4.2 Profiles of Hazards

As presented in Section 4.1, Delaware County considered all hazards of potential interest based on the study area's geographic location. As detailed in Section 4.1, hazards that could occur in the area were considered and screened out based on their low probability of occurrence and limited potential loss impact in the study area. Based on Delaware County's hazard analysis, 10 natural hazards, one technological hazard and one man-made hazard of concern were retained for profiling in this section. Profiles for these hazards are presented according to root-cause groupings and the priority of each hazard, as summarized below:

Natural Hazards (Section 4.2.1)

Flood
Severe Storm (wind, including hurricanes and tornadoes)
Ice Jam
Severe Winter Storm (snow)
Extreme Temperature
Ice Storm
Infestation (agricultural and disease-carrying insects)
Wildfire
Epidemic (agricultural)
Drought

Technological Hazards (Section 4.2.2)

Dam Failure

Man-Made Hazards (Section 4.2.3)

Water Supply Contamination

Risk Factors are characteristics of a hazard that contribute to the severity of potential losses in the study area.

HAZNY Risk Factors are those risk factors addressed using the HAZNY scoring system and are summarized in the upper right hand corner of each hazard profile.

This section presents additional information regarding these hazards of concern as hazard profiles. Hazard profiles assist communities in evaluating and comparing the hazards that can impact their community by comparing a number of hazard factors. Each type of hazard has unique characteristics that vary from event to event. That is, the impacts associated with a specific hazard can vary depending on the magnitude and location of each event (a hazard event is a specific, uninterrupted occurrence of a particular type of hazard). Further, the probability of occurrence of a hazard in a given location impacts the priority assigned to that hazard. Finally, each hazard will impact different communities in different ways, based on geography, local development, population distribution, age of buildings, and mitigation measures already implemented.

Profile information, combined with data regarding the people and structures at risk (Section 4.3, Inventory of Assets), prepares the community to develop risk scenarios and estimate potential damages and losses for each hazard (Section 4.4, Loss Estimates).

For this mitigation plan, considerable research was conducted to develop hazard profiles for the hazards of concern selected for further evaluation. The sources of information and data and maps showing

vulnerable areas are provided with each profile, as applicable. Each hazard profile includes text addressing the following risk factors:

1) Background and local conditions
2) Historic frequency and probability of occurrence
3) Severity
4) Historic losses and impacts
5) Designated hazard areas

Much of the data for these profiles was obtained from the HAZNY Reports for Delaware County. Therefore, each profile also includes a summary of the HAZNY risk factors for each hazard. In addition, data was obtained from FEMA, NOAA-NCDC, the Hazard Research Lab-USC, NY SEMO the National Atlas database and through review of available newspaper articles.

The HAZNY program provides "Ground Rules" that guide the user in the correct facilitation and application of the program. The ground rules guide users in evaluating the hazards and in making decisions when facilitating a group of participants applying the program. In addition, the rules assist in maintaining the integrity of the program and provide a sound foundation to compare results across different municipalities in the state. It is important to understand these ground rules to understand the risk factors presented for each hazard in this section. Table 4-2-1 summarizes the HAZNY risk factors, lists the descriptions of each factor, and provides the specific descriptor choices for each risk factor and description.

Table 4-2-1. HAZNY Risk Factors and Descriptions

Risk Factor	Description	Descriptors
Potential Impact	Defines the area impacted by a hazard event	Large region – impact would extend for miles and comprise a significant portion of the jurisdiction
		Small region – impact would be limited to a neighborhood or downtown section of a city
Onset	Period of time between initial recognition of an approaching hazard and when the hazard begins to impact the community	No warning
		Several hours warning
		1 day warning
		Up to 1 week warning
		More than 1 week warning
Frequency	Prediction of how often a hazard will occur in the future	Rare event - occurs less than once every 50 years
		Infrequent event - occurs between once every 8 years and once every 50 years (inclusive)
		Regular event - occurs between once a year and once every 7 years
		Frequent event - occurs more than once a year
Hazard Duration	How long the hazard remains active	Less than 1 day
		1 day
		2 to 3 days
		4 days to a week
		More than 1 week
Cascade Effects	A particular hazard's capability of triggering additional hazards	No, highly unlikely
		Yes, some potential
		Yes, highly likely
Recovery Time	Time emergency operations will continue once the hazard is inactive	Less than 1 day
		1 to 2 days
		3 days to 1 week

Risk Factor	Description	Descriptors
		1 to 2 weeks

Source: HAZNY Ground Rules (NYSEMO Planning Section and American Red Cross No date)

Each profile also includes a profile ranking of the hazard (ranging from no/low risk to severe risk). The planning group determined this initial profile ranking based on all of the hazard identification and profile research summarized in Sections 4.1 and 4.2 and group discussion and evaluation of all of the data. The profile ranking for each hazard is presented as a hazard risk gauge at the start of each hazard profile.

A summary of the importance of each hazard by jurisdiction also was performed and is presented in Section 4.5.

Hazard Risk Gauge is a graphic icon used during the initial planning process to convey the relative risk of a given hazard in the study area. The scale ranges from green (indicating relatively low or no risk) to red (indicating severe risk).

For the selected hazards, the profile ranking is as follows:

- High – Flood
- Moderate to High – Severe storm (wind, including hurricane and tornado), ice jam, severe winter storm, and extreme temperature
- Moderate – Ice storm, infestation(agricultural and disease-carrying insects), wildfire, epidemic (agricultural), drought, dam failure, water supply contamination

Based on hazard identification and profiling results and consideration of existing efforts to address mitigation and prevention for specific natural hazards, particular emphasis in this plan is placed on the flood, severe storm (wind, including hurricane and tornado), ice jam and severe winter storm (snow) and extreme temperature hazards. Infestation (agricultural and disease-carrying insects) and the epidemic (agricultural) hazards are also addressed, but detailed planning for these events are under the purview of the Delaware County Office of Emergency Management, Delaware County Public Health Department, and the Delaware County Soil and Water Conservation District. Therefore, these hazards are not considered with as much depth in this plan. Other natural hazards of more limited concern also are evaluated, but fewer resources were expended on evaluating these hazards, based on their lower priority and potential risk for this study area.

While only natural hazards are currently required to be considered under DMA 2000, the technological dam failure hazard and the man-made water supply contamination were included in this Plan. Dam failure was included due to the great number of dams, including several major high-hazard dams, in the County. Further, in 1996, a private dam on Chase Brook burst in the Town of Tompkins washing out a bridge on Rainbow Lodge Road. Five people were killed when they drove into the breach. Water supply contamination was included as the County watershed lands provide 50% of New York Cities drinking water, and the residents of Delaware County are generally reliant on private wells.

Implementation of mitigation actions through these existing agencies was identified in Section 2 of this plan. Specific mitigation strategies, goals, objectives, and activities are addressed in Section 5 of this plan. Close coordination with all relevant agencies will be implemented to ensure proper planning, resource distribution, and mitigation for the hazards of concern in Delaware County.

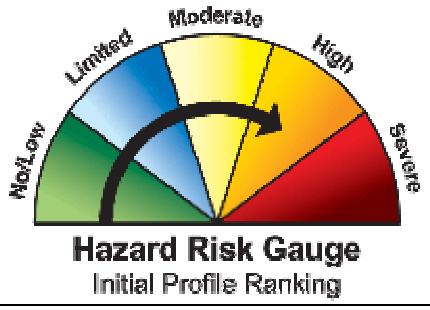
4.2.1 Natural Hazards

This section presents profiles of the various natural hazards of concern selected for further profiling and evaluation for Delaware County. Natural hazards are natural events that threaten lives, property, and many other assets. Often, natural hazards can be predicted, where they tend to occur repeatedly in the

same geographical locations because they are related to weather patterns or physical characteristics of an area.

4.2.1.1 Flood

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	Several Hours Warning
Frequency:	Frequent event
Hazard Duration:	1 Day
Cascade Effects:	Highly Likely
Recovery Time	More than 2 weeks



FLOOD HAZARD PROFILE

Background and Local Conditions

Floods are one of the most common hazards in the United States, with effects that can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple states. Most communities in the United States have experienced some kind of flooding, after spring rains, heavy thunderstorms, or winter snow thaws. A flood, as defined by the FEMA National Flood Insurance Program (NFIP) is: "A general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (at least one of which is your property) from: an overflow of inland or tidal waters; Unusual and rapid accumulation or runoff of surface waters from any source; or a mudflow. [The] collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood." Floods can be slow, or fast rising but generally develop over a period of days. All floods are not alike, where some develop slowly over a period of days, and others, identified as flash floods can develop quickly. Flash floods often have a dangerous wall of roaring water that carries rocks, mud, and other debris and can sweep away most things in its path. Overland flooding occurs outside a defined river or stream, but can still be destructive. Flooding can also occur when a dam breaks, producing effects similar to flash floods. Areas that are most susceptible to the effects of floods are low-lying areas, near water or downstream from a dam. An average of 197.8 million to 682.3 million is spent annually on flood damage throughout New York State (FEMA, 2004).

Floods result in greater property losses and damage and cause more casualties and fatalities each year than any other natural hazard. Several 100-year and 500-year floodplains are located within Delaware County along the shores of lakes, streams, creeks, rivers and reservoirs. These areas are prone to relatively frequent floods and/or inundation, as the County receives high amounts of precipitation and subsequent run-off. When severe thunderstorms or storms associated with hurricanes or tropical storms/depressions occur, they often result in floods in Delaware County. Flash floods also occur relatively frequently within the county. Flood hazard areas are defined as areas that would be inundated by a flood of a given magnitude. These areas are determined using statistical analyses of flood discharge data and hydraulic and topographic analyses. Tools such as FEMA's Flood Insurance Rate Maps (FIRM) show street maps with flood hazard areas clearly shown. A 100-year flood has a 1-percent chance of being equaled or exceeded in any given year. This flood event is also referred to as the base flood. A flood that has a 0.2-percent chance of being equaled or exceeded in any one year is called a 500-year flood. See Sections 4.3 and 4.4 for data on homes and other buildings located within 100- and 500-year flood zones in the Delaware County Multi-Jurisdictional Study area. According to FEMA's National Flood Insurance Program (NFIP), 393 claims have been made since 1978 by communities within Delaware County. An approximate $2.7 million in losses has been paid from January 1, 1978 through December 31, 2004 to Delaware County. The Towns of Colchester, Hancock, Margaretville, Sidney and Walton submitted between 30 and 60 losses each regardless of the status (FEMA NFIP, 2005).

FLOOD HAZARD PROFILE

Background and Local Conditions (Continued)

Floods are problematic in numerous ways, including but not limited to water-related damage to the interior and exterior of buildings, especially homes, destruction of electrical and other expensive and difficult to replace equipment, loss of life, injury and proliferation of disease vectors, disruption of utilities, including water, sewer, electricity, and communications networks and facilities, loss of agricultural crops and livestock, placement of stress on emergency response and healthcare facilities and personnel, loss of productivity, and displacement of persons from homes and places of employment. Flood events require responses (such as pumping of basements and barricading roads) above and beyond the typical daily operations of emergency response organizations and fire departments. Developments and resources in the bottoms of valleys and at the foot of steep slopes; mobile homes and mobile home parks in low-value, low-lying lands; and lakefront properties are particularly hard-hit by floods. Dam failure is also a concern to some Delaware County residents due to the Cannonsville Dam located in the Town of Tompkins and Deposit and the Downsville Dam in the Town of Andes and Colchester. Additionally, several other smaller scale dams are located along tributaries and streams with some of questionable structural integrity. A list of dams within Delaware County provided by the National Performance of Dams Program (NPDP) are provided Section 4.3. Ice jams often cause flooding in Delaware County during periods of spring thaw. Considerations involving ice jams are discussed further in the Hazard Profile for Ice Jams in following sections.

Historic Frequency and Probability of Occurrence

All floods are not alike, where some develop slowly over a period of days, and others, identified as flash floods can develop quickly. Flooding is a major persistent hazard that affects Delaware County, posing significant risk and resulting in repetitive loss and mitigation costs to the county and towns. According to the National Oceanic and Atmospheric Administration (NOAA)'s National Climate Data Center (NCDC) storm events database, 48 significant floods were reported for Delaware County between January 1950 and February 2005. With respect to the probability of future flooding hazard events, the HAZNY report resulted in a frequency description term of a "frequent event" for flooding. The ground rules for the program quantify this descriptor as an event that occurs more than once a year. Based on historical information found on the NOAA website and data provided by FEMA on Presidential Declared Disasters, it is estimated that Delaware County will continue to experience significant flooding each year (both in terms of frequency and impact), with possible major and flash floods that could result in a Presidential Disaster Declaration.

Severity

According to a recent NWS study, flooding (including flash flooding) is the most costly hazard facing Delaware County. Delaware County residents are particularly vulnerable to repetitive flooding because the historic population centers are clustered in valleys and along the shores of local creeks, rivers and reservoirs. Furthermore, Delaware County is home to more than over 4,599 manufactured homes (that is, trailers/mobile homes), making up 15% of the total housing units within Delaware County. Residents of these types of homes are generally more vulnerable to flood impacts. Although injuries or fatalities are primarily rare, the impact on property and public infrastructure is moderate and can be highly destructive.

Historic Losses and Impacts

- Damages typically include structural damages (to private and public structures such as roads, bridges, homes, businesses, etc.),
- According to FEMA, Delaware County has received five Presidential Disaster Declarations for flooding events between 1998 and 2005, with estimated losses unknown (See Table 4.2.2)
- According to FEMA-National Flood Insurance Program (NFIP), loss statistics for Delaware County between January 1, 1978 and December 31, 2004 estimated to be approximately $2.7 million. The Towns of Colchester, Hancock and Margaretville and Villages of Sidney and Walton experienced the most losses as a result of floods, ranging between 30 to 60 losses. The Village of Walton consisted of the most losses, estimating at $813,663 (FEMA-NFIP, 2004)
- The Binghamton National Weather Service (NWS) identified that approximately 24 flood events have occurred between 1993 and 2002, which are primarily localized or within flood prone areas with the duration ranging between hours to days. Annual average number of events is approximately 2.4 events. Information regarding losses or location for each event was not documented. The Binghamton NWS also provided additional storm data regarding countywide flood events. One such flash flood event occurred on January 19-20, 1996 resulting in the loss of six lives and an estimated $9.3 million in property losses. A July 8, 1998 flash flood occurred within the northern portion of Delaware County, particularly within Sidney Center. Several homes were affected, many yards and driveways suffered damage as large divets were carved out by rushing waters, and many major roadways were closed (Route 35). Emergency management personnel that inspected the scene estimated that more than a half million dollars worth of property damage occurred.

Historic Losses and Impacts (Continued)

- The Binghamton NWS identified that Delaware County was one of the hardest hit counties in the Binghamton Forecast Office's Service area as a result of Hurricane Ivan floods on September 18-19, 2004. Major flash flooding began about 2:45 am in Delaware County and lasted until 7:00 pm Saturday Evening. Cooks Falls, Hancock, Margaretville, Walton, Delhi area and Downsville were some of the hardest hit areas in the county. Both the east and west branches of the Delaware River and The Beaver Kill Creek at Cooks Falls experienced major flooding. Damage estimates are running close to six million dollars. This was the worst flood this area had seen since the Hurricane Diane Flood of 1955. Also, an April 2-4, 2005 flood in Delaware County resulted in approximately 4.7 million in damages, 100 buildings destroyed or damaged, six bridges closed, all roads closed due to being a declared state of emergency and six roads were destroyed. Hardest hit areas were Colchester, Hancock and Margaretville.
- The Delaware County Farm Service Agency office indicated that county-wide croplands were significantly impacted as a result of many flooding events. Between 1987 and 2005, five flooding events resulted in the damage of various crop fields and farms, estimating approximately $654,672 in losses. An April 1987 flood event affected the eastern part of the county, with losses averaging $19,920. An August 1991 event affected Veenerua/China Road, with losses averaging $3,752. An April 1993 event, affected acres of cropland, with average losses unknown. A January 1996 event, which took place over a three day period of time, resulted in 445 requests for funding and losses averaging $500,000. An April 2005 event, which took place over a two day period of time, impacted various sections of the county, including Harmony Farms in Downsville, River Haven in Delancey and Del-Rose rented land. Total losses received to date are averaged at $131,000; however, that monetary figure is subject to change.
- According to the Hazard Research Lab-USC, between 1995 and 2000, 10 flood events occurred within Delaware County, with property damages totaling approximately $12.5 million and crop damages totaling approximately $500,000. Also, six fatalities and two injuries resulted from these flood events (National Atlas, 2005).
- Delaware County representatives have indicated through their supporting documentation that Delaware County has experience multi-million dollar losses in property and crop damage throughout various townships and villages as a result of severe flooding between 1935 and 2004. Total amount of losses between that extended time period are difficult to decipher. As a result of the January 1996 floods, a Post Flood Recovery and Reconstruction Plan was established on March 1996 to limit the exposure of the County's residents to flooding, and thereby reduce the potential impacts to flood disasters.
- According to the Spatial Hazard Events and Losses Database for United States (SHELDUS) program established by the Hazard Research Lab-USC, Delaware County experienced multiple flood events between 1960 and 2003. The database indicated that flood hazard events and losses specifically associated with Delaware County and its municipalities totaled $2.4 million in property damage and $500,550 in crop damage. However, these numbers may vary due to the database identifying the location of the hazard event in various forms; therefore, only the losses identified for the locations specifically presented for Delaware County or its municipalities were incorporated into the aforementioned estimates. Specified losses were listed for the Towns of Walton, Sidney, Andes, Deposit, Hancock, Downsville, Masonville, and Delhi (USC, Hazard Research Lab, 2003).
- NY SEMO indicated that a January 1996 flood event resulted in $3.6 million in losses. Additional aid was provided, totaling $103,516, for that flood event at a later date. In 1998, Delaware County was one of 14 counties that received disaster aid for a severe flooding event; however, total amount of aid provided was not documented.
- An October 21, 2003 Disaster Recovery Initiative Report indicated that approximately six flood mitigation projects have been completed within the Town of Walton, Hamden, Roxbury and Hancock. Total grants for the various projects estimated to be $81,142.00. Other towns also have considered or implemented mitigation efforts (Delaware County Planning Department, 2003).

Designated Hazard Areas

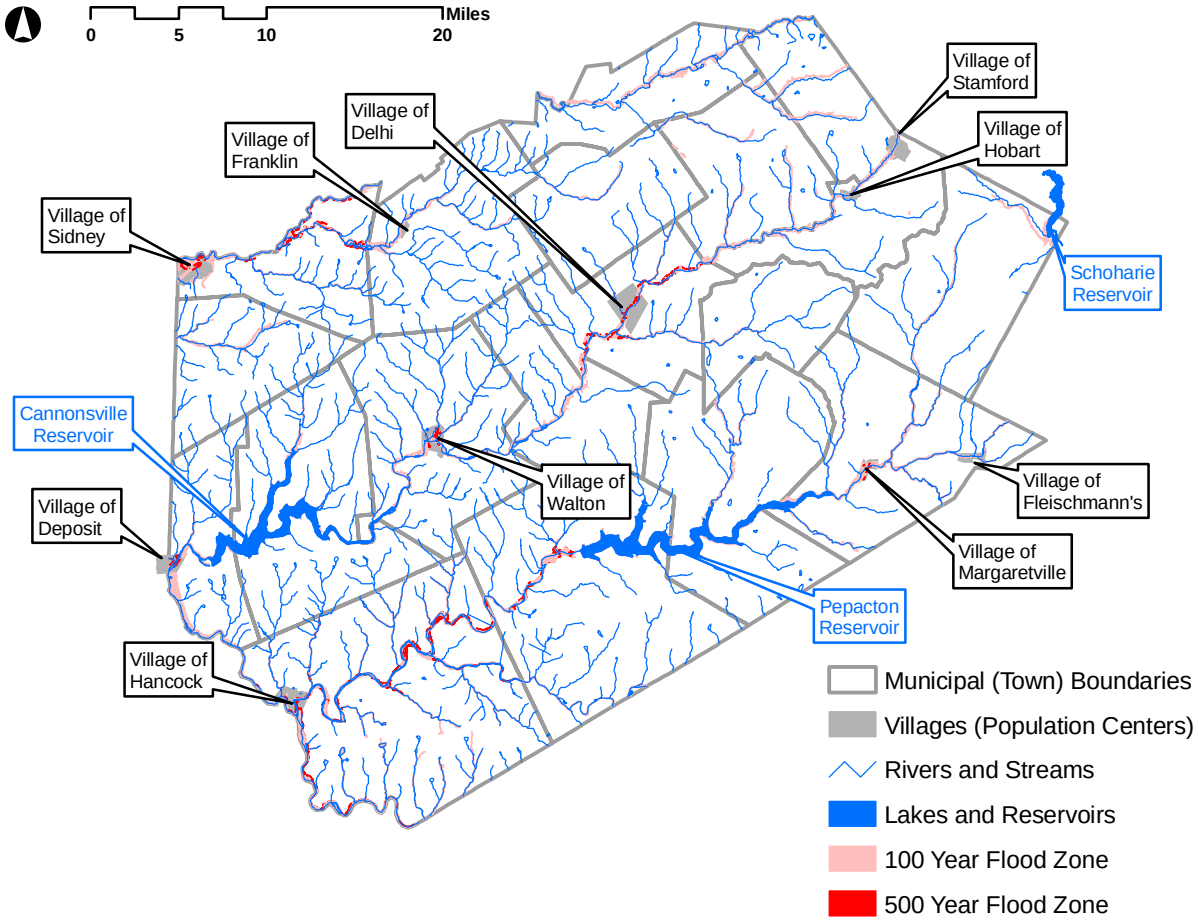
The geography of Delaware County includes steep slopes and large valleys; several municipalities are especially susceptible to chronic flooding events, including those villages along the East and West Branches of the Delaware River and their tributaries at or near the point of confluence, including but not limited to the Villages of Delhi, Margaretville, and Walton. In addition, lake or reservoir flooding resulting from rain events can continue for several days to 2 weeks. Figure 4-2-1 shows the areas within the Delaware County Multi-Jurisdictional Study Area within the designated 100-year and 500-year flood zones.

Table 4-2-2. Presidential Disaster Declarations for Flooding Events (1996 to 2005)

Type of Event	Date	Declaration Number	Cost of Losses (approx.)
Severe Storm and Flooding	January 1996	DR 1095	TBD
Severe Storm and Flooding	November 1996	DR 1148	TBD
Severe Storm and Flooding	July 1998	DR 1233	TBD
Severe Storm, Tornadoes and Flooding	August 2003	DR 1486	TBD
Severe Storm and Flooding	October 2004	DR 1564	TBD
Severe Storm and Flooding	August 2004	DR 1534	TBD
Severe Storm and Flooding	April 2005	DR 1589	TBD
Total Cost			TBD

Notes: Dollars rounded to nearest thousand. Recorded losses indicate the dollar value of loss made available through public records reviewed for this risk assessment.
Source: FEMA website (http://www.fema.gov/library/drcys.shtm)

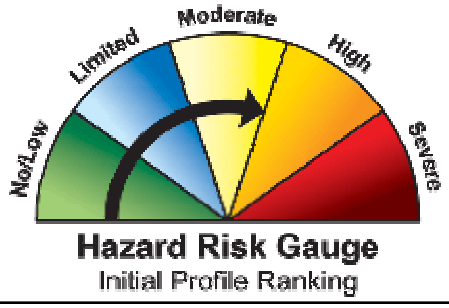
Figure 4-2-1. 100- and 500-Year Flood Zones within Delaware County



Source: FEMA Q3 Flood Delineations

4.2.1.2 Severe Storm (Wind, including Hurricane and Tornado)

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	No Warning
Frequency:	Frequent event
Hazard Duration:	Less than 1 day
Cascade Effects:	Highly Likely
Recovery Time	3 days to 1 week



SEVERE STORM HAZARD PROFILE

Background and Local Conditions

The severe storm hazard includes hurricanes and severe thunderstorms with associated heavy winds, lightning, and hailstorms. Tornadoes also are included, as they do not fit into another category(s). A hurricane is a tropical storm with winds that have reached a constant speed of 74 miles per hour or more. A thunderstorm is formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm and cold front, a sea breeze or a mountain. All thunderstorms contain lightning, which is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. Thunderstorms may occur singly, in clusters or in lines. Thus, it is possible for several thunderstorms to affect one location in the course of a few hours. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time. A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. Tornado season is generally March through August, although tornadoes can occur at any time of year (FEMA, 2004).

Severe storms in Delaware County tend to create severe property and crop damage, including damage to building rooftops and windows, vehicles, fences, signs, utility lines, and trees. Serious injuries or fatalities do not typically occur, however, injuries have been documented within the past as a result of such events. The hurricane hazard is included in this category for the Delaware County plan because hurricanes are rarely seen in Delaware County, but the effects from hurricanes that impact adjacent areas on the U.S. East Coast tend to be similar to severe winds and thunderstorms. Severe windstorms can result in power outages, disruptions to transportation corridors and equipment, restricted workplace access, significant property damage, injuries, loss of life, and the need to shelter and care for individuals impacted by the events. Most of Delaware County experiences windstorms frequently, and large-scale events tend to affect the entire county.

Full force hurricanes are not likely to occur in Delaware County due to latitude and distance of the County from the Atlantic Ocean. Of greater impact in Delaware County is the secondary flooding associated with hurricanes that hit areas closer to the coast (Flooding is of particular concern in the County for reasons stated in the hazard profile for flood.) According to the NOAA-NCDC, Delaware County experienced flooding in association with Hurricane's Bob (1991), Floyd (1999), Isabel (2003), Frances, Ivan, and Jeanne (2004) (NCDC, 2004). Also, according to NOAA National Hurricane Center, Delaware County experienced flooding from Hurricane Gracie (1959) and Hurricane David (1979) and a Tropical Depression (1939) (National Atlas, 2005)

Historic Frequency and Probability of Occurrence

Windstorms and thunderstorms occur relatively frequently in Delaware County; however, only a small fraction of all storms are considered severe. NCDC lists 169 thunderstorm, heavy wind, hail and lightning events for the period between 1950 and 2005 (see Figure 4-2-3). One such event include a thunderstorm wind event with winds reaching 80-90 knots between the Town of Walton and Delhi in July 2003. Property damage averaged to approximately $500,000 as a result of the event (see additional details below) (NCDC, 2005). According to the Binghamton NWS, Tornado events average approximately .35 annually and Hail events average approximately .65 annually. NCDC also lists eight tornado events during the period of 1950 and 2005, One tornado event consisted of an F3 tornado in May 1998, property damage estimated at approximately $1.0 million in the Towns of Deposit, Tompkins, Colchester, and Downsville (NCDC, 2005).

SEVERE STORM HAZARD PROFILE

Historic Frequency and Probability of Occurrence (Continued)

According to the NCDC, no hurricanes were reported for Delaware County since 1950. However, the county has felt the peripheral landward effects, including high winds, heavy rains, and flooding associated with several hurricanes and tropical storms in recent history. Most recently, Delaware County experienced high winds associated with Hurricane Jeanne in September, 2004. Additionally, Delaware County experienced flooding in association with Hurricane's Bob (1991), Floyd (1999), Isabel (2003), Frances, and Ivan (2004) (NCDC, 2004). Also, according to NOAA National Hurricane Center, Delaware County experienced flooding from Hurricane Gracie (1959) and Hurricane David (1979) and a Tropical Depression (1939) (National Atlas, 2005). Winds associated with Hurricane David averaged approximately 45 miles per hour.

With respect to the probability of future severe storm hazard events, the HAZNY report resulted in a frequency description term of a "frequent event" for severe storm. The ground rules for the program quantify this descriptor as an event that occurs more than once a year. Based on historical information found on the NOAA websites 150 severe storm event days including heavy winds have occurred from 1950 through 2005, and eight tornados (2 FO, 4 F1, 1 F2, and 1 F3) have occurred from 1986 through 2004. Data provided by FEMA on Presidential Declared Disasters identifies eight Presidential Declared Disasters since 2005 (Table 4-2-3). It is estimated that Delaware County will continue to experience severe storms annually that may induce secondary hazards such as utility failure and transportation accidents.

Severity

The severe storm hazard is of moderate severity due to the fact that it affects a large region, allows little or no warning time, and occurs regularly. Damages tend to be relatively minor (such as damaged building rooftops, snapped tree limbs, downed power lines and dispersed debris), but are widespread. Severe storm and hurricane hazards tend to disproportionately affect elderly and infirm persons because they are less able to prepare their homes for storms and are often immobile and unable to evacuate when necessary.

The damage from hurricane-force winds would be severe (due to widespread damages to buildings and utilities from downed trees). A consequence of the severe storm and hurricane event is flooding. An additional cascade effect of severe storm events is lost power due to downed power lines.

Historic Losses and Impacts

The following sources provided data and statistics of historic losses and impacts as a result of severe storm events within Delaware County:

- According to NOAA's NCDC storm events database, total property damages as a result of severe storm events (including tornado events) estimated to be approximately $9.7 million between 1950 and 2005. In addition, 12 injuries resulted from these severe storm events. Between the Towns of Walton and Delhi, a thunderstorm wind event was documented in July 21, 2003, which resulted in approximately $500,000 in losses to property. Winds estimated between 60 to 90 mph in various areas. Multiple trees were snapped or uprooted, four cabins at a 4-H camp were crushed, building rooftops were torn off, 14 houses were damaged and 10,000 electric customers lost power for more then 24 hours. A lighting event on September 4, 2002 took place in Delaware County a couple miles north east of Trout Creek, resulting in a barn being engulfed in flames, eight pigs being killed and cattle being injured. Losses estimated to be approximately $100,000. An F3 Tornado event took place between Deposit and Downsville in May 1998, covering a 30 mile distance in Delaware County and resulting in approximately $1.0 million in damages, primarily in the Town of Deposit. This tornado event damaged or destroyed more than 30 homes and injured nearly 20 people within Delaware, Tioga and Broome Counties. Also, hail as large as 3 to 4 inches in diameter accompanied some of the tornadic supercells resulting in smashed windows, dented cars, and crop losses. Power outages as a result of the tornado impacted for thousands over a multi-county area, including Delaware County (NCDC 2005). Figure 4-2-4 identifies all historical North Atlantic Tropical Cyclone tracks that have impacted Delaware County.
- According to FEMA, Delaware County has received eight Presidential Disaster Declarations or state of emergencies for severe storm events between 1998 and 2005, with estimated losses unknown (FEMA, 2005). Table 4-2-3 identifies storms that resulted in Presidential Disaster Declarations.
- According to Binghamton NWS, Delaware County has experienced approximately 109 severe weather events between 1983 and 2002. Also, approximately seven tornado events including two killer tornados (F2 or greater) have occurred within Delaware County between 1983 and 2002. Additionally, 13 hail events (greater then .75 inches) including four killer hail events (greater than 1.5 inches in diameter) occurred between 1983 and 2002. Information regarding losses or location for each event was not documented. Photographs of 2003 severe storm damage in Delaware County are provided as Figures 4-2-5 and 4-2-6.

SEVERE STORM HAZARD PROFILE

Historic Losses and Impacts (Continued)

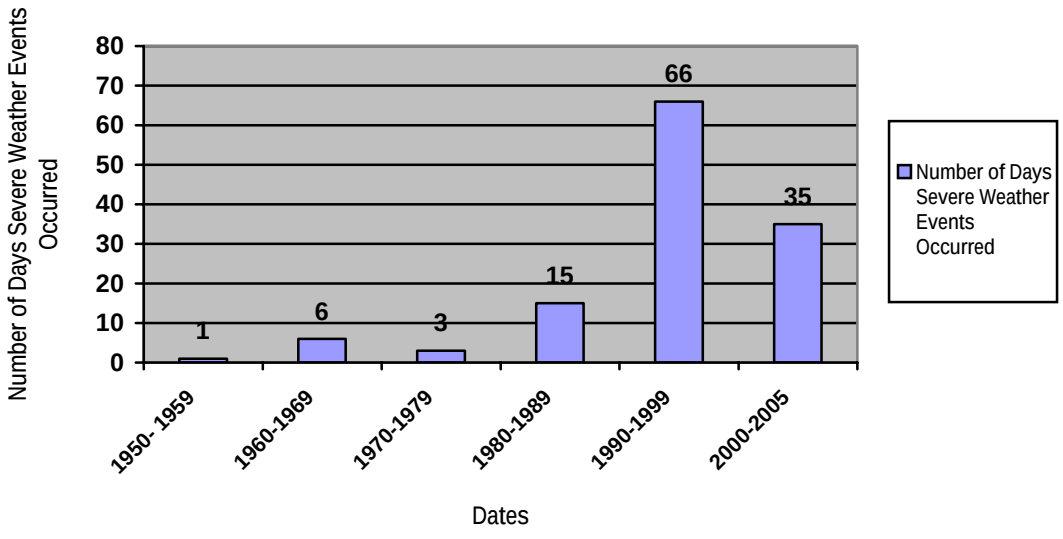
- According to the Hazard Research Lab-USC, between 1995 and 2000, 42 severe storm events occurred within Delaware County, with property damages totaling approximately $2.2 million. Fatalities or injuries were not recorded (National Atlas, 2005).
- Delaware County representatives have indicated through their supporting documentation that the Townships of Sidney and Franklin experienced approximately $250,000 in property damage as a result of severe storm on July 8, 1998. According to the Sheldus program established by the Hazard Research Lab-USC, Delaware County experienced multiple severe storm events between 1960 and 2003. The database indicated that severe storm hazard events and losses specifically associated with Delaware County and its municipalities totaled $2.4 million in property damage and $754,286 in crop damage. 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, including Delaware County; therefore, only the losses identified for the locations specifically presented for Delaware County or its municipalities were incorporated into the aforementioned estimates. Specified losses were listed for the Towns of Andes, Bovina, Colchester, Davenport, Delhi, Downsville, Franklin, Hancock, Harpersfield, Lordville, Meridale, Meredith, Roxbury, Sidney, and Walton (Sheldus, 2003).

Designated Hazard Areas

Severe storms and associated wind may occur throughout the mitigation plan area; however the impacts to property may be greatest to manufactured homes, vehicles, and other nonpermanent structures. Figure 4-2-7 indicates that Delaware County falls in Wind Zone II or III according to FEMA and could experience winds up to 160 - 200 mph.

The entire county can be considered a designated hurricane hazard area. Vulnerable structures include older building districts (not able to handle high winds), mobile home communities, power grid hubs (loss or damage of which could affect large numbers of people), and areas near rivers, lakes or reservoirs that could be affected by flooding as a result of severe storms.

Figure 4-2-3. Delaware County Severe Storm Events (1950-present)



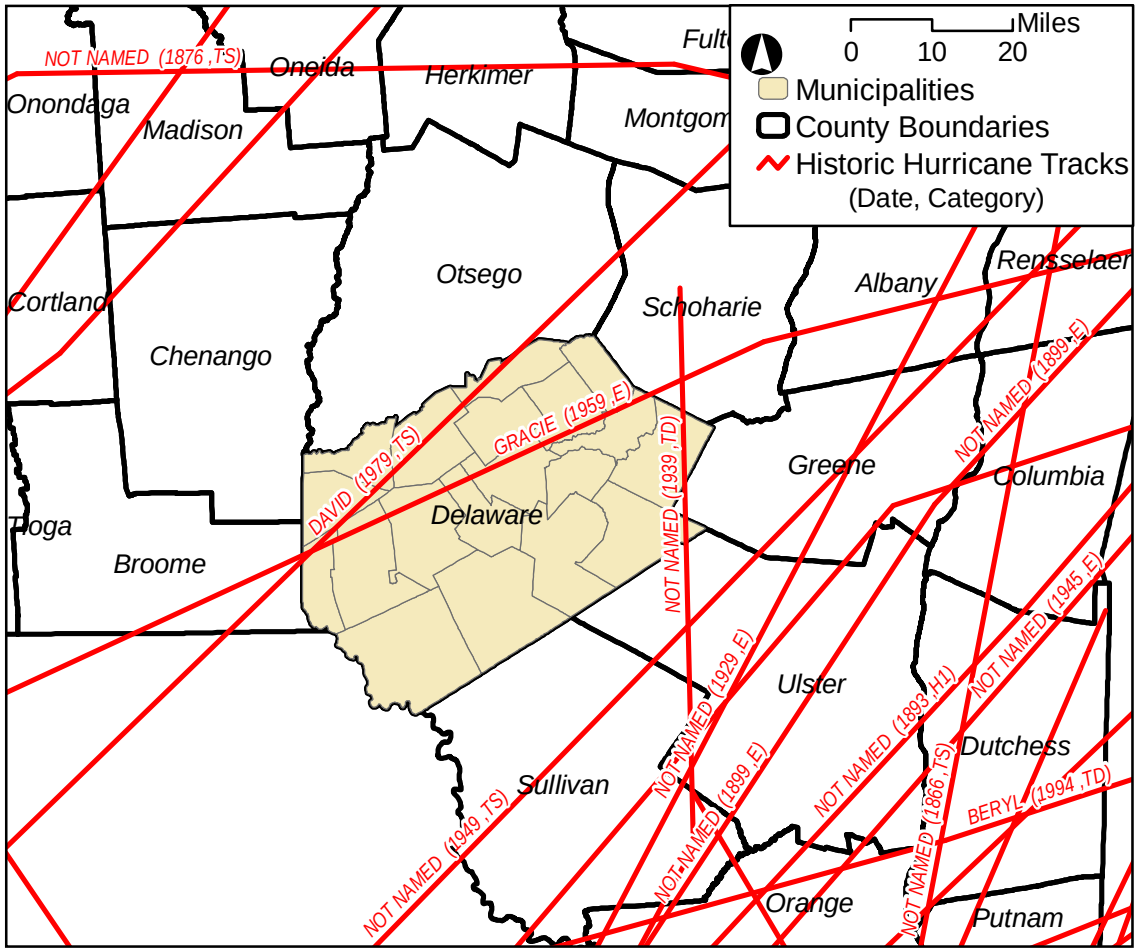
Source: NOAA NCDC Storm Event Database for Severe Storms, 2005
Note: NOAA tracks the storm events by type of storm event and location. Because the data set above includes all of Delaware County, some of the events occurred outside of the study area and in some instances more than one event is recorded for some days. For this figure, all days storm events occurred are tabulated, so repetitive dates are not included. It is considered likely that significantly more events were reported since 1990 due in large part to improved meteorological equipment and reporting, as well as revised definitions of severity for the various types of storm.

Table 4-2-3. Presidential Disaster Declarations for Severe Storm Events

Type of Event	Date	Declaration Number	Cost of Losses (approx.)
Severe Storm and Flooding	January 1996	DR 1095	TBD
Severe Storm and Flooding	November 1996	DR 1148	TBD
Severe Storm and Flooding	July 1998	DR 1233	TBD
Tornado	May 1998	State of Emergency	TBD
Severe Storm, Tornadoes and Flooding	August 2003	DR 1486	TBD
Severe Storm and Flooding	October 2004	DR 1564	TBD
Severe Storm (Tropical Depression Ivan)	October 2004	DR 1565	TBD
Severe Storm and Flooding	August 2004	DR 1534	TBD
Severe Storm and Flooding	April 2005	DR 1589	TBD
Severe Storm	April 2005	DR 1587	TBD
Total Cost			

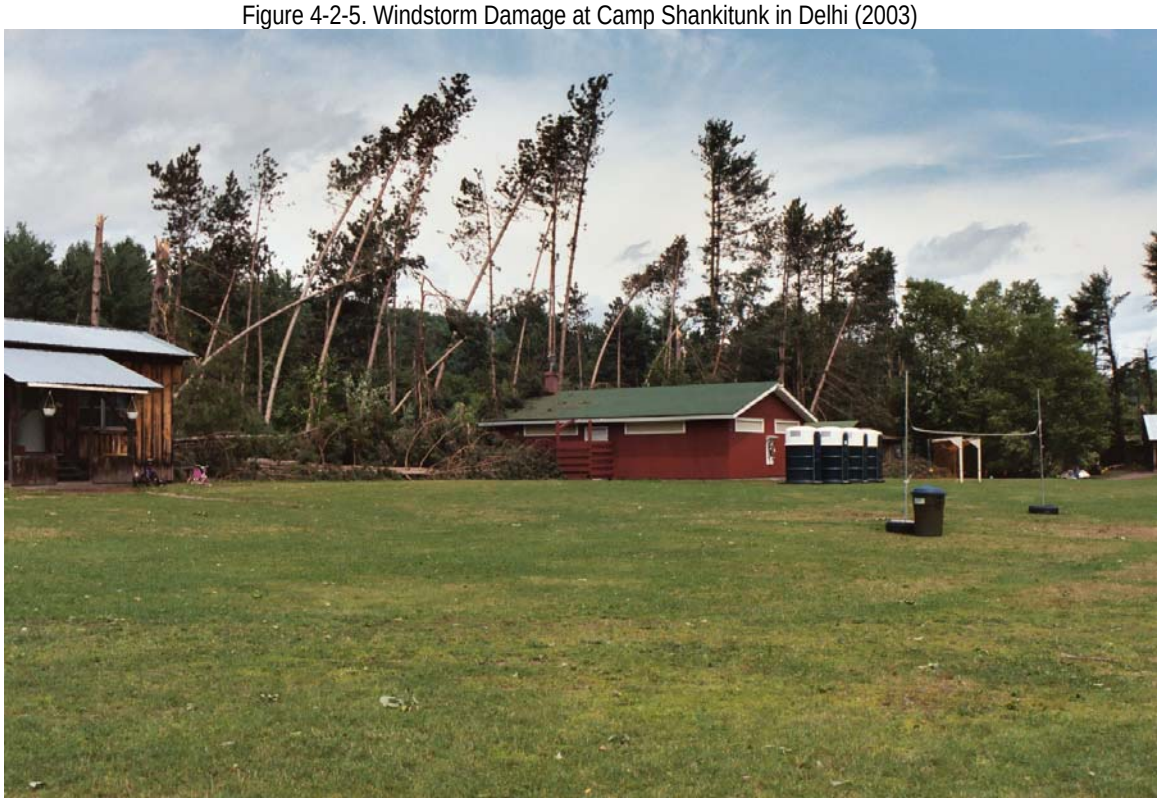
Source: FEMA website (http://www.fema.gov/library/drcys.shtm)
Notes: Recorded losses indicate the dollar value of loss made available through public records reviewed for this risk assessment.

Figure 4-2-4. Historical North Atlantic Tropical Cyclone Tracks (1851-2002)



Source: National Oceanic and Atmospheric Administration (NOAA), Tropical Prediction Center/National Hurricane Center, 2003

Figure 4-2-5. Windstorm Damage at Camp Shankitunk in Delhi (2003)

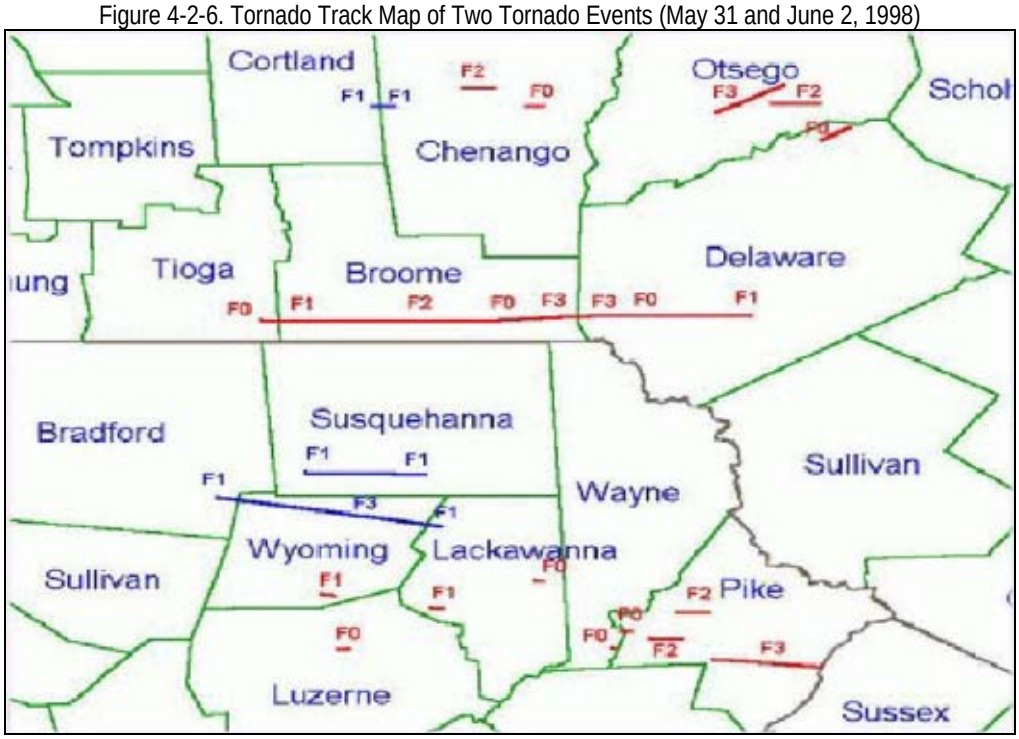


Source: Delaware County Planning Department, 2005

Figure 4-2-6. Severe Storm Damage in Delaware County Forest (July 31, 2003)

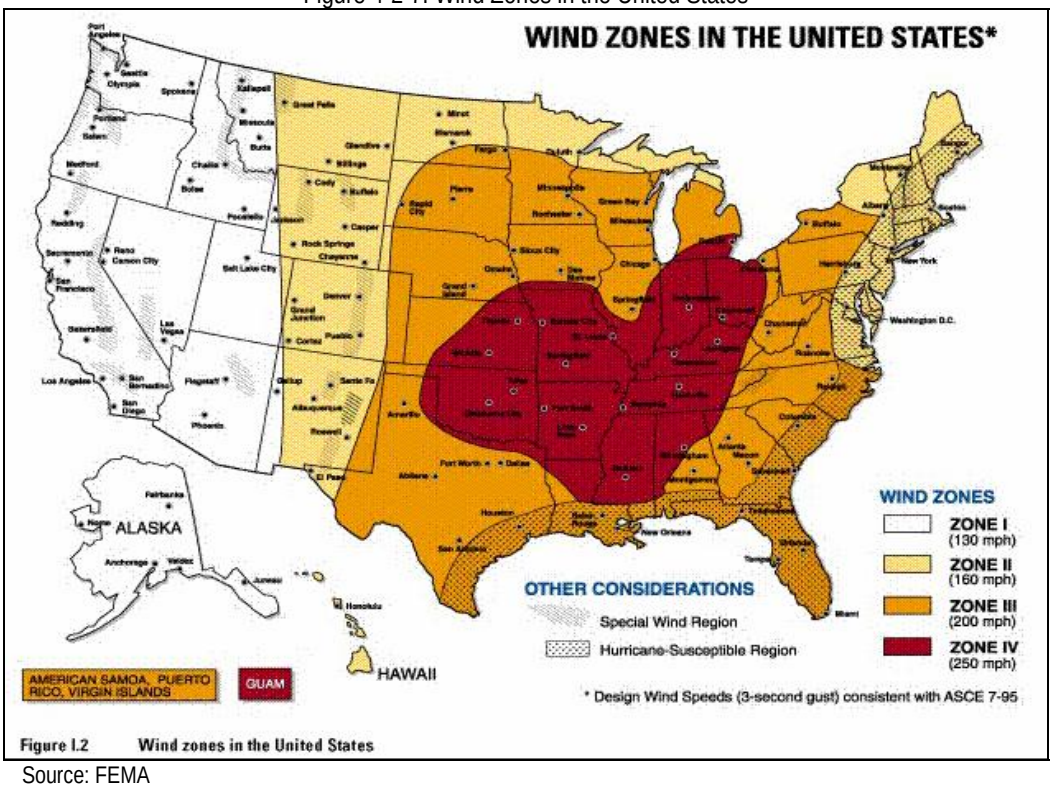
Source: Binghamton NWS, 2005

Figure 4-2-6. Tornado Track Map of Two Tornado Events (May 31 and June 2, 1998)



Notes: Red tracks are May 31, 1998 tornados and blue tracks are June 2, 1998 tornados. An F3 Tornado impacted Deposit, NY.
Source: Binghamton NWS, 2005

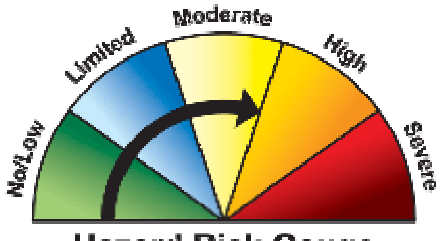
Figure 4-2-7. Wind Zones in the United States



Source: FEMA

4.2.1.3 Ice Jams

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	No Warning
Frequency:	Regular event
Hazard Duration:	2 to 3 days
Cascade Effects:	Some Potential
Recovery Time	More than 2 weeks



ICE JAM HAZARD PROFILE

Background and Local Conditions

An ice jam is an accumulation of ice in a river that acts as a natural dam and can flood low-lying areas upstream. Downstream areas also flood if the jam releases suddenly, releasing a wave of ice and water. Ice jams can damage roads, bridges, buildings, and homes, and cost the community thousands to millions of dollars. But ice jam damages tend to be localized and often do not meet the requirements for FEMA assistance. So the U.S. Corp of Army Engineers (USACE) plays a large role in ice jam emergency response and long-term mitigation (Darling, 2001).

An ice jam occurs when warm temperatures and heavy rains cause rapid snow melting. The melting snow combined with the heavy rain, causes frozen rivers to swell. The rising water breaks the ice layers into large chunks, which float downstream and often pile up near narrow passages or near obstructions, such as bridges and dams. The ice jam may then build to a thickness great enough to raise the water level and cause flooding (NESEC, 2005). Some of the most devastating winter floods have been associated with a combination of heavy rainfall, rapid snowmelt and ice jams. According to the USACE, Cold Region Research and Engineering Lab (CRREL), Delaware County has experienced approximately 77 historic ice jam events between 1930 and 2001 (Figure 4-2-8). In addition, 14 ice jams have also been recorded within the Schoharie Creek, which partially extends through the northeastern section of Delaware County. Most ice jam events create significant impacts to areas located along rivers, streams, reservoirs and/or tributaries. Ice Jams typically have formed along the following rivers and tributaries within Delaware County: the Little Delaware River, the West and East Branch of the Delaware River, Oquagq Creek, Oulelet Creek, Trout Creek, Susquehanna River, Schoharie Creek, Platte Kill, Mill Brook, Terry Clove Kill, Coles Clove Kill, Beaver Kill and Tremper Kill (USACE-CRREL, 2005). Areas where ice jams have occurred are presented in Figure 4-2-9. Ice jams are separated from winter weather events due to being categorized as an event that could occur on its own without other natural hazards.

Historic Frequency and Probability of Occurrence

Ice jams occur relatively frequently in Delaware County; however, only a small fraction of ice jams are considered severe. The USACE - CRREL indicated that 77 individual ice jam events took place within Delaware County between 1930 and 2001, with ice jams per year primarily ranging between zero to four events. However, historical ice jams ranged between five and eight events within 1945, 1946, and 1950. All documented events have occurred between January to April, in association with snow melts. Based on the CRREL database, it appears that ice jam incidences have declined within the recent years, however, there is always the potential for such unexpected events to occur during the winter months.

With respect to the probability of future ice jam hazard events, the HAZNY report resulted in a frequency description term of a "regular event" for ice jams. The ground rules for the program quantify this descriptor as an event that occurs between once a year and once every 7 years (inclusive). It is estimated that Delaware County will continue to experience ice jams annually that may induce secondary hazards such as flooding, utility failure and transportation accidents.

Severity

The ice jam hazard is of moderate severity due to the fact that it affects a large region, allows little or no warning time, and is documented to occur regularly. Damages tend to be localized and relatively minor; however, depending on the magnitude of the ice jam, major damages and losses can result (such as damaged roads, bridges, buildings, and homes). Impacts from ice jams tend to primarily affect areas located along rivers, tributaries or reservoirs. The hazard duration is two to three days, with a recovery time of more then two weeks (Delaware County, 2003). When ice jam events take place, typically, flooding occurs within the localized area of the event as a result.

ICE JAM HAZARD PROFILE

Historic Losses and Impacts

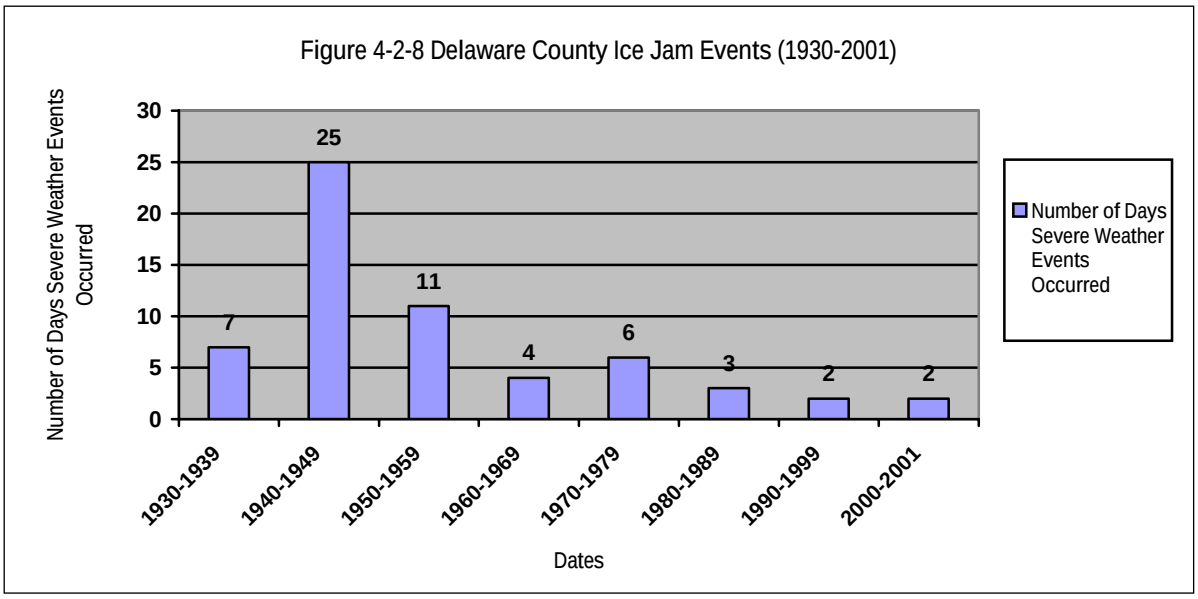
Damages from ice jams and its associated flooding typically may include structural damages to private and public structures such as roads, bridges, buildings/homes, and businesses. Information pertaining to the estimated losses associated with Ice Jam events has not been identified, however, ice jams do have the potential to cost communities thousands to millions of dollars, depending on the severity of the hazard event. FEMA has not provided aid for ice jam events do to not meeting the requirements for assistance, therefore, the USACE plays a large role in ice jam emergency response. The following source provided data and statistics for ice jam events within Delaware County:

- According to the USACE-CRREL, approximately 77 separate ice jam events have taken place within the boundaries of Delaware County between 1930 and 2001, with some occurring on the same day. In addition, 14 ice jams have taken place within close proximity to the Schoharie Creek/Schoharie Reservoir, which is located within a portion of the northeastern section of Delaware County. Therefore, there is potential that Delaware County was impacted by those additional ice jams. Documented ice jam events within Delaware County have occurred in the following locations:

  1. Fishs Eddy along the East Branch Delaware River
  2. Hale Eddy along the West Branch Delaware River
  3. Rock Royal along Trout Creek
  4. East Sidney along Ouleout Creek
  5. Unadilla along Susquehanna River
  6. Delhi along the Little Delaware River
  7. Dunraven along Platte Kill
  8. Arena along Mill Brook
  9. Pepacton along Terry Clove Kill
  10. Shavertown along Tremper Kill
  11. Pepacton along Coles Clove Kill
  12. Cooks Falls along Beaver Kill
  13. Deposit along Oquaga Creek
  14. Stilesville along the West Branch Delaware River
  15. Cannonsville along Trout Creek
  16. Harvard along the East Branch Delaware River
  17. Andes along Tremper Kill
  18. Walton along the West Branch Delaware River

Designated Hazard Areas

Ice jam events may occur along rivers, tributaries or reservoirs throughout the mitigation plan area; however the impacts to property may be greatest to roadways, bridges, existing dams, and private and public buildings.



Source: Northeast States Emergency Consortium (NESEC) and USACE Cold Region Research and Engineering Lab (CRREL), 2001
Note: For this figure, all days storm events occurred are tabulated, so repetitive dates are not included. It is considered likely that significantly more events were reported since 1990 due in large part to improved meteorological equipment and reporting, as well as revised definitions of severity for the various types of storm. Events along Schoharie Creelk are excluded.

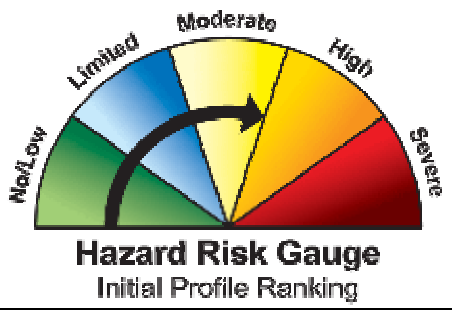
Figure 4-2-9. Historical Ice Jam Locations within Delaware County

Source: USACE-CRREL, 2005

- 1 Ice Jam
- 2 - 5 Ice Jams
- 5 - 10 Ice Jams
- > 10 Ice Jams

4.2.1.4 Severe Winter Storm (Snow)

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	1 Day Warning
Frequency:	Frequent event
Hazard Duration:	2 to 3 days
Cascade Effects:	Highly Likely
Recovery Time	3 Days to 1 week



SEVERE WINTER STORM HAZARD PROFILE

Background and Local Conditions

A winter storm can range from moderate snow to blizzard conditions: blinding wind driven snow over 35 mph that last several days. A severe winter storm deposits four or more inches of snow during a 12 hour period or six inches of snow during a 24 hour period. A blizzard is a snowstorm with sustained winds of 40 mph or more or gusting up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of 10ºF or colder, and potentially life-threatening traveling conditions.

Winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, blowing snow, and cold temperatures. People can become trapped at home, without utilities or other services. Heavy snowfall and blizzards can trap motorists in their cars. Attempting to walk for help in a blizzard can be a deadly decision. Winter storms can make driving and walking extremely hazardous. The aftermath of a winter storm can have an impact on a community or region for days, weeks, or even months and can generate winter flooding, ice jams and snow melt resulting in significant damage and loss of life. Storm effects such as extremely cold temperatures and snow accumulation, and sometimes coastal flooding, can cause hazardous conditions and hidden problems for people in the affected area. A winter storm can range from a moderate snow over a few hours to blizzard conditions with blinding wind-driven snow that lasts several days. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely reduce visibility (American Red Cross, 2001). Sleet is raindrops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects; however, it can accumulate like snow and cause a hazard to motorists. Freezing rain is rain that falls onto a surface with a temperature below freezing; this causes it to freeze to surfaces, such as trees, cars, and roads, forming a glaze of ice. Even small accumulations of ice can cause a significant hazard. An ice storm occurs when freezing rain falls and freezes immediately on impact; communications and power can be disrupted for days, and even small accumulations of ice may cause extreme hazards to motorists and pedestrians (National Disaster Education Coalition, 2004). Ice storms are discussed as an individual natural hazard in Section 4.2.7.

Heavy snowfall and ice, coupled with low temperatures, often results in increases in traffic accidents, disruptions in transportation, commerce, government, and education, utility outages due to falling trees, branches, and other objects, personal injuries associated with slippery surfaces and freezing temperatures, and numerous other problems. Fortunately, Delaware County is relatively well prepared for severe winter storms, having sophisticated response, early warning, and snow removal systems in place. The climate of Upstate New York, with its northern latitude and high precipitation rate, is conducive to the regular occurrence of severe winter weather. As such, severe winter storms present a significant hazard to life and property in Delaware County. Severe winter storms can produce freezing rain, ice, snow, dangerously cold conditions, and freezing wind. The steep topography of Delaware County adds to the hazard associated with snow and ice-related events. Of particular concern in Delaware County is the increased likelihood of cascade effects from snow and ice, including utility failures, increased frequency and magnitude of transportation accidents, increased risk of injuries and death due to falls, hypothermia, and reduced access to emergency services (see also the profile for Utility Failure). As many homes in Delaware County are served by well water with electric pumps and heated by electricity, utility failure associated with winter storms can result in people being without heat and water for prolonged periods of time. Severe winter storms can cause numerous impacts to the social, political, and public safety infrastructure, as well, causing lost productivity and work time, school cancellations, transportation delays, increased road maintenance, and higher demands on community services. The elderly, infirm, homeless, impoverished, and other vulnerable populations are at increased risk of adverse impacts associated with severe winter storms. Ice covers surfaces and results in

significant damage to trees, building and infrastructure inventory, such as power lines, bridges, and substations. The freeze/thaw cycle, salts, sand, and heavy use of plows and trucks that often accompanies winter storms results in formation of potholes, damaged roads and bridges, and increased maintenance costs to the affected communities. As identified in Section 4.2.1.3, Delaware County also experiences chronic ice jams that occur on the County's abundant streams and often result in flooding. Although they typically occur during spring thaws, they are still related to winter storm conditions. Damages and losses associated with severe winter storms are similar to those for ice storms, however, ice storms are described as a separate hazard in Section 4.2.7. Most areas of Delaware County experience the effects of winter storms frequently.

Historic Frequency and Probability of Occurrence

Several severe winter storms occur each year in Delaware County and the participating municipalities. The blizzard of 1996 also affected the Delaware County area. The NOAA NCDC Storm Event database lists 71 heavy snow and/or freezing rain events between 1993 and 2005 (see Figure 4-2-9), with some events occurring on the same day. Winter storm events usually impact multiple counties at one time, therefore, such events are not necessarily contained within Delaware County alone. One such event includes a slow moving nor'easter that affected multiple counties including Delaware County in January 2003. The event resulted in resulted in closed roads and thousands of residents being without power for several days, requiring residents to use emergency shelters. Total property damage averaged to approximately $6.0 million, respectively, as a result of the event (see additional details below) (NCDC, 2005). Also, according to NCDC, blizzards or nor'easter's that hit the region in 1992 and 1996 resulted in closed roads and thousands of residents being without power for several days, requiring residents to use emergency shelters. According to the U.S. Department of Commerce, NOAA, and the NWS, the 2001 "Winter Storms – The Deceptive Killer" preparedness guide, revealed that Delaware County has an mean snowfall ranging between 48.1 and 72 inches annually (See Figure 4.2.10).

According to the Binghamton NWS, historical information documented for multiple winter storm events indicated that Delaware County is one of the hardest hit counties within New York State. Historically, a severe storm band always tends to travel directly across Delaware County, resulting in significantly higher snow fall amounts then surrounding counties. Between 1956 and 2005, the highest snowfall amounts within a one day period of time with Walton Township were documented on December 25, 2002 with 33.2 inches, March 14, 1993 with 22.0 inches, and January 23, 1987 with 20.0 inches. Throughout 1995, snow fall within Delaware County was the worst documented at 150.5 inches.

With respect to the probability of future severe winter storm hazard events, the HAZNY report resulted in a frequency description term of a "frequent event" for severe winter storm. The ground rules for the program quantify this descriptor as an event that occurs more than once a year. Based on historical information found on the NOAA website it is estimated that Delaware County will continue to experience heavy snow events annually, with the secondary effects causing possible utility failure and transportation accidents.

Severity

The intensity of the impact from severe weather could be minor to total damage in a localized area or regional damage affecting property and the economy, such as a hard frost occurring early in the growing season, killing off the season's crop yield.

Historic Losses and Impacts

The following sources provided data and statistics of historic losses and impacts as a result of severe winter storm events within Delaware County:

- According to NOAA's NCDC storm events database, total property damages as a result of severe winter storm events estimated to be approximately $23.3 million between 1950 and 2005 (That monetary figure also includes damages to other counties). In addition, three fatalities and ten injuries resulted from these severe winter storm events. A heavy snow event took place on January 3-4, 2005, encompassing multiple counties including Delaware County, where total property damages averaged to $6.0 million. Snowfall amounts ranged between 8 to 14 inches within the vicinity of Delaware County. Numerous power outages occurred as a result of the snow event. All of the major roadways had documented motor vehicle accidents during the course of the event (NCDC 2005). See Figure 4-2-10 for Delaware County Winter Weather events between 1993 and 2005.

- According to FEMA, Delaware County has received two Emergency Declarations for snow events between in 2003, with estimated losses unknown (FEMA, 2005). Table 4-2-4 identifies storms that resulted in Presidential Emergency Declarations.

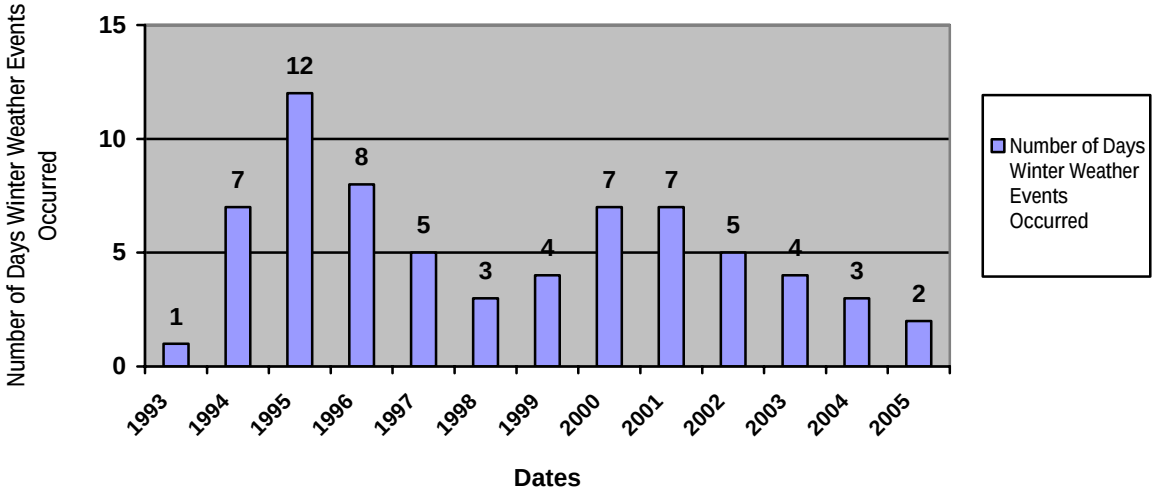
SEVERE WINTER STORM HAZARD PROFILE

- According to Binghamton NWS, approximately 47 heavy snow events have occurred within Delaware County between 1993 and 2002, creating an annual average number of events to be approximately 4.7 events. Additionally, winter storm events (including snow and ice) occurred approximately 65 times between 1993 and 2002, averaging 6.5 events annually within Delaware County. Information regarding losses or location for each event was not documented.
- According to the Hazard Research Lab-USC, between 1995 and 2000, 14 winter storm events occurred within Delaware County, with property damages totaling approximately $630,532. Fatalities or injuries were not recorded (National Atlas, 2005).
- According to the Sheldus program established by the Hazard Research Lab-USC, Delaware County experienced multiple severe winter storm events between 1960 and 2003. The database indicated that severe winter storm events and losses specifically associated with Delaware County and its municipalities totaled approximately $785,696 million in property damage. 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, including Delaware County; therefore, only the losses identified for the locations specifically presented for Delaware County or its municipalities were incorporated into the aforementioned estimates (USC-Hazard Research Lab, 2003).

Designated Hazard Areas

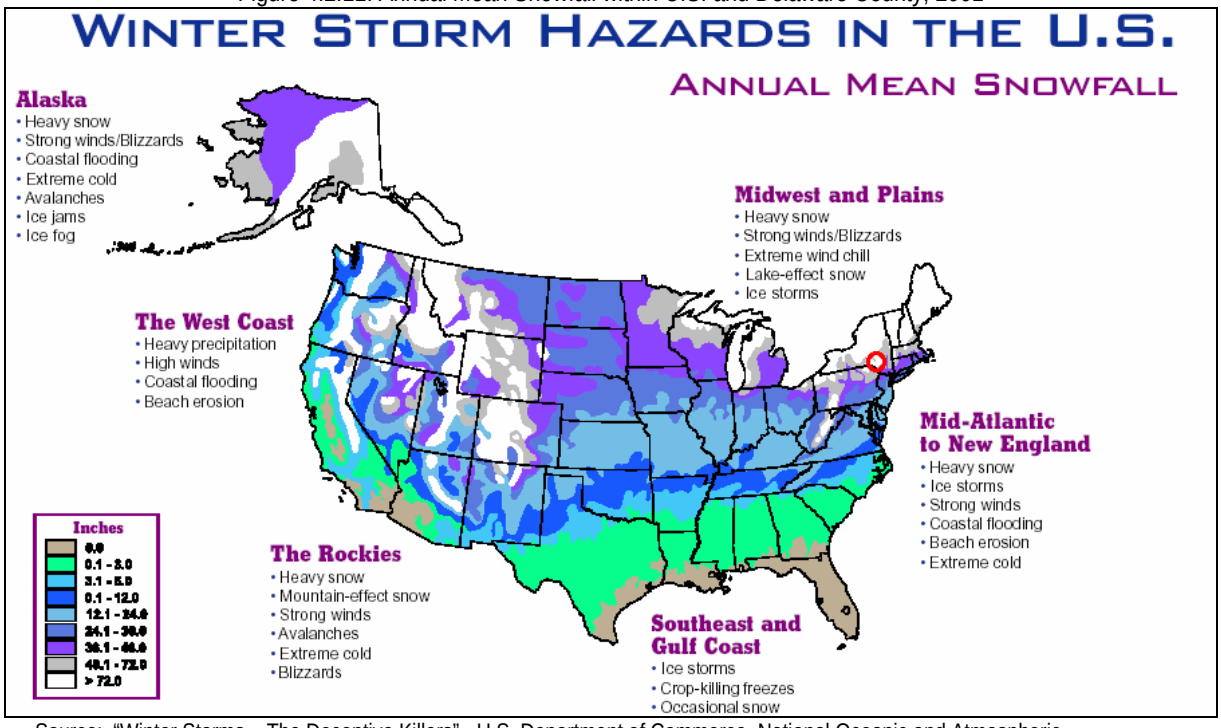
Essentially, all of Delaware County is susceptible to winter storms. However, areas at particular risk include: certain areas with elderly, impoverished, or otherwise vulnerable populations; areas that are remote from community services and transportation corridors; antiquated or poorly constructed facilities (e.g., mobile homes); structures susceptible to power or telecommunications failure; and steep or hilly areas adjacent to water bodies, or served water from electric pumped-powered wells. Demographics, population density, transportation and considerations regarding construction, well usage, and topography in the region are presented throughout this plan.

Figure 4-2-10 Delaware County Winter Weather Events (1993-2005)



Source: NOAA NCDC Storm Event Database for Winter Weather Events, 2005
Note: NOAA tracks the storm events by type of storm event and location. Because the data set above includes all of Delaware County, some of the events occurred outside of the study area and in some instances more than one event is recorded for some days. For this figure, all days storm events occurred are tabulated, so repetitive dates are not included. It is considered likely that significantly more events were reported since 1990 due in large part to improved meteorological equipment and reporting, as well as revised definitions of severity for the various types of storm.

Figure 4.2.11: Annual Mean Snowfall within U.S. and Delaware County, 2001



Source: "Winter Storms – The Deceptive Killers" - U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), National Weather Service. December, 2001. http://www.nws.noaa.gov/om/winterstorm/winterstorms.pdf
Note: The red circle within New York State indicates the approximate location of Delaware County. Annual mean snow fall within Delaware County ranges between 48.1 t0 72 inches.

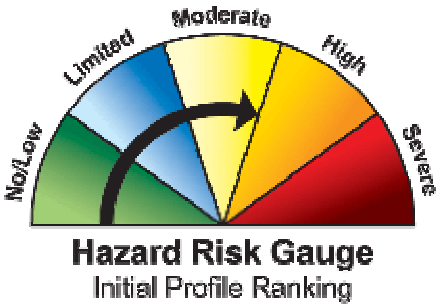
Table 4-2-4. Presidential Disaster Declarations for Severe Winter Storm Events

Type of Event	Date	Declaration Number	Cost of Losses (approx.)
Snow	March 2003	EM 3184	
Snow	February 2003	EM 3173	
Total Cost			

Source: FEMA website (http://www.fema.gov/library/drcys.shtm)
Notes: Recorded losses indicate the dollar value of loss made available through public records reviewed for this risk assessment.

4.2.1.5 Extreme Temperature

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	1 Day Warning
Frequency:	Regular event
Hazard Duration:	4 days to 1 week
Cascade Effects:	Highly Likely
Recovery Time	1 to 2 days



EXTREME TEMPERATURE HAZARD PROFILE

Background and Local Conditions

Extreme temperatures include both cold and hot events, which can have a significant impact to human health and commercial/agricultural businesses. What constitutes extreme cold and its effects can vary across different areas of the country. In regions relatively unaccustomed to winter weather, such as Delaware County, near freezing temperatures are considered "extreme cold." Whenever temperatures drop decidedly below normal and as wind speed increases, heat can leave your body more rapidly. These weather related conditions may lead to serious health problems such as hypothermia, cold stress, frostbite or freezing of the exposed extremities such as fingers, toes, nose and ear lobes, with infants and elderly people being most susceptible. Extreme cold is a dangerous situation that can bring on health emergencies in susceptible people, such as those without shelter or who are stranded, or who live in a home that is poorly insulated or without heat, such as mobile homes. Temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation. Extreme heat temperatures may also lead to serious health problems, including heat stroke, heat exhaustion, or sunburn (Center for Disease Control (CDC), 2004). Older adults, young children, and those who are sick or overweight are more likely to succumb to extreme heat. Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and poor air quality. Consequently, people living in urban or commercialized areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the "urban heat island effect." Heat islands develop when a large fraction of the natural land cover in an area is replaced by built surfaces that trap incoming solar radiation during the day and then re-radiate it at night. This slows the cooling process thereby keeping nighttime air temperatures high relative to temperatures in less urbanized areas (NJDEP, 2004). During winter and summer months, Delaware County regularly experiences many extreme temperature events which usually result in cascading effects, such as drought, moderate damage to private property or moderate structural damage to public facilities.

Historic Frequency and Probability of Occurrence

Several extreme temperature events occur each year in Delaware County which usually result in cascading hazard events including winter weather events as a result of extreme cold conditions and droughts as a result of extreme heat conditions. However, as identified by NOAA in Figure 4-2-12, record high temperatures within New York State as a whole are generally lower then most states within the country ranging between 100 and 108ºF. According to the NOAA-NCDC, approximately two hot weather events impacted multiple counties, including Delaware County, between 1995 and 2001. Also, 16 extreme cold events impacted multiple counties, including Delaware County, between 1995 and 2005. Approximate losses for all counties impacted estimated at $463,000 as a result of the extreme temperatures (NCDC, 2005)

EXTREME TEMPERATURE HAZARD PROFILE

Given its northern location, Delaware County is more prone to low temperature extremes than high temperature extremes. According to information provided by Binghamton NWS for Walton Township, which is documented for having the most extreme temperature data for Delaware County between 1956 and 2005, many occurrences of low temperatures have ranged between 0 to -19ºF (See Figure 4-2-13). Certain years experienced between one to six days of temperatures below -19ºF, with 2005 experiencing such conditions on three separate days.

The lowest minimum temperature on record for Walton Township is -33ºF on January 21, 1994. However, temperatures of 89ºF or higher are much less frequent. The 1960's and 1980's appeared to experience the most days with temperatures greater then 89ºF, with a total of 52 days(See Figure 4-2-14). 1998 was the hottest year, experiencing 20 events and historically known as the year that New York State suffered from a significant drought event as a result of the extreme heat. According to the NWS representative, most high temperatures within Delaware County only stay within the 80's throughout the spring and summer months. On July 16, 1988, the highest temperature recorded for Walton Township between 1956 and 2005 was 98ºF. Additionally, recorded temperatures during crop production and harvest months (late May through September) between 1956 and 2005 revealed that frost events (< 33ºF) occurred within multiple years in May, June, August and September. Such temperatures during the summer months could create significant losses in crops, depending on the duration of the frost event.

With respect to the probability of future extreme temperature hazard events, the HAZNY report resulted in a frequency description term of a "regular event". The ground rules for the program quantify this descriptor as an event that occurs between once a year and once every 7 years; however, many extreme temperature events throughout the course of the year can result in secondary hazard events. Based on historical information found on the NOAA website it is estimated that Delaware County will continue to experience extreme temperature events, with the secondary effects causing potential snow, hail, ice or wind storms, thunderstorms, drought, human health impacts and transportation accidents as well as many other anticipated impacts.

Severity

The intensity of the impact from extreme temperatures could be minor to total damage in a localized area or regional damage affecting property and the economy, such as a severe heat wave occurring early in the growing season, killing off the season's crop yield due to drought conditions.

Historic Losses and Impacts

The following sources provided data and statistics of historic losses and impacts as a result of severe winter storm events within Delaware County:

- According to NOAA's NCDC storm events database, approximately two excessive heat events and 16 extreme cold events occurred between 1995 and 2005 within multiple counties, including Delaware County. Total property damages for all counties impacted by the extreme temperatures estimated to be approximately $463,000 (That monetary figure also includes damages to other counties)(NCDC 2005).

- According to Binghamton NWS, approximately 77 extreme cold events (minimum temperature of -10ºF or below) have occurred within Delaware County between 1983 and 2002, creating an annual average number of events to be approximately 3.8 events. Extreme heat events were not documented during that time period. Also, information regarding losses or location for each event was not documented.

Little other specific data was available to support this risk assessment. The County will collect additional specific data over time on both historic and future impacts associated with this weather event.

Designated Hazard Areas

Essentially, all of Delaware County, and surrounding counties, are susceptible to extreme cold and hot temperatures. However, areas at particular risk include: certain areas with elderly, impoverished, or otherwise vulnerable populations; areas that are remote from community services and transportation corridors; antiquated or poorly constructed facilities (e.g., mobile homes) with inadequate capabilities for withstanding extreme temperatures; agricultural areas and structures susceptible to power or telecommunications failure. Excessive temperatures have the ability to impact utility services, cause wildfires or urban fires, and impact human health.

Figure 4-2-12: Record High Temperatures in the U.S. by State

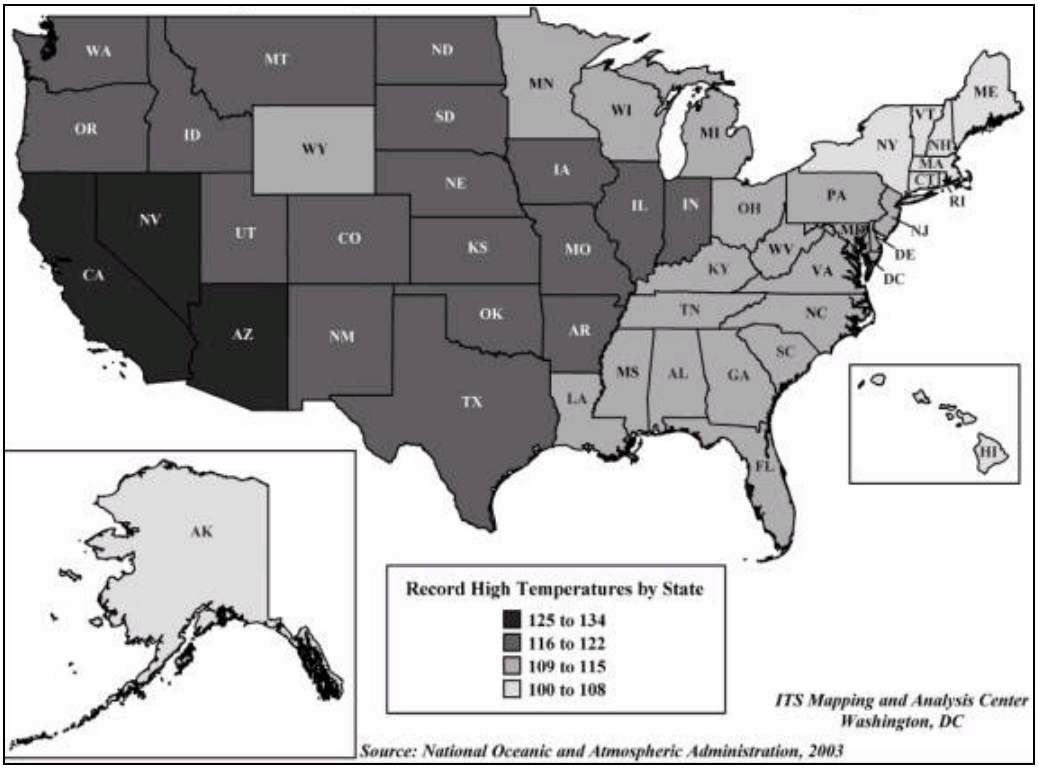
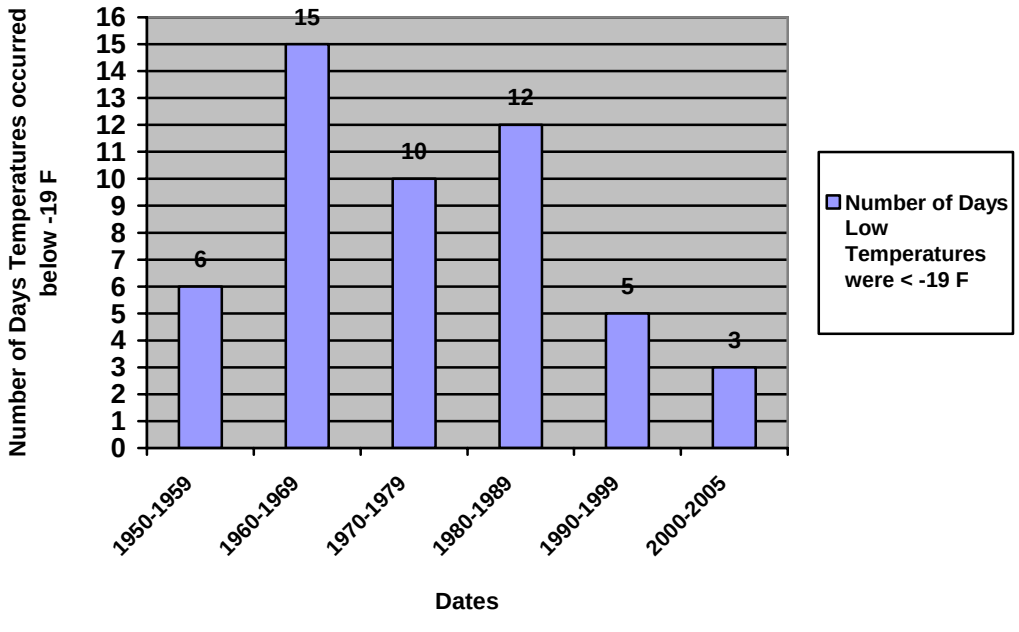
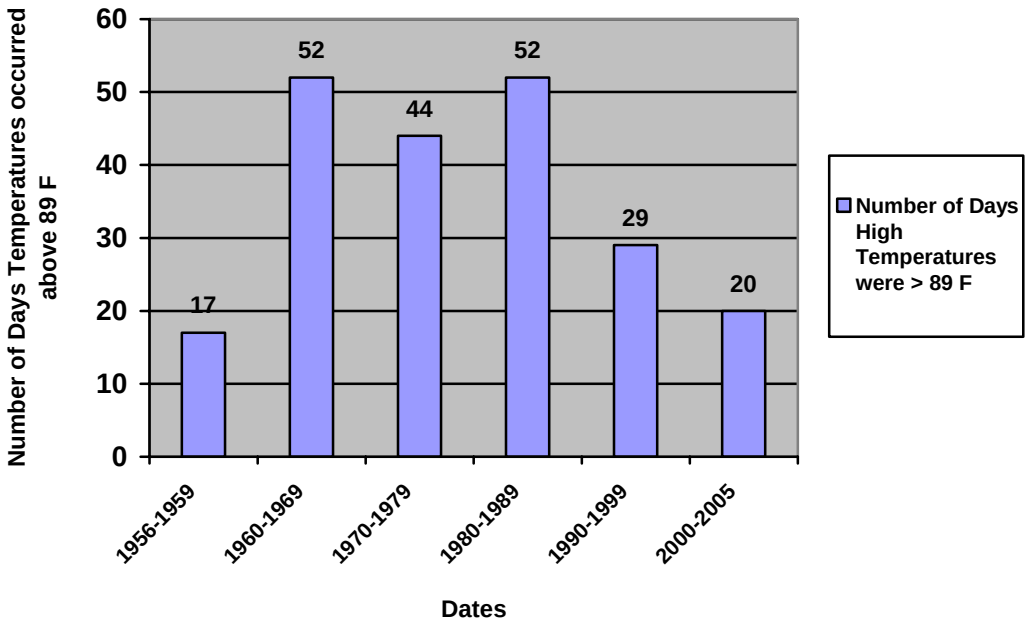


Figure4-2-13: Delaware County Low Temperature Events (<19F) (1956-2005)



Source: Binghamton NWS: Monthly Frequencies – Minimum Temperatures < 19ºF between 1956 and 2005. August, 2005

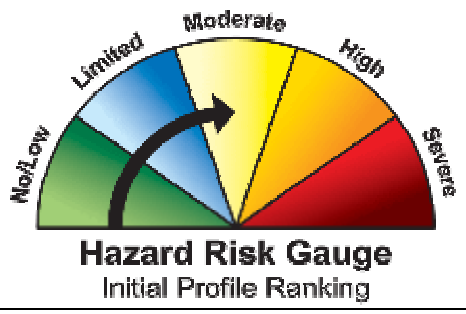
Figure 4-2-14 Delaware County High Temperature Events (>89F) (1956-2005)



Source: Binghamton NWS: Monthly Frequencies – Maximum Temperatures > 89ºF between 1956 and 2005. August, 2005

4.2.1.6 Ice Storm

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	Several Hours Warning
Frequency:	Infrequent event
Hazard Duration:	1 Day
Cascade Effects:	Highly Likely
Recovery Time	More than 2 weeks



ICE STORM HAZARD PROFILE

Background and Local Conditions

An ice storm involves rain, which freezes upon impact. Ice storms are often winter's worst hazard, in which they could paralyze large regions for several days. In addition to creating emergency situations, they can make responding to those same situations quite difficult. The severity of ice storms depends on the accumulation of ice, the duration of the event, the location and extent of the area affected (Institute for Catastrophic Loss Reduction (ICLR), 2005). The climate of New York state, with its northern latitude and high precipitation rate, is conducive to the regular occurrence of severe winter weather, including ice storms. The steep topography of Delaware County adds to the hazard associated with ice-related events. Of particular concern in Delaware County is the increased likelihood of cascade effects from ice, including utility failures, increased frequency and magnitude of transportation accidents, increased risk of injuries and death due to falls, hypothermia, and reduced access to emergency services. As many homes in Delaware County are served by well water with electric pumps and heated by electricity, utility failure associated with ice storms and other winter weather hazards can result in people being without heat and water for prolonged periods of time. Ice storms can cause numerous impacts to the social, political, and public safety infrastructure, as well, causing lost productivity and work time, school cancellations, transportation delays, increased road maintenance, and higher demands on community services. Additional impacts as a result of ice storms could include losses to livestock producers, loss of timber production, urban, residential and commercial impacts, other health impacts, disruption of services (power, communications, government offices and schools closed), general economic effects (cost to repair damaged infrastructure), loss of wildlife habitat and loss of trees (BRADD, no date).

The elderly, infirm, homeless, impoverished, and other vulnerable populations are at increased risk of adverse impacts associated with severe ice storms and other winter weather events. Ice covers surfaces and results in significant damage to trees, building and infrastructure inventory, such as power lines, bridges, and substations. The freeze/thaw cycle, salts, sand, and heavy use of plows and trucks that often accompanies ice storms results in formation of potholes, damaged roads and bridges, and increased maintenance costs to the affected communities. Most areas of Delaware County experience the effects of ice storms frequently.

Historic Frequency and Probability of Occurrence

Several severe ice storms occur each year in Delaware County in conjunction with other winter storm events. According to the NOAA-NCDC, approximately eight ice storm events impacted multiple counties, including Delaware County, between 1998 and 2003 (Figure 4-2-15). Approximate losses for all counties impacted estimated $1.2 million as a result of the ice storms (NCDC, 2005)

With respect to the probability of future severe ice storm hazard events, the HAZNY report resulted in a frequency description term of an "infrequent event". The ground rules for the program quantify this descriptor as an event that occurs between once every 8 years and once every 50 years (inclusive); however, many winter weather events throughout the coarse of the year can result in secondary ice storms events. Based on historical information found on the NOAA website it is estimated that Delaware County will continue to experience ice storm events, with the secondary effects causing possible utility failure and transportation accidents as well as many other anticipated impacts.

Severity

The intensity of the impact from ice storms could be minor to total damage in a localized area or regional damage affecting property and the economy, such as a hard frost occurring early in the growing season, killing off the season's crop yield.

ICE STORM HAZARD PROFILE

Historic Losses and Impacts

The following sources provided data and statistics of historic losses and impacts as a result of severe winter storm events within Delaware County:

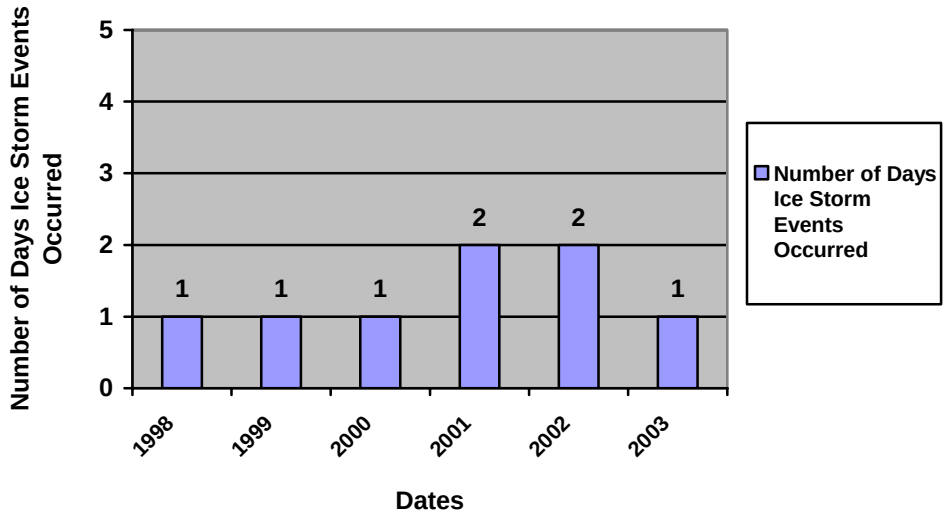
- According to NOAA's NCDC storm events database, approximately eight ice storm events occurred between 1998 and 2003 within multiple New York State counties, including Delaware County. Total property damages for all counties impacted by the ice storms estimated to be approximately $1.2 million (That monetary figure also includes damages to other counties)(NCDC 2005).
- According to Binghamton NWS, approximately eight ice storm events have occurred within Delaware County between 1993 and 2002, creating an annual average number of events to be approximately 0.8 events. Information regarding losses or location for each event was not documented.

Damages from ice storms can range from briefly hazardous road conditions to near total loss of aboveground utility systems in the area and loss of energy transmission capabilities, causing loss of life, severe property damage, and economic loss. Impacts from ice storms range from minor fender bender accidents with no personal injury to wide area catastrophic damage, involving loss of life, property damage, and severe economic hardship for the community.

Designated Hazard Areas

Essentially, all of Delaware County is susceptible to ice storms. However, areas at particular risk include: certain areas with elderly, impoverished, or otherwise vulnerable populations; areas that are remote from community services and transportation corridors; antiquated or poorly constructed facilities (e.g., mobile homes); structures susceptible to power or telecommunications failure; and steep or hilly areas adjacent to water bodies, or served water from electric pumped-powered wells. Demographics, population density, transportation and considerations regarding construction, well usage, and topography in the region are presented throughout this plan.

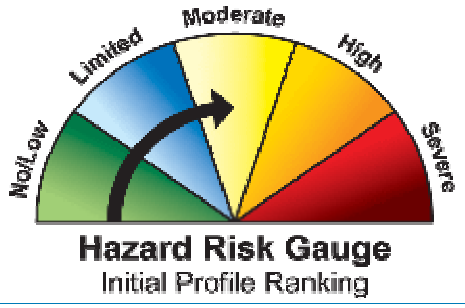
Figure 4-2-15 Delaware County Ice Storm Events (1998-2003)



Source: NOAA NCDC Storm Event Database for Ice Storms, 2003

4.2.1.7 Infestation (Agricultural and disease-carrying insects)

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	More than 1 week warning
Frequency:	Regular event
Hazard Duration:	More than 1 week
Cascade Effects:	Some potential
Recovery Time	More than 2 weeks



INFESTATION HAZARD PROFILE

Background and Local Conditions

An infestation is defined as a state of being invaded or overrun by parasites that attack plants and animal species and human populations. Insect, fungi and parasitic infestations can result in destruction of various natural habitats (forested areas) and croplands, human health impacts, and disease and death amongst native plant and wildlife as well as livestock. New York state has been impacted by various past and present infestations including but not limited to high populations of mosquito's (increasing the risk of West Nile Virus (WNV) and other diseases amongst animals and humans); deer ticks (increasing the risk of Lyme disease amongst animals and humans); Asian longhorned beetles (ALB) (a non-native insect posing a serious threat to forest ecosystems); khapra beetles (a foreign insect considered to be most destructive pests of grain products and seeds) and hemlock woolly adelgid (a fluid-feeding insect that feeds and destroys hemlock trees throughout eastern North America). Mosquito's and deer ticks appear to be primary concerns within the state and Delaware County due to creating impacts to not only animal populations but human populations as well.

Infestation is included as a natural hazard in this plan as the greatest amount of development and agriculture occurs in Delaware County is located in the more level regions adjacent to floodplains and wetland areas. Mosquito populations that thrive under wetland conditions increase the potential for WNV and other mosquito-borne diseases to occur in the County. The West Nile Virus (WNV) is transmitted by mosquitoes to birds and other animals through a mosquito bite. It was first isolated in 1937 and has caused asymptomatic infection and fevers in humans in Africa, West Asia, and the Middle East. It was first identified in the Western Hemisphere in 1999. The WNV normally cycles between mosquitoes and birds. However, people also may be infected if they are bitten by a WNV-infected mosquito. Most humans infected with WNV have no symptoms; however, a small proportion develops mild symptoms including fever, headache, body aches, skin rash, and swollen lymph glands. Less than 1 percent of infected persons develop severe illness including: meningitis or encephalitis. One of about 1,000 persons that develop severe symptoms may die.

The WNV was first reported in the United States in New York State in the summer of 1999. From 1999 to 2001, 149 cases of illness and 18 deaths caused by WNV were reported in humans in the United States. In 2002, state health departments reported more than 4,100 cases and more than 280 deaths in humans based on electronic surveillance systems prepared by the Centers for Disease Control and Prevention (CDC)*. In 2003 more than 9,800 cases and 264 deaths in humans were reported. Also of concern is Eastern Equine Encephalitis (EEE). EEE is a rare disease that is spread to horses and humans by infected mosquitoes. It is among the most serious of a group of mosquito-borne virus diseases that can affect the central nervous system and cause severe complications and even death. Other similar diseases are Western Equine Encephalitis, St Louis Encephalitis and LaCrosse Encephalitis. It is noted that horses can be vaccinated against EEE, however this is not believed to be common practice to date (source).

Data related to WNV are available on the USGS West Nile web site (http://westnilemaps.usgs.gog/2004) and the New York Health Department web site (http://www.health.state.ny.us/nysdoh/westnile). Given the prevalence of WNV in New York the NYSDOH has developed WNV Response Plans that are available at their WNV web site. Data regarding cases of WNV identified in New York state are posted on their website and summarized in Table 4-2-3, below. With respect to the probability of future infestation hazard events, the HAZNY report categorizes the potential frequency as a "regular event. " The ground rules for the program quantify this descriptor as an event that occurs between once a year and once every 7 years.

INFESTATION HAZARD PROFILE

Historic Frequency and Probability of Occurrence

Data related to WNV are available on the USGS West Nile web site (http://westnilemaps.usgs.gog/2004) and the New York Health Department web site (http://www.health.state.ny.us/nysdoh/westnile). Given the prevalence of WNV in New York the NYSDOH has developed WNV Response Plans that are available at their WNV web site. Data regarding cases of WNV identified in New York state are posted on their website and summarized in Table 4-2-3, below. With respect to the probability of future infestation hazard events, the HAZNY report categorizes the potential frequency as a "regular event. " The ground rules for the program quantify this descriptor as an event that occurs between once a year and once every 7 years.

Severity

WNV first struck the northern hemisphere in Queens, N.Y. in 1999 and killed four people. In 2003, all 50 states warned of an outbreak from any of the 30 mosquito species known to carry the WNV. Since identification of WNV in New York in 1999, confirmed human cases of the virus have been identified in states through 2002, and have resulted in 284 deaths. Less than one percent of those infected with WNV develop severe symptoms. However, almost 300 deaths have occurred. Infants and the elderly appear to be at high risk for the severe aspects of the disease.

Historic Losses and Impacts

According to the 2003 Delaware County HAZNY report, it was identified that actions have been taken at the height of the response to the WNV and the increasing number of Lyme Disease cases in the County.

Historic data as available from the NYSDOH are included in Table 4-2-5. This data indicated that approximately 21 bird species have been reported dead within Delaware County between 2000 and 2003. No cases for horses, mosquito pools, humans, or other animal species were reported for WNV within Delaware County.

According to National Atlas, through using the Center For Disease Control and Prevention as their source, crow / wild bird and human samples were submitted for testing, with no crows or human found to be positive for WNV in 2000, and 2001. However, in 2002 and 2003, testing of wild birds showed confirmed pr probable presence of the WNV.

According to FEMA, Delaware County has received one Emergency Declarations for WNV in October 2000 (EM 3155), with estimated cases or losses unknown (FEMA, 2005).

Designated Hazard Areas

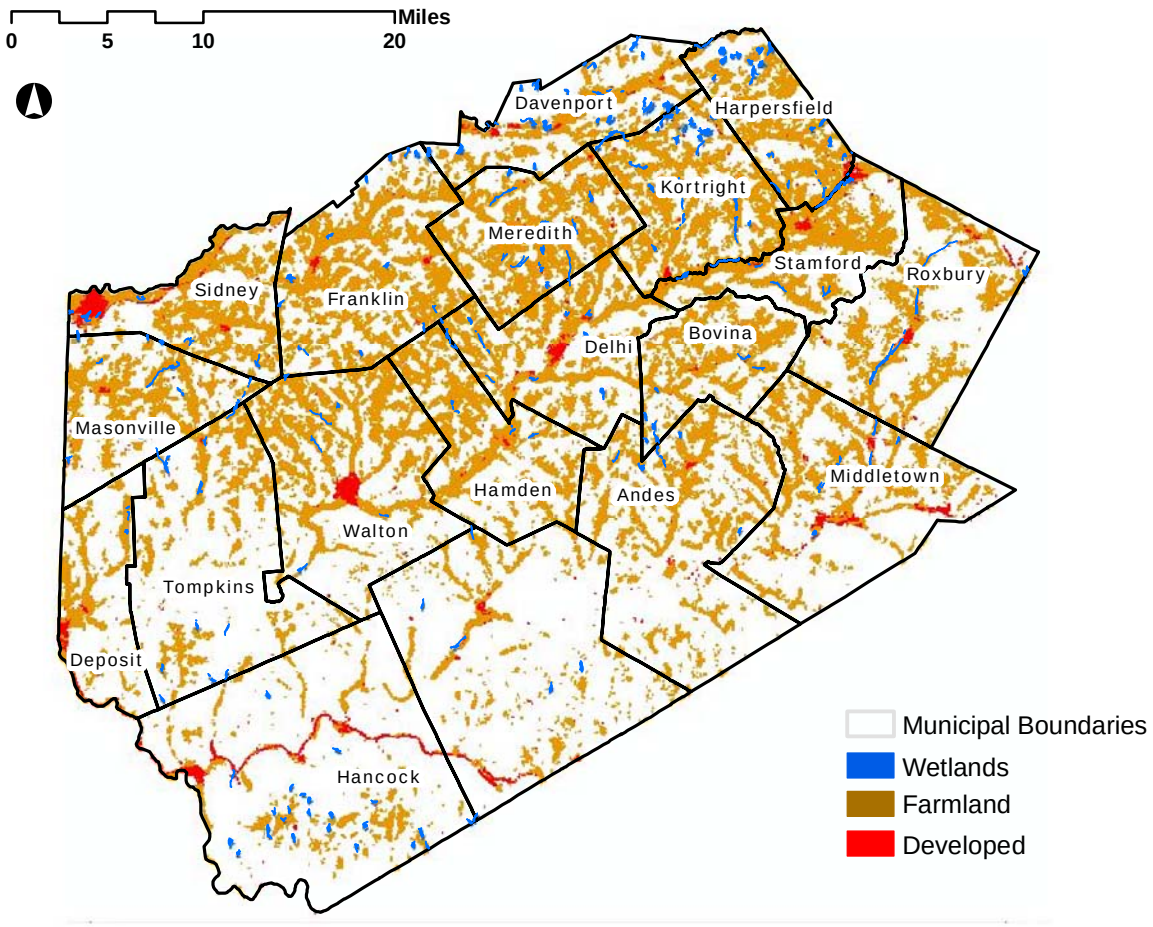
Delaware County has several significant wetland complexes that are typical habitat for mosquitoes. Figure 4-2-16 shows wetland and urbanized areas in the town. It may be assumed that the areas of greatest risk to mosquito-borne disease in humans are where urban areas are in close proximity to major wetland complexes. [Identify any particularly prone area, based on input from DC] Persons over age 50 are at higher risk of severe illness following infection and areas of concentrated elderly populations (such as assisted living centers) should monitor for potential WNV impacts.

Table 4-2-5: WNV Documentation for New York State and Delaware County (2000 to 2005)

Year	WNV Positive Results for New York (State/ Delaware County)				
	Live and Dead Birds	Horses	Mosquito Pools	Humans	Others
2005	14 / 0	0 / 0	0 / 0	0 / 0	0 / 0
2004	207 / 0	5 / 0	238 / 0	10 / 0	1 / 0
2003	1,367 / 8	32 / 0	471 / 0	71(1) / 0	3 / 0
2002	1,410 / 9	36 / 0	445 / 0	83(5) / 0	2 / 0
2001	732 / 0	22 / 0	316 / 0	15(2) / 0	0 / 0
2000	1263 / 4	28 / 0	400 / 0	14(Not listed) / 0	5 / 0

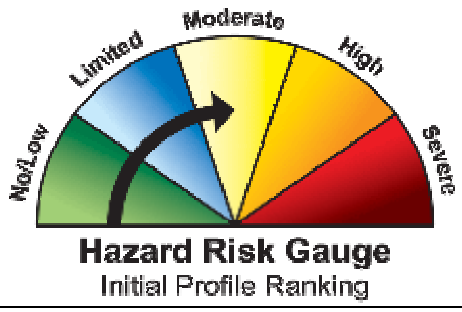
Notes: Data obtained from http://www.health.state.ny.us/nysdoh/westnile/ on the NYDOH web site. Data available for the years 2000 through 2005. Data indicate the presence of the virus in specimens analyzed; they do not necessarily indicate ill or symptomatic specifies. Numbers in parentheses for humans indicate deaths.

Figure 4-2-16: Mosquito Hazard Areas in Delaware County



4.2.1.8 Wildfire

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	No Warning
Frequency:	Infrequent event
Hazard Duration:	2 to 3 days
Cascade Effects:	Some potential
Recovery Time	3 days to 1 week



WILDFIRE HAZARD PROFILE

Background and Local Conditions

The fire hazard (including, urban and wild land fire), while generally local in impact, is capable of rapidly causing complete destruction of property, assets, natural resources, and human life and health. There are three different classes of wildland fires including surface fires, ground fires, and crown fires. Surface fires are the most common type and burns along the floor of a forest, moving slowly and killing or damaging trees. Ground fires are usually started by lightning and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Most forest fires are started by people due to negligent human behavior (FEMA, 1993).

The costs associated with fire prevention, fighting, and recovery can be very high. NOAA's NCDC maintains records of wild and forest fires in Delaware County since 1950. According to the NCDC website, no significant wildfires were reported for Delaware County during this period. The climate of Delaware County is not conducive to large-scale drought and dry climate vegetation that are primary causes of the massive and highly destructive wildfires that occur periodically in the Western United States.

Wildfire is a serious and growing hazard over much of the United States. Wildfires pose a great threat to life and property, particularly when they move from forest or rangeland into developed areas. An average of 5 million acres burns every year in the United States as a result of wildfires, causing millions of dollars in damage (FEMA, 2005). A wildfire or wild land fire is any uncontrolled fire occurring on undeveloped land that requires fire suppression. The potential for wildfire is influenced by three factors: the presence of fuel, the area's topography, and air mass. Fuel may include living and dead vegetation on the ground, along the surface as brush and small trees, and aerial fuel including tree canopies. Topography includes both slope and elevation. The air mass includes temperature, relative humidity, wind speed and direction, cloud cover, precipitation amount and duration, and the stability of the atmosphere at the time of the fire. Wildfires can be ignited by lightning and, most frequently, by human activity including smoking, campfires, equipment use, and arson.

Of particular concern in Delaware County with respect to fire involve the ability of the local fire and emergency response personnel to respond to fires that occur in the smaller towns and rural areas where fire suppression equipment and water is not readily available. Small brush fires occasionally occur in the study area.

Historic Frequency and Probability of Occurrence

Historic data available NCDC indicate no wildfires have occurred in Delaware County from 1950 to 2005. National Fire Incident Reporting System (NFIRS) records provided by [pending]

Generally, the climate in this area is cool and includes adequate precipitation to prevent wildfire events. Dry weather such as drought can increase the likelihood of wildfire events. The NCDC indicates only one major drought event from 1950 to 2005 for Delaware County. Lighting can trigger wildfire and urban fire events. The NCDC database indicates ten lightning strikes have occurred in Delaware County. One such event occurred in September 2002, when lightning struck a barn near Trout Creek, setting it on fire. The fire completely engulfed the barn, killed eight pigs, and seriously injured four breed cattle. Property damage estimated to be $100,000. Generally, area conditions are not conducive to wild land fire events.

Data published by the New York State Office of Fire Prevention and Control for the years 1998-2001 provide the following statistics for Delaware County:

Year:	Fire Count (structural/other*)	Dollar Losses ($M)	Human Losses (Injuries/Deaths)
1998	75 / 59	1.49	2 / 0
1999	92 / 103	1.59	6 / 1
2000	88 / 49	2.08	9 / 0
2001	75 / 88	1.91	4 / 0

* Fire types are only classified as “Structural”, “Vehicle” or “Other”.

With respect to the probability of future fire (urban and wild land) hazard events, the HAZNY report resulted in a frequency description term of an “infrequent event” for fire. The ground rules for the program quantify this descriptor as an event that occurs between occurs between once every 8 years and once every 50 years (inclusive).

Severity

Impacts to human health and safety and property from major urban fires are often severe and direct. The intensity of fire impact can range from minor to significant. Fires have significant community-wide impacts, especially when lives and homes are claimed. A fire in a manufacturing facility can result in the closing and relocating of the business elsewhere.

Historic Losses and Impacts

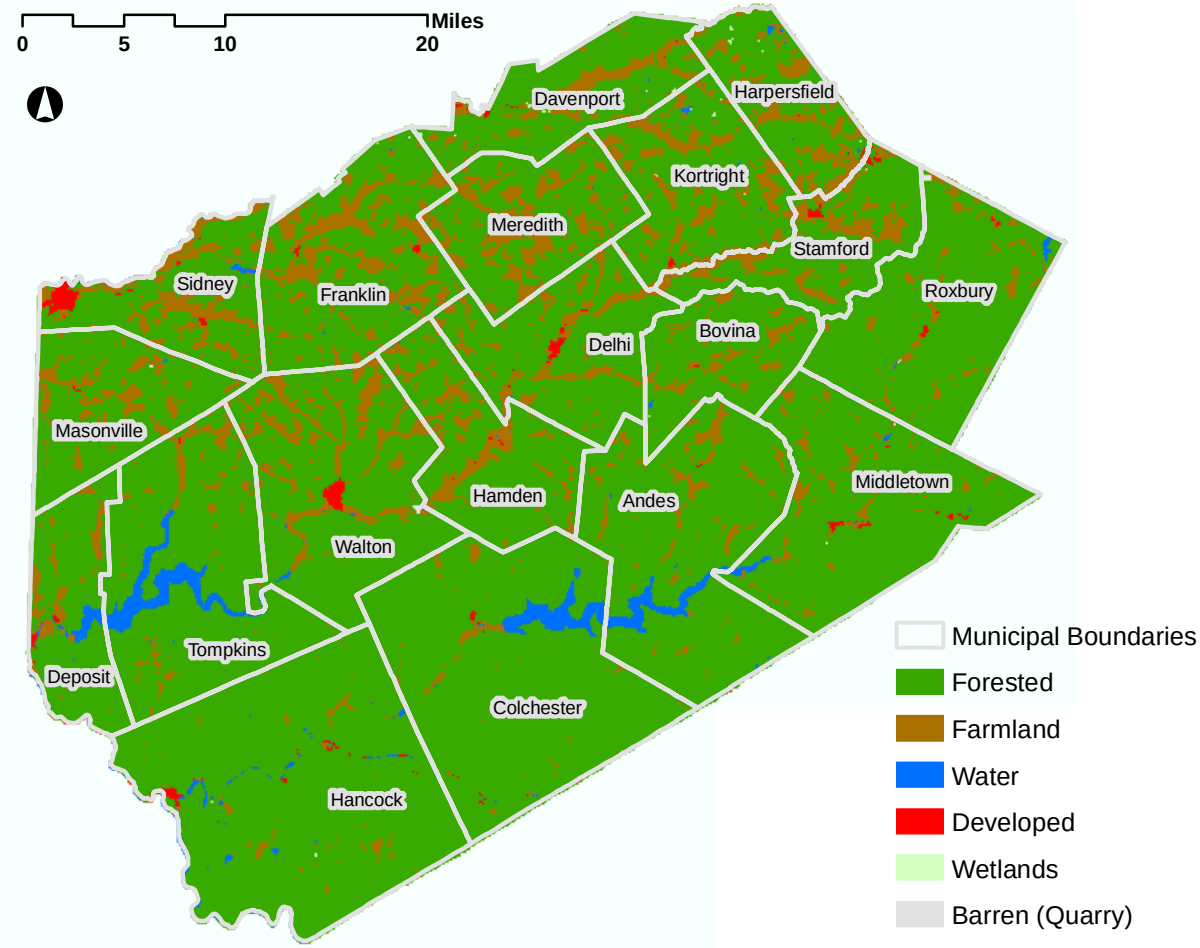
As discussed under Historic Frequency and Probability of Occurrence, it appears that major wildfires are unlikely in the area; no wildfire events have been identified in the NCDC database for Delaware County from 1950 to 2005. NFIRS fire call data [pending], have identified no measurable losses associated with vegetative fires that have occurred in the County in memorable history. As this information becomes available, it will be incorporated into updated and final revisions of this plan.

Designated Hazard Areas

Urban areas have the potential for greater damage to infrastructure, loss of life, and strain on existing healthcare facilities and emergency responders due to its higher structural and population densities. Areas of land use prone to wildfire include areas that are wooded or forested. Figure 4-2-17 shows high-density residential, commercial/industrial, and forested areas (not including forested wetlands) in Delaware County. It may be assumed that any upland forested areas are susceptible to wildfire, however the risk to life and property is greatest in those areas where forested areas adjoin urbanized areas (high density residential, commercial and industrial). It is noted that a majority of the urbanized areas in Delaware County are adjacent to forested areas. Thus, we consider all urbanized areas within Delaware County to be vulnerable to urban and wildfires, however as has been noted previously the frequency of such events appears to be low.

While the greatest risk of losses in the wildland/urban interface (WUI) is in the areas of denser development, it is likely that the most vulnerable structures are those in the more remote, sparsely populated areas where fire fighting resources are limited.

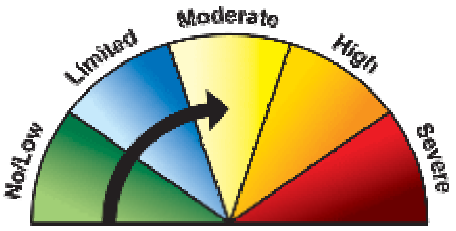
Figure 4-2-17. Urban and Wild Land Fire Hazard Areas in Delaware County Multi-Jurisdictional Study Area



Source: HAZUS-MH (FEMA 2004)

4.2.1.9 Epidemic (Agricultural)

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	Several Days Warning
Frequency:	Rare event
Hazard Duration:	More than 1 week
Cascade Effects:	Some potential
Recovery Time	More than 2 weeks



EPIDEMIC (AGRICULTURAL) HAZARD PROFILE

Background and Local Conditions

Plant disease epidemics on agricultural crops impact U.S. agriculture each year by affecting the economic value, quantity and quality of food and fiber products. Much of Delaware County's economy relies on agricultural and farming practices and, as a result, incidences of epidemics that threaten animals are a significant concern in Delaware County and are capable of having a large impact on the local economy and population.

In 2003, there were 190,300 acres in farms in Delaware County, making up 21 percent of the county's total 925,679 acres. There were 780 farms in the county averaging 244 acres per farm. Delaware County ranks 17th in the state for number of farms and 14th for land in farms (New York Agricultural Statistics Service (NASS), 2005). According the USDA, NASS, the county was home to 35,818 cattles and calves, 967 hogs and 1,926 sheep in 2002. Delaware County is also considered one of the top 10 counties in New York State for the distribution of beef products. Also, Delaware County farmers harvested 8,215 acres planted in corn (silage and grain), 52 acres in sorghum (silage or greenchop) and 39 acres for potatoes. Acreage for oats, hay and soybeans were withheld from County data to avoid disclosing data for individual farms. In 2002, according to the Census of Agriculture, the market value of all agricultural products sold from Delaware County farms was $50.5 million, with total sales averaging $64,111 per farm. The leading products sold were dairy products, cattle and calves, nursery and greenhouse, hay and other crops and Christmas trees (NASS, 2005).

Beginning in the 1970's, poultry disease became an important concern for Babcock Breeders, who implemented self-quarantine procedures that are still used to protect breeding stock. Hog farming and livestock operations have similar concerns, and have implemented mitigation measures including limiting access to these areas by people.

Historic Frequency and Probability of Occurrence

Common livestock diseases that may affect Delaware County include Johnes Disease and Foot and Mouth Disease. Additionally, according to the Delaware County HAZNY, it was identified that agricultural community of Delaware County has suffered economic losses from an increase in army worms and moth populations amongst crops.

With respect to the probability of future agricultural epidemic hazard events, the HAZNY report resulted in a frequency description term of a "rare event" for animals. The ground rules for the program quantify this descriptor as an event that occurs less than once every 50 years. Currently, based on the best available data there is no historical record of agricultural epidemics in Delaware County; however, with the recent outbreak of Mad Cow disease in the United States, concern over potential impacts to dairy and beef cattle in Delaware County has heightened. Large events such as the livestock auctions and county fairs could increase the frequency of occurrence. Delaware County's concern about the potential occurrence of disease in hogs and cattle and mad cow disease has increased and that heightened concern is expected to continue.

Severity

This hazard is ranked as severe for farm animals since agriculture is a predominant industry in Delaware County. This hazard would impact a large region and has no warning time. The event is estimated to last more than 1 week with a recovery time of greater than 2 weeks (Delaware County, 2003). The overall severity ranking is high.

Historic Losses and Impacts

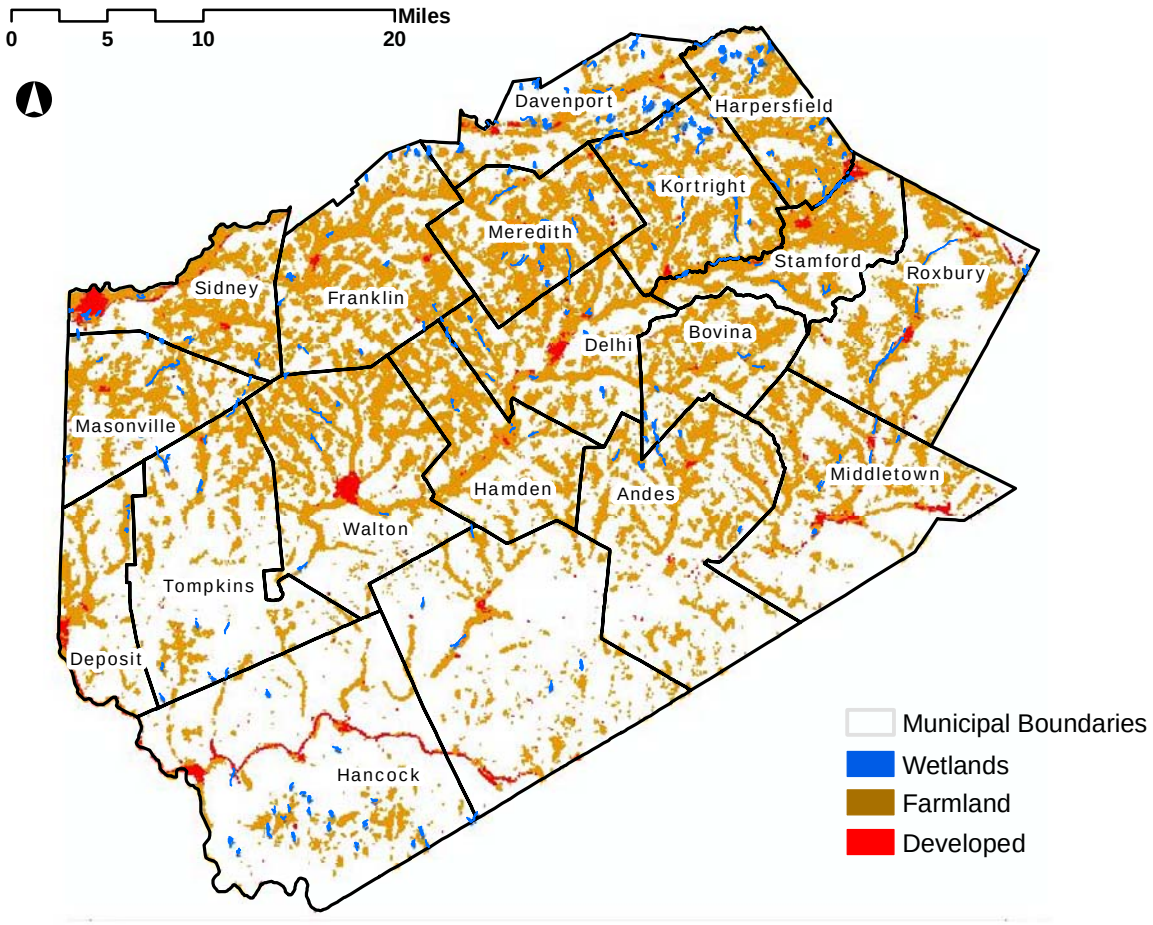
In Delaware County, there is no history of major epidemics affecting crops or livestock; however Delaware County assumes the impact of an epidemic upon the study area would likely result in serious injury or death to be unlikely, severe damage to private property (agricultural animals), and little to no structural damage to public facilities.

EPIDEMIC (AGRICULTURAL) HAZARD PROFILE

Designated Hazard Areas

All agricultural animals are theoretically susceptible to a disease outbreak that affects the respective species. Specific agricultural epidemic hazard areas within the Delaware County study area include ….. Figure 4-2-18 identifies the agricultural areas within the mitigation plan area that could be most affected by an outbreak. An August Delaware County Fair event is held annually in Walton and is attended by numerous cattle and owners from Delaware County. An outbreak at this fair could result in high losses under certain conditions (e.g., highly infectious vector).

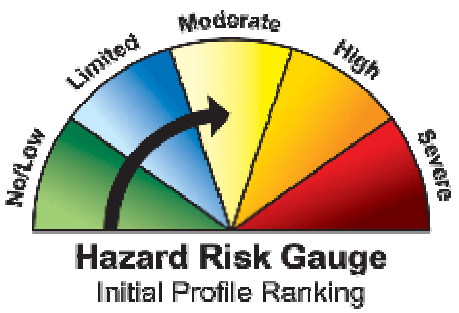
Figure 4-2-18. Map of Agricultural Epidemic Exposure Areas in Delaware County Multi-Jurisdictional Study Area



Source: HAZUS-MH (FEMA 2004)

4.2.1.10 Drought

HAZNY Summary of Risk Factors	
Potential Impact:	Large region
Onset:	More than 1 week warning
Frequency:	Infrequent event
Hazard Duration:	More than 1 week
Cascade Effects:	Highly Likely
Recovery Time	3 days to 1 week



DROUGHT HAZARD PROFILE

Background and Local Conditions

Drought is a condition of abnormal dry weather resulting in a serious water shortage, with consequences on crops, humans and livestock. It can be aggravated by other factors such as high temperatures, high winds, and low relative humidity. The severity of drought can depend on the duration, intensity, geographic extent, and the regional water supply demands made by human activities and vegetation. They are caused by anomalous weather patterns when shifts in the jet stream block storm systems from reaching an area. As a result, large high-pressure cells may dominate a region for a prolonged period, thus reducing precipitation. This natural hazard differs from others in several ways. First, there is no universally accepted definition of drought. Second, drought onset and recovery are usually slow. Third, droughts also can cover a much larger area and last many times longer than most other natural hazards. Fourth, they are part of the natural variability. Due to these differences many communities have neglected to include this hazard in their disaster management plans (ICLR, 2005).

Around the world droughts cause many deaths, but their impacts are primarily economic by comparison. Droughts affect agriculture where losses to crops and livestock have reached the million of dollars. They have also caused extensive environmental problems through increased degradation and erosion of soil, destruction of the ecological habitats and deterioration of lakes. During severe droughts, agricultural crops do not mature, wildlife and livestock are undernourished, land values decline, and unemployment increases. Droughts can cause a shortage of water for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may decline and the number and severity of wildfires may increase. It is important to note that with climate warming more frequent drought is a likely consequence (ICLR, 2005). A prolonged drought can have a serious economic impact on a community. Increased demand for water and electricity may result in shortages of resources. Moreover, food shortages may occur if agricultural production is damaged or destroyed by a loss of crops or livestock (FEMA, 2005). Additionally, drought could also lead to urban and wildland fires. An increase in dry conditions during the spring and summer months could create higher potential of ignitibility amongst forested areas, which could further lead to destruction of forests and wildlife and residential homes and communities.

Historic Frequency and Probability of Occurrence

Although Delaware County generally experiences hot temperatures during the summer months, creating dry conditions, drought events do not typically result from such conditions. The NOAA NCDC Storm Event database identifies that multiple New York counties, including Delaware County, were impacted by a significant drought event in September 1999 which caused major crop failures and some wells to run dry. Many streams and rivers were also brought to their lowest recorded levels. The crops most affected were corn and hay, which caused many problems for dairy farmers. However, no other major drought events have been recorded for Delaware County.

With respect to the probability of future drought hazard events, the HAZNY report resulted in a frequency description term of an "infrequent event" for drought. The ground rules for the program quantify this descriptor as an event that occurs between once every 8 years and once every 50 years (inclusive). Based on historical information found on the NOAA website it is estimated that Delaware County will continue to experience drought events on occasion, with the secondary effects causing potential disruption or damage to agricultural activities and creating shortages in water supply within communities.

Severity

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services. Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and

damage to wildlife and fish habitat are a few examples of direct impacts. The consequences of these impacts illustrate indirect impacts. For example, a 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 because of reduced expenditures, increased crime, foreclosures on bank loans to farmers and businesses, migration, and disaster relief programs. The impacts of drought can be categorized as economic, environmental, or social.

Many economic impacts occur in agriculture and related sectors, including forestry and fisheries, because of the reliance of these sectors on surface and subsurface water supplies. In addition to obvious losses in yields in both crop and livestock production, drought is associated with increases in insect infestations, plant disease, and wind erosion. Droughts also bring increased problems with insects and diseases to forests and reduce growth. The incidence of forest and range fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk.

Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality; forest and range fires; degradation of landscape quality; loss of biodiversity; and soil erosion. Some of the effects are short-term and conditions quickly return to normal following the end of the drought. Other environmental effects linger for some time or may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species will eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity of the landscape. Although environmental losses are difficult to quantify, growing public awareness and concern for environmental quality has forced public officials to focus greater attention and resources on these effects (National Drought Mitigation Center (NDMC), 2005).

The intensity of the impact from drought could be minor to total damage in a localized area or regional damage affecting property and the economy, such as a severe heat wave occurring early in the growing season, killing off the season's crop yield due to drought conditions.

Historic Losses and Impacts

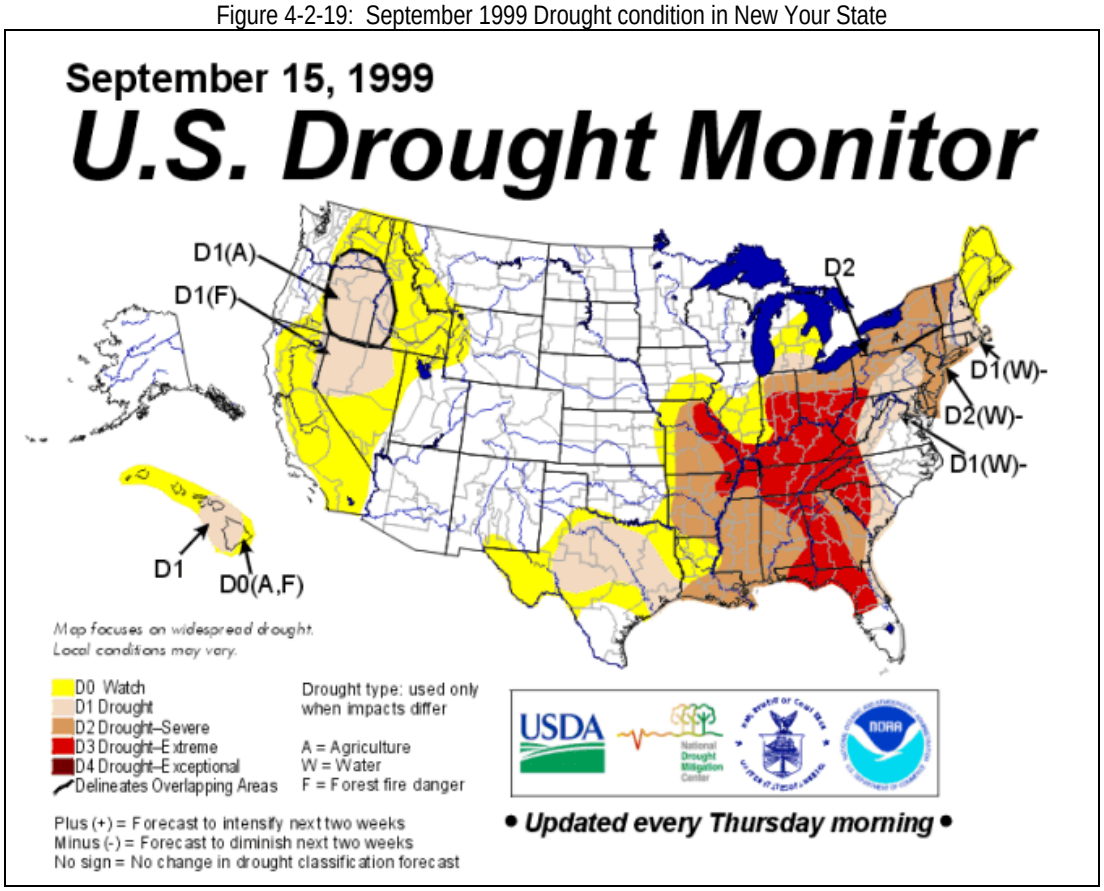
The following sources provided data and statistics of historic losses and impacts as a result of severe winter storm events within Delaware County:

- According to NOAA's NCDC storm events database, total crop damages as a result of a severe drought event in September 1999 estimated to be approximately $50 million (That monetary figure also includes damages to other counties). A very dry spring and summer caused major crop failures throughout many New York counties, including Delaware County. Many streams and rivers were brought to their lowest recorded levels, vegetable and grain crops were significantly impacted, and feed (corn and hay) used to support dairy farmers became limited (NCDC 2005). See September 1999 drought conditions demonstrated in Figure 4-2-19 provided by the National Drought Mitigation Center (NDMC).
- According to the Hazard Research Lab-USC and the Sheldus program, total property damage for the 1999 drought event within Delaware County, totaled approximately $2.9 million.
- The Delaware County Farm Service Agency office indicated that county-wide cropland was impacted as a result of a drought event in 2000. As a result of the drought, various cropland producers requested funding for their dried wells.
- An article displayed in Trout Unlimited – Fly Fishing Connection in December 2001 indicated that in the Town of Hancock, a "drought emergency" had been declared for the NYC reservoirs in the Upper Delaware Basin. As a result, flows out of the reservoir on the West and East Branch of the Delaware were affected, creating harmful and deadly conditions for fish populations downstream.
- According to Delaware County assumes the impact of an drought event upon the study area would likely result in serious injury or death to be unlikely, moderate damage to private property, and little to no structural damage to public facilities.

Designated Hazard Areas

Essentially, all of Delaware County is susceptible to drought. However, areas at particular risk include: areas used for agricultural purposes (farms and cropland), areas where communities rely on private wells for potable water supply, and certain areas with elderly, impoverished, or otherwise vulnerable populations.

Figure 4-2-19: September 1999 Drought condition in New Your State



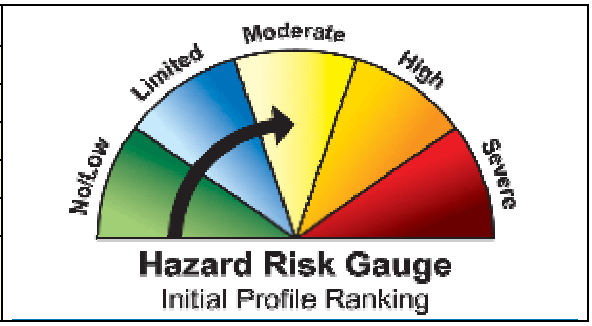
Source: National Drought Mitigation Center (NDMC), University of Nebraska, 2005.
http://drought.unl.edu/dm/archive/99/drmon0915.htm

4.2.2 Technological Hazards

This section presents profiles of the one technological hazard of concern selected for further profiling and evaluation.

4.2.2.1 Dam Failure

HAZNY Summary of Risk Factors	
Potential Impact:	Several Locations
Onset:	No Warning
Frequency:	Rare event
Hazard Duration:	Less than 1 day
Cascade Effects:	Highly Likely
Recovery Time	More than 2 weeks



DAM FAILURE HAZARD PROFILE

Background and Local Conditions

A dam is defined as a barrier constructed across a watercourse for the purpose of storage, control, or diversion of water. Dams typically are constructed of earth, rock, concrete, or mine tailings. A dam failure is an accidental or unintentional collapse, breach, or other failure of an impoundment structure that results in downstream flooding. Because dams are man-made structures, dam failures are usually considered technological hazards. However, since most dam failures result from prolonged periods of rainfall, they are often cited as secondary or cascading effects of natural flooding disasters and are not named as the primary hazard that causes disaster declarations.

A dam impounds water in the upstream area, referred to as the reservoir. The amount of water impounded is measured in acre-feet. An acre-foot is the volume of water that covers an acre of land to a depth of one foot. As a function of upstream topography, even a very small dam may impound many acre-feet of water. Two factors influence the potential severity of a full or partial dam failure: (1) the amount of water impounded, and (2) the density, type, and value of development and infrastructure located downstream. Troubles from dam failures can occur anytime, without warning, and with catastrophic results. Dam failures can result from any one or a combination of the following causes:

- prolonged periods of rainfall and flooding, which cause most failures
- inadequate spillway capacity, resulting in excess overtopping flows
- internal erosion caused by embankment or foundation leakage or piping
- improper design
- improper maintenance
- negligent operation
- failure of upstream dams on the same waterway

Throughout history, a variety of dams were built to store water for a variety of reasons. Some of these dams have the dubious distinction of failing and sometimes inflicting tremendous loss of life, as well as great damage to property. Dam failure has occurred to dams (1) built according to accepted engineering standards of design and construction at the time and also to (2) dams built without application of engineering principles. Regardless of the type of construction, when a dam fails or is subject to massive overtopping, huge quantities of water rush downstream with great destructive force (Hambrick, no date).

There are about 80,000 dams in the United States today, the majority of which are privately owned. Other owners are state and local authorities, public utilities, and federal agencies. The benefits of dams are numerous: they provide water for drinking, navigation, and agricultural irrigation. Dams also provide hydroelectric power and create lakes for fishing and recreation. Most important, dams save lives by preventing or reducing floods (FEMA, 2004).

DAM FAILURE HAZARD PROFILE

If dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. Dam failures can result in the worst flood events. When a dam fails, a gigantic quantity of water is suddenly let loose downstream, destroying anything in its path. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life, lifeline disruption, economic disaster, great property damage, and environmental damage to human and environmental resources downstream of the dam. The National Dam Safety Program (NDSP) is dedicated to protecting the lives of American citizens and their property from the risks associated with the development, operation, and maintenance of America's dams (FEMA, 2004).

New York State consists of approximately 83,479 dams with over 150 dams located within Delaware County. The two largest dams within Delaware County are the Downsville Dam and the Cannonsville Dam, which are attributed to the two largest reservoirs in Delaware County, Cannonsvile and Pepacton, which significantly contribute to the New York City's (NYC's) water supply.

Historic Frequency and Probability of Occurrence

With respect to the probability of future dam failure hazard events, the HAZNY report resulted in a frequency description term of a "rare event" for Delaware County. The ground rules for the program quantify this descriptor as an event that occurs less than once every 50 years. Based on data provided by the National Performance of Dams Program (NPDP) there is one historical occurrence of a potential dam failure incident within Delaware County. The Jerome E. Arledge Pond Dam near the Town of Walton was listed in the NPDP dam incident notification system for an incident that took place in April 2000 as a result of a flood event. A rainfall event combined with other conditions at the dam caused the dam to be overtopped, creating the danger of dam failure which may have caused damage to properties downstream. State, County, and Town law enforcement and emergency response personnel were mobilized in response to the condition and the NYS DEC, Dam Safety Section conducted an inspection and investigation of the dam revealed that the dam was found to be "unsound" because it had deficiencies of such a nature that the safety of the dam cannot be assured, including an inadequate spillway capacity. Also, the dam was classified as a hazard class "B-Intermediate" because there are homes downstream which, in the judgment of the NYS DEC, could be damaged if the dam should fail. Based on these findings and other minor conditions, the investigation revealed It was identified that as a result of the incident that all deficiencies be corrected immediately. No dam failure actually took place.

The Steering Committee further identified that In 1996, a private dam on Chase Brook burst in the Town of Tompkins washing out a bridge on Rainbow Lodge Road. Five people were killed when they drove into the breach.

Severity

If a dam failure were to occur, which is highly unlikely for Delaware County, this hazard is ranked as severe, due to being an event that could create detrimental impacts to multiple human, man-made and natural resources, depending on the size and storage capacity of the dam. This hazard would impact a several locations and has no warning time. The event is estimated to last less than 1 day with a recovery time of greater than 2 weeks (Delaware County 2003). The overall severity ranking is moderate.

Historic Losses and Impacts

As discussed above in Historic Frequency and Probability of Occurrence, only one incident occurred that almost resulted in a dam failure near the Town of Walton. However, no actual losses or impacts occurred. Based on all available sources, no other dams within Delaware County experienced dam failures; however, if additional information is obtained, it will be included at a later date.

Designated Hazard Areas

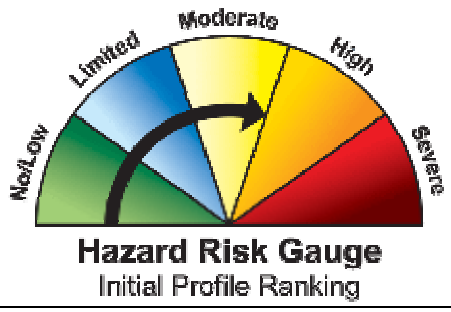
All dams and areas located downstream from the dams are theoretically susceptible to the impacts of a dam failure event. Impacts would be significantly greater to downstream towns of the two largest dams within Delaware County, Cannonsville and Downsville, primarily including the Towns of Colchester and Deposit. Figure 4-2-20 identifies areas within Delaware County that could be impacted if a dam failure were to occur.

4.2.3 Man-Made Hazards

This section presents profiles of the one man-made hazard of concern selected for further profiling and evaluation.

4.2.3.1 Water Supply Ccntamination

HAZNY Summary of Risk Factors	
Potential Impact:	Several Locations
Onset:	No Warning
Frequency:	Infrequent event
Hazard Duration:	Less than 1 day
Cascade Effects:	Highly Likely
Recovery Time	More than 2 weeks



WATER SUPPLY CONTAMINATION HAZARD PROFILE

Background and Local Conditions

WATER SUPPLY CONTAMINATION HAZARD PROFILE

Adequate supply of fresh and clean drinking water is a basic need for all human beings on the earth, yet it has been observed that millions of people worldwide are deprived of this. Freshwater resources all over the world are threatened not only by over exploitation and poor management but also by ecological degradation. The main source of freshwater pollution can be attributed to discharge of untreated waste, dumping of industrial effluent, improper use of household chemicals and run-off from agricultural fields. Industrial growth, urbanization and the increasing use of synthetic organic substances have serious and adverse impacts on freshwater bodies. It is a generally accepted fact that the developed countries suffer from problems of chemical discharge into the water sources mainly groundwater, while developing countries face problems of agricultural run-off in water sources. Polluted water like chemicals in drinking water causes problem to health and leads to waterborne diseases which can be prevented by taking measures even at the household level.

Many areas of groundwater and surface water are now contaminated with heavy metals, POPs (persistent organic pollutants), and nutrients that have an adverse affect on health. Water-borne diseases and water-caused health problems are mostly due to inadequate and incompetent management of water resources. Safe water for all can only be assured when access, sustainability, and equity can be guaranteed. Access can be defined as the number of people who are guaranteed safe drinking water and sufficient quantities of it. There has to be an effort to sustain it, and there has to be a fair and equal distribution of water to all segments of the society. In the urban areas water gets contaminated in many different ways, some of the most common reasons being leaky water pipe joints in areas where the water pipe and sewage line pass close together. Sometimes the water gets polluted at source due to various reasons and mainly due to inflow of sewage into the source. Ground water can be contaminated through various sources including: pesticides, sewage (coliform), nutrients, synthetic organics, and acidification.

Chemicals in water can be both naturally occurring or introduced by human interference and can have serious health effects. Chemicals that have been found within drinking water sources include: fluoride, arsenic, lead, recreational use of water, petroleum chemicals, other heavy metals and chlorinated solvents. The majority of the contaminants found in our drinking water can be traced back to improper or excessive use of ordinary compounds like lawn chemicals, gasoline, cleaning products and even prescription drugs. Next to chlorine, lead is the most common contaminant found in tap water. Lead in drinking water usually originates between the water main in the street and the household faucet, so treatment from a central point is neither logical or practical. Most lead in drinking water comes from lead lined pipes, lead solder and brass plumbing fixtures inside your home. The EPA estimates that 98% of all homes have pipes, fixtures or solder joints in the household plumbing that can contribute some level of lead to the tap water (Aquasana, 2005).

According to the USEPA Safe Drinking Water Information System (SDWIS), a majority of Delaware County residents obtain their primary drinking source from ground water, through community water systems, non-transient non-community water systems and transient non-community water systems. Community water systems are those that serve the same people year-round (e.g. in homes or businesses). Non-transient non-community water systems are those that serve the same people, but not year-round (e.g. schools or businesses that have their own water systems). Transient non-community water systems are those that do not consistently serve

the same people (e.g. rest stops, campgrounds, gas stations and retail stores) (USEPA SDWIS, 2005). Most of the drinking water consumed by Delaware County residents originates from source waters that extend through Delaware County's watersheds. Source water is untreated water from streams, rivers, lakes or underground aquifers which are used to supply private wells and public drinking water. Delaware County consists of three watershed including the East Branch Delaware, Upper Delaware and Schoharie watersheds. The Pepacton Reservoir resides within the East Branch Delaware watershed and Cannonsville Reservoir and Upper West Branch Delaware River reside within the Upper Delaware watershed (USEPA, 2005). The source water that extends throughout these watersheds provides drinking water to not only Delaware County residents but also significantly contributes to New York City's water supply.

Intentional or unintentional contamination of these water supplies is of particular concern because of the number of people that rely on each system and the fact that surface water resources are relatively easily contaminated. Potential situations that could impact the water supply of Delaware County include:

- Physical damage to water supply or delivery systems (breaks in pipes, landslides that block water supply intakes, water treatment etc.)
- Hazardous material releases, spills, and leaks that reach surface water supplies or drinking water aquifers
- Bacterial contamination, such as *E. coli*

Close to 185 wells exist in the study area. Groundwater in Delaware County is predominantly from bedrock and unconfined aquifers. Contamination of wells by chemicals and bacteria is a concern for residents as bedrock and unconfined aquifers are highly susceptible to contamination from spills, herbicide and pesticide runoff, and leaking underground storage tanks. Because bedrock geology is complex, it is often difficult to find alternate water supplies once one is contaminated. Table 4-2-4 summarizes potable water data for Delaware County

Historic Frequency and Probability of Occurrence

According to the USEPA SDWIS, several instances of contamination to the water systems and source waters in the Delaware County's study area have been recorded, including:

- October 1997 coliform contamination within Walton Village (serving a population of 3070 residents).
- September 1999 contamination as a result of a sewer treatment technique (SWTR) to the Bovina Center Water District No. 1 (serving a population of 142 residents). State compliance was achieved in December 2002.
- May 2001 coliform contamination within the Cooks Falls Water District (serving a population of 150 residents). This water system also received multiple monitoring and reporting violations between1994 and 2004 for violating routine major monitoring of various contaminants, including coliform, lead, copper, arsenic, mercury and many other heavy metals.
- August 2001 coliform contamination within the Davenport Water Company (serving a population of 104 residents)
- August 2002 lead and copper contamination within the Downsville Water District (serving a population of 500 residents). State compliance was achieved in February 2003.

Water systems serving major villages within Delaware County including Delhi (serving 3833 residents), Fleishmanns (625 residents), Hancock (1189 residents), Margaretville (660 residents), Roxbury Water District (750 residents), Sidney (5100 residents), Stamford (1280 residents) and Walton (3070 residents) had no listed health based violations reported. THE USEPA has no record of any health-based violations reported by the state for these water systems.

Also, according to the USEPA the watersheds of Delaware County have experienced levels of source water contamination, including:

- East Brach Delaware – Pepacton Reservoir (Delaware River) was listed in 2002 as a waterbody designated as priority for Total Maximum Daily Load (TMDL) development over the next two years (New York City Watershed). This reservoir was listed with state impairments as a result of the presence of mercury, other metals and pathogens within the waterbody. Metals were a low priority; however, pathogens were listed as a high priority. In June and October 2000, the TMDL pollutant, phosphorus, was listed for Pepacton Reservoir.
- Upper Delaware – Cannonsville Reservoir (Delaware River) was listed in 2002 as a waterbody designated as priority for TMDL development over the next two years (New York City Watershed). This reservoir was listed with state impairments as a result of the presence of mercury, other metals within the waterbody. Metals were identified as a low priority. In April 1997 and October 2000, the TMDL pollutant, phosphorus, was listed for Cannonsville Reservoir.
- Upper Delaware – Upper West Branch Delaware River was listed in 2002 as a waterbody designated as priority for TMDL development over the next two years (New York City Watershed). This river was listed with state impairments as a result of the presence phosphorus and other nutrients within the waterbody, identified as a high priority.
- Schoharie – Schoharie Reservoir (Mohawk River) was listed in 2002 as a waterbody designated as priority for TMDL development over the next two years (New York City Watershed). Impairments of high priority, were identified as siltation in 1998 and sediment siltation in 2002. In June and October 2000, the TMDL pollutant, phosphorus, was listed for Schoharie Reservoir.

According to the USEPA National Priorities List (NPL), three sites have been listed within the Village of Sidney and Sidney Center, New York. Site names include the Richardson Hill Road Landfill/Pond, Sidney Landfill and GCL Tie and Treating Inc.

- The Richardson Hill Road Landfill site was found responsible for inorganic, PCBs, and VOC contamination of nearby surface and groundwater sources including private wells. Culverts beneath the Richardson Hill Road drain from the site into two beaver ponds (where PCBs, trichloroethylene, vinyl chloride and toluene were detected in 1981. These ponds further drain into Herrick Hollow Creek, Trout Creek and further to Cannonsville Reservoir. EPA is working to ensure that contaminated groundwater migration is under control.
- Sidney Landfill was found responsible for the release of Base Neutral Acids, Inorganics, Metals, PAH, PCBs, Pesticides, VOC into groundwater, leachate, sediment, soil, solid waste, and surface water. Contaminated groundwater migration at this site is under control and remedial action was completed on September 24, 2004.
- GCL Tie and Treating Inc. was found responsible for the release of Base Neutral Acids, Metals, PAH, VOC into air, groundwater, sediment, soil, and surface water. EPA is working to ensure that contaminated groundwater migration is under control. And remedial action was completed on September 22, 2004.

With respect to the probability of water contamination hazard events, the HAZNY report resulted in a frequency description term of an "infrequent event" for water supply contamination. The ground rules for the program quantify this descriptor as an event that occurs between once every 8 years and once every 50 years. This type of hazard is impossible to accurately predict; however, historic review of location of transportation accidents that resulted in water contamination and identification and study of areas prone to traffic accidents near water bodies (for example, see Figure 4-2-12 which identifies transportation routes that intersect water bodies in Delaware County) can assist in determining the potential location of future events. More stringent environmental regulations and mapping of leaking underground storage tanks could assist in determining hazard areas, and in identifying mitigation activities to decrease the likelihood of future events. Based on the historic data and HAZNY results, it is estimated that a water supply contamination event of magnitude could occur once every 15 years.

Severity

Serious injury or death from water contamination based on historic events is unlikely. Moderate damage would occur to private property, while little to no structural damage would result to public facilities (Delaware County 2003e).

Historic Losses and Impacts

(See Historical Frequency and Probability of Occurrence)

In Delaware County, several incidents of groundwater contamination have resulted from leaking underground storage tanks and industrial and commercial spills and improper operations. The hazardous materials response database of the National Response Center (NRC), a department of the U.S. Coast Guard that records responses and incidents involving hazardous materials releases for the U.S., lists several incidents involving spills to surface water and land from fixed and mobile sources in Delaware County since 1990. None of the incidents reported in the database appear likely to result in widespread contamination.

WATER SUPPLY CONTAMINATION HAZARD PROFILE

Designated Hazard Areas
Hazard areas include all areas that receive their water from water systems within each Township and Village and individual water treatment facilities within school systems and businesses. In addition, the source waters that significantly contribute water to the local water systems are of concern because impacts to them could result in impacts to groundwater. Areas where the groundwater is shallow or easily infiltrated by industrial or other forms of contamination are also vulnerable (see Figure 4-2-14).