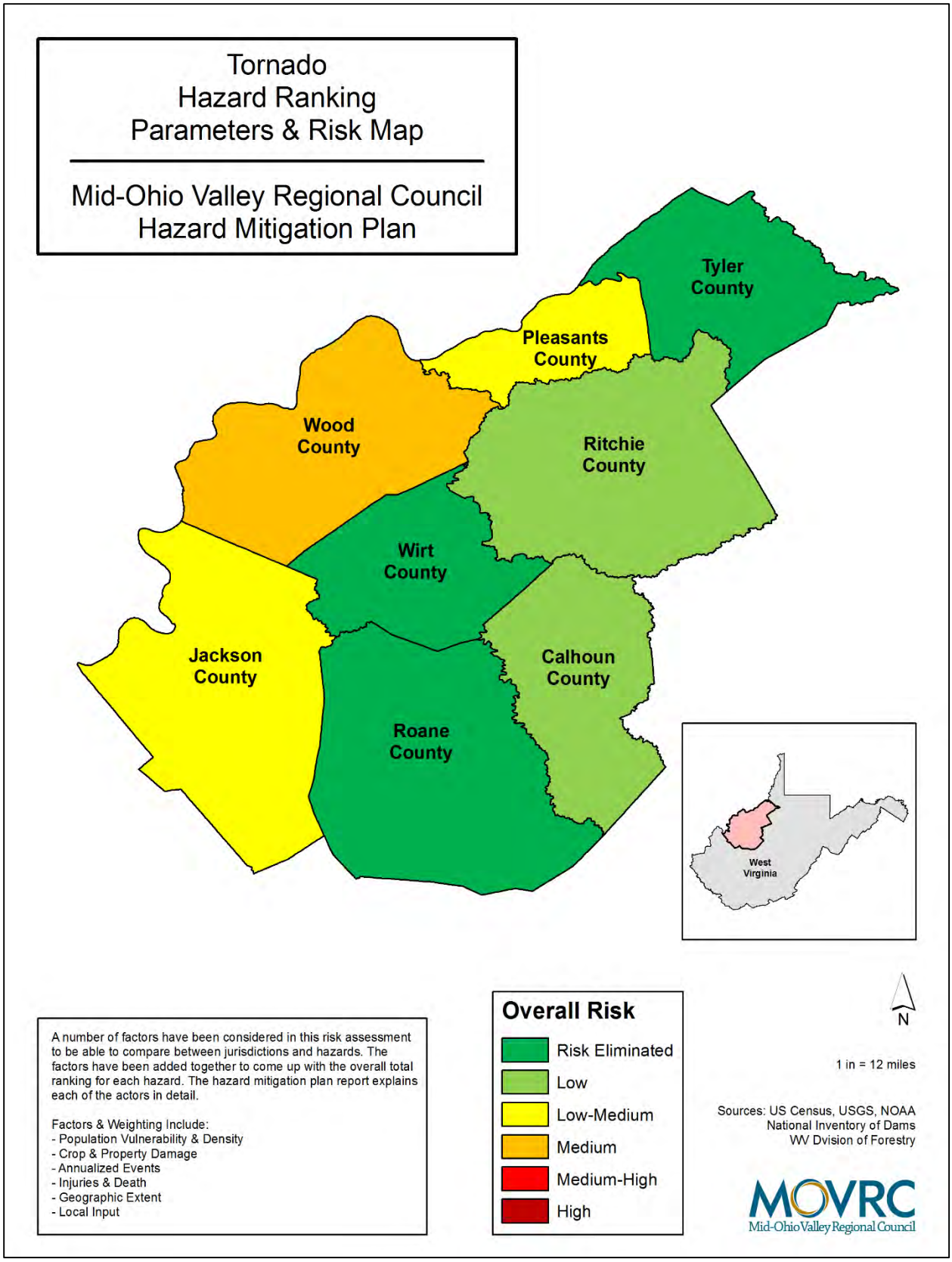


Figure 3.36 Risk Presented by Tornados to Each MOV County

3.14.4 Hazard Preparedness

Before a Tornado

- To begin, prepare an emergency kit and family communications plan.
- Listen to NOAA Weather Radio or to commercial radio or television newscasts for the latest information.
- Be alert to changing weather conditions. Look for approaching storms.
- Look for the following danger signs:
  - Dark, often greenish sky
  - Large hail
  - A large, dark, low-lying cloud (particularly if rotating)
  - Loud roar, similar to a freight train.
  - If you see approaching storms or any of the danger signs, be prepared to take shelter immediately.

During A Tornado

- If you are in a structure (residence, small building, school, nursing home, hospital, factory, shopping center, high-rise building):
  - Go to a pre-designated area such as a safe room, basement, storm cellar, or the lowest building level. If there is no basement, go to the center of a small interior room on the lowest level away from corners, windows, doors, and outside walls. Put as many walls as possible between you and the outside. Get under a sturdy table and use your arms to protect your head and neck. Do not open windows.
  - In a high-rise building, go to a small interior room or hallway on the lowest floor possible.
  - Put on sturdy shoes.
- Do not open windows. If you are in a manufacture home or office
  - Get out immediately and go to a pre-identified location such as the lowest floor of a sturdy, nearby building or storm shelter. Mobile homes, even if tied down, offer little protection from tornadoes.
- If you are not in a sturdy building, there is no single research-based recommendation for what last-resort action to take because many factors can affect your decision. Possible actions include:
  - Immediately get into a vehicle, buckle your seat belt and try to drive to the closest sturdy shelter. If your vehicle is hit by flying debris while you are driving, pull over and park.
  - Take cover in a stationary vehicle. Put the seat belt on and cover your head with your arms and blanket, coat or other cushion if possible.
  - Lie in an area noticeably lower than the level of the roadway and cover your head with your arms and a blanket, coat or other cushion if possible.
- In all situations:
  - Do not get under an overpass or bridge. You are safer in a low flat location.
  - Never try to outrun a tornado in urban or congested areas in a car or truck. Instead, leave the vehicle immediately for safe shelter.
  - Watch out for flying debris. Flying debris from tornadoes causes most fatalities and injuries.

3.15 Landslides

3.15.1 Description

According to Ready.gov and the USGS landslides occur when masses of rock, earth or other debris move down a slope; the term landslide includes a wide range of ground movement, such as rock falls, deep failure or slopes, and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there are other contributing factors:

- Erosion by rivers, glaciers, or ocean waves create over steepened slopes.
- Rock and soil slopes are weakened through saturation by snowmelt or heavy rains.
- Earthquakes create stresses that make weak slopes fail.
- Earthquakes of magnitude 4.0 and greater have been known to trigger landslides.
- Volcanic eruptions produce loose ash deposits, heavy rain, and debris flows.
- Excess weight from accumulation of rain or snow, stockpiling of rock or ore, from waste piles, or from man-made structures may stress weak slopes to failure and other structures.

Slope material that becomes saturated with water may develop a debris flow or mud flow. The resulting slurry of rock and mud may pick up trees, houses, and cars, thus blocking bridges and tributaries causing flooding along its path. They can flow rapidly, striking with little or no warning at avalanche speeds. They can also travel several miles from their source, growing in size as they pick up trees, boulders, cars and other materials. Landslides can occur quickly, often with little notice.

The USGS States that landslides occur in every state and U.S. territory, and specifies that the area of the U.S. containing the Appalachian Mountains as having severe landslide problems. Figure 3.37 below displays a portion of a landslide overview map prepared by USGS to indicate the percentage of the area subject to landslide incidents. Although the physical cause of many landslides cannot be removed, geologic investigations, good engineering practices, and effective enforcement of land use management regulations can reduce landside hazards.

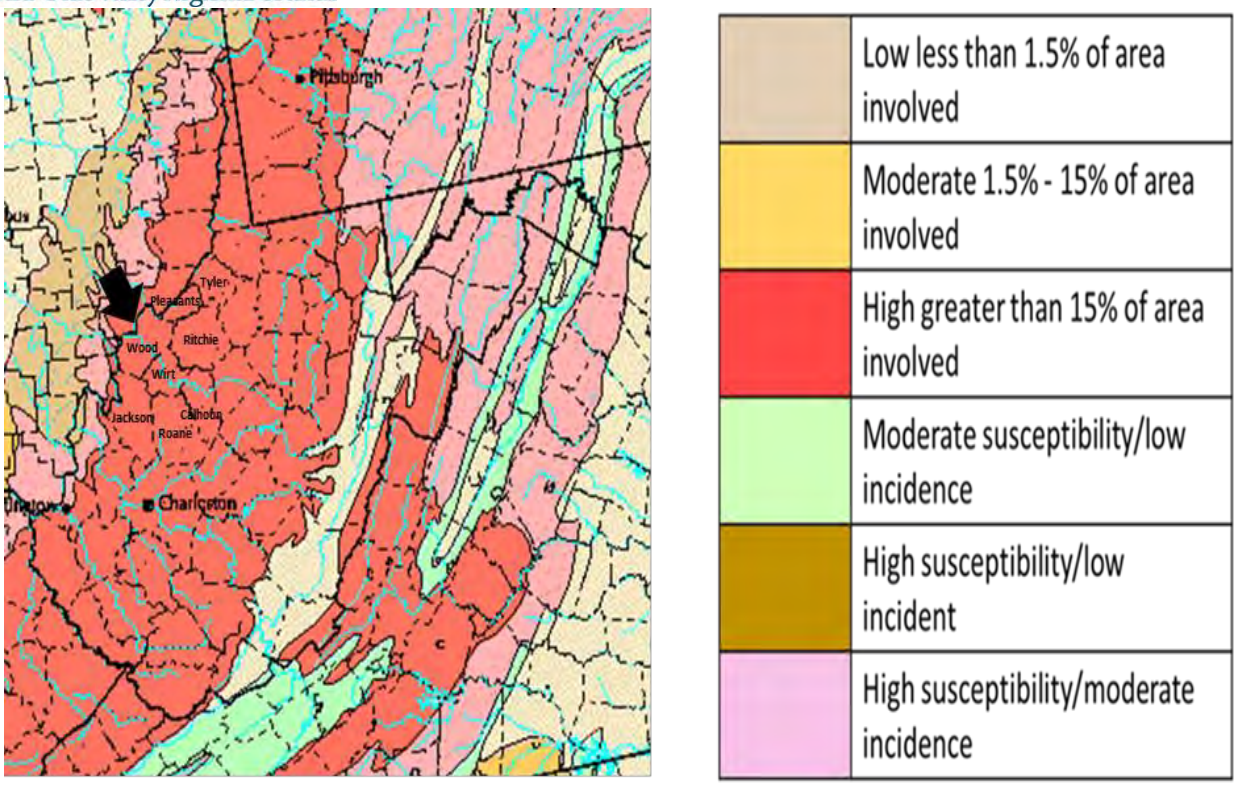


Figure 3.37 Map by USGS Indicating Precentage of the Area Succestable to Landslide Events

3.15.3 Historic Occurrence

The NCDC storm events database which was utilize as a large part of research for this plan, does not record landslide events and a complete database recording these such events was not located in research to complete this HMP. Therefore, in order to estimate landslide events in the Mid-Ohio Valley major disaster declarations for the region were utilized. The database of major disaster declarations started recording landslides in the Mid-Ohio Valley in 1997 so there is a large portion of the history that is unavailable for analysis. Table 3.46 below displays the number of major disaster declarations containing landslides by county in the Mid-Ohio Valley Region.

County	Number of Events
Calhoun	9
Jackson	10
Pleasants	3
Ritchie	7
Roane	10
Tyler	8
Wirt	9
Wood	4

Table 3.46 Number of Recorded Landslide Events in the MOV

Knowledge regarding landslides in the Mid-Ohio Valley was supplemented with information gained from the West Virginia Division of Highways (WVDOH). Through this channel it was discovered that landslides and slips occur frequently in the region and are a common problem facing the WVDOH. The WVDOH identified locations that repeatedly experienced slips and slides and described changes in the way in which they repaired such events. Additionally, members of the various county Local Emergency Planning Committees identified land slips and slides as hazards they continuously face. However, through this research there was no way to identify a correct amount of property or crop damage incurred by each county as a result of a landslide.

Hazard's Impact on Region

As stated above, data sources regarding landslides in the Mid-Ohio Valley region are lacking and the MOVRC reached out to the WVDOH for supplemental information regarding landslides in the region. MOVRC planners sat down with district 3 of the WVDOH to gain a better understand of how landslides affect the Mid-Ohio Valley. WVDOH District 3 is located in Parkersburg and covers Calhoun, Jackson, Pleasants, Ritchie, Roane, Wirt, and Wood Counties (all of the MOV region except for Tyler County). The DOH indicated in the meeting that landslides do occur very frequently across the region and can disrupt or completely stop transportation dependent upon the severity of the landslide. Damage from landslides may only be the falling of rock and debris into the roadway. The resulting damage from a landslide may however be far more significant such as the falling away of part or all of a road way.

Additionally, dependent on the availability of funding, whenever a landslide even occurs it may receive a temporary fix until such funds are available. When possible damage from landslides is corrected expediently and with a permanent solution. However, there are times that a temporary solution is the best option to correct damage from a landslide. An example of a temporary solution may be the closure of one lane of a road for a section effected by the landslide. Stop signs or maybe temporary traffic lights are fixed at either end of the landslide area so that traffic can alternate.

Hazard Extreme in the Mid-Ohio Valley

As landslide events are not recorded in the NCDC storm events database, to complete the risk assessment for this hazard the number major disaster declarations involving landslides was utilized. It is impossible to pinpoint event details specific for landslides using this same data however as particulars of the events are not included in the declarations. However, from 1957 to August, 2015 there have been 36 Major Disaster Declarations and Emergency Declarations in the Mid-Ohio Valley. Of those 36 declarations, 15 have been declared in part due to landslides/mudslides. That's 41% of all disaster declarations involving landslides. This indicates that though landslides

are not documented in the NCDC database as events effecting the Mid-Ohio Valley, landslides do have a very significant impact on the region

3.15.3 Risk assessment

The risk assessment for this HMP identified that landslides present varying levels of risk for the counties of the Mid-Ohio Valley Region. As discussed above data is limited regarding landslide events in the region. With this in mind, there has been no reported property or crop damage directly resulting from a landslide event. Also there have been no reported deaths or injuries resulting from landslides.

As the NCDC database does not record landslide events, major disaster declarations were used to evaluate the number of landslide events in the region. Though this was the best option available, it is still lacking in accuracy. The events evaluated only include the landslides that were associated severe storms devastating enough to constitute a major disaster declaration, not landslides associated with smaller storms. Even through its faults, this data was the best available to serve the purposes of this HMP, and indicated that every county in the region has experienced at least 3 landslide events. Table 3.47below displays that average annual landslide events that occur in each county based on Major Disaster and Emergency Declarations. Figure 3.35 above prepared by the USGS indicates that landslides have the potential to affect 15% or more of each county located in the region.

County	Average Number of Events each year
Calhoun	0.50
Jackson	0.55
Pleasants	0.17
Ritchie	0.39
Roane	0.55
Tyler	0.44
Wirt	0.50
Wood	0.22

*Table 3.47 Average Number of Yearly Landslides Event**s***

Landslides were identified during public meetings as a threat facing communities in Calhoun, Pleasants, Ritchie, Roane, Tyler and Wirt Counties. Additionally, citizens in Calhoun and Wirt Counties identified landslides as presenting the biggest or second biggest threat to their neighborhoods through the online survey instrument. Figure 3.38 below displays the level of risk presented by landslides identified for each county within the region.

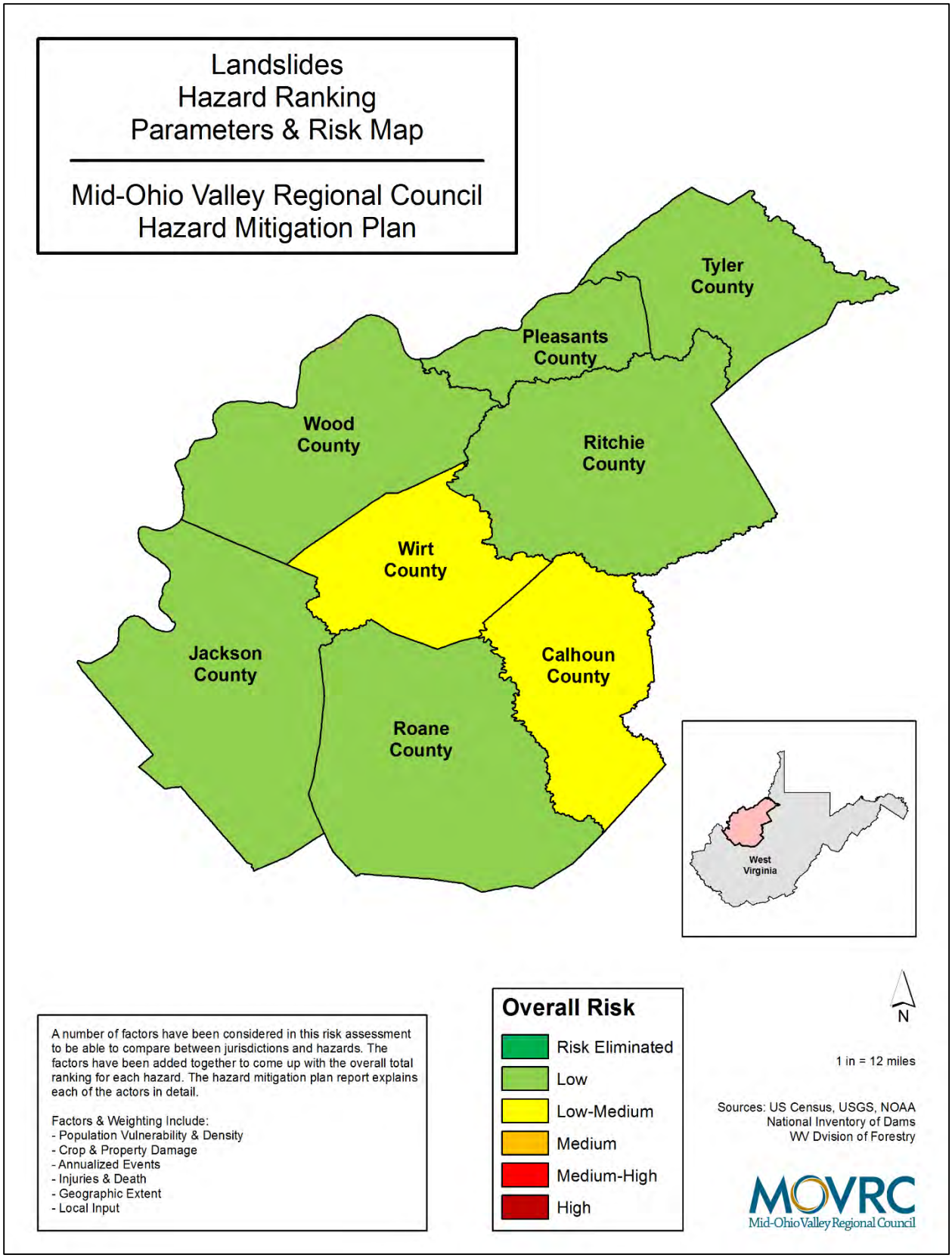


Figure 3.38 Risk Presented by Landslides in Each County

3.15.4 Hazard Preparedness

The following are things you can do to protect yourself, your family and your property from the effects of a landslide or debris flow:

- To begin preparing, you should build an emergency kit and make a family communications plan.
- Prepare for landslide by following proper land-use procedures – avoid building near steep slopes, close to mountain edges, near drainage ways or along natural erosion valleys.
- Become familiar with the land around you. Learn whether debris flows have occurred in your area by contacting local officials. Slopes where debris flows have occurred in the pas are likely to experience them in the future.
- Get a ground assessment of your property.
- Consult a professional for advice on appropriate preventative measures for your home or business, such as flexible pipe fitting, which can better resist breakage.
- Protect your property by planting ground cover on slopes and building retaining walls.
- In mudflow areas, build channels or deflection walls to direct the flow around buildings. Be aware, however, if you build walls to divert debris flow and the flow lands on a neighbor's property, you may be liable for damages.
- If you are at risk from a landslide talk to your insurance agent. Debris flow may be covered by flood insurance policies from the national flood insurance program.

Recognize landslide warning signs

- Changes occur in your landscape such as patterns of storm-water drainage on slopes, especially the places where runoff water coverages, land movement, small slides, flows, or progressively leaning trees.
- Doors or windows stick or jam for the first time.
- New cracks appear in plaster, tile, brick, or foundations.
- Outside walls, walks, or stairs begin pulling away from the building.
- Slowly developing, widening cracks appear on the ground or on paved areas such as streets or driveways.
- Underground utility lines break.
- Bulging ground appears at the base of a slope.
- Water breaks through the ground surface in new locations.
- Fences, retaining walls, utility poles, or trees tilt or move.
- A faint rumbling sound that increases in volume is noticeable as the landslide nears.
- The ground slopes downward in one direction and may begin shifting in that direction under your feet.
- Unusual sounds, such as trees cracking or boulders knocking together, might indicate moving debris.
- Collapsed pavement, mud, fallen rocks, and other indications of possible debris flow can be seen when driving.

3.16 Excessive Heat

3.16.1 Description

According to Ready.gov a heat wave is an extended period of extreme heat, and is often accompanied by high humidity. Excessive heat results from a combination of high temperatures and high humidity. An excessive heat event occurs and is reported in the NCDC storm data whenever the heat index values meet or exceed locally/regionally established excessive heat warning thresholds, on a widespread or localized basis. Depending on the part of the country experiencing high temperatures, the heat effects are modulated by relative humidity, cloud cover, wind speeds, the duration of a hot spell, the time of the year, and other factors, including mortality rates and types of housing.

The heat index is a measure of how hot it really feels when relative humidity is factored in with the actual air temperature. Figure 3.39 below represents the NWS heat index it reads as follows: if the air temperature is 96°F and the relative humidity is 65%, the heat index, how hot it feels, is 121°. The red area without numbers indicates extreme danger, and the NWS initiates alert procedures when the heat index is expected to exceed 105°F to 110° F for at least 2 consecutive days.

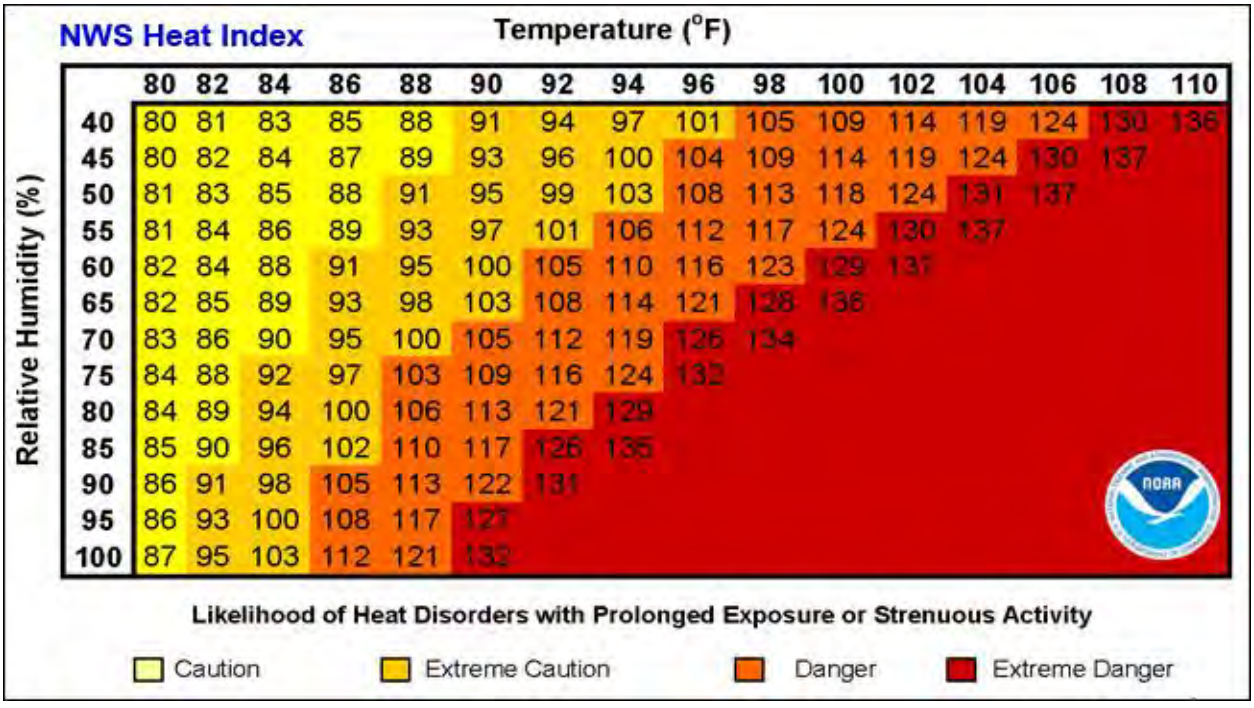


Figure 3.39 NWS Explanation of the Relationship between Actual Temperature and Relative Humidity

It surprises many people to learn that the heat index values in the chart above are for shady locations. If you are exposed to direct sunlight, the heat index value can be increased by up to 15°F. As shown in the table above, heat indices meeting or

exceeding 103°F can lead to dangerous heat disorders with prolonged exposure and/or physical activity in the heat.

According to Ready.gov, these conditions can be dangerous and even life-threatening for humans who do not take the proper precautions. Heat kills by pushing the human body beyond its limits. In extreme heat and high humidity, evaporation is lowed and the body must work extra hard to maintain a normal temperature. Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. Older adults, young children and those who are sick or overweight are more likely to succumb to extreme heat.

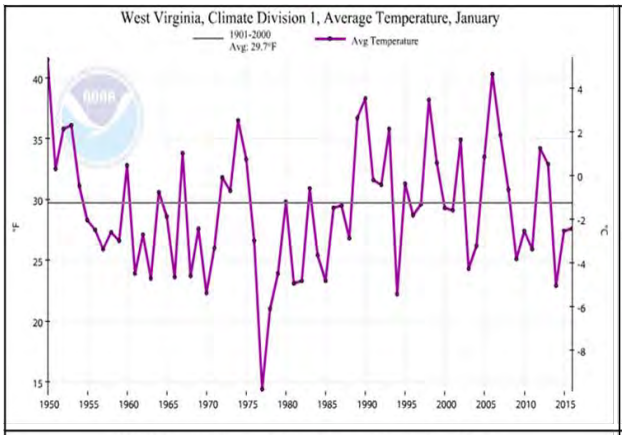
Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the "urban heat island effect." Table 3.48 below was created by the NWS to explain the effects extreme heat can have on the human body at varying classifications of heat.

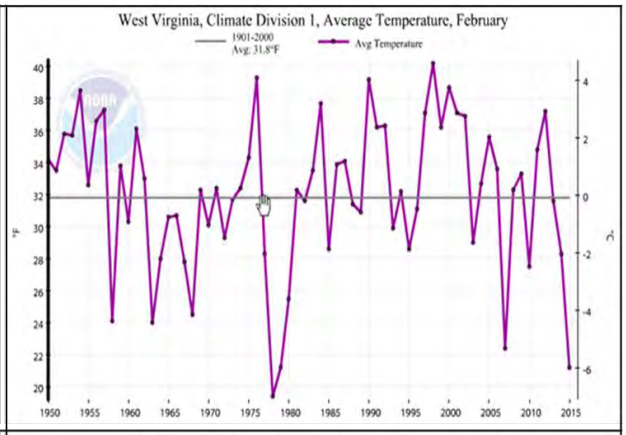
Classification	Heat Index	Effect on the Body
Caution	80°F -90°F	Fatigue possible with prolonged exposure and/or physical activity
Extreme Caution	90°F-103°F	Heat stroke, heat cramps, or hear exhaustion possible with prolonged exposure and/or physical activity
Danger	103°F-124°F	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity
Extreme Danger	125°F or higher	Heat stroke highly likely

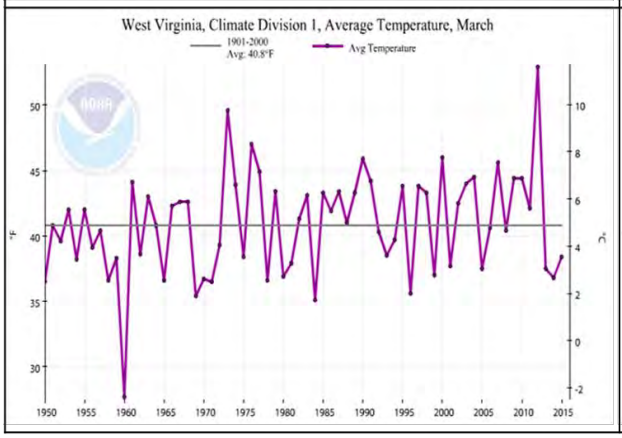
Table 3.48 NWS Key to Explain the Effects of Extreme Heat on the Human Body

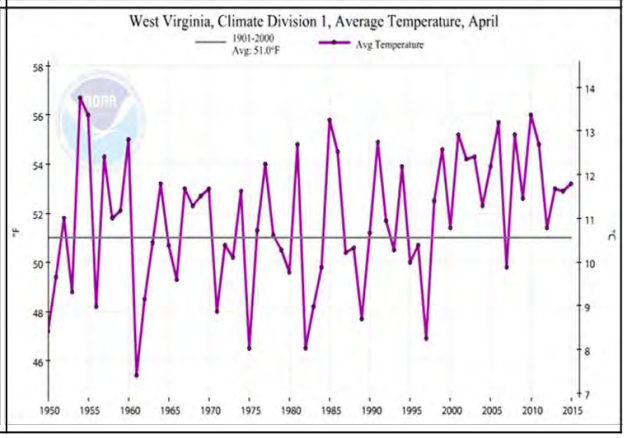
3.16.2 Historic Occurrence

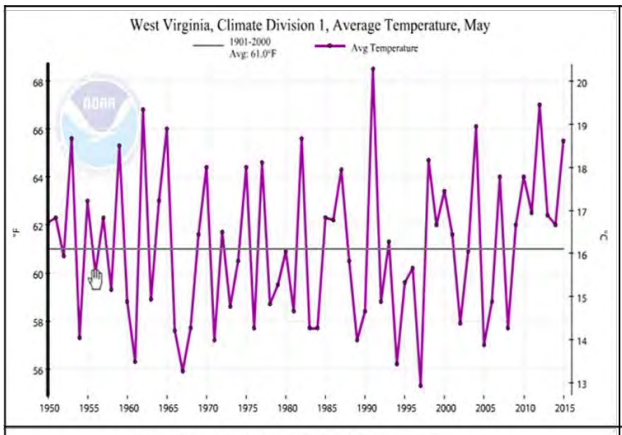
The NCDC storm events database indicates that there have been 19 excessive heat events since 1996 in Calhoun, Pleasants, Ritchie, Tyler, Wirt, and Wood Counties and there have been 20 such events in Jackson and Roane Counties. The size of the region enables the variations in the way counties experience natural hazards. As described above, excessive heat becomes a problem when the actual temperature combines with a high humidity level. Figure 3.40 below indicates the average temperature for each month in the Mid-Ohio Valley from 1950-2015. As may be expected temperatures were generally higher in summer months and cool in winter months. However, according to the NCDC the Mid-Ohio Valley's extreme heat events have occurred in all seasons, specifically in the months of January, February, March, April, July, August, September, and December.

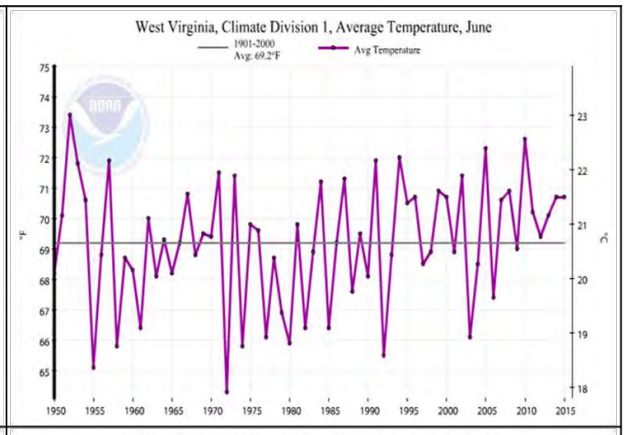

West Virginia, Climate Division 1, Average Temperature, January
1901-2000 Avg: 29.7°F
Avg Temperature
°F
°C

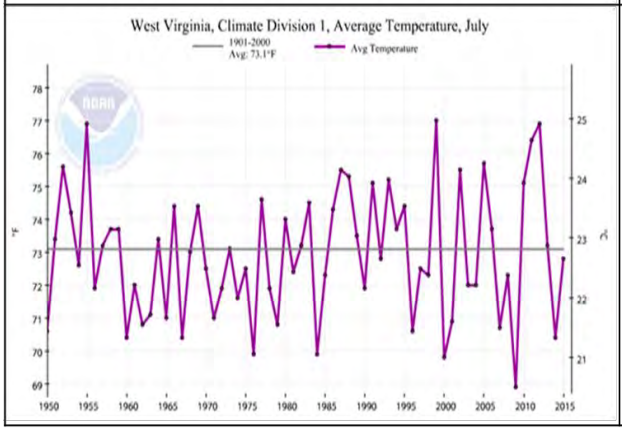

West Virginia, Climate Division 1, Average Temperature, February
1901-2000 Avg: 31.8°F
Avg Temperature
°F
°C

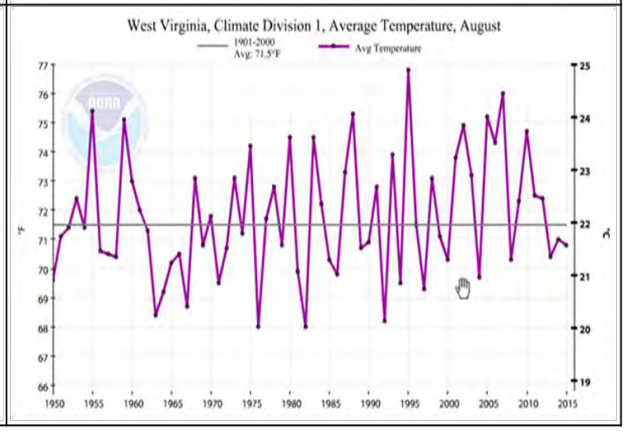

West Virginia, Climate Division 1, Average Temperature, March
1901-2000 Avg: 40.8°F
Avg Temperature
°F
°C


West Virginia, Climate Division 1, Average Temperature, April
1901-2000 Avg: 51.0°F
Avg Temperature
°F
°C


West Virginia, Climate Division 1, Average Temperature, May
1901-2000 Avg: 61.0°F
Avg Temperature
°F
°C


West Virginia, Climate Division 1, Average Temperature, June
1901-2000 Avg: 69.2°F
Avg Temperature
°F
°C


West Virginia, Climate Division 1, Average Temperature, July
1901-2000 Avg: 73.1°F
Avg Temperature
°F
°C


West Virginia, Climate Division 1, Average Temperature, August
1901-2000 Avg: 71.5°F
Avg Temperature
°F
°C

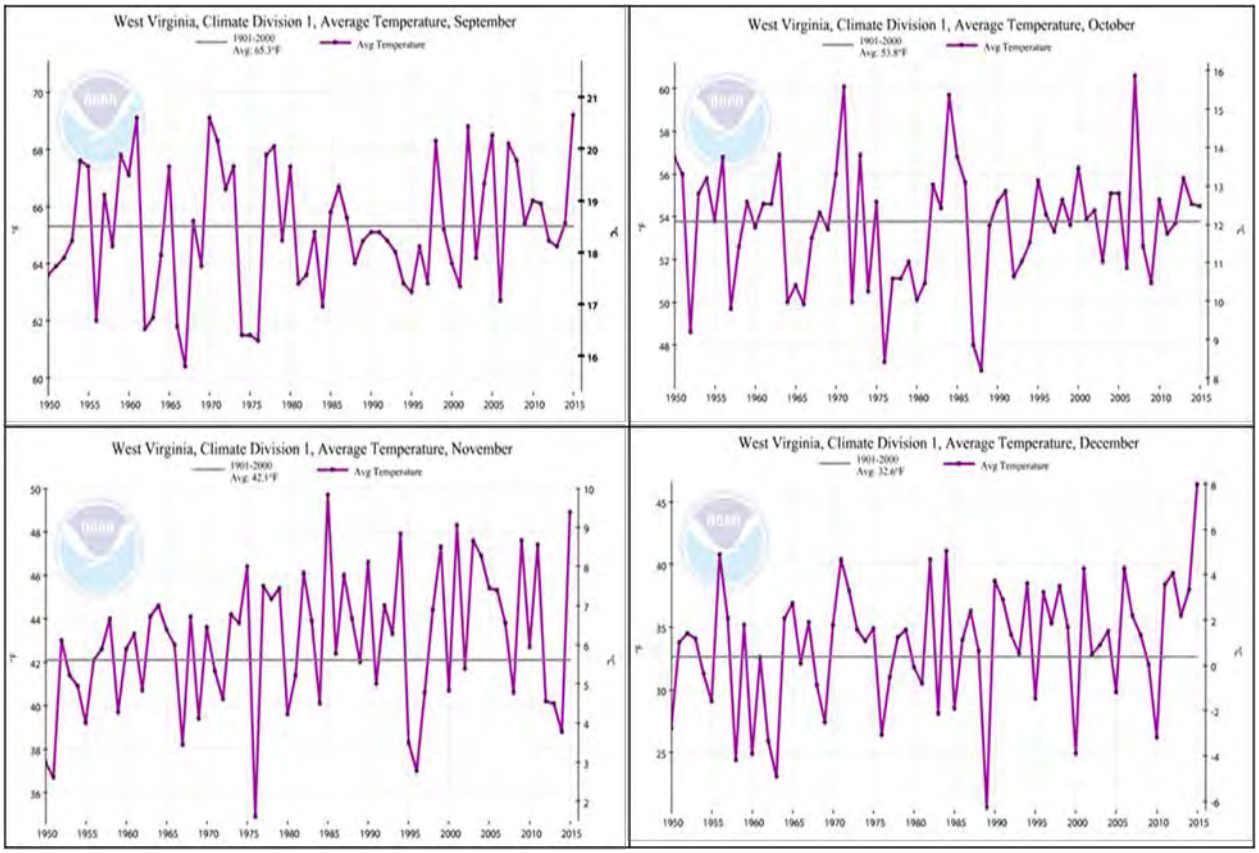


Figure 3.40 Average Tempurature in the MOV by Month from 1901 – 2000

Hazard's Impact on Region

As discussed above, extreme heat events present hazardous conditions for humans that are exposed to the high temperatures because the body must work extra hard to maintain a normal body temperature. The biggest impact excessive heat has on the Mid-Ohio Valley region is the extra safety precautions individuals must take during excessive heat events. Individuals must be wary of heat related sickness during physical activities whether they are work or play related. This demands extra breaks, drinking more water, and waring the correct clothing.

Hazard Extreme in the Mid-Ohio Valley

On August 16, 2007 in Jackson County afternoon temperatures rose into the 100 to 105-degree range across the lowlands and to the mid-90s through higher terrain. For many locations it was the hottest day since July 1988. The NCDC Storm Events Database only recorded extreme evets 1996 to present, therefore the record setting event in the Mid-Ohio Valley is not described in the database. However, the high record temperatures in each county, was identified through "The Weather Channel's" Almanac and have been displayed in table 3.49 below.

County Seat	Record High	Year
Grantsville, Calhoun County	99	1988
Ripley, Jackson County	103	1988
St. Marys, Pleasants County	91	1988
Harrisville, Ritchie County	94	1988
Spencer, Roane County	99	1895
Middlebourne, Tyler County	100	1988
Elizabeth, Wirt County	99	1988
Parkersburg, Wood County	95	1988

Table 3.49 Record Temperature for Each County Seat & Year Recorded (Weather Chanel)

3.16.3 Risk Assessment

According to the NCDC in the Mid-Ohio Valley Region excessive heat has not resulted in any reported property or crop damage nor have there been any reported deaths or injuries directly associated with the natural hazard. Excessive heat was not identified as a concerning threat in any public meeting held in preparation for this plan. Excessive heat was however identified in Pleasants and Wood Counties in the online survey completed by citizens as presenting the biggest or second biggest threat to their neighborhoods. Geographically, excessive heat presents a possible threat in all areas of the Mid-Ohio Valley Region as temperature and humidity levels are capable of varying from high to low.

Excessive heat events have occurred multiple times in all of the region's counties since they began being recorded in the NCDC database in 1996. In fact, each county has averaged at least one such event in each year. The annualized number of events was considered in the risk assessment for this plan and is displayed below in table 3.50. Figure 3.41 below depicts the threat level presented by excessive heat as a natural hazard to each county within the region.

County	Average Number of Events each year
Calhoun	1
Jackson	1.05
Pleasants	1
Ritchie	1
Roane	1.05
Tyler	1
Wirt	1
Wood	1

Table 3.50 Average Number of Yearly Excessive Heat Events

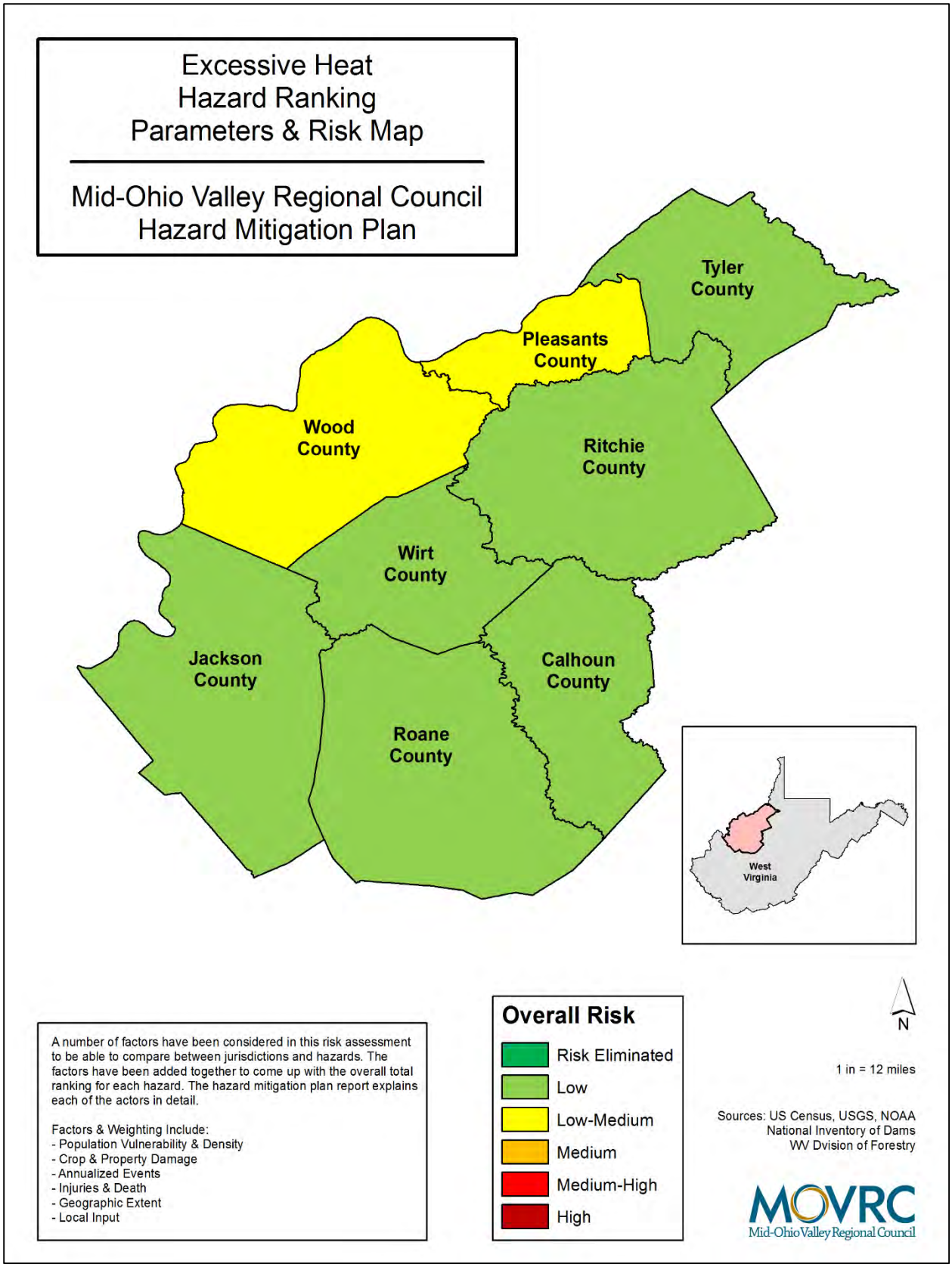


Figure 3.41 Level of Risk Presented by Excessive Heat in the MOV

3.16.4 Hazard Preparedness

Before extreme heat, to prepare for extreme heat, you should:

- To begin preparing, you should build an emergency kit and make a family communications plan.
- Install window air conditioners snugly; insulate if necessary.
- Check air-conditioning ducts for proper insulation.
- Install temporary window reflectors (for use between windows and drapes), such as aluminum foil-covered cardboard, to reflect heat back outside.
- Weather-strip doors and sills to keep cool air in.
- Cover windows that receive morning or afternoon sun with drapes, shades, awnings, or louvers.
- Keep storm windows up all year.
- Listen to local weather forecasts and stay aware of upcoming temperature changes.
- Know those in your neighborhood who are elderly, young, sick or overweight. They are more likely to become victims of excessive heat and may need help.

During Extreme Heat, what you should do if the weather is extremely hot:

- Listen to NOAA Weather Radio for critical updates from the National Weather Service.
- Never leave children or pets alone in closed vehicles.
- Stay indoors as much as possible and limit exposure to the sun. Stay on the lowest floor out of the sunshine if air conditioning is not available.
- Postpone outdoor games and activities.
- Consider spending the warmest part of the day in public buildings such as libraries, schools, movie theaters, shopping malls, and other community facilities. Circulating air can cool the body by increasing the perspiration rate of evaporation.
- Eat well-balanced, light, and regular meals. Avoid using salt tablets unless directed to do so by a physician.
- Drink plenty of water; even if you do not feel thirsty. Avoid drinks with caffeine. Persons who have epilepsy or heart, kidney, or liver disease; are on fluid-restricted diets; or have a problem with fluid retention should consult a doctor before increasing liquid intake.
- Limit intake of alcoholic beverages.
- Dress in loose-fitting, lightweight, and light-colored clothes that cover as much skin as possible. Avoid dark colors because they absorb the sun's rays.
- Protect face and head by wearing a wide-brimmed hat.
- Avoid strenuous work during the warmest part of the day. Use a buddy system when working in extreme heat, and take frequent breaks.
- Check on family, friends, and neighbors who do not have air conditioning and who append much of their time alone.
- Avoid extreme temperature changes.
- Check on your animals frequently to ensure that they are not suffering from the heat. Go to a designated public shelter if your home loses power during period of extreme heat.

3.17 Drought

3.17.1 Description

According to the National Weather Service (NWS) National Oceanic and Atmospheric Administration (NOAA) report on Storm Data Preparation, drought is a deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area. Conceptually, drought is a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield. Drought impacts vary from region to region making it difficult to define because what may be considered a drought in Bali (six days without rain) would certainly not be considered a drought in Libya which has an annual rainfall less than 180mm. In the most general sense, drought originates from a deficiency of precipitation over an extended period of time – usually a season or more – resulting in a water shortage for some activity, group, or environmental sector.

There are different kinds of drought: meteorological, agricultural, hydrological, and social-economic. Meteorological drought is defined usually on the basis of the degree of dryness (in comparison to some "normal" or average amount) and the duration of the dry period. Definitions of meteorological drought must be considered as region specific since the atmospheric conditions that result in deficiencies of precipitations are highly variable from region to region. Agricultural drought links various characteristics of meteorological or hydrological drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced groundwater or reservoir levels, and so forth. Hydrological drought is associated with the effects of periods of precipitations shortfalls on surface or subsurface water supply. Although all droughts originate with a deficiency of precipitation, hydrologists are more concerned with how this deficiency plays out through the hydrologic system. Socioeconomic definitions of droughts associate the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought. It differs from the aforementioned types of drought because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts.

3.17.2 Historic Occurrence

The United States Drought Monitor classifies drought by the event's level of intensity, with D1 being the least intense and D4 being the most intense. D0, drought watch areas are either drying out and possibly heading for drought, or are recovering from drought but not yet back to normal, suffering long-term impacts such as low reservoir levels. Table 3.36 below provides a descriptive title for each drought category and

describes the possible impacts of each drought category. Details for the table were gained from the U.S. Drought Monitor Classification Scheme.

Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought • Short-term dryness slowing planting, growth of crops or pastures Coming out of drought • Some lingering water deficits • Pastures or crops not fully recovered
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and well creating water emergencies

Table 3.51 Explanation of Drought Categories

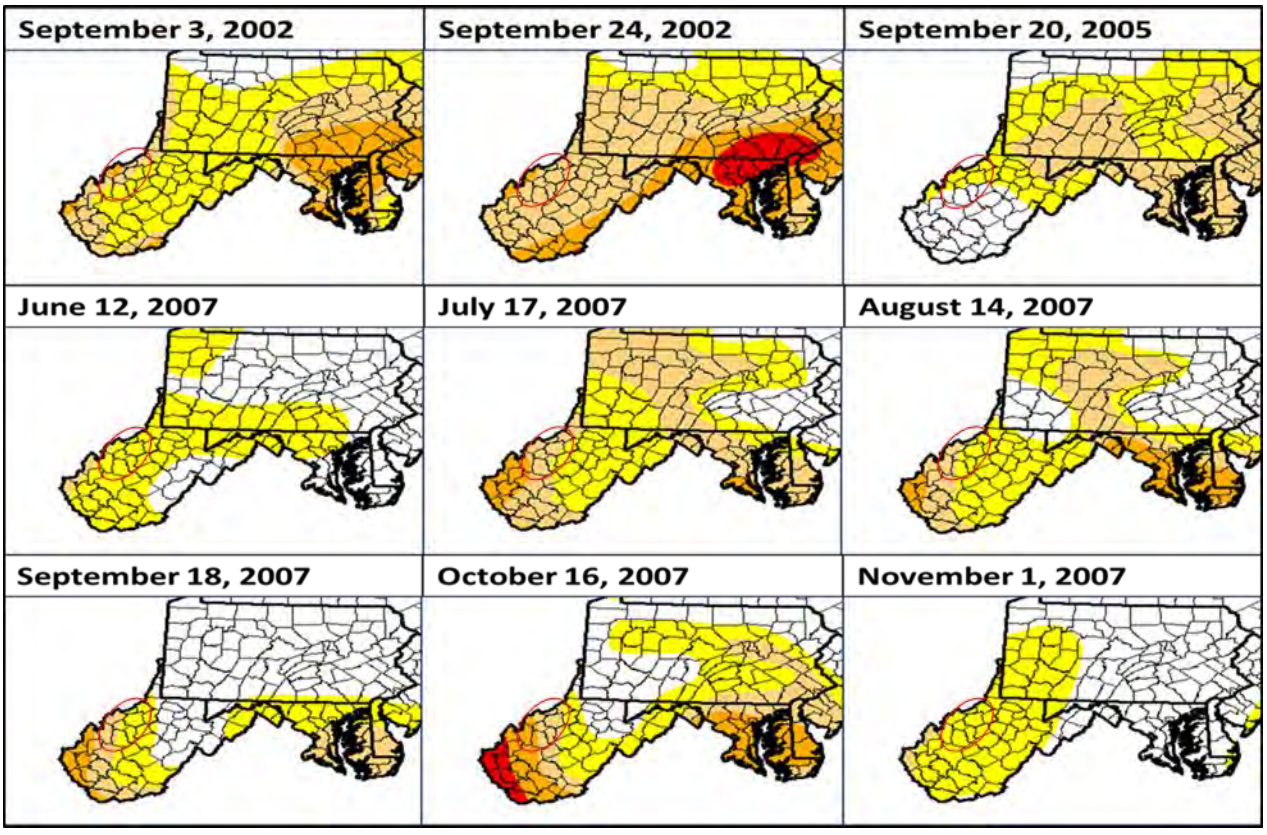


Figure 3.42 Intensity of Previous Droughts in the MOV

According to the NOAA NCDC storm database, the Mid-Ohio Valley region as a whole has experienced at least 9 months of droughts since 1996. Jackson and Roane counties have experienced higher number of droughts as the counties are located on the southern edge of the region and have the potential to be affected by weather events more or less intensely than other parts of the region. The severity of the drought incidents in the Mid-Ohio Valley prior to 2000 were not included in the data accessed for this assessment. Those events occurred in the Summer and Fall of 1997 and 1999. The data reported by the United States Drought Monitor (USDM) depicted conditions in the Mid-Ohio Valley ranged from abnormally dry to that of a severe drought. Figure 3.40 above depicts the intensity of drought conditions in the Mid-Ohio Valley during recorded drought events as purported by the USDM. Though the drought events have occurred and been reported in the storm events database, there has been no resulting property or crop damage directly resulting from the hazard in the Mid-Ohio Valley.

Hazard's Impact on Region

The NCDC database does not report any crop or property damage in the Mid-Ohio Valley Region directly caused by a drought event. The NCDC defines drought as "a deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area. Conceptually, drought is a protracted period of deficient precipitation resulting in extensive damage to crops, resulting in loss of yield." As the region does not report any crop damage due to drought, the second part of that definition does not hold true in the Mid-Ohio Valley. This indicates that drought's impacts are mostly felt by people and animals in the region. Affects felt by citizens may be the need to conserve water and decrease accessibility to water. Direct deaths or injuries caused by drought are extremely rare and there have been none recorded in the Region.

Hazard Extreme in the Mid-Ohio Valley

In 1999 from May through October the region, along with most of the State, experienced a drought event. After a dry April, drought conditions resurfaced again in May, after being alleviated during the winter months. Total rainfall during May was only 1 to 2 inches, less than half of normal. During June the drought continued to spread and strengthen in West Virginia. Most counties saw a deterioration of stream flow and soil moisture. Governor Underwood started a voluntary water conservation program for both citizens and business. On June 28th, he declared an agricultural state of emergency. The drought strengthened during the 1st half of July, however showers became more common during the last 2 weeks of the month. The drought ease somewhat during August with 2 to 4 inches of rain. Also, temperatures were not as hot as those endured during July. However, the drought still lingered by month's end. In September the drought severity increased again for the western lowland counties, generally west of the Interstate 79 corridor (the MOV region). In

October the drought severity eased and monthly rainfall was an inch above normal in may counties. Approximately 18% of the wells in the state were dry or in danger of going dry.

3.17.3 Risk Assessment

As described above, drought has presented itself in each of the Region's counties multiple times since such events began being recorded by the NCDC Storm Database. The average number of droughts year by county can be seen in table 3.52 below. However, the sheer occurrence of an event does not solely satisfy the requirements of evaluating the risk presented by the hazard and other factors must be considered. The NCDC database purported no property or crop damage as resulting from drought events. Nor were there any deaths or injuries due to drought reported, though the possibility of death or injury due to drought was accounted for. Additionally, droughts were not identified by the public as a hazard that individuals felt threatened their communities. Drought was however identified by citizens in Wood County as the natural hazard presenting the biggest or second biggest threat to their neighborhood in the online survey tool used to gain public input into the plan.

County	Average Number of Events each year
Calhoun	0.47
Jackson	0.79
Pleasants	0.47
Ritchie	0.47
Roane	0.63
Tyler	0.47
Wirt	0.47
Wood	0.47

*Table 3.52 Average Number of Yearly Drought Event**s***

To effectively calculate the geographic extent to which drought affects each county individually, the intensity of the drought present in the county according to the Drought Monitor Classification Scheme was analyzed. Utilizing the data available from the USDM, the greatest drought intensity experienced in each county was identified and then assigned a value between 1 and 4; 1 being least intense and 4 having the greatest intensity. For example, Calhoun, Pleasants, Ritchie, and Tyler Counties were scored as 2 because the greatest intensity for those counties was moderate drought. While Jackson, Roane, Wirt, and Wood Counties received a ranking of 3 because their greatest drought intensity was severe drought.

The risk assessment performed for this regional HMP evaluates multiple qualitative elements of hazards to identify the risk they present to each community. Through this risk assessment process, the hazard of drought was found to be an eliminated risk for

Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, and Wirt Counties, a medium-low risk for Wood County. The higher level of risk in Wood County is largely due to citizen concern regarding the level of risk the hazard presents to their communities. Figure 3.43 depicts the level of risk presented by drought in the counties of the Region.

Even though droughts were evaluated as an eliminated risk for each of the counties in the region except for Wood County, droughts still present a risk to each county. Each county averages between 0.47 and 0.79 droughts annually. Wood County scored much higher in the risk assessment because it was identified as a concern through the gathering of local input and also because of the County's large population. The risk is still present in each county and is not to be considered an impossibility. The potential for the hazard exists and mitigation planning was executed accordingly. Table 3.53 below displaces the risk assessment scores recorded for drought broken down by county and evaluation factor.

County	Population Density	Population Vulnerability	Number Events	Property damage	Crop Damage	Deaths & Injuries	Geographic Extent	Local Input	Total
Calhoun	1	1	1.5	0	0	1	2	0	6.5
Jackson	1.5	1.5	2	0	0	1	3	0	9
Pleasants	1.5	1	1.5	0	0	1	2	0	7
Ritchie	1	1	1.5	0	0	1	2	0	6.5
Roane	1	1	2	0	0	1	3	0	8
Tyler	1	1	1.5	0	0	1	2	0	6.5
Wirt	1	1	1.5	0	0	1	3	0	7.5
Wood	3	2.5	1.5	0	0	1	3	3	14

Table 3.53 Drought Hazard Ranking Score

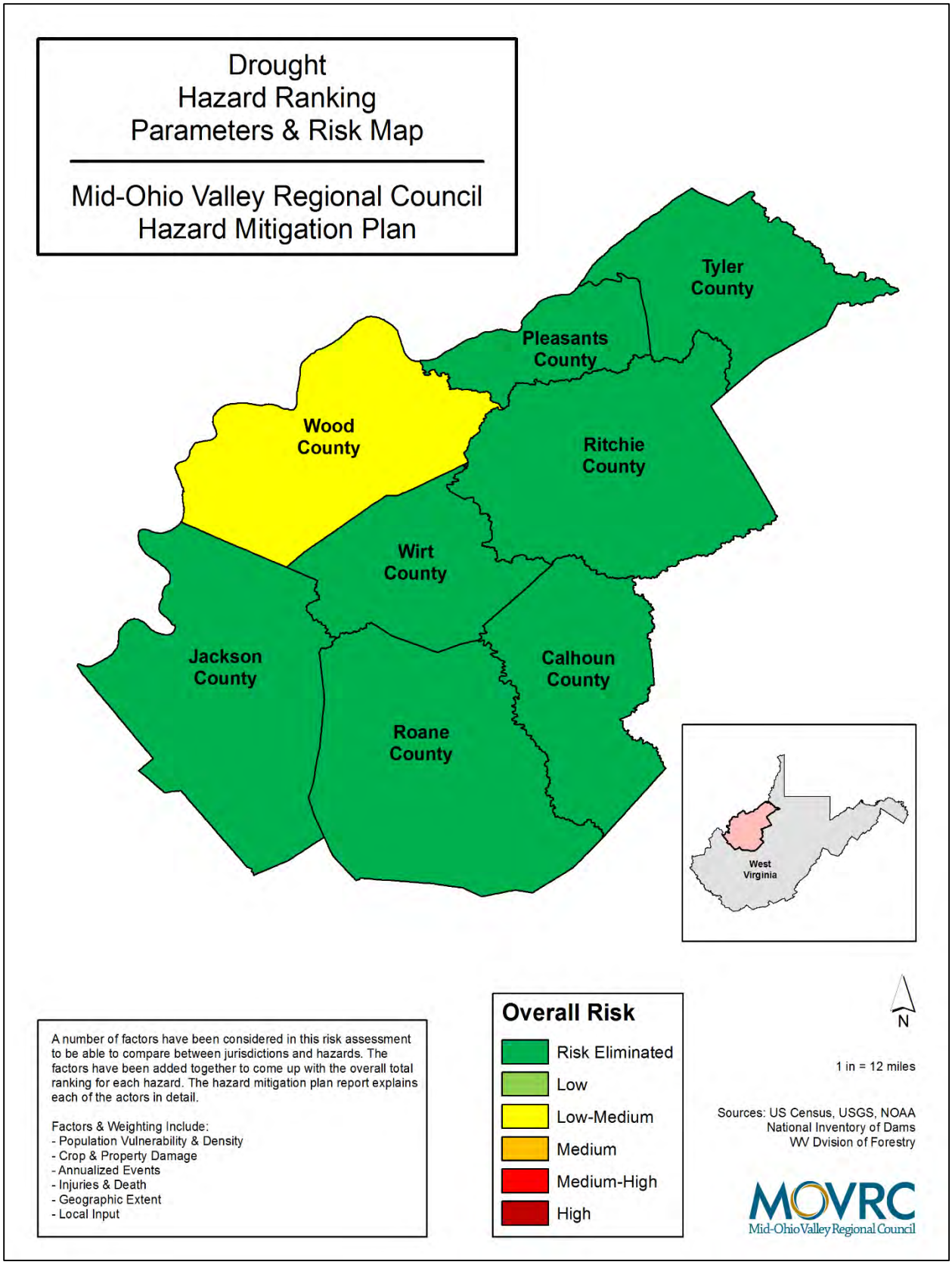


Figure 3.43 Risk Presented by Drought in Each of the MOV Counties

3.17.4 Hazard Preparedness

Before a drought, strategies for preparedness focus mainly on water conservation. During a drought always observe state and local restrictions on water use. If restricted, for example, do not water your lawn, wash your car, or other non-essential uses, to help ensure there is enough water for essential uses.

Indoor water conservation tips:

- Bathroom –
  - Avoid flushing the toilet unnecessarily. Dispose of tissues, insects, and other similar waste in the trash rather than the toilet.
  - Avoid taking baths – take short showers – turn on water only to get wet and lather and then again to rinse off.
  - Avoid letting the water run while brushing your teeth, washing your face or shaving.
  - Place a bucket in the shower to catch excess water for watering plants.
- Kitchen –
  - Operate automatic dishwashers only when they are fully loaded. Use the "light wash" feature, if available, to use less water.
  - Hand wash dishes by filling two containers – one with soapy water and the other with rinse water containing a small amount of chlorine bleach.
  - Clean vegetables in a pan filled with water rather than running water from the tap.
  - Store drinking water in the refrigerator. Do not let the tap run while you are waiting for water to cool.
  - Avoid wasting water waiting for it to get hot. Capture it for other sues such as plant watering of heat it on the stove or in a microwave.
  - Avoid using running water to thaw meat or other frozen foods. Defrost food overnight in the refrigerator or use the defrost setting on your microwave oven.
- Laundry –
  - Operate automatic clothes washers only when they are fully loaded or set the water level for the size of your load.

Outdoor water conservation tips while in a drought:

- Car washing
  - Use a commercial car wash that recycles water.
  - If you wash your own car, use a shut-off nozzle that can be adjusted down to a fine spray on your hose.
- Lawn care
  - Avoid over watering your lawn and water only when needed.
  - A heavy rain eliminates the need for water for up to two weeks. Most of the year, lawns only need one inch of water per week.
  - Check the soil moisture levels with a soil probe, spade or large screwdriver. You don't need to water if the soil is still moist. If your grass springs back when you step on it, it doesn't need water yet.
  - If your lawn does require watering, do so early in the morning or later in the evening when the temperatures are cooler.
  - Check your sprinkler system frequently and adjust sprinklers so only your lawn is watered and not the house, sidewalk, or street.
  - Water in several short sessions rather than one long one, in order for your lawn

to better absorb moisture and avoid runoff.
- Use a broom or blower instead of a hose to clean leaves and other debris from your driveway or sidewalk.
- Avoid leaving sprinklers or hoses unattended. A garden hose can pour out 600 gallons or more in only a few hours.
- In extreme drought, allow lawns to die in favor of preserving trees and large shrubs.

3.18 Dam Failure

Insufficient data was available to fully complete an assessment of dam failure in the Mid-Ohio Valley. The following section assess dam failure to the best extent possible with the county specific data. The MOVRC planners understand the issue this creates in successful hazard mitigation planning. In order to remedy this issue and complete a better, more comprehensive assessment of dam failure during the 2022 HMP update, planners have included Mitigation action 2016-39 in this plan which reads:

> *Expand upon data from the National Inventory of Dams to more accurately identify the risk level presented by dams in the region. The data needed is not currently available broken down to the county level and is not specific to individual dams. This will enable for more comprehensive planning regarding mitigating dam failure in the Mid-Ohio Valley Region.*

This mitigation action has been included under mitigation goal three "Improve Understand of Risk and Vulnerability for Planning Purposes." This goal has been included in the plan to establish actions that need to be taken before the next plan update to remedy issues found in the planning process during this update. Gathering more complete and county specific data will enable planners in 2022 to develop a more comprehensive assessment of dam failure in the Mid-Ohio Valley. Goal three and the according mitigation actions can be found in section 4.2.2 of this plan.

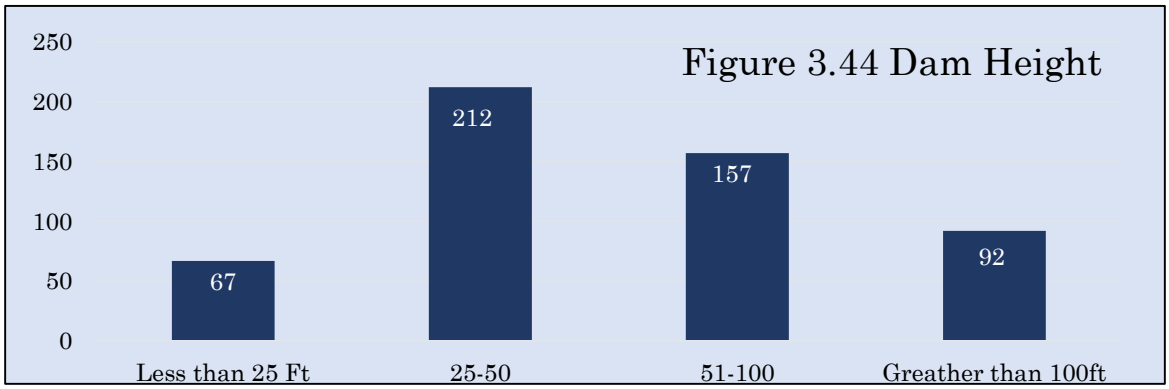
3.18.1 Description

The West Virginia Dam Control and Safety Act establishes regulations for dams in the State. Under the regulations dams are defined as: An artificial barrier or obstruction, including any works appurtenant to it and any reservoir created by it, which is or will be placed, constructed, enlarged, altered or repaired so that it does or will impound or divert water. According to the WV State HMP, dams are barriers constructed to impound water for storage, flood control, power generations, and/or stream navigation. Dams also are constructed to impound hydraulically transported industrial waste including spoil or mine processing waste, or coal combustions waste of fly ash.

Dams are barriers constructed to impound water for storage, flood control, power generation, and/or stream navigation. Dams also are constructed to impound hydraulically transported industrial waste including spoil or mine processing waste, or coal combustions waste of fly ash. The structures can vary greatly in size based on their purpose and area topography; however, the law establishes that regulated dams must be:

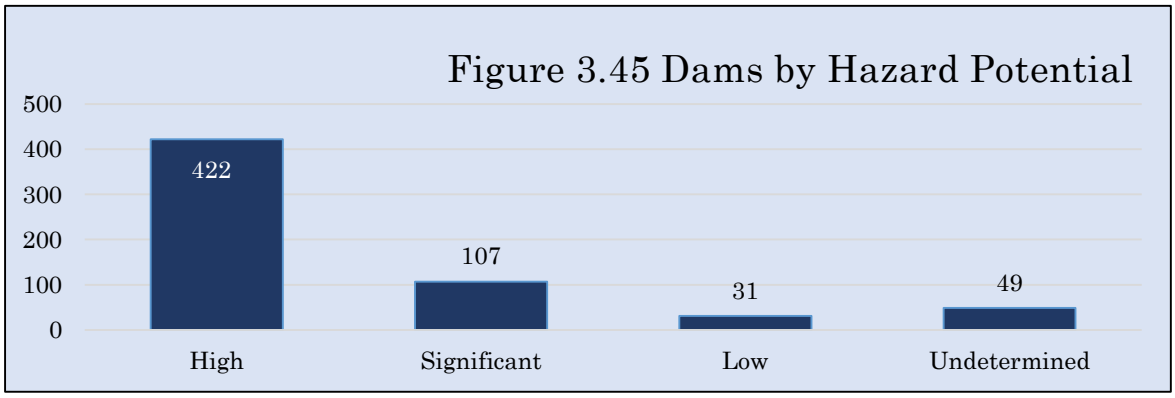
> 25 feet or more in height and impound 15 or ore are-feet (4,917,420 gallons) of water volume, **OR** 6 feet or more in height and impound 50 or more acre-feet (16,391,400 gallons) of water volume.

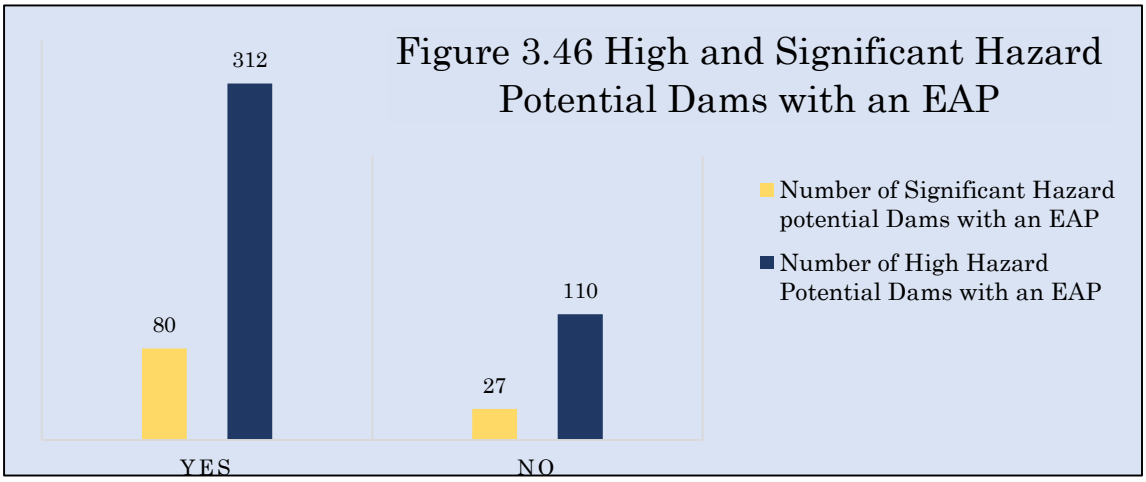
Height is the vertical distance from the natural streambed at the downstream toe of the dam to the crest of the dam. Water volume is measured to the crest of the dam, not to normal reservoir level. Water means any liquid, including any solids or other matter which may be contained therein, which is or may be impounded by a dam. Figure 3.44 below details the highest of all dams in WV as provided National Inventory of Dams (NID).



Dam failure occurs when a dam fails to retain the water it is holding back in some capacity. According to the 2013 WV HMP most failures occur due to lack of maintenance of facilities in combination with major precipitation events, such as hurricanes and thunderstorms. In order to prevent dam failure and maintain public safety and prevent property damage caused by dam failure dams are constructed, maintained, operated or removed in a safe manner. One such aspect of dam safety measures is Emergency Action Plans (EAP) which are required for dams that have high hazard potential dams. Hazard potential is not related to the structural integrity of a dam, but strictly to the potential for downstream flooding. While the level of hazard potential is identified for all dams in the state, it is not possible to identify the location of dams with a high hazard potential. However, these figures indicate that 69.3% of dams located in West Virginia have a high hazard potential and 17.6% have a significant hazard potential. Figure 3.45 below, created using information from the

NID, detail the hazard potential for each of the State's dams and figure 3.46 details the number of dams without EAPs.





3.18.2 Historic Occurrence

There are no comprehensive databases of historical dam or levee failure in West Virginia. With a history that includes the Buffalo Creek Disaster, dam failure is a serious issue in West Virginia. However, the Mid-Ohio Valley Region has no coal mining nor the dams associated with it. There are several large impoundments in the region, most notably North Fork Hughes River Lake, O'Brien Lake, Woodrum Lake, Charles Fork Lake, Conaway Lake, Pond Run Mountwood Lake, and Lake Washington. Most are located in rural areas with no

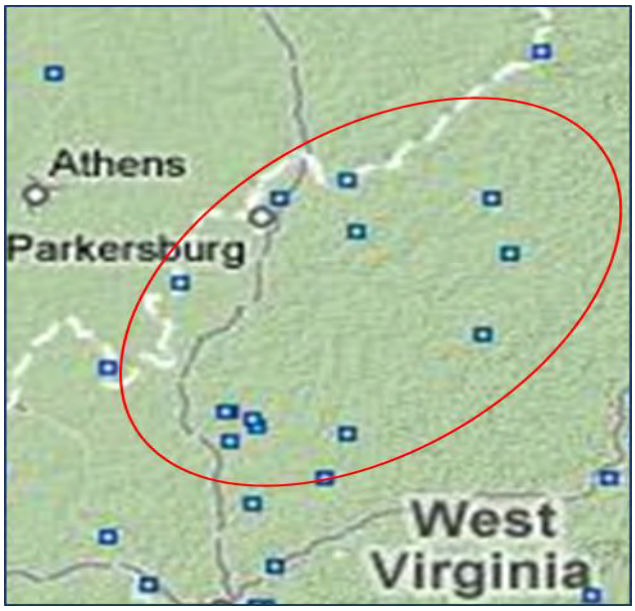


Figure 3.47 NID Locations of Dams in MOV

development immediately downstream, thereby lessening the potential impact of a dam failure. North Fork Hughes River Lake and Charles Fork Lake are the most conspicuous exceptions. The Town of Cairo and the City of Spencer are downstream of these reservoirs. Figure 3.47 above is from the NID and displays the locations of dams throughout the region.

Dam safety is not a local government responsibility; therefore, none of the County Commissions nor any of the cities in the region have inspection programs. The WV Department of Environmental Protection (WVDEP) does have primary responsibility for dam safety. Table 3.54 below lists the all of the dams located in the Mid-Ohio Valley Region, the owner type, the primary purpose of the dam, and the dam type according to the (NID).

County	Total Dams	Owner Type	#	Primary Purpose	#	Dam Type	#
Calhoun	-	-	-	-	-	-	-
Jackson	14	Local Government	7	Flood Control	5	Rockfill	4
		Private	2	Recreation	4	Earth	7
		State	5	Water Supply	1	Unknown	3
				Multi	4		
Pleasants	2	Private	1	Tailings	2	Earth	1
		Public Utility	1			Other	1
Ritchie	8	Local Government	5	Flood Control	3	Earth	5
		Private	3	Water Supply	3	Other	1
				Fire Protection	1	Concrete	1
				Unknown	1	Unknown	1
Roane	8	Local Government	5	Water Supply	3	Earth	7
		Private	2	Recreation	2	Unknown	1
		Unknown	1	Flood Control	2		
				Unknown	1		
Tyler	2	WVDNR	1	Recreation	1	Earth	1
		OSI Specialties	1	Tailings	1	Unknown	1
Wirt	-	-	-	-	-	-	-
Wood	6	Private	4	Recreation	4	Earth	5
		Local Government	2	Flood Control	1	Unknown	1
				Multi	1		

Table 3.54 Dams Located in the MOV Identified by the NID

3.18.3 Risk Assessment

Due to the lack of data providing the required details of dams for each county of the region, this HMP's risk assessment could not evaluate the risk presented by dam failure in the same way it handled all other hazards. While the details are not available on the county level, the NID does provide a great deal of information regarding dam failure for West Virginia's total 609 dams. Figure 3.48 below provides

summary information regarding dams in the State of WV as depicted by the NID. While the NID provides this information for the entire State, it does not provide this information on a county by county basis. As there has been no dam failure event recorded in the MOV, each county in the has an average annual event of 0.

While calculating the risk presented by dam failure in the region was challenging, an altered assessment was executed. There have been no recorded dam failure events, property damage, crop damage, or deaths or injuries. Furthermore, dam failure was not identified through public meetings or through the online survey by citizens as a major threat to their neighborhoods. Dam failure events were eliminated for Calhoun and Wirt Counties as there are currently no dams that exist in either County. For the remaining counties, the number of dams existing dams was considered to determine the geographic extent.

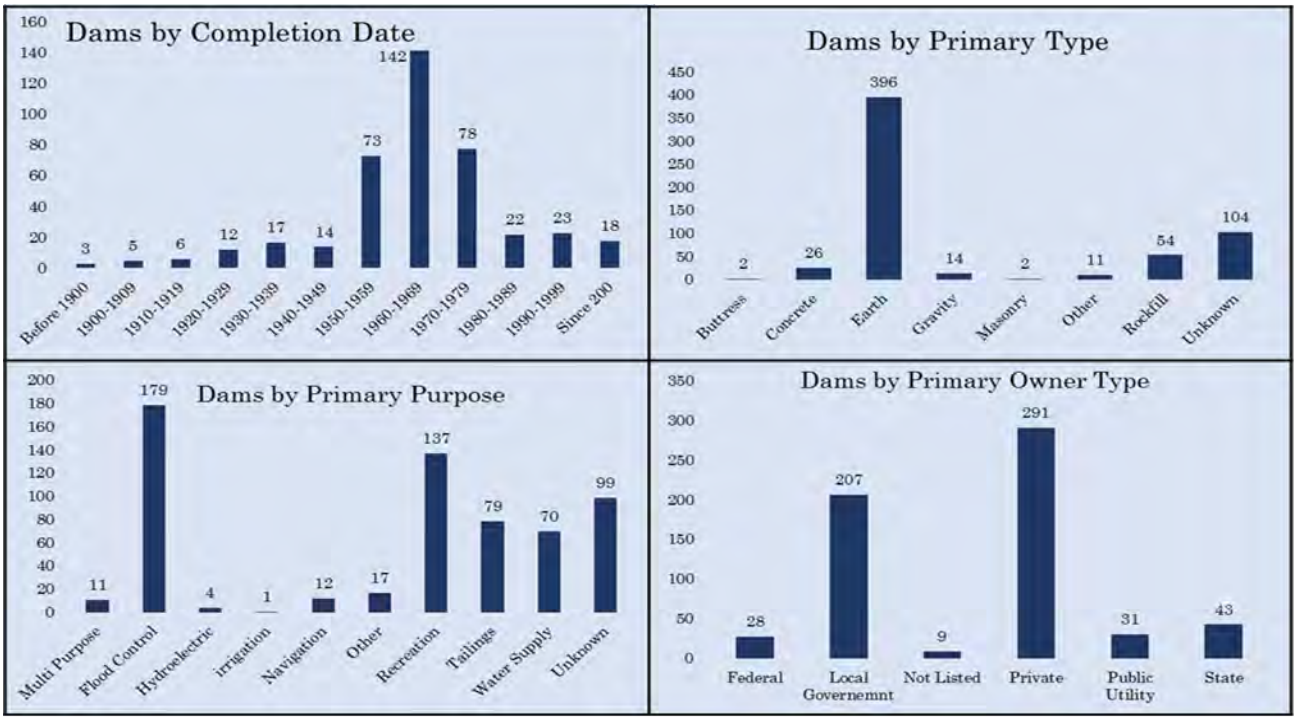


Figure 3.48 Summary Information for all Dams in WV Provided by the NID

This assessment indicated that dam failure as an eliminated risk, however because the data used to complete the risk assessment was lacking in detail it is not an accurate assessment. For this reason, the potential of risk, dam failure should be considered **a present hazard in each county that hosts a dam of any kind**. Chapter 4 of this plan which discusses mitigation strategies describes ways in which a better assessment of dams may be possible in the future. The lack of data on this subject in the region has impeded planning. Figure 3.49 represents the evaluated risk for dam failure in each county using the available data.

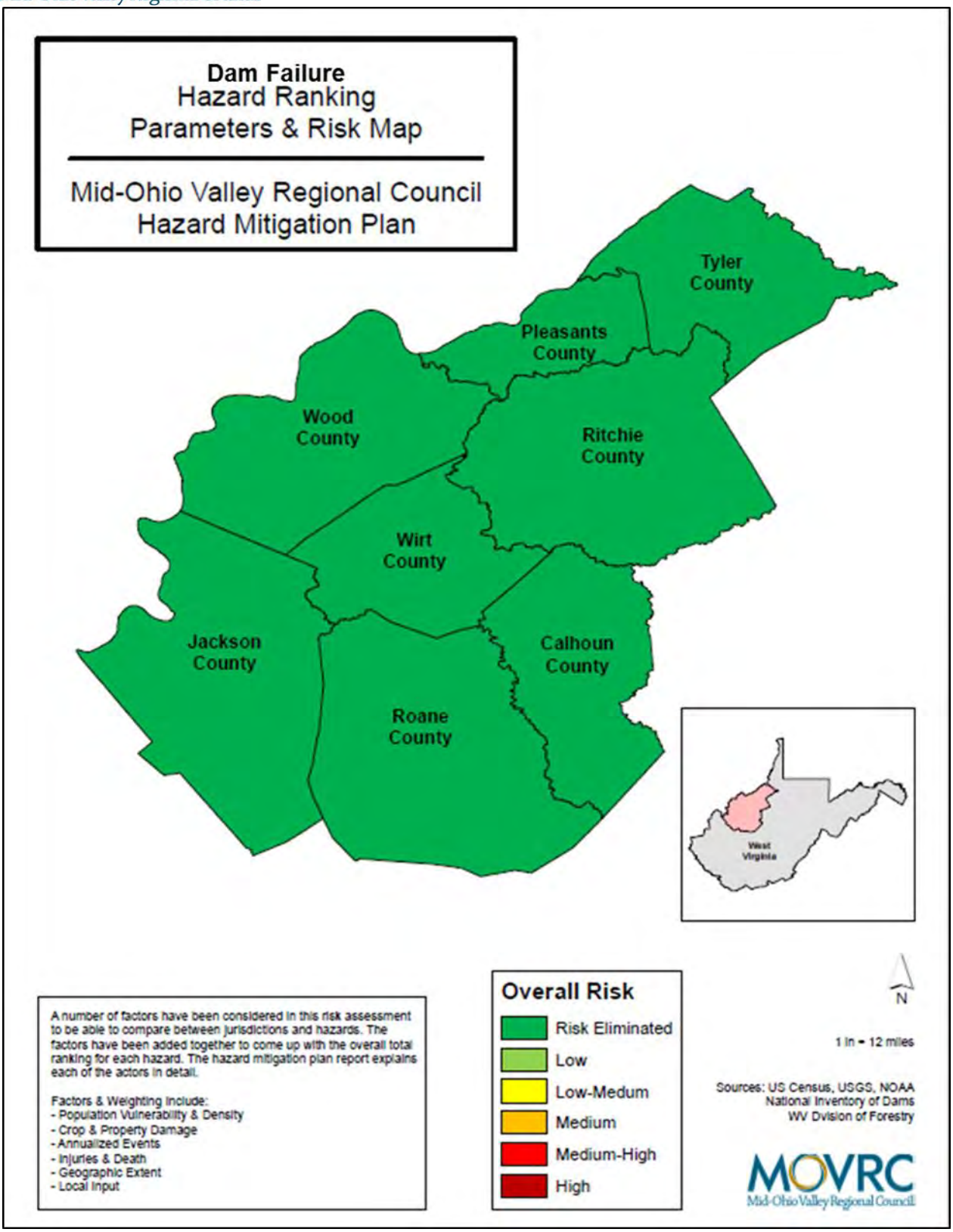


*Figure 3.49 Risk Presented by Dam Failure in Each of the MOV Counties *based on data available and not a complete representation. Please see the above text.*

3.18.4 Hazard Preparedness

Basic Safety Tips:

- Avoid walking or driving through flood waters; turn around, don't drown. Just 6 inches of moving water can knock you down, and 2 feet of water can sweep your vehicle away.
- If there is a chance of flash flooding, move immediately to higher ground; flash floods are the #1 cause of weather-related deaths in the U.S.
- IF floodwater rise around your car but the water is not moving abandon the car and move to higher ground. Do not leave the car and enter moving water.
- Avoid camping or parking along streams, rivers, and creeks during heavy rainfall. These areas can flood quickly and with little warning.

Flood Watch = Be Aware, Conditions are right for flooding to occur in your area.

- Steps to Take
  - Turn on your TV/Radio, you will receive the latest weather updates and emergency instructions.
  - Know where to go, you may need to reach higher ground quickly and on foot.
  - Build or restock your emergency preparedness kit. Include a flashlight, batteries, cash, and first aid supplies.
- Prepare Your Home
  - Bring in outdoor furniture and move important indoor items to the highest possible floor. This will help protect them from flood damage.
  - Disconnect electrical appliances and do not touch electrical equipment if you are wet or standing in water, you could be electrocuted.
  - If instructed, turn your gas and electricity main switch or valve. This helps prevent fires and explosions.

Flood warning = Tack Action, flooding is either happening or will happen shortly.

- Steps to take
  - Move immediately to higher ground or stay on high ground
  - Evacuate if directed and avoid walking or driving through flood waters.

After a Flood

- Return home only when authorities say it is safe.
- Be aware or areas where floodwaters have receded and watch out for debris, floodwater often erode roads and walkways.
- Do not attempt to drive through areas that are still flooded.
- Avoid standing water as it may be electrically charged from underground or downed powerlines.
- Photograph damage to your property for insurance purposes.

When it's not Flooding: Make a flood plan

- Know your flood risk
- Make a flood emergency plan
- Build or restock your emergency preparedness kit, including a flashlight, batteries, cash, and first aid supplies.
- Consider buying flood insurance
- Familiarize yourself with local emergency plans. Know where to go and how to get there should you need to get to higher ground, the highest level of a building, or to evacuate. Stay tuned to your phone alerts, TV, or radio for weather updates, emergency instructions, or evacuation orders.

3.19 Potential Risks with Limited Regional Precedent

This section of the plan profiles potential hazard for the Mid-Ohio Valley Region that have been statistically eliminated using this plan's risk assessment process but still have to the potential to threaten the region. These hazards do not or have not occurred within in the region in a manner that has generated enough data to register at the minimum of a low risk **but** the potential for this type of hazard does exist in the region. Natural hazards cannot be eliminated solely on the bases of past events; some hazards only occur once or twice every 50 years. It is for this reason a wide variety of hazards were included in the risk assessment and evaluated using multiple factors. As the potential for the hazard does exist it is important for mitigation planners, emergency responders, and citizens to be prepared for any such events even though it is unlikely that it will occur according to the risk assessment of this plan. The risk for the hazard is still present in the region and should be considered in all mitigation planning efforts.

3.19.1 Earthquakes

Description

The USGS defines earthquakes as both the sudden slip on a fault, and the resulting ground shaking and radiated seismic energy caused by the slip, or by volcanic or magmatic activity, or other sudden stress changes in the earth. Earthquakes are the sudden, rapid shaking of the ground caused by the shifting and breaking of rock beneath the earth's surface. While most earthquakes tend to occur at the boundaries where tectonic plates meet, some earthquakes do occur in the middle of the plates. Earthquakes can be felt over large areas, and usually last less than one minute. All 50 states and 5 U.S. territories are at some risk for earthquakes. Earthquakes can happen at any time of the year, and cannot be predicted although scientists are working on it.

The relative size of an earthquake is characterized by its magnitude. Magnitude is based on measurement of the maximum motion recorded by a seismograph. Several scales have been defined, but the most commonly used are (1) local magnitude (ML), commonly referred to as "Richter magnitude," (2) surface-wave magnitude (Ms), (3) body-wave magnitude (Mb), and (4) moment magnitude (Mw). Scales 1-3 have limited range and applicability and do not satisfactorily measure the size of the largest earthquakes. The moment magnitude (Mw) scale, based on the concept of seismic moment, is uniformly applicable to all sizes of earthquakes but is more difficult to compute than the other types. All magnitude scales should yield approximately the same value for any given earthquake.

Historic Occurrence

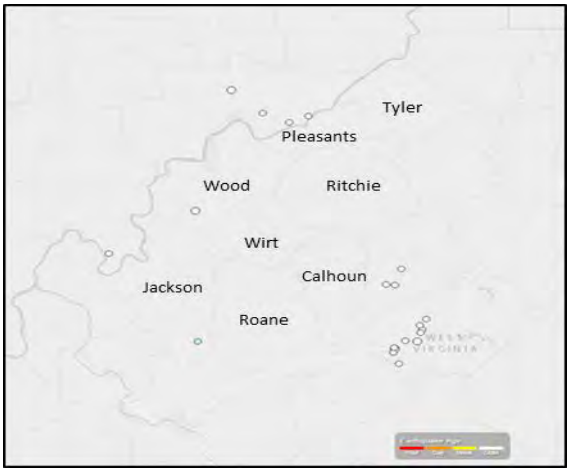


Figure 3.50 Locations of Previous Earthquakes

In searching the USGS earthquake archives, it was discovered that that since 1950 there have been two earthquakes in the Mid-Ohio Valley Region. The first occurred in southern Wood County near interstate 77 12 miles from the City of Parkersburg, WV on October 20, 1974 at 1:15 pm. The earthquake had a magnitude of 3.4 and depth of 11.0 km. The second earthquake occurred in southern Jackson County 8 miles northeast of the Town of Sissonville, WV on June 6, 2014 at 3:40pm. The earthquake had a magnitude of 2.6 and depth of 29.6 km. Figure 3.50 above represents that geographic location of earthquakes occurring in the Mid-Ohio Valley region since 1950 as purported by the USGS earthquake archives. For the purposes of this risk assessment, the archives were only searched from 1950-September 30, 2015 as those are the limitations of the NCDC database of hazardous events utilized for other event types in this report.

To properly evaluate the risk level previous earthquake events could project for the Mid-Ohio Valley region, the magnitude of the previous earthquakes was taken into consideration. According to the USGS Earthquake Hazards Program earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of about 4.5 or greater – there are several thousand such shocks annually – are strong enough to be recorded by sensitive seismographs all over the world. Great earthquakes have a magnitude of 8.0 or higher and on average, one earthquake of such size occurs somewhere in the world each year. Both of the previously occurring earthquakes have had a magnitude of less than 3.5 in the region.

Earthquake ground shaking varies from place to place and the hazard depends on the magnitudes and locations of likely earthquakes, how often they occur, and the properties of the rocks and sediment that earthquake waves travel through. The USGS Hazards Program prepares hazard maps to aid in evaluating the risk that areas face from earthquakes. The mapped hazards display an estimate of the probability of exceeding a certain amount of ground shaking, or ground motion, in 50 years. The 2014 earthquake hazard map for West Virginia was utilized to determine the geographic extent of the risk presented to the Mid-Ohio Valley region by this hazard. Figure 3.51 below details the extent of that risk.

Figure 3.51 USGUS Map probablity of Ground Shaking Risk

Figure 3.52 below was created by the USGS Earthquake Hazard program to incorporate the count of earthquakes occurring in central and eastern U.S. with a magnitude of 3.0 or higher since 1974 and the 2014 USGS National Seismic Hazard Map. The earthquake events have been plotted on the hazard map, and only one such event has occurred in the Mid-Ohio Valley Region since 1974.

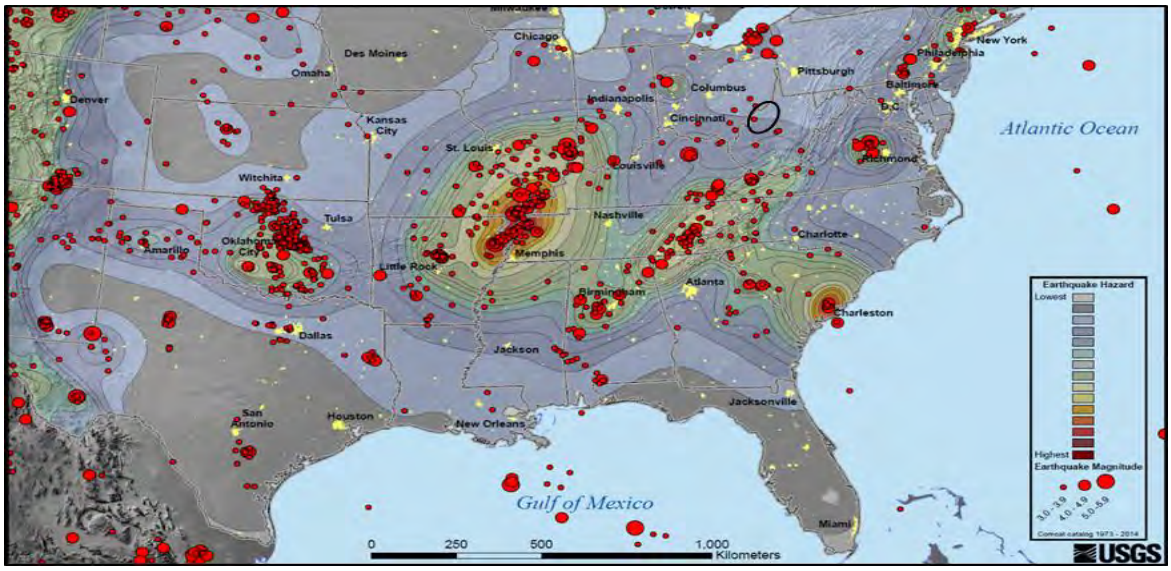


Figure 3.52 USGS Map of Earthquakes in Eastern U.S. 1974-2014

Risk Assessment

As stated under historic occurrence in this section, two earthquakes have occurred in the Mid-Ohio Valley Region, both with a magnitude less than 3.5. Theses earthquakes occurred in Wood and Jackson Counties. Earthquakes were statistically identified as an eliminated hazard for the Mid-Ohio Valley Region. However as is indicated by the recorded occurrence of two previous earthquakes, it is known that the potential for an

earthquake exists. Therefore, earthquakes cannot be eliminated as a potential natural hazard for the region. Table 3.55 below displays the average number of earthquakes in the region each year.

County	Average Number of Events each year
Calhoun	0
Jackson	0.02
Pleasants	0
Ritchie	0
Roane	0
Tyler	0
Wirt	0
Wood	0.02

Table 3.55 Average Number of Yearly Earthquakes Events

While earthquakes are few and far between in the mid-Ohio Valley, the possibility of their occurrence is important to consider when evaluating natural hazards. Table 3.56 below displays the scoring of earthquakes through this plan's risk assessment. Earthquakes scored lower than the required threshold to be counted as a low risk in each county. This occurred for two possible reasons 1) the data necessary to evaluate earthquakes in this manner was either not recorded or recorded correctly under another hazard type, or 2) there was no significant data to be record.

Though this risk assessment identified earthquakes as an eliminated risk, the potential for this type of hazard exists. This is evident by the fact that two earthquakes have affected the region. Even though they are rare, the potential for earthquakes does exists and the hazard should in no way be considered an impossibility in the Mid-Ohio Valley. Figure 3.53 below is a map that indicates the evaluated risk of earthquakes in the region. It is important to keep in mind that though it is a statistically eliminated hazard, **the potential for the hazard does exist in all of the region's counties**.

County	Population Density	Population Vulnerability	Number Events	Property damage	Crop Damage	Deaths & Injuries	Geographic Extent	Local Input	Total
Calhoun	1	1	0	0	0	1	1.5	0	4.5
Jackson	1.5	1.5	1	0	0	1	1.5	0	6.5
Pleasants	1.5	1	0	0	0	1	1	0	4.5
Ritchie	1	1	0	0	0	1	1	0	4
Roane	1	1	0	0	0	1	1.5	0	4.5
Tyler	1	1	0	0	0	1	1	0	4
Wirt	1	1	0	0	0	1	1.5	0	4.5
Wood	3	2.5	1	0	0	1	1	0	10.5

Table 3.56 Earthquake Hazard Ranking Score

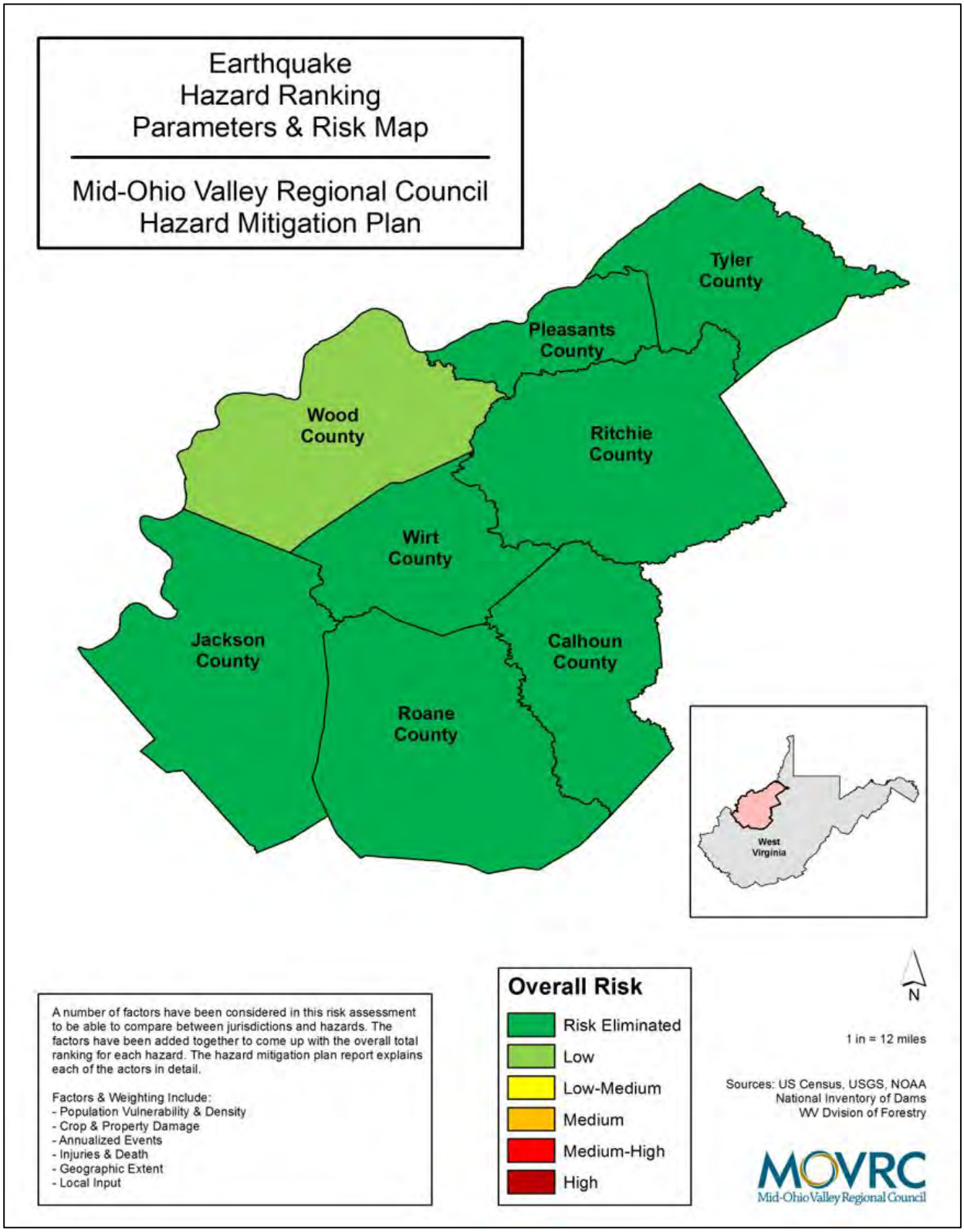


*Figure 3.53 Risk Presented by Earthquakes in Each of the MOV Counties *based on data available and not a complete representation. Please see the above text.*

Hazard Preparedness

Before an earthquake:

- Look around places were you spend time. Identify safe places such as under a sturdy piece of furniture or against an interior wall in your home office or school so that when the shaking starts, you Drop to the ground, cover you head and neck with your arms, and if a safer place is nearby, crawl and Hold On.
- Practice how to "Drop, Cover, and Hold ON" to react quickly you must practice often. You may only have seconds to protect yourself in an earthquake.
- Before an earthquake occurs, secure items that could fall and cause injuries.
- Store critical supplies and documents.
- Plan how you will communicate with family members, including multiple methods by making a family emergency communication plan.
- When choosing your home or business, check if the building is earthquake resistant per local building codes.

During an earthquake:

- If you are inside a building –
  - Stay where you are until the shaking stops. Do not run outside. Do not get in a doorway as this does not provide protection from falling or flying objects, and you may not be able to remain standing.
  - Drop down onto your hands and knees so the earthquake doesn't knock you down. Drop to the ground.
  - Cover you head and neck with your arms to protect yourself from falling debris.
  - Hold on to any sturdy covering so you and move with it until the shaking stops. Stay where you are until the shaking stops.
- If getting safely to the floor to take cover is not possible –
  - Identify an inside corner of the room away from windows and objects that could fall on you. The Earthquake Country Alliance advise getting as low as possible to the floor. People who use wheelchairs or other mobility devices would lock their wheels and remain seated until the shaking stops. Protect your head and neck with your arms, a pillow, a book, or whatever is available.
- If you are in bed when you feel the shaking –
  - Stay there and cover your head and neck with a pillow. At night, hazards and debris are difficult to see and avoid; attempts to move in the dark result in more injuries than remaining in bed.
- If you are outside when you feel the shaking –
  - If you are outdoors when the shaking starts, move away from buildings, streetlight, and utility wires. Once in the open, drop, cover and hold on. Stay there until the shaking stops. This might not be possible in a city so you may need to duck inside a building to avoid falling debris.
- If you are in a moving vehicle when you feel the shaking –
  - Stop as quickly and safely as possible and stay in the vehicle. Avoid stopping near or under buildings, trees, overpasses, and utility wires. Proceed

cautiously once the earthquake has stopped. Avoid roads, bridges, or ramps that the earthquake may have damaged.

After an earthquake:

- When the shaking stops, look round. If there is a clear path to safety, leave the building and go to an open space away from damaged areas.
- If you are trapped, do not move about or kick up dust.
- If you have a cell phone with you, use it to call or text for help.
- Tap on a pipe or wall or use a whistle, if you have one, so that rescuers can locate you.
- Once safe, monitor local news reports via battery operated radio, TV, social media, and cell phone text alters for emergency information and instructions.
- Be prepared to drop, cover and hold on in the likely event of aftershocks.

3.19.2 Hurricanes

Description

Hurricanes are defined by the NOAA as a tropical cyclone in which the maximum 1-minute sustained surface wind is 64 knots (74 mph) or greater. In the Atlantic Ocean or the North Pacific Ocean east of the International Date Line this event would be labeled as Hurricane, and in the North Pacific Ocean west of the International Dateline this event would be classified as a Typhoon. Hurricanes will usually include many individual hazards, such as storm tide, freshwater flooding, tornadoes, rip currents, and winds.

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures. Table 3.57 below describes hurricane categories in depth according to the National Hurricane Center.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few days.
2	96-110 mph	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted

		trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall months. Most of the area will be uninhabitable for weeks or months.

Table 3.57 National Hurricane Center's Description of Hurricane Categories

Historic Occurrence

The Mid-Ohio Valley region is located roughly over 200 miles west of the Atlantic Ocean and hurricanes primarily affect coastal towns. The region's distance from the Ocean acts as a buffer, diminishing the force of a hurricane. According to research from the National Hurricane Center, around 5 hurricanes have made a path through the Mid-Ohio Valley since 1851. However, by the time they reach this far inland they have weakened significantly lessening the effects of the dangerous winds that come with Hurricanes on the coasts. Therefore, when hurricanes hit in the Mid-Ohio Valley the hazards that threaten the region are generally rains and flooding. Figure 3.54 below display all of the hurricanes occurring in the Mid-Ohio Valley Region.

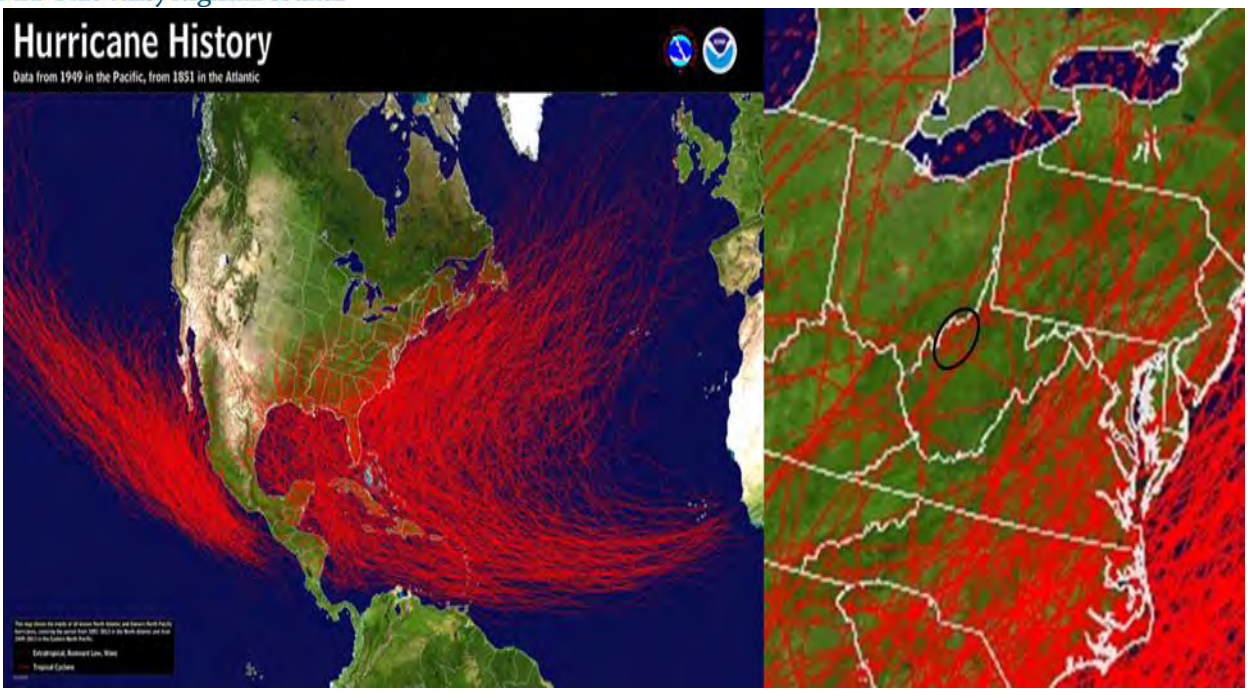


Figure 3.54 Hurricanes in the MOV 1851-2015

Risk Assessment

As discussed above, according to the National Hurricane Center there have been around 5 hurricanes in the region from 1851 to 2015. These statistics calculate an annual average of 0.03 hurricanes yearly in the region. Table 3.58 below displays the average number of hurricanes in each county each year. It is possible that the effects of hurricanes were registered as other hazard types in the NCDC database. Due to the region's location, over 200 miles inland, the wind threat presented by the hazard is lessened substantially. The region does however feel the effects of the other threats presented by the hazard such as flooding and rain which have been evaluated in the previous sections of this plan. Additionally, any wind event resulting from hurricane systems is also recorded as a type of wind event in the NCDC storm event database.

County	Average Number of Events each year
Calhoun	0.03
Jackson	0.03
Pleasants	0.03
Ritchie	0.03
Roane	0.03
Tyler	0.03
Wirt	0.03
Wood	0.03

*Table 3.58 Average Number of Yearly Hurricanes Event**s***

While hurricane events are few and far between in the Mid-Ohio Valley, the **possibility** of their occurrence is important to consider when evaluating natural

hazards. Table 3.59 below displays the scoring of hurricanes through this plan's risk assessment. Though hurricanes scored lower than the required threshold to be counted as a low risk in each county, the occurrence of previous hurricanes proves that a potential for hurricanes exists in the region. This has occurred for two possible reasons 1) the data necessary to evaluated hurricanes in this manner was either not recorded or recorded correctly under another hazard type, or 2) there was no significant data to record.

County	Population Density	Population Vulnerability	Number Events	Property damage	Crop Damage	Deaths & Injuries	Geographic Extent	Local Input	Total
Calhoun	1	1	1	0	0	1	2	0	6
Jackson	1.5	1.5	1	0	0	1	2	0	7
Pleasants	1.5	1	1	0	0	1	2	0	6.5
Ritchie	1	1	1	0	0	1	2	0	6
Roane	1	1	1	0	0	1	2	0	6
Tyler	1	1	1	0	0	1	2	0	6
Wirt	1	1	1	0	0	1	2	0	6
Wood	3	2.5	1	0	0	1	2	0	9.5

Table 3.59 Hazard Ranking Score

Though the risk assessment identified hurricanes as an eliminated risk, the potential for this type of hazard exists. This is evident by the fact that hurricanes have affected the region, all be it very rarely; 0.03 average hurricanes yearly. The possibility of a hurricane persists and will be considered in mitigation planning. Though they do not frequently occur, **hurricanes should in no way be considered an impossibility in the Mid-Ohio Valley**. Figure 3.55 below is a map indicating the evaluated risk of hurricanes in the region. It is important to keep in mind that though it is a statistically eliminated hazard, the potential for the hazard does exist in all of the region's counties.

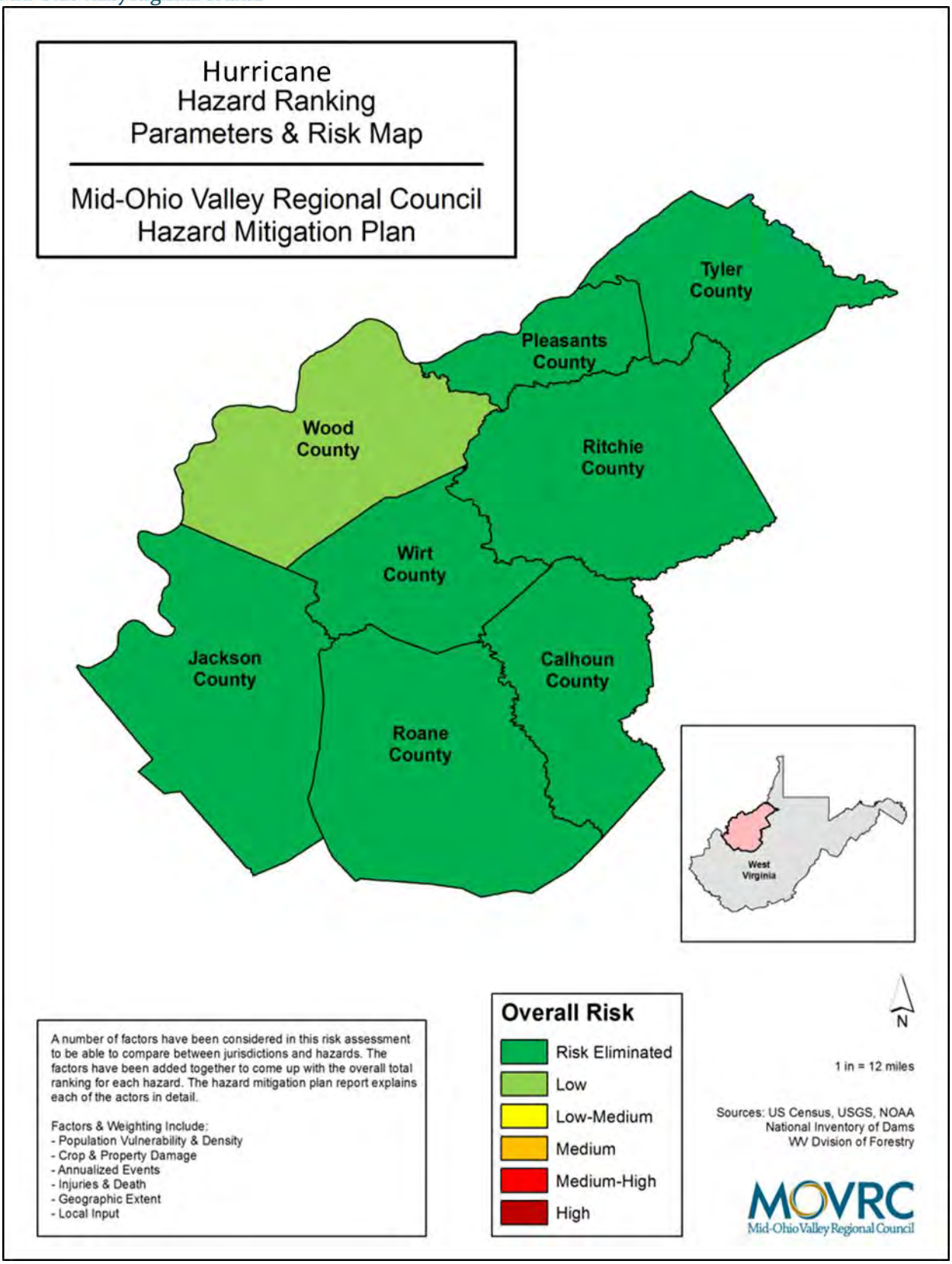


*Figure 3.55 Risk Presented by Hurricanes in Each of the MOV Counties *based on data available and not a complete representation. Please see the above text.*

Hazard Preparedness

Individuals should take the following steps to prepare for a hurricane:

- Know where to go. If you are ordered to evacuate, know the local hurricane evacuation route(s) to take and have a plan for where you can stay. Contact your local emergency management agency for more information.
- Put together a disaster supply kit, including a flashlight, batteries, cash, first aid supplies, and copies of your critical information if you need to evacuate.
- If you are not in an area that is advised to evacuate and you decide to stay in your home, plan for adequate supplies in case you lose power and water for several days and you are not able to leave due to flooding or blocked roads.
- Make a family emergency communication plan.
- Many communities have text or email alerting systems for emergency notifications. To find out what alerts are available in your area, search the Internet with your town, city, or county name and the word "alerts."

Homes should be prepared in the following manner:

- Hurricane winds can cause trees and branches to fall, so before hurricane season trim or remove damaged trees and limbs to keep you and your property safe.
- Secure loose rain gutters and downspouts and clear any clogged areas or debris to prevent water damage to your property.
- Reduce property damage by retrofitting to secure and reinforce the roof windows and doors, including the garage doors.
- Purchase a portable generator or install a generator for use during power outages. Remember to keep generators and other alternative power/heat sources outside, at least 20 feet away from windows and doors and protected from moisture; and NEVER try to power the house wiring by plugging in a generator into a wall outlet.
- Consider building a FEMA safe room or ICC 500 storm shelter designed for protection from high-winds and in locations above flooding levels.

3.19.3 Natural Resource Extraction

Description

West Virginia is known for its natural resource extraction industry, particularly underground and surface coal mining and more recently oil and natural gas. Coal mining, especially the underground mining prevalent in West Virginia, is a relatively hazardous industry. Coal mining hazards include those facing miners working in active operations, as well as residual post-mining hazards, especially those represented by abandoned mines. According to the WV State Hazard Mitigation Plan, by frequency of occurrence, dangerous (open) mine portals and unprotected highwalls are West Virginia's most common Abandoned Mine Land (AML) hazards. However, over half of all emergency problems abated in the State are related to abandoned mine subsidence. The most expensive AML hazard to remedy is landslides. Additionally, aside from the very serious and dangerous hazards presented to the miners

themselves, the most significant community hazard posed by active mines are mine waste impoundment dam failures and waste pile landslides.

Another extraction industry in West Virginia is the procurement of oil and natural gas. The Marcellus Shale is an organic-rich shale in Appalachia that occurs at the surface and in the subsurface from New York to eastern Tennessee. Marcellus Shale is present throughout much of West Virginia with the exception of the far eastern and western sections of the State. It varies in thickness through the state but is thicker generally from the Pennsylvania border south in to the north-central portions of the State. This sedimentary rock formation was deposited over 350 million years ago. The decomposition of organic materials under high pressure and temperature has produced reserves of natural gas, which is mainly held in pore spaces and fractures in the shale.

Newly developed drilling techniques now make it profitable for energy companies to target this shale for gas exploration. A procedure called hydraulic fracturing is used to retrieve the natural gas deposits. This process involves the hydraulic fracturing of the shale by pumping water at high pressures into the rock to create vertical fractures in the shale layer, while at the same time introducing sand into the rock to keep the fractures open once the water is removed. Then the Gas Company drills horizontally through the layer of shale to intersect the vertical fractures in the rock which contain the natural gas.

According to the 2013 State Hazard Mitigation Plan, hydraulic fracturing may have negative impacts on the environment and for property owners and communities near the wells. The water that is pumped at high pressures into the well is mixed with a series of chemicals, a few of which include acids, diesel fuels, gelling agents, antibacterial agents, and corrosion inhibitors. A portion of these chemicals may remain trapped in the ground and may leach into groundwater or surface water, and some of them qualify as hazardous materials and known carcinogens.

While the removal of these natural resources is not a natural process, the condition of the land after the extraction does provide conditions for natural hazards to occur. For example, the removal of the resources from the ground can provide the opportunity for land subsidence.

Historic Occurrence

While much of West Virginia has developed an underground or surface coal mining industry this is not the case in the Mid-Ohio Valley. As indicated in Figure 3.56 below from the WVGES, none of the region's eight counties have surface or underground coal mines. This with the combination of no exiting previous events, injuries or deaths,

or property and crop damage eliminates natural resource extraction resulting from coal mining as a hazard in this HMP for the Mid-Ohio Valley Region.

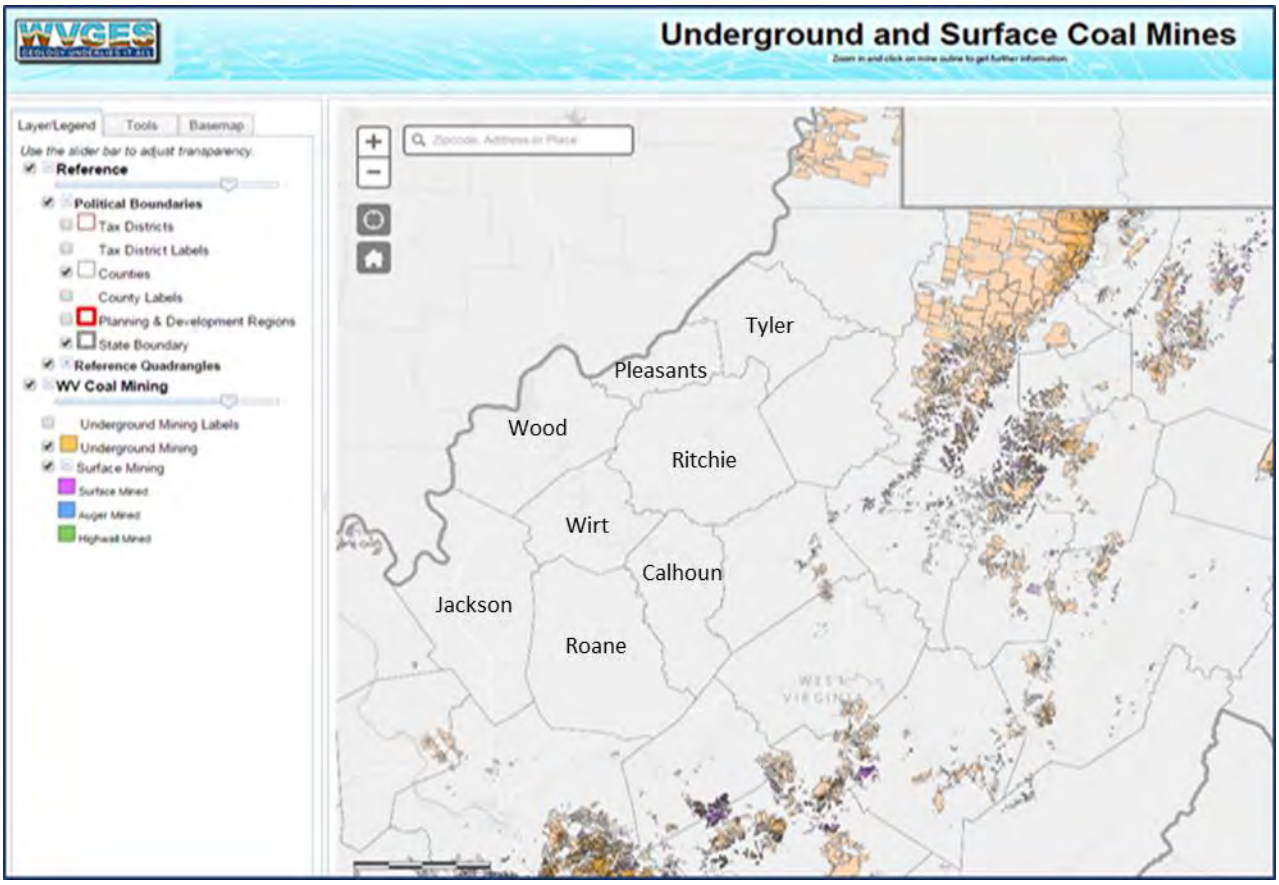


Figure 3.56 WVGES Map of Surface and Coal Mines

Natural gas and oil extraction has become a more prominent industry in much of West Virginia in recent years. This increase in industry has included some parts of all of the Mid-Ohio Valley Region's counties. Figure 3.55 below is a map of all gas, oil, and combination wells presently located in the Mid- Ohio Valley. Though this map indicates a large number of wells in the region, the various data sources available to this plan's project team do not indicate previous disasters directly related to the extraction of natural gas or oil within the region. This is not to suggest that such a disaster could not happen or that it has not happened. This statement is to indicate that any such disaster has not been indicated in any of the data used in the formation of this plan.

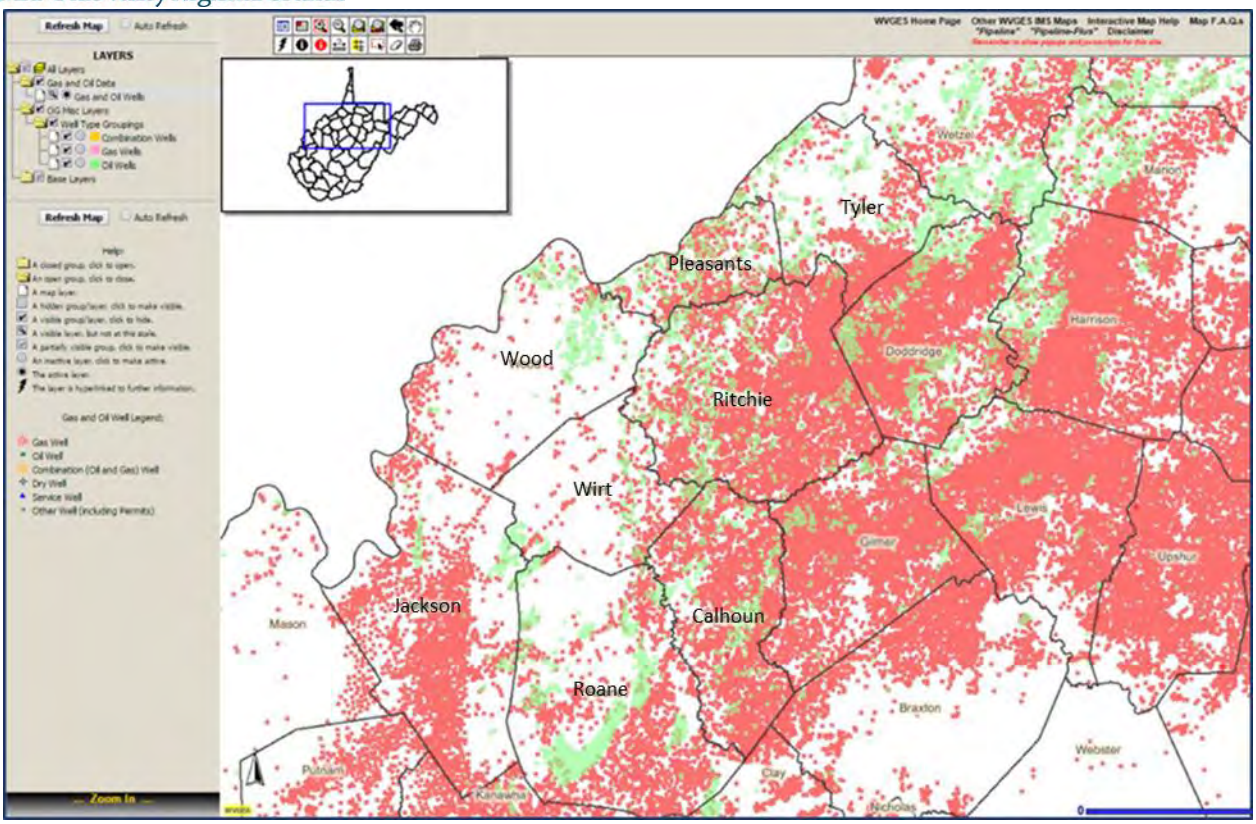


Figure 3.57 WVGES Map of Oil and Gas Wells

Risk Assessment

As is indicated in the map in figure 3.54 there are not existing surface or underground coal mines in the Mid-Ohio Valley Region. It is for this reason that natural resources extraction resulting from coal mining operations has been eliminated as a potential hazard in the Mid-Ohio Valley Region. Coal mining does not occur in the region and therefor the potential for any such disaster resulting from coal extraction is eliminated for the region.

As discussed above, according to the data utilized in this **planning there have not been specific hazard events, deaths or injuries, property damage, or crop damage resulting from natural gas extraction in the Mid-Ohio Valley Region**. However, as is indicated in the map in figure 3.55 natural gas and oil extraction are geographically present in the region. Therefore, the **POTENTIAL** for such an event does exist in the region and will be included in mitigation planning. Table 3.60 below displays the scoring of natural resource extraction (natural gas and oil) through this plan's risk assessment. This hazard scored lower than the required threshold to be counted as a low risk in each county. This occurred for two possible reasons 1) the data necessary to evaluate natural resource extraction in this manner was either not record or recorded correctly under another hazard type, or 2) there was no

signification data to record. Table 3.61 below displays the average number of yearly hazard events resulting from natural resource extraction in the Mid-Ohio Valley.

County	Population Density	Population Vulnerability	Number Events	Property damage	Crop Damage	Deaths & Injuries	Geographic Extent	Local Input	Total
Calhoun	1	1	0	0	0	1	4	0	7
Jackson	1.5	1.5	0	0	0	1	3	0	7
Pleasants	1.5	1	0	0	0	1	3	0	6.5
Ritchie	1	1	0	0	0	1	4	0	7
Roane	1	1	0	0	0	1	2	0	5
Tyler	1	1	0	0	0	1	2	0	5
Wirt	1	1	0	0	0	1	1	0	4
Wood	3	2.5	0	0	0	1	1	0	7.5

Table 3.60 Hazard Ranking Score

County	Average Number of Events each year
Calhoun	0.00
Jackson	0.00
Pleasants	0.00
Ritchie	0.00
Roane	0.00
Tyler	0.00
Wirt	0.00
Wood	0.00

Table 3.61 Average Number of Yearly Hazard Events Due to Natural Resource Extraction

Though this risk assessment identified natural resource extraction (natural gas and oil) as an eliminated risk, the potential for this type of hazard exists. This is evident by the geographic location of natural gas and oil wells located in each of the region's counties. The possibility of an events presets and will be considered in mitigation planning. Though it has not happened, according to the data utilized, to this point does not mean it is an impossibility. Figure 3.58 below is a map indicating the evaluated risk of natural resource extraction (natural gas and oil) in the region. **It is important to keep in mind that though it is a statically eliminated risk, the potential for the risk does exist in all of the region's counties.**

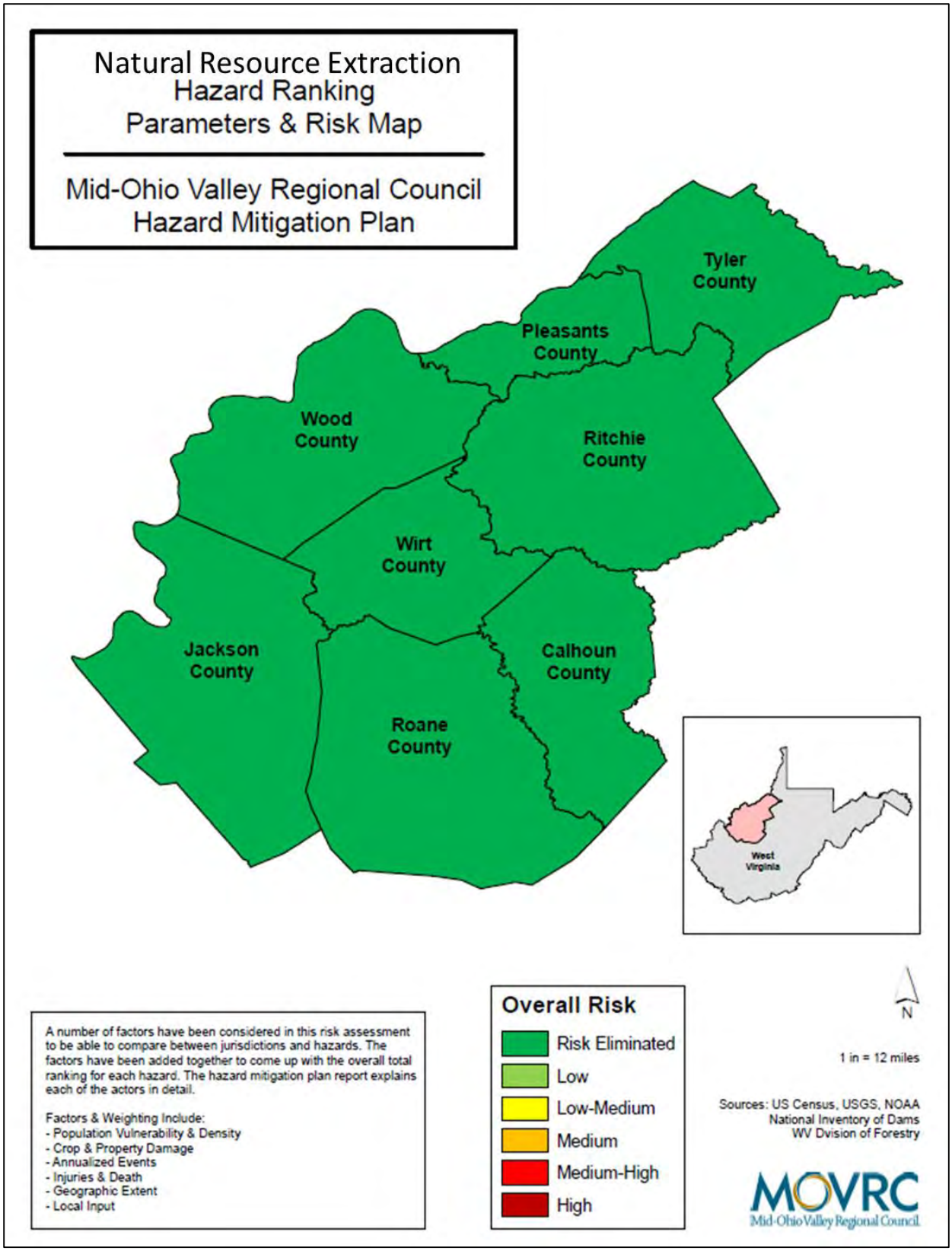


*Figure 3.58 Risk Presented by Dam Failure in Each of the MOV Counties *based on data available and not a complete representation. Please see the above text.*

Hazard Preparedness

For emergency preparedness procedures for natural resource extraction refer to those listed in Section 3.15.4 under landslides.

3.20 Eliminated Hazards

Natural hazards to be evaluated in this plan were selected in two ways, first any natural hazard identified by a citizen, either through online survey or during a public meeting was included in the risk assessment process. Second, after evaluating the previous 2011 Regional HMP and the 2013 State HMP any natural hazard mentioned concerning the Mid-Ohio Valley Region was included in the risk assessment. This process was used to ensure that all possible hazards were identified, as opposed to simply reviewing historic events due to the nature of some natural hazards. Section 3.4.5 discusses this process in more depth.

There are however some natural hazards that can be eliminated from further consideration after being evaluated through the risk assessment process. A lack of historic occurrences which results in no property or crop damage, injuries or deaths, coupled with very limited or no existing possibility of the hazard based on the geographic extent associated with the hazard results in the elimination of the hazard. Along with geographic elimination, when analyzing the composite totals of the hazard, if the score was low enough that it only included the scores for the county's population vulnerability, population density, and one point to account for possible deaths and injuries it was eliminated as a possible hazard for the region. The following hazards were included in the risk assessment for this HMP and after analysis were found to be eliminated hazards.

3.20.1 Avalanche

Description

As defined by the National Weather Service (NWS) National Oceanic and Atmospheric Administration (NOAA) report on Storm Data Preparation, an avalanche is a mass of snow, sometimes containing rocks, ice, trees, or other debris, that moves rapidly down a steep slope, resulting in a fatality, injury, or significant damage. If a search team inadvertently starts another avalanche, it will be entered as a new Avalanche event. A report from the NWS NOAA Winter Weather Preparedness Week in Colorado explains that most avalanches occur during or just after snowstorms and most occur on a slope of 30 to 45 degrees. According to an online article from the National Snow & Ice Data Center Titled Avalanche Awareness several factors may affect the likelihood of an avalanche, including weather, temperature, slope steepness, slope orientation (facing north or south), wind direction,

terrain, vegetation, and general snowpack conditions. Different combinations of these factors can create low, moderate or extreme avalanche conditions.

Eliminating Factors

While Avalanches can occur on any slope given the right conditions, in the U.S. certain time of the year and certain locations are naturally more dangerous than others. An avalanche requires a mass of snow to slide down a slope, however in the Mid-Ohio Valley region winter weather does not accumulate a "mass" of snow to constitute an avalanche. While some amount of snow may sluff off as temperature changes, the amount is minute and does not cause an avalanche event.

3.20.2 Expansive Soils

Description

Expansive soils are types of soil that shrink or swell as the moisture content decreases or increases. Structures build on these soils may experience shifting, cracking, and breaking damage as soils shrink and subside or expand. Generally, soils that are expansive include different types of clay.

Eliminating Factors

	Over 50 percent of these areas are underlain by soils with abundant clays of high swelling potential.
	Less than 50 percent of these areas are underlain by soils with clays of high swelling potential.
	Over 50 percent of these areas are underlain by soils with abundant clays of slight to moderate swelling potential.
	Less than 50 percent of these areas are underlain by soils with abundant clays of slight to moderate swelling potential.
	These areas are underlain by soils with little to no clays with swelling potential.
	Data insufficient to indicate the clay content or the swelling potential of soils.

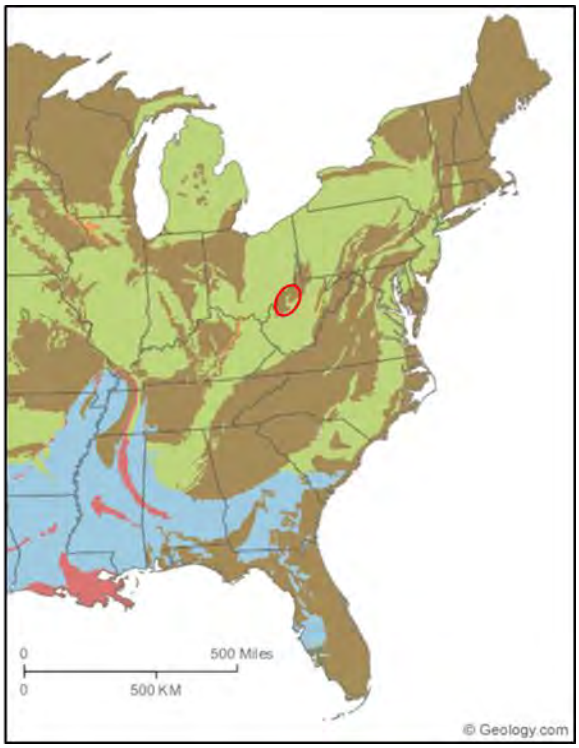


Figure 3.59 Displays the Soil Makeup of the Eastern U.S. from the USGS National Geologic Map Database

To date there have not been any NCDC recorded events due to expansive soils in the

Mid-Ohio Valley Region nor have there been any Federal Major Disaster Declarations or Emergency Declarations due to expansive soils. The public has not expressed a concern regarding a threat that expansive soils. Furthermore, the majority of the Mid-Ohio Valley's soil makeup includes little to no clays with swelling potential. The remaining soil is located in areas with less than 50% of the underlain soils are abundant with clays of slight to moderate swelling potential. The map above in figure 3.59 depicts the soil makeup of the eastern United States. It is for these reasons expansive soils were eliminated from hazards present in the Mid-Ohio Valley region.

3.20.3 Coastal Flood and Erosion

Description

According to the NWS NOAA report on Storm Data Preparation a coastal flood is described as flooding of coastal areas due to the vertical rise above normal water level caused by strong, persistent onshore wind, high astronomical tide, and/or low atmospheric pressure, resulting in damage erosion, flooding, fatalities, or injuries. Coast areas are defined as those portion of coastal land zones (coastal county/parish) adjacent to the waters and bays of the oceans. As the rise in water elevation moves farther inland the flood event becomes a flash flood or flood.

Eliminating Factors

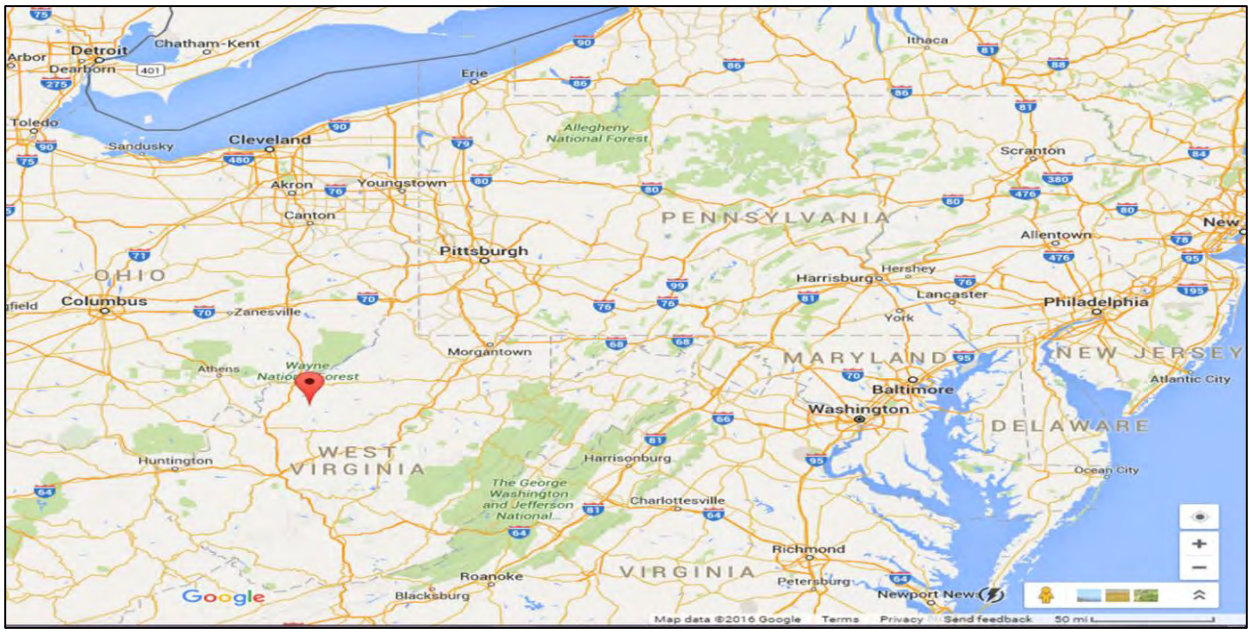


Figure 3.60 Map Indicating the distance of the MOV from Coastal Areas

The Mid-Ohio Valley region is located roughly over 200 miles west of the Atlantic Ocean and roughly over 200 miles south of Lake Eire and possible flooding caused by changes in sea or bay level would be categorized as flash floods or flooding because of the region's distance inland. Therefore, coastal flood and erosion is an eliminated

hazard for the Mid-Ohio Valley region. Figure 3.60 above is a map indicating the distance of the Mid-Ohio Valley from both the Atlantic Ocean and Lake Erie. The point identified in the map is in Wirt County which is roughly in the middle of the 8 counties comprising the Mid-Ohio Valley Region.

3.20.4 Volcanos

Description

A Volcano is a vent at the Earth's surface through which magma (molten rock) and associated gases erupt, and also the cone built by effusive and explosive eruptions. Volcanos are classified as either active and currently showing signs of unrest, dormant, not currently active but could become restless, or extinct meaning that it will not likely erupt again. Volcanic eruptions are measured by the volume of lava ejected as pumice and ash during an explosive phase or the volume of lava extruded during an effusive phase. Eruption volumes are commonly expressed in cubic kilometers (km^3) and one km^3 is roughly equivalent to 0.24 cubic mile.

Eliminating Factors

Figure 3.61 USGS Map of Volcanos in North America (Green Triangles)

The closest active volcano to the Mid-Ohio Valley Region is the Yellowstone Volcano and it is located in Yellowstone National Park, Wyoming over 1,000 miles west of the region. The largest eruption used by the USGS Volcano Hazards Program to demonstrate the scale of eruption size was the eruption of Toba 74,000 years ago. Toba, which is located in Sumatra, Indonesia, had an eruption volume of 2,800 km3 which is roughly the equivalent of 672 cubic miles. If the active volcano in Yellowstone national park erupted with the same volume of Toba it would not directly affect the

Mid-Ohio Valley region. Furthermore, according to the USGS volcano hazards program there are many more small eruptions than there are larger eruptions, and the largest are very infrequent. For example, the 1980 eruption of Mount St. Helens in Washington covered around 1/10th of a mile.

The lack of previous volcanic eruptions in the Mid-Ohio Valley region and the distance of the region from active volcanos eliminates this natural hazard from posing a risk to the region. The map in figure 3.61 below from the USGS volcano Hazard Program depicts volcanos in North America. The red arrow indicates the location of the MOV.

3.20.5 Tsunami

Description

A series of very long waves generated by any rapid, large-scale disturbances of the sea (e.g., an underwater earthquake, landslide, or volcanic eruption) resulting in a fatality, injury or damage. When the wave reaches the coast, a tsunami may appear as a rapidly rising or falling tide, a series of breaking waves, or even a bore. The event narrative should include the source of the tsunami, the height and time of the maximum wave, and the inland distance of inundation. Any other characteristics, such as the observation of water draining from bays should be included.

Tsunamis range in size from inches to over a hundred feet. In deep water (greater than 600 feet), tsunamis are rarely over 3 feet and are not normally noticed by ships due to their long period of time between crests. As tsunamis propagate into shallow water, the wave height can increase by over 10 times. Tsunami heights vary greatly along a coast. The waves can be amplified by shoreline and sea floor features. A large tsunami can flood low-lying coastal land over a mile from the coast.

Eliminating Factors

Figure 3.62 Map Indicating Previous 40 Tsunamis for North America

Although tsunamis are caused by events such as earthquakes and landslides that do occur in our region, the geographic location of the region eliminates this hazard. The Mid-Ohio Valley region is located roughly over 200 miles west of the Atlantic Ocean and roughly over 200 miles south of Lake Eire. Although flooding that may result can reach over a mile inland, the Mid-Ohio Valley's distance from the coast eliminates the risk tsunami's present to the region. Figure 3.62 below from the NOAA NWS national Tsunami Warning Center and depicts the previous 40 tsunamis that have occurred in the world in green diamonds and the red arrow indicates roughly the location of the Mid-Ohio Valley region. They have all been located along coastal regions where volcanic and/or earthquake activity frequently occurs.

3.20.6 Land Subsidence (Karst)

Description

Generally, land subsidence can be described as the loss of surface elevation due to the removal of subsurface support. This can range from broad regional lowering of surface land to localized collapse. The term subsidence is commonly used to imply a gradual sinking, but it also can refer to an instantaneous or catastrophic collapse. Subsidence is the differential settlement of land that when occurring under a structure causes house walls to crack, doors and windows to bind, floors and pavements to break open and drop, and if the vertical movement is sufficient, and entire house may tilt. Subsidence may be accompanied by frost heaving, shrink-swell of clay materials, and sometimes landslides. Karst, a particular type of subsidence, is a terrain with distinctive landforms and hydrology created from the dissolution of soluble rocks, principally limestone and dolomite. Karst terrain is characterized by springs, caves, sinkholes, and a unique hydrogeology that results in aquifers that are highly productive but extremely vulnerable to contamination. In limestone areas, karst subsidence occasionally occurs when land over caves and caverns or around sink holes settles and falls into underground voids.

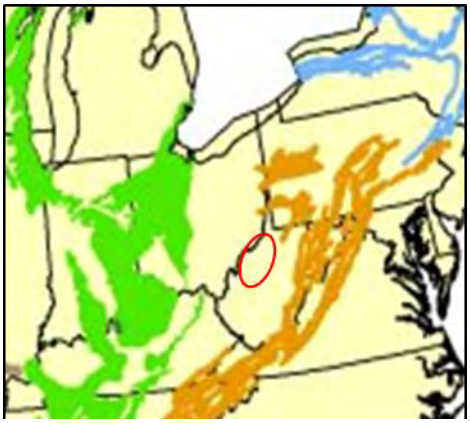


Figure 3.63 Karst Aquifers in the Eastern US. From the USGS

In the United States, about 40% of the groundwater used for drinking comes from Karst aquifers. Figure 3.63 displays principal karst aquifers in the eastern United States and the red arrow indicates the location of the Mid-Ohio Valley Region. The mustard colored aquifer is the Mid- Ohio Valley and Ridge, Piedmont, and Blue Ridge Aquifers, the green is the Midwest Paleozoic Carbonate aquifers, the lower blue is the upper Floridan and Biscayne aquifers, and the up blue aquifer is New England Karst

aquifers. As depicted, there are no aquifers in the Mid-Ohio Valley Region. This information was gained from USGS Groundwater Information online.

Eliminating Factors

To determine the geographic extent of karst event possibility the WVGES Geologic Map of West Virginia represented in figure 3.64 and the USGS map of U.S. aquifers in figure 3.63 were evaluated. The geologic terrain of the Mid-Ohio Valley includes soils from three era-periods; the first a most predominate is the Paleozoic – Transitional Pennsylvanian/Permian (251 + million years ago) which includes cyclic sequence of sandstone, red beds, shale, limestone and coal. The second most common is the Paleozoic – Pennsylvanian (299 – 318 million years ago) which includes cyclic sequences of sandstone, shale, clay, coal, and limestone. The third which is only found in small portions of Jackson, Wirt, and Wood Counties is the Cenozoic – Quaternary (0-2 million years ago) and includes Alluvial Deposits of sand, gravel, silt and clay along major streams. Though limestone is a component of the environment creating a karst land subsidence, due to the role that underground aquifers play in creating karsts, and the fact that the region is not located on a major aquifer this was eliminated.

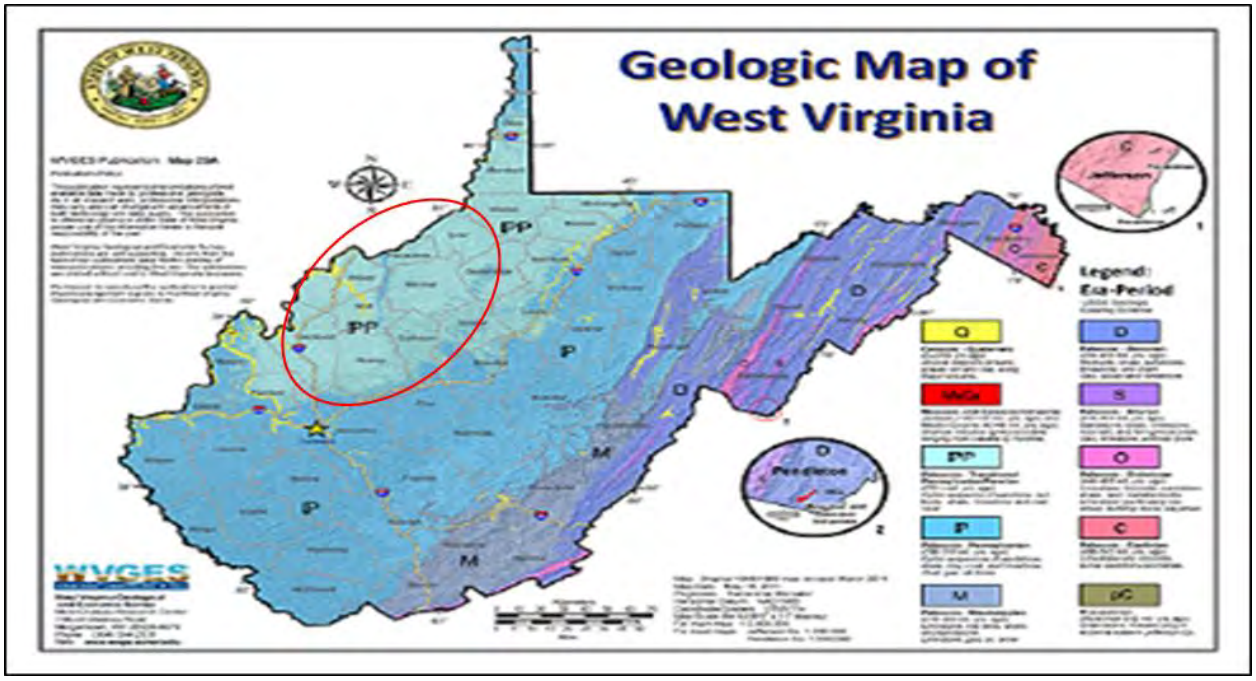


Figure 3.64 WVGES Geologic Map of WV

There have been no recorded land subsidence incidents in the region and therefor there has not been any property or crop damage as a result. Additionally, the lack of occurrence has contributed to the hazard not being identified by the public as a threat to the region. It is for these reasons that land subsidence or Karst has been eliminated as a hazard for the region.

CHAPTER 4: MITIGATION STRATEGY

DISASTER MITIGATION ACT OF 2000

44 Code of Federal Regulations

§201.6(c)(3) A mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on exiting authorities, policies, programs and resources, and its ability to expand on and improve these existing tools. This section shall include:

§201.6(c)(3)(i): A description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

§201.6(c)(3)(ii) A section that identifies an analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements as appropriate.

§201.6(c)(3)(iii): An action plan describing how the actions identified in paragraph (c)(3)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

§201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

This chapter serves to fulfill the above listed mitigation strategy requirements set forth in title 44 of the Code of Federal Regulations or 44 CFR §201.6(c)(3).

4.1 Planning Process

The Mid-Ohio Valley Hazard Mitigation Strategy is structured with a traditional hierarchy of goals and supporting actions. The Mitigation goals outline the overall desired outcomes, while the mitigation actions detail specific projects to be executed. Accomplishing the goals depends on successful implementation of supporting actions.

The plan contains 68 mitigation actions that directly support the plan's 5 goals. These include strategies that were brought forward from the 2011 plan along with new actions identified through the planning process for this 2016 Mitigation Plan. These mitigation actions were developed through the evaluation of discussions held during the eight public meetings and the public responses to specific questions of the online citizen survey. During the public meetings, one held in each county in conjunction with the County Local Emergency Planning Commission (LEPC) meeting, citizens

and public officials were invited to discuss natural hazards effecting the region. A portion of each meeting was dedicated to the identification of specific mitigation projects needed in each county to address various natural hazards. Each identified mitigation project was evaluated and organized to into a specific action that has been included in this plan. Additionally, to identify mitigation projects throughout the region, responses to two questions of the online citizen survey were analyzed. Specifically, the questions evaluated were:

1. "When you think of the natural hazards you face, or most likely would face where you live, what types of projects or steps do you feel your local government could take to reduce or eliminate the risk of hazard damages in your neighborhood?"
2. "Are there any specific concerns or issues you can identify related to risk reduction and hazard mitigation activities in your neighborhood or community? (I.e. cost to taxpayers or local government, increased utility bills, loss of housing or historical structures, endangering or changing natural habitats, interference with private property, etc.)"

Identified projects were organized and refined by eliminating duplicated projects, combining similar project, and were then organized into specific actions. Then the actions were organized into groups according to the goal of the plan that the action best serves.

4.1.1 Goals, Objectives, and Actions

Goals, objectives, and actions are interrelated. For this project table 4.1 defines the previously mentioned terms used for this update.

Term	Definition
Goals	A purpose statement describing a vision for achievement
Objectives	Specific and measurable strategies necessary to achieve identified goals.
Actions	More specific than objectives with identified responsible parties, timeframes, and potential funding sources.

Table 4.1

During this 2016 regional update, the previous 2011 regional plan's goals were reviewed, revised, and restructured in order to improve clarity and reduce potential confusion. Additionally, the goals section was restructured to more accurately reflect the way in which the WV State Hazard Mitigation plan enumerated goals, objectives, and activities which were formally listed as strategies. Table 4.2 below illustrates the goals from the previous 2011 regional HMP.

2011 Mid-Ohio Valley Hazard Mitigation Plan Identified Goals
1. To insure that all citizens and critical populations can be readily provided for during emergency events.
2. Remove or elevate structures that have significant risk of damage due to flooding.
3. To provide a reliable means of warning communication for residents in identified high hazard areas and to insure that all special populations in identified risk areas are provided with the means to reliably communicate with emergency services.
4. To insure that all building and dwellings meet FEMA, IBC and Insurance regulations regarding structure location and construction.
5. To insure that local community shelters are capable of providing comfort and shelter to local residents for extended periods of time during winter storms and floods.
6. To clean and clear all streams that repeatedly flood or become blocked in order to prevent local flood events intensification.
7. To reduce impact from severe wind events.

Table 4.2

Restructuring this section of the plan allowed for the goals to become broad overarching and encompassing targets for mitigation activities to work toward achieving. Goals 1-4 are very similar to the statewide plan goals as they are broad enough to be applicable on the regional level and will serve the needs of the region's mitigation issues.

Goal One: Improve Regional Resilience
Goal Two: Protect Life and Property
Goal Three: Improve Understanding of Risk and Vulnerability for Planning Purposes
Goal Four: Bolster Public Understanding and Preparedness
Goal Five: Enhance Citizen Access to Aid After Hazard Events

4.1.2 Action Prioritization

These actions were developed by the MOVRC planners after the completion of the hazard identification and risk assessment in chapter 3. Formation of these actions required consideration of the 2011 regional HMP, results of the completed risk assessment, discussions during public LEPC meetings, and citizen responses to the online citizen survey.

Mitigation actions were evaluated using an adapted version of the STAPLEE criterion suggested in FEMA's Hazard Mitigation Planning How-To-Guide Series. The STAPLEE criterion addresses feasibility, cost-effectiveness, and environmental

considerations, among other factors for the region, not the State as the unaltered version of STAPLEE describes. Regional planners reviewed the STAPLEE criterion and considered the potential impacts of the proposed action on the identified criteria. Each project, strategy, or action was then ranked as high, medium, or low based on this qualitative assessment. Table 4.3 below contains the adapted STAPLEE Review and Selection Criteria found in the FEMA How-To-Guide.

Actions	Selection Criteria
Social	• Is the proposed action socially acceptable to residents of the Region and surrounding community? • Are there equity issues involved that would mean that one segment of the community is treated unfairly?
Technical	• Will the proposed action work? Is it technically feasible? • Does it provide a long-term solution to the identified issue? • Does the proposed action create secondary impacts or residual risk that is unacceptable?
Administrative	• Is there someone to coordinate and lead the effort? • Is there sufficient funding available? • Can the project be sustained? Are there ongoing administrative requirements that need to be met?
Political	• Is the action politically acceptable? • Is there public support both to implement and to maintain the project?
Legal	• Are the local governments authorized to implement the proposed action? • Are there legal side effects? Could the activity be construed as a taking? • Will the local governments be liable for action or lack of action? • Will the activity be challenged?
Economic	• What are the costs and benefits of this action? Do the benefits exceed the costs? • Has funding been secured for the proposed action? If not, what are the potential funding sources (public, nonprofit, and private)? • How will this action affect the fiscal capability of the State? • What burden will this action place on the tax base or local economy?
Environmental	• Will the action need environmental regulatory approvals? • Are endangered or threatened species likely to be affected? • Is the action consistent with Federal Laws? • Is it consistent with state environmental goals?

Table 4.3 STAPLEE Review and Selection Criteria Used for Mitigation Action Prioritization

4.2 Mitigation Action Plan

After the actions and objectives were defined by the regional planners, mitigation action plans were developed. The action plans included:

- ID Number
- A general description of the mitigation action
- The hazard it is designed to mitigate
- The Goal it supports
- Potential funding sources, if applicable
- The agency responsible for carrying out the strategy
- A target completion date
- Interim measure of success
- Priority Level

It is important to note that information provided in each action such as location/action area, potential funding sources, responsible agency, and target completion date are not restrictive. These identified mitigation actions address issues identified through the development of this plan; the needs of any jurisdiction by be altered at any time.

4.2.1 Action IDs and Numbering Scheme

All mitigation actions include a unique ID number. Id numbers use consistent numbering systems based on the year that the action was developed and a sequential value. Actions from the previous 2011 plan were not given ID numbers and therefore were assigned an ID number for this 2016 plan. Furthermore, mitigation actions from 2011 were assigned ID numbers based on the actions sequential appearance in the 2011 plan. For example, the first mitigation action identified in the 2011 HMP would be identified as 2011-01 in this 2016 plan. Mitigation actions identified in the 2016 planning process were assigned ID numbers based on the action's identified priority level and the order the action appears under a stated goal. For example, the first 2016 mitigation action identified under Goal 1 with a high priority level is numbered 2016-01 while the first mitigation action identified under goal 1 with a medium priority is numbered 2016-20; all high priority mitigation actions were numbered before mitigation actions with medium priority. Additionally, all mitigation actions from 2011 appear before 2016 mitigation actions of the same priority level as they have been identified for a longer period of time. All of the 2011 mitigation actions are included in Appendix C. Many of these were brought forward into this 2016 plan because they still remain applicable or have yet to be completed.

4.2.2 Mitigation Actions

Table 4.4 below displays the Mitigation Action Plan completed for this 2016 Regional Hazard Mitigation Plan.

Goal One: *Improve Regional Resilience*	
2011-10	
Description:	Develop plans for emergency access to shelters and establish criteria for community use. Continue to coordinate emergency shelter plans with the American Red Cross.
Priority:	High
Responsible Agency:	Emergency Services Director
Potential Funding Sources:	WVDMAPS, Local
Interim Measure of Success:	Completion or Update of 3 plans
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2011-15	
Description:	To prepare for the efficient and cost effective removal of debris in the wake of a severe wind event or flood event. Work with County Emergency Services, Solid Waste Authority, and state agencies to develop a protocol for debris disposal.
Priority:	High
Responsible Agency:	ES Director, Code Enforcement, SWA
Potential Funding Sources:	Utilities, SWA, WV DOH
Interim Measure of Success:	Two counties per year adopt debris removal protocol
Target Completion Date:	Ongoing
Hazard Mitigated:	High Wind, Flooding
2016-01	
Description:	Calhoun County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations, or acquisitions or identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within the County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated

	structure. The County will comply with all acquisition, elevation, relocation, and mitigation reconstruction requirements, as per the HMA Guidance.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Completion of two mitigation projects
Target Completion Date:	Ongoing; two projects currently in development one in Grantsville and on in greater Calhoun County will be complete by 2019.
Hazard Mitigated:	All
2016-02	
Description:	Jackson County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations, or acquisitions or identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within the County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. The County will comply with all acquisition, elevation, relocation, and mitigation reconstruction requirements, as per the HMA Guidance.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Completion of two mitigation projects
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-03	
Description:	Pleasants County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations, or acquisitions or identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within the County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance

	with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. The County will comply with all acquisition, elevation, relocation, and mitigation reconstruction requirements, as per the HMA Guidance.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Completion of two mitigation projects
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-04	
Description:	Ritchie County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations, or acquisitions or identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within the County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. The County will comply with all acquisition, elevation, relocation, and mitigation reconstruction requirements, as per the HMA Guidance.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Completion of two mitigation projects
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-05	
Description:	Roane will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations, or acquisitions or identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within the County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the

	regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. The Roane will comply with all acquisition, elevation, relocation, and mitigation reconstruction requirements, as per the HMA Guidance.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Completion of two mitigation projects
Target Completion Date:	Ongoing; two current projects in development one in Spencer will be complete by 2018, and on in greater Roane County will be complete by 2019
Hazard Mitigated:	All
2016-06	
Description:	Tyler County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations, or acquisitions or identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within the County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. The County will comply with all acquisition, elevation, relocation, and mitigation reconstruction requirements, as per the HMA Guidance.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Completion of two mitigation projects
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-07	
Description:	Wirt County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations, or acquisitions or identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed

	properties within the County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. The County will comply with all acquisition, elevation, relocation, and mitigation reconstruction requirements, as per the HMA Guidance.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Completion of two mitigation projects
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-08	
Description:	Wood County will continue to seek out opportunities to apply for Hazard Mitigation Assistance (HMA) funds for mitigation reconstruction, elevations, relocations, or acquisitions or identified at risk, repetitive loss, non-repetitive loss, substantial damaged, partially or completely demolished or destroyed properties within the County. If mitigation reconstruction is chosen, properties identified as partially or completely demolished, outside of the regulatory floodway, as identified by available flood hazard data, will be reconstructed in accordance with the standards established in the local floodplain ordinance and in accordance with the same conditions as an elevated structure. The County will comply with all acquisition, elevation, relocation, and mitigation reconstruction requirements, as per the HMA Guidance.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Completion of two mitigation projects
Target Completion Date:	Ongoing; current project in the Happy Valley area of Wood county is in the application phase and will be completed by 2018.
Hazard Mitigated:	All
2016-09	
Description:	Ensure that all public utilities, specifically water and sewer operations have generators that will allow them to operate when power outages occur.

Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA, ARC, CDBG, and IJDC
Interim Measure of Success:	Receive funding for 25% of needed generators each year
Target Completion Date:	December 2020
Hazard Mitigated:	High Wind, Winter Weather, Flooding, Tornado, Landslides, and Lightning
2016-10	
Description:	Continue updates, upgrades, and maintenance to existing and new power lines to provide resilience to power outages. Establish communication and relationships between local governments and utilities so that there is good communication during hazard events.
Priority:	High
Responsible Agency:	Utilities, Local Governments
Potential Funding Sources:	Utilities
Interim Measure of Success:	Establishing communication between local governments and utility providers
Target Completion Date:	Ongoing
Hazard Mitigated:	High Wind, Winter Weather, Flooding, Tornados, Landslides, and Lightning
2016-11	
Description:	Ensure that Emergency response organizations such as Volunteer Fire Departments (VFD), OES, and 911 centers are equipped with generators so that emergency operations are uninterrupted during power outages.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Securing funding for 25% of needed generators each year
Target Completion Date:	December 2020
Hazard Mitigated:	High Wind, Winter Weather, Flooding, Tornado, Landslides, and Lightning
2016-12	
Description:	Ensure that there are more training opportunities and resources in the region for individuals wishing to become Volunteer Firemen, EMS personnel, and/or Police Officers.

Priority:	High
Responsible Agency:	Local Government, Local Emergency Response Teams
Potential Funding Sources:	Local Government, FEMA
Interim Measure of Success:	Securing funds for two training opportunities per year.
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-13	
Description:	Obtain a warning system program or programs for each county. To provide a reliable means of warning communication for residents in identified high hazard areas and to ensure that all special populations in identified risk areas are provided with the means to reliably communicate with emergency services. Currently Ritchie, Roane, and Wirt Counties do not have a formal system of communication with the public during hazard events. Some utilize Facebook however this is insufficient because it does not reach all citizens, and is inoperable during a power outage. These systems can warn of potential hazards as well as communicate vital information during and after a hazard event.
Priority:	High
Responsible Agency:	Local Governments, Local OES/911
Potential Funding Sources:	Local Governments, FEMA
Interim Measure of Success:	At least one county upgraded by 2018
Target Completion Date:	December 2020
Hazard Mitigated:	All
2011-07	
Description:	Each Local jurisdiction will continue to enforce and update existing floodplain ordinances to develop regulations, standards, and ordinances within local jurisdictions consistent with documented national standards and regulations.
Priority:	Medium
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA, WVDMAPS for training
Interim Measure of Success:	100% participation by each county in training
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-46	

Description:	Upgrade emergency operation equipment so that responders are more readily able to reach those in need in rural locations.
Priority:	Medium
Responsible Agency:	Local Governments, Emergency Service Operations
Potential Funding Sources:	FEMA, Local Governments,
Interim Measure of Success:	Upgrade one county's every other year
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-45	
Description:	Establish capability to obtain fuel for emergency vehicles during power outages in each county.
Priority:	Medium
Responsible Agency:	Local Governments, Local 911/OES Operations
Potential Funding Sources:	FEMA, Local Governments, Local 911/OES Operations
Interim Measure of Success:	Two counties per year establish plan.
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-46	
Description:	Update existing and establish more cell phone towers to improve broadband and cell phone reception for communication purposes throughout the region. Portions of each County in the region are without cell phone service and have poor broadband connectivity; this is a hindrance to communication during hazard events.
Priority:	Medium
Responsible Agency:	FEMA, Local Governments, USDA
Potential Funding Sources:	FEMA, Local Governments
Interim Measure of Success:	One underserved area received improved service per year
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-47	
Description:	Improve and upgrade the snow removal equipment and supplies in each of the Region's Counties.
Priority:	Medium
Responsible Agency:	Local Governments, WV DOH

Potential Funding Sources:	Local Governments, WV DOH, FEMA
Interim Measure of Success:	Ongoing
Target Completion Date:	Ongoing
Hazard Mitigated:	Winter Weather
2011-08	
Description:	Establish new or reinforce existing building codes and code enforcement within those jurisdictions where it is deemed appropriate, especially where new developments are being planned whether or not the developments are in identified flood zones. Use IBC as a standard to develop regulations, standards, and ordinances within local jurisdictions consistent with documented national standards and regulations.
Priority:	Low
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA, WVDMAPS for training
Interim Measure of Success:	One additional jurisdiction adopting code per year.
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding, High Wind
2016-58	
Description:	Conduct tree trimming and the removal of fallen/broken branches in public right-of-ways to limit the possibility of damage caused by limbs and whole trees. This includes trees and down limbs along public utility lines, along public roads and public buildings, and along areas of public stream access.
Priority:	Low
Responsible Agency:	WVDOH, Local Governments, Utilities
Potential Funding Sources:	FEMA, WV DOH, Utilities
Interim Measure of Success:	Conducting 1 round of tree trimming/removal of fallen & broken branches in each county of the region.
Target Completion Date:	Ongoing
Hazard Mitigated:	All
Goal Two: *Protect Life and Property*	
2011-02	
Description:	To provide an equitable buy-out program to interested owners of those properties located in the identified floodplain that have experienced recurrent damages.
Priority	High

Responsible Agency:	Local Governments
Potential Funding Sources:	WVDMAPS, FEMA, HUD DRI
Interim Measure of Success:	Average acquisition/demolition of three structures per year.
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-14	
Description:	Establish a formalized safety check system for vulnerable members of the population in each county. The system will be completely voluntary and there will be no eligibility requirements to be included in the check. Presently, only Pleasants County has one such system in place. Designate, equip, and train local emergency responders for the purpose of maintaining lifelines for residents with special needs. Require home alert providers to register at the 911 Service; review and update the list annually.
Priority:	High
Responsible Agency:	Local Governments, Local OES/911
Potential Funding Sources:	Local Governments, FEMA
Interim Measure of Success:	Revised and updated annually
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-15	
Description:	Execute flood mitigation activities in Calhoun County: • Explore possible buy outs, in southern Calhoun County along the Upper West Fork in Altizer and Stinson.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH
Interim Measure of Success:	Securing funds
Target Completion Date:	Project currently in development, expected completion date 2019
Hazard Mitigated:	Flooding
2016-16	
Description:	Execute flood mitigation activities in Calhoun County: • Replace and correct the low water bridge at Henry's Fork in Altizer to correct backups and flooding.
Priority	High

Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH
Interim Measure of Success:	Securing Funds
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-17	
Description:	Execute flood mitigation activities in Calhoun County: • Repair, replace, and/or reconstruct low-lying roadways to prevent parts of the county from being cut off from the other during flooding events. Currently during flood events many places in Calhoun get cut off by high water and a series of islands forms which causes isolation and can make it difficult for citizen travel and even emergency responders to navigate the county.
Priority	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH
Interim Measure of Success:	Securing Funds
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-18	
Description:	Execute flood mitigation activities in Jackson County: • Mitigate flash floods in the Evans Area where water covers the road and can isolate the area.
Priority	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH
Interim Measure of Success:	Securing Funding
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-19	
Description:	Execute flood mitigation activities in Jackson County: • Repair, replace, and/or reconstruct low-lying roadway in Kenna area that when flooded cut off the PSD, EMS and the VFD.
Priority	High

Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH
Interim Measure of Success:	Securing Funding
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-20	
Description:	Execute flood mitigation activities in Jackson County: • Repair, replace, and/or reconstruct low-lying roadway in Sandyville area that when flooded may cut off the PSD, EMS, and the VFD.
Priority	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH
Interim Measure of Success:	Securing Funding
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-21	
Description:	Execute flood mitigation activities in Jackson County: • Complete activities on Sycamore Road along Sycamore Creek to prevent flooding.
Priority	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH
Interim Measure of Success:	Securing Funding
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-22	
Description:	Execute flood mitigation activities in Jackson County: • Complete activities in the Grand Central Ave area in Ripley to negate flooding.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH

Interim Measure of Success:	Securing Funding
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-23	
Description:	Execute flood mitigation activities in Pleasants County: • Conduct all other necessary mitigation activities along Cow Creek, Sled Fork, and the Left Fork of French Creek to further reduce flooding.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH
Interim Measure of Success:	Securing Funding
Target Completion Date:	December 2020
Hazard Mitigated:	Flooding
2016-24	
Description:	Execute flood mitigation activities in Ritchie County: • Perform flood mitigation in downtown Cairo to prevent flooding in the downtown area which currently can impede transportation.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Identification of specific actions to take in downtown Cairo
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-25	
Description:	Execute flood mitigation activities in Ritchie County: • Develop a position in Ritchie County to enforce the County's existing floodplain permit and correct the current issue of campers that are being set up and lived in by people in the established floodplain.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Identification of specific actions to take in downtown Cairo

Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-26	
Description:	Execute flood mitigation activities in Roane County: • The Roane County 911/OES and EMS Centers are currently located in a floodplain and were flooded to the point of evacuation 2012. The Center needs to be relocated to a more secure location.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Ongoing
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-27	
Description:	Execute flood mitigation activities in Roane County: • Evaluate and formulate action plan to conduct flood mitigating buyouts for repeatedly flooded single family properties located in Spencer along Bens Run.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Ongoing
Target Completion Date:	Project currently in development and expected to be completed by 2018.
Hazard Mitigated:	Flooding
2016-28	
Description:	Execute flood mitigation activities in Roane County: • Relocate the Reedy VFD as it is susceptible to flooding.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Ongoing
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-29	

Description:	Execute flood mitigation activities in Roane County: • Replace the bridge at Wal-Mart in Spencer with a structure better suited to accommodate the volume of potential flood waters that may flow through the stream. Currently the bridge is too low and water can flow over the top of the bridge. Also the opening under the bridge is structured in a way that impedes the flow of water and debris during flood events.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Ongoing
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-30	
Description:	Execute flood mitigation activities in Roane County: • Replace the bridge at the junction of Rt. 33 and Rt. 14 as its current condition contributes to flooding.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Ongoing
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-31	
Description:	Execute flood mitigation activities in Roane County: • Explore and conduct flood mitigation buyouts in the greater Roane County along Spring Creek, Pidgeon Run, Little Pidgeon Run, Big Sandy Creek, and Hurricane Creek.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Ongoing
Target Completion Date:	Project currently under development and expected to be completed by 2019.
Hazard Mitigated:	Flooding

2016-32	
Description:	Execute flood mitigation activities in Tyler County: • There are possible buyout mitigation projects in Lima along Indian Creek and also along Middle Island Creek.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	One bridge replacement every other year
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-33	
Description:	Execute flood mitigation activities in Tyler County: • Replace, repair, and/or reconstruct low bridges along Indian Creek, in Shirley, Rt. 23, Sellers Run Road, Stewarts Run, Elk Fork, Muddy Creek, Little Sancho, and Meadville. These low bridges may be responsible for up to 60% of school cancellations because buses can't get through and there are no feasible alternative routes.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	One bridge replacement every other year
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-34	
Description:	Execute flood mitigation activities in Wirt County: • Take steps to mitigate flooding the Newark area at the confluence of the Little Kanawha and Hughes Rivers. This area floods quickly and can block portions of Rt. 47.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Identification of specific action plan for mitigation efforts in Newark area.
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-35	

Description:	Execute flood mitigation activities in Wirt County: • Take steps to mitigate flooding near Newark and Boy Scout road. This flooding blocks off the Wirt County VFD and EMS.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Identification of specific action plan for mitigation efforts in Newark area.
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-36	
Description:	Execute flood mitigation activities in Wirt County: • Take steps to mitigate flooding along Garfield road in the southern part of Wirt County.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Identification of specific action plan for mitigation efforts in Newark area.
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-37	
Description:	Execute flood mitigation activities in Wood County: • Replace or repair the primitive culvert located in Little Tygart Creek near the Woodridge Golf Club in Wood County which floods and disrupts transportation.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Developing a feasible, fundable action plan for the replacement or repair to resolve the issue.
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding
2016-38	
Description:	Execute flood mitigation activities in Wood County: • Complete flood mitigation buyouts in the Happy Valley area, along Nicollet road, and other areas along the County's rivers to mitigate loss in repeatedly flooded

	homes and structures.
Priority:	High
Responsible Agency:	FEMA, WV DOH, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA, WV DOH, Local Governments
Interim Measure of Success:	Award of all funding required to complete the project.
Target Completion Date:	Project currently in the application phase expecting to be complete by 2018.
Hazard Mitigated:	Flooding
2016-48	
Description:	Landslide or slips/slide present a problem along the roadways of the MOV. Correct landslide issues using the WVDOH method of resolution: • Along route 47 outside of Smithville in Ritchie County, the Hughes River there has been a slip underneath the road resulting in the closure of one lane. There are now stop signs on each side of the road to facilitate alternating traffic.
Priority:	Medium
Responsible Agency:	WVDOH,
Potential Funding Sources:	FEMA, WVDOH
Interim Measure of Success:	Increase in preventative repairs
Target Completion Date:	2016 (was not complete at the time of first submission but will be complete by the end of the year)
Hazard Mitigated:	Landslides, Flooding
2016-49	
Description:	Landslide or slips/slide present a problem along the roadways of the MOV. Correct landslide issues using the WVDOH method of resolution: • There has been a slip under Sellers Run Road, route 24, caused by flooding in Middle Island Creek in Tyler County. The slip is located about a half mile from route 18 and has resulted in one lane of the road being closed and has disrupted travel.
Priority:	Medium
Responsible Agency:	WVDOH,
Potential Funding Sources:	FEMA, WVDOH
Interim Measure of Success:	Increase in preventative repairs
Target Completion Date:	Ongoing

Hazard Mitigated:	Landslides, Flooding
2016-50	
Description:	Landslide or slips/slide present a problem along the roadways of the MOV. Correct landslide issues using the WVDOH method of resolution: • Utah Road in Jackson County near Ravenswood has had slip issues.
Priority:	Medium
Responsible Agency:	WVDOH,
Potential Funding Sources:	FEMA, WVDOH
Interim Measure of Success:	Increase in preventative repairs
Target Completion Date:	Ongoing
Hazard Mitigated:	Landslides, Flooding
2016-51	
Description:	Perform stream cleaning activities to mitigate flooding in areas were debris collects. Rivers and streams across the region, which are in need, should be cleaned in a manner that is in compliance with WV DEP and US EPA standards. Some specific areas in need of stream dredging/clean up identified through the planning process include: • Along Cow Creek, Sled Fork, and the Left fork of French Creek in Pleasants County.
Priority:	Medium
Responsible Agency:	DOH, EPA, DEP, Local Government
Potential Funding Sources:	FEMA, DOH, EPA, DEP
Interim Measure of Success:	Completion of stream cleaning in the above identified areas, then further spots should be considered.
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-52	
Description:	Perform stream cleaning activities to mitigate flooding in areas were debris collects. Rivers and streams across the region, which are in need, should be cleaned in a manner that is in compliance with WV DEP and US EPA standards. Some specific areas in need of stream dredging/clean up identified through the planning process include: • Ben's Run, which flows between Bell and Reynolds Street in the City of Spencer, Roane County.
Priority:	Medium
Responsible Agency:	DOH, EPA, DEP, Local Government

Potential Funding Sources:	FEMA, DOH, EPA, DEP
Interim Measure of Success:	Completion of stream cleaning in the above identified areas, then further spots should be considered.
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-53	
Description:	Perform stream cleaning activities to mitigate flooding in areas were debris collects. Rivers and streams across the region, which are in need, should be cleaned in a manner that is in compliance with WV DEP and US EPA standards. Some specific areas in need of stream dredging/clean up identified through the planning process include: • The area of Spring Creek flowing under the Market Street Bridge in the City of Spencer, Roane County.
Priority:	Medium
Responsible Agency:	DOH, EPA, DEP, Local Government
Potential Funding Sources:	FEMA, DOH, EPA, DEP
Interim Measure of Success:	Completion of stream cleaning in the above identified areas, then further spots should be considered.
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-54	
Description:	Perform stream cleaning activities to mitigate flooding in areas were debris collects. Rivers and streams across the region, which are in need, should be cleaned in a manner that is in compliance with WV DEP and US EPA standards. Some specific areas in need of stream dredging/clean up identified through the planning process include: • The bridge at the junction of Rt. 33 and Rt. 14 in Spencer along Tanner Run in Roane County.
Priority:	Medium
Responsible Agency:	DOH, EPA, DEP, Local Government
Potential Funding Sources:	FEMA, DOH, EPA, DEP
Interim Measure of Success:	Completion of stream cleaning in the above identified areas, then further spots should be considered.
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-55	
Description:	Perform stream cleaning activities to mitigate flooding in areas were debris collects. Rivers and streams across the region, which

	are in need, should be cleaned in a manner that is in compliance with WV DEP and US EPA standards. Some specific areas in need of stream dredging/clean up identified through the planning process include: • Provide opportunities and incentives for local groups and organizations to participate and work with government agencies in community stream clean-ups.
Priority:	Medium
Responsible Agency:	DOH, EPA, DEP, Local Government
Potential Funding Sources:	FEMA, DOH, EPA, DEP
Interim Measure of Success:	Completion of stream cleaning in the above identified areas, then further spots should be considered.
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2011-14	
Description:	To encourage compliance with West Virginia regulations that require anchoring for mobile homes. Work with utilities to require proof of proper installation prior to utility hook-ups.
Priority:	Low
Responsible Agency:	ES Director, Code Enforcement
Potential Funding Sources:	Utilities
Interim Measure of Success:	One formal agreement per year
Target Completion Date:	Ongoing
Hazard Mitigated:	High Wind, Flooding
2016-59	
Description:	Establish position in Roane County to enforce permit requirements for mobile homes to ensure that they are not established in flood plains and are installed or anchored correctly to prevent damage during wind events.
Priority:	Low
Responsible Agency:	Local Governments, FEMA
Potential Funding Sources:	FEMA, Local Governments
Interim Measure of Success:	Obtaining 25% of the required funding for this project
Target Completion Date:	December 2030
Hazard Mitigated:	Flooding and High Wind
Goal Three: *Improve Understanding of Risk and Vulnerability for Planning Purposes*	
2016-39	

Description:	Expand upon data from the National Inventory of Dams to more accurately identify the risk level presented by dams in the region. The data needed is not currently available broken down to the county level and is not specific to individual dams. This will enable for more comprehensive planning regarding mitigating dam failure in the Mid-Ohio Valley Region.
Priority:	High
Responsible Agency:	Local Governments, NID
Potential Funding Sources:	FEMA, Local Governments, NID
Interim Measure of Success:	Establishing a plan to identify and evaluate all dams located in the region.
Target Completion Date:	December 2019
Hazard Mitigated:	Dam Failure
2016-40	
Description:	Complete GIS Mapping in all of the region's counties that do not currently have it, to better identify the risk to life and property presented by flooding which will be used in the future with TEIF software. Work with County Assessors to identify the actual location and value of properties in each county to assess the value of the property and the risk presented by flooding.
Priority:	High
Responsible Agency:	FEMA, WVDHSEM, Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Identification and assessment of existing records
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
Goal Four: *Bolster Understanding and Preparedness*	
2011-04	
Description:	Encourage acquisition of radios for residents of the region to provide a reliable means of warning communication for residents in identified high hazard areas and to ensure that all special populations in identified risk areas are provided with the means to reliably communicate with emergency services.
Priority:	High
Responsible Agency:	OES, County Commission, 911 Center
Potential Funding Sources:	Local, OES, Grants
Interim Measure of Success:	Ongoing

Target Completion Date:	Varies by County
Hazard Mitigated:	All
2016-41	
Description:	Create opportunities for public education regarding risks presented by natural hazards, specifically; how to prepare for hazard events, identification of risks presented, actions to take during a hazard event, and how to recover after a hazard events. Additionally, make citizens aware of the resources available to them during a hazard event and how to utilize those resources. Some specific activities may include: disaster drills, neighborhood action plans for hazard events, and informing citizen of the location of shelters and their availability. This is in no way an exhaustive list and other relevant activities should be completed.
Priority:	High
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA, PACF
Interim Measure of Success:	Average number of 2 training each year
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-42	
Description:	Ensure that each county has committed and established emergency shelters and that the locations and amenities of each shelter are public knowledge. (this is an issue for all counties but is more prevalent issue in some counties than in others) • Provide basic stores and supplies at each community shelter
Priority:	High
Responsible Agency:	Local OES/911, Local Governments WVDMAPS, American Red Cross
Potential Funding Sources:	FEMA, American Red Cross
Interim Measure of Success:	Securing Funds
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-43	
Description:	Ensure that each county has committed and established emergency shelters and that the locations and amenities of each shelter are public knowledge. (this is an issue for all counties but is more prevalent issue in some counties than in others) • Provide electric generators at each community shelter. Install and maintain electric generators at each shelter

	location for lighting, communication, cooking, and heating.
Priority:	High
Responsible Agency:	Local OES/911, Local Governments WVDMAPS, American Red Cross
Potential Funding Sources:	FEMA, American Red Cross
Interim Measure of Success:	Securing Funds
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-44	
Description:	Ensure that each county has committed and established emergency shelters and that the locations and amenities of each shelter are public knowledge. (this is an issue for all counties but is more prevalent issue in some counties than in others) • Recruit and train more committed volunteers to staff and operate emergency shelters in all counties during hazard events.
Priority:	High
Responsible Agency:	Local OES/911, Local Governments WVDMAPS, American Red Cross
Potential Funding Sources:	FEMA, American Red Cross
Interim Measure of Success:	Securing Funds
Target Completion Date:	Ongoing
Hazard Mitigated:	All
Goal Five: *Improve Citizen Access to Aid After Hazard Events*	
2016-45	
Description:	Bolster citizen knowledge and awareness of the process for applying for disaster relief funds after hazard events. Make the process as streamlined as possible for citizens that need aid after hazard events.
Priority:	High
Responsible Agency:	Local Governments, FEMA
Potential Funding Sources:	Local Governments, FEMA
Interim Measure of Success:	Ongoing
Target Completion Date:	Ongoing
Hazard Mitigated:	All
2016-56	
Description:	The FEMA flood maps in all of the region's counties have been recently updated; all updates were completed between 2004 and

	2014. Citizens have identified issues with the newly established flood zones; particularly some areas included in the flood zone should be excluded and conversely some currently excluded areas should be included. This issue has been identified through public meetings and also through the online citizen survey. It is an issue because it requires some citizen to purchase flood insurance at an inflated cost, and does not require some citizens to have flood insurance when it is necessary. To correct mapping issues citizens must hire a surveyor and report the results to FEMA. The region's counties will work together to form a plan to develop a pool of funds that will be available for citizens to offset the cost of correcting the flood map containing their home. These problems were particularly voiced in Calhoun, Pleasants, Ritchie, Roane, Tyler and Wirt Counties.
Priority:	Medium
Responsible Agency:	Local Government, FEMA
Potential Funding Sources:	FEMA, Local Government, PACF, MOVRC
Interim Measure of Success:	Forming a plan of action to develop the funding pool.
Target Completion Date:	Ongoing
Hazard Mitigated:	Flooding
2016-57	
Description:	Establish loan program for citizens to access to conduct precautionary tree removal as a hazard mitigating action.
Priority:	Medium
Responsible Agency:	Local Governments
Potential Funding Sources:	FEMA
Interim Measure of Success:	Securing funds
Target Completion Date:	Ongoing
Hazard Mitigated:	Heavy Wind, Winter Weather, Tornado, Landslides, and Lightning

Table 4.4 Identified Mitigation Actions

CHAPTER 5: MONITORING, MAINTENANCE & REVISION

DISASTER MITIGATION ACT OF 2000

44 Code of Federal Regulations

§201.6(c)(4) A plan maintenance process that includes:

§201.6(c)(4)(i) A section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

§201.6(c)(4)(ii) A process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvements plans, when appropriate.

5.1 Method & Schedule of Monitoring, Evaluating, & Updating

This 2016 Hazard Mitigation Plan (HMP) will serve as the first update to the original regional, or multi-jurisdictional plan, completed for the Mid-Ohio Valley Region in 2011. Prior to 2011 each county previously developed individual HMP with assistance from the Mid-Ohio Valley Regional Council (MOVRC). As mandated by 44 CFR §201.6(c)(4)(i) mutli-jurisdictional plans are to be updated in five year cycles, therefore this 2016 HMP will be fully updated again and submitted for approval in the year 2021. However, activities and projects that are essential to improving future HMP updates will be ongoing through the five-year stretch.

5.1.1 Monitoring

After the adoption of this plan by all the region's municipalities and counties, and the acceptance of the plan by FEMA, various monitoring activities are necessary to ensure that the plan serves the region to its fullest capacity. It would serve no purpose to simply complete a regional HMP without taking steps to implement actions listed in the plan. The West Virginia Division of Homeland Security and Emergency Management (WVDHSEM), the MOVRC, and local governments will be responsible for supervising the matching of Hazard Mitigation Grant Program (HMGP) funds to priority projects/actions listed in the HMP. The actions identified in the HMP are able to be funded through the HMGP monies. The above listed agencies will be responsible for monitoring funding opportunities, through the HMGP or otherwise, that will enable the implementation of actions identified in this plan.

The MOVRC will be continuously watching for changes and amendments to the regulatory requirements for multi-jurisdictional plans on the federal and state level. Currently 44 CFR §201.6 dictates the requirements of a multi-jurisdictional HMP; listing exactly each component required of the plan. The list of requirements in this section of the federal register enables planners to plan not only what needs to be included in the HMP but also enables them to create a plan to accomplish those requirements. Vigilance in identifying any amendments to regulatory requirements and reviewing the requirements even without change will enable planners to identify exactly what is expected of the plan.

5.1.2 Evaluating

In order to assess progress on strategies and projects identified in the 2016 HMP, a public meeting of the plans stakeholders will be held annually. At the meeting each action identified in the 2016 plan and its status will be discussed. For example, if funding for a certain action has not yet been secured, the group will discuss why it has not yet been funded, identify possible steps could be taken to further the project, and explore new approaches to get the project on its feet. Evaluating the progress of hazard mitigation actions in this manner will serve two purposes 1) stakeholders will remain on top of the implementation of mitigation actions and 2) it will aid in shaping future mitigation actions in the 2021 plan update.

After the submittal and adoption of the 2016 Regional HMP, the MOVRC or responsible entity for developing the plan will strive to refine the planning process and timeline for new plan development in preparation for the 2021 HMP Update. Particularly, the planners at the MOVRC will evaluate the planning process executed to complete the 2016 plan to determine what worked well and what was not as successful in completing the plan. An initial assessment will occur within a month after the approval of 2016 update, however the MOVRC will make an ongoing effort to refine and further develop the hazard mitigation planning process. Furthermore, the MOVRC will develop a satisfaction survey to be disseminated to the region's municipalities and to the general public to evaluate the region's planning process. The MOVRC will utilize the results of the survey to improve the planning process for the future HMP update.

Additionally, in conjunction with the above described meeting to assess the progress of implementing mitigation actions, there will an annual discussion and evaluation of future risk assessment possibilities. Through this evaluation, stakeholders will be able to identify ways to improve the risk assessment process or identify specific aspects of the process or even hazards that should be more thoroughly addressed. This will ensure that the region is as knowledgeable of the risk presented by each hazard

as possible.

5.1.3 Updating

Completing the updated plan in 2021 will require updates that are more extensive than the process of writing the document. Throughout the five year cycle the MOVRC will work to expand and refine the collective data used to complete this risk assessment for this plan. In addition to the formally named National Climatic Data Center's Storm Events Database, the risk assessment conducted as a part of this HMP required information from various other data sources. Over the course of the 5 years until the next required updated, other information or better data sources may become available and enable a better risk assessment to be completed. It will be the responsibility of the planners to work to expand and refine the data utilized to complete the risk assessment. Prior to the approval of this 2016 HMP it is already evident that two specific hazards will require improved data to complete the updated risk assessment in 2021.

Due to the rural nature of the majority of the Mid-Ohio Valley Region, currently GIS mapping required to more accurately identify the level of risk presented by flooding to the region is not complete. At this moment, Wood County has been the most extensively mapped as it is the population and business center of the region. However, the remaining 7 counties, whose combined population is less than Wood County's, do not have the necessary information mapped to perform as accurate of a risk assessment. Prior to the 2021 HMP update, stakeholders will be working to complete the needed mapping in order to better assess the risk presented by flooding to the region.

As discussed in the section 3.18 of this plan, the information needed to assess the risk presented by damn failure on a local level is not currently freely accessible. Prior to the 2021 HMP update, the MOVRC will work the National Inventory of Dams to pinpoint local level information to better assess the level of risk presented to each county in the region by dam failure. Currently, data presented by the NID is board and only addresses to potential for dam failure at a state level and does not indicate the required specific information pertaining to individual dams needed for proper assessment. After gathering further information planners will be able to more accurately assess the risk presented to the region by dam failure. Table 5.1 below displays the established schedule for monitoring, evaluating, and updating.

Task	Responsibility	Time Frame
1. Refine planning process and timeline for new plan development	WVDHSEM, MOVRC	Ongoing
2. Complete GIS mapping in all of the region's counties to better identify the risk to life and property presented by flooding.	State and Local Governments, WVDHSEM	Ongoing
3. Expand upon data from the National Inventory of Dams (NID) to pinpoint local level information to better assess the level of risk presented to each county by dam failure.	NID, WVDHSEM, State and Local Governments	Ongoing
4. Work to expand and refine data base to better conduct risk assessment for future plan updates.	MOVRC	Ongoing
5. Continue to match available HMGP funds to priority projects, especially to mitigate severe repetitive and repetitive loss structures.	WVDHSEM, MOVRC	Ongoing
6. Continue working with local governments and state contacts on plan implementation	WVDHSEM, MOVRC, Local Governments	Ongoing
7. Convene local governments and/or LEPC members to discuss and evaluate future risk assessment possibilities	Local Governments, MOVRC	August, 2017 August, 2018 August, 2019 August, 2020 August, 2021
8. Assess progress on strategies and projects identified in the 2016 HMP annually.	Local Governments, LEPCs, MOVRC	August, 2017 August, 2018 August, 2019 August, 2020 August, 2021
9. Review current regulatory requirements for plan revision.	MOVRC	Ongoing
10. Initiate review and revision of the 2016 hazard risk assessment and analysis.	MOVRC	July 1, 2020
11. Review and update of 2016 Mitigation Goals and Strategies	MOVRC	April 1, 2021
12. Draft Review by WV Division of Homeland Security and Emergency	MOVRC	May 1, 2021
13. Draft Review by FEMA	MOVRC	June 1, 2021
14. Submit new Revised Regional Hazard Mitigation to FEMA	MOVRC	July 1, 2021

Table 5.1 Projected Schedule for Monitoring, Evaluating, and Updating the HMP

5.2 Incorporating Mitigation Planning into Local Planning Efforts

With few exceptions, most of the region's municipalities and county governments do not possess the financial capacity to develop, implement, and maintain planning and development efforts independently and effectively. Currently Parkersburg, Ravenswood, Vienna, Williamstown and Wood County have active comprehensive or strategic plans. Serving as the Regional Planning and Development Council for the West Virginia's Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt and Wood Counties, one function of the MOVRC is to assist local governments in their planning and development endeavors. As community planning and plan updating efforts arise in the region's municipalities and counties the MOVRC will aid those communities in plan development and ensure that planning efforts consider this regional HMP as a resource. However, the MOVRC presently coordinates regional planning efforts for the region's municipalities and counties.

5.2.1 Regional Development Plan & Comprehensive Economic Development Strategy

As a Regional Planning & Development Council established by the Appalachian Regional Commission (ARC) the MOVRC is responsible for maintaining and updating a Regional Development Plan (RDP). Additionally, as a recipient of grant funds from the Economic Development Administration (EDA) the MOVRC is also required to complete and update a Comprehensive Economic Development Strategy (CEDS). With the approval of both the ARC and the EDA, the MOVRC produces a joint RDP/CEDS document to avoid repetition and to ensure both documents are congruent. The MOVRC conducts a complete updated of their joint RDP/CEDS every five years and every year in between the MOVRC provides an update on the region's accomplishments in the previous year with regard to the plan.

The RDP/CEDS establishes goals and objectives for the region to work toward achieving. There are four goals currently detailed in the MOVRC's RDP/CEDS:

> **Goal 1:** Increase Job Opportunities and Per Capita Income in Appalachia to Reach Parity with the Nation.
> **Goal 2:** Strengthen the Capacity of the People of Appalachia to Compete in the Global Economy.
> **Goal 3:** Develop and Improve Appalachian's Infrastructure to Make the Region Economically Competitive.
> **Goal 4:** Build the Appalachian Development Highway System to Reduce Appalachia's Isolation.

The current MOVRC RDP/CEDS discusses regional hazard mitigation planning on page 35 of the document to describe MOVRC involvement in regional programs and

activities by saying, "MOVRC continues to work with local governments to insure that FEMA planning requirements are met. This includes the preparation of a Regional Hazard Mitigation Plan on a cyclical basis."

As illustrated in the text of this entire HMP, the goal of completing such a plan is to ultimately increase the resiliency of the region and its ability to withstand hazard events without suffering physical or human losses as well as improve the region's ability to recover after hazard events. Implementing the mitigation actions detailed in section 4.2.1 of this plan to improve resiliency will serve both goals 2 and 3 of the RDP/CEDS. By decreasing potential damage and improving the region's ability to recover through hazard mitigation actions, the region's economy will endure less of an interruption. For example, mitigation action 2016-10 states:

> "*Continue updates, upgrades, and maintenance to existing and new power lines to provide resilience to power outages. Establish communication and relationships between local governments and utilities so that there is good communication during hazard events.*"

Fewer power outages will allow commerce to continue as shops, restaurants, and other businesses will be able to remain open and conduct business. Furthermore, mitigation actions such as 2016-24 will make transportation more reliable during hazard events. Mitigation action 2016-24 stats:

> "*Execute flood mitigation activities in Ritchie County: Perform flood mitigation in downtown Cairo to prevent flooding in the downtown area which currently can impede transportation.*"

Taking such action will not only improve the region's resiliency with regard to hazard events, but will also strengthen the capacity of the people in the region and improve the region's infrastructure. MOVRC will be required to complete a full update to the joint RDP/CEDS in fall 2016 and at that time MOVRC planners will include strategies and objectives concerning the implementation of mitigation actions to serve the appropriate goals. While mitigation actions and RDP/EDS actions serve different explicitly stated goals, the implementation and completion of such actions serves both purposes.

5.2.2 Local Planning Resources for Future Hazard Mitigation Planning.

Additionally, the MOVRC is involved in the development of regional planner efforts that while they may not allow for integration of planning processes, do provide resources for future hazard mitigation plan updates. The sections below explain these such plans.

Long Range Transportation Plan

The Wood-Washington-Wirt Interstate Planning Commission (WWW), housed in the MOVRC, is the Metropolitan Planning Organization responsible for transportation planning activities within the Wood County, West Virginia and Washington County, Ohio study area. WWW is currently in the process of updating the current Long Range Transportation Plan (LRTP) in accordance with the four-year updating cycle. This effort is designed to be a comprehensive examination of the future transportation needs of the residents in the study area over the next twenty years. Similar to previous panning efforts, this effort will conclude with financially feasible recommendations that provide the most benefit to the transportation system with emphasis on safety, security, congestion, and preservation of existing facilities.

As described in Chapter 3, in the Hazard Impact on Region sections of the hazard profiles, it is explained that many hazards impact the region by disrupting transportation. While the LRTP focuses on developing transportation in a way that it will address the changing needs of the region and does not focuses specifically on the effects of various hazards on transportation, it can still be a valuable resource to hazard mitigation planners. The LRTP provides a plan for effective transportation in the Mid-Ohio Valley, HM planners can utilize this transportation development plan to more effectively evaluate risk. For example, if a new interstate entrance or exit is planned and developed HM planners will evaluate how, if at all, it impacts population in that county or how it can aid transportation during a hazard event.

Source Water Protection Plans

Coordinated by the West Virginia Bureau of Public Health (WVBPH) the MOVRC has served as the administrator for the development of Source Water Protection Plans (SWP) in the Region. The plans have been completed by engineering firms and the process has been managed by the MOVRC's Community Development Staff under the source water assessment and protection (SWAP) program. At this time, SWPs have not been completed for all areas of the region. The goal of the WVBPH SWAP program is to prevent degradation of source waters which may preclude present and future uses of drinking water supplies to provide safe water in sufficient quantity to users. The intent of the source water plans is to describe what has been done what is currently being done, what is planned to protect the sources of drinking water in the future.

When they are all completed, SWP plans will provide excellent resources for HM planners. Hazard planners will be able to consult the SWP plans when determining how a proposed mitigation action will impact the region. For example, if a future mitigation action purposes stream dredging in a particular area of the region to mitigate the impact of flooding, planners will be able to consult the SWP plans to help determine how this action may affect the region's water.