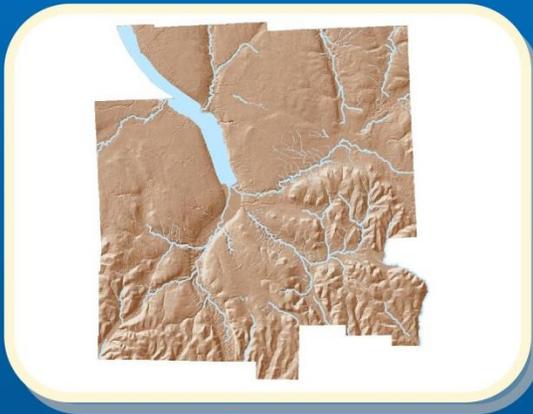


TOMPKINS COUNTY HAZARD MITIGATION PLAN: 2013 UPDATE

December 2013



*A joint effort of Tompkins County, NY municipalities to update the
2006 Multi-Jurisdictional All-Hazard Mitigation Plan.*

Tompkins County
New York

Planning Department

This Multi-Jurisdictional All-Hazard Mitigation Plan Update has been completed by Barton & Loguidice, P.C., under the direction and support of the Tompkins County Planning Department. All jurisdictions within the County participated in this update process. A special thanks to the representatives and various project team members, whose countless time and effort on this project was instrumental in putting together a concise and meaningful document.

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Executive Summary

To collectively reduce Tompkins County's hazard risk, each of the 17 jurisdictions in the County worked together in producing this update to the Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan. The initial mitigation plan was finalized and approved by FEMA in 2006. Having a FEMA-approved hazard mitigation plan allows communities to be eligible for federal pre-disaster mitigation funds. Hazard mitigation is broadly defined as *a method for reducing or alleviating losses prior to a hazard event*. Mitigation should not be confused with the other distinctly different phases of emergency management which include preparedness, response, and recovery. This Plan includes aspects of each of these other phases, though its focus is on mitigation.

There are several aspects of the update which differ from the 2006 Plan. For one, the previous Plan involved just a little over half of the County's jurisdictions, whereas the update includes all 17 jurisdictions. Also, the 2006 Plan analyzed risks associated with just 12 hazards; the Plan update examines 22. The most significant new aspect of the Plan update includes the examination of future hazard risks, specifically as related to climate change and future potential of horizontal hydraulic fractured gas drilling.

The 22 hazards identified were examined based on scope, cascading effect, frequency of occurrence, time of onset, duration and recovery time. A group of community stakeholders utilized these criteria in examining the hazard's relative risk to Tompkins County. Those hazards identified by the group as highest risk were transportation accidents, severe storms, flash floods, and infestations. Infestations are events characterized as an excessive population of plants, insects, rodents, or other animals requiring control measures due to their potential to carry diseases, destroy crops, or harm the environment. The recent regional issues surrounding invasive forest pests and the aquatic invasive, hydrilla, have elevated this hazard risk.

In further examining these hazards, both history and future potential for occurrence were examined. As an example, flash floods, which were distinguished from lake floods, have occurred 24 times over the last 19 years. This flooding has largely occurred within the nearly 10,000 acres of mapped floodplain. The total reported countywide annual losses associated with flash floods are nearly \$47,000. The New York State Energy Research and Development Authority (NYSERDA)'s ClimAid technical report projects that average annual precipitation is projected to increase by up to 5% by the 2020s, 10% by the 2050s and up to 15 percent by the 2080s. These increases would surely affect the frequency and severity of flash flooding events in Tompkins County.

Recognizing that hazard risk does not respect political boundaries, every Town, City and Village, along with Tompkins County, participated in the Plan update. To assist in guiding the update, a Project Team was established and represented by at least one municipal representative from each participating jurisdiction. The team was responsible for assisting in data collection, document review, and coordination efforts. Additionally, a Technical Committee was established. The Technical Committee includes researchers, practitioners, and others, whose task is to aid in guiding and revising the plan based on their various interests and areas of expertise.

The Plan's Project Team identified a number of actions designed to reduce community risk associated with the identified hazards. The proposed actions are varied, but can be grouped into the following six broad categories: prevention, property protection, public education and awareness, natural resource protection, emergency services, and structural projects. Each jurisdiction identified actions pertinent to their specific communities' as well multi-jurisdictional actions. Actions were evaluated based on an initial evaluation of costs and benefits. Of the multi-jurisdictional actions, 15 were noted as high priority requiring implementation over the next five years. High priority actions that were identified include developing a countywide debris management plan, updating the County's flood insurance rate maps, and conducting annual climate science outreach to municipalities and large institutions.

The Plan is designed to be easily updated and implementable. As identified in the Plan Maintenance Section (Section 9.0), the Plan will be evaluated annually by an Implementation Committee which is made up of the participating jurisdictions. The Committee will evaluate a number of aspects related to the Plan, including any issues associated with the implementation of the priority actions.

The Plan update provides the jurisdictions of Tompkins County a path toward a future in which the risks associated with natural, technological and man-made hazards can be collectively reduced.

1.0 Introduction

1.1 Background

What is a Hazard?

A hazard is defined as a situation which poses a level of threat to life, health, property, and/or the environment. A hazard can be natural, technological or human-caused.

What is Hazard Mitigation?

Hazard mitigation is broadly defined as a method for reducing or alleviating property loss, reducing damage to the environment, and reducing the number and severity of injuries that occur from hazard events through long and short-term strategies. Responsibility for implementing mitigation measures runs community wide from individuals to industries, private business and all levels of government.

Hazard Mitigation and the Other Phases of Emergency Management

Hazard mitigation is often considered just one of four phases of emergency management. The other phases include preparedness, response and recovery. Each of these phases relate to and rely upon each other, as illustrated by Figure 1.1.

Figure 1.1 – The Phases of Emergency Management



The overarching goal of all of these emergency management activities is the prevention or minimizing of loss of life and property in disaster situations. The Tompkins County Department of Emergency Response (DOER) serves as the lead local agency in promoting this goal. DOER's responsibilities include:

- Provision of public preparedness information, including sharing of such information with citizens, the private sector, municipalities, and non-governmental organizations (NGOs)

- Participate in planning activities of many types and at many levels (keeper of the County's Comprehensive Emergency Plan) in partnership with other agencies involved in emergency responses ... authoring After Action Reports/Improvement Plans that identify best practices as well as areas for improvement.
- Coordination of fire and Emergency Medical Services (EMS) responses within the County
- 911 Center Operations (Public Safety); communications systems
- Liaison to State and Federal resources in times of disasters
- Operation of the County's Emergency Operations Center during the time of a disaster/emergency; and
- Coordination of recovery efforts after a disaster and liaison with State and Federal agencies involved in this process.

It is important to note that this plan relates to several of these emergency management phases, though its focus is mitigation.

FEMA and Hazard Mitigation

The Federal Emergency Management Agency (FEMA) provides assistance through the Robert T. Stafford Disaster Relief and Emergency Assistance Act to local governments that are recovering from a hazard event. The Federal Disaster Mitigation Act of 2000 (DMA 2000) recognized the importance and cost-effectiveness of mitigation in specifying that local governments must have a FEMA approved natural hazard mitigation plan in order to be eligible for mitigation project funding.

DMA 2000 encourages and rewards local and state pre-disaster planning, promotes conservation and sustainability, and seeks to integrate state and local planning with an overall goal of strengthening statewide hazard mitigation planning. As of November 1, 2004, all local governments were required to have a FEMA approved hazard mitigation plan to receive funding through the Hazard Mitigation Grant Program (HMGP) for specified mitigation projects. Tompkins County was awarded a pre-disaster mitigation grant to update their 2006 Multi-Jurisdictional All-Hazard Mitigation Plan in order to maintain this eligibility.

1.2 Plan Purpose

Why Develop a Hazard Mitigation Plan?

The purpose of this Multi-Jurisdictional All-Hazard Mitigation Plan (HMP) is to effectively reduce future disaster damages, public expenditure, private losses, and community hazard vulnerability. This plan update provides an opportunity for Tompkins County and its municipalities to develop a comprehensive risk assessment and to outline proposed mitigation actions to minimize the costs and impacts of future disaster events.

The intention of this plan update is to meet the New York State and federal hazard mitigation planning requirements established and managed by the New York State Office of Emergency

Management (NYS OEM) and FEMA. Jurisdictions that are participating in this plan update will benefit from the planning and implementation of the mitigation actions proposed and included within. The Pre-Disaster Mitigation Program (PDM) and the Flood Mitigation Assistance Program (FMA) continue to require communities to have an active FEMA-approved multi-hazard mitigation plan in-place prior to requesting project implementation funds. Participating jurisdictions that are granted funds are able to implement and complete positive mitigation actions to minimize impacts to their communities from hazard events. The following resources are key documents which authorize and provided guidance for the preparation of this plan update:

- Section 404 of Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended by Public Law 100-707;
- Federal Disaster Mitigation Act of 2000;
- Hazard Mitigation Grant Program (HMGP), Pre-disaster Mitigation Program, Flood Mitigation Assistance Program, Repetitive Floodplain Claims Program (RFC), Severe Repetitive Loss Program (SRL);
- Code of Federal Regulations (CFR) – 44 Part 201;
- Hazard Mitigation and Relocation Assistance Act of 1993;
- FEMA – 44 CFR Part 9 – Floodplain Management and Protection of Wetlands and 44 CFR Part 10 – Environmental Considerations;
- New York State Executive Law, Article 2-B, Sections 23 and 28-a; and
- New York State Hazard Mitigation Plan (2011).

The Tompkins County Planning Department (TCPD) organized the effort to update the Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan that was originally adopted in 2006. The efforts made to update the original plan were made possible by a grant from FEMA that was administered by the Tompkins County Planning Department. The five year plan maintenance period has lapsed and Tompkins County contracted with Barton & Loguidice, P.C., hired through a formal request for qualifications (RFQ) process, to assist in the update effort. In addition to the basic requirements of updating the plan, Tompkins County is seeking the integration of three new features: the involvement of all 17 jurisdictions in Tompkins County, the impacts and risks associated with anticipated **climate change**, and the impacts and risks associated with anticipated widespread shale **gas drilling**. The continued monitoring and evaluation of this updated HMP will be provided by the TCPD.

The development of a HMP update for Tompkins County provides the following benefits:

- eligibility for federal funds to complete pre-disaster mitigation actions;
- development of more sustainable and disaster-resistant communities;
- formation of partnerships that support planning and mitigation efforts;
- reduction in long-term impacts to structures and human-health associated with extreme hazard events which are in some cases exacerbated by changing climactic conditions; and

- increased understanding of the hazards that could potentially impact the County and its municipalities.

Comments or questions about this plan should be addressed to the Tompkins County Planning Department, 121 East Court Street, Ithaca, NY 14850. This office can also be reached by phone at (607) 274-5560 and by email from their website <http://www.tompkins-co.org/planning/staff/contact.htm>.

1.3 Planning Participants

The 2013 HMP Update for Tompkins County includes all 17 jurisdictions located within Tompkins County: Tompkins County, nine towns (Caroline, Danby, Dryden, Enfield, Groton, Ithaca, Lansing, Newfield, and Ulysses), six villages (Cayuga Heights, Dryden, Freeville, Groton, Lansing, Trumansburg), and one city (Ithaca). Figure 1.2 shows the locations of these municipalities within the County limits and the position of Tompkins County within New York State.

The participation of all jurisdictions in the HMP Update process fulfills one of the main goals that Tompkins County had for this effort, and greatly improves the quality and completeness of this planning effort. The original 2006 HMP included only seven participating jurisdictions: Tompkins County and the Towns of Caroline, Danby, Enfield, Groton, Ithaca, Lansing, and Ulysses. The City of Ithaca and Dryden independently fulfilled DMA 2000 requirements through the implementation of single jurisdiction mitigation plans. The historic documentation and risk assessment data included in these single jurisdiction plans will be incorporated into this Multi-Jurisdictional HMP Update.

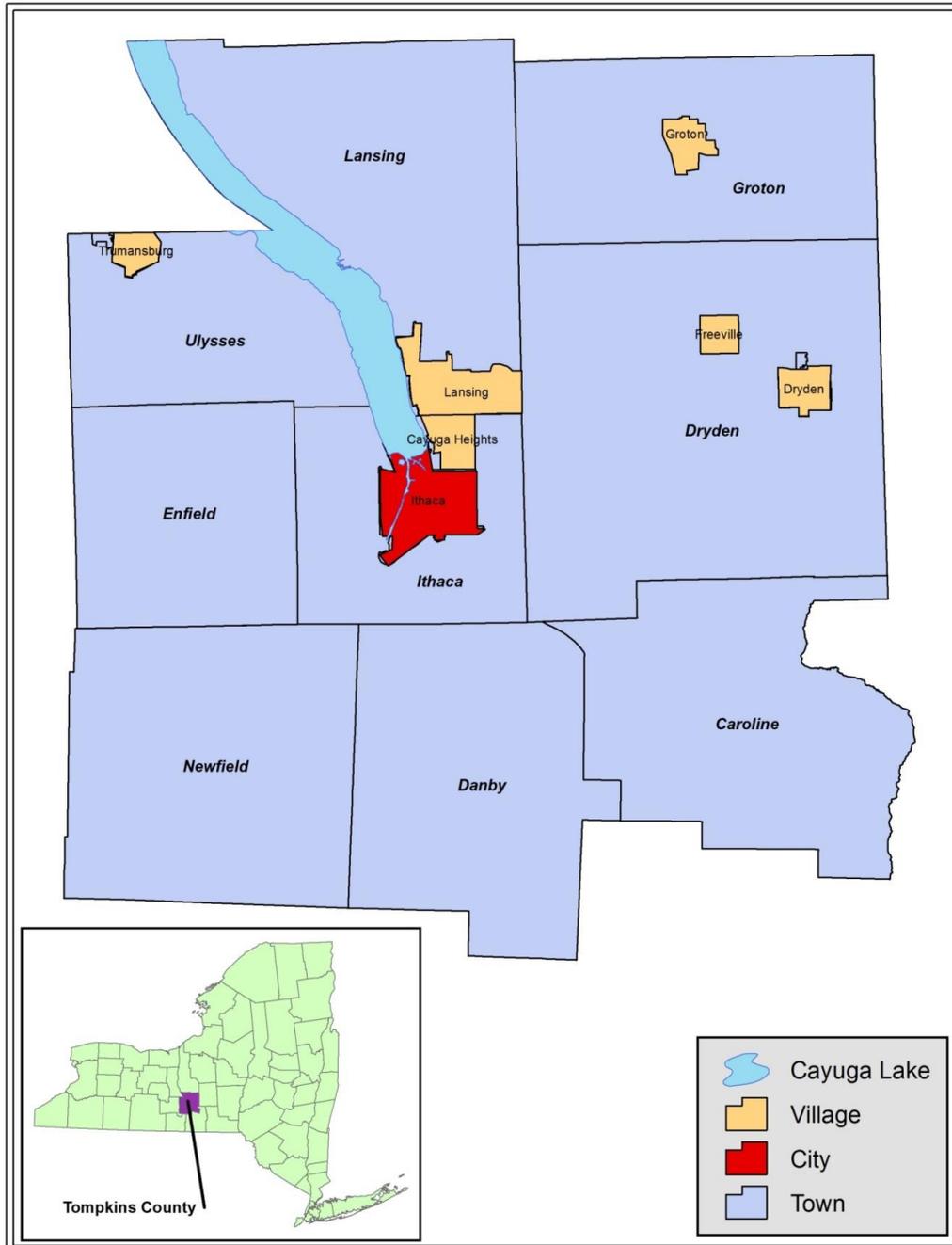
All municipalities within Tompkins County were contacted by the TCPD to participate in the plan update and were invited to attend a variety of meetings held throughout the planning process. Each participating jurisdiction provided updated information about the hazards that have historically occurred within their boundaries, with a focus on post-2006 events. Repair costs and damage estimates associated with such hazard events were also provided. All jurisdictions reviewed the critical facilities within their boundaries and the risk assessment and vulnerability information provided within this Plan Update. TCPD coordinated data collection and information review with jurisdictions and agencies unable to attend scheduled meetings.

A wide variety of additional resources were utilized to gather information concerning historic and recent occurrences of hazard events within Tompkins County, vulnerabilities within the County related to future hazard events, and costs and damages likely to occur as a result of a hazard event. The goals and objectives included in the County's 2006 HMP were reviewed and updated, as appropriate. Goals are created to assist in the formulation of potential mitigation actions that could be implemented to minimize the damage in Tompkins County that could occur to life, property, and/or the environment as a result of hazard events.

Representatives from the participating jurisdictions made up the Project Team. A Technical Committee was also assembled by the TCPD; this committee consisted of representatives from the following agencies, groups, and entities: Town of Ulysses, Cornell University, Tompkins County Department of Health, Tompkins County Soil and Water District, Bolton Point Water

Treatment Plant, City of Ithaca, New York State Electric & Gas (NYSEG), Town of Lansing Highway Department, Tompkins County Department of Emergency Response, and United States Geological Survey (USGS). Technical Committee members were selected and invited to participate in this update process based upon their specialties and fields of interest. Further detail about the Project Team and the Technical Committee are provided in Section 3.0.

Figure 1.2 – Participating Jurisdictions



1.4 Hazard Mitigation Planning Process

As with Tompkins County's original HMP, all participating jurisdictions accomplished the following objectives to support the plan update process:

- Established a knowledgeable planning group to represent all participating jurisdictions;
- Assessed numerous natural, technological, and human-caused hazards to determine those that have the greatest possibility of impacting the County;
- Analyzed and profiled all selected hazards;
- Incorporated recent planning efforts and new updated scientific information into hazard profiles and mitigation activities;
- Updated critical facility mapping within the County;
- Estimated damages and impacts that could occur as a result of various hazard events;
- Developed pre-disaster mitigation strategies and actions for the various types of hazards detailed in this document; and
- Reviewed and revised the plan maintenance procedures associated with this Plan.

DMA 2000 only requires that communities evaluate the impact of natural hazards. Though 14 natural hazards are the focus of this Plan Update, Tompkins County and other participants also chose to assess the County's vulnerability to six technological hazards and two human-caused hazards. All of these hazards are further described and profiled in Section 5 of this Plan Update.

2.0 Tompkins County Profile

This section details the existing environmental features, transportation networks, demographics, history, and available facilities within Tompkins County. A profile of Tompkins County and its existing features and facilities was not included in the original 2006 HMP. Section 2.0 is a new section that has been added to help detail and identify the existing conditions, capabilities, and vulnerabilities of Tompkins County and its 16 participating jurisdictions.

2.1 Geographic Location

Tompkins County is located in Upstate New York, northwest of the City of Binghamton and southwest of the City of Syracuse. Tompkins County is located in the Finger Lakes Region and is geographically positioned near the southern end of Cayuga Lake. Cayuga Lake is approximately 40 miles long, 3.5 miles wide at its widest point, and approximately 435 feet deep at its deepest point. Tompkins County shares government boundaries with six adjacent New York State counties: Cayuga (north), Cortland (east), Tioga (south), Chemung (southwest), Schuyler (west), and Seneca (northwest).

The City of Ithaca serves as the county seat for Tompkins County. The County includes one City, nine Towns, six Villages, and 31 Hamlets. Tompkins County consists of a total land area of 474.6 square miles and a total water area of 16.9 square miles (2010 Census Gazetteer files, 2012). In terms of total area, the Town of Dryden is the largest jurisdiction within Tompkins County, totaling 94.2 square miles. This equates to almost 20 percent (20%) of the total area of the County. The Town of Ithaca is the smallest Town in Tompkins County, totaling 30.3 square miles in area, which represents only six percent of the total area of Tompkins County. Table 1 provides the total areas (in square miles) for each jurisdiction included within Tompkins County.

Table 1 – Approximate Areas for Jurisdictions Within Tompkins County (City-Data, 2011)				
Jurisdiction	Total Area (square miles)	Total Land (square miles)	Total Water (square miles)	% of Total Area in County
Tompkins County	491.6	474.6	16.9	100.00%
Caroline (Town)	55.1	55.0	0.1	11.2%
Danby (Town)	53.7	53.5	0.2	10.9%
Dryden (Town)	94.2	93.9	0.3	19.2%
Enfield (Town)	36.9	36.9	0.0	7.5%
Groton (Town)	49.6	49.5	0.1	10.0%
Ithaca (Town)	30.3	29.1	1.2	6.2%
Ithaca (City)	6.1	5.5	0.6	1.2%
Lansing (Town)	69.9	60.7	9.2	14.2%
Newfield (Town)	59.0	58.9	0.1	12.0%
Ulysses (Town)	36.8	33.0	3.9	7.5%

Jurisdiction	Total Area (square miles)	Total Land (square miles)	Total Water (square miles)	% of Total Area in County
Cayuga Heights (Village)	1.8	1.8	0.0	-
Dryden (Village)	1.7	1.7	0.0	-
Freeville (Village)	1.1	1.1	0.0	-
Groton (Village)	1.7	1.7	0.0	-
Lansing (Village)	4.6	4.6	0.0	-
Trumansburg (Village)	1.2	1.2	0.0	-

The northern portion of the County consists of more gentle terrain associated with moderate to high elevation areas, whereas the southern portion of the County is dominated by the highest elevations and the greatest topographic relief. Overall topography in the County ranges from approximately 400 feet above mean sea level (msl) to greater than 2,000 feet above msl. The highest topographic point in the County, Connecticut Hill, is located in the Town of Newfield at an elevation of 2,200 feet above msl. The lowest elevation within the County is noted as the surface water level of Cayuga Lake, recorded at 382 feet above msl.

2.2 Climate Change in Tompkins County

The climate of Tompkins County is of the humid continental type, typical of the interior northeastern United States (NYS Climate Office, 2010). Humid continental climates are known for their variable weather conditions, due to their location between the polar and tropic air masses. Polar air masses collide with tropical air masses, causing uplift of the moist tropical air and resulting in precipitation.

Since Tompkins County is far removed from the moderating effects of the ocean, the climate experiences great swings in seasonal temperature (Ritter, 2006). Temperatures average 70°F in July with lows of about 24°F in January, and the year-round average temperature is about 47°F. The average monthly rainfall increases from January (2.0 inches) to July (4.1 inches) and decreases from July (4.1 inches) to December (2.4 inches). Rainfall averages 35.9 inches annually, while annual snowfall exceeds 70.0 inches and provides snow cover for the majority of winter (Weatherbase, 2012). Figures 2.1, 2.2, and 2.3, included in Appendix A, illustrate Tompkins County's climate compared to the rest of New York State. The location of Tompkins County on these figures is indicated by the purple star symbol. Table 2 also shows the average temperatures, precipitation, and seasonal snowfall that have been recorded at the regional National Weather Service Forecast Office in Binghamton between 1951 and 2011.

Years	Average Temperature (°F)	Average Precipitation (inches)	Average Seasonal Snowfall (inches)
2001-2011	46.9	40.97	89.00
1991-2001	46.2	38.90	92.06
1981-1991	46.7	37.84	72.10
1971-1981	45.6	39.23	78.52
1961-1971	45.2	33.93	84.63
1951-1961	46.8	37.28	89.78
Overall Average	46.23	38.03	84.35

The best, most recent, climate science indicates a future of increased temperatures and shifting precipitation patterns for Tompkins County and New York State. Rates are projected to increase much faster than historic natural rates over the coming century, and as a result extreme hazard events may increase in frequency and intensity. The NYSERDA-commissioned report, *ClimAID: the Integrated Assessment for Effective Climate Change Adaptation Strategies in New York State*, released in November 2011, was written by scientists from Cornell University, Columbia University, and the City University of New York. The report and adaptation guidance focus exclusively on climate change adaptation strategies specific to New York State, and is geared to assist local decision-makers in developing and adopting adaptation strategies. The ClimAID report highlights the need for Tompkins County to prepare for the following impacts:

- **Heat waves** will become more frequent and intense, increasing heat-related illness and death and posing new challenges to the energy system, air quality, and agriculture.
- **Summer drought** is projected to increase, affecting water supply, agriculture, ecosystems, and energy production.
- **Heavy downpours** are increasing and are projected to increase further. These can lead to flooding and related impacts on water quality, infrastructure, and agriculture.
- **Major changes to ecosystems** including species range shifts, population crashes, and other sudden transformations could have wide-ranging impacts, not only for natural systems but also for health, agriculture, and other sectors.

The ClimAID report predicts that temperatures will rise across the state, by 1.5 to 3°F by the 2020s, 3 to 5.5°F by the 2050s, and 4 to 9°F by the 2080s, with the lower ends of these ranges expected under lower greenhouse gas emissions and the higher ends for higher emissions scenarios. The report notes that these are not the best and worst cases, just the most likely; sharp cuts in global emissions could result in temperature increases lower than the bottom ends of these ranges, while a continuation of business-as-usual could result in increases higher than the high ends.

The ClimAID report also projects that annual average precipitation will increase by up to 5 percent by the 2020s, up to 10 percent by the 2050s, and up to 15 percent by the 2080s. This will

not be distributed evenly over the course of the year. Much of this additional precipitation is likely to occur during the winter months as rain, with the possibility of slightly reduced precipitation projected for the late summer and early fall. Continuing the observed trend, more precipitation is expected to fall in heavy downpours and less in light rains.

Vulnerabilities specific to Tompkins County that are identified in the ClimAID report are potential flooding increases, milk production losses in a region dominated by dairy, and location at the front line for the state as invasive insects, weeds and other pests move north.

In addition, the report highlights that some areas, including Tompkins County, are vulnerable in other ways: rural areas are more vulnerable to, and have less capacity to cope with, extreme events such as floods, droughts, ice storms, and other climate-related stressors; regions that depend on agriculture and tourism (such as fishing, skiing, and snowmobiling) may be especially in need of adaptation assistance; and low-income urban neighborhoods, especially those within flood zones, are less able to cope with climate impacts such as heat waves and flooding. New York State's 2100 Commission's *Recommendations to Improve the Strength and Resilience of the Empire State's Infrastructure* (2013) identified a need to reduce inland vulnerability to extreme weather events. It is important that the community promote mitigation and adaptation strategies that enable incremental adaptations across sectors and communities over time. Mitigation and Adaptation strategies are described later in this report, specifically in Table 32 and Appendix A – Table 33.

Specific groups of people that are identified in the ClimAID report as being particularly vulnerable include elderly, disabled, and health compromised individuals who are more vulnerable to climate hazards, including floods and heat waves; low-income groups that have limited ability to meet higher energy costs; farm workers who may be exposed to more chemicals if pesticide use increases in response to climate change; asthma sufferers who will be more vulnerable to the decline in air quality during heat waves; and people who depend on public transportation and lack private cars for evacuating during emergencies. Small businesses are also identified as being particularly vulnerable, as they are typically less able to cope with costly climate related interruptions and stresses, such as power and communication service disruptions, than larger businesses. Climate Change projects by hazard are further detailed in the natural hazard profiles included in Section 5.0.

2.3 Historical Overview

The earliest inhabitants of Tompkins County were the Cayugas, one of the five nations of the Iroquois Confederacy. Settlement in the Tompkins County area began in 1792. Early settlers consisted of squatters and others cashing in their Military Tract land allocations. In 1817, Tompkins County was formally established through an act of the New York State Legislature. Soon after, Cornell University was established (1865), bringing solidity to the County's economy by attracting students, faculty, and many new residents. Ithaca College opened almost thirty years later in 1892 in downtown Ithaca. For more historic context, reference Appendix B.

2.4 Demographics

According to the U.S. Census, the population of Tompkins County totaled 101,564 in 2010, reflecting a growth of 5,063 people when compared to the 2000 U.S. Census data (96,501 people). This increase in population over the past decade reflects steady growth within the County. Table 3 provides population data for the County and its Cities and Towns (including respective Villages) over the past decade (2000-2010). Within that time period, City of Ithaca and all Towns within the County have seen positive population growth (2.0% or greater), while growth within Tompkins County is documented at 5.29 percent.

Population age data indicated that 16,659 people were estimated to be under 18 years (16.4%) and 10,929 people were estimated to be over the age of 65 (10.8%) (U.S. Census Bureau, 2010(2)). Overall, Tompkins County has a greater population of individual's between the ages of 18 and 65 than New York State.

The 2010 Census indicates that 82.6 percent (%) of Tompkins County's population was White, 4.0% of the population was Black or African American, 9.0% Asian, 0.4% American Indian and Alaska Native, 1.2% some other race, and 3.2% two or more races. In addition, 4.2% of Tompkins County residents reported themselves as being Hispanic or Latino (of any race) (U.S. Census Bureau, 2010(2)). Figure 2.4 in Appendix A graphs the population diversity of Tompkins County using a pie chart format.

Table 3 – Tompkins County Population Data (U.S. Census Bureau 2009 and U.S. Census 2012)												
Jurisdiction	Data Year											Growth 2000-2010 (%)
	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	
Tompkins County	101,564	101,779	101,027	100,413	99,997	99,698	99,747	99,203	98,393	97,575	96,662	5.07
Town of Caroline	3,282	3,019	3,007	3,009	3,000	3,001	3,011	2,999	2,980	2,930	2,916	12.55
Town of Danby	3,329	3,261	3,213	3,169	3,148	3,113	3,097	3,060	3,038	3,011	3,008	10.67
Town of Dryden	14,435	14,342	14,084	14,004	13,884	13,854	13,885	13,759	13,683	13,495	13,525	6.73
Town of Enfield	3,512	3,620	3,608	3,570	3,545	3,503	3,481	3,449	3,429	3,388	3,374	4.10
Town of Groton	5,950	5,904	5,864	5,832	5,837	5,820	5,848	5,815	5,805	5,763	5,789	2.78
Town of Ithaca	19,930	20,307	20,210	20,192	19,917	19,827	19,832	19,734	19,090	18,895	18,752	6.28
Town of Lansing	11,033	11,071	10,967	10,885	10,848	10,785	10,773	10,697	10,587	10,537	10,528	4.80
Town of Newfield	5,179	5,225	5,204	5,171	5,152	5,144	5,158	5,125	5,111	5,091	5,105	1.45
Town of Ulysses	4,900	5,017	4,988	4,941	4,910	4,886	4,878	4,826	4,799	4,762	4,773	2.66
City of Ithaca	30,014	30,013	29,882	29,640	29,756	29,765	29,784	29,739	29,871	29,703	28,892	3.88

2.5 Land Use

Land use within Tompkins County is mixed, with the majority of tax parcel use reflected in the following land use categories: agriculture, residential, commercial, and vacant land. Table 4 displays the percent of acreage for each jurisdiction in Tompkins County by land use category.

Jurisdiction	Agriculture	Barren	Commercial	Inactive Agriculture	Industrial	Public/Institutional	Recreation	Residential	Transportation	Vegetative Cover	Water	Wetlands
(C) Ithaca	0%	1%	12%	0%	3%	8%	10%	35%	1%	19%	10%	1%
(T) Caroline	14%	0%	0%	4%	0%	0%	0%	4%	0%	73%	0%	3%
(T) Danby	8%	0%	0%	4%	0%	0%	0%	5%	0%	78%	1%	3%
(V) Dryden	7%	1%	4%	4%	1%	4%	2%	31%	0%	35%	0%	11%
(V) Freeville	25%	0%	1%	0%	0%	4%	1%	15%	0%	40%	3%	10%
(T) Dryden	18%	0%	0%	5%	1%	0%	0%	8%	0%	60%	1%	6%
(T) Enfield	31%	0%	0%	6%	0%	0%	1%	8%	0%	51%	1%	2%
(V) Groton	10%	0%	4%	2%	1%	6%	3%	30%	0%	40%	0%	4%
(T) Groton	37%	0%	0%	7%	0%	0%	1%	7%	0%	42%	0%	5%
(V) Cayuga Heights	0%	0%	2%	0%	0%	5%	2%	71%	1%	19%	0%	0%
(T) Ithaca	15%	1%	1%	3%	1%	3%	3%	19%	0%	49%	4%	1%
(V) Lansing	2%	1%	11%	0%	1%	2%	1%	19%	13%	47%	0%	3%
(T) Lansing	31%	0%	1%	4%	1%	0%	1%	9%	1%	36%	14%	2%
(T) Newfield	11%	0%	0%	3%	0%	0%	0%	6%	0%	78%	0%	1%
(V) Trumansburg	7%	0%	3%	4%	0%	6%	4%	46%	0%	28%	1%	1%
(T) Ulysses	34%	0%	1%	5%	0%	0%	1%	9%	0%	37%	11%	2%

Figure 2.5 in Appendix A displays land use and land cover information for Tompkins County from the Tompkins County Planning Department (2007). This figure illustrates changes in land use and cover between the years 1969, 1995, and 2007. Table 5 shows the changes in land use/land cover categories between 1969, 1995, and 2007 by percentage.

Table 5 – Land Use and Land Cover Change in Tompkins County (Tompkins County Planning Department, 2007)					
Land Use Category	Changes in Land Use (percent, %)				
	1969	1995	% Change	2007	% Change
Agriculture	29.67	24.25	-5.42	21.10	-3.15
Barren or Disturbed	0.26	0.36	+0.11	0.23	-0.13
Commercial	0.27	0.42	+0.15	0.52	+0.10
Inactive Agriculture	16.15	6.25	-9.89	4.42	-1.83
Industrial	0.35	0.50	+0.15	0.53	+0.02
Public/Institutional	0.71	0.57	-0.14	0.59	+0.02
Recreation	1.04	0.71	-0.33	0.78	+0.06
Residential	2.13	6.97	+4.84	8.17	+1.20
Transportation/Transmission	0.30	0.25	-0.05	0.26	0.00
Vegetative Cover	43.75	53.21	+9.47	56.68	+3.47
Water	3.21	3.45	+0.23	3.48	+0.03
Wetlands	2.17	3.05	+0.88	3.24	+0.19

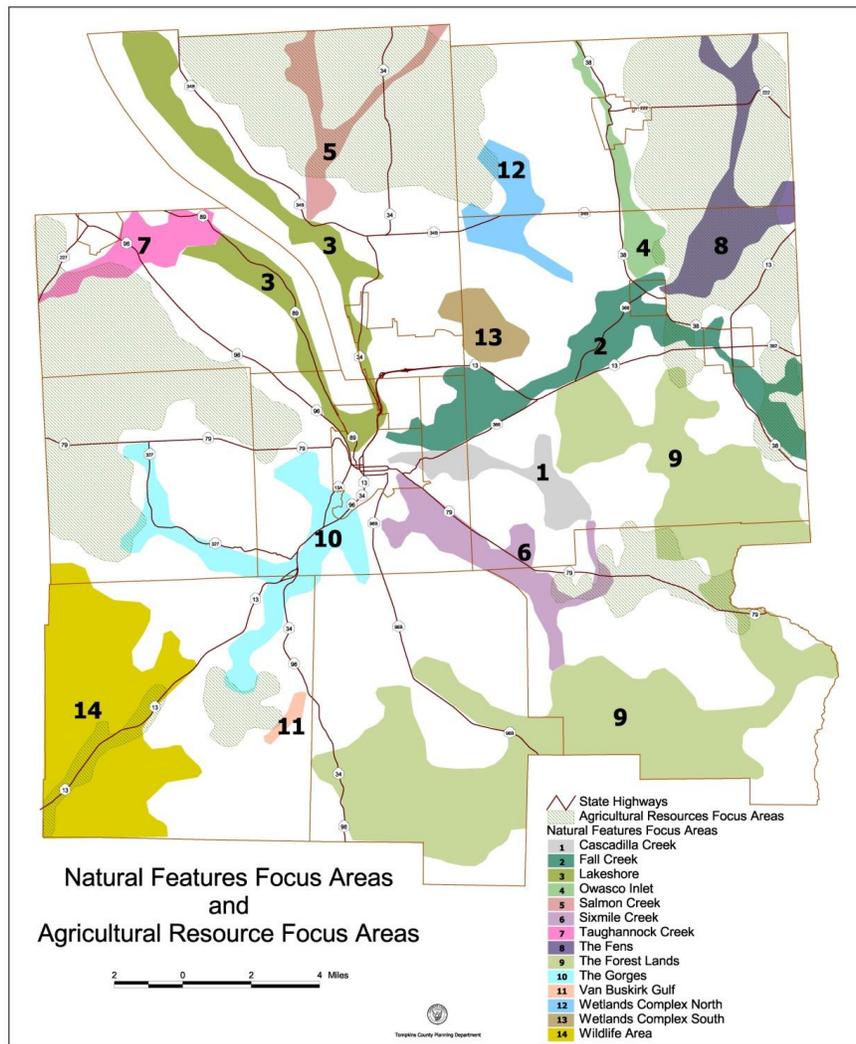
According to Tompkins County's 2004 Comprehensive Plan, up to a third of the total land area in the County consists of farmland. Farming operations within the County are quite diverse, including dairy, grain, livestock, hay, tree farms, vegetables, horticulture, aquaculture, poultry, vineyards, and orchards. Approximately 100,000 acres of land in Tompkins County are owned by farming operations; with about 80,000 acres being actively farmed (Tompkins County Comprehensive Plan, 2004). Over the past three decades, Tompkins County has seen a decrease in total farming operations and cultivated acreage; however, most recently, this reduction has seemed to stabilize locally. Two New York State Agricultural Districts are recognized within Tompkins County; the boundaries of these areas are shown on Figure 2.6 in Appendix A.

Areas of high residential intensity are concentrated within the Villages and around the City of Ithaca. A 2006-2010 estimate by the U.S. Census Bureau indicates that Tompkins County had a vacancy rate of 7.1 percent, representing approximately 2,935 housing units out of 41,381 total units (U.S. Census Bureau, 2006-2010). This vacancy rate is lower than the New York State rate during the same time period.

Aside from Cayuga Lake, Tompkins County also supports 10 major streams: Salmon Creek, Cayuga Inlet, Six Mile Creek, Cascadilla Creek, Fall Creek, Owasco Inlet, Owego Creek, Catatunk Creek, Cayuta Creek, and Taughannock Creek. In terms of land, Table 6 provides an estimate of the total acres of protected natural resources within Tompkins County. Figure 2.7 illustrates the locations of protected lands, perennial streams and areas the County has identified as Natural Feature Focus Areas as well as Agricultural Resource Focus Areas.

Table 6 – Protected Natural Areas (Tompkins County Comprehensive Plan, 2004)	
Owner	Size (acres)
New York State	27,801
Cornell University	6,528
Finger Lakes Land Trust	2,609
City of Ithaca	1,071
Tompkins County	654
The Nature Conservancy	393
Private/other	75
Other local municipalities	30
Total	39,161

Figure 2.7 – Natural Feature and Agricultural Resource Focus Areas
(Tompkins County Planning Department, 2004)



2.6 Economic Characteristics and Employment

The unemployment rate in Tompkins County has increased over the past year to approximately 6.4% (NYS Dept. of Labor, 2012), though it remains lower than the New York State unemployment rate of 7.9%. The increase or decrease in numbers of jobs within different industries between June 2011 and June 2012 is shown in Table 7. The data reported in this table represents the Ithaca Metropolitan Statistical Area (IMSA), which includes all of Tompkins County.

Table 7 – Change Observed in Total Number of Jobs in Different Industries Between June 2011 and June 2012 – Ithaca Metropolitan Statistical Area (<i>NYSDOL, 2012(2)</i>)	
Industry	Change Observed (# of jobs)
Education & Health Service	-500
Manufacturing	0
Trade, Transportation, Utilities	0
Professional & Business Services	+100
Financial Activities	0
Information	-100
Natural Resources, Mining, Construction	0
Leisure & Hospitality	+200
Other Services	0

The top 21 major employers for 2006 (most recent data available) in Tompkins County are listed in Table 8.

Table 8 – Top Major Employers for Tompkins County - 2006 (<i>Cornell University, 2006</i>)	
Company Name	# of Employees
Cornell University	9,480
Ithaca College	1,525
Borg-Warner Automotive	1,500
Ithaca City School District	1,200
Cayuga Medical Center	1,000
County of Tompkins	750
Wegman's Food Markets	570
Emerson Power Transmission	450
Franziska Racker Center	420
Tompkins/Seneca/Tioga BOCES	380

Table 8 – Top Major Employers for Tompkins County - 2006 (Cornell University, 2006)	
Company Name	# of Employees
Dryden Central School District	375
The CBORD Group	250
Therm, Inc.	225
Tompkins County Trust Co.	223
Tompkins Cortland Community College	200
Tops Friendly Markets	170
Thomas Group Architects and Engineers, PC	160
Boyce Thompson Institute	150
Hi-Speed Checkweigher	117
The Ithaca Journal	116
Holiday Inn Executive Towers	100-150 seasonal

Additional economic characteristics for Tompkins County are included as Table 9 in Appendix A.

2.7 Transportation

In Tompkins County, roadway, rail, and air transportation options are available. Tompkins County contains 15 State Routes that are maintained by the NYS Department of Transportation. No Interstate Routes or U.S. Routes are located within Tompkins County. The County highway system is comprised of approximately 88 routes (NYSDOT, 2011). Many of the County Routes overlap with portions of State Routes. The locations of the major roadways in Tompkins County are shown on Figure 2.8.

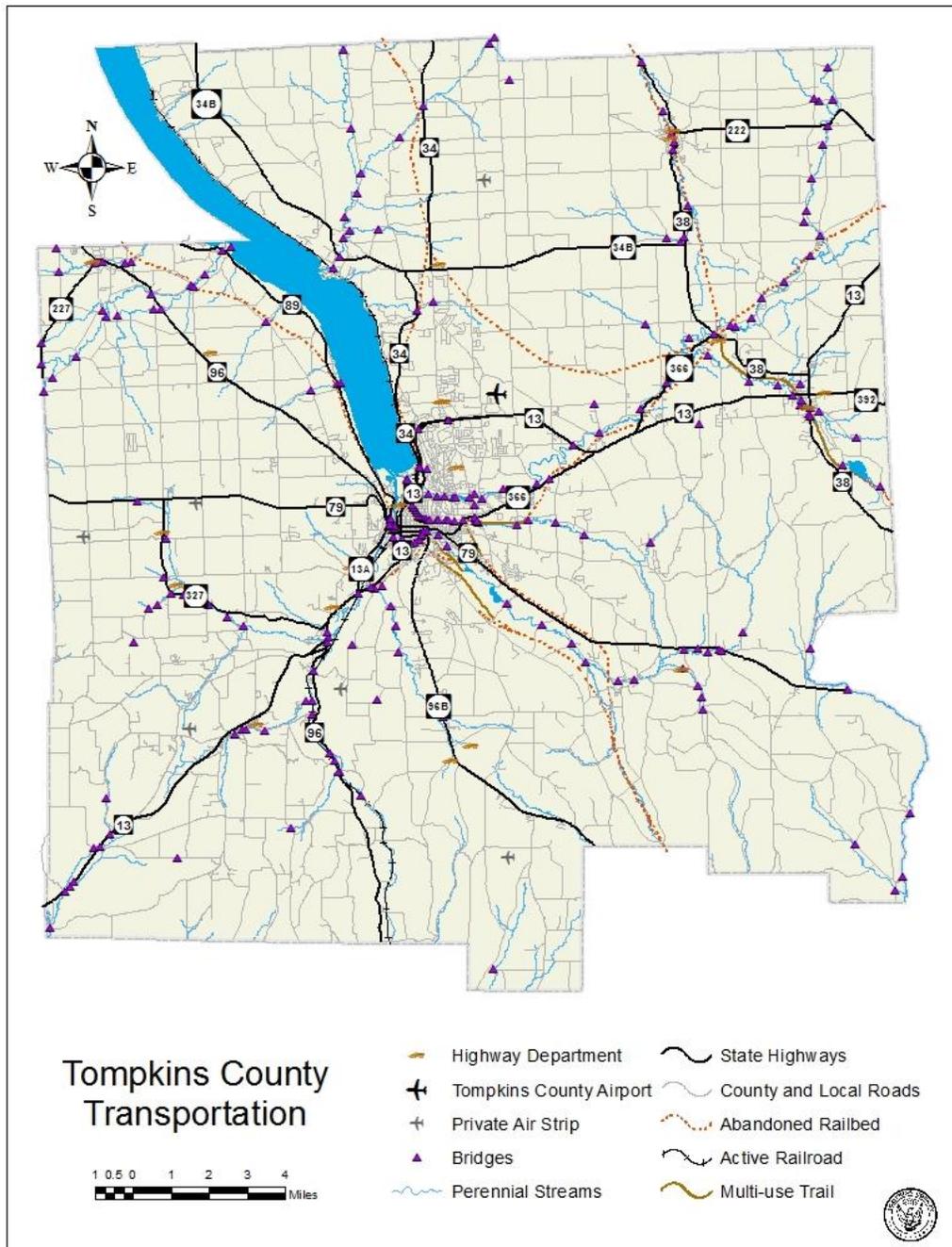
The Tompkins County Department of Public Works maintains more than 300 miles of County roads and more than 100 bridges and is responsible for snow removal, maintaining County buildings and parks, and maintaining the County's vehicle fleet. The Department of Public Works also operates the Tompkins County Regional Airport.

Only one active railroad remains in Tompkins County, the Norfolk Southern Railway Company. Norfolk Southern operates a freight-only line that runs from the mainline of the former Lehigh Valley track at the VanEtten Junction to just south of the former Ithaca station, and then along the east shore of Cayuga Lake to Lake Ridge (HC Lee, 2008). The remaining historic railroad segments have been abandoned and the tracks removed. Locations of active and abandoned railroad segments are depicted on Figure 2.8.

In addition to the County's Highway Department, there are nine Town Highway Departments, one NYSDOT Barn, six Village Highway Departments and one City of Ithaca Department of Streets and Facilities. The locations of these transportation maintenance facilities are denoted on Figure 2.8.

In terms of air transportation, there are six public and private airports in Tompkins County. The Ithaca Tompkins Regional Airport is the sole publicly owned airport in the County (Global Aviation Navigator, 2012). The Ithaca Tompkins Regional Airport is owned and operated by Tompkins County and is a division of the Department of Public Works. The airport has been operated by Tompkins County since 1956. The Ithaca Tompkins Regional Airport recently developed a Sustainable Master Plan and is the first airport to integrate sustainability into its master plan. Table 10 in Appendix A details the active airport facilities within the County, and Figure 2.8 depicts the locations of these airport facilities.

Figure 2.8 – Transportation Facilities in Tompkins County



2.8 Critical Community Facilities

Many of the critical facilities, including hospitals, medical facilities, and educational facilities, identified for each participating jurisdiction, are clustered around the City of Ithaca, and the Villages and Hamlets within the County. Critical facilities identified for hazard planning have been updated significantly since the 2006 Plan. Such facilities include utility infrastructure (water tanks, electric substations, cell towers, etc.) , banks, senior housing, mobile home complexes, boatyards, bus terminals, municipal buildings, community centers, correctional facilities, courthouses, dams, day care centers, schools, emergency operations, fire and police departments, highway facilities, human services, major industrial locations, medical facilities and hospitals, post offices, sports complexes and facilities, and locations of other public facilities. Figure 2.9, included in Appendix A of this document, shows the locations of critical facilities within Tompkins County. The locations of critical facilities were considered during the risk assessment and hazard vulnerability components of this HMP process.

2.9 Tompkins County Department of Emergency Response

The Tompkins County Department of Emergency Response is responsible for the following County-wide services:

- Oversees emergency dispatch and communications system that allows residents to dial 911 to receive emergency medical, fire, police, or other emergency help from any phone in the County;
- Implements County Mutual Aid and Disaster Plans, which provide fire, emergency medical, and other agency assistance when local services have exceeded their local equipment and personnel resources; and
- Provides emergency medical personnel training in coordination with Tompkins-Cortland Community College and fire training with the NYS Office of Fire Prevention and Control.

Tompkins County emergency information is posted on the TompkinsREADY website (www.tompkinsready.org). Disaster and emergency information is also broadcast from local radio stations: 870AM WHCU, 97.3FM WYXL, 1470 AM, WQNY 103.7 FM, 93.5 FM WVBR and 91.7FM WICB. Tompkins County also participates in NY-Alert, NYS's All-Hazards Alert and Notification System. Participants can elect to receive emergency information such as road closures and weather alerts through their cell phones (call or text message), E-mail, fax, or really simple syndication (RSS) message.

3.0 Planning Process

This planning process section of the plan describes who was involved in the development of this document, what steps were taken to complete all phases of the process, and how public involvement was considered throughout plan development. Throughout the plan development process, information was gathered from participating jurisdictions, as well as state, federal and local agencies and groups, citizens and business owners in the community, and other stakeholders. Project Team and Technical Committee representatives were also tasked with collecting data and information from their respective jurisdictions or areas of expertise. The information included in this plan represents the results of an extensive planning process that involved the input of many jurisdictions and community members.

3.1 Resources and Information Collection

The planning process followed for the development of the Tompkins County Multi-Jurisdiction All Hazard Mitigation Plan Update is consistent with the guidelines provided in the State and Local Mitigation Planning, how-to guides (FEMA Report 386-2) and the Local Multi-Hazard Mitigation Planning Guidance (FEMA, July 1, 2008).

In addition to these references and the original Hazard Mitigation Plan (2006), the following County and municipal documents were also reviewed and considered during the development of this document: Tompkins County Comprehensive Emergency Management Plan (2003), Tompkins County Comprehensive Plan (2004), Tompkins County Comprehensive Plan – Energy and Greenhouse Gas Emissions Element (2008), City of Ithaca Mitigation Plan (2002), Hazard Analysis Report (County and Specified Towns) (2003), and the Town of Dryden – Hazard Analysis Report (1999), Tompkins County Conservation Plan Part 1: A Strategic Approach to Natural Resource Stewardship (2007), Tompkins County Conservation Plan Part II: A Strategic Approach to Agricultural Resource Stewardship (2010), and Tompkins County Conservation Strategy (2012) .

Much of the event-specific information and details came from the members of the Planning Team and Technical Committee. The public and other interested parties were provided numerous opportunities throughout the planning process to provide input and comments. After the approval of Tompkins County's original HMP in 2006, a Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan Implementation Committee was formed. This group initially met on an annual basis to review the HMP and discuss implementation efforts, mitigation activity updates, and information distribution and resource updates. Though notes from only 2007 and 2008 were available for review (Appendix C), these details provided important information during the HMP Update process.

3.1.1 Planning Mechanisms and Capabilities

Another important objective of updating the HMP is to incorporate the document into existing and future planning efforts and initiatives throughout the County. Elements of the plan will be considered during municipal and County development and comprehensive planning efforts. The approved HMP will also serve as an important resource for developing and updating emergency

operations plans and procedures throughout Tompkins County. This updated HMP will be incorporated into, considered during, and referenced by future updates and efforts at the County and municipal levels concerning the plans, policies, ordinances, programs, studies, reports, and staff included in Table 11. The following is a list of local planning efforts and regulations which were reviewed for the Plan Update. These resources were seen as critical to refining the key aspects of the Plan. Conversely, pertinent aspects of the Plan Update will be integrated into these resources as they are updated by each associated jurisdiction.

Table 11 – Planning Mechanisms and Capabilities for Each Participating Jurisdiction																	
Plans	Jurisdiction																
	Town of Caroline	Village of Cayuga Heights	Town of Danby	Village of Dryden	Town of Dryden	Town of Enfield	Village of Freeville	Village of Groton	Town of Groton	City of Ithaca	Town of Ithaca	Village of Lansing	Town of Lansing	Town of Newfield	Village of Trumansburg	Town of Ulisses	Tompkins County
Comprehensive/Land Use Plan	'06	*	'03	'06	'05*	'02	'02*	'05	'05	'71*	'93*	'05	'06	*	'09	'09	'04
Economic Development Plan	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes
Post-disaster Recovery Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Flood Mitigation Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Local Waterfront Revitalization Plan	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes	No	No	Yes	Yes
College Campus Plan	NA	CU	No	No	TC3 CU	No	No	No	No	CU	IC CU	No	No	No	No	No	NA
Emergency Response/Evac Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Open Space Plan	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	Yes
Watershed Protection Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Capital Improvement Plan	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	No	No	Yes
Redevelopment Plan	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Floodplain Management Plan	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Comprehensive Emer. Mgmt. Plan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Policies/Ordinances																	
Building Codes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zoning/Land Use Codes/Restriction	No	'99	'05	'90	'95*	No	'86	'03	'11	'03	'03	'09	'04	No	'12*	'07	No
Subdivision Regulations	'00	'92	'07	'96	'12*	'06	'86	'86	'70	'89	'96	'75	'04	No	'90	'07	No
Property Set-back Ordinance	No	No	No	No	No	No	No	No	No	No	*	No	No	No	*	Yes	No
Flood Regulations	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No
Steep Slope Ordinance	No	No	No	No	No	No	No	No	No	No	*	No	No	No	No	No	No

Table 11 – Planning Mechanisms and Capabilities for Each Participating Jurisdiction																	
Plans	Jurisdiction																
	Town of Caroline	Village of Cayuga Heights	Town of Danby	Village of Dryden	Town of Dryden	Town of Enfield	Village of Freeville	Village of Groton	Town of Groton	City of Ithaca	Town of Ithaca	Village of Lansing	Town of Lansing	Town of Newfield	Village of Trumansburg	Town of Ulysses	Tompkins County
Stormwater Ordinance	Yes	Yes	Yes	No	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Site Plan Review Requirements	No	'92	'05	'06	'96	'96*	'86	'94	'97	'99	'00	Yes	'04	No	'06	'07	No
Agricultural Plan	No	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No	*	Yes
Gas Drilling Prohibition	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No	Yes	No	+	+	Yes	Yes	No
Programs																	
NFIP Participant	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
NFIP CRS Participating Community	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Property Acquisition Program	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Public Education/Awareness Prog.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stream Maintenance Program	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Storm Drainage Maint. Program	No	No	No	No	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No
Studies/Reports																	
Hazard Analysis/Risk Assessment	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Floodplain Maps/Insurance Studies	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Staff/Development																	
Development Planner	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes	No	No	No	No	Yes	Yes
Building Code Official	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GIS and/or HAZUS Specialist	No	No	No	No	Yes	No	No	No	No	Yes	Yes	No	No	No	No	No	Yes
Engineer/Public Works Official	No	Yes	No	Yes	Yes	No	No	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes
Local Floodplain Administrator	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No
Environmental Cons. Specialist	No	No	No	No	Yes	No	No	No	No	No	Yes	No	No	No	No	Yes	Yes
Public Information Official	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	Yes

* = Draft, in progress
 + = Moratorium in place
 CU = Cornell University
 IC = Ithaca College
 TC3 = Tompkins County Community College

Links and web addresses to many of the Tompkins County resources listed above are located in Appendix D for easy access.

3.2 Planning Team and Technical Committee

Three groups were created to assist in various facets of information collection and document preparation and review: Project Team, Technical Committee, and Key Stakeholders. The Project Team is represented by at least one municipal representative from each participating jurisdiction or agency, and is responsible for assisting in data collection, document review, and coordination efforts. The Technical Committee includes interest group representatives, researchers, educators, and others, whose task is to aid in guiding and revising the plan based on their various interests and areas of expertise. This committee consisted of representatives from the following agencies, groups, and entities: Town of Ulysses, Cornell University, Tompkins County Department of Health, Tompkins County Soil and Water District, Bolton Point Water Treatment Plant, City of Ithaca, New York State Electric & Gas (NYSEG), Town of Lansing Highway Department, Tompkins County Department of Emergency Response, and United States Geological Survey (USGS). The Key Stakeholders group includes various members of the community such as local elected officials, municipal employees, school officials, fire and emergency response personnel, and other interested community members.

Meetings with these three groups of selected and interested individuals were held at strategic points throughout the HMP development process. A County-wide risk assessment review was also held to kick-off the HMP Update process. This event, which many different stakeholders and agency representatives attended, helped set the stage for the remainder of the hazard mitigation planning process. All meetings that were held during the development of the HMP are located in Appendix E, including the notable accomplishments or objectives of each. Participants and representatives that attended every meeting are also listed in Appendix E, along with their affiliation, as it relates to the project.

3.3 Jurisdiction Participation

To be included in the Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan, all interested jurisdictions needed to express their willingness to be a part of the process and needed to remain an active participant throughout all stages of plan development. Active participation for each jurisdiction was gauged based on the following factors: meeting attendance, information collection and research, plan review and comment, mitigation action submission, public review assistance, and final resolution to adopt the HMP. A jurisdiction did not have to meet all criteria listed to be considered a participating member (for example, meeting attendance), but each jurisdiction did have to show an effort to participate and provide relevant information (for example, email follow-up after a missed meeting to discuss what was missed). Details regarding meetings that were held to support the update of this Plan are included in Appendix E – Hazard Mitigation Plan Update Process Meeting Timeline and Attendees. When municipal partners were unable to attend an important meeting, the Tompkins County Planning Department made a concerted effort to follow-up with each missing entity. In order to warrant participation in the HMP update process, each municipality was required to share information, provide input on the document and during meetings, and show a commitment to intermunicipal hazard mitigation planning. Overall, it was determined that all jurisdictions within Tompkins County met the

participation requirements and are therefore included and considered in this document. All participating jurisdictions have agreed to pass a resolution to adopt the HMP after NYSOEM and FEMA review and approval. These resolutions will be added to Appendix F, as they are adopted. For now, a sample resolution is provided.

3.4 Public Participation

During the Tompkins County Hazard Mitigation Plan Update process, public involvement was included at two levels. At the local level, community input was sought during the hazard vulnerability and assessment phase of the project. Each participating jurisdiction was responsible for making sure their hazard history and vulnerabilities were accurately portrayed in the draft HMP. The collection of this information often times involved individuals aside from those on the Project Team.

The second level of public involvement for the County HMP was provided through two formal public meetings, held at the Dryden Town Hall and Tompkins County Public Library on April 22, 2013, and the solicitation of comments during a publicly requested review of the Draft HMP. Many announcements regarding the issuance of the HMP Update for public review and the scheduling of a County-wide public meeting were included in area newspapers. The public was invited to review the draft document and to provide comments and input on hazards, hazard response, and hazard mitigation during the public meeting and for 30-days afterwards. This meeting also provided a favorable forum in which to answer any questions from the public.

Aside from being available for review in hard copy form during the public meeting and at the Tompkins County Planning Department in the City of Ithaca, the Draft Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan was also available for review electronically on the website of TCPD at www.tompkins-co.org/planning/haz_mit.htm. Comments received during this public review process included items like the Soil & Water District's concern that the vulnerabilities of creek pipeline crossings were not adequately addressed and the Tompkins County Environmental Management Council's concern over the plan's under emphasis of climate adaptation. All comments received as part of the public review were considered and incorporated into the HMP, as appropriate. In the case of the two specific comments detailed above, the vulnerabilities of utility crossings at streams was emphasized in the water contamination hazard profile section and identified as a specific mitigation action item, and further integration of climate adaptation activities were included in the HMP and were also carried over to the County's Comprehensive Plan update process. A summary of the public meeting participation and plan feedback is included in Appendix E.

3.5 Coordination with Agencies

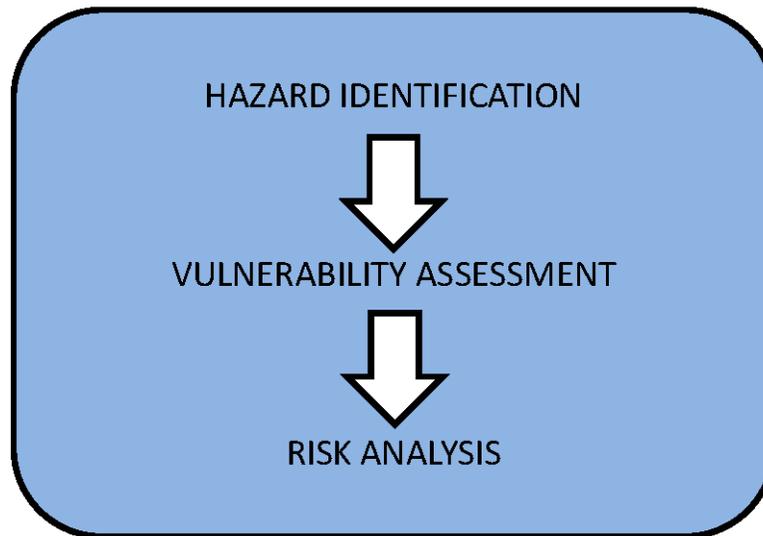
County, regional, state, and federal agencies were consulted for relevant information and recommendations with regard to the Hazard Mitigation Plan Update effort. The contributions from agencies and organizations that supported the update planning process include participation in the HIRA-NY risk assessment, review and comment on portions of the Draft HMP, and the collection and/or dissemination of information or data to be used in the planning process. These agencies that provided the most assistance throughout this process include: FEMA, Tompkins County Department of Emergency Response, NOAA, Tompkins County Planning Department,

Tompkins County Emergency Management Program, National Weather Service, NYSOEM, Tompkins County Soil and Water Conservation District, NYS Electric and Gas Corporation (NYSEG), and the U.S. Geological Survey.

4.0 Risk Assessment

Risk Assessments consist of three phases of analysis: hazard identification, vulnerability assessment and risk analysis.

Figure 4.1 – Three Phases of Risk Assessment



Risk Assessments should generally be conducted in the order identified in Figure 4.1 as each phase utilizes information from previous phases.

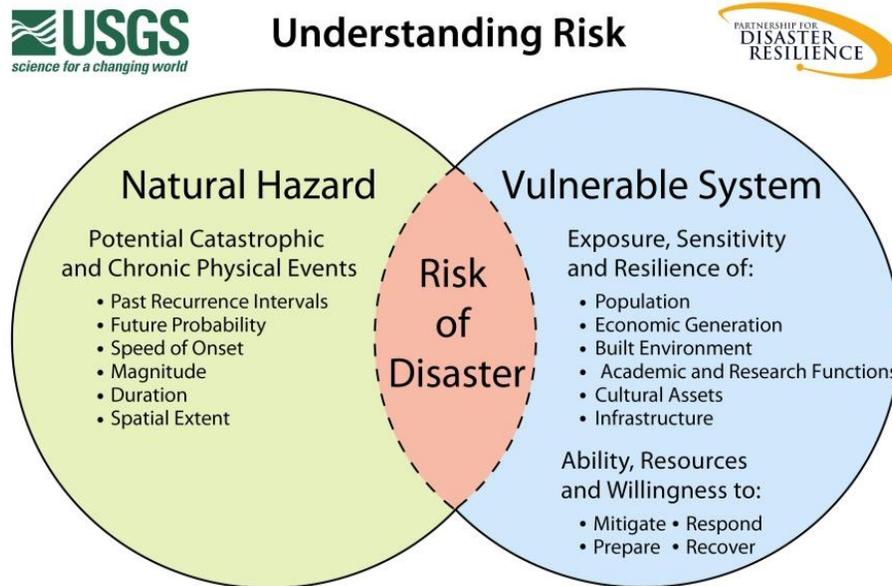
The first phase, *hazard identification*, calls on the community to identify all potential hazards, document their geographic extent, probability of occurrence and anticipated intensity. This phase will also incorporate the best available data on anticipated climate projections and states the intended impacts as they relate to each hazard.

The next phase, *vulnerability assessment*, utilizes the information obtained through the first phase and analyzes it with local information of properties and populations exposed to that hazard. As a part of this phase both current and future development potentials will be analyzed.

The last phase, *risk analysis*, estimates the damage, injuries, and costs likely to occur as a result of that hazard in the community. The picture of risk is broken down into both magnitude and probability of harm occurring. For many hazards this phase of risk assessment will not be realized.

Figure 4.2 was established by the Oregon Partners for Disaster Resilience, an applied research firm which works toward the mission of creating a disaster-resilient and sustainable state, and the United States Geological Society (USGS). This figure depicts the risk assessment process and points out that the goal of hazard mitigation is to “reduce the area where hazards and vulnerable systems overlap.”

Figure 4.2 – The Risk Assessment Process
(Oregon Partnership for Disaster Resilience Research Collaboration and USGS, 2006)



Source: USGS- Oregon Partnership for Disaster Resilience Research Collaboration, 2006

Tompkins County is vulnerable to numerous natural, technological, and human-caused hazards. The historic documentation associated with past hazard events that was included in the County's 2006 HMP has been expanded as part of the risk assessment to include the most recent data available, as well as analysis of identified potential impacts from a changing climate and widespread natural gas drilling in the region. Some of the key revisions that are included in this section of the plan update include: results of Tompkins County's 2012 risk assessment, profiles of new hazards, and the establishment of updated hazard rankings and hazard mitigation planning goals.

4.1 Framing the Risk Assessment Using HIRA-NY

All applicable hazards were evaluated, reviewed, and ranked during a risk assessment session moderated by the New York State Office of Emergency Management (NYSOEM) using the automated Hazard Identification and Risk Assessment (HIRA-NY) program. The selections made in HIRA-NY are based on information entered into preformatted Microsoft Excel spreadsheets recommended by FEMA and NYSOEM. The HIRA-NY risk assessment process helps participating jurisdictions and agencies focus on the hazards that may potentially impact the County and assists in detailing the most prevalent and highest ranking hazards. In order to complete the risk assessment, consideration was given to details such as location or geographic area that could be affected by a given hazard, extent or magnitude of each hazard event, previous hazard occurrences, and probability of future occurrences.

Within the HIRA-NY program, there are five factors in which the answers provided during the risk assessment process directly impact the ultimate hazard rankings. These five factors are denoted and detailed below.

HIRA-NY Factor 1: Scope

This factor looks at two aspects of the overall scope of a hazard: what area or areas in the jurisdiction could be impacted by the hazard, and what are the chances of the hazard triggering another hazard and causing a cascade effect. Once the potential area of impact is determined, the program requires the selection of one of the following impact area options:

<i>A single location</i>	Several hazards can impact a single location
<i>Several individual locations</i>	Many hazards are capable of impacting several individual locations. This does not mean that the hazards occur simultaneously, but that they could occur at one or several locations at the same time.
<i>Throughout a small region</i>	Where a single location or several individual locations comprise a significant area.
<i>Throughout a large region</i>	A larger region would extend for miles and comprise a significant portion of the community being assessed.

The next part of the scope factor is to determine whether the hazard could potentially trigger another hazard. When assessing this factor, the group evaluates various severity levels, including a credible worst-case scenario. The options for the cascading effect potential of a hazard are as follows: *no, highly unlikely; yes, some potential; or yes, highly likely.*

HIRA-NY Factor 2: Frequency

Frequency indicates how often a hazard results in an emergency situation or disaster event. Frequency includes both historic occurrences and the likelihood that it will happen in the future. The frequency of a hazard is not based on the worst-case scenario, but rather how often an event would cause various types of damage within the community that would require activation of emergency response forces. The program provides the following options when deciding the frequency of a hazard event:

<i>A rare event</i>	Occurs less than once every 50 years.
<i>An infrequent event</i>	Occurs between once every 8 years and once every 50 years (inclusive).
<i>A regular event</i>	Occurs between once a year and once every 7 years (inclusive).
<i>A frequent event</i>	Occurs more than once a year.

HIRA-NY Factor 3: Impact

The impact of a hazard is assessed on various severity levels, including a credible worst-case scenario. There are three types of impacts that are included in the HIRA-NY program: impacts on the population, impacts on private property, and impacts on community infrastructure.

Impacts on populations include the ability of a hazard to cause serious injury and/or death to surrounding human populations:

<i>Serious injury or death is unlikely</i>	Serious injuries require immediate medical attention, without which the injured person's life or limb is threatened.
<i>Serious injury or death is likely, but not in large numbers</i>	Applies when the casualties of a hazard can be adequately treated through the normal operation of a community's emergency medical system.
<i>Serious injury or death is likely in large numbers</i>	Applies when the number of casualties requires a full or near full activation of a community's medical facilities' disaster plans.
<i>Serious injury or death is likely in extremely large numbers</i>	This option denotes a catastrophe and applies when the numbers of casualties overwhelms the local emergency medical system, and substantial outside assistance is required.

Impacts on private property includes the potential for a hazard to physically or economically damage private property, including industrial structures, homes and contents, commercial businesses, belongings, and income in a community. The HIRA-NY options to denote a hazard's impact on private property include: *little or no damage; moderate damage; or severe damage.*

The HIRA-NY program also requires the identification of precise types and numbers of properties and structures that have the potential to be impacted. Impacts on community infrastructure is related to the potential for a hazard to specifically cause structural damage to the infrastructure that serves the community, including government buildings, roads, bridges, and public utility lines, plants, and substations. The options provided in HIRA-NY to indicate a hazard's impact on community infrastructure include: *little or no structural damage; moderate structural damage; or severe structural damage.*

As with private property, the above classification of damage should be supported by detailed information regarding the type of public property likely to be impacted.

HIRA-NY Factor 4: Onset

The onset factor is related to the amount of time between the initial recognition of an approaching hazard and when the hazard begins to impact the community. For some hazards, ample warning time is available so that if plans and procedures have not been developed, there is still time to accomplish such tasks before the hazard occurs. Other hazards provide no warning, so the response to a hazard event depends on existing plans, if any. The choices for time of onset are: *no warning; several hours warning; one day warning; several days warning; or a week or more of warning.*

For a few hazards there may be different warning times depending on location. In this case, the HIRA-NY tool suggests using the shortest warning time that is realistic and associated with a credible worst-case event.

HIRA-NY Factor 5: Duration

There are two types of duration analyzed in the HIRA-NY program: 1) how long the hazard remains active and 2) how long emergency operations continue after the hazard event has ended. A third duration addressed in HIRA-NY, but not included in a community's hazard analysis report, is how long it takes the community to fully recover from the hazard event. The recovery process continues until the operations of the community return to normal. The options provided for the duration of the hazard are: *less than one day; one day; two to three days; four days to a week; or more than one week.*

The program offers the following options for recovery time of a community after a hazard event: *less than one day, one to two days, three days to one week, or one week to two weeks.*

4.2 Hazard Identification

In order to ascertain which hazards affect Tompkins County, several resources were accessed and reviewed. Utilized sources included reviews of available reports or plans, consultation with community experts, accessing available information online, and documenting information provided by the public during public meetings.

On the basis of this review, the most prevalent and potentially the most damaging hazards that could affect the County were included in the County's HIRA-NY risk assessment. The chosen hazards are mainly caused by various types of storms, especially those that create cascading effects like power outages, flooding, or structural damage. Other hazards appear to occur on a less frequent basis or normally have an insignificant impact based on the historic data collected. The following hazards are those included in the HIRA-NY program, not just the hazard selected for additional analysis during Tompkins County's recent risk assessment event. These descriptions, which include natural, technological, and human-caused hazards, summarize the types of hazards and their applicability and ability to affect Tompkins County. This section of the plan is mirrored after the step-by-step process outlined in FEMA's publication 386-2 entitled "Understanding Your Risks, identifying hazards and estimating losses."

Air Contamination – Air contamination is indicative of pollution caused by atmospheric conditions such as temperature inversion induced smoggy condition sufficiently serious to create some danger to human health. Given Tompkins County's rural landscapes and a lack of large industrial areas and business parks outside of the City of Ithaca, air contamination is not a concern at this time within the County. This hazard is not profiled further in this plan update.

Avalanche – An avalanche occurs when a significant amount of snow slides off mountainous terrain. Although Tompkins County is subject to significant snow storms, no avalanches were found to be an issue at this time. Therefore, this hazard is not profiled further in this mitigation plan update.

Civil Unrest – Civil unrest is when an individual or collective action causes serious interference with the peace, security, and/or functioning of a community. Due to the presence of two college campuses in the central portion of Tompkins County, civil unrest events are a concern. For this reason, civil unrest is further profiled in Section 5 of this plan update.

Coastal Storm – Coastal storms cause increases in tidal elevations, wind speed, and erosion, caused both by extra-tropical events and tropical cyclones. Tompkins County is a mainland County in New York State; only a portion of the County borders water (Cayuga Lake). Though six (6) Tompkins County municipalities border Cayuga Lake, no portions are adjacent to any tidal waters. Therefore, coastal storms are not recognized as an issue within the County and were not included in the risk assessment.

Dam Failure – Dam failures consist of flood damage specifically caused by the structural failure of a man-made water impoundment structure. Tompkins County has several significant water impoundments that are controlled by dams. This hazard is not evaluated in Section 5 due to its infrequent occurrence and limited impact on communities within the County.

Drought – Drought is the loss of water supply due to the lack of rainfall. The majority of water supply in Tompkins County is obtained from groundwater wells. Groundwater levels are less susceptible to seasonal and droughty conditions than surface waters. None the less, drought events have historically impacted Tompkins County, particularly in the 1960s. No recent drought events have been recorded, though the unpredictability of weather patterns is always a concern for the farming community since they seldom have local irrigation systems. The role that climate change may have on future drought events is also of interest and concern and is further detailed in the drought hazard profile in Section 5.

Earthquake – Earthquakes are described as a shaking or trembling of the earth that is volcanic or tectonic in origin. There is potential for earthquake tremors to be felt within Tompkins County, though no history of such impacts is available. The concerns surrounding this hazard are compounded by the fact that Tompkins County is located approximately 15 miles outside of the 50-mile ingestion pathway for the nuclear power plants in Oswego County. Though this hazard is not likely to cause extensive damage within Tompkins County, because of the County's location within New York State and its adjacency to the nuclear facilities' 50-mile ingestion pathway ring, it is included in the HMP Update risk assessment.

Epidemic – An epidemic is the spreading of a contagious disease on a mass basis. The majority of significant epidemic history within Tompkins County focuses on agricultural epidemics and diseases. The frequency of widespread human epidemics within Tompkins County is not high, though the County's vulnerability to such an event is elevated due to the large national and international college student contingent that seasonally resides within the County. This hazard was included in the risk assessment process and is further detailed in Section 5.

Explosion – Explosions included the rapid burning of material and gases yielding the violent release of energy. There is no known history of explosions within the County. Therefore, this hazard is not analyzed further in regards to its potential impacts on Tompkins County.

Extreme Temperatures – Extreme temperatures include extended periods of excessive hot or cold weather with a serious impact on human and/or animal populations. Cascade effects can include enhanced fire/wildfire potential and drought. In past years, periods of extreme heat have had a greater impact within Tompkins County than extreme cold. Vulnerable populations, such as the elderly, reside within the County, elevating the potential risk of an extreme temperature event. Though this hazard was not assessed in the County’s original HMP, the effect that climate change may have on yearly temperatures is a growing concern. Therefore, this hazard was assessed and is documented in the hazard profile section.

Fire – Fire is the uncontrolled burning of residential, commercial, industrial, institutional, or other property. As is common in many populated areas, structural fires frequently occur within Tompkins County. Because of the potential damage that a large-scale fire could cause in the City of Ithaca, for example, this hazard was included in the HIRA-NY risk analysis. Further details regarding this hazard are included in this Plan Update.

Flash Flood – Flooding is the submergence of lands in the vicinity of rising waterway levels generally adjacent to water bodies and drainage areas. A distinction was made as part of this HMP Update between flash flooding, short-term, rapid flooding events, and lake flooding. Almost all of the documented damage that has occurred in Tompkins County as a result of flooding is related to flash flooding events. Such an event is normally caused by excessive rainfall or rapid thaw of snow packs. Details surrounding this hazard event and how its frequency, onset, and damage potential might change due to climate change are included in the next Section.

Lake Flood – A general flood hazard was profiled in the 2006 HMP for Tompkins County. During the 2012 risk assessment process, this hazard was further broken down into flash flooding and lake flooding, which would be directly associated with Cayuga Lake. During lake flood events, the water levels rise slowly because of the larger surface area of the waterbody. Minimal damage is associated with such water level rises since there is more warning, a slower onset, and the water levels in Cayuga Lake can be altered by the Canal Corporation if they become too high. Historic occurrences and other details associated with lake flooding in Tompkins County are included in the natural hazard profile section, below.

Food Shortage – A food shortage occurs when the normal distribution pattern and/or timely delivery of foodstuffs to retail establishments for normal consumer demand is interrupted for a substantial period of time. There is no historic documentation pointing to a food shortage within Tompkins County; therefore this hazard is not analyzed further in this document.

Fuel Shortage – Similar to the above, a fuel shortage may occur when the normal distribution pattern and/or timely delivery of fuel to retail establishments for normal consumer demand is interrupted for a substantial period of time. The assessment of this hazard focused on potential long-range impacts that could occur as the supply of fuel continues to decrease while the demand increases. Few incidences of a fuel shortage have occurred within Tompkins County; however, these historical events coupled with the hazard assessment assumption that a fuel shortage would impact the entire County, elevated this hazard into the top five (5) highest rated hazards during the risk assessment process. This hazard, which was not included in the 2006 HMP, is further detailed in Section 5.

HAZMAT – Fixed Sites – Hazardous materials at fixed site locations is defined as the discharge of hazardous materials (toxic, flammable or corrosive) into the environment from a facility located at a specific location. Generally, HAZMAT issues from fixed sites in the County are limited in nature and infrequent in occurrence. This hazard is not included in further assessments.

HAZMAT – In Transit – Hazardous materials in transit is the discharge of hazardous materials (toxic, flammable or corrosive) during their transport via a variety of transportation means (motor vehicle, truck, train, boat or plane). Risk assessment discussion surrounding this hazard focused on the potential for hydraulic fracturing operations to be sited within Tompkins County in the future. High numbers of hazmat in transit events have been documented in Pennsylvania associated with hydraulic fracturing operations. Because of the potential for such activities to occur within Tompkins County, this hazard was included in the County’s risk assessment and will be further detailed in Section 5.

Hurricane – A hurricane is a type of tropical cyclone with winds exceeding 74 miles per hour (mph) accompanied by rain, thunder and lightning. High wind events are commonly documented within Tompkins County, but by definition are classified in this Plan Update as severe storm events. Weather patterns that begin as hurricanes are often re-classified as tropical storms or tropical depressions (two other types of tropical cyclones) by the time they reach New York State. Tropical storms are organized systems of strong thunderstorms with a defined circulation and maximum sustained winds of 39 to 73 mph. Tropical depressions are organized systems of clouds and thunderstorms with a defined circulation and maximum sustained winds of 38 mph or less. Despite the numerous definitions, one historic record of a hurricane that affected Tompkins County does exist. Though this hazard has a moderately low potential, it is recommended that it be reviewed as part of the mitigation planning process. Hurricane was included in the County’s risk assessment process and will be further detailed below.

Ice Jam – Ice jams occur when water bodies are clogged with large blocks of ice. The ice is normally formed by the freezing of the water body and becomes dislodged due to hydraulic conditions whereby the ice floats and may jam at sections of the water body that have a limited cross section (i.e., at bridges and natural channel contractions). Ice jam events have been regularly reported throughout the County and are frequently associated with flash flood events in the late winter/early spring. This is a newly added hazard to the Plan, and will receive further detail in the next section.

Ice Storm – Ice storms include freezing rains which cause icing of roads, structures, and vegetation, and can cause structural damages and create hazardous slippery conditions. Ice storms have frequently occurred in the County based upon discussion during the risk assessment. These events routinely cause trees to topple due to the weight of the ice which has the potential to cause structural damage and utility failures. This hazard is profiled further in this plan.

Infestation – An infestation event is characterized by an excessive population of plants, insects, rodents, or other animals requiring control measures due to their potential to carry diseases, destroy crops, or harm the environment. The County is actively dealing with multiple species of invasives, which was the driver behind the top five ranking of this hazard event. Information regarding the occurrence of this hazard and how the effects might change in response to potential

climate changes will be reviewed in the next plan section. Infestation is a new hazard to the 2012 Plan Update and was not included in the original plan document.

Landslide – Landslides are defined as the downward movement of a sloped land mass under the force of gravity. Based upon historic information, landslides have occurred in the County on a localized basis. The potential for this hazard was determined to be low, though the potential for cascading hazards to occur was noted. This hazard, which was not included in the 2006 Plan, is profiled further in Section 5.

Mine Collapse – Mine collapse is the structural failure of an underground mine used to harvest minerals from the earth. There are no known active mines in Tompkins County. Since no historic mine collapse issues have been documented within the County, mine collapse was not included in the risk assessment process.

Oil Spill – Oil spills include the discharge of oil into the environment by a fixed site or mobile site (vehicles). This hazard is similar to what has been mentioned with respect to hazardous material hazards. Historically, it is known that fuel oil spills have resulted due to the lack of maintenance of oil storage facilities or due to damage as a consequence of a cascade effect resulting in the structural damage of an oil containing vessel. Though minor spills occur, large scale oil spills are not a concern within Tompkins County and a lengthy history of such events does not exist. Concerns related to oil spills will be applied to the hazardous materials hazard analyses, as this hazard will not be detailed further in this document.

Radiological – Fixed Site – Radiological materials at fixed sites is defined as the release or threat of release of radioactive material from a nuclear power generating station or research reactor or other stationary source of radioactivity. No nuclear power locations or other radiological facilities exist within Tompkins County; therefore, this hazard is not profiled in the next section of the plan.

Radiological – In Transit – Radiological materials in transit constitutes a release of radioactive material into the environment while in transit due possibly to an accident or malfunction in the container which holds the material. No historical data was available to indicate the release of any radioactive material within the County. As no history of this hazard is documented within Tompkins County, this hazard is not afforded further consideration in this plan.

Severe Storm – A severe storm hazard event includes hail storms, windstorms, and severe thunderstorms (with associated severe wind events such as derechos, gustnados (ground based gust vortex), and downbursts). Severe storm was included in the HIRA-NY risk assessment completed by Tompkins County, ranking second among the highest rating. This hazard frequently occurs within the County and therefore will be detailed further in the next section of this plan.

Severe Thunderstorm – Severe thunderstorms can produce tornados, hail, flooding, or high winds. These three potential side effects of severe thunderstorms are fully described and included under the hazards severe storm (includes hail events and high winds) and tornado. Therefore, this additional hazard will not be analyzed as part of this plan. Severe thunderstorms will be incorporated under the severe storm hazard.

Structural Collapse – Structural collapse is the failure and caving in of a structure. In and of itself, potential for the structural collapse of a structure within the County was not historically found to be an issue, unless it was caused by another hazard. Generally, building code enforcement prevents flagrant issues from arising. In addition, programs for the demolition of abandoned structures have helped to remove abandoned structures before they collapse. Because programs are in place to mitigate this potential hazard, structural collapse is not analyzed in this plan.

Terrorism – Terrorism is the systematic use of violence committed by groups in order to intimidate a population or government into granting their demands. Though no significant locations that may be targeted by large-scale terrorist events exist in the County, when compared to other areas across the Country, smaller scale events could potentially occur. Because of the increased threat of terrorism in the past decade this hazard will be profiled further in this plan.

Tornado – Tornados are violent destructive whirling winds accompanied by a funnel-shaped cloud that progresses in a narrow path over the land. Historic tornados have been recorded within New York State. Though an infrequent event within in Tompkins County, such an event has the potential to cause a large amount of damage. This was not assessed in the 2006 HMP, but has been added to this Plan Update and will be profiled in Section 5.

Tsunami-wave Action – Tsunamis are a series of enormous waves created by an underwater disturbance such as an earthquake, landslide, volcanic eruption, or meteorite. Due to Tompkins County's distance from the ocean, there is no potential for tsunamis to affect the County. No historic data was uncovered to show otherwise. This hazard is not included further in this plan update.

Transportation Accident – A transportation accident is an unexpected happening causing loss or injury. Historically, minor traffic accidents frequently occur in Tompkins County. Some of these events are due to the cascading effects caused by other hazards such as severe winter weather or ice storms. More severe accidents are fairly common, especially within densely populated areas of the County or on main transportation routes. Transportation accident, the highest rated hazard during the County's risk assessment process, will be included in Section 5 of this plan.

Utility Failure – Utility failure is defined as the loss of electric and/or natural gas supply, telephone service, or public water supply, as a result of an internal system failure and not by the effects of disaster agents. A few key historic utility failure events were documented during the HIRA-NY analysis; however, the majority of utility failures occur as a cascading effect from another hazard event. Regardless, this hazard was determined to have the potential to impact the County. Further consideration of this hazard will be provided in the next section of this document.

Water Supply Contamination – Water supply contamination includes the contamination or potential contamination of surface or subsurface public water supply by chemical or biological materials that results in restricted or diminished ability to use the water source. Water supply contamination within Tompkins County is infrequently documented, as approximately 50-percent of the County's population is on public water. Concerns raised for this hazard were

associated with future potential effects from hydraulic fracturing operations. This hazard was included in the County's risk assessment and is detailed further in section 5 to discuss these concerns.

Wildfire – Wildfires are described as the uncontrollable combustion of trees, brush, or grass involving a substantial land area which may have the potential for threatening human life and property. Though some areas of Tompkins County are heavily forested, few historic wildfire events have been documented. Because of the low incidence and low probability of this hazard to occur within the County, it is not included in further assessments.

Winter Storm (severe) – Winter storms include heavy snowfall and extreme cold and can immobilize an entire region. Major snowstorms have occurred in Tompkins County in the past, placing high demands on the Public Works Departments of the County, Towns, and Villages, and adding risks for emergency response personnel. This hazard is included in the County's risk assessment due to its frequent occurrence.

4.3 Results of the Tompkins County HIRA-NY

On March 8, 2012, a group of County staff, local officials, agency/interest group representatives, and technical experts was assembled to complete a HIRA-NY risk assessment process for Tompkins County. Such a risk assessment was previously conducted as part of the County's original 2006 Hazard Mitigation Plan, and was performed again for this Plan Update. NYSOEM Region IV personnel facilitated the March 2012 risk assessment and input the results in the HIRA-NY computer program. Detailed meeting notes were recorded throughout the process by Beth Harrington with the Department of Emergency Response, and reviewed by the project team in subsequent meetings. The following individuals attended this event:

NYSOEM Region IV – Ronald Raymond, Tom M^cCartney
Tompkins County Department of Emergency Response – Lee Shurtleff, Beth Harrington, Jessica Verfuss
Town of Caroline – Irene Weiser
Town of Ithaca – Creig Hebdon
Town of Dryden – David Sprout
Town of Enfield – Larry Stillwell
Town of Danby – Ric Dietrich, Susan Beeners
Town of Newfield – Richard Driscoll
City of Ithaca – Julie Holcomb
Town of Ulysses – Darby Kiley
Tompkins County Planning Department – Scott Doyle, Katie Borgella
Cornell University Horticulture Department – Jonathan Comstock
Cornell University Environmental Health and Safety – Dan Maas, Leah Stoner
Bolton Point Water Treatment Plant – Jack Rueckheim
U.S. Geological Society – Ed Bugliosi
Tompkins County Department of Public Works – Cheryl Nelson
National Weather Service – Dave Nicosia
American Red Cross – Kevin Carpenter
Tompkins County Public Information Office – Marcia Lynch

Tompkins County Sheriff's Department – Bob Lampman
 Tompkins County Administration – Paula Younger
 Tompkins County Health Department – Adam Hartwig
 Tompkins County Assessment Office – Al Fiorille
 Barton & Loguidice – John Condino, Johanna Duffy

Based on the professional knowledge of those present, historical County data, hazard event definitions, history from the National Weather Service, recent scientific reports on anticipated impacts from climate change in New York and likely impacts from widespread natural gas drilling in the region, and discussions that occurred amongst the group, 22 hazards were assessed and ranked using the HIRA-NY program. The County's top three rated hazards identified using the HIRA-NY tool are: transportation accident, severe storm, and flash flood. The hazards that were assessed, their 2012 rankings, and the original 2003 hazard rankings are included in Table 12.

Table 12 – Tompkins County Risk Assessment Hazard Rankings				
<i>Tompkins County's HIRA-NY risk assessment completed on March 8, 2012</i>				
Hazard	2012 Rank (HMP Update)	2012 Risk Assessment Score	2003 Rank (original HMP)	2003 Risk Assessment Score
Transportation accident	1	289	8	217
Severe storm	2	281	4	236
Flash flood	3	232	1	297
Infestation	4	231	N/A	N/A
Fuel shortage	5	212	N/A	N/A
Fire	6	210	7	223
Tornado	7	207	N/A	N/A
Utility failure	8	205	13	180
Ice storm	9	204	5	233
Epidemic	10	197	3	260
Water supply contamination	11	195	6	227
Hazmat in transit	12	194	12	196
Severe winter storm	12	194	10	201
Hurricane	13	193	9	215
Terrorism	14	192	2	295
Extreme temperatures	15	190	N/A	N/A
Ice jam	15	190	N/A	N/A

A total of 22 hazards were analyzed during this risk assessment process: 14 natural hazards, 6 technological hazards, and 2 human-caused hazards. Nine new hazards were assessed during the 2012 HIRA-NY analysis that were not profiled in the 2006 HMP: infestation, fuel shortage, tornado, extreme temperatures, ice jam, drought, lake flood, earthquake, and landslide. The ranks and assessment scores for some of the hazards vary greatly between the 2003 and 2012 risk

assessments. This variation is attributed to that fact that risk assessment participants are more likely to rank recent events and hazards that have recently affected the community higher than others. The individuals present for the County's 2012 risk assessment process determined the severity of impacts for the 22 selected hazards based on the five factors previously discussed: scope, frequency, impact, onset, and duration. Table 13 details the selections that were made for these five factors in relation to each of the analyzed hazards.

Table 13 – HIRA-NY Risk Assessment Rating Characteristics <i>Scope, frequency, impact, onset, and duration results for the 22 hazards analyzed as part of Tompkins County's HIRA-NY risk assessment completed on March 8, 2012.</i>							
Hazard	Rating	Scope	Cascade Effects	Frequency	Onset	Hazard Duration	Recovery Time
Transportation accident	289	Throughout a large region	Some potential	A frequent event	No warning	One day	One to two days
Severe storm	281	Throughout a large region	Highly likely	A frequent event	No warning	Less than one day	One to two days
Flash flood	232	Throughout a large region	Highly likely	A regular event	Several hours warning	Less than one day	One to two days
Infestation	231	Throughout a large region	Highly likely	An frequent event	More than a week warning	More than one week	Less than one day
Fuel shortage	212	Throughout a large region	Some potential	An infrequent event	More than a week warning	More than one week	More than two weeks
Fire	210	Throughout a small region	Some potential	An infrequent event	No warning	Two to three days	Three days to one week
Tornado	207	Throughout a large region	Highly likely	An infrequent event	No warning	Less than one day	Three days to one week
Utility failure	205	Throughout a large region	Some potential	An infrequent event	No warning	Less than one day	Less than one day
Ice storm	204	Throughout a large region	Highly likely	An infrequent event	Up to one day warning	Two to three days	Three days to one week
Epidemic	197	Throughout a large region	Some potential	A rare event	More than a week warning	More than one week	More than two weeks
Water supply contamination	195	Throughout a large region	Some potential	An infrequent event	No warning	Two to three days	Less than one day
Hazmat in transit	194	Throughout a large region	Some potential	An infrequent event	No warning	Less than one day	One to two days
Severe winter storm	194	Throughout a large region	Highly likely	A regular event	Up to one week warning	One day	One to two days
Hurricane	193	Throughout a large region	Highly likely	A rare event	Up to one week warning	One day	More than two weeks
Terrorism	192	Several individual locations	Some potential	A rare event	No warning	Less than one day	More than two weeks

Table 13 – HIRA-NY Risk Assessment Rating Characteristics <i>Scope, frequency, impact, onset, and duration results for the 22 hazards analyzed as part of Tompkins County's HIRA-NY risk assessment completed on March 8, 2012.</i>							
Hazard	Rating	Scope	Cascade Effects	Frequency	Onset	Hazard Duration	Recovery Time
Extreme temperatures	190	Throughout a large region	Some potential	A regular event	Up to one week warning	Two to three days	Less than one day
Ice jam	190	Several individual locations	Some potential	A regular event	Several hours warning	Two to three days	Less than one day
Drought	181	Throughout a large region	Some potential	An infrequent event	More than a week warning	More than a week	Three days to one week
Lake flood	172	Throughout a small region	Highly likely	An infrequent event	Up to one week warning	More than one week	Three days to one week
Earthquake	166	Throughout a large region	Some potential	A rare event	No warning	Less than one day	One to two days
Civil unrest	160	Several individual locations	Some potential	An infrequent event	No warning	Less than one day	Less than one day
Landslide	159	Several individual locations	Highly likely	An infrequent event	No warning	Less than one day	One to two days

The County's three highest rated hazards, transportation accident, severe storm, and flash flood, have many factors in common, such as little warning, frequent or regular occurrences, and ability to affect a large portion of the County. It is important to understand that the rating scores serve to approximate the risks associated with each hazard. As previously mentioned, the extent of risk varies depending on the group of individuals present during such an exercise and the health and safety issues current at the time the assessment is completed. Based on the highest rated hazards identified by the County HIRA risk assessment event, objectives were suggested and a mitigation plan was formulated to minimize the potential loss and impact of these hazards. These objectives and mitigation strategies are documented later on in this document.

4.4 Presidential Disaster Declaration

After a state has declared a State Disaster Area, as the result of a particular disaster event, that state and its local governments will evaluate recovery options, capabilities, and costs. If the damage from the disaster event is beyond the recovery capabilities of the state, the governor will send a letter to the President, through FEMA, detailing the situation. The president then makes the decision whether to declare a major disaster or emergency. After a presidential declaration is made, FEMA designates the impacted area eligible for assistance and announces the types of assistance available. FEMA provides supplemented assistance for the recovery of state and local governments; the federal share will always be at least 75 percent of the total eligible costs (FEMA, Presidential Disaster Declarations, 2009). According to the NYSOEM (NYSOEM GIS, 2010), damages within Tompkins County that occur from any given hazard event need to meet or exceed \$315,558 for a Presidential Disaster Declaration to be issued. Appendix A - Figure 4.3

shows the total number of Presidential Disaster Declarations that have occurred between 1954 and 2010 for every County in New York State. Tompkins County has had nine (9) declarations within this time period.

One additional Presidential Disaster Declaration has been declared in New York State since 2010 that has included public assistance for Tompkins County. FEMA DR-4031 was issued as a result of Tropical Storm Lee on September 13, 2011.

4.5 Natural Gas Drilling

The potential for natural gas drilling related to the Marcellus and Utica Shale deposits in Tompkins County and throughout the Southern Tier Region of New York State, has created a tremendous amount of concern in some communities regarding the possible environmental effects of the horizontal drilling process. Drilling for natural gas in such shale deposits uses a process termed hydraulic fracturing, also known as hydrofracking or fracking, in which the gas is extracted through a horizontal well drilling technique which is not currently permitted in New York State. Hydrofracking refers to the pumping of a mixture of water, chemical, and sand into the rock formations creating fractures in the shale that allow for the natural gas to escape to a production well where it is extracted and collected. The New York State Department of Environmental Conservation (NYSDEC) has finished compiling a Supplemental Generic Environmental Impact Statement (SGEIS) to review the potential environmental effects of this process. The information in the SGEIS will be used by the NYSDEC to formulate and propose a set of regulations, which the drilling companies will have to abide by to minimize the potential impacts from these drilling activities.

While there are currently no horizontal natural gas wells within Tompkins County, it was estimated in 2011 that 39-percent of the land within the County was leased for potential future gas drilling operations. Tompkins County has established a Council of Governments Gas Drilling Task Force to keep abreast of the latest developments regarding this topic. Concerns within the County surrounding natural gas drilling include: site disturbance, loss of active farmland, increased water consumption, chemical mixture used during drilling process, flowback of water, increased truck traffic and access, and disposal/treatment of utilized water/chemical mixture. Nearly all of jurisdictions within the County have already passed moratorium on the process, or ordinances prohibiting the natural gas drilling within their municipal boundaries.

Many of the HMP planning process participants expressed concerns regarding potential cascading effects that could result from natural gas drilling within their municipalities. While horizontal natural gas drilling is not considered a natural hazard, there was strong concern expressed among several participants that such drilling techniques present the potential to create human-caused environmental impacts such as oil spills, explosions, fire, fixed site and in-transit hazardous material spills, and water supply contamination. The NYSDEC's SGEIS indicates that, "though the potential for severe negative impacts from any one site is low, when all activities in the State are considered together, the potential for negative impacts on water quality, land use, endangered species, and sensitive habitats, increases significantly."

As previously mentioned, natural gas hydrofracturing drilling is currently not permitted within New York State, and the regulations surrounding the process which may be passed one day

cannot be speculated at this time with certainty. As this issue relates to the County's HMP Update, it is premature to attempt to identify and include all potential impacts that could result from the allowance of such drilling techniques, since there is little or no history available regarding such activities within New York State, but it is prudent to consider these potential impacts when evaluating hazards in this document. As this issue continues to progress, it will be tracked and discussed as part of future HMP reviews and 5-year updates. It will be imperative that this section be reviewed and expanded or removed in the future to accommodate future realities.

5.0 Hazard Histories and Future Potential

Based on the information collected during the data review and risk assessment portion of this plan, 22 hazards were determined to have the potential to affect Tompkins County. A summary of these hazards is provided below in Table 14.

Table 14 – Primary Hazards Determined to Affect Tompkins County	
Hazard	Type of Hazard
Severe storm	Natural
Flash flood	
Infestation	
Tornado	
Ice storm	
Epidemic	
Severe winter storm	
Hurricane	
Extreme temperatures	
Ice jam	
Drought	
Lake flood	
Earthquake	
Landslide	
Transportation accident	Technological
Fuel shortage	
Fire	
Utility failure	
Water supply contamination	
Hazmat in transit	
Terrorism	Human-caused
Civil unrest	

The analyses included in Section 4.3 eliminated the need for further discussion on the following hazards: air contamination, avalanche, coastal storm, explosion, food shortage, mine collapse, oil spill, radiological – fixed site, radiological – in transit, severe thunderstorm, hazardous materials – fixed site, dam failure, structural collapse, tsunami-wave action, water supply contamination, and wildfire. Though these hazards are not included in the 2012 HMP Update for Tompkins County, they can be incorporated into future plan updates, as needed. The remaining 22 hazards listed in Table 14 are profiled below because it was determined that they have the potential to impact Tompkins County. These hazard profiles included details of their historic occurrence within the County, County and individual jurisdiction vulnerability and susceptibility, historic

cost damage estimates from previous hazard events, and future potential including their relationship to climate change. Of the 22 identified hazards, the following 15 (Table 15) were noted as having the potential to be more impacted by climate change.

Table 15 –Hazards Identified as Having the Potential to be Impacted by Climate Change
Natural Hazards
Severe Storm
Flash flood
Infestation
Ice storm
Epidemic
Severe winter storm
Hurricane
Extreme temperatures
Ice jam
Drought
Lake flood
Landslide
Technological Hazards
Fire
Utility failure
Water supply contamination

Based on each hazard’s profile and associated details, a qualitative probability of occurrence (i.e., low, medium, or high) was determined for each. The level of detail included for each hazard was limited by the amount of historical data and prior cost and damage estimates available.

5.1 Natural Hazard Profiles

Details associated with historical hazards occurrences were collected using National Climactic Data Center (NCDC) data, technical and project committee knowledge, Tompkins County records, information available through FEMA, and other resources, as appropriate.

5.1.1 Severe Storms and Hurricane

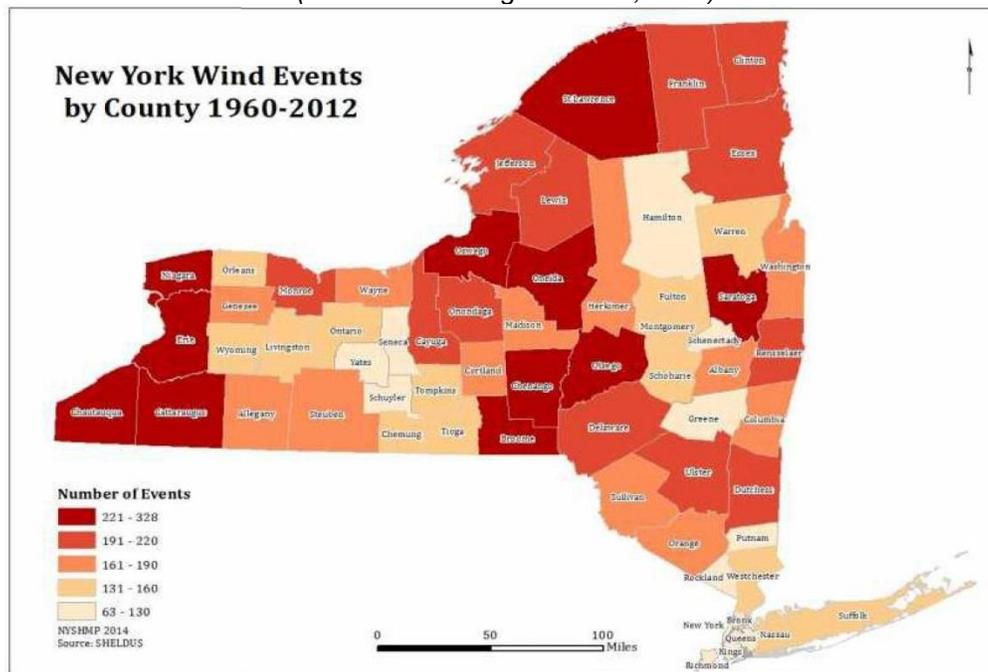
Because of the similarities between the severe storms and hurricane hazard characteristics and definitions, they have been combined into one hazard profile.

General Hazard Description

Severe storms are defined as storms with a tornado and/or surface hail $\frac{3}{4}$ " or greater and wind gusts of 58 mph or greater. They include 1) hailstorms, 2) windstorms, and 3) severe thunderstorms (with associated severe wind events).

- 1) Hailstorms –Typically associated with severe thunderstorms, hailstorms are characterized by balls or irregularly shaped lumps of ice greater than $\frac{3}{4}$ " in diameter. The peak occurrence period for hailstorms is late spring and early summer. Hailstorms can cause extensive damage to agriculture crops, particularly those that are herbaceous and long-stemmed. Severe hailstorms can also cause damage to buildings and automobiles, but rarely cause fatalities or serious injuries. Probability for severe hail to occur in the U.S. is included as Appendix A – Figure 5.1.
- 2) Windstorms – Wind is defined as the motion of air relative to the earth’s surface. Extreme windstorm events are associated with hurricanes, winter cyclones, and severe thunderstorms. Tompkins County is located in wind zone III; winds with a potential speed up to 200 mph are depicted for this zone (Appendix A – Figure 5.2).
- 3) Severe Thunderstorms – According to the National Weather Service (NWS), thunderstorms are considered to be ‘severe’ if they produce hail at least $\frac{3}{4}$ " in diameter, winds of at least 58 mph, or a tornado. NWS estimates that approximately 1,000 severe thunderstorms occur each year on the U.S. mainland. Severe thunderstorms can produce damaging tornadoes, hailstorms, windstorms, lightning and flash floods. Figure 5.3 indicates that Tompkins County experienced 63 to 130 high wind events between 1960 and 2012.

Figure 5.3 - Number of Wind Events for Tompkins County, 1960-2012
(NYS Hazard Mitigation Plan, 2014)



Hurricanes, also termed tropical cyclones, are defined as storms with wind speeds of 74 mph or greater which blow in a large spiral around an “eye” (calm center). Hurricanes are typically downgraded to tropical storms or tropical depressions by the time they reach Tompkins County. This hazard has a high potential to cause other cascading effects and extensive damage to life and property.

Key Severe Storm and Hurricane Findings for Tompkins County:

- Hailstorms – An average of one hailstorm occurs annually (1980-1999).
- Windstorms – There is potential for winds up to 200 mph in Tompkins County (Wind Zone III) (Appendix A – Figure 5.2).
- Severe Thunderstorms – An average of four to five severe thunderstorms occur annually (1980-1999).
- Hurricanes – Tompkins County is not located within a hurricane-susceptible region.

Historical Hazard Occurrence

Hurricane - No hurricane or tropical storm events were noted for Tompkins County, though Hurricane Irene and Tropical Storm Lee had devastating impacts to adjacent counties, which heightened awareness of these types of hazards in Tompkins County. The County’s geographic location within the U.S. and New York State provides protection from full-strength hurricane events. Historically, Tompkins County has however experienced high wind events; the most severe of which are associated with remnants of hurricanes that have tracked up the Atlantic Coast. Hurricane strength and severity generally decreases as the storm continues north and inland to central New York. Therefore, the damage potential is relatively low and is mostly associated with downed trees and interruptions to utility services. A list of hurricane force wind events that have historically been reported within the County is provided below:

- 1935 – high wind event (eight to ten fatalities occurred)
- 1954 (October) – Remnants of Hurricane Hazel
- 1970s – extreme wind gusts
- 2003 – Remnants of Hurricane Isabel
- 2011 – Remnants of Hurricane Irene and Tropical Storm Lee

Severe Storms - NCDC data was queried to obtain records of severe storm events that have occurred over the past six years (fall 2006 – fall 2012). Two reports of high wind events and 31 reports of severe thunderstorm were reported for Tompkins County. The occurrence details and storm damages, if any, are summarized in Appendix A - Table 16.

The most significant severe storm event reported within the last six years occurred on April 28, 2011, in Danby, which included a tornado (detailed in Section 5.1.12). This storm consisted of a straight line of winds of nearly 100 mph that resulted from a storm system that moved east across New York State from the Great Lakes. Significant tree damage was reported as a result of this

storm, as well as multiple reports of roof and siding damage to residential housing. Hail associated with the storm also struck homes and cars in the area. This storm resulted in an estimated \$100,000 in damages.

Historical Cost and Damage Estimates

Based on the NCDC's damage reports, the majority of severe storm events within Tompkins County resulted in \$1,000 to \$2,000 worth of damage. The total damages recorded over the previous six years amount to \$208,000, the majority of which was associated with residential property damage. No fatalities or injuries have been reported over this time period. Based on the NCDC damages included in Appendix A - Table 16, an average of \$35,000 in losses occurred annually between 2006 and 2012. Storms that occur between late spring and early fall have a greater probability of damage to croplands. The majority of reported severe storm events occurred within that window, during summer, from June to August. Impacts to public utilities are commonly reported as a result of severe storm events. Such impacts require an immediate response by utility company personnel and are often fixed quickly. Hail events can cause minimal damage to private property, especially vehicles, but often do not result in an increased need for County emergency services or other resources. After a severe storm event ends, the County and municipal public works departments are sometimes called upon to clean up debris or fix infrastructure damage that may have occurred.

Future Potential Impacts

Based on recent literature related to climate change potential within New York State, including the New York State Energy and Research Development Authority's (NYSERDA) ClimAID Report, weather patterns are projected to change and increase in severity. Annual average precipitation is predicted to increase by up to 5% by the 2020s, up to 10% by the 2050s, and up to 15% by the 2080s (NYSERDA, 2011). The greatest changes are projected to occur in northern New York; however, no area of the state will be spared from climate change effects. The majority of this additional precipitation is expected to fall as rain during winter and an increase in heavy rainfalls is expected, with less incidence of light rain. Due to the projected increase in precipitation and the increase in yearly average temperatures, severe storm events are anticipated to increase in frequency and intensity.

5.1.2 Flash Flood

General Hazard Description

Floods are natural events for rivers and streams where excess water from snowmelt or rainfall accumulates and overflows onto the banks and adjacent floodplains. FEMA has mapped 100-year floodplains, which designates areas that, on average, have a 1-percent chance of flooding in any given year. A large amount of rainfall over a short period of time can result in flash flood conditions. Flash flood damage tends to occur in and around floodplains.

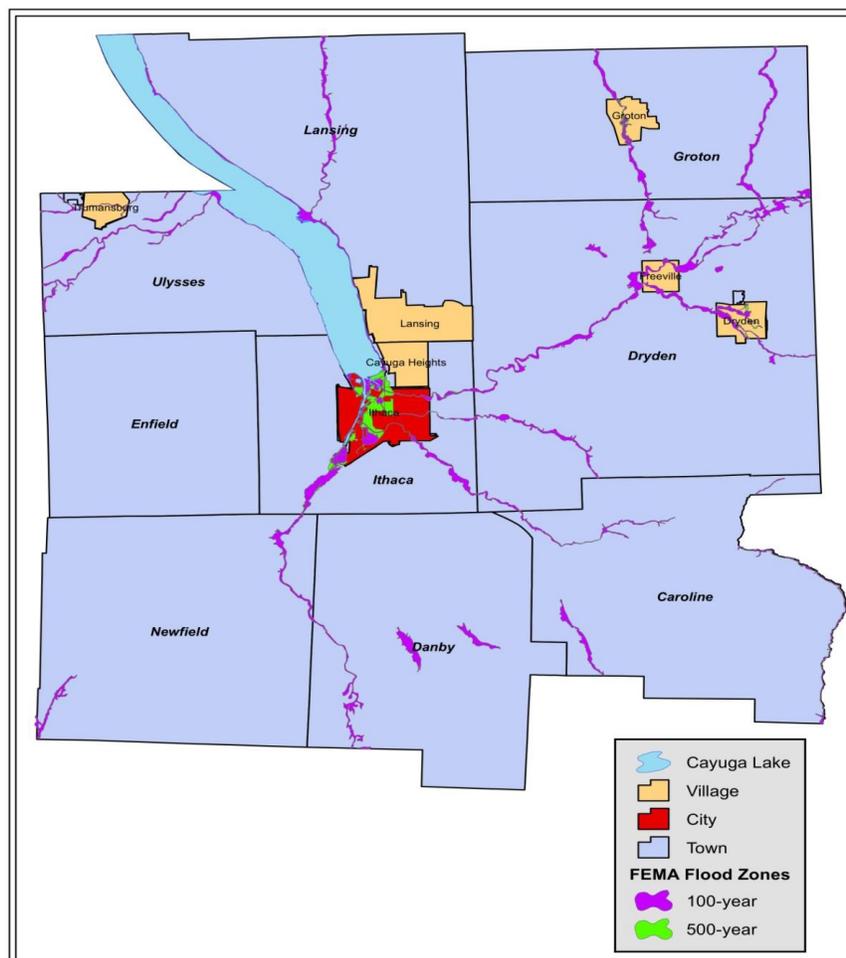
Numerous 100 and 500-year flood zones are recognized within the limits of Tompkins County. These areas, totaling approximately 10,665 acres, are more prone to impacts from flooding events due to their location. FEMA flood maps were last updated in the mid-1980s and are at this point inaccurate in many parts of the County. Direct losses from flash flood events are not

frequently documented unless they occur in association with large flood events or storms with significant flooding as a cascading hazard.

Key Flash Flood Findings for Tompkins County

- Twenty-four (24) flash flood events have been documented over the last nineteen (19) years (National Weather Service).
- Over 10,000 of a total approximate 31,000 acres in Tompkins County fall within either the 100 or 500-year FEMA Flood Insurance Rate Map Flood Zones. An estimated 3,977 tax parcels intersect these flood zones; these areas are classified as follows: commercial (519 parcels), community services (203 parcels), industrial (12 parcels), public services (118 parcels), recreation (61 parcels), and residential (3064 parcels – all occupied).
- 100-year flash flood events have a 1-percent chance of occurring in any given year.
- A total of 8 Presidential Declarations for flooding events have been issued for Tompkins County between 1953 and April 2010 (NYSOEM GIS, 2010).

Figure 5.4 - Shows the FEMA Floodplain Mapping for Tompkins County (FEMA, 2006)



Historical Hazard Occurrences

Due to the topographic characteristics of Tompkins County, several municipalities are vulnerable to flash floods and associated landslides, particularly the Towns of Dryden, Groton, Caroline, the City of Ithaca, and the Villages of Freeville and Groton. Cornell University has also reported multiple landslide events on their properties, which have resulted from flash flooding. Tompkins County does not have a history of flood related deaths or serious injuries; however, flash flooding was determined to be a priority hazard event within Tompkins County due to its frequency as well as economic impacts related to property and infrastructure damage.

The NWS reports that twenty-four (24) flash flood events have been documented within Tompkins County over the last nineteen (19) years. Four such occurrences have taken place since the County's initial HMP in 2006. These NCDC records are detailed in Table 17, below.

Table 17 –Tompkins County Flash Flood Events between October 2006 and October 2012 (NOAA, NCDC, Storm Events Search, 2012)						
Location	Date	Event	Deaths (#)	Injuries (#)	Property Damage (\$)	Crop Damage (\$)
Ithaca	11/2006	Flash Flood	0	0	\$25,000	0
McKinneys Point	8/2007	Flash Flood	0	0	\$1,000	0
Ithaca	9/2011	Flash Flood	0	0	\$20,000	0
Ellis Hollow	9/2011	Flash Flood	0	0	\$400,000	0

Tompkins County did not sustain any significant damages associated with October 2012's Hurricane Sandy. The most significant recent flash flooding event was associated with Tropical Storm Lee and Hurricane Irene (September 2011). A record rainfall of six to twelve (12) inches resulted in the flash flooding of creeks in and around the Susquehanna River Basin. Damages associated with this event in New York and Pennsylvania were estimated at close to 1 billion dollars. Other historical occurrences of flash flooding in Tompkins County include Virgil Creek flooding in Dryden, flooding at the Dryden Elementary School, Groton Nursing Home & Senior Citizens building, and localized flooding along Little Egypt Creek and East Shore Drive Plaza.

Historical Costs and Damage Estimates

As illustrated by the NCDC property damage estimates above, a single flash flood event has resulted in \$1,000 - \$400,000 in damage costs. To look at the average annual losses reported for communities that participate in the National Flood Insurance Program (NFIP), flood damage data was reviewed and is included in Appendix A - Table 18. As of 2007, Tompkins County had 299 NFIP policy holders. The Village of Groton reports the highest annual losses from flooding events. The total average annual loss due to flooding in the County is reported as \$46,858.85 based on the NFIP records. This number is conceivably higher during years where a significant flash flooding event occurs. It is always important to remember that not all jurisdictions within Tompkins County participate in the NFIP; therefore, additional losses are assumed to occur every year.

Based on the data depicted in Appendix A - Figure 5.5, approximately 7,860 acres of agricultural lands are within or immediately adjacent to 100-year or 500-year floodplains. This amount of land represents an estimated value of \$16,640,635.00, based on Tompkins County Real Property records. Depending on the time of year and the type of agricultural enterprise, damages to these lands from flash flooding could range from minimal (\$500) to significant (\$1,000,000), though no significant agricultural damages have been recorded as a result of past flash flood events.

Flood events have the potential to quickly impact all structures and facilities. Large flood events often include mandatory evacuations and the establishment of emergency shelters. Residential properties are the property type most often located within mapped floodplains; therefore, impacts to private houses are anticipated to be the largest structural impact that would result from a large flood event. Tompkins County currently has twelve (12) Repetitive Loss properties. A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling ten-year period, since 1978. The greatest number of RL properties fall within the Town of Lansing boundaries. Since 1978, a total of \$290,991.02 has been paid to these residents for both building and content damages. Extensive impacts to transportation infrastructure, agricultural lands, and public utilities can also occur from flash flooding.

As noted in the United States Army Corps of Engineers' *Hydraulic Analysis and Impacts of Long Term Shoaling for Flood Risk Management Project, Cayuga Inlet, Ithaca, NY* flooding is most pronounced in the City of Ithaca downstream of Sixmile Creek, between State Street and Cascadilla Creek. In this area flood waters often cross Meadow Street and inundate portions of Adams, Fourth and Fifth streets. Also, Cascadilla Creek water will often back up and flood parts of Lincoln and Dey streets. The report indicates that the flood risk to the residences and businesses in these areas is increased due to the lack of regular maintenance of the Flood Risk Management project on the Cayuga Inlet.

Future Potential Impacts

According to the climate projections noted in NYSERDA's ClimAID technical report, annual average precipitation is projected to increase by up to 5 percent by the 2020s, up to 10 percent by the 2050s, and up to 15 percent by the 2080s. Such increases are sure to affect the frequency and severity of flash flooding events within New York State. It is anticipated that these increase will not be evenly distributed throughout the year. Reports indicate that the bulk of these increases will be realized in the winter months and mainly come in the form of rain. More rain on frozen ground will most likely increase the likelihood of flash flooding. Because Tompkins County is located at the southern end of Cayuga Lake and has numerous freshwater streams within its boundaries, the County will become increasingly vulnerable to potential impacts from flash flooding events as precipitation increases in amount and frequency. Adverse flood impacts in the City of Ithaca in the area mentioned in the Army Corps of Engineers' report will continue if dredging of the Inlet does not occur. To accurately track fluctuations in flood activity to assess future potential impact, existing USGS stream gages should continue to be supported (2 in Sixmile Creek, 1 in Fall Creek, 1 in Cayuga Lake Inlet). Added gages should be considered for installation in Salmon Creek and Owasco Inlet. Due to the multiple benefits of these gages, continued funding should be sought both with and without USGS support.

5.1.3 Earthquake

General Hazard Description

An earthquake is a sudden motion or trembling that is caused by a release of strain accumulated within or along the edge of Earth's tectonic plates. The effects of an earthquake can be felt at distances beyond its actual occurrence, though they are less severe as the distance increases. As Appendix A - Figure 5.6 illustrates, multiple earthquake events have been reported within New York State, primarily in the North Country/Adirondack regions. Effects like ground shaking have been frequently reported within the State even though the earthquake itself occurred outside state borders.

The U.S. Geological Survey (USGS) produces seismic hazard maps. Earthquake probability on these maps is commonly displayed in terms of peak ground acceleration (PGA). PGA measurements indicate the geographic area affected, the probability of an earthquake at different levels of severity, and the strength of ground movement (expressed in acceleration force of gravity, % g). Appendix A - Figure 5.7 shows that Tompkins County is located in an area of low peak acceleration, likely due to a low incidence rate and small maximum magnitude for nearby earthquakes. Any jurisdiction that has a peak ground acceleration value of 3% or higher is required to fully profile the earthquake hazard in order to receive FEMA plan approval. As illustrated in Appendix A – Figure 5.7, Tompkins County's PGA value is between 2% and 3% g. Table 19 shows what PGA values equate to in terms of hazard intensity, damage potential, and magnitude.

Table 19 – Richter Magnitude Scale and Mercalli Intensity Scale Ratings (USGS, Earthquake Hazards Program, 2010 and NYSOEM, State HMP, 2011)				
Acceleration PGA (%g)	Mercalli Intensity Scale	Richter Magnitude Scale	Damage Potential	Intensity Scale Details
<0.17	I	1.0 – 3.0	None	Not felt except by a few persons at rest under favorable conditions
0.17 – 1.4	II – III	3.0 – 3.9	None	Felt only by some at rest – felt noticeably indoors, especially on upper floors
1.4 – 9.2	IV – V	4.0 – 4.9	None	Felt by many indoors, some/many outdoors, minor damage occurs
9.2 - 34	VI – VII	5.0 – 5.9	Light to moderate	Felt by all, damage to inadequate structures, many frightened
34 - 124	VIII – IX	6.0 – 6.9	Moderate to heavy	Considerable damage to many types of structures, structural collapse
>124	X or higher	7.0 and higher	Very heavy	Structures destroyed, bridges and rails bent, objects thrown, line of sight & level distorted

Key Earthquake Findings for Tompkins County

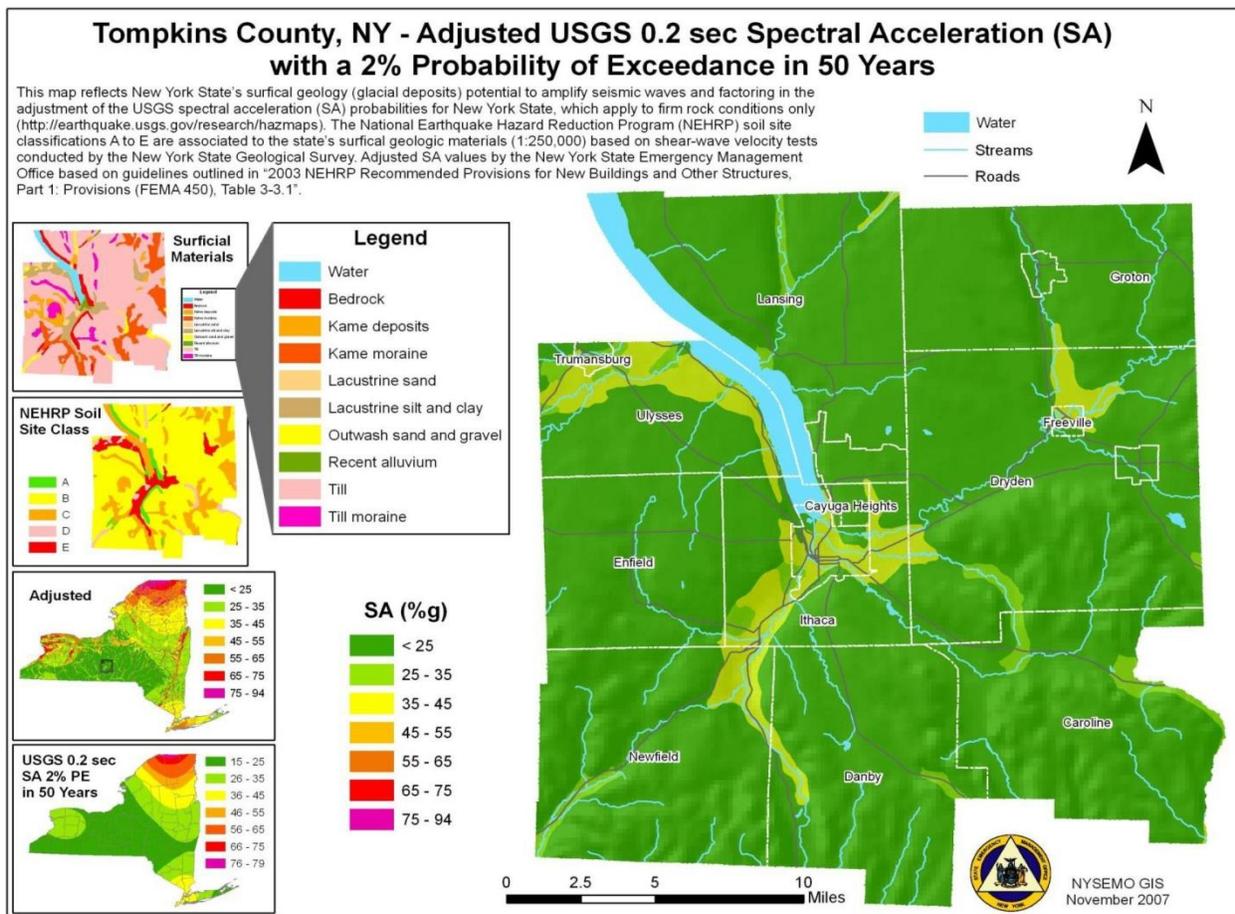
- There is no record of local earthquake occurrences.

- Tompkins County’s PGA value is 2-3% g, which indicates limited seismic activity, which typically results in minor damages.

Historical Hazard Occurrence

Earthquakes are designated as having a moderately low potential to impact Tompkins County. Seismic maps provide the best estimates of earthquake probability expressed in terms of PGA and also spectral acceleration (SA). SA is a measurement that describes the maximum acceleration in an earthquake on an object. Figure 5.8 shows a map produced by the New York State Geological Survey that shows the potential for lands within Tompkins County to accelerate and amplify seismic waves based on surficial geology and soil data.

Figure 5.8 – Spectral Acceleration Data for Tompkins County
(NYSOEM, State Hazard Mitigation Plan-GIS, 2007)



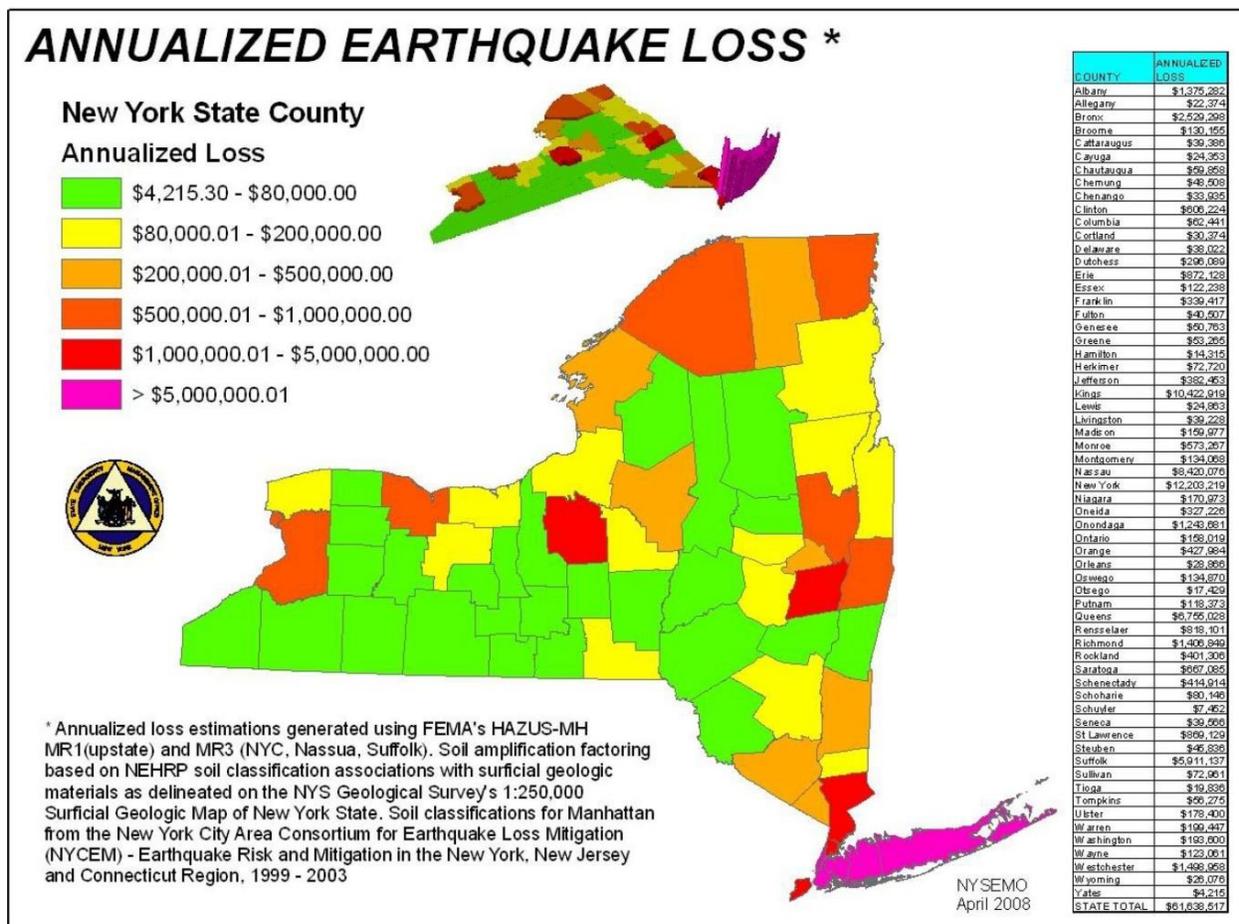
SA is expressed in “g”, which represents the acceleration due to Earth’s gravity. The map represents the ground motion that can be reasonably expected in a 50 year period. The majority of Tompkins County, as shown in the above figure, is located in an area of less than 25% g; however a few areas are mapped within the County that exhibit 25-35% g. All of these values indicate a low potential for seismic activity within the County. There are additionally no historical records of an earthquake occurring within Tompkins County, or of a nearby earthquake event that has significantly impacted the County. Despite this history, it is recommended that

projects involving new infrastructure construction strictly follow the existing New York State Building Code with respect to where and when seismic design practices should be incorporated into a facility design.

Historical Cost and Damage Estimates

The New York State Hazard Mitigation Plan (2011) has modeled potential loss to earthquakes by County. This information, depicted by Figure 5.9, used surficial geology and soils data to estimate earthquake risk and potential loss if such a hazard event were to occur. This mapping illustrates that damages reported within Tompkins County could range from \$4,215.30 to \$80,000.00.

Figure 5.9 – Estimated Annual Earthquake Loss by County
(NYSOEM, State HMP, 2011)



Additional earthquake damage potential and loss estimation data is included in the state plan. Of the 62 counties in the State, Tompkins County ranks 31st in terms of exposure to earthquake hazard events. The value of facilities, infrastructure, and property within the County that is potentially vulnerable to such a hazard event is estimated at \$5,887,685.

Future Potential Impacts

Tompkins County, in its entirety, is vulnerable to an earthquake event because earthquake locations cannot be predicted; however, the potential for an earthquake to occur within the limits of Tompkins County is minimal. Future climate change projections have not focused on changes in the severity and/or frequency of earthquake events. In recent years, a greater frequency of earthquakes is occurring throughout the world which may be due to advances in seismic activity detection. If natural gas drilling moves forward in the State there may be increased potential of earthquakes in the area.

5.1.4 Lake Flood

General Hazard Description

Lake flooding occurs when the water level of Cayuga Lake increases along the shoreline, impacting properties along the lake and backing up water levels in the creeks that outlet to Cayuga Lake. During the risk assessment discussion for this hazard, it was determined that the water level of Cayuga Lake would have to reach an elevation of 387 feet to meet the definition of a lake flood. At this elevation, impacts to the New York State Route 13 corridor begin to occur and residential properties along the shoreline begin to flood. According to the New York State Canal Corps, the entity in charge of adjusting the lake levels, 385 feet represents the flood stage of Cayuga Lake.

Key Lake Flood Findings for Tompkins County

- A lake flood hazard occurs when the water level in Cayuga Lake Exceeds 387 feet.
- Lake flood events occur on average of once a decade, but due to climate change projections, this rate is anticipated to increase in the future.

Historical Hazard Occurrence

The effects from lake flooding are amplified by the topographic characteristics of the County. A notable amount of development within the County occurs along Cayuga Lake's shoreline and the valleys along the main creeks that outlet into the lake. This is most prevalent in the City of Ithaca which is built around the southern end of the lake. Multiple jurisdictions within the County have been susceptible to chronic lake flooding events, which cause the water levels in feeder creeks to drain slowly. These jurisdictions include the towns of Ithaca, Lansing, and Ulysses, Village of Cayuga Heights and the City of Ithaca. Lake flood events that have been documented over the past 50 years include:

- 1972 – Hurricane Agnes
- 1993 – Unspecified storm event
- 2005 – Fall Creek Flooding (\$100,000 in property damage) - connected with ice jam near Ithaca High School

- 2011 – Hurricane Irene, Tropical Storm Lee (Lake water levels were reported at 383/384 feet)

Historical Cost and Damage Estimates

It was estimated that 50-60 houses would be impacted by a lake elevation of 387 feet in the Town and Village of Lansing, specifically the Myers Corners and Ladoga Park areas. The towns of Ulysses and Ithaca, and the City of Ithaca and Village of Cayuga Heights are also located along the shoreline of Cayuga Lake though most of these structures are above this elevation. Because the Canal Corps adjusts the water elevation in the lake at 385 feet, sustained and increasing damage to shoreline and creek side properties in the County are not expected to be an issue. Immediate and short-term damage to property may occur, resulting in around \$50,000 to \$100,000 in damage for a lake flood hazard event. Fatalities and injuries are not anticipated to occur as a result of such events. Lake floods do not pose as high a risk to loss of life and property as flash floods, because they have greater warning times and slower rising water levels.

Future Potential Impacts

Should development continue along the shoreline of Cayuga Lake, lake flooding impacts to developed property will increase. Climate change projections indicate that precipitation levels in the future will increase. Such significant increases in rain and runoff levels will more often raise the water level of the lake, inundating shoreline properties and low-lying areas adjacent to the main creeks within the County. Due to these predicted changes in climate, it can be inferred that more incidents of lake flooding will occur in the future. USGS data has also noted increases in extreme water flows in recent years. To accurately track fluctuations in lake flooding to assess future potential impact, existing USGS stream gages should continue to be supported (2 in Sixmile Creek, 1 in Fall Creek, 1 in Cayuga Lake Inlet). The installation of additional gages should also be considered, including in Salmon Creek and Owasco Inlet. Due to the multiple benefits of these gages, continued funding should be sought both with and without USGS support.

5.1.5 Severe Winter Storm and Ice Storm

General Hazard Description

Severe winter storms are denoted by the accumulation of 12” or more of snow in a 12-hour period.

Ice storms are characterized by freezing rain which accumulates in a substantial glaze layer of ice resulting in serious disruptions of normal transportation and possible downed power lines. An ice storm occurs when ¼” of ice build-up is observed.

Key Severe Winter Storm Findings for Tompkins County

- A severe winter storm occurs on average 3 times a year
- A severe ice storm occurs just once every 3 to 5 years.

Historical Hazard Occurrence

Severe winter storms are annually encountered within Tompkins County. The NWS reports that the County averages 3.3 annual severe winter storms that meet the definition outlined above. Records of severe winter storm events reported by the NCDC are included in Appendix A – Table 20.

Ice storms occur in the County once every 3 to 5 years. An ice storm in January 2003 left thousands of residents without power for several days. A similar event, resulting in up to 0.5 inches of ice, also occurred within Tompkins County in March 2008. According to the NWS, 8 ice storms, resulting in ¼- ½” of ice, have occurred in Tompkins County over the past 19 years.

Historical Cost and Damage Estimates

Severe winter storms result in little or no private property or public infrastructure damage. Ice storm events, or winter storms that have an ice component, can cause much more extensive damage, mostly to utility infrastructure, but moderate damage to private property has been documented. Actual damage costs can range from the thousands to millions, depending upon severity, duration, and nature of the event. Elderly and impoverished populations are typically more vulnerable during severe winter storm or ice storm events, especially if power failure results. For this reason, particular care is provided to these populations including the establishment of emergency and warming shelters during prolonged storm or power outage events.

Future Potential Impacts

Climate change is extremely likely to bring warmer temperatures to most of the state. Total annual precipitation is expected to increase, but mostly in the form of rain, or freezing rain, not snow. The build-up of significant amounts of snow events may be less likely to occur in the future due to the change in seasonal temperatures, however freezing rain and ice may be more frequent. In the short-term, severe winter storms, and ice storms to a lesser degree, will continue to be regular events within Tompkins County. Because of this frequency, the County must continue to provide reliable and well-tested system to keep the County functioning and the residents safe during such hazard events. The likelihood of ice storms in the future should be incorporated into planning for utility and infrastructure needs.

5.1.6 Ice Jams

General Hazard Description

An ice jam is described as a large accumulation of ice in rivers or streams that interrupts the normal flow of water and often leads to flooding conditions and/or damage to nearby structures. Ice jam events are often short-lived and often affect only a localized reach or area of a body of water (U.S. Army CRREL, 2004).

Key Ice Jam Findings for Tompkins County

- Since 1926, 24 ice jam events have occurred, most frequently on Fall Creek, in the City of Ithaca.
- The NWS reports that ice jam events occur twice every 10 years.
- All historic ice jam events have occurred between the months of December and March.

Historical Hazard Occurrence

The NWS reported during the County's 2012 risk assessment exercise that an ice jam has been documented within Tompkins County twice in 10 years. Occurrences of ice jams in the County are commonly associated with flash flooding events that mobilize the ice. The U.S. Army Corps of Engineers' (USACE) Ice Jam Database reports that 24 ice jams have been documented within the City of Ithaca since 1926, the date of the first hazard report. The City of Ithaca is the only Tompkins County location included in this database. The majority of the ice jam reports involve Fall Creek. USACE database records of ice jam events that have historically occurred in Tompkins County are included in Appendix A – Table 21.

Appendix A - Figure 5.10 depicts locations of frequent ice jam incidents within New York State. Fall Creek has the highest rate of ice jam frequency within Tompkins County; 21 reports of ice jam events are listed for this water resource between 1875 and 2007. Salmon Creek also has issues with ice jams that threaten a railroad trestle that is used daily.

Historical Cost and Damage Estimates

Of the 24 historic ice jam reports, only two mentioned potential damage to infrastructure and private property. Potential damage is associated with flooding caused by the ice jam and resulting water level increases. Minor flooding to basements results in minimal damage, estimated at \$1,000 - \$2,000 per affected property. Though no evidence of such major damage exists, a large ice jam event could cause severe damage to highway or railroad bridges that cross the main waterways in the County. The cost to repair a damaged bridge structure is estimated at \$500,000 - \$1,000,000.

Future Potential Impacts

Recent climate change research initiatives, such as ClimAID, reports that increases in air temperature will lead to increases in water temperature over the next handful of decades. Higher water and air temperatures will likely decrease the potential for thick ice to cover water resources within Tompkins County. Even if ice forms on the water surface, an increase in air and water temperatures would quicken the melting process, thus discouraging the build-up of large blocks of ice.

5.1.7 Landslides

General Hazard Description

Landslides are defined as the downward and outward movement of slope-forming materials reacting to the force of gravity. Slide materials may be composed of natural rock, soil, artificial fill, or combinations of these materials. Landslides are activated by storms, earthquakes, volcanic eruptions, fires, freezing/thawing, and steepening of slopes by erosion or human modification.

Key Landslide Findings for Tompkins County

- Ten Landslide events have occurred locally (1837-2007).
- Two locations of moderate landslide incidence are mapped within Tompkins County.

Historical Hazard Occurrence

Historically, landslide events within Tompkins County have been infrequent and are commonly triggered by heavy rainfall events. Multiple occurrences have been noted within the County in recent years, though these events are primarily confined to localized areas adjacent to steep slopes or waterways. Figure 5.11 shows that two locations of moderate landslide incidence are mapped within Tompkins County, while the majority of the County is identified as a low incidence area. The two moderate incidence locations correspond to lands surrounding Cayuga Lake, and lands located within the Pleasant Valley area, extending to the Village of Dryden. According to the data associated with this figure, 8.93 percent of the land area within Tompkins County is represented by the two locations of moderate incidence. According to USGS information included in the State Hazard Mitigation Plan, 10 landslide events have occurred in Tompkins County between 1837 and 2007 (USGS Open File Report 94-615). The County's most active landslide is in the Town of Ulysses on South Street Extension abutting Taughannock Creek. Small scale landslide activity among the region's many gorges has caused adverse impacts to human safety and recreation.

Historical Cost and Damage Estimates

A potable water pipeline that services the City of Ithaca is known to be located in a landslide susceptible slope area; no back-up service main is currently in operation. A slope failure in this area has the potential to result in infrastructure damage to the pipeline, but also to cause interruptions in water service to many households in the City. Even a short-term service interruption could cost an estimated \$100,000 to repair and cost affected households the inconvenience and additional cost associated with finding a secondary water source (i.e. family member's house, bottled water, etc.). This situation is hypothetical; no damage numbers are available for documented landslide events that have occurred within Tompkins County. Significant costs have additionally been incurred over the years to safely maintain the network of gorge trail infrastructure.

Figure 5.11 – Landslide Susceptibility within New York State
 (USGS, NYS Hazard Mitigation Plan, 2011)



Future Potential Impacts

The majority of landslide incidents within Tompkins County are spurred by heavy rainfall events. These heavy rainfall events are expected to increase in the future, mostly in areas that have historically documented bank failures or slope subsidence. Annual average precipitation in NYS is projected to increase by 5 to 10 percent by 2080 (ClimAID, 2012). With this the frequency of landslides to occur in the County will likely increase. In addition, climate models also project that the frequency of heavy rainfall events will increase. These predicted changes in weather patterns are likely to result in an increase in the frequency of landslides, potentially with greater levels of property damage.

5.1.8 Drought

General Hazard Description

A drought is defined as a prolonged period of limited precipitation affecting the supply and quality of water. An absolute drought consists of a period of at least 15 consecutive days where none of the days experience 0.01 inches of rain or greater. A partial drought is a period of at least 20 consecutive days where the mean daily rainfall does not exceed 0.01 inches. A dry spell consists of a period of at least 15 consecutive days where none of the days experience 0.04 inches or more of rainfall (USGS, 2009). Agricultural drought relates to agricultural impacts that occur as a result of various meteorological characteristics, such as precipitation shortages and

soil water deficits. Hydrological drought relates to the effects that a lack or decrease in precipitation has on surface or subsurface water supplies.

Key Drought Findings for Tompkins County

- Tompkins County's agricultural sector is that which is most vulnerable to drought.
- A 2005 drought event resulted in significant sugar maple die off.

Historical Hazard Occurrence

Periods of drought have had limited and localized impacts in Tompkins County. The largest vulnerability that the County has related to this hazard is its strong agricultural industry. Tompkins County agriculture was responsible for \$60 million in revenue in 2011. A drought event occurred in 2005, resulting in significant sugar maple die-off around the County. That summer is reportedly the driest over the last 130 years. September 1999 was also a recorded dry month that caused major crop failures and some wells to run dry within Central New York. Corn and hay crops were most severely impacted.

Historical Cost and Damage Estimates

Aquifer recharge could potentially be affected by absolute or partial drought events. This may result in impacts to drinking water supplies, since stream fed water systems are affected by groundwater fluctuations. The agriculture industry would experience crop damage and plant fatality as a result of a prolonged drought event. Many farms in the County do not have local irrigation systems, so a lack of water would reduce crop production and survival. Drought conditions also have the potential to impact livestock producers, through effects such as reduced milk production, decreased stock weights, and high cost for feed. Damages from the 1999 drought event were reported to be as high as \$17.7 million in Cayuga County. Specific damage amounts were not available for Tompkins County, but are estimated to have ranged around \$1 million. Over \$60 million in agricultural products are produced annually by Tompkins County farms. Those agencies who assist with agricultural practices will continue to play a key role in mitigating impacts related to drought on farms.

Future Potential Impacts

The frequency and extent of drought conditions are expected to rise in the future due to climate change. Summer drought is projected to affect water supply, agriculture, ecosystems and energy production.

5.1.9 Infestation

General Hazard Description

Infestation is defined as an excessive population of insects, plants, rodents, or other animals requiring control measures due to their potential to carry diseases, destroy crops, or harm the environment.

Key Infestation Findings for Tompkins County

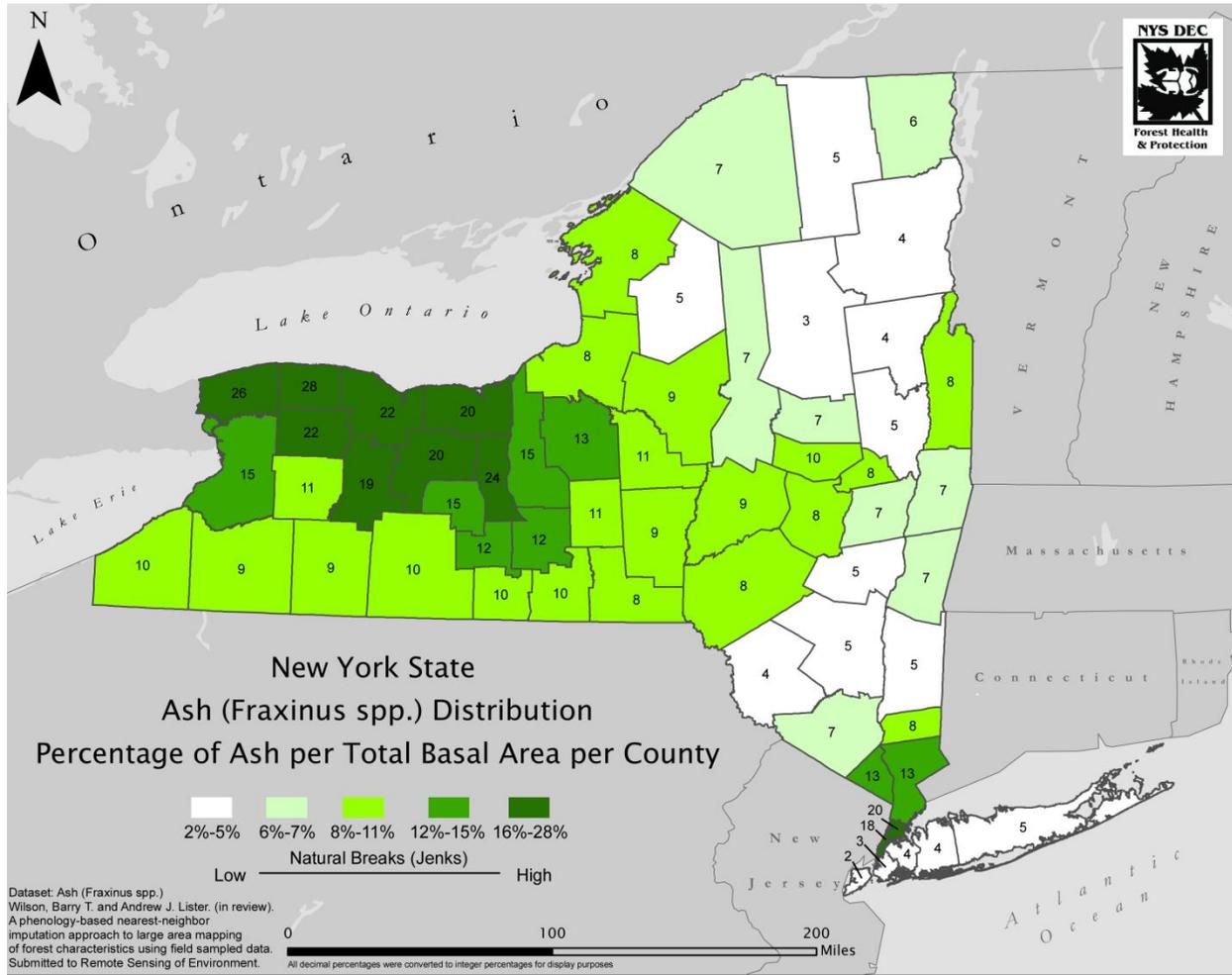
- An increase in property, road and infrastructure damages is anticipated with Emerald Ash Borer.
- Research has indicated that the prevention and eradication of Hydrilla is far cheaper than containment or management.

Historical Hazard Occurrence

Plant populations: Hydrilla is a highly invasive aquatic plant that was first detected in August 2011 in the Linderman Creek area of Cayuga Inlet. Hydrilla is a very aggressive growing plant, which can grow up to a foot a day and can grow underwater of lengths up to 25 feet. It creates a thick mat of vegetation when it grows to the water surface. This mat shades out other plants and clogs waterways in a fashion that has the potential to increase lake flooding. This plant has most immediate impacts to the City of Ithaca, but has far reaching regional impacts. Since discovering Hydrilla in the Cayuga Inlet, extensive efforts have been undertaken to limit the spread of this species into Cayuga Lake.

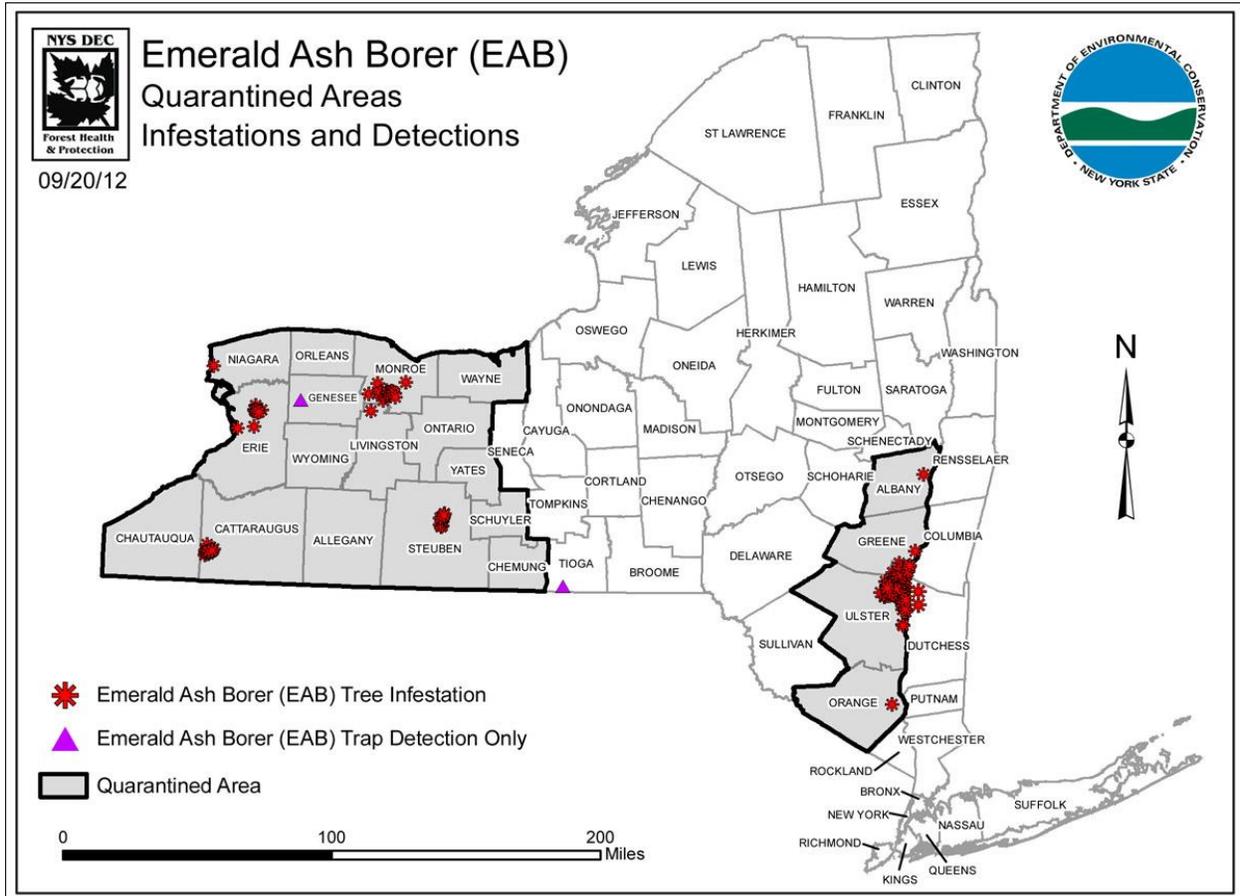
Insect populations: A detailed history of infestation events is not available for Tompkins County; however recent events and concerns have been documented. For one, the emerald ash borer (EAB) is an insect of increasing concern within NYS. This species was first confirmed in NYS on June 17, 2009, but research indicates that it has been present in some areas since the mid 1990s. Tompkins County susceptibility to this species isn't fully documented since the number of ash trees within the area has never been quantified and the areas of greatest ash density are not known. However, U.S. Forest Service (USFS) data estimates that 12 percent of the total tree volume in Tompkins County is ash (Figure 5.12). An accurate inventory of trees in priority, high-traffic areas needs to be completed so that liabilities can be calculated.

Figure 5.12 – Percentage of Ash per Total Basal per County in New York State
 (NYSDEC Forest Health and Protection, 2012)



Based on guidance from the Technical Committee, an EAB infestation can influence a community for 10-20 years after it first descends upon an area. Figure 5.13 shows the currently documented infestation locations of EAB within NYS. As shown, the closest identified infestation is in the Town of Nichols, Tioga County; Tompkins County is located just 16 miles north of this infestation location.

Figure 5.13 – Emerald Ash Borer Infestation, Detection, and Quarantine Locations within New York State
 (NYSDEC, Forest Health and Protection, 2012)



Other invasive insect pests that are documented within NYS and have the potential to impact Tompkins County include hemlock woolly adelgid (HWA) and Asian longhorn beetle (ALB). Asian long-horned beetles weaken the integrity of infected trees, which results in decreased wood quality, structural weakness, and eventual death for the tree. ALB populations attack a variety of tree species representing 15 different plant families. Appendix A - Figure 5.14 depicts locations within the Country that are susceptible to ALB infestations. Hemlock woolly adelgid poses a major threat to eastern hemlock trees, a species which is not overly abundant in Tompkins County. Regardless, changes to ecosystem structure and function could occur in riparian areas and moist sites where hemlocks thrive. It should be noted that significant tree loss will have an aesthetic impact on the County’s many natural areas which may have an impact on the region’s tourism industry. Additional insect populations that aren’t a problem right now when the forests are healthy could become a problem once the forestlands are weakened by an invasive pest.

Historical Cost and Damage Estimates

Plant populations: Ecological and economic impacts of Hydrilla are significant. This includes shading of native plants, oxygen deficits, fish kills, habitat quality change, cyanobacteria outbreaks and toxin production linkage with bald eagle. Due to the wide use of Cayuga Lake, economic impacts to tourism, fishing, swimming, and property values have the potential to be significant. The waterways affect the local economy in three primary ways; through flood protection, property tax revenues and tourism spending, particularly spending associated with recreational boating and water-dependent businesses. Property values in the waterfront are high; although nearly 97% of waterfront properties are tax exempt, annual tax revenues from the remaining 3% is over \$2 million. Finally, water-dependent businesses generated over \$2 million in sales (nearly \$700,000 of which came from docking fees) in 2008. Revenues from facilities specializing in non-motorized boats are not included. The Inlet has four primary facilities catering to non-motorized boaters: Cornell University and Ithaca College Crew facilities, a business that rents and sells canoes and kayaks, and the Cascadilla Boat Club with approximately 175 members with annual membership and training fees of \$60,000 (CCETC, 2012).

Based on the experience in Tompkins County the cost of maintenance associated with Hydrilla is substantial. The local Hydrilla Task Force elected to utilize herbicide treatments of endothall and fluridone to attempt to eradicate Hydrilla. An endothall treatment was applied on June, 26, 2012 and was deemed a success. A fluridone treatment was applied to the Cayuga Inlet area, including Cascadilla Creek and Six Mile Creek, starting July 12, 2012 and ending October 31, 2012. The funding for this effort was received from the New York State Department of Environmental Conservation in the amount of \$800,000. Appendix A – Figure 5.15 shows the specific locations where the fluridone treatment was applied. Currently, the effectiveness of this treatment is being analyzed; additional eradication efforts will likely be needed. Significant staff time of local officials from the City of Ithaca, Cornell University, Tompkins County, Tompkins County Soil and Water District and others have been used in this effort. The effort and funds expended to-date are significant. Not including in-kind contributions, approximately \$130,000 was spent in 2011 and \$460,000 in 2012. The estimate for eradication efforts in future years is approximately \$500,000 per year. Eradication of this species from the waterways of Tompkins County represents a realistic scenario that could occur at any time in association with additional invasive plant species.

Insect populations: EAB damage will very likely result in the death of all untreated ash trees within the County. Infested trees begin to fall in large sections soon after dying, causing a significant potential threat to health, property, and public infrastructure. An increase in property and road maintenance costs would likely occur and an increase in overhead utility service repair requests. Falling ash debris also has the potential to accumulate in waterways and clog culvert locations. Management efforts for the EAB and hemlock woolly adelgid often consist of insecticide treatments and removal of infested trees. Such efforts will prove to be costly, when they are needed in the future. Wood-boring pests in the U.S. cause an estimated \$3.5 billion in damage annually. When infestations are confirmed, state and national funding may be made available to the affected areas to help with the pest management and hazard mitigation. Such funds in other infested areas have ranged from \$20 million to \$65 million.

Future Potential Impacts

Given the steady increase of documented invasive species in the country, reports of new invasive populations within the County are expected to continue. A 2011 study indicated that there is over a 30 percent chance that another damaging wood boring insect will be introduced into the U.S. within the next 10 years. Local government coordination with local property owners and utility providers will be critical in mitigating risks associated with tree fall and debris management. Current climate change projections indicate that long-term temperature increases and other weather changes are likely to create a more satisfactory environment for the establishment and survival of invasive populations. According to climate changes forecasts such as ClimAID, the Southern Tier of New York State, including Tompkins County, will likely be the first area of the state to be affected by invasive plant and animal species.

5.1.10 Extreme Temperatures

General Hazard Description

An extreme temperature event was determined to occur if an event lasted for at least 3 days with a temperature colder than -10 degrees Fahrenheit (cold wave) or hotter than 95 degrees Fahrenheit (heat wave). This hazard is defined by extended periods of excessive cold or hot weather with a serious impact on human and/or animal populations, particularly elderly and/or persons with respiratory ailments. People living in urban environments may be at greater risk from the effects of prolonged heat wave than those living in rural areas due to the “urban heat island effect.” Exposure to extreme temperatures for prolonged periods of time can result in death.

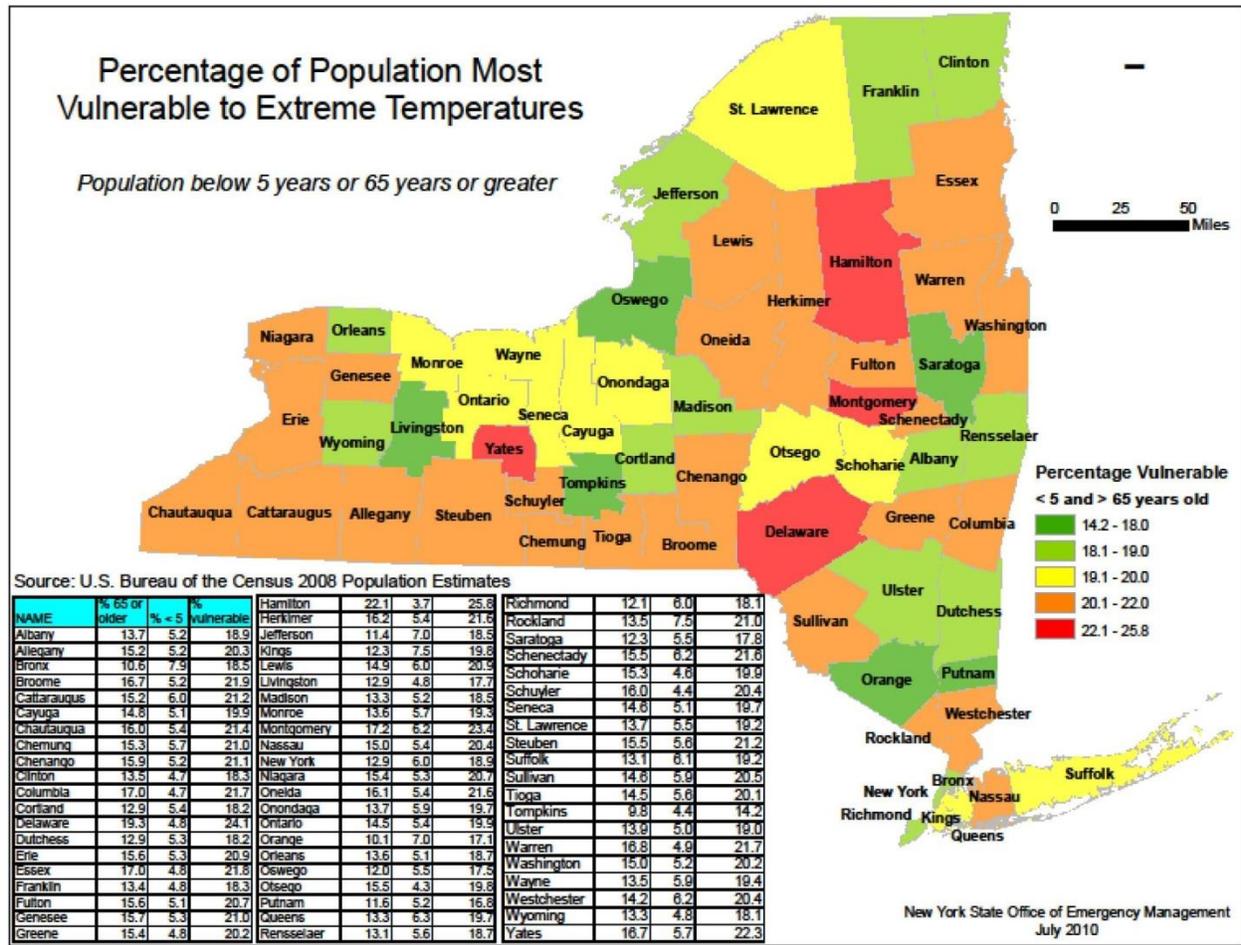
Key Extreme Temperature Findings for Tompkins County

- 45 extreme cold events have occurred over the past 29 years.
- Just 2 Extreme heat events (3 consecutive days with temperatures of 100 degrees Fahrenheit (standard for extreme heat events)) have occurred over the past 29 years.

Historical Hazard Occurrence

According to the NWS, 45 cold events have occurred in Tompkins County over the past 29 years and 2 heat events have occurred in the County over the same time period that have exceeded 100 degrees Fahrenheit for three or more consecutive days. Figure 5.16 depicts the NYS Counties with the highest and lowest rates of vulnerable populations (aged < 5 and > 65 years). Tompkins County exhibits a vulnerable population of 14.2 percent of the total County residents. This number further breaks down to 9.8 percent aged 65 and older and 4.4 percent aged less than 5 years.

Figure 5.16 – Percent of Populations Most Vulnerable to Extreme Temperature Events
(NYS Hazard Mitigation Plan, 2011)



Historical Cost and Damage Estimates

Most concern related to extreme heat events occur when people or animals are overexposed to heat and have over-exercised for their age and/or physical condition. Older adults, young children, and those who are sick or overweight are more likely to experience the adverse effects of extreme heat. Similarly, cold events have a greater potential to affect elderly populations. Historically, Tompkins County has opened cooling centers at Cornell University and elsewhere to provide heat relief to the public, especially vulnerable populations.

Future Potential Impacts

NYSERDA’s ClimAID report states that temperatures will continue to rise over the next several decades, indicating that extreme heat events would increase in frequency and duration. Because of this warming, extreme cold events are not likely to increase in duration and frequency.

5.1.11 Epidemic

General Hazard Description

An epidemic is the occurrence or outbreak of disease to an unusual number of individuals or proportion of the population, human or animal.

Key Epidemic Findings for Tompkins County

- Tompkins County is considered to be notably vulnerable to this hazard because of its significant number of international student populations.
- The County's active role in the H1N1 virus preparations (2009) has provided a framework for epidemic risk reduction.

Historical Hazard Occurrence

There is no extensive record of historic epidemic events within Tompkins County. However, because of the diverse global representation found on the Cornell University and Ithaca College campuses, the County is notably vulnerable to human outbreaks of disease. Recent epidemic events that have been previously documented in Tompkins County include avian flu (2003), influenza A (H1N1) (2009), and severe acute respiratory syndrome (SARS). Agricultural epidemics are also an important component of this hazard in Tompkins County. Historic epidemics that have affected the agricultural community include leucosis, Marek's disease, as well as foot and mouth disease.

Historical Cost and Damage Estimates

A large-scale epidemic event could affect large numbers of people and has the potential to result in mass care and/or mass casualties. Initiatives to quarantine and/or vaccinate residents to prevent the spread of a particular disease would be an expensive, but needed, effort. Because historic records of previous epidemic events are not available, it is difficult to estimate that total damages that could occur from a widespread event. Because the majority of the County's economy relies on agriculture and farming, an increase in agricultural epidemics would also be costly to the area.

Future Potential Impacts

Global trends indicate that pandemics occur in predictable cycles. The last mass pandemic was the 1912 Spanish Flu; experts suggest that the next cycle is approaching and that jurisdictions should begin preparing for this future occurrence. Because diseases are dynamic, it is difficult to predict what types may appear in the future and what the most effective way is to combat these potential events. Agricultural epidemics should also continue to be addressed through both mitigation and response plans. Climate change may increase the likelihood of epidemics due to increased floodwaters contaminating drinking water supplies and increasing temperatures allowing more disease-causing agents and vector-borne diseases to flourish. One of the future goals of Tompkins County, related to epidemic events, is to build partnerships with other agencies and groups to prepare for such events.

5.1.12 Tornado

General Hazard Description

Tornadoes are described as local atmospheric storms, generally of short duration, formed by winds rotating at very high speeds. The vortex of the tornado can be up to several hundred yards wide and is visible to the observer as a whirlpool-like column of winds rotating about a hollow cavity or funnel. Tornado winds have been estimated to be as high as 400 miles per hour. During the County's 2012 risk assessment discussion, it was determined that a credible worst-case scenario for a tornado event is a F2 or F3 magnitude. Tornadoes of these magnitudes commonly exhibit 3-second wind gusts between 110 and 209 mph (Appendix A – Table 22).

Key Tornado Findings for Tompkins County

- Five historic tornado events have been documented for Tompkins County between 1952 and 2009 (57 years).
- The most recent tornado event to impact the County occurred in April 2011 in the Town of Danby.

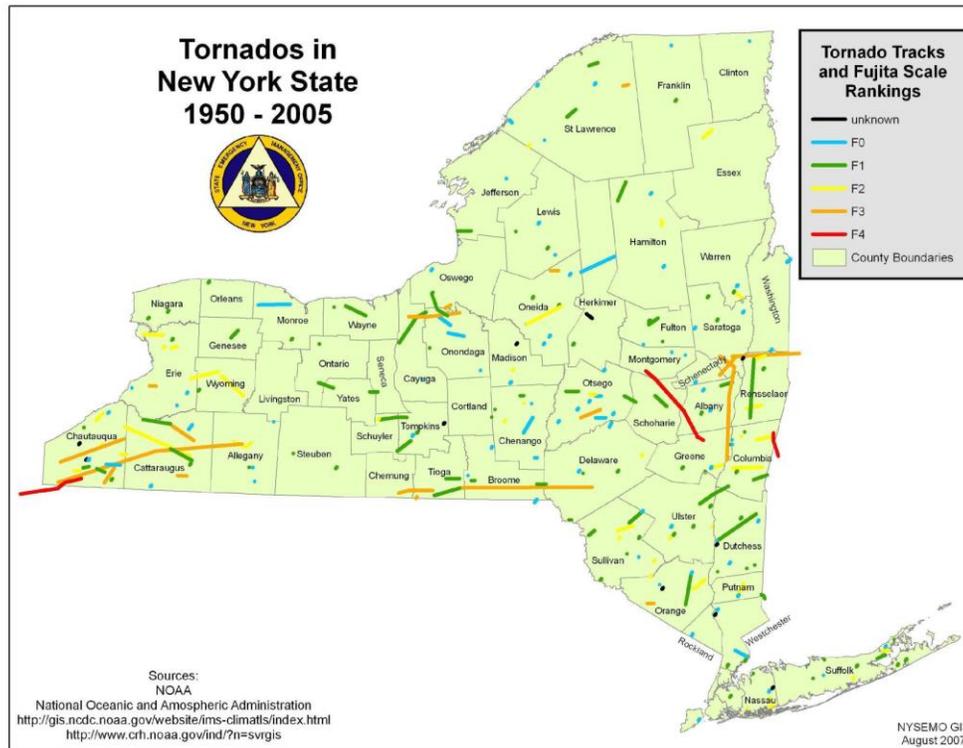
Historical Hazard Occurrence

As indicated by Appendix A - Figure 5.17, Tompkins County is mapped in a light yellow shaded area, denoting that between one and five F3, F4, or F5 tornadoes have occurred within the County for every 3,700 square miles. Appendix A – Figure 5.18 shows that Tompkins County, and the majority of NYS, is not mapped within a high risk area for tornado events.

The State Hazard Mitigation Plan includes five records of tornadoes that occurred in Tompkins County between 1952 and 2009; details of these hazard events are included in Table 23. Tracks of these tornadoes are depicted on Figure 5.19. Anecdotal information indicates that a minor tornado event occurred in Ulysses in the early 1990s, damaging a residence. The most recent tornado recorded for Tompkins County, and the event reported by the NCDC, occurred on April 28, 2011, in the Town of Danby and the Town of Ithaca. The path of this tornado stretched from the northern boundary of the Town of Danby and Route 96B, southwest, to the Town of Ithaca's western boundary. This event resulted in significant tree damage along this hazard route.

Date	Location	Magnitude	Details
08/25/1961	Tompkins Co	F0	\$25,000 in property damage
06/20/1969	Tompkins Co	F1	\$25,000 in property damage
06/18/1977	Tompkins Co	Undetermined	\$3,000 in property damage
08/28/1988	Tompkins Co	F1	\$250,000 in property damage
8/21/1994	Dryden	F0	\$500,000 in property damage

Figure 5.19 – Tornado Tracks within New York State, 1950-2005
(NYS Hazard Mitigation Plan, 2011)



Historical Cost and Damage Estimates

It is difficult to accurately estimate potential damage levels associated with this hazard in Tompkins County because of the limited historic occurrence of tornados in this area. Hundreds of millions of dollars' worth of damages would likely occur if a tornado tracked through the center of the City of Ithaca, while much smaller damage levels can be assumed for tornados in more rural portions of the County. According to the loss estimates reported from the NYS Hazard Mitigation Plan for this hazard, damages have historically ranged between \$3,000 and \$500,000 within Tompkins County. It is estimated that \$627,200 in (public or private) property damage resulted from the 2011 tornado that touched down in the Town of Danby. Therefore, it is reasonable to estimate that an F2 or F3 tornado event would result in over \$1 million in damages within the County.

Future Potential Impacts

Recent climate change projections predict an increase in severe weather events. Such events could include tornado occurrences. The frequency of this hazard occurring in Tompkins County will continue to remain low, despite these severe weather projections. The National Weather Service does have active advisory processes in place to warn residents of potential tornado threats. Pre-disaster warnings such as this will help to minimize the potential damage that could occur within the County as a result of a tornado event. Such warnings are anticipated to at least limit the amount of potential deaths and injuries associated with a tornado event. Impacts could

occur anywhere in the County and affect a wide range of existing infrastructure and properties. The exact path and touchdown locations of a tornado are often difficult to predict.

5.2 Technological and Human-caused Hazard Profiles

Details associated with the eight technological and human-caused hazards profiles in this section were obtained using Geographic Information System (GIS) layers, technical and project committee knowledge, Tompkins County records, NYS OEM and FEMA data and information, and other resources, as appropriate.

5.2.1 Transportation Accident

General Hazard Description

A transportation accident is defined as a mishap involving one or more conveyances on land, sea, and/or in the air, which can result in multiple casualties and/or substantial loss of property.

Key Transportation Accident Findings for Tompkins County

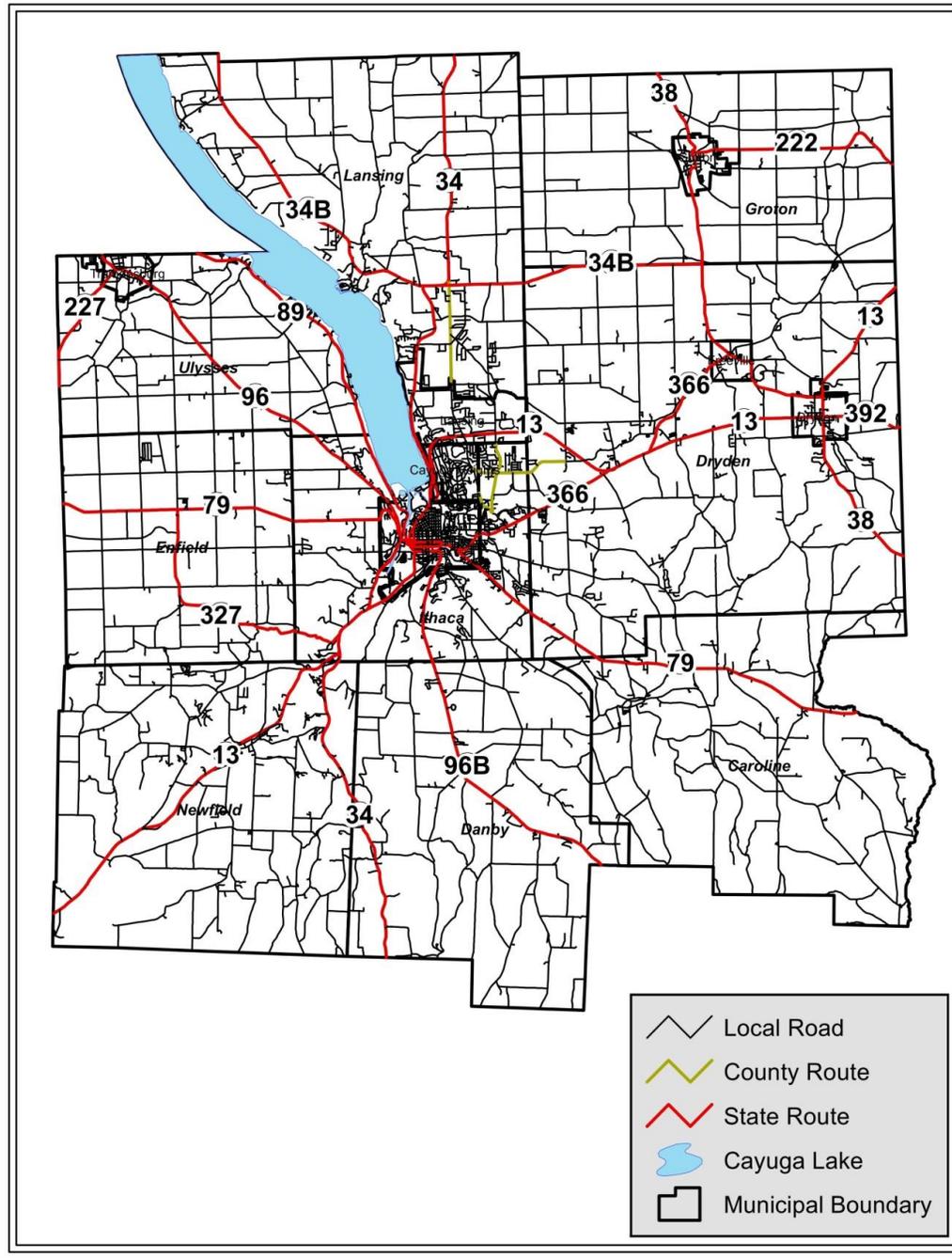
- Approximately 2,500 transportation accidents occur in Tompkins County each year. In 2010, 11 accidents resulted in fatalities, which is slightly above average.
- The City of Ithaca has the highest crash rate within the County, but the lowest deer collision rate.

Historical Hazard Occurrence

Transportation accidents are unpredictable, both in time, location, and frequency. On average, there are less than 10 accidents a year in Tompkins County that result in fatalities (NYSDMV, 2000). The highest accident rates and most severe accidents occur on the State Routes (SR) located within the County. These State Routes total approximately 176.3 miles in length and include the following route numbers: 13, 13A, 222, 227, 327, 34, 34B, 366, 38, 392, 79, 89, 930F, 96, and 96B. The prevalence of accidents along these routes is likely attributed to higher posted speed limits and a greater volume of traffic. Figure 5.20 shows the locations of State Routes within Tompkins County.

Accident information and data for Tompkins County was obtained from the Ithaca-Tompkins County Transportation Council (ITCTC). ITCTC created maps using the NYS Department of Transportation's Accident Location Information System (ALIS) 200-2009 data. The highest crash rate within the County was reported for the City of Ithaca. Numerous roads within the City report having between 9 and 15, or > 15, accidents per million vehicle miles. The severity of accident data looks at the amount of fatalities and injuries per reported accident (severity index). The severity index shows the occurrence of severe accidents throughout all portions of the County, though six roads in particular have a rating >15: Shaffer Road (Town of Newfield), Bostwick Road (Town of Ithaca), Fall Creek Road and West Dryden Road (Town of Dryden), and Ridge Road (SR 34B) and Auburn Road (SR 34) (Town of Lansing). Accident data involving pedestrians and bicyclists were also reviewed. The City of Ithaca had the highest rate of accidents involving a pedestrian or a bicyclist.

Figure 5.20 – State Route Transportation Network in Tompkins County
(NYSDOT, ALIS, 2004)



A healthy deer population in Tompkins County is also a variable linked to transportation accidents. The City of Ithaca has the lowest deer collision rate in the County. In contrast, there are 13 roads in the County where > 25 % of all accidents that occur involve deer collisions: Bundy Road (Town of Ithaca), Ellis Hollow Road (Towns of Ithaca and Dryden), Bostwick Road and Trumbulls Corners Road (Town of Enfield), Perry City Road (Town of Ulysses), Ridge Road and North Triphammer Road (Town of Lansing), Asbury Road and Scofield Road (Towns

of Lansing and Dryden), West Dryden Road (Town of Dryden), and Sovocool Hill Road, Spring Street Extension, and Cobb Street (Town of Groton).

No records of accidents involving other modes of transportation were available or located. During the County's risk assessment, it was estimated that a bus accident occurs about once per year and that runaway truck accidents occur approximately once every other year.

Historical Cost and Damage Estimates

Often times, the damages involved in accidents, particularly vehicular, are the responsibility of the drivers involved. When damage to public infrastructure occurs, the local jurisdictions may be responsible to make repairs. A high frequency of transportation accidents occurs within Tompkins County, but the majority does not result in loss of life or damage to property. According to the New York Department of Transportation's Accident Location Information System (ALIS), the City of Ithaca does historically have the highest number of accidents (1,375 in 2010) though only a small percentage of those accidents result in fatalities (1 in 2010, or 0.1%). Fewer accidents occur in the surrounding rural areas, however of those accidents a higher percentage are fatal. For example, in 2010 the Town of Enfield was noted as having 95 accidents, 20 of which (21.1%) resulted in injuries. Of these 2 (2.1%) resulted in fatalities.

Future Potential Impacts

Transportation accidents, particularly vehicular, will continue to occur within Tompkins County and will be difficult to predict. With the potential of future shale gas drilling, truck traffic is anticipated to increase throughout the region. The New York State Department of Environmental Conservation's Supplemental Generic Environmental Impact Statement (SGEIS) for High-Volume Hydraulic Fracturing notes that truck traffic associated with this practice is two to three times higher than traditional vertical well drilling. This increase is largely due to the need for heavy truck water delivery. The SGEIS notes that a single well may produce nearly 6,000 truck trips. Regional truck traffic would likely increase even if no wells are drilled in Tompkins County. Local roads and minor collectors would likely experience the most level of congestion and potentially accidents. The SGEIS indicates, "An increase in the amount of truck traffic, and vehicular traffic in general, traveling on both higher and lower level local roads would most likely increase the number of accidents and breakdowns in areas experiencing well development" (NYSDEC, 2011).

5.2.2 Fuel Shortage

General Hazard Description

A fuel shortage is defined as a situation in which the normal quantity and/or timely delivery of fuel supplies to distributors and retail establishments are interrupted. As part of this document, the definition was further expanded to assume that a fuel shortage event would occur County-wide.

Key Fuel Shortage Findings for Tompkins County

- Fuel shortage events are limited to the 1973 oil crisis and the 1979 energy crisis.

- The growth of alternative fuels and green living helps to reduce dependence on fuel.

Historical Hazard Occurrence

Two documented occurrences of fuel shortages have historically affected Tompkins County. The 1973 oil crisis resulted in gas rationing across the country, while the 1979 energy crisis caused widespread panic and odd-even gas rationing in NYS.

Historical Cost and Damage Estimates

No cost figures were available to determine how much it cost the County or State to implement and oversee gas rationing during the 1973 or 1979 events. No other fuel shortage events have been recorded in the County, so damage estimates are not available.

Future Potential Impacts

World politics and natural hazards are hard to predict, especially in the long-term, so it is difficult to know when a world event may occur that would threaten the U.S.' supply and acquisition of fuel. Regardless, as economic growth continues to trend toward alternative fuels and alternative transportation options, the demand for fuel may decrease. If this decline is achieved, it is likely to be slow, as alternative fuel use is still in its infancy in the County.

5.2.3 Fire (Urban)

General Hazard Description

Fire is defined as the uncontrolled burning in residential, commercial, industrial, institutional, or other structures in developed areas. It is important to note that fire spreads quickly. Heat and smoke from fire can be more dangerous than the flames themselves. Fire produces poisonous gases that make a person disoriented and drowsy. Asphyxiation is the leading cause of fire deaths. For the purposes of this document, a fire is defined as a block or neighborhood scale event.

Key Urban Fire Findings for Tompkins County

- Fire is defined as a block or neighborhood scale event.
- As storm severity increases, the potential for fire to occur also increases.

Historical Hazard Occurrence

There is no historical evidence of fire events affecting Tompkins County. Numerous smaller scale fires that have been isolated to one or two buildings or properties have occurred in the past; a handful of such events occur within the County annually.

Historical Cost and Damage Estimates

Given that no urban fire events that match the hazard definition have occurred in Tompkins County, damage estimates from such an event were not available. According to the TCPD, the City of Ithaca has the highest full market assessed property value, totaling \$17,701,001,320. The City is home to 5,555 properties. A hypothetical scenario may consist of a block fire in the City that impacts 5 houses at 80% of their total value. This hazard event scenario would result in approximately \$12,745,995 in total damages.

Future Potential Impacts

This hazard received a moderately low ranking due to its infrequent occurrence within the County. As storm events increase in severity and frequency over the coming decades, as is predicted by climate change research, the potential for fire to occur as a cascading hazard increases.

5.2.4 Utility Failure

General Hazard Description

Utility failure includes the loss of electric power supply, telephone service, or public water supply as a result of an internal system failure or by the effects of a natural disaster. A widespread electrical power outage could cause traffic accidents, civil unrest, and failures to other utility infrastructure that relies on electricity.

Key Utility Failure Findings for Tompkins County

- Utility failure impacts every jurisdiction at least once a year.
- The severity and frequency of utility failures are anticipated to increase in the future, as storm occurrence and severity increases.

Historical Hazard Occurrence

For many of the natural disasters previously profiled, utility failure was identified as a cascading hazard, meaning it results from another hazard. The frequency of a power failure is approximately once a year in each jurisdiction, with typical duration of less than a single day (less than 24 hours). Historical documented utility failures in Tompkins County include:

- 2000 – Town of Dryden
- August 2003 – Northeast blackout – power restored by next day
- May 2004 – Town of Dryden – electricity
- June 2005 – Town of Dryden – power restored same day
- May 2012 – Village and Town of Dryden

The most significant regional event listed was the 2003 blackout. Power was restored by the following day; however, thousands of people were impacted. This power outage event was declared a Presidential Disaster, authorizing up to \$5 million in federal funding to reimburse local and state governments that were negatively impacted.

Historical Cost and Damage Estimates

Although accurate figures were not found to assess the cost of power outages, the disruption of services, spoiling of food, and loss of work production could range from the hundreds of thousands to millions of dollars. Since utility failures rarely occur by themselves, and not as a result of another hazard, specific data within Tompkins County is limited. A previous concern revolved around the water treatment plants in the County in the event of a power failure. This is less of a concern given that many of the plants are now installing full size generators in preparation for such occurrences. Residents with private wells would however lose potable water supply during a power failure.

Future Potential Impacts

NYSERDA's climate change research points to an increased severity and frequency of extreme weather events. Extreme weather events and utility failure go hand in hand; therefore, an increase in the severity and frequency of utility failures is presumed.

5.2.5 Water Supply Contamination

General Hazard Description

Water supply contamination is defined as the contamination, or potential contamination, of surface or subsurface public water supply by chemical or biological materials that results in restricted or diminished ability to use the water source. Though single property events will be discussed, this hazard was determined to occur if it affected a large region; the effects were reviewed from a population standpoint and not based on affected geographic area.

Key Water Supply Contamination Findings for Tompkins County

- Water supply contamination concerns are estimated to occur once or twice every 10 years.
- Isolated contamination events are estimated to cause approximately \$25,000 in damages, while a larger scale event could result in millions of dollars in damages.

Historical Hazard Occurrence

Approximately fifty (50) percent of the County's population receives public water; the remaining households are on private well systems. During droughts and dry seasons, some well residents have experienced inadequate water supplies. These wells are susceptible to contamination from spills, herbicide and pesticide run-off, and leaking underground storage tanks. County residents that receive public water are largely supplied by one of three water treatment plants (WTP): Cornell WTP (withdraws from Fall Creek), City of Ithaca WTP (withdraws from Six Mile

Creek), and Bolton Point WTP (withdraws from Cayuga Lake). Other “village systems” serve the Villages of Dryden, Groton and Trumansburg as well as the Hamlet of Newfield.

Documented events of water supply contamination that have occurred in Tompkins County include:

- MTBE and gasoline contamination in the Village of Groton as a result of a Smith Corona spill, which has now been remediated.
- The Town of Newfield’s Shelter Valley Water System has received multiple “do not drink” orders from the County Department of Health in the past.
- Prior to 1981, the City of Ithaca’s and Cornell’s WTPs were shut down on multiple occasions because of high turbidity and nearby fuel oil spills.
- In 1997 a fuel oil spill from a fuel truck resulted in a water supply outage at the Cornell WTP for 6 days.
- On December 4, 2009, an attempted theft of gasoline from the Caroline Highway Facility resulted in 500 gallons of fuel leaking into Six Mile Creek.
- Precautionary shutdown of the City of Ithaca’s water treatment plant occurred as a result of an overturned truck on Burns Road that leaked diesel fuel into the reservoir.

Historical Cost and Damage Estimates

Contamination of the public water supplies within Tompkins County is a concern because of the amount of people that rely on these systems. A history of both fuel and manure spills have occurred in the County which has led to water supply contamination. Even short-term water supply outages can cause hardships on residents. The spill event that occurred in 2009 resulted in \$25,000 in losses and damages. This contamination event represents a realistic hazard scenario and damage estimate for Tompkins County. A larger scale water supply contamination event has the potential to result in millions of dollars in damages due to the number of properties and residents that would be affected.

Future Potential Impacts

Increased flooding expected as a result of climate change is likely to cause an increase in the number of water supply contamination events in the future, beyond the current documented water supply contamination events rate of one to two events every ten (10) years. While numerous safeguards are put in place at the water treatment plants to account for short-term outages or shut downs, it is likely that these safeguards will be relied upon more heavily in the future. As an example, Bolton Point must now monitor for pesticides in their intake and finished water. Another concern that was voiced during the County’s risk assessment was how susceptible private well water supply, as is found in much of the rural areas of the county, would be to contamination due to less predictable precipitation in the future.

One added area of increasing concern is the aging infrastructure of pipelines that cross several of the County’s creeks. These pipelines carry a variety of potentially dangerous materials, including sewage, oil, and natural gas. It is estimated that these pipelines cross at least 60 stream locations in the County, many of which have been observed as being in poor condition. The

rupturing of these pipelines could have immediate adverse impacts to water quality and, in many cases, could put drinking water supplies at risk. More detailed analysis and mitigation should be undertaken by local government, pipeline owners, and local stakeholders to reduce this risk.

5.2.6 *Hazardous Materials in Transit*

General Hazard Description

Hazardous materials in transit events consist of an uncontrolled release of material during transport, which when released can result in death or injury to people and/or damage to property and the environment through the material's flammability, toxicity, corrosiveness, chemical instability, and/or combustibility.

Key Hazardous Materials in Transit Findings for Tompkins County

- Historical hazardous materials in transit events have been minor with limited clean-up needs and no long-term impacts.
- The frequency and severity of hazardous material in transit occurrences may increase if hydraulic fracturing is approved in New York State.

Historical Hazard Occurrence

In addition to rail transport, hazardous materials are transported through Tompkins County on several of the State Routes that traverse the area. Rail car transport is limited to rock salt and coal; no other hazardous materials are transported by rail in the County. These routes are major transport corridors since interstate access to the County is limited. During peak traffic times, it is estimated that over 400 freight trucks pass through the County every two hours. Often times, the materials being transported by trucks or train are unknown, making it more difficult to deal with a hazardous materials situation when it does occur. New York State does not require the registration of vehicles that transport hazardous materials, or require that such vehicles follow a set route; however it is required that federal codes be followed for marking and placarding of such trucks (ITCTC, 2002). Historical hazardous material events noted within the County include:

- 1988: A fuel truck overturned along NYS Route 96 in the Town of Ulysses.
- 1997: A train derailed in the Town of Dryden causing a fuel oil spill that led to the shutdown of the Cornell WTP.

Historical Cost and Damage Estimates

Specific damage reports associated with previous hazardous materials in transit events were not available. In cases of minor fuel oil spills, \$10,000 would cover the cost of clean-up, but larger events involving WTP shutdowns or prolonged road or railroad closures could result in much larger costs.

Future Potential Impacts

Hazardous materials in transit concerns are expected to continue in the future given the frequency of truck and train transportation within Tompkins County. Although prior hazard events were mostly minor with short-term impacts, a growing concern among County residents is the potential for hydraulic fracturing fluids to be transported through the area, especially if such an activity is approved to occur within New York State in the future. As discussed under the Transportation Accident hazard, the number of trucks traveling on roads in the County is expected to rise dramatically if shale gas drilling is approved. The SGEIS for High Volume Hydraulic Fracturing notes that trucks will be transporting potentially hazardous materials and that “additional transport resulting from horizontal drilling poses an additional risk” (NYSDEC, 2011). Tompkins County Department of Emergency response does not anticipate hazardous material transport associated with gas drilling to cause major disruptions, though the Department is preparing a plan to address potential impacts related to drilling operations. This concern is further detailed in Section 4.5.

5.2.7 Terrorism

General Hazard Description

Terrorism is defined as the threat or use of violence to achieve political or social ends usually associated with community disruption and/or multiple injuries or deaths.

Key Terrorism Findings for Tompkins County

- Cornell University received anthrax threats concurrent with the national anthrax episodes post-September 2001.

Historical Hazard Occurrences

A major terrorist event has never been documented within Tompkins County; however, Cornell University and other facilities received anthrax threats concurrent with the national anthrax episodes post-September 2001. Because of the potential for mass casualties to occur as a result of such a terrorist event, the fact that such events occur with no warning, and the concern that such events are likely to increase in the Country in the future, this hazard was assessed as part of Tompkins County’s HMP. Terrorism is determined to have a moderately low potential of occurrence within the County, as there are no significant targets recognized within the area.

Historical Cost and Damage Estimates

Terrorism events can result in a wide range of damages and recovery costs. A small isolated event may result in a minor disruption with low damage and cost implications, while a large-scale event could take years of recovery and cost billions of dollars to clean up and re-build an area. Given the unpredictable nature and variety of terrorist actions, it is difficult for the County and municipalities to be prepared and secure the proper equipment for such an event.

Future Potential Impacts

An isolated terrorist event has a low potential to occur within Tompkins County. Though no nationally significant targets were identified within the County, facilities such as airports, municipal buildings, universities, and water/wastewater treatment plants have a potential of being targeted in Tompkins County. Although occurrences have been relatively minor, agricultural terrorism should continue to be addressed, largely through response plans.

5.2.8 *Civil Unrest*

General Hazard Description

Civil unrest is defined as an individual or collective action causing serious interference with the peace, security, and/or functioning of a community. This hazard governs major disruptions, not just civil disobedience events.

Key Civil Unrest Findings for Tompkins County

- Incidents of civil unrest within Tompkins County are infrequent and are commonly associated with Cornell University or Ithaca College.
- Civil unrest and public demonstration events in Tompkins County are normally peaceful and focused on a specific cause.

Historical Hazard Occurrences

Although public demonstrations are frequent events in Tompkins County, major incidents of civil unrest are less frequent and are normally associated with Cornell University or Ithaca College students in the City and Town of Ithaca. Campus parties and student activities, including Slope Day at Cornell University and Fountain Day at Ithaca College, often require additional law enforcement, medical services, or fire personnel to become involved. Noise ordinances, particularly the ordinance implemented by the Town of Ithaca, have resulted in the noted decrease in noise related events. The largest civil unrest occurrence in Tompkins County occurred on the Cornell University campus in 1968 when a group of students took over Willard Straight Hall. Other documented events include: a demonstration that blocked traffic on Green Street, the occupying of Immaculate Conception Catholic Church on Seneca Street, and a demonstration in the Town of Dryden on the ethical treatment of animals.

Historical Cost and Damage Estimates

Though civil unrest events have been known to cause property damage and vandalism, this is not the case with the majority of the civil unrest events and public demonstrations in Tompkins County. These events are normally peaceful and focused on a specific cause. The costs related to the extra law enforcement required to deal with large or unruly events is the highest cost associated with this hazard.

Future Potential Impacts

Civil unrest and organized demonstrations are unpredictable, though Tompkins County, with its three institutions of higher education, may be at higher risk than surrounding counties for these types of events to occur.

6.0 Hazard Vulnerability

The Tompkins County HIRA-NY risk assessment was completed to identify the hazards with the highest potential to impact the County and associated jurisdictions. This information was used to guide the subsequent ranking of such hazards in order of the most severe and/or frequently occurring type, to help determine the highest priority of need with respect to implementation of pre-disaster action, and to guide the focus for recommendations and mitigation actions to be included in this HMP Update. After these pertinent hazards were identified and profiled, the vulnerability assessment, as described below, was completed to provide a quantitative estimate of the people and property that may be susceptible to a particular hazard event.

Each Town and Village was asked to provide information concerning the occurrence of hazards in their community and to help identify what areas these hazards affected. This information was combined with information provided by FEMA, via the FEMA website, and from the NYSOEM with respect to relative cost of damages reported for various declared disaster events in New York State.

6.1 Identify Assets

Critical facilities identified within Tompkins County include, but are not limited to, the E-911 Emergency Center, schools, fire departments, hospitals, medical centers, County and Town highway garages, government agencies, Town and Village Halls, police departments, local operational offices for telephone and electrical power utilities, airports, water supply facilities, waste water treatment facilities, etc. These facilities represent the critical assets located within the County. For the purpose of this planning document, lists of these critical facilities were prepared using information provided by the County, Towns, and Villages and are provided as Appendix G. A list of community assets and critical facilities was not identified in the original plan.

6.2 Damage Potential

The damage potential for housing within Tompkins County was estimated using housing characteristics and housing values reported by the U.S. Census Bureau's American Fact Finder. In 2011, 39,000 occupied housing units were identified in Tompkins County; 22,000 (55 percent) were owner occupied and 18,000 (45 percent) were renter occupied. These numbers represent an approximate 7 percent vacancy rate among existing residential structures in the County.

The damage potential for housing within Tompkins County was estimated using 2012 tax parcel data provided by the Tompkins County Department of Assessment. Care was taken to ensure housing types were not consolidated so as to better compare across jurisdictions. Information on the age of mobile homes was not available; therefore, these residential structures were not included in the Table 24 analysis. Tables 24, 25 and 26, below, further detail the housing types and values reported for the participating jurisdictions within Tompkins County.

Table 24 – Housing Types
(Tompkins County Department of Assessment, 2013)

	1 Family Residential	2 Family Residential	3 Family Residential	Apartment	Estate	Manufactured Housing	Manufactured Housings	Manufactured Housing Park	Multiple Residence	Residence with Commercial Use	Rural Residential	Rural Residential & Agriculture	Rural Residential & Recreation	Seasonal Residence	Mobile Home
Town of Caroline	698	58	8	12	0	146	5	2	28	2	0	42	143	19	187
Village of Cayuga Heights	707	147	8	16	1	0	0	0	0	0	0	0	0	0	0
Town of Danby	795	92	3	7	0	53	2	0	16	3	0	54	205	17	103
Village of Dryden	517	44	8	19	0	1	0	0	7	2	0	1	1	0	1
Town of Dryden	795	92	3	7	0	53	0	2	16	3	0	54	205	17	1100
Town of Enfield	551	32	4	16	0	295	36	7	16	3	0	44	111	5	527
Village of Freeville	119	21	2	2	0	2	0	0	2	1	0	0	2	0	0
Village of Groton	541	57	15	20	0	10	1	1	4	1	0	1	2	0	66
Town of Groton	680	19	1	6	0	305	9	1	13	2	0	52	161	0	357
City of Ithaca	2542	868	116	540	0	0	1	1	39	9	1	0	0	0	110
Town of Ithaca	2704	473	11	75	0	0	0	1	31	7	2	8	58	4	64
Village of Lansing	499	50	3	11	1	2	0	0	4	0	0	0	4	0	2
Town of Lansing	1980	114	19	33	1	211	12	5	48	8	1	48	134	27	305
Town of Newfield	866	62	5	20	269	28	0	9	31	5	0	32	168	10	816
Village of Trumansburg	707	147	8	16	1	0	0	0	0	0	0	0	0	0	104
Town of Ulysses	988	45	6	11	41	2	1	1	19	2	49	111	35	0	58
Tompkins County	15689	2321	220	811	314	1108	67	30	274	48	53	447	1229	99	3800

Table 25 – Age of Structures <i>(Tompkins County Department of Assessment, 2013)</i>					
	<1940	1940-1959	1960-1979	1980-1999	2000-2011
Town of Caroline	458	101	230	249	99
Village of Cayuga Heights	255	294	239	113	22
Town of Danby	306	141	293	343	171
Village of Dryden	193	96	195	163	34
Town of Dryden	702	417	952	821	406
Town of Enfield	256	96	172	242	94
Village of Freeville	95	19	27	19	14
Village of Groton	430	42	149	98	26
Town of Groton	485	80	176	190	123
City of Ithaca	2948	390	811	703	128
Town of Ithaca	580	706	1018	990	275
Village of Lansing	39	71	129	296	134
Town of Lansing	603	312	566	759	428
Town of Newfield	366	119	377	307	147
Village of Trumansburg	290	90	99	77	41
Town of Ulysses	467	221	250	304	146
Tompkins County	8473	3195	5683	5674	2288

Table 26 – Housing Values <i>(Tompkins County Department of Assessment, 2013)</i>							
	Less than \$50K	\$50-99K	\$100-149K	\$150-199K	\$200-299K	\$300-499K	\$500K or greater
Town of Caroline	24	100	365	304	264	106	90
Village of Cayuga Heights	0	0	11	46	304	395	122
Town of Danby	29	174	361	318	240	106	17
Village of Dryden	5	59	327	147	57	4	1
Town of Dryden	96	363	946	888	726	260	52
Town of Enfield	104	294	356	193	133	29	13
Village of Freeville	1	23	85	33	7	1	1
Village of Groton	20	272	289	55	14	1	2
Town of Groton	98	443	421	184	81	21	1
City of Ithaca	14	190	793	1251	1209	483	178
Town of Ithaca	3	84	494	1029	1129	552	80
Village of Lansing	2	34	45	66	163	205	58

	Less than \$50K	\$50-99K	\$100-149K	\$150-199K	\$200-299K	\$300-499K	\$500K or greater
Town of Lansing	43	248	619	576	454	486	213
Town of Newfield	65	369	598	281	146	33	13
Village of Trumansburg	2	6	28	66	258	332	94
Town of Ulysses	24	100	365	304	264	106	90
Tompkins County	530	2759	6103	5741	5449	3120	1025

These data reveal that a considerable amount of residential infrastructure in the County was constructed before 1960, of which over two-thirds was built prior to 1940. Older houses are typically more susceptible to impacts or damage from an ice storm, winter storm, windstorm, fire event, etc. Approximately 24-percent of occupied housing in Tompkins County is represented by mobile homes that also are more vulnerable to damage from major disasters. In addition, based on 2011 U.S. Census Bureau data, an estimated 7-percent of all housing within the County remains unoccupied. Vacant structures and properties often fall into a state of disrepair, making them more susceptible to damage from storm events.

The approximate median value of an occupied housing unit in Tompkins County is \$199,000 (U.S. Census Bureau, 2011). If 1 percent (265 units) of the total occupied housing units in Tompkins County were demolished by a severe storm event, a tornado for example, the potential value of damage would amount to \$52,735,000. Granted, natural storm damage does not typically amount to complete destruction of homes in Tompkins County, but this scenario does demonstrate how significant the damage has the potential to be when only a limited amount of total infrastructure within the County is affected. Even if 1 percent of houses in the County each sustained only \$1,000 in minor damage from a storm event, it would still amount to a considerable sum: \$265,000.

The following Table 27 provides an approximate monetary range for losses associated with some of the natural hazards that were profiled in this plan. Costs associated with a hazard's potential to impact people and properties were estimated for the highest ranking natural hazards. The completion of this assessment utilizes estimates and assumptions of damages and costs that have been developed using historic storm damage information for Tompkins County, damage estimates provided by other sources such as the NCDRC, and the use of engineering judgment. Actual hazard events have the potential to incur greater or lesser losses and impacts than what the results of the vulnerability assessment indicate. The cost estimates put together to assess hazard vulnerability are not exhaustive and may not encompass all damages that could occur as a result of a hazard event. To aid in this exercise, information from Section 2.5, Table 4 was considered regarding the number of parcels per land use category for each jurisdiction. Additionally, the total property values of all lands within each jurisdiction were estimated by the Tompkins County Office of Real Property (included in Appendix A - Table 28). This information was helpful during the inventory of assets step of this hazard mitigation planning process and was also considered during this vulnerability assessment. During the compilation of

this document, each jurisdiction was tasked with identifying their vulnerabilities, if any, to the hazards evaluated during the risk assessment process. The significant vulnerabilities for each jurisdiction are included in Table 27, below. Flooding remains the number one hazard of concern among the municipalities within Tompkins County.

Table 27 - Natural Hazards: Range of Potential Damages (\$) to Vulnerable Structures in Tompkins County			
	Damage Potential	Loss of Life Potential	Significantly Vulnerable Jurisdictions
Severe storm/Hurricane	\$1,000 - \$10,000 each event \$35,000 annually	Moderate	All jurisdictions vulnerable
Earthquake	\$4,000 - \$80,000 each event \$0 annually	Moderate	All jurisdictions vulnerable
Landslide	\$0 - \$100,000 each event \$0 annually	Low	Town of Danby, Town of Ithaca, City of Ithaca, Village of Lansing, Town of Ulysses
Flash flood	\$1,000 - \$400,000 each event \$47,000 annually	Moderate	Town of Lansing, Village/Town of Groton, Town/City of Ithaca, Town/Village of Dryden, Town of Caroline, Village Cayuga Heights, Town of Enfield, Village of Freeville, Town of Newfield, Village of Trumansburg,
Lake flood	\$1,000 - \$100,000 each event \$5,000 annually	Low	City of Ithaca, Town /Village of Lansing, Town of Ulysses
Infestation	\$10,000 - \$2,000,000 each event	Low	City of Ithaca
Tornado	\$3,000 - \$1,000,000 each event	Moderate	No significant vulnerabilities identified
Severe winter storm/Ice storm	\$0 - \$1,000,000 each event \$10,000 annually	Moderate	All jurisdictions vulnerable
Epidemic	\$10,000 - \$10,000,000	High	City of Ithaca
Extreme temperatures	\$0 - \$1,000 each event \$0 annually	Moderate	City of Ithaca, Village of Cayuga Heights, Village of Lansing
Drought	\$0 - \$15,000,000 each event	Low	No significant vulnerabilities identified
Ice jam	\$0 - \$1,000,000 each event \$2,000 annually	Low	City of Ithaca, Town of Ithaca

6.3 Development Trends

As stated in the Tompkins County Development Focus Area Strategy, for over half a century new construction in Tompkins County has been located in rural areas, outside of the city and villages, by a ratio of 2 to 1, but conditions have changed and continue to evolve to the point where the majority of development is occurring in the City and Town of Ithaca.

Since adoption of the 2006 Hazard Mitigation Plan, development has continued throughout Tompkins County at a slow, but steady rate. Much development has occurred within the City and Town of Ithaca, though the surrounding Towns and Villages have also seen their share of development.

In the Town of Ithaca, several projects have been built or received approval focused on expanding senior housing options. These projects have occurred on West Hill (Conifer Village Senior Living Community, Conifer West Hill Development), South Hill (Longview Care Facility Addition, Longview Patio Homes), as well as East Hill (Ellis Hollow Senior Apartments). Over this same time period, substantial projects at Cornell University (CU) and Ithaca College (IC), which have considerable portions of their campuses within the Town of Ithaca, have continued to occur. The most substantial development on campus has been the Ithaca College Athletic and Events Center. The facility opened at IC in 2011 and includes a 130,000 square foot field house plus a 47,000 square foot aquatics pavilion. It is anticipated that the center will host some of the largest events in the County. Other major projects at IC have included the building of a new business school, the Peggy Williams Center, the expanded boathouse on Cayuga Inlet and the expansion of the Circle Apartments student housing facility. Projects at CU, within the Town of Ithaca, include the Heat and Power Plant, the Merrill Family Sailing Center on Cayuga Lake, the Physical Sciences building, and the East Hill Office Building. Other noted projects within the Town of Ithaca include an expansion of EcoVillage at Ithaca, Belle Sherman Cottages, Overlook at West Hill, and the approved Holochuck Homes and Holly Creek subdivisions.

The majority of development activity in the County has occurred within the City of Ithaca. In 2007, the City elected to rebuild their century old water treatment plant on its existing site. The new plant, currently in planning stages, will continue to draw water from Sixmile Creek for treatment and distribution throughout the City. The largest project to occur over the last several years in the City is the Collegetown Terraces. The first phase of this project is now complete and includes 80 graduate student apartments and 184 bedrooms. Downtown Ithaca's major projects include the mixed use Cayuga Green II and approvals for the Breckenridge Apartments affordable housing project, the Holiday Inn Expansion, and Seneca Way mixed use building. Projects within the City at CU included Milstein Hall. Approvals were also granted for the CU law school addition as well as a new Computer and Information Services building. Other significant projects in the City include the development of affordable housing on Floral Avenue on the Cayuga Inlet, the Coal Yard Apartments on Maple Avenue, and the College Park Apartments on Eddy Street.

Other notable projects include the development of dormitories in the Town of Dryden at the Tompkins-Cortland Community College, the Poet's Landing affordable housing project in the Village of Dryden, and approved subdivisions in the Town of Lansing, including Lansing

Commons, Woodland Park, and Farm Pond Circle. Near the junction of Routes 34 and 34B in the Town of Lansing, there is also added activity surrounding the new Lansing Market.

6.3.1 Affordable Housing

Housing prices in Tompkins County continue to increase with median housing prices continuing to be 50 to 75 percent higher than in neighboring counties. As stated in the County's Comprehensive Plan (2004), barely half of the homes in the County are owner occupied. With the high price of housing and low vacancy rates, affordable housing continues to be an issue, which several jurisdictions are struggling to deal with and integrate into development proposals. Some of the available "affordable housing" is located in high risk areas such as floodplains.

6.3.2 Development Focus Areas

A number of the new development proposals have occurred in areas identified by Tompkins County as Development Focus Areas. These noted areas have existing public water, public sewer, and transit infrastructure. By continuing to develop mixed-use compact development within these areas, several benefits will be realized, including the improved resilience and adaptation to changing energy markets as well as natural hazard events.

7.0 Hazard Mitigation and Adaptation

The 2006 HMP served as the basis for this Plan Update and all hazards, mitigation goals, objectives, and actions in that original plan were reviewed and, if they were still deemed to be relevant priorities, incorporated into the update. The planning process for the Plan Update encouraged the evaluation of new information, emerging issues, ideas, and actions to ensure that the plan is a living document that will be well-used by participants in the future.

7.1 Mitigation and Adaptation Goals

The prime objective of setting hazard mitigation and adaptation goals is to reduce or eliminate losses and damages from hazard events well in advance of hazard occurrence. It is important to create goals that are tangible. The goals identified below represent what the participants and municipalities are hoping to achieve through the implementation of this hazard mitigation plan.

- **Goal 1: Protect Life and Property**
- **Goal 2: Increase Public Education, Outreach, and Partnerships**
- **Goal 3: Protect and Restore Natural Ecosystems**
- **Goal 4: Enhance Emergency Services**

These goals were developed based on the risk assessment results, County-wide vulnerabilities, County and jurisdiction capabilities, and overall disaster preparedness. The addition of *Goal 3: Protect and Restore Natural Ecosystems* reflects the region's belief that natural systems play a critical role in increasing hazard resilience, particularly in the face of increasing climate change concerns. An example of this is the County's emphasis on advancing watershed-based approaches to flood hazard mitigation, where natural systems are utilized to build resilience in a way that protects water quality and avoids adverse impacts both up and downstream. The establishment of goals helped the jurisdictions to focus on effective and meaningful mitigation actions.

7.2 Mitigation and Adaptation Strategy

7.2.1 Mitigation and Adaptation Actions

Numerous mitigation actions were proposed by participating jurisdictions to reduce the impact of potential hazard events. These actions were evaluated in a public process and resulted in the identification of 86 actions to be taken by jurisdictions and partners to help achieve the goals outlined in the Plan Update. Of those actions there are 45 individual jurisdictional actions, 15 high priority multi-jurisdictional actions, and 26 other multi-jurisdictional actions. The proposed mitigation actions are varied, but can be grouped into six broad categories as indicated by FEMA 386-3:

- **Prevention** – Government administrative or regulatory actions or processes that influence the way land and buildings are developed and built. These actions also include public activities to reduce hazard losses. Examples include planning and zoning, building

codes, capital government programs, open space preservation, and storm water management regulations.

- **Property Protection** – Actions that involve the adaptation of existing buildings, infrastructure systems, or structures to protect them from a hazard, or removal from the hazard area. This includes the protection, upgrading, and/or strengthening of existing systems. Examples include acquisition, elevation, relocation, structural retrofits, storm shutters, and shatter-resistant glass.
- **Public Education and Awareness** – Actions to inform and educate citizens, elected officials, and property owners about the hazards and potential ways to mitigate and increase resilience to them. Such actions include outreach projects, real estate disclosure, hazard information centers, and school-age and adult education programs.
- **Natural Resource Protection** – Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. These actions include the use of green infrastructure, sediment and erosion control, stream corridor restoration, watershed management, forest and vegetation management, and wetland restoration and preservation.
- **Emergency Services** – Actions that protect people and property during and immediately after a disaster or hazard event. Services include warning systems, emergency response services, and protection of critical facilities.
- **Structural Projects** – Actions that involve the construction of structures to reduce the impact of a hazard. Such structures include dams, levees, floodwalls, seawalls, retaining walls, and safe rooms.

All the mitigation and adaptation actions included in this Plan Update have been reviewed by plan participants to ensure that they meet the goals of the plan. The proposed actions represent a range of projects that are well distributed throughout the six categories of mitigation. It is realized that some of the proposed actions included in this plan represent maintenance actions or post-hazard actions, which are generally not eligible for funding under FEMA's Hazard Mitigation Assistance Program. Regardless, such actions were deemed important to the community and are included in this plan. Other grants and funding sources will be sought to complete such proposed efforts.

Each participating jurisdiction proposed at least one implementable, pre-disaster mitigation activity to be included in this document. Table 29 outlines each individual jurisdiction's list of proposed mitigation measures. This table shows that all jurisdictions took an active role in the planning of this document and considered what action(s) could be implemented to minimize hazard vulnerabilities in their community. This list reflects the re-inclusion of some actions from the original plan that are still relevant, but also incorporates many new actions that would also minimize potential impacts to life and property as a result of hazard events. This list represents mitigation actions that were proposed by participating jurisdictions, agencies, and members of the public, based on need. Those actions identified as multi-jurisdictional are addressed in section 7.2.4.

7.2.2 2006 Plan Implementation

Since the adoption of the 2006 Multi-Jurisdictional All-Hazard Mitigation Plan for Tompkins County, numerous efforts have been made through the County, Town, Village, and support agencies toward reducing the impacts of disasters on the community. The 2006 HMP mitigation actions were reviewed to determine their statuses and implementation details. These actions are included in Appendix A – Table 30, along with their statuses (active (re-included), inactive (deleted), completed) and any additional details. Details associated with local mitigation activities that have been implemented over the past five years are also included as part of the 2007 and 2008 Implementation Reports, completed by the HMP Implementation Committee. These meeting notes are included in Appendix C for review.

7.2.3 Mitigation and Adaptation Strategy

There are many factors that must be considered when implementing an action or project. Table 29, below, contains specific implementation details associated with each proposed action including goals achieved, implementing agency(ies), estimated costs, possible funding sources, and implementation timeframes.

When detailed costs were not available, estimated price ranges were considered for each mitigation action. The levels for the cost estimates are as follows:

- Low: cost is estimated to be below \$10,000
- Medium: cost is estimated to be between \$10,000 and \$100,000
- High: cost is estimated to be over \$100,000

The implementation timeframes provided for each action are also estimated. Smaller, locally funded projects are easier to implement and therefore have shorter timeframes, while larger, complicated actions that involve funding applications, agency reviews, etc. will likely take five years or longer to complete. The levels for the timeframe estimates for each mitigation action are as follows:

- Short: completion anticipated within 1-2 years
- Moderate: completion anticipated within 5 years
- Long: completion anticipated in greater than 5 years
- Ongoing: action involves continued coordination or effort

For some actions, timeframe is presented as a range. This indicates that the action is currently being implemented or should be implemented as soon as possible and that it will continue for an extended period of time.

Table 29 – Individual Municipality Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
Tompkins County									
TC 1	Improve general outreach information through Tompkins Ready and other formats. Include in that outreach an increased awareness on what warning and advisory systems mean.	All Natural Hazards	2	DOER	Tompkins County Emergency Planning Committee	Low (\$2,000)	County budget, FEMA HMGP	Short	New & Existing
TC 2	Establish and promote undeveloped buffers for streams and wetlands. This should include continuing the funding and administration of the Tompkins County Stream Restoration and Flood Hazard Mitigation Program.	Flash Flood, Landslide, Water Contamination	1, 2, 3	TCPD	TCSWCD	Medium (\$25,000 per year) to High	County budget	Short	Existing
TC 3	Replacement/rehabilitation or other resilient actions for transportation infrastructure with reoccurring flooding issues (see list of specific County locations in Appendix H)	Flash Flood, Severe Storm	1	TC Highway Division	Municipalities	High	NYSDOT/FHWA funding, County budget	Long– Ongoing	Existing
TC 4	Continue supporting aquifer studies to gain better understanding of regional groundwater and to enhance their protection	Flood (Flash & Lake)	1, 3	TCPD	Municipalities	High (\$4.5 million)	USGS, County, Local	Long	N/A
TC 5	Increase collaboration between government and community organizations regarding the containment and response plans for epidemic events	Epidemic	1, 2	TC Health Dept.	ARC	Low	County budget	Moderate	N/A
TC 6	Improve farm health by participating in the integrated disease prevention through the NYS Cattle Health Assurance Program and supporting agricultural agencies that assist farms in improve this health.	Epidemic	1	SWCD	NRCS, CCE	Low	County budget	Ongoing	N/A
Town of Caroline									
C1	Continue local stream bank stabilization projects	Flood	1, 3	Town of Caroline Watershed Committee	TCSWCD, TCPD	Medium (\$30,000 per year)	Local	Moderate	Existing
C2	Formalize protections and green infrastructure practices along stream banks to encourage riparian vegetation for channel and floodplain stabilization and wildlife habitat	Flash Flood	3	Town of Caroline Watershed Committee	TCSWCD, TCPD	High (\$100,000)	NYSDEC, County & Municipal Budgets	Long (6 years)	New & Existing

Table 29 – Individual Municipality Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
Village of Cayuga Heights									
CH1	Develop strategy for mitigating drainage concerns at Winthrop Drive and Triphammer Road	Flash Flood	1, 3	Village of Cayuga Heights	NYSDEC	Medium-High	FEMA PDM and Local	Moderate	Existing
Town of Danby									
DB1	Continue working with NSYDOT to survey West Danby fire station site distance to determine if intersection requires physical changes or additional lighting when fire station is used for other purposes	Transportation Accident	1, 4	Town of Danby	West Danby Fire, NYSDOT	Medium	State Funding, County/municipal budget	Long	Existing
DB2	Mitigate risk related to stream pipeline crossings on Buttermilk Creek, including that at Comfort Road	Landslide, Utility Failure	1, 3	Town of Danby	Utility Companies, NYSDEC	Medium	FEMA PDM, NYSDEC, Local	Long	Existing
Town of Dryden									
DR1	Establish conservation corridors along stream banks to encourage riparian vegetation for channel and floodplain stabilization and wildlife habitat	Flash Flood	1, 3	Town of Dryden	TCPD, FLLT	High (\$100,000)	NYSDEC, County & Municipal Budgets	Long (6 years)	New & Existing
DR2	Actively inventory and mitigate risk associated with pipeline stream crossings including Sixmile Creek at German Cross Road	Flash Flood	1	Town of Dryden	Utility Providers, TCPD, NYSDEC	Low	FEMA, PDM and Local	Long	Existing
Village of Dryden									
VD1	Support dam inundation and stream corridor improvements for Virgil Creek	Flash flood	1	Village of Dryden	NYSDEC	Low-Medium	FEMA, NYSOEM, NYSDEC, Municipal budget	Moderate	Existing
Town of Enfield									
E1	Become participating member of NFIP	Flash Flood	1	Town of Enfield	TCPD	Low	FEMA NFIP	Short	New & Existing
Village of Freeville									
F1	Encourage Interagency collaboration in the humane management of beaver populations, particularly in Fall and Virgil Creeks	Flash Flood, Severe Storm	1, 3	Village of Freeville	NYSDEC, TCSWCD	Low	Municipal budget	Moderate	N/A

Table 29 – Individual Municipality Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
F2	Address drainage issues near private homes along Virgil Creek	Flash flood, Severe Storm	1	Village of Freeville	NYSDEC, TCSWCD	Medium-High	FEMA PDM, Local	Moderate	Existing
Town of Groton									
TG1	Develop Watershed Assessment for Owasco Inlet to assess priority flood hazard and stream corridor improvements	Water Contamination, Flash Flood, Severe Storm	1,2,3	Town of Groton	TCPD, TCSWCD	Low	NYSDEC, Tompkins County Flood Hazard and Stream Corridor Restoration, FLOWPA	Moderate	Existing
Village of Groton									
VG1	Develop Watershed Assessment for Owasco Inlet to assess priority flood hazard and stream corridor improvements	Water Contamination, Flash Floods, Severe Storm	1,2,3	Village of Groton	TCPD, TCSWCD	Low	NYSDEC, Tompkins County Flood Hazard and Stream Corridor Restoration, FLOWPA	Moderate	Existing
VG2	Prohibit development within the stream corridor of Owasco Inlet and actively work to increase the resilience of structures that exist within these areas	Flash Flood	1	Village of Groton		Medium	FEMA PDM	Moderate	New & Existing
Town of Ithaca									
TI1	Establish conservation corridors and green infrastructure along stream banks to encourage riparian vegetation for channel and floodplain stabilization and wildlife habitat. Priority focus area should be bank stabilization of the intermittent streams which flow into Sixmile Creek like those near the Six Mile Creek Vineyard.	Flash Flood, Landslide	1, 3	Town of Ithaca	TC Conservation Partners	High (\$100,000)	NYSDEC, Tompkins County Flood Hazard and Stream Corridor Restoration, FLOWPA	Long (6 years)	New & Existing
TI2	Analyze drainage issues that occur post large storm events at corner of Pine Tree Road / Ellis Hollow / Mitchell Roads as well as Route 13 at Buttermilk Falls Road and implement appropriate mitigation measures.	Severe Storm	1, 3	Town of Ithaca	TC Highway Division, NYSDOT	High	NYSDOT, NYSDOT & Municipal Budgets	Moderate	Existing
TI3	Promote underground utilities on new development projects	Utility Failure, Ice Storm	1	Town of Ithaca	None	Low	Private funds	Short	New

Table 29 – Individual Municipality Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
City of Ithaca									
CI1	Inventory storm drains and determine where retrofits needed to prevent backflow flooding	Flash Flood, Lake Flood, Severe Storm	1	City of Ithaca	City and County GIS	Low	Local	Moderate	Existing
CI2	Encourage the retrofitting of residential basement utilities	Flash Flood, Lake Flood	1,2	City of Ithaca	CCE	Low	Local	Moderate	New & Existing
CI3	Estimate costs that may be incurred to local businesses from increased flooding, particularly in the Route 13 corridor, and work with businesses to adapt to increased risk	Lake Flood, Flash Flood	1,2	City of Ithaca GIS	None	Low	Local, private funds	Moderate	Existing
CI4	Analyze and map potential impacts of Hurricane Irene/Lee level precipitation in watersheds of City of Ithaca	Flash Flood	1,2,4	City of Ithaca GIS	Army Corps	Low	Local	Short	New & Existing
CI5	Create a rapid response unit in cooperation with the Tompkins County Sheriff's Department to assist in dealing with water borne invasives such as Hydrilla	Infestation	1,2,3	City of Ithaca	TC Sheriff's Department, TCSWCD	Low	Local	Short	N/A
CI6	Continue to advocate for funding to support eradication of Hydrilla from Cayuga Inlet	Infestation	1,2,3	City of Ithaca	TCSWCD	Low	NYSDEC	Long	N/A
CI7	Finalize plans for an emergency generator for City Hall and the Water Filtration Plant	Utility Failure	1,4	City of Ithaca	None	Medium	FEMA, Local Funds	Moderate	New and Existing
CI8	Promote underground utilities and district heating on new development projects	Ice Storm, Utility failure	1	City of Ithaca	None	Low	Private funds	Short	New
CI9	Implement the update of the Water Filtration Plant and formalize protection of the Sixmile Creek Watershed through the development of a watershed plan that includes stream corridor protections and green infrastructure recommendations	Water Contamination	1	City of Ithaca	None	High	Local Funds	Moderate	New
CI10	Address creek side erosion at City of Ithaca Raw Water Intake on Sixmile Creek	Landslide	1	City of Ithaca	TCPD, TCSWCD	Medium	FEMA PDM, TC Stream Corridor	Long	Existing
Town of Lansing									
TL1	Finalize the Ludlowville Stormwater Control Project	Flash Flood	1,2,3	TCPD	Lansing Highway, Tompkins County Highway	Low	Local	Short	N/A
TL2	Implement stream restoration efforts on Salmon Creek at Salmon Creek Road	Flash Flood	1, 3	Town of Lansing Highway	TCPD, TCSWCD	Medium	Local, NYSDEC	Moderate	Existing

Table 29 – Individual Municipality Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
TL3	Assist with the retrofitting or acquisition of properties with high exposure to lake flooding in and around Myers Point/Lagoda Park	Lake Flood	1	Town of Lansing	DOER, NYSOEM	High	FEMA PDM	Long	Existing
TL4	Improve communication with the Department of Environmental Conservation to assist in clarifying the need and support for the permitting of regular maintenance of the mouth of Salmon Creek to reduce flooding of residences and community infrastructure	Flash Flood, Lake Flood, Ice Jam	1, 3	Town of Lansing	NYSDEC, Army Corps of Engineers	Low	None	Short	Existing
Village of Lansing									
VL1	Inventory business park and hazard risks, and implement retrofits as appropriate	Multi-Hazard	4	Village of Lansing	DOER	Medium	Local Funds	Long	Existing
VL2	Evaluate the intake area/building for Bolton Point since that is located in the flood area for the Village of Lansing and determine the impact if flooded	Lake Flood, Flash Flood	1	Bolton Point	Village of Lansing, DOER	Low	FEMA, Local Funds	Short	Existing
VL3	Assess the main raw water intake line for Bolton Point to determine if there needs to be additional measures implemented in the event that the current trunk line fails	Landslide, Water Contamination	1	Bolton Point	Village of Lansing, TCPD	Low	NYSDEC, Local Funds	Short	Existing
Town of Newfield									
N1	Develop long term mitigation plans for Main Street Culvert	Flash Flood	1	Town of Newfield Highway	NYSDEC, NYSOEM, TCPD	High	FEMA PDM	Long	Existing
N2	Retrofit culvert on Douglas Road for added resilience	Flash Flood	1	Town of Newfield	NYSDEC	Medium	Local, FEMA	Moderate	Existing
Village of Trumansburg									
VT1	Address erosion of stream bank at Village material disposal area	Landslide, Flash Flood	1, 3	Village Public Works	Town of Ulysses, TCSWCD	High	FEMA PDM, NYSDCE and Local Funds	Long	Existing
Town of Ulysses									
U1	Appoint a contact person for lakeshore sandbagging (Maplewood Point or Willow Point) and determine how the action is coordinated.	Lake Flood	1, 4	Town of Ulysses	DOER	Low	Local	Short	New

Table 29 – Individual Municipality Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
U2	Reduce of escarpment erosion along South Street Extension at Taughannock Creek	Landslide	1, 2, 3	Tompkins County Highway	TCPD, Town of Ulysses, TCSWCD	High	NYSDEC Grant, Capital Budget, Tompkins County Flood Hazard and Stream Corridor Restoration Program	Moderate	Existing

7.2.4 Mitigation and Adaptation Action Prioritization

A cost-benefit analysis was completed for each proposed action as a way to prioritize the many actions included in this document. The priority level indicated for each action is based on the current knowledge of the mitigation actions, including their estimated costs, timeframes, and funding availability. Prioritization criteria will continue to be reviewed and revised on an annual basis during the five-year plan update timeframe. By implementing the proposed actions as part of pre-disaster mitigation, and not as an afterthought, the implementation will be more cost effective and the incorporation of these actions into normal planning processes and operational procedures will naturally occur.

Each proposed action was evaluated against the following considerations (FEMA, 2008):

- Compatibility with goals and objectives identified in the current NYS Hazard Mitigation Plan (2006 HMP);
- Compatibility with goals of the plan update;
- Assessment of the impact of identified actions on jurisdictions within the entire planning area or region;
- Cost/benefit reviews of potential actions;
- Funding priorities identified in the current NYS Hazard Mitigation Plan; and
- Compatibility with other local and regional plans and programs.

Each participating jurisdiction evaluated the actions that applied to their jurisdiction. These evaluations considered the six elements addressed above. This exercise provided the participating jurisdictions with a way to prioritize the mitigation actions using a simple cost/benefit analysis (Table 31). Depending on the results of the action evaluations, each action is recognized as a high priority project, medium priority project, or low priority project. The results of the mitigation and adaptation action priority assessment are included in Table 32 and Appendix A – Table 33.

Table 31 – Benefit and Cost Prioritization Rankings			
	Assessment Levels and Description		
	High	Medium	Low
<i>Benefits</i>	Action within the next five years is important and is anticipated to have a meaningful impact on reduction of losses.	A long-term impact on the reduction of losses is anticipated. Action within the next five years is anticipated, though not critical.	It is difficult to assess the benefits of an action due to its long-term timeframe. Action within the next five year is unlikely.
<i>Costs</i>	Existing funding sources are inadequate or are not identified to cover implementation of the action.	Funding exists, but will have to be reapportioned or budgeted over multiple years.	Funds to implement action are available in existing budget.

Actions recorded as having a benefit level equal to or higher than the cost level, were viewed as cost-beneficial actions, therefore receiving a high priority ranking. This priority ranking process should be viewed as a preliminary analysis. As the implementation of mitigation and adaptation strategies progresses, the ranking system used during this evaluation will evolve based on input from participating jurisdictions, agency representatives, and other branches of state and federal government. Additional funding sources will be required for many of the proposed actions. Coordination with agencies such as NYSOEM and FEMA will be necessary to secure funds for proposed mitigation actions, especially those with high costs and long-term implementation schedules.

Table 32 lists the 15 highest priority multi-jurisdictional actions being proposed as part of this HMP Update. The plan update project team identified these actions as those with most importance for implementation in the next five years. This list reflects the re-inclusion of some actions from the original plan that are still relevant, but also incorporates many new actions that would also minimize potential impacts to life and property as a result of hazard events. This list represents actions that were proposed by participating jurisdictions, agencies, and members of the public, based on need. Some of the proposed actions relate to a specific type of hazard event or specific jurisdiction, while others are proposed to mitigate an array of hazards or will apply to multiple jurisdictions. Appendix A – Table 33 includes the remaining list of 26 multi-jurisdictional actions identified as a part of the update process.

Table 32 – HIGH PRIORITY Multi-Jurisdictional Mitigation and Adaptation Action Strategies									
#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
Multi-Jurisdictional									
1	Further identify vulnerable populations, including disabled, elderly, children, non-native speakers, and the homeless and identify mitigation measures to reduce adverse impacts to these groups from hazard impacts	Multi-Hazard	1, 2, 4	County Human Services Cabinet	American Red Cross of Tompkins and Cortland Counties	Low	None	Short	New & Existing
2	Establish and implement a system for regularly collecting detailed information about structural damages, costs, injuries and other details relevant to tracking impacts of hazard events.	Multi-Hazard	1, 2	DOER	TCPD, Insurance Industry	Low	None	Short	Existing
3	Develop a County-wide debris management plan	All Natural Hazards	1, 2	County Public Works Cabinet	DOER, SWCD	Moderate	NYSDEC, Local Funds	Moderate	Existing
4	Conduct annual climate science outreach to municipalities and other large institutions and businesses to share latest climate change information for use in the design of a variety of work, including capital projects	All Natural Hazards	2	TCPD	NYSERDA, Cornell	Low	None	Short	New & Existing
5	Meet annually with utilities to discuss needs and operations to ensure preparation for increasing storm events, including tree trimming, supplies of repair materials, and backup plans for outages. The meeting should also focus on increasing communication and coordination, during, and after events.	Severe Storm	1, 2	City of Ithaca	Village of Groton, Municipalities, Others	Low	None	Short	New & Existing
6	Continue to advocate for the update of county Flood Insurance Rate Maps. In addition look for ways to map additional flood-related hazards and manage development in high risk areas. This could include the development of a pilot project with USGS to create interactive flood inundation maps for a stream corridor with regular flooding concerns, such as Fall Creek or Sixmile Creek	Flood (Flash & Lake)	1, 2, 4	TCPD	USGS, SWCD, City GIS, County GIS, Dryden GIS, Municipalities	Moderate to High	USGS Matching Funds, FEMA	Long	New & Existing

Table 32 – HIGH PRIORITY Multi-Jurisdictional Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
7	Conduct an enhanced inventory of critical facilities in the County and share information with municipalities and other facility owners. The inventory should include facilities for water and wastewater treatment, transit operations, emergency responder operations, and culverts and bridges	Flood (Flash & Lake)	1, 4	DOER	Municipalities, CU Water	Moderate	FEMA, Local Funds	Short	Existing
8	Once critical facilities have been inventoried, perform engineering-based risk assessments that take into account projected climate change, to understand potential impacts to critical facilities and service operations under different climate change scenarios. Assessments should include complete adaptations plans that include decision making software, such as the COAST model, and include recommendations for retrofits or acquisitions based on these assessments	Flood (Flash & Lake)	1, 2, 4	Municipalities	TCCOG, TCPD	Moderate	FEMA	Moderate	Existing
9	Convene an annual meeting and training session for all municipal Floodplain Administrators to discuss topics of interest and address training needs	Flash Flood	2	TCPD	Municipalities	Low	None	Short	Existing
10	Develop and implement a plan to reduce flood damage in the Sixmile Creek Watershed, including specific attention to aging pipeline crossings along the Creek	Utility failure, Flash Flood	1, 3	Town of Caroline	DOER, SWCD, TCPD	High	FEMA, NYSDEC, Local Funds	Long	New & Existing
11	Support dredging in and around the Cayuga Inlet Flood Control Channel to reduce threat of flood inundation	Lake Flood	1, 2, 3, 4	City of Ithaca	Municipalities	High	NYSDEC, Army Corps of Engineers, Local Funds	Long	Existing
12	Create a database and map of fire hydrants (including dry hydrants) and water resources that can be used for fire fighting and share that information with municipalities. Based on this information develop an action plan for improving access to these resources.	Fire	1, 4	DOER	County GIS, SWCD, Highway Depts, Town of Dryden, Bolton Point	Low	Local Funds	Short	New & Existing
13	Work with local businesses to formalize continuity of operations plans	Terrorism	1, 2	DOER	Chamber of Commerce, Emergency Planning Committee	Moderate	Local Funds	Moderate	Existing

Table 32 – HIGH PRIORITY Multi-Jurisdictional Mitigation and Adaptation Action Strategies									
#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
14	Analyze impacts from droughts across sectors and develop more comprehensive drought management plans and management systems	Drought	1, 2, 3	DOER	TCPD	Moderate	NYSDEC, NYSERDA	Moderate	New & Existing
15	Engage the NYS Canal Corporation in proactive discussions to develop a process for regulating lake levels	Lake Flood	1, 2	City of Ithaca	Town of Lansing, Town of Ithaca, Town of Ulysses, Village of Lansing, Tompkins County	Low	None	Short	Existing

8.0 National Flood Insurance Program

Long-term mitigation of potential flood impacts can be best achieved through comprehensive floodplain management regulations and enforcement, particularly at a local level. The National Flood Insurance Program (NFIP) is regulated by FEMA. The goal of this program is to reduce the impact of flooding on private and public structures by providing affordable insurance for property owners. The program encourages local jurisdictions to adopt and enforce floodplain management regulations in order to mitigate the potential effects of flooding on new and existing infrastructure (FEMA, 2009).

Communities that participate in the NFIP adopt floodplain ordinances that require that all insured structures that are damaged over 50-percent of the property's market value must comply with the floodplain ordinance when the structure is repaired/re-built. These repairs could mean changes to the elevation of the structure, acquisition and demolition by the municipality, or relocation to a location outside of the floodplain. Insured structures that are located within floodplains identified on FEMA's Flood Insurance Rate Maps (FIRMs) receive funds if impacted by a flooding disaster. These distributed funds are to be used to mitigate the risk of future flooding by implementing pre-disaster mitigation actions, such as those previously referenced.

The NFIP and other flood mitigation actions are important for the protection of public and private property and public safety. Flood mitigation is valuable to communities because (1) it creates safer environments by reducing loss of life and decreasing property damage; (2) it allows individuals to minimize post-flood disaster disruptions and to recover quicker (homes built to NFIP standards receive less damage from flood events – when damage does occur, the flood insurance program protects the homeowner's investment); and (3) it lessens the financial impacts on individuals, communities, and other involved parties (FEMA, 2009).

8.1 Tompkins County Flood Mapping

FEMA's Q3 flood data, which is derived from their FIRMs, were reviewed for Tompkins County. These datasets were last updated in 1996. Enfield is the only jurisdiction in the County that has never been mapped by FEMA. The Village of Cayuga Heights has been mapped, though there are no floodplains identified within the Village's municipal boundary.

There are a total of about 6,464 acres of land in the County that are located within 100-year or 500-year mapped flood zones. A 100-year flood indicates a flood elevation that has a 1-percent chance of being equaled or exceeded each year. Similarly, a 500-year flood indicates a flood elevation that has 0.2-percent chance of being equaled or exceeded in any given year. The land area in Tompkins County that is mapped within either of these flood zones accounts for, at least portions of, 3,749 tax parcels. The full market value of these parcels, in their entirety, is \$7,423,609,047. Parcels located within mapped floodplains consist of the following land uses: 364 parcels – Commercial, 129 parcels – Community Services, 76 parcels – Forest, 9 parcels – Industrial, 59 parcels – Public Services, 36 parcels – Recreation, 2475 parcels – Residential, 507 parcels – Vacant. As indicated, an overwhelming majority of lands mapped within 100- and 500-year floodplains are residential properties. The majority of identified parcels are located adjacent to Salmon Creek, Taughannock Creek, Fall Creek, Cascadilla Creek, Sixmile Creek,

Cayuga Inlet, Owasco Inlet, Mud Creek, and Virgil Creek. Table 34 lists the total number of parcels mapped in 100- and 500-year floodplains according to their jurisdiction location.

Table 34 – Total Parcels Mapped in 100- and 500-Year Floodplains by Jurisdiction (1996 Q3 FEMA Flood Mapping and 2011 TCPD Tax Parcel Data)		
Jurisdiction	Total Parcels Located in Floodplains (includes entire or partial parcels)	Total Parcels Within Jurisdiction
Town of Caroline	229	1,968
Town of Danby	83	2,009
Town of Dryden (including Villages of Dryden and Freeville)	585	5,818
Town of Groton (including Village of Groton)	244	2,783
Town of Ithaca (including Village of Cayuga Heights)	224	5,434
City of Ithaca	1,874	5,676
Town of Lansing (including Village of Lansing)	202	4,801
Town of Newfield	71	2,328
Town of Ulysses (including Village of Trumansburg)	400	2,637

FEMA has been slowly updating FIRM mapping for Counties within New York State in recent years. An update to the flood mapping in Tompkins County is planned, but no further specifics have been proposed at this time. Future Plan annual reviews and five-year updates will consider any new flood mapping and information that becomes available.

8.2 Tompkins County NFIP Policy and Loss Statistics

National Flood Insurance Program records and claims were analyzed to determine the extent of participation, flood losses, and flood insurance policies within Tompkins County. All of the jurisdictions within the County are current participants in FEMA's NFIP, except for the Town of Enfield. NFIP Policy Data and Loss statistics for all participating jurisdiction in Tompkins County are included on Tables 35 and 36. These data are current as of August 31, 2012.

The information included in Table 35 documents the number of flood insurance policies, coverage amounts, and premium amounts for all jurisdictions within Tompkins County on August 31, 2012. The NFIP policy statistics indicate that the only jurisdiction that does not have any properties currently purchasing flood policies is the Village of Trumansburg. The Town of Enfield has no data, but that is because they currently do not participate in the NFIP. The City of Ithaca has the highest number of policies in-force and the greatest insurance amounts in-force.

The flood loss data included in Table 36 documents the number of losses and payment amounts associated with flood losses from January 1, 1978 to August 31, 2012. It indicates that the City of Ithaca has experienced the highest incidence of loss from flood events, but that the Village of Groton has sustained the most total damage, signified by the amount of total payments. The

Town of Lansing also shows a large amount of total loss and a high total payments value. The Village of Lansing and the Town of Danby have not reported any loss claims since this information started to be collected in 1978. Out of an approximate 34,885 tax parcels in Tompkins County, 364 flood insurance policies were in place as of August 2012. The jurisdictional distribution of these policies is included in Table 35.

Table 35 – NFIP Policy Statistics, Snapshot as of August 31, 2012 (Bureau Net, Policy Information, 2012)			
Jurisdiction	Policies In-Force	Insurance In-Force (whole \$)	Written Premium In-Force
Caroline (Town)	11	\$2,088,100	7,895
Cayuga Heights (Village)	3	\$1,050,000	1,215
Danby (Town)	5	\$1,050,000	1,527
Dryden (Town)	23	\$6,368,800	28,583
Dryden (Village)	27	\$3,449,900	24,064
Enfield (Town)	-	-	-
Freeville (village)	6	\$743,300	3,919
Groton (Town)	15	\$1,445,300	12,352
Groton (Village)	15	\$4,149,900	23,321
Ithaca (Town)	48	\$11,206,200	33,358
Ithaca (City)	139	\$28,801,400	159,258
Lansing (Town)	43	\$6,602,700	28,069
Lansing (Village)	3	\$592,000	2,080
Newfield (Town)	8	\$819,000	4,299
Trumansburg (Village)	0	0	0
Ulysses (Town)	18	\$3,848,400	10,058

Policies in-force = NFIP policies as of August 31, 2012

Insurance in-force = coverage amount for policies in-force

Written premium in-force = premium paid for policies in-force

Table 36 – NFIP Loss Statistics, as of August 31, 2012 for Losses Incurred Since January 1, 1978 (Bureau Net, Claim Information, 2012)					
Jurisdiction	Total Losses	Closed Losses	Open Losses	Closed without Payment Losses	Total Payments
Caroline (Town)	21	17	0	4	\$72,531.40
Cayuga Heights (Village)	4	3	0	1	\$15,790.79
Danby (Town)	0	0	0	0	0
Dryden (Town)	5	5	0	0	\$56,450.54
Dryden (Village)	16	12	0	4	\$84,639.71
Enfield (Town)	-	-	-	-	-
Freeville (village)	4	4	0	0	\$17,760.16
Groton (Town)	6	4	0	2	\$16,773.65
Groton (Village)	12	9	0	3	\$614,682.96
Ithaca (Town)	17	13	0	4	\$35,396.78
Ithaca (City)	86	63	0	23	\$220,430.64
Lansing (Town)	52	41	0	11	\$442,746.94
Lansing (Village)	0	0	0	0	0
Newfield (Town)	2	2	0	0	\$9,297.04
Trumansburg (Village)	3	2	0	1	\$902.32
Ulysses (Town)	1	1	0	0	\$5,798.14

Total losses = all losses submitted regardless of status, total claims

Closed losses = losses that have been paid

Open losses = losses that have not been paid in full

CWOP losses = losses closed without payment

Total payments = total amount paid on losses

According to the NYSOEM State Mitigation Plan (NYSOEM, 2011), there are 11 properties in Tompkins County that have repetitive flood loss, though the TCPD documents 12 parcels that meet the repetitive loss definition (Section 5.1.2). The State Plan includes an estimated value of structures located within 100-year mapped floodplains in Tompkins County. This estimate includes a median sales price of \$164,800 and an estimate of 997 structures in 100-year floodplains, for a total calculated estimated value of \$164,305,600. This potential flood loss estimate is based on 100-year floodplain mapping and estimated values of structures.

8.3 NFIP Mitigation Actions

As part of the Tompkins County Hazard Mitigation Plan Update, each participating jurisdiction was required to evaluate a specific set of mitigation actions aimed at continued compliance and participation with FEMA's NFIP. These mitigation actions are proposed in addition to the mitigation actions already included in this plan. The mitigation actions, incorporated by FEMA

in their 2008 guidance, and included to reduce the impacts of future flood hazard events, consist of the following:

- Revisions to floodplain management ordinances in order to comply with FEMA's latest regulations and remain consistent with the FIRMs;
- The designation of a Floodplain Administrator in each participating jurisdiction;
- Ensuring that staff members have appropriate training to adequately enforce NFIP regulations and ordinances;
- Requiring staff involved in floodplain management and/or regulations to become Certified Floodplain Managers (CFMs);
- Joining the Community Rating System (CRS).

These NFIP specific mitigation actions are further detailed in the Multi-Jurisdictional mitigation action strategies included in Table 33, located in Appendix A. In addition to these NFIP mitigation actions, one of the specific pre-disaster mitigation actions proposed by the Town of Enfield is to become a participating member of the NFIP. The Community Rating System is a voluntary incentive program that recognizes and encourages floodplain management activities at the community level. As a result of CRS participation, flood insurance premium rates are discounted to reflect the reduced flood risk that results from community actions to meet the three goals of the CRS: reduce flood loss, facilitate accurate insurance ratings, and promote flood insurance awareness (FEMA, 2010).

9.0 Plan Maintenance Process

This section details the future maintenance process that will be followed for subsequent plan updates. The Disaster Mitigation Act of 2000 requires that adopted mitigation plans define and document the processes and mechanisms for maintaining and updating the hazard mitigation plan at least once every five years in order for the participating jurisdictions to remain eligible for funding. This hazard mitigation plan maintenance process must include: monitoring and evaluating the plan; updating the plan; providing an implementation schedule; and outlining steps for continued public involvement. A checklist to assist with the monitoring, evaluation, and updating of this Hazard Mitigation Plan is included in Appendix I.

9.1 Plan Monitoring and Evaluation

The 2013 Tompkins County Hazard Mitigation Plan will be monitored on an annual basis to ensure that the goals and objectives of the Plan remain relevant and that the proposed mitigation actions are being implemented efficiently. The Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan – Implementation Committee will continue to hold annual meetings to review and discuss this document, recent hazard events, and how to incorporate this Plan into other County-wide planning efforts. These annual meetings will be publicized and open to the public, as a way to promote continued public involvement in this process. The Tompkins County Planning Department will be in charge of scheduling and moderating the Implementation Committee annual meetings, and will be responsible for compiling a meeting summary and annual report at the end of every year. This annual report should detail changes made to the HMP document, if any, and how and when these changes will be made. The meeting summary will provide important information regarding hazard events that occurred during the previous year and implementation details associated with the proposed mitigation actions included in the HMP.

The implementation of proposed mitigation actions is important to review to determine whether the plan is being executed correctly. Items that should be reviewed and recorded for each completed mitigation action include the ultimate cost of the activity, the successes and failures of the action in minimizing hazard impacts, and the funding sources used for the action. During each annual meeting of the Implementation Committee, the following HMP components will be assessed:

- Whether the goals and objectives address current and expected conditions;
- Whether the nature, magnitude, and/or type of risks have changed;
- Whether the current resources are appropriate for implementing the plan;
- Whether there are implementation problems or coordination issues with other agencies;
- Whether the outcomes have occurred as expected, and
- Whether agencies and other partners participated as originally proposed.

The schedule and tasks associated with the monitoring of Tompkins County's HMP are included in Appendix I. The annual reports compiled by the TCPD will be posted to the County's website for public review.

9.2 Plan Updating

The 2013 HMP will be updated by addendum at any time during the five-year execution period in which the Implementation Committee determines that a significant change has occurred that warrants such an action. In the event of a hazard occurrence, the goals, actions, and procedures outlines in the Plan will be reviewed, as necessary. If any revisions or changes are warranted, the plan will be updated immediately, or at the next five-year update timeframe, depending on the importance of the proposed change(s) or revision(s). During the updating process, the participating jurisdictions will be contacted to provide updated information concerning the elements of the Plan applicable to their community. This process will be completed through the issuance of a questionnaire to be returned to the Implementation Committee for review prior to their annual meeting.

Approximately 18 months prior to the end of the current five-year execution period, the Plan update process should be initiated. This document represents the first update to Tompkins County's original HMP, review and approved by NYSOEM and FEMA in 2006. Participant and public review will continue to be completed during each five-year Plan Update process. All future plan updates will be submitted for re-approval in accordance with the five-year review schedule dictated in DMA 2000. Following FEMA conditional approval, each participating jurisdiction must formally adopt the new Plan by resolution. These resolutions should be collected and filed in Appendix F for documentation, and submitted to FEMA and NYSOEM for final HMP approval. A user friendly checklist was formulated to aid Tompkins County in competing future five-year updates to the HMP. A copy of this checklist is provided in Appendix I. This checklist will help the County organize and complete revisions to future Plan Updates and will assist the County in adequately meeting the five-year review timeframe instituted by FEMA.

9.3 Local Planning Considerations

Hazard mitigation has become integrated in regional planning in and around Tompkins County. Due to a number of significant storm events, refined climate data and municipal interest mitigation planning is becoming closely engrained in local decision making. As noted in Table 11, approximately half of the jurisdictions in Tompkins County have, or are in the process of updating, community Comprehensive Plans – including Tompkins County. Through the comprehensive planning visioning process, communities can identify key vulnerabilities across a broad range of topic areas and select actions that may help them mitigate those risks. As an example, the Village of Trumansburg identified the following concern in its 2009 Comprehensive Plan, “heavy rainfall in the upstream drainage area of Trumansburg, and its large tributary, Boardman Creek, can produce periods of significant flows through the Village.” As a result of this, the Village recognized the multi-faceted role that stream buffers could play in terms of stabilizing streams, improving water quality and habitat, as well as protecting property. Recommendations for regulated buffers were included in this comprehensive planning effort. The Village then codified this regulation in the update of its municipal zoning code which now

requires stream buffers in certain creekside zones. Buffers now play an active role in the Village's development review and enforcement process.

Continuing with the stream buffer example, several other jurisdictions, including the Town of Ulysses and the Town of Ithaca, have enacted stream buffer regulations from similar processes. Tompkins County has further developed model stream buffer regulations which are currently being considered by several jurisdictions for implementation. The County has also continued to support its *Stream Corridor Restoration & Flood Hazard Mitigation Program*, which has resulted in the planting and protection of over 12,000 linear feet of stream corridor throughout the County. Projects have ranged from restoring stream corridor vegetation to developing, implementing and monitoring riparian easements. The majority of these projects have been advanced thanks to the prioritized guidance of the region's watershed assessments. These watershed assessments highlight the key "hotspots" in need of mitigation in most of the County's watersheds. Information on some of these resources is available at <http://www.tompkinscountyny.gov/planning/water-resources-stream-buffers>. Each of these projects has additionally allowed for the advancement of mitigation education with municipalities, landowners and the several hundred volunteers and contractors involved with these projects.

Stream buffer protection serves as just one example of how mitigation is integrated with planning efforts in Tompkins County. Other significant strides are being made in relation to infestation through local public works and conservation efforts along with a host of flood mitigation efforts.

Thanks to the mitigation planning process, with the inclusion of the required 5-year update of our FEMA approved hazard mitigation plan, this work is even further advanced. Through its review of local plans and projects, Tompkins County is committed to regularly ensuring mitigation planning is integrated. Additionally, the County will continue to convene municipal partners at least annually to revisit the mitigation plan's goals/actions and to encourage the proactive coordination of mitigation in various planning and policy decisions. Lastly, to set an example for the importance of mitigation in local planning, the County is currently in the process of updating its own Comprehensive Plan. As a component of that update, climate adaptation/mitigation has been identified as a key overarching principal that will be addressed in the broad range of chapters of this communitywide plan.

By adopting a resolution to accept the Multi-Jurisdictional All-Hazard Mitigation Plan, each participating jurisdiction agrees to reference and incorporate the document into their future local planning documents, codes, decisions, processes, and regulations. Plan elements will be considered during municipal and County-wide development actions and comprehensive planning. Planning mechanisms and current capabilities recognized among the participating jurisdictions are demonstrated by Table 11 in Section 3.1.1. Table 11 will be revised as new mechanisms and capabilities are adopted and updated by the participating jurisdictions. Table 37 shows how this HMP will be incorporated into the existing and future planning mechanisms and opportunities of each jurisdiction.

Table 37 – Planning Mechanism Incorporation	
Mechanism	How Plan Will be Incorporated
Emergency Planning	Plan will be added/referenced as an Appendix to the County’s Emergency Response/Evacuation Plan (an annex of the CEMP). Hazard risk assessment and vulnerability data included in the mitigation plan will be reviewed during emergency planning and Emergency Response/Evacuation Plan updates. Specific mitigation activities will be incorporated into the annual work plans of TC-DOER and the County Emergency Management Planning Committee.
Annual Budget	Mitigation actions will be considered when setting the annual budgets within participating jurisdictions.
Plans and Programs	Hazard Mitigation Plan information will be considered by each participating jurisdiction during program and protection updates and revisions. Programs and plans will be compared to the Hazard Mitigation Plan to ensure that goals and objectives are consistent among all documents.
Grant Applications and other Funding Opportunities	Data and maps from the HMP may be used as supporting documentation in grant applications. Mitigation actions included in the Plan will be considered during application submission and fund allocation.
Economic Development	Hazard vulnerability information will be reviewed and utilized during the siting of local development efforts within each participating jurisdiction.
Capital Improvement Planning	Current and future projects will be reviewed for hazard vulnerability. Hazard resistant construction standards will be incorporated into the design and location of potential projects, as appropriate.

Some jurisdictions in Tompkins County are taking a more active role in sustainable development, green infrastructure, disaster planning, etc. within their community. After a review of the planning mechanisms and capabilities associated with each jurisdiction, a list of recommended regulatory elements or planning documents was compiled. These potential efforts include:

- Comprehensive/Land Use Plan – Town of Enfield (Update) and City of Ithaca (Update)
- Watershed Protection Plan – all jurisdictions, especially those with repetitive flood loss
- Redevelopment Plan – City of Ithaca
- Land Use Regulation – Towns of Enfield, Caroline, Newfield
- Zoning Code Review and Update – Villages of Freeville and Dryden

- Flood Regulations – Town of Enfield, Villages of Cayuga Heights, Dryden, Lansing and Trumansburg
- Participate in the NFIP – Town of Enfield

Numerous changes and additions were made to this document as part of the five-year HMP Update process. These updates and reorganization have made the 2013 Plan more valuable as a planning tool and more easily implementable. No evidence to support the integration of the 2006 HMP by participating jurisdictions into their local planning mechanisms or processes was noted. No indications of such are included in the Implementation Committee annual meeting notes. An emphasis on such efforts will be placed over the next five-year period. The incorporation of this document in local planning efforts and processes will be reviewed and discussed on an annual basis.

9.4 Public Involvement

It is the intent of Tompkins County and participating jurisdictions to keep the public informed about the hazard mitigation planning efforts, actions, and projects that occur within the County. To accomplish this goal, and in addition to the public involvement already incorporated into the completion and review of this document, the following opportunities for ongoing public involvement will be made available:

- A web link will be provided on Tompkins County's website that will include a digital copy of the hazard mitigation plan and a list of upcoming planning activities and plan updates;
- Public announcements of, and invitations to, annual mitigation committee planning meetings and five-year mitigation plan update events; and
- Completion of public outreach and mitigation training events throughout the County, especially in higher risk hazard areas.

Public outreach efforts will be documented in future plan updates through the inclusion of samples, copies of notices, flyers, web announcements, and/or meeting minutes. If public response is lacking during subsequent update processes, additional ways to expand participation will be considered. Public outreach ideas that may be implemented to increase participation include:

- Distribute targeted questionnaires to local civic, community, and non-profit groups to received public feedback;
- Organize topic specific meetings with key individuals and experts to discuss particular concerns and brainstorm solutions; and
- Hold education programs during various community events to disseminate information and engage the public in discussions on mitigation planning and hazard preparation.

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Appendix A
Additional Figures and Tables

Figure 2.1 – Average Annual Precipitation for New York State (World Book, 2010)

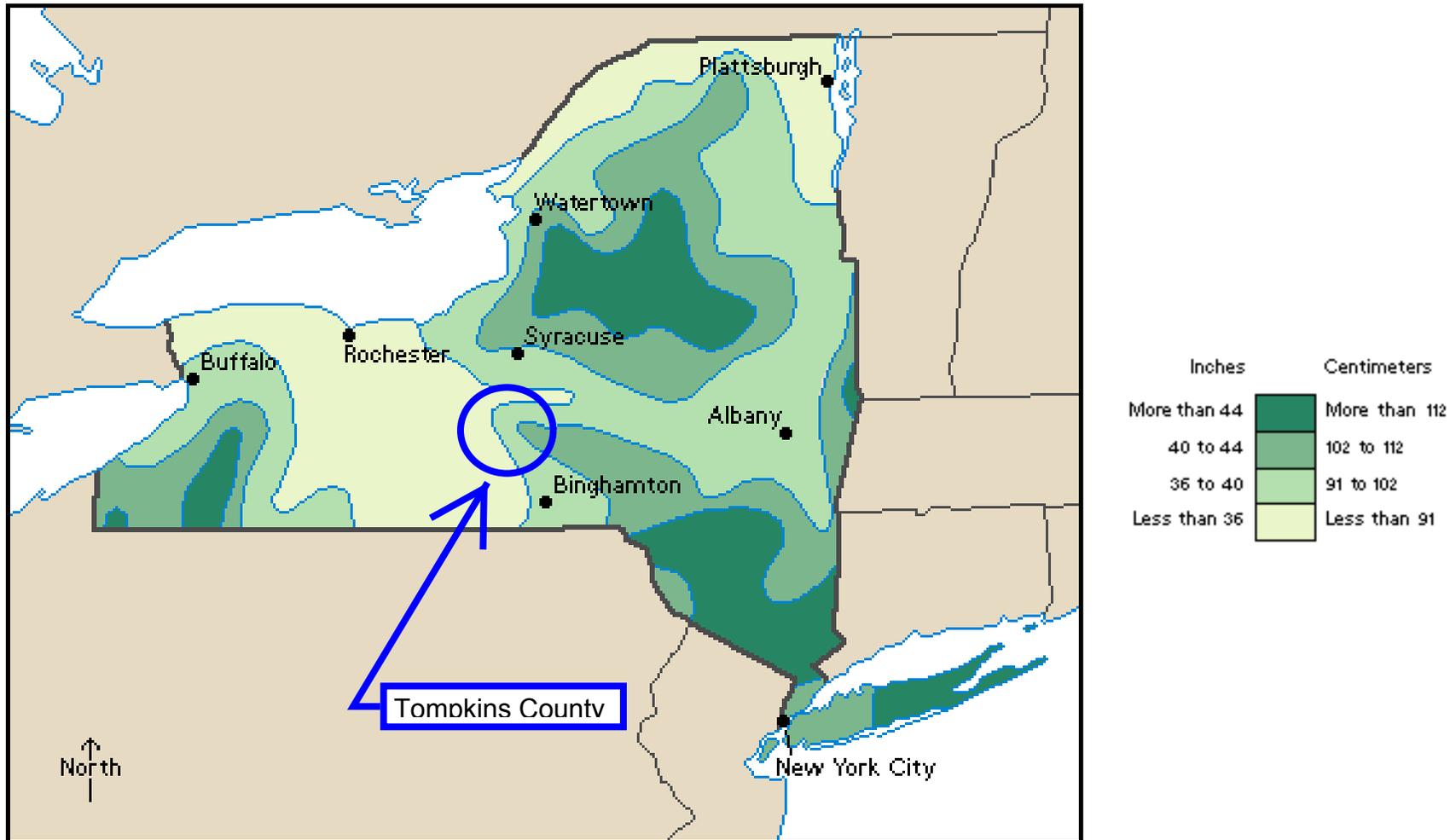


Figure 2.2 – Average January Temperatures for New York State (World Book, 2010)

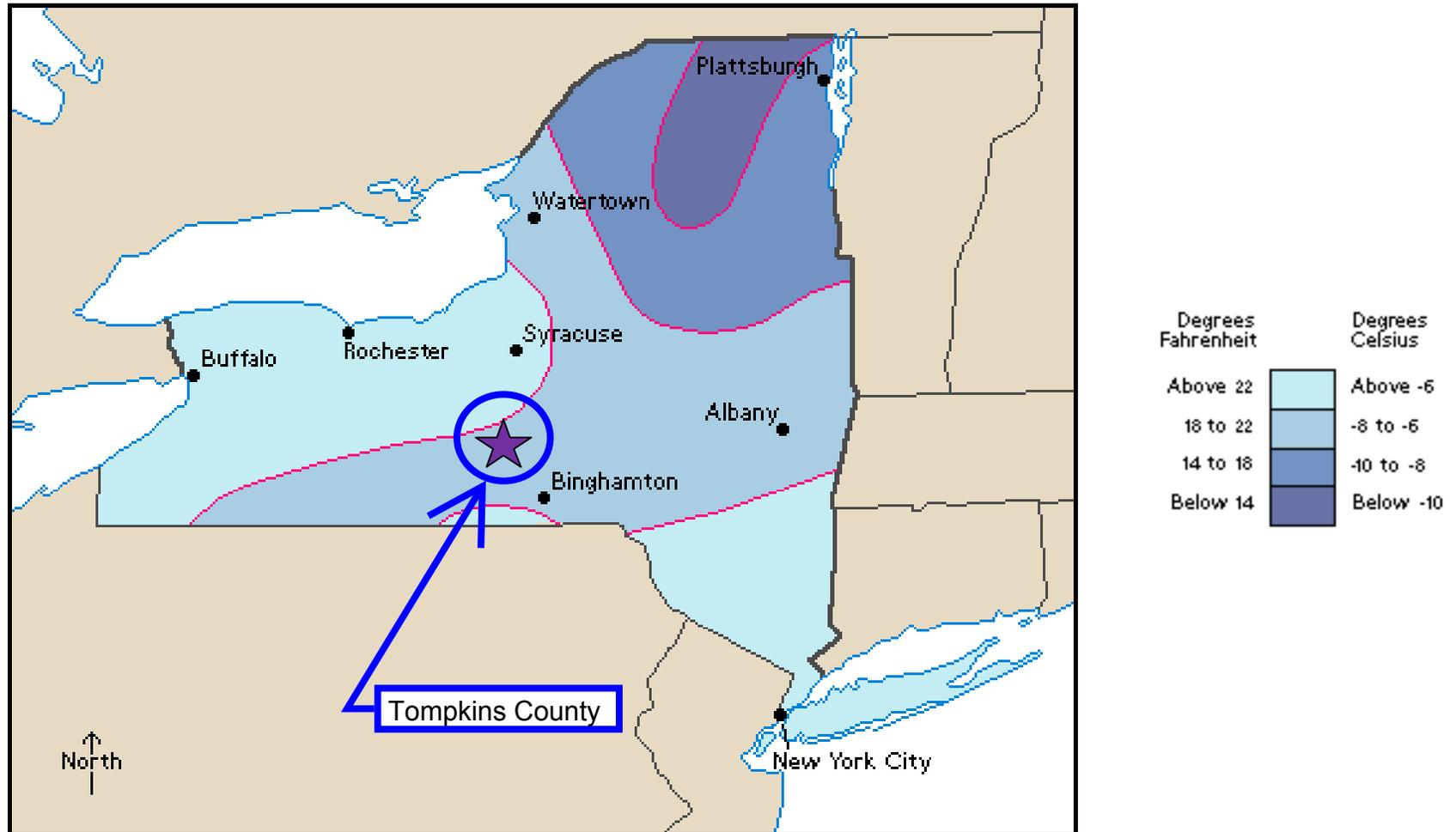


Figure 2.3 – Average July Temperatures for New York State (World Book, 2010)

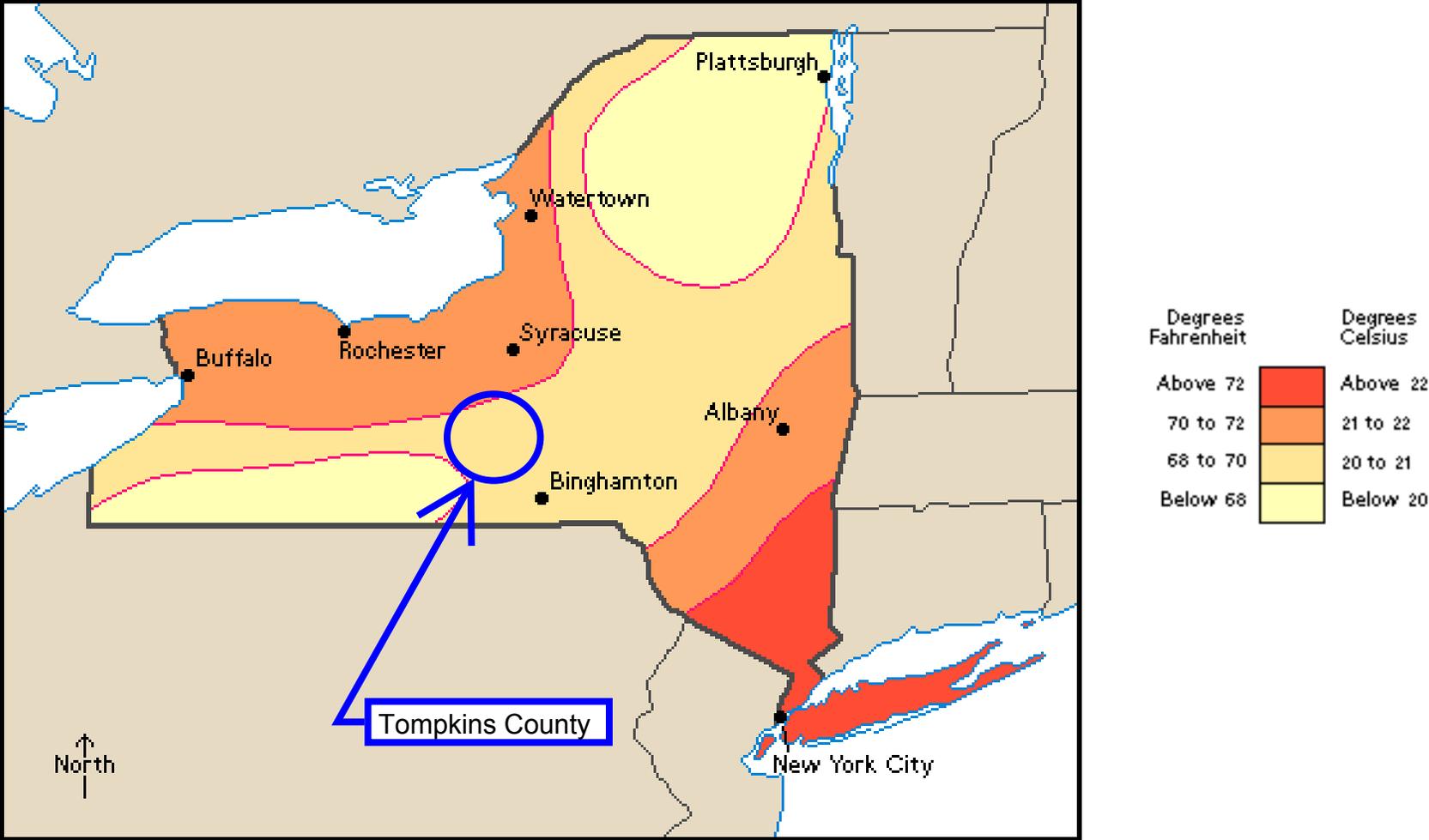


Figure 2.4 - Population Diversity within Tompkins County
(U.S. Census Bureau Interactive Population Search, 2010)

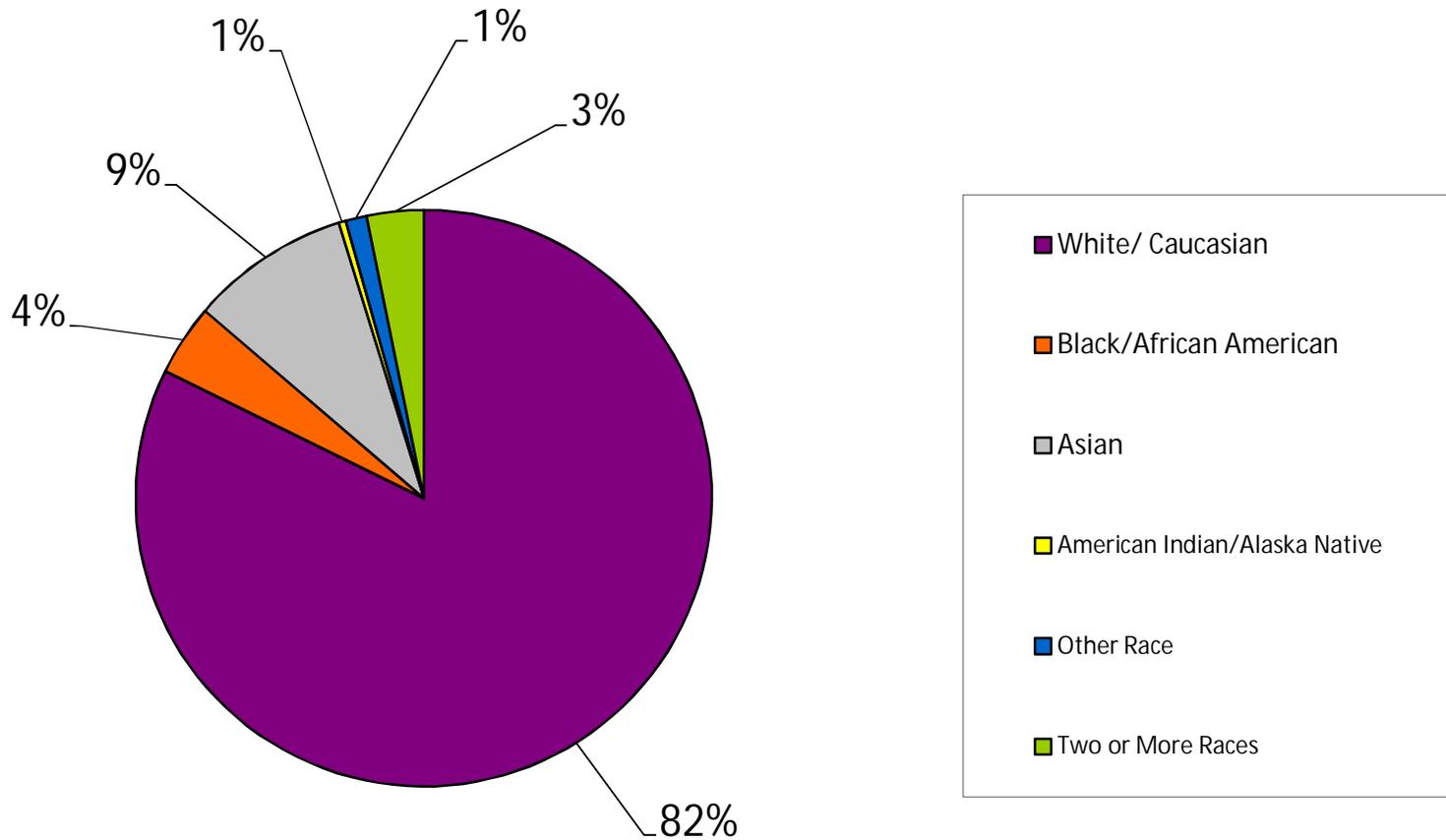


Figure 2.5 – Changes in Land Cover – 1969, 1995, and 2007
(Tompkins County Planning Department, 2007)

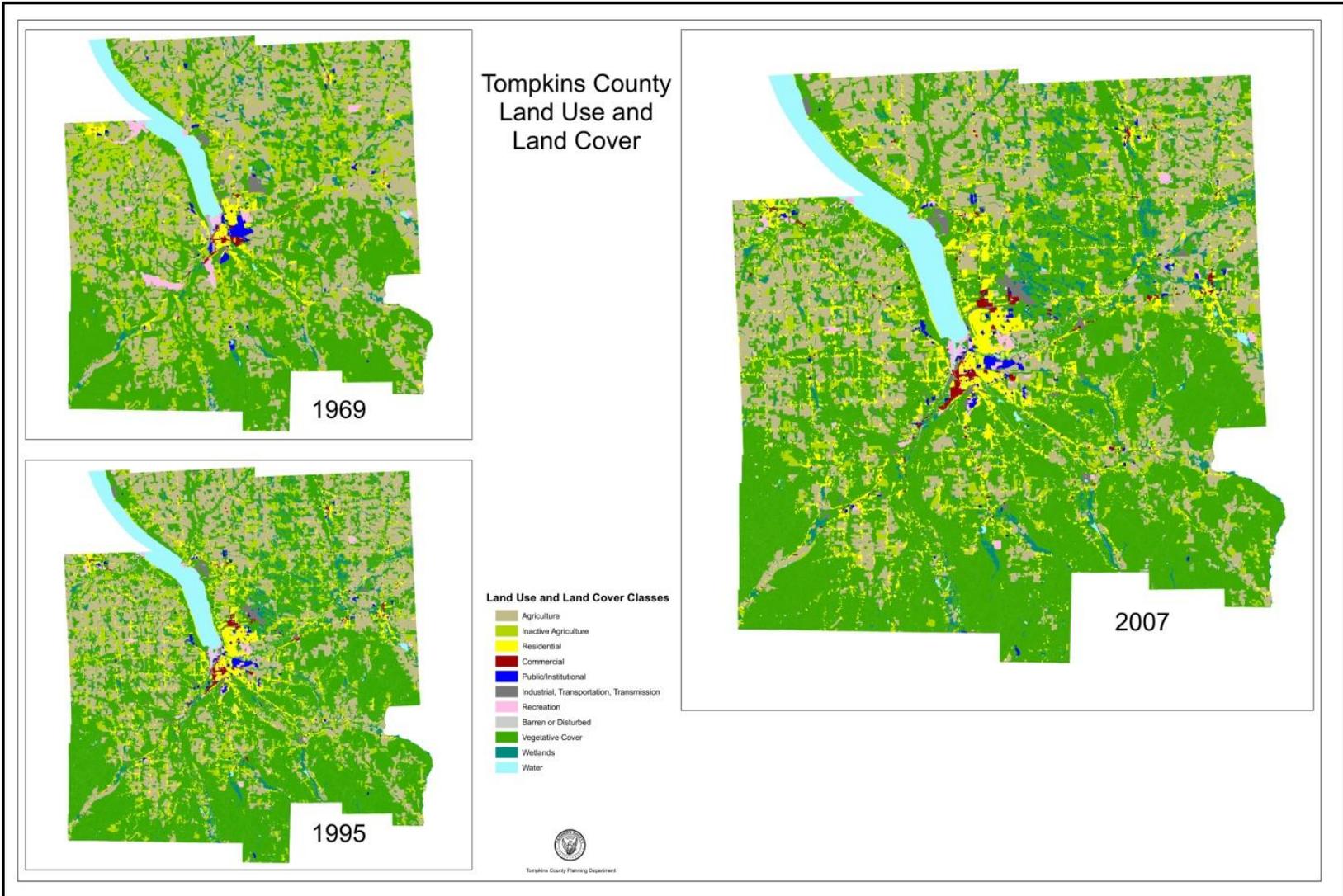


Figure 2.6 - Mapped Agricultural Districts within Tompkins County
(Tompkins County GIS Datasets at CUGIR)

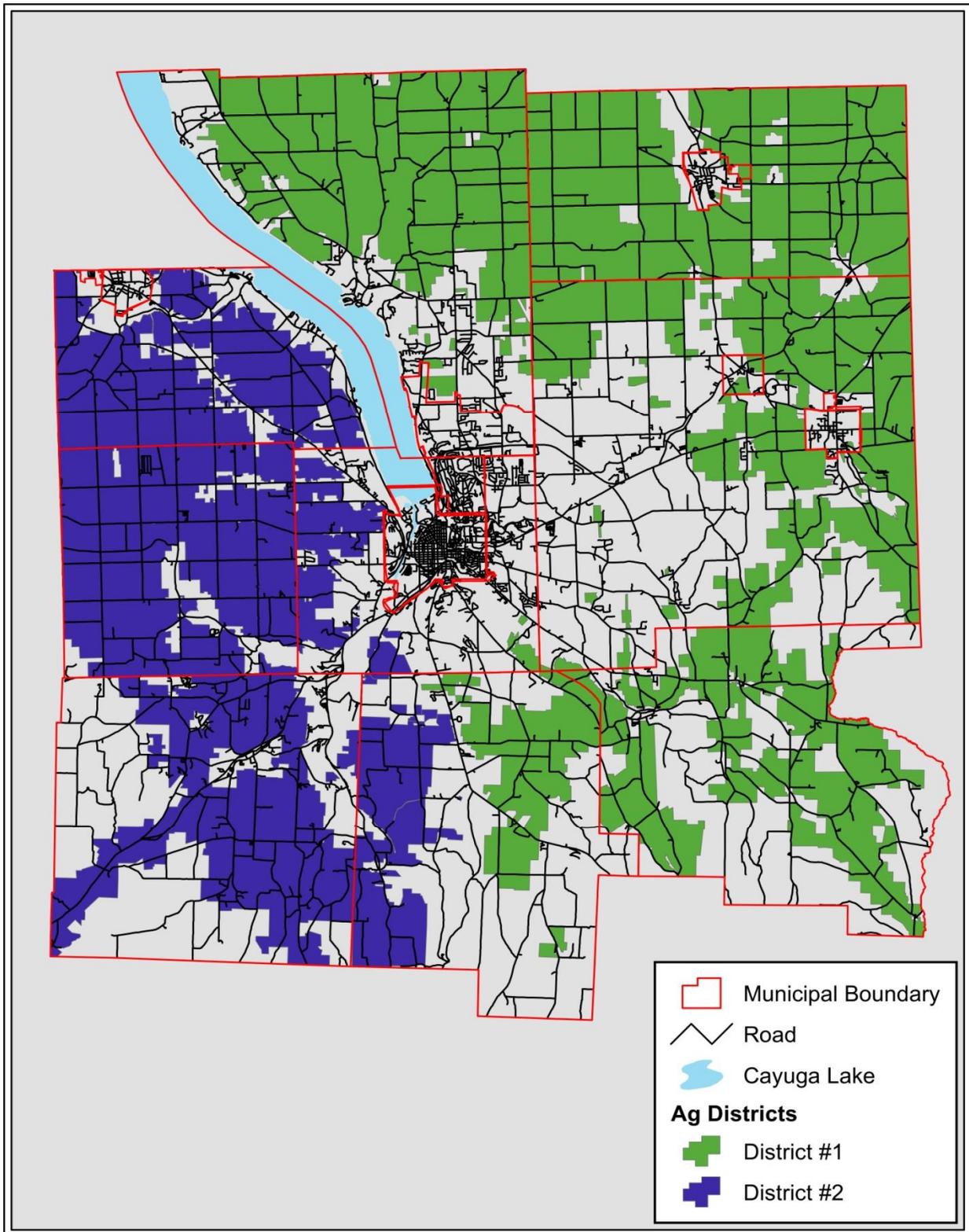
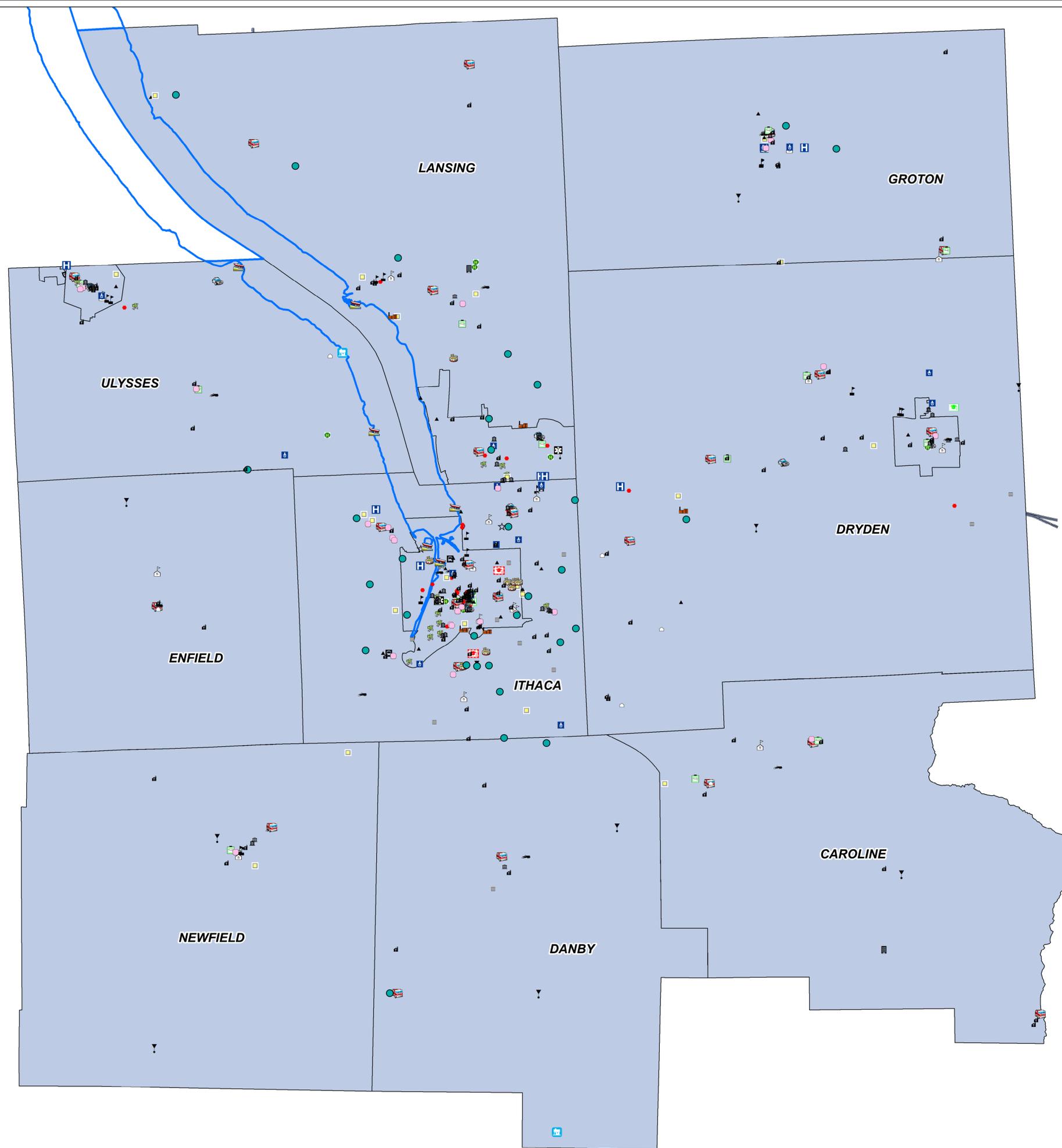


Figure 2.9

Critical Facilities in Tompkins County

Figure 2.9 - Tompkins County Critical Facilities

(Tompkins County GIS - Planning Department)



-  Water Tank
-  Banks
-  SeniorHousing
-  Boatyard
-  Bus Terminal
-  Camp
-  City Hall; Town Hall; Village Hall; Town Hall/Polling Place
-  Community Center
-  Correctional Facility
-  Courthouse
-  Dam
-  Day Care Center
-  Electrical Substation
-  Elementary School
-  Emergency Operations
-  Fire Department
-  High School; Middle School
-  Highway Department
-  Human Services
-  Industrial
-  Major University
-  Medical Facility
-  Other Public Facility
-  Performing Arts
-  Police Department
-  Post Office
-  Public Works
-  Shopping Area
-  Small College
-  Stadium or Sports Facility
-  Vocational School
-  Towers
-  Cayuga Lake
-  Municipal Boundary
-  Transmission Lines

**Table 9 – Economic Characteristics of Tompkins County , 2006-2010
(U.S. Census Bureau, 2012)**

Statistics	Tompkins County 2010		New York State 2010		Tompkins County 2006 to 2010		New York State 2006 to 2010	
	Number	%	Number	%	Number	%	Number	%
Labor Force (#)	51,363	58.2%	9,912,749	63.5%	53,040	61.5%	9,808,150	63.7%
Travel Time to Work (mins)	20.0	-	31.3	-	18.4	-	31.3	-
Median Household Income (\$)	\$52,064	-	\$54,148	-	\$48,655	-	\$55,603	-
Median Family Income (\$)	\$77,131	-	\$91,447	-	\$72,231	-	\$67,405	-
Per Capita Income (\$)	\$25,041	-	\$30,011	-	\$25,737	-	\$30,948	-
Families Below Poverty Line	-	6.8%	-	11.5%	-	6.5%	-	10.8%
Individuals Below Poverty Line	-	21.8%	-	14.9%	-	18.8%	-	14.2%

Table 10 – Airport Facilities Located Within Tompkins County*(Global Aviation Navigator, Inc., 2012)*

Name	Location	ICAO ID No.*	IATA ID No.*	Ownership	Runway(s)
Grund Field Airport	Town of Enfield	NY55	NY55	Private	1 (turf)
Ithaca Tompkins Regional Airport	Village of Lansing	KITH	ITH	Public	2 (1 asphalt, 1 turf)
James Henion Private Field Airport	Town of Danby	NK72	NK72	Private	1 (turf)
Keech Airport	Hamlet of Etna (Freeville)	5NY3	5NY3	Private	1 (turf)
Neno International Airport	Town of Enfield	NY18	NY18	Private	2 (turf)
Tom N' Jerry Airport	Town of Danby	NK05	NK05	Private	1 (turf)
*ICAO = International Civil Aviation Organization					
*IATA = International Air Transport Association					

Figure 4.3 – Total Presidential Disaster Declarations for hazard events, displayed at the County level, 1954 – 2010
(NYSOEM, 2011 NYS Hazard Mitigation Plan)

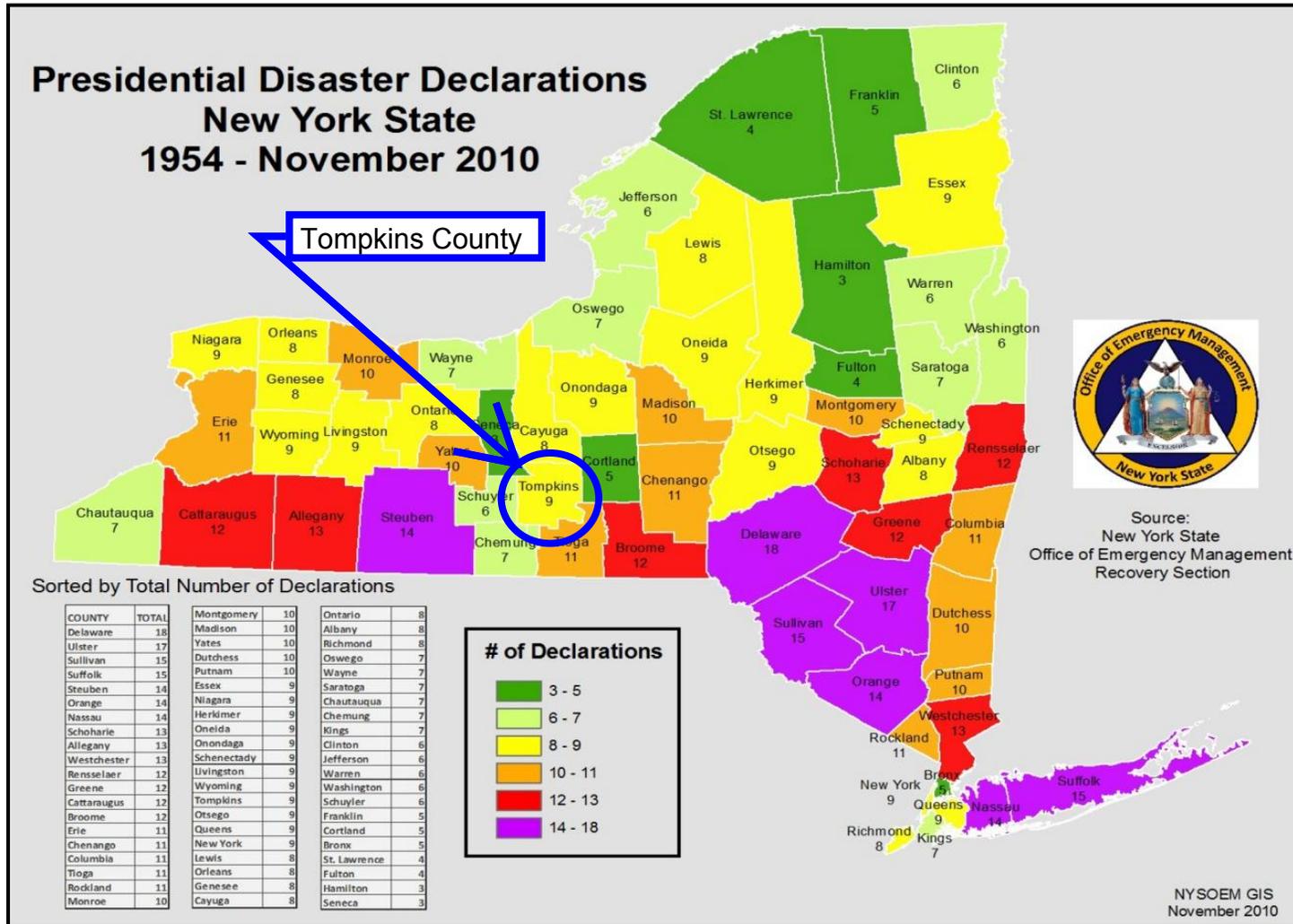


Figure 5.1 – Probability for severe hail (3/4-inch diameter or greater) to occur in the United States, reported in days per year (NOAA, NSSL, 2003)

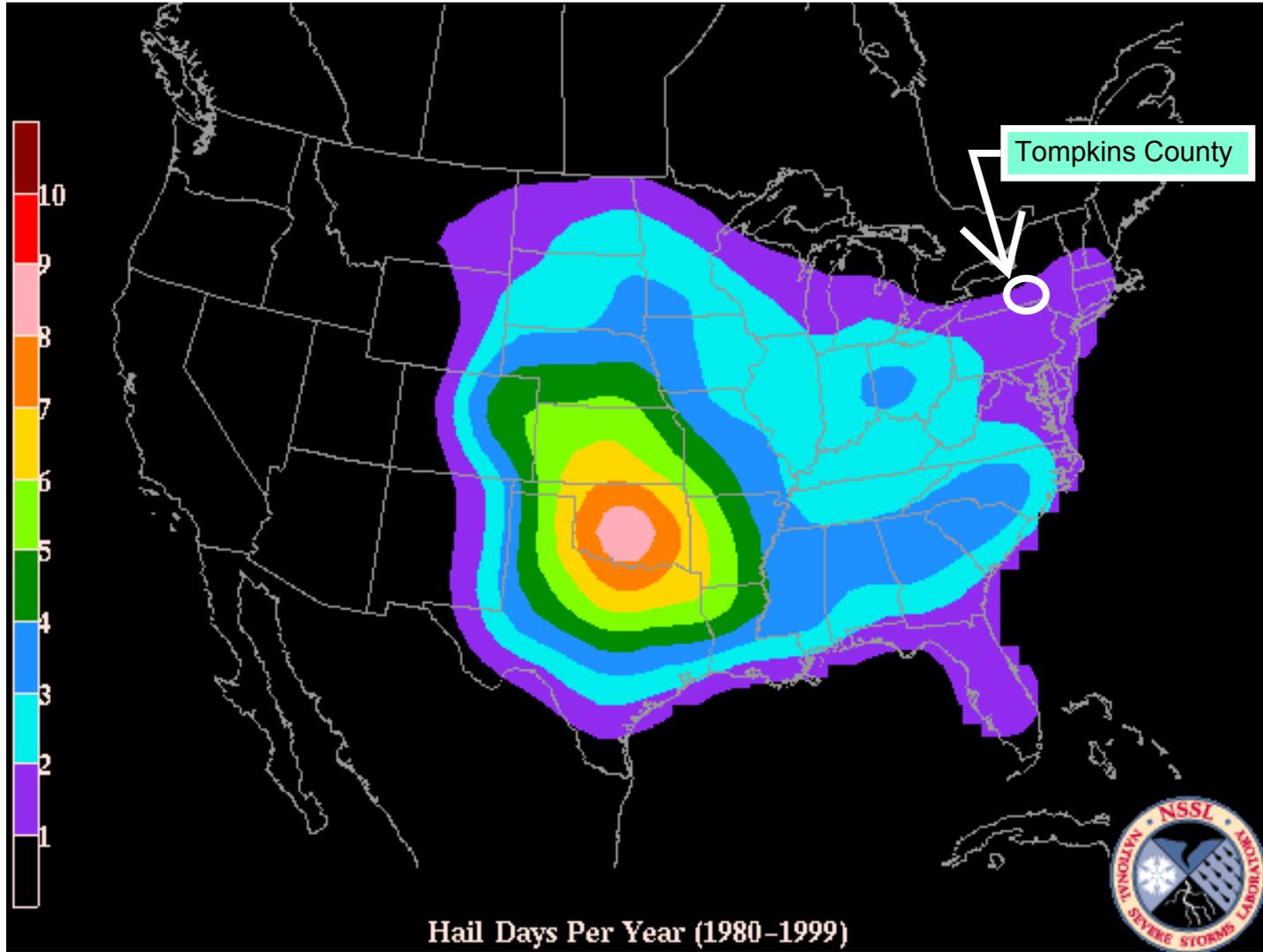


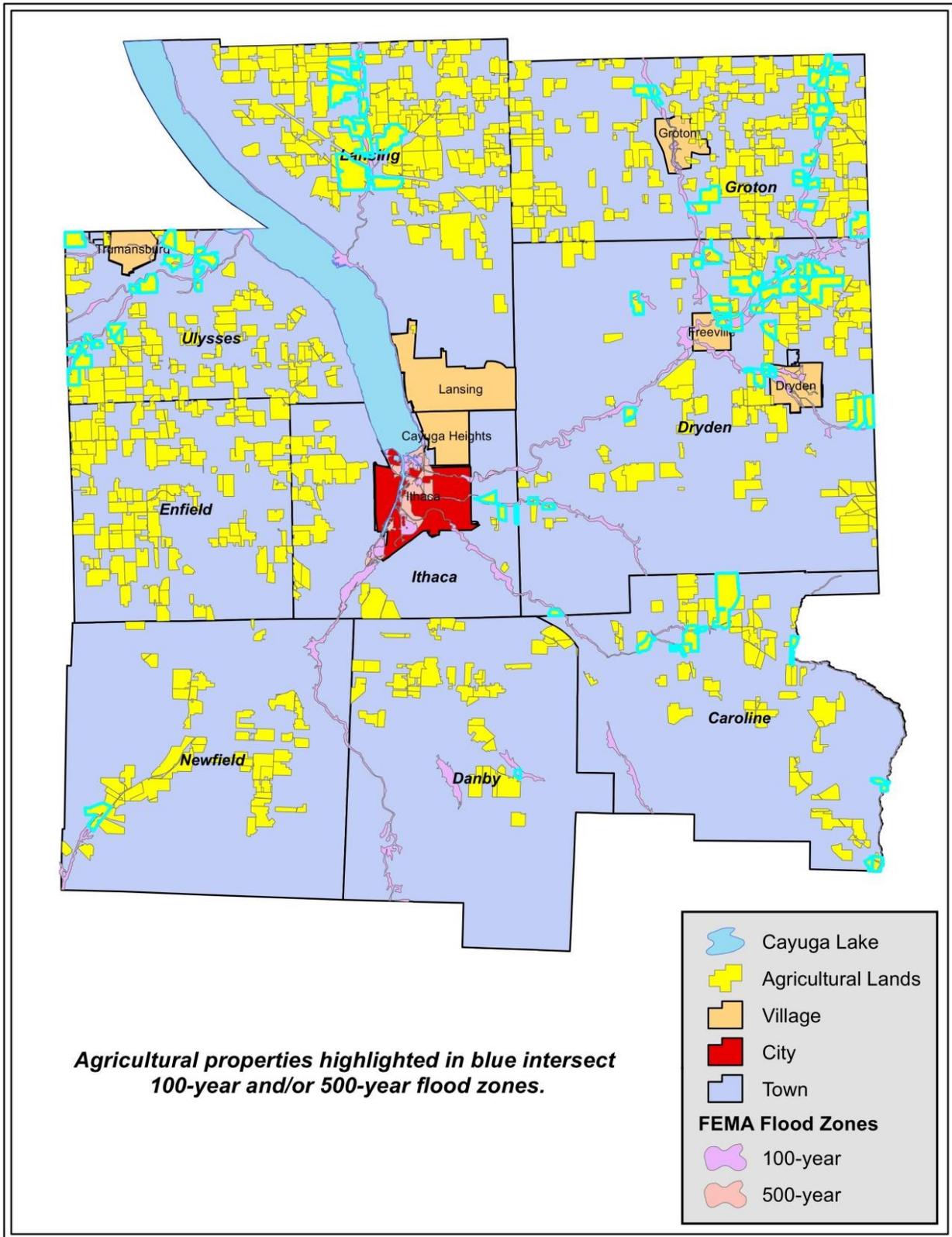
Table 16 – NOAA NCDC Query Results: Severe Storm Events Recorded for Tompkins County, October 2006 – October 2012
(NOAA, NCDC, Storm Events Search, 2012)

Location	Date	Event	Magnitude	Deaths (#)	Injuries (#)	Property Damage (\$)	Crop Damage (\$)
Groton	11/16/2006	Tstm Wind	50 knots	0	0	1,000	0
Groton	12/1/2006	Tstm Wind	50 knots	0	0	1,000	0
Ithaca	6/21/2007	Tstm Wind	50 knots	0	0	0	0
Caroline	6/27/2007	Tstm Wind	60 knots	0	0	0	0
McKinney's Point	7/27/2007	Tstm Wind	50 knots	0	0	2,000	0
Trumansburg	8/17/2007	Tstm Wind	50 knots	0	0	2,000	0
Ithaca	8/17/2007	Tstm Wind	50 knots	0	0	2,000	0
McKinney's Point	8/24/2007	Tstm Wind	50 knots	0	0	1,000	0
McKinney's Point	8/24/2007	Tstm Wind	50 knots	0	0	0	0
Freeville	8/24/2007	Tstm Wind	60 knots	0	0	2,000	0
Grotto	8/24/2007	Tstm Wind	50 knots	0	0	2,000	0
Dryden	8/24/2007	Tstm Wind	50 knots	0	0	2,000	0
McKinney's Point	8/24/2007	Tstm Wind	50 knots	0	0	3,000	0
Dryden	8/25/2007	Tstm Wind	50 knots	0	0	2,000	0
Ithaca	8/25/2007	Tstm Wind	50 knots	0	0	5,000	0
Grotto	10/9/2007	Tstm Wind	50 knots	0	0	0	0
McKinney's Point	1/9/2008	Tstm Wind	50 knots	0	0	1,000	0
Besemer	6/20/2008	Tstm Wind	50 knots	0	0	1,000	0
Ithaca	6/23/2008	Tstm Wind	50 knots	0	0	1,000	0
Trumansburg	6/27/2008	Tstm Wind	50 knots	0	0	0	0
Tompkins County	9/15/2008	High Wind	50 knots	0	0	4,000	0
Enfield	5/16/2009	Tstm Wind	50 knots	0	0	0	0

Table 16 – NOAA NCDC Query Results: Severe Storm Events Recorded for Tompkins County, October 2006 – October 2012
(NOAA, NCDC, Storm Events Search, 2012)

Location	Date	Event	Magnitude	Deaths (#)	Injuries (#)	Property Damage (\$)	Crop Damage (\$)
Grotto	8/10/2009	Tstm Wind	50 knots	0	0	0	0
Peruville	8/10/2009	Tstm Wind	50 knots	0	0	1,000	0
McKinney's Point	7/21/2010	Tstm Wind	50 knots	0	0	2,000	0
Tompkins County	2/18/2011	High Wind	50 knots	0	0	50,000	0
Danby	4/28/2011	Tstm Wind	87 knots	0	0	100,000	0
Ithaca	4/28/2011	Tstm Wind	50 knots	0	0	5,000	0
Groton	4/28/2011	Tstm Wind	60 knots	0	0	12,000	0
Tompkins County	6/23/2011	Tstm Wind	50 knots	0	0	1,000	0
Tompkins County	6/28/2011	Tstm Wind	50 knots	1	0	5,000	0
Krum Corner	7/19/2011	Tstm Wind	50 knots	0	0	0	0
Totals:	--	--	--	0	0	\$208,000	\$0
Tstm = Thunderstorm							

Figure 5.5 – Agricultural Properties that Intersect Flood Zones

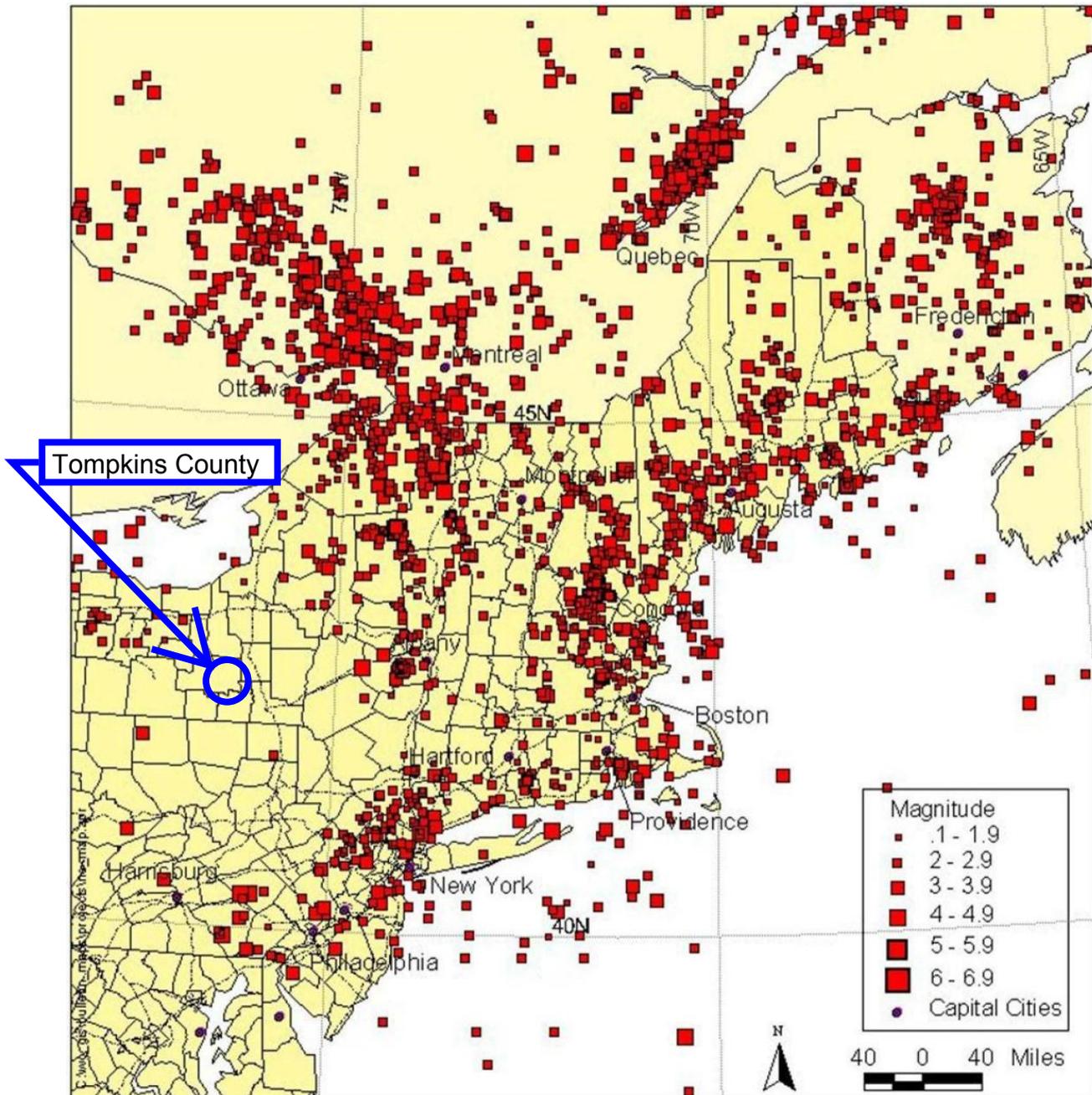


**Table 18 – NFIP Flood Damage Data for Tompkins County,
1978 - August 31, 2012
(FEMA, NFIP, 2012)**

Town/Village/City	Total Flood Loss 1/1/78 - 8/31/12	Average Annual Loss*
Caroline	\$ 72,531.40	\$ 2,133.28
Cayuga Heights	\$ 15,790.79	\$ 464.44
Dryden (T)	\$ 56,450.54	\$ 1,660.31
Dryden (V)	\$ 84,639.71	\$ 2,489.40
Freeville	\$ 17,760.16	\$ 522.36
Groton (T)	\$ 16,773.65	\$ 493.34
Groton (V)	\$ 614,682.96	\$18,078.91
Ithaca (C)	\$ 220,430.64	\$ 6,483.25
Ithaca (T)	\$ 35,396.78	\$ 1,041.08
Lansing	\$ 442,746.94	\$13,021.97
Newfield	\$ 9,297.04	\$ 273.44
Trumansburg	\$ 902.32	\$ 26.54
Ulysses	\$ 5,798.14	\$ 170.53
TOTAL	\$1,593,201.07	\$46,858.85

* Partial year for 2012 included as a full year in annual loss average calculation

Figure 5.6 – Seismic Activity within the Northeastern United States and Eastern Canada, Occurrences Between October 1975 – March 2010
(NYSOEM, State Hazard Mitigation Plan, 2011)



Source: Boston College Weston Observatory, <http://www.bc.edu/research/westonobservatory/northeast/eqmaps.html>

Figure 5.7 – Peak Ground Acceleration Values for New York State
(NYSOEM, State Hazard Mitigation Plan, 2011)

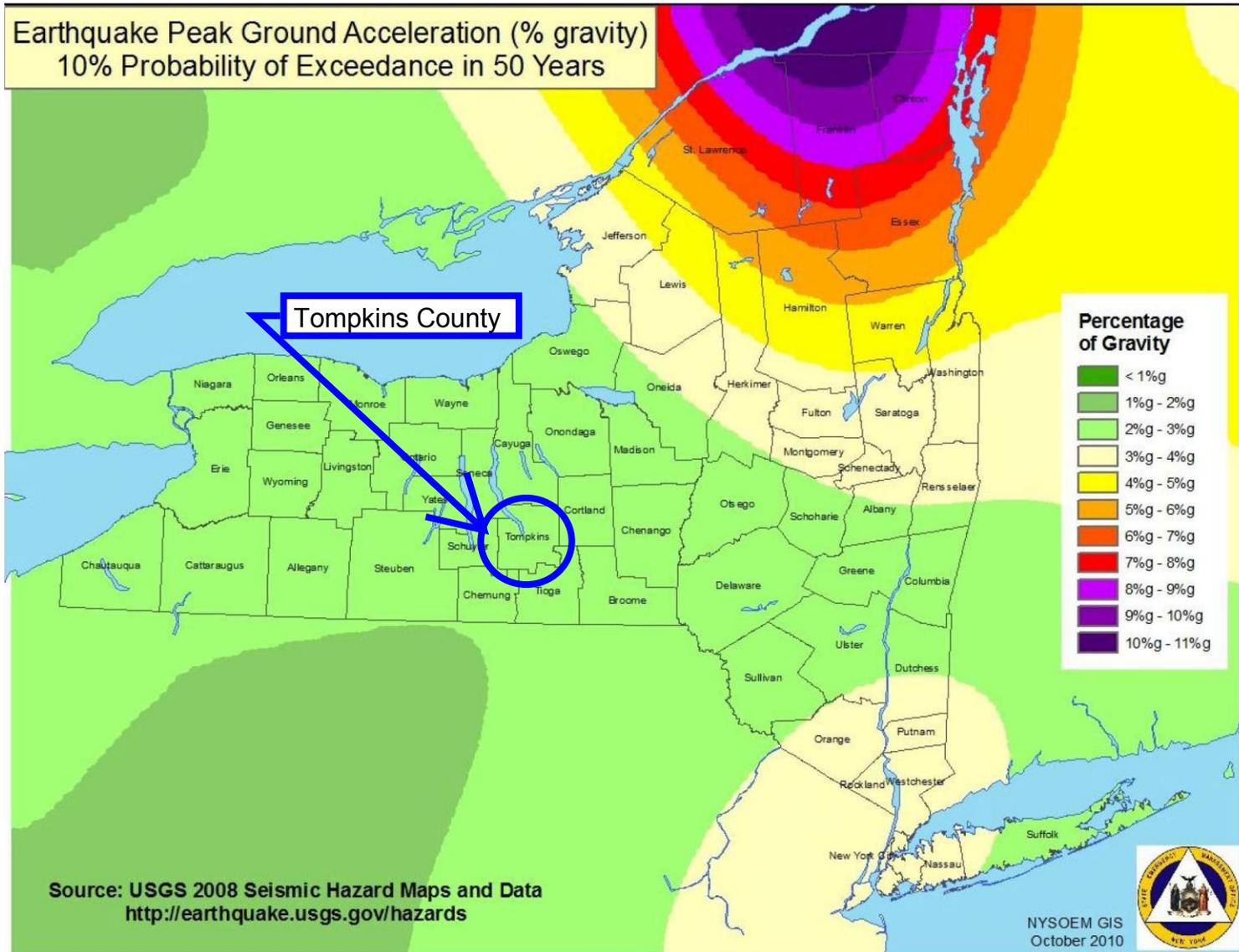


Table 20 – NOAA NCDC Query Results: Severe Winter Storm Events Recorded for Tompkins County, October 2006 – October 2012
(NOAA, NCDC, Storm Events Search, 2012)

Location	Date	Event	Magnitude	Deaths (#)	Injuries (#)	Property Damage (\$)	Crop Damage (\$)
County-wide	02/13/2007	Winter Storm	N/A	0	0	0	0
County-wide	03/17/2007	Lake-Effect Snow	N/A	0	0	0	0
County-wide	04/15/2007	Winter Storm	N/A	0	0	0	0
County-wide	12/13/2007	Heavy Snow	N/A	0	0	0	0
County-wide	02/26/2008	Winter Storm	N/A	0	0	0	0
County-wide	12/11/2008	Winter Storm	N/A	0	0	0	0
County-wide	12/19/2008	Winter Storm	N/A	0	0	0	0
County-wide	02/25/2010	Winter Storm	N/A	0	0	0	0
County-wide	02/25/2011	Winter Storm	N/A	0	0	0	0
County-wide	03/06/2011	Heavy Snow	N/A	0	0	0	0
County-wide	01/13/2012	Heavy Snow	N/A	0	0	0	0
Totals:	--	--	--	0	0	\$0	\$0

Figure 5.10 – Number and Locations of Ice Jams on New York State Waterways
(NYS Hazard Mitigation Plan, 2011)

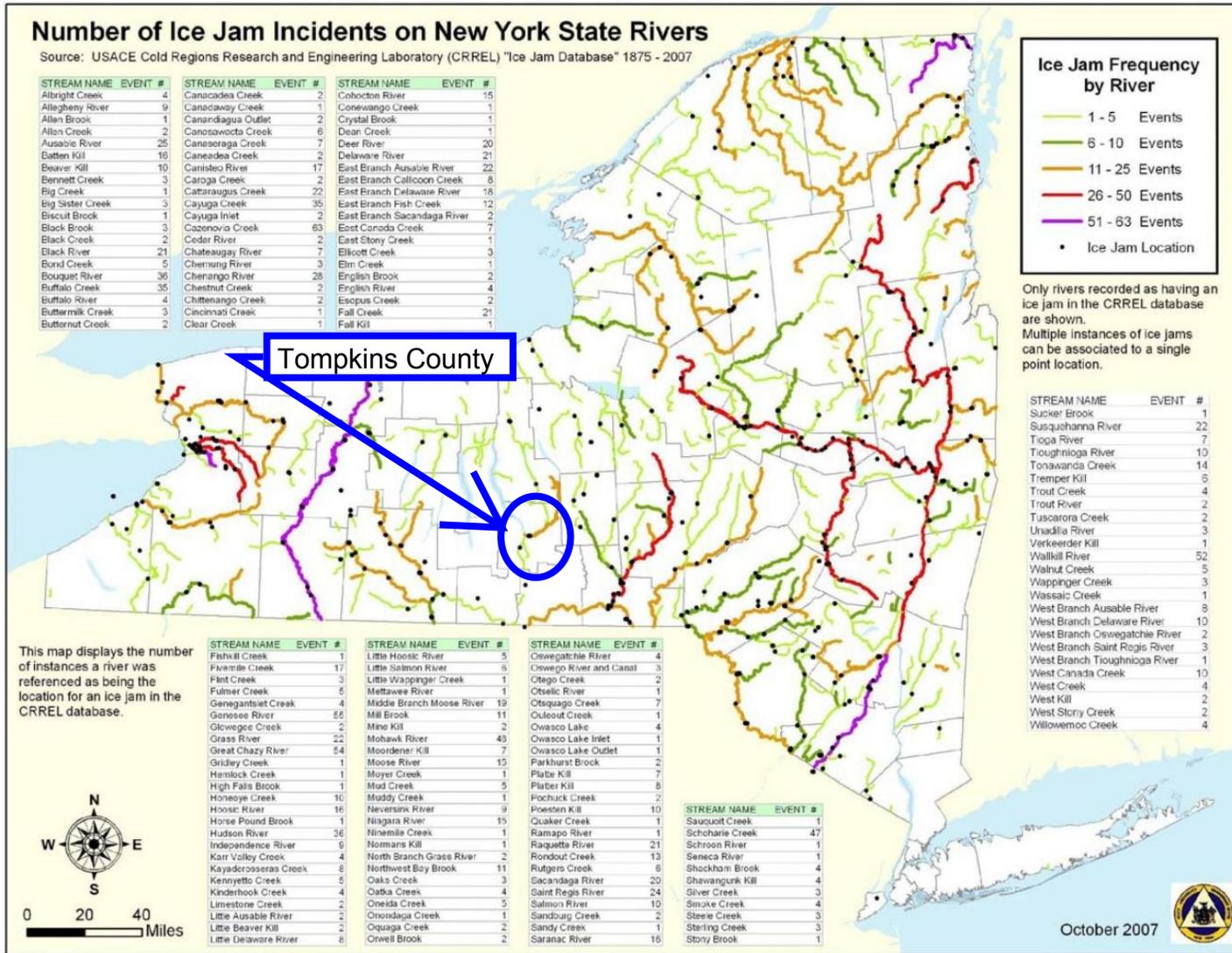


Table 21 – Ice Jam Database Events in Tompkins County
(USACE, CRREL, 2012)

Jam Date	Location	Water	Details
01/19/1926	Ithaca	Fall Creek	Water level effected by backwater from ice
01/22/1927	Ithaca	Fall Creek	Water level effected by backwater from ice
02/08/1928	Ithaca	Fall Creek	Water level effected by backwater from ice
02/27/1929	Ithaca	Fall Creek	Water level effected by backwater from ice
02/20/1930	Ithaca	Fall Creek	Water level effected by backwater from ice
03/04/1934	Ithaca	Fall Creek	Water level effected by backwater from ice
02/16/1935	Ithaca	Fall Creek	Water level effected by backwater form ice
12/01/1944	Ithaca	Cayuga Inlet	Water level effected by backwater from ice
03/02/1946	Ithaca	Fall Creek	Ice effect of 6.3 feet
02/19/1948	Ithaca	Fall Creek	Ice effect of 3.0 feet
12/21/1951	Ithaca	Cayuga Inlet	Water level effected by backwater from ice
12/11/1952	Ithaca	Fall Creek	Ice effect of 0.05 feet
02/22/1955	Ithaca	Fall Creek	Ice effect of 6.0 feet
01/22/1957	Ithaca	Fall Creek	Ice effect of 3.4 feet
02/28/1958	Ithaca	Fall Creek	Ice effect of 1.9 feet
01/21/1959	Ithaca	Fall Creek	Ice effect of 6.3 feet
02/28/1962	Ithaca	Fall Creek	Water level effected by backwater from ice
03/17/1963	Ithaca	Fall Creek	Ice jam increased water level
02/21/1971	Ithaca	Fall Creek	Ice jam increased water level
01/01/1977	Ithaca	Fall Creek	Ice 10 feet thick located beneath Route 13 and RR bridges – caused localized flooding
03/15/1978	Ithaca	Fall Creek	Ice jam increased water level
03/02/1979	Ithaca	Fall Creek	Water level effected by backwater from ice
03/03/2003	Ithaca	Fall Creek	Water level effected by backwater from ice
02/11/2009	Ithaca	Fall Creek	Water temps caused ice to run and jam, resulting in moderate flooding

Figure 5.14 – Asian Longhorn Beetle Susceptible Areas in U.S.
(Don't Move Firewood, 2011)

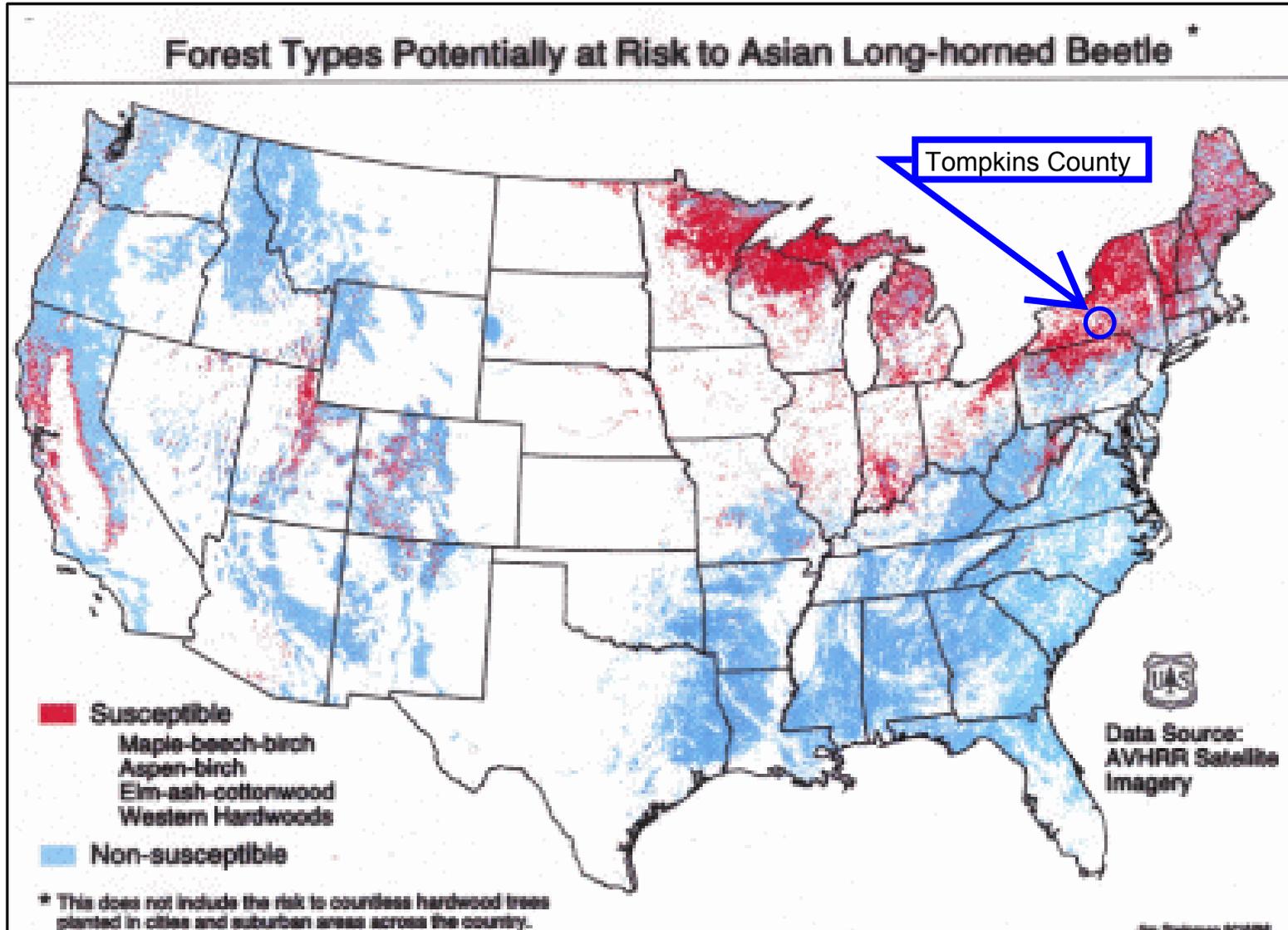


Figure 5.15 – Hydrilla: 2012 Herbicide Application Plan

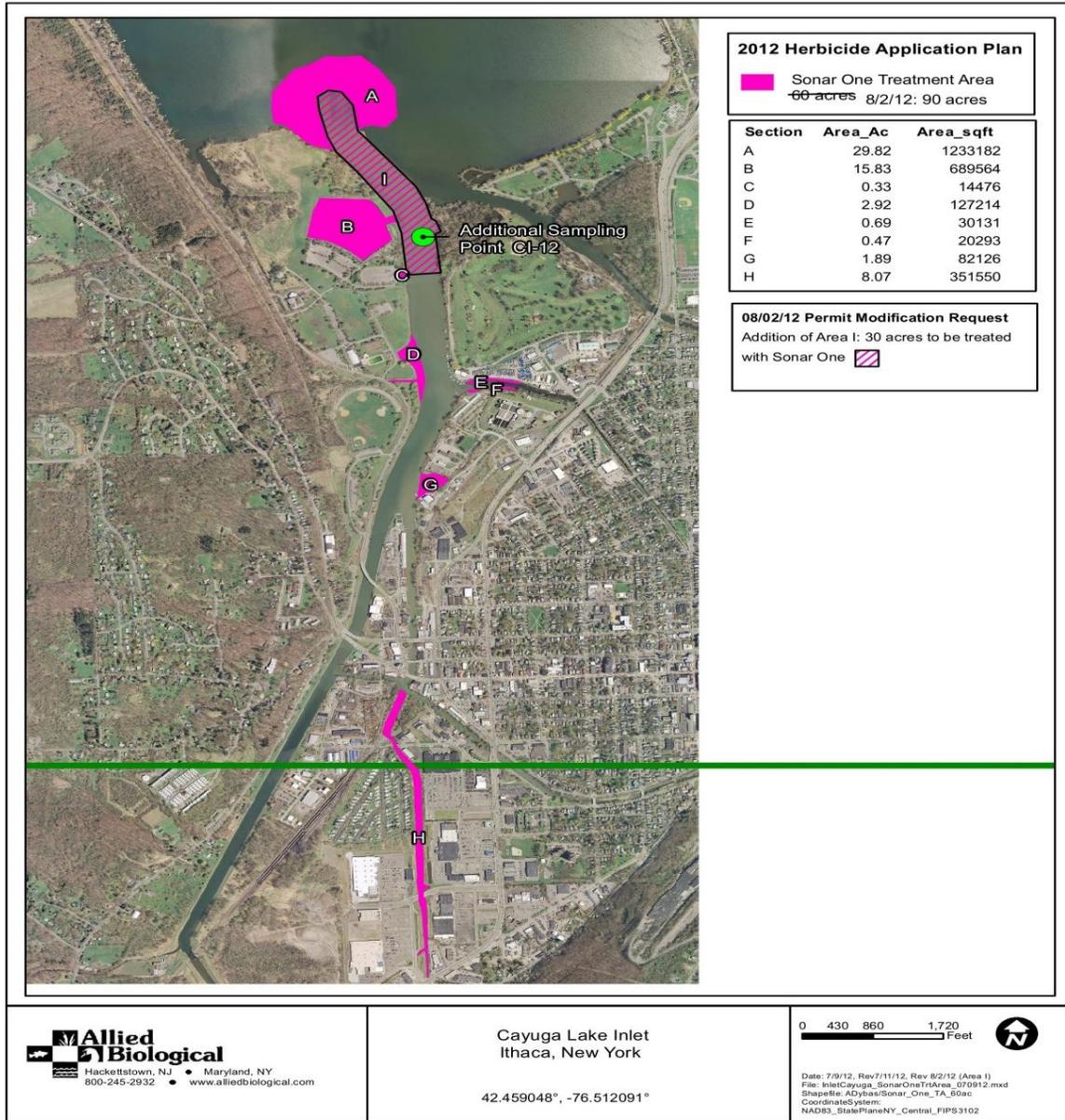


Table 22 – Enhanced F-Scale System Used to Rate Magnitude of Tornado Events*(NOAA, Storm Prediction Center, Enhanced F-Scale)*

Fujita Scale		Derived EF Scale		Operational EF Scale		
F Number	Fastest ¼-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Figure 5.17 – Tornado Activity in U.S., 1950 – 1998

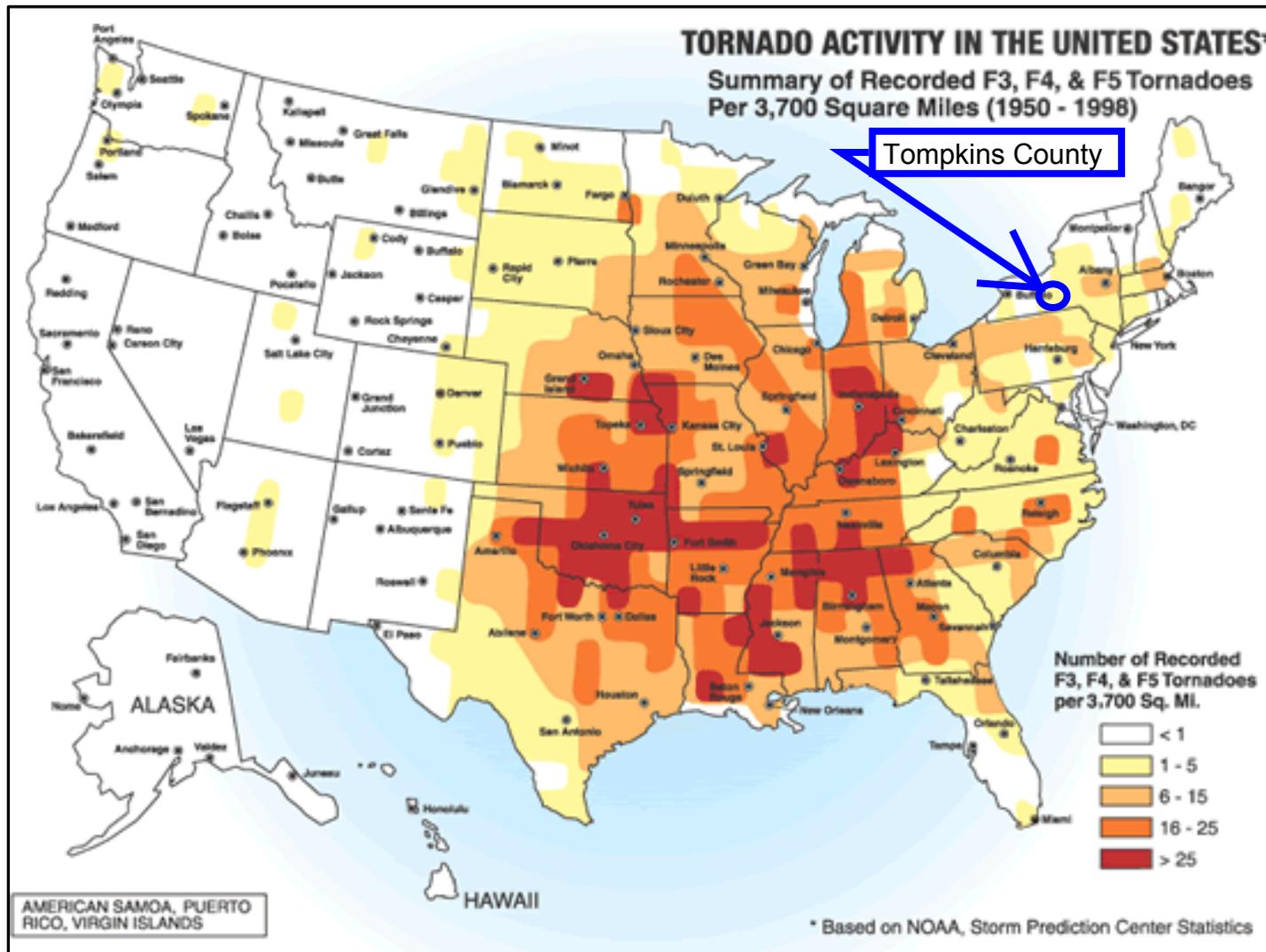


Figure 5.18 –Tornado Risk Areas in the Continental United States

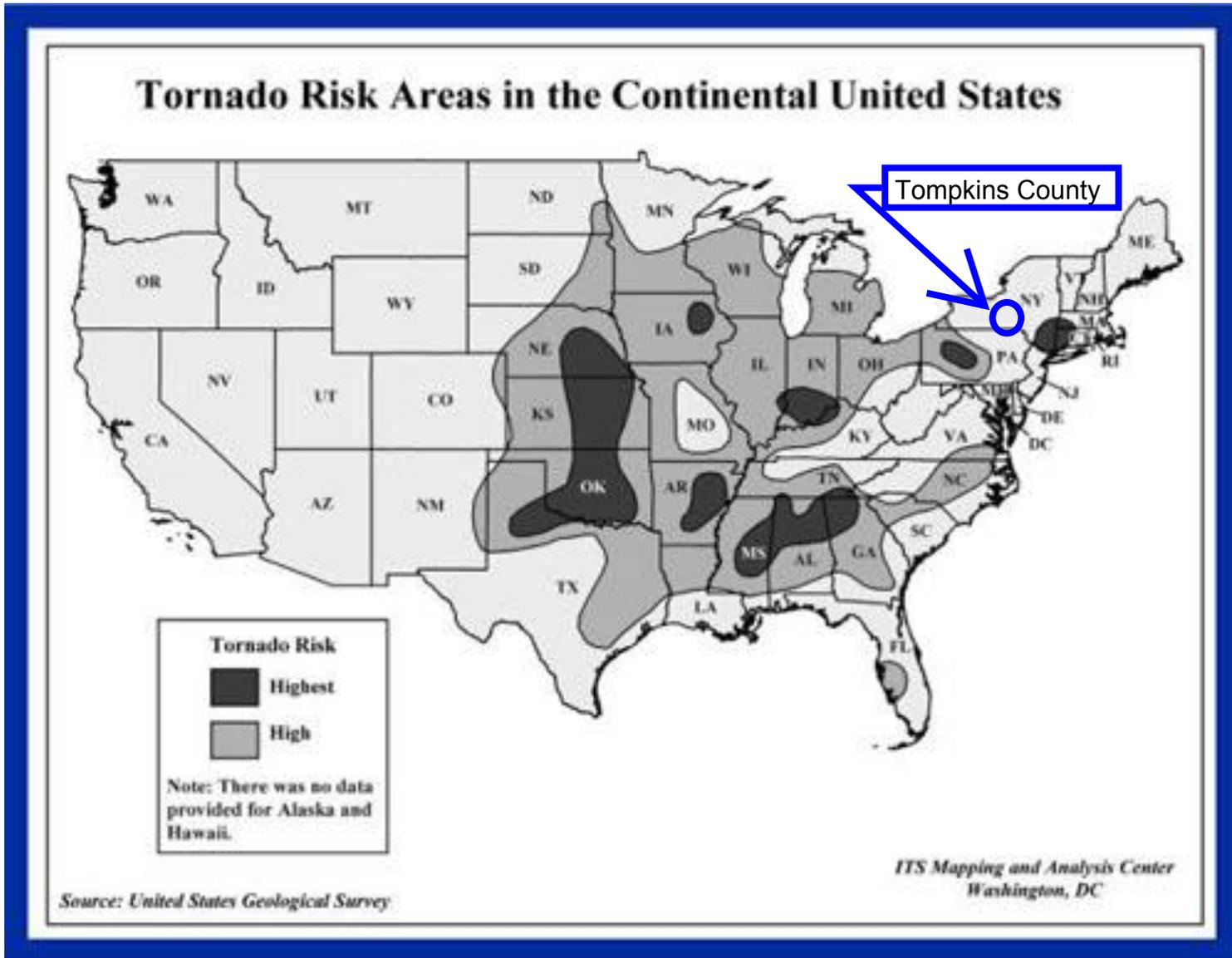


Table 28 – Estimated Property Values of Lands within Tompkins County
(TC Office of Real Property, 2012)

Jurisdiction	# of Properties	Full Market Assessed Value (\$)
Caroline (Town)	1968	249,429,396
Cayuga Heights (Village)	989	452,038,518
Danby (Town)	2016	268,870,442
Dryden (Town)	4799	891,283,394
Dryden (Village)	795	128,119,790
Enfield (Town)	1662	188,971,300
Freeville (village)	233	35,494,500
Groton (Town)	1871	209,018,898
Groton (Village)	908	122,905,410
Ithaca (Town)	4293	2,017,893,667
Ithaca (City)	5555	17,701,001,320
Lansing (Town)	3776	1,083,359,160
Lansing (Village)	1056	532,085,231
Newfield (Town)	2327	289,695,259
Trumansburg (Village)	710	137,661,412
Ulysses (Town)	1928	373,088,800

Table 30

Status and Details of 2006 HMP Mitigation Plan

Appendix A - Table 30 - Status of 2006 HMP Mitigation Actions

Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Flood	5.1.40 Ensure that adequate shelter is available to community residents in the event that a flood event causes displacement.	Goal 4, Objective 4-2	L to M	Ongoing	ARC, ER, HMGP	ARC	TCDER, TST BOCES, NYS Dept. of Education, IC, CU	Action item has been discussed in local planning efforts, and shelters have been clearly identified though more work remains. As such the item has been reincluded in the plan update as "Action Item A4" with an emphasis on sheltering in place and enhanced through heating and cooling centers in "Action Item A16".
Flood	5.1.30 Monitor to ensure that the Cayuga Inlet Flood Control Channel and Levee are well maintained to minimize the threat of levee failure.	Goal 1, Objective 1-1	L	Ongoing	Flood Mitigation Initiatives; recommendations of watershed studies	Canal Corp.	Cayuga Watershed Committee, TCSWCD, TCDPW	The City of Ithaca has worked very closely with local partners to take steps to dredge the Cayuga Inlet so as to ensure the flood control channel functions as design. This has yet to be implemented, and thus has been reincluded in the plan update as "High Priority Action 11" because of the number of properties at-risk in and around the Inlet.
Flood	5.1.46 Continue local stream bank stabilization projects (administered by Caroline Watershed Committee)	Goal 1, Objectives 1-1, 1-3, and 1-5	\$30,000/Year	Ongoing	Programs administered by Caroline Watershed Committee	Caroline Watershed Committee	TC, TCSWCD	Very successful stream corridor work Tompkins County Flood Hazard Mitigation Program led by the Tompkins County Planning Department and Tompkins County Soil and Water Conservation District has resulted in over 2.3 linear miles of stream planted, protected or restored throughout Tompkins County since 2006. Work has resulted in the planting of over 2,000 trees and shrubs with the assistance of over 200 volunteers on 7 creeks, in 5 watersheds and 7 different municipalities. Due to its success the action item has been reincluded in the plan update (TC2, C1, DR1, T11, TL2, VT1).
Civil Unrest	5.11.6 Continue to support City of Ithaca neighborhood police patrol program.	Goal 4, Objective 4-1	Current budget	Ongoing	Neighborhood police patrol program	City of Ithaca Police Department	Town, TC	While support for this work continues, it has been removed from the plan update due to its generality.
Flood	5.1.6 Work jointly with other stakeholders in the Cayuga Lake Basin to manage the lake level to reduce the potential for seasonal flooding.	Goal 3, All Objectives	L	Ongoing	Cayuga Lake Basin Initiatives, CLRPP	CLWN	TC	Action has not been adequately dealt with and is reincluded as "High Priority Action #15" in Plan Update
Civil Unrest	5.11.1 Increase the number of student activities on campus on Friday and Saturday nights.	Goal 1, Objective 1-8	TBD	Ongoing	TBD	College Security Departments	TC EPC, local police, TCDER	While support for this work continues, it has been removed from the plan update due to its generality.
Civil Unrest	5.11.3 Conduct regular training events (e.g., crowd control planning and training) for local and campus police.	Goal 4, Objective 4-2	\$5,000	Ongoing	Existing training protocols	College Security Departments	TC EPC, local police, TCDER	While support for this work continues, it has been removed from the plan update due to its generality.
Civil Unrest	5.11.4 Create emergency plans for backup personnel to support local and campus police, if necessary.	Goal 4, Objective 4-2	\$5,000	2 years	Existing Emergency Protocols	College Security Departments	TC EPC, local police, TCDER	No longer seen as priority in mitigation plan as institutions have developed their own plans. Has been deleted in update.
Civil Unrest	5.11.5 Enforce local ordinances and assembly permits, as necessary.	Goal 1, Objective 1-5	Current budget	Ongoing	Current ordinances and permits	College Security Departments	Local police	While support for this work continues, it has been removed from the plan update due to its generality.
Civil Unrest	5.11.2 Develop a stricter student party ordinance.	Goal 1, Objective 1-5	Current budget	2 years	Ordinances	College Security Departments, Town of Ithaca	TBD	City of Ithaca Noise Ordinance has addressed most of these concerns and has thus been deleted.
Fire (Urban and Wild)	5.6.5 Enhance outreach and education programs aimed at mitigating fire hazards and reducing or preventing the exposure of citizens, public agencies, private property owners, and businesses to natural hazards. TC/ARC should be a support agency for public outreach.	Goal 2, All Objectives	\$1,000/year	Ongoing	Current public outreach initiatives	County and Local Fire Depts.	All towns	Remains active and reincluded as "Action Item A6" which emphasizes work with older structures.

Appendix A - Table 30 - Status of 2006 HMP Mitigation Actions

Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Fire (Urban and Wild)	5.6.10 Identify deficiencies in equipment and training and ensure that local fire departments are adequately equipped to respond safely and effectively to fires.	Goal 4, Objectives 4-2 and 4-3	L to M	1 year	TBD	County and Local Fire Depts.	TC DER	Support for this work continues, included in plan update as Action Item A7.
Severe Winter Storm	5.2.9 Monitor streams for ice jams to minimize damage to infrastructure (bridges).	Goal 1, Objective 1-1	L	Ongoing	Water Quality Monitoring (Volunteer) and Maintenance	County and local public works	Towns	The City of Ithaca Department of Public Works monitors the main problem area on Fall Creek and Lansing monitors Salmon Creek. As such action has been removed in plan update.
Severe Winter Storm	5.2.10 Retrofit critical structures to increase resistance to storm hazards and promote hazard resistant construction of new buildings.	Goal 1, Objective 1-1	L to M	Ongoing	Owners of critical facilities, Code Enforcement Officers	County and local public works	Town officials	Increased focus on this action in light of climate change science. Reincluded as "High Priority Actions 7 and 8" in plan update.
Severe Winter Storm	5.2.11 Minimize the disruption and cost of storm events by maintaining to the extent possible the ability of public works personnel to maintain the safe flow of traffic over streets and highways through DPW specific activities such as purchasing additional equipment, securing funds for additional personnel during winter storm events, and purchasing additional road salt.	Goal 4, Objective 4-2	\$100,000	Ongoing	Existing Transportation and Emergency Plans	County and local public works	TC ERC, HMGP	Actively implemented by DPW staff and has thus been removed from update.
Flood	5.1.29 Retrofit or re-construct bridges at a higher elevation to withstand flood events.	Goal 1, Objective 1-1	H	Ongoing	NFIP, HMGP	County, State	TCPD, TCDPW, TCSWCD, TCAD, NYSDEC, SEMO, FEMA	Increased focus on this action in light of climate change science. Reincluded as "High Priority Actions 7 and 8" and TC3 in plan update.
Utility Failure	5.7.8 Educate home owners on necessity to maintain trees near utility lines on or near their property.	Goal 2, All Objectives	\$1,000/year	Ongoing	Current public outreach initiatives	County, Towns	Towns	Remains an issue especially in light of increased threat of invasives. Reincluded with this emphasis as Action A15, A26 as well as High Priority Action Item 5.
Severe Winter Storm	5.2.6 Obtain funding to purchase backup generators and other redundant utilities for nursing homes and other critical assets that require such emergency power sources.	Goal 4, All Objectives	\$40,000	5 years	HMGP, ARC	County/Towns	ARC, Office of Aging	No longer an issue, action removed for update.
Utility Failure	5.7.2 Conduct major tree pruning initiatives along power lines.	Goal 1, Objective 1-1	M to H	TBD	Preventive maintenance	Energy suppliers	TC DPW	Active issue reincluded as High Priority Action item 5.
Transportation Accident	5.8.1 Support procurement of hardware and software to support a state transportation accident database to track accidents and estimate costs to respond and remediate. (Currently the State provides free software to track transportation and accidents and detect trends, but the hardware requirements are significant).	Goal 2, Objective 2-3; Goal 4, Objectives 4-3 and 4-4	\$400,000	4-5 years	Data Collection Efforts for Mitigation Planning; DMV tracking	ITCTC	TC and Towns	No longer an issue, action removed for update.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Transportation Accident	5.8.9 Conduct an enhanced freight study to better understand the types and volumes of hazardous waste that travel through the County and what routes are used to transport such materials.	Goal 4, Objective 4-4	\$50,000	2 years	Public safety concerns; NYDOT and NYSDEC regulation and support	ITCTC	NYDOT, USDOT, EPA	Enhanced Transportation Study conducted in 2002 and is no longer an active action item.
Terrorism	5.10.9 Acquire a training simulator for the Tompkins County Airport that mimics an airplane fire (originating from a wheel or engine).	Goal 4, Objective 4-3	M	5 years	NA	Ithaca Regional Airport	TC EPC, TC DER	Addressed through existing training program. No longer an issue and not included in update.
Flood	5.1.55 Evaluate the benefits and costs of obtaining flood insurance for public buildings at highest risk.	Goal 1, Objectives 1-2 and 1-3	L	1 year	NFIP	Local government	TBD	Remains a high priority issue. Included in the broader "High Priority Action 8" which outlines need for mitigation strategies for critical facilities.
Terrorism	5.10.8 Provide redundant utilities and communications (internet link for government communications) to support critical facilities.	Goal 4, Objective 4-3	M	TBD	Emergency Management Planning	local governments	TC DITS	Remains a high priority issue. Included in the broader "High Priority Action 8" which outlines need for mitigation strategies for critical facilities.
Transportation Accident	5.8.13 Ensure that carriers involved in the transportation of hazardous materials comply with all applicable laws through proactive police enforcement of commercial carrier rules and regulations.	Goal 4, Objective 4-2	L to M (to enforce existing laws)	Ongoing	NYDOT regulation, public safety concerns, local enforcement programs	Local Police	NYDOT, County police	While support for this work continues, it has been removed from the plan update due to its generality.
Severe Storm	5.3.2 Enhance public education programs regarding both incoming and outgoing evacuation routes.	Goal 4, Objective 4-4	\$2,000/town	2 years	Public-private partnerships;	Local police and fire	TC, SEMO	Action item that has not received much attention. Included in update as Action Item A4 which changes focus to sheltering in place.
Utility Failure	5.7.12 Enhance public awareness by creating a training course for the public and local jurisdictions on utility emergency situations.	Goals 2 and 3, All Objectives	\$2,000/town	2 years	Public-private partnerships	Local police and fire, NYSEG	TC	Action item that has not received much attention. Included in update as Action Item A4 which changes focus to sheltering in place.
Transportation Accident	5.8.11 Provide public education and outreach materials regarding the appropriate actions to take in the event of a hazardous material spill. TC/ARC should be a support agency for public outreach.	Goal 2, All Objectives	\$2,000/	2 years	Public-private partnerships	Local police and fire, TCDOH	TC	Action item that has not received much attention. Included in update as Action Item A4 which changes focus to sheltering in place.
Flood	5.1.7 Update flood plain (FIRM) maps.	Goal 1, Objective 1-4	H	5 years	NYSDEC, FEMA MMI	NYSDEC	TCPD	Continues to be a problem and one of the County's highest priorities. As such it is reincluded as "High Priority Action 6" in the plan update.
Flood	5.1.33 Develop flood insurance maps for Virgil Creek flood control project and downstream areas (See also 5.1.7).	Goal 1, Objective 1-4	M to H	2 years	NFIP, FEMA, NYSDEC	NYSDEC	TCPD	Continues to be a problem and one of the County's highest priorities. As such it is reincluded as "High Priority Action 6" in the plan update.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Severe Winter Storm	5.2.2 Develop a buddy network of concerned citizens that will check in on elderly, handicapped, low-income, or non-English speaking citizens during major or extended events.	Goal 2, All Objectives and Goal 3, Objective 3-2	L	Ongoing	Office of Aging, ARC, Existing church programs	Office of Aging	ARC	Still remains an issue and has been elevated to "High Priority 1" in the plan update.
Severe Storm	5.3.8 Retrofit critical facilities with wind resistant designs and construction.	Goal 1, Objective 1-1	M	5 years	HMGP	Owners of critical facilities	TC, SEMO	Remains a high priority issue. Included in the broader "High Priority Action 8" which outlines need for mitigation strategies for critical facilities.
Fire (Urban and Wild)	5.6.8 Retrofit existing critical facilities to bring them up to fire code, if they are not already.	Goal 1, Objective 1-1	M	Ongoing	Code, enforcement, and zoning	Owners of critical infrastructure	TBD	Remains a high priority issue. Included in the broader "High Priority Action 8" which outlines need for mitigation strategies for critical facilities.
Terrorism	5.10.1 Enhance pre-emptive security around critical facilities and infrastructure.	Goal 1, Objective 1-1	L to H	Ongoing	Current anti-terrorism initiatives	Owners of facilities and infrastructure	TC EPC, TC DER	Remains a high priority issue. Included in the broader "High Priority Action 8" which outlines need for mitigation strategies for critical facilities.
Fire (Urban and Wild)	5.6.7 Ensure that structures (especially places of public assembly) are maintained and comply with any and all applicable fire and safety codes.	Goal 1, Objective 1-5	L	Ongoing	Code, enforcement and zoning	Owners of structures	TBD	Remains a high priority issue. Included in the broader "High Priority Action 8" which outlines need for mitigation strategies for critical facilities.
Transportation Accident	5.8.6 Improve reporting of minor accidents and engineering investigations of collisions to determine patterns to improve signals, traffic markings, and identify educational efforts needed to reduce accidents.	Goal 1, Objective 1-1	See 5.8.1	See 5.8.1	See 5.8.1	See 5.8.1	See 5.8.1	Currently tracked through local transportation agencies. Deleted in plan update.
Transportation Accident	5.8.5 Ensure rapid and coordinated response by emergency responders in the event of a hazardous materials spill event by enhancing the Chain of Command for Emergency Response Flow Chart and identifying notification requirements.	Goal 4, Objective 4-2	See Section 5.4.4	See Section 5.4.4	See Section 5.4.4	See Section 5.4.4	See Section 5.4.4	Not included in plan update as this is being addressed in local emergency response plans.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Severe Storm	5.3.1 Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during storm events.	Goal 3, Objective 3-1 Goal 4, Objective 4-2	See Table 5-4-1-2	See Table 5-4-1-2	See Table 5-4-1-2	See Table 5-4-1-2	See Table 5-4-1-2	Active issue reincluded as High Priority Action item 5.
Flood	5.1.50 Establish a conservation corridor along both stream banks of Six Mile Creek, and other applicable watersheds, to encourage riparian vegetation for channel and floodplain stabilization and wildlife habitat.	Goal 1, Objective 1-7 and Goal 3, All Objectives	\$100,000	6 years	Comprehensive Planning, Watershed initiatives, zoning, site planning, code enforcement, Six Mile Creek Partnership, TCFHMP	Six Mile Creek Partnership	Towns, TCPD, TCSWCD	Very successful stream corridor work through the Tompkins County Flood Hazard Mitigation Program led by the Tompkins County Planning Department and Tompkins County Soil and Water Conservation District has resulted in over 2.3 linear miles of stream planted, protected or restored throughout Tompkins County since 2006. Work has resulted in the planting of over 2,000 trees and shrubs with the assistance of over 200 volunteers on 7 creeks, in 5 watersheds and 7 different municipalities. Due to its success the action item has been reincluded in the plan update (TC2, C1, DR1, T11, TL2, and VT1).
Transportation Accident	5.8.4 Construct new roads and infrastructure in accordance with current land use plans, zoning, and local ordinances.	Goal 1, Objective 1-1	L (to enforce existing codes)	TBD	TBD	TBD	TBD	While support for this work continues, it has been removed from the plan update due to its generality.
Terrorism	5.10.4 Harden (retrofit and upgrade) fixed critical public facilities and infrastructure from the threat of terrorist attack.	Goal 1, Objective 1-1	L to H (based on needs)	Ongoing	Current anti-terrorism initiatives	TBD	TBD	Remains a high priority issue. Included in the broader "High Priority Action 8" which outlines need for mitigation strategies for critical facilities.
Flood	5.1.2 Encourage NFIP communities to participate in the CRS.	Goal 1, Objectives 1-2 and 1-3	L	3 years	NFIP, NYSDEC	TC	All jurisdictions, FEMA, SEMO	Remains an important action item that has not gained traction. Is reincluded in update as Action Item A1.
Flood	5.1.15 Develop model ordinances for sediment and erosion control, stormwater control, and stream buffer implementation.	Goal 1, Objectives 1-1, 1-4, 1-5, 1-6, and 1-9	\$3,000	1 year	Phase II Stormwater Regulatory Requirements	TC	Towns; NYSDEC, NYSDOS	County Planning has developed a model stream buffer ordinance and several communities have considered or implemented such measures. The model will continue to be used and the action is removed from the plan update.
Flood	5.1.17 Continue Six Mile Creek, Fall Creek, Salmon Creek, and Cayuga Inlet Watershed Assessments.	Goal 1, Objective 1-4	\$30,000	3 years	Current watershed assessments	TC	Applicable jurisdictions	Watershed Assessments have continued to be developed throughout the County. New assessments include Taughannock and Buttermilk Creeks. The county anticipates working with Cayuga County in developing the Owasco Inlet watershed assessment as well.
Flood	5.1.20 Identify, evaluate, and implement effective flood mitigation activities for specific "hot spots" within the county.	Goal 1, Objective 1-1	L	Ongoing	Flood Mitigation Initiatives	TC	Participating Towns	Currently worked on through the Tompkins County Flood Hazard Mitigation Program and other municipal initiatives. Much of this work has been supported by the development of the various Watershed Assessments. Due to its success the action item has been reincluded in the plan update (TC2, TC3, C1, DR1, T11, TL2, VT1 and High Priority Action 10)
Flood	5.1.52 Address erosion and failure of the stacked rock retaining wall at the Tutton property (reach #3487) in Slaterville Springs.	Goal 1, Objective 1-7	L to M	4 years	HMGP, TCFHMP	TC	TCSWCD, NYSDEC, TCPD	Project complete, action item removed from plan update.
Flood	5.1.53 Develop a stormwater program to ensure the maintenance of stormwater control policies, measures and systems and flood control.	Goal 1, Objectives 1-1, 1-4, 1-5 and 1-9	L to M	2 years	Phase II Stormwater Regulations; County Comprehensive Plan	TC	Local government	Actively implemented and thus removed from plan update.
Severe Winter Storm	5.2.13 Enhance strategies for debris management for severe winter storm (including ice storm) events.	Goal 4, Objectives 4-2 and 4-3	L	1 year	Emergency Preparedness	TC	TC DPW, SEMO	Remains an important action that has not progressed. Included in update as "High Priority Action 3".

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Severe Storm	5.3.6 Encourage development and enforcement of wind-resistant building siting and construction codes. Focus to be placed on vulnerable residencies first (i.e. mobile homes).	Goal 1, Objective 1-1	L	TBD	Building code, enforcement	TC	TCPD	Remains an active action. Included in plan update as Action Item A5.
Severe Storm	5.3.7 Enhance strategies for debris management for severe storm events.	Goal 3, Objective 3-1 Goal 4, Objectives 4-2 and 4-3	L	1 year	Emergency Preparedness	TC	TCDPW, SEMO	Remains an important action that has not progressed. Combined with other action and included in update as "High Priority Action 3".
Fire (Urban and Wild)	5.6.4 Encourage development and dissemination of maps relating to the fire hazard to help educate and assist builders and homeowners in being engaged in fire mitigation activities and to help guide emergency services during response.	Goal 2, All Objectives	L	2 years	Community Technology Initiatives	TC	TCDITS, Towns, TCGIS	Support for this work continues, combined, reworded and included in plan update as Action Item A7.
Utility Failure	5.7.1 Implement physical mitigation activities (riprap, etc.), as necessary, to the second, exposed gas pipe crossing the Six Mile Creek, approximately 2,000 feet downstream of German Cross Road, to protect against utility failure and water contamination.	Goal 1, Objectives 1-1 and 1-9	L	5 years	Continued community infrastructure maintenance	TC	Pipeline Group	Project complete, action item removed from plan update.
Utility Failure	5.7.14 Retrofit critical facilities with the latest utility connections.	Goal 1, Objective 1-1	\$18,000	1 year	TBD	TC	Owners of critical facilities	Remains a high priority issue. Included in the broader "High Priority Action 8" which outlines need for mitigation strategies for critical facilities.
Utility Failure	5.7.16 In the event of a utility failure, currently all communications need to go through the City of Ithaca's emergency communication systems because the County's system can only support communication for 4 hours following a power failure. Acquire a generator to support County communication systems as a more sustainable and long-term solution.	Goal 4, Objective 4-3	\$20,000	1 year	TC communications system	TC	TC DITS	Project complete, action item removed from plan update.
Transportation Accident	5.8.14 Enhance public safety through awareness, by releasing timely public service announcements via various media (television, radio) and supplying suggestions for alternate routes.	Goal 2, All Objectives	Current budgets	Ongoing	Newspapers, Radio, Television, PSAs	TC	TCHD	Actively implemented. Combined and reincluded in plan update as Action Item A4.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Water Supply Contamination	5.9.1 Work with major public water suppliers on hazard mitigation and emergency response efforts and to enhance cooperative relationships.	Goal 3, Objective 3-1; Goal 4, Objective 4-1	L	Ongoing	Public-Private Partnerships	TC	Public Water Suppliers, TC EPC	Actively implemented by each water supplier. Combined, restated and included in update as Action Item A12.
Water Supply Contamination	5.9.2 Continue aquifer assessment studies to better understand groundwater dynamics and re-charge areas.	Goal 1, Objectives 1-1, 1-6, and 1-9	\$450,000	7 years	Current aquifer studies	TC	USGS	Actively implemented by each water supplier. Combined, restated and included in update as Action Item TC4.
Water Supply Contamination	5.9.6 Identify and plan for use of backup water supply for the community, should the primary water supply become contaminated.	Goal 1, Objective 1-9; Goal 4, Objective 4-2	L to M	1 year	Public-Private Partnerships, NYSDEC	TC	Public Water Suppliers, TC EPC, other nearby cities, TCWRC	Actively implemented by each water supplier. Combined, restated and included in update as Action Item A12.
Water Supply Contamination	5.9.8 Complete water vulnerability assessments (VA) for water supply and water treatment systems and make improvements to harden security and ensure that appropriate emergency plans are in place.	Goal 1, Objective 1-1	\$35,000/VA; Improvement cost to be based on results of VA	2 years	Current anti-terrorism initiatives	TC	SEMO, water suppliers, TCWRC	Actively implemented by each water supplier. Combined, restated and included in update as Action Item A12.
Water Supply Contamination	5.9.12 Enhance public safety through awareness, by releasing timely PSAs via various media (television, radio).	Goal 2, All Objectives	Current budgets	Ongoing	Newspapers, Radio, Television, PSAs	TC	TC WRC	Actively implemented. Combined and reincluded in plan update as Action Item A4.
Utility Failure	5.7.15 Develop and distribute a list of materials needed for an individual to survive for 3 days without power. TC/ARC should be a support agency for public outreach.	Goal 4, All Objectives	\$10,000	1 year	Public Outreach	TC DER	TC EPC, NYSEG	Actively implemented. Combined and reincluded in plan update as Action Item A4.
Water Supply Contamination	5.9.5 Increase collaboration between government and community organizations regarding containment, response, and cleanup plans.	Goal 3, Objective 3-2	L	Ongoing	Public Private Partnerships	TC DER	Local government, citizen groups	Remains an important action that has not progressed. Combined with other action and included in update as "High Priority Action 3".

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Terrorism	5.10.5 Provide real-time information on alert levels from the Homeland Security Advisory System from the U.S. DHS.	Goal 2, All Objectives	Current funds	Ongoing	Emergency Management Planning	TC DER	TC EPC, SEMO	Actively implemented. Combined and reincluded in plan update as Action Item A4.
Terrorism	5.10.6 Respond to increased threat level assessments, as issued by DHS, by providing increased surveillance of fixed critical infrastructure.	Goal 4, Objective 4-2	M to H	As needed	Emergency Management Planning	TC DER	TC EPC, local police and fire	A part of existing protocol, included only as Action A13 in plan update.
Water Supply Contamination	5.9.7 Develop procedures for testing and sampling the water supply and a warning system should any tests reveal contamination.	Goal 1, Objective 1-9; Goal 2, All Objectives	L to M	2 years	Public-Private Partner-ships, NYSDEC, SEMO	TC DER, public water suppliers	NYSDEC, TC DOH, local labs, Cornell	Actively implemented by each water supplier. Combined, restated and included in update as Action Item A12 and likely a part of Action Item A10.
Terrorism	5.10.3 Work with hospitals to ensure there are adequate response procedures in the event of a terrorist event and provide training on these procedures.	Goal 3, All Objectives, Goal 4, Objectives 4-1, 4-2, and 4-3	\$15,000	Ongoing	Emergency Management Planning	TC DOH	Regional Hospitals, local police and fire, TC EPC, SEMO	Cayuga Medical Center has adequately prepared for large scale events. Action item removed from update.
Flood	5.1.44 Analyze and enhance overall drainage system at Boiceville Bridge in Caroline, Hayts, Lansingville Road, Etna Road, Old 76 Road (beyond narrows), Perry City Road in Ulysses, Ludlowville along Salmon Creek, and East King Road.	Goal 1, Objectives 1-1, 1-3, and 1-5	L to H	2 years	Community Infrastructure Maintenance; TCFMP	TC DPW	Towns	Majority of analyses complete through watershed assessments. Action Item TC3 in the plan update addressing the few remaining areas.
Transportation Accident	5.8.3 Continue to conduct regular training for first response personnel.	Goal 4, Objective 4-2	\$10,000/year L (to enforce existing codes)	Ongoing/Annual	Emergency Preparedness Initiatives	TC EPC	SEMO, local police and fire, NYSDEC, NYDOT	Currently implemented through local agencies. Reincluded in part as Action Item A7.
Transportation Accident	5.8.12 Inventory current first response equipment and acquire new equipment as necessary.	Goal 4, Objective 4-3	Current resources	1 year	Emergency preparedness initiatives	TC EPC	Local fire and police	Currently implemented through local agencies. Reincluded in part as Action Item A7.
Terrorism	5.10.2 Identify separate grant programs to obtain additional emergency preparedness and response resources.	Goal 1, Objective 1-1 and Goal 3, All Objectives	L	Ongoing	Emergency Management Planning	TC EPC	SEMO	While support for this work continues, it has been removed from the plan update due to its generality.
Flood	5.1.42 Implement training and public outreach to residents, code officials, and contractors on floodplain management and flood mitigation as well as flood response planning and training.	Goal 2, All Objectives, Goal 3, All Objectives	\$2,000/Town	1 year	NFIP, TCFMP	TC NFIP Managers	Towns	Has not occurred to date, though need still exists. Included in plan update as "High Priority Action 9".

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Flood	5.1.54 Conduct outreach to property owners, the banking community, and the insurance industry regarding risk management associated with flood.	Goal 2, All Objectives	\$2,000/	2 years	Public-private partnerships, Public Outreach programs, Ithaca Journal; Radio Stations, PBS	TC, SEMO	TCDER	Is a part of regular community outreach. Opportunities for enhanced outreach efforts are anticipated as a result of the reincluded "High Priority Action 6 (Update of Flood Maps)" and Action Item A1 (Enrollment in CRS Program).
Severe Storm	5.3.4 Increase public awareness of storm mitigation activities, including severe storm warnings and advisories.	Goal 2, All Objectives	\$2,000/Town	2 years	Public-private partnerships, Public Outreach programs, Ithaca Journal; Radio Stations, PSAs, PBS	TC, SEMO	TCDER	Actively implemented. Combined and reincluded in plan update as Action Item A4.
Utility Failure	5.7.17 Work with Co-operative Extension to identify mitigation activities for utility failure on dairy farms.	Goal 4. All objectives	Current budget	2 years	Public-Private Partnerships	TC, Towns	CUCC, LF	Actively discussed and reincluded with climate focus as Action Item A14.
Transportation Accident	5.8.16 Encourage adoption of County or local regulation requiring identification of hazardous materials being transported through Tompkins County.	Goal 2, Objective 2-3; Goal 4, Objectives 4-3 and 4-4	TBD	5 years	Public safety concerns	TC/Town	TC/Town	County and local government legislation on road use and hauling routes has been implemented. Aspects of this issue remain especially in light of potential gas drilling in the region. Included as a part of Action Item A10.
Severe Winter Storm	5.2.5 Survey institutions that have specific needs populations to identify their emergency needs.	Goal 4, All Objectives	L	6 years	TBD	TCDER	HNTF, TCDSS, ARC	Actively being addressed. Combined and reincluded with "High Priority Action 1".
Severe Winter Storm	5.2.12 Wherever practicable, coordinate emergency services, public works departments, and public utility responses to winter storm events to ensure efficient use of resources.	Goal 4, Objective 4-2	Current funds	Ongoing	TCDER, local highway agency	TCDER	SEMO, TC, NYSEG	A part of existing protocol, deleted in plan update.
Severe Winter Storm	5.2.14 Enhance weather monitoring to attain earlier severe winter and ice storm warnings.	Goal 2, All Objectives	L to H	Ongoing	Weather Monitoring	TCDER	TCSWCD, NOAA, NWS, County and local public works	A part of existing protocol, deleted in plan update.
Epidemic (Human)	5.5.4 Identify and secure resources to build the appropriate medical stockpile of medicines and medical supplies to address sizable epidemics.	Goal 4, Objective 4-3	M to H	2 years	FEMA, SEMO, DHS preparedness efforts	TCDER	TCEPC, TCDOH, Regional Hospitals	Actively implemented and thus removed from plan update.
Epidemic (Human)	5.5.5 Enhance public safety through awareness, by releasing timely public service announcements via various media (television, radio). TC/ARC should be a support agency for public outreach.	Goal 2, All Objectives	Current budget	Ongoing	Newspapers, Radio, Television, PSAs	TCDER	TCEPC, planning group, TCDOH	Actively implemented, combined and reincluded in plan update as Action Item A4.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Fire (Urban and Wild)	5.6.3 Enhance emergency services to increase the efficiency of wildfire response and recovery activities.	Goal 4, All Objectives	M	Ongoing	Community safety	TCDER	TCEPC County and Local Fire Dept.	Actively implemented, combined and reincluded in plan update as Action Item A4.
Terrorism	5.10.7 Provide a wireless communication command and control channel for use by TC.	Goal 4, Objective 4-3	M	TBD	Emergency Management Planning	TCDER	TC EPC, TC DITS	Project complete, action item removed from plan update.
Severe Winter Storm	5.2.8 Increase public awareness of storm mitigation activities, including storm warnings and advisories. (See also 5.2.1)	Goal 2, All Objectives	\$2,000/jurisdiction	Ongoing	Public-private partnerships, Public Outreach programs, Ithaca Journal, PSAs, Radio Stations, PBS, EBS	TCDER, SEMO, Towns	ARC, NOAA	Actively implemented, combined and reincluded in plan update as Action Item A4.
Epidemic (Human)	5.5.1 Enhance and strengthen communication between regional hospitals and facilities about possible epidemic events.	Goal 3, Objective 3-1	L to M	Ongoing	Current health care communication systems	TCDOH	TCEPC, Regional Hospitals	Actively implemented through the County Emergency Planning Committee. Reincluded as Action Item TC5.
Epidemic (Human)	5.5.3 Continue to support the position of Bioterrorism Preparedness Coordinator at the County level.	Goal 1, Objective 1-1; Goals 2 and 3, All Objectives	Current budget	Ongoing	Bioterrorism preparedness efforts	TCDOH	TCEPC, TCDER	Position remains, thus action removed from plan update.
Flood	5.1.58 Map historical off road drainage ways so the County and local highway departments can explore the possibility of getting access to them and improving stormwater management.	Goal 1, Objective 1-1	M	1 year	Phase II Stormwater Regulations; TCFMP	TCDPW	TCPD	Actively analyzed. Action broadened and reincluded in plan update as Action Item A18.
Severe Winter Storm	5.2.4 Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms (including ice storms).	Goal 1, Objective 1-1	M	Ongoing	FEMA Programs	TCDPW	TCDER	Remains active. Reincluded in plan update in the form of various actions such as "High Priority Action 5", TC3, and "High Priority Action 8".

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Utility Failure	5.7.11 Maintain all gas pipes across creeks.	Goal 1, Objective 1-1	L	Ongoing	Maintenance of County infrastructure	TCDPW	TBD	Remains a concern. Rephrased and included as Action Item A25.
Flood	5.1.16 Develop system/process for cleaning and maintaining stormwater drains and catch basins.	Goal 1, Objectives 1-1, 1-4, 1-5, 1-6, and 1-9	\$5,000	2 years	Phase II Stormwater Regulations	TCDPW, Towns	Private landowners	Actively implemented, thus removed in plan update.
Epidemic (Human)	5.5.2 Increase collaboration between government and community organizations regarding containment and response plans for epidemic events involving human beings.	Goal 3, Objective 3-2	L to M	Ongoing	TCEPC- planning group integration	TCEPC	City of Ithaca, Regional academic institutions, Regional hospitals	Actively implemented with the County Emergency Planning Committee. Reincluded in plan update as TC5.
Fire (Urban and Wild)	5.6.11 Enhance the Tompkins County Emergency Management Plan to include an emergency fire relief program (to collaborate between the towns to expedite capabilities to fight fires).	Goal 1, Objectives 1-7 and 1-8	Current budget	1 year	Procedural changes	TCEPC	TCPG	Program currently exists, deleted in plan update.
Fire (Urban and Wild)	5.6.1 Conduct a study identifying all water resources in the jurisdictions for fire fighting (urban and wildland), map locations, and develop fire fighting strategies based on this data.	Goal 4, Objective 4-2	L to M	2-5 years	Community Infrastructure Management	TCFPB	TCEPC County and Local Fire Dept.	Slowly implemented, reincluded as "High Priority Action 12".
Fire (Urban and Wild)	5.6.9 Investigate and, where feasible, implement programs that would encourage and assist owners of older commercial structures in rehabilitating and improving the fire resistance of their properties.	Goal 1, Objective 1-1	L	Ongoing	Infrastructure management, code, and zoning	TCFPB	Towns	Action has not occurred in a comprehensive way. Reincluded in plan update as Action Item A6.
Fire (Urban and Wild)	5.6.13 Educate personnel on Federal cost-share and grant programs, Fire Protection Agreements, and other related Federal programs so the full array of assistance available to local agencies is understood.	Goal 3, All Objectives	L	4 years	Interagency cooperation	TCFPB	Local and County Fire Depts.	While support for this work continues, it has been removed from the plan update due to its generality.
Fire (Urban and Wild)	5.6.14 Inventory alternative firefighting water sources and encourage the development of additional sources.	Goal 4, Objective 4-2	L to M	TBD	TBD	TCFPB	Local and County Fire Depts.	Slowly implemented, reincluded as "High Priority Action 12".

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Fire (Urban and Wild)	5.6.15 Increase communication, coordination, and collaboration between wildland/urban interface property owners, local and county planners, and fire prevention crews and officials to address risks, existing mitigation activities, and Federal assistance programs.	Goal 2, All Objectives	L	TBD	Public Private Partnerships	TCFPB	Public, Local and County Fire Depts.	WUI has been determined to be a very minimal issue at this time. Specific action deleted though fire mitigation remains in Action Items A6, A7 and A8.
Fire (Urban and Wild)	5.6.16 Undertake vegetation management activities to reduce potential fuel for a wildfire (activities could include tree pruning, selective planting, and establishing vegetative setback distances).	Goal 1, Objective 1-7	M	TBD	TBD	TCFPB	TBD	WUI has been determined to be a very minimal issue at this time. Specific action deleted though fire mitigation remains in Action Items A6, A7 and A8.
Severe Storm	5.3.3 Map and publicize locations around the county that have the highest incidence of severe-storm related impacts.	Goal 1, Objective 1-7; Goal 2, Objective 2-3	\$10,000	2 years	Community Technology Initiatives, NOAA and NWS data	TCGIS	TCDITS, SEMO	Determined to be impractical, deleted in plan update.
Flood	5.1.4 Enhance data and mapping for floodplains within the County and identify and map any flood-prone areas outside of currently designated areas (see also 5.1.7).	Goal 1, Objective 1-4	M to H	2 years	NYCDEC, NAF Managers	TCGIS, NYSDEC	TCPD, TCSWCDTCDITS	Remains one of the highest priority activities in the County as maps have yet to be updated. Reincluded in plan update as "High Priority Action 6" which includes both FIRM and inundation mapping interest.
Fire (Urban and Wild)	5.6.2 Obtain or create a map of existing and planned fire hydrants throughout the county and identify areas that need fire hydrants.	Goal 1, Objective 1-1	L	1 year	Community Technology Initiatives	TCGIS, TC	TCDITS	Continues to be developed and is of interest in the community. Reincluded as "High Priority Action 12"
Flood	5.1.8 Continue to conduct engineering studies and watershed assessments to support the reduction of flood potential.	Goal 1, Objective 1-4	M	1 year	TCFHMP	TCPD	WRC, TCSWCD	Completed for the majority of the County. Owasco Inlet Watershed is the most significant remaining and is included as an action by the Town of Groton as Action TG1.
Flood	5.1.25 Continue maintenance to existing and planned structures, such as structural walls and other vertical barriers.	Goal 1, Objective 1-1	Current funding	Ongoing	Flood Mitigation Initiatives; watershed study follow-up	TCPD	TCDPW, TCSWCD	Actively implemented and reincluded as TC3.
Flood	5.1.26 Encourage development of acquisition and management strategies to preserve open space for flood mitigation, fish habitat, and water quality in the floodplain.	Goal 1, Objective 1-7	\$40,000	6 years	County Comprehensive Plan, FLLT strategic plan	TCPD	FLLT, Towns	Several local agencies are actively involved with this work. Action is restructured to include consideration in green infrastructure in these projects as Action A18.
Flood	5.1.32 Further coordinate multi-jurisdictional mitigation activities as outlined in the Flood Mitigation Needs Assessment for Six Mile Creek.	Goal 3, All Objectives	L	6 years	TCFHMP, 6 Mile Creek Partnership	TCPD	Local government, TCSWCD	Actively implemented by the Tompkins County Stream Corridor Restoration and Flood Hazard Mitigation Program. This remains a priority as "High Priority Action 10", TC2 and others.

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Flood	5.1.41 Identify or update existing land use in major stream corridors and floodplains in Tompkins County.	Goal 1, Objectives 1-4 and 1-6	\$1,000	1 year	Land Use and County Comprehensive Planning	TCPD		Actively implemented by the Tompkins County Stream Corridor Restoration and Flood Hazard Mitigation Program. This remains a priority as "High Priority Action 10", TC2 and others.
Flood	5.1.49 Re-emphasize watershed approaches by developing a strategy to address needs at the watershed level, including cumulative flood mitigation activities and priorities.	Goal 1, Objective 1-4	L	Ongoing	Comprehensive Planning, Watershed initiatives	TCPD	Towns, TCSWCD	Actively implemented by the Tompkins County Stream Corridor Restoration and Flood Hazard Mitigation Program. This remains a priority as "High Priority Action 10", TC2 and others.
Severe Winter Storm	5.2.7 Map and publicize locations around the county that have the highest incidence of severe storms related events.	Goal 1, Objective 1-7	\$10,000	2 years	NOAA and NWS data, HMGP, TCFHMP, NYSDOT	TCPD	TC Municipal Officials	Considered a part of Flood Inundation Mapping project identified in "High Priority Action 6"
Fire (Urban and Wild)	5.6.6 Amend county policies to require the use of fire-retardant materials in new construction.	Goal 1, Objective 1-1	L	TBD	Code, zoning, enforcement, engineering	TCPD	TBD	Existing practice, removed from plan update.
Utility Failure	5.7.13 Enhance GIS coverage and analysis of existing and planned, future utility lines in the county. Managed data security.	Goals 2 and 3, All Objectives	M	TBD	County Information Databank	TCPD, TCGIS	TCDITS	Existing practice, removed from plan update.
Flood	5.1.9 Continue analysis of resistance of mobile homes to flood events.	Goal 1, Objectives 1-1, 1-2, and 1-5	Current resources	Ongoing	Community Infrastructure Improvements	TCPG	Towns	Practice to be considered as a part of CRS program. Included in plan update as Action Item A1.
Flood	5.1.61 Introduce programs/measures to reduce impervious surfaces	Goal 1, Objective 1-9	M	4 years	Existing land use and stormwater management programs; zoning	TCPG	Towns	Actively implemented by the Tompkins County Stream Corridor Restoration and Flood Hazard Mitigation Program. This remains a priority as "High Priority Action 10", TC2 and others.
Utility Failure	5.7.5 Continue discussion with planning group and EPC on costs and benefits of purchasing generators for critical facilities or installing generator hook ups.	Goal 4, Objective 4-3	Current budget	Ongoing	TCPG, TCEPC	TCPG	TC EPC	Actively discussed with County Emergency Management Planning Committee and reincluded as "High Priority Action 8".

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Utility Failure	5.7.9 Support/encourage electrical utilities to use underground construction methods where possible to reduce power outages from other hazard events.	Goal 3, Objective 3-2	L	TBD	Zoning	TCPG	NYSEG	Actively advocated where appropriate. Included in plan update as Action Item A9.
Utility Failure	5.7.3 Local agencies will work with NYSEG to ensure smooth communication and response coordination with NYSEG's principal crews, which are now located in the County of Broome.	Goal 4, Objectives 4-1 and 4-2	Current budget	1 year	N/A	TCPG, NYSEG	TC EPC	Currently coordinated with several jurisdictions. Reincluded as "High Priority Action 5".
Utility Failure	5.7.4 Identify contact point at NYSEG and work to evaluate and increase responsiveness to utility failure. Increase coordination and communication with NYSEG during and between emergencies.	Goal 3, Objective 3-2; Goal 4, All Objectives	Current budget	1 year	N/A	TCPG, NYSEG	TC EPC	Currently coordinated with several jurisdictions. Reincluded as "High Priority Action 5".
Utility Failure	5.7.18 Conduct discussions with NYSEG about dispatching from highway departments and work in teams with highway department to expedite response to power failure.	Goal 3, Objective 3-2; Goal 4, All Objectives	Current budget	1 year	N/A	TCPG, NYSEG	TC EPC	Currently coordinated with several jurisdictions. Reincluded as "High Priority Action 5".
Flood	5.1.3 Analyze repetitive loss properties within Tompkins County and identify feasible mitigation options (through the Tompkins County Flood Mitigation Program).	Goal 1, Objective 1-4	M	1-2 years	NFIP, TCFHMP	TCSWCD	TCPD	Has been conducted. Repetitive loss properties in Tompkins County are fortunately very few. They are however actively considered through the Stream Corridor Restoration and Flood Hazard Mitigation Program and other programs (Action Item A2 and TL3).
Flood	5.1.21 Construct synthetic floodways to disperse flow and reduce velocity of water in the Six Mile Creek.	Goal 1, Objective 1-1	M to H	6 years (2010)	County Comprehensive Planning, TCFHMP, OSC	TCSWCD	TCPD	Currently actively implemented. Included in plan update as Actions C1, C2 and "High Priority Action 10.
Flood	5.1.22 Increase channel roughness of the Six Mile Creek, including introducing large woody debris in the banks, creating boulder and log sills in the riverbed, installing individual boulders and boulder clusters in the channel, and redefining the channel's thalweg.	Goal 1, Objective 1-1	L to M	Ongoing	Flood Mitigation Initiatives; recommendations of watershed studies; EPF, EPA, NYSDEC	TCSWCD	USFWS	Currently actively implemented. Included in plan update as Actions C1, C2 and "High Priority Action 10.
Flood	5.1.23 Construct additional detention ponds and wetlands upland and upstream of the Six-Mile Creek, for other appropriate watersheds, and for repeat flash flooding areas to help control peak runoff rates.	Goal 1, Objective 1-1	M to H	Ongoing	Flood Mitigation Initiatives; recommendations of watershed studies; EPF, EPA, NYSDEC	TCSWCD	FWS	Currently actively implemented. Included in plan update as Actions C1, C2 and "High Priority Action 10.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Flood	5.1.48 Implement other Susquehanna initiatives.	Goal 1, Objectives 1-1, 1-3, and 1-5	\$200,000	2 years	Susquehanna initiatives TCSWCD	TCSWCD	Town	Considered as a part of Stream Corridor Restoration and Flood Hazard Mitigation Program and other programs (Action Item A2 and TL3).
Epidemic (Agricultural)	5.4.4 Increase coordination with organizations such as NYSCHAP and CLEAR.	Goal 3, Objective 3-1	L	Ongoing	TC, Agriculture & Farmland Protection Board	TCSWCD	TCSWCD, CLEARCUCC	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Epidemic (Agricultural)	5.4.5 Distribute NYSCHAP assessment checklist.	Goal 2, All Objectives	L	2 years	NYSCHAP checklist, local paper, mailer to local farmers	TCSWCD	TCSWCD, CLEAR, LF, CUCC	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Epidemic (Agricultural)	5.4.6 Distribute guidelines and specific procedures to prevent Johnes Disease and Foot and Mouth Disease.	Goal 2, All Objectives	L	1 year	local paper, mailer to local farmers, See also 5.4.11	TCSWCD	TCSWCD, CLEAR, LF, CUCC	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Epidemic (Agricultural)	5.4.7 Increase awareness in farming communities of precautions for livestock before shows, fairs, and other events.	Goal 2, All Objectives	L	Ongoing	See 5.4.11	TCSWCD	CLEAR, LF, CUCC, USDA	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Epidemic (Agricultural)	5.4.8 Increase awareness of precautions against zoonotic diseases, including rabies, ringworm, water-borne pathogens, lyme disease, anthrax, and west nile virus.	Goal 2, All Objectives	L	Ongoing	See 5.4.11	TCSWCD	CLEAR, LF, CUCC, USDA	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Epidemic (Agricultural)	5.4.11 Advertise availability of the Tompkins County Emergency Action Plan for Farms.	Goal 1, Objective 1-8; Goal 3, All Objectives	N/A	1 year	<i>Ithaca Journal</i> , flyers, libraries	TCSWCD	CUCC	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Epidemic (Agricultural)	5.4.10 Enhance public safety through awareness, by releasing timely public service announcements via various media (television, radio).	Goal 2, All Objectives	N/A	Ongoing	<i>Ithaca Journal</i> , Radio & TV announcements	TCSWCD	CUCC	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Epidemic (Agricultural)	5.4.1 Increase collaboration between government and community organizations regarding containment and response plans for epidemic events involving animals.	Goal 3, Objective 3-2	L to M	Ongoing	TC, Agriculture & Farmland Protection Board	TCSWCD, CLEAR	LF, CUCC	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Epidemic (Agricultural)	5.4.2 Participate in the integrated disease prevention program with the New York State Cattle Health Assurance Program (NYSCHAP)	Goal 1, Objective 1-1	M	Ongoing	Disease prevention programs	TCSWCD, CLEAR	NYSCHAP, NYDAM, LF	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Epidemic (Agricultural)	5.4.3 Strengthen communication with farmers regarding procedures to prevent the entry of pathogens onto farms.	Goal 2, All Objectives	L	Ongoing	TC, Agriculture & Farmland Protection Board	TCSWCD, CLEAR	NYSCHAP, NYDAM, LF, CUCC	Has not occurred to date, action item combined with others and addressed with farm emergency planning (Action Item A14).
Flood	5.1.35 Conduct a mailing campaign to property owners in the 100- and 500- year flood plains.	Goal 2, All Objectives	\$500	3 years	TCFHMP	TCWRC	TCPD, TCGIS	Anticipated as a part of "High Priority Action 6".
Water Supply Contamination	5.9.9 Identify appropriate protection measures for groundwater drinking water systems.	Goal 1, Objectives 1-1, 1-6, and 1-9	L (to identify)	5 years	SWAP	TCWRC	NYSDEC, USGS	Currently considered by jurisdictions of Danby and Dryden in the form of aquifer recharge area protections. Combined and reincluded in plan update as action A12 and likely action A10.
Water Supply Contamination	5.9.10 Support and implement measures to reduce contamination potential of public groundwater wells.	Goal 1, Objectives 1-1, 1-5, and 1-9	L, plus current SWAP funding	5 years	Source Water Assessment Program	TCWRC	NYSDEC, USGS	Currently considered by jurisdictions of Danby and Dryden in the form of aquifer recharge area protections. Combined and reincluded in plan update as action A12 and likely action A10.
Epidemic (Agricultural)	5.4.9 Include a reference in the Tompkins County Soil and Water Conservation District Farm Emergency Management Plan to the All Hazard Mitigation Plan.	Goal 1, Objective 1-8	L	1 year	Farm Emergency Management Plan, Multi-Jurisdictional All Hazard Mitigation Plan	Tompkins County	TCSWCD	Included in plan update as a part of action A14.
Flood	5.1.59 Complete the flood protection berm at the Speedville Mill Road bridge site.	Goal 1, Objectives 1-1, 1-3, and 1-5	Current resources	1 year	TCFMP	Tompkins County DPW	TC	No longer an issue, action removed for update.
Flood	5.1.5 Identify and address obstructions to surface water drainage.	Goal 1, Objective 1-4	L to M	Ongoing	TCFHMP, Ongoing highway official work, stormwater programs	Town	TCSWCD	Actively implemented and removed from plan update.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Flood	5.1.19 Conduct regular maintenance and inspections on the local flood control dams.	Goal 1, Objective 1-1	L	Ongoing	Joint ownership of structures	Town	TC	Currently a part of updated state regulations. Removed from plan update.
Water Supply Contamination	5.9.3 Continue Six Mile, Virgil, and Willseyville Creek Aquifer Studies.	Goal 1, Objectives 1-1, 1-6, and 1-9	\$750,000	6 years	Current aquifer studies	Town	TC, USGS	Active - under development
Water Supply Contamination	5.9.4 Take thermal images of the lake front area to identify locations of failing septic systems.	Goal 1, Objectives 1-1, 1-6, and 1-9	\$8,000	3 years	Current stormwater and water quality initiatives	Town	TBD	Complete, most recent work completed by the Town of Ulysses, and removed from plan update.
Flood	5.1.13 Replace the pipes under West Jersey Hill Road at Lick Brook Creek to prevent further undermining of the road.	Goal 1, Objectives 1-1, 1-3, and 1-5	M	1 year	Current DPW activities	Town	TC DPW	Complete, deleted in plan update.
Flood	5.1.14 Implement Barrile stream bank stabilization.	Goal 1, Objectives 1-1, 1-3, and 1-5	\$250,000-\$300,000	1 year	Current stream bank stabilization projects	Town	TC, NYSDEC	Significant project led by Tompkins County Soil and Water District complete in Sixmile Creek Watershed, as such deleted in plan update.
Flood	5.1.15 Stabilize the Brooktondale Road stream bank.	Goal 1, Objectives 1-1, 1-3, and 1-5	L	1 year	Current stream stabilization projects; Programs administered by Caroline Watershed Committee	Town	TC DPW	Much of this work complete led by Tompkins County Highway Division, aspects reincluded in plan update as a part of "High Priority Action 10".
Flood	5.1.60 Restore West Creek.	Goal 1, Objectives 1-1, 1-3, and 1-5	L to H	3 years	TCFMP; Interagency Initiatives	Town	TCSWD, Tioga County	Work completed and thus deleted in plan update.
Severe Winter Storm	5.2.15 Evaluate and develop, as appropriate, a parking ordinance for emergency snow removal.	Goal 4, Objectives 4-2 and 4-3	\$3,000	Ongoing	Existing zoning policies and procedures	Town	NA	Regulations developed and removed from plan update.
Utility Failure	5.7.6 Provide backup power to the West Danby Water District System.	Goal 4, Objective 4-3	\$15,000	1 year	TBD	Town	ARC	Completed action, removed in plan update.
Utility Failure	5.7.7 Purchase back up generator for the Town of Caroline Senior Center.	Goal 4, Objective 4-3	\$20,000	1 year	TBD	Town	TCDOH	Complete action, removed in plan update.
Utility Failure	5.7.19 Purchase backup generator for Slaterville Fire Company.	Goal 4, Objective 4-3	\$20,000	1 year	N/A	Town	Fire Department	Complete action, removed in plan update.
Transportation Accident	5.8.2 Involve NYSDOT in making safety improvements to the area near the Walding Lane intersection with NYS Routes 34/96.	Goal 1, Objective 1-1; Goal 3 Objective 3-1	L to M	2 years	Public safety concerns; routine community improvements	Town	NYDOT, TC DPW	No longer an issue, action removed for update.
Transportation Accident	5.8.7 Alleviate traffic congestion at the intersection of Route 13N and Triphammer Road.	Goal 1, Objective 1-1	TBD	TBD	Public safety concerns;	Town	TCPG, TCHD	Remains an issue, combined and reincluded in the broader Action Item A23.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Transportation Accident	5.8.8 Make safety improvements to the area near the East and West Miller Road intersections with NYS Route 96B.	Goal 1, Objective 1-1	TBD	1 year	Public safety concerns; routine community improvement	Town	NYDOT	Remains an issue, combined and reincluded in the broader Action Item A23.
Transportation Accident	5.8.15 Involve NYDOT in making additional safety improvements to the intersection of Sylvan Lane with NYS Routes 34/96.	Goal 1, Objective 1-1; Goal 3 Objective 3-1	L to M	1 year	Existing safety concerns	Town	NYDOT, TC DPW	Remains an issue, combined and reincluded in the broader Action Item A23.
Flood	5.1.43 Replace the pipe under La Rue Road at Sulphur Springs Creek (west branch) to prevent further road undermining, and consult with NYSDEC and private landowners related to possible diversion ditching and cross pipes uphill.	Goal 1, Objectives 1-1, 1-3, and 1-5	L to M	1 year	Community Infrastructure Maintenance; TCFMP	Town of Danby	NYSDEC, TC DPW	Remains an issue, combined and reincluded in the broader Action Item A23.
Flood	5.1.56 Replace the pipe under Howland Road at Sulphur Springs Creek (east branch) and raise road elevation, to prevent recurrent flooding.	Goal 1, Objectives 1-1, 1-3, and 1-5	M to H	2 years	Community Infrastructure Maintenance; TCFMP	Town of Danby	TC DPW	Pipe replaced, no longer an issue and removed in plan update.
Flood	5.1.57 Encourage interagency collaboration in the humane management of beaver populations, especially where beaver activities compromise drainage structures and transportation routes.	Goal 3, All Objectives	L	Ongoing	Interagency Cooperation; Natural Resource Initiatives	Town of Danby	TC	A part of regular environmental review process, deleted in plan update.
Fire (Urban and Wild)	5.6.12 Continue to work with Tompkins County Soil and Water Conservation District in planning for and installing dry hydrants at accessible ponds.	Goal 1, Objectives 1-6 and 1-8, Goal 3, Objective 3-1	Low if grant program is ongoing	Ongoing	Interagency cooperation	Town of Danby	TCSWCD	Actively implemented and reincluded as "High Priority Action 12"
Fire (Urban and Wild)	5.6.17 Work with NYSDEC on assessing fire hazards and emergency access needs related to the Danby State Forest.	Goal 1, Objectives 1-6 and 1-8, Goal 3, Objective 3-1	L to M	3 years	Interagency cooperation	Town of Danby	NYSDEC	Not actively developed to date, reincluded in plan update as Action Item A8.
Fire (Urban and Wild)	5.6.18 Install supervised fire/security alarm system at Danby Town Hall.	Goal 1, Objective 1-1	\$20,000	2 years	Continued building upgrades	Town of Danby	NA	No longer an issue, action removed for update.
Transportation Accident	5.8.10 Arrange for NYDOT to survey West Danby fire station site distance to determine if intersection requires physical requirements or additional lighting when fire station is used for other purposes.	Goal 1, Objective 1-1; Goal 3 Objective 3-1	L (to arrange)	1 year	Public safety concerns; NYDOT regulation and support	Town of Danby	NYDOT	Addressed with NYSDOT through West Danby Fire, continue to be tracked in plan update through Action Item A23.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Flood	5.1.1 Encourage the Town of Enfield to join the National Flood Insurance Program (NFIP).	Goal 1, Objectives 1-2 and 1-3	L	2 years	NFIP, NYSDEC	Town of Enfield	TC, DEC	Discussed but not implemented. Remains Enfield's #1 priority. Application materials provided to Supervisor. Listed in plan update as Action Item E1.
Civil Unrest	5.11.7 Conduct training events (e.g., crowd control planning and training) for local law enforcement.	Goal 4, Objective 4-2	\$5,000	Ongoing	Existing training protocols	Town of Ulysses Police Department	TC EPC, local police, TC DER	Existing practice, removed from plan update.
Civil Unrest	5.11.8 Create emergency plans for backup personnel to support local police.	Goal 4, Objective 4-2	\$5,000	2 years	Existing Emergency Protocols	Town of Ulysses Police Department	TC EPC, local police, TC DER	Existing practice, removed from plan update.
Flood	5.1.12 Implement Phase 2 Stormwater regulation compliance, and focus on efforts under S4 that also help to reduce flood risk.	Goal 1, Objectives 1-1, 1-4, 1-5, 1-6, and 1-9	\$100,000	5 years	Phase II Stormwater Regulatory Requirements	Towns	TC	Existing practice, removed from plan update.
Flood	5.1.24 Continue use of the NYSDEC's Stormwater Management Manual to minimize the impact of future land use changes.	Goal 1, Objective 1-7	L	Ongoing	Phase II Stormwater Regulatory Requirements, NYSDEC	Towns	TCSWCD, NYSDEC, TCAD	Existing practice, removed from plan update.
Flood	5.1.28 Retrofit, acquire, and/or relocate buildings in flood-prone areas (including wet or dry flood proofing).	Goal 1, Objective 1-1	H	Ongoing	NFIP, HMGP	Towns	TCPD, TCDPW, TCSWCD, TCAD, NYSDEC, SEMO, FEMA	Actively analyze flood prone areas through the Stream Corridor Restoration and Flood Hazard Mitigation Program. Reincluded in plan update as Action Item A2 and A1.
Flood	5.1.31 Implement physical mitigation activities, as necessary, within Six-Mile Creek and other appropriate watersheds (including stacked rock walls, installation of riprap, installation of check dams, and vegetation plantings).	Goal 1, Objectives 1-1 and 1-7	M to H	Ongoing	TCFHMP, Bond Act, EPF	Towns	TCPD, TCDPW, TCSWCD, TCAD	Much work has occurred in this watershed over the last 5 years. Continues to be focus and is reincluded in plan update in "High Priority Action 10" and several other actions.
Flood	5.1.36 Continue to develop and/or enforce existing floodplain regulations to encourage the continued function of naturally controlling flood control mechanisms.	Goal 1, Objective 1-5	L	Ongoing	Site plan review, code enforcement	Towns	TCPD	Through CRS development and update of floodmaps the County will work with municipalities in addressing regulations. County has advocated and worked closely with the Town of Ulysses, Town of Ithaca and Village of Trumansburg in developing stream buffer regulations. Continues to be a focus in plan update as Action Item A3.
Flood	5.1.37 Limit, to the extent practicable, development within floodplain areas to avoid degradation of their capacity to control flood levels and to reduce potential future losses due to flooding.	Goal 1, Objective 1-5	L	Ongoing	Site plan review, code enforcement, zoning	Towns	TCPD	Through CRS development and update of floodmaps the County will work with municipalities in addressing regulations. County has advocated and worked closely with the Town of Ulysses, Town of Ithaca and Village of Trumansburg in developing stream buffer regulations. Continues to be a focus in plan update as Action Item A3.

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Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Flood	5.1.38 Ensure that property development that occurs within floodplain areas is constructed to be flood proof, to the extent practicable.	Goal 1, Objective 1-5	L	Ongoing	Site plan review, code enforcement, zoning	Towns	NYSDEC	Through CRS development and update of floodmaps the County will work with municipalities in addressing regulations. County has advocated and worked closely with the Town of Ulysses, Town of Ithaca and Village of Trumansburg in developing stream buffer regulations. Continues to be a focus in plan update as Action Item A3.
Flood	5.1.39 Wherever practicable, use zoning and other growth management techniques to channel intensive development to areas outside of floodplains.	Goal 1, Objective 1-5	L to M	Ongoing	Site plan review, code enforcement, zoning, NFIP	Towns	TCPD	Through CRS development and update of floodmaps the County will work with municipalities in addressing regulations. County has advocated and worked closely with the Town of Ulysses, Town of Ithaca and Village of Trumansburg in developing stream buffer regulations. Consulting with Towns without zoning in how to protect these areas and properties. Continues to be a focus in plan update as Action Item A3.
Flood	5.1.51 Address the bifurcated flow in Six Mile Creek, upstream of Banks Road at the property of Scott Whitman (reach #3505) by redirecting the flow into the left channel and converting the right channel into a riparian wetland floodplain.	Goal 1, Objective 1-7	M to H	6 years	TCFHMP	Towns	Cornell, TCSWCD TCPD	No longer an issue, action removed for update.
Severe Winter Storm	5.2.3 Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during storm events.	Goal 3, Objective 3-1 Goal 4, Objective 4-2	M	Ongoing	FEMA Programs	Towns	TCDPW, NYSEG	Still remains an issue and has been included as "High Priority 6" in the plan update.
Severe Storm	5.3.5 Develop tree trimming and removal efforts in the Towns of Ulysses and Caroline.	Goal 3, Objective 3-1 Goal 4, Objective 4-2	\$7,000	Ongoing	TBD	Towns	TCDPW	Still remains an issue and has been combined and included as "High Priority 6" in the plan update.
Utility Failure	5.7.10 Provide adequate redundant utilities (such as backup electrical power and alternative communication methods) for designated emergency mass care shelters and other critical facilities.	Goal 4, Objectives 4-2 and 4-3	M	TBD	TBD	Towns	TC	Slowly implemented, reincluded as "High Priority Action 8".
Water Supply Contamination	5.9.11 Implement training and public outreach to residents, code officials, and contractors about water supply contamination and response planning and training.	Goal 2, All Objectives, Goal 3, All Objectives	\$2,000/ton	2 years	Public-private partnerships	Towns	TC	Part of current practice, removed from plan update.
Severe Winter Storm	5.2.1 Inform citizens about winter storm events how to prepare for such events. Indicate locations of shelters and tips for staying at home. Provide advisories to avoid road travel combined with safe travel tips. Provide information on hazards of unheated houses, guidance on the use of portable and standby generators, fire hazards associated with space heaters, protecting plumbing during a winter storm, and coping with power failures.	Goal 2, All Objectives	\$2,000	1 year	Mailing pamphlet or page in newspaper, annually. PSAs; FEMA mitigation resources, public education grant	Towns	ARC	Currently implemented through the Tompkins Ready program. Generally supported through Action Item A4.

Appendix A - Table 30 - Status of 2006 HMP Mitigation Actions

Hazard	Mitigation Activity	Evaluation Against Goals and Objectives	Budget	Implementation Timeline	Existing Policies, Programs, and Resources to Support Implementation	Lead Agency	Support Agency	STATUS
Flood	5.1.34 Develop a program to ensure the maintenance of stormwater control measures.	Goal 1, Objective 1-4	L to M	Ongoing	Phase II Stormwater Regulatory Requirements	Towns, developers	TCPD	A part of current practice by Public Works/Highway departments. Removed in plan update.
Flood	5.1.18 Continue to operate the USGS stream flow gauge for Six Mile Creek. Collect flow data for other sub-watersheds to determine their potential flood risk.	Goal 1, Objective 1-4	Current funding	Ongoing	Aquifer program	USGS	Towns	Continual problem to keep gages funded. While the region has mainly been successful with this, it remains a Action Item in plan update (A24).
Flood	5.1.47 Conduct an assessment of groundwater resources within major glacial valleys in Tompkins County to better understand current surface and groundwater resources in the region.	Goal 1, Objective 1-4	\$4.5M	20 years	Continued County groundwater aquifer studies	USGS	TCPD, NYSDEC, Towns	Actively supported through the County Aquifer Study program. Support remains for this in Action Item TC4.
Water Supply Contamination	5.9.13 Harden (retrofit) fixed public water facilities and infrastructure from the threat of terrorist attack.	Goal 1, Objective 1-1	Contingent on retrofits selected	TBD	Current anti-terrorism initiatives	Water utilities	TBD	Focused on in City of Ithaca Water Plant rebuild and other critical infrastructure improvements. Remains in a general sense a part of plan update in "High Priority Action 8".
Flood	5.1.27 Establish a framework to compile and coordinate surface water management plans and data across the county.	Goal 1, Objective 1-4	L	2 years	WRC workplan, CLWN, Cornell	WRC	TCPD, TCDOH	A part of the current practice of the Water Resources Council. Deleted in plan update.

Table 33

**Additional Mitigation Action Strategies
Lower Priority**

Appendix A – Table 33 - Additional Multi-Jurisdictional Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
Multi-Jurisdictional									
A1	Encourage NFIP communities to participate in the Community Rating System (CRS) which would result in lower flood insurance premiums	Flood (Flash & Lake)	1	DOER	Municipalities, FEMA, NYSOEM	Low	FEMA, NYSOEM, Local Funds	Moderate	New & Existing
A2	Prioritize high risk floodplains for protection and conservation through acquisition, easement and green infrastructure improvements	Flood (Flash & Lake)	3	TCPD	Tompkins County Conservation Partners	Medium (\$40,000)	NYSDEC, NYSDAM, Foundations	Long	Existing
A3	Develop regulations to prohibit future building in flood-prone areas as well as create incentives to encourage property owners to protect and improve streams and buffers. This should include improving gorge safety and carefully designed and maintained trails within these buffer areas.	Flood (Flash & Lake)	1	Municipalities	TCPD, NYSDDEC, FEMA, NYSOEM, Cornell University, NYS Parks	High	Capital Improvement Project (CIP) funding or bonds	Ongoing	New & Existing
A4	Support existing preparedness campaigns including sheltering in place during storm events	Severe Storms	2	DOER	TC Public Info	Low	County budget	Moderate	N/A
A5	Identify wind-resistant building siting and construction codes and incorporate in code updates and work with vulnerable structures	Severe Storms	1	Municipalities	Building Code Officials, FEMA	Low	Local budgets, County budget	Long	New & Existing
A6	Develop a program that would encourage owners of older structures to make improvements for better fire resistance	Fire	1	CCE	DOER	Low-Medium	County Budget	Long	Existing
A7	Identify deficiencies in equipment and training and ensure that local fire departments are adequately equipped to respond safely and effectively to fires	Fire	4	DOER	Municipal Fire Departments	Low	Municipal budgets	Long	N/A
A8	Work with NYSDDEC on assessing fire hazards and emergency access needs related to the Danby, Yellow Barn and Shindagin Hollow State Forests	Fire	3, 4	DOER	NYSDEC	Low	NYSDEC grant, County budget	Long	N/A
A9	Encourage the use of underground utilities for new development	Utility failure	1	Municipalities	None	Low	N/A	Long	New

Goals: 1-Protect Life and Property, 2-Increase Public Education, Outreach and Partnerships, 3-Protect and Restore Natural Ecosystems, 4-Enhance Emergency Services

Agencies: DOER – Tompkins County Department of Emergency Response; TCPD – Tompkins County Planning Department; FEMA – Federal Emergency Management Agency, NYSOEM – New York State of Emergency Management; FLLT – Finger Lakes Land Trust; NRCS – US Natural Resource Conservation Service; IC – Ithaca College.

Appendix A – Table 33 - Additional Multi-Jurisdictional Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
A10	Develop mitigation/response plan for oil and gas operations	Water supply contamination, Trans. accidents, Hazmit In-transit	1, 2, 3, 4	TC Emergency Response Planning Committee	TCCOG	Medium	State grant, County budget	Short-Moderate	New
A11	Identify model regulations that buffer aquifer recharge areas	Water supply contamination	3	TCPD	Municipalities	Medium	Enviro protection grant, state funds, County budget	Moderate	New
A12	Complete water vulnerability assessment for water supply, water treatment systems and ground water systems and make recommended improvements	Water supply contamination	1, 3	TCPD	SWCD, Municipalities, NYSDEC	High	USDA funding, state grants, County budget	Long	N/A
A13	Enhance pre-emptive security around critical facilities and infrastructure	Terrorism	1	Municipalities	None	Medium	County and Municipal budgets	Long	Existing
A14	Assist farm support agencies in providing support and guidance for farm community in preparation for climate change including assisting dairies in building resilience to utility failures, extreme weather events and increasing drought conditions as well as working with crop farmers to assess the viability of current and potential future crops. This outreach should also include publicizing availability of TCSWCD's Farm Emergency Action Plan.	Utility failure, All Natural Hazards	2, 3	TCSWCD	NRCS, TCPD, Municipalities	Medium	Federal, State	Moderate	New
A15	Inventory Ash and Hemlock trees to assist in preparations of entrance of invasives and plant native tree species known to have a broad range of environmental tolerances	Infestation	1, 3	Tompkins County Conservation Partners	TCPD	Medium	NYSDEC WQIP	Long	New
A16	Develop and publicize heat response plan which includes the use of cooling centers	Extreme Temperatures	1, 2	DOER	City of Ithaca, Cornell, IC	Low	Federal and Local	Short	New

Goals: 1-Protect Life and Property, 2-Increase Public Education, Outreach and Partnerships, 3-Protect and Restore Natural Ecosystems, 4-Enhance Emergency Services

Agencies: DOER – Tompkins County Department of Emergency Response; TCPD – Tompkins County Planning Department; FEMA – Federal Emergency Management Agency, NYSOEM – New York State of Emergency Management; FLLT – Finger Lakes Land Trust; NRCS – US Natural Resource Conservation Service; IC – Ithaca College.

Appendix A – Table 33 - Additional Multi-Jurisdictional Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
A17	Incentivize and regulate the use of Energy Star and LEED building rating systems which save energy while also building resilience to extreme temperature events	Extreme Temperatures	2	Municipalities	TCPD	Low	Local	Long	New
A18	Encourage the use of green infrastructure to encourage water conservation, open space protection, and flood mitigation to reduce vulnerability, both in upstream areas and in urban areas. This should include the development of a watershed adaptation plan which prioritizes areas in which these improvements would have the most benefit in being implemented.	Drought, Flash Flood	3	Municipalities	NYSDEC	Medium	TC Stream Corridor and Local	Ongoing	New & Existing
A19	Promote the use of design techniques to shade buildings and windows or use highly reflective roof paints and surfaces to reduce warming in buildings from sun exposure	Extreme Temperatures	1	Municipalities	TCPD	Low	(None)	Moderate	New
A20	Work with the scientific community to update and refine regional climate projections/impacts and utilize this information in planning and management	Multi-Hazard	2	TCPD	Cornell, Federal Agencies	Low	(None)	Long	N/A
A21	Enhance our understanding of the impacts of climate change on public health	Multi-Hazard	1, 2	Tompkins County Human Services Cabinet	TCPD	Low	(None)	Long	N/A
A22	Create partnerships between the business and insurance industry to understand coverage and advance mitigation efforts	Multi-Hazard	1, 2	Tompkins County Chamber of Commerce	TCPD	Low	(None)	Moderate	New

Goals: 1-Protect Life and Property, 2-Increase Public Education, Outreach and Partnerships, 3-Protect and Restore Natural Ecosystems, 4-Enhance Emergency Services

Agencies: DOER – Tompkins County Department of Emergency Response; TCPD – Tompkins County Planning Department; FEMA – Federal Emergency Management Agency, NYSOEM – New York State of Emergency Management; FLLT – Finger Lakes Land Trust; NRCS – US Natural Resource Conservation Service; IC – Ithaca College.

Appendix A – Table 33 - Additional Multi-Jurisdictional Mitigation and Adaptation Action Strategies

#	Mitigation Action	Hazard(s) Mitigated	Goals Met	Lead Agency	Support Agencies	Estimated Cost Level	Potential Funding Sources	Implementation Timeframe	Targeted Development (new or existing)
A23	Utilize NY State Accident Location Information System (ALIS) traffic accident database to analyze high risk locations based on vehicle classification and relay that information to municipalities to advance mitigation measures as needed.	Transportation Accident	1	Ithaca-Tompkins County Transportation Council	Municipalities	Low	None	Short	Existing
A24	Continue to support the funding of the USGS gage stations which assist in forecasting and mitigating flood risk	Flood (Flash and Lake Flood)	1,2,3,4	USGS	Municipalities	Medium	Federal and Local	Ongoing	Existing
A25	Develop a plan with regional partners including local government, utility providers, agencies and engineers for analyzing and prioritizing pipeline crossings mitigation.	Water Supply Contamination	1,2,3	TCSWCD	TCPD, Municipalities, Utility Providers	Medium	None	Moderate	Existing
A26	Develop a coordinated strategy for reducing risk and conservation damage associated with tree fall related to the anticipated arrival of the Emerald Ash Borer	Infestation	1,2,3	Tompkins County Conservation Partners	Municipalities	Low	NYSDEC	Short	Existing

Goals: 1-Protect Life and Property, 2-Increase Public Education, Outreach and Partnerships, 3-Protect and Restore Natural Ecosystems, 4-Enhance Emergency Services

Agencies: DOER – Tompkins County Department of Emergency Response; TCPD – Tompkins County Planning Department; FEMA – Federal Emergency Management Agency, NYSOEM – New York State of Emergency Management; FLLT – Finger Lakes Land Trust; NRCS – US Natural Resource Conservation Service; IC – Ithaca College.

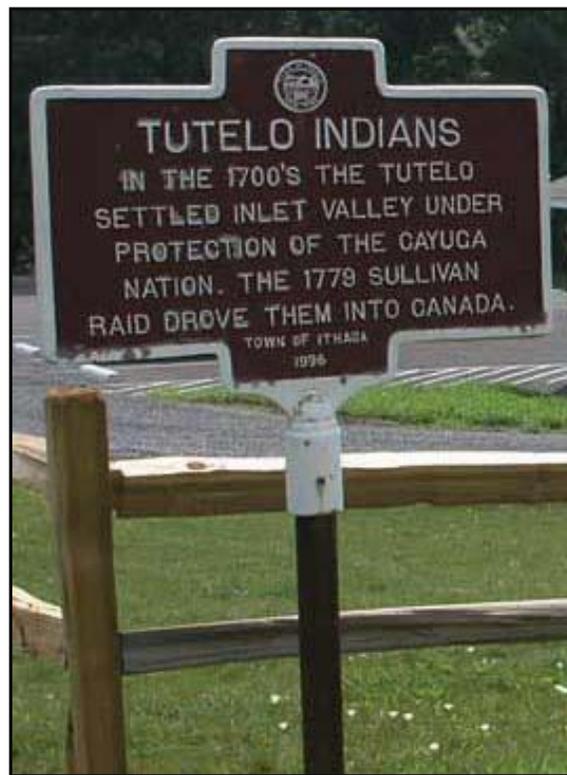
Appendix B

Tompkins County Historical Information

Appendix B – Tompkins County Historical Information

The Office of the Tompkins County Historian has compiled a history of Tompkins County. According to the County Historian, the earliest inhabitants of Tompkins County were the Cayugas, one of the five nations of the Iroquois Confederacy, also called the Haudenosaunee or “People of the Longhouse.” The term ‘Cayuga’ names the people of that Nation and the lake by which they lived, although they primarily inhabited the area around the northern half of the lake. In the 1700s, the Sapony and Tutelo Tribes journeyed north to lands inhabited by the Iroquois Confederacy after being forced to leave their lands by early settlers. The Cayugas provided the people of these Tribes land at the southern end of Cayuga Lake. Figure 2.2 depicts a photograph of a plaque marking Tutelo Park, located in the Town of Ithaca, as a place where the Tutelo Tribe had settled and built a village called Coreorgonel (Kammen, 2004).

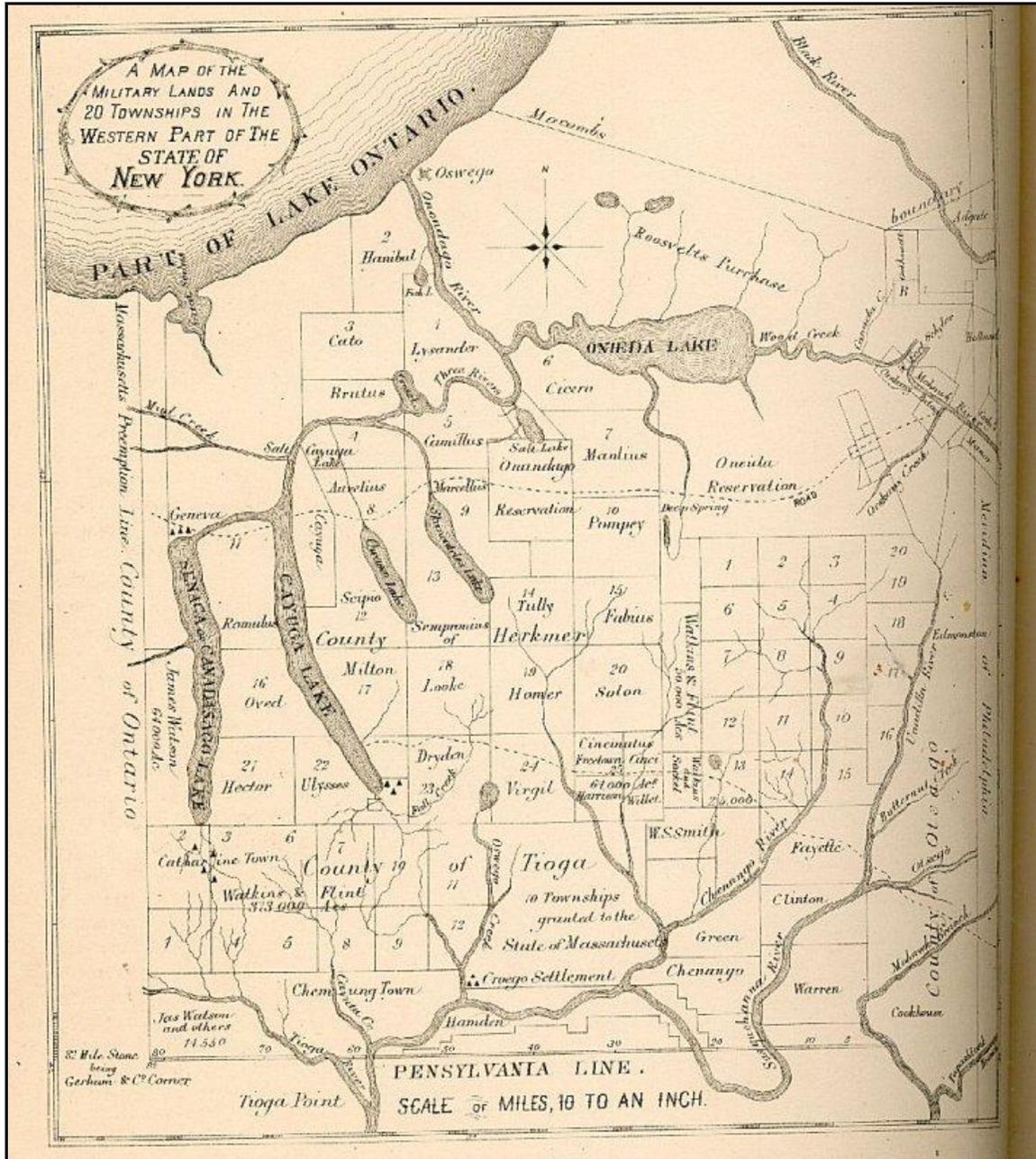
Figure 2.2 – Town of Ithaca Landmark in Tompkins County
(*Tompkins County Historian, 2012*)



In 1779, during the Revolutionary War, Lieutenant Colonel Henry Dearborn and Lieutenant Colonel William Butler, under Major General John Sullivan, marched men down either side of Cayuga Lake. This raid destroyed Native American villages and forced the Cayugas to surrender their land (Tompkins County Comprehensive Plan, 2004). Upon conclusion of the Revolutionary War in 1783, land in Central New York was designated as Military Tract, broken up, and provided to soldiers who had fought in the war as payment for their services (Kammen, 2004). This Military Tract land stretched from Lake Ontario south to the head waters of Cayuga and Seneca Lakes, spanning from the eastern shore of Seneca Lake, west, to present day Cortland County. This Military Tract area contained, at least in part, present day Tompkins

County (Kammen, 2004). Figure 2.3 displays the military lands and 20 Townships recognized in the western part of New York (current Finger Lakes and Southern Tier Regions) during this post-Revolutionary War period.

Figure 2.3 – Historic Map of the Finger Lakes, Central, and Southern Tier Regions of New York State Post-Revolutionary War
(Family Search, 2012)



Settlement in the Tompkins County area began in 1792. Early settlers consisted of squatters and others cashing in their Military Tract land allocations. Ministers, lawyers, and merchants followed the first settlers and by 1810, Ithaca had been formed as an unincorporated village. The

Ithaca-Owego Turnpike opened in late 1810, connecting Cayuga Lake with the Susquehanna River and providing for the transportation of goods south to cities like Baltimore, Maryland. This transportation system helped to identify Ithaca as an important transportation point for the shipment of goods. The opening of the Erie and Seneca Canals, as well as railroad development throughout the nineteenth (19th) century, provided a constant supply of local goods to regional markets (Tompkins County Comprehensive Plan, 2004).

On April 7, 1817, Tompkins County was formally established through an act of the New York State Legislature. Tompkins County was formed from portions of Cayuga and Seneca counties, and the unincorporated village of Ithaca was named county seat. Tompkins County was named after Daniel D. Tompkins, a former governor of New York State and the vice president of the United States from 1817 to 1825. Between 1819 and 1854, the boundaries of Tompkins County were altered three times, reaching the present limits in 1854 when a portion of the Town of Newfield and the entire Town of Hector became part of Schuyler County (Kammen, 2004).

Soon after, Cornell University was established (1865), bringing solidity to the County's economy by attracting students, faculty, and many new residents. The Cornell University campus, officially opened in 1868, was sited in the City of Ithaca on a hillside chosen by its namesake, Ezra Cornell. Figure 2.4 depicts a photograph of the current Cornell University campus overlooking Cayuga Lake. Ithaca College opened almost thirty years later in 1892 in downtown Ithaca. Ithaca College began as the Ithaca Conservatory of Music before expanding course offerings and adding additional schools in the 1920s. Today, Ithaca College offers a variety of private, coeducational undergraduate and graduate programs in business, communications, health sciences and human performance, humanities and sciences, music, and interdisciplinary studies.

Figure 2.4 – Photograph of Cornell University Overlooking Cayuga Lake
(*Cornell University, 2012*)



The land uses within Tompkins County slowly began to shift from an array of farms and mills to an area of towns and villages, accessible by various forms of transportation (Tompkins County Comprehensive Plan, 2004). Significant industries that came to be established in Tompkins County in the early 1900s include the Ithaca Gun Company, the Thomas-Morse airplane company, and the Groton Iron Bridge Company. Beginning in the 1960s, the local economy began to shift again, this time from manufacturing and industry toward education and public service sectors (Tompkins County Comprehensive Plan, 2004).

Appendix C

Hazard Mitigation Plan Implementation Committee Meeting Notes – 2007 & 2008

Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan (TCHMP) – 2007 Implementation Report

As outlined in the 2006 TCHMP, “a report summarizing the previously mentioned activities will be written and maintained. These annual reports will provide data for the 5-year update of this plan and will assist in pinpointing implementation challenges. By monitoring the implementation of the plan on an annual basis the planning group will be able to assess which projects are completed, which are no longer feasible, and if funding is being provided.”

I. Meetings Update

The **Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan – Implementation Committee** was formed in December 2007 and met for the first time on January 30th 2008. The group, made up of representatives of each of the municipalities involved in development of the TCHMP, met to both lay the groundwork for the plan’s update in 2011 and develop strategies for implementation of the plan. The focus of the meeting was to examine the plan’s action items and update them based on accomplished items, repetition, and new realities. To assist with this review a consolidated list of hazard mitigation plan action items was built. This review document noted 181 action items over 11 hazards (flood, severe winter storm, severe storm, epidemic (agricultural), epidemic (human), fire (urban and wild), utility failure, transportation accident, water supply contamination, terrorism, civil unrest). The action items were listed by hazards and by lead agency responsible for implementation. Just flood hazard action items (59 action items) were examined as a part of the January meeting, future meetings will address other action items. Based on clarification from New York State Emergency Management Office (SEMO) no formal reporting is required as of yet for this update process, though they do encourage a group being formed. This group will meet annual for 2008 and 2009, and meet with greater regularity in 2010 to prepare for the required update. **An agenda of the meeting is attached.** Other results of the meeting included:

- Interest in reaching across County lines for assistance with various efforts.
- Need to reconvene post-disaster event to see if mitigation measures have been useful, what added steps need be taken.
- Emergency awareness will be greatly enhance through obtaining LIDAR data (due summer 2008).
- Local communities could use assistance with grant development and implementation. A “grants day” was recommended.
- The committee did not think the plan should take on an “adaptation” role in dealing with global climate change at this juncture. They did indicate that “thinking green” certainly did relate to hazard mitigation planning.

The **Tompkins County Emergency Management Planning Group (TCEMPG)** met bi-monthly throughout 2007. Meetings were held the third Tuesday of the month beginning in February. Meetings were held February 20, April 17, June 19, August 21, October 16 and December 18. The TCEMPG is the group of representatives from throughout the County whom are involved in emergency management issues. This group includes representatives from County government, local fire/police, the area College and University, American Red Cross, local utilities and several others.

At the August 21st meeting a short presentation was made regarding the TCHMP maintenance and implementation through a formal mitigation planning group. This group would include a representative from each of the jurisdictions involved with the development of the plan and would update aspects of the plan and evaluate the overall progress of mitigation action items. The proposal for the formation of the mitigation planning group, which would be a formal reporting subgroup to the TCEMPG, was formally submitted to the group at the October 16th Meeting.

The August 21st meeting also served as an opportunity to update the group on a presentation that the County Emergency Manager, the County Hazard Mitigation Coordinator, Public Works Administrator and planning department staff provided to the Tompkins County Council of Governments (TCCOG). TCCOG is a representative body of the municipalities that lie within Tompkins County. The bulk of TCCOG participants represent jurisdictions covered by the TCHMP. Mayors, Town Board Members and Town Supervisors are among those who attend. The July 26th presentation outlined the four levels of emergency management (Preparedness, Response, Recovery and Mitigation) with a special emphasis on mitigation. The mitigation discussion outlined current activities and the need for the development of a mitigation planning committee to implement and update the mitigation plan.

A variety of Town-County and inter-County meetings laid the ground work for the items the mitigation planning committee will tackle for annual meetings. In essence the plan's action items will be revisited to determine what has moved forward, what hasn't, what is still relevant and also examine if any new risk assessment data is available to provide updates to the plan. Due to a turnover at the Hazard Mitigation Coordinator position and elections at several of the involved municipalities the mitigation planning committee will not meet until the first quarter of 2008.

II. Local Mitigation Activity Update

A variety of mitigation activity happened throughout 2006 and 2007 that activity is outlined below.

- Ludlowville Stormwater Control Project
 - Flood Action Item 5.1.44 – Analyze overall drainage system at Lansingville Road
 - The Tompkins County Planning Department applied for and received funding from the NYS Department of Environmental Conservation's Water Quality Improvement Program (WQIP) to study the drainage and design an engineered system to reduce property damage from area stormwater runoff.
- Watershed Assessments
 - Flood Action Item 5.1.8 – Continue to conduct engineering studies and watershed assessments to support the reduction of flood potential
 - Flood Action Item 5.1.17 – Continue Six Mile Creek, Fall Creek, Salmon Creek, and Cayuga Inlet Watershed Assessments
 - Watershed, flood mitigation needs assessment were conducted for Six Mile Creek, Salmon Creek, Fall Creek & Cayuga Inlet. Priority issues and recommendations were identified for each of these waterbodies.
- Reorganization of the Tompkins County Flood Hazard Mitigation Program
 - Flood Action Item 5.1.49 - Re-emphasize watershed approaches by developing a strategy to address the needs at the watershed level, including cumulative flood mitigation activities and priorities
 - Flood Action Item 5.1.20 - Identify, evaluate, and implement effective flood mitigation activities for specific "hot spots" within the county
 - In using information gained from the previously mentioned watershed assessments the Tompkins County Flood Hazard Mitigation Program was re-organized to provide a more watershed based approach. Several of those projects were addressed in implementing the following action items.
- Implementation of the Barrile stream bank stabilization
 - Flood Action Item 5.1.14 - Implement Barrile stream bank stabilization
 - Flood Action Item 5.1.21 - Construct synthetic floodways to disperse flow and reduce velocity of water in Six Mile Creek
 - Flood Action Item 5.1.22 - Increase channel roughness of Six Mile Creek
 - Significant sized project helped to reduce flood risks for a number of property owners in the Town of Caroline. Most recently the project was vegetated through the County Flood Hazard Mitigation Program. The Town of Caroline is currently planning a follow up project further down Six Mile Creek.
- As a part of the 2007 Tompkins County Flood Hazard Mitigation Program, the Salmon Creek Bank Erosion project was conducted that reduced erosion and dispersed the flow and velocity of Salmon Creek
 - Flood Action Item 5.1.46 - Continue local stream bank stabilization projects
 - Flood Action Item 5.1.31 - Implement physical mitigation activities, as necessary within Six Mile Creek and other appropriate watersheds
 - Flood Action Item 5.1.45 - Stabilize the Brooktondale Road stream bank
- Banks Road – Six Mile Creek Readjustment
 - Flood Action Item 5.1.51 - Address the bifurcated flow in Six Mile Creek, upstream of Banks Road
 - Funding allocated to implement a project on this site, though follow up indicated that the Creek shifted and remained canalized, requiring no added work
- The County financially committed to support the Tompkins County Soil and Water District's contract to fly the County to collect LiDAR data that is the first step in updating flood plain (FIRM) maps.

- Flood Action Item 5.1.4 – Enhance data and mapping for floodplains within the County and identify and map any floodprone areas currently outside the County (see also 5.1.7)
 - Flood Action Item 5.1.7 – Update flood plain (FIRM) maps.
- Various municipalities have implemented aspects of their Phase 2 Stormwater Regulations – efforts have been made
 - Flood Action Item 5.1.12 – Implement Phase 2 Stormwater regulation compliance, and focus on efforts under S4 that help to reduce flood risk.
- Obtained grant to develop countywide stream buffer protection
 - Flood Action Item 5.1.41 - Identify or update existing land use in major stream corridors and floodplains in Tompkins County.
- Continuing to conduct aquifer studies in the Towns of Caroline, Danby and Dryden and actively initiating new studies
 - Flood Action Item 5.1.47 – Conduct an assessment of groundwater resources within major glacial valleys in Tompkins County to better understand current surface and groundwater resources in the region.
 - Water Supply Contamination 5.9.2 – Continue aquifer assessment studies to better understand groundwater dynamics and re-charge areas.
 - Water Supply Contamination 5.9.3 – Continue Six Mile, Virgil and Willseyville Creek Aquifer Studies.
- Help to coordinate funding for local USGS stream flow gauge operation
 - Flood Action Item 5.1.18 – Continue to operate the USGS stream flow gauge for Six Mile Creek. Collect flow data for other sub-watersheds to determine their potential flood risk.
- The Tompkins County Planning Department coordinated the development of the Tompkins County Conservation Plan which identifies priority protection areas throughout the County. This plan, among other things, sets forth a strategy to preserve open space for flood mitigation, fish habitat and water quality in the floodplain.
 - Flood Action Item 5.1.26 – Encourage development of acquisition and management strategies to preserve open space for flood mitigation, fish habitat, and water quality in the floodplain.
- The Town of Danby conducted surveys of special needs populations to help identify those who may need extra assistance during a hazard event.
 - Severe Winter Storm Action Item 5.2.5 – Survey institutions that have specific needs populations to identify their emergency needs.
- The Town of Ithaca developed a stricter noise ordinance to assist in dealing with recurring student party concerns on South Hill.
 - Civil Unrest Action Item 5.11.2 – Develop a stricter student party ordinance
- Other mitigation measures not previously mentioned...

III. Information Distribution Update

The following information was distributed or obtained relating to the TCHMP this year:

- SEMO provided 3 mitigation funding opportunities in the fall of 2007 that was provided to the local municipalities and interested parties within Tompkins County. This continues to be a difficult process as the information from FEMA and SEMO is provided just weeks or days prior to a formal Letter of Intent is requested.
- Conversations with SEMO indicated that a State Emergency Management Conference would likely be reinstated in the approaching years. This is certainly something the County and mitigation team should be involved with as it is developed.
- A Tompkins County Planning Department staff member attended an energy/climate change conference in November and indicated some discussion statewide of adaptation planning for climate change – in essence conducting planning work to prepare for community wide changes associated with climate change. At the first quarter, mitigation planning group meeting in 2008 one agenda item will be this issue and its relationship to the TCHMP.

IV. Resource Update

In May 2007, Tompkins County hired a new Senior Planner, Scott Doyle, to assume recent department vacancies, including that of County Hazard Mitigation Officer, Kate Hackett. Scott will assume the hazard mitigation coordinator role among others and coordinate the implementation and update of the Plan. He has previously worked on hazard mitigation planning issues, including PDM, throughout the State of Oregon. He can be reached at 607-274-5560 or at sdoyle@tompkins-co.org.

Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan (TCHMP) – 2008 Implementation Report

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I. Meetings Update

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- Beth Harrington (Tompkins County Emergency Response)
- Ric Dietrich (Danby)
- Lee Shurtleff (Tompkins County Emergency Response)
- Glenn Morey (Groton)
- Dick Coogan (Ulysses)
- Jessica Verfuss (Tompkins County Emergency Response)
- Peter Hoyt (Caroline)
- Charlie Purcell (Lansing)
- Scott Doyle (Tompkins County Planning)

To assist with this review a consolidated list of hazard mitigation plan action items was built. This review document noted 181 action items over 11 hazards (flood, severe winter storm, severe storm, epidemic (agricultural), epidemic (human), fire (urban and wild), utility failure, transportation accident, water supply contamination, terrorism, civil unrest). The action items were listed by hazards and by lead agency responsible for implementation. Just flood hazard action items (59 action items) were examined as a part of the January meeting, future meetings will address other action items. Based on clarification from New York State Emergency Management Office (SEMO) no formal reporting is required as of yet for this update process, though they do encourage a group being formed. This group will meet again in 2009 at least one time, and meet with greater frequency in 2010 to prepare for the required update. An agenda of the 2008 meeting is attached. Other results of the meeting included:

- Interest in reaching across County lines for assistance with various efforts.
- Need to reconvene post-disaster event to see if mitigation measures have been useful, what added steps need be taken.
- Emergency awareness will be greatly enhance through obtaining LIDAR data (Obtained Summer 2008).
- Local communities could use assistance with grant development and implementation. A “grants day” was recommended.
- The committee did not think the plan should take on an “adaptation” role in dealing with global climate change at this juncture. They did indicate that “thinking green” certainly did relate to hazard mitigation planning.

The 2009 meeting has been set for February 29, 2009.

The Tompkins County Emergency Management Planning Group (TCEMPG) met bi-monthly throughout 2008. Meetings were held the third Tuesday of the month beginning in February. The TCEMPG is the group of representatives from throughout the County whom are involved in emergency management issues. This group includes representatives from County government, local fire/police, Ithaca College, Cornell University, American Red Cross, local utilities and several others.

At the October 2008 meeting a short presentation was made regarding the TCHMP maintenance and implementation through a formal mitigation planning group. A goal of updating all action items in early 2009 and mapping a timeline for the plan update

A variety of Town-County and inter-County meetings laid the ground work for the items the mitigation planning committee will tackle for annual meetings. In essence the plan's action items will be revisited to determine what has moved forward, what hasn't, what is still relevant and also examine if any new risk assessment data is available to provide updates to the plan.

II. Local Mitigation Activity Update

A variety of mitigation activity happened throughout 2008 which is outlined below.

- Ludlowville Stormwater Control Project
 - Flood Action Item 5.1.44 – Analyze overall drainage system at Lansingville Road
 - The Tompkins County Planning Department applied for and received funding from the NYS Department of Environmental Conservation's Water Quality Improvement Program (WQIP) to study the drainage and design an engineered system to reduce property damage from area stormwater runoff.
 - A consultant, Barton & Loguidice, PC, was hired in the spring of 2008 and has conducted an existing conditions analysis for the region. One public meeting was held in 2008 to introduce the project. A follow up meeting will be held in 2009 to detail the initial report and introduce proposed design solutions.
- Watershed Assessments
 - Flood Action Item 5.1.8 – Continue to conduct engineering studies and watershed assessments to support the reduction of flood potential.
 - Ground work was laid for watershed assessment for the Owasco Inlet.
 - Flood Action Item 5.1.17 – Continue Six Mile Creek, Fall Creek, Salmon Creek, and Cayuga Inlet Watershed Assessments
 - Watershed, flood mitigation needs assessment were conducted for Six Mile Creek, Salmon Creek, Fall Creek & Cayuga Inlet. Priority issues and recommendations were identified for each of these waterbodies. Several of these projects were investigated and implemented in 2008.
- Reorganization of the Tompkins County Flood Hazard Mitigation Program
 - Flood Action Item 5.1.49 - Re-emphasize watershed approaches by developing a strategy to address the needs at the watershed level, including cumulative flood mitigation activities and priorities
 - Flood Action Item 5.1.20 - Identify, evaluate, and implement effective flood mitigation activities for specific "hot spots" within the county
 - In using information gained from the previously mentioned watershed assessments the Tompkins County Flood Hazard Mitigation Program was re-organized to provide a more watershed based approach. Several of those projects were addressed in implementing the following action items.
- Implementation of the Barrile stream bank stabilization
 - Flood Action Item 5.1.14 - Implement Barrile stream bank stabilization
 - Flood Action Item 5.1.21 - Construct synthetic floodways to disperse flow and reduce velocity of water in Six Mile Creek
 - Flood Action Item 5.1.22 - Increase channel roughness of Six Mile Creek
 - Significant sized project helped to reduce flood risks for a number of property owners in the Town of Caroline. Most recently the project was vegetated in 2007 through the County Flood Hazard Mitigation Program. The Town of Caroline is currently planning a follow up project further down Six Mile Creek.
- As a part of the 2008 Tompkins County Flood Hazard Mitigation Program, the Salmon Creek Bank Erosion project was conducted that reduced erosion and dispersed the flow and velocity of Salmon Creek. Projects were identified, designed and implemented in the Fall Creek, Salmon Creek, Cayuga Inlet and Sixmile Creek watersheds. These projects included the stabilization of over 3,000 feet of stream bank and the vegetation of banks with over 600 trees,
 - Flood Action Item 5.1.46 - Continue local stream bank stabilization projects
 - Flood Action Item 5.1.31 - Implement physical mitigation activities, as necessary within Six Mile Creek and other appropriate watersheds

- Working closely with property owner, the project was stabilized with the assistance of natural in stream structures and a redesigned bank, vegetated with over 100 native trees and reseeded. The project runs 350' along the bank of Sixmile Creek and has created a protected 50' Riparian Buffer Area.
 - Flood Action Item 5.1.45 - Stabilize the Brooktondale Road stream bank
 - Flood Action Item 5.1.22 – Increase channel roughness of the Six Mile Creek, including introducing large woody debris in the banks, creating boulder and log sills in the riverbed, installing individual boulders and boulder clusters in the channel, and redefining the channel's thalweg.
- Banks Road – Six Mile Creek Readjustment. Funding was allocated to implement a project on this site, though follow up indicated that the Creek shifted and remained channelized, requiring no added work.
 - Flood Action Item 5.1.51 - Address the bifurcated flow in Six Mile Creek, upstream of Banks Road
- Tompkins County Soil and Water District with some financial support from the County obtained LiDAR data that is useful in a number of projects and is the first step in updating flood plain (FIRM) maps.
 - Flood Action Item 5.1.4 – Enhance data and mapping for floodplains within the County and identify and map any floodprone areas currently outside the County (see also 5.1.7)
 - Flood Action Item 5.1.7 – Update flood plain (FIRM) maps.
- Various municipalities continue to implement aspects of their Phase 2 Stormwater Regulations.
 - Flood Action Item 5.1.12 – Implement Phase 2 Stormwater regulation compliance, and focus on efforts under S4 that help to reduce flood risk.
- Obtained grant to develop countywide stream buffer protection and designed and implemented a number of protection tools including a model riparian buffer ordinance. Outreach for these tools will be conducted in 2009.
 - Flood Action Item 5.1.41 - Identify or update existing land use in major stream corridors and floodplains in Tompkins County.
 - Flood Action Item 5.1.15 – Develop model ordinances for sediment and erosion control, stormwater control, and stream buffer implementation.
- Continuing to conduct aquifer studies in the Towns of Caroline, Danby and Dryden and actively initiating new studies. Outreach to the Towns of Newfield and Groton as well as the Village of Groton regarding this program.
 - Flood Action Item 5.1.47 – Conduct an assessment of groundwater resources within major glacial valleys in Tompkins County to better understand current surface and groundwater resources in the region.
 - Water Supply Contamination 5.9.2 – Continue aquifer assessment studies to better understand groundwater dynamics and re-charge areas.
 - Water Supply Contamination 5.9.3 – Continue Six Mile, Virgil and Wilseyville Creek Aquifer Studies.
- Help to coordinate funding for local USGS stream flow gauge operation. A variety of efforts were conducted to continue funding for gauges. One gauge, on Salmon Creek, did not receive funding for continued use.
 - Flood Action Item 5.1.18 – Continue to operate the USGS stream flow gauge for Six Mile Creek. Collect flow data for other sub-watersheds to determine their potential flood risk.
- The Tompkins County Planning Department coordinated the development of the Tompkins County Conservation Plan which identifies priority protection areas throughout the County. This plan, among other things, sets forth a strategy to preserve open space for flood mitigation, fish habitat and water quality in the floodplain. A variety of outreach was conducted for this planning effort.

- Flood Action Item 5.1.26 – Encourage development of acquisition and management strategies to preserve open space for flood mitigation, fish habitat, and water quality in the floodplain.
- Bridge upgrades in Tompkins County continue to be designed to support natural stream functions further withstand flooding events.
 - Flood Action Item 5.1.29 – Retrofit or re-construct bridges at a higher elevation to withstand flood events.
- Retrofit of Caroline Town Barn to support streambank stabilization
 - Severe Winter Storm Action Item 5.2.10 – Retrofit critical structures
- Obtained funding for purchasing backup generators in Caroline and Danby
 - Severe Winter Storm Action Item 5.2.6 – Obtain funding to purchase backup generators
- Public awareness of storm mitigation activities, including warnings and advisories were distributed via NY-ALERT
 - Severe Winter Storm Action Item 5.3.4 – Increase public awareness of storm mitigation activities
 - Epidemic (Human) Action Item 5.5.5 – Enhance public safety through awareness, by releasing timely public service announcements via various media
- Resources were secured and identified to build the appropriate medical stockpiles
 - Epidemic (Human) Action Item 5.5.4 – Identify and secure resources to build the appropriate medical stockpile of medicines and medical supplies
- Outreach and education programs continue to be advanced by local fire departments in particular, through national fire prevention month (October)
 - Fire Action Item 5.6.5 – Enhance outreach and education programs aimed at mitigating fire hazards
- Fire and security alarm system installed at Danby Town Hall
 - Fire Action Item 5.6.18 – Install supervised fire/security alarm system at Danby Town Hall
- Backup power to West Danby Water District
 - Utility Failure Action Item 5.7.6 – Provide backup power to the West Danby Water District System
- Backup generator purchased for Slaterville Fire Company
 - Utility Failure Action Item 5.7.19 – Purchase backup generator for Slaterville Fire Company
- Some signal improvements to improve safety around West Danby Fire Station
 - Transportation Accident 5.8.10 – Arrange for NYSOT To survey West Danby fire station site distances

III. Information Distribution Update

The following information was distributed or obtained relating to the TCHMP this year:

- SEMO provided 3 mitigation funding opportunities in the fall of 2008 that was provided to the local municipalities and interested parties within Tompkins County. This continues to be a difficult process as the information from FEMA and SEMO is provided just weeks or days prior to a formal Letter of Intent is requested.
- Conversations with SEMO indicated that a State Emergency Management Conference would likely be reinstated in the approaching years. This is certainly something the County and mitigation team should be involved with as it is developed.
- Emergency response and recovery training opportunities continue to be coordinated through the Tompkins County Department of Emergency Response.
- It continues to be the goal of the Implementation Committee to have priority projects ready to implement as funding opportunities arise.

IV. Resource Update

Scott Doyle continues to serve as the County Hazard Mitigation Officer and will coordinate the implementation and update of the Plan. He has previously worked on hazard mitigation planning issues, including PDM, throughout the State of Oregon. He can be reached at 607-274-5560 or at sdoyle@tomppkins-co.org.

Appendix D

Website Links to Tompkins County Planning Resources

County Resources Links:

Tompkins County Comprehensive Plan - 2004

http://www.tompkins-co.org/planning/compplan/compplan_for_web.pdf

Tompkins County Conservation Strategy – 2012

<http://www.tompkins-co.org/planning/nri/documents/ConservationStrategyfinal08-28-12.pdf>

Tompkins County Conservation Plan - 2010

http://www.tompkins-co.org/planning/Rural%20Resources/documents/FINAL_Tompkins_Conservation_Plan_Part_II_04-10_000.pdf

Tompkins County Conservation Plan – 2007

http://www.tompkins-co.org/planning/nri/documents/Tompkins_County_Conservation_Plan09-24-07.pdf

Tompkins County Natural Resources Inventory - 2001

<http://www.tompkins-co.org/planning/nri/inventory.pdf>

Tompkins County Scenic Resources Inventory – 2007

<http://www.tompkins-co.org/planning/nri/documents/TCSRreportJan17.pdf>

NYS Local Waterfront Revitalization Program – Cayuga Lake Waterfront Plan - 2004

<http://www.cayuga-heights.ny.us/doc/oth08132012.pdf>

Tompkins County Forest Management Plan – 2007

<http://www.tompkins-co.org/planning/Rural%20Resources/documents/Oct10MainPlan.pdf>

Tompkins County Multi-Jurisdictional All-Hazard Mitigation Plan - 2013

http://www.tompkins-co.org/planning/haz_mit.htm

Tompkins County Workforce Strategy – 2010

<http://www.tompkinsworkforceny.org/workforcestrategy.pdf>

Tompkins County 2020 Energy Strategy – 2010

http://www.tompkins-co.org/planning/energyclimate/documents/EnergyStrategy20208-20-10_2.pdf

Development Focus Areas Strategy – 2012

http://www.tompkins-co.org/planning/community%20planning/documents/DevelopmentFocusAreasStrategy_adopted_10-2-12_000.pdf

Appendix E

Hazard Mitigation Plan Update Process Meeting Timeline and Attendees

Appendix E
Hazard Mitigation Plan Update Process Meeting Timeline and Attendees

In updating the plan, the County established two committees assist in guiding the process, the Steering Committee of municipal representation and the Technical Committee which consists of local experts in fields addressed in the plan update. The following is a list of that membership.

Hazard Mitigation Update Project Steering Committee

Name		Municipality/Agency
Beth	Harrington	Tompkins County Department of Emergency Response
Lee	Shurtleff	Tompkins County Department of Emergency Response
Jessica	Verfuss	Tompkins County Department of Emergency Response
Katie	Borgella	Tompkins County Planning Department
Scott	Doyle	Tompkins County Planning Department
Cheryl	Nelson	Tompkins County Public Works
Kevin	Romer	Town of Ulysses
Don	Barber	Town of Caroline
Dominic	Frongillo	Town of Caroline
Irene	Weiser*	Town of Caroline
Jeff	Overstrom*	Town of Lansing
Creig	Hebdon*	Town of Ithaca
Dan	Thaete	Town of Ithaca
David	Sprout*	Town of Dryden
Mary Ann	Sumner	Town of Dryden
Elizabeth	Thomas	Town of Ulysses
Darby	Kiley*	Town of Ulysses
Susan	Beeners*	Town of Danby
Matt	Cooper	Town of Danby
Ric	Dietrich	Town of Danby
Richard	Driscoll*	Town of Newfield
Glenn	Morey*	Town of Groton
Julie	Holcomb*	City of Ithaca
Guy	Van Benschoten	City of Ithaca
Roy	Barriere	Town of Enfield

Name		Municipality/Agency
Larry	Stilwell*	Town of Enfield
Ann	Rider	Town of Enfield
Don	Hartill*	V. Lansing
Marty	Moseley	V. Lansing
Tammy	Morse	V. Trumansburg
Martin	Petorvic*	V. Trumansburg
Randall	Sterling*	V. Dryden
Abby	Homer	V. Dryden
Kevin	Ezell	V. Dryden
Lotte	Carpenter*	V. Freeville
Stephanie	Mulinos	V. Freeville
Jeffery	Evener	V. Groton
Chuck	Rankin*	V. Groton
Kate	Supron*	V. Cayuga Heights
Mary	Mills	V. Cayuga Heights
James	Steinmetz	V. Cayuga Heights
George	Tamborelle	V. Cayuga Heights
Brent	Cross	V. Cayuga Heights

*Lead municipal contact

Hazard Mitigation Plan Technical Committee

Name		Agency/Muni	Field
Art	Pearce	Community Volunteer	Gas Drilling
Darby	Kiley	Town of Ulysses, Former County Staff for Gas Drilling Work	Gas Drilling
Jonathan	Comstock	Cornell Horticulture	Climate/ClimAid
Frank	Kruppa	County Health	Public Health
Craig	Schutt	Tompkins Co. Soil & Water Conservation District (TCSWCD)	Ag +
Mark	Whitmore	Cornell Nat. Res.	Invasives
Jack	Rueckheim	Bolton Point	Water
Roxanna	Johnston	City of Ithaca	Water
Bob	Passe	NYSEG	Utilities

Name		Agency/Muni	Field
Jack	French	Lansing Highway	Transp
Jessica	Verfuss	Emergency Response	EM
Ed	Bugliosi	USGS	Water
Bill	Gray	City of Ithaca	Public Works

The following is the meetings held as a part of the plan update process and a list of attendees.

Steering Committee Kick Off Meeting – September 20, 2011 — Organizing meeting, discussed why updating the plan, what new aspects we would explore, how we would engage the public and other items. The meeting included the following attendees:

- Beth Harrington, Tompkins County Department of Emergency Response (DOER)
- Kevin Romer, Town of Ulysses
- Don Barber, Town of Caroline
- Jeff Overstrom, Town of Lansing
- Creig Hebdon, Town of Ithaca
- Katie Borgella, Tompkins County Planning Department (TCPD)
- David Sprout, Town of Dryden
- Elizabeth Thomas, Town of Ulysses
- Lee Shurtleff, DOER
- Jessica Verfuss, DOER
- Susan Beeners, Town of Danby
- Cheryl Nelson, Tompkins County Public Works
- Richard Driscoll, Town of Newfield
- Scott Doyle, TCPD

Technical Committee Meeting #1 – February 10, 2012 – Overview of the process, discussion of committee’s role, risk assessment preparation, and other items. The meeting included the following attendees:

- Darby Kiley, Town of Ulysses
- Jonathan Comstock, Cornell University Horticulture
- Frank Kruppa, Tompkins County Health Department
- Roxy Johnston, City of Ithaca Water Treatment Plant
- Craig Schutt, Tompkins County Soil and Water Conservation District
- Mark Whitmore, Cornell University Department of Natural Resources
- Jack French, Town of Lansing Highway Department
- Ed Bugliosi, United States Geological Survey (USGS)
- Katie Borgella, TCPD
- Scott Doyle, TCPD
- John Condino, Barton & Loguidice (B&L)
- Johanna Duffy, B&L

Hazard Analysis Workshop - March 8, 2012 - A group of County staff, local officials, agency/interest group representatives, and technical experts was assembled to complete a HIRA-NY risk assessment process for Tompkins County. Such a risk assessment was previously conducted as part of the County's original 2006 Hazard Mitigation Plan, and was performed again for this Plan Update. NYSOEM Region IV personnel facilitated the March 2012 risk assessment and input the results in the HIRA-NY computer program. Detailed meeting notes were recorded throughout the process by Beth Harrington with the Department of Emergency Response, and reviewed by the project team in subsequent meetings. The following individuals attended this event:

- Ronald Raymond, NYSOEM Region IV
- Tom M^cCartney, NYSOEM Region IV
- Beth Harrington, Lee Shurtleff, Jessica Verfuss, DOER
- Irene Weiser, Town of Caroline
- Creig Hebdon, Town of Ithaca
- David Sprout, Town of Dryden
- Larry Stilwell, Town of Enfield
- Susan Beeners, Town of Danby
- Ric Dietrich, Town of Danby
- Matt Cooper, Town of Danby
- Richard Driscoll, Town of Newfield
- Julie Holcomb, City of Ithaca
- Darby Kiley, Town of Ulysses
- Scott Doyle, TCPD
- Katie Borgella, TCPD
- Jonathan Comstock, Cornell University Horticulture Department
- Dan Maas, Cornell University Environmental Health and Safety
- Leah Stoner, Cornell University Environmental Health and Safety
- Jack Rueckheim, Bolton Point Water Treatment Plant
- Ed Bugliosi, USGS
- Cheryl Nelson, Tompkins County Department of Public Works
- Dave Nicosia, National Weather Service
- Kevin Carpenter, American Red Cross
- Marcia Lynch, Tompkins County Public Information Office
- Bob Lampman, Tompkins County Sheriff's Department
- Paula Younger, Tompkins County Administration
- Adam Hartwig, Tompkins County Health Department
- Al Fiorille, Tompkins County Assessment Office
- John Condino, B&L
- Johanna Duffy, B&L

In addition, representatives from the following agencies, groups, and jurisdictions were also invited: Town of Lansing, Town of Groton, Village of Lansing, Village of Trumansburg, Village of Dryden, Village of Freeville, Village of Groton, Village of Cayuga Heights, Tompkins County Soil and Water District, NYS Electric & Gas, NYS

Police, Ithaca College, Tompkins County Community College, Cayuga Medical Center, and T-S-T BOCES.

Technical Committee Meeting #2 – March 29, 2012 – Overview of hazard analysis workshop and refinement of risk assessment data. The meeting included the following attendees:

- Frank Kruppa, Tompkins County Health Department
- Ed Bugliosi, USGS
- Craig Schutt, TCSWCD
- Darby Kiley, Town of Ulysses
- Roxanna Johnston, City of Ithaca
- Mark Whitmore, Cornell University Department of Natural Resources
- Katy Borgella, TCPD
- Scott Doyle, TCPD
- Jessica Verfuss, DOER

Steering Committee Meeting #2 – April 19, 2012 – Review of plan requirements, the update process, hazard history refinement and action item updates. The meeting included the following attendees:

- David Sprout, Town of Dryden
- Darby Kiley, Town of Ulysses
- Larry Stilwell, Town of Enfield
- Katie Borgella, TCPD
- Creig Hebdon, Town of Ithaca
- Kevin Ezell, Village of Dryden
- Irene Weiser, Town of Caroline
- Jeff Overstrom, Town of Lansing
- Susan Beeners, Town of Danby
- Jessica Verfuss, DOER
- Beth Harrington, DOER
- Glenn Morey, Town of Groton
- Matt Cooper, Town of Danby
- Julie Holcomb, City of Ithaca
- Cheryl Nelson, Tompkins County Public Works
- Dominic Frongillo, Town of Caroline
- Scott Doyle, TCPD
- Lee Shurtleff, DOER
- John Condino, B&L
- Johanna Duffy, B&L

Steering Committee Meeting #3 – May 24, 2012 – Work Session to refine hazard history and map critical infrastructure. The meeting included the following attendees:

- Darby Kiley, Town of Ulysses
- Dan Thaete, Town of Ithaca
- Johanna Duffy, B&L
- John Condino, B&L
- Larry Stilwell, Town of Enfield
- James Steinmeiz, Village of Cayuga Heights
- George Tamborelee, Village of Cayuga Heights Fire Department
- Glenn Morey, Town of Groton
- David Sprout, Town of Dryden
- Jessica Verfuss, DOER
- Beth Harrington, DOER
- Scott Doyle, TCPD
- Irene Weiser, Town of Caroline
- Susan Beeners, Town of Danby
- Guy Van Benschoten, City of Ithaca
- Lee Shurtleff, DOER

Steering Committee Meeting #4 – October 18, 2012 – Reviewed the hazard vulnerability section of the HMP Update document. Introduced mitigation action concepts and discussed goals and objectives of the actions. The following jurisdictions were represented at this meeting:

- Jessica Verfuss, DOER
- Darby Kiley, Town of Ulysses
- David Sprout, Town of Dryden
- Katie Borgella, TCPD
- John Condino, B&L
- Beth Harrington, DOER
- Irene Weiser, Town of Caroline
- Susan Beeners, Town of Danby
- Scott Doyle, TCPD
- Johanna Duffy, B&L
- Lee Shurtleff, DOER
- Glenn Morey, Town of Groton
- Creig Hebdon, Town of Ithaca

Steering Committee Meeting #5 – November 20, 2012 – Action Item Workshop where plan’s hazard profile section was reviewed and the statuses of the 2006 HMP actions were discussed. Started to identify new action items to include in the Plan Update. The meeting included the following attendees:

- Katie Borgella, TCPD
- Darby Kiley, Town of Ulysses
- Susan Beeners, Town of Danby
- Matt Cooper, Town of Danby
- Jessica Verfuss, DOER
- Beth Harrington, DOER
- Guy VanBenschoten, City of Ithaca
- Scott Doyle, TCPD
- Johanna Duffy, B&L
- John Condino, B&L
- David Sprout, Town of Dryden
- Irene Weiser, Town of Caroline

Steering Committee Meeting #6 – January 23, 2013 – Fine-tuned and discussed new or combined mitigation actions to include in the HMP Update. Discussed action prioritization and ranked the Plan’s action items. The following individuals were in attendance:

- Johanna Duffy, B&L
- Beth Harrington, DOER
- Katie Borgella, TCPD
- John Condino, B&L
- Darby Kiley, Town of Ulysses
- Matt Cooper, Town of Danby
- Guy Van Benschoten, City of Ithaca
- Scott Doyle, TCPD
- Irene Weiser, Town of Caroline
- Chuck Rankin, Village of Groton
- Brent Cross, Town of Danby
- Creig Hebdon, Town of Ithaca
- Larry Stilwell, Town of Enfield
- Marty Moseley, Village of Lansing
- Lee Shurtleff, DOER
- Glenn Morey, Town of Groton
- Julie Holcomb, City of Ithaca
- David Sprout, Town and Village of Dryden
- Ann Rider, Town of Enfield

Hazard Mitigation Plan Update – Public Meetings - March 20, 2013

Town of Dryden Town Hall – 3PM

Attendee List

- Craig Schutt – TCSWCD
- Barry Goodrich – Caroline/Water Resources Council
- Glenn Morey – Town of Groton
- Dan Kwasnowski – Town of Dryden
- Josh Bogdon – Town of Dryden
- Jane Nicholson – Town of Dryden
- David Sprout – Town of Dryden
- Scott Doyle – Tompkins County
- John Condino – B&L
- Johanna Duffy – B&L

Comment and Notes from meeting

- Has there been much conversation with NYSEG? Particularly in relation to Emerald Ash Borer impacts (increased tree loss/debris, plugged culverts), local power production and supply?
- Pipelines are referenced throughout document to specific locations though this topic deserves much more attention. Calculations are that there are 160 pipeline crossing in throughout the County, many in need of attention. Particularly along Sixmile and the Inlet. Damage to pipelines could result in substantial disruption. Make this topic a more general County-wide issue - do not focus on it from a jurisdictional level.
- Is there much in terms of a generator inventory? Like for the Varna Community Center? Were previous opportunities through Project Impact for solar generators – perhaps could be investigated further?
- How about deer impacts? Likely connected with infestation.
- How is agriculture addressed in the plan? Ag generators? Fires? Epidemics like hoof and mouth? Manure spills?
- Access to hydrant action items? Does this include dry hydrants? Dryden is working with Bolton Point to map currently.
- Doesn't FEMA have a post hazard focus? Starting to move more toward mitigation. Example of Banks Road rebuild through FEMA funding, culverts on Beaver Creek.

Tompkins County Public Library – City of Ithaca – 6PM

Attendee List

- Brian Eden – EMC
- Tom Shelley – Ithaca CAC
- Barry Stein – Tompkins County Red Cross
- Gay Nicholson – Sustainable Tompkins
- Scott Doyle – Tompkins County
- John Condino – B&L
- Johanna Duffy – B&L

Comment and Notes from Meeting

- The clarification of who and where vulnerable populations are is very important. Red Cross in Cortland has initiated a self reported registry that may be worth looking more into. Who currently holds this info? Who needs to? Religious orgs? Should it be online and available to planners and responders? Example of Chicago/Cuba and research related to social isolation of elderly populations.
- Important to place emphasis on natural systems resiliency – much research related to this recently and NYS support (2100 Commission Report). Brian Eden to follow up with more detail.
- Green infrastructure also important
- Our region, particularly the City, is behind on Stream Buffer protection. Much interest in promoting added protections and regulations.
- Undergrounding of utilities on The Commons. District Heating and CHP interesting resilient options being utilized locally.
- Dredging a key locally. Have you worked with Army Corps? Like to see sediment prevention plan, climate/development discussion. Implement projects to prevent sediment accumulation in lake – focus on problem before lake
- Look into COAST model through Department of State. Used in areas like Kingston, NY and allows users to visualize investments in mitigation measures and what benefits they can achieve.
- City of Ithaca updating their comprehensive plan – it will be important to weave this planning effort with that one.
- What happens when the grid goes down? Extra vulnerability. Examples of renewable energy based cooling center. Something to look into locally? Energy/Hazard relationship.
 - Warming centers as well. History of those in Ithaca – example the RIBS building.
- Emphasize generator maintenance.
- Need to normalize preparedness (talk about it enough and people get used to incorporating it into their everyday lives/routines)
- Town of Lansing – provide information to Katrina
- Mitigation as grassroots action? How does that fit here?
- Public awareness on mitigation very important
 - B&L to provide examples to Gay
- Civic engagement as mitigation.

Tompkins County Hazard Mitigation Plan Update Comments Summary

- Todd Bittner – Cornell Plantations – Suggestion to add language related to trail improvements and gorge safety – previously had trouble applying for FEMA funds to support trail improvements in gorges as it wasn't mention in previous plan
- Rob Gallinger – USDA Farm Service Agency – asked if foreign animal disease response and agro tourism should be included. Wondered if plan was intended to be used for response
- Matt Cooper – Danby CEO – noted Table 11 should show their gas prohibition is finalized
- Gay Nicholson – provided link to COAST model
- Water Resources Council – Advocated for supporting stream gages and support for farm agencies
- Dave Herrick – TG Miller – Submitted letter noting concern over pipeline crossings and felt this should be further addressed
- DOER – Various comments directly on plan, would like to see critical facility mapping
- EMC – comments based on old plan? Would like to see more emphasis on adaptation, green infrastructure, ties to NYS 2100 Commission, gas drill ban

Appendix F

Plan Adoption Resolution and Sample Resolution

Name of Jurisdiction: _____

**RESOLUTION
TO AUTHORIZE THE ACCEPTANCE AND ADOPTION OF THE
MULTI-JURISDICTIONAL ALL-HAZARD MITIGATION PLAN UPDATE FOR
TOMPKINS COUNTY, NEW YORK**

WHEREAS, the Tompkins County Planning Department, with the assistance from Barton & Loguidice, P.C., has gathered information and prepared the Multi-Jurisdictional All-Hazard Mitigation Plan Update for Tompkins County, New York; and

WHEREAS, the Multi-Jurisdictional All-Hazard Mitigation Plan Update for Tompkins County, New York has been prepared in accordance with the Disaster Mitigation Act of 2000 and Title 44 Code of Federal Regulations (CFR), Part 201; and

WHEREAS, Title 44 CFR, Chapter 1, Part 201.6(c)(5) requires each local government participating in the preparation of a Multi-Jurisdictional Mitigation Plan or Plan Update to accept and adopt such plan; and

WHEREAS, the Town/Village of _____, has reviewed the 2013 Hazard Mitigation Plan Update, has found the document to be acceptable, and as a local unit of government, has afforded its citizens an opportunity to comment and provide input regarding the Plan Update and the actions included in the Plan;

WHEREAS, the Town/Village of _____, will consider the Tompkins County HMP Update during the implementation and updating of local planning mechanisms, and will incorporate the hazard assessment data, hazard vulnerabilities, and mitigation actions in these mechanisms, where applicable;

NOW THEREFORE, BE IT RESOLVED, that the Town/Village of _____, as a participating jurisdiction, adopts the Multi-Jurisdictional All-Hazard Mitigation Plan Update for Tompkins County, New York, dated March 2013.

This resolution was thereupon declared duly adopted on _____.

(Mayor/Supervisor)

(Clerk)

Appendix G

Tompkins County Critical Facilities List

Appendix G

Tompkins County Critical Facilities List

Locations of these facilities are generally shown on Figure 2.9 in Appendix A.

Boatyards:

- Johnson's Boatyard and Marina
- Treman Marina
- East Shore Sailing
- Ithaca Yacht Club
- Myers Point
- Taughannock Falls State Park Marina

Bus Terminals:

- Lansing CSD Bus Garage
- Ithaca Bus Terminal
- Ithaca Tompkins Transit Center

Camps:

- Empire State Speech and Hearing Camp
- Camp Barton Girl Scout Camp

Community Centers:

- Cayuga Nature Center
- Bethel Grove Community Center
- Ellis Hollow Community Center
- Enfield Community Center
- Brooktondale Community Center
- Hillside Children's Center
- Southside Community Center
- Coddington Road Community Center
- Varna Community Association
- American Red Cross Community Center

Correctional Facilities:

- Lansing School for Girls
- Tompkins County Jail
- NYS McCormick Training Center

Dams:

- Jennings Pond
- Treman Lake at Buttermilk State Park
- Cayuga Inlet Fish Ladder
- Dryden Lake Dam
- Virgil Creek Dam
- Second Dam
- First Dam
- Van Natta Dam
- Flat Rock
- Beebe Lake

Day Care Centers:

- Groton Head Start
- TCAction Head Start
- FSA Child Care Center at Tompkins County Community College
- Ithaca Community Childcare at Kendal
- Community Nursery School
- Franziska Racker Center
- Coddington Child Care Center
- Drop-in Children's Center
- Happy Way Child Care
- Ithaca Montessori School
- Stepping Stones Preschool
- Cornell Child Care Center
- Namaste Montessori
- IC3
- Groton Day Care

Electrical Substations:

- Trumansburg Substation
- South Lansing Substation
- Cayuga Heights Substation
- South Hill Substation
- Etna Substation
- Peruville Substation
- Groton Substation
- Milliken Substation
- East Hill Substation
- County Hospital Substation
- Kite Hill Substation
- 4th Street Substation
- West Hill Substation
- State Hospital Substation

- Newfield Substation
- Brooktondale Substation
- Dryden Substation
- Ludlowville Substation
- Cayuga Rock Salt Substation

Elementary Schools:

- Montessori School
- Dryden Elementary School – Dryden Central School District
- Freeville Elementary School – Dryden Central School District
- Trumansburg Elementary School – Trumansburg Central School District
- Newfield Elementary School – Newfield Central School District
- Groton Elementary School – Groton Central School District
- Cassavant Elementary School – Dryden Central School District
- R.C. Buckley Elementary School – Lansing Central School District
- Caroline Elementary School – Ithaca City School District
- South Hill Elementary School – Ithaca City School District
- Northeast Elementary School – Ithaca City School District
- Beverly J Martin Elementary School – Ithaca City School District
- Fall Creek Elementary School – Ithaca City School District
- Enfield Elementary School – Ithaca City School District
- Cayuga Heights Elementary School – Ithaca City School District
- Belle Sherman Elementary School – Ithaca City School District

Emergency Operations:

- Tompkins County Emergency Rescue (EOC)

Fire Departments:

- Neptune Hose – Company #1
- Newfield Fire Company
- Varna Fire Station
- Ithaca Fire Department – Central Station
- West Danby Fire Hall
- Trumansburg Fire Department
- Speedsville Fire Hose
- Slaterville Springs Fire House
- McLean Fire Department
- Lansing Fire Department – Company #5
- Lansing Fire Department – Company #4
- Lansing Fire Department – Company #3
- Lansing Fire Department – Central Station, Company #1 and #2
- Ithaca Fire Department – College Avenue Station #9
- Ithaca Fire Department – Fall Creek Station #7
- Ithaca Fire Department – West Hill Station #6

- Ithaca Fire Department – South Hill Station #5
- Groton Fire Station
- Freeville Fire Department
- Etna Volunteer Fire Department
- Enfield Fire Station
- Danby Volunteer Fire Company
- Cayuga Heights Fire Department
- Brooktondale Fire Station

Government Centers:

- Ithaca City Hall
- Ithaca City Courthouse
- Tompkins County Courthouse
- Post Offices
- Groton Town Hall
- Newfield Town Hall
- Enfield Town Hall
- Ithaca Town Hall
- Danby Town Hall
- Lansing Town Hall
- Ulysses Town Hall
- Caroline Town Hall
- Dryden Town Hall
- Dryden Village Hall
- Village of Freeville Office
- Lansing Village Office
- Cayuga Heights Village Office
- Trumansburg Village Office
- Groton Village Hall

High Schools and Vocational Schools:

- Lehman Alternative School
- William George Agency
- Newfield High School – Newfield Central School District
- Charles O. Dickerson High School – Trumansburg Central School District
- Dryden High School – Dryden Central School District
- Groton High School – Groton Central School District
- Lansing High School – Lansing Central School District
- Ithaca High School – Ithaca City School District
- Tompkins-Seneca-Tioga BOCES

Highway Departments:

- Town of Groton Highway Department
- Town of Lansing Highway Department
- Town of Dryden Highway Department
- Town of Caroline Highway Department
- Town of Danby Highway Department
- Town of Newfield Highway Department
- Town of Ithaca Highway Department
- Town of Enfield Highway Department
- Town of Ulysses Highway Department
- City of Ithaca Streets and Facilities
- NYSDOT Barn

Human Services:

- Franziska Racker Center
- Tompkins County Health Department
- Occupational Services of the Finger Lakes
- Loaves and Fishes
- Community Dispute Resolution Center
- Lansing Residential Center
- Finger Lakes Residential Center

Industrial:

- NYS Electric & Gas
- Borg Warner
- Emerson Power Transmission
- THERM, Inc.
- Cargill Salt Mine

Major University or Small College:

- Ithaca College
- Cornell University
- Tompkins County Community College
- Empire State College – SUNY
- TCCC Extension Center

Medical Facility:

- Parkview Medical Campus
- Convenient Care
- Cayuga Medical Center
- Guthrie Clinic
- Trumansburg Family Health Center
- Groton Intermediate Care Facility
- Groton Community Health Care Center

Middle School:

- Boynton Middle School – Ithaca City School District
- DeWitt Middle School – Ithaca City School District
- Lansing Middle School – Lansing Central School District
- Groton Middle School – Groton Central School District
- Dryden Middle School – Dryden Central School District
- Russell I. Doig Middle School – Trumansburg Central School District
- Newfield Junior High School – Newfield Central School District

Other Public Facility:

- Chamber of Commerce
- Ithaca City Youth Bureau
- Tompkins County Airport
- Tompkins County Annex Building
- Old Jail
- Old Courthouse
- Tompkins County Mental Health
- NYS Department of Motor Vehicles
- Tompkins County Soil & Water Conservation District
- Clinton House
- Greater Ithaca Activities Center
- NYS Army National Guard
- NYS Department of Environmental Conservation
- Northeast Transit/Swarthout & Ferris
- US Coast Guard Auxiliary
- US Army Reserve Center
- US Geological Survey
- American Auto Association
- GIAC Community Pool
- State Theatre
- Trumansburg Fairgrounds
- YMCA

Performing Arts:

- Ballet Center of Ithaca
- Ithaca Academy of Dance
- Hangar Theatre
- Firehouse Theatre
- Kitchen Theatre

Police Department:

- Ithaca Police Department
- Village of Cayuga Heights Police Department
- Village of Dryden Police Department
- Village of Trumansburg Police Department
- New York State Police
- Tompkins County Public Safety
- Groton Police Department
- State Parks Headquarters

Public Works:

- Tompkins County Public Works
- Tompkins County Recycle and Solid Waste Center
- Bell Atlantic
- Ithaca City Water & Sewer
- Ithaca City Streets & Facilities
- Ithaca Wastewater Treatment Plant
- Groton Sewage Treatment Plant
- Milliken Station Power Plant
- Bolton Point Water Treatment Plant
- Ithaca City Water Treatment Plant
- Groton Municipal Light & Power Plant
- Cornell Heating Plant
- Hydroelectric Plant
- Cayuga Heights Sewage Treatment Plant
- Trumansburg Sewage Treatment Plant
- Village of Groton Public Works Department
- Cornell Water Treatment Plant
- Cornell Water Filtration Plant
- Bolton Intake
- Dominion Transfer Station
- Dryden Sewage Treatment Plant

Shopping Area:

- Pyramid Mall
- Triphammer Mall
- Ithaca Commons
- Ithaca Farmers Market
- Community Corners
- Greenstar Co-op Market
- Center Ithaca
- East Hill Plaza
- Cayuga Mall
- Trumansburg Farmer's Market

Stadium or Sports Facility:

- Barton Hall
- Schoelkopf Field
- Lynah Rink
- Ithaca College Events Center
- Cass Park Rink and Pool
- Butterfield Stadium
- The Rink
- Bartels Hall

Appendix H

Tompkins County Transportation Infrastructure with Reoccurring Flooding Issues

Appendix H

Tompkins County Transportation Infrastructure with Reoccurring Flooding Issues

The replacement/rehabilitation/or other mitigative measures to prevent or minimize the impacts to these structures from flood events has been included as Individual Municipality Mitigation Action Strategy TC3 for Tompkins County (Table 28). Priority sites are denoted by an asterisk (*).

Roadway Locations with Flooding Concerns and Reoccurring Problems:

- *Ringwood Road (CR 164), from the intersection with Ringwood Court to approximately ½-mile northeast in Dryden. This location is subject to frequent washouts from flooding where two Cascadilla Creek tributaries converge as a roadside ditch on a steep hill with narrow shoulders.
- Stevens Road (CR 104), just south of the bridge over Fall Creek in Groton. During flood events, Fall Creek floods outside of its main channel and some of the sub-channels that form are cut-off from re-entering the main channel due to a turn at the bridge location. Elevated water levels from flood events have damaged the road and adjacent properties from the bridge to Cemetery Lane.
- Fall Creek Road (CR 105), just south of the bridge over Fall Creek that is located between Peruville and North Roads in Dryden. Fall Creek floods outside of its channel upstream of the bridge and waters flow over the roadway south of the bridge as a result.
- Sheldon Road (CR 180), at Mill Creek just south of Bone Plain Road in Dryden. This is a double-barrel culvert that is frequently plugged by local beaver populations. The County is hoping to replace the existing structure with a single box culvert.
- Station Road (CR 188), just east of Brown Road in West Danby. The outfall from a double-barrel culvert that has filled with sediment needs to be re-graded to encourage flow to Cayuga Inlet, approximately 1400 feet away. The double-barrel culvert may also need to be replaced.

County Bridges that are Scour-Critical and would Benefit from Flood Mitigation/Scour Protection:

- Boiceville Road over Sixmile Creek (also prone to over-topping in major storm events)
- *German Cross Road over Sixmile Creek (also prone to over-topping in major storm events)
- *Hines Road over Enfield Creek (has a downstream check dam to prevent bed degradation – check dam needs work)
- *Freese Road over Fall Creek
- West Malloryville Road over Fall Creek
- Davis Road over Fall Creek
- Stevens Road over Fall Creek (roadway included above)
- Connecticut Hill Road over Pony Hollow Creek
- South George Road over Virgil Creek

- Johnson Street over Virgil Creek
- Dodge Road over Cascadilla Creek
- Genung Road over Cascadilla Creek
- Salmon Creek Road over Salmon Creek (prone to debris build-up during flood events)
- Lockerby Hill Road over Salmon Creek
- South Street Extension over Bolter Creek

Appendix I

Hazard Mitigation Plan Update Process Checklist

Tompkins County
Multi-Jurisdiction All-Hazard Mitigation Plan
Monitoring, Evaluation and Update Checklist

Steps to be completed, at a minimum, at the end of Years 1, 2, 3, and 4:

Meeting

- Identify members of the Hazard Mitigation Plan Implementation Committee (may need to be revised year-to-year)
- Set a meeting date and notify Implementation Committee members
 - Members should come prepared to specifically discuss status and details of pre-disaster mitigation projects or actions executed by their respective agency/organization
- Publish meeting date in newspaper and online to invite public participants
- Hold meeting – discuss hazard events that have occurred since last meeting or Plan Update, including:
 - Type of hazard event
 - Damages incurred
 - Cost of repairs
 - Hazard response
 - Hazard duration and recovery time
- Discuss how the HMP actions, strategies, and other information has been incorporated into local planning mechanisms and agency efforts over the past year (if applicable)
- Evaluate the HMP Update by assessing:
 - Whether the goals and objectives address current and expected conditions
 - Whether the nature, magnitude, and/or type of risks have changed
 - Whether the current resources are appropriate for implementing the plan
 - Whether there are implementation problems or coordination issues with other agencies
 - Whether the outcomes, thus far, have occurred as expected
- Update the HMP by addendum if any significant changes are needed

Documentation

- Tompkins County Planning Department to prepare annual summary of collected information, hazard occurrences and damages, completed mitigation actions and costs, and other applicable information
- Post this annual summary on County website for public review and keep in files for next formal HMP Update process

Steps to be completed end of Year 3/early in Year 4:

Grant Funding

- Submit application to FEMA for grant funding to complete next HMP Update

Steps to be completed in early/mid-way Year 4:

Plan Document

- Determine who will be the primary author of Plan Update (Consultant or In-house)

Meeting

- Inform Implementation Committee members of first meeting to begin formal Plan Update process

HIRA-NY Risk Assessment (if needed)

- Send email to participants with date and time of HIRA-NY event
- Complete HIRA-NY program with NYSOEM facilitation

Steps to be completed in Year 5:

Plan Document

- Update pertinent sections of the Plan, including Appendices
- Add-in hazard related details that were collected during annual Implementation Committee meetings

Meetings

- Hold Implementation Committee meeting(s) to discuss and revise Plan Update
- Hold meetings and discussions with participating jurisdictions to update information relevant to each jurisdiction and revise each jurisdiction's previous risk assessment
 - Discuss how the HMP actions, strategies, and other information has been incorporated into local planning mechanisms since the last Plan Update
- Hold public information meeting(s) to solicit comments on Plan Update

Plan Approval Process

- Submit final draft to NYSOEM for review
- Complete NYSOEM revisions and respond to comments, if necessary, and submit Plan Update to NYSOEM/FEMA for pre-approval
- Complete FEMA comments, if necessary, and re-submit
- County and participating jurisdictions pass resolutions accepting the Plan Update – include these in Appendix F