4.3.13 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 Mercer County.

2021 HMP UPDATE CHANGES

- Previous occurrences were updated with events that occurred between 2015 and 2020.
- A vulnerability assessment was conducted for the wildfire hazard referencing the NJDEP 2009 wildfire fuel hazard areas, an updated building stock, an updated critical facility dataset, and the ACS 2018 5-year population estimates. To determine exposure, a spatial analysis was conducted using the New Jersey Forest Fire Service (NJFFS) Fuel Hazard Area guidelines.

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 4.3.4 (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.

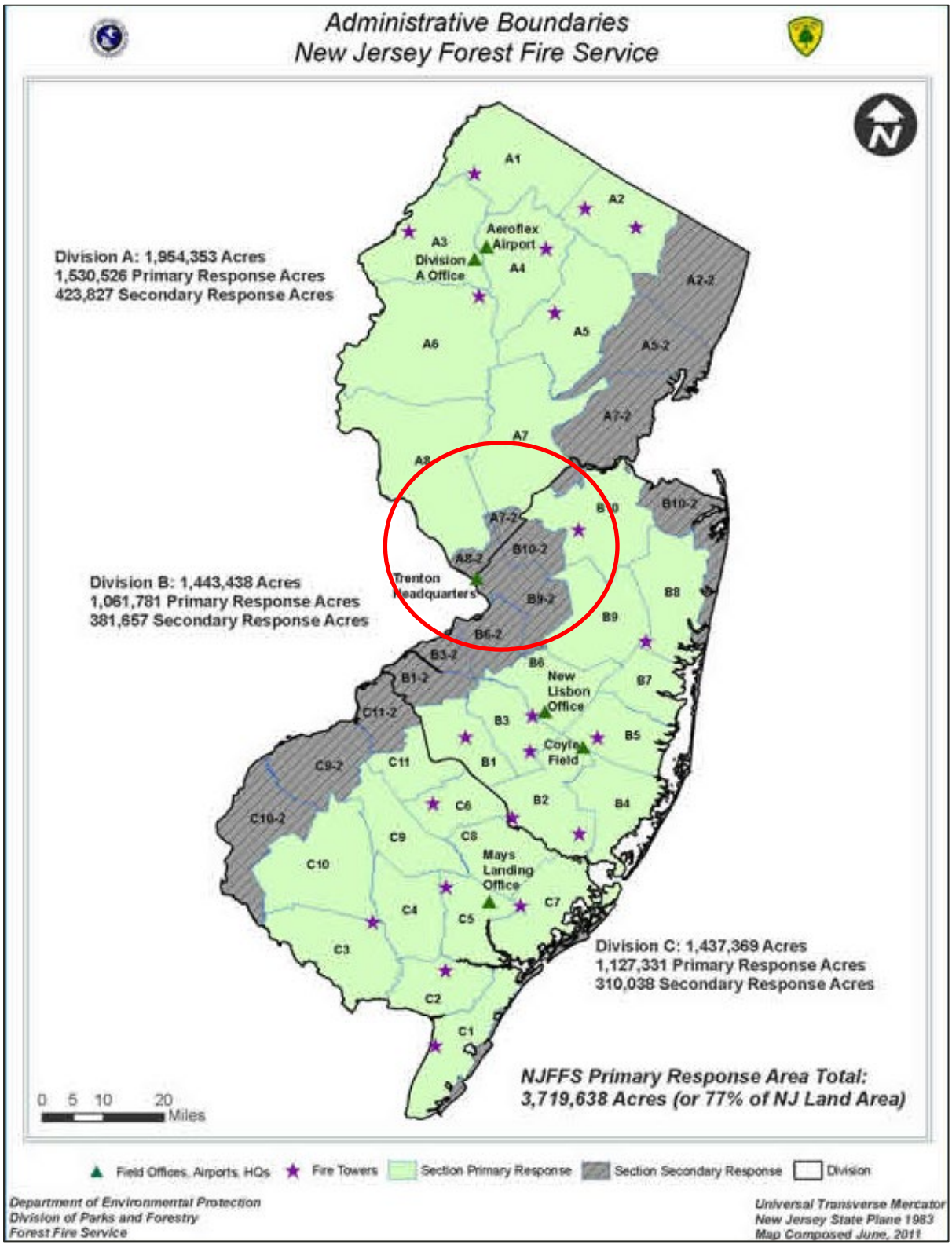
Location

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 Mercer County, wildfires have the potential to occur anywhere in the County.

The NJFFS, a division of the 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 4.3.13-1 illustrates the NJFFS region divisions within the State. Mercer County is located in Division A (Northern NJ) and Division B (Central NJ).

Figure 4.3.13-1. Fire Divisions of New Jersey



Source: *NJDEP 2015*

Note: *The red circle indicates the location of Mercer County. The County is located in Fire Division A.*

Wildfire Fuel Hazard Areas

NJFFS developed Wildfire Fuel Hazard data for the entire state based on NJDEP data; refer to Figure 4.3.13-2 for the locations of the extreme, very high, and high hazard areas in Mercer County. For details on the information was developed, refer to: https://www.state.nj.us/dep/gis/njfh.html. Hopewell Township has the greatest number of acres categorized as extreme wildfire risk.

Table 4.3.13-1. Area in the Wildfire Fuel Hazard Ranking Zones in Mercer County

Hazard Area	Area (Acres)
Extreme	2,085
Very High	3,186
High	3,761

Source: NJDEP 2019; NJFFS 2009

Table 4.3.13-2. Approximate Area in Wildfire Fuel Hazard Ranking Zones in Mercer County

Municipality	Total Area (Acres)	New Jersey Forest Fire Service Risk Areas					
		High	Percent in Hazard Area	Very High	Percent in Hazard Area	Extreme	Percent in Hazard Area
East Windsor (Twp)	10,019	193	1.9%	113	1.1%	38	0.4%
Ewing (Twp)	9,784	156	1.6%	193	2.0%	114	1.2%
Hamilton (Twp)	25,469	1,091	4.3%	253	1.0%	32	0.1%
Hightstown (B)	810	1	0.1%	7	0.9%	0	0.0%
Hopewell (B)	464	4	0.9%	8	1.7%	0	0.1%
Hopewell (Twp)	37,430	981	2.6%	2,017	5.4%	1,602	4.3%
Lawrence (Twp)	14,063	349	2.5%	247	1.8%	112	0.8%
Pennington (B)	624	7	1.1%	1	0.2%	2	0.3%
Princeton	11,784	90	0.8%	101	0.9%	106	0.9%
Robbinsville (Twp)	13,168	369	2.8%	178	1.4%	17	0.1%
Trenton (C)	4,893	51	1.0%	14	0.3%	0	0.0%
West Windsor (Twp)	16,801	469	2.8%	55	0.3%	64	0.4%
Mercer County (Total)	**145,308**	**3,761**	**2.6%**	**3,186**	**2.2%**	**2,085**	**1.4%**

Source: NJDEP 2019; NJFFS 2009
Note: B = Borough; C = City, Twp = Township; % = Percent

Wildfire/Urban Interface (WUI)

Wildland urban interface (WUI) is the area where natural areas and development meet. Since 1990, 60% of new homes in the U.S. have been built in the WUI. These homes are at risk of structure loss, injury, and death from a wildfire. The WUI is divided into two categories: intermix and interface. Intermix WUI refers to areas where housing and wildland vegetation intermingle, while interface WUI refers to areas where housing is in the vicinity of a large area of dense wildland vegetation (Martinuzzi et al. 2015). Intermix areas have more than one house per 40 acres and have more than 50% vegetation. Interface areas have more than one house per 40 acres, have

less than 50% vegetation, and are within 1.5 miles of an area over 1,235 acres that is more than 75% vegetated (Stewart et al. 2006).

A detailed WUI (interface and intermix) was obtained through the SILVIS Lab, Department of Forest Ecology and Management, University of Wisconsin-Madison which also defines the wildfire hazard area. The California Fire Alliance determined that 1.5 miles is the approximate maximum distance that firebrands can be carried from a wildland fire to the roof of a house. Therefore, even structures not located within the forest are at risk to wildfire. This buffer distance, along with housing density and vegetation type were used to define the WUI illustrated in Figure 4.3.13-3.

Figure 4.3.13-2. Wildfire Fuel Hazard for Mercer County

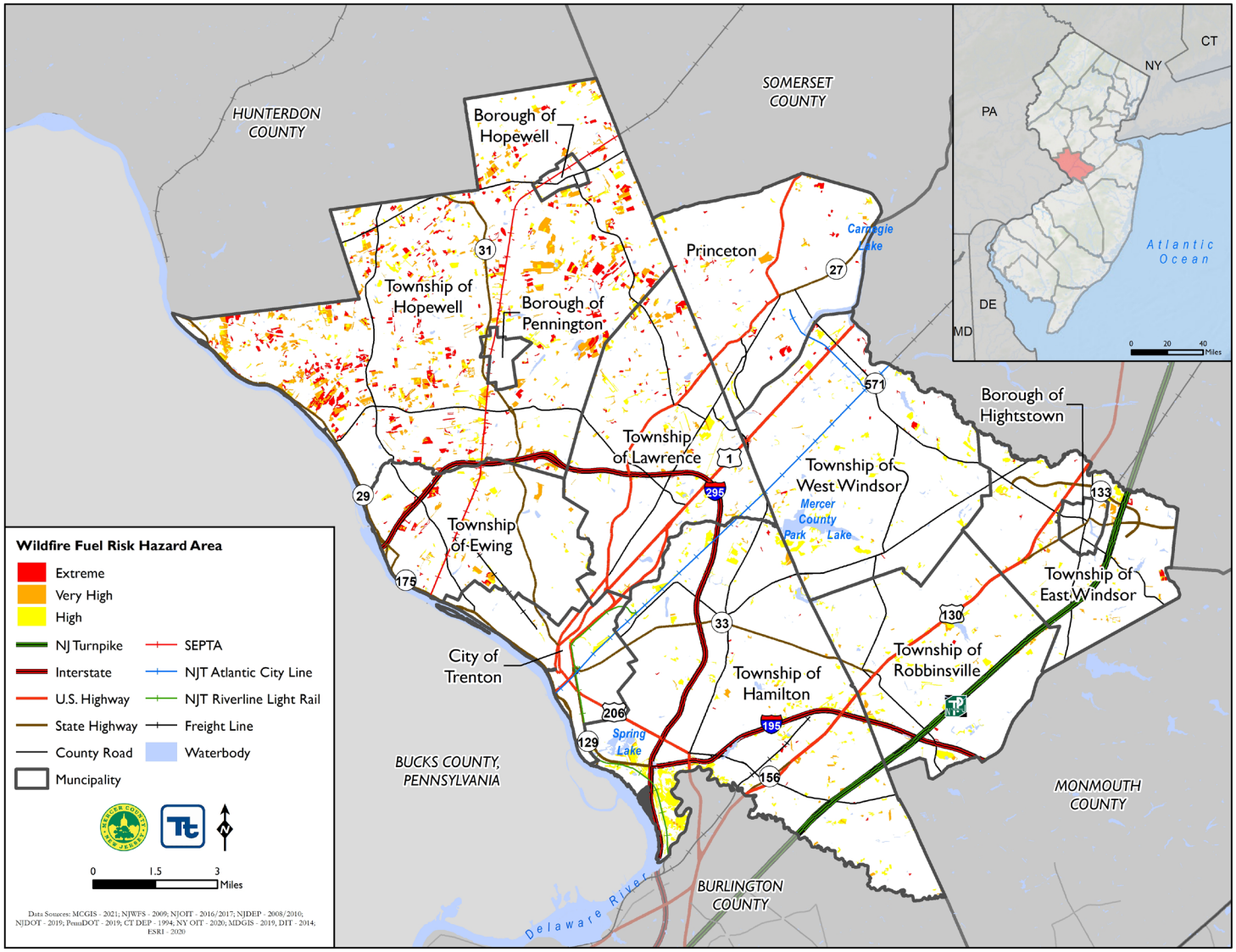
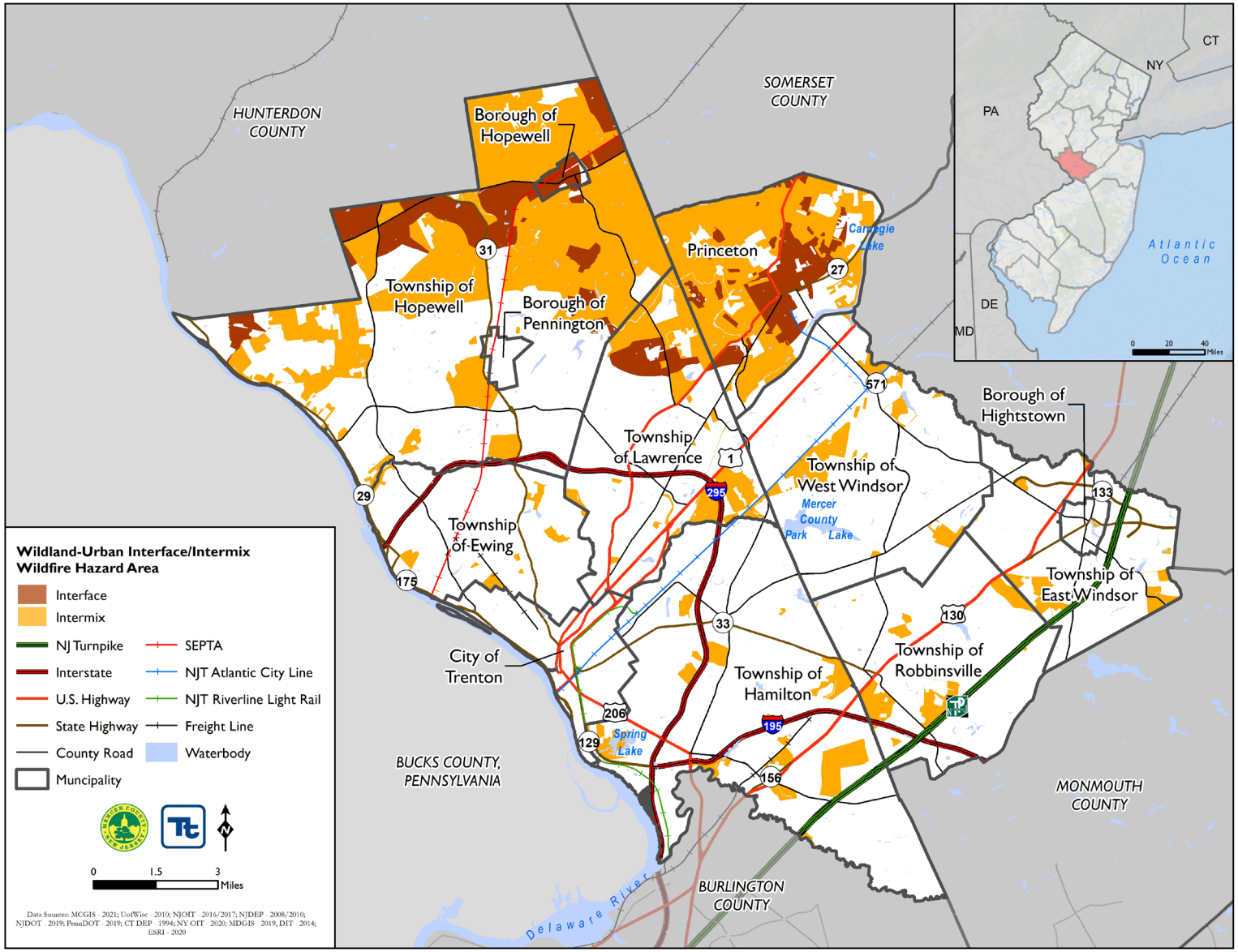


Figure 4.3.10-3. Wildland-Urban Interface/Intermix Wildfire Hazard Area for Mercer County



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 4.3.10-3. 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

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. Mercer County was not included in either FEMA FMA declaration (FEMA 2021).

U.S. Department of Agriculture Disaster Declarations

The Secretary of Agriculture from the 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, Mercer County was not included in any USDA disaster declarations related to wildfire (USDA 2021).

Wildfire Events

As noted in Table 4.3.13-4, there were no wildfire events that have caused significant impacts in Mercer County from 2015 to 2021.

Table 4.3.13-4. Wildfire Events in Mercer County, 2015 to 2021

Date(s) of Event	Event Type	FEMA Declaration Number (if applicable)	Mercer County Designated?	Location	Description
No significant wildfire events were reported in Mercer County from 2015 to 2021.					

Source: *FEMA 2021; NOAA-NCEI 2021; NJOEM 2019*
Note: *Not all events that have occurred in Mercer 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 Mercer 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 Mercer 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, Mercer County experienced 12 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 Mercer County in future years (NOAA NCEI 2021).

Table 4.3.13-5. Probability of Future Occurrence of Wildfire Events

Hazard Type	Number of Occurrences Between 1950 and 2021	Rate of Occurrence or Annual Number of Events (average)	Recurrence Interval (in years) (# Years/Number of Events)	Probability of Event in any given year	Percent chance of occurrence in any given year
Wildfire	12	0.17	5.92	0.17	16.9%

Source: NOAA-NCEI 2021

In Section 4.4, the identified hazards of concern for Mercer 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 that cause significant impacts is considered 'occasional'.

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% 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% increase. By 2050, annual precipitation in New Jersey could increase by 4% to 11% (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 while 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 Mercer 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).

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 4.3.13-5 summarizes the estimated population located in the wildfire fuel hazard area by municipality.

Based on the analysis, an estimated 1,099 residents, or 0.3-percent of the County's population, are located in the extreme, high, and very high wildfire fuel hazard areas. Overall, the Township of Hamilton has the greatest number of individuals located in the extreme, very high, and high hazard areas (313 persons) and the Borough of Hightstown has the greatest proportion of its population exposed (1.0-percent).

Of the population exposed, in addition to emergency responders, the most vulnerable include the economically disadvantaged and the population over age 65. In Mercer County, there are 40,980 persons living below the poverty level and 46,347 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 impact to their families. In addition, their recovery may be longer. 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 4.3.13-6 Population in Wildfire Fuel Hazard Areas

Jurisdiction	American Community Survey (2015-2019) Population	Estimated Number of Persons Located in the High, Very High, and Extreme Wildfire Fuel Hazard Areas	Percent of Total
East Windsor (Twp)	27,245	163	0.6%
Ewing (Twp)	36,037	195	0.5%
Hamilton (Twp)	87,424	313	0.4%
Hightstown (B)	5,375	55	1.0%
Hopewell (B)	1,915	0	0.0%
Hopewell (Twp)	18,067	127	0.7%

Jurisdiction	American Community Survey (2015-2019) Population	Estimated Number of Persons Located in the High, Very High, and Extreme Wildfire Fuel Hazard Areas	Percent of Total
Lawrence (Twp)	32,614	63	0.2%
Pennington (B)	2,531	13	0.5%
Princeton	31,000	38	0.1%
Robbinsville (Twp)	14,365	102	0.7%
Trenton (C)	83,412	12	0.0%
West Windsor (Twp)	27,937	20	0.1%
Mercer County (Total)	**367,922**	**1,099**	**0.3%**

Source: American Community Survey 2018 5-year estimates; NJDEP 2009
Note: B – Borough; C– City; Twp – Township; % - Percent

Impact on General Building Stock

Buildings located in 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 . 4.3.10-7 summarizes the estimated building stock inventory located in the hazard area by municipality. Approximately 1.3-percent ($1.9 billion) of the County's building replacement cost value is located in the extreme/very high/high hazard area. The Township of Hamilton has the greatest number of buildings located in the wildfire hazard area (138 structures – 0.5-percent of its total), and the Borough of Hightstown and the Township of Hopewell have the greatest proportion of buildings located in the wildfire hazard area (0.9-percent).

Table 4.3.13-7. Impact of Wildfire Hazard upon General Building Stock

Jurisdiction	Number of Buildings	Total Replacement Cost Value	Number of Buildings Located in the High, Very High, and Extreme Wildfire Fuel Hazard Areas	Percent of Total	Total Replacement Cost Value of Structures Located in the High, Very High, and Extreme Wildfire Fuel Hazard Areas	Percent of Total
East Windsor (Twp)	5,439	$7,712,408,240	34	0.6%	$38,910,540	0.5%
Ewing (Twp)	12,054	$18,161,858,212	71	0.6%	$235,571,728	1.3%
Hamilton (Twp)	29,515	$30,878,928,699	138	0.5%	$898,194,137	2.9%
Hightstown (B)	1,624	$1,867,544,787	14	0.9%	$8,383,549	0.4%
Hopewell (B)	844	$850,167,003	0	0.0%	$0	0.0%
Hopewell (Twp)	7,719	$11,709,101,176	66	0.9%	$191,496,153	1.6%
Lawrence (Twp)	9,027	$14,232,035,476	42	0.5%	$340,364,955	2.4%
Pennington (B)	953	$1,009,760,468	4	0.4%	$5,878,261	0.6%
Princeton	7,527	$12,608,393,758	9	0.1%	$10,029,196	0.1%
Robbinsville (Twp)	4,162	$7,167,631,183	30	0.7%	$24,991,619	0.3%
Trenton (C)	17,152	$36,604,311,832	9	0.1%	$171,591,443	0.5%
West Windsor (Twp)	7,563	$13,179,360,332	11	0.1%	$59,072,284	0.4%
Mercer County (Total)	**103,579**	**$155,981,501,165**	**428**	**0.4%**	**$1,984,483,864**	**1.3%**

Source: Mercer County GIS 2020; RS Means 2021; NJDEP 2009
Note: B – Borough; C – City; Twp – Township; % - Percent

Impact on Critical Facilities and Lifelines

In Mercer County, there are 97 critical facilities and lifelines located in the wildfire hazard area. Out of these exposed critical facilities, 48 are bridges. The Township of Hopewell has the greatest number of critical facilities exposed to the wildfire fuel hazard areas (38 facilities). Refer to Table . 4.3.10-8 which summarizes the number of exposed critical facilities and lifelines by jurisdiction.

Additionally, Table 4.3.13-9 summarizes the distribution of critical facilities exposed to the wildfire fuel hazard area.

Table 4.3.13-8. Estimated Number of Critical Facilities and Lifelines Exposed to the Wildfire Fuel Hazard Area

Jurisdiction	Total Number of Critical Facilities	Total Number of Lifelines	Number of Critical Facilities and Lifeline Facilities Located in the High, Very High, and Extreme Wildfire Fuel Hazard Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
East Windsor (Twp)	171	154	11	6.4%	11	7.1%
Ewing (Twp)	266	215	6	2.3%	5	2.3%
Hamilton (Twp)	639	537	3	0.5%	3	0.6%
Hightstown (B)	70	63	0	0.0%	0	0.0%
Hopewell (B)	47	39	0	0.0%	0	0.0%
Hopewell (Twp)	438	406	38	8.7%	36	8.9%
Lawrence (Twp)	334	304	6	1.8%	5	1.6%
Pennington (B)	44	40	0	0.0%	0	0.0%
Princeton	252	209	6	2.4%	6	2.9%
Robbinsville (Twp)	136	127	3	2.2%	3	2.4%
Trenton (C)	701	478	13	1.9%	13	2.7%
West Windsor (Twp)	288	234	11	3.8%	9	3.8%
Mercer County (Total)	**3,386**	**2,806**	**97**	**2.9%**	**91**	**3.2%**

Source: Mercer County GIS 2020; NJDEP 2009
Note: B – Borough; C – City; Twp – Township; % - Percent

Table 4.3.13-9. Distribution of Critical Facilities Exposed to the Wildfire Fuel Hazard Area

Jurisdiction	Critical Facilities Located Within the High, Very High, and Extreme Wildfire Fuel Hazard Area															
	Bank	Bridge	Community Services	Dam	Federal Building	Hazardous Material Facility	Major Employer	Park/Recreation	Police Station	Potable Water Well	Primary Education	Public Housing	Rail Yard	State Building	Wastewater Lift Station	Wastewater Treatment Plant
East Windsor (Twp)	0	6	0	1	0	2	0	0	0	0	0	0	0	0	2	0
Ewing (Twp)	0	1	0	0	1	0	1	0	1	0	1	1	0	0	0	0
Hamilton (Twp)	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Hightstown (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hopewell (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hopewell (Twp)	1	24	1	2	0	0	0	2	0	7	0	0	0	0	0	1
Lawrence (Twp)	0	3	0	1	0	1	0	1	0	0	0	0	0	0	0	0
Pennington (B)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Princeton	0	3	0	2	0	0	0	0	0	0	0	0	0	0	1	0
Robbinsville (Twp)	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trenton (C)	0	3	0	0	0	0	0	0	0	0	0	0	9	1	0	0
West Windsor (Twp)	1	3	0	0	0	0	0	2	0	4	0	0	0	0	1	0
Mercer County (Total)	**2**	**48**	**1**	**6**	**1**	**3**	**1**	**5**	**1**	**11**	**2**	**1**	**9**	**1**	**4**	**1**

Source: Mercer County GIS 2020; NJDEP 2009
Note: B – Borough; C – City; Twp – Township

Table 4.3.13-10. Estimated Number of Lifelines Categorized by FEMA Lifeline Categories Exposed to the Wildfire Fuel Hazard Area

FEMA Lifeline Category	Number of Lifelines	Number of Lifelines Located in the High, Very High, and Extreme Wildfire Fuel Hazard Area
Communications	160	2
Energy	132	0
Food, Water, and Shelter	620	17
Hazardous Materials	95	3
Health and Medical	422	1
Safety and Security	587	11
Transportation	790	57
Mercer County (Total)	**2,806**	**91**

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

Wildfires can have an impact on 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.

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 contaminates 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 Mercer County can exacerbate consequences of fires on the environment because of the increased amount of chemicals and contaminates 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.

Cascading Impacts on Other Hazards

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. Additionally, wildfires can be increased with rising temperatures and increased droughts. More information about the drought and severe weather hazards of concern can be found in Section 5.4.3 and Section 5.4.11, respectively.

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 2018 5-year population estimates from the American Community Survey, the population of Mercer County (i.e., 142,298 persons) has decreased by approximately 4.7-percent since 2010. Even though the population has decreased, 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 conductive 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 NJDEP Wildfire Fuel Hazard spatial layer has not been updated since the last HMP. The 2021 HMP has been updated to reflect 2015-2019 AS 5-year estimates for population changes. The building stock inventory was updated using data from Mercer County. Further, the building stock inventory replacement cost values were updated using RS Means 2020 values providing an overall update to the assets assessed in this risk assessment.