



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 Morris County.

2020 HMP Changes

- Previous occurrences were updated with events that occurred between 2014 and 2019.
- The vulnerability assessment was conducted using updated population, building and critical facility/lifeline spatial data to determine exposure to the wildfire hazard.

4.3.13.1 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 4.3.6 (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.

In the State of New Jersey, each year, an average of 1,500 wildfires damage or destroy 7,000 acres of the state's forests. Wildfires not only damage woodlands but threaten homeowners who live within or adjacent to forest environments. From January 1, 2018, to August 12, 2018, there were 552 wildfires in New Jersey that burned over 1,300 acres. In contrast, during this same period in 2017, the State experienced 588 fires, which burned



over 5,024 acres (New Jersey Forest Fire Service [NJFFS] 2018). Details regarding the number of fires in Morris County were not included in these overall statistics.

Location

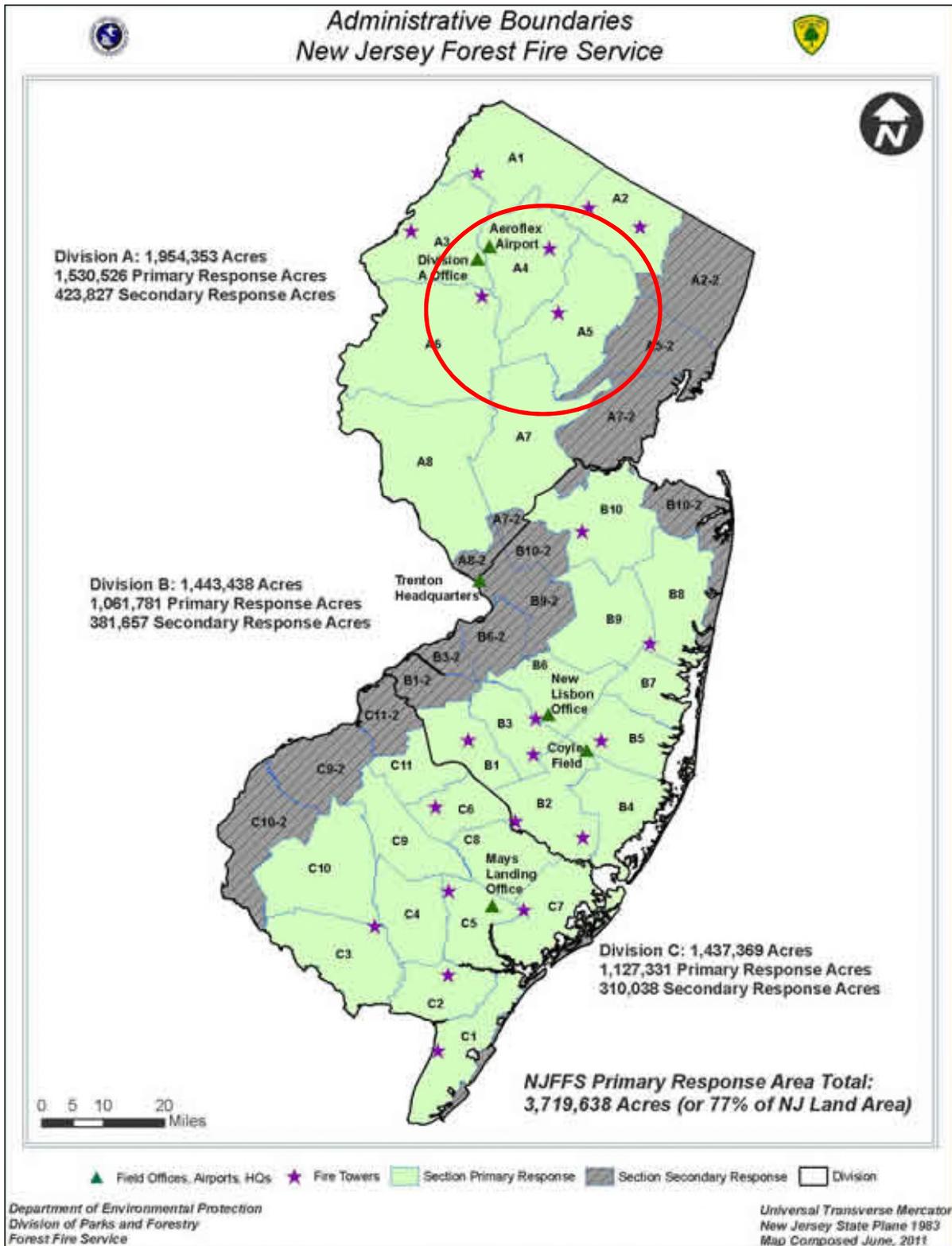
According to the U.S. Fire Administration (USFA), the fire problem in the U.S. varies from region to region. This often is a result of climate, poverty, education, demographics, and other causal factors (USFA, 2012). Wildfires occur in virtually all of the U.S. The western portion of the U.S. is subject to more frequent wildfires, due to their more arid climate and prevalent conifer and brush fuel types. Wildfires have proven to be the most destructive in California but have become an increasingly frequent and damaging phenomenon nationwide (FEMA, 1996). States with a large amount of wooded, brush, and grassy areas, such as California, Colorado, New Mexico, Montana, Kansas, Mississippi, Louisiana, Georgia, Florida, North and South Carolina, Tennessee, Massachusetts, and the national forests of the western U.S. are at highest risk for wildfires (University of Florida, 1998). In Morris 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 2013). Figure 4.3.13-1 illustrates the NJFFS region divisions within the State. Morris County is located in Division A (Northern NJ).



Figure 4.3.13-1. Fire Divisions of New Jersey



Source: NJDEP 2013

Note: The red circle indicates the location of Morris 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. For details on the information was developed, refer to: <https://www.state.nj.us/dep/gis/njfh.html>. A majority of Morris county has low fuel hazard and low risk; refer to Figure 4.3.13-2. Every municipality in Morris County has at least a small portion of the community located within the high to extreme risk area, with Chester Township having largest percentage of land within the high to extreme risk area (9.7%). Table 4.3.13-1 summarizes the amount of land in each of the wildfire fuel hazard ranking zones for Morris County. Table 4.3.13-2 summarizes the approximate area in the NJFFS risk areas in the County.

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

Hazard Area	Area (Square Miles)
Extreme	4.0
Very High	3.6
High	10.1
Moderate	75.8
Low	218.4

Source: NJFFS 2009

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

Municipality	Total Area (Square Miles)	NJ Forest Fire Service Risk Areas (square miles)			
		Low to Moderate	% in Low to Moderate Hazard Area	High to Extreme	% in High to Extreme Hazard Area
Boonton Town	2.5	0.59	23.7%	0.12	5.0%
Boonton Township	8.5	6.40	75.3%	0.25	2.9%
Butler Borough	2.1	0.53	25.7%	0.02	0.9%
Chatham Borough	2.4	0.61	25.7%	0.02	0.9%
Chatham Township	9.3	5.84	62.5%	0.22	2.3%
Chester Borough	1.6	0.65	40.6%	0.07	4.4%
Chester Township	29.2	21.65	74.1%	2.82	9.6%
Denville Township	12.7	6.98	54.8%	0.15	1.2%
Dover Town	2.7	0.80	29.3%	0.04	1.4%
East Hanover Township	8.1	3.55	43.8%	0.10	1.2%
Florham Park Borough	7.5	3.22	43.0%	0.08	1.1%
Hanover Township	10.7	3.99	37.1%	0.41	3.9%
Harding Township	20.6	16.73	81.4%	0.48	2.3%
Jefferson Township	42.8	30.74	71.8%	2.18	5.1%
Kinnelon Borough	19.2	14.90	77.5%	0.42	2.2%
Lincoln Park Borough	6.9	3.95	57.1%	0.19	2.7%
Long Hill Township	12.1	8.16	67.7%	0.37	3.1%
Madison Borough	4.3	1.04	24.1%	0.08	1.9%
Mendham Borough	6.0	3.79	63.3%	0.14	2.4%
Mendham Township	18.0	14.78	82.0%	0.68	3.8%
Mine Hill Township	3.0	1.76	58.6%	0.04	1.3%
Montville Township	19.1	10.86	56.8%	0.50	2.6%
Morris Plains Borough	2.6	0.74	28.4%	0.02	0.7%

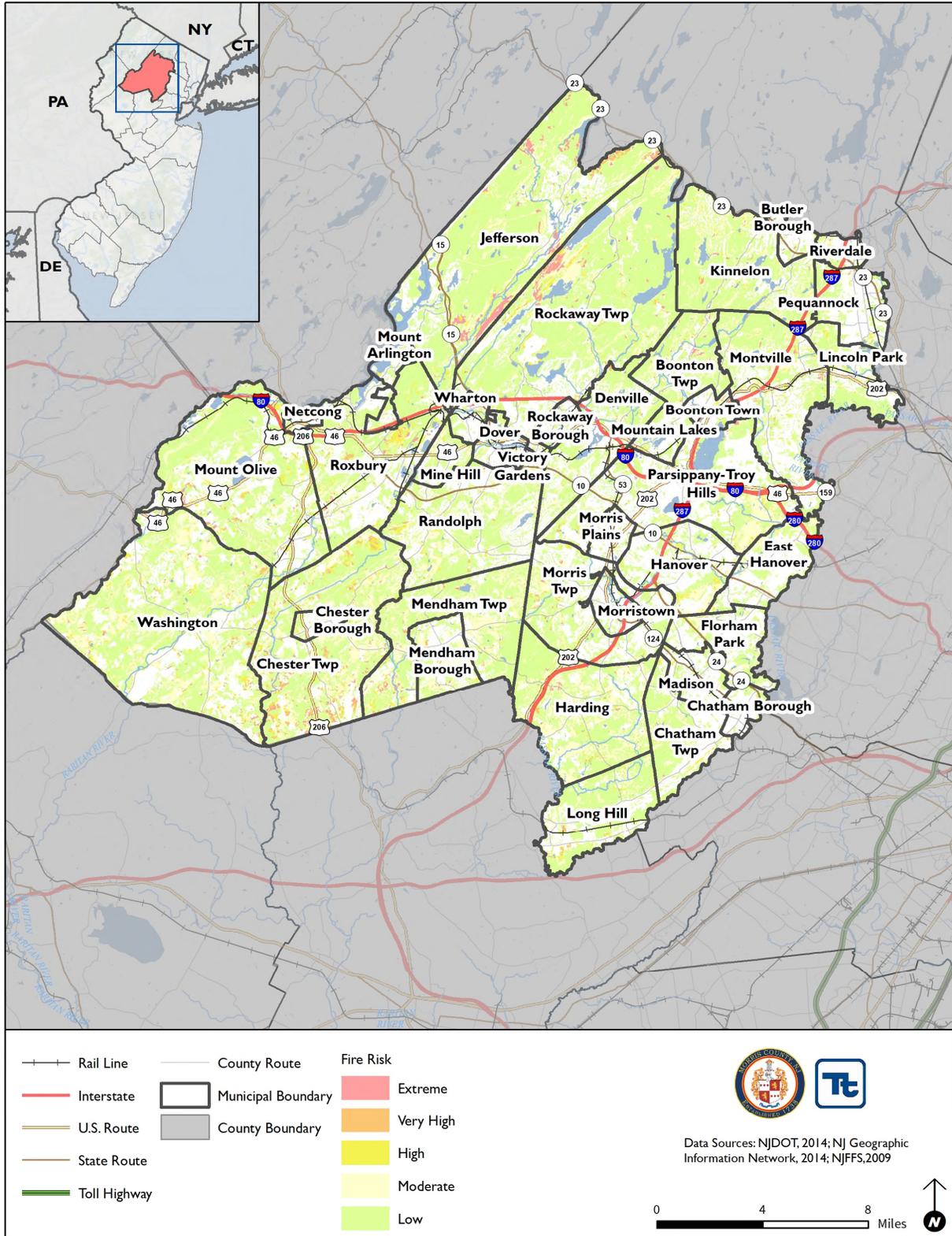


Municipality	Total Area (Square Miles)	NJ Forest Fire Service Risk Areas (square miles)			
		Low to Moderate	% in Low to Moderate Hazard Area	High to Extreme	% in High to Extreme Hazard Area
Morris Township	15.8	7.94	50.2%	0.38	2.4%
Morristown Town	3.0	0.73	24.2%	0.01	0.2%
Mount Arlington Borough	2.8	1.05	37.5%	0.05	1.8%
Mount Olive Township	31.2	19.04	61.0%	1.32	4.2%
Mountain Lakes Borough	2.9	1.25	42.9%	0.01	0.3%
Netcong Borough	1.0	0.23	24.4%	0.00	0.3%
Parsippany-Troy Hills Township	25.3	10.07	39.7%	0.76	3.0%
Pequannock Township	7.1	2.73	38.5%	0.16	2.3%
Randolph Township	21.2	12.07	57.1%	0.51	2.4%
Riverdale Borough	2.1	0.75	36.1%	0.08	4.1%
Rockaway Borough	2.1	0.61	29.0%	0.02	1.0%
Rockaway Township	45.9	32.44	70.7%	1.78	3.9%
Roxbury Township	21.9	12.01	54.8%	1.28	5.8%
Victory Gardens Borough	0.1	0.01	4.3%	0.00	0.4%
Washington Township	44.9	30.27	67.4%	1.95	4.4%
Wharton Borough	2.1	0.76	35.6%	0.06	2.7%
Morris County Total	481.4	294.20	61.1%	17.77	3.7%

Source: NJFFS 2009



Figure 4.3.13-2. Wildfire Fuel Hazard for Morris 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 4.3.13-3. Fire Danger Rating and Color Code

Fire Danger Rating and Color Code	Description
Low (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 (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 (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 (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 bum into heavier fuels.
Extreme (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 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

Between 1954 and 2019, 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. Morris County was not included in any FMA declarations.

Based on all sources used to research and identify wildfires in the County, there have been no wildfire incidents in Morris County between 2014 and 2019. Any small brush fires were managed locally with little impacts.

Probability of Future Occurrences

Estimating the approximate number of urban fires and wildfires to occur in Morris 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 Morris 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.

In Section 4.4, the identified hazards of concern for Morris County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Steering Committee and Planning Committee, the probability of occurrence for wildfire in the County is considered 'frequent' with little impacts due to scale of events and great capabilities in the County, region and State.

Climate Change Impacts

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).

Average annual temperatures have increased by 3°F in New Jersey over the past century (NOAA NCEI 2019). By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F (Sustainable Jersey Climate Change Adaptation Task Force 2011). As for precipitation, Northern New Jersey's 1971-2000 precipitation average was over five inches (12%) greater than the average from 1895-1970 (Office of New Jersey State Climatologist). Average annual precipitation is projected to increase in the region up to 10% by the 2020s and up to 15% by the 2050s. Most of the additional precipitation is expected to come during the winter months (New York City Panel on Climate Change [NPCC] 2013).

As stated above, according to the temperature projections for Northern New Jersey, including Morris 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).

4.3.13.2 Vulnerability Assessment

A spatial analysis was conducted using the NJFFS Wildfire Fuel Hazard spatial layer. For the purposes of the plan, 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 (Methodology and Tools) for additional details on the methodology used to assess wildfire risk.

Impact on Life, Health and Safety

As demonstrated by historic wildfire events in New Jersey and other parts of the country, potential losses include impacts to human health and life of residents and responders, structures, infrastructure and natural resources. In addition, wildfire events can have major economic impacts on a community from the initial loss of structures and the subsequent loss of revenue from destroyed businesses. 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 4.3.13-4 summarizes the estimated residential population living in the wildfire hazard area by municipality.

Based on the spatial analysis, an estimated 1,153 people, or less than 1-percent of the County’s population, live in the wildfire hazard area (NJFFS high, very high and extreme wildfire fuel hazard area). Overall, Chester Township has the greatest number of residents living in the hazard area (183 people). This is due to the large areas of open space including the presence of the Hacklebarney State Park and the Black River Wildlife Management Area. The Borough of Mount Arlington has the greatest percentage of its population exposed (130 people or 2.4% of the municipal population).

Of the population exposed, the most vulnerable include the economically disadvantaged and the population over age 65. 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. In the wildfire hazard area, there are approximately 182 people over the age of 65 and 39 people below the poverty level.

Table 4.3.13-4. Estimated Population Living in the Wildfire Hazard Area

Municipality	American Community Survey (2013-2017) Population	Estimated Population Exposed	
		Wildfire Hazard Area (Extreme, Very High and High)	Percent (%) of Total Exposed
Town of Boonton	8,390	3	<1%
Township of Boonton	4,353	23	0.5%
Borough of Butler	7,780	34	0.4%
Chatham Borough	9,003	0	0.0%
Chatham Township	10,507	32	0.3%
Chester Borough	1,540	3	0.2%





Municipality	American Community Survey (2013-2017) Population	Estimated Population Exposed	
		Wildfire Hazard Area (Extreme, Very High and High)	Percent (%) of Total Exposed
Chester Township	7,931	183	2.3%
Denville Township	16,822	5	<1%
Town of Dover	18,307	0	0.0%
Township of East Hanover	11,241	30	0.3%
Borough of Florham Park	11,792	8	0.1%
Township of Hanover	14,436	15	0.1%
Township of Harding	3,887	11	0.3%
Township of Jefferson	21,440	33	0.2%
Borough of Kinnelon	10,242	95	0.9%
Borough of Lincoln Park	10,464	3	<1%
Township of Long Hill	8,763	11	0.1%
Borough of Madison	16,080	0	0.0%
Borough of Mendham	4,992	8	0.2%
Township of Mendham	5,877	48	0.8%
Township of Mine Hill	3,609	0	0.0%
Township of Montville	21,739	67	0.3%
Township of Morris	22,498	18	0.1%
Borough of Morris Plains	5,605	0	0.0%
Town of Morristown	18,833	0	0.0%
Borough of Mount Arlington	5,405	130	2.4%
Township of Mount Olive	29,010	131	0.5%
Borough of Mountain Lakes	4,309	0	0.0%
Netcong Borough	3,245	3	0.1%
Township of Parsippany-Troy Hills	53,444	45	0.1%
Township of Pequannock	15,499	7	<1%
Township of Randolph	25,918	41	0.2%
Borough of Riverdale	4,238	9	0.2%
Borough of Rockaway	6,473	0	0.0%
Township of Rockaway	24,758	24	0.1%
Township of Roxbury	23,458	16	0.1%
Borough of Victory Gardens	1,655	0	0.0%
Township of Washington	18,713	119	0.6%
Borough of Wharton	6,591	0	0.0%
Morris County (Total)	498,847	1,153	0.2%

Sources: American Community Survey 5-year Estimate, 2017; NJFFS, 2009

Impact on General Building Stock

Buildings located within the NJFFS 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, stone or concrete. Table 4.3.13-5 summarizes the estimated building stock inventory located in the hazard area by municipality. Less than 1-percent (\$686 million) of the County’s building replacement cost value is located in the extreme/very high/high hazard area. Chester Township has the greatest number of buildings located in the wildfire hazard area (80





structures, or 2.2% of its total), while the Township of Rockaway has the greatest replacement cost value located in the hazard area (\$106 million or 1.5% of its total).

Table 4.3.13-5. Building Stock Replacement Value Located in Wildfire Fuel Hazard Ranking Zones

Municipality	Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Exposed			
			Number of Buildings - Extreme, Very High, and High	Percent (%) of Total	RCV - Extreme, Very High, and High	Percent (%) of Total
Town of Boonton	3,262	\$1,832,625,537	3	0.1%	\$56,455,160	3.1%
Township of Boonton	1,898	\$1,388,780,135	10	0.5%	\$8,941,511	0.6%
Borough of Butler	2,701	\$1,489,686,071	10	0.4%	\$4,571,201	0.3%
Chatham Borough	3,286	\$1,673,960,469	0	0.0%	\$0	0.0%
Chatham Township	4,080	\$2,300,237,613	11	0.3%	\$6,568,775	0.3%
Chester Borough	853	\$694,668,411	3	0.4%	\$37,087,726	5.3%
Chester Township	3,680	\$2,782,631,274	80	2.2%	\$45,685,277	1.6%
Denville Township	7,198	\$4,397,845,504	3	0.0%	\$2,733,159	0.1%
Town of Dover	4,514	\$2,640,787,978	3	0.1%	\$17,000,114	0.6%
Township of East Hanover	4,848	\$4,740,072,304	17	0.4%	\$9,413,269	0.2%
Borough of Florham Park	3,805	\$3,768,421,982	4	0.1%	\$26,325,084	0.7%
Township of Hanover	7,090	\$5,609,469,027	11	0.2%	\$15,453,719	0.3%
Township of Harding	2,230	\$1,808,255,972	10	0.4%	\$8,726,112	0.5%
Township of Jefferson	9,625	\$4,421,074,958	23	0.2%	\$8,878,519	0.2%
Borough of Kinnelon	4,093	\$2,858,766,250	39	1.0%	\$34,802,554	1.2%
Borough of Lincoln Park	4,166	\$2,125,371,898	2	0.0%	\$859,451	0.0%
Township of Long Hill	3,643	\$2,253,461,094	5	0.1%	\$2,004,832	0.1%
Borough of Madison	6,301	\$3,066,320,935	1	<1%	\$56,280	<1%
Borough of Mendham	2,139	\$1,479,178,043	3	0.1%	\$2,872,025	0.2%
Township of Mendham	2,667	\$2,099,041,883	22	0.8%	\$23,880,733	1.1%
Township of Mine Hill	1,590	\$766,971,485	1	0.1%	\$405,614	0.1%
Township of Montville	8,179	\$6,714,034,036	31	0.4%	\$30,940,427	0.5%
Township of Morris	9,713	\$6,091,077,654	14	0.1%	\$9,264,855	0.2%
Borough of Morris Plains	2,378	\$1,738,775,034	0	0.0%	\$0	0.0%
Town of Morristown	4,413	\$2,945,511,672	0	0.0%	\$0	0.0%
Borough of Mount Arlington	2,333	\$1,065,424,961	73	3.1%	\$29,361,224	2.8%
Township of Mount Olive	9,115	\$7,181,400,421	75	0.8%	\$65,779,166	0.9%
Borough of Mountain Lakes	1,642	\$1,183,405,498	0	0.0%	\$0	0.0%
Netcong Borough	1,100	\$695,081,980	1	0.1%	\$478,031	0.1%
Township of Parsippany-Troy Hills	17,064	\$11,747,551,200	62	0.4%	\$67,155,304	0.6%
Township of Pequannock	5,642	\$3,911,039,941	3	0.1%	\$7,950,550	0.2%



Municipality	Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Exposed			
			Number of Buildings - Extreme, Very High, and High	Percent (%) of Total	RCV - Extreme, Very High, and High	Percent (%) of Total
Township of Randolph	8,600	\$6,709,486,516	17	0.2%	\$9,892,518	0.1%
Borough of Riverdale	1,183	\$1,165,082,666	4	0.3%	\$4,521,952	0.4%
Borough of Rockaway	2,617	\$1,612,749,951	0	0.0%	\$0	0.0%
Township of Rockaway	11,485	\$7,225,058,745	32	0.3%	\$106,943,809	1.5%
Township of Roxbury	9,544	\$5,918,169,131	18	0.2%	\$16,264,735	0.3%
Borough of Victory Gardens	339	\$163,035,099	0	0.0%	\$0	0.0%
Township of Washington	8,062	\$5,265,032,309	59	0.7%	\$25,242,707	0.5%
Borough of Wharton	2,051	\$1,539,335,501	0	0.0%	\$0	0.0%
Morris County (Total)	189,129	\$127,068,881,137	650	0.3%	\$686,516,394	0.5%

Sources: Morris County 2019; Microsoft 2018; Open Street Map 2019; NJOIT 2018; NJFFS 2009

Impact on Critical Facilities

In Morris County, there are 11 critical facilities located in the wildfire hazard area. Three of these critical facilities are community lifelines. Refer to Table 4.3.13-6 for the number of types of critical facilities located in the wildfire hazard area.

Table 4.3.13-6. Number and Types of Critical Facilities Located in the Wildfire Hazard Area in Morris County

Type of Critical Facility	Number of Critical Facilities
Dam	5
Hazmat	2
Sewer Pump	1
Sewer Utility	1
Water	1
Well	1
Total	11

Source: NJFFS 2009

Roads and bridges in areas of fire risk are extremely important because they provide ingress and egress to large areas and, in some cases, to isolated neighborhoods. According to the exposure analysis, 2.5 miles of major highway fall within wildfire hazard area: NJ 124, US 46, US 206, NJ 53, NJ 15, and US 202.

Fires can create conditions that block or prevent access and can isolate residents and emergency service providers. Areas surrounding any dams located in wooded areas or other areas adjacent to the wildfire hazard areas are particularly vulnerable to additional impacts from a wildfire. Wildfires may not directly impact dams, but it can create conditions in which dams can be obstructed or damaged by falling tree debris and cause potential flooding in the area.



Impact on Economy

Wildfire events can have major economic impacts on a community including the loss of tax base and business revenue from destroyed structures. Depending upon the scale of the event, wildfires can cost thousands of taxpayer dollars to suppress and control and 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.

As noted above, wildfire can also severely impact roads and infrastructure. Disruption to transit routes can create connectivity issues for businesses and the transport of goods and services throughout the County.

Due to a lack of data regarding past structural and economic losses specific to Morris County or its municipalities, it is not possible to estimate potential future economic losses due to wildfire events currently.

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 the infrastructure within Morris County implies that a fire can have exacerbated consequences 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. In addition, wildfire can impact air quality, displace or destroy wildlife, and destroy habitat and valuable environmental resources.

Future Changes that May Impact Vulnerability

Understanding future changes that affect vulnerability can assist in planning for future development and ensure establishment of appropriate mitigation, planning, and preparedness measures. The County considered the following factors to examine potential conditions that may affect hazard vulnerability:

- Potential or projected development
- Projected changes in population
- Other identified conditions as relevant and appropriate, including the impacts of climate change

Projected Development

As discussed in Section 3 (County Profile), areas targeted for future growth and development have been identified across Morris County. It is anticipated that any new development and new residents in the wildfire hazard area will be exposed to the wildfire hazard.

Each municipality identified areas of recent development and proposed development in their community. Developments that could be located using an address or Parcel ID were geocoded and overlain with the NJFFS high, very high, and extreme wildfire hazard areas to determine exposure to the wildfire hazard. There are 8 anticipated new development located in the wildfire hazard area. Refer to Section 3 (County Profile), and Volume II Section 9 for potential new development in Morris County; and Figure 4.3.13-3 for a map of proposed new development and the NJFFS boundaries for Morris County.

Projected Changes in Population

In 2017, the Morris County Strategic Plan Steering Committee reviewed population trends for their community. The report indicates that employment is expected to decrease, the population is generally getting older, and household sizes are shrinking (Morris County 2017). Overall the County population has been increasing and is



projected to continue to increase the next few decades. Refer to Section 3 (County Profile) which includes a discussion on population trends for the County. As the population expands and new development is constructed, vulnerability to this hazard will depend upon the location of the new construction and its proximity to wildfire fuels. It will continue to be important to implement wildfire hazard mitigation measures in the County such as the coordination of prescribed burns between Morris County Park Commission and the NJFFS. The prescribed burns reduce the hazard for wildfire through the removal of accumulated vegetative fuels and control non-native invasive species and enhancement of wildlife habitat.

Climate Change

As discussed earlier, temperatures are anticipated to increase, 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 can increase the County's vulnerability. If stronger winds occur near a wildfire and emergency services are unable to initially contain the event, the fast-moving fire can spread to nearby developments. This can directly impact the County's population and built environment in the vicinity of the fire, and also indirectly affect those served by utility infrastructure that can be damaged by a fire.

Change of Vulnerability Since 2015 HMP

The entire County continues to be vulnerable to the wildfire hazard. Several differences exist between the 2015 HMP and this update. For this plan update, an updated general building stock based upon replacement cost value from MODIV tax assessment data and 2019 RS Means, and an updated critical facility inventory were used to assess the County's risk to the hazard areas; further lifelines were identified. In addition, the 2017 American Community Survey population estimates were used and estimated at a structural level as compared to the 2015 plan which evaluated exposure using 2010 U.S. Census blocks. The NJFFS Wildfire Fuel Hazard spatial layer has not been updated since the last HMP. Changes in exposure are attributed to increases in population and new development.



Figure 4.3.13-3. Wildfire Risk and New Development for Morris County

