



5.2 IDENTIFICATION OF HAZARDS OF CONCERN

To provide a strong foundation for mitigation actions considered in Sections 6 (Mitigation Strategy) and 9 (Jurisdictional Annexes), Putnam County focused on considering a full range of hazards that could impact the area and then identified and ranked those hazards that presented the greatest concern. The hazard of concern identification process incorporated input from the county and participating jurisdictions; review of the New York State Hazard Mitigation Plan (NYS HMP 2019); review of the 2015 Putnam County HMP (Putnam County HMP 2015); research and local, state, and federal information on the frequency, magnitude, and costs associated with the various hazards that have previously, or could feasibly, impact the region; and qualitative or anecdotal information regarding natural (not manmade) hazards and the perceived vulnerability of the study area’s assets to them. Table 5.2-1 documents the process of identifying the natural hazards of concern for further profiling and evaluation. Specific hazards not identified as a hazard of concern for Putnam County will not be further discussed in detail.

Hazards of Concern are those hazards that are considered most likely to impact a community. These are identified using available data and local knowledge.

Natural Hazards are those hazards that are a source of harm or difficulty created by a meteorological, environmental, or geological event.

5.2.1 Changes from 2015 Hazard Mitigation Plan

Since the development of the last plan, hazards and disasters not assessed in the prior plan have occurred in the County. These hazards were identified by the Steering Committee and Planning Partnership as areas to address in this plan update.

Harmful Algal Blooms: The prior plan did not address Harmful Algal Blooms (HABs) as a hazard of concern. This plan identifies and assesses HABs as a hazard in light of the incidence of HABs in water bodies in the County since the last plan update. Three lakes in the County were the subject of Action Plans developed by New York State Department of Environmental Conservation (NYSDEC). In 2015, there were seven lakes in the County with reported blooms. By 2019, this increased to 15 lakes. The Steering Committee and Planning Partnership identified HABs as a concern from a water supply perspective.

Drought: The 2015 Plan did not include Drought as a hazard of concern. Data procured from the U.S. Department of Agriculture indicated that the County experienced a significant amount of time (at least two years) between 2015-2019 in drought or abnormally dry conditions. When presented this data, the Steering Committee and Planning Partnership identified droughts as a hazard of concern.

Disease Outbreak: The prior plan did not address disease outbreaks as a hazard of concern. In 2020, Putnam County was hard-hit by the COVID-19 pandemic, which had catastrophic impacts in the Tri-State area. As of October 16, 2020, over 54,000 persons were tested in the County, of which 1,889 (3.5%) tested positive (Putnam County 2020). Putnam County has the 20th highest number of cases in the State and the 11th highest positive rate of cases. Overall, Putnam County experienced 63 deaths associated with COVID-19, ranking 22nd in the State (New York State Department of Health 2020). The rate of infection is approximately that of the statewide total (when adjusted to remove New York City) and is lower than that of the statewide total when New York City is included.

Table 5.2-1. COVID-19 Infection by Municipality

Municipality	Count (10/16)	Population (ACS 5-Year 2018)	Rate per 1,000
Carmel	648	34,227	18.9
Kent	291	13,325	21.8





Municipality	Count (10/16)	Population (ACS 5-Year 2018)	Rate per 1,000
Patterson	182	11,922	15.3
Philipstown	137	9,724	14.1
Putnam Valley	216	11,654	18.5
Southeast	413	18,218	22.7
Putnam County Total	1,889	99,070	19.1
Statewide (Sans NYC)	229,929	11,098,496	20.7
NYC	254,352	8,443,713	30.1
Statewide Total	484,281	19,542,209	24.8

Source: The New York Times 2020; American Community Survey, Putnam County 2020; NYS Department of Health 2020

The 2021 Putnam County Hazard Mitigation Plan Update includes best available data throughout the plan to present an updated understanding Putnam County’s risk.

5.2.2 Hazard Groupings

As per the 2015 Putnam County HMP, the Steering Committee grouped hazards based on the similarity of hazard events, typical concurrence or impacts, consideration of how hazards have been grouped in Federal Emergency Management Agency (FEMA) guidance documents (*FEMA 386-2 Understanding Your Risks, Identifying Hazards and Estimating Losses; Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy; Local Mitigation Planning Handbook*), and consideration of hazard grouping in the NYS HMP.



The *Disease Outbreak* hazard profile addresses diseases with the potential to impact Putnam County, including the novel coronavirus (COVID-19).



The *Drought* hazard profile specifically addresses drought events that occurred in Putnam County or had a considerable impact on the county.



The *Earthquake* hazard profile specifically addresses earthquakes that occurred in Putnam County or had a considerable impact on the county.



The *Extreme Temperature* hazard profile specifically addresses periods of extreme temperature that occurred in Putnam County or had a considerable impact on the county.



The *Flood* hazard includes riverine flooding, flash flooding, shallow flooding, ice jam flooding, and dam failure flooding. Inclusion of the various forms of flooding under a general *Flood* hazard is consistent with that used in FEMA’s *Multi-Hazard Identification and Risk Assessment* guidance and the NYS HMP.



The *Harmful Algal Blooms* hazard profile addresses algal bloom events that impact Putnam County’s waterbodies.



The *Severe Storm* hazard includes windstorms that often entail a variety of other influencing weather conditions, including thunderstorms, hail, lightning, and tornadoes. Tropical disturbances (hurricanes, tropical storms and tropical depressions) are often identified as a type of severe storm. For this HMP update *Severe Storm* includes thunderstorms, hail, lightning, tornadoes, hurricanes, tropical storms, and Nor’Easters.



The *Severe Winter Storm* hazard includes heavy snowfall, blizzards, freezing rain/sleet, and ice storms. This grouping is consistent with the NYS HMP.



The *Wildfire* hazard profile specifically addresses wildfires that occurred in Putnam County or had a considerable impact on the county.

Technological (e.g., hazardous material incidents) and man-made hazards (e.g., terrorism, man-made dam breaches/failures) are not being addressed in this planning process. The regulations do not require consideration of such hazards, and due to limited funding, these were not chosen for inclusion in this plan by Putnam County and planning participants. The county can expand the scope of this HMP to include other less frequent natural, technological, and man-made hazards as resources permit.

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Table 5.2-2. Identification of Natural Hazards of Concern for Putnam County

Hazard	Is this a hazard that may occur in Putnam County?	If yes, does this hazard pose a significant threat to Putnam County?	Why was this determination made?	Source(s)
Avalanche	Yes	No	<ul style="list-style-type: none"> The 2019 NYS HMP identifies avalanche as a hazard of concern and avalanches have been documented in New York State; however, no known occurrences were identified in Putnam County. Avalanches can occur in any situation where snow, slope and weather conditions combine to create proper conditions. About 90 percent of all avalanches start on slopes of 30 to 45 degrees and about 98 percent of all avalanches occur on slopes of 25 to 50 degrees. Steep slopes in Putnam County are a defining part of the landscape. New York State, in general, has a very low occurrence of avalanche events based on statistics provided by National Avalanche Center – American Avalanche Association (NAC-AAA) between 1998 and 2019. Due to the geography of the County and the lack of avalanches occurring in the County, the Steering Committee and Planning Partnership do not consider the hazard to be a significant concern. 	<ul style="list-style-type: none"> NYS DHSES NAC-AAA Input from Steering Committee and Planning Partnership
Coastal Erosion	Yes	No	<ul style="list-style-type: none"> The 2019 NYSHMP identifies coastal erosion as a hazard of concern for New York State. Erosion can impact all of the state’s coastal counties along: Lake Erie and the Niagara River, Lake Ontario and the St. Lawrence River, Atlantic Ocean and Long Island Sound, Hudson River south of the federal dam in Troy, the East River, the Harlem River, the Kill van Kull and Arthur Kill, and all connecting waterbodies, bays, harbors, shallows and wetlands. Though the Hudson River in Putnam County is tidally influenced, the County’s shoreline has not been identified as an area significantly impacted by coastal erosion. The Steering Committee and Planning Partnership do not consider the hazard to be a significant concern. 	<ul style="list-style-type: none"> NYS DHSES FEMA Input from Steering Committee and Planning Partnership
Dam Failure	Yes	Yes	<ul style="list-style-type: none"> The 2019 NYS HMP identifies dam failure as a hazard of concern for New York State and includes it in the Flood hazard profile. According to the NYS DEC there are 130 dams are within Putnam County, as shown in Section 4 (County Profile). Of these 130 dams, 66 are low hazard, 28 are intermediate hazard, 21 are high hazard, 10 are negligible or no hazard classification, and five have an unknown classification. The Steering Committee and Planning Partnership identified dam failure as a hazard of concern for the County and it is discussed in the flood profile. 	<ul style="list-style-type: none"> NYS DHSES Input from Steering Committee and Planning Partnership NYSDEC NYS GIS
Disease Outbreak	Yes	Yes	<ul style="list-style-type: none"> The 2019 NYS HMP does not identify disease outbreak as a hazard of concern for New York State. The County has been impacted by various diseases, including influenza, Lyme disease, and COVID-19. As of October 16, 2020, Putnam County totaled 1,889 positive COVID-19 cases. 	<ul style="list-style-type: none"> NYS DHSES NYS DEC Input from Steering Committee and



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			<ul style="list-style-type: none"> The Steering Committee and Planning Partnership identified disease outbreak as a hazard of concern for Putnam County. 	Planning Partnership
Drought	Yes	Yes	<ul style="list-style-type: none"> The 2019 NYS HMP identifies drought as a hazard of concern for the state. Putnam County has been impacted by several drought events that have occurred in New York State. Drought conditions can cause shortages in water for human consumption, impact agricultural production, and lead to reduced local firefighting capabilities. A majority of Putnam County relies on groundwater for their potable water, and droughts can impact groundwater resources significantly, limiting the availability of drinking water to county residents. New York State was included in one FEMA drought-related disaster declaration, which did not include Putnam County. Data presented in the 2019 NYS HMP indicates that Putnam County and the Lower Hudson area have faced a large number of drought events between 2000-2016, making it one of the most drought-prone regions of the State in the last two decades. Putnam County is located in the NYS Catskills drought region and the NRCC, Hudson Valley Climate Division. The Hudson Valley Climate Division has been impacted by periods of severe and extreme drought, including the following events: <ul style="list-style-type: none"> November – December 1908 May – July 1911 October 1930 – April 1931 December 1939 – January 1940 November 1941 – February 1942 November – December 1942 September – November 1957 June 1964 – August 1966 April – May 1985 August – September 1995 July – August 1999 November 2001 – April 2002 Putnam County has experienced abnormally dry periods at least annually since 2015. A drought period beginning in May 2015 lasted 10 months, and one beginning in April 2016 lasted more than one year and included periods of extreme and severe drought conditions. Based on previous occurrences and input from the Steering Committee and Planning Partnership, drought is identified as a hazard of concern for Putnam County. 	<ul style="list-style-type: none"> NYS DHSES FEMA USDA Input from Steering Committee and Planning Partnership NOAA-NCEI NRCC



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Earthquake	Yes	Yes	<ul style="list-style-type: none"> The 2019 NYS HMP identified earthquake as a hazard of concern for the state, though the frequency of damaging earthquakes within the State is relatively low. The HMP does not identify Putnam County as being in a region where soft soils amplify the impacts of the earthquake. Putnam County is in a region where a 10% in 50-year chance of peak ground accelerations between three and four are expected. According to the FEMA document “Understanding Your Risks: Identifying Hazards and Estimating Losses”, areas with 3%g should conduct a risk assessment for earthquakes. New York State was included in one FEMA earthquake-related disaster declaration (DR-1415); Putnam County was not included in this declaration. According to the NYS HMP, between 1950 and 2019, there were more than 500 earthquakes epicentered in the state. Of those events, six had an epicenter in Putnam County. Maps shown in the 2019 NYS HMP show clusters of historic earthquakes in and near the County, as well as a relatively high PGA (2% in 50 years) compared to the rest of the state. Based on the potential for significant loss and input from the Steering Committee, earthquake has been identified as a hazard of concern for Putnam County, even though it does not pose a significant threat to the county and there have not been any previous occurrences of major earthquakes within the county. 	<ul style="list-style-type: none"> NYS DHSES Input from Steering Committee and Planning Partnership USGS – Earthquake Hazards Program, Review of USGS Seismic Maps
Extreme Temperature	Yes	Yes	<ul style="list-style-type: none"> The 2019 NYS HMP identified extreme temperatures as a hazard of concern for New York State. The HMP notes comparably warmer summers in the Lower Hudson region (including Putnam County), but no recorded damages from heat waves or cold waves in the County. Putnam County was not included in any recent USDA disaster declarations related to extreme temperature events. However, the County remains at risk for relatively regularly-occurring extreme temperatures. The Steering Committee identified extreme temperature as a hazard of concern for Putnam County. 	<ul style="list-style-type: none"> NYS DHSES Input from Steering Committee and Planning Partnership NOAA-NCEI USDA
Flood (riverine, ice jam, dam failure and flash)	Yes	Yes	<ul style="list-style-type: none"> The 2019 NYS HMP identified flooding as a hazard of concern for New York State. It identifies \$1.9M in damage (\$83,000 on an annualized basis) resulting from floods. Between 1954 and 2019, Putnam County was included in 12 FEMA flood-related declarations. <ul style="list-style-type: none"> FEMA-DR-311 (Severe Storms and Flooding) – September 1971 FEMA-DR-487 (Storms, Rains, Landslides & Flooding) – October 1975 FEMA-DR-1095 (Severe Storms and Flooding) – January 1996 FEMA-EM-3149 (Hurricane Floyd Disaster Declaration) – September 1999 FEMA-DR-1296 (Hurricane Floyd) – September 1999 	<ul style="list-style-type: none"> NYS DHSES Input from Steering Committee and Planning Partnership FEMA NOAA-NCEI USACE CRREL Ice Jam Database



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			<ul style="list-style-type: none"> o FEMA-DR-1534 (Severe Storms and Flooding) – May-June 2004 o FEMA-DR-1589 (Severe Storms and Flooding) – April 2005 o FEMA-DR-1692 (Severe Storms and Inland Coastal Flooding) – April 2007 o FEMA-EM-3328 (Hurricane Irene) – August/September 2011 o FEMA-DR-4020 (Hurricane Irene) – August/September 2011 o FEMA-EM-3351 (Hurricane Sandy) – October/November 2012 o FEMA-DR-4085 (Hurricane Sandy) – October/November 2012 • Between 1950 and 2020, there have been three ice jams in the county. • Based on the history of flooding and its impacts on Putnam County and input from the Steering Committee identified flooding as a hazard of concern for the county. 	
Hailstorm	Yes	Yes	Please see Severe Storm	
Harmful Algal Blooms	Yes	Yes	<ul style="list-style-type: none"> • The 2019 NYS HMP did not identify HABs as a hazard of concern for the State. • Putnam County is the subject of three action plans addressing harmful algal blooms by the State’s Water Quality Rapid Response Team. • Since the State started tracking blooms in 2012, the County has regularly experienced algal blooms. • The Steering Committee identified HABs as a hazard of concern for Putnam County. 	<ul style="list-style-type: none"> • NYS DEC • Input from Steering Committee and Planning Partnership
Hurricane	Yes	Yes	Please see Severe Storm	
Ice Jams	Yes	Yes	Please see Flood	
Ice Storm	Yes	Yes	Please see Severe Winter Storm	
Infestation	Yes	No	<ul style="list-style-type: none"> • The 2019 NYS HMP does not include infestation as a hazard of concern for New York State. • While Putnam County has experienced the impacts of infestation and invasive species, the Steering Committee and Planning Partnership did not identify infestation as a hazard of concern for the County. 	<ul style="list-style-type: none"> • NYS DHSES • Input from Steering Committee and Planning Partnership
Landslide	Yes	No	<ul style="list-style-type: none"> • The 2019 NYS HMP includes landslide as a hazard of concern for New York State, however it does not provide information on population exposure. However, according to the 2014 NYS HMP, 18,391 people in Putnam County live within a high incidence of landslide area. The remainder of the population lives within a low incidence area. The 2019 NYS HMP reports no damage from landslides in Putnam County. • Karst landscapes exist from carbonate rock in Putnam County. Having this increases the County’s risk of land subsidence and sinkholes. • Between 1954 and 2019, New York State was included in one landslide-related disaster declaration. Putnam County was included in this declaration. 	<ul style="list-style-type: none"> • NYS DHSES • Input from Steering Committee and Planning Partnership • FEMA



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			<ul style="list-style-type: none"> o FEMA-DR-487 (Severe Storms, Heavy Rain, Landslides, Flooding) – September 25-27, 1975 • Other landslide incidents in Putnam County include: <ul style="list-style-type: none"> o August 7, 1990 o August 28-30, 2011 – Hurricane Irene – rains caused a mudslide in Philipstown • The Putnam County 2017 CEPA ranked landslide as a medium hazard, with a score of 9, therefore, due to this information in addition to the lack of significant events historically the Steering Committee did not identify landslide as a hazard of concern for Putnam County. 	
Nor'Easters	Yes	Yes	Please see Severe Storm	
Severe Storm (windstorms, thunderstorms, hurricanes / tropical storms, Nor'Easters, hail and tornados)	Yes	Yes	<ul style="list-style-type: none"> • The 2019 NYS HMP identified severe storm as a hazard of concern for New York State; however, in this plan, these hazards are profiled individually as thunderstorms, lightning, hail, tornadoes, high winds, and hurricanes/tropical storms. For this Putnam County HMP update, these hazards are combined into one profile. The 2019 NYS HMP reports \$2.43M in wind damages (\$106,000 on an annualized basis), \$350,000 in losses due to tornados, and \$633,000 from hurricanes. • Between 1954 and 2020, Putnam County was included in 12 FEMA severe storm-related declarations. <ul style="list-style-type: none"> o FEMA-DR-311 (Severe Storms & Flooding) – September 1971 o FEMA-DR-487 (Storms, Rains, Landslides & Flooding) – October 1975 o FEMA-DR-1095 (Severe Storms and Flooding) – January 1996 o FEMA-DR-1534 (Severe Storms and Flooding) – May-June 2004 o FEMA-DR-1589 (Severe Storms and Flooding) – April 2005 o FEMA-DR-1692 (Severe Storms and Inland Coastal Flooding) – April 2007 o FEMA-DR-4020 (Hurricane Irene) – August 2011 o FEMA-EM-3328 (Hurricane Irene) – August 2011 o FEMA-EM-3351 (Hurricane Sandy) – October-November 2012 o FEMA-DR-4085 (Hurricane Sandy) – October-November 2012 • According to the SPC, 6 tornados impacted Putnam County between 1950 and 2019. • Based on previous occurrences and input from the Steering Committee and Planning Partnership, severe storms are identified as a hazard of concern for Putnam County. 	<ul style="list-style-type: none"> • NYS DHSES • FEMA • NOAA-NCEI • SPC • Input from Steering Committee and Planning Partnership
Severe Winter Storm (heavy snow, blizzards, ice storms)	Yes	Yes	<ul style="list-style-type: none"> • The 2019 NYS HMP identified severe winter storm as a hazard of concern for New York State indicating Putnam County’s average annual winter storm losses are \$261,000. • FEMA included Putnam County in five winter storm-related disaster declarations: <ul style="list-style-type: none"> o FEMA-DR-801 (Severe Winter Storm) – October 1987 	<ul style="list-style-type: none"> • NYS DHSES • FEMA • NOAA-NCEI • Input from Steering Committee and



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			<ul style="list-style-type: none"> o FEMA-EM-3107 (Severe Blizzard) – March 1993 o FEMA-DR-1083 (Blizzard of '96) – January 1996 o FEMA-DR-3184 (Snow) – February 2003 o FEMA-DR-3299 (Severe Winter Storm) – December 2018 • Based on previous occurrences and input from the Steering Committee, severe winter storms are identified as a hazard of concern for Putnam County. 	Planning Partnership
Tornado	Yes	Yes	Please see Severe Storm	
Tsunami	No	Now	<ul style="list-style-type: none"> • The 2019 NYS HMP analyzes tsunamis as a hazard but reports no incidence of tsunamis in the State. The plan notes that low-lying coastal areas (such as those along the Hudson River in Putnam County) may be vulnerable to wave action. • The Steering Committee does not consider tsunami to be a hazard of concern for Putnam County. 	<ul style="list-style-type: none"> • NYS DHSES • Input from Steering Committee and Planning Partnership
Volcano	No	No	<ul style="list-style-type: none"> • The 2019 NYS HMP analyzed volcanos as a hazard but did not identify volcano as a hazard of concern for New York State and, therefore, the Steering Committee does not consider volcano to be a hazard of concern for Putnam County. 	<ul style="list-style-type: none"> • NYS DHSES • Input from Steering Committee and Planning Partnership
Wildfire	Yes	Yes	<ul style="list-style-type: none"> • The 2019 NYS HMP identified wildfire as a hazard of concern for New York State. The HMP identified Putnam as one of the Counties with the highest susceptibility to wildfire. • Putnam County was not included in any FEMA wildfire-related disaster declarations but has large areas of forest cover. Isolated brush fires have been reported. • Based on available data, the Steering Committee identified wildfire as a hazard of concern for Putnam County. 	<ul style="list-style-type: none"> • NYS DHSES • Input from Steering Committee and Planning Partnership • FEMA
Windstorm	Yes	Yes	Please see Severe Storm	

CRREL Cold Regions Research and Engineering Laboratory
DR Presidential Disaster Declaration Number
EM Presidential Disaster Emergency Number
FEMA Federal Emergency Management Agency
M Million (\$)
NCEI National Centers for Environmental Information
NRCC Northeast Regional Climate Center
NYS DEC New York State Department of Environmental Conservation

NYS DHSES New York State Division of Homeland Security and Emergency Services
NYS HMP New York State Hazard Mitigation Plan
PGA Peak ground acceleration
SPC Storm Prediction Center
USDA U.S. Department of Agriculture
USGS United States Geologic Survey





5.2.3 Summary of Hazards of Concern

In summary, a total of 10 hazards of concern were identified as significant hazards affecting the planning area, to be addressed at the county level in this plan (shown here in alphabetical order):

- Disease Outbreak
- Drought
- Earthquake
- Extreme Temperatures
- Flood (riverine, dam failure, flash, and ice jam)
- Harmful Algal Bloom
- Severe Storm (thunderstorm, hail, wind, tornado, hurricane/tropical storm, and Nor'Easter)
- Severe Winter Storm
- Terrorism
- Wildfire

Other hazards of concern that might occur in Putnam County were deemed to have a low potential to result in significant impacts and can be considered in future updates to this plan.