



5.4.1 Drought

The following section provides the hazard profile and vulnerability assessment for the flood hazard for the Livingston County Hazard Mitigation Plan (HMP).

5.4.1.1 Hazard Profile

This section provides profile information including description, location, extent, previous occurrences and losses, probability of future occurrences, and climate change impacts, as well as the vulnerability assessment for the drought hazard in Livingston County.

Description

Drought is a period characterized by long durations of below-normal precipitation. Drought is a temporary irregularity and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate. Drought conditions occur in virtually all climatic zones yet its characteristics vary significantly from one region to another, since it is relative to the normal precipitation in that region. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life.

There are four different ways that drought can be defined or grouped:

- **Meteorological** drought is a measure of departure of precipitation from normal. It is defined solely on the relative degree of dryness. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.
- **Agricultural** drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, differences between actual and potential evapotranspiration, soil water deficits, reduced ground water or reservoir levels, and other parameters. It occurs when there is not enough water available for a particular crop to grow at a particular time. Agricultural drought is defined in terms of soil moisture deficiencies relative to water demands of plant life, primarily crops.
- **Hydrological** drought is associated with the effects of periods of precipitation shortfalls (including snowfall) on surface or subsurface water supply. It occurs when these water supplies are below normal. It is related to the effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
- **Socioeconomic** drought is associated with the supply and demand of an economic good with elements of meteorological, hydrological, and agricultural drought. This differs from the aforementioned types of drought because its occurrence depends on the time and space processes of supply and demand to identify or classify droughts. The supply of many economic goods depends on weather (for example, water, forage, food grains, fish, and hydroelectric power). Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply (National Drought Mitigation Center 2014).

Location

Droughts can occur in all parts of the United States and any time of the year. Drier regions are more susceptible to long term or extreme drought conditions, while other areas tend to be more susceptible to short term, less severe droughts. In New York State (NYS), there is an abundant supply of water found throughout the State with streams, lakes, and coastal areas that have an average precipitation ranging from 60 inches in the Catskills to 28 inches in the Lake Champlain Valley. Variations in the normal amounts can lead to periods of



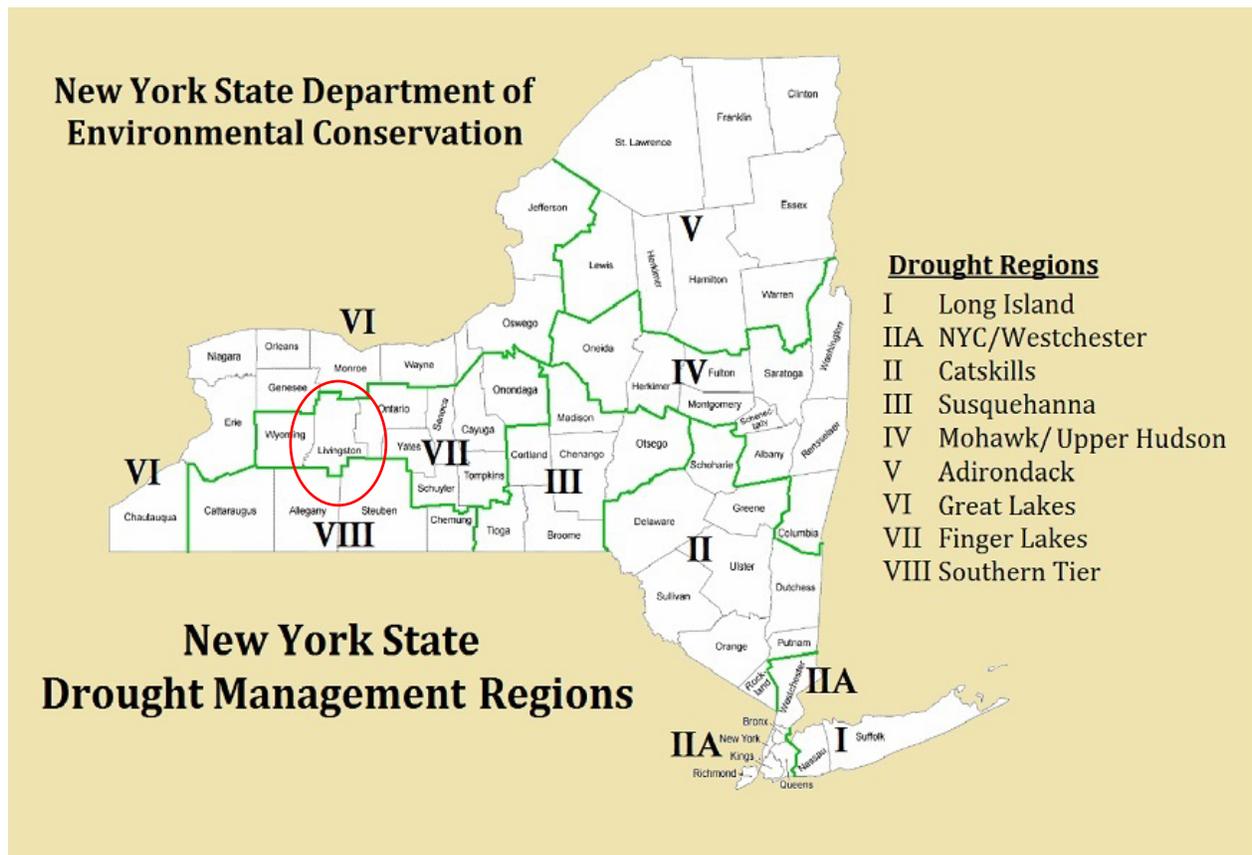


dry weather and periods of drought (NYS Division of Homeland Security and Emergency Services [DHSES] 2014).

The National Oceanic and Atmospheric Administration (NOAA) has divided the United States into 344 climate divisions. According to NOAA, New York State is made up of 10 climate divisions: Western Plateau, Eastern Plateau, Northern Plateau, Coastal, Hudson Valley, Mohawk Valley, Champlain Valley, St. Lawrence Valley, Great Lakes, and Central Lakes (NOAA 2016). Livingston County is located in the Central Lakes Climate Division.

The New York State Department of Environmental Conservation (NYS DEC) has divided New York State into nine drought management regions based roughly on drainage basins and county lines. NYS DEC monitors precipitation, lake and reservoir levels, stream flow, and groundwater level at least monthly in each region and more frequently during periods of drought. NYS DEC uses this data to assess the condition of each region, which can range from "normal" to "drought disaster" (NYS DEC 2016). Figure 5.4.1-1 shows the drought regions of New York State with Livingston County indicated. Livingston County is located within the Finger Lakes drought region (Region VII).

Figure 5.4.1-1. NYS DEC Drought Management Regions of New York State



Source: NYS DEC 2016

Note: The red oval indicates the location of Livingston County.

Extent

The severity of a drought depends on the degree of moisture deficiency, the duration, and the size and location of the affected area. The longer the duration of the drought and the larger the area impacted, the more severe





the potential impacts (NOAA 2000). The NYS DEC and the New York State Drought Management Task Force identifies droughts in the following four stages:

- **Normal** is considered the standard moisture soil level found throughout New York State
- **Drought Watch** is the first stage of drought. This stage is declared by the NYS DEC and is intended to give advance notice of a developing drought. As this stage, the general public is urged to conserve water. Public water purveyors and industries are urged to update and begin to implement individual drought contingency plans.
- **Drought Warning** is the second stage of drought. This stage is also declared by the NYS DEC and is a notice of impending and imminent severe drought conditions. A warning declaration includes stepping up public awareness and increasing voluntary conservation. Public water supply purveyors and industries are urged to continue to implement local drought contingency plans. Federal, state, and local water resources agencies are notified to prepare for emergency response measures.
- **Drought Emergency** is the third stage of drought. This stage is declared by the NYS DHSES, based upon recommendation of the Task Force. It is a notice of existing severe and persistent drought conditions. An emergency declaration is a notice for local water resources agencies to mandate conservation and implement other emergency response measures. A continuing and worsening drought emergency may result in the New York State governor declaring a drought disaster. It is a notice of the most severe and persistent drought conditions. At this stage, a significant proportion of communities in the impacted area likely are unable to respond adequately (NYS DHSES 2014).

New York State uses two methodologies to determine the various drought stages. The Palmer Drought Index (PDI) is a commonly used drought indicator and is primarily based on soil conditions. These are typically the first indicators that a moisture deficit is present. These values range from -5 to +5 with positive values indicating wetter conditions and negative values representing drier conditions (NYS DHSES 2014).

The second methodology used by New York State was developed by the NYS DEC and is referred to as the State Drought Index (SDI). The SDI evaluates drought conditions on a more comprehensive basis by measuring whether numerous indicators reach dire thresholds. The data collected are compared against critical threshold values to show a normal or changeable drought condition. The indicators are weighted on a regional basis to reflect the unique circumstances of each drought management region (NYS DHSES 2014).

In Livingston County, the greatest agricultural impact of drought would be insufficient water for consumption by and cooling of farm animals. Table 5.4.1-1 shows the typical water consumption for a number of animals common to Livingston County farms.

Table 5.4.1-1. Typical Water Consumption of Animals

Animal	Water Consumption, Typical	
	(gallons per day)	(liter per day)
Chickens/100	6	23
Cow, Dry	15	57
Milking Cows	35	130
Dairy Calves (1 - 4 months)	2.4	9
Dairy Heifers (5 - 24 months)	6.6	25
Dry Cows	9.3	41
Hog	4	15
Horse, Steer	12	45
Pig, feeder	1.1 - 2	5-9





Animal	Water Consumption, Typical	
	(gallons per day)	(liter per day)
Sheep	2	7.5
Turkeys/100	20	75

Source: King 2015

Previous Occurrences and Losses

Many sources provide historical information regarding previous occurrences and losses associated with drought events throughout New York State and Livingston County. Information about loss and impact resulting from each of many events can vary depending on the source. Notably, monetary amounts cited in this section on drought derive solely from information obtained during research for this Hazard Mitigation Plan (HMP) update.

Between 1954 and 2021, New York State experienced one Federal Emergency Management Agency (FEMA)-declared drought-related major declaration (DR) classified as a water shortage. Livingston County was not included in this declaration (FEMA 2021).

In addition to FEMA and State disaster declarations, Livingston County has been included in agriculture-related drought disasters. According to the U.S. Department of Agriculture (USDA), these types of disasters are quite common; between one-half and two-thirds of the counties in the United States have been designated as disaster areas in each of the past several years. The USDA Secretary of Agriculture is authorized to designate counties as disaster areas to make emergency loans (EM) to producers suffering losses in those counties and in counties that are contiguous to a designated county. In addition to EM eligibility, other emergency assistance programs, such as Farm Service Agency (FSA) disaster assistance programs, have historically used disaster designations as an eligibility requirement trigger. Table 5.4.1-2 provide the USDA Secretarial disaster declarations from January 1, 2012 through October 26, 2021. During this time, Livingston County was included in four drought-related USDA declarations.

Table 5.4.1-2. Drought-Related USDA Declarations in Livingston County, 2012 to 2021

Year	Approval Date	Designation Number	Description of Disaster
2012	October 24, 2012	S3427	Drought, excessive heat
2012	November 26, 2012	S3441	Drought
2016	August 24, 2016	S4023	Drought
2016	September 7, 2016	S4031	Drought

Source: USDA 2019

Crop losses can have a significant impact on the economy by reducing produce sales and purchases. Such impacts may have long-term consequences, particularly if crop yields are low the years following a drought as well. The USDA Risk Management Agency (RMA)-insured crop losses through Livingston County because of drought conditions are shown in Table 5.4.1-3. Table 5.4.1-3 shows the highest year of crop losses was in 2016 valued at \$3.3 million. Please note that these data only apply to insured crops.

Table 5.4.1-3. USDA Crop Losses from Drought in Livingston County, 2000-2021

Year	Crop Type	Losses
2015	Corn	\$11,000
2016	Corn, green peas, oats, potatoes, processing beans, soybeans, sweet corn, wheat	\$3.3 million
2017	Wheat	\$2,300





Year	Crop Type	Losses
2018	Processing beans, potatoes	\$260,000

Source: USDA 2021

For this 2022 HMP update, known drought events (including FEMA and USDA disasters) that have impacted Livingston County between 2000 and 2021 are identified in Table 5.4.1-4. Please note that not all events that have occurred in the County are included due to the extent of documentation and the fact that not all sources may have been identified or researched. Loss and impact information could vary depending on the source. Therefore, the accuracy of monetary figures discussed is based only on the available information identified during research for this HMP update.

Table 5.4.1-4. Drought Events in Livingston County between 2015 and 2021

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts*
July through November 2016	Drought	N/A	N/A	\$0 in recorded losses

Sources: U.S. Drought Monitor 2021; USDA 2021

* Losses reported only applies to insured crops.

N/A Not applicable

USDA U.S. Department of Agriculture

RMA Risk Management Agency

Probability of Future Events

Sporadic occurrences of drought are common within the United States. Streams, lakes, and coastal regions in the State of New York are supplied by an annual average precipitation ranging from 28 to 60 inches per year. Although the State manages mild moist climates, typical variations in weather patterns can lead to dry periods. Overall, based on historical occurrences, New York State’s overall annual future probability for drought is 3 percent (NYS DHSES 2014). However, as the climate changes and temperatures rise, the probability of future droughts will likely increase. Therefore, it is likely that droughts will occur in the State and County of varied severity in the future.

For the 2022 HMP update, the most up-to-date data were collected to calculate the probability of future occurrence of drought events (of all magnitudes) for Livingston County. Information from NOAA National Centers for Environmental Information (NCEI) storm events database, the Northeast Regional Climate Center (NRCC) drought periods, and the Drought Impact Reporter were used to identify the number of drought events that occurred between 1950 and 2021. Using these sources ensures the most accurate probability estimates possible. Table 5.4.1-5 below show these statistics, as well as the annual average number of events and the estimated percent chance of an incident occurring in any given year.

Table 5.4.1-5. Probability of Future Occurrences of Drought Events

Hazard Type	Number of Occurrences Between 1950 and 2017	Recurrence Interval (in years) (# Years/Number of Events)	Percent Chance of Occurrence in Any Given Year
Drought	5	14	7%

Source: NOAA-NCEI 2021; NRCC 2021; DIR 2021

Livingston County is estimated to continue to experience direct and indirect impacts of drought on occasion, with the secondary effects causing potential disruption or damage to agricultural activities and creating shortages in water supply within communities.





In Section 5.3, the identified hazards of concern for Livingston County were ranked. The probability of occurrence, or likelihood of the event, is one parameter used for hazard rankings. Based on historical records and input from the Planning Partnership, the probability of occurrence for drought in the County is considered “rare” (between 1 and 10-percent annual probability of a hazard event occurring, as presented in Table 5.3-2).

Climate Change Impacts

Each region in New York State, as defined by the Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State (ClimAID), has attributes that will be affected by climate change. Livingston County is part of geographical Region 1, Western New York, Great Lakes Plain. Some of the characteristics of this region that are affected by climate change include relatively low rainfall that may increase summer drought risk, high-value crops that may need irrigation, and projected improved conditions for grapes (New York State Energy Research and Development [NYSERDA] 2014).

Within Region 1, temperatures are anticipated to increase between 3 and 5.5 °F by the 2050s, and between 4.5 and 8.5 °F by the 2080s (baseline of 48°F). Precipitation totals will increase between 0 and 10% by the 2050s, and between 0 and 15 percent by the 2080s (baseline of 37 inches). Table 5.4.1-6 lists projected seasonal precipitation changes within the Southern Tier ClimAID Region (NYSERDA 2014).

Table 5.4.1-6. Projected Seasonal Precipitation Change in Region 3, 2050s (percent change)

Winter	Spring	Summer	Fall
5 to +15	0 to +15	-10 to +10	-5 to +10

Source: *NYSERDA 2014*

Snowfall rates in Livingston County may increase due to reduced freezing of the Great Lakes as temperatures warm. However, as the climate continues to warm, temperatures may rise enough to the point where winter precipitation may fall as rain instead of snow (NYSERDA 2014). These fluctuations in snowfall could result in an increase or decrease in the County’s winter snowpack. Reductions in snowpack would increase the possibility of drought.

Extreme heat events are likely to increase throughout New York State, and short-duration warm season droughts will become more common. With the increase in temperatures, heat waves (defined as 3 or more consecutive days with maximum temperatures at or above 90 °F) will become more frequent and intense. Summer droughts are projected to increase under these conditions (NYSERDA 2014).

By the end of the 21st century, the number of droughts is likely to increase, as the effect of higher temperatures on evaporation is likely to outweigh the increase in precipitation. Droughts in the northeast United States have been associated with local and remote modes of multi-year, ocean-atmosphere variability that are unpredictable and may change with climate change. Changes in distribution of precipitation throughout the year and in timing of snowmelt could increase frequency of droughts (NYSERDA 2011).

5.4.1.2 Vulnerability Assessment

To understand risk, a community must evaluate exposed and vulnerable assets within the identified hazard area. Regarding the drought hazard, all of Livingston County has been identified as exposed to the hazard. Therefore, all assets within the County (population, structures, critical facilities, and lifelines), as described in the County Profile (Section 4), are potentially vulnerable to drought. This section evaluates and estimates potential impacts of the drought hazard on the County, including:

- Overview of vulnerability
- Data and methodology used for the evaluation





- Impact on (1) life, health, and safety of residents; (2) general building stock; (3) critical facilities; (4) economy; and (5) future growth and development
- Effect of climate change on vulnerability
- Change in vulnerability from that presented in the 2008 Livingston County HMP
- Further data acquisitions that will improve understanding of this hazard over time

Overview of Vulnerability

Drought is a concern to Livingston County, mainly due to its impact on public health, natural resources, and agriculture. Assets at particular risk would include any open land or structures located along the wildland/urban interface (WUI) that could become vulnerable to the wildfire hazard due to the extended periods of low rain and high heat usually associated with a drought. In addition, water supply resources could be impacted by extended periods of low rain. Many residents are served by private wells, which can be significantly affected by periods of diminished groundwater resources. Lastly, vulnerable populations could be particularly susceptible to the drought hazard and cascading impacts due to age, health conditions, and limited ability to mobilize to shelter, cooling, and medical resources. Overall, Livingston County’s vulnerability has not changed since the 2015 HMP and the entire County continues to be exposed and vulnerable to the drought hazard.

Data and Methodology

Data were acquired from the following sources: HAZUS-MH, USDA, NOAA-NCEI, Livingston County, and the Planning Partnership. Not enough data were available to model the long-term potential impacts of a drought on the County. Over time, additional data will be obtained to allow better analysis of this hazard. Available information and a preliminary assessment are included below.

Impacts on Life, Health, and Safety

The entire population of Livingston County is vulnerable to drought events (population of 63,591 people, according to U.S. Census 2019 population estimates) (U.S. Census Bureau 2020). Drought conditions can affect health and safety, including health problems related to low water flows and poor water quality, and health problems related to dust. If droughts are severe enough, these health problems can lead to loss of human life.

Health implications of drought are numerous. Other possible impacts on health from drought include increased recreational risks; effects on air quality; diminished living conditions related to energy, air quality, and sanitation and hygiene; compromised food and nutrition; and increased incidence of illness and disease. Particularly susceptible to the drought hazard and cascading impacts are populations vulnerable because of age, health conditions, limited ability to mobilize to shelter, and limited accessibility to cooling and medical resources. Some drought-related health effects are short term, while others can be long term (Center for Disease Control and Prevention [CDC] 2012).

During dry periods, soil water can deplete quickly. If precipitation deficiencies continue, people who depend on other sources of water will begin to feel impacts of the shortage. Those who rely on surface water (for example, reservoirs and lakes) and subsurface water (for example, groundwater) are usually the last to be affected. A short-term drought that persists for 3 to 6 months may have little impact on these sectors, depending on characteristics of the hydrologic system and intensity of water use (NYS DHSES 2014).

Social impacts primarily involve public safety, health, conflicts among water users, reduced quality of life, and inequities in distribution of impacts and disaster relief. Many economic and environmental effects induce social impacts as well (NYS DHSES 2014).



As previously stated, drought conditions can cause shortages of water for human consumption. Droughts can also lead to reduced local firefighting capabilities. The drought hazard is a concern for Livingston County because rural populations within the County rely upon private water supply from local groundwater resources.

Impact on General Building Stock

No structures are anticipated to be directly affected by a drought event. However, droughts contribute to conditions conducive to wildfires and droughts reduce fire-fighting capabilities. Risk to life and property is greatest in those areas where forested areas adjoin urbanized areas (high-density residential, commercial, and industrial) also known as the wildland urban interface (WUI). Therefore, all assets in and adjacent to the WUI zone—including population, structures, critical facilities, lifelines, and businesses—are considered vulnerable to wildfire. Section 5.4.13 of this HMP presents the wildfire risk assessment.

Impact on Critical Facilities

Water supply facilities may be affected by short supplies of water. The County’s public water supply system is a mix of public and privately-owned water systems, but much of the rural populations are served by private wells and are significantly affected by periods of diminished groundwater resources. A short-term drought that persists for 3 to 6 months may have little impact on surface water and subsurface water, depending on characteristics of the hydrologic system and intensity of water use (NYS DHSES 2014).

As mentioned, drought events generally do not impact buildings; however, droughts can impact agriculture-related facilities and critical facilities associated with potable water supplies. Also, those critical facilities in and adjacent to the WUI zone are considered vulnerable to wildfire.

Impact on the Economy

Drought causes many economic impacts on agriculture and related sectors (forestry, fisheries, and waterborne activities). In addition to losses in yields for crop and livestock production, drought is associated with increased insect infestations, plant diseases, and wind erosion. Drought can lead to other losses because so many sectors are affected, such as losses associated with reduced income for farmers, and reduced business for retailers and others who provide goods and services to farmers. These business losses lead to unemployment, increased credit risk for financial institutions, capital shortfalls, and loss of tax revenue. Prices for food, energy, and other products may also increase as supplies decrease (NYS DHSES 2014).

When a drought occurs, the agricultural industry is most at risk for economic impact and damage. During droughts, crops do not mature, which results in smaller crop yields, undernourishment of wildlife and livestock, decreases in land values, and ultimately financial loss to the farmer (FEMA 2021). The agricultural sector in New York State encompasses more than 34,000 farms that occupy approximately one-quarter of the State’s land area and contribute \$4.5 billion annually to the State’s economy. A large majority of the State’s agriculture is rain-fed without irrigation. However, summer precipitation is not sufficient to fully meet crop water needs during most years (NYSERDA 2014).

Table 5.4.1-7 summarizes direct and indirect losses to agricultural producers, livestock producers, timber producers, fishery producers, and tourism (NYS DHSES 2014).

Table 5.4.1-7. Impacts on the Economy

Losses to Agricultural Producers	Losses to Livestock Producers	Losses to Timber Producers
Annual and perennial crop losses	Reduced productivity of rangeland	Losses from wildland fires
Damage to crop quality	Reduced milk production	Losses from tree disease



Losses to Agricultural Producers	Losses to Livestock Producers	Losses to Timber Producers
Income loss for farmers due to reduced crop yields	Forced reduction of foundation stock	Losses from insect infestation
Reduced productivity of cropland (wind erosion, long-term loss of organic matter, etc.)	High cost/unavailability of water for livestock	Impaired productivity of forest land
Insect infestation	Cost of new or supplemental water resource development (wells, dams, pipelines)	Direct loss of trees, especially saplings
Plant disease	High cost/unavailability of feed for livestock	Transportation Industry
Wildlife damage to crops	Increased feed transportation costs	Loss from impaired navigability of streams, rivers, and canals
Increased irrigation costs	High livestock mortality rates	Decline in food production/disrupted food supply
Cost of new or supplemental water resource development (wells, dams, pipelines)	Disruption of reproduction cycles (delayed breeding, more miscarriages)	Increase in food prices
Loss from Fishery Production	Decreased stock weights	Increased importation of food (higher costs)
Damage to fish habitat	Increased predation	
Loss of fish and other aquatic organisms due to decreased flows	Increased risk of grass fires	
Loss to Recreation and Tourism Industry	Energy-related Effects	Water Suppliers
Loss to manufacturers and sellers of recreational equipment	Increased energy demand and reduced supply because of drought-related power curtailments	Revenue shortfalls and/or windfall profits
Losses related to curtailed activities (such as hunting and fishing, bird watching, boating, etc.)	Costs to energy industry and consumers associated with substituting more expensive fuels (oil) for hydroelectric power	

Source: New York State Disaster Preparedness Commission (NYS DPC) 2011

When a drought occurs, the agricultural industry is most at risk for economic impact and damage. Crops do not mature during droughts, which results in smaller crop yield, undernourishment of wildlife and livestock, decreases in land values, and ultimately financial loss to the farmer (FEMA 1997). A large majority of the State’s agriculture is rain-fed without irrigation; however, summer precipitation is currently not sufficient to fully meet crop water needs during most years (NYSERDA 2011). Based on information from the 2017 Census of Agriculture, 661 farms were present in Livingston County, encompassing 189,488 acres of total farmland. The average farm size was 287 acres. Products sold from Livingston County farms had a total market value of \$183.7 million (\$55.2 million in crop sales; and \$128.5 million in livestock, poultry, and related products), averaging \$277,904 per farm. The Census indicated that 540 farm operators reported farming as their primary occupation (USDA 2017). Table 5.4.1-8 lists the acreage of agricultural land exposed to the drought hazard.

Table 5.4.1-8. Agricultural Land in Livingston County in 2017

Number of Farms	Land in Farms (acres)	Total Cropland (acres)	Harvested Cropland (acres)	Total Cropland Used Only For Pasture/Grazing (acres)
661	189,488	145,878	131,567	14,311

Source: USDA 2012

In 2017, the top three agricultural products sold in Livingston County were grains, oilseeds, dry beans, and dry peas (\$41.5 million); corn (\$25.2 million); and other crops and hay (\$8.3 million) (USDA 2017).





If the average production (dollar value) per crop type could be identified on a per-acre basis, loss estimates could be developed based on assumed percent damage that could result from a drought. If a drought impacted 40 percent of the agricultural products sold from Livingston County farms, losses would be estimated at \$73.5 million based on 2017 market values.

A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages and higher costs for these resources. Industries that rely on water for business may be impacted the most (for example, landscaping businesses). Although most businesses will still be operational, they may be impacted aesthetically. These aesthetic impacts are most significant within the recreation and tourism industry. Moreover, droughts within another area could impact the food supply and price of food for residents within the County.

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across Livingston County. Future growth could affect the amount of potable water available due to a drain on available water resources. Other areas that could be impacted include agriculture and recreational facilities such as golf courses, farms, and nurseries. Areas targeted for potential future growth and development within the next 5 years have been identified across the County at the municipal level. The jurisdictional annexes in Volume II of this HMP include municipal-specific information.

Future Changes that May Impact Vulnerability

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

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

Projected Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the County. Any areas of growth could be potentially impacted by the drought hazard because the entire County is exposed and vulnerable to droughts. Future growth could impact the amount of potable water available due to a drain on the available water resources. Other areas that could be impacted include agriculture and recreational facilities such as golf courses, farms, and nurseries.

Projected Changes in Population

Refer to Section 4.4.2 - Population Trends in the County Profile for a discussion on trends for the County. According to population projects from the Cornell Program on Applied Demographics, Livingston County will experience an overall population decrease through 2040 (approximately 560 people in total by 2040). This decrease will reduce the overall vulnerability of the County's population over time. While fewer people will reside in the County, populations may move into more densely populated areas of the County, increasing the stress on the water supplies in those locations.



Climate Change

As discussed earlier, summer droughts are projected to increase which may affect water supply, agriculture and ecosystems (NYSERDA 2014). An increased incidence of drought may impact availability of water supplies, primarily placing an increased stress on the population. It is unlikely that structure exposure and vulnerability would increase as a direct result of drought, although secondary impacts of drought, such as wildfire, may increase and threaten structures. If a wildfire were to occur during a drought, emergency services may face complications from a water shortage depending on their water source. Critical water-related service sectors may need to adjust management practices and actively manage resources. Increased incidence of drought may also increase the potential for impacts on the local economy including the production of agricultural products.

Change of Vulnerability

An examination of change in the County's vulnerability to drought events from the 2015 HMP to this update must scrutinize each exposed and vulnerable entity. Total population across the County has decreased, as indicated by a comparison of the 2010 U.S. Census (65,393 people) with the 2019 U.S. Census Estimates (63,591 people).

Regarding the agricultural industry within Livingston County, from 2012 to 2017, the number of farms remained exactly the same at 661 farms. The amount of land in farms decreased by 2% to 183,695 acres. The County also saw a slight decrease in the size of farms – from 295 acres to 287 acres. The Market Value of Products sold fell slightly to a total of \$183,695,000. When droughts occur they almost always impact the market value of crops. (USDA Census of Agriculture 2017).