5.4.10 Wildfire

This section provides a profile and vulnerability assessment of the wildfire hazard for Chenango County.

5.4.10.1 Profile

This section provides information regarding the description, extent, location, previous occurrences and losses, and the probability of future occurrences for the wildfire hazard.

Hazard Description

Wildfire is defined as an uncontrolled fire spreading through natural or unnatural vegetation that can threaten lives and property if not contained. Wildfires are also known as ground fires, grass fires, forest fires, brush fires, wildland urban interface fires, or range fires. Wildfires do not include fires naturally or purposely ignited to manage vegetation for one or more benefits (NYS DHSES 2019). Although destructive fires do not occur annually, the State's fire history shows a cycle of outbreaks that have caused human death, property loss, forest destruction, and air pollution (NYS DHSES 2019).

Extent

Wildfire events can range in size and intensity. A wildfire's intensity depends significantly on meteorological conditions and human activity.

Wildfire Behavior and Fire Ecology

Fire behavior is defined as the manner in which fuel ignites, flame develops, and fire spreads, which depend on interactions among fuel, weather, and topography. Fire behavior is one of the most important aspects of wildfires because almost all actions in response to a fire depend on how it behaves. The extent to which fire manages can understand and predict fire behavior relies on success in pre-suppression planning and actual suppression of wildfires.

Potential for wildfire and its subsequent development (growth) and severity are controlled by the three principal factors of topography, fuel, and weather, described as follows:

Topography **–** Topography can powerfully influence wildfire behavior. Movement of air over the terrain tends to direct a fire's course. A gulch or canyon can funnel air and act as a chimney, intensifying fire behavior and inducing faster spread. Saddles on ridgetops tend to offer lower resistance to passage of air and draw fires. Solar heating of drier, south-facing slopes produces upslope thermal winds that can complicate behavior. Slope is an important factor. If the percentage of uphill slope doubles, the rate the wildfire spreads will most likely double as well. Terrain can inhibit wildfires: fire travels downslope much more slowly than it does upslope, and ridgetops often mark the end of a wildfire's rapid spread (FEMA 1997).

Fuel **–** Fuels are classified by weight or volume (fuel loading) and by type. Fuel loading is used to describe the amount of vegetative material available. If this amount doubles, energy released can also double. Each fuel type is given a burn index—an estimate of amount of potential energy that may be released, effort required to ignite a fire in a given fuel and expected flame length. Different fuels have different burn qualities, and some burn more easily than others. Grass fires release relatively little energy but can sustain very high rates of spread (FEMA 1997). According to the U.S. Forest Service (USFS), a forest stand may consist of several layers of live and dead vegetation in the understory (surface fuels), midstory (ladder fuels), and overstory (crown fuels):

- Surface fuels consist of grasses, shrubs, litter, and woody material lying on the ground. Surface fires burn low vegetation, woody debris, and litter. Under the right conditions, surface fires reduce likelihood that future wildfires will grow into crown fires.

- Ladder fuels consist of live and dead small trees and shrubs; live and dead lower branches from larger trees, needles, vines, lichens, mosses; and any other combustible biomass between the top of surface fuels and bottom of overstory tree crowns.

- Crown fuels are suspended above the ground in treetops or other vegetation and consist mostly of live and dead fine material. When historically low-density forests become overcrowded, tree crowns may merge and form a closed canopy. Tree canopies constitute the primary fuel layer in a forest crown fire (USFS 2003).

Fire behavior is strongly influenced by these fuels.

Weather / Air Mass – Weather is the most important factor influencing fire behavior, but it is always changing. Air mass, defined by the National Weather Service (NWS) as a body of air covering a relatively wide area and exhibiting horizontally uniform properties, can affect wildfire through climatic factors that include temperature and relative humidity, local wind speed and direction, cloud cover, precipitation amount and duration, and stability of the atmosphere at the time of the fire (NWS 2009). Extreme weather leads to extreme events, and often a subsidence of severe weather marks the end of a wildfire's growth and the beginning of successful containment. High temperatures and low humidity can produce vigorous fire activity. Fronts and thunderstorms can produce winds that radically and suddenly change in speed and direction, causing similar changes in fire activity. The rate of spread of a fire varies directly with wind velocity. Winds may play a dominant role in directing the course of a fire. The most damaging firestorms are typically marked by high winds (FEMA 1997).

Several tools are available to estimate fire potential, extent, danger, and growth, including: Wildland Fire Assessment System, Fire Potential Index, Fuel Moisture, Keetch-Byram Drought Index, Haines Index, and Buildup Index. In New York State, the Department of Conservation Wildfire Predictive Services created the New York State Fire Danger Rating Area (FDRA). This the tool used by New York State to describe fire danger throughout the state. ,:

The ***Fire Danger Rating Area (FDRA)*** in New York is established using information from the National Fire Danger Rating System (NFDRS) and takes into account current and antecedent weather, fuel types, and both live and dead fuel moisture. This information is provided by local station managers (USFS, n.d.) in each of the ten regions of New York State. Figure 5.4.10-1 shows an example of a FDRA in the State and the fire danger risk within each area on a specific date. Chenango County is part of the Leatherstocking FDRA. As of April 21, 2020, the entire state's fire danger was low. Table 5.4.10-1 lists fire danger ratings and color codes, also used by NYSDEC to update its fire danger rating maps, identified later in this section.

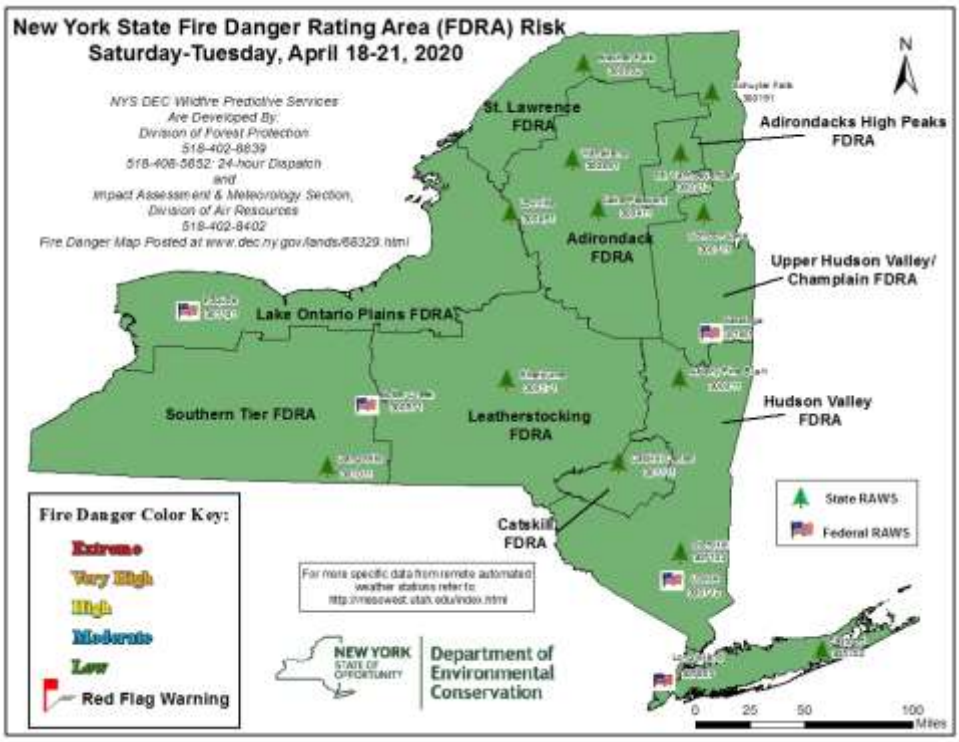
Table 5.4.10-1. Description of Fire Danger Ratings in New York State

Adjective Rating Class and Color Code	Class Description
Red Flag	A short-term, temporary warning, indicating presence of a dangerous combination of temperature, wind, relative humidity, fuel, or drought conditions that can contribute to new fires or rapid spread of existing fires. A Red Flag Warning can be issued at any Fire Danger level.
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

Adjective Rating Class and Color Code	Class Description
	effective and safe control action is on the flanks until the weather changes or the fuel supply lessens.
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.
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.
Moderate (blue)	Fires can start from most accidental causes, but except for 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.
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.

Source: NYS DEC 2020

Figure 5.4.10-1. New York State Fire Danger Rating Areas



Source: NYSDEC 2020

Location

Chenango County is a significantly forested County that exhibits characteristics that make it prone to fires (NYSDEC 2020). In New York State, NYSDEC's Division of Forest Protection (Forest Ranger Division) is designated as the State's lead agency for wildfire mitigation. The Division has fought fires and retained records

for more than 125 years. Over the past 25 years (1993-2017), Division records indicate that rangers suppressed 5,423 wildfires that burned a total of 52,580 acres (NYSDEC 2018). Currently, more than 1,700 fire departments respond to an average of 5,400 wildfires each year. The Forest Ranger Division (which is separate from the Fire Danger Rating Area) for Chenango County is Region 7. The boundaries of the Fire Danger Rating Areas do not match the Forest Ranger Division boundaries displayed in Figure 5.4.10-2.

Chenango County has a robust network of forests, some of which are in the form of State forest land and others that are in private ownership. Altogether there are over 79,959 acres of State-owned public space (Chenango County Parks & Recreation 2013).

According to tax records analyzed in the Chenango County Comprehensive Plan, forest lands cover 112,777 acres (176 square miles) of land area. This comprises just over 19 percent of the County. The actual proportion of tree cover may be higher due to clusters of trees on other property types. Refer to Table 4-2 in Section 4 (County Profile) for the acreage of land use types in the county.

Table 5.4.10-2 below, adapted from the Chenango County Comprehensive Plan, describes the extent of State Forest in each municipality. The Towns of Pharsalia, German, McDonough, and Lincklaen each have total acreages in excess of 30 percent of land area.

Table 5.4.10-2. Acreage of State Forest by Municipality

Town	Town Acreage	Acreage of State Forest	% of Total Acreage
Afton	29,824	3,881.14	13.01
Bainbridge	23,488	386.01	1.64
Columbus	24,576	1,444.03	5.88
Coventry	31,744	3,396.21	10.7
German	18,368	6,938.12	37.77
Greene	50,368	438.61	0.87
Guilford	39,872	1,751.69	4.39
Lincklaen	17,024	5,241.94	30.79
McDonough	25,280	8,025.38	31.75
New Berlin	29,440	2,783.69	9.46
North Norwich	18,304	1,194.95	6.53
Norwich	27,584	23.63	0.09
Otselic	24,960	7,424.65	29.75
Oxford	39,424	2,765.40	7.01
Pharsalia	25,408	12,879.79	50.69
Pitcher	18,368	3,008.05	16.38
Plymouth	27,392	3,829.46	13.98
Preston	22,592	1,673.90	7.41
Sherburne	28,544	1,449.12	5.08
Smithville	32,512	8,418.89	25.89
Smyrna	27,456	3,991.98	14.54
Chenango County	**582,528**	**80,946.64**	**13.9**

Source: Chenango County Comprehensive Plan, 2016

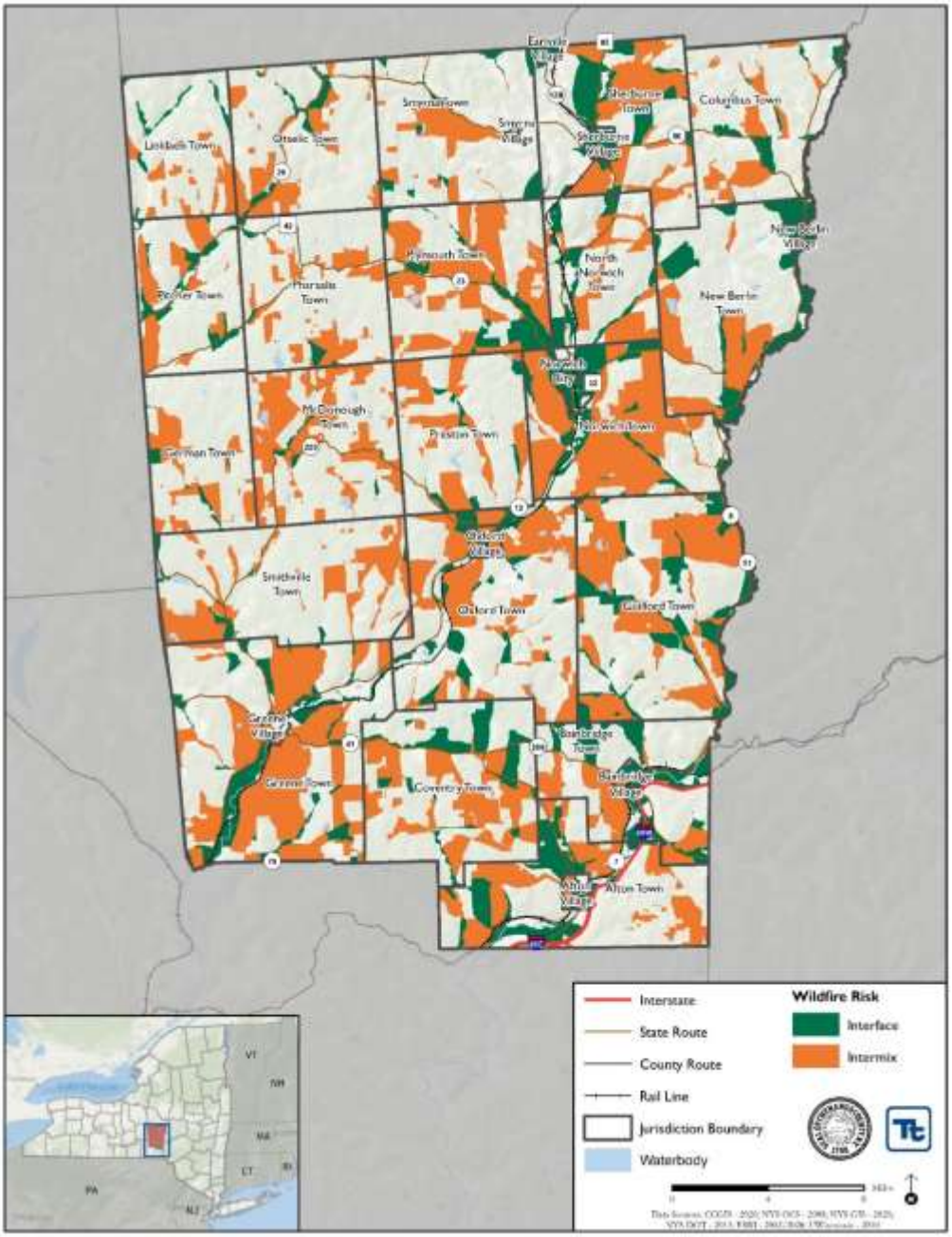
The wildland-urban interface (WUI) is the area where houses and wildland vegetation meet or intermingle, and where wildfire problems are most pronounced (Radeloff et al 2018). A detailed WUI, divided into Interface and Intermix areas, defines the wildfire hazard area for Chenango County. Intermix WUI are areas where housing and vegetation intermingle; interface WUI are areas with housing in the vicinity of contiguous wildland vegetation. This data was obtained through the SILVIS Laboratory, Department of Forest Ecology and Management, University of Wisconsin – Madison. Approximately 10 percent of the county's land area is within the WUI interface and 26.9 percent of the county's land is within the WUI intermix. The table below shows the value and percent of the WUI, changes since 1990, and its relation to the rest of the County.

Table 5.4.10-3. Wildland-Urban Interface Area and Changes Since 1990

	2010 Total (Sq. Mi)	# Change Since 1990 (Sq. Mi)	% of Change	% of County Land Area
Intermix WUI	242.1	75.5	45.30%	26.9%
Interface WUI	92.0	17.0	22.60%	10.2%
WUI Total	**334.1**	**92.5**	**38.20%**	**37.2%**
Non-WUI	**564.5**	**-92.5**	**-14.00%**	**62.8%**

Source: SILVIS Laboratory, Department of Forest Ecology and Management, University of Wisconsin – Madison

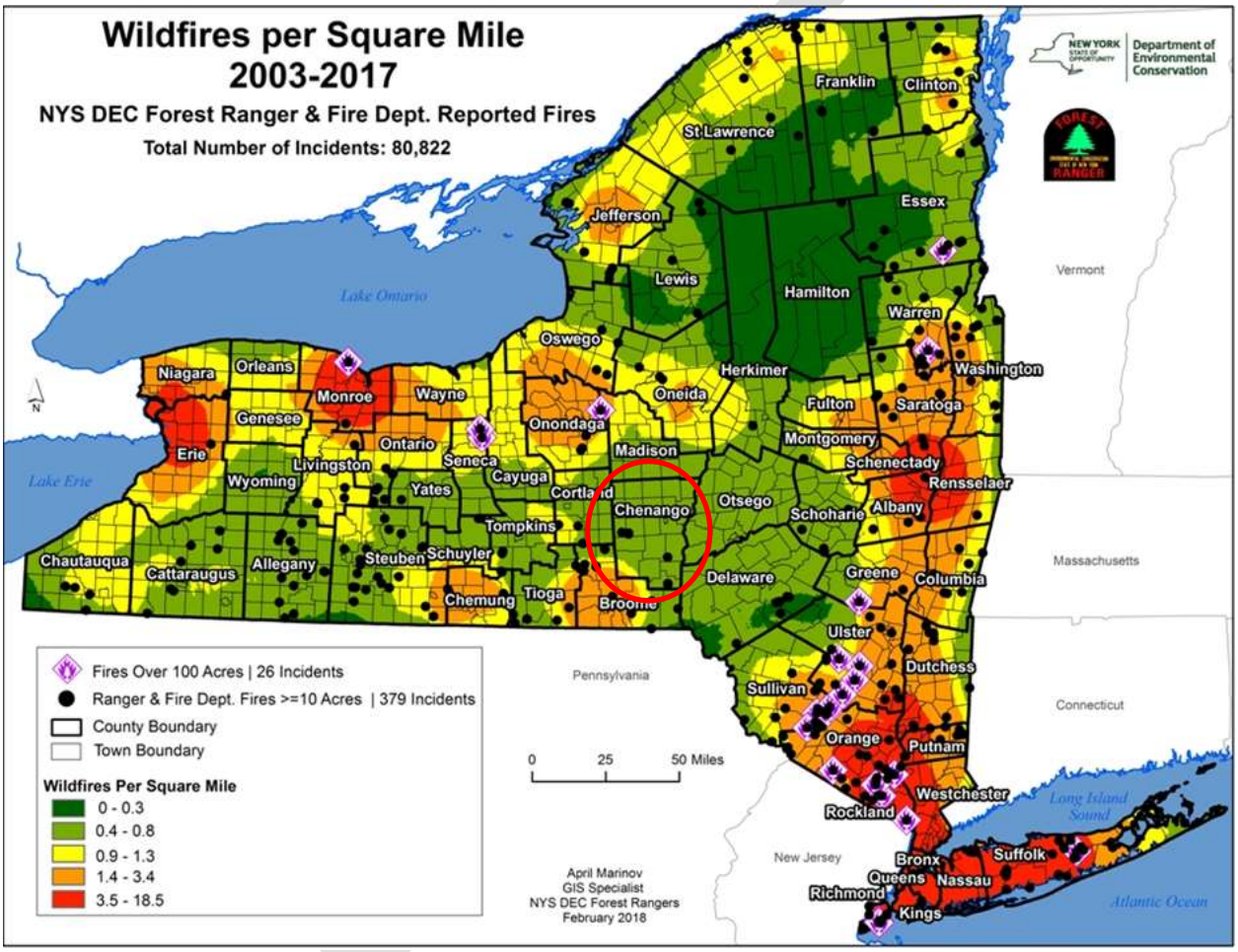
Figure 5.4.10-2. Wildland Urban Interface and Intermix in Chenango County



Previous Occurrences and Losses

Determinations of wildfire occurrences in New York State are based on two data sources: the New York State Forest Ranger force, and the New York State Office of Fire Prevention and Control (NYS OFP&C). Figure 5.4.10-3 illustrates occurrences of wildfires in the State between 2003 and 2017. This figure reveals occurrences of between 0.4 and 0.8 wildfires per square mile from 2003 to 2017 within Chenango County municipalities. The southwest section of the County in the Town of Greene has had a greater extent of occurrences owing to its proximity to Broome County, which faces more recent fire damage. The majority of these fires are small brush fires.

Figure 5.4.10-3. Wildfire Occurrences in New York State, 2003-2017



Source: NYSDEC 2020
Note: The red oval indicates the location of Chenango County.

FEMA Disaster Declarations

Between 1954 and 2020, NYS was not included in any wildfire-related major disaster (DR) or emergency (EM) declarations (FEMA 2020).

USDA Disaster Declarations

Between 2012 and 2020, Chenango County was included in the following USDA Disaster Designations for wildfire:

Table 5.4.10-4. USDA Declarations

Designation Number	Event Date	Declaration Date	Incident Type	Title
S4031	July 12, 2016	September 7, 2016	Fire, Wildfire	Drought – Fast Track

Source:USDA 2020

Previous Events

Between 1950 and 2020, Chenango County has not experienced any major wildfire events (NOAA-NCEI 2021).

Climate Change Projections

Climate change directly and indirectly affects growth and productivity of forests: directly as a result of changes in atmospheric carbon dioxide and climate, and indirectly through complex interactions within forest ecosystems. Climate also affects frequency and severity of many forest disturbances, such as infestations, invasive species, wildfires, and storm events. Extreme heat events and heat waves are also projected to increase, as listed in Table 5.4.10-5. below. As temperatures increase, suitability of a habitat for specific types of trees changes. Prolonged heat waves are likely to generate a greater number of wildfires. Stronger winds from larger storms may lead to more fallen branches for wildfires to consume. Increases in rain and snow events prime forests for fire by supporting growth of more fuel. Drought and warmer temperatures lead to drier forest fuels (NYS DHSES 2019).

Table 5.4.10-5. Extreme Event Projections for Region 3

Event Type (2020s)	Low Estimate (10th Percentile)	Middle Range (25th to 75th Percentile)	High Estimate (90th Percentile)
Days over 90 degrees Fahrenheit (°F) (8 days)	15	17-21	23
# of Heat Waves (0.7 heat waves)	2	2 to 3	3
Duration of Heat Waves (4 days)	4	4 to 5	5
Days below 32°F (133 days)	119	122 to 130	134

Source: NYSERDA 2014

Fire potential depends on climate variability, local topography, and human intervention. Climate change can affect multiple elements of the wildfire system: fire behavior, ignitions, fire management, and vegetation fuels. Hot, dry spells create highest fire risk. With temperatures increasing in NYS, wildfire danger may intensify with warming and drying of vegetation. When climate alters fuel loads and fuel moisture, susceptibility of forest to wildfires changes. Climate change also may increase winds that spread fires. Faster fires are harder to contain, and thus are more likely to expand into residential neighborhoods.

Probability of Future Occurrences

Nationally, wildfire risk is increasing. Wildfire experts point to four reasons why wildfire risks are increasing:

- The way forests were handled in the past allowed fuel in the form of fallen leaves, branches and plant growth, to accumulate. Now this fuel is lying around the forest with potential to "feed" a wildfire.
- Increasingly hot, dry weather has occurred and will occur within the United States.
- Weather patterns across the country are changing.
- More homes are built within areas of WUI, meaning that homes are built closer to wildland areas where wildfires can occur (NYS DHSES 2014).

According to the NYS Forest Ranger Division, between 1993 and 2017 more than half of all fire department-response to wildfires occurred between March and May. Beginning in 2010, NYS enacted revised open burning regulations that ban brush burning statewide during this time period. Forest ranger data indicate that this new statewide ban resulted in 46 percent fewer wildfires caused by debris burning in upstate New York from 2010 to 2017 (NYS DEC 2020).

In Chenango County, brush fire events will continue to occur with some regularity. The likelihood of one of those fires attaining significant size and intensity cannot be predicted and is highly dependent on environmental conditions and firefighting response. However, advanced methods of wildfire management and better understanding of fire ecosystems should reduce the number of devastating fires in the future (NYSDEC 2020). Invasive forest insects can increase the likelihood of wildfires occurring; insects that attack and kill trees, such as Emerald Ash Borer, increase the total wildfire fuel available in wooded areas. Climate change is also likely to increase the probability of future wildfires. Prolonged periods of drought caused by climate change can potentially increase the length of the wildfire season and provide a more favorable climate for ignition.

In Section 5.3, the ranking of identified hazards of concern for Chenango County is provided. The probability of occurrence, or likelihood of the event, is one parameter used for ranking hazards. Based on historical records and input from the Planning Committee, the probability of occurrence for wildfire in the county is considered 'occasional' (between 10 and 100% chance of occurring annually).

5.4.10.2 Vulnerability Assessment

To understand risk, a community must evaluate what assets are exposed and vulnerable in the identified hazard area. A spatial analysis was conducted using the University of Wisconsin 2010 wildland-urban interface/intermix spatial layer. For the purposes of the assessment, an asset (population, structures, critical facilities, and lifelines) is considered exposed and potentially vulnerable to the wildfire hazard if it is located in the wildland-urban interface or wildland-urban intermix hazard areas.

Impact on Life, Health and Safety

Wildfires have the potential to impact human health and life of residents and responders, structures, infrastructure, and natural resources. The most vulnerable populations include emergency responders and those within a short distance of the interface between the built environment and the wildland environment. First responders are exposed to the dangers from the initial incident and after-effects from smoke inhalation and heat stroke. Table 5.4.10-6 summarizes the estimated population exposed to the wildfire hazard by jurisdiction.

Based on the analysis, an estimated 37,152 residents, or approximately 76.8-percent of the County's population, are located in the wildland-urban interface/intermix hazard areas. Overall, the Town of Norwich has the greatest number of individuals located in the wildfire hazard areas (i.e., 6,181 persons).

Of the population exposed, the most vulnerable include the economically disadvantaged and the population over age 65. In Chenango County, approximately 9,539 people over the age of 65 and 6,826 people below the poverty level (American Community Survey 2018). 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. 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. 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 5.4.10-6. Estimated Population Located in the Wildland-Urban Interface/Intermix Hazard Areas in Chenango County

Jurisdiction	American Community Survey (2014-2018) Population	Estimated Population Exposed				
		Wildland-Urban Interface	Percent of Total	Wildland-Urban Intermix	Percent of Total	Total Wildland- Urban Interface/Intermix (WUI)
Afton (T)	1,767	668	37.8%	652	36.9%	1,320
Afton (V)	986	564	57.2%	418	42.4%	982
Bainbridge (T)	1,756	864	49.2%	527	30.0%	1,391
Bainbridge (V)	1,442	1,194	82.8%	248	17.2%	1,442
Columbus (T)	903	196	21.7%	217	24.0%	413
Coventry (T)	1,601	490	30.6%	693	43.3%	1,184
Earlville (V)	577	573	99.3%	0	0.0%	573
German (T)	385	39	10.0%	185	48.0%	223
Greene (T)	3,526	740	21.0%	1,828	51.8%	2,568
Greene (V)	1,704	75	4.4%	183	10.7%	258
Guilford (T)	2,834	1,126	39.7%	1,068	37.7%	2,194
Lincklaen (T)	366	78	21.4%	95	25.9%	173
McDonough (T)	773	65	8.5%	554	71.7%	619
New Berlin (T)	1,618	557	34.4%	500	30.9%	1,056
New Berlin (V)	927	731	78.9%	180	19.4%	911
North Norwich (T)	1,558	703	45.1%	497	31.9%	1,200
Norwich (C)	3,802	3,800	99.96%	0	0.0%	3,800
Norwich (T)	6,813	2,633	38.6%	3,548	52.1%	6,181
Otselic (T)	910	242	26.6%	361	39.7%	603
Oxford (T)	2,325	395	17.0%	1,137	48.9%	1,531
Oxford (V)	1,430	879	61.5%	541	37.8%	1,420
Pharsalia (T)	632	62	9.9%	361	57.2%	424
Pitcher (T)	708	257	36.3%	198	27.9%	455
Plymouth (T)	1,806	423	23.4%	998	55.3%	1,421
Preston (T)	1,089	114	10.5%	482	44.3%	596
Sherburne (T)	1,896	575	30.3%	745	39.3%	1,320
Sherburne (V)	1,414	1,168	82.6%	246	17.4%	1,414
Smithville (T)	1,451	273	18.8%	683	47.0%	956
Smyrna (T)	1,119	198	17.7%	326	29.1%	524
Smyrna (V)	230	0	0%	0	0.0%	0
Chenango County (Total)	**48,348**	**19,683**	**40.7%**	**17,469**	**36.1%**	**37,152**

Source: American Community Survey 2018 (ACS 2014-2018); University of Wisconsin, 2010
Notes: T = Town, V = Village,

Impact on General Building Stock

The most vulnerable structures to wildfire events are those within the wildland-urban interface/intermix hazard area. 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. To estimate the buildings exposed to the wildfire hazard, the wildland-urban interface/intermix hazard areas were overlaid upon the updated building inventory at the structure level. The replacement cost value of the structures with their center in the wildland-urban interface

and intermix hazard areas were totaled (refer to Table 5.4.10-7.). Overall, 22,478 buildings with a replacement cost value of $15.8 billion is exposed to the wildfire hazard areas in Chenango County.

Table 5.4.10-7. Building Stock Replacement Cost Value and Building Count within the Wildland-Urban Interface Hazard Area in Chenango County

Jurisdiction	Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Exposed									
			Number of Buildings – Wildland-Urban Interface	Percent of Total	Replacement Cost Value (RCV) of Buildings – Wildland-Urban Interface	Percent of Total	Number of Buildings – Wildland-Urban Intermix	Percent of Total	Replacement Cost Value (RCV) of Buildings – Wildland-Urban Intermix	Percent of Total	Total Buildings in Wildland - Urban Interface/Intermix (WUI)	Total Replacement Cost Value (RCV) in Wildland- Urban Interface/Intermix (WUI)
Afton (T)	1,609	$864,699,700	613	38.1%	$315,947,573	36.5%	551	34.2%	$311,883,774	36.1%	1,164	$627,831,346
Afton (V)	531	$1,019,188,804	306	57.6%	$790,093,339	77.5%	216	40.7%	$152,981,515	15.0%	522	$943,074,854
Bainbridge (T)	1,493	$915,529,770	697	46.7%	$417,015,598	45.5%	451	30.2%	$226,784,208	24.8%	1,148	$643,799,806
Bainbridge (V)	697	$584,957,184	588	84.4%	$490,581,424	83.9%	109	15.6%	$94,375,760	16.1%	697	$584,957,184
Columbus (T)	748	$862,354,994	135	18.0%	$159,867,334	18.5%	155	20.7%	$84,222,137	9.8%	290	$244,089,471
Coventry (T)	1,255	$703,237,371	346	27.6%	$178,094,879	25.3%	531	42.3%	$271,888,408	38.7%	877	$449,983,287
Earlville (V)	155	$87,153,360	153	98.7%	$85,604,735	98.2%	0	0%	$0	0%	153	$85,604,735
German (T)	395	$203,106,925	44	11.1%	$19,479,982	9.6%	186	47.1%	$75,596,547	37.2%	230	$95,076,529
Greene (T)	2,711	$1,319,736,091	599	22.1%	$312,079,173	23.6%	1,351	49.8%	$543,204,583	41.2%	1,950	$855,283,756
Greene (V)	700	$686,754,321	28	4.0%	$14,602,199	2.1%	82	11.7%	$81,098,666	11.8%	110	$95,700,865
Guilford (T)	1,963	$1,010,987,220	783	39.9%	$421,398,929	41.7%	717	36.5%	$324,004,333	32.0%	1,500	$745,403,262
Lincklaen (T)	398	$229,671,722	75	18.8%	$34,354,690	15.0%	90	22.6%	$32,105,901	14.0%	165	$66,460,591
McDonough (T)	807	$339,089,552	73	9.0%	$30,980,387	9.1%	551	68.3%	$219,932,560	64.9%	624	$250,912,948
New Berlin (T)	1,225	$778,713,525	428	34.9%	$376,734,490	48.4%	345	28.2%	$151,255,237	19.4%	773	$527,989,727
New Berlin (V)	411	$432,605,770	327	79.6%	$390,072,265	90.2%	77	18.7%	$40,049,620	9.3%	404	$430,121,885
North Norwich (T)	1,121	$823,054,726	509	45.4%	$294,879,495	35.8%	324	28.9%	$166,698,358	20.3%	833	$461,577,853
Norwich (C)	2,503	$3,140,959,099	2,469	98.6%	$2,912,911,744	92.7%	0	0%	$0	0%	2,469	$2,912,911,744
Norwich (T)	2,013	$2,080,430,801	835	41.5%	$927,113,283	44.6%	934	46.4%	$664,712,865	32.0%	1,769	$1,591,826,147
Otselic (T)	741	$461,373,250	202	27.3%	$140,692,043	30.5%	267	36.0%	$148,760,881	32.2%	469	$289,452,924
Oxford (T)	1,731	$958,330,880	310	17.9%	$219,767,698	22.9%	760	43.9%	$316,831,538	33.1%	1,070	$536,599,236
Oxford (V)	648	$679,367,779	404	62.3%	$498,395,802	73.4%	235	36.3%	$170,627,867	25.1%	639	$669,023,668
Pharsalia (T)	583	$389,863,952	57	9.8%	$33,992,193	8.7%	284	48.7%	$146,924,943	37.7%	341	$180,917,135
Pitcher (T)	609	$315,344,531	212	34.8%	$110,157,991	34.9%	162	26.6%	$77,783,980	24.7%	374	$187,941,971
Plymouth (T)	1,244	$510,829,645	303	24.4%	$129,598,409	25.4%	663	53.3%	$256,298,180	50.2%	966	$385,896,589
Preston (T)	782	$348,948,426	84	10.7%	$32,941,678	9.4%	331	42.3%	$130,393,620	37.4%	415	$163,335,297

Jurisdiction	Number of Buildings	Total Replacement Cost Value (RCV)	Estimated Building Stock Exposed									
			Number of Buildings – Wildland-Urban Interface	Percent of Total	Replacement Cost Value (RCV) of Buildings – Wildland-Urban Interface	Percent of Total	Number of Buildings – Wildland-Urban Intermix	Percent of Total	Replacement Cost Value (RCV) of Buildings – Wildland-Urban Intermix	Percent of Total	Total Buildings in Wildland - Urban Interface/Intermix (WUI)	Total Replacement Cost Value (RCV) in Wildland- Urban Interface/Intermix (WUI)
Sherburne (T)	1,463	$1,113,221,738	420	28.7%	$223,665,889	20.1%	513	35.1%	$205,695,116	18.5%	933	$429,361,005
Sherburne (V)	611	$768,785,678	515	84.3%	$698,812,660	90.9%	85	13.9%	$31,488,906	4.1%	600	$730,301,566
Smithville (T)	1,032	$690,983,617	186	18.0%	$199,039,800	28.8%	447	43.3%	$212,230,482	30.7%	633	$411,270,282
Smyrna (T)	842	$519,858,907	147	17.5%	$80,359,187	15.5%	213	25.3%	$84,305,350	16.2%	360	$164,664,537
Smyrna (V)	99	$161,456,951	0	0.0%	$0	0.0%	0	0.0%	$0	0.0%	0	$0
Chenango County (Total)	**31,120**	**$23,000,596,289**	**11,848**	**38.1%**	**$10,539,234,867**	**45.8%**	**10,630**	**34.2%**	**$5,222,135,335**	**22.7%**	**22,478**	**$15,761,370,202**

Source: Chenango County GIS, 2020; University of Wisconsin, 2010
Notes: T = Town, V = Village; C= City

Impact on Critical Facilities

It is recognized that a number of critical facilities are located in the wildfire hazard area and are also vulnerable to the threat of wildfire. Majority of the critical facilities exposed to the wildland-urban interface/intermix hazard areas are government facilities, potable water and wastewater facilities. Table 5.4.10-8 summarizes the number of critical facilities and lifelines within the wildfire hazard areas by jurisdiction. Overall, 314 critical facilities are exposed to the wildland-urban interface/intermix hazard areas. 307 of the critical facilities are considered lifelines for the County. The City of Norwich has the greatest number of critical facilities built in the wildland-urban interface/intermix hazard areas (i.e., 43). The exposed lifelines are categorized into FEMA lifeline groupings and are summarized in Table 5.4.10-8 and Table 5.4.10-9. Additionally, the distribution of critical facilities exposed to the wildfire hazard areas by critical facility type are shown in Table 5.4.10-11.

Table 5.4.10-8. Critical Facilities and Lifelines in the Wildland-Urban Interface Hazard Areas in Chenango County

Jurisdiction	Total Critical Facilities Located in Jurisdiction	Total Lifelines Located in Jurisdiction	Number of Critical Facilities and Lifeline Facilities Exposed to Wildfire Hazard Area			
			Critical Facilities	Percent of Total Critical Facilities	Lifelines	Percent of Total Lifelines
Afton (T)	10	10	9	90.0%	9	90.0%
Afton (V)	16	16	16	100.0%	16	100.0%
Bainbridge (T)	8	8	3	37.5%	3	37.5%
Bainbridge (V)	23	22	23	100.0%	22	95.7%
Columbus (T)	7	6	3	42.9%	3	42.9%
Coventry (T)	20	20	13	65.0%	13	65.0%
Earlville (V)	4	4	4	100.0%	4	100.0%
German (T)	5	5	0	0.0%	0	0.0%
Greene (T)	14	14	9	64.3%	9	64.3%
Greene (V)	25	24	5	20.0%	5	20.0%
Guilford (T)	16	16	11	68.8%	11	68.8%
Lincklaen (T)	1	1	1	100.0%	1	100.0%
McDonough (T)	13	13	8	61.5%	8	61.5%
New Berlin (T)	15	15	13	86.7%	13	86.7%
New Berlin (V)	24	23	24	100.0%	23	95.8%
North Norwich (T)	10	10	5	50.0%	5	50.0%
Norwich (C)	55	50	43	78.2%	40	72.7%
Norwich (T)	39	38	20	51.3%	19	48.7%
Otselic (T)	14	13	11	78.6%	10	71.4%
Oxford (T)	15	14	6	40.0%	6	40.0%
Oxford (V)	25	25	24	96.0%	24	96.0%
Pharsalia (T)	5	5	2	40.0%	2	40.0%
Pitcher (T)	1	1	1	100.0%	1	100.0%
Plymouth (T)	23	23	10	43.5%	10	43.5%
Preston (T)	17	17	10	58.8%	10	58.8%
Sherburne (T)	16	16	8	50.0%	8	50.0%
Sherburne (V)	23	23	20	87.0%	20	87.0%
Smithville (T)	28	28	7	25.0%	7	25.0%
Smyrna (T)	102	102	5	4.9%	5	4.9%
Smyrna (V)	5	5	0	0.0%	0	0.0%
Chenango County (Total)	**579**	**567**	**314**	**54.2%**	**307**	**53.0%**

Source: Chenango County GIS 2020; University of Wisconsin, 2010
Notes: T= Town; V=Village; C=City

Table 5.4.10-9. Critical Facilities and Lifelines in the Wildland-Urban Intermix Hazard Areas in Chenango County

Jurisdiction	Facility Types																					
	Convenience Store	Dam	Electrical Substation	Fire Station	Fire/EMS	Gas Station/ Convenience Store	Hazmat	Levee	Major Employer	Medical Facility	Municipal Hall	Natural Gas Well	Police Station	Potable Water Well	Reservoir	School	Senior Center	Shelter	Supermarket	Water Pump House	Water Tank	Water Treatment Facility
Afton (T)	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Afton (V)	0	0	0	0	0	0	0	0	1	1	1	0	1	1	2	1	0	2	0	0	0	1
Bainbridge (T)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Bainbridge (V)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	0
Columbus (T)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Coventry (T)	0	0	0	0	0	1	0	0	0	0	1	5	1	0	0	0	1	1	0	0	0	0
Earlville (V)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
German (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greene (T)	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0
Greene (V)	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	1
Guilford (T)	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Lincklaen (T)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
McDonough (T)	0	2	0	0	1	0	0	0	0	0	1	1	0	0	0	0	2	1	0	0	0	0
New Berlin (T)	0	0	1	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1
New Berlin (V)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0
North Norwich (T)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0
Norwich (C)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norwich (T)	0	2	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0
Otselic (T)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	1	0
Oxford (T)	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0
Oxford (V)	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	2	0
Pharsalia (T)	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Pitcher (T)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Plymouth (T)	0	0	0	0	1	0	0	0	0	0	1	7	0	0	0	0	0	1	0	0	0	0
Preston (T)	0	0	0	0	1	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0
Sherburne (T)	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Sherburne (V)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smithville (T)	0	0	0	0	1	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0

Jurisdiction	Facility Types																					
	Convenience Store	Dam	Electrical Substation	Fire Station	Fire/EMS	Gas Station/ Convenience Store	Hazmat	Levee	Major Employer	Medical Facility	Municipal Hall	Natural Gas Well	Police Station	Potable Water Well	Reservoir	School	Senior Center	Shelter	Supermarket	Water Pump House	Water Tank	Water Treatment Facility
Smyrna (T)	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Smyrna (V)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenango County (Total)	**1**	**6**	**5**	**1**	**6**	**2**	**2**	**1**	**7**	**1**	**8**	**37**	**2**	**6**	**3**	**5**	**5**	**10**	**2**	**1**	**8**	**4**

Source: Chenango County GIS 2020; University of Wisconsin, 2010
Notes: T= Town; V=Village; C=City

Table 5.4.10-10. Critical Facilities and Lifelines in the Wildland-Urban Interface Hazard Areas in Chenango County

Jurisdiction	Facility Types																											
	Airport	Bus Station	College	Convenience Store	County Building	Dam	Electrical Substation	EOC	Fire Station	Fire/EMS	Gas Station/ Convenience Store	Hazmat	Heating Fuel	Kerosene	Levee	Major Employer	Medical Center	Medical Facility	Municipal Hall	Natural Gas Well	Police Station	Potable Water Well	Public Health Department	Reservoir	School	Senior Center	Shelter	Supermarket	Water Tank	Water Treatment Facility
Afton (T)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0
Afton (V)	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
Bainbridge (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bainbridge (V)	0	0	0	1	0	0	1	0	0	1	2	1	0	0	1	2	0	0	2	0	1	2	0	0	1	0	1	1	0	2
Columbus (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Coventry (T)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Earlville (V)	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
German (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greene (T)	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greene (V)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Guilford (T)	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0

Jurisdiction	Facility Types																													
	Airport	Bus Station	College	Convenience Store	County Building	Dam	Electrical Substation	EOC	Fire Station	Fire/EMS	Gas Station/ Convenience Store	Hazmat	Heating Fuel	Kerosene	Levee	Major Employer	Medical Center	Medical Facility	Municipal Hall	Natural Gas Well	Police Station	Potable Water Well	Public Health Department	Reservoir	School	Senior Center	Shelter	Supermarket	Water Tank	Water Treatment Facility
Lincklaen (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
McDonough (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Berlin (T)	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	1	0
New Berlin (V)	0	0	0	1	0	0	1	0	0	1	3	0	0	0	0	2	0	0	2	0	1	3	0	0	0	3	1	1	1	1
North Norwich (T)	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Norwich (C)	0	1	1	2	4	0	1	1	0	0	0	0	1	0	1	9	1	1	0	0	1	0	1	0	4	7	3	1	2	1
Norwich (T)	0	0	0	1	0	0	1	0	0	0	4	0	1	0	0	1	0	0	1	0	1	1	0	0	0	0	0	2	1	0
Otselic (T)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	2	0	0	0	0	0	0	0	0
Oxford (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Oxford (V)	0	0	0	2	0	0	0	0	0	1	1	0	1	0	0	0	0	1	2	0	1	3	0	0	1	0	2	0	0	2
Pharsalia (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pitcher (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plymouth (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Preston (T)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Sherburne (T)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0
Sherburne (V)	0	0	0	3	0	0	0	0	0	1	2	4	0	0	0	1	0	2	2	0	1	0	0	0	0	2	0	1	1	0
Smithville (T)	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smyrna (T)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Smyrna (V)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenango County (Total)	**1**	**1**	**1**	**14**	**4**	**1**	**8**	**1**	**1**	**10**	**19**	**5**	**4**	**1**	**2**	**18**	**1**	**4**	**14**	**8**	**7**	**15**	**1**	**1**	**8**	**13**	**9**	**7**	**6**	**6**

Source: Chenango County GIS 2020; University of Wisconsin, 2010
Notes: T= Town; V=Village; C=City

Table 5.4.10-11. Lifelines Exposed to the Wildland-Urban Interface/Intermix Hazard Areas

FEMA Lifeline Category	Number of Lifelines	Number of Lifelines Exposed to the Wildland Urban Interface (WUI) Hazard Area
Communications	2	2
Energy	226	63
Food, Water, Shelter	127	92
Hazardous Material	17	7
Health and Medical	45	36
Safety and Security	147	105
Transportation	3	2
County Total	**567**	**307**

Source: Chenango County GIS 2020; University of Wisconsin, 2010

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 and decrease in tourism. Wildfires can cost thousands of taxpayer dollars to suppress and control and can involve hundreds of operating hours on fire apparatus and thousands of volunteer man hours from the volunteer firefighters. There are also many direct and indirect costs to local businesses that excuse volunteers from working to fight these fires.

Impact on the Environment

According to the USGS, post-fire runoff polluted with debris and contaminates can be extremely harmful to ecosystem and aquatic life (USFS 2020). Studies show that urban fires in particular are more harmful to the environment compared to forest fires (USFS 2020). The age and density of infrastructure within Chenango County can exacerbate consequences of fires on the environment because of the increased amount of chemicals and contaminates that would be released from burning infrastructure. These chemicals, such as iron lead, and zinc, may leach into the storm water, contaminate nearby streams, and impair aquatic life.

Cascading Impacts on Other Hazards

Wildfires result in the uncontrolled destruction of forests, brush, field crops, grasslands, real estate, and personal property, and have secondary impacts on other hazards such as flooding, by removing vegetation and destroying watersheds. Additionally, wildfires can be increased with rising temperatures and increased droughts. Wildfires can also impact the County's susceptibility to dam failures. Wildfires can damage the surface of dams and spillways, especially vegetation on embankment slopes or grass lining in spillway channel. They can also damage dam-associated facilities, power supplies, communication equipment, and access roads. More information about the drought, extreme temperature, and flood hazards of concern can be found in Section 5.4.2, Section 5.4.3 and Section 5.4.4, respectively.

Future Changes That May Impact Vulnerability

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

Projected Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth located in the wildland-urban interface/intermix hazard areas could be at risk. Refer to Figure 5.4.10-4 a countywide map of new development and wildfire and additionally, refer the maps in each jurisdictional annex (Section 9 of this HMP) to view the new development project areas and their proximity to the wildland-urban interface/intermix hazard areas.

Projected Changes in Population

According to the U.S. Census Bureau, the population in Chenango County has decreased by approximately 4.2-percent between 2010 and 2018 (US Census Bureau 2020). Estimated population projections provided by the 2017 Cornell Program on Applied Demographics indicates that the County's population will continue to decrease into 2040, decreasing the total population to approximately 41,123 persons (Cornell Program on Applied Demographics 2017). The population that remains in the county is vulnerable to wildfires. Refer to Section 4 (County Profile) for additional discussion on population trends.

Climate Change

As discussed above, most studies project that the State of New York will see an increase in average annual temperatures and precipitation. Changes in temperature can have an effect on how fire interacts with the surrounding natural habitat and built environment. Fire interacts with climate and vegetation (fuel) in predictable ways. Understanding the climate/fire/vegetation interactions is essential for addressing issues associated with climate change that include:

- Effects on regional circulation and other atmospheric patterns that affect fire weather
- Effects of changing fire regimes on the carbon cycle, forest structure, and species composition, and
- Complications from land use change, invasive species and an increasing wildland-urban interface (USFS 2020).

It is projected that higher summer temperatures will likely increase the high fire risk by 10- to 30-percent. Fire occurrence and/or area burned could increase across the U.S. due to the increase of lightning activity, the frequency of surface pressure and associated circulation patterns conductive to surface drying, and fire-weather conditions, in general, which is conductive to severe wildfires. Warmer temperatures will also increase the effects of drought and increase the number of days each year with flammable fuels and extending fire seasons and areas burned (USFS 2020).

Future changes in fire frequency and severity are difficult to predict. Global and regional climate changes associated with elevated greenhouse gas concentrations could alter large weather patterns, thereby affecting fire-weather conducive to extreme fire behavior (USFS 2020).

Change of Vulnerability Since the 2015 HMP

For this hazard mitigation plan update, the 2010 Wildland-Urban Interface/Intermix data from the University of Wisconsin was referenced to determine areas within Chenango County that are vulnerable to wildfires. Population statistics have also been updated using the 5-Year 2014-2018 American Community Survey Population Estimates. The 2015 general building stock was updated using RS Means 2019 replacement cost values and updated parcel and tax assessment information. Additionally, the critical facility inventory was updated by Chenango County.

Overall, this vulnerability assessment uses a more accurate and updated building inventory which provides more accurate estimated exposure and potential losses for Chenango County.

Figure 5.4.10-4 New Development and Wildfire in Chenango County