# 4.3.9 Wildfire

## 2024 HMP Changes

- New and updated figures from federal and state agencies are incorporated.
- New Jersey Forest Fire Service (NJFFS) Wildfire Fuel Hazard data was used to identify wildfire fuel rankings in Burlington County.
- U.S. 2020 Census data was incorporated, where appropriate.
- Previous occurrences were updated with events that occurred between 2018 and 2023.

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 Burlington County.

## Hazard Description

A wildfire can be defined as any non-structural fire that occurs in the wildland. Three distinct types of wildfires 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. Wildfires can be caused by lightning, human carelessness, and arson (NPS 2022, National Geographic 2022). Most frequently, wildfires in New Jersey are caused by humans (NJOEM 2019). 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 (NPS 2022).

Wildfires can increase the probability of other natural disasters, specifically floods and mudflows. Wildfires, particularly 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 2021).

## Location

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 (NJFFS 2023). The height of wildfire season in New Jersey is typically March through May and culminates in early May, corresponding with the driest live fuel moisture periods of the year. Although the spring season is the most severe, summer and fall may also experience extensive fires in the state. While the spring season is historically the period in which wildfire danger is the highest, wildfires can occur every month of the year. Drought 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 (NJOEM 2019).

The New Jersey Forest Fire Service (NJFFS), a division of NJDEP, is responsible for protecting the 3.15 million acres of public and private wildland in the State. NJFFS is under the direction of the State fire warden and is headquartered in Trenton. It is broken up into three divisions (A, B, C). Each division is responsible for responding to wildfire events within their boundaries. Burlington County is located in Division B (see Figure 4.3.9-1). 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 2020).

All of Burlington County is susceptible to wildfire and they can occur anywhere in the County. However, the greatest risk for wildfire is in the southeastern two thirds of the County which is located in the Pinelands National Reserve.

### The Pinelands and Pine Barrens

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 combine to produce an expansive vegetative mosaic unsurpassed in the Northeast. The Pine Barrens was recognized as a nationally and internationally important ecological region when, in 1978, Congress created the Pinelands National Reserve, our country's first National Reserve and a U.S. 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 body 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 land. 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 (NPS 2018).

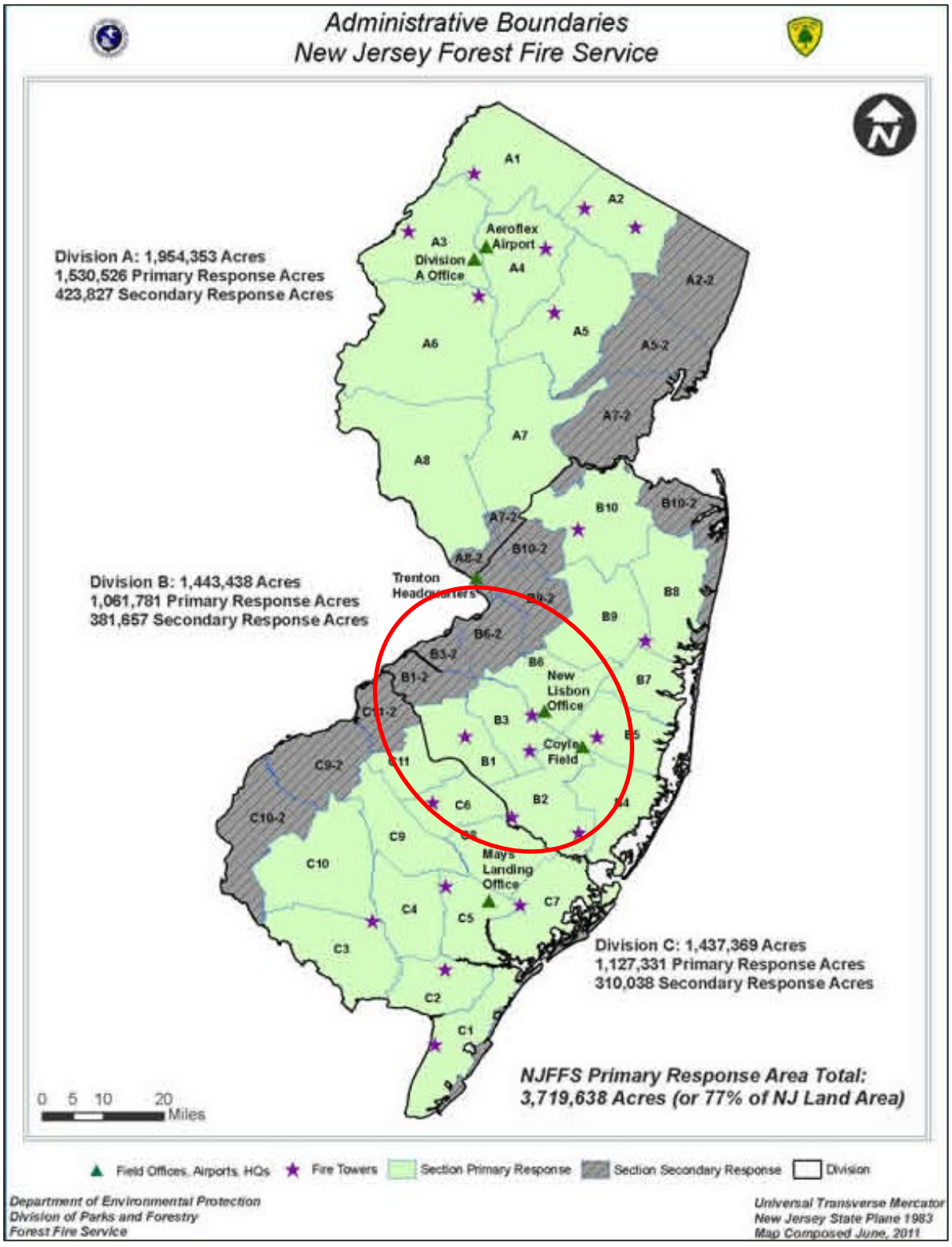
According to the New Jersey Pinelands Commission 2013 Pinelands Long-Term Economic Monitoring Program, 35 percent of Burlington County's municipalities (or 14 of the 40 municipalities) are located within the Pinelands Area, as shown in Figure 4.3.9-2 (NJ Pinelands Commission 2018). Approximately 21 percent of Burlington County's 2010 population (93,489 residents) resided in the Pinelands Area. Approximately 20 percent of the County's housing units (35,141 housing units) and 64 percent of the County's total land area (334,250 acres) were also reported as located within the Pinelands Area (NJ Pinelands Comsission 2014).

Naturally occurring wildfires burning several thousands of acres per year have been a common occurrence in the Pinelands for many hundreds of years. Development of the unique flora of the Pinelands is closely related to the occurrence of fire, with many plant species relying on fire for a part of their reproductive cycle (NJOEM 2019).

Pinelands fires tend to burn extremely hot and spread rapidly. Crown fires here are fairly common (spreading from treetop to treetop). While Pinelands fires generally do not cause casualties due to the low population residing within its limits, property loss can run in the thousands of dollars per event, not including costs associated with emergency response and firefighting. Often, State roads have closed because of smoke conditions (NJOEM 2019).

Conditions conducive to forest fires are some of the most consistent and serious impacts of drought, a hazard profiled earlier in this plan. This applies particularly to the Pine Barrens, where drying conditions favor the combustion of forest fuels. Generally, a relative humidity of less than 40 percent, winds greater than 13 miles an hour, and precipitation of less than 0.01 inches during a month are ideal conditions for forest fires in the Pine Barrens. The season of greatest fire threat runs from March through May, though extensive fires have occurred in the summer and autumn months (NJOEM 2019).

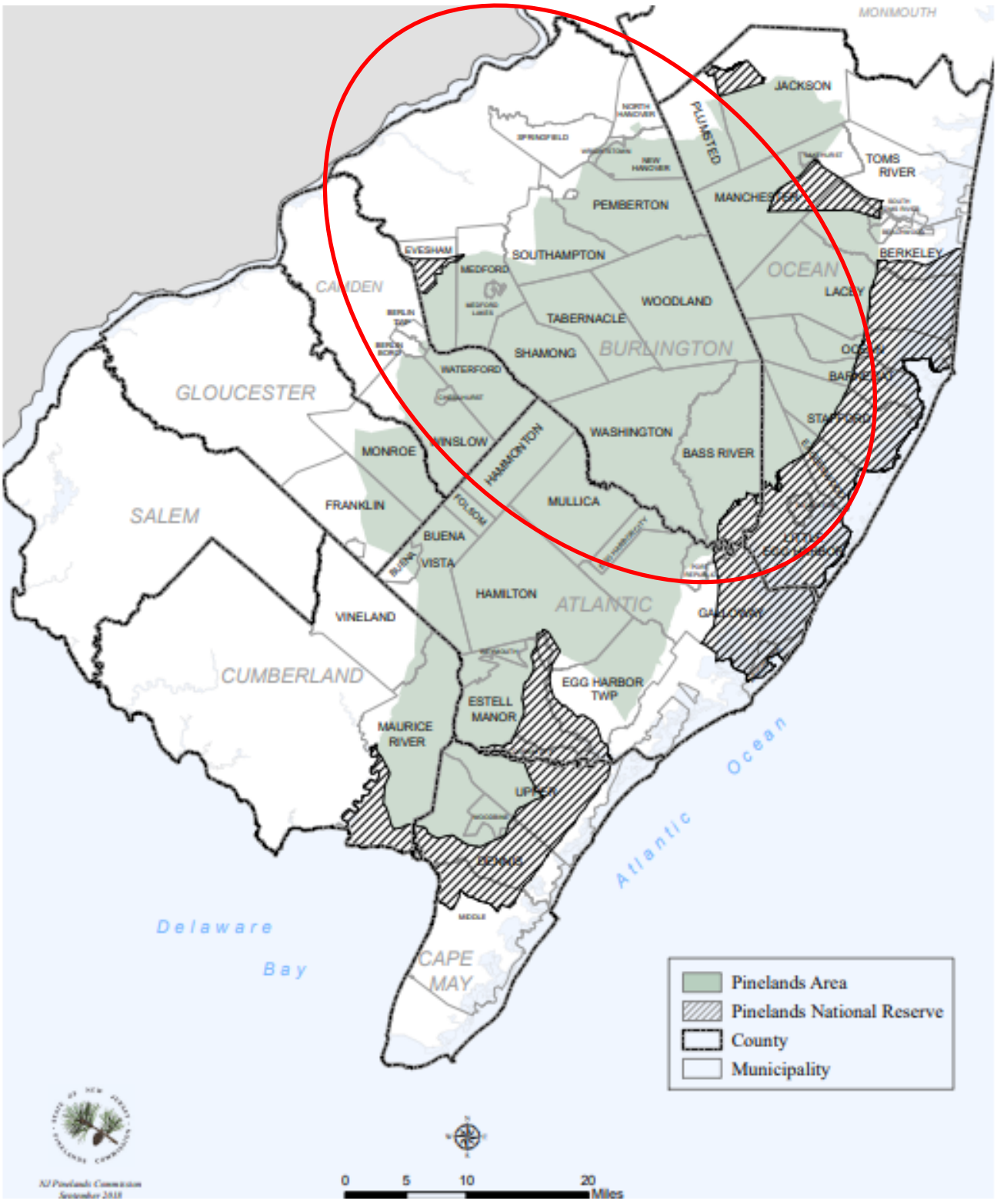
Figure 4.3.9-1. Fire Divisions of New Jersey




*Source: NJDEP 2015*

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

Figure 4.3.9-2. Pinelands Management and Planning Areas in Burlington County




*Source: NJ Pinelands Commission 2018*
*Note: The red circle indicates the location of Burlington County.*

### 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. Figure 4.3.9-3 illustrates the wildfire fuel hazard and wildfire risk for Burlington County. A majority of the County has extreme fuel hazard and moderate to high risk. With the exception of Fieldsboro, every municipality in Burlington County has at least a small portion of the community located within the high to extreme risk area.

### Burn Probability

Burn probability is the annual probability of wildfire burning in a specific location. At the community level, burn probability or wildfire likelihood is averaged where housing units occur. Burn Probability is based on fire behavior modeling across thousands of simulations of possible fire seasons. In each simulation, factors contributing to the probability of a fire occurring, including weather, topography, and ignitions are varied based on patterns derived from observations in recent decades (New Jersey Forest Fire Service 2023).

Burn Probability is not predictive and does not reflect any currently forecasted weather or fire danger conditions. Burn Probability is simply a probability that any specific location may experience wildfire in any given year. It does not say anything about the intensity of fire if it occurs (New Jersey Forest Fire Service 2023). Table 4.3.9-1 displays Burlington County's Burn Probability; also refer to Figure 4.3.9-4.

**Table 4.3.9-1. Burlington County Burn Probability**

| | Burn Probability Category | Acres | Percent |
|---|---|---|---|
| | 1/10 - Little to No Burn Probability | 119,578 | 22.8 % |
| | 2/10 - Low Burn Probability | 42,696 | 8.1 % |
| | 3/10 - Low Burn Probability | 45,519 | 8.7 % |
| | 4/10 - Moderate Burn Probability | 35,288 | 6.7 % |
| | 5/10 - Moderate Burn Probability | 35,018 | 6.7 % |
| | 6/10 - High Burn Probability | 53,168 | 10.1 % |
| | 7/10 - Very High Burn Probability | 171,864 | 32.7 % |
| | 8/10 - Extreme Burn Probability | 21,767 | 4.1 % |
| | 9/10 - Extreme Burn Probability | 0 | 0.0 % |
| | 10/10 - Extreme Burn Probability | 0 | 0.0 % |
| | **Total** | **524,898** | **100.0 %** |

Source: New Jersey Forest Fire Service 2023

Figure 4.3.9-3. Wildfire Risk for Burlington County

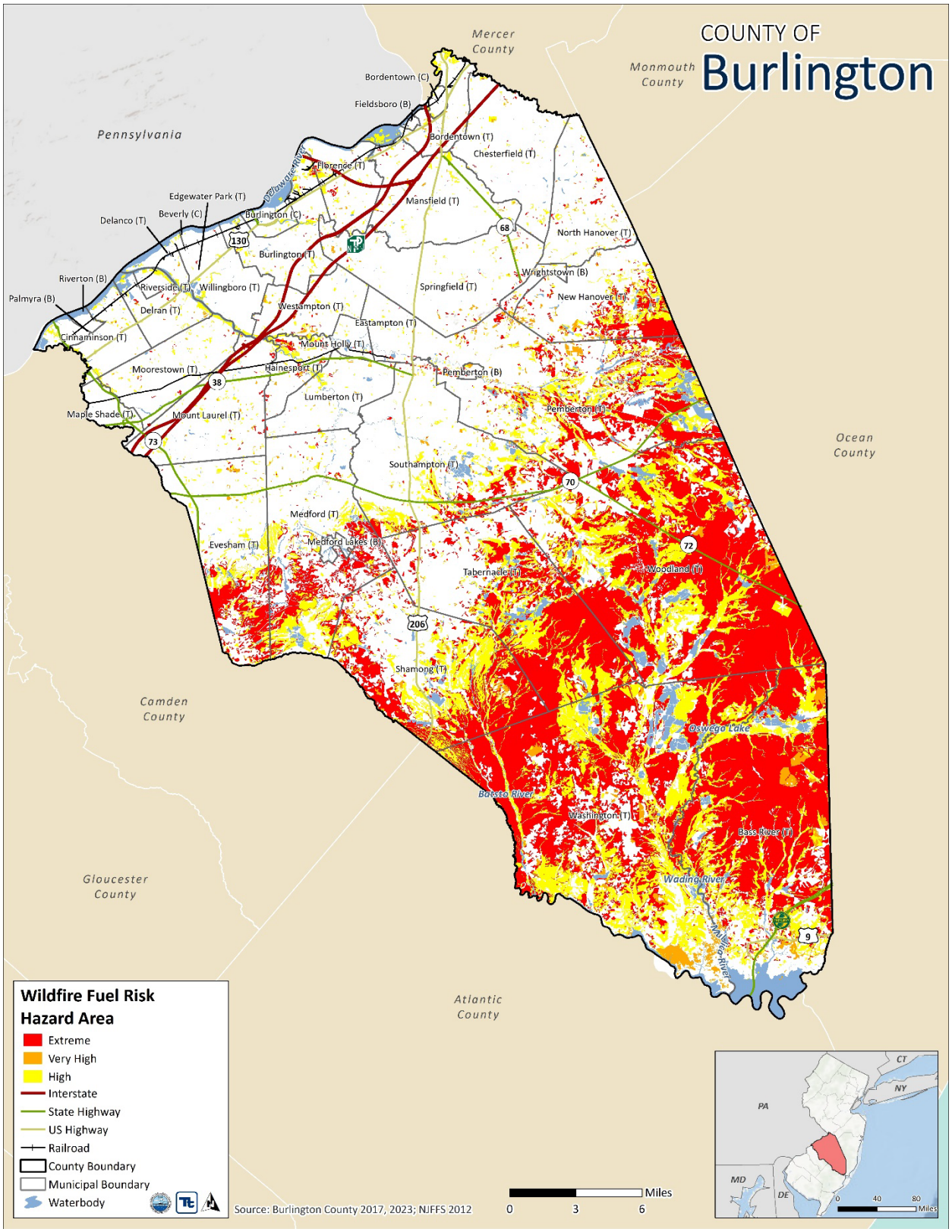
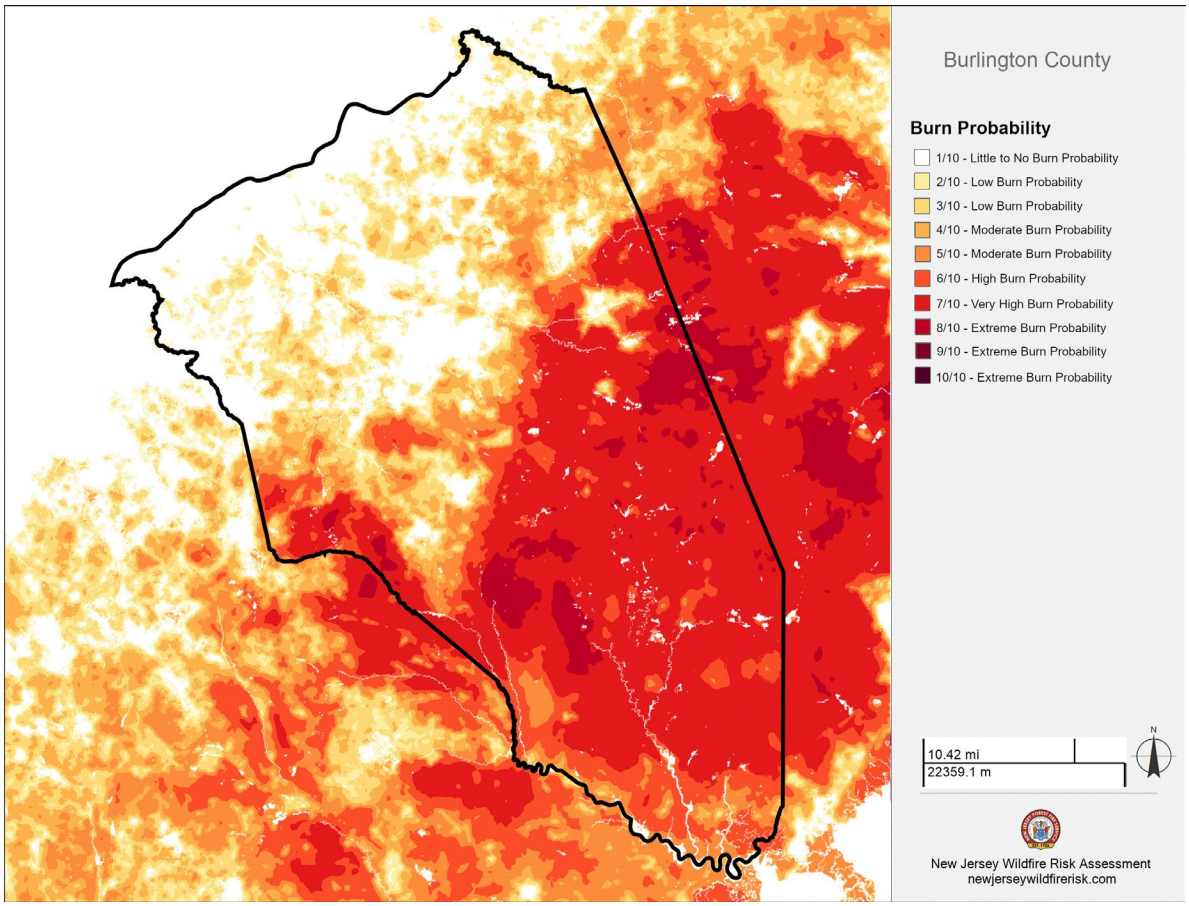


Figure 4.3.9-4. Burlington County Burn Probability




*Source: New Jersey Forest Fire Service 2023*

## Extent

The extent (that is, magnitude or severity) of wildfires depends on the 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 (NJDEP 2023).

- 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 (NOAA 2020).
- The *Keetch-Byram Drought Index* 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 (NPS 2023).

In addition to the two indices, the NJFFS uses the National Fire Danger Rating System 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 rating system uses a five-color coded system to help the public understand fire potential. The NJFFS slightly adapted the color system for their purposes. The National Fire Danger Rating System, with the NJFFS color scheme, can be seen in Table 4.3.9-2.

**Table 4.3.9-2. National Fire Danger Rating System**

| 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 burn 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 (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: USFS n.d.

According to the NJFFS, a major fire is declared when a fire reaches 100 acres of forest (or 500 acres of marsh), this is when additional support is provided to the Incident, such as Mobile Command Post, overhead support, including the Incident management team (a type 2 Incident Command Team), and fleet maintenance personnel are dispatch. All specialized units may be called on smaller incidents as needed. Including large agriculture pumps, and other specialized equipment. Helicopters can be used on smaller fire to help access remote areas, by using Bambi buckets for water drops, or airlifting equipment and firefighters to reach remote areas, as well as lighting backfires. Major fires in Central and Southern New Jersey in the Pine Barrens areas, can be mostly contained in 24 to 48 hours, due to the use of mechanized attack with off road wildland engines, and tractor plows/dozers (New Jersey Forest Fire Service 2023).

## Previous Occurrences and Losses

Historical information regarding previous occurrences and losses associated with wildfire events throughout New Jersey and areas within Burlington County was obtained from many sources. Given so many sources reviewed for the purpose of this HMP, loss and impact information regarding many events could vary depending on the source.

### FEMA Major Disasters and Emergency Declarations

Between May 1953 and June 2023, FEMA declared that the State of New Jersey experienced 2 wildfire-related disasters (DR) or emergencies (EM). Generally, these disasters cover a wide region of the State; therefore, they may have impacted many counties. Burlington County was included in one of these wildfire-related declarations between 1954 and 2023. Table 4.3.9-3 lists declarations from May 1953 and June 2023 for this HMP update. Detailed information about the declared disasters since 1953 is provided in Section 3 (County Profile).

Table 4.3.9-3. FEMA Declarations for Wildfire Events in Burlington County

| FEMA Declaration Number | Date of Declaration | Date of Event | Event Type | Event Title |
|---|---|---|---|---|
| **FM-2695-NJ** | May 16, 2007 | May 15, 2007 | Wildfire | New Jersey Warren Grove Fire |

Source: FEMA 2023

### 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 August 2018 and June 2023, Burlington County was not included in any wildfire-related agricultural disaster declarations (USDA 2023).

### Previous Events

For the 2024 HMP update, known wildfire events that impacted Burlington County between August 2018 and May 2023 are listed in Table 4.3.9-4. For events prior to August 2018, refer to the 2020 Burlington County HMP.

Table 4.3.9-4. Wildfire Events in Burlington County, 2018 to 2023

| Date of Event | Event Type | Declaration Number | Burlington County Designated? | Losses / Impacts |
|---|---|---|---|---|
| **April 22-24, 2018** | Wildfire | N/A | N/A | During the afternoon of April 22nd, a wildfire was spotted by the Cedar Bridge and Batsto fire towers. At first, about 50 acres were involved but a sea breeze caused the fire to quickly grow to 843 acres. The fire was located in Washington Township, just north of Lake Oswego. |
| **March 30 - April 1, 2019** | Wildfire | N/A | N/A | On March 30, a wildfire ignited in the Penn State Forest region within the Pinelands of Burlington County, NJ. Gusty southerly winds helped to cause rapid fire to spread; however widespread showers helped with containment efforts on March 31. By the time the fire was fully contained, more than 11,000 acres of forest had burned. The fire continued burning early on April 1, but was considered contained the prior evening. |

| Date of Event | Event Type | Declaration Number | Burlington County Designated? | Losses / Impacts |
|---|---|---|---|---|
| **June 19-21, 2022** | Wildfire | N/A | N/A | A wildfire (Mullica River Fire) was detected in a remote section of the Wharton State Forest in Mullica Twp. Unseasonably dry, windy conditions, combined with difficulty in accessing the initial fire location, led to rapid fire spread. By the time the fire was fully contained an estimated 14,983 acres had burned. This made it the largest wildfire in New Jersey since 2007. No structures were lost during this fire, though several were threatened and protected in nearby campgrounds. No serious injuries were reported. |
| **June 27, 2022** | Wildfire | N/A | N/A | A wildfire (Brickworks Fire) was detected by the Apple Pie Hill Fire Tower. This fire reached 315 acres in size, with 100% containment reached the same day. Firing and burnout operations were successful in completing containment. |
| **July 13, 2022** | Wildfire | N/A | N/A | A wildfire (Maple Branch Wildfire) was detected by Batsto Village. This fire reached 98 acres in size, with 100% containment achieved the same day. |
| **May 31, 2023 - June 2, 2023** | Wildfire | N/A | N/A | A wildfire (Allen Road Fire) in Bass River State Forest of roughly 5,000 acres resulted in dense smoke. An inversion in the atmosphere caused a combination of smoke and fog to reduce visibility to dangerous levels. As a result, the Garden State Parkway was closed between the Exit 38 and Exit 63 for several hours. |
| **June 3, 2023** | Wildfire | N/A | N/A | A wildfire (Flatiron Fire) was reported on June 3, 2023. The fire was estimated at 20 acres and was 100% contained on the same as reported. One outbuilding/shed was destroyed. |
| **June 12, 2023** | Wildfire | N/A | N/A | A wildfire (Buzby Boggs Wildfire) was reported via Facebook, burning south of the Black Run preserve in Evesham Township. New Jersey Forest Fire Service resources along with local fire units responded immediately and discovered an active wildfire burning in a remote area estimated to be more than 20 acres. This fire reached an estimated 700 acres at containment. |
| **June 12, 2023** | Wildfire | N/A | N/A | At approximately 11:35am fire towers saw smoke, located in the area of City Line Road in Pemberton Township. This fire (City Line Wildfire) reached 850 acres at containment. |
| **June 20, 2023** | Wildfire | N/A | N/A | Fire was discovered by an aircraft from Fort Dix (Joint Base MDL). Fire was reported directly to the New Jersey Forest Fire Service at 11:00 am on June 19, 2023. Aircraft from the NJFFS on a previously planned flight diverted to the reported location, confirmed there was an active fire, then guided ground forces into the fire location. The fire (Acorn Hill Wildfire) reached 246 acres at containment. |
| **August 20-23, 2023** | Wildfire | N/A | N/A | A major forest fire (Dragway Fire) occurred in Wharton State Forest, Waterford, and Shamong Township. Road closures were issued by the municipalities and the County. The Shamong Local Fire Company undertook structural protection of Oak View Estates Mobile Home Park. Over 5,000 acres burned. |

Source: NOAA NCEI 2023; FEMA 2023

The NJFFS keeps records of wildfires and prescribed burns in the State of New Jersey. In Burlington County, between 2018 and 2022, there have been a total of 244 fires with a total acres burned of 31,667. During the same timeframe, there have been 186 prescribed burns with 20,630 acres of land treated. Refer to Table 4.3.9-5 for an annual breakdown.

Table 4.3.9-5. Wildfires and Prescribed Burns in Burlington County 2018-2022

| Year | Wildfires | | Prescribed Burns | |
|---|---|---|---|---|
| | Number of Fires | Acres Burned | Number of Treatments | Acres Treated |
| **2018** | 28 | 1,359 | 21 | 1,457 |
| **2019** | 49 | 12,036 | 44 | 4,034 |
| **2020** | 60 | 4,796 | 51 | 7,416 |
| **2021** | 58 | 1,972 | 39 | 4,285 |
| **2022** | 49 | 11,503 | 31 | 3,438 |
| **Total** | **244** | **31,667** | **186** | **20,630** |

Source: New Jersey Forest Fire Service 2023

## Probability of Future Occurrence

For the 2024 HMP update, the most up-to-date data was collected to calculate the probability of future occurrence of wildfire events for the County. Information from NOAA-NCEI storm events database, the 2019 State of New Jersey HMP, and the 2019 Burlington County HMP, were used to identify the number of wildfire events that occurred between January 1950 and March 2023. Table 4.3.9-6 presents the probability of future events for wildfire in Burlington County.

Table 4.3.9-6. Probability of Future Occurrences of Wildfire Events

| Hazard Type | Occurrences Between 1905 and 2023 | % Chance of Occurring in Any Given Year | Recurrence Interval (in years) (# Years/Number of Events) |
|---|---|---|---|
| Wildfire | 62 | 52.54% | 1.90 |

Source: NOAA NCEI 2023; NJOEM 2019; Burlington County 2019

Note: Disaster occurrences include federally declared disasters since the 1950 Federal Disaster Relief Act, and selected events since 1968. Due to limitations in data, not all wildfire events occurring between 1954 and 1996 are accounted for in the tally of occurrences. As a result, the number of hazard occurrences is underestimated.

In Section 4.4, the identified hazards of concern for the County are 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 Team, the probability of occurrence rating for wildfires in the County is "occasional."

## Climate Change Impacts

Providing projections of future climate change for a specific region is challenging. Shorter term projections are more closely tied to existing trends making longer term projections even more challenging. The further out a prediction reaches the more subject to changing dynamics it becomes.

Climate change includes major changes in temperature, precipitation, or wind patterns over many decades. 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 average temperature, which is faster than the rest of the Northeast region (2 °F [1.1 °C]) and the world (1.5 °F [0.8 °C]). 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). 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). 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. 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. Changes in winter temperatures could result in a change in the frequency of ice jam events (NJDEP 2020).

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. 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. By the end of this century, heavy precipitation events are projected to occur two to five times more often and with more intensity than in the last century. New Jersey will experience more intense rain events, less snow, and more rainfalls. Also, small decreases in the amount of precipitation may occur in the summer months, resulting in greater potential for more frequent and prolonged droughts (NJDEP 2020).

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. An increase in invasive species, such as the emerald ash borer, can lead to the destruction and death of ash trees, adding more fuel for fires. 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 (US EPA 2022). 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 (National Geographic 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 (US EPA 2022).

As stated above, according to the temperature projections, Burlington County 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 (US EPA 2022).

## Vulnerability Assessment

A spatial analysis was conducted using 2012 New Jersey Forest Fire Service hazard data. To determine what assets are exposed to wildfire, the various inventory datasets (critical facilities, general building stock, population, and new development) were overlaid with the hazard area. Assets with their centroid located in the hazard area were totaled to estimate the totals and values at risk to impacts from a wildfire event. 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.

Smoke generated by wildfire consists of visible and invisible emissions that contain particulate matter (soot, tar, water vapor, and minerals), gases (carbon monoxide, carbon dioxide, nitrogen oxides), and toxics (formaldehyde, benzene). Emissions from wildfires depend on the type of fuel, the moisture content of the fuel, the efficiency (or temperature) of combustion, and the weather. Public health impacts associated with wildfire include difficulty in breathing, odor, and reduction in visibility.

Table 4.3.9-7 summarizes the estimated population exposed to the wildfire hazard by municipality.

Based on the analysis, an estimated 6,406 residents, or 1.4 percent of the County's population, are located in the extreme, high, and very high wildfire hazard areas. Overall, the Township of Evesham has the greatest number of individuals located in the extreme, very high, and high hazard areas (i.e., 1,032 persons) and the Borough of Pemberton has the greatest proportion of its population exposed to the extreme, very high, and high hazard areas (i.e., 21.1 percent).

*Socially Vulnerable Populations*

Economically disadvantaged populations are more vulnerable to wildfire 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.

Smoke and air pollution from wildfires can be a severe health hazard, especially for sensitive populations, including children, the elderly, and those with respiratory and cardiovascular diseases.

According to the 2021 5-year ACS estimates, there are 27,947 total persons living below the poverty level, 78,093 persons over the age of 65 years, 23,350 persons under the age of 5 years, 9,103 non-English speakers, and 51,899 persons with a disability in Burlington County, as shown in Table 4.3.9-8.

**Table 4.3.9-7. Population in Wildfire Fuel Hazard Areas**

| Jurisdiction | Total Population (Decennial Population 2020) | Estimated Population in Extreme, Very High, or High Wildfire Fuel Risk Hazard Area | |
|---|---|---|---|
| | | Number of People | Percent of Total |
| **Bass River (T)** | 1,355 | 108 | 7.9% |
| **Beverly (C)** | 2,499 | 0 | 0.0% |
| **Bordentown (C)** | 3,993 | 4 | 0.1% |
| **Bordentown (T)** | 11,791 | 172 | 1.5% |
| **Burlington (C)** | 9,743 | 4 | <0.1% |
| **Burlington (T)** | 23,983 | 63 | 0.3% |
| **Chesterfield (T)** | 9,422 | 270 | 2.9% |
| **Cinnaminson (T)** | 17,064 | 69 | 0.4% |
| **Delanco (T)** | 4,824 | 75 | 1.5% |
| **Delran (T)** | 17,882 | 223 | 1.2% |
| **Eastampton (T)** | 6,191 | 24 | 0.4% |

| Jurisdiction | Total Population (Decennial Population 2020) | Estimated Population in Extreme, Very High, or High Wildfire Fuel Risk Hazard Area | |
|---|---|---|---|
| | | Number of People | Percent of Total |
| **Edgewater Park (T)** | 8,930 | 4 | <0.1% |
| **Evesham (T)** | 46,826 | 1,032 | 2.2% |
| **Fieldsboro (B)** | 526 | 0 | 0.0% |
| **Florence (T)** | 12,812 | 104 | 0.8% |
| **Hainesport (T)** | 6,035 | 282 | 4.7% |
| **Lumberton (T)** | 12,803 | 235 | 1.8% |
| **Mansfield (T)** | 8,897 | 164 | 1.8% |
| **Maple Shade (T)** | 19,980 | 0 | 0.0% |
| **Medford (T)** | 24,497 | 589 | 2.4% |
| **Medford Lakes (B)** | 4,264 | 24 | 0.6% |
| **Moorestown (T)** | 21,355 | 118 | 0.6% |
| **Mount Holly (T)** | 9,981 | 15 | 0.1% |
| **Mount Laurel (T)** | 44,633 | 257 | 0.6% |
| **New Hanover (T)** | 6,367 | 626 | 9.8% |
| **North Hanover (T)** | 7,963 | 59 | 0.7% |
| **Palmyra (B)** | 7,438 | 0 | 0.0% |
| **Pemberton (B)** | 1,371 | 289 | 21.1% |
| **Pemberton (T)** | 26,903 | 376 | 1.4% |
| **Riverside (T)** | 8,003 | 3 | <0.1% |
| **Riverton (B)** | 2,764 | 3 | 0.1% |
| **Shamong (T)** | 6,460 | 160 | 2.5% |
| **Southampton (T)** | 10,317 | 218 | 2.1% |
| **Springfield (T)** | 3,245 | 38 | 1.2% |
| **Tabernacle (T)** | 6,776 | 318 | 4.7% |
| **Washington (T)** | 693 | 55 | 7.9% |
| **Westampton (T)** | 9,121 | 148 | 1.6% |
| **Willingboro (T)** | 31,889 | 0 | 0.0% |
| **Woodland (T)** | 1,544 | 249 | 16.1% |
| **Wrightstown (B)** | 720 | 27 | 3.8% |
| **Burlington County Total** | **461,860** | **6,406** | **1.4%** |

Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; U.S. Census Bureau 2020; NJFFS 2012

Table 4.3.9-8. Burlington County Socially Vulnerable Populations by Municipality

| Jurisdiction[a] | Decennial Population 2020 | | American Community Survey 5-Year Population Estimates (2021) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Population Over 65 | | Population Under 5 | | Non-English Speaking Population | | Population with Disability | | Population Below Poverty Level | |
| | Jurisdiction Total | % of County Total | Number | % of Jurisdiction Total | Number | % of Jurisdiction Total | Number | % of Jurisdiction Total | Number | % of Jurisdiction Total | Number | % of Jurisdiction Total |
| Bass River (T) | 1,355 | 0.3% | 248 | 18.3% | 67 | 4.9% | 0 | 0.0% | 175 | 12.9% | 95 | 7.0% |
| Beverly (C) | 2,499 | 0.5% | 292 | 11.7% | 183 | 7.3% | 0 | 0.0% | 249 | 10.0% | 300 | 12.0% |
| Bordentown (C) | 3,993 | 0.9% | 772 | 19.3% | 216 | 5.4% | 16 | 0.4% | 422 | 10.6% | 227 | 5.7% |
| Bordentown (T) | 11,791 | 2.6% | 1,601 | 13.6% | 472 | 4.0% | 289 | 2.4% | 1,092 | 9.3% | 194 | 1.6% |
| Burlington (C) | 9,743 | 2.1% | 1,301 | 13.4% | 661 | 6.8% | 208 | 2.1% | 1,251 | 12.8% | 1,422 | 14.6% |
| Burlington (T) | 23,983 | 5.2% | 3,526 | 14.7% | 1,497 | 6.2% | 385 | 1.6% | 2,366 | 9.9% | 2,185 | 9.1% |
| Chesterfield (T) | 9,422 | 2.0% | 760 | 8.1% | 578 | 6.1% | 153 | 1.6% | 423 | 4.5% | 165 | 1.8% |
| Cinnaminson (T) | 17,064 | 3.7% | 3,103 | 18.2% | 929 | 5.4% | 208 | 1.2% | 1,661 | 9.7% | 584 | 3.4% |
| Delanco (T) | 4,824 | 1.0% | 1,297 | 26.9% | 191 | 4.0% | 42 | 0.9% | 676 | 14.0% | 322 | 6.7% |
| Delran (T) | 17,882 | 3.9% | 2,570 | 14.4% | 1,047 | 5.9% | 723 | 4.0% | 1,548 | 8.7% | 902 | 5.0% |
| Eastampton (T) | 6,191 | 1.3% | 557 | 9.0% | 264 | 4.3% | 0 | 0.0% | 478 | 7.7% | 488 | 7.9% |
| Edgewater Park (T) | 8,930 | 1.9% | 1,571 | 17.6% | 700 | 7.8% | 367 | 4.1% | 1,465 | 16.4% | 1,645 | 18.4% |
| Evesham (T) | 46,826 | 10.1% | 8,574 | 18.3% | 2,237 | 4.8% | 749 | 1.6% | 4,504 | 9.6% | 1,476 | 3.2% |
| Fieldsboro (B) | 526 | 0.1% | 82 | 15.6% | 64 | 12.2% | 0 | 0.0% | 62 | 11.8% | 36 | 6.8% |
| Florence (T) | 12,812 | 2.8% | 2,122 | 16.6% | 645 | 5.0% | 260 | 2.0% | 1,460 | 11.4% | 827 | 6.5% |
| Hainesport (T) | 6,035 | 1.3% | 1,327 | 22.0% | 58 | 1.0% | 0 | 0.0% | 744 | 12.3% | 250 | 4.1% |
| Lumberton (T) | 12,803 | 2.8% | 2,048 | 16.0% | 661 | 5.2% | 107 | 0.8% | 1,490 | 11.6% | 805 | 6.3% |
| Mansfield (T) | 8,897 | 1.9% | 2,506 | 28.2% | 394 | 4.4% | 330 | 3.7% | 1,465 | 16.5% | 181 | 2.0% |
| Maple Shade (T) | 19,980 | 4.3% | 2,897 | 14.5% | 1,159 | 5.8% | 694 | 3.5% | 2,433 | 12.2% | 1,971 | 9.9% |
| Medford (T) | 24,497 | 5.3% | 5,151 | 21.0% | 1,085 | 4.4% | 31 | 0.1% | 2,775 | 11.3% | 724 | 3.0% |
| Medford Lakes (B) | 4,264 | 0.9% | 879 | 20.6% | 211 | 4.9% | 0 | 0.0% | 407 | 9.5% | 26 | 0.6% |
| Moorestown (T) | 21,355 | 4.6% | 3,480 | 16.3% | 837 | 3.9% | 603 | 2.8% | 1,654 | 7.7% | 807 | 3.8% |
| Mount Holly (T) | 9,981 | 2.2% | 1,199 | 12.0% | 454 | 4.5% | 133 | 1.3% | 1,624 | 16.3% | 958 | 9.6% |
| Mount Laurel (T) | 44,633 | 9.7% | 8,299 | 18.6% | 2,011 | 4.5% | 889 | 2.0% | 4,203 | 9.4% | 1,689 | 3.8% |
| New Hanover (T) | 6,367 | 1.4% | 311 | 4.9% | 214 | 3.4% | 29 | 0.4% | 192 | 3.0% | 116 | 1.8% |
| North Hanover (T) | 7,963 | 1.7% | 532 | 6.7% | 975 | 12.2% | 125 | 1.6% | 631 | 7.9% | 481 | 6.0% |
| Palmyra (B) | 7,438 | 1.6% | 1,077 | 14.5% | 190 | 2.6% | 44 | 0.6% | 961 | 12.9% | 616 | 8.3% |
| Pemberton (B) | 1,371 | 0.3% | 282 | 20.6% | 56 | 4.1% | 47 | 3.4% | 308 | 22.5% | 140 | 10.2% |

| Jurisdiction[a] | Decennial Population 2020 | | American Community Survey 5-Year Population Estimates (2021) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Population Over 65 | | Population Under 5 | | Non-English Speaking Population | | Population with Disability | | Population Below Poverty Level | |
| | Jurisdiction Total | % of County Total | Number | % of Jurisdiction Total | Number | % of Jurisdiction Total | Number | % of Jurisdiction Total | Number | % of Jurisdiction Total | Number | % of Jurisdiction Total |
| **Pemberton (T)** | 26,903 | 5.8% | 4,306 | 16.0% | 1,429 | 5.3% | 1,092 | 4.1% | 4,006 | 14.9% | 2,518 | 9.4% |
| **Riverside (T)** | 8,003 | 1.7% | 1,039 | 13.0% | 354 | 4.4% | 754 | 9.4% | 972 | 12.1% | 1,257 | 15.7% |
| **Riverton (B)** | 2,764 | 0.6% | 554 | 20.0% | 80 | 2.9% | 5 | 0.2% | 187 | 6.8% | 72 | 2.6% |
| **Shamong (T)** | 6,460 | 1.4% | 1,313 | 20.3% | 324 | 5.0% | 0 | 0.0% | 671 | 10.4% | 136 | 2.1% |
| **Southampton (T)** | 10,317 | 2.2% | 3,153 | 30.6% | 293 | 2.8% | 125 | 1.2% | 1,551 | 15.0% | 589 | 5.7% |
| **Springfield (T)** | 3,245 | 0.7% | 479 | 14.8% | 129 | 4.0% | 65 | 2.0% | 311 | 9.6% | 160 | 4.9% |
| **Tabernacle (T)** | 6,776 | 1.5% | 1,524 | 22.5% | 380 | 5.6% | 0 | 0.0% | 747 | 11.0% | 233 | 3.4% |
| **Washington (T)** | 693 | 0.2% | 138 | 19.9% | 8 | 1.2% | 8 | 1.1% | 87 | 12.6% | 21 | 3.0% |
| **Westampton (T)** | 9,121 | 2.0% | 1,139 | 12.5% | 263 | 2.9% | 81 | 0.9% | 802 | 8.8% | 268 | 2.9% |
| **Willingboro (T)** | 31,889 | 6.9% | 5,707 | 17.9% | 1,916 | 6.0% | 538 | 1.7% | 5,100 | 16.0% | 2,685 | 8.4% |
| **Woodland (T)** | 1,544 | 0.3% | 319 | 20.7% | 49 | 3.2% | 0 | 0.0% | 627 | 40.6% | 363 | 23.5% |
| **Wrightstown (B)** | 720 | 0.2% | 58 | 8.1% | 69 | 9.6% | 5 | 0.7% | 119 | 16.5% | 13 | 1.8% |
| **Burlington County Total** | **461,860** | **100.0%** | **78,093** | **16.9%** | **23,350** | **5.1%** | **9,103** | **2.0%** | **51,899** | **11.2%** | **27,947** | **6.1%** |

Source: U.S. Census Bureau 2020, 2021

Note: Persons per household = 2.6

a. (B) = borough; (C) = city; (T) = township

### 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 4.3.9-9 summarizes the estimated building stock inventory located in the hazard area by municipality. The replacement cost value (RCV) of general building stock located in the extreme/very high/high hazard area $4.9 billion (2.6 percent of the countywide total). The Township of Evesham has the greatest number of buildings located in the wildfire hazard area (298 structures; 2.2 percent of its total), and the Borough of Pemberton has the greatest proportion of its buildings located in the wildfire hazard area (i.e., 18.9 percent).

Table 4.3.9-9. Estimated Number and Total Replacement Cost Value of Structures Located in the Extreme, Very High, or High Wildfire Fuel Risk Hazard Area

| Jurisdiction | Total Number of Buildings | Total RCV | Estimated Building Stock in the Extreme, Very High, or High Wildfire Fuel Risk Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Building Count | | RCV | |
| | | | Number | Percent of Total | Value | Percent of Total |
| **Bass River (T)** | 719 | $881,423,037 | 62 | 8.6% | $209,639,006 | 23.8% |
| **Beverly (C)** | 939 | $1,218,790,334 | 0 | 0.0% | $0 | 0.0% |
| **Bordentown (C)** | 1,041 | $2,794,074,193 | 1 | 0.1% | $404,984 | <0.1% |
| **Bordentown (T)** | 3,389 | $5,866,485,431 | 50 | 1.5% | $85,775,137 | 1.5% |
| **Burlington (C)** | 3,165 | $5,813,312,404 | 1 | <0.1% | $313,504 | <0.1% |
| **Burlington (T)** | 6,525 | $8,819,483,894 | 26 | 0.4% | $350,605,710 | 4.0% |
| **Chesterfield (T)** | 2,673 | $2,243,175,804 | 64 | 2.4% | $69,215,640 | 3.1% |
| **Cinnaminson (T)** | 5,833 | $6,206,033,564 | 29 | 0.5% | $113,838,056 | 1.8% |
| **Delanco (T)** | 1,717 | $1,777,428,934 | 26 | 1.5% | $14,048,583 | 0.8% |
| **Delran (T)** | 5,008 | $5,342,639,406 | 64 | 1.3% | $55,900,779 | 1.0% |
| **Eastampton (T)** | 1,947 | $1,223,958,808 | 10 | 0.5% | $42,252,750 | 3.5% |
| **Edgewater Park (T)** | 2,210 | $2,391,677,740 | 4 | 0.2% | $10,387,539 | 0.4% |
| **Evesham (T)** | 13,368 | $11,128,366,531 | 298 | 2.2% | $359,847,666 | 3.2% |
| **Fieldsboro (B)** | 224 | $241,524,257 | 0 | 0.0% | $0 | 0.0% |
| **Florence (T)** | 4,084 | $6,582,323,116 | 40 | 1.0% | $975,513,479 | 14.8% |
| **Hainesport (T)** | 2,546 | $3,283,651,920 | 128 | 5.0% | $557,105,713 | 17.0% |
| **Lumberton (T)** | 3,724 | $4,304,673,748 | 64 | 1.7% | $65,834,861 | 1.5% |
| **Mansfield (T)** | 3,805 | $3,398,330,024 | 67 | 1.8% | $59,834,774 | 1.8% |
| **Maple Shade (T)** | 5,120 | $5,835,178,181 | 2 | <0.1% | $5,072,980 | 0.1% |
| **Medford (T)** | 8,792 | $10,042,226,056 | 212 | 2.4% | $279,010,351 | 2.8% |
| **Medford Lakes (B)** | 1,804 | $967,238,228 | 10 | 0.6% | $4,902,485 | 0.5% |
| **Moorestown (T)** | 7,173 | $12,232,463,125 | 47 | 0.7% | $94,829,163 | 0.8% |
| **Mount Holly (T)** | 2,987 | $3,763,298,318 | 5 | 0.2% | $37,041,713 | 1.0% |
| **Mount Laurel (T)** | 13,150 | $15,418,468,979 | 112 | 0.9% | $498,657,930 | 3.2% |
| **New Hanover (T)** | 1,068 | $2,868,939,587 | 38 | 3.6% | $34,205,426 | 1.2% |
| **North Hanover (T)** | 2,176 | $2,404,670,347 | 12 | 0.6% | $5,543,827 | 0.2% |
| **Palmyra (B)** | 2,482 | $2,133,107,140 | 0 | 0.0% | $0 | 0.0% |
| **Pemberton (B)** | 519 | $736,141,491 | 98 | 18.9% | $60,839,592 | 8.3% |
| **Pemberton (T)** | 9,729 | $6,973,242,840 | 133 | 1.4% | $189,790,177 | 2.7% |
| **Riverside (T)** | 2,532 | $2,459,954,166 | 2 | 0.1% | $34,927,702 | 1.4% |
| **Riverton (B)** | 989 | $1,096,729,598 | 1 | 0.1% | $394,654 | <0.1% |

| Jurisdiction | Total Number of Buildings | Total RCV | Estimated Building Stock in the Extreme, Very High, or High Wildfire Fuel Risk Hazard Area | | | |
|---|---|---|---|---|---|---|
| | | | Building Count | | RCV | |
| | | | Number | Percent of Total | Value | Percent of Total |
| **Shamong (T)** | 2,494 | $2,504,926,736 | 59 | 2.4% | $88,580,000 | 3.5% |
| **Southampton (T)** | 5,368 | $4,593,018,255 | 110 | 2.0% | $120,593,923 | 2.6% |
| **Springfield (T)** | 1,826 | $2,140,517,320 | 18 | 1.0% | $30,851,057 | 1.4% |
| **Tabernacle (T)** | 2,938 | $2,200,440,237 | 135 | 4.6% | $142,700,222 | 6.5% |
| **Washington (T)** | 538 | $604,084,949 | 43 | 8.0% | $71,812,466 | 11.9% |
| **Westampton (T)** | 2,795 | $4,620,292,645 | 50 | 1.8% | $133,583,131 | 2.9% |
| **Willingboro (T)** | 10,830 | $8,789,434,159 | 1 | <0.1% | $2,629,502 | <0.1% |
| **Woodland (T)** | 782 | $1,333,495,830 | 110 | 14.1% | $153,193,076 | 11.5% |
| **Wrightstown (B)** | 296 | $748,872,423 | 8 | 2.7% | $3,653,448 | 0.5% |
| **Burlington County Total** | **149,305** | **$167,984,093,756** | **2,140** | **1.4%** | **$4,963,331,009** | **3.0%** |

Source: Burlington County, 2023; NJOGIS 2023; Microsoft BING 2022; RS Means 2022; NJFFS 2012

### Impact on Critical Facilities

In Burlington County, there are 56 critical facilities and lifelines located in the wildfire hazard area. There are 35 safety and security lifelines located in the wildfire fuel hazard area. Refer to Table 4.3.9-10 which summarizes the number of critical lifelines in the wildlife fuel hazard area.

Table 4.3.9-10. Estimated Number of Lifelines Located in the Wildfire Fuel Hazard Area

| FEMA Lifeline Category | Number of Lifelines | Number of Lifelines Located in the Extreme, Very High, or High Wildfire Fuel Risk Hazard Area |
|---|---|---|
| **Communications** | 2 | 0 |
| **Energy** | 31 | 0 |
| **Food, Hydration, Shelter** | 189 | 1 |
| **Hazardous Materials** | 207 | 6 |
| **Health and Medical** | 113 | 8 |
| **Safety and Security** | 1,101 | 35 |
| **Transportation** | 53 | 3 |
| **Water Systems** | 119 | 3 |
| **Burlington County (Total)** | **1,813** | **56** |

Source: Burlington County, 2023; NOAA 2022

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. 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. Route 206, which runs north to south through the County is located in portions of the wildfire hazard areas that are associated with the Pineland forests. This should be considered for evacuation

route purposes since it serves as the major north/south corridor in the interior of the County. No major utilities such as power generation facilities are located in fire hazard areas.

### Impact on 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.

Table 4.3.9-9 displays the replacement cost value of buildings located in the extreme, very high, or high wildfire fuel risk area. Overall, approximately $5 billion of the County's replacement cost value (3 percent) is located in the extreme, very high, or high wildfire fuel risk area. The Town of Florence has the highest replacement cost value exposed ($975,513,479). Bass River Township has the highest percentage of replacement cost value exposed (23.8 percent).

Closure of major roadways, such as the Garden State Parkway, and cancellation of outdoor events due to nearby fire and smoke can also result in economic impacts.

### Impact on Environment

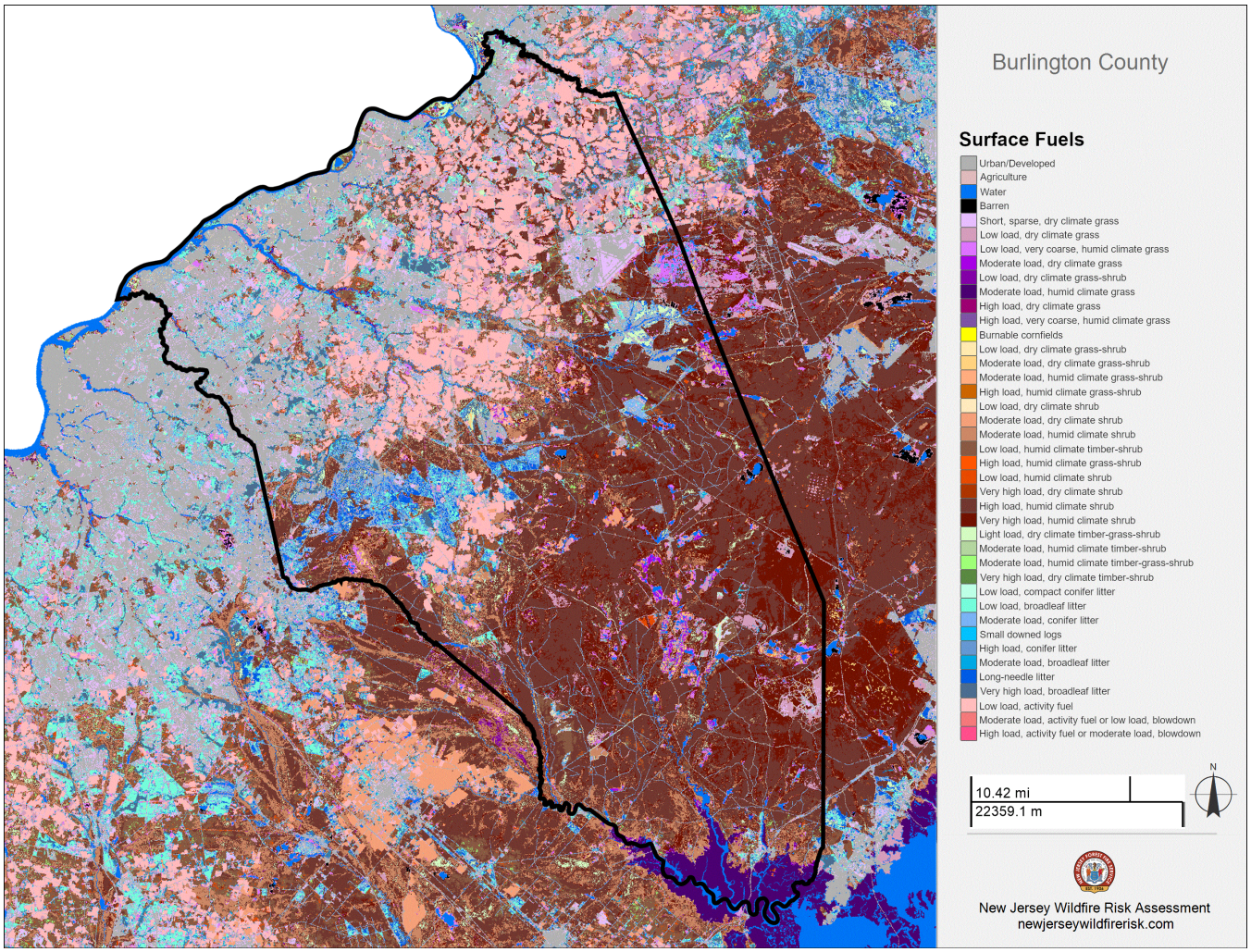
While wildfire is a necessary part of ecosystem health in Burlington County, particularly in the Pinelands areas, intense wildfire that burns too hot can result in severe damage to the environment, including burning and killing of plant and animal life. Intense fire can also heat narrow and shallow waterways, resulting in damage to aquatic systems.

Surface fuels are defined by fire behavior fuel models. A fuel model contains the parameters required by the surface fire spread model to compute surface fire behavior characteristics, including rate of spread, flame length, fire line intensity, and other fire behavior metrics. As the name might suggest, surface fuels account only for surface fire potential and surface fuels are generally defined to be less than six feet in height off the ground. Surface fuels typically are categorized into one of six primary fuel types based on the primary carrier of the surface fire: 1) Grass, 2) Grass/Shrub, 3) Shrub, 4) Timber/Understory, 5) Timber Litter and 6) Slash. These surface fuel models provide the input parameters needed to compute surface fire behavior. Figure 4.3.9-5 and Table 4.3.9-11 visualize the surface fuel in Burlington County (New Jersey Forest Fire Service 2023).

According to the USGS, post-fire runoff polluted with debris and contaminates can be extremely harmful to terrestrial ecosystems and aquatic life (USGS 2023). Studies show that urban fires in particular are more harmful to the environment compared to forest fires (Harvard University 2022). The age and density of infrastructure within Burlington 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 stormwater, contaminate nearby streams, and impair aquatic life.

Intense wildfire events that destroy existing ecosystems can result in an increase in invasive species that may be able to move into an area with a lack of natural competitors (U.S. Department of the Interior 2012).

## Figure 4.3.9-5. Surface Fuels in Burlington County




*Source: New Jersey Forest Fire Service 2023*

## Table 4.3.9-11. Surface Fuels in Burlington County

| Surface Fuel Model | Description | Acres | Percent | Surface Fuel Model | Description | Acres | Percent |
|---|---|---|---|---|---|---|---|
| NB1 | Urban/Developed | 67,070 | 12.8 % | SH5 | High load, humid climate grass-shrub | 0 | 0.0 % |
| NB3 | Agriculture | 53,975 | 10.3 % | SH6 | Low load, humid climate shrub | 4,513 | 0.9 % |
| NB8 | Water | 13,736 | 2.6 % | SH7 | Very high load, dry climate shrub | 21 | 0.0 % |
| NB9 | Barren | 421 | 0.1 % | SH8 | High load, humid climate shrub | 155,327 | 29.6 % |
| GR1 | Short, sparse, dry climate grass | 22,862 | 4.4 % | SH9 | Very high load, humid climate shrub | 46,841 | 8.9 % |
| GR2 | Low load, dry climate grass | 16,224 | 3.1 % | TU1 | Light load, dry climate timber-grass-shrub | 7,527 | 1.4 % |
| GR3 | Low load, very coarse, humid climate grass | 8,993 | 1.7 % | TU2 | Moderate load, humid climate timber-shrub | 276 | 0.1 % |
| GR4 | Moderate load, dry climate grass | 1,741 | 0.3 % | TU3 | Moderate load, humid climate timber-grass-shrub | 1,116 | 0.2 % |
| GR5 | Low load, dry climate grass-shrub | 1,408 | 0.3 % | TU5 | Very high load, dry climate timber-shrub | 71 | 0.0 % |
| GR6 | Moderate load, humid climate grass | 8,491 | 1.6 % | TL1 | Low load, compact conifer litter | 413 | 0.1 % |
| GR7 | High load, dry climate grass | 0 | 0.0 % | TL2 | Low load, broadleaf litter | 13,319 | 2.5 % |
| GR8 | High load, very coarse, humid climate grass | 0 | 0.0 % | TL3 | Moderate load, conifer litter | 15,623 | 3.0 % |
| AG9 | Burnable cornfields | 0 | 0.0 % | TL4 | Small downed logs | 0 | 0.0 % |
| GS1 | Low load, dry climate grass-shrub | 3,284 | 0.6 % | TL5 | High load, conifer litter | 3,607 | 0.7 % |
| GS2 | Moderate load, dry climate grass-shrub | 4,250 | 0.8 % | TL6 | Moderate load, broadleaf litter | 5,771 | 1.1 % |
| GS3 | Moderate load, humid climate grass-shrub | 2 | 0.0 % | TL8 | Long-needle litter | 5,713 | 1.1 % |
| GS4 | High load, humid climate grass-shrub | 0 | 0.0 % | TL9 | Very high load, broadleaf litter | 10,308 | 2.0 % |
| SH1 | Low load, dry climate shrub | 157 | 0.0 % | SB1 | Low load, activity fuel | 0 | 0.0 % |
| SH2 | Moderate load, dry climate shrub | 2,181 | 0.4 % | SB2 | Moderate load, activity fuel or low load, blowdown | 0 | 0.0 % |
| SH3 | Moderate load, humid climate shrub | 29,575 | 5.6 % | SB3 | High load, activity fuel or moderate load, blowdown | 0 | 0.0 % |
| SH4 | Low load, humid climate timber-shrub | 20,077 | 3.8 % | | | | |
| | | | | | **Total** | **524,893** | **100.0 %** |

Source: New Jersey Forest Fire Service 2023

### Cascading Impacts on Other Hazards

Following wildfires, cascading hazards such as debris flow, landslides, and flooding may occur due to loss of stabilizing vegetation, resulting in potentially catastrophic sequences. When wildfire hits in drought-stricken areas, watersheds and reservoirs can be further impacted by ash and debris flows, water treatment facilities may shut down with damage or loss of power, crops can be destroyed, and smoke can affect animal and human health (NIDIS 2023).

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 2020). For detailed information regarding flooding, see Section 4.3.6 (Flood).

As previously mentioned, intense wildfire events that destroy existing ecosystems can result in an increase in invasive species that may be able to move into an area with a lack of natural competitors (U.S. Department of the Interior 2012).

### Further Changes that May Impact Vulnerability

Understanding future changes that may impact vulnerability in the County can assist in planning for future development and ensuring that appropriate mitigation, planning, and preparedness measures are in place. The County considered the following factors 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 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 U.S. Census Bureau, the County's population increased by approximately 3 percent between 2010 and 2020 (U.S. Census Bureau 2020). The New Jersey Department of Labor and Workforce Development produced populations projections by County from 2014 to 2019, 2024, 2029, and 2034. According to these projections, Burlington County is projected to have a population of 460,400 by 2024, 464,900 by 2029, and 472,700 by 2034 (State of New Jersey 2017). 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.

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 (United Nations 2021).

Understanding the climate/fire/vegetation interactions is essential for addressing issues associated with climate change that include (USFS 2011):

- 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 wildland-urban interface (USFS 2011).

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 and droughts 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 2019 HMP

The 2024 HMP has been updated to reflect the 2020 Decennial Census and the 2021 ACS 5-year estimates for population changes. The building stock inventory was updated using data from Burlington County. Further, the building stock inventory replacement cost values were updated using RS Means 2022 values providing an overall update to the assets assessed in this risk assessment. The New Jersey Forest Fire Service data 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.