

This appendix provides a comprehensive list of mitigation actions considered by Tioga County and participating jurisdictions that met the goals and objectives of the Plan.

Catalog of Risk Reduction Measures

Risk is defined as being a function of the:

- Hazard
- Exposure
- Vulnerability, and
- Capability

Therefore risk can be reduced through mitigation by manipulating the hazard, reducing exposure to the hazard, reducing the vulnerability and/or increasing capability. And, where mitigation is not yet possible, the risk can be reduced through preparation, response or/and recovery. *The list is not meant to be exhaustive, but to inspire thought.*

Risk Reduction Measures	Hazard Category			
	Flooding			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Personal scale	1.) Clear stormwater drains and culverts	1.) Locate outside of hazard area	1.) Retrofit structure (Elevate structure above BFE)	1.) Enforce NFIP
		2.) Elevate utilities above BFE	2.) Elevate items with house above BFE	2.) Buy flood insurance
		3.) Institute low impact development techniques on property	3.) Build new homes above BFE	3.) Develop household mitigation plan, such as retrofit savings, communication capability with outside, 72 hr self-sufficiency during and after an event
			4.) Floodproof existing structures.	
Corporate scale	1.) Clear stormwater drains and culverts	1.) Locate business critical facilities or functions outside hazard area	1.) Build redundancy for critical functions/ retrofit critical buildings.	1.) Increase capability by having cash reserves for reconstruction
		2.) Institute low impact development techniques on property	2.) Provide flood-proofing measures when new critical infrastructure must be located in floodplains.	2.) Support and implement hazard disclosure for the sale/re-sale of property in identified risk zones.
				3.) Solicit "cost-sharing" through partnerships with private sector stakeholders on projects with multiple benefits.
Government Scale	1.) Clear stormwater drains and culverts	1.) Locate/re-locate critical facilities outside of hazard area	1.) Harden infrastructure	1.) Produce better hazard maps
	2.) Dredging, levee construction, providing retention areas...	2.) Acquire or relocate identified repetitive loss properties.	2.) Provide redundancy for critical functions and infrastructure	2.) Capture/survey "high-water" marks during flood events.
	3.) Structural flood control: levee's, dams, channelization, revetments.	3.) Promote open space uses in identified high hazard areas via techniques such as:PUD's, easements, setbacks, greenways, sensitive area tracks.	3.) Adopt appropriate regulatory standards such as cumulative substantial improvement/damage, freeboard, lower substantial damage threshold, compensatory storage.	3.) Provide technical information and guidance
	4.) Construct regional stormwater control facilities	4.) Adopt land development criteria such as PUD's, Density transfers, clustering	4.) Stormwater management regulations and master planning.	4.) Enact tools to help manage development in hazard areas (stronger controls, tax incentives, information)
		5.) Institute low impact development techniques on property	5.) Adopt "no-adverse impact" floodplain management policies that strive to not increase the flood risk on down-stream communities.	5.) Incorporate retrofitting/replacement of critical system elements in CIP
		6.) Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff	6.) Participate in the Community Rating System (CRS)	6.) Develop strategy to take advantage of post disaster opportunities
			7.) Implement as-built regulatory requirements,	7.) Warehouse critical infrastructure components
			8.) Implement site review ordinances/requirements	8.) Develop and adopt a COOP
				9.) Join CRS program
				10.) Maintain existing data as well as gather new data needed to define risks and vulnerability.
				11.) Train emergency responders
				12.) Create a building and elevation inventory of structures in the floodplain
				13.) develop and implement a public information strategy

Risk Reduction Measures	Hazard Category			
	Flooding			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Government Scale				14.) Charge a Hazard mitigation fee on all new permits to create a hazard mitigation funding source for initiatives or grant cost share requirements. 15.) Integrate floodplian mangement policies into other planning mechanisms within the planning area. 16.) Establish a Stormwater Utility to deal with urban drainage/flooding issues 17.) Establish incentives to promote flood hazard mitigation of private property. 18.) Develop mitigation partnerships with Stakeholders 19.) Join "Storm Ready" Program 20.) Participate in County Training Programs 21.) Implement annual training to account for high turnover of municipal officials. 22.) Educate public on Flood Hazards 23.) Develop flood response plan. 24.) Prepare innundation maps for use by local emergency personnel 25.) Dsseminate evacuation procedures 26.) Ensure public safety and ambulance drivers know safe evacuation routes. 27.) Install local radio transmitter for local radio information dissemination 28.) Locate EOC and shelters on high ground. 29.) Install rain gage/flood warning system 30.) Gather and input resident cell phone numbers into reverse 911. 31.) Provide better communication systems and back-up communication systems to inform public of hazards and to communicate during the hazard event. 32.) Produce municipal and county post-disaster manuals to provide efficient recovery procedures and reimbursement of funds. 33.) Implement safe document archiving systems to preserve important records on municipal, county, and agency levels. 34.) Support the establishment of a silver jacket team in NYS to support the reduction of flood risk in communities. 35.) Develop better education and outreach regarding flood insurance and NFIP programs. 36.) Pursue flood/stormwater study on regional/watershed level.

Risk Reduction Measures	Hazard Category			
	Severe Storms			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Personal Scale	None	None	1.) Insulate house	1.) Trim or remove trees that could effect power lines
			2.) Provide redundant heat and power.	2.) Promote 72 hour self-sufficiency
			3.) Insulate structure	3.) Obtain a NOAA wether radio.
			4.) Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program.	4.) Obtain an emergency generator.
Corporate Scale	None	None	1.) Relocate critical infrastructure, such as power lines, underground	1.) Trim or remove trees that could affect power lines
			2.) Reinforce or relocate critical infrastructure such as powerlines so that it meets performance expectations.	2.) Create redundancy
			3.) Install tree wire	3.) Equip your facilities with a NOAA weather radio
				4.) Equip vital facilities with emergency power sources. 5.) Montor impending storm events so that you can release employees in such a manner as to not negatively impact emergency response personnel/services.
Government			1.) Harden infrastructure such a locating utilities under ground.	1.) Support programs such as "Tree Watch" that proactively manage problem areas by use of selective removal of hazardous trees, tree replacement, etc
			2.) Trimming trees back from power lines	2.) Establish and enforce building codes that require all roofs to withstand snow loads
			3.) Designate snow routes and strengthen critical road sections and bridges.	3.) Increase communication alternatives
			4.) Adopt ordinances that regulate the type and quantity of tress planted near utility lines	4.) Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors.
			5.) Relocate critical infrastructure, such as power lines, underground	5.) Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines
				6.) Provide NOAA weather radios to the public 7.) Create/Enhance "mutual aid" agreements for response to all emergencies 8.) Create/Identify evacuation routes to be utilized during Severe Storm events.
Government				

Risk Reduction Measures	Hazard Category			
	Severe Storms			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
	None	None		9.) Join "Storm-Ready" program 10.) Provide early warning of impending severe storm events to identified critical or essential facilities. This would include facilities such as large employments centers, schools, hospitals. 11.) Promote emergency power supplies to private property. 12.) Improve cell phone service 13.) Provide training on new technologies such as Brine de-icing 14.) Recruit additional emergency personnel or use mutual aid agreements 15.) Increase sheltering capabilities 16.) Improve highway dept knowledge 17.) Provide diversified energy such as wind and solar. 18.) Increase capability to respond to power outages and downed power lines. Establish partnerships with utility providers through proactive planning. 19.) Provide better communication systems and back-up communication systems to inform public of hazards and to communicate during the hazard event.

Severe Winter Storms

Risk Reduction Measures	Hazard Category			
	Severe Winter Storms			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Personal scale	None	None	1.) Insulate house	1.) Trim or remove trees that could effect power lines
			2.) Provide redundant heat and power.	2.) Promote 72 hour self-sufficiency
			3.) Insulate structure	3.) Be aware of inclement weather conditions, and move your vehicles off of the street as severe weather systems approach.
			4.) Plant appropriate trees near home and power lines ("Right tree, right place" National Arbor Day Foundation Program).	4.) Retrofit structures
Corporate Scale	None	None	1.) Relocate critical infrastructure, such as power lines, underground	1.) Trim or remove trees that could affect power lines
			2.) Reinforce or relocate critical infrastructure such as powerlines so that it meets performance expectations.	2.) Create redundancy in utilities and communications
			3.) Install tree wire	3.) Develop a Continuity of Operations Plan (COOP) to address operations before, during and after coastal storm events. 4.) Utilize weather radios at the work place to keep your employees apprised of severe weather conditions.
Government			1.) Harden infrastructure such a locating utilities under ground where appropriate.	1.) Support programs such as "Tree Watch" that proactively manage problem areas by use of selective removal of hazardous trees, tree replacement, etc
			2.) Trimming trees back from power lines	2.) Establish and enforce building codes that require all roofs to withstand snow loads-- Develop/Improve/Enforce building Codes in Hazard Areas
			3.) Designate snow routes and strengthen critical road sections and bridges.	3.) Increase communication alternatives
			4.) Adopt codes and regulations that address the issues of parking of vehicles along roadways during severe weather events.	4.) Modify land use and environmental regulations to support vegetation management activities that improve reliability in utility corridors.
			5.) Develop or enhance the capacity/capability of stormwater conveyance systems.	5.) Modify landscape and other ordinances to encourage appropriate planting near overhead power, cable, and phone lines
			6.) Provide backup power sources at vital critical facilities.	6.) Provide weather radios to vulnerable populations

Risk Reduction Measures	Hazard Category			
	Severe Winter Storms			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Government	None	None		7.) Enhance public awareness campaigns to address those issues of alert and warning and actions to take during severe weather events.
				8.) Utilize the best available technology to enhance the warning systems for all severe weather events (i.e.: tornado warning systems).
				9.) Coordinate severe weather warning capabilities and the dissemination of warning amongst those agencies within the planning are with the highest degree of capability.
				10.) Placeholder.
				11.) Join the Community Rating System
				12.) Join "Storm-Ready"
				13.) Retrofit critical structures and promote hazard resistant construction
				14.) Keep open communications and education of hazards for mobile home communities
				15.) Retrofit above-ground utilities to u/g facilities if appropriate
				16.) Create a salt reserve or research alternates to stretch salt reserve.
				16.) Provide better communication systems and back-up communication systems to inform public of hazards and to communicate during the hazard event.

Catalog of Risk Reduction Measures	Hazard Category			
	Extreme Temperatures			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Personal Scale	None	1.) Vacation in Cooler climates during summer months.	1. Air Condition non-conditioned buildings. 2.) put in back-up wood burning stoves	1.) be aware of impending heat waves.
		2. Insulate house		2.) Inform yourself on the do's and don'ts during heat waves.
		3. Provide redundant power.		3.) Have fans available for use during peak demands in lue of air conditioning.
		4. Insulate structure		4.) install back-up generators
		5. Plant appropriate trees near home ("Right tree, right place" National Arbor Day Foundation Program).		
Corporate Scale	None	1.) create redundancy to power supply to deal with power grid vulnerability during high demands	1. Air Condition non-conditioned buildings.	1.) inform employess of the seriousness of heat waves.
				2.) monitor weather forecasts.
				3.) establish an COOP.
Government Scale	None	1.) create redundancy to power supply to deal with power grid vulnerability during high demands	1.) air condition public buildings.	1.) inform the public on the seriousness of heat-waves.
				2.) identify populations vulnerable to extreme heat (elderly, poor) for early warning during potential heat waves.
				3. Enhance weather forecasting capability
				4.) Distribute fans to vulnerable populations.
				5.) Promote selective approaches to cooling buildings during peak demands.

Risk Reduction Measures	Hazard Category			
	Earthquake			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Personal scale	None	1.) Locate outside of hazard area (off soft soils)	1.) Retrofit structure (anchor house structure to foundation) 2.) Secure household items that can cause injury or damage such as water heaters, bookcases, and other appliances 3.) Build to higher design	1.) Practice "drop, cover and hold" 2.) Develop household mitigation plan, such as creating a retrofit savings account, communication capability with outside, 72 hr self-sufficiency during an event 3.) Increase capability by having cash reserves for reconstruction 4.) become informed on the hazard and risk reduction alternatives available. 5.) develop a post-disaster action plan for your household.
Corporate scale	None	1.) Locate/relocate mission critical functions outside hazard area where possible.	1.) Build redundancy for critical functions/facilities 2.) Retrofit critical buildings/areas housing mission critical functions. 3.) Anchor or stabilize utility equipment (electrical transformers and generators) to withstand earthquake forces and movements. Examples: anchor electrical transformers; combine equipment on one foundation 4.) Reinforce, restrain, or improve utility transmission lines and connections to withstand earthquake forces, soil movements and differential settlements. Examples: install expansion joints; reinforce well shaft or install submersible pump; restrain pipes; improve pipe materials. 5.) Anchor or improve vertical/elevated tank structures or stand pipes to withstand earthquake forces and movements. 6.) Anchor critical equipment (e.g., computers) and shelving in offices, warehouses, and maintenance buildings in conjunction with building structural upgrades.	1.) Adopt higher standard for new construction -- Consider "performance based design" when building new structures 2.) Increase capability by having cash reserves for reconstruction 3.) Inform your employees on the possible impacts of earthquake and how to deal with them at your work facility. 4.) Develop and adopt a Continuity of Operations Plan (COOP)
		1.) Locate critical facilities or functions outside of hazard area where possible.	1.) Harden infrastructure 2.) Provide redundancy for critical functions 3.) Higher regulatory standards for structures 4.) Enforce the seismic design provisions in the International Building Code for all new buildings and infrastructure. 5.) Anchor critical equipment (e.g., computers) and shelving in offices, warehouses, and maintenance buildings in conjunction with building structural upgrades.	1.) Provide better hazard maps 2.) Provide technical information and guidance 3.) Enact tools to help manage development in hazard areas: tax incentives, information 4.) Include retrofitting/replacement of critical system elements in CIP 5.) Develop strategy to take advantage of post disaster opportunities

Risk Reduction Measures	Hazard Category			
	Earthquake			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Government	None		6.) Identify critical facilities constructed of un-reinforced masonry using local knowledge and/or pictometry/orthophotos. These facilities may not be functional during response/recovery efforts after an earthquake and alternative resources/assets should be identified in emergency response/recovery plans.	6.) Warehouse critical infrastructure components such as pipe, power line, and road repair material.
			7.) Identify privately owned structures/residences constructed of un-reinforced masonry using local knowledge and/or pictometry/orthophotos. These buildings may not withstand earthquakes of certain magnitudes and plans to provide emergency response/recovery efforts for these properties should be in place.	7.) Develop and adopt a Continuity of Operations Plan (COOP)
			8.) Initiate triggers guiding improvements such as: (< 50% substantial damage/improvements)	
			9.) Further enhance seismic risk assessment to target high hazard buildings for mitigation opportunities.	
			10.) Develop a post disaster action plan that includes a grant funding and debris removal components.	
			11.) Educate builders and developers on seismic construction standards	
			12.) Add earthquakes to emergency response plans for training and drills for employees.	
			13.) Increase public awareness of potential earthquake hazards	
			14.) Enhance public education and outreach efforts to increase awareness of earthquake hazards and risks in the County.	
			15.) Enhance emergency preparedness/response capabilities by training building officials, engineers, architects, building owners, emergency managers, and/or interested citizens the Rapid Visual Screening (RVS) methodology outlined by FEMA in the Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook. Second Edition. RVS is used to identify, inventory and rank buildings posing risk of death, injury, or severe curtailment in use following an earthquake.	
			16.) Train building code officials on seismic standards/design provisions in the International Building Code.	

Catalog of Risk Reduction Measures	Hazard Category			
	Drought			
	Manipulate Hazard	Reduce Exposure	Reduce Vulnerability	Increase Capability
Personal Scale	None	1. Consider stored water/captured water techniques during dry seasons.	1.) Drought resistant landscapes	1.) Practice active water conservation techniques.
			2.) Reduce Water system losses	2.) Seek ways to operate wells in such a way to enhance their functional longevity and supply capability.
			3.) Modify plumbing systems, ie water saving kits	
Corporate Scale	None	1. Consider stored water/captured water techniques during dry seasons.	1.) Drought resistant landscapes	1.) Practice active water conservation
			2.) reduce private water system losses	2. develop a water conservation plan.
			3. identify alternate water supplysources.	3. develop a COOP
Government Scale	1.) Ground Water Recharge through stormwater management 2. implement cloud seeding techniques during dry seasons.	1.) Identify and create ground water back up sources. 2. Create /identify new impounded water supply points.	1.) water use conflict regulations	1.) Public education on drought resistance
			2.) reduce water system losses	2.) Identify alternative water supplies for time of drought. Mutual aid agreements with alternative suppliers.
			3.) Distribute water saving kits	3.) Develop a drought contingency plan
			4. identify sites ideally suited for ground water recharge.	4.) develop criteria-"triggers" for drought related actions
			5. Implement stormwater retention in regions ideally suited for groundwater recharges.	5.) Improve accuracy of water supply forecasts
			6. utilize drought resistant landscapes on community owned facilities.	6.) Provide incentives to influence active water conservation techniques such as water user rate reductions..
				7. Esatblish protocol for salt water de-salinization to be implemented during conditions of severe drought.
				8. consider providing incentives to property owners that utilize drought resistant landscapes in the design of their homes.
				9.) Continue Use of Water buffalo Tankers
				10.) Promote well usage techniques that strive to enhance functional longevity and supply capability of private water supply wells.