



4.3.15 Wildfire

The following section provides the hazard profile (hazard description, location, extent, previous occurrences and losses, probability of future occurrences, and impact of climate change) and vulnerability assessment for the wildfire hazard in Gloucester County.

2022 HMP Update Changes

- Previous occurrences were updated with events that occurred between 2015 and 2021.
- A vulnerability assessment was conducted for the wildfire hazard; it now directly follows the hazard profile. To determine exposure, a spatial analysis was conducted using the NJFFS Fuel Hazard Area guidelines.

4.3.15.1 Profile

Hazard Description

A wildland fire can be defined as any non-structural fire that occurs in the wildland. Three distinct types of wildland fires have been defined and include: naturally occurring wildfire, human-caused wildfire, and prescribed fire. Many of these are highly destructive and can be difficult to control. They occur in forested, semi-forested, or less developed areas. Wildland fires can be caused by lightning, human carelessness, and arson. Most frequently, wildland fires in the State of New Jersey are caused by humans. Wildfires result in the uncontrolled destruction of forests, brush, field crops, grasslands, real estate, and personal property, and have secondary impacts on other hazards such as flooding, by removing vegetation and destroying watersheds.

Wildfires can increase the probability of other natural disasters, specifically floods and mudflows. Wildfires, particular large-scale fires, can dramatically alter the terrain and ground conditions, making land already devastated by fire susceptible to floods. Lands impacted by wildfire increase the risk of flooding and mudflow in those areas impacted by wildfire. Normally, vegetation absorbs rainfall, reducing runoff. However, wildfires leave the ground charred, barren, and unable to absorb water; thus, creating conditions perfect for flash flooding and mudflows. Flood risk in these impacted areas remain significantly higher until vegetation is restored, which can take up to five years after a wildfire (FEMA 2013).

Flooding after a wildfire is often more severe, as debris and ash left from the fire can form mudflows. During and after a rain event, as water moves across charred and denuded ground, it can also pick up soil and sediment and carry it in a stream of floodwaters. These mudflows have the potential to cause significant damage to impacted areas. Areas directly affected by fires and those located below or downstream of burn areas are most at risk for flooding (FEMA 2013). For detailed information regarding flooding, see Section 4.3.7 (Flood).



The height of wildland fire season in New Jersey is typically in spring (March through May) and culminates in early May, corresponding with the driest live fuel moisture periods of the year. Although the spring months are the most severe, the summer and fall months may also experience extensive fires in the state. While the spring season is historically the period in which wildfire danger is the highest, wildland fires can occur every month of the year. Drought, snow pack, and local weather conditions can expand the length of the fire season. The early and late shoulders of the fire season usually are associated with human-caused fires. Lightning generally is the cause of most fires in the peak season.

Location

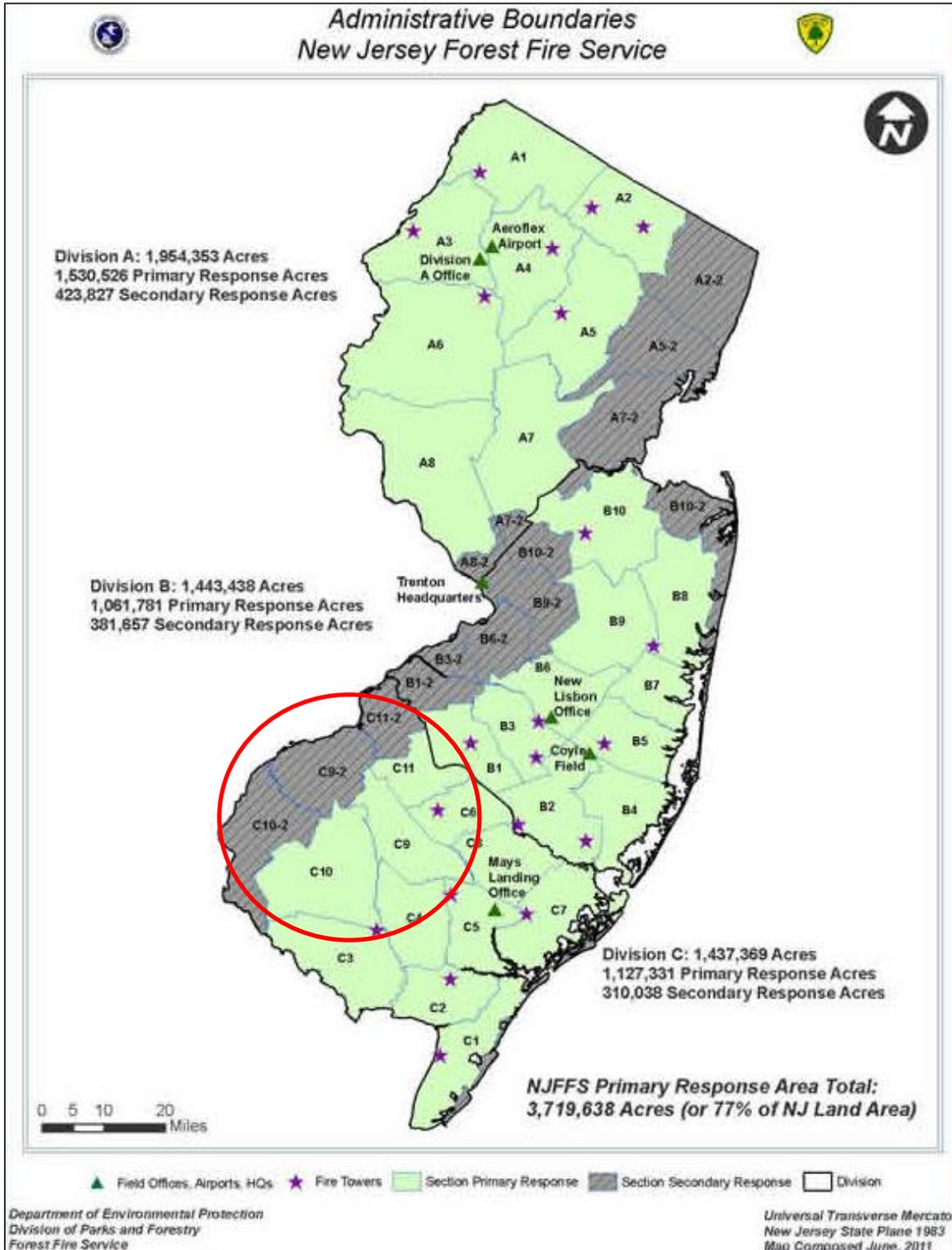
According to the U.S. Fire Administration (USFA), the fire problem in the U.S. varies from region to region. This often is a result of climate, poverty, education, demographics, and other causal factors (USFA 2021). In Gloucester County, wildfires have the potential to occur anywhere in the County.

NJFFS, a division of the New Jersey Department of Environmental Protection (NJDEP), is responsible for protecting the 3.25 million acres of wildland in the State. NJFFS is under the direction of the State fire warden and is headquartered in Trenton. NJFFS has 85 full-time employees that provide an array of services including staffing the State's 21 fire towers, which are operational during the months of March, April, May, October, and November.

NJFFS divides the State into three regions (Northern, Central, Southern) each totaling about 1,250,000 acres. There are 29 125,000 acre sections with a dedicated forest fire warden in each; and 269 districts each consisting of 15,000-20,000 acres. In total, 29 section forest fire wardens, 269 district forest fire wardens and 2,000 trained crew members respond to fires on an as-needed basis (NJFFS 2015). Figure 4.3.15-1 illustrates the NJFFS region divisions within the State. Gloucester County is located in Division C (Southern NJ).



Figure 4.3.15-1. Fire Divisions of New Jersey



Source: NJDEP 2015

Note: The red circle indicates the location of Gloucester County. The County is located in Fire Division C.



Wildfire Fuel Hazard Areas

NJFFS developed Wildfire Fuel Hazard data for the entire state based on NJDEP data. For details on the information was developed, refer to: <https://www.state.nj.us/dep/gis/njfh.html>. A majority of Gloucester County has low fuel hazard and low risk; refer to Figure 4.3.15-2. Every municipality in Gloucester County has at least a small portion of the community located within the high to extreme risk area, with Township of Monroe having largest percentage of land within the high to extreme risk area (20.5 percent). Table 4.3.15-1 summarizes the amount of land in each of the wildfire fuel hazard ranking zones for Gloucester County. Table 4.3.15-2 summarizes the approximate area in the NJFFS risk areas in the County.

Table 4.3.15-1. Area in the Wildfire Fuel Hazard Ranking Zones in Gloucester County

Hazard Area	Area (Square Miles)
Extreme	12.2
Very High	19.8
High	5.2

Source: NJDEP 2009

Table 4.3.15-2. Approximate Area in Wildfire Fuel Hazard Ranking Zones in Gloucester County

Municipality	Total Area (Square Miles)	New Jersey Forest Fire Service Risk Areas			
		Low to Moderate	Percent in Hazard Area	High to Extreme	Percent in Hazard Area
Clayton Borough	7.3			1.1	15.7%
Deptford Township	17.6			1.7	9.5%
East Greenwich Township	14.9			0.6	4.3%
Elk Township	19.3			1.8	9.2%
Franklin Township	56.4			9.0	15.9%
Glassboro Borough	9.4			1.1	11.3%
Greenwich Township	9.3			1.0	11.0%
Harrison Township	19.0			0.8	4.1%
Logan Township	22.1			3.9	17.7%
Mantua Township	16.1			0.9	5.4%
Monroe Township	46.9			9.6	20.5%
National Park Borough	1.0			0.2	17.7%
Newfield Borough	1.7			0.1	6.4%
Paulsboro Borough	2.1			0.2	9.4%
Pitman Borough	2.3			0.0	1.9%
South Harrison Township	16.0			0.9	5.8%
Swedesboro Borough	0.8			0.0	2.0%
Washington Township	21.5			1.0	4.7%
Wenonah Borough	1.0			0.1	5.4%
West Deptford Township	15.7			1.7	10.7%
Westville Borough	1.1			0.1	5.9%



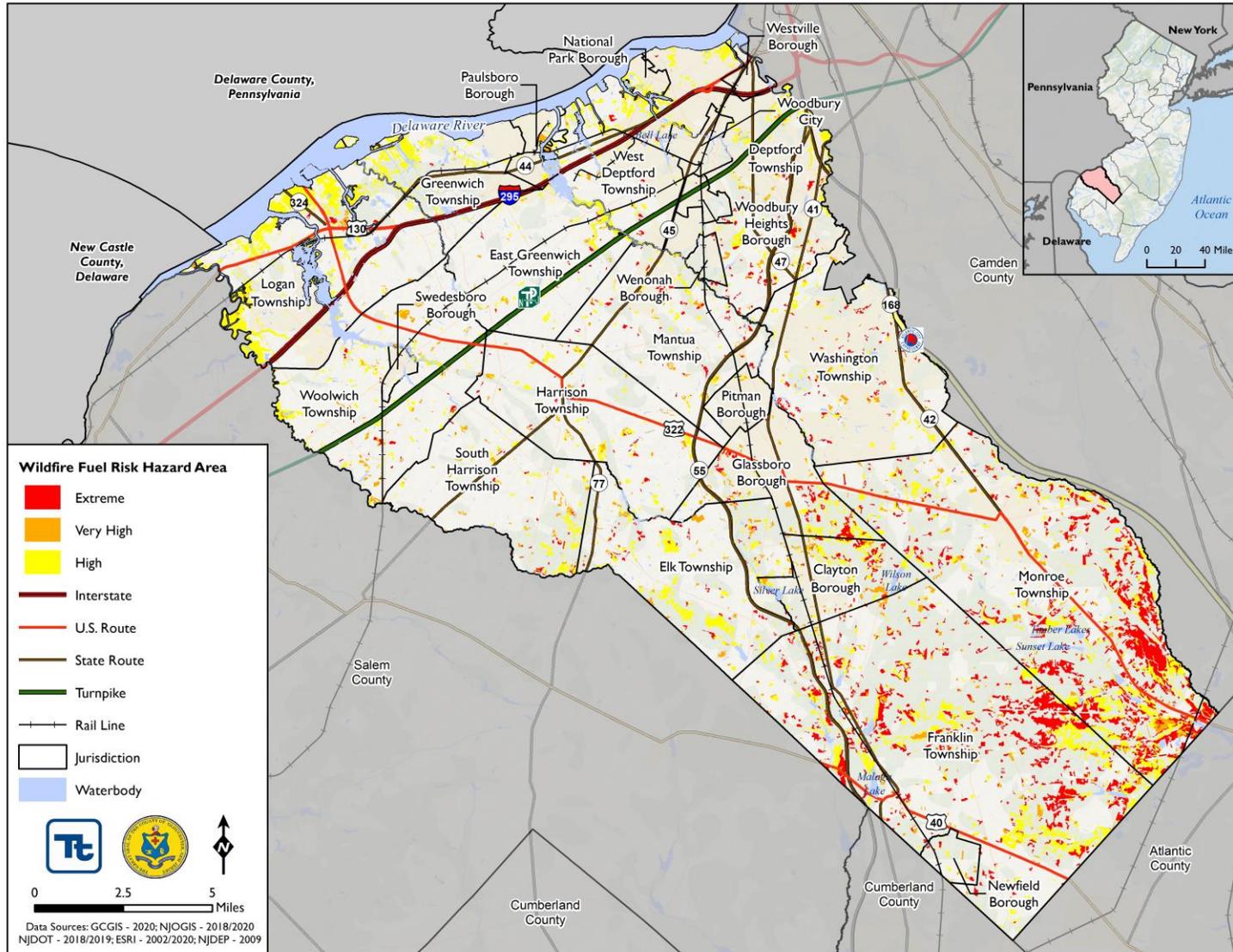
Municipality	Total Area (Square Miles)	New Jersey Forest Fire Service Risk Areas			
		Low to Moderate	Percent in Hazard Area	High to Extreme	Percent in Hazard Area
Woodbury City	2.1			0.0	1.3%
Woodbury Heights Borough	1.3			0.0	1.3%
Woolwich Township	21.4			1.4	6.3%
Gloucester County Total	326.2			37.2	11.4%

Source: NJDEP 2009

DRAFT



Figure 4.3.15-2. Wildfire Fuel Hazard for Gloucester County





New Jersey Pinelands

The southeastern corner of Gloucester County is located in the New Jersey Pinelands National Reserve. The New Jersey Pinelands is a fire-adapted forest ecosystem that depends on wildfire for reproduction and the control of fuel buildup. This forest community is one of the most hazardous wildland fuel types in the nation. Pinelands fires burn extremely hot and spread rapidly. New Jersey has a high population density and more people are moving from urban areas to build homes in rural wildland areas. With more people living in and enjoying the State's wildlands for various forms of recreation, the number of potential fire starts and the seriousness of their consequences increases. A potentially explosive combination is created when hazardous wildland fuels, home development, and an increased risk of human-caused ignition come together under extreme fire weather conditions (NJOEM 2019)

The New Jersey Pine Barrens are characterized by low, dense forests of pine and oak, ribbons of cedar and hardwood swamps bordering drainage courses, pitch pine lowlands, and bogs and marshes combined to produce an expansive vegetative mosaic unsurpassed in the northeastern United States. The Pine Barrens was recognized as a nationally and internationally important ecological region when, in 1978, Congress created the Pinelands National Reserve, the United States' first National Reserve and a United States Biosphere Reserve of the Man and the Biosphere Program. The Pinelands National Reserve encompasses approximately 1.1 million acres statewide, occupying 22-percent of New Jersey's land area and covering portions of seven counties and all or parts of 56 municipalities. It is the largest area of open space on the Mid-Atlantic seaboard between Richmond and Boston, and is underlain by aquifers containing 17 trillion gallons of some of the purest water in the region. Through the creation of the Pinelands Commission, the State of New Jersey formed the necessary partnerships to preserve, protect, and enhance the natural and cultural resources of the Pinelands. The Commission oversees many development and management decisions within the Pinelands National Reserve (NJDEP 2021).

Extent

The extent (that is, magnitude or severity) of wildfires depends on weather (dryness/drought) and human activity. To determine the potential for wildfires, the NJFFS uses two indices to measure and monitor the dryness of forest fuels and the possibility of fire ignitions becoming wildfires. This includes the National Fire Danger Rating Systems Buildup Index and the Keetch-Byram Drought Index. Both are used for fire preparedness planning, which includes the following initiatives: campfire and burning restrictions, fire patrol assignments, staffing of fire lookout towers, and readiness status for both observation and firefighting aircraft.

- The **Buildup Index** is a number that reflects the combined cumulative effects of daily drying and precipitation fuels with a 10-day time lag constant. It is a rating of the total amount of fuel available for combustion.
- The **Keetch-Byram Drought Index** (KBDI) is an index used to determining forest fire potential. The drought index is based on a daily water balance, where a drought factor is balanced with precipitation



and soil moisture (assumed to have a maximum storage capacity of 8-inches) and is expressed in hundredths of an inch of soil moisture depletion.

In addition to the two indices, the NJFFS uses the National Fire Danger Rating System (NFDRS) to provide a measure of relative seriousness of burning conditions and threat of fire in the State. It allows the NJFFS to estimate the daily fire danger for a given area. The NFDRS uses a five-color coded system to help the public understand fire potential. The NJFFS slightly adapted the color system for their purposes. The NFDRS, with the NFFS color scheme, is as follows:

Table 4.3.15-3. Fire Danger Rating and Color Code

Fire Danger Rating and Color Code	Description
Low (L) (Green)	Fuels do not ignite readily from small firebrands although a more intense heat source, such as lightning, may start fires in duff or punky wood. Fires in open cured grasslands may burn freely a few hours after rain, but woods fires spread slowly by creeping or smoldering, and burn in irregular fingers. There is little danger of spotting.
Moderate (M) (Blue)	Fires can start from most accidental causes, but with the exception of lightning fires in some areas, the number of starts is generally low. Fires in open-cured grasslands will burn briskly and spread rapidly on windy days. Timber fires spread slowly to moderately fast. The average fire is of moderate intensity, although heavy concentrations of fuel, especially draped fuel, may burn hot. Short-distance spotting may occur, but is not persistent. Fires are not likely to become serious and control is relatively easy.
High (H) (Yellow)	All fine dead fuels ignite readily and fires start easily from most causes. Unattended brush and campfires are likely to escape. Fires spread rapidly and short-distance spotting is common. High-intensity burning may develop on slopes or in concentrations of fine fuels. Fires may become serious and their control difficult unless they are attacked successfully while small.
Very High (VH) (Orange)	Fires start easily from all causes and, immediately after ignition, spread rapidly and increase quickly in intensity. Spot fires are a constant danger. Fires burning in light fuels may quickly develop high-intensity characteristics such as long-distance spotting and fire whirlwinds when they burn into heavier fuels.
Extreme (E) (Red)	Fires start quickly, spread furiously, and burn intensely. All fires are potentially serious. Development into high-intensity burning will usually be faster and occur from smaller fires than in the very high fire danger class. Direct attack is rarely possible and may be dangerous except immediately after ignition. Fires that develop headway in heavy slash (trunks, branches, and tree tops) or in conifer stands may be unmanageable while the extreme burning condition lasts. Under these conditions the only effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.

Source: NJFFS 2020

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with flooding throughout Gloucester County. With so many sources reviewed for the purpose of this HMP, loss and impact information for many events may vary. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP.



FEMA Major Disasters and Emergency Declarations

Between 1954 and 2021, New Jersey was included in two FEMA fire management assistance (FMA) declarations. Generally, these disasters cover a wide range of the State; therefore, the disaster may have impacted many counties. Gloucester County was not included in either FEMA FMA declaration (FEMA 2021).

U.S. Department of Agriculture Disaster Declarations

The Secretary of Agriculture from the U.S. Department of Agriculture (USDA) is authorized to designate counties as disaster areas to make emergency loans to producers suffering losses in those counties and in counties that are contiguous to a designated county. Between 2015 and 2021, Gloucester County was not included in any USDA disaster declarations related to wildfire (USDA 2021).

Wildfire Events

Major wildfire events that have impacted Gloucester County between 2015 and 2021 are identified in Table 4.3.15-4. With wildfire documentation for New Jersey and Gloucester County being so extensive, not all sources have been identified or researched. Therefore, Table 4.3.15-4 may not include all events that have occurred in the County. Please see Section 9 (Jurisdictional Annexes) for detailed information regarding impacts and losses to each municipality.

Table 4.3.15-4. Wildfire Events in Gloucester County, 2015 to 2021

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Gloucester County Designated?	Location	Description

Source: FEMA 2021; NOAA-NCEI 2021; NJOEM 2019

Note: Not all events that have occurred in Gloucester County are included due to the extent of documentation and the fact that not all sources have been identified or researched.

K: Thousand

DR Disaster Declaration (FEMA)

FEMA Federal Emergency Management Agency

Mph miles per hour

N/A Not Applicable

Probability of Future Occurrences

Estimating the approximate number of wildfires to occur in Gloucester County is difficult to predict in a probabilistic manner. This is because a number of variable factors impact the potential for a fire to occur and because some conditions (for example, ongoing land use development patterns, location, fuel sources, and construction sites) exert increasing pressure on the WUI zone. Based on available data, urban fires and wildfires will continue to present a risk to Gloucester County. Given the numerous factors that can impact urban fire and wildfire potential, the likelihood of a fire event starting and sustaining itself should be gauged by professional fire managers on a daily basis.



According to the NOAA, Gloucester County experienced 8 severe wildfire events between 1950 and 2021. The table below shows these statistics, as well as the annual average number of events and the percent chance of the wildfire occurring in Gloucester County in future years (NOAA NCEI 2021).

Table 4.3.15-5. Probability of Future Occurrence of Wildfire Events

Hazard Type	Number of Occurrences Between 1950 and 2021	Percent chance of occurrence in any given year
Wildfire	8	11.11

Source: NOAA-NCEI 2021

In Section 4.4, the identified hazards of concern for Gloucester County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Committee, the probability of occurrence for wildfire in the county is considered 'occasional' (between 10 and 100 percent annual probability of a hazard event occurring, as presented in Table 4.4-1). The ranking of the wildfire hazard for individual municipalities is presented in the jurisdictional annexes.

Climate Change Impacts

Climate change includes major changes in temperature, precipitation, or wind patterns, which occur over several decades or longer. Due to the increase in greenhouse gas concentrations since the end of the 1890s, New Jersey has experienced a 3.5° F (1.9° C) increase in the State's average temperature (Office of the New Jersey State Climatologist 2020), which is faster than the rest of the Northeast region (2° F [1.1° C]) (Melillo et al. 2014) and the world (1.5° F [0.8° C]) (IPCC 2014). This warming trend is expected to continue. By 2050, temperatures in New Jersey are expected to increase by 4.1 to 5.7° F (2.3° C to 3.2° C) (Horton et al. 2015). Thus, New Jersey can expect to experience an average annual temperature that is warmer than any to date (low emissions scenario) and future temperatures could be as much as 10° F (5.6° C) warmer (high emissions scenario) (Runkle et al. 2017). New Jersey can also expect that by the middle of the 21st century, 70 percent of summers will be hotter than the warmest summer experienced to date (Runkle et al. 2017). The increase in temperatures is expected to be felt more during the winter months (December, January, and February), resulting in less intense cold waves, fewer sub-freezing days, and less snow accumulation.

As temperatures increase, Earth's atmosphere can hold more water vapor which leads to a greater potential for precipitation. Currently, New Jersey receives an average of 46 inches of precipitation each year (Office of the New Jersey State Climatologist 2020). Since the end of the twentieth century, New Jersey has experienced slight increases in the amount of precipitation it receives each year, and over the last 10 years there has been a 7.9 percent increase. By 2050, annual precipitation in New Jersey could increase by 4 percent to 11 percent (Horton et al. 2015). By the end of this century, heavy precipitation events are projected to occur two to five times more often (Walsh et al. 2014) and with more intensity (Huang et al. 2017) than in the last century. New Jersey will experience more intense rain events, less snow, and more rainfalls (Fan et al. 2014, Demaria et al. 2016, Runkle et al. 2017). Also, small decreases in the amount of precipitation may occur in the summer months, resulting in greater potential for more frequent and prolonged droughts (Trenberth 2011).



A gradual change in temperatures will alter the growing environment of many tree species throughout the United States and New Jersey, reducing the growth of some trees and increasing the growth of others. Tree growth and regeneration may be affected more by extreme weather events and climatic conditions than by gradual changes in temperature or precipitation. Warmer temperatures may lead to longer dry seasons and multi-year droughts, creating triggers for wildfires, insects, and invasive species. Increased temperature and change in precipitation will also affect fuel moisture during wildfire season and the length of time during which wildfires can burn during a given year (U.S. Department of Agriculture [USDA] 2012). Climate change may also increase the frequency of lightning strikes. A warmer atmosphere holds more moisture which is one of the key items for triggering a lightning strike. Lightning strikes cause approximately half the wildfires in the United States. If the frequency of lightning strikes increases, the potential for wildfires from these strikes also increases (Lee 2014). Wildfire incidents are predicted to increase throughout the United States due to climate change, causing at least a doubling of areas burned within the next century (USDA 2012).

As stated above, according to the temperature projections for Northern New Jersey, including Gloucester County, this area can expect warmer and drier conditions which may increase the frequency and intensity of wildfires. Higher temperatures are expected to increase the amount of moisture that evaporates from land and water. These changes have the potential to lead to more frequent and severe droughts, which, in turn, increases the likelihood of wildfires (U.S. EPA 2009).

4.3.15.2 Vulnerability Assessment

A spatial analysis was conducted using the 2009 NJDEP Wildfire Fuel Hazard spatial layer. For the purposes of the assessment, an asset (population, structures, critical facilities, and lifelines) is considered exposed and potentially vulnerable to the wildfire hazard if it is located in the 'extreme', 'very high' and 'high' wildfire fuel hazard areas. Refer to Section 4.2 for additional details on the methodology used to assess wildfire risk.

Impact on Life, Health, and Safety

Wildfires have the potential to impact human health and life of residents and responders, structures, infrastructure, and natural resources. The most vulnerable populations include emergency responders and those within a short distance of the interface between the built environment and the wildland environment. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. Table 4.3.15-6 summarizes the estimated population exposed to the wildfire hazard by municipality.

Based on the analysis, an estimated 3,786 residents, or 1.3-percent of the County's population, are located in the extreme, high, and very high wildfire hazard areas. Overall, the Township of Monroe has the greatest number of individuals located in the extreme, very high, and high hazard areas (i.e., 525 persons) and the Township of Harrison has the greatest proportion of its population exposed to the extreme, very high, and high hazard areas (i.e., 7.0-percent).



Of the population exposed, the most vulnerable include the economically disadvantaged and the population over age 65. In Gloucester County, there are 21,340 persons living below the poverty level and 44,794 persons over 65 years old. Economically disadvantaged populations are more vulnerable because they are likely to evaluate their risk and make decisions to evacuate based on net economic impacts on their families. The population over age 65 is also more vulnerable because they are more likely to seek or need medical attention that may not be available due to isolation during a wildfire event, and they may have more difficulty evacuating.

Table 4.3.15-6 Population in Wildfire Fuel Hazard Areas

Jurisdiction	Total Population (American Community Survey 2015-2019)	Estimated Population Located Within the High, Very High, and Extreme Wildfire Fuel Hazard Area	
		Number of People	Percent of Total
Clayton (B)	8,626	186	2.2%
Deptford (Twp)	30,448	294	1.0%
East Greenwich (Twp)	10,488	113	1.1%
Elk (Twp)	4,135	93	2.2%
Franklin (Twp)	16,440	323	2.0%
Glassboro (B)	19,826	190	1.0%
Greenwich (Twp)	4,831	0	0.0%
Harrison (Twp)	12,995	536	4.1%
Logan (Twp)	5,924	20	0.3%
Mantua (Twp)	14,941	213	1.4%
Monroe (Twp)	36,789	1,111	3.0%
National Park (B)	2,959	0	0.0%
Newfield (B)	1,521	16	1.0%
Paulsboro (B)	5,904	0	0.0%
Pitman (B)	8,805	0	0.0%
South Harrison (Twp)	3,148	57	1.8%
Swedesboro (B)	2,579	0	0.0%
Washington (Twp)	47,833	64	0.1%
Wenonah (B)	2,259	13	0.6%
West Deptford (Twp)	21,149	363	1.7%
Westville (B)	4,169	0	0.0%
Woodbury (C)	9,861	0	0.0%
Woodbury Heights (B)	2,986	3	0.1%
Woolwich (Twp)	12,549	192	1.5%
Gloucester County (Total)	291,165	3,786	1.3%

Source: American Community Survey 2019 5-year estimates; NJDEP 2009
Note: B – Borough; T – Town; Twp – Township; -percent - Percent

Impact on General Building Stock

Buildings located within the NJDEP identified extreme, very high or high fuel hazard areas are exposed and considered vulnerable to the wildfire hazard. Buildings constructed of wood or vinyl siding are generally more likely to be impacted by the fire hazard than buildings constructed of brick or concrete. Table 4.3.15-7 summarizes the estimated building stock inventory located in the hazard area by municipality. Approximately



1.2-percent (\$1.2 billion) of the County’s building replacement cost value is located in the extreme/very high/high hazard area. The Township of Monroe has the greatest number of buildings located in the wildfire hazard area (396 structures – 3.2-percent of its total), and the Township of Harrison has the greatest proportion of its buildings located in the wildfire hazard area (i.e., 3.8-percent).

Table 4.3.15-7 Probability of Future Occurrence of Wildfire Events

Jurisdiction	Total Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Located Within the High, Very High, and Extreme Wildfire Fuel Hazard Area			
			Number of Buildings Within the Wildfire Hazard Area	Percent of Total	Total Replacement Cost Value of Buildings Located Within the Wildfire Hazard Area	Percent of Total
Clayton (B)	3,295	\$1,933,299,905	69	2.1%	\$36,950,955	1.9%
Deptford (Twp)	11,284	\$10,081,159,584	106	0.9%	\$99,913,254	1.0%
East Greenwich (Twp)	4,346	\$2,927,045,409	45	1.0%	\$31,716,695	1.1%
Elk (Twp)	2,339	\$1,784,179,937	43	1.8%	\$27,127,980	1.5%
Franklin (Twp)	8,432	\$5,637,186,975	153	1.8%	\$134,584,008	2.4%
Glassboro (B)	5,959	\$5,816,332,907	57	1.0%	\$45,705,518	0.8%
Greenwich (Twp)	2,807	\$2,734,741,222	0	0.0%	\$0	0.0%
Harrison (Twp)	4,817	\$4,828,239,008	183	3.8%	\$118,169,500	2.4%
Logan (Twp)	2,805	\$6,591,573,691	12	0.4%	\$18,773,825	0.3%
Mantua (Twp)	6,569	\$4,738,271,524	97	1.5%	\$121,883,512	2.6%
Monroe (Twp)	12,553	\$8,458,118,166	396	3.2%	\$256,546,997	3.0%
National Park (B)	1,483	\$781,021,288	1	0.1%	\$3,782,219	0.5%
Newfield (B)	891	\$622,948,021	8	0.9%	\$7,241,163	1.2%
Paulsboro (B)	2,615	\$2,076,864,026	1	0.0%	\$58,794	0.0%
Pitman (B)	3,521	\$2,916,470,733	0	0.0%	\$0	0.0%
South Harrison (Twp)	1,726	\$1,494,748,661	25	1.4%	\$29,727,010	2.0%
Swedesboro (B)	1,040	\$936,236,069	0	0.0%	\$0	0.0%
Washington (Twp)	17,413	\$13,732,374,547	47	0.3%	\$88,986,922	0.6%
Wenonah (B)	930	\$778,702,966	5	0.5%	\$6,697,034	0.9%
West Deptford (Twp)	7,561	\$9,201,121,261	114	1.5%	\$99,638,733	1.1%
Westville (B)	1,733	\$1,529,846,612	0	0.0%	\$0	0.0%
Woodbury (C)	3,605	\$4,139,381,075	1	0.0%	\$2,205,856	0.1%
Woodbury Heights (B)	1,295	\$1,265,332,236	1	0.1%	\$716,136	0.1%
Woolwich (Twp)	4,074	\$4,551,585,778	60	1.5%	\$75,203,332	1.7%
Gloucester County (Total)	113,093	\$99,556,781,602	1,424	1.3%	\$1,205,629,442	1.2%

Source: Gloucester County GIS 2020; RS Means 2020; NJDEP 2009

Note: B – Borough; T – Town; Twp – Township; -percent – Percent

Impact on Critical Facilities

In Gloucester County, there are 18 critical facilities and lifelines located in the wildfire hazard area. The Borough of Glassboro has the greatest number of facilities located in the wildfire fuel hazard areas. Refer to Table 4.3.15-8 which summarizes the number of exposed critical facilities and lifelines by jurisdiction.



Additionally, Table 4.3.15-9 summarizes the distribution of critical facilities exposed to the wildfire fuel hazard area by facility type. There are six hazardous materials facilities and eight safety and security lifelines located in the wildfire fuel hazard area; refer to Table 4.3.15-10.

Table 4.3.15-8. Estimated Number of Critical Facilities and Lifelines Located in the Wildfire Fuel Hazard Area

Jurisdiction	(Total) Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Located in the High, Very High, Extreme Wildfire Fuel Hazard Areas			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Clayton (B)	25	25	0	0.0%	0	0.0%
Deptford (Twp)	79	77	2	2.5%	2	2.6%
East Greenwich (Twp)	46	46	1	2.2%	1	2.2%
Elk (Twp)	6	6	0	0.0%	0	0.0%
Franklin (Twp)	35	35	1	2.9%	1	2.9%
Glassboro (B)	137	137	4	2.9%	4	2.9%
Greenwich (Twp)	31	31	0	0.0%	0	0.0%
Harrison (Twp)	26	26	1	3.8%	1	3.8%
Logan (Twp)	50	50	0	0.0%	0	0.0%
Mantua (Twp)	30	30	0	0.0%	0	0.0%
Monroe (Twp)	29	26	1	3.4%	1	3.8%
National Park (B)	41	41	0	0.0%	0	0.0%
Newfield (B)	9	9	1	11.1%	1	11.1%
Paulsboro (B)	29	29	0	0.0%	0	0.0%
Pitman (B)	19	19	1	5.3%	1	5.3%
South Harrison (Twp)	12	12	0	0.0%	0	0.0%
Swedesboro (B)	9	9	0	0.0%	0	0.0%
Washington (Twp)	75	75	3	4.0%	3	4.0%
Wenonah (B)	4	4	0	0.0%	0	0.0%
West Deptford (Twp)	157	149	2	1.3%	2	1.3%
Westville (B)	23	21	0	0.0%	0	0.0%
Woodbury (C)	59	59	0	0.0%	0	0.0%
Woodbury Heights (B)	9	9	0	0.0%	0	0.0%
Woolwich (Twp)	16	16	1	6.3%	1	6.3%
Gloucester County (Total)	956	941	18	1.9%	18	1.9%

Source: Gloucester County GIS 2020; NJDEP 2009

Note: B – Borough; C – City; Twp – Township; -percent - Percent



Table 4.3.15-9. Distribution of Critical Facilities Exposed to the Wildfire Fuel Hazard Area

Jurisdiction	Number of Critical Facilities Located in the High, Very High, and Extreme Wildfire Fuel Hazard Area								
	Assisted Living	Board of Education	EMS	Hazardous Material Facility	Municipal Building	Post-Secondary Education	Potable Water Well	Primary Education	Wastewater Metering Station
Clayton (B)	0	0	0	0	0	0	0	0	0
Deptford (Twp)	0	0	0	0	1	0	0	1	0
East Greenwich (Twp)	0	0	0	1	0	0	0	0	0
Elk (Twp)	0	0	0	0	0	0	0	0	0
Franklin (Twp)	0	0	0	1	0	0	0	0	0
Glassboro (B)	0	0	0	0	0	3	1	0	0
Greenwich (Twp)	0	0	0	0	0	0	0	0	0
Harrison (Twp)	0	0	0	1	0	0	0	0	0
Logan (Twp)	0	0	0	0	0	0	0	0	0
Mantua (Twp)	0	0	0	0	0	0	0	0	0
Monroe (Twp)	0	0	1	0	0	0	0	0	0
National Park (B)	0	0	0	0	0	0	0	0	0
Newfield (B)	0	1	0	0	0	0	0	0	0
Paulsboro (B)	0	0	0	0	0	0	0	0	0
Pitman (B)	0	0	0	0	0	0	0	0	1
South Harrison (Twp)	0	0	0	0	0	0	0	0	0
Swedesboro (B)	0	0	0	0	0	0	0	0	0
Washington (Twp)	1	1	0	0	0	0	0	1	0
Wenonah (B)	0	0	0	0	0	0	0	0	0
West Deptford (Twp)	0	0	0	2	0	0	0	0	0
Westville (B)	0	0	0	0	0	0	0	0	0
Woodbury (C)	0	0	0	0	0	0	0	0	0
Woodbury Heights (B)	0	0	0	0	0	0	0	0	0
Woolwich (Twp)	0	0	0	1	0	0	0	0	0
Gloucester County (Total)	1	2	1	6	1	3	1	2	1

Source: Gloucester County GIS 2020; NJDEP 2009

Note: B – Borough; C – City; T – Town; Twp – Township

Table 4.3.15-10. Estimated Number of Lifelines Categorized by FEMA Lifeline Categories Exposed to the Wildfire Fuel Hazard Area

FEMA Lifeline Category	Total Number of Lifelines in the County	Number of Lifelines Located in the High, Very High, and Extreme Wildfire Fuel Hazard Area
Energy	5	0
Food, Water, Shelter	214	2
Hazardous Materials	116	6
Health and Medical	102	2
Safety and Security	481	8
Transportation	23	0



FEMA Lifeline Category	Total Number of Lifelines in the County	Number of Lifelines Located in the High, Very High, and Extreme Wildfire Fuel Hazard Area
Gloucester County (Total)	956	18

Source: Gloucester County GIS 2020; NJDEP 2009; FEMA 2020

As mentioned previously, wildfires can have an impact on the water supplies throughout the County because of residual pollutants like char or debris landing in water resources which can clog wastewater pipes, culverts, etc. Wildfires may also impact transportation routes, blocking residents and commuters from getting in and out of the County during a wildfire event because of char and debris polluting the air making it difficult to drive, or the flames having close proximity to the roadways making the route an unsafe passageway. Table 4.3.15-11 summarizes the number of miles roadways are built in the wildfire fuel hazard areas; a total of 1.2-percent. In general, roads and bridges surrounding the areas of fire risk are important because they provide ingress and egress to large areas and, in some cases, to isolated neighborhoods. Fires can create conditions that block or prevent access and can isolate residents and emergency service providers

Table 4.3.15-11. Major Transportation Routes Exposed to the Wildfire Fuel Hazard Areas

Road Type	Total Miles for County	Roadway Miles Exposed to the Wildfire Hazard Areas	
		Miles	Percent of Total
Turnpike	36	0	0.0%
State Routes	124	2	1.6%
US Highways	60	1	1.6%
Interstate	34	0	0.0%
Gloucester County (Total)	254	3	1.2%

Source: Gloucester County GIS 2020; NJDEP 2009, NJDOT 2019

Impact on the Economy

Wildfire events can have major economic impacts on a community from the initial loss of structures and the subsequent loss of revenue from destroyed business. These events may cost thousands of taxpayer dollars to suppress and control and may involve hundreds of operating hours on fire apparatus and thousands of volunteer man hours from the volunteer firefighters. There are also many direct and indirect costs to local businesses that excuse volunteers from working to fight these fires.

Impact on the Environment

According to the USGS, post-fire runoff polluted with debris and contaminants can be extremely harmful to ecosystem and aquatic life (USGS 2018). Studies show that urban fires in particular are more harmful to the environment compared to forest fires (USGS 2018). The age and density of infrastructure within Gloucester County can exacerbate consequences of fires on the environment because of the increased amount of chemicals and contaminants that would be released from burning infrastructure. These chemicals, such as iron lead, and zinc, may leach into the storm water, contaminate nearby streams, and impair aquatic life.



Future Changes That May Impact Vulnerability

Understanding future changes that effect vulnerability in the County can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. Changes in the natural environment and built environment and how they interact can also provide insight about ways to plan for the future.

Projected Development

As discussed and illustrated in Section 3 (County Profile), areas targeted for future growth and development have been identified across the County. Any changes in development can impact the County's risk to the wildfire hazard of concern. Therefore, the County should implement wildfire management strategies in existing building code to protect structures against the residual impacts from wildfire such as heat, debris, and char. Furthermore, development should be built with access to transit routes that will enable easier evacuation during a wildfire event.

Projected Changes in Population

According to the 2019 5-year population estimates from the American Community Survey, the population of Gloucester County (i.e., 291,165 persons) has increased by approximately 0.9-percent since 2010. Any changes in the density of population can impact the number of persons exposed to the wildfire hazard. Fire suppression capabilities are high at the State and local levels. However, new development and changes in population with a mix of additional structures, ornamental vegetation, and wildland fuels will require continued assessment of the hazard and mitigation risk.

Climate Change

According to the USDA Forest Service, climate change will likely alter the atmospheric patterns that affect fire weather. Changes in fire patterns will, in turn, impact carbon cycling, forest structure, and species composition (EPA 2020). Climate change associated with warmer temperatures, changes in rainfall, and increased periods of drought may create an atmospheric and fuel environment that is more conducive to large, severe fires (USDA 2013). Under a changing climate, wildfires exceeding 50,000 acres has increased over the past 30 years (USDA 2013). However, a study from the National Interagency Fire Center of the USGS shows that the number of acres burned by wildfires in New Jersey has decreased by 0.25 acres per square mile from events that took place in 2000 to 2014 compared to events that took place in 1984 and 1999 (EPA 2020).

Understanding the climate/fire/vegetation interactions is essential for addressing issues associated with climate change that include:

- Effects on regional circulation and other atmospheric patterns that affect fire weather
- Effects of changing fire regimes on the carbon cycle, forest structure, and species composition, and
- Complications from land use change, invasive species and an increasing WUI.



As discussed earlier, average temperatures are anticipated to increase in New Jersey, therefore, suitability of habitats for specific types of trees potentially changes, altering the fire regime and resulting in more frequent fire events and changes in intensity. Prolonged and more frequent heat waves have the potential to increase the likelihood of a wildfire. The increased potential combined with stronger winds may make it harder to contain fires and thus increase the County's vulnerability to this hazard.

Change of Vulnerability Since the 2016 HMP

The 2022 HMP has been updated to reflect 2015-2019 ACS 5-year estimates for population changes. The building stock inventory was updated using data from Gloucester County. Further, the building stock inventory replacement cost values were updated using RS Means 2021 values providing an overall update to the assets assessed in this risk assessment. The NJDEP Wildfire Fuel Hazard spatial layer has not been updated since the last HMP; therefore, changes and any increases in overall wildfire hazard exposure are attributed to increases in population and new development.

DRAFT