GREENBRIER COUNTY FLOOD IMPACT STUDY RESOURCES
*Compiled by Kurt Donaldson 2/17/2023*

**I. Greenbrier County Study Focus Group Materials.** Materials presented at focus group meetings in November 2022 at Rainelle and White Sulphur Springs, Greenbrier County, WV.

1. Flood Risk Indicators
	1. [Hazard Risk Characteristics](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281a%29_FloodCharacteristics/Rainelle_3D_Viewshed_FEMA_Flood_Characteristics_for%20poster.pdf)
		1. Frequency
		2. Depth
		3. Velocity
		4. Duration
		5. Rise and Fall
	2. Exposure Risk Indicators
		1. [Human Exposure](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Building_Parcel_Human_Exposure_WSS_Rainelle.pdf%22%20%5Cl%20%22page%3D17)
		2. [Physical Exposure](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Building_Parcel_Human_Exposure_WSS_Rainelle.pdf)
	3. Vulnerability Risk Indicators
		1. Institutional Vulnerability
		2. [Social Vulnerability](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Social_Vulnerability_WSS_Rainelle.pdf)
		3. [Physical Vulnerability](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Building_Parcel_Human_Exposure_WSS_Rainelle.pdf%22%20%5Cl%20%22page%3D3)
	4. Flood Loss Models Estimates
		1. [Building Damage and Dollar Percent Estimates](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Damage_Loss_Estimates_WSS_Rainelle.pdf)
		2. [Substantial Damage Estimates](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Damage_Loss_Estimates_WSS_Rainelle.pdf)
		3. [Building Debris Removal Estimates](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Damage_Loss_Estimates_WSS_Rainelle.pdf)
		4. [Population Displacement and Short-Term Shelter Estimates](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Damage_Loss_Estimates_WSS_Rainelle.pdf%22%20%5Cl%20%22page%3D2)
		5. [Transportation Inundation Models Estimates](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%281b_1c_1d%29_Exposure-Vulnerability-Loss/Building_Parcel_Human_Exposure_WSS_Rainelle.pdf%22%20%5Cl%20%22page%3D15)
2. Mitigation Actions
	1. [Mitigated Structures](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%282%29_Mitigation_Actions/Mitigation_WSS_Rainelle.pdf)
	2. Building Adaptability (CTP)
	3. [Open Space Preservation (OSP)](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%282%29_Mitigation_Actions/Mitigation_WSS_Rainelle.pdf)
	4. [Higher Standards](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%282%29_Mitigation_Actions/Mitigation_WSS_Rainelle.pdf%22%20%5Cl%20%22page%3D2)
	5. [Flood Insurance](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%282%29_Mitigation_Actions/Mitigation_WSS_Rainelle.pdf#page=2)
	6. [Floodplain Management](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%282%29_Mitigation_Actions/Mitigation_WSS_Rainelle.pdf#page=2)
	7. [Risk Communication](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%282%29_Mitigation_Actions/Mitigation_WSS_Rainelle.pdf%22%20%5Cl%20%22page%3D2)
	8. Pre-Disaster Planning
	9. Post-Disaster Findings and Planning
	10. Training
3. Tools /Products
	1. Community Risk Indicators and Rankings
		1. [Indicator](https://data.wvgis.wvu.edu/pub/RA/State/CL/Risk_Matrices)/[Ranking](https://data.wvgis.wvu.edu/pub/RA/State/CL/Risk_Rankings/) Tables
		2. Indicator Charts
		3. Flood Risk Maps
		4. Flood Risk/Loss Dashboards. [Rainelle](https://data.wvgis.wvu.edu/pub/RA/State/CL/Risk_Dashboards/Communities_Risk_Dashboards/Rainelle_Risk_Dashboard.pdf) | [WSS](https://data.wvgis.wvu.edu/pub/RA/State/CL/Risk_Dashboards/Communities_Risk_Dashboards/WhiteSulphurSprings_Risk_Dashboard.pdf)
		5. [Updated FEMA Dashboard](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/Updated_FEMA_Dashboards/Updated_Risk_Dashboards_WSS_Rainelle_20221109.pdf)
		6. [Display Posters of Risk Assessment (Exposure/Vulnerability/Loss)](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/)
	2. Story Maps
	3. Mitigation Assessment Tools
		1. [Mitigation Tables](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/%282%29_Mitigation_Actions/Mitigation_WSS_Rainelle.pdf)
		2. Mitigation Maps. Rainelle [Streets](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/Rainelle_BLRA_Poster.pdf) | [Aerial](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/Rainelle_BLRA_Imagery_Poster.pdf) ; WSS [Streets](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/WSS_BLRA_Poster.pdf) | Aerial
		3. Building-Level Mitigation Images. [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/building_mitigation_images/Rainelle) | [WSS](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/building_mitigation_images/WSS)
	4. [Flood Tool](https://www.mapwv.gov/flood/)
	5. Multimedia
		1. [Community-Level 3D Movies](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/3Dflood/Community_Level_Movies/)
		2. [Community-Level 3D Viewsheds](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/3Dflood/ArcGIS_Viewshed_FloodFrequency/)
		3. [Neighborhood-Level 3D Mitigation Maps](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/3Dflood/GoogleEarth_Mitigated_Properties/)
		4. [Structure-Level 3D Views](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/3Dflood/SketchUp_Mitigated_Structures/)
	6. Posters
		1. Flood Hazard Characteristics [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/Rainelle_Flood_Characteristics_Poster.pdf)| [WSS](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/WSS_Flood_Characteristics_Poster.pdf)
		2. Flood Risk Indicators [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/Rainelle_Risk_Indicators_Poster.pdf) | [WSS](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/WSS_Risk_Indicators_Poster.pdf)
		3. Flood Mitigation Measures [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/Rainelle_Mitigation_Poster.pdf) | [WSS](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/WSS_Mitigation_Poster.pdf)
		4. Community Mitigation Maps
			1. Street Base Map. [Rainelle Streets](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/Rainelle_BLRA_Poster.pdf) | [WSS Streets](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/WSS_BLRA_Poster.pdf)
			2. Imagery Base Map. [Rainelle Imagery](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/Rainelle_BLRA_Imagery_Poster.pdf)  | [WSS Imagery](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/posters/WSS_BLRA_Imagery_Poster.pdf)

**II. Supporting Documents.** Materials for focus group meetings in November 2022.

1. Inundation Maps
	1. RAINELLE inundation maps
		1. FEMA Preliminary – 2022
			1. [10-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_10yr_DepthGrid.pdf) Return Period Estimate
			2. [25-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_25yr_DepthGrid.pdf) Return Period Estimate
			3. [[50-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_10yr_DepthGrid.pdf)](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_50yr_DepthGrid.pdf) [Return Period Estimate](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_10yr_DepthGrid.pdf)
			4. [100-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_100yr_DepthGrid_6colors.pdf) Return Period Estimate
			5. [100-Year Plus](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_100yr-Plus_DepthGrid.pdf) Return Period Estimate **(Climate Change)**
			6. [500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_500yr_DepthGrid_6colors.pdf) Return Period Estimate (similar to 100-yr Plus for NE Rainelle because of backwater modeling)
			7. [FSF All Flood Frequencies](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_FloodFrequency.pdf)
			8. [100-Year & 500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_100Yr_500Yr_DepthGrids_Combined.pdf) Return Periods Combined
			9. [Floodplain Map & Floodway](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_floodplains_floodway.pdf) (Preliminary FIRM)
			10. [3D Viewshed](https://data.wvgis.wvu.edu/pub/NSF/viewshed/Rainelle_3D_Viewshed_FEMA_Flood_Inundation.pdf)
		2. First Street Foundation (FSF) - 2022
			1. [5-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FSF_5Yr_DepthGrid.pdf) Return Period Estimate
			2. [20-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FSF_20Yr_DepthGrid.pdf) Return Period Estimate
			3. [100-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FSF_100yr_DepthGrid_6colors.pdf) Return Period Estimate
			4. [100-Year Climate](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FSF_100yr_Climate2052Depth.pdf) 2052 Return Period (30 years) **(Climate Change)**
			5. [500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FSF_500yr_DepthGrid_6colors.pdf) Return Period Estimate
			6. [500-Year Climate](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FSF_500yr_Climate2052_Depth.pdf) 2052 Estimate **(Climate Change)**
			7. [100-Year & 500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FSF_100Yr_500Yr_DepthGrids_Combined.pdf) Return Periods Combined
			8. [FSF All Flood Frequencies](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FSF_FloodFrequency.pdf)
			9. Source: [Flood Factor Methodology](https://riskfactor.com/methodology/flood)
		3. Comparison between FSF and FEMA
			1. [100-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMAvsFSF_100yr.pdf) Comparison
			2. [500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMAvsFSF_500yr.pdf) Comparison
			3. Combine exceedance probability with depth
		4. USGS [High Water Marks](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_HWM.pdf) (2016 Flood)
	2. WHITE SULPHUR SPRINGS inundation maps
		1. FEMA Preliminary – 2022
			1. [10-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_10yr_DepthGrid.pdf) Return Period Estimate
			2. [25-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMA_25yr_DepthGrid.pdf) Return Period Estimate
			3. [[50-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_10yr_DepthGrid.pdf)](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMA_50yr_DepthGrid.pdf) [Return Period Estimate](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_FEMA_10yr_DepthGrid.pdf)
			4. [100-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMA_100yr_DepthGrid_6colors.pdf) Return Period Estimate
			5. [100-Year Plus](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMA_100yr-Plus_DepthGrid.pdf) Return Period Estimate **(Climate Change)**
			6. [500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMA_500yr_DepthGrid_6colors.pdf) Return Period Estimate
			7. [100-Year & 500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMA_100Yr_500Yr_DepthGrids_Combined.pdf) Return Periods Combined
			8. [Floodplain Map & Floodway](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMA_floodplains_floodway.pdf) (Preliminary FIRM)
			9. [FEMA All Flood Frequencies](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMA_FloodFrequency.pdf)
			10. [3D Viewshed](https://data.wvgis.wvu.edu/pub/NSF/viewshed/WSS_3D_Viewshed_FEMA_Flood_Inundation.pdf)
		2. First Street Foundation (FSF) - 2022
			1. [5-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FSF_5Yr_DepthGrid.pdf) Return Period Estimate
			2. [20-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FSF_20Yr_DepthGrid.pdf) Return Period Estimate
			3. [100-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FSF_100yr_DepthGrid_6colors.pdf) Return Period Estimate
			4. [100-Year Climate](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FSF_100yr_Climate2052Depth.pdf) 2052 Return Period (30 years) **(Climate Change)**
			5. [500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FSF_500yr_DepthGrid_6colors.pdf) Return Period Estimate
			6. [500-Year Climate](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FSF_500yr_Climate2052_Depth.pdf) 2052 Estimate **(Climate Change)**
			7. [100-Year & 500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FSF_100Yr_500Yr_DepthGrids_Combined.pdf) Return Periods Combined
			8. [FSF All Flood Frequencies](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FSF_FloodFrequency.pdf)
		3. Comparison between FSF and FEMA
			1. [100-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMAvsFSF_100yr.pdf) Comparison
			2. [500-Year](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_FEMAvsFSF_500yr.pdf) Comparison
		4. USGS [High Water Marks](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_HWM.pdf) (2016 Flood)
	3. **Future Building Map Conditions – SFHA Change Building In / Building Out**
		1. Rainelle [Building Future Map Conditions](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Bldg_FutureMapConditions.pdf) (100-yr) *preliminary*
		2. White Sulphur Springs [Building Future Map Conditions](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Bldg_FutureMapConditions.pdf) (100-yr) *preliminary*
2. **BUILDING EXPOSURE**
	1. **Building Type** (Occupancy Class: Residential versus Non-Residential)
		1. Communitywide Building Type by Parcels. Source 2022 tax assessments.
		2. Communitywide Building Type Parcels and 1% Floodplain BLRA Points. The BLRA (Building-Level Risk Assessment) is a detailed and verified inventory of building structures within the 1%-chance floodplain.
		3. AOI Building Type Parcels and 1% Floodplain BLRA Points.
		4. Graphics
			1. Rainelle Occupancy Class [Community](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_OccupancyClass.pdf) | [with BLRA](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_OccupancyClass_withBLRA.pdf) | [BLRA AoI](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_OccupancyClass_withBLRA_AOI.pdf)
			2. WSS Occupancy Class [Community AOI](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_OccupancyClass.pdf) | [BLRA](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_OccupancyClass_withBLRA.pdf)
	2. **Owned versus Rented** for Residential Properties
		1. Owner Occupied versus Rented graphic
		2. Selection Criteria
			1. Property Class = **R**esidential or **A**partment
			2. Land Use Codes <> Vacant Lands or Auxiliary Structures
			3. Hazus Occupancy Classes from RES1 to RES3B
			4. Building Value (tax assessment appraisal value) > $5,000
		3. Tax Class
			1. Value 2 = Owner Occupied
			2. Value 4 = Renter Occupied
		4. Graphics
			1. Rainelle Owner-Occupied [Community](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_OwnerOccupied.pdf) | [Floodplain](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_OwnerOccupied_Floodplain.pdf)
			2. WSS Owner-Occupied [Community AOI](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_OwnerOccupied.pdf) | [Floodplain AOI](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_OwnerOccupied_Floodplain.pdf)
	3. **Subgrade Basements** (2022 Tax Assessment Foundation)
		1. [Rainelle Basements](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Basements_FSF_500yr.pdf) (FSF 500-yr depth)
		2. [WSS Basements](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Basements_FSF_500yr.pdf) (FSF 500-yr depth)
3. **BUILDING DAMAGE LOSS**
	1. **2016 Flood Substantial Damage Estimates** (percentage damaged)
		1. [WSS Substantial Damage Estimates](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_SDE_2016flood.pdf)
		2. Rainelle Substantial Damage Estimates (no data)
	2. **Hazus Flood Loss Estimates**
		1. FEMA 100-Yr SDE Percent Damage
			1. Rainelle [Building Damage Loss Estimates](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Bldg_DamageLossEstimates_100yr.pdf) (100-yr) *preliminary*
			2. WSS [Building Damage Loss Estimates](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Bldg_DamageLossEstimates_100yr.pdf) (100-yr) *preliminary*
		2. Hazus Building Damage Loss SDE (Elevated versus Non-Elevated); Building Counts; SDE (>50% Counts). Graphics show building footprints with red points for SDEs. Tabular summary data for dollar value estimates.
			1. FEMA
				1. FEMA 100-Yr 1ft. [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_HAZUS_FEMA100_1ftFFH.pdf)
				2. FEMA 100-Yr Elevated [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_HAZUS_FEMA100_ElevFFH.pdf)
				3. FEMA 100-Yr Plus 1ft. (Climate)
				4. FEMA 100-Yr Plus Elevated (Climate) [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_HAZUS_FEMA100plus_ElevFFH.pdf)
				5. FEMA 500-Yr 1ft.
				6. FEMA 500-Yr Elevated
			2. First Street Foundation
				1. FSF 100-Yr 1ft.
				2. FSF 100-Yr Elevated
				3. FSF 100-Yr 2052 1ft. (Climate)
				4. FSF 100-Yr 2052 Elevated (Climate)
				5. FSF 500-Yr 1ft. [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_HAZUS_FSF500_1ftFFH.pdf) | [White Sulphur Springs](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_HAZUS_FSF500_1ftFFH.pdf)
				6. FSF 500-Yr Elevated
	3. **Repetitive Loss**
		1. Rainelle RL (and tabular)
		2. WSS RL (and tabular) (few data points)
4. **TRANSPORTATION INUNDATION**
	1. [Rainelle Inundated Transportation](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Inundated_Transportation-FEMA_100yr.pdf) (FEMA 100-yr)
	2. [WSS Transportation Inundation](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Inundated_Transportation-FEMA_100yr.pdf) (FEMA 100-yr)
5. **MITIGATION**
	1. **Mitigated Properties: Mitigated Structures and Acquisition Properties (Post Flood)**
		1. **MITIGATED RECONSTRUCTION, ELEVATION, and ACQUISITION/BUYOUT** (Close or open foundations for mitigated structures). Mitigated properties are structures that have been removed, reconstructed, or elevated to protect them from a flood hazard.
			1. [Rainelle Mitigated Properties](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Mitigated_Properties.pdf)
			2. [WSS Mitigated Properties](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Mitigated_Properties.pdf)
			3. Mitigation Reconstruction by Sponsor
				1. ASP [Greenbrier County](https://data.wvgis.wvu.edu/pub/NSF/graphic/Greenbrier_MR_ASP.pdf) / [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_MR_ASP_Rainelle.pdf)
				2. VOAD
				3. WV RISE
		2. **RELOCATION.** New Residential Construction Post Flood – Relocated Communities. (2017-2021 Tax Assessment)
			1. [Rainelle New Residential Construction](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Residential_NewConstruction_PostFlood.pdf) and Relocation Community (Tax Assessment 2017-2021) (FSF 500-yr depth)
			2. [WSS New Residential Construction](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Residential_NewConstruction_PostFlood.pdf) and Relocation Community (Tax Assessment 2017-2021) (FSF 500-yr depth)
	2. **Unmitigated Properties:**
		1. **Unmitigated Low Value Structures.** Low-valued structures in which not mitigation measures have been taken.
			1. [Rainelle Unmitigated Low Value Structures](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Low_Value_Structures.pdf)
			2. [WSS Unmitigated Low Value Structures](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Low_Value_Structures.pdf)
		2. **Unmitigated Repaired/Rehabilitated Structures.** Structures damaged from a flood but the lowest floor was not mitigated or elevated above the base flood elevation to reduce or eliminate long-term flood risk to people and property. Structures were rehabilitated only to their previous building design.
			1. [Rainelle Unmitigated Rehabilitated / Repaired](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Rehabilitated-Repaired_Structures.pdf)
			2. [WSS Unmitigated Rehabilitated / Repaired](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Rehabilitated-Repaired_Structures.pdf)
	3. **Community Mitigated Properties Map** (combined mitigated and unmitigated measures)
		1. Mitigated Properties
			1. Structures
				1. Mitigation Reconstruction/Elevation to DFE (Green Tags)
				2. Relocation (only on community-wide graphic). Source data is from tax assessment records (building year 2017-2022).
			2. Open Space Preservation (Light green shaded parcels)
				1. Acquisition/Buyout Parcels (Deed Restricted)
				2. Community Owned (parks, stormwater management, etc.)
		2. Unmitigated Properties
			1. Low Value Structures (Red Tags)
			2. Repaired/Rehabilitated Structures (Orange Dots)
		3. Partial Mitigation
			1. Elevated Structures not to DFE
			2. Elevated Structures with Improper flood vents (solid wall foundation)
		4. *Reference and other Flood-Related Layers*: Incorporated place boundary, 1% floodplain and floodway, stream names, high water marks with depth values, elevation certificates with FFH values, 2016 SDE > 50%, mobile homes (RES2), 1% floodplain structures with subgrade basements. Also for consideration: Post-FIRM structures, future building condition structures, parcels, site addresses.
	4. **Mitigated Actions after 2016 Flood** using Pre-Flood Oblique Imagery (Google Earth). Shows removed structures, mitigation reconstruction, acquisition/buyout parcels, and 2016 SDE field surveys.
		1. [Rainelle](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/3Dflood/GoogleEarth_Mitigated_Properties/Views/)
			1. 7th Street
			2. Greenbrier Ave
		2. [White Sulphur Springs](https://data.wvgis.wvu.edu/pub/NSF/_GreenbrierStudy/3Dflood/GoogleEarth_Mitigated_Properties/Views/)
			1. Central Ave
			2. Freeland Ave
	5. **Lowest Floor Elevation of Residential Buildings.** Building Lowest Floor or Design Flood Elevation above the Base Flood Elevation
		1. Graphics:
			1. [Rainelle Building DFE](https://data.wvgis.wvu.edu/pub/NSF/graphic/Rainelle_Bldg_DFE.pdf)
			2. [WSS Building DFE](https://data.wvgis.wvu.edu/pub/NSF/graphic/WSS_Bldg_DFE.pdf)
		2. Criteria: First Floor Height (FFH) < Base Flood Elevation (BFE) + 2 ft.
			1. 100-year depth grid plus 2 feet freeboard (BFE + 2 ft.)
			2. Residential buildings
			3. Include “Mitigation Reconstruction to DFE” as map layer. Verify with “Rehabilitated/Repaired” to DFE layer
		3. Floodplain management compliance. The lowest floor must be above the BFE plus freeboard for all new construction or existing structures significantly improved.
	6. **Areas of Mitigation Interest**
		1. Rainelle AoMI (AoMI)
		2. WSS AoMI (AoMI)
	7. **Loss Avoidance Study**
		1. Avoided damages losses (Hazus computed)
		2. Open Space Preservation

1. **FEMA FLOOD STUDIES AND REPORTS**
	1. 2022 Flood Insurance Study (Preliminary) [Volume 1](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV001B.pdf)  | [Volume 2](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV002B.pdf)
		1. [Historical Stream Gage HWM](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV001B.pdf#page=40) (page 36)
		2. [Channelization of Sewell Creek](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV001B.pdf#page=41) (page 37). Refer to engineering notes from Matt Breen.
		3. Rainelle [FIRM Index and Panels](https://data.wvgis.wvu.edu/pub/NSF/FIS/FIRM2012/)
		4. Flood Profiles
			1. [Howard Creek - WSS Garden Street Profiles](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV002B.pdf#page=43) (page 43)
			2. [Sewell Creek Flood Profiles](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV002B.pdf#page=52) (page 52)
		5. Floodway Information
			1. [Floodway Description](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV001B.pdf#page=36) (page 32)
			2. [Howard Creek Floodway Velocity data](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV001B.pdf#page=78) (page 74)
			3. [Sewell Creek Floodway Velocity data](https://data.wvgis.wvu.edu/pub/NSF/FloodProfiles/54025CV001B.pdf#page=81) (page 77)
	2. 2016 Flood Report
		1. FEMA [Lessons Learned from June 2016 Flood](https://www.fema.gov/sites/default/files/documents/Region_III_WV_FloodReport.pdf) | [Story Map](https://wvu.maps.arcgis.com/apps/Cascade/index.html?appid=32292859b21b44e99c0be706f6da8aa3)
			1. [Story Map WV Flooded Towns, June 2016. The Historic Flooding of Southern West Virginia on June 23, 2016](https://wvu.maps.arcgis.com/apps/Cascade/index.html?appid=7b98379452094cd6827dc8f09c8293bd)
		2. USGS [Characteristics of peak streamflows and extent of inundation in areas of West Virginia and southwestern Virginia affected by flooding, June 2016](https://pubs.er.usgs.gov/publication/ofr20171140) | [Publication Download Site](https://pubs.er.usgs.gov/publication/ofr20171140)
			1. HWM map of [White Sulphur Springs](https://pubs.usgs.gov/of/2017/1140/ofr20171140.pdf#page=38) (page 30)
			2. HWM map of [Sewell Creek](https://pubs.usgs.gov/of/2017/1140/ofr20171140.pdf#page=39) (page 31)
	3. 2012 Flood Study
		1. Rainelle
			1. [Sewell Creek Flood Map](https://map1.msc.fema.gov/firm?id=54025C0357E)
			2. [FIS Report](https://map1.msc.fema.gov/data/54/S/PDF/54025CV000A.pdf?LOC=a85974aa6e069ec39812076cf89fc2eb)
	4. 1987 Flood Study – [Rainelle’s 1987 Sewell Creek Flood Map](https://map1.msc.fema.gov/firm?id=5402280001A)
	5. 1977 Flood Study – [HUD Rainelle’s 1977 Sewell Creek Flood Map](https://map1.msc.fema.gov/firm?id=540228)