

West Virginia Statewide Risk Assessment: An Overview

Many communities in West Virginia are updating their hazard mitigation plans (HMPs) to reflect current risks and priorities. These communities now have access to a wealth of detailed information on local flood and landslide risks. The data were produced by the West Virginia Statewide Risk Assessment. This is an ambitious project led by the West Virginia GIS Technical Center (WVGISTC) at West Virginia University. It features building-level risk assessments for flood and landslide hazards across the state. They cover all of the state's 11 regions, 55 counties, 229 incorporated places, and 55 unincorporated areas.

About This Resource

This fact sheet is the first in a series published by FEMA Region 3. The goal is to help mitigation planning teams use the West Virginia Statewide Risk Assessment for plan updates. The fact sheets should be read in order:

1. **Overview:** The first fact sheet gives an overview of the Statewide Risk Assessment's datasets. It explains how planning teams can use the results in each phase of mitigation planning.
2. **Identify At-Risk Significant Structures:** The second fact sheet focuses on analyzing exposure, vulnerability, and impacts from flood hazards. It explains how to get the data, extract key information, and add local context.
3. **Prioritize At-Risk Significant Structures:** The third fact sheet focuses on summarizing exposure and vulnerability from flood hazards. It explains how to tap into local values to set priorities and create problem statements.

About the West Virginia Statewide Risk Assessment

The WVGISTC developed this project with support from FEMA and the state Emergency Management Division. It aims to help planning teams understand local disaster risks in more detail and create more effective solutions. The project focuses on floods and landslides. These are the two costliest natural disasters in the state.

The Statewide Risk Assessment includes the following information: 1) a full inventory of the buildings in the state; 2) detailed, building-level flood risk assessments; and 3) detailed, building-level landslide risk assessments. The flood risk assessments are known as Total Exposure in Floodplain (TEIF). The landslide risk assessments are known as Total Exposure Area Landslide (TEAL). These results are provided in a range of formats, including spreadsheets, reports, maps, GIS files, and interactive map viewers. Plan owners and planning consultants can access the results online. They can also ask the WVGISTC for a customized data package. Communities can also use the results to



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support local floodplain management activities that meet or exceed the requirements of the National Flood Insurance Program (NFIP). Table 1 lists some of the flood risk assessment products available online. Table 2 lists some of the other risk assessment and mitigation products developed by the project.

Table 1: Flood Risk Assessment Products Available Online

Data Product	Description
Building-Level Risk Assessment Tables	<p>These are countywide spreadsheets. They list each building in the effective or advisory 1%-annual-chance floodplain. Advisory 1%-annual-chance floodplains are non-regulatory high-risk flood zones that are likely to become effective in the future.</p> <p>These tables include more than 80 data fields for each building. These include 16 data fields related to the building identification and location and 11 related to its flood zone. They also include more than 20 data fields related to building characteristics (what is at risk) including the construction year and Flood Insurance Rate Map (FIRM) status (Post-/Pre-FIRM) and more than 20 others related to estimated flood losses (the degree of risk). The “MetaData” tab describes all the available data fields in more depth.</p> <p>Upon request, current <i>Regional</i> and <i>Most Vulnerable Building Lists</i> can also be extracted from the Statewide Building-Level Risk Assessment (BLRA) geodatabase for more focused analyses. Data extracts include High Building Value Exposure, High Damage Loss Structures, and High Minus-Rated Structures.</p>
Building-Level Risk Assessment Geodatabase	This is a statewide geodatabase. It includes all buildings in the effective or advisory 1%-annual-chance floodplain. It can be used by plan owners and planning consultants with GIS capabilities. All these points are displayed on the Risk MAP view of WV Flood Tool as well.
Essential Facilities Table (Significant Facilities)	This is a statewide spreadsheet. It lists all essential facilities in the effective or advisory 1%-annual-chance floodplain as well as the 0.2%-annual-chance floodplain. The WVGISTC defines essential facilities as those that provide critical services to the community. They include police and fire stations, emergency operations centers, schools, hospitals, and nursing homes. These essential facilities are also included in the WV Flood Tool (Risk MAP View). Community-level tables and 2021 regional reports are available at this download link .
Community Assets Table (Significant Facilities)	This is also a statewide spreadsheet. It lists all community assets in the effective or advisory 1%-annual-chance floodplain. These may be non-historical community assets including government facilities (federal, state, local), emergency medical services, religious organizations, utilities, post-secondary educational facilities, and other buildings of significance. These community assets can be viewed on the WV Flood Tool (Risk MAP View). Community assets may also be historical structures listed on the National Register of Historic Places to include buildings listed in registered historic districts that were constructed before 1930. These historical community assets can also be displayed on the WV Flood Tool (Risk MAP View, under Critical Infrastructure). Community-level tables and 2021 regional reports are available at this download link .

Data Product	Description
Building Exposure Maps (Count and Value)	These are statewide maps. They show the distribution of buildings and building value in the 1%-annual-chance floodplain at the community level. The records for individual structures in floodplain can be accessed via the WV Flood Tool (Risk MAP View).
Building Exposure Table	This is a statewide spreadsheet. For each community, it lists the total building count and dollar exposure in the 1%-annual-chance floodplain. It also shows the exposure for different occupancy classes. The classes include Single-Family Dwelling, Mobile Home, Multi-Family Dwelling, Other Residential (Temporary Lodging, Institutional Dormitory, and Nursing Home), Commercial, Industrial, Agricultural, Educational, Government, and Religious/Nonprofit.
Community-Level Estimated Loss Table	This is a statewide spreadsheet. For each community, it lists the total estimated building damage and debris generated for the 1%-annual-chance flood based on the Hazus Depth/Damage model. It also shows the loss estimates for different occupancy classes. These include Residential Units 1-4, Residential Units > 4, Commercial, Industrial, Agriculture, Educational, Government, and Religious/Nonprofit. The First Floor Height (FFH) is a determining factor for the loss model. Therefore, inaccuracy of the FFH may cause uncertainty in loss estimation.
Community-Level Substantial Damage Estimation (SDE) Table	This is a statewide spreadsheet. For each community, it lists the counts and loss amounts of buildings estimated to be substantially damaged by a 1%-annual-chance flood. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred is referred to as substantial. In addition, the table provides the above information for occupancy classes of 1-4 Unit Residential, Above 4 Unit Residential, Commercial, and Other, separately. It also shows the number of buildings with moderate (10% - 50%) and slight (1% - 10%) damages as well as the median and average building damage percentage/value for each community. Additionally, the table provides detailed information about Minus-Rated properties, with the lowest floor one foot or more below the base flood elevation (BFE) of a 1%-annual-chance flood.
Transportation Flood Inundation Models	This is a statewide spreadsheet. For each community, it lists the miles of Interstate, U.S., State, and other roads in addition to railroads and number of inundated bridges in the 1%-annual-chance floodplain. It also shows the miles and percentage of total roads exposed to different flood depths in each community. Flood depth affects evacuation, vehicle rescue, and response. Inundation of transportation infrastructure can also be viewed on the WV Flood Tool (Risk MAP View, under Critical Infrastructure).
WV Flood Tool (RiskMAP View)	The West Virginia Flood Tool is an interactive map viewer that shows the best available flood mapping data from FEMA and other approved sources. It shows background layers from federal, state, local, and commercial sources. The WVGISTC published about 98,000 building-level risk assessments to the Risk MAP View. It also includes critical infrastructure layers, verified LOMAs, USGS High Water Marks, and mitigated property layers. Other hazards like landslide susceptibility and high-risk dams are displayed on the Risk Map View as well. Most of the risk assessment data available in GIS Files, tables, and static maps can be viewed on the Risk Map View of the WV Flood Tool (www.mapwv.gov/Flood).

Data Product	Description
Additional Resources	<ul style="list-style-type: none"> • Risk Assessment Information Index • TEIF/TEAL Project Closeout Report and Resources • Flood Risk Assessment and WV Flood Tool presentation (May 2023) • Landslide Risk Assessment presentation (April 2022) • Static Map Catalogs (in progress)

Table 2: Other Risk Assessment and Mitigation Products

Data Product	Description
Community-Level Landslide Susceptibility	This is a statewide spreadsheet. For each community, it lists the areas with high, medium, and low landslide susceptibility in addition to the ratio of these areas in each jurisdiction.
WV Landslide Tool	The West Virginia Landslide Tool is an interactive map viewer that shows the best available data on landslide incidence and landslide risk. It does not provide site-specific information.
Community-Level Buyout Properties	This is a statewide spreadsheet. For each community, it lists the total number of buyout properties. It also shows the buyout properties in different flood zone categories. The categories include effective Special Flood Hazard Area (SFHA), advisory SFHA, and non-SFHA.
Mitigated Structures	Information on elevated structures may be available on request.
Repetitive Loss Structures	Information on repetitive loss structures and areas may be available on request.
Communities Downstream of High Hazard Dams	Information on communities downstream of high hazard dams may be available on request.

Planning Process

Mitigation planning teams in West Virginia can use the Statewide Risk Assessment results to drive mitigation action at the local level. Moving from data to action, however, needs a robust planning process that engages local stakeholders. These stakeholders have the context needed to understand and prioritize local risks. They also have the authority needed to take actions that reduce local risks. Plan owners, planning consultants, and plan participants each have a role to play in building the risk assessment results into the planning process.

Plan owners and planning consultants should take the lead in giving plan participants access to the data and guiding dialog and decision-making. They should work with the WVGISTC early on to learn about the risk assessment and mitigation products available for their planning area. If needed, they can request a customized data package for each participating jurisdiction. Plan owners and planning consultants should also build the results of the Statewide

Risk Assessment into the engagement strategy. They should develop a strategy that helps plan participants interact with the data. It should provide them with the time and training they need to work with the data for their community. It should also help plan participants add local information, set priorities, and create problem statements. Training needs will depend on the planning area. In some cases, a group training may be needed on a certain product. In other cases, one-on-one training on several products may be needed for a certain community.

Plan owners should take the lead in adding expected engagement and training activities to the plan update Scope of Work (SOW). FEMA suggests that plan owners consider the timing and costs of these activities before preparing the SOW. This way, the mitigation grant schedule and budget can include enough time and resources. FEMA also suggests that plan owners include these engagement and training activities in any request for proposals. This way, plan owners can clarify what is expected of planning consultants.

Plan participants should take the lead in using the data from the Statewide Risk Assessment to understand local risks, update local priorities, and create local solutions. Local knowledge, values, and skills are the basis of mitigation planning. Plan participants should understand the results of the Statewide Risk Assessment, fix any incomplete or incorrect data, and add local context. They can then use this information to identify changes in local flood and landslide risks, and changes in local priorities. They can also develop mitigation actions and find gaps in local capabilities. By taking the time to engage with the data, plan participants can stay ahead of flood and landslide risks in their communities. They can act before the next disaster strikes to keep families and neighborhoods safe.

The **plan owner** is the entity sponsoring the development of an HMP. In West Virginia this could be a regional planning and development council or a county.

The **planning consultant** works under contract to the plan owner to give professional and technical support for plan updates. Planning consultants can come from private consulting firms, academic institutions, or nonprofit organizations.

Plan participants are local officials and community representatives from participating jurisdictions. They are most affected by the plan's outcomes. They also have the authority to carry out the mitigation actions.

Risk Assessment

The detailed information from the Statewide Risk Assessment can help planning teams in West Virginia identify flood and landslide risks with greater accuracy and precision. Risk, for the purpose of hazard mitigation planning, is the potential for damage, loss, or other impacts created by the interaction of natural hazards with physical or human assets. The tasks for conducting a risk assessment can be divided into four steps: 1) describe hazards, 2) identify at-risk assets, 3) analyze vulnerability and impacts, and 4) summarize risk. The results of the Statewide Risk Assessment can help with each of these steps.

The datasets developed by the Statewide Risk Assessment can be considered “best available data” for flood hazards, landslide hazards, and building/human exposure. The location and extent of high-risk floodplains can be viewed on the [WV Flood Tool](#). The Risk MAP view provides the most detail. Users can turn on different risk layers to see the effective 1%-annual-chance floodplain and flood depth. They can also see the draft or preliminary floodplains (if FEMA is updating an area's flood maps) as well as the 0.2%-annual-chance floodplain. Planning teams

can download a statewide GIS dataset of high-risk floodplains on the [WVGISTC website](#). Similarly, the location and extent of landslide hazards can be viewed on the [WV Landslide Tool](#). Users can turn on the Landslide Hazard Susceptibility layer to see the areas with medium and high landslide susceptibility. Planning teams can also download statewide or regional GIS datasets of landslide susceptibility on the [WVGISTC data portal](#). The primary focus of the Statewide Risk Assessment was to create more detailed flood and landslide risk assessments. However, the project also created a structure-level inventory of buildings and facilities in West Virginia. This inventory includes statewide building replacement costs for 1.1 million structures from 1.4 million parcel centroids and tax assessment attributes. This data may be available from the WVGISTC on request. It can be used to assess other disaster risks.

After describing hazards and identifying exposed assets, the next step of a risk assessment is analyzing vulnerability and impacts. Exposure refers to which physical assets and populations are at risk and vulnerability is the susceptibility of these exposed elements. Impacts refer to the consequences of a hazard. Examples include fatalities, injuries, and population displacement; building and infrastructure damages; and loss of services. The Statewide Risk Assessment created a range of community-level and building-level risk assessment products that can help with this step. Table 3 lists some of these products and their role in analyzing vulnerability and impacts.

Table 3: Risk Assessment Products Available to Analyze Vulnerability and Impacts

Data Product	How to Use the Product
Building-Level Risk Assessment Tables	Planning teams can interact with this data to identify structures in the high-risk flood zone. They can sort and filter at-risk buildings based on building characteristics, flood zone information, and estimated flood losses.
Building Exposure Table	Planning teams can use this data to describe the potential impacts of flooding on each community in terms of the number, type, and value of exposed buildings.
Community-Level Estimated Loss Table	Planning teams can use this data to describe the potential impacts of flooding on each community in terms of building repair costs and debris generated.
Community-Level Population Displacement and Shelter Needs Table	Planning teams can use this data to describe the population residing in floodplain and potential impacts of flooding on each community in terms of the population that could be displaced and the related short-term shelter needs.
Community-Level Landslide Susceptibility	Planning teams can use this data to describe the potential impacts of landslides on each community in terms of the extent of high and medium landslide susceptibility.
Essential Facilities Table	Planning teams can use this data to learn more about at-risk essential facilities. For more detail see the factsheet: <i>West Virginia Statewide Risk Assessment: Identify At-Risk Significant Structures</i> .
Community Assets Table	Planning teams can use this data to learn more about at-risk community assets. For more detail see the factsheet: <i>West Virginia Statewide Risk Assessment: Identify At-Risk Significant Structures</i> .
Transportation Flood Inundation Models	Planning teams can use this dataset to understand the extent of roads, railroads, and bridges at risk of flooding.

The final step of the risk assessment is summarizing risk. The risk assessment creates a wide range of information on hazards, exposed/vulnerable assets, and potential impacts. This information needs to be summarized. That way, plan participants can use the findings to guide the mitigation strategy, and share findings with local decision makers. One suggested approach is for the planning team to create problem statements for each high-priority significant structure (community asset or essential facility). These short and simple statements highlight key issues from the data. Problem statements should be created through a process that allows local stakeholders to discuss priorities and highlight the issues of most concern. For more detail on setting priorities and creating problem statements, see the fact sheet: *West Virginia Statewide Risk Assessment: Prioritize At-Risk Significant Structures*. Note that the summary of vulnerability must also address NFIP-insured structures that have been repetitively damaged by floods. Information on repetitive loss structures may be available from the WVGISTC on request.

Basic Requirements

At a minimum, the risk assessment section of the HMP should include a narrative description of community-level flood and landslide risks. For both hazards, the narrative should describe potential impacts in terms of the number, type, and value of exposed structures. For flood hazards, the narrative should also address future map conditions, FIRM status, and depth in structure. An assessment of future map conditions may identify areas where many buildings are in the mapped-in category. Residents and business owners in these areas may not be aware of their high flood risks. A review of FIRM status and depth in structure may also find areas with a high density of Post-FIRM, minus-rated structures. This may show weaknesses in the permitting process that allow unsafe building practices.

Beyond the Basics

The WVGISTC's building-level flood risk assessments give planning teams in West Virginia the opportunity to exceed the minimum requirements for plan updates. Planning teams can use the data to discuss flood risk at the structure level. They can use it to consider *why* a significant structure is at risk to flooding and the *value* it brings to the community. For more information see the FEMA factsheets: *West Virginia Statewide Risk Assessment: Identify At-Risk Significant Structures* and *West Virginia Statewide Risk Assessment: Prioritize At-Risk Significant Structures*.

Example: Without the detailed information from the Statewide Risk Assessment, a community may only be able to determine that it has X structures in the high-risk flood zone. With the data from the Statewide Risk Assessment, the community can also learn about the types of structures at risk from the 1%-annual-chance flood and their function in the community. They can also review information about the extent of flooding, the building characteristics, and the estimated flood losses. Local stakeholders can combine this information with local knowledge to prioritize buildings for mitigation.

Mitigation Strategy

The results of the Statewide Risk Assessment also have a role in creating the mitigation strategy. This is the heart of the HMP. It serves as the long-term blueprint for staying ahead of future disasters and keeping communities safe. The mitigation strategy consists of mitigation goals, mitigation actions, and an action plan. Planning teams can use the Statewide Risk Assessment results to help identify, evaluate, and rank mitigation actions. Working with plan

participants to use the Statewide Risk Assessment results is key. Ultimately, they will carry out the mitigation actions.

To identify a range of mitigation actions, the planning team should start with the problem statements from the risk assessment. As described above, the Statewide Risk Assessment can help the planning team highlight key issues and create problem statements. For each problem statement, the planning team should consider different types of mitigation actions. Note that problem statements can include gaps in the available data. The planning team should also revisit the status of previous mitigation actions. Data on completed flood mitigation projects may be available from the WVGISTC. They collected data on a range of mitigation projects including buyouts, elevation, wet-proofing, dry-proofing, and protection of utilities. For each community, an Area of Mitigation Interest (AoMI) map can be provided by the WVGISTC on request to help prioritize areas for potential mitigation actions. Such maps represent flood-prone community areas into three priority zones of highest, moderate, and lower based on the floodplain types and inundation depths. Example maps have been created for the communities of Rainelle and White Sulphur Springs.

Once a range of actions is identified, the planning team will evaluate and prioritize them. The planning team must consider the benefits that would result from a mitigation action versus the cost. Benefits include losses avoided. For example, benefits could include the number and value of structures protected by a mitigation action. The data from the Statewide Risk Assessment can help estimate the benefits of flood mitigation projects. Additional criteria may include social, technical, political, environmental, and economic factors. The planning team needs to agree on these other criteria.

Plan Maintenance and Implementation

The mitigation plan is a living document that must be updated to stay relevant. The WVGISTC can work with the planning team to track progress toward flood mitigation actions. Data on buyout properties and mitigated structures may be available on request. The planning team can then revise the plan to reflect completed projects. The plan should include a table with the number and types of mitigated structures for each flood-prone community.

FEMA suggests that the plan owner create space to monitor the plan on a regular basis. Annual plan reviews are a great way to do this. During annual reviews, the planning team can gather and validate new data on completed mitigation projects. Plan owners are also encouraged to document and submit updates to the HMP regularly throughout the five-year planning cycle. Updates can reflect shifts in priorities due to changing community traits, risks, or available resources. This will help make the plan as relevant as possible and help fast-track the next plan update.

Maintaining drive throughout the planning cycle is essential. Acting on the plan is the final step in the mitigation planning process. As communities take action to reduce disaster risks, they will build more resilient communities that keep families and neighborhoods safe.