9. FLOOD

9.1 HAZARD PROFILE

9.1.1 Hazard Description

A flood is an overflow of water from oceans, rivers, groundwater, or rainfall that submerges areas that are usually dry. This natural phenomenon can occur during any season and can be exacerbated by features of the built environment.

Flooding in Passaic County can be the result of heavy rainfall produced by hurricanes moving up the coast, large frontal storms from the west and south, and local thunderstorms (FEMA FIS 2015). Flooding can also result from the failure of a water control structure, such as a dam or levee (NWS 2019). Flood can be exacerbated by other hazards such as sea level rise. Flooding commonly includes one or more of the following scenarios (NWS 2019):

- Riverine overbank flooding
- Flash floods
- Alluvial fan floods
- Mudflows or debris floods
- Dam- and levee-break floods
- Local draining or high groundwater levels
- Fluctuating lake levels
- Ice-jams

For the purpose of this HMP and as deemed appropriate by the Passaic County Steering Committee, the main flood types of concern are riverine, flash flooding, storm surge, stormwater/urban, ice jam, and erosion.

Riverine Flooding

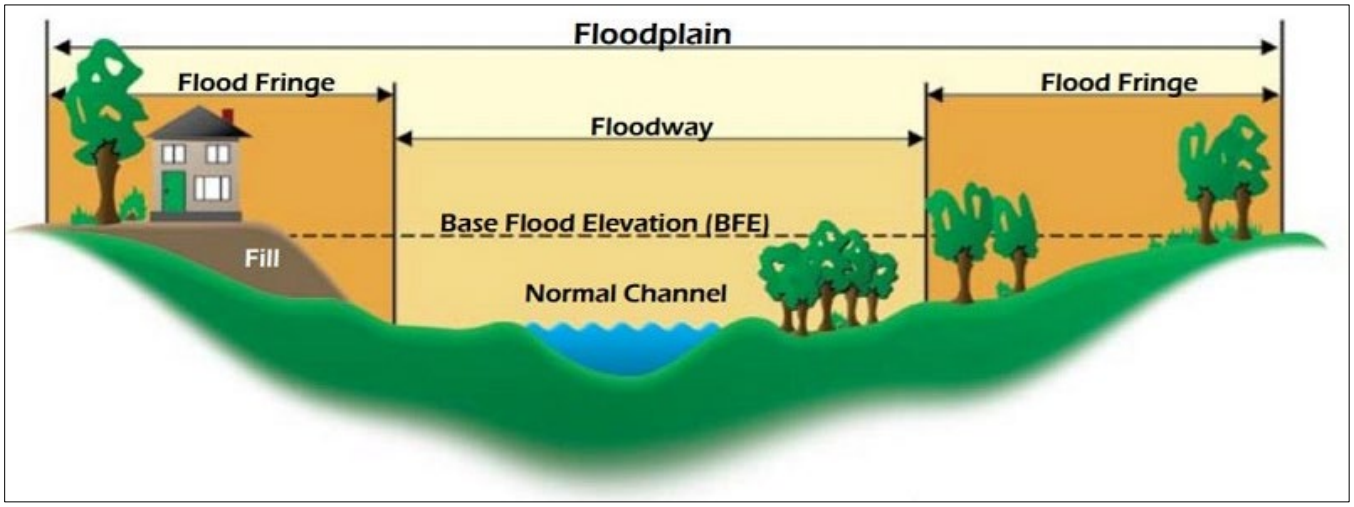
Riverine floods are the most common flood type. They occur along the channels of rivers, creeks, streams, or ditches. When a channel receives too much water, the excess water flows over its banks and inundates low-lying areas (FEMA 2019). The inundated area is called the floodplain (NWS n.d.). Floodplains are typically flat land adjacent to a watercourse that is subject to periodic inundation. A floodplain is made up of the following components (refer to Figure 9-1) (FEMA 2019, US DHS 2019):

- **Floodway:** the channel of a river or other waterway and the adjacent land areas that are under water or reserved to carry and discharge the overflow of water caused by flooding.
- **Flood Fringe:** the area within the floodplain but outside the floodway; this area extends from the outer banks of a floodway to the river valley, where the elevation begins to rise.

Riverine flooding is measured by how frequently a given level of flooding occurs. The 1 percent annual chance flood, also referred to as the base flood or 100-year flood, is a flood with a level that has a 1 percent chance of being equaled or exceeded in any given year. Though commonly called the 100-year flood, this flood can occur more than once in a relatively short period of time. Similarly, the flood with a 0.2 percent chance of being equaled or exceeded each year is often called the 500-year flood but can occur more frequently than that (FEMA 2020).

FEMA prepare maps of the expected floodplains along water courses, based on historical riverine and coastal flooding conditions. In FEMA flood maps, the floodplain inundated by the 1 percent annual chance flood is identified as Special Flood Hazard Area (SFHA). This is the area where flood insurance and floodplain management requirements apply (FEMA 2020).

Figure 9-1. Characteristics of a Floodplain



Source: FEMA 2022

The following are additional definitions relating to flood map:

- **Special Hazard Flood Areas (SFHAs)—**Labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30.
- **Zone B or Zone X (shaded)—**Moderate flood hazard areas. These are the areas between the limits of the base flood and the 0.2 percent annual chance (or 500-year) flood.
- **Zone C or Zone X (unshaded)—**Areas of minimal flood hazard, outside the SFHA and at higher elevations than the elevation of the 0.2 percent annual chance flood.

Mapped floodplain boundaries may require updating as a result of changes in land use or the amount of impervious surface, the placement of obstructing structures in floodways, changes in precipitation and runoff patterns, improvements in technology for measuring topographic features, or new hydrologic modeling techniques (USGS 2016). Flooding outside of the SFHA area may include stormwater or urban flooding and flash flooding. Urban and stormwater flooding and future conditions (e.g., sea level rise and rainfall areas) are not reflected in FEMA floodplain mapping. As such, FEMA floodplain maps may underestimate flood risk in many areas.

Flash Flooding

Flash floods are floods caused by heavy rainfall in a short period of time, generally less than 6 hours (NWS 2009). These floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons. They can occur within minutes or a few hours of excessive rainfall.

Storm Surge

Storm surge causes backwater flooding as a result of rising water elevations at coastal river mouths. Strong winds can increase tide levels and water-surface elevations in the connected bodies of water. Storm systems generate large waves that run up and can push high amounts of water inland along waterways opposite the direction of their typical flow, which can overtop banks and impact adjacent low-lying floodplains.

Stormwater/Urban Flooding

Urban stormwater flooding is flooding caused by local drainage issues and high groundwater levels in areas other than delineated floodplains or along recognizable channels. It is generally the result of increased water runoff due to urban development and inadequate drainage systems. If local conditions cannot accommodate intense precipitation through a combination of infiltration and surface runoff, water may accumulate and cause flooding problems. During winter and spring, frozen ground and snow accumulations may contribute to inadequate drainage and localized ponding. Flooding of this nature generally occurs in areas with flat gradients and generally increases with urbanization, which speeds the accumulation of floodwaters because of impervious areas. Shallow street flooding can occur unless channels have been improved to account for increased flows. Urban flooding can inundate streets, underpasses, low lying areas, or storm drains (FEMA 2007).

Drainage systems are designed to remove surface water from developed areas as quickly as possible to prevent flooding on streets and other urban areas. Such systems often make use of a closed conveyance system that channels water away from an urban area to surrounding streams. This bypasses the natural processes of water filtration through the ground, containment, and evaporation of excess water. Because drainage systems reduce the amount of time the surface water takes to reach surrounding streams, flooding in those streams can occur more quickly and reach greater depths than prior to development in that area (Harris, How Floods Work 2008). The growing number of extreme rainfall events that produce intense precipitation are resulting in increased urban flooding (Center for Disaster Resilience 2016).

High groundwater levels can cause problems even where there is no surface flooding. Basements are susceptible to high groundwater levels. Seasonally high groundwater is common in many areas, though it often occurs only after a long period of above-average precipitation (USGS 2016).

Ice Jam Flooding

An ice jam occurs when pieces of floating ice are carried with a stream's current and accumulate behind an obstruction to the stream flow. Obstructions may include river bends, mouths of tributaries, points where the river slope decreases, dams, or bridges. The water held back by this obstruction can cause flooding upstream, and if the obstruction suddenly breaks, flash flooding can occur (NESEC 2021). The formation of ice jams depends on the weather and physical condition of the river and stream channels. They are most likely to occur where the channel slope naturally decreases, in culverts, and along shallows where channels may freeze solid.

There are two different types of ice jams: freeze-up and breakup. Freeze-up jams occur in the early to mid-winter when floating ice may slow or stop due to a change in water slope as it reaches an obstruction to movement. Breakup jams occur during periods of thaw, generally in late winter and early spring. The ice cover breakup is usually associated with a rapid increase in runoff and corresponding river discharge due to a heavy rainfall, snowmelt, or warmer temperatures (FEMA 2023).

Erosion

Erosion is the geological process in which earthen materials are worn away and transported by natural forces such as wind or water. Most erosion is performed by liquid water, wind, or ice. Liquid water is the major agent of erosion. Rain, rivers, floods, and lakes carry away bits of soil and sand and slowly wash away the sediment (National Geographic 2023).

9.1.2 Location

Riverine Flooding

Most flooding in Passaic County occurs during the summer and early fall; however, floods have occurred at different times throughout the year. According to the County's Flood Insurance Study (FIS) report, multiple waterways have a history of flooding including the Passaic River, the Molly Ann Brook, the Pequannock River, and the Wanaque River. Many of the bodies of water are the primary source for flooding; however, most flooding is due to indirect causes such as undersized culverts, tidal impacts from headwaters, and confluences with other waterbodies (FEMA FIS 2015).

Flood Mapping

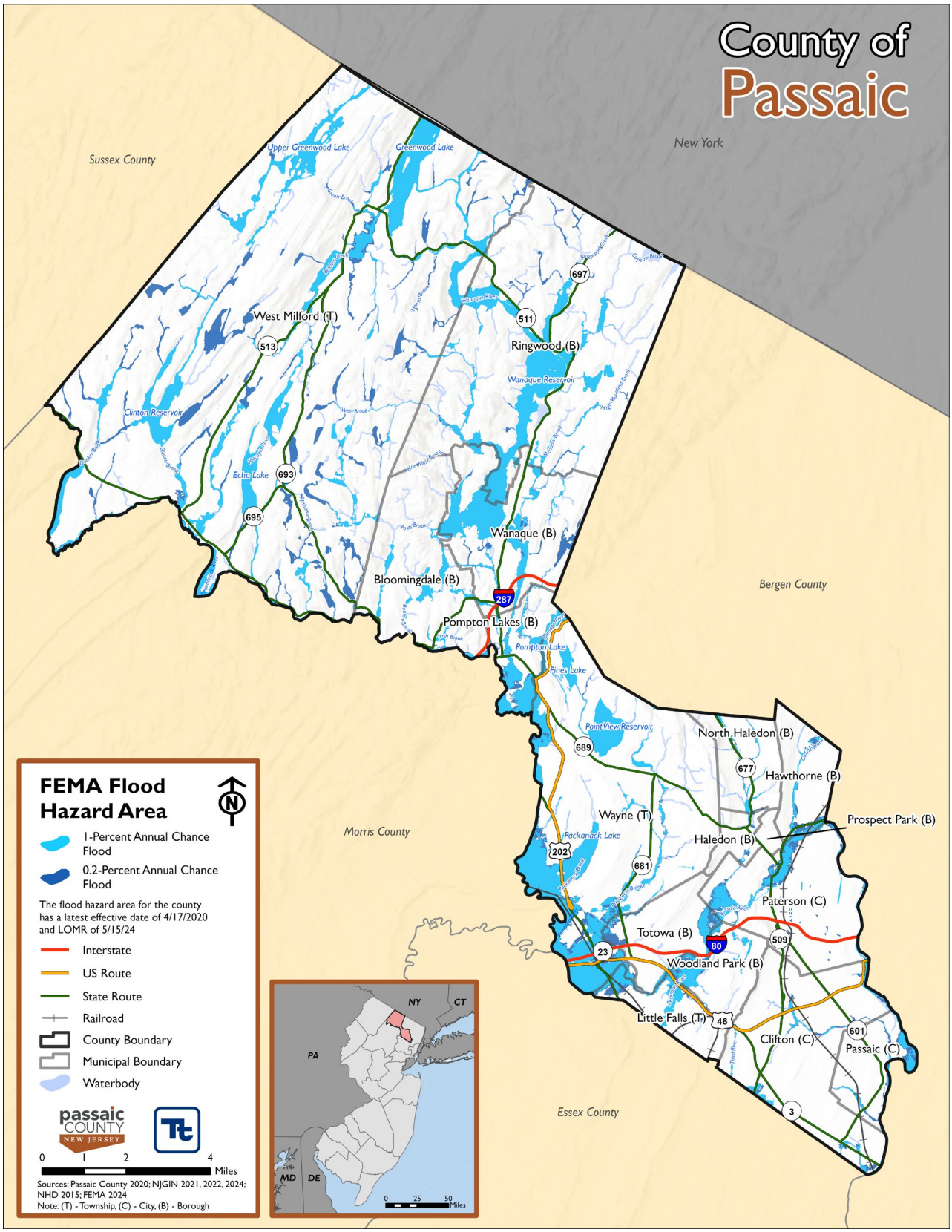
Locations of flood zones in Passaic County, as depicted on the FEMA preliminary Digital Flood Insurance Rate Map (DFIRM), are illustrated in Figure 9-2. The total land area in the floodplain, excluding water bodies, is summarized in Table 9-1.

Table 9-1. Number of Acres in Passaic County Exposed to 1 Percent and 0.2 Percent Annual Chance Flood

Jurisdiction	Total Area Excluding Water Bodies (acres)	Area Excluding Water Bodies in the 1% Annual Chance Flood Hazard Area		Area Excluding Water Bodies in the 0.2% Annual Chance Flood Hazard Area	
		Total Area (acres)	% of Jurisdiction Total	Total Area (acres)	% of Jurisdiction Total
Bloomingdale (B)	5,615.2	179.4	3.2%	209.0	3.7%
Clifton (C)	7,314.8	240.4	3.3%	350.7	4.8%
Haledon (B)	778.6	15.4	2.0%	37.9	4.9%
Hawthorne (B)	2,153.0	147.6	6.9%	245.3	11.4%
Little Falls (T)	1,840.8	327.5	17.8%	417.7	22.7%
North Haledon (B)	2,257.5	95.2	4.2%	122.2	5.4%
Passaic (C)	2,073.4	196.3	9.5%	293.0	14.1%
Paterson (C)	5,564.1	562.2	10.1%	782.9	14.1%
Pompton Lakes (B)	1,831.8	509.5	27.8%	599.3	32.7%
Prospect Park (B)	300.8	3.4	1.1%	7.0	2.3%
Ringwood (B)	15,986.4	452.2	2.8%	620.3	3.9%
Totowa (B)	2,611.0	244.2	9.4%	405.8	15.5%
Wanaque (B)	5,060.5	457.4	9.0%	577.9	11.4%
Wayne (T)	15,232.7	2,684.1	17.6%	3,084.3	20.2%
West Milford (T)	48,071.3	2,007.7	4.2%	3,805.6	7.9%
Woodland Park (B)	1,965.8	322.2	16.4%	383.0	19.5%
Passaic County (Total)	118,657.8	8,444.8	7.1%	11,942.0	10.1%

Source: (NJGIN 2024); (FEMA 2020)

Figure 9-2. FEMA Flood Hazard Areas in Passaic County



Flood Gages

The USGS National Water Information System collects surface water data from more than 850,000 stations across the country. The time-series data describes stream levels, stream flow (discharge), reservoir and lake levels, surface water quality, and rainfall. The data is collected by automatic recorders and manual field measurements at the gage locations. USGS uses stream gages to determine the severity of flood at different points along a body of water. There are numerous gages in Passaic County, in addition to others just outside of the County's boundary, that provide critical flood data for waterways affecting the County.

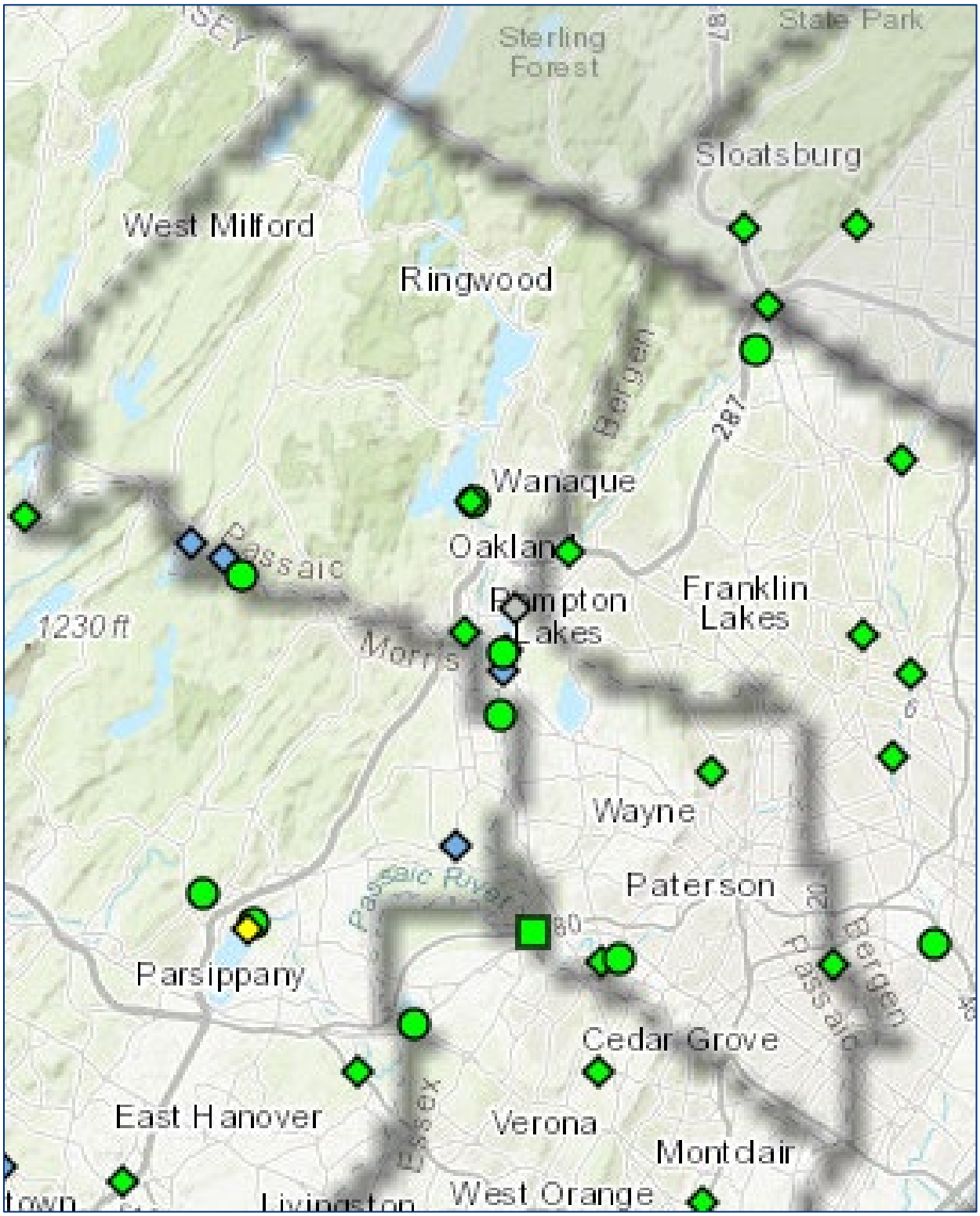
The 22 stream gages in the County are shown in Figure 9-3 and listed in Table 9-2. The USGS website provides details about each of the gages and the gage heights of flooding events. The NWS provides the different flood stages for the gages.

Table 9-2. Gages in Passaic County

Gage Site Number	Site Name	Flood Stage Height (feet)	Record Flood Height (Feet)
01382385	Pequannock River at Green Pond Junction NJ	N/A	N/A
01382500	Pequannock River at Macopin Intake Dam NJ	5.5	9.4
01383000	Greenwood Lake at Awosting NJ	Not Available	Not Available
01383500	Wanaque River at Awosting NJ	Not Available	Not Available
01384500	Ringwood Creek near Wanaque NJ	Not Available	Not Available
01386000	West Brook near Wanaque NJ	Not Available	Not Available
01386990	Wanaque Reservoir at Wanaque NJ	302.0	N/A
01387000	Wanaque River at Wanaque NJ	6.0	10.8
01387940	Ramapo River at Lakeside Ave at Pompton Lakes NJ	Not Available	Not Available
01387998	Ramapo River above dam at Pompton Lakes NJ	11.5	15.6
01388000	Ramapo River at Pompton Lakes NJ	11.5	22.6
01388100	Ramapo River at Dawes Highway at Pompton NJ	Not Available	Not Available
01388500	Pompton River at Pompton Plains NJ	16.0	25.2
01388910	Pompton River at Mountain View NJ	Not Available	Not Available
01389005	Passaic River below Pompton River at Two Bridges NJ	Not Available	Not Available
01389010	Passaic River at I-80 at Singac NJ	7.0	11.5
01389492	Passaic River abv Beatties Dam at Little Falls NJ	11.3	14.1
01389500	Passaic River at Little Falls NJ	7.0	17.5
01389550	Peckman River at Little Falls NJ	Not Available	Not Available
01389765	Molly Ann Brook at North Haledon NJ	6.0	10.9
01389802	Passaic River at Passaic (Great) Falls at Paterson NJ	Not Available	Not Available
01389890	Passaic River at Dundee Dam at Clifton NJ	4.5	8.4

Source: NWS 2023; USGS 2023

Figure 9-3. Stream Gages in Passaic County



Source: NWS 2023

Flash Flooding

Flash flooding, like riverine flooding, occurs throughout the County, primarily along the bodies of water that flow through it. There is no standardized mapping system for flash flooding.

Storm Surge

The area along the Passaic River in the southeastern part of Passaic County is vulnerable to storm surge as far upstream as Dundee Dam in the City of Clifton. The dam is on the Passaic River, 17 miles upstream from the river's outlet at Newark Bay (Passaic County 2020). Only the City of Passaic and City of Clifton along the Passaic River are affected by tidal influence (NJDEP 2018). These municipalities are vulnerable to storm surge.

Inundation from storm surge has devastating impacts on the state's coastal communities. USACE, in cooperation with FEMA, prepared maps of storm surge inundation areas called SLOSH (Sea, Lake, and Overland Surges from Hurricanes) maps. SLOSH maps represent potential flooding from worst-case combinations of hurricane direction, forward speed, and landfall point, and high astronomical tide. The SLOSH maps do not include riverine flooding caused by hurricane surge or inland freshwater flooding.

The mapping was developed for the coastal communities in the State of New Jersey using the computer model to forecast surges that occur from wind and pressure forces of hurricanes. In New Jersey, hurricane category is the predominant factor in worst-case hurricane surges. The resulting inundation areas are grouped into Category 1 and 2 (dangerous), Category 3 (devastating), and Category 4 (catastrophic) classifications. The hurricane category refers to the Saffir/Simpson Hurricane Intensity Scale. Figure 9-4 shows the SLOSH zones for Passaic County.

Stormwater/Urban Flooding

Stormwater/urban flooding is not mapped by the state or FEMA but is most likely to occur in highly developed areas with high percentages of impervious surface that contributes to high rates of runoff. Locations that have undersized stormwater components or stormwater components that are prone to becoming clogged or failing often experience stormwater flooding.

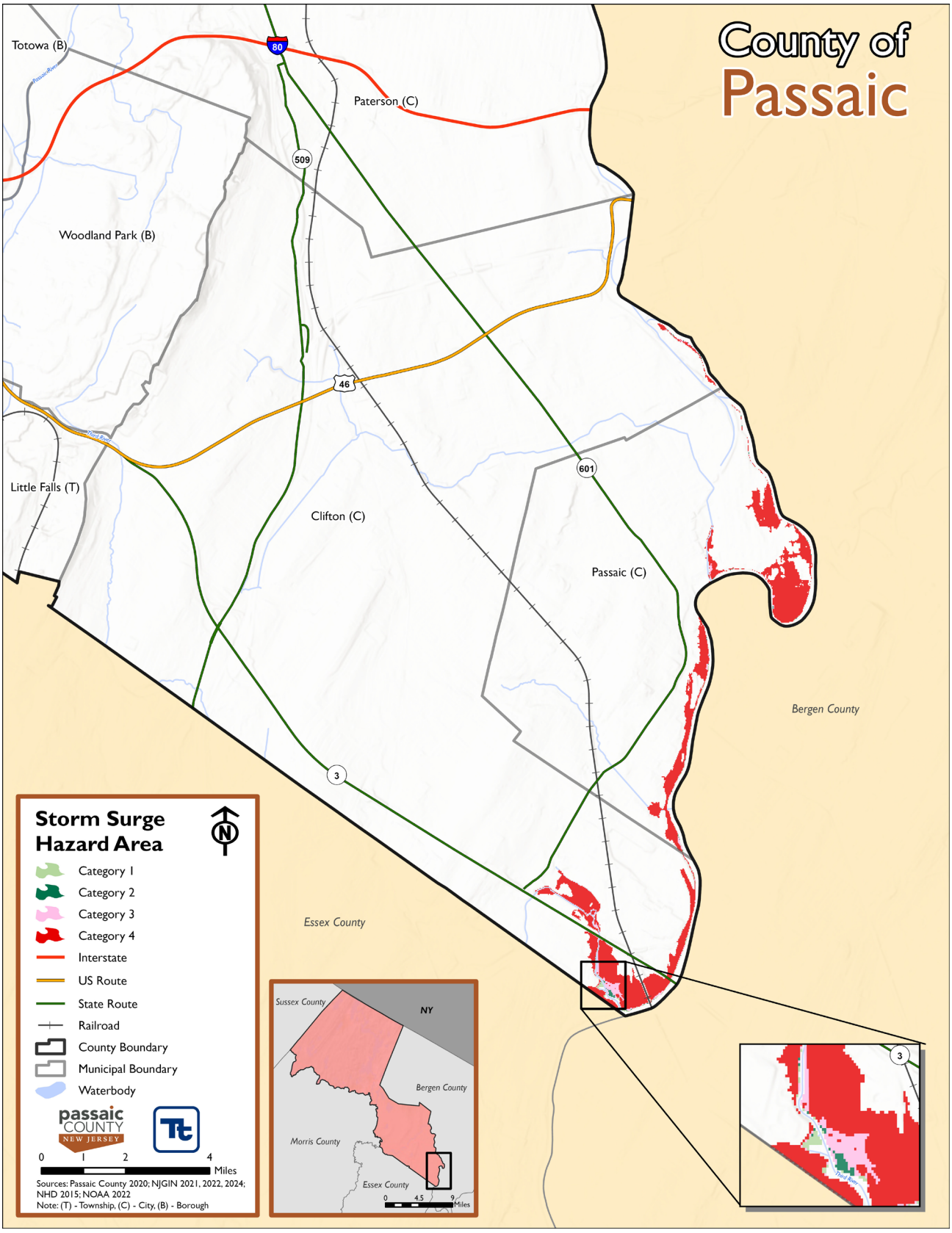
Ice Jam Flooding

Areas of New Jersey that include characteristics conducive to ice jam flooding are the northern counties along the Passaic River and its tributaries—Essex, Hudson, Passaic, and Bergen. According to the USACE Ice Jam Database, Passaic County has not been impacted by any historic ice jam incidents between 1780 and 2023. The Passaic River has experienced ice jams in neighboring Morris County, demonstrating that Passaic County can be impacted by ice jam events (USACE 2023).

Erosion

Erosion in Passaic County is limited to fluvial (river and stream) erosion. Fluvial erosion may occur along all rivers, streams, and creeks that flow throughout the County.

Figure 9-4. Storm Surge Hazard Area



9.1.3 Extent

Riverine and Flash Flooding

The severity of riverine and flash flooding is determined by stream and river basin topography; precipitation and weather patterns; soil moisture conditions; degree of vegetative clearing; and impervious surface. Generally, floods are long-term events that may last for several days.

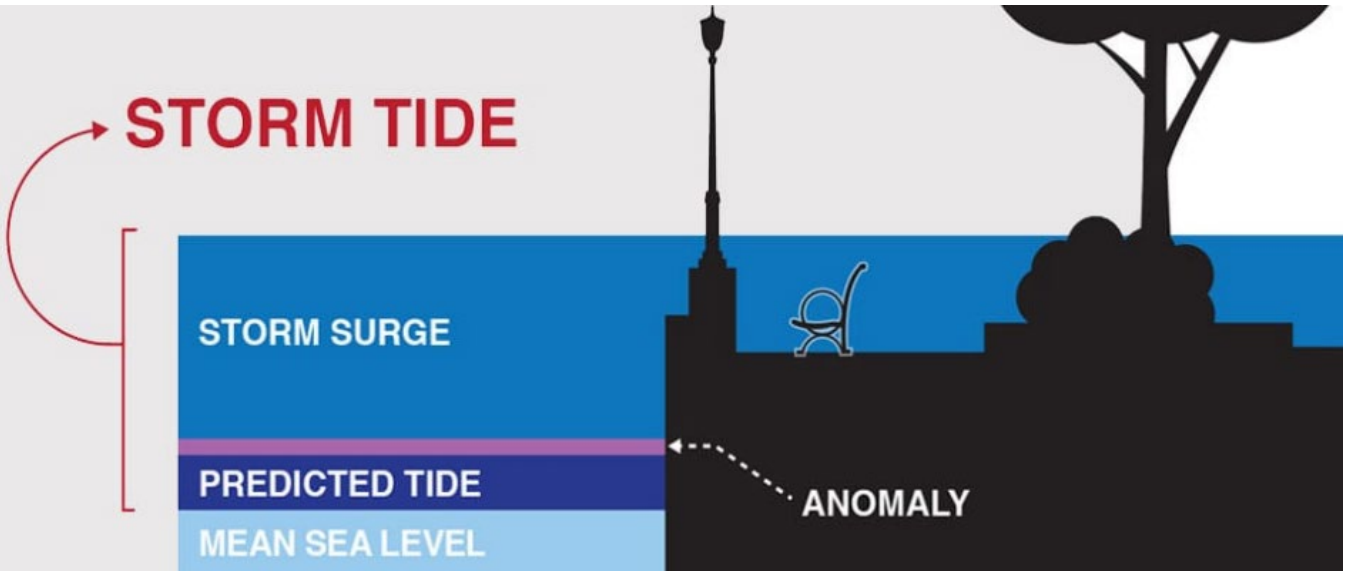
Riverine flooding is assessed based on the probability that a given river discharge (flow) level will be equaled or exceeded each year. Flood studies use historical records to determine the probability of occurrence for the different discharge levels. Once a river reaches flood stage, the flood extent categories used by the NWS are as follows (NSSL n.d.):

- **Minor Flooding** can cause minimal or no property damage, with possibly some public threat or inconvenience.
- **Moderate Flooding** can cause some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations are necessary.
- **Major Flooding** can cause extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

Storm Surge

Storm surge is estimated by subtracting the regular tide level from the observed storm tide. Typical storm surge heights range from several feet to more than 25 feet. The exact height of the storm surge and which coastal areas will be flooded depends on the intensity and speed of the storm that causes it; the direction the storm is moving relative to the shoreline; how rapidly the sea floor slopes along the shore; the shape and elevation of the shoreline; and the astronomical tide. Storm surge is most damaging when it occurs along a shallow sloped shoreline, during high tide, and in a highly populated and developed area. Figure 9-5 illustrates water level differences for storm surge, storm tide, and a normal (predicted) high tide as compared to sea level (NOAA 2024).

Figure 9-5. Storm Tide Diagram



Source: NOAA 2024

Stormwater/Urban Flooding

Currently, there is no measurement used to define severity of stormwater/urban flooding.

Ice Jam Flooding

Ice jam flooding events often occur suddenly and are difficult to predict, allowing for little time to prepare for and warn of an event. The size of the snowpack and the rate of snowmelt controls the extent of an ice jam (Rokaya 2018).

According to USACE, the State of New Jersey ranks 24th in the United States for total number of ice jam events, with 109 incidents documented between 1867 and 2023 (USACE 2023).

Erosion

Erosion is typically expressed as a rate: rate of linear retreat (feet of shoreline recession per year) or volumetric loss (cubic yards of eroded sediment per linear foot of shoreline frontage per year). Erosion rates are cited as positive numbers, with corresponding shoreline change rates as negative numbers. For example, an erosion rate of 2 feet per year is equivalent to a shoreline change rate of “-2 feet per year”. Accretion rates are stated as positive numbers, with corresponding shoreline change rates as positive numbers. For example, an accretion rate of 2 feet per year is equivalent to a shoreline change rate of “2 feet per year”.

Erosion rates are usually computed and cited as long-term, average annual rates. However, erosion rates are not uniform in time or space and can vary substantially, including from one location along the shoreline to another (even when the two locations are only a short distance apart), over time at a single location, or seasonally.

9.1.4 Previous Occurrences

FEMA Major Disaster and Emergency Declarations

Passaic County has been included in 13 major disaster (DR) or emergency (EM) declarations for flood-related events (FEMA 2024).Table 9-3 lists these declarations.

USDA Declarations

The U.S. Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans from the U.S. Department of Agriculture (USDA) to producers suffering losses in those counties and in contiguous counties. Between 2019 and 2023, Passaic County was not included in any USDA flood-related agricultural disaster declarations (USDA 2024).

Previous Events

Known hazard events that impacted Passaic County between August 2019 and December 2023 are listed in Table 9-4. For events prior to 2019, refer to the 2020 Passaic County HMP.

Table 9-3. FEMA Declarations for Flood Events in Passaic County (1954 to 2023)

Event Date	Declaration Date	Declaration Number	Description
March 9, 1962	March 9, 1962	DR-124-NJ	Severe Storm, High Tides & Flooding
June 18, 1968	June 18, 1968	DR-245-NJ	Heavy Rains & Flooding
September 4, 1971	September 4, 1971	DR-310-NJ	Heavy Rains & Flooding
July 23, 1975	July 23, 1975	DR-477-NJ	Heavy Rains, High Winds, Hail & Tornadoes
March 28-April 8, 1984	April 12, 1984	DR-701-NJ	Coastal Storms & Flooding
September 16-18, 1999	September 17, 1999 September 18, 1999	EM-3148-NJ DR-1295-NJ	Hurricane Floyd
August 26 – September 5, 2011	August 27, 2011 August 31, 2011	EM-3332-NJ DR-4021-NJ	Hurricane Irene
October 26-November 8, 2012	October 28, 2012 October 30,2012	EM-3354-NJ DR-4086-NJ	Hurricane Sandy
September 1-3, 2021	September 2, 2021 September 5, 2021	EM-3573-NJ DR-4614-NJ	Remnants of Hurricane Ida

Source: FEMA 2024

Table 9-4. Flood Events in Passaic County (August 2019 to December 2023)

Event Date	FEMA Declaration Number	Passaic County Included in Declaration?	Location Impacted	Description
August 7, 2019	N/A	N/A	Little Falls	Showers and thunderstorms across northeast New Jersey resulted in flash flood. Observers reported 2.76 inches of rain near Little Falls, 3.21 inches of rain near Livingston Township, and 3.05 inches in Cedar Grove.
July 6, 2020	N/A	N/A	Passaic	Showers and thunderstorms resulted in widespread rainfall of 0.5 to 2 inches, with Teterboro Airport reporting 2.89 inches. Much of this rain fell over 1 to 2 hours, resulting in flash flooding.
July 10, 2020	N/A	N/A	Athenia (Clifton)	Tropical Storm Fay resulted in numerous reports of flash flooding. Rainfall totals ranged from 1 to 3 inches across northeast New Jersey, with Caldwell, NJ reporting 2.75 inches, Newark Airport reporting 2.68 inches, and Teterboro Airport reporting 2.62 inches.
July 8, 2021	N/A	N/A	Hawthorne, Pompton Junction (Pompton Lakes)	Flash flooding occurred across portions of the area due to Tropical Storm Elsa. Rainfall amounts ranged from 1.5 to 4 inches, with Teterboro Airport reporting 2.37 inches.
July 12, 2021	N/A	N/A	Skyline Lake (Ringwood)	Storms following a week of wet conditions resulted in isolated flash flooding across Passaic County. Charlotteburg measured 3.96 inches of rain.

Event Date	FEMA Declaration Number	Passaic County Included in Declaration?	Location Impacted	Description
July 29, 2021	N/A	N/A	Allwood (Clifton)	Scattered showers and thunderstorms resulted in flash flooding in Essex, Passaic, and Bergen Counties. A localized area of 1 to 3 inches of rain occurred along the border of Passaic and Essex Counties, with reports of 1.69 inches outside of Little Falls Township.
August 21-22, 2021	N/A	N/A	Passaic Park, Hawthorne, West Milford, Wanaque	Preceding thunderstorms and rainfall from Hurricane Henri resulted in flash flooding. Rainfall totals amounted to 3 to 7 inches in many locations over 24 to 36 hours.
August 27, 2021	N/A	N/A	Passaic	Scattered thunderstorms and wet antecedent conditions associated with Tropical Storm Henri resulted in isolated flash flooding in northeast New Jersey.
September 1-2, 2021	N/A	N/A	Great Notch (Little Falls), Totowa, Haledon, South Paterson, Clifton, Passaic	Extremely heavy rainfall associated with Hurricane Ida overspread northeast New Jersey. Rainfall totals ranged from 5 to 8 inches, much of it in just a few hours. This resulted in widespread flash flooding leading to numerous road closures and water rescues in addition to extensive river flooding. Eight people died as a result of the flash flooding.
October 26, 2021	N/A	N/A	Clifton	Thunderstorms dropped 1 to 3 of rain over a several hour period. Moderate to heavy rain persisted through the morning, with total rainfall amounts of 2 to 4 inches.
May 28, 2022	N/A	N/A	Allwood (Clifton)	Several rounds of rainfall with 0.75 to 1 inch of rain in an hour caused brief localized flash flooding. Total rainfall amounts in Northeast new Jersey were 1.5 to 3 inches.
July 18, 2022	N/A	N/A	Passaic	Thunderstorms produced a widespread 1 to 3 inches of rainfall with localized spots up to 4 inches.
June 25, 2023	N/A	N/A	Totowa	Slow moving thunderstorms with heavy rainfall over Northeast New jersey resulted in 1 to 2 inches of rainfall. Rain fell quickly, resulting in localized flash flooding.
December 18, 2023	N/A	N/A	Prospect Park, Haledon, Great Notch (Little Falls), Totowa	Heavy rainfall occurred over a 12–18-hour period. A widespread 2 to 5 inches of rain fell over the area. This resulted in many areas of flash flooding as well as significant rises in rivers.

Source: FEMA 2024, NOAA NCEI 2024

9.1.5 Probability of Future Occurrences

Probability Based on Previous Occurrences

Information on previous flood occurrences in the County was used to calculate the probability of future occurrence of such events, as summarized in Table 9-5. Based on historical records and input from the Steering Committee, the probability of occurrence for flood events in the County is considered “occasional.”

Table 9-5. Probability of Future Flood Events in Passaic County

Hazard Type	Number of Occurrences Between 1996 and 2023	Percent Chance of Occurring in Any Given Year
Coastal Flood[a]	5	18%
Flash Flood[a]	126	100%
Flood[a]	44	100%
Storm Surge	0	0%
Total	**175**	**100%**

Source: NOAA NCEI 2024

a. *The NCEI database categorizes flood events into types that do not correspond to the flood types outlined in this profile. Coastal flood, flash flood, and flood events likely represent other types of flooding discussed in this profile, such as riverine flooding and stormwater/urban flooding.*

Effect of Climate Change on Future Probability

A warmer atmosphere means storms have the potential to be more intense and occur more often. In New Jersey, extreme storms typically include coastal nor'easters, snowstorms, spring and summer thunderstorms, tropical storms, and on rare occasions hurricanes. Most of these events occur in the warmer months between April and October, with nor'easters occurring between September and April. The State will experience more intense rain events, less snow, and more rainfall. The State could also experience an increase in the number of flood events (NJDEP 2020).

Projections of climate change for New Jersey predict more intense rainfall events and increases in total annual precipitation (see Section 3.4.4). By 2050, annual precipitation in New Jersey could increase by 4 to 11 percent (NJDEP 2020). By the end of this century, heavy precipitation events are projected to occur two to five times more often and with more intensity than in the last century.

9.1.6 Cascading Impacts on Other Hazards

Flooding can elevate the risk of dam failures if water levels exceed a dam's storage capacity or floodwaters damage equipment. Flooding can increase the likelihood of a landslide occurring if the water destabilizes slopes. More intense flood events may also amplify potential debris flows or associated damage from landslides.

Depending on a flood's severity and the substances in its path, floodwaters can be contaminated by pollutants such as sewage, human and animal feces, pesticides, fertilizers, oil, asbestos, and rusting building materials. After flood events, excess moisture and standing water contribute to the growth of mold in buildings. Mold may present a health risk to building occupants, especially those with already compromised immune systems such as infants, children, the elderly and pregnant women. Common public health risks associated with flood events also include unsafe food, contaminated drinking or washing water, more disease-carrying organisms (i.e., mosquitos), carbon monoxide poisoning, and even mental stress and fatigue (CDC 2024).

Floods of any type have the potential to result in water and power utilities failures. Such failures may impact public and private use, as well as cause disruption to critical infrastructure. Oversaturated soils from periods of heavy rain and flooding may cause utility poles to tip over or fall completely, interrupting the power grid for a potentially large area, especially if the transformer is impacted.

9.2 VULNERABILITY AND IMPACT ASSESSMENT

The 1- and 0.2 percent annual chance flood events were examined to evaluate the county's risk from the flood hazard. Additionally, SLOSH Categories 1 through 4 were analyzed to evaluate the county's risk from storm surge. Data and methods used for the assessment are described in Chapter 4.

9.2.1 Life, Health, and Safety

Floodwaters can cause injuries, displace individuals, or necessitate the need for shelter. The degree of impact is influenced by the severity of the event and the adequacy of warning time provided to residents. Vulnerable populations are those living in or near areas that could be inundated by a flood event. People traveling in flooded areas or those whose access to emergency services is compromised are also considered to be vulnerable.

Overall Population

Riverine Flood

Table 9-6 summarizes the population exposed to the 1 percent- and 0.2 percent annual chance flood hazard by jurisdiction. There are an estimated 20,905 residents living in the 1 percent annual chance floodplain—4 percent of the County's total population. There are an estimated 32,037 residents living in the 0.2 percent annual chance floodplain, or 6.2 percent of the County's total population. The City of Paterson has the greatest number of residents living in the 1 percent annual chance flood hazard area with approximately 7,846 residents. The City of Paterson also has the highest number of residents living in the 0.2 percent annual chance flood area—an estimated 12,818 people.

The Hazus riverine model estimates the potential sheltering needs during a 1 percent annual chance flood event will include 18,109 persons displaced, and 2,482 people seeking short-term sheltering. These statistics, by jurisdiction, are presented in Table 9-7. The estimated displaced population and number of persons seeking short-term sheltering differs from the number of persons exposed to the 1 percent annual chance flood because the displaced population numbers take into consideration that not all residents will be significantly impacted enough to be displaced or to require short-term sheltering during a flood event.

The total number of injuries and casualties resulting from flooding is generally limited based on advance weather forecasting, blockades, and warnings. Therefore, injuries and deaths generally are not anticipated if proper warning and precautions are in place. Ongoing mitigation efforts should help to avoid the most likely cause of injury, which results from persons trying to cross flooded roadways or channels during a flood.

Storm Surge

Table 9-8 summarizes the population exposed to the SLOSH Category 4 hazard area by jurisdiction. Only two jurisdictions have residents in this hazard area. The City of Passaic has the highest percentage of its population in this category, with 0.8 percent, or 540 individuals. The City of Clifton follows with 0.1 percent, or 117 individuals. Overall, Passaic County has 657 residents, representing 0.1 percent of the total population, within the SLOSH Category 4 hazard area. There are no residents in the hazard areas SLOSH categories 1 through 3.

Table 9-6. Population Living in the 1 Percent and 0.2 Percent Flood Hazard Areas

Jurisdiction	Total Population	Population in the 1 Percent Annual Chance Flood Hazard Area		Population in the 0.2 Percent Annual Chance Flood Hazard Area	
		Number of People	Percent Total	Number of People	Percent Total
Bloomingdale (B)	7,726	222	2.9%	323	4.2%
Clifton (C)	89,451	117	0.1%	542	0.6%
Haledon (B)	8,945	0	0.0%	144	1.6%
Hawthorne (B)	19,456	156	0.8%	248	1.3%
Little Falls (T)	14,229	3,036	21.3%	3,744	26.3%
North Haledon (B)	8,801	74	0.8%	115	1.3%
Passaic (C)	70,048	599	0.9%	1,943	2.8%
Paterson (C)	157,864	7,846	5.0%	12,818	8.1%
Pompton Lakes (B)	11,052	2,703	24.5%	3,570	32.3%
Prospect Park (B)	6,299	7	0.1%	105	1.7%
Ringwood (B)	11,692	61	0.5%	90	0.8%
Totowa (B)	10,975	1,099	10.0%	1,512	13.8%
Wanaque (B)	11,217	249	2.2%	322	2.9%
Wayne (T)	54,143	3,018	5.6%	3,546	6.5%
West Milford (T)	24,797	284	1.1%	670	2.7%
Woodland Park (B)	13,291	1,434	10.8%	2,345	17.6%
Passaic County (Total)	519,986	20,905	4.0%	32,037	6.2%

Source: NJOIT 2024; FEMA 2020; Microsoft 2019; US Census Bureau 2022

Table 9-7. Displaced or Persons Seeking Short-Term Sheltering, 1 Percent Annual Chance Flood

Jurisdiction	Total Population	1% Annual Chance Flood Impacts on People	
		Displaced Population	Persons Seeking Short-Term Sheltering
Bloomingdale (B)	7,726	443	48
Clifton (C)	89,451	292	107
Haledon (B)	8,945	146	72
Hawthorne (B)	19,456	259	31
Little Falls (T)	14,229	1,787	50
North Haledon (B)	8,801	126	26
Passaic (C)	70,048	1,548	554
Paterson (C)	157,864	4,715	932
Pompton Lakes (B)	11,052	2,499	111
Prospect Park (B)	6,299	29	7
Ringwood (B)	11,692	196	14
Totowa (B)	10,975	1,233	37
Wanaque (B)	11,217	374	108
Wayne (T)	54,143	2,819	228
West Milford (T)	24,797	442	82
Woodland Park (B)	13,291	1,201	75
Passaic County (Total)	519,986	18,109	2,482

Source: Hazus v6.1; (US Census Bureau 2022); FEMA 2024

Table 9-8. Population Living in the SLOSH Category 4 Hazard Area

Jurisdiction	Total Population	Population in the SLOSH Category 4 Hazard Area	
		Number of Persons	% of Jurisdiction Total
Bloomingdale (B)	7,726	0	0.0%
Clifton (C)	89,451	117	0.1%
Haledon (B)	8,945	0	0.0%
Hawthorne (B)	19,456	0	0.0%
Little Falls (T)	14,229	0	0.0%
North Haledon (B)	8,801	0	0.0%
Passaic (C)	70,048	540	0.8%
Paterson (C)	157,864	0	0.0%
Pompton Lakes (B)	11,052	0	0.0%
Prospect Park (B)	6,299	0	0.0%
Ringwood (B)	11,692	0	0.0%
Totowa (B)	10,975	0	0.0%
Wanaque (B)	11,217	0	0.0%
Wayne (T)	54,143	0	0.0%
West Milford (T)	24,797	0	0.0%
Woodland Park (B)	13,291	0	0.0%
Passaic County (Total)	519,986	657	0.1%

Source: U.S Census Bureau 2022; NJOIT, Microsoft 2019, NOAA 2022

Socially Vulnerable Population

Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on the net economic impact to their family. The population over the age of 65 is more vulnerable because they are more likely to need medical attention which may not be available due to isolation during a flood event, and they may have more difficulty evacuating. Special consideration should be taken when planning for disaster preparation, response, and recovery for these vulnerable groups.

Riverine Flood

Table 9-9 and Table 9-10 presents the estimated socially vulnerable populations living in the 1 and 0.2 percent annual chance flood hazard areas. There are 3,192 persons over the age of 65 years, 1,258 persons under the age of 5 years, 2,341 non-English speakers, 1,700 persons with a disability, and 2,638 living in poverty located in the 1 percent annual chance flood hazard area. There are 4,757 persons over the age of 65 years, 2,013 persons under the age of 5 years, 3,984 non-English speakers, 2,632 persons with a disability, and 4,415 living in poverty located in the 0.2 percent annual chance flood hazard area.

Storm Surge

Table 9-11 presents the estimated socially vulnerable populations in the SLOSH Category 4 hazard area. The City of Passaic has 48 persons over the age of 65, 44 persons under the age of 5 years, 121 non-English speakers, 42 persons with a disability, and 117 persons living in poverty within the SLOSH Category 4 hazard area. The City of Clifton has 20 persons over the age of 65, 6 persons under the age of 5 years, 13 non-English speakers, 13 persons with a disability, and 8 persons living in poverty within the SLOSH Category 4 hazard area. There are no residents in the hazard areas for SLOSH Categories 1 through 3.

Table 9-9. Vulnerable Persons Living in the 1 Percent Annual Chance Flood Hazard

Jurisdiction	Estimated Number of Vulnerable Persons Located in the 1 Percent Annual Chance Flood Hazard Area									
	Persons Over 65	% of Total	Persons Under 5	% of Total	Non-English Speaking Persons	% of Total	Persons with a Disability	% of Total	Persons in Poverty	% of Total
Bloomingdale (B)	32	2.8%	7	2.8%	3	2.9%	16	2.7%	20	2.9%
Clifton (C)	20	0.1%	6	0.1%	13	0.1%	13	0.1%	8	0.1%
Haledon (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Hawthorne (B)	32	0.8%	6	0.8%	7	0.8%	14	0.8%	7	0.7%
Little Falls (T)	467	21.3%	100	21.3%	128	21.3%	229	21.3%	98	21.3%
North Haledon (B)	18	0.8%	4	0.8%	1	0.5%	6	0.8%	2	0.7%
Passaic (C)	53	0.8%	49	0.8%	134	0.9%	46	0.8%	130	0.9%
Paterson (C)	901	5.0%	618	5.0%	1,733	5.0%	633	5.0%	1,846	5.0%
Pompton Lakes (B)	433	24.4%	138	24.4%	55	24.1%	195	24.4%	234	24.4%
Prospect Park (B)	0	0.0%	0	0.0%	0	0.0%	1	0.1%	1	0.1%
Ringwood (B)	10	0.5%	2	0.4%	0	0.0%	4	0.4%	1	0.4%
Totowa (B)	213	10.0%	40	9.8%	34	9.9%	130	10.0%	42	10.0%
Wanaque (B)	55	2.2%	10	2.2%	6	2.0%	33	2.2%	15	2.2%
Wayne (T)	605	5.6%	159	5.6%	111	5.5%	242	5.6%	79	5.5%
West Milford (T)	53	1.1%	18	1.1%	3	1.1%	22	1.1%	8	1.1%
Woodland Park (B)	300	10.8%	101	10.8%	113	10.7%	116	10.7%	147	10.7%
Passaic County (Total)	3,192	4.1%	1,258	3.8%	2,341	3.4%	1,700	3.6%	2,638	3.8%

Source: (US Census Bureau 2022); (NJOIT 2024); (FEMA 2020); Microsoft 2019; Means 2024

Table 9-10. Vulnerable Persons Living in the 0.2 Percent Annual Chance Flood Hazard Area

Jurisdiction	Estimated Number of Vulnerable Persons Located in the 0.2 Percent Annual Chance Flood Hazard Area									
	Persons Over 65	% of Total	Persons Under 5	% of Total	Non-English Speaking Persons	% of Total	Persons with a Disability	% of Total	Persons in Poverty	% of Total
Bloomingdale (B)	47	4.1%	10	4.0%	4	3.8%	24	4.1%	29	4.2%
Clifton (C)	95	0.6%	29	0.6%	64	0.6%	62	0.6%	39	0.6%
Haledon (B)	23	1.6%	8	1.4%	15	1.6%	16	1.6%	12	1.6%
Hawthorne (B)	51	1.3%	9	1.2%	11	1.2%	23	1.3%	12	1.3%
Little Falls (T)	576	26.3%	123	26.2%	158	26.3%	282	26.3%	121	26.2%
North Haledon (B)	28	1.3%	6	1.2%	2	1.0%	10	1.3%	4	1.3%
Passaic (C)	174	2.8%	160	2.8%	435	2.8%	152	2.8%	423	2.8%
Paterson (C)	1,473	8.1%	1,010	8.1%	2,832	8.1%	1,035	8.1%	3,015	8.1%
Pompton Lakes (B)	572	32.3%	182	32.2%	73	32.0%	258	32.3%	310	32.3%
Prospect Park (B)	10	1.6%	8	1.5%	11	1.5%	15	1.7%	18	1.7%
Ringwood (B)	15	0.8%	3	0.6%	0	0.0%	7	0.7%	2	0.8%
Totowa (B)	292	13.7%	56	13.8%	47	13.7%	179	13.7%	57	13.6%
Wanaque (B)	72	2.9%	13	2.8%	8	2.7%	42	2.8%	19	2.7%
Wayne (T)	711	6.5%	187	6.5%	131	6.5%	284	6.5%	93	6.5%
West Milford (T)	126	2.7%	44	2.7%	7	2.7%	53	2.7%	20	2.7%
Woodland Park (B)	492	17.6%	165	17.6%	186	17.6%	190	17.6%	241	17.6%
Passaic County (Total)	4,757	6.1%	2,013	6.0%	3,984	5.8%	2,632	5.6%	4,415	6.4%

Source: U.S. Census Bureau 2022; NJOIT; Microsoft 2019; FEMA 2020

Table 9-11. Vulnerable Persons Living in the SLOSH Category 4 Hazard Area

Jurisdiction	Estimated Number of Vulnerable Persons Located in the SLOSH Category 4 Hazard Area									
	Persons Over 65	% of Total	Persons Under 5	% of Total	Non-English Speaking Persons	% of Total	Persons with a Disability	% of Total	Persons in Poverty	% of Total
Bloomingdale (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Clifton (C)	20	0.1%	6	0.1%	13	0.1%	13	0.1%	8	0.1%
Haledon (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Hawthorne (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Little Falls (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
North Haledon (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Passaic (C)	48	0.8%	44	0.8%	121	0.8%	42	0.8%	117	0.8%
Paterson (C)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pompton Lakes (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Prospect Park (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Ringwood (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Totowa (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Wanaque (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Wayne (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
West Milford (T)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Woodland Park (B)	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Passaic County (Total)	68	0.1%	50	0.1%	134	0.2%	55	0.1%	125	0.2%

Source: U.S. Census Bureau 2022; NJOIT; Microsoft 2019; NOAA 2022

9.2.2 General Building Stock

Riverine Flooding

Table 9-12 summarizes buildings in the riverine flood hazard areas by jurisdiction. There are 4,713 buildings in the 1 percent annual chance flood hazard area, with an estimated $5 billion of building and contents replacement cost value (RCV). This represents 4.6 percent of the County's total general building stock inventory. There are 6,984 buildings in the 0.2 percent annual chance flood hazard area, with an estimated $9 billion of building and contents RCF. This represents 6.8 percent of the County's total general building stock inventory.

Table 9-13 list the buildings by general occupancy within the 1 or 0.2 percent annual chance flood hazard areas. For the 1 percent annual chance flood hazard area, the Township of Wayne (783) has the highest number of residential buildings (783) at risk, followed by the Borough of Pompton Lakes (705). The Township of Wayne also has the highest in commercial buildings (340) at risk. The City of Paterson leads in industrial buildings (23) and in government, religion, agricultural, and education buildings (12) at risk of the 1 percent annual chance flood event.

For the 0.2 percent annual chance flood hazard area, the City of Paterson has the highest number of residential buildings (1,075) at risk, followed by the Borough of Pompton Lakes (931). The Township of Wayne has the highest number of commercial buildings (453) at risk. While the City of Paterson leads in industrial buildings (37), and government, religion, agricultural, and education buildings (20) at risk of the 0.2 percent annual chance flood event.

The Hazus flood model estimated potential damage associated with the 1 percent annual chance flood to the buildings in Passaic County, using the custom structure inventory developed for this HMP and the depth grid generated using the effective 2020 DFIRM data. Table 9-14 lists the estimated losses by jurisdiction and occupancy class. The potential damage estimated by Hazus to the general building stock inventory associated with the 1 percent annual chance flood is $639.8 million or 0.7 percent of the total building RCV. The Township of Wayne has the greatest estimated building loss—$183.3 million (1.2 percent of the total RCV).

Storm Surge

Table 9-15 provides an overview of the number and RCV of buildings located in the SLOSH Category 4 hazard area across jurisdictions in the County. The City of Clifton is the only jurisdiction with a building in this hazard area, accounting for less than 0.1 percent of the jurisdictional total, with an RCV of an estimated $2.7 million. For SLOSH Categories 1 through 3, there are no buildings in these hazard areas. Table 9-16 indicates that the City of Clifton has one commercial building in this hazard area. All other jurisdictions have no buildings in the SLOSH Category 4 hazard area. There are no buildings in the hazard areas for SLOSH Categories 1 through 3.

Table 9-12. General Building Stock Located in the 1 Percent and 0.2 Percent Annual Chance Flood Hazard Areas

Jurisdiction	Jurisdiction Total Buildings		1 Percent Annual Chance Flood Event Hazard Area				0.2 Percent Annual Chance Flood Event Hazard Area			
			Number of Buildings		Replacement Cost Value		Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Bloomingdale (B)	2,406	$1,358,262,927	87	3.6%	$40,421,669	3.0%	126	5.2%	$69,245,127	5.1%
Clifton (C)	20,935	$15,833,226,790	43	0.2%	$95,757,538	0.6%	181	0.9%	$442,003,408	2.8%
Haledon (B)	1,898	$1,277,354,659	1	0.1%	$254,639	<0.1%	46	2.4%	$97,697,355	7.6%
Hawthorne (B)	6,079	$3,946,342,797	92	1.5%	$139,744,344	3.5%	167	2.7%	$466,373,959	11.8%
Little Falls (T)	2,915	$3,414,669,325	634	21.7%	$522,048,863	15.3%	800	27.4%	$678,586,454	19.9%
North Haledon (B)	2,952	$2,161,286,853	28	0.9%	$14,033,783	0.6%	45	1.5%	$25,317,681	1.2%
Passaic (C)	5,784	$11,383,166,371	78	1.3%	$523,024,440	4.6%	209	3.6%	$1,033,017,412	9.1%
Paterson (C)	16,686	$18,630,913,440	849	5.1%	$1,092,447,290	5.9%	1,378	8.3%	$1,793,170,877	9.6%
Pompton Lakes (B)	3,271	$1,954,260,257	774	23.7%	$315,930,946	16.2%	1,029	31.5%	$462,996,897	23.7%
Prospect Park (B)	1,016	$492,237,246	1	0.1%	$2,785,797	0.6%	20	2.0%	$9,953,005	2.0%
Ringwood (B)	4,369	$2,697,179,876	31	0.7%	$19,374,004	0.7%	46	1.1%	$28,439,179	1.1%
Totowa (B)	3,765	$5,499,989,017	379	10.1%	$178,767,818	3.3%	541	14.4%	$1,038,319,961	18.9%
Wanaque (B)	3,183	$2,352,891,840	67	2.1%	$36,315,755	1.5%	92	2.9%	$68,477,158	2.9%
Wayne (T)	15,577	$15,872,014,112	1,146	7.4%	$1,314,912,010	8.3%	1,416	9.1%	$2,287,269,486	14.4%
West Milford (T)	9,452	$5,622,763,478	119	1.3%	$53,351,121	0.9%	267	2.8%	$117,546,454	2.1%
Woodland Park (B)	2,965	$3,101,377,870	384	13.0%	$744,184,835	24.0%	621	20.9%	$908,684,120	29.3%
Passaic County (Total)	103,253	$95,597,936,857	4,713	4.6%	$5,093,354,852	5.3%	6,984	6.8%	$9,527,098,533	10.0%

Source: (NJOIT 2024); Microsoft 2019, RS Means 2024; (FEMA 2020)

Table 9-13. Buildings in the 1 Percent and 0.2 Percent Annual Chance Flood Hazard Areas, by General Occupancy Class

Jurisdiction	1 Percent Annual Chance Flood Event Hazard Area				0.2 Percent Annual Chance Flood Event Hazard Area			
	Residential	Commercial	Industrial	Other[a]	Residential	Commercial	Industrial	Other[a]
Bloomingdale (B)	60	26	0	1	87	38	0	1
Clifton (C)	24	18	1	0	111	61	9	0
Haledon (B)	0	1	0	0	25	19	2	0
Hawthorne (B)	41	49	2	0	65	89	12	1
Little Falls (T)	515	98	18	3	635	143	19	3
North Haledon (B)	22	6	0	0	34	11	0	0
Passaic (C)	41	28	5	4	133	61	9	6
Paterson (C)	658	156	23	12	1,075	246	37	20
Pompton Lakes (B)	705	59	10	0	931	86	10	2
Prospect Park (B)	1	0	0	0	15	5	0	0
Ringwood (B)	21	8	1	1	31	13	1	1
Totowa (B)	317	57	4	1	436	87	16	2
Wanaque (B)	61	6	0	0	79	13	0	0
Wayne (T)	783	340	16	7	920	453	29	14
West Milford (T)	93	24	1	1	219	43	1	4
Woodland Park (B)	277	97	10	0	453	157	10	1
Passaic County (Total)	3,619	973	91	30	5,249	1,525	155	55

Source: Microsoft 2019; (NJOIT 2024); (FEMA 2020)

a. Other = Government, Religion, Agricultural, and Education

Table 9-14. Estimated General Building Stock Potential Loss to the 1 Percent Chance Flood Event

Jurisdiction	Total Replacement Cost Value	1 Percent Annual Chance Flood Event Impact on Buildings				
		Estimated Loss for All Occupancies	Percent of Total	Estimated Loss for Residential Properties	Estimated Loss for Commercial Properties	Estimated Loss for All Other Occupancies[a]
Bloomingdale (B)	$1,358,262,927	$16,340,739	1.2%	$14,905,434	$1,435,305	$0
Clifton (C)	$15,833,226,790	$6,121,990	<0.1%	$139,398	$5,974,693	$7,899
Haledon (B)	$1,277,354,659	$9,735,286	0.8%	$0	$371,629	$9,363,658
Hawthorne (B)	$3,946,342,797	$13,387,694	0.3%	$878,621	$9,769,658	$2,739,415
Little Falls (T)	$3,414,669,325	$53,304,437	1.6%	$29,109,776	$15,996,110	$8,198,551
North Haledon (B)	$2,161,286,853	$1,017,853	<0.1%	$706,884	$310,969	$0
Passaic (C)	$11,383,166,371	$55,144,312	0.5%	$3,888,040	$17,097,857	$34,158,415
Paterson (C)	$18,630,913,440	$157,807,703	0.8%	$17,308,941	$64,852,196	$75,646,567
Pompton Lakes (B)	$1,954,260,257	$43,402,273	2.2%	$33,448,677	$4,620,166	$5,333,429
Prospect Park (B)	$492,237,246	$1,612	<0.1%	$1,612	$0	$0
Ringwood (B)	$2,697,179,876	$6,636,911	0.2%	$5,782,069	$854,842	$0
Totowa (B)	$5,499,989,017	$23,130,039	0.4%	$10,690,458	$8,676,863	$3,762,718
Wanaque (B)	$2,352,891,840	$440,221	<0.1%	$170,344	$269,877	$0
Wayne (T)	$15,872,014,112	$183,331,263	1.2%	$58,740,041	$96,355,501	$28,235,721
West Milford (T)	$5,622,763,478	$18,492,781	0.3%	$15,615,573	$2,370,834	$506,374
Woodland Park (B)	$3,101,377,870	$51,461,817	1.7%	$10,975,638	$36,859,258	$3,626,921
Passaic County (Total)	$95,597,936,857	$639,756,932	0.7%	$202,361,506	$265,815,757	$171,579,668

Source: Hazus v6.1; Microsoft 2019; RS Means 2024; FEMA 2024; (NJOIT 2024)

a. Other = Industrial, Government, Religion, Agricultural, and Education

Table 9-15. Buildings in the SLOSH Category 4 Hazard Area

Jurisdiction	Jurisdiction Total Buildings		Buildings in the SLOSH Category 4 Hazard Area			
			Number of Buildings		Replacement Cost Value	
	Count	Replacement Cost Value	Count	% of Jurisdiction Total	Value	% of Jurisdiction Total
Bloomingdale (B)	2,406	$1,358,262,927	0	0.0%	$0	0.0%
Clifton (C)	20,935	$15,833,226,790	1	<0.1%	$2,692,183	<0.1%
Haledon (B)	1,898	$1,277,354,659	0	0.0%	$0	0.0%
Hawthorne (B)	6,079	$3,946,342,797	0	0.0%	$0	0.0%
Little Falls (T)	2,915	$3,414,669,325	0	0.0%	$0	0.0%
North Haledon (B)	2,952	$2,161,286,853	0	0.0%	$0	0.0%
Passaic (C)	5,784	$11,383,166,371	0	0.0%	$0	0.0%
Paterson (C)	16,686	$18,630,913,440	0	0.0%	$0	0.0%
Pompton Lakes (B)	3,271	$1,954,260,257	0	0.0%	$0	0.0%
Prospect Park (B)	1,016	$492,237,246	0	0.0%	$0	0.0%
Ringwood (B)	4,369	$2,697,179,876	0	0.0%	$0	0.0%
Totowa (B)	3,765	$5,499,989,017	0	0.0%	$0	0.0%
Wanaque (B)	3,183	$2,352,891,840	0	0.0%	$0	0.0%
Wayne (T)	15,577	$15,872,014,112	0	0.0%	$0	0.0%
West Milford (T)	9,452	$5,622,763,478	0	0.0%	$0	0.0%
Woodland Park (B)	2,965	$3,101,377,870	0	0.0%	$0	0.0%
Passaic County (Total)	103,253	$95,597,936,857	1	<0.1%	$2,692,183	<0.1%

Source: NJOIT, Microsoft 2019, RS Means 2024, NOAA 2022

Table 9-16. Buildings in the SLOSH Category 4 Hazard Area by General Occupancy Class

Jurisdiction	Buildings in the SLOSH Category 4 Hazard Area by General Occupancy Class			
	Residential	Commercial	Industrial	Other[a]
Bloomingdale (B)	0	0	0	0
Clifton (C)	0	1	0	0
Haledon (B)	0	0	0	0
Hawthorne (B)	0	0	0	0
Little Falls (T)	0	0	0	0
North Haledon (B)	0	0	0	0
Passaic (C)	0	0	0	0
Paterson (C)	0	0	0	0
Pompton Lakes (B)	0	0	0	0
Prospect Park (B)	0	0	0	0
Ringwood (B)	0	0	0	0
Totowa (B)	0	0	0	0
Wanaque (B)	0	0	0	0
Wayne (T)	0	0	0	0
West Milford (T)	0	0	0	0
Woodland Park (B)	0	0	0	0
Passaic County (Total)	0	1	0	0

Source: NJOIT, Microsoft 2019, NOAA 2022

a. Other = Government, Religion, Agricultural, and Education

NFIP Statistics

Participating in the NFIP is voluntary. Communities that choose to participate agree to adopt and implement local floodplain management regulations that protect lives and reduce risk from future flooding. In return, the federal government makes flood insurance available to property owners throughout the community. To join, a community must complete an application; adopt a resolution of intent to participate and cooperate with FEMA; and adopt and submit a floodplain management ordinance that meets or exceeds the minimum NFIP criteria. The ordinance must adopt any FEMA-approved flood mapping for the community (FEMA 2020, FEMA 2022).

To inform this risk assessment, FEMA provided a list of residential properties with NFIP policies, past claims, and multiple claims (repetitive loss [RL] properties). Properties with multiple claims are defined as repetitive loss (RL) properties or severe repetitive loss (SRL) properties, based on definitions from two FEMA programs as follows:

- The NFIP defines RL properties as structures that meet either of the following qualifiers:
  - Two or more claims of more than $1,000 paid by NFIP within any rolling 10-year period since 1978
  - Two or more claims (building payments only) that, on average, equal or exceed 25 percent of the current value of the property
- FEMA's Flood Mitigation Assistance (FMA) grant program defines RL properties as structures covered by a contract for flood insurance made available under the NFIP that meet both of the following qualifiers:

  - Has incurred flood-related damage on two occasions, in which the cost of the repair, on average, equaled or exceeded 25 percent of the market value of the structure at the time of each flood event
  - At the time of the second incidence of flood-related damage, the contract for flood insurance contained increased cost of compliance coverage.
- The NFIP defines SRL properties as residential properties covered under an NFIP flood insurance policy that satisfy the third condition below and either of the first two:
  - Four or more separate claim payments for the property (including building and contents) over $5,000 each have occurred, and the cumulative amount of such claims payments exceeded $20,000.
  - At least two separate claims payments for the property (building payments only) have occurred, and the cumulative amount of the building portion of such claims exceeded the current value of the property.
  - For either of the above, at least two of the referenced claims must have occurred within any 10-year- period and must have occurred more than 10 days apart.
- The FMA defines  properties as structures covered by a contract for flood insurance that meet one of two qualifiers:
  - Four or separate claims payments (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 claims payments exceeding $20,000.
  - At least two separate claim payments (includes only building) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structured.

Table 9-17 summarizes NFIP claims, payments, and repetitive loss statistics for Passaic County. Table 9-18 provides additional information about the RL and SRL properties in Passaic County. Locations of the properties with policies, claims, and RL and SRL flooding were geocoded by FEMA with the understanding that differences (and variations in those differences) are possible between listed coordinates of properties and actual locations of property addresses—i.e., the indicators of some locations are more accurate than others.

Table 9-17. NFIP Claims, Payments, and Repetitive Loss Statistics for Passaic County

Jurisdiction	Total Claims	Total Payments	Number of NFIP RL Properties	Number of FMA RL Properties	Number of NFIP SRL Properties	Number of FMA SRL Properties
Bloomingdale (B)	38	$414,533	13	0	0	0
Clifton (C)	45	$2,964,266	11	0	2	3
Haledon (B)	2	$7,119	1	0	0	0
Hawthorne (B)	140	$4,151,227	14	0	6	8
Little Falls (T)	1,408	$35,368,159	144	4	85	148
North Haledon (B)	0	$0	0	0	0	0
Passaic (C)	38	$13,324,407	7	0	3	3
Paterson (C)	682	$32,173,512	149	0	48	48
Pompton Lakes (B)	1,913	$49,258,456	147	3	110	168
Prospect Park (B)	0	$0	0	0	0	0
Ringwood (B)	3	$30,759	1	0	0	0
Totowa (B)	261	$6,026,201	40	1	9	9
Wanaque (B)	25	$363,762	7	0	1	1
Wayne (T)	4,536	$113,266,831	246	8	227	446
West Milford (T)	62	$1,297,068	10	3	3	3
Woodland Park (B)	385	$8,568,897	94	1	16	16
Passaic County (Total)	9,538	$267,215,197	884	20	510	853

Source: (NJOEM 2024)

Table 9-18. Summary of Repetitive Loss Properties by Jurisdiction

Jurisdiction	Repetitive Loss Properties					Severe Repetitive Loss Properties				
	Single Family	2-4 Family	Business	Other Residential	Other Non-Residential	Single Family	2-4 Family	Business	Other Residential	Other Non-Residential
Bloomingdale (B)	7	4	0	0	1	0	0	0	0	0
Clifton (C)	6	3	1	0	1	1	0	2	0	2
Haledon (B)	0	1	0	0	0	0	0	0	0	0
Hawthorne (B)	1	5	0	0	8	0	2	2	0	9
Little Falls (T)	130	5	5	0	3	195	6	2	0	4
North Haledon (B)	0	0	0	0	0	0	0	0	0	0
Passaic (C)	3	0	1	0	2	0	0	4	0	2
Paterson (C)	73	57	3	1	13	22	40	10	4	10
Pompton Lakes (B)	145	1	1	1	1	258	6	2	0	0
Prospect Park (B)	0	0	0	0	0	0	0	0	0	0
Ringwood (B)	1	0	0	0	0	0	0	0	0	0
Totowa (B)	32	8	1	0	0	14	2	0	0	2
Wanaque (B)	7	0	0	0	0	0	2	0	0	0
Wayne (T)	223	7	4	0	16	583	16	14	0	20
West Milford (T)	12	0	0	0	1	6	0	0	0	0
Woodland Park (B)	57	20	11	0	7	20	8	2	0	2
Passaic County (Total)	697	111	27	2	53	1,099	82	38	4	51

Source: (NJOEM 2024)

9.2.3 Community Lifelines and Other Critical Facilities

Critical services during and after a flood event may not be available if critical facilities are directly damaged or transportation routes to access these critical facilities are impacted. Roads that are blocked or damaged can isolate residents and can prevent access throughout the planning area to many service providers needing to get to vulnerable populations or to make repairs. Utilities such as overhead power, cable, and phone lines could also be vulnerable due to utility poles damaged by standing water or the surge of water from a flood event. Loss of these utilities could create additional isolation issues.

Table 9-19 and Table 9-20 summarize the number of community lifelines exposed to the 1 percent and 0.2 percent flood hazard areas by jurisdiction. Table 9-21 through Table 9-24 list the distribution and risk levels of community lifelines in the four SLOSH category hazard areas.

Most of the 174 community lifelines in the 1 percent annual chance flood hazard area are transportation facilities (101). Similarly, most of the 232 community lifelines located in the 0.2 percent annual chance flood hazard area are transportation facilities (119).

Passaic County has one facility the in SLOSH Category 1 hazard area, representing 0.1 percent of the total. There are two facilities (0.2 percent) in the SLOSH Category 2 hazard area, three facilities (0.2 percent) in the SLOSH Category 3 hazard area, and eight facilities (0.6 percent) in the SLOSH Category 4 hazard area. The transportation lifeline has the highest number of facilities in all SLOSH Hazard categories: Category 1 (1), Category 2 (2), Category 3 (3) and Category 4 (8).

During a disaster event in which short-term functionality is impacted by flooding, facilities of neighboring municipalities may need to increase support response functions. Mitigation planning should consider means to reduce flood impacts on critical facilities and ensure sufficient emergency and school services remain when a significant event occurs.

9.2.4 Economy

Flood impacts on the local and regional economy include general building stock damage and associated tax loss, loss of use of utilities and infrastructure, agricultural losses, business interruption, and impacts on tourism. Renovations of commercial and industrial buildings may be necessary, disrupting associated services. Extensive flood damage to public utilities can cause disruptions to delivery of services. Loss of power and communications may occur, and drinking water and wastewater treatment facilities may be temporarily out of operation.

Debris management may also be a large expense after a flood event. Hazus estimates the amount of debris generated from the 1 percent annual chance event. The model breaks down debris into three categories based on the types of equipment needed to handle the debris: finishes (dry wall, insulation, etc.); structural (wood, brick, etc.); and foundations (concrete slab and block, rebar, etc.). The distinction is made because of the different types of equipment needed to handle the debris. Table 9-25 summarizes the debris estimates for riverine flooding in Passaic County. During a 1 percent annual chance event, an estimated 21,269 tons of debris will be generated in total.

Table 9-19. Number of Facilities in the 1 Percent Annual Chance Flood Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the 1 Percent Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Bloomingdale (B)	0	0	0	0	0	0	4	0	1	5	17.9%
Clifton (C)	0	0	0	0	1	0	6	1	0	8	4.8%
Haledon (B)	0	0	0	0	0	0	6	0	0	6	20.0%
Hawthorne (B)	0	0	0	0	0	2	7	8	0	17	21.8%
Little Falls (T)	0	0	0	0	1	0	1	1	1	4	8.5%
North Haledon (B)	0	0	0	0	0	1	1	0	0	2	6.5%
Passaic (C)	0	0	0	0	0	1	6	0	1	8	8.6%
Paterson (C)	0	1	2	1	0	2	17	0	4	27	9.4%
Pompton Lakes (B)	1	0	0	0	0	1	8	3	0	13	36.1%
Prospect Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Ringwood (B)	0	0	0	0	0	0	4	1	0	5	8.2%
Totowa (B)	0	0	0	0	2	1	3	3	1	10	13.7%
Wanaque (B)	0	0	0	0	0	3	4	4	0	11	22.0%
Wayne (T)	0	0	0	0	2	0	17	6	2	27	15.9%
West Milford (T)	0	0	0	0	0	2	13	0	0	15	13.2%
Woodland Park (B)	0	0	0	1	1	2	4	1	7	16	36.4%
Passaic County (Total)	1	1	2	2	7	15	101	28	17	174	13.1%

Source: (Passaic County 2020); (Passaic County Department of Planning & Economic Development 2024); (NJGIN 2017, 2021, 2022); (HIFLD 2017, 2018, 2022, 2023); (FEMA 2020); Passaic County 2024

Table 9-20. Number of Facilities in the 0.2 Percent Annual Chance Flood Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the 0.2 Percent Annual Chance Flood Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Bloomingdale (B)	0	0	0	0	0	0	4	0	1	5	17.9%
Clifton (C)	0	0	0	0	1	0	12	1	0	14	8.3%
Haledon (B)	0	0	0	0	0	0	7	0	0	7	23.3%
Hawthorne (B)	0	0	0	0	0	3	7	10	1	21	26.9%
Little Falls (T)	0	0	0	0	1	2	1	2	1	7	14.9%
North Haledon (B)	0	0	0	0	0	1	1	0	0	2	6.5%
Passaic (C)	0	0	0	0	0	1	10	0	2	13	14.0%
Paterson (C)	0	1	2	1	3	8	19	1	6	41	14.2%
Pompton Lakes (B)	1	0	0	0	0	2	8	3	0	14	38.9%
Prospect Park (B)	0	0	0	0	0	0	1	0	0	1	5.0%
Ringwood (B)	0	0	0	0	0	0	4	5	0	9	14.8%
Totowa (B)	0	1	0	2	3	2	3	5	2	18	24.7%
Wanaque (B)	0	0	0	0	0	3	4	4		11	22.0%
Wayne (T)	0	0	0	0	4	0	20	6	2	32	18.8%
West Milford (T)	0	0	0	0	0	2	14	2	0	18	15.8%
Woodland Park (B)	0	0	0	1	1	4	4	1	8	19	43.2%
Passaic County (Total)	1	2	2	4	13	28	119	40	23	232	17.4%

Source: (Passaic County 2020); (Passaic County Department of Planning & Economic Development 2024); (NJGIN 2017, 2021, 2022); (HIFLD 2017, 2018, 2022, 2023); (FEMA 2020); Passaic County 2024

Table 9-21. Number of Facilities in the SLOSH Category 1 Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the SLOSH Category 1 Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Bloomingdale (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Clifton (C)	0	0	0	0	0	0	1	0	0	1	0.6%
Haledon (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Hawthorne (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Little Falls (T)	0	0	0	0	0	0	0	0	0	0	0.0%
North Haledon (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Passaic (C)	0	0	0	0	0	0	0	0	0	0	0.0%
Paterson (C)	0	0	0	0	0	0	0	0	0	0	0.0%
Pompton Lakes (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Prospect Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Ringwood (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Totowa (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Wanaque (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Wayne (T)	0	0	0	0	0	0	0	0	0	0	0.0%
West Milford (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Woodland Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Passaic County (Total)	0	0	0	0	0	0	1	0	0	1	0.1%

Source: Passaic County 2020 HMP, Passaic County 2024, NJGIN 2017, 2021, 2022, HIFLD 2017, 2018, 2022, 2023, Passaic County Dept. of Planning & Economic Development 2024; NOAA 2022

Table 9-22. Number of Facilities in the SLOSH Category 2 Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the SLOSH Category 2 Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Bloomingdale (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Clifton (C)	0	0	0	0	0	0	1	0	0	1	0.6%
Haledon (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Hawthorne (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Little Falls (T)	0	0	0	0	0	0	0	0	0	0	0.0%
North Haledon (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Passaic (C)	0	0	0	0	0	0	1	0	0	1	1.1%
Paterson (C)	0	0	0	0	0	0	0	0	0	0	0.0%
Pompton Lakes (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Prospect Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Ringwood (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Totowa (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Wanaque (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Wayne (T)	0	0	0	0	0	0	0	0	0	0	0.0%
West Milford (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Woodland Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Passaic County (Total)	0	0	0	0	0	0	2	0	0	2	0.2%

Source: Passaic County 2020 HMP, Passaic County 2024, NJGIN 2017, 2021, 2022, HIFLD 2017, 2018, 2022, 2023, Passaic County Dept. of Planning & Economic Development 2024; NOAA 2022

Table 9-23. Number of Facilities in the SLOSH Category 3 Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the SLOSH Category 3 Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Bloomingdale (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Clifton (C)	0	0	0	0	0	0	1	0	0	1	0.6%
Haledon (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Hawthorne (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Little Falls (T)	0	0	0	0	0	0	0	0	0	0	0.0%
North Haledon (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Passaic (C)	0	0	0	0	0	0	2	0	0	2	2.2%
Paterson (C)	0	0	0	0	0	0	0	0	0	0	0.0%
Pompton Lakes (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Prospect Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Ringwood (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Totowa (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Wanaque (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Wayne (T)	0	0	0	0	0	0	0	0	0	0	0.0%
West Milford (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Woodland Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Passaic County (Total)	0	0	0	0	0	0	3	0	0	3	0.2%

Source: Passaic County 2020 HMP, Passaic County 2024, NJGIN 2017, 2021, 2022, HIFLD 2017, 2018, 2022, 2023, Passaic County Dept. of Planning & Economic Development 2024; NOAA 2022

Table 9-24. Number of Facilities in the SLOSH Category 4 Hazard Area, by Lifeline Category

Jurisdiction	Number of Facilities in the SLOSH Category 4 Hazard Area, by Lifeline Category									Total Facilities in Hazard Area	
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health & Medical	Safety & Security	Transportation	Water Systems	Other Critical Facilities	Count	% of Jurisdiction Total
Bloomingdale (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Clifton (C)	0	0	0	0	1	0	1	1	0	3	1.8%
Haledon (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Hawthorne (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Little Falls (T)	0	0	0	0	0	0	0	0	0	0	0.0%
North Haledon (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Passaic (C)	0	0	0	0	0	1	4	0	0	5	5.4%
Paterson (C)	0	0	0	0	0	0	0	0	0	0	0.0%
Pompton Lakes (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Prospect Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Ringwood (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Totowa (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Wanaque (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Wayne (T)	0	0	0	0	0	0	0	0	0	0	0.0%
West Milford (T)	0	0	0	0	0	0	0	0	0	0	0.0%
Woodland Park (B)	0	0	0	0	0	0	0	0	0	0	0.0%
Passaic County (Total)	0	0	0	0	1	1	5	1	0	8	0.6%

Source: Passaic County 2020 HMP, Passaic County 2024, NJGIN 2017, 2021, 2022, HIFLD 2017, 2018, 2022, 2023, Passaic County Dept. of Planning & Economic Development 2024; NOAA 2022

Table 9-25. Estimated Debris Generated from the 1 Percent Annual Chance Flood Event

Jurisdiction	1 Percent Annual Chance Flood Event			
	Total (tons)	Finish (tons)	Structure (tons)	Foundation (tons)
Bloomingdale, Borough of	2,080	727	768	584
Clifton, City of	117	114	2	1
Haledon, Borough of	107	88	11	7
Hawthorne, Borough of	144	144	0	0
Little Falls, Township of	2,120	1,942	106	72
North Haledon, Borough of	111	102	6	4
Passaic, City of	466	426	24	16
Paterson, City of	2,274	1,613	416	245
Pompton Lakes, Borough of	3,084	2,825	157	102
Prospect Park, Borough of	7	7	0	0
Ringwood, Borough of	1,456	374	610	472
Totowa, Borough of	692	669	13	9
Wanaque, Borough of	332	150	104	79
Wayne, Township of	4,553	3,469	640	444
West Milford, Township of	2,802	638	1,174	989
Woodland Park, Borough of	926	750	106	70
Passaic County (Total)	21,269	14,038	4,138	3,093

Source: Hazus v6.1; (NJOIT 2024); FEMA 2024; Microsoft 2019

9.2.5 Natural, Historic and Cultural Resources

Natural

The environmental impacts of a flood can include significant water quality and debris-disposal issues. Floodwaters can back up sanitary sewer systems and inundate wastewater treatment plants, causing raw sewage to contaminate the flooded waterway. The contents of unsecured containers of oil, fertilizers, pesticides, and other chemicals get added to floodwaters. Hazardous materials may be released and distributed widely across the floodplain. After floodwaters subside, contaminated and flood-damaged building materials and contents must be properly disposed of. Contaminated sediment must be removed from buildings, yards, and properties. In addition, severe erosion caused by flooding can negatively impact local ecosystems. The erosion of sediment can deteriorate riverbanks, causing additional flooding into locations that may not otherwise have experienced flooding conditions.

Historic

Historic places, community facilities, and religious institutions are all vulnerable to impacts from flooding. Historic buildings face structural damage during flood events. Restoration of flood-damaged historic buildings that are subject to landmark laws can pose significant challenges. These laws often require adherence to strict preservation standards, which can complicate and prolong the recovery process.

Cultural

Cultural resources, such as community facilities and religious institutions, face significant risks of damage because they are not easily replaceable. These facilities often serve multiple functions, acting as communal spaces for different groups, which makes their loss particularly impactful. Flood events can lead to closures of these vital community spaces.

Parks and recreational areas, although often designed with flooding in mind, are also vulnerable. Flood events can lead to closures of parks, recreation areas, and community spaces, disrupting residents' lives and hindering access to critical community services.

9.3 FUTURE CHANGES THAT MAY AFFECT RISK

9.3.1 Potential or Planned Development

As Passaic County communities grow, flood events may increase in frequency and severity due to land use changes, the construction of more structures, and the expansion of impervious surfaces. Specific areas of recent and new development are indicated in the jurisdictional annexes in Volume II of this plan. The ability of new development to withstand flooding impacts can be enhanced through land use practices and consistent enforcement of codes and regulations for new construction. New development changes the landscape, where buildings, roads, and other infrastructure replace open land and vegetation. This transformation of pervious surfaces (including vegetation) to impervious surfaces increases runoff and the potential for flooding. Proper planning and implementation of green infrastructure can help mitigate these effects by promoting natural water absorption and reducing the risk of flood events.

9.3.2 Projected Changes in Population

If population growth occurs outside the SFHA, risk exposure remains the same. However, if it grows within the SFHA, risk exposure increases. Any changes in the density of population can create issues for local residents during evacuation of a flood event.

The New Jersey Department of Labor and Workforce Development produced population projections by County for 2029 and 2034. According to these projections, Passaic County is projected to have an increase in population in the upcoming years. These projections include a population of 536,100 by 2029 and 542,500 by 2034 (State of New Jersey 2017).

9.3.3 Climate Change

Most studies project that New Jersey will see an increase in average annual precipitation, primarily in the form of heavy rainfalls, which have the potential to increase the risk of flash flooding and riverine flooding. Increases in precipitation may alter and expand the floodplain boundaries and runoff patterns, resulting in the exposure of populations, buildings, and critical facilities and infrastructure that were previously outside the floodplain. This increase in exposure would result in an increased risk to life and health, an increase in structural losses, a diversion of additional resources to response and recovery efforts, and an increase in business closures affected by future flooding events due to loss of service or access.

9.3.4 Other Identified Conditions

It is anticipated that Passaic County will continue to experience direct and indirect impacts of flooding events annually that may induce secondary hazards such as infrastructure deterioration or failure, utility failures, power outages, water quality and supply concerns, and transportation delays, accidents, and inconveniences.