Mid-Ohio Valley Regional Council

Regional Hazard Mitigation Plan

For the Communities of Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood Counties

Updated 2022

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MID-OHIO VALLEY REGIONAL HAZARD MITIGATION PLAN

MID-OHIO VALLEY REGIONAL COUNCIL

UPDATED ~ 2021-2022

FOR THE COMMUNITIES IN CALHOUN, JACKSON, PLEASANTS, RITCHIE, ROANE, TYLER, WIRT, AND WOOD COUNTIES

MID-OHIO VALLEY HAZARD MITIGATION PLAN

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EXECUTIVE SUMMARY

The 2022 Mid-Ohio Valley Regional Hazard Mitigation Plan is an update to the regional council's 2016 plan. The Mid-Ohio Valley Regional Council (MOVRC) utilized a "dual committee" approach to ensure regional needs appear in this version of the plan. A steering committee comprised of a representative sampling of stakeholders worked extensively with MOVRC staff and its consultant, while the full regional council served as an advisory body receiving periodic updates from MOVRC staff. This version represents the second major update to the first regional mitigation plan published in 2011.

The Mid-Ohio Valley region consists of eight counties, 10 cities, and 12 towns. The region has a population of 160,782 and covers 2,664 square miles. The plan has been prepared in accordance with the Disaster Mitigation Act of 2000 (DMA2K), which requires local governments to have an approved, adopted hazard mitigation plan in order to be eligible for mitigation funds through the federal government. Funding programs include, but are not necessarily limited to the Building Resilient Infrastructure and Communities (BRIC), Hazard Mitigation Grant Program (HMGP), and High-Hazard Potential Dams (HHPD).

Though the requirements only require consideration of natural hazards, the 2022 version includes technological hazards as well. The following 12 hazards are profiled by the plan.

- Commercial/industrial/manufacturing incident
- Dam failure
- Drought
- Earthquake
- Epidemic/pandemic
- Extreme temperatures
- Flooding
- Geologic hazards (i.e., land subsidence, landslides, etc.)
- Severe summer storms
- Tornadoes
- Wildfire
- Severe winter storms

The steering committee added the *commercial/industrial/manufacturing incident* and *epidemic/pandemic* hazards as part of this update. The update commenced during the latter stages of the 2020 Covid-19 pandemic, and as such, epidemic/pandemic issues were "top of mind." Through examining the hazard, though, the committee learned of a far-reaching set of potential impacts resulting from epidemics and pandemics, thereby justifying the inclusion of the profile. Further, the Ohio River counties of the region see significant industrial activity, including large facilities, waterway commodity transport, and railway operations. Ritchie and Tyler Counties see significant industrial activity through the energy sector. As such, the steering committee felt it prudent to examine hazardous material incident impacts as part of this project, and when doing so, realized that the fires, structural collapses, and other types of incidents within the commercial, industrial, and manufacturing sectors could impact the region as well.

The hazard profiling process ranked the hazards considered by the plan in terms of the region's vulnerability to them. The following table shows the rankings, scoring, and the categories contributing to the overall vulnerability scores. Interestingly, these rankings are largely consistent with average risk index scores that appear in FEMA's 2021 National Risk Index (NRI) (see Section 2.4 for additional information).

Summary of Hazard Rankings

Hazard	*Vulnerability*	***Total***	*Frequency*	*Response*	*Onset*	*Magnitude*	*Business*	*Human*	*Property*
Severe Summer Storms	High	**21**	5	3	2	4	1	4	2
Flooding	Medium	**20**	5	3	3	1	2	4	2
Commercial/ Industrial/ Manufacturing Incidents	Medium	**18**	5	2	4	2	1	3	1
Epidemic/ Pandemic	Medium	**18**	2	5	1	4	1	4	1
Severe Winter Storms	Medium	**17**	5	3	1	4	1	2	1
Tornadoes	Medium	**16**	3	3	4	1	1	3	1
Geologic Hazards	Low	**15**	5	4	1	1	1	1	2
Dam Failure	Low	**14**	2	3	4	1	1	2	1
Wildfire	Low	**14**	2	3	4	1	1	2	1
Drought	Low	**13**	2	4	1	3	1	1	1
Earthquake	Low	**12**	2	2	4	1	1	1	1
Extreme Temperatures	Low	**12**	5	1	1	1	1	2	1

To attempt to mitigate the negative effects of these hazards, the steering committee generated a series of goals and objectives as a way to organize and align specific projects toward common ends. The goals are broad, and they represent a more action-oriented means of mitigation progress. Put differently, some communities opt to include aspirational goals (e.g., "Eliminate the negative effects of flooding"). However, the steering committee (building off of the approach used in 2016) felt the goals should represent a more strategic, actionable focus. To add clarity to what types of efforts would constitute progress toward achieving the goal, the committee added as many as four objectives for each goal. The following table shows the goals and objectives.

Mid-Ohio Valley Regional Mitigation Goals and Objectives
Goal 1: Improve Regional Resilience Objective 1.1: Reduce risk through sustainable development. Objective 1.2: Mitigate social vulnerability variables as a means of promoting regional resilience. Objective 1.3: Prioritize projects that strengthen critical infrastructure and reduce risks in communities.
Goal 2: Protect Life and Property Objective 2.1: Build structures designed to reduce risk in communities. Objective 2.2: Reduce the negative effects of severe summer and winter weather events. Objective 2.3: Reduce risk through an enhanced, more efficient emergency response. Objective 2.4: Reduce risk by removing at-risk properties.
Goal 3: Improve Understanding of Risk and Vulnerability for Planning Purposes Objective 3.1: Make data available to relevant communities to support mitigation-related decision-making.
Goal 4: Bolster Public Understanding and Preparedness Objective 4.1: Encourage residents to undertake personal mitigation projects on their properties.
Goal 5: Enhance Citizen Participation in Mitigation and Disaster Recovery Activities Objective 5.1: Identify partners that can help engage a larger, more representative sample of the population in mitigation planning. Objective 5.2: Build up the region's capability to support their populations in the aftermath of a large-scale hazard occurrence.

The action plan (see Section 3.2) includes 50 projects (labeled "actions") that support the achievement of these goals and objectives, all of which have at least one corresponding project. The projects are loosely defined according to the following five categories.

- Local Plans and Regulations
- Structure and Infrastructure Projects
- Natural Systems Protection
- Education Programs
- Preparedness and Response Activities

To support the 30 member governments, the action plan also includes six regional actions with the MOVRC as a coordinating agency. The actions include supporting member governments by compiling applications for mitigation funding, providing Total Exposure in Floodplain (TEIF) and Total Exposure Area Landslide (TEAL) mapping data to communities, support education and outreach on the National Flood Insurance Program (NFIP), looking at consolidation of water/sewer utilities, the expansion of broadband in the region, and establishing and managing a loan program for citizens to access for mitigation purposes. The focus of the regional actions is an effort to build a hazard mitigation capacity in the region.

1.0 INTRODUCTION

Purpose

The purpose of the mitigation plan is to identify risks and vulnerabilities from hazards that affect the Mid-Ohio Valley region in west-central West Virginia. With these risks and vulnerabilities identified, local officials can reduce losses of life, injuries, and to limit future damages by developing methods to mitigate or eliminate damages.

Scope

The *Mid-Ohio Valley Hazard Mitigation Plan* follows a planning methodology that includes public involvement, a risk assessment for various identified hazards, an inventory of critical facilities and at-risk areas, a mitigation strategy for high-risk hazards, and a method to maintain and update the plan.

Plan Authority

The *Mid-Ohio Valley Hazard Mitigation Plan* is “multi-jurisdictional,” meaning that it includes several jurisdictions. Regional stakeholders prepared this plan per federal requirements outlined in the Disaster Mitigation Act of 2000 (DMA2K), which requires communities to formulate a hazard mitigation plan to be eligible for mitigation funds made available through the Federal Emergency Management Agency (FEMA). Section 322 of the Robert T. Stafford Act requires that local jurisdictions develop and submit plans meeting the criteria outlined in 44 CFR Part 201.6.

When the content of this plan corresponds to a requirement of 44 CFR 201.6, it will include a description of the relevant guidance. The following table lists the requirements of 44 CFR 201.6 and identifies the sections of the plan fulfilling the guidance.

44 CFR 201.6 REQUIREMENTS IN THIS PLAN		
Section	*Description*	*Section in Plan*
§ 201.6	The local mitigation plan is the representation of the jurisdiction's commitment to reduce risks from natural hazards, serving as a guide for decision makers as they commit resources to reducing the effects of natural hazards. Local plans will also serve as the basis for the state to provide technical assistance and to prioritize project funding.	Section 1.0 Introduction
§ 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.	Section 1.1 Documentation of the Planning Process

44 CFR 201.6 REQUIREMENTS IN THIS PLAN		
Section	*Description*	*Section in Plan*
§ 201.6(b)(1)	An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval	Section 1.1 Documentation of the Planning Process Section 4.3 Continued Public Involvement
§ 201.6(b)(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	Section 1.1 Documentation of the Planning Process
§ 201.6(b)(3)	Review and incorporate, if appropriate, existing plans, studies, reports, and technical information	Section 1.3 Capabilities Section 1.2 Description of the Planning Area Section 2.3 Risk & Vulnerability Implications from Development Trends Section 4.2 Implementation through Existing Programs
§ 201.6(c)(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	Section 1.1 Documentation of the Planning Process
§ 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.	Section 2.0 Risk Assessment
§ 201.6(c)(2)(i)	The risk assessment shall include 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.	Section 2.1 Identify Hazards Section 2.2 Profile Hazards
§ 201.6(c)(2)(ii)	The risk assessment shall include 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.	Section 2.2 Profile Hazards Section 2.4 Hazard Rankings
§ 201.6(c)(2)(ii)(A)	The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;	Section 2.2 Profile Hazards
§ 201.6(c)(2)(ii)(B)	The plan should describe vulnerability in terms of 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;	Section 2.2 Profile Hazards
§ 201.6(c)(2)(ii)(c)	The risk assessment shall provide a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.	Section 1.2 Description of the Planning Area Section 2.3 Risk & Vulnerability Implications from Development Trends
§ 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.	Section 2.2 Profile Hazards

44 CFR 201.6 REQUIREMENTS IN THIS PLAN		
Section	*Description*	*Section in Plan*
§ 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 existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.	Section 3.0 Mitigation Strategy
§ 201.6(c)(3)(i)	This section shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	Section 3.1 Mitigation Goals & Objectives
§ 201.6(c)(3)(ii)	This section shall include a section that identifies and 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.	Section 3.2 Mitigation Actions
§ 201.6(c)(3)(iii)	This section shall include 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.	Section 3.2 Mitigation Actions
§ 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.	Section 3.2 Mitigation Actions
§ 201.6(c)(4)(i)	A plan maintenance process that includes a section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.	Section 4.1 Monitoring, Evaluating & Updating the Plan
§ 201.6(c)(4)(ii)	A plan maintenance process that includes a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.	Section 4.2 Implementation through Existing Programs
§ 201.6(c)(4)(iii)	A plan maintenance process that includes discussion on how the community will continue public participation in the plan maintenance process.	Section 4.3 Continued Public Involvement
§ 201.6(c)(5)	Documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commission, Tribal Council). For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.	Section 5.0 Appendix 7
§ 201.6(d)(1)	Plans must be submitted to the State Hazard Mitigation Officer (SHMO) for initial review and coordination. The State will then send the plan to the appropriate FEMA Regional Office for formal review and approval. Where the State point of contact for the FMA program is different from the SHMO, the SHMO will be responsible for coordinating the local plan reviews between the FMA point of contact and FEMA.	Section 5.0 Appendix 7
§ 201.6(d)(3)	A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within five years in order to continue to be eligible for mitigation project grant funding.	Section 3.1 Mitigation Goals & Objectives Section 3.2 Mitigation Actions Section 5.0 Appendix 2

1.0 INTRODUCTION

1.1 Documentation of the Planning Process

§ 201.6(c)(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.

The Mid-Ohio Valley Regional Council (MOVRC) (i.e., the Region 5 Planning and Development Council) coordinated an update to the region's hazard mitigation plan in 2022. MOVRC contracted JH Consulting, LLC, a consultant, to assist in the process. The following planning process was a joint effort between MOVRC and consultant staff.

1.1.1. Planning Committee

The MOVRC utilized a tiered committee approach to accomplishing the goals of the mitigation planning process. A "steering committee" (see the table below for its membership) provided overall strategic direction for jurisdictional and public outreach, formatting for the updated document and draft review, hazards to include, project prioritization instructions, etc. A smaller steering committee approach allowed for greater interaction *at the strategic level,* and by including entities such as the Little Kanawha Area Development Corporation, Wood County Board of Education, and WVU-Parkersburg, ensured a broader consideration (beyond just emergency management of community planning).

Mid-Ohio Valley Regional Hazard Mitigation Plan Steering Committee		
Agency Represented	*Participant Name*	*Participant Type*
Calhoun County Emergency Management	Julie Sears	Participant (County Jurisdiction)
Jackson County Emergency Management	Walter Smittle Montana Boggess	Participant (County Jurisdiction)
Little Kanawha Area Development Corporation	Shelia Burch	Partner Entity (Community & Economic Development)
Mid-Ohio Valley Regional Council	Joel Davis Luke Peters Katrina Kratche Brad Morris	Participant (Plan Developer)
Pleasants County Emergency Management	Steve Knight	Participant (County Jurisdiction)
Ripley Floodplain Management	Tom Armstead	Participant (Municipal Jurisdiction)
Ritchie County Emergency Management	Edwin Cox	Participant (County Jurisdiction)
Roane County Emergency Management	Melissa Gilbert	Participant (County Jurisdiction)
Tyler County Emergency Management	Tom Cooper	Participant (County Jurisdiction)
Vienna, City of	Steve School	Participant (Municipal Jurisdiction)

Mid-Ohio Valley Regional Hazard Mitigation Plan Steering Committee		
Agency Represented	*Participant Name*	*Participant Type*
West Virginia Department of Transportation, Region 3	Neil Reed	Partner Entity (Transportation)
Wirt County Emergency Management	Denzil Lynch	Participant (County Jurisdiction)
Wood County Emergency Management	Mike Shook	Participant (County Jurisdiction)
Wood County Schools	Donald Brown	Partner Entity (Public Education)
WVU-Parkersburg	Senta Goudy	Partner Entity (Higher Education)
West Virginia Division of Emergency Management	Tim Keaton Brent Burger	Partner Entity (Plan Reviewer)
FEMA Region 3	Casey Garnett	Partner Entity (Plan Reviewer)
JH Consulting, LLC	Jeffery Harvey	Partner Entity (Plan Developer Consultant)

Steering Committee Meetings

The steering committee met five times throughout the 2022 update. See Appendix 2 for meeting minutes. Though most steering committee members attended regularly, some members were unable to attend at the times designated for the meetings. These individuals remained involved through receipt of the minutes and correspondence with the MOVRC.

February 24, 2022

The 2022 update kicked off with the February steering committee meeting. The agenda largely consisted of an orientation to the mitigation planning process, including what steering committee members could expect as members. The discussion was robust, and committee members agreed on the need to avoid a so-called "plan utopia." Communities throughout the region are small, and many have limited capabilities to implement large projects. As such, committee members recommended streamlining the project list to keep the plan manageable. Further, the committee discussed updated goals and objectives to guide the update.

March 29, 2022

The second meeting was a virtual session that occurred immediately following a brief plan development training hosted by the West Virginia Division of Emergency Management (WVEMD) and FEMA Region 3. The primary agenda item was the hazard list. Committee members reviewed the hazards from the 2016 version of the plan, discussed the events that had occurred since 2016, and finalized the list of hazards to include in the 2022 update.

April 27, 2022

Meeting 3 finalized discussions about hazards, and committee members mentioned several secondary impacts, such as the ongoing drug problem, that can exacerbate risk and vulnerability. Members also discussed zoning and building codes, and recognized that more stringent regulations do support resilience *moving forward*. However, new or revised zoning and building ordinances, though necessary, do not address the risks posed by decisions made in the past. Finally, the third meeting was the session during which the committee talked at length about how to ensure equitable opportunities for public participation.

May 25, 2022

The fourth meeting focused on the project timeline. Given the 2022 update occurred while the plan was expired, members recognized a need to fast-track the update, with efforts made at completing it by September 30, 2022. Unfortunately, doing so would mean decreasing the number of opportunities for broader participation (outside of public sector entities). Committee members also discussed municipal participation, the TEIF/TEAL data requirements, and project prioritization criteria (to include the designation of a "project prioritization subcommittee").

August 31, 2022

The fifth steering committee meeting was a virtual session and a review of early draft material. The consultant requested a review for formatting, the types of content included, etc. before mass producing the remaining plan documents. Attendance was light, but the MOVRC shared the draft material with the entire committee.

The steering committee did not directly enable participation by all of the region's member governments. Jurisdiction-by-jurisdiction participation is discussed in Section 1.1.2 below. However, the regional council comprised of representatives from the MOVRC's member governments served as the second tiered committee in the 2022 update. The council itself consists of an elected representative from county, city, and town in the region, along with other development leaders from the communities. Though not active participants in the update, MOVRC staff updated the council as to the plan's progress throughout the update process. As such, the participating counties, cities, and towns will recognize the plan they will ultimately be asked to adopt.

1.1.2. Jurisdictional Participation

Jurisdictional participation occurred in several ways. The MOVRC administered a "capability assessment survey" that enabled participating jurisdictions and partner agencies to conduct a capability self-assessment, which identified existing mechanisms that could support hazard mitigation and risk reduction initiatives. Fourteen (14) respondents provided information, representing Calhoun County, Grantsville, Middlebourne, Parkersburg, Ravenswood, Roane County (x3), Spencer, Tyler County, Vienna (x2), and Wood County (x2).

Though identified as a "partner entity" in the table above, the Little Kanawha Area Development Corporation represented Calhoun and Wirt Counties via the steering committee. Tyler County's steering committee represented specifically reached out to the municipalities in Tyler County as well as Belmont and St. Mary's, inviting them to attend a local emergency planning committee meeting at which the mitigation plan update was presented. After that meeting, MOVRC staff and its consultant met with Friendly, Middlebourne, Paden City, and St. Mary's to discuss not only their municipal projects, but also the state's TEIF/TEAL data. MOVRC personnel and the council's consultant attended a meeting in Roane County to review projects with the county, Reedy, and Spencer. Afterward, the Roane County Office of Emergency Management took attendees on a tour of flood-prone areas in Spencer.

Most of the region's jurisdictions, though, participated through one-on-one contact with MOVRC staff and the council's consultant. This 2022 update stretched from February to October, and in so doing, provided ample opportunity to garner municipal feedback on projects through the course of regular interaction (i.e., "regular" because the MOVRC represents and supports its 30 member governments in numerous ways). The "Other" column in the table below identifies instances where personnel met directly with municipal representatives. Some of these meetings, like Reedy and Ripley, were specifically to discuss this plan. Others, like Jackson County (i.e., a public meeting in Sandyville to discuss flood mitigation) occurred as a sidebar or post-hoc conversation about other projects. Finally, since this update was a high-profile project for the region (given the amount of mitigation dollars tied to its approval), MOVRC staff updated the full regional council at a meeting on June 23, 2022. The council consists, in part, of the chief elected officials from each of the 30 member governments.

All of the local governments in the Mid-Ohio Valley region (i.e., eight counties and 22 cities/towns) had the opportunity to participate in the 2022 update. See Appendix 1 for a list (i.e., names, titles) of the participants[1] representing these member governments. The following table

[1] Per the *Local Mitigation Planning Policy Guide* (FP 206-21-0002, effective April 19, 2023), a *participant* is "any local government or entity developing or updating a local mitigation plan" (p. 18).

outlines jurisdictional participation[2] in the 2022 update. The aforementioned list in Appendix 1 also provides a description of the activities that warranted inclusion in the "Other" column.

[2] Per the *Local Mitigation Planning Policy Guide* (FP 206-21-0002, effective April 19, 2023), a *participation* is "being engaged and having the chance to provide input on the plan" (p. 18).

Mid-Ohio Valley Regional Hazard Mitigation Plan Jurisdictional Participation

	Meetings							*Activities*						
Jurisdiction	Steering Committee (SC): February 4, 2022	SC: March 29, 2022	SC: April 27, 2022	SC: May 25, 2022	SC: August 31, 2022	Tyler County LEPC: June 2, 2022	Regional Council (RC): June 23, 2022	"Tell Me a Story"	Capability Survey	Project Updates	Project Prioritization Subcommittee	Roane County Project Tour	Sandyville Flood Control Meeting	Other
Mid-Ohio Valley Regional Council (MOVRC)	X	X	X	X	X	X		X		X	X	X	X	X
Auburn, Town of										X				
Belmont, City of										X				
Cairo, Town of										X				X
Calhoun County									X	X				
Elizabeth, Town of										X				X
Ellenboro, Town of										X				X
Friendly, Town of						X				X				X
Grantsville, Town of									X	X				X
Harrisville, Town of							X			X				X
Jackson County	X	X	X				X	X		X			X	X
Middlebourne, Town of						X			X	X				X
North Hills, Town of										X				
Paden City, City of						X				X				X
Parkersburg, City of									X	X				
Pennsboro, City of							X			X				X
Pleasants County		X								X				
Pullman, Town of										X				
Ravenswood, City of									X	X				
Reedy, Town of										X				X
Ripley, City of										X				X
Ritchie County							X			X				
Roane County									X	X		X		X
Sistersville, City of										X				X
Spencer, City of									X	X		X		X
St. Mary's, City of						X				X				X

Mid-Ohio Valley Regional Hazard Mitigation Plan Jurisdictional Participation														
	Meetings							*Activities*						
Jurisdiction	Steering Committee (SC): February 4, 2022	SC: March 29, 2022	SC: April 27, 2022	SC: May 25, 2022	SC: August 31, 2022	Tyler County LEPC: June 2, 2022	Regional Council (RC): June 23, 2022	"Tell Me a Story"	Capability Survey	Project Updates	Project Prioritization Subcommittee	Roane County Project Tour	Sandyville Flood Control Meeting	Other
Tyler County	X		X	X	X	X			X	X	X			
Vienna, City of	X	X	X	X				X	X	X				
Williamstown, City of										X				X
Wirt County									X	X				
Wood County		X	X	X				X		X				

1.1.3. Additional Stakeholders

Additional stakeholders came together for specific tasks associated with the update. First, a subset of the steering committee comprised of Joel Davis (MOVRC), Senta Goudy (WVU-Parkersburg), Tom Cooper (Tyler County Emergency Management), and Jeffery Harvey (JH Consulting, LLC) served as a “project priority” subcommittee. This subcommittee assisted in the consultant in determining the criteria for prioritizing mitigation projects. This group completed an online survey following the fourth steering committee meeting to provide its input.

The Tyler County Local Emergency Planning Committee (LEPC) served as a valuable stakeholder. The LEPC gave the MOVRC two opportunities to present at meetings, the first on June 2, 2022, and the second on September 1, 2022. At the first meeting (as noted above), planners introduced representatives from municipalities in Tyler and Pleasants Counties to the Total Exposure in Floodplain (TEIF) and Total Exposure Area Landslide (TEAL) data as well as reviewed existing projects with them. At the second meeting, the local press publicized the availability of the general online public survey.

The Mid-Ohio Valley region includes 41 dams, 24 of which are categorized as high risk and 10 of which are substantial risk. To ensure eligibility for funding under FEMA’s High Hazard Potential Dams (HHPD) program, the regional council invited dam owners to participate via an online survey in October of 2022. The MOVRC’s consultant provided a link to the survey to the eight county emergency managers serving the region for distribution to the dam owners. Planners utilized the county emergency managers because they often receive emergency action plan (EAP) submissions and, thus, have a relationship (or at least a familiarity) with the dam owners. Receiving the survey from a known contact would likely bolster the response rate.

To ensure an awareness as to the findings of the planning process, the MOVRC notified neighboring jurisdictions. Upon completion of a draft of the plan, the MOVRC emailed neighboring planning and development councils as well as neighboring counties in Ohio to notify those entities that the updated plan was available online. This notification afforded an opportunity for those stakeholders to comment on the plan (via email to the MOVRC). Through the use of county-level emergency managers on the steering committee, the MOVRC took advantage of the variety of regional affiliations in West Virginia to ensure consistency with risk assessment efforts in other areas of the state. For instance, Tyler County Emergency Management aligns with Northern Panhandle and North Central West Virginia counties as part of Homeland Security Region 2; the remaining seven emergency management agencies in the region participate with Homeland Security Region 1. The Wood-Washington-Wirt Interstate Planning Commission operates out of the MOVRC office and ensured awareness of planning efforts in Washington County, Ohio.

1.1.4. Public Involvement

MOVRC utilized both in-person and online options for engaging the public in this process. Two meetings, one in Jackson County and the other in Tyler County, provided opportunities for residents to provide input on hazard mitigation (and flood mitigation, in particular). On September 17, 2022, the MOVRC and the Jackson County Commission sponsored a public meeting in the Sandyville area to discuss a potential feasibility study for flood mitigation options. Thirty-five (35) residents attended, and during the meeting, the MOVRC discussed the mitigation plan and the feasibility study's place in it. Ultimately, a significant number of residents did not support the feasibility study (though there are residents looking at flood mitigation options for the community); however, the meeting provided an opportunity to engage residents regarding hazard mitigation.

On June 18, 2022, staff from the MOVRC set-up at a safety fair and first responder celebration in Paden City (Tyler County). Antero Resources and other private sector industry partners in Tyler County hosted a community appreciation event for emergency responders, which was well-attended. The MOVRC spoke with residents about hazard mitigation and solicited written participation via a brief survey (see Appendix 4). The survey consisted of six questions, two of which were demographic questions. The other four were as follows.

- Do you have a 72-hour emergency kit in your home?
- Do you live in a special flood hazard zone?
- If you have homeowner's or renter's insurance, does it include flood insurance?
- What mitigation actions would you support in your community (with check boxes highlighting seven options)?

The results of this brief survey (n=43) were as follows. The percentages indicate the percentage of the total respondents that checked the reported box.

1. Do you live in the Mid-Ohio Valley region?
   Yes: 95.35% No: 4.65%

2. What is the name of your county/city/town?
   Results omitted from this summary; see Appendix 4.

3. Do you have a 72-hour emergency kit in your home?
   Yes: 51.16% No: 37.21% I don't know: 11.63%

4. Do you live in a special flood hazard zone?
   Yes: 9.30% No: 83.72% I don't know: 6.98%

5. If you have homeowner's or renter's insurance, do it include flood insurance?

Yes:	11.63%	No:	74.42%	I don't know:	6.98%	Not insured:	6.98%

6. What mitigation efforts would you support in your community?

55.81%	Buying out properties, relocating or elevating houses that are prone to repetitive flooding
83.72%	Upgrading water and sewer systems
93.02%	Installing generators in critical facilities such as police and fire stations, hospitals, etc.
65.12%	Promoting the collection and reuse of rainwater such as in rain gardens and green roofs
53.49%	Adopting building codes that go above and beyond the basic requirements of construction
72.09%	Building shelters for tornadoes and severe weather events
90.70%	Supporting educational campaigns aimed at preparing the population for a variety of hazards

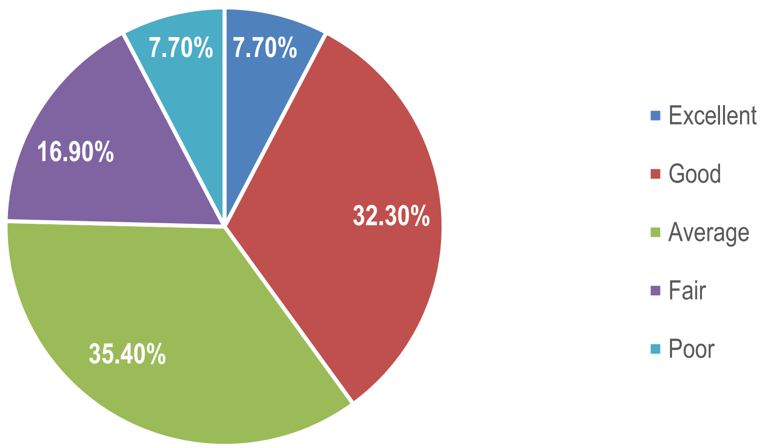
The results from this mini-survey were interesting. First, as noted in Appendix 4, respondents represented all counties in the region except for Jackson. For an event in the far-northern reaches of the region, the attendance was somewhat surprising. Second, the survey suggests that education on a variety of fronts could benefit mitigation and preparedness in the region. Several respondents indicated they did not know whether they had a 72-hour kit in their home. Three respondents (each) indicated they did not know if they lived in a special flood hazard area or if their insurance policies included flood insurance.

Finally, the MOVRC, steering committee members, regional council representatives, and member governments promoted an online survey to garner public comment. These stakeholders shared the survey with colleagues via email, online via social media accounts, and websites. Further, the local media in the region covered a presentation at the September 1, 2022, Tyler County LEPC meeting, where MOVRC personnel discussed the survey at length. The survey accepted responses from August through early October of 2022; 65 individuals responded to the survey, representing all counties in the region except for Wirt County. See Appendix 4 for the full results. Severe summer weather was the hazard to which the highest number of respondents indicated being "Concerned" or "Very Concerned" (n=42), followed by severe winter weather (n=41). Regarding the types of mitigation actions respondents would support in their communities, three types of projects received the most support:

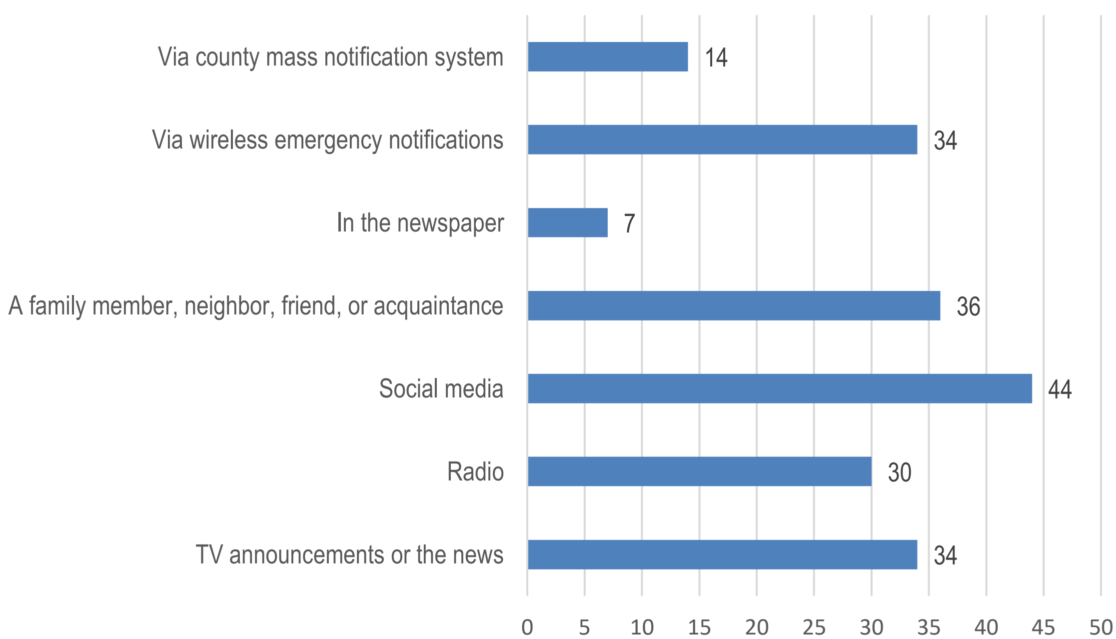
a. Upgrading the water and sewer systems (n=52, 85.2% of respondents)
b. Installing generators in critical facilities such as clinics, police stations, fire stations, etc. (n=52, 85.2% of respondents)
c. Burying power lines to provide for uninterrupted power during severe weather (n=49, 80.3% of respondents)

References to the survey responses appear in each of the hazard profiles in Section 2.2 below. These references report the results for the levels of concern for the hazards included in the plan, memory of past occurrences, and thoughts as to increasing/decreasing impacts survey questions. The survey included a question for respondents to indicate whether they would be willing to participate in a mitigation project should their community sponsor one. Those that responded affirmatively provided their contact information, and the MOVRC provided that information to the respective community. Other results are as follows.

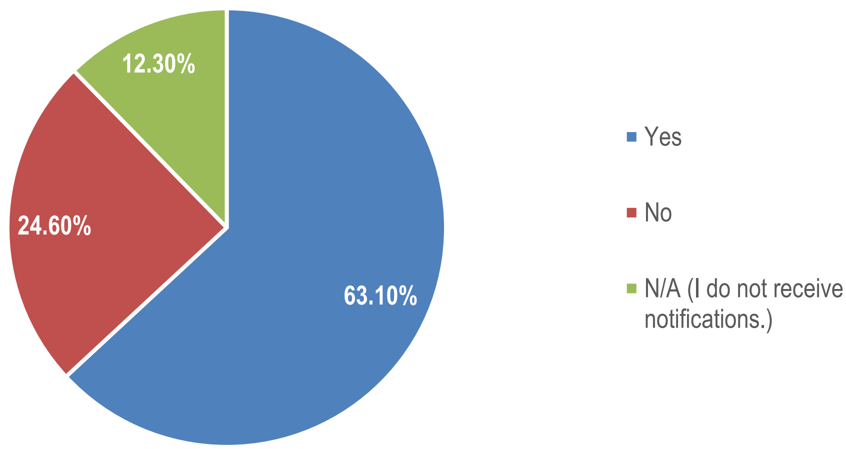
How would you rate your community's ability to respond (to the hazards considered in this plan)? (n=65)



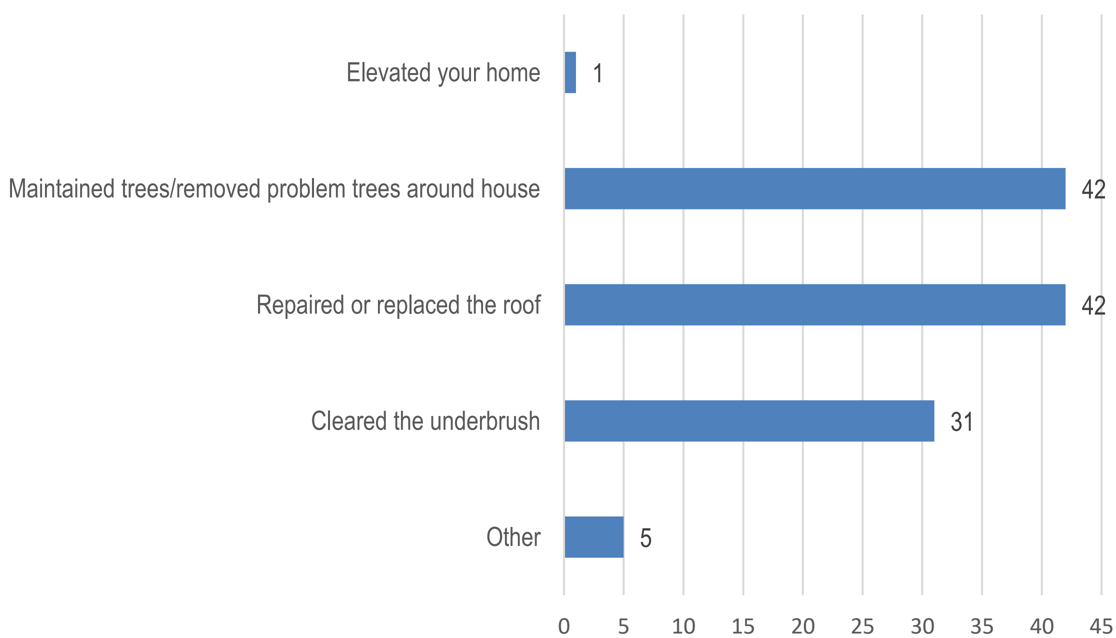
How do you find out about upcoming hazards? (n=65)



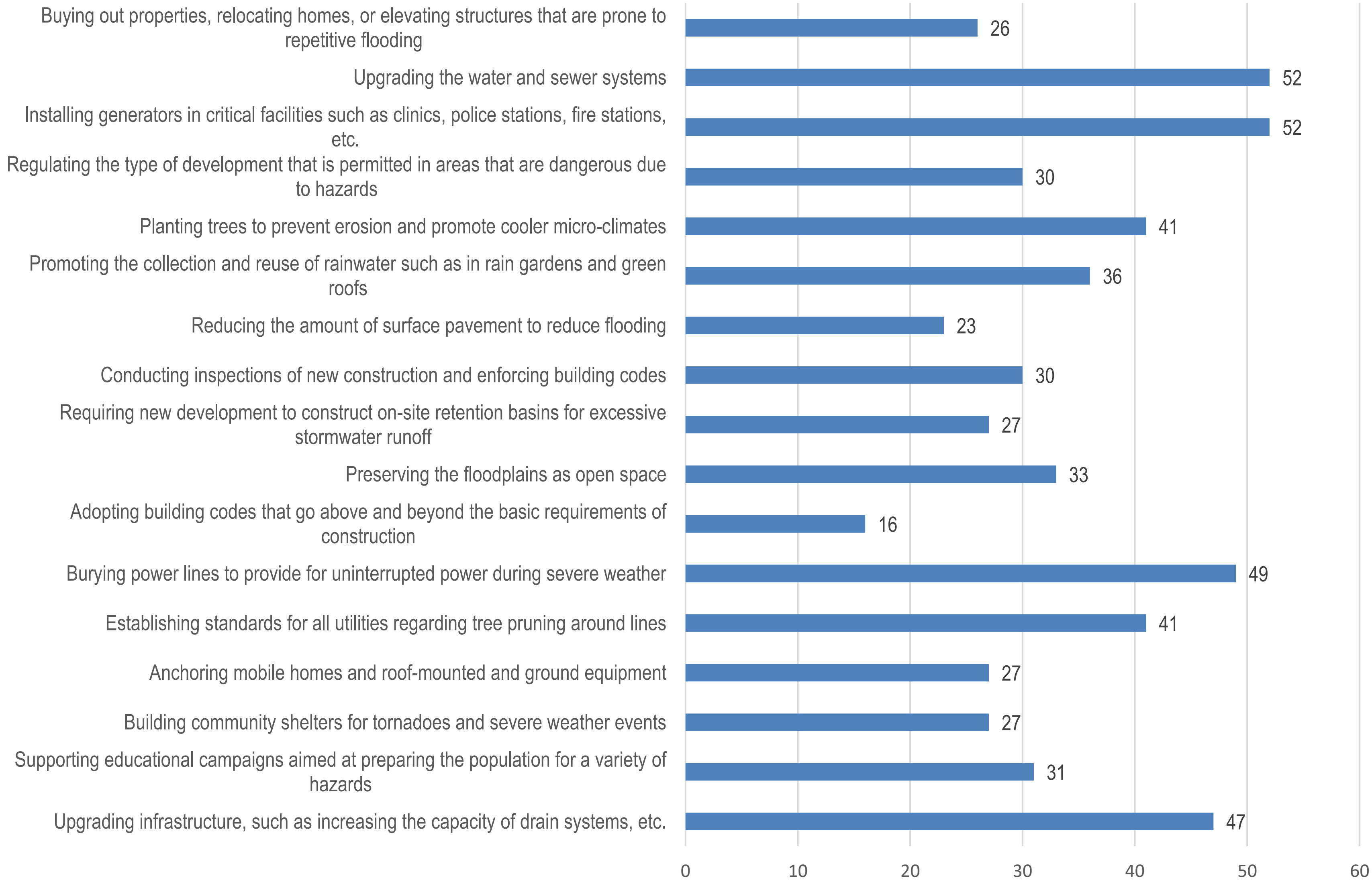
Do you receive timely, accurate, and effective notifications from these sources? (n=65)



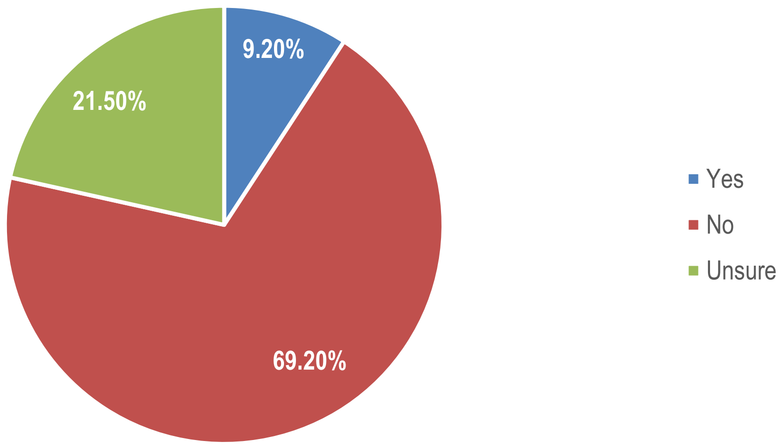
Mitigation is an effort by you, your community, and/or your local officials to reduce the negative impacts of hazards. Have you ever (check all that apply): (n=57)



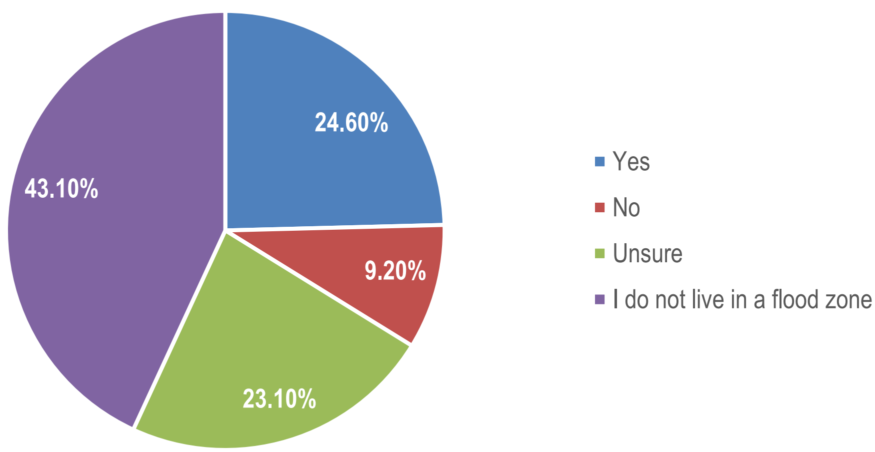
Please indicate the types of mitigation actions you would support; these could be something you can do or an initiative by local officials (check all that apply). (n=61)



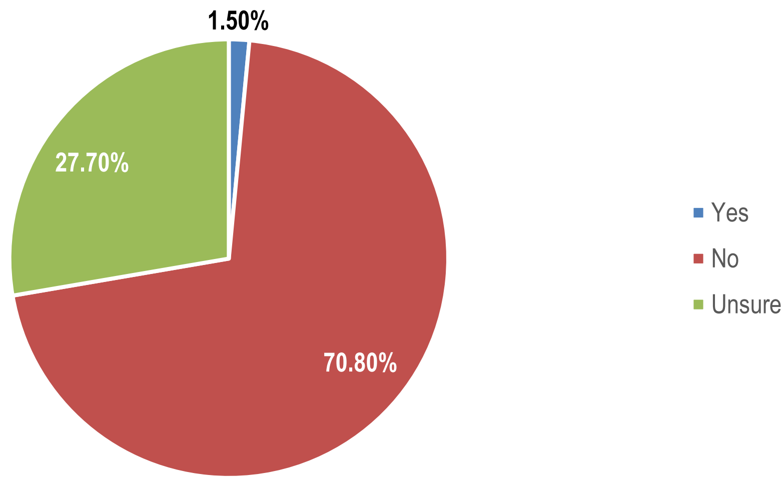
Do you live in a special flood hazard area (SFHA)? (n=65)



Do you know your flood zone? (n=65)



Are you insured through the NFIP? (n=65)



1.0 INTRODUCTION

1.2 Description of the Planning Area

The description of the planning area contextualizes the remainder of this document. It provides the background information on the areas impacted by various hazards and serves as a foundation for mitigation decisions. The Mid-Ohio Valley Regional Council (i.e., Region 5) consists of eight counties situated on the Appalachian Plateau in western West Virginia. The counties in the region include Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood. The region also houses 22 municipalities. The region covers 2,664 square miles (Census, 2022).

Several counties and other planning and development council (PDC) regions border the Mid-Ohio Valley region, including PDCs 2, 3, 6, 7, and 10. The counties that border the region include Wetzel, Doddridge, Gilmer, Braxton, Clay, Kanawha Putnam, and Mason. The Ohio River forms the western edge of the region, and as such, Athens, Meigs, Monroe, and Washington counties in Ohio also border the planning area.

Local Governments in the Mid-Ohio Valley Region

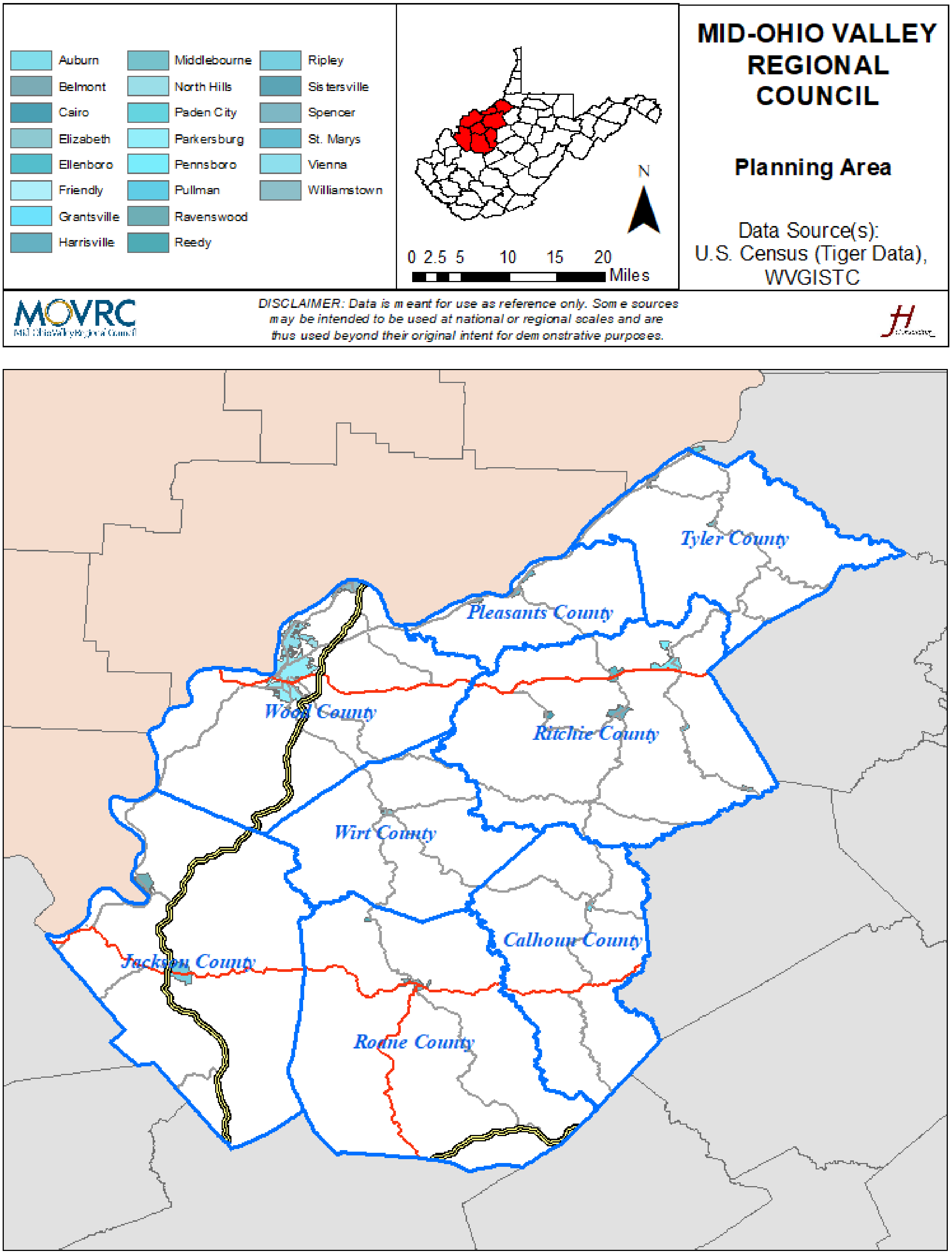
Name	*Level*	*Location*
Auburn	Town	Ritchie Co.
Belmont	Town	Pleasants Co.
Cairo	Town	Ritchie Co.
Calhoun	County	N/A
Elizabeth*	Town	Wirt Co.
Ellenboro	Town	Ritchie Co.
Friendly	Town	Tyler Co.
Grantsville*	Town	Calhoun Co.
Harrisville*	Town	Ritchie Co.
Jackson	County	N/A
Middlebourne*	Town	Tyler Co.
North Hills	Town	Wood Co.
Paden City	City	Tyler Co.
Parkersburg*	City	Wood Co.
Pennsboro	City	Ritchie Co.
Pleasants	County	N/A
Pullman	Town	Ritchie Co.
Ravenswood	City	Jackson Co.
Reedy	Town	Roane Co.
Ripley*	City	Jackson Co.
Ritchie	County	N/A
Roane	County	N/A
Sistersville	City	Tyler Co.
Spencer*	City	Roane Co.
St. Mary's*	City	Pleasants Co.
Tyler	County	N/A
Vienna	City	Wood Co.
Williamstown	City	Wood Co.
Wirt	County	N/A
Wood	County	N/A

* Denotes a county seat

Calhoun County is in the southeastern part of the region; the county covers 281 square miles, of which 279 square miles are land, and 1.4 square miles are water. Calhoun County contains one municipality: the Town of Grantsville which is the county seat. Jackson County is in the southwest part of the region. The county consists of 472 square miles, of which 464 are land. Jackson County consists of two municipalities: the cities of Ravenswood and Ripley. Ripley is the Jackson County seat. Pleasants County is located in the northwestern section of the region. It covers 135 square miles, of which 130 are land. Pleasant County consists of two municipalities: the City of St. Mary's, the county seat, and the Town of Belmont.

Ritchie County is in the northeastern section of the region. Ritchie County consists of 454 square miles, of which 452 are land. Ritchie County includes six municipalities: the City of Pennsboro, and the Towns of Auburn, Cairo, Ellenboro, Harrisville (county seat), and Pullman. Roane County is in the southwestern section of the region. Roane County is comprised of 484 square miles and consists of two municipalities: the City of Spencer, the county seat, and the Town of Reedy.

Tyler County is the northern-most county of the region. The county consists of 261 square miles, of which 256 are land. Tyler County is home to four municipalities: the cities of Paden City and Sistersville, and the towns of Friendly and Middlebourne (county seat). Wirt County is centrally located in the region. The county is comprised of 235 square miles, all but two of which are land. Wirt County contains one municipality, the Town of Elizabeth, the county seat. Wood County is in the western section of the region. Wood covers 377 square miles, 367 of which are land. Wood County consists of four municipalities: the City of Parkersburg, the county seat, and the cities of Vienna and Williamstown, along with the Town of North Hills. Wood County is the most densely-populated county in the region.



MOVRC
Mid-Ohio Valley Regional Council

Demographics

The following table presents general demographics for the Mid-Ohio Valley region. The table is organized by jurisdiction. The source for all of the demographic data is the U.S. Bureau of the Census (2022).

Mid-Ohio Valley Region Demographics							
Community	*Population*	*White*	*Black or African American*	*American Indian and Alaskan Native*	*Asian*	*Native Hawaiian or Pacific Islander*	*Two or More Races*
Auburn, Town of	79	79	0	0	0	0	0
Belmont, Town of	875	823	4	3	4	0	40
Cairo, Town of	176	163	1	4	1	1	4
Calhoun County	6,229	6,003	13	12	13	2	180
Elizabeth, Town of	724	671	1	0	0	2	49
Ellenboro, Town of	221	216	0	0	0	0	5
Friendly, Town of	101	90	1	1	0	0	9
Grantsville, Town of	494	472	3	2	2	0	15
Harrisville, Town of	1,631	1,569	7	1	7	3	35
Jackson County	27,738	27,073	194	83	83	0	305
Middlebourne, Town of	717	698	0	2	0	0	17
North Hills, Town of	834	746	11	1	20	2	54
Paden City, City of	2,541	2,399	3	7	5	0	114
Parkersburg, City of	29,403	27,933	941	0	59	0	470
Pennsboro, City of	1,054	1019	1	0	3	2	27
Pleasants County	7,601	7,251	129	23	15	0	106
Pullman, Town of	135	126	0	1	0	0	8
Ravenswood, City of	3,865	3,582	28	10	19	1	184
Reedy, Town of	150	140	0	1	0	0	8
Ripley, City of	3,079	2,943	10	4	22	0	78
Ritchie County	8,383	8,173	51	25	25	0	109
Roane County	13,989	13,625	41	56	56	1	196
Sistersville, City of	1,412	1,337	1	1	2	0	69
Spencer, City of	2,063	1,933	7	2	12	11	98
St. Mary's, City of	1,831	1,749	6	8	5	0	54
Tyler County	8,155	7,935	33	33	65	1	90
Vienna, City of	10,652	9,727	130	17	209	2	528
Williamstown, City of	2,997	2,870	12	6	10	0	92
Wirt County	5,063	4,921	30	15	15	0	81
Wood County	83,624	80,279	1,003	167	502	1	1,589

Community	Hispanic or Latino	Veterans	Foreign Born Persons	Housing Units	Median Household Income	Persons In Poverty	Persons Per Square Mile
Auburn, Town of	0	5	0	40	$23,000	30	262.7
Belmont, Town of	0	38	6	414	$50,083	130	2,112.70
Cairo, Town of	0	31	7	193	$24,215	123	538.1
Calhoun County	0	477	37	3,182	$38,668	1,246	22.3
Elizabeth, Town of	20	40	0	477	$23,098	439	1,771.70
Ellenboro, Town of	0	10	1	129	$50,625	22	322.7
Friendly, Town of	0	3	0	54	$26,667	49	1,198.00
Grantsville, Town of	0	16	27	321	$28,750	186	1,179.30
Harrisville, Town of	0	132	37	1,067	$36,161	512	1,056.80
Jackson County	332	1,821	277	12.881	$49,115	3,939	59.8
Middlebourne, Town of	0	18	0	420	$43,929	183	2,044.30
North Hills, Town of	31	50	12	307	$114,861	89	1,367.50
Paden City, City of	0	289	9	1,274	$50,739	459	2,764.50
Parkersburg, City of	353	2,540	206	15,246	$37,933	6,498	2,524.00
Pennsboro, City of	7	98	11	675	$41,673	191	371.8
Pleasants County	91	548	38	3,214	$55,508	988	58.8
Pullman, Town of	0	36	0	116	$48,125	18	559.7
Ravenswood, City of	38	177	148	1,563	$37,012	907	2004.9
Reedy, Town of	22	12	0	78	$28,125	56	825.6
Ripley, City of	205	335	6	1,591	$34,107	697	994.3
Ritchie County	84	803	108	4,163	$44,328	1,375	18.7
Roane County	181	1096	28	5,599	$38,895	2,877	29
Sistersville, City of	45	125	31	719	$34,107	328	2,441.90
Spencer, City of	18	124	5	1,196	$21,139	818	1,620.00
St. Mary’s, City of	0	181	0	1,094	$49,836	133	1,730.50
Tyler County	45	692	33	4,118	$90,000	1,241	32.4
Vienna, City of	59	779	264	4,860	$55,151	1,198	2,551.40
Williamstown, City of	21	191	0	1,409	$71,442	211	2,011.00
Wirt County	41	515	10	2,714	$45,315	911	22.3
Wood County	1,087	6,320	920	40,301	$48,711	12,041	230

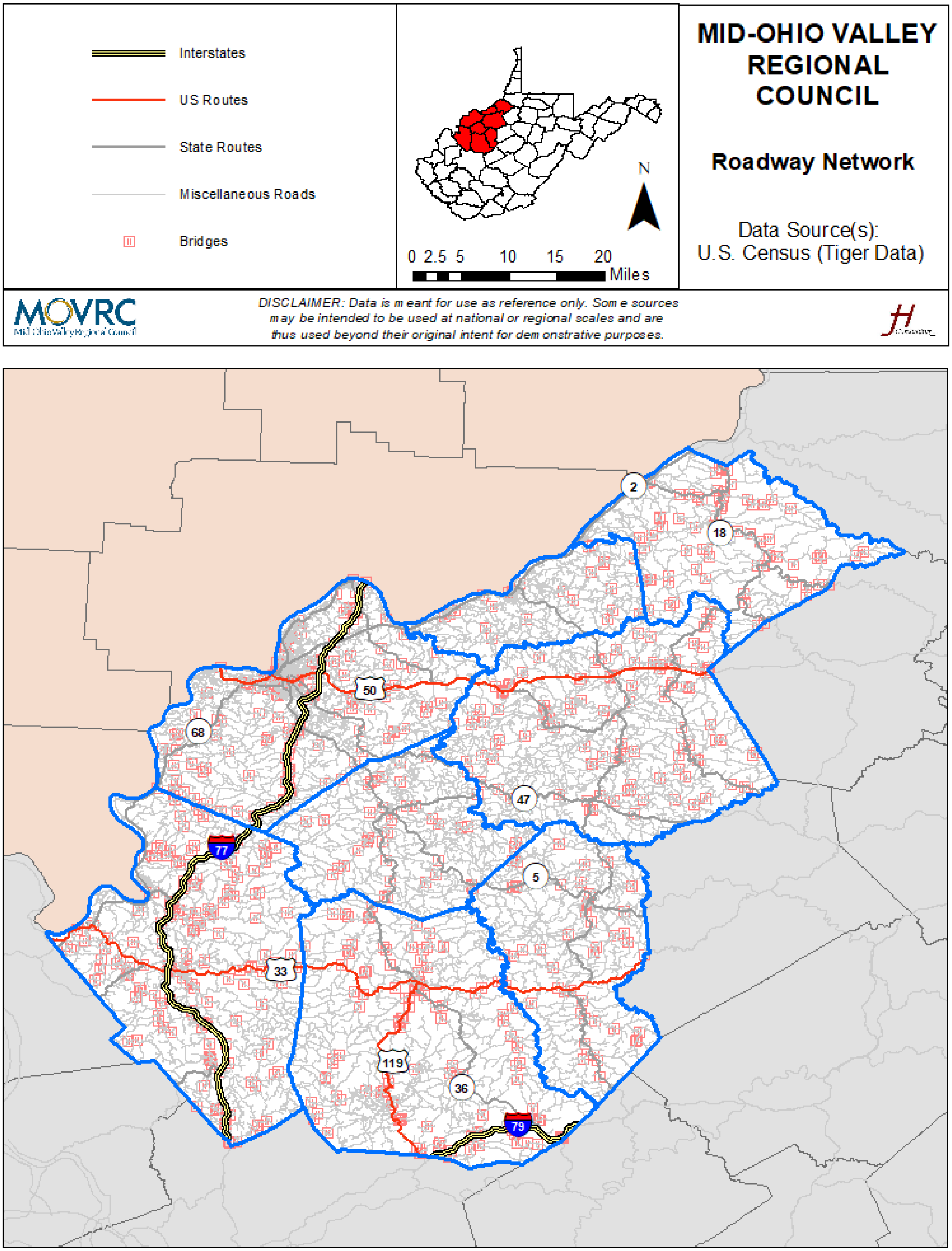
Collectively, the region has a population of 160,782 (Census, 2022, using 2021 estimates). This population represents a decrease of 6.36% from the 2010 census. The region had a larger decrease in population than the state, which decreased 3.20% between decennial censuses. As noted above, the largest population is in Wood County, whose population of 83,624 comprises 52.01% of the regional population. The population is overwhelmingly Caucasian, which represents 96.57% of the population. Hispanics account for 1.16% of the region's population, with individuals of two or more races representing 1.54%.

Transportation

Due to the location of the region the transportation network is particularly robust. All four of the major transportation methods (road, rail, water, and air) are present in the region.

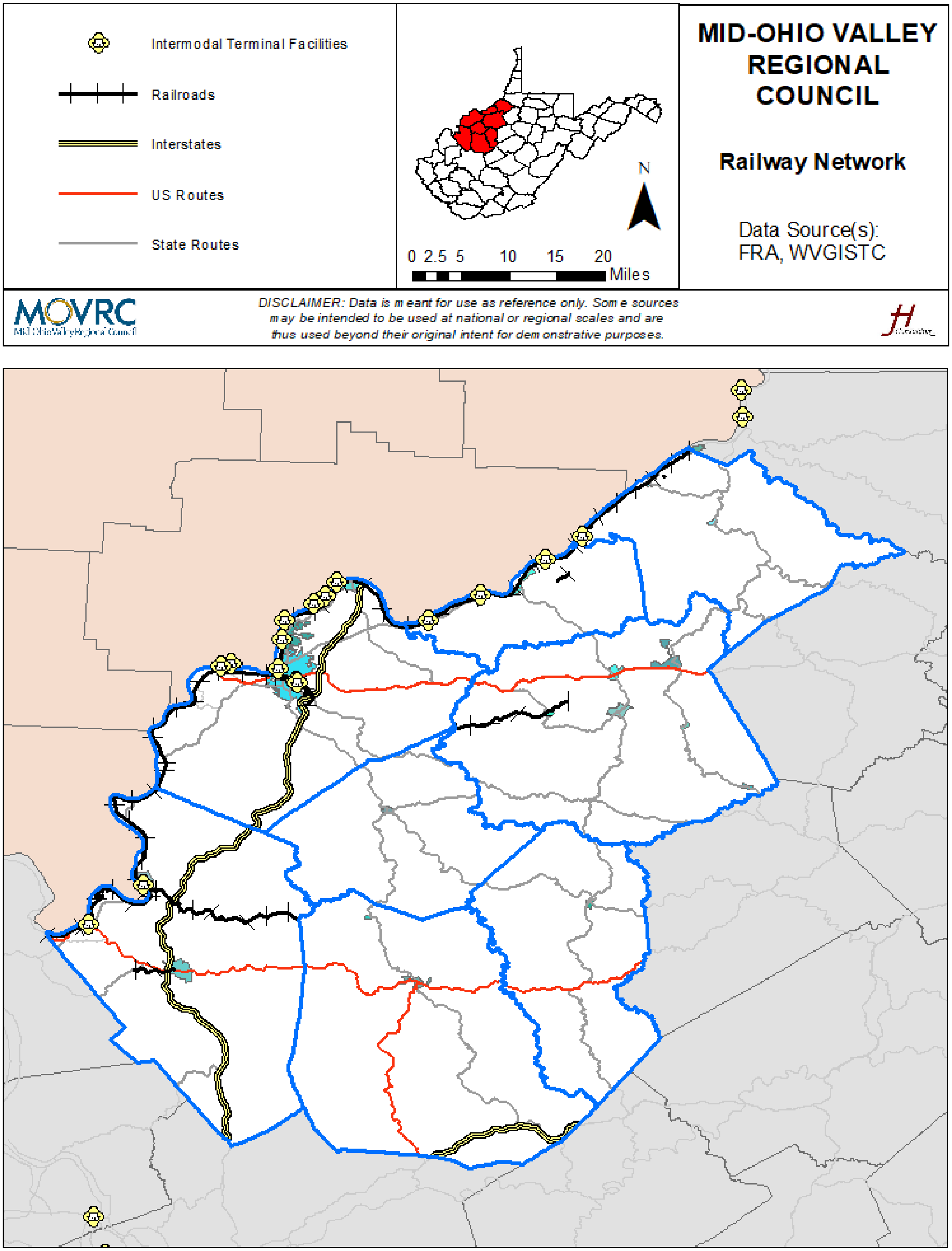
Roadway

There are two interstates in the Mid-Ohio Valley region. Interstate 77 is a north-south route that runs through from the Jackson-Kanawha County border to Ohio via the Williamstown-Marietta Bridge. Interstate 79 is a north-south route that runs through the southeastern portion of Roane County from the Roane-Clay County border to the Roane-Kanawha County border. In addition to the interstates, three U.S. highways traverse the region. US 33 runs east-west through Calhoun, Roane, and Jackson Counties; US 50 is an east-west route that runs through Ritchie and Wood Counties; and US 119 runs north-south through Calhoun and Roane Counties. There are also numerous state highways throughout all eight counties.


Interstates
US Routes
State Routes
Miscellaneous Roads
Bridges
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY
REGIONAL
COUNCIL
Roadway Network
Data Source(s):
U.S. Census (Tiger Data)
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources
may be intended to be used at national or regional scales and are
thus used beyond their original intent for demonstrative purposes.
2
18
50
68
47
77
5
33
119
36
79

Railway

Railroads have played an important role in the development of many West Virginia communities, including those in the Mid-Ohio Valley region. CSXT operates a rail line in the area. The line runs along the Ohio River from Tyler County and south, through Wood and Jackson Counties.


Intermodal Terminal Facilities
Railroads
Interstates
US Routes
State Routes
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Railway Network
Data Source(s):
FRA, WVGISTC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Airway

The Mid-Ohio Valley Regional Airport, located seven miles northeast of Parkersburg, is the only commercial airport in the region. The airport is served by Contour Airlines offering domestic flights to select destinations. There are two other airports in the region. Jackson County Airport is a county-owned public-use facility located near Ravenswood, and Boggs Field is a privately-owned public-use airport near Spencer.

Waterway

According to Waterways Council, Inc. (WCI) (n.d.), there are five commercially navigable river systems in West Virginia. One of these rivers is the Ohio River, which is the western border of the region. The Ohio River is formed by the confluence of the Alleghany and Monongahela Rivers in Pittsburgh, Pennsylvania and is the largest tributary of the Mississippi River. According to the WCI, the entire Ohio River (981 miles) is navigable. Navigation along the Ohio is a major economic asset to Jackson, Tyler, and Wood Counties. Numerous industrial facilities operate commercial docks along the river. The Little Kanawha River meets the Ohio at Parkersburg, and a brief portion of it is navigable in and around Parkersburg.

Economy

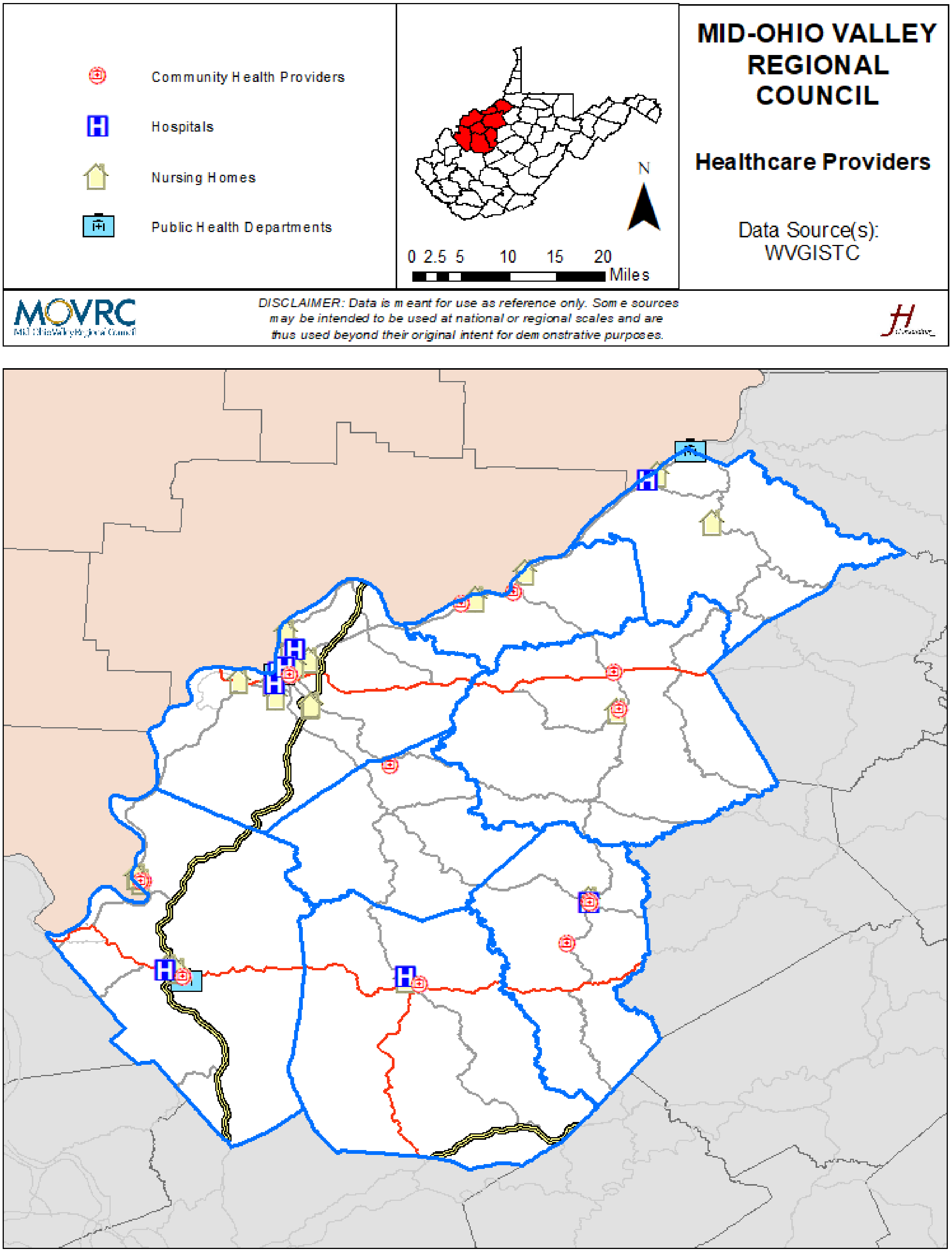
The region has a highly diverse economy, ranging from the education sector to healthcare, and natural resources and mining.

Top Ten Employers by County			
Calhoun	*Jackson*	*Pleasants*	*Ritchie*
Minnie Hamilton Healthcare, Inc.	Constellium Rolled Products Ravenswood, LLC	Pleasants County Board of Education	Simonton Industries, Inc.
Calhoun County Board of Education	Jackson County Board of Education	Cytec Industries, Inc.	Hall Drilling, LLC
Momentum Pipeline, LLC	Walmart	Simonton Industries, Inc.	Ritchie County Board of Education
Calhoun County Commission	Henkels & McCoy, Inc.	St. Mary's Correctional Center	Jay-Bee Oil & Gas, Inc.
Calhoun County Bank, Inc.	WVU Medicine	Summit Environmental Services, LLC	TLN Four, Inc. (McDonald's)
Calhoun County Committee on Aging, Inc.	Jackson County Commission	Pioneer Pipe, Inc.	Bruce Allen Incorporated
Geoforce Utility Technologies	Star Plastics, LLC	Zoetis, LLC	Pine View Nursing & Convalescent Home, Inc.
WV Division of Highways	Eldercare of Jackson County, LLC	Pleasants-Carehaven Operating, LLC	Ritchie County Commission
Waco Food, LLC	Kroger	Pleasants County Commission	Troy Nonwovens, LLC
WV Department of Health and Human Resources	Penske Logistics, LLC	Helping Hands for Independent Living	P & B Supermarkets and RKE Corporation
Roane	*Tyler*	*Wirt*	*Wood*
Roane General Hospital	Momentive Performance Materials USA, Inc.	WVUHS Home Care, LLC	United States Department of Treasury
Roane County Board of Education	Tyler County Board of Education	Wirt County Board of Education	WVU Medicine
Walmart	Mentor Management, Inc.	EWV Holdings, LLC	Wood County Board of Education
Armacell, LLC	Tyler County Commission	Wirt County Health Services Association	Dupont/Chemours
R & S Mills, Inc. (McDonald's)	Quality Carriers, Inc.	WV Division of Highways	Walmart
Humana Insurance Company	Real Alloy Recycling, LLC	AJC Ventures, LLC	Westbrook Health Services, Inc.
Roane County Commission	201 Wood Street Operations, LLC	Ellison Dozer Services, Inc.	West Virginia University
825 Summit Street Operations	Council of Senior Tyler Countians, Inc.	Wirt County Commission	Linx Community Services, LLC
Roane County Family Health Care, Inc.	Sistersville Tank Works, Inc.	Athley Development Corporation, Inc.	Lowes Home Venters, Inc.
Rock Forge Bridge Company, LLC	WV Division of Highways	United State Postal Service	City of Parkersburg

SOURCE: Workforce WV, 2021

<u>Healthcare</u>

Five general care hospitals serve the Mid-Ohio Valley region (i.e., hospitals not listed as specialty or psychiatric). The facilities are in Calhoun, Jackson, Roane, Tyler, and Wood Counties. There are no hospitals in Pleasants, Ritchie, or Wirt Counties. The region is also served by numerous rural health clinics and federally-qualified health centers that can provide family care and non-acute emergency services.


Community Health Providers
Hospitals
Nursing Homes
Public Health Departments
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Healthcare Providers
Data Source(s): WVGISTC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Climate

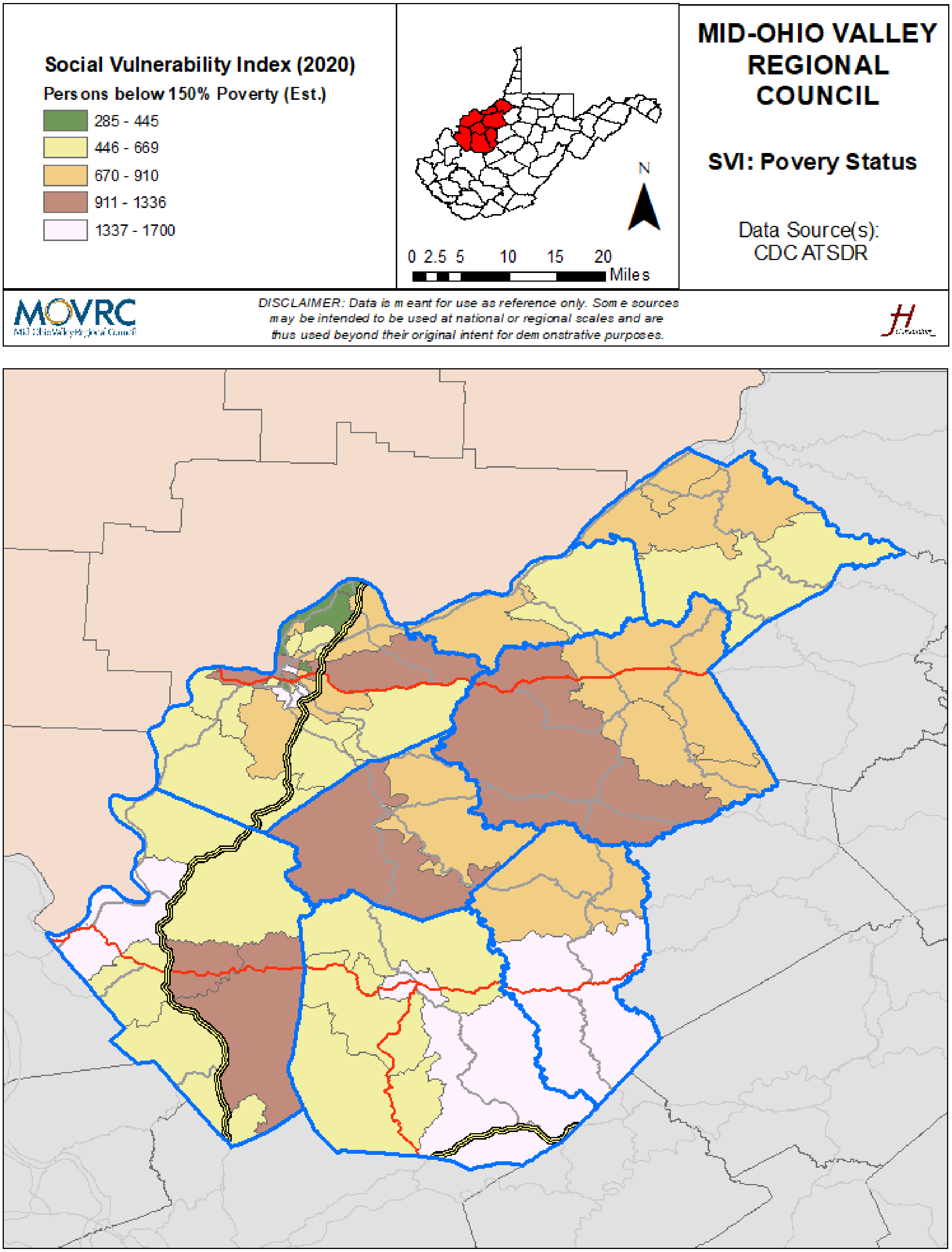
West Virginia generally has a humid subtropical climate, except at higher elevations, such as those found in the eastern portion of the state. The Mid-Ohio Valley region is in the humid subtropical climate with warm hot summers, significant summer humidity, and chilly winters. According to U.S. Climate Data (2022a), Parkersburg, located on the Ohio River, has an annual average high temperature of 65° Fahrenheit and an average low temperature of 44° Fahrenheit. Parkersburg has an average rainfall of 42.08" and an average snowfall of 11". Spencer, located in the eastern portion of the region has a higher annual snowfall, 26" (U.S. Climate Data, 2022b), as lower elevations along the Ohio River have slightly less wintry conditions along the western edge of the region.

Social Vulnerability

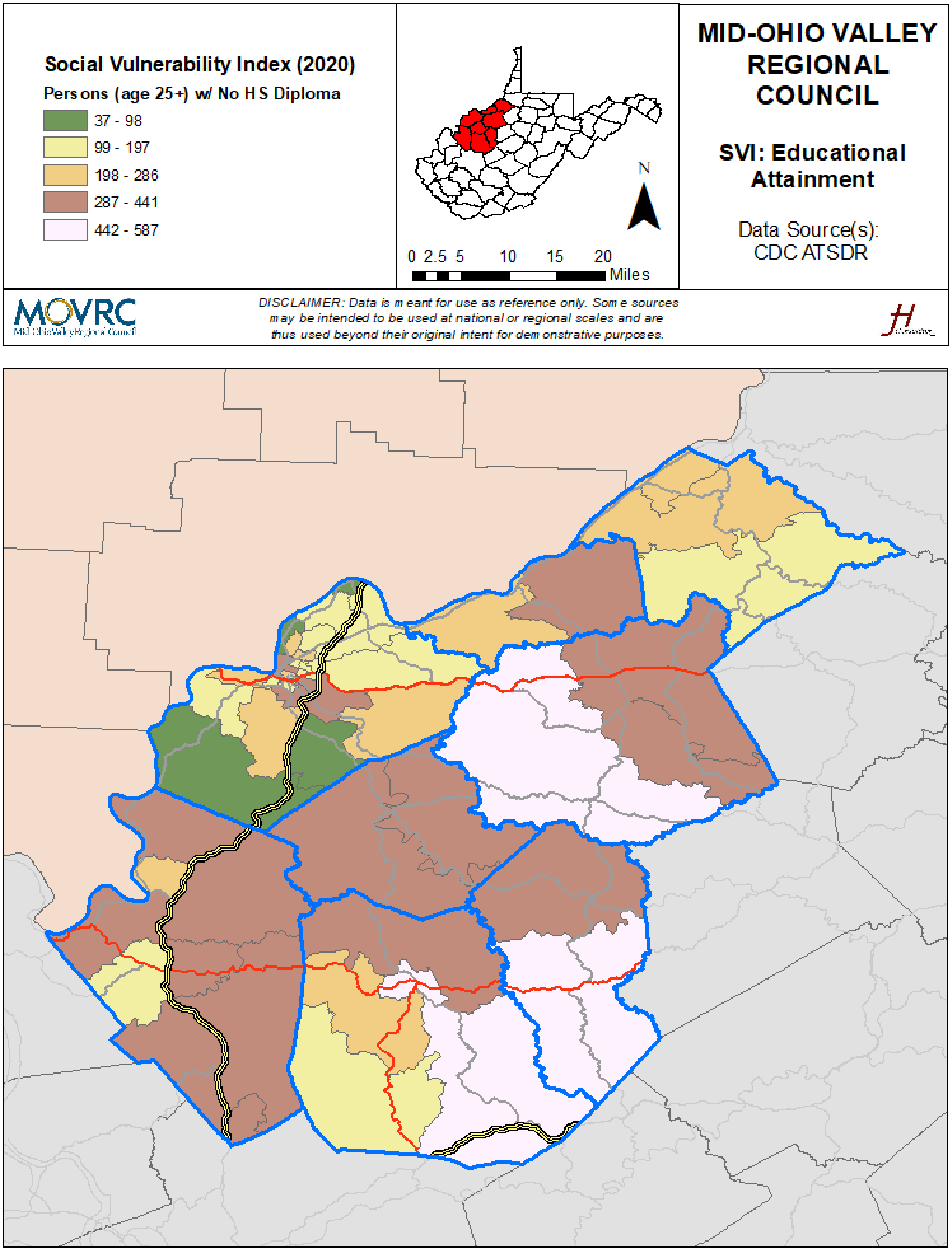
The Agency for Toxic Substances and Disease Registry (ATSDR), a division of the Centers for Disease Control and Prevention (CDC) has developed a "social vulnerability index" (SVI) that measures and compares social vulnerability among census tracts. The ATSDR defines social vulnerability as the degree to which certain social conditions in a community, including poverty, car ownership, or the number of people in a household may affect the community's ability to prevent human suffering and financial loss in the event of a disaster (2022). The dataset includes numerous variables informed by data collected and developed by the Census Bureau; data sources include the American Community Survey (ACS) administered between 2018 and 2020 (ATSDR, 2022).

Poverty and Educational Attainment

The SVI includes a variable that measures the estimated number of persons who live below the poverty level. Researchers at the CDC, who authored *A Social Vulnerability Index for Disaster Management*, explain that, "economically disadvantaged populations are disproportionately affected by disasters" (Flanagan, Gregory, Hallisey, Heitgard, & Lewis, 2011). The poor are less likely to have the income or assets needed to properly prepare for a possible disaster, or to recover after a disaster occurs (Cutter, Boruff, & Shirley, 2003). These areas will need significant support during recovery activities, and could greatly benefit from targeted mitigation. Closely associated with the poverty level is the unemployment rate. The following graphic identifies, by Census tract, the number of persons below 150% poverty (ATSDR, 2022).


Social Vulnerability Index (2020)
Persons below 150% Poverty (Est.)
285 - 445
446 - 669
670 - 910
911 - 1336
1337 - 1700
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Povery Status
Data Source(s):
CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Scholars consider education as a socioeconomic variable, though the relationship between education and vulnerability is not absolutely understood (Flanagan et al, 2011). Education associates with both income and poverty. Many people without a high school diploma will struggle to find steady, well-paying jobs. This is especially true within the boom and bust cycles associated with natural resource industries. During boom times, these residents can earn decent wages, but when the industry enters a bust cycle there is little on which to fall back. Applying for federal aid and other recovery activities requires the proper completion of complex paperwork. For people with less education, the practical and bureaucratic hurdles to cope with and recover from disaster prove increasingly difficult to surmount (Morrow & Gladwin, 1999). The following image shows the persons (age 25+) in each Census tract with no high school diploma (ATSDR, 2022).

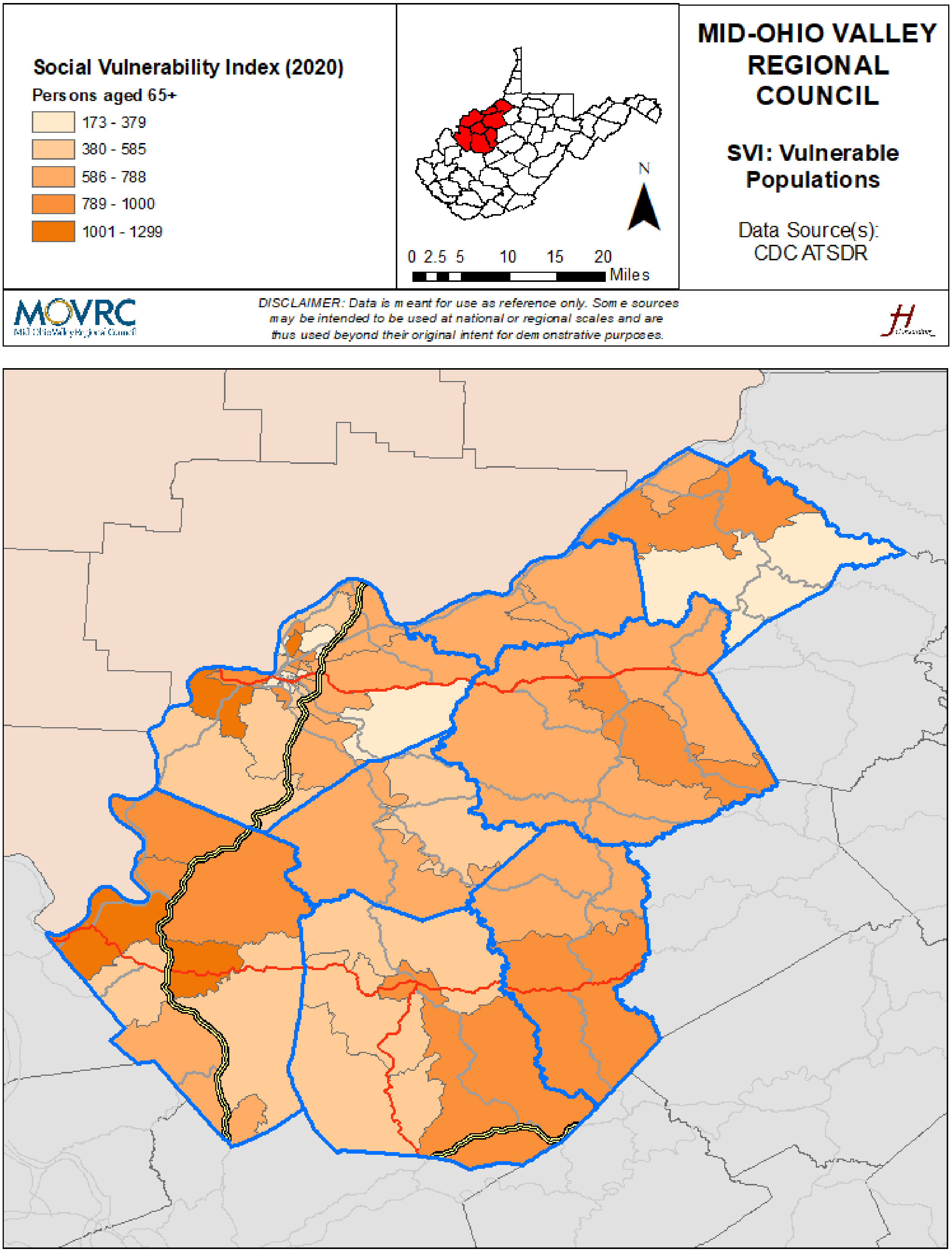

Social Vulnerability Index (2020)
Persons (age 25+) w/ No HS Diploma
37 - 98
99 - 197
198 - 286
287 - 441
442 - 587
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Educational Attainment
Data Source(s):
CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Access to Internet

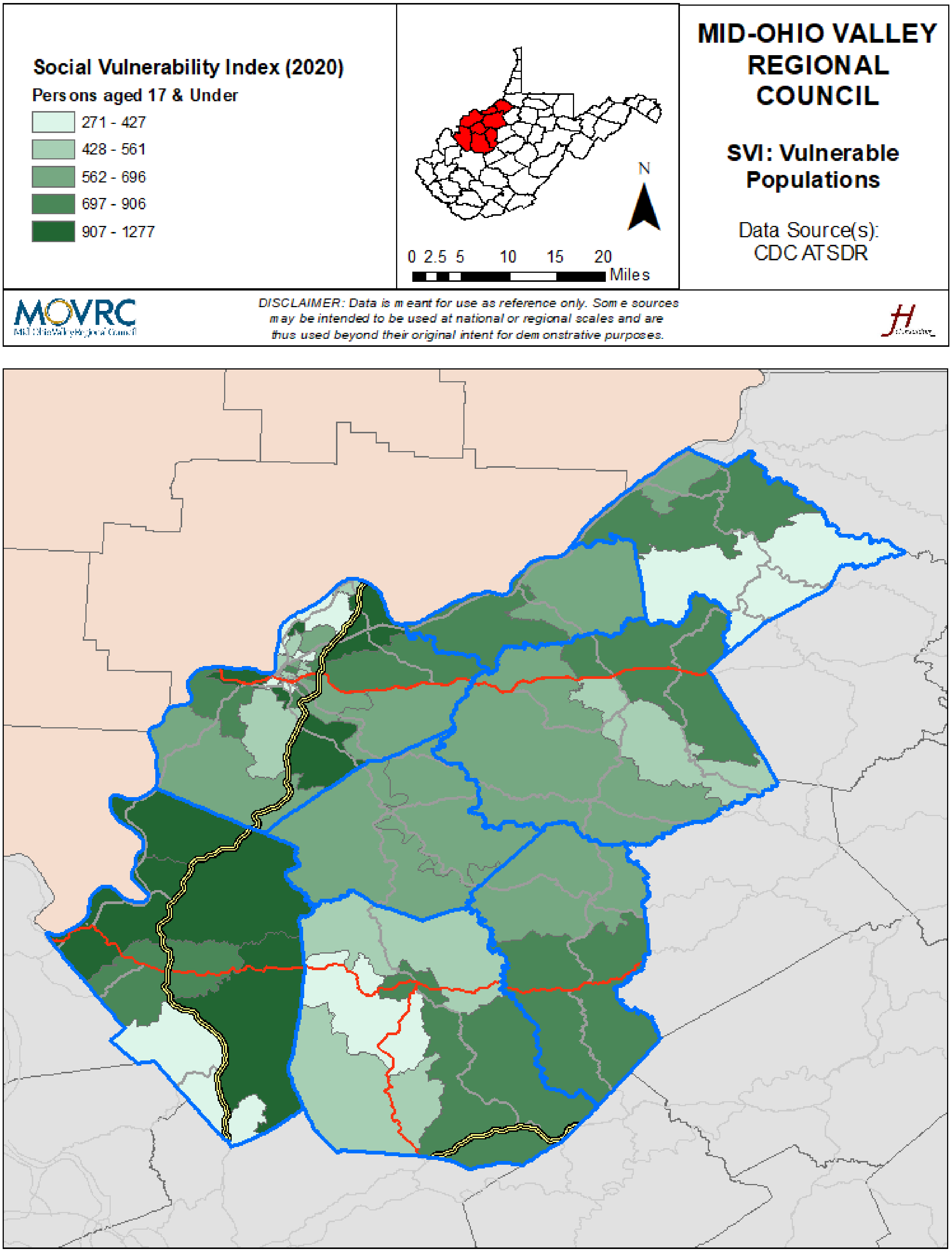
During the COVID-19 pandemic, the internet kept many connected to work, school, family, and friends. However, a Gallup analysis shows “more than half a billion of the world’s most-vulnerable people, who were struggling to meet even their basic food and shelter needs and didn’t have anyone to help them, didn’t have internet access” (Ray, Pugliese, & Espova, 2020). Inequality in income and of opportunity worsens due to disadvantaged groups of people who live in rural areas that have limited, or no internet access (Garcia-Escribano, 2020).

Household Composition

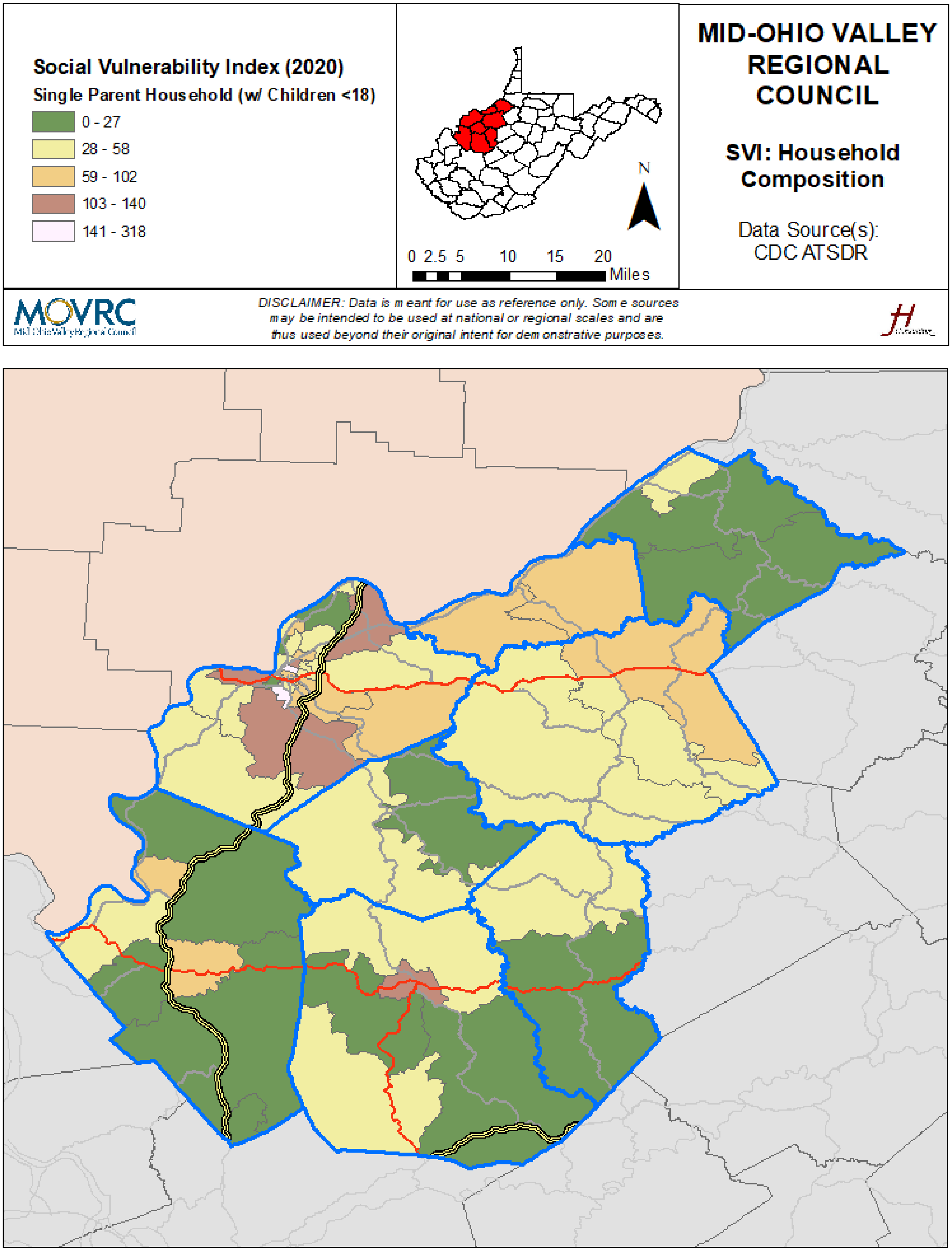
The household composition section of the SVI includes variables measuring vulnerable ages and vulnerable households. Vulnerable ages include those under the age of 18 and those over the age of 65. Multiple researchers have concluded that children and elders are the most vulnerable groups in disaster events (Flanagan et al, 2011). Nearly 75% of the victims of Hurricane Katrina were elderly (Phillips, Thomas, Fothergill, & Blinn-Pike, 2010). Many elderly citizens have disabilities that require the assistance of either machines (e.g., oxygen concentrators) or others (e.g., difficulty walking). The family members or neighbors who typically assist elderly persons may be either overwhelmed by the disaster or physically unable to gain access to those persons (Flanagan et al, 2011). Extended power outages will disproportionality effect elderly populations. The figure below shows the estimated populations, by Census tract, aged 65 and over (ATSDR, 2022).


Social Vulnerability Index (2020)
Persons aged 65+
173 - 379
380 - 585
586 - 788
789 - 1000
1001 - 1299
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Vulnerable Populations
Data Source(s): CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Children, and especially the very young, generally cannot protect themselves and are heavily reliant on their care takers for protection and care. Scholars have determined that children are rarely incorporated into disaster planning and scenario exercises due to the assumption of parental responsibility (Martin, Bush, & Lynch 2006). By not including this population in the planning process, responders are not adequately prepared or equipped to deal with children. The map below shows populations aged 17 and under, by Census tract (ATSDR, 2022).

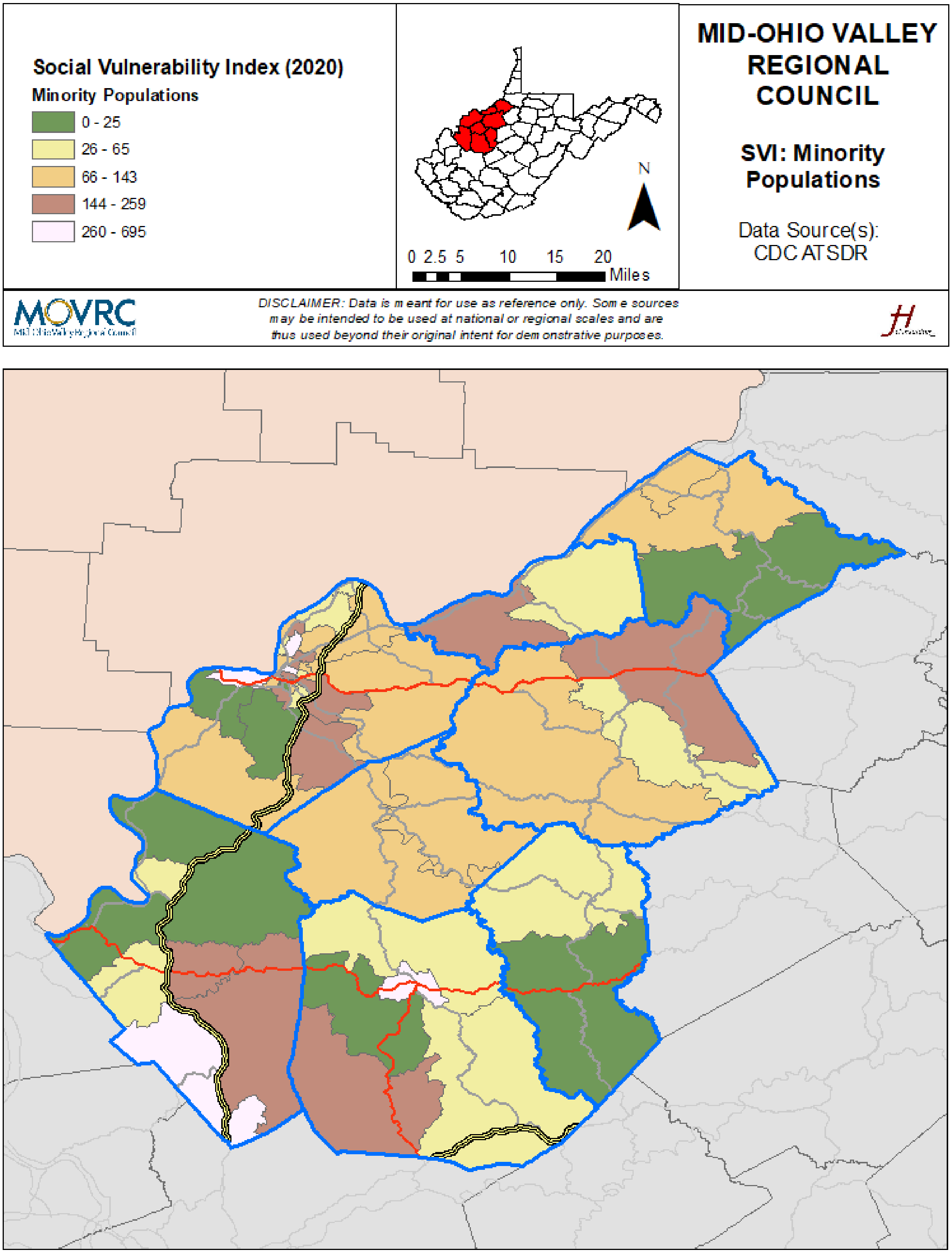

Social Vulnerability Index (2020)
Persons aged 17 & Under
271 - 427
428 - 561
562 - 696
697 - 906
907 - 1277
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Vulnerable Populations
Data Source(s):
CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

The final variable among the housing composition grouping is the percent of households that are single-parent households with children who are under the age of 18. Similar to the discussion of previous variables, children are among the most vulnerable of populations, while single-parent households are among the lowest socioeconomic status households. These households are especially vulnerable during a disaster because all the caretaker duties fall to one parent, who must also deal with the disaster event and recovery from that event (Flanagan et al, 2011). The following graphic shows, again by Census tract, the number of single parent households with children under 18 in the home (ATSDR, 2022).

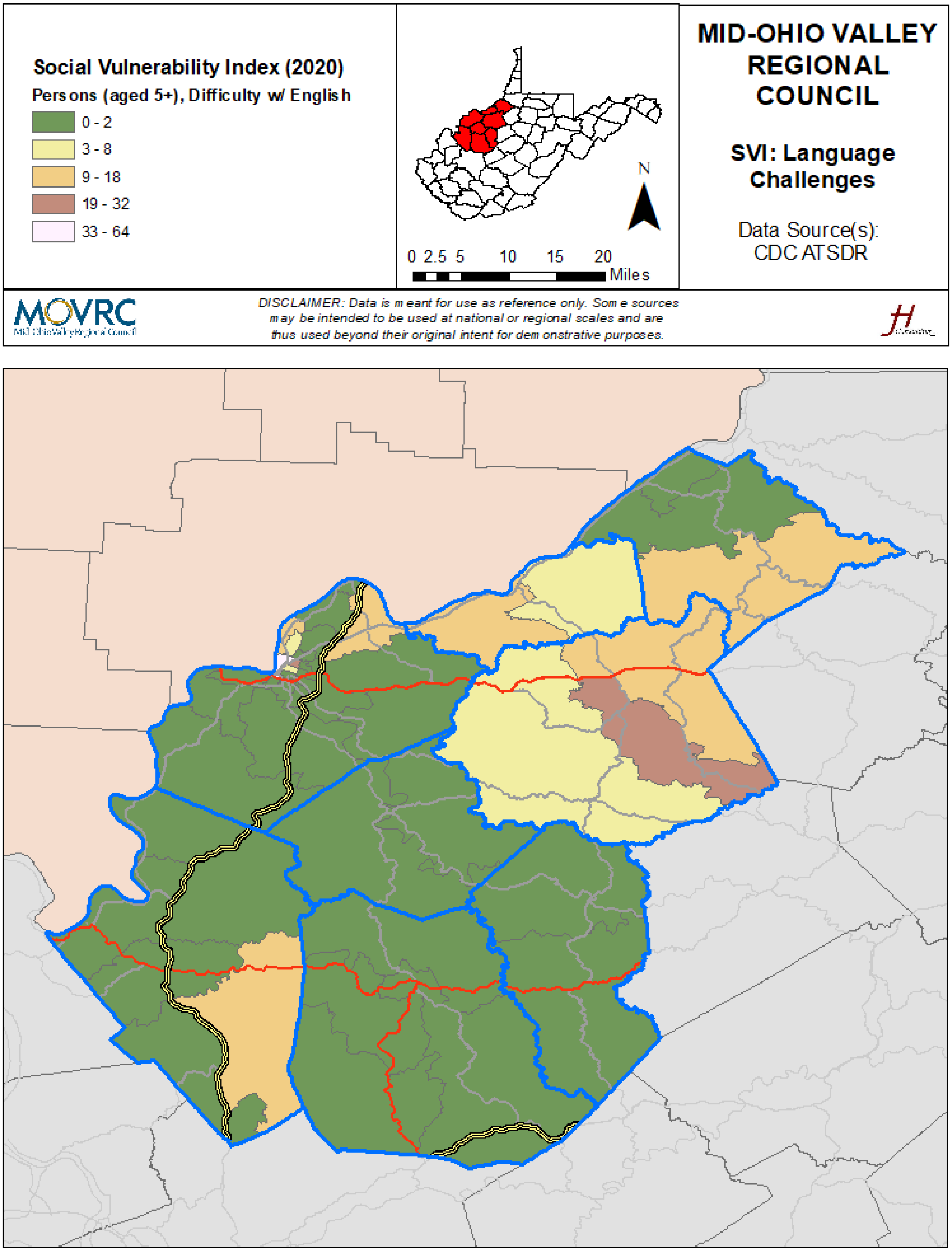

Social Vulnerability Index (2020)
Single Parent Household (w/ Children <18)
0 - 27
28 - 58
59 - 102
103 - 140
141 - 318
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Household Composition
Data Source(s):
CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Minority Status/Language

Several studies have found that the overall marginalization of racial and ethnic minority groups has made these populations more vulnerable during all stages of a disaster (Flanagan et al, 2011). Specifically, studies have shown that populations of African Americans, Native Americans, Asian Americans, Pacific Islanders, and those of Hispanic origin are correlated with higher vulnerability rates (Flanagan et al, 2011). The following graphic shows minority populations by Census tract (i.e., Hispanic or Latino of any race; Black and African American, not Hispanic or Latino; American Indiana and Alaska Native, not Hispanic or Latino; Native Hawaiian and other Pacific Islander, not Hispanic or Latino; two or more races, not Hispanic or Latino; other races, not Hispanic or Latino) (ATSDR, 2022).

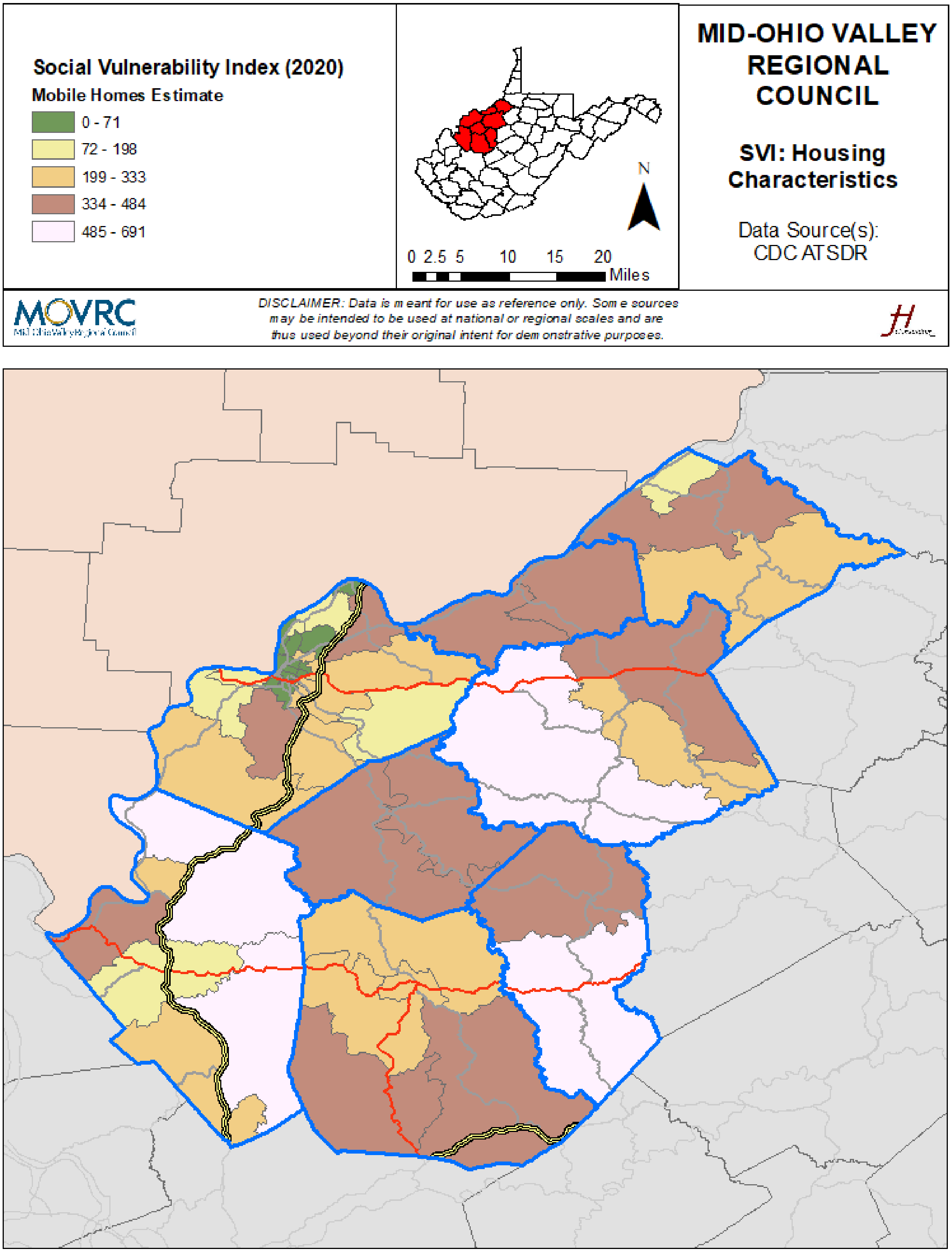

Social Vulnerability Index (2020)
Minority Populations
0 - 25
26 - 65
66 - 143
144 - 259
260 - 695
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Minority Populations
Data Source(s): CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

A specific variable among minorities that can greatly increase their vulnerability during a disaster is an inability to speak or read English well, or at all. While small in comparison to the overall population of the region, this population is exceedingly vulnerable. Without accurate translations, these populations may not understand impending disasters, preparedness warnings, or evacuation notices. Research has shown that immigrant populations are more likely to rely on relatives, friends, and neighbors for information, rather than official sources (Flanagan et al., 2011). The map below shows persons (age 5+) who speak English “less than well,” by Census tract (ATSDR, 2022).

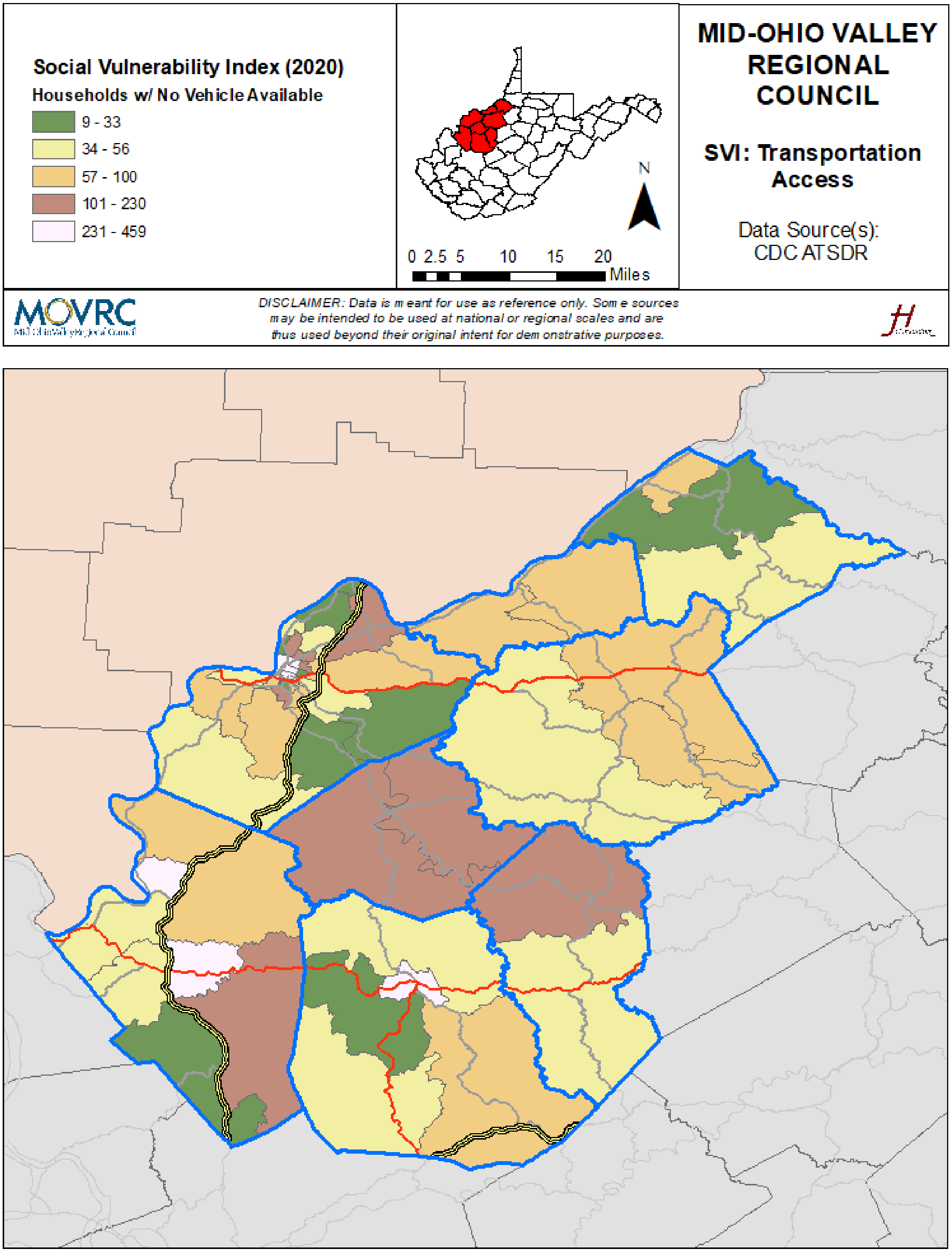

Social Vulnerability Index (2020)
Persons (aged 5+), Difficulty w/ English
0 - 2
3 - 8
9 - 18
19 - 32
33 - 64
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Language Challenges
Data Source(s):
CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Housing/Transportation

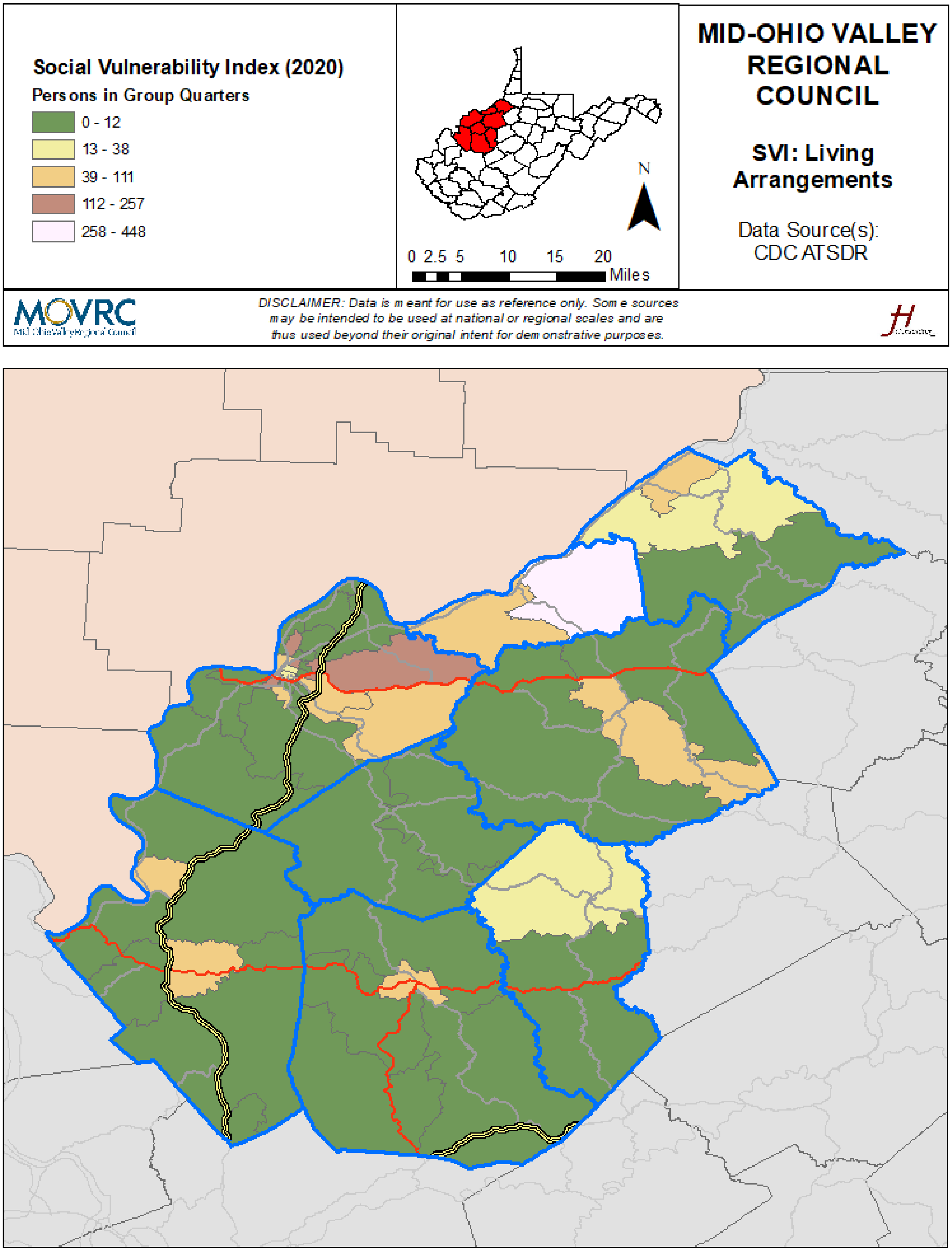
The SVI includes a number of variables that describe housing and transportation, three of which appear here: mobile homes, vehicle ownership/access, and institutionalized housing. Housing quality is an important factor in evaluating vulnerability and is closely tied with socioeconomic status and personal wealth (Flanagan et al, 2011). Mobile homes, which typically are inhabited by those of lower socioeconomic groups, are not designed to withstand severe weather events or flooding. Mobile homes are frequently found outside of metropolitan areas, making access difficult in regular conditions, even more so during and immediately after a disaster (Flanagan et al, 2011). Mobile homes are often clustered in communities, which increases the overall vulnerability of these communities (Flanagan et al, 2011). The following graphic provides an estimate of mobile homes by Census tract (ATSDR, 2022).


Social Vulnerability Index (2020)
Mobile Homes Estimate
0 - 71
72 - 198
199 - 333
334 - 484
485 - 691
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Housing Characteristics
Data Source(s):
CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Vehicle ownership/access is crucial to being prepared as well as evacuating, when needed. Those who do not possess (or have access to) a vehicle will have difficulty going to stores in order to obtain preparedness supplies and will have less capacity to bring those supplies back to their home. This is even more pronounced in rural areas, which typically lack robust public transportation networks. Little Kanawha Bus provides limited services to Calhoun, Jackson, and Roane Counties. Wood County has limited services provided by Mid-Ohio Transit Authority. Other areas of the region may have services provided by appointment-only services, including those that offer specialized service such as wheelchair vans. Providers would likely be overwhelmed prior to an impending disaster such as a snow storm, and would likely not operate immediately following an event. The graphic below shows an estimated number of households, by Census tract, with no vehicle available (ATSDR, 2022).


Social Vulnerability Index (2020)
Households w/ No Vehicle Available
9 - 33
34 - 56
57 - 100
101 - 230
231 - 459
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Transportation Access
Data Source(s):
CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

The final housing vulnerability variable to discuss is those who live in institutional settings. These include college dorms, farm worker's dormitories, health institutions, and prisons, which present special concerns for evacuations (Flanagan et al, 2011). Nursing homes and other residential medical facilities are particularly vulnerable. The increased vulnerability is due to the special and timely needs of the residents, and because of understaffing in these institutions in emergencies (Flanagan et al, 2011). Evacuating these facilities is a time and resource consuming operation, requiring numerous specialty vehicles and staff such as advanced life support ambulances. While these facilities will have backup generators for vital machines, in an extended power outage, these generators will need additional fuel deliveries. According to data from the West Virginia Office of Health Facility Licensure & Certification (2013), there are 14 licensed nursing homes in the region. The map below estimates the persons living in group quarters by Census tract (ATSDR, 2022).

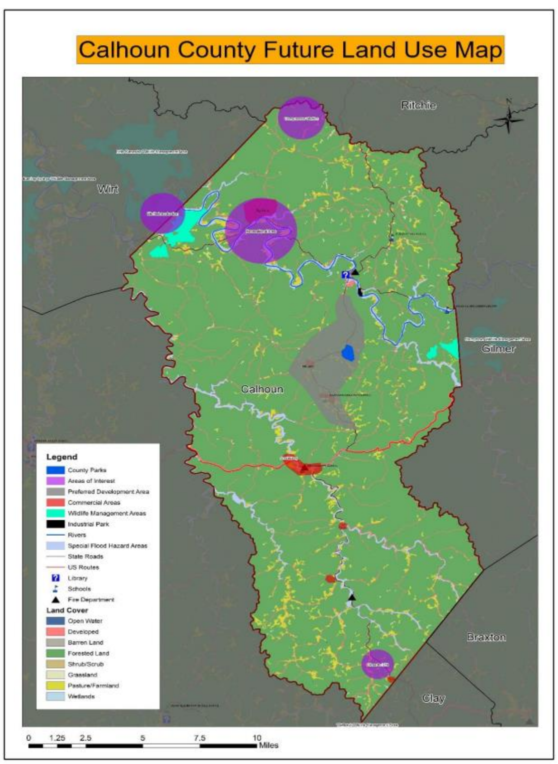

Social Vulnerability Index (2020)
Persons in Group Quarters
0 - 12
13 - 38
39 - 111
112 - 257
258 - 448
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SVI: Living Arrangements
Data Source(s): CDC ATSDR
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

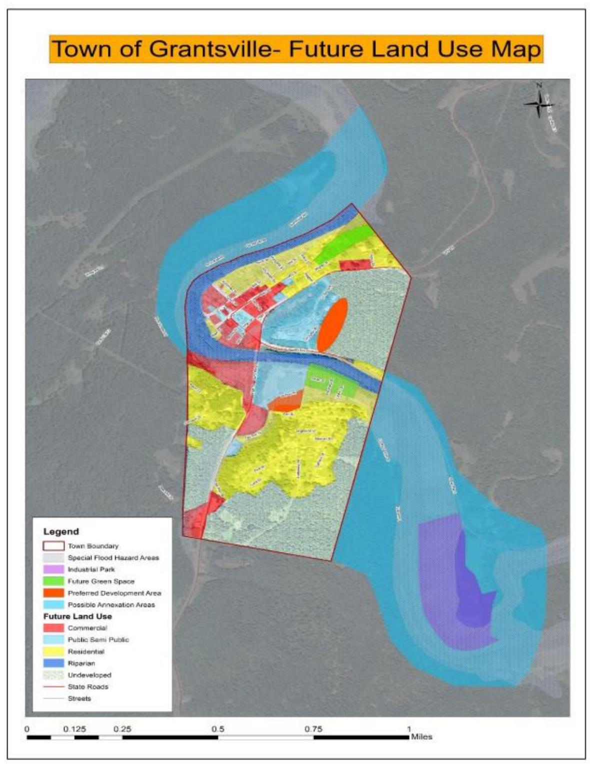
Development and Other Trends

§201.6(c)(2)(ii)(C)	[The plan should describe vulnerability in terms of] providing a general discussion of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

For several years, development decisions have stemmed from a desire to slow out-migration from the region. The focus is on developing the economic base to allow for the presence of good-paying jobs that may attract people to the counties of the region. These types of decisions are deceptively simple. Rather than recruit new residents (or lure native residents back) to the region, local leaders must ensure that the housing stock can absorb population changes, recreational opportunities will entice potential residents, school systems can compete with other communities around the country, etc.

Several county-level initiatives (e.g., comprehensive plans, development authority actions, etc.) identify areas in the region's counties that may be targeted for various development. The Calhoun County comprehensive plan (2021) includes future land use designations for both the county and the Town of Grantsville. The county's map shows four "areas of interest," and Grantsville's map is a more traditional-looking land use map.





As another (non-plan) example, Berkshire Hathaway Energy recently made a substantial investment in Jackson County, with the potential to bring up to 1,000 jobs to the area (McElhinny, 2022). Local officials and the MOVRC have been coordinating efforts to examine how to support that potential influx of people, to include infrastructure (i.e., water/sewer) upgrades and identifying areas suitable for housing development. Existing areas in Jackson County, like Ripley and Ravenswood, offer redevelopment opportunities (particularly for housing), but the Fairplain and Millwood areas are also potential sites for commercial and residential development.

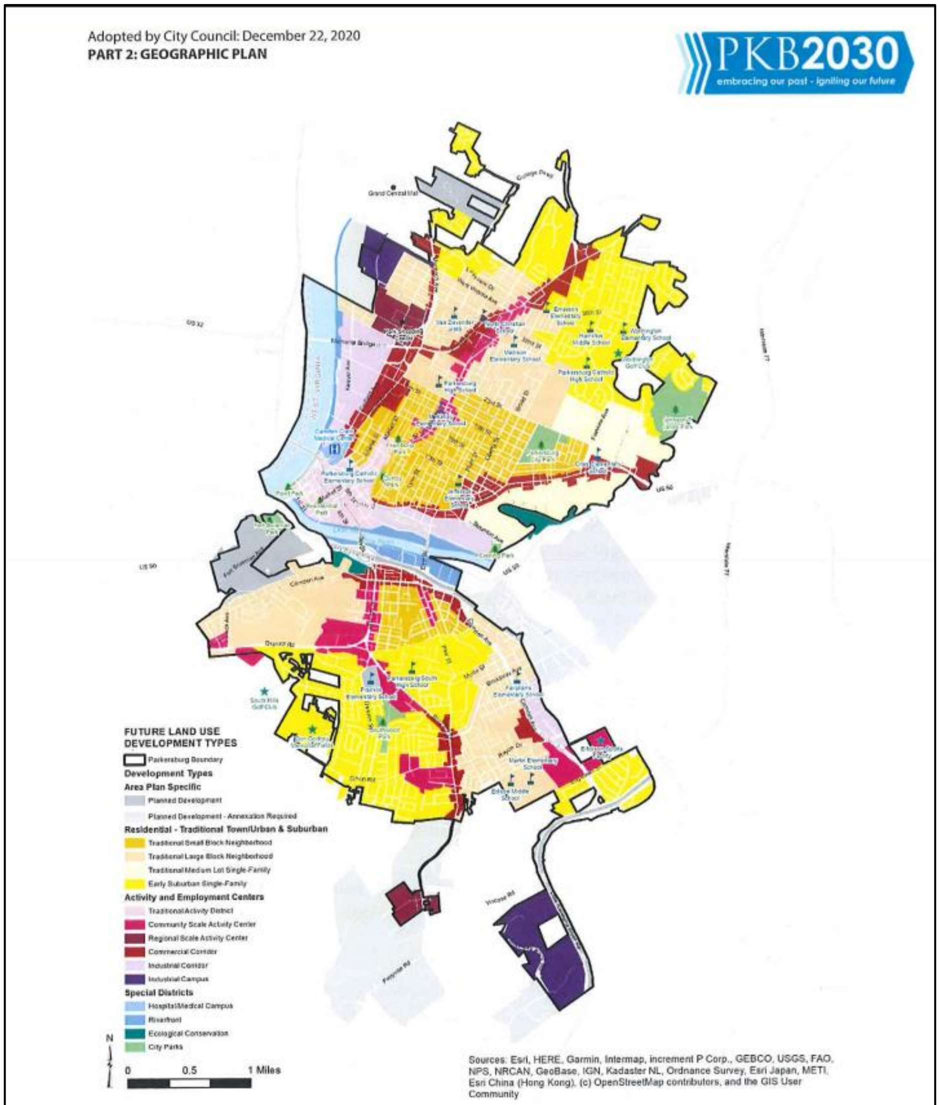
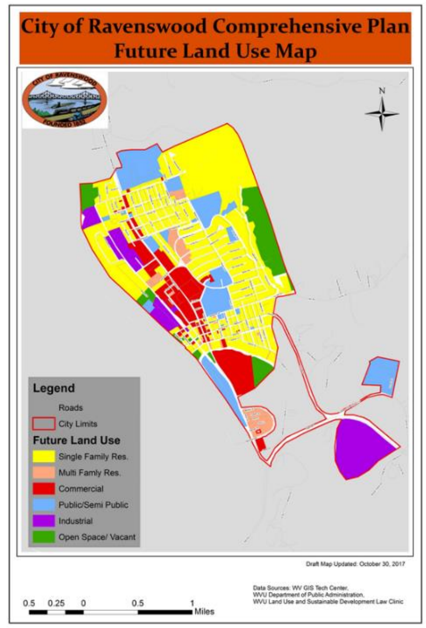


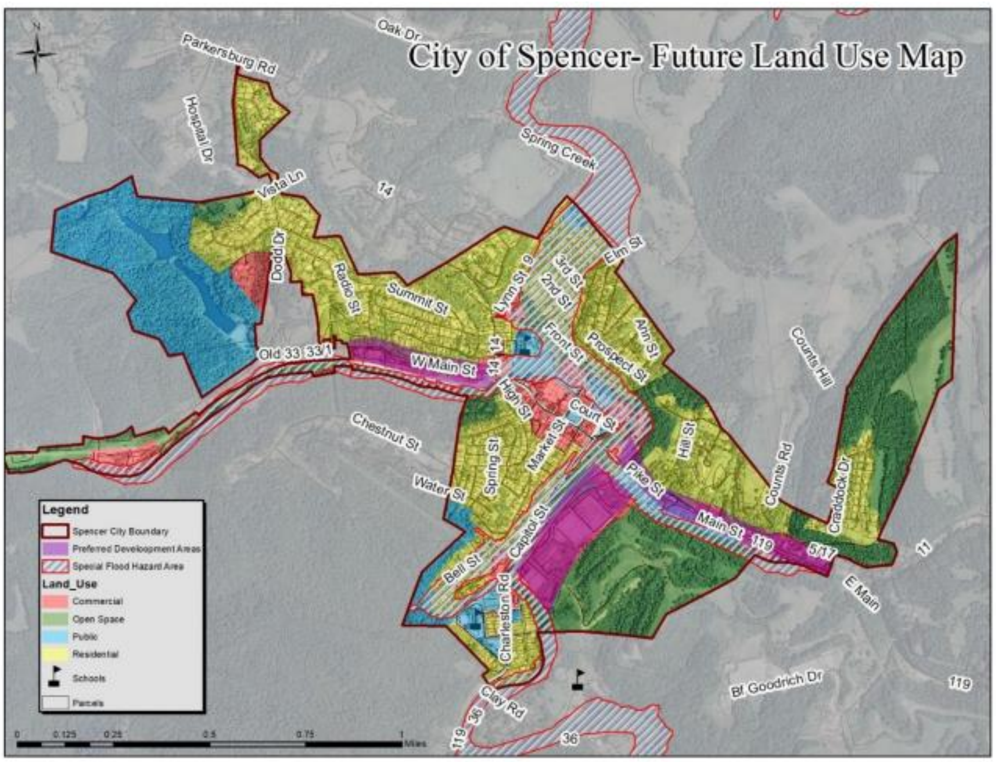
Figure 3: Future Land Use Map (Development Types)

Parkersburg's PKB2030 plan (2020) includes a map entitled, "Future Land Use Development Types." This map, shown to the right, identifies large areas of commercial (the maroon-shaded areas) alongside various types of residential development (yellow areas), community scale activity areas (pink areas), and industrial areas (light and dark purple areas). Note the development in the downtown core, but remember that a levee system provides flood protection in this area.

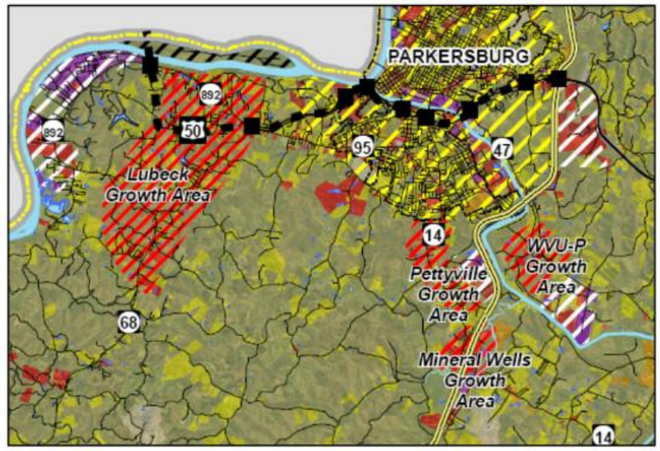
The Ravenswood comprehensive plan (2018) includes a future land use map (see at right). This map identifies large segments targeting single family residential development as well as smaller areas of multi-family residential development. Commercial development appears in the downtown core of the city. The plan also includes considerations for open space.



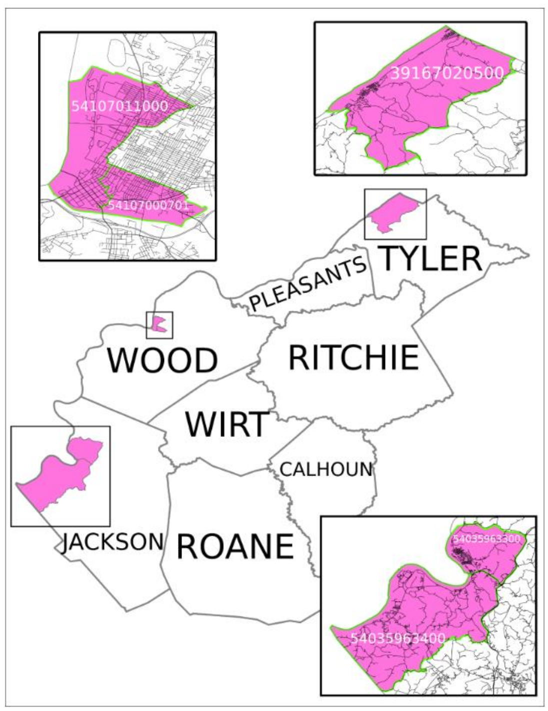
Spencer's comprehensive plan (2021) also includes a future land use map that identifies significant areas for open space along with residential development. This map, see below, also identifies "preferred development areas," and though these preferred areas generally steer clear of the special flood hazard area noted on the map, they are adjacent to them.



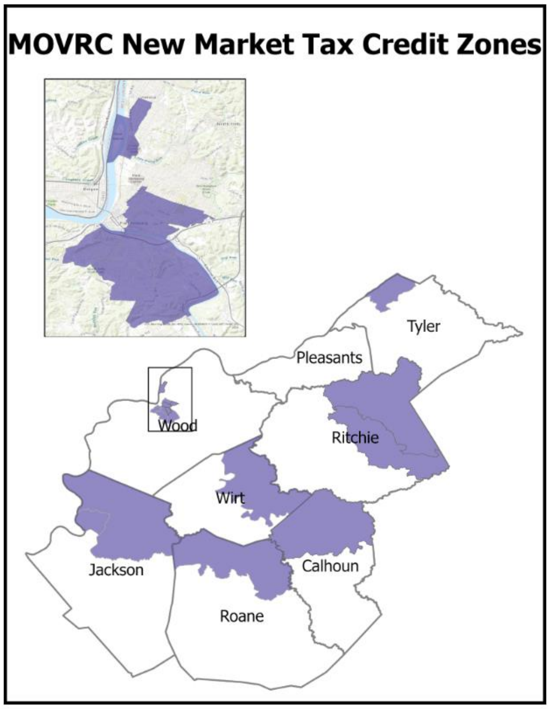
Wood County's plan supports the ongoing development of WVU-Parkersburg as well as the cities of Parkersburg, Vienna, and Williamstown regarding riverfront development. The plan highlights the Polymer Technology Park near Davisville. The plan generally identifies Pettyville, Mineral Wells, areas around WVU-P, Davsville, Lubeck, Washington Bottom, and Waverly as "growth areas" (see image at right).



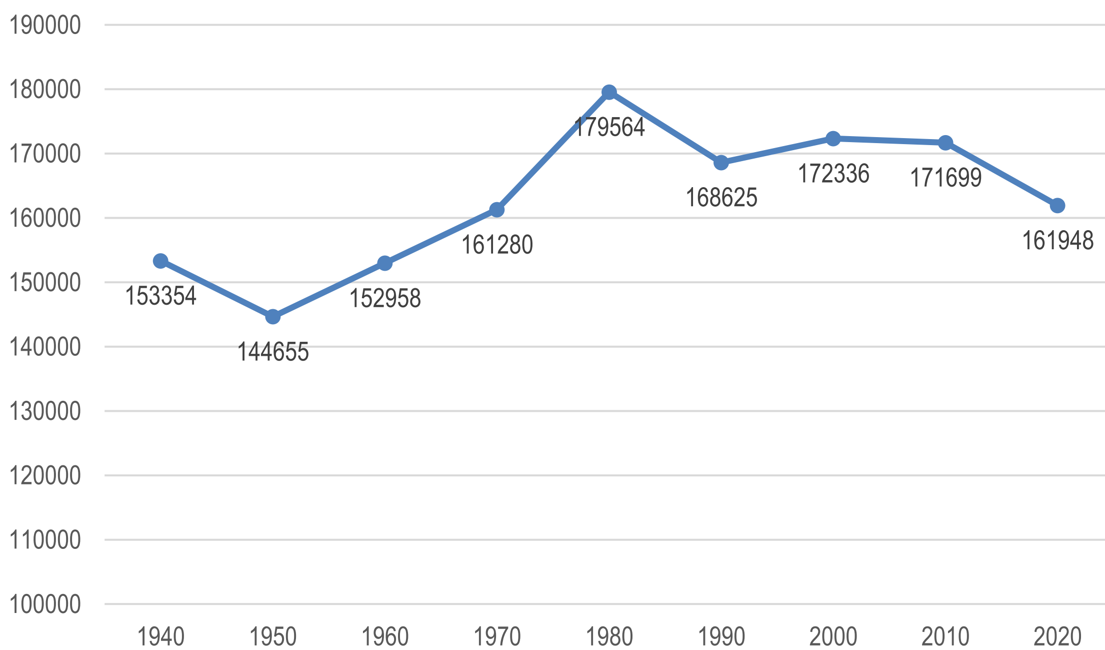
According to the MOVRC's Comprehensive Economic Development Strategy (CEDS) for 2021, there are several qualified opportunity zones (QOZ) in the region. These are economically distressed communities where new investments, under certain conditions, may be eligible for preferential tax treatment. These areas may be preferential for new development. The graphic below depicts these areas.



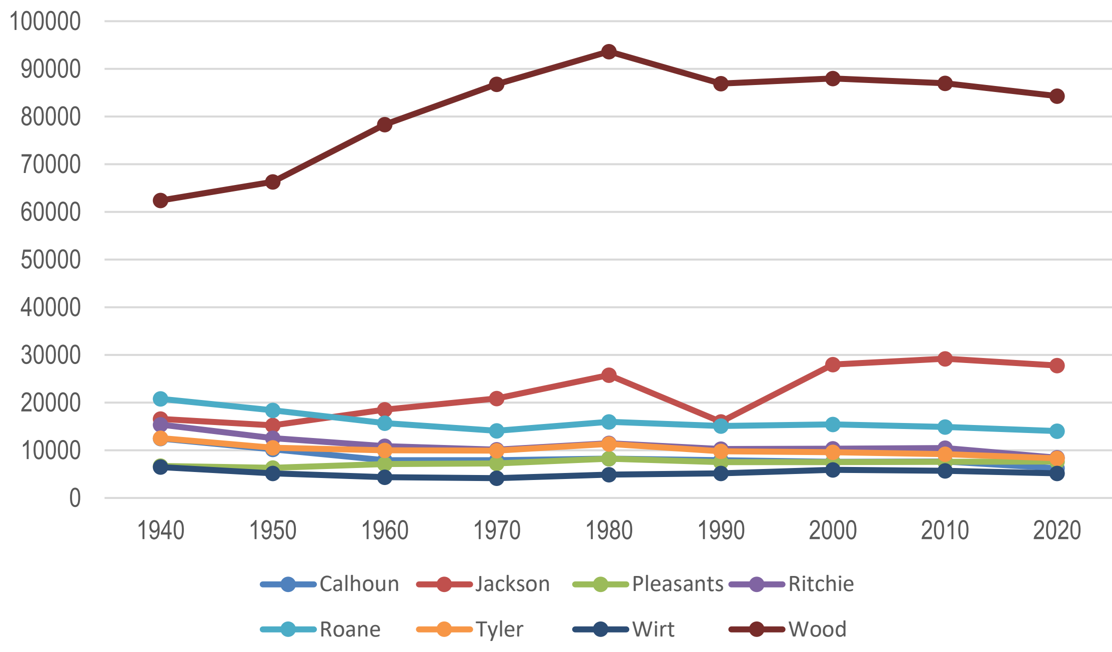
Similarly, the following graphic shows the new market tax credit zones in the region.



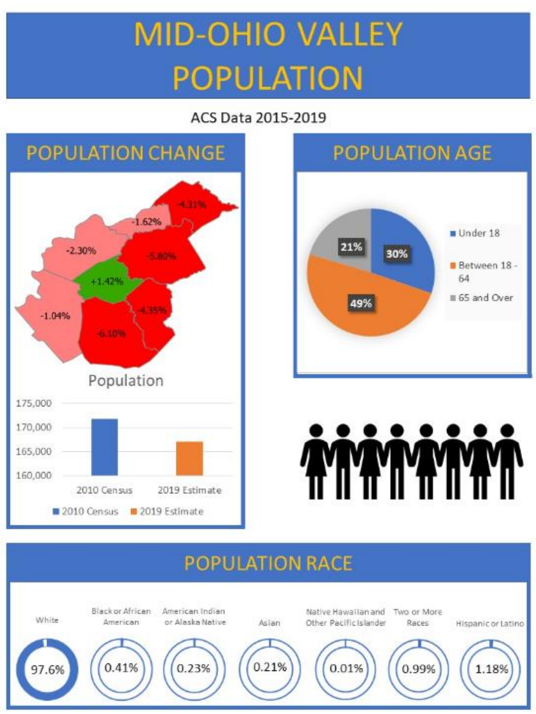
The U.S. Census keeps records of population through the years; every 10 years, the bureau updates data through a decennial census. Though the region has experienced a net increase in population over 1940 totals, there has been a steady decline in population since a 1980 peak. The graph below shows the population trends in the Mid-Ohio Valley region since 1940.



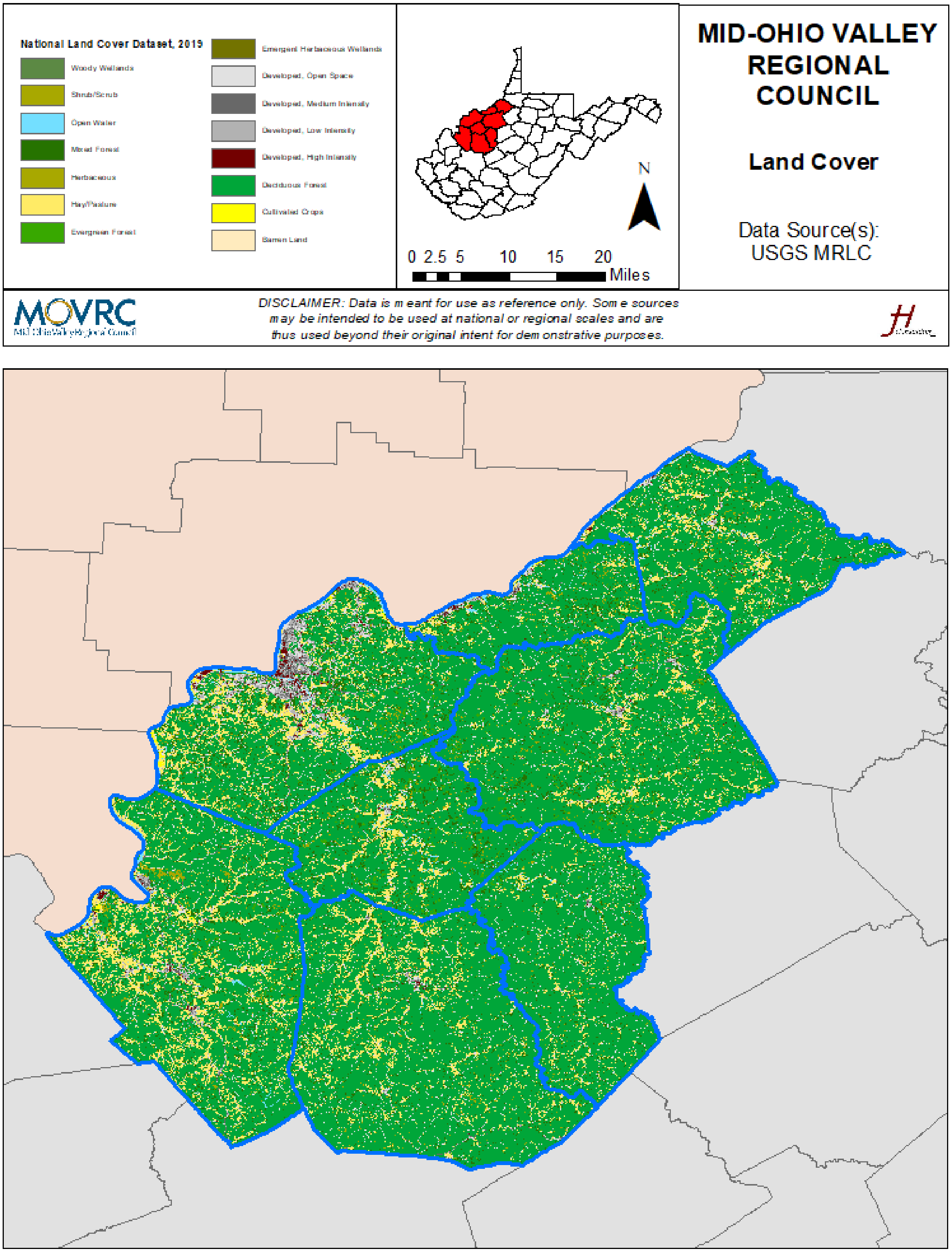
The line graph below shows the county population change over the same period.



Finally, within the MOVRC's CEDS (2021), planners examined population change over the five-year period 2015 to 2019 with data from the Census Bureau's American Community Survey.



The region's land use is varied. Generally, the areas that are prime for residential, commercial, and industrial development are the areas that already see that type of land use. They are the areas most accessible to transportation infrastructure, and in some cases, re-development of these areas is a fiscally-responsible way to invest in the region's communities. The map below shows the land use of the Mid-Ohio Valley region.


National Land Cover Dataset, 2019
Woody Wetlands
Shrub/Scrub
Open Water
Mixed Forest
Herbaceous
Hay/Pasture
Evergreen Forest
Emergent Herbaceous Wetlands
Developed, Open Space
Developed, Medium Intensity
Developed, Low Intensity
Developed, High Intensity
Deciduous Forest
Cultivated Crops
Barren Land
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Land Cover
Data Source(s):
USGS MRLC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Other trends affecting the area are those also impacting a much wider area. These trends, including an aging infrastructure, construction and development practices, and climate change, change the nature of the region's communities. In some cases, they may exacerbate the impacts of the risks faced by the region. See also the "Future Occurrences" sections of each hazard profile in Section 2.2.

Several of the future occurrence discussions in the hazard profiles will reference the Nation's (and the region's) aging critical infrastructure. The public survey conducted for the 2022 update highlighted residents' concern about severe summer storms. Anecdotally, much of that concern stems from the cascading impact of those storms: power outages. Prolonged power outages can be devastating to a community, particularly when considering the networked communications systems that we employ. Power outages stem from myriad variables, including more intense storms, but also because of a more fragile power system. Similar statements could be made regarding water distribution infrastructure, transportation systems, etc.

Construction and development practices also dictate various rends in communities. For example, urban areas are beginning to see redevelopment of their historic downtown or central city areas, attributable, in part, to shifts in urban lifestyle preferences with the Millennial generation. While this shift is a welcome change for many communities, it represents a reversal from the urban sprawl type of development away from downtown cores of the past several decades (Buxton, n.d.). Sprawl-style development occurs on a smaller scale in communities like those of the Mid-Ohio Valley region. These trends impact communities in interconnected ways. The alter perceptions on land use; the presence of paved surfaces impacts water runoff and heat retainage. As and if development shifts away from these areas, communities may see very large, empty buildings in the middle of vast paved lots.

Perhaps one of the most significant trends has to do with the climate changes that communities are experiencing. "Climate change" is a divisive topic, and it has garnered substantial political attention in recent years. However, changes to the climate, regardless of the root cause, carry implications for risk and vulnerability to natural hazards is an important distinction between weather and climate. Weather refers to the atmospheric conditions of a geographical region over a short period, such as days or weeks. Climate, in contrast, refers to the atmospheric conditions of a geographic area over long periods, such as years or even decades (Keller & Devecchio, 2015, pp. 406-407). According to the U.S. Global Change Research Program, there are weather and climate changes already observed in the United States.

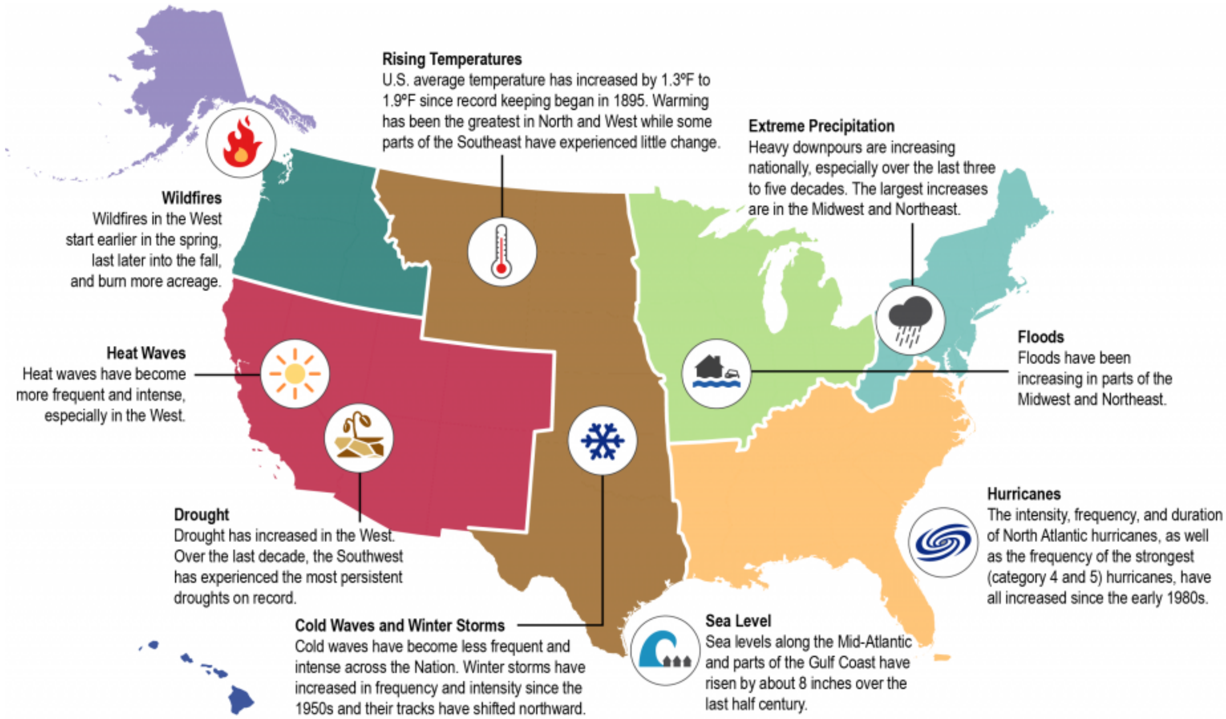
- Since recordkeeping began in 1895, the average U.S. temperature has increased by 1.3°F to 1.9°F, with most of the increase happening since 1970. Also, the first decade of the 2000s was the warmest on record.
- The average precipitation across the U.S. has increased since 1900, with some areas experiencing higher than the national average and some lower. Heavy downpours are increasing, especially over the last 30-50 years.
- Drought events have increased in the west. Changes in precipitation and runoff, combined with changes in consumption and withdrawal, have reduced surface and groundwater supplies in many areas.
- Some types of severe weather events have experienced changes. Heatwaves are more frequent and intense, and cold waves have become less frequent and intense overall.
- The intensity, frequency, and duration of North Atlantic hurricanes have increased since the early 1980s.

Climate change can have a significant impact on human health and the environment. The changes mentioned above can affect the environment by leading to changes in land use, ecosystems, infrastructure conditions, geography, and agricultural production. Extreme heat, poor air quality, reduced food and water supply and quality, changes in infectious agents, and population displacement can lead to public health concerns such as heat-related illnesses, cardiopulmonary illnesses, food, water, and vector-borne diseases and have consequences on mental health and stress (USGCRP, 2016).

The National Climate Assessment (NCA) defined climate trends for national U.S. regions in 2014. The major trends are:

- wildfires and heat waves on the west coast,
- rising temperatures and increased severity and frequency of winter storms in the middle of the country,
- more rain and flooding in the Midwest and northeastern parts of the country, and
- an increase in sea levels in the mid-Atlantic with a rise in hurricane activity in the southeastern states.

The Intergovernmental Panel on Climate Change (IPCC) largely concurs with the above list (IPCC, n.d.). In West Virginia, the trend will likely be an increase in extreme precipitation, as noted in the graphic below.



A balanced assessment of climate change trends recognizes areas of emerging scholarship alongside more thoroughly-researched data. For instance, many of the talking points in the IPCC data are supported by scientific research, but it is important to understand that vast numbers of studies are currently underway. As those studies conclude, new ones begin, and more longitudinal approaches contribute to the knowledge-based, what informs our understanding today may change, and perhaps significantly. Put more directly within the context of this hazard mitigation plan, evidence linking temperature extremes with climate is stronger than the evidence linking the rise in extreme precipitation, increased flooding, increased wildfires, etc. (C2ES, n.d.; Myhre et al., 2019; Rajkovich & Schwarz, 2022; Tabari, 2020; USEPA, 2022a). The evidence supporting the latter is more emergent (i.e., resulting from more recently-initiated study) than the former.

Additionally, communities may experience climate-related impacts that are very different from weather-related risks. There is a growing body of research examining whether climate migration will strain communities in various parts of the United States. For instance, sea level rise is an oft-noted impact of climate change, and one that will necessitate a series of very visible adaptations. People may move away from coasts or migrate to other areas besides coastal communities. Former Rust Belt communities along the Great Lakes, for example, may be a destination for the climate migrants because they have established infrastructures, and they are in areas that are relatively climate stable (as compared to coastal communities) (Hakala, 2022; Van Berkel, Kalafatis, Gibbons, Naud, & Lemos, 2022). Though not "Great Lakes communities," the Mid-Ohio Valley region is an area perhaps perceived as more climate stable than coastal communities, near traditional manufacturing centers, accessible via a variety of transportation means, etc. Communities may be faced with re-envisioning development decisions that have, for decades, focused on slowing out-migration toward a rapid escalation of growth to handle in-migration of individuals seeking relief from climate-related impacts[1].

[1] Local leaders should recognize that this is an area of emerging scholarship. It appears here as a trend worth monitoring.

1.0 INTRODUCTION

1.3 Capability Assessment

§201.6(b)(3)	Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

This section examines the existing capabilities of the Mid-Ohio Valley region and its participating jurisdictions. Specifically, this section looks at those capabilities that can support the implementation of hazard mitigation efforts. All jurisdictions in the region had an opportunity to complete a “capability self-assessment” via an online survey. Further, planners reviewed ordinances posted on websites, and Mid-Ohio Valley Regional Council (MOVRC) staff commented on the availability and enforcement of local ordinances. The table below provides a snapshot of the capabilities that may be available in the region.

Regional Capabilities (Non-Comprehensive)							
Municipality	*Comprehensive Plan*	*Building Codes*	*Zoning Ordinance*	*NFIP Participation*	*Funds in Capital Budget*	*Funds in Public Works Budget*	*Overall Capability*
Auburn, Town of	NO	YES	NO	YES	NO	NO	LOW
Belmont, City of	NO	YES	NO	YES	NO	NO	LOW
Cairo, Town of	NO	YES	NO	YES	NO	NO	LOW
Calhoun County	YES	YES	NO	YES	NO	NO	LOW
Elizabeth, Town of	NO	YES	NO	YES	NO	NO	LOW
Ellenboro, Town of	NO	YES	NO	YES	NO	NO	LOW
Friendly, Town of	NO	YES	NO	YES	NO	NO	LOW
Grantsville, Town of	YES	YES	NO	YES	NO	NO	LOW
Harrisville, Town of	NO	YES	NO	YES	NO	NO	LOW
Jackson County	NO	YES	NO	YES	UNK	UNK	MOD
Middlebourne, Town of	NO	YES	NO	YES	NO	NO	LOW
North Hills, Town of	NO	YES	NO	NO	NO	NO	LOW
Paden City, City of	NO	YES	YES	YES	NO	NO	LOW
Parkersburg, City of	YES	YES	YES	YES	YES	YES	HIGH
Pennsboro, City of	NO	YES	YES	YES	NO	NO	LOW
Pleasants County	NO	YES	NO	YES	NO	NO	LOW
Pullman, Town of	NO	YES	NO	YES	NO	NO	LOW
Ravenswood, City of	YES	YES	YES	YES	YES	YES	HIGH
Reedy, Town of	NO	YES	NO	YES	NO	NO	LOW
Ripley, City of	NO	YES	YES	YES	NO	NO	MOD
Ritchie County	NO	YES	NO	YES	NO	NO	LOW
Roane County	NO	YES	NO	YES	NO	NO	MOD
Sistersville, City of	NO	YES	NO	YES	NO	NO	LOW
Spencer, City of	YES	YES	YES	YES	NO	NO	MOD
St. Mary’s, City of	NO	YES	YES	YES	NO	NO	LOW

Regional Capabilities (Non-Comprehensive)							
Municipality	Comprehensive Plan	Building Codes	Zoning Ordinance	NFIP Participation	Funds in Capital Budget	Funds in Public Works Budget	Overall Capability
Tyler County	NO	YES	NO	YES	UNK	UNK	MOD
Vienna, City of	YES	YES	YES	YES	NO	NO	MOD
Williamstown, City of	NO	YES	YES	YES	NO	NO	LOW
Wirt County	NO	YES	NO	YES	NO	NO	LOW
Wood County	YES	YES	NO	YES	UNK	UNK	HIGH

1.3.1 Existing Plans and Ordinances

The counties and municipalities that make up the Mid-Ohio Valley region have many capabilities that can support mitigation efforts, including comprehensive plans, building codes, zoning ordinances, and floodplain regulations. This section describes those capabilities.

Comprehensive Plans

Comprehensive plans promote sound land use and regional cooperation among local governments to address planning issues. These plans serve as the official policy guide for influencing the location, type, and extent of future development by establishing the basic decision-making and review processes on zoning matters, subdivision and land development, land uses, public facilities, and housing needs over time.

The Mid-Ohio Valley region is served by a range of comprehensive plans. The Mid-Ohio Valley Regional Council (MOVRC) maintains a comprehensive economic development strategy (CEDS) that also serves as a regional development plan. Some communities have stand-alone comprehensive plans. It is, perhaps, not surprising that larger communities like Parkersburg, Ravenswood, and Wood County have these stand-alone documents, yet in the region, Calhoun County, Grantsville, and Spencer have their own documents. A complete listing of plans by jurisdiction is somewhat difficult to compile because towns look at these documents differently. Vienna’s recent action plan for Community Development Block Grant (CDBG) funding, for instance, is integrated into a similar discussion of Wood County’s and Parkersburg’s (which makes sense, given the location of the jurisdictions). Further, most of the municipalities in the region have planning commissions that support development in their jurisdictions, but these commissions do not always compile free-standing plans.

The plans that are available address similar content: planning focus areas, land use, utilities and other services, recreation, housing, and historic preservation. These documents contain excellent descriptions of their study areas, and because their focus is not risk, the level of detail about natural features, developed areas, etc. can be qualitatively richer than what is typically found in mitigation plans. Parkersburg's, Ravenswood's, and Wood County's plans are consistent with the region's Horizon 2045 Long-Range Transportation Plan. Calhoun County's, Grantsville's, and Spencer's plans are similar, and they address community needs (to include broadband development). Per a brief review, none of these comprehensive plans address risk and vulnerability directly, but they do contain basic provisions regarding the maintenance of public safety. Much of the information about comprehensive planning came from a capability survey that the MOVRC administered during the 2022 update. In that survey, a question asked if emergency management/response personnel participated in the comprehensive planning process. Of the responses, 7.1% said "No" while 50% did not know. Participation by these local officials represents an opportunity to align risk reduction and development objectives, where appropriate.

Sample Plans in the Mid-Ohio Valley Region

- Calhoun County Commission. (2021). *Calhoun County Comprehensive Plan.* Grantsville, WV: Local Government.
- City of Parkersburg, WV. (2020). *PKB 2030: Comprehensive Plan.* Parkersburg, WV: Local Government.
- City of Ravenswood, WV. (2018). *City of Ravenswood, WV Comprehensive Plan.* Ravenswood, WV: Local Government.
- City of Spencer, WV. (2021). *City of Spencer Comprehensive Plan, Draft 2021.* Spencer, WV: Local Government.
- City of Vienna, WV. (2021). *AP-5 Executive Summary – 91.200(c), 91.220(b): Annual Action Plan.* Vienna, WV: Local Government.
- Mid-Ohio Valley Regional Council. (2021). *Comprehensive Economic Development Strategy/Regional Development Plan.* Parkersburg, WV.
- Wood County Commission. (2007). *Wood County, WV Comprehensive Plan Update*. Parkersburg, WV: Local Government.
- Wood-Washington-Wirt Interstate Planning Commission. (2021). *Horizon 2045: Long-Range Transportation Plan.* Parkersburg, WV.

Building Codes

Building codes regulate construction standards for new construction and substantially renovated buildings. Standards can require resistant or resilient building design practices to address hazard impacts common to a given community. Building codes can contribute substantially to hazard mitigation, even if a jurisdiction only adopts codes to the level of the recommended International Building Code (IBC).

In the Mid-Ohio Valley region, it is likely that all jurisdictions have some type of building code, at least in the sense that it governs the building permit process. West Virginia State Fire Commission (WVSFC) is responsible for adopting, promulgating, and amending statewide construction codes. Further, the WVSFC has adopted the 2018 IBC.

Several municipalities in the region, including Paden City, Parkersburg, Ravenswood, Ripley, Spencer, St. Mary's, and Vienna, make their municipal-specific building codes available. A brief review of these documents confirms they are similar, setting for standards for construction, repair, and alteration; fire limits; various clearances; etc. These documents do not specifically mention hazard mitigation nor do they include measures for natural hazards. The most commonly-cited hazard in these codes is fire.

Sample Building Codes in the Mid-Ohio Valley Region

- Paden City, Art. 1711: Local Regulations and Standards
- Parkersburg, Part Seventeen: Building Code
- Ravenswood Code of Ordinances, Title XV: Land Usage, Art. 150: Building Regulations
- Ripley, Art. 1705: Administration; Permits and Fees
- Spencer, Part 17, Article 1705: Administration; Permits and Fees
- St. Mary's, Art. 1705: Building Permits
- Vienna, Art. 1721: State Building Code

Zoning Ordinances

Zoning ordinances allow for local communities to regulate the use of land to protect the interests and safety of the general public. Zoning ordinances can address unique conditions or concerns within a given community. They may be used to create buffers between structures and high-risk areas, limit the type or density of development, or require land development to consider specific hazard vulnerabilities.

A brief review of a sampling of zoning ordinances indicates that the majority of these ordinances address districts within a jurisdiction (e.g., residential, central business, public school, etc.), annexations, and property appurtenances like mailboxes, satellites, swimming pools, etc. Some (e.g., Ravenswood) address oil and gas well drilling. Parkersburg's ordinance outlines residential, business, manufacturing, recreation, and historic districts, and it addresses manufacturing housing and mobile homes. Ripley's ordinance, for example, discusses the location of mobile home parks, which might support mitigative purposes. Generally, though, these ordinances do not strictly govern the specifics of the development that occurs in these areas (i.e., do not bar development from certain areas because of hazard vulnerability).

The presence of zoning ordinances is sporadic throughout the region. As noted in the table above, several jurisdictions have them in place, though a larger number do not. Conversations about zoning are on-going in the region's communities. The Town of Elizabeth, for instance, is exploring its options for adopting zoning guidelines, and there is a desire to do so. Enforcement is a challenge for the town, though. The Mid-Ohio Valley region is similar to much of West Virginia with respect to zoning. Ordinances are somewhat common in municipal jurisdictions, but uncommon for unincorporated areas (typically under the jurisdiction of a county government). Residents throughout the state frequently cite moving out incorporated areas because of a less restriction on property uses.

Further, though not "zoning" in the traditional sense, two jurisdictions in the region (i.e., St. Mary's and Vienna) have subdivision and land development ordinances (SALDOs) in place. These regulations support the responsible development of subdivisions in a community, and in the sense that they regulate land uses, they appear here under the zoning discussion. The Vienna SALDO, for instance, specifically identifies "fire, flood and other danger" and discusses "reasonable standards of design." Parkersburg has similar items that appear as a chapter in the city's zoning ordinance. The St. Mary's ordinance ensures consistency with other comprehensive plans and discusses such items as traffic patterns.

Sample Zoning Ordinances in the Mid-Ohio Valley Region

- Parkersburg, Part Thirteen: Planning and Zoning Code
- Ravenswood Code of Ordinances, Title XV: Land Usage, Art. 152: Zoning Code
- Ripley, Part Thirteen – Planning and Zoning Code
- Spencer, Part Thirteen – Planning and Zoning Code
- St. Mary's, Art. 1311, Subdivision Plats
- St. Mary's, Chapter Five – Zoning Regulations
- Vienna, Chapter 1 – Zoning Administrations
- Vienna, Chapter 5 – Subdivision Regulations

Floodplain Management

Through the administration of floodplain ordinances, local governments can ensure that all new construction or substantial improvements to existing structures located in the floodplain are floodproofed, dry-floodproofed, or built above anticipated flood elevations. Floodplain ordinances may also prohibit development in certain areas altogether. The NFIP establishes minimum ordinance requirements in order for that community to participate in the program. However, a community is permitted and encouraged to adopt standards that exceed NFIP requirements. The following paragraphs present generalized information as to floodplain management in the region (i.e., elements common to all communities) as well as a small sampling of more specific sample activities.

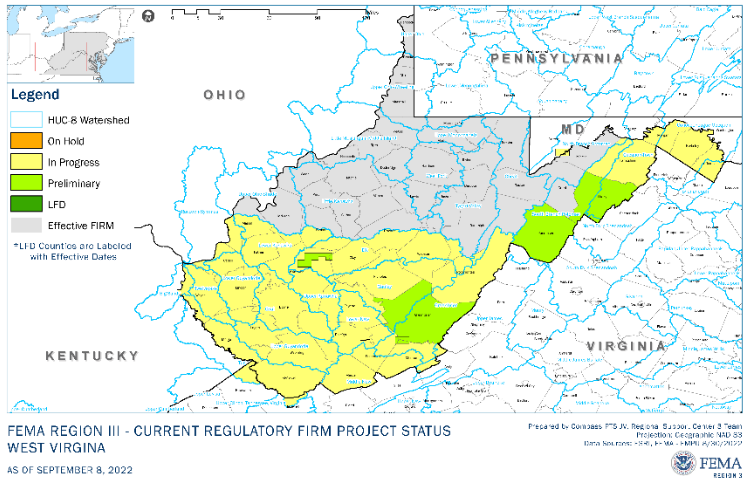
Twenty-nine (29) of the region's 30 governmental jurisdictions participation in the National Flood Insurance Program (NFIP). (The Town of North Hills in Wood County is the only jurisdiction that does not participate. Pond Run goes through the town and there is a special flood hazard area [SFHA] in its corporate limits; however, the structures in the town are largely on the hill overlooking the SFHA.) There are no community rating system (CRS) participants in the region. Per a brief review of several floodplain ordinances from throughout the region, it is apparent that the state and other regulatory support services have provided template ordinances. Despite jurisdictional variance in terminology (e.g., positions) and formatting, the content of the ordinances is consistent. These ordinances define a series of terms, and then they identify flood hazard areas (such as the floodplain), outline what development can occur in those hazard areas, detail the specifications to which that development must adhere, and measures for enforcing the ordinance. Development in special flood hazard areas throughout the region must be above base flood elevation (BFE), and the ordinances restrict what uses the areas in structures that are below BFE can have. For instance, spaces that are at least five feet tall below a first floor at BFE may only be converted to use for parking, some storage, or access to the structure in the St. Mary's ordinance. Spencer's ordinance reads the same.

Parkersburg's ordinance discourages subdivisions in flood prone areas, and it discusses the placement of mobile and manufactured homes as well as recreational vehicles in flood hazard areas. The ordinance includes a provision for a flood protection setback equal to twice the width of the watercourse channel from the top of one back to the top of the opposite bank, or 50', whichever is greater. Ripley's ordinance also includes a flood protection setback equal to 35' measuring from the top of one bank to the top of the banks of all watercourses shown on a FIRM map. Ripley's ordinance also notes the placement of manufactured homes, appurtenant structures, and recreational vehicles. Ripley's ordinance also notes a requirement for backflow preventors for all structures with sewage or drainage facilities located in the floodplain.

Other common elements include provisions for utility placement and the use of flood-resistant materials, and approximately half of the floodplain ordinances reviewed included obvious and easily-discernible guidelines for anchoring. A freeboard area of two feet was common when there was a freeboard requirement in the ordinance. Though the format and general content of the ordinances was similar, there appear to be opportunities to think regionally (or at the county level) about standardizing requirements like freeboards, flood protection setback specifications, etc.

The City of Williamstown's codes include provisions for a storm water utility with the authority to plan, acquire, improve, construct, develop, install, modify, manage, operate, maintain, replace, control, demolish, abandon, regulate, and fun storm and surface drainage services and systems within the urban watershed.

The following table presents the effective date of the most recent DFIRM/FIRM for the region's communities. At the time of this plan update, FEMA was in the process of conducting updated flood studies and revising DFIRM/FIRM mapping. Most of the region has an effective FIRM (i.e., a completed study); however, the southern portions of Jackson and Roane Counties have studies in progress (i.e., the areas in yellow).



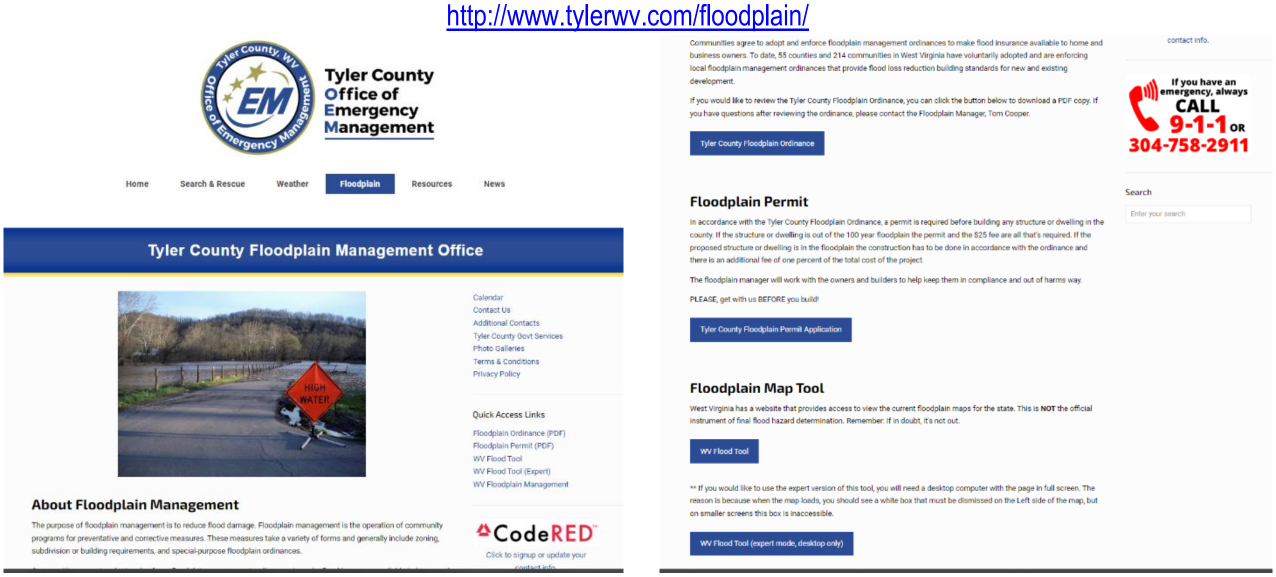
Date of Current DFIRM/FIRM by Community			
Community	*Date*	*Community*	*Date*
Calhoun County	06/18/2010	Ritchie County	02/02/2012
Grantsville, Town of	06/18/2010	Auburn, Town of	02/02/2012
		Cairo, Town of	02/02/2012
Jackson County	02/18/2004	Ellenboro, Town of	02/02/2012
Ravenswood, City of	02/18/2004	Harrisville, Town of	02/02/2012
Ripley, City of	02/18/2004	Pennsboro, City of	02/02/2012
		Pullman, Town of	02/02/2012
Pleasants County	05/05/2014		
Belmont, City of	05/05/2014	Tyler County	05/03/2010
St. Mary's, City of	05/05/2014	Friendly, Town of	05/03/2010
		Middlebourne, Town of	05/03/2010
Roane County	03/02/2012	Paden City, City of	09/25/2009
Reedy, Town of	03/02/2012	Sistersville, City of	05/03/2010
Spencer, City of	03/02/2012		
		Wood County	11/06/2013
Wirt County	08/02/2012	Parkersburg, City of	11/06/2013
Elizabeth, Town of	08/02/2012	Vienna, City of	11/06/2013
		Williamstown, City of	11/06/2013

Communities make DFIRM/FIRM information available to their citizens in a variety of ways. The maps are available at various offices, such as the utility building (Vienna), emergency management (Roane County), the 911 center (Calhoun County), and in city/town halls (e.g., Middlebourne). Many jurisdictions make information available via their websites as well. The three images below demonstrate the range of the ways floodplain management information is distributed via the web. Some sites are elaborate with a variety of information sources; others are more direct. The common element is the ability to access the floodplain ordinance.

www.pleasantscountywv.org/floodplain-management/

https://www.roanewv.com/cms.aspx?Name=Floodplain Management

http://www.tylerwv.com/floodplain/



Further, various entities support requests for map updates. Designated floodplain coordinators serve some communities, while the floodplain coordinator position is an added duty for several others. (For instance, the floodplain coordinator for Ripley is also the city treasurer while the coordinator for Roane County is the emergency manager.) Communities typically share information, support LOMA and LOMR updates, etc. as services. Various offices also maintain the letters of map changes, like the Vienna Utility Board, Roane County 911/EM, Calhoun County Office of Emergency Services, Ravenswood Planning & Zoning, Middlebourne Town Manager, Parkersburg Engineering Division, and the Spencer building code official (to name a few).

The communities in the Mid-Ohio Valley region, like all communities in West Virginia, take advantage of the *West Virginia Flood Tool* at https://www.mapwv.gov. This online resource is a great tool for quickly determining a working determination of a property's relationship with the Special Flood Hazard Area (SFHA). The map shows SFHAs across a variety of base maps, to include aerial photography that depicts structures. Other reference layers include address labels, parcel lines, and building footprints. Though floodplain managers throughout the region regularly remind residents, developers, etc. to check with local representatives to obtain an official determination, the flood tool is a quick, easy way to make SFHA information available to the public.

Interestingly, there was variation in the responses to the capability survey within the same jurisdiction on a small number of occasions as to the presence of a floodplain ordinance, how floodplain managers interact with the public, etc. This finding suggests that education could help to standardize expectations and understanding with respect to floodplain management and development. Further, while there is consistency in terms of the content of the ordinances, there is much wider variance in the management of the NFIP throughout the region.

1.3.2 Fiscal Capability

The decision and capacity to implement mitigation activities is often strongly dependent on the presence of local financial resources. While some mitigation actions are less costly than others, it is important that money is available locally to implement policies and projects. Financial resources are particularly important if communities are trying to take advantage of federal or state mitigation grant opportunities that require local match contributions.

Generally, absent grant opportunities, the financial capability of the region to implement large-scale mitigation projects is low. Large-scale projects include buyout and elevation projects, new structural mitigation projects, etc. Local funding will likely support small projects, like educational initiatives, or those that reduce risk through optimizing an emergency response.

Included in the financial capability is the presence of personnel that can assist in the preparation of grant applications and the administration of grant awards. Fortunately, the MOVRC is an entity whose core mission is to provide administrative support to the member governments in the region. In that sense, there is a capability available in the region, though the MOVRC's services for large-scale projects would be contracted (likely through an administrative line item in the grant itself). Three jurisdictions indicating having a grants specialist on their payrolls (i.e., Lubeck Public Service District, Parkersburg, and Ravenswood). Further, two entities indicated having available funds in capital and/or public works budgets to support mitigation (Parkersburg

[both] and Ravenswood [both]). Administrative financial capabilities *for taking on extra mitigation projects* in the smaller jurisdictions is low.

2.0 RISK ASSESSMENT

A risk assessment analyzes, “the potential for damage, loss, or other impacts created by the interaction of hazards with community assets” (FEMA, 2013). This risk assessment section contains information on identified hazards that threaten the Mid-Ohio Valley region and the vulnerability of the area as it relates to the region’s assets.

2.0 RISK ASSESSMENT

2.1 Identify Hazards

§201.6(c)(2)(i)	[The risk assessment shall include a] description of the…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.

This section notes that hazards included in the Mid-Ohio Valley Hazard Mitigation Plan. Planners used several methods of research to identify the hazards to which the region is susceptible, and the steering committee validated the research with the members' experiences living and working in the area. This process led to the inclusion of the following hazards.

- Commercial/industrial/manufacturing incidents
- Dam failure
- Drought
- Earthquake
- Epidemic/pandemic
- Extreme temperatures
- Flooding
- Geologic hazards
- Severe summer storms
- Tornadoes
- Wildfire
- Severe winter storms

The steering committee made several changes to the hazard list from previous versions of the plan. "Epidemic/pandemic" is a new hazard, and its addition is not a surprise given the global Covid-19 pandemic. The steering committee removed "hurricanes" since the remnants of hurricanes that reach West Virginia manifest as severe storms. "Landslides" has been renamed "geologic hazards" to include expansive soils, slips, mudflows, subsidence, etc. "Winter weather" was renamed "severe winter storms" to match the newly-created severe summer storms hazard. Several previous hazards were consolidated under new headings as follows.

- "Excessive heat," "extreme cold/wind chill," "hail," "heavy rain," and "lightning" will now appear under "severe summer storms."
- "Natural resource extraction," along with new considerations for fixed facility and transportation-based hazardous material incidents will now appear under "commercial/industrial/manufacturing incidents."

The following chart illustrates the hazards to which the region and its local governments are not susceptible. The intent of this chart is to justify the exclusion of these hazards from the plan.

Hazard[1]	Justification for Elimination
Avalanche	Avalanches happen mainly in the western United States and Canada. The terrain and geography of the Mid-Ohio Valley region are not rugged or severe enough to have avalanches.
Coastal Erosion	There are no coast lines (oceanic or Great Lakes) in the region.
Sea Level Rise	As with coastal erosion, there are no oceanic coasts in the region. The Atlantic east coast is approximately 370 miles away, and the Pacific west coast is approximately 2,200 miles away. Neither would affect the region.
Storm Surge	Storm surge is typically a function of severe weather along oceanic coasts. The Atlantic east coast is approximately 370 miles away, and the Pacific west coast is approximately 2,200 miles away. Neither would affect the region.
Tsunami	Tsunamis occur in oceans. The Atlantic east coast is approximately 370 miles away, and the Pacific west coast is approximately 2,200 miles away. Neither would affect the region.
Volcano	The closest monitored volcano is in Yellowstone National Park in Wyoming and is approximately 1,500 miles away. It would not affect the Mid-Ohio Valley region.

[1] These hazards appear in Worksheet 5.1 of the *Local Mitigation Planning Handbook* (FEMA, 2013).

2.0 RISK ASSESSMENT

2.2 Profile Hazards

The following profiles detail each hazard considered by this plan, which includes discussion on how the hazard impacts the area. Within each profile, research and historical data inform the following elements.

- **Hazard Overview:** Defines the hazard and presents a summary table of the hazard.
- **Location and Extent:** Identifies the physical places in the region that are vulnerable to the hazard and the severity of a hazard in a given location.

§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.

- **Impact and Vulnerability:** Describes impacts on different topics such as health, the environment, or infrastructure that may result from the hazard as well as specific populations that may be vulnerable.

§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.

- **Historical Occurrences:** Summarizes significant past events related to the hazard.

§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.

- **Loss and Damages:** Outlines the methods used for loss amounts (of deaths, injury, and property damage depending on available information) and estimates based on historical information and vulnerable populations, structures, and infrastructure.

§201.6 (c)(2)(ii)(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.

- **Risk Assessment:** Details methods for calculating the probability and severity of each hazard.

§201.6(c)(2)(ii)(A)	The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.
§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.

One of the components of the risk assessment is to determine the risk of and vulnerability to hazards, determined by the probability of occurrence and the potential severity of those occurrences. This process helps identify which hazards pose the most significant concerns to the Mid-Ohio Valley region and its participating member governments. The probability of an event derives from the number of historical events within a certain timeframe. Timeframes vary based on information available from different sources (and they can vary widely).

It is important to recognize the value of implementing several categories to determine the overall risk and vulnerability. The following narrative and tables describe the categories utilized by this plan and how the relate to the available data. Historical occurrences inform all calculations, not worst-case scenarios. In cases with zero occurrences, other available data (which varies across the hazards and is outlined in each profile) support determinations.

Frequency			
Value	*Score*	*Description*	*Definition*
0.76 - >1.0	5	Excessive	Will occur during a year
0.51 – 0.75	4	High	Likely to occur in a year
0.26 – 0.50	3	Medium	May (or may not) occur in a year
0 – 0.25	2	Low	Unlikely to occur in a year
0	1	None	So unlikely that it can be assumed it will not occur in a year

"Frequency" refers to the number of times a hazard occurs in a specific period (based on available historical data). In most instances, the total occurrences (e.g., three occurrences) are divided by the length of time (in years) that data is available (e.g., 10 years). Thus, in the example, three occurrences divided by 10 years equals 0.3. The table above translates the resultant numeric values into a narrative description of frequency. In the example described her, the hazard would have a "low" frequency. At times, no historical data is available; in these cases, the hazard receives the lowest possible points for the category (i.e., one).

Other qualitative vulnerability categories enable a clearer understanding of a hazard's potential impacts. The table below depicts the variables used in this plan. Planners assigned values to these categories based on available research (cited, as appropriate, in the profiles), and each profile includes a very brief description to contextualize the selection of the appropriate variable. Importantly, the qualitative nature of these variables enables planners to consider potential future impacts, which is helpful when considering the nexus of risk and future development as well as the potential impacts of climate change. These variables should be considered as a set. For instance, in the profiles that follow, a hazard like severe summer storms would receive a *Magnitude* score of "catastrophic" simply because the entire planning area (i.e., well over 50% of the land area) is at risk. A catastrophic score, though, could mislead a reader without the context provided by the other vulnerability variables that would receive a much lower score (such as *Onset* and *Human*, which would both receive the lowest scores available).

Vulnerability Categories						
	Response	*Onset*	*Magnitude*	*Business*	*Human*	*Property*
1	Less than half a day	Over 24 hours	Localized (less than 10% of land area affected)	Less than 24 hours	Minimum (minor injuries)	Less than 10% of property affected
2	One day	12-24 hours	Limited (10-25% of land area affected)	One week	Low (some injuries)	10-25% of property affected
3	One week	6-12 hours	Critical (25-50% of land area affected)	At least two weeks	Medium (multiple severe injuries)	25-50% of property affected
4	One month	Less than 6 hours	Catastrophic (more than 50% of land area affected)	More than 30 days	High (multiple deaths)	More than 50% of property affected
5	More than one month	N/A	N/A	N/A	N/A	N/A

Each hazard receives a score for each category that corresponds to the number in the far-left column. Hazards receive scores of between 7 (i.e., all seven categories receive a value of one) and 30 points (i.e., all seven categories receive a value of four or five). The list below represents an overall range by which planners ranked all of the hazards in this plan.

Range of Points (Score)	*Hazard Ranking*
7 – 10	Lowest
11 – 15	Low
16 – 20	Medium
21 – 25	High
26 – 30	Highest

Section 2.0: Risk Assessment concludes with a “hazard rankings” section that presents a table that summarizes the scores for all the hazards. Profiles appear in the following alphabetical order.

- 2.2.1 Commercial/industrial/manufacturing incidents
- 2.2.2 Dam failure
- 2.2.3 Drought
- 2.2.4 Earthquake
- 2.2.5 Epidemic/pandemic
- 2.2.6 Extreme temperatures
- 2.2.7 Flooding
- 2.2.8 Geologic hazards
- 2.2.9 Severe summer storms
- 2.2.10 Tornadoes
- 2.2.11 Wildfire
- 2.2.12 Severe winter storms

2.0 RISK ASSESSMENT

2.2.1 Commercial/Industrial/Manufacturing Incident

A technological or human-caused incident at a commercial, industrial, or manufacturing facility that causes a public safety concern. Incidents may or may not be "emergencies" that necessitate a response.				
Vulnerability HIGHEST HIGH MEDIUM LOW LOWEST	**Period of Occurrence:**	At any time	**Hazard Index Ranking:**	Medium
	Warning Time:	Varies, though for the community, warning time is typically minimal	**State Risk Ranking:**	N/A
	Probability:	Excessive	**Severity:**	Medium
	Type of Hazard:	Human-caused	**Disaster Declarations:**	EM-3366-WV (Elk River Chemical Spill, 2014)

Hazard Overview

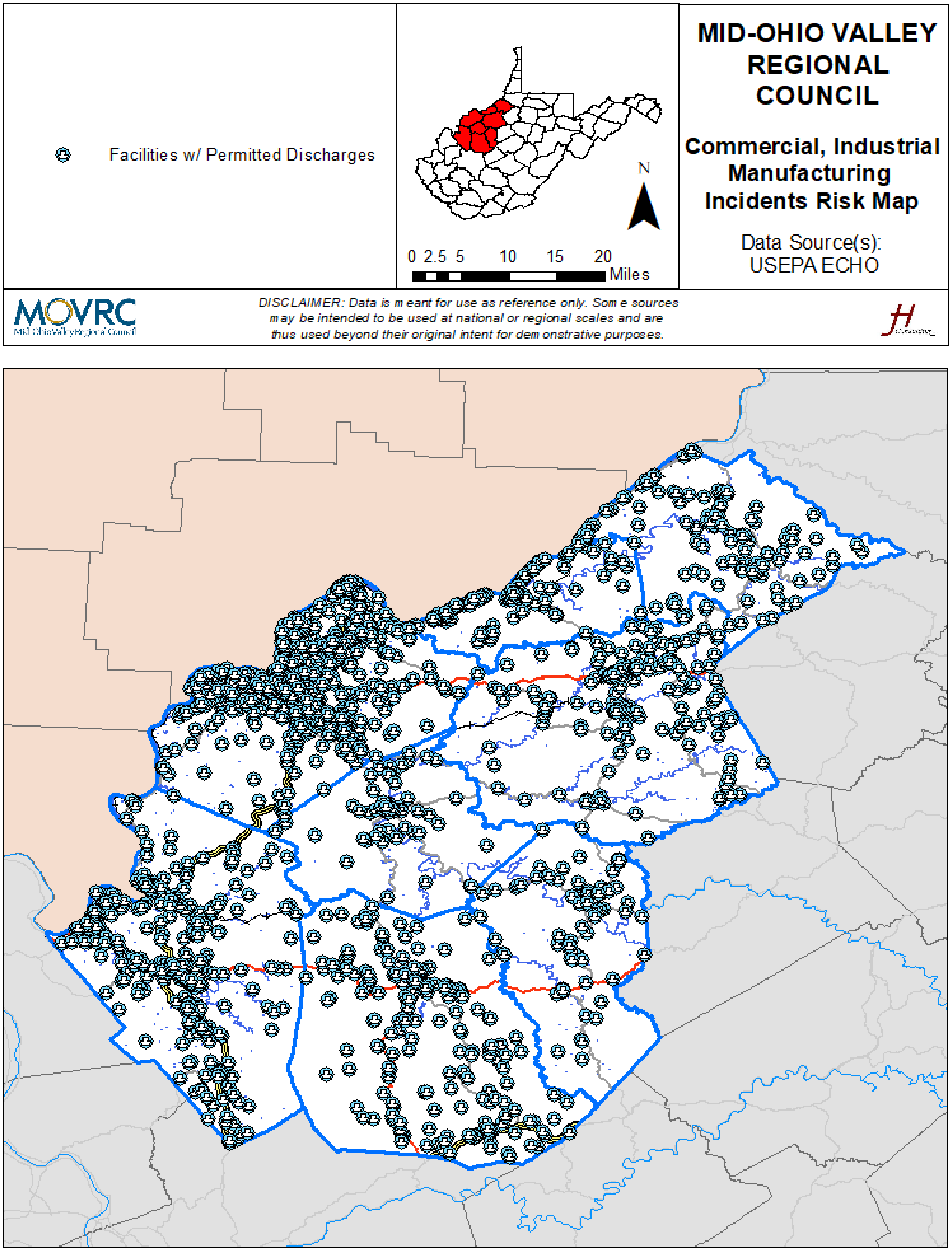
This profile focuses on those commercial, industrial, and manufacturing incidents that could have a community impact. As such, small fires, other occupational health issues, etc. that occur internally at facilities do not appear in this analysis. Generally, planners consider incidents that are fixed facility, transportation-based, or environmental.

- **Fixed Facility:** An unintentional release[1] of hazardous materials from within a commercial, manufacturing, or industrial facility. Fixed facility incidents may also include large scale fires at these facilities, civil disturbances (e.g., strikes) that threaten surrounding areas, etc.
- **Transportation-Based:** An unintentional release[1] of hazardous materials on highways, railways, waterways, or from pipelines or aircraft; large-scale transportation-based fires; train derailments, etc.
- **Environmental:** The environmental category examines contaminations to groundwater, air, etc., which includes Superfund sites, brownfields, hazardous waste locations, etc.

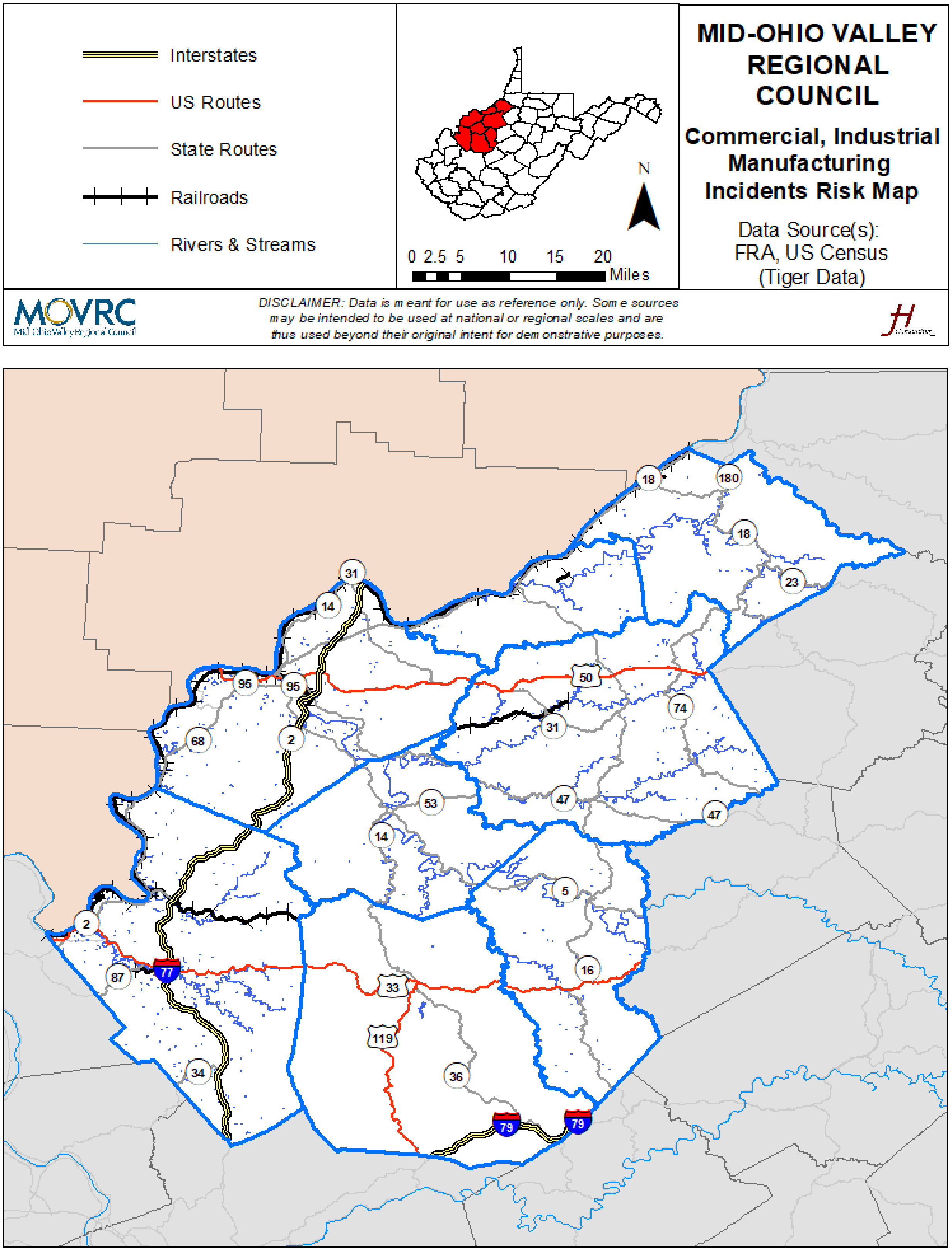
[1] *Unintentional release* means the escape of a hazardous material from a package on an occasion not anticipated or planned. This includes releases resulting from collision, package failures, human error, criminal activity, negligence, improper packing, or unusual conditions such as the operation of pressure relief devices as a result of over-pressurization, overfill, or fire exposure (49 CFR Part 171).

Location and Extent

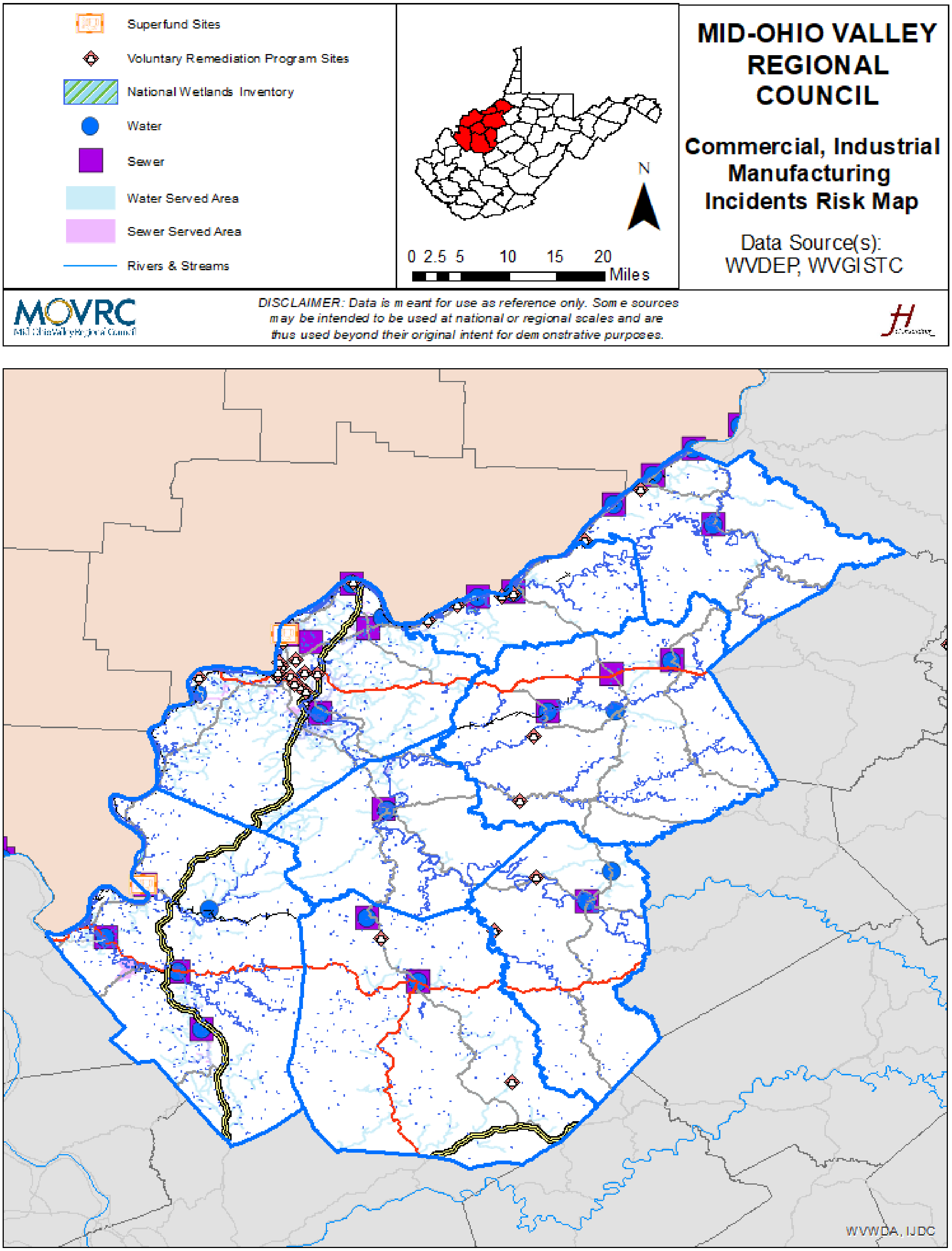
Commercial, industrial, and manufacturing incidents, as described above, occur in areas near fixed facilities, along or near major transportation routes, and near sensitive areas. The following maps depict these areas. The first shows the locations of facilities with permitted discharges; there are 2,437 of them in the Mid-Ohio Valley region. Though located throughout the region, the majority of these facilities are in the western areas along the Ohio River and Interstate 77. The US Route 50 corridor through Ritchie County is also home to many permitted facilities. The implication is that the areas near the facilities noted on the map may be more at-risk to commercial, industrial, or manufacturing incidents. Those areas near clusters of facilities may be at even more risk.


Facilities w/ Permitted Discharges
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Commercial, Industrial Manufacturing Incidents Risk Map
Data Source(s): USEPA ECHO
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

The second identifies major commodity shipping highway routes and railways. The major routes include I-77 through the central portions of Jackson and Wood Counties, as well as I-79 in the southern tip of Roane County. US Route 50 is a east-west thoroughfare through Ritchie and Wood Counties and sees significant transport of materials, particularly from energy sector. Finally, State Route 2 along the Ohio River is a major thoroughfare for the facilities located along the river. Additionally, the Ohio River serves as a major commodity shipping route, particularly for coal, aggregates, and petrochemicals. As with facility locations, the areas near these major commodity shipping routes are at an elevated risk of transportation-based commercial, industrial, and manufacturing incidents.


Interstates
US Routes
State Routes
Railroads
Rivers & Streams
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Commercial, Industrial Manufacturing Incidents Risk Map
Data Source(s): FRA, US Census (Tiger Data)
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

The third identifies the locations of superfund sites, voluntary remediation projects, and wetlands. There are two superfund sites in the region: one is in Ravenswood (i.e., PCE groundwater plume), and the other is in Vienna (i.e., Vienna Tetrachloroethane). There are 30 voluntary remediation program participants located throughout the region, though the majority are along the Ohio River and particularly in the Parkersburg area. Wetlands, as well as rivers, small streams, and small lakes, are located throughout the region. The purple squares and large blue dots represent areas with public water and sewer service. Those areas appear here because of the implication that areas not served by public water obtain water via wells (i.e., groundwater). Commercial, industrial, and manufacturing incidents in these areas can impact the availability of water.


Superfund Sites
Voluntary Remediation Program Sites
National Wetlands Inventory
Water
Sewer
Water Served Area
Sewer Served Area
Rivers & Streams
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Commercial, Industrial Manufacturing Incidents Risk Map
Data Source(s): WVDEP, WVGISTC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
WVWDA, IJDC

Impacts and Vulnerability

Commercial, industrial, and manufacturing incidents often involve hazardous materials, and those materials pose the risk to the wider community. Even when the incident is a fire on-site at a commercial, industrial, or manufacturing facility, various hazardous materials burning in the blaze cause a wider issue (in addition to the acute impacts on-site). Hazardous materials are classified several ways. The United States Department of Transportation (DOT) organizes substances into nine classes, which are listed in the following table. Other agencies further categorize hazardous materials, but the nine DOT classifications are largely consistent across all reporting agencies. Resources such as the DOT's *Emergency Response Guidebook* describe the potential impacts of materials in these classes.

Hazard Class	Description
1	Explosives
2	Gases (flammable and non-flammable)
3	Flammable and combustible liquids
4	Flammable solids, substances liable to spontaneous combustion, substances which, on contact with water, emit flammable gases
5	Oxidizing substances and organic peroxides
6	Toxic substances and infectious substances
7	Radioactive materials
8	Corrosives substances
9	Miscellaneous dangerous goods/hazardous materials and articles

Further, hazardous materials vary greatly in the types of health risks they pose to humans. According to the United States Environmental Protection Agency (USEPA), hazardous substances may irritate the skin or eyes, make it difficult to breathe, cause headaches or nausea, or cause other types of illnesses (USEPA,2022c). Additional health risks include thermal harm, radiological harm, asphyxiation, chemical harm, biological harm, or mechanical harm.

- **Thermal Harm:** Thermal harm results from exposure to temperature extremes. Thermal injuries can be external) from contact or close proximity to a fire or heat source) or internal (from inhaling fumes or heated air). Thermal injuries can also include frostbite from contact with low-temperature hazardous materials.
- **Radiological Harm:** Radiological harm results from exposure to radioactive materials. Different types of radiation have different energy levels, and not all are dangerous. The radiation that poses a threat to humans is ionizing radiation, which can damage living cells and DNA. Examples of sources of ionizing radiation are medical isotopes used for diagnostic and therapeutic purposes, X-rays, and some survey equipment.

- **Asphyxiation:** Asphyxiation results from exposure to materials that reduce oxygen levels that may cause suffocation. Asphyxiation can occur in confined spaces or with extremely-concentrated forms of chemical asphyxiants, such as carbon dioxide and methane. Asphyxiants are generally odorless and tasteless, and displace so much oxygen from the atmosphere that the lungs cannot deliver enough oxygen to tissues, and the victim slowly suffocates.
- **Chemical harm:** Chemical harm results from exposure to chemicals, including poisons and corrosives. Injuries and illnesses vary by material.
- **Biological Harm:** Biological harm results from exposure to biological materials, including bacteria, viruses, and biological toxins. Symptoms of biological harm are often delayed, because the pathogens often require time to multiply sufficiently to cause illness in the person carrying the pathogen.
- **Mechanical Harm:** Mechanical harm results from exposure to, or contact with, fragmentation or debris scattered because of a pressure release, explosion, or boiling liquid expanding vapor explosion (BLEVE). Certain predictable reactions occur during and immediately following an explosion, which routinely injure or kill anyone in close proximity. The degree of harm is closely related to the size of the explosion and proximity to the device. Sources of injury include fragmentation and flying debris, blast overpressure, and secondary blast injuries.

The impacts of hazardous material incidents can also vary based on interactions with other phenomena. If a part of a transportation incident, the hazardous release may be a primary hazard, but it must be managed while giving consideration to the impacts on the physical roadways, traffic flow (particularly if the incident occurs on a busy thoroughfare like I-77), etc. Similarly, hazardous material concerns may be a cascading impact of other hazard events. Flood waters may inundate areas where hazardous materials are used or stored, thereby becoming contaminated and carrying those materials elsewhere. Severe summer and winter weather can impact covered facilities that report using and storing hazardous materials. In some of these instances, hazardous materials may not be released, yet extra response measures may be necessary to keep them from releasing.

Historical Occurrences

Transportation incident data are available from the U. S. Department of Transportation's Pipeline Hazardous Material and Safety Administration (PHMSA). The table below lists the transportation incidents in the region from 1971 forward (USDOT, 2022). The incident narratives are taken verbatim from the PHMSA database.

Transportation-Based Hazardous Materials Releases, 1971 to Current

Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Advantage Tank Lines, Inc.	HC 89	Mount Zion	#########	20	LGA	1993	Fuel Oil (No. 1, 2, 4, 5, or 6)	3	0	1022	Hwy	Spillage
Driver was making delivery and the entire amount of product did not fit into storage tank. A small amount of product overflowed onto the ground. The spilled product was immediately contained and cleaned up. No waterways or sewers were affected by the spilled product.												
Ralph H. Burns & Son, Inc.	I-77 South Bound Milepost 124	Kenna	4/2/1998	2058	LGA	1999	Asphalt, at or above its flash point	3	0	26000	Hwy	Spillage
Our driver, Franklin Withrow, pulled off exit 124 south bound on I-77 at 0230 to go to sleep and when he awoke at 0530 he discovered that he had a leak around his unit. It appeared the material was coming out of the overflow. After he pulled down on level ground the leak continued. A lady with a cellular phone stopped and the driver contacted William R. Burns (owner of Ralph H. Burns & Son, Inc.) at 0600. I called the dot at 0625 and left message on answering machine. Called David Fisher with doh to have him to take sand for buffer dams to contain the spill at 0635. Dispatched another cargo tank to off load leaking cargo tank at 0640. Sent Ralph Burns to site to oversee clean up at 0640. Called insurance agent at 0700. Called WVDEP to inform them of the spill at 0800. Weavertown Environmental Group was contacted about the spill and they sent a crew in to clean up the spill at 0830.												
Yellow Freight System, Inc.	I-77	Kenna	7/14/2001	40	LGA	1993	Flammable Liquids, n.o.s.	3	0	2875	Hwy	Spillage
While enroute, trailer was discovered leaking. A certified emergency response team was notified and responded to the scene. A drum was discovered crushed and leaking. The drum was recouped into a dot approved salvage drum with a chemical liner. Properly marked and labeled. The spillage was absorbed and disposed of properly. The shipper was notified.												
Rogers Cartage Co.		Ripley	#########	<1	LGA	1157	Diisobutyl Ketone	2	0	0	Hwy	Spillage
Driver noticed that the external valve had a few drips develop while enroute to the consignee. Driver went to a tankwash where they repacked the valve.												
Roadway Express, Inc.	SR 2	Belmont	6/1/2000	5	LGA	1760	Corrosive Liquids, n.o.s.	8	0	2100	Hwy	Spillage
While traveling southbound on SR 2, about three miles south of Belmont, WV, apparently, the tractor-trailer blew out a tire causing the tractor-trailer unit to jackknife. A 5-gallon pail was damaged inside of the trailer. Approximately 5-gallons of free product were released. Apparently, the damage to the pail was due to being crushed by a tote bin as a result of the load shifting. The shipper's hazmat team responded and performed the clean-up. The shipper's hazmat team returned the remainder of the shipment to the shipper. The three pails were unaffected. The Belmont Fire Department, West Virginia State Highway Patrol, Cytec emergency services, and the Department of Transportation out of Charleston, WV were on scene. No soil or water were affected. No injuries or exposures were reported. The MSDS was requested and received.												
Edwards Transport	SR 2 North	St. Mary's	7/16/2000	3000	LBS	3170	Aluminum Processing By-Products	4.3	0	4287	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Hit rough spot on highway causing tail gate on rear of trl to fly open. Reported to company when safety director arrived on scene. St. Mary's state police, St. Mary's Fire Dept & Sisterville Fire Dept. Chemtrec was notified by Pleasants County disaster director, and Edwards Vac Truck 3. Double check each tail gate before leaving shipper to make sure latch is secure. (Drivers have been retrained on this procedure).												
Advantage Tank Lines	201 Barkwill St.	St. Mary's	5/27/2007	300	LGA	1993	Fuel Oil (No. 1, 2, 4, 5, or 6)	3	0	8250	Hwy	Spillage
As our driver was attempting to load his trailer, he tried to put too much fuel into the compartment. As a result, approximately 300 gallons of diesel fuel was spilled. Most of the spilled diesel fuel was caught in the containment area but a small amount was able to escape to the soil surrounding the loading facility. BBU Environmental handled the spill remediation and no further impact expected.												
Airgas Specialty Products, Inc.	1 Duggar Road	Belmont	7/10/2012	>1	GCF	1005	Ammonia Anhydrous	2.3	0	0	Hwy	Vapor (Gas) Dispersion
Airgas driver mad connections to tank. He leak check all connections and began unloading he smelled a little ammonia and shut down the unloading process, closing all valves. He found that the full-circle swivel joint on the vapor unloading line was leaking vapor. He made sure it was isolate and let the remaining vapor leak out. He reported the incident to his manager.												
Yellow Freight System, Inc.	SR 2	Belmont	11/6/1992	25	LGA	1760	Corrosive Liquids, n.o.s.	8	0	2250	Hwy	Spillage
The rear trailer unhooked from a set of twin trailers configuration, and fell to its landing gears. A metal drum was accidentally punctured. The trailer was isolated and union carbide chemicals was immediately notified of the incident. Union carbide emergency help team responded to the scene and cleaned up the spill, recoopered and overpacked the drum into a new DOT-approved salvage drum, with proper markings and labels applied. The shipment was then forwarded to the consignee and was delivered on 11/10/92.												
Bruceton Petroleum Co., Inc.	2080 Pike Road	St. Mary's	3/4/2013	150	LGA	1993	Fuel Oil (No. 1, 2, 4, 5, or 6)	3	0	209689	Hwy	Spillage
Driver Michael Wheeler, either fell asleep and/or passed out, causing the vehicle to roll and wreck when rounding a curve on route 16.												
Advantage Tank Lines, LLC	2175 Marsh Run Rd.	Pennsboro	5/3/2019	58	LGA	1267	Petroleum Crude Oil	3	0	6100	Hwy	Spillage
The Advantage Tank Lines, LLC driver had just loaded the trailer with crude oil. As he exiting the customer location, approximately 58 gallons of crude oil was released from a loose dome lid on the trailer. EP&S environmental responded to the scene and handled the remediation. No further environmental impact is anticipated.												
Thomas, FLC	Stone Church Road	Pennsboro	1/7/2015	0	N/A	1993	Diesel Fuel	3	0	204000	Hwy	No Release
Driver of tractor and cargo tank combination lost control of vehicle on small snow-covered road. On an uphill grade, the driver lost traction and slid backwards and over an embankment causing the unit to rollover.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Manfredi Motor Transit Co.	I-79	Amma	2/22/2004	4800	LBS	2215	Maleic Anhydride	8	0	127500	Hwy	Spillage
Trailer overturned. In process of off-loading to upright vent was not maintained and trailer "sacked in". Then, as attempt was made to upright a half empty unit, barrel cracked releasing maleic anhydride.												
Fleet Transport Co., Inc.	Pennzoil, Inc. in plant	Alma	7/29/1996	10	LGA	1267	Petroleum Crude Oil	3	0	150	Hwy	Spillage
Driver overflowed trailer at shipper plant while loading. The customer's pump did not shut off when driver pressed shut off button. Shipper cleaned up spilled product - which was captured in a containment area.												
Tri-State Express, Inc.	SR 2 North	Friendly	1/5/2001	35	LGA	3295	Hydrocarbons, Liquid, n.o.s.	3	0	100	Hwy	Spillage
Driver in route to delivery. Tote started leaking in transit. Due to metal case holding tote. Metal bent in creating hole in tote bottom. Tri-State management notified and leakage contained. No leakage from trailer during transit. Spill cleaned & properly disposed of. Consignee notified and will contact shipper of packaging problems. Freight was not loaded improperly.												
Schneider Nat'l Bulk Carriers	SR 2 South	Friendly	3/11/2002	1	LGA	1760	Corrosive Liquids, n.o.s.	8	0	0	Hwy	Spillage
Started to unload flange on trailer started to leak most of it went into bucket & spill pad used spill pads to clean up.												
Quality Carriers	Ge silicones, 3500 SR 2	Friendly	5/3/2006	5	LGA	1993	Fuel Oil (No. 1, 2, 4, 5, or 6)	3	0	0	Hwy	Spillage, explosion
While unloading valve stem came off causing about 5 gallons of product to spill. Spill was cleaned by consignee.												
Lewis Transport, Inc.	SR 180	Middlebourne	9/3/2006	1001	LGA	1993	Diesel Fuel	3	2	37703	Hwy	Spillage, fire, explosion, material entered waterway/ storm sewer, environmental damage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Based on information from the West Virginia State Police, our unit had been traveling south on WV Route 18, transporting gasoline and diesel fuel to a local gas station. Upon passing the Chevron fuel station, located along the west roadway edge of SR 18, and entering a left-hand turn, our vehicle traveled off the west roadway edge, striking the guardrail. Subsequently, our unit turned over in the roadway coming to rest on its passenger side. According to witness statements, our unit immediately burst into flames, starting at the rear resulting in multiple explosions. Due to our unit sustaining extensive damage due to the fire it would be impossible to conclude if the accident was caused by mechanical failure. Also, of the witnesses interviewed none could provide information indicative to our unit showing signs of mechanical failure; i.e., tire smoke, erratic weaving, heavy braking, etc.												
Lewis Transport, Inc.	SR 180	Middlebourne	9/3/2006	7000	LGA	1203	Gasoline includes gasoline mixed with ethyl alcohol, with not more than 10% alcohol	3	2	37703	Hwy	Spillage, fire, explosion, material entered waterway/ storm sewer, environmental damage
Based on information from the West Virginia State Police, our unit had been traveling south on WV Route 18, transporting gasoline and diesel fuel to a local gas station. Upon passing the Chevron fuel station, located along the west roadway edge of SR 18, and entering a left-hand turn, our vehicle traveled off the west roadway edge, striking the guardrail. Subsequently, our unit turned over in the roadway coming to rest on its passenger side. According to witness statements, our unit immediately burst into flames, starting at the rear resulting in multiple explosions. Due to our unit sustaining extensive damage due to the fire it would be impossible to conclude if the accident was caused by mechanical failure. Also, of the witnesses interviewed none could provide information indicative to our unit showing signs of mechanical failure; i.e., tire smoke, erratic weaving, heavy braking, etc.												
Schneider National Bulk Carriers, Inc.	SR 2 South & SR 18	Sistersville	1/21/2014	1079	LGA	1824	Sodium Hydroxide, Solution	8	0	93000	Hwy	Spillage, material entered waterway/ storm sewer, environmental damage
The driver reported he was going the speed limit on a left-hand curve. He missed a pothole with this tractor but caught the tandems of the cargo tank causing the units to tip over. Product started flowing out of the vacuum relief vent on the top of the cargo tank. Approximately 1079 gallons spilled out before the first responder fire personnel were able to stop the leak. The remaining product was transferred to another cargo tank and the trailer was up-righted. Road (state route) was closed for several hours. Product spilled down an embankment and a small amount of product got into a tributary. An emergency response crew began working with the dep to clean up the release and continue to monitor the soil samples.												
Quality Carriers, Inc.	3500 SR 2	Friendly	9/24/2014	>1	LGA	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage

<table>
<tr><th colspan="13">Transportation-Based Hazardous Materials Releases, 1971 to Current</th></tr>
<tr><th>Carrier Reporter Name</th><th>Route</th><th>City</th><th>Date</th><th>Qty. Rel.</th><th>Unit</th><th>UN / NA</th><th>Commodity</th><th>Class</th><th>Fata-lity</th><th>Dam-age</th><th>Mode</th><th>Result</th></tr>
<tr><td colspan="13">Driver dropping trailer at consignee and while backing up noticed product dripping from trailer. Dome lid was closed but not tie strapped causing small amount of product to leak out. Consignee cleaned up spill. Event 43139</td></tr>
<tr><td>UPS Freight</td><td>10851 Energy Hwy</td><td>Friendly</td><td>1/17/2017</td><td>1</td><td>LGA</td><td>2735</td><td>Amines, Liquid, Corrosive, n.o.s. or Polyamines, Liquid, Corrosive, n.o.s.</td><td>8</td><td>0</td><td>3000</td><td>Hwy</td><td>Spillage</td></tr>
<tr><td colspan="13">The driver was at the consignee's location and when unloading the freight they noticed something had leaked out. A pallet had shifted in transit and punctured the seam at the bottom of the drum. A contractor was called out to clean up the spill.</td></tr>
<tr><td>Federal Express Corporation</td><td>Taoyuan Intl. Airport</td><td>Brohard</td><td>8/20/2021</td><td>>1</td><td>LGA</td><td>1207</td><td>Hexaldehyde</td><td>3</td><td>0</td><td>0</td><td>Air</td><td>Spillage</td></tr>
<tr><td colspan="13">A undeclared dangerous goods shipment of un1207, hexaldehyde, packing group 111, was observed leaking during inbound sort operations at the FedEx express ramp facility at Taoyuan International Airport in Taiwan. The involved box was part of a five-piece shipment. The outer fiberboard packaging contained an inner un specification jerrican that was overpacked inside the box. A small amount leaked from the lid of the inner container into the outer packaging, which dampened the box. The outer box did have dangerous goods markings and labeling, and a shipper’s declaration for dangerous goods was offered with the shipment. The ramp was directed by dangerous goods administration to contain the shipment in a salvage drum and hold it pending further disposition instruction. The shipment was subsequently picked up at the ramp by the recipient.</td></tr>
<tr><td colspan="2">CSX Transportation</td><td>Parkersburg</td><td>2/19/1996</td><td>1.5</td><td>LGA</td><td>1993</td><td>Flammable Liquids, n.o.s.</td><td>3</td><td>0</td><td>0</td><td>Rail</td><td>Spillage</td></tr>
<tr><td colspan="13">T/c was found to be leaking from its bottom valve. T/c was isolated in yard. Shipper notified: Dave Fione (708) 305-1526 who contracted Weavertown Envir. To response. Car was transloaded for repair on the bottom outlet valve.</td></tr>
<tr><td>CSX Trans.</td><td>825 Depot St.</td><td>Parkersburg</td><td>3/23/2004</td><td>2</td><td>LGA</td><td>1993</td><td>Flammable Liquids, n.o.s.</td><td>3</td><td>0</td><td>0</td><td>Rail</td><td>Spillage</td></tr>
<tr><td colspan="13">While switching cars at CSX Transportation's rail yard in Parkersburg, WV, the crew reported srix30126, load flammable liquid, nos (cyclohexane styrene) to be wet on the side of the tank. The car was isolated and the shipper, Kration Polymers, was notified via Chemtrec. The shipper sent personnel to the yard to repair the car. The shipper reported that they replaced the manway cover gasket and secured the manway cover. The car was released to continue to destination.</td></tr>
<tr><td>CSX Trans.</td><td>Rail Yard</td><td>Parkersburg</td><td>8/18/1996</td><td>1</td><td>LGA</td><td>2303</td><td>Isopropenylbenzene</td><td>3</td><td>0</td><td>0</td><td>Rail</td><td>Spillage</td></tr>
<tr><td colspan="13">Tank car load isopropenyl benzene noted splash leak from dome of tank car. Tank car isolated shipper response team replaced defective manway gasket. Tank car released.</td></tr>
</table>

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fatality*	*Dam-age*	*Mode*	*Result*
CSX Transportation		Parkersburg	11/4/1996	>1	LGA	1010	Butadienes, Stabilized or Butadienes and Hydrocarbon Mixture, Stabilized containing more than 40% Butadienes	2.1	0	0	Rail	Spillage
A carman at CSXT's rail yard in Parkersburg, WV, reported a strong odor coming from SCMX 4033. Yard personnel called the consignee to assist. The consignee responded & attempted to repair the vapor leak at the base of the gauging device but could not. The local fire dept was notified. They responded & shut down yard operations. The consignee's hazmat team responded. CSXT responded a hazmat manager from Walbridge. OH, for unloading. At 1700hrs, the consignee's team stopped the leak by applying a modified C kit. The fire dept released the yard at 1735 hrs. Csxt obtained an emergency approval to move the car to Belpre, OH. For unloading. CSXT's hazmat manager & hazmat team escorted the car to destination.												
Tri-State Motor Transit Co.	I-77	Mineral Wells	4/29/1997	0.5	LGA	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
Upon performing enroute inspection, driver noticed seepage on 10 drums and a small amount of products on floor of trailer (secondary contained). The bungs were loose therefore the driver tighten the bungs and cleaned up product from floor and trailer and disposed of rags at facility.												
CSX Trans.	825 Depot Street	Parkersburg	5/29/1997	75	LGA	1789	Hydrochloric Acid, Solution	8	0	7600	Rail	Spillage
During inspection, West Virginia Corporation Commission inspector observed GATX 52456 leaking from the bottom sump. The car was in a mainline train. The train was stopped and the area around the leaking car was isolated. The shipper was notified via Chemtrec. The shipper responded their hazardous materials team. The local fire department was also notified. Agricultural lime was placed on the ground underneath the leak to neutralized the spilled acid and suppress vapors. Closer inspection revealed that the source of the leak was a seep hole on the bottom sump cover. The plug for this seep hole had either corroded and/or fallen out. The seep hole was closed with a wooden plug. The contents of the leaking car were transferred into another tank car for movement to the consignee. The leaking car was routed to a repair shop for cleaning and repair.												
CSX Transportation		Parkersburg	6/2/1997	>1	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Rail	Spillage, Vapor (Gas) Dispersion
A tank car at CSXT's rail yard in Parkersburg, WV, was reported to have vented some vapors from the top when coupled into during switching. The car was isolated and the shipper (of the last load) was notified. The shipper responded. They found the liquid education line phlange was loose and when the car was coupled into, it caused the gasket to leak some vapors. The phlange securement bolts were tightened and the car was released.												
CSX Transportation		Parkersburg	7/17/1997	2	LGA	2303	Isopropenylbenzene	3	0	0	Rail	Spillage
Crew reported a tank car with a slosh leak from the top when at CSXT's railyard in Parkersburg, WV. Car set in shop track, and the shipper was notified. The shipper sent Rescar to make repairs. Rescar found car had a bad manway gasket. They replaced the gasket and released the car.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
American Freightways Co., Inc.	I-77 & SR 14	Mineral Wells	11/3/1997	2	LGA	3103	Organic Peroxide Type C, Liquid	5.2	0	300	Hwy	Spillage
Several containers had faulty seals and resulted in a release of the product. All damaged product and absorbent were handled according to all local, state and federal regulations.												
Overnite Transportation Co.	4400 Camden Ave.	Parkersburg	1/14/1998	1	LGA	2810	Poisonous Liquids, n.o.s.	6.1	0	1650	Hwy	Spillage
At time of loading the drum was removed from the small skid to avoid the drum from turning over in transit. While removing from the skid I would say that the bottom of the drum hit the corner of the skid causing the pin hole in drum. Dunnage was placed under the drum so very little material came out. When the trailer was opened in Parkersburg a cleanup crew was called in to handle the cleanup.												
CSX Trans.	325 Depot Street	Parkersburg	5/4/1998	2	LGA	2303	Isopropenylbenzene	3	0	2000	Rail	Spillage
Yard crew observed liquid sloshing from the top of PTLX 120166. The car was isolated and the proper authorities notified. The shipper was notified of the situation and requested that the carrier have a contractor make the necessary repairs to the car. The carrier's contractor responded and found that the 2" liquid eduction valve on the top of the car was loose. The valve body was not secured to the eduction pipe flange allowing product to seep around the threads. The valve body was tightened and the leak was stopped. After the valve was secured the car was rechecked for leaks, finding none, the car was released for movement to the consignee.												
CSX Trans.	825 Depot Street	Parkersburg	6/28/2004	2	LGA	1993	Combustible Liquid, n.o.s.	2	0	0	Rail	Spillage
Switcher, y20128, working in CSX Transportation's rail yard in Parkersburg, WV, reported tank car, UTLX 200915, load combustible liquid, nos (2-ethyl hexyl alcohol), was sloshing product from the top when it was moved. The car was isolated and the shipper, union carbide (Dow Chem.) Was notified via Chemtrec. Dow Chemical authorized CSXT to send an emergency response contractor to repair the cause of the release. The contractor responded on 06-29-04. They found that two of eight manway cover securement bolts were not finger tight. They made certain all the manway cover securement bolts were wrench tight. They also inspected the liquid valve and the vapor valve finding them to be ok. The car was released to continue to destination. Dow chemical was advised of the cause of the release.												
Jevic Trans., Inc.	Parkersburg Business Center	Mineral Wells	1/21/1999	100	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	2900	Hwy	Spillage
Consignee's painting contractor's employees were unloading their shipment using a "cherry picker" cane. They damaged two drums while picking them up, allowing escape of the contents of both. Contractor's employees handled cleanup of the carrier's vehicle and disposal of the waste.												

<table>
<tr><th colspan="13">Transportation-Based Hazardous Materials Releases, 1971 to Current</th></tr>
<tr><th>Carrier Reporter Name</th><th>Route</th><th>City</th><th>Date</th><th>Qty. Rel.</th><th>Unit</th><th>UN / NA</th><th>Commodity</th><th>Class</th><th>Fata-lity</th><th>Dam-age</th><th>Mode</th><th>Result</th></tr>
<tr><td>Overnite Transportation Co.</td><td>4400 Camden Ave</td><td>Parkersburg</td><td>6/10/1999</td><td>0.125</td><td>LGA</td><td>1824</td><td>Sodium Hydroxide, Solution</td><td>8</td><td>0</td><td>500</td><td>Hwy</td><td>Spillage</td></tr>
<tr><td colspan="13">When unloading trailer there was residue on trailer floor. Clean up team was called to clean up the spill. When inspecting the shipment there was no damage done to the container. The only explanation that we have is that one of the caps came loose during transit but was tightened up later. There was very min. Liquid that had spilled out. Freight was delivered and trailer was cleaned up by hazmat team.</td></tr>
<tr><td>Overnite Transportation Co.</td><td>4400 Camden Street</td><td>Parkersburg</td><td>8/20/1999</td><td>0.0625</td><td>LGA</td><td>1830</td><td>Sulfuric Acid with more than 51% Acid</td><td>8</td><td>0</td><td>810</td><td>Hwy</td><td>Spillage</td></tr>
<tr><td colspan="13">Material fell on box while in transit causing damage to carton. Proper clean up disposal conducted.</td></tr>
<tr><td>Federal Express Corporation</td><td>6650 Emerson Ave</td><td>Parkersburg</td><td>2/4/2005</td><td>284</td><td>LGA</td><td>1950</td><td>Aerosols, Flammable, (each not exceeding 1 L capacity)</td><td>2.1</td><td>0</td><td>0</td><td>Air</td><td>Vapor (Gas) Dispersion</td></tr>
<tr><td colspan="13">This package was found to have numerous items from this shipper and among them was a flammable aerosol 10 oz. Can of leather spray which was completely discharged within the package because the cap came off and somehow the top was depressed.</td></tr>
<tr><td>Overnite Transportation Co.</td><td>95 & Rayon Drive</td><td>Parkersburg</td><td>2/25/2000</td><td>10</td><td>LGA</td><td>2810</td><td>Toxic Liquids, Organic, n.o.s.</td><td>6.1</td><td>0</td><td>4400</td><td>Hwy</td><td>Spillage</td></tr>
<tr><td colspan="13">As we were unloading, we saw leaking from trailer-called clean up team. Team found one drum leaking from side.</td></tr>
<tr><td>Federal Express Corp.</td><td>6650 Emerson Ave</td><td>Parkersburg</td><td>8/11/2000</td><td>0.249907</td><td>LGA</td><td>1760</td><td>Corrosive Liquids, n.o.s.</td><td>8</td><td>0</td><td>0</td><td>Air</td><td>Spillage</td></tr>
<tr><td colspan="13">This package was saturated from the spill of 2 inner containers. When the inner contents were inspected, some inner boxes were found to be marked "orm-d". The spill was cleaned up per FedEx policy and procedure and i was notified about this possible hidden dangerous goods shipment. Because of the "orm-d" marking on inner packages, i notified the FAA about this hidden dangerous goods shipment. The data sheets on some of the contents describe them as corrosive liquid, n.o.s. (hydroxyethanediphosphonic acid). (943 ml of this spilled), corrosive liquid, n.o.s. (n-diphosphonic acid, and corrosive solid, n.o.s. (sulfamic acid). This package will be held in a secure location until the FAA investigates and releases the shipment. There were no dangerous goods markings or labelings on the outer box and no dangerous goods paperwork was offered to FedEx. There were 6 other pieces in this shipment, but they were delivered before this one was found.</td></tr>
<tr><td>Overnite Transportation Co.</td><td>95 & Rayon</td><td>Parkersburg</td><td>6/2/2000</td><td>0.03125</td><td>LGA</td><td>1133</td><td>Adhesives, containing a Flammable Liquid</td><td>3</td><td>0</td><td>874</td><td>Hwy</td><td>Spillage</td></tr>
<tr><td colspan="13">A nail from the skid the drums were loaded on punched a hole in the drum. The adhesives sealed itself. Damage drum was placed in overpack and delivered to customer.</td></tr>
</table>

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fatality*	*Dam-age*	*Mode*	*Result*
Liquid Transport Corp.	401 Buckeye St.	Parkersburg	8/31/2000	1	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Hwy	Spillage
Prior to commencing product loading the loading mechanism was being positioned at near the cargo tank when a valve was intentionally opened on the mechanism. The valve was immediately closed and no further release occurred. Plant personnel contained and washed down the spilled product.												
Conway Central Express	RR 3 Box 180	Williamstown	5/4/2001	0.0625	LGA	1993	Flammable Liquids, n.o.s.	3	0	1500	Hwy	Spillage
Driver using a single drum grab forklift attachment. While maneuvering in to p/u drum the frame of drum graber, punctured drum.												
Conway Central Express	SR 14 South	Williamstown	7/6/2001	5	LGA	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
Shipment was being loaded at Cleveland Freight Assembly Center 1 pail of material accidently creased with forklift. Material leaked enroute to Parkersburg. Upon arrival leaking material contained, repackaged in salvage drum & declined to consignee.												
CSX Transportation		Parkersburg	8/29/2001	0.625	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Rail	Vapor (Gas) Dispersion
On August 29, 2001, personnel in the CSXT Parkersburg, WV yard noticed GATX 50733, a loaded tank car of hydrochloric acid, fuming from the top. The car was isolated and the consignee, along with a CSXT response contractor, was dispatched to the scene. The consignee found the frangible disc blown and replaced the disc. The fuming stopped and the car was released without incident.												
Federal Express Corp.	6650 Emerson Ave	Parkersburg	8/24/2001	0.264172	LGA	1950	Aerosols, Flammable, (each not exceeding 1 L capacity)	2.1	0	0	Air	Spillage
During the offload operations in Parkersburg, WV. The cargo handlers noticed a strong smell and then a damp spot on the outside of the fiberboard box. Inner inspection revealed nine (9) aerosol cans loaded inside the box. The protective caps had come off of some of the aerosol cans and one of the cans had the spray nozzle engaged, which sprayed paint all over the inner units. Package was cleaned and placed inside a salvage drum. The outer package was not marked, labeled or documented to contain dangerous goods. The FAA office in Pittsburgh, PA. Was notified and the shipment was held pending FAA investigation.												
Perma-Fix of Orlando	Liberty Truck Stop	Mineral Wells	3/19/2002	160	LBS	2588	Pesticides, Solid, Toxic, n.o.s.	6.1	0	55000	Hwy	Spillage, Vapor (Gas) Dispersion, Environmental Damage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Driver had parked his tractor/trailer at the truck stop the evening before at approx. 10:30 pm and made his final inspection around vehicle and found everything to be ok. Then 2 hrs. Later the truck stop fuel attendant awoke the driver to report the trailer was leaking out the rear door on the right side. Our driver then called myself, Chemtrec and asked one of the employees from the truck stop to call 911. The fire dept was called and showed up shortly after along with their local 1st response team to assess the situation. They then proceeded to make additional arrangements for the cleanup then later that day they finally removed enough drums to find the one drum as I have reported which had a small hole on the very bottom not any larger then a dime which began to leak at some point in time. The drum was repacked and sent to its destination.												
Overnite Transportation Co.	4400 Camden St.	Parkersburg	#########	0.125	LGA	1992	Flammable Liquids, Toxic, n.o.s.	3	0	405	Hwy	Spillage
This pyramided skid had a pc of vinyl flooring fail onto it that crushed the ctn. Upon inspection clean up team was called in. Report of excretion was noted and report back to loading terminal. Corrective action and training given to loader.												
XPO Logistics, LLC	4624 Williams Hwy	Williamstown	4/26/2018	30	LBS	3077	Environmentally Hazardous Substances, Solid, n.o.s.	9	0	3000	Hwy	Spillage
(1) 2200 pound supersack containing un3077, sulfone monomer standard released approximately 30 pounds onto the trailer floor due to a tear cause by improper loading												
UPS Freight	4400 Camden Ave.	Parkersburg	4/30/2018	20	LGA	3082	Environmentally Hazardous Substances, Liquid, n.o.s.	9	0	5000	Hwy	Spillage
The drum was punctured by the pallet that was loaded in front of this shipment.												
XPO Logistics	4624 Williams Hwy	Williamstown	6/1/2018	0.25	LBS	3242	Azodicarbonamide	4.1	0	0	Hwy	Spillage
No comments provided.												
UPS Freight	4400 Camden Ave.	Parkersburg	8/3/2018	0.03125	LGA	3082	Environmentally Hazardous Substances, Liquid, n.o.s.	9	0	1000	Hwy	Spillage
The cap was loose and some product leaked out onto the top of the tote.												
Advantage Tank Lines, Inc.	Grand Central Ave.	Vienna	7/20/2002	3	LGA	1993	Fuel Oil (No. 1, 2, 4, 5, or 6)	3	0	54	Hwy	Spillage
While switching compartments the gasket on the delivery hose became disconnected. Driver was not aware that the gasket had fallen out and continued with delivery. A small amount of product (3 gallons) spilled onto the ground. No product reached any waterways or sewers. It was immediately contained and cleaned up.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam- age*	*Mod e*	*Result*
UPS Freight	4400 Camden Avenue	Parkersburg	#########	55	LG A	1993	Flammable Liquids, n.o.s.	3	0	2500	Hwy	Spillage
The dockworker entered the trailer to unload the freight and his forks were raised too high and he punctured the drum.												
UPS Freight	4400 Camden Ave.	Parkersburg	#########	0.01562 5	LG A	1090	Acetone	3	0	0	Hwy	Spillage
The carton was punctured while the freight was being loaded.												
CSX Trans.	2201 Keever St., MP Bn92.5	Parkersburg	1/11/2019	0.5	LG A	1218	Isoprene, Stabilized	3	0	5000	Rail	Spillage, Vapor (Gas) Dispersion
On January 11, 2019, at approximately 1905 hours, Brandon Boone, Parkersburg Utility employee reported that in the Parkersburg WV yard, a strong smell of a chemical coming from a tank car. Sunpro, a CSXT response contractor responded and found TILX 301522 leaking from the top of the tank car. The tank car was isolated and the shipper Kraton Polymers was notified, Sunpro responded and found the sample line a quarter turn open and the secondary closure plug less than tool tight. The issue was identified and corrective actions were communicated to the shipper, Kraton (Jerri Sage ph# 904-349-1180). TILX 301522 was released back into transportation without any further delays. This did not require a special switch.												
Federal Express Corporation	6650 Emerson Ave.	Parkersburg	4/17/2019	0.12495 2	LG A	1170	Ethanol or Ethyl Alcohol or Ethanol Solutions or ethyl Alcohol Solutions	3	0	0	Air	Spillage
The consignment was offered as a limited quantity shipment, the inner container broke during handling losing all of its contents. The customer was notified of the incident and informed that the package and waste was prepared for environmental disposal												
UPS Freight	4400 Camden Ave.	Parkersburg	6/11/2019	1	LG A	1719	Caustic Alkali Liquids, n.o.s.	8	0	0	Hwy	Spillage
The pail was punctured by a nail on the pallet.												
FedEx Freight, Inc.	190 Elizabeth Pike	Mineral Wells	5/6/2019	0.0625	LG A	1263	Paint Related Material including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	Spillage
Associate did not block and/or brace freight properly for transport. Freight was crushed causing release of product.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam-age*	*Mod e*	*Result*
XPO Logistics, LLC	4624 Williams Hwy	Williamstow n	7/31/2019	0.5	LG A	2735	Amines, Liquid, Corrosive, n.o.s. or Polyamines, Liquid, Corrosive, n.o.s.	8	0	0	Hwy	Spillage
XPO Logistics reported to ERTS that (1) 55-gallon metal drum was punctured due to adjacent freight, releasing approximately .5 gallons of un 2735, 2-methylpentamethylenediamine to the dock and trailer floor. Terminal personnel cleaned the spill using proper PPE and absorbents, then placed the damaged drum and waste debris into an 85-gallon poly drum. All generated waste was staged on site.												
FedEx Freight, Inc.	190 Elizabeth Pike	Mineral Wells	7/30/2019	0.25	LG A	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage
Associate punctured freight with forklift blades while loading / unloading causing product to leak.												
CSX Transportatio n, Inc.	CSX Parkersbur g Yard, MP ba384	Parkersburg	#########	1	LG A	1218	Isoprene, Stabilized	3	0	25000	Rail	Vapor (Gas) Dispersion
On 10/28/2019, at 1933 hours, personnel in the CSXT Parkersburg discovered GATX 201122, a loaded tank car of isoprene, leaking from protective housing. The car was isolated and the shipper, local fire department, West Virginia Department Of Environmental Protection, National Response Center, and Federal Railroad Administration were notified. (Chemtrec report #2019-1029-000010). Specialized Professional Services, Inc, a CSXT emergency response contractor, was dispatched to the scene and found a vapor release emanating from the magnetic gauging device. The issue was identified and corrective actions were communicated to the shipper's representative, Ms. Gerry Sage, phone 904-349-1180. Contractor personnel installed midland emergency response capping kit to secure the vapor release. The contents of GATX 201122 were transferred, and the car was cleaned and purged on 11/1/2019. This incident did not require a special switching move. 7.1 will be completed by the CSX hazardous materials team. Cause code: 479 narri: 40												
CSX Transportatio n, Inc.	CSX Parkersbur g Yard MP ba384	Parkersburg	1/7/2020	1	LG A	1218	Isoprene, Stabilized	3	0	1500	Rail	Vapor (Gas) Dispersion
On 01/07/2020, at 1252 hours, an FRA hazmat inspector in the CSXT Parkersburg Yard took exception to PROX 633039 as having loose closures. PROX 633039 was a loaded tank car of isoprene, stabilized. The car was isolated and the shipper, National Response Center, and West Virginia DEP were notified. Specialized Professional Services, Inc., a CSXT emergency response contractor, was dispatched to the scene and found liquid, vapor, and sample line secondary closures less than tool tight, and a vapor release emanating from the vapor line valve due to a partially open valve. The issue was identified and corrective actions were communicated to the shipper Ms. Aimee Dose, phone 904-928-8837. Contractor personnel secured all valves and closures, and the car was released for transport. This incident did not require a special switching move. 7.1 will be completed cause code: 134 narri: 40												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fatality*	*Damage*	*Mode*	*Result*
CSX Transportation, Inc.	CSX Parkersburg Yard MP ba384	Parkersburg	2/2/2020	1	LGA	1129	Butyraldehyde	3	0	3500	Rail	Spillage
On 02/02/2020, at 0645 hours, personnel in the CSXT Parkersburg Yard discovered OXAX 23166, a loaded tank car of butyraldehyde, leaking from the protective housing. The car was isolated and the shipper, National Response Center, and West Virginia DEP were notified. (Chemtrec report #2020-0202-00013). Specialized Professional Services, Inc, a Csxt emergency response contractor, was dispatched to the scene and found the liquid line valve primary flange gasket misaligned and the valve not properly secured. The issue was identified and corrective actions were communicated to the shipper, Mr. Sean Wengler, phone 979-241-4222. Contractor personnel removed the liquid line valve, reinstalled the primary flange gasket, and reinstalled the liquid line valve. The leak was secured and the car was released for transport. This incident did not require a special switching move. Cause code: 278 narri: 110												
United Parcel Service	2500 Gihon Rd.	Parkersburg	2/12/2020	0	N/A	1950	Aerosols, Poison, Packing Group III (each not exceeding 1 L capacity)	2.2	0	0	Hwy	No release
N/A.												
FedEx Freight, Inc.	190 Elizabeth Pike	Mineral Wells	1/17/2020	80	LBS	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
Associate did not block and/or brace freight properly for transport. Freight was crushed causing release of product.												
CSX Transportation	CSX MP ba384 Parkersburg Yard	Parkersburg	9/7/2020	1	LGA	1129	Butyraldehyde	3	0	10000	Rail	Vapor (Gas) Dispersion
On 09/07/2020, at 0907 hours, personnel in the CSXT Parkersburg Yard discovered OXAX 23230, a load tank car of butyraldehyde, with a strong odor emanating from the car. The car was isolated and the shipper, national response center, and West Virginia Department Of Environmental Protection were notified. (Chemtrec report #2020-0907-00023). Specialized Professional Services, Inc., a CSXT emergency response contractor, was dispatched to the scene and confirmed a vapor release from a broken bottom outlet valve flange to tank car connection. The issue was identified and corrective actions were communicated to the shipper's representative, Mr. Kendrick Bowen, phone 214-577-1046. Contractor personnel cleaned all liquid product from the exterior of the valve, wrapped it in poly sheeting, and installed a spill pan reservoir. The car's contents were transferred on 9/10/2020. As of this report, the tank car remains on hold in the CSX Parkersburg Yard awaiting repair from an AAR authorized MRU. This incident did not require a special switching move. 7.1 will be submitted. Cause code: 543 - ***note*** - the mounting flange gasket was misaligned due to the mounting flange being cracked. Narri: 32												
R & J Trucking Co.	Emerson Rd.	Parkersburg	#########	2.5	LGA	3170	Aluminum Smelting By-Products or Aluminum Remelting By-Products	4.3	0	100	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
An R&J Trucking, Inc. Tractor trailer containing aluminum smelting by-products was discovered to have released approximately 20 lbs. Of material onto the asphalt pavement. The Parkersburg Fire Department with the assistance of the driver with R&J Trucking, Inc. Swept the material into a pile and placed approximately 20 lbs. of aluminum smelting by-products released onto the asphalt pavement back into the trailer.												
CSX Transportation, Inc.	CSX Parkersburg Yard MP ba384	Parkersburg	2/4/2021	0.01671	GCF	1010	Butadienes, Stabilized or Butadienes and Hydrocarbon Mixture, Stabilized containing more than 40% Butadienes	2.1	0	2000	Rail	Vapor (Gas) Dispersion
On 02/04/2021, at 0312 hours, personnel in the CSXT Parkersburg Yard discovered CTCX 780290, a residue tank car of butadienes, leaking from the top of the car. The car was isolated and Kraton Polymers, National Response Center, West Virginia DEP, and the federal railroad administration were notified. (Chemtrec report #2021-0204-00018). Specialized Professional Services, Inc, a CSXT emergency response contractor, was dispatched to the scene and found the a-end liquid valve a quarter turn open and the secondary closure plug less than tool tight. The issue was identified and corrective actions were communicated to the shipper, Aimee Dose, phone 904-349-9028. Contractor personnel closed the valve and installed the secondary closure tool tight thus securing the release. The leak was secured and the car was released for transport. This incident did not require a special switching move. Cause code: 117 narri: 36												
CSX Transportation, Inc.	CSX Parkersburg Yard MP ba384	Parkersburg	2/4/2021	0.13368	GCF	1010	Butadienes, Stabilized or Butadienes and Hydrocarbon Mixture, Stabilized containing more than 40% Butadienes	2.1	0	2000	Rail	Vapor (Gas) Dispersion
On 02/04/2021, at 0312 hours, personnel in the CSXT Parkersburg Yard discovered ACFX 220452, a residue tank car of butadienes, leaking from the top of the car. The car was isolated and Kraton Polymers, National Response Center, West Virginia DEP, and the federal railroad administration were notified. (Chemtrec report #2021-0204-00018). Specialized Professional Services, Inc, a CSXT emergency response contractor, was dispatched to the scene and found the b-end liquid valve a quarter turn open and the secondary closure plug less than tool tight. The issue was identified and corrective actions were communicated to the shipper, Aimee Dose, phone 904-349-9028. Contractor personnel closed the valve and installed the secondary closure tool tight thus securing the release. The leak was secured and the car was released for transport. This incident did not require a special switching move. Cause code: 117 narri: 36												
XPO Logistics, LLC	4624 Williams Hwy	Williamstown	3/29/2021	0.75	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage
It was reported that due to a forklift puncture approximately 1 gallon of medium urethane reducer (hazardous - UN1263) was released from (1) 1 gallon metal can. The caller stated that the released product was contained to the dock floor. Terminal personnel cleaned and drummed the release.												

Transportation-Based Hazardous Materials Releases, 1971 to Current

Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Ranger Landstar, Inc.	Interstate 77 South	Rockport	4/16/2021	39683.2	LBS	3077	Environmentally Hazardous Substances, Solid, n.o.s.	9	0	10000	Hwy	Spillage
On April 16, 2021 at 1130 et, Landstar truck #570523 and trailer #668530 were involved in a single - vehicle, rollover accident. As a result, all cargo, (18) 1,000 kg bulk bags of un3077, environmentally hazardous substance, solid, nos (4,4'-dichlorodiphenyl sulfone),9, pgiii, marine pollutant were damaged and released all contents, roughly 39,683 pounds impacting the soil alongside the roadway. Hepaco was dispatched out of Ashland, KY to perform emergency response and cleanup activities. The contractor excavated the impacted area of soil after removing the debris. Impacted soil was placed into three (3) roll off boxes. Final site restoration is still pending.												
FedEx Freight, Inc.	190 Elizabeth Pike	Mineral wells	4/22/2021	2	LGA	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	Spillage
Associate stacked heavy freight on top of hazmat crushing carton/pail and causing product to leak.												
Ford Brothers, Inc.		Parkersburg	2/28/1972	0		1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	0	Hwy	No result
N/A.												
CSX Corporation	CSX MP ba384	Parkersburg	8/7/2022	1	LGA	1218	Isoprene, Stabilized	3	0	5000	Rail	Vapor (Gas) Dispersion
On 08/07/2022, at 1731 hours, personnel in the CSXT Parkersburg Yard discovered UTLX 952520, a loaded tank car of isoprene, leaking from the top of the car. The car was isolated and the shipper of record, national response center, and West Virginia DEP were notified. (Chemtrec report #2022-0807-00047). Specialized Professional Services, Inc, a CSXT emergency response contractor, was dispatched to the scene and found the vapor valve operating handle partially open and the secondary closure plug less than tool tight. The issue was identified and corrective actions were communicated to the shipper Mr. Pat Mentzel of Odjfell Terminals, phone 832-359-1557. Contractor personnel closed the operating valve and installed the secondary closure plug in accordance with 49 CFR 173.31. The leak was secured and the car was released for transport. This incident did not require a special switching move. 7.1 is not required. Cause code: 136 narri:100												
CSX Corporation	CSX MP ba384	Parkersburg	8/14/2022	1	LGA	1218	Isoprene, Stabilized	3	0	2000	Rail	Vapor (Gas) Dispersion

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
On 08/14/2022, at 2330 hours, personnel in the CSXT Parkersburg Yard discovered SCMX 4038, a loaded tank car of isoprene, leaking from the top of the car. The car was isolated and shipper of record, national response center, and West Virginia DEP were notified. (Chemtrec report #2022-0815-00003). Specialized Professional Services, Inc, a CSXT emergency response contractor, was dispatched to the scene and found the vapor line operating handle partially open and the secondary closure plug less than tool tight. The issue was identified and corrective actions were communicated to the shipper, Mr. Ron Riddell of Goodyear Tire & Rubber, phone 330.604.3676. Contractor personnel closed the vapor valve operating handle and installed the secondary closure plug in accordance with 49 CFR 173.31. The leak was secured and the car was released for transport. This incident did not require a special switching move. 7.1 is not required. Cause code: 136 narri: 100												
Ford Brothers, Inc.		Parkersburg	#########	0	N/A	1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	0	Hwy	No result
N/A.												
Motor Freight Express, Inc.		Parkersburg	3/29/1974	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Baltimore & Ohio Railroad Co.		Parkersburg	9/21/1974	0	N/A	1010	Butadienes, Stabilized or Butadienes and Hydrocarbon Mixture, stabilized containing more than 40% butadienes	2.1	0	0	Rail	Spillage
N/A.												
Johnson Motor Lines, Inc.		Parkersburg	2/19/1975	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Yellow Freight System, Inc.		Parkersburg	3/17/1975	0	N/A	2811	Poisonous Solids, n.o.s	6.1	0	0	Hwy	Spillage
N/A.												
Yellow Freight System, Inc.		Parkersburg	3/18/1975	0	N/A	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
N/A.												

Transportation-Based Hazardous Materials Releases, 1971 to Current													
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam- age*	*Mod e*	*Result*
Ford Brothers, Inc.		Parkersburg	3/10/1975	0	N/A	1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	0	Hwy	Spillage
N/A.												
Yellow Freight System, Inc.		Parkersburg	7/8/1975	0	N/A	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
N/A.												
Yellow Freight System, Inc.		Parkersburg	8/5/1975	0	N/A	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
N/A.												
Gould, Inc.		Parkersburg	8/12/1975	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Gould, Inc.		Parkersburg	8/26/1975	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Gould, Inc.		Parkersburg	8/26/1975	0	N/A	2794	Batteries, wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Yellow Freight System, Inc.		Parkersburg	9/17/1975	0	N/A	2810	Poisonous Liquids, n.o.s.	6.1	0	0	Hwy	Spillage
N/A.												
Gould, Inc.		Parkersburg	9/18/1975	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Gould, Inc.		Parkersburg	#########	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam-age*	*Mod e*	*Result*
Gould, Inc.		Parkersburg	#########	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Gould, Inc.		Parkersburg	#########	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Ford Brothers, Inc.		Parkersburg	12/8/1975	0	N/A	1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	0	Hwy	Spillage
N/A.												
Advantage Tank Lines, Inc.	Prima Gihon Rd.	Parkersburg	2/21/2003	5	LG A	1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	510	Hwy	Spillage
Tank overfilled causing approximately 5-gal spill. Spill was contained and cleaned up. Product did not reach waterways or sewers.												
Dupont EI de Nemours & Co.		Parkersburg	10/9/1976	5	LG A	2924	Flammable Liquids, Corrosive, n.o.s.	3	0	0	Hwy	Spillage
N/A.												
Eazor Express, Inc.		Parkersburg	3/24/1977	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Eazor Express, Inc.		Parkersburg	4/20/1977	0	N/A	1142	Compound, Lacquer, Paint, or Varnish, Removing, Reducing, or Thinning, Liquid	3	0	0	Hwy	Spillage
N/A.												
Baltimore & Ohio Railroad Co.		Parkersburg	6/23/1977	1	LG A	1075	Petroleum Gases, Liquefied or Liquefied Petroleum Gas	2.1	0	0	Rail	Spillage
N/A.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Yellow Freight System, Inc.		Parkersburg	6/24/1977	0	N/A	1760	Water Treatment Compounds, Liquid	8	0	0	Hwy	Spillage
N/A.												
Overnite Transportation Co.		Parkersburg	7/7/1977	10	LGA	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Eazor Express, Inc.		Parkersburg	7/19/1977	1	LGA	2553	Naphtha	2	0	0	Hwy	Spillage
N/A.												
Overnite Transportation Co.		Parkersburg	7/29/1977	0	N/A	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
N/A.												
Yellow Freight System, Inc.		Parkersburg	9/12/1977	0	N/A	1993	Compounds, Cleaning Liquid	3	0	0	Hwy	Spillage
N/A.												
Yellow Freight System, Inc.		Parkersburg	9/6/1977	1	LGA	1139	Coating Solution (includes surface treatments or coatings used for industrial or other purposes such as vehicle undercoating, drum or barrel lining)	3	0	0	Hwy	Spillage
N/A.												
CSX Transportation	825 Depot St.	Parkersburg	5/7/2003	1	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Rail	Spillage
The trainmaster at CSX Transportation's rail yard in Parkersburg, WV reported tank car GATX 72779, load hydrochloric acid, to possibly be leaking. The trainmaster inspected the car and found no obvious sign of a liquid leak, however there was a residue on the top and the side of the tank. The shipper, Atofina Chemical was notified via Chemtrec. Atofina advised that they would request the consignee, tetra chemical, to respond to repair the car. Tetra Chemical personnel found that the car had a blown rupture disk. They installed a new 165-pound disk, secured the car. It was then released to continue to consignee's facility.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam-age*	*Mod e*	*Result*
Carolina Freight Carriers Corp.		Parkersburg	12/1/1977	0	N/A	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	Spillage
N/A.												
Eazor Express, Inc.		Parkersburg	#########	0	N/A	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
N/A.												
Overnite Transportation Co.		Parkersburg	#########	1	LG A	1830	Sulfuric Acid	8	0	0	Hwy	Spillage
N/A.												
Eazor Express, Inc.		Parkersburg	3/6/1978	1	LG A	1760	Corrosive Liquids, n.o.s.	8	0	0	Hwy	Spillage
N/A.												
Turner Oil Co., Inc.		Parkersburg	3/9/1978	5	LG A	1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	0	Hwy	Spillage
N/A.												
Baltimore & Ohio Railroad Co.		Parkersburg	3/2/1978	7000	LG A	1381	Phosphorus White or Yellow, Dry	4.4	0	0	Rail	Spillage
N/A.												
Consolidated Freightways		Parkersburg	4/6/1978	0	N/A	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	No result
N/A.												
Rogers Cartage Co.		Parkersburg	5/11/1978	5	LG A	1917	Ethyl Acrylate, Stabilized	3	0	0	Hwy	Spillage
N/A.												
Overnite Transportation Co.		Parkersburg	6/7/1978	0	N/A	1760	Compounds, Cleaning Liquid	8	0	0	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
N/A.												
Yellow Freight System, Inc.		Parkersburg	7/6/1978	0	N/A	1133	Cement	3	0	0	Hwy	No result
N/A.												
Yellow Freight System, Inc.		Parkersburg	8/4/1978	0	N/A	1993	Compounds, Tree Killing, Liquid or Compounds, Weed Killing, Liquid	3	0	0	Hwy	No result
N/A.												
Consolidated Freightways		Parkersburg	8/31/1978	0	N/A	1987	Alcohols, n.o.s.	3	0	0	Hwy	Spillage
N/A.												
Johnson Motor Lines, Inc.		Parkersburg	11/1/1978	1	LGA	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	Spillage
N/A.												
Dupont El de Nemours & Co.		Parkersburg	3/27/1979	10	LGA	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	Spillage
N/A.												
Consolidated Freightways		Parkersburg	3/2/1979	1	LGA	1993	Solvent, n.o.s.	3	0	0	Hwy	No result
N/A.												
Johnson Motor Lines, Inc.		Parkersburg	6/15/1979	0	N/A	1142	Compound, Lacquer, Paint, or Varnish, Removing, Reducing, or Thinning, Liquid	3	0	0	Hwy	No result
N/A.												
Baltimore & Ohio Railroad Co.		Parkersburg	6/19/1979	1	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Rail	Spillage
N/A.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Allegheny Freight Lines, Inc.		Parkersburg	1/22/1980	5	LGA	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	No result
N/A.												
Central Transport, Inc.		Parkersburg	6/5/1980	2	LGA	2810	Poisonous Liquids, n.o.s.	6.1	0	0	Hwy	Spillage
N/A.												
Allegheny Freight Lines, Inc.		Parkersburg	6/30/1980	1	LGA	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	No result
N/A.												
Dupont El de Nemours & Co.		Parkersburg	6/21/1980	12	LGA	1142	Compound, Lacquer, Paint, or Varnish, Removing, Reducing, Or Thinning, Liquid	3	0	0	Hwy	Spillage
N/A.												
Commercial Lovelace Motor Freight		Parkersburg	8/11/1980	1	LGA	1133	Cement	3	0	0	Hwy	No result
N/A.												
Ford Brothers, Inc.		Parkersburg	9/29/1980	100	LGA	1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	0	Hwy	Spillage
N/A.												
Baltimore & Ohio Railroad Co.		Parkersburg	10/2/1980	1	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Rail	Spillage
N/A.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
PPG industries inc. Corp. Fleet		Parkersburg	1/14/1981	0	N/A	1142	Compound, Lacquer, Paint, or Varnish, Removing, Reducing, or Thinning, Liquid	3	0	0	Hwy	Spillage
N/A.												
CSX Transportation	825 Depot Street	Parkersburg	9/11/2003	1	LGA	1789	Hydrochloric Acid, Solution	8	0	15	Rail	Vapor (Gas) Dispersion
Employees at rail yard observed white vapors coming from the top of tank car GATX 62621. The area around the car was isolated and the proper authorities notified. Representatives of the shipper responded and inspected the fittings on the top of the car. They found that the gasket underneath the rupture disk had bubbled due to corrosion and was allowing vapors to seep past the rupture disk assembly. The shipper's representatives replaced the defective gasket and installed a new rupture disk. All other fittings and closures were inspected and found to be sealed and in good condition. The car was then released for movement to the consignee.												
Central Transport, Inc.		Parkersburg	8/10/1981	20	LGA	1760	Corrosive Liquids, n.o.s.	8	0	0	Hwy	Spillage
N/A.												
CSX Transportation	825 Depot Street	Parkersburg	9/24/2003	0.125	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Rail	Vapor(gas) dispersion
The trainmaster at CSX Transportation's rail yard in Parkersburg, WV, reported that GATX 62624, residue last contained, hydrochloric acid, was venting vapors from the top of the car. The shipper, Tetra Chemical, was notified of the situation and responded a technician to inspect the car. Tetra Chemical's representative reported that the rubber gasket on the bottom of the graphite frangible disk was deformed (puckered) preventing a vapor tight seal and allowed vapors to escape around the gasket. He replaced the frangible disk with a new disk with a new disk and secured the car. The vapor release was stopped. In follow up with Tetra Chemical they advised that they have had a problem with deformed rubber gaskets on the bottom of frangible disks Tetra Chemical has installed a new teflon surge protectors in their cars that provide a wider contact surface than the disk gasket alone to ensure a vapor tight seal.												
Commercial Lovelace Motor Freight		Parkersburg	3/26/1982	0	N/A	2810	Coal Tar Dye, Liquid (not otherwise specifically named in 172.101)	8	0	0	Hwy	Spillage
N/A.												
Commercial Lovelace Motor Freight		Parkersburg	3/26/1982	0	N/A	2810	Coal Tar Dye, Liquid (not otherwise specifically named in 172.101)	8	0	0	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam- age*	*Mod e*	*Result*
Baltimore & Ohio Railroad Co.		Parkersburg	4/19/1982	1	LG A	1129	Butyraldehyde	3	0	0	Rail	Spillage
N/A.												
Commercial Lovelace Motor Freight		Parkersburg	2/23/1983	0	N/A	1789	Hydrochloric Acid, Solution	8	0	0	Hwy	Spillage
N/A.												
Chessie System		Parkersburg	2/27/1983	0	N/A	1993	FLAMMABLE LIQUIDS, N.O.S.	3	0	0	Rail	Spillage
N/A.												
Chessie System		Parkersburg	4/27/1983	2	LG A	1824	Sodium Hydroxide, Solution	8	0	0	Rail	Spillage
N/A.												
Allegheny Freight Lines		Parkersburg	6/20/1983	0	N/A	1226	Lighter Fluid	3	0	0	Hwy	Spillage
N/A.												
Chessie System		Parkersburg	3/2/1983	0	N/A	1280	Propylene Oxide	3	0	0	Rail	Spillage
N/A.												
Chemical Leaman Tank Lines, Inc.		Parkersburg	8/8/1983	10	LG A	1170	Ethanol or Ethyl Alcohol or Ethanol Solutions or Ethyl Alcohol Solutions	3	0	0	Hwy	Spillage
N/A.												
Chessie System Railroad		Parkersburg	10/1/1983	1	LG A	1789	Hydrochloric Acid, Solution	8	0	0	Rail	Spillage
N/A.												
Chessie System		Parkersburg	#########	0.063	LG A	1993	Combustible Liquid, n.o.s.	2	0	0	Rail	Spillage
N/A.												
Baltimore & Ohio Railroad Co.		Parkersburg	1/7/1984	5	LG A	2076	Cresols, Liquid	6.1	0	0	Rail	Spillage
N/A.												
Baltimore & Ohio Railroad Co.		Parkersburg	1/7/1984	5	LG A	2055	Styrene Monomer, Stabilized	3	0	0	Rail	Spillage
N/A.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Beattyville Transport, Inc.		Parkersburg	8/11/1984	400	LGA	1993	Fuel Oil, No. 1, 2, 4, 5, or 6	2	0	0	Hwy	Spillage
N/A.												
Baltimore & Ohio Railroad Co.		Parkersburg	8/22/1984	0	N/A	1824	Sodium Hydroxide, Solution	8	0	0	Rail	Spillage
N/A.												
Fleet Transport Co., Inc.		Parkersburg	2/19/1985	10	LGA	1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	0	Hwy	Spillage
N/A.												
ABF Freight System, Inc.		Parkersburg	7/25/1985	0.078	LGA	1133	Cement, Roofing, Liquid	3	0	0	Hwy	Spillage
N/A.												
Ashland Oil Co.		Parkersburg	9/19/1985	100	LGA	1993	Fuel Oil, No. 1, 2, 4, 5, or 6	2	0	0	Hwy	Spillage
N/A.												
Conoco Chemicals, Inc.		Parkersburg	#########	125	LGA	1730	Antimony Pentachloride, Liquid	8	0	0	Hwy	Spillage
At approximately 8:10 p.m., October 14, 1985, a gas was observed escaping from a closed van trailer which contained a single 2000 lb. Capacity cylinder filled with antimony pentachloride. After it was determined that this was not a momentary pressure release, the local emergency organizations were contacted as well as the Dupont facility nearby. The leak was stopped and the contamination was contained in the parking area and the van trailer. The cause was determined to be a faulty pressure relief device. All relief devices of this type are being checked by the shipper. Approximately 320 drums of contaminated soil were reclaimed. 80 of these were taken to Chemical Waste management, Emelle, AL 35459. The remainder were taken to e. I. Dupont de Nemours Co, Inc.												
Ryder Truck Lines, Inc.		Parkersburg	2/3/1986	5	LGA	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
N/A.												
Yellow Freight System, Inc.		Parkersburg	8/20/1986	35	LGA	2924	Flammable Liquids, Corrosive, n.o.s.	3	0	0	Hwy	Spillage
N/A.												
ABF Freight System, Inc.		Parkersburg	6/29/1987	1.5	LGA	1791	Hypochlorite Solutions with more than 5 percent but less than 16% available chlorine	8	0	0	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
N/A.												
Yellow Freight System, Inc.		Parkersburg	#########	5	LGA	1917	Ethyl Acrylate, Stabilized	3	0	0	Hwy	Spillage
N/A.												
Mid America Airgas	I-77 MM 158	Mineral Wells	#########	0.625	LGA	1013	Carbon Dioxide	2.2	0	8373	Hwy	Vapor (Gas) Dispersion
Driver fell asleep at the wheel. Crossed I-77 median from north bound lane stopping against guard rail on southbound side. 65# CO2 cylinder in median of highway with the valve open. Turn cylinder valve back to close position. Duration of release unknown. Cylinder valve was closed shortly after accident. No mitigation necessary since cylinder valve was still functioning properly to allow closure. Driver training to stop & pull over for rest. Cylinder valve was jarred open when it landed on ground.												
Overnite Transportation Co.	4400 Camden Ave.	Parkersburg	8/20/2003	30	LGA	2265	N,n-dimethylformamide	3	0	9500	Hwy	Spillage
Product was viewed leaking from trailer, paperwork was reviewed and inspection made. Hazmat cleanup team called and emergency response number called, leak contained with dry all & plastic drum, Weavertown Environmental arrived and make clean up. Number 8 tote leaking due to valve nut being loose, gray nut was tightened and leak stopped. Valve should be checked before filling unit.												
Cargo, Inc.		Parkersburg	10/5/1988	0	N/A	1760	Corrosive Liquids, n.o.s.	8	0	0	Hwy	Spillage, vapor(gas) dispersion
Chemtrec assigned to clean up and repackaging. Future shipments will include closer inspection at loading.												
Superior Carriers, Inc.	I-77	Rockport	10/8/1989	2166	LGA	1993	Flammable Liquids, n.o.s.	3	0	380000	Hwy	Fire, Explosion, Material Entered Waterway/Storm Sewer, Environmental Damage
On 10-8-89 approx. 2315 hours, vehicle #1 was north bound on i-77 near mm 158.69 (Rockport, WV). Vehicle #1 left the north bound lanes of traffic crossed the median strip and struck vehicle #2, in the southbound lanes of traffic and overturned. Vehicle #1 slid down the pavement on its side for approx. 350 ft. The tank (4 compartment aluminum) ruptured and caught fire and the unit completely destroyed. The soil at the scene is being dug up and placed in mounds covered with plastic awaiting test to be completed, before taking to an ap proved landfill.												
CSX Transportation		Parkersburg	5/8/1990	68	LGA	1993	Combustible Liquid, n.o.s.	2	0	0	Rail	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Chemtrec received a call from the yard master at Parkersburg, WV, reporting a leaking tank car. Car was reported leaking from the bottom outlet where it attaches to the tank. Car was isolated and bucket placed under leakage to contain the spill. The shipper was notified via Chemtrec. Shipper respond ed personnel who determined car was leaking from the tank itself. Shipper obtained tank trucks and transloaded product from tank car to trucks. Truck s took product back to shipper's facility.												
CSX Transportation	825 Depot St.	Parkersburg	11/1/1990	1	LGA	1993	Combustible Liquid, n.o.s.	2	0	0	Rail	Spillage
Car found leaking by the mechanical dept. At Parkersburg Yard, from the bottom outlet valve. (Dripping approx. 30-40 drops per minute). Mech dept placed a container under the car to collect material. G.E personnel responded & attempted to secure the bottom outlet, unable to do so a temporary patch was applied, and the container keep in place and moved to the G.E. facility for offloading G.E. Plant is approx. 4 to 5 miles from yd.												
UPS	2500 Gihon Rd.	Parkersburg	8/11/2005	1	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage
Driver discovered leaking pkg before moving truck. He notified supervisor. Designated responder Jim Cox responded using decision tree appropriate response sheet and proper PPE. He cleaned up the spill and removed package and spill residue to dump area for further processing												
FedEx Freight East, Inc.	190 Elizabeth Pike	Mineral Wells	9/20/2005	0.0625	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage
The cartons were damaged by forklift puncture causing release of product.												
CSX		Parkersburg	3/12/2006	0	LGA	1789	Hydrochloric Acid	8	0	0	Rail	Vapor (Gas) Dispersion
Main manyway on car needed tightening. Railcar was overloaded. Product expanded due to the ambient temperature increase that day. Scale ticket did not indicate the car was overloaded at the time of shipping.												
FedEx Freight East, Inc.	190 Elizabeth Pike	Mineral Wells	5/11/2006	0.125	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
The carton was damaged by forklift puncture causing release of product. All product was absorbed with oil dry and placed into a salvage drum. All damaged product was handled according to all local, state, and federal regulations.												
FedEx Freight East, Inc.	190 Elizabeth Pike	Mineral Wells	4/4/2007	0.007812	LGA	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
Bolt on trailer was sticking up above boards and caused a small hole in drum.												
CSX Transportation	Yard	Parkersburg	8/29/1991	1	LGA	1783	Hexamethylenediamine Solution	8	0	0	Rail	Spillage
EGC reported to me a leaking tank car in Parkesburg, WV. I contacted Mr. Tishnull (trainmaster of yard) he stated that El Dupont came out and tightened manway cover bolts. El Dupont was contacted locally in Parkersburg. The car then was shipped to destination.												
Federal Express Corporation	6650 Emerson Ave.	Parkersburg	7/11/2007	0	N/A	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Air	No release
During cargo operations this shipment was detected to have a strong paint odor. Shipment was not marked, labeled or documented to contain dangerous goods. There is no information to confirm whether the paint is flammable. No MSDS or other information to refer to. Shipment is being held for FAA investigation.												
UPS Freight		Parkersburg	7/30/2007	0.078125	LGA	1993	Combustible Liquid, n.o.s.	2	0	0	Hwy	Spillage
Round metal cap on tote was not installed correctly - and a small amount of product leaked out on top of tote. Shipper was contacted and admitted, it was their mistake.												
CSX Transportation	825 Depot Street	Parkersburg	9/19/1991	1	LGA	1993	Combustible Liquid, n.o.s.	2	0	0	Rail	Spillage
Switch crew noticed wetness on sides of tank car. Trainmaster contacted nearby consignee. Team responded to yard and discovered worn/torn manway gasket. Repaired gasket, secured manway and tank car delivered to consignee.												
UPS Ground Freight	4400 Camden Avenue	Parkersburg	12/4/2007	1	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Hwy	Spillage
Cartons of corrosive liquid arrived with a hole punctured in the box due to improperly blocked and braced freight which fell in transit and pushed a steel pipe into the cartons.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
FedEx Freight East	190 Elizabeth Pike	Mineral wells	#########	0.25	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage
While loading other freight, associate pushed dunnage into pails, crushing them & causing the release of product. All product was absorbed with oil dry and placed into a salvage drum and was handled according to all local, state, and federal regulations.												
UPS Freight	4400 Camden Ave.	Parkersburg	3/25/2008	0.117188	LGA	1760	Medicines, Corrosive, Liquid, n.o.s.	8	0	0	Hwy	Spillage
55 gallon overpack is leaking from the bottom of the overpack. Looks like it is a bad overpack small leak from the bottom at the weld.												
Ashland Chemical Co.	SR 95 & I-77	Parkersburg	11/3/1991	8500	LGA	1203	Gasoline includes Gasoline Mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	96300	Hwy	Spillage, Fire, Explosion, Material Entered Waterway/Storm Sewer, Environmental Damage
Driver delivering 8500 gallons of gasoline from terminal to service station. Unit overturned causing trailer to rupture - spilling gasoline. Product ignited causing a fire - the entire tractor and trailer burned. Cause of the accident had not been totally determined.												
Bridge Terminal Transport, Inc.	221 Airport Industrial Park Rd.	Parkersburg	5/7/2008	0.551156	LBS	2670	Cyanuric Chloride	8	0	0	Hwy	Spillage
According to the information obtained, the following occurred. While unloading, one (1) 550-kilogram bag was punctured by the forklift. Approximately one-quarter kilogram of free product was released onto the trailer floor. Personnel from the consignee, west concepts, inc. Performed the cleanup using level "c" protection, a broom, and a shovel. The cleanup materials, recovered product, and damaged bag were placed into a recovery drum. West concepts, inc. Will coordinate disposal of the waste generated as a result of the incident.												
Carolina Freight Carriers Corp.	St rt 14s	Mineral Wells	12/3/1991	5	LGA	1993	Flammable Liquids, n.o.s.	3	0	90	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam- age*	*Mod e*	*Result*
While unloading trailer at dock our checker noted that there was some leakage, customer came to pick up this freight at the dock and it was then that it was discovered hazardous material was punctured. The cardboard that was used under the pails absorbed 95% of leakage. 100% loss of product was incurred. The rest of the liquid was soaked up by absorbent and laid out with the cardboard to ventilate/dry. Our breakbulks need to inspect pallets that are used as dunnage with drums/pails closer. As a nail was protruding from the one used to protect pails from other freight.												
Airgas Merchant Gases, LLC	I-77 @ MM 159.5	Rockport	11/5/2008	200	LG A	1977	Nitrogen, Refrigerated Liquid (Cryogenic Liquid)	2.2	0	36350 0	Hwy	Spillage, Vapor (Gas) Dispersion
The Airgas merchant gases driver and co-driver were returning to the terminal in canton, oh after a delivery in Allen, KY. The driver ran off of the interstate crashing into a guardrail and a bridge abutment causing substantial damage to the undercarriage of the truck and a rollover. At some point a fuel tank was ruptured and a fire was ignited. The tractor was totally destroyed and the fire impinged upon the cargo tank. The vapor pressure within the tank was enough to overcome the relief devices installed on the unit. As a result the integrity of the tank was compromised and cause the pressure to release in the area of the intense heat exposure, just behind the king pin. The release was mostly vapor and was of a short duration according to the fire chief on the scene. As nitrogen is the main component of air there was no mitigation required.												
FedEx Freight, Inc.	190 Elizabeth Pike	Mineral Wells	1/15/2009	0.25	LG A	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	Spillage
Shipper's container failed. All product was absorbed with oil dry, placed into a salvage drum and handled according to all local, state, and federal regulations.												
UPS Ground Freight	4400 Camden Ave.	Parkersburg	4/2/2009	10	LG A	1993	Combustible Liquid, n.o.s.	2	0	2500	Hwy	Spillage
Defective packaging												
FedEx Freight, Inc.	190 Elizabeth Pike	Mineral Wells	8/5/2009	0.25	LG A	1263	Paint Related Material Including Paint Thinning, Drying, Removing, or Reducing Compound	3	0	0	Hwy	Spillage
Associate pushed another skid too close to freight, puncturing it with the other skid, causing product to leak. All product was absorbed with oil dry and placed into a salvage drum and was handled according to all local, state, and federal regulations.												
CSX Transportation		Parkersburg	#########	2	LBS	2280	Hexamethylenediamine , Solid	8	0	0	Rail	Spillage

<table>
<tr><th colspan="13">Transportation-Based Hazardous Materials Releases, 1971 to Current</th></tr>
<tr><th>Carrier Reporter Name</th><th>Route</th><th>City</th><th>Date</th><th>Qty. Rel.</th><th>Unit</th><th>UN / NA</th><th>Commodity</th><th>Clas s</th><th>Fata -lity</th><th>Dam- age</th><th>Mod e</th><th>Result</th></tr>
<tr><td colspan="13">On 10/30/09 at 06:22 hrs., personnel in the CSX lower yard, Parkersburg, WV, discovered INVX 26181, a residue tank car of hexamethylenediamine, solid, leaking from the top of the car. The car was isolated and the shipper, Dupont El Denemours + company (representative Ms. Leslie McHenry), was notified via Chemtrec (report #2009103000022). Shipper personnel responded and reported the securement bolts for the liquid line valve mounting flange were loose. Shipper representatives secured the bolts and requested invx26181 be returned to their Washington, WV facility. CSXT discussed this incident with the shipper, Ms. Leslie McHenry, on November 2, 2009. No special switching moves required. Cause code: 284 narri: 5(4 + 3)(2 + 0) = 70</td></tr>
<tr><td>UPS Ground Freight</td><td>4400 Camden Ave.</td><td>Parkersburg</td><td>7/9/2010</td><td>55</td><td>LGA</td><td>1263</td><td>Paint</td><td>2</td><td>0</td><td>0</td><td>Hwy</td><td>Spillage</td></tr>
<tr><td colspan="13">Originally only 4 ounces leaked out due to a pinhole in the drum, cause unknown. Then when the service center was trying to recoup the drum it flipped from their hands and fell over and leaked all 55 gallons.</td></tr>
<tr><td colspan="2">CSX Transportation</td><td>Parkersburg</td><td>9/22/2010</td><td>0.25</td><td>LGA</td><td>1017</td><td>Chlorine</td><td>2.3</td><td>0</td><td>5000</td><td>Rail</td><td>Vapor (Gas) Dispersion</td></tr>
<tr><td colspan="13">On 09/22/2010 at 03:44 hrs., Mr. Howard Dean, CSX Transportation yardmaster at Parkersburg, WV, advised the CSXT public safety coordination center that a conductor reported a strong odor of chlorine around tank car PPGX 1704, a residue tank car of chlorine. CSXT notified the local authorities, NRC #954781, WVDEP #54138140 and Chemtrec #2010-09-22-00027. CSXT requested Chlorep team response via Chemtrec and dispatched Sunpro Environmental Services, Inc., an emergency response contractor to the scene. The shipper's,representative, Mr. Matthew Bond, and Sunpro personnel advised CSXT that the release was due to a slight vapor leak at the a end liquid line valve. Mr. Bond closed the valve 1/4 turn. He also discovered the plug for this valve was corroded. Mr. Bond installed a replacement, secondary closure plug for this valve. This incident did not require a special switching move. A qa 7.1 non-conformance report is not required for this incident. Cause code: 119 narri code: 5 (4+10+2) x (2+0) = 160</td></tr>
<tr><td>FedEx Freight Inc.</td><td>190 Elizabeth Pike</td><td>Mineral Wells</td><td>3/3/2011</td><td>0.5</td><td>LGA</td><td>2922</td><td>Corrosive Liquids, Toxic, n.o.s.</td><td>8</td><td>0</td><td>0</td><td>Hwy</td><td>Spillage</td></tr>
<tr><td colspan="13">Associate did not block and/or brace freight properly for transport. Freight was crushed causing release of product. All product was absorbed with oil dry and placed into a salvage drum and was handled according to all local, state, and federal regulations.</td></tr>
<tr><td colspan="2">CSX Transportation</td><td>Parkersburg</td><td>4/2/2011</td><td>1</td><td>LGA</td><td>1789</td><td>Hydrochloric Acid, Solution</td><td>8</td><td>0</td><td>3010</td><td>Rail</td><td>Vapor (Gas) Dispersion</td></tr>
<tr><td colspan="13">On April 2, 2011 at 21:24 hours at the CSXT low yard in Parkersburg, WV, personnel reported tank car GATX 50766, dot 111a100w5, a load of hydrochloric acid solution, was noted venting vapor from its top area. The car was isolated and Specialized Professional Services, Inc. (SPSI), a CSXT emergency response contractor, was dispatched to the scene. Chemtrec #2011040200104, was notified and the shipper's representative, Mr. John Prince 270-395-6379, advised shipper assistance to the scene was not forthcoming. On April 3, 2011 at 02:50 hours SPSI advised the frangible disc for the pressure relief vent was broken and the plug for the pressure relief vent "quick inspect" port was not in place, but rather dangling at the pressure relief vent assembly attached to a cable seal. The bottom threads of this plug were broken rendering this fitting improper. Mr. R. Anderson, tetra technologies, Parkersburg, WV advised CSXT, that on April 3, 2011, he replaced the rupture disc, its gasket and "quick inspect" port rendering the car safe for transportation. This incident did not require a special switching move. A qa 7.1 non-conformance report is not required for this incident. Cause code: 441 narri code: 5 (5+5+0) x (2+0) =100</td></tr>
</table>

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
CGI International	N/A	Williamstown	4/18/2011	0	N/A	1977	Nitrogen, Refrigerated Liquid (Cryogenic Liquid)	2.2	0	201000	Hwy	Fire
There was not a package failure. The nitrogen trailer did not leak, only the outer shell was damaged, the tractor was a complete loss due to it caught fire												
CSX Transportation		Parkersburg	11/7/2011	1	LGA	1789	Hydrochloric Acid, Solution	8	0	2500	Rail	Spillage
On 11/7/2011 at 0150 hrs, personnel in the CSXT Parkersburg, WV yard discovered GATX 93335, a loaded tank car of hydrochloric acid, leaking from the top of the tank car. The car was isolated and the shipper, Arkema Inc., was notified via Chemtrec, report 2011-11-07-00004. SPSI, a CSXT emergency response contractor, was dispatched to the scene and found a salco rupture disk assembly with the top assembly off and the rupture disk out of place. The surge protection was found on top of the tank car, inspection found the top threads on the assembly were broken and split. After a thorough inspection of the yard, the top assembly and the rupture disk was not located. SPSI personnel replaced the entire rupture disk assembly and decontaminated the tank car. The issue was identified and corrective actions were communicated to the shipper's representative, Freddie Hines 270-395-7121. The shipper will apply for an FRA movement approval prior to releasing the car for transportation. This incident did require a special switching move. A qa 7.1 non-conformance report will be filled for this incident. Cause code: 424 narri - 5 x (5+5+0) x (2+0) = 100												
Tanner Industries, Inc.	I-77 North, MM 169	Mineral Wells	1/10/2012	0.01671	GCF	1005	Ammonia Anhydrous	2.2	0	0	Hwy	Vapor (Gas) Dispersion
Vapor leak was detected on rear pump seal at weigh station in Wood County, WV. Following communication with transportation division of West Virginia Public Service Commission officer, the transport mc331 trailer was relocated to shop where seal and o-ring were replaced. There were no injuries, or off-site consequences as a result of this occurrence.												
CSX Transportation		Parkersburg	3/28/2013	0.5	LGA	2348	Butyl Acrylates, Stabilized	3	0	2500	Rail	Vapor (Gas) Dispersion
On march 28, 2013, at 0728 hours, a car inspector at the CSXT Parkersburg Yard, Parkersburg, West Virginia noticed an odor near DOWX 73056, a loaded tank car of un2348, butyl acrylates stabilized. The tank car was isolated. The shipper, Rohm + Haas Co. (Dow Chemical), was notified via Chemtrec report #2013-0328-00039. SPSI, a CSXT emergency response contractor, was dispatched to the scene and found both vapor securement plugs were less than tool tight and were tightened approximately three complete turns each. The shipper representative, Doug James, 979-299-9709, was notified of the condition found. The vapor release was secured and the tank car was released for disposition. This incident did not require a special move. Narri: 5 (5+1+0)x(2+0) = 60 cause code: 135												
CSX Transportation	Rail Yard	Parkersburg	3/2/1993	1	LGA	1247	Methyl Methacrylate Monomer, Uninhibited (high-purity, if acceptable under 173.21 of this subchapter)	3	0	0	Rail	Spillage
Tank car residue methyl methacrylate monomer noted leaking during switching operations in yard. Shipper response team repaired tank car by wrapping teflon tape on threads of bottom outlet valve plug. Tank car leak stopped/secured at 2250 hours 3/2/93.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
United Parcel Service Co.	2500 Gihon Rd.	Parkersburg	8/28/2013	0.0625	LBS	2794	Batteries, Wet, Filled with Acid, Electric Storage	8	0	0	Hwy	Spillage
The driver noticed a wet spot on the package. The package was put in a lined spill tray. The designated responder use silver shield gloves inside the nitrile gloves and used PH tape to identify the liquid as a acid. The decision tree was used and the corrosive liquid response sheet was used to clean up.												
United Parcel Service	2500 Gihon Rd.	Parkersburg	9/11/2013	0.25	LGA	1219	Isopropanol or Isopropyl Alcohol	3	0	0	Hwy	Spillage
Wall of pkgs fell, this one started to leak unloader left trailer notified me. I donned my PPE. I responded to spill, following my decision tree & response sheet for flammable liquid i cleaned up spill and processed it through the dump.												
Roadway Express Inc.	I-77 South	Mineral Wells	3/26/1993	5	LGA	2014	Hydrogen Peroxide, Aqueous Solutions with not less than 20 percent but not more than 40% hydrogen peroxide (stabilized as necessary)	5.1	0	225	Hwy	Spillage
Driver noted spillage in transit and isolated unit. Fire department was called and responded to the scene along with a local response team. Clean up contractor was called and material was contained. All contaminated material was held for proper disposal.												
FedEx Freight	216 West Airport Industrial Rd.	Parkersburg	4/1/2014	0.03125	LGA	190	Acetone	3	0	0	Hwy	Spillage
Associate loaded freight upside which allowed it to leak in transit. All product was absorbed with oil dry and placed into a salvage drum and was handled according to all local, state, and federal regulations.												
UPS Freight Services, Inc.	4400 Camden Ave.	Parkersburg	7/1/2014	5	LGA	1090	Acetone	3	0	0	Hwy	Spillage
One of the pails had leaked out all its contents due to a bad seam. All the product had evaporated.												
UPS Freight Services, Inc.	4400 Camden Ave.	Parkersburg	7/22/2014	0.03125	LGA	1993	Combustible Liquid, n.o.s.	2	0	0	Hwy	Spillage
The drum had been knicked by a forklift blade and was beginning to leak product.												
United Parcel Service Co.	2500 Gihon Rd.	Parkersburg	7/15/2014	2	LGA	1824	Sodium Hydroxide, Solution	8	0	0	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fatality*	*Damage*	*Mode*	*Result*
The unloader found a leaking pkg he left area and notified his supervisor. I responded donned my PPE including the silver shields. I followed the decision tree and corrosive response sheet. 1 neutralized, solidified and containerized the spill. I took the containerized material and the leaking pkg to the dump area for further processing. Upon further inspection I noticed that this package had been re-wrapped in a previous facility i followed the waste disposal chart and decontamination procedures this package was being processed through the dump.												
FedEx Freight	216 West Airport Industrial Rd.	Parkersburg	5/29/2014	1	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage
Associate did not block and/or brace freight properly for transport.												
CSX Transportation		Parkersburg	#########	0.05	LGA	1789	Hydrochloric Acid	8	0	0	Rail	Vapor (Gas) Dispersion
On November 10, 2014, at 0830 hours, mechanical foreman at the CSXT Parkersburg Yard, Parkersburg, West Virginia reported that GATX 62613, a loaded tank car of un1789, hydrochloric acid was venting. Reportedly there was a slight vapor cloud visible from the vapor line at the prv. The tank car was isolated. The consignee, tetra technologies, was notified directly to respond and assist in securing the release. The shipper Arkema was notified via Chemtrec, report #2014-1110-00035 . Ron Anderson 304 488 5419 from tetra technologies was dispatched to the Parkersburg Yard. Ron Anderson found that the prv was in fact releasing vapor due to a blown frangible disk. The frangible disk was replaced and the release was thus secured. GATX 62613 was then placed back in transportation. This incident did not require a special move. Narri: 5x(5+5+0)x(2+0) = 100 cause code:1004												
UPS Freight Services, Inc.	4400 Camden Ave.	Parkersburg	2/20/2015	0.5	LGA	2922	Corrosive Liquids, Toxic, n.o.s.	8	0	2000	Hwy	Spillage
A tote that was loaded in front of the pails was pushed into the pails crushing one of them causing product to leak out.												
CSX Transportation		Parkersburg	7/20/2015	1	LGA	1789	Hydrochloric Acid	8	0	0	Rail	Vapor (Gas) Dispersion
On July 20, 2015, at 23:25 hours, mechanical foreman at the CSXT Parkersburg Yard, Parkersburg, West Virginia reported that GATX 72773, a residue tank car of un1789, hydrochloric acid. Reportedly, there was a slight vapor cloud being emitted from the top of the tank car intermittently. The tank car was isolated. The shipper, tetra technologies inc. Was notified directly and Ron Anderson, (304) 488-5419 responded to inspect and secure the release. Ron Anderson found that the release was from the fill hole and after tightening the fill hole bolts further the release of vapor stopped. This incident did require a special move. Narri: 5x(4+5+0)x(2+0) = 90 cause code:224												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
Con-Way	4301 Camden Ave.	Parkersburg	8/18/2015	1	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	3500	Hwy	Spillage
A 1-gallon pail of un1263 paint fell off a pallet during transit due to improper prep for transport. The can released approximately 1 gallon of paint to the trailer floor. The spill was contained to the trailer floor and did not affect any soils, waterways or drains.												
UPS Freight Services, Inc.	4400 Camden Ave.	Parkersburg	9/24/2015	0.03125	LGA	3082	Environmentally Hazardous Substances, Liquid, n.o.s.	9	0	1000	Hwy	Spillage
The cap on top of the tote was loose causing some products to leak out.												
FedEx Freight	216 West Airport Industrial Rd.	Parkersburg	11/2/2015	0.023438	LGA	1993	Flammable Liquids, n.o.s.	3	0	0	Hwy	Spillage
Associate punctured freight with forklift blades while loading / unloading causing product to leak.												
UPS Freight	4400 Camden Ave.	Parkersburg	1/19/2016	0.03125	LGA	1993	Combustible Liquid, n.o.s.	2	0	0	Hwy	Spillage
The product was leaking from the seal of the cap on top of the drum.												
United Parcel Service	2500 Gihon Rd.	Parkersburg	1/22/2016	0.5	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage, Material Entered Waterway/Storm Sewer
I arrived at work at midnight and was told i had a hazard leaker to clean up. The package car that the leaker was in was already cleaned out. I got the GGAB, decision tree, lined spill tub. I cleaned up some of the material going in to the drain and on the floor. I solidified the rest of the liquid with clay-based absorbent.												
Federal Express Corporation	6650 Emerson Ave.	Parkersburg	2/29/2016	0.999921	LGA	2924	Flammable Liquids, Corrosive, n.o.s.	3	0	0	Air	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam- age*	*Mod e*	*Result*
The package was noted as leaking at the origin location. The shipment was placed on a cart and the other bottom of one the containers was cracked. The spill recovered using SCU procedures and the customer was contacted for disposition												
UPS Freight	4400 Camden Ave.	Parkersburg	4/4/2016	1	LG A	3082	Environmentally Hazardous Substances, Liquid, n.o.s.	9	0	1500	Hwy	Spillage
Pallets were used for dunnage around the totes. A pallet was broken and pushed the ball valve partially open causing the leakage.												
UPS Freight	4400 Camden Ave.	Parkersburg	5/25/2016	1	LG A	2735	Amines, Liquid, Corrosive, n.o.s. or Polyamines, Liquid, Corrosive, n.o.s.	8	0	1500	Hwy	Spillage
One of the drums was leaking from a seam on the side of the drum.												
CSX Transportation		Parkersburg	7/20/2016	8	LBS	2280	Hexamethylenediamine , Solid	8	0	15000	Rail	Spillage
At 1150 hours on 20 July 2016, a federal railroad administration inspector notified CSX Transportation personnel of the discovery of product on the outside of tank car invx 29608 located in the CSX Parkersburg Yard. The car was isolated, access restricted, and all required regulatory notifications made. CSX contracted Specialized Professional Services, Inc to respond for assistance. Initial investigation found significant solid product buildup under the top mounted protective housing and down both sides of the car. The solids were removed, and car was relocated in the yard for safer access. It was determined the point of release to be a defective vacuum relief device located inside the protective housing. The device was temporarily replaced with a blind flange in order to secure the release. On 22 July 2016 CSX contracted Sunpro, Inc to install a new vacuum relief device and perform qualification testing for movement of the car to destination and unloading.												
Federal Express Corp.	6650 Emerson Ave.	Parkersburg	#########	0.26417 2	LG A	1203	Gasoline includes Gasoline mixed with Ethyl Alcohol, with not more than 10% alcohol	3	0	0	Air	Spillage
As the package was on the sort belt. Fumes were found to be coming from the box. Upon opening the box, we found a gasoline tank with an undetermined amount of gasoline in it. The tank was giving off strong fumes. The box was removed from the sort and placed in a steel salvage drum. The shipper has been notified and we are waiting for a disposition (it is the opinion of the FedEx employee who inspected the package that there was much more than 60ml of gas in the package.												
CSX Transportation		Parkersburg	9/9/2016	1	LG A	1268	Petroleum Distillates, n.o.s. or Petroleum Products, n.o.s.	3	0	3000	Rail	Spillage
On 09/09/2016, CSX Transportation mechanical car inspector observed an audible noise coming from the top of tank car PROX 44976 in the Parkersburg, WV yard. All regulatory notifications were made, and CSX Transportation contracted with Sunpro Environmental Services to respond, investigate, and remediate. Upon arrival personnel observed a release of no more than one liquid gallon to the top of the car as a result from a deteriorated manway nozzle gasket. The release was secured by installation of a new gasket, and all material was removed from all visible surfaces.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam- age*	*Mod e*	*Result*
FedEx freight	190 Elizabeth Pike	Mineral Wells	#########	0.01562 5	LG A	3267	Corrosive Liquid, Basic, Organic, n.o.s.	8	0	0	Hwy	Spillage
Responsible associate has been shown proper freight handling and loading techniques as well as recertified for forklift operation.												
UPS Freight	4400 Camden Ave.	Parkersburg	1/5/2017	15	LG A	1993	Flammable Liquids, n.o.s.	3	0	3000	Hwy	Spillage
The drum was loaded onto the trailer. It was later noticed that something was leaking. There was a nail sized dent in the side of the drum like it had been pushed up against something.												
FedEx freight	190 Elizabeth Pike	Mineral Wells	4/28/2017	15	LG A	3082	Environmentally Hazardous Substances, Liquid, n.o.s.	9	0	0	Hwy	Spillage
Shipper's container failed causing product to leak during transport.												
Ferrell Gas, Inc.	SR 95	Parkersburg	2/1/1994	0.0625	LA	1978	Propane	2.1	0	0	Hwy	Spillage, Vapor (Gas) Dispersion
Truck overturned in roadway truck went around curve, slowed down- then overturned. Truck stayed in roadway. Minor leak occurred at fill valve. Fire dept hosed tank and leak froze. Truck was then pumped off (LPG). No injury or property damage due to release.												
UPS Freight	4400 Camden Ave.	Parkersburg	6/6/2017	0.5	LG A	Un226 4	N,n-dimethylcyclohexylami ne	8	0	2000	Hwy	Spillage
While unloading the freight the drum fell off the drum pick causing a puncture at the bottom.												
CSX Transportatio n	825 Depot Street-Parkersbur g	Parkersburg	5/30/2017	0.125	LG A	1218	Isoprene, Stabilized	3	0	3000	Rail	Vapor (Gas) Dispersion
On 05/30/2017, at 0138 hours, personnel in the CSXT Parkersburg Yard discovered SCMX 4137, a loaded tank car of isoprene, leaking from the protective housing. The car was isolated and Shell Chemical Company, the National Response Center, and the West Virginia Department of Environmental Protection were notified. Chemtrec report 2017-05-30-00023). Specialized Professional Services, Inc, a CSXT emergency response contractor, was dispatched to the scene and found the a-end liquid line valve partially open and the secondary closure plug not secured. The issue was identified and corrective actions were communicated to the shipper, Mr. Jeffrey Bowes, 403-465-0547. Contractor personnel secured the open valve and secondary closure plug. The leak was secured and the car was released for transport. This incident did not require a special switching move. 7.1 is not required.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
UPS Freight	4400 Camden Ave.	Parkersburg	7/24/2017	0.25	LGA	3082	Environmentally Hazardous Substances, Liquid, n.o.s.	9	0	0	Hwy	Spillage
When the shipper loaded their freight into the trailer, they pushed the drum into another drum which put a small crease in the bottom lip of the drum causing some product to leak out.												
UPS Freight	4400 Camden Ave.	Parkersburg	8/7/2017	1	LGA	3082	Environmentally Hazardous Substances, Liquid, n.o.s.	9	0	3000	Hwy	Spillage
The product was leaking from the weld.												
FedEx freight	190 Elizabeth Pike	Mineral Wells	8/17/2017	5	LGA	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	0	Hwy	Spillage
Associate did not block and/or brace freight properly for transport. Freight was crushed causing release of product.												
CSX Transportation	825 Depot Street	Parkersburg	#########	5	LGA	1146	Cyclopentane	3	0	6000	Rail	Spillage, Vapor (Gas) Dispersion
On 12/18/2017, at 1906 hours, personnel in the CSXT Parkersburg Yard discovered TILX 319475, a loaded tank car of cyclopentane, leaking from the protective housing. The car was isolated and the shipper and national response center were notified. (Chemtrec report #2017-1218-00194). Specialized Professional Services, Inc, a CSXT emergency response contractor, was dispatched to the scene and found the sample line valve in the open position and the secondary closure plug less than tool tight. The issue was identified and corrective actions were communicated to the shipper Mr. Mike McCoy of Odjfell Terminal, phone 843-714-6330. Contractor personnel closed the sample line valve, tightened the secondary closure plug, and cleaned all spilled material from the car. The leak was secured and the car was released for transport. This incident did not require a special switching move. 7.1 is not required. Cause code: 145 narri:80												
Carolina Freight Carriers Corp.	SR 14 South	Parkersburg	5/17/1994	7	LGA	1760	Corrosive Liquids, n.o.s.	8	0	0	Hwy	Spillage
While unloading trailer. freight was stacked on top of cartons & some were jammed between tall wall & floor. A load error ip certification was issued to Orion Terminal.												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Clas s*	*Fata -lity*	*Dam- age*	*Mod e*	*Result*
Carolina Freight Carriers Corp.	SR 14 South	Mineral Wells	5/23/1994	1	LG A	1263	Paint including Paint, Lacquer, Enamel, Stain, Shellac Solutions, Varnish, Polish, Liquid Filler and Liquid Lacquer Base	3	0	70	Hwy	Spillage
Drums sitting on back of load, it appears that somehow either a forklift or other freight has hit the drum putting a small hole in the lower portion of the drum. See pictures, we used drum sealant (gortex) and put metal tape over the top. The leak has been effectively sealed.												
Carolina Freight Carriers Corp.	SR 14 South	Mineral Wells	5/26/1994	5	LG A	1993	Flammable Liquids, n.o.s.	3	0	15	Hwy	Spillage
5 gallon pail was set on top of a drum, it apparently worked itself off of this drum in-transit and settled between 2 plts which was the source of the damage.												
United Parcel Service, Inc.	TV Plaza	Parkersburg	7/28/1994	0.25	LG A	1760	Corrosive Liquids, n.o.s.	8	0	0	Hwy	Spillage
No remarks.												
CSX Transportatio n	825 Depot Street	Parkersburg	2/6/2004	1	LBS	2280	Hexamethylenediamine , Solid	8	0	0	Rail	Spillage
The car inspector at CSX Transportation's rail yard in Parkersburg, WV, reported that GATX 90369, residue last contained, hexamethylenediamine, was emitting fumes and an odor from the top of the car. The shipper was notified via Chemtrec. The shipper, EI Dupont, responded a team from their Washington Works facility. Dupont reported that they put about 15 pounds of nitrogen on these cars to assist in the unloading and to protect the product's color. Nitrogen is left on the cars after unloading. When they inspected the car, Dupont found that nitrogen and a product odor were being released from around the vacuum relief valve. According to Dupont, they could not determine the exact source of the nitrogen release, so they bled nitrogen pressure off the car. When the pressure was reduced, the nitrogen leak and odor stopped. The car was released to continue to destination. Dupont indicated that the car will be inspected when it returns to their Orange, TX facility. The release was reported to the WV Department of Environmental Protection and the National Response Center.												
FedEx Freight East, Inc.	190 Elizabeth Pike	Mineral wells	2/3/2005	0.5	LG A	2735	Amines, Liquid, Corrosive, n.o.s. or Polyamines, Liquid, Corrosive, n.o.s.	8	0	650	Hwy	Spillage
The drum was damaged by a nail from another skid of freight causing damage and release of product. All product was absorbed with oil dry and placed into a salvage drum. All damaged product was handled according to all local, state, and federal regulations.												
Yellow Freight System, Inc.	796 97th Rd.	Parkersburg	#########	0.03125	LG A	1993	Combustible Liquid, n.o.s.	2	0	360	Hwy	Spillage

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fatality*	*Dam-age*	*Mode*	*Result*
While unloading a trailer, removing a steel tote tank, a dockman noticed seepage around the filler cap. The seal was defective and could not be tighten. The shipper was notified of the incident. The shipper sent a team to clean up the tote tank and install a new seal. The tote tank was then forwarded to destination. The team cleaned up the spillage and took care of disposal.												
CSX Transportation		Parkersburg	12/3/1998	1	LGA	2076	Cresols, Liquid	6.1	0	0	Rail	Spillage
GATX 15802, load cresols, reported by yd crew to be wet on side of car and has a strong odor. Car was isolated Chemtrec notified at 1426 hours. The shipper, Jim Hinton (713) 428-5675 arranged to have Rescar respond to repair the car. Gary at Rescar reported car had leaked from the two-inch unloading valve. The valve handle was off and product had leaked through the packing around the valve stem. Rescar replaced the valve. The car was then released.												
Federal Express Corp	6650 Emerson Ave.	Parkersburg	7/9/1999	0	N/A	1090	Acetone	3	0	0	Air	Spillage
This package and 5 others were noticed due to an odor the sorting operation at this facility. The packaged were set aside and the spill person was contacted. Upon inspection it was discovered that the boxes contained numerous inner packages of fingernail polish. The packages were part of two different shipments for these big bear stores. This package was part of a shipment along with ab#'s 809659121020 & 809659121031 going to the 100 Gihon Road address. The packages going to the park center drive address were on ab#'s 809659120929-0929, & 8096-59120918. These boxes were not labeled or marked as dangerous goods, nor was there any dangerous goods paperwork with these shipments. I noticed the pit/casfu and Nancy Richardson was to investigate this incident.												
CSX Transportation, Inc.		Parkersburg	7/1/2005	0.0625	LGA	1018	Chlorodifluoromethane or Refrigerant Gas R22	2.2	0	0	Rail	Vapor (Gas) Dispersion
0745 hours, 07/01/05-CSXT noted vapor release from DUPX 20194 while car was at Parkersburg, WV, lower yard. E. I. Dupont de Nemours (consignee), Washington (Parkersburg), WV responded. Mr. Galen Cox, (304-863-2790), Dupont, Washington, WV advised leak was from the "detection device" (valve) of the "combination pressure relief system. The "non-reclosing" portion was defective and the "detection device" was not closed. Dupont hazmat team closed the "detection device" valve and leak stopped.												
CSX Transportation, Inc.	625 Depot Street	Parkersburg	1/3/2006	0.125	LGA	1789	Hydrochloric Acid, Solution	8	0	0	Rail	Spillage, Vapor (Gas) Dispersion
NATX 75405 was noted leaking vapor from the top of the tank while it was at CSXT, Parkersburg, WV. Leak was vapor emanating from atop the car. CSXT, Jim Briski, mgr.-haz. (CSXT call duty officer) contacted shipper, PPG Industries, Inc., Natrium WV, Mr. Brian Goudy @ 0200 hours, 01/03/06. Ppg ind., inc. Responded. Mark Sinclair advised csxt, tim Mannas, mgr.-hazmat, 01/10/06, that vapor release was due to loose securement bolts for the pressure relief vent cover (tri-corner style.) Bolts were tightened by PPG Ind. Personnel on 01/03/06.												
CSX Transportation, Inc.		Parkersburg	7/10/2006	15	LGA	2303	Isopropenylbenzene	3	0	0	Rail	Spillage
At 1232 hours, CSX Transportation yardmaster in Parkersburg, WV, advised CSX Transportation Public Safety Communication Center that UTLX 202143 was noted leaking from its top. Consignee was contacted and responded. They advised the liquid line valve was partially open and plug for the liquid line valve was cross threaded. They closed the valve and correctly inserted and tightened the plug in the valve. They advised approximately 15 gallons of product was lost. Chemtrec #07102006039 cause code:317 narri: 5(5+1+0)x(2+0)=60												

Transportation-Based Hazardous Materials Releases, 1971 to Current												
Carrier Reporter Name	*Route*	*City*	*Date*	*Qty. Rel.*	*Unit*	*UN / NA*	*Commodity*	*Class*	*Fata-lity*	*Dam-age*	*Mode*	*Result*
CSX Transportation		Parkersburg	8/29/2015	0.06684	GCF	1017	Chlorine	2.3	0	3000	Rail	Vapor (Gas) Dispersion
On August 29, 2015, at 05:06 hours, mechanical foreman at the CSXT Parkersburg Yard, Parkersburg, WV reported that a chlorine odor was reported around AXLX 1456, a residue tank car of un1017, chlorine. Reportedly, there was evidence of discoloration around the protective housing. The tank car was isolated. The shipper, Clearon Corp, was notified via Chemtrec, report # 2015-0829-00030. SPSI, a CSXT emergency response contractor, was dispatched to the Parkersburg Yard. Matt Bond, (304) 266-8287 from the consignee axial was contacted for local Chlorep team. SPSI found that the product was in fact releasing product and would need to be capped with a "c" kit as the tank car only had 129 psi. CSX contacted local FRA hazmat Dan McCourt who alerted FRA Region 2 that an emergency move would need to take place and return the tank car to Axial facility in Natrium, WV. CSX arranged for a special train move that would have air monitoring equipment on board and the "c" kit would be checked periodically to ensure the leak remained contained. Once returned to axial the tank car would be depressurized and appropriate repairs would be made. AXLX 1456 was handed off to axial at 17:15. Narri: 5x(4+10+2)x(2+7) = 720 cause code:702												

A single source for fixed facility incidents is more difficult to obtain. The following incidents appeared in local media archives (and may not be comprehensive).

- **May 1994:** An explosion and multiple fires at a Shell Oil chemical plant near Belpre, Ohio killed three workers and resulted in the temporary evacuation of 1,700 residents. The incident polluted the Ohio River for more than 20 miles downstream. (Source: https://pophistorydig.com/topics/shell-oil-belpre-explosion/)
- **October 2017:** Twenty departments from six counties, including state agencies, responded to the Ames Plant on Camden Avenue in Parkersburg for a large fire that burned for several days. The incident impacted air quality throughout the region. (Mancini, 2017; participant responses during the planning process)
- **July 2022:** An explosion at a silicon recycling plant in Parkersburg was accidental. (Source: Parkersburg News and Sentinel, https://www.newsandsentinel.com/news/local-news/2022/07/explosion-at-parkersburg-plant/)

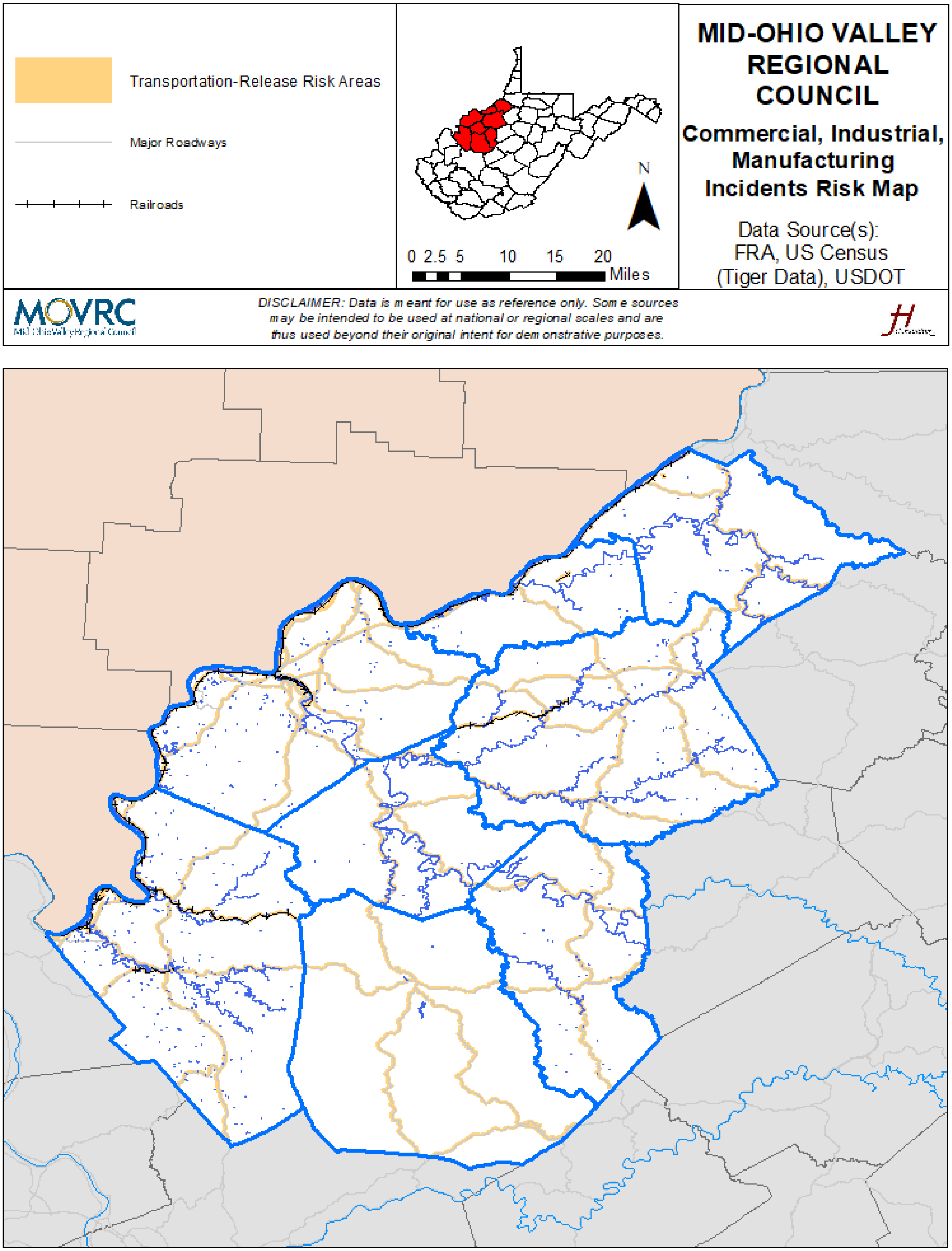
Loss and Damages

By law, the parties responsible for the use, transportation, storage, and disposal of hazardous substances and oil are liable for costs of containment, cleanup, and damages resulting from a release to their own activities (USEPA, 2021). When a responsible party cannot be identified, or refuses to cooperate with the response effort, the USEPA and participants in the National Response System ensure the emergency is dealt with in an appropriate and timely manner. The 241 transportation-based hazardous materials incidents in the Mid-Ohio Valley region caused $2,804,940.00 in damages, for an average of $11,640.00 per incident (USDOT, 2022).

Data is available nationally regarding loading/unloading incidents at fixed facilities. According to a report prepared for the Federal Motor Carrier Safety Administration, the average non-explosion loading/unloading incident results in losses of $5,000 (Battelle, 2001). Though it is difficult to extrapolate that figure out to an annualized loss estimate, it provides a site-specific point of reference for future planning.

Future Occurrences

As noted in the table above, most of the commercial, industrial, and manufacturing incidents to occur in the region have been highway incidents. Nationally, Class 3 flammable liquids are involved in the most incidents (USDOT, 2022). Given these variables, incidents involving flammable liquids along roadways are the most likely future occurrence. The following map again shows the primary commodity routes through the region with a 1,000' buffer around major highways and railways to indicate a potential risk area (per the "large spill" guidelines in Response Guide 128 in the U.S. Department of Transportation's *Emergency Response Guidebook*).


Transportation-Release Risk Areas
Major Roadways
Railroads
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Commercial, Industrial, Manufacturing Incidents Risk Map
Data Source(s): FRA, US Census (Tiger Data), USDOT
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Other, non-hazardous material commercial, industrial, and manufacturing incidents could also occur. These includes fires, civil disturbances, etc. These incidents are largely site-specific and could occur at any one of the business locations in the region. Though the steering committee members noted high profile incidents, given the scope of industrial and commercial operations in the region on a daily basis, incidents are infrequent.

From a geographic perspective, the areas along the Ohio River have been the traditional industrial anchors of the region, and they will continue to be. Oil and gas development along the U.S. Route 50 corridor, particularly in Ritchie County (and north into Tyler County as well) has also occurred. These areas may be more prone to commercial, industrial, and manufacturing incidents in the coming years as a result of more operations being present.

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from commercial, industrial, and manufacturing incidents. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its throughs on hazard vulnerabilities. The following table presents the results of that survey regarding commercial/industrial/manufacturing incidents.

Public Sentiment, Commercial/Industrial/Manufacturing Incidents					
	Level of Concern				*Total Responses*
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	
Commercial/ Industrial/ Manufacturing Incident	8 (12.31%)	24 (36.92%)	16 (24.62%)	17 (26.15%)	65
In the past ten years, do you remember this hazard occurring in your community?				32 (49.23%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				13 (20.00%)	65
Have you noticed a decrease in the occurrences or intensity of this hazard?				2 (3.08%)	65

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Commercial/Industrial/Manufacturing Incident Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	5	Excessive (Will occur during a year)	Since 1972, there have been 241 transportation-based commercial/industrial/manufacturing incidents, which is an average of 4.82 per year. This figure does not include fixed facility incidents or non-hazardous material incidents. Therefore, this hazard occurs frequently.
Response	2	One day	Many responses, such as spills along highways, are short duration responses, yet others, such as the Ames warehouse fire cited above, can last for days or weeks. Planners selected a 12-24-hour response for estimation purposes.
Onset	4	Less than 6 hours	Commercial/industrial/manufacturing incidents typically occur with little or no notice, despite the presence of warning signs that are often noted following investigations into a large incident.
Magnitude	2	Limited (10-25% of land area affected)	Though large incidents are relatively uncommon, they can impact things like air quality or groundwater for a significant distance away from the source of the incident (ref: Ames warehouse fire above that impacted air quality throughout Wood County and in neighboring counties as well as the Belpre Shell incident that impacted the Ohio River for 20 miles downstream).
Business	1	Less than 24 hours	A commercial/industrial/manufacturing incident could have permanent consequences at its source, but the business community of the wider community would not likely shut down for longer than a nearby acute response.
Human	3	Medium (multiple severe injuries)	This category was another difficult category to rank. These incidents may have minimal impacts to a large number of people (e.g., air quality or water quality impacts over a wide area), or they may cause death to a small number of individuals at the site of an incident. Therefore, planners selected a mid-point for estimation purposes.
Property	1	Less than 10% of property affected	These incidents would not impact a substantial portion of the property in the region.
Total	**18**	**Medium**	

2.0 RISK ASSESSMENT

2.2.2 Dam Failure

<table>
<tr><td colspan="5">A dam is an artificial barrier or obstruction that impounds, or will impound, water. A dam failure is a failure of that structure, which occurs when the barrier does not obstruct/restrain water as designed. Dam failures can rapidly result in large areas of completely-inundated land.

A levee is an embankment built to prevent the overflow of a stream or river, and it often functions as a system, rather than a single barrier. A levee failure implies that something about that system allowed flooding of the area the levee was designed to protect.</td></tr>
<tr><td rowspan="4">Vulnerability
HIGHEST
HIGH
MEDIUM
LOW
LOWEST</td><td>Period of Occurrence:</td><td>At any time, but typically following a period of prolonged precipitation</td><td>Hazard Index Ranking:</td><td>Low</td></tr>
<tr><td>Warning Time:</td><td>No-notice events can occur with less than six hours of warning, while rain-related events typically have over 24 hours of warning</td><td>State Risk Ranking:</td><td>Medium</td></tr>
<tr><td>Probability:</td><td>Unlikely to occur in a year</td><td>Severity:</td><td>Low</td></tr>
<tr><td>Type of Hazard:</td><td>Technological</td><td>Disaster Declarations:</td><td>N/A</td></tr>
</table>

<u>*Hazard Overview*</u>

This profile discussed dam failures and levee failures. The three main causes of dam failure in the United States include overtopping, foundation defects and slope instability, and piping.

- **Overtopping** occurs when water spills over the top of the dam. Overtopping due to inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for approximately 34% of all dam failures in the U.S.
- **Foundation defects and slope instability**, including settlement, cause approximately 30% of all dam failures.
- **Piping** is the internal erosion caused by seepage. Seepage occurs around hydraulic structures, such as pipes and spillways, through animal burrows, around roots of vegetation, and through cracks in the dam. Piping accounts for another 20% of dam failures in the U.S.

These types of failures are often interrelated in a complex manner. For example, uncontrolled seepage may weaken the soil and lead to a structural failure. A structural failure may shorten the seepage path and lead to a piping failure. Surface erosion may result in structural failure, and so on. Minor defects such as cracks in the embankment may be the first visual sign of a major problem, which could lead to failure of the structure. Someone experienced in dam design and construction should evaluate the seriousness of all deficiencies as soon as they are detected.

Dam failures can be no-notice failures that occur during non-flooding situations when reservoirs are at normal levels. Other failures occur during periods of excessive rainfall or flooding and can exacerbate inadequate spillway capacity. No-notice failures are generally more hazardous because of their unexpected nature and little warning time for evacuation.

Dams are not the only impoundment-type of structures that can fail. Levees are embankments meant to prevent the overflow of a stream or river. They can be a combination of barriers and other appurtenances designed to divert water. Levee failures occur when a part of these systems fails, allowing water to inundate the areas the structures are designed to protect. The U.S. Army Corps of Engineers notes that levees are not subject to consistent design, construction, operations, and maintenance standards (USACE, n.d.). Though the lack of a standard does not imply risk inherently, it does suggest that it is more difficult to discuss risk from levees than from dams.

Location and Extent

The West Virginia Department of Environmental Protection (WVDEP) defines a dam as “an artificial barrier or obstruction that impounds, or will impound, water” (WVDEP, 2022). The WVDEP does not maintain a list of dams on its website; however, the website does state that the agency contributes to the National Inventory of Dams.

As such, the USACE National Inventory of Dams (NID) identifies 561 dams in West Virginia with an average of 56 years. There are 24 high-risk dams in the Mid-Ohio Valley region with an average NID height of 67.5 feet and an average NID storage area of 6,313.421 acre-feet. There are 10 significant risk dams in the region with an average NID height of 50.53 feet and an average NID storage of 41,059.5 acre-feet. There are seven other dams in the region ranked either as a low hazard or undetermined (USACE, 2020).

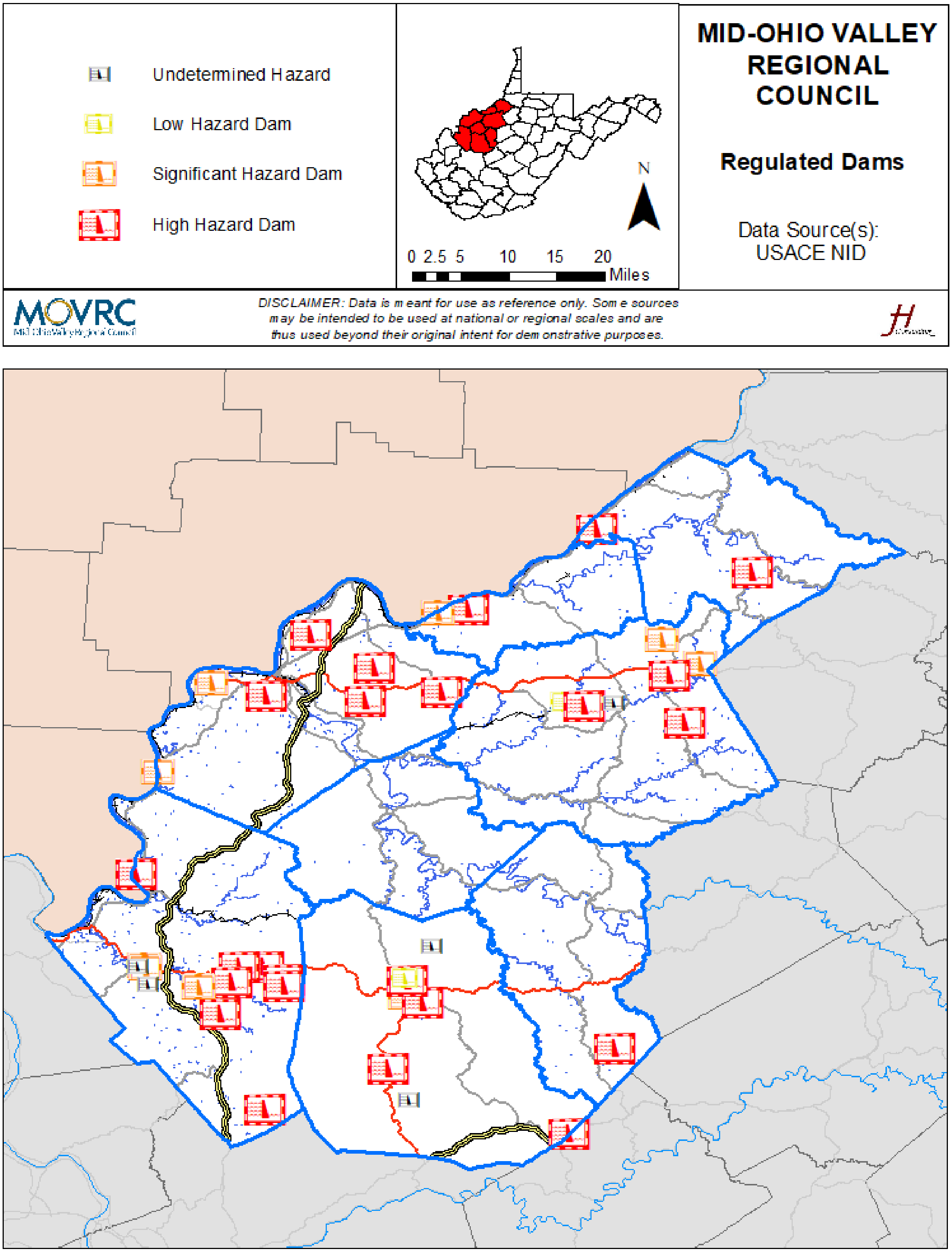
Dam Name	Owner	State-Reg. (Y/N)	County	Primary Purpose	Primary Dam Type	NID Height (Ft)	Dam Length (Ft)	Year Completed	NID Storage (Acre-Ft)	Normal Storage (Acre-Ft)	Surface Area (Acres)	Drainage Area (Sq Mi)	Hazard Class.	EAP Prepared
Glade Creek Dam No. 1	Public Utility	Yes	Calhoun	Water Supply	Concrete	37	340	1945	147	90	10	26.1	High	Yes
Turkey Run Lake	State	Yes	Jackson	Recreation	Earth	33	1000	1964	340	64			High	No
Cedar Lake Dam No.2	State	Yes	Jackson	Recreation	Earth	32	140	1952	31	19	2	0.31	Significant	Yes
Rollins Dam No.2	State	Yes	Jackson	Recreation	Rockfill	7	900	1956	179	143			Significant	Not Req.
Rollins Lake Dam No.1	State	Yes	Jackson	Recreation	Rockfill	9	700	1956	179	143	36		Significant	Not Req.
Mill Creek No.5	Local Govt.	Yes	Jackson	Flood Risk Reduction	Earth	53	945	1976	1987	220	37	6.67	High	Yes
Mill Creek No.8	Local Govt.	Yes	Jackson	Flood Risk Reduction	Earth	67	435	1981	1936	122	16	2.68	High	Yes
Mill Creek No.13	Local Govt.	Yes	Jackson	Flood Risk Reduction	Earth	92	663	1986	25362	2623	217		High	Yes
Mill Creek No.4	Local Govt.	Yes	Jackson	Flood Risk Reduction	Rockfill	50	620	1976	1660	139	21	3.25	High	Yes
Mill Creek #9 Dam	Local Govt.	Yes	Jackson	Flood Risk Reduction	Rockfill	60	569	1991	2261	187	24	4.82	High	Yes
Mill Creek #10 Dam	Local Govt.	Yes	Jackson	Flood Risk Reduction	Rockfill	69.3	1049.3	1997	25545	2792	278		High	Yes
Cedar Lake Dam No.1	State	Yes	Jackson	Recreation	Earth	32	520	1952	90	59	5	0.38	Significant	Yes
Pocatalico Structure No.28	Local Govt.	Yes	Jackson	Flood Risk Reduction	Rockfill	88	403	1987	17921	4750	244	15.55	High	Yes
WV Baptist Church Camp Lake	Private	Yes	Jackson	Recreation	Rockfill	20	322	1967	50	30	5		Und.	No
Hutchinson Farm Pond	Private	No	Jackson	Fire Protection, Stock, Or Small Fish Pond	Earth	18	220	1966	110	48	1		Und.	Not Req.

Dam Name	Owner	State-Reg. (Y/N)	County	Primary Purpose	Primary Dam Type	NID Height (Ft)	Dam Length (Ft)	Year Completed	NID Storage (Acre-Ft)	Normal Storage (Acre-Ft)	Surface Area (Acres)	Drainage Area (Sq Mi)	Hazard Class.	EAP Prepared
McElroy Run Dam	Public Utility	Yes	Pleasants	Tailings	Other	243	2150	1978	19896	0	266		High	Yes
Willow Island Locks and Dam	Fed.	No	Pleasants	Navigation	Concrete	111	1475	1976	177600	177600	6400	26900	Significant	No
Pennsboro Water Supply Dam #2	Local Govt.	Yes	Ritchie	Water Supply	Earth	32	290	1968	138	85	9.5	0.67	Significant	No
No. 1-West of Cornwallis	Private	Yes	Ritchie	Fire Protection, Stock, Or Small Fish Pond	Earth	31	1043	1863	41	23	1.5		Low	No
Schellhas Dam	Private	Yes	Ritchie	Other	Earth	40.5	310		243	68.95			High	Yes
North Fork Hughes River Site 21c Dam	Local Govt.	Yes	Ritchie	Flood Risk Reduction	Other	93	538	2002	44231	3717	306		High	Yes
North Bend Golf Course Area	Private	Yes	Ritchie	Irrigation	Earth	43.5	276	1955	18	17	1		Und.	No
Pullman No. 1	Local Govt.	Yes	Ritchie	Flood Risk Reduction	Earth	37.5	378	1968	80.1	55	9.2	0.29	High	Yes
Bonds Creek Site No. 1	Local Govt.	Yes	Ritchie	Flood Risk Reduction	Earth	52.8	365	1962	345	154	19.1	0.51	Significant	Yes
Lake Trotter	Local Govt.	Yes	Roane	Other	Earth	27	229	1955	83	39	5	0.58	Significant	Yes
Charles Fork	Local Govt.	Yes	Roane	Flood Risk Reduction	Earth	86.5	445	1973	4243	1643	72	3.88	High	Yes
Pocatalico No. 14	Local Govt.	Yes	Roane	Flood Risk Reduction	Earth	68.3	385	1980	2136	202	87.5	3.24	High	Yes
Bee Run Dam	State	Yes	Roane	Recreation	Earth	70	550	2005	475	275	20	0.59	High	Yes
Miletree Run Dam No. 2	Local Govt.	Yes	Roane	Water Supply	Earth	62	310	1953	162	83	5	0.53	High	Yes
Methodist Church Camp Lake	Private	Yes	Roane	Recreation	Earth	34	300	1963	64	39.2	3.5		Und.	No

Dam Name	Owner	State-Reg. (Y/N)	County	Primary Purpose	Primary Dam Type	NID Height (Ft)	Dam Length (Ft)	Year Completed	NID Storage (Acre-Ft)	Normal Storage (Acre-Ft)	Surface Area (Acres)	Drainage Area (Sq Mi)	Hazard Class.	EAP Prepared
Lawsons Farm Lake	Private	Yes	Roane	Recreation	Earth	32	246	1970	29.4	23	2		Und.	No
Miletree Run Dam No. 1	Local Govt.	Yes	Roane	Water Supply	Earth	26	180	1930	64	32	5	0.53	Low	Yes
Conaway Run Public Fishing Area	State	Yes	Tyler	Recreation	Earth	40	450	1963	868	428	30	922	High	Yes
Momentive Landfill #2 Dam	Private	Yes	Tyler	Tailings	Rockfill	121	600		406	344	10	0.08	High	Yes
Lake Washington	Private	Yes	Wood	Recreation	Concrete	72.5	497	1935	2750	730	103	0.9	Significant	No
Tennants Farm Pond	Private	Yes	Wood	Recreation	Earth	30	175	1953	42	17	2	0.27	High	No
Upper Smith Dam	Private	Yes	Wood	Recreation	Earth	48	450	1955	71	57	4	0.18	High	Yes
Walker Creek #1	Local Govt.	Yes	Wood	Recreation	Earth	64	490	1974	730	0	48	5.77	High	Yes
A & O Farm Pond	Private	Yes	Wood	Recreation	Earth	35	240	1971	113	65	6	0.29	High	Yes
Pond Run #1	Local Govt.	Yes	Wood	Flood Risk Reduction	Earth	31.9	648	1977	667	0	49	1.88	High	Yes
Belleville Locks and Dam	Fed.	No	Wood	Navigation	Concrete	130	1509	1968	229200	229200	8900	39350	Significant	No

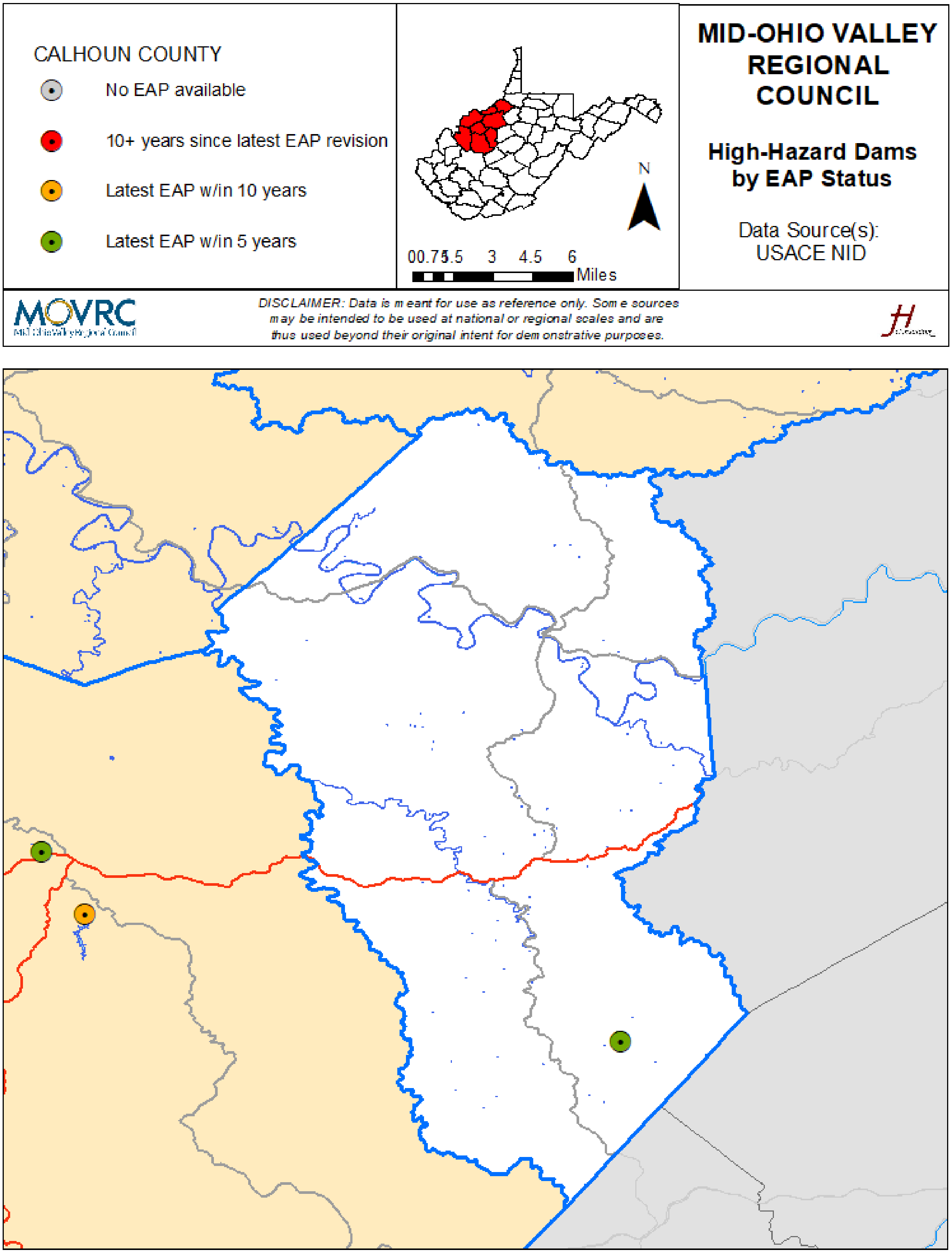
The NID lists one dam in Calhoun. It is a state-regulated, high-hazard facility with an emergency action plan and an age of 77 years. Jackson County has the most dams in the region with 14. These dams have an average age of 50 years, and 88% of the facilities have an emergency action plan. Of these 14 dams, 93% are state-regulated. In Pleasants County, two high hazard dams are present with an average age of 45 years. One is state-regulated (and has an emergency action plan); the other is federally-regulated. Ritchie County houses seven facilities with an average age of 69 years. Four of the five high or significant hazard dams have an emergency action plan; all seven facilities are state-regulated. There are eight dams in Roane County, all state-regulated. They have an average age of 56 years and 100% of the high-hazard dams have an emergency action plan. In Tyler County, there are a total of two dams, both state-regulated and with emergency action plans. The average age of these facilities is 59 years. According to the USACE NID, there are no dams in Wirt County. There are seven dams in Wood County with an average age of 60 years. Of these dams, 86% are state-regulated and 14% are federally-regulated. The majority of the dams in Wood County (80%) have an emergency action plan, and 14% of the dams are with hydropower.

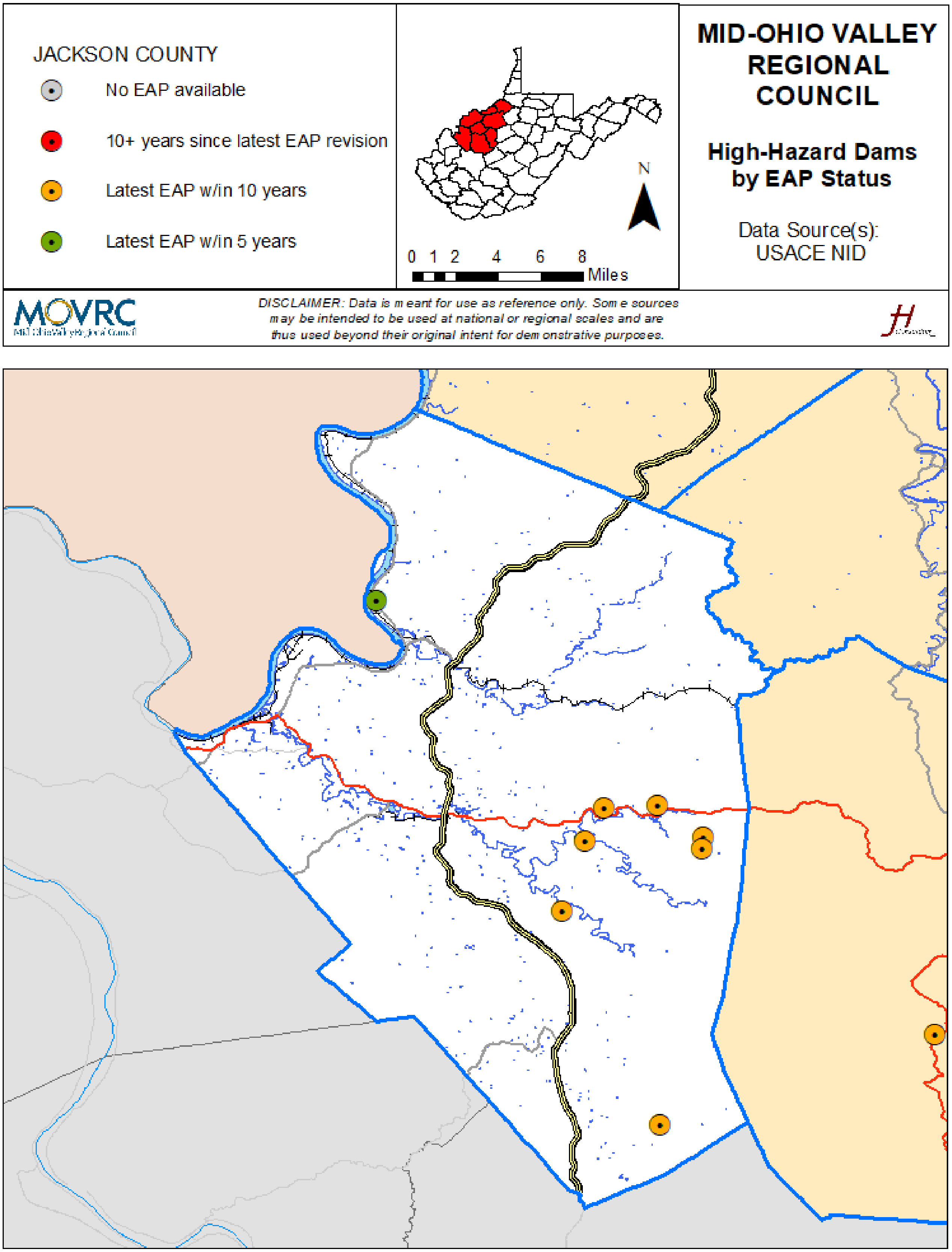
The following graphic shows the location of all of the regulated dams in the Mid-Ohio Valley region.

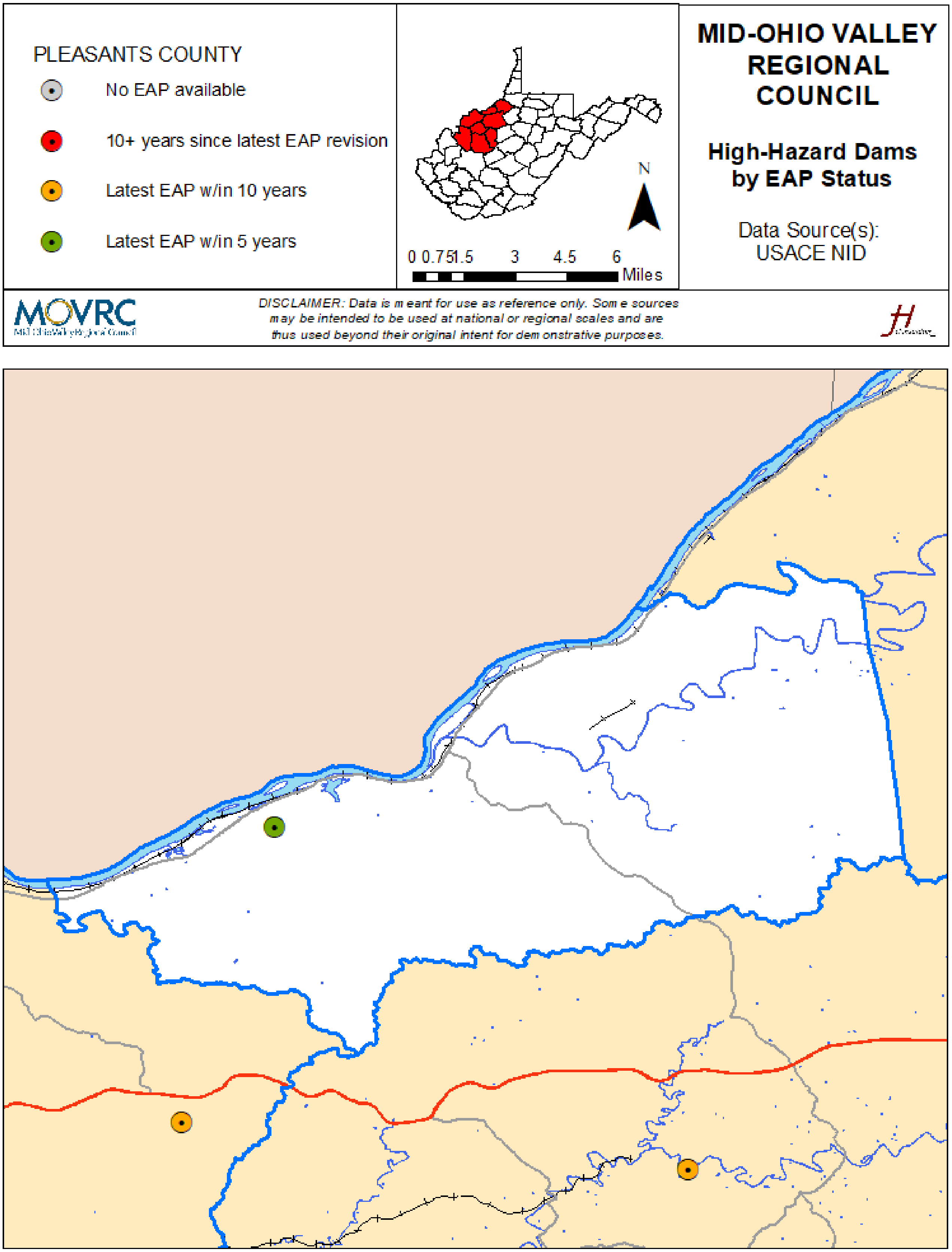

Undetermined Hazard
Low Hazard Dam
Significant Hazard Dam
High Hazard Dam
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Regulated Dams
Data Source(s):
USACE NID
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

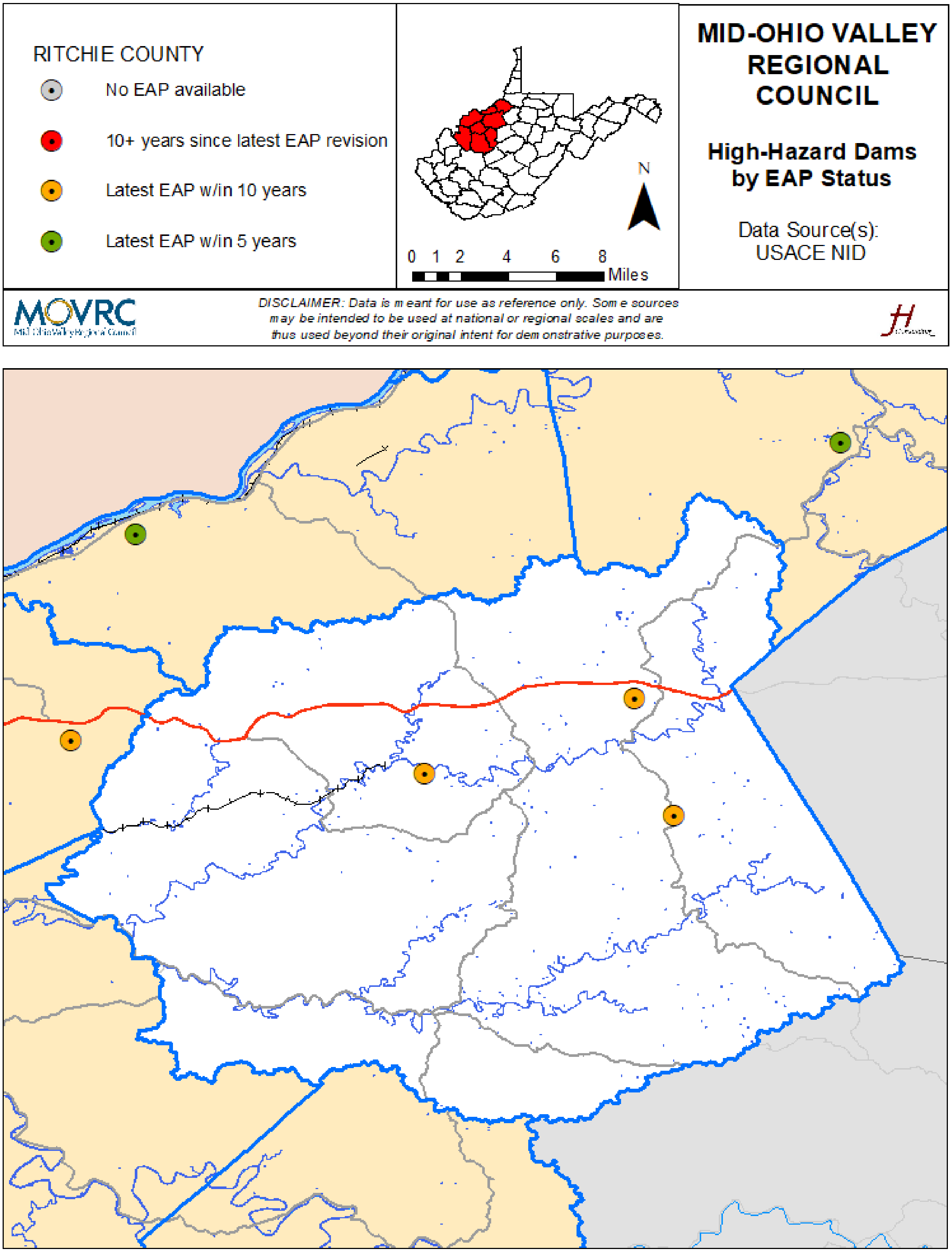
As per West Virginia Code, the WVDEP Division of Water and Waste Management oversees the dam safety program. Ultimately, dam owners are liable for losses should a dam failure occur. As such, owners of high-hazard dams are required to develop an emergency action plan (EAP) and provide it to the dam safety program. To ensure communication continues between the dam owner, the local community, and the WVDEP, the WVDEP issues certificates of approval that require annual renewal (which includes an approved EAP, up-to-date inspections, an approved maintenance plan, and no outstanding safety violations). The following maps, each at the county level (except for Wirt County, which has no high-hazard dams), show only the high hazard dams in the region. These maps address the status of the EAPs for the high-hazard dams. A gray-colored icon represents a high-hazard dam for which there is no EAP on file. Red icons identify instances where an EAP is on file, but it has been 10 or more years since the latest update. Orange icons identify high-hazard dams with EAPs updated between five and 10 years ago, and green icons identify “current” EAPs, i.e., those updated within the last five years. The data source for the latest EAP date was the NID.

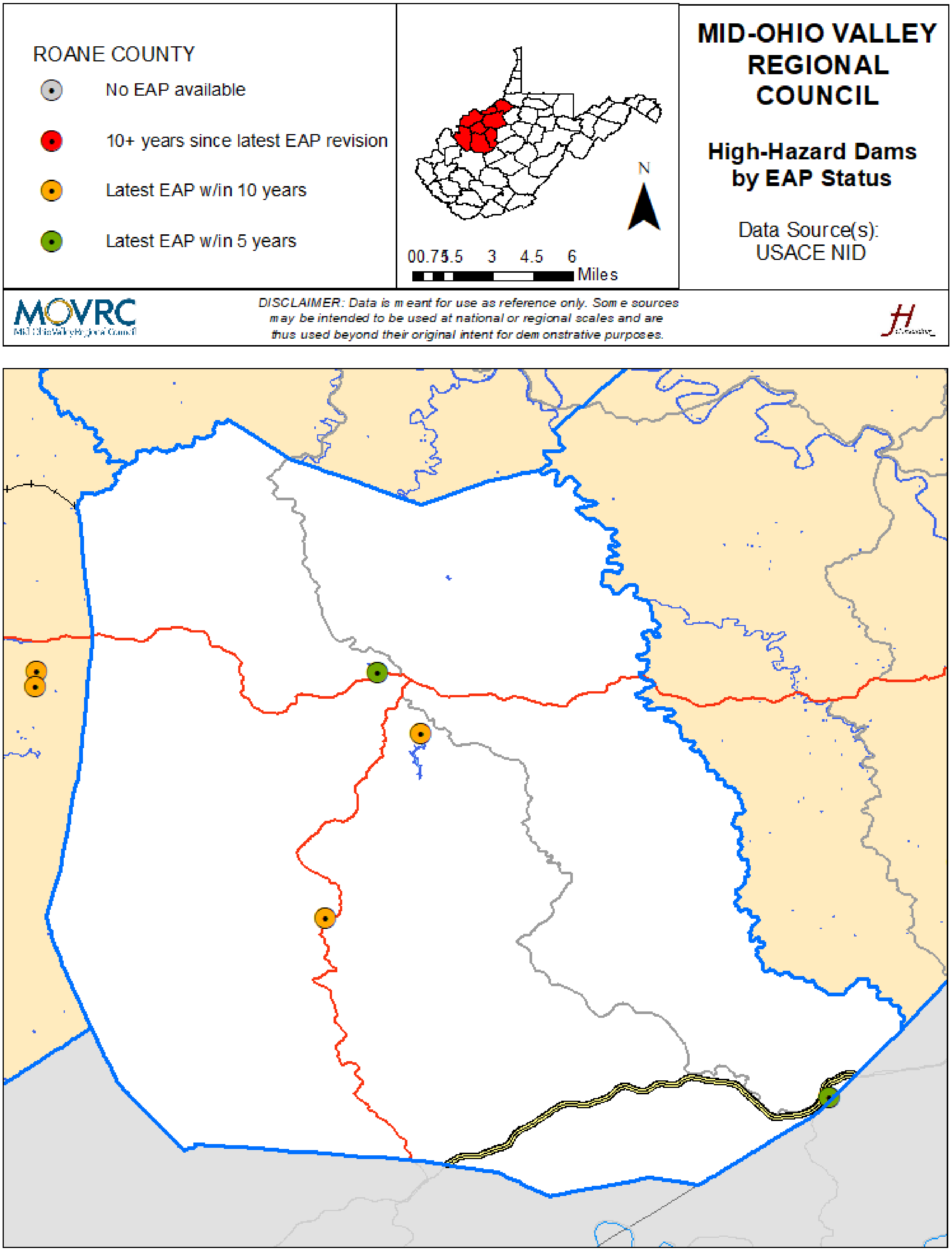
The EAPs are important to mitigating risk for two primary reasons. First, and most obviously, the plans outline the emergency response guidelines should an incident occur. Part of the EAP discussed how dam owners will notify emergency response personnel and warn those downstream from a dam. During EAP preparation, dam owners should coordinate with local authorities to determine the capabilities and limitations of emergency response agencies. Secondly, EAPs for high-hazard dams identify a potential inundation area which allows for responders to work directly with potentially-impacted communities and facilities. Current and accurate inundation areas also identify areas in which property owners can consider mitigation actions.

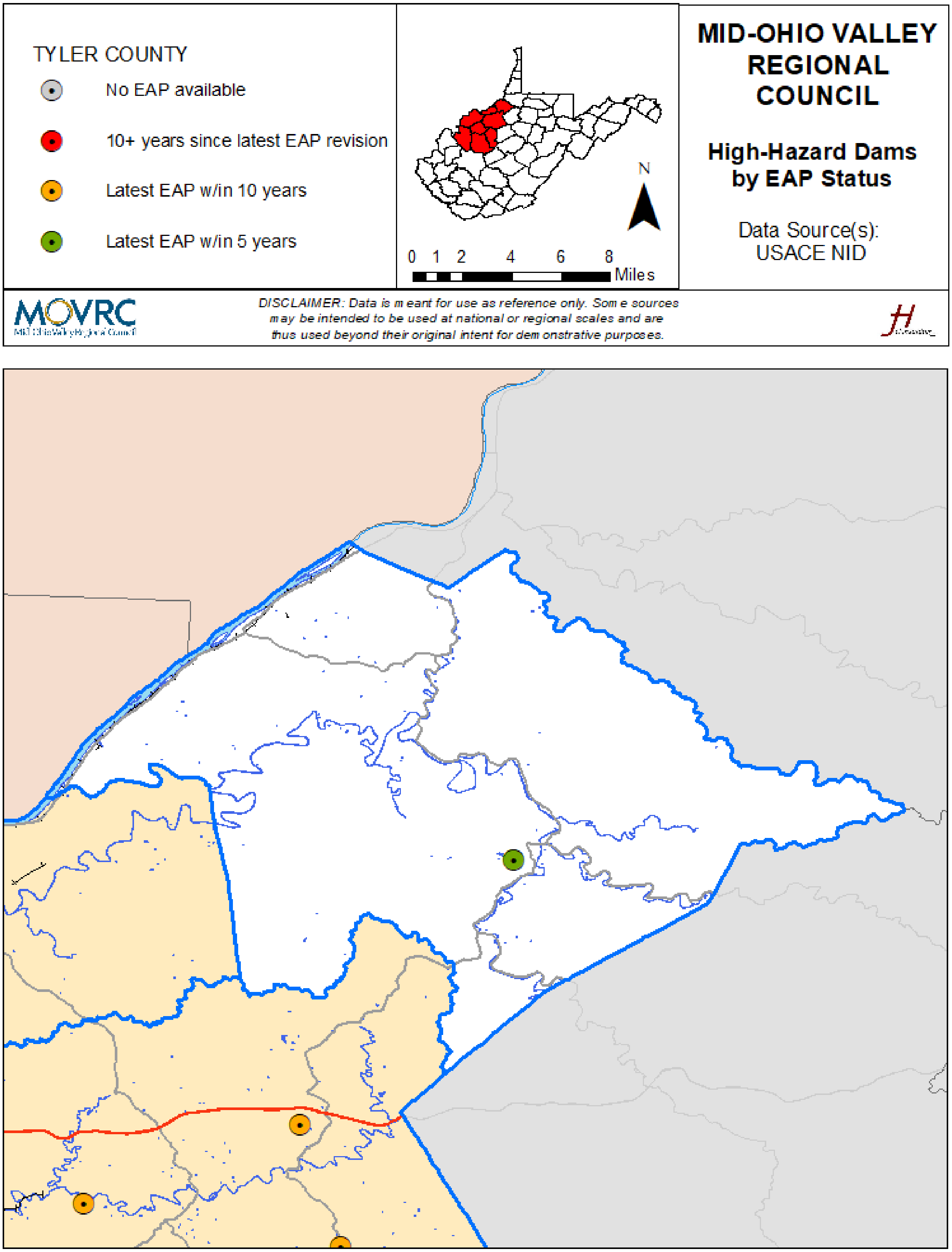

CALHOUN COUNTY
No EAP available
10+ years since latest EAP revision
Latest EAP w/in 10 years
Latest EAP w/in 5 years
N
00.751.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
High-Hazard Dams by EAP Status
Data Source(s): USACE NID
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

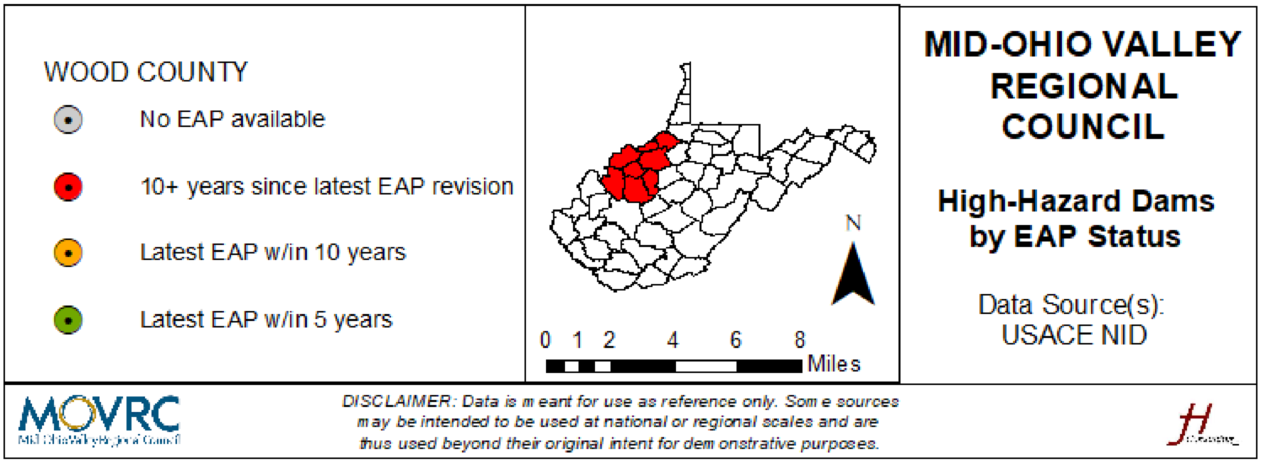

JACKSON COUNTY
No EAP available
10+ years since latest EAP revision
Latest EAP w/in 10 years
Latest EAP w/in 5 years
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
High-Hazard Dams by EAP Status
Data Source(s): USACE NID
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

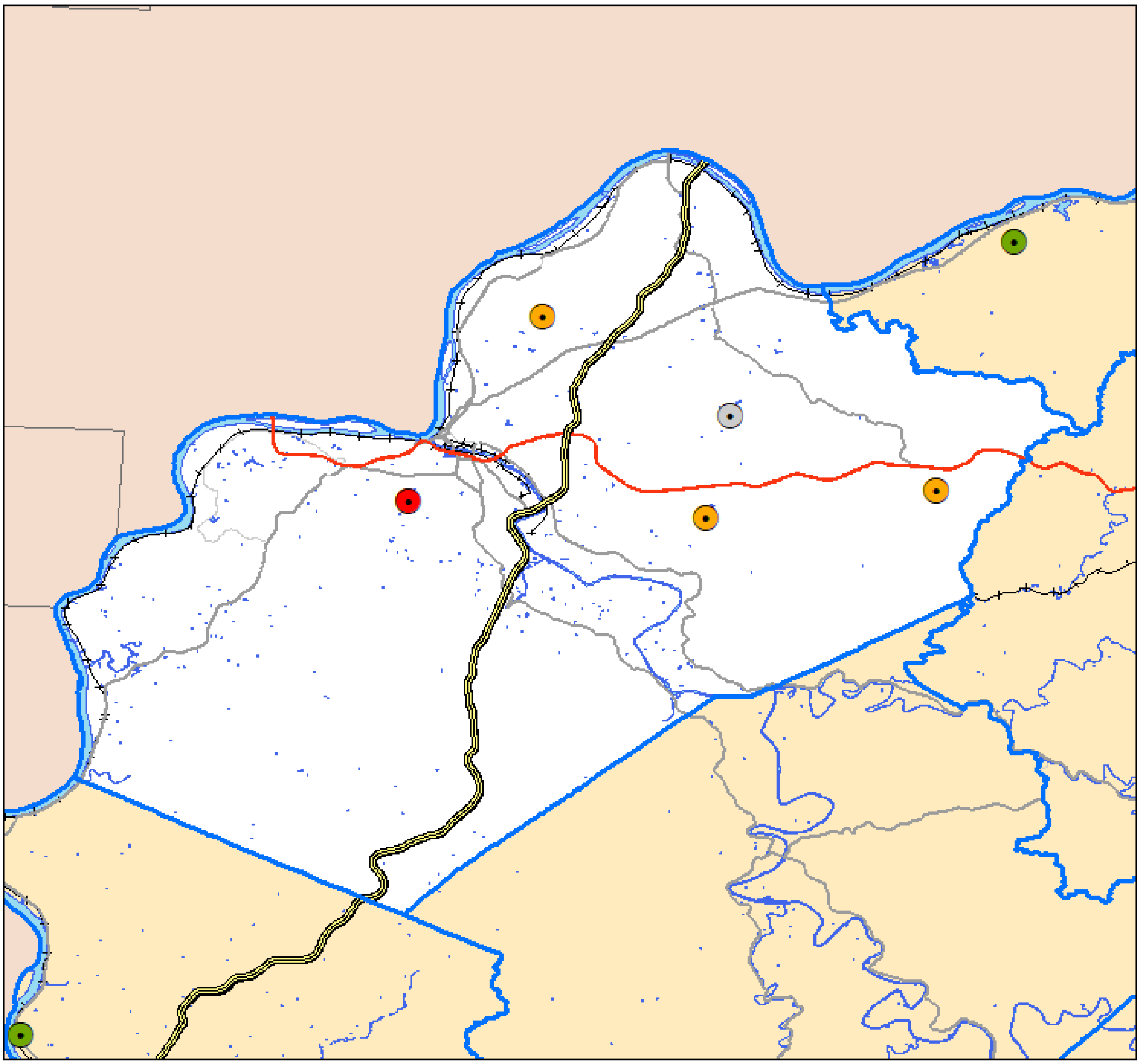

PLEASANTS COUNTY
No EAP available
10+ years since latest EAP revision
Latest EAP w/in 10 years
Latest EAP w/in 5 years
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
High-Hazard Dams by EAP Status
Data Source(s): USACE NID
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


RITCHIE COUNTY
No EAP available
10+ years since latest EAP revision
Latest EAP w/in 10 years
Latest EAP w/in 5 years
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
High-Hazard Dams by EAP Status
Data Source(s): USACE NID
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


ROANE COUNTY
No EAP available
10+ years since latest EAP revision
Latest EAP w/in 10 years
Latest EAP w/in 5 years
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
High-Hazard Dams by EAP Status
Data Source(s):
USACE NID
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


TYLER COUNTY
No EAP available
10+ years since latest EAP revision
Latest EAP w/in 10 years
Latest EAP w/in 5 years
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
High-Hazard Dams by EAP Status
Data Source(s):
USACE NID
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

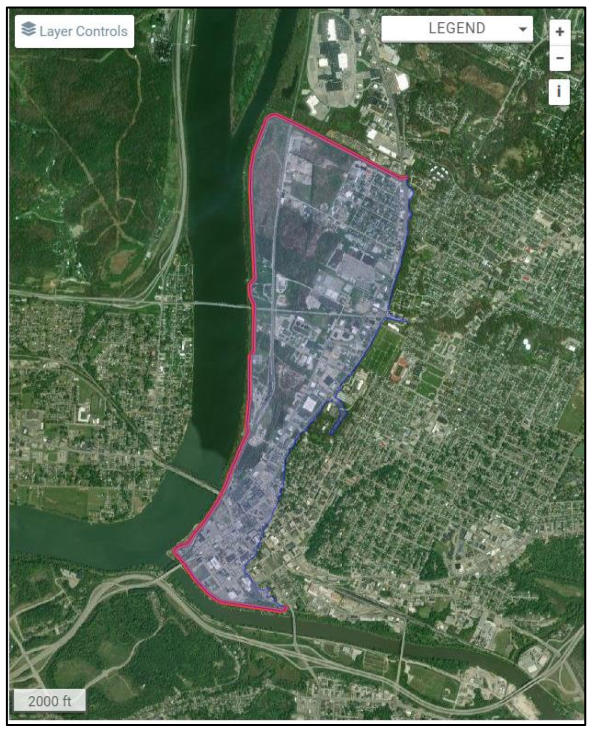

WOOD COUNTY
No EAP available
10+ years since latest EAP revision
Latest EAP w/in 10 years
Latest EAP w/in 5 years
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
High-Hazard Dams by EAP Status
Data Source(s):
USACE NID
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



Regarding governance, the Mid-Ohio Valley Regional Council and the emergency management agencies in the eight counties of the region distributed a survey to the owners of dams in their counties. The response rate was low, but the survey did yield insights regarding the monitoring of dams during significant rain events. One owner conducts an engineering inspection if a rain event exceeding a 50-year rainfall event or a six-hour storm (i.e., approximately 3" of rain in six hours). If there was an issue resulting from that inspection, owners would notify regulatory authorities, 911 and emergency responders for the community, and residences and businesses in the impacted areas.

Similar to the NID, the USACE maintains a National Levee Database (NLD). That resource identifies one levee in the Mid-Ohio Valley region. The USACE constructed the Parkersburg Levee System in 1950 to provide flood damage reduction to the city. The system consists of approximately 1.8 miles of earthen embankment and 2.0 miles of concrete wall. It sits at the confluence of the Little Kanawha and Ohio Rivers. The protected area behind the levee includes residential and commercial properties, with an estimated population of 5,500 and as many as 835 homes and businesses. Property values in the protected area are approximately $630 million (USACE, 2022).

Based on a risk assessment of the system in 2012, the USACE finds the levee to be moderate risk based on concerns that extreme weather may lead to a swelling of both the Little Kanawha and Ohio, resulting in water seeps through the earthen embankment or under the floodwall. The USACE notes that the City of Parkersburg, which current operates and maintains the system, has been aggressive at resolving issues noted in the 2012 assessment (USACE, 2022). The image to the right estimates the location of the levee along with the protected area.



Impacts and Vulnerability

The hazard classification of a dam corresponds to the potential for downstream flooding, not the structural integrity of a dam. The table below describes the downstream effects of a dam failure based on the hazard class.

Dam Hazard Potential Classification	Low Hazard Potential	Significant Hazard Potential	High Hazard Potential
Loss of Human Life	None expected	None expected	Probable
Economic Loss	Low and generally limited to owner	Yes	Yes (but not necessary for this classification)
Environmental Damages	Low and generally limited to owner	Yes	Yes (but not necessary for this classification)
Lifeline Interest Impacted	No	Yes	Yes (but not necessary for this classification)

Further, there are generally three types of risks associated with dams: incremental risk, non-break risk, and residual risk.

- **Incremental Risk:** The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or mis-operation, where the consequences considered are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences in the pool area upstream of the dam.
- **Non-Breach Risk:** The risk in the reservoir pool area and affected downstream floodplain due to 'normal' operation of the dam (e.g., large spillway flows within the design capacity that exceed channel capacity) or 'overtopping of the dam without breaching' scenarios.
- **Residual Risk:** The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as "risk remaining at any time" (FEMA, 2018). It is the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.

For this profile, planners utilized the USACE's risk classification rating definitions for the Parkersburg Levee System. The table below presents these classifications and recommended actions for operators and communities with levees at these classes (USACE, 2022).

Risk Classification	Actions for Levee Systems and Leveed Areas in this Class
Very High	Based on risk drivers, take immediate action to implement interim risk reduction measures. Increase frequency of levee monitoring, communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning systems and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as very high priority.
High	Based on risk drivers, implement interim risk reduction measures. Increase frequency of levee monitoring; communicate risk characteristics to the community within an expedited timeframe; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as high priority.
Moderate	Based on risk drivers, implement interim risk reduction measures as appropriate. Verify risk information is current and implement routine monitoring program; assure O&M is up to date; communicate risk characteristics to the community in a timely manner; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions as a priority.
Low	Verify risk information is current and implement routine monitoring program and interim risk reduction measures if appropriate; assure O&M is up to date; communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and, recommend purchase of flood insurance. Support risk reduction actions to further reduce risk to as low as practicable.
Very Low	Continue to implement routine levee monitoring program, including operation and maintenance, inspections, and monitoring of risk. Communicate risk characteristics to the community as appropriate; verify emergency plans and flood inundation maps are current; ensure community is aware of flood warning and evacuation procedures; and recommend purchase of flood insurance.
No Verdict	Not enough information is available to assign risk.

Historical Occurrences

The National Performance of Dams Program (NPDP) at Stanford University maintains records on all modifications, repairs, incidents and their consequences, and inspections for dams in the U.S. and worldwide. According to the NPDP, since 1974, there have been no serious incidents in the Mid-Ohio Valley region. Further, there have been no historical incidents associated with the Parkersburg levee system.

Loss and Damages

Regarding Parkersburg's levee, as noted above, the USACE categories the structure and system as "moderate risk," which means that the implementation of interim risk measures, such as verifying risk information is current, ensuring operation/maintenance is up-to-date, etc., is appropriate. Should the system fail, 5,489 people, 842 buildings, and as much as $630 million in property value would be exposed (USACE, 2022).

Future Occurrences

The state of dam infrastructure in the region (and all of West Virginia) is a concern. As dams age, they become susceptible to issues related to that age (with respect to the life span of materials used in construction). The communities around dams, particularly upstream along the waterways they impound, also change. While some changes, such as declining population in those upstream areas, might not alter the risk profile in measurable ways, other changes, such as increased development (leading to increased runoff) upstream can strain dams. The American Society of Civil Engineers (ASCE) regularly issues a "report card" on America's infrastructure with state-by-state breakdowns. The ASCE's 2021 grade for West Virginia's dams is a "D." The ASCE notes that 75% of the state's dams are classified as high-hazard potential. West Virginia fares slightly better than the rest of the nation regarding the condition of state-regulated high-hazard dams, with 89% being in fair or satisfactory condition (compared to 71% nationwide). The ASCE further notes funding needs of more than $900 million for the operation, maintenance, and repair of the state's dam facilities.

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from dam failure. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its throughs on hazard vulnerabilities. The following table presents the results of that survey regarding dam failure.

Public Sentiment, Dam Failure					
	Level of Concern				*Total Responses*
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	
Dam Failure	27 (41.54%)	25 (38.46%)	9 (13.85%)	4 (6.15%)	65
In the past ten years, do you remember this hazard occurring in your community?				0 (0.00%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				1 (1.54%)	65
Have you noticed a decrease in the occurrences or intensity of this hazard?				2 (3.08%)	65

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Dam Failure Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	2	Low (Unlikely to occur in a year)	There have been no serious dam- or levee-related incidents since at least the mid-1970s.
Response	3	One week	If a catastrophic failure were to occur at the region's most at-risk dam, the immediate response and recovery effort would likely be in the one-week range. Clean-up and long-term recovery would extend much longer, though.
Onset	4	Less than 6 hours	Five of the region's dams are listed as "poor" by the USACE. These facilities may suffer a no-notice or quick onset failure.
Magnitude	1	Localized (less than 10% of land area affected)	There are a relatively few numbers of dams in the region, and dam failures, though significant, would be site-specific occurrences.
Business	1	Less than 24 hours	Dam failure incidents would not likely result in widespread business closures throughout the region.
Human	2	Low (some injuries)	Though injuries could occur at the site of a failure, with warning, a low number of fatalities should result.
Property	1	Less than 10% of property affected	As a site-specific hazard, less than 10% of the property in the region would be impacted from an incident.
Total	**14**	**Low**	

2.0 RISK ASSESSMENT

2.2.3 Drought

A drought is a period of abnormally dry weather that persists long enough to produce a severe hydrological imbalance.				
Vulnerability HIGHEST HIGH MEDIUM LOW LOWEST	**Period of Occurrence:**	At any time, typically after a period of prolonged absence of precipitation	**Hazard Index Ranking:**	Low
	Warning Time:	Over 24 hours	**State Risk Ranking:**	Medium
	Probability:	Possible	**Severity:**	Limited
	Type of Hazard:	Natural	**Disaster Declarations:**	USDA FSA S3384 (2012) USDA FSA S4131 (2017)

Hazard Overview

A drought is a period of abnormally dry weather, which persists long enough to produce a severe hydrological imbalance. Drought is a term used in relation to who or what is affected by the lack of moisture. It can be a result of multiple causes, including global weather patterns that produce persistent, upper-level high pressure systems with warm, dry air resulting in less precipitation. Droughts develop slowly; typically, they are already underway when they are officially identified. There are several types of droughts (Sears, 2017), as noted below.

- **Meteorological Drought:** Differences from the streamflow precipitation amounts. Because not every area receives the same amount of rainfall, a drought in one place might not be a drought in another.
- **Agricultural Drought:** Moisture deficiency seriously harmful to crops, livestock, or other agricultural commodities. Parched plants may wither and die. Pastures may become insufficient to support livestock. The effects of agricultural droughts are difficult to measure because many variables may impact production during the same growing season.
- **Hydrological Drought:** Reduction in groundwater, lake and reservoir levels, depletion of soil moisture, and a lowering of the groundwater table. Consequently, there is a decrease in groundwater discharge to streams and lakes. Prolonged hydrological drought will affect the water supply.
- **Socioeconomic Drought:** A lack of water that begins to affect people's daily lives.

Precipitation falls in uneven patterns across the country; the amount of precipitation at a particular location varies from year to year, but over the years, the average amount is reasonably constant. The amount of rain and snow also varies with the seasons. Even if the total amount of rainfall for a year is about average, rainfall shortages can occur during a period when moister is critically necessary for plant growth, such as early summer. When little to no rain falls, soils can dry out, and plants can die. When rainfall is deficient for several weeks, months, or years, the depth to water in wells increases. If dry weather persists and water-supply problems develop, the dry period can become a drought (USGS, 2018).

Location and Extent

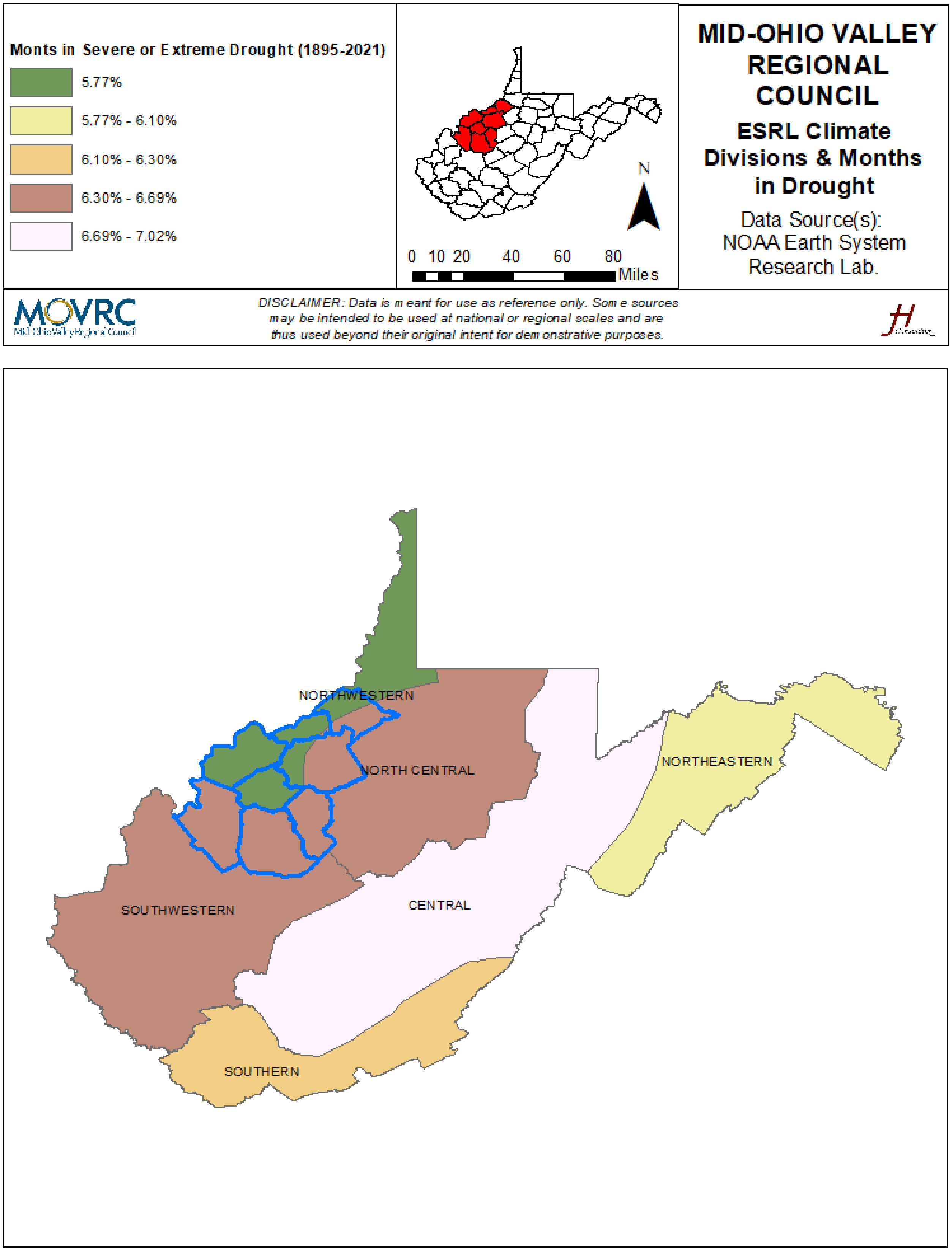
Droughts are region-wide hazards that can affect all areas and jurisdictions within a region. They are widespread events that may extend to several states in varying degrees of severity. With the Mid-Ohio Valley region, the extent of drought could be similar across the region's eight counties given similar geography and environmental qualities. Local officials may expect generalized fluctuation between the conditions in the region's river-adjacent counties and the more inland counties. A drought can vary in severity throughout the year; what starts as a mild drought can reach severe or extreme drought and then return to a mild status. This process could take weeks or even months, and the effects could be felt even months after the drought conditions end.

USDM AND PDSI COMPARISON			
U.S. Drought Monitor		*Palmer Drought Severity Index*	
N/A		> 4.0	Extreme moist spell
		3.0 to 3.99	Very moist spell
		2.0 to 2.99	Unusual moist spell
		1.0 to 1.99	Moist spell
		0.50 to 0.99	Incipient moist spell
		-0.49 to 0.49	Near normal
		-0.5 to 0.99	Incipient dry spell
D0	Abnormally dry	-1.0 to -1.99	Mild drought
D1	Moderate drought	-2.0 to -2.99	Moderate drought
D2	Severe drought	-3.0 to -3.99	Severe drought
D3	Extreme drought	< -4.0	Extreme drought
D4	Exceptional drought	N/A	

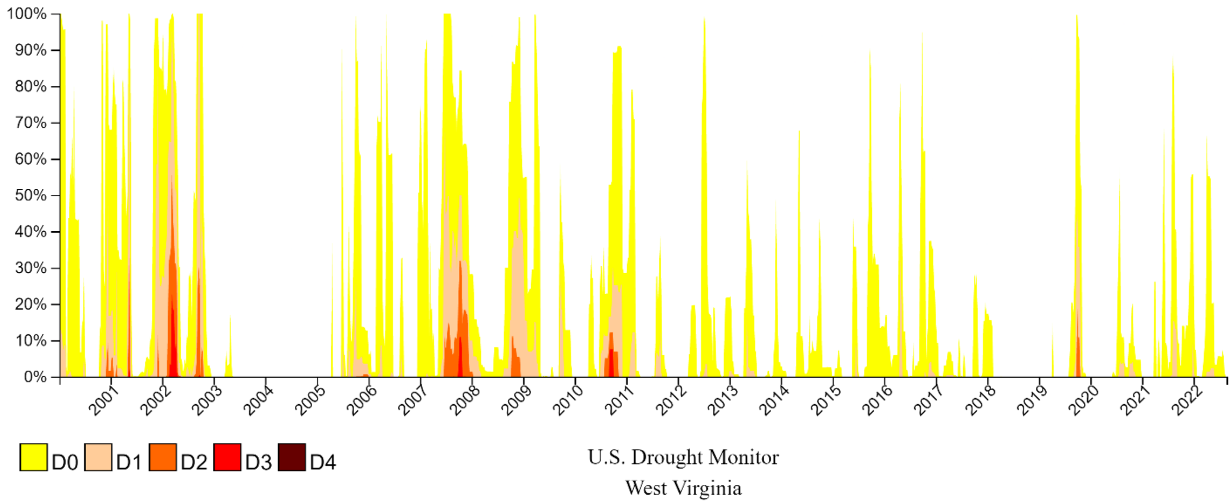
The Palmer Drought Severity Index (PDSI) is a measure of drought that is widely used to track moisture conditions. The PDSI is an interval, generally months or years, during which the actual moisture at a given place consistently falls short of the climatically appropriate moisture supply (Alley, 1984). The range of PDSI is from -4.0 (extremely dry) to +4.0 (excessively wet), with the central half -0.5 to +0.5) representing the normal or near-normal conditions (Dai et al., 2019). In the United States, the USDA National Drought Mitigation Center at the University of Nebraska-Lincoln, U.S. Department of Commerce, and the National Oceanic and Atmospheric

Administration (NOAA) developed another measure of drought named the U.S. Drought Monitor (USDM). The table above shows and compares the two scales.

Generally, West Virginia does not see widespread drought conditions on a regular basis. The map below shows the months spent in drought between 1895 and 2021 (shown as a percentage of the total months in the date range). The Mid-Ohio Valley region stretches across three of West Virginia's climate divisions. Pleasants, Wirt, Wood, and portions of Ritchie and Tyler Counties are in the Northwestern division, for which 5.77% of the months between 1895 and 2021 were in either severe or extreme drought. The remainders of Ritchie and Tyler Counties, along with Calhoun County are in the North Central division, where between 6.30 and 6.69% of the months were in severe or extreme drought. Jackson and Roane Counties are in the Southwestern division, also where between 6.30 and 6.69% of the months between 1895 and 2021 were under severe or extreme drought conditions.


Monts in Severe or Extreme Drought (1895-2021)
5.77%
5.77% - 6.10%
6.10% - 6.30%
6.30% - 6.69%
6.69% - 7.02%
N
0 10 20 40 60 80 Miles
MID-OHIO VALLEY REGIONAL COUNCIL
ESRL Climate Divisions & Months in Drought
Data Source(s): NOAA Earth System Research Lab.
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
NORTHWESTERN
NORTH CENTRAL
NORTHEASTERN
SOUTHWESTERN
CENTRAL
SOUTHERN

Similarly, the U.S. Drought Monitor produces a graphic that shows the portion of its weekly national maps depicting areas in drought. The graphic below shows 2000 to the present.



Impacts and Vulnerability

Droughts can impact drinking water both in terms of availability and demand. According to the U.S. Environmental Protection Agency (USEPA), as temperatures rise, people and animals need more water to maintain health (2016). Additionally, a large number of economic activities require abundant water sources such as energy production and growing crops. As droughts reduce available water sources, local officials will need to monitor water usage closely to maintain enough for critical uses.

According to the U.S. Drought Monitor, the possible impacts from each level of drought are as follows (2022).

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 wells creating water emergencies

In the region, Jackson, Pleasants, Tyler, and Wood Counties border the Ohio River and each contain commercial facilities with docking capabilities on the river. An often-overlooked impact of serious, prolonged droughts (i.e., D4-Exceptional Drought per the above graphic) is the second-order impact on water in streams. The Ohio River is a major asset for waterborne commerce. Low water levels could disrupt barge transport (Cotton Farming.com, 2013; Manous, Gagnon, & Hilleary, 2022).

Historical Occurrences

The Storm Events Database from the NOAA National Centers for Environmental Information (NCEI) indicates 81 drought events between 1997 and 2007 (though there are only 15 unique begin dates identified). (NOTE: The search parameters within the NCEI were 1950 through 2022.) The table below shows those incidents (and includes repeated reports). NCEI data does not report any crop or property damages.

Drought Occurrences in the Mid-Ohio Valley Region

Zone Name	*Begin Date*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*	*End Date*
Calhoun (Zone)	2/1/1997	0	0	0	0	2/28/1997
Tyler (Zone)	2/1/1997	0	0	0	0	2/28/1997
Pleasants (Zone)	2/1/1997	0	0	0	0	2/28/1997
Wood (Zone)	2/1/1997	0	0	0	0	2/28/1997
Jackson (Zone)	2/1/1997	0	0	0	0	2/28/1997
Wirt (Zone)	2/1/1997	0	0	0	0	2/28/1997
Roane (Zone)	2/1/1997	0	0	0	0	2/28/1997
Ritchie (Zone)	2/1/1997	0	0	0	0	2/28/1997
Jackson (Zone)	5/1/1999	0	0	0	0	5/31/1999
Roane (Zone)	5/1/1999	0	0	0	0	5/31/1999
Jackson (Zone)	6/1/1999	0	0	0	0	6/30/1999
Wood (Zone)	6/1/1999	0	0	0	0	6/30/1999
Calhoun (Zone)	6/1/1999	0	0	0	0	6/30/1999
Pleasants (Zone)	6/1/1999	0	0	0	0	6/30/1999
Tyler (Zone)	6/1/1999	0	0	0	0	6/30/1999
Wirt (Zone)	6/1/1999	0	0	0	0	6/30/1999
Roane (Zone)	6/1/1999	0	0	0	0	6/30/1999
Ritchie (Zone)	6/1/1999	0	0	0	0	6/30/1999
Wirt (Zone)	7/1/1999	0	0	0	0	7/31/1999
Tyler (Zone)	7/1/1999	0	0	0	0	7/31/1999
Roane (Zone)	7/1/1999	0	0	0	0	7/31/1999
Pleasants (Zone)	7/1/1999	0	0	0	0	7/31/1999
Calhoun (Zone)	7/1/1999	0	0	0	0	7/31/1999
Jackson (Zone)	7/1/1999	0	0	0	0	7/31/1999
Ritchie (Zone)	7/1/1999	0	0	0	0	7/31/1999

Drought Occurrences in the Mid-Ohio Valley Region						
Zone Name	Begin Date	Deaths	Injuries	Property Damage	Crop Damage	End Date
Wood (Zone)	7/1/1999	0	0	0	0	7/31/1999
Ritchie (Zone)	8/1/1999	0	0	0	0	8/31/1999
Roane (Zone)	8/1/1999	0	0	0	0	8/31/1999
Wood (Zone)	8/1/1999	0	0	0	0	8/31/1999
Tyler (Zone)	8/1/1999	0	0	0	0	8/31/1999
Calhoun (Zone)	8/1/1999	0	0	0	0	8/31/1999
Pleasants (Zone)	8/1/1999	0	0	0	0	8/31/1999
Wirt (Zone)	8/1/1999	0	0	0	0	8/31/1999
Jackson (Zone)	8/1/1999	0	0	0	0	8/31/1999
Wirt (Zone)	9/1/1999	0	0	0	0	9/30/1999
Pleasants (Zone)	9/1/1999	0	0	0	0	9/30/1999
Tyler (Zone)	9/1/1999	0	0	0	0	9/30/1999
Calhoun (Zone)	9/1/1999	0	0	0	0	9/30/1999
Jackson (Zone)	9/1/1999	0	0	0	0	9/30/1999
Roane (Zone)	9/1/1999	0	0	0	0	9/30/1999
Ritchie (Zone)	9/1/1999	0	0	0	0	9/30/1999
Wood (Zone)	9/1/1999	0	0	0	0	9/30/1999
Roane (Zone)	10/1/1999	0	0	0	0	10/31/1999
Calhoun (Zone)	10/1/1999	0	0	0	0	10/31/1999
Pleasants (Zone)	10/1/1999	0	0	0	0	10/31/1999
Tyler (Zone)	10/1/1999	0	0	0	0	10/31/1999
Wirt (Zone)	10/1/1999	0	0	0	0	10/31/1999
Jackson (Zone)	10/1/1999	0	0	0	0	10/31/1999
Ritchie (Zone)	10/1/1999	0	0	0	0	10/31/1999
Wood (Zone)	10/1/1999	0	0	0	0	10/31/1999
Jackson (Zone)	9/1/2002	0	0	0	0	9/25/2002
Wirt (Zone)	9/1/2002	0	0	0	0	9/25/2002
Calhoun (Zone)	9/1/2002	0	0	0	0	9/25/2002
Tyler (Zone)	9/1/2002	0	0	0	0	9/25/2002
Wood (Zone)	9/1/2002	0	0	0	0	9/25/2002
Pleasants (Zone)	9/1/2002	0	0	0	0	9/25/2002
Ritchie (Zone)	9/1/2002	0	0	0	0	9/25/2002
Roane (Zone)	9/1/2002	0	0	0	0	9/25/2002
Pleasants (Zone)	9/1/2005	0	0	0	0	9/30/2005
Ritchie (Zone)	9/1/2005	0	0	0	0	9/30/2005
Roane (Zone)	9/1/2005	0	0	0	0	9/30/2005
Wirt (Zone)	9/1/2005	0	0	0	0	9/30/2005
Tyler (Zone)	9/1/2005	0	0	0	0	9/30/2005
Wood (Zone)	9/1/2005	0	0	0	0	9/30/2005
Calhoun (Zone)	9/1/2005	0	0	0	0	9/30/2005
Jackson (Zone)	9/1/2005	0	0	0	0	9/30/2005
Calhoun (Zone)	10/1/2005	0	0	0	0	10/31/2005
Jackson (Zone)	10/1/2005	0	0	0	0	10/31/2005
Tyler (Zone)	10/1/2005	0	0	0	0	10/31/2005
Wirt (Zone)	10/1/2005	0	0	0	0	10/31/2005
Wood (Zone)	10/1/2005	0	0	0	0	10/31/2005
Ritchie (Zone)	10/1/2005	0	0	0	0	10/31/2005
Roane (Zone)	10/1/2005	0	0	0	0	10/31/2005
Pleasants (Zone)	10/1/2005	0	0	0	0	10/31/2005

Drought Occurrences in the Mid-Ohio Valley Region						
Zone Name	Begin Date	Deaths	Injuries	Property Damage	Crop Damage	End Date
Jackson (Zone)	6/8/2007	0	0	0	0	6/30/2007
Jackson (Zone)	7/1/2007	0	0	0	0	7/31/2007
Jackson (Zone)	8/1/2007	0	0	0	0	8/31/2007
Roane (Zone)	9/1/2007	0	0	0	0	9/30/2007
Jackson (Zone)	9/1/2007	0	0	0	0	9/30/2007
Roane (Zone)	10/1/2007	0	0	0	0	10/31/2007
Jackson (Zone)	10/1/2007	0	0	0	0	10/31/2007

The United States Department of Agriculture (USDA) Farm Service Agency (FSA) reports records of disaster declaration designations made by the U.S. Secretary of Agriculture. FSA data indicates disasters (between 2012 and 2022), organized by declaration approval date, in West Virginia as follows.

- January 18, 2022 (drought and excessive heat)
- February 15, 2022 (drought)
- February 5, 2020 (drought and excessive heat/high temperatures)
- November 4, 2019 (drought-FAST TRACK)
- January 5, 2017 (drought)
- April 5, 2017 (drought)
- March 29, 2018 (drought and excessive heat)
- January 28, 2015 (drought)
- February 11, 2015 (drought)
- September 5, 2012 (drought, excessive heat)

Only two of the FSA drought designations impacted the Mid-Ohio Valley region. The January 5, 2017, designation affected Pleasants, Tyler, and Wood Counties, and it referred to an event between May 24 and October 21 of 2016. The September 5, 2012, designation referenced a drought beginning on February 1, 2012 (with no end date noted). Pleasants, Tyler, and Wood Counties were again the counties named in the designation.

February 1997 Drought Conditions

The monthly average temperature was five to seven degrees warmer than usual. It was the 7th warmest February in the 20th century at Charleston. The three-month average temperature for the “winter” was two to five degrees above normal. Many counties had only five to eight inches of precipitation in 1996, making the three winter months in late 1996 and early 1997 dry. Further, snow accumulations were minimal (NCEI, 2022).

Summer 1999 Drought Conditions

After a dry April, drought conditions began to resurface during May after being somewhat alleviated during the 1998-1999 winter months. Total rainfall in May was typically between one and two inches. In June, drought conditions spread and strengthened in West Virginia. Most counties saw a deterioration of stream flow and soil moisture in June. Small streams and small farm ponds began to go dry. June rains were also typically between one and two inches. A heat wave sent maximum temperatures into the 90s for eight consecutive days between June 6 and 13. On June 10, 1999, Spencer reached 99° F.

Showers during the last two weeks of July temporarily improved soil moisture and stream flow; however, the extreme heat quickly dried the surface and ground water continued to be depleted. In was the second-warmest July (at that time) on record at both Huntington and Beckley, while Charleston had its fifth-warmest July. At the start of the July, many counties were setting up water distribution points for citizens with dry wells. By month’s end, the state purchased 500 portable water storage tanks and two dozen water pumps. Voluntary water conservation was in effect for 30 West Virginia counties.

August saw two to four inches of rain and cooler temperatures, both of which helped though the drought still lingered at the end of the month. State officials sought a federal drought disaster from President Clinton on August 2, 1999. Mandatory water conservation continued for many small public service districts. In September, drought severity increased for the western lowland counties, generally west of Interstate 79. Finally, in October, drought severity eased with monthly rainfall totals of three to four inches common. Despite ground water remaining low and approximately 18% of the wells in the state dry or in danger of going dry, surface flow in streams increased and subsequent fall and winter weather brought the reported drought conditions to an end.

Summer 2005 Drought Conditions

After a hot summer, the total monthly rainfall was only 0.5” to 0.75” for the majority of the northern lowlands of West Virginia. The airports at Parkersburg, Clarksburg, and Elkins all reported about a half-inch of rain during the month of September. Temperatures remained warmer than normal, and the long-term Palmer Drought Severity Index was in the -2 to -2.5 range (moderate drought). Fortunately, it was too late in the growing season to affect most crops. The surface waterflow in streams, though, was at a minimum and some streams were dry (NCEI, 2022).

Loss and Damages

The USDA's National Agricultural Statistics Service (2022) maintains data about agricultural activities through five-year censuses. The following table is from 2007, 2012, and 2017 efforts. It represents potential economic loss exposure.

USDA Census of Agriculture Data – Mid-Ohio Valley Region					
Year	*Farms*	*Land in Farms (acres)*	*Harvested Cropland (acres)*	*Average Harvested Cropland per Farm (acres)*	*Market Value of Agricultural Products Sold*
2007	4,015	597,328	107,884	26.87	$25,666,000
2012	3,431	549,408	97,489	28.41	$33,306,000
2017	4,005	610,213	111,886	27.94	$37,558,000

There can be no correlation drawn between the presence of farms and drought risk; however, the market value of agricultural products sold provides evidence of total agricultural economic activity exposed to losses from droughts (an average of $32,176,667). For planning purposes, utilizing research on average crop yield losses provides the basis for a mathematical loss calculation. Kuwayama (2019) focused on corn and soybeans and found that a week of drought in non-irrigating counties results in average crop yield reductions ranging from 0.1% to 1.2%. The average market value of agricultural products sold annually (i.e., across 52 weeks) suggests an average weekly value of approximately $618,782 (for a potential weekly exposure ranging from $619 to $7,425).

The declared incidents cited above note the length of the 2016 drought as from mid-May through mid-October (five months). The average length of historical droughts (receiving a secretarial designation) in the Mid-Ohio Valley region is thus five months (or 20 weeks). Combining these calculations suggests a range of exposure of $12,376 to $148,508 per drought.

Future Occurrences

As suggested above, drought may impact various aspects of life in the Mid-Ohio Valley region. The map below depicts land cover areas that are "Pasture/Hay" and "Cultivated Crops" per the USGS National Land Cover Dataset (EROS, 2019). Relatively few areas of the region's land cover are designated agricultural, with most of the areas being in Jackson and Wood Counties. These areas may be where future agriculture losses can be anticipated.

National Land Cover Dataset (NLCD)

- Pasture/Hay
- Cultivated Crops
- Rivers & Streams

0 2.5 5 10 15 20 Miles

N

MID-OHIO VALLEY REGIONAL COUNCIL

Drought Risk Map

Data Source(s):
USGS MRLC,
US Census (Tiger Data)

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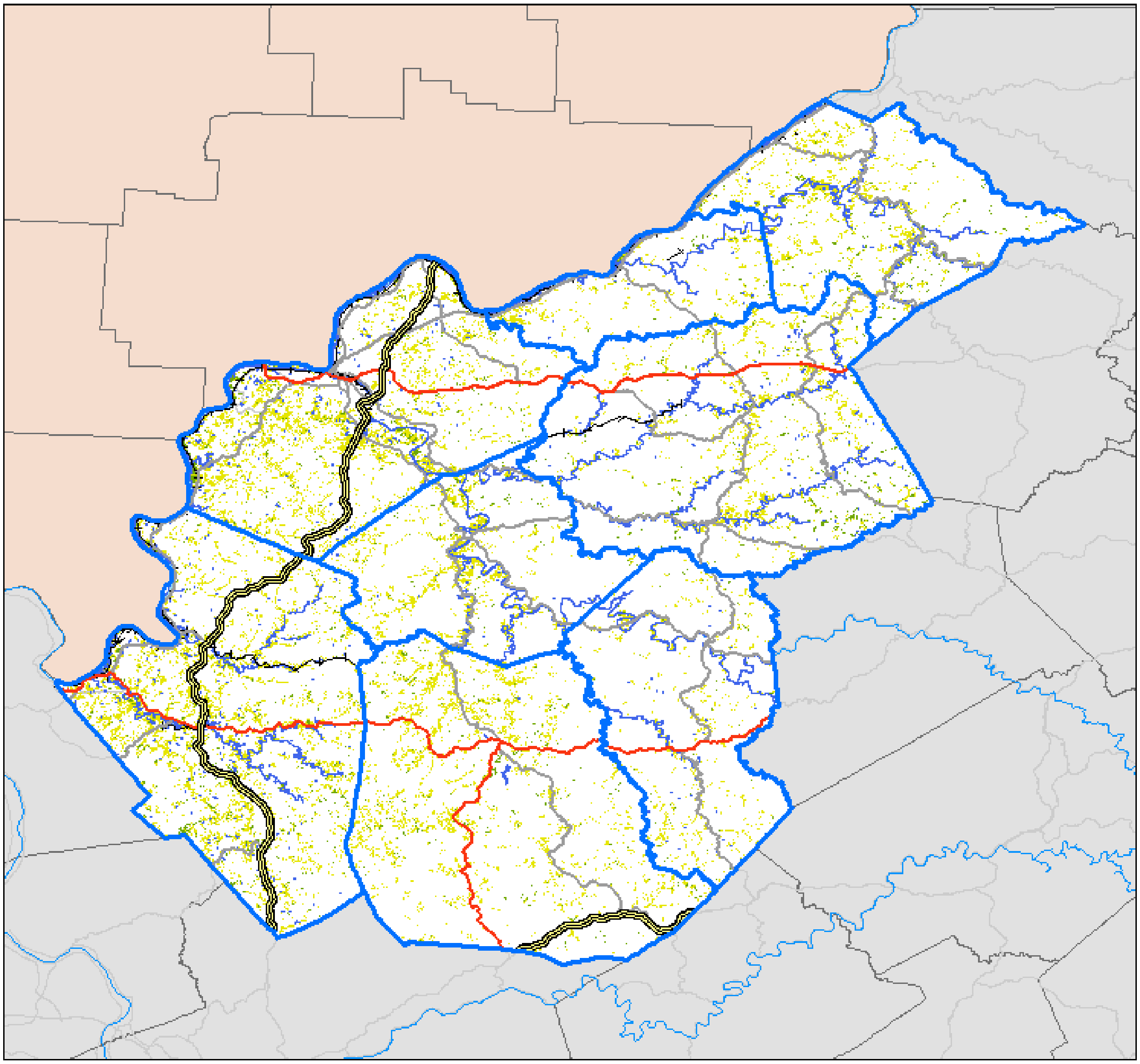
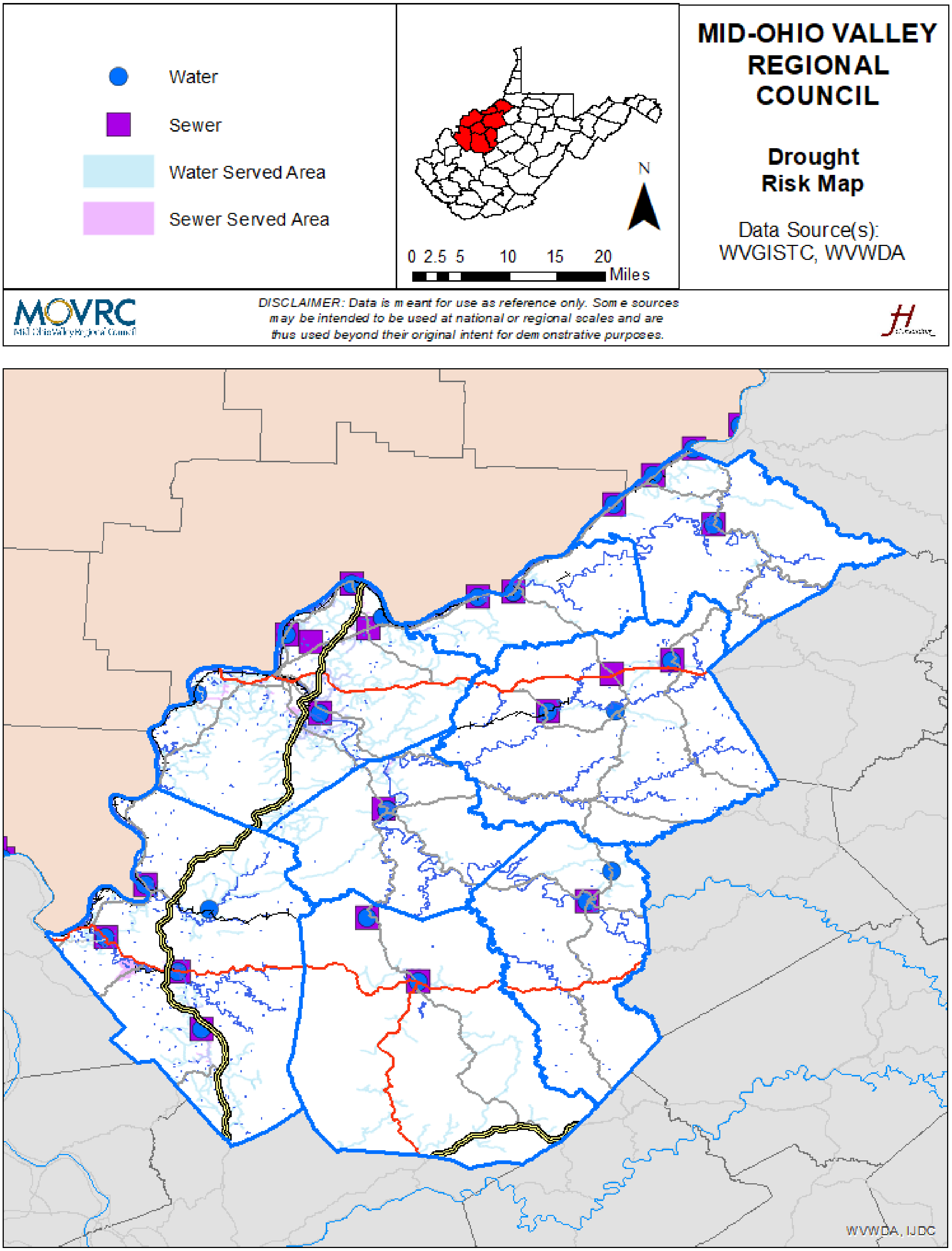
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



According to the Fourth National Climate Assessment (2018), future agricultural losses may stem from an unlikely source: *too much* moisture. Excess moisture, accompanying projected increases in precipitation amount, intensity and persistence (p. 682) can result in soil compaction, delays in planting, and the number of suitable days when fields are workable. The following map, with data from the West Virginia Water Development Authority and the West Virginia Infrastructure and Jobs Development Council, shows the areas in the region served by public water and sewer systems. Areas with public water appear in a light blue shade. Unshaded areas presumably rely on private wells and may be at additional risk of prolonged drought conditions that impact groundwater availability.


Water
Sewer
Water Served Area
Sewer Served Area
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Drought Risk Map
Data Source(s): WVGISTC, WVWDA
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
WVWDA, IJDC

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from drought. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding drought.

Public Sentiment, Drought					
Hazard	*Level of Concern*				*Total Responses*
	Not at All	*Somewhat*	*Concerned*	*Very*	
Drought	24 (36.92%)	27 (41.54%)	10 (15.38%)	4 (6.15%)	65
In the past ten years, do you remember this hazard occurring in your community?				10 (15.4%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				15 (22.72%)	66
Have you noticed a decrease in the occurrences or intensity of this hazard?				5 (7.58%)	66

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Drought Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	2	Low (unlikely to occur in a year)	Fifteen (15) events in 72 years (i.e., 1950-2022) yields an estimate of 0.21 incidents per annum.
Response	4	One month	Though the agricultural response may be extensive and much longer, it is a response that is not as acute as many other emergency responses.
Onset	1	Over 24 hours	Drought conditions occur following an extended period of specific hydrological conditions.
Magnitude	3	Critical (25-50% of land area affected)	The Mid-Ohio Valley region has a land area of 2,664.59 mi2 (US Census Bureau, 2020) (or 1,705,338 acres). Given 610,213 acres in farmland (USDA National Agricultural Statistics Service, 2022, 2017 data), approximately 35.78% of the region's land area is agricultural.
Business	1	Less than 24 hours	Drought is not likely to necessitate business *closure,* though agricultural businesses may experience losses.
Human	1	Minimum (minor injuries)	Drought is not likely to result in injuries (and historical data from the region supports this assumption).
Property	1	Less than 10% of property affected	Though a significant amount of land could be impacted, drought conditions do not affect personal property as severely.
Total	**13**	**Low**	

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2.0 RISK ASSESSMENT

2.2.4 Earthquake

An earthquake is the movement or shaking of the Earth's tectonic plates.				
Vulnerability	**Period of Occurrence:**	At any time	**Hazard Index Ranking:**	Low
HIGHEST HIGH MEDIUM **LOW** LOWEST	**Warning Time:**	Little to none	**State Risk Ranking:**	Medium
	Probability:	Low	**Severity:**	Limited
	Type of Hazard:	Natural	**Disaster Declarations:**	None

<u>Hazard Overview</u>

Earth consists of four layers: the inner core (innermost layer), outer core, mantle, and crust (outermost layer). The crust layer consists of many, slowly-moving tectonic plates that slide past and bump into one another. Most earthquakes originate along the edges of these tectonic plates, called fault lines. Though rough edges of the tectonic plates become lodged against each other. When a plate moves enough, the edges become dislodged, causing an earthquake. The epicenter of the earthquake is the location directly above the ruptured fault.

<u>Location and Extent</u>

Earthquake intensity ranges from "small to feel" to violent incidents that cause significant damage. The U.S. Geological Survey (USGS) uses the Modified Mercalli Intensity (MMI) scale to measure the intensity of earthquakes. The MMI scale characterizes the intensity of an earthquake by the severity of ground shaking at a given location and the effects of the shaking on people, human-made structures, and the landscape (USGS, n.d.). Two other common ways to measure earthquakes include the Richter scale and peak ground acceleration (PGA).

- **Richter Scale:** The Richter scale, developed in 1935, measures the severity of an earthquake. The magnitude of an earthquake can range between 0 and 10. The effects of an earthquake can extend far beyond the site of its occurrence (USGS, n.d.A).
- **Peak Ground Acceleration (PGA):** PGA is "the maximum ground acceleration that occurred during earthquake shaking at a location. PGA is equal to the amplitude of the

largest absolute acceleration recorded on an accelerogram at a site during a particular earthquake" (Douglas, 2003).

The graphic below outlines the MMI scale and compares it to the Richter (magnitude) scale.

Modified Mercalli and Magnitude Scale Comparison		
Modified Mercalli Scale		*Magnitude Scale*
I	Felt by few people under especially favorable conditions.	1.5
II	Felt by few persons at rest, especially on uppers floors of buildings.	2.0 2.5
III	Felt quite noticeably indoors, especially on upper floors of buildings. Many do not recognize it as an earthquake. Standing vehicles may rock slightly. Vibration feels like a passing truck.	3.0
IV	During the day, felt indoors by many; outdoors by few. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation of a heavy truck striking building; standing vehicles rock noticeably.	3.5
V	Felt by nearly everyone; many awakened. Some dishes and windows broken. Unstable objects overturned.	4.0 4.5
VI	Felt by all; many frightened. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.	5.0
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly-designed structures; some chimneys broken. Noticed by vehicle drivers.	5.5
VIII	Damage slight in specially-designed structures; considerable damage in ordinary substantial buildings with partial collapse; damage great in poorly-built structures; fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned.	6.0
IX	Damage considerable in specially-designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations. Underground pipes broken.	6.5 7.0
X	Some well-built wooden structures are destroyed; most masonry and frame structures with foundations destroyed; train rails bent.	7.5
XI	Few, if any, masonry structures remain standing. Bridges destroyed. Underground pipelines taken out of service. Train rails bent greatly.	8.0

XII	Damage total. Waves seen on ground surfaces. Lines of sight and level are distorted. Objects thrown into air.	8.5

The area of most considerable seismic activity in the United States is along the Pacific Coast, in the states of California and Alaska; however, as many as 40 states have moderate earthquake risk. Although most people do not think of West Virginia as an earthquake-prone state, at least 108 earthquakes with epicenters in West Virginia have occurred since 1824, and 24 of those have been magnitude 3.0 or higher.

Generally, the number of earthquakes in the eastern U.S. has increased over the past decade (USGS, n.d.B). From 1973 to 2008, there were approximately 26 earthquakes per year of magnitude three or larger. Since 2009, that number has increased to 327 per year. Regulators and researchers have documented earthquakes induced by human activity in the United States, Japan, and Canada (USGS, n.d.B). The cause of these human-caused earthquakes was the injection of fluids into deep wells for waste disposal and secondary recovery of oil, and filling large reservoirs for water supplies. Deep mining and nuclear testing can also cause small to moderate quakes. A common misconception is that hydraulic fracturing, or “fracking,” is causing *all* of the induced earthquakes. In reality, fracking “is directly causing a small percentage of the felt-induced earthquakes observed in the United States. Most induced earthquakes in the United States are a result of the deep disposal of fluids (wastewater) related to oil and gas production” (Rubinstein and Mahani, 2015).

Impacts and Vulnerability

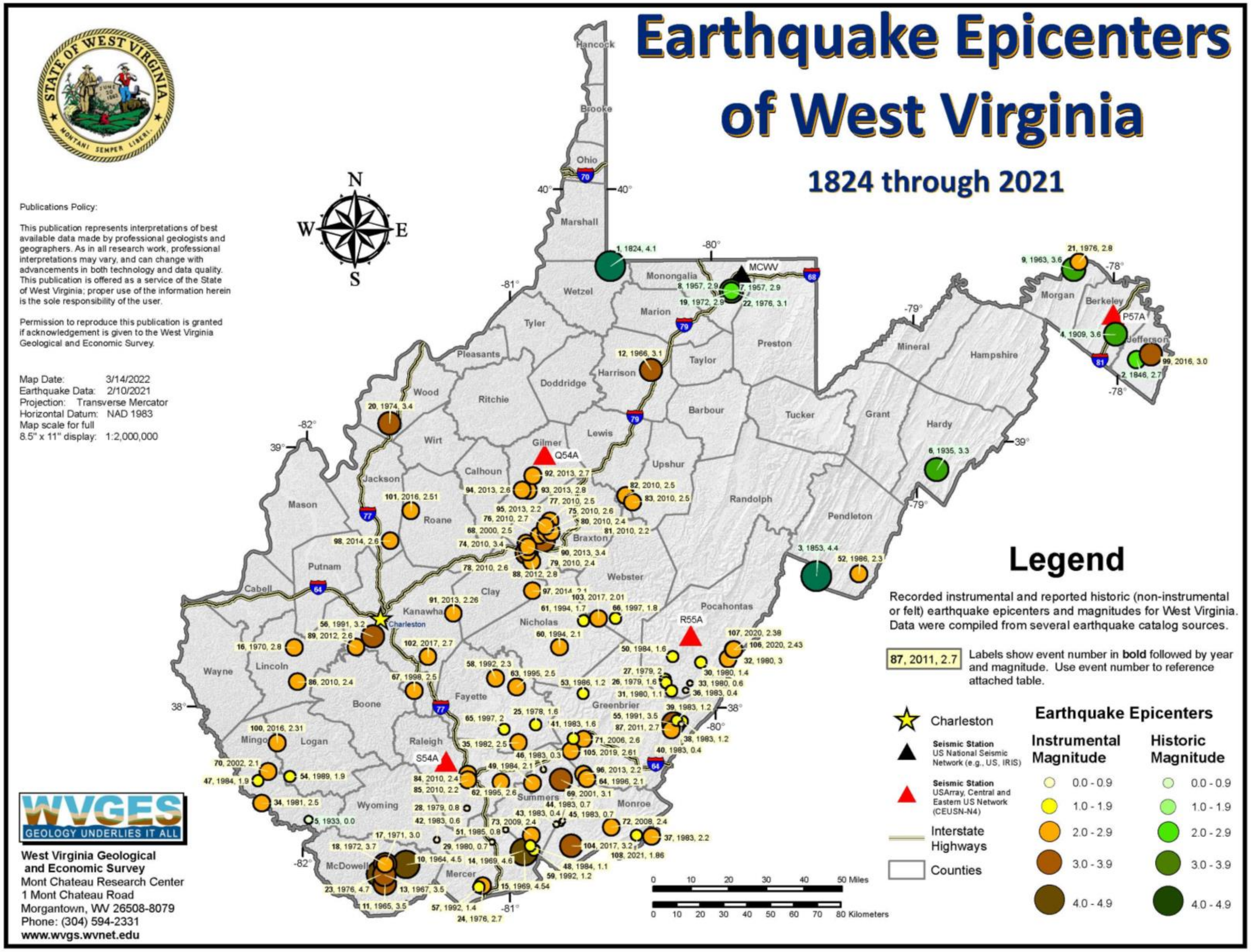
The direct effects of earthquakes include ground movement and ground failure. Cascading effects can include structural damage and utility and communication system outages. The risk of fire also increases after an earthquake due to potentially-damaged gas pipelines and electrical lines. The most significant human risk during an earthquake is structure movement and collapse. Contents within structures may fall or fail and injure or kill the people inside.

Historical Occurrences

Three earthquakes have occurred in the Mid-Ohio Valley region. The following table from the West Virginia Geological and Economic Survey (2021) lists those earthquakes.

Earthquakes in the Mid-Ohio Valley Region		
County	*Date/Time*	*Details*
Wood	October 20, 1974 / 1:55 p.m.	Magnitude 3.4 (Richter Scale) 11 km SSW of Mineral Wells, WV; depth 11.0 km
Jackson	June 6, 2014 / 10:15 p.m.	Magnitude 2.6 (Richter Scale) 13 km NNE of Sissonville, WV; depth 29.6 km
Roane	December 1, 2016 / 1:27 a.m.	Magnitude 2.5 (Richter Scale) 12 km WSW of Spencer, WV; 27.0 km depth

The following graphic, also from the WVGES (2021), depicts the earthquake epicenters in West Virginia. Areas to the east and south of the region are reasonably high in activity (as compared to the Mid-Ohio Valley region itself). Neighboring Braxton and Gilmer Counties, in particular, have seen an uptick in earthquakes, with Braxton seeing 12 since 2000 (nine of which were in 2010 alone) and Gilmer seeing three in 2013.



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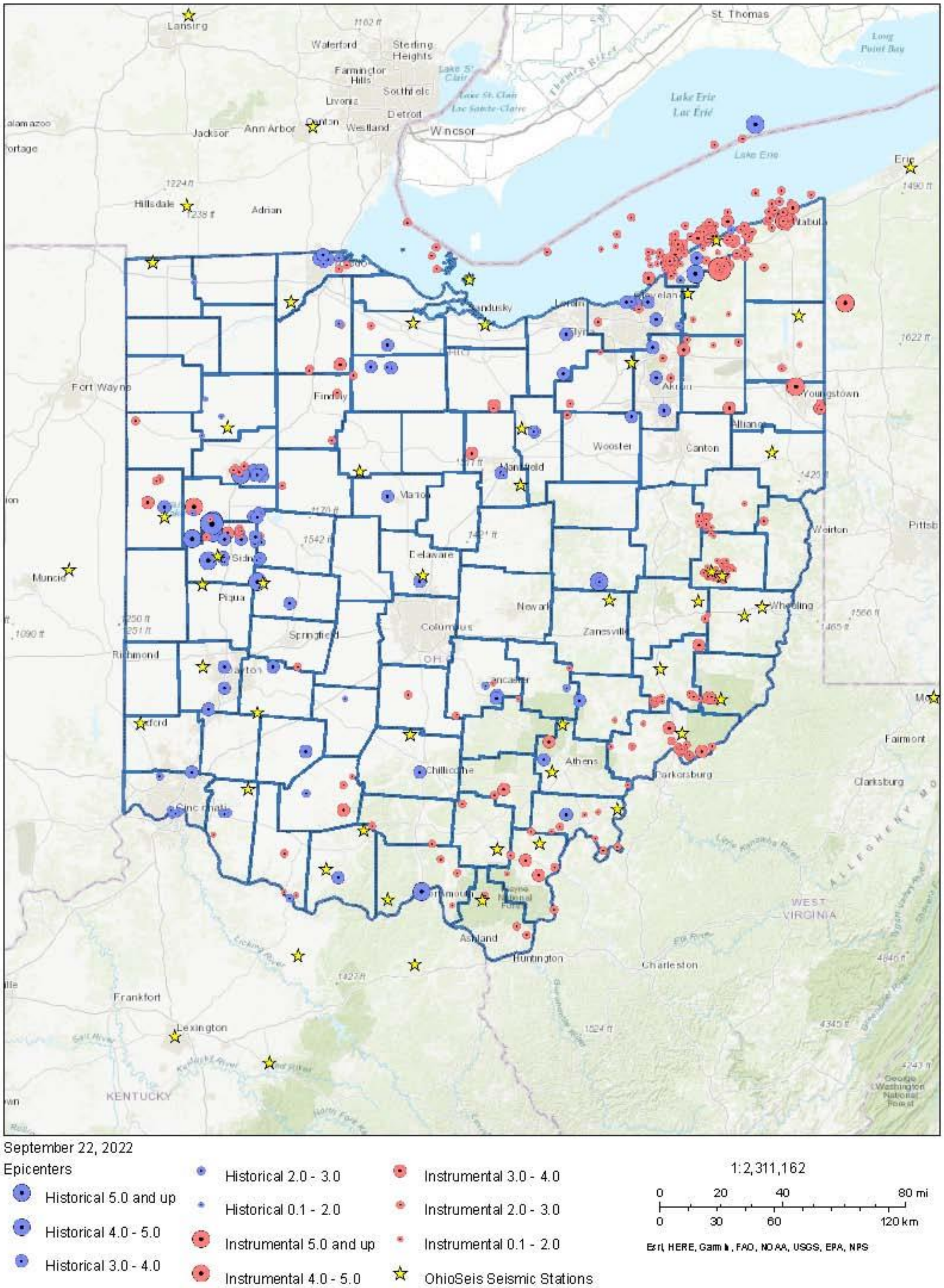
The Mid-Ohio Valley region lies in western West Virginia, with four counties bordering Ohio. The following is a graphic from the Ohio Department of Natural Resources, Division of Geological Survey, Ohio Seismic Network (2022), which shows earthquake epicenters in Ohio. The Appalachian region of Ohio has been the location of several epicenters.

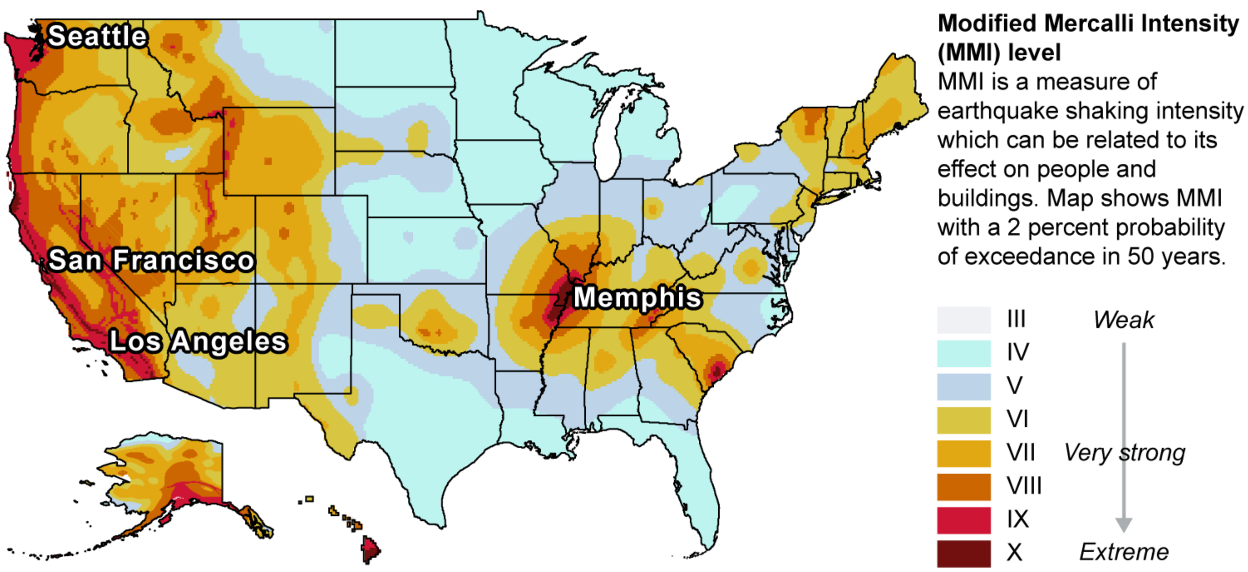
Ohio Earthquake Epicenters



<u>*Loss and Damages*</u>

Earthquakes, though probable in the region (and even likely in West Virginia and Ohio), remain a low-priority concern in the Mid-Ohio Valley. The three historical events were all MMI IV or lower events, with few recorded damages. Further, MMI I-III events are not anticipated to cause damage. MMI IV events are more noticeable and may yield impacts to dishes and other loose items indoors.

In a study examining risks to federal buildings and the associated implications for an early warning system, the Government Accountability Office (GAO) included a map of MMI level (that is similar to the familiar perceived shaking peak ground acceleration [PGA] map). As noted on the image below, the GAO map shows MMI with a 2% probability of exceedance in 50 years.

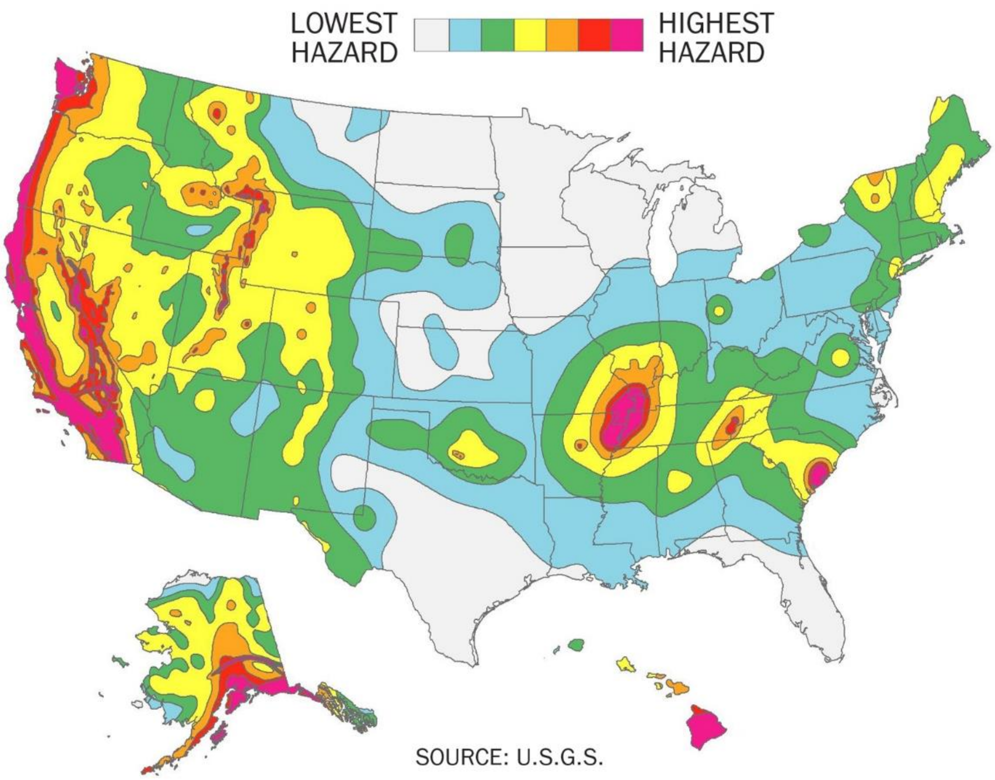


Source: GAO presentation of U.S. Geological Survey mapping; MapInfo (map). | GAO-16-680

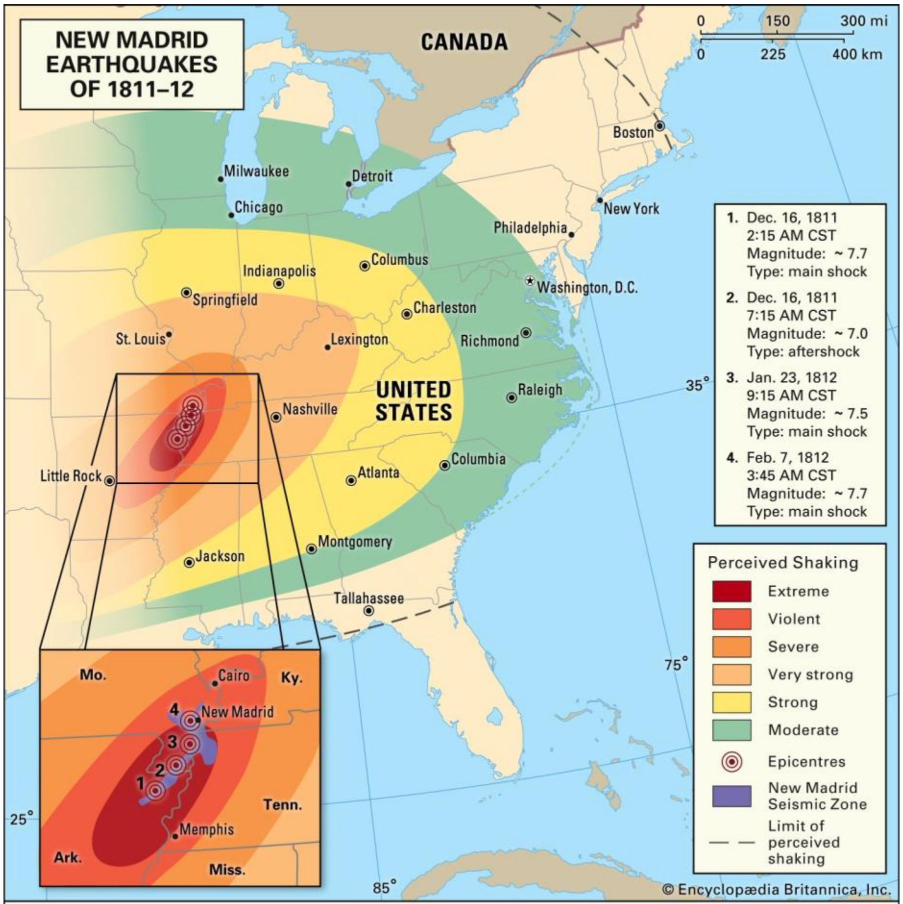
For reference, “A 2 percent in 50 years probability equates to an earthquake recurring and exceeding a given MMI level about every 2,475 years” (2016). Historical occurrences would be consistent with this statement as the entire Mid-Ohio Valley region (loosely corresponding to the red circle) is within (i.e., less than) a maximum MMI V level. The USGS indicates that MMI V earthquakes would be felt with potential dishes/window damage and an overturning of unstable objectives (see graphic in the “Location and Extent” section above), yet damage would still be minimal. Thus, the steering committee anticipates minimal losses from earthquakes.

<u>Future Occurrences</u>

There are fault lines running under West Virginia, but those lines have not prompted the USGS to designate West Virginia as anything more than two of the three lowest hazard areas it identifies for potential earthquakes in the nation. Further, historic data indicates that when earthquakes occur, there are typically of a low magnitude with minimal damage (though there are outliers).



Scientists studying earthquakes have noted the potential for a major incident in the New Madrid Seismic Zone. Based on data from the New Madrid earthquakes of 1811 and 1812, portions of the region could perceive moderate or strong shaking (Britannica.com, n.d.).



Note: Modern city locations and state boundaries shown.
Sources: Magnitude and time of earthquakes from U.S. Geological Survey, Earthquake Hazards Program, "New Madrid 1811–1812 Earthquakes." Perceived shaking information from Otto W. Nuttli, "The Mississippi Valley Earthquakes of 1811 and 1812" (1973); and U.S. Geological Survey.

Finally, human-induced earthquakes from activities such as wastewater injection may continue to occur with more frequency, but those events are likely to remain small and cause minimal damage.

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from earthquakes. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its throughs on hazard vulnerabilities. The following table presents the results of that survey regarding earthquake.

Public Sentiment, Earthquake					
Hazard	*Level of Concern*				*Total Responses*
	Not at All	*Somewhat*	*Concerned*	*Very*	
Earthquake	46 (70.77%)	16 (26.66%)	2 (3.08%)	1 (1.54%)	65
In the past ten years, do you remember this hazard occurring in your community?				3 (4.66%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				4 (6.15%)	65
Have you noticed a decrease in the occurrences or intensity of this hazard?				2 (3.08%)	65

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Earthquake Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	2	Low (unlikely to occur in a year)	Three events in 47 years (i.e., 1974-2021) yields an estimate of 0.06 incidents per annum.
Response	2	One day	The largest earthquake in the region has been a magnitude of 3.4, which would likely be felt, but cause minimal damage. The average magnitude of all earthquakes to impact West Virginia has been even smaller (i.e., 2.35). As such, a response may be necessarily, but it will likely be a minor operation.
Onset	4	Less than 6 hours	Though there may be tremors, most earthquakes occur with little to no warning.
Magnitude	1	Localized (less than 10% of land area affected)	Though an earthquake would impact large areas of the region (by square miles), the earthquakes that occur in the central Appalachian region do not yield significant damage, meaning that land areas throughout the region would not likely be "affected."
Business	1	Less than 24 hours	Again, the size of earthquakes in the region causes minimal damage. A business may close for the remainder of a day, but absent damage, it is unlikely that it will remained closed.
Human	1	Minimum (minor injuries)	There have been no reported injuries from earthquakes in the region; further, the magnitude of the earthquakes do not typically result in significant injuries.
Property	1	Less than 10% of property affected	The magnitude of the earthquakes in the region may "disturb" dishes, windows, etc., but damage is typically slight.
Total	**12**	**Low**	

2.0 RISK ASSESSMENT

2.2.5 Epidemic/Pandemic

This profile primarily examines two types of public health emergencies, each corresponding to the level of disease presence (defined below): epidemic and pandemic.				
Vulnerability HIGHEST HIGH MEDIUM LOW LOWEST	**Period of Occurrence:**	At any time	**Hazard Index Ranking:**	Medium
	Warning Time:	Over 24 hours	**State Risk Ranking:**	N/A
	Probability:	Unlikely to occur in a year	**Severity:**	Medium
	Type of Hazard:	Natural	**Disaster Declarations:**	EM-3450-WV (2020) DR-4517-WV (2020)

Hazard Overview

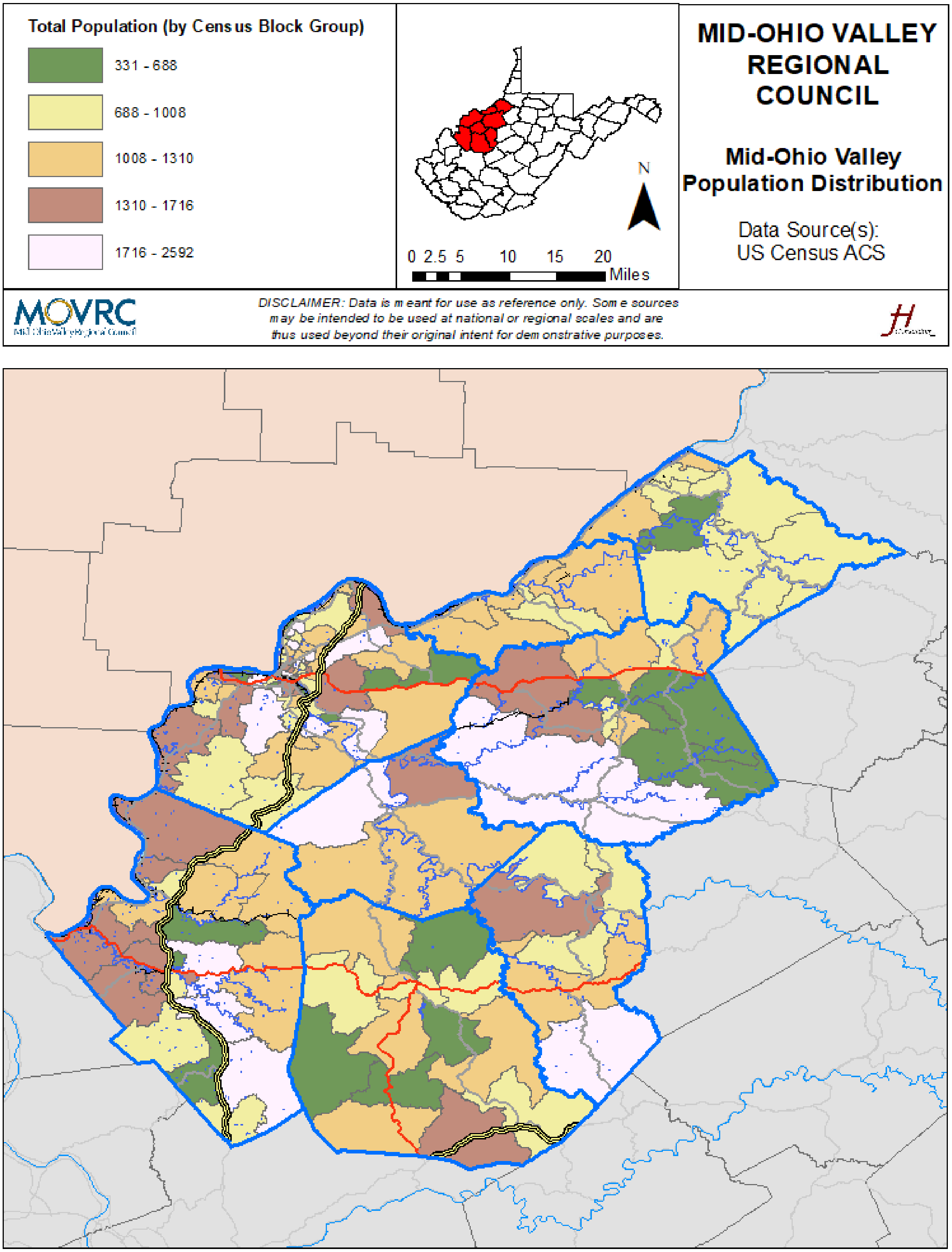
According to the Centers for Disease Control and Prevention (CDC), there are three widely-accepted levels of disease presence. This profile focuses on epidemics and pandemics.

- **Endemic:** The baseline level of a particular disease in population of area. This level is not necessarily the desired level, but the observed level.
- **Epidemic:** An increase in the number of cases of a disease above the usual level in that population or area. Epidemics may result from an increase of the disease's virulence, presence of a disease in a new outbreak, enhanced disease transmission, increased susceptibility among exposed persons, or increased exposure to the disease-causing agent. Note that while the term "epidemic" originally included infectious diseases, some non-infectious health conditions (such as obesity and the opioid misuse) have reached epidemic status in the United States.
- **Pandemic:** An epidemic that has spread over several countries or continents, typically affecting a large number of people.

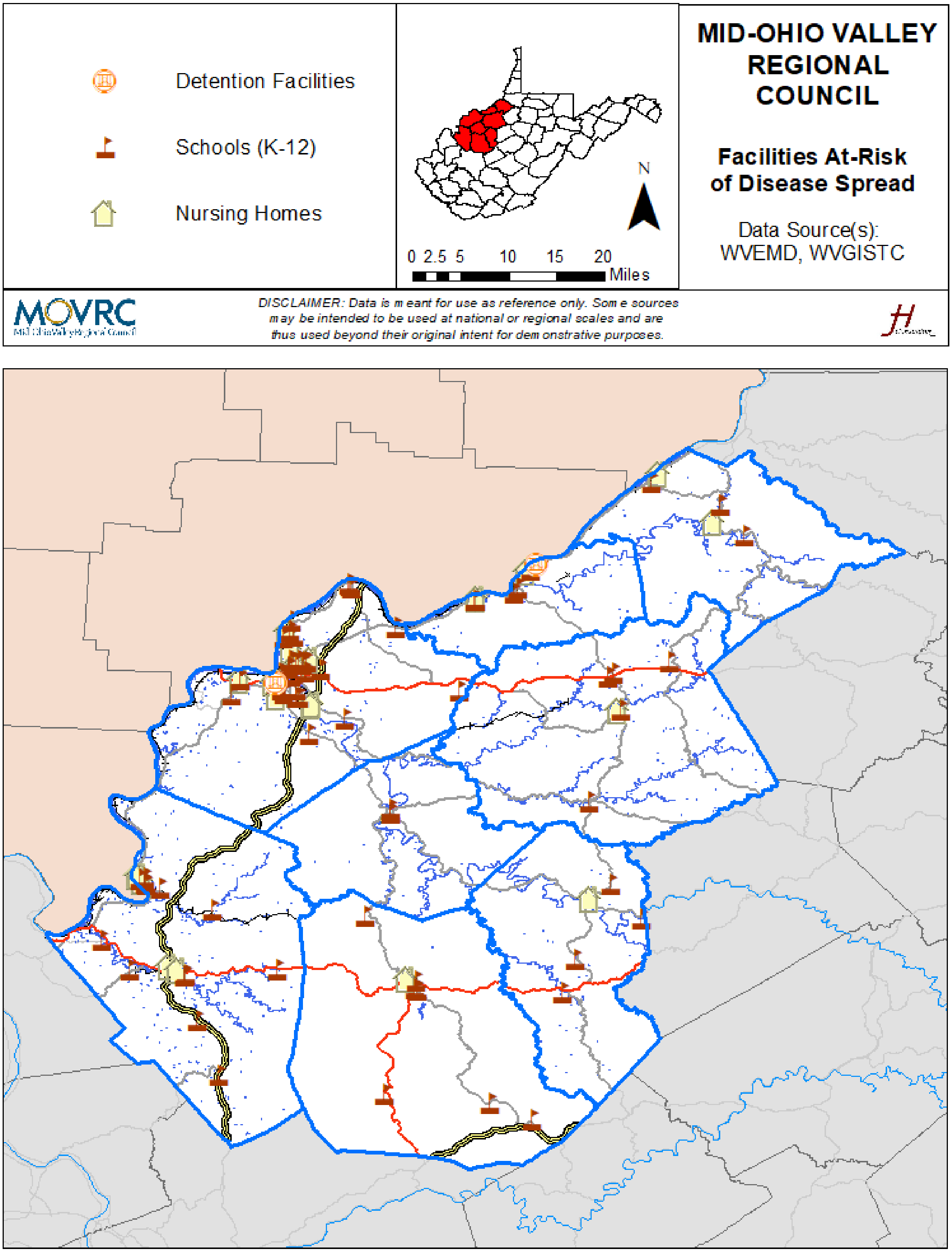
Location and Extent

An epidemic can affect all parts of the Mid-Ohio Valley region, but it is more likely to impacted densely-populated areas and congregate populations, such as multi-unit residential complexes, nursing homes, detention facilities, etc. The graphic below shows the region's population by Census block group. Some of the densest areas of population are in and around

Parkersburg; however, some larger, more rural block groups also report higher populations (in large part due to geographic size).


Total Population (by Census Block Group)
331 - 688
688 - 1008
1008 - 1310
1310 - 1716
1716 - 2592
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Mid-Ohio Valley Population Distribution
Data Source(s):
US Census ACS
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

The following graphic identifies nursing homes and detention facilities in the region. These facilities house populations in close quarters, and outbreaks are common (during both epidemics and pandemics). The map also identifies the schools in the region. During the Covid-19 pandemic, virus spread in schools was a major concern. Similar to congregate housing, schools see concentrated populations of vulnerable individuals on a frequent basis. Though the region is home to WVU-Parkersburg (and the WVUP Jackson Center), these facilities do not have on-campus housing, and classroom populations tend to be smaller than in public school systems.


Detention Facilities
Schools (K-12)
Nursing Homes
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Facilities At-Risk of Disease Spread
Data Source(s): WVEMD, WVGISTC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Impacts and Vulnerability

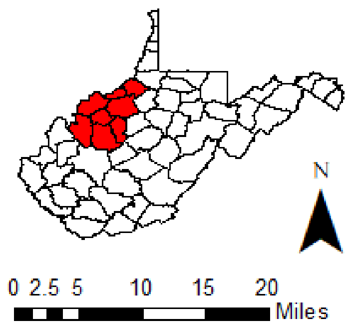
Major concerns during any outbreak include the ability of local health care providers to provide medical attention to everyone who becomes ill and the ability to identify the source or what is causing the population to become ill. The cascading effects of epidemics and pandemics can include the following.

- Illness or death
- Civil disturbance
- Distrust of government
- Poor water quality
- Temporary loss of income

Disease can affect any age group; however, it can more easily affect the youngest and oldest populations. The maps on the following pages use U.S. Census data to identify concentrations of younger (i.e., under 18) and older (i.e., 65 and over) populations.

Persons Under 18 (by Census Block Group)

- 8 - 139
- 140 - 244
- 245 - 370
- 371 - 579
- 580 - 911



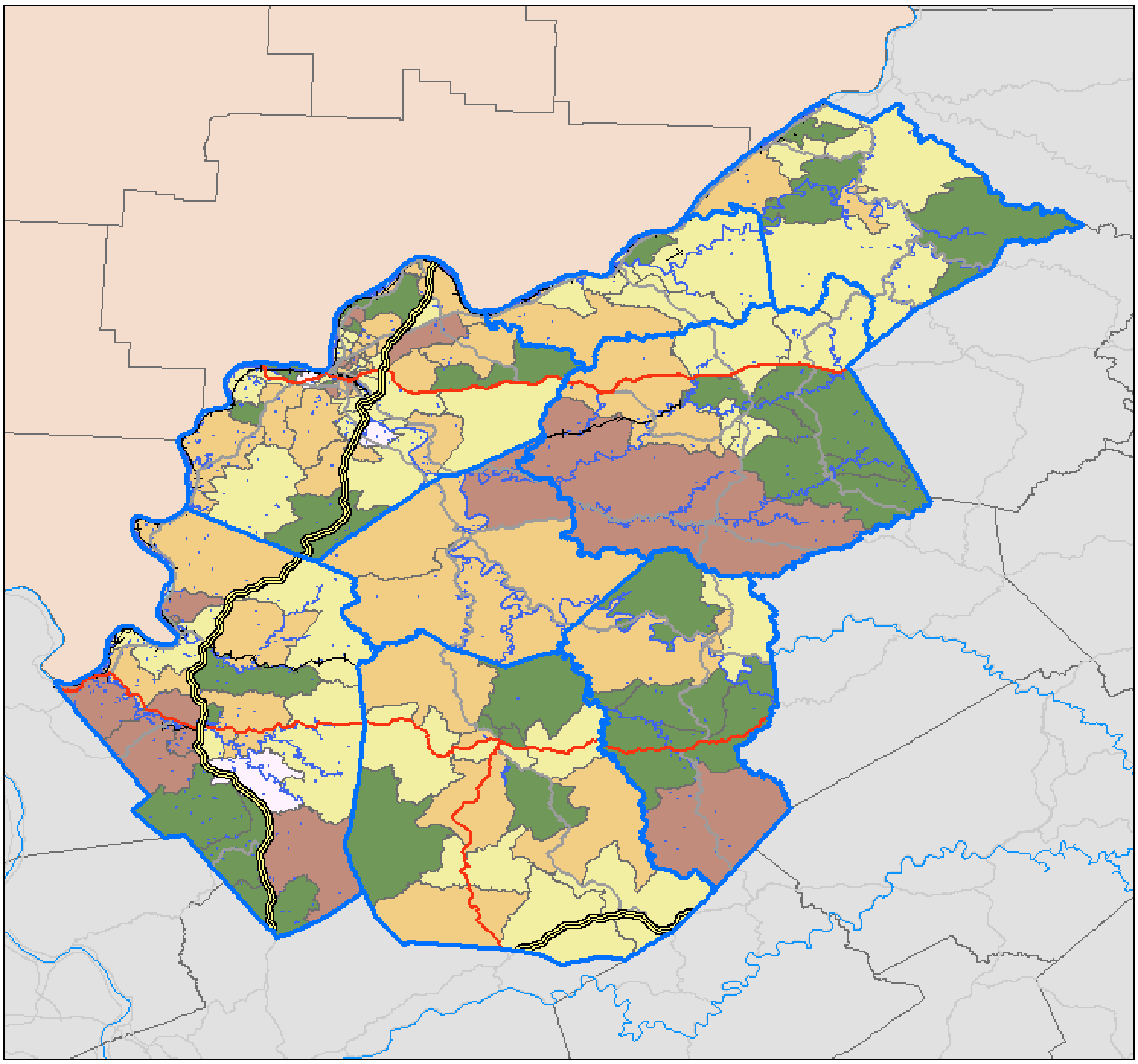
MID-OHIO VALLEY REGIONAL COUNCIL

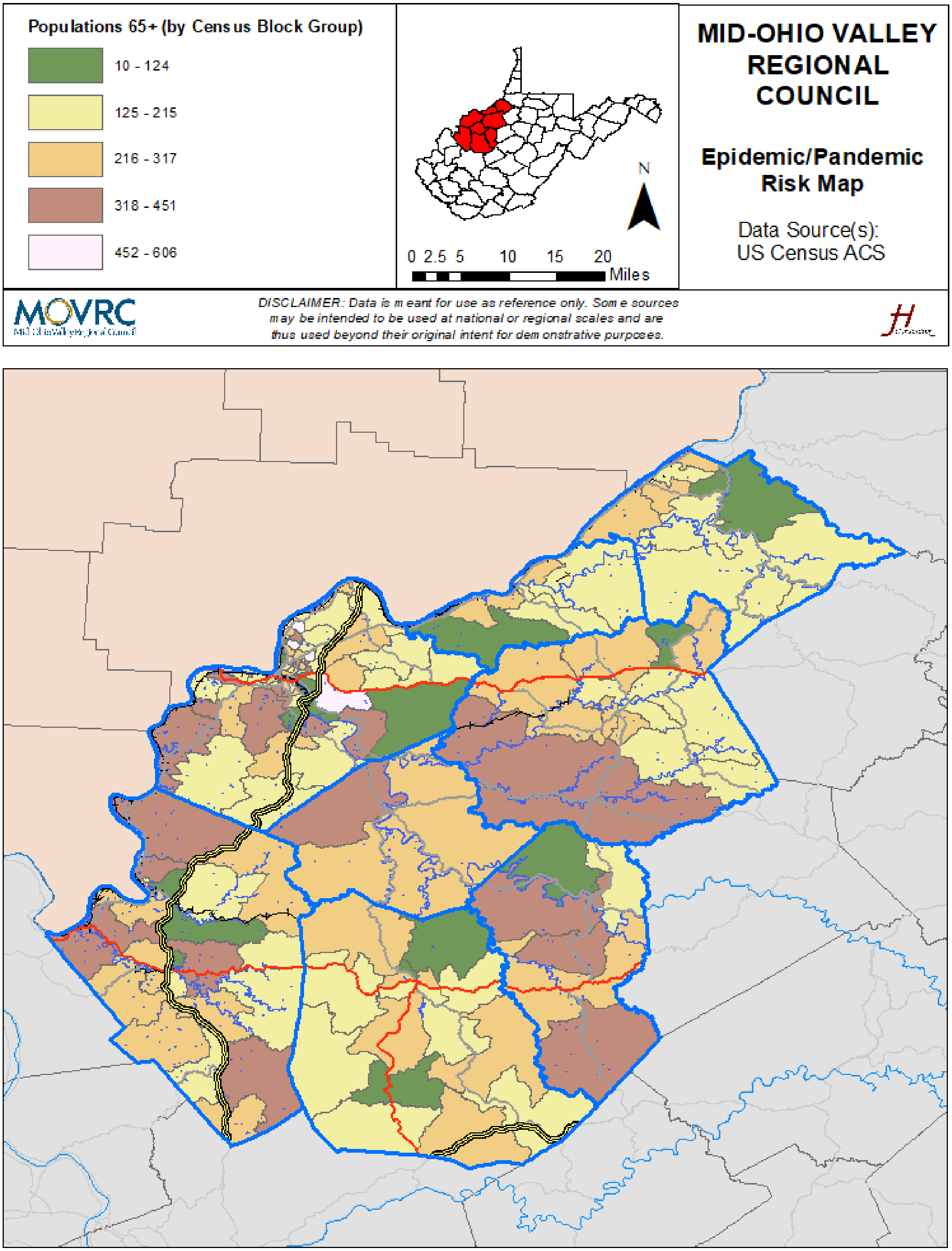
Epidemic/Pandemic Risk Map

Data Source(s):
US Census ACS

MOVRC

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.




Populations 65+ (by Census Block Group)
10 - 124
125 - 215
216 - 317
318 - 451
452 - 606
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Epidemic/Pandemic Risk Map
Data Source(s):
US Census ACS
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

There are also economic impacts of a pandemic. The global COVID-19 pandemic has had sweeping impacts on society; some of the direst are economic in nature. In West Virginia, stay-at-home orders enacted by Governor Justice in March 2020 resulted in many West Virginians losing work, in part or altogether. The shutdowns also shifted consumption patterns, with more spending online and at grocery stores taking the place of entertainment, travel, and accommodations. To respond to the economic hardships felt by the pandemic, beginning in late March, the United States federal government issued multiple rounds of financial assistance in the form of business loans, stimulus checks, grants, and contracts.

Historical Occurrences

Five pandemics have occurred in just over the last century. For many years, the 1918 Spanish Influenza outbreak was the worst-case pandemic on record, though the Covid-19 pandemic of 2020 to the present competes with the 1918 incident in many ways. The following table identifies these previous worldwide pandemics (CDC, 2019a; CDC, 2019b; CDC, 2019c; CDC, 2019d; CDC 2022; WHO, 2022).

Previous Worldwide Pandemic Events		
Date	*Pandemic Name/Subtype*	*Worldwide Deaths (Est.)*
1918-1920	Spanish Flu / H1N1	50 million Est. 675,000 in the U.S.
1957-1958	Asian Flu / H2N2	1.1 million Est. 116,000 in the U.S.
1968-1969	Hong Kong Flu / H3N2)	1 million Est. 100,000 in the U.S.
2009-2010	Swine Flu / H1N1	152,000 – 575,000 Est. 12,000 in the U.S.
2020-Present	Covid-19	6.5 million[1,2] Est. 1,054,443 in the U.S.[1]

Coronavirus Disease (Covid)-19 Pandemic

This plan was written during the Coronavirus Disease 2019 (COVID-19) pandemic. COVID-19 first appeared in West Virginia on March 17, 2020. Prior to the first case, Governor Justice and the West Virginia Department of Health and Human Resources (WVDHHR) took steps to prepare. Throughout the pandemic, the Governor issued Executive Orders to help combat the spread of COVID-19. As of October 5, 2022, West Virginia has had 601,887 confirmed

[1] Figures estimated at the time of this update
[2] Data from the World Health Organization; all other data from the CDC

cases with 7,436 deaths since March of 2020 (WVDHHR, 2022). Confirmed cases for the region include the following (WVDHHR, 2022).

- Calhoun: 1,097 (15 deaths)
- Jackson: 6,848 (144 deaths)
- Pleasants: 1,704 (38 deaths)
- Ritchie: 1,845 (32 deaths)
- Roane: 3,132 (43 deaths)
- Tyler: 1,589 (33 deaths)
- Wirt: 1,218 (26 deaths)
- Wood: 19,089 (361 deaths)

As of October 5, 2022, there have been 615,777,700 confirmed cases of the virus, resulting in over 6.5 million deaths worldwide (WHO, 2022). The virus has spread to every country and continent of the world. The pandemic "shut down" the entire United States for several months in 2020 due to stay-at-home and social distancing orders and isolation and quarantine mandates. Global air travel was restricted for several months, and the pandemic continues to have a negative effect on supply-chains. Though unknown at the time of writing, the overall cost of the pandemic on the US economy is expected to be in the trillions.

The steering committee guiding the development of this plan updated discussed several Covid-19 pandemic vulnerabilities in the region's communities. Virus outbreaks impacted daycare operation, and the strain on child care placed heavy burdens on many households. Further, upon the advent and distribution of vaccines, discrepancies in access appeared, and vaccine hesitancy across racial and ethnic lines surprised many officials. Significant tensions stemming from the perceived severity of the virus led to many contentious situations, including board of education meetings (as a high-profile example). Ultimately, the social disruptions were nearly as challenging as the complications related to the virus.

H1N1 Pandemic of 2009

Additionally, the region felt the impacts of the 2009 swine flu pandemic, caused by the H1N1 influenza virus. The World Health Organization (WHO) designated the pandemic from June 2009 through August 2010. Though its effects paled in comparison to the Covid-19 pandemic (e.g., there were substantially fewer deaths and significantly less economic disruption during the 2009 pandemic), the incident was the first widely-agreed upon pandemic to noticeably impact West Virginia in many years.

Loss and Damages

Losses based on historical epidemics are difficult to estimate. Epidemics rarely affect structures, though because they affect people, at times, the operations of critical facilities, businesses, and other community assets may be impacted. According to a study, seasonal influenza results in a substantial economic impact, estimated, in part, at $16.3 billion in lost earnings (Molinari et al., 2007). By population, the Mid-Ohio Valley region represents 0.05% of the United States (calculations based on Census data). Since seasonal influenza primarily impacts the human population, using the region's composition of the U.S. as a multiplier (i.e., 0.0005) and applying it to the potential economic impact, lost earnings in the Mid-Ohio Valley could reach $7,964,300 each year. Though that number appears high, it equates to approximately $93.41 per year for each person listed by the U.S. Census Bureau as "in civilian labor force" for the region.

Comprehensive estimates of losses associated with the Covid-19 pandemic will inform this discussion in future updates, but at the time of this writing, reliable estimates were not available. For planning purposes, Billings (1997) indicated that the impact of the 1918 Spanish Flu pandemic was a 2% drop in the gross domestic product (GDP) for the world. Further, the United States Bureau of Economic Analysis reports GDP estimates at the county level. Planners averaged the GDP for the eight counties to arrive at a figure of $778,319,375 for the Mid-Ohio Valley (USBEA, 2022). Billings' calculation thus suggests an estimated economic loss of $15,566,400 in the region from major pandemics.

Future Occurrences

Seasonal influenza activity peaks every winter, generally from December to February (CDC, 2018a), and these spikes may reach outbreak status, particularly in congregate settings such as nursing homes, detention facilities, and schools. Other bacterial and viral sicknesses, such as the common cold, RSV, hand-foot-mouth disease, etc., may yield localized (i.e., site-specific) outbreaks as well. In the United States, the CDC surveils various diseases in concert with state and local public health entities, and at the global level, it coordinates with the World Health Organization (WHO) regarding outbreaks and epidemics that have the potential to evolve into a pandemic.

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from epidemic and pandemic. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding epidemic and pandemic.

Public Sentiment, Epidemic/Pandemic					
	Level of Concern				*Total Responses*
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	
Epidemic / Pandemic	9 (13.85%)	21 (32.31%)	18 (27.69%)	17 (26.15%)	65
In the past ten years, do you remember this hazard occurring in your community?				55 (84.62%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				53 (81.54%)	65
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.54%)	65

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Epidemic/Pandemic Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	2	Low (Unlikely to occur in a year)	There have been five pandemics (i.e., the worst-case when compared to epidemics) in 104 years that impacted the Mid-Ohio Valley, yielding an estimated 0.048 events per year.
Response	5	More than one month	The response to the Covid-19 pandemic has exceeded two years in length. The response to epidemics will be much smaller; planners opted to estimate based on the worst-case.
Onset	1	Over 24 hours	Disease surveillance efforts typically will suggest an escalating problem prior to a formal pandemic declaration. Epidemics occur somewhat more quickly, but are detectable in a similar manner.
Magnitude	4	Catastrophic (more than 50% of land area affected)	The term "catastrophic" is a bit dramatic in this instance, yet the entire region is susceptible to a pandemic.
Business	1	Less than 24 hours	Even though some businesses shut down during the Covid-19 pandemic, many businesses continued operations virtually; restaurants and retail establishments offered drive through, delivery, or pick-up services; etc.
Human	4	High (multiple deaths)	The region has experienced 692 deaths from the Covid-19 pandemic.
Property	1	Less than 10% of property affected	Epidemics and pandemics impact human populations, not physical property.
Total	**18**	**Medium**	

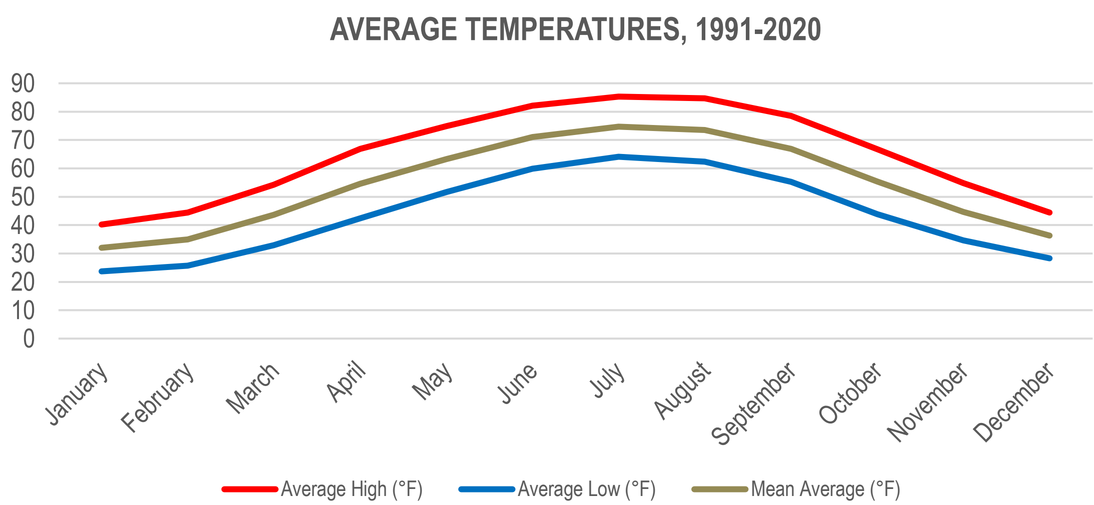
2.0 RISK ASSESSMENT

2.2.6 Extreme Temperatures

Extreme temperatures are those 10° F or more above the average high or below the average low for an area.				
Vulnerability HIGHEST HIGH MEDIUM LOW LOWEST	**Period of Occurrence:**	At any time, typically during the middle summer and middle winter months	**Hazard Index Ranking:**	Low
	Warning Time:	Over 24 hours	**State Risk Ranking:**	N/A
	Probability:	Excessive	**Severity:**	Low
	Type of Hazard:	Natural	**Disaster Declarations:**	USDA FSA S3384 (2012) USDA FSA S3934 (2015) USDA FSA S4498 (2019) USDA FSA S4733 (2020) USDA FSA S4735 (2020) USDA FSA S4747 (2020)

Hazard Overview

Temperatures vary widely over a year, but each season has an average temperature range. The National Oceanic and Atmospheric Administration (NOAA) generates monthly "normal" reports from its different stations. The data below shows the average minimum and maximum temperatures from 1991 to 2020 using data from the NWS Charleston, WV Forecast Office.



Extreme temperatures are those 10 degrees above or below the average high or low temperature. For example, an *extremely* cold temperature for the Mid-Ohio Valley region would be below 23.7° F in January (per the average minimum), and above 95.3° F in July (per the average maximum) would constitute an *extremely* hot temperature. Ready.gov uses slightly different definition for extreme heat, identifying it as "a period of high heat *and humidity* with temperatures above 90 degrees *for at least two to three days*" (https://www.ready.gov/heat, emphasis added). Significantly, this definition adds a time element and the moderating variable of humidity. Duration can be significant in that inability to get relief from the extreme temperatures contributes to the impact.

Location and Extent

Extreme temperatures affect each jurisdiction in the Mid-Ohio Valley equally. Although the temperatures may vary slightly across the region, the average of the temperatures and the extent of extremes are very similar. The National Weather Service, in collaboration with local partners, issues several heat-related products as conditions warrant. Descriptions of those products are in the table below.

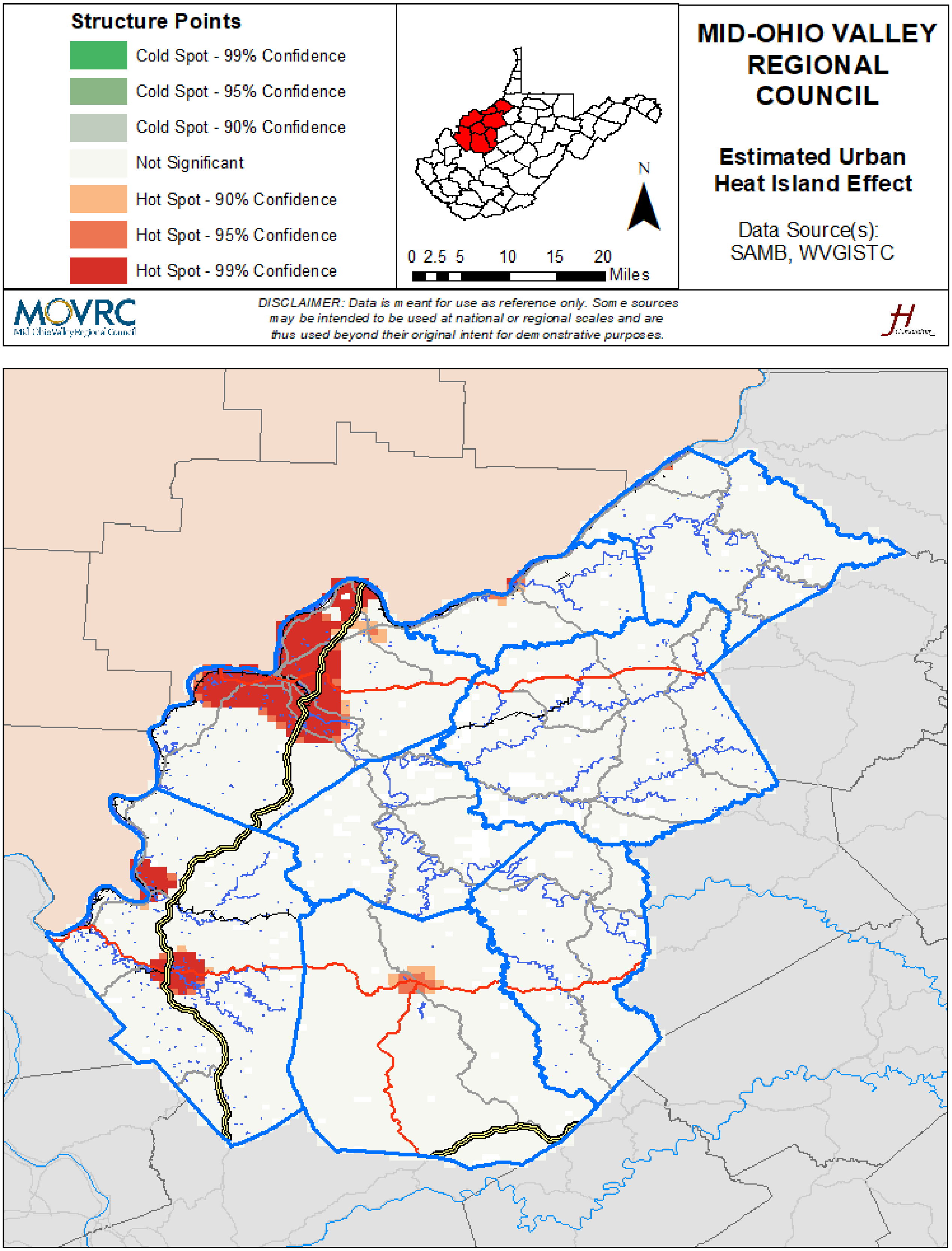
NWS, HEAT-RELATED PRODUCTS	
Product	*Description*
Excessive Heat Warning	Issued within 12 hours of extremely dangerous heat conditions. Issued when the maximum heat index temperature is expected to be 105°F or higher for at least two days and night time air temperatures will not drop below 75°.
Excessive Heat Watch	Issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A watch is used when the risk of a heatwave has increased, but its occurrence and timing is still uncertain.
Heat Advisory	Issued within 12 hours of the onset of extremely dangerous heat conditions. This Advisory is issued when the maximum heat index temperature is expected to be 100°F or higher for at least two days, and nighttime temperatures will not drop below 75°.
Excessive Heat Outlook	Issued when the potential exists for an excessive heat event in the next 3-7 days. Provides information to those who need considerable lead time to prepare for an event.

The National Weather Service also issues products regarding extremely cold temperatures. Such products include frost advisories, freeze watches and warnings, and hard freeze watches and warnings. The descriptions are in the table below.

NWS, PRODUCTS RELATED TO EXTREME COLD	
Product	*Description*
Frost Advisory	Issued when temperatures, winds, and sky cover are favorable for frost development. This is most likely when temperatures are less than or equal to 36 degrees.
Freeze Watch	Freeze Watches are issued a few days ahead of a cold front in which temperatures are expected to be 29-32 degrees.
Freeze Warning	Freeze Warnings are issued when low temperatures are expected to be 29-32 degrees.
Hard Freeze Watch	Hard Freeze Watches are issued days ahead of a cold front in which temperatures are expected to be 28 degrees or less.
Hard Freeze Warning	Hard Freeze Warnings issued when temperatures are expected to be 28 degrees or less

A potential variable to consider is the urban heat island. Urban heat islands occur when cities replace natural land cover with dense concentrations of pavement, buildings, and other surfaces that absorb and retain heat. Urbanized areas experience higher temperatures than outlying rural areas as these buildings, infrastructure, etc. absorb and re-emit the sun's heat. Daytime temperatures in urban areas can be approximately 1° to 1.7° F higher than temperatures in more rural areas, and nighttime temperatures can be between 2° and 5° F higher. These conditions thus exacerbate heat events.

The following graphic estimates areas susceptible to the urban heat island effect in the Mid-Ohio Valley region. Planners conducted an optimized hot spot analysis on structure point data from the West Virginia Statewide Addressing and Mapping Board. This denser concentration of structures serves as a proxy for "urbanized areas."


Structure Points
Cold Spot - 99% Confidence
Cold Spot - 95% Confidence
Cold Spot - 90% Confidence
Not Significant
Hot Spot - 90% Confidence
Hot Spot - 95% Confidence
Hot Spot - 99% Confidence
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Estimated Urban Heat Island Effect
Data Source(s): SAMB, WVGISTC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Impacts and Vulnerability

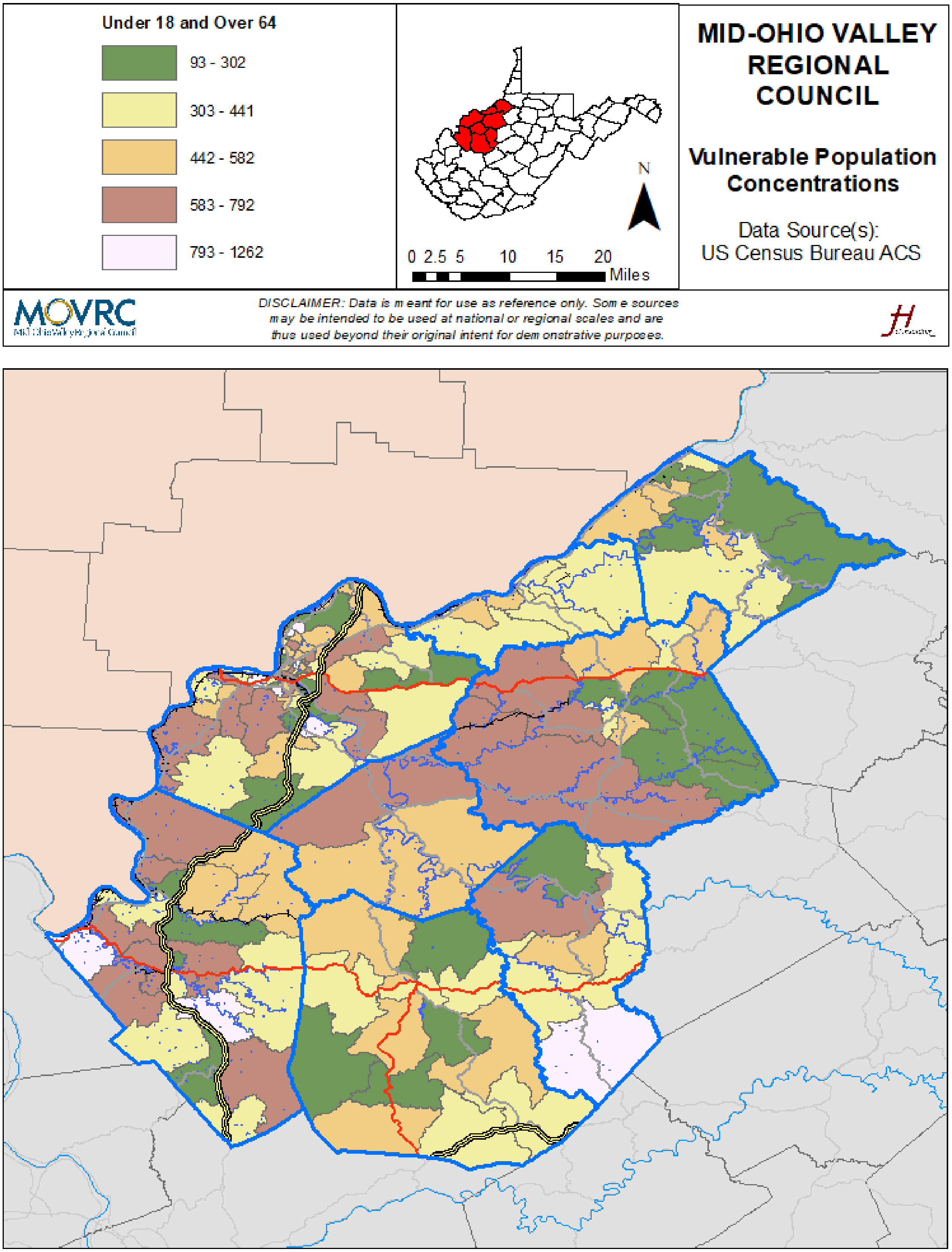
Impacts of extreme temperatures affect the population's health, rather than structures. The extent of damage to infrastructure would consist of broken pipes, cracks in the pavement due to expansion/contraction, and power outages.

Extreme heat can impact health in a variety of ways. High temperatures can trigger a variety of heat stress conditions such as heat stroke, heat exhaustion, heat cramps, sunburn, and heat rash. High relative humidity exacerbates these conditions. High humidity also reduces the ability of sweat to evaporate from the skin, reducing the body's ability to cool itself. Prolonged exposure to heat can necessitate medical intervention; in extreme cases, prolonged exposure could cause death. The table below outlines the possible heat disorders for people in high-risk groups (i.e., children, elderly, etc.).

HEAT RISKS	
Heat Index	*Possible Heat Disorders for People in High-Risk Groups*
80°F-90°F	Fatigue possible with prolonged exposure of physical activity
90°F -105°F	Sunstroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
105°F -130°F	Sunstroke, heat cramps, or heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity
130°F +	Heat/Sunstroke highly likely with continued exposure

Source: https://nws.weather.gov/blog/nwsdesmoines/2014/06/06/iowa-heat-awareness-day-june-5-2014-2/

Extreme cold conditions also impact human health in several ways. Cold weather acts as a vasoconstrictor, meaning it constricts blood vessels and raises the risk of a heart attack. Prolonged exposure to cold weather can cause cold-related illnesses, which include hypothermia, frostbite, trench foot/immersion foot, and chilblains. Extreme temperatures of either type, heat or cold, appear to impact children and the elderly more severely than other population groups. The following map shows concentrations of the elderly (i.e., 65 and over) as well as children (i.e., under 18) in the region. According to the map, some of the highest concentrations of vulnerable populations are either in the urban core of Parkersburg or some of the most remote areas of the region. As noted above, those dense populations in the Parkersburg core may experience higher temperatures during heat events because of the higher concentrations of pavement, buildings, etc. that hold and re-emit the sun's heat.


Under 18 and Over 64
93 - 302
303 - 441
442 - 582
583 - 792
793 - 1262
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Vulnerable Population Concentrations
Data Source(s):
US Census Bureau ACS
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Historical Occurrences

According to the NOAA'S National Centers for Environmental Information, there have been 368 extreme temperature events in the Mid-Ohio Valley since 1996. As with other weather-related hazards, many of these events are duplicates because the hazard impacts the region as a whole (and, as such, each county is listed separately as having had an event). In the table below, there are 47 unique dates, which yields a more accurate number of incidents. This revised figure, 47, suggests an average of two incidents per year.

Historical Extreme Temperature Events						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Jackson (Zone)	2/4/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	2/4/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	2/4/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	2/4/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	2/4/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	2/4/1996	Cold/Wind Chill	0	0	$10,000.00	$0.00
Ritchie (Zone)	2/4/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	2/4/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	2/27/1996	Heat	0	0	$0.00	$0.00
Wood (Zone)	2/27/1996	Heat	0	0	$0.00	$0.00
Tyler (Zone)	2/27/1996	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	2/27/1996	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	2/27/1996	Heat	0	0	$0.00	$0.00
Wirt (Zone)	2/27/1996	Heat	0	0	$0.00	$0.00
Roane (Zone)	2/27/1996	Heat	0	0	$0.00	$0.00
Jackson (Zone)	2/27/1996	Heat	0	0	$0.00	$0.00
Roane (Zone)	3/10/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	3/10/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	3/10/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	3/10/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	3/10/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	3/10/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	3/10/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	3/10/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	5/13/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	5/13/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	5/13/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	5/13/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	5/13/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	5/13/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	5/13/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	5/13/1996	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	1/1/1997	Heat	0	0	$0.00	$0.00
Wirt (Zone)	1/1/1997	Heat	0	0	$0.00	$0.00
Roane (Zone)	1/1/1997	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	1/1/1997	Heat	0	0	$0.00	$0.00
Tyler (Zone)	1/1/1997	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	1/1/1997	Heat	0	0	$0.00	$0.00

Historical Extreme Temperature Events						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood (Zone)	1/1/1997	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	1/1/1997	Heat	0	0	$0.00	$0.00
Wirt (Zone)	1/16/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	1/16/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	1/16/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	1/16/1997	Cold/Wind Chill	0	0	$5,000.00	$0.00
Jackson (Zone)	1/16/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	1/16/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	1/16/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	1/16/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	2/21/1997	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	2/21/1997	Heat	0	0	$0.00	$0.00
Wirt (Zone)	2/21/1997	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	2/21/1997	Heat	0	0	$0.00	$0.00
Wood (Zone)	2/21/1997	Heat	0	0	$0.00	$0.00
Tyler (Zone)	2/21/1997	Heat	0	0	$0.00	$0.00
Roane (Zone)	2/21/1997	Heat	0	0	$0.00	$0.00
Jackson (Zone)	2/21/1997	Heat	0	0	$0.00	$0.00
Wood (Zone)	4/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	4/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	4/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	4/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	4/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	4/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	4/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	4/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	5/7/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	5/7/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	5/7/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	5/7/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	5/7/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	5/7/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	5/7/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	5/7/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	5/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	5/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	5/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	5/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	5/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	5/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	5/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	5/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	9/4/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	9/4/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	9/4/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	9/4/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	9/4/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	9/4/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	9/4/1997	Cold/Wind Chill	0	0	$0.00	$0.00

Historical Extreme Temperature Events						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Jackson (Zone)	9/4/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	10/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	10/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	10/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	10/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	10/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	10/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	10/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	10/23/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	11/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	11/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	11/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	11/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	11/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	11/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	11/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	11/1/1997	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	3/10/1998	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	3/10/1998	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	3/10/1998	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	3/10/1998	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	3/10/1998	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	3/10/1998	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	3/10/1998	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	3/10/1998	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	3/26/1998	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	3/26/1998	Heat	0	0	$0.00	$0.00
Jackson (Zone)	3/26/1998	Heat	0	0	$0.00	$0.00
Tyler (Zone)	3/26/1998	Heat	0	0	$0.00	$0.00
Wirt (Zone)	3/26/1998	Heat	0	0	$0.00	$0.00
Wood (Zone)	3/26/1998	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	3/26/1998	Heat	0	0	$0.00	$0.00
Roane (Zone)	3/26/1998	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	9/14/1998	Heat	0	0	$0.00	$0.00
Tyler (Zone)	9/14/1998	Heat	0	0	$0.00	$0.00
Roane (Zone)	9/14/1998	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	9/14/1998	Heat	0	0	$0.00	$0.00
Wood (Zone)	9/14/1998	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	9/14/1998	Heat	0	0	$0.00	$0.00
Jackson (Zone)	9/14/1998	Heat	0	0	$0.00	$0.00
Wirt (Zone)	9/14/1998	Heat	0	0	$0.00	$0.00
Wirt (Zone)	12/6/1998	Heat	0	0	$0.00	$0.00
Tyler (Zone)	12/6/1998	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	12/6/1998	Heat	0	0	$0.00	$0.00
Jackson (Zone)	12/6/1998	Heat	0	0	$0.00	$0.00
Roane (Zone)	12/6/1998	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	12/6/1998	Heat	0	0	$0.00	$0.00
Wood (Zone)	12/6/1998	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	12/6/1998	Heat	0	0	$0.00	$0.00

Historical Extreme Temperature Events						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Roane (Zone)	1/22/1999	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	1/22/1999	Heat	0	0	$0.00	$0.00
Tyler (Zone)	1/22/1999	Heat	0	0	$0.00	$0.00
Jackson (Zone)	1/22/1999	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	1/22/1999	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	1/22/1999	Heat	0	0	$0.00	$0.00
Wood (Zone)	1/22/1999	Heat	0	0	$0.00	$0.00
Wirt (Zone)	1/22/1999	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	2/11/1999	Heat	0	0	$0.00	$0.00
Roane (Zone)	2/11/1999	Heat	0	0	$0.00	$0.00
Tyler (Zone)	2/11/1999	Heat	0	0	$0.00	$0.00
Wirt (Zone)	2/11/1999	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	2/11/1999	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	2/11/1999	Heat	0	0	$0.00	$0.00
Wood (Zone)	2/11/1999	Heat	0	0	$0.00	$0.00
Jackson (Zone)	2/11/1999	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	3/1/1999	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	3/1/1999	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	3/1/1999	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	3/1/1999	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	3/1/1999	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	3/1/1999	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	3/1/1999	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	3/1/1999	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	1/2/2000	Excessive Heat	0	0	$0.00	$0.00
Tyler (Zone)	1/2/2000	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	1/2/2000	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	1/2/2000	Excessive Heat	0	0	$0.00	$0.00
Calhoun (Zone)	1/2/2000	Excessive Heat	0	0	$0.00	$0.00
Wood (Zone)	1/2/2000	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	1/2/2000	Excessive Heat	0	0	$0.00	$0.00
Ritchie (Zone)	1/2/2000	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	1/22/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	1/22/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	1/22/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	1/22/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	1/22/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	1/28/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	1/28/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	1/28/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	1/28/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	1/28/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	1/28/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	1/28/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	1/28/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	2/25/2000	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	2/25/2000	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	2/25/2000	Excessive Heat	0	0	$0.00	$0.00
Roane (Zone)	2/25/2000	Excessive Heat	0	0	$0.00	$0.00

Historical Extreme Temperature Events						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Ritchie (Zone)	2/25/2000	Excessive Heat	0	0	$0.00	$0.00
Wood (Zone)	2/25/2000	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	2/25/2000	Excessive Heat	0	0	$0.00	$0.00
Tyler (Zone)	2/25/2000	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	2/26/2000	Excessive Heat	0	0	$0.00	$0.00
Ritchie (Zone)	2/26/2000	Excessive Heat	0	0	$0.00	$0.00
Roane (Zone)	2/26/2000	Excessive Heat	0	0	$0.00	$0.00
Tyler (Zone)	2/26/2000	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	2/26/2000	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	2/26/2000	Excessive Heat	0	0	$0.00	$0.00
Wood (Zone)	2/26/2000	Excessive Heat	0	0	$0.00	$0.00
Calhoun (Zone)	2/26/2000	Excessive Heat	0	0	$0.00	$0.00
Calhoun (Zone)	3/8/2000	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	3/8/2000	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	3/8/2000	Excessive Heat	0	0	$0.00	$0.00
Ritchie (Zone)	3/8/2000	Excessive Heat	0	0	$0.00	$0.00
Roane (Zone)	3/8/2000	Excessive Heat	0	0	$0.00	$0.00
Tyler (Zone)	3/8/2000	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	3/8/2000	Excessive Heat	0	0	$0.00	$0.00
Wood (Zone)	3/8/2000	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	10/8/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	10/8/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	10/8/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	10/8/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	10/8/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	10/8/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	10/8/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	10/8/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	11/21/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	11/21/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	11/21/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	11/21/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	11/21/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	11/21/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	11/21/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	11/21/2000	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	12/1/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	12/1/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	12/1/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	12/1/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	12/1/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	12/1/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	12/1/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	12/1/2000	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	2/9/2001	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	2/9/2001	Excessive Heat	0	0	$0.00	$0.00
Roane (Zone)	2/9/2001	Excessive Heat	0	0	$0.00	$0.00
Ritchie (Zone)	2/9/2001	Excessive Heat	0	0	$0.00	$0.00
Calhoun (Zone)	2/9/2001	Excessive Heat	0	0	$0.00	$0.00

Historical Extreme Temperature Events						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Tyler (Zone)	2/9/2001	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	2/9/2001	Excessive Heat	0	0	$0.00	$0.00
Wood (Zone)	2/9/2001	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	3/1/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	3/1/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	3/1/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	3/1/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	3/1/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	3/1/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	3/1/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	3/1/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	10/8/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	10/8/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	10/8/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	10/8/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	10/8/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	10/8/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	10/8/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	10/8/2001	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	12/1/2001	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	12/1/2001	Heat	0	0	$0.00	$0.00
Roane (Zone)	12/1/2001	Heat	0	0	$0.00	$0.00
Tyler (Zone)	12/1/2001	Heat	0	0	$0.00	$0.00
Jackson (Zone)	12/1/2001	Heat	0	0	$0.00	$0.00
Wirt (Zone)	12/1/2001	Heat	0	0	$0.00	$0.00
Wood (Zone)	12/1/2001	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	12/1/2001	Heat	0	0	$0.00	$0.00
Tyler (Zone)	1/28/2002	Excessive Heat	0	0	$0.00	$0.00
Wood (Zone)	1/28/2002	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	1/28/2002	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	1/28/2002	Excessive Heat	0	0	$0.00	$0.00
Roane (Zone)	1/28/2002	Excessive Heat	0	0	$0.00	$0.00
Ritchie (Zone)	1/28/2002	Excessive Heat	0	0	$0.00	$0.00
Calhoun (Zone)	1/28/2002	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	1/28/2002	Excessive Heat	0	0	$0.00	$0.00
Ritchie (Zone)	1/31/2002	Excessive Heat	0	0	$0.00	$0.00
Roane (Zone)	1/31/2002	Excessive Heat	0	0	$0.00	$0.00
Calhoun (Zone)	1/31/2002	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	1/31/2002	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	1/31/2002	Excessive Heat	0	0	$0.00	$0.00
Wood (Zone)	1/31/2002	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	1/31/2002	Excessive Heat	0	0	$0.00	$0.00
Tyler (Zone)	1/31/2002	Excessive Heat	0	0	$0.00	$0.00
Calhoun (Zone)	4/16/2002	Excessive Heat	0	0	$0.00	$0.00
Roane (Zone)	4/16/2002	Excessive Heat	0	0	$0.00	$0.00
Tyler (Zone)	4/16/2002	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	4/16/2002	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	4/16/2002	Excessive Heat	0	0	$0.00	$0.00
Wirt (Zone)	4/16/2002	Excessive Heat	0	0	$0.00	$0.00

Historical Extreme Temperature Events						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood (Zone)	4/16/2002	Excessive Heat	0	0	$0.00	$0.00
Ritchie (Zone)	4/16/2002	Excessive Heat	0	0	$0.00	$0.00
Pleasants (Zone)	5/19/2002	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	5/19/2002	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	5/19/2002	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	5/19/2002	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	5/19/2002	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	5/19/2002	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	5/19/2002	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	5/19/2002	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	1/14/2003	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	1/14/2003	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	1/14/2003	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	1/14/2003	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	1/14/2003	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	1/14/2003	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	1/14/2003	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	1/14/2003	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	8/16/2007	Excessive Heat	0	0	$0.00	$0.00
Jackson (Zone)	8/16/2007	Excessive Heat	0	0	$0.00	$0.00
Roane (Zone)	7/20/2011	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	7/20/2011	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	7/20/2011	Heat	0	0	$0.00	$0.00
Jackson (Zone)	7/20/2011	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	7/20/2011	Heat	0	0	$0.00	$0.00
Wood (Zone)	7/20/2011	Heat	0	0	$0.00	$0.00
Wirt (Zone)	7/20/2011	Heat	0	0	$0.00	$0.00
Tyler (Zone)	7/20/2011	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Jackson (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Pleasants (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Ritchie (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Roane (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Tyler (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Tyler (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Wirt (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Wood (Zone)	7/28/2011	Heat	0	0	$0.00	$0.00
Calhoun (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	$20,000.00	$0.00
Wood (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	$200,000.00	$0.00
Wirt (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	$20,000.00	$0.00
Tyler (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	$20,000.00	$0.00
Roane (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	$20,000.00	$0.00
Ritchie (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	$20,000.00	$0.00
Pleasants (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	$20,000.00	$0.00
Jackson (Zone)	1/6/2014	Extreme Cold/Wind Chill	0	0	$20,000.00	$0.00
Wood (Zone)	1/27/2014	Extreme Cold/Wind Chill	0	0	$25,000.00	$0.00
Jackson (Zone)	1/27/2014	Extreme Cold/Wind Chill	0	0	$25,000.00	$0.00
Wirt (Zone)	1/27/2014	Extreme Cold/Wind Chill	0	0	$25,000.00	$0.00
Ritchie (Zone)	1/27/2014	Extreme Cold/Wind Chill	0	0	$25,000.00	$0.00

Historical Extreme Temperature Events						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Tyler (Zone)	1/27/2014	Extreme Cold/Wind Chill	0	0	$25,000.00	$0.00
Roane (Zone)	1/27/2014	Extreme Cold/Wind Chill	0	0	$25,000.00	$0.00
Pleasants (Zone)	1/27/2014	Extreme Cold/Wind Chill	0	0	$25,000.00	$0.00
Calhoun (Zone)	1/27/2014	Extreme Cold/Wind Chill	0	0	$25,000.00	$0.00
Jackson (Zone)	2/14/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	2/14/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	2/14/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	2/14/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	2/14/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	2/14/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	2/14/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	2/14/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	2/18/2015	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	2/18/2015	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	2/18/2015	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	2/18/2015	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	2/18/2015	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	2/18/2015	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	2/18/2015	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	2/18/2015	Extreme Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	2/23/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	2/23/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	2/23/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	2/23/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	2/23/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	2/23/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	2/23/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	2/23/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Calhoun (Zone)	3/6/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Jackson (Zone)	3/6/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Pleasants (Zone)	3/6/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Ritchie (Zone)	3/6/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Roane (Zone)	3/6/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Tyler (Zone)	3/6/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Wirt (Zone)	3/6/2015	Cold/Wind Chill	0	0	$0.00	$0.00
Wood (Zone)	3/6/2015	Cold/Wind Chill	0	0	$0.00	$0.00
		Totals	**0**	**0**	**$555,000.00**	**$0.00**

June 2012 Extreme Heat Event (EHE)

Concurrently with the 2012 super derecho wind event, an extreme heat event impacted Maryland, Ohio, Virginia, and West Virginia. Parkersburg reported a high of 98° F. Fowler and colleagues (2013) examined heat-related deaths in this event. Across all four states, the event was noted in the deaths of 32 individuals, one of which was in West Virginia.

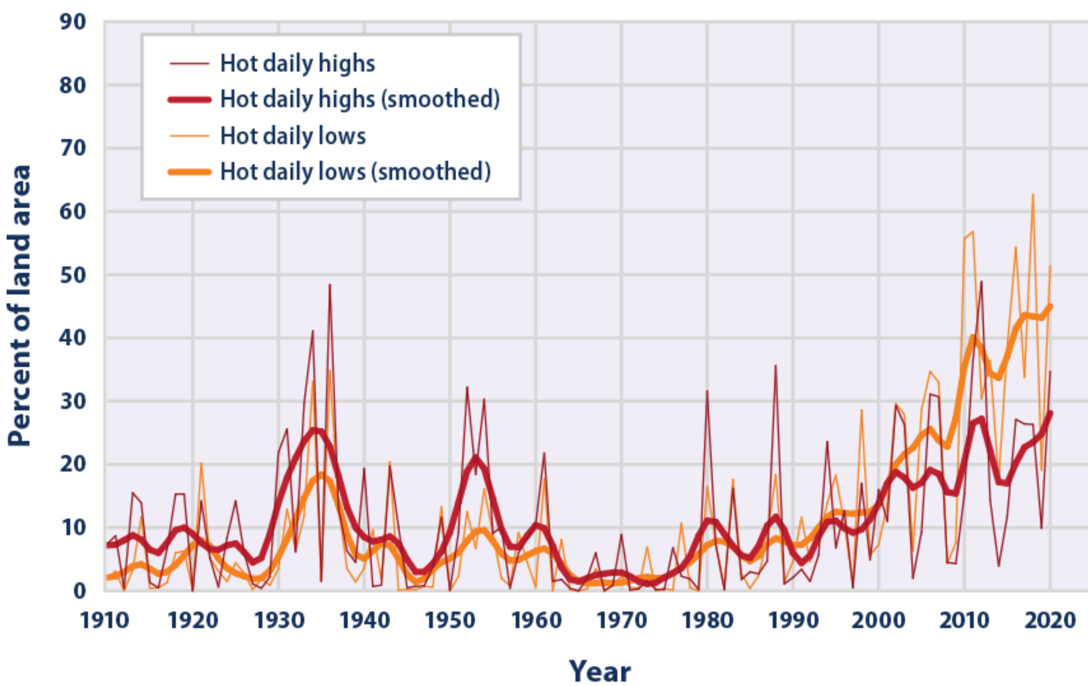
<u>Loss and Damages</u>

According to the NCEI, there have been $555,000 in property damages across 47 unique incidents. As such, estimated losses, not including health impacts, from extreme temperatures could be $11,800.00 per event. Given the data above that suggests West Virginia is not seeing significant changes in the number of hot or cold days, these physical damages may remain relatively constant.

<u>Future Occurrences</u>

The Mid-Ohio Valley region has experienced an average of two extreme temperature events per year, and these are expected to continue in the summer (June to September) and winter (December to February) months. Anecdotally, participants in the plan update process reported summers being generally hotter than in the past. The following graphic shows there is an upward trend in the hot daily lows in the contiguous 48 states (USEPA, 2022a). The smoothed line of the hot daily highs is not trending upward as much, but it appears as though the Nation is not getting the relief on those hot days that it once did.

Area of the Contiguous 48 States with Unusually Hot Summer Temperatures, 1910–2020

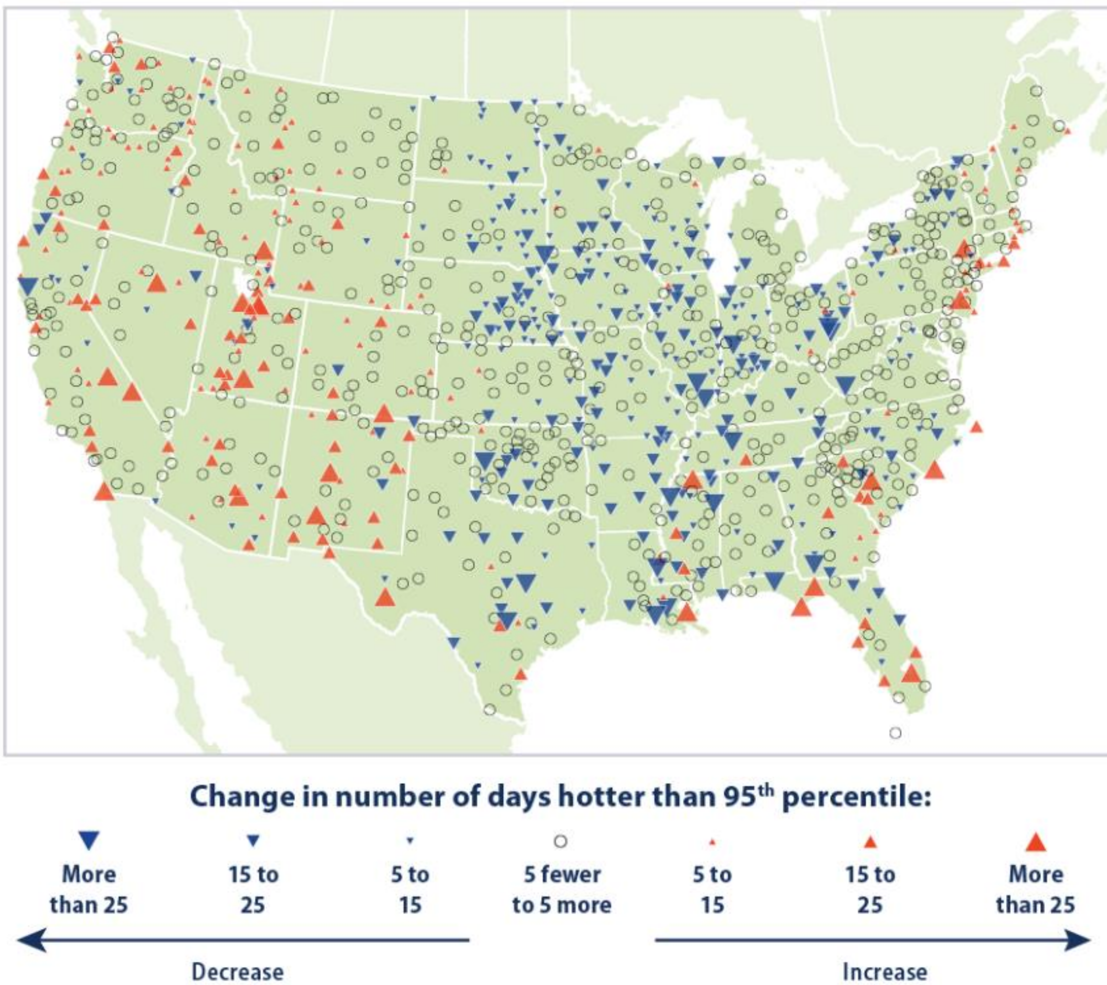


Data source: NOAA (National Oceanic and Atmospheric Administration). 2021. U.S. Climate Extremes Index. Accessed March 2021. www.ncdc.noaa.gov/extremes/cei.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.

West Virginia, though, is an outlier in this trend, as shown in the graphic below (USEPA, 2022a). While the region may continue to experience pockets of extreme heat, this graphic shows the heat trends to be more pronounced in the western states, small areas of the south, and along the eastern coast. West Virginia is mostly within the five-day change (+/-).

Change in Unusually Hot Temperatures in the Contiguous 48 States, 1948–2020

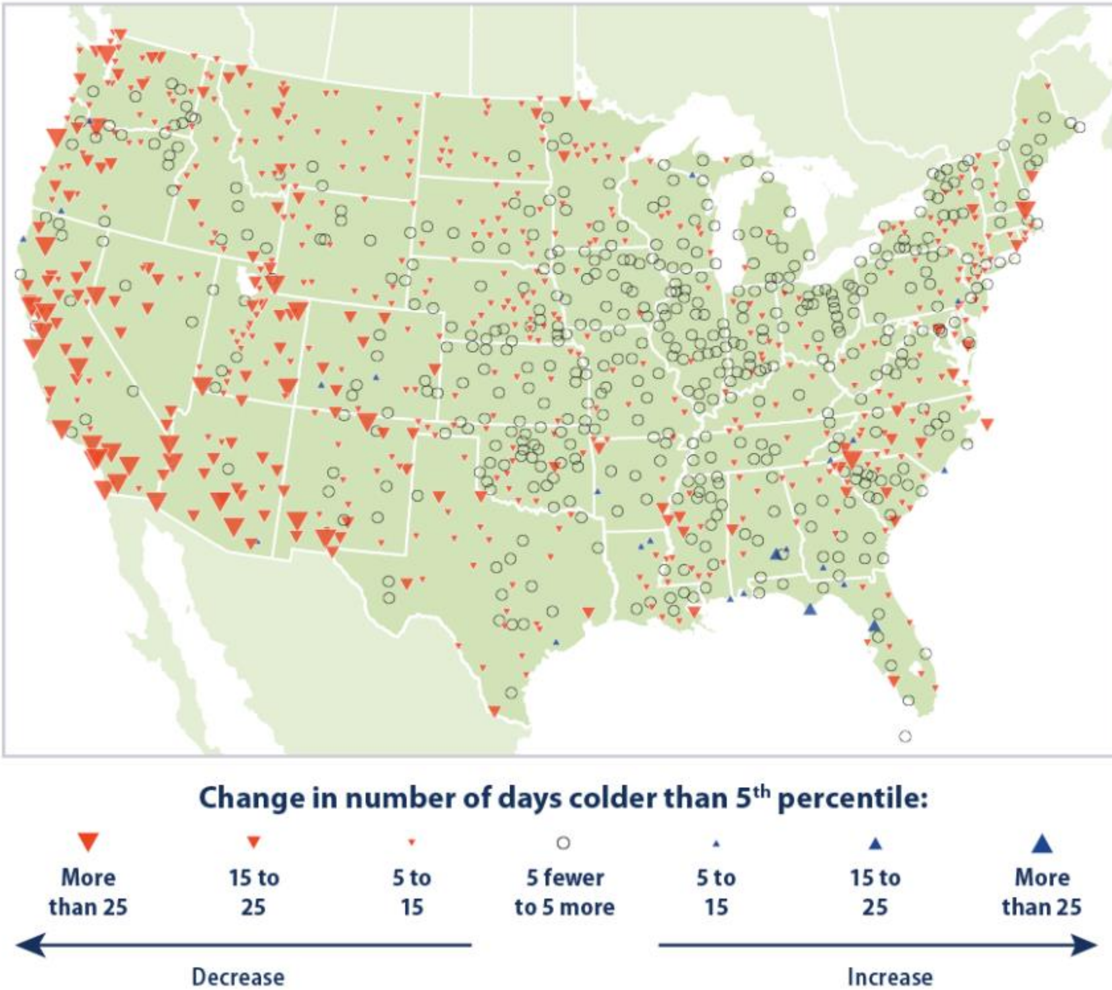


Data source: NOAA (National Oceanic and Atmospheric Administration). 2021. National Centers for Environmental Information. Accessed March 2021. www.ncdc.noaa.gov.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.

Similarly, West Virginia has seen little change with respect to the number of days colder than the fifth percentile (USEPA, 2022a).

Change in Unusually Cold Temperatures in the Contiguous 48 States, 1948–2020



Data source: NOAA (National Oceanic and Atmospheric Administration). 2021. National Centers for Environmental Information. Accessed March 2021. www.ncdc.noaa.gov.

For more information, visit U.S. EPA's "Climate Change Indicators in the United States" at www.epa.gov/climate-indicators.

While these graphics may suggest that West Virginia should anticipate similar extreme conditions in the future, this data is purely climatological. It does not take into account the interaction between fluctuations in temperatures and vulnerable populations. West Virginia's population is currently aging, meaning more of its population is becoming vulnerable to the extreme days that do occur.

<u>Risk Assessment</u>

This section summarizes the vulnerability to the Mid-Ohio Valley region from extreme temperatures. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding extreme temperatures.

Public Sentiment, Extreme Temperatures					
	Level of Concern				*Total*
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	*Responses*
Extreme Temperatures	23 (35.38%)	17 (26.15%)	16 (24.62%)	9 (13.85%)	65
In the past ten years, do you remember this hazard occurring in your community?				30 (46.15%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				39 (60.00%)	65
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.54%)	65

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Extreme Temperatures Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	5	Excessive (Will occur during a year)	The NCEI reports 47 events across a 19-year period, for an average of 2.47 events annually.
Response	1	Less than half a day	Temperature extremes may necessitate increased medical calls for services like EMS or fire and they may prompt the opening of warming/cooling centers, but extended responses are rare.
Onset	1	Over 24 hours	Extreme temperature events are forecasted well in advance of onset.
Magnitude	1	Localized (less than 10% of land area affected)	Though the entire region is susceptible to extreme temperatures, the impacts are often localized (sometimes to the individual household). As such, planners selected the lowest magnitude ranking for estimation purposes.
Business	1	Less than 24 hours	Though a business may close due to a heat-related power outage or a cold-related pipe failure, widespread business closure from temperature extremes is unlikely.
Human	2	Low (some injuries)	There are no historical records of injuries from heat or cold in the region, though injuries or death are possible.
Property	1	Less than 10% of property affected	The majority of the impacts from temperature extremes are human in nature, resulting in minimal property damages.
Total	**12**	**Low**	

2.0 RISK ASSESSMENT

2.2.7 Flooding

A flood is a general or temporary condition of partial or complete inundation of normally dry land areas or the rapid accumulation of runoff surface waters from any source. A flash flood is a sudden local flood, typically due to heavy rain.				
Vulnerability HIGHEST HIGH MEDIUM ◄ LOW LOWEST	**Period of Occurrence:**	At any time, typically after prolonged periods of precipitation	**Hazard Index Ranking:**	Medium
	Warning Time:	6-12 hours	**State Risk Ranking:**	High
	Probability:	Will occur in a year	**Severity:**	Medium
	Type of Hazard:	Natural	**Disaster Declarations:**	DR-224-WV (1967) DR-569-WV (1978) DR-628-WV (1980) DR-753-WV (1985) DR-1096-WV (1996) DR-1168-WV (1997) DR-1229-WV (1998) DR-1319-WV (2000) DR-1378-WV (2001) DR-1474-WV (2003) DR-1500-WV (2003) DR-1522-WV (2004) DR-1558-WV (2004) DR-1574-WV (2005) DR-1769-WV (2008) DR-1837-WV (2009) DR-4059-WV (2012) USDA FSA S3386 (2012) DR-4132-WV (2013) DR-4210-WV (2015) DR-4220-WV (2015) DR-4221-WV (2015) DR-4236-WV (2015) USDA FSA S3934 (2015) DR-4273-WV (2016) DR-4331-WV (2017) DR-4359-WV (2018) USDA FSA S4480 (2019) USDA FSA S4498 (2019) USDA FSA S4532 (2019) USDA FSA S4541 (2019)

<u>Hazard Overview</u>

Floods are the most prevalent hazard in the United States. Each year, floods cause more property damage in the U.S. than any other type of natural disaster, killing an average of 150 people a year. According to NOAA, some of the possible causes for flooding include the following.

- **Excessive Rainfall:** This is the most common cause of flooding. Water accumulates quicker than the soil can absorb, resulting in flooding.
- **Snowmelt**: It occurs when the primary source of water involved is melting snow. 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.
- **Ice or Debris Jams**: Common during the winter and spring along rivers, streams, and creeks. As ice or debris moves downstream, it may get caught on obstructions to the water flow. When this occurs, water can be held back, causing upstream flooding. When the jam finally breaks, flash flooding can occur downstream.
- **Dam Breaks or Levee Failure**: Dams can overtop, have excessive seepage, or have a structural failure. For more information, see Section 2.2.2 Dam Failure.

National Flood Insurance Program (NFIP)

The NFIP is a FEMA-managed program designed to provide flood insurance to property owners, renters, and businesses. The intent of the program is to help those property owners recover more quickly following a flood event. The NFIP, though, is not *just* an insurance program. Program representatives work with communities to adopt and enforcement floodplain management regulations to lessen the exposure to damages in flood-prone areas. All but one of the jurisdictions in the region participate in the NFIP. The following table outlines NFIP policies in force[1] throughout the Mid-Ohio Valley region.

NFIP Policies in Force – Mid-Ohio Valley Region			
Community Name (Number)	*Polices in Force*	*Total Coverage*	*Total Written Premium + FPF*
Calhoun County (540020)	33	$4,089,000	$27,462
Grantsville, Town of (540021)	12	$1,120,800	$19,217
Unknown (Unknown)	3	$258,000	$5,536
Jackson County (540063)	95	$17,693,900	$108,751
Ravenswood, City of (540241)	17	$4,334,200	$25,894
Ripley, City of (540064)	11	$2,222,500	$10,704
Unknown (Unknown)	7	$1,252,000	$9,086
Ritchie County (540224)	23	$4,840,400	$20,904
Cairo, Town of (540179)	3	$134,000	$1,388
Pennsboro, City of (540182)	17	$2,100,600	$17,255
Unknown (Unknown)	1	$19,000	$953
Roane County (540183)	80	$11,104,200	$56,781
Reedy, Town of (540184)	5	$356,000	$5,577
Spencer, City of (540185)	22	$4,139,100	$37,430

[1] This table is a recreation of the spreadsheet available from the NFIP. Some policies are flagged for a county, but the community name is unknown. In those cases, this table will report "Unknown."

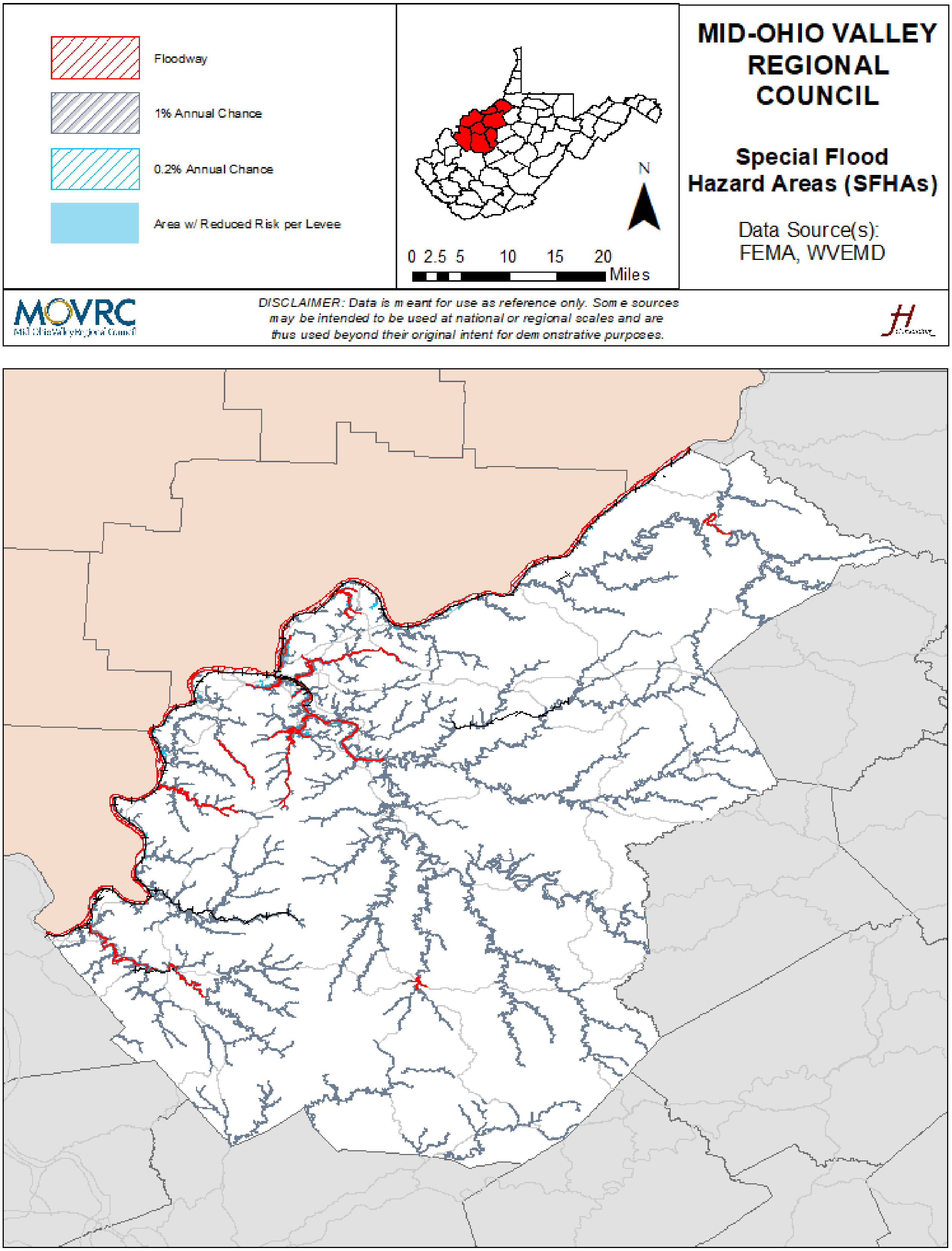
NFIP Policies in Force – Mid-Ohio Valley Region			
Community Name (Number)	*Polices in Force*	*Total Coverage*	*Total Written Premium + FPF*
Unknown (Unknown)	7	$936,000	$13,633
Tyler County (540277)	25	$3,782,500	$20,537
Friendly, Town of (540259)	6	$553,900	$4,222
Middlebourne, Town of (540195)	1	$9,000	$345
Paden City, City of (540196)	1	$28,000	$160
Sistersville, City of (540197)	7	$545,500	$7,278
Unknown (Unknown)	3	$423,000	$3,435
Wirt County (540211)	20	$2,283,600	$16,462
Elizabeth, Town of (540212)	13	$1,737,500	$10,861
Unknown (Unknown)	2	$50,000	$896
Wood County (540213)	205	$36,364,400	$203,059
Parkersburg, City of (540214)	34	$8,551,100	$53,669
Unknown (Unknown)	30	$4,495,000	$41,739
Vienna, City of (540215)	72	$17,348,100	$92,278
Williamstown, City of (540216)	9	$2,253,800	$27,969

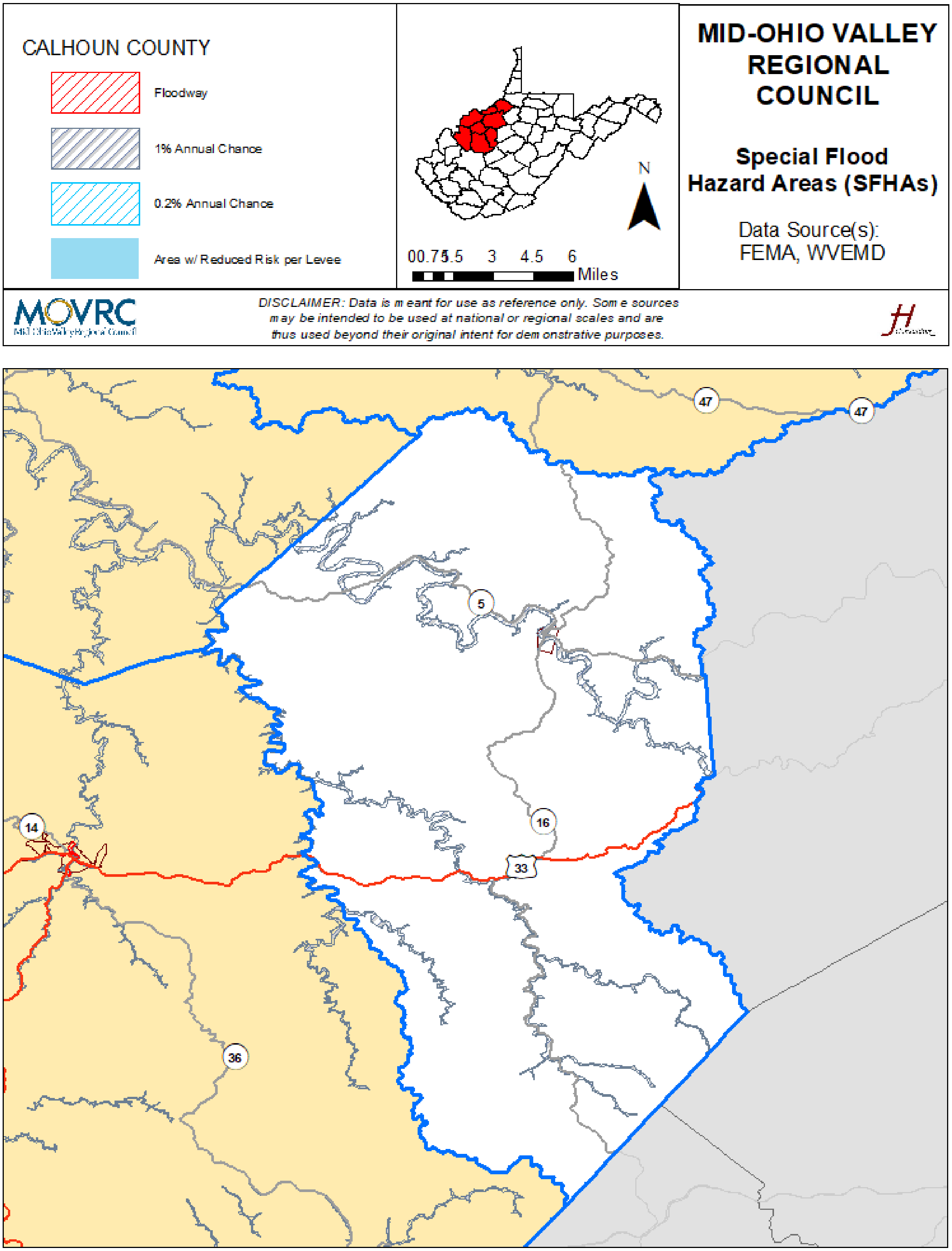
For a discussion about jurisdictional management of the NFIP in the Mid-Ohio Valley region, see Section 1.3: Capabilities.

<u>*Location and Extent*</u>

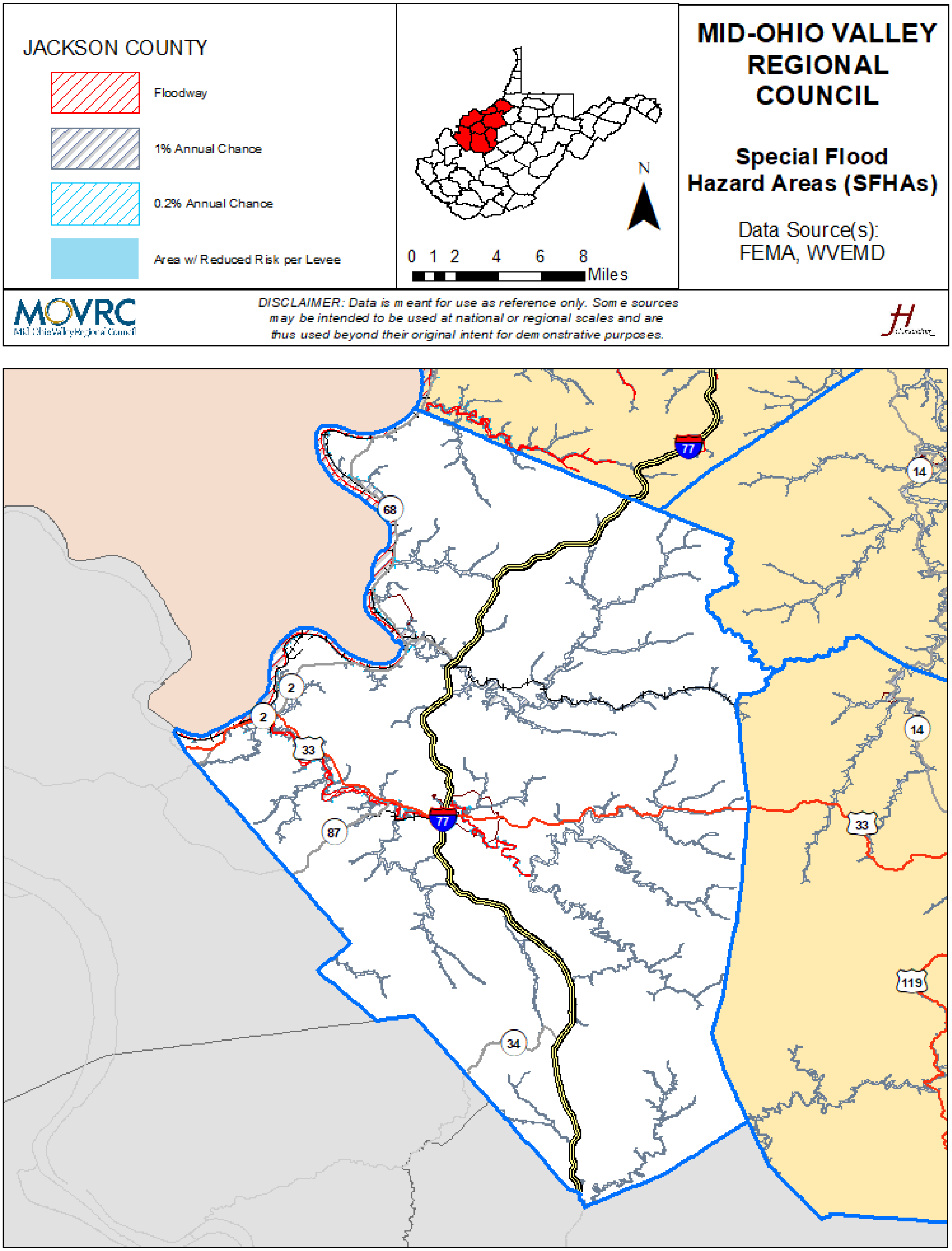
Floods are described by their horizontal extents, the depth of the floodwaters, and the probability of occurrence. Unfortunately, meteorological officials historically have expressed the likelihood of occurrence in terms such as a “100-year flood”, which the general public logically assumes means a flood that happens once in 100 years. The probability of occurrence is interpreted best as a percent chance of occurring. So, a 100-year flood is that flood level that has a 1% chance of occurring in any given year. The 100-year, or 1% flood, is often a function of risk planning. Smaller floods are more likely to occur; thus, a 10-year flood has a 10% chance of occurring in any given year.

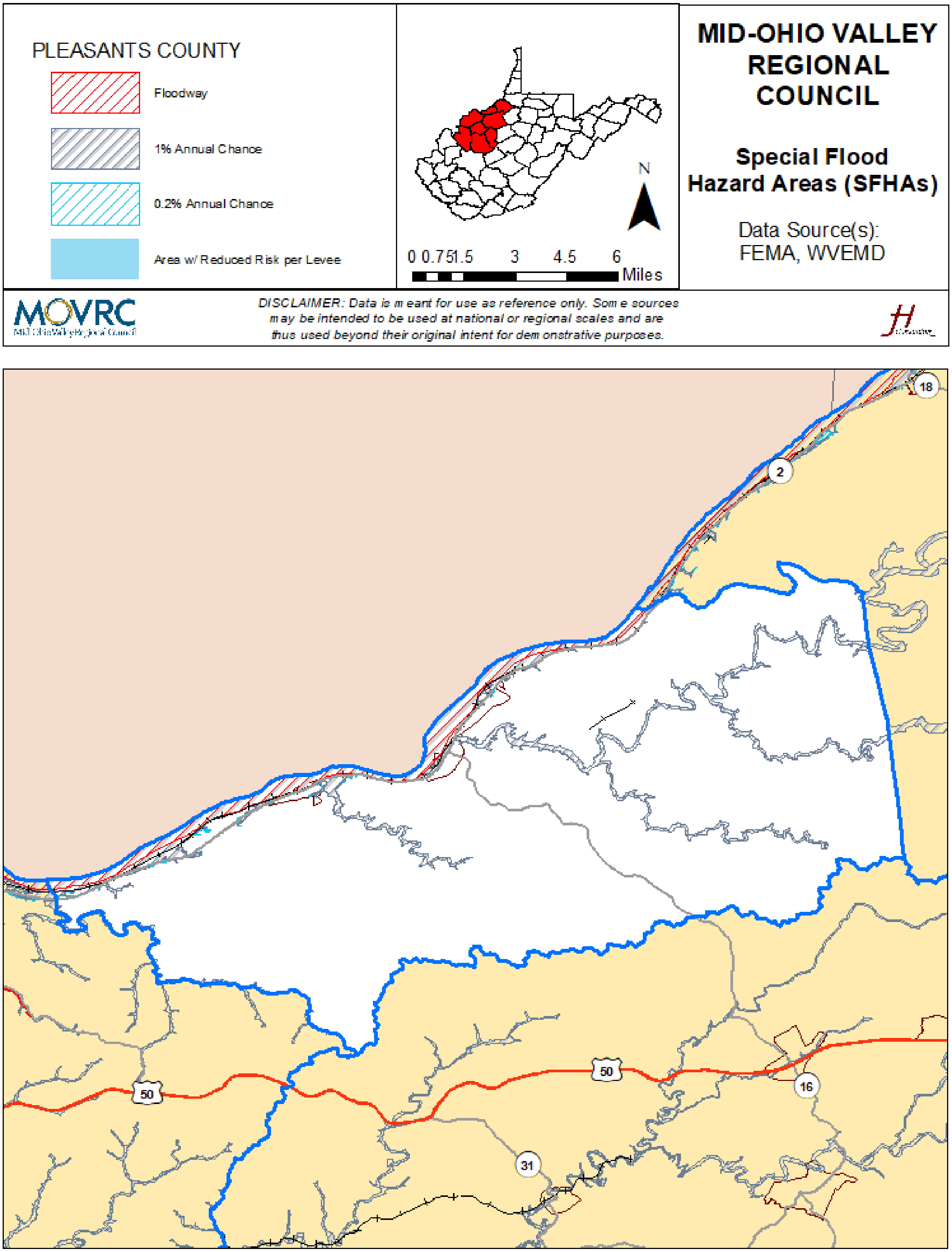
The following maps identify the special flood hazard areas (SFHAs) for the region and each of its eight counties. The SFHAs shown include the floodway (the channel of a river or other watercourse and the adjacent land areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation by more than a designated height), 1% annual chance hazard areas (see above definition), and the 0.2% annual chance areas (moderate flood hazard areas, formerly referred to as the “500-year flood”) (FEMA, n.d.). Mapping with a jurisdiction-by-jurisdiction building-level risk analysis (BLRA) appears in Appendix 5.

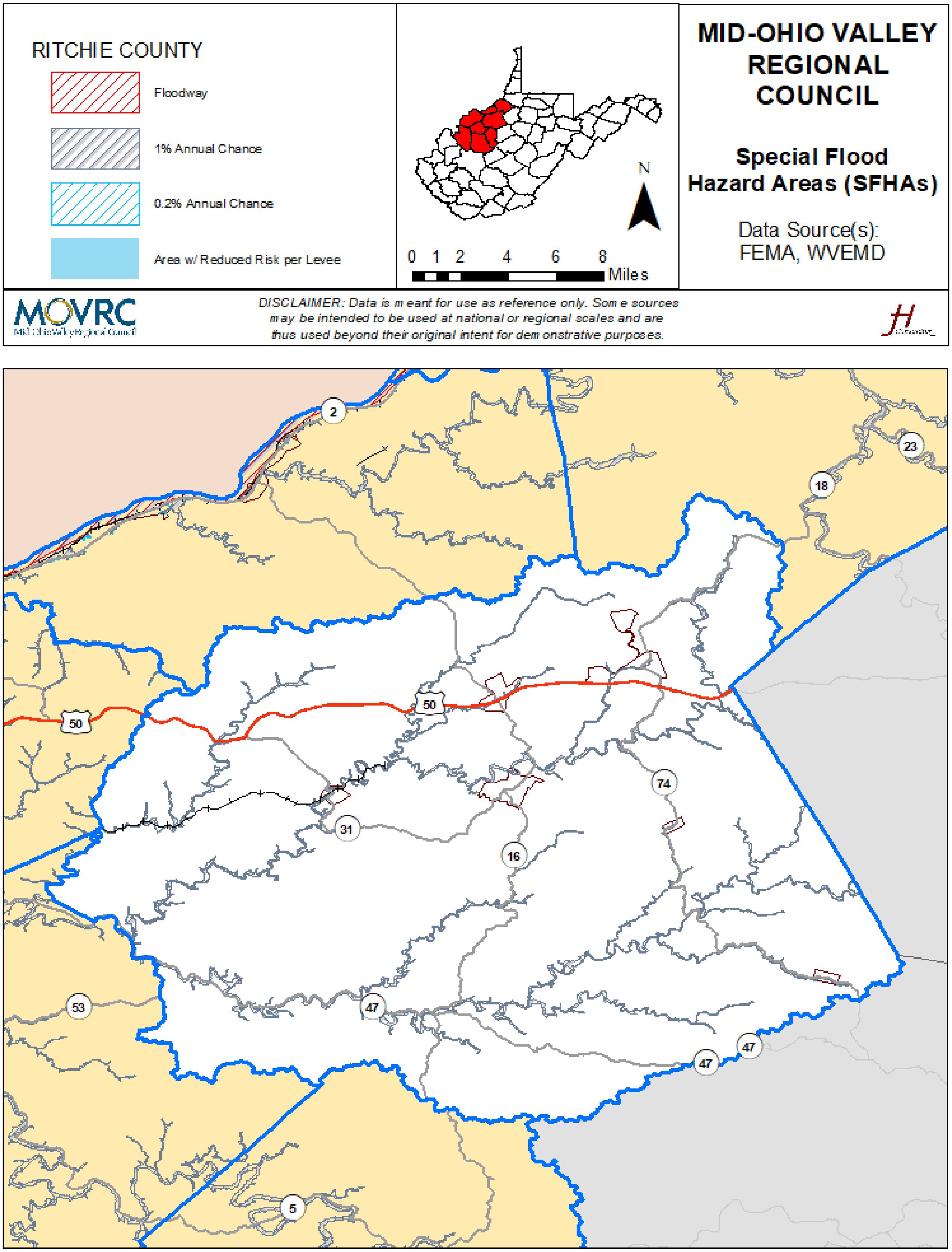

Floodway
1% Annual Chance
0.2% Annual Chance
Area w/ Reduced Risk per Levee
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Special Flood Hazard Areas (SFHAs)
Data Source(s): FEMA, WVEMD
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



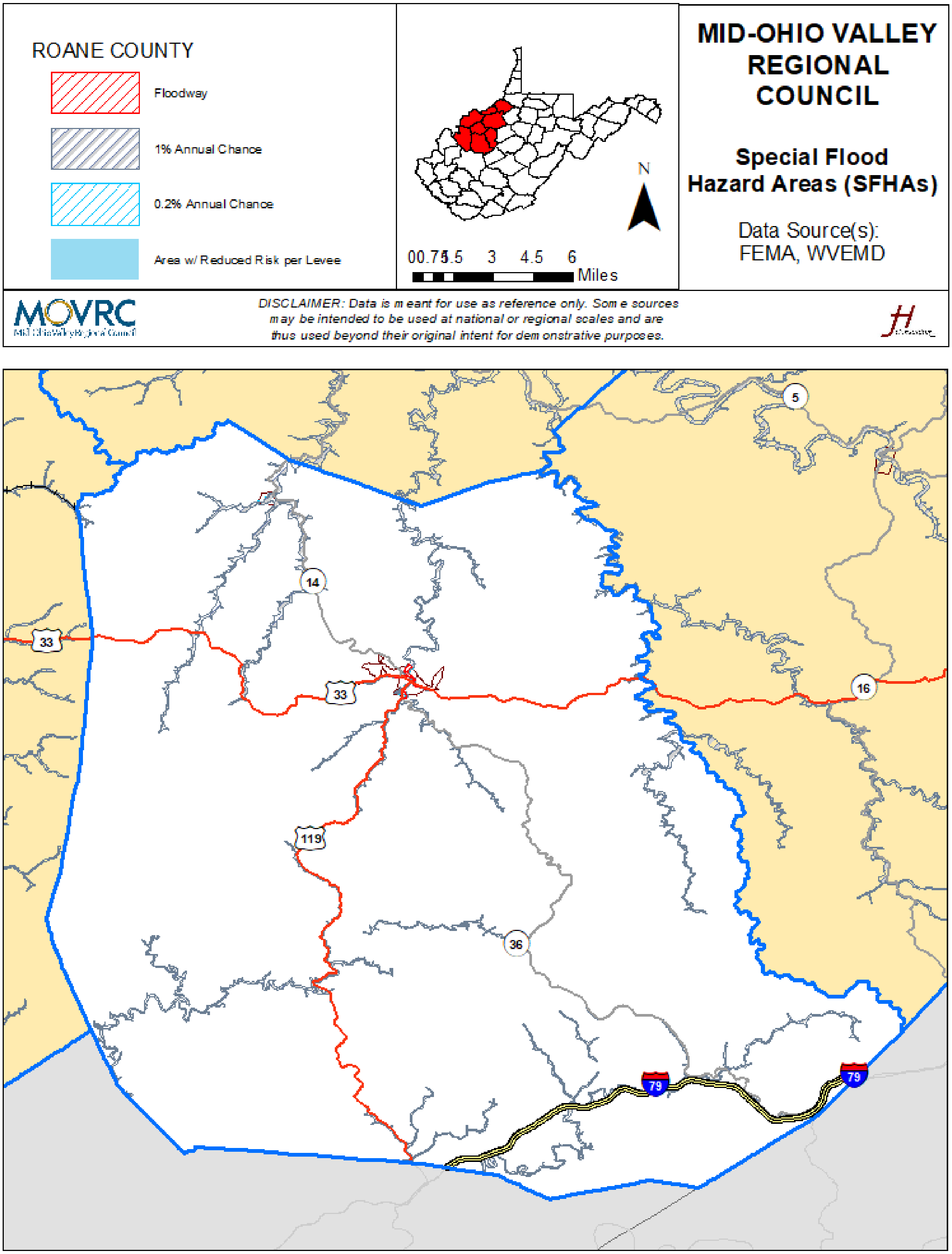
MOVRC
Mid-Ohio Valley Regional Council

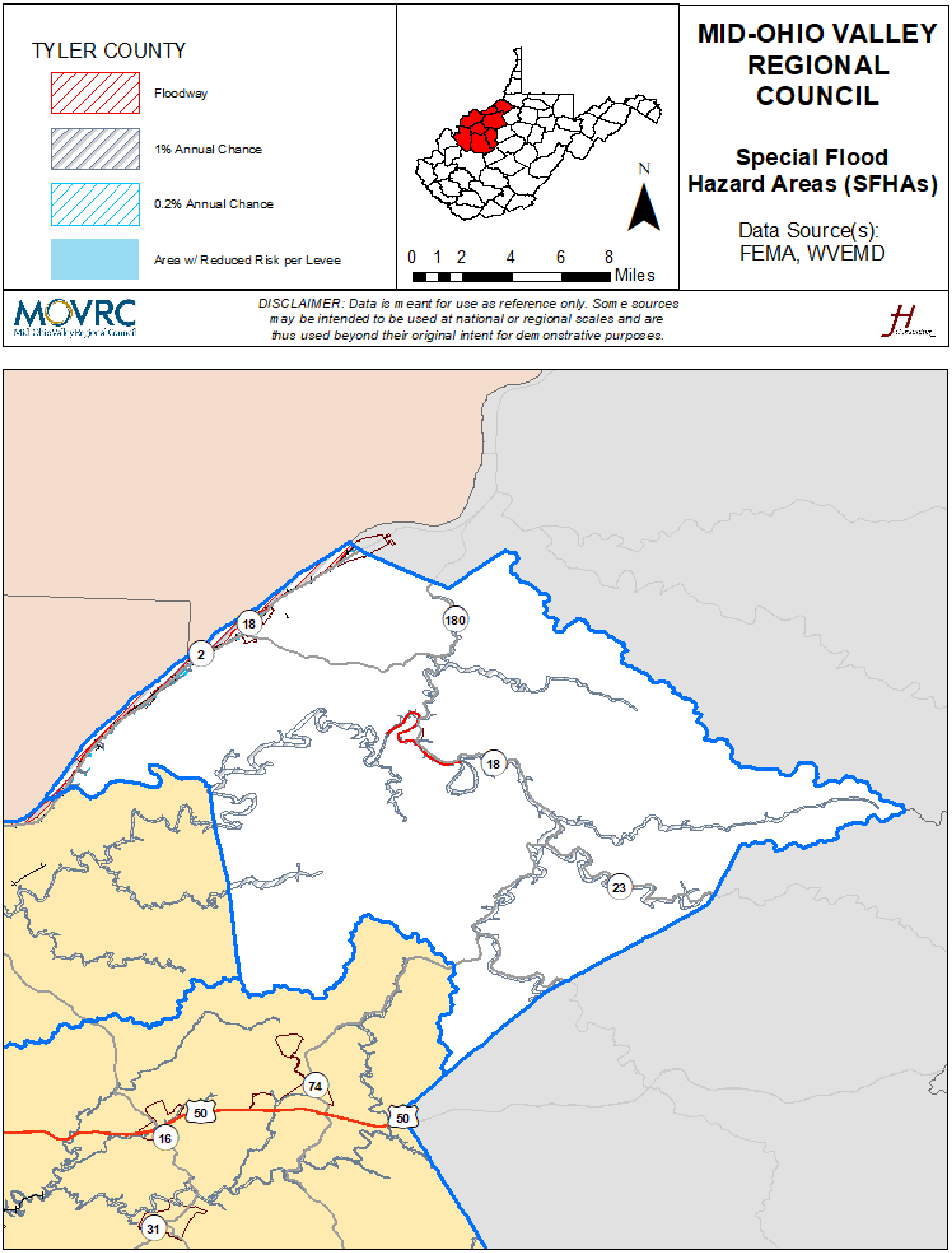

JACKSON COUNTY
Floodway
1% Annual Chance
0.2% Annual Chance
Area w/ Reduced Risk per Levee
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Special Flood Hazard Areas (SFHAs)
Data Source(s): FEMA, WVEMD
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
77
14
68
2
2
33
77
87
14
33
119
34

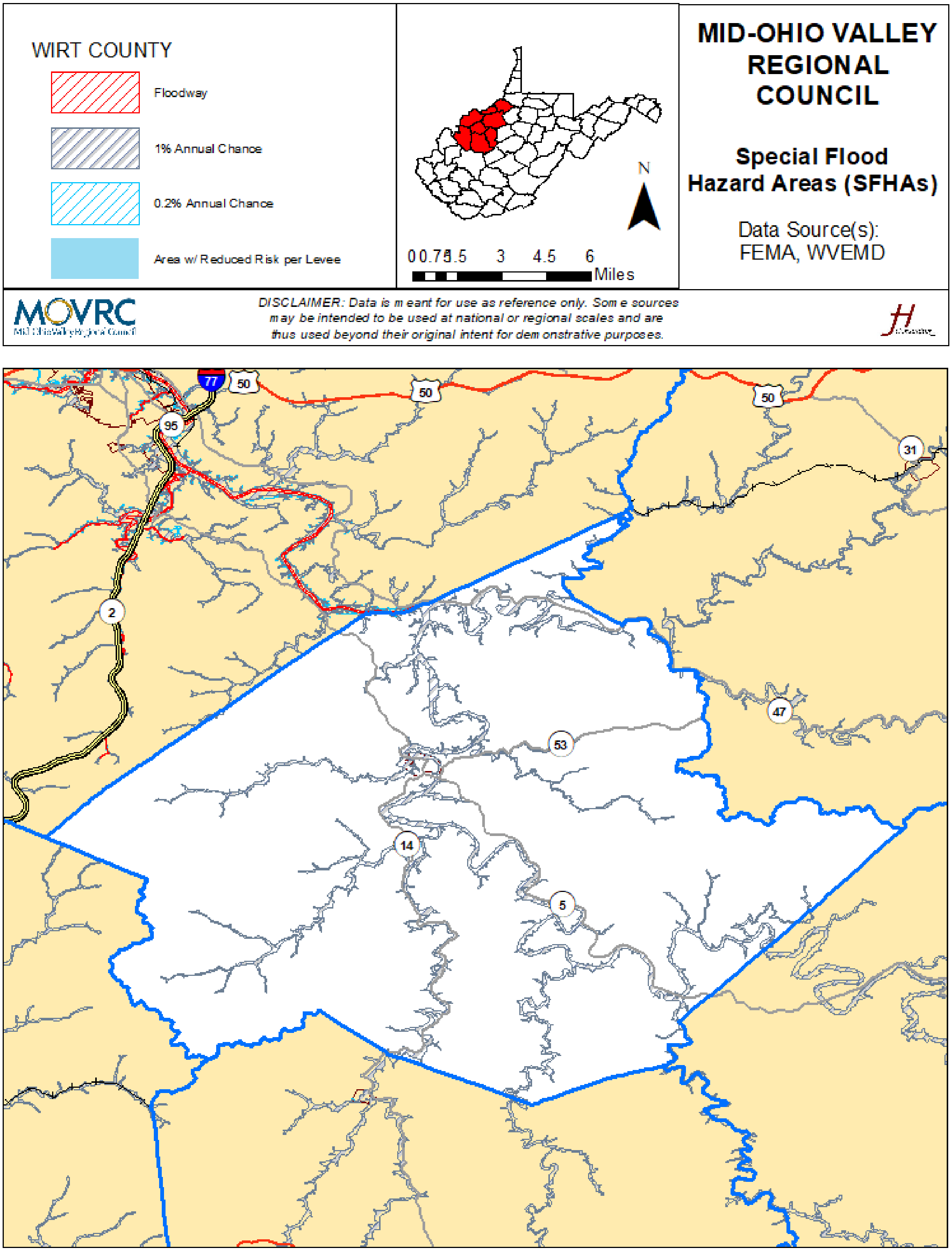

PLEASANTS COUNTY
Floodway
1% Annual Chance
0.2% Annual Chance
Area w/ Reduced Risk per Levee
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Special Flood Hazard Areas (SFHAs)
Data Source(s): FEMA, WVEMD
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
18
2
50
16
31

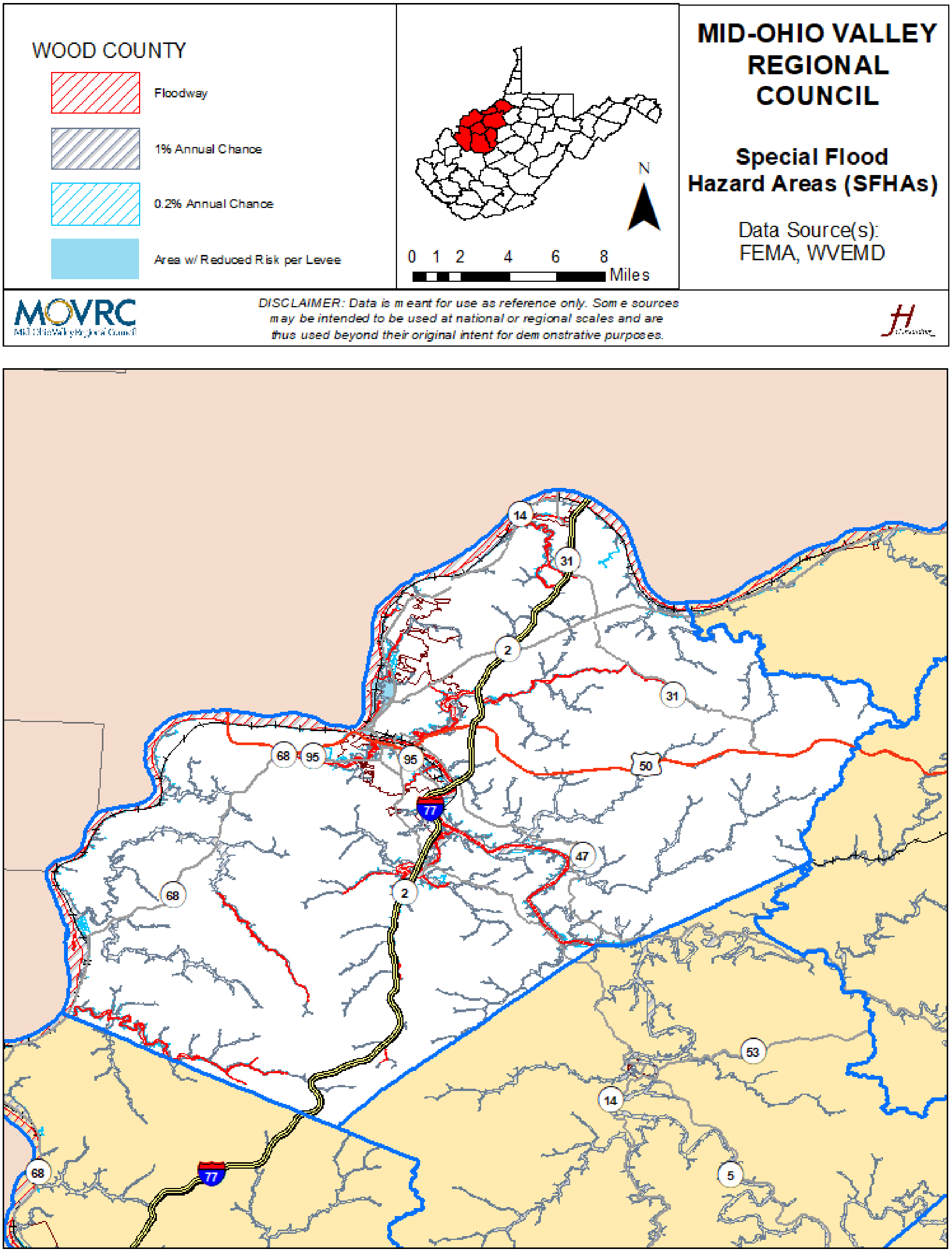


MOVRC
Mid-Ohio Valley Regional Council


ROANE COUNTY
Floodway
1% Annual Chance
0.2% Annual Chance
Area w/ Reduced Risk per Levee
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Special Flood Hazard Areas (SFHAs)
Data Source(s): FEMA, WVEMD
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
5
14
33
33
16
119
36
79
79


TYLER COUNTY
Floodway
1% Annual Chance
0.2% Annual Chance
Area w/ Reduced Risk per Levee
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Special Flood Hazard Areas (SFHAs)
Data Source(s):
FEMA, WVEMD
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
18
180
2
18
23
74
50
50
16
31


WIRT COUNTY
Floodway
1% Annual Chance
0.2% Annual Chance
Area w/ Reduced Risk per Levee
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Special Flood Hazard Areas (SFHAs)
Data Source(s): FEMA, WVEMD
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
77
50
50
50
95
31
2
47
53
14
5


WOOD COUNTY
Floodway
1% Annual Chance
0.2% Annual Chance
Area w/ Reduced Risk per Levee
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Special Flood Hazard Areas (SFHAs)
Data Source(s): FEMA, WVEMD
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.
14
31
2
31
50
68
95
95
77
47
68
2
53
14
68
77
5

When structures experience more than one flooding event, they can become "repetitive loss" or "severe repetitive loss" properties. The Flood Mitigation Assistance (FMA) grant and the NFIP define repetitive loss and severe repetitive loss slightly differently. The table below outlines both definitions.

Repetitive Loss and Severe Repetitive Loss Definitions		
Program	*Repetitive Loss*	*Severe Repetitive Loss*
Flood Mitigation Assistance (FMA) Grant	*A repetitive loss (RL) property is a structure covered by a contract for flood insurance made available under the NFIP that:* Has 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 time of each such flood event; At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage.	(a) Is covered under a contract for flood insurance made available under the NFIP; and (b) Has incurred flood-related damage i. For <u>which 4 or more separate claims payments</u> (includes building and contents) have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claim's payments exceeding $20,000, or ii. For which <u>at least 2 separate claims payments</u> (includes only building) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure.
National Flood Insurance Program (NFIP)	A repetitive loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period since 1978.	A single-family property (consisting of one to four residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which four or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding $5,000 and with cumulative amount of such claims payments exceeding $20,000; or for which at least two separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

There are 230 repetitive loss properties in the region, with the following breakdown by occupancy type.

- **2-4 Family:** 6 properties
- **Assumed Condo:** 6 properties
- **Non-Residential:** 37 properties
- **Other Residential:** 3 properties
- **Single Family:** 178 properties

The table below lists the properties by community name.

Repetitive Loss Properties, Mid-Ohio Valley Region (Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood Counties)				
Community Name	*Community Number*	*Occupancy*	*SFHA Zone*	*Losses*
Calhoun County	540020	Single Family	AE	4
Calhoun County	540020	Assumed Condo	EMG	2
Calhoun County	540020	Single Family	A	2
Calhoun County	540020	Single Family	AE	3
Calhoun County	540020	Single Family	A	3
Calhoun County	540020	Single Family	AE	4
Calhoun County	540020	Single Family	AE	2
Calhoun County	540020	Non-Residential	AE	2
Calhoun County	540020	Single Family	AE	2
Calhoun County	540020	Non-Residential	A	2
Calhoun County	540020	Single Family	AE	3
Calhoun County	540020	Single Family	A	3
Calhoun County	540020	Single Family	EMG	2
Grantsville, Town of	540021	Assumed Condo	EMG	2
Grantsville, Town of	540021	Non-Residential	A	2
Grantsville, Town of	540021	Assumed Condo	EMG	2
Grantsville, Town of	540021	Single Family	X	2
Grantsville, Town of	540021	Single Family	AE	2
Grantsville, Town of	540021	Single Family	EMG	2
Grantsville, Town of	540021	Single Family	AE	4
Grantsville, Town of	540021	Non-Residential	AE	2
Grantsville, Town of	540021	Non-Residential	A	3
Grantsville, Town of	540021	Single Family	AE	2
Grantsville, Town of	540021	Non-Residential	AE	8
Grantsville, Town of	540021	Single Family	AE	2
Grantsville, Town of	540021	Single Family	AE	6
Grantsville, Town of	540021	Single Family	EMG	2
Grantsville, Town of	540021	Non-Residential	AE	3
Jackson County	540063	Single Family	C	2
Jackson County	540063	Single Family	C	2
Jackson County	540063	Single Family	C	3
Jackson County	540063	Single Family	A	3
Jackson County	540063	Single Family	C	2
Jackson County	540063	Single Family	C	8
Jackson County	540063	Single Family	X	2
Jackson County	540063	Single Family	A	2
Jackson County	540063	Non-Residential	A	2
Jackson County	540063	Single Family	X	3
Jackson County	540063	Single Family	A	2
Jackson County	540063	Single Family	A	2
Jackson County	540063	Single Family	A	2
Jackson County	540063	Single Family	A	2
Jackson County	540063	Single Family	C	2
Jackson County	540063	Single Family	C	2
Jackson County	540063	Single Family	A	2
Jackson County	540063	Single Family	A	3
Jackson County	540063	Single Family	A	3
Jackson County	540063	Single Family	X	2
Jackson County	540063	Single Family	A	2

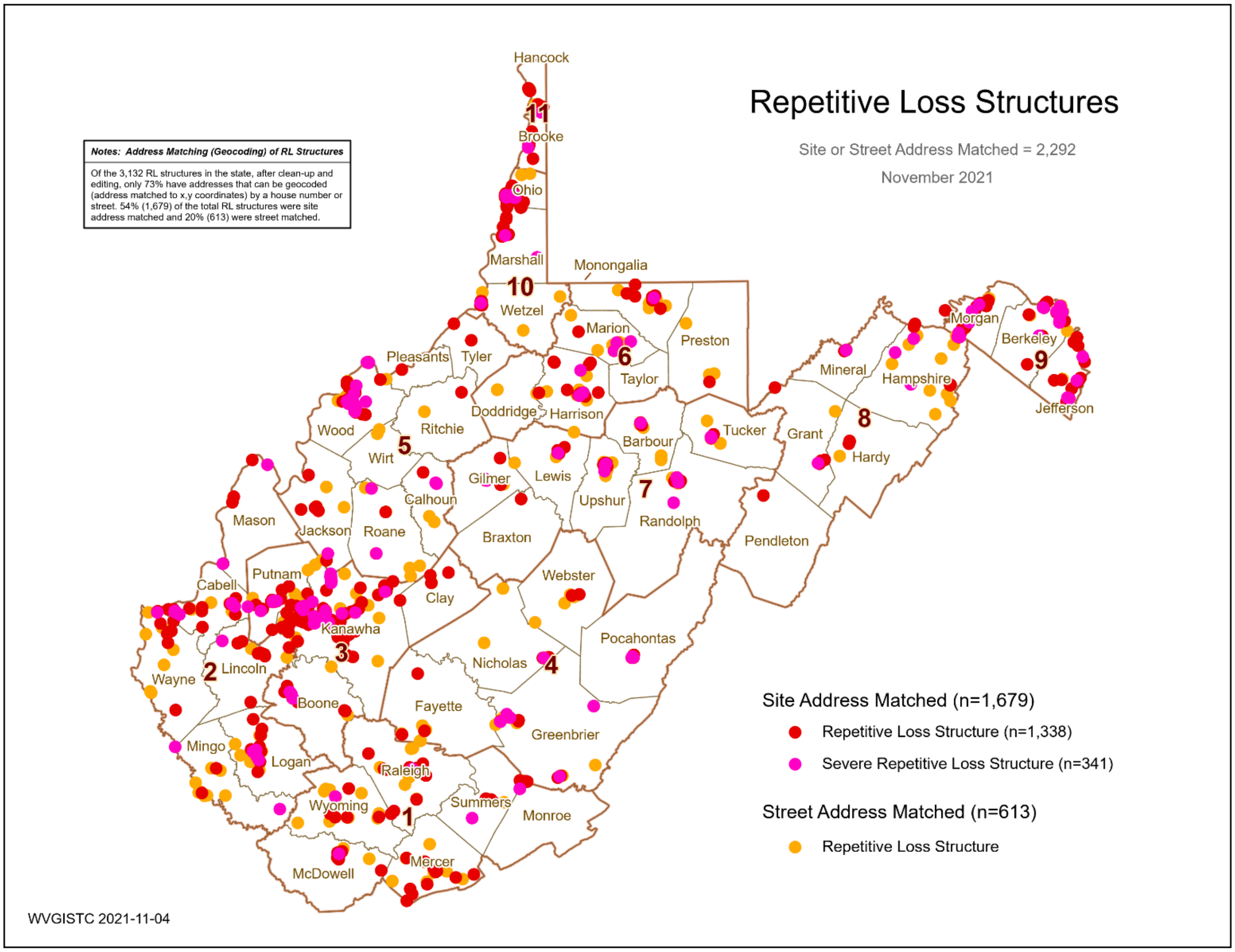
Repetitive Loss Properties, Mid-Ohio Valley Region (Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood Counties)				
Community Name	*Community Number*	*Occupancy*	*SFHA Zone*	*Losses*
Jackson County	540063	Single Family	C	3
Jackson County	540063	Single Family	A	2
Jackson County	540063	Single Family	X	2
Jackson County	540063	Single Family	A	2
Jackson County	540063	Single Family	A	3
Ravenswood, City of	540241	Single Family	A	5
Ripley, City of	540064	Single Family	C	3
Ripley, City of	540064	Assumed Condo	X	2
Ripley, City of	540064	2-4 Family	X	2
Ripley, City of	540064	Non-Residential	A07	2
Ripley, City of	540064	Single Family	C	2
Ripley, City of	540064	Single Family	X	2
Belmont, Town of	540253	Single Family	EMG	5
Pleasants County	540225	Single Family	N/A	5
Pleasants County	540225	Single Family	AE	2
Pleasants County	540225	Single Family	A	2
Pleasants County	540225	2-4 Family	AE	3
Pleasants County	540225	Single Family	A	3
St. Mary’s, City of	540156	Single Family	EMG	2
Ritchie County	540224	Single Family	A	3
Ritchie County	540224	Single Family	A	3
Ritchie County	540224	Non-Residential	A	2
Ritchie County	540224	Single Family	A	2
Reedy, Town of	540184	Single Family	N/A	2
Reedy, Town of	540184	Single Family	N/A	2
Reedy, Town of	540184	Single Family	N/A	2
Reedy, Town of	540184	Single Family	AE	2
Reedy, Town of	540184	Single Family	A02	2
Reedy, Town of	540184	Single Family	N/A	3
Reedy, Town of	540184	Single Family	N/A	2
Reedy, Town of	540184	Single Family	N/A	2
Reedy, Town of	540184	Single Family	A02	2
Reedy, Town of	540184	Single Family	B	4
Roane County	540183	Single Family	A	2
Roane County	540183	Non-Residential	A	2
Roane County	540183	Single Family	X	2
Roane County	540183	Single Family	A	4
Spencer, City of	540185	Single Family	C	3
Spencer, City of	540185	Single Family	A07	2
Middlebourne, Town of	540195	Single Family	X	2
Sistersville, City of	540197	Single Family	X	2
Sistersville, City of	540197	Single Family	X	2
Tyler County	540277	Single Family	X	2
Wirt County	540211	Single Family	A	2
Wirt County	540211	Single Family	A	2
Wirt County	540211	Single Family	A	2
Wirt County	540211	Single Family	A	2
Wirt County	540211	Single Family	A	3
Wirt County	540211	Single Family	A	2

Repetitive Loss Properties, Mid-Ohio Valley Region (Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood Counties)				
Community Name	*Community Number*	*Occupancy*	*SFHA Zone*	*Losses*
Wirt County	540211	Single Family	A	2
Parkersburg, City of	540214	Non-Residential	AE	8
Parkersburg, City of	540214	Single Family	A17	2
Parkersburg, City of	540214	Single Family	AE	2
Parkersburg, City of	540214	Single Family	A	8
Parkersburg, City of	540214	Single Family	A17	2
Parkersburg, City of	540214	Single Family	B	2
Parkersburg, City of	540214	Single Family	A17	2
Parkersburg, City of	540214	Single Family	A17	2
Parkersburg, City of	540214	Single Family	A	5
Parkersburg, City of	540214	Single Family	A17	2
Parkersburg, City of	540214	Single Family	A17	2
Parkersburg, City of	540214	Single Family	A17	4
Parkersburg, City of	540214	Single Family	A17	2
Parkersburg, City of	540214	Single Family	AE	2
Parkersburg, City of	540214	Single Family	AE	2
Parkersburg, City of	540214	Non-Residential	A17	2
Parkersburg, City of	540214	2-4 Family	A17	4
Vienna, City of	540215	Single Family	AE	2
Vienna, City of	540215	Single Family	A	2
Vienna, City of	540215	Single Family	A17	2
Vienna, City of	540215	Single Family	A17	2
Vienna, City of	540215	Single Family	AE	2
Vienna, City of	540215	Single Family	A	2
Vienna, City of	540215	Single Family	A17	4
Vienna, City of	540215	Single Family	A17	2
Williamstown, City of	540216	Single Family	A17	6
Williamstown, City of	540216	Single Family	AE	2
Williamstown, City of	540216	Single Family	AE	2
Williamstown, City of	540216	Single Family	AE	2
Williamstown, City of	540216	Single Family	AE	4
Williamstown, City of	540216	Single Family	A17	2
Williamstown, City of	540216	Single Family	AE	4
Williamstown, City of	540216	Non-Residential	A17	3
Williamstown, City of	540216	2-4 Family	B	4
Williamstown, City of	540216	2-4 Family	B	3
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A17	2
Wood County	540213	Non-Residential	AE	4
Wood County	540213	Single Family	AE	2
Wood County	540213	Single Family	A	5
Wood County	540213	Single Family	A17	2
Wood County	540213	Assumed Condo	A	5
Wood County	540213	Non-Residential	A	8
Wood County	540213	Non-Residential	AE	5
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A17	4
Wood County	540213	Non-Residential	AE	3
Wood County	540213	Non-Residential	AE	3

Repetitive Loss Properties, Mid-Ohio Valley Region (Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood Counties)				
Community Name	*Community Number*	*Occupancy*	*SFHA Zone*	*Losses*
Wood County	540213	Non-Residential	AE	3
Wood County	540213	Non-Residential	AE	2
Wood County	540213	Non-Residential	AE	2
Wood County	540213	Non-Residential	AE	2
Wood County	540213	Non-Residential	AE	2
Wood County	540213	Non-Residential	AE	2
Wood County	540213	Non-Residential	AE	2
Wood County	540213	Other Residential	A17	2
Wood County	540213	Single Family	C	2
Wood County	540213	Non-Residential	AE	4
Wood County	540213	Single Family	EMG	2
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A17	8
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A	3
Wood County	540213	Single Family	B	4
Wood County	540213	Single Family	AE	6
Wood County	540213	Single Family	A	4
Wood County	540213	Single Family	A17	3
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A	6
Wood County	540213	Single Family	AE	6
Wood County	540213	Other Residential	A	2
Wood County	540213	Single Family	A	5
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A	5
Wood County	540213	Single Family	A	3
Wood County	540213	Single Family	A17	3
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A17	3
Wood County	540213	Other Residential	EMG	2
Wood County	540213	Single Family	A	3
Wood County	540213	Single Family	EMG	2
Wood County	540213	Single Family	A17	3
Wood County	540213	Non-Residential	A17	4
Wood County	540213	Non-Residential	AE	4
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A	5
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A17	3
Wood County	540213	Non-Residential	AE	2
Wood County	540213	Assumed Condo	EMG	2
Wood County	540213	Single Family	AE	4
Wood County	540213	Single Family	A17	2

Repetitive Loss Properties, Mid-Ohio Valley Region (Calhoun, Jackson, Pleasants, Ritchie, Roane, Tyler, Wirt, and Wood Counties)				
Community Name	*Community Number*	*Occupancy*	*SFHA Zone*	*Losses*
Wood County	540213	Single Family	AE	3
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A17	3
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A	3
Wood County	540213	Single Family	A	3
Wood County	540213	Non-Residential	C	5
Wood County	540213	Non-Residential	A	2
Wood County	540213	Single Family	A	8
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A17	3
Wood County	540213	Non-Residential	A	2
Wood County	540213	Single Family	A17	3
Wood County	540213	Non-Residential	AE	5
Wood County	540213	Single Family	A17	6
Wood County	540213	Single Family	AE	4
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	AE	3
Wood County	540213	Single Family	A17	2
Wood County	540213	Non-Residential	AE	2
Wood County	540213	Single Family	B	2
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	B	8
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A17	2
Wood County	540213	Single Family	A17	5
Wood County	540213	Single Family	A	2
Wood County	540213	Single Family	A	6
Wood County	540213	Single Family	A	3
Wood County	540213	2-4 Family	A	3
Wood County	540213	Single Family	AE	2
Wood County	540213	Single Family	A17	2
Wood County	540213	Non-Residential	A17	2
Wood County	540213	Non-Residential	A	2

The graphic below shows the concentrations of repetitive loss properties (with the subcategory of severe repetitive loss properties).



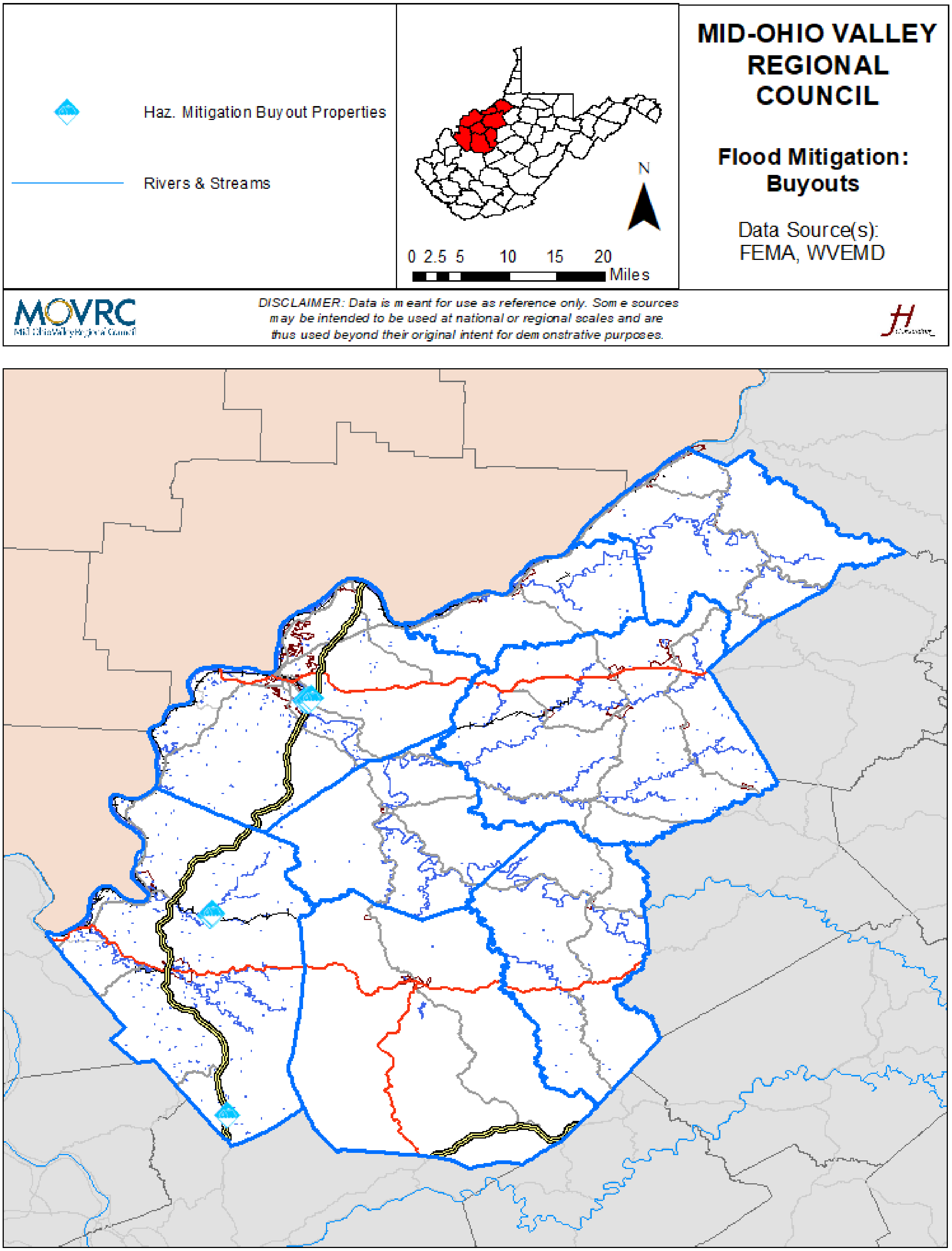
Impacts and Vulnerability

Impacts from flooding can be primary or secondary. Primary effects are those that occur due to contact with water. Secondary effects occur because of flooding, such as disruption of services and changes in the position of river channels.

Effects of Flooding	
Type	*Description*
Primary Impacts	• With higher velocities, streams are able to transport larger particles as suspended load. Such large particles include not only rocks and sediment, but, during a flood, could include such large objects as automobiles, houses, and bridges. • Massive amounts of erosion can be accomplished by floodwaters. Such erosion can undermine bridge structures, levees, and buildings causing their collapse. • Water entering human-built structures cause water damage. Even with minor flooding of homes, furniture is ruined, floors and walls are damaged, and anything that comes in contact with the water is likely to be damaged or lost. Flooding of automobiles usually results in damage that cannot easily be repaired. • The high velocity of floodwaters allows the water to carry more sediment as suspended load. When the floodwaters retreat, velocity is generally much lower and sediment is deposited. After retreat of the floodwaters, everything is usually covered with a thick layer of stream deposited mud, including the interior of buildings. • Flooding of farmland usually results in crop loss. Livestock, pets, and other animals are often carried away and drown. • Humans that get caught in the high-velocity floodwaters are often drowned by the water. • Floodwaters can concentrate garbage, debris, and toxic pollutants that can cause the secondary effects of health hazards.
Secondary Impacts	Disruption of services - • Drinking water supplies may become polluted, especially if sewerage treatment plants are flooded. This may result in disease and other health effects, especially in underdeveloped countries. • Gas and electrical service may be disrupted. • Transportation systems may be disrupted, resulting in shortages of food and clean-up supplies. In underdeveloped countries, food shortages often lead to starvation.
Long-Term (Tertiary) Impacts	• Location of river channels may change as the result of flooding, new channels develop, leaving the old channels dry. • Sediment deposited by flooding may destroy farmland (although silt deposited by floodwaters could also help to increase agricultural productivity). • Jobs may be lost due to the disruption of services, destruction of business, etc. (although jobs may be gained in the construction industry to help rebuild or repair flood damage). • Insurance rates may increase. • Corruption may result from misuse of relief funds. • Destruction of wildlife habitat.

As discussed in the drought profile (i.e., Section 2.2.3), Jackson, Pleasants, Tyler, and Wood Counties border the Ohio River and each contain commercial facilities with docking capabilities on the river. Flooding conditions can impact waterborne commerce on the Ohio River (Manous, Gagnon, & Hilleary, 2022). High water levels after significant rainfall events resulting in flooding can render lock facilities “unavailable” (CITE), effectively pausing waterborne commerce (Grier, n.d.).

The West Virginia GIS Tech Center compiled data from multiple sources to provide information on locations buyout properties. The map below shows the locations of these properties in the Mid-Ohio Valley region. These projects included 15 projects in Jackson County and 11 properties in Wood County.


Haz. Mitigation Buyout Properties
Rivers & Streams
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Flood Mitigation: Buyouts
Data Source(s): FEMA, WVEMD
MOVRC
Mid-Ohio Valley Regional Council
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Historical Occurrences

There have been 155 floods and 204 flash floods in the region since 1996 (NOAA NCEI, 2022). Some of these events are duplicates as flooding occurred in multiple counties as a result of the same storm system. As with other weather-related data from the NCEI for the region, it is more accurate to examine the number of unique dates with a flooding (i.e., 65) or flash flood (i.e., 124) event to determine the per annum estimate. Doing so yields 2.6 floods and 4.96 flash floods, on average, per year. The table below lists the instances of flooding.

Historical Occurrences of Flood, 1996-2021

Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood (Zone)	1/20/1996	Flood	0	0	$200,000.00	$0.00
Jackson (Zone)	1/20/1996	Flood	0	0	$100,000.00	$0.00
Tyler (Zone)	1/20/1996	Flood	0	0	$250,000.00	$0.00
Pleasants (Zone)	1/20/1996	Flood	0	0	$200,000.00	$0.00
Wirt (Zone)	3/2/1997	Flood	0	0	$500,000.00	$0.00
Jackson (Zone)	3/2/1997	Flood	0	0	$300,000.00	$0.00
Calhoun (Zone)	3/2/1997	Flood	1	0	$200,000.00	$0.00
Wood (Zone)	3/2/1997	Flood	0	0	$400,000.00	$0.00
Jackson (Zone)	1/10/1998	Flood	0	0	$10,000.00	$0.00
Jackson (Zone)	6/29/1998	Flood	0	0	$5,000.00	$0.00
Calhoun (Zone)	2/19/2000	Flood	0	0	$150,000.00	$0.00
Jackson (Zone)	2/19/2000	Flood	0	0	$0.00	$0.00
Roane (Zone)	1/24/2002	Flood	0	0	$15,000.00	$0.00
Jackson (Zone)	1/24/2002	Flood	0	0	$0.00	$0.00
Calhoun (Zone)	1/24/2002	Flood	0	0	$0.00	$0.00
Roane (Zone)	3/20/2002	Flood	0	1	$75,000.00	$0.00
Jackson (Zone)	3/20/2002	Flood	0	0	$20,000.00	$0.00
Calhoun (Zone)	3/20/2002	Flood	0	0	$10,000.00	$0.00
Wirt (Zone)	3/20/2002	Flood	0	0	$0.00	$0.00
Calhoun (Zone)	4/21/2002	Flood	0	0	$0.00	$0.00
Roane (Zone)	4/21/2002	Flood	0	0	$0.00	$0.00
Jackson (Zone)	4/21/2002	Flood	0	0	$0.00	$0.00
Pleasants (Zone)	4/28/2002	Flood	0	0	$0.00	$0.00
Jackson (Zone)	4/28/2002	Flood	0	0	$0.00	$0.00
Roane (Zone)	4/28/2002	Flood	0	0	$0.00	$0.00
Jackson (Zone)	2/22/2003	Flood	0	0	$0.00	$0.00
Calhoun (Zone)	2/22/2003	Flood	0	0	$0.00	$0.00
Wood (Zone)	2/22/2003	Flood	0	0	$0.00	$0.00
Wirt (Zone)	2/22/2003	Flood	0	0	$0.00	$0.00
Tyler (Zone)	2/22/2003	Flood	0	0	$0.00	$0.00
Roane (Zone)	2/22/2003	Flood	0	0	$0.00	$0.00
Ritchie (Zone)	2/22/2003	Flood	0	0	$0.00	$0.00
Pleasants (Zone)	2/22/2003	Flood	0	0	$0.00	$0.00
Calhoun (Zone)	5/10/2003	Flood	0	0	$100,000.00	$0.00
Jackson (Zone)	9/2/2003	Flood	0	0	$20,000.00	$0.00
Roane (Zone)	9/2/2003	Flood	0	0	$50,000.00	$0.00
Calhoun (Zone)	9/2/2003	Flood	0	0	$50,000.00	$0.00
Wood (Zone)	11/12/2003	Flood	0	0	$5,000.00	$0.00

Historical Occurrences of Flood, 1996-2021						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Pleasants (Zone)	11/12/2003	Flood	0	0	$5,000.00	$0.00
Tyler (Zone)	11/12/2003	Flood	0	0	$5,000.00	$0.00
Jackson (Zone)	11/19/2003	Flood	0	0	$10,000.00	$0.00
Ritchie (Zone)	11/19/2003	Flood	0	0	$100,000.00	$0.00
Tyler (Zone)	11/19/2003	Flood	0	0	$15,000.00	$0.00
Roane (Zone)	11/19/2003	Flood	0	0	$10,000.00	$0.00
Calhoun (Zone)	11/19/2003	Flood	0	0	$100,000.00	$0.00
Calhoun (Zone)	3/6/2004	Flood	0	0	$0.00	$0.00
Roane (Zone)	3/6/2004	Flood	0	0	$0.00	$0.00
Jackson (Zone)	3/6/2004	Flood	0	0	$0.00	$0.00
Roane (Zone)	4/12/2004	Flood	0	0	$4,000.00	$0.00
Calhoun (Zone)	4/12/2004	Flood	0	0	$0.00	$0.00
Roane (Zone)	5/27/2004	Flood	0	0	$100,000.00	$0.00
Calhoun (Zone)	5/27/2004	Flood	0	0	$50,000.00	$0.00
Jackson (Zone)	9/8/2004	Flood	0	0	$10,000.00	$0.00
Wood (Zone)	9/8/2004	Flood	0	0	$10,000.00	$0.00
Tyler (Zone)	9/8/2004	Flood	0	0	$10,000.00	$0.00
Pleasants (Zone)	9/8/2004	Flood	0	0	$10,000.00	$0.00
Jackson (Zone)	9/17/2004	Flood	0	0	$500,000.00	$0.00
Wood (Zone)	9/17/2004	Flood	0	0	$2,000,000.00	$0.00
Wirt (Zone)	9/17/2004	Flood	0	0	$500,000.00	$0.00
Pleasants (Zone)	9/17/2004	Flood	0	0	$1,000,000.00	$0.00
Roane (Zone)	9/17/2004	Flood	0	0	$250,000.00	$0.00
Tyler (Zone)	9/17/2004	Flood	0	0	$1,000,000.00	$0.00
Jackson (Zone)	11/4/2004	Flood	0	0	$10,000.00	$0.00
Tyler (Zone)	1/5/2005	Flood	0	0	$400,000.00	$0.00
Pleasants (Zone)	1/6/2005	Flood	0	0	$100,000.00	$0.00
Wood (Zone)	1/6/2005	Flood	0	0	$1,000,000.00	$0.00
Jackson (Zone)	1/7/2005	Flood	0	0	$25,000.00	$0.00
Tyler (Zone)	1/11/2005	Flood	0	0	$15,000.00	$0.00
Pleasants (Zone)	1/11/2005	Flood	0	0	$10,000.00	$0.00
Jackson (Zone)	11/9/2005	Flood	0	0	$5,000.00	$0.00
Jackson County	9/12/2006	Flood	0	0	$40,000.00	$0.00
Wirt County	9/12/2006	Flood	0	0	$2,000.00	$0.00
Ritchie County	6/4/2008	Flood	0	0	$25,000.00	$0.00
Jackson County	6/4/2008	Flood	0	0	$5,000.00	$0.00
Roane County	6/4/2008	Flood	0	0	$5,000.00	$0.00
Calhoun County	6/4/2008	Flood	0	0	$100,000.00	$0.00
Calhoun County	5/4/2009	Flood	0	0	$250,000.00	$0.00
Roane County	2/5/2010	Flood	0	0	$2,000.00	$0.00
Jackson County	2/5/2010	Flood	0	0	$2,000.00	$0.00
Calhoun County	2/5/2010	Flood	0	0	$2,000.00	$0.00
Wood County	5/1/2010	Flood	0	0	$20,000.00	$0.00
Tyler County	5/2/2010	Flood	0	0	$10,000.00	$0.00
Ritchie County	5/2/2010	Flood	0	0	$10,000.00	$0.00
Jackson County	3/11/2011	Flood	0	0	$15,000.00	$0.00
Tyler County	3/11/2011	Flood	0	0	$10,000.00	$0.00
Wood County	3/11/2011	Flood	0	0	$25,000.00	$0.00
Pleasants County	3/11/2011	Flood	0	0	$15,000.00	$0.00

Historical Occurrences of Flood, 1996-2021						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood County	4/19/2011	Flood	0	0	$10,000.00	$0.00
Ritchie County	4/19/2011	Flood	0	0	$10,000.00	$0.00
Calhoun County	11/22/2011	Flood	0	0	$100,000.00	$0.00
Roane County	11/22/2011	Flood	0	0	$100,000.00	$0.00
Jackson County	11/22/2011	Flood	0	0	$5,000.00	$0.00
Wirt County	11/22/2011	Flood	0	0	$50,000.00	$0.00
Tyler County	7/19/2013	Flood	0	0	$10,000.00	$0.00
Wood County	3/4/2015	Flood	0	0	$75,000.00	$0.00
Ritchie County	3/4/2015	Flood	0	0	$200,000.00	$0.00
Pleasants County	3/4/2015	Flood	0	0	$25,000.00	$0.00
Tyler County	3/4/2015	Flood	0	0	$200,000.00	$0.00
Wirt County	3/4/2015	Flood	0	0	$75,000.00	$0.00
Jackson County	3/4/2015	Flood	0	0	$200,000.00	$0.00
Roane County	3/4/2015	Flood	0	0	$350,000.00	$0.00
Roane County	4/14/2015	Flood	0	0	$25,000.00	$0.00
Tyler County	2/16/2016	Flood	0	0	$15,000.00	$0.00
Roane County	6/23/2016	Flood	0	0	$2,500,000.00	$0.00
Jackson County	3/1/2017	Flood	0	0	$3,000.00	$0.00
Tyler County	3/1/2017	Flood	0	0	$8,000.00	$0.00
Wood County	11/6/2017	Flood	0	0	$10,000.00	$0.00
Ritchie County	1/12/2018	Flood	0	0	$2,000.00	$0.00
Wood County	1/12/2018	Flood	2	0	$5,000.00	$0.00
Tyler County	1/12/2018	Flood	0	0	$2,000.00	$0.00
Wood County	2/16/2018	Flood	0	0	$500.00	$0.00
Ritchie County	2/16/2018	Flood	0	0	$1,000.00	$0.00
Tyler County	2/16/2018	Flood	0	0	$2,000.00	$0.00
Pleasants County	2/16/2018	Flood	0	0	$1,000.00	$0.00
Roane County	2/16/2018	Flood	0	0	$1,000.00	$0.00
Jackson County	2/16/2018	Flood	0	0	$1,000.00	$0.00
Wood County	2/16/2018	Flood	0	0	$100,000.00	$0.00
Jackson County	2/17/2018	Flood	0	0	$0.00	$0.00
Tyler County	4/3/2018	Flood	0	0	$0.00	$0.00
Pleasants County	4/4/2018	Flood	0	0	$2,000.00	$0.00
Jackson County	4/5/2018	Flood	0	0	$0.00	$0.00
Tyler County	4/16/2018	Flood	0	0	$2,000.00	$0.00
Wood County	6/21/2018	Flood	0	0	$1,000.00	$0.00
Pleasants County	6/21/2018	Flood	0	0	$1,000.00	$0.00
Ritchie County	6/21/2018	Flood	0	0	$500.00	$0.00
Tyler County	6/22/2018	Flood	0	0	$1,000.00	$0.00
Tyler County	6/27/2018	Flood	0	0	$1,000.00	$0.00
Tyler County	9/10/2018	Flood	0	0	$1,000.00	$0.00
Roane County	9/27/2018	Flood	0	0	$500.00	$0.00
Wood County	2/6/2019	Flood	0	0	$2,000.00	$0.00
Pleasants County	2/6/2019	Flood	0	0	$2,000.00	$0.00
Ritchie County	2/20/2019	Flood	0	0	$20,000.00	$0.00
Jackson County	2/20/2019	Flood	0	0	$2,000.00	$0.00
Tyler County	2/21/2019	Flood	0	0	$2,000.00	$0.00
Wirt County	12/16/2019	Flood	0	0	$2,000.00	$0.00
Wood County	12/16/2019	Flood	0	0	$10,000.00	$0.00

Historical Occurrences of Flood, 1996-2021						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Roane County	12/16/2019	Flood	0	0	$2,000.00	$0.00
Jackson County	12/16/2019	Flood	0	0	$2,000.00	$0.00
Tyler County	12/17/2019	Flood	0	0	$4,000.00	$0.00
Tyler County	1/25/2020	Flood	0	0	$0.00	$0.00
Tyler County	2/13/2020	Flood	0	0	$3,000.00	$0.00
Tyler County	2/13/2020	Flood	0	0	$2,000.00	$0.00
Wood County	5/20/2020	Flood	0	0	$8,000.00	$0.00
Pleasants County	5/20/2020	Flood	0	0	$3,000.00	$0.00
Roane County	5/20/2020	Flood	0	0	$4,000.00	$0.00
Roane County	5/28/2020	Flood	0	0	$4,000.00	$0.00
Ritchie County	2/28/2021	Flood	0	0	$15,000.00	$0.00
Wirt County	2/28/2021	Flood	0	0	$2,000.00	$0.00
Roane County	2/28/2021	Flood	0	0	$15,000.00	$0.00
Wood County	2/28/2021	Flood	0	0	$4,000.00	$0.00
Tyler County	3/1/2021	Flood	0	0	$2,000.00	$0.00
Jackson County	3/1/2021	Flood	0	0	$4,000.00	$0.00
Tyler County	3/1/2021	Flood	0	0	$2,000.00	$0.00
Wirt County	3/1/2021	Flood	0	0	$8,000.00	$0.00
Jackson County	6/10/2021	Flood	0	0	$7,000.00	$0.00
		Totals	**3**	**1**	**$14,679,500.00**	**$0.00**

The following table lists the instances of flash flooding.

Historical Occurrences of Flash Flood, 1996-2021						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Tyler County	1/19/1996	Flash Flood	0	0	$5,000.00	$0.00
Wood County	1/24/1996	Flash Flood	0	0	$5,000.00	$0.00
Wirt County	1/24/1996	Flash Flood	0	0	$5,000.00	$0.00
Ritchie County	1/24/1996	Flash Flood	0	0	$0.00	$0.00
Tyler County	5/16/1996	Flash Flood	0	0	$25,000.00	$0.00
Tyler County	7/19/1996	Flash Flood	0	0	$10,000.00	$0.00
Wood County	7/30/1996	Flash Flood	0	0	$10,000.00	$0.00
Tyler County	7/30/1996	Flash Flood	0	0	$10,000.00	$0.00
Roane County	7/31/1996	Flash Flood	0	0	$200,000.00	$0.00
Jackson County	8/8/1996	Flash Flood	0	0	$3,000.00	$0.00
Wood County	8/8/1996	Flash Flood	0	0	$2,000.00	$0.00
Roane County	3/1/1997	Flash Flood	0	0	$1,500,000.00	$0.00
Jackson County	3/1/1997	Flash Flood	0	2	$200,000.00	$0.00
Calhoun County	3/1/1997	Flash Flood	0	0	$500,000.00	$0.00
Pleasants County	3/2/1997	Flash Flood	0	0	$10,000.00	$0.00
Wood County	3/2/1997	Flash Flood	0	0	$50,000.00	$0.00
Wirt County	3/2/1997	Flash Flood	0	0	$300,000.00	$0.00
Tyler County	3/2/1997	Flash Flood	0	0	$150,000.00	$0.00
Ritchie County	3/2/1997	Flash Flood	0	0	$50,000.00	$0.00
Calhoun County	3/2/1997	Flash Flood	0	0	$10,000.00	$0.00
Roane County	3/2/1997	Flash Flood	0	0	$100,000.00	$0.00
Jackson County	6/1/1997	Flash Flood	0	0	$75,000.00	$25,000.00

Historical Occurrences of Flash Flood, 1996-2021						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood County	6/1/1997	Flash Flood	0	0	$50,000.00	$0.00
Roane County	6/1/1997	Flash Flood	0	0	$3,000.00	$0.00
Ritchie County	6/2/1997	Flash Flood	0	0	$3,000.00	$0.00
Pleasants County	6/2/1997	Flash Flood	0	0	$25,000.00	$0.00
Roane County	6/2/1997	Flash Flood	0	0	$5,000.00	$0.00
Jackson County	6/2/1997	Flash Flood	0	0	$5,000.00	$0.00
Tyler County	6/2/1997	Flash Flood	0	0	$20,000.00	$0.00
Wirt County	7/1/1997	Flash Flood	0	0	$45,000.00	$5,000.00
Jackson County	7/1/1997	Flash Flood	0	0	$30,000.00	$0.00
Wood County	7/27/1997	Flash Flood	0	0	$8,000.00	$0.00
Tyler County	8/17/1997	Flash Flood	0	0	$5,000.00	$0.00
Tyler County	1/7/1998	Flash Flood	0	0	$5,000.00	$0.00
Roane County	3/20/1998	Flash Flood	0	0	$5,000.00	$0.00
Tyler County	5/2/1998	Flash Flood	0	0	$5,000.00	$0.00
Jackson County	6/15/1998	Flash Flood	0	0	$5,000.00	$0.00
Calhoun County	6/15/1998	Flash Flood	0	0	$5,000.00	$0.00
Tyler County	6/19/1998	Flash Flood	0	0	$25,000.00	$0.00
Ritchie County	6/26/1998	Flash Flood	0	0	$550,000.00	$0.00
Tyler County	6/28/1998	Flash Flood	0	0	$250,000.00	$0.00
Pleasants County	6/28/1998	Flash Flood	0	0	$500,000.00	$0.00
Ritchie County	6/28/1998	Flash Flood	0	0	$500,000.00	$0.00
Wood County	6/28/1998	Flash Flood	0	0	$4,000,000.00	$0.00
Wirt County	6/28/1998	Flash Flood	0	0	$200,000.00	$0.00
Calhoun County	6/28/1998	Flash Flood	0	0	$200,000.00	$0.00
Jackson County	6/28/1998	Flash Flood	0	0	$4,000,000.00	$0.00
Roane County	6/28/1998	Flash Flood	0	0	$750,000.00	$0.00
Ritchie County	6/28/1998	Flash Flood	0	0	$250,000.00	$0.00
Wirt County	6/28/1998	Flash Flood	0	0	$200,000.00	$0.00
Calhoun County	6/28/1998	Flash Flood	0	0	$100,000.00	$0.00
Roane County	7/19/1998	Flash Flood	0	0	$40,000.00	$0.00
Roane County	1/21/1999	Flash Flood	1	0	$250,000.00	$0.00
Wirt County	1/21/1999	Flash Flood	0	0	$15,000.00	$0.00
Tyler County	2/13/2000	Flash Flood	0	0	$2,000.00	$0.00
Pleasants County	2/18/2000	Flash Flood	0	0	$25,000.00	$0.00
Tyler County	2/18/2000	Flash Flood	0	0	$250,000.00	$0.00
Wood County	2/18/2000	Flash Flood	0	0	$75,000.00	$0.00
Wirt County	2/18/2000	Flash Flood	0	0	$600,000.00	$0.00
Jackson County	2/18/2000	Flash Flood	0	0	$300,000.00	$0.00
Ritchie County	2/18/2000	Flash Flood	0	0	$850,000.00	$0.00
Roane County	2/18/2000	Flash Flood	0	0	$900,000.00	$0.00
Calhoun County	2/18/2000	Flash Flood	0	0	$400,000.00	$0.00
Tyler County	5/23/2000	Flash Flood	0	0	$5,000.00	$0.00
Wood County	7/4/2000	Flash Flood	0	0	$25,000.00	$0.00
Jackson County	8/9/2000	Flash Flood	0	0	$25,000.00	$0.00
Roane County	8/9/2000	Flash Flood	0	0	$25,000.00	$0.00
Calhoun County	8/27/2000	Flash Flood	0	0	$5,000.00	$0.00
Roane County	9/2/2000	Flash Flood	0	0	$75,000.00	$0.00
Roane County	5/22/2001	Flash Flood	1	0	$35,000.00	$0.00
Ritchie County	6/12/2001	Flash Flood	0	0	$10,000.00	$0.00

Historical Occurrences of Flash Flood, 1996-2021						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Tyler County	7/8/2001	Flash Flood	0	0	$5,000.00	$0.00
Ritchie County	8/10/2001	Flash Flood	0	0	$15,000.00	$0.00
Calhoun County	8/23/2001	Flash Flood	0	0	$10,000.00	$0.00
Calhoun County	5/7/2002	Flash Flood	0	0	$3,000.00	$0.00
Roane County	5/7/2002	Flash Flood	0	0	$3,000.00	$0.00
Wood County	6/14/2003	Flash Flood	0	0	$10,000.00	$0.00
Jackson County	7/1/2003	Flash Flood	0	0	$2,000.00	$0.00
Wood County	7/1/2003	Flash Flood	0	0	$5,000.00	$0.00
Ritchie County	7/10/2003	Flash Flood	0	0	$300,000.00	$0.00
Jackson County	7/10/2003	Flash Flood	0	0	$15,000.00	$0.00
Wood County	7/12/2003	Flash Flood	0	0	$2,000.00	$0.00
Roane County	7/28/2003	Flash Flood	0	0	$5,000.00	$0.00
Calhoun County	7/28/2003	Flash Flood	0	0	$5,000.00	$0.00
Wood County	8/8/2003	Flash Flood	0	0	$50,000.00	$0.00
Wirt County	8/9/2003	Flash Flood	0	0	$5,000.00	$0.00
Tyler County	8/11/2003	Flash Flood	0	0	$5,000.00	$0.00
Pleasants County	8/15/2003	Flash Flood	0	0	$40,000.00	$0.00
Jackson County	5/27/2004	Flash Flood	0	0	$400,000.00	$0.00
Tyler County	5/20/2005	Flash Flood	0	0	$2,000.00	$0.00
Wirt County	7/16/2005	Flash Flood	0	0	$5,000.00	$0.00
Calhoun County	8/29/2005	Flash Flood	0	0	$900,000.00	$0.00
Roane County	8/29/2005	Flash Flood	0	0	$25,000.00	$0.00
Roane County	11/9/2005	Flash Flood	0	0	$10,000.00	$0.00
Ritchie County	7/5/2006	Flash Flood	0	0	$5,000.00	$0.00
Ritchie County	12/13/2007	Flash Flood	0	0	$15,000.00	$0.00
Pleasants County	12/13/2007	Flash Flood	0	0	$15,000.00	$0.00
Tyler County	12/13/2007	Flash Flood	0	0	$20,000.00	$0.00
Tyler County	6/4/2008	Flash Flood	0	0	$50,000.00	$0.00
Wood County	5/18/2010	Flash Flood	0	0	$2,000.00	$0.00
Pleasants County	7/13/2010	Flash Flood	0	0	$75,000.00	$0.00
Pleasants County	7/13/2010	Flash Flood	0	0	$10,000.00	$0.00
Jackson County	4/16/2011	Flash Flood	1	0	$20,000.00	$0.00
Tyler County	5/12/2011	Flash Flood	0	0	$10,000.00	$0.00
Wood County	6/19/2011	Flash Flood	0	0	$15,000.00	$0.00
Ritchie County	6/28/2011	Flash Flood	0	0	$10,000.00	$0.00
Ritchie County	2/29/2012	Flash Flood	0	0	$100,000.00	$0.00
Tyler County	2/29/2012	Flash Flood	0	0	$25,000.00	$0.00
Jackson County	5/4/2012	Flash Flood	0	0	$225,000.00	$0.00
Wood County	5/8/2012	Flash Flood	0	0	$5,000.00	$0.00
Roane County	6/13/2013	Flash Flood	0	0	$3,000,000.00	$0.00
Calhoun County	6/13/2013	Flash Flood	0	0	$5,000.00	$0.00
Roane County	6/18/2013	Flash Flood	0	0	$15,000.00	$0.00
Wood County	7/1/2013	Flash Flood	0	0	$50,000.00	$0.00
Tyler County	7/9/2013	Flash Flood	0	0	$5,000.00	$0.00
Wood County	7/10/2013	Flash Flood	0	0	$15,000.00	$0.00
Roane County	7/12/2013	Flash Flood	0	0	$80,000.00	$0.00
Jackson County	7/19/2013	Flash Flood	0	0	$5,000.00	$0.00
Jackson County	8/8/2013	Flash Flood	0	0	$25,000.00	$0.00
Tyler County	8/13/2013	Flash Flood	0	0	$400,000.00	$0.00

Historical Occurrences of Flash Flood, 1996-2021						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood County	8/13/2013	Flash Flood	0	0	$100,000.00	$0.00
Pleasants County	8/13/2013	Flash Flood	0	0	$200,000.00	$0.00
Ritchie County	8/13/2013	Flash Flood	0	0	$400,000.00	$0.00
Tyler County	8/23/2013	Flash Flood	0	0	$1,000.00	$0.00
Tyler County	8/23/2013	Flash Flood	0	0	$1,000.00	$0.00
Ritchie County	5/28/2014	Flash Flood	0	0	$10,000.00	$0.00
Ritchie County	5/29/2014	Flash Flood	0	0	$5,000.00	$0.00
Ritchie County	6/12/2014	Flash Flood	0	0	$2,000.00	$0.00
Calhoun County	6/12/2014	Flash Flood	0	0	$2,000.00	$0.00
Ritchie County	6/20/2014	Flash Flood	0	0	$5,000.00	$0.00
Calhoun County	6/20/2014	Flash Flood	0	0	$2,000.00	$0.00
Calhoun County	9/4/2014	Flash Flood	0	0	$5,000.00	$0.00
Roane County	9/6/2014	Flash Flood	0	0	$15,000.00	$0.00
Ritchie County	4/9/2015	Flash Flood	0	0	$0.00	$0.00
Tyler County	4/10/2015	Flash Flood	0	0	$25,000.00	$0.00
Wood County	4/10/2015	Flash Flood	0	0	$20,000.00	$0.00
Jackson County	6/26/2015	Flash Flood	0	0	$350,000.00	$0.00
Roane County	7/8/2015	Flash Flood	0	0	$50,000.00	$0.00
Roane County	7/10/2015	Flash Flood	0	0	$100,000.00	$0.00
Jackson County	7/10/2015	Flash Flood	0	0	$5,000.00	$0.00
Wood County	7/12/2015	Flash Flood	0	0	$650,000.00	$0.00
Ritchie County	8/18/2015	Flash Flood	0	0	$10,000.00	$0.00
Tyler County	8/18/2015	Flash Flood	0	0	$2,000.00	$0.00
Roane County	12/25/2015	Flash Flood	0	0	$70,000.00	$0.00
Calhoun County	12/25/2015	Flash Flood	0	0	$10,000.00	$0.00
Wood County	4/26/2016	Flash Flood	0	0	$10,000.00	$0.00
Ritchie County	6/23/2016	Flash Flood	0	0	$50,000.00	$0.00
Wood County	6/23/2016	Flash Flood	0	0	$5,000.00	$0.00
Jackson County	6/23/2016	Flash Flood	1	0	$500,000.00	$0.00
Ritchie County	7/4/2016	Flash Flood	0	0	$10,000.00	$0.00
Roane County	7/26/2016	Flash Flood	0	0	$0.00	$0.00
Tyler County	3/1/2017	Flash Flood	0	0	$2,000.00	$0.00
Wood County	4/16/2017	Flash Flood	0	0	$2,000.00	$0.00
Jackson County	5/27/2017	Flash Flood	0	0	$1,000.00	$0.00
Wood County	6/23/2017	Flash Flood	0	0	$1,000.00	$0.00
Jackson County	6/23/2017	Flash Flood	0	0	$1,000.00	$0.00
Jackson County	6/23/2017	Flash Flood	0	0	$5,000.00	$0.00
Wood County	7/22/2017	Flash Flood	0	0	$2,000.00	$0.00
Ritchie County	7/22/2017	Flash Flood	0	0	$1,000.00	$0.00
Wood County	11/6/2017	Flash Flood	0	0	$2,000.00	$0.00
Ritchie County	11/6/2017	Flash Flood	0	0	$2,000.00	$0.00
Tyler County	5/22/2018	Flash Flood	0	0	$2,000.00	$0.00
Calhoun County	5/23/2018	Flash Flood	0	0	$50,000.00	$0.00
Jackson County	6/21/2018	Flash Flood	0	0	$500.00	$0.00
Pleasants County	6/27/2018	Flash Flood	0	0	$10,000.00	$0.00
Tyler County	6/27/2018	Flash Flood	0	0	$20,000.00	$0.00
Roane County	7/27/2018	Flash Flood	0	0	$1,000.00	$0.00
Calhoun County	7/27/2018	Flash Flood	0	0	$1,000.00	$0.00
Jackson County	8/3/2018	Flash Flood	0	0	$3,000.00	$0.00

Historical Occurrences of Flash Flood, 1996-2021						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wirt County	8/3/2018	Flash Flood	0	0	$2,000.00	$0.00
Roane County	8/12/2018	Flash Flood	0	0	$30,000.00	$0.00
Tyler County	5/25/2019	Flash Flood	0	0	$5,000.00	$0.00
Pleasants County	7/6/2019	Flash Flood	0	0	$2,000.00	$0.00
Ritchie County	7/11/2019	Flash Flood	0	0	$500.00	$0.00
Ritchie County	7/11/2019	Flash Flood	0	0	$5,000.00	$0.00
Ritchie County	7/15/2019	Flash Flood	0	0	$500.00	$0.00
Ritchie County	7/17/2019	Flash Flood	0	0	$1,000.00	$0.00
Ritchie County	7/22/2019	Flash Flood	0	0	$60,000.00	$0.00
Wood County	8/8/2019	Flash Flood	0	0	$1,000.00	$0.00
Ritchie County	5/22/2020	Flash Flood	0	0	$5,000.00	$0.00
Roane County	5/28/2020	Flash Flood	0	0	$3,000.00	$0.00
Wood County	6/4/2020	Flash Flood	0	0	$4,000.00	$0.00
Roane County	6/14/2020	Flash Flood	0	0	$1,500.00	$0.00
Ritchie County	6/14/2020	Flash Flood	0	0	$4,000.00	$0.00
Calhoun County	6/18/2020	Flash Flood	0	0	$40,000.00	$0.00
Ritchie County	6/27/2020	Flash Flood	0	0	$1,500.00	$0.00
Roane County	7/30/2020	Flash Flood	0	0	$2,000.00	$0.00
Calhoun County	7/30/2020	Flash Flood	0	0	$200,000.00	$0.00
Wirt County	8/27/2020	Flash Flood	0	0	$1,000.00	$0.00
Roane County	8/27/2020	Flash Flood	0	0	$10,000.00	$0.00
Ritchie County	5/4/2021	Flash Flood	0	0	$5,000.00	$0.00
Ritchie County	5/4/2021	Flash Flood	0	0	$20,000.00	$0.00
Jackson County	6/10/2021	Flash Flood	0	0	$10,000.00	$0.00
Jackson County	6/10/2021	Flash Flood	0	0	$25,000.00	$0.00
Calhoun County	6/11/2021	Flash Flood	0	0	$10,000.00	$0.00
Tyler County	6/13/2021	Flash Flood	0	0	$3,000.00	$0.00
Wood County	6/13/2021	Flash Flood	0	0	$4,000.00	$0.00
Calhoun County	6/13/2021	Flash Flood	0	0	$30,000.00	$0.00
Roane County	6/13/2021	Flash Flood	0	0	$3,000.00	$0.00
Wood County	6/21/2021	Flash Flood	0	0	$3,000.00	$0.00
Jackson County	8/19/2021	Flash Flood	0	0	$5,000.00	$0.00
Jackson County	8/19/2021	Flash Flood	0	0	$5,000.00	$0.00
Jackson County	8/19/2021	Flash Flood	0	0	$3,000.00	$0.00
Jackson County	8/19/2021	Flash Flood	0	0	$5,000.00	$0.00
		Totals	**4**	**2**	**$28,136,500.00**	**$30,000.00**

June 1998 Flash Flooding

Three consecutive nights of thunderstorms left western and northern West Virginia counties with wind damage and flooding. The first night was from Friday evening, June 26, into early Saturday morning, the 27th. The convection on the second and third nights was further south than the first night, hitting the Parkersburg to Charleston corridor the hardest. Total rains were six to 10 inches across portions of Wood, Jackson, and northern Kanawha Counties, with five inches further northeast, into the Middle Island Creek basin.

The heaviest rain rates were with the second night of convection from late Saturday night. June 27, into Sunday morning. The cloudbursts swept southeast from eastern Ohio, hitting Jackson, southern Roane, and northern Kanawha before dawn on Sunday. Ripley measured 6.8 inches in the four hours from 4:30 to 8:30 a.m.

Serious flash flooding occurred. A federal disaster declaration for individual and public assistance was declared for 15 counties in West Virginia, including Roane, Jackson, Calhoun, Wirt, Wood, Pleasants, and Ritchie. About 240 dwellings were destroyed, the most being from Wood, Kanawha, Roane, and Jackson Counties. Nearly 500 homes had major damage, the most from Kanawha and Ritchie counties. Around 100 dwelling had minor water damage. These figures included mobile homes, many of which were located in areas most susceptible to stream flooding.

In Jackson County, about 12 mobile homes were washed into the creek just after dawn on June 28 from the Northern Mobile Home Park in Ripley. The trailers were smashed against the Route 21 bridge, about 50 yards down the stream. All total, 21 of the 23 trailers were destroyed. Luckily, everyone escaped uninjured. One resident found only one item from their destroyed mobile home. It was a book, describing the West Virginia flood of 1985. Near Interstate 77, east of Ravenswood, Straight Fork heavily damaged Abel's Mobile Home Park. Along the Left Fork of Sandy Creek, the Dewey Thomas Hill Bridge was destroyed. The 100-year-old steel bridge washed into the stream, leaving only its concrete supports. Further down the creek near Odaville, the Sarvis Fork Covered Bridge passed the test of time. The high-water mark was some three to four feet on the upstream outer wooden shell. The Lockhart Church near the Route 21 and Medina Road intersection, had four to five feet of water inside. Local lifelong residents of the upper reaches of the Left Fork of Sandy Creek said it was the highest water levels they have ever seen.

In Wood County, Neal Run destroyed about 50 mobile homes in two trailer parks in South Parkersburg on the morning of June 28. One resident said, "It was unreal how fast the water came up." Little Tygart Creek caused severe flooding just south of Mineral Wells, including the Lincolnshire development and Slate Creek Village. Along Lee Creek, a mobile home with two occupants was washed downstream until becoming lodged in trees. The occupants escaped uninjured. Stillwell and Pond Creeks also had significant flooding in Wood County.

In Ritchie County, after the initial flash flood near Cairo, more flash flooding occurred. Bunnell Run flooded Pennsboro and about 50 people had to be evacuated. Two manufactured homes were destroyed, and six homes had major damage. One resident said, "It has never been like this. My whole house was flooded. Everything I have is ruined." The Pennsboro Fire Chief said, "There was no time to do anything. Some of my men didn't even make it out of their homes when the water hit. " A Pontiac car dealership in Pennsboro had several cars flooded.

In Roane County, most of the severe flooding was from the Cicerone-Kettle area on toward Cotton. One house on Green Creek was swept away, prompting the emergency director to say, "It must have been some force, because it took everything and there was nothing left but the ground."

Hurricane Ivan Remnants, 2004

As the weakening Hurricane Ivan moved inland across Alabama, light rain began in southern West Virginia on the morning of the September 16. The rain shield moved into northern counties overnight. Heavy rain began before dawn on the 17th around Huntington. The heavier rain moved up the Ohio River counties and engulfed the Ravenswood, Parkersburg, and Sistersville vicinities during the mid-morning on the 17th. The heavy rain continued along the Ohio River counties into the mid-afternoon, before lifting north and east.

A 30 to 36-hour duration event dumped 3.5 to 6 inches of rain. The upper range was concentrated along the Ohio River counties from Huntington through Parkersburg. A secondary maximum in the rain ran south from Parkersburg into northern Kanawha County. Preliminary storm totals from cooperative observers had R. C. Byrd Lock and Dam with 5.9 inches, Elizabeth 5.0 inches, Sandyville 4.8 inches, downtown Parkersburg 4.6 inches, Ripley 4.5 inches, Parkersburg airport 4.1 inches, and Middlebourne with 3.8 inches. Since the remains of Hurricane Frances were just eight days prior to this rain, small stream flooding was more significant with the remnants of Ivan.

Most of the small stream flooding receded by late Friday evening, September 17; however, even heavier rain fell over the northern panhandle of West Virginia into western Pennsylvania. Rain amounts of six to eight inches were more common there. As a result, the main stem of the Ohio River rose one to two feet per hour during the evening of the 17th in the Sistersville-to-Parkersburg vicinity. For example, at Parkersburg, the Ohio River rose from 25.6 feet at 4:00 p.m. to 33.0 feet at 8:00 p.m. on the 17th. A slower, but steady rise continued into Saturday the 18th. Moderate to major river flooding occurred on September 18 and 19 from Sistersville on down through St. Mary’s, Williamstown, Vienna, Parkersburg, and Ravenswood. The floodwall protected the City of Parkersburg. Backwater also caused flooding, sometimes a few miles from the Ohio River. One example was along the lower reaches of the Little Kanawha River in Wood County.

Specific crests include Willow Island Lock and Dam 44.8 feet, Marietta 2SW 42.4 feet, Parkersburg 43.7 feet, and Belleville Lock and Dam 45.8 feet. At Parkersburg, the crest was the highest level in 40 years. (Back in March 1964, the river reached 45.2 feet at Parkersburg.) In terms of damage to housing, Tyler County had five destroyed and 19 with major damage. Pleasants County had 21 homes destroyed and 10 homes with major damage. Wood County reported several hundred homes affected. The Red Cross reported 19 homes destroyed in Wood County. Wirt County had 21 homes destroyed and 10 with major damage. Jackson County had 14 homes with major damage. Tyler County reported around 30 businesses destroyed and 8 with major damage.

June 2016 Flooding

Multiple rounds of convection resulted in wind damage and flooding. Flash flooding on small streams turned into river flooding. A historic and record setting flood occurred along portions of the Elk and Gauley Rivers in central West Virginia. Less significant flooding occurred on the perimeter of the hardest hit area.

The initial convective complex developed during the evening hours of June 22 near Chicago. The complex reached southeast Ohio just after midnight on the 23rd, while a surface warm front was returning northeast into West Virginia. A few renegade storms even formed ahead of the complex along the warm front. The first round of convection entered West Virginia around 1:00 a.m. on the 23rd. It crossed West Virginia during the pre-dawn hours with downpours and gusty winds. Within this initial round of convection, a brief tornado was confirmed in Jackson County. The first complex exited the eastern counties of the state a few hours after dawn, yet the undisturbed southwest low-level flow of moisture rich air allowed new convection to form in its wake. These new showers and storms formed in the Mid-Ohio Valley from southern Ohio eastward toward the Huntington and Charleston vicinity. These thunderstorms moved back east, across central West Virginia during the late morning and mid-day time frame. In the muggy air, additional storms formed during the afternoon and early evening hours. The rains finally diminished after 7:00 p.m. on the 23rd. The total duration of these multiple rounds of convective showers and storms encompassed no more than 18 hours.

A two to four-inch rain maximum occurred with the initial convective complex. This initial rain maximum ran from near Parkersburg on up the Little Kanawha River Valley to near Glenville and through Upshur Counties. For example, by 9:00 a.m., Pullman in Ritchie County measured 3.76 inches. Harrisville (in Ritchie County) measured 3.48 inches of rain. Willow Island on the Ohio River measure 3.38 inches. Minor flash flooding occurred with this initial convective band during the predawn and dawn time frame. Less rains fell further south. The new convection that formed during the morning of June 23 saw its heavier rain fall south of the initial band. The rain axis went from Jackson County southeast into Clay and Nicholas Counties. After the third and fourth rounds of convection during the afternoon and evening, a four-to-7.5" rainfall maximum occurred in less than 18 hours. The axis of this maximum rain went from Jackson County on southeast through Roane, northern Kanawha, Clay, Nicholas, Webster, into southern Pocahontas. Fatalities occurred in Kanawha and Jackson Counties. Thankfully, no fatalities occurred in Roane, Clay, Webster, Nicholas, Fayette, and Pocahontas Counties.

The American Red Cross had over 800 workers helping at its peak. They distributed over 7,500 cleanup kits and over 100,000 meals and snacks. Many church-based organizations and ordinary individual citizens volunteered their time and services to help in the flood recovery. Nationally-known celebrities and sport figures with ties to West Virginia also helped to raise awareness and increase donations for flood recovery.

Governor Tomblin declared a state of emergency. At its peak deployment, around 650 members of the West Virginia Army National Guard and West Virginia Air National Guard were activated. Major tasks assigned to the guard troops included delivering supplies to residents with no road access, and removal of flood debris. Private contractors were also used for debris removal. A federal disaster was quickly declared by President Obama. At least eight counties were eligible from the events of June 23rd and 24th within the forecast area of the National Weather Service in Charleston (which included Jackson and Roane Counties). Over 4900 individuals applied for federal assistance from those eight counties, totaling over $20 million. Public assistance for debris removal, emergency protective services, roads, bridges, and schools, was over $50 million in those same eight counties.

Jurisdictional participants noted several other concerns regarding the changing nature of flooding. As an example, the mayor of Pullman recounted a 2022 flood blocked a bridge near the SR 74 intersection and floodwaters entered the U.S. Post Office on Main Street. The mayor noted she had never seen anything like those waters in her 22 years of living in the town.

Loss and Damages

Floods and flash floods have caused $42,846,000 in damages in the region since 1996, which translates to an average loss per year of $1,713,840 or $119,350 per event. Further, West Virginia statewide Total Exposure in Floodplains (TEIF) data can support loss estimation. The table below shows potential losses by structure use type, as it appears in the TEIF data, for each jurisdiction in the Mid-Ohio Valley region.

Total Exposure (Building Dollar) in the Floodplain, by County: Residential vs. Non-Residential

Community Name	*Residential*				*Commercial Non-Residential*		*Other Non-Residential*		*Total Building Value*		
	#	% Count	Value ($)	% Value	#	Value ($)	#	Value ($)	#	Value ($)	Rank[1]
Calhoun County*	437	90.9%	$13,861K	43.7%	25	$3,231K	19	$14,599K	481	$31,692K	5
Grantsville	94	71.8%	$2,716K	42.1%	34	$2,722K	3	$1,015K	131	$6,452K	10
Calhoun Totals	**531**	**86.8%**	**$16,577K**	**43.5%**	**59**	**$5,953K**	**22**	**$15,614K**	**612**	**$38,144K**	6
Jackson County*	861	92.1%	$49,287K	70.8%	47	$10,207K	27	$10,154K	935	$69,648K	3
Ravenswood	135	90.0%	$9,351K	88.9%	13	$843K	2	$323K	150	$10,517K	7
Ripley	16	72.7%	$1,737K	58.8%	3	$218K	3	$999K	22	$2,954K	11
Jackson Totals	**1012**	**91.4%**	**$60,375K**	**72.6%**	**63**	**$11,268K**	**32**	**$11,476K**	**1107**	**$83,119K**	3
Belmont	9	56.3%	$869K	41.4%	6	$647K	1	$582K	16	$2,098K	13
Pleasants County*	248	89.9%	$13,570K	59.1%	23	$8,840K	5	$533K	276	$22,943K	6
St. Mary's	88	58.3%	$5,243K	20.6%	51	$16,929K	12	$3,257K	151	$25,429K	4
Pleasants Totals	**345**	**77.9%**	**$19,682K**	**39.0%**	**80**	**$26,417K**	**18**	**$4,372K**	**443**	**$50,470K**	5
Auburn	16	94.1%	$334K	89.8%	0	$0K	1	$38K	17	$372K	19
Cairo	21	80.8%	$931K	83.0%	5	$191K	0	$0K	26	$1,122K	16
Ellenboro	11	61.1%	$378K	39.4%	7	$582K	0	$0K	18	$959K	17
Harrisville	1	100.0%	$17K	100.0%	0	$0K	0	$0K	1	$17K	20
Pennsboro	16	48.5%	$983K	10.4%	14	$2,148K	3	$6,342K	33	$9,474K	8
Pullman	13	86.7%	$444K	69.8%	1	$39K	1	$153K	15	$636K	18
Ritchie County*	364	91.9%	$14,915K	86.4%	25	$1,405K	7	$945K	396	$17,265K	8
Ritchie Totals	**442**	**87.4%**	**$18,002K**	**60.3%**	**52**	**$4,365K**	**12**	**$7,478K**	**506**	**$29,845K**	7
Reedy	23	79.3%	$1,009K	71.1%	3	$71K	3	$338K	29	$1,418K	15
Roane County*	773	93.2%	$45,192K	63.4%	30	$4,531K	26	$21,547K	829	$71,270K	2
Spencer	172	78.2%	$7,679K	23.5%	38	$10,818K	10	$14,184K	220	$32,681K	3
Roane Totals	**968**	**89.8%**	**$53,880K**	**51.1%**	**71**	**$15,420K**	**39**	**$36,068K**	**1078**	**$105,368K**	2
Friendly	51	89.5%	$1,587K	83.5%	4	$140K	2	$174K	57	$1,901K	14
Middlebourne	2	66.7%	$82K	3.2%	0	$0K	1	$2,500K	3	$2,582K	12
Paden City**	2	66.7%	$93K	43.3%	1	$122K	0	$0K	3	$215K	
Sistersville	76	88.4%	$4,540K	52.5%	7	$2,665K	3	$1,439K	86	$8,644K	9
Tyler County*	639	95.2%	$28,216K	63.6%	17	$2,304K	15	$13,811K	671	$44,331K	4
Tyler Totals	**770**	**93.9%**	**$34,518K**	**59.5%**	**29**	**$5,231K**	**21**	**$17,924K**	**820**	**$57,674K**	4
Elizabeth	51	77.3%	$2,790K	23.7%	12	$1,666K	3	$7,324K	66	$11,780K	5
Wirt County*	439	96.3%	$15,072K	87.1%	6	$970K	11	$1,269K	456	$17,311K	7
Wirt Totals	**490**	**93.9%**	**$17,861K**	**61.4%**	**18**	**$2,637K**	**14**	**$8,593K**	**522**	**$29,091K**	8
Parkersburg	240	78.4%	$19,489K	13.4%	63	$55,685K	3	$70,326K	306	$145,500K	1
Vienna	271	85.8%	$21,887K	27.7%	43	$56,304K	2	$785K	316	$78,976K	2
Williamstown	58	58.6%	$4,828K	43.8%	39	$4,067K	2	$2,125K	99	$11,020K	6
Wood County*	1402	89.7%	$109,746K	72.4%	129	$22,818K	31	$18,942K	1562	$151,506K	1
Wood Totals	**1971**	**86.3%**	**$155,950K**	**40.3%**	**274**	**$138,874K**	**38**	**$92,178K**	**2283**	**$387,002K**	1
SUMMARY	*6,529*	*88.4%*	*$376,845K*	*53.9%*	*646*	*$210,164K*	*194*	*$190,779K*	*7,369*	*$777,788K*	

* Unincorporated
** Split Community
[1] Group Rank on Community Type: County, Unincorporated, Incorporated

Another way to visualize flood losses is to examine the NFIP claims paid on a county-by-county basis. The following table shows this information for the region, for the period 1989 through 2021.

FIMA NFIP Claims Data, 1989-2021 (Open-Source)				
Community Name	*Paid on Building Claim*	*Paid on Contents Claim*	*Paid on Increased Cost of Compliance Claim*	*Total Paid*
Calhoun County	$368,200.00	$55,359.00	$0.00	$423,559.00
Jackson County	$961,945.00	$616,455.00	$0.00	$1,578,400.00
Pleasants County	$186,262.00	$13,498.00	$0.00	$199,780.00
Ritchie County	$151,939.00	$52,677.00	$0.00	$204,617.00
Roane County	$1,259,752.00	$372,059.00	$13,247.00	$1,645,057.00
Tyler County	$145,789.00	$10,172.00	$0.00	$155,962.00
Wirt County	$214,131.00	$54,398.00	$0.00	$268,529.00
Wood County	$5,278,182.00	$1,086,378.00	$0.00	$6,364,560.00
Total	*$8,566,221.00*	*$2,260,996.00*	*$13,247.00*	*$10,840,464.00*

Future Occurrences

Floods can occur at any time, but are most likely to occur between March and September. While this trend is expected to continue, intense severe storms at various times in the year may result in floods at uncommon times. See Section 2.2.9: Severe Summer Storms for a discussion of runoff flooding as a result of heavy downpours. The Intergovernmental Panel on Climate Change (IPCC) notes that the most likely impacts from climate change on West Virginia will be an increase in extreme precipitation (IPCC, n.d.). Interestingly, a secondary impact of that precipitation is a quick-rising flood. Further, the IPCC lists increased flooding as a primary impact in the Midwest and a significant impact in the Northeast (which includes West Virginia in the IPCC report).

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from flooding. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding flooding.

Public Sentiment, Flooding					
Hazard	*Level of Concern*				*Total Responses*
	Not at All	*Somewhat*	*Concerned*	*Very*	
Flooding	3 (4.62%)	22 (33.85%)	20 (30.77%)	20 (30.77%)	65
In the past ten years, do you remember this hazard occurring in your community?				51 (78.46%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				36 (55.38%)	66
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.54%)	66

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Flooding Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	5	Excessive (Will occur during a year)	Per NCEI records, the region experiences approximately 2.6 floods and 4.96 flash floods per year.
Response	3	One week	Not all floods require a major response, but larger floods require, at minimum, a multi-day response.
Onset	3	6-12 hours	Though storm systems are forecasted, the accuracy of estimates necessary to determine actionable flood data is much closer to the onset of the event.
Magnitude	1	Localized (less than 10% of land area affected)	Flooding typically occurs in SFHAs near creeks and streams. Flash flood, though not bound geographically like riverine flooding, typically occurs quickly in localized areas. Though destructive, neither event impacts more than 10% of the region's land area on a per incident basis.
Business	2	One week	Some floods, like the 2016 floods in West Virginia, impacted and thus closed businesses, However, community-wide business closure would be rare. Planners selected one week as a mid-point between the experiences of non-impacted and impacted businesses.
Human	4	High (multiple deaths)	NCEI data reports both injuries and deaths as a result of both flooding and flash flooding.
Property	2	10-25% of property affected	Flood/flash flood events may not impact 10-25% of the building stock on a per incident basis, but property damage is typically substantial due to infrastructure impacts.
Total	**20**	**Medium**	

2.0 RISK ASSESSMENT

2.2.8 Geologic Hazards

<table>
<tr><td colspan="5">Geologic hazards refer to those affecting soils, topography, etc., e.g., land subsidence, landslides, mine subsidence, and mudslides.</td></tr>
<tr><td rowspan="4">Vulnerability
HIGHEST
HIGH
MEDIUM
LOW
LOWEST</td><td>Period of Occurrence:</td><td>At any time, though landslide conditions can occur after soil saturation from rains, winter weather, etc.</td><td>Hazard Index Ranking:</td><td>Low</td></tr>
<tr><td>Warning Time:</td><td>Over 24 hours (subsidence)

Less than 6 hours (landslides)</td><td>State Risk Ranking:</td><td>High</td></tr>
<tr><td>Probability:</td><td>Will occur in a year</td><td>Severity:</td><td>Low</td></tr>
<tr><td>Type of Hazard:</td><td>Natural</td><td>Disaster Declarations:</td><td>DR-1319-WV (2000)
DR-1474-WV (2003)
DR-1500-WV (2003)
DR-1522-WV (2004)
DR-1558-WV (2004)
DR-1574-WV (2005)
DR-1769-WV (2008)
DR-1838-WV (2009)
DR-4059-WV (2012)
DR-4210-WV (2015)
DR-4220-WV (2015)
DR-4221-WV (2015)
DR-4236-WV (2015)
USDA FSA S3934 (2015)
DR-4273-WV (2016)
DR-4331-WV (2017)
DR-4359-WV (2018)</td></tr>
</table>

Hazard Overview

This hazard profile addresses three primary geologic hazards: land subsidence, landslides, mine subsidence, and mudslides. The definitions of these are as follows.

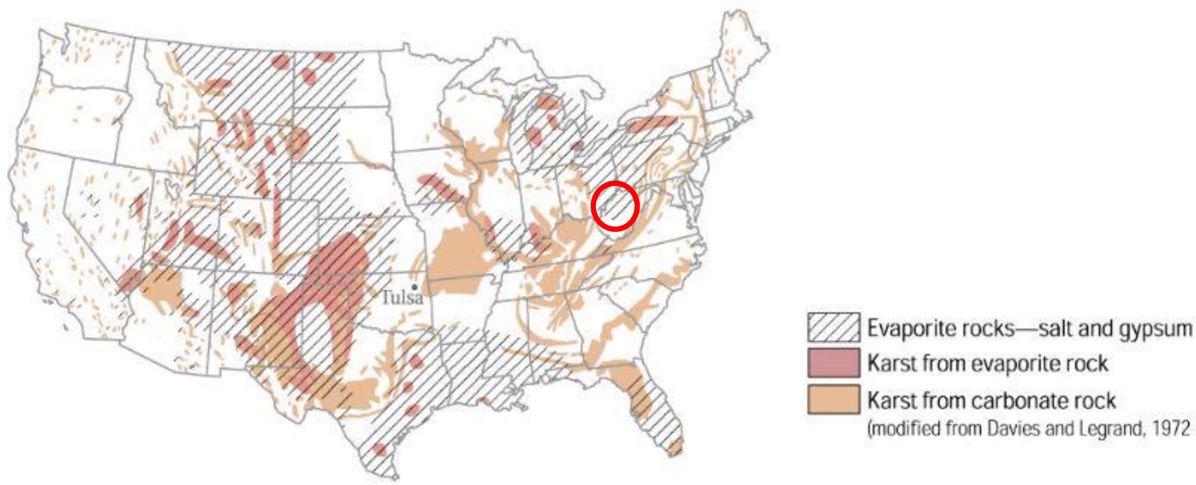
- **Land Subsidence:** The sinking of the ground often caused by the removal of water, oil, gas, or mineral resources from the ground. However, subsidence can also be caused by natural events such as earthquakes or soil compaction (NOAA NOS, n.d.). Put differently, land subsidence is the motion of the Earth's surface as it shifts downward relative to a benchmark (often sea-level) of the surrounding terrain.
- **Landslides:** Occur when dry rock, soil, and/or debris move down a slope. These uncontrolled movements can be localized or massive in size. Landslides can also vary in speed.

- **Mine Subsidence:** The loss of elevation caused by the removal of support below the surface.
- **Mudslide:** A type of landslide, often referred to as a debris flow, that develops when water rapidly accumulates in the ground and results in a surge of water-saturated rock, earth, and debris.

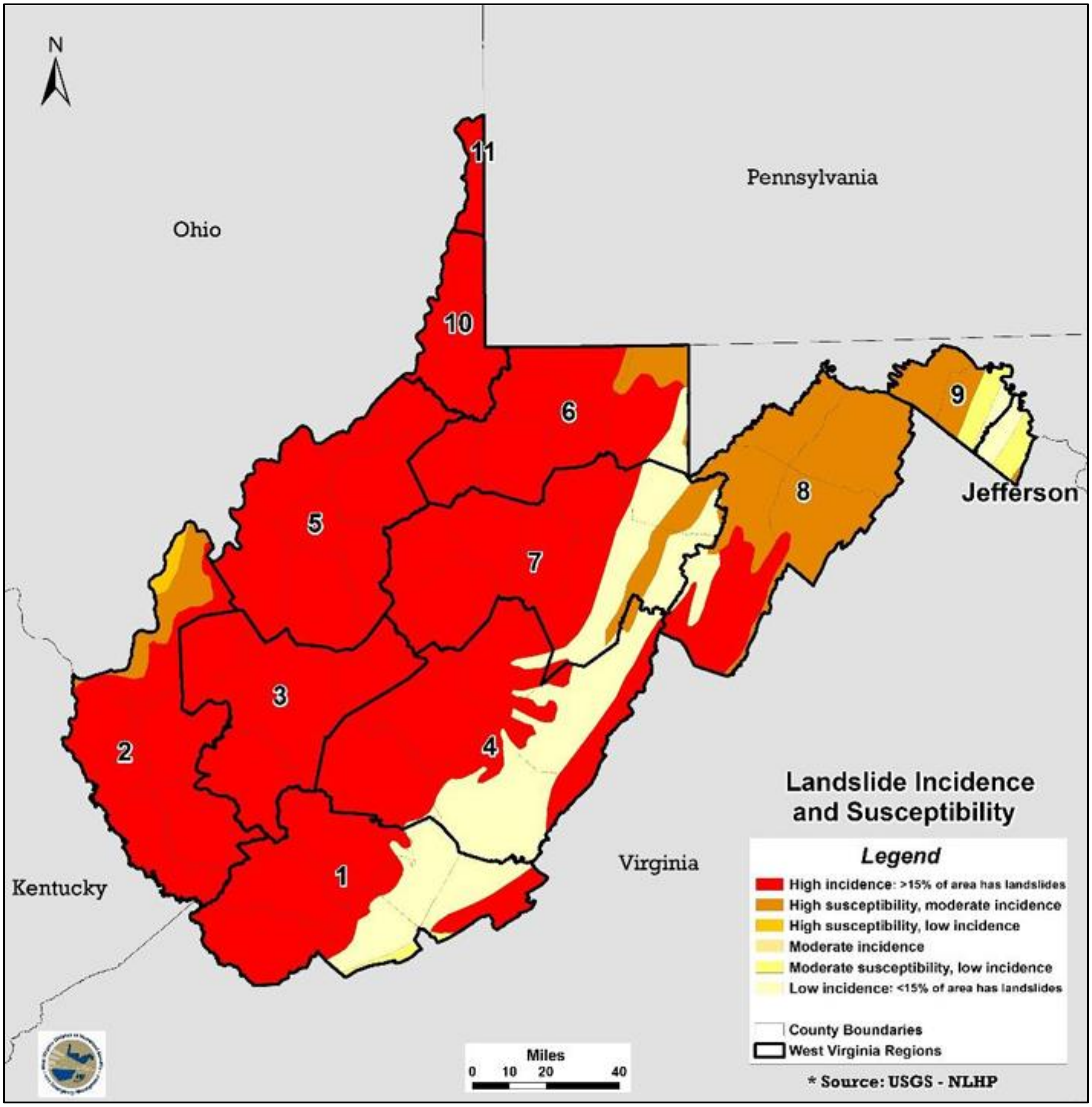
Land subsidence is often associated with expansive soils, which are soils or soft rock that dramatically expand, or swell when wet and shrink or contract when dry. The swelling and shrinking action can cause extensive damage to transportation routes, such as highways and rail lines, and structures that are built over these areas, as the soils can experience significant shifting. Landslides are caused by the anchoring material becoming compromised (usually by the loss of vegetation) and releasing (Haddow, Bullock, & Coppola, 2011). In West Virginia, the primary cause of mine subsidence is Abandoned Underground Mines (AUMs). Underground mining of coal began in the early 1800's and continues to current day. All mining activities create voids under the Earth's surface. Several key factors determining the potential for these voids to collapse include depth, mining technique used, type of rock and/or soils, and development on the ground surface. Mudslides typically start on steep slopes and may be activated by other natural occurrences (like heavy rainfall). Areas impacted by recent wildfires that destroy vegetation may be particularly vulnerable to landslides during and after heavy rains (CDC, 2018b).

Location and Extent

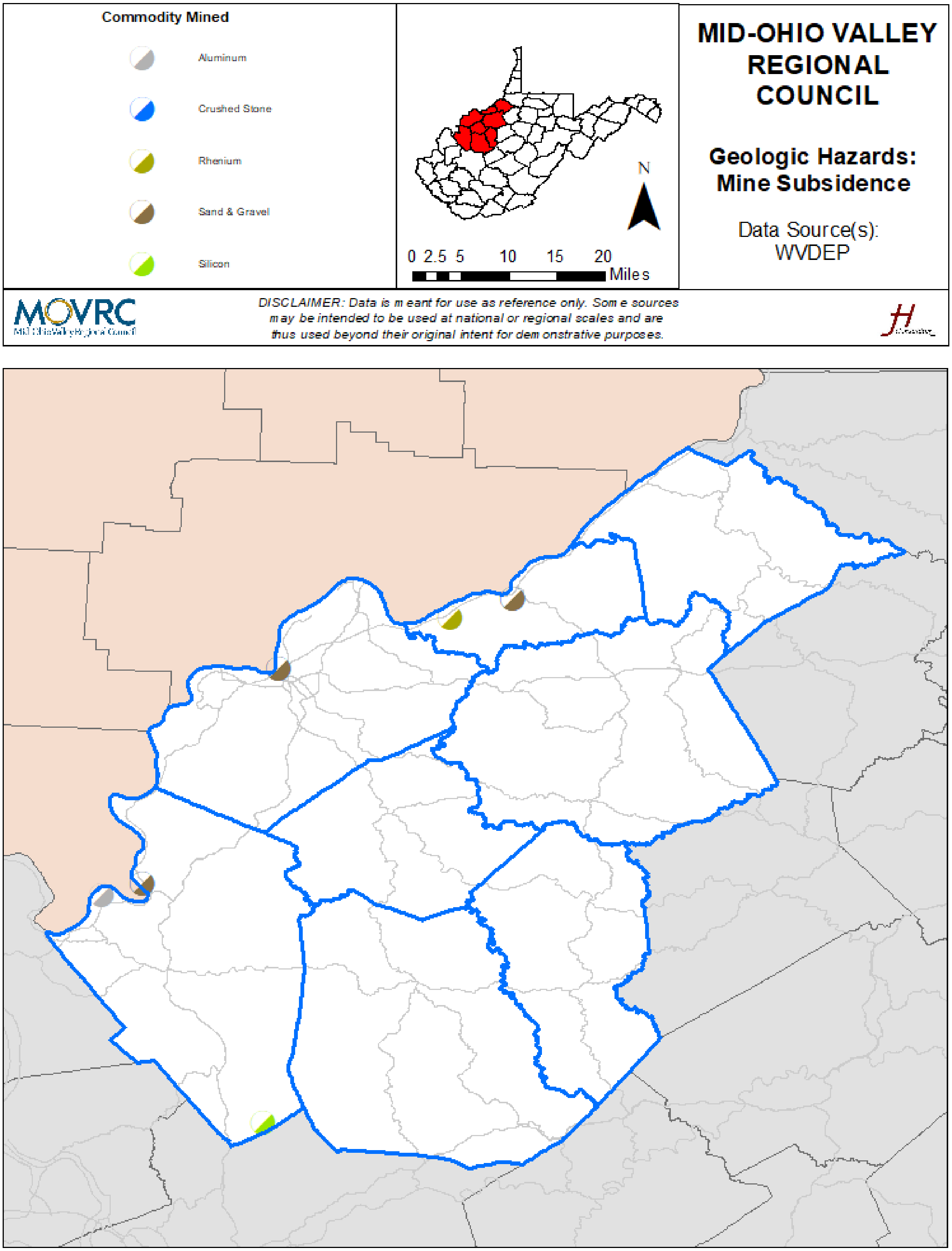
The geography of the region creates large areas that are vulnerable to the landslides and land subsidence, as is true for most of the state. Land subsidence susceptibility, like most geologic hazards, is related to the soil types in an area. The following image identifies areas of evaporite rocks like salt and gypsum under West Virginia (USGS, 2000), with the Mid-Ohio Valley region highlighted via a small red circle. Salt and gypsum are soluble in water, being susceptible to dissolution and the formation of cavities that may collapse (causing subsidence). Salt and gypsum are more soluble than limestone, which is the rock most associated with catastrophic sinkholes, which means that cavities may form in days to years (versus the centuries to millennia seen for other carbonate rocks like limestone).



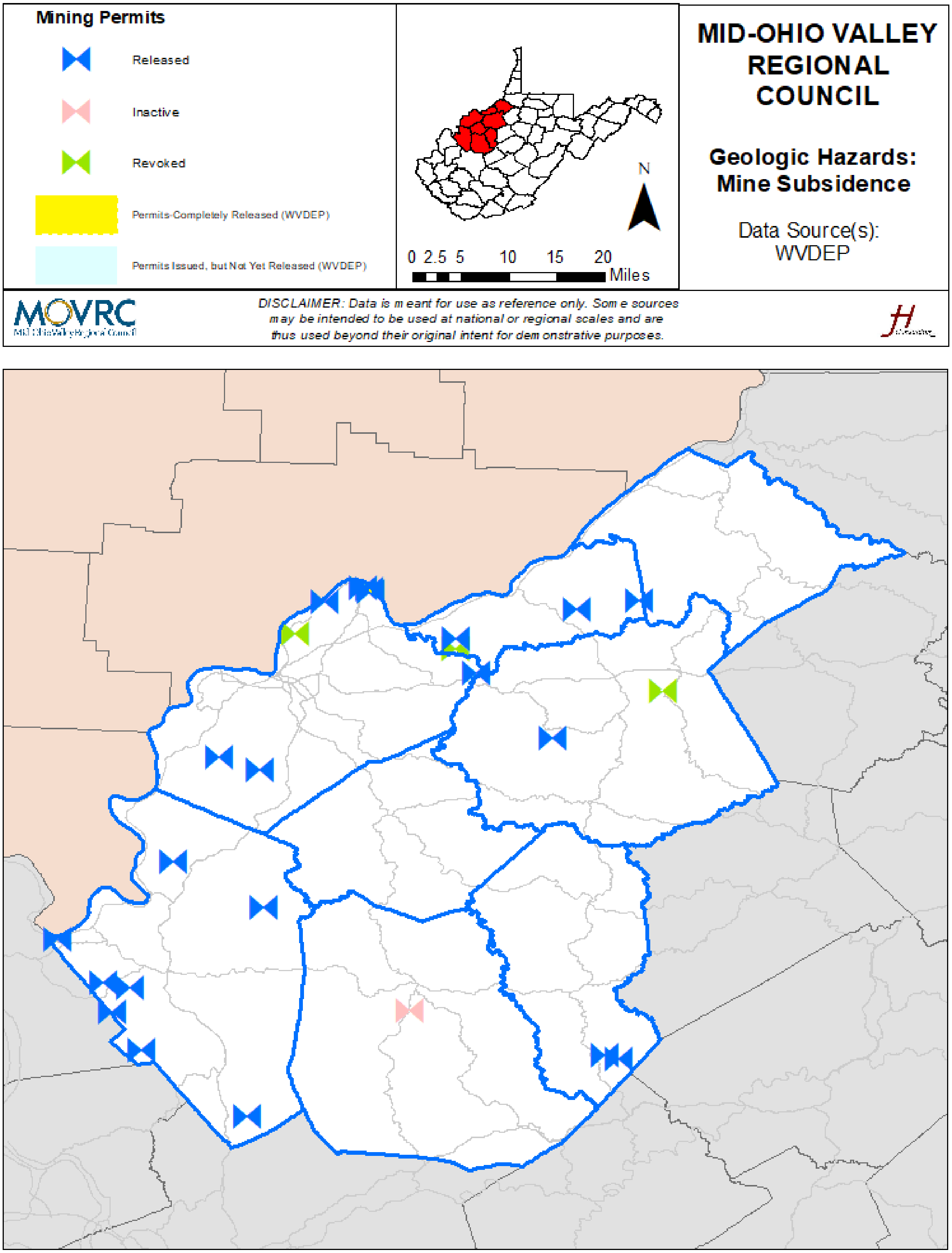
The U.S. Geological Survey (USGS) indicates that nearly all of West Virginia is susceptible to landslides. The following graphic comes from the state's hazard mitigation plan (WVEMD, 2018), and identifies USGS landslide incidence and susceptibility determinations. As seen, all of the Mid-Ohio Valley region is located in a red area, which suggests there is a greater than 15% chance the area has landslides.



Mine subsidence is somewhat more predictable in its location. It occurs in areas that have been undermined. The following map shows the mineral operations in the Mid-Ohio Valley region. In West Virginia, most people thinking of coal mining. However, coal mining is of lesser prevalence in the Mid-Ohio Valley region than other minerals. The minerals reported by the West Virginia Department of Environmental Protection include aluminum, crushed stone, rhenium, sand and gravel, and silicon.


Commodity Mined
Aluminum
Crushed Stone
Rhenium
Sand & Gravel
Silicon
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Geologic Hazards: Mine Subsidence
Data Source(s): WVDEP
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

The second following map shows mining permits by status. There are 25 permits in the region, three of which are revoked and one of which is inactive. The map also lists two completely-released permits in northern Wood County as well as four permits issued but not yet released, also in northern Wood County.


Mining Permits
Released
Inactive
Revoked
Permits-Completely Released (WVDEP)
Permits Issued, but Not Yet Released (WVDEP)
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Geologic Hazards: Mine Subsidence
Data Source(s): WVDEP
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

More specifically, the West Virginia Emergency Management Division, Department of Homeland Security, and Federal Emergency Management Agency facilitated a landslide susceptibility study and community-based risk assessment organized by planning and development council region. The report[1] contains a significant amount of information, but a "road risk analysis" and "structure/parcel analysis" contribute to this profile. The following statistics appeared in the executive summary of the document for the Mid-Ohio Valley region. Regarding road risks:

> *Calhoun County has 68 miles of road that is susceptible to high/medium probability of landslides. Jackson County has about 92 miles; Pleasants County has about 29 miles; Ritchie County has almost 105 miles; Roane County has about 123 miles; Tyler County has almost 44 miles; Wirt County has about 53 miles; and Wood County has 86 miles of road prone to high/medium risk for slope failure. Counties were ranked for slope failure risk based on the number of miles that are at risk. Three Region 5 counties rank in the Top 20 for highest number of road miles at risk from landslides in the state. Of all 55 counties, Calhoun County ranks 32nd, Jackson 20th, Pleasants 47th, Ritchie 15th, Roane 10th, Tyler 43rd, Wirt 36th, and Wood 23rd. In each county, most of the at-risk roads are in unincorporated areas.* (WVGISTC, FEMA, & WVEMD, 2022, p. 1)

The analysis also included a structure/parcel analysis that examined the numbers of structures with a medium or high susceptibility. The report stated:

> *Calhoun County has a total of 62 primary structures with a total appraisal value of $1,290,525 that are in high/medium susceptibility areas. Jackson County has 278 primary structures with a total appraisal value of $9,222,702 in high/medium susceptibility areas. Pleasants County has 122 primary structures with a total appraisal value of $2,235,075 in high/medium susceptibility areas. Ritchie County has a total of 157 primary structures with a total appraisal value of $6,013,139 that are in high/medium susceptibility areas. Roane County has 306 primary structures with total appraisal value of $8,132,245 in high/medium susceptibility areas. Tyler County has 71 primary structures with a total appraisal value of $945,900 in high/medium susceptibility areas. Wirt County has 88 primary structures with total appraisal value of $636,117 in high/medium susceptibility areas. Wood County has 392 primary structures with a total appraisal value of $20,735,403 in high/medium susceptibility*

[1] The Mid-Ohio Valley Region Council maintains a copy of the full report for Region 5.

areas. For total count of at-risk structures in the state, Calhoun ranks 55th, Jackson 36th, Pleasants 50th, Ritchie 49th, Roane 31st, Tyler 53rd, Wirt 51st, and Wood 21st. For the value of total assets at high or medium risk of landslides, Calhoun ranks 53rd, Jackson 32nd, Pleasants 50th, Ritchie 43rd, Roane 35th, Tyler 54th, Wirt 55th, and Wood 19th. (WVGISTC, FEMA, & WVEMD, 2022, p. 1)

Impacts and Vulnerability

The whole of Earth's surface is endangered by land slippage, and all landslides or slips involve the failure of earth materials under stress. Particularly vulnerable areas to landslides are mountainous regions and those that experience volcanic, seismic, or excessive flooding activity, Removal of lateral support, overloading, vibrations from earthquakes, soil composition, and change in weather or water content all contribute to land movement. Slope saturation by water is a primary cause of landslides (USGS, 2004). This can occur from intense rainfall, snowmelt, changes in ground-water levels, and water-level changes along coastlines, earth dams, and the bands of lakes, reservoirs, canals, and rivers.

Landslides can destroy individual homes or sweep away whole communities, devastate farm and forest land, destroy mines, cut roadways, roads, bridges, tunnels, cables, surface mains and pipelines, and damage dams, channels, and protecting walls. Significant rock movement may also cause secondary losses, as debris may dam whole valleys and create temporary or permanent water reservoirs.

Generally, landslides and subsidence (general and mining) cause death, injuries, trauma and suffocation from entrapment. Depending on the location, these events could cause losses and damages to homes, infrastructure and critical facilities and block whole communities off.

Historical Occurrences

The NOAA National Centers for Environmental Information (NCEI) Storm Events Database (2022) lists one geologic hazard for the region. On June 19, 2019, a low-pressure system and associated cold front moved into the Ohio Valley, which was primed for locally-heavy rainfall given the abundant amount of low-level moisture. Showers and thunderstorms formed that evening, resulting mostly in flash flooding throughout the region. However, a mudslide occurred along State Route 2 between Paden City and Sistersville in Tyler County.

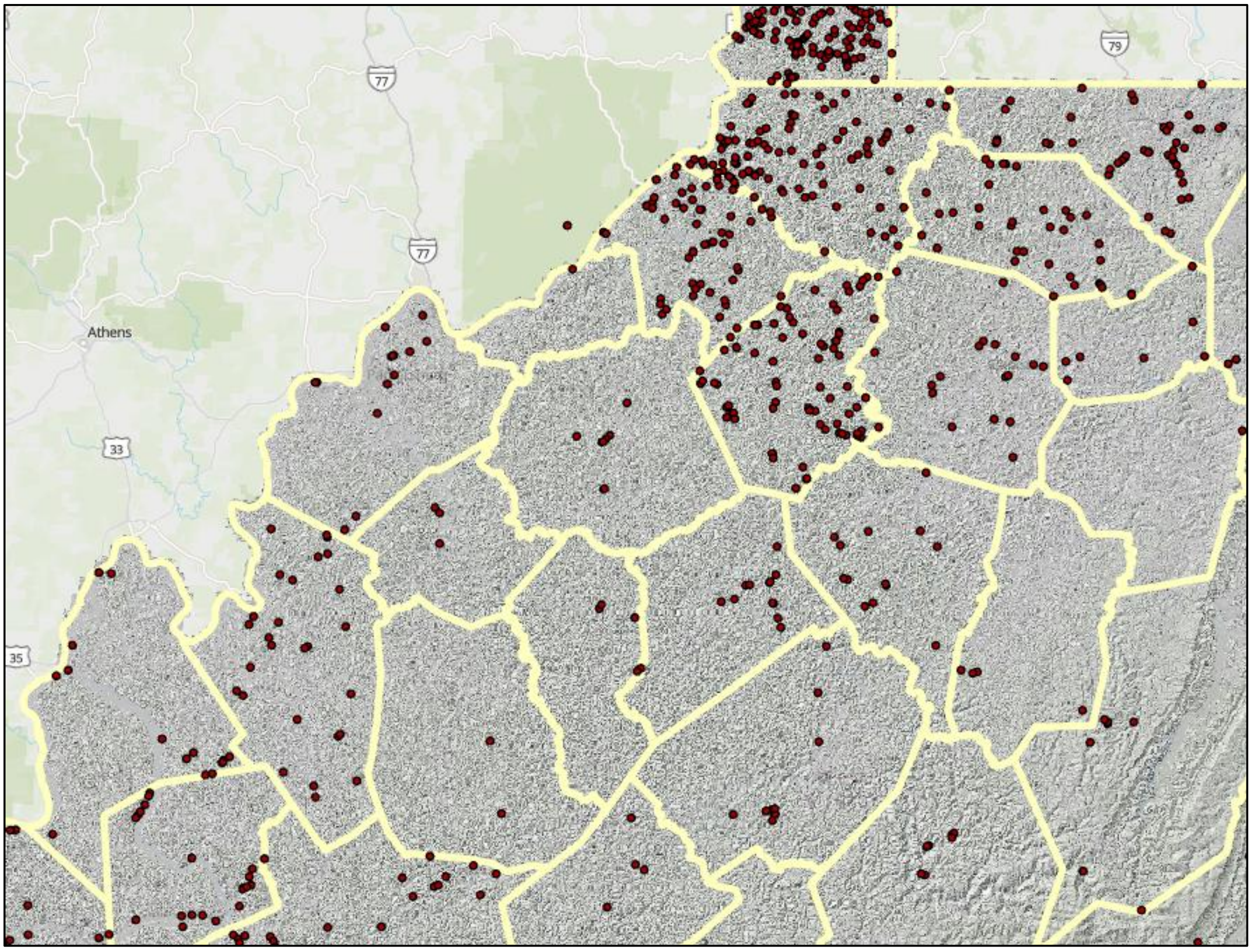
7th Street / Jackson Ave.
Parkersburg

As such, a reasonably accurate comprehensive list of geologic hazard occurrences is difficult to compile. A February 2019 report on social media included photos of a landslide between 7th Street and Jackson Avenue in Parkersburg. Local media outlets have reported other instances of geologic hazards. In April 2020, the Washington Bottom Volunteer Fire Department responded to an instance of a mudslide lifting a home from its foundation, forcing the residents to evacuate their home (Thompson, 2020).

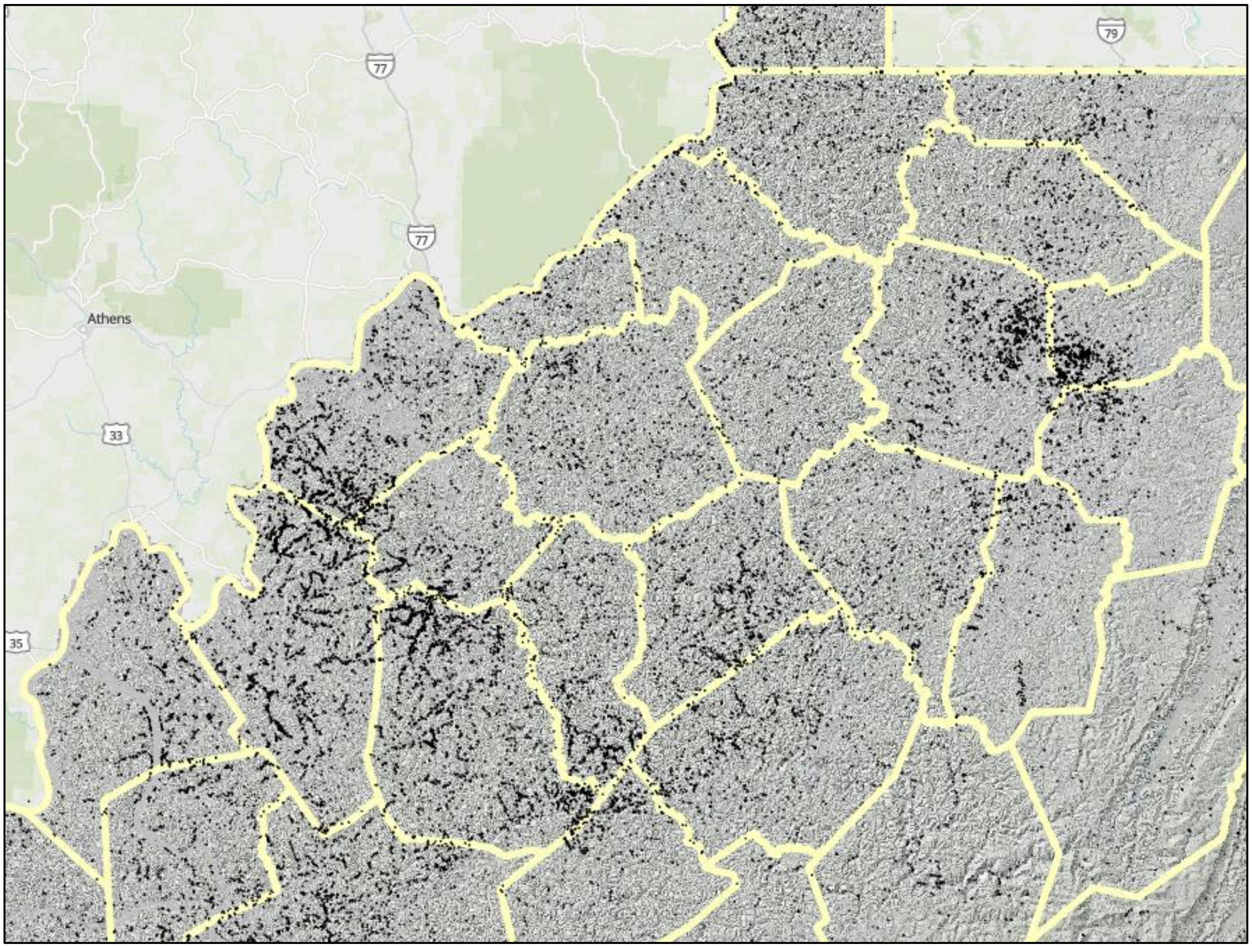
Washington Home (2020)

The West Virginia Landslide Tool (www.mapwv.gov/landslide) contains a historical data inventory of landslides (WVGISTC, 2022). Two data layers show landslides in the Mid-Ohio Valley region. The first is from the West Virginia Department of Transportation (WVDOT), and it lists 1,406 slips noted by that entity statewide between 1973 and 2016. The following graphic is a screen capture of that map zoomed into a rough area of the region. The gray areas are topographical representations that are indiscernible at the scale in the image; however, the maroon dots are the slips captured by the WVDOT.

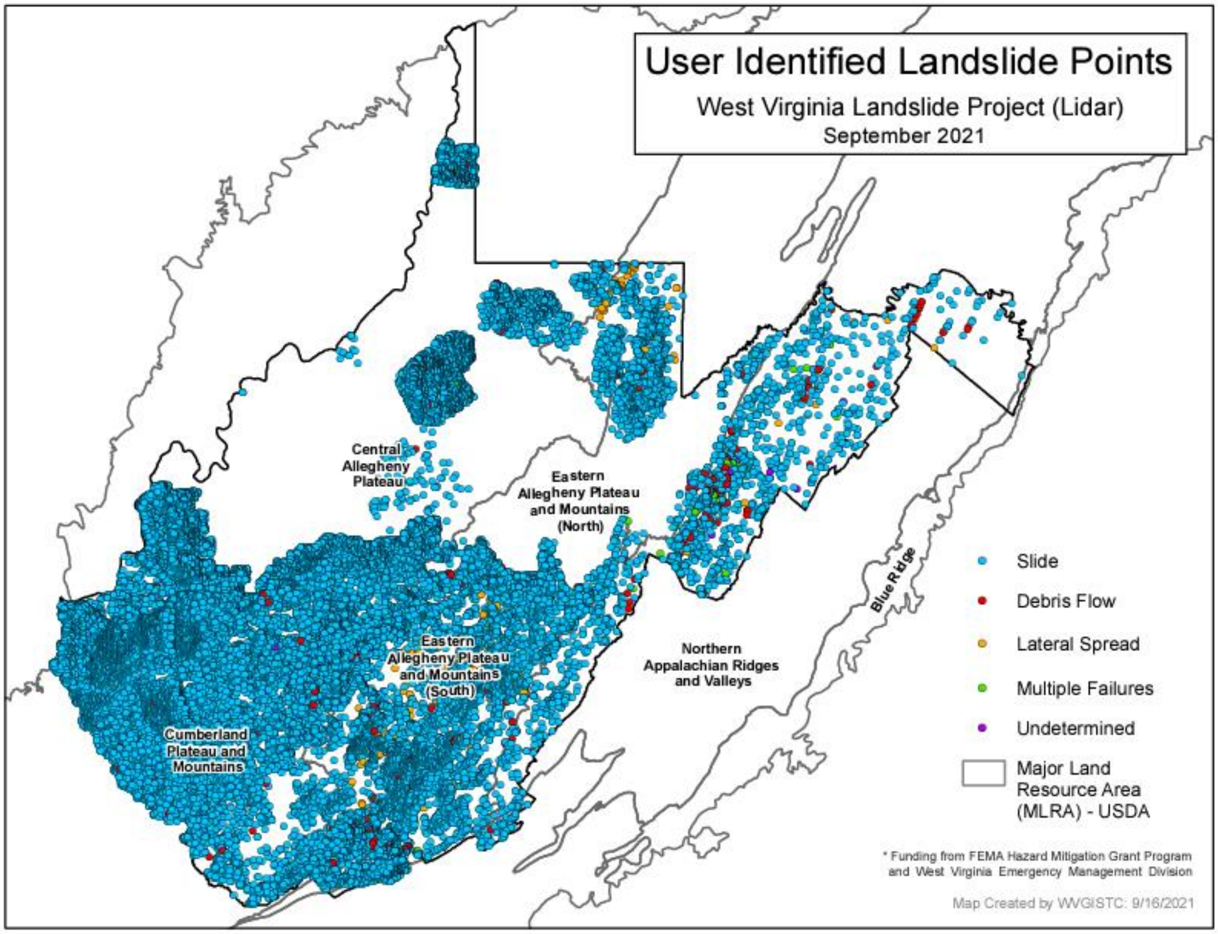
MOVRC
Mid-Ohio Valley Regional Council

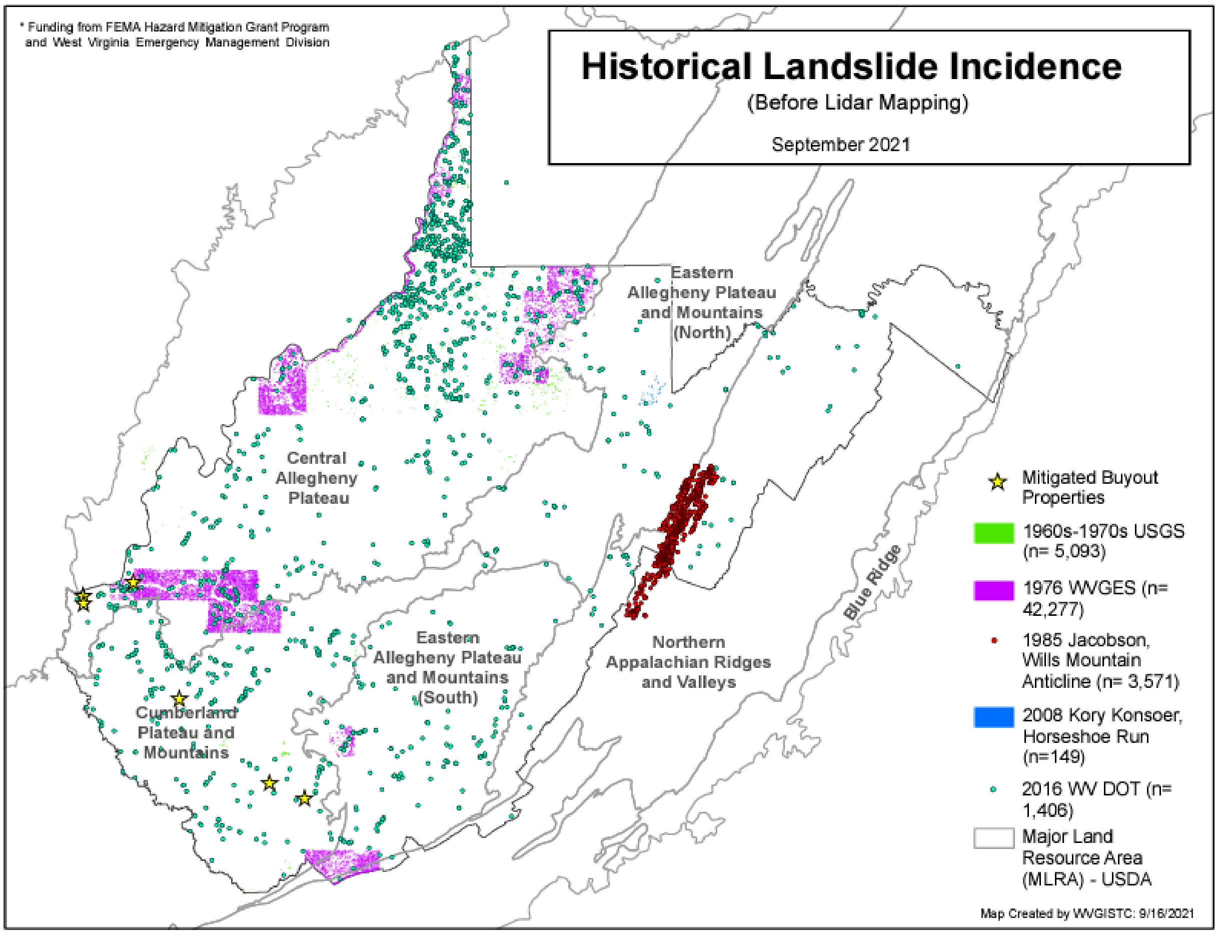


The other layer from the landslide tool that is relevant is from the USGS that shows "active or recently active landslides" between 1978 and 1985. The following images are screen captures of that data. Again, the gray areas are topographical representations; the black areas are collections of polygons that show landslide incidents.



Finally, the WVGISTC, FEMA, and WVEMD landslide study contains two maps with historical landslide data. The first map is entitled, “User Identified Landslide Points.” The data is somewhat incomplete for the Mid-Oho Valley regional area. The second map is entitled, “Historical Landslide Incidents (Before Lidar Mapping),” and it contains some data for the region.


User Identified Landslide Points
West Virginia Landslide Project (Lidar)
September 2021
Central Allegheny Plateau
Eastern Allegheny Plateau and Mountains (North)
Eastern Allegheny Plateau and Mountains (South)
Cumberland Plateau and Mountains
Northern Appalachian Ridges and Valleys
Blue Ridge
Slide
Debris Flow
Lateral Spread
Multiple Failures
Undetermined
Major Land Resource Area (MLRA) - USDA
* Funding from FEMA Hazard Mitigation Grant Program and West Virginia Emergency Management Division
Map Created by WVGISTC: 9/16/2021



Loss and Damages

The West Virginia statewide Total Exposure Area Landslide (TEAL) data can assist in estimating losses. The tables below shows susceptibility by road type and structures (to mimic the WVGISTC, FEMA, and WVEMD study) for each jurisdiction in the region.

High/Medium Risk of Landslide by Road Type & Length							
Community Name	*County*	*Roads Total (miles)*	*Roads Total (miles) – High/Medium Risk*	*Interstate Roads High/Medium Risk*	*US Roads High/Medium Risk*	*State Roads High/Medium Risk*	*Other Roads*
Calhoun County*	CALHOUN	494.7	67.4	0	5.3	7.6	54.6
Grantsville	CALHOUN	5	0.6	0	0	0.4	0.3
	CALHOUN	**499.7**	**68**	**0**	**5.3**	**8**	**54.9**
Jackson County *	JACKSON	961.3	90	5.6	1.5	2.8	80.1
Ravenswood	JACKSON	6.5	0.1	0	0	0	0
Ripley	JACKSON	15.6	1.5	0.1	0.7	0	0.7
	JACKSON	**983.4**	**91.6**	**5.7**	**2.2**	**2.8**	**80.8**
Belmont	PLEASANTS	4.8	0	0	0	0	0
Pleasants County*	PLEASANTS	248.4	28.5	0	0	1.7	26.8
St. Mary's	PLEASANTS	4.7	0.2	0	0	0.2	0
	PLEASANTS	**257.9**	**28.7**	**0**	**0**	**1.9**	**26.8**
Auburn	RITCHIE	1.5	0.1	0	0	0	0.1
Cairo	RITCHIE	3.9	0.2	0	0	0	0.1
Ellenboro	RITCHIE	9.9	0.3	0	0.1	0	0.2
Harrisville	RITCHIE	6.9	0.2	0	0	0.1	0.1
Pennsboro	RITCHIE	13.2	2.4	0	0.4	0.1	1.8
Pullman	RITCHIE	2.5	0	0	0	0	0
Ritchie County*	RITCHIE	772.4	101.4	0	1.8	11.1	88.4
	RITCHIE	**810.3**	**104.6**	**0**	**2.3**	**11.3**	**90.7**
Reedy	ROANE	2.6	0	0	0	0	0
Roane County*	ROANE	890.5	123.1	1.9	8.9	6.1	106.3
Spencer	ROANE	10.1	0.4	0	0	0.1	0.3
	ROANE	**903.2**	**123.5**	**1.9**	**8.9**	**6.2**	**106.6**
Friendly	TYLER	1.2	0.1	0	0	0	0.1
Middlebourne	TYLER	1.4	0.1	0	0	0.1	0
Paden City**	TYLER	1.3	0	0	0	0	0
Sistersville	TYLER	3.3	0.5	0	0	0.3	0.2
Tyler County*	TYLER	432.3	43.1	0	0	5.4	37.7
	TYLER	**439.5**	**43.8**	**0**	**0**	**5.8**	**38**
Elizabeth	WIRT	5.9	0	0	0	0	0
Wirt County*	WIRT	404.8	53.2	0	0	6	47.2
	WIRT	**410.7**	**53.2**	**0**	**0**	**6**	**47.2**
North Hills	WOOD	0.1	0	0	0	0	0
Parkersburg	WOOD	67.2	0.9	0.1	0.1	0.5	0.2
Vienna	WOOD	13.3	0	0	0	0	0
Williamstown	WOOD	3.9	0	0	0	0	0
Wood County*	WOOD	898.3	85.2	3.5	5.1	5.8	70.7
	WOOD	**982.8**	**86.1**	**3.6**	**5.2**	**6.3**	**70.9**
Paden City**	TYLER & WETZEL	2.8	0.2	0	0	0	0.1

* Unincorporated Areas
** Split Community
Source: WVGISTC, FEMA, & WVEMD, 2022, p. 14

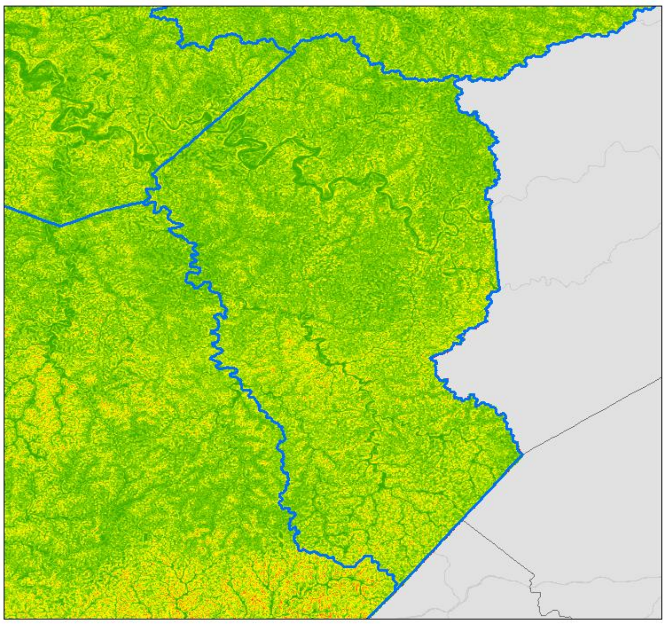
High/Medium Risk of Landslide Susceptibility by Type of Structure							
		RESIDENTIAL OCCUPANCY CLASS High/Medium Susceptibility		COMMERCIAL OCCUPANCY CLASS High/Medium Susceptibility		OTHER OCCUPANCY CLASS High/Medium Susceptibility	
Community Name	County	Res. Count	Res. Value	Comm. Count	Comm. Value	Other Count	Other Value
Calhoun County*	CALHOUN	26	$626,425	1	$33,800	30	$532,400
Grantsville	CALHOUN	5	$97,900	0	$0	0	$0
	CALHOUN	**31**	**$724,325**	**1**	**$33,800**	**30**	**$532,400**
Jackson County *	JACKSON	132	$3,849,830	6	$862,900	98	$2,299,800
Ravenswood	JACKSON	2	$22,900	0	$0	1	$0
Ripley	JACKSON	32	$1,840,272	1	$346,000	6	$1,000
	JACKSON	**166**	**$5,713,002**	**7**	**$1,208,900**	**105**	**$2,300,800**
Belmont	PLEASANTS	0	$0	0	$0	0	$0
Pleasants County*	PLEASANTS	70	$1,770,442	1	$0	47	$298,633
St. Mary's	PLEASANTS	3	$166,000	0	$0	1	$0
	PLEASANTS	**73**	**$1,936,442**	**1**	**$0**	**48**	**$298,633**
Auburn	RITCHIE	0	$0	0	$0	0	$0
Cairo	RITCHIE	5	$52,100	3	$65,200	0	$0
Ellenboro	RITCHIE	1	$23,100	0	$0	0	$0
Harrisville	RITCHIE	3	$100,300	0	$0	1	$0
Pennsboro	RITCHIE	23	$405,200	1	$0	2	$5,900
Pullman	RITCHIE	1	$22,300	0	$0	0	$0
Ritchie County*	RITCHIE	66	$1,811,623	3	$2,845,400	48	$682,015
	RITCHIE	**99**	**$2,414,623**	**7**	**$2,910,600**	**51**	**$687,915**
Reedy	ROANE	1	$43,300	0	$0	0	$0
Roane County*	ROANE	176	$4,955,017	3	$75,300	78	$1,600,362
Spencer	ROANE	44	$1,408,767	1	$30,300	3	$19,200
	ROANE	**221**	**$6,407,083**	**4**	**$105,600**	**81**	**$1,619,562**
Friendly	TYLER	5	$66,600	0	$0	0	$0
Middlebourne	TYLER	1	$34,800	0	$0	0	$0
Paden City**	TYLER	0	$0	0	$0	0	$0
Sistersville	TYLER	10	$95,600	0	$0	1	$0
Tyler County*	TYLER	23	$425,350	0	$0	31	$323,550
	TYLER	**39**	**$622,350**	**0**	**$0**	**32**	**$323,550**
Elizabeth	WIRT	0	$0	0	$0	0	$0
Wirt County*	WIRT	50	$444,450	0	$0	38	$191,667
	WIRT	**50**	**$444,450**	**0**	**$0**	**38**	**$191,667**
North Hills	WOOD	2	$283,900	0	$0	0	$0
Parkersburg	WOOD	80	$4,677,010	0	$0	7	$9,700
Vienna	WOOD	10	$1,707,950	0	$0	0	$0
Williamstown	WOOD	3	$221,200	0	$0	0	$0
Wood County*	WOOD	221	$11,806,684	5	$243,581	64	$1,785,377
	WOOD	**316**	**$18,696,745**	**5**	**$243,581**	**71**	**$1,795,077**
Paden City**	TYLER & WETZEL	4	$146,000	0	$0	1	$0

* Unincorporated Areas
** Split Community
Source: WVGISTC, FEMA, & WVEMD, 2022, p. 18

Future Occurrences

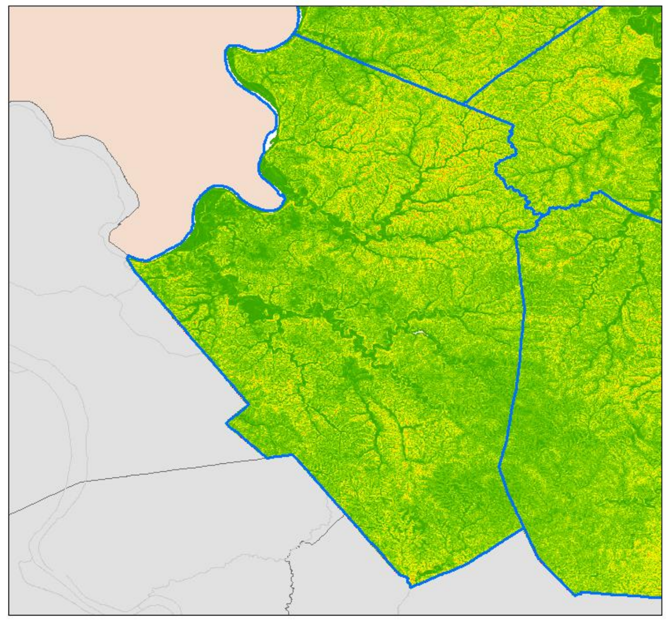
The aforementioned landslide susceptibility study and community-based risk assessment including mapping that shows landslide susceptibility (see below for the Mid-Ohio Valley region). The maps show a range corresponding to the landslide susceptibility of the area and may be of interest when considering the location of future landslide occurrences. Green areas are of lowest concern, while yellow areas are mid-level and red areas are of the highest concern.

CALHOUN COUNTY



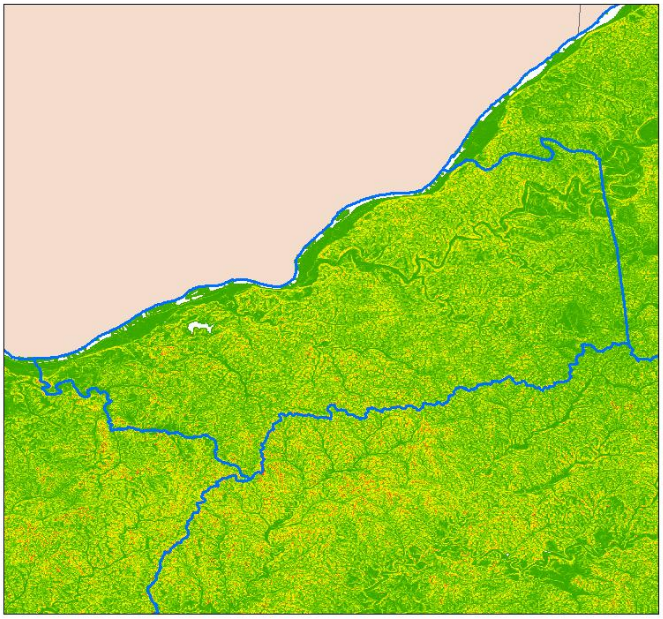
Instances of red pop through the yellow from about the midpoint of the county toward the south.

JACKSON COUNTY



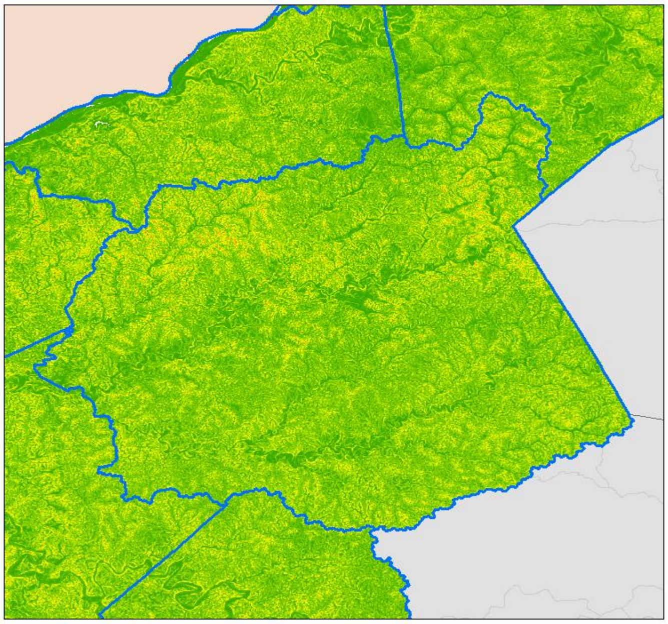
Northeastern Jackson County shows the most areas in red.

PLEASANTS COUNTY



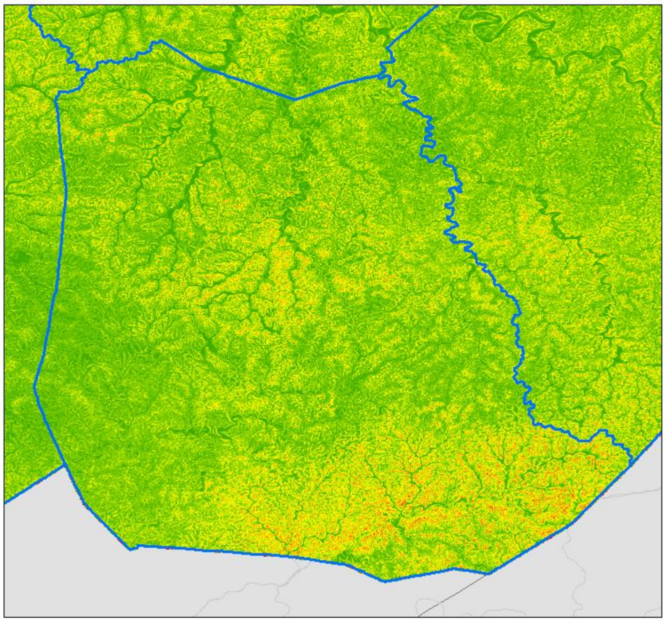
Central Pleasants County shows sporadic red and areas of yellow.

RITCHIE COUNTY



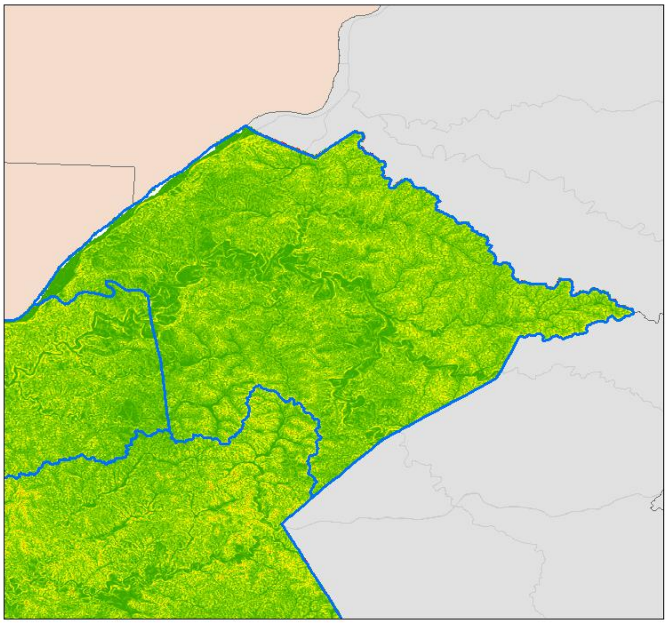
Ritchie County's most susceptible areas, showing some red, are largely along the U.S. Route 50 corridor and points north.

ROANE COUNTY



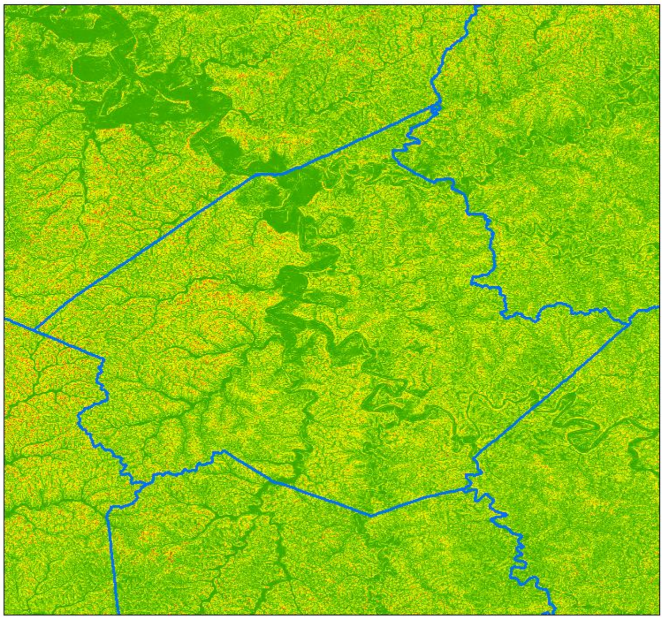
There are some areas of red in the center of the county, but the majority of the areas of concern are in the southern portions of Roane County. The southern Roane areas are some of the most susceptible in the region.

TYLER COUNTY



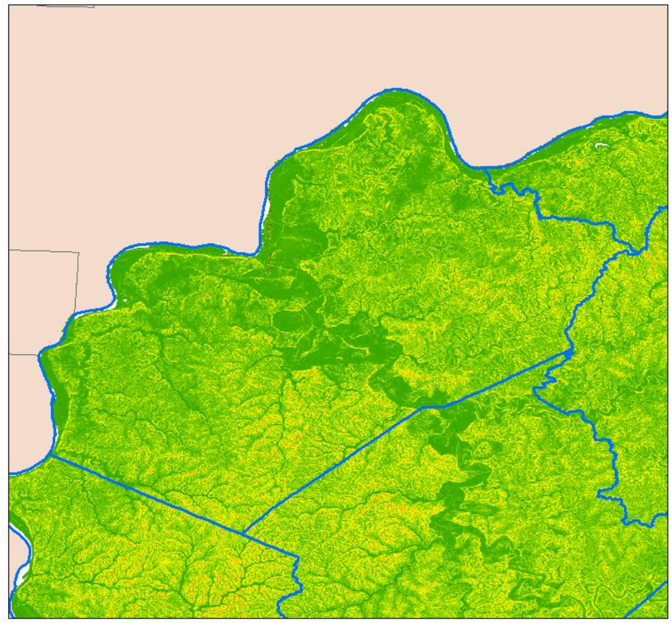
Tyler County's most susceptible areas are largely yellow with some sporadic red along the Ohio River.

WIRT COUNTY



Wirt County's areas of highest susceptibility are the corner of Jackson and Wood Counties in its western areas.

WOOD COUNTY



The western portions of Wood County show yellow areas with sporadic red; however, the southwestern portions near the corner of Jackson and Wirt Counties appear to be the most susceptible.

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from geologic hazards. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding geologic hazards.

Public Sentiment, Geologic Hazards					
	Level of Concern				*Total Responses*
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	
Geologic Hazards	12 (18.46%)	22 (33.85%)	15 (23.08%)	16 (24.62%)	65
In the past ten years, do you remember this hazard occurring in your community?				26 (40.00%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				27 (40.91%)	66
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.52%)	66

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Geologic Hazards Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	5	Excessive (Will occur in a year)	Though a number of total incidents is unavailable, the data that is available demonstrates land subsidence, landslide, and mudslide occurrences throughout the region.
Response	4	One month	The response to geologic hazards may be protracted. As an example, to fix a slip or a slide along a roadway, a crew may be on-site for a week for clean-up and construction to fix the area would take longer.
Onset	1	Over 24 hours	Some slips can occur without notice; however, the areas most susceptible to land subsidence and landslides are known.
Magnitude	1	Localized (less than 10% of land area affected)	Incidence data suggests the entire region (i.e., 100%) could be susceptible to occurrences; however, the incidents that do occur are site-specific. Further, per WVGISTC, FEMA, and WVEMD data, less than 10% of the roadway and building stock is at high/medium risk.
Business	1	Less than 24 hours	Widespread business closure would be unexpected as a result of a landslide, mudslide, or land subsidence. An impacted business may be interrupted, though.
Human	1	Minimum (minor injuries)	Though not impossible, there is no historical evidence of injury or death in the region from geologic hazards.
Property	2	10-25% of property affected	Planners used this ranking as a middle ground between likely factors. Occurrences of the hazard would not likely impact 10-25% of the entire building stock of the region; however, an occurrence may impact the entirety (100%) of an impacted structure.
Total	**15**	**Low**	

2.0 RISK ASSESSMENT

2.2.9 Severe Summer Storms

<table>
<tr><td colspan="5">A severe thunderstorm is one that produces a tornado, winds in excess of 58 miles per hour, or hail of one inch in diameter or larger. Severe hail is often a product of severe storms, producing hailstones of one inch in diameter or larger. Straight-line winds (derechos), downbursts, macrobursts, and gust fronts are all part of severe wind events.</td></tr>
<tr><td rowspan="4">Vulnerability
HIGHEST
HIGH
MEDIUM
LOW
LOWEST</td><td>Period of Occurrence:</td><td>At any time</td><td>Hazard Index Ranking:</td><td>High</td></tr>
<tr><td>Warning Time:</td><td>12-24 hours</td><td>State Risk Ranking:</td><td>High</td></tr>
<tr><td>Probability:</td><td>Will occur in a year</td><td>Severity:</td><td>Medium</td></tr>
<tr><td>Type of Hazard:</td><td>Natural</td><td>Disaster Declarations:</td><td>DR-569-WV (1978)
DR-628-WV (1980)
DR-753-WV (1985)
DR-1168-WV (1997)
DR-1229-WV (1998)
DR-1319-WV (2000)
DR-1378-WV (2001)
DR-1474-WV (2003)
DR-1500-WV (2003)
DR-1522-WV (2004)
DR-1558-WV (2004)
DR-1574-WV (2005)
DR-1769-WV (2008)
DR-1838-WV (2009)
EM-3345-WV (2012)
DR-4059-WV (2012)
DR-4071-WV (Super Derecho, 2012)
USDA FSA S3386 (2012)
DR-4132-WV (2013)
DR-4210-WV (2015)
DR-4220-WV (2015)
DR-4221-WV (2015)
DR-4236-WV (2015)
USDA FSA S3934 (2015)
DR-4273-WV (2016)
DR-4331-WV (2017)
DR-4359-WV (2018)
USDA FSA S4480 (2019)
USDA FSA S4498 (2019)
USDA FSA S4532 (2019)
USDA FSA S4541 (2019)
USDA FSA S4733 (2020)
USDA FSA S4735 (2020)
USDA FSA S4747 (2020)</td></tr>
</table>

Hazard Overview

The steering committee guiding this update consolidated several weather hazards into this profile because the responses to them are similar, as are mitigative measures. This profile considers:

- Hail,
- Heavy rain,
- High winds,
- Lightning,
- Strong winds, and
- Thunderstorm winds.

Tornadoes are considered independently as a part of Section 2.2.10. For discussion of severe winter weather, see Section 2.2.12.

A thunderstorm is "severe" when it produces a tornado, winds of at least 58 mph, or hail at least one inch in diameter. Hazards associated with severe thunderstorms include lightning, heavy rain, hail, damaging wind, and tornadoes.

Types of Thunderstorms

Type	*Description*	*Duration*	*Wind Speeds*	*Associated Hazards*
Single Cell	Uncommon	20 - 30 minutes	N/A	• Non-damaging hail • Microbursts • Weak tornadoes
Multi-Cell	Common, organized cluster of two or more single cells.	Each cell lasts approximately 20 minutes	Downbursts of up to 80 mph	• Heavy rainfall • Downbursts • Hail • Weak tornadoes
Mesoscale Convective System (MCS)	A well-organized system of thunderstorms	Up to 12 hours or more	55 mph or more	• Torrential rainfalls • Derechos • Tornadoes
Squall Lines	May extend over 250 to 500 miles and 10 to 20 miles wide	Individual cells last from 30 to 60 minutes	N/A	• Significant rain after the storm • Derechos
Super Cells	Most dangerous storms, visible with Doppler radars	1 - 6 hours	Updrafts and downdrafts of more than 100 mph	• Tornadoes • Hail

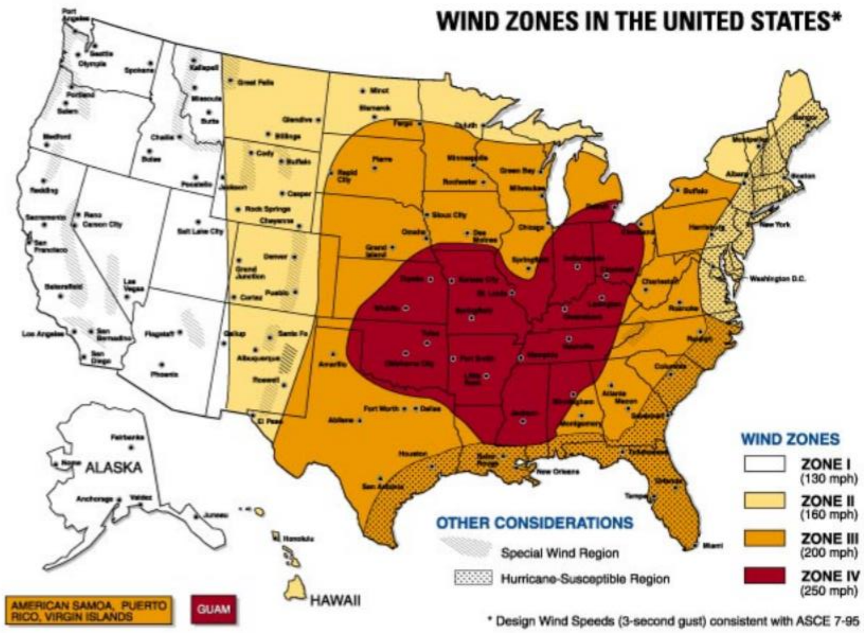
Lightning is a naturally-occurring spark of electricity in the air between clouds, the air, or the ground. Air acts as an insulator between the cloud and the ground, but when the charge difference becomes great enough, this insulating capacity breaks down, allowing the rapid discharge of electricity. This electrical discharge is known as lightning.

Severe wind includes non-tornadic, damaging winds from thunderstorms. There are six types of severe wind: straight-line wind, downbursts, macrobursts, microbursts, gust fronts, and derechos.

- **Straight-line Wind:** Straight-line wind is a term used to define any thunderstorm wind not associated with rotation, used mainly to differentiate from tornadic winds.
- **Downburst:** Downburst is the general term for all localized strong wind events caused by a strong downdraft within a thunderstorm.
- **Macroburst:** An outward burst of strong winds at or near the surface with a diameter larger than 2.5 miles that occurs when a strong downdraft reaches the surface.
- **Microburst:** A small, concentrated downburst that produces an outward burst of strong winds near the surface. Microbursts are small and short-lived, with a diameter less than 2.5 miles and lasting only five to 10 minutes.
- **Gust Front:** The leading edge of rain-cooled air that clashes with warmer thunderstorm inflow. It is characterized by a wind shift, temperature drop, and gusty winds ahead of a thunderstorm.
- **Derecho:** A widespread, long-lived wind storm associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts and downbursts. An event with wind speeds of at least 58 mph and a diameter of 240 miles is a derecho.

Location and Extent

Thunderstorms and hail can affect all areas of the region. These events can last a few seconds (i.e., lightning), minutes, hours (thunderstorms and hailstorms), or days (high winds). The wind is a commonplace phenomenon across the globe. Wind events can impact several jurisdictions at the same time, with varying duration and severity. All areas of the Mid-Ohio Valley are at an equal risk of experiencing severe wind events. FEMA's wind zone map classifies wind zones in the United States. As shown below, all of West Virginia lies within a Zone III area, which means buildings should be constructed to withstand three-second gusts of up to 200 miles per hour.



The Beaufort Wind Scale measures wind. This scale characterizes wind using a 0-12 metric based on observation rather than exact measurements. The table below outlines the scale in detail.

Beaufort Wind Scale					
Force	*Wind Speed*		*Description*	*Appearance of Wind Effects*	
	Knots	*MPH*		*On Water*	*On Land*
0	>1	>1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-6	4-7	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	7-10	8-12	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	11-16	13-18	Moderate Breeze	Small waves 1-4 ft. becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	17-21	19-24	Fresh Breeze	Moderate waves 4-8 ft. taking longer form, many whitecaps, some spray	Small trees in leaf begin to sway
6	22-27	25-31	Strong Breeze	Larger waves 8-13 ft., whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	28-33	32-38	Near Gale	Sea heaps up, waves 13-19 ft., white foam streaks off breakers	Whole trees moving, resistance felt walking against wind

Beaufort Wind Scale					
Force	Wind Speed		Description	Appearance of Wind Effects	
	Knots	MPH		On Water	On Land
8	34-40	39-46	Gale	Moderately high (18-25 ft.) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	41-47	47-54	Strong Gale	High waves (23-32 ft.), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	48-55	55-63	Storm	Very high waves (29-41 ft.) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, "considerable structural damage"
11	56-63	64-72	Violent Storm	Exceptionally high (37-52 ft.) waves, foam patches cover sea, visibility more reduced	N/A
12	64+	72+	Hurricane	Air filled with foam, waves over 45 ft., sea completely white with driving spray, visibility greatly reduced	N/A

Impacts and Vulnerability

The impacts of severe summer storms include injury and even death. In some cases, lightning has caused fires in structures and open land or forests, while heavy rains can damage vegetation and infrastructure. Hail has caused substantial damage to vehicles and buildings. Recently, some of the most damaging impacts of severe summer storms have been the cascading effects of long-term power outages.

Severe wind can cause a variety of secondary and tertiary hazards. In addition to damaging roofs and other home finishings, wind can cause damage to trees that may interrupt power service or block roadways. Such damages could be widespread and severe, potentially overwhelming the capacity of local responders to address the situation.

Historical Occurrences

As suggested by the number of disaster declarations referencing weather that occurs during severe summer storms, this hazard is one of the most frequent facing the Mid-Ohio Valley region. The NOAA National Centers for Environmental Information Storm Event Database (2022), lists 1,403 severe summer storm events in the region since 1956. Many of the events overlap because they in the database for multiple counties and because, for example, lightning and hail may occur during a thunderstorm event. There are 448 unique dates associated with these events, which likely yields a more accurate estimate of the number of events to have occurred since 1956.

For space and readability purposes, the following table lists only the 592 events for which any property or crop loss was reported. Though no damages appeared with the remaining 811 event records, two deaths and 29 injuries did appear.

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.*[1]	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood County	2/21/1993	Thunderstorm Wind	52 mph	0	0	$5,000.00	$0.00
Roane County	2/21/1993	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Roane County	5/18/1993	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Jackson County	11/17/1993	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Tyler County	11/17/1993	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Tyler County	11/17/1993	Thunderstorm Wind	0	0	0	$500.00	$0.00
Ritchie County	4/15/1994	Hail	1"	0	0	$5,000.00	$0.00
Roane County	6/11/1994	Hail	1"	0	0	$5,000.00	$5,000.00
Roane County	6/11/1994	Thunderstorm Wind	0	0	0	$500.00	$0.00
Tyler County	6/21/1994	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Roane County	7/9/1994	Thunderstorm Wind	0	0	0	$50,000.00	$0.00
Roane County	7/9/1994	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Tyler County	7/20/1994	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Wood County	7/20/1994	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Jackson County	7/29/1994	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Wood County	9/25/1994	Hail	1"	0	0	$500,000.00	$0.00
Wood County	9/25/1994	Hail	2.25"	0	0	$500,000.00	$0.00
Wood County	5/10/1995	Thunderstorm Wind	0	0	0	$1,000.00	$0.00
Jackson County	6/8/1995	Thunderstorm Wind	0	0	0	$10,000.00	$0.00
Jackson County	6/10/1995	Thunderstorm Wind	0	0	0	$20,000.00	$0.00
Wood County	6/20/1995	Thunderstorm Wind	0	0	0	$20,000.00	$0.00
Ritchie County	6/20/1995	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Wood County	6/20/1995	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Tyler County	6/21/1995	Thunderstorm Wind	0	0	0	$30,000.00	$0.00
Jackson County	8/1/1995	Thunderstorm Wind	0	0	0	$5,000.00	$0.00
Ritchie County	2/8/1996	Heavy Rain	N/A	4	0	$5,000.00	$0.00
Pleasants County	3/25/1996	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Pleasants County	3/25/1996	Hail	1"	0	0	$2,000.00	$0.00
Wood County	4/23/1996	Thunderstorm Wind	N/A	0	1	$250,000.00	$0.00
Jackson County	4/23/1996	Thunderstorm Wind	N/A	0	0	$20,000.00	$0.00
Ritchie County	4/23/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Calhoun County	4/23/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Tyler County	4/23/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Pleasants County	4/23/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00

[1] "Mag." = Magnitude

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.*[1]	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wirt County	4/23/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Roane County	4/23/1996	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Jackson County	5/4/1996	Thunderstorm Wind	N/A	0	0	$75,000.00	$0.00
Wirt County	5/4/1996	Thunderstorm Wind	N/A	0	0	$25,000.00	$0.00
Wood County	5/4/1996	Thunderstorm Wind	N/A	0	0	$10,000.00	$0.00
Jackson County	5/4/1996	Thunderstorm Wind	N/A	0	0	$10,000.00	$0.00
Calhoun County	5/4/1996	Thunderstorm Wind	N/A	0	0	$10,000.00	$0.00
Roane County	5/4/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Ritchie County	5/4/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Wood County	6/7/1996	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Wood County	6/14/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Ritchie County	6/14/1996	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wood County	6/22/1996	Hail	1.75"	0	0	$20,000.00	$0.00
Wood County	6/22/1996	Hail	1.75"	0	0	$5,000.00	$0.00
Pleasants County	6/24/1996	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Jackson County	6/24/1996	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Roane County	6/24/1996	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Tyler County	6/24/1996	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Jackson County	7/2/1996	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wood County	7/30/1996	Thunderstorm Wind	N/A	0	1	$400,000.00	$0.00
Calhoun County	7/30/1996	Thunderstorm Wind	N/A	0	0	$40,000.00	$0.00
Jackson County	8/8/1996	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Wood County	8/8/1996	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Wood County	5/18/1997	Thunderstorm Wind	70 mph	0	0	$8,000.00	$0.00
Pleasants County	5/18/1997	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Ritchie County	6/13/1997	Thunderstorm Wind	N/A	0	0	$10,000.00	$0.00
Jackson County	7/2/1997	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Ritchie County	7/9/1997	Thunderstorm Wind	N/A	0	0	$85,000.00	$0.00
Jackson County	7/9/1997	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Ritchie County	7/9/1997	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Wood County	7/27/1997	Lightning	N/A	0	0	$50,000.00	$0.00
Jackson County	7/27/1997	Lightning	N/A	0	0	$20,000.00	$0.00
Wood County	7/27/1997	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Wood County	7/27/1997	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Wood County	7/27/1997	Strong Wind	N/A	0	2	$2,000.00	$0.00
Jackson County	7/28/1997	Thunderstorm Wind	N/A	0	0	$15,000.00	$0.00
Tyler County	7/28/1997	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Pleasants County	7/28/1997	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wood County	7/28/1997	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Ritchie County	7/28/1997	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wirt County	7/28/1997	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wood County	7/28/1997	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Roane County	8/15/1997	Thunderstorm Wind	N/A	0	0	$100,000.00	$0.00
Wood County	8/17/1997	Thunderstorm Wind	N/A	0	0	$200,000.00	$0.00
Ritchie County	8/17/1997	Thunderstorm Wind	N/A	0	0	$70,000.00	$0.00
Jackson County	8/17/1997	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Jackson County	8/17/1997	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Roane County	8/17/1997	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Jackson County	1/8/1998	Thunderstorm Wind	N/A	0	0	$175,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.[1]*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Jackson County	1/8/1998	Hail	1.75"	0	0	$20,000.00	$0.00
Wood County	1/8/1998	Hail	1.75"	0	0	$20,000.00	$0.00
Wood County	1/8/1998	Hail	1.75"	0	0	$5,000.00	$0.00
Pleasants County	1/9/1998	Thunderstorm Wind	N/A	0	0	$80,000.00	$0.00
Roane (Zone)	3/9/1998	Strong Wind	N/A	0	0	$5,000.00	$0.00
Ritchie County	6/12/1998	Thunderstorm Wind	N/A	0	0	$90,000.00	$0.00
Wirt County	6/12/1998	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Jackson County	6/13/1998	Thunderstorm Wind	N/A	0	0	$150,000.00	$0.00
Calhoun County	6/16/1998	Thunderstorm Wind	N/A	0	0	$50,000.00	$0.00
Tyler County	6/16/1998	Thunderstorm Wind	N/A	0	0	$50,000.00	$0.00
Ritchie County	6/16/1998	Hail	1.75"	0	0	$50,000.00	$0.00
Jackson County	6/16/1998	Thunderstorm Wind	N/A	0	0	$25,000.00	$0.00
Wirt County	6/16/1998	Hail	1.25"	0	0	$25,000.00	$25,000.00
Pleasants County	6/16/1998	Thunderstorm Wind	N/A	0	0	$15,000.00	$0.00
Wood County	6/22/1998	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Tyler County	6/26/1998	Thunderstorm Wind	N/A	0	0	$15,000.00	$0.00
Ritchie County	6/26/1998	Thunderstorm Wind	N/A	0	0	$10,000.00	$0.00
Wood County	6/26/1998	Thunderstorm Wind	N/A	0	0	$10,000.00	$0.00
Tyler County	6/26/1998	Hail	1.5"	0	0	$10,000.00	$0.00
Pleasants County	6/26/1998	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Ritchie County	6/26/1998	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wood County	6/27/1998	Thunderstorm Wind	63 mph	0	0	$450,000.00	$0.00
Pleasants County	6/27/1998	Thunderstorm Wind	N/A	0	0	$75,000.00	$0.00
Tyler County	6/27/1998	Thunderstorm Wind	N/A	0	0	$30,000.00	$0.00
Tyler County	6/27/1998	Thunderstorm Wind	N/A	0	0	$20,000.00	$0.00
Ritchie County	6/27/1998	Thunderstorm Wind	N/A	0	0	$10,000.00	$0.00
Wirt County	6/27/1998	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Roane County	6/27/1998	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Calhoun County	6/27/1998	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Calhoun County	6/27/1998	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Calhoun County	6/28/1998	Thunderstorm Wind	N/A	0	0	$50,000.00	$0.00
Wirt County	6/28/1998	Thunderstorm Wind	N/A	0	0	$40,000.00	$0.00
Tyler County	6/28/1998	Thunderstorm Wind	N/A	0	0	$15,000.00	$0.00
Roane County	6/28/1998	Thunderstorm Wind	N/A	0	0	$10,000.00	$0.00
Roane County	6/28/1998	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Pleasants County	6/28/1998	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Jackson County	6/29/1998	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Wood County	7/22/1998	Lightning	N/A	0	0	$12,000.00	$0.00
Tyler County	8/24/1998	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Ritchie County	8/25/1998	Thunderstorm Wind	N/A	0	0	$8,000.00	$0.00
Wirt County	4/9/1999	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Jackson County	4/9/1999	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Ritchie County	4/9/1999	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Tyler County	4/23/1999	Hail	1.75"	0	0	$5,000.00	$0.00
Ritchie County	7/17/1999	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Ritchie County	7/31/1999	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Jackson County	8/13/1999	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Calhoun County	4/17/2000	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Jackson County	4/17/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.*[1]	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Jackson County	4/20/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Pleasants County	5/23/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Roane County	5/24/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Roane County	6/2/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Calhoun County	6/2/2000	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Roane County	6/14/2000	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Roane County	6/14/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Ritchie County	6/14/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Roane County	6/15/2000	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Ritchie County	7/10/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Jackson County	7/10/2000	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Roane County	7/10/2000	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Roane County	7/10/2000	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Tyler County	8/3/2000	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Jackson County	8/9/2000	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Calhoun County	8/9/2000	Thunderstorm Wind	N/A	0	0	$3,000.00	$0.00
Roane County	8/9/2000	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Tyler County	9/20/2000	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Ritchie County	9/20/2000	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Jackson (Zone)	4/15/2001	High Wind	N/A	0	0	$2,000.00	$0.00
Jackson County	5/17/2001	Thunderstorm Wind	N/A	0	0	$20,000.00	$0.00
Wood County	5/17/2001	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Wirt County	5/17/2001	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wirt County	5/17/2001	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Jackson County	5/18/2001	Hail	1.5"	0	0	$15,000.00	$0.00
Jackson County	5/18/2001	Hail	1"	0	0	$10,000.00	$0.00
Jackson County	5/18/2001	Hail	1.5"	0	0	$10,000.00	$0.00
Roane County	5/21/2001	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Jackson County	5/21/2001	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Calhoun County	5/21/2001	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Jackson County	6/2/2001	Thunderstorm Wind	N/A	0	0	$20,000.00	$0.00
Jackson County	6/2/2001	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Ritchie County	6/12/2001	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wirt County	6/12/2001	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Pleasants County	7/1/2001	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wood County	10/24/2001	Thunderstorm Wind	N/A	0	0	$5,000.00	$0.00
Jackson (Zone)	3/9/2002	High Wind	N/A	0	0	$10,000.00	$0.00
Wood (Zone)	3/9/2002	High Wind	61 mph	0	0	$5,000.00	$0.00
Roane (Zone)	3/9/2002	High Wind	N/A	0	0	$2,000.00	$0.00
Tyler (Zone)	3/9/2002	High Wind	N/A	0	0	$2,000.00	$0.00
Wirt (Zone)	3/9/2002	High Wind	N/A	0	0	$1,000.00	$0.00
Pleasants (Zone)	3/9/2002	High Wind	N/A	0	0	$1,000.00	$0.00
Ritchie (Zone)	3/9/2002	High Wind	N/A	0	0	$1,000.00	$0.00
Wood County	4/28/2002	Hail	1"	0	0	$10,000.00	$0.00
Ritchie County	4/28/2002	Hail	1.75"	0	0	$10,000.00	$0.00
Calhoun County	4/28/2002	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Pleasants County	6/4/2002	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Jackson County	6/4/2002	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Calhoun County	8/3/2002	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.*[1]	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Jackson County	11/10/2002	Thunderstorm Wind	N/A	0	0	$200,000.00	$0.00
Calhoun County	11/10/2002	Thunderstorm Wind	N/A	0	0	$2,000.00	$0.00
Wood County	11/10/2002	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Wirt County	11/10/2002	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Roane County	11/10/2002	Thunderstorm Wind	N/A	0	0	$1,000.00	$0.00
Calhoun County	5/10/2003	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Jackson County	7/10/2003	Thunderstorm Wind	70 mph	0	0	$125,000.00	$0.00
Wood County	7/10/2003	Thunderstorm Wind	60 mph	0	3	$50,000.00	$0.00
Roane County	7/10/2003	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	3/5/2004	Thunderstorm Wind	55 mph	0	0	$10,000.00	$0.00
Pleasants County	3/5/2004	Thunderstorm Wind	55 mph	0	0	$5,000.00	$0.00
Jackson County	5/26/2004	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	7/15/2005	Lightning	N/A	0	0	$25,000.00	$0.00
Ritchie County	7/25/2005	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Pleasants County	7/25/2005	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood County	7/25/2005	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Tyler County	7/25/2005	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Jackson County	7/25/2005	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wirt County	7/25/2005	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Calhoun County	7/25/2005	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Roane County	7/25/2005	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wirt County	8/7/2006	Thunderstorm Wind	55 mph	0	0	$150,000.00	$0.00
Wood County	8/7/2006	Thunderstorm Wind	55 mph	0	0	$10,000.00	$0.00
Roane County	10/4/2006	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood (Zone)	2/10/2008	Strong Wind	49 mph	0	0	$10,000.00	$0.00
Wood County	5/31/2008	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	6/4/2008	Thunderstorm Wind	87 mph	0	0	$10,000.00	$0.00
Jackson County	6/16/2008	Hail	1"	0	0	$10,000.00	$0.00
Roane County	6/16/2008	Hail	1.75"	0	0	$1,000.00	$0.00
Wood County	6/22/2008	Hail	1.75"	0	0	$5,000.00	$0.00
Wirt County	6/28/2008	Thunderstorm Wind	50 mph	0	0	$350,000.00	$0.00
Wood County	6/28/2008	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Tyler County	6/28/2008	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Jackson County	7/20/2008	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Jackson County	7/22/2008	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Pleasants County	7/22/2008	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Jackson County	2/11/2009	Thunderstorm Wind	50 mph	0	0	$20,000.00	$0.00
Roane County	2/11/2009	Thunderstorm Wind	55 mph	0	0	$20,000.00	$0.00
Calhoun County	2/11/2009	Thunderstorm Wind	55 mph	0	0	$10,000.00	$0.00
Jackson County	2/11/2009	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wirt County	2/11/2009	Thunderstorm Wind	55 mph	0	0	$5,000.00	$0.00
Wood County	2/11/2009	Thunderstorm Wind	55 mph	0	0	$5,000.00	$0.00
Wood County	2/11/2009	Thunderstorm Wind	55 mph	0	0	$5,000.00	$0.00
Pleasants County	2/11/2009	Thunderstorm Wind	55 mph	0	0	$5,000.00	$0.00
Roane County	5/4/2009	Heavy Rain	N/A	0	0	$20,000.00	$0.00
Ritchie County	5/16/2009	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	5/16/2009	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	5/16/2009	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Jackson County	5/30/2009	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.[1]*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood County	6/2/2009	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Wood County	6/2/2009	Hail	1.5"	0	0	$5,000.00	$0.00
Wood County	6/2/2010	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	6/23/2010	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Tyler County	6/23/2010	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Jackson County	8/4/2010	Thunderstorm Wind	50 mph	0	0	$20,000.00	$0.00
Roane County	8/4/2010	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Tyler County	8/4/2010	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	8/4/2010	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Calhoun County	8/4/2010	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Calhoun County	8/5/2010	Thunderstorm Wind	50 mph	0	0	$4,000.00	$0.00
Wirt County	9/16/2010	Thunderstorm Wind	65 mph	0	0	$75,000.00	$0.00
Tyler County	9/16/2010	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Wirt County	9/16/2010	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Calhoun County	9/16/2010	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Calhoun County	9/16/2010	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Calhoun County	9/16/2010	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Jackson County	10/26/2010	Thunderstorm Wind	50 mph	0	0	$25,000.00	$0.00
Jackson County	10/26/2010	Thunderstorm Wind	50 mph	0	0	$25,000.00	$0.00
Jackson County	10/26/2010	Thunderstorm Wind	50 mph	0	0	$25,000.00	$0.00
Jackson County	10/26/2010	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Wood County	11/16/2010	Thunderstorm Wind	44 mph	0	0	$1,000.00	$0.00
Wood County	2/28/2011	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Calhoun County	3/21/2011	Hail	1.75"	0	0	$8,000.00	$0.00
Wood County	3/23/2011	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Wood County	3/23/2011	Hail	1.75"	0	0	$10,000.00	$0.00
Wood County	3/23/2011	Hail	1.75"	0	0	$10,000.00	$0.00
Wood County	3/23/2011	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wirt County	4/23/2011	Thunderstorm Wind	40 mph	0	0	$1,000.00	$0.00
Wood County	5/23/2011	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Roane County	6/7/2011	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Pleasants County	6/7/2011	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Pleasants County	6/7/2011	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wirt County	6/7/2011	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	6/9/2011	Thunderstorm Wind	50 mph	0	0	$8,000.00	$0.00
Wood County	7/11/2011	Thunderstorm Wind	38 mph	0	0	$1,000.00	$0.00
Ritchie County	8/7/2011	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Ritchie County	8/7/2011	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Ritchie County	8/7/2011	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	8/7/2011	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	8/7/2011	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Jackson County	9/14/2011	Hail	1"	0	0	$5,000.00	$0.00
Jackson County	9/14/2011	Hail	1"	0	0	$1,000.00	$0.00
Calhoun County	9/26/2011	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood County	2/29/2012	Thunderstorm Wind	74 mph	0	0	$15,000.00	$0.00
Wood County	6/29/2012	Thunderstorm Wind	56 mph	0	0	$4,000,000.00	$0.00
Jackson County	6/29/2012	Thunderstorm Wind	56 mph	0	0	$2,500,000.00	$0.00
Roane County	6/29/2012	Thunderstorm Wind	56 mph	0	0	$2,000,000.00	$0.00
Ritchie County	6/29/2012	Thunderstorm Wind	61 mph	0	0	$1,000,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.*[1]	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Tyler County	6/29/2012	Thunderstorm Wind	56 mph	0	0	$750,000.00	$0.00
Wirt County	6/29/2012	Thunderstorm Wind	61 mph	0	0	$750,000.00	$0.00
Calhoun County	6/29/2012	Thunderstorm Wind	56 mph	0	0	$750,000.00	$0.00
Pleasants County	6/29/2012	Thunderstorm Wind	56 mph	0	0	$500,000.00	$0.00
Ritchie County	6/29/2012	Thunderstorm Wind	75 mph	0	0	$500,000.00	$0.00
Wood County	6/29/2012	Thunderstorm Wind	56 mph	0	0	$100,000.00	$0.00
Wood County	6/29/2012	Thunderstorm Wind	52 mph	0	0	$20,000.00	$0.00
Ritchie County	7/1/2012	Thunderstorm Wind	50 mph	0	0	$25,000.00	$0.00
Roane County	7/3/2012	Thunderstorm Wind	50 mph	0	0	$20,000.00	$0.00
Roane County	7/3/2012	Lightning	N/A	0	0	$10,000.00	$0.00
Roane County	7/3/2012	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Calhoun County	7/26/2012	Thunderstorm Wind	50 mph	0	0	$6,000.00	$0.00
Pleasants County	7/26/2012	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Roane County	7/26/2012	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Tyler County	7/26/2012	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Roane County	5/22/2013	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wirt County	6/13/2013	Thunderstorm Wind	70 mph	0	0	$20,000.00	$0.00
Jackson County	6/13/2013	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Jackson County	6/13/2013	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	7/10/2013	Thunderstorm Wind	52 mph	0	0	$2,000.00	$0.00
Wood County	7/10/2013	Lightning	N/A	0	0	$2,000.00	$0.00
Wirt County	7/19/2013	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	11/1/2013	Thunderstorm Wind	50 mph	0	0	$80,000.00	$0.00
Jackson County	11/1/2013	Thunderstorm Wind	52 mph	0	0	$25,000.00	$0.00
Ritchie County	11/17/2013	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Roane County	11/17/2013	Thunderstorm Wind	50 mph	0	0	$4,000.00	$0.00
Wirt County	11/17/2013	Thunderstorm Wind	52 mph	0	0	$2,000.00	$0.00
Calhoun County	12/22/2013	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Roane County	12/22/2013	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	2/21/2014	Thunderstorm Wind	50 mph	0	0	$15,000.00	$0.00
Roane County	5/13/2014	Thunderstorm Wind	50 mph	0	0	$20,000.00	$0.00
Roane County	5/13/2014	Thunderstorm Wind	50 mph	0	0	$15,000.00	$0.00
Wood County	5/27/2014	Lightning	N/A	0	0	$125,000.00	$0.00
Jackson County	5/28/2014	Heavy Rain	N/A	0	0	$2,000.00	$0.00
Ritchie County	6/3/2014	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood County	6/3/2014	Hail	1.25"	0	0	$2,000.00	$0.00
Jackson County	6/10/2014	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	6/11/2014	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	6/16/2014	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Wood County	6/16/2014	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	7/8/2014	Thunderstorm Wind	83 mph	0	1	$350,000.00	$0.00
Ritchie County	7/8/2014	Thunderstorm Wind	50 mph	0	0	$175,000.00	$0.00
Calhoun County	7/8/2014	Thunderstorm Wind	56 mph	0	0	$100,000.00	$0.00
Jackson County	7/8/2014	Thunderstorm Wind	52 mph	0	0	$50,000.00	$0.00
Jackson County	7/8/2014	Thunderstorm Wind	50 mph	0	0	$25,000.00	$0.00
Wirt County	7/8/2014	Thunderstorm Wind	52 mph	0	0	$20,000.00	$0.00
Roane County	7/8/2014	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Jackson County	7/8/2014	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Calhoun County	7/8/2014	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.*[1]	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Jackson County	7/8/2014	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Jackson County	7/8/2014	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Roane County	7/8/2014	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Pleasants County	7/27/2014	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	7/27/2014	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	7/27/2014	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood (Zone)	11/1/2014	Strong Wind	40 mph	0	0	$5,000.00	$0.00
Calhoun (Zone)	11/1/2014	Strong Wind	39 mph	0	0	$2,000.00	$0.00
Jackson (Zone)	11/1/2014	Strong Wind	35 mph	0	0	$2,000.00	$0.00
Pleasants (Zone)	11/1/2014	Strong Wind	39 mph	0	0	$2,000.00	$0.00
Ritchie (Zone)	11/1/2014	Strong Wind	39 mph	0	0	$2,000.00	$0.00
Roane (Zone)	11/1/2014	Strong Wind	39 mph	0	0	$2,000.00	$0.00
Tyler (Zone)	11/1/2014	Strong Wind	39 mph	0	0	$2,000.00	$0.00
Wirt (Zone)	11/1/2014	Strong Wind	39 mph	0	0	$2,000.00	$0.00
Jackson County	12/6/2014	Heavy Rain	N/A	0	0	$30,000.00	$0.00
Wirt County	4/8/2015	Thunderstorm Wind	40 mph	0	0	$4,000.00	$0.00
Ritchie County	4/9/2015	Hail	1.25"	0	0	$25,000.00	$0.00
Jackson County	5/11/2015	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	5/11/2015	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wirt County	5/11/2015	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Calhoun County	5/26/2015	Thunderstorm Wind	50 mph	0	0	$100,000.00	$0.00
Wood County	6/20/2015	Thunderstorm Wind	39 mph	0	0	$1,000.00	$0.00
Jackson County	6/26/2015	Thunderstorm Wind	83 mph	0	0	$125,000.00	$0.00
Jackson County	6/26/2015	Thunderstorm Wind	70 mph	0	0	$75,000.00	$0.00
Jackson County	6/26/2015	Thunderstorm Wind	61 mph	0	0	$50,000.00	$0.00
Jackson County	6/26/2015	Thunderstorm Wind	70 mph	0	0	$25,000.00	$0.00
Jackson County	6/26/2015	Hail	1"	0	0	$25,000.00	$0.00
Roane County	6/26/2015	Thunderstorm Wind	61 mph	0	0	$20,000.00	$0.00
Roane County	6/26/2015	Thunderstorm Wind	56 mph	0	0	$15,000.00	$0.00
Roane County	6/26/2015	Thunderstorm Wind	56 mph	0	0	$15,000.00	$0.00
Jackson County	6/26/2015	Hail	2"	0	0	$15,000.00	$0.00
Jackson County	6/26/2015	Hail	1.25"	0	0	$15,000.00	$0.00
Jackson County	6/26/2015	Hail	1.75"	0	0	$15,000.00	$0.00
Roane County	6/26/2015	Thunderstorm Wind	56 mph	0	0	$10,000.00	$0.00
Jackson County	6/26/2015	Hail	1.75"	0	0	$10,000.00	$0.00
Jackson County	6/26/2015	Hail	1.75"	0	0	$5,000.00	$0.00
Jackson County	6/26/2015	Thunderstorm Wind	56 mph	0	0	$1,000.00	$0.00
Wirt County	7/7/2015	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Calhoun County	7/7/2015	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Calhoun County	7/7/2015	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Pleasants County	7/14/2015	Thunderstorm Wind	61 mph	0	0	$25,000.00	$0.00
Wood County	7/14/2015	Thunderstorm Wind	50 mph	0	0	$20,000.00	$0.00
Calhoun County	7/14/2015	Thunderstorm Wind	50 mph	0	0	$20,000.00	$0.00
Wood County	7/14/2015	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Ritchie County	7/14/2015	Thunderstorm Wind	74 mph	0	0	$5,000.00	$0.00
Ritchie County	7/14/2015	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wirt County	7/14/2015	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Roane County	7/14/2015	Thunderstorm Wind	96 mph	0	0	$3,000.00	$0.00
Calhoun County	7/14/2015	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.*[1]	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Ritchie County	8/10/2015	Heavy Rain	N/A	0	0	$2,000.00	$0.00
Roane (Zone)	3/1/2016	Strong Wind	45 mph	0	0	$25,000.00	$0.00
Wood (Zone)	3/1/2016	Strong Wind	38 mph	0	0	$25,000.00	$0.00
Jackson (Zone)	3/1/2016	Strong Wind	39 mph	0	0	$10,000.00	$0.00
Pleasants (Zone)	3/1/2016	Strong Wind	39 mph	0	0	$10,000.00	$0.00
Wirt (Zone)	3/1/2016	Strong Wind	39 mph	0	0	$10,000.00	$0.00
Calhoun (Zone)	3/1/2016	Strong Wind	39 mph	0	0	$10,000.00	$0.00
Ritchie (Zone)	3/1/2016	Strong Wind	39 mph	0	0	$10,000.00	$0.00
Tyler (Zone)	3/1/2016	Strong Wind	40 mph	0	0	$10,000.00	$0.00
Wood (Zone)	4/2/2016	Strong Wind	43 mph	0	0	$15,000.00	$0.00
Calhoun (Zone)	4/2/2016	Strong Wind	43 mph	0	0	$15,000.00	$0.00
Jackson (Zone)	4/2/2016	Strong Wind	43 mph	0	0	$10,000.00	$0.00
Pleasants (Zone)	4/2/2016	Strong Wind	43 mph	0	0	$10,000.00	$0.00
Wirt (Zone)	4/2/2016	Strong Wind	43 mph	0	0	$10,000.00	$0.00
Tyler (Zone)	4/2/2016	Strong Wind	43 mph	0	0	$10,000.00	$0.00
Roane (Zone)	4/2/2016	Strong Wind	43 mph	0	0	$10,000.00	$0.00
Ritchie (Zone)	4/2/2016	Strong Wind	43 mph	0	0	$10,000.00	$0.00
Ritchie County	4/26/2016	Hail	1.75"	0	0	$10,000.00	$0.00
Ritchie County	4/26/2016	Hail	1.75"	0	0	$5,000.00	$0.00
Wood County	4/28/2016	Hail	2"	0	0	$75,000.00	$0.00
Wood County	4/28/2016	Hail	1.75"	0	0	$25,000.00	$0.00
Wirt County	4/28/2016	Hail	2"	0	0	$10,000.00	$0.00
Jackson County	6/23/2016	Thunderstorm Wind	60 mph	0	0	$1,000.00	$0.00
Wood County	7/15/2016	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Tyler County	10/20/2016	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Jackson County	3/1/2017	Thunderstorm Wind	60 mph	0	0	$5,000.00	$0.00
Jackson County	3/1/2017	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Ritchie County	3/1/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Jackson County	3/1/2017	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Jackson County	3/1/2017	Thunderstorm Wind	50 mph	0	0	$200.00	$0.00
Pleasants (Zone)	3/2/2017	Strong Wind	40 mph	0	0	$2,000.00	$0.00
Tyler (Zone)	3/2/2017	Strong Wind	40 mph	0	0	$2,000.00	$0.00
Calhoun County	4/29/2017	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Jackson County	6/23/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood County	6/23/2017	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Jackson County	6/23/2017	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	6/23/2017	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Tyler County	7/7/2017	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	7/7/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood County	7/7/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Pleasants County	7/7/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Pleasants County	7/7/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Pleasants County	7/7/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	7/7/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood County	7/10/2017	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	7/10/2017	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	7/10/2017	Thunderstorm Wind	50 mph	0	0	$4,000.00	$0.00
Wood County	7/10/2017	Thunderstorm Wind	60 mph	0	0	$2,000.00	$0.00
Wood County	7/10/2017	Thunderstorm Wind	60 mph	0	0	$2,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.[1]*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Tyler County	7/10/2017	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Calhoun County	7/10/2017	Thunderstorm Wind	45 mph	0	0	$500.00	$0.00
Roane County	7/10/2017	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Wood County	7/22/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	7/22/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	7/22/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood County	7/22/2017	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Pleasants County	8/19/2017	Thunderstorm Wind	45 mph	0	0	$5,000.00	$0.00
Jackson (Zone)	11/18/2017	Strong Wind	35 mph	0	0	$5,000.00	$0.00
Ritchie (Zone)	11/18/2017	Strong Wind	35 mph	0	0	$5,000.00	$0.00
Roane (Zone)	11/18/2017	Strong Wind	35 mph	0	0	$5,000.00	$0.00
Jackson County	4/3/2018	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Jackson County	4/3/2018	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Tyler County	5/15/2018	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Tyler County	5/15/2018	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Tyler County	5/15/2018	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	5/21/2018	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Roane County	5/21/2018	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Tyler County	5/22/2018	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	7/1/2018	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Jackson County	7/6/2018	Lightning	N/A	0	0	$10,000.00	$0.00
Wood County	7/23/2018	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Calhoun County	7/31/2018	Thunderstorm Wind	50 mph	0	0	$6,000.00	$0.00
Roane County	8/12/2018	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Roane County	8/12/2018	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	12/1/2018	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie (Zone)	2/24/2019	Strong Wind	45 mph	0	0	$50,000.00	$0.00
Pleasants (Zone)	2/24/2019	Strong Wind	45 mph	0	0	$50,000.00	$0.00
Jackson (Zone)	2/24/2019	Strong Wind	45 mph	0	0	$50,000.00	$0.00
Wood (Zone)	2/24/2019	Strong Wind	45 mph	0	0	$50,000.00	$0.00
Calhoun (Zone)	2/24/2019	Strong Wind	45 mph	0	0	$50,000.00	$0.00
Wirt (Zone)	2/24/2019	Strong Wind	45 mph	0	0	$50,000.00	$0.00
Tyler (Zone)	2/24/2019	Strong Wind	45 mph	0	0	$50,000.00	$0.00
Roane (Zone)	2/24/2019	Strong Wind	45 mph	0	0	$50,000.00	$0.00
Jackson County	4/26/2019	Hail	0.88"	0	0	$5,000.00	$0.00
Jackson County	4/26/2019	Hail	1"	0	0	$1,000.00	$0.00
Jackson County	4/26/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Roane County	4/26/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Calhoun County	5/3/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	5/17/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Jackson County	5/23/2019	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Roane County	5/23/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	5/23/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Tyler County	5/25/2019	Lightning	N/A	0	0	$1,000,000.00	$0.00
Tyler County	5/25/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Tyler County	5/25/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Tyler County	5/25/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Tyler County	5/25/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Wirt County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.*[1]	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wirt County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Jackson County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Calhoun County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wood County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Jackson County	5/26/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wirt County	5/29/2019	Thunderstorm Wind	78 mph	0	0	$20,000.00	$0.00
Roane County	5/29/2019	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Wood County	5/29/2019	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wirt County	5/29/2019	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Jackson County	5/29/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	5/29/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	5/29/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	5/29/2019	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Wirt County	5/29/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Roane County	5/29/2019	Thunderstorm Wind	50 mph	1	0	$500.00	$0.00
Wirt County	6/2/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Pleasants County	7/6/2019	Thunderstorm Wind	50 mph	0	0	$4,000.00	$0.00
Ritchie County	7/11/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	7/11/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	7/14/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	7/17/2019	Thunderstorm Wind	40 mph	0	0	$2,000.00	$0.00
Pleasants County	8/8/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Pleasants County	8/8/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	8/8/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	8/8/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	8/8/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	8/8/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	8/8/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	8/8/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Tyler County	8/18/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Tyler County	8/18/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Tyler County	8/18/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Tyler County	8/20/2019	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Tyler County	8/20/2019	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Jackson (Zone)	11/27/2019	Strong Wind	43 mph	0	0	$50,000.00	$0.00
Roane (Zone)	11/27/2019	Strong Wind	39 mph	0	0	$30,000.00	$0.00
Calhoun (Zone)	1/11/2020	Strong Wind	45 mph	0	0	$10,000.00	$0.00
Jackson (Zone)	1/11/2020	Strong Wind	45 mph	0	0	$10,000.00	$0.00
Wood (Zone)	1/11/2020	Strong Wind	45 mph	0	0	$10,000.00	$0.00
Wirt (Zone)	1/11/2020	Strong Wind	45 mph	0	0	$10,000.00	$0.00
Tyler (Zone)	1/11/2020	Strong Wind	45 mph	0	0	$10,000.00	$0.00
Roane (Zone)	1/11/2020	Strong Wind	45 mph	0	0	$10,000.00	$0.00
Ritchie (Zone)	1/11/2020	Strong Wind	45 mph	0	0	$10,000.00	$0.00
Pleasants (Zone)	1/11/2020	Strong Wind	45 mph	0	0	$10,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.[1]*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Ritchie County	1/11/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	1/11/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Tyler County	1/11/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	1/11/2020	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Roane County	1/11/2020	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Roane County	1/11/2020	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Ritchie County	4/7/2020	Hail	1.25"	0	0	$10,500.00	$0.00
Tyler County	4/7/2020	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Wood County	4/8/2020	Thunderstorm Wind	50 mph	0	0	$8,000.00	$0.00
Wood County	4/8/2020	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Roane County	4/9/2020	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Ritchie (Zone)	4/13/2020	Strong Wind	43 mph	0	0	$5,000.00	$0.00
Tyler (Zone)	4/13/2020	Strong Wind	43 mph	0	0	$5,000.00	$0.00
Tyler (Zone)	4/21/2020	Strong Wind	35 mph	0	0	$10,000.00	$0.00
Wood (Zone)	4/21/2020	Strong Wind	38 mph	0	0	$10,000.00	$0.00
Tyler County	6/3/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	6/6/2020	Thunderstorm Wind	45 mph	0	0	$500.00	$0.00
Wood County	6/10/2020	Thunderstorm Wind	50 mph	0	0	$8,000.00	$0.00
Ritchie County	6/10/2020	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Wood County	7/10/2020	Thunderstorm Wind	50 mph	0	0	$1,000.00	$0.00
Wood County	7/10/2020	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Roane County	7/21/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Pleasants County	7/27/2020	Thunderstorm Wind	50 mph	0	0	$4,000.00	$0.00
Roane County	8/1/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Calhoun County	8/1/2020	Thunderstorm Wind	50 mph	0	0	$500.00	$0.00
Ritchie County	8/25/2020	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Wirt County	8/25/2020	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Jackson County	8/25/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	8/25/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Roane County	8/27/2020	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Calhoun County	8/27/2020	Thunderstorm Wind	50 mph	0	0	$2,000.00	$0.00
Ritchie County	9/3/2020	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Ritchie County	9/3/2020	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Wood County	6/13/2021	Thunderstorm Wind	50 mph	0	0	$20,000.00	$0.00
Calhoun County	6/13/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Calhoun County	6/13/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Calhoun County	6/13/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	6/13/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Ritchie County	6/13/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Ritchie County	6/13/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Tyler County	6/14/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	6/14/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Tyler County	6/14/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Ritchie County	6/21/2021	Thunderstorm Wind	50 mph	0	0	$8,000.00	$0.00
Wood County	6/21/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	6/21/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wirt County	6/21/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Wood County	6/21/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Tyler County	6/21/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00

Historical Severe Summer Storms							
Location	*Date*	*Type*	*Mag.[1]*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Ritchie County	6/21/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Ritchie County	6/21/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Wood County	6/30/2021	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Calhoun County	7/7/2021	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Roane County	8/3/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Jackson County	8/3/2021	Thunderstorm Wind	50 mph	0	0	$5,000.00	$0.00
Roane County	8/3/2021	Thunderstorm Wind	50 mph	0	0	$1,500.00	$0.00
Roane County	8/3/2021	Thunderstorm Wind	50 mph	0	0	$1,500.00	$0.00
Roane County	8/3/2021	Thunderstorm Wind	50 mph	0	0	$1,500.00	$0.00
Roane County	8/3/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Roane County	8/3/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Tyler County	8/10/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Ritchie County	8/29/2021	Thunderstorm Wind	50 mph	0	0	$3,000.00	$0.00
Jackson County	8/29/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Ritchie County	9/22/2021	Thunderstorm Wind	50 mph	0	0	$10,000.00	$0.00
Pleasants County	9/22/2021	Thunderstorm Wind	50 mph	0	0	$4,000.00	$0.00
Tyler County	9/22/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Tyler County	9/22/2021	Thunderstorm Wind	45 mph	0	0	$1,000.00	$0.00
Wood County	12/25/2021	Thunderstorm Wind	42 mph	0	0	$5,000.00	$0.00
			Totals	**5**	**8**	**$23,178,700.00**	**$30,000.00**

Further, many of the 312 hail events appeared on the table above given the parameters identified. The average size hail reported was 1.06”, with a median of 1”. The largest size hailstone reported was 2.75” during an April 1976 event in Tyler County and an April 2015 event in Wood County.

1994 Hailstorm

On September 25, 1994, a hailstorm impacted the Mid-Ohio Valley region. In Wood County, hailstones measuring 2.25” fell near Pettyville, while many other areas measured stones of 1”. This event yielded approximately $1,000,000 in property damages in Roane and Wood Counties.

2012 Super Derecho

The event known as “The Derecho” throughout West Virginia occurred on June 29, 2012, and impacted areas across the eastern United States including all eight counties of the Mid-Ohio Valley region. A strong line of storms moved across a large section of the Midwestern United States, across the Appalachians, and into the Mid-Atlantic states on the afternoon and evening of the 29th. The storm destroyed power lines and utility poles across the state, leaving over 640,000 residents in West Virginia without power. MetroNews reported that the storm downed 70 high voltage powerlines.

Locally, the event left many without power for weeks. The region experienced fuel and food disruptions, and several homes suffered roof damage. The wind event combined with an extreme temperature event, with temperatures reported in the high 90s at various points throughout the region. Numerous trees and large branches were blown down in scattered locations throughout Wood County. A man was seriously injured in Parkersburg as a tree fell onto his car parked at 16th and Latrobe Streets. Four rental units were destroyed in the county. Four other dwellings had major damage, and five others had minor damage. Over 42,000 customers were without electricity in Wood County. The fairgrounds had 10 permanent structures damaged, mostly to roofs. The public infrastructure damage assessment was around $360,000.

In Jackson County, a construction canopy on the bridge across the Ohio River at Ravenswood collapsed, closing the structure. Electricity was lost to around 10,000 customers. Two homes were destroyed; five had major damage; and six others had minor damage. The public infrastructure damage assessment was over $800,000. In Roane County, around 10,000 customers lost electricity. One home was destroyed, and three others had minor damage. The public infrastructure damage assessment was over $900,000. Near Ellenboro, three lattice steel towers carrying 500-kilowatt electric lines were bent over and collapsed. A fourth tower was pulled off kilter. Corrosion, foundation cracks, or even flying debris could have been a factor. Repair crews built three temporary towers while awaiting construction of the permanent replacement.

In Tyler County, numerous trees and large branches were blown down in scattered locations. One house had major damage, and two others had minor damage. Electric was lost to around 11,500 customers. The public infrastructure damage assessment was approximately $150,000. Calhoun County’s public infrastructure damage was near $47,000 with power out to approximately 5,500 customers. Two houses were destroyed; two others had major damage, while one more had minor damage.

In Pleasants County, there was one indirect death. A 38-year-old man died while riding his four-wheeler late at night. He struck a tree that had fallen across a road near Arvilla. Large trees and branches were blown down in scattered locations throughout the county. One house had major damage, and two others had minor damage. Around 3,100 customers were without electricity. The public infrastructure damage assessment was around $55,000. Finally, in Wirt County, numerous trees and large branches were blown down in scattered locations. Roof and porch damage occurred in Elizabeth. In total, four houses had major damage, and eight others had minor damage. Around 4,000 customers lost electricity. The public infrastructure damage assessment was approximately $39,000.

May 2019 Lightning Strike

Lightning is believed to be the cause of a fire at a natural gas condensate storage tank owned by Dominion Energy Transmission, Inc. near Ben's Run in Tyler County. The million-gallon tank was holding roughly 640,000 gallons of fuel, and took about 12 hours to extinguish. Bens Run was evacuated for a time due to concerns of explosion.

Loss and Damages

Planners can easily generate loss estimates associated with severe summer storms based on historical data. With that in mind, the following table estimates losses from hail, lightning, rains, and winds (which is a combination of high, strong, and thunderstorm wind events).

Historical Losses, Severe Summer Storms			
Type	*Average Events Per Annum*	*Property Damage Per Annum*	*Crop Damage Per Annum*
Hail	4.83	$23,600.00	$460.00
Lightning	0.55	$57,000.00	$0.00
Rains	12.57	$2,800.00	$0.00
Winds	12.54	$242,800.00	$0.00

Data on the impacts of climate change suggest that severe summer storms may increase in intensity in the coming years, rendering loss estimates based on previous occurrences obsolete. As yet, there is no collectively agreed upon manner of adjusting historical losses to accurately forecast future damages.

Future Occurrences

Drought, flooding, and severe storms (i.e., "extreme precipitation" [IPCC, n.d.]) are likely to be the hazards most-impacted by climate changes in West Virginia. In fact, the impacts to both drought and flooding may stem from what the region feels with respect to changes in future severe storms. According to the USEPA, annual precipitation in most of West Virginia has increased since the first half of the 20th century, "and precipitation from extremely heavy rainstorms in the eastern United States increased by more than 25 percent since 1958" (USEPA, 2016). A *Washington Post* article cited Huntington, West Virginia, just to the south of the region, as seeing severe storms "30% more extreme than in 1970" (Dennis, 2022). The EPA anticipates continued increases in average annual precipitation as well as in the frequency of heavy downpours.

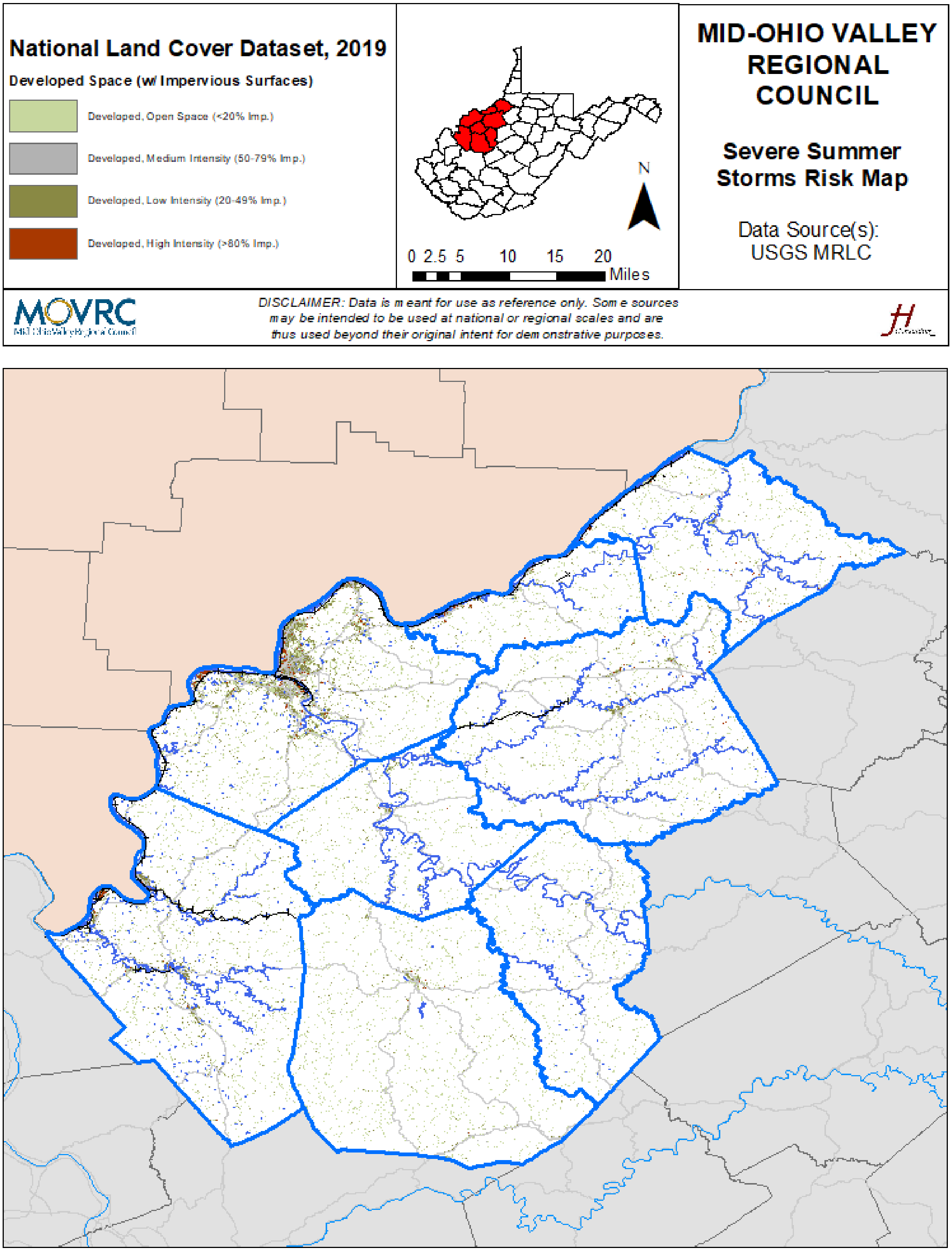
Interestingly, the EPA expects precipitation to increase in the winter and spring rather than the summer and fall. Thanks to these changes, intense, hyper-local rainfall events may exacerbate flooding in both areas that frequently experience it as well as those with little history of flooding. Rising temperatures may melt snow earlier in the spring season and increase evaporation, which may dry the soil in the summer and fall seasons. Intense precipitation is a phenomenon recognized in the *Fourth National Climate Assessment* (2018), and its discussion of increased rainfall intensity, with such effects in the Northeast outpacing other areas of the county, are consistent with the reported experiences of steering committee members.

Severe storm-exacerbated flooding is a potential future vulnerability to consider. The Mid-Ohio Valley region includes communities that range from very rural (in parts of Calhoun and Wirt Counties) to more urbanized (particularly in the Parkersburg area, but in areas like Belmont, Ravenswood, Ripley, and St. Mary's as well). In the rural areas with fewer impervious surfaces, the region's natural features will manage increased precipitation differently than the more urbanized areas. Runoff will be a region-wide concern, but in the rural areas, the natural features will absorb more of the water than in the urban areas with more land covered by impervious materials.

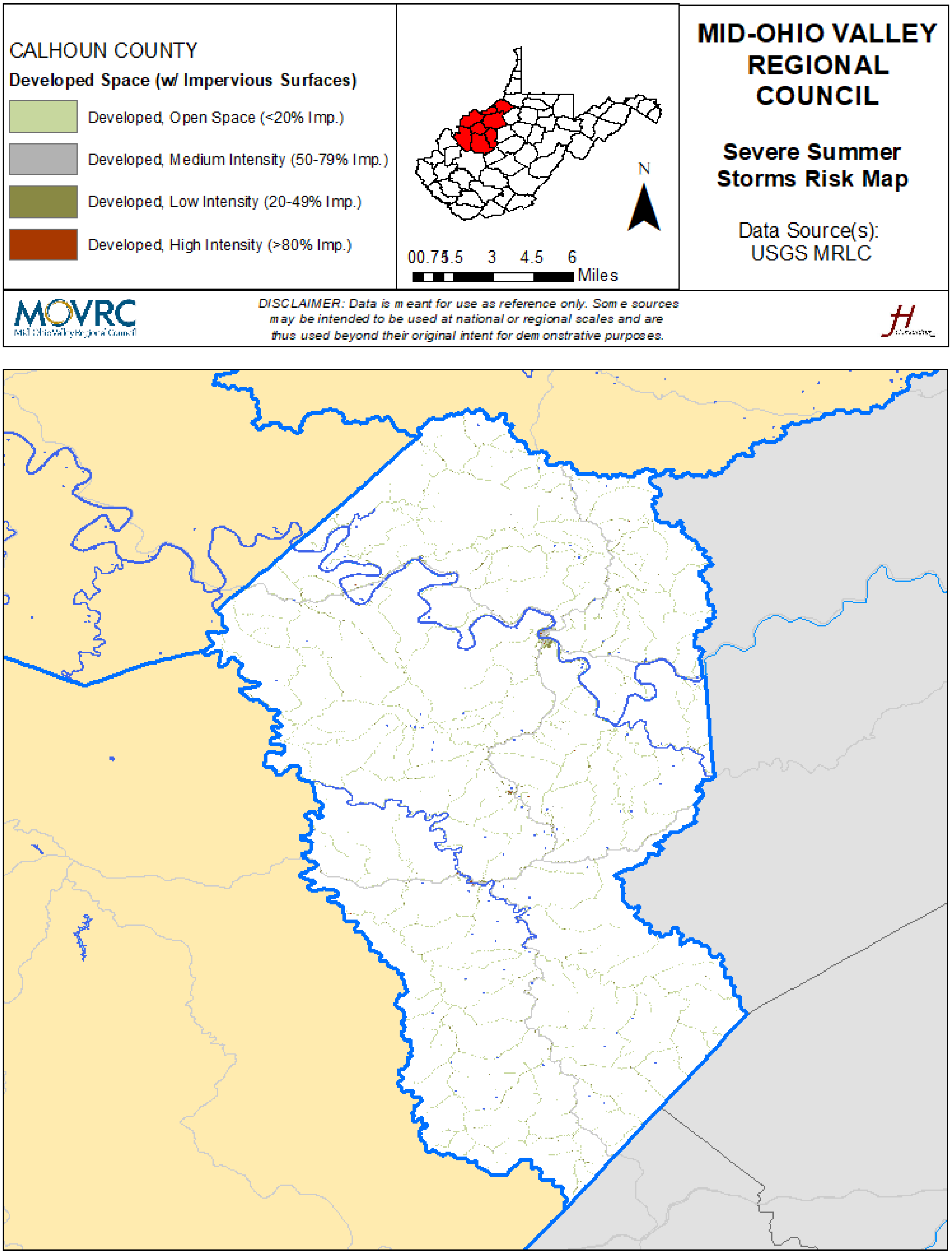
The following map examines land cover, and in particular, impervious land cover. These maps identify areas by the percentage of land covered by impervious surfaces per the National Land Cover Dataset (USGS, 2019). Only developed areas were considered, and the shaded areas identify one of four conditions:

- Less than 20% of surfaces covered with impervious materials,
- 20-49% of surfaces considered to be impervious,
- 50-79% of surfaces impervious, and
- Greater than 80% of surfaces covered with impervious materials.

The higher the coverage with impervious surfaces, the less water from severe rainfall events can be absorbed. Consequently, these areas may see increased future vulnerability to flooding.


National Land Cover Dataset, 2019
Developed Space (w/ Impervious Surfaces)
Developed, Open Space (<20% Imp.)
Developed, Medium Intensity (50-79% Imp.)
Developed, Low Intensity (20-49% Imp.)
Developed, High Intensity (>80% Imp.)
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Severe Summer Storms Risk Map
Data Source(s): USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

The following maps depict the same information at a county level.


CALHOUN COUNTY
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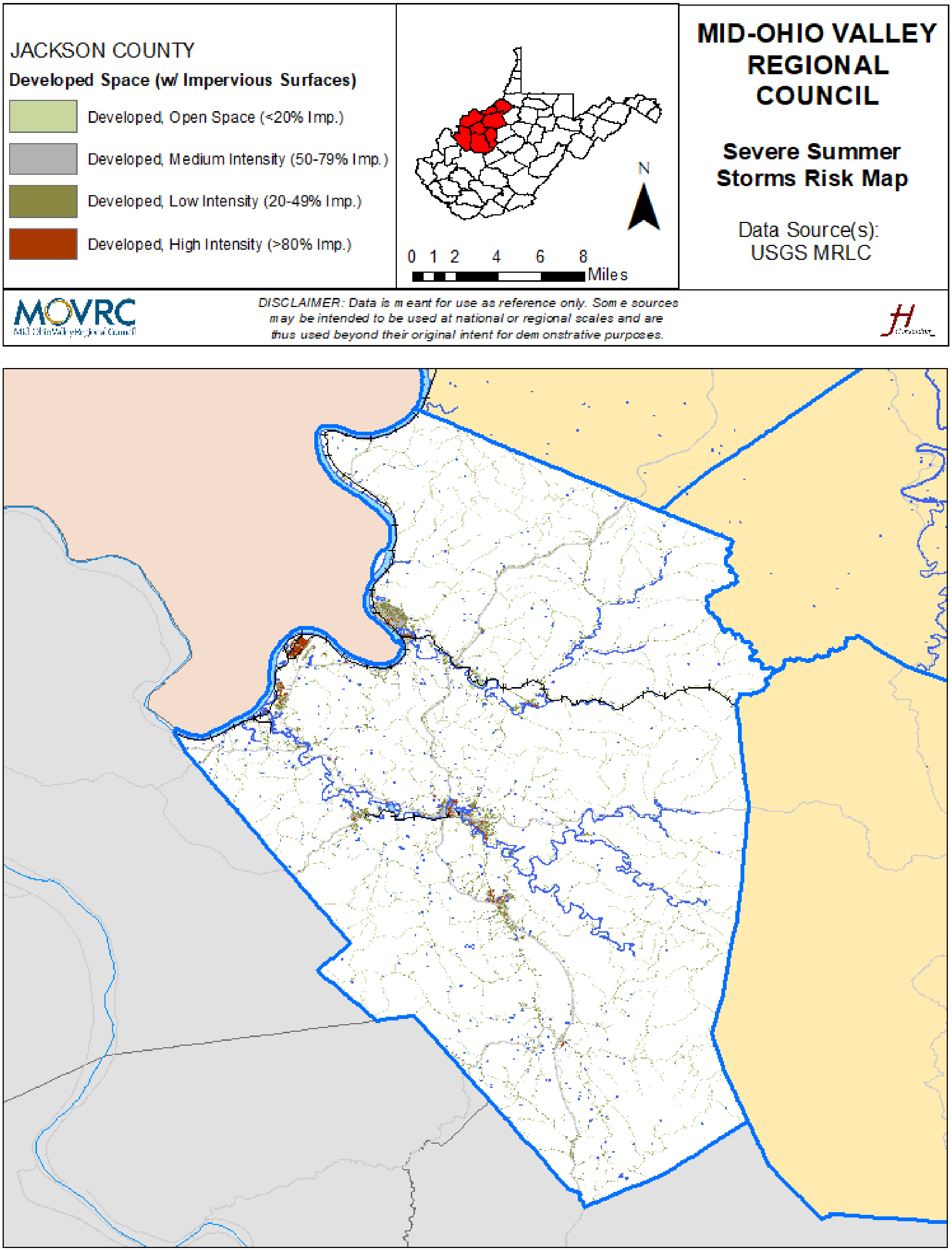
Developed, Medium Intensity (50-79% Imp.)
Developed, Low Intensity (20-49% Imp.)
Developed, High Intensity (>80% Imp.)
N
00.751.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Severe Summer Storms Risk Map
Data Source(s):
USGS MRLC
MOVRC
Mid-Ohio Valley Regional Council
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


JACKSON COUNTY
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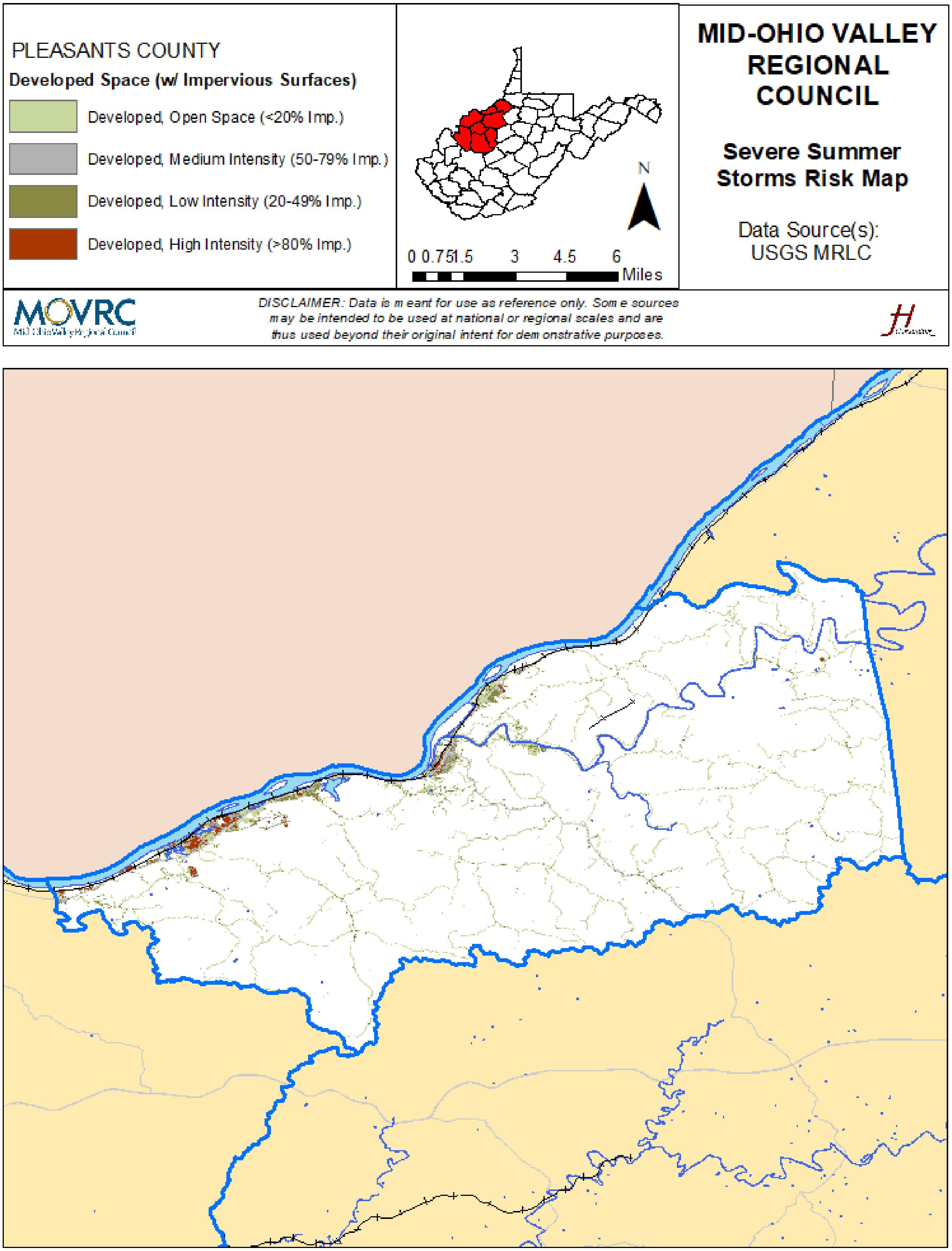
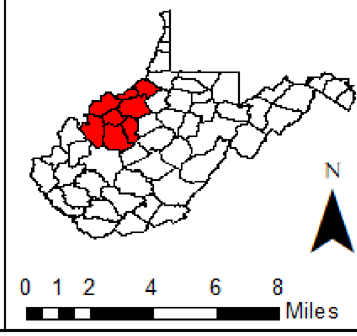
Developed, Medium Intensity (50-79% Imp.)
Developed, Low Intensity (20-49% Imp.)
Developed, High Intensity (>80% Imp.)
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Severe Summer Storms Risk Map
Data Source(s):
USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


PLEASANTS COUNTY
Developed Space (w/ Impervious Surfaces)
Developed, Open Space (<20% Imp.)
Developed, Medium Intensity (50-79% Imp.)
Developed, Low Intensity (20-49% Imp.)
Developed, High Intensity (>80% Imp.)
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Severe Summer Storms Risk Map
Data Source(s):
USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

RITCHIE COUNTY

Developed Space (w/ Impervious Surfaces)

- Developed, Open Space (<20% Imp.)
- Developed, Medium Intensity (50-79% Imp.)
- Developed, Low Intensity (20-49% Imp.)
- Developed, High Intensity (>80% Imp.)

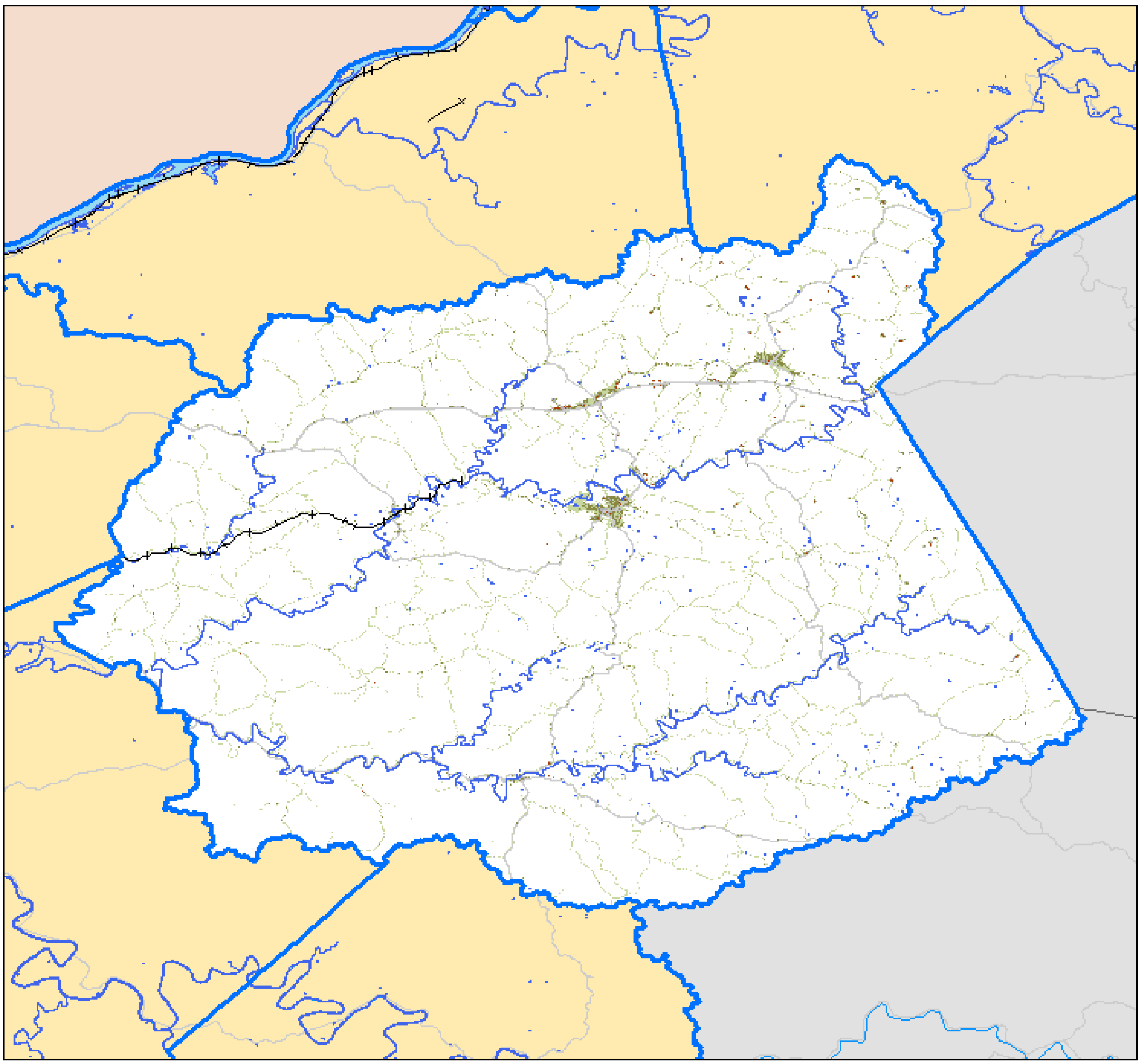


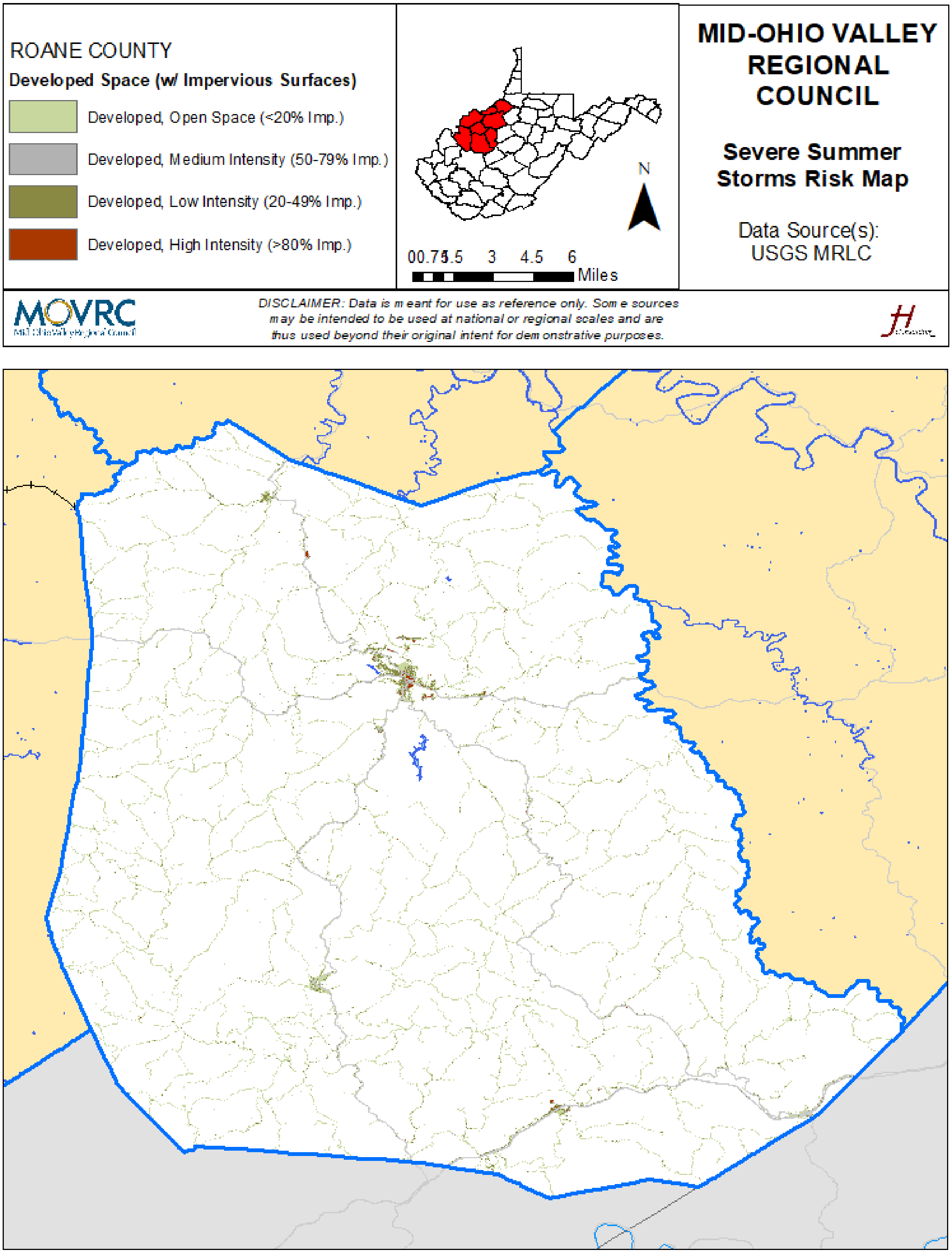
MID-OHIO VALLEY REGIONAL COUNCIL

Severe Summer Storms Risk Map

Data Source(s):
USGS MRLC

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

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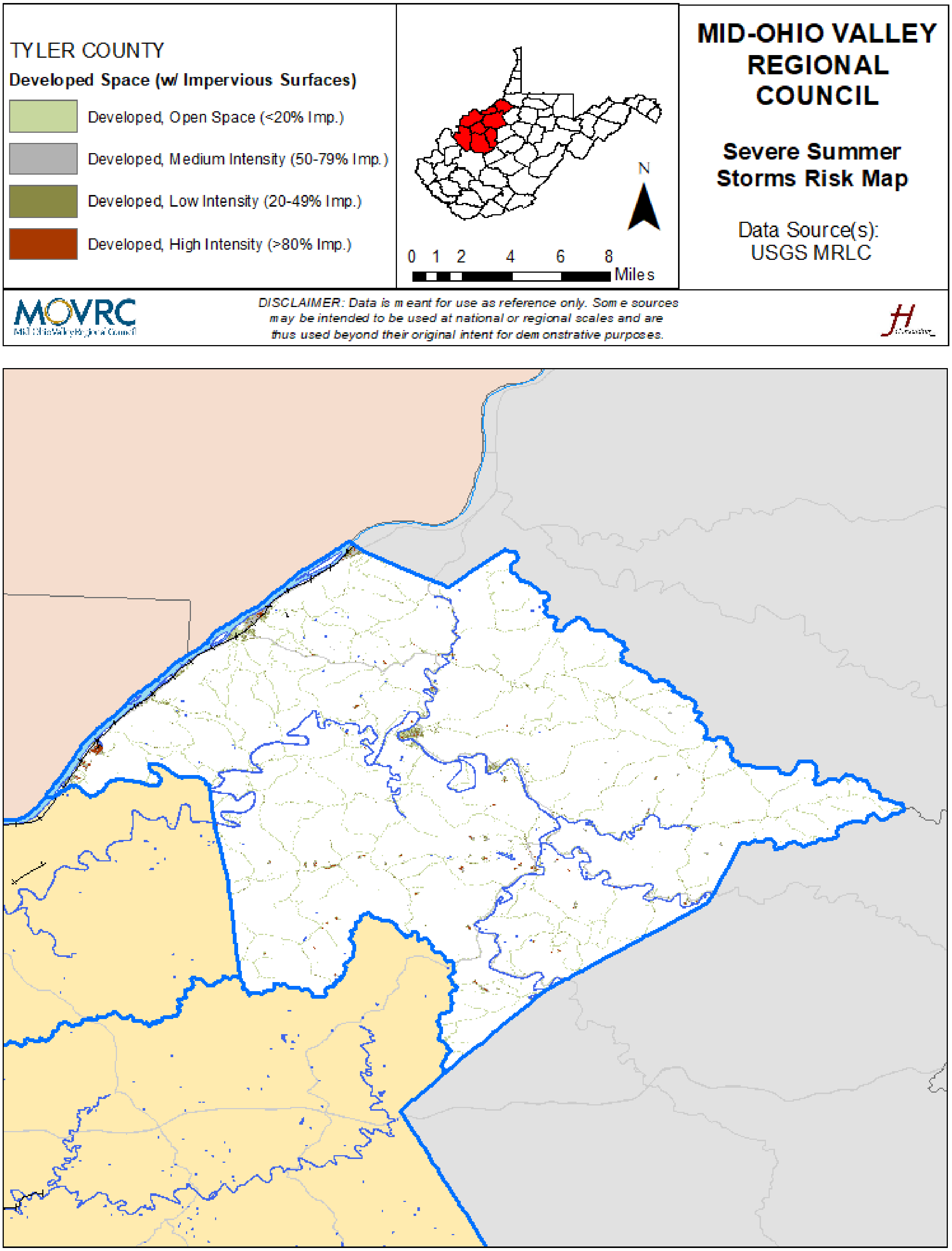
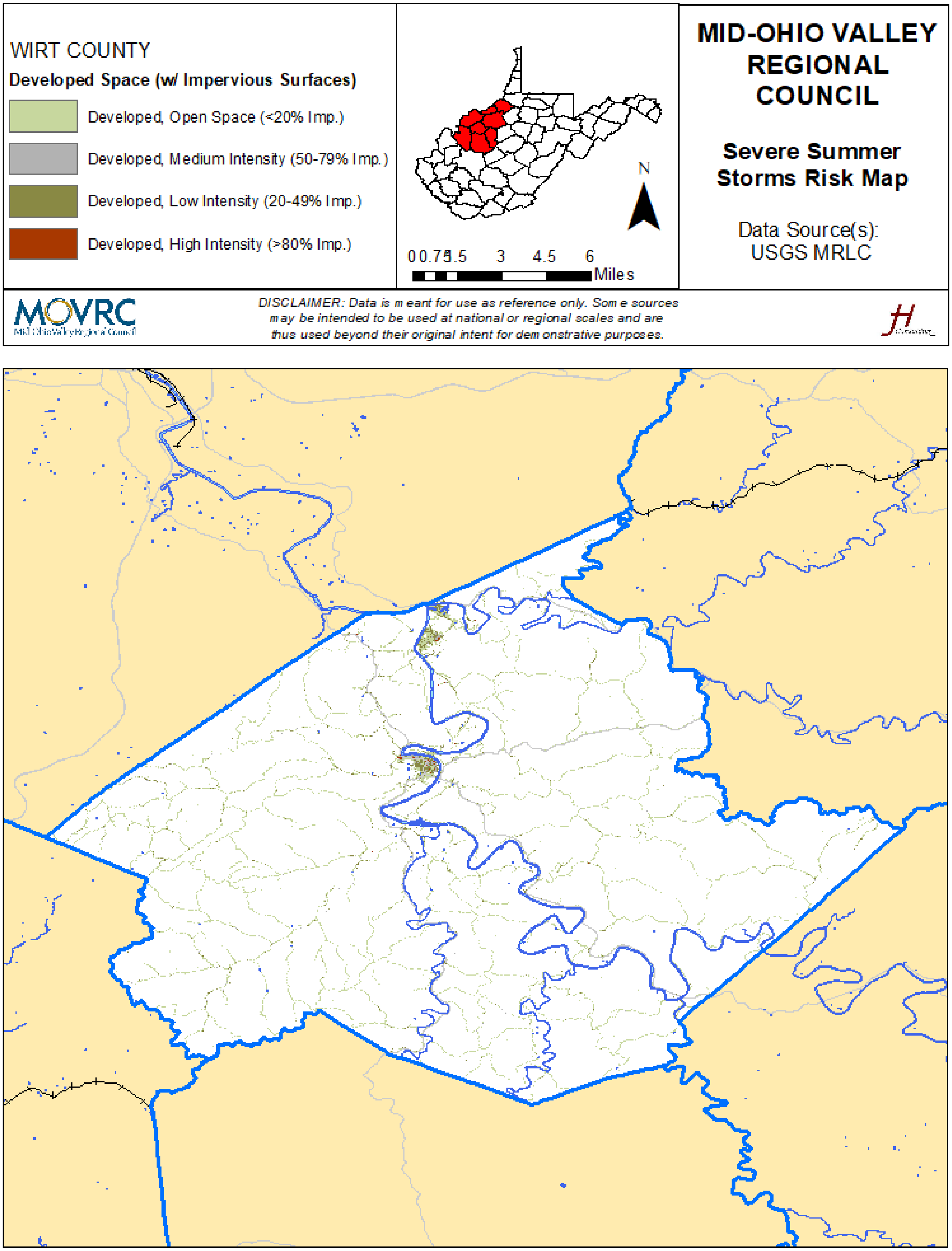
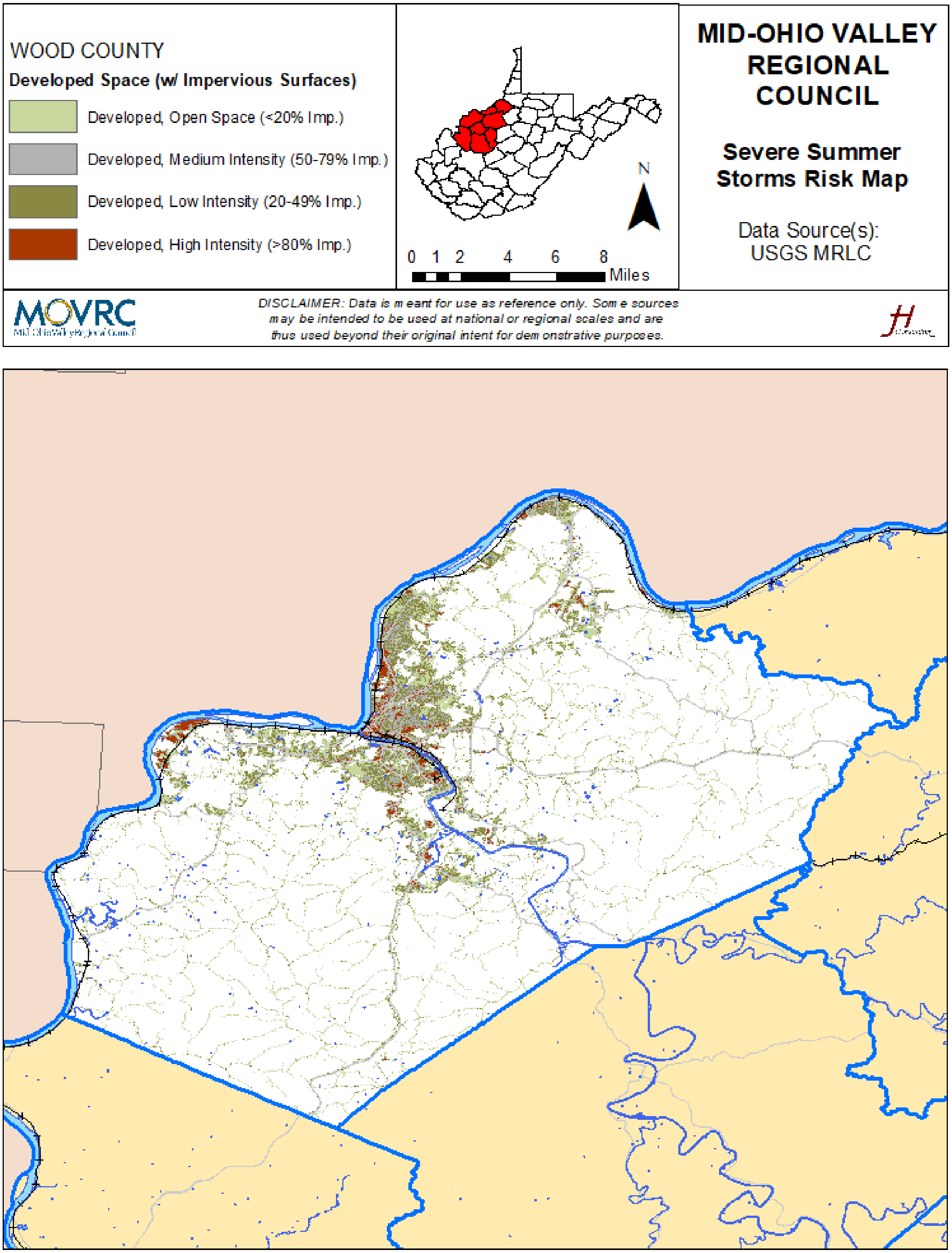
Developed, Open Space (<20% Imp.)
Developed, Medium Intensity (50-79% Imp.)
Developed, Low Intensity (20-49% Imp.)
Developed, High Intensity (>80% Imp.)
N
00.751.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Severe Summer Storms Risk Map
Data Source(s): USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


TYLER COUNTY
Developed Space (w/ Impervious Surfaces)
Developed, Open Space (<20% Imp.)
Developed, Medium Intensity (50-79% Imp.)
Developed, Low Intensity (20-49% Imp.)
Developed, High Intensity (>80% Imp.)
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Severe Summer Storms Risk Map
Data Source(s): USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


WIRT COUNTY
Developed Space (w/ Impervious Surfaces)
Developed, Open Space (<20% Imp.)
Developed, Medium Intensity (50-79% Imp.)
Developed, Low Intensity (20-49% Imp.)
Developed, High Intensity (>80% Imp.)
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Severe Summer Storms Risk Map
Data Source(s):
USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


WOOD COUNTY
Developed Space (w/ Impervious Surfaces)
Developed, Open Space (<20% Imp.)
Developed, Medium Intensity (50-79% Imp.)
Developed, Low Intensity (20-49% Imp.)
Developed, High Intensity (>80% Imp.)
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Severe Summer Storms Risk Map
Data Source(s): USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Similarly, as will be discussed in Section 2.2.12: Severe Winter Storms, more severe storms may impact infrastructure systems like the power grid and stormwater management features. High winds can impact electricity distribution systems, and as those systems age, they may be more prone to the effects of said weather. Thus, future severe summer storms may be accompanied by more frequent (and longer-duration) power outages. Additionally, more intense precipitation compounded by the rapid gathering of increased runoff may strain the ability of aging dams to perform as designed (see Section 2.2.2: Dam Failure).

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from severe summer storms. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding summer storms.

Public Sentiment, Severe Summer Storms					
	Level of Concern				*Total Responses*
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	
Severe Summer Storms	8 (12.31%)	15 (23.08%)	22 (33.85%)	20 (30.77%)	65
In the past ten years, do you remember this hazard occurring in your community?				53 (81.54%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				42 (64.62%)	65
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.54%)	65

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Severe Summer Storms Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	5	Excessive (Will occur in a year)	448 unique events occurred between 1956 and 2021, for an average of 6.89 events per year.
Response	3	One week	Most events necessitate approximately one day of response activities, but the larger events (like the 2012 derecho) necessitate much longer; as such, planners selected a week for estimation purposes.
Onset	2	12-24 hours	Though weather events are forecast, the severity of summer storms often changes rapidly. In some cases, communities are not aware of the severity of a storm until it hits.
Magnitude	4	Catastrophic (more than 50% of land area affected)	Planners selected this criterion because the entire region is often impacted by severe summer storms.
Business	1	Less than 24 hours	Severe summer storms may result in brief business shut-downs, but widespread business interruptions last longer than a single day are not anticipated.
Human	4	High (multiple deaths)	Historically, severe summer storms have caused seven deaths and 37 injuries.
Property	2	10-25% of property affected	The derecho event of 2012 yielded $12,750,000 in property damages per the NCEI database.
Total	**21**	**High**	

2.0 RISK ASSESSMENT

2.2.10 Tornadoes

Tornadoes are violently-rotating columns of air that touch the ground and are usually attached to the base of a thunderstorm.				
Vulnerability	**Period of Occurrence:**	At any time, typically when warm and cold air temperatures are present together	**Hazard Index Ranking:**	Medium
HIGHEST HIGH **➔ MEDIUM** LOW LOWEST	**Warning Time:**	Less than 6 hours	**State Risk Ranking:**	High (combined with Severe Storms in the state plan)
	Probability:	Medium	**Severity:**	High
	Type of Hazard:	Natural	**Disaster Declarations:**	DR-1769-WV (2008) DR-4059-WV (2012)

Hazard Overview

Tornadoes form when warm, humid air collides with cold, dry air. Tornadoes can also occur along a "dryline" which separates very warm, moist air to the east from hot, dry air to the west. They are vertical funnels of rapidly spinning air that extend from a thunderstorm cloud to the ground. Tornadoes can have wind speeds up to 250 miles per hour and a width of approximately 660 feet. They occur in the U.S. more than anywhere else in the world. Tornadoes originate from rotating thunderstorms called "supercells" or from quasi-linear convective systems (QLCS).

Location and Extent

It is a common misconception that tornadoes do not affect mountainous areas, but that has proven to be a myth. West Virginia's tornado instances are not as frequent as areas in the Great Plains states, but there the potential for a tornado is nevertheless present in the Appalachian regions. Topography, though, can have an influence on tornado behavior "by altering the near-surface inflow" (Wagner & Doe, 2018). The intensity of tornadoes can change depending on the position of the tornado relative to certain terrain.

Officials utilize the Enhanced Fujita (EF) Scale to classify tornadoes. This scale uses a rating system based on wind speeds and related damages. The EF scale was adapted from the original Fujita Scale designed by Dr. Theodore Fujita to better estimate wind and storm damage. The table below describes the EF Scale.

ENHANCED FUJITA (EF) SCALE		
EF Rating	*3-second Gust Speed (mph)*	*Possible Damage*
0	**65-85**	**Light Damage.** Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to signboards.
1	**86-110**	**Moderate Damage.** Surface peeled off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
2	**111-135**	**Considerable Damage**. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
3	**136-165**	**Severe Damage**. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off the ground and thrown.
4	**166-200**	**Devastating Damage**. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
5	**200+**	**Incredible Damage**. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile sized missiles fly through the air more than 100-yards; trees debarked; incredible phenomena will occur.

The original Fujita Scale appears below. This table is a reference for those historical events measured by the original scale.

FUJITA TORNADO SCALE		
Scale	*Wind Estimate (MPH)*	*Typical Damage*
F0	**< 73**	**Light Damage**. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	**73 – 112**	**Moderate Damage**. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	**113 – 157**	**Considerable Damage**. Roofs torn off frame houses; mobile homes demolished; boxcars overturned; large trees snapped or uprooted; light-objects missiles generated; cares lifted off ground.
F3	**158 – 206**	**Severe Damage**. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown.
F4	**207 – 260**	**Devastating Damage**. Wall-constructed houses leveled; structures with weak foundations blown away some distance; cars thrown and large missiles generated.
F5	**261 – 318**	**Incredible Damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 109 yards; trees debarked; incredible phenomena will occur.

Impacts and Vulnerability

While tornadoes are typically short-lived, they are intensely-focused and destructive. Tornadoes are the most violent of all atmospheric storms. Damage from tornadoes comes from the strong winds they contain. Wind speed in tornadoes can reach 300 miles per hour; winds of that speed can destroy homes, uproot trees, cause automobiles to become airborne, and turn glass and debris into high-velocity projectiles. Secondary and tertiary impacts from tornadoes include damage to roofs and other home finishings. Additionally, fallen trees can interrupt power service or block transportation access.

Because tornadoes are somewhat unpredictable (i.e., occur with little to no warning), the human effects can include emotional distress such as overwhelming anxiety, trouble sleeping, and other depression-like symptoms. These impacts are similar to the notion of disaster writ large, but can be heightened around “tornado” because of its occurrence with little to no warning (SAMHSA, 2022).

Historical Occurrences

The NOAA National Centers for Environmental Information Storm Event Database (2022) lists 19 historical tornadoes and funnel clouds in the Mid-Ohio Valley region. The table below provides details on the events.

Historical Tornado Occurrences in the Mid-Ohio Valley

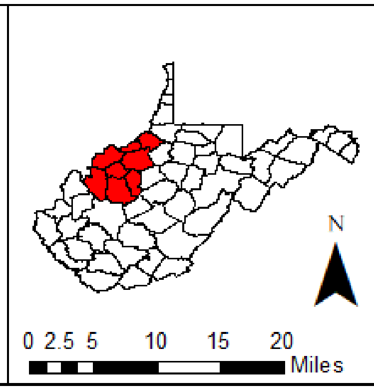
Location	*Date*	*Type*	*Magnitude*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood County	8/9/1950	Tornado	F1	0	0	$0.00	$0.00
Wood County	6/26/1951	Tornado	F1	0	1	$0.00	$0.00
Jackson County	7/19/1963	Tornado	F1	0	0	$250,000	$0.00
Wood County	6/12/1968	Tornado	F0	0	0	$30.00	$0.00
Pleasants County	7/28/1981	Tornado	F2	0	3	$250,000.00	$0.00
Roane County	6/12/1989	Tornado	F1	0	0	$0.00	$0.00
Wood County	6/12/1989	Tornado	F0	0	0	$0.00	$0.00
Wood County	1/8/1998	Tornado	F2	0	0	$200,000.00	$0.00
Tyler County	5/23/2000	Tornado	F1	0	0	$85,000.00	$0.00
Wood County	5/21/2001	Tornado	F0	0	0	$175,000.00	$0.00
Wood County	7/10/2003	Tornado	F2	0	0	$1,500,000.00	$0.00
Wood County	9/16/2010	Tornado	EF3	1	10	$1,000,000.00	$0.00
Wirt County	9/16/2010	Tornado	EF1	0	0	$75,000.00	$0.00
Pleasants County	7/27/2014	Tornado	EF1	0	0	$5,000.00	$0.00
Ritchie County	7/27/2014	Tornado	EF1	0	0	$15,000.00	$0.00
Ritchie County	7/27/2014	Funnel Cloud	N/A	0	0	$0.00	$0.00
Jackson County	6/26/2015	Tornado	EF0	0	0	$25,000.00	$0.00
Wood County	12/23/2015	Tornado	EF0	0	0	$100,000.00	$0.00
Jackson County	6/23/2016	Tornado	EF1	0	2	$20,000.00	$0.00
			Totals	**1**	**16**	**$3,700,030.00**	**$0.00**

The following graphic shows the paths of those events.

Tornado (TD) or Funnel Cloud

Tornadoes w/ Paths

Tornado Paths



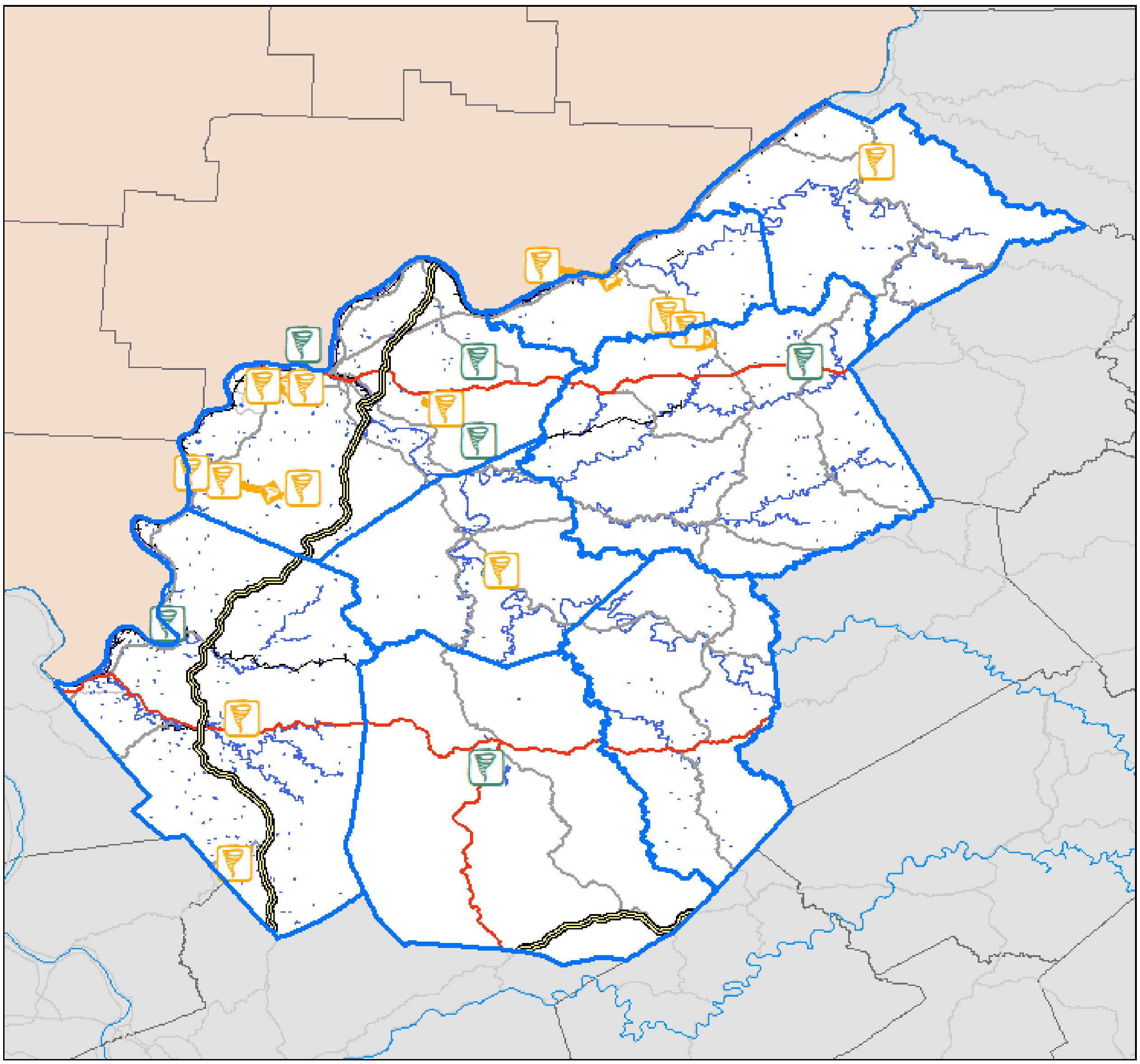
MID-OHIO VALLEY REGIONAL COUNCIL

Historical Tornado Occurrences

Data Source(s):
NOAA NCEI

MOVRC

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.



Belleville Tornado (2010)

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 damage located along State Route 68 in the valley and floodplain along the river. The maximum wind gusts were estimated at 160 mph. The width of the tornado briefly widened to 500 yards. Well-built single-family homes received major damage or were destroyed. A 57-year-old male died after he, his wife, and their dog had gone into a basement for protection and he returned upstairs to get a flashlight. His body was found some 150 to 200 feet away in a field. Ten other people were injured, but none seriously. Other significant structural and tree damage occurred along a river access road and along South Fork of Lee Creek toward Rockport. The total path length from Meigs County into Wood County was over nine miles.

Loss and Damages

Planners can calculate tornado loss estimates using historical data. The historical worst-case event resulted in $1,500,000.00 in losses. The average property and crop damages from previous tornadoes in the region is $194,740.00. Though these figures are easy to derive, local officials should be aware that numerous variables could impact future losses, including development (and an increase in the building stock), greater storm severity, etc.

Future Occurrences

The historical data for tornadoes in the region does not indicate an increasing frequency per se. Between 2010 and 2016, incidents appeared to be occurring on a near annual basis; however, there were no events listed in the NCEI database between 2017 and 2021. The Intergovernmental Panel on Climate Change (IPCC) suggests that severe weather in West Virginia may increase in frequency and intensity, and this weather could result in an uptick in tornado occurrences.

National Geographic (n.d.) notes the lack of long-term trends in the frequency of tornadoes, but there is an apparent recent geographic shift in tornado patterns. The number of tornadoes in the traditional “Tornado Alley” are falling while they have been increasing in Mississippi, Alabama, Arkansas, Missouri, Illinois, Indiana, Tennessee, and Kentucky.

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from tornadoes. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding tornadoes.

Public Sentiment, Tornadoes					
	Level of Concern				*Total Responses*
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	
Tornadoes	18 (27.69%)	34 (52.31%)	10 (15.38%)	3 (4.62%)	65
In the past ten years, do you remember this hazard occurring in your community?				12 (18.46%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				13 (19.70%)	66
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.52%)	66

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Tornado Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	3	Medium (May [or may not] occur in a year)	Eighteen tornadoes and one funnel cloud occurred between 1950 and 2016 (66 years), for an average of 0.29 events per year.
Response	3	One week	The widespread (i.e., community) response may not be a full week. However, with a precedent for EF3 tornadoes, some structures may require repair, clean-up operations may be necessary, etc. The average tornado response would likely be shorter than a week, but the response to the worst ones that have occurred would exceed a week.
Onset	4	Less than 6 hours	Conditions supporting tornadoes could be forecasted, but the actual onset of an event would occur much more quickly and unpredictably.
Magnitude	1	Localized (less than 10% of land area affected)	Tornadoes occur in a hyper local area despite high potential damage.
Business	1	Less than 24 hours	If an EF3 tornado impacted a business, it would be closed for an undetermined period of time; however, community-wide business closures would be minimal (if any).
Human	3	Medium (multiple severe injuries)	Though casualty numbers have been low, there has been one reported death. This ranking uses a higher number of anticipated injuries as a proxy for the severity of the death.
Property	1	Less than 10% of property affected	Again, property in the path of a tornado, particularly an EF3, would be damaged; however, community-wide impacts would be far fewer than 10% of the property of the region (or a jurisdiction).
Total	**16**	**Medium**	

2.0 RISK ASSESSMENT

2.2.11 Wildfire

A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures.				
Vulnerability HIGHEST HIGH MEDIUM LOW LOWEST	**Period of Occurrence:**	Type	**Hazard Index Ranking:**	Low
	Warning Time:	Less than 6 hours	**State Risk Ranking:**	Medium
	Probability:	Unlikely to occur in a year	**Severity:**	Low
	Type of Hazard:	Natural	**Disaster Declarations:**	N/A

Hazard Overview

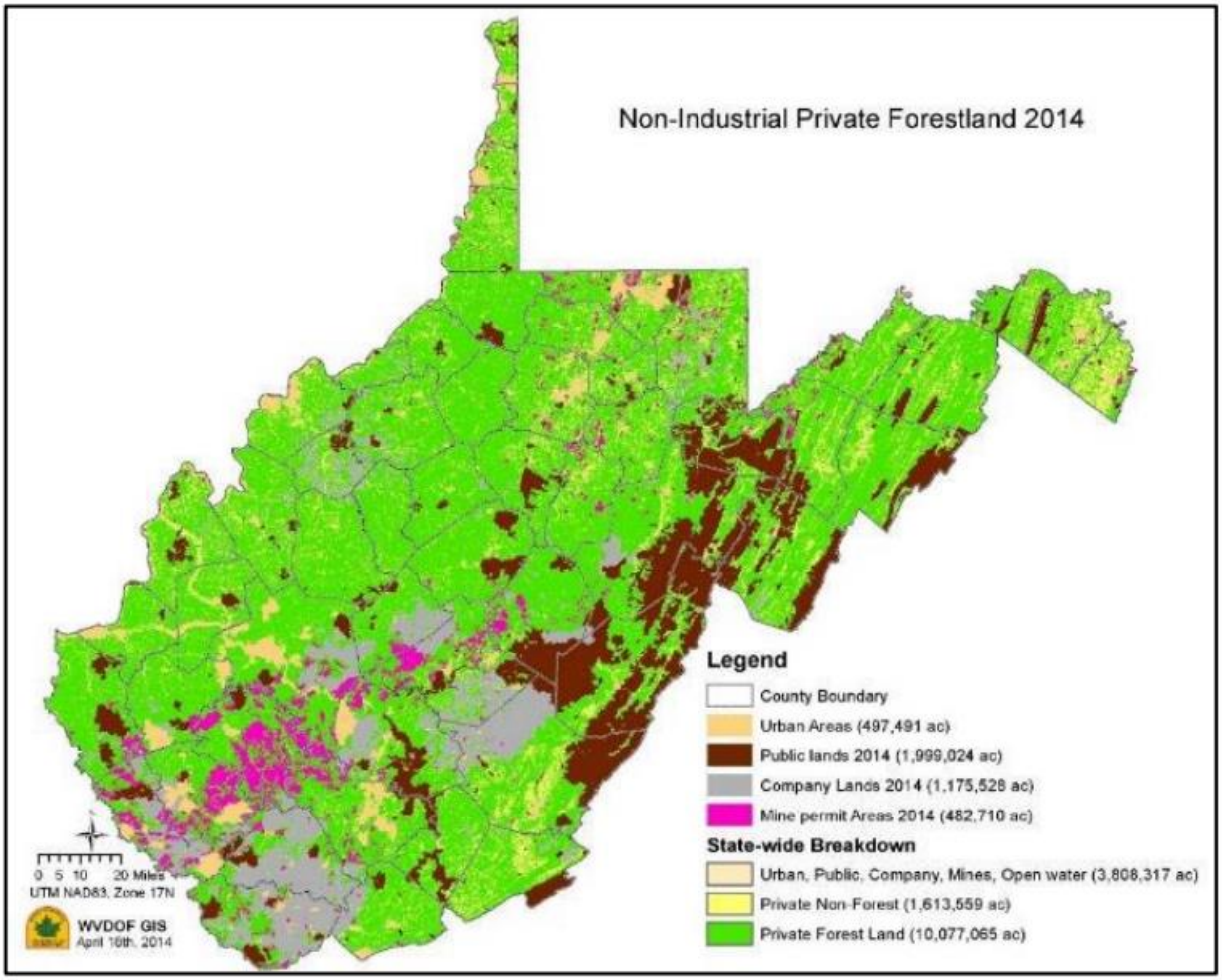
A wildfire is a raging, uncontrolled fire that spreads rapidly through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and can spread quickly, creating dense smoke that is visible for miles. Wildfires can occur at any time of the year but mostly happen during prolonged, dry, hot spells. Any small fire in a wooded area, if not quickly detected and suppressed, can get out of control. Human carelessness, negligence, and ignorance cause most wildfires. In some instances, lightning strikes can precipitate spontaneous combustion.

During the 2022 update, the steering committee guiding the plan update discussed the inclusion of wildfires. The Mid-Ohio Valley region does not experience the types of wildfires that occur in the U.S. western states, and the use of the term could cause confusion as residents compare those impacts with what they have experienced locally. However, “wildfire” is a general term referencing an uncontrolled fire through vegetative fuels as noted above; the term itself does not have a size-related qualifier. As such, the committee kept the label, yet this profile will focus on the smaller fires often experienced in West Virginia.

Location and Extent

Wildfires need vegetative fuels to burn, and most of those are located in forests. According to the *West Virginia Statewide Standard Hazard Mitigation Plan* (WVEMD, 2018), “West Virginia is the third most heavily forested state in the nation.” Most forested areas in the state are privately-owned. The map below (from the state’s plan) shows the non-industrial private forestland in West

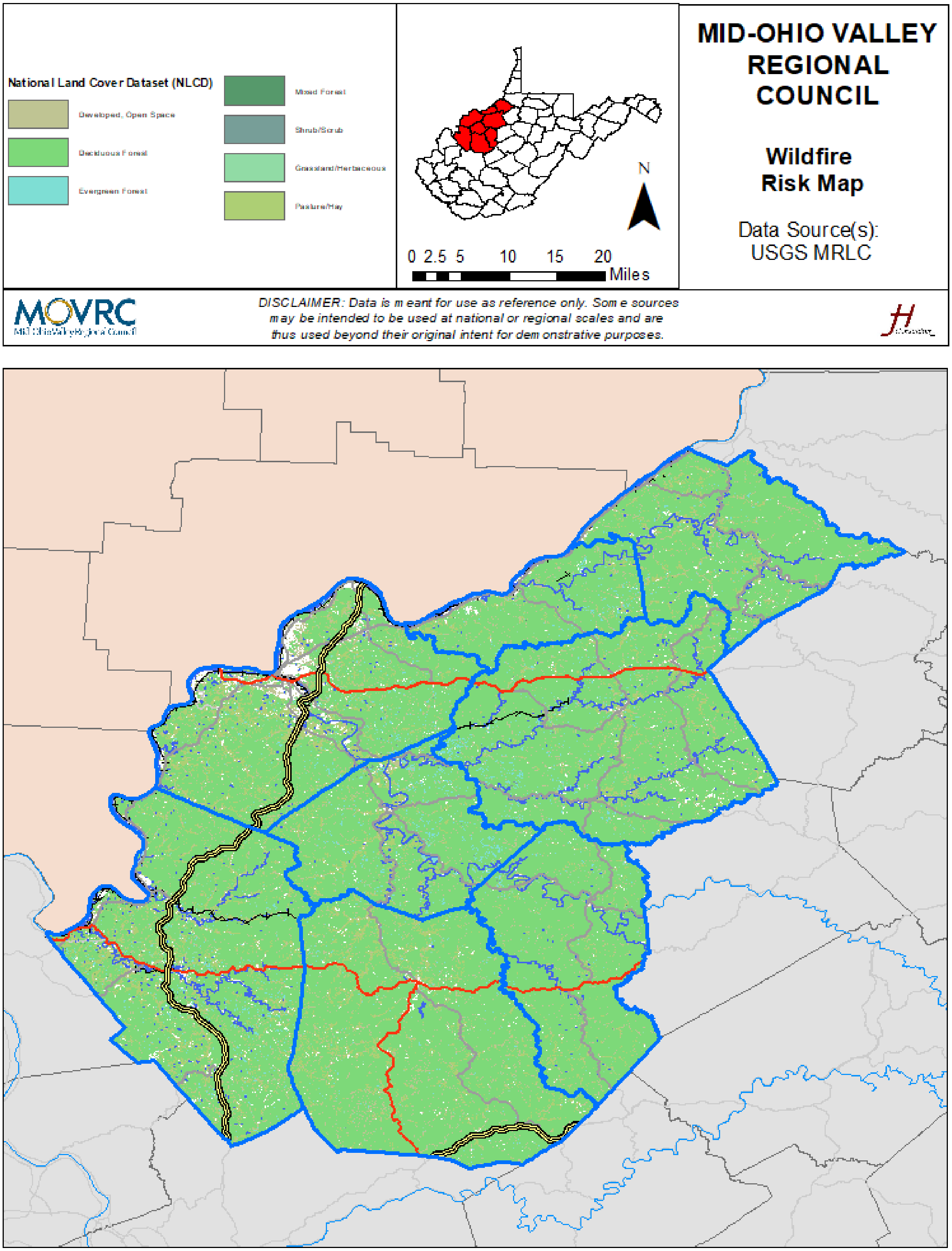
Virginia. All eight Mid-Ohio Valley counties have extensive forested areas within their borders, making this a region-wide hazard.



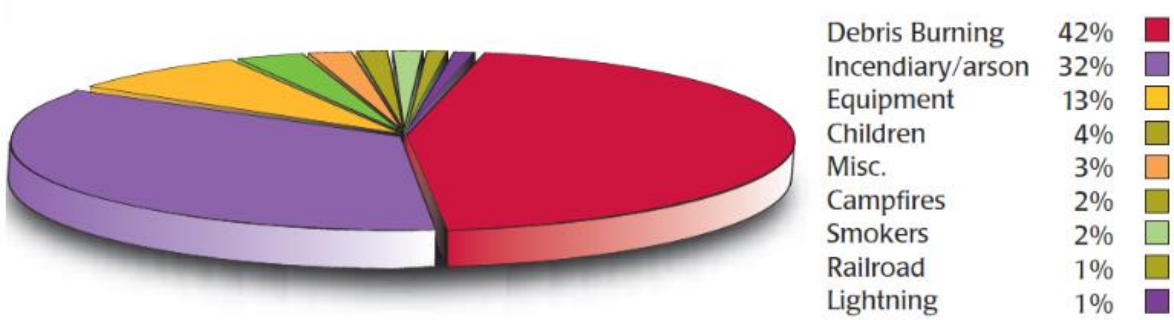
The land cover map below shows the region's areas of potential concern with respect to vegetative fuels. It shows the following.

- **Developed, Open Space:** Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of the land cover. Vegetative fuels may be in these areas, but at a lower concentration.
- **Deciduous Forest:** Areas dominated by trees generally greater than five meters tall and greater than 20% of the total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change. Vegetative fuels may be present in these areas.

- **Evergreen Forest:** Areas dominated by trees generally greater than five meters tall and greater than 20% of the total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage. Vegetative fuels may be present in these areas.
- **Mixed Forest:** Areas dominated by trees generally greater than five meters tall and greater than 20% of the vegetation cover. Neither deciduous nor evergreen species are greater than 75% of the total tree cover. Vegetative fuels may be present in these areas.
- **Shrub/Scrub:** Areas dominated by shrubs less than five meters tall with shrub canopy typically greater than 20% of the total vegetation. This class includes shrubs, young trees in an early successional stage or trees stunted from environmental conditions. Vegetative fuels are present in these areas.
- **Grassland/Herbaceous:** Areas dominated by grammanoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be used for grazing. Vegetative fuels are present in these areas.
- **Pasture/Hay:** Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of total vegetation. Vegetative fuels may be present in these areas.


National Land Cover Dataset (NLCD)
Developed, Open Space
Deciduous Forest
Evergreen Forest
Mixed Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Wildfire Risk Map
Data Source(s):
USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

West Virginia Rivers (2017) identifies nine potential causes of wildfires in the state. The graphic below depicts these causes with an estimated percentage of the fires started via these causes.

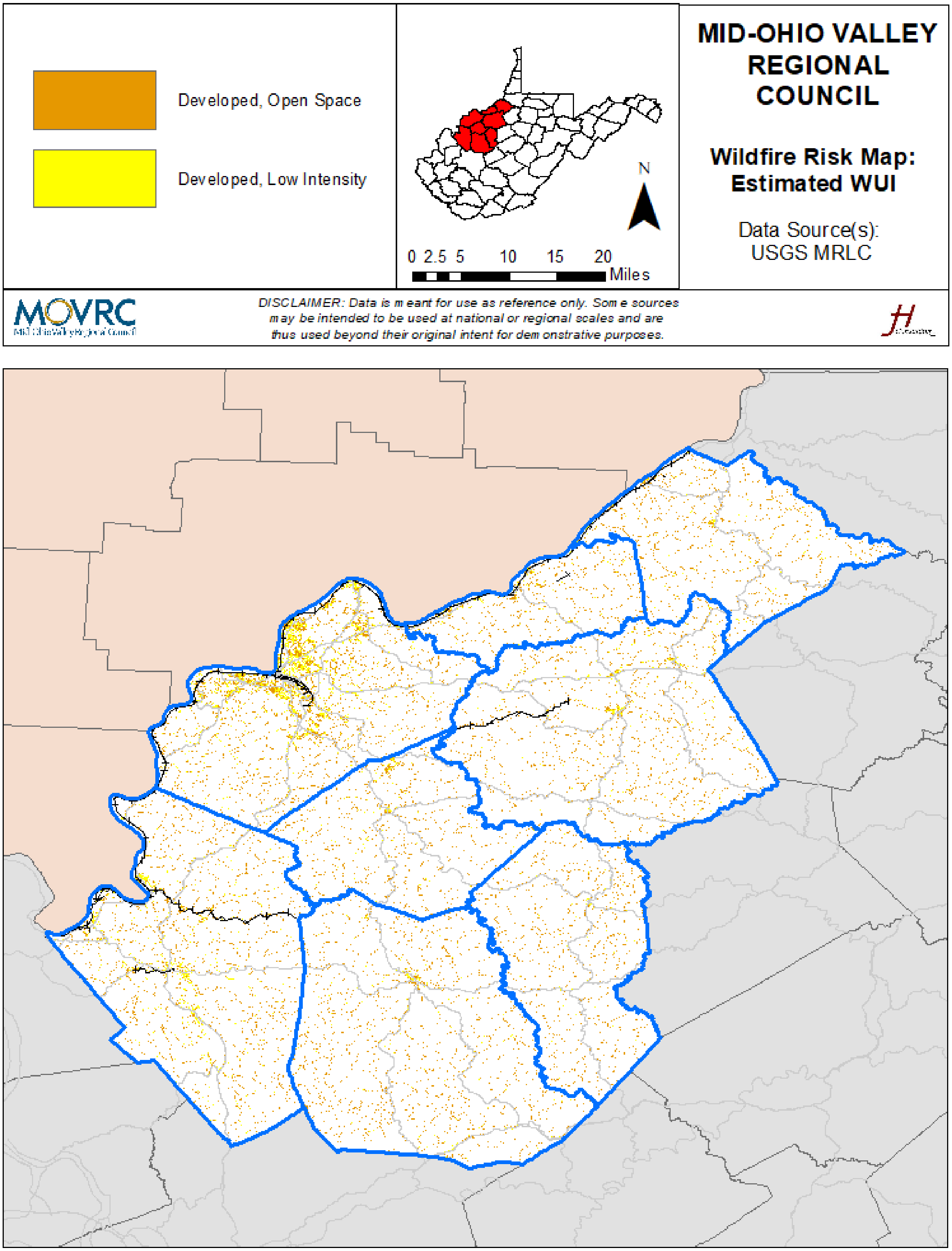


Of particular concern when discussing wildfires is the "wildland urban interface" area. Radeloff and colleagues (2005) defined the WUI as "…the area where houses meet or intermingle with undeveloped wildland vegetation" (citing the USDA and USDI, 2001, p. 800). Critically, the WUI does not recognize an area where wildfires are more or less prone to occur. Rather, it identifies areas that can expect higher wildfire-related damages should an incident occur. It is difficult to understand that the WUI, even in a single county, is not a place, per se, but conditions that exist. Thus, the WUI can be a rural subdivision in a wooded or vegetative area or three to four homes on an open range (wildlandfirersg.org, 2020).

There is no agreed upon map data layer labeled "wildland-urban interface." As such, planners utilized the National Land Cover Dataset (2019) to depict a proxy for the WUI. According to the dataset, two land cover categories describe areas where housing and wildland areas meet.

- **Developed, Open Space:** Includes areas with a mixture of some constructed materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20% of the total land cover.
- **Developed, Low Intensity:** Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for less than 50% of total land cover.

The following map highlights these areas as the estimated WUI. The open space areas are shaded in orange, while the low intensity areas are yellow in an effort to depict a "decreasing" WUI as one moves away from more heavily vegetated areas.


Developed, Open Space
Developed, Low Intensity
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Wildfire Risk Map: Estimated WUI
Data Source(s):
USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Impacts and Vulnerability

Aside from the obvious effects in humans such as burns and injuries, the smoke from fires is of great concern. Though research findings appear mixed, there are associations between wildfire smoke exposure and respiratory health, particularly with respect to asthma (Reid & Maestas, 2019). Forest fires can also damage structures and homes in wildfire-urban interface areas. Cascading effects from forest fires include erosion and water quality from vegetation being removed from a watershed (Keller & DeVecchio, 2015).

From an emergency response standpoint, wildfires could put a major strain on the region's fire departments, according to members of the steering committee that supported the 2022 plan update. Due to personnel shortages, mutual aid from other counties – both in and out of the region (and state) – may be needed to support the response to large fires.

Historical Occurrences

The NOAA National Centers for Environmental Information (NCEI) Storm Events Database (2022) reports one wildfire event in the region. The event began on April 21, 2014, in Roane County. After several days of dry weather, a few brush fires were observed on the 21st into the 22nd. A brush fire in southern Roane County caused one firefighter from the Walton VFD to be overcome by heat exhaustion. That fire was in the vicinity of Lewis Station and Payne Ridge Roads. This event record did not include property damage or crop damage.

Loss and Damages

Given the lack of historical losses from wildfires, planners researched wildfires from other parts of the state to generate a loss estimate. A 1991 article from United Press International noted the presence of 500 forest fires in West Virginia that combined to yield an estimated $100 million in damages (UPI, 1991). This data suggests a high range of $200,000 per wildfire event. Perhaps a more accurate estimate comes from averaging the total losses from wildfires in West Virginia as reported in the NCEI database (2022). From 1999 to 2016, seven wildfires caused $73,000 in damages, for an average of just under $10,500 of damage per fire.

Future Occurrences

Weather conditions, including extreme heat and drought, can increase the likelihood of fires escalating to the level of "wildfire." Any fire left unattended or mismanaged has the potential to become a wildfire; however, the likelihood of a fire attaining a significant size and intensity is unpredictable and varies based on environmental conditions.

Material presented above helps to frame the discussion of future occurrences of wildfires. The West Virginia Rivers graphic suggests that as many as 95% of wildfires in West Virginia are human-caused in some way. As outdoor recreation opportunities develop, human behaviors may ignite more fires that have the potential to escalate into larger wildfires. Additionally, the discussion on the WUI is relative for future considerations. Subdivisions continue to be built on the fringe of more urbanized areas in the region, and these may be more susceptible to wildland fires.

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from wildfire. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding wildfire.

Public Sentiment, Wildfire

Hazard	*Level of Concern*				*Total Responses*
	Not at All	*Somewhat*	*Concerned*	*Very*	
Wildfire	27 (41.54%)	23 (35.38%)	10 (15.38%)	5 (7.69%)	65
In the past ten years, do you remember this hazard occurring in your community?				2 (3.08%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				5 (7.69%)	65
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.54%)	65

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Wildfire Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	2	Low (Unlikely to occur in a year)	NCEI data reports one wildfire over an eight-year period, for an average of 0.125 events per year. This far under-estimates the number of brush fires to which fire departments respond, but it represents a larger incident that has, to date, been less frequent.
Response	3	One week	A large wildfire of the type considered by this profile may take up to a week to full extinguish. The historical event was a multi-day response.
Onset	4	Less than 6 hours	At the time of the notification of an incident, it is already underway.
Magnitude	1	Localized (less than 10% of land area affected)	The Mid-Ohio Valley region is approximately 2,664.59 square miles in land area. One square mile equals 639.9994 acres, which means that the region covers an area of 1,705,336 acres. A wildfire would have to eclipse more than 170,500 acres to consume 10% of the regional land area, which is unlikely.
Business	1	Less than 24 hours	A wildfire impacts rural areas, and though a small community business may be impacted, widespread shutdowns are not anticipated.
Human	2	Low (some injuries)	Historical records recount a firefighter with heat exhaustion, and though serious, it is an injury that is recoverable. Other injuries are possible, particularly to responders.
Property	1	Less than 10% of property affected	If a wildfire impacts the WUI, damage could be substantial; however, it is unlikely that a wildfire would impact more than 10% of the building stock in the region.
Total	**14**	**Low**	

2.0 RISK ASSESSMENT

2.2.12 Severe Winter Storms

Definition.				
Vulnerability HIGHEST HIGH MEDIUM LOW LOWEST	**Period of Occurrence:**	Type	**Hazard Index Ranking:**	Medium
	Warning Time:	Over 24 hours	**State Risk Ranking:**	High
	Probability:	Excessive	**Severity:**	Medium
	Type of Hazard:	Natural	**Disaster Declarations:**	EM-3109-WV (1993) DR-1084-WV (Blizzard of '96, 1996) DR-1455-WV (2003) DR-1881-WV (2010) DR-1903-WV (2010) EM-3358-WV (Hurricane Sandy, 2012)

<u>Hazard Overview</u>

During winter, there are multiple instances of cold weather, snow, and storms. This profile includes only those winter weather events that are damaging enough to be considered "severe." These include NOAA-labeled winter storms, heavy snow, blizzards, and ice storms.

- **Winter Storm:** A winter storm is a combination of heavy snow, blowing snow, and dangerous wind chills.
- **Heavy Snow:** Heavy snow refers to snowfall accumulating to 4" or more in 12 hours or less or snowfall accumulating to 6" or more in 24 hours or less.
- **Blizzard:** A blizzard is a dangerous winter storm that is a combination of blowing snow and wind and results in very low visibility (less than ¼ mile). Heavy snowfall and severe cold usually accompany blizzards, but not always. Sometimes strong winds can pick up fallen snow, creating a ground blizzard.
- **Ice Storm:** An ice storm is a storm that results in the accumulation of at least 0.25'' of ice on exposed surfaces. It can create hazardous driving and walking conditions, and tree branches and power lines can easily snap under the weight of the ice.

Just like with other storms, the right combination of ingredients is necessary for a winter storm to develop. The three key components of a winter storm are cold air, lift, and moisture.

Location and Extent

Generally, severe winter weather affects all areas of the county similarly. More specifically, winter weather affects several jurisdictions simultaneously, yet with varying severity and duration. There is no widely-used scale to classify snowstorms, but Paul Kocin and Louis Uccellini (2004) from the National Weather Service developed the Northeast Snowfall Impact Scale (NESIS). The NESIS characterizes and ranks high-impact Northeastern snowstorms from “notable” to “extreme.”

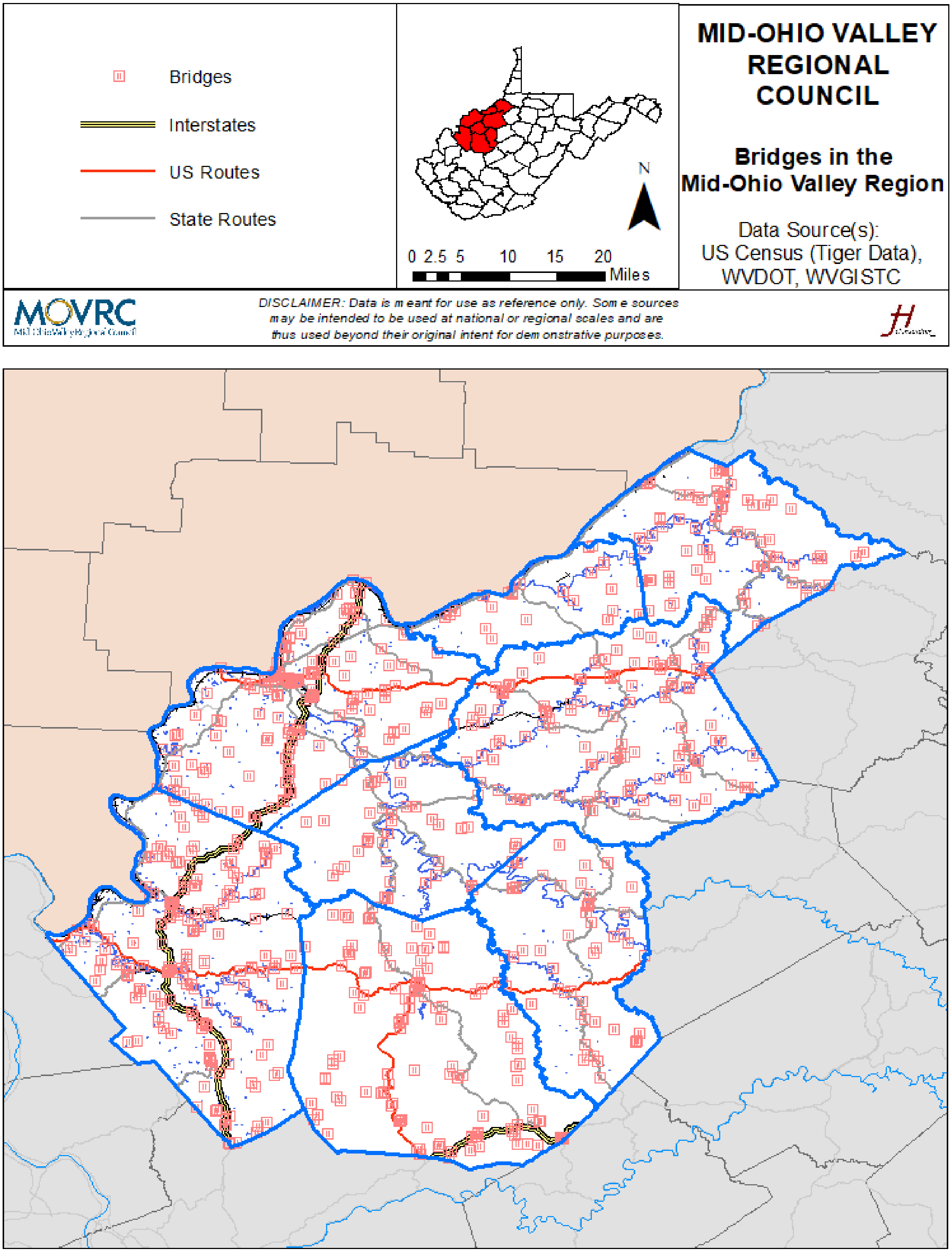
NORTHEAST SNOWFALL IMPACT SCALE		
Category	*NESIS Value*	*Description*
1	1.0-2.499	Notable
2	2.5-3.99	Significant
3	4.0-5.99	Major
4	6.0-9.99	Crippling
5	10.0+	Extreme

Significantly, the NESIS does not predict the impacts of a forecasted storm; instead, it is a mechanism for rating impacts after a storm occurs.

Impacts and Vulnerability

According to the National Severe Storms Laboratory (NSSL), most deaths from winter storms are not from the storm itself. People die from traffic accidents on icy roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to cold. During severe storms, everyone is potentially at risk, particularly those stranded in their vehicle or outside during the storm. Recent data shows that 70% of injuries related to ice and snow occur in automobiles, and 25% are people caught out in the storm. Most victims are males over 40 years old. Further, snow accumulation, ice, and extreme cold temperatures can make it difficult for emergency vehicles and crews to reach those in need of assistance.

Ice accumulation can topple power lines, utility poles, and communication towers. The resultant disruption in communication and utility services can last several days. Even minimal ice accumulation can pose a serious threat to motorists and pedestrians. Bridges and overpasses are particularly dangerous, as they freeze before other surfaces. The following graphic shows the location of bridges greater than 20-feet in length and maintained by the West Virginia Department of Transportation.


Bridges
Interstates
US Routes
State Routes
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Bridges in the Mid-Ohio Valley Region
Data Source(s): US Census (Tiger Data), WVDOT, WVGISTC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Historical Occurrences

According to the NOAA National Centers for Environmental Information Storm Event Database (2022), there have been 388 frost/freeze, heavy snow, ice storm, winter storm, and winter weather events in the Mid-Ohio Valley region since 1996. The following table summarizes those events. (Note: Many of the events overlap because they appear in the database for multiple counties.)

Historical Occurrences of Severe Winter Weather

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
Roane (Zone)	1/1/1996	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	1/6/1996	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/6/1996	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	1/6/1996	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	1/6/1996	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	1/6/1996	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	1/6/1996	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	1/6/1996	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	1/6/1996	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	2/2/1996	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	2/2/1996	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	2/2/1996	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	2/2/1996	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	2/2/1996	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	2/2/1996	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	2/2/1996	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	2/2/1996	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	3/7/1996	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	3/7/1996	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	3/7/1996	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	3/7/1996	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	3/7/1996	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	3/7/1996	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	3/7/1996	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	3/7/1996	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	4/30/1996	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	2/3/1998	Winter Storm	0	0	$0.00	$0.00
Roane (Zone)	2/3/1998	Winter Storm	0	0	$0.00	$0.00
Wirt (Zone)	1/8/1999	Winter Storm	0	0	$0.00	$0.00
Tyler (Zone)	1/8/1999	Winter Storm	0	0	$0.00	$0.00
Ritchie (Zone)	1/8/1999	Winter Storm	0	0	$0.00	$0.00
Calhoun (Zone)	1/8/1999	Winter Storm	0	0	$0.00	$0.00
Pleasants (Zone)	1/8/1999	Winter Storm	0	0	$0.00	$0.00
Wood (Zone)	1/8/1999	Winter Storm	0	0	$0.00	$0.00
Tyler (Zone)	2/12/1999	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	2/12/1999	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	2/12/1999	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	2/12/1999	Winter Weather	0	0	$0.00	$0.00

Historical Occurrences of Severe Winter Weather						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Ritchie (Zone)	2/12/1999	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	2/12/1999	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	2/12/1999	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/12/1999	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	3/9/1999	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	3/9/1999	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	3/9/1999	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	3/9/1999	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	3/9/1999	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	3/9/1999	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	3/9/1999	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	3/9/1999	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	3/14/1999	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	3/14/1999	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	3/14/1999	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	3/14/1999	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	3/14/1999	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	1/19/2000	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	1/19/2000	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	1/19/2000	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/19/2000	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	1/19/2000	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	1/19/2000	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	2/22/2001	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	1/6/2002	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/6/2002	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	1/6/2002	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	1/6/2002	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	1/6/2002	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	1/6/2002	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	1/6/2002	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	1/19/2002	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	1/19/2002	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	1/19/2002	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	1/19/2002	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	1/19/2002	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/19/2002	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	1/19/2002	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	1/19/2002	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	12/4/2002	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	12/4/2002	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	12/4/2002	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	12/4/2002	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	12/4/2002	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	12/4/2002	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	12/4/2002	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	12/4/2002	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	1/26/2003	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/26/2003	Heavy Snow	0	0	$0.00	$0.00

Historical Occurrences of Severe Winter Weather						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wirt (Zone)	1/26/2003	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	2/14/2003	Heavy Snow	0	0	$50,000.00	$0.00
Wood (Zone)	2/14/2003	Heavy Snow	0	0	$100,000.00	$0.00
Tyler (Zone)	2/14/2003	Heavy Snow	0	0	$50,000.00	$0.00
Ritchie (Zone)	2/14/2003	Heavy Snow	0	0	$50,000.00	$0.00
Roane (Zone)	2/16/2003	Ice Storm	0	0	$2,000,000.00	$0.00
Calhoun (Zone)	2/16/2003	Ice Storm	0	0	$400,000.00	$0.00
Jackson (Zone)	2/16/2003	Ice Storm	0	0	$3,500,000.00	$0.00
Wirt (Zone)	2/16/2003	Ice Storm	0	0	$400,000.00	$0.00
Pleasants (Zone)	10/3/2003	Frost/Freeze	0	0	$0.00	$0.00
Ritchie (Zone)	10/3/2003	Frost/Freeze	0	0	$0.00	$0.00
Roane (Zone)	10/3/2003	Frost/Freeze	0	0	$0.00	$0.00
Wirt (Zone)	10/3/2003	Frost/Freeze	0	0	$0.00	$0.00
Tyler (Zone)	10/3/2003	Frost/Freeze	0	0	$0.00	$0.00
Wood (Zone)	10/3/2003	Frost/Freeze	0	0	$0.00	$0.00
Jackson (Zone)	10/3/2003	Frost/Freeze	0	0	$0.00	$0.00
Calhoun (Zone)	10/3/2003	Frost/Freeze	0	0	$0.00	$0.00
Ritchie (Zone)	1/25/2004	Winter Storm	0	0	$0.00	$0.00
Roane (Zone)	1/25/2004	Winter Storm	0	0	$0.00	$0.00
Jackson (Zone)	1/25/2004	Winter Storm	0	0	$0.00	$0.00
Tyler (Zone)	1/25/2004	Winter Storm	0	0	$0.00	$0.00
Calhoun (Zone)	1/25/2004	Winter Storm	0	0	$0.00	$0.00
Wirt (Zone)	1/25/2004	Winter Storm	0	0	$0.00	$0.00
Wood (Zone)	1/25/2004	Winter Storm	0	0	$0.00	$0.00
Pleasants (Zone)	1/25/2004	Winter Storm	0	0	$0.00	$0.00
Jackson (Zone)	4/28/2004	Frost/Freeze	0	0	$0.00	$0.00
Calhoun (Zone)	4/28/2004	Frost/Freeze	0	0	$0.00	$0.00
Wood (Zone)	4/28/2004	Frost/Freeze	0	0	$0.00	$0.00
Wirt (Zone)	4/28/2004	Frost/Freeze	0	0	$0.00	$0.00
Tyler (Zone)	4/28/2004	Frost/Freeze	0	0	$0.00	$0.00
Roane (Zone)	4/28/2004	Frost/Freeze	0	0	$0.00	$0.00
Ritchie (Zone)	4/28/2004	Frost/Freeze	0	0	$0.00	$0.00
Pleasants (Zone)	4/28/2004	Frost/Freeze	0	0	$0.00	$0.00
Calhoun (Zone)	5/4/2004	Frost/Freeze	0	0	$0.00	$0.00
Wood (Zone)	5/4/2004	Frost/Freeze	0	0	$0.00	$0.00
Wirt (Zone)	5/4/2004	Frost/Freeze	0	0	$0.00	$0.00
Tyler (Zone)	5/4/2004	Frost/Freeze	0	0	$0.00	$0.00
Pleasants (Zone)	5/4/2004	Frost/Freeze	0	0	$0.00	$0.00
Jackson (Zone)	5/4/2004	Frost/Freeze	0	0	$0.00	$0.00
Roane (Zone)	5/4/2004	Frost/Freeze	0	0	$0.00	$0.00
Ritchie (Zone)	5/4/2004	Frost/Freeze	0	0	$0.00	$0.00
Tyler (Zone)	2/27/2005	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	3/1/2005	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	2/7/2007	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	2/7/2007	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	2/7/2007	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/7/2007	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	2/7/2007	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	2/7/2007	Winter Weather	0	0	$0.00	$0.00

Historical Occurrences of Severe Winter Weather						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Jackson (Zone)	2/7/2007	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	3/7/2007	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	12/5/2007	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	12/5/2007	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	12/5/2007	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	12/5/2007	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	12/5/2007	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	12/5/2007	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	2/20/2008	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	2/20/2008	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	2/20/2008	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	2/20/2008	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	2/20/2008	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	2/20/2008	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/20/2008	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	2/20/2008	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	1/27/2009	Winter Storm	0	0	$0.00	$0.00
Pleasants (Zone)	1/27/2009	Winter Storm	0	0	$0.00	$0.00
Tyler (Zone)	1/27/2009	Winter Storm	0	0	$0.00	$0.00
Wirt (Zone)	1/27/2009	Winter Storm	0	0	$0.00	$0.00
Wood (Zone)	1/27/2009	Winter Storm	0	0	$0.00	$0.00
Ritchie (Zone)	1/27/2009	Winter Storm	0	0	$0.00	$0.00
Roane (Zone)	1/27/2009	Winter Storm	0	0	$0.00	$0.00
Calhoun (Zone)	1/27/2009	Winter Storm	0	0	$0.00	$0.00
Roane (Zone)	12/18/2009	Heavy Snow	0	0	$50,000.00	$0.00
Jackson (Zone)	12/18/2009	Heavy Snow	0	0	$25,000.00	$0.00
Wirt (Zone)	12/18/2009	Heavy Snow	0	0	$25,000.00	$0.00
Calhoun (Zone)	12/18/2009	Heavy Snow	0	0	$25,000.00	$0.00
Ritchie (Zone)	12/18/2009	Heavy Snow	0	0	$20,000.00	$0.00
Pleasants (Zone)	12/18/2009	Heavy Snow	0	0	$10,000.00	$0.00
Tyler (Zone)	12/18/2009	Heavy Snow	0	0	$10,000.00	$0.00
Calhoun (Zone)	2/5/2010	Winter Storm	0	0	$0.00	$0.00
Ritchie (Zone)	2/5/2010	Winter Storm	0	0	$0.00	$0.00
Wood (Zone)	2/5/2010	Winter Storm	0	0	$0.00	$0.00
Jackson (Zone)	2/5/2010	Winter Storm	0	0	$0.00	$0.00
Roane (Zone)	2/5/2010	Winter Storm	0	0	$0.00	$0.00
Pleasants (Zone)	2/5/2010	Winter Storm	0	0	$0.00	$0.00
Wirt (Zone)	2/5/2010	Winter Storm	0	0	$0.00	$0.00
Tyler (Zone)	2/5/2010	Winter Storm	0	0	$0.00	$0.00
Tyler (Zone)	2/26/2010	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	2/26/2010	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	2/26/2010	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	2/26/2010	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	2/26/2010	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	2/26/2010	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	12/16/2010	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	12/16/2010	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	12/16/2010	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	12/16/2010	Heavy Snow	0	0	$0.00	$0.00

Historical Occurrences of Severe Winter Weather						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood (Zone)	12/16/2010	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	1/11/2011	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	1/11/2011	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/11/2011	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	1/20/2011	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	1/20/2011	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	1/20/2011	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/20/2011	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	1/20/2012	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	1/20/2012	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	1/20/2012	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	1/25/2013	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	1/25/2013	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	1/25/2013	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/25/2013	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	1/25/2013	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	1/25/2013	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	1/25/2013	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	1/25/2013	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	2/4/2013	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	2/4/2013	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	2/4/2013	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	2/4/2013	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/4/2013	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	2/4/2013	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	2/4/2013	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	2/4/2013	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	3/17/2013	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	3/17/2013	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	3/24/2013	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	3/24/2013	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	12/8/2013	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	12/8/2013	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	12/8/2013	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	1/21/2014	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	1/21/2014	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/21/2014	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	1/21/2014	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	1/21/2014	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	1/25/2014	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	1/25/2014	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	1/25/2014	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	1/25/2014	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	1/25/2014	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	1/25/2014	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/25/2014	Winter Storm	0	0	$0.00	$0.00
Calhoun (Zone)	1/25/2014	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	2/2/2014	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	2/2/2014	Heavy Snow	0	0	$0.00	$0.00

Historical Occurrences of Severe Winter Weather						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Ritchie (Zone)	2/2/2014	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	2/2/2014	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	2/2/2014	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	2/2/2014	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	2/12/2014	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	2/12/2014	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	2/14/2014	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	2/14/2014	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	2/14/2014	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	2/25/2014	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	2/25/2014	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	2/25/2014	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/25/2014	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	2/25/2014	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	2/25/2014	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	3/2/2014	Winter Storm	0	0	$0.00	$0.00
Tyler (Zone)	3/2/2014	Winter Storm	0	0	$0.00	$0.00
Wood (Zone)	3/2/2014	Winter Storm	0	0	$0.00	$0.00
Ritchie (Zone)	3/2/2014	Winter Storm	0	0	$0.00	$0.00
Jackson (Zone)	3/2/2014	Winter Storm	0	0	$0.00	$0.00
Wirt (Zone)	3/2/2014	Winter Storm	0	0	$0.00	$0.00
Roane (Zone)	3/2/2014	Winter Storm	0	0	$0.00	$0.00
Calhoun (Zone)	3/2/2014	Winter Storm	0	0	$0.00	$0.00
Roane (Zone)	3/16/2014	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	3/16/2014	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	3/16/2014	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	3/16/2014	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	3/16/2014	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	1/6/2015	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/6/2015	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	1/6/2015	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	1/6/2015	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	1/6/2015	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	1/6/2015	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/16/2015	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	2/16/2015	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	2/16/2015	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	2/16/2015	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	2/16/2015	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	2/16/2015	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	2/21/2015	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	2/21/2015	Winter Storm	0	0	$0.00	$0.00
Jackson (Zone)	2/21/2015	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	2/21/2015	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	2/21/2015	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	2/21/2015	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	2/21/2015	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	2/21/2015	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	3/4/2015	Heavy Snow	0	0	$0.00	$0.00

Historical Occurrences of Severe Winter Weather						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Pleasants (Zone)	3/4/2015	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	3/4/2015	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	3/4/2015	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	3/4/2015	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	3/4/2015	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	3/4/2015	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	3/4/2015	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	1/8/2016	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/8/2016	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	1/8/2016	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	1/8/2016	Winter Weather	0	0	$50,000.00	$0.00
Pleasants (Zone)	1/8/2016	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	1/8/2016	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/22/2016	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	1/22/2016	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	1/22/2016	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	1/22/2016	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	1/22/2016	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	1/22/2016	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	1/22/2016	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	1/22/2016	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	2/8/2016	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	2/8/2016	Heavy Snow	0	0	$0.00	$0.00
Wirt (Zone)	2/8/2016	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	2/8/2016	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	2/14/2016	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/14/2016	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	1/5/2017	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	1/5/2017	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/5/2017	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	1/5/2017	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	1/5/2017	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	1/5/2017	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	1/5/2017	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	1/5/2017	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	1/29/2017	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/29/2017	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	1/29/2017	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	1/12/2018	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	1/12/2018	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	1/12/2018	Winter Storm	0	0	$0.00	$0.00
Wood (Zone)	1/12/2018	Winter Storm	0	0	$0.00	$0.00
Jackson (Zone)	1/12/2018	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	1/12/2018	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	1/12/2018	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/12/2018	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	1/16/2018	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	1/16/2018	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	1/16/2018	Winter Weather	0	0	$0.00	$0.00

Historical Occurrences of Severe Winter Weather						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Tyler (Zone)	1/16/2018	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	1/16/2018	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	1/16/2018	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	1/16/2018	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	1/16/2018	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	2/6/2018	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	2/6/2018	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/6/2018	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	2/17/2018	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	2/17/2018	Winter Weather	0	0	$0.00	$0.00
Pleasants (Zone)	2/17/2018	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	2/17/2018	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	2/1/2019	Winter Storm	0	0	$0.00	$0.00
Jackson (Zone)	2/7/2020	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	2/7/2020	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	2/7/2020	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	2/7/2020	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	12/1/2020	Winter Weather	0	0	$0.00	$0.00
Tyler (Zone)	12/1/2020	Heavy Snow	0	0	$0.00	$0.00
Pleasants (Zone)	12/1/2020	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	12/1/2020	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	12/1/2020	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	12/1/2020	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	12/1/2020	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	12/1/2020	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	12/16/2020	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	12/24/2020	Heavy Snow	0	0	$0.00	$0.00
Jackson (Zone)	12/24/2020	Heavy Snow	0	0	$0.00	$0.00
Wood (Zone)	12/24/2020	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	12/24/2020	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	12/24/2020	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	12/24/2020	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	12/24/2020	Heavy Snow	0	0	$0.00	$0.00
Roane (Zone)	1/19/2021	Winter Weather	0	0	$0.00	$0.00
Ritchie (Zone)	1/19/2021	Winter Weather	0	0	$0.00	$0.00
WOOD (ZONE)	1/19/2021	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	1/19/2021	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/10/2021	Winter Weather	0	0	$0.00	$0.00
Wirt (Zone)	2/10/2021	Winter Weather	0	0	$0.00	$0.00
Wood (Zone)	2/10/2021	Winter Weather	0	0	$3,000.00	$0.00
Jackson (Zone)	2/10/2021	Winter Storm	0	0	$5,000.00	$0.00
Ritchie (Zone)	2/10/2021	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	2/15/2021	Ice Storm	0	0	$8,000.00	$0.00
Wirt (Zone)	2/15/2021	Ice Storm	0	0	$2,000.00	$0.00
Tyler (Zone)	2/15/2021	Winter Storm	0	0	$3,000.00	$0.00
Pleasants (Zone)	2/15/2021	Winter Storm	0	0	$3,000.00	$0.00
Ritchie (Zone)	2/15/2021	Winter Weather	0	0	$0.00	$0.00
Calhoun (Zone)	2/15/2021	Winter Weather	0	0	$0.00	$0.00
Roane (Zone)	2/15/2021	Winter Weather	0	0	$0.00	$0.00

Historical Occurrences of Severe Winter Weather						
Location	*Date*	*Type*	*Deaths*	*Injuries*	*Property Damage*	*Crop Damage*
Wood (Zone)	2/15/2021	Winter Storm	0	0	$3,000.00	$0.00
Wirt (Zone)	2/17/2021	Heavy Snow	0	0	$0.00	$0.00
Calhoun (Zone)	2/17/2021	Heavy Snow	0	0	$0.00	$0.00
Ritchie (Zone)	2/17/2021	Heavy Snow	0	0	$0.00	$0.00
Tyler (Zone)	2/17/2021	Winter Weather	0	0	$0.00	$0.00
Jackson (Zone)	2/17/2021	Heavy Snow	0	0	$3,000.00	$0.00
Roane (Zone)	2/17/2021	Heavy Snow	0	0	$5,000.00	$0.00
		Totals	**0**	**0**	**$6,800,000.00**	**$0.00**

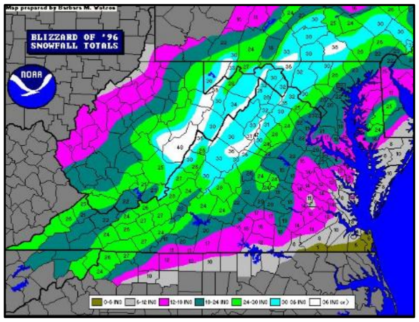
All eight counties in the region have felt the impacts of severe winter storms. The following list notes the number of events for each county (as listed in the table above).

- Calhoun County: 49 events
- Jackson County: 50 events
- Pleasants County: 41 events
- Ritchie County: 53 events
- Roane County: 52 events
- Tyler County: 49 events
- Wirt County:48 events
- Wood County: 46 events

Blizzard of 1993

In mid-March of 1993, after prolonged dry conditions, a massive snow storm impacted the eastern United States, including West Virginia. Parts of the state received 30+ inches of snow (Whetstone, 2016). The storm brought high winds and wind chill readings below zero. It reportedly stranded 4,000 motorists on roads throughout the state. Nine people died statewide (WV Public Broadcasting, 2018).

North American Blizzard of 1996



The North American Blizzard of 1996 was a nor'easter that struck the U.S. East Coast in early January. It is one of only three snowstorms to receive the top rating of five, or "Extreme," on the NESIS scale. Portions of eastern West Virginia received nearly 50" of snow, though most of the Mid-Ohio Valley received between six and 18 inches.

Loss and Damages

Severe winter weather caused $6,800,000.00 in damages in the Mid-Ohio Valley region over 25 years, with an average of $17,526.00 per event (though many events had no associated losses). This estimate likely underestimates damages to infrastructure and power lines. Severe winter weather can impact all areas and jurisdictions in the region.

Future Occurrences

Severe winter weather is another general label referring to weather phenomena, similar to the Intergovernmental Panel on Climate Change's (IPCC's) term "extreme precipitation." Winter precipitation events could thus become more extreme in nature, though they would like impact the same areas (as the entire region is equally susceptible to the occurrence of winter weather). The steering committee guiding this update noted several anecdotal observations about winter weather, including an apparent decrease in the number of events per winter season as well as a shift in winter from December through February to a January to March timeframe. Recent polar vortex events (see Section 2.2.6: Extreme Temperatures for more details) have yielded discussion that winter weather will include more cold snaps versus precipitation. Interestingly, this lived experience differs slightly from what is projected by the *Fourth National Climate Assessment* (2018).

The severity of severe winter storms may change in the future. For instance, heavy winter precipitation and blizzard conditions can impact power distribution utilities, and as those systems age, weather-related impacts may become more frequent in the form of power outages. The National Climate Assessment identifies a shortened snow season in the Northeast U.S., of which its report considers West Virginia to be a part. The report cites the increase in the amount of winter precipitation that falls as rain as a result of a likely northward shift in the rain-snow transition zone.

Risk Assessment

This section summarizes the vulnerability to the Mid-Ohio Valley region from severe winter storms. The Mid-Ohio Valley Regional Council conducted an online survey for the public to share its thoughts on hazard vulnerabilities. The following table presents the results of that survey regarding severe winter storms.

Public Sentiment, Severe Winter Storms					
	Level of Concern				*Total*
Hazard	*Not at All*	*Somewhat*	*Concerned*	*Very*	*Responses*
Severe Winter Storms	4 (6.15%)	20 (30.77%)	19 (29.23%)	22 (33.85%)	65
In the past ten years, do you remember this hazard occurring in your community?				43 (66.15%)	65
Have you noticed an increase in the occurrences or intensity of this hazard?				28 (42.42%)	66
Have you noticed a decrease in the occurrences or intensity of this hazard?				1 (1.52%)	66

The following table assigns point totals based on the methodology identified in Section 2.2: Profile Hazards above.

Severe Winter Storms Vulnerability Summary			
Category	*Points*	*Description*	*Notes*
Frequency	5	Excessive (Will occur during a year)	The region experienced 388 events over a 25-year period (1996-2021), for an average of 16 annual events.
Response	3	One week	Though most winter weather disruptions typically require a one- or two-day response, the response to major events, like the blizzards in 1993 and 1996, can take days.
Onset	1	Over 24 hours	Winter weather events are forecasted.
Magnitude	4	Catastrophic (more than 50% of land area affected)	Though the term “catastrophic” may seem extreme and acute impacts may be distributed, large winter storms impact the entire region.
Business	1	Less than 24 hours	Severe winter storms may shut businesses down for a few days, but rarely for a week or more.
Human	2	Low (some injuries)	The data above does not identify injuries or deaths from winter weather specifically in the region, though both injuries and death are possible.
Property	1	Less than 10% of property affected	The average loss of just over $17,000 per event is far less than the total value of personal property in the region.
Total	**17**	**Medium**	

2.0 RISK ASSESSMENT

2.3 Risk & Vulnerability Implications from Development Trends

§201.6(c)(2)(ii)(C)	[The plan should describe vulnerability in terms of] providing a general discussion of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Section 1.2 above presents information about development and other trends. This section revisits those trends, and applies lessons learned from the risk assessment to the trend discussion.

The future land use maps that appear in the various comprehensive plans outline targeted areas for residential, commercial, and industrial development. Some of these maps identify public use areas and green space. However, very little space is dedicated toward green space, and there are no mentions of buffer areas from hazard vulnerabilities. (Spencer's future land use map is sensitive to the special flood hazard area, though.) Land use maps typically support redevelopment and in-fill rather than identifying large swaths of land for different types of uses. As such, many of the risks outlined in the hazard profiles of Section 2.2 remain viable considerations for the near-term (i.e., next couple of planning cycles).

The most detailed future land use maps were for compact municipal areas. Even Parkersburg's corporate limits are compact when considering its population and the land area of comparable cities in, for example, Ohio. As such, to meet these municipal development goals, minimal space is available for naturalized areas. These areas are significant because they allow for the absorption of rain water. In an environment where heavier rains may occur, accounting for that water over highly-developed areas with high percentages of impervious surfaces may increase the risk of flooding.

The Mid-Ohio Valley Regional Council's (MOVRC) comprehensive economic development strategy (CEDS) identifies three "qualified opportunity zones" (QOZs), one each in Jackson, Wood, and Tyler Counties. All three areas are along the Ohio River. Though riverine flood impacts to developments in these QOZs is a concern, flash flooding along the small streams that feed into the Ohio River may present more issues. Further, the bulk of the region's rail freight activity (i.e., hazardous material transport) occurs along the river. The availability of commodity shipping is an attractive development feature, but it presents risks of hazardous materials released (dubbed "commercial/industrial/manufacturing incidents" by this plan). The new market tax credit zones from the CEDS document are more evenly distributed in the region and highlight mostly rural areas. Development in these areas may be impacted by cascading power outages, communications limitations, and resource disruptions due to issues with the limited transportation infrastructure in these areas.

The answer is not always to limit development. Rather, these municipalities may feature on-site stormwater management through retention basins and other green infrastructure solutions in future development. Partnerships with counties regarding the development in surrounding, more rural areas may allow for a more comprehensive approach to supporting resilient development.

Direct, measurable consequences of disasters can include fatalities, injuries, and damages to humans, animals, or property. Disasters do not end there; there are several indirect effects, tangible and intangible, associated with the. Some examples of these include loss of livelihood and income, loss of community and population, mental and psychological impacts, costs of rebuilding, repair or replacement, loss of inventory, wages and tax revenue, etc. (Bullock, Haddow, & Coppola, 2017). All of these also have a cost associated with them, but it is much more challenging to assign a specific dollar value and quantify them accurately. Often, disasters exacerbate risks that were already in a community (Comfort et al., 1999; Raker, Arcaya, Lowe, Zacher, Rhodes, & Waters, 2020). For instance, in areas where poverty is a concern, a disaster makes the challenges faced by those living in poverty much more difficult. In areas where access to public services is a concern, disasters may highlight how segments of the population cannot access assistance. Local leaders in areas where public trust in governmental systems is low may have difficulty in rallying residents to follow the community's response strategy.

Section 1.2 identifies a range of social vulnerability variables. The identification of the variables provides local officials the opportunity to think about how to best meet the needs of those populations during emergency situations. The preceding risk assessment helps those officials to think about how those populations might be impacted. Ideas (non-exhaustive) may include the following.

- **Commercial/Industrial/Manufacturing Incidents:** Low-income and minority populations often live near industrial areas due to phenomena such as gentrification, lower property values in industrial areas, air quality concerns, etc.; populations with a low English proficiency may not understand immediate warnings to evacuate; households with no vehicle can experience difficulty evacuating
- **Dam Failure:** Populations with a low English proficiency may not understand immediate warnings to evacuate; households with no vehicle can experience difficulty evacuating

- **Epidemic/Pandemic:** Populations without reliable internet service may be cut off from opportunities in stay-at-home situations; persons in group quarters may not be able to effective isolate from infected individuals
- **Extreme Temperatures:** Heat and cold waves impact the elderly and the very young, and areas with higher concentrations of these vulnerable populations may be disproportionately impacted; elderly populations often live in more urban areas subject to an urban heat island effect, thus exacerbating severe heat illnesses in this vulnerable population
- **Flooding:** Poverty-stricken populations often cannot afford flood insurance; populations with a low English proficiency may not understand immediate warnings to evacuate; households with no vehicle can experience difficulty evacuating
- **Severe Summer Storms:** Households below the poverty line are often un- or under-insured
- **Tornadoes:** Populations with a low English proficiency may not understand immediate warnings to evacuate; mobile homes are not constructed to standards that can withstand many high wind events and tornadoes
- **Severe Winter Storms:** Households below the poverty line are often un- or under-insured

Countless instances of the hazards identified in Section 2.2 could result in a disruption to critical infrastructure systems throughout the region. Loosely-related variables often considered *cascading hazards*, can complicate some hazards. For example, high winds may cause sporadic damage, but usually do not become a significant region-wide or county-wide concern until a large number of residents are without power. In addition to weather-related power outages, cascading hazards in the Mid-Ohio Valley region could include (but not be limited to) the following.

- Damage to infrastructure (i.e., roads, bridges, pipes, utility poles, etc.) and residences following flooding
- Flooding of downstream or protected areas in the event of a dam failure
- Drinking water supply shortages and contamination following severe and prolonged drought conditions or floods
- Power outages, ruptured gas lines, etc. following earthquakes or severe weather
- Public health concerns following flooding conditions
- Permanent or temporary population displacement before, during, or after an event

Further, the discussion of development trends in Section 1.2 notes the potential for an influx of families surrounding the creation of up to 1,000 jobs (i.e., the Berkshire Hathaway project in Jackson County). Sharply rising populations will likely strain infrastructure systems that are already insufficient or at maximum capacity.

Construction and development can change natural drainage paths and create or increase flood risks. New buildings, parking lots, and roads (i.e., impervious surfaces) mean less land to absorb excess precipitation forcing water onto land it previously would not reach. Industrial companies may impound water for their operations, causing land disturbances. Timbering operations may alter natural drainage paths or change the vegetation that is available to absorb rainwater. Changes to wetlands and erosion are other land disturbances that impact the permeability of areas. For these reasons, regional leaders may wish to consider low-impact development or green infrastructure projects.

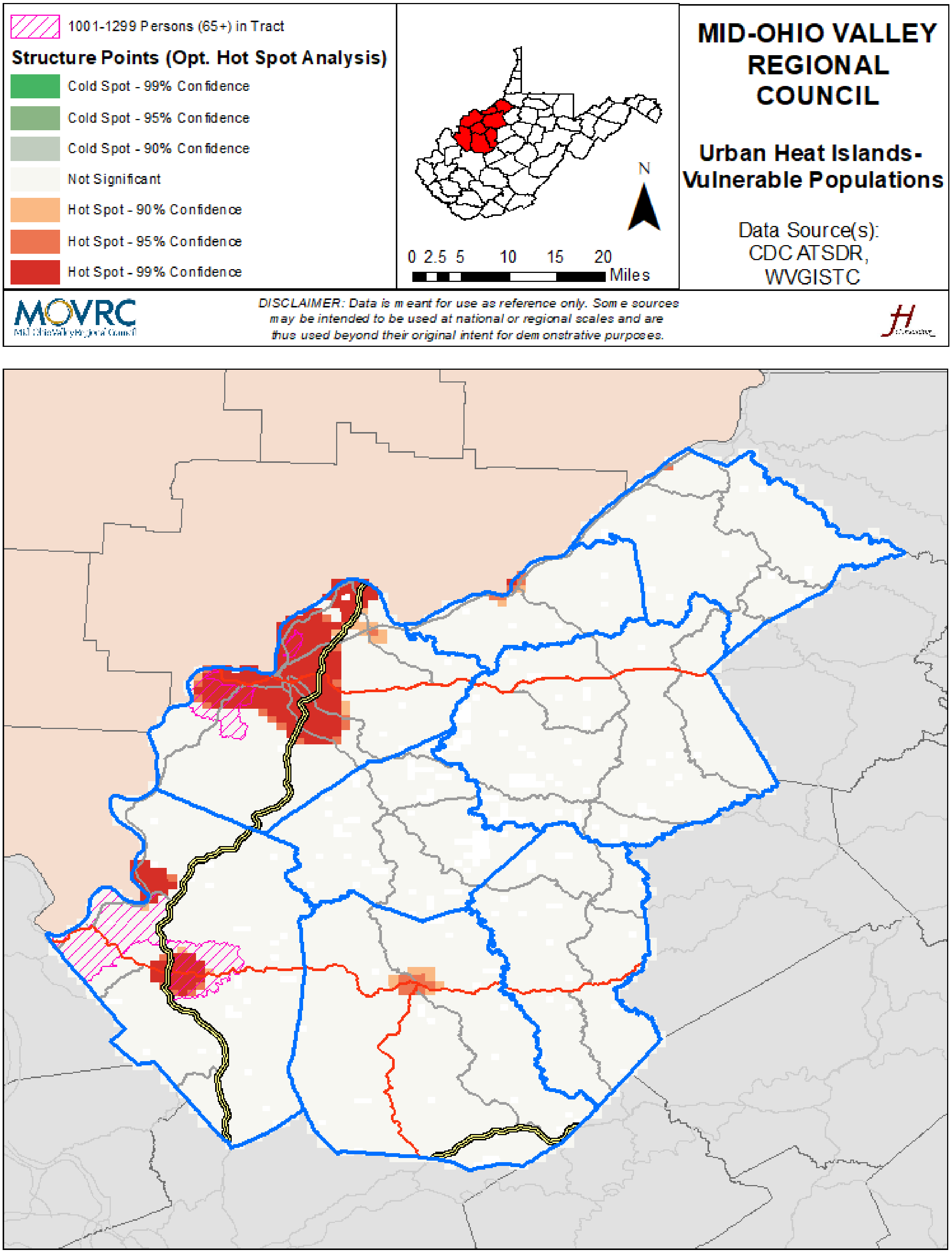
Erosion is not a hazard considered by this plan in-depth, but it can create challenges throughout the region. Dictionary.com defines erosion as “the process by which the surface of the earth is worn away by the action of water, glaciers, winds, waves, etc.” Erosion is a natural process controlled by weather drivers such as rainfall, bedrock wear in rivers, flooding, wind abrasion, groundwater process, and other mass movements of soils. The rates at which these processes act control how fast a surface is eroded (Cheraghi, Jomaa, Sander, & Barry, 2016).

Through the Mid-Ohio Valley region, erosion may happen as a result of, or may otherwise complicate or worsen the impacts of a variety of hazards. Heavy rains or snow melt may swell creeks and streams, causing waters to rush through them at a much higher velocity than is normal. At extremely high flows, kolks or vortices form from large volumes of rapidly rushing water. Kolks cause extreme local erosion, plucking bedrock and creating pothole-type geographical features called rock-cut basins (Alt, 2001). Rushing waters may wash away part of stream banks, depositing the sediment and material in other areas, and the deposits may cause future occurrences of hazards such as flooding in areas previously unaffected by flooding. In areas where material erodes, residents may experience property damage if structures are built in close proximity to stream banks or may experience fewer tangible losses as parts of their properties are washed away.

High winds can also cause erosion, stripping lands of valuable minerals and other cover. Two varieties of wind erosion can occur. *Deflation* occurs when wind picks up loose particles and carries them away. *Abrasion* refers to instances when surfaces wear down after be struck by airborne particles in the wind (Blanco-Canqui & Rattan, 2008; Dewey, Ryan, & Anderson, 1993; Balba, 1995). Wind erosion is more severe during times of drought (Wiggs, 2011).

Erosion is a known issue tied to construction projects, and it is common practice to compile an erosion and sediment control plan for large-scale projects. While construction-related erosion is not a significant risk to the region, it represents instances when a combination of variables could yield serious impacts. Heavy rains following the completion of a project may impact landscaping soon after construction ends because vegetation hasn't had the chance to take hold.

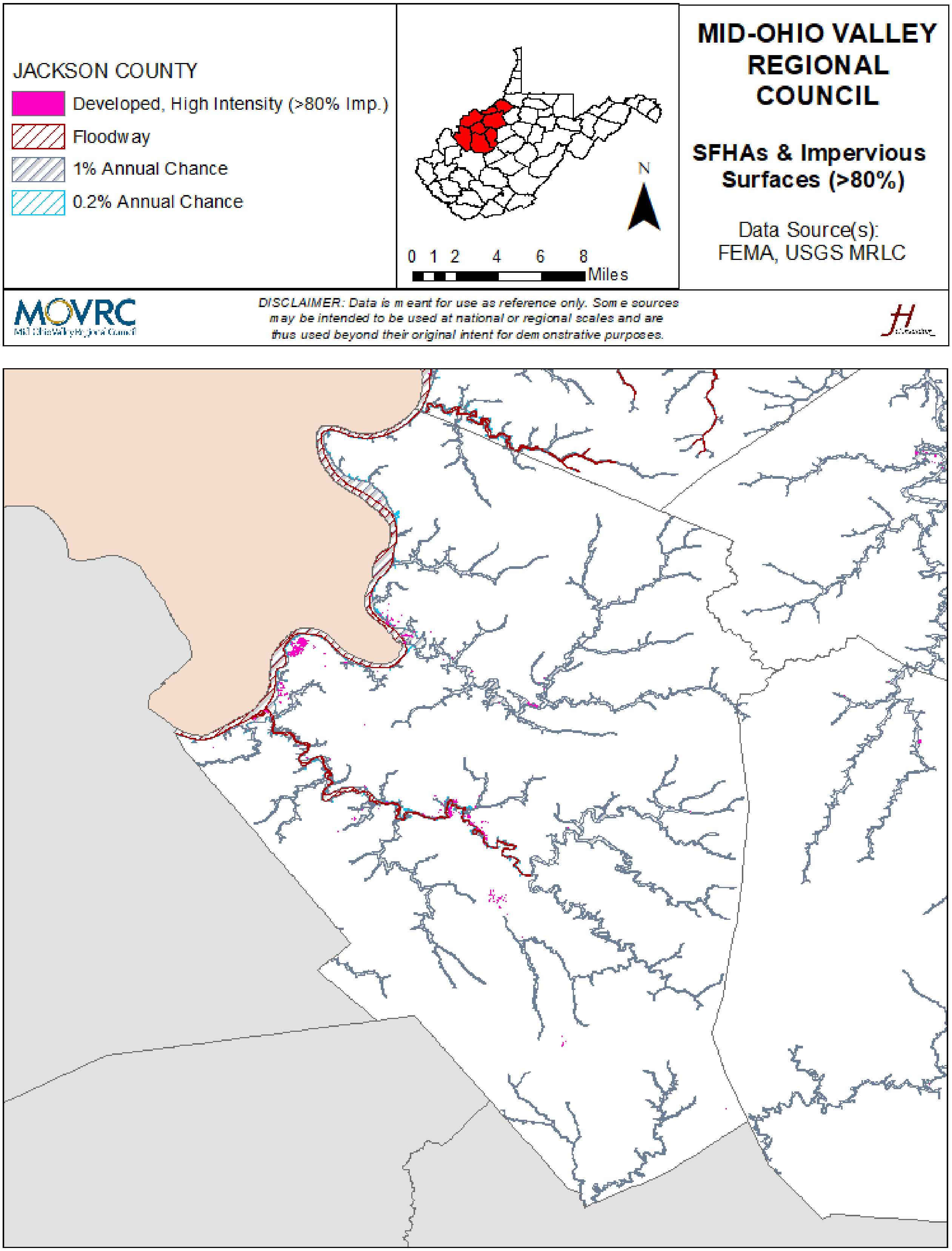
Vulnerability associated with climate, as noted in Section 1.2, is still difficult to describe with certainty as the research, though compelling, is emerging. Scientists have connected temperature extremes to the changing climate, and in this sense, Section 2.2.6: Extreme Temperatures serves as a resource. The profile identifies areas that could be subject to a more intense urban heat island effect, and it identifies concentrations of vulnerable populations. The intersection of those risk factors provides insights to local officials on where to target hazard mitigation efforts related to extreme temperatures (in extreme heat, in particular). The map below shows the locations of the Census tracts with the highest concentrations of vulnerable populations that are also located in areas with a potentially high urban heat island effect. Since the tracts do not align with the heat mapping that generated the urban heat island image, the tracts appear as a magenta-colored diagonal hatch.

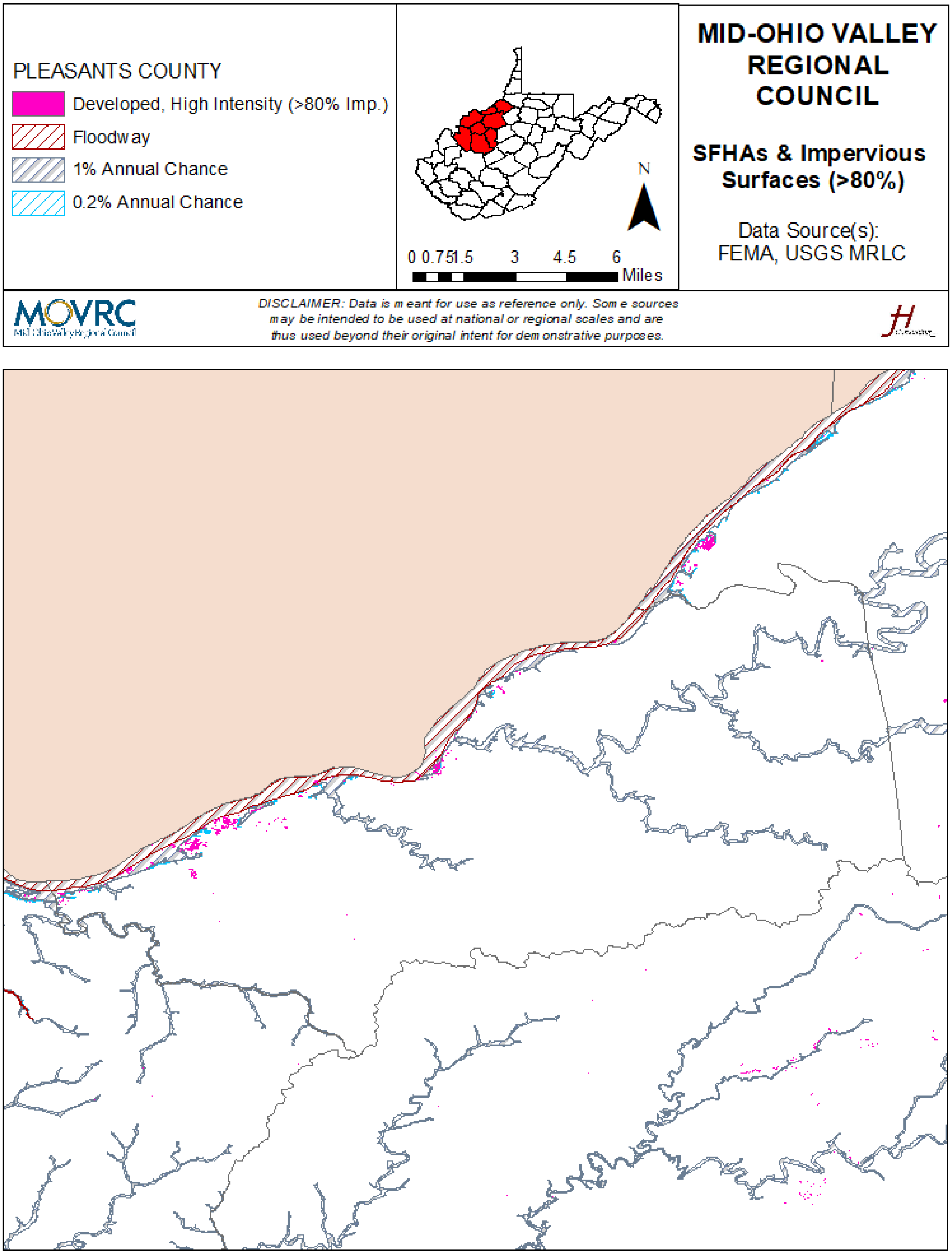

1001-1299 Persons (65+) in Tract
Structure Points (Opt. Hot Spot Analysis)
Cold Spot - 99% Confidence
Cold Spot - 95% Confidence
Cold Spot - 90% Confidence
Not Significant
Hot Spot - 90% Confidence
Hot Spot - 95% Confidence
Hot Spot - 99% Confidence
N
0 2.5 5 10 15 20
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
Urban Heat Islands- Vulnerable Populations
Data Source(s): CDC ATSDR, WVGISTC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

Additionally, the Intergovernmental Panel on Climate Change (IPCC) suggests that areas in the Northeast (to include West Virginia) could see an increased risk of extreme precipitation and flooding. Steering committee members and other local leaders participating in this process noted the increased frequency of severe, hyper local storms. Some areas of the region may experience extremely heavy rain in a short period, while other, nearby areas, may experience little precipitation. Further, storms forecasted to be minor have in them pockets of heavy precipitation, leading to relatively small areas (in geographic terms) of heavy damage. Finally, participants in this process anecdotally noted that flooding seems to occur more regularly in areas with minimal flooding histories. These changing weather conditions often interact with the built environment to create damage related to runoff.

The "Future Occurrences" section of 2.2.9: Severe Summer Storms identifies areas with higher percentages of land covered by impervious surfaces. The intersection of these areas with flood hazard areas may provide local leaders with insights as to where to concentrate hazard mitigation efforts related to stormwater management and flash flooding. The maps below identify areas, by county (if applicable), that are greater than 80% imperious *and* in a special flood hazard area. Note the magenta patches as follows.

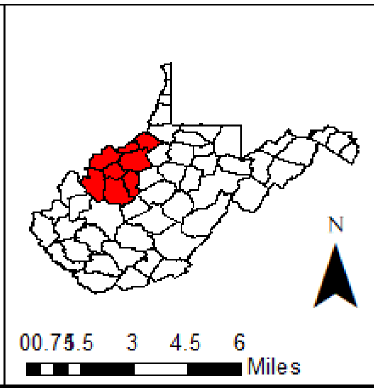
- **Jackson County:** The southern Ohio River areas, near the Ripley and Fairplain areas
- **Pleasants County:** Along the Ohio River
- **Roane County:** Spencer area
- **Tyler County:** Western edge of the county
- **Wirt County:** Elizabeth area
- **Wood County:** Along the Ohio River, Parkersburg area, and Mineral Wells area


JACKSON COUNTY
Developed, High Intensity (>80% Imp.)
Floodway
1% Annual Chance
0.2% Annual Chance
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SFHAs & Impervious Surfaces (>80%)
Data Source(s):
FEMA, USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


PLEASANTS COUNTY
Developed, High Intensity (>80% Imp.)
Floodway
1% Annual Chance
0.2% Annual Chance
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SFHAs & Impervious Surfaces (>80%)
Data Source(s):
FEMA, USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

ROANE COUNTY

- Developed, High Intensity (>80% Imp.)
- Floodway
- 1% Annual Chance
- 0.2% Annual Chance

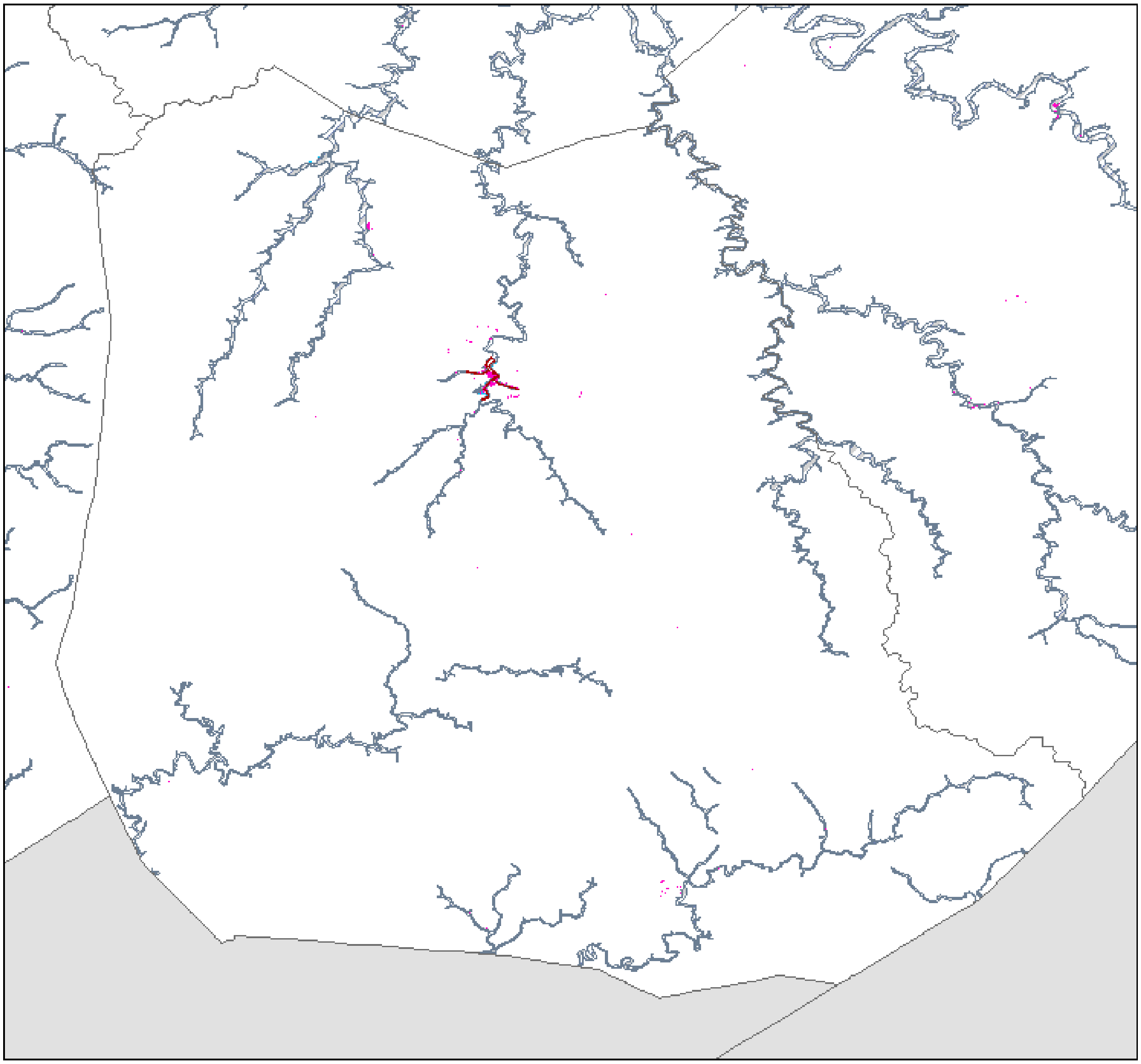


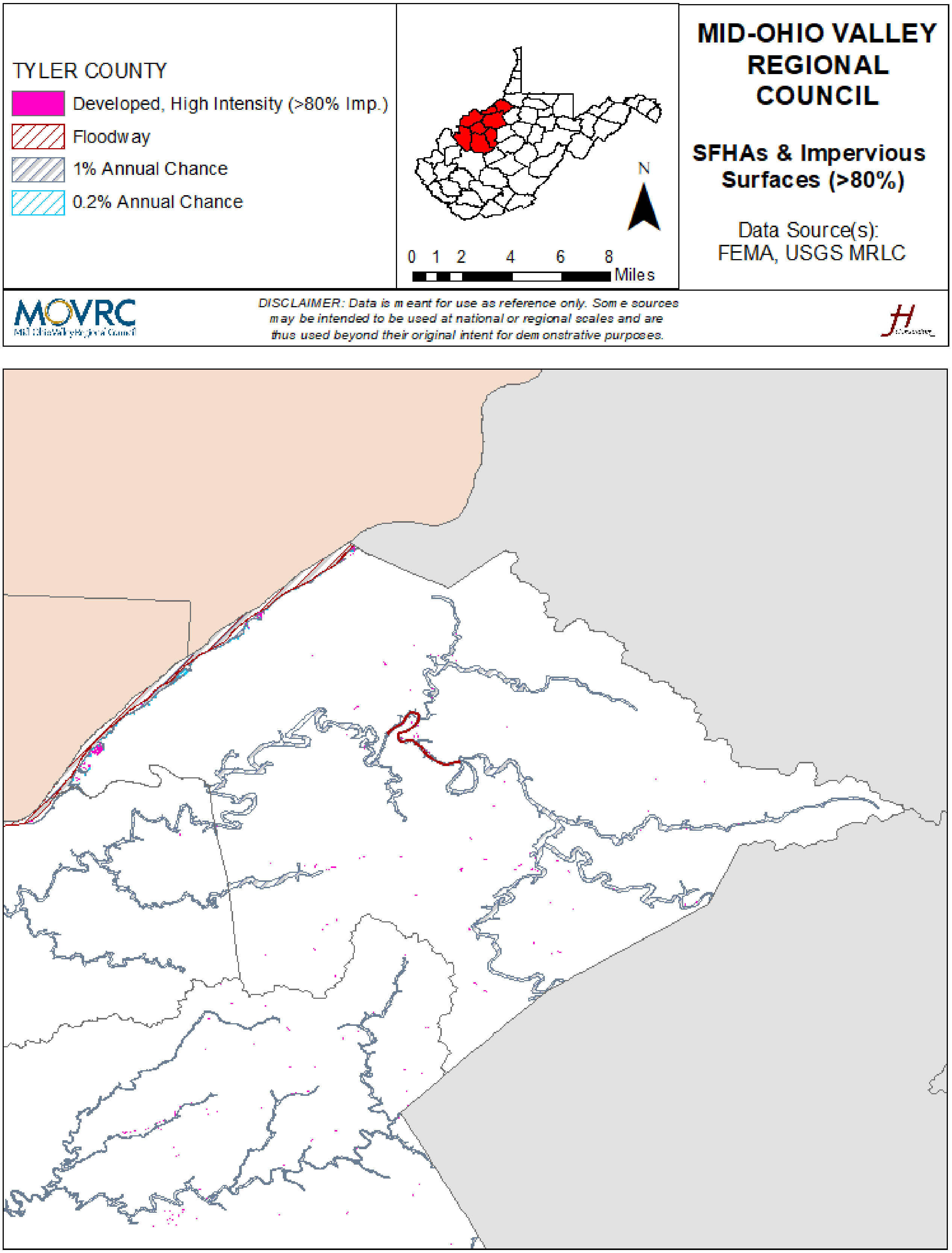
MID-OHIO VALLEY REGIONAL COUNCIL

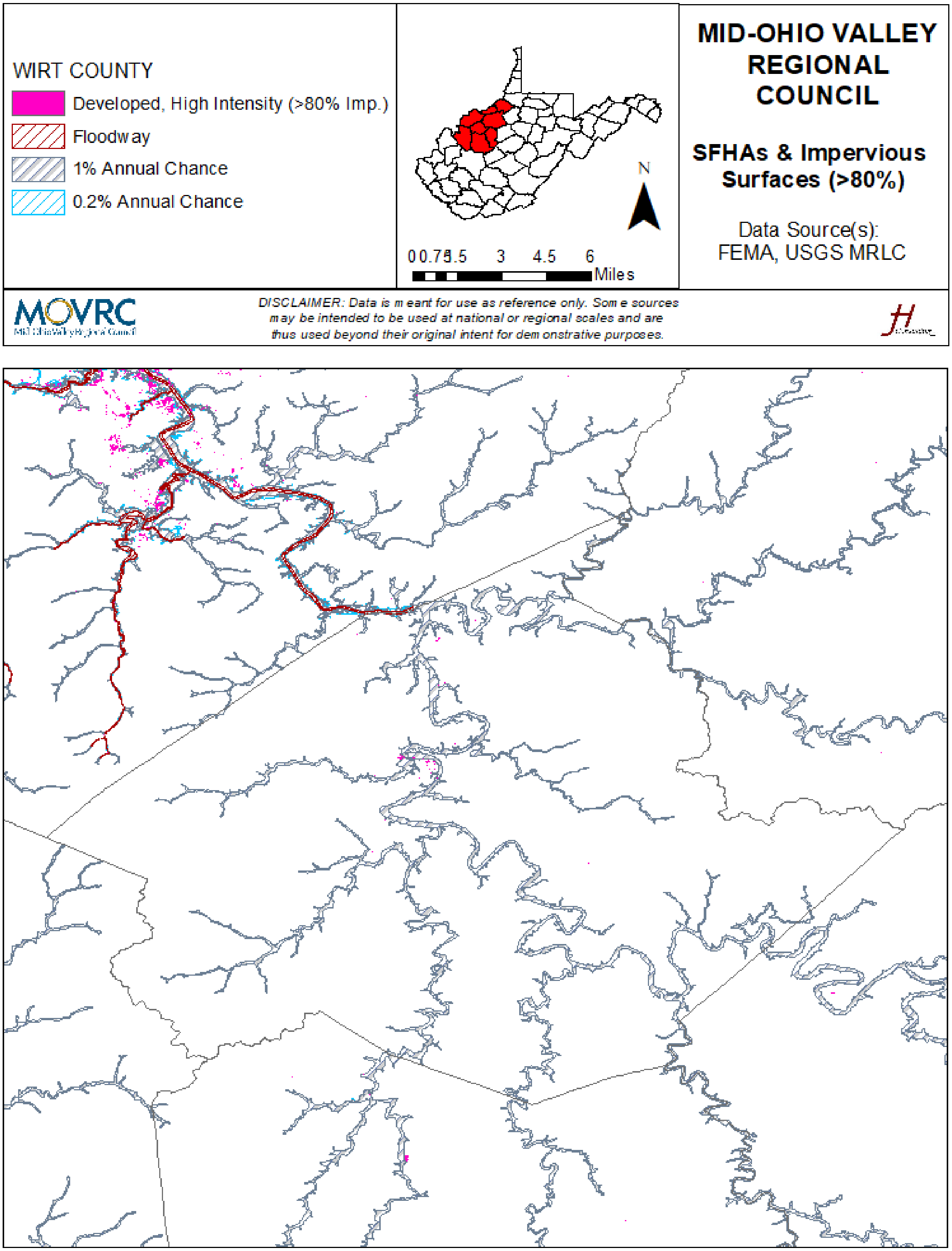
SFHAs & Impervious Surfaces (>80%)

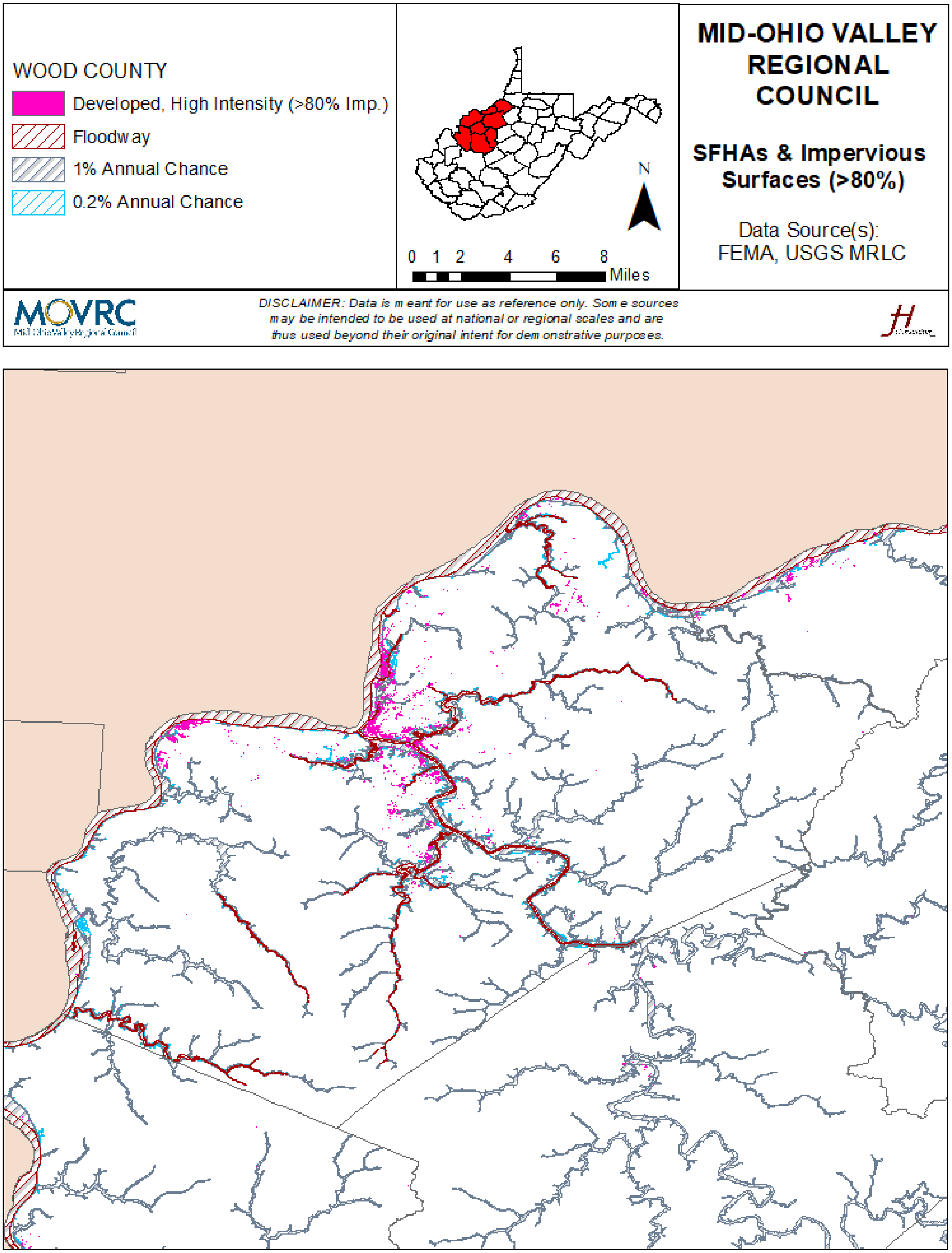
Data Source(s):
FEMA, USGS MRLC

DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.




TYLER COUNTY
Developed, High Intensity (>80% Imp.)
Floodway
1% Annual Chance
0.2% Annual Chance
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SFHAs & Impervious Surfaces (>80%)
Data Source(s):
FEMA, USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


WIRT COUNTY
Developed, High Intensity (>80% Imp.)
Floodway
1% Annual Chance
0.2% Annual Chance
N
0 0.75 1.5 3 4.5 6
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SFHAs & Impervious Surfaces (>80%)
Data Source(s):
FEMA, USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.


WOOD COUNTY
Developed, High Intensity (>80% Imp.)
Floodway
1% Annual Chance
0.2% Annual Chance
N
0 1 2 4 6 8
Miles
MID-OHIO VALLEY REGIONAL COUNCIL
SFHAs & Impervious Surfaces (>80%)
Data Source(s):
FEMA, USGS MRLC
MOVRC
DISCLAIMER: Data is meant for use as reference only. Some sources may be intended to be used at national or regional scales and are thus used beyond their original intent for demonstrative purposes.

2.0 RISK ASSESSMENT

2.4 Hazard Rankings

The hazard profiles above identify disaster declarations impacting the region on a hazard-by-hazard basis. The following table denotes which of the region's counties were in those declarations (*n* = 48).

Disaster Declarations in the Mid-Ohio Valley Region

Disaster Number	Calhoun County	Jackson County	Pleasants County	Ritchie County	Roane County	Tyler County	Wirt County	Wood County
DR-224-WV Flooding (1967)	X	X					X	X
DR-569-WV Severe Storms, Flooding (1978)		X						
DR-628-WV Severe Storms, Flooding (1980)		X						
DR-753-WV Severe Storms and Flooding (1985)	X					X		
EM-3109-WV Severe Snowfall and Winter Storm (1993)	X	X	X	X	X	X	X	X
DR-1084-WV Blizzard of '96 (1996)	X	X	X	X	X	X	X	X
DR-1096-WV Flooding (1996)			X			X		X
DR-1168-WV Heavy and Wind Driven Rain, High Winds, Flooding, Slides (1997)	X	X			X	X	X	X
DR-1229-WV Severe Storms and Flooding (1998)	X	X	X	X	X	X	X	X
DR-1319-WV Flooding, Severe Storms, and Landslides (2000)	X	X		X	X	X	X	
DR-1378-WV Severe Storms and Flooding (2001)	X				X			
DR-1455-WV Severe Winter Storm, Record/Near Record Snow, Heavy Rains, Flooding, and Landslides (2003)	X	X			X	X	X	
DR-1474-WV Severe Storms, Flooding, and Landslides (2003)				X				
DR-1500-WV Severe Storms, Flooding, and Landslides (2003)	X			X				
DR-1522-WV Severe Storms, Flooding, and Landslides (2004)		X			X		X	
DR-1558-WV Severe Storms, Flooding, and Landslides (2004)		X	X			X	X	X
EM-3221-WV Hurricane Katrina Evacuation (2005)	X	X	X	X	X	X	X	X

Disaster Declarations in the Mid-Ohio Valley Region								
Disaster Number	*Calhoun County*	*Jackson County*	*Pleasants County*	*Ritchie County*	*Roane County*	*Tyler County*	*Wirt County*	*Wood County*
DR-1574-WV Severe Storms, Flooding, and Landslides (2005)						X		
DR-1769-WV Severe Storms, Tornadoes, Flooding, Mudslides, and Landslides (2008)	X	X		X		X	X	
DR-1838-WV Severe Storms, Flooding, Mudslides, and Landslides (2009)	X				X		X	
DR-1881-WV Severe Winter Storm and Snowstorm (2010)	X			X	X			
DR-1903-WV Severe Winter Storms and Snowstorms (2010)				X		X		
EM-3358-WV Hurricane Sandy (2012)	X	X	X	X	X	X	X	X
EM-3345-WV Severe Storms (2012)	X	X	X	X	X	X	X	X
DR-4059-WV Severe Storms, Tornadoes, Flooding, Mudslides, and Landslides (2012)				X	X			
DR-4071-WV Super Derecho (2012)	X	X	X	X	X	X	X	X
USDA FSA S3384 Drought, Excessive Heat (2012)			X			X		X
USDA FSA S3386 Excessive Rain, Flooding, Flash Flooding (2012)		X						X
DR-4132-WV Severe Storms and Flooding (2013)					X			
EM-3366-WV Elk River Chemical Spill (2014)		X			X			
DR-4210-WV Severe Winter Storm, Flooding, Landslides, and Mudslides (2015)		X		X	X	X	X	X
DR-4220-WV Severe Storms, Flooding, Landslides, and Mudslides (2015)		X	X	X		X		
DR-4221-WV Severe Storms, Flooding, Landslides, and Mudslides (2015)	X	X	X		X		X	
DR-4236-WV Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides (2015)		X			X			X
USDA FSA S3934 Excessive Rain, Flash Flooding, Flooding, Excessive Heat, Landslides, Mudslides, High Winds, Hail, and Lightning (2015)		X	X			X		X
DR-4273-WV Severe Storms, Flooding, Landslides, and Mudslides (2016)		X			X			

Disaster Declarations in the Mid-Ohio Valley Region

Disaster Number	*Calhoun County*	*Jackson County*	*Pleasants County*	*Ritchie County*	*Roane County*	*Tyler County*	*Wirt County*	*Wood County*
DR-4331-WV Severe Storms, Flooding, Landslides, and Mudslides (2017)						X		
USDA FSA S4131 Drought (2017)			X			X		X
DR-4359-WV Severe Storms, Flooding, Landslides, and Mudslides (2018)	X		X	X		X	X	X
USDA FSA S4480 Hurricanes Florence and Michael (2019)	X	X	X	X	X	X	X	X
USDA FSA S4498 Extreme Cold, Excessive Rain, Flooding and the Polar Vortex (2019)			X			X		X
USDA FSA S4532 Excessive Rain and Flooding (2019)		X	X			X		X
USDA FSA S4541 Excessive Rain and Flooding (2019)						X		
EM-3450-WV Covid-19 (2020)	X	X	X	X	X	X	X	X
DR-4517-WV Covid-19 Pandemic (2020)	X	X	X	X	X	X	X	X
USDA FSA S4733 Excessive Moisture and Cold Temperatures (2020)			X			X		X
USDA FSA S4735 Excessive Rain and Cold Temperatures (2020)		X						X
USDA FSA S4747 Excessive Rain and Cold Temperatures (2020)								X

The preceding sections also identify a means for describing the probability and severity of the hazard effects on the Mid-Ohio Valley region. The process appears in Section 2.2, while a hazard-by-hazard consideration appears in each of the hazard profiles. The following table quickly summarizes that data and presents a ranked list of anticipated hazard impacts.

Summary of Hazard Rankings										
Hazard	*Vulnerability*	***Total***	*Frequency*	*Response*	*Onset*	*Magnitude*	*Business*	*Human*	*Property*
Severe Summer Storms	High	**21**	5	3	2	4	1	4	2
Flooding	Medium	**20**	5	3	3	1	2	4	2
Commercial/ Industrial/ Manufacturing Incidents	Medium	**18**	5	2	4	2	1	3	1
Epidemic/ Pandemic	Medium	**18**	2	5	1	4	1	4	1
Severe Winter Storms	Medium	**17**	5	3	1	4	1	2	1
Tornadoes	Medium	**16**	3	3	4	1	1	3	1
Geologic Hazards	Low	**15**	5	4	1	1	1	1	2
Dam Failure	Low	**14**	2	3	4	1	1	2	1
Wildfire	Low	**14**	2	3	4	1	1	2	1
Drought	Low	**13**	2	4	1	3	1	1	1
Earthquake	Low	**12**	2	2	4	1	1	1	1
Extreme Temperatures	Low	**12**	5	1	1	1	1	2	1

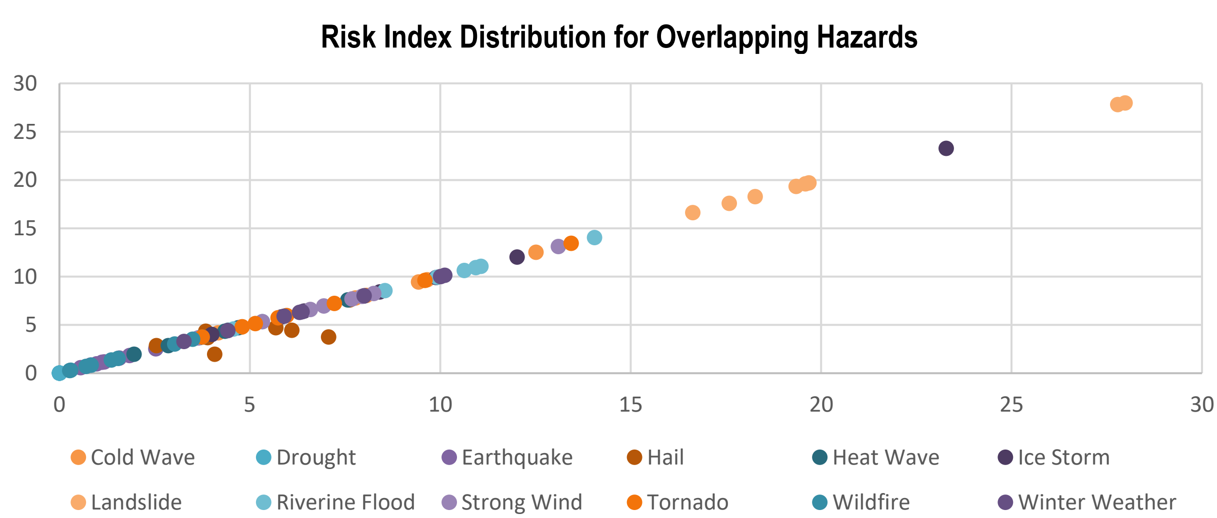
FEMA created the National Risk Index (NRI) in 2021 (FEMA, 2021) to illustrate the communities in the United States that are most at-risk from a dataset of 18 natural hazards. The tool is an interactive, online map ranking risk variables such as expected annual loss, social vulnerability, and community resilience (derive an aggregated risk score). For the hazards that appear in both this plan and the National Risk Index, a comparison with the rankings that appear in the preceding table can validate the findings of the above risk assessment.

The hazards that appear in both the NRI and this plan are: cold wave (appearing in this plan as “extreme temperatures”), drought, earthquake, hail (appearing in this plan as “severe summer storms”), heat wave (also appearing as “extreme temperatures”), ice storm (within “severe winter weather”), landslide (in “geologic hazards”), riverine flooding, strong wind (in “severe summer storms”), tornado, wildfire, and winter weather. The aggregated scores for the region are generally low. Only Wood County ranks as “Relatively Low,” while the remaining seven counties appear as “Very Low.”

The following table presents the region’s eight counties with their NRI scores for overall risk, expected annual loss, social vulnerability, and community resilience. Scoring is on a scale of 0 to 100. Per the NRI, lower risk is driven by lower loss, lower social vulnerability, and higher community resilience.

Mid-Ohio Valley Regional Risk Index				
County	*Risk Index*	*Expected Annual Loss*	*Social Vulnerability*	*Community Resilience*
Calhoun	5.67 (Very Low)	5.57 (Very Low)	42.69 (Relatively Moderate)	48.44 (Very Low)
Jackson	6.16 (Very Low)	8.04 (Very Low)	35.16 (Relatively Low)	52.99 (Relatively Low)
Pleasants	5.05 (Very Low)	7.27 (Very Low)	32.56 (Relatively Low)	54.15 (Relatively Moderate)
Ritchie	4.87 (Very Low)	5.22 (Very Low)	42.22 (Relatively Moderate)	52.23 (Relatively Low)
Roane	8.06 (Very Low)	8.37 (Very Low)	42.06 (Relatively Moderate)	50.45 (Relatively Low)
Tyler	5.57 (Very Low)	5.53 (Very Low)	46.00 (Relatively High)	52.79 (Relatively Low)
Wirt	3.56 (Very Low)	5.98 (Very Low)	27.04 (Relatively Low)	52.39 (Relatively Low)
Wood	8.38 (Relatively Low)	10.27 (Very Low)	39.77 (Relatively Moderate)	56.32 (Relatively High)

The following scatter plot shows the risk index scores for hazards that appear in both this plan and the NRI. Eight nodes appear for each overlapping hazards, representing the eight counties in the region. Despite the small sample size, the plot begins to identify trends. Generally, landslide rates high on the NRI, as evidenced by the orange nodes between the 15 and 20 ranges (as well as its accounting for the highest two outliers). The NRI data thus supports the development and use of the TEAL data in West Virginia, in particularly for the use of that data in the Mid-Ohio Valley region. The light blue nodes represent riverine flooding, and those notes are *generally* clustered between the 10 and 15 range. Hail data (i.e., maroon nodes) showed the most variance within the scatter plot. Finally, most of the rankings appeared in the 0 to 5 range, which was expected given the overall county rankings of "Very Low" and "Relatively Low."



Finally, the following table averages the risk index scores for the hazards appearing in both this plan and the NRI[1] and ranks them from highest to lowest score. The far-right column describes the variance from the rankings table above (which was derived entirely from the analysis in the hazard profiles).

NRI and Hazard Profile Rankings Comparison					
Hazard	*Risk Index (Average of Scores)*	*Absolute NRI Ranking*	*Hazard Profile Vulnerability Assignment*	*Absolute Hazard Profile Ranking*	*Change (from Hazard Profile Absolute Ranking Placement)*
Landslide (i.e., Geologic Hazards)	20.86	1	Low (15)	7	↑ 6
Riverine Flood (i.e., Flooding)	9.38	2	Medium (20)	2	↔
Severe Winter Storms	8.26	3	Medium (17)	5	↑ 2
Tornado	6.71	4	Medium (16)	6	↑ 2
Severe Summer Storms	6.27	5	High (21)	1	↓ 4
Extreme Temperatures	5.85	6	Low (12)	T11	↓ 5
Wildfire	1.44	7	Low (14)	T8	↓ 1
Earthquake	1.33	8	Low (12)	T11	↓ 3
Drought	0.00	9	Low (13)	10	↑ 1

When beginning to compare data, the first acknowledgement should be that this mitigation plan and the NRI considered different variables. For example, this document analyzed extreme cold and heat side-by-side, whereas the NRI considered them separately. Thus, comparisons are for planning purposes only.

The largest variance in the two sources lies with landslides (i.e., geologic hazards). This plan considered geologic hazards to include landslides along with land subsidence, mine subsidence, and mudslides. The steering committee guiding the 2022 mitigation update consolidated these hazards based on their experiences with them, to include a similar response to each. Landslides are typically the most destructive of the four hazards considered in the geologic hazards profile, and the loss estimations for the mitigation plan may have decreased

[1] To ensure that hazard categories aligned, for this table, planners averaged the NRI scores for "Code Wave" and "Heat Wave" into a composite score for "Extreme Temperatures." Planners also averaged the scores for "Hail" and "Strong Wind" into a score for "Severe Summer Storms" as well as the scores for "Ice Storm" and "Winter Weather" into a "Severe Winter Storms" category.

with the addition of the subsidence-centric variations of the hazard. (Geologic hazards did rank the highest of the “Low” vulnerability hazards in the region, being just one point shy of a “Medium” designation per Section 2.2 above.) Additionally, the Mid-Ohio Valley region, like all regions in West Virginia, only began to use the Total Exposure Area Landslide (TEAL) data in this update cycle. The TEAL data is not as mature as its flood-centric counterpart (i.e., the TEIF data). As the TEAL data becomes more robust and communities become accustomed to using it, planning considerations for landslides may change.

Severe summer storms ranked higher from the data in the hazard profiles than in the NRI. Again, this may be a function of local experience, as severe storms (particularly high winds) are typically some of the most problematic in the Mid-Ohio Valley. Summer storms results in cascading impacts such as power outages, and in some cases, they may generate secondary hazards like mudslides or landslides, which appear elsewhere in both this plan and the NRI.

Finally, commercial/industrial/manufacturing incidents and epidemic/pandemic appear in this plan (i.e., the third and fourth highest scores from the calculations in the hazard profiles), but they did not appear in the National Risk Index. If one compares *only* the overlapping hazards (i.e., severe summer storms, flooding, severe winter storms, geologic hazards, and tornadoes) as they appear in the absolute rankings from the hazard profiles above, the top five hazards from both scales are the same five hazards, suggesting more congruence between the measures than may at first appear.

3.0 MITIGATION STRATEGY

§ 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 existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

According to FEMA (2013), "the mitigation strategy is made up of three main required components: mitigation goals, mitigation actions, and action plan for implementation. These provide the framework to identify, prioritize, and implement actions to reduce risk to hazards." This section contains the aforementioned items; it describes the updated goals and objectives for this mitigation plan, it outlines the action items (or projects) for each participating jurisdiction within the Mid-Ohio Valley region, and each project identifies the agency responsible for completing the project as well as a general timeline for completion.

3.0 MITIGATION STRATEGY

3.1 Mitigation Goals and Objectives

The Mid-Ohio Valley's existing hazard mitigation plan included five broad goals to guide hazard mitigation activities. At its first meeting, the steering committee discussed the goals and, with the exception of a slight revision to the fifth goal, agreed to keep them the same. Thus, the hazard mitigation goals for the Mid-Ohio Valley region.

1. Improve Regional Resilience
2. Protect Life and Property
3. Improve Understanding of Risk and Vulnerability for Planning Purposes
4. Bolster Public Understanding and Preparedness
5. Enhance Citizen Participation in Mitigation and Disaster Recovery Activities

The steering committee elected to add objectives under each goal to organize specific mitigation actions and to serve as "metrics" for measuring goal progress. Each of the actions that appear in Section 3.2 below will reference the goals and objectives. The following table lists the objectives under each of the goals.

Mid-Ohio Valley Regional Mitigation Goals and Objectives
Goal 1: Improve Regional Resilience Objective 1.1: Reduce risk through sustainable development. Objective 1.2: Mitigate social vulnerability variables as a means of promoting regional resilience. Objective 1.3: Prioritize projects that strengthen critical infrastructure (including dams) and reduce risks in communities.
Goal 2: Protect Life and Property Objective 2.1: Build structures designed to reduce risk in communities. Objective 2.2: Reduce the negative effects of severe summer and winter weather events. Objective 2.3: Reduce risk through an enhanced, more efficient emergency response. Objective 2.4: Reduce risk by removing at-risk properties.
Goal 3: Improve Understanding of Risk and Vulnerability for Planning Purposes Objective 3.1: Make data available to relevant communities to support mitigation-related decision-making.
Goal 4: Bolster Public Understanding and Preparedness Objective 4.1: Encourage residents to undertake personal mitigation projects on their properties.
Goal 5: Enhance Citizen Participation in Mitigation and Disaster Recovery Activities Objective 5.1: Identify partners that can help engage a larger, more representative sample of the population in mitigation planning. Objective 5.2: Build up the region's capability to support their populations in the aftermath of a large-scale hazard occurrence.

3.0 MITIGATION STRATEGY

3.2 Mitigation Actions

This section serves as a mitigation action plan to reduce the losses and other impacts the Mid-Ohio Valley region may suffer from the hazards included in the risk assessment. “A mitigation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementing mitigation actions helps achieve the plan’s mission and goals. The actions to reduce vulnerability to threats and hazards form the core of the plan and are a key outcome of the planning process” (FEMA, 2013).

§ 201.6(c)(3)(ii)	A section that identifies and 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.

Mid-Ohio Valley Regional Council (MOVRC) staff, the MOVRC’s consultant, and steering committee members reached out to the participating jurisdictions regarding mitigation projects. This outreach included steering committee meetings, individual telephone calls, ancillary meetings (such as the local officials meeting in Spencer, Sandyville flood control project meeting, and Tyler County Local Emergency Planning Committee [LEPC] meetings), emails from MOVRC staff, etc. The remainder of this section describes the types of mitigation actions from which participating jurisdictions could choose, outlines the methodology for prioritizing mitigation projects, and presents the final project list. See Appendix 3 for a list of projects that have been completed, deferred, or deleted.

Types of Mitigation Actions

There are five primary types of mitigation actions that can work to reduce long-term vulnerability: local plans and regulations, structure and infrastructure projects, natural systems protection, education programs, and preparedness and response activities (Coastal Hazards Research Center & Center for Sustainable Community Design, n.d.).

- **Local Plans and Regulations:** Local land use or comprehensive plans embody the goals, values, and aspirations of the community, as expressed through a process of community engagement. Local ordinances and review processes influence land development and building construction. In some cases, plans and regulations can work as cross-purposes. For instance, a capital improvement plan may call for extending water and sewer lines to an area that is vulnerable to natural hazards. Examples include the following.

- Comprehensive plans
- Land use ordinances
- Subdivision regulations
- Development review
- Building codes and enforcement
- NFIP and the Community Rating System (CRS)
- Capital improvement programs
- Open space preservation
- Stormwater management regulations and master plans

- **Structure and Infrastructure Projects:** These actions involve modifying existing structures and infrastructure to protect them from a hazard or remove them from a hazard area. These projects could apply to public or private structures as well as critical facilities and infrastructure. This type of action also involves projects to construct human-made structures to reduce the impact of hazards. Examples include the following.
  - Acquisitions and elevations of structures in flood-prone areas
  - Utility undergrounding
  - Structural retrofits
  - Floodwalls and retaining walls
  - Detention and retention structures
  - Culverts
  - Safe rooms

- **Natural Systems Protection:** These are actions that minimize damage and losses while preserving or restoring the functions of natural systems. Examples include the following.
  - Sediment and erosion control
  - Stream corridor restoration
  - Forest management
  - Conservation easements
  - Wetland restoration and preservation

- **Education Programs:** These are actions to inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them. Although this type of mitigation reduces risk less directly than structural projects or regulations, it is an important foundation. A greater understanding and awareness of hazards and risk among local officials, stakeholders, and the public can lead to direct actions. Examples include the following.
    - Social media, radio or television spots
    - Websites, with maps and information
    - Real estate disclosure
    - Presentations to school groups or neighborhood organizations
    - Mailings to residents in hazard-prone areas.
    - StormReady
    - Firewise Communities

- **Preparedness and Response Activities:** Mitigation actions that reduce or eliminate long-term risk are different from actions taken to prepare for, or respond to, hazard events. Mitigation activities lessen or eliminate the need for preparedness or response resources in the future. When analyzing risks and identifying mitigation actions, the planning team may also identify emergency response or operational preparedness actions.

    For some hazards such as tornadoes, including preparedness actions in the mitigation plan may be necessary and practical. The mitigation plan may be the best place for your community to capture and justify the need for these actions. However, these will not supplant or meet the federal requirements for identifying mitigation actions. It is important that the planning team understands the difference and can distinguish between mitigation and other emergency management activities.

For this update, communities also considered another type of mitigation project: those that address social vulnerability and access to assistance. Identifying a broader range of impacts to likely hazards enables community leaders to identify more ways in which to achieve potential risk reduction. Further, working to ensure greater access to participation in future mitigation work as well as to assistance when hazard events occur may lessen loss by lessening the amount of time a family struggles post-disaster.

Project Prioritization

Prioritizing projects helps to define the types of action that local leaders should pursue first, though there is a recognition that communities may implement projects out of a prioritized order based on the availability of funding. FEMA guidance recommends the use of the STAPLEE method, and the MOVRC's steering committee largely agreed. Following the fourth steering committee meeting, a "project prioritization subcommittee" completed an activity to determine the appropriate criteria to consider for each STAPLEE category. The 2016 version of the plan included multiple criteria for each category, and the steering committee wanted to trim criteria down to a single, tangible item.

Further, the subcommittee ranked the STAPLEE categories in order from the one they felt was most important down to the least important of the seven categories and assigned points based on that ranking. The post important category equals seven points; the least important equals one point. The criteria for each category yield a positive or a negative response. If the project under consideration answers the criteria question positively, it receives the allocated points for that category. The table below presents the STAPLEE categories, in ranked order, along with the criteria question and the available points per category. See Appendix 2 for project scoring.

Prioritization Criteria and Scoring		
STAPLEE Category	*Criteria*	*Allocated Points*
Legal (L)	Will the project be challenged in court?	7
Administration (A)	Does the coordinating agency have the capability of meeting any ongoing administrative requirements the project will create (i.e., is the project sustainable)?	6
Economic (E)	Will the benefits of this project exceed the cost (over a measurable span of time, even if that time is in years)?	5
Social (S)	Will the project unfairly treat any segment of the community (e.g., the homeless, those living under the poverty line, by any protected class category, etc.)?	4
Technical (T)	Will the proposed action work (i.e., is it technically feasible)?	3
Environmental (E)	Will the project require environmental regulatory approvals?	2
Political (P)	Is there stakeholder and public support to implement and maintain the project?	1

The steering committee allowed for tie scores. In the instance of a tie, the projects will appear with the same priority. The next highest priority will fall in numerical order based on the number of projects in the tie. For instance, if a jurisdiction has four projects and two of them tie for Priority 2, that jurisdiction's priority listing would be 1, 2, 2, and 4 (with the slot occupied by the third priority "taken" by the tied second priority project).

2022-2027 Project List

The following tables list the active hazard mitigation projects for the MOVRC and the counties, cities, and towns in the region. Jurisdictional representatives throughout the Mid-Ohio Valley region began their consideration of an updated project list by first reviewing their projects from the 2016 version of the plan. The above mitigation action types as well as FEMA's *Local Mitigation Planning Handbook* (2013) also served as resources for ideas when communities wanted to consider new projects.

- The first table, entitled *2022-2027 Regional Actions List*, lists regional mitigation actions to be coordinated by the Mid-Ohio Valley Regional Council (MOVRC).
- The second table, entitled *2022-2027 Jurisdictional Actions List*, lists jurisdictional mitigation actions addressing all hazards.

It was important to local representatives to avoid "plan utopia." As such, the MOVRC and participating jurisdictions ensured the creation of realistic projects. Some of these projects are large. The planning team listed "5 years" as the timeframe because this plan is updated every five years; however, there is an explicit understanding that it is not possible to complete the project list that appears below in five years.

The West Virginia Division of Emergency Management (WVEMD) provided planning and development councils with TEIF[1] and TEAL[2] data during this update cycle. Jurisdictions in the Mid-Ohio Valley region were most interested in the TEIF data because it deals with flooding, a primary hazard of concern. Generally, local officials were intrigued by the data. However, the volume of available data was difficult to comprehend in the context of the mitigation plan update. Put differently, the detail in the TEIF data will enable specific operational decisions regarding risk reduction and public education, but participants could only scratch the surface of the data when focusing on the more pressing concern of updating the jurisdiction's project list.

Nine (9) jurisdictions utilized the TEIF building-level risk analysis (BLRA) to inform the development of their flood mitigation projects in the table below. MOVRC and its consultant engaged several jurisdictions in a discussion about their BLRA, and through those discussions, developed "problem statements" to identify priority flood mitigation projects. For those jurisdictions that utilized problem statements, the narrative in the status line describes the statement (e.g., a phrase like, "the image at right presents the structures in the floodway" corresponds to a problem statement about structures located in a floodway).

[1] TEIF = Total Exposure in Floodplains
[2] TEAL = Total Exposure Area Landslide

2022-2027 Regional Actions List

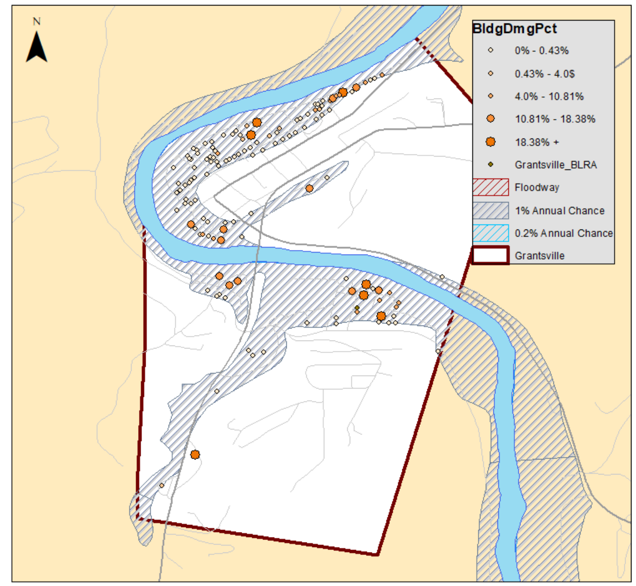
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2022-01	Support municipalities by compiling applications for and administration of mitigation funding (e.g., BRIC, HMGP).	2	As-needed	MOVRC	Counties, Municipalities (i.e., grant applicants)	N/A (MOVRC may utilize allowable administrative funds if awarded)	BRIC, HMGP, CDBG, Local funds	Education Programs	All (but primarily Flooding and Severe Summer Storms)
Goal Alignment: Goal 5 – Enhance Citizen Participation in Mitigation and Disaster Recovery Activities (see Objective 5.2) **Status:** NEW – This project appears for the first time in 2022. The MOVRC has been engaged in these activities, and given the lack of in-house capability at some of the region's municipalities, being more deliberate in offering this assistance may help more communities either reduce risk or recover from occurrences.									
2022-02	Provide TEIF and TEAL data to member governments, to include support with GIS analysis.	1	1 year	MOVRC	N/A	N/A (TEIF/ TEAL data is already available	N/A	Education Programs	Flooding, Geologic Hazards
Goal Alignment: Goal 3 – Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1) **Status:** NEW – This project appears for the first time in 2022. The data was just made available to the planning and development councils as part of this plan update. To begin, MOVRC should focus on Jackson, Ritchie, and Wood Counties.									
2022-03	Develop an educational program for member governments and residents regarding NFIP and floodplain management.	4	3 years	MOVRC	Floodplain Coordinators	N/A (The action calls for bringing together existing information)	N/A	Education Programs	Flooding
Goal Alignment: Goal 4 – Bolster Public Understanding and Preparedness (see Objective 4.1) **Status:** NEW – This project appears for the first time in 2022. It comes from the results of the public survey, where residents were not consistently aware of whether or not they lived in a special flood hazard area. Further, the MOVRC received conflicting responses regarding floodplain management on the capability survey.									
2022-04	Continue to examine consolidation of water and sewer utilities in order to provide more reliable service to residents.	4	5 years	MOVRC	Counties, Municipalities, PSDs	N/A (Facilitation requires no funding)	CDBG, USDA, WVIJDC (re: implement-tation)	Structure & Infrastructure Projects	Severe Summer Storms, Severe Winter Storms
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** NEW – This project appears for the first time in 2022. It is consistent with existing efforts to ensure a more efficient service delivery, to include greater reliability of critical infrastructure. Efforts are currently underway involving Pennsboro, the Hughes River Water Board, West Union, and Doddridge County and involving Grantsville and the Mt. Zion and Pleasant Hills PSDs.									

2022-2027 Regional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2022-05	Support broadband development throughout the region.	3	5 years	MOVRC	Counties, Municipalities, PSC	Unknown	USDA, USEDA	Structure & Infrastructure Projects	All
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** NEW – This project appears for the first time in 2022. Broadband connectivity, including Internet access, is a foundational aspect of the region's infrastructure, related to warnings, emergency public information, and general communication in the aftermath of disasters. This action includes continued support for the Calhoun-Clay-Roane Regional Plan that appears in the West Virginia State Broadband Plan 2020-2025.									
2016-57	Establish a loan program for citizens to access for hazard mitigation purposes.	6	On-going	MOVRC	Financial Institutions	Contingent on requests	Local funds	Education Programs	All
Goal Alignment: Goal 4 – Bolster Public Understanding and Preparedness (see Objective 4.1) **Status:** ONGOING – The MOVRC has a loan program designed to support small business development in the region. The MOVRC revised this action (which previously focused on tree removal) to be broadly applicable to hazard mitigation, and it intends to use the small business development program as a model as it considers establishing the mitigation-centric program.									

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-01	Calhoun County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	12 (Tie)	5 years	Calhoun County (Commission, FP Coordinator, OES, etc.)	MOVRC	$100,800[3] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – The Little Kanawha Highway flood mitigation acquisition project is underway, and MOVRC staff are currently working with county officials on a project along the Upper West Fork. Administratively, the planning team consolidated Project #2016-15 with this project. Project 2016-01 remains ongoing because there are still areas in the county targeted for mitigation projects, pending funding.									
2022-06	Utilize TEIF data to better describe remaining acquisition, elevation, and relocation projects.	1 (Tie)	1 year	MOVRC	Calhoun County FP Coordinator	N/A (The data is already available)	N/A	Education Programs	Flooding
Goal Alignment: Goal 3: Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1) **Status:** NEW – This project appears for the first time in 2022. The North Side Road project in Calhoun County is unfunded, but remains a beneficial potential project. Utilizing TEIF data to identify the most at-risk structures may help local officials target properties, making the project both more effective and more attractive for funding.									
2022-07	Grantsville will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	12 (Tie)	5 years	Grantsville FP Coordinator	MOVRC, Calhoun County FP Coordinator	$100,800[3] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding

[3] Estimate taken from Census data (i.e., "median value of owner-occupied housing units, 2016-2020").

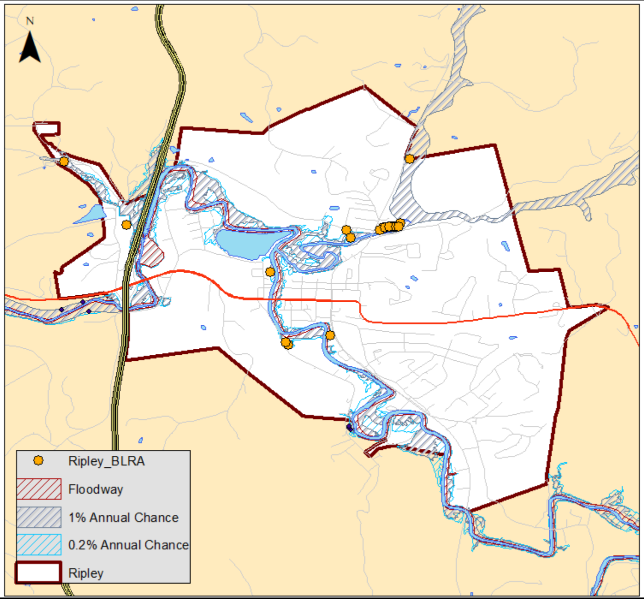
2022-2027 Jurisdictional Actions List

Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** NEW – This project appears for the first time in 2022. The Town of Grantsville has worked with the MOVRC to identify potential mitigation areas on Court Street, Florence Street, Mill Street, and River Street. TEIF data indicates the following potential properties in these areas. The larger orange dots indicate structures along these streets with potential damage percentages that exceed 10.81%.  									
2016-02	Jackson County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	12 (Tie)	5 years	Jackson County (Commission, FP Coordinator, OES, etc.)	MOVRC	$126,100[4] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Jackson County has not undertaken mitigation projects since the 2016 update, but give the presence of repetitive loss properties in the county, the county, the MOVRC, and the steering committee opted to keep this project listed. Administratively, the planning team consolidated Project #2016-21 with this project; as such, Sycamore Road along Sycamore Creek is a targeted area.									

[4] Estimate taken from Census data (i.e., "median value of owner-occupied housing units, 2016-2020").

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-22	Ripley will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the city.	12 (Tie)	5 years	Ripley FP Coordinator	MOVRC, Jackson County FP Coordinator	$126,100[4] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding

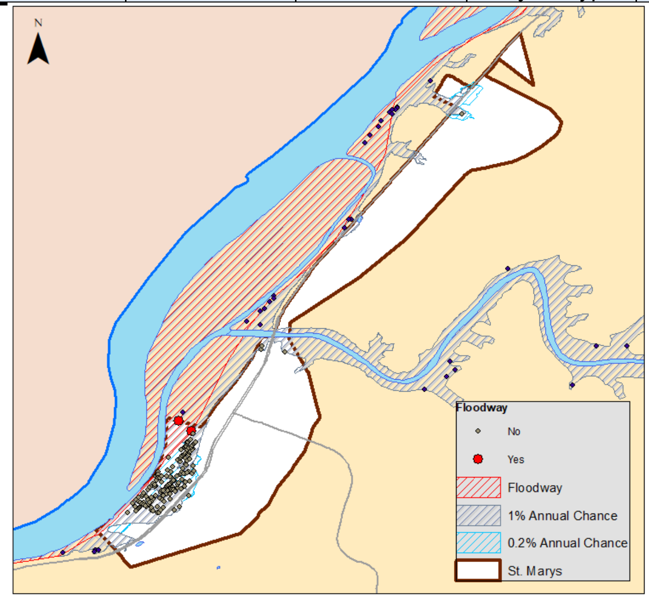
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4)
Status: ONGOING – This project is ongoing from the 2016 version of the plan. Planners revised the project to accurately reference at-risk areas in the city. TEIF data shows 22 properties in flood hazard areas, as shown in the image to the right. Twelve (12) of these structures are along McDermott Lane in the northern portion of the city.



2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-03	Pleasants County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	12 (Tie)	5 years	Pleasants County FP Coordinator	MOVRC	$110,500[5] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Pleasants County has not undertaken mitigation projects since the 2016 update, but give the presence of repetitive loss properties in the county, the county, the MOVRC, and the steering committee opted to keep this project listed. Administratively, the planning team consolidated Project #2016-23 with this project. Areas along Cow Creek, Sled Fork, and the Left Fork of French Creek could be targeted areas.									
2022-08	St. Mary's will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the city.	12 (Tie)	5 years	St. Mary's FP Coordinator	MOVRC, Pleasants County FP Coordinator	$110,500[5] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding

[5] Estimate taken from Census data (i.e., "median value of owner-occupied housing units, 2016-2020").

2022-2027 Jurisdictional Actions List

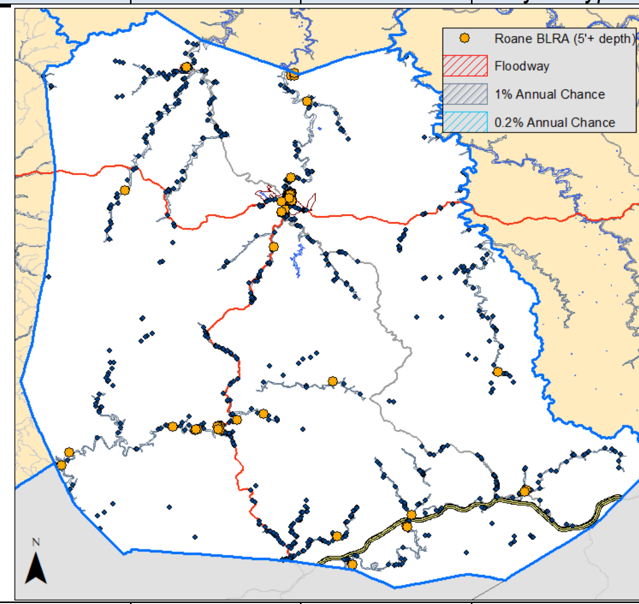
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** NEW – This project appears for the first time in 2022. City leaders reviewed TEIF data and chose to focus on mitigating the two properties located in the floodway. The image at right shows those structures (per the TEIF data).  									
2016-04	Ritchie County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	12 (Tie)	5 years	Ritchie County FP Coordinator	MOVRC	$96,100[6] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Ritchie County has not undertaken mitigation projects since the 2016 update, but give the presence of repetitive loss properties in the county, the county, the MOVRC, and the steering committee opted to keep this project listed.									

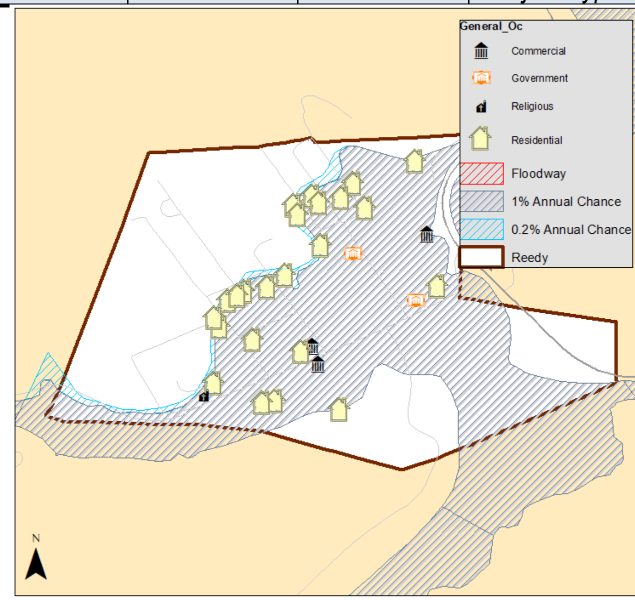
[6] Estimate taken from Census data (i.e., "median value of owner-occupied housing units, 2016-2020").

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-24	Cairo will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	12 (Tie)	5 years	Cairo FP Coordinator	MOVRC, Ritchie County FP Coordinator	$96,100[6] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Cairo has not undertaken mitigation projects since the 2016 update, but give the presence of repetitive loss properties in the county, the county, the MOVRC, and the steering committee opted to keep this project listed.									
2016-05	Roane County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.		5 years	Roane County FP Coordinator	MOVRC	$97,900[7] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding

[7] Estimate taken from Census data (i.e., “median value of owner-occupied housing units, 2016-2020”).

2022-2027 Jurisdictional Actions List

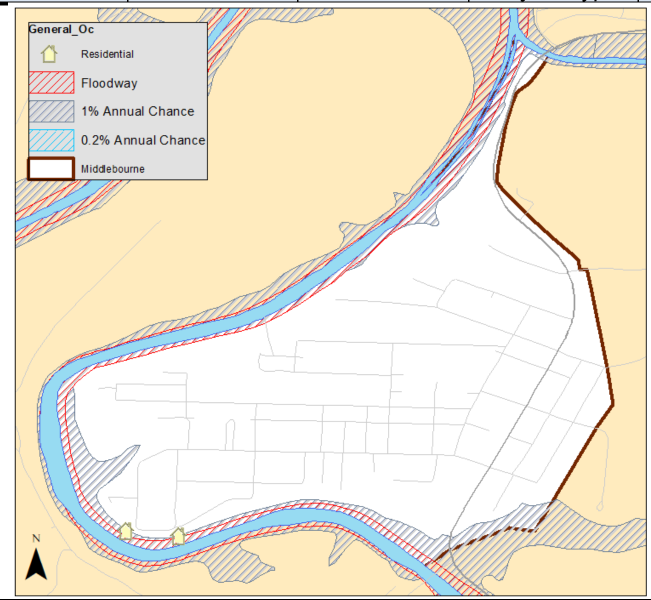
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Roane County is active with its buyout program and had a project underway (by supporting Spencer) along Spring Creek at this time of the 2022 update. Administratively, the planning team consolidated Projects #2016-26, 2016-27, and 2016-31 with this project. As such, Pidgeon Run, Little Pidgeon Run, Big Sandy Creek, and Hurricane Creek remain areas to target with future projects. Further, this project how also includes relocating the county's 911/OES office and emergency medical services facility out of the special flood hazard area. During a July county-specific meeting, the Roane County Floodplain Coordinator reviewed TEIF data and indicated a preference for mitigating properties in the floodway. Those projects are primarily located in Spencer (and will appear below). As a second priority, the county will focus on mitigating properties with the potential of having five or more feet of floodwaters in them. The image to the right shows those properties.									
2022-09	Reedy will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	12 (Tie)	5 years	Reedy FP Coordinator	Roane County FP Coordinator, MOVRC	$97,900[7] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding

<table>
<tr><th colspan="10">2022-2027 Jurisdictional Actions List</th></tr>
<tr><th>Project #</th><th>Action</th><th>Priority</th><th>Timeframe</th><th>Coordinator</th><th>Support Entities</th><th>Est. Cost</th><th>Resources</th><th>Mitigation Project Type</th><th>Hazard Addressed</th></tr>
<tr><td colspan="10">Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4)
Status: NEW – This project appears for the first time in 2022. The town has completed mitigation projects in the past, and there have been mixed benefits. However, there are risks that remain. The TEIF data to the right shows the structures in the flood hazard area. Administratively, the planning team consolidated Project #2016-28 with this project. As such, flood mitigation efforts for the town now include relocating the Reedy VFD that is susceptible to flooding.

</td></tr>
<tr><td>2022-10</td><td>Spencer will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the city.</td><td>12 (Tie)</td><td>5 years</td><td>Spencer FP Coordinator</td><td>Roane County FP Coordinator, MOVRC</td><td>$97,900[7] per structure</td><td>BRIC, HMGP, Local funds</td><td>Structure & Infrastructure Projects</td><td>Flooding</td></tr>
<tr><td colspan="10">Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4)
Status: NEW – This project appears for the first time in 2022. The city is currently working with Roane County and the MOVRC on a mitigation project that includes Front Street and other areas along Spring Creek (see photos at right). The Reynolds Street project along Bens Run moved from the mitigation reconstruction list to an acquisition/relocation project per WVEMD request, and remains a priority (but as yet unfunded) project.
 </td></tr>
</table>

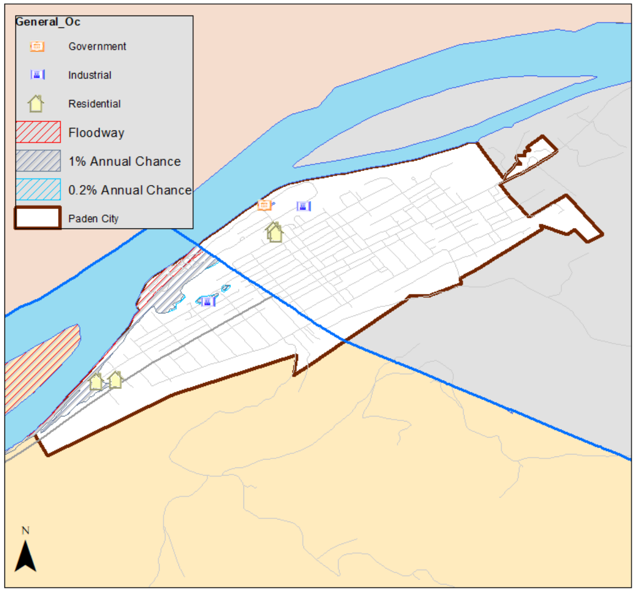
2022-2027 Jurisdictional Actions List

Project #	Action	Priority	Timeframe	Coordinator	Support Entities	Est. Cost	Resources	Mitigation Project Type	Hazard Addressed
2016-06	Tyler County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	12 (Tie)	5 years	Tyler County FP Coordinator	MOVRC	$90,900[8] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Tyler County has not undertaken traditional flood mitigation projects since the 2016 update (though it has completed other mitigation projects), but give the presence of repetitive loss properties in the county, the county, the MOVRC, and the steering committee opted to keep this project listed. Administratively, the planning consolidated Project #2016-32 with this project; as such, areas in Lima along Indian Creek and also along Middle Island Creek are target areas.									
2022-11	Middlebourne will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	12 (Tie)	5 years	Middlebourne FP Coordinator	Tyler County FP Coordinator, MOVRC	$90,800[8] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding

[8] Estimate taken from Census data (i.e., “median value of owner-occupied housing units, 2016-2020”).

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** NEW – This project appears for the first time in 2022. During a June 2022 LEPC meeting, officials from Middlebourne reviewed TEIF data, which identified two properties in the flood hazard area (as shown in the image at right). The town will prioritize mitigating those properties if it has the opportunity to participate in a mitigation program.									
2022-12	Paden City will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the city.	12 (Tie)	5 years	Paden City FP Coordinator	Tyler County FP Coordinator, MOVRC	$90,800[8] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** NEW – This project appears for the first time in 2022. During a June 2022 LEPC meeting, officials from Paden City reviewed TEIF data, which identified seven properties in the flood hazard area (as shown in the image at right). The city will prioritize mitigating those properties if it has the opportunity to participate in a mitigation program.									



2022-13	Friendly will continue to seek out opportunities to apply for hazard mitigation assistance for new construction to protect assets as well as mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	12 (Tie)	5 years	Friendly FP Coordinator	Tyler County FP Coordinator, MOVRC	(Likely greater than) $120 per linear foot of levee	BRIC, CDBG, USACE, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.1) **Status:** NEW – This project appears for the first time in 2022. During a June 2022 LEPC meeting, Friendly officials reviewed TEIF data for the town. Flooding is a concern, yet traditional acquisition projects would hamper the tax base for the town. As such, town officials elected to explore the feasibility of constructing a levee to protect town assets.									

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-07	Wirt County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	12 (Tie)	5 years	Wirt County FP Coordinator	MOVRC	$93,500[9] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Wirt County has not undertaken traditional flood mitigation projects since the 2016 update, but give the presence of repetitive loss properties in the county, the county, the MOVRC, and the steering committee opted to keep this project listed. Administratively, the planning team consolidated Projects #2016-35 and 2016-36 with this project, and as such, Garfield Road in southern Wirt County is an area of consideration. Areas near Boy Scout Road in Newark are also a consideration, as flooding in this area blocks off the county fire department and EMS.									
2016-08	Wood County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	12 (Tie)	5 years	Wood County FP Coordinator	MOVRC	$126,300[10] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Wood County has not undertaken traditional flood mitigation projects since the 2016 update, but give the presence of repetitive loss properties in the county, the county, the MOVRC, and the steering committee opted to keep this project listed.									
2016-38	Complete flood mitigation buyouts in the Happy Valley area of Wood County.	12 (Tie)	Ongoing	Wood County FP Coordinator	MOVRC	$126,300[10] per structure	BRIC, HMGP, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4) **Status:** ONGOING – Six phases of buyouts have been completed in the Happy Valley area; however, there are additional properties at risk. (The original project identified 241 at-risk homes and structures.) Thus, the project remains active for the 2022 update.									

[9] Estimate taken from Census data (i.e., "median value of owner-occupied housing units, 2016-2020").
[10] Estimate taken from Census data (i.e., "median value of owner-occupied housing units, 2016-2020").

<table>
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<tr><th>Project #</th><th>Action</th><th>Priority</th><th>Timeframe</th><th>Coordinator</th><th>Support Entities</th><th>Est. Cost</th><th>Resources</th><th>Mitigation Project Type</th><th>Hazard Addressed</th></tr>
<tr><td>2011-02</td><td>The remaining municipalities in the region will consider opportunities for mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions to mitigate flood risks.</td><td>12 (Tie)</td><td>5 years</td><td>Municipal FP Coordinators</td><td>County FP Coordinators, MOVRC</td><td>$105,250[11] per structure</td><td>BRIC, HMGP, Local funds</td><td>Structure & Infrastructure Projects</td><td>Flooding</td></tr>
<tr><td colspan="10">Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.4)
Status: ONGOING –The MOVRC kept (and revised) this project to specifically reference all municipalities in the region to allow for eligibility for future flood mitigation programs. The municipalities that appear with specific projects of their own are not included in this strategy; they appeared above because they are actively working on projects (or developing projects for application submissions) with the MOVRC. As such, this action is for the following municipalities.
Auburn
Belmont
Elizabeth
Ellenboro
Harrisville
North Hills
Parkersburg
Pennsboro
Pullman
Ravenswood
Sistersville
Vienna
Williamstown</td></tr>
<tr><td>2016-09</td><td>Ensure that all critical infrastructure providers, specifically water and sewer operations, have generators that will allow them to operate when power outages occur.</td><td>7</td><td>5 years</td><td>Municipal utility boards, PSD boards</td><td>MOVRC</td><td>$20,000+ per unit</td><td>BRIC, HMGP, WVIJDC, Local funds</td><td>Structure & Infrastructure Projects</td><td>Severe Summer Storms, Severe Winter Storms</td></tr>
<tr><td colspan="10">Goal Alignment: Goal 2: Protect Life and Property (see Objective 2.2)
Status: ONGOING – The MOVRC elected to keep this project active in the 2022 version of the plan after revising it from “public utilities” to “critical infrastructure providers.” Two utilities – the Town of Elizabeth and the Tyler PSD – are currently working on auxiliary power projects for their systems. Administratively, the planning team consolidated Project #2016-11 with this project, and as such, the project now includes VFDs, EMS stations, police stations, 911 centers, and emergency operations centers as targeted facilities for auxiliary power. This action is all 30 jurisdictions in the region.</td></tr>
<tr><td>2016-12</td><td>Ensure the availability of training opportunities and resources in the region for individuals wishing to become volunteer firefighters, EMS personnel, or law enforcement officers.</td><td>35</td><td>5 years</td><td>County EMAs</td><td>First responder orgs., WVEMD, WVSFM, WVOEMS</td><td>N/A (Identifying training opportunities would not require funding)</td><td>N/A</td><td>Education Programs</td><td>All</td></tr>
</table>

[11] Estimated derived by averaging Census data (i.e., “median value of owner-occupied housing units, 2016-2020”) for all counties in the region.

2022-2027 Jurisdictional Actions List

Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
Goal Alignment: Goal 2 – Protect Life and Property (see Objectives 1.2 and 2.3) **Status:** ONGOING – The MOVRC elected to keep this project active for the 2022 update. It is not a mitigation project, and despite a deliberate effort to focus this project list on mitigation, the council recognizes that staffing is a critical concern for emergency responder agencies, and support for solutions to the problem is paramount across all phases of emergency management. Further, when looking at social vulnerability indicators, an increased cadre of emergency responders might better serve a wider range of their communities.									
2016-13	Obtain a warning system program or programs for each county.	8 (Tie)	5 years	County EMAs	MOVRC, WVEMD	$15,000+ per unit	BRIC, Local funds	Preparedness & Response Activities	All
Goal Alignment: Goal 3 – Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1) **Status:** ONGOING – The planning team kept this project active for the 2022 update. The region's counties now have various versions of mass notification systems, but public information and warning is a continuous effort, and emergency managers take a toolbox approach to continually cover more of their populations. Additionally, these capabilities can be used to notify populations about mitigation opportunities. In Tyler County, the OES has recently purchased variable LED message signs for warning and outreach purposes. This action is for the eight counties in the region.									
2011-07	Each jurisdiction participating in the NFIP will continue to enforce and, when appropriate, update its floodplain ordinance consistent with documented national standards and regulations.	42 (Tie)	Ongoing	FP Coordinators	WVEMD	N/A (NFIP jurisdictions already have ordinances in place)	N/A	Local Plans & Regulations	Flooding
Goal Alignment: Goal 2 – Protect Life and Property (see Objective 2.1) **Status:** ONGOING – The planning team left this project active. All but one jurisdiction in the region participates in the NFIP, and ordinance maintenance is a key requirement for remaining in the program. This action is for all jurisdictions except for North Hills.									
2016-46	Upgrade systems throughout the region to support more broadband connectivity as well as cellular coverage.	12 (Tie)	5 years	MOVRC	County Commissions, WVDO	$70M+ per the regional plan that includes Roane County	Unknown	Structure & Infrastructure Projects	All
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** ONGOING – The planning team left this project active for 2022, but significantly revised it to focus more on the development of broadband. Broadband development is a priority project statewide, and it supports reduced risk by enabling more reliable communication, warning, and public information. This action is for the region's eight counties.									
2016-47	Improve and upgrade the snow removal equipment and supplies in each of the region's counties.	3 (Tie)	Ongoing	WVDOH	Local governments	Unknown	Unknown	Preparedness & Response Activities	Severe Winter Storms
Goal Alignment: Goal 2 – Protect Life and Property (see Objective 2.2) **Status:** ONGOING – This project remains active for 2022. It is a preparedness-centric project, but several DOH operations in the region's counties have been active in their efforts to upgrade equipment. This project remains as a means of supporting those efforts. This action is for all of the region's member governments.									

2022-2027 Jurisdictional Actions List

Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2011-08	Consider strengthened building codes and developing zoning ordinances throughout the region, remembering to calculate enforcement as an ongoing cost of implementation.	42 (Tie)	5 years	Municipal councils	Building code officials, WVSFC	N/A (Exploring these options will not require significant funds)	Local funds (for enforcement)	Local Plans & Regulations	All (but particularly Flooding, Geologic Hazards, Severe Summer Storms, and Severe Winter Storms)
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.1) **Status:** ONGOING – This project also remains active, but it has been significantly revised. Some jurisdictions, such as the Town of Elizabeth, are exploring zoning ordinances, but the costs of enforcement have been a challenge. Further, zoning is a controversial topic in West Virginia. Regarding building codes, all jurisdictions have them, but there is room to consider strengthening them to go above and beyond IBC recommendations. This action is for the region's 22 municipal jurisdictions.									
2016-58	Conduct tree trimming and removal of fallen/broken branches in public rights-of-way to limit the possibility of damage.	42 (Tie)	Ongoing	County EMAs	Municipal public works, first responders, WDOH	Unknown	Local funds	Natural Systems Protection	Severe Summer Storms, Severe Winter Storms
Goal Alignment: Goal 2 – Protect Life and Property (see Objective 2.2) **Status:** ONGOING – This project remains active for 2022. Often, the WVDOH initiates right-of-way clearance along roadways, and private sector power companies clear power line rights-of-way. There have also been instances of pipeline operators clearing pipeline rights-of-way. Preventive maintenance may keep first responders from having to respond to downed limbs. This action is for all of the region's jurisdictions.									
2016-14	Establish a formalized "safety check system" for vulnerable populations in the region's communities.	48 (Tie)	Ongoing	County EMAs	First responders, local churches	N/A (Community outreach would necessitate little funding)	Local funds	Preparedness & Response Activities	All
Goal Alignment: Goal 5 – Enhance Citizen Participation in Mitigation and Disaster Recovery Activities (see Objectives 1.2 and 5.2) **Status:** ONGOING – Though there was debate about the definition of a "safety check system" during the 2022 update, the planning team elected to keep this project active for three reasons. First, though it is preparedness centric, it is underway in counties such as Tyler. Second, the steering committee heavily discussed equity and disaster justice issues, and this action supports that effort. Finally, outreach to vulnerable populations can include education about personal and household mitigation. This action is for the region's eight counties.									

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-16	Replace and correct the low water bridge at Henry's Fork in Altizer (Calhoun County) to correct backups and flooding.	36 (Tie)	5 years	Calhoun County FP Coordinator	Calhoun County OES, MOVRC, WVDOH	Unknown	BRIC, State funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** ONGOING – There has been no progress on this project due to a lack of available funding.									
2016-17	Repair, replace, or reconstruct low-lying roadways to prevent parts of the county from being cut off from the others during flood events in Calhoun County.	36 (Tie)	5 years	Calhoun County FP Coordinator	Calhoun County OES, MOVRC, WVDOH	Unknown (Until specific areas identified for study)	N/A	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** ONGOING - There has been no progress on this project due to a lack of available funding.									
2016-18	Mitigation flash floods in various areas of Jackson County, where water covers roadways and isolates communities. Targeted areas include Evans, Kenna, and Sandyville.	36 (Tie)	5 years	Jackson County FP Coordinator	Jackson County OES, MOVRC, WVDOH	Unknown	BRIC, State funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objectives 1.1 and 1.3) **Status:** ONGOING – This project remains active in 2022 though no progress has been made to date. The Kenna area serves as a priority because flash flooding typically isolates the VFD and EMS provider (as well as the PSD office). Particularly in the Evans area, local officials may consider low-impact development or green infrastructure solutions. Administratively, the planning team consolidated Projects #2016-18, 2016-19, and 2016-20 with this project.									
2016-25	In Ritchie County, address the enforcement of the county's floodplain ordinance regarding campers (associated with energy contractors) set up and inhabited in the floodplain.	48 (Tie)	Ongoing	Ritchie County FP Coordinator	Ritchie County Commission	N/A (Primarily an enforcement issue)	Local funds	Local Plans & Regulations	Flooding
Goal Alignment: Goal 5 – Enhance Citizen Participation in Mitigation and Disaster Recovery Activities (see Objective 5.1) **Status:** ONGOING – This project is a carryover from 2016, but it has been revised. Previously, the action called for the creation of an employee position, which is likely unfeasible. However, the problem of recreational vehicles serving as housing for energy contractors in floodplains remains a risk. The revised version of this project calls for a more participative process to consider solutions to the problem.									

2022-2027 Jurisdictional Actions List

Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-29	In Spencer, replace the bridge at Walmart with a structure better-suited to accommodate the volume of potential floodwaters that may flow through the stream.	36 (Tie)	5 years	Spencer FP Coordinator	Roane County FP Coordinator, MOVRC, WVDOH, Property developer	Unknown	BRIC, State funds, Local funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** ONGOING – There has been no progress on this project due to a lack of available funding.									
2016-33	Replace, repair, or reconstruct low bridges along Indian Creek, in Shirley, along SR 23, on Sellers Run Road, Stewarts Run, Elk Fork, Muddy Creek, Little Sancho, and Meadville. These low bridges may be responsible for up to 60% of the school cancellations due to flooding because buses cannot get through and there are no feasible alternative routes.	36 (Tie)	5 years	Tyler County FP Coordinator	Tyler County OES, Tyler County Schools, MOVRC, WVDOH	Unknown	BRIC, State funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** ONGOING – There has been no progress on this project due to a lack of available funding.									
2016-34	Take steps to mitigate flooding in the Newark area of Wirt County at the confluence of the Little Kanawha and Hughes Rivers. This area floods quickly and can block portions of SR 47.	36 (Tie)	5 years	Wirt County FP Coordinator	Wirt County OES, MOVRC, WVDOH	Unknown	BRIC, State funds	Structure & Infrastructure Projects	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** ONGOING – There has been no progress on this project due to a lack of available funding.									
2016-50	Utah Road in Jackson County (near Ravenswood) has had slip issues. Consider addressing this area.	5 (Tie)	5 years	Jackson County OES	MOVRC, WVDOH	Unknown	State funds	Structure & Infrastructure Projects	Geologic Hazards
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** ONGOING – There has been no progress on this project due to a lack of available funding.									

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-51	Perform streambank restoration, natural channel restoration, and stream cleaning activities along Cow Creek, Sled Fork, and the Left Fork of French Creek in Pleasants County.	8 (Tie)	5 years	Pleasants County FP Coordinator	WVDEP, USEPA	Unknown	Local funds	Natural Systems Protection	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.1) **Status:** ONGOING – Though local officials feel it would be beneficial, there has been no movement on this project.									
2016-52	Perform streambank restoration, natural channel restoration, and stream cleaning activities along Bens Run (between Bell and Reynolds Streets), Spring Creek (under the Market Street Bridge), and Tanner Run (near the intersection of US 33 & SR 14) in Spencer.	8 (Tie)	5 years	Spencer FP Coordinator	Roane County FP Coordinator, WVDEP, USEPA	Unknown	Local funds	Natural Systems Protection	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.1) **Status:** ONGOING – Though local officials feel it would be beneficial, there has been no movement on this project. Administratively, the planning team consolidated Projects #2016-53 and 2016-54 with this project.									
2011-14	To encourage compliance with West Virginia (and local) regulations requiring anchoring for mobile homes, work with utilities to require proof of proper installation prior to utility hook-ups.	42 (Tie)	Ongoing	County FP Coordinators	County EMAs	N/A (Coordination requires little to no additional funding)	N/A	Local Plans & Regulations	Flooding
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.1) **Status:** ONGOING – This project remains active for the 2022 update, though county floodplain coordinates throughout the region indicate that communication with utilities has occurred. This action is for the eight counties in the region.									

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-39	Expand upon data from the National Inventory of Dams (NID) to more accurately identify the risk level presented by dams in the region. This effort can begin with a review of existing emergency action plans (EAPs) and the development of accurate inundation areas, which can then be loaded into GIS systems for building-level risk analysis.	3 (Tie)	5 years	County EMAs	Dam Owners, WVDEP, WVEMD	N/A (The EAPs are available and working with dam owners would necessitate little to no additional funding)	Local funds (for GIS projects)	Preparedness & Response Activities	Dam Failure
Goal Alignment: Goal 3 – Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1) **Status:** ONGOING – This project remains active, but it was substantially revised to include the GIS component. This action is for the eight counties in the region.									
2022-14	Coordinate with the owners of high-hazard potential dams regarding emergency preparedness and mitigation, to include rehabilitating structures with known or potential structural risks.	12 (Tie)	5 years	County EMAs	Dam Owners, WVDEP	N/A (Coordination should require little to no additional funding)	HHPD (for identified rehabilitations)	Structure & Infrastructure Projects	Dam Failure
Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.3) **Status:** NEW – This project appears for the first in 2022.									
2016-40	Complete GIS mapping for all of the region's counties that do not currently have it to better identify the risk to life and property presented by various hazards. Work with county assessors to identify the actual location and value of properties in each county to enhance risk assessment loss estimates.	8 (Tie)	Ongoing	MOVRC	County assessors, County EMAs, WVGISTC	N/A (The MOVRC already has a GIS capability)	Local funds	Preparedness & Response Activities	All
Goal Alignment: Goal 3 – Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1) **Status:** ONGOING – This project remains active. In the 2016 version of the plan, it references the TEIF data, which is now available. Ongoing development of GIS systems will incorporate both TEIF and TEAL data as well as locally generated data and dam inundations areas, as noted in a previous action. This action is for the eight counties in the region.									

2022-2027 Jurisdictional Actions List

Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2016-41	Create opportunities for public education regarding risks presented by all hazards; specifically, how to prepare for hazard events, identification of risks presented, actions to take during a hazard event, and how to recovery (including where to find assistance) after 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 citizen participation in disaster drills, neighborhood action plans for events, and public education campaigns (non-exhaustive).	33 (Tie)	5 years	County EMAs	First responders, local churches, WVEMD, FEMA	Up to $2,500 for campaigns; large disaster drills may cost between $10,000 and $25,000	EMPG, HSGP, Local funds	Education Programs	All
Goal Alignment: Goal 4 – Bolster Public Understanding and Preparedness (see Objective 4.1) **Status:** ONGOING – This project remains active for 2022 because of the continued importance for public education. Further, this action incorporates the steering committee's interest in ensuring access to participation opportunities and potential assistance during/after hazard events. Administratively, the planning team consolidated Project #2016-45 with this project. This action is for all 30 member governments in the region (supported by the eight county emergency management offices).									
2016-42	Ensure that each county has a viable list of potential emergency shelters, cooling/warming centers, etc.	32	Ongoing	County EMAs	First responders, local churches, Red Cross	N/A (Outreach activities designed to build partnerships require little funding)	Local funds (as a part of regular EMA duties)	Preparedness & Response Activities	All
Goal Alignment: Goal 2 – Protect Life and Property (see Objective 2.3) **Status:** ONGOING – This project remains active for 2022. The eight county-level emergency management agencies undertake this project as a matter of routine operations; however, the availability of facilities changes frequently. This action remains in the plan to show support for the efforts it takes to keep a current, fully MOU'd list of shelters ready. It supports mitigation by reducing loss of life through having viable, safe facilities available during hazard events. Administratively, the planning team consolidated Projects #2016-43 and 2016-44 with this project. As such, the planning recognizes that identifying shelters with auxiliary power capabilities or arranging for mobile auxiliary power capabilities is part of the action. This action is for the region's eight counties.									

<table>
<tr><th colspan="10">2022-2027 Jurisdictional Actions List</th></tr>
<tr><th>Project #</th><th>Action</th><th>Priority</th><th>Timeframe</th><th>Coordinator</th><th>Support Entities</th><th>Est. Cost</th><th>Resources</th><th>Mitigation Project Type</th><th>Hazard Addressed</th></tr>
<tr><td>2016-56</td><td>Continue to address and support citizen requests for review of flood hazard areas based on revised DFIRM maps; support the citizenry as the state migrates to Risk 2.0 requirements.</td><td>42 (Tie)</td><td>5 years</td><td>County FP Coordinators</td><td>County EMAs, MOVRC, WVEMD, FEMA</td><td>N/A (Technical assistance is a regular duty of floodplain coordinators)</td><td>Local funds</td><td>Education Programs</td><td>Flooding</td></tr>
<tr><td colspan="10">Goal Alignment: Goal 4 – Bolster Public Understanding and Preparedness
Status: ONGOING – This project remains active for 2022, but it has been significantly revised to reflect imminent changes to flood insurance and floodplain management per the Risk 2.0 program. This action is for all of the region’s member governments (except for North Hills).</td></tr>
<tr><td>2022-15</td><td>Improve stormwater management and drainage in the City of Ripley. Actions could include the creation of a stormwater utility, a stormwater ordinance that requires portions of stormwater to be managed on-site at future developments, support for green infrastructure initiatives throughout the city, and gray infrastructure upgrades, as necessary.</td><td>33 (Tie)</td><td>5 years</td><td>Ripley City Council</td><td>Ripley FP Coordinator, Jackson County OES, MOVRC</td><td>Varies per the selected initiative</td><td>Unknown (but could include BRIC, CDBG, WVIJDC, Local funds, to name a few)</td><td>Structure & Infrastructure Projects</td><td>Flooding</td></tr>
<tr><td colspan="10">Goal Alignment: Goal 2 – Protect Life and Property (see Objective 2.1)
Status: NEW – This project first appeared in 2022. It is intentionally broad because it represents initial efforts by the city to identify relevant and viable specific solutions.</td></tr>
<tr><td>2022-16</td><td>Mitigate flooding in the Sandyville area of Jackson County.</td><td>42 (Tie)</td><td>5 years</td><td>Jackson County FP Coordinator</td><td>MOVRC</td><td>Unknown until specific projects are identified</td><td>N/A (but could include BRIC, HMGP)</td><td>Structure & Infrastructure Projects</td><td>Flooding</td></tr>
<tr><td colspan="10">Goal Alignment: Goal 1 – Improve Regional Resilience (see Objective 1.1)
Status: NEW – This project first appeared in 2022. During the 2022 revision, the MOVRC and Jackson County Commission held a public meeting to discuss a feasibility study to examine possible flood control solutions. Though there was not sufficient citizen consensus from that meeting to undertake the study, there are interested populations in the area that are working with the watershed group that serves the area to continue looking at flood mitigation options.</td></tr>
<tr><td>2022-17</td><td>Mitigate landslides along Euclid Nicut Road in Calhoun County.</td><td>5 (Tie)</td><td>5 years</td><td>Calhoun County Commission</td><td>MOVRC, Little Kanawha Area Dev. Corp.</td><td>Unknown until specific areas are identified</td><td>N/A (but could include BRIC, HMGP)</td><td>Structure & Infrastructure Projects</td><td>Geologic Hazards</td></tr>
</table>

2022-2027 Jurisdictional Actions List									
Project #	*Action*	*Priority*	*Timeframe*	*Coordinator*	*Support Entities*	*Est. Cost*	*Resources*	*Mitigation Project Type*	*Hazard Addressed*
2022-18	Mitigation landslides in the Washington area of Wood County.	1 (Tie)	3 years	Wood County Commission	MOVRC	$280,000	BRIC, HMGP	Structure & Infrastructure Projects	Geologic Hazards
Goal Alignment: Goal 2 – Protect Life and Property (see Objective 2.4) **Status:** NEW – This project first appeared in 2022 in response to actual landslide occurrences that damaged a residence in the Washington area of Wood County.									

The 2022 update marked the first time this plan had been reviewed following U.S. Department of Homeland Security/FEMA's release of the "community lifelines" (FEMA, 2019) as a tool for thinking of preparedness and response. Though not *mitigation* in the strictest sense, thinking of how the projects above support community lifelines is a helpful activity to link the material in this plan with other preparedness efforts. The following table lists each project and identifies the lifelines with which it is consistent.

Mitigation Actions Compared with Community Lifelines

Mitigation Action	COMMUNITY LIFELINES						
	Safety and Security	Food, Water, Shelter	Health and Medical	Energy (Power & Fuel)	Communications	Transportation	Hazardous Materials
2022-01: Support municipalities by compiling applications for and administration of mitigation funding (e.g., BRIC, HMGP).	X						
2022-02: Provide TEIF and TEAL data to member governments, to include support with GIS analysis.	X						
2022-03: Develop an educational program for member governments and residents regarding NFIP and floodplain management.	X						
2022-04: Continue to examine consolidation of water and sewer utilities in order to provide more reliable service to residents.		X					
2022-05: Support broadband development throughout the region.					X		
2016-57: Establish a loan program for citizens to access for hazard mitigation purposes.	X						
2016-01: Calhoun County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	X						
2022-06: Utilize TEIF data to better describe remaining acquisition, elevation, and relocation projects.	X						
2022-07: Grantsville will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	X						

Mitigation Actions Compared with Community Lifelines							
	COMMUNITY LIFELINES						
Mitigation Action	Safety and Security	Food, Water, Shelter	Health and Medical	Energy (Power & Fuel)	Communications	Transportation	Hazardous Materials
2016-02: Jackson County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	X						
2016-22: Ripley will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the city.	X						
2016-03: Pleasants County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	X						
2022-08: St. Mary's will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the city.	X						
2016-04: Ritchie County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	X						
2016-24: Cairo will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	X						

Mitigation Actions Compared with Community Lifelines							
	COMMUNITY LIFELINES						
Mitigation Action	Safety and Security	Food, Water, Shelter	Health and Medical	Energy (Power & Fuel)	Communications	Transportation	Hazardous Materials
2016-05: Roane County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	X						
2022-09: Reedy will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	X						
2022-10: Spencer will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the city.	X						
2016-06: Tyler County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	X						
2022-11: Middlebourne will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	X						
2022-12: Paden City will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the city.	X						

Mitigation Actions Compared with Community Lifelines							
	COMMUNITY LIFELINES						
Mitigation Action	Safety and Security	Food, Water, Shelter	Health and Medical	Energy (Power & Fuel)	Communications	Transportation	Hazardous Materials
2022-13: Friendly will continue to seek out opportunities to apply for hazard mitigation assistance for new construction to protect assets as well as mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the town.	X						
2016-07: Wirt County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	X						
2016-08: Wood County will continue to seek out opportunities to apply for hazard mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions for identified at-risk, repetitive loss, non-repetitive loss, substantially damaged, partially or completely-demolished or destroyed properties within the county.	X						
2016-38: Complete flood mitigation buyouts in the Happy Valley area of Wood County.	X						
2011-02: The remaining municipalities in the region will consider opportunities for mitigation assistance for mitigation reconstruction, elevations, relocations, or acquisitions to mitigate flood risks.	X						
2016-09: Ensure that all critical infrastructure providers, specifically water and sewer operations, have generators that will allow them to operate when power outages occur.				X			
2016-12: Ensure the availability of training opportunities and resources in the region for individuals wishing to become volunteer firefighters, EMS personnel, or law enforcement officers.	X						
2016-13: Obtain a warning system program or programs for each county.					X		
2011-07: Each jurisdiction participating in the NFIP will continue to enforce and, when appropriate, update its floodplain ordinance consistent with documented national standards and regulations.	X						

Mitigation Actions Compared with Community Lifelines							
	COMMUNITY LIFELINES						
Mitigation Action	Safety and Security	Food, Water, Shelter	Health and Medical	Energy (Power & Fuel)	Communications	Transportation	Hazardous Materials
2016-46: Upgrade systems throughout the region to support more broadband connectivity as well as cellular coverage.					X		
2016-47: Improve and upgrade the snow removal equipment and supplies in each of the region's counties.	X					X	
2011-08: Consider strengthened building codes and developing zoning ordinances throughout the region, remembering to calculate enforcement as an ongoing cost of implementation.	X						
2016-58: Conduct tree trimming and removal of fallen/broken branches in public rights-of-way to limit the possibility of damage.				X		X	
2016-14: Establish a formalized "safety check system" for vulnerable populations in the region's communities.	X						
2016-16: Replace and correct the low water bridge at Henry's Fork in Altizer (Calhoun County) to correct backups and flooding.	X						
2016-17: Repair, replace, or reconstruct low-lying roadways to prevent parts of the county from being cut off from the others during flood events in Calhoun County.	X					X	
2016-18: Mitigate flash floods in various areas of Jackson County, where water covers roadways and isolates communities. Targeted areas include Evans, Kenna, and Sandyville.	X						
2016-25: In Ritchie County, address the enforcement of the county's floodplain ordinance regarding campers (associated with energy contractors) set up and inhabited in the floodplain.	X						
2016-29: In Spencer, replace the bridge at Walmart with a structure better-suited to accommodate the volume of potential floodwaters that may flow through the stream.	X						
2016-33: Replace, repair, or reconstruct low bridges along Indian Creek, in Shirley, along SR 23, on Sellers Run Road, Stewarts Run, Elk Fork, Muddy Creek, Little Sancho, and Meadville. These low bridges may be responsible for up to 60% of the school cancellations due to flooding because buses cannot get through and there are no feasible alternative routes.	X					X	

Mitigation Actions Compared with Community Lifelines

Mitigation Action	COMMUNITY LIFELINES: Safety and Security	Food, Water, Shelter	Health and Medical	Energy (Power & Fuel)	Communications	Transportation	Hazardous Materials
2016-34: Take steps to mitigate flooding in the Newark area of Wirt County at the confluence of the Little Kanawha and Hughes Rivers. This area floods quickly and can block portions of SR 47.	X					X	
2016-50: Utah Road in Jackson County (near Ravenswood) has had slip issues. Consider addressing this area.						X	
2016-51: Perform streambank restoration, natural channel restoration, and stream cleaning activities along Cow Creek, Sled Fork, and the Left Fork of French Creek in Pleasants County.	X						
2016-52: Perform streambank restoration, natural channel restoration, and stream cleaning activities along Bens Run (between Bell and Reynolds Streets), Spring Creek (under the Market Street Bridge), and Tanner Run (near the intersection of US 33 & SR 14) in Spencer.	X						
2011-14: To encourage compliance with West Virginia (and local) regulations requiring anchoring for mobile homes, work with utilities to require proof of proper installation prior to utility hook-ups.	X						
2016-39: Expand upon data from the National Inventory of Dams (NID) to more accurately identify the risk level presented by dams in the region. This effort can begin with a review of existing emergency action plans (EAPs) and the development of accurate inundation areas, which can then be loaded into GIS systems for building-level risk analysis.	X						
2022-14: Coordinate with the owners of high-hazard potential dams regarding emergency preparedness and mitigation, to include rehabilitating structures with known or potential structural risks.	X						
2016-40: Complete GIS mapping for all of the region's counties that do not currently have it to better identify the risk to life and property presented by various hazards. Work with county assessors to identify the actual location and value of properties in each county to enhance risk assessment loss estimates.	X						

Mitigation Actions Compared with Community Lifelines							
	COMMUNITY LIFELINES						
Mitigation Action	Safety and Security	Food, Water, Shelter	Health and Medical	Energy (Power & Fuel)	Communications	Transportation	Hazardous Materials
2016-41: Create opportunities for public education regarding risks presented by all hazards; specifically, how to prepare for hazard events, identification of risks presented, actions to take during a hazard event, and how to recovery (including where to find assistance) after 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 citizen participation in disaster drills, neighborhood action plans for events, and public education campaigns (non-exhaustive).	X						
2016-42: Ensure that each county has a viable list of potential emergency shelters, cooling/warming centers, etc.		X					
2016-56: Continue to address and support citizen requests for review of flood hazard areas based on revised DFIRM maps; support the citizenry as the state migrates to Risk 2.0 requirements.	X						
2022-15: Improve stormwater management and drainage in the City of Ripley. Actions could include the creation of a stormwater utility, a stormwater ordinance that requires portions of stormwater to be managed on-site at future developments, support for green infrastructure initiatives throughout the city, and gray infrastructure upgrades, as necessary.	X	X					
2022-16: Mitigate flooding in the Sandyville area of Jackson County.	X						
2022-17: Mitigate landslides along Euclid Nicut Road in Calhoun County.						X	
2022-18: Mitigation landslides in the Washington area of Wood County.	X						

4.0 PLAN MAINTENANCE PROCESS

§201.6(c)(4)(i)	[The plan maintenance process shall include 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)	[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.
§201.6(c)(4)(iii)	[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.

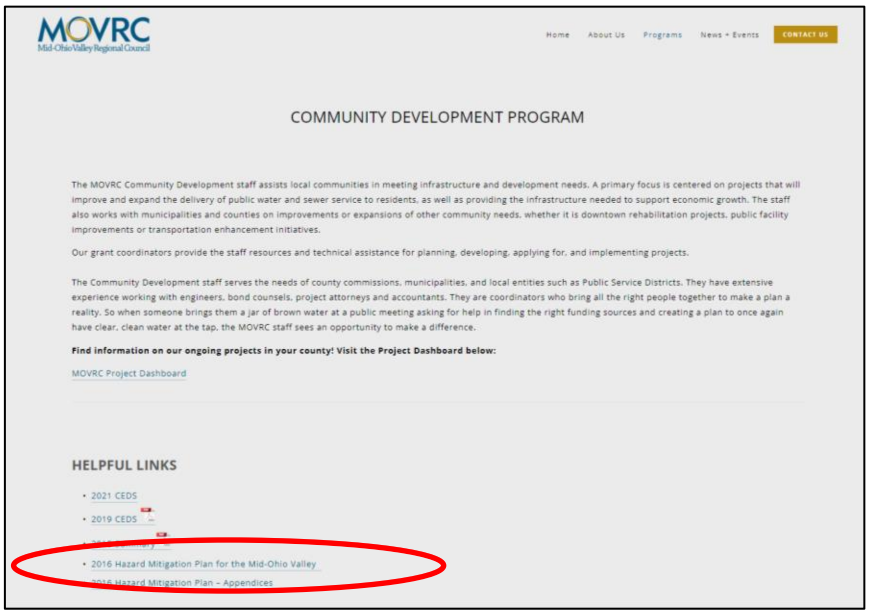
4.1 Monitoring, Evaluating, and Updating the Plan

The Mid-Ohio Valley Regional Council (MOVRC) (Region 5) serves as the custodian agency for this plan, and in that role, MOVRC's responsibilities include its regular maintenance.

Annual Reviews and Formal Updates

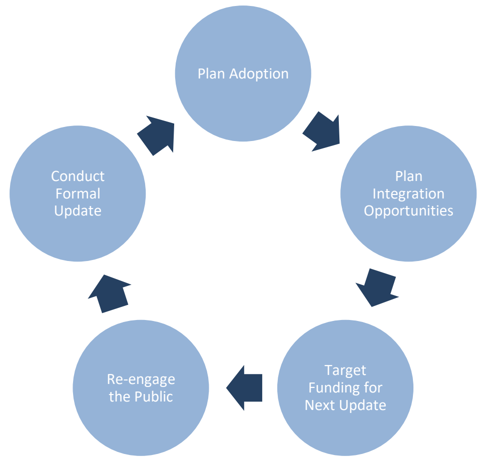
"Maintenance" carries with it several tasks, to include designating a steering committee to serve as the principal body overseeing plan development activities, serving as a support entity for the various member governments in the eight-county region on a variety of matters (to include hazard mitigation), and convening the steering committee for annual review sessions or five-year formal updates. Put simply, the MOVRC will be the entity that initiates annual reviews and formal updates.

Additionally, the MOVRC maintains the master copy of the plan. The master copy houses all additions, corrections, and changes. When major changes occur, the MOVRC will send copies to its member governments. Otherwise, a current copy of the plan is always available via the MOVRC's webpage (https://www.movrc.org/cdp).



The formal review and updating process will consist of meetings (either face-to-face or virtual) to review mitigation projects, review hazards (and significant hazard occurrences), and to compare the two. The basic process follows "the wheel" methodology (see the image to the right). Specifically, annual activities between five-year updates include the following.

- **Year 1:** Adopt the updated plan. Communities will have participated to varying degrees in the actual update, and as such, their governing bodies may need technical assistance during the adoption process.
- **Year 2:** Review opportunities to align hazard mitigation with other planning activities such as stormwater management, transportation planning, emergency operations planning, etc. Often, these complimentary planning processes evolve just as does mitigation planning. Reconvene the steering committee to discuss project status and hazard experiences.



- **Year 3:** "Begin" the next formal update by targeting funding sources. Reconvene the steering committee to discuss project status and hazard experiences.
- **Year 4:** Consider engaging the public through an online survey about its experiences with hazards. Reconvene the steering committee to discuss project status and hazard experiences.
- **Year 5:** Conduct the regulation-required formal update to the plan.

Notice in Years 3, 4, and 5 that the steering committee should meet to discuss project status and hazard experiences. These discussions should inform the upcoming update and ensure a more thorough discussion of project status in future updates. Additionally, the MOVRC will keep track of notes, minutes, etc. for the meetings associated with specific mitigation projects that local governments undertake between planning cycles.

Planning Addenda

Addenda to this plan may be necessary during the five-year planning cycle as programs and priorities change. Member governments may request addenda through the MOVRC, who would then coordinate submission of the addenda to the West Virginia Division of Emergency Management (WVEMD) and to FEMA Region 3. Addenda approved by WVEMD and FEMA will be included in the master copy of the plan (as well as on the MOVRC website). The affected jurisdictions should adopt the relevant addendum by resolution, but addenda do not generally necessitate re-adoption by other participating communities in the region.

4.2 Implementation through Existing Programs

Many other community planning initiatives can support hazard mitigation objectives. As a regional entity that supports a variety of planning efforts throughout the eight-county region, the MOVRC is uniquely positioned to encourage the implementation of hazard mitigation through existing programs. The following table lists several complimentary planning initiatives and aligns goals and objectives from those plans with the goals and objectives set forth by the steering committee for this plan in the 2022 update.

<table>
<tr><th colspan="5">Opportunities for Alignment with Existing Planning Initiatives</th></tr>
<tr><th>Existing Program</th><th>Responsible Agency(ies)</th><th>Applicable Plan (i.e., Document)</th><th colspan="2">Hazard Mitigation Alignment</th></tr>
<tr><td rowspan="7">Floodplain Management</td><td rowspan="7">Jurisdictional Floodplain Coordinators</td><td rowspan="7">Floodplain ordinances (county and municipal levels)</td><td colspan="2">Continue to enforce floodplain development ordinances
Consider participation in the Community Rating System (CRS), as appropriate for the jurisdiction
Continue public outreach to ensure awareness of flood risk and mitigation options</td></tr>
<tr><td>PLAN ELEMENTS/POLICIES</td><td>ASSOCIATED MITIGATION GOAL/ OBJECTIVE</td></tr>
<tr><td>Establish the definitions of flood hazard areas in the community</td><td>Goal 3: Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1)</td></tr>
<tr><td>Outline measures for preserving floodways and waterways</td><td>Goal 1: Improve Regional Resilience (see Objective 1.1)
Goal 2: Protect Life and Property (see Objective 2.2)</td></tr>
<tr><td>Support resilience by ensuring new development steers clear of known hazard areas or is built in such a way as to withstand the effects of known hazards</td><td>Goal 3: Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1)</td></tr>
<tr><td>Protect green spaces in special flood hazard areas</td><td>Goal 1: Improve Regional Resilience (see Objective 1.1)</td></tr>
<tr><td>Establish specifications for development in flood hazard areas</td><td>Goal 1: Improve Regional Resilience (see Objective 1.1)</td></tr>
</table>

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<tr><th>Existing Program</th><th>Responsible Agency(ies)</th><th>Applicable Plan (i.e., Document)</th><th colspan="2">Hazard Mitigation Alignment</th></tr>
<tr><td rowspan="4">Stormwater Management</td><td rowspan="4">Municipal Utilities
Public service districts</td><td rowspan="4">Jurisdictional MS4 permits, as applicable</td><td colspan="2">Upgrade and maintain systems designed to control storm water runoff</td></tr>
<tr><td>PLAN ELEMENTS/POLICIES</td><td>ASSOCIATED MITIGATION GOAL/ OBJECTIVE</td></tr>
<tr><td>Encourage on-site management of runoff</td><td>Goal 2: Protect Life and Property (see Objective 2.1)
Goal 2: Protect Life and Property (see Objective 2.2)</td></tr>
<tr><td>Encourage low-impact development options for stormwater management</td><td>Goal 1: Improve Regional Resilience (see Objective 1.1)</td></tr>
<tr><td rowspan="6">Emergency Operations Planning</td><td rowspan="6">Local emergency management agencies (county level)
Local emergency planning committees (LEPCs)</td><td rowspan="6">Emergency operations plans
Hazard/vulnerability analyses
Commodity flow studies</td><td colspan="2">Ensure consistency between the hazard analyses that appear in these documents with the risk assessment portion of this plan
Recognize hazard mitigation as a component of the overall cycle of emergency management</td></tr>
<tr><td>PLAN ELEMENTS/POLICIES</td><td>ASSOCIATED MITIGATION GOAL/ OBJECTIVE</td></tr>
<tr><td>Establish and maintain effective response programs</td><td>Goal 2: Protect Life and Property (see Objective 2.3)</td></tr>
<tr><td>Outline public warning capabilities</td><td>Goal 2: Protect Life and Property (see Objective 2.3)</td></tr>
<tr><td>Identify resources to support responses to worst-case instances of known risks</td><td>Goal 2: Protect Life and Property (see Objective 2.3)</td></tr>
<tr><td>Outline vulnerable areas to specific hazards, such as hazardous materials, terrorism, etc.</td><td>Goal 3: Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1)</td></tr>
</table>

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<tr><th>Existing Program</th><th>Responsible Agency(ies)</th><th>Applicable Plan (i.e., Document)</th><th colspan="2">Hazard Mitigation Alignment</th></tr>
<tr><td rowspan="5">Infrastructure Development (i.e., water, sewer, broadband)</td><td rowspan="5">MOVRC
Municipal Utilities
Public Service Districts
Communications Providers</td><td rowspan="5">Comprehensive economic development strategy (CEDS) – see Goal #3: Critical Infrastructure
Calhoun-Clay-Roane Regional Plan (from WV State Broadband Plan, 2020-2025)
Source water protection plans</td><td colspan="2">Ensure access to clean, potable water
Support communications connectivity
Support environmental preservation by limiting contamination</td></tr>
<tr><td>PLAN ELEMENTS/POLICIES</td><td>ASSOCIATED MITIGATION GOAL/ OBJECTIVE</td></tr>
<tr><td>Extend public utility service to under-served portions of the region</td><td>Goal 1: Improve Regional Resilience (see Objective 1.3)</td></tr>
<tr><td>Improve communications and access to high-speed internet</td><td>Goal 1: Improve Regional Resilience (see Objective 1.3)</td></tr>
<tr><td>Maintain and upgrade systems to ensure responsible use of environmental resources</td><td>Goal 1: Improve Regional Resilience (see Objective 1.1)</td></tr>
<tr><td rowspan="5">Community/Economic Development</td><td rowspan="5">MOVRC
Little Kanawha Area Development Corporation
Jackson County Development Authority
Parkersburg Planning Commission
Pleasants County Development Authority
Ritchie County Economic Development
Roane County Economic Development Authority
Tyler County Development Authority
Wood County Economic Development
Wood County Planning Commission</td><td rowspan="5">CEDS – see Goals #4: Regional Assets and #5: Resiliency
PKB 2030 Comprehensive Plan
Wood County, WV Comprehensive Plan Update</td><td colspan="2">Identify sustainable development options for the region's communities
List physical areas available for residential, recreational, commercial, and industrial development
Engage members of the community in a variety of planning initiatives</td></tr>
<tr><td>PLAN ELEMENTS/POLICIES</td><td>ASSOCIATED MITIGATION GOAL/ OBJECTIVE</td></tr>
<tr><td>Encourage responsible land use</td><td>Goal 1: Improve Regional Resilience (see Objective 1.1)</td></tr>
<tr><td>Identify opportunities and threats for the different types of development in various geographic areas throughout the region</td><td>Goal 3: Improve Understanding of Risk and Vulnerability for Planning Purposes (see Objective 3.1)</td></tr>
<tr><td>Ensure public participation</td><td>Goal 5: Enhance Citizen Participation in Mitigation and Disaster Recovery Activities (see Objective 5.1)</td></tr>
</table>

Opportunities for Alignment with Existing Planning Initiatives				
Existing Program	*Responsible Agency(ies)*	*Applicable Plan (i.e., Document)*	*Hazard Mitigation Alignment*	
Transportation Planning	MOVRC Wood-Washington-Wirt Interstate Planning Commission	Horizon 2045 LRTP	Examine future transportation needs for the region (particularly Wirt and Wood Counties) Consider multi-modal transportation issues and service needs	
			PLAN ELEMENTS/POLICIES	ASSOCIATED MITIGATION GOAL/ OBJECTIVE
			Support upgrades to critical transportation infrastructure	Goal 1: Improve Regional Resilience (see Objective 1.3) Goal 2: Protect Life and Property (see Objective 2.1)
			Consider the development of alternate modes of transportation and transit	Goal 1: Improve Regional Resilience (see Objective 1.1)
			Ensure public participation	Goal 5: Enhance Citizen Participation in Mitigation and Disaster Recovery Activities (see Objective 5.1)

4.3 Continued Public Involvement

Hazard mitigation at the community level is most effective when the whole community, from elected leaders to business and education professions to the general public participate in and own the process. As such, the MOVRC and its member governments will invite the public to participate as the plan is updated through attendance at future meetings and the distribution of surveys (see Year 4 above). Public participation is also a key element of many funding requests for specific projects, and as such, communities may engage their publics when they select mitigation projects for implementation.

As noted above, the plan appears on the MOVRC's website, and the public may contact the council staff with any comments on the plan. The MOVRC will keep a file master copy of the plan at its office in Parkersburg for review and inspection during regular business hours. MOVRC staff will log any comments received in person.

During the 2022 update, the steering committee discussed how to ensure participation from the full range of the region's population. Town hall meetings have historically been poorly attended, and though online surveys are effective, steering committee members recognized areas of the region that are not well-served by high-speed internet access, potentially limiting participation via survey. Surveys as a sole means of participation are problematic, with issues ranging from the wording of questions (and the associated comprehension), unknown biases that factor into the design of survey questions and the answers residents provide, etc. As part of the 2022 update, the MOVRC participated in a community day event in Paden City of Tyler County. The event, which was a celebration of the area's emergency responders, provided an opportunity for the MOVRC to both educate the public as to the presence/benefits of the hazard mitigation plan as well as to solicit comments on the hazards about which the public is most concerned.

Future updates should consider additional activities akin to the community day event. Further, the steering committee may consider surveys in multiple languages, engaging entities like the county boards of education as partners to enlist for information sharing (and targeted, plan-specific feedback), etc.