**30 Fast Facts about Flooding**

**in West Virginia**

**February 2024**



**WV GIS Technical Center**

1. **Federally-Declared Flood Disasters:**

**32 flood disasters** have been federally declared in West Virginia since 1953 which equals to **3.6%** of the total federally-declared flood disasters nationwide.

1. **Regulatory Floodplain Area:**
2. The total **modified** area of regulatory floodplains (aSFHA) in West Virginia, excluding large open water lakes (> 10 acres), large rivers (bank-to-bank > 500 ft.), and federal lands (> 10 acres), amounts to **528,635 acres** which constitutes **3.4%** of the state's total land area.
3. Although only **31%** of the state has mapped **Detailed Flood Zones** with advanced engineering studies including inundation depth analysis, the Detailed Flood Zones contain **65%** of the Building Stock located in the Special Flood Hazard Area (SFHA).
4. The median ratio of modified area of regulatory floodplains (aSFHA) to community area for all **incorporated places** statewide is **13.8%**.
5. **Maximum Flood Depth:**

The maximum estimated flood depth at structure locations statewide is **38.8 ft**, estimated at a single-family residential building in the Raleigh Unincorporated Area.

1. **Structures in High-Risk Floodplains:**
2. Totally, **9.6%** of the primary (insurable) buildings in the state are located in the high-risk 1%-annual-chance (100-year) floodplains.
3. Of the total primary buildings in the state, **8.2%** are located in the **regulatory** 1%-annual-chance (100-year) floodplain also know as the Special Flood Hazard Area (SFHA).
4. **Structures in Floodways:**

Of the primary buildings in the statewide regulatory high-risk 1%-annual-chance (100-year) floodplain, **9.9%** are located in the floodways, the main channels of the rivers or streams where floodwaters are likely the deepest with the highest velocities and greatest debris potential.

1. **Flood Depth at Structures:**

Within the statewide high-risk 1%-annual-chance (100-year) floodplains, a total of **2,015** primary buildings are located in areas where the estimated flood depths **exceed 10 feet**.

1. **Total Building Value in Floodplains:**

The cumulative estimated value of primary structures exposed to a high-risk 1%-annual-chance (100-year) flood is about **10.5 billion dollars**.

1. **Residential Building Values in Floodplains:**

Within the statewide high-risk 1%-annual-chance (100-year) floodplains, **41.3%** of the total exposed building value is associated with single- to multi-family residential structures and mobile homes.

1. **High-Value Residential Structures in Floodplains:**

Among the residential buildings exposed to a high-risk 1%-annual-chance (100-year) flood in the state, there are **36** structures with appraised values **exceeding one million dollars**. The majority of these structures (74%) are located along Howard Creek in Greenbrier County.

1. **Manufactured Homes in Floodplains:**

In the statewide high-risk 1%-annual-chance (100-year) floodplains, there are **23,329** manufactured (mobile) homes, constituting **24%** of the total exposed structures. Such structures are not designed to withstand extreme weather conditions or flooding and are particularly more vulnerable to flooding compared to conventional dwellings.

1. **Structures with Basements in Floodplains:**

Of the total buildings exposed to high-risk floods in the state, **27.9%** have either full or partial basements, rendering them more susceptible at greater risk of physical damage.

1. **One-Story Residential Buildings in Floodplains:**

Of the residential buildings exposed to high-risk floods in the state, **75.4%** are one-story which are more vulnerable to flooding. During a flood event, residents in single-story buildings face limited options for seeking higher elevations within their premises, and given the typical exposure of the entire one-story structure to floodwaters, these buildings often experience a higher ratio of flood damage to replacement cost.

1. **Renter-Occupied Housing in Floodplains:**

Of the residential buildings exposed to high-risk floods in the state, **26.6%** are occupied by renters who may potentially have less ability or motivation to make their homes resistant structurally or buy flood insurance.

1. **Low-Value Structures in Floodplains:**

Among the total buildings exposed to high-risk floods in the state, **7.4%** have appraised values **less than 10,000 dollars**.

1. **Building Year & New Construction in Floodplains:**

The Flood Insurance Rate Map (FIRM) date is when the initial flood maps became effective and floodplain development standards were adopted by a community. Among the total primary buildings in the statewide high-risk 1%-annual-chance (100-year) floodplains, **66.4%** are categorized as **Pre-FIRM**, constructed before the FIRM dates. In contrast, **22.7%** are identified as **Post-FIRM** structures or new developments, subject to adherence to the floodplain development standards outlined in the local floodplain management ordinance.

1. **Essential Facilities in Floodplains:**

In the high-risk (1%-annual-chance or 100-year) and moderate-risk (0.2%-annual-chance or 500-year) floodplains statewide, there are a total of **491** essential facilities. These include 188 fire departments, 171 schools, 88 police stations, 19 nursing homes, 15 hospitals, and 10 E-911 emergency operations centers. Among the above essential facilities, **232** are identified as the **most vulnerable**. This subset comprises all schools, hospitals, and nursing homes in addition to other essential facilities situated either in the floodway or in areas with estimated flood depths equal to or exceeding three feet.

1. **Non-historical Community Assets in Floodplains:**

In the high-risk (1%-annual-chance or 100-year) floodplains statewide, there are **2,116** structures classified as non-historical community assets. These include 1,464 structures affiliated with religious organizations, 430 federal, state, or local government facilities, 168 utilities (water, sewage, gas, electric, or phone), 25 emergency medical response (EMS) facilities, 21 postsecondary educational facilities, and 8 other significant buildings contributing to the built environment of the community. Among these community assets, **1,627** are identified as the **most vulnerable**, comprising structures situated in the floodway or in areas with estimated flood depths equal to or exceeding three feet.

1. **Historical Community Assets in Floodplains:**

There are **3,159** historical community assets in the high-risk (1%-annual-chance or 100-year) floodplains statewide. These include flood-prone buildings identified within National Register Areas (100 structures) or structures in registered historic districts constructed before 1930 (3,059 structures). Among these historical community assets, **1,627** are identified as the **most vulnerable**, comprising structures situated in the floodway or in areas with estimated flood depths equal to or exceeding three feet.

1. **Flood Building Damage Estimates:**
2. The cumulative estimated building loss resulting from a high-risk (1%-annual-chance or 100-year) flood in the state amounts to **854.6 million dollars**, equivalent to **8.2%** of the total building value exposed to such a flood statewide.
3. Overall, **6,587** primary structures in the state are estimated to incur **substantial damage**, amounting to 50% or more of their appraised value, due to a high-risk (1%-annual-chance or 100-year) flood. This figure represents **6.8%** of the buildings exposed to such a flood event statewide.
4. **Flood Debris Removal Estimates:**

The total estimated debris resulting from a high-risk (1%-annual-chance or 100-year) flood in the state amounts to **509,343 tons**.

1. **Roads Inundation Estimates:**

Out of the total 39,997 miles of interstate, U.S., state, and other roads in West Virginia, **2,550 miles (6.4%)** are susceptible to inundation by a high-risk (1%-annual-chance or 100-year) flood. Approximately half of this flood-prone mileage or **1,267 miles** can experience inundation to **depths exceeding three feet**.

1. **Population in Floodplains:**

Overall, **200,255** persons are estimated to reside in the high-risk (1%-annual-chance or 100-year) floodplains statewide, constituting **11.1%** of the state's population according to the Census Bureau's 2021 American Community Survey (ACS).

1. **Population Displacement by Flooding:**

In the event of a statewide high-risk (1%-annual-chance or 100-year) flood, it is anticipated that **118,856** individuals will be temporarily displaced from their residences. This displacement represents approximately **6.6%** of the state's population, based on data from the Census Bureau's 2021 American Community Survey (ACS).

1. **Short-Term Shelter Needs:**

In the event of a statewide high-risk (1%-annual-chance or 100-year) flood, it is projected that **22,930** individuals, along with **5,697** companion pets (dogs and cats), are anticipated to require short-term shelters for up to two weeks.

1. **Flood Fatalities over Time:**

According to the analysis of **flood fatalities in the 48 contiguous United States** between 1959 and 2019, West Virginia has the **third highest ranking** in the nation when flood fatalities are standardized as the average annual number of fatalities per million inhabitants.

Reference: Han, Z., & Sharif, H. O. (2021). Analysis of flood fatalities in the United States, 1959–2019. *Water*, *13*(13), 1871.

1. **2016 Flood Fatalities & Flood Maps:**

Of the fatalities by the 2016 flood, **91%** occurred in high risk (100-year) flood zones mapped by FEMA, while the remaining fatalities occurred in close proximity to high risk flood zones.

1. **2016 Flood Fatalities & Flood Characteristics:**

It is estimated that the **rapid rise of water** contributed to the death of **87%** (20 of 23) of the victims by the 2016 flood because they did not evacuate to higher ground or a higher floor in time. Eighteen of the 23 or **78%** fatalities were contributed to **high flood velocities and flood depths** in which the victims drowned, while the remaining five flood fatalities occurred from injuries related to flooding (e.g., respiratory or heart failure, electrocution, severe burns).

1. **2016 Flood Fatalities & Building Type:**

Seventeen of the 23 or **74%** of fatalities by the 2016 flood were associated with private residential structures of which homes with **basements** or **no second floor** presented a greater risk to loss of life.

1. **2016 Flood Fatalities & Behavior:**

**Risky behavior**, such as attempting to rescue pets, retrieve memorabilia from basements, playing near flooded creeks, driving into floodwaters, and crossing or viewing from bridges, was identified for nine of the 23 victims or **39%** of the fatalities by the 2016 flood. It is estimated that the other 14 victims or **61%** of the fatalities **delayed evacuations** of which three victims had had major health issues and required special assistance for evacuation.

1. **Demographics of the 2016 Flood Victims:**
2. Of the total victims of the 2016 flood, **nine** were **aged over 65**, accounting for **39.1%** of the total fatalities. This proportion is significantly higher than the ratio of this age group in the state population, which was 19.9% in 2016. Additionally, **eleven** victims were between **15 to 64 years old**, while **three** were **younger than 15**.
3. A minimum of **five** victims of the 2016 flood (22%) had **pre-existing health conditions** (cancer, Alzheimer’s, respiratory disease, etc.) and **disabilities** while living with care givers who were unable to seek medical attention or evacuate persons of need in a timely manner. The 2016 fatalities exceeded the statewide disabled population percentage of 20% in 2016.