5.4.1 DROUGHT

This section provides a profile and vulnerability assessment for the drought hazard.

HAZARD PROFILE

This section provides profile information including: description, location and extent, previous occurrences and losses, and the probability of future occurrences.

Description

The Climate Prediction Center (CPC) of the National Weather Service (NWS) defines drought as a deficiency of moisture that results in adverse impacts on people, animals, or vegetation over a sizeable area (CPC, 2009). According to the New York State Hazard Mitigation Plan (NYS HMP), drought is a normal, recurrent feature of climate. Although its features vary from region to region, this hazard occurs almost everywhere. Defining drought is therefore difficult; it depends on differences of regions, water supply needs, and disciplinary perspectives. In general, drought originates from a deficiency of precipitation over an extended period of time, resulting in a water shortage for some activity, group, or environmental sector (NYS HMP, 2011). Other climatic factors, such as high temperatures, prolonged high winds and low relative humidity, can aggravate the severity of a drought.

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

- Meteorological drought is a measure of departure of precipitation from normal. 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 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 related to the effects of precipitation shortfalls on stream flows and reservoir, lake and groundwater levels.
- 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 [NDMC], 2012).

Drought can produce a range of impacts that span many sectors of an economy and can reach beyond an area experiencing physical drought. This exists because water is integral to our ability to produce goods and provide services. Direct impacts of drought include reduced crop yield, increased fire hazard, reduced water levels, and damage to wildlife and fish habitat. The consequences of these impacts illustrate indirect impacts that include: reduction in crop, rangeland, and forest productivity may result in reduced income for farmers and agribusiness, increased prices for food and timber, unemployment, reduced tax revenues due to reduced expenditures, increased crime, foreclosures, migration, and disaster relief programs. The many impacts of drought can be listed as economic, environmental, or social (NYS HMP, 2011).

Economic impacts occur in agriculture and related sectors because of the reliance of these sectors on surface and subsurface water supplies. Environmental impacts are the result of damage to plant and animal species, wildlife habitat, and air and water quality, forest and grass fires, degradation of landscape quality, loss of biodiversity and soil erosion. Social impacts involve public safety, health, conflicts between water users, reduced quality of life and inequities in the distribution of impacts and disaster relief (NYS HMP, 2011). A summary of potential impacts associated with drought are identified in Table 5.4.1-1. This table includes only some of the potential impacts of drought.

Table 5.4.1-1. Economical, Environmental and Social Impacts of Drought

Economical	Environmental	Social
• Loss of national economic growth, slowing down of economic development • Damage to crop quality, less food production • Increase in food prices • Increased importation of food (higher costs) • Insect infestation • Plant disease • Loss from dairy and livestock production • Unavailability of water and feed for livestock which leads to high livestock mortality rates • Disruption of reproduction cycles (breeding delays or unfilled pregnancies) • Increased predation • Increased fire hazard - Range fires and Wildland fires • Damage to fish habitat, loss from fishery production • Income loss for farmers and others affected • Unemployment from production declines • Loss to recreational and tourism industry • Loss of hydroelectric power • Loss of navigability of rivers and canals	• Increased desertification - Damage to animal species • Reduction and degradation of fish and wildlife habitat • Lack of feed and drinking water • Disease • Increased vulnerability to predation. • Loss of wildlife in some areas and too many in others • Increased stress to endangered species • Damage to plant species, loss of biodiversity • Increased number and severity of fires • Wind and water erosion of soils • Loss of wetlands • Increased groundwater depletion • Water quality effects • Increased number and severity of fires • Air quality effects	• Food shortages • Loss of human life from food shortages, heat, suicides, violence • Mental and physical stress • Water user conflicts • Political conflicts • Social unrest • Public dissatisfaction with government regarding drought response • Inequity in the distribution of drought relief • Loss of cultural sites • Reduced quality of life which leads to changes in lifestyle • Increased poverty • Population migrations

Source: NYS HMP, 2011

Extent

The extent (e.g., magnitude or severity) of drought can depend on the duration, intensity, geographic extent, and the regional water supply demands made by human activities and vegetation. The intensity of the impact from drought could be minor to total damage in a localized area or regional damage affecting human health and the economy. Generally, impacts of drought evolve gradually and regions of maximum intensity change with time. The severity of a drought is determined by areal extent as well as intensity and duration. The frequency of a drought is determined by analyzing the intensity for a given duration, which allows determination of the probability or percent chance of a more severe event occurring in a given mean return period.

Several indices developed by Wayne Palmer (Palmer Drought Severity Index [PDSI], Crop Moisture Index [CMI], and Standardized Precipitation Index [SPI]), are the most useful for describing the many scales of drought. Other indices include accumulated departure from normal streamflows, low-flow frequency estimates and changes in water storage, groundwater levels and rates of decline, and lake levels. Most commonly used indices that are used to measure or identify the severity and classification of past and present droughts primarily include, but not limited to, the following:

The Palmer Drought Severity Index (PDSI) was developed in 1965, and indicates the prolonged and abnormal moisture deficiency or excess. The PDSI is an important climatological tool for evaluating the scope, severity, and frequency of prolonged periods of abnormally dry or wet weather. It can be used to help delineate disaster areas and indicate the availability of irrigation water supplies, reservoir levels, range conditions, amount of stock water, and potential intensity of forest fires (NWS CPC, 2005).

The PDSI has become the semi-official drought index. It is the most effective in determining long-term droughts; however, it is not as effective with short-term forecasts. Table 5.4.1-2 lists the Palmer Classifications. Zero is used as normal and drought is shown in terms of negative numbers (NOAA, Date Unknown).

Table 5.4.1-2. PDSI Classifications

Palmer Classifications	
4.0 or more	extremely wet
3.0 to 3.99	very wet
2.0 to 2.99	moderately wet
1.0 to 1.99	slightly wet
0.5 to 0.99	incipient wet spell
0.49 to -0.49	near normal
-0.5 to -0.99	incipient dry spell
-1.0 to -1.99	mild drought
-2.0 to -2.99	moderate drought
-3.0 to -3.99	severe drought
-4.0 or less	extreme drought

Source: NDMC, Date Unknown

The CMI, developed by Wayne Palmer in 1968, can be used to measure the status of dryness or wetness affecting warm season crops and field activities. It gives the short-term or current status of purely agricultural drought or moisture surplus and can change rapidly from week to week (NWS CPC, 2005). The CMI responds more rapidly than the PDSI so it is more effective in calculating short-term abnormal dryness or wetness affecting agriculture. CMI is designed to indicate normal conditions at the beginning and end of the growing season; it uses the same levels as the Palmer Drought (NOAA, Date Unknown).

The Standardized Precipitation Index (SPI) is a probability index that considers only precipitation. It is based on the probability of recording a given amount of precipitation, and the probabilities are standardized so that an index of zero indicates the median precipitation amount (half of the historical precipitation amounts are below the median, and half are above the median). The index is negative for drought, and positive for wet conditions. The SPI is computed by NCDC for several time scales, ranging from one month to 24 months, to capture the various scales of both short-term and long-term drought (Heim, 2008).

The NDMC produces a daily drought monitor map that identifies drought areas and ranks droughts by intensity ranging from D1 (moderate drought) to D4 (exceptional drought). Category D0, drought watch areas, are drying out and possibly heading for drought, or are recovering from drought but not yet back to normal (Table 5.4.1-3).

Table 5.4.1-3. NDMC Drought Severity Classification Table

Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (%)	USGS Weekly Streamflow (%)	Standardized Precipitation Index (SPI)	Satellite Vegetation Health Index
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	36-45
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	26-35
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	16-25
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	6-15
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells, creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	1-5

Source: NDMC, 2002

Note: Additional indices used, mainly during the growing season, include the USDA/NASS Topsoil Moisture, Crop Moisture Index (CMI), and Keetch Byram Drought Index (KBDI). Indices used primarily during the snow season and in the West include the River Basin Snow Water Content, River Basin Average Precipitation, and the Surface Water Supply Index (SWSI).

The Drought Impact Reporter (DIR) is an interactive tool developed by the NDMC to collect, quantify, and map reported drought impacts for the U.S., which is one of the resources used to identify known drought events throughout Town of Blooming Grove Planning Area for this Plan (NDMC, 2012).

The North America Drought Monitor (NA-DM) is a cooperative effort between drought experts in Canada, Mexico and the U.S. to monitor drought across the continent on an ongoing basis. The Drought Monitor concept was developed as a process that synthesizes multiple indices, outlooks and local impacts, into an assessment that best represents current drought conditions. The final outcome of each Drought Monitor is a consensus of federal, state and academic scientists (NCDC, 2012).

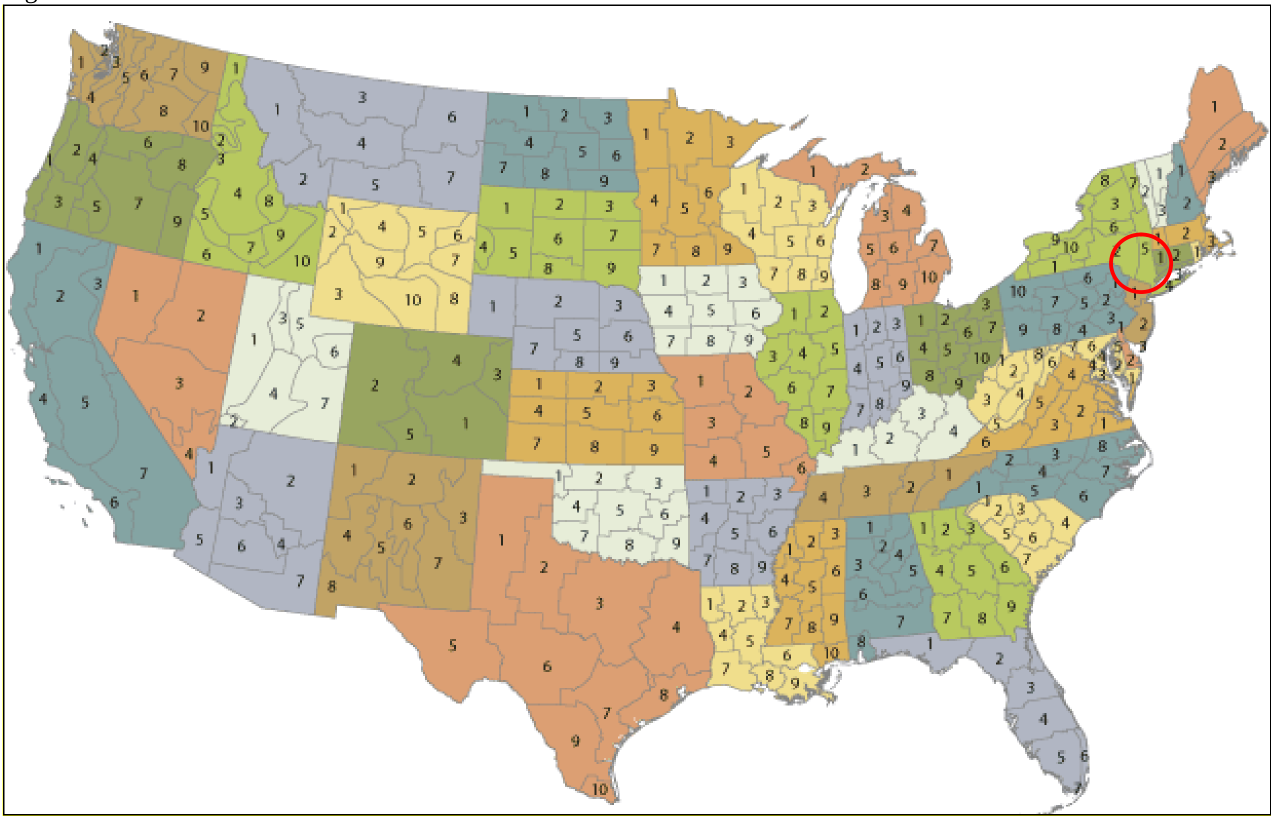
Location

The location of drought events throughout New York State and Town of Blooming Grove Planning Area are further identified below.

Climate divisions are regions within a state that are climatically homogenous. The National Oceanic and Atmospheric Administration (NOAA) divided the U.S. into 359 climate divisions. The boundaries of these divisions typically coincide with the county boundaries, except in the western U.S., where they are based largely on drainage basins (U.S. Energy Information Administration, Date Unknown).

According to NOAA, New York State is comprised 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. The Town of Blooming Grove Planning Area is located within the Hudson Valley Climate Division (NOAA, 2012). Figure 5.4.1-1 shows the climate divisions throughout the U.S. and Figure 5.4.1-2 shows the climate divisions of New York.

Figure 5.4.1-1. Climate Divisions of the U.S.

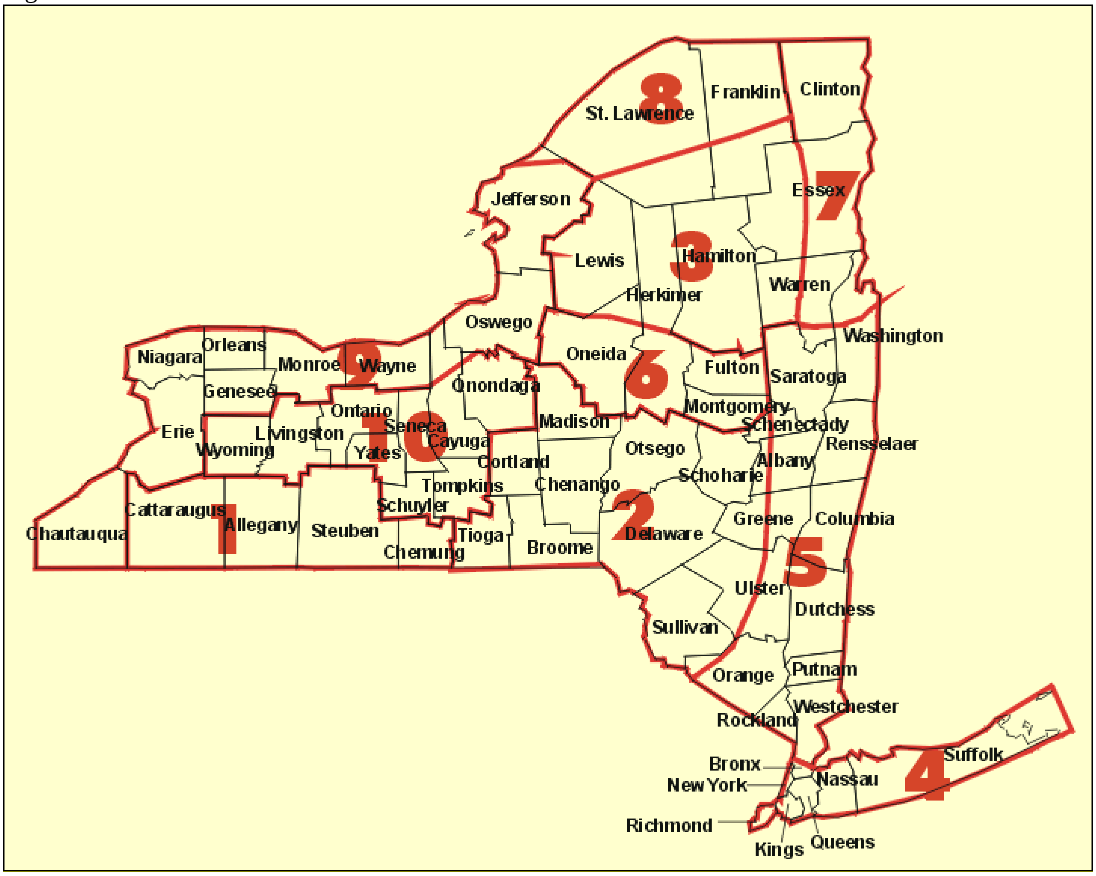


Source: NOAA, 2012

Note (1): The red circle indicates the approximate location of Town of Blooming Grove (Eastern Plateau).

Note (2): 1 = Western Plateau; 2 = Eastern Plateau; 3 = Northern Plateau; 4 = Coastal; 5 = Hudson Valley; 6 = Mohawk Valley; 7 = Champlain Valley; 8 = St. Lawrence Valley; 9 = Great Lakes; 10 = Central Lakes

Figure 5.4.1-2. Climate Divisions of New York

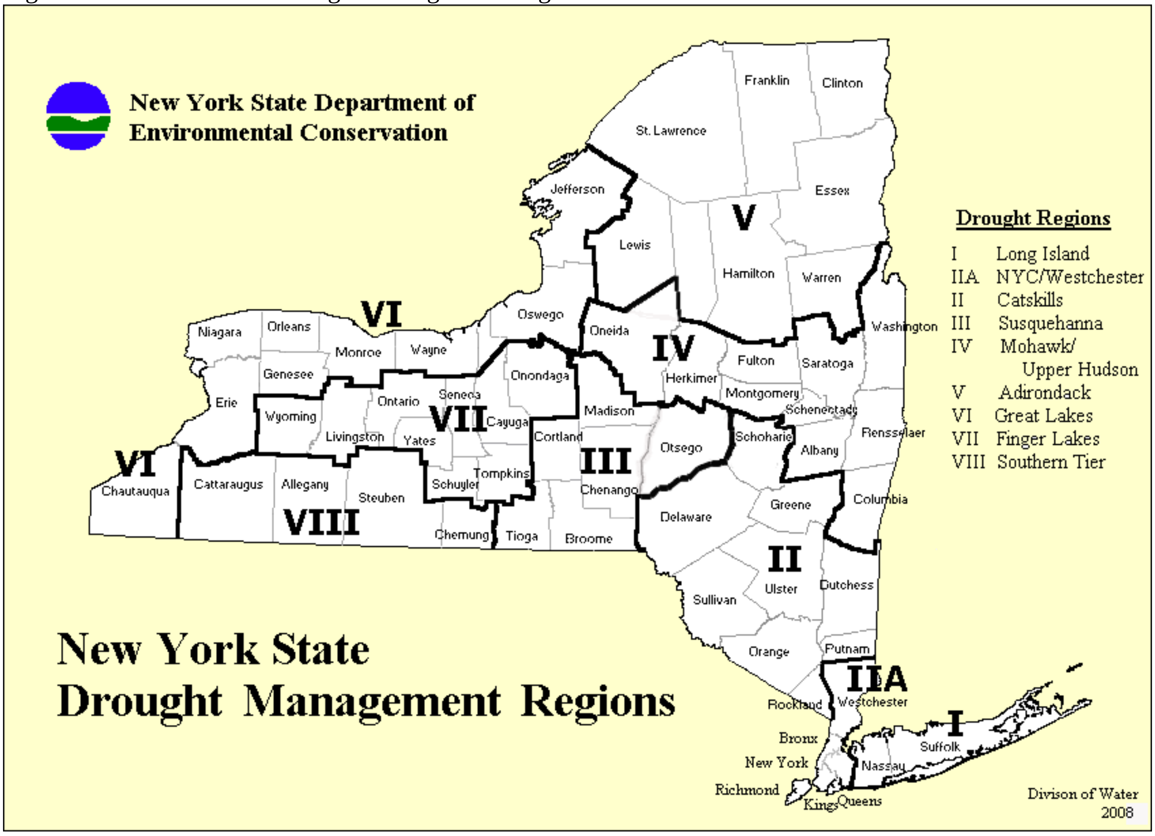


Source: CPC, 2005

Note: 1 = Western Plateau; 2 = Eastern Plateau; 3 = Northern Plateau; 4 = Coastal; 5 = Hudson Valley; 6 = Mohawk Valley; 7 = Champlain Valley; 8 = St. Lawrence Valley; 9 = Great Lakes; 10 = Central Lakes

New York State is divided into nine drought management regions based roughly on drainage basin and county lines. The New York State Department of Environmental Conservation (NYSDEC) monitors precipitation, lake and reservoir levels, stream flow, and groundwater level on a monthly basis in each region and more frequently during periods of drought. The NYSDEC uses this data to assess the condition of each region, which can range from "normal" to "drought disaster" (NYSDEC, Date Unknown). The Town of Blooming Grove Planning Area is identified as NYSDEC Drought Management Region 2, the Catskills Drought Region (Figure 5.4.1-3.).

Figure 5.4.1-3. NYSDEC Drought Management Regions of New York State



Source: NYSDEC, 2008

Previous Occurrences and Losses

Many sources provided historical information regarding previous occurrences and losses associated with drought events throughout New York State, Orange County and the Town of Blooming Grove Planning Area. With many sources reviewed for the purpose of this HMP, loss and impact information for many events 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.

According to NOAA's NCDC storm events database, Orange County experienced 10 drought events between 1950 and December 31, 2012. Note, NCDC lists each month during 2001-2002 as a separate drought event, in regards to the HMP consecutive months of drought will be considered one event, therefore two drought events occurred between January 1, 2000 and December 31, 2012. There were no damages associated with these events. According to the Hazard Research Lab at the University of South Carolina's Spatial Hazard Events and Losses Database for the U.S. (SHELDUS), between 1960 and 2012, two drought events occurred within Orange County. The database indicated that drought events and losses specifically associated with Orange County and its municipalities totaled over $16,000 in property damage and over $1.8 million in crop damages. However, these numbers may vary due to the database identifying the location of the hazard event in various forms or throughout multiple counties or regions.

Between 1954 and 2012, FEMA declared that New York State experienced one drought-related disaster (DR) or emergency (EM) classified as the following disaster types: water shortage. The Orange County HMP and other sources indicate that Orange County was declared as a disaster area as a result of this drought-related event (FEMA, 2012).

Based on all sources researched, known drought and extreme events, between 1950 and 2012, that have affected Orange County and its municipalities, including the Town of Blooming Grove Planning Area, are identified in Table 5.4.1-4. Not all sources have been identified or researched; therefore, Table 5.4.1-4 may not include all events that have occurred throughout the Planning Area, County or region.

Table 5.4.1-4. Drought Events Affecting Orange County Between 1950 and 2012.

Dates of Event	Event Type	FEMA Declaration Number	County Designated?	Losses / Impacts	Source(s)
May 1964 – September 1966	Drought and Water Shortage	DR-204	Yes	The New York Times claimed this was the most prolonged drought in New York State History. Just prior to the start of the drought in May 1964 local reservoirs were at around 69% of capacity but had dropped to 38% of capacity within a year, and reached 25% before the end of the drought. Many crop yields were significantly reduced, with wheat crops being particularly affected. The PDSI reached -6.66 in November 1964. Orange County was eligible for both Public and Individual Assistance.	Orange County HMP, FEMA, NRCC
June 1988	Drought	NA	NA	A prolonged period of drought caused over $16K in property damages and over $16.5 M in crop damages.	SHELDUS
June - August 1991	Drought	NA	NA	A prolonged period of drought caused over $185 K in crop damages.	SHELDUS
August – December 1993	Drought	NA	NA	A prolonged period of drought during the summer of 1993 decimated much of the agriculture in southeast New York.. Estimates of feed grain losses in affected counties were well over 40 percent and in some cases nearly 100 percent. Especially hard hit were hay and corn crops as well as other fruits and vegetables. In November 1993 a drought alert advisory was upgraded to a drought warning by the New York State Drought Management Task Force.	Orange County HMP
October 1994	Drought	NA	NA	October 1994 tied for the 7th driest month on record in Albany.	NYS HMP
June-September 1995	Drought	NA	NA	A lack of rainfall across much of eastern New York prompted officials to institute water restrictions in some areas and seek federal aid for others; Orange County did not receive federal aid.	NYS HMP
November 2001 – January 2002	Water Shortage	NA	NA	The combined storage in the New York City water supply reservoir system was 41% of capacity (normal for this time is 71%).	NYS HMP, Orange County HMP, NCDC
April – October 2002	Drought and Water Shortage	NA	NA	Ground water and water storage facilities were below normal. The New York City reservoir system reached a low of 64.5%, which was 34% below normal. Orange County Officials claimed that this was the worst drought in almost 30 years.	NYS HMP, Orange County HMP, NCDC

Sources: NRCC, 2012; NOAA-NCDC, 2012; SHELDUS, 2012; NDMC, 2012; USDA, 2012

FEMA Federal Emergency Management Agency   HMP Hazard Mitigation Plan

K	Thousand ($)	NYS	New York State
M	Million ($)	PDSI	Palmer Drought Severity Index
N/A	Not Applicable	SBA	Small Business Administration
NCDC	National Climatic Data Center	U.S.	United States
NOAA	National Oceanic and Atmospheric Administration	USDA	U.S. Agricultural Department
NRCC	Northeast Regional Climate Center		

Agriculture-related drought disasters are quite common. One-half to two-thirds of the counties in the United States have been designated as disaster areas in each of the past several years. The 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. Table 5.4.1-5 presents USDA declared drought events impacting Orange County.

Table 5.4.1-5. Drought Events Declared by USDA

Incidence Period	Event Type	USDA Designation Number	County Designated?*	Losses / Impacts	Source(s)
June 1 to October 24, 2012	Drought and Excessive Heat	S3427	Yes	Production losses were attributed to drought and excessive heat	USDA
Winter 2013	Drought	S3487	Yes	NA	USDA

Source: USDA, 2012
*Disaster event occurred within the county.

M	Presidential Major Disaster Declaration
N	Administrative Physical Loss Notification
S	Secretarial National Disaster Determination
USDA	United States Department of Agriculture

Probability of Future Events

It is estimated that the Town of Blooming Grove Planning Area will continue to experience direct and indirect impacts related to drought. In Section 5.3, the identified hazards of concern for Town of Blooming Grove Planning Area 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 Committee, the probability of occurrence for drought in the Planning Area is considered 'Rare' (likely to occur within 100 years, as presented in Table 5.3-6).

Effect of Climate Change on Vulnerability

Climate change is beginning to affect both people and resources in New York State, and these impacts are projected to continue growing. Impacts related to increasing temperatures and sea level rise are already being felt in the State. ClimAID: the Integrated Assessment for Effective Climate Change in New York State (ClimAID) was undertaken to provide decision-makers with information on the State's vulnerability to climate change and to facilitate the development of adaptation strategies informed by both local experience and scientific knowledge (New York State Energy Research and Development Authority [NYSERDA], 2011).

Each region in New York State, as defined by ClimAID, has attributes that will be affected by climate change. Orange County is part of Region 2, Catskill Mountains and West Hudson River Valley. Some of the issues in this region, affected by climate change, include: this is the watershed for the New York City water supply which may be impacted; popular apple varieties may decline; winter recreation may decline while summer opportunities increase; native brook trout may decline and be replaced by bass (NYSERDA, 2011).

Temperatures are expected to increase throughout the state, by 1.5 to 3ºF by the 2020s, 3.5 to 5.5ºF by the 2050s and 4.5 to 8.5ºF by the 2080s. The lower ends of these ranges are for lower greenhouse gas emissions scenarios and the higher ends for higher emissions scenarios. Annual average precipitation is projected to increase by up to five-percent by the 2020s, up to 10-percent by the 2050s and up to 15-

percent by the 2080s. During the winter months is when this additional precipitation will most likely occur, in the form of rain, and with the possibility of slightly reduced precipitation projected for the late summer and early fall. Table 5.4.1-6 displays the projected seasonal precipitation change for the Catskill Mountains and West Hudson River Valley ClimAID Region (NYSERDA, 2011).

Table 5.4.1-6. Projected Seasonal Precipitation Change in Region 2, 2050s (% change)

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

Source: NYSERDA, 2011

Even though an increase in annual precipitation is projected, other climate change factors, such as an extended growing season, higher temperatures, and the possibility of more intense, less frequent summer rainfall, may lead to additional droughts and increased short-term drought periods (Cornell University, Date Unknown).

Droughts can cause deficits in surface and groundwater used for drinking water. The New York State Water Resources Institute at Cornell University conducted a vulnerability assessment of drinking water supplies and climate change. To assess water supplies in New York State, it was assumed that long-term average supply will remain the same but the duration and/or frequency of dry periods may increase. Both types of water supplies, surface water and groundwater, were divided into three categories: sensitive to short droughts (two to three months), sensitive to moderate and longer droughts (greater than six months), and relatively sensitive to any droughts. Major reservoir systems are presumed to have moderate sensitivity to drought because there is a likelihood of decreases in summer and fall water availability (Cornell University, Date Unknown). The greatest likelihood of future water shortages is likely to occur on small water systems (Cornell University, Date Unknown).

VULNERABILITY ASSESSMENT

To understand risk, a community must evaluate what assets are exposed and vulnerable in the identified hazard area. For the drought hazard, all of the Town of Blooming Grove Planning Area has been identified as the hazard area. Therefore, all assets (population, structures, critical facilities and lifelines), as described in the Regional Profile (Section 4), are vulnerable to a drought. The following text evaluates and estimates the potential impact of the drought hazard on the Planning Area 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
- Further data collections that will assist understanding this hazard over time

Overview of Vulnerability

Essentially, all of the Planning Area is vulnerable to drought. However, areas at particular risk are areas used for agricultural purposes, open/forested land vulnerable to the wildfire hazard, densely-populated areas where communities rely on surface water supplies (above ground reservoirs) for industrial, commercial, and domestic purposes, and certain areas where elderly, impoverished or otherwise vulnerable populations are located.

Data and Methodology

Data was collected from HAZUS-MH, USDA and Planning Committee sources. Insufficient data was available to model the long-term potential impacts of a drought on the Planning Area. Over time, additional data will be collected to allow better analysis for this hazard. Available information and a preliminary assessment are provided below.

Impact on Life, Health and Safety

Droughts conditions can cause a shortage of water for human consumption and reduce local fire-fighting capabilities. Areas most often affected by a drought are densely populated areas that rely on above-ground reservoirs for their water supply. Areas more resistant to drought conditions are less densely populated and rely on groundwater or surface water sources (NYS HMP, 2011).

Social impacts of a drought include mental and physical stress, public safety (increased threat from forest/grass fires), health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. The infirm, young, and elderly are particularly susceptible to drought and extreme temperatures, sometimes associated with drought conditions, due to their age, health conditions and limited ability to mobilize to shelters, and medical resources. Impacts on the economy and environment may have social implications as well (NYS HMP, 2011). For the purposes of this HMP, the entire population in the Planning Area is vulnerable to drought events.

The majority of the Planning Area residents rely on private well water and six municipal water supply districts for potable water. The following table indicates the approximate average daily water consumption in each water district (Table 5.4.1-7) (Town of Blooming Grove Comprehensive Plan, 2005). Refer to Section 4 for a list of the potable water facilities in the Planning Area.

Table 5.4.1-7. Municipal Water Supply Districts

District Number	Area Served	Average Daily Consumption (gallons)
1	Worley Heights	125,000
2	Oxford Heights	12,000
3	Tomahawk Lake	15,000
4	Tappan Homes	40,000
5	Mountain View Estates	20,000
6	Merriewold	130,000

Source: Town of Blooming Grove Comprehensive Plan, 2005

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 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) or wildland/urban interface (WUI). Refer to the Wildfire Risk Assessment for more detailed information on the vulnerability of the built environment to the wildfire hazard.

Impact on Critical Facilities

It is expected that critical facilities will continue to be operational during a drought event.

Impact on the Economy

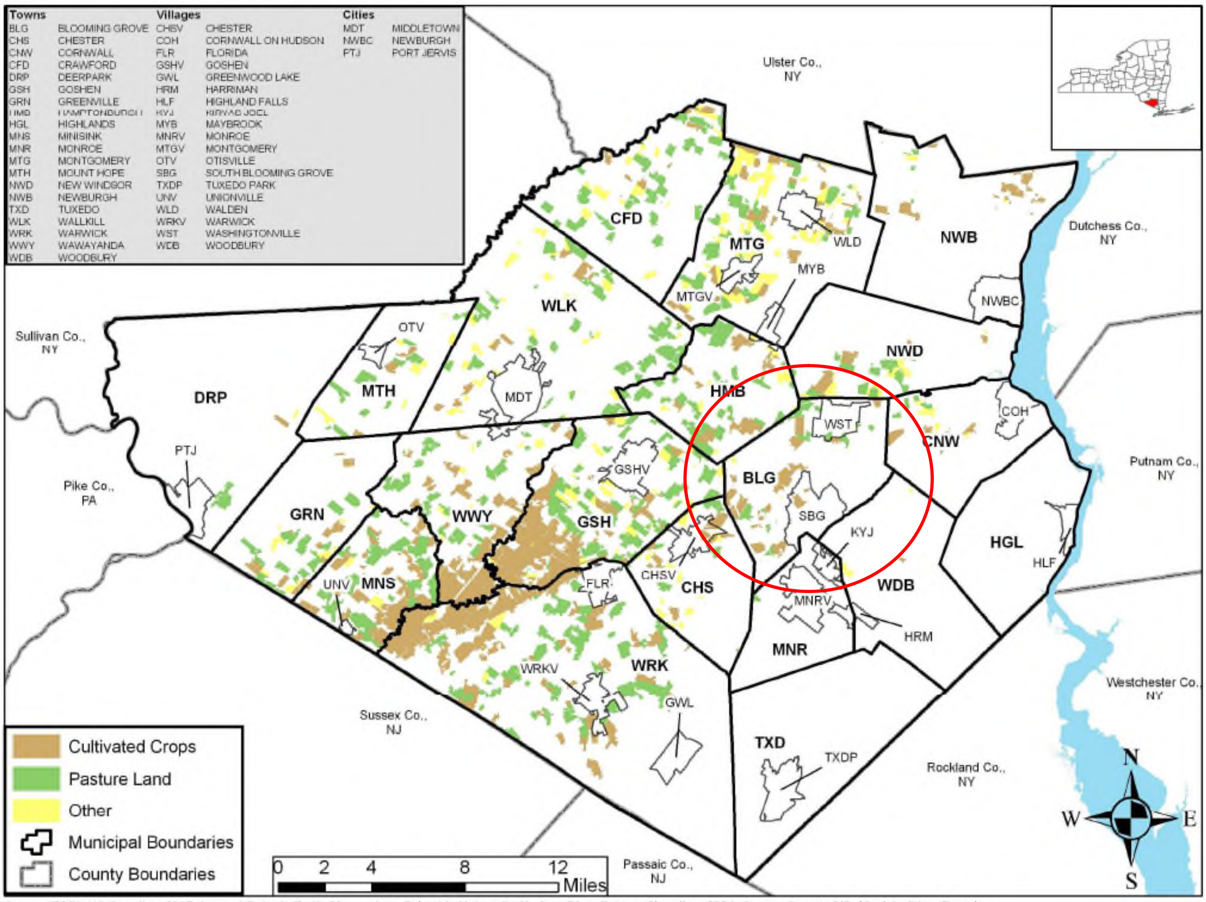
A prolonged drought can have serious direct and indirect economic impacts on a community. As noted in the NYS HMP, it is difficult to estimate financial damages as a result of a drought because ‘the more removed the impact from the cause, the more complex the link to the cause’ (NYS HMP, 2011).

General economic effects from a drought include the following:

- Decreased land prices
- Loss to industries directly dependent on agricultural production (e.g., machinery and fertilizer manufacturers, food processors, dairies, etc.)
- Unemployment from drought-related declines in production
- Strain on financial institutions (foreclosures, more credit risk, capital shortfalls)
- Revenue losses to Federal, State, and Local governments (from reduced tax base)
- Reduction of economic development
- Fewer agricultural producers (due to bankruptcies, new occupations)
- Rural population loss (NYS HMP, 2011).

As discussed earlier, agricultural resources need ample water supplies for successful production, relying on natural precipitation and the supply and demand of surface and groundwater resources, both of which become limited or compromised during times of drought. A prolonged drought can have a serious economic impact on a community (i.e., a lessened crop yield, financial loss to the farmer). Table 5.4.1-8 lists the distribution of agricultural land in the Town of Blooming Grove Planning Area. Figure 5.4.1-4 shows the extent, location and general distribution of agricultural land across Orange County.

Figure 5.4.1-4. Agricultural Land in Orange County



Source: ESRI, US Counties, 2005; Lamont-Doherty Earth Observatory, Columbia University, Hudson River Estuary Shoreline, 2004; Orange County GIS, Municipalities, Parcels

Source: Orange County, 2011

Note: The red circle indicates the location of the Town of Blooming Grove Planning Area.

Table 5.4.1-8. Distribution of Agricultural Land in the Town of Blooming Grove Planning Area

Municipality	Total Area (Acres)	Cultivated Cropland (Acres)	Pasture Land (Acres)	Other Agricultural Land (Acres)	Total Agricultural Land (Acres)	Total Agricultural Land (%)
Town of Blooming Grove	18,230	1,754	835	65	2,653	14.6%
Village of South Blooming Grove	3,060	148	0	0	148	4.8%
Village of Washingtonville	1,644	0	97	9	106	6.5%

Source: Excerpt from the Orange County Hazard Mitigation Plan (Orange County, 2011)

Increased demand for water and electricity during drought conditions may result in shortages and a higher cost for these resources. Industries that rely on water for business may be impacted the hardest (e.g., nurseries, golf courses, places of recreation). Even though most businesses will still be operational, they may be impacted aesthetically.

Future Growth and Development

As discussed in Section 4, areas targeted for future growth and development have been identified across the Planning Area. 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.

Additional Data and Next Steps

Historic data available indicate that droughts can impact the Town of Blooming Grove Planning Area and impact the local economy. For future plan updates, localized concerns and impacts will be collected and analyzed. Mitigation efforts could include development of a drought contingency plan, development of "triggers" for drought related actions, or provision of incentives to influence active water conservation techniques.