Natural Hazard Mitigation Plan

for the

Central Connecticut Region

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Purpose

The purpose of the Central Connecticut Region's Natural Hazard Mitigation Plan ("the Plan") is to assess hazard risks at the regional and local levels, review existing mitigation strategies, and recommend additional strategies that can help to reduce economic disruption, loss of life, and destruction of property resulting from natural disasters.

Natural disasters can and do inflict damage on the same locations year after year, requiring repeated reconstruction efforts that become more expensive as the years go by. Hazard mitigation breaks this expensive cycle of recurrent damage and escalating reconstruction costs by preventing damage up front and taking a long-term view of rebuilding and recovery following natural disasters. This requires long-term strategies including planning, policy-making, programs, projects, and other activities.

The plan will take into consideration the following natural disasters: floods, dam failure, winter storms (ice and snow), hurricanes and tornadoes, drought, wildfires, and earthquakes. Each of these risks will be evaluated for likelihood of occurrence and potential for loss of life and property.

Municipalities in the region currently have a variety of formal and informal hazard mitigation strategies in place. The Plan identifies and assesses these existing strategies, and proposes new strategies that address identified gaps in current mitigation efforts. Lastly, the Plan prioritizes the mitigation strategies and proposes an overall implementation strategy.

Authority and Funding

This Natural Hazard Mitigation Plan is authorized under the provisions of Section 22a-6 (a) (2) of the General Statutes of Connecticut, and complies fully with all regulations and requirements of the National Flood Insurance Program – 44 CFR Subchapter B (NFIP) and the Pre-Disaster Mitigation Program, Disaster Mitigation Act of 2000 (42 U.S.C. 5133 et seq). Funding for this Plan was provided by the Federal Emergency Management Agency (as administered by the Connecticut Department of Environmental Protection) per P.L. 106-390, Section 102, with the required match from the Central Connecticut Regional Planning Agency.

Regional Overview

The Central Connecticut Region is small, but richly varied. One of 15 planning regions in Connecticut, it consists of seven municipalities that span two counties (Hartford and Litchfield): the cities of New Britain and Bristol, and the towns of Berlin, Burlington, Plainville, Plymouth, and Southington. These seven towns are urban, suburban, and rural; hilly and flat; young and old; dense and sparsely populated. They have differing levels of wealth, educational attainment, and diversity; different accessibility via highways, rail lines, and bus routes; and different characters. But they share many common goals, including a strong commitment to protecting their populations from the ravages of natural hazards.

Geography & Transportation

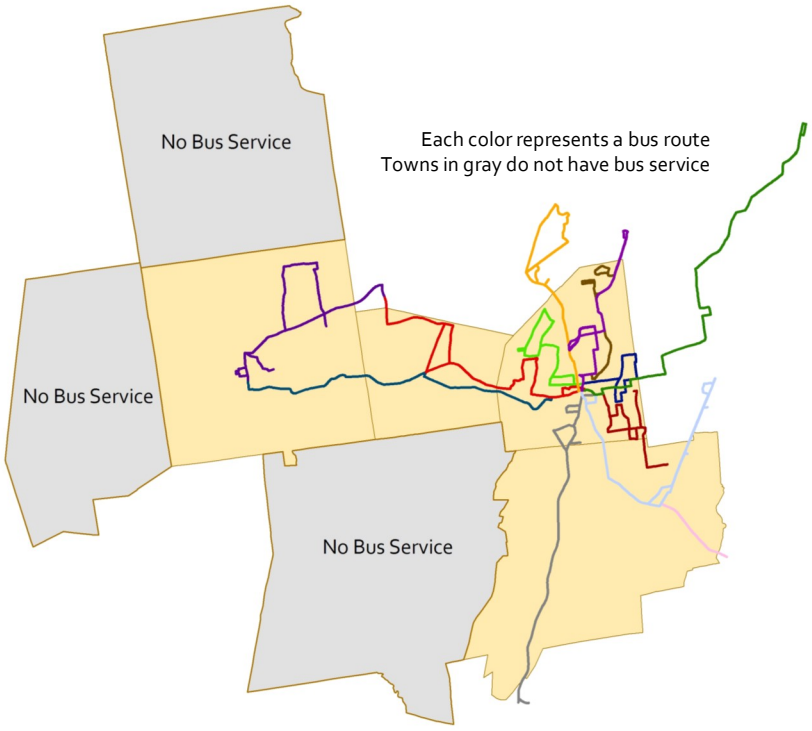
The region is located, appropriately, near the center of Connecticut, at the southwestern corner of Hartford County (and the southeastern corner of Litchfield County). It is west of the

Connecticut River and roughly 13 miles southwest of Hartford, 107 miles from Boston, 88 miles from New York City, and 77 miles from Providence, Rhode Island.

The region acts as something of a crossroads between three of the state's three urban centers: Hartford, to the northeast, bordered by the city of New Britain; Waterbury, to the southwest, bordered by Plymouth; and New Haven, far to the south but accessible via Rte 5/15, a major road in Berlin. Interstate 84, which serves ¾ of the state and connects Interstate 90 (the Massachusetts Turnpike) and northern New England with major highways in New York, New Jersey, and Pennsylvania, passes through New Britain, Plainville, and Southington. In Hartford, I-84 connects to the state's north-south interstate, I-91, which provides a connection to New Haven and I-95. Route 9 is another major freeway which passes through Berlin and New Britain and provides a connection to I-91 that bypasses Hartford. Burlington, Bristol, and Plainville access these freeways via Route 72, a small freeway connecter that joins I-84 in Plainville and terminates near the Bristol border. Route 72 is currently being extended to the center of Bristol. To the west of the region, Route 8 provides a north-south connection to Waterbury.

Residents of the region spend, on average, 46 minutes per day commuting to and from work on these freeways, as the majority of the region is not well served by public transit. According to the 2000 Census, of the 110,309 residents of the region who worked outside their homes, 86% drove to work alone, 9% carpooled, and 1% (1,373 people) took the bus. Other modes of transportation included walking – twice as many people walked as rode the bus – bicycling, and taking the train.

Public Transit in Central Connecticut



The region's public transit consists primarily of bus service. (Berlin has Amtrak service which connects to

Hartford, northern New England, New Haven, and New York via the Northeast Regional and Vermonter routes.) Busses do not serve all the towns in the region, and transfers between routes are notoriously difficult. Due to low demand, service hours are limited and wait times between busses can be long, making the bus an often inconvenient and difficult option even for those without cars.

Across the region, 3% of owner-occupied households and 18% of renter-occupied households did not have access to a vehicle in 2000 (U.S. Census Bureau; SF3 H44). While the carless are largely concentrated in New Britain and Bristol, cities that do have bus service, 1% of owner-occupied units without access to cars and 7% of carless renter-occupied units are located in the three towns without any transit service whatsoever. These individuals may find it difficult to evacuate or access designated shelters in the event of a natural hazard.

Vehicle Access

	Percent of Housing Units that Lack Vehicle Access	Percent of Housing Units Without Vehicle Access that are Renter-Occupied
Burlington	1%	0%
Berlin	3%	46%
Plymouth	4%	72%
Southington	4%	50%
Plainville	6%	56%
Bristol	7%	77%
State	10%	11%
New Britain	16%	81%

Source: Census 2000, Summary File 3, Table H44.

The Central Connecticut Regional Planning Agency, as the MPO for the region, provides ADA-compliant paratransit service that parallels the available mass transit in the region. Accordingly, the service is available in those towns that have regular bus service: Berlin, Bristol, New Britain, and Plainville. Evacuation assistance for special needs populations in the seven municipalities is handled differently from town to town, and it is unlikely that paratransit service users would require bus service in the event of an evacuation.

Demography

At 1,363 persons per square mile, the Central Connecticut region is roughly twice as densely populated as the State, although this density varies greatly across the seven towns. At one extreme is the city of New Britain, where 71,538 people live in only 13.4 square miles, at a density of 5,339 persons per square mile (nearly twice that of Bristol, the second-most-dense area). At the other end of the spectrum, rural Burlington has nearly three times New Britain's land area but less than an eighth of its population, with only 269 persons per square mile. Three of the towns have densities higher than

the region's average, while five have densities higher than the state's.

Population Density in Central Connecticut

	Total Population	Area (Square Miles)	Population Density
New Britain	71,538	13.4	5,339
Bristol	60,062	26.8	2,241
Plainville	17,328	9.8	1,768
Central CT Region	***226,695***	***166.3***	***1,363***
Southington	39,728	36.6	1,086
Berlin	18,215	27	675
State	***3,405,565***	***5,092.90***	***669***
Plymouth	11,634	22.3	522
Burlington	8,190	30.4	269

Source: United States Census Bureau, *2000 Census of Population and Housing, Summary File 1.*

According to the Connecticut Department of Transportation's population projections, the Central Connecticut region is expected to grow at a moderate pace (approximately 4.4%) over the next twenty years. Projections for individual towns vary; Berlin and New Britain's populations are expected to increase the most (by 15% and 9.7%, respectively), while Bristol and Plainville are projected to lose population.

Projected Population Change in the Region, 2000 - 2030

	2000	2010	2020	2030	Percent Change 2010-2030
Berlin	18,113	19,536	20,878	22,490	15.1%
Bristol	59,291	58,556	58,167	57,738	-1.4%
Burlington*	8,178	8,802	8,982	9,095	3.3%
New Britain	68,467	66,951	69,917	73,462	9.7%
Plainville	17,145	16,657	16,164	15,635	-6.1%
Plymouth	11,564	11,997	12,229	12,355	3.0%
Southington	39,132	40,455	41,219	42,073	4.0%
REGION	221,890	222,954	227,555	232,847	4.4%

Source: Connecticut Department of Transportation, *Population Projections for Connecticut Municipalities from 2010 to 2030 by Age, Ethnicity and Sex Distributions.* May, 2007.

* data is preliminary

Within the growing and shrinking town populations, there are structural shifts afoot. As the entire state of Connecticut is aging, so too is the Central Connecticut region. In every town, the percent of the population aged 60 years old and older will increase by 2030. In Burlington, the most dramatic example, the number of residents aged 60 years old and older is projected to increase by

84% (from 862 persons to nearly 3,000), and the percent of the population aged 60 and older will increase from 10.5% in 2000 to 32.1% in 2030.

Population 60 years old and older

	2000	2010	2020	2030	Percent Change 2010-2030
Berlin	3,681	4,260	5,703	7,332	72%
Bristol	10,629	11,752	14,209	16,033	36%
Burlington*	862	1,586	2,370	2,916	84%
New Britain	12,592	13,242	16,617	16,965	28%
Plainville	3,199	3,694	4,411	4,615	25%
Plymouth	1,846	2,213	3,005	3,649	65%
Southington	7,166	9,282	11,100	13,828	49%
* data is preliminary					
REGION	39,975	46,029	57,415	65,338	42%

Source: Connecticut Department of Transportation, *Population Projections for Connecticut Municipalities from 2010 to 2030 by Age, Ethnicity and Sex Distributions.* May, 2007.

By 2030, residents over 60 years of age will comprise at least 30% of the population in five of the region's towns. In every town, this cohort will comprise more than 20% of the population, with New Britain having the smallest percent, at 23.1%. In Plainville, which will see the smallest overall increase in older residents (a 25% increase), this cohort will nonetheless comprise 29.5% of the population in 2030, due to the town's projected population loss.

Percent of Population 60 years old and older

	2000	2010	2020	2030
Berlin	20.3%	21.8%	27.3%	32.6%
Bristol	17.9%	20.1%	24.4%	27.8%
Burlington*	10.5%	18.0%	26.4%	32.1%
New Britain	18.4%	19.8%	23.8%	23.1%
Plainville	18.7%	22.2%	27.3%	29.5%
Plymouth	16.0%	18.4%	24.6%	29.5%
Southington	18.3%	22.9%	26.9%	32.9%
* data is preliminary				
REGION	18.0%	20.6%	25.2%	28.1%

Source: Connecticut Department of Transportation, *Population Projections for Connecticut Municipalities from 2010 to 2030 by Age, Ethnicity and Sex Distributions.* May, 2007.

This demographic shift presages not only economic difficulty for the towns, whose labor forces will decline as their senior populations rise, and a need for increased services, but also potential difficulties in hazardous conditions. An older population may be less mobile, more dependent on neighbors and family, and less able to evacuate or survive in isolation, or without heat or electricity, for extended periods of time. Elder care facilities need to be equipped with supplies that can allow

Race, Ethnicity, Income, Vehicle Access, and Language Spoken at Home

	% Minority or Mixed Race	% Hispanic (Any Race)	Median household income as % of state median	% Population Speaking Language other than English at Home	Top 2 Languages other than English Spoken at Home	% Population Speaking Language at Home
Berlin	3.0%	1.5%	126%	15%	Polish	4%
					Italian	3%
Bristol	8.4%	5.3%	88%	16%	French	5%
					Spanish	5%
Burlington	2.6%	1.3%	153%	7%	Spanish	2%
					French	2%
New Britain	30.6%	26.8%	63%	43%	Spanish	22%
					Polish	12%
Plainville	6.5%	3.6%	89%	19%	Polish	7%
					French	4%
Plymouth	2.7%	1.3%	100%	8%	French	3%
					Polish	1%
Southington	3.6%	2.0%	112%	10%	French	2%
					Italian	2%

Source: U.S. Census Bureau, Census 2000 Summary File 3: PCT10, P53; Summary File 1: P3, P4.

senior populations to shelter in place; meanwhile, towns must also consider added need for medical sheltering. Hazard mitigation plans for an aging population must address protection of critical facilities and vulnerable populations to ensure that all residents are able to weather the storms.

Vulnerable populations may include not only senior citizens and persons who are less mobile, but also low-income and minority populations, some of whom may have difficulty evacuating or protecting their homes, or may miss critical information due to limited ability in English. In four of the region's towns, more than 15% of the population does not speak English at home. New Britain in particular has large Spanish (22%) and Polish (12%) speaking populations. Public education efforts must take into account each town's particular language groups and make sure that information is made available to them, so that mitigation planning efforts do not systematically discriminate against non-English speaking communities.

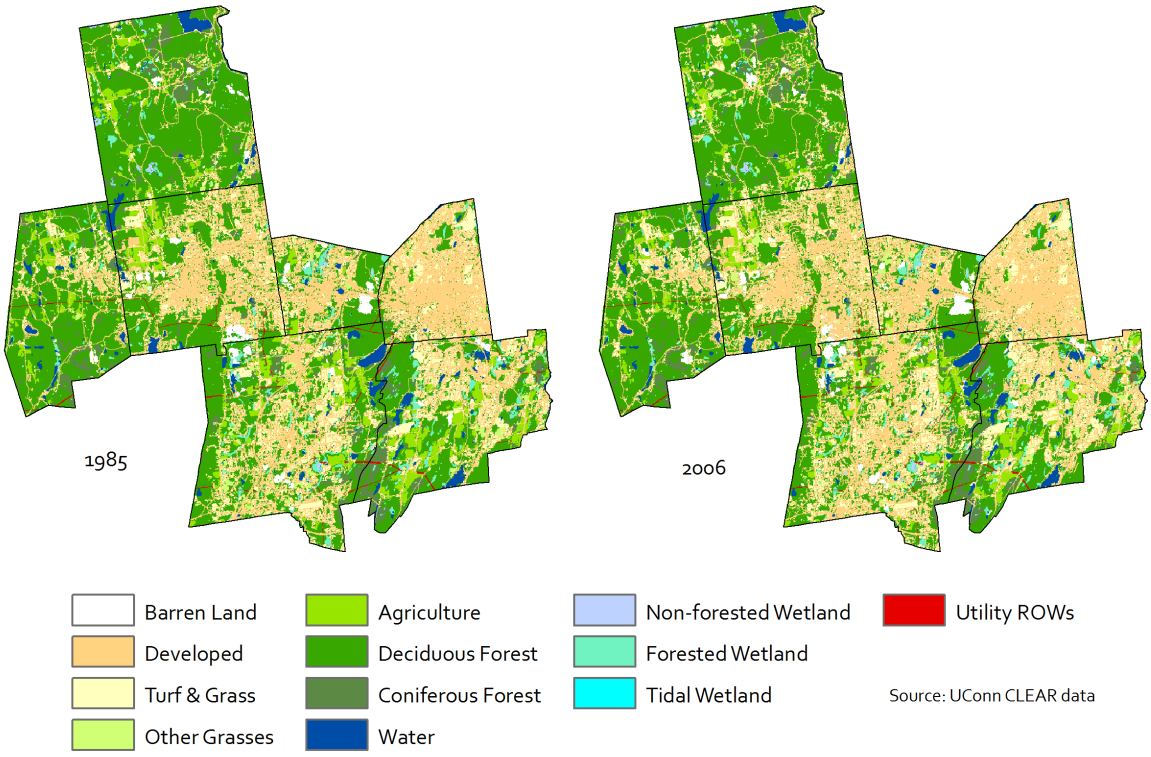
Land Use & Development Patterns

Towns in the region exhibit a typical development pattern for New England: dense population

centers (often more than one per town) cluster around rivers, where mills and other businesses were once located. These population centers may have a rich mix of uses, with additional residential development spiraling outward, creating relatively compact villages. While this historic pattern results in picturesque town centers, it also increases the potential for flood damage. Development in recent years has largely abandoned the traditional centralized pattern, and followed a more sprawling pattern, with new development radiating out ever further from traditional population centers, and filling in the open space and former agricultural fields that once separated village centers. By consuming land formerly reserved for open space and agriculture, development covers an ever-higher percentage of the region's land with impervious surfaces. By restricting the natural flow of storm water, increased impervious surfaces and other man-made obstructions contribute, over time, to increased flooding.

Much of the development the region has seen since 1985 has come at the cost (mainly) of its agricultural land and deciduous and coniferous forests. The maps below, from the UConn Center for Land-Use Education and Research (CLEAR), show differences in development from 1985 to 2006. The corresponding table (following page) highlights percent increases and decreases in different kinds of land cover.

Change in Land Cover, 1985-2006



Source: UConn Center for Land-Use Education and Research (CLEAR)

% Change in Land Cover Categories, 1985-2006

	Berlin	Bristol	Burlington	New Britain	Plainville	Plymouth	Southington
Developed	24%	17%	38%	5%	16%	16%	23%
Turf & Grass	13%	11%	72%	-5%	3%	35%	17%
Other Grasses	46%	1%	33%	14%	48%	26%	-36%
Agricultural Field	-32%	-24%	-32%	-73%	-77%	-25%	-18%
Deciduous Forest	-10%	-15%	-6%	-15%	-18%	-5%	-14%
Coniferous Forest	-3%	-13%	-4%	-17%	-27%	-2%	-9%
Water	-9%	-3%	-5%	-11%	-16%	-6%	-8%
Non-Forested Wetland	60%	55%	14%	-63%	0%	59%	9%
Forested Wetland	-10%	-17%	-8%	-26%	-9%	-9%	-9%
Tidal Wetland	0%	0%	0%	0%	0%	0%	0%
Barren	46%	-22%	34%	697%	22%	87%	39%

Source: Uconn CLEAR, "Connecticut's Changing Landscape, Version 2," http://clear.uconn.edu/projects/landscape/your/town.asp, accessed 8/17/2009.

The majority of development in the region is occurring on previously undeveloped land. The most endangered land, by far, is agricultural land. The region is home to some prime farmland soils and farming operations, but the majority of this land is zoned residential, which opens the door to development. With the exception of Southington, every town in the region lost a higher percentage of its agricultural acreage to development than any other type of land cover. This holds even where a town lost more total acres of forest than farmland, since farmland makes up a smaller overall percentage of most towns' land.

Development of formerly open space is driven, in part, by population increase. Increased populations lead to more home construction, school expansions, and potential commercial development. New development may not be limited to communities actually experiencing population increases; commercial development or even housing development may occur in other towns hoping to profit from their neighbors' successes.

Between 1990 and 2000, three of the region's towns (Berlin, Burlington, and Southington) gained in population. On average, these towns developed .4 acres of land for each new resident during this time. Between 2000 and 2005, four towns (Berlin, Burlington, Plymouth and Southington) had population increases, with an average increase in developed land per additional person of .28 acres.

The towns varied in the number of acres developed per person; Southington added between.8 and.32 acres per person, while Plymouth added only .09 acres per person. On average, however, over the 15 years, towns that gained in population added .28 acres of development per person. (Increased

Population and Land Cover Change, 1990-2005

	1990-2000			2000-2005		
	Population Increase*	Increase in Developed Acres (1990-2002)**	Acres developed per added person	Population Increase*	Increase in Developed Acres (2002-2006)**	Acres developed per added person
Berlin	1326	301	0.23	749	111	0.15
Burlington	1152	186	0.16	399	97	0.24
Plymouth	-	-	-	294	27	0.09
Southington	614	502	0.82	722	232	0.32

*Source: U.S. Census Bureau, 1990 and 2000 Decennial Census, P001.

**Source: UConn CLEAR, *Connecticut's Changing Landscape Version 2* , http://clear.uconn.edu/projects/landscape. Years are actually 1990-2002 and 2002-2006.

development was not isolated to the towns that gained in population; overall the region saw an increase in developed land of 8%, or 2,389 acres, despite losing over 6,000 people. This may indicate an optimistic attitude toward development's ability to attract inmigrants, indirect impacts of the new residents on neighboring towns, or unrelated events, such as business expansions.)

ConnDOT's population projections predict a regional increase of 9,893 people by 2030. If development continues apace, averaging .28 acres developed per additional resident (in towns that gain population), 16% (2,770 acres) of the region's net developable land will be developed by 2030. (If increased population and residential development in one town triggers additional development in neighboring towns that do not gain population, this number may be higher.) This additional development will not be equally distributed across the towns, but will be concentrated in towns with more developable land. CCRPA's 2007 Plan of Conservation and Development for the region estimated developable land per town as follows:

Net Developable Land

	Net Developable Land (NDL) in Acres	NDL as a Percentage of Municipality's Total Land	NDL as a Percentage of Total NDL for Region
Berlin	1754	11%	10%
Bristol	1759	10%	10%
Burlington	3358	18%	20%
New Britain	280	3%	2%
Plainville	940	14%	5%
Plymouth	3907	28%	23%
Southington	5224	23%	30%

Source: CCRPA, *Plan of Conservation and Development for the Central Connecticut Region, 2007-2017* , pg. 17

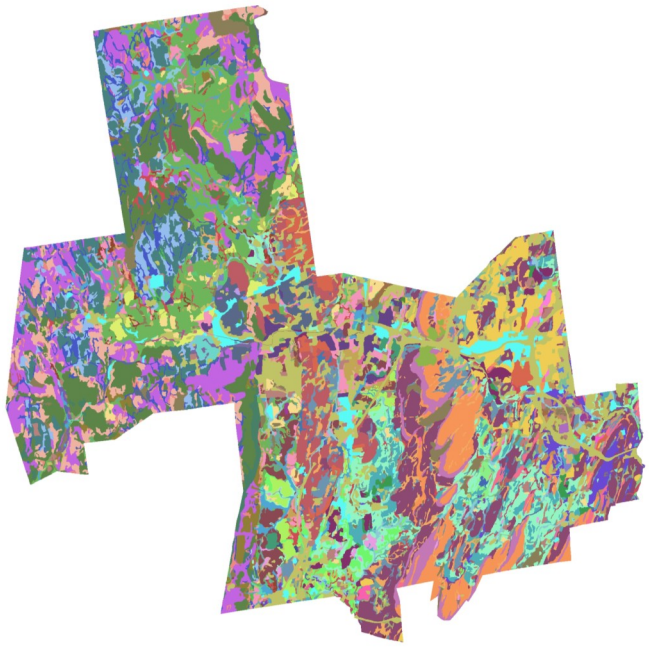
Net Developable Land represents the currently undeveloped land in each municipality that is available for development (e.g. does not have conservation easements) and not hampered by build-out constraints (such as wetlands, stream buffers, floodplain areas, water bodies, protected open space, and areas with prohibitive slopes). Net Developable Land of 30% does *not* indicate that a town is 70% built out.

Net Developable Land as a percentage of a municipality's total land gives a clue as to how the towns could develop in the future. In Plymouth, up to 28% of the town's land could be converted to development, whereas in New Britain, only 280 acres remain that could be converted. Southington has the most land available for conversion – 5,224 acres – and will likely see the greatest concentration of development.

Geology & Hydrology

One concern raised by this continuing, a-centric development pattern is its impact on natural systems, particularly hydrologic systems. Due to its geographic location, actions taken in the region have the potential to impact areas that are quite distant.

Soil Types in Central Connecticut



Source: CT Department of Environmental Protection (DEP) GIS files

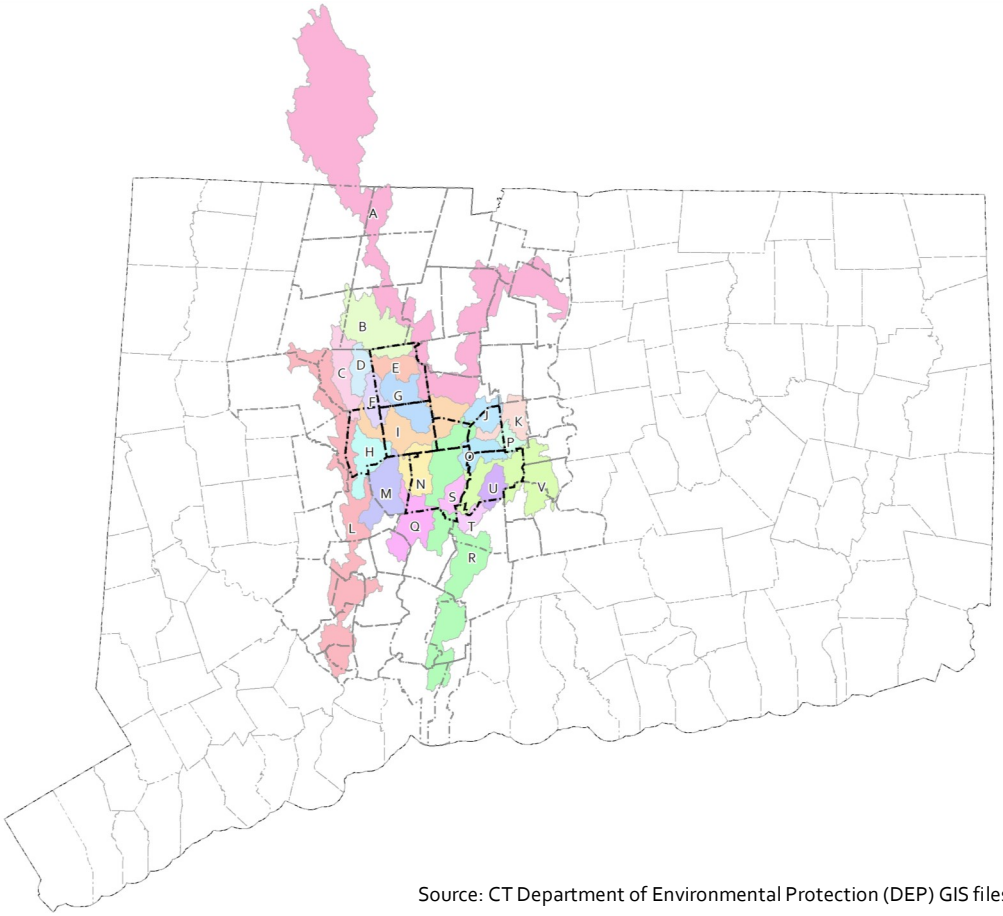
The Central CT Region sits at the transition of Connecticut's Western Highlands to its Central Valley. The Highlands are characterized by rolling hills, and thin, rocky soil, with rugged slopes in the northwest corner of the state. The Central Valley is a flatter expanse that lies between the Western and Eastern Highlands, and boasts rich agricultural soils. The Valley is divided by the rocky Metacomet Ridge (orange and red on the Soil Types map, above). According to CT-DEP:

> The fertile soils of the Central Valley were formed through a combination of fine-grained glacial lake sediments and loamy or sandy alluvial deposits. Glacial till soils in the Western and Eastern Highlands, derived from crystalline rocks, tend to be rocky with little organic accumulation. *CT DEP, Connecticut's Comprehensive Wildlife Conservation Strategy, 2005 (2-3).*

Towns at the western end of the region (Burlington and Plymouth) have hilly topography and forested slopes. Other towns are relatively flat, with higher concentrations of prime and statewide-important farmland soils. The Metacomet Ridge divides the easternmost towns in the region (New Britain and Berlin) from the rest, and provides a recreational and scenic amenity.

Water from the region drains into three of the state's major watershed basins: the Housatonic, Connecticut, and South Central Coast. En route to its final destination, the water navigates five regional and 23 sub-regional basins that reach from Massachusetts nearly all the way to Connecticut's shoreline, touching a total of 52 towns in Connecticut on their way.

Sub-Regional Watershed Basins in the Central CT Region



Source: CT Department of Environmental Protection (DEP) GIS files

In 2005, CCRPA conducted a build-out analysis that examined the impact of different degrees of build-out upon these sub-regional drainage basins. Development brings impervious surface, and increased impervious surface means trouble for the health of a watershed:

> Impervious surfaces in a watershed adversely impact the health of the watershed. These effects include adverse impacts on water quantity, degraded water quality, changes to habitat, diminished stream and landscape aesthetics, bank erosion and flash floods. **Similarly, impervious surfaces dramatically increase peak discharges during storm or snowmelt events, resulting in the increased flow and possible downstream flooding.** According to different studies, biological integrity and habitat quality of streams are inversely affected by the amounts of impervious surfaces adjacent to them (Arnold & Gibbons1996; Klein1979; Schueler1994). **A watershed is considered to be impacted when the impervious surface exceeds 10% of the total watershed** (Schueler 1994). *CCRPA, Pequabuck River State of the Watershed Report, July 2004 [emphasis added].*

The table below reveals the impact that the impervious surfaces associated with varying degrees of regional build-out would have on the health of sub-regional watersheds. According to the build-out methodology, the region would be 25% built-out (according to residential zoning requirements and other factors) with the addition of 18,251 people – roughly twice the population increase expected by 2030. If development occurs as projected, once the region is 25% built out, 12 of the sub-regional

Percent of Impervious Surface of Sub-Regional Basin Land Area within the Central CT Region*

	Existing (2005)	25% Buildout	50% Buildout	70% Buildout	Map Code
Bass Brook	14.65%	14.90%	15.15%	15.34%	J
Belcher Brook	20.08%	21.08%	22.08%	22.88%	U
Burlington Brook	13.63%	15.32%	17.01%	18.37%	E
Copper Mine Brook	18.98%	20.07%	21.16%	22.03%	G
Eightmile River	16.49%	18.18%	19.88%	21.23%	N
Farmington River	0.24%	0.31%	0.37%	0.42%	A
Hancock Brook	8.76%	10.87%	12.99%	14.68%	H
Leadmine Brook	0.78%	1.03%	1.29%	1.50%	C
Mad River	0.52%	0.53%	0.54%	0.55%	M
Mattabesset River	9.88%	10.42%	10.96%	11.40%	V
Misery Brook	21.29%	22.93%	24.56%	25.87%	S
Naugatuck River	0.54%	0.71%	0.87%	1.01%	L
Nepaug River	0.57%	0.65%	0.73%	0.79%	B
Pequabuck River	22.61%	23.58%	24.56%	25.34%	I
Piper Brook	9.69%	9.77%	9.84%	9.90%	K
Poland River	5.19%	6.18%	7.17%	7.96%	F
Quinnipiac River	9.49%	10.15%	10.80%	11.32%	R
Rock Brook	0.03%	0.04%	0.04%	0.04%	D
Sodom Brook	1.60%	1.83%	2.06%	2.25%	T
Tenmile River	3.51%	3.98%	4.46%	4.83%	Q
Webster Brook	11.78%	11.87%	11.95%	12.02%	P
Willow Brook	28.45%	29.60%	30.76%	31.68%	O

* Many sub-regional basins extend past the perimeter of the region (see map, pg. 12). Land area outside the region was not evaluated.
Source: CCRPA, Plan of Conservation and Development for the Central CT Region, 2007-2017

basins affected by flow in the region would be adversely impacted, including the three biggest rivers in the region: the Quinnipiac, the Mattabesset, and the Pequabuck. Flooding from these rivers already has dramatic impacts on the region's towns; engaging in responsible development practices to avert increased impacts on the region's watersheds is imperative to avoid worsening floods in the future.

Natural Hazards: Risks to the Region

Floods

Flooding, the hazard encountered with the greatest frequency in Central Connecticut, can and does happen at any time. Rain storms are common throughout the year, and each season brings its own source of floods: from mid-summer through fall, hurricanes bring wind and torrential rain; winter Nor'Easters pound the region with snow and rain; snowmelt inundates local hydrologic systems in early spring; and summer thunderstorms can bring flash floods in minutes. Historical development patterns encouraged dense construction of town centers near water bodies; consequently many areas with chronic flooding problems are in population centers. Most towns identified flooding as the natural hazard of most concern in their communities.

All seven towns in the Central Connecticut region participate in the National Flood Insurance Program, and have done so since 1974.FIRMs for the six towns in Hartford County are quite recent, dating to September of 2008. Plymouth, located in Litchfield County, has FIRMs a decade older (last updated November 1998). Each town has worked with FEMA to update its FIRMs and established a floodplain ordinance that limits the amount and kind of development that can occur in flood-prone areas. Towns continue to assist their residents in acquiring flood insurance, providing on-site flood water storage, and otherwise protecting their assets through responsible practices.

Regional Participation in NFIP

	Init FHBM Identified	Init FIRM Identified	Current Effective Map Date
Berlin	8/16/1974	7/16/1980	9/26/2008
Bristol	5/17/1974	11/18/1981	9/26/2008
Burlington	7/19/1974	6/1/1981	9/26/2008
New Britain	5/24/1974	7/16/1981	9/26/2008
Plainville	5/31/1974	11/19/1980	9/26/2008
Plymouth	8/16/1974	10/15/1982	11/6/1998
Southington	5/10/1974	7/16/1981	9/26/2008

Source: Fema, National Flood Insurance Community Status Book.

All the towns in Central Connecticut feel the impact of flooding on a regular basis. The

Pequabuck, Quinnipiac, and Mattabesset Rivers flow through the region, and all have flood-prone areas. Impacts from flooding vary according to the severity of each flood event, but can range from minor damage of personal property to dam failure, septic and sewer system failure, and even the destruction of homes and loss of lives. Flood damage is predictable in its location, however, and every town in the region has one or more specific properties that are damaged by flooding on a regular basis.

Historically, the region has seen a great deal of flooding. The National Climatic Data Center's Storm Events Database lists many flood events for Hartford and Litchfield Counties. Some events with particularly significant impacts on the region were:

> **January 28, 1996:** Gale force south winds with gusts to 60 mph, heavy rainfall of from 1 to 2 inches, and very mild temperatures rising into the 50s preceded a sharp cold front that was approaching from the west. A peak wind gust to 61 mph was reported in East Windsor and a gust to 60 mph was reported in East Hartford, both in Hartford County. In New Britain, a brick facade of a six family apartment house was blown down. In Windham County, trees were blown down, blocking several roads. Street flooding was reported in the town of Thompson, closing several roads. Falling trees and tree limbs cause scattered power outages throughout the region. Power outages affected 60,000 electric customers statewide. Minor river flooding occurred in Hartford County along the North Branch of the Park River in Hartford, which crested at 9.9 feet at 8:30 PM on the 28th; flood stage is 8.0 feet. Flooding occurred along the Connecticut River at Thompsonville, which crested at 6 PM on the 28th at 5.7 feet; flood stage is 5 feet. At Hartford, a crest of 20.7 feet occurred at 10 AM on the 29th; flood stage is 16 feet. The Farmington River crested at Simsbury at 1 AM on the 29th at 13.7 feet; flood stage is 12.0 feet. The Quinnipiac River crested at 3.5 feet at Southington at 1 AM on the 28th; flood stage is 3.0 feet.

> **April 16-18, 1996:** Two to 3 inches of rain fell on April 16th in northern Connecticut, with totals of 3 to 5 inches in the south portion of Hartford and Tolland Counties. All of the rain fell in about a 12-hour period. The ground had remained saturated from heavy snowmelt during the previous week and this combined with the heavy rain to produce urban flooding, flooding of small streams, and finally minor to moderate flooding of the major rivers. After a record snowfall during the first ten days of the month, wet and milder weather returned, resulting in the most significant mainstem river flooding along the Connecticut River in 9 years. A flash flood occurred in Berlin, where boats were needed to rescue people stuck in two cars on Route 71 at about 3 PM on the 16th. The North Branch of the Park River crested at Hartford at 12.9 feet at 4:23 PM on the 16th; flood stage is 8 feet. Moderate flooding was reported along the South Branch of the Park River at Hartford. The Farmington River crested at Simsbury at 12.17 feet at 9:30 PM on the 17th. The Connecticut River crested at Thompsonville at 6.61 feet at 1:15 AM on the 18th; flood stage is 5 feet. The Connecticut River crested at Hartford at 22.06 feet at 1:30 PM on the 18th; flood stage is 16 feet. Moderate flooding was reported along the Quinnipiac River at Hartford around 3 PM on the 16th. In general, during this event low-lying riverfront land and some roads were flooded, but no significant damage was reported.

> **March 11, 1998:** A powerful storm system moving slowly northeast from the Ohio Valley to the eastern Great Lakes brought strong winds and heavy rainfall to Connecticut, which resulted in urban street flooding, basement flooding, small stream flooding, and main stem river flooding. At times, the rainfall was torrential, especially in thunderstorms during the evening of March

9th. Rainfall totals of 3 to 5 inches were reported across northern Connecticut. Some of the greatest totals included: Storrs, 4.86"; Willimantic, 4.50"; South Windsor, 4.00"; Glastonbury, 3.86"; Woodstock, 3.80"; Wethersfield, 3.77"; Newington and Scotland, 3.60"; and Southington, 3.56". A new record daily rainfall total for March 9th was established at Bradley International Airport, Windsor Locks, with 2.40". Several small streams flooded. The Quinnipiac River at Southington reached flood stage of 3.5 feet at 1:00 PM on March 9th, crested at 5.0 feet at 9:45 PM and then fell below flood stage at 11:00 AM on March 10th. One unidentified stream reached flood stage at 1:20 PM on March 9th at West Hartford. Another unidentified stream reached flood stage in Newington at 1:25 PM on March 9th. In Windham County, at Warrenville, the Mount Hope River reached flood stage of 7 feet at 1:00 PM on March 9th, crested at 8.5 feet at 12:00 AM on March 10th, then fell below flood stage at 6:00 AM on March 10th. The Connecticut River reached flood stage of 16 feet at Hartford at 1 PM on March 11th, crested at 16.9 feet at 10 AM on March 12th, then fell below flood stage at 11 PM on the 12th. The Farmington River at Simsbury crested at 11.7 feet at 9 PM on the 10th, just shy of flood stage, which is 12 feet. Strong south winds occurred after the passage of a warm front during the mid to late morning hours. Winds gusted to 40 to 55 mph.

September 16, 1999: Farmington River Tropical Storm Floyd brought torrential rainfall and strong winds to northern Connecticut, as it tracked up the Connecticut River valley into central Massachusetts. Although many areas received torrential rainfall, with totals between 4 and 8 inches, the heaviest rain fell in western Hartford County where as much as 10.80 inches was reported in Bristol. The rainfall produced widespread flooding of low lying areas, especially in Hartford County. Smaller rivers such as the Quinnipiac, North Branch Park, and Burlington Brook rose rapidly out of their banks as the heavy rain arrives late in the afternoon and early in the evening on the 16th. Crests of 2 to 3 feet above flood stage occurred by daybreak on the 17th. The Farmington River went into flood at Unionville from 11 pm on the 16th to 413 am on the 17th, cresting a foot above flood stage at 1 am on the 17th. At Simsbury, the Farmington went into flood at 715 am on the 17th and crested about a foot over flood stage at 930 pm on the 17th, before returning to its banks at 215 pm on the 18th. The longer responding Connecticut River rose out of its banks in Hartford at 1259 am on the 18th, and crested at 17.2 feet at 130 pm on the 19th, which is about a foot over its 16 foot flood stage. It returned to its banks at 132 am on the 19th. Farther downstream at Middletown, the Connecticut went into flood at 1050 am on the 18th, and crested at 8.8 feet at 1115 am on the 19th, almost a foot above its 8 foot flood stage. It returned to its banks at 846 pm that same day. Surprisingly, no flood damage was reported, even in those areas where the smaller rivers rose rapidly. Strong winds were also felt in northern Connecticut as Floyd passed. There were scattered reports of small trees or branches downed, which did not cause significant damage.

June 30-July 1, 1998: An area of heavy showers and thunderstorms associated with a slow moving warm front brought 2 to 4 inches of rainfall, resulting in urban street, basement, small stream, and river flooding in Hartford County. The Quinnipiac River in Southington had reached flood stage at 6:10 PM on June 30th, crested at 4.24 feet at 8:39 PM, continued flooding through midnight, then fell below flood stage at 8:40 AM on July 1st.The South Branch of the Park River, a small stream in Hartford, reached flood stage of 9 feet at 9:45 pm on June 30th, crested at 9.85 feet at 10:30 PM, and fell back below flood stage right at midnight at the start of July 1st. Also at 9:45 PM, in West Hartford, the Trout Brook went over its banks flooding nearby areas. Urban street flooding was reported with water four feet deep on Pen Drive and one foot deep in some other areas. No other flooding was reported during the rest of the month of July.

January 24, 1999: Quinnipiac River Rainfall amounts of 2 to 3 inches caused the Quinnipiac River to overflow its banks. The river crested at 4.0 feet at Southington, just over the flood stage of 3.5 feet. There were no reports of flood damage.

February 2, 1999: Quinnipiac River Low pressure moving from the Carolinas to southern New England brought 1 to 2 inches of rain to northern Connecticut. Very wet antecedent conditions caused significant rises on small streams throughout the region. The Quinnipiac River at Southington rose out of its banks late on the 2nd, producing minor flooding to low lying areas along the river. It crested at 4.17 feet around 3 am on the 3rd, which is less than one foot above its flood stage of 3.5 feet. There were no reports of flood damage.

April 22, 2000: Quinnipiac River Low pressure moving across southeast New England brought 2 to 4 inches of rain to Hartford County, most of which fell in a 6 to 12 hour period. The Quinnipiac River in Southington experienced a minor flood, cresting at 4.5 feet at 7 am on the 22nd, which is just over its flood stage of 4 feet. No flood damage was reported.

March 23, 2001: Quinnipiac River at Southington The combination of melting snow and heavy rain brought the Quinnipiac River into flood. It crested at 4.6 feet at 3 pm on the 22nd (flood stage is 3.5 feet). Several roadways near the river were closed by flood waters, but no damage was reported.

March 30, 2001: Quinnipiac River Renewed flooding occurred on the Quinnipiac River. Flows remained well above normal after the previous week's flooding, and a storm system brought 2 to 3 inches of rain to Hartford County. The river crested at 4.4 feet at 10 pm on the 20th (flood stage is 3.5 feet). There were no reports of flood damage.

September 28, 2003: Significant urban flooding affected central Hartford County, after nearly 4 inches of rain fell in a few hours. Several cars were stranded in Berlin and West Hartford, and Willow Brook rose out of its banks in New Britain, flooding a nearby park. This event included flash flooding in Berlin that caused $25,000 worth of property damage.

December 12, 2008: Roack Road in Burlington was closed due to flooding. EPISODE NARRATIVE: While a major ice storm affected Massachusetts and Southern New Hampshire, three to four inches of rain fell in Connecticut resulting in small stream and some street flooding.

The storms listed above represent just a small sample of events affecting the region. Other storms not listed have often inflicted greater damage on the region. In 1992, for example, New Britain experienced a great deal of flooding from a rainstorm that, according to a report by Maguire Group, exceeded a 100-year storm. The flooding that resulted from the storm inundated local playing fields and caused $654,000 worth of damage to bridges, culverts, and roads.

As a result of these regular flooding events, many properties situated near key rivers in the region flood on a regular basis. According to FEMA's Repetitive Loss Property Database, the 55 repetitive loss properties in the region have incurred $1.77 million in repairs to buildings and replacement of building contents over the last 30 years (see table, next page).

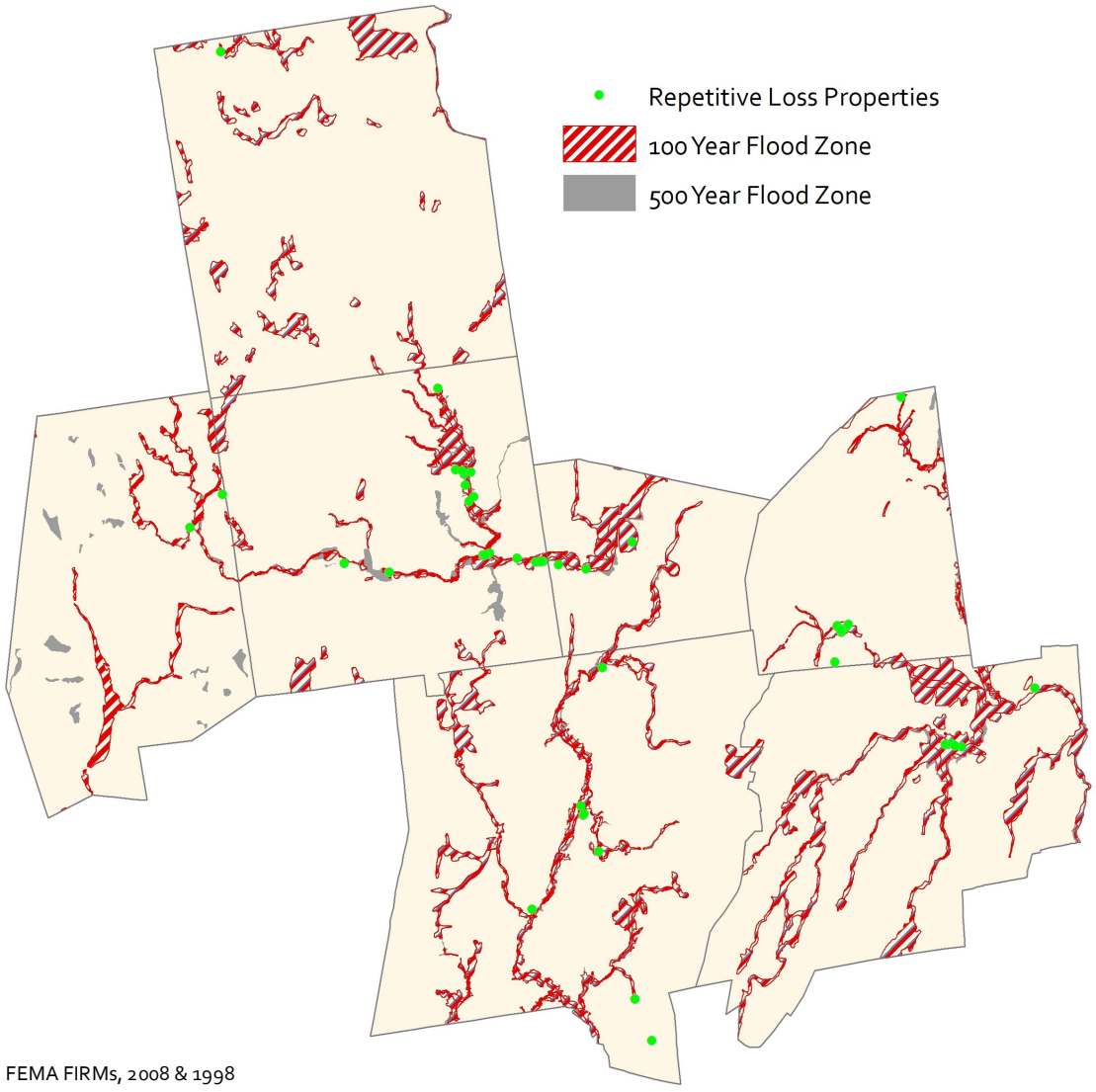
The majority of the repetitive loss properties in the region are privately owned and have not

Repetitive Loss Properties, 1978-2009

Town	Building Payments	Contents Payments	Total Losses	Total Properties
Berlin	$ 157,809.72	$ 93,730.35	19	6
Bristol	$ 706,501.72	$ 44,607.41	62	24
Burlington	$ 15,080.58	$ -	2	1
New Britain	$ 70,148.79	$ 12,366.70	21	8
Plainville	$ 96,110.52	$ 28,111.82	14	4
Plymouth	$ 34,348.37	$ 14,109.99	4	2
Southington	$ 190,182.85	$ 311,295.40	26	10

Source: FEMA Repetitive Loss Property Database

FEMA Flood Zones & Repetitive Loss Properties



Source: FEMA FIRMs, 2008 & 1998

been mitigated. Towns in the region differ in their ability to acquire and remediate these properties; while some structures have been demolished, others still stand. Some properties have not flooded for over a decade, and are low on municipalities' priority lists; others lie in areas known for frequent flooding, but are privately owned and beyond municipal reach.

Percent of Flood Zone by Land Use (Zoned)

	Agriculture / Open Space	Commercial	Industrial	Residential	Total Acres in Flood Zone
Berlin	11%	7%	34%	47%	2,286
Bristol	1%	3%	7%	90%	15,172
Burlington	0%	0%	5%	95%	1,372
New Britain	0%	8%	13%	79%	297
Plainville	21%	4%	27%	49%	2,236
Plymouth	0%	2%	7%	90%	723
Southington	0%	11%	15%	73%	1,712
REGION	**3%**	**4%**	**12%**	**81%**	**23,798**

Source: FEMA FIRMs (2008 & 1998), Town Zoning Maps

Repetitive Loss Properties by Zoning Classification

Town	Agricultural	Commercial	Industrial	Residential	TOTAL
Berlin	0	2	4	0	**6**
Bristol	0	10	1	13	**24**
Burlington	0	0	0	1	**1**
New Britain	0	0	0	8	**8**
Plainville	1	1	1	1	**4**
Plymouth	0	0	0	2	**2**
Southington	0	3	2	5	**10**
REGION	**2%**	**29%**	**15%**	**55%**	**55**

Region-wide, 81% of the land that falls within FEMA's 100-year flood zones is zoned residential; only 3% of the land is zoned for agriculture, open space, or other natural preservation. This has a great deal to do with the historic development patterns that gave shape to the region's towns. As a consequence, despite the fact that not all of the residentially-zoned land has been developed,

flooding presents a considerable (and expensive) problem for many property owners in the region.

Zoning classifications for repetitive loss properties are similarly weighted toward residential properties, but have a higher percent commercial zoning than the flood zones as a whole. Almost 30% of the repetitive loss properties in Central Connecticut are in traditional village centers located along the region's rivers. These areas tend to have zoning that allows some form of mixeduse development, which skews the zoning classifications more toward general commercial and light industrial uses.

Flooding is a hazard of great concern for the Central Connecticut Region. A HAZUS-MH analysis of flooding potential in the region highlights just how expensive this problem can be. An analysis based on the building inventory data stored in HAZUS (data limitations at the local level made it impossible to use more accurate and/or recent data) revealed that a 100-year storm which flooded all reaches simultaneously could cause building damage (excluding contents and other variables) ranging from $5.6 million to $267.2 million per town . A 500-year storm has the potential to be even more destructive.

HAZUS-MH results for Floods, by town

	Damage to buildings, 100 year flood (millions)	Damage to buildings, 500 year flood (millions)
Berlin	$ 17.9	$ 28.7
Bristol	$ 60.3	$ 64.0
Burlington	$ 5.6	$ 6.4
New Britain	$ 13.6	$ 19.7
Plainville	$ 127.6	$ 156.3
Plymouth	$ 11.8	$ 12.0
Southington	$ 267.2	$ 409.7
REGION	$ 504.0	$ 696.7

Dam Failure

Dam failure, both a potential cause and result of flooding, could do tremendous damage in the region. Many of the region's lakes, reservoirs, and other water bodies are regulated by dams, some of which have been standing for a very long time. Were these dams to fail, they would release torrents of water that could cause not only flooding but also violent destruction.

Not all dams pose a serious threat; the vast majority of dams in the state regulate water bodies that, either because of their size or location, would not cause major destruction in the event of a dam failure. The Connecticut Department of Environmental Protection (DEP) has created five dam classifications, based on hazard potential:

Class AA: negligible hazard potential dam which, if it were to fail, would result in no measurable damage to roadways, land and structures, and negligible economic loss

Class A: low hazard potential dam which, if it were to fail, would result in damage to agricultural land, damage to unimproved roadways, or minimal economic loss

Class BB: moderate hazard potential dam which, if it were to fail, would result in damage to normally unoccupied storage structures, damage to low-volume roadways, or moderate economic loss

Class B: significant hazard potential dam which, if it were to fail, would result in possible loss of life; minor damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to or interruption of the use or service of utilities; damage to primary roadways and railroads; or significant economic loss

Class C: high hazard potential dam which, if it were to fail, would result in the probable loss of life; major damage to habitable structures, residences, hospitals, convalescent homes, schools, etc; damage to main highways; or great economic loss.

As of 2001, 83% of all dams in the state were classified as AA, A, or BB (dam classification can change as a result of downstream development). All dams are subject to inspection by the DEP. Owners of Class B and C dams are further required to prepare Operation and Maintenance Manuals for their dams. All dam owners are obligated to periodically inspect their dams, maintain the

Frequency of DEP Dam Inspections

Hazard Class	Inspection Frequency
AA	At least once
A	Every 10 years
BB	Every 7 years
B	Every 5 years
C	Every 2 years

Source: CT DEP, Guidelines for Inspection and Maintenance of Dams, 2001

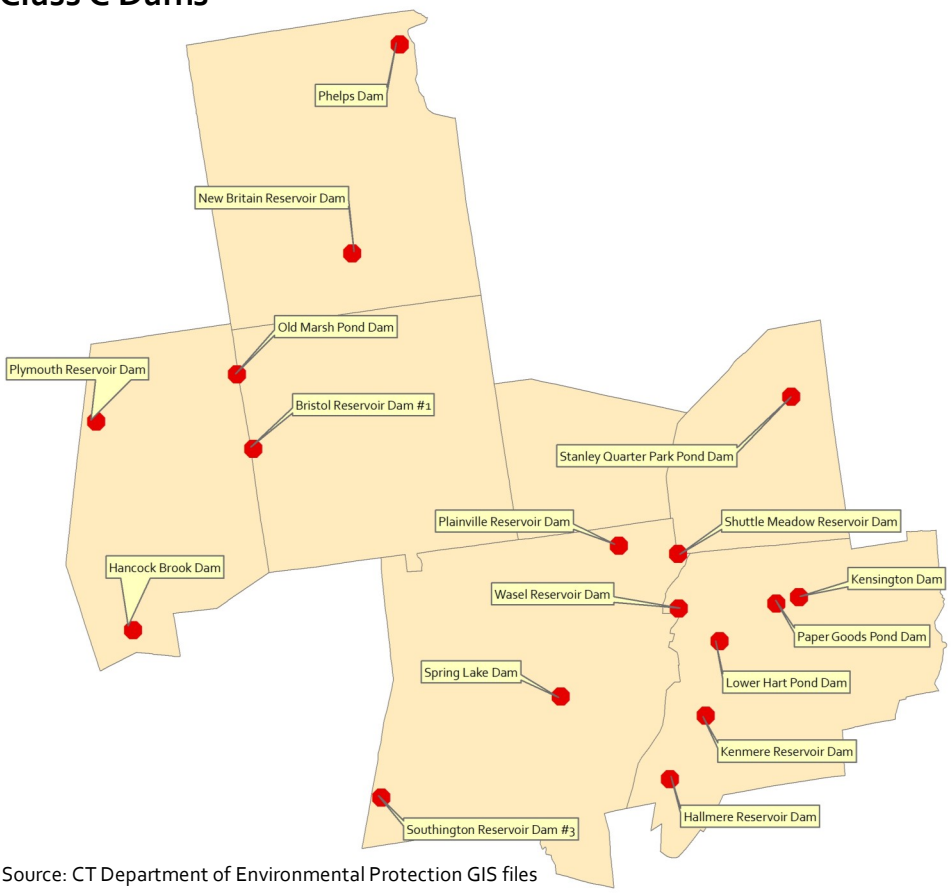
CT-DEP Registered Dams in Central Connecticut

	A	BB	B	C	Total
Berlin	10	4	3	6	23
Southington	7	1	0	5	13
Plymouth	11	6	13	3	33
Burlington	13	2	3	2	20
New Britain	3	3	0	2	8
Bristol	5	3	4	1	13
Plainville	0	0	0	0	0

(An additional 32 dams appear on DEP maps but are not classified.)

Source: Ct Department of Environmental Protection, maps (2005)

Class C Dams



Source: CT Department of Environmental Protection GIS files

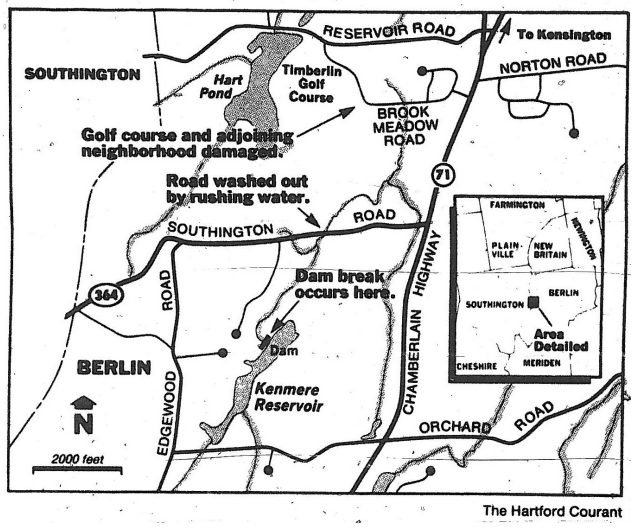
structures and their adjacent areas, keep written records of inspection and maintenance activities, and notify DEP of major damage (DEP, *Guidelines for Inspection and Maintenance of Dams*, 2001).

Of the 142 dams in Central Connecticut, only 19 are Class C. Another 23 are Class B, and the remaining 100 are dams with relatively little potential impact on life or property. The 19 class C dams are distributed throughout the region. Every town is home to at least one Class C dam, with the exception of Plainville.

The three dams in the region with the largest potential for destruction are the Hancock Brook Dam in Plymouth, the Shuttle Meadow Reservoir Dam in Southington, and the Phelps Dam in Burlington. The Phelps Dam, the largest in the region, is an earth and stone structure 1,125 feet in length, which creates the Nepaug Reservoir, an 850-acre water body with a storage capacity of up to 9.8 billion gallons of water (according to the Metropolitan District Commission, which manages the reservoir). Hancock Brook Dam, the second largest dam in the region, is an earthen structure 630 feet long and 57 feet high which is maintained by the Army Corps of Engineers. It creates a 260-acre lake

with a 1.3 billion gallon storage capacity. Shuttle Meadow Reservoir Dam, an earthen dam 600 feet long and 30 feet high, creates a 250-acre reservoir with storage capacity of approximately 1.5 billion gallons. The Nepaug and Shuttle Meadow Reservoirs are parts of the public water supply systems for greater Hartford and New Britain, respectively; consequently their dams impound water on a full-time basis. The Hancock Brook Dam, by contrast, is a specific flood-control dam built and maintained by the Army Corps of Engineers. Hancock Brook Lake, which it creates, is filled only during flood events. The lake detains flood waters and gradually releases them when floodwaters have receded.

Kenmere Dam Collapse, 1987



Central Connecticut has seen one of its Class C dams fail: the Kenmere Reservoir Dam in Berlin collapsed on March 31, 1987, during a reconstruction effort. According to the Hartford Courant, torrential rains overwhelmed the dam and sent roughly 80 million gallons of water into surrounding Berlin, where it destroyed a bridge, inundated homes and businesses, and did extensive damage to a municipal golf course. No serious injuries resulted from the dam failure, and the property damage incurred was estimated to be approximately $187,000 (1987 dollars).

Once a dam collapses, the damage it does is largely dependent upon the sorts of land uses surrounding it. While the Kenmere dam inflicted damage primarily upon a golf course, other dams in the region (notably the Shuttle Meadow Reservoir Dam, which overlooks densely developed New Britain) could do far more damage in a collapse. Not only can buildings downstream be inundated by resulting flooding; they can be damaged by the violent torrent of water, which impacts like a battering ram. Utility connections can be severed, in turn causing fires and power outages; people can be injured or even killed by rushing waters and the debris carried therein.

Dam failures are generally caused by other natural hazards: floods arising from thunderstorms, spring thaw, and hurricanes; wind damage from hurricanes and tornadoes; and forces from earthquakes. Failure due to material fatigue is also possible, but regular maintenance and dam inspections can detect leaks and other signs of material fatigue before the problem escalates. Dam emergency operations plans can detail procedures to be taken in the case of other natural hazards.

Winter Storms

Winter storms are a regular occurrence in Connecticut. While some storms are mild and of little consequence, blizzards, ice storms, and Nor'Easters can interrupt utility service, knock down trees and power lines, and blanket the region in snow and ice. While picturesque, snow and ice can create impassable roads and isolate people in their homes or workplaces, sometimes without electricity or heat. Melting snow and ice can also cause flooding, as can winter rainstorms which hit when the ground is already frozen. According to FEMA's disaster history, five of the past six emergency declarations for Connecticut have been prompted by snowfall.

Ice and Snow Removal

	Total miles of road	Total town-owned miles of road	Average spent per town-owned mile (2003-2009)*	Average spent per year (2003-2009)*
Berlin	131.66	103.72	$1,289.66	$133,763.15
Bristol^	243.59	223.24	$3,758.95	$839,147.39
Burlington	98.76	86.15	$1,598.78	$137,735.02
New Britain	183.89	164.33	$2,097.02	$344,603.83
Plainville	84.36	66.84	$2,992.02	$199,986.75
Plymouth	94.80	82.38	$1,853.09	$152,657.50
Southington	226.61	195.26	$3,408.63	$665,569.01

* Average of years for which data is availble.

^ Bristol's cost figures include cost of plowing State Rte 6 & are therefore inflated

Snow and ice removal has a tremendous impact on municipal budgets. The impact varies by town; some towns use their own staff to clear roads, which may represent savings but also be inefficient. Other towns hire contractors to remove 100% of the snow and ice. The remainder of towns use a combination of town staff and contractors. Regardless of staffing, every town is faced with spending between $100,000 and $1 million per year on snow and ice management.

The size, scope, and timing of a particular storm can drastically affect towns' annual expenditures. Blizzards in 1888 and 1978 each delivered nearly a season's worth of snow in a single event. Nor'Easters in 1979, 1983, 1988, 1992, 1996, and 2003 dropped masses of snow, causing deadly car crashes and widespread blackouts. Even storms that are not unusual can cause damage and loss of life. Below is a brief history of some of the worst storms of the last 10 years, excerpted from the NOAA Storm Events Database.

January 7, 1996: This storm was one of the most significant winter storms to hit southern New England in the past 20 years and was named the "Blizzard of '96" from the Middle Atlantic states to southern New England. However, by National Weather Service definition, no actual blizzard conditions occurred in the state. Snowfall across the north and northeast portions of the state ranged from 15 to 23 inches. In Hartford County, Bradley International Airport recorded 18.2 inches. New Britain had 18 inches and Wethersfield, 15.3 inches. In Tolland County, there was 22.5 inches in Mansfield... This storm disrupted transportation systems and closed schools and businesses. A barn roof collapsed in Simsbury within a week or so following this very heavy snowfall.

March 2, 1996: A total of 6 to 7 inches of snow fell across the northern part of the state. There were 391 skidding accidents reported to the state police. Three people were killed and dozens injured on the icy roadways. A number of state highways were closed for a time due to the numerous accidents and very slippery conditions, including Route 30 in Tolland and Route 195 in Mansfield.

December 6, 1996: An intensifying storm system moving eastward from the southeast tip of Long Island caused heavy, wet snow across northern Connecticut. The greatest totals were reported from the higher elevations... Several thousand electric customers lost power, including a total of 1700 in Avon. In Simsbury, a town-owned tobacco barn collapsed under the weight of the snow. The barn was in rough shape to start with, but the collapse amounted to approximately $37,000, according to the Simsbury Assessors' Office. Road conditions became very poor as the snow continued to fall throughout the day.

December 7, 1996: This storm brought heavy, wet snow and resulted in widespread power outages. There had been another heavy, wet snow event the day before, too. A total of 225,000 electric customers lost power statewide, including 100,000 in central Connecticut and 95,000 in the eastern part of the state. Power remained out for several days, despite the efforts of dozens of electric company repair crews, many from out-of-state. Many roads remained unplowed until the utility companies could clear away fallen wires. A firefighter died instantly while on duty in Somers when he came in contact with a 23,000 volt power line that had been knocked down by the heavy snow. Route 44 was closed for 15 hours due to a fallen power line. Up to 22 shelters were opened across the region and many residents left their unheated and darkened homes. Many vehicles and homes were damaged by falling tree limbs and damage was estimated in the millions of dollars...

January 24, 1997: Light freezing rain created very treacherous driving conditions and caused numerous skidding accidents, including many multiple-car accidents. State police at the Tolland barracks reported 60- 80 accidents, mostly minor, late Friday night, January 24th. Several bridges had to be closed in the Hartford area when more than a dozen cars collided. Several other highways also were closed in northern Connecticut due to icing conditions. A spotter in Windsor reported 1/4" to 1/3" of ice on trees during the early morning hours on January 25th.

December 20, 1999: Light freezing rain fell in the deeper valleys of northern Connecticut, as rain fell into a shallow layer of below freezing air at the surface. The resultant light coating of ice formed "black ice" on many roadways, which caused many accidents. It was estimated that there were nearly one hundred accidents, mostly fender benders, throughout Hartford, Tolland, and Windham Counties as a result of the slick driving conditions.

November 26, 2000: Low pressure moving north up the mid Atlantic coast brought a period of light freezing rain to much of northern Connecticut. Ice accretion was under one quarter inch, but the freezing rain left black ice on roads, causing dozens of accidents at the end of the Thanksgiving weekend, usually a busy travel day. Temperatures warmed into the 40s by late morning, ending the danger of icing.

February 5, 2001: A major winter storm brought heavy snow and strong winds to northern Connecticut. The highest snowfall totals, between 12 and 24 inches, were reported in Hartford County. Totals of 12 to 18 inches were widely observed in Tolland and Windham Counties. Several minor accidents were attributed to the storm, and traffic in greater Hartford was brought to a standstill during the height of the storm. Several thousand electric customers were left without power.

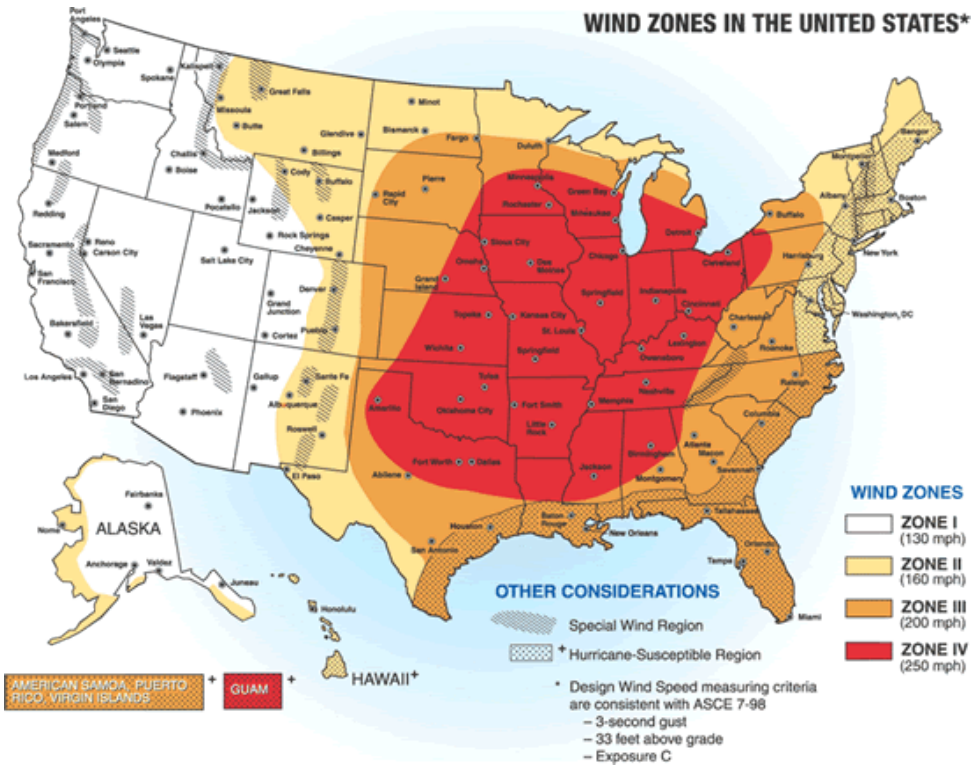
November 16, 2002: A major ice storm caused significant damage in north central Connecticut. There were numerous reports of downed trees, limbs, and power lines as a result of one-half to three quarters of an inch of icing. An estimated 100,000 customers in Hartford and Tolland Counties were left without power because of the storm. Damage was especially severe in western Hartford County, where entire communities such as Hartland, Granby, Simsbury, and Canton were left without power for as much as five days. Sections of Canton were completely isolated due to downed trees and wires, according to local police. The damage from the ice storm was compounded by high winds one day later. Gusts as high as 50 mph hampered the cleanup effort, downing more trees and branches which were weighted down by ice. Total damage from the storm in Hartford County was estimated at two million dollars. The damage was less severe in neighboring Tolland County, but there were still many reports of downed trees, limbs, and wires countywide. Total damage was estimated at half a million dollars.

January 8, 2005: Low pressure quickly strengthened as it passed south of New England and brought a mix of snow, sleet and freezing rain to much of interior southern New England. North central Connecticut was especially hard hit by freezing rain, where as much as one half inch of glaze brought down trees, tree limbs and power lines. There was no estimate of how many customers lost power, but dozens of accidents were reported as a result of icy roads.

March 8, 2005: Low pressure strengthened rapidly off the Delaware coast and tracked southeast of New England, bringing heavy snow and high winds to parts of northern Connecticut… Several highways, including Interstate 84, were described by state police as "barely passable" during the height of the storm. In Hartford, downtown streets were jammed with cars as many businesses and state offices closed early. Commuting times were doubled or tripled in many locations.

Despite their dangers, winter storms are a familiar part of life in New England, one that many residents would not do without. Towns are experienced in storm budgeting, cleanup, and management; most residents understand what to expect and are prepared for power outages. The majority of towns are prepared to open small shelters to accommodate those who cannot shelter in place. Businesses, schools, and local governments frequently close or operate on reduced hours to give cleanup efforts time to take effect. At the municipal level, some towns have begun putting their utility lines below ground to avoid loss of power during storms; others find such a path unaffordable

and politically untenable, and rely instead on voluntary tree-trimming programs to minimize power outages.



Source: FEMA: http://www.fema.gov/plan/prevent/saferoom/tsfs02_wind_zones.shtm

Wind Storms: Hurricanes and Tornadoes

Although less common than winter storms and regular flood events, wind storms (hurricanes and tornadoes) do affect even inland areas of Connecticut, including the Central region. These storms can be even more damaging than winter storms and floods; according to FEMA, nine of the twelve major disaster declarations affecting the state were for severe wind storms with flooding, including four hurricanes, two tornadoes, and a tropical storm.

According to FEMA, the entire state of Connecticut is in Wind Zone II, with the potential to see winds up to 160mph, and is a hurricane-susceptible region. Winds up to the maximum of 160 mph are quite rare in the state, however. Current building codes used throughout the state reflect this, requiring buildings to withstand a wind load of only 90-100 miles per hour.

According to Connecticut's 2007 Natural Hazards Mitigation Plan Update:

> Hurricanes have the greatest destructive potential of all natural disasters in Connecticut. A moderate Category II hurricane can be expected to make landfall in Connecticut once every ten

years. Based on the past frequency and intensity of hurricanes in the twentieth century, at least one major hurricane of Category III or IV may occur before 2040. Although winter storms cause more frequent coastal flooding and more annual damage, a single major hurricane (Category III or greater) can cause 3-10 times that amount of damage. (*CT 2007 Natural Hazard Mitigation Plan Update, pg. 2-10)*

THE SAFFIR-SIMPSON HURRICANE SCALE

The Saffir-Simpson Hurricane Scale is a 1-5 rating system based on the hurricane's intensity at a given time. This scale is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf in the landfall region. Note that all winds are using the U.S. 1-minute average.

Category One Hurricane:
Winds 74-95 mph (64-82 kt or 119-153 kph). Storm surge generally 4-5 ft above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs. Also, some coastal road flooding and minor pier damage. Hurricanes Allison of 1995 and Danny of 1997 were Category One hurricanes at peak intensity.

Category Two Hurricane:
Winds 96-110 mph (83-95 kt or 154-177 kph). Storm surge generally 6-8 feet above normal. Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane's center. Small craft in unprotected anchorages break moorings. Hurricane Bonnie of 1998 was a Category Two hurricane when it hit the North Carolina coast, and Hurricane Georges of 1998 was a Category Two Hurricane when it hit the Florida Keys and the Mississippi Gulf Coast.

Category Three Hurricane:
Winds 111-130 mph (96-113 kt or 178-209 kph). Storm surge generally 9-12 ft above normal. Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the hurricane's center. Flooding near the coast destroys smaller structures with larger structures damaged by battering of floating debris. Terrain continuously lower than 5 ft above mean sea level may be flooded inland 8 miles (13 km) or more. Evacuation of low-lying residences within several blocks of the shoreline may be required. Hurricanes Roxanne of 1995 and Fran of 1996 were Category Three hurricanes at landfall on the Yucatan Peninsula of Mexico and in North Carolina, respectively.

Category Four Hurricane:
Winds 131-155 mph (114-135 kt or 210-249 kph). Storm surge generally 13-18 ft above normal. More extensive curtainwall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut by rising water 3-5 hours before arrival of the hurricane's center. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as 6 miles (10 km). Hurricane Luis of 1995 was a Category Four hurricane while moving over the Leeward Islands. Hurricanes Felix and Opal of 1995 also reached Category Four status at peak intensity.

Category Five Hurricane:
Winds greater than 155 mph (135 kt or 249 kph). Storm surge generally greater than 18 ft above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the hurricane center. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required. Hurricane Mitch of 1998 was a Category Five hurricane at peak intensity over the western Caribbean. Hurricane Gilbert of 1988 was a Category Five hurricane at peak intensity and is the strongest Atlantic tropical cyclone of record. Hurricane Katrina in 2005 was a Category Five hurricane before it came on shore in the Gulf Coast states.

Source: State of CT 2007 Natural Hazards Mitigation Plan Update, pg. 2-8

Hurricanes in CT, 1938-2008

Year	Name	Category	Affected Area	Damage
1938	N/A	3	central	125 dead, $53 million (1938 dollars) in damage
1944	N/A		whole state	7 dead, $3 to 5 million dollars (1944 dollars)
1954	Carol		southeastern CT	0 dead, $53 million (1938 dollars)
1955	Connie		whole state	with Diane, 70 deaths, massive flooding, State declared disaster area, no drinking water, 14 towns classified health hazards, $300 million (1955 dollars) in damages
1955	Diane		whole state	with Connie, 70 deaths, massive flooding, State declared disaster area, no drinking water, 14 towns classified health hazards, $300 million (1955 dollars) in damages
1976	Belle	1	coastal	5 dead, some minor damage
1985	Gloria	2	southwestern CT	power outages & downed trees, little flooding
1991	Bob	2	RI, CT, MA	light
1991	Grace		shoreline from Maine to New Jersey	shoreline damage
1999	Floyd	Trop. Storm	western / central	$2.2 million; 418 buildings affected
2008	Hanna	Trop. Storm	southwestern CT	1 dead, $32,000 in damages

Source: State of CT 2007 Natural Hazard Mitigation Plan Update, pgs. 2-6 to 2-9; National Climatic Data Center's Storm Events database

The state has seen at least 11 hurricanes (of various intensities, including tropical storms) since 1938. These storms are estimated to have killed at least 208 people, injured thousands, and done hundreds of millions of dollars worth of damages.

Central Connecticut is protected from the worst effects of hurricanes (the storm surge) by its inland location. As storm surge prevents waterways from draining, however, the torrential rains often associated with hurricanes can cause severe flooding in the region, while strong winds knock down tree limbs and cause power outages. Tropical Storm Floyd, for example, dropped an average of four to eight inches of rain across the State, flooding 25 to 30 homes in Southington, which received rainfall on the order of a 250-year event. Plainville and Bristol also saw many homes flooded as a result of this storm. Sixteen buildings in the state were utterly destroyed by the storm (CT 2007 Natural Hazard Mitigation Plan Update, pg. 2-7 & 2-9).

Analysis in HAZUS-MH shows that hurricanes do have potential to visit not-inconsiderable damage upon the region, but that damage is estimated to be less than the towns would see from severe flooding. A 500-year storm is projected to do serious damage, especially in more built-up communities where building and infrastructure proximity increases the potential for destruction from damaging winds and fires resulting from severed utility connections. Strategies such as putting

HAZUS-MH results for Hurricanes, by town

	Damage to buildings, 100 year storm (millions)	Damage to buildings, 500 year storm (millions)
Berlin	$ 9.4	$ 87.6
Bristol	$ 22.0	$ 153.3
Burlington	$ 1.9	$ 11.1
New Britain	$ 34.6	$ 225.2
Plainville	$ 8.1	$ 71.9
Plymouth	$ 3.3	$ 24.9
Southington	$ 17.8	$ 163.2
REGION	$ 97.0	$ 737.2

utilities below ground and trimming trees that overhang power lines can help alleviate the worst effects that the Central region sees from high-wind storms.

Tornadoes occur less frequently than hurricanes. Between 1950 and 2003, the state experienced 81 tornadoes, in the months from April to October. The storms caused roughly $590 million in damages, killed at least 7 people and injured another 700 (CT 2007 Natural Hazards Mitigation Plan Update, pg. 2-26). According to the state Hazard Mitigation Plan,

> The pattern of occurrence and locations for tornadoes in Connecticut is expected to remain unchanged in the 21st Century. The highest risk for tornadoes is expected in New Haven and Hartford Counties. The second area of moderate to high risk is in Fairfield and New Haven Counties. The Counties of Middlesex, Tolland and Windham have a moderate risk and the County of New London can expect a low risk. (*CT 2007 Natural Hazards Mitigation Plan Update, pg. 2-27)*

Fortunately, it is rare for the state to see a very strong tornado. Of the tornadoes that occurred in the state between 1950 and 2008, 92% were less than an F3. Only 2 tornadoes since 1950 were rated F4, and none stronger. The state averages approximately three tornadoes every two years.

Three tornadoes have touched down within the Central Connecticut Region in the past 60 years. On September 24, 1942, a tornado touched down in Plainville, destroying a church. In 1962, an F3 tornado killed one person, injured 50 more, and completely destroyed over 200 buildings in Southington and Waterbury. On July 21, 2010, the region saw its third touchdown: an EF1 tornado whose winds and hail affected five of the region's towns touched down briefly in Bristol and Plymouth.

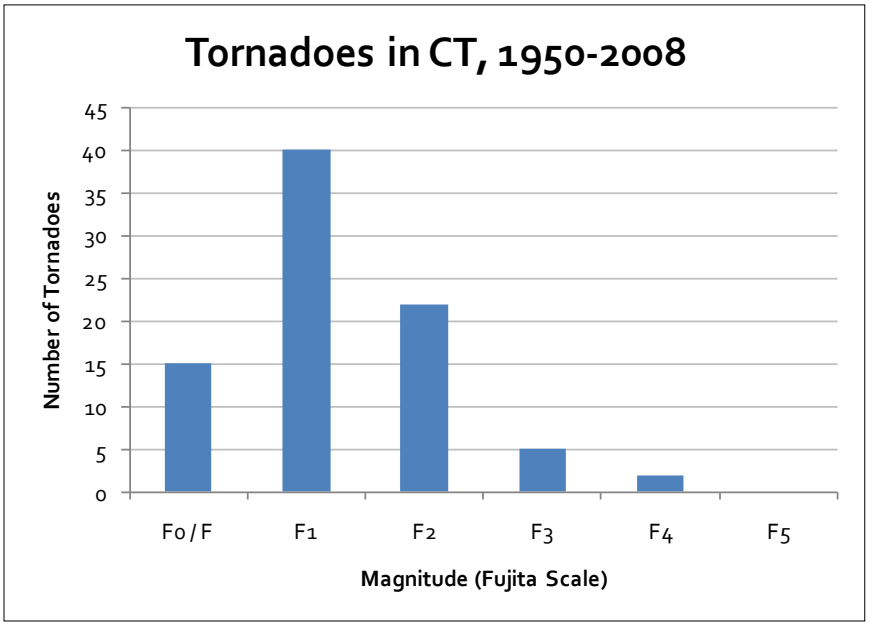
In Bristol, the tornado incurred more than $550,000 in damages, uprooting sizeable trees and twisting off the tops of others, and leaving many residents without power. In Plymouth, the storm left approximately 880 locations without power, and resulted in multiple road and business closures. Neighboring towns also experienced high winds, trees knocked down, power outages, and hail up to one inch in diameter.

Enhanced Fujita Scale

Fujita Scale			Enhanced Fujita	
F Number	Fastest 1/4 mile (mph)	3 Second Gust (mph)*	**EF Number**	**3 second Gust (mph)**
0	40-72	45-78	**0**	**65-85**
1	73-112	79-117	**1**	**86-110**
2	113-157	118-161	**2**	**111-135**
3	158-207	162-209	**3**	**136-165**
4	208-260	210-261	**4**	**166-200**
5	261-318	262-317	**5**	**Over 200**

* 3-second gust numbers have been rounded
Source: National Oceanic and Atmospheric Administration website: http://www.spc.noaa.gov/faq/tornado/ef-scale.html, accessed 9/10/09.

A few tornadoes have touched down just beyond the limits of the region. Between 1962 and 2001, tornadoes touched down in Torrington, Avon, Watertown, Thomaston, Waterbury, and Wolcott. In 1979, an F4 tornado touched down in Windsor Locks, about 30 miles northeast of the region, in Hartford County. The storm destroyed 12 homes, killed 2 people, injured 10 others, and ultimately did an estimated $214 million in damages.



While Connecticut clearly faces some risk from tornadoes, the nature of the storms makes them unpredictable and near-impossible to defend against. While property destruction may be unavoidable, loss of life can be minimized through efficient, coordinated response.

Drought

History of Drought in Connectict's Central Climate Division, 1901-2003

Drought Periods	Duration	Lowest PDSI* (Palmer Drought Severity Index)
1/1901 - 2/1901	2 months	-3.97 in 2/1901
11/1909 - 12/1909	2 months	-3.28 in 12/1909
4/1910 - 9/1911	18 months	-5.20 in 5/1911
9/1912 - 2/1913	6 months	-3.66 in 11/1912
7/1913 - 9/1913	3 months	-3.97 in 8/1913
9/1914 - 12/1914	4 months	-3.62 in 11/1914
4/1915 - 6/1915	3 months	-3.98 in 6/1915
11/1924 - 6/1925	8 months	-4.01 in 4/1925
11/1929 - 4/1931	18 months	-4.77 in 9/1930
10/1931 - 2/1932	5 months	-4.35 in 12/1931
4/1932 - 7/1932	4 months	-3.41 in 5/1932
11/1949 - 1/1950	3 months	-3.52 in 12/1949
7/1957 - 11/1957	5 months	-3.68 in 9/1957
9/1964 - 1/1965	5 months	-4.01 in 11/1964
3/1965 - 10/1966	20 months	-4.40 in 8/1966
1/1967 - 2/1967	2 months	-3.17 in 2/1967
2/2002 - 4/2002	3 months	-3.28 in 2/2002

**PDSI ranges from -6 (severe drought) to 6 (extremely wet)*

Source: *Northeast Regional Climate Center*

Although flooding is the number one natural hazard affecting the Central Connecticut Region, the region is still susceptible to drought. According to the Northeast Regional Climate Center, Connecticut's central climate division (which includes the Central Connecticut Region) experienced 17 droughts between 1900 and 2003. Notable droughts in the area occurred in 1910-1911, from 1929-1932 (during the "dust bowl" years of the early thirties), and from 19641966 (see table, next page).

Drought impacts are typically felt through economic and environmental consequences rather than as direct risks to life and property. The three kinds of droughts (meteorological, hydrological, and agricultural) have impacts of varying degrees. Meteorological droughts are statistical in nature: they

encompass any period where precipitation is below normal. Hydrological droughts cause surface and subsurface waters to dip below typical levels, while agricultural droughts cause crop failure when there is insufficient water to support growth.

The State of Connecticut has a Drought Preparedness Plan, prepared in 2003 by an Interagency Drought Work Group, and accepted by the Connecticut Water Planning Council. (A copy of the plan can be accessed here: http://www.drought.state.ct.us/drtwkpln.pdf) The plan outlines four drought stages and the state-level responses (including advisories, conservation strategies, monitoring, and other actions) for each stage, as well as post-drought actions to be taken.

The Central Connecticut Region does not experience a higher risk for drought than the rest of the state.

Wildfires

Fire risk in the region is also roughly the same as in the rest of the state. Within the region, some towns experience a greater risk of wildfire than others, as a result of differing amounts of forest from town to town. Many of the region's towns are home to tracts of forested land owned by water utility companies; Burlington has by far the most acreage so owned, and is also home to the Nassahegan State Forest. As a result, Burlington's fire risk is somewhat higher than the other towns'. Staff in Burlington did not identify wildfire as a hazard of particular concern, however.

Connecticut experiences three distinct fire seasons: from mid-March to mid-May, prior to leaf-out, when fuels such as grasses, dead leaves, branches and twigs on the forest floor are dried out by the sun; from mid-May to mid-September, depending on precipitation; and from October until the first snowfall, when dead leaves collect on the forest floor. Differences in available fuel and conditions lend different characteristics to fires in different seasons: spring and fall fires tend to spread quickly, burning through readily-available fuels on the surface of the forest floor and causing little long-term damage; summer fires burn deeper into the ground and tend to spread less quickly and be more difficult to suppress. Summer fires are the most destructive to vegetation.

The Division of Forestry at CT DEP issues forest fire danger ratings (low, moderate, high, very high, and extreme) throughout the three fire seasons, with daily advisories during the spring season. According to DEP's website:

> Connecticut traditionally experiences high forest fire danger in the Spring from mid-March through May. DEP's Division of Forestry constantly monitors the danger of forest fire to help protect Connecticut's 1.8 million acres of forested land. Throughout the Spring forest fire season, DEP sends daily advisories on forest fire danger levels to DEP's state park forest field staff, municipalities, fire departments and the media. Forest fire danger levels are classified at low, moderate, high, very high or extreme. In an average year approximately 1,300 acres of Connecticut woodland are scorched by forest fires.

In the last 15 years, a handful of fires have occurred in the Central Connecticut Region. Statewide droughts in 1999 and 1995 resulted in fires in the region and in other locations in the state. A few fires from the Central Connecticut region were reported on in the *Hartford Courant*:

> **September, 1995:** During a drought, a blaze started in Southington that would burn over 25 acres of land for 3 days before being contained. No homes or businesses were affected.
>
> **August, 1999:** A forest fire burned over 18 acres of woodland along the Berlin/Meriden border for 7 days before being extinguished. The Berlin Fire Chief suspected that the blaze originated from a campfire. No homes or businesses were affected.
>
> **November, 1999:** A blaze on water company land in Burlington and Harwinton burned for 2 days and ranged over 110 acres, 80% of which were in Burlington. The blaze did not threaten any homes or businesses.

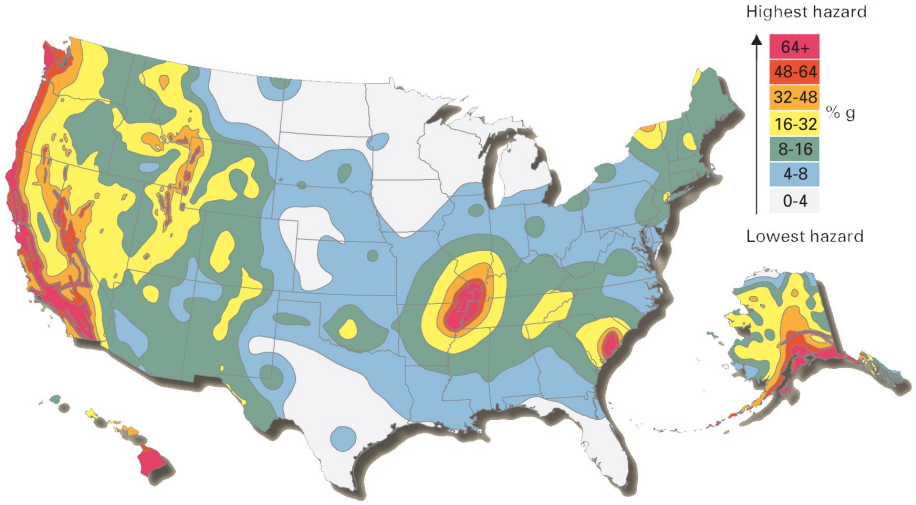
Earthquakes

According to the U.S. Geological Survey (USGS), Connecticut is in an area of moderate to low risk for earthquakes. Historically, the state saw 136 earthquakes between 1938 and 2009, all of which had Richter Scale magnitudes of less than 4 (see graph and table on following page). Earthquakes felt in the state often originate elsewhere; soft soils and filled wetlands conduct energy better than bedrock, and create instances where earthquakes with their centers in upstate New York, New Hampshire, and Massachusetts make themselves felt in Connecticut.

The seismic hazard for the state is generally low. According to USGS, Central Connecticut has a 2% chance of seeing an earthquake with peak ground acceleration exceeding 8-10% of gravity in 50 years (corresponding to a return period for an earthquake of this intensity of over 2,000 years). An earthquake in exceedance of 10% of gravity is generally considered one that would damage older dwellings and those not resistant to earthquakes. The strongest earthquake in Connecticut history occurred in East Haddam in 1791, and is recorded with intensity VII (see chart, previous page). According to USGS, the earthquake, which was felt in Boston and New York City, caused stone walls and chimney tops to fall, and latched doors to open.

2008 United States National Seismic Hazard Maps

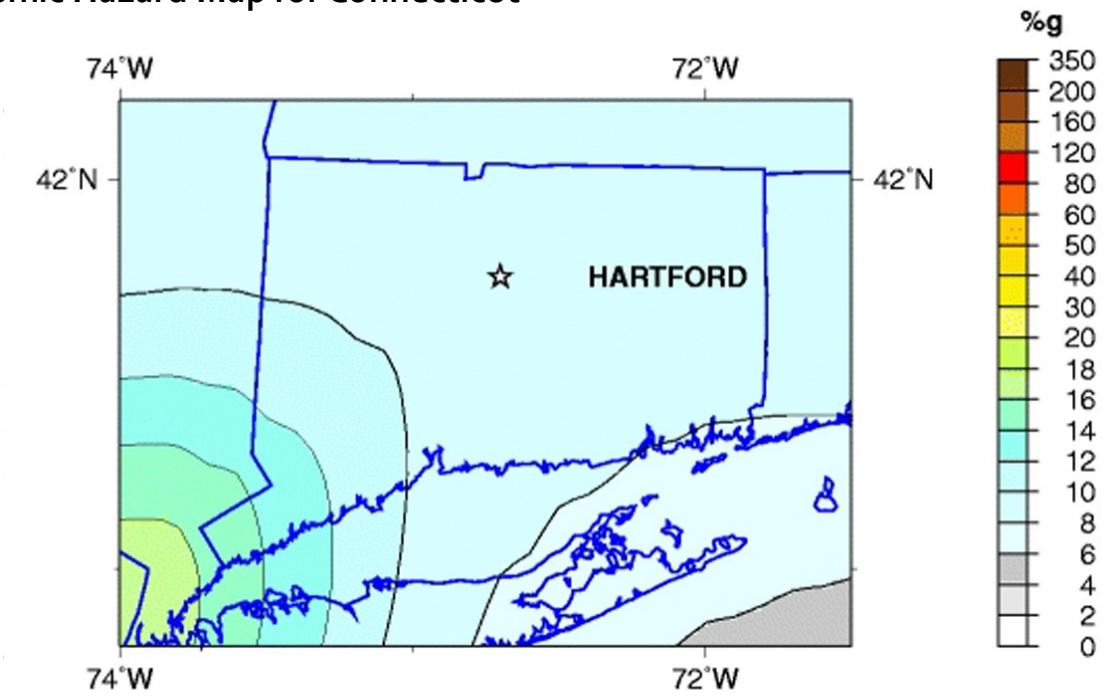
The U.S. Geological Survey's National Seismic Hazard Maps are the basis for seismic design provisions of building codes, insurance rate structures, earthquake loss studies, retrofit priorities, and land-use planning. Incorporating these hazard maps into designs of buildings, bridges, highways, and critical infrastructure allows these structures to withstand earthquake shaking without collapse. Properly engineered designs not only save lives, but also reduce disruption to critical activities following a damaging event. By estimating the likely shaking for a given area, the maps also help engineers avoid costs from over-design for unlikely levels of ground motion.



*Colors on this map show the levels of horizontal shaking that have a 2-in-100 chance of being exceeded in a 50-year period. Shaking is expressed as a percentage of **g** (**g** is the acceleration of a falling object due to gravity).*

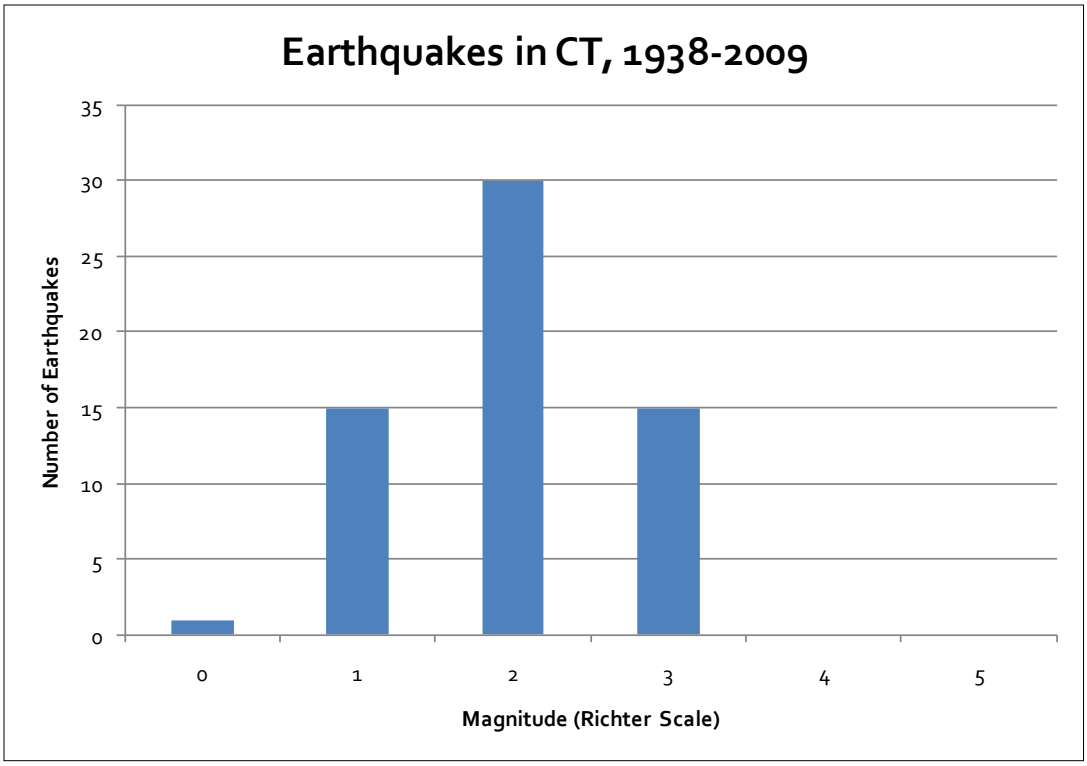
Source: USGS Fact Sheet 2008-3018, downloaded from http://pubs.usgs.gov/fs/2008/3018/pdf/FS08-3018_508.pdf on 1/7/2009.

Seismic Hazard Map for Connecticut



Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary
National Seismic Hazard Mapping Project (2008)

Source: USGS 2008 National Seismic Hazard Mapping Project. Map downloaded from: http://earthquake.usgs.gov/earthquakes/states/connecticut/hazards.php 1/13/10.



Source: Weston Observatory at Boston College

Earthquake Magnitudes and Intensities

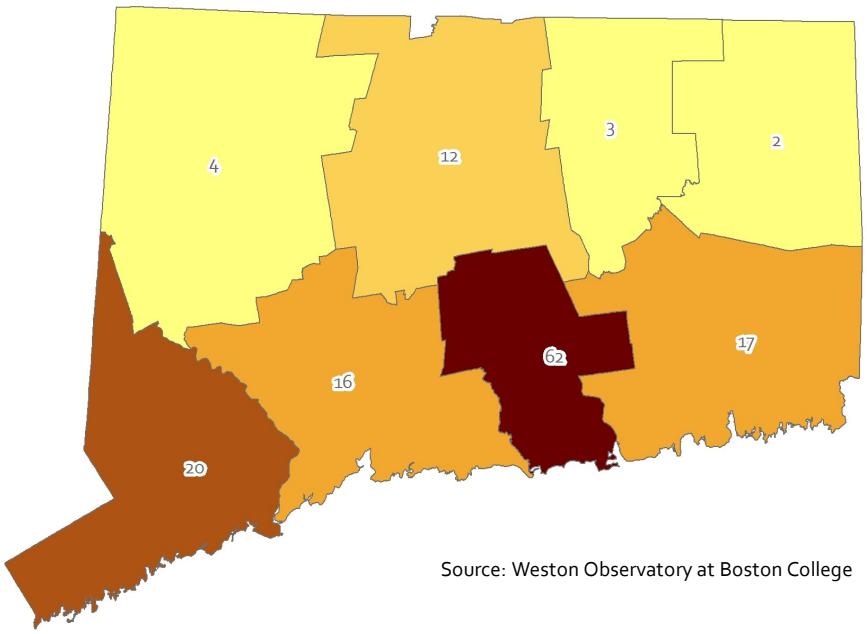
Magnitude (Richter Scale)	Intensity	Impact
1.0 - 3.0	I	Not felt except by a very few.
3.0 - 3.9	II - III	Felt by a few people; especially noticable indoors; similar to vibrations from a passing truck.
4.0 - 4.9	IV - V	Felt by almost everyone indoors, some outdoors; dishes and other objects disturbed or broken; cars shake; unstable objects overturned.
5.0 - 5.9	VI - VII	Felt by all; heavy furniture moved; slight to moderate damage in well-built structures; some chimneys broken.
6.0 - 6.8	VII - IX	Considerable damage to most masonry strucutres; buildings shifted off foundations; heavy furniture overturned, chimneys fall.
7.0 and higher	VIII or higher	Considerable to total damage to masonry and wood structures; bridges may collapse; possible distortion of lines of sight and level.

Source: USGS Magnitude/Intensity Comparison: http://earthquake.usgs.gov/learning/topics/mag_vs_int.php

Intensities based on Modified Mercalli Intensity Scale.

Earthquakes that have been reported in Connecticut have most frequently occurred in the southern half of the state (see "Earthquakes in CT, 1938-2009" map, previous page). Central Connecticut infrequently sees earthquakes. Of the towns in the region, New Britain would have the highest risk from earthquakes, simply because its buildings and infrastructure are tightly packed and many structures may have been erected before seismic impacts were incorporated into the state building code in 1992. However, due to a variety of factors including distance from fault lines, building types, and settlement patterns, risk to the region in general from earthquake damage is quite small.

Earthquakes in CT, 1938-2009



Source: Weston Observatory at Boston College

A HAZUS-MH analysis (see table, below) of the region's seven towns confirmed this small risk. For earthquakes of magnitude 5 or less, the analysis showed no direct economic loss in the form of structural or non-structural damage in any of the towns. At magnitude 6.5, all towns showed some damage to buildings, with all towns but Burlington projected to see losses to buildings in the millions. As Connecticut has never in recorded history seen an earthquake in excess of magnitude 3, the threat of a 6.5 earthquake striking the state is acceptably low.

HAZUS-MH results for Earthquakes, by town

	Damage to buildings, 5.0 magnitude (millions)	Damage to buildings, 6.5 magnitude (millions)
Berlin	$ -	$ 2.3
Bristol	$ -	$ 6.3
Burlington	$ -	$ 0.7
New Britain	$ -	$ 7.2
Plainville	$ -	$ 2.2
Plymouth	$ -	$ 1.2
Southington	$ -	$ 4.3
REGION	$ -	$ 24.2

Municipal Mitigation Goals, Objectives, and Strategies

While the risks from natural hazards confronting the seven municipalities of Central Connecticut may be largely similar, priorities, concerns, economic constraints, and capacity vary from town to town. Each town has a unique history and set of circumstances that dictate best practices; accordingly, space in this section is dedicated to review of hazard impacts in each town, accompanied by a profile of each town's current mitigation actions and goals, objectives, and strategies. Strategies were prioritized according to a variation on the STAPLEE criteria; each strategy was given a score of 1 to 3 (low to high) on each of the following criteria: social acceptability, technical feasibility, administrative feasibility, potential mitigation impact, legality, economic feasibility, and environmental responsibility. Strategies that achieved a cumulative score of 18 or higher qualified as "high" priority.

Berlin

Berlin is a primarily suburban community in the southeast corner of the region that boasts large rural areas. The town features mainly decentralized development, with a large retail strip flanking Rte 5/15 and three small village centers. With slightly more than 18,000 residents living on its 26 square miles in 2000, Berlin had a population density of 675 persons per square mile, slightly higher than the state as a whole. Median age in the town is 43, and 84% of the housing is single-family.

The Town's Plan of Conservation and Development reveals a strong concern for preserving the character of the community, with calls for preserving and protecting ridgelines, open meadows and fields, woodlands and forests, wetlands, watercourses, and flood hazard areas. The Plan also emphasizes smart growth principles, and establishes a service boundary for the town, beyond which sewer, water, and other municipal services are not extended.

Challenges

Berlin experiences recurrent flooding throughout the town, with regular, localized flooding at a handful of known locations 4-5 times per year. During larger events, floodwaters can divide the town into sections, separating the population centers of Kensington and East Berlin from Berlin. This complicates both evacuation and sheltering in emergencies. The Physical Services building complex floods during major events, to the point that staff remove low file drawers and place them on top of tables at the end of the day if very heavy rains are expected. Lately, concern has arisen in the town about the municipal storm water policy. Current policy requires flood-proofing and on-site water storage for properties within flood zones, but does not address the problem comprehensively, from a hydrological systems perspective. In interviews, several individuals from the town questioned whether a more systematic approach would go further in lessening the severity and frequency of floods.

The rupture of the Kenmere Dam in 1987 alerted Berlin to the potential risks it faces from its dams. Eight to ten dams affect the town of Berlin, and six category C dams lie within the town's boundaries. The 1987 failure loosed 80 million gallons of water into the town; because of the dam's location, most of this water inundated a golf course. Had the dam been situated differently, however, the outcome could have been far worse—a fact not lost on town staff, who are working on a Dam Breakage Emergency Response Plan.

Berlin also faces the usual challenges during winter storms; ice and snow make roads impassable, knock down tree limbs, and disrupt utility service. The combined effect leaves people stranded in their homes, potentially without heat or power. Removal of the ice and snow from Berlin's town-owned roads is handled by a combination of town workers and contractors; the town also handles debris removal.

Current Mitigation and Response Activities

- Berlin has flood control regulations in place that limit the type of development that may occur in the flood zone. Regulations also stipulate use of flood-resistant materials, flood-proofing, required elevation for buildings' lowest floors, and on-site water storage.
- The town is preparing a Dam Breakage Emergency Response Plan.
- During floods, the town uses sandbags to control flood waters, and evacuates people with homes in known flooding locations, including: sections of Farmington Avenue, residences

on Lower Lane, properties on Norton Road between the two schools, Massirio Drive, and the east side of New Britain Road.

- The town has an open space acquisition program, although it does not specifically target wetlands or flood-prone properties. It also encourages low-impact development.
- Berlin uses a reverse 911 system for emergency notifications, in combination with TV and radio announcements.
- Berlin does annual inspection and cleaning of its culverts.
- The town participates in the National Flood Insurance Program, and has begun mitigating its Repetitive Loss Properties: a single-family house at 79 Massirio Drive has been removed and the parcel is now vacant.
- The town participates in DEMHS Region 3 and follows its Regional Emergency Support Plan.

Goals, Objectives, and Strategies

Goal: reduce losses of life and property, and minimize economic consequences of natural hazards.

Objective 1: Update town policies and plans to encourage sound practices

	Strategy	Priority	Lead	Hazard
S1	Target wetland or flood plain properties for open space acquisition	High	Planning, Conservation Commission	Flooding
S2	Complete the Dam Breakage Emergency Plan	High	Planning	Dam Failure
S3	Revise subdivision / zoning code to offer incentives for low-impact	Medium	Planning	Flooding
S4	Conduct comprehensive study of storm-water issues across town; examine benefits (if any) of developing a strategic (rather than piecemeal) storm-water management plan	Medium	Planning, Public Works	Flooding

Objective 2: Ensure access to critical facilities

	Strategy	Priority	Lead	Hazard
S1	Relocate Physical Services building complex to higher ground	Medium	Public Works	Flooding

Objective 3: Improve capacity to deal with hazards by investing in necessary equipment & training

	Strategy	Priority	Lead	Hazard
S1	Acquire generators and shelter supplies to equip multiple shelters	High	Emergency Management	Winter Storms
S2	Improve coordination and efficiency by periodically exercising and evaluating response plans	High	Emergency Management	All
S3	Take advantage of regional WebEOC training as necessary	High	Emergency Management	All
S4	Invest in a sandbag loader, sandbags, and sand to help manage recurrent flooding	Medium	Public Works	Flooding
S5	Purchase chainsaws and a wood chipper to expedite removal of downed trees and other debris	Medium	Public Works	Winter Storms

Objective 4: Enable residents to better help themselves through preparedness education

	Strategy	Priority	Lead	Hazard
S1	Develop & distribute a pamphlet about household preparedness for natural hazards; postpdf of pamphlet on town website	High	Emergency Management, Staff	All
S2	Publish evacuation plan on town website	High	Emergency Management	All
S3	Encourage preparedness workshops in schools	High	Emergency Management	All

Objective 5: Continue Participation in National Flood Insurance Program

	Strategy	Priority	Lead	Hazard
S1	Continue enforcement of floodplain management ordinances by regulating all new and substantially improved construction in flood zones	High	Planning	Flooding
S2	Work with FEMA to update FIRMs as necessary	High	Planning, Public Works	Flooding
S3	Continue to distribute information about the NFIP to homeowners	High	Planning	Flooding
S4	Continue to assist homeowners with amendments to NFIP maps as necessary	High	Planning	Flooding

Contributors

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Bristol

One of two cities in the region, Bristol serves as a transportation nexus for the outlying towns in the region. Major arterial roads (state routes 72, 6, and 69) provide interstate access for the towns of Burlington and Plymouth, while commercial development along Rte 6 makes Bristol a regional shopping destination. While the city's economic base was traditionally manufacturing and industry, today it is working to diversify while preserving and repurposing its richly historic building stock.

With 60,062 people living within its 26.8 square miles in 2000, Bristol was the second most dense municipality in the region, with 2,241 people per square mile. Correspondingly, there is greater variation in housing type—only 57.5% of housing in the city is single-family. Median age in Bristol is on par with the state as a whole at 40,and while the city is aging, it is not doing so as quickly as the more suburban towns in the region; by 2030 the Department of Transportation expects to see only a 36% increase in the number of residents aged 60 and older.

Challenges

Winter storms are the biggest natural hazard concerns for the City of Bristol. Snow and ice removal can become quite expensive, exceeding municipal budgets. The City handles plowing on its own roads and, when required, assists in keeping traffic moving on State Rte 6, a road which is vital to the region but of relatively low priority for the Department of Transportation. When the State cannot clear Rte 6 in a reasonable amount of time and the police department requests assistance, City forces will handle snow and ice removal along the state road. Higher elevations in the City have more trouble with snow and ice; generally, major thoroughfares and routes to the hospital are tended to first, followed by higher elevation areas.

The City also has the usual trouble with tree limbs downed by snow and ice; these take out power lines, block roads, and can leave people without electricity, heat, or communication lines when

they are already isolated. Burying power lines would alleviate these problems, but is prohibitively expensive on a citywide basis. The city's subdivision regulations state that utility lines will be bured wherever feasible, but there are no plans to bury older infrastructure.

Flooding is also a concern in the City; the Pequabuck River snakes directly through the downtown, with a number of old buildings built straddling the watercourse. Copper Mine Brook, on the east side of Bristol, floods frequently as well. At the confluence of the water bodies, where Copper Mine Brook empties into the Pequabuck, an existing railroad bridge causes flooding problems—the 3' high girders of the bridge act as a restricting dam, impounding water until the flow is sufficient to overtop the girders. This is a known problem, but high replacement costs and railroad ownership of the bridge prevent the City from taking action and replacing it. There are also issues with culvert capacity, although the City has worked to improve a number of culverts. Flooding can back up the sewer system; the City is currently working on a $13.5 million Sanitary Sewer Overflow Elimination project to address the problem, in addition to a phased Infiltration and Inflow Reduction project. The city has several flood control projects in the works that were identified in the Copper Mine Brook Drainage Evaluation document that may assist in mitigating the impacts of flooding on many of its repetitive loss properties. The projects require work on private property; the City is in the process of applying for funding to do the work.

Finally, the City's shelters are undersupplied and have not been used in the past 25 years. The majority of people in Bristol—as in other towns—shelter at home for winter storms, preferring to stay in place than travel about. In flood situations, the City finds that it is rarely confronted with need sufficient to merit opening shelters (even if they were fully equipped), noting that it is more cost-effective to put individuals up in local motels than to open the shelter for a handful of people.

Current Mitigation and Response Activities

- Flood Control Regulations limit the type of development that may occur in the flood plain, and require flood-proofing and on-site water storage.
- Uses NIMS to establish lead agency in a disaster
- The city's subdivision regulations authorize the Planning Commission to require that up to 15% of the land in a proposed subdivision be set aside for open space. The city's zoning regulations include provisions for an Open Space Development Zone, which requires, in

return for reducing minimum lot sizes or clustering dwelling units, the preservation of at least 25% of the land as open space.

- The City's subdivision regulations state that, wherever feasible, utilitiy lines shall be placed underground. Nearly every new subdivision since the mid 1990s has had underground utility lines.
- The City has an evacuation plan which is documented within its shelter plan; evacuation routes are not signed.
- The City is engaged in a $13.5 million Sanitary Sewer Overflow Elimination project as well as a phased Infiltration and Inflow Reduction project.
- Fire Department notifies residents of flood-prone areas when water levels begin to rise.
- Procedures outlined in the Emergency Operations Plan are tested periodically.
- The City participates in the statewide reverse-911 system
- Uses WebEOC to stay abreast of developments across the state
- The City participates in the National Flood Insurance Program.
- Bristol Hospital (a private hospital) has backup generators and is self-sufficient; hospital access roads are plowed first during winter storm events.
- The City provides extensive preparedness education information on its website.
- The City participates in DEMHS Region 3 and follows their Regional Emergency Support Plan.

Goals, Objectives, and Strategies

Goal: reduce losses of life and property, and minimize economic consequences of natural hazards.

Objective 1: Improve City's capacity to deal with hazards by investing in necessary equipment & training

	Strategy	Priority	Lead	Hazard
S1	Invest in supplies sufficient to stock existing shelter for a major mass care event	Medium	Emergency Management	Winter Storms

Objective 2: Improve infrastructure to minimize flooding impacts

	Strategy	Priority	Lead	Hazard
S1	Increase capacity of culverts where necessary; encourage private property owners to improve capacity of culverts on private land where necessary	High	Public Works	Flooding
S2	Improve city sewer system to prevent sewer backups during flood events	Medium	Public Works	Flooding
S3	Replace railroad bridge where Copper Mine Creek empties into the Pequabuck River (requires railroad cooperation)	Medium	Public Works	Flooding

Objective 3: Build upon existing preparedness education efforts

	Strategy	Priority	Lead	Hazard
S1	Encourage preparedness workshops in schools	High	Emergency Management	All
S2	Consider posting signs along evacuation routes to raise public awareness	High	Emergency Management	All

Objective 4: Continue participation in National Flood Insurance Program

	Strategy	Priority	Lead	Hazard
S1	Continue enforcement of floodplain management ordinances by regulating all new and substantially improved construction in flood zones	High	Inland Wetlands & Watercourses Commission	Flooding
S2	Work with FEMA to update FIRMs as necessary	High	Public Works, Inland Wetlands & Watercourses Commission	Flooding
S3	Continue to distribute information about the NFIP to homeowners	High	Inland Wetlands & Watercourses Commission	Flooding
S4	Continue to assist homeowners with amendments to NFIP maps as necessary	High	Inland Wetlands & Watercourses Commission	Flooding

Contributors

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Burlington

Burlington is by far the most rural town in the region, with hundreds of acres of protected State Forest and water company lands. Miles of recreational trails cross its woods, while reservoirs in the town are key elements of the public water supply for nearby New Britain. The town's natural setting is prized by its residents, who are few in number; with 8,190 residents in the 30.4 square mile town in 2000, Burlington had a population density of 269 people per square mile.

In 1996 Burlington was ranked the fastest-growing town in Connecticut, and it is projected to grow in coming decades. The Department of Transportation anticipates 3.3% increase in population by 2030—a slightly smaller increase than in the region as a whole. Burlington is also projected to see an 84% increase in number of residents aged 60 and older by 2030. This increase would move the town's population from 18.7% aged 60 and older in 2000 to 32.1% in 2030.

Challenges

Flooding and winter storms both present challenges for Burlington, although those challenges are not uniform across the town. Situated at the edge of the Western Highlands, Burlington experiences large changes in elevation that result in different weather patterns in different areas of town. When the northwest corner of town, elevation of roughly 1100' above sea level, gets a foot of snow, the southeast corner (at 600') might only see an inch or two. The Farmington River makes a loop through the northeast corner of the town, where elevations are low, before heading into Farmington to the east.

Flooding problems in Burlington arise in two main areas: along the brooks that feed into the Farmington River from the northwest, and in the Whigville area, in the southeast. Flooding in both areas impacts residences as well as town infrastructure. Many of the flooding problems involve infrastructural damage arising from a storm in October 2005 which inundated the town with 16" of

rain over the course of 5 days. The storm washed out a number of roads and bridges, and overwhelmed culverts throughout the town. Damage from the storm is still widespread; notable locations include:

- Upson Road: the road was washed out during the 2005 storm. Culverts need to be enlarged.
- Foote Road: Bunnell Brook needs a berm or a larger channel in this area; every time it rains, it floods the recreation facility next to it. 2 FEMA claims were submitted regarding brook modifications in 2005/2006.
- Corey & Hotchkiss Roads: a bridge over Bunnell Brook washed out during the 2005 storm.
- Main Street (in Whigville): a bridge over the Whigville Brook washed out in 2005. The town made temporary repairs in order to reopen the bridge, but permanent repairs need to be made.
- Prospect Street (in Whigville): a bridge over Whigville Brook washed out in 2005 and remained closed for a year. The town made temporary repairs to reopen the bridge, but permanent repairs are still needed.

Other flooding problems in the town arise from persistent conflicts with beavers, which build dams inside culverts and obstruct the flow. The dams can result in surprising problems including landslides, undermined bridges, and road collapses. The culvert at Scoville Road needs to be replaced, partially due to damage from beavers; in heavy rains the road floods and must be closed. The town works to install beaver-proof grates in as many culverts as it can, and clears out debris from the beavers before large storms in order to prevent flooding.

Winter storms also pose challenges for Burlington. The town handles all of its own snow and ice removal without relying on contractors. The topography of the town means that some areas may be inundated with snow and ice while others are barely affected by the same storm. Although zoning regulations require all new construction (since 2005) to bury utility lines, older homes still have above-ground wires, and power is disrupted by fallen tree limbs in Burlington as in the other towns in the Region.

Because of its extensive wooded areas, Burlington experiences a somewhat greater risk of wildfires than do the other towns in the Region.

Current Mitigation and Response Activities

- All new construction (since 2005) must have underground wires for electricity per the zoning regulations; older infrastructure has not been buried
- DEP monitors dams
- Wetlands areas protected since 1970s
- Flood plain regulations limit development within the flood plain
- All schools in town are Red Cross approved shelters and are equipped with generators.
- Town Hall is an emergency warming / cooling center, also has a generator.
- Town uses a reverse-911 notification system for emergencies. Emergency Management also has permission to use the school system notification service and to post emergency messages on the variable-message sign at the High School; this will be possible when the correct software is obtained and installed. The Town received a $40,000 grant to purchase a second sign to be installed on Rte 4 by Town Hall, but cannot install the sign until they receive a zoning variance.
- Key individuals are trained in WebEOC; EMD is hoping to train more in the future.
- The Town participates in the National Flood Insurance Program.

Goals, Objectives, Strategies

Goal: reduce losses of life and property, and minimize economic consequences of natural hazards.

Objective 1: Improve citizen awareness, preparedness, and response time through education

	Strategy	Priority	Lead	Hazard
S1	Develop & distribute a pamphlet about household preparedness & town emergency response services	High	Emergency Management	All
S2	Encourage preparedness workshops in schools	High	Emergency Management	All
S3	Publish preparedness pamphlet and evacuation plan on town website	High	Emergency Management	All
S4	Offer low-cost or no-cost town-wide CPR training	Medium	Emergency Management	All

Objective 2: Improve town infrastructure to better handle hazards

	Strategy	Priority	Lead	Hazard
S1	Upgrade culverts on Upson and Scoville Roads	High	Highway Department	Flooding
S2	Replace culvert on Alto Road at the intersection of Brookside Drive	High	Highway Department	Flooding
S3	Repair/replace bridges as necessary at Prospect Street, Main Street, and the intersection of Covey & Hotchkiss Roads	High	Highway Department	Flooding
S4	Beaver-proof culverts where possible	High	Highway Department	Flooding
S5	Look at widening channel of Bunnell Brook near Foote Road	High	Highway Department	Flooding
S6	Examine possibility of burying older electrical infrastructure in order to curtail disruptions in service	Medium	Highway Department	Winter Storms, Wind Storms

Objective 3: Improve town communications capacities

	Strategy	Priority	Lead	Hazard
S1	Upgrade town radio equipment to 700mhz to ensure interoperability with the state	High	Emergency Management	All
S2	Replace ITAC/ICALL mobile base unit by 2013; upgrade portable units and add one	High	Emergency Management	All
S3	Revise zoning or grant a variance to allow installation of variable-message notification sign on Rte 4 by town hall	High	Emergency Management, Planning & Zoning	All
S4	Install a radio transmission tower between Lake Garda and Whigville, to extend reception to all parts of town and eliminate gaps	Medium	Highway Department	All
S5	Implement a one-touch alert notification system to allow Emergency Management and other first responders to contact each other instantaneously in the event of an emergency	Medium	Emergency Management	All

Objective 4: Improve sheltering capacity for vulnerable populations

	Strategy	Priority	Lead	Hazard
S1	Acquire a generator for the senior center	High	Emergency Management	All

Objective 5: Increase town capacity to plan for, simulate, and respond to hazards

	Strategy	Priority	Lead	Hazard
S1	Equip Fire and Emergency Management vehicles with portable notebook computers and GPS units	High	Emergency Management	All
S2	Develop GIS capacity to assist in emergency planning and response	Medium	Planning	All

Objective 6: Continue Participation in National Flood Insurance Program

	Strategy	Priority	Lead	Hazard
S1	Continue enforcement of floodplain management ordinances by regulating all new and substantially improved construction in flood zones	High	Planning	Flooding
S2	Work with FEMA to update FIRMs as necessary	High	Public Works	Flooding
S3	Continue to distribute information about the NFIP to homeowners	High	Planning	Flooding
S4	Continue to assist homeowners with amendments to NFIP maps as necessary	High	Planning	Flooding

Contributors

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New Britain

The City of New Britain is distinct from the rest of the region in a number of ways. It is denser, younger, and more diverse than the other towns. In 2000, 71,538 people lived in New Britain's 13 square miles, giving it a population density of 5,503 people per square mile. Median age in the city is 35, and it is aging less quickly than any of the other towns in the region; projections show less than 25% of the city's population aged 60 and older in 2030. According to the 2000 Census, 30% of the population identifies as minority or mixed-race, while 43% speak a language other than English at home.

Physically, the city is also built out more than the other towns in the region. According to CCRPA's 2007 regional Plan of Conservation and Development, only 280 net developable acres remained in New Britain—a mere 3% of the city's land area. The city's densely developed core comprises primarily older, multi-story buildings supported by a world of aging infrastructure. Tucked in among the buildings, however, are 1200 acres of parks and open space, as well as numerous bodies of water.

Challenges

As in other towns, flooding and winter storms present the biggest challenges in New Britain. Several water bodies in the city flood on occasion: Webster Brook, Bass Brook, and the Quinnipiac River all give rise to minor flooding issues at times, while Willow Brook and West Canal create more frequent and severe flooding problems.

Willow Brook is a well-known source of flooding in the City. Overflow from the brook floods a southwest neighborhood where 60-80 properties are affected, as well as the New Britain stadium. A strong storm in June of 1992 caused extensive flooding from Willow Brook, which was the subject of a study by the Maguire Group, who catalogued the damage wrought by the flooding (see appendix). According to their report, the 1992 flooding resulted in over $650,000 of damages.

West Canal is another source of frequent flooding in the city, although it is undocumented on FEMA's FIRMs due to its high elevation. The 1992 storm caused the canal, built in 1908, to breach; flooding washed out nearby streets and inundated homes. The City paid out $30,000 in damages to homeowners, who were not eligible for reimbursements under the NFIP. Development in the area impacted by flooding from West Canal is not limited by the City's flood control regulations, which apply only to areas documented in FIRMs.

Drainage infrastructure and water and sewer lines throughout the City are in need of major upgrades. The majority of the infrastructure was constructed in or around 1872 and was not designed to support the level of development the city has seen. Undersized pipes result in flooding, sewer backups, system leaks, and other problems.

New Britain also faces the usual challenges during winter storms; ice and snow make roads impassable, knock down tree limbs which in turn disrupt utility service. The combined effect leaves people stranded in their homes, potentially without heat or power. New Britain's hills pose a particular problem; to mitigate the problem, the city will pre-treat hilly streets with salt before a big storm.

Finally, New Britain has more concern about earthquakes than other towns. Although earthquakes are rare in this area, New Britain is almost fully built-out with many older buildings that could sustain serious damage in the event of a quake. In response to concerns, the city's building code was changed in 2005 to accommodate seismic requirements for new structures.

Current Mitigation and Response Activities

- Flood control regulations limit development in "special flood hazard areas," which are defined as "the area within New Britain subject to one percent or greater chance of flooding in any given year, as identified by New Britain's FIRM." These regulations prohibit manufactured homes and recreational vehicles while imposing restrictions on residential and non-residential construction regarding base elevation, materials, construction methods, etc.
- Seismic standards were added to the building code in 2005.
- Town participates in National Flood Insurance Program

Goals, Objectives, Strategies

Goal: reduce losses of life and property, and minimize economic consequences of natural hazards.

Objective 1: Improve municipal response capabilities

	Strategy	Priority	Lead	Hazard
S1	Improve communication and coordination between response personnel in different departemnts (Police, Fire, Water, Public Works) by holding regularly scheduled, multi-agency exercises of the EOP	High	Emergency Management	All
S2	Create guidelines for releasing water from dams during storm events to avoid dam breakage	High	Planning, Public Works	Flooding, Dam Failure

Objective 2: Enable residents to better help themeselves through preparedness education

	Strategy	Priority	Lead	Hazard
S1	Develop anddistribute pamphlet about preparedness for residents (English, Spanish, and Polish); post on city website	High	Emergency Management	All
S2	Encourage preparedness workshops in schools	High	Emergency Management	All

Objective 3: Upgrade aging infrastructure to improve City's capacity to deal with inundation

	Strategy	Priority	Lead	Hazard
S1	Create a plan for repairing/replacing aging infrastructure including water, sewer, and stormwater drainage lines throughout the City	High	Planning, Public Works	Flooding
S2	Coordinate improvement plans with utility companies re: putting utility lines underground	Medium	Planning	Winter Storms, Wind Storms

Objective 4: Align planning policies with affected areas

	Strategy	Priority	Lead	Hazard
S1	Amend the City's Flood Control Regulations to apply to the West Canal area despite that area not being included on FEMA's FIRMS*	High	Planning	Flooding

*(The current regulations read, "This article shall apply to all special flood hazard areas within the jurisdiction of the City of New Britain," where "special flood hazard area" is defined as "the area within New Britain subject to one percent or greater chance of flooding in any given year, as identified by New Britain's FIRM.")

Objective 5: Continue Participation in National Flood Insurance Program

	Strategy	Priority	Lead	Hazard
S1	Continue enforcement of floodplain management ordinances by regulating all new and substantially improved construction in flood zones	High	Planning	Flooding
S2	Work with FEMA to update FIRMs as necessary	High	Public Works	Flooding
S3	Continue to distribute information about the NFIP to homeowners	High	Planning	Flooding
S4	Continue to assist homeowners with amendments to NFIP maps as necessary	High	Planning	Flooding

Contributors

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Plainville

As its name suggests, the primarily suburban community of Plainville is situated almost entirely in a flat plain. Despite encompassing only 9.6 miles of land, the town boasts urban, suburban, and rural areas and hosts sections of Interstate 84 and State Route 72, both limited-access highways pivotal to the region's transportation system. With 17,328 residents in the year 2000, Plainville had a population density of 1,768 persons per square mile, nearly triple the density of the entire state.

Plainville is largely built out, with only 940 net developable acres (14% of the town's total acreage) left as of 2007. The town's 2009 Plan of Conservation and Development, in recognition of this fact, stresses the importance of comprehensive open space planning, natural resource protection, and limitation of impervious surface cover.

Challenges

Flooding is the primary challenge in Plainville. The Pequabuck and Quinnipiac Rivers both pass through the town; of the two, the Pequabuck poses the greater flooding risk. At one time flooding from the Pequabuck would divide the town, flooding a bridge on Washington Street and thus rendering the northwest section of town inaccessible. Now, access to the northwest is secured via Northwest Drive, which provides a connection between Rtes 10 and 177. The river still floods several other areas, including a strip of homes on Robert Street Extension. Although the area floods regularly, and informal plans are known, there is no written evacuation plan for the street.

The town's wastewater treatment plant is also subject to flooding, although on a less regular basis. Although according to a 1980 FEMA flood study the plant is constructed above the 100 year flood elevation, the plant still floods during extreme conditions. The gravity-operated plant was built in the 1940s, and its location is non-negotiable.

Even slight flooding can cause backups in Plainville's sewer and storm water systems. This has been the case for some time, and was the subject of a Comprehensive Drainage Study completed in May of 1975. While the report's findings are still valid, the solutions proposed for alleviating the situation have always been prohibitively expensive, and have not been implemented.

The town faces the same challenges from winter storms as do the other towns in the region: cleanup and management of the storms can be expensive; residents can be isolated by snowy and icy roads; and downed trees can block roads and cause power outages, depriving residents of electricity, communications, and even heat. As in other towns, the vast majority of residents, accustomed to Connecticut's weather, choose to shelter in place, waiting out the storms from the comfort of their own homes. In the event that shelters are required for winter storms or other events, the town has two Red Cross approved shelters.

Current Mitigation and Response Activities

- Plainville has the toughest floodplain regulations of any town in the region. The regs specifically disallow "any use requiring substantial investment in a structure and permanent equipment that could be damaged by flooding," including residential and commercial uses.
- The town is actively pursuing new methods of storm water management to minimize system back-ups associated with flooding. In November 2009 they hired a consultant to review their Land Use Regulations and Ordinances with an eye toward reorganizing them, removing "impediments and barriers to appropriate site development design relating to the management of storm water, including storm water quality," and creating incentives and/or requirements for LID techniques.
- The town participates in DEMHS Region 3 and follows its Regional Emergency Support Plan.
- The town's evacuation plan, last updated in August 2009 and scheduled for future updates at regular intervals as required by DEMHS, is included in the Emergency Operations Plan.
- The town participates in the State's Reverse-911 system, implemented in November 2009.

- Police notify residents of flood-prone areas (such as Robert Street Extension) of possible flooding to give them time to evacuate. (As of November, 2009, the town is using the statewide reverse-911 system for this process.)
- The town participates in the National Flood Insurance Program, and one of its Repetitive Loss Properties has been mitigated: the former Sullivan Foundry at 28 N Washington St. has been demolished and removed.
- The two Red Cross approved shelters in town are located at the Linden Street and Middle Schools.

Goals, Objectives, and Strategies

Objective 1: Update and formalize existing plans

	Strategy	Priority	Lead	Hazard
S1	Develop a formal evacuation plan for the Robert Street Extension area, and include it in the EOP	High	Emergency Management	Flooding
S2	Update the 1975 Comprehensive Drainage Study with cost/benefit analyses and an eye toward implmentation	High	Technical Services	Flooding
S3	Revise the subdivision plan/zoning code to include requirements and incentives for low-impact development	High	Planning	Flooding

Goal: reduce losses of life and property, and minimize economic consequences of natural hazards.

Objective 2: Increase town capacity to plan for and simulate hazard impacts

	Strategy	Priority	Lead	Hazard
S1	Develop GIS capacity to assist in emergency planning and response	Medium	Planning	All

Objective 3: Improve critical infrastructure and ensure access to critical facilities

	Strategy	Priority	Lead	Hazard
S1	Improve bridges identified as needing repair through the bridge and dam inspection program.	High	Public Works	Flooding

Objective 4: Enable residents to better help themselves through preparedness education

	Strategy	Priority	Lead	Hazard
S1	Develop & distribute a pamphlet about household preparedness for natural hazards	High	Emergency Management	All
S2	Post pamphlet and evacuation plan on town website	High	Emergency Management, Staff	All
S3	Encourage preparedness workshops in schools	High	Emergency Management, Schools	All

Objective 5: Continue Participation in National Flood Insurance Program

	Strategy	Priority	Lead	Hazard
S1	Continue enforcement of floodplain management ordinances by regulating all new and substantially improved construction in flood zones	High	Planning	Flooding
S2	Work with FEMA to update FIRMs as necessary	High	Planning, Public Works	Flooding
S3	Continue to distribute information about the NFIP to homeowners	High	Technical Services	Flooding
S4	Continue to assist homeowners with amendments to NFIP maps as necessary	High	Technical Services	Flooding

Contributors

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Plymouth

The gateway to Litchfield County from the east, the town of Plymouth is a suburb of the cities of Bristol and Waterbury. The town is primarily residential in nature, with commercial and retail development along Routes 6 and 72, and industrial uses located in Pequabuck and Greystone, and in the industrial park located off Harwinton Avenue. Route 6 (Main Street) bisects the town from east to west and acts as the town's primary arterial, providing connections Route 8 to the west and Route 84 to the east via Route 72.

Plymouth had a population of 11,634 in the year 2000, with 522 people per square mile. The town has several distinct population centers within its 22.3 square miles: Terryville, which is the largest center in the eastern part of the town, and also Pequabuck, Fall Mountain, Lake Plymouth, East Church, Greystone, and Plymouth Center. Due to varied topography and historical settlement patterns, these population centers have remained fairly distinct over the years.

Plymouth's Plan of Conservation and Development was updated in 2005. A central focus of the plan was to increase economic development and conservation of open space. The plan also included sewer and water supply district mapping. Sewers, water and gas are available in densely populated portions of the town.

Challenges

Winter storms and flooding represent the biggest natural hazard concerns for Plymouth. Winter plowing and deicing operations are performed exclusively by Public Works Department staff, and at times stretch manpower and resources beyond the available budget. Occasionally state forces are not available and the town will need to treat state roads, particularly when accidents occur. Plymouth has also had its emergency services strained during prolonged icing events, which can lead to power outages, shelter establishment and road closures throughout town. Preventive tree removal is also a high priority program that is under budgeted.

Plymouth experiences regular flooding in three of its subregional watershed basins: the Poland River to the Northeast, the Pequabuck River in central Terryville, and Hancock Brook to the south. In the Poland River watershed, flooding problems include:

- Residential flooding on North Main Street due to insufficient capacity
- River level at the North Main Street bridge coming within inches of breach
- Marsh Brook breaches on North Riverside Ave at Sandra Ave, causing significant bank erosion in the rear of properties on Hoye Street.

The Pequabuck River watershed faces the following flooding risks:

- Insufficient culvert and channel capacity, which causes flooding from Beach Avenue through the rear of properties on Main Street and across Main to the junction of the Pequabuck and Poland rivers
- Flooding in the post office parking area can render it unusable
- Flooding has caused significant damage to the river bank that protects the Water Pollution Control Facility on Canal Street
- Floodwaters nearly reach the electrical substation on Woodside Lane

Flooding issues with Hancock Brook, to the south, include:

- Road closures and washouts along Old Waterbury Road due to inadequate private culverts in the area
- Regular flooding along Todd Hollow Brook due to combination of culvert and downstream capacity
- Localized street flooding which affects private properties when storm events exceed street drainage capacity

Drainage easements in many places are not clearly defined, which complicates maintenance and repair efforts.

Plymouth's large proportion of open space leads to some local concern over wildfires. Although wildfires do sometimes occur in Plymouth, the existence of an all-terrain response vehicle helps first responders access and control them.

A final concern in Plymouth is access: Routes 6 and 72 are both crossed by low railroad bridges with restrictive clearances that limit the height of approaching vehicles. This limits the ability of trucks and other large vehicles to access the town, which could be problematic in the case of a natural hazard.

Current Mitigation and Response Activities

- Plymouth has flood control regulations that require certain improvements for development in the flood plain, including the use of flood resistant construction, raised connections to utilities and maintaining floodway capacity
- The Fire Department pumps out basements when they are inundated with more than 4 inches of water
- The Subdivision and site plan regulations require a zero increase in net runoff for new developments for the 25 year storm event for the Pequabuck and Poland River watersheds.
- Open Space Acquisition through subdivision regulations
- Annual Catch Basin cleaning
- The Town participates in DEMHS Region 5 for Regional Emergency Planning
- The town has intergovernmental mutual aid agreements in place with Burlington, Wolcott, Thomaston, Bristol, and Harwinton
- Completed NIMS training and a Tabletop exercise to test preparedness.
- The town has a portable 60KW generator that can be used when needed during an emergency.
- The centralized dispatch in Town Hall has been upgraded to allow for multiple dispatcher operation.
- Subdivision regulations require utilities to be buried.
- Town Hall is a Red Cross Certified Shelter.
- The EOC is located at 7 North Main St.

Goals, Objectives, and Strategies

Goal: maximize survival of people, prevent and/or minimize injuries and preserve property and resources of the Town of Plymouth in the event of natural disasters.

Objective 1: Improve town infrastructure to reduce hazard impacts

	Strategy	Priority	Lead	Hazard
S1	Resolve flooding problems on Todd Hollow Road and Beach Avenue by reconstructing the drainage systems and roads	High	Public Works	Flooding
S2	Improve Bemis Street and Seymour Road	High	Public Works	Flooding
S3	Upgrade bridges as necessary to alleviate flooding problems including North Main Street Bridge	High	Public Works	Flooding
S4	Provide for an increase in selective tree trimming and removal	High	Public Works	Winter Storms, Wind Storms
S5	Increase the railroad clearances on Rte 72 in Pequabuck	Medium	Public Works	All

Objective 2: Upgrade town facilities & assets to maximize response capabilities

	Strategy	Priority	Lead	Hazard
S1	Certify the high school, fire houses, and Eli Terry Middle School as Red Cross shelters	High	Emergency Management	Winter Storms
S2	Provide indoor space for equipment storage and build a salt shed at the highway facility	High	Public Works	Winter Storms
S3	Upgrade fire trucks and the traffic signals on Main Street to allow for emergency signal preemption	High	Public Works, Fire Department	All
S4	Install computer at EOC	High	Emergency Management	All
S5	Improve communiciation system	High	Emergency Management	All
S6	Follow the objectives listed in the Fire Department's Master Plan, including constructing a new Fire Station in the Fall Mountain area	Medium	Fire Department	All
S7	Increase size of Police Department through Town Hall expansion	Medium	Police Department	All

Objective 3: Invest in training and equipment to increase response capacity

	Strategy	Priority	Lead	Hazard
S1	Have a full-scale, multi-agency emergency response drill	High	Emergency Management	All
S2	Train additional staff in WebEOC	High	Emergency Management	All
S3	Purchase additional emergency generator for Plymouth Fire House	High	Fire Department	All
S4	Take advantage of statewide Reverse-911 service through Everbridge	High	Administration, Emergency Management	All
S5	Use GIS to improve and coordinate response services	Medium	Planning, Emergency Management	All

Objective 4: Use policy and planning tools to address potential impacts of hazards

	Strategy	Priority	Lead	Hazard
S1	Prepare Dam Emergency Response Plan	High	Planning, Public Works	Dam Failure, Flooding
S2	Update the Town Emergency Response Plan at regular intervals	High	Emergency Management	All
S3	Update the Shelter Management Plan	High	Emergency Management	Winter Storms
S4	Develop an Town Evacuation Plan	High	Emergency Management, Public Works	All
S5	Develop low impact development regulations with incentives	Medium	Planning	Flooding
S6	Prepare a town-wide Drainage / Flooding Study	Medium	Planning, Public Works	Flooding
S7	Better define drainage easements	Medium	Planning, Public Works	Flooding
S8	Use GIS to improve governmental and emergency services	Medium	Planning, Emergency Management	All

Objective 5: Enable residents to better help themselves through preparedness education

	Strategy	Priority	Lead	Hazard
S1	Provide emergency planning tools on the town website	High	Emergency Management	All
S2	Encourage preparedness workshops in schools	High	Emergency Management	All
S3	Take advantage of statewide Reverse-911 service through Everbridge	High	Administration, Emergency Management	All

Objective 6: Coordinate plans & reponse efforts with neighboring parties to increase efficacy

	Strategy	Priority	Lead	Hazard
S1	Coordinate dam releases with upstream dam owners prior to significant rainfall events to reduce potential for downstream flooding	High	Public Works, Dam Operators	Dam Failure, Flooding
S2	Test coordination plans (above) with neighboring municipalities and other affected parties through a practice exercise, either tabletop or full-scale	High	Public Works, Dam Operators	Dam Failure, Flooding

Objective 7: Continue Participation in National Flood Insurance Program

	Strategy	Priority	Lead	Hazard
S1	Continue enforcement of floodplain management ordinances by regulating all new and substantially improved construction in flood zones	High	Planning	Flooding
S2	Work with FEMA to update FIRMs as necessary	High	Planning	Flooding
S3	Continue to distribute information about the NFIP to homeowners	High	Planning	Flooding
S4	Continue to assist homeowners with amendments to NFIP maps as necessary	High	Planning	Flooding

Contributors

Mark Sekorski (Fire Chief), Paul Schwanka (Civil Preparedness Director), Khara Dodds (Dir of Planning & Economic Development), Anthony Lorenzetti (Director of Public Works), Bill Kuehn (former Director of Planning & Economic Development), Tim Pollack (former Interim Director of Public Works), Karl Paulette (former Interim Highway Superintendent), Bill Herzman (former Building Official), Tony Orsini (former Emergency Management Director)

Southington

Southington , similar to its next-door neighbor Berlin, is a suburban community in the southeast part of the region. Originally an agricultural community, Southington has also hosted industry and now boasts several designated historic districts and a revitalized downtown. Physically, it is among the largest towns in the region, at 36 square miles, and is home to a variety of landscapes.

With 39,728 residents in 2000, the town had a population density of 1104 people per square mile. Median age is 42, and 77% of all housing is single-family. According to the Department of Transportation, Southington is projected to see a 50% increase in its population aged 60 and over; this cohort is expected to comprise almost 1/3 of the town's population by 2030. Southington is one of the three towns in the region that are not served by public transportation.

Challenges

Flooding from the Quinnipiac River is the main challenge for Southington. The town is relatively flat throughout, which means that floodwaters tend to recede very slowly. The Plantsville area is particularly hard-hit by flooding. It has an undersized drainage system that needs to be upgraded, especially within the floodplain of the Quinnipiac. Upgrading the system would improve the situation during smaller flood events, although the area would still likely flood during larger events.

Woodruff Street is another area with recurrent flooding. Although the publicly-owned culvert was replaced 15 years ago and is in good condition, the channel that runs across private land is undersized and needs to be widened and deepened for a length of approximately 3,000 feet. As the flooding issue occurs on private land, it is beyond the town's ability to remedy. The town's floodplain ordinance mandates zero increase in storm water runoff in flood plain areas, and town staff places high priority on convincing property owners to provide adequate on-site floodwater storage.

The town faces the same challenges from winter storms as do the other towns in the region: cleanup and management of the storms can be expensive; residents can be isolated by snowy and icy roads; and downed trees can block roads and cause power outages, depriving residents of electricity, communications, and even heat. As in other towns, the vast majority of residents, accustomed to Connecticut's weather, choose to shelter in place, waiting out the storms from the comfort of their own homes.

Current Mitigation and Response Activities

- The town's Open Space and Land Acquisition Committee cites "water quality / resource protection" and "flood control" as two of its rationales for acquisitions and targets wetlands and other properties valuable for pursuing those ends
- The health department keeps lists of crucial facilities and vulnerable populations, and assists with evacuations during emergencies. The health director, Chuck Motes, is also the deputy emergency management director.
- The water department has a water conservation plan in place, to be used in the event of drought
- Town tests its emergency operations plan every 12 to 18 months; the last test was on July 15, 2009
- Flood plain regulations limit development that can occur in flood zones and flood ways
- The town participates in the National Flood Insurance Program
- Participates in DEMHS Region 3 planning activities

Goals, Objectives, and Strategies

Goal: reduce losses of life and property, and minimize economic consequences of natural hazards.

Objective 1: Increase capacity to shelter large numbers of people in the case of an emergency

	Strategy	Priority	Lead	Hazard
S1	Inventory town shelters	High	Emergency Management	Winter Storms
S2	Invest in supplies sufficient to stock at least one shelter in case of a major event	High	Emergency Management	Winter Storms
S3	Develop a comprehensive shelter plan	Medium	Emergency Management	Winter Storms

Objective 2: Improve town's capacity to deal with hazards by investing in necessary equipment and upgrading infrastructure

	Strategy	Priority	Lead	Hazard
S1	Invest in emergency generators in order to keep critical facilities online during emergencies	High	Public Works	Winter Storms, Wind Storms
S2	Invest in chainsaws and a wood chipper to expedite removal of downed trees	High	Public Works	Winter Storms, Wind Storms
S3	Invest in sump pumps to more quickly remove floodwaters	High	Public Works	Flooding
S4	Increase capacity of Plantsville drainage system	Medium	Public Works	Flooding

Objective 3: Improve citizen notification, awareness, and response time

	Strategy	Priority	Lead	Hazard
S1	Take advantage of the statewide Reverse-911 system offered through Everbridge	High	Administration, Emergency Management	All
S2	Develop & distribute household preparedness pamphlet	High	Emergency Management	All
S3	Encourage preparedness workshops in schools	High	Emergency Management	All
S4	Post preparedness pamphlet and town evacuation plans on town website	High	Emergency Management	All

Objective 4: Continue Participation in National Flood Insurance Program

	Strategy	Priority	Lead	Hazard
S1	Continue enforcement of floodplain management ordinances by regulating all new and substantially improved construction in flood zones	High	Planning & Zoning	Flooding
S2	Work with FEMA to update FIRMs as necessary	High	Planning, Public Works	Flooding
S3	Continue to distribute information about the NFIP to homeowners	High	Planning	Flooding
S4	Continue to assist homeowners with amendments to NFIP maps as necessary	High	Planning	Flooding

Contributors

Mark Sciota (Deputy Town Manager / Emergency Management Director), Tony Tranquillo (Director of Public Works), Jim Grappone (Assistant Town Engineer), Mary Savage-Dunham (Town Planner), Jim Butler (Assistant Building Inspector)

Regional Mitigation Goals, Objectives, and Strategies

While each town presents its own set of circumstances, its own level of current action, and its own agenda for future preparations, some mitigation actions are best considered on the regional level. This section outlines goals, objectives, and strategies to be undertaken by Central Connecticut Regional Planning Agency, in support of the municipal actions outlined earlier. Strategies are prioritized according to the same schema used by the towns.

Current Mitigation and Response Activities

- National Flood Insurance Program: all of the region's towns participate in the NFIP; however, few if any of the region's Repetitive Loss Properties have been remediated. CCRPA will attempt to aid towns in mitigating their Repetitive Loss Properties.
- State Building Code: all municipalities in Connecticut employ the State Building Code. The code was last updated in 2005 with state-specific amendments to the 2003 International Building Code, and incorporates the latest standards for wind and seismic resistance.
- Participation in DEMHS planning groups: Six of the region's seven towns (those which are located in DEMHS Region 3 / Hartford County) are members of CREPC, the Captiol Region Emergency Planning Committee. This body coordinates resources and capabilities across the capitol region. The outlying town, Plymouth, falls in DEMHS Region 5, and CCRPA staff acts as liaison between the town and the Region 5 planning committee.
- CRCOG's RED Plan: The six towns that are members of CREPC are also covered by CRCOG's Regional Emergency Deployment (RED) plan. According to CRCOG, "the RED plan provides a framework for communities and agencies to collaborate in planning, communication, information sharing, and coordination activities before, during, or after a regional emergency, including natural hazards."
- Reverse-911: In 2009-2010, the State of Connecticut is working to implement a statewide reverse-911 service which can be accessed by all municipalities. CCRPA is working to keep the seven towns in the region updated on the state's progress, and will help towns collect information, acquire training, and coordinate with the state as necessary to access this service.

- Dam Safety: The Connecticut Department of Environmental Protection's Dam Safety division enforces the state's dam safety laws, inspecting existing dams and similar structures, and permitting new construction and alterations or repairs. These efforts by CT DEP greatly reduce the risk of dam breaches in the state.

Goals, Objectives, and Strategies

Goal: Assist towns in the region with reducing the potential for loss of life, property, and economic well-being as the result of natural hazards.

Objective 1: Assist towns in implementing their mitigation strategies

	Strategy	Priority	Lead	Hazard
S1	Assist towns in identifying and pursuing funding opportunities	High	CCRPA	All
S2	Provide necessary research and technical assistance to towns, including preparation of relevant studies, plans, and ordinances	High	CCRPA	All
S3	Keep towns apprised of all relevant developments at the state level	High	CCRPA	All
S4	Work with towns and state and federal agencies to improve the available data	Medium	CCRPA	All
S5	Assist towns in developing GIS capacity; for towns that lack capacity, continue to provide GIS mapping and analysis services as requested	Medium	CCRPA	All

Objective 2: Maintain regional focus on hazard mitigation

	Strategy	Priority	Lead	Hazard
S1	Work with member municipalities to maintain this Plan and update it every 5 years	High	CCRPA	All
S2	Incorporate hazard mitigation strategies into regional plans as appropriate, including the regional Plan of Conservation and Development	High	CCRPA	All

Objective 3: Act as a resource to help towns find strategies that suit them

	Strategy	Priority	Lead	Hazard
S1	Provide information regarding best practices about flood prevention strategies, such as: low impact development, open space preservation, and storm water management	High	CCRPA	All
S2	Provide information regarding regionalization of services where such regionalization would result in increased efficiency and municipal cost savings	High	CCRPA	All

Objective 4: Help towns accomplish strategies regionally that might be impossible on a smaller scale

	Strategy	Priority	Lead	Hazard
S1	Pursue educational programs for regional schools through FEMA	High	CCRPA	All
S2	Create/source household preparedness pamphlet for distribution to homeowners in the region	High	CCRPA	All
S3	Help towns approach utility companies about putting new and existing utility infrastructure underground	Medium	CCRPA	All

Objective 5: Work towards regional mitigation of Repetitive Loss Properties

	Strategy	Priority	Lead	Hazard
S1	Work with towns to devise effective and feasible strategies for mitigating repetitive loss properties	High	CCRPA	Flooding
S2	Work with towns to locate and obtain funding necessary for them to acquire and mitigate RLPs	High	CCRPA	Flooding
S3	Assist towns, as necessary, with outreach to owners of RLPs	Medium	CCRPA	Flooding

Planning Process

Preparation of this Natural Hazard Mitigation Plan began in 2003, when CCRPA was awarded a Pre-Disaster Mitigation Planning Grant. CCRPA served as the lead agent in development of the plan over the next seven years. An initial draft of the hazard profile chapters of this plan was completed by CCRPA staff in October 2006. The plan was reviewed by municipal representatives from each of the region's seven towns, and was sent to DEP and FEMA for comments. FEMA's comments were received in late 2007. The plan was revised accordingly, and municipal representatives were given an opportunity to review the revisions in late 2009.

Oversight & Staffing/Multi-Jurisdictional Participation

The planning process was overseen by key staff from each of the seven municipalities in the Central Connecticut Region. Directors of Planning, Directors of Public works, and Emergency Management Directors comprised the oversight group. While individuals serving in these capacities did change over the years, the involvement of the position holders remained constant (see table, below). Members of the oversight group were consulted regularly via email, phone, and in-person conversations about progress on the Plan, and were given drafts of the plan to review before copies were made public or submitted to DEP or FEMA. Many members of the group also gave one or more in-depth interviews as part of the planning process (see "Data Collection & Analysis, pg. 75").

Composition of Oversight Group for Hazard Mitigation Plan, 2003-2010

Town	Public Works / Engineer Representative	Years*	Emergency Management Representative	Years*	Planning Representative	Years*
Berlin	Morgan Seelye Jim Horbal Art Simonian	2003-2005 2005-2010 2009-2010	Matt Odishoo	2003-2010	Brian Miller Hellyn Riggins	2003-2005 2005-2010
Bristol	Paul Strawderman Walter Veselka	2003-2010 2004-2010	Richard Ladisky	2003-2010	Alan Weiner	2003-2010
Burlington	Scott Tharau	2003-2010	Robert Gleason	2009-2010	N/A	N/A
New Britain	Clarence Corbin Mark Moriarty	2003-2007 2007-2010	Don Janelle Jr. Mark Carr	2003-2005 2005-2010	Steven Schiller	2003-2010
Plainville	Bob Jahn John Bossi	2003-2005 2005-2010	Larry Sutherland	2003-2010	Len Tundermann Mark DeVoe	2003-2006 2006-2010
Plymouth	Tom Pollack Anthony Lorenze	2004-2005 2006-2010	Tony Orsini Paul Schwanka	2003-2008 2008-2010	Bill Kuehn Khara Dodds	2003-2008 2008-2010
Southington	Tony Tranquillo Jim Grappone (As	2003-2010 2009-2010	Mark Sciota	2009-2010	Mary Hughes Mary Savage-Dunham	2003-2006 2007-2010

*"Years" indicates years spent working with CCRPA on the Natural Hazard Mitigation Plan, not duration or dates of employment

The planning process was also overseen by the Central Connecticut Regional Planning Agency's board of directors, who approved progress on the Hazard Mitigation Grant and approved drafts of the plan before they were made public and/or submitted to DEP and FEMA. The Agency Board is comprised of representatives of all seven municipalities, appointed by each town's planning commission, CEO, and town council (for towns with population greater than 50,000). Appendix B includes agendas and minutes of meetings where the Plan was discussed. All Agency Board meetings are open to the public and properly noticed. Agendas are made publicly available in advance of the meetings at town clerks' offices, and on the Agency website.

Hazards Identification

CCRPA staff based their list of hazards to be profiled off of the 2007 Update of the State Natural Hazard Plan (this plan is currently being updated, but information from the new draft was not yet available as of 8/23/10), other regions' Natural Hazard Mitigation Plans, and data collected from the CT DEP, USGS, and NOAA, among other sources. By eliminating hazards from which the region faces little to no risk (e.g. tsunami, mudslide, etc), staff generated the list of hazards to be profiled in the plan: flood, dam failure, winter storms, hurricanes, tornadoes, drought, wildfire, and earthquakes.

Data Collection & Analysis

CCRPA staff used data from a number of sources to assess the risks faced by the region and the seven municipalities. These included: historical information gleaned from NOAA, the Weston Observatory at Boston College, local newspapers, USGS, FEMA, DEP, and others; demographic data from the US Census Bureau and the Connecticut Department of Transportation; budget records and assessors' data from the seven municipalities; GIS data from USGS, the US Census Bureau, DEP, FEMA, and others; and interviews conducted with the following local municipal officials, representatives of local utility companies, and town residents (chronologically ordered):

Date	Interviewee
4/12/2005	Larry Cole, Associate Director E-911, SBC
4/12/2005	Susan Gaylord, Manager of Emergency Response, Northeast Utilities
4/12/2005	James LaChance, Manager of System Restoration & Emergency Preparedness, Northeast Utilities
4/12/2005	Ed Pass, E-911 Technical Manager, SBC
4/25/2005	Bill Volovski, Building Official, Town of Plainville
5/2/2005	Janet Marineau, Superintendent of Sewer Plant, Town of Plainville
5/2/2005	Carmen Matteo, Director of Physical Services, Town of Plainville
5/25/2005	Dan Murphy, Camp Dresser & McKee
6/2/2005	Steven Schiller, City Planner, Town of New Britain

Date	Interviewee
6/3/2005	Clarence Corbin, Director of Public Works, Town of New Britain
6/13/2005	Pat Toscano, City Surveyor, Town of New Britain
6/20/2005	Bill Kuehn, Town Planner, Town of Plymouth
6/21/2005	Frank Wiatr, Chief Building Official, Town of New Britain
6/29/2005	Brian Miller, Town Planner, Town of Berlin
7/5/2005	Tony Tranquillo, Town Engineer, Town of Southington
7/6/2005	Alan Weiner, City Planner, Town of Bristol
7/7/2005	Jim Horbal, Deputy Director of Public Works, Town of Berlin
7/7/2005	Larry Sutherland, EMD/Fire Marshall, Town of Plainville
7/8/2005	Paul Strawdermann, City Engineer, Town of Bristol
8/7/2005	Larry Sutherland, EMD/Fire Marshall, Town of Plainville
9/19/2005	Hellyn Riggins, Town Planner, Town of Berlin
9/23/2005	Mary Hughes, Town Planner, Town of Southington
9/29/2005	Morgan Seelye, Former Town Engineer, Town of Berlin
10/3/2005	Nick Chirico, Building Official, Town of Berlin
10/5/2005	Jim Butler, Assistant Buildng Inspector, Town of Southington
10/5/2005	Matt Odishoo, EMD, Town of Berlin
11/1/2005	Bill Herzman, Building Official, Town of Plymouth
11/1/2005	Karl Paulette, Interim Highway Superintenden, Town of Plymouth
11/1/2005	Tom Pollack, Interim Director of Public Works, Town of Plymouth
11/2/2005	Donald Janelle, Jr., EMD, Town of New Britain
11/2/2005	Charles Kirchofer, Building Official, Town of Burlington
11/2/2005	Ted Scheidel, 1st Selectman, Town of Burlington
11/2/2005	Scott Tharau, Highway Foreman, Town of Burlington
11/16/2005	James Thompson, Town Engineer, Town of Burlington
11/18/2005	Bart Bovee, Citizen, Berlin
11/21/2005	Dennis Kern, Citizen, Berlin
11/28/2005	Richard Ladisky, EMD, Town of Bristol
12/1/2005	Tony Orsini, EMD, Town of Plymouth
2/15/2006	Richard Miller, Chairman of Inland Wetlands & Watercourses Agency, Town of Burlington
4/2/2006	Tom Chizinski, Connecticut Natural Gas
6/8/2006	Mark Austin, Bristol Inland Wetlands Commission, Bristol
6/23/2006	Gilbert Bligh, Director, New Britain Water Department
6/28/2006	Cynthia Gaudino, Manager of Source Protection & Real Estate, Connecticut Water Company
7/7/2006	James Randazzo, Manager of Water Supply, MDC
7/7/2006	Carol Youell, Natural Resources Administrator, MDC
9/15/2008	Vince D'Andrea, Buliding Official, Town of Bristol
10/17/2008	Bill Kuehn, Town Planner, Town of Plymouth
2/5/2009	Philip Sher, Head of Gas Pipeline Safety Unit, CT Department of Public Utility Control
2/27/2009	Jim Grappone, Assistant Town Engineer, Town of Southington
2/27/2009	Tony Tranquillo, Town Engineer, Town of Southington
3/6/2009	Cynthia Gaudino, Manager of Source Protection & Real Estate, Connecticut Water Company
3/21/2009	John Bossi, Town Engineer, Town of Plainville
3/21/2009	Len Tundermann, Former Town Planner, Town of Plainville
9/14/2009	John Bossi, Town Engineer, Town of Plainville

Date	Interviewee
9/14/2009	Mark DeVoe, Town Planner, Town of Plainville
9/14/2009	Larry Sutherland, EMD/Fire Marshall, Town of Plainville
9/30/2009	Richard Ladisky, EMD, Town of Bristol
9/30/2009	Walter Veselka, Public Works Director, Town of Bristol
9/30/2009	Alan Weiner, City Planner, Town of Bristol
10/5/2009	Jim Horbal, Deputy Director of Public Works, Town of Berlin
10/5/2009	Matt Odishoo, EMD, Town of Berlin
10/5/2009	Hellyn Riggins, Town Planner, Town of Berlin
10/5/2009	Mary Savage-Dunham, Town Planner, Town of Southington
10/5/2009	Art Simonian, Public Works Director, Town of Berlin
10/5/2009	Tony Tranquillo, Town Engineer, Town of Southington
10/6/2009	Khara Dodds, Town Planner, Town of Plymouth
10/6/2009	Tony Lorenzetti, Director of Public Works, Town of Plymouth
10/22/2009	Mark Moriarty, Public Works Director, Town of New Britain
10/22/2009	Steven Schiller, City Planner, Town of New Britain
11/19/2009	Robert Gleason, EMD, Town of Burlington
11/19/2009	Scott Tharau, Highway Foreman, Town of Burlington
8/18/2010	Cynthia Gaudino, Manager of Source Protection & Real Estate, Connecticut Water Company
8/23/2010	Carol Youell, Natural Resources Administrator, MDC

This data was compiled and used to create a cohesive picture of likely hazard impacts in the region. Interviews held in 2009 and 2010 were used to confirm and update material from earlier interviews, to ensure that information appearing in this Plan is current and accurate.

Additional analysis of the region's risks was done using HAZUS-MH, FEMA's loss estimation software, in combination with ArcGIS. HAZUS analyses were done using the base data available in HAZUS. The base data reflects data from the 2000 U.S. Census and is known to be out of date at this time; however, recent, spatially-attributed local data of sufficient detail for the analyses does not exist for all jurisdictions in the region. Analyses were conducted for floods, hurricanes, and earthquakes; the data are reproduced in the relevant hazard sections.

Review & Incorporation of Existing Plans

As part of the planning process, staff reviewed and incorporated information from the following existing plans, studies, ordinances, reports, and technical information:

- State of Connecticut Natural Hazards Mitigation Plan for 2007-2010 (2010 draft is in progress but data will not be made available until the final publication date)
- Capitol Region Pre-Disaster Natural Hazard Mitigation Plan (CRCOG)
- A Natural Hazards Mitigation Plan, Risk and Vulnerability Assessment (CRERPA)

- Pre-Disaster Mitigation Strategy Document for Connecticut's South Western Region (SWRPA)
- Plan of Conservation and Development for the Central CT Region, 2007-2017
- Plan of Conservation & Development, City of Bristol CT
- Plan of Conservation and Development, Town of Plainville
- Town of Berlin Plan of Conservation and Development
- Town of Plymouth Plan of Conservation and Development
- Town of Southington Plan of Conservation & Development
- Burlington Plan of Conservation and Development
- Flood Insurance Study, Hartford County (Study # 09003CV002A) (FEMA, 2008)
- Flood Insurance Study, Town of Berlin (Community # 090022) (FEMA, 1980)
- Flood Insurance Study, Town of Bristol (Community # 090023) (FEMA, 1981)
- Flood Insurance Study, Town of Burlington (Community # 090145) (FEMA, 1980)
- Flood Insurance Study, City of New Britain (Community # 090032) (FEMA, 1981)
- Flood Insurance Study, Town of Plainville (Community # 090034) (FEMA, 1980)
- Flood Insurance Study, Town of Plymouth (Community # 090138) (FEMA, 1982)
- Flood Insurance Study, Town of Southington (Community # 090037) (FEMA, 1981, 1990)
- Town of Berlin Zoning Regulations
- City of Bristol Zoning Regulations
- Burlington Zoning Regulations
- Zoning Ordinances of the City of New Britain
- Zoning Regulations, Town of Plainville
- Zoning Regulations, Town of Plymouth
- Zoning Regulations of the Town of Southington
- Berlin, CT Emergency Operations Plan
- City of Bristol, CT Emergency Operations Plan
- Burlington, CT Emergency Operations Plan
- City of New Britain, CT Emergency Operations Plan
- Town of Plainville Emergency Operations Plan
- Town of Southington Emergency Operations Plan
- Capitol Region Council of Governments Regional Emergency Disaster Plan (RED Plan)

- Connecticut Valley Flood Plain Management Study: Watershed Investigation Report: Mattabesset River: Berlin & New Britain, CT (USDA)
- The Pequabuck River Watershed Management Plan (CCRPA, 2005)
- The Pequabuck River Watershed Action Plan (CCRPA, 2000)
- The Pequabuck River State of the Watershed Report (CCRPA, 2004)
- Report on the June 5-6 1992 Flood: New Britain, CT (Maguire Group, 1992)
- Comprehensive Storm Drainage Study, Bristol CT (Greiner Engineering Sciences, 1985)
- Comprehensive Drainage Study, Plainville CT (1975)
- Coppermine Brook Drainage Evaluation: Bristol, CT (Milone & MacBroom, 2008)
- Tributary B - Copper Mine Brook Channel Improvement Study, City of Bristol CT (HRP Associates, 2003)
- Drainage Improvements to Copper Mine Brook, Bristol CT (Maguire Group, 1987)
- Storm Water Phase II Compliance Assistance Guide (US EPA)
- Heavy Rains & Flooding of Sub-Regional Drainage Basins: October 7-15, 2005 (CT-DEP)
- Agriculture Preservation and Enhancement Strategies for the Central Connecticut Region (CCRPA, 2007)
- Connecticut's State Building Code (1999, with amendments through 2004)
- Update Report for Connecticut (Army Corps of Engineers, 2005)
- Report to the Department of Public Utility Control on the Condition of Underground Gas Facilities (Yankee Gas 2005, 2008)
- Inspection Report: Merimere Reservoir Dam (Roald Haestad, Inc & City of Meriden Water Division 2007)
- Inspection Report: Merimere Reservoir Dike (Roald Haestad, Inc & City of Meriden Water Division 2007)
- Inspection Report: Hallmere Reservoir Dam (Roald Haestad, Inc & City of Meriden Water Division 2007)
- Inspection Report: Kenmere Reservoir Dam (Roald Haestad, Inc & City of Meriden Water Division 2007)
- Phase I Inspection Report: Whigville Reservoir Dam (Army Corps of Engineers, 1980)
- Phase I Inspection Report: Shuttle Meadow Reservoir Dam (Army Corps of Engineers, 1979)
- Phase I Inspection Report: Wasel Reservoir Dam (Army Corps of Engineers, 1978)

- New Britain Water Department Emergency Contingency Plan
- Goodwin Dam EAP (2004)
- Southington Water Supply Plan Update (Maguire Group, 2006)

Other, more general guidance documents were also reviewed during the development of the plan, including:

- Are You Ready: A Guide to Citizen Preparedness (FEMA)
- Taking Shelter from the Storm: Building a Safe Room Inside Your House (FEMA)
- Understanding Soil Risks & Hazards (USDA)
- 2003 International Building Code (sections)
- BOCA National Building Code (1996)
- Earthquake Design and Evaluation for Civil Works Projects (US Army Corps of Engineers, Regulation # 1110-2-1806, 1995)
- Guidelines for Inspection and Maintenance of Dams (CT-DEP, 2002)
- National Flood Insurance Community Status Book (FEMA)

Further data and guidance were sought from the websites of the following agencies:

- FEMA
- CT DEP
- US Geological Survey (USGS)
- National Oceanic and Atmospheric Administration (NOAA)
- The United States Census
- US Army Corps of Engineers
- US Department of Housing and Urban Development (HUD)
- The Weston Observatory at Boston College
- The Metropolitan District Council
- Connecticut State Climate Center
- Connecticut Department of Transportation
- UConn Center for Land-Use Education and Research (CLEAR)
- Northeast Regional Climate Center

Goals, Objectives, and Strategies

Hazard mitigation goals, objectives, and strategies were developed in consultation with representatives from each of the seven municipalities of the Central Connecticut Region in the fall of

2009. A series of meetings and emails sought to elicit initial contributions and later refinements from each town's Emergency Management Director (EMD), Town Planner, and Public Works representative. Depending on the structure of town departments, these meetings and emails also included (variously) highway foremen, building officials, engineers, and others. Contributors are noted at the end of each town's chapter.

Strategies were prioritized based on a modified version of FEMA's STAPLEE schema. Once a town had identified and agreed on a list of objectives and strategies, municipal staff were asked to score the strategies based on 7 factors: social acceptability, technical feasibility, administrative feasibility, potential mitigation impact, legality, economic feasibility, and environmental responsibility. Every strategy received a score from 1 (lowest) to 3 (highest) in each category. The category scores were summed and formed the basis for assigning priority (high, medium, and low). This method assured that, in addition to general acceptability criteria, the importance of the potential mitigation impact and a reasonable assessment of the economic feasibility of all strategies were taken into account, assuring a prioritization that reflected a cost-benefit analysis.

Plan Review

An initial draft of the hazard profile chapters of this plan was completed by CCRPA staff in October 2006. The plan was reviewed by the Agency Board, and municipal representatives from each of the region's seven towns, and was sent to DEP and FEMA for comments. FEMA's comments were received in late 2007. The plan was revised accordingly, and municipal representatives were given multiple opportunities to review drafts of their towns' chapters, including the background description, overview of current mitigation strategies, and future goals, objectives, and strategies. Drafts were circulated and comments accepted via email in January, February, and March of 2010. Comments were also accepted in person and over the phone.

A draft of the plan that included the purpose, authority and funding, regional overview, hazard profile, and municipal and regional goals, objectives, and strategies sections was distributed to the municipalities for review on February 17, 2010, in anticipation of a public hearing held at the CCRPA offices on February 24, 2010. The hearing was noticed in the Hartford Courant, in municipal libraries and town clerks' offices, and on the CCRPA website. Copies of the plan were made available to the public in the town clerks' offices and libraries, as well as at the CCRPA offices, and on the CCRPA website. After the public hearing was complete, the plan was revised and sent to town staff for final review.

Once municipal staff approved the draft, it was circulated to neighboring municipalities, educational institutions, government agencies, nonprofits, and business groups for their comments and input. Representatives of the following municipalities and groups were invited to contribute:

- Town of New Hartford
- Town of Canton
- Town of Avon
- Town of Farmington
- Town of Newington
- City of Middletown
- Town of Rocky Hill
- City of Meriden
- Town of Cheshire
- Town of Wolcott
- Town of Thomaston
- Town of Harwinton
- Capitol Region Council of Governments (CRCOG)
- Council of Governments of Central Naugatuck Valley (COGCNV)
- Litchfield Hills Council of Governments (LHCEO)
- Midstate Regional Planning Agency
- DEMHS Region 3
- DEMHS Region 5
- Connecticut Emergency Management Association (CEMA)
- CT Fire Chiefs' Association
- Central CT State University
- University of Connecticut
- Tunxis Community College
- Greater Southington Chamber of Commerce
- Greater Bristol Chamber of Commerce
- Greater New Britain Chamber of Commerce
- Central Connecticut Economic Developers' Group

The Plan was submitted to the Department of Environmental Protection (CT DEP) for preliminary review in March, 2010. CT DEP returned the plan to CCRPA for revisions; revisions were

completed and the plan was resubmitted to CT DEP in April, 2010. CT DEP accepted the plan and forwarded it to FEMA for review. FEMA completed their preliminary review in July 2010, finding the draft not satisfactory in two sections. CCRPA staff revised the plan again and presented it to the Agency Board at their September 2, 2010 meeting for approval, before resubmitting it to CT DEP and FEMA.

Plan Adoption

[FORTHCOMING]

Public Participation

Draft versions of the region's Natural Hazard Mitigation Plan have been available on the CCRPA website since 2006, when the plan was first given to the Agency Board for review prior to initial submission to DEP and FEMA. As all Agency Board meetings are open to the public, the public was afforded opportunity to comment on the draft at that date and subsequently.

Individual input was sought from residents of the towns during the 2005 interview process.

A public hearing was held on February 24, 2010 to solicit input from residents of all seven towns regarding the draft plan, which was made publicly available on February 17, 2010. The hearing was noticed in the Hartford Courant on February 19 and 20, and notices were also placed in the town clerks' offices and main branch libraries in each of the towns. Copies of the plan were made available in the same locations; an additional copy was made available in the CCRPA offices, and a digital copy was posted to CCRPA's website. Comments from the public were accepted at the public hearing and via email and phone in the week preceding the hearing.

The revised draft plan was presented to the Agency Board for their approval on September 2, 2010, at their usual meeting. The meeting was open to the public, and was noticed at all Town Clerks' offices. The draft was made available on the CCRPA website prior to the meeting.

Continued Public Involvement

The Natural Hazard Mitigation Plan is not static; it will change over time, and as it changes, the public will continue to be consulted. CCRPA's Natural Hazard Mitigation Planning Committee (see Plan Implementation & Maintenance, next page) will hold annual meetings (open to the public) to discuss hazards experienced during the preceding years, impacts from those hazards, etc. These meetings will be noticed at Town Clerks' offices and on the CCRPA website no less than 1 week in advance. Information gathered at these meetings will be made available on the CCRPA website, and contact information will be made available for the planner in charge of the project.

Every 5 years, or upon municipal request, CCRPA will prepare an update of the Plan. The update will be prepared in a manner similar to this Plan, with contributions from the Planning Committee. The update process will involve at least one noticed public hearing, supplemented by a publicized comment period. 5-year update drafts will be made available on the Agency's website and at municipal clerks' offices for a period of not less than 7 days prior to the public hearing.

Plan Implementation & Maintenance

Implementation of the strategies outlined in this Plan will depend, largely, on the availability of resources and funding. Each jurisdiction will need to assess the costs, available funding sources, and potential impacts of all strategies individually. Preference should be given to those projects which achieved high priority rankings in this Plan. Municipal CEOs, EMDs, and staff who contributed to this Plan will be responsible for making the Plan available to other departments and agencies, and ensuring its relevance as a decision-making tool.

Monitoring & Updating

If the Plan is to become and remain an effective planning tool, it must be monitored. To that end, CCRPA will convene a Natural Hazard Mitigation Planning Committee to oversee the continued monitoring and updating of this document. The committee will consist of representatives of the seven towns (to be chosen from the current oversight group of planners, public works directors, and emergency management directors) who meet annually in the fall. Each year, CCRPA will solicit information from this committee regarding hazards experienced during the preceding year, impacts from those hazards, strategies successfully implemented, and new strategies planned for the future. This information will be made public via the Agency's website. (All committee meetings will also be open to the public and noticed at town clerk's offices no less than one week prior to the meeting.) As part of the meeting, CCRPA will provide towns with the latest guidance about FEMA's Hazard Mitigation Grant Program.

Every five years, or at municipal or committee request, CCRPA staff will prepare an update of this plan, under the oversight of the natural hazard planning committee. The process for updating the plan will include group interviews with relevant town staff, similar to those conducted in preparation of this plan, during which municipal staff will have the opportunity to amend or update information and strategies as appropriate. The update process will include at least one public hearing to apprise the public of progress made in hazard mitigation over the preceding five years, and to provide the public an opportunity to comment on the plan.

Incorporation into Existing Planning Mechanisms

Where appropriate, recommendations from the Plan will be incorporated into local planning mechanisms, including Plans of Conservation and Development, Capital Improvement Plans, and

Emergency Operations Plans. In addition, many strategies in the Natural Hazard Mitigation Plan call directly for revision to other plans and policies (e.g. zoning/subdivision codes, open space acquisition plans, and specific studies such as Berlin's Dam Breakage Emergency Plan).

Once the Plan or a Plan update is completed, CCRPA staff will send a letter to each town's staff (including: Planner, Emergency Management Director, and Public Works Director, or their equivalents) detailing the town's final list of strategies, and recommending other planning mechanisms in which the strategies should be included. Annual communication between CCRPA and municipal staff regarding hazard occurrences, implementation of strategies, and new planned strategies will provide opportunity to track progress on strategies and their incorporation into local planning mechanisms.

In addition, CCRPA will incorporate municipal and regional strategies into regional planning documents (e.g. the regional Plan of Conservation and Development, the Transportation Improvement Plan (TIP), regional watershed and open space plans, and the Long Range Transportation Plan) as appropriate.

Appendices

A. Resolutions of Adoption

B. Agendas and Minutes of CCRPA Board Meetings

C. Flood Control Ordinances (7 towns)

Appendix A: Resolutions of Adoption

Appendix B: Agendas and Minutes of CCRPA Board Meetings

Appendix C: Flood Control Ordinances