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Integrating FEMA and Scouts for Local Community Hazard Preparedness

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Introduction

The mission of the Spirit of Adventure Council (BSA) is to “serve others by helping instill values in young people and in other ways prepare them to make ethical choices over their lifetime in achieving their full potential” (Spirit of Adventure, 2022). The council has 12,700 youth who participate in scouting, including completing approximately 75,000 community service hours a year. In an effort to expand their activities and service within the community, The Spirit of Adventure (SoA) Council has taken the initiative to link their programs with the Federal Emergency Management Agency’s (FEMA) National Preparedness Goal. SoA Council’s goal is to assist youths in developing skills that will allow them to enhance and deliver FEMA’s preparedness efforts. As a result, FEMA and the SoA Council are beginning a mutually beneficial relationship to prepare communities for disasters through youth development. The SoA plans to implement programs including the distribution of Prepare with Pedro activity books, the integration of Student Tools for Emergency Planning (STEP) programs, and the addition of teen community emergency response teams (CERT) into local towns.

Purpose

The purpose of this report is to identify prevalent hazards within the counties of Eastern Massachusetts to help guide the Spirit of Adventure (SoA) Council on where to focus their preparedness efforts. The SoA Council can play a major role in enhancing the preparedness efforts within their local communities. The identified hazards and risks will serve as a baseline to provide the SoA Council with resources to make priorities for their role in preparedness and response activities based on FEMA support.

The National Preparedness Goal, defined by FEMA, seeks to establish “a secure and resilient nation with capabilities required across the community to prevent, protect against, mitigate, response to, and recover from threats and hazards that pose the greatest risk” (Federal Emergency Management Agency, 2020). There are five primary areas of focus including prevent, protection, mitigation, response, and recovery, where individuals, organizations, and communities need input and opportunity to improve their actions against disasters. Of the six pieces of the National Preparedness System, this report focuses on identifying and assessing risk, as well as the core capabilities underpinning preparedness.

Counties

The Spirit of Adventure Council covers 77 towns within these four counties in Massachusetts: Essex, Middlesex, Norfolk, and Suffolk County. The following towns in Suffolk County are included: Boston, Chelsea, and Revere. The following towns in Norfolk County are included: Brookline, Dedham, Dover, Milton, Needham, Quincy, and Westwood (Spirit of Adventure, 2022).

The following towns in Essex County are included: Andover, Amesbury, Beverly, Boxford, Danvers, Essex, Georgetown, Gloucester, Groveland, Hamilton, Haverhill, Ipswich, Lawrence, Lynn, Lynnfield, Manchester, Marblehead, Methuen, Merrimac, Middleton, Nahant, Newbury, Newburyport, North Andover, Peabody, Rockport, Rowley, Salem, Salisbury, Saugus, Swampscott, Topsfield, Wenham, and West Newbury (Spirit of Adventure, 2022).

The following towns in Middlesex County are included: Arlington, Bedford, Belmont, Billerica, Cambridge, Carlisle, Chelmsford, Concord, Dracut, Dunstable, Everett, Lexington, Lincoln, Lowell, Malden, Medford, Melrose, North Reading, Reading, Somerville, Stoneham, Tewksbury, Tyngsboro, Wakefield, Waltham, Watertown, Westford, Wilmington, Winchester, and Woburn (Spirit of Adventure, 2022).

Demographics

The social and economic factors of a person or group can impact their level of vulnerability to a disaster. For example, Latinos may be more vulnerable due to their language abilities, as disaster warnings are often issued in English and may not be understood by Spanish speaking individuals. Economic factors, such as poverty, can play a role in the resources available during disaster preparedness, response, and recovery. Individuals who are living below the poverty level, may not have access to a car or alternative means to evacuate during a hurricane.

According to the 2020 Census Bureau Populations, Essex County has 809,829 residents. Of those residents, 68.9% identify as white alone and 4.1% identify as black alone. There are 0.5% of residents who identify as American Indian or Alaska Native alone, while 3.7% of the population in Essex County identifies as Asian. There are 13.4% of residents that identify with some other race alone and 9.3% identify with two or more races. Within Essex County, 79.1% of the population is eighteen or older and 20.9% are younger than eighteen. A majority of residents are white females, followed by 22.2% of the population which identify as Hispanic or Latino. There are approximately 31,000 veterans living within Essex County (U.S. Census Bureau, 2022).

Essex County is comprised of 327,185 housing units with a 5.5 vacancy rate. The vacancy rate is the number of homes which are not occupied within the county. Essex County has two emergency services offices, which are defined as a government agency that is the lead agency for an emergency situation. These agencies can exist at the local, state, or federal level and lead preparation, response, and recovery actions in Essex County. There is one emergency services office per 387,930 residents and per 246 square miles. Last measured in 2010, there were 1,508 people per square mile within Essex County. Between 2016 and 2020, 92.1% of households had a computer and 87.6% had a broadband internet subscription. The median household income between 2016 and 2020 was \$82,225 with 9.0% of people in poverty (U.S. Census Bureau, 2022).

Middlesex County, according to the 2020 Census Bureau Populations, has 1,632,002 residents. Of those residents, 68.2% identify as white alone and 5.2% identify as black alone. Only 0.2% identify as American Indian or Alaska Native, while 12.9% identify as Asian alone. 8.3% of the population in Middlesex County identifies as Hispanic or Latino, as a majority of the population is white females. There are approximately 54,000 veterans living within Middlesex County. According to the Census Bureau, between 2016 and 2020, 21.3% of the residents were foreign born. A majority of the population, 80.5%, are eighteen or older, with 19.5% younger than eighteen. However, based on county data, Middlesex County has the largest number of youths (U.S. Census Bureau, 2022).

Middlesex County is comprised of 658,283 housing units with a vacancy rate of 4.9. There are 11 emergency services offices within the county, with 1 office per 143,896 residents and every 74 square miles. Between 2016 and 2020, 94.2% of households had a computer and 91.3% had a broadband internet subscription. The median household income in 2020 was \$106,202, with 7.1% of people living in poverty. Last measured in 2010, there were 1,837 people per square mile in Middlesex County (U.S. Census Bureau, 2022).

Norfolk County, according to the 2020 Census Bureau Populations, has 725,981 residents. Of those residents 71.6% identify as white alone and 7.1% identify as black alone. Only 0.2% of the residents identify as American Indian or Alaska Native, while 12.2% identify as Asian. 6.4% of the population identifies with two or more races, with 2.6% identifying with some other race alone. Only 5.0% of the population identifies as Hispanic or Latino, with a majority of the population being white alone and non-Hispanic or Latino. There are approximately 27,563 veterans in the county and 18.5% of residents are foreign born. Norfolk has a population comprised of 79.5% eighteen years and older and 20.5% younger than eighteen (U.S. Census Bureau, 2022).

Norfolk County is comprised of 349,616 housing units with a vacancy rate of 4.5. There are five emergency service offices, with one per 138,877 people and one every 246 square miles. According to the Census Bureau, between 2016 and 2020, 94.6% of households had a computer and 91.5% had a broadband internet subscription. In addition, between 2016 and 2020, 5.8% of the population under 65 had a disability. The median household income was \$105,320, with 5.9% of the county living in poverty. Last recorded in 2010, there were 1,693 people living per square mile in Norfolk County (U.S. Census Bureau, 2022).

According to the 2020 Census Bureau Populations, Suffolk County has 797,936 residents. Of those residents 47.1% identify as white alone and 18.2% identify as black alone. 10.2% of the population identifies as Asian, while 12.8% identify with some other race alone and 11.1% identify with two or more races. Approximately 23% of the population identifies as Hispanic or Latino. Suffolk County has the largest diversity index at 71.3% compared to the next highest, Middlesex County at 52.8%. Within Suffolk County, 84% of the residents are eighteen and older, while 16% are younger than eighteen. There are approximately 18,000 veterans living within the county and 29.7% of the population is foreign born. Between 2016 and 2020, 39.5% of the population spoke a language other than English in their household (U.S. Census Bureau, 2022).

Suffolk County is comprised of 349,616 housing units with a vacancy rate of 7.1. There are fifteen emergency service offices within Suffolk County, with one per 52,045 people and one office every 3 square miles. Since Boston, the capitol of Massachusetts, is located within Suffolk County, there are more emergency services and government buildings. 92.2% of households had a computer and 86.7% of households had a broadband internet subscription. The median household income was \$74,881 in 2020 and 16.5% of residents were living in poverty. Last measured in 2010, there were 12,415 people per square mile in Suffolk County (U.S. Census Bureau, 2022).

Introduction to Hazards, Disasters, and Risks Data

In order to identify preparedness priorities for the SoA Council, the Introduction to Hazards, Disasters, and Risks Fall 2021 class at the University of Akron, prepared a risk analysis for Middlesex County, Essex County, Suffolk County, and Norfolk County. The assumptions were made that an all-hazards approach would be taken, and the focus would be on preparedness actions. Over the course of a few weeks, the students researched hazards within their designated county and determined which hazards should be of focus and possible resources for schools. Based on these recommendations a further in-depth risk assessment was conducted for a final list of hazards of focus for SoA Council preparedness efforts.

In addition to working with the Introduction to Hazards, Disasters, and Risks Fall 2021 class, I worked with Dr. Pellegrino and the SoA Council to build their partnership with FEMA. I attended monthly Teams meetings to discuss the status of the project and provided data on the number of active community emergency response teams (CERT) within the relevant counties. I systematically worked through the list of towns included in the SoA region to determine whether they had an existing CERT. I spoke with police and fire departments, in addition to local emergency management agencies. The goal of gathering this data was to identify which CERTs could be connected with the teen CERT program in order to increase community preparedness.

RISK ASSESSMENT

The following severity and frequency charts are used to determine the level of risk for each hazard within Massachusetts (Massachusetts Emergency Management Agency, 2010, pg. 118-119).

Frequency Categorization

Very Low Frequency	Occurring less than once in 100 years (less than 1% each year)
Low Frequency	Occurring once in 50 years to once in 100 years (1% - 2% each year)
Medium Frequency	Occurring once in 5 years to once in 50 years (2% - 20% each year)
High Frequency	Occurring more than once in 5 years (greater than 20% each year)

Severity Categorization

Minor	Scattered property damage, essential services not interrupted, limited public infrastructure damage, limited fatalities or injuries
Serious	Scattered major property damage, brief interruption of essential services, some injuries or fatalities
Extensive	Widespread major property damage, up to several days for public infrastructure repairs, interruption of essential services for hours to days, many injuries and/or fatalities

Catastrophic	Infrastructure and property destroyed, numerous injuries and fatalities, and essential services are stopped
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WINTER RELATED HAZARDS

Winter-related hazards includes heavy snowfalls, nor'easters, and blizzards. Heavy snowfall is defined as accumulating to four inches or more in twelve hours or less or accumulating to six inches or more in twenty-four hours or less. A blizzard can bring heavy snow and is defined by the National Weather Service as “blowing and/or falling snow with winds of at least 35 mph, reducing visibilities to a ¼ of a mile or less for at least three hours” (National Weather Service, n.d.).

A Nor'easter is a specific storm that moves up the east coast and often produces heavy snow, rain, or sleet. A nor'easter differs from a blizzard due to the direction from which the storm develops, specifically the winds. A nor'easter develops from a weak disturbance moving out of the Plains that interacts with large areas of moisture. The storm collects moisture from the Gulf and Atlantic and develops off the east coast. These storms move north up the east coast and obtain maximum intensity over New England. A nor'easter is most common between September and April but can occur any day of the year. These storms can be accompanied by winter storm, high wind, blizzard, and coastal flood watches and warnings (National Weather Service, n.d.).

Previous Occurrences

In Essex County, there have been 118 reported events between 1/01/1972 and 12/31/2021. Of these reports, there have been zero injuries/fatalities and approximately \$7.4M in property damage. In the last six years, from 2015 to 2021, there have been 15 reported events of heavy snow, with a property damage estimate of \$40.5k. There have also been twelve additional events classified as a winter storm in Essex County. In Middlesex County, there have been 178 reported events between 1/01/1972 and 12/31/2021. Of these reports, there have been zero injuries/fatalities and approximately \$4.9M in property damage. Since 2015, there have been 41 reported events of heavy snow, with a property damage estimate of \$79.5k. There have been twelve additional winter storm classifications listed for Middlesex County (National Centers for Environmental Information, 2022).

In Norfolk County, there have been 214 reported events between 1/01/1972 and 12/31/2021. Of these reports, there have been two deaths and one injury, and approximately \$17.6M in property damage. Since 2015, there have been 36 reported events of heavy snowfall and a property damage estimate of \$211.8k. There have been eleven additional events classified as a winter storm in Norfolk County. In Suffolk County, there have been 50 reported events of heavy snowfall, with ten of those reports occurring within the last six years. As a result of heavy snowfall, there has been an estimated \$9.6M in property damage and one reported injury (National Centers for Environmental Information, 2022).

The 2003 Nor'easter impacted the Eastern United States during the first week of December. The storm dumped one to three feet of snow over a large area of Massachusetts. Boston's southwest suburbs received 28 to 35 inches of snow. Coastal seas reached as high as 30 feet off the eastern

side of Massachusetts. Peak wind gusts reached 58 mph at the height of the storm. The storm resulted in one death, when a railway worker was struck by a train while clearing snow from the tracks. In Tauton, the snowfall total reached 25.9 inches and Boston Logan received 16.9 inches. Beverly received some of the highest totals, with 32 inches, followed by 29 inches in Everett. Boston implemented an emergency parking ban and Boston Logan was forced to downgrade to one runway for the duration of the storm (National Centers for Environmental Information, 2022).

In January 2005, Boston experienced its fifth worst blizzard since 1892, receiving 22.5 inches in two days. Of that 22.5 inches, 13.4 fell in one day, breaking the previous daily snowfall record set in 1966. Record amounts of snow impacted areas of Massachusetts including 38 inches in Plymouth and Salem. Wind gusts reached as high as 65 mph and minor coastal flooding occurred during high tide. Whiteouts caused by the storm impacted road conditions and airport travel throughout the state. The storm impacted all four counties within the SoA Council coverage area (National Centers for Environmental Information, 2022).

Winter Storm Nemo in February 2013 brought blizzard conditions to the region. The storm developed off North Carolina, moving up the coast Friday evening to impact New England. Overnight, the region received two to three inches per hour, with some areas experiencing three to five inches per hour. Hurricane-force winds of 74 mph were sustained Friday night along the Massachusetts coast. The storm resulted in massive power outages due to downed wires and major coastal flooding occurred. The storm surge in Boston reached three to four feet, making many coastal roadways inaccessible (National Centers for Environmental Information, 2022).

A historic winter storm began on Monday, January 26, 2015 and lasted until the early morning of Tuesday, January 27, 2015. The storm was well forecasted, with blizzard watches and winter storm watches issued two days prior to snowfall. At the storm's peak, snowfall was two to three inches per hour. Blizzard conditions were reported in Boston and Beverly. Daily snowfall totals reached 22.1 inches in Boston and 31.9 inches in Worcester. Highest snow totals also included Methuen, with the town receiving 31.5 inches of snow. The Massachusetts coast had gusts up to 50-65 mph, some winds reaching hurricane force. Significant coastal flooding occurred, specifically south of Boston. As a result of the storm, 116 towns declared local states of emergency, activating their emergency operations centers (EOCs). Over 40 shelters were opened across the four counties and President Obama issued a federal disaster declaration for eastern parts of Massachusetts (National Centers for Environmental Information, 2022).

Two major storms impacted Massachusetts in 2018, with the first impacting the east coast in January. The blizzard made the largest impact on Massachusetts, bringing hurricane-force winds and one to two feet of snow. Winds on the coast reached up to 76 mph while mainland winds reached over 70 mph. Snowfall totals reached 17 inches in Boston. The coast of Boston saw storm tides of 15 feet, flooding areas of the financial district. The second major storm of 2018 occurred in early March, bringing one to two feet of snow across Massachusetts. Wind gusts reached between 70 and 80 mph, with blizzard conditions observed at Boston Logan Airport. Suffolk County received fifteen to twenty-four inches of snowfall (National Centers for Environmental Information, 2022).

Level of Risk

The frequency of Nor'easters in Massachusetts is categorized as high, due to its location along the east coast. A high frequency categorization means an event occurs more than once in five years, more than 20% each year. However, these nor'easters tend to have a minor impact in terms of severity. Since nor'easters are so common within Massachusetts, the state has developed successful mitigation and preparedness actions to defend against winter storms. Heavy snowfall and blizzards are also categorized as high frequency with a minor severity rating. A minor severity categorization means there is limited property and infrastructure damage, limited fatalities and injuries, and essential services are not interrupted. The impact of winter storms is widespread and statewide. Although, preparedness is high for winter storms, there is a higher risk for vulnerable populations (Massachusetts Emergency Management Agency, 2010, pg. 118).

HIGH WINDS

According to the National Weather Service, there are six threat levels associated with high wind. The scale ranges from "non-threatening" to "damaging high wind". "High wind" is the fifth level of the scale and is associated with a high threat to life and property. "High wind" is defined as sustained speeds of 40 to 57 mph and are consistent with a high wind warning. High winds can break off small branches and blow around loose objects. High winds can cause damage to porches, carports, and pool enclosures, as well as cause power outages. "Damaging high wind" is defined as sustained speeds greater than 58 mph or as gusts greater than 58 mph. "Damaging high winds" are associated with an extreme threat to life and property and consistent with a high wind warning. Damaging high winds can impact unanchored mobile homes, awnings, and carports, as well as tear shingles from roofs. Large branches can break off trees and widespread power outages may occur (National Weather Service, 2021a). High winds can occur on their own or accompany a storm, such as a hurricane, tornado, thunderstorm, or blizzard.

Previous Occurrences

From 1/01/2015 to 12/31/2021, there were 159 incidents of high wind reported in Norfolk County. The highest wind recorded reached 76 kts (87 mph) in 2021 and 2018. In Suffolk County, there were 35 incidents of high wind reported, with the highest being 61 kts (70 mph). Of 68 reported events of high wind in Essex County, the highest recorded was 69 kts (79 mph) in 2019, off the coast of Marblehead, on Children's Island. Middlesex County also recorded a high wind of 69 kts (79 mph), with an average of 50 kts (57 mph) over the span of 41 reported events. The highest winds recorded in these four counties were located on or near the eastern coast of Massachusetts (National Centers for Environmental Information, 2022).

Hurricane-force winds accompanied the October 2021 Nor'easter that swept across eastern Massachusetts. Wind gusts ranging from 60-90 mph and over were recorded, with half a million residents without power. Numerous trees were downed, resulting in blocked roads and property damage. Overall, 118k in property damage was reported as a result of high winds (National Centers for Environmental Information, 2022). Schools were closed for multiple days and residents of southeastern Massachusetts were warned to stay off the roads. Beverly reported wind gusts of 51 mph and Scituate reached 87 mph (Ellement, 2021).

On April 13, 2020, a storm brought winds reaching over 80 mph in some parts of Massachusetts. As a result of the high winds, numerous trees were downed and approximately 100,000 people

were left without power. Over 50,000 people continued to remain without power the day following the storm. Milton, located in Norfolk County, recorded winds exceeding 80 mph and Plymouth had gusts reaching 72 mph. Boston Logan Airport saw wind speeds of 58 mph, resulting in multiple flights being canceled (Enos, 2020).

The highest winds ever recorded in the region accompanied The Great New England Hurricane of 1938. The storm continued to strengthen along the east coast until it made landfall in Southern New England. The Blue Hill Observatory in Milton, MA, recorded wind speeds of 121 mph, with peak gusts of 186 mph. To this day, the storm is considered one of the most destructive storms to impact Southern New England (Vallee et. al, n.d.).

Level of Risk

Massachusetts is at a high level of frequency for high wind events. Specifically, Norfolk, Suffolk, and Essex County are at an increased risk due to their coastal locations. However, the severity of these wind events are minor compared to other hazards. Vulnerable populations include those living in motor homes, especially those unanchored to the ground. High winds put residents at risk for power outages and downed trees and power lines. Elderly residents are at risk when high winds occur during winter months. Power outages combined with low temperatures can put elderly residents at risk for hypothermia and other illnesses. High winds impact Massachusetts at a regional level and often occur statewide (Department of Conservation and Recreation et. al, 2010).

FLOOD HAZARDS

There are four main types of flooding which impact Massachusetts: inland flooding, coastal flooding, flash floods, and storm surges. Inland flooding occurs when water levels rise higher than riverbanks due to excessive rainfall. Increases in rainfall can be caused by thunderstorms, hurricanes, nor'easters, or extended periods of rainfall and snowmelt. Incidents of inland flooding are becoming increasingly more common due to increases in rainfall resulting from climate change. Inland flooding can cause damage to riverbanks, parks and recreational land, drinking water, wastewater treatment systems, and infrastructure (Bureau of Environmental Health, n.d.)

Flash flooding is caused by an excessive amount of rainfall in a short amount of time. Dam failures and mudslides can also be a cause of flash floods. Flash floods can occur within minutes or hours of excessive rainfall, depending on multiple factors. Intensity of the rainfall, location, land use, vegetation, soil type, and soil water-content can all have an impact on how severe a flash flood is when it occurs. The dangers of flash flooding are due to how quickly they can occur and oftentimes residents are caught off-guard. Unlike coastal and inland flooding, flash flooding can occur anywhere within the state (National Severe Storm Labs, n.d.).

Coastal flooding can cause damage in Suffolk, Norfolk, and Essex County within Massachusetts. Coastal flooding occurs when high tides, heavy rainfall, and/or onshore winds create an inundation of the land along the coast. Combined with the rising sea levels due to climate change, Boston and the surrounding metro area are at high risk for coastal flooding.

Storm surges impact the eastern coast of Massachusetts, especially Norfolk, Suffolk, and Essex Counties. Defined as an abnormal rise in the water level, storm surges are caused by severe storms. The water level rises above the regular tide level and is impacted by wind, waves, and a low atmospheric pressure. As a result of storm surges, severe flooding can occur along the coast, especially when combined with a normal high tide. Storm surges often accompany hurricanes and can cause major property damage and loss of life. Since sea levels continue to rise, storm surges will increase in frequency and cause more damage along the coast. Surges have the ability to impact roadways, subways, railroads, commercial buildings, and residential properties. Erosion and ecosystem damage can also occur as a result of storm surges (Massachusetts Climate Change Clearinghouse, 2022).

Previous Occurrences

Hurricane Sandy was the deadliest hurricane to impact the U.S. during the 2012 hurricane season. Moderate coastal flooding occurred along the Massachusetts coastline. The storm surge averaged around 2.5 to 4.5 feet with its peak between high tide cycles. The storm surge reached between 20 and 25 feet as the hurricane continued to barrel the coast. Massachusetts often suffers damages from the remnants of hurricanes, such as Hurricane Ida and Tropical Storm Fred. Heavy rains led to flash flooding in the wake of Tropical Storm Fred, with multiple vehicles in need of rescuing from highways and local roads. Rainfall levels reached an inch per hour until the drainage systems became inundated (StormTeam5, 2021). Hurricane Ida brought five inches of rain to some areas resulting in major flash flooding. Storrow Drive in Boston became flooded and impossible to pass through, with SUVs getting stuck in the flood waters. A wastewater treatment plant in New Bedford recorded 9.5 inches of rain and 6,100 customers were without power (MacNeill, 2021).

The January 4th, 2018 blizzard also brought severe flooding to Boston. Emergency response teams on Atlantic Avenue in Boston raced to rescue motorists with boats. Flooding in Saugus also required boat rescues. Eastern Massachusetts saw some of the worst flooding it had seen in recent history. Combined with freezing temperatures, individuals were at major risk if stuck in flood waters (National Center for Environmental Information, 2022).

June 28, 2020, massive flash flooding occurred in Massachusetts, specifically around Norwood. The severe storm was accompanied by heavy rains, lightening, damaging wind and hail, and flash flooding. A flash flood emergency occurred in Norwood, with Norwood Hospital reporting four feet of water in the basement. As a result of the water damage, Norwood Hospital had to evacuate 80 to 90 people and has been closed since the event occurred. Thousands of people lost power due to downed trees and power lines. In Lynn of Essex County, 1,100 customers were without power. Flooding of major roads occurred, with some reaching one to three feet of water. Hail ranging from quarter to golf ball size was reported throughout Massachusetts.

Level of Risk

The Charles River flows 80 miles, from Hopkinton to Boston Harbor. The river drains rain and snowmelt from a watershed area of 310 square miles that is home to approximately one million residents. The river is a major source of recreation and marks one of the most prominent urban rivers in New England. The Charles River and its watershed include 35 municipalities including Lincoln, Lexington, Waltham, Arlington, Watertown, Cambridge, Somerville, Dover, Needham,

Westwood, Dedham, Boston, and Brookline. The river is home to 25 dams and 298 river crossings. An increase in rainfall due to climate change has heightened the chance of flooding. Homes located within the watershed and facilities close to river crossings are at a high risk of damages due to flooding (Charles River Watershed Association, 2021).

As of the 2013 Hazard Mitigation Plan, Essex County had 32 dams labeled high hazard. High hazard refers to dams located where a failure would result in serious damage to homes, industrial facilities, public utilities, main highways, and loss of life. Middlesex County has 44 dams labeled high hazard. Norfolk County has 17 dams labeled high hazard, while Suffolk County only has one high hazard dam. Essex County has 56 dams labeled a significant hazard, with Middlesex County having a total of 84 significant hazard dams. Significant hazard refers to dams located where a failure would cause loss of life, damage to commercial facilities, homes, secondary highways and an interruption in public utilities. Norfolk County has 57 significant hazard dams, while Suffolk County only has 3 significant hazard dams. There have been two incidents of potential dam failure, which would have led to serious flooding and severe damage. Whittenton Pond Dam and Forge Pond Dam occurred in 2005 and 2010 respectively, with no damage occurring but emergency actions were taken to prevent possible damage. Dam failures are often infrequent but can coincide with a disaster, making preparedness an important aspect. Dam failures can also cause secondary hazards such as landslides (Commonwealth of Massachusetts, 2013).

Massachusetts currently has 84,000 people at risk of coastal flooding. By 2050, that number is expected to grow to 133,000 people at risk of coastal flooding. Those at risk are living in 100-year coastal floodplains. Massachusetts has a high frequency of flooding which can result in serious damage to property and loss of life. Flooding impacts Massachusetts regionally and occurs statewide (Department of Conservation and Recreation et. al, 2010). Although Massachusetts has a high level of preparedness for coastal flooding, due to the sea level rise and the density of coastal populations, the state is at a high risk for flooding. A major flooding event could result in catastrophic damage to these four counties within the SoA Council region.

EXTREME TEMPERATURES

Extreme heat is defined as “a period of high heat and humidity with temperatures above 90 degrees for at least two to three days” (U.S. Department of Homeland Security, 2021). When there is extreme heat, the human body works overtime to maintain a normal body temperature. Among weather-related hazards, extreme heat is the cause of the highest annual number of deaths. Those most at risk for extreme heat include older adults and children. Extreme heat can cause heat cramps, heat exhaustion, and heat stroke.

Extreme cold is defined as a prolonged period of freezing temperatures. Especially along the coast of Massachusetts, extreme cold can be impacted by wind. The National Weather Service will issue a Wind Chill Advisory when the temperature falls between -15 degrees and -24 degrees Fahrenheit for a minimum of three hours. A Wind Chill Warning will be issued when the temperature reaches below -25 degrees Fahrenheit for a minimum of three hours. Temperatures of extreme cold can be especially dangerous to older adults, young children, and those who are sick or without shelter. Extreme cold can cause frostbite and hypothermia in under an hour.

Previous Occurrences

On July 3rd, 2018, Suffolk County Heat Index reached between 105- and 109-degrees Fahrenheit. Temperatures were similar in both Essex and Norfolk County as well. Boston Logan recorded temperatures of 105 degrees Fahrenheit, making it dangerous for populations at high risk of heat stroke. On August 28, 2018, Norfolk County reached the low 100s, marking another period of extreme heat.

Middlesex County has had three recorded events of extreme cold in 2015 and 2016. Temperatures reached a low between 25 and 35 degrees below zero. Norfolk, Suffolk, and Essex County all had the same events of extreme cold throughout 2015 and 2016. January 11, 2020, temperatures reached sub-zero, -30 degrees Fahrenheit in some towns, resulting in closed schools and COVID-19 testing sites. On Saturday, January 15, 2022, the Mayor of Boston declared a cold emergency due to the extreme temperatures. Warming centers rushed to open to house the homeless population and other residents without adequate shelter.

Level of Risk

Extreme temperatures are categorized as medium frequency for these four counties of Massachusetts. However, due to the climate, the severity of impacts is only categorized as minor. Should the worst-case scenario occur, the severity would increase to serious. Residents of Massachusetts are more aware of the risks faced with extreme temperatures compared to other hazards. The most vulnerable populations include older adults and young children, in addition to those who may have underlying illnesses. Extreme temperatures are widespread and occur statewide (Department of Conservation and Recreation et. al, 2010).

HURRICANE/TROPICAL STORM HAZARDS

When a tropical cycle has maximum sustained winds of less than 39 mph it is called a tropical depression. A storm with maximum sustained winds 39 mph or higher is called a tropical storm. When the maximum sustained winds reach 74 mph or higher, it is called a hurricane. Hurricanes are rated on the Saffir-Simpson Hurricane Wind Scale and range from a Category 1 to a Category 5. This scale rates storms by sustained wind speed and does not consider additional hazards such as storm surge, rainfall, and tornadoes. A category 1 hurricane consists of very dangerous winds that will produce damage to shingles, gutters, siding, tree branches, and power lines. Once a hurricane reaches 111 mph, it is considered a major hurricane and will produce devastating damage. A category 5 hurricane consists of sustained winds of 157 mph or higher and will cause catastrophic damage. Homes will be destroyed, with roofs and walls collapsing, and fallen trees and power lines will result in widespread power outages that will leave residents without power for weeks to months. Some areas affected by a category 5 hurricane will be uninhabitable for weeks following landfall. Hurricane season begins on June 1 and ends November 30; however, hurricanes can occur outside of this time frame (National Hurricane Center, n.d). Tropical storm or hurricane storm surge can cause devastating damage along the coast, depending on the severity. Storm surge damage can occur to roads, bridges, buildings, and beaches. If the storm becomes severe enough, the storm surge impacts can reach miles inland, impacting homes and buildings.

Previous Occurrences

Hurricane Irene made impact in Massachusetts as a tropical storm on August 28, 2011. Widespread flooding was reported, as the storm coincided with high tides on the eastern coast. The average storm surge ranged from two to four feet along the coast. The highest wind speed at Boston Logan Airport was recorded as 44 mph. Rainfall amounts ranged from zero to ten inches, with higher amounts contributing to inland flooding. High winds resulted in \$34.7M in property damage, while storm surges and flooding caused \$24.1M in property damage. Downed trees and power lines resulted in outages across Massachusetts (National Center for Environmental Information, 2022).

Hurricane Sandy impacted Massachusetts in October 2012, marking the strongest and deadliest hurricane of the 2012 Atlantic hurricane season. However, the storm made landfall in Massachusetts as a tropical storm. As a result of the storm, approximately 380,000 residents were without power and sustained winds of 35 mph continued to damage trees and power lines throughout the storm. Gusts of more than 60 mph were reported in Brookline, Milton, and Lawrence. Utility companies were unable to repair the damages due to the sustained high winds. Boston Logan Airport canceled over 900 flights and the MBTA closed following reports of downed trees and power lines. Over 1,300 National Guard soldiers were deployed to deal with the impacts of a high tide combined with the storm surge. Severe flooding, worse than that of Hurricane Bob in 1991, was expected. Governor Deval Patrick declared a state of emergency due to the impacts of the storm. Those without adequate shelter were forced to take refuge in emergency shelters as the wind became too much to bear (Schworm et. al, 2012).

Hurricane Isaias impacted Massachusetts as a tropical storm, leaving 215,000 people without power on August 4, 2020. The next morning, August 5, 150,000 residents of Massachusetts remained without power. Maximum wind gusts of 53 mph impacted Boston, bringing down trees and power lines. As a result of high winds, the MBTA service was suspended and widespread damage occurred to vehicles, homes, and streets. Beaches and water-front areas were closed in preparation of the storm, as a high tide combined with a storm surge was expected Tuesday night (Hamm et. al, 2020). One fatality was reported in Chelmsford as a result of the storm.

Level of Risk

Historically, a majority of hurricanes on route to impact Massachusetts are downgraded to a tropical storm before making impact. Therefore, hurricanes and tropical storms are categorized as medium frequency in Massachusetts. The impacts of these storms are categorized as serious; however, damage could be catastrophic if a major category impacted Massachusetts. Due to the coastal landscape, towns located on the eastern coast would be at high risk for a major hurricane. Storm surges and high tides, combined with high sustained winds, could wreak havoc on the coastal environment. Since there is often a warning period before a hurricane makes landfall, residents have a better chance of successfully preparing to mitigate the damage. Hurricane and tropical storm impacts are widespread and occur statewide (Department of Conservation and Recreation et. al, 2010).

TORNADOES

According to the NOAA, a tornado is “a narrow, violently rotating column of air that extends from a thunderstorm to the ground” (National Weather Service (NWS), 2021). Since wind is

invisible, it may be difficult to notice a tornado, making them a dangerous atmospheric hazard. Favorable conditions for a tornado to occur include instability, warm moist air near the ground, cooler dry air aloft, and a change in wind speed and/or direction with height (NWS, 2021). Tornadoes can spawn from supercells, a severe, long-lived thunderstorm with an air mass extending through the storm and downward towards the ground. The most common months for tornadoes are June, July, and August, but can occur any day of the year. Tornadoes are currently measured by the “Enhanced Fujita Scale (EF)”, implemented in 2007 to replace the “Fujita Scale (F)” (NWS, 2021). The EF scale goes from EF0 to EF5, with EF5 being the most severe. For example, an EF5 tornado has winds over 200 mph and can carry strong homes off their foundations and for considerable distances (NWS, 2021).

Previous Occurrences

Between 1/01/1972 and 12/31/2021, in the SoA Council area of consideration, there has been a total of 19 tornadoes recorded to have made an impact. In Essex County, there have been two recorded events resulting in zero deaths and fatalities and approximately \$253k in property damage. In Middlesex County, there have been seven recorded events including an F2 and F3 on the Fujita Scale. On 7/21/1972, a tornado touched down between Chelmsford and Tyngsboro, resulting in four injuries and \$2.5M in property damage. In 1974, an F3 touched down between Billerica and Andover, resulting in 1 injury and \$250K in property damage. As a result of an August 2016 tornado in Concord, 39 homes were damaged due to downed trees and power lines. Tornadoes spawned as secondary hazards from Tropical Storm Henri, causing minimal damage to cars in Stow and Marlborough (National Center for Environmental Information, 2022).

In Norfolk County, nine events have been recorded, including an F1 which caused six injuries and one fatality. The tornado traveled from Needham to Watertown on 8/9/1972 causing \$25K in property damage. On 8/21/2004, an F1 impacted outside of the SoA Council zone but developed from a strong thunderstorm and resulted in \$1.5M in property damage. There were six additional tornadoes recorded with a rating of EF0 in 1990, 2013, 2015, and 2020, with minimal damage reported (National Center for Environmental Information, 2022).

In Suffolk County, there has been only one recorded incident on 7/28/2014. The tornado touched down in the Boston metro area, resulting in 2 direct injuries and 4 indirect injuries. A majority of the injuries, including a child and elderly woman, were caused by flying debris. The storm continued into Revere and Chelsea where it created \$4M in property damages (National Center for Environmental Information, 2022).

Level of Risk

On average, there are one to three tornadoes within southern New England each year. The frequency of tornadoes within Massachusetts is categorized as medium, meaning an event occurs from once in five years to once in 50 years (2% to 20% per year) (Massachusetts Emergency Management Agency, 2010, pg. 118). The severity of tornadoes in Massachusetts is categorized as serious, meaning there can be major property damage, minor infrastructure damage, some injuries/fatalities, and there is little impact to essential services (Massachusetts Emergency Management Agency, 2010, pg. 118).

EARTHQUAKES

An earthquake occurs when two tectonic plates slide past each other at a fault line. The location directly above where the slip occurred is called the epicenter and is where the strongest effects are felt. An earthquake can have both foreshocks, which occur prior to the main earthquake, and aftershocks, which occur after the main earthquake. Earthquakes are measured by seismographs and range on a scale from 1 to 10. A rating of 2.5 or less is usually not felt and occurs millions of times each year. Minor damages can be caused once the rating reaches between 2.5 and 5.4. A rating of 5.5 to 6.0 can cause slight damage to structures and occur approximately 300 times a year. A rating of 6.1 to 6.9 can cause major damage, especially in populated areas. Once the rating reaches 7.1 to 7.9, serious damage occurs and is categorized as a major earthquake. An 8.0 rating or above occurs once every year and can totally destroy communities, specifically those located near the epicenter of the earthquake (Michigan Technological University, n.d.). Oftentimes buildings and bridges collapse, landslides and avalanches are triggered, and gas, electricity, and telephone services are interrupted.

Previous Occurrences

Historically, between 1668 and 2016, there have been 408 recorded earthquakes, with damaging earthquakes occurring in 1727 and 1755. Damage reported includes downed chimneys and church steeples, and downed stone fences. The most recent earthquakes recorded have a rating of 2.5 or less, meaning they were not felt and did not cause any damage (Northeast States Emergency Consortium, 2022).

Level of Risk

Massachusetts is categorized as a very low frequency for earthquakes, as events occur less than 1% per year. The severity of an earthquake would be categorized as serious, due to the population density within Massachusetts. However, were a major earthquake to occur, the damage could be catastrophic, especially in Boston and surrounding towns. Since there is no warning time for earthquakes, there are little to no preparedness actions that can be taken by individuals.

TSUNAMIS

Tsunamis are often the result of an earthquake below or near the ocean floor. The force of the earthquake causes the displacement of the ocean, creating a large wave. The wave moves through the entire ocean from floor to surface, unlike a wind wave often seen at the beach. Tsunamis can also be caused by volcanic activity, landslides, and other weather activities. The speed depends on the depth of the ocean; however, tsunamis can travel up to 500 mph in water. As a tsunami approaches land, the speed slows to 20 to 30 mph and the height increases. Warnings are issued through radio, television, and sirens if they are present in the area. If a tsunami is approaching, it is important to act fast and evacuate to higher ground. A tsunami wave can range from 10 to 100 ft in severe cases and flood the coast with water. Just six inches of fast-moving water can knock an adult off its feet and twelve inches can carry a small car. Tsunamis pick up debris as water moves inland, making the water more dangerous for victims and property. Tsunamis can have multiple waves, so it is important to stay away from the waterfront following the first wave. Experts cannot predict when a tsunami will strike but deep-water observation systems can track a tsunami once it originates to give warning to impact zones (National Oceanic and Atmospheric Administration, 2018).

Previous Occurrences

There have been no recent previous occurrences of major tsunamis on the east coast. There are no major subduction zones in the Atlantic Ocean, resulting in a very low frequency of tsunamis compared to the Pacific Ocean.

Level of Risk

Although frequency is very low compared to other hazards, if a tsunami were to occur in the Atlantic Ocean and impact the east coast, the effects would be devastating. A majority of the Boston coast is less than ten feet above sea level, putting residents at risk for tsunami damage. For example, Logan Airport is located along the coast of the Boston Harbor and would be leveled by catastrophic damage by a tsunami, even one with a low wave height. The Charles River would carry water and debris inland, resulting in major damage to adjacent neighborhoods. According to the 2013 Massachusetts hazard mitigation plan, were a tsunami to occur, the severity would be extreme, even catastrophic in the event of the worst-case scenario (Department of Conservation and Recreation et. al, 2010).

NUCLEAR HAZARDS

Nuclear power plants are used to produce electricity and have produced 20% of the total annual electricity since 1990. Nuclear power plants heat water, which produces steam, which then is used to rotate a turbine, resulting in electricity. There are three hazards associated with power plant emergencies: radiation exposure to the body from clouds and particles, inhalation of radioactive materials, or ingestion of radioactive materials. Households within a ten-mile radius of a power plant could be harmed by direct radiation exposure and are included in emergency planning zones. Outside of ten miles, water, crops and livestock could be impacted by radioactive materials (Dukes County, n.d.).

There are four different levels of alert associated with a power plant emergency: notification of an unusual event, alert, site area emergency, and general emergency. A notification of an unusual event means a small problem has occurred, but action is not necessary, as radiation material has not been released. An alert also means that a small problem has occurred, and action is not necessary, however, small amounts of radiation have been released inside the plant. A site area emergency means a more serious problem has occurred and action may be necessary to protect against a small radiation leak. Local and state officials will ensure the public is aware of all protective actions that need to be taken. A general emergency is the most serious problem and means material has leaked outside the plant and plant site. Local and state officials will warn the public and instruct residents on which protective actions to take to ensure their safety. The Massachusetts Emergency Management Agency will monitor weather conditions so that all affected communities are notified (Dukes County, n.d.).

There are two nuclear power plants whose emergency planning zones impact the four SoA Council counties of Massachusetts. Seabrook Nuclear Power Station is located in Seabrook, New Hampshire, however, the emergency planning zone includes Amesbury, Merrimac, Newburyport, Salisbury, and West Newbury. There are existing emergency plans for Seabrook Station which include school, livestock, pet, and travel plans. There are also potassium iodide dosage pick-up locations, reception centers, and important numbers distributed to all households

within the emergency planning zones (Massachusetts Emergency Management Agency, 2022). The second nuclear power station is located in Plymouth, Massachusetts, Pilgrim Nuclear Power Station. This power station ceased to generate power in May 2019 and is currently being decommissioned. Therefore, the emergency zone plans, and procedures are not distributed to residents within the ten miles radius any longer.

Previous Occurrences

There have been no previous occurrences of emergencies which would impact the emergency planning zones surrounding both stations. Minor unusual events have occurred but been maintained onsite both power stations.

Level of Risk

The frequency of a nuclear event within Massachusetts is very low, as only one nuclear facility is in use as of 2019. If a nuclear event were to occur, residents within the emergency planning zone could be at risk for radiation exposure. Immediate action would have to be taken to minimize the impacts on human life. In addition, nuclear facilities are at risk for becoming secondary hazards following an earthquake or tsunami. However, Massachusetts has a low frequency of each of these events.

TERRORISM

According to the Federal Bureau of Investigation, terrorism is defined as “the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives” (Federal Bureau of Investigation (FBI), 2020). There are two types of terrorism: domestic and international. Domestic terrorism refers to acts perpetrated by U.S. persons who reside in the U.S. and are not acting on behalf of a foreign power. International terrorism refers to acts perpetrated by U.S. persons or foreign nationals in the U.S. who are acting on behalf of a foreign power (FBI, 2020). Acts of terrorism can be carried out through multiple means including active shootings, bombings, and biological attacks.

Previous Occurrences

The Boston Marathon Bombing took place on Marathon Monday, April 15, 2013. The Marathon began in Hopkinton at 9:00 a.m., with 27,000 runners on the Marathon course by 11:00 a.m. and the Red Sox game beginning at 11:05 a.m. Elite runners had finished the race by 12:36 a.m. and roads were opened in Hopkinton, Ashland, Framingham, and Natick. The first bomb detonated on Boylston Street near the Finish Line at 2:49 p.m., while the second bomb detonated 13 seconds later 180 yards from the first bombing site. Triage and treatment began at both explosion sites with EMS, fire, and police all present at the scene. Hospitals within the Boston area fully activated their emergency operations centers and braced for injuries and casualties. Thursday, April 18, 2013, the FBI released photos of the bombing suspects to the public. Around 12:19 a.m. on Friday, April 19, 2013, Cambridge PD responded to a carjacking on Memorial Drive. A firefight between suspects and police ensued, with the first suspect being pronounced dead at the hospital at 1:06 in the morning. As a result of the second suspect still on the loose, a system-wide transit shutdown was enacted, and a shelter-in-place request was announced. Following the request, a Watertown resident reported an individual hiding in his boat and the suspect was

eventually taken into custody Friday night (Massachusetts Emergency Management Agency, 2015).

Level of Risk

Massachusetts is categorized as a low risk for terrorism; however, the City of Boston and surrounding areas are at an elevated risk. Boston has the potential for being a target of a terrorist attack due to its size, location, and number of soft and hard targets. Boston is ranked 23rd in the United States based on population and has a population density of 12,792, which was last recorded by the U.S. Census Bureau in 2010 (U.S. Census Bureau, 2020). Consisting of major transportation systems, Boston is an attractive target for an act of terrorism. Major transportation vulnerabilities are the Massachusetts Bay Transportation Authority, Boston Logan International Airport, and the series of tunnels completing the Central Artery/Tunnel Project.

Massachusetts Bay Transportation Authority (MBTA): The MBTA is the fourth largest mass transit system in the U.S., consisting of four subway main lines throughout the Boston metro area. The MBTA, on average, has half a million riders a week. In addition to the four main subway lines, the MBTA consists of 171 bus routes, 4 rapid transit routes, commuter rail lines, and ferry rides. In 2019, the MBTA had approximately 8,728,580 passenger bus trips and 14,286,641 heavy rail passenger trips (Borstein, 2021). Although MBTA use has decreased since Covid-19, numbers are beginning to rise, with heavy rail passengers already four times that number seen in 2020 (Massachusetts Bay Transportation Authority, 2022).

Boston Logan International Airport (BOS): BOS is located along the Boston Harbor and consists of six runways in approximately 3,000 acres. In 2019, BOS had a total of 1,052,981,181 passengers. While that number decreased, due to Covid-19 in 2020, to 398,654,991, the number is slowly on the rise again, reaching approximately 700 million passengers in 2021. BOS has strict security measures including security checkpoints and baggage screenings. BOS currently displays a memorial for the victims of 9/11, as two of the hijacked planes took off from BOS. Boston also serves as a layover destination for many connecting flights, increasing the number of already daily local passengers. As of February 2022, there had been over half a million flights from Boston Logan International Airport (Massport, 2022).

Central Artery/Tunnel Project: The main goal of the Central Artery/Tunnel Project was to reduce Boston traffic and improve mobility throughout the city. The project replaced the previous Central Artery (I-93) with an underground highway and two bridges spanning the Charles River. The project also expanded I-90 to BOS, creating more than 300 acres of open land for public use. As a result of the project, the Leonard P. Zakim Bunker Hill Bridge was created, marking the widest ever built and the first to use an asymmetrical design. The Ted Williams Tunnel, which travels under the Boston Harbor is 8,448 feet, with 3,960 feet underwater. A majority of this construction is a vulnerability due to the resulting damage that would occur if the structural integrity were to be compromised (Massachusetts Department of Transportation, 2022).

Liquefied Natural Gas (LNG) Terminals: There are two main LNG import facilities within Massachusetts: Everett LNG and the Northeast Gateway. The import facility of main focus is Everett LNG, located on the Mystic River in Boston Harbor. As a result, millions of gallons of highly flammable fuel are brought through Boston Harbor. LNG is a natural gas that has been

liquified for storage and transportation over long distances. Although LNG is not flammable as a liquid, the vapors are highly combustible and can be ignited by any source of ignition. Therefore, were there to be an accident or act of terrorism that resulted in an LNG tanker explosion, fire damage of up to a 1-mile radius could occur (Northeast Gas Association, 2022).

Recommendations

Based on the above risk assessment, the SoA Council should focus their preparedness actions on hazards related to winter storms, nor'easters, and hurricanes/tropical storms. These hazards are the most frequent that can cause a severe impact to the community. Winter storms and nor'easters are accompanied by heavy snowfall and extreme cold temperatures. In addition to hurricanes/tropical storms, all of these hazards create heavy wind, damaging private and public property. Hurricanes/tropical storms have also previously been the cause of major flooding within Massachusetts. Of the last ten state of emergency declarations, eight have been a result of a hurricane, winter storm, or nor'easter. The only two outliers were a result of the Merrimack Valley Gas Explosion and the June 2011 tornadoes (Massachusetts Emergency Management Agency, n.d.). Although winter storms, nor'easters, and hurricanes/tropical storms should be the focus, SoA Council towns in and surrounding Boston should also be aware of possible terrorist attacks. Targets such as Boston Logan International Airport are still top terror targets due to the location and size. Hazards such as earthquakes and tsunamis lack the warning time and frequency to be a hazard of focus for these four counties.

In order to enhance preparedness efforts throughout Middlesex, Essex, Suffolk, and Norfolk Counties, scouts can participate in multiple preparedness actions. Primarily, cub scouts should be bringing information home with them through Prepare with Pedro activity books. By utilizing these books, scouts can bring home information to their parents regarding hazards in the area and share preparedness steps with the whole family. Families should be discussing evacuation plans in the case of a hurricane or loss of power due to a winter storm. Families need to be aware of local shelters within the area they can visit, if their home is no longer a safe option. The goal is to facilitate a culture of preparedness within each community, beginning with the family unit. SoA can provide quick facts, to children in cub scouts and older, about hazards that impact their areas the most frequently.

An important aspect of being prepared for a disaster, comes from understanding the hazards and warnings that may impact an individual's community. For residents along the coastline, understanding the severe impacts of a storm surge and paying attention to hurricane warnings can prevent property damage and loss of life. Residents who live in a floodplain need to understand the damage that can occur to their property and the benefit of flood insurance. These scouts can help spread their knowledge about warnings, including those for severe thunderstorms and heavy wind, to those around them. By educating children at a young age, they are able to carry this knowledge onto the rest of their adult lives.

Teen CERT is another preparedness activity that older scouts can participate in to enhance the culture of preparedness. CERT teams can fill gaps that exist in each town between emergency services and the public preparedness goal. For example, CERT teams can check in on older residents during a winter storm, ensuring they are not in danger or at risk. When elderly residents need to be transported to a shelter, CERT members can play the important role of staffing these

shelters as well. A majority of CERT member actions should be based on hazards related to winter storms, nor'easters, and hurricanes. These hazards are the most common in the SoA Council counties and impacts can be mitigated through successful preparedness activities. Teen CERT as a scouting resource can enhance the preparedness efforts of communities, especially in smaller communities that lack the necessary emergency services.

Teen CERTs located along the coast, including those in Essex, Norfolk, and Suffolk Counties, can spread the word about storm surge hazards and participate in preparedness activities. For example, during a hurricane warning, teen CERT can help local businesses and homes place sandbags along their property to protect it from the damages of a flood hazard. Teen CERTS within all four counties, can create disaster kits that can be distributed in their communities. These kits can include items such as flashlights, extra batteries, emergency blankets, a first aid kit, and a battery powered radio. The creation and distribution of kits can be utilized by scouts to earn a badge towards their completion of the program.

The SoA Council will continue to work with FEMA to increase preparedness within their region. In the future, SoA and the University of Akron will work to map the active CERTs, emergency management agencies, and local scouts to provide an additional resource for matching these programs together. The hope for this project is to create a road map for other scouting groups to utilize to increase preparedness in their local community. Scouting in the next two years should make a shift towards actions and trainings based on local hazards. For example, day camps through SoA often have a theme, with 2022 having a space theme. In the future, the theme may be focused on disaster preparedness and include activities such as wilderness first aid, kit building, and games such as Ready 2 Help (U.S. Department of Homeland Security, 2021).

Conclusion

The Spirit of Adventure Council can utilize the hazards of focus, determined through the above risk assessment, to create preparedness actions that will support community resilience. Each preparedness action should be based upon an aspect of a hazard that impacts the community at a high frequency. These hazards include nor'easters, hurricanes/tropical storms, and winter storms. In addition, Boston CERT can focus on preparing for acts of terrorism, as the city remains a top terror target. By focusing on the more frequent hazards, these four counties within the Spirit of Adventure Council will begin to have a community of preparedness. Kits or "go bags" can be updated to include resources that can be used against the most prevalent hazards in society. The goal is to utilize the SoA Council and Scout resources to bolster FEMA's National Preparedness Goal of establishing a resilient nation with the capabilities required to prevent and protect against threats and hazards that pose the greatest risk (Federal Emergency Management Agency, 2020).

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