



West Virginia Risk Explorer

Localized risk assessment tools for analysis and visualization

West Virginia Flood Resiliency Framework (WVFRF)

August 2025



WV GIS Technical Center
West Virginia University



WV Flood Resiliency Framework (WVFRF)



A virtual hub of risk assessment, visualization, planning, and training resources for building community flood resiliency in WV

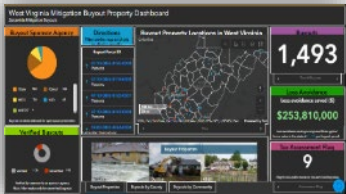
Flood Visualizations



WV Flood Tool



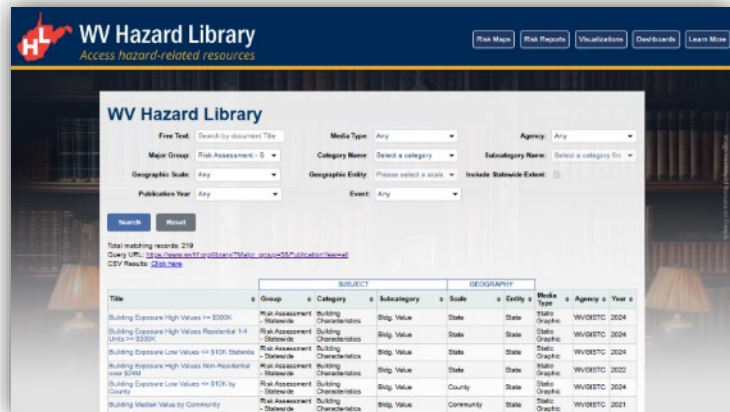
Flood Dashboards



WV Risk Explorer



Example Tools



Hazard Library

RISK TOOLS

- WV Risk Explorer
- WV Flood Tool
- Visualizations
- Dashboards

9 Geographic Scales

COMMUNITY ENGAGEMENT

- Focused Outreach Meetings
- Flood Symposium
- Resiliency Tools & Products
- Learning Resources & Reports



Community Engagement Meeting

HAZARD LIBRARY

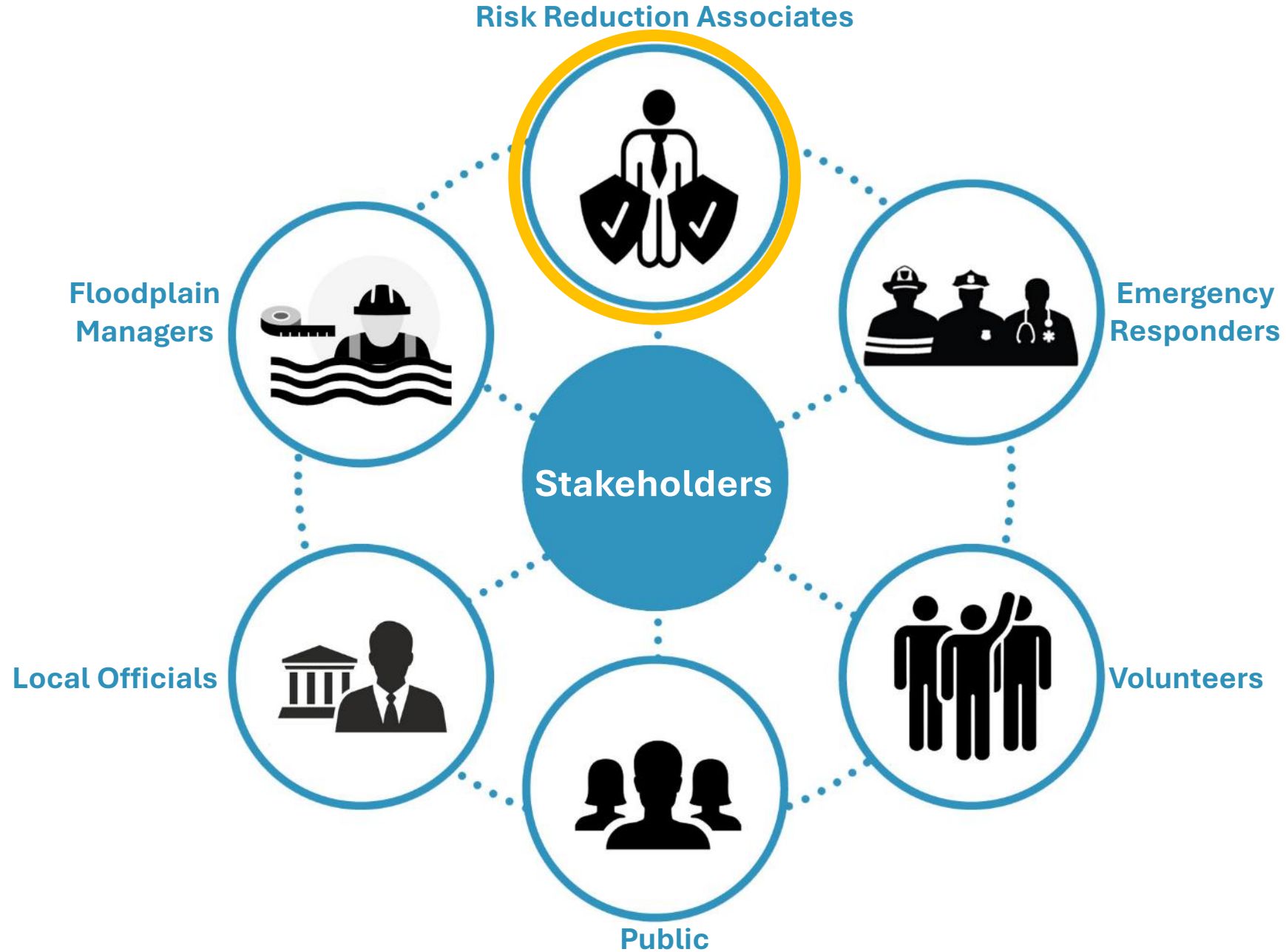
Search online hazard resources by title, subject, media, event, geography, data, etc.

STAKEHOLDERS

- Risk Reduction Associates
- Emergency Responders
- Floodplain Managers
- Local Officials
- Volunteers
- Public



Flood Symposium Stakeholders



WVFRF (BETA)

[PROJECT OVERVIEW](#) [WV RISK EXPLORER](#) [WV FLOOD TOOL](#) [CONTRIBUTORS](#) [CONTACT US](#)

WEST VIRGINIA FLOOD RESILIENCY FRAMEWORK



Image courtesy of The Atlantic



A virtual hub of risk assessment, visualization, planning, and training resources for building community flood resiliency in West Virginia

PRIMARY TOOLS



[WV Risk Explorer](#)



[WV Flood Tool](#)



[WV Property Viewer](#)



[WV Hazard Library](#)

Benefits of the Tools



■ Planning

- Enhancing state resiliency and hazard mitigation plans
- Updating emergency operation plans
- Prioritizing and allocating resources
- Identifying the need for more refined risk assessments



■ Risk Communications

- Encouraging community-level risk communication and engagement
- Educating new homeowners and renters
- Informing the insurance and mortgage industries



■ Mitigation

- Identifying areas of mitigation interest
- Supporting the development or enhancement of codes and standards
- Informing long-term community recovery



WV Building-Level Flood Risk Assessment



Inventory of what is the risk and the degree of risk for major riverine flood events.

Building-Level Flood Risk Assessments support:

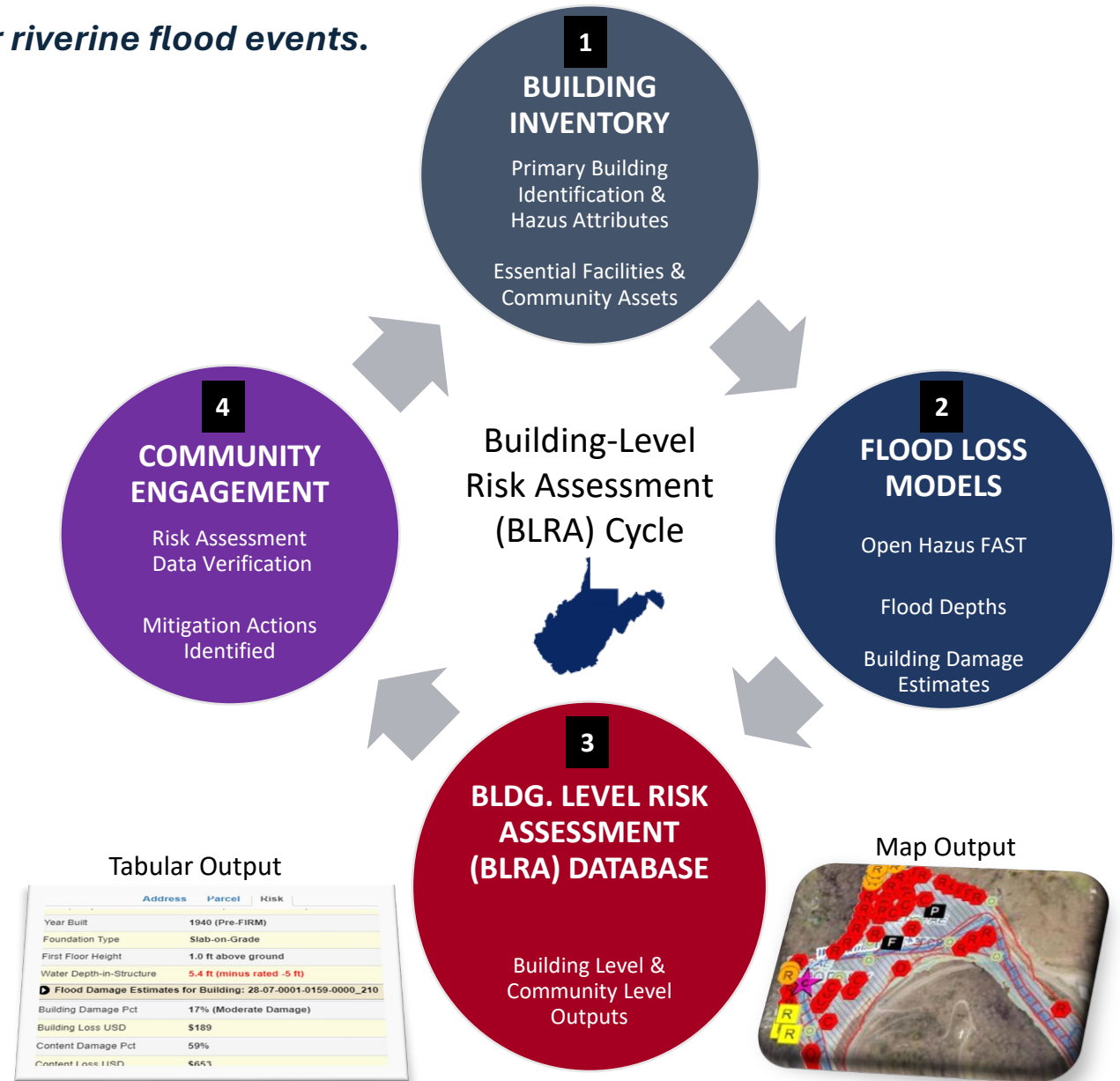
- Hazard Mitigation Plans
- Floodplain Management
- Community Assisted Visits
- Community Rating System

Benefits:

- More detailed and accurate assessments
- Automated scripts generate outputs quickly
- Cost savings through efficiencies
- Helps multiple stakeholders
- Comprehensive Building Risk Spatial Database

Methodology:

- Consistent methodology statewide
- Semi-automated workflows
- Continuous cycle to improve and update assessments



WV Floodplain Building Inventory (BI)



Flood Exposure Assessment (Building-Level)

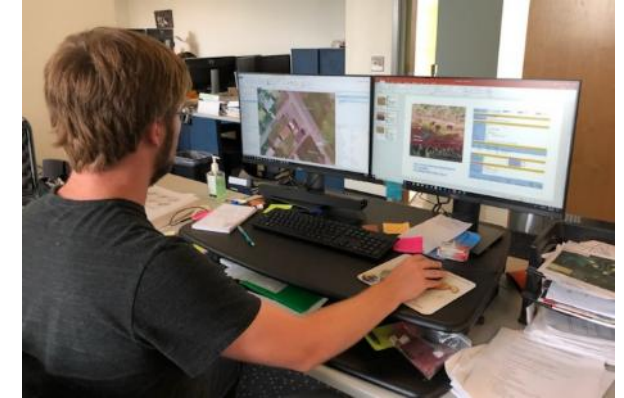
Funded by: FEMA Hazard Mitigation Grant Program (HMGP) and State Hazard Mitigation Office

- All primary (insurable) structures in the 1%-annual-chance (100-yr) floodplain
- Community Assets (Historical & Non-Historical) in the 100-yr floodplain
- Essential Facilities in the 100-yr and 500-yr floodplains

Essential Facilities



Community Assets



Detailed building characteristics from tax assessment

+

Population exposure and displacement estimates (100-yr flood)

Manual process of identification using Arc GIS

+

Programmed scripts to extract and process data

Product: **WV Flood Tool**  mapwv.gov/flood



Analytical & Visualization Tools at Multiple Scales



Political Boundaries

State



PDC Regions (11)



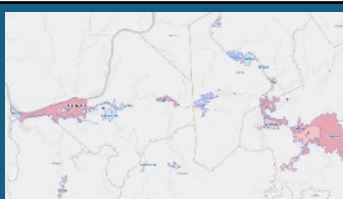
Counties (55)



Communities (284)



**Incorporated
Places
(229)**



**Unincorporated
Areas
(55)**



Drainage Areas / Streams

**Watersheds
(33)**



**Streams/Rivers
(156)**

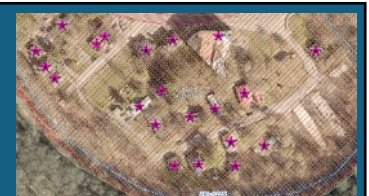


Property Levels

Parcels



Buildings



Overall Flood Risk

(1) FLOODPLAIN CHARACTERISTICS

Floodplain Area

Floodplain Length^{1 2}

Floodplain Depth^{1 2}

Flood Disaster Frequency

(2) BUILDING EXPOSURE

Building Floodplain Count^{1 2}

Building Floodway Count^{1 2}

Building Floodplain Ratio²

Building Density^{1 2}

(3) BUILDING CHARACTERISTICS

Building Value^{1 2}

Mobile Homes

Basement

One Story

Building Year*

(4) CRITICAL INFRASTRUCTURE

Essential Facilities

Roads Inundated

(5) COMMUNITY ASSETS

Historical Assets

Non-Historical Assets

(6) BUILDING DAMAGE LOSS

Substantial Damage Estimates^{*1 2}

Previous Claims

Repetitive Losses

(7) PEOPLE / SOCIAL VULNERABILITIES

Population in Floodplain

Population Displaced

WV Social Vulnerability Index

(8) OTHER HAZARDS

Landslides

Karst**

Dam/Levee Failure**

Used for the Index

* Multiple Indicators

** In Progress

¹ River/Stream Indicator

² Watershed Indicator

Geographic Entities at VERY HIGH Risk (Top 10%)



RANK	All Communities	Index Score	Incorporated Places	Index Score	Unincorporated Areas	Index Score	Counties	Index Score	Regions	Index Score
1	New Martinsville - Incorporated	100.0%	Clendenin - Incorporated	100.0%	Kanawha County* - Unincorporated	100.0%	Kanawha	100.0%	PDC Region 2	100%
2	Boone County* - Unincorporated	99.6%	New Martinsville - Incorporated	99.5%	Boone County* - Unincorporated	98.1%	Boone	98.1%	PDC Region 3	90%
3	Clendenin - Incorporated	99.2%	Alderson** - Incorporated	99.1%	Wayne County* - Unincorporated	96.2%	McDowell	96.2%		
4	Marlinton - Incorporated	98.9%	Marlinton - Incorporated	98.6%	McDowell County* - Unincorporated	94.4%	Logan	94.4%		
5	Wheeling** - Incorporated	98.5%	Kimball - Incorporated	98.2%	Mingo County* - Unincorporated	92.5%	Mingo	92.5%		
6	McDowell County* - Unincorporated	98.2%	Parsons - Incorporated	97.8%	Logan County* - Unincorporated	90.7%	Wyoming	90.7%		
7	Alderson** - Incorporated	97.8%	Wheeling** - Incorporated	97.3%						
8	Wayne County* - Unincorporated	97.5%	Northfork - Incorporated	96.9%						
9	Parsons - Incorporated	97.1%	Danville - Incorporated	96.4%						
10	Kanawha County* - Unincorporated	96.8%	Madison - Incorporated	96.0%						
11	Madison - Incorporated	96.4%	Milton - Incorporated	95.6%						
12	Kimball - Incorporated	96.1%	Oceana - Incorporated	95.1%						
13	Lincoln County* - Unincorporated	95.7%	Keystone - Incorporated	94.7%						
14	Milton - Incorporated	95.4%	Wellsburg - Incorporated	94.2%						
15	Mingo County* - Unincorporated	95.0%	Gary - Incorporated	93.8%						
16	Logan County* - Unincorporated	94.6%	Rowlesburg - Incorporated	93.4%						
17	Danville - Incorporated	94.3%	Grantsville - Incorporated	92.9%						
18	Wellsburg - Incorporated	93.9%	Richwood - Incorporated	92.5%						
19	Oceana - Incorporated	93.6%	Rainelle - Incorporated	92.1%						
20	Rowlesburg - Incorporated	93.2%	Mannington - Incorporated	91.6%						
21	Northfork - Incorporated	92.9%	Spencer - Incorporated	91.2%						
22	Gary - Incorporated	92.5%	Welch - Incorporated	90.7%						
23	Wyoming County* - Unincorporated	92.2%	Buckhannon - Incorporated	90.3%						
24	Welch - Incorporated	91.8%								
25	Summers County* - Unincorporated	91.5%								
26	Buckhannon - Incorporated	91.1%								
27	Richwood - Incorporated	90.8%								
28	Ceredo - Incorporated	90.4%								
29	Mannington - Incorporated	90.1%								

RANK	Streams (Top 20)	Index Score	Watersheds	Index Score
1	Coal River	100.0%	Lower Kanawha	100%
2	Ohio River	99.7%	Coal	96.7%
3	Little Coal River	99.5%	Upper Kanawha	93.5%
4	Greenbrier River	99.3%	Tug	90.3%
5	Davis Creek	99.1%		
6	Island Creek	98.9%		
7	Kanawha River	98.7%		
8	Campbells Creek	98.4%		
9	Wheeling Creek	98.2%		
10	Pocatalico River	98.0%		
11	Cacapon River	97.8%		
12	Big Coal River	97.6%		
13	Mud River	97.4%		
14	Cabin Creek	97.1%		
15	Pond Fork	96.9%		
16	Elk River	96.7%		
17	Twelvepole Creek	96.5%		
18	Buckhannon River	96.3%		
19	South Branch Potomac River	96.1%		
20	Paint Creek	95.8%		

Last update: Aug. 2024
Streams & Watersheds: Jul. 2025
Colors:
Black --> Incorporated places
Black on yellow** --> Split communities
Black on blue: Incorporated communities included in the detailed risk report (Camden-on-Gauley, Clendenin, Marlinton, Rainelle, Richwood, and White Sulphur Springs)
Brown on gray --> Unincorporated areas
Green --> Counties (Total)

WV Flood Tool

Determine the degree of flood risk for a **specific area** or **property** using the Public and Expert Views. View building risk assessments and mitigation measures using the Risk Map View.

Primary Components:

- Public View
- Expert View (Floodplain Management)
- RiskMap View (Risk Reduction)
- Reference Layers & Basemaps
- Property Search Tools
- Links to External Viewers & Resources



Applications:

- Flood Risk Determinations at Property Level
- Floodplain Management
- Mitigation Measures
- Damage Assessments
- Property Identification
- Flood Visualizations & Risk Communications
- CRS Map Credits
- Other Hazards

WV Risk Explorer

View and analyze riverine flood risk at the **aggregate level** for community, county, region, watershed, and stream scales. **Compare risk** among different geographic entities, complete with risk scores and rankings, from the building level to state scales.

Primary Components:

- Risk Maps Tool
- Risk Reports Tool
- Risk & Mitigation Dashboard Tools
- Building Level Risk Tools
- Flood Visualization Tools
- Data linkages WV Flood Tool & Hazard Library



Applications:

- Plans (Resiliency, Emergency Operations, Hazard Mitigation)
- Risk Studies (Risk MAP, Risk Reduction, Community Focused)
- Mitigation Measures, Tracking & Monitoring
- Flood Visualizations & Risk Communications
- CRS Programming Variables
- Other Hazards

West Virginia Risk Explorer (WVRE)



Four Groups of Tools:

■ Risk Assessment Tools

- Localized risk assessment including a broad range of risk categories by aggregating detailed building-level data
- Help identify the communities most at risk of riverine flooding for efficient allocation of limited mitigation resources

■ Risk Communication Tools

- Scenario-based 2D and 3D visualizations to translate complex data into accessible insights
- Facilitate risk comprehension for different groups of stakeholders to support informed decision-making and encourage public engagement

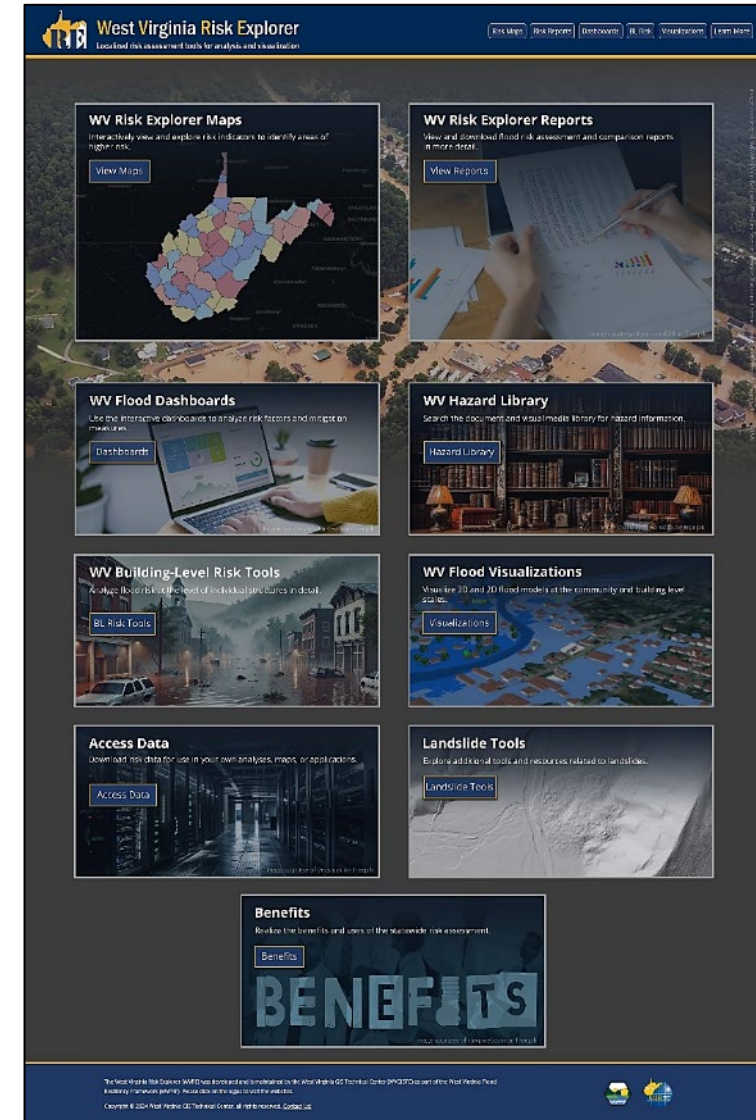
■ Mitigation Assessment Tools

- Assessment of mitigation efforts such as elevation, relocation, and buyouts and calculation of loss estimates
- Enable planners and decision-makers to evaluate past and ongoing efforts, identify gaps, and prioritize future investments

■ Hazard Library and Data Access

- Access to online hazard resources including data, documents, and media searchable by title, subject, event, geography, and more.
- Allow users to access comprehensive datasets for use in analyses, maps, or applications to support planning, research, and decision-making related to hazard mitigation and response

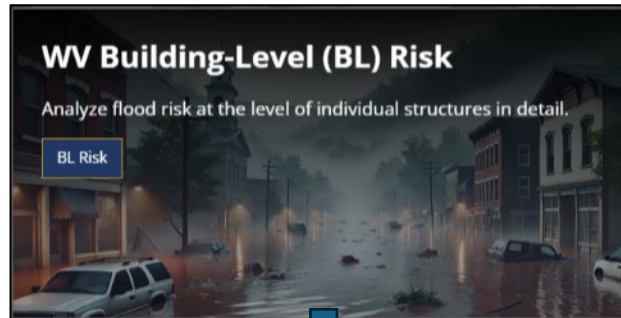
WVRE Landing Page



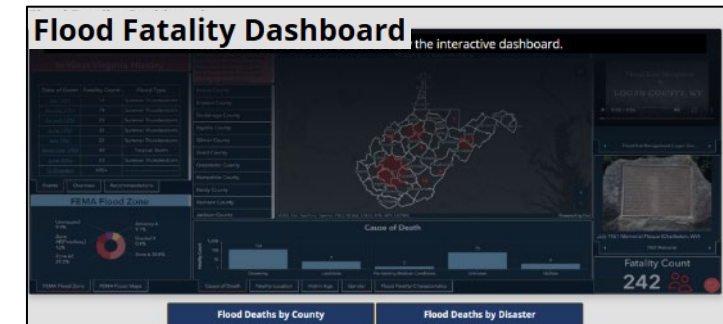
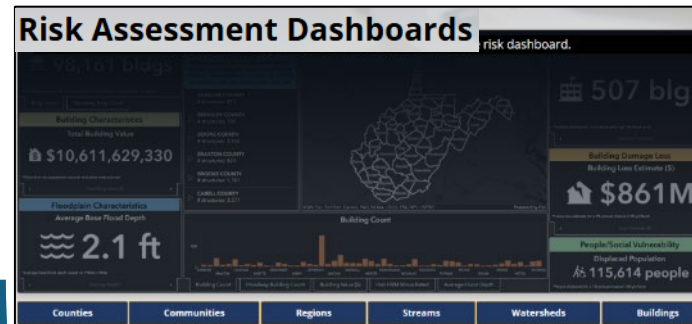
Risk Assessment Tools



Localized risk assessment tools for analysis



Building/Property-Level



Aggregated

Risk Communication Tools

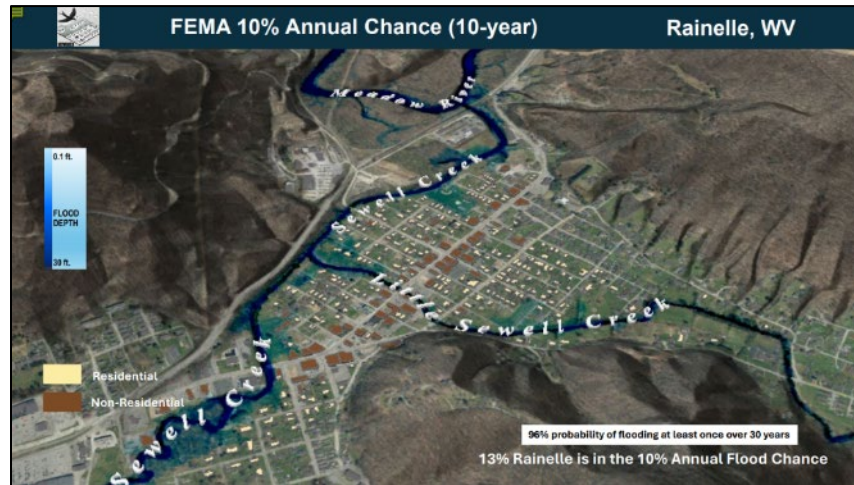
- Facilitating risk comprehension for different groups of stakeholders
(combined with other risk communication activities such as SFHA change letters, focus group meetings, presentations, etc.)



Risk Communication Tools...



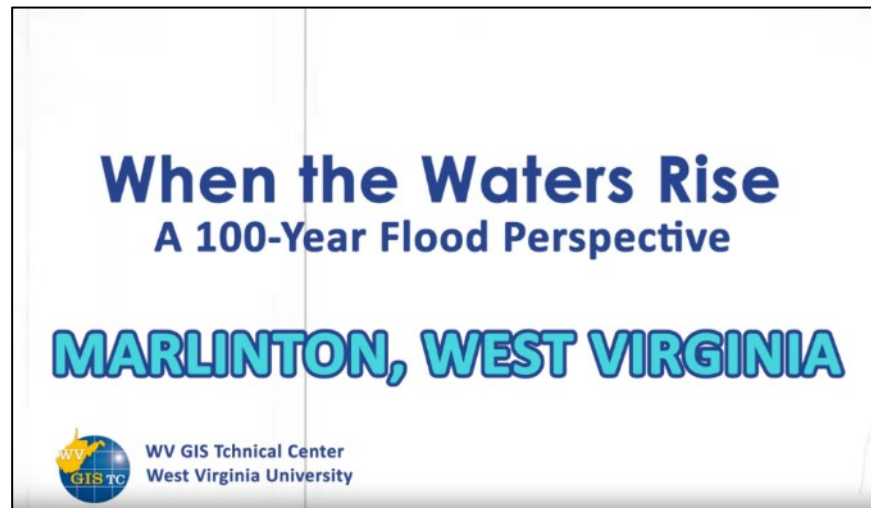
Visualization Examples



Viewshed for Rainelle



Building Profile in Clendenin



3D Movie for Marlinton



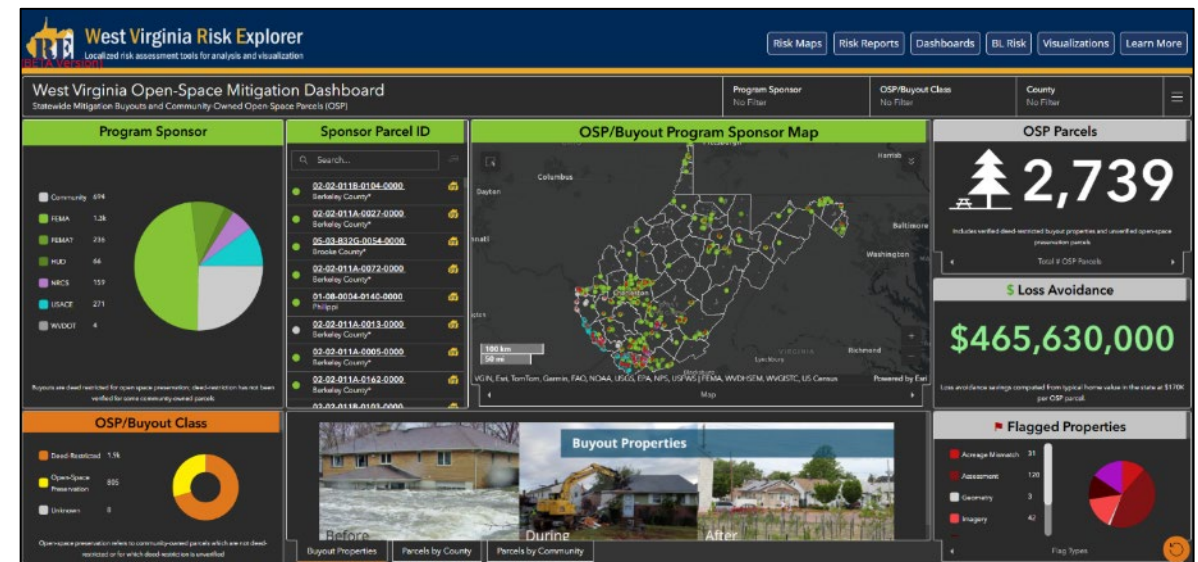
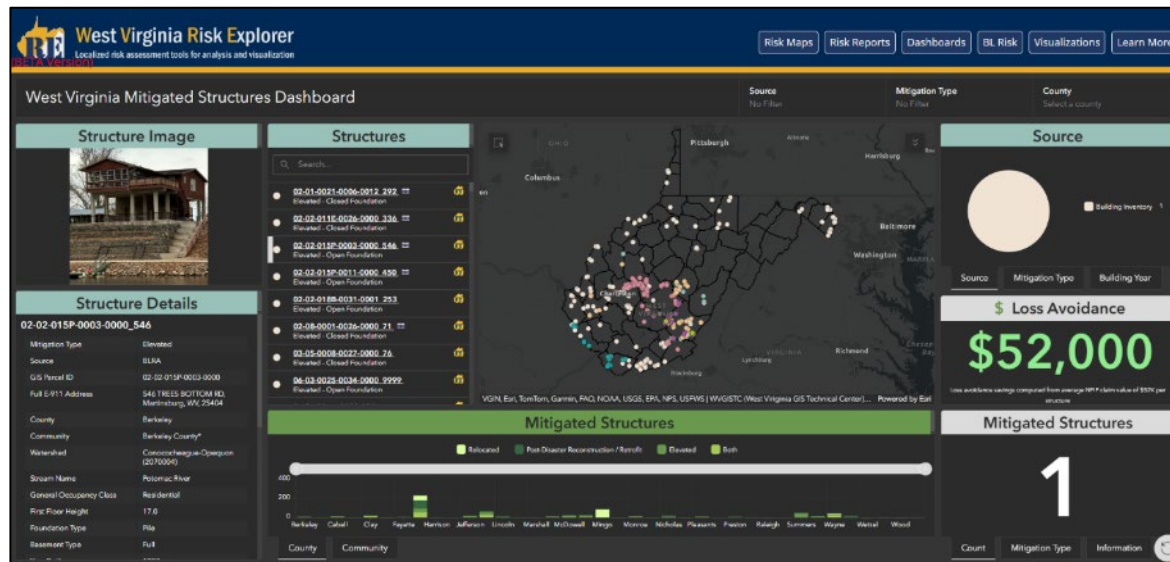
Building Profile in Charleston

Mitigation Assessment Tools



- Tracking mitigation efforts such as building elevation, relocation, acquisition, and buyouts

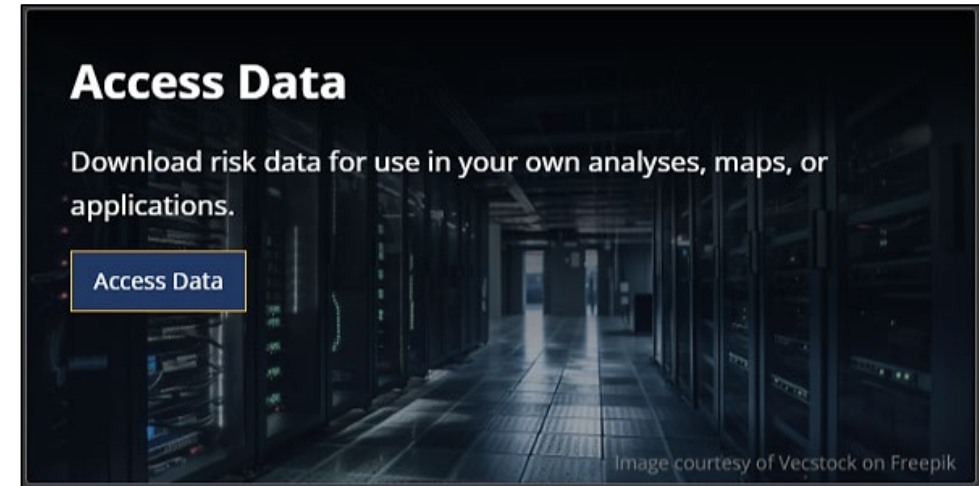
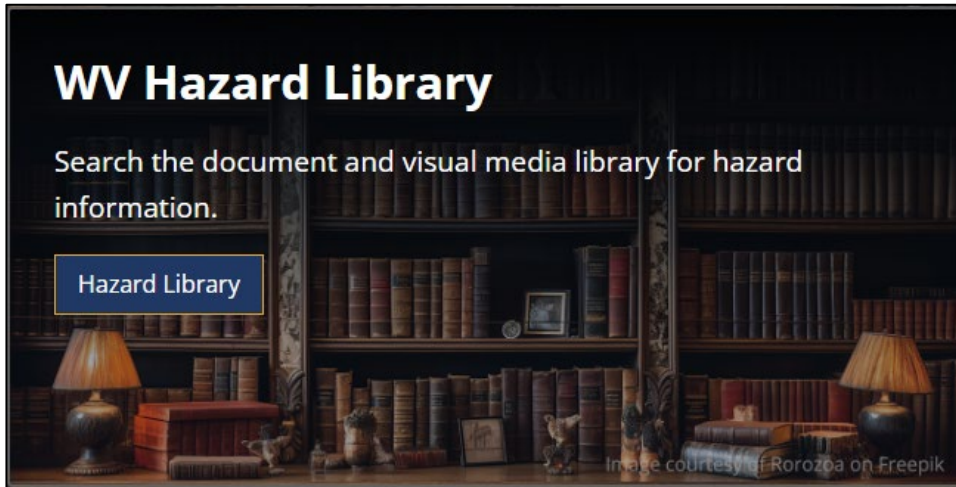
- Mitigated Structures Dashboard
- Open-Space Mitigation Dashboard



Hazard Library and Data Access



- Online hazard resources including comprehensive datasets, documents, and media



WV HAZARD LIBRARY		
TOPICS	MEDIA TYPES	SEARCH TYPES
<ul style="list-style-type: none">Risk Assessment & Planning<ul style="list-style-type: none">State Risk AssessmentsLocal Risk AssessmentsPlanning ResourcesWeb ToolsMitigation<ul style="list-style-type: none">Flood InsuranceFloodplain ManagementFloodplain MappingOther Mitigation MeasuresFlood Disaster<ul style="list-style-type: none">Flood EventFlood Research	<ul style="list-style-type: none">3D MovieBldg. ProfileDashboardData-GISData-MetadataData-TableFlyerGraphicGuideJournal ArticleLetterNews ArticlePicturePlanPosterReportSlidesSocial MediaStatic MapStory MapVideoViewshedWeb InfoWeb Tool	<ul style="list-style-type: none">AgencyDownloadable DataEvent DisasterEvent MeetingGeographic Scale<ul style="list-style-type: none">EntityMedia TypePublication DateSubject<ul style="list-style-type: none">Major GroupCategorySubcategorycross-indexingStakeholder TypeTitle (free text search)Predefined Searches<ul style="list-style-type: none">VisualizationsFloodplain Management Key Materials



Building-Level Flood Risk Data:

Building-Level Risk Assessment (BLRA)*:

[Table](#) | [Online BLRA Metadata](#) | [Full BLRA Metadata](#) | [GIS](#)

* Passcode required to access, please contact the [WVGISTC](#).

At-Risk Significant Structures:

[Table](#) | [Metadata](#) | [Essential Facilities GIS](#) | [Community Assets GIS](#)

Aggregated-Level Flood Risk Data:

Risk Index (Rankings/Scores):

[Table](#) | [Metadata](#)

Risk Full Matrix:

[Table](#) | [Metadata](#)

West Virginia Social Vulnerability Index (WV SVI):

[Table](#) | [Metadata](#)

Flood Mitigation Data:

Buyout Properties:

[Table](#) | [GIS](#) | [Metadata](#)

Floodplain Data:

[GIS](#) | [Effective Metadata](#) | [Advisory Metadata](#)

Landslide Data:

[Table](#) | [GIS](#) | [Metadata](#)

Unique Features of WV Risk Explorer Tools



- **Risk indicators Rankings to Identify Communities at Higher Risk in Risk Maps & Reports**

Interactively view and explore flood risk indicators on a map to identify areas of higher risk.

- **Interactive Downloadable Risk Reports by Multi-Scale Aggregation of Detailed Building-Level Inventory**

View and download flood risk assessment and comparison reports in more detail.

- **Sharable Queries for Risk Reports, Maps, and Tables**

Share your geographic selections along with data field queries for consistent use across teams.

- **Rationale and Recommendations for Risk Indicators**

Use the Technical Documentation to understand the rationale for the risk indicators and the recommendations associated with them.

- **Statewide Consistent Methodology and Risk Indicators**

In-depth flood risk indicators covering all of West Virginia uniformly, not just selected regions.

- **Flood Dashboards**

Use the interactive dashboards to analyze risk factors and mitigation measures.

- **Flood Visualizations**

Visualize 3D and 2D flood models at the community and building level scales.

- **Hazard Library Customized to West Virginia**

Search the document and visual media library for hazard information.

- **Data Access**

Download risk data for use in your own analyses, maps, or applications.

- **Scalable**

Scalable for other hazards such as landslides or enhancements to risk indicators.

- **Hazard Library Finalization (coming soon)**

Expanded catalog of hazard layers and supporting data

- **Planned Updates**

Regular feature data updates, additions, and indicator refinements

- **User Feedback Loop**

Reporting and feedback for tool improvements

- **Mobile-Friendly Access**

Responsive design for field use

- **Expanded Hazard Coverage**

Landslide, Dam Failure, and Karst

- **Future Maintenance**

Ongoing functioning and system performance improvements

- **Training & Support**

User training sessions, documentation, and guidance



Links to Tools / Data



→ WV Flood Tool: <https://www.mapwv.gov/flood/>



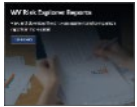
→ West Virginia Flood Resiliency Framework (WVFRF): <https://wvfrf.org/>



→ West Virginia Risk Explorer (WVRE) (Landing Page): <https://www.wvfrf.org/wvre/>



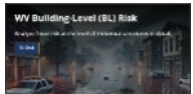
→ WV Risk Explorer Maps: https://wvfrf.org/wvre/map/?scaleid=3&gslid=&index=CUM_INDEX&type=pct



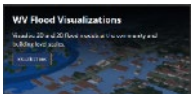
→ WV Risk Explorer Reports: <https://wvfrf.org/wvre/report/?entityid=68&scaleid=1&type=all>



→ WV Flood Dashboards: <https://wvfrf.org/wvre/dashboard/home/>



→ WV Building-Level (BL) Risk: <https://wvfrf.org/wvre/buildings/>



→ WV Flood Visualizations: <https://wvfrf.org/wvre/visualization/home/>



→ Access Data: <https://wvfrf.org/wvre/data/home/>

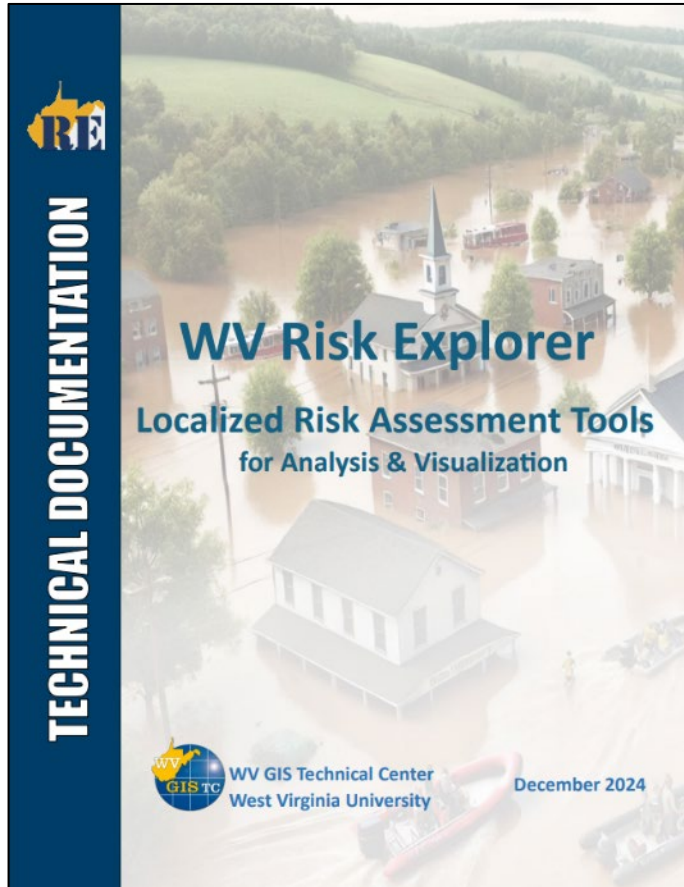


→ WV Hazard Library: <https://wvfrf.org/library/>



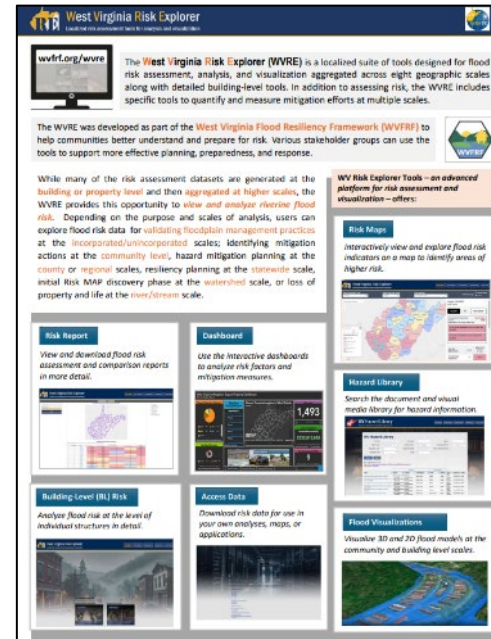
→ Landslide Tools: <https://wvfrf.org/wvre/landslides/>

WVRE Technical Document



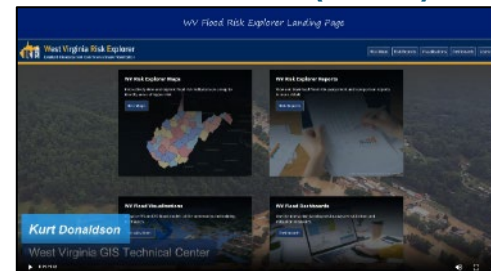
https://data.wvgis.wvu.edu/pub/RA/RI/WVRE/DOCS/WVRE_TechnicalDoc.pdf

WVRE One-Pager



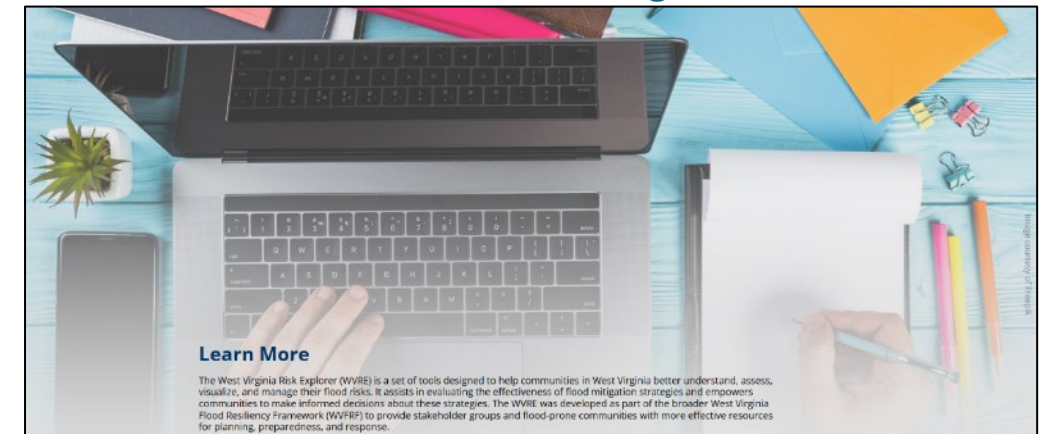
https://data.wvgis.wvu.edu/pub/RA/HL/WVFRF/Flyer/WVRE_Info_OnePager.pdf

WVRE Demo (Video)



https://data.wvgis.wvu.edu/pub/RA/HL/WVFRF/Video/WV_Risk_Explorer_Movie_20240826.mp4

WVRE Learn More Page



<https://wvrf.org/wvre/more/>

Metadata Documents

Data Dictionary (Metadata) WV Risk Index (Rankings/Scores)

https://data.wvgis.wvu.edu/pub/RA/HL/Data/RA-AL/1a_AL-RISK-INDEX/2_Metadata/WV_RiskIndex_DataDictionary.pdf

Data Dictionary (Metadata) Risk Full Data Matrix

https://data.wvgis.wvu.edu/pub/RA/HL/Data/RA-AL/1b_AL-MATRIX/2_Metadata/Full_Matrix_DataDictionary.pdf

Metadata, Full Building-Level Risk Assessment (BLRA) for Primary Structures

https://data.wvgis.wvu.edu/pub/RA/HL/Data/RA-BL/2a_BL-BLRA/3_Metadata/Full_BLRA_Metadata.pdf

Metadata, Building-Level Significant Structures at Risk

https://data.wvgis.wvu.edu/pub/RA/HL/Data/RA-BL/2b_BL-SIG-STRC/1_All_Sig_Structures/2_Metadata/Significant_Structures_Metadata.pdf

Thank you!

Questions?



Email:

kurt.donaldson@mail.wvu.edu

behrang.bidadian@mail.wvu.edu