

# **THE TOWN OF BUCKLAND LOCAL NATURAL HAZARDS MITIGATION PLAN**

**Adopted April 9, 2013**



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# 1 - INTRODUCTION

## Hazard Mitigation

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The Federal Emergency Management Agency (FEMA) and the Massachusetts Emergency Management Agency (MEMA) define Hazard Mitigation as any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards such as flooding, storms, high winds, hurricanes, wildfires, earthquakes, etc. Mitigation efforts undertaken by communities will help to minimize damages to buildings and infrastructure, such as water supplies, sewers, and utility transmission lines, as well as natural, cultural and historic resources.

Planning efforts, like the one undertaken by the Town of Buckland and the Franklin Regional Council of Governments (FRCOG), make mitigation a proactive process. Pre-disaster planning emphasizes actions that can be taken before a natural disaster occurs. Future property damage and loss of life can be reduced or prevented by a mitigation program that addresses the unique geography, demography, economy, and land use of a community within the context of each of the specific potential natural hazards that may threaten a community.

Preparing a Local Natural Hazards Mitigation Plan before a disaster occurs can save the community money and will facilitate post-disaster funding. Costly repairs or replacement of buildings and infrastructure, as well as the high cost of providing emergency services and rescue/recovery operations, can be avoided or significantly lessened if a community implements the mitigation measures detailed in the Plan. FEMA requires that a community adopt a pre-disaster mitigation plan as a condition for mitigation funding. For example, the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance Program (FMA) and the Community Rating System (CRS), are programs with this requirement.

## Planning Process

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The natural hazard mitigation planning process for the Town of Buckland included the following tasks:

- Review of the Buckland 2005 Local Natural Hazards Mitigation Plan, assessment of relevancy of existing materials, status of action items and addition of new materials based upon MEMA recommendations and Committee input.
- Identifying the natural hazards that may impact the community, and past occurrences of hazards at the local or regional level.
- Conducting a Vulnerability/Risk Assessment to identify the infrastructure (i.e., critical facilities, public buildings, roads, homes, businesses, etc.) at the highest risk for being damaged by the identified natural hazards, particularly flooding.
- Identifying and assessing the policies, programs, and regulations a community is currently implementing to protect against future disaster damages. Examples of such strategies include:

- Preventing or limiting development in natural hazard areas like floodplains, wetlands, drinking water recharge areas, and conservation land;
  - Implementing recommendations in existing planning documents including Community Development Plans, Master Plans, Open Space and Recreation Plans, and Emergency/Evacuation Plans that address the impacts of natural hazards; and
  - Requiring or encouraging the use of specific structural requirements for new buildings such as buried utilities, flood-proofed structures, and lightening grounding systems.
- Identifying deficiencies in the current strategies and establish goals for updating, revising or adopting new strategies.
  - Identifying specific projects that will mitigate the risk to public safety and damages to infrastructure from natural hazards.
  - Adopting and implementing the final Natural Hazards Mitigation Plan.

The planning process for the Town of Buckland also incorporated the following procedures:

- Providing an opportunity for the public to comment on the plan during the drafting and prior to the approval of the plan. Publicity was done with a press release in the Greenfield Recorder and the West County Independent in February and March 2011 as well as through flyers posted in town. See Appendix B for copies of the flyers and press release. A copy of the draft plan has been available to the public at the Town Hall throughout the entire planning process.
- Providing an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities and agencies that have the authority to regulate development, and businesses, academia and other private and nonprofit organizations to be involved in the planning process by publicizing the planning process.
- Reviewing and incorporating, if appropriate, existing plans, studies, reports and technical information. Plans reviewed and incorporated in part include:
  - Route 112 Scenic Byway Corridor Management Plan 2009
  - Mohawk Trail Scenic Byway Corridor Management Plan 2002
  - Town of Buckland Comprehensive Emergency Management Plan 2010
  - Town of Buckland Open Space and Recreation Plan 2010
  - Draft Regional Transportation Plan 2011
  - Buckland Community Development Plan 2004
- Documenting the planning process, including how it was prepared, and how the public was involved.

Much of this work was carried out by the staff of the FRCOG Planning Department with the assistance of the Buckland Local Natural Hazards Mitigation Planning Committee (the Committee), which includes representatives of the Police Department, Fire Department, Highway Department, Planning Board, Zoning Board of Appeals, Emergency Management, Conservation Commission, Board of Health and the Town Administrator. Meeting minutes, sign in sheets and other correspondence is located in the appendix of this document.

## Plan Update and Changes

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As indicated above in the Planning Process section, changes and updates were made to this Plan based upon MEMA recommendations and committee input. The following sections of the 2011 plan were added to and/or substantially updated:

- **Section 2: Local Profile**
  - Cultural and Historic Resources section added ..... 9-13
- **Section 3: Risk Assessment**
  - Natural Hazard Identification and Profile
    - Location and Extent for Each Hazard added ..... 14-33
    - Beaver Dams (Sub-Category of Dam Failure) added ..... 22-23
    - Landslides added ..... 27-28
    - Ice Jams added ..... 28-29
    - Manmade Hazards added ..... 29-33
  - Vulnerability Assessment Methodology
    - All Hazards Risk Assessment Methodology expanded ..... 66-69
    - All Hazards Vulnerability Assessment Table added ..... 70
  - Vulnerability Assessment
    - Assessment by Hazard – detailed section for each hazard added
      - Exposure ..... 34-65
      - Damages ..... 34-65
      - Loss estimates ..... 34-65
      - Population impacts ..... 34-65
      - Data deficiencies ..... 34-65
    - Development Trends Analysis ..... 71-72
    - Zoning Map added ..... 73
    - Critical Facilities and Infrastructure Map added ..... 74
- **Section 4: Mitigation Strategy**
  - Current Mitigation Strategies were added for new hazards
    - Landslides ..... 104-105
    - Ice Jams ..... 106
    - Manmade Hazards ..... 107-108
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- **Section 5: Plan Adoption and Implementation**
  - Potential Funding Sources Table added ..... 116





## 2 – LOCAL PROFILE<sup>1</sup>

### Community Setting

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Buckland was originally part of the towns of Charlemont and Ashfield. Its settlers had no established name for their town, and thus called it “No Town.” Settlers arrived as early as 1742. The town is situated along the Deerfield River in the western central part of Franklin County. As with many other Franklin County towns, the proximity of the river played a major role in the development of the town. Buckland is strongly linked with the neighboring Town of Shelburne through the shared village of Shelburne Falls, which straddles the river between the two towns.

Shelburne Falls was once known as ‘Salmon Falls’ and was an important Native American fishing ground prior to European settlement of the area in the mid-1700s. The falls were an attraction to the Native Americans and early inhabitants as a supply of fresh salmon. The 64-foot falls prevented the fish from traveling further upstream. The falls later provided an excellent power source, allowing the village to develop into a major manufacturing center during the mid-1800s. While most settlers established farms in the outlying regions of Buckland and Shelburne, Shelburne Falls continued to be the site of the most productive salmon fishing in Massachusetts until the early 1800s.

Conflicts with Native Americans caused the town to be sporadically settled until around 1769. The town was incorporated in 1779. During the Federal period, there was an increase in use of the river for sawmills and gristmills, but farming remained dominant.

In the early industrial period, the town saw a dramatic increase in manufacturing, especially with the expansion and success of the Lamson & Goodnow Company. Most industrial building was done on the Buckland side of the river, as the Shelburne side was nearly built out by the time that major industry began to spring up. The location of the railroad on the Buckland side of the river was also a factor in the location of industry.

The Great Depression and rise of the automobile are seen as factors in the decline in industry in Shelburne Falls and the subsequent decline in the growth and development of the adjacent residential village. Overall, the loss of manufacturing jobs in the region led to a drop in population and stagnation in the development of the village.

Manufacturing still in operation in Buckland include Lamson & Goodnow Manufacturing, which produces cutlery, and Mayhew Steel. Mayhew Steel makes cutting tools and has expanded their facilities to Montague. With the relatively small number of manufacturing jobs in Buckland, most residents commute elsewhere to work.

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<sup>1</sup> The majority of the information for this section was obtained from the May 1999 Buckland-Shelburne Master Plan and the 2010 Buckland Open Space and Recreation Plan.

## **Infrastructure**

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Buckland's geography has been a major factor in the development of its infrastructure. The Town is about 19.75 square miles and is approximately eighty one percent wooded, according to 2005 Franklin County land use data. Preservation of farmland and the rural nature of the town are very important to Buckland's residents. According to the 2010 Buckland Open Space and Recreation Plan Survey, residents rated the loss of farmland and the loss of open space as the top threats to the rural character of their town. According to the same survey, the residents also rated lack of economic growth as one of the top four threats to the Town's sense of community.

According to the Buckland Community Development Plan, the town's unemployment rate is consistently the lowest in the county. However, while the majority of working Buckland residents are employed within Franklin County, they are employed outside of Buckland.

### **Roads and Highways**

Running parallel to Clesson Brook is the Town of Buckland's principal roadway, Ashfield Road, also known as Route 112. This is a north-south byway linking Buckland with Ashfield and Franklin County to the south. To the south, Route 112 extends to Goshen and connects the town to Route 9, another primary east-west corridor, with connections to Northampton and Interstate 91, the major north-south highway. To the north, this roadway provides a northern corridor through Colrain to Vermont. Along the northeastern corner of town, Route 2 provides a major east-west highway, which intersects in Greenfield with Interstate 91, the primary north-south route for western Massachusetts.

About six miles (12 percent) of Buckland's roads are gravel. The town has a total of fifty five miles of roads.<sup>2</sup>

### **Rail**

Freight rail service in Buckland is available from PanAm Rail Systems.

### **Public Transportation**

The Franklin Regional Transit Authority (FRTA) schedules a regular bus route with four busses a day, Monday through Friday, between Greenfield, Shelburne Falls, Buckland, and Charlemont.. However, stops in Buckland are limited on the westbound trip to one stop in the morning at Mohawk Trail Regional School. Traveling eastbound, three busses stop at Mohawk Trail Regional School, and all four busses travel down State Street, stopping on the Buckland side of Shelburne Falls before continuing to Shelburne and Greenfield. FRTA also provides on-demand transportation for the elderly and people with disabilities with scheduling done through the Shelburne Falls Senior Center.

### **Public Drinking Water Supply**

The Shelburne Falls Fire District was established in 1912, and provides water supply to approximately 2,200 persons within the village of Shelburne Falls, on both the Buckland and Shelburne side. The District has two active wells, and an emergency supply in the Fox Brook

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<sup>2</sup> "Answers to Frequently Asked Questions About Gravel Roads," produced by the Franklin Regional Council of Governments, September 2001 and FRCOG's 2007 summary of gravel road inventories from MassDOT.

Reservoir. The wells are located between 120 and 165 feet from the banks of the North River in the Town of Colrain. Farmland on the west side of the North River is protected through the Agricultural Preservation Restriction Program. Fox Brook Reservoir has a surface area of approximately 3 acres and a total storage capacity of 12 million gallons. In 2009, the Fire District served the residents, commercial businesses, and industries with 61.7 million gallons of drinking water, with an average annual daily withdrawal of 169,088 gallons. The registered withdrawal for the system is 310,000 gallons per day. Approximately half of the water consumed in 2009 was by Buckland residents and businesses and half by Shelburne's. The Shelburne Falls Fire District has a delineated Zone II Recharge Area and received a Source Water Assessment and Protection (SWAP) Report from the DEP in 2003.

### **Sewer Service**

Sewage disposal in Buckland is primarily by private systems, except for the buildings and homes in a small part of town known as the "Shelburne Falls" district of Buckland. These homes and businesses utilize the Shelburne Falls Waste Water Facility, a shared sewage treatment facility that also covers part of Shelburne. The effectiveness of the private systems is variable and depends on topography, water table, and soils. Dependence on private sewage disposal requires that housing be restricted to soils and slopes that can reasonably be expected to handle on-site sewage systems. Soil types are critical for determining this capacity, and many soils in Buckland are wet, are shallow to bedrock, or are coarse and stony which provide very little filtration to septic leachate since water passes through coarse soils very quickly. While not precluding development in Buckland, the density and total amount of new development in the near future will in large part be determined by the soils and their ability to pass percolation tests.

### **Schools**

Schools in Buckland include Buckland-Shelburne Regional Elementary School in Shelburne Falls and Mohawk Regional high School in Buckland.

## **Natural Resources**

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The town is situated in the Berkshire Hills. According to 2005 land use data, approximately 7.8 percent of the town is agricultural land - down from 9.2 percent in 1999. This agricultural land is mostly located along the Clesson Brook Valley and in the Deerfield River floodplain. The land is rugged, with high upland hills and steep slopes and is predominantly forested. The prime farmland soils of the town have contributed to its economy throughout its history.

The majority of commercial and industrial development has occurred in the Shelburne Falls area.

### **Water Resources**

Buckland lies in the Deerfield River Watershed, a part of the larger Connecticut River Watershed. Clesson Brook and Clark Brook are important sub-watersheds within the town. Buckland has approximately twelve acres covered by wetlands, which are fed by nearby brooks and rivers.<sup>3</sup> The town also has a fairly substantial amount of open water within its borders

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<sup>3</sup> 2005 McConnell Land Use Data.

(approximately 132 acres). The Connecticut and Deerfield rivers are supportive of recreational use.

## **Forests**

Buckland is located in the Northern Hardwoods Region (USDA, 1992). This forest type commonly occurs up to an elevation of 2,500 ft. above sea level and prefers fertile, loamy soils and good moisture conditions. In New England, the Northern Hardwoods can be found in Massachusetts in the glacial till soils west of the Connecticut River and in small portions of Maine and Connecticut, as well as most of the forested areas in New Hampshire and Vermont. The predominant species of the Northern Hardwoods are American beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*) and sugar maple (*Acer saccharum*). Associated species include red maple (*Acer rubrum*), white ash (*Fraxinus americana*), eastern hemlock (*Tsuga canadensis*), paper birch (*Betula papyrifera*), quaking and big tooth aspen (*Populus tremuloides* and *P. grandidentata*), eastern white pine (*Pinus strobus*), red spruce (*Picea rubens*) and red oak (*Quercus rubra*).

Buckland contains areas in the eastern part of Town identified by the Harvest Forest as forested in the 1830s that may not ever have been tilled, placing them in a category of Primary Forest with greater biodiversity value than forest with soils that have been tilled over time.<sup>4</sup> Native biodiversity unique to these areas typically includes soil fauna and flora, microorganisms and plants that produce primarily vegetatively, as well as species of wildflowers not common in other areas. Harvest Forest has GIS maps available showing primary forests by town. (Harvard Forest, 2002, 1830 Map Project).

## **Cultural and historic Resources**

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The importance of integrating cultural resource and historic property considerations into hazard mitigation planning is demonstrated by disasters that have occurred in recent years, such as the Northridge earthquake in California, Hurricane Katrina in New Orleans, or floods in the Midwest. The effects of a disaster can be extensive—from human casualty to property and crop damage to the disruption of governmental, social, and economic activity. Often not measured, however, are the possibly devastating impacts of disasters on historic properties and cultural resources. Historic structures, artwork, monuments, family heirlooms, and historic documents are often irreplaceable, and may be lost forever in a disaster if not considered in the mitigation planning process. The loss of these resources is all the more painful and ironic considering how often residents rely on their presence after a disaster, to reinforce connections with neighbors and the larger community, and to seek comfort in the aftermath of a disaster.<sup>5</sup>

Historic properties and cultural resources can be important economic assets, often increasing property values and attracting businesses and tourists to a community. While preservation of historic and cultural assets can require funding, it can also stimulate economic development and

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<sup>4</sup> Primary Forests are not the same as Old Growth forests, as they have likely been pastured and/or harvested over time.

<sup>5</sup> Integrating Historic Property and Cultural Resource Considerations Into Hazard Mitigation Planning, State and Local Mitigation Planning How-To Guide, FEMA 386-6 / May 2005.

revitalization. Hazard mitigation planning can help forecast and plan for the protection of historic properties and cultural resources.

Cultural and historic resources help define the character of a community and reflect its past. These resources may be vulnerable to natural hazards due to their location in a potential hazard area, such as a river corridor, or because of old or unstable structures.

**Table 2-1: Significant Structures and Sites within the Buckland Historic District**

Name of Feature	Date	Location	MHC Form Number
Sash, door, and blind factory	1863	State St., east of split with North St.	156
Shelburne Falls Fire House	1869	#4 and # 6 State Street	157
Shelburne Falls Business District	Late 1860's to early 1900's	Ashfield Street and State Street	31-37 +903
Methodist Episcopal Church (now Buckland Town Hall)	1877	17 State Street	155
Odd Fellows Building	1877	On corner of State and Clement Streets	153
Buckland – Shelburne Iron Bridge	1890	Bridge Street	904
Potter Grain Company	1894	Off of Ashfield Street, west of Shelburne Falls	158
Newell Block	1895	On State St, opposite the Truss Bridge	154
Methodist Episcopal Church	1906	On corner of State and Clement Streets	152
Bridge of Flowers (1929 Flowers added)	1908 Const.	Across Deerfield River, State - Water Streets	903

Source: Compiled from Massachusetts Historical Commission Inventory forms and the Massachusetts Cultural Resource Information System (MACRIS) database.

The Massachusetts Cultural Resource Information System (MACRIS) The Shelburne Falls National Historic District (NHD) encompasses 26 acres in the village center business district spanning both Buckland and Shelburne. The commercial core of the Shelburne Falls NHD, located one-half mile from Route 2, contains many contributing commercial, civic, and religious buildings located primarily to the north and south of Bridge Street in Shelburne and on State Street in Buckland. Within the NHD are the Glacial Potholes located in the Deerfield River, just south of the dam and falls.

**Table 2-2: Other Significant Structures and Sites in Buckland**

Name of Feature	Date	Location	MHC Form #
No. 2 East Buckland, Cemetery	1804 - 1876	Old County Rd. (abandoned)	801
East Buckland Cemetery	1849 - Present	Buckland Road	802
Upper City Cemetery	1841	Old Apple Valley Road	804
Mary Lyon birth place, bronze plaque on a rock	1887	East Buckland Road	901
Mary Lyon's first school, bronze plaque on quartz boulder	1968	Walker Road	902
Boston and Maine Railroad Trestle	1885	Old Conway Road, approx. 300 meters northwest of Gardner Falls Hydro Facility	905

Name of Feature	Date	Location	MHC Form #
Gardner Falls Station Power House, Canal and Dam	1904	Gardner Falls Station Road	159, 906, 907
Glacial Pothole	unknown	North Street, near feature # 13	909
Residence	1800	South Street	160
Home of Lois Buell	pre 1800	Off of Old Goodnough Road	151
Salt Box Home	1880	Off of Stone Road	150
F. R. Bray Farm	1820	On West side of Bray Road	148
Residence	1840	Stone Road	149
The Elmer Place	1876	Off of Bray Road, north of Stone Road	147
The Drake Place	1780	On Bray Road 100 yards north of Ashfield	146
The Nilman House	1846	Off of Nilman Road	145
The Johnson House	1896	East Buckland Road	144
The Bellows Place	1810	East Buckland Road	143
Hog Hollow Schoolhouse	1800	Hog Hollow Road	142
Purinton House	1852	Hog Hollow Road	141
Goddard Place (Porter House)	1812	Hog Hollow Road	140
The Hartwell House (Schneider Dog Pound)	not available	Hawley Road	138
The Rood Place	1830	Hawley Road	137
The Cranson Place	1700	Hawley Road	136
The Sanderson Ruddock Place	1800	Dodge Road	135
The Dodge Place	1805	Dodge Road	134
The Orta Kenney Place	1750	Hawley Road	133
Residence	1780	Hawley Road	132
The Ward Place	1790	Hawley Road	131
High Street School House	1850	Hawley Road	130
Auge Place	1880	Hawley Road	129
Scott House	1830	Hawley Road	127
The Hartwell House	1790	Hawley Road	126
The Lily Place (H. L. Dea. Warfield House)	1830	Martin Road	115
The Wood House	1810	Ashfield Road	121
Hathaway Place	1750	Hawley Road	122
District No. 5 Schoolhouse	1829	Hawley Road, Buckland Four Corners	123
The Kenney Place (Enos Pomeroy House)	1750	Hawley Road	124
Enoch Wells Place	1814	Hawley Road	125
Residence	1871	85 North Street	2
Freighter's Inn	c. 1800	124 North Street	1
Residence	1800	South Street	43
Braehead Farm	1795	88 Elm Street, near intersection of Homestead Avenue	42
Residence, Salt Box	1795	65 Elm Street, near intersection of Laurel Road	41
Residence, Greek Revival	1830	41 Elm Street	40

Name of Feature	Date	Location	MHC Form #
Residence	1850	Bray Road, just south of Ashfield Street	38
Residence	1815	Elm Street, on corner of Birch Road	39
The Lanfair Estate	1830	26 Walker Road	37
Residence	1850	9 Kendrick Road	36
Residence, Cape	1875	79 Ashfield Street	35
Parsonage for Catholic Church	1870	Monroe Avenue on corner of Ashfield Street	34
Crittenden School	after Dec. 6, 1919	Ashfield Street, near intersection with Franklin Street	33
E. B. Sherwin House	1830	50 - 52 Ashfield Street, on corner of School Street	32
Slattery House	1830	49 School Street	31
Nathaniel Lamson House	1850	39 Green Street	30
The Spencer Woodward House	1790	Rand Road, opposite the high school	52
Patch Farm	1785	Crittenden Hill Road, near intersection with Rand Road	53
The Luther Dunnell House	1840	Ashfield Road	54
Pine Brook Farm	1809	Ashfield Road, near intersection with Rand Road	55
The Gould Place	1875	Woodward Road, near intersection with Ashfield Road	56
Boehmer's Mill	1810	Ashfield Road and Woodward Road	57
The Lightning Splitter	1900	Ashfield Road, on corner of Depot Road	58
Bert Shaw's House	1830	Depot Road, near corner of Ashfield Rd	59
William Taylor House	Pre - 1800's	Dunbar Road	60
Dunbar House	1776	Dunbar Road	61
Burdick Place	1796	Laurel Road	62
The Otis Field House	1790	Purinton Road	63
The Sweet Place	1890	Laurel Road	64
Residence	1850	Purinton Road (Mowry's)	65
Goodnow Farm	1860	Purinton Road	66
Scott's Dairy	1780	Ashfield Road	67
Cooper's Shop	Pre - 1800	Ashfield Road, opposite Purinton Road	68
The Silas Trowbridge Place	1829	Ashfield Road, opposite Purinton Road	69
Enos Taylor House	Pre - 1800's	Ashfield Road, just north of intersection with Purinton Road	70
The Buckland Post Office	1819	Ashfield Rd, at intersection of Depot Rd	71
Koonchaug Farm	1800	Avery Road	82
Keach Place	pre - 1793	Charlemont Road	81
The Ward Place	1858	Charlemont Road	80
The Manard Place	1812	Charlemont Road	79

Source: Compiled from Massachusetts Historical Commission Inventory forms and the Massachusetts Cultural Resource Information System (MACRIS) database.

The various historic structures and sites within the NHD have been compiled from the Massachusetts Historical Commission (MHC) inventory and the Massachusetts Cultural

Resource Information System (MACRIS)<sup>6</sup> database. The table includes the name of the feature, the date of origin, and its location. The tables also include a form number, assigned by the MHC. The form numbers were recorded from the individual MHC historical inventories. MACRIS properties are cited in Table 2-2. Designation on the MACRIS database does not provide any protective measures for the historic resources but designated sites may qualify for federal and state funding if damaged during a natural or manmade hazard.

Buildings of historic and/or cultural interest identified by the Committee as lying in the flood include all the buildings listed in Table 2-1, excluding the Potter Grain Company. Many of the more than 80 buildings and sites listed in Table 2-2 – as well as other buildings and sites not yet identified – may also be located in the floodplain. An Action Item for this plan should include compiling the inventory and mapping all the buildings and sites to make a determination as to which may be at most risk for flooding or other hazards.

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<sup>6</sup> <http://mhc-macris.net/Results.aspx>



## 3 – HAZARD IDENTIFICATION & ANALYSIS

### Natural Hazard Identification

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Historical research, conversations with local officials and emergency management personnel, available hazard mapping and other weather-related databases were used to identify the natural hazards which are most likely to have an impact on the Town of Buckland.

#### Floods

##### *General Description*

The average annual precipitation for Buckland and surrounding areas in northwestern Massachusetts is 44 inches.<sup>7</sup> There are three major types of storms that bring precipitation to Buckland. Continental storms that originate from the west continually move across the region. These storms are typically low-pressure systems that may be slow-moving frontal systems or more intense, fast-moving storms. The second major storm type are coastal storms. There are two kinds that bring major precipitation and wind – nor'easters and hurricanes. Nor'easters bring heavy rain, high winds, ice storms or blizzards into New England from the coast of Maine and Canada. In late summer or early fall, hurricanes may reach Massachusetts from the south and result in significant amounts of rainfall. The third type of storm is the result of local convective action. Thunderstorms that form on warm, humid summer days can cause locally significant rainfall.

Floods are classified as either *flash floods*, which are the product of heavy, localized precipitation in a short time period over a given location or *general floods*, which are caused by precipitation over a longer time period in a particular river basin. Since the Town lies along the Deerfield River, Buckland could be particularly vulnerable to flooding. There are several local factors that determine the severity of a flooding event, including: stream and river basin topography, precipitation and weather patterns, recent soil moisture conditions, amount of impervious surface area, and the degree of vegetative clearing. Floods occur more frequently and are one of the most costly natural hazards in the United States.

*Flash flooding* events typically occur within minutes or hours after a period of heavy precipitation, after a dam or levee failure, or from a sudden release of water from an ice jam. Most often, flash flooding is the result of a slow-moving thunderstorm or the heavy rains from a hurricane. In rural areas, flash flooding often occurs when small streams spill over their banks. However, in urbanized areas, flash flooding is often the result of clogged storm drains (leaves and other debris) and the higher amount of impervious surface area. In contrast, *general flooding* events may last for several days. Excessive precipitation within a watershed of a stream or river can result in flooding particularly when development in the floodplain has obstructed the natural flow of the water and/or decreased the natural ability of the groundcover to absorb and retain surface water runoff.

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<sup>7</sup> Massachusetts Department of Conservation and Recreation 2009 precipitation data, <http://www.mass.gov/dcr/watersupply/rainfall/index.htm>.

A floodplain is the relatively flat, lowland area adjacent to a river, lake or stream. Floodplains serve an important function, acting like large “sponges” to absorb and slowly release floodwaters back to surface waters and groundwater. Over time, sediments that are deposited in floodplains develop into fertile, productive farmland like that found in the Connecticut River Valley. In the past, floodplain areas were also often seen as prime locations for development. Industries were located on the banks of rivers for access to hydropower. Residential and commercial development occurred in floodplains because of their scenic qualities and proximity to the water. Although periodic flooding of a floodplain is a natural occurrence, past and current development and alteration of these areas will result in flooding that is a costly and frequent hazard.

Another flooding event noted by the Committee is the April 2007 nor’easter, whose impact was felt much more in the form of flooding ultimately, than in snow. The Town experienced widespread flooding with many areas of gravel roads washed out. Some roads heavily impacted include Shepherd Road, Dodge Road, South Street, Clesson Brook Road, Avery Road and Cemetery road. The town requested \$3,400 in aid from MEMA

### ***Location and Extent***

Franklin County has several major rivers and numerous tributaries which are susceptible to flood events. The major rivers in the region include the Connecticut, the Deerfield, and the Millers, with the Deerfield River running through Buckland. Table 3-1 shows occurrences of flooding in Franklin County since 1993. Data detail does not contain any specific occurrences directly in Buckland.

**Table 3-1: Flooding Events in Franklin County Since 1993**

Year	# of Flood Events	Annual Property Damage	Annual Crop Damage
2010	1	\$150,000	\$0
2009	0	\$0	\$0
2008	3	\$38,000	\$0
2007	1	\$250,000	\$0
2006	0	\$0	\$0
2005	5	\$11,435,000	\$0
2004	2	\$10,000	\$0
2003	1	\$10,000	\$0
2002	0	\$0	\$0
2001	1	\$0	\$0
2000	1	\$0	\$0
1999	0	\$0	\$0
1998	4	\$75,000	\$0
1997	0	\$0	\$0
1996	11	\$1,800,000	\$0
1995	3	\$0	\$0
1994	2	\$0	\$0
1993	5	\$0	\$0
<b>18</b>		<b>\$764,889</b>	<b>\$0</b>
# of Years		Average Annual Property Damage	Average Annual Crop Damage

Source: <http://www4.ncdc.noaa.gov>

The majority of 100-year floodplain in Buckland is along Clesson and Clark brooks and on the Deerfield River. Committee members identified the following areas as being prone to chronic flooding:

- ***Buckland Recreation Area:*** This area has had chronic issues with flooding and riverbank erosion. In the 2010 Buckland Open Space and Recreation Plan, an action item was listed to “follow up on work already done to secure funding to address stream bank erosion at Buckland Recreation Area”. The project had been started but has stalled. Potential funding sources for completing this project include MEMA, DEP s.319 Program and NRCS. Responsible groups identified to manage this project include the Recreation Committee, the Select Board, and the Conservation Commission with a projected completion date of 2011.
- ***South Street Culvert:*** This culvert chronically floods and requires periodic repairs. This culvert has been identified to receive funds for repair through MEMA. See Appendix C.
- ***Clesson Brook Road:*** Culvert for Clesson Brook on Clesson Brook Road is undersized and floods chronically.
- ***Fox Road:*** A private dam on Clark Brook off Fox Road flood chronically.

See map on page 74 for locations of chronic flooding.

## Severe Winter Storms

### *General Description*

Severe winter storms can pose a significant risk to property and human life because the rain, freezing rain, ice, snow, cold temperatures and wind associated with these storms can disrupt utility service, phone service and make roadways extremely hazardous. Severe winter storms can be deceptive killers. The types of deaths that can occur as a result of a severe winter storm include: traffic accidents on icy or snow-covered roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to cold temperatures. Infrastructure and other property are also at risk from severe winter storms and the associated flooding that can occur following heavy snow melt. Power and telephone lines, trees, and telecommunications structures can be damaged by ice, wind, snow, and falling trees and tree limbs. Icy road conditions or roads blocked by fallen trees may make it difficult to respond promptly to medical emergencies or fires. Prolonged, extremely cold temperatures can also cause inadequately insulated potable water lines and fire sprinkler pipes to rupture and disrupt the delivery of drinking water and cause extensive property damage.

### *Location and Extent*

Franklin County regularly experiences severe winter storm events between the months of December and April. According to the National Climatic Data Center (NCDC), there have been a total of 111 snow and ice events reported in Franklin County between February 1, 1993 and February 26, 2010, including heavy snow, snow, ice storms, snow squalls, freezing rain and winter storms.<sup>8</sup> The NCDC web site has more detailed information about each of the listed storms. Seven out of the 111 snow and ice events that impacted Franklin County (as well as other areas of Massachusetts) resulted in Presidential Disaster Declarations or Emergency Declarations, which then made the state, residents and businesses eligible for federal disaster

<sup>8</sup> <http://www4.ncdc.noaa.gov/cgi-win/wwcgui.dll?wwevent~storms>

relief funds. Table 3-2 lists the 7 recent severe winter disasters that have led to Presidential Disaster or Emergency Declarations in Massachusetts.

**Table 3-2: Major Disaster and Emergency Declarations in Massachusetts, 1993 - 2009**

Disaster Name	Date of Event	Declared Areas	Disaster #/Type of Assistance	Federal Share Disbursed	Non-Federal Share Disbursed	Total Disbursement
Blizzards, High Winds and Record Snowfall	March 1993	All 14 Counties	FEMA-3103-EM (PA)	\$1,284,873	\$183,649	\$1,468,522
Blizzard	January 1996	All 14 Counties	FEMA-1090-EM (PA)	\$16,177,860		\$16,177,860
Snowstorm	March 2001	Counties of Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, and Worcester. The cost share is 75% federal and 25% local.	FEMA-3165-EM (PA)	\$21,065,441		\$21,065,441
Snowstorm	February 2003	All 14 Counties. The cost share is 75% federal and 25% local.	FEMA-3175-EM (PA)	\$28,868,815		\$28,868,815
Snowstorm	December 2003	Counties of Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, and Worcester	FEMA-3191-EM (PA)	\$35,683,865		\$35,683,865
Snowstorm	January 2005	All 14 Counties	FEMA-3201-EM (PA)	\$49,945,087		\$49,945,087
Severe Winter Storm	December 2008	Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Suffolk, and Worcester *(Figure as of 9/8/2009)	FEMA-3296-EM-MA	\$66,509,713		
Severe Storms and Flooding	December 2008	All 14 Counties (6 month lock-in \$7,200,000)	FEMA-1813-DR-MA(PA)			

Notes: **Public Assistance (PA) Project grants.** Supplemental disaster assistance to states, local governments, certain private non-profit organizations resulting from declared major disasters or emergencies.

Snow and ice storms can have a town-wide impact, with the possibility of downed power lines in difficult-to-access locations. Although ice storms occur much less frequently than snow storms (4 out of 111 in the NCDC database), the effects can be devastating. On December 11, 2008, Franklin County residents awoke to a landscape coated with ice. Half an inch of ice accumulated on exposed surfaces across Franklin County. This major ice storm affected interior Massachusetts and southern New Hampshire as well as much of northern New England. The ice buildup on exposed surfaces combined with breezy conditions resulted in numerous downed trees, branches, and power lines, which resulted in widespread power outages. More than 300,000 customers were reportedly without power in Massachusetts and an additional 300,000

were without power in the state of New Hampshire. Because of the breadth of this storm (from Pennsylvania to Maine), extra crews to reinstate power were harder to come by. Power crews from states as far away as South Carolina, as well as local National Guard teams, were called out to help with power restoration and clean up. While most people had their power restored within a week, others were still without power at Christmas (nearly 2 weeks later).

During this period, temperatures were mostly below normal and at least one major snowstorm affected the same area. At the time of the December 19th snowstorm, which dumped 7 – 12 inches of snow in eastern Franklin County and 9 – 14 inches of snow in western part of the county, over 100,000 customers were still without power in the two states combined. Two days later, on December 21<sup>st</sup>, 5 – 7 inches of new snow blanketed eastern Franklin County.

Buckland did not suffer as devastating a blow from this ice storm as some of its neighboring Franklin County towns at higher elevations. However, the Committee reports that the Town tallied 137 downed trees or hanging limbs from the storm. All told, 50 miles of streets and right-of-ways required repair or clearing and power outages ranged from 1-5 days, depending upon location in town. Anecdotal reports included property damage such as garages and decks crushed by trees as well as water damage due frozen pipes in those structures that lost power. There were numerous car accidents and reports of dirt roads washed out, but no reports of injuries. The Town submitted \$15,864 in costs related to this ice storm to MEMA.

## **Hurricanes and Tropical Storms**

### ***General Description***

Hurricanes are violent rainstorms with strong winds that can reach speeds of up to 200 miles per hour. Hurricanes generally occur between June and November and can result in flooding and wind damage to structures and above-ground utilities. August, September, and the first half of October are when most hurricanes occur in New England. In Massachusetts, major hurricanes occurred in 1904, 1938, 1954, 1955, 1960, 1976, 1985, and 1991. The last hurricane to make landfall in New England was Hurricane Bob, a weak category 2 hurricane, in August 1991. In Franklin County, Hurricane Bob caused roughly \$5,555,556 in property and crop damages.<sup>9</sup>

Tropical storms, defined as having sustained winds from 34-73 mph, have also resulted in high winds and damages in Franklin County. Between 1990 and 2008, 16 tropical storms impacted the County, causing almost \$600,000 in property damages.<sup>10</sup> No significant damage was reported in Buckland due to any hurricane events.

### ***Location and Extent***

High winds from hurricanes could potentially impact the built and natural environments in Buckland and could result in power outages due to downed power lines and to injuries to Town residents. Tropical storms, defined as having sustained winds from 34-73 mph, have resulted in high winds and damages in Franklin County. Between 1990 and 2008, 16 tropical storms impacted the County, causing almost \$600,000 in property damages.<sup>11</sup>

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<sup>9</sup> Spatial Hazard Events and Losses Database (SHELDUS), <http://webra.cas.sc.edu/hvri/>

<sup>10</sup> Ibid.

<sup>11</sup> Ibid.

An unnamed hurricane was recorded as passing through Buckland in September of 1945. According to the Committee, there have been no other hurricanes in Buckland since then.

## **Tornadoes and Microbursts**

### ***General Description***

The category of Tornadoes and Microbursts includes thunderstorm events, and associated storm effects including hail and lightning. Tornadoes are swirling columns of air that typically form in the spring and summer during severe thunderstorm events. In a relatively short period of time and with little or no advance warning, a tornado can attain rotational wind speeds in excess of 250 miles per hour and can cause severe devastation along a path that ranges from a few dozen yards to over a mile in width. The path of a tornado may be hard to predict because they can stall or change direction abruptly. Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester, including towns in eastern Franklin County.

High wind speeds, hail, and debris generated by tornadoes can result in loss of life, downed trees and power lines, and damage to structures and other personal property (cars, etc.). Since the 1950s, there have been over twenty tornadoes in Franklin County. In the last fifteen years, three tornadoes have been reported in Franklin County, in the towns of Heath, Charlemont, and Wendell. The July 2006 tornado in Wendell was rated F2 (Strong) on the Fujita Scale with winds estimated near 155 mph.<sup>12</sup>

Of additional concern are microbursts, which often do tornado-like damage and can be mistaken for tornadoes. In contrast to the upward rush of air in a tornado, air blasts rapidly downward from thunderstorms to create microbursts.<sup>13</sup> According to data supplied by the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center, between May 1996-April 2010, there have been no microbursts located directly in Buckland, however a strong microburst hit nearby Greenfield and caused significant damage in the form of downed trees, downed power lines and damage to property.

Thunderstorms can occur frequently in Western Massachusetts, sometimes accompanied by strong winds, hail and lightning. On May 26, 2010, strong thunderstorm winds caused damages throughout the Connecticut River Valley with numerous trees and wires down and widespread power outages. More data on these hazard events is located in the Vulnerability Assessment section of this plan.

### ***Location and Extent***

Within Massachusetts, tornadoes have occurred most frequently in Worcester County and in communities west of Worcester, including towns in eastern Franklin County. While the likelihood of a tornado touching down in Buckland is low, a occurrence could cause damage along a path, including damage to the built and natural environment and potential injury to

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<sup>12</sup> NOAA National Climate Data Center, <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

<sup>13</sup> <http://www.fema.gov/regions/vii/2003/03r7n06a.shtm>

citizens. The location and extent of microbursts and thunderstorms, on the other hand, can be more widespread.

## **Wildfires/Brushfires**

### ***General Description***

According to FEMA, there are three different classes of wildland fires: *surface fires*, *ground fires* and *crown fires*.<sup>14</sup> The most common type of wildland fire is a surface fire that burns slowly along the floor of a forest, killing or damaging trees. A ground fire burns on or below the forest floor and is usually started by lightening. Crown fires move quickly by jumping along the tops of trees. A crown fire may spread rapidly, especially under windy conditions.

While wildland fires have not been a significant problem in Buckland, there is always a possibility that changing land use patterns and weather conditions will increase a community's vulnerability. For example, drought conditions can make forests and other open, vegetated areas more vulnerable to ignition. Once the fire starts, it will burn hotter and be harder to extinguish. Soils and root systems starved for moisture are also vulnerable to fire. Residential growth in rural, forested areas increases the total area that is vulnerable to fire and places homes and neighborhoods closer to areas where wildfires are more likely to occur.

### ***Location and Extent***

Between 2004 and 2009, one brushfire was reported in Buckland by the Massachusetts Fire Incident Reporting System.<sup>15</sup> Buckland has approximately 17,780 acres of forests, and could be at risk for wildfires, particularly if there are significant areas of blown down trees, serving as a potential fuel source.

The Town of Buckland's residents were issued 258 burn permits in 2010. Specific burn permit guidelines are established by the state, such as the burning season and the time when a burn may begin on a given day. It may be beneficial for the state to change some of their regulations to prevent wildfires and brushfires. Currently, the burning season extends from January 15<sup>th</sup> to May 1<sup>st</sup>. If the burning season were to start in November or December and end in April, this would allow for a longer season during the months found to be, traditionally, the least dry in Massachusetts. Currently, residents may only burn between 10 a.m. and 4 p.m. If state guidelines were changed to allow for an earlier start time, this would allow for most of the burning to be conducted in the morning before winds traditionally increase.

## **Dam Failure**

### ***General Description***

Although dams and their associated impoundments provide many benefits to a community, such as water supply, recreation, hydroelectric power generation, and flood control, they also pose a potential risk to lives and property. Dam failure is not a common occurrence but dams do represent a potentially disastrous hazard. When a dam fails, the potential energy of the stored water behind the dam is instantly released, oftentimes with catastrophic consequences as the

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<sup>14</sup> FEMA, "Fact Sheet: Wildland Fires," September 1993.

<sup>15</sup> Massachusetts Fire Incident Reporting System (MFIRS), Massachusetts Department of Fire Services.

water rushes in a torrent downstream flooding an area engineers refer to as an “inundation area.” The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area.

Many dams in Massachusetts were built in the 19<sup>th</sup> century without the benefit of modern engineering design and construction oversight. Dams can fail because of structural problems due to age and/or lack of proper maintenance. Dam failure can also be the result of structural damage caused by an earthquake or flooding brought on by severe storm events.

The Massachusetts Department of Conservation and Recreation (DCR) is the agency responsible for regulating dams in the state (M.G.L. Chapter 253, Section 44 and the implementing regulations 302 CMR 10.00). The DCR was also responsible for conducting dam inspections until 2002, when state law was changed to place the responsibility and cost of inspections on the owners of the dams. In accordance with the new regulations, which went into effect in 2005, dam owners must register, inspect and maintain dams in good operating condition. Owners of High Hazard Potential dams and certain Significant Hazard Potential dams are also required to prepare, maintain and update Emergency Action Plans. The state has three hazard classifications for dams:

The state has three hazard classifications for dams:

- *High Hazard:* Dams located where failure or improper operation will likely cause loss of life and serious damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads.
- *Significant Hazard:* Dams located where failure or improper operation may cause loss of life and damage to homes, industrial or commercial facilities, secondary highways or railroads or cause interruption of use or service of relatively important facilities.
- *Low Hazard:* Dams located where failure or improper operation may cause minimal property damage to others. Loss of life is not expected.

The inspection schedule for dams is as follows:

- Low Hazard dams – 10 years
- Significant Hazard dams – 5 years
- High Hazard dams – 2 years

The time intervals represent the maximum time between inspections. More frequent inspections may be performed at the discretion of the state. Dams and reservoirs licensed and subject to inspection by the Federal Energy Regulatory Commission (FERC) are excluded from the provisions of the state regulations provided that all FERC-approved periodic inspection reports are provided to the DCR. All other dams are subject to the regulations unless exempted in writing by DCR.

Along with manmade dams, failure of beaver dams can cause flooding as well. Alteration of the landscape by beavers is a natural process that creates habitat for shore birds, mammals and rare amphibians. However, beaver ponds can flood structures, roads and utilities, causing costly and



potentially dangerous situations. Beaver activity can also pollute drinking water supplies. Mitigation measures suggested by Massachusetts Division of Fish and Wildlife (MassWildlife) and other agencies can help communities and homeowners deal with nature's master builders.

Until 1996, when a ballot initiative passed restricting the practice, Massachusetts residents were permitted to trap beavers. That change in policy caused a spike in the beaver population, which, in turn, led to a sharp increase in complaints about beaver activity and its effects. The law was modified in 2000 so that town Board of Health members could issue emergency trapping permission outside of the usual trapping season. But an increased beaver population, combined with land development reducing beaver habitat, means that humans and beavers continue to clash. Several mitigation measures, when applied thoughtfully, legally and with maintenance measures in mind, can help with beavers' negative effects, while preserving beavers' positive impact on the land.<sup>16</sup>

State law makes it illegal for any person to disturb or tear open a beaver dam or beaver lodge without written permission from MassWildlife and the local Conservation Commission or Department of Environmental Protection. Permits are needed to disturb a beaver dam for any reason in Massachusetts. Even dams that cause flooding require permits to be breached.<sup>17</sup>

While trapping beaver can have short-term benefits, the right conditions for beaver habitat will eventually lure new beavers. It may be best to combine trapping with measures that discourage beaver activity that's bad for humans. Techniques used to mitigate the flooding damage caused by beaver include breaching of beaver dams, protecting road culverts with fences or guards, and controlling water levels with water flow devices. All these techniques require a certain degree of effort and regular maintenance to insure water levels that can be tolerated (thereby preserving the positive aspects of the associated wetland). See the MassWildlife publication *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts* for details on these mitigation measures. The following techniques were adapted from that publication.

- Dam breaching is an immediate but very short-term solution to flooding problems caused by beaver. Potato hoes or stone hooks are the best tools for dismantling dams by hand. Shovels and spading forks are ineffective. Good water control is possible if the breach is kept shallow and broad so that the water level falls slowly. Opening a deep breach creates a dangerous situation and may cause serious flooding and erosion downstream. Tractor- or truck-mounted excavators may be used by town, county or state highway employees to remove large amounts of material from beaver dams but care should be taken to avoid downstream flooding. Neighbors should be told where, when, and why a dam excavation is going to be done. If the method is justified and must be used, it is best done in mid-summer when the water level is low.
- Beavers build dams instinctively. When they sense running water, they start to build or repair dams. Culverts, especially ones made out of metal, will amplify the sound of the water rushing through them. Thus, beaver will commonly block road culverts with sticks, mud and rocks. This can cause flooding upstream. Culverts blocked from the inside are

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<sup>16</sup> Otsego County (NY) *All Hazards Mitigation Plan*, 2010.

<sup>17</sup> Langlois, S.A. and T.A. Decker. 2004. *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts* (Rev. Ed.). MA Division of Fisheries and Wildlife. 18pp.

difficult to clean and potentially dangerous. The use of meshes and grills, placed on both the upstream and downstream ends of the culvert, can prevent beavers from entering. Several strategies are listed in *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts*.

- Water Level Control Devices (WLCDs) keep beavers away from an intake pipe that lowers the water level of the pond. It's been estimated that only 4.5% of beaver problems in Massachusetts will respond to these devices. Using and maintaining a WLCD in conjunction with trapping young beavers can allow coexistence for years. Several types of WLCDs are available. For construction details, see *The Use of Water Flow Devices and Flooding Problems Caused by Beaver in Massachusetts*.

### ***Location and Extent***

In January of 2011, the MA DCR Office of Dam Safety provided information about eight dams in Buckland. All are listed as under the jurisdiction of FERC (Table 3-3). The MA DCR Office of Dam Safety does not provide information on the physical condition nor on the inspection dates of those dams under FERC jurisdiction.

**Table 3-3: MA DCR Office of Dam Safety 2011 Data**

<b>Dam Name</b>	<b>River</b>	<b>Year Built</b>	<b>E10 - Overall Physical Condition of the Dam</b>	<b>Date of Most Recent Phase I Report</b>	<b>Latest Emergency Inspection Date</b>	<b>Latest Follow-up Inspection Date</b>	<b>Ownership Type</b>	<b>Primary Owner</b>
New England Power Co. #4 Dam	Deerfield River						FERC Jurisdiction	TransCanada Hydro Northeast Inc.
New England Power Co. #3 Dam	Deerfield River						FERC Jurisdiction	TransCanada Hydro Northeast Inc.
Gardner Falls Diversion Canal/Forebay	Tributary of Deerfield River						FERC Jurisdiction	NAEA Energy Massachusetts, LLC
Gardner Falls-Main Dam	Deerfield River						FERC Jurisdiction	NAEA Energy Massachusetts, LLC
New England Power Co. Forebay #3	Deerfield River						FERC Jurisdiction	TransCanada Hydro Northeast Inc.
New England Power Co. Forebay #4	Tributary of Deerfield River						FERC Jurisdiction	TransCanada Hydro Northeast Inc.
New England Power Co. #2 Dam	Deerfield River						FERC Jurisdiction	TransCanada Hydro Northeast Inc.

Due to the lack of information contained in the DCR Office of Dam Safety data, the Buckland Comprehensive Emergency Management Plan (CEM) has been used for more complete information on dams in Buckland. The CEM Plan lists three dams in the Buckland area: the

Gardner Falls Dam, New England Power Co. #3 and New England Power Co. #4. The CEM Plan lists the former as medium hazard and the latter two as high hazard dams.

The New England Power Co. #4 Dam and the New England Power Co. #3 Dam are both under FERC regulation and are categorized as high hazard.

The Gardner Falls-Main Dam is FERC licensed and is categorized significant hazard.

The New England Power Co Forebay #3, New England Power Co. Forebay #4 and New England Power Co.#2 Dam are all FERC licensed and are categorized as low hazard. The Gardner Falls Diversion and Hillman Ice Pond Dam are not FERC licensed and are categorized low hazard.

Of particular note are the upstream projects on the Deerfield River owned by TransCanada, Inc. and licensed by FERC. These projects include the Somerset Dam, the Harriman Dam, the Sherman Dam, the Fife Brook Dam and the Bear Swamp Upper Reservoir, all of which are classified as high hazard dams. The Emergency Action Plans for these projects include a series of inundation maps for each dam which illustrate potential flooding conditions for downstream areas including portions of Shelburne and adjacent to the Deerfield and Connecticut rivers.<sup>18</sup> A catastrophic failure of any one of these high hazard dams would likely result in the cascading failure of all the downstream dams (both high and low hazard dams), resulting in widespread flooding of downstream areas in a matter of hours.

For example, on a sunny day (no additional precipitation added to released water), water from a catastrophic failure of the Harriman Dam would reach the Cold River (20.4 miles from origin) in 1.9 hours and the center of Charlemont (23.7 miles from origin) in 2.3 hours. Under “Probable Maximum Flood” (PMF) conditions, the worst-case scenario, floodwaters from a catastrophic failure of the Sherman Dam would reach the center of Charlemont in 1.4 hours. Both “Sunny Day” and PMF conditions are presented on the inundation maps for the five TransCanada New England High Hazard Dams.

Inundation maps for the Harriman Dam extend from the dam downstream to Holyoke, roughly 86 miles away. Under PMF conditions, water would reach the Gardner Falls Dam between Buckland and Shelburne (35.2 miles from origin) in 2.7 hours. In four hours, it would reach Deerfield (46.2 miles from origin). It would reach the Route 5 Bridge (50.3 miles from origin) in 4.6 hours.

The remaining five TransCanada dams on the Deerfield River are classified as low hazard dams; therefore, no emergency action plan or inundation mapping are required by FERC. Consultants hired by TransCanada examined a “Sunny Day” failure scenario for these dams to determine the downstream flooding hazard potential. Next, the incremental impact was determined for a dam failure that occurred at a flow equivalent to the 100-year frequency flood. For these two scenarios, the study indicates that the additional flooding above the 100-year flood stage was insignificant and therefore these projects do not present a significant hazard to life and

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<sup>8</sup> “Emergency Action Plans for the Deerfield River FERC Licensed Projects Nos. 2323 and 2669,” prepared for US GEN New England, Inc., by Kleinschmidt Energy and Water Resource Consultants, November 2003.

property.<sup>19</sup> However, the cascading failure of one or more of these dams that would occur if one of the high hazard dams failed would result in the catastrophic flooding shown on the inundation maps in the EAP.

Put in simplest terms, if the Harriman Dam fails under PMF conditions, every dam downstream of it on the Deerfield River will most likely fail as the water released by the Harriman Dam reaches it. During such an event, the river is expected to rise approximately 72 feet, sending an estimated 675 million gallons of water rapidly downstream. This would occur with very little warning or preparation time. There would be the potential for incalculable property damage and significant loss of life in every town on the Deerfield River from Monroe to Holyoke. Therefore, emergency responders should review inundation areas and identify possible evacuation routes as well as familiarizing themselves with the contents of the Harriman Dam Emergency Action Plan. The Harriman Dam holds back the Harriman Reservoir. Located on the Deerfield River near Whitingham, VT, the drainage basin of the dam is roughly 25.3 miles long with a basin width of 13 miles. The development structures were completed in 1924 and consist of an earth embankment of the semihydraulic fill type, a morning glory spillway, a concrete lined rock tunnel from a concrete intake tower upstream of the dam, and a power house connected to the surge tank.<sup>20</sup>

The 100-year flood plain covers about four percent, or roughly 551 acres of the town, including an estimated 32 acres of developed residential land. An inundation area due to dam failure would cover substantially more acreage. Emergency responders should review inundation areas and identify possible evacuation routes.

According to data taken from NOAA, there have been no dam failures in Franklin County in the past twenty years. Committee members confirmed no dam failures in Buckland.

The Committee identified significant beaver dams in Buckland:

- **Nillman Road:** Beaver dam on Hog Hollow Brook with an approximate 10acre impoundment.
- **East Buckland Road:** A breached beaver dam is located on the Clark Brook.
- **Dodge Road:** A breached beaver dam is located off Dodge Road.

## Earthquakes

### *General Description*

An earthquake is a sudden, rapid shaking of the ground that is caused by the breaking and shifting of rock beneath the Earth's surface. Earthquakes can occur suddenly, without warning, at any time of the year. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people<sup>21</sup>. Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as avalanches, flash floods (dam failure) and fires. Un-reinforced

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<sup>19</sup> Ibid.

<sup>20</sup> Harriman Dam Emergency Action Plan.

<sup>21</sup> Northeast States Emergency Consortium Web site: [www.nesec.org/hazards/earthquakes.cfm](http://www.nesec.org/hazards/earthquakes.cfm)

masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake<sup>22</sup>.

### ***Location and Extent***

Tables 3-4 and 3-5 show historic occurrences of earthquakes in the Northeastern part of the United States. A NOAA data query for earthquake events in Franklin County between the years 1991 and 2010 turned up no events. Additional, the Committee confirmed there have been no significant events but there have been occasional minor tremors.

**Table 3-4: Northeast Earthquakes with a Magnitude of 4.2 or more 1924 - 2007**

Location	Date	Magnitude
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5
Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Plattsburg, NY	April 20, 2002	5.1
Bar Harbor, ME	October 3, 2006	4.2

Source: Northeast States Emergency Consortium Web site: [www.nesec.org/hazards/earthquakes.cfm](http://www.nesec.org/hazards/earthquakes.cfm).

**Table 3-5: Northeast States Record of Historic Earthquakes**

State	Years of Record	Number Of Earthquakes
Connecticut	1668 - 2007	137
Maine	1766 - 2007	544
Massachusetts	1668 - 2007	355
New Hampshire	1638 - 2007	360
Rhode Island	1776 - 2007	38
Vermont	1843 - 2007	73
New York	1840 - 2007	755
<b><i>Total Number of Earthquakes within the Northeast states between 1638 and 2007 = 2,403.</i></b>		

Source: Northeast States Emergency Consortium Web site: [www.nesec.org/hazards/earthquakes.cfm](http://www.nesec.org/hazards/earthquakes.cfm).

According to the United States Geological Survey, a fault line runs north-south and extends along the entire length of Franklin County, and was originally responsible for the creation of the Connecticut River.

<sup>22</sup> Federal Emergency Management Agency Web site: [www.fema.gov/hazards/earthquakes/quake.shtm](http://www.fema.gov/hazards/earthquakes/quake.shtm).

Massachusetts introduced earthquake design requirements into their building code in 1975. However, these specifications apply only to new buildings or to extensively modified existing buildings. Buildings, bridges, water supply lines, electrical power lines and facilities built before 1975 may not have been designed to withstand the forces of an earthquake. The seismic standards have also been upgraded with the 1997 revision of the State Building Code.

## **Landslides**

### ***General Description***

Landslides are geological phenomena that include a wide range of ground movement, such as rock falls, failure of slopes and shallow debris flows. They can occur in coastal, mountain, and river edge environments.

Landslides occur when the stability of a slope changes from a stable to an unstable condition. A change in the stability of a slope can be caused by a number of factors, acting together or alone. Natural causes of landslides include:

- groundwater pressure acting to destabilize the slope
- loss or absence of vertical vegetative structure, soil nutrients, and soil structure (e.g. after a wildfire)
- erosion of the toe of a slope by rivers
- weakening of a slope through saturation by snowmelt or heavy rains
- earthquakes adding loads to barely-stable slopes
- earthquake-caused liquefaction destabilizing slopes
- volcanic eruptions

Landslides are created by human activities as well, including deforestation, cultivation and construction, which destabilize already fragile slopes

- vibrations from machinery or traffic
- blasting
- earthwork which alters the shape of a slope, or which imposes new loads on an existing slope
- in shallow soils, the removal of deep-rooted vegetation that binds colluvium to bedrock
- construction, agricultural or forestry activities (logging) which change the amount of water which infiltrates the soil.

### ***Location and Extent***

A typical setting for a landslide might bring to mind the precarious seaside hills in California. However, landslides have occurred much closer to home. According to WWLP News, early in the morning on March 7 of 2011, torrential rains swept away a piece of cemetery into the backyards of homes and nearby streets in Greenfield, MA. The landslide sent silt, mud, and debris slid down from the Green River Cemetery into homes on nearby Meridian Street. Residents did not hear a thing. A passerby called 911 and alerted authorities that part of the Green River Cemetery had slid down onto Meridian Street. Residents of three homes were evacuated. This area of Greenfield has been in the news before due to other landslides.

In Buckland, no significant landslide issues were identified by the Committee. There is, however, potential for a landslide in the area behind North Street where houses back up against a steep hill and where there has been some minor landslide issues.

## Ice Jams

### *General Description*

Ice jams (or ice dam) occur when water builds up behind a blockage of ice. Ice dams can occur in various ways, but in New England they predominantly form on rivers and streams and mainly threaten infrastructure.

When the upstream part of a river thaws first and the ice is carried downstream into the still-frozen part of the watercourse, ice can form an ice dam and flood low lying areas upstream of the jam. Also, once an ice dam breaks apart, the sudden surge of water that breaks through the dam can flood areas downstream of the jam. Ice jams and flooding usually occur in spring; however, they can happen as winter sets in when the downstream reach of a river freezes first. Where floods threaten, the blockage can be removed mechanically.

### *Location and Extent*

Buckland has experienced what is known locally as *backwater flooding* due to ice jams on the Deerfield River.<sup>23</sup> The committee stated that no other substantial ice jams have occurred in Buckland.

Ice jams occurring in and near Buckland could have an impact similar to flooding or dam failure, depending upon the size and impoundment associated with the jam. Historical data from the U.S. Army Cold Regions Research and Engineering Laboratory<sup>24</sup> from 2008 show ice jams occurrences, located by river. Since recording began there have been no ice jams on the Deerfield River in Buckland but there have been several in Charlemont, just upstream from Buckland. See Table 3-6. On the Deerfield River, no ice jams have been recorded since 1959.

**Table 3-6: Ice Jam Occurrences on the Deerfield River in or near Buckland**

Date	Type	Latitude	Longitude	Town	Description or other information
01/22/1959	unknown	42° 32' 9" N	72° 39' 54" W	West Deerfield	Maximum annual gage height of 11.46 feet
01/23/1957	unknown	42° 32' 9" N	72° 39' 54" W	West Deerfield	Maximum annual gage height of 7.49 feet. Discharge 9,570 cfs
02/08/1941	unknown	42° 32' 9" N	72° 39' 54" W	West Deerfield	Maximum annual gage height of 8.31 feet. Discharge "about" 10,000 cfs
03/12/1936	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 19.9 feet
02/05/1934	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 8.80 feet
02/17/1930	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 8.22 feet

<sup>23</sup> According to the state MEMA maps, there have been three historic ice jams on the Deerfield River near the center of Buckland. They occurred on February 8, 1941; January 22, 1959 and January 23, 1957. Their types are classified as "unknown."

<sup>24</sup> [www.crrel.usace.army.mil](http://www.crrel.usace.army.mil)

02/12/1925	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 15.97 feet. Discharge 9,330 cfs
03/23/1923	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 20.0 feet
03/21/1918	unknown	42° 37' 33" N	72° 51' 12" W	Charlemont	Maximum annual gage height of 11.75 feet

## Manmade Hazards<sup>25</sup>

### *General Description*

Most non-natural or manmade hazards fall into two general categories: intentional acts and accidental events, although these categories can overlap. Some of the hazards included in these two categories, as defined by MEMA, consist of intentional acts such as explosive devices, biological and radiological agents, arson and cyberterrorism and accidental events such as nuclear hazards, invasive species, infrastructure failure, industrial and transportation accidents. Accidental events can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials.

*Note: This plan does not address all manmade hazards that could affect Franklin County. A complete hazards vulnerability analysis was not within the scope of this update. For the purposes of the 2010 plan, the Committee evaluated those non-natural hazards that are of an accidental nature. They include industrial transportation accidents and industrial accidents in a fixed facility.*

### Hazardous Materials Definition

Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products are shipped daily on the nation's highways, railroads, waterways, and pipelines. Chemical manufacturers are one source of hazardous materials, but there are many others, including service stations, hospitals, and hazardous materials waste sites. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants.

A release may occur at a fixed facility or in transit. Communities with a large industrial base may be more inclined to experience a hazardous materials release due to the number of facilities such materials in their manufacturing process. Communities with several major roadways may be at a greater risk due to the number and frequency of trucks transporting hazardous materials passing through.

### *Location and Extent*

#### Industrial Accidents - Transportation

Franklin County transportation systems include road, rail, and air. Accessible and efficient freight transportation plays a vital function in the economy of the region. Most freight and goods being transported to and from Franklin County are by truck; however, a significant amount of freight that moves through the county is being hauled over the three main rail lines. Given that

<sup>25</sup> Content adapted from Commonwealth of Massachusetts State Hazard Mitigation Plan 2010



any freight shipped via air needs first to be trucked to an airport outside the region, air transportation is not being evaluated in this plan.

According to the Franklin County Hazardous Material Emergency Plan<sup>26</sup>, approximately 13 to 15 trucks per hour traveling through the region contain hazardous materials (Table 3-7). While most of these vehicles are on Interstate 91, 2 trucks per hour travel on Route 2, some of which pass through Buckland. Other major roadways potentially carrying hazardous materials in Buckland include Route 112.

Ten to 24 trains per day travel on the Pan Am Systems Main Freight line which runs through Buckland (Table 3-8). On each of these trains, an average of 4 cars carries hazardous waste.

**Table 3-7: Estimated Levels of Hazardous Material Transported on Area Roadways**

Roadway	Number of Tank or Van Trucks Carrying Hazardous Materials per hour
Interstate 91	10
Route 2	2
Other major roadways ( <i>Routes 5/10, 63, 47, 116, 202, 8A, 78, 122, 142, and 2A</i> )	1 or 0

**Table 3-8: Estimated Level of Hazardous Material Transport on Area Train Lines**

Train Line	Trains per Day (General Merchandise)	Average Number of Cars per Train	Average Number of Cars per Train with Hazardous Waste
<b>Main Freight Line, Pan Am Systems</b>	<b>10 to 24</b>	<b>50</b>	<b>4</b>
Connecticut River Line, Pan Am Systems	2 to 3	30	2
East Deerfield Rail Yard, Pan Am Systems	10 to 15 trains passing through yard	n/a	2 to 5
New England Central	2	60	5

Safe and efficient transportation routes for trucks to and through the region are important to the region's economy to and to the safety of its citizens. The safer the transportation routes are, the less likely a transportation accident will occur. Some challenges to safe transportation routes were identified in the FRCOG 2007 Regional Transportation Plan and include:

- The severity of the exit ramp curves impacts the safety of exiting for top-heavy vehicles such as freight trucks.
- Steep declines, including those on Route 2 eastbound west of Greenfield. The feasibility of adding runaway truck lanes is being evaluated.

#### Industrial Accidents – Fixed Facilities

An accidental hazardous material release can occur wherever hazardous materials are manufactured, stored, transported, or used. Such releases can affect nearby populations and contaminate critical or sensitive environmental areas. Those facilities using, manufacturing, or

<sup>26</sup> Franklin County Local Emergency Planning Committee, Franklin County Hazardous Material Emergency Plan and Maps, 2006. Based on a one-time survey conducted in 2003.

storing toxic chemicals are required to report their locations and the quantities of the chemicals stored on-site to state and local governments. The Toxics Release Inventory (TRI) contains information about more than 650 toxic chemicals that are being used, manufactured, treated, transported, or released into the environment (Table 3-9).

**Table 3-9: Toxics Release Inventory (TRI)**

FACILITY NAME	ADDRESS	NUMBER OF COMPOUNDS REPORTED AT SITE
LAMSON & GOODNOW MFG. CO.	BUCKLAND, MA 013700128	3

Source: EPA Toxic Release Inventory, 2010. *Note: Table 3-9: Toxics Release Inventory (TRI) in no way indicates any issues with any of the sites but rather is an inventory of those facilities meeting TRI reporting requirements.*

Table 3-10 shows those facilities which have reported chemical inventories to the Local Fire Department, the State Emergency Response Commission, and the LEPC, according to the Town CEM Plan.

**Table 3-10: CEM Plan Facilities Reporting Chemical Inventories**

Facility Name	Facility Address	Check if in Floodplain
Buckland WWTP	16 Gardner Falls Road	✓
Gardner Falls Hydro Electric Plant	Gardner Falls Road	✓
Lamson and Goodnow Cutlery	45 Conway Street	✓
Mohawk Trail Regional High School	26 Ashfield Road	✓
N.E. Power #3 Station	Conway Street	✓
N.E. Power #4 Station	Route 2	✓
Rice Oil	30 Conway Street	✓
Shelburne Falls Fire Station	121 State Street, Shelburne Falls	✓

Facilities which store or use extremely hazardous substances on-site could pose a potential health or environmental threat to the community. In addition, special institutions, public venues, transportation facilities, critical infrastructure, health & medical facilities, and mass care shelters at risk and emergency response resources are also listed. Of particular concern is that all facilities listed in the CEM Plan are located in a floodplain and could be subject to flooding, potentially causing spills to stored chemicals. In addition to the CEM Plan list, the Committee added the facilities shown in Table 3-11 as those also potentially storing or using hazardous materials and/or chemicals:

**Table 3-11: Facilities with Chemical Inventories Reported by the Committee**

Facility Name	Facility Address	Check if in Floodplain
Mayhew Steel	Conway Street	✓
Mass Highway Facility	112/State Street	Unknown
Buckland Highway Garage	Conway Street	✓
Sessions Garage – This site used to contain underground fuel tanks and still has water quality monitoring sites.	Conway Street	✓

A potential action item could include inventorying and mapping all facilities in Buckland housing and / or using hazardous materials, determining which of those facilities are located in the floodplain or areas subject to chronic flooding, and determining the facilities preparedness for the impacts of flooding.

In addition to facilities potentially housing hazardous compounds, the transportation of hazardous materials through Buckland is a potential manmade hazard. Route 2 and the Pan Am Systems Railroad both serve as primary routes for transportation of cargo, some of which is of a hazardous nature. According to the HMEP<sup>27</sup> Hazardous Materials Survey Results, the Pan Am Systems Railroad carries 5-12 freight trains in each direction daily with an average train length of 50 cars, an average of four of which carry hazardous materials. The hazardous materials regularly carried on these trains passing through Buckland include:

- Hydrocyanic acid
- Sulfuric acid
- Liquified petroleum gas
- Hydrochloric acid
- Chlorine
- Caustic soda
- Methanol
- Sodium chloride

The same plan identifies hazardous materials being carried on highways. On Route 2, which runs through Buckland, an average of 2 hazardous materials tank or van trucks travel per hour. The hazardous materials regularly carried on these trucks passing through Buckland include:

- Gasoline
- Fuel oil
- Kerosene
- Liquified petroleum gas
- Propane
- Sodium aluminate
- Sulfuric acid
- NOS liquids 3082

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<sup>27</sup> [http://www.frcog.org/pubs/emergency/Franklin\\_County\\_HMEP.pdf](http://www.frcog.org/pubs/emergency/Franklin_County_HMEP.pdf)

## Vulnerability Assessment

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### Vulnerability Overview

The tables within the Vulnerability Assessment section were developed to provide towns with a template for calculating and estimating potential losses and costs of flooding and other hazards. They draw from and integrate the work of other Natural Hazard Mitigation Plans, specifically the Natural Hazard Mitigation Plan for Thurston County, Washington, September 2009, but the tables can be linked to the most recent demographic, land use, and infrastructure information (databases) and automatically calculate and estimate the cost of flooding to each town or region.

### Vulnerability Assessment Methodology

The Vulnerability Assessment is a series of tables that enabled FRCOG staff to determine the vulnerability of Buckland to flooding and to calculate the potential costs of flooding to the town.<sup>28</sup> Estimated losses for all other hazard events were also determined, based on damages from past recorded events. The potential implications for vulnerable populations such as senior and low income populations in the event of a hazard are also assessed.

## Floods

### *Hazard Summary*

In this section, a vulnerability assessment was prepared to evaluate the potential impact that flooding could have on the portions of Buckland located within the 100-year floodplain. Flooding can be caused by severe storms, such as hurricanes, nor'easters, and microbursts, as well as ice jams and snow melt. To determine the vulnerability of the town, data was gathered and calculated for the value of residential, commercial, and industrial properties. The damage estimates presented are rough estimates and likely reflect a worst-case scenario. Computing more detailed damage assessments based on assessor's records is a labor-intensive task and beyond the scope of this project.

### *Data Collected and Used*

National weather databases and Town of Buckland data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website. This data was used to support an evaluation of exposure and potential impacts associated with this hazard. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on flooding and the Committee interviewed for additional information.

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<sup>28</sup> These tables were developed to provide towns with a template for calculating and estimating potential losses and costs of flooding. They draw from and integrate the work of other Natural Hazard Mitigation Plans, specifically the Natural Hazard Mitigation Plan for Thurston County, Washington, September 2009, but the tables can be linked to the most recent demographic, land use, and infrastructure information (databases) and automatically calculate and estimate the cost of flooding to each town or region.

NOAA flood event data for 1993 through 2010 for Franklin County is shown in Table 3-12. The average annual property damage in Franklin County due to flooding for those years is \$764,889, with no annual crop damage reported.

**Table 3-12: Flood Events in Franklin County**

Year	# of Flood Events	Annual Property Damage	Annual Crop Damage
2010	1	\$150,000	\$0
2009	0	\$0	\$0
2008	3	\$38,000	\$0
2007	1	\$250,000	\$0
2006	0	\$0	\$0
2005	5	\$11,435,000	\$0
2004	2	\$10,000	\$0
2003	1	\$10,000	\$0
2002	0	\$0	\$0
2001	1	\$0	\$0
2000	1	\$0	\$0
1999	0	\$0	\$0
1998	4	\$75,000	\$0
1997	0	\$0	\$0
1996	11	\$1,800,000	\$0
1995	3	\$0	\$0
1994	2	\$0	\$0
1993	5	\$0	\$0
<b>18</b>		<b>\$764,889</b>	<b>\$0</b>
<b># of Years</b>		<b>Average Annual Property Damage</b>	<b>Average Annual Crop Damage</b>

NOAA data shows no flooding events specific to the Buckland Shelburne area, however one event the Committee noted is the flood of April 4, 1987 during which the Town experienced widespread flooding. In the Village the Town Hall was flooded while on Upper Street the library was flooded and its furnace destroyed.

Table 3-13 identifies the recorded flood events in Buckland, as discussed in the Natural Hazard Identification and Profile section. Additionally, see Flood Hazard Identification and Profile section for information on areas of chronic flooding. According to NOAA data, no severe flood events were reported specifically in Buckland.

**Table 3-13: Severe Flood Events in Buckland**

Recorded Flood Events	Year	Location	Recorded Property Damages
Flooding	5/4/87	Town wide	Unknown
Post-nor'easter flooding	5/2007	Town wide	\$3,400

Source: Town Administrator

## ***Impact on the Community***

### ***Exposure and Loss Estimation***

Flooding can cause a wide range of issues, from minor nuisance roadway flooding and basement flooding to major impacts such as roadway closures. Specific damages associated with flooding events include the following primary concerns:

- Blockages of roadways or bridges vital to travel and emergency response
- Breaching of dams
- Damaged or destroyed buildings and vehicles
- Uprooted trees causing power and utility outages
- Drowning, especially people trapped in cars
- Contamination of drinking water
- Dispersion of hazardous materials
- Interruption of communications and/or transportation systems
- Debris management issues including debris removal and identification of disposal sites

### ***Property Damage***

Of Buckland's total land mass of 12,679 acres, 691 – or 5.45% - acres lie within the 100-year floodplain. Table 3-14 displays the number of dwelling units and the estimated population living in the 100-year floodplain in Buckland. According to 2005 MassGIS Land Use data there are 45 dwelling units located in the floodplain. Using this number and Buckland's average household size as of the 2009 U.S. Census Population Estimates, it is estimated that 45 people, or 5.81% of Buckland's total population, reside in the floodplain.

**Table 3-14: Number of Dwelling Units and % of Total Population in Flood Hazard Area**

<b>Total Town Population</b>	<b>Average # of people per household</b>	<b>Number of Dwelling Units in Flood Hazard Area</b>	<b>Estimated population in Flood Hazard Area</b>	<b>% of total population that reside in the Flood Hazard Area</b>
1,989	2.57	45	116	5.81

Source: 2000-2009 U.S. Census Population Estimates Program, Released June 22, 2010; 2000 U.S. Census; 2005 MassGIS Land Use data.

Table 3-15 shows the amount of commercial, industrial, and public/institutional land uses located in town and within the floodplain. Nearly 5 acres of commercial and over 5 acres public/institutional land uses lie within the floodplain. Nearly 5 acres of industrial land use is located in the floodplain, accounting for over 35% percent of the industrial land in town.

**Table 3-15: Acres of Commercial, Industrial, and Public/Institutional Land Use Within the Flood Hazard Area**

<b>Land Use</b>	<b>Total acres in Town</b>	<b>Acres in Flood Hazard Area</b>	<b>% of total acres in Flood Hazard Area</b>
<b>Commercial</b>	24.36	1.2	4.92%
<b>Industrial</b>	14.97	5.29	35.38%
<b>Public/Institutional</b>	22.53	1.19	5.28%

Source: 2005 MassGIS Land Use data.

The average assessed values of the residential, commercial, and industrial land uses located within the floodplain are displayed in Table 3-16. The total average assessed value for these three land uses within the floodplain is \$210,953,431, with the largest assessed value falling within the residential land use category at \$175,528,250. This is of concern because should a catastrophic flooding event befall Buckland, the assessed values of these structures and facilities would likely be significantly reduced, which in turn would impact the town's tax revenues.

**Table 3-16: Average Assessed Value of Land Use in Flood Hazard Area**

Land Use	Total Acres in Town	Total Assessed Value	Average Assessed Value Per Acre	Acres in Flood Hazard Area	Average Assessed Value in Flood Hazard Area
<b>Residential</b>	624.7	\$175,528,250	\$280,985	32.37	\$9,095,470.48
<b>Commercial</b>	24.36	\$8,585,801	\$352,455	1.2	\$422,945.86
<b>Industrial</b>	14.97	\$26,839,380	\$1,792,878	5.29	\$9,484,323.33

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010; 2005 MassGIS Land Use data.

The total value of the building contents for each structure was estimated using the percentages for different classes of buildings and facilities. Table 3-17 displays occupancy class and the estimated contents value as a percentage of the building replacement value according.

**Table 3-17: Occupancy Class and Estimated Contents Value of Buildings**

Occupancy Class	Contents Value % (as a percentage of building replacement value)
Residential (temporary lodging, dormitory, and nursing homes)	50%
Commercial (including retail, wholesale, professional, services, financial, entertainment & recreation)	100%
Commercial (including hospital and medical office/clinic)	150%
Commercial Parking	50%
Industrial (including heavy, light technology)	150%
Agriculture	100%
Religion/Non-Profit	100%
Government Emergency Response	150%
Government General Services	100%
Education Schools/Libraries	100%
Education Colleges/Universities	150%

Source: Natural Hazard Mitigation Plan for Thurston County, Washington, September 2009.

Actual 2010 assessed building values were collected from the Buckland Assessor's Office for all significant structures located in the floodplain in Buckland. The total building value (Table 3-18) is presented as a percentage of the replacement value of the building (the assessed value of the structure) based on the class of structure. The percentages vary for certain classes because the replacement cost of the contents is different from institution to business to service. The estimated combined total building value for all significant structures is \$25,964,680.

**Table 3-18: Total Building Value in Flood Hazard Area**

<b>Structure</b>	<b>Building Structure Value in Flood Hazard Area</b>	<b>Building Yard Items Value in Flood Hazard Area</b>	<b>Total Building Value in Flood Hazard Area</b>
Buckland WWTP, 16 Gardner Falls Road	\$70,900	\$172,700	\$243,600
Gardner Falls Hydro Electric Plant, Gardner Falls Road	\$4,897,140	\$7,900	\$4,905,040
Lamson and Goodnow Cutlery, 45 Conway Street	\$827,000	\$50,800	\$877,800
TransCanada Hydro, Conway Street	\$9,322,340	\$138,500	\$9,460,840
TransCanada Hydro, Creamery Avenue	\$9,610,900	\$2,100	\$9,613,000
Inergy Propane, 30 Conway Street	\$176,000	\$126,300	\$302,300
Shelburne Falls Fire Station, 121 State Street, Shelburne Falls	\$562,100		\$562,100
<b>Total</b>	<b>\$25,466,380</b>	<b>\$498,300</b>	<b>\$25,964,680</b>

Source: 2011 Buckland Assessors data.

Table 3-19 displays potential loss estimates for significant structures in the floodplain. A flood resulting in 1% damage to all structures would cause approximately \$206,991 in damages, while a flood resulting in damages to 10% of all structures would result in roughly \$2,069,905 in damages.

**Table 3-19: Potential Estimated Loss for Buildings Located in Flood Hazard Area**

<b>Structure</b>	<b>Total Building Value in Flood Hazard Area</b>	<b>1% Damage Loss Estimate</b>	<b>5% Damage Loss Estimate</b>	<b>10% Damage Loss Estimate</b>
Buckland WWTP, 16 Gardner Falls Road	\$243,600	\$2,436	\$12,180	\$24,360
Gardner Falls Hydro Electric Plant, Gardner Falls Road	\$4,905,040	\$49,050	\$245,252	\$490,504
Lamson and Goodnow Cutlery, 45 Conway Street	\$877,800	\$8,778	\$43,890	\$87,780
TransCanada Hydro, Conway Street	\$9,460,840	\$94,608	\$473,042	\$946,084
TransCanada Hydro, Creamery Avenue	\$9,613,000	\$96,130	\$480,650	\$961,300
Inergy Propane, 30 Conway Street	\$302,300	\$3,023	\$15,115	\$30,230
Shelburne Falls Fire Station, 121 State Street, Shelburne Falls	\$562,100	\$5,621	\$28,105	\$56,210
<b>Total</b>	<b>\$25,964,680</b>	<b>\$259,647</b>	<b>\$1,298,234</b>	<b>\$2,596,468</b>

Source: Derived from 2011 Buckland Assessors data.

Table 3-20 identifies the average assessed value of all residential, commercial, and industrial land uses located in the floodplain in Buckland, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a major flooding event.

**Table 3-20: Potential Estimated Loss in Flood Hazard Area by Land Use**

<b>Land Use</b>	<b>Average Assessed Value of Land in Floodplain</b>	<b>1% Damage Loss Estimate</b>	<b>5% Damage Loss Estimate</b>	<b>10% Damage Loss Estimate</b>
Residential	\$175,528,250	\$1,755,283	\$8,776,413	\$17,552,825



Land Use	Average Assessed Value of Land in Floodplain	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Commercial	\$8,585,801	\$85,858	\$429,290	\$858,580
Industrial	\$26,839,380	\$268,394	\$1,341,969	\$2,683,938
<b>Total</b>	<b>\$210,953,431</b>	<b>\$2,109,534</b>	<b>\$10,547,672</b>	<b>\$21,095,343</b>

Source: Massachusetts Dept. of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

### *Population Impacts*

The Town should be aware that senior and low income segments of Buckland's population may be more vulnerable to hazard events due to a number of factors. Senior and low income populations may be physically or financially unable to react and respond to a hazard event and require additional assistance. Access to information about the hazard event may be lacking, as well as access to transportation in the case of an evacuation. The location and construction quality of housing can also pose a significant risk. Table 3-21 displays the number of senior and low income residents in Buckland. It should be noted that there may be overlap within the two categories, so that the total number of persons exposed may be lower than what is shown in the table. However the town should be aware of the potential needs of residents within these population segments in the event of a hazard occurrence.

**Table 3-21: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	264	13.3%
Low Income (Persons with annual incomes less than \$20,000)*	278	13.9%
<b>Total</b>	<b>542</b>	<b>27.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45). Source: 2000 U.S. Census.

### *Repetitive Loss Properties*

Repetitive loss properties are those for which two or more losses of at least \$1000 each have been paid under the National Flood Insurance Program (NFIP) within any 10-year period since 1978. According to MEMA, there are no repetitive loss structures in Franklin County.

### *Overall Vulnerability Assessment*

Flooding is common in New England, often causing significant impacts to the roads, structures, facilities, utilities, and populations. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as and the low-lying areas that can be impacted by flooding related to ice jams or rapid snow melt.

### *Data Deficiencies*

In assessing the risks to Buckland from flood hazards, the following data deficiencies were identified:

- Lack of available data on the number of vulnerable populations living in households in the floodplain.

- Lack of digital floodplain data to overlay on zoning to determine number of developable lots in the flood hazard area.
- Data for the location and condition of dams within Buckland provided by the DCR Office of Dam Safety Legal Department was incomplete. This plan uses 2005 data.

### Severe Winter Storms

Severe snow and ice storms are common in Buckland, often impacting the Towns' roads, structures, facilities, utilities, and population. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

#### *Hazard Summary*

Severe winter storms cause significant concern because they happen often and can be quite severe; they cost residents money; they require snow and ice removal, which can limit access to facilities and can cause health problems; they can cause utility failure and flooding from ice jams; and they put stress on community resources.

#### *Data Collected and Used*

National weather databases and Town of Buckland data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website. This data was used to support an evaluation of exposure and potential impacts associated with this hazard. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on severe winter storm hazard data and mitigation measures.

Table 3-22 shows the results of a data query with NOAA for heavy snow and ice events in Franklin County from 1993 to 2010, as of September 2010. For each year, the number of events, the annual property and crop damage is shown. The bottom of the table shows the average annual property damage of \$4,523,333 and the average annual crop damage, which is \$0.

**Table 3-22: Severe Heavy Snow/Ice Events in Franklin County**

Year	# of Heavy Snow/Ice Events	Annual Property Damage	Annual Crop Damage
2010	3	\$30,000	\$0
2009	5	\$0	\$0
2008	12	\$6,020,000	\$0
2007	7	\$10,000	\$0
2006	0	\$0	\$0
2005	9	\$625,000	\$0
2004	3	\$0	\$0
2003	5	\$50,000	\$0
2002	7	\$1,605,000	\$0
2001	7	\$11,000,000	\$0

Year	# of Heavy Snow/Ice Events	Annual Property Damage	Annual Crop Damage
2000	7	\$0	\$0
1999	6	\$0	\$0
1998	3	\$0	\$0
1997	6	\$10,030,000	\$0
1996	10	\$47,000,000	\$0
1995	6	\$0	\$0
1994	8	\$5,050,000	\$0
1993	7	\$0	\$0
<b>18</b>		<b>\$4,523,333</b>	<b>\$0</b>
<b># of Years</b>		<b>Average Annual Property Damage</b>	<b>Average Annual Crop Damage</b>

Information specific to the Buckland area is also available from NOAA. Table 3-23 shows heavy snow and ice events for the Towns of Buckland and Shelburne. Given their close proximity, both towns are listed.

**Table 3-23: NOAA Severe Heavy Snow/Ice Events in Buckland / Shelburne Area**

Location	Date	Type	Property Damage	Excerpts from storm details for FC only
Buckland / Shelburne	11/28/1997	Snow Squall	\$30,000	A sudden heavy snow squall reduced visibilities to near zero and resulted in a major multi-vehicle pileup on Interstate 91 in Deerfield. At least 21 people were injured. Several accidents also occurred in Greenfield. Route 2 from Greenfield to Shelburne was closed briefly.
Buckland / Shelburne	3/30/2001	Heavy Snow	\$8,000,000	A storm system brought heavy snow to portions of interior Massachusetts, heavy rain and strong winds closer to the coast, and renewed flooding on some rivers and streams in eastern Massachusetts. Snowfall accumulations as much as 15 inches fell in Ashburnham, 12 inches in Leyden and Shelburne
Buckland / Shelburne	12/11/2002	Heavy Snow	\$0	Heavy snow affected the higher terrain of western Franklin and western Hampshire counties. Amounts averaged 8 to 10 inches, with as little as 2 to 4 inches reported in the valleys. No damage or injuries were reported. Some specific snowfall totals included 11 inches in Williamsburg; 10 inches in Goshen and Plainfield; 9 inches in Shelburne; and 8 inches in Worthington.
Buckland / Shelburne	1/27/2004	Winter Storm	\$0	A fast moving coastal storm brought heavy snow to the higher elevations of western Franklin County, where around 6 inches of snow was reported by trained spotters in Ashfield and Shelburne.
Buckland / Shelburne	3/16/2004	Heavy Snow	\$0	A late season winter storm passing southeast of New England brought heavy snow to most of Massachusetts. Snowfall totals of 5 to 10 inches were common from the east slopes of the Berkshires across central and eastern Massachusetts. 11 inches in Ashfield, 8 inches in Shelburne and 6 inches in Northfield, Whately.

In addition to this data, Committee members provided more information on additional snow and ice events as shown in Table 3-24.

**Table 3-24: Severe Heavy Snow/Ice Events in Buckland**

Date	Type	Damages filed with MEMA	Details
3/5/ 2001	Winter Storm	\$4,800	Heavy snow event. Snow removal assistance required.
12/2003	Winter Storm	\$3,800	Heavy snow storm. Requested assistance from MEMA for snow removal and materials.
2/17/2003	Snow Storm	\$3,200	President's Day snow storm with heavy snow. Assistance requested from MEMA for snow removal and materials.
5/2007	Nor'Easter	See flooding	Widespread impact from this snow event, primarily in the form of rapid melting and flooding. See flooding for details.

### ***Impact on the Community***

#### ***Exposure and Loss Estimation***

Heavy snowfall coupled with low temperatures often results in increases in traffic accidents; disruptions in transportation, commerce, government, and education; utility outages due to falling trees, branches, and other objects; personal injuries associated with slippery surfaces and freezing temperatures; and numerous other problems. Specific damages associated with severe winter storm (snow) events include the following primary concerns:

- Injuries and fatalities associated with accidents, low temperatures, power loss, falling objects and accidents associated with frozen and slippery surfaces and snow accumulation
- Increases in the frequency and impact of traffic accidents, resulting in personal injuries
- Ice-related damage to trees, building and infrastructure inventory, and utilities (power lines, bridges, substations, etc.)
- Roads damaged through freeze and thaw processes
- Stress on the local shelters and emergency response infrastructure
- Lost productivity that occurs when people cannot go to work, school, or stores due to inclement conditions
- Debris management issues including debris removal and identification of disposal sites

New England's climate offers no immunity to the potential damaging effects of severe winter storms. Some minimum damage is anticipated annually, with potential extensive damage occurring about once every 10 years.

#### ***Property Damage***

As presented in Table 3-25, historic data for severe winter storm (heavy snow) events indicate that between 1993 and 2010, 111 heavy snow events were recorded in Franklin County. An average of 6.1 heavy snow and ice events occur each year, causing an average annual property damage county-wide of \$4.5 million.

**Table 3-25: Severe Heavy Snow/Ice Events in Franklin County**

Year	# of Heavy Snow/Ice Events	Annual Property Damage	Annual Crop Damage
2010	3	\$30,000	\$0
2009	5	\$0	\$0
2008	12	\$6,020,000	\$0
2007	7	\$10,000	\$0
2006	0	\$0	\$0
2005	9	\$625,000	\$0
2004	3	\$0	\$0
2003	5	\$50,000	\$0
2002	7	\$1,605,000	\$0
2001	7	\$11,000,000	\$0
2000	7	\$0	\$0
1999	6	\$0	\$0
1998	3	\$0	\$0
1997	6	\$10,030,000	\$0
1996	10	\$47,000,000	\$0
1995	6	\$0	\$0
1994	8	\$5,050,000	\$0
1993	7	\$0	\$0
<b>18</b>	<b>111</b>	<b>\$4,523,333</b>	<b>\$0</b>

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.

### Population Impacts

As discussed above, some traffic accidents associated with storm events include injuries and in limited cases, deaths. However, the number of injuries and deaths reported for accidents is generally low.

Populations considered most vulnerable to severe winter storm impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-26 summarizes the population in Buckland over the age of 65 or living in households with an income below \$20,000 per year.

**Table 3-26: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	264	13.3%
Low Income (Persons with annual incomes less than \$20,000)*	278	13.9%
<b>Total</b>	<b>542</b>	<b>27.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45). Source: 2000 U.S. Census.

The entire built environment of Buckland is vulnerable to a severe winter storm. Table 3-27 identifies the assessed value of all residential, commercial, and industrial land uses in Town, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a severe winter storm.

**Table 3-27: Potential Estimated Loss by Land Use**

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
<b>Residential</b>	\$175,528,250	\$1,755,283	\$8,776,413	\$17,552,825
<b>Commercial</b>	\$8,585,801	\$85,858	\$429,290	\$858,580
<b>Industrial</b>	\$26,839,380	\$268,394	\$1,341,969	\$2,683,938
<b>Total</b>	<b>\$210,953,431</b>	<b>\$2,109,534</b>	<b>\$10,547,672</b>	<b>\$21,095,343</b>

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

### ***Overall Vulnerability Assessment***

Severe winter storms are common in New England, often causing significant impacts to the roads, structures, facilities, utilities, and populations. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events when they occur. The cascade effects of severe winter storms include utility losses, transportation accidents, and flooding. Losses associated with flooding are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding related to ice jams or rapid snow melt.

### ***Data Deficiencies***

In assessing the risks to Buckland from severe winter storms, no data deficiencies were identified.

## **Hurricanes and Tropical Storms**

### ***Hazard Summary***

Hurricanes and tropical storms are rare in Buckland but could cause severe impacts such as flooding, power outages, flying debris, damage to property and injury and loss of life. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Hurricanes or tropical cyclones, can spin off tornadoes and bring thunderstorms, high winds and, in coastal areas, storm surges in the sea, possibly resulting in beach erosion and loss or damage to property. (See Tornadoes and Microbursts Section Below.) Inland, hurricanes mainly bring heavy rains that can cause flooding.

### ***Data Collected and Used***

National weather databases and Town of Buckland data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website, and the Spatial Hazard Events and Losses Database (SHELDUS). This data was used to support an evaluation of exposure and potential impacts associated with this hazard. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on hurricanes and tropical storms hazard data and mitigation measures.

### ***Impact on the Community***

#### ***Exposure and Loss Estimation***

High winds and heavy rain and/or hail associated with thunderstorms, hurricanes and tornadoes can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death. Other associated concerns are debris management issues including debris removal and identification of disposal sites. Table 3-28 shows hurricane and tropical storm events in Franklin County for the last 20 years, from 1990 to 2009.

#### ***Property Damage***

**Table 3-28: Hurricane and Tropical Storm Events in Franklin County**

<b>Year</b>	<b># of Hurricane/Tropical Storm Events</b>	<b>Annual Property Damage</b>	<b>Annual Crop Damage</b>
2009	0	\$0	\$0
2008	0	\$0	\$0
2007	0	\$0	\$0
2006	5	\$277,861	\$0
2005	1	\$33,889	\$0
2004	1	\$37,778	\$0
2003	2	\$127,381	\$0
2002	0	\$0	\$0
2001	0	\$0	\$0
2000	0	\$0	\$0
1999	1	\$7,692	\$0
1998	2	\$63,269	\$0
1997	0	\$0	\$0
1996	0	\$0	\$0
1995	1	\$0	\$0
1994	1	\$35,714	\$0
1993	0	\$0	\$0
1992	0	\$0	\$0
1991	1	\$5,555,556	\$555,556
1990	2	\$7,142	\$0
<b># of Years</b>	<b>Total # of Events</b>	<b>Average Annual Property Damage</b>	<b>Average Annual Crop Damage</b>
<b>20</b>	<b>17</b>	<b>\$307,314</b>	<b>\$27,778</b>

Source: Spatial Hazard Events and Losses Database (SHELDUS), <http://webra.cas.sc.edu/hvri/>.

#### ***Population Impacts***

Populations considered most vulnerable to hurricane and tornado impacts in Buckland are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-29 summarizes the population over the age of 65 or living in households with an annual income below \$20,000.

**Table 3-29: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	264	13.3%
Low Income (Persons with annual incomes less than \$20,000)*	278	13.9%
<b>Total</b>	<b>542</b>	<b>27.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45). Source: 2000 U.S. Census.

The entire built environment of Buckland is vulnerable to the high winds and/or flooding from a hurricane or tornado. Table 3-30 identifies the assessed value of all residential, commercial, and industrial land uses in Buckland, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of an extreme wind and rain storm.

**Table 3-30: Potential Estimated Loss by Land Use**

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
<b>Residential</b>	\$175,528,250	\$1,755,283	\$8,776,413	\$17,552,825
<b>Commercial</b>	\$8,585,801	\$85,858	\$429,290	\$858,580
<b>Industrial</b>	\$26,839,380	\$268,394	\$1,341,969	\$2,683,938
<b>Total</b>	<b>\$210,953,431</b>	<b>\$2,109,534</b>	<b>\$10,547,672</b>	<b>\$21,095,343</b>

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

### ***Overall Vulnerability Assessment***

Thunderstorms are common in New England, and can impact property, crops, utilities and the population of Buckland. Hurricanes and tornados are less common, but can cause significant damage when they do occur. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events. The cascade effects of severe storms include utility losses and transportation accidents and flooding. Losses associated with the flood hazard are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding.

### ***Data Deficiencies***

In assessing the risks to Buckland from thunderstorms, hurricanes and tornadoes, no data deficiencies were identified:

## **Tornados and Microbursts**

### ***Hazard Summary***

Like hurricanes, tornadoes and microbursts are relatively rare in Buckland but could cause severe impacts such as flooding, power outages, flying debris, damage to property and injury and loss of life. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events. Thunderstorms, a sub-category of Tornados and Microbursts, are common in western Massachusetts and can cause significant damage.



Additional data were available for hail and lightning events, and are included in tables 3-29 and 3-30. Hail and lightning are events generally associated with thunderstorms.

Tornados can have devastating effects on infrastructure, property and human health. Striking at random, their conical winds leave trails of devastation, at times more than a mile wide, in their wake. Small tornadoes, known as “gustnadoes,” have been known to strike in Franklin County, most recently in Sunderland in 2009. The gustnado does not appear in data compiled on tornadoes for this report, however, even gustnadoes can cause damage; the 2009 occurrence destroyed a barn and downed trees in Sunderland.

Thunderstorms bring strong winds, rain and, at times, hail, potentially causing damage to property, crops and utilities and injuries or deaths to residents. Persistent rain can also cause flooding.

### ***Data Collected and Used***

National weather databases and Town of Buckland data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration’s (NOAA) National Climatic Data Center website, and the Spatial Hazard Events and Losses Database (SHELDUS). This data was used to support an evaluation of exposure and potential impacts associated with this hazard. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on tornadoes and microburst hazard data and mitigation measures.

As presented in Table 3-31, between 1990 and 2009 one hurricane and 16 tropical storms have been recorded in Franklin County. Hurricane Bob in 1991 caused over 5.5 million dollars in property damage in the county, and over \$500,000 in crop damage. Overall, tropical storms and hurricanes have caused an average annual property damage of just over \$300,000 over the last 20 years.

**Table 3-31: Tornado Events in Franklin County**

<b>Year</b>	<b># of Tornado Events</b>	<b>Annual Property Damage</b>	<b>Annual Crop Damage</b>
2010	0	\$0	\$0
2009	0	\$0	\$0
2008	0	\$0	\$0
2007	0	\$0	\$0
2006	1	\$200,000	\$0
2005	0	\$0	\$0
2004	0	\$0	\$0
2003	0	\$0	\$0
2002	0	\$0	\$0
2001	0	\$0	\$0
2000	0	\$0	\$0
1999	0	\$0	\$0

Year	# of Tornado Events	Annual Property Damage	Annual Crop Damage
1998	0	\$0	\$0
1997	2	\$100,000	\$0
1996	0	\$0	\$0
1995	0	\$0	\$0
1994	0	\$0	\$0
1993	0	\$0	\$0
1992	1	\$25,000	\$0
1991	0	\$0	\$0
<b># of Years</b>	<b>Total # of Events</b>	<b>Average Annual Property Damage</b>	<b>Average Annual Crop Damage</b>
<b>20</b>	<b>4</b>	<b>\$16,250</b>	<b>\$0</b>

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.

### ***Impact on the Community***

#### ***Exposure and Loss Estimation***

High winds and heavy rain and/or hail associated with tornados and microbursts can cause damage to utilities, structures, roads, trees (potentially causing vehicle accidents) and injuries and death. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

#### ***Property Damage***

As presented in Table 3-32, historic data for tornado events indicate that between 1991 and 2010, 4 tornadoes were recorded in Franklin County. Over 20 years, tornadoes have caused an average of \$16,000 in property damages yearly. Between 1990 and 2009, one hurricane and 16 tropical storms have been recorded in Franklin County. Hurricane Bob in 1991 caused over 5.5 million dollars in property damage in the county, and over \$500,000 in crop damage. Overall, tropical storms and hurricanes have caused an average annual property damage of just over \$300,000 over the last 20 years.

**Table 3-32: Tornado Events in Franklin County**

Year	# of Tornado Events	Annual Property Damage	Annual Crop Damage
2010	0	\$0	\$0
2009	0	\$0	\$0
2008	0	\$0	\$0
2007	0	\$0	\$0
2006	1	\$200,000	\$0
2005	0	\$0	\$0
2004	0	\$0	\$0
2003	0	\$0	\$0
2002	0	\$0	\$0
2001	0	\$0	\$0

Year	# of Tornado Events	Annual Property Damage	Annual Crop Damage
2000	0	\$0	\$0
1999	0	\$0	\$0
1998	0	\$0	\$0
1997	2	\$100,000	\$0
1996	0	\$0	\$0
1995	0	\$0	\$0
1994	0	\$0	\$0
1993	0	\$0	\$0
1992	1	\$25,000	\$0
1991	0	\$0	\$0
<b># of Years</b>	<b>Total # of Events</b>	<b>Average Annual Property Damage</b>	<b>Average Annual Crop Damage</b>
<b>20</b>	<b>4</b>	<b>\$16,250</b>	<b>\$0</b>

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.

According to data supplied by the National Weather Service, from 2000 to 2010, the area of Buckland and Shelburne experienced several separate microburst (or “thunderstorm wind”) events. Table 3-33 details the locations and impacts of each storm, where information was available.

**Table 3-33: NOAA Data for Microburst and Thunderstorm Winds – 2000-2010**

Location	Date	Time	Type	Property Damage	Description
Buckland	8/3/2007	18:00 PM	Thunderstorm Wind	\$0	Trees down. Numerous strong thunderstorms, many of which became severe and produced large hail and damaging winds.
Shelburne	6/16/2008	15:49 PM	Thunderstorm Wind	\$5,000	Numerous large trees were downed by thunderstorm winds; including one that blocked North Road. There were a few instances of damaging thunderstorm winds.
Shelburne	6/22/2008	14:03 PM	Thunderstorm Wind	\$15,000	Multiple trees and wires on Ashfield Road in the Shelburne Falls section of Shelburne were downed by thunderstorm winds. Some of these landed on cars. Some of these thunderstorms became severe, producing damaging wind gusts.
Shelburne	7/20/2008	19:39 PM	Thunderstorm Wind	\$5,000	A large tree on Old Greenfield Road was downed onto wires by thunderstorm winds. These storms produced damaging wind and lots of lightning.

Location	Date	Time	Type	Property Damage	Description
Shelburne	7/27/2008	12:50 PM	Thunderstorm Wind	\$1,000	Trees were downed by thunderstorm winds.
Buckland	5/26/2010	22:15 PM	Thunderstorm Wind	\$20,000	Trees and wires were downed throughout portions of Buckland, leaving large parts of town without power. This resulted in dozens of road closures, including portions of Route 2 and Interstate 91.
Shelburne	5/28/2001	2:40 PM	Thunderstorm Wind	\$0	Severe thunderstorms produced large hail throughout much of western and central Massachusetts. In Franklin County, hail as large as a half dollar fell in Conway, while quarter sized hail fell in Ashfield and covered the ground. Dime sized hail was reported in Greenfield and Whately. Thunderstorm winds downed trees and wires in Northfield.
Shelburne	7/23/2002	1:10 PM	Thunderstorm Wind	\$5,000	A line of severe thunderstorms moved across much of the Bay State during the afternoon and early evening, producing widespread wind damage. There were numerous reports of downed trees, power lines, and large branches
Buckland	7/29/2006	5:18 PM	Thunderstorm Wind	\$15,000	A severe thunderstorm brought down a tree onto a transformer in Buckland. Large branches were downed onto Hawley Road in Ashfield.

Severe thunderstorms hail and lightning events brought about significant property wreckage in Franklin County in recent years. Thunderstorms, 115 of them in the last 19 years, caused an average annual property loss of more than \$59,000 (Table 3-34). It is worth noting that the number of thunderstorms has increased in recent years; in the 1990s, there were an average of 3.8 storms per year, according to NOAA data. From 2000 to 2008, NOAA recorded an average of 9.6 storms per year, 2.5 times the previous decade. In 2007 and 2008, the most recent years with data available, 40 storms were recorded countywide for an average number of 20 storms for those two years (Table 3-35).

**Table 3-34: Thunderstorm Events in Franklin County**

Year	# of Thunderstorm Events	Annual Property Damage	Annual Crop Damage
2008	21	\$602,000	\$0
2007	19	\$0	\$0
2006	9	\$338,000	\$0
2005	9	\$85,000	\$0
2004	4	\$30,000	\$0
2003	1	\$10,000	\$0

Year	# of Thunderstorm Events	Annual Property Damage	Annual Crop Damage
2002	6	\$25,000	\$0
2001	5	\$0	\$0
2000	3	\$20,000	\$0
1999	5	\$0	\$0
1998	8	\$2,000	\$0
1997	7	\$10,000	\$0
1996	5	\$0	\$0
1995	3	\$0	\$0
1994	4	\$0	\$0
1993	0	\$0	\$0
1992	2	\$0	\$0
1991	3	\$0	\$0
1990	1	\$0	\$0
<b># of Years</b>	<b>Total # of Events</b>	<b>Average Annual Property Damage</b>	<b>Average Annual Crop Damage</b>
<b>19</b>	<b>115</b>	<b>\$59,053</b>	<b>\$0</b>

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgl.dll?wwevent~storms>.

**Table 3-35: Severe Thunderstorm Events in the Buckland/Shelburne Area**

Location	Date	Time	Property Damage	Crop Damage	Details
Shelburne Falls	5/31/1998	4:30 PM	\$0	\$0	A severe thunderstorm moved through Franklin County bringing damaging winds to many communities during the late afternoon. A wind gust to an estimated 68 mph was reported by a spotter in Greenfield at 5:50 PM. In addition, law enforcement officials reported that trees were blown down between 5:30 PM and 6:10 PM in Shelburne Falls, Shelburne, Conway, Gill, Bernardston, Leyden, Northfield, and Warwick.
Shelburne	7/6/1999	3:20 PM	\$0	\$0	Severe thunderstorms swept across Massachusetts in advance of a strong cold front. For the fourth day in a row, temperatures soared well up into the 90s across the Bay State, along with high humidity. The thunderstorms arrived in two lines: one from mid-afternoon into early evening with winds clocked as high as 82 mph, and the second during the late evening with winds estimated over 80 mph and large hail. Damage was widespread from the east slopes of the Berkshires to the North and South Shore communities around Boston. In the wake of the storms, tens of thousands of electric customers were left without power, and in some communities, it took several days for power to be restored.
Shelburne	5/28/2001	2:40 PM	\$0	\$0	In Franklin County, hail as large as a half dollar fell in Conway, while quarter sized hail fell in Ashfield and covered the ground. Dime sized hail was reported in Greenfield and Whately. Thunderstorm winds downed trees and wires in Northfield.
Shelburne	7/23/2002	1:10 PM	\$5,000	\$0	A line of severe thunderstorms moved across much of the Bay State during the afternoon and early evening, producing widespread wind damage. There were numerous reports of downed trees, power lines, and large branches.
99 Buckland	7/29/2006	5:18 PM	\$15,000	\$0	A severe thunderstorm brought down a tree onto a transformer in Buckland. Large branches were downed onto Hawley Road in Ashfield.
Shelburne	6/16/2007	14:14 PM	\$0	\$0	Thunderstorms downed large tree limbs in Shelburne and Conway. A few of the thunderstorms produced wind damage as well as large hail.
Buckland	8/3/2007	18:00 PM	\$0	\$0	Trees down. Numerous strong thunderstorms, many of which became severe and produced large hail and damaging winds.

Location	Date	Time	Property Damage	Crop Damage	Details
Shelburne	6/16/2008	15:49 PM	\$5,000	\$0	Numerous large trees were downed by thunderstorm winds; including one that blocked North Road. Most of the events that occurred were hail though there were a few instances of damaging thunderstorm winds.
Shelburne	6/22/2008	14:03 PM	\$15,000	\$0	Multiple trees and wires on Ashfield Road in the Shelburne Falls section of Shelburne were downed by thunderstorm winds. Some of these landed on cars. Some of these thunderstorms became severe, producing damaging wind gusts.
Shelburne	7/20/2008	19:39 PM	\$5,000	\$0	A large tree on Old Greenfield Road was downed onto wires by thunderstorm winds.
Shelburne	7/27/2008	12:50 PM	\$1,000	\$0	Trees were downed by thunderstorm winds. Much of this line of storms was severe with damaging thunderstorm winds and occasional hail.
Buckland	5/26/2010	22:15 PM	\$20,000	\$0	Trees and wires were downed throughout portions of Buckland, leaving large parts of town without power. Significant wind damage was produced throughout much of the Connecticut River Valley in Massachusetts with numerous trees and wires down and widespread power outages. This resulted in dozens of road closures, including portions of Route 2 and Interstate 91.

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgl.dll?wwevent~storms>.

As Table 3-36 shows, 24 hail storms between 1993 and 2010 have caused an average of more than \$560,000 in property damage per year. Ten lightning events (Table 3-37) have caused an average of more than \$8,000 in property damage per year over the last 15 years in Franklin County.

**Table 3-36: Hail Events in Franklin County**

Year	# of Hail Events	Annual Property Damage	Annual Crop Damage
2009	0	\$0	\$0
2008	0	\$0	\$0
2007	0	\$0	\$0
2006	5	\$1,928,000	\$0
2005	1	\$305,000	\$0
2004	1	\$340,000	\$0
2003	2	\$1,350,000	\$0
2002	0	\$0	\$0
2001	0	\$0	\$0
2000	0	\$0	\$0
1999	1	\$0	\$0
1998	0	\$0	\$0
1997	0	\$0	\$0
1996	2	\$0	\$0
1995	5	\$0	\$0
1994	4	\$5,050,000	\$0
1993	3	\$550,000	\$0
<b># of Years</b>	<b>Total # of Events</b>	<b>Average Annual Property Damage</b>	<b>Average Annual Crop Damage</b>
<b>17</b>	<b>24</b>	<b>\$560,176</b>	<b>\$0</b>

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgl.dll?wwevent~storms>.

**Table 3-37: Lightning Events in Franklin County**

Year	# of Hail Events	Annual Property Damage	Annual Crop Damage
2008	1	\$10,000	\$0
2007	0	\$0	\$0
2006	0	\$0	\$0
2005	1	\$50,000	\$0
2004	1	\$35,000	\$0
2003	0	\$0	\$0
2002	1	\$15,000	\$0
2001	1	\$20,000	\$0
2000	0	\$0	\$0
1999	0	\$0	\$0
1998	0	\$0	\$0
1997	1	\$3,000	\$0
1996	0	\$0	\$0
1995	2	\$0	\$0
1994	2	\$0	\$0
# of Years	Total # of Events	Average Annual Property Damage	Average Annual Crop Damage
15	10	\$8,867	\$0

Source: NOAA National Climatic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>.

In addition to lightning and hail events in the Franklin County area, data was accessed specific to the Buckland / Sherburne area. Tables 3-38 and 3-39 identify hazards throughout the last 20 years in the local area and their associated damages.

**Table 3-38: Lightning Events in Buckland/Shelburne Area**

Location	Date	Time	Property Damage	Details
Buckland	8/14/2002	3:00 PM	\$15,000	Lightning struck a large tree in Buckland, causing a portion of it to fall onto a nearby home.

Source: NOAA National Climatic Data Center.

**Table 3-39: Hail Events in Buckland/Shelburne Area**

Location	Date	Time	Property Damage	Details
Shelburne	6/16/2008	15:44 PM	\$0	Southern New England was under the favorable left front quadrant of a strong upper level jet as a shortwave moved across the region. This shortwave provided enough lift in an already unstable atmosphere to produce showers and thunderstorms across much of the area. Most of the events that occurred were hail though there were a few instances of damaging thunderstorm winds.
Buckland	8/3/2007	18:00 PM	\$0	Quarter size hail. An approaching cold front coupled with a strong upper level disturbance interacted with a very unstable airmass on the afternoon of the 3rd. The result was numerous strong thunderstorms, many of which became severe and produced large hail and damaging winds.

Location	Date	Time	Property Damage	Details
Buckland	5/31/1998	8:07 PM	\$0	A severe thunderstorm affected parts of Franklin, Hampshire, and Hampden Counties during the evening hours, with large hail and damaging winds. There was one report of dime size hail in Franklin County in the town of Buckland.
Shelburne Falls	5/23/1994	12:25PM	\$0	

Source: NOAA National Climatic Data Center.

### Population Impacts

As discussed above, some traffic accidents associated with storm events include injuries and deaths. However, the number of injuries and deaths reported for accidents is generally low.

Populations considered most vulnerable to tornado and microburst impacts in Buckland are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-40 summarizes the population over the age of 65 or living in households with an annual income below \$20,000.

**Table 3-40: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	202	13.8%
Low Income (Persons with annual incomes less than \$20,000)*	284	19.4%
<b>Total</b>	<b>486</b>	<b>33.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45).

Source: 2000 U.S. Census.

The entire built environment of Buckland is vulnerable to the high winds and/or flooding from a hurricane or tornado. Table 3-41 identifies the assessed value of all residential, commercial, and industrial land uses in Buckland, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of an extreme wind and rain storm.

**Table 3-41: Potential Estimated Loss by Land Use**

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
Residential	\$121,791,060	\$1,217,911	\$6,089,553	\$12,179,106
Commercial	\$7,227,231	\$72,272	\$361,362	\$722,723
Industrial	\$295,631,498	\$2,956,315	\$14,781,575	\$29,563,150
<b>Total</b>	<b>\$424,649,789</b>	<b>\$4,246,498</b>	<b>\$21,232,489</b>	<b>\$42,464,979</b>

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.



### ***Overall Vulnerability Assessment***

Thunderstorms are common in New England, and can impact property, crops, utilities and the population of Buckland. Tornadoes and microbursts are less common, but can cause significant damage when they do occur. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events. The cascade effects of severe storms include utility losses and transportation accidents and flooding. Losses associated with the flood hazard are discussed earlier in this section. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways and utilities that can be damaged by such storms and the low-lying areas that can be impacted by flooding.

### ***Data Deficiencies***

In assessing the risks to Buckland from tornadoes and microbursts and associated storms events such as thunderstorms, hail and lightning, no data deficiencies were identified.

## **Wildfires/Brushfires**

### ***Hazard Summary***

Wildfires can damage woodlands, homes, utilities and buildings, and could cause injuries or deaths. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

Burn piles that blaze out of control, lightning strikes in forested land, campfires improperly managed, and arson can cause wildfires. Buckland is vulnerable to these conflagrations, especially in times of drought. Fire suppression can be expensive and dangerous for firefighters, and wildfires can threaten wildlife and human habitat and health.

**Table 3-42: Massachusetts Fire Incident Reporting System (MFIRS) 2004-2009**

Department	Total # of Brush Fires	2004	2005	2006	2007	2008	2009
BERNARDSTON	44	5	14	7	5	8	5
CHARLEMONT	15	3	1	0	8	1	2
COLRAIN	8	3	1	0	3	0	1
CONWAY	25	4	5	5	3	4	4
DEERFIELD	23	6	5		1	4	7
ERVING	10	4	2	1	0	3	0
GILL	14	0	1	7	4	1	1
GREENFIELD	35	0	1	4	11	13	6
HAWLEY	2	0	0	2	0	0	0
HEATH	6	1	1	0	0	2	2
LEVERETT	11	1	1	3	5	0	1
LEYDEN	3	1	0	0	2	0	0
MONTAGUE CENTER	38	3	8	10	7	1	9
NEW SALEM	14	0	0	3	5	1	5
NORTHFIELD	1	0	0	0	0	1	0
ORANGE	25	4	3	3	9	0	6
SHELBURNE CTR	13	4	2	5	2	0	0
SHELBURNE FALLS	7	0	0	1	4	1	1

Department	Total # of Brush Fires	2004	2005	2006	2007	2008	2009
SHUTESBURY	4	0	1	0	0	1	2
SOUTH DEERFIELD	18	4	2	3	5	2	2
SUNDERLAND	17	4	6	6	0	1	0
TURNERS FALLS	29	8	5	4	7	1	4
WARWICK	4	2	1	1	0	0	0
WENDELL	9	0	0	6	2	0	1
WHATELY	23	6	7	6	1	3	0
Total	398	63	67	77	84	48	59

### ***Data Collected and Used***

National weather databases, FRIRS, and Town of Buckland data were collected and analyzed. Data on historic property damage and loss, and injuries and deaths, was collected for Franklin County from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center website. According to data from Massachusetts Fire Incident Reporting System of the Massachusetts Department of Fire Services, the Buckland Fire Department responded to 20 wildfires between 2004 and 2009 (13 in Shelburne Center and 7 for Shelburne Falls, Table 3-42). The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on wildfires and brushfires hazard data and mitigation measures.

### ***Impact on the Community***

#### ***Exposure and Loss Estimation***

A major out-of-control wildfire can damage property, utilities and forested land; create smoke that can cause breathing problems; and injure or kill people. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

#### ***Property Damage***

The Committee indicated there has been no reported property damage in Buckland due to wildfires.

#### ***Population Impacts***

Populations considered most vulnerable to wildfire impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-43 summarizes the population over the age of 65 or living in households with an income below \$20,000 per year.

**Table 3-43: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	264	13.3%
Low Income (Persons with annual incomes less than \$20,000)*	278	13.9%
<b>Total</b>	<b>542</b>	<b>27.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45). Source: 2000 U.S. Census.

Because Buckland is heavily wooded, has so many historic wooden structures, and has the potential fuel load of dead trees and limbs from the 2008 ice storm, the entire built environment

of the Town could be vulnerable to a wildfire. Table 3-44 identifies the building type and valuation of this inventory as well as the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a wildfire.

**Table 3-44: Potential Estimated Loss by Land Use**

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
<b>Residential</b>	\$175,528,250	\$1,755,283	\$8,776,413	\$17,552,825
<b>Commercial</b>	\$8,585,801	\$85,858	\$429,290	\$858,580
<b>Industrial</b>	\$26,839,380	\$268,394	\$1,341,969	\$2,683,938
<b>Total</b>	<b>\$210,953,431</b>	<b>\$2,109,534</b>	<b>\$10,547,672</b>	<b>\$21,095,343</b>

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

### ***Overall Vulnerability Assessment***

While wildfires have caused minimal damage, injury and loss of life to date in Buckland, their potential to destroy property and cause injury or death exists. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events when they occur. Wildfires can also cause utility disruption and air-quality problems. Particular areas of vulnerability include low-income and elderly populations.

### ***Data Deficiencies***

In assessing the risks to Buckland from wildfire hazards, no data deficiencies were identified.

## **Dam Failure**

### ***Hazard Summary***

Dams hold back water, and when a dam fails, the potential energy of the stored water behind the dam is instantly released as water rushes in torrent downstream, flooding an area engineers refer to as an “inundation area.” The number of casualties and the amount of property damage will depend upon the timing of the warning provided to downstream residents, the number of people living or working in the inundation area, and the number of structures in the inundation area. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for these events.

When a dam fails, huge quantities of water quickly flow downstream. Areas adjacent to a river or stream or on low ground are in danger of being inundated by a large volume of water that could destroy structures, utilities, roadways and bridges, and cause injuries or deaths. Many dams in Massachusetts were built in the 19<sup>th</sup> century without the benefit of modern engineering design and construction oversight. Dams can fail because of structural problems due to age and/or lack of proper maintenance. Dam failure can also be the result of structural damage caused by an earthquake or flooding brought on by severe storm events.

### ***Data Collected and Used***

Data from the National Oceanic and Atmospheric Administration’s National Climatic Data Center website shows no dam failures have occurred in or impacted Franklin County in the last

20 years. According to the members of the Committee, no dam failures have occurred in Buckland in the last 20 years.

### ***Impact on the Community***

#### ***Exposure and Loss Estimation***

While dam failures are rare, their impacts can be devastating, including loss of property, disruption to infrastructure, and injury and death. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

#### ***Property Damage***

Historic data for dam failure events indicate that between 1993 and 2010, no events were recorded in Franklin County, causing no property damage or population impacts.

#### ***Population Impacts***

Populations considered most vulnerable to dam failure are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-45 summarizes the population over the age of 65 or living in households with an income below \$20,000 per year.

**Table 3-45: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

<b>Population Category</b>	<b>Number of Persons Exposed</b>	<b>Percentage of Total Population</b>
Senior (Over 65 years of age)	264	13.3%
Low Income (Persons with annual incomes less than \$20,000)*	278	13.9%
<b>Total</b>	<b>542</b>	<b>27.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45). Source: 2000 U.S. Census.

Structures that lie in the inundation area of each of the dams in Buckland are vulnerable to a dam failure. Table 3-46 identifies the building type and valuation for all residential, commercial, and industrial uses in Town, as well as the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a dam failure.

**Table 3-46: Potential Estimated Loss Due to Dam Failure in Flood Hazard Area by Land Use**

<b>Land Use</b>	<b>Average Assessed Value of Land in Floodplain</b>	<b>1% Damage Loss Estimate</b>	<b>5% Damage Loss Estimate</b>	<b>10% Damage Loss Estimate</b>
Residential	\$175,528,250	\$1,755,283	\$8,776,413	\$17,552,825
Commercial	\$8,585,801	\$85,858	\$429,290	\$858,580
Industrial	\$26,839,380	\$268,394	\$1,341,969	\$2,683,938
<b>Total</b>	<b>\$210,953,431</b>	<b>\$2,109,534</b>	<b>\$10,547,672</b>	<b>\$21,095,343</b>

Source: Massachusetts Dept. of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

### ***Overall Vulnerability Assessment***

Dam failures, while rare, can destroy roads, structures, facilities, utilities, and impact the population of Buckland. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, buildings in the

floodplain or inundation areas, and infrastructure such as roadways and utilities that can be damaged by such events. According to the members of the Committee, no (manmade) dam failures have occurred in the last 20 years in Buckland. However, as noted earlier in the Plan, the Committee identified significant beaver dams in Buckland as follows:

- **Nillman Road:** Beaver dam on Hog Hollow Brook with an approximate 10acre impoundment.
- **East Buckland Road:** A breached beaver dam is located on the Clark Brook.
- **Dodge Road:** A breached beaver dam is located off Dodge Road.

### ***Data Deficiencies***

In assessing the risks to Buckland from dam failure hazards, the following data deficiencies were identified:

- Data for the location and condition of dams within Buckland provided by the DCR Office of Dam Safety Legal Department was incomplete. This plan uses 2005 data.

## **Earthquakes**

### ***Hazard Summary***

Earthquakes are rare in Franklin County; however temblors are unpredictable and can cause significant damage to roads, structures, facilities, utilities, and population. Existing and future mitigation efforts should continue to be developed and employed that will enable the Town to be prepared for earthquakes.

While rare in Franklin County, earthquakes have happened in New England. New England experiences an average of 30 to 40 earthquakes each year although most are not noticed by people.<sup>29</sup> Ground shaking from earthquakes can rupture gas mains and disrupt other utility service, damage buildings, bridges and roads, and trigger other hazardous events such as landslides, avalanches, flash floods (dam failure) and fires. Un-reinforced masonry buildings, buildings with foundations that rest on filled land or unconsolidated, unstable soil, and mobile homes not tied to their foundations are at risk during an earthquake.<sup>30</sup>

### ***Data Collected and Used***

The National Oceanic and Atmospheric Administration recorded no earthquakes for Franklin County in the last 20 years (Tables 3-47 and 4-48). The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on earthquake hazard data and mitigation measures.

**Table 3-47 Northeast Earthquakes with a Magnitude of 4.2 or more 1924 - 2007**

Location	Date	Magnitude
Ossipee, NH	December 20, 1940	5.5
Ossipee, NH	December 24, 1940	5.5
Dover-Foxcroft, ME	December 28, 1947	4.5

<sup>29</sup> Northeast States Emergency Consortium web site: [www.nesec.org/hazards/earthquakes.cfm](http://www.nesec.org/hazards/earthquakes.cfm)

<sup>30</sup> Federal Emergency Management Agency web site: [www.fema.gov/hazards/earthquakes/quake.shtm](http://www.fema.gov/hazards/earthquakes/quake.shtm).

Kingston, RI	June 10, 1951	4.6
Portland, ME	April 26, 1957	4.7
Middlebury, VT	April 10, 1962	4.2
Near NH Quebec Border, NH	June 15, 1973	4.8
West of Laconia, NH	Jan. 19, 1982	4.5
Plattsburg, NY	April 20, 2002	5.1
Bar Harbor, ME	October 3, 2006	4.2

Source: Northeast States Emergency Consortium Web site: [www.nesec.org/hazards/earthquakes.cfm](http://www.nesec.org/hazards/earthquakes.cfm).

**Table 3-48 Northeast States Record of Historic Earthquakes**

State	Years of Record	Number Of Earthquakes
Connecticut	1668 - 2007	137
Maine	1766 - 2007	544
Massachusetts	1668 - 2007	355
New Hampshire	1638 - 2007	360
Rhode Island	1776 - 2007	38
Vermont	1843 - 2007	73
New York	1840 - 2007	755
<b>Total Number of Earthquakes within the Northeast states between 1638 and 2007 = 2,403.</b>		

Source: Northeast States Emergency Consortium Web site: [www.nesec.org/hazards/earthquakes.cfm](http://www.nesec.org/hazards/earthquakes.cfm).

### ***Impact on the Community***

#### ***Exposure and Loss Estimation***

A major earthquake could cause severe damage to Buckland buildings, including older structures that were built before a 1975 law requiring new buildings to withstand earthquakes. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

#### ***Property Damage***

Historic data for earthquake events indicate that between 1991 and 2010, no earthquakes were recorded in Franklin County during this period, causing no damage to property.<sup>31</sup>

#### ***Population Impacts***

Populations considered most vulnerable to earthquake impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-49 summarizes the population over the age of 65 or living in households with an income below \$20,000 per year.

<sup>31</sup> NOAA National Climactic Data Center. <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>

**Table 3-49: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

Population Category	Number of Persons Exposed	Percentage of Total Population
Senior (Over 65 years of age)	264	13.3%
Low Income (Persons with annual incomes less than \$20,000)*	278	13.9%
<b>Total</b>	<b>542</b>	<b>27.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45). Source: 2000 U.S. Census.

The entire built environment of Buckland is vulnerable to earthquakes. Table 3-50 identifies the assessed value of all residential, commercial, and industrial land uses in Buckland, and the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of an earthquake.

**Table 3-50: Potential Estimated Loss by Land Use**

Land Use	Total Assessed Value	1% Damage Loss Estimate	5% Damage Loss Estimate	10% Damage Loss Estimate
<b>Residential</b>	\$175,528,250	\$1,755,283	\$8,776,413	\$17,552,825
<b>Commercial</b>	\$8,585,801	\$85,858	\$429,290	\$858,580
<b>Industrial</b>	\$26,839,380	\$268,394	\$1,341,969	\$2,683,938
<b>Total</b>	<b>\$210,953,431</b>	<b>\$2,109,534</b>	<b>\$10,547,672</b>	<b>\$21,095,343</b>

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

### ***Overall Vulnerability Assessment***

Earthquakes, while rare, could cause significant impacts and losses to the roads, structures, facilities, utilities, and population of Buckland. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes and buildings erected before 1975, and infrastructure such as roadways and utilities that could be damaged by earthquakes. According to members of the Committee, no earthquakes have impacted Buckland in the last 20 years.

### ***Data Deficiencies***

In assessing the risks to Buckland from earthquakes, no data deficiencies were identified.

## **Landslides**

### ***Hazard Summary***

Landslides rarely occur in Franklin County but have occurred in the eastern part of the state: Following heavy rains in March 2010, Walpole and Topsfield experienced landslides that destroyed a storage building and closed a portion of Route 1. The Topsfield slide resulted in a tree land on a passing car, but no injuries were reported. Earlier that month, a mudslide at a construction site brought mud within 12 feet of train tracks at the Wellesley Hills station of the Massachusetts Bay Transportation Authority in Wellesley. Landslides are most often caused by heavy rains destabilizing slopes but can have other causes, including clearing land for development, earthquakes, and vibrations from machinery or blasting. Landslides can be

dangerous because they are unexpected and fast. They can bury structures with little warning and rescue efforts can be threatened by new slides.

### ***Data Collected and Used***

National Oceanic and Atmospheric Administration's National Climatic Data Center website shows no landslide events in Franklin County for the last 20 years. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on landslide hazard data and mitigation measures.

### ***Impact to the Community***

#### **Exposure and Loss Estimation**

While landslides are rare, their impacts can be devastating, including loss of property, disruption to infrastructure, and injury and death. Continued development, particularly on steep slopes or unstable soils, increases the chances that landslides will be a danger. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

#### **Property Damage**

Historic data for landslide events indicate that between 1993 and 2010, no landslide events were recorded in Franklin County.

#### **Population Impacts**

Populations considered most vulnerable to landslide impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-51 summarizes the population over the age of 65 or living in households with an income below \$20,000 per year.

**Table 3-51: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

<b>Population Category</b>	<b>Number of Persons Exposed</b>	<b>Percentage of Total Population</b>
Senior (Over 65 years of age)	264	13.3%
Low Income (Persons with annual incomes less than \$20,000)*	278	13.9%
<b>Total</b>	<b>542</b>	<b>27.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45). Source: 2000 U.S. Census.

Table 3-52 identifies the assessed value of all residential, commercial, and industrial uses in Town, as well as the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of a massive landslide.

**Table 3-52: Potential Estimated Loss by Land Use**

<b>Land Use</b>	<b>Total Assessed Value</b>	<b>1% Damage Loss Estimate</b>	<b>5% Damage Loss Estimate</b>	<b>10% Damage Loss Estimate</b>
Residential	\$121,791,060	\$1,217,911	\$6,089,553	\$12,179,106
Commercial	\$7,227,231	\$72,272	\$361,362	\$722,723
Industrial	\$295,631,498	\$2,956,315	\$14,781,575	\$29,563,150
<b>Total</b>	<b>\$424,649,789</b>	<b>\$4,246,498</b>	<b>\$21,232,489</b>	<b>\$42,464,979</b>



Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010.

### ***Overall Vulnerability Assessment***

Landslides, while rare in Franklin County, can destroy roads, structures, facilities, utilities, and impact the population of Buckland. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, and buildings, roadways, and utilities near the foot of slopes, especially when slopes are destabilized. According to the members of the Committee, no landslides have occurred in the last 20 years in Buckland.

### ***Data Deficiencies***

In assessing the risks to Buckland from landslides, no data deficiencies were identified.

## **Ice Jams**

### ***Hazard Summary***

Ice jams (or ice dams) occur when water builds up behind a blockage of ice. Ice jams can occur in various ways, but in New England they predominantly form on rivers and streams and mainly threaten infrastructure.

When the upstream part of a river thaws first and the ice is carried downstream into the still-frozen part of the watercourse, ice can form an ice dam and flood low lying areas upstream of the jam. Also, once an ice dam breaks apart, the sudden surge of water that breaks through the dam can flood areas downstream of the jam. The resulting flow of water when an ice jam is broken can cause flooding downstream, threatening infrastructure, structures, and roadways.

The structures and people most at risk from an ice jam are those within the floodplain. The average assessed values of the residential, commercial, and industrial land uses located within the floodplain are displayed in Table 3-53. The total average assessed value for these three land uses within the floodplain is \$210,953,431, with the largest assessed value falling within the residential land use category at \$175,528,250. This is of concern because should a catastrophic flooding event befall Buckland, the assessed values of these structures and facilities would likely be significantly reduced, which in turn would impact the town's tax revenues.

**Table 3-53: Average Assessed Value of Land Use in Flood Hazard Area**

Land Use	Total Acres in Town	Total Assessed Value	Average Assessed Value Per Acre	Acres in Flood Hazard Area	Average Assessed Value in Flood Hazard Area
<b>Residential</b>	386.05	\$121,791,060	\$315,480	0.98	\$309,170
<b>Commercial</b>	29.44	\$7,227,231	\$245,490	0.12	\$29,459
<b>Industrial</b>	49.29	\$295,631,498	\$5,997,799	5.45	\$32,688,003

Source: Massachusetts Department of Revenue - Division of Local Services, Municipal Databank/Local Aid Section 2010; 2005 MassGIS Land Use data.

### ***Data Collected and Used***

The National Oceanic and Atmospheric Administration's National Climatic Data Center website shows no ice jam events or damage in Buckland over the last 20 years. The Commonwealth of Massachusetts State Hazard Mitigation Plan 2010 was also reviewed for information on ice jam hazard data and mitigation measures.

### ***Impact to the Community***

#### ***Exposure and Loss Estimation***

Losses to ice jams include the rising waters along the river or stream that is being dammed, and the rush of water downstream when the dam either melts or is broken up by human intervention. Buildings, roadways and utilities are threatened by ice blockages. Other associated concerns are debris management issues including debris removal and identification of disposal sites.

#### ***Property Damage***

Data on ice jams in Franklin County indicate that no property damage or injuries or deaths occurred as the result of ice jams in the last 20 years.

#### ***Population Impact***

Populations considered most vulnerable to ice jam impacts are identified based on a number of factors including their physical and financial ability to react or respond during a hazard and the location and construction quality of their housing. Table 3-54 summarizes the population over the age of 65 or living in households with an income below \$20,000 per year.

**Table 3-54: Senior and Low Income Populations in Buckland Exposed to Natural Hazards**

<b>Population Category</b>	<b>Number of Persons Exposed</b>	<b>Percentage of Total Population</b>
Senior (Over 65 years of age)	264	13.3%
Low Income (Persons with annual incomes less than \$20,000)*	278	13.9%
<b>Total</b>	<b>542</b>	<b>27.2%</b>

\* Low income population was calculated by multiplying 2000 U.S. Census Households with Incomes of Less than \$20,000 (116) by 2000 U.S. Census Average Household Size (2.45). Source: 2000 U.S. Census.

The built environment in the floodplain of Buckland is vulnerable to ice jam events. Land uses located in the floodplain are discussed in the flooding section above. Table 3-55 identifies the average assessed value for all residential, commercial, and industrial uses in Town, as well as the losses that would result from 1%, 5%, and 10% damage to this inventory as a result of an ice jam.

**Table 3-55: Potential Estimated Loss by Land Use Category**

<b>Land Use</b>	<b>Total Acres in Town</b>	<b>Total Assessed Value</b>	<b>Average Assessed Value Per Acre</b>	<b>Acres in Flood Hazard Area</b>	<b>Average Assessed Value in Flood Hazard Area</b>
<b>Residential</b>	386.05	\$121,791,060	\$315,480	0.98	\$309,170
<b>Commercial</b>	29.44	\$7,227,231	\$245,490	0.12	\$29,459
<b>Industrial</b>	49.29	\$295,631,498	\$5,997,799	5.45	\$32,688,003

### ***Overall Vulnerability Assessment***

Ice jams occur throughout New England, often causing significant impacts and losses to roads, structures, facilities, utilities, and the population. Existing and future mitigation efforts should continue to be developed and employed that will enable Buckland to be prepared for these events when they occur. Particular areas of vulnerability include low-income and elderly populations, trailer homes, and infrastructure such as roadways near rivers and streams and utilities and low-lying areas. According to the members of the Committee, no ice jams have occurred in the last 20 years in Buckland.

### ***Data Deficiencies***

In assessing the risks to Buckland from ice jams, no data deficiencies were identified.

## **Manmade Hazards**

### ***Hazard Summary***

Manmade hazards are being assessed at the local level for the first time in this plan update. A preliminary assessment was made only of those manmade hazards of an accidental nature, such as transportation accidents or fixed facility accidents involving hazardous materials. No formal vulnerability assessment was done on manmade hazards, however the potential for accidents, the unknown impact of such accidents and the lack of well-analyzed data make this hazard a high priority on the Action Plan.

Assessment from the Committee indicated concern about the close proximity of rail lines and Routes 2 and 112 to the Deerfield River and to residential structures. In the event of a transportation accident involving hazardous materials, both population and natural resources could be at risk for harm or contamination.

### ***Data Deficiencies***

- Need to research available models and data requirements to adequately evaluate the potential impact of hazardous accidents on the Deerfield River, on drinking water supplies and on public health.

## Hazard Analysis Methodology

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In updating Buckland's Local Natural Hazard Mitigation Plan, the Franklin Regional Council of Governments developed the All Hazards Risk Assessment methodology for assessing the risk of natural hazards. The All Hazards Risk Assessment is an interactive table that the Committee completed with the FRCOG staff to evaluate all the natural hazards that can impact the town based on frequency of occurrence, severity of impacts, area of occurrence and preparedness. This Assessment Builds on the information gleaned in each individual hazard assessment. The completed table gives the town an overall understanding of the natural hazards, provides guidance on which hazards the Town may want to focus mitigation efforts on, reaffirms that Buckland's planning and preparedness is on track, and shows residents that town departments and agencies are organized in case of a natural disaster. Note that the Assessment does not include manmade hazards, given lack of data assessed for this plan. In rating the hazards, the committee considered the following issues for each category:

Issues considered when ranking frequency of occurrence:

- 1) Known risk
- 2) Historical data (previous occurrences)

Issues considered when ranking severity of impacts:

- 1) Building stock
- 2) Critical facilities
- 3) Transportation systems
- 4) Lifeline utility systems
- 5) Communications systems and networks
- 6) High potential loss facilities
- 7) Hazardous material facilities
- 8) Economic elements
- 9) Special consideration areas
- 10) Historic, cultural, and natural resource areas

Issues considered when ranking preparedness:

- 1) Status of current plans
- 2) Training status
- 3) Availability of backup systems
- 4) Community resources (equipment, personnel, etc.)

The following rating charts were used to determine the rating for each event.

**Table 3-56: Frequency of Occurrence Rating Chart**

Classification	#	Frequency of Occurrence
Very High	5	events that occur at least once each year (100% per year)
High	4	events that occur from once in 2 years to once in 4 years (25% to 50% per year)
Medium	3	events that occur from once in 5 years to once in 50 years (2% to 20% per year)
Low	2	events that occur from once in 50 years to once in 100 years (1% to 2% per year)
Very Low	1	events that occur less frequently than once in 100 years (less than 1% per year)

**Table 3-57: Severity of Impacts Rating Chart**

Classification	#	Severity of Multiple Impacts
Catastrophic	4	Multiple deaths and injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of facilities for 30 days or more.
Critical	3	Multiple injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 week.
Limited	2	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of facilities for more than 1 day.
Minor	1	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of facilities.

**Table 3-58: Severity of Impacts Definitions**

Severity of Impact Category	Severity of Impact Category Definitions
Built	Building Stock includes residential, commercial, industrial, and institutional buildings.
Built	Hazardous Material Facilities include facilities housing industrial/hazardous materials, such as corrosives, explosives, flammable materials, radioactive materials, and toxins.
Built	Historic, Cultural, and Natural Resource Areas may include buildings, structures, objects, sites, national and local historic or significant districts, and historical archival storage facilities.
Infrastructure	Critical Facilities are essential to the health and welfare of the whole population and are especially important following hazard events. Since vulnerability is based on service losses as well as building structure integrity and content value, assess the effects on the service function interruption of critical facilities as well as their physical aspects. For purposes of this mitigation planning guidance, critical facilities may include emergency service facilities such as hospitals and other medical facilities, jails and juvenile detention centers, police and fire stations, emergency operations centers, public works facilities, evacuation shelters, schools, and other uses that house special needs populations.
Infrastructure	Transportation Systems include airways (including airports, heliports, etc.), roadways (including highways, bridges, tunnels, roadbeds, overpasses, transfer centers, etc.), railways and public transit (including trackage, tunnels, bridges, rail yards, depots, etc.), and waterways (including canals, locks, seaports, ferries, harbors, dry-docks, piers, etc.).
Infrastructure	Lifeline Utility Systems such as potable water, wastewater, oil, natural gas, electric power, substations, power lines, etc.
Infrastructure	Communications Systems and Networks such as telephones, emergency service radio systems, repeater sites and base stations, television and radio stations, etc.
Natural	Natural Resources include agricultural land, water supply lands, rivers.
Population	High Potential Loss Facilities include facilities that would have a high loss associated with them, such as nuclear power plants or dams.
Population	Economic Elements include major employers, financial centers, and other business or retail districts in the community that could significantly affect the local or regional economy if interrupted.
Population	Special Consideration Areas include areas of high density residential, commercial, institutional, and industrial development that, if damaged, could result in economic and functional losses and in high death tolls and injury rates.

**Table 3-59: Area of Occurrence Rating Chart**

Classification	#	Percentage of Town Impacted
Large	3	More than 50% of the town affected.
Medium	2	10 to 50% of the town affected.
Isolated	1	Less than 10% of the town affected.

**Table 3-60: Preparedness Rating Chart**

Classification	#
Poor	3
Fair	2
Good	1

To determine the final hazard index for each hazard, each category was assigned a weight. Frequency of Occurrence was given the most weight (45%), followed by Severity of Impacts (30%), Area of Occurrence (15%), and Preparedness (10%). Ratings were entered into a spreadsheet which calculated the weighted hazard index for each hazard. Hazards with higher index scores represent the events most in need of organization focus and resources for emergency planning and mitigation projects.

All Hazards Vulnerability Assessment can be seen in Table 3-61. The hazards receiving a Weighted Hazard Index of 4.5 or more are – in order of vulnerability – Dam Failure, Severe Winter Storm/Ice Storm, Earthquake, Hurricane and Wind Storms, Microbursts.

Dam failure was rated the highest vulnerability and, while it is the hazard for which some of the best data has been kept and yet for which the most catastrophic impact exists. The Committee acknowledged that although the likelihood of a catastrophic dam failure is moderate, the potential impact would be devastating to the Town's built and natural environments as well as to the Town's infrastructure. The Committee felt the amount of notification time of over two hours would be adequate for evacuation of residents, thus making the severity of impact for population less severe than that for the built, natural and infrastructure environments.

For Severe Winter Storm/Ice Storm – rated second highest vulnerability – the Committee evaluated the Town's preparedness as Fair and the severity of impacts as severe for the built and natural environments as well as for population and infrastructure. The Frequency of Occurrence was rated at high, second only to Wind Storms/Microbursts.

After Dam Failure and Severe Winter Storm/Ice Storm, Earthquakes and Hurricanes were next highest on the hazard index. Both hazards were rated as having a Very Low frequency of occurrence. But while historically there have been no Hurricane events in Buckland; the Vulnerability Assessment revealed an occurrence could critically impact the Town, with potential multiple injuries to citizens possible and with a potential of more than 25% of property in affected area damaged or destroyed. An Earthquake event could potentially have a similar critical impact to all aspects of the town.

In terms of overall preparedness for hazards, the Committee rated the Town as most prepared – or a rating of Good – for Wild Fires/Brush Fires. The Committee rated the Town as moderately prepared – or a rating of Fair – for Dam Failures, Severe Winter Storms/Ice Storms, Hurricanes, Wind Storms/Microbursts, Ice Jams, and Floods. A rating of Poor in preparedness was given to Earthquakes, Tornados, and Landslides. Being poorly prepared for Landslides could potentially have only a minor effect on the Town, given the projected severity of impact. But being poorly prepared for Earthquakes and Tornados could potentially have a devastating effect on the Town, given the projected critical impact each of those hazards could have on the town.

In the Town’s hazard mitigation planning, much emphasis has been placed on flooding and yet the Vulnerability Assessment helped to highlight areas in which more hazard mitigation planning might be needed, such as for Dam Failure, Severe Winter Storms/Ice Storms, Earthquakes and Hurricanes, given their high hazard index rating, as well as Landslides, Earthquakes and Tornadoes, given their Poor preparedness rating.. The Committee acknowledged that a lower incidence of occurrence and lack of historic events is no protection against future hazards.





TABLE 3-61: All Hazards Vulnerability Assessment

EVENTS	FREQUENCY OF OCCURRENCE*	FOC WEIGHTED VALUE	SEVERITY OF IMPACTS*				SOI WEIGHTED VALUE	AREA OF OCCURRENCE*	Add WEIGHTED VALUE	PREPAREDNESS	PREP. WEIGHTED VALUE	WEIGHTED HAZARD INDEX
ASSIGNED WEIGHTING FACTOR	45%		30%					15%		10%		
INDEX VALUE	1-5		Built 1-4*	Natural 1-4*	Population 1-4*	Infrastructure 1-4*		1-3		1-3		
NATURAL HAZARDS												
Dam Failure	3	1.35	4	4	2	4	4.2	2	0.3	2	0.2	6.05
Severe Winter Storm/Ice Storm	4	1.8	3	3	3	3	3.6	2	0.3	2	0.2	5.9
Earthquake	1	0.45	3	3	3	3	3.6	3	0.45	3	0.3	4.8
Hurricanes / Tropical Storms	1	0.45	3	3	3	3	3.6	3	0.45	2	0.2	4.7
Microbursts	5	2.25	1	2	1	2	1.8	2	0.3	2	0.2	4.55
Tornados	1	0.45	3	3	3	3	3.6	1	0.15	3	0.3	4.5
Ice Jam	3	1.35	2	2	2	2	2.4	1	0.15	2	0.2	4.1
Flood	3	1.35	2	1	1	2	1.8	2	0.3	2	0.2	3.65
Wild Fire/Brush Fire	4	1.8	1	2	1	1	1.5	1	0.15	1	0.1	3.55
Landslide	1	0.45	1	1	1	1	1.2	1	0.15	3	0.3	2.1
* See rating charts												



## Development Trends Analysis

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In assessing development trends for the Town of Buckland - and the impact those trends might have on hazard mitigation - the Committee was asked to evaluate the probability of development in town and areas most likely to be targeted for development. The Committee was also asked about changes in industry, proposed housing and retail development, and any major highway or public transit improvements that might change accessibility to parts of town. Additionally, data such as number of construction permits issued, change in population, current zoning bylaws and the acres of developable land was considered.

The Committee forecasted that little development is likely over the next ten years. There are no proposed housing or retail developments pending and no development pressures such as big box stores. There are no pending changes in industry and no changes in highway or transit that might impact accessibility in town.

The Committee's assessment of development trends is reflected in the data consulted. According to Census data for new privately-owned residential building permits issued in Buckland, a total of 39 permits for 43 units were issued between the years 2000 and 2009. More notably, in 2008 and 2009, only 1 permit was issued each year.<sup>[1]</sup> There is no new residential or non-residential development slated for the next several years.

The total estimated population for 2009 in Buckland is 1,989. The population change in Buckland between 2000 and 2009, based on estimated 2009 census figures, was a net loss of 2 people. This trend is relatively close to the overall population change in Franklin County, which saw an estimated increase of .28% countywide.

As discussed in the Vulnerability Assessment Section of this plan, current development in the 691 flood plain acres includes 7.68 acres of commercial, public/institutional and industrial uses and 32.37 acres of residential use. The majority of the land in and along the floodplain is zoned Rural Residential. Given current available GIS data, it is not known how much of that land is currently developed.

An analysis of the percentage of acres in the floodplain and its zoning would rely on estimations. However, given that the floodplain meanders along the Deerfield River as well as along Clesson, Shepherd, and Clark Brooks and their many smaller tributaries, estimations would not be accurate. Further GIS analysis beyond the scope of the current project would be necessary to determine the exact number of developable acres in and along the floodplain.

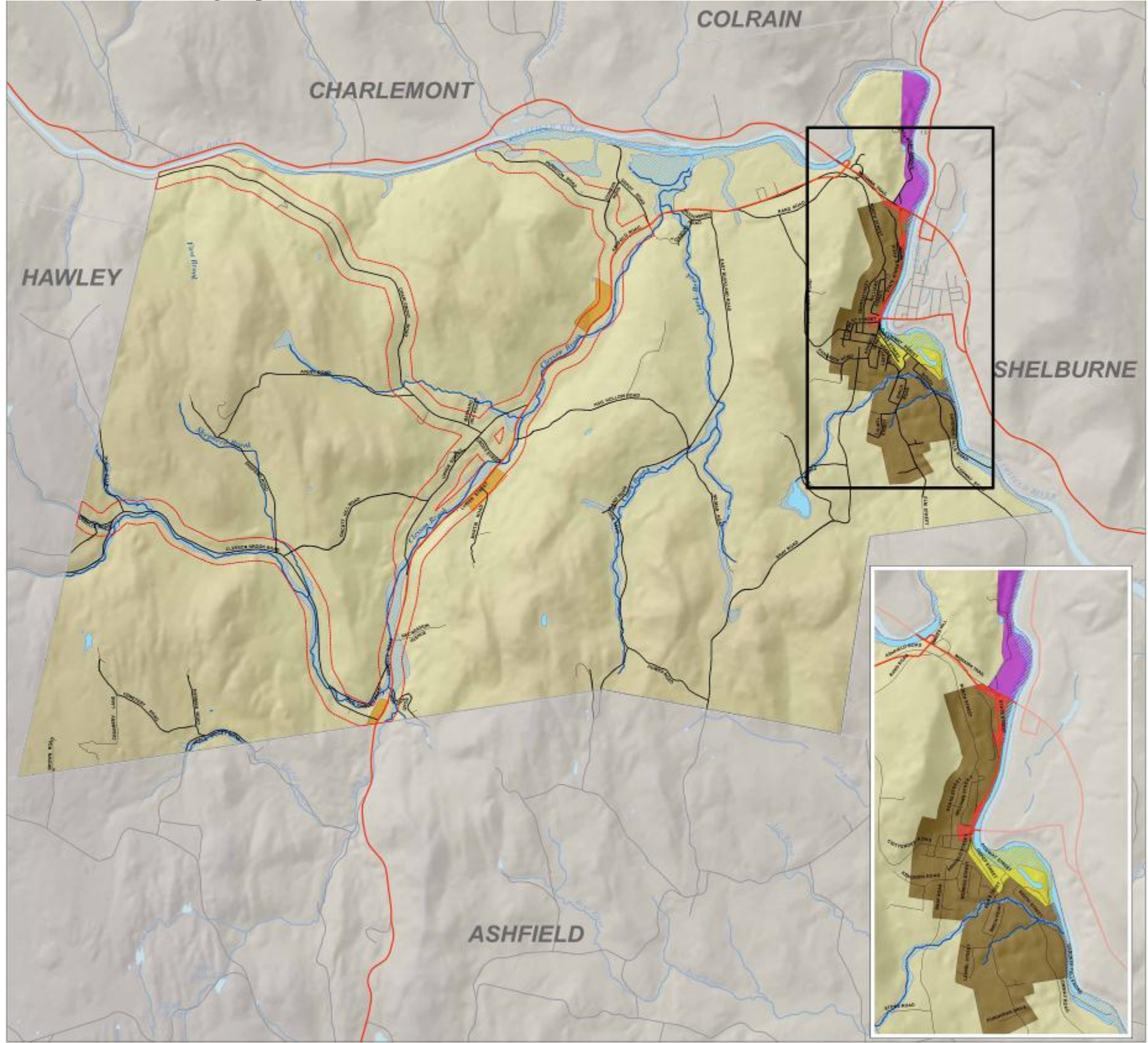
Generally speaking though, the vast majority of the total acres of land in the floodplain is located in land zoned Rural Residential. Based on the Dimensional Schedule in Section 5-2 of Buckland's Zoning Bylaws, updated in 2010, the minimum lot size for Rural Residential zoned land is approximately 2 acres. Without knowing the total floodplain acreage in each zoning district, it is not possible to estimate potential developable acres in the floodplain. Obtaining

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<sup>[1]</sup> <http://censtats.census.gov>

accurate date and mapping this information for future plan updates has been listed as an Action Item in this plan.

The Town of Buckland did adopt a Floodplain Overlay District. The underlying permitted uses are allowed, however, as long as they meet the requirements of the Section VII of the Zoning Bylaws as well as those of the Massachusetts State Building Code. See the Appendix of this document for wording of the Bylaws. Some changes to the Floodplain Overlay District Bylaws recommended in 2005 have not yet been acted upon. They include limiting new development within the 100-year floodplain and adding flood prevention and protecting the integrity of the Floodplain as stated purposes of the Floodplain Overlay District.



# Town of Buckland

## Zoning 2010

### Open Space and Recreation Plan

#### Legend

- |                                            |                          |
|--------------------------------------------|--------------------------|
| Town Boundary                              | <b>Zoning Districts</b>  |
| Major Road                                 | Commercial (C)           |
| Road                                       | Village Commercial (VC)  |
| River, Stream                              | Industrial (I)           |
| Pond, Lake                                 | Historic Industrial (HI) |
| 100 Year Flood Plain                       | Village Residential (VR) |
| Farm Building Reuse Overlay District (FBR) | Rural Residential (RR)   |



0 0.25 0.5 1 Miles

**FRANKLIN REGIONAL COUNCIL OF GOVERNMENTS**  
Main Office: 475-174-3187  
405 Main Street  
Greenfield, Massachusetts 01301

#### Map Notes:

Map produced by the Franklin Regional Council of Governments Planning Department. GIS data sources include the MRCOG Planning Department, the Massachusetts Highway Department and MassGIS. Digital data obtained from MassGIS represents the efforts of the Massachusetts Executive Office of Environmental Affairs and its agencies to secure information from the source data or the associated documentation. MRCOG maintains an ongoing program to record and document data in the GIS data base as it is brought in as to the master data set. Any use of the GIS data, MRCOG maintains records regarding its methods used to collect and process these data and will provide the information on request. Franklin Regional Council of Governments, MassGIS GIS Data Center, 311 Casco Street, Suite 100, Greenfield, MA 01301-1000. Notes: Copyright boundaries are approximate and are provided for planning purposes only. Open space provided by the town of Buckland and provided by the Franklin Regional Council of Governments. Buckland is a member of the MRCOG.

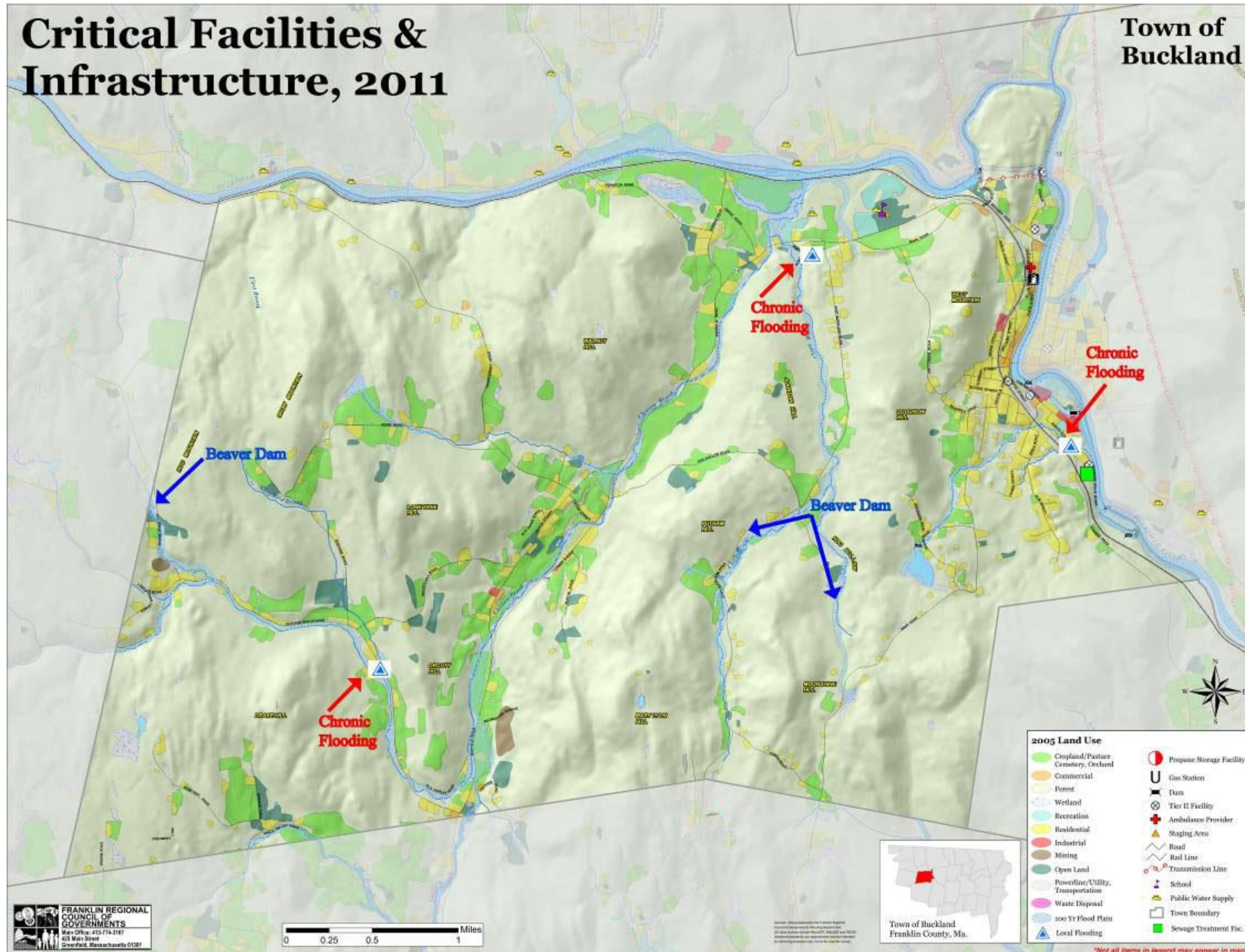






# Critical Facilities & Infrastructure, 2011

Town of Buckland







## 4 –MITIGATION STRATEGIES

One of the goals of this Natural Hazards Mitigation Plan is to evaluate all of the town's existing policies and practices related to natural hazards and identify potential gaps in protection. This section presents mitigation strategies to reduce the potential exposure and losses identified as concerns in the risk assessment based on the frequency, severity, and impact of each hazard and as summarized in Table 3-61: All Hazards Vulnerability Assessment. This section also reviews the general mitigation measures for each hazard already in place in Buckland, assesses any potential changes suggested for the existing measures, and evaluates whether the 2005 suggested changes were implemented. If suggested changes from the previous plan were not implemented, they are evaluated for relevance. Any additional suggested changes are also included. This section addresses both mitigation activities that are specific to particular hazards, and approaches that could apply to multiple hazards.

Regarding shelters, the Committee provided the following general information:

### Shelters Providing Food:

- Highway Department
- High School
- Fire Station

### Shelters Providing Sleeping Accommodations:

- Mary Lyon Church
- Shelburne Falls Fire Station
- Highway Department
- EMD Office
- High School
- Shelburne Falls Community Center

### Shelters with Back-Up Power:

- Shelburne Falls Fire Station
- Highway Department
- High School

### Shelters Providing Showers:

- Shelburne Falls Fire Station
- High School

## Current Mitigation Strategies

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### Floods

#### *Mapping*

The Critical Facilities, Infrastructure, 2011 Land Use & Natural Hazards Map for the Town of Buckland shows the 100-year flood zone identified by FEMA flood maps. The 100-year flood zone is the area that will be covered by water as a result of a flood that has a one percent chance of occurring in any given year. The major floods recorded in Buckland during the 20th century have been the result of rainfall alone or rainfall combined with snowmelt.

#### *Management Plans*

The Comprehensive Emergency Management (CEM) Plan for Buckland lists the following generic mitigation measures for flood planning:

- Identify areas in the community that are flood prone and define methods to minimize the risk. Review National Flood Insurance Maps.
- Disseminate emergency public information and instructions concerning flood preparedness and safety.
- Community leaders should ensure that Buckland is enrolled in the National Flood Insurance Program.
- Strict adherence should be paid to land use and building codes, (e.g., Wetlands Protection Act), and new construction should not be built in flood prone areas.
- Ensure that flood control works<sup>32</sup> are in good operating condition at all times.
- Natural water storage areas<sup>33</sup> should be preserved.
- Maintain plans for managing all flood emergency response activities including addressing potentially hazardous dams.

The Comprehensive Emergency Management (CEM) Plan for Buckland lists the following generic preparedness and response measures for floods:

- Place emergency operations center (EOC) personnel on standby during stage of flood ‘watch’ and monitor NWS/New England River Forecast Center reports.
- Ensure that public warning systems are working properly and broadcast any information that is needed at this time.
- Review mutual aid agreements.
- Monitor levels of local bodies of water.
- Arrange for all evacuation and sheltering procedures to be ready for activation when needed.
- Carry out, or assist in carrying out needed flood-proofing measures such as sand bag placement, etc.
- Regulate operation of flood control works such as flood gates.
- Notify all emergency management related groups that will assist with flood response activities to be ready in case of flood ‘warning.’
- Broadcast warning/notification of flood emergency.

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<sup>32</sup> Refers to manmade levees, dikes and dams. This definition includes dams not specifically constructed for flood control.

<sup>33</sup> Refers to ponds, lakes, vernal pools and other such bodies of water. Wetlands are not included in this definition.

- Coordinate traffic control and proceed with evacuation of affected populations as appropriate.
- Open and staff shelters and reception centers.
- Undertake, or continue to carry out flood proofing measures.
- Dispatch search and rescue teams and emergency medical teams.
- Refer to the Resource Manual's Transportation Inventory for information regarding transportation providers.

### ***Evacuation Options***

The majority of land subject to the 100-year floodplain in Buckland is farmland or open space. According to the Buckland CEM Plan, local officials have not identified shelters for victims of flooding. Of greater concern is the potential for flooding due to dam failure. Emergency management personnel should assess existing floodplain and dam failure data to determine an appropriate evacuation plan.

The Buckland CEM Plan does not list shelters within the town specifically for victims of flooding. It does list Mass Care Shelters and Reception Centers. They are: the Mohawk Trail Regional High School, Mary Lyon Church, Shelburne Falls Fire Station, Buckland Highway Department, the EMD Office, Buckland Center School and the Shelburne Falls Community Center. The Committee confirmed that the high school is the shelter identified in the event of floods. The Mary Lyon Church is within 1000 feet of the floodplains for the Clesson and Taylor Brooks. The High School is also within 1000 of acres of floodplain along and near the Deerfield River. Finally, the Shelburne Falls Fire Station is in or very near the floodplain of the Deerfield River. None of the shelters offers a viable option should Buckland experience severe, town-wide flooding due to such factors as prolonged heavy rain or significant, rapid ice melt. Included in the plan is a map showing evacuation routes for victims of flood, hurricane and dam emergencies. However, these routes may need to be redrawn to make them more accurate for such events. For example, one route follows Charlemont Road to its intersection with the Deerfield River and may therefore be inappropriate for residents wishing to avoid the dangers of flooding. The town should consider establishing alternate evacuation routes for victims of natural hazards.

In addition, there are several creeks and tributaries of the river - most notably Clesson and Clark brooks - that run through populated areas and have the potential to cause flooding during a 100-year flood event. Also, a culvert on South Street is undersized and floods chronically. This culvert has been identified to receive funds for repair through MEMA. See Appendix C for more information. Buckland also has a number of bridges situated either in or adjacent to the 100-year floodplain, which could make evacuation efforts more difficult. Some of the roads that residents would most likely take to reach safety travel through flood-affected areas.

Note should also be taken of the fact that the town's wastewater treatment facility lies directly adjacent to the floodplain. According to Dan Fleuriel at the wastewater treatment plant, there has been no flood-proofing of the facility, however, the facility is located approximately 25' above the river bank. He stated that only a failure of the Harriman Dam could flood out the facility. Even in the 1987 flood, the floodwaters did not threaten the facility.

### ***Flood Control Structures***

FEMA has identified no flood control structures within the Town of Buckland. Floods on the Connecticut River and portions of its major tributaries that are prone to backwater effects are controlled by nine, flood control reservoirs located upstream in Massachusetts, New Hampshire, and Vermont.

### ***Land Use Regulations that Mitigate Impacts from Flooding***<sup>34</sup>

The Town of Buckland has adopted several land use regulations that serve to limit or regulate development in floodplains, to manage stormwater runoff, and to protect groundwater and wetland resources, the latter of which often provide important flood storage capacity. These regulations are summarized below and their effectiveness evaluated in Table 4-1. Complete language of any land use regulations can be found in Appendix A.

### ***Zoning Bylaws***

The Town of Buckland Zoning Bylaws were last updated in May of 2010. Regulations pertaining to flooding are listed below.

#### Floodplain Overlay District

Buckland's zoning bylaws – last updated in 2005 – establish a Floodplain District as an overlay to all other districts:

(Section 3.2 Part e) Location of Districts

(Section 3.2 Part e A) Location of Districts

(Section 3.2 Part e B) Location of Districts

#### Section VII Floodplain District

(Section 7.2) Flood Plain District Boundaries and Base Flood Elevation and Floodway Data

(Section 7.2 Section A Part 1) Base Flood Elevation and Floodway Data

(Section 7.2 Section B Part 2) Base Flood Elevation and Floodway Data

(Section 7.3) Notification of Watercourse Alteration

(Section 7.4 Part a-b) Flood Plain Overlay District Use Regulations

(Section 7.4 Part A) Reference to Existing Regulations.

(Section 7.4 Part A) Other Use Regulations.

(Section 7.5) Uses

(Section 4.4 Backlots With Farmland Set Aside)

(Section 4.5 Part d 3 Cluster Development/Conservation Bylaw – Minimum Standards)

(Section 4.5 Part d 5 Cluster Development/Conservation Bylaw – Minimum Standards)

(Section 7.1 Part f) General Regulations – Removal of Natural Materials)

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<sup>34</sup> All bulleted items and direct quotes in the Buckland Local Natural Hazards Mitigation Plan are taken from the Town of Buckland's zoning and subdivision regulations. Other references to those documents contained herein are paraphrases of the same.

### Subdivision Rules and Regulations

(Section 4.C) Definitive Plan – Contents. Requires the proponent, in part, to identify:

(Section IV.D) Performance Guarantee

(Section IV.E Part 2) Wetlands

(Section V Design Standards Part D) Protection of Natural Features

(Section V Design Standards Part I Easements and Restrictions)

- (Subset 2.a) Conservation Restrictions

- (Subset 2.b) Conservation Restrictions

(Section V Design Standards Part I - Easements and Restrictions)

(Section V.J Sewerage – Storm Sewers)

(Section VI.C Required Improvements - Responsibility)

(Section VI.G Required Improvements – Road, Berm, and Curb Cuts)

(Section VI.I Required Improvements – Groundwater Drainage)

(Section VI.I Required Improvements – Bank Plantings)

(Section VII Storm Drainage)

(Section VII Natural Conditions)

(Section VI Environmental Impact)

### ***River and Stream Protection***

The Town of Buckland follows the standards established by the Wetlands Protection Act, which protects water bodies and wetlands through the town Conservation Commission. Towns can elect to institute local bylaws that are stricter than the standards set forth in the Wetlands Protection Act.

### ***Buckland Community Development Plan (CDP): Open Space and Resource Protection***

Recent efforts in the Town of Buckland have resulted in the creation of municipal plans that are useful for flood hazard mitigation purposes. In 2004, the town completed its Community Development Plan. The intent of the document is not to address hazard mitigation or flood control in a direct or comprehensive way. However, it inventories the natural features and environments in the town. Many of the natural features, such as wetlands, aquifer recharge areas, farms, rivers, streams, and brooks, contain floodplain, dam failure inundation or localized flooding areas.

### ***Buckland Open Space and Recreation Plan (OSRP)***

The Massachusetts Open Space Plan guidelines dictate that the document should contain an inventory of assets, a community vision, an assessment of needs and a seven-year action plan that addresses the goals and objectives of the community. Buckland completed its Open Space & Recreation Plan in 2010. An Open Space Plan is used to guide decisions of municipal officials regarding open space preservation planning, which can be helpful in floodplain areas so that they continue to absorb flood waters when needed. The 2010 plan contains no action items specific to flood or other hazard mitigation.

### ***National Flood Insurance Program***

See pages 112-114 for complete information on the National Flood Insurance Program.



**Table 4-1: Existing Flood Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
<b>Zoning Bylaws: Floodplain Overlay District</b>	<p>Development should be designed consistent with the need to minimize flood damage.</p> <p>All encroachments, including new construction, fill or substantial improvement to existing structures require professional engineer certification.</p> <p>Certification by a professional engineer is required to show no decrease in flood storage capacity or increase in flood levels.</p> <p>Displacement of streams or watercourses is forbidden without notification of adjacent communities, and the National Flood Insurance Program.</p>	Special Flood Hazard Areas (Zones A and A1-30) to indicate the 100-year floodplain.	Effective for controlling new development within the 100-year floodplain.	<p>Consider limiting new development within the 100-year floodplain.</p> <p>Consider adding flood prevention and protecting the integrity of the Floodplain as stated purposes of the Floodplain Overlay District.</p>	Not yet accomplished, still relevant
<b>Back lots with Farmland Set Aside</b>	<p>Encourages the maintenance of open farmland.</p> <p>Requires the preservation of natural site features, including water courses, one hundred year flood plains, wetlands, ponds and other water bodies, marshes, scenic points and historic sites.</p>	Parcels within the town with roadside farmland or roadside frontage land.	Effective.	None.	N/A
<b>Cluster Development/ Conservation Bylaw</b>	<p>Excludes wetlands from net developable acreage for development.</p> <p>Conservation Commission must define all wetlands in accordance with the provisions of the Wetlands Protection Act.</p>	Areas of town identified on the Zoning Map for Residential Development.	Effective.	None.	N/A

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
<b>Removal of Natural Materials</b>	Regulates the removal of sod, earth, stone, rock and mineral aggregates through a permitting process. Exempts routine farming operations and activities taking place under current building permits.	Entire town.	Not effective for controlling localized flooding. This bylaw does not specifically address the potential for localized flooding that soil removal can cause.	Add reducing or eliminating the potential for localized flooding events as a purpose of the bylaw. Require mitigation of potential impacts from flooding.	Not yet accomplished, still relevant
<b>Subdivision Rules and Regulations</b>	<p>Requires that subdivision design reduce, to the extent reasonably possible, flood damage. Includes several other provisions that mitigate the potential for flooding and its associated impacts.</p> <p>Requires a Definitive Plan for new subdivisions, including location of storm drainage systems, water courses, marshes, flood plains, and wetland resources areas.</p> <p>Performance guarantee ensures that subdividers cover the cost of construction and improvements for projects.</p> <p>Requires that a minimum of five (5) percent of land tract be maintained as open space.</p>	Areas of town identified on the Zoning Map for Residential Development.	Somewhat effective for mitigating or preventing localized flooding of roads and other infrastructure. Somewhat effective for controlling impacts from stormwater runoff.	<p>Consider adding Flood Prevention and Mitigation to purpose section of the Subdivision Rules and Regulations. Definitive Plan should identify impacts and include flooding mitigation measures.</p> <p>Consider amending standards to address impacts of uncontrolled surface water runoff and sedimentation of streams and surface water bodies by requiring temporary and permanent erosion control measures. Consider updating subdivision regulations to prohibit</p>	Not yet accomplished, still relevant



Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
				<p>permanent alterations of watercourses or streams.</p> <p>Consider adding formal regulations for new driveway openings or curb cuts that include grade and design standards to prevent runoff and icing conditions. Driveway curb cut requests for ANR and subdivision plans should be submitted to the Highway Superintendent for review and approval prior to the decision by the Planning Board and within the time frame established by Massachusetts General Law.</p>	
<b>River and Stream Protection</b>	The town follows the standards set by the Wetlands Protection Act.	Entire town.	Effective.	None.	<b>N/A</b>

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
<b>Buckland Community Development Plan/Open Space and Recreation Plan</b>	<p>Inventories natural features and environments in the town, including many that contain floodplain areas such as wetlands, aquifer recharge areas, farms, rivers, streams, and brooks.</p> <p>Encourages development to locate outside certain flood-prone areas.</p>	Entire town.	Effective in establishing priorities for environmentally sensitive development that will mitigate flooding impacts.	<p>Consider adopting recommendations laid out in Community Development Plan.</p> <p>Consider implementing the Five-Year Action Plan strategies, particularly those dealing with protection of forests, farmland and floodplain forests.</p>	Not yet accomplished, still relevant
<b>Participation in the National Flood Insurance Program</b>	As of 2010, there were 11 homeowners with flood insurance policies.	Areas identified by the FEMA maps.	Somewhat effective, provided that the town remains enrolled in the National Flood Insurance Program.	The town should evaluate whether to become a part of FEMA's Community Rating System.	Not yet accomplished, still relevant
<b>State Building Code</b>	The Town of Buckland has adopted the Massachusetts State Building Code.	Entire town.	Effective.	None.	N/A
<b>Repair of South Street Culvert</b>	See Appendix C for project description.	South Street Area	Effective	None.	<b>New project this plan.</b>

## Severe Snowstorms/Ice Storms

Winter storms can be especially challenging for emergency management personnel because, although the storm has usually been forecast. The Massachusetts Emergency Management Agency (MEMA) serves as the primary coordinating entity in the statewide management of all types of winter storms and monitors the National Weather Service (NWS) alerting systems during periods when winter storms are expected.<sup>35</sup>

### *Management Plans*

The CEM Plan for Buckland lists the following generic mitigation measures for severe winter storms:

- Develop and disseminate emergency public information concerning winter storms, especially material that instructs individuals and families how to stock their homes, prepare their vehicles, and take care of themselves during a severe winter storm.
- As it is almost guaranteed that winter storms will occur annually in Massachusetts, local government bodies should give special consideration to budgeting fiscal resources with snow management in mind.
- Maintain plans for managing all winter storm emergency response activities.

To the extent that some of the damages from a winter storm can be caused by flooding, all of the flood protection mitigation measures described in Table 4-1 can also be considered as mitigation measures for severe snowstorms/ice storms.

The CEM Plan for Buckland lists the following generic preparedness and response measures for severe winter storms:

- Ensure that warning/notification and communications systems are in readiness.
- Ensure that appropriate equipment and supplies, (especially snow removal equipment), are in place and in good working order.
- Review mutual aid agreements.
- Designate suitable shelters throughout the community and make their locations known to the public.
- Implement public information procedures during storm ‘warning’ stage.
- Prepare for possible evacuation and sheltering of some populations impacted by the storm (especially the elderly and special needs).
- Broadcast storm warning/notification information and instructions.
- Conduct evacuation, reception and sheltering activities.
- If appropriate, activate media center. Refer to Resource Manual for media center information.
- Dispatch search and rescue and emergency medical teams.
- Take measures to guard against further danger from power failure, downed trees and utility lines, ice, traffic problems, etc.
- Close roads and/or limit access to certain areas if appropriate.
- Provide assistance to homebound populations needing heat, food and other necessities.

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<sup>35</sup> Comprehensive Emergency Management Plan for the Town of Buckland, August 2002.

- Provide rescue and sheltering for stranded/lost individuals.

### ***Restrictions on Development***

There are no restrictions on development that are directly related to severe winter storms. The Town of Buckland Subdivision Rules and Regulations set grade limits on streets (Section 5.G Design Standards), which, although not specified as weather hazard mitigation, can serve to minimize accident potential from severe winter storms. See Appendix A for regulation language.

- (Section 5-G.a) Design Standards – Location and Alignment.
- (Section 5-G.h) Design Standards – Location and Alignment.
- (Section 5-G) Design Standards – Location and Alignment.

### ***State Building Code***

For new or recently built structures, the primary protection against snow-related damage is construction according to the State Building Code, which addresses designing buildings to withstand snowloads.

### ***Other Mitigation Measures***

Severe snowstorms or ice storms can often result in a small or widespread loss of electrical service, affecting infrastructure such as public water supply wells and water treatment plants. These effects can be mitigated by installing back-up power to ensure adequate service. The public water supply wells are not equipped with standby power sources. In the event of a major power failure, there would be an estimated water supply of seven days. The Shelburne Falls water treatment plant is equipped with a standby power source.

**Table 4-2: Existing Winter Storms Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
<b>Subdivision Regulations – Design Standards for Roads</b>	Standards include street grade regulations (five to ten percent maximum).	Entire town.	Effective.	None.	N/A
<b>Subdivision Regulations – Utilities (electric and telephone)</b>	The town requires all utilities to be placed underground for new subdivisions.  Utility equipment within the 100-year floodplain must be flood proofed.	Entire town.	Effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	Encourage utility companies to underground existing utility lines in locations where repetitive outages occur.  Encourage utility companies to underground new utility lines.	Not accomplished, still relevant.
<b>State Building Code</b>	The Town of Buckland has adopted the Massachusetts State Building Code.	Entire town.	Effective.	None.	N/A



## Hurricanes and Tropical Storms

Of all the natural disasters that could potentially impact Buckland, hurricanes provide the most lead warning time because of the relative ease in predicting the storm's track and potential landfall. MEMA assumes "standby status" when a hurricane's location is 35 degrees North Latitude (Cape Hatteras) and "alert status" when the storm reaches 40 degrees north Latitude (Long Island).<sup>36</sup> The flooding associated with hurricanes can be a major source of damage to buildings, infrastructure and a potential threat to human lives. Therefore, all of the flood protection mitigation measures described in Table 4-1 can also be considered hurricane mitigation measures. High winds that oftentimes accompany hurricanes can also damage buildings and infrastructure.

Town of Buckland cell phone regulations, restrictions on development and mobile home and State Building Code regulations, as listed below, are equally applicable to wind events such as hurricanes and tornadoes.

### *Management Plans*

The CEM Plan for Buckland includes the following generic mitigation measures for hurricane planning and response:

- Develop and disseminate emergency public information and instructions concerning hurricane preparedness and safety.
- Community leaders should ensure that Buckland is enrolled in the National Flood Insurance Program.
- Develop and enforce local building codes to enhance structural resistance to high winds and flooding. Build new construction in areas that are not vulnerable to direct hurricane effects.
- Maintain plans for managing all hurricane emergency response activities.

The CEM Plan for Buckland includes the following generic preparedness and response measures for hurricanes:

- Ensure that warning/notification systems and equipment is ready for use at the 'hurricane warning' stage.
- Review mutual aid agreements.
- Designate suitable wind and flood resistant shelters in the community and make their locations known to the public.
- Prepare for coordination of evacuation from potentially impacted areas including alternate transportation systems and locations of special needs facilities.
- Activate warning/notification systems to inform public of protective measures to be taken, including evacuation where appropriate.
- Conduct evacuation of affected populations.
- Open and staff shelters and reception centers.
- Dispatch search and rescue and emergency medical teams.
- Activate mutual aid activities.
- Take measures to guard against further danger from downed trees and utility lines, debris, etc.

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<sup>36</sup> Ibid.

## ***Zoning***

(Section X) Bylaw for Personal Wireless Service Facilities.

### ***Restrictions on Development***

The only restrictions on development that are wind-related are the provisions in the zoning bylaw related to wireless communications facilities. In addition, new permanent mobile homes, which are susceptible to catastrophic damage during high wind events, are prohibited in town.

### ***Temporary Mobile Homes***

According to the Town of Buckland Zoning Bylaws, the owner of a residence destroyed by fire or other natural holocaust may occupy a trailer or mobile home while the residence is being rebuilt, for a period not to exceed twelve (12) months. There are special regulations for the placement of mobile homes within the Flood Plain District. Grandfathered mobile homes are the only permanent mobile homes permitted within the Town of Buckland.

- (Section 9-2) Special Regulations for the Flood Plain District part a.

### ***State Building Code***

For new or recently built structures, the primary protection against wind-related damage is construction according to the State Building Code, which addresses designing buildings to withstand high winds.



**Table 4-3: Existing Hurricane and Tropical Storm Hazard Mitigation Measures (Applies to Tornadoes and Microbursts)**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
<b>Zoning regulations for wireless communications facilities</b>	Requires a special permit from the Planning Board. Wireless facilities are required to have a fall zone of the height of the structure plus ten feet.  Facilities are not permitted within 150 feet of designated wetlands, water bodies and areas with a slope in excess of five percent.	Entire town.	Effective.	Add safety and prevention of wind-related damage as a stated purpose.	<b>Not accomplished, still relevant.</b>
<b>State Building Code</b>	The Town of Buckland has adopted the Massachusetts State Building Code.	Entire town.	Effective.	None.	<b>N/A</b>
<b>Zoning Regulations prohibiting new mobile homes</b>	Town of Buckland Zoning Bylaw prohibits mobile homes within the town.	Entire town.	Does not address potential damage to existing mobile homes.	Consider using Community Development Block Grant home rehabilitation funds to assist homeowners in retrofitting grandfathered mobile homes.	<b>Not accomplished, still relevant.</b>
<b>Subdivision Regulations – Utilities (electric and telephone)</b>	The town requires all utilities to be placed underground in new subdivisions.	Entire town.	Effective for ensuring that utility service is uninterrupted by severe storms in new areas of residential development.	Encourage utility companies to underground existing utility lines in locations where repetitive outages occur.  Encourage utility companies to underground new utility lines.	<b>Not accomplished, still relevant.</b>
<b>Shelters</b>	Shelters for victims of natural hazards in Buckland have not been identified.	Entire town.	Not effective.	Consider identifying shelters within the town.  Ensure that identified	<b>Not accomplished, still relevant.</b>

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
				shelters have sufficient back-up utility service in the event of primary power failure.	
<b>Debris Management Plan</b>	A debris management plan could be developed. <sup>37</sup>	Entire town.	Effective.	Consider participation in the creation of a Regional Debris Management Plan.	<b>Not accomplished, still relevant.</b>

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<sup>26</sup> Natural disasters can precipitate a variety of debris, including trees, construction and demolition materials and personal property. After a natural disaster, potential threats to the health, safety and welfare of impacted citizens can be minimized through the implementation of a debris management plan. Such a plan can be critical to recovery efforts after a disaster, including facilitating the receipt of FEMA funds for debris clearance, removal and disposal. Additional information is available at <http://www.fema.gov/rrr/pa/dmgbroch.shtm>.

## **Tornados and Microbursts**

Most damage from tornados and microbursts – and associated storm events including thunderstorms, hail and lightning—comes from high winds that can fell trees and electrical wires and can generate hurtling debris. Thus, the existing mitigation measures for Tornados and Microbursts are similar as for Hurricanes and Tropical Storms. See preceding section for more information.

### ***Management Plans***

The CEM Plan for Buckland includes the following generic mitigation measures for tornado and microburst planning and response:

- Develop and disseminate emergency public information and instructions concerning tornado safety, especially guidance regarding in-home protection and evacuation procedures, and locations of public shelters.
- Strict adherence should be paid to building code regulations for all new construction.
- Maintain plans for managing tornado response. Refer to the non-institutionalized, special needs and transportation resources listed in the *Resource Manual*.

The CEM Plan for Buckland includes the following generic preparedness and response measures for tornados and microbursts:

- Designate appropriate shelter space in the community that could potentially withstand tornado impact.
- Periodically test and exercise tornado response plans.
- Put emergency management on standby at tornado ‘watch’ stage.
- At tornado ‘warning’ stage, broadcast public warning/notification safety instructions and status reports.
- Conduct evacuation, reception and sheltering services to victims.
- Dispatch search and rescue and emergency medical teams.
- Activate mutual aid agreements.
- Take measures to guard against further injury from such dangers as ruptured gas lines, downed trees and utility lines, debris, etc.
- Acquire needed emergency food, water fuel and medical supplies.
- Take measures relating to the identification and disposition of remains of the deceased.

### ***Zoning***

See Hurricanes and Tropical Storms section.

### ***Restrictions on Development***

See Hurricanes and Tropical Storms section.

### ***Temporary Mobile Homes***

See Hurricanes and Tropical Storms section.

### ***State Building Code***

See Hurricanes and Tropical Storms section.

## **Wildfires/Brushfires**

Franklin County has approximately 356,465 acres of forested land, which accounts for 77% of total land area. Forest fires are therefore a potentially significant issue. A large portion of the town remains forested and is therefore at risk of fire.

### ***Management Plans and Regulatory Measures***

The Buckland CEM Plan does not include any specific information on wildfires.

### ***Burn Permits***

Burn permits for the Town of Buckland are issued from the Shelburne Control Center of the Massachusetts State Police. Approximately 369 permits were issued in 2003. During this process, the applicant is read the State Law, which includes guidelines for when and where the burn may be conducted as well as fire safety tips provided by the control center. Specific burn permit guidelines are established by the state, such as the burning season and the time when a burn may begin on a given day. It may be beneficial for the state to change some of their regulations to prevent wildfires and brushfires. Currently, the burning season extends from January 15<sup>th</sup> to May 1<sup>st</sup>. If the burning season were to start in November or December and end in April, this would allow for a longer season during the months found to be, traditionally, the least dry in Massachusetts. Currently, residents may only burn between 10 a.m. and 4 p.m. If state guidelines were changed to allow for an earlier start time, this would allow for most of the burning to be conducted in the morning when winds are often calmest.

### ***Subdivision Review***

The Buckland Fire Department reviews subdivision plans to ensure that their trucks will have adequate access and that the water supply is adequate for firefighting purposes. Cul-de-sac streets are required to have a turn around sufficient for fire apparatus even if the street is blocked by fallen trees or automobile accidents.

### ***Public Education/Outreach***

The Buckland Fire Department has an ongoing educational program in the schools to teach fire safety during Fire Prevention Week, which falls during the first week of October.

### ***Restrictions on Development***

There are currently no restrictions on development that are based on the need to mitigate the hazards of wildfires/brushfires.

**Table 4-4: Existing Wildfire/Brushfire Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
<b>Burn Permits</b>	Residents are permitted to obtain burn permits over the phone. State police personnel provide information on safe burn practices.	Entire town.	Effective.	<b>Coordinate with the FRCOG and other appropriate agencies to coordinate efforts to request that the State revise burn permit guidelines.</b>	
<b>Subdivision Review</b>	The fire department is involved in the review of subdivision plans.	Entire town.	Effective.	<b>None.</b>	N/A
<b>Public Education/Outreach</b>	The fire department has an ongoing educational program in the schools.	Entire town.	Effective.	<b>Develop and distribute an educational pamphlet on fire safety and prevention.</b>	<b>Not accomplished, still relevant.</b>
<b>State Forest</b>	Adequate and well-maintained fire roads provide access for firefighting purposes.	Entire Town.	Effective, providing roads are maintained		<b>Recommended in 2011</b>



## Earthquakes

Although there are five mapped seismological faults in Massachusetts, there is no discernable pattern of previous earthquakes along these faults nor is there a reliable way to predict future earthquakes along these faults or in any other areas of the state. Consequently, earthquakes are arguably the most difficult natural hazard to plan for. Most buildings and structures in the state were constructed without specific earthquake resistant design features.

### *Management Plans*

The Buckland CEM Plan lists the following generic mitigation measures for earthquakes:

- Community leaders in cooperation with Emergency Management Personnel should obtain local geological information and identify and assess structures and land areas that are especially vulnerable to earthquake impact and define methods to minimize the risk.
- Strict adherence should be paid to land use and earthquake resistant building codes for all new construction.
- Periodic evaluation, repair, and/or improvement should be made to older public structures.
- Emergency earthquake public information and instructions should be developed and disseminated.
- Earthquake drills should be held in schools, businesses, special care facilities and other public gathering places.

The Buckland CEM Plan lists the following generic preparedness and response measures for earthquakes:

- Earthquake response plans should be maintained and ready for immediate use.
- All equipment, supplies and facilities that would be needed for management of an earthquake occurrence should be maintained for readiness.
- Emergency management personnel should receive periodic training in earthquake response.
- If the designated EOC is in a building that would probably not withstand earthquake impact, another building should be chosen for an earthquake EOC.
- Mass Care shelters for earthquake victims should be pre-designated in structures that would be most likely to withstand earthquake impact.
- EOC will be activated and response will immediately be engaged to address any and all earthquake effects listed.
- Emergency warning/notification information and instructions will be broadcast to the public.
- Search and rescue and emergency medical teams will be dispatched.
- Firefighters will address fires/explosions and HAZMAT incidents.
- Law enforcement personnel will coordinate evacuation and traffic control as well as protecting critical facilities and conducting surveillance against criminal activities.
- Reception centers will be opened and staffed.
- Animal control measures will be taken.
- Immediate life-threatening hazards will be addressed such as broken gas lines, downed utility wires and fire control resources.
- Emergency food, water and fuel will be acquired.
- Activate mutual aid.

- Measures will be taken by the chief medical examiner relating to identification and disposition of remains of the deceased.

### ***Evacuation Options***

The Buckland CEM Plan does not currently specify to which shelter residents should go in the event of an earthquake.

### ***State Building Code***

State and local building inspectors are guided by regulations put forth in the Massachusetts State Building Code. The first edition of the Massachusetts State Building Code went into effect on January 1, 1975 and included specific earthquake resistant design standards. These seismic requirements for new construction have been revised and updated over the years and are part of the current, 6<sup>th</sup> Edition of the Massachusetts State Building Code. Given that most structures in Massachusetts were built before 1975, many buildings and structures do not have specific earthquake resistant design features. According to the 2000 U.S. Census, 83% of the housing in Buckland was built before 1970. In addition, built areas underlain by artificial fill, sandy or clay soils are particularly vulnerable to damage during an earthquake.

### ***Restrictions on Development***

There are no seismic-related restrictions on development.



**Table 4-5: Existing Earthquake Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
<b>State Building Code</b>	The Town of Buckland has adopted the 6 <sup>th</sup> Edition of the State Building Code.	Entire town but applies to new construction only.	Effective for new buildings only.	Evaluate older structures, particularly schools and shelters, to determine if they are earthquake resistant. If not, identify alternate structures as shelters for earthquake events.	<b>Not accomplished, still relevant.</b>
<b>Debris Management Plan</b>	A debris management plan could be developed.	Entire town.	Effective.	Consider participation in the creation of a Regional Debris Management Plan.	<b>Not accomplished, still relevant.</b>



## **Dam Failures**

The only mitigation measures in place are the state regulations that control the construction and inspection of dams. The Buckland CEM Plan states that there are three categories of dam failure or overspill and that action should be taken according to hazard rating:

### *Type 1: Slowly developing condition*

- Activate EOC;
- Activate all communication networks. Establish communications with command post on a 24-hour basis;
- Release public information;
- Notify MEMA area headquarters, the American Red Cross and downstream communities;
- Review plans for evacuation and sheltering, including availability and capacity; food, supplies and equipment; shelter owners and managers and other communities (if out of town sheltering is required); and,
- Require 'stand by' status of designated response forces.

### *Type 2: Rapidly developing condition*

- Establish 24-hour communication from the damsite to EOC;
- Assemble, brief and assign specific responsibilities to emergency response forces;
- Release public information;
- Obtain and prepare required vehicles/equipment for movement; and,
- Prepare to issue warning.

### *Type 3: Practically instantaneous failure*

- Issue warning;
- Commence immediate evacuation;
- Commit required resources to support evacuation;
- Activate shelters or coordinate activation of shelters located outside the community;
- Notify MEMA area headquarters and the Red Cross; and,
- Initiate other measures as required to protect lives and property.

## **Management Plans and Regulatory Measures**

The Buckland CEM Plan contains the following generic mitigation measures for dam failure:

- Develop and conduct public education programs concerning dam hazards.
- Maintain up-to-date plans to deal with threat and actual occurrence of dam overspill or failure.
- Emergency management and other local government agencies should familiarize themselves with technical data and other information pertinent to the dams that impact Buckland. This should include determining the probable extent and seriousness of the effect to downstream areas.
- Dams should be inspected periodically and monitored regularly.
- Repairs should be attended to promptly.
- As much as is possible burdens on faulty dams should be lessened through stream re-channeling.
- Identify dam owners.

- Determine minimum notification time for downstream areas.

The Buckland CEM Plan contains the following generic preparedness and response measures for dam failure:

- Pre-place adequate warning/notification systems in areas potentially vulnerable to dam failure impact.
- Pre-place procedures for monitoring dam site conditions at first sign of any irregularity that could precipitate dam failure.
- Identify special needs populations, evacuation routes and shelters for dam failure response.
- Have sandbags, sand and other items to reinforce dam structure or flood proof flood prone areas.
- Disseminate warning/notification of imminent or occurring dam failure.
- Coordinate evacuation and sheltering of affected populations.
- Dispatch search and rescue teams.
- Coordinate evacuation and sheltering of affected populations.
- Activate mutual aid if needed.
- Acquire additional needed supplies not already in place, such as earthmoving machinery.
- Establish incident command post as close to affected area as safely possible.
- Provide security for evacuated public and private property.

The Buckland Comprehensive Emergency Management Plan (CEM) lists three dams in the Buckland area: the Gardner Falls Dam, New England Power Co. #3 and New England Power Co. #4. The CEM Plan lists the former as Medium Hazard and the latter two as High Hazard dams. The MA DCR Office of Dam Safety provided information about eight dams in Buckland. All are privately owned. The New England Power Co. #4 Dam and the New England Power Co. #3 Dam are both under the Regulation of the Federal Energy Regulatory Commission (FERC) and are categorized as High Hazard.

The Gardner Falls-Main Dam is FERC licensed and is categorized Medium/Significant Hazard. The New England Power Co Forebay #3, New England Power Co. Forebay #4 and New England Power Co.#2 Dam are all FERC licensed and are categorized as Low Hazard. The Gardner Falls Diversion and Hillman Ice Pond Dam are not FERC licensed and are categorized Low Hazard.

### ***Permits Required for New Dam Construction***

Massachusetts State Law (M.G.L. Chapter 253 Section 45) regulates the construction of new dams. A permit must be obtained from the Department of Conservation and Recreation (DCR) before construction can begin. One of the permit requirements is that all local approvals or permits must be obtained.

### ***Dam Inspections***

The DCR requires that dams rated as Low Hazards are inspected every ten (10) years and dams that are rated as Significant Hazards are inspected every five (5) years. The dams listed in Buckland by the DCR are privately owned. Owners of dams are responsible for hiring a qualified engineer to inspect their dams and are responsible for reporting the results to the DCR. Owners of High-Hazard dams and certain Significant Hazard dams are also required to prepare, maintain,

and update Emergency Action Plans. Potential problems may arise if the ownership of a dam is unknown or is contested. Additionally, the cost of hiring an engineer to inspect a dam or to prepare an Emergency Action Plan may be prohibitive for some owners.

### ***Zoning***

While no specific mention is made regarding the construction of new dams in the Floodplain Overlay District (Section 7), the language regarding encroachment and the erection of structures in existing bylaws would indicate that a Special Permit would be required from the Zoning Board of Appeals and an Order of Conditions would be required from the Conservation Commission. In addition, several state federal and local agencies would also be involved.<sup>38</sup>

### ***Restrictions on Development***

There are no town restrictions on dam locations. The DCR issues permits for new dams and does have the authority to deny a permit if it is determined that the design and/or location of the dam is not acceptable.

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<sup>38</sup> Including potentially the DEP, The Environmental Protection Agency, and the Army Corps of Engineers.



**Table 4-6: Existing Dam Failure Hazard Mitigation Measures**

Type of Existing or Proposed Protection	Description	Area Covered	Effectiveness	Potential Changes	Accomplished / Still Relevant
<b>Permits required for new dam construction</b>	State law requires a permit for the construction of any dam.	Entire town.	Effective. Ensures dams are adequately designed.	<b>None.</b>	<b>N/A</b>
<b>Dam Inspections</b>	DCR has an inspection schedule that is based on the hazard rating of the dam (low, significant, high hazard).	Entire town.	Low. The DCR does not have adequate staff and resources to inspect dams according to the required schedule.	<b>Emergency action plans should be reviewed for all high hazard dams impacting the town, including those located in Vermont and New Hampshire.</b>	<b>Not accomplished, still relevant.</b>
<b>Zoning</b>	Special Permit and/or Order of Conditions required for dams in floodplain district or wetlands.	Floodplain areas and those under the jurisdiction of the Conservation Commission.	Effective.	<b>None.</b>	<b>N/A</b>
<b>Evacuation Plans</b>	Comprehensive evacuation plans would ensure the safety of the citizens in the event of dam failure.	Inundation areas in town.	None.	None.	<b>N/A</b>

See also Table 4-1: Existing Flood Hazard Mitigation Measures for related information.





## **Landslides**

Regulating land use and development to avoid construction on steep slopes and ensuring that construction does not reduce slope stability is one way to mitigate the hazard potential of landslides. The following regulations contain strategies that help reduce the risk of landslides in Buckland.

### ***Land Use Regulations***

#### ***Subdivision Rules and Regulations***

The Subdivision Rules and Regulations contain several provisions that mitigate the potential for landslides, including Section V Part D: Protection of Natural Features.



**Table 4-7: Existing Landslide Hazard Mitigation Measures**

Type of Existing Protection	Description	Area Covered	Effectiveness	2011 Potential Changes
Subdivision Rules and Regulations	<ul style="list-style-type: none"><li>Preserves natural features such as trees over sixteen inch diameter and other features as listed above.</li></ul>	Entire Town	Effective.	N/A



## **Ice Jams**

The most common hazard associated with ice jams is flooding upstream of the ice jam. Therefore strategies to mitigate flooding are also appropriate for mitigating the impacts of ice jams. See Table 4.1: Existing Flood Hazard Mitigation Measures and the preceding section for complete information.

## **Manmade Hazards**

Timely, informative and accurate notification of a hazardous material emergency is critical for an effective emergency response and for the safety and protection of Buckland's citizens. With the transportation of hazardous materials via Routes 2 and 112 as well as via the railroad – and with the close proximity of these routes to homes and water bodies - the possibility exists of a catastrophic accident or spill. Strategies to plan for the evacuation of residents and for the cleanup of any chemical spill are key to hazard mitigation.

### ***Management Plans and Regulatory Measures***

The following are generic preparedness and response measures for manmade hazards listed in the Town CEM Plan, specifically hazardous materials emergencies:

- The immediate notification of the community emergency coordinator and the State is required when a release of an extremely hazardous substance or hazardous chemical in an amount above the Reportable Quantity (RQ) occurs. Specific information is required by the notification such as chemical name, method of release, health effects, medical attention and protective actions.
- The Hazardous Materials Release Report Form must be used in the event of the release of a hazardous substance
- Both local and State response personnel, including the DEP must be notified immediately of a release. The local point of contact is the local fire department through the 911 dispatch Center.

### ***Evacuation Options***

Evacuation of an incident site could be required upon the recommendation of the on-scene commander. The routes of evacuation and staging areas for the evacuees will be determined by the Incident Commander. Once the incident site has been evacuated, law enforcement officials will support expanded evacuation if required. The necessity for additional evacuation will be determined by the Incident Commander.

**Table 4-8: Existing Manmade Hazard Mitigation Measures**

Type of Existing Protection	Description	Area Covered	Effectiveness	2011 Potential Changes	Accomplished/Still Relevant?
None currently in place	N/A	N/A	N/A	N/A	N/A





## **Future Mitigation Strategies**

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### **Hazard Mitigation Goal Statements and Action Plan**

As part of the natural hazards mitigation planning process to be undertaken by the Committee, existing gaps in protection and possible deficiencies will be identified and discussed. The Committee will develop general goal statements and Action Items that, when implemented, will help to reduce risks and future damages from natural hazards. The goal statements, Action Items, town department(s) responsible for implementation, and the proposed timeframe for implementation for each category of natural hazard are described below. There are also several general Action Items that were developed.

Several of the Action Items have multiple benefits because, if implemented, these Action Items will mitigate or prevent damages from more than one type of natural hazards. For example, updating the Subdivision Regulations to require new utility lines be placed underground will prevent property damage and loss of service in the event of high winds (tornado or hurricane) or severe snow and ice storms.

Action items from the previous plan were carried over where they were still applicable and/or where the item had not yet been completed. Those action items that have been completed since the last plan are listed below in the **2005 Action Items Completed** section.

## 2011 Action Plan

### *Prioritization of Goals and Action Items*

The Committee prioritized Mitigation Action Items by examining the results of the All Hazards Risk Assessment completed by the Committee (see Section 3, pages 56 through 59). The All Hazards Risk Assessment is an interactive table that the Committee completed with the FRCOG staff to evaluate all the natural hazards that can impact the town based on frequency of occurrence, severity of impacts, area of occurrence and preparedness. The completed table gives the town an overall understanding of the natural hazards, provides guidance on which hazards the Town may want to focus mitigation efforts on, reaffirms that Buckland's planning and preparedness is on track, and shows residents that town departments and agencies are organized in case of a natural disaster. Those hazards receiving the highest Weighted Hazard Index number were assigned the highest priority. Hazards were rated as follows:

**Table 4-10: Hazard Index Range**

Weighted Hazard Index	Priority Level
> 4.75	High
4.0 – 4.75	Medium
< 4.0	Low

**Table 4-11: Summary of All Hazards Vulnerability Assessment**

Natural Hazard	Weighted Hazard Index	Priority Level
Dam Failure	6.05	High
Severe Winter Storm/Ice Storm	5.9	High
Earthquake	4.8	High
Hurricane	4.7	Medium
Wind Storms, Microbursts, etc.	4.55	Medium
Tornado	4.5	Medium
Ice Jam	4.1	Medium
Flood	3.65	Low
Wild Fire/Brush Fire	3.55	Low
Landslide	2.1	Low

Because the ranking of priorities was based on the results of the All Hazards Risk Assessment, factors such as local knowledge of the frequency of occurrence of hazard events, the severity of impacts to the population, infrastructure, and the built and natural environments, the location and extent of impacts of the hazard events, and the town's preparedness to respond to hazard events were included in the prioritization process. The Committee's process also considered the anticipated benefits from the implementation of each Action Item to the population, the town's infrastructure, and to the built and natural environment. For most of the Action Items, project

costs are not specifically known but there was consideration of whether or not the town currently had the technical and administrative capability to carry out the mitigation measures. Even when the political will exists to implement the Action Items, the fact remains that Buckland is a rural town that relies heavily on a small number of paid staff, many of whom have multiple responsibilities, and a dedicated group of volunteers who serve on town boards. The town does not have money to hire consultants and engineers to assist them with implementation of Action Items. Limited technical assistance is available from the Franklin Regional Council of Governments. However, the availability of FRCOG staff can be constrained by the availability of grant funding.

The final 2011 Buckland Natural Local Hazards Mitigation Prioritized Action Plan is shown in Table 4-12. Some Action Items were evaluated as being associated with several hazards and were labeled “Multiple Hazard”. Multiple Hazard Action Items were assigned a high priority given their association with more than one hazard. Potential funding sources to assist the town with implementation of the Action Item were listed. Finally, each Action Item was given an estimated completion date and assigned a responsible department or board.

With respect to Manmade Hazards, the Committee evaluated the potential for fixed facility and transportation hazardous materials accidents as high – particularly transportation related accidents, given the proximity of Route 2 and the railroad tracks to the Deerfield River and to more densely populated areas of Town. However, no formal vulnerability assessment was done for manmade hazards due to the lack of available data to use in an appropriate assessment model. The consensus of the Committee was that the potential for these types of manmade hazards to occur, the unknown impact of such accidents on the town’s population, infrastructure, and the natural and built environment, and the lack of available and well-analyzed data make this hazard and the implementation of associated Action Items a high priority.



Table 4-12: 2011 Buckland Local Natural Hazards Mitigation Prioritized Action Plan

Hazard	Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
HIGH PRIORTY (≥ 4.75 Weighted Hazard Index)						
<b>MULTIPLE HAZARDS</b> - <i>Goal Statement:</i> To provide adequate shelter, water, food and basic first aid to displaced residents in the event of a natural disaster and to provide adequate notification and information regarding evacuation procedures, etc., to residents in the event of a natural disaster.						
	Identify shelters for victims of natural hazards that are equipped with an auxiliary power supply and are earthquake resistant as well as outside of floodplain and inundation areas. Disseminate this information to appropriate town departments.	Emergency Management Director	P	Town, Volunteers	Implemented and will continue over the next 5 years	50% complete. Shelters have been identified but information has not yet been disseminated.
	Inventory supplies for identified shelters and develop a needs list and storage requirements. Establish arrangements with local or neighboring vendors for supplying shelters with potable water, food and first aid supplies in the event of a natural disaster.	Police Department, Emergency Management Director	P	Town, Volunteers	Implemented and will continue over the next 5 years	75% complete
	Examine current notification system including feasibility of Reverse 911. Develop a preliminary project proposal and cost estimate and implement plan	Town Administrator, Police Department, Select Board, Board of Health	P	Town	Implemented and will continue over the next 5 years	90% complete. MEMA grant pending to complete installation. The \$500 annual upkeep fee has been planned for as well.
	Collect, periodically update, and disseminate information on which local radio stations provide emergency information, what to include in a ‘home survival kit,’ how to prepare homes and other structures to withstand flooding and high winds, and the proper evacuation procedures to follow during a natural disaster. Could include information in tax bill mailing.	Select Board, FRCOG, Emergency Management Director	P	Town	June 2012	Not started.
<b>DAM FAILURES</b> – <i>Goal Statement:</i> To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to dam failures.						
	Identify locations for emergency shelters and evacuation routes for people who live in an inundation area.	Police Department, Fire Department, Planning Board, Emergency Management Director	P	Town, Volunteers	June 2012	Shelters have been identified but information has not yet been disseminated.
	The town and Emergency Action Plan coordinators of upstream dams should coordinate efforts to ensure that appropriate municipal officials and departments are properly informed of potential impacts to the town of a dam failure.	Police Department, Fire Department, TransCanada	B, N, P, I	Town, Volunteers, TransCanada	June 2012	Not started.
<b>SEVERE SNOW STORMS / ICE STORMS</b> – <i>Goal Statement:</i> To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to severe snow and ice storms.						
	Ensure that identified shelters have sufficient back-up utility service in the event of primary power failure.	Emergency Management Director	P	Town	Complete	Generators in place.

Hazard	Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
	Work with utility companies to underground new utility lines and existing lines where repetitive outages occur.	Select Board	B, P, I		Implemented and will continue over the next 5 years	Ongoing – New utility lines have not been undergrounded but poles have been placed in less vulnerable locations when possible
<b>EARTHQUAKES</b>						
	Ensure Compliance with the Massachusetts State Building Code. The Building Inspector should ensure that all new construction complies with the appropriate seismic requirements of the State Building Code.	Building Inspector	B, N, P, I	Town	Implemented and will continue over the next 5 years	Ongoing
<b>MANMADE HAZARDS</b>						
	Research appropriate vulnerability assessment models for fixed facility and transportation hazardous materials accidents, collect relevant data, and populate model to further prioritize manmade hazard action items.	Emergency Management Director, FRCOG	B, N, P, I	FEMA		New action item
	Develop an evacuation plan and notification system in the event of a chemical spill in a fixed structure or in a transportation setting such as Route 2 or the rail line.	Emergency Management Director	P	FEMA		New action item
	Seek technical assistance to ensure annual update of the Town of Buckland CEM Plan.	Emergency Management Director, Planning Board	B, N, P, I	FEMA		New action item
MEDIUM PRIORTY (4.0 – 4.75 Weighted Hazard Index)						
<b>HURRICANES</b> (Note additional high-wind related action items in Tornado section below.)						
	Consider requiring tie downs for mobile homes to prevent wind-related damage or disallow mobile homes.	Building Inspector, Planning Board	B, P, I	Town	June 2012	New action item
<b>WIND STORMS / MICROBURSTS</b>						
	Note additional high-wind related action items in Tornado section below.	N/A	N/A	N/A	N/A	N/A
<b>TORNADOS</b> – <i>Goal Statement:</i> To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to high winds associated with hurricanes and tornadoes.						
	Review and update Chapter X of the Buckland Zoning Bylaw that regulates wireless communication facilities. Consider adding ‘the prevention of wind-related damage’ as one of the purposes of the bylaw	Planning Board	B, P, I	N/A	June 2012	Not complete.
	Enforce the State Building Code to ensure new buildings are designed to withstand high winds.	Building Inspector	B, P, I	Town	Implemented and will continue over the next 5 years	Ongoing

Hazard	Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
	Enforce the State Building Code to ensure for construction of new homes with a minimum of four (4) foot wall foundation such that basements or crawl spaces provide shelter during a tornado, hurricane or other storm event with high winds.	Building Inspector	B, P, I	Town	Implemented and will continue over the next 5 years	Ongoing
	Consider using Community Development Block Grant home rehabilitation funds to assist homeowners in retrofitting grandfathered mobile homes.	Select Board	B, P	CDC	Implemented and will continue over the next 5 years	Some assistance has been obtained. Ongoing.
	Consider participation in the creation of a Regional Debris Management Plan.	Select Board, Planning Board, FRCOG, Solid Waste Management District	B, N, P, I	N/A	June 2013	A regional plan was drafted in 2009 but has not yet been implemented.
<b>ICE JAMS –</b>						
	Monitor the Deerfield River and other rivers, brooks, and streams in Town for potential ice buildup and ice jams.	Emergency Management Director, Fire Department, TransCanada	B, N, P, I	Town	Implemented and will continue over the next 5 years	New Action Item
LOW PRIORITY (< 4.0 Weighted Hazard Index)						
<b>FLOODS – Goal Statement:</b> To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to flooding.						
	Seek technical assistance to inventory and map all sites and structures of historic and/or cultural value and overlay with a floodplain map to determine potential vulnerability to flooding.	Planning Board, EMD, FRCOG, Open Space and Recreation Committee	B, I	FEMA, Town, Volunteers	2014	Note: This action item is also contained in the 2010 OSRP
	Seek technical assistance to obtain additional GIS data to map the number of potential developable acres in the floodplain	Planning Board, FRCOG, Board of Assessors	B, N, P, I	FEMA, Town, Volunteers	2014	\$13K recently approved at Town Meeting for the purpose of digitizing Town maps.
	Seek technical assistance to inventory and map all facilities in Buckland housing and / or using hazardous materials, determine which of those facilities are located in the floodplain or areas subject to chronic flooding, and determine the facilities preparedness for the impacts of flooding.	Planning Board, FRCOG, EMD	N, P	FEMA, Town, Volunteers	2014	Not started.
	Review and update the Floodplain District Overlay Zoning Bylaw, including adding flood prevention and preservation of the integrity of the floodplain as stated purposes. Special consideration should be given to further restricting or limiting new development within the 100-year floodplain.	Planning Board, EMD, FRCOG	B, N, P, I	Town	2014	Not started.
	Using Assessors' data and other available information, expand and update the Vulnerability Assessment for properties located within the 100-year floodplain.	Planning Board, EMD	B, P, I	Town	2014	Not started.
	Consider adding flood prevention and mitigation to the Purpose Section of the Zoning and Subdivision Regulations reviewed in Section 4 and noted in Table 4-1 of this report.	Planning Board, EMD	B, N, P, I	Town	2014	Not started.
	Review evacuation procedures for the flood prone and inundation areas in town	Police Department, Fire	P	Town	2014	Not started.

Hazard	Action Item	Responsible Department / Board	Benefits What Areas Primarily? Built (B), Natural (N), Population (P), Infrastructure (I)	Potential Funding Source	Estimated Completion Date	Status
	(identified on the map) and update.	Department, Emergency Management Director				
	Coordinate with state and regional agencies to identify a location(s) for the temporary storage of contaminated/hazardous flood debris.	Select Board, Planning Board, FRCOG, Solid Waste Management District	B, N, P, I	N/A	June 2013	A regional plan was drafted in 2009 but has not yet been implemented.
	Support local and regional, watershed-wide open space protection efforts, particularly in floodplain areas.	Conservation Commission, Select Board	N	Town	Implemented and will continue over the next 5 years	Ongoing
	Consider adding formal regulations for new driveway openings or curb cuts that include grade and design standards to prevent runoff and icing conditions.	Highway Department, Select Board	N, I	Town	2012	Underway
	Review and implement the Five-Year Action Plan strategies of the 2010 Open Space and Recreation Plan, particularly those dealing with protection of forests, farmland and floodplain forests.	Select Board, Open Space and Recreation Committee	B, N, P, I	Town	Implemented and will continue over the next 5 years	Ongoing
	The town should evaluate whether to join FEMA’s Community Rating System based on information in this plan and available through FEMA.	Planning Board, Select Board, Conservation Commission	P	Town	Implemented and will continue over the next 5 years	Ongoing
<b>WILD FIRES / BRUSH FIRES – Goal Statement:</b> To minimize the loss of life, damage to property, and the disruption of governmental services and general business activities due to wildfires/brushfires.						
	Educate homeowners about general fire safety, including the development and distribution of an educational pamphlet on fire safety and prevention.	Shelburne Falls Fire District, Buckland Fire District, FRCOG	B, P	Town	Implemented and will continue over the next 5 years	Ongoing
	Coordinate with the FRCOG and other appropriate agencies to coordinate efforts to request that the State revise burn permit guidelines to allow for burning during optimal seasons of the year.	Shelburne Falls Fire District, Buckland Fire District, FRCOG	B, P	Town	Implemented and will continue over the next 5 years	Ongoing
<b>LANDSLIDES –</b>						
	Implement plan for erosion and stream bank stabilization issues at Buckland Recreation Center.	Highway Department, Conservation Commission	N	Town	Implemented and will continue over the next 5 years	New Action Item



## National Flood Insurance Program Compliance

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The U.S. Congress established the National Flood Insurance Program (NFIP) in 1968, with the passage of the National Flood Insurance Act of 1968. “For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, seawalls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses, nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked.

“In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.”<sup>39</sup>

The State of Massachusetts, through its local communities,<sup>40</sup> complies with the NFIP in part by enforcing the Wetlands Protection Act (WPA), which helps restrict development in flood-prone areas, enforcing the State Building Code, which regulates building specifications and additional related zoning bylaws, such as a floodplain overlay district. At the local level, Buckland’s compliance with the NFIP is enforced through the building inspector and building code, the Conservation Commission and wetland and floodplain regulations, and the zoning bylaws and subdivision regulations related to flooding. While the local building code cannot be more restrictive than the state building code, the local Conservation Commission can restrict development above and beyond the requirements in the WPA. The ability of the Conservation Commission to further regulate development in flood prone areas could be a crucial tool in flood mitigation. In addition, the ability of the Select Board to adopt further bylaws such as a floodplain overlay district could also mitigate flooding.

The Town of Buckland participates in the National Flood Insurance Program. As of 2010, there were 11 policies in effect in Buckland for a total of \$2,158,100 worth of insurance. The town is not a member of the Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The CRS ranking is based on the steps the town has taken to control flood losses.

### ***NFIP Community Rating System (CRS)***<sup>41</sup>

The town is not a member of the NFIP Community Rating System, which entitles policyholders to a discount on flood insurance premiums. The Community Rating System is a part of NFIP and provides incentives and tools to further these goals. The goals of the CRS are to recognize, encourage, and reward, by the use of flood insurance premium adjustments, community and state activities beyond the minimum required by the NFIP that:

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<sup>39</sup> <http://www.fema.gov/library/viewRecord.do?id=1404>

<sup>40</sup> Massachusetts is a Home Rule state, the local communities have significant authority to implement state regulations and many towns adopt their own wetland and floodplain regulations that are more stringent than state.

<sup>41</sup> <http://training.fema.gov/EMIWeb/CRS/>

- Reduce flood damage to insurable property,
- Strengthen and support the insurance aspects of the NFIP, and
- Encourage a comprehensive approach to floodplain management.

The Community Rating System reduces flood insurance premiums to reflect what a community does above and beyond the National Flood Insurance Program's (NFIP) minimum standards for floodplain regulation. The objective of the CRS is to reward communities for what they are doing, as well as to provide an incentive for new flood protection activities. It provides lower insurance premiums under the National Flood Insurance Program. The premium reduction is in the form of a CRS Class, similar to the classifications used for fire insurance. For example, a Class 1 provides a 45% premium reduction while a Class 10 provides no reduction. The CRS Class is based on the floodplain management activities a community implements. In many cases, these are activities already implemented by the community, the state, or a regional agency. The more activities implemented, the better the CRS class.

#### Benefits of participating in the Community Rating System:

- Money stays in the community instead of being spent on insurance premiums.
- Every time residents pay their insurance premiums, they are reminded that the community is working to protect them from flood losses, even during dry years.
- The activities credited by the CRS provide direct benefits to the community, including:
  - Enhanced public safety,
  - Reduction in damage to property and public infrastructure,
  - Avoidance of economic disruption and losses,
  - Reduction of human suffering, and
  - Protection of the environment.
- Local flood programs will be better organized and more formal.
- The community can evaluate the effectiveness of its flood program against a nationally recognized benchmark.
- Technical assistance in designing and implementing some activities is available at no charge.
- The community will have an added incentive to maintain its flood programs over the years.
- The public information activities will build a knowledgeable constituency interested in supporting and improving flood protection measures.

#### Costs to the local government to participate in the Community Rating System:

- The community must designate a CRS Coordinator who prepares the application papers and works with FEMA and the Insurance Services Office (ISO) during the verification visit.
- Each year the community must recertify that it is continuing to implement its activities. It must provide copies of relevant materials (e.g., permit records).
- The community must maintain elevation certificates, permit records, and old Flood Insurance Rate Maps forever.
- The community must maintain other records of its activities for five years, or until the next ISO verification visit, whichever comes sooner.

### ***Community Rating System Process***

One of the actions that Buckland can take to improve their CRS rating (and subsequently lower their premiums) is to develop a CRS plan. The CRS 10-step planning process provides additional points for activities that communities can take during their planning process that go above the minimum described below, thus possibly lowering insurance rates. At a minimum, an *approved* multi-hazard mitigation plan that addresses floods could qualify for CRS credit. Although communities are not required to participate in CRS in order to receive approval of a Local Natural Hazards Mitigation Plan, FEMA encourages jurisdictions to integrate the CRS planning steps into their multi-hazard mitigation plans.

Credit is provided for preparing, adopting, implementing, evaluating, and updating a comprehensive floodplain management plan or repetitive loss area analyses. The Community Rating System does not specify what must be in a plan, but it only credits plans that have been prepared and kept updated according to CRS standard planning process. Credit is also provided for implementing a habitat conservation plan.

### ***Community Rating System Credit Points<sup>42</sup>***

A total of up to 359 points are provided for three elements. Up to 294 points are provided for adopting and implementing a floodplain management plan (FMP) that was developed using the following standard planning process. There must be some credit for each of the 10 planning steps:

**Table 4-13: CRSC Standard Planning Process Steps**

<b>Step</b>	<b>Maximum Points</b>
• Organize to prepare the plan	10
• Involve the public	85
• Coordinate with other agencies	25
• Assess the hazard	20
• Assess the problem	35
• Set goals	2
• Review possible activities	30
• Draft an action plan	70
• Adopt the plan	2
• Implement, evaluate, and revise	15

Up to 50 additional points are provided for conducting repetitive loss area analyses (RLAA) and up to additional 15 points are provided for adopting and implementing a Habitat Conservation Plan (HCP).

More information is available at <http://www.fema.gov/business/nfip/crs.shtm>. A copy of the “Local Official’s Guide to Saving Lives, Preventing Property Damage, and Reducing the Cost of Flood Insurance” is including in the Appendix of this plan or can be downloaded at <http://www.fema.gov/library>.

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<sup>42</sup> FEMA Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008.



## 5 – PLAN ADOPTION & IMPLEMENTATION

### **Plan Adoption**

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The Franklin Regional Council of Governments (FRCOG) provided support to the Buckland Local Natural Hazards Mitigation Planning Committee as they underwent the planning process. Town officials were invaluable resources to the FRCOG and provided background and policy information and municipal documents, which were crucial to facilitating completion of the plan.

When the preliminary draft of the Local Natural Hazards Mitigation Plan was completed, copies were distributed to the Buckland Local Natural Hazards Mitigation Planning Committee for comment and input. The Committee was comprised of representatives of Town boards and departments who bear the responsibility for implementing the action items and recommendations of the completed plan.

Copies of the Final Draft Local Natural Hazards Mitigation Plan for the Town of Buckland were distributed to the Town boards for their review and comment. A copy of the plan was also posted on the town website for public review. Once reviewed and approved by MEMA, the plan was sent to the Federal Emergency Management Agency (FEMA) for their approval. On April 9, 2013, the Board of Selectmen voted to adopt the plan. See the Appendix D for the signed Certificate of Adoption.

### **Plan Maintenance Process**

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The implementation of the Buckland Local Natural Hazards Mitigation Plan will begin following its approval by MEMA and FEMA and formal adoption by the Buckland Select Board. Specific Town departments and boards will be responsible for ensuring the development of policies, bylaw revisions, and programs as described in Table 4-12: 2011 Buckland Local Natural Hazards Mitigation Prioritized Action Plan. The Buckland Natural Hazards Mitigation Planning Committee will oversee the implementation of the plan.

### **Monitoring, Evaluating, and Updating the Plan**

The measure of success of the Buckland Local Natural Hazards Mitigation Plan will be the number of identified mitigation strategies implemented. In order for the Town to become more disaster resilient and better equipped to respond to natural disasters, there must be a coordinated effort between elected officials, appointed bodies, Town employees, regional and state agencies involved in disaster mitigation, and the general public.

The Buckland Natural Hazards Planning Committee will meet on an annual basis or as needed (i.e., following a natural disaster) to monitor the progress of implementation, evaluate the success or failure of implemented recommendations, and brainstorm for strategies to remove

obstacles to implementation. Following these discussions, it is anticipated that the committee may decide to reassign the roles and responsibilities for implementing mitigation strategies to different Town departments and/or revise the goals and objectives contained in the plan. At a minimum, the committee will review and update the plan every five years, beginning in the fall of 2014. The meetings of the committee will be organized and facilitated by the staff of the Buckland Town Administrator. Increasing committee membership to include entities such as the Planning Board and the Conservation Commission could help improve the completion rate of action items.

As is the case with many Franklin County towns, Buckland's government relies on few public servants filling many roles, upon citizen volunteers and upon limited budgets. As such, implementation of the recommendations of this plan could be a challenge to the Committee. As the Committee meets regularly to assess progress, it should strive to identify shortfalls in staffing and funding and other issues which may hinder Plan implementation. The Committee should seek technical assistance from the Franklin Regional Council of Governments to help alleviate some of the staffing shortfalls. The Committee could also seek assistance and funding from such sources as are listed in Table 5-1.

**Table 5-1: Potential Funding Sources for Hazard Mitigation Plan Implementation**

<b>Funding Source</b>	<b>Description</b>	<b>Estimated Annual Funding</b>
Hazard Mitigation Grant Program	Provides post-disaster funds to communities to help implement long-term hazard mitigation strategies.	\$15M (from three past Presidential disaster declarations)
Flood Mitigation Assistance Program	Provides pre-disaster funds. There are three types of grants: planning grants, project grants, and technical assistance grants. Requires a 25% non-Federal match and is based on the total number of NFIP policies in the State.	\$500,000
Community Development Block Grant	Although this funding comes from HUD, it is made available to communities through the State Economic and Community Development Administration. The grants are used to expand affordable housing and economic opportunities, and to revitalize communities by improving community facilities and services.	\$2M
SBA Small Business Administration	Post-disaster low interest, long-term loans given to homeowners, renters, businesses, or private non-profit organizations. Up to 20% of the loan amount can be used for hazard mitigation actions.	\$500,000 (based on past disasters)
State Office for Mitigation Funding	This newly created State Office was authorized by a recent act of the State Legislature. This Office will make funds available to local communities for hazard mitigation planning through an increase in the State's gasoline tax.	\$5M
Manufactured Homebuilders Association	The State is interested in forming an agreement with this association to develop an earthquake-resistant homes campaign.	In-kind services
National Association of Homebuilders	The State is pursuing a relationship with this association and is discussing how the association can assist the State in promoting construction of safe rooms.	In-kind services

### **Incorporating the Plan into Existing Planning Mechanisms**

Upon approval of the Buckland Local Hazards Mitigation Plan by FEMA, the Committee will provide all interested parties and implementing departments with a copy of the plan, with emphasis on the 2011 Buckland Local Natural Hazards Mitigation Prioritized **Action Plan**. The

committee should also consider initiating a discussion with each department on how the plan can be integrated into that department's ongoing work.

The Committee acknowledges the importance of the Action Plan as a stand-alone document which will be distributed to all those cited as Responsible Department or Board including:

- Emergency Management Director
- Police Department
- Town Administrator
- Select Board
- Board of Health
- Planning Board
- Fire Department
- TransCanada
- Building Inspector
- Solid Waste Management District
- Open Space and Recreation Committee
- Board of Assessors
- Conservation Commission
- Highway Department
- Shelburne Falls Fire District
- Buckland Fire District

The previous Buckland Local Natural Hazards Mitigation Plan was not incorporated into existing planning mechanisms to the fullest extent possible. Some possible planning mechanisms could include:

- Incorporation of relevant Hazards Mitigation information into the Open Space and Recreation Plan. There are opportunities to discuss findings of the hazard mitigation plan and incorporate them into Environmental Inventory and Analysis section of the OSRP and to include appropriate action items from the hazard mitigation plan in the OSRP Action Plan.
- Any future updates of master plans and scenic byway plans, such as the Route 2 Scenic Byway Plan, could incorporate relevant material from this plan into sections such as the Natural Resources section and any action plans
- When the Final Draft Local Natural Hazards Mitigation Plan for the Town of Buckland is distributed to the Town boards for their review, a letter asking each board to endorse any action item that lists that board as a responsible party would help to encourage completion of action items.
- The Planning Board could include discussions of the Hazards Mitigation Plan Action Items in one meeting annually and assess progress. Current Subdivision Rules and Regulations and Zoning Bylaws should be reviewed and revised by the Committee, Planning Board and Select Board based upon the recommendations of this plan. Model bylaws are available from the FRCOG to help assist in the modification of Buckland's current Bylaws.

### **Continued Public Involvement**

The Town of Buckland is dedicated to continued public involvement in the hazard mitigation planning and review process. During all phases of plan maintenance, the public will have the opportunity to provide feedback. The 2011 Plan will be maintained and available for review on the Town website through 2014. Individuals will have an opportunity to submit comments for the Plan update at any time. Any public meetings of the Committee will be publicized. This will provide the public an opportunity to express their concerns, opinions, or ideas about any updates/changes that are proposed to the Plan.



# APPENDICES

## Appendix A: Zoning Bylaws and Subdivision Rules and Regulations

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### Zoning Bylaws

#### Floodplain Overlay District

Buckland's zoning bylaws – last updated in 2005 – establish a Floodplain District as an overlay to all other districts:

- (Section 3.2 Part e) Location of Districts. The Flood Plain District is herein established as an overlay district. The underlying permitted uses are allowed provided that they meet the following additional requirements as well as those of the Massachusetts State Building Code dealing with construction in flood plains. The Flood Plain District includes all special flood hazard areas designated as Zone A, A1-30 on the Buckland Flood Insurance Rate Maps (FIRM) and the Flood Boundary and Clerk, Planning Board and Building Commissioner. These maps as well as the accompanying Buckland Flood Insurance Study are incorporated herein by reference. In addition these general regulations apply to all uses in the Flood Plain District.
- (Section 3.2 Part e A) Location of Districts. Within Zone A, where the base flood elevation is not provided on the FIRM, the applicant shall obtain any existing base flood elevation data and it shall be reviewed by the Building Commissioner for its reasonable utilization toward meeting the elevation or flood proofing requirements as appropriate of the State Building Code.
- (Section 3.2 Part e B) Location of Districts. In the floodway, designated on the Flood Boundary and Floodway Map; the following provisions shall apply:
  - o All encroachments, including fill, new construction, substantial improvements to existing structures and other development are prohibited unless certification by a registered professional engineer. Encroachment shall not result in any increase in flood levels during the occurrence of the 100-year flood.
  - o Any encroachment meeting the above standard shall comply with the flood plain requirements of the State Building Code.

Section V Part D: Protection of Natural Features. All natural features such as trees over sixteen inch diameter, water courses, one hundred year floodplains, wetlands, ponds and other waterbodies, marshes, stone walls, scenic points, and historic sites shall be preserved.

Section VII of Buckland's zoning bylaws define the Floodplain District, its definitions and restraints. The purpose of the Floodplain District is to “ensure public safety through reducing the threats to life and personal injury; eliminate new hazards to emergency response officials; prevent the occurrence of public emergencies resulting from water quality contamination, and pollution due to flooding; avoid the loss of utility services which if damaged by flooding would disrupt or shut down the utility network and impact regions of the community beyond the site of flooding; eliminate costs associated with the response and cleanup of flooding conditions; reduce damage to public and private property resulting from flooding waters.”

(Section 7.2) Flood Plain District Boundaries and Base Flood Elevation and Floodway Data. The Floodplain District is herein established as an overlay district. The underlying uses are allowed provided that they meet the following additional requirements as well as those of the Massachusetts State Building Code dealing with construction in floodplains. The District includes all special flood hazard areas designated on the Buckland Flood Insurance Rate Map (FIRM) issued by the Federal Emergency Management Agency (FEMA) for the administration of the National Flood Insurance Program (NFIP) dated May 15, 1980 as Zone A, A1-30 and the Flood Boundary & Floodway Map dated May 15, 1980, both maps which indicate the 100-year regulatory floodplain. The exact boundaries of the District may be defined by the 100-year base flood elevations shown on the FIRM and further defined by the Flood Insurance Study booklet dated November 1979. The FIRM, Floodway Maps and Flood Insurance Study booklet are incorporated herein by reference and are on file with the Town Clerk, Planning Board, Building Inspector and Conservation Commission.” Specifically, the bylaw requires that:

- (Section 7.2 Section A Part 1) Base Flood Elevation and Floodway Data. In Zone A, A1-30, and AE, along watercourses that have not had a regulatory floodway designated, the best available Federal, State, local, or other floodway data shall be used to prohibit encroachments in floodways which would result in any increase in flood levels within the community during the occurrence of the base flood discharge.
- (Section 7.2 Section B Part 2) Base Flood Elevation and Floodway Data. Base flood elevation data is required for subdivision proposals or other developments greater than 50 lots or 5 acres, whichever is the lesser, within unnumbered A zones.
- (Section 7.3) Notification of Watercourse Alteration. Notify, in a riverine situation, the following of any alteration or relocation of a watercourse: adjacent communities, bordering states (optional), NFIP State Coordinator and NFIP Program Specialist.

(Section 7.4 Part a-b) Flood Plain Overlay District Use Regulations provides regulations for the district. “The Floodplain District is established as an overlay district to all other districts. All development in the district, including structural and non-structural activities, whether permitted by right or by special permit must be in compliance with Chapter 131, Section 40 of the Massachusetts General Laws and with the following:”

- (Section 7.4 Part A) Reference to Existing Regulations.
  - o Section of the Massachusetts State Building Code which addresses floodplain and coastal high hazard areas (currently 780 CMR 2102.0, “Flood Resistant Construction”);
  - o Wetlands Protection Regulations, Department of Environmental Protection (DEP) (Currently 310 CMR 10.00);
  - o Inland Wetlands Restriction, DEP (currently CMR 6.00); and,
  - o Any variances from the provisions and requirements of the above referenced state regulations may only be granted in accordance with the required variance procedures of these state regulations.
- (Section 7.4 Part A) Other Use Regulations.

- o Within Zone A1-30, along watercourses that have a regulatory floodway designated on the Buckland FIRM or Flood Boundary & Floodway Map encroachments are prohibited in the regulatory floodway which would result in any increase of flood levels within the community during the occurrence of the base flood discharge.
  - o Review all subdivision proposals to assure that: a) such proposals minimize flood damage; b) all public utilities and facilities are located and constructed to minimize flood damage; and c) adequate drainage is provided to reduce exposure to flood hazards.
  - o Existing contour intervals of site and elevations of existing structures must be included on plan proposal.
  - o There shall be established a “routing procedure” which will circulate or transmit one copy of the development plan to the Conservation Commission, Planning Board, Board of Health, and Building Inspector for comments which will be considered by the appropriate permitting board prior to issuing applicable permits.
- (Section 7.5) The following uses of low flood damage potential and causing no obstructions to flood flows are encouraged provided they are permitted in the underlying district and they do not require structures, fill, or storage of materials or equipment:
  - o Agricultural uses such as farming grazing, truck farming, horticulture, etc.;
  - o Forestry and nursery uses;
  - o Outdoor recreational uses, including fishing, boating, play areas, etc.;
  - o Conservation of water, plants, wildlife;
  - o Wildlife management areas, foot, bicycle, and/or horse paths;
  - o Temporary non-residential structures used in connection with fishing, growing, harvesting, storage, or sale of crops raised on the premises; and,
  - o Buildings lawfully existing prior to the adoption of these provisions.

The zoning bylaws contain several other measures which, while not specifically designed for flood mitigation and control, can be used to mitigate or prevent the effects of flooding, including:

- (Section 4.4 Backlots With Farmland Set Aside) establishes requirements to encourage the preservation within the town of productive farmland. Requires preservation of: All natural site features including, water courses, one hundred year flood plains, wetlands, ponds and other water bodies, marshes, scenic points and historic sites.
- (Section 4.5 Part d 3 Cluster Development/Conservation Bylaw – Minimum Standards)
  - o a. The maximum number of dwelling units permitted within a cluster development shall be one building lot for each two acres of the net developable acreage of the cluster development tract. Net developable acreage is determined by subtracting all wetlands, all areas with slopes of 25% or greater, and all areas determined by the Board of Health to be unsuitable for on-site sewage disposal.

- o b. All wetlands shall be defined under the supervision of the Conservation Commission and in accordance with the provisions of the Wetlands Protection Act, M.G.L. Ch. 131, Sec. 40.
- (Section 4.5 Part d 5 Cluster Development/Conservation Bylaw – Minimum Standards) At least forty (40) percent of the net acreage remaining after subtracting all of the wetlands must be preserved as agricultural or forested land. To the extent possible the preserved land shall form a contiguous tract to enable continued farming of forestry operations. Additional site design standards require that layout and construction of utilities, drainage systems, and roads shall be located to have the least possible impact on on-site and adjacent agricultural lands and uses or mature forest stands.
- (Section 7.1 Part f) General Regulations – Removal of Natural Materials) The removal of sod, earth, mineral aggregates, stone, or rock from a parcel of land hereafter shall require a permit of approval authorized by the Board of Appeals; except where such is incident to the construction of an approved building, or is a routine part of normal farming operations.

(Section 9-2) Special Regulations for the Flood Plain District part a. Within Zone A1-30, all mobile homes shall provide that:

- o 1. stands or lots are elevated on compacted fill or on pilings so that the lowest floor of the mobile home will be at or above the base flood level; and,
- o 2. adequate surface drainage and access for a hauler are provided; and
- o 3. in the instance of elevation on pilings, lots are large enough to permit steps, piling foundations are placed in stable soil no more than 10 feet apart, and reinforcement is provided by piers more than six feet above ground level.

(Section 9-2) Special Regulations for the Flood Plain District part b. The placement of mobile homes, except in an existing mobile home park or mobile home subdivision, are prohibited in the floodway.

(Section X) Bylaw for Personal Wireless Service Facilities. See Appendix A for Bylaw language. “Personal wireless service facilities are subject to the following conditions to minimize their adverse visual and environmental impacts, to avoid damage to adjacent properties, to lessen impacts on surrounding properties, to lessen traffic impacts, to minimize the installation of towers and to reduce the number of towers constructed. The regulation of personal wireless service facilities is consistent with the purpose of the Buckland Zoning Bylaw and planning efforts at the local government level to further the conservation and preservation of developed, natural and undeveloped areas, wildlife, flora and habitats for endangered species: protection of the natural resources of Buckland: enhancement of open space areas and respect for Buckland’s rural character.

The chapter requires that for such facilities minimum distance “to any property line, road, habitable dwelling, business or institutional use, or public recreation area shall be the height of the structure plus 10 ft. This setback is considered a “fall zone.” In addition, “setback from designated wetlands, water bodies and areas with a slope in excess of five (5) percent shall be at

least one hundred and fifty (150) feet, unless the personal wireless service facility is located on a pre-existing structure.” The bylaw requires a special permit from the Planning Board before such a facility can be erected.

### **Subdivision Rules and Regulations**

Buckland’s Subdivision Rules and Regulations were adopted in 1988 for the purpose of “protecting the safety, convenience and welfare of the inhabitants of the town by regulating the laying out and constructing of ways with subdivisions providing access to the several lots therein, but which have not become public ways, and ensuring sanitary conditions in subdivisions, and in proper cases, parks and open areas; and, to promote the health, safety and welfare of the inhabitants of Buckland, to reduce hazards, to prevent the overcrowding of land, to conserve the value of land and buildings, to encourage energy efficiency, and to preserve the rural nature of the town.” The powers of the planning board shall be exercised to secure safety in the case of fire, flood, panic and other emergencies. The Subdivision Rules and Regulations contain several provisions that mitigate the potential for flooding, including,

- (Section 4.C) Definitive Plan – Contents. Requires the proponent, in part, to identify:
  - Existing and proposed topography at a two-foot contour interval for gentle slopes (less than 25%) and at a five foot contour interval for steep slopes (25% or greater); elevations, expressed in feet above MSL (or current equivalent) shall be provided at a ten foot interval;
  - Water courses, one hundred year flood plains, wetlands, ponds, marshes, rock outcrop, stone walls, trees of over eight (8) inches diameter (unless otherwise specified by the Board) and other significant natural features.
  - Location of all the following improvements unless specifically waived in writing by the Board: street paving, sidewalks, street lighting standards, all utilities above and below ground (i.e., all underground electricity, phone, cable TV, gas), curbs, gutters, storm drainage, and all easements (with statement of the purpose of each such easement).
  - A storm drainage system shown including invert and rim elevations of all catch basins and man-holes together with surface elevations of all waterways within the subdivision at one hundred (100) foot intervals and approximate depth of water at these points. Surface elevation and approximate depth of water at the annual high water line shown at each point where the drainage pipe ends at a water way. Drainage calculations prepared by the applicant’s engineer, including design criteria used, drainage area and other information sufficient for the Board to check the size of any proposed drain, culvert or bridge Existing storm sewerage should be shown.
  - Existing and proposed lines of streets, ways, easements, and public or common areas within the subdivision. (The proposed names of the proposed streets shall be shown in pencil until they have been approved by the Board.)
  - Profiles of proposed streets shall be drawn with profiles showing vertical location of existing and proposed drainage lines and other utility crossings as well as required new waterways. Sizes of all pipes, slopes of all storm and

sanitary lines, invert and rim elevation of each man-hole or catch basin shall be shown. Profiles shall include proposed lines even if the new work is outside the subdivision. Water mains (for fire protection) will be shown in profile to demonstrate sufficient cover and clearance of their structures.

- Cross section and construction details shall include roadway section showing paving, crown, berm, shoulder, tie to R/W line, width, walk and all other components or features; details for catch basins, man-holes, endwalls and all other components or features, with specific references to the appropriate sections of the State Construction Standards and drainage trench or waterway relocation section.
- (Section IV.D) Performance Guarantee. Before endorsement of approval of a Definitive Plan for a subdivision, the subdivider must provide a performance guarantee, including a fifteen percent contingency fund sufficient to cover cost of all improvements shown or required and reimbursement to the Town for the full cost of all supervision, inspection, and review services provided by the Town or the Board or professional consultants.
- (Section IV.E Part 2) Wetlands Protection. No activity of any kind subject to regulation under the Massachusetts Wetlands Protection Act or any other local wetlands bylaw may be carried out unless approved in accordance with that Act and Bylaw. In order to determine if the proposed subdivisions, or parts thereof, are subject to the provisions of the Wetlands Protection Act or a local wetlands bylaw, the Planning Board shall submit a copy of the definitive Plan to the Conservation Commission, together with a request that the Conservation Commission file a report with the Planning Board within forty-five (45) days following submission of the plan. Said report should state that the area within the proposed subdivision is (a) not subject to the provisions of the Wetland protection Act or a local wetlands bylaw, or (b) the Wetlands Protection Act or a local wetlands bylaw applies to certain indicated areas. In the event that in the opinion of the Conservation Commission the Act or bylaw does apply, the Planning Board shall include in its decision for approval a condition that the applicant shall obtain approval from the Conservation Commission prior to any activity within the affected areas. If the Conservation Commission does not make a report to the Board, said condition shall provide that no activity of any kind subject to regulation under the Massachusetts Wetlands Protection Act or a local wetlands bylaw may be carried out unless approved in accordance with that act and bylaw. The making of a report by the Conservation Commission to the Planning Board concerning a proposed Definitive Plan shall not be treated as, not deemed to be approved of, an Order of Conditions or any other approval provided by the Wetlands Protection Act or regulations issued there under, or by any local wetlands bylaw; and, a request by the Planning Board for such a report shall not be treated as, no deemed to be, a Notice of Intent or any other application provided by the Wetlands Protection Act or regulations issued there under, or by any local wetlands bylaw.
- (Section V Design Standards Part D) Protection of Natural Features. All natural features such as trees of over sixteen (16) inch diameter, water courses, one hundred year flood plains, wetlands, ponds and other waterbodies, marshes, stone walls, scenic points, and historic sites shall be preserved.

- (Section V Design Standards Part I Easements and Restrictions) Addresses the following:
  - (Subset 2.a) Conservation Restrictions. Watercourses, drainage ways, channels or streams shall be located within easements conforming substantially with the lines of their courses, whose width shall be not less than 19.685 feet (6 meters) and whose boundaries shall not be closer than two (2) meters (6.562 feet) horizontally from the one hundred year floodplain. Wetlands shall be located within easements whose boundaries shall be not closer than 100 feet from the boundaries of the wetlands. No building shall be constructed and no paving or other activity shall be permitted within such easement except as permitted under the Zoning bylaw and under the Massachusetts Wetlands Protection Act (Sections 40 and 40A of Chapter 131 of the General Laws) and any local wetlands bylaw.
  - (Subset 2.b) Conservation Restrictions. In any subdivision, the developer may grant to the Town a conservation restriction over any part of the subdivision providing the area subject to the restriction has the approval of the Conservation Commission and the Board of Selectmen (Use Form M appended hereto).
- (Section V Design Standards Part I - Easements and Restrictions) The Buckland Subdivision Regulations set Open Space standards as listed below:
  - a. Before approval of a plan, the Board shall also require the plan to show a park or parks suitably located for playground or recreation purposes. The park or parks shall be of reasonable size, but not less than five (5) percent of the area of the land being subdivided. The Board shall by appropriate endorsement on the plan require that no building may be erected on such park or parks without its approval for a period of not more than three years after the approval of the Definitive Plan. If this land is not conveyed to the Town of Buckland by sale or gift within three years after the approval of the Definitive Plan, then such land may be incorporated into a subsequent subdivision.
  - b. Land designated for open space or park purposes shall not include wetlands, ledge, or other land unsuitable for playground or recreation use.
  - c. Any open space, park or playground shall be provided with a minimum of one hundred feet (100') continuous frontage on a street. Pedestrian Ways will be required to provide access from each of the surrounding streets, if any, on which the open space, park, or playground has no frontage. Further, such parks and playgrounds may be required to have maintenance provided for by covenants and agreements acceptable to the Board, until such time (if any) as public acquisition maybe accomplished by the community, but in no case longer than three (3) years.
- (Section V.J Sewerage – Storm Sewers) The Buckland Subdivision Regulations set storm sewer standards as listed below:

- (V.J 2) a. Design storm intensity for surface runoff shall be calculated according to the methodology set forth in Technical Release Number 55, entitled “Urban Hydrology for Small Watersheds,” by the Soil Conservation Service of the U.S. Department of Agriculture, or such other methodology as the Board may, in its discretion, approve. All tributary areas shall be assumed to be fully developed in accordance with the Zoning Bylaw unless publicly owned or deed restricted. Water velocities in pipes and paved gutters shall be between two (2) and ten (10) feet per second, and not more than five (5) feet per second on unpaved surfaces. Facility design shall be as follows: street surface drainage (storm sewers, swales) – 25 year storm, detention basins – 50 year storm, watercourses, drainage ways, channels and streams – 100 year storm, culverts, bridges, other water crossings – 100 year storm.
- b. Minimum size of pipe for surface runoff shall be twelve (12) inches ID. Footing drain and subdrain connection pipe size shall be a minimum of six (6) inches ID.
- c. Connection of footing drain, roof drains, or storm drains to a sewage disposal system is prohibited.
- d. Maximum distance between man-holes shall be 300 feet. Maximum distance for street runoff to travel along a berm or gutter to a catch basin shall be 300 feet. Maximum distance between a catch basin and a man-hole shall be 300 feet.
- e. Catch basins will be placed at street intersections to intercept surface runoff, and will be placed to prevent water from crossing the streets.
- f. Proper drainage design includes appropriate storm lines and channels to accommodate properties “upstream” and appropriate structures to preclude “downstream” damage to adjacent properties.
- g. Where a portion of a subdivision lies within an aquifer recharge area, storm drainage shall be directed, when appropriate in the opinion of the Board, to retention basins in order to artificially recharge the ground water system.
- h. Peak stream flows and run-off at the boundaries of the subdivision development in a twenty-five (25) year frequency storm shall be no higher following development than prior to development. This provision may, in the discretion of the Board, be waived by the Board based on information from the Conservation Commission or other consultants, which weighs the ability of receiving wetlands or waterbodies to absorb the increase and the consequences of providing detention capacity.
- (Section 5-G.a) Design Standards – Location and Alignment. All streets in the proposed areas to be developed shall be designed so that, in the opinion of the Board, they will provide safe vehicular travel at a design speed of thirty (30) miles per hour. Where minimum standards are not herein specified, American Association of State Highway Transportation Officials (AASHTO) shall apply.
- (Section 5-G.h) Design Standards – Location and Alignment. No street shall be constructed within one hundred (100) feet from any wetland, on any one hundred year flood plain, or on any other land subject to the jurisdiction of the Buckland



Conservation Commission and the Massachusetts Department of Environmental Quality Engineering, pursuant to the Massachusetts Wetlands Protection Act or regulations issues there under, or a local wetlands bylaw.

- (Section 5-G) Design Standards – Location and Alignment. Right of way and street design standards call for a maximum of 10 percent grade on minor streets (twelve percent being allowed for short distances), 8 percent on secondary streets and 5 percent on major streets.
- (Section VI.F) Utilities. All gas, telephone, electricity, cable antenna, television, and other utility lines shall be installed underground. If located within a one hundred year flood plain, transformers, switching equipment, and all other components shall be flood proofed and approved by a registered engineer appointed by the Board. The subdivider shall promptly reimburse the Town for the full amount of the cost of such engineer.
- (Section VI.C Required Improvements - Responsibility) The responsibility for adequate drainage shall rest with the developer. This shall include the risk involved in connecting with existing drainage facilities (if any) provided by the town. Where property adjacent to the subdivision, but within the same watershed, is not subdivided, provision shall be made for proper projection of the drainage systems by continuing appropriate drains and easements to the exterior boundaries of the subdivision at such size and grade as will allow for such projection. Drainage rights which are appropriate, sufficient, and necessary to handle drainage from the subdivision and adjacent areas shall be secured for the town.
- (Section VI.G Required Improvements – Road, Berm, and Curb Cuts) Wherever a sidewalk or bicycle path intersects a roadway, curb cuts shall be provided. Roadways, berms, curbs, curb cuts, and shoulders will be constructed in accordance with State Construction Standards.
- (Section VI.I Required Improvements – Groundwater Drainage) As construction progresses, unforeseen groundwater conditions may be encountered which require additional subdrains or curtain drains. These conditions include potential problems if construction is in progress at a time of low water table or other dry conditions. The Board reserves the right to require appropriate systems to accommodate the problem.
- (Section VI.I Required Improvements – Bank Plantings)
  - a. All cut or fill bankings that tend to wash or erode shall be planted with suitable, well-rooted, and low-growing plantings. All plants shall be the equivalent of nursery grown stock in good health, free from injury, harmful insects, and diseases.
  - b. Acceptable planting types may be selected from a list in the Planning Board files in the Town Hall, which includes very low-growing (4” to 12”), low growing (12” to 30”), and herbaceous plantings. Perennial grass turf installed as sod is an acceptable alternative for the planting of banks.

- c. If bank plantings are of a type which are properly spaced at close intervals, 8” to 12” of loam shall be spread over the entire bank. If the plantings are to be widely spaced they may be planted in loam pits.
- d. Mulch (wood chips or equal) shall be spread heavily among plantings for weed and erosion control.

e. The subdivider shall be responsible for maintenance of bank plantings and replacement of those which have died or become diseased from the time of planting through one full growing season. Section VII Development Impact Statement “A Development Impact Statement (DIS) is a documented, written analysis of a proposed development which provides the Planning Board and Town officials with information necessary for plan review. It is a developer’s responsibility to prepare and document the DIS in sufficient detail to permit an adequate evaluation by the planning Board; however, additional data may be requested in writing by the Board; however, additional data may be requested in writing by the Board. This is one reason why it is to the advantage of the developer to prepare and submit to the Board a preliminary plan including a draft DIS. It is necessary to respond to all sections of the DIS form, except when a written exemption is granted by the Planning Board.” Elements which must be addressed in the plan include the following:

- (Section VII Storm Drainage) Discuss the storm drainage system including the projected flow from a 50 year storm, name of the receptor stream, and any flow constrictions between the site and the receptor streams.
- (Section VII Natural Conditions) –Among the natural elements to be described include:
  - a. Topography – Indicate datum, source, date, slopes greater than 15%; provide contours at two-foot intervals, with graphic drainage analysis showing annual highwater mark; show location of existing structures, including fences and walls.
  - b. Soils – Indicate soils and land types, utilizing all government soil surveys covering the project area, including but not limited to, prime agricultural land, depth to bedrock, and extent of land which has been filled.
  - g. Wetlands
  - h. Watercourses
  - k. Vegetative cover – Provide an analysis of vegetative cover, including identification of general cover type (including but not limited to wooded, open area, cropland, wetlands, etc.); show location of all tree groupings by major or dominant species; show location of and describe wildlife habitats; identify endangered species; identify unusual habitats, meaning those not commonly found in the Connecticut River Valley in Franklin County, Massachusetts.
- (Section VI Environmental Impact)
  - e. Prevent erosion, sedimentation, or other instability in soils or vegetative cover.

- l. Protect wetlands and floodplains, and ensure compliance with the Wetlands Protection Act (Sections 40 and 40A of Chapter 131 of the General Laws) and any local wetlands bylaw.
- n. Minimize or avoid all short-term and long-term impacts identified in Section IV of the DIS (“Natural Conditions”) and not otherwise covered in this section.

## **Appendix B: Meeting Minutes, Sign In Sheets, Correspondence and Publicity**

### MEMA Natural Hazards Mitigation Buckland Project November 3, 2011 Meeting

#### **Attendance:**

<b>Name</b>	<b>Email</b>	<b>Position/Affiliation</b>
Andrea Llamas	<a href="mailto:townadmin@town.buckland.ma.us">townadmin@town.buckland.ma.us</a>	Town Administrator
Mike Dekoschak	<a href="mailto:mjdeko@gmail.com">mjdeko@gmail.com</a>	Police / Assistant EMD
Steven Daby	<a href="mailto:bucklandhwy@crocker.com">bucklandhwy@crocker.com</a>	Highway Department
John Gould	<a href="mailto:gocapo@verizon.net">gocapo@verizon.net</a>	Planning Board / ZBA
James Hicks	<a href="mailto:chiefbpd@verizon.net">chiefbpd@verizon.net</a>	Police
Arthur Phillips	<a href="mailto:phillips32med1@msn.com">phillips32med1@msn.com</a>	EMD
John Organ	<a href="mailto:John_organ@fws.gov">John_organ@fws.gov</a>	Conservation Commission
Richard Warner	<a href="mailto:rwarn@crocker.com">rwarn@crocker.com</a>	Board of Health
Mary Praus Governments	<a href="mailto:mpraus@frcog.org">mpraus@frcog.org</a>	Franklin Regional Council of

#### **Introductions**

##### **Review by Mary Praus:**

- Reviewed timeline and expectations for remaining project timeline
- 2004 plans expired in June 2010
- Approved plan by MEMA/FEMA = grant eligibility
- MEMA wants more public involvement
- MEMA wants to see tangible action items and projects and emphasis on vulnerable structures/sites

##### **General Plan Review by Mary Praus:**

- Overview of information / data to be provided by the Committee

##### **Vulnerability Assessment Table**

- Each hazard was assessed using the interactive table
- The Committee discussed each hazard and debated its rating based on frequency of occurrence, potential severity of impacts and area of occurrence as well as preparedness
- The discussion was valuable in beginning to bring to light some of the shortcomings as well as the strengths of the Town's readiness for each hazard
- Rating of hazards will be used to rate the action items

##### **Next Steps:**

- Committee to meet independently, as needed
- Committee to provide missing information / data to Mary

- Committee to complete review of draft plan
- Committee to provide match forms to Andrea / Mary
- Mary to complete final draft plan
- Schedule final meeting to review draft plan – mid to late April

**MEMA Natural Hazards Mitigation Project  
Buckland Meeting – March 3, 2011  
Attendance Sheet**

Name	Email Address	Affiliation
Mike DeKoschik	mJDeKo@gmail.com	Buckland Police Dept./Ass EMD
Steven Daby	bucklandwy@crocker.com	Buckland Highway
Andrea Llamas	twadmin@town.buckland.ma.us	Town Administrator
JOHN GOULD	gocapo@verizon.net	Plan Bd / ZBA
James Hicks	chiefbpd@verizon.net	Buckland Police
Forther Phillip's	phillips32med1@nsw.com	EMD
John Organ	John.Organ@sws.gov	Buckland Conservation Commission
Richard Warner	rwarner@crocker.com	Buckland Bolt

# **AGENDA**

**Town of Buckland  
Local Natural Hazards Mitigation Planning Committee Meeting  
Buckland Town Hall  
May 5, 2011  
6:30 – 7:30 p.m.**

1. Review of any outstanding items needed from the Committee
2. Quick review of the Vulnerability Assessment from previous meeting
3. Review of the Action Plan including status and relevancy of action items from previous plan
4. Mapping any items mentioned in plan such as chronic flooding, beaver dams, other
5. Next Steps

**MEMA Natural Hazards Mitigation Project  
Buckland Meeting – May 5, 2011  
Attendance Sheet**

Name	Email Address	Affiliation
Steven Daby	bucklandhwy@crocker.com	Highway Dept.
Andrea Lomas	townadmin@town.bucklandma.us	Town admin
Richard Warner	rwarner@crocker.com	Board of Health
Alan Gould	gplap@verizon.net	Plan Bd
John Organ	John_organ@tus.gov	Conservation Commission
Mike DeKosch	mjd@b@gmail.com	Police, asst. EMD



Insert Town Seal

## **Town of Buckland Hazard Mitigation Plan Update Underway**

The **Buckland** Hazard Mitigation Local Planning Committee is currently updating the Hazard Mitigation Plan for Erving, in partnership with the Franklin Regional Council of Governments (FRCOG) Planning Department. Once the updated Plan is adopted by the Town and approved by FEMA, the Town will be eligible for state and federal grant monies to fund pre- and post-disaster mitigation projects.

The purpose of this Hazard Mitigation Plan update is to identify natural and other hazards that may impact the community; conduct a risk assessment to identify infrastructure at the highest risk for being damaged by hazards; inventory and assess current Town hazard mitigation policies, programs, and regulations; and identify action steps to prevent damage to property and loss of life.

The **Buckland** Hazard Mitigation Local Planning Committee will meet several times to compile new and updated information for the Plan. All meetings of the Committee are open to the public; meeting notices and agendas can be found at the **Buckland** Town Hall.

To find out more about this project and how you can become involved, please contact Andreas Llamas at (413) 625-6167 or [twnamdin@town.buckland.ma.us](mailto:twnamdin@town.buckland.ma.us) or Mary Praus, FRCOG Land Use Planner at (413) 774-1194 x107 or [mpraus@frcog.org](mailto:mpraus@frcog.org).

This flyer provided to Committee on January 31, 2011.

## **Buckland Hazard Mitigation Plan**

*The Buckland Hazard Mitigation Local Planning Committee, in partnership with the Franklin Regional Council of Governments (FRCOG), has completed a draft Hazard Mitigation Plan for Buckland. The purpose of this Hazard Mitigation Plan update is to identify natural and other hazards that may impact the community; conduct a risk assessment to identify infrastructure at the highest risk for being damaged by hazards; inventory and assess current Town hazard mitigation policies, programs, and regulations; and identify action steps to prevent damage to property and loss of life.*

*Once the updated Plan is adopted by the Town and approved by FEMA, the Town will be eligible for state and federal grant monies to fund pre- and post-disaster mitigation projects.*

*A copy of the draft Hazard Mitigation Plan is available at the Buckland Town Hall and comments are being accepted on the Plan until May 20, 2011.”*

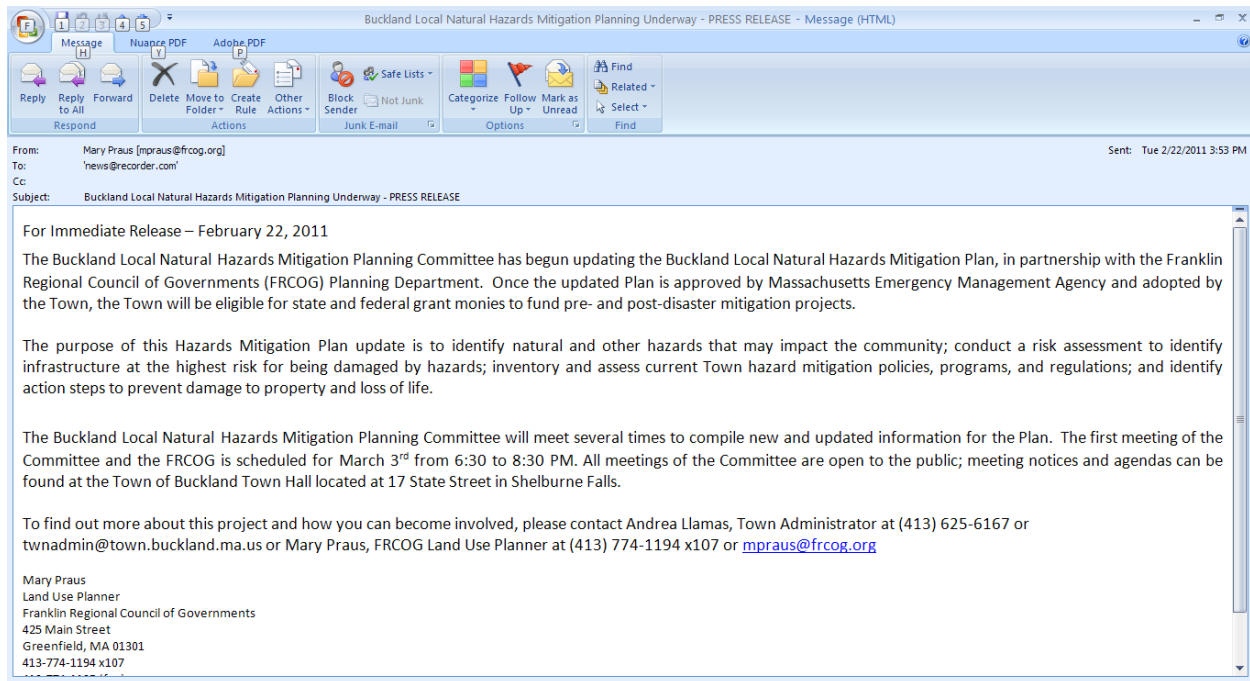
**Now available at the Buckland Town Hall!**

For more information contact:

Andrea Llamas, Town Administrator, (413) 625-6167

Mary Praus, Land Use Planner, FRCOG, (413) 774-1194 X107

This flyer posted at Buckland Town Hall on 05/09/11.



This press release run by the Greenfield Recorder and the North County News newspapers.

## Appendix C: South Street Project Description

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Report of Internet-Based Project Database  
December 23, 2010

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<b>Town:</b>	<b>Buckland</b>
<b>Project Name:</b>	<b>South Street Culvert</b>
<b>Mitigation Type:</b>	<b>Minor Localized Flood Reduction Project</b>
<b>Project Statement:</b>	"On one side of South Street there is a large drainage area where two streams that cross under the road converge and dump a lot of water. One of the structures is a pipe under the road and the other is a culvert. This area in general is poorly constructed and is constantly flooding causing water backup onto South Street, icy conditions, and severe road damage. A primary problem is one of the structures is a culvert that is in poor shape and, in fact, undermined and in danger of failing."

The potential project is a conveyance and drainage improvement that may alleviate nuisance and/or overbank flooding. A secondary benefit would be to prevent failure of the culvert. The subject stream is located within a 100-year floodplain, and the floodplain crosses South Street. A FEMA map section follows this page. The stated possibility of flooding is "medium" and the threat index calculated by the web tool is 3.65. However, it is noted that despite the "medium" rating, the project statement speaks of the area "constantly flooding."



The representative of Buckland responded in the web tool that critical facilities are not directly threatened by the flooding. However, the sewage treatment plant for the village of Shelburne Falls is accessed by Gardner Falls Road, which intersects with South Street adjacent to the culverts, and critical roads are reportedly affected by flooding. A site reconnaissance indicated that (1) residential properties may be affected if flooding were to occur, and (2) access to the sewage treatment plant may be affected by flooding. Therefore, the project has a potential of achieving a

benefit-cost ratio of one or greater using the BCA toolkit.

## Appendix D: Plan Adoption Documentation

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### CERTIFICATE OF ADOPTION

Town of Buckland, Massachusetts

Board of Selectmen

### A RESOLUTION ADOPTING THE TOWN OF BUCKLAND HAZARD MITIGATION PLAN

WHEREAS, the Town of Buckland established a Committee to prepare the Hazard Mitigation plan; and

WHEREAS, the Town of Buckland Hazard Mitigation Plan contains several potential future projects to mitigate potential impacts from natural hazards in the Town of Buckland, and

WHEREAS, a duly-noticed public meeting was held by the Board of Selectmen on November 13, 2012, and

WHEREAS, the Board of Selectmen authorizes responsible departments and/or agencies to execute their responsibilities demonstrated in the plan, and

NOW, THEREFORE BE IT RESOLVED that the Board of Selectmen, adopts the Town of Buckland Hazard Mitigation Plan, in accordance with M.G.L. c. 40.

**ADOPTED AND SIGNED this April 9, 2013**

Robert A. Dean, Chair, Board of Selectmen

Cheryl L. Dukes, Vice Chair, Board of Selectmen

Kevin P. Fox, Member, Board of Selectmen

Buckland Town Hall | 17 State Street | Shelburne Falls, MA 01370

JUL 19 2013



U.S. Department of Homeland Security  
FEMA Region I  
99 High Street, Sixth Floor  
Boston, MA 02110-2132

**FEMA**

JUL 08 2013

Robert A. Dean, Chairman  
Board of Selectmen  
Town of Buckland  
17 State Street  
Shelburne Falls, MA 01370

Dear Mr. Dean:

Thank you for the opportunity to review the Town of Buckland Local Natural Hazards Mitigation Plan. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I has evaluated the plan for compliance with 44 C.F.R. Pt. 201. The plan satisfactorily meets all of the mandatory requirements set forth by the regulations.

With this plan approval, the Town of Buckland is eligible to apply to Massachusetts Emergency Management Agency for mitigation grants administered by FEMA. Requests for mitigation funding will be evaluated individually according to the specific eligibility requirements identified for each of these programs. A specific mitigation activity or project identified in your community's plan may not meet the eligibility requirements for FEMA funding; even eligible mitigation activities or projects are not automatically approved.

Approved mitigation plans are eligible for points under the National Flood Insurance Program's Community Rating System (CRS). Complete information regarding the CRS can be found at [www.fema.gov/business/nfip/crs.shtm](http://www.fema.gov/business/nfip/crs.shtm), or through your local floodplain administrator.

The Town of Buckland Local Natural Hazards Mitigation Plan must be reviewed, revised as appropriate, and resubmitted to FEMA for approval within **five years of the plan approval date of June 28, 2013** in order to maintain eligibility for mitigation grant funding. Over the next five years, we encourage the Town to continue updating the plan's assessment of vulnerability, adhere to its maintenance schedule, and begin implementing, when possible, the mitigation actions proposed in the plan.

Robert A. Dean  
Page 2

Once again, thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please do not hesitate to contact Marilyn Hilliard at (617) 956-7536.

Sincerely,

A handwritten signature in black ink, appearing to read "Paul F. Ford". The signature is fluid and cursive, with the first name "Paul" being more prominent than the last name "Ford".

Paul F. Ford  
Acting Regional Administrator

PFF:mh

cc: Richard Zingarelli, Massachusetts Acting State Hazard Mitigation Officer;  
and Massachusetts State NFIP Coordinator  
Marybeth Groff, Massachusetts State Hazard Mitigation Planner  
Andrea Llamas, Buckland Town Administrator  
Sherry Clark, Buckland Board of Selectmen Administrative Assistant  
Mary Praus, Land Use Planner, FRCG

Enclosure

# LOCAL MITIGATION PLAN REVIEW TOOL

## TOWN OF BUCKLAND, MA – Final Plan

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

<b>Jurisdiction:</b> Town of Buckland, MA	<b>Title of Plan:</b> The Town of Buckland Local Natural Hazards Mitigation Plan	<b>Date of Plan:</b> Final Adopted April 9, 2013
<b>Single or Multi-Jurisdiction:</b> SINGLE		<b>New Plan or Update:</b> UPDATE
<b>Point of Contact:</b> Mary Praus Land Use Planner/Homeland Security Project Planner Franklin Regional Council of Governments 12 Olive Street, Suite 2 Greenfield, MA 01301 413-774-3167 x131 <a href="mailto:mporaus@frcog.org">mporaus@frcog.org</a> ----- Sherry Clark, Administrative Assistant Board of Selectmen <b>Phone:</b> (413) 625-6330 <b>Email:</b> <a href="mailto:shclark@crocker.com">shclark@crocker.com</a>		<b>Local Point of Contact:</b> Robert A. Dean, Chairman Board of Selectmen Town of Buckland 17 State Street Shelburne Falls, MA 01370  Andrea Llamas, Town Administrator Town of Buckland 17 State Street Shelburne Falls, MA 01370 <b>Phone:</b> (413) 625-6167 <b>Email:</b> <a href="mailto:twnamdin@town.buckland.ma.us">twnamdin@town.buckland.ma.us</a>

<b>State Reviewer:</b> Sarah White & Kathryn Fatherley	<b>Title:</b> MEMA Hazard Mitigation Planners	<b>Date:</b> 06/09/2011, 2/29/2012
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<b>FEMA Reviewer:</b> Nan Johnson Caroline Williams Nan Johnson	<b>Title:</b> Region I Community Planner JFO HM Community Planner Region I Community Planner	<b>Date:</b> 12/ 2011, 08/2012 05/28/2013 6/09/2013, 6/28/2013
<b>Date Received in FEMA Region I</b>	06/10/2011; Resubmitted 2/29/2012; Final Plan w/Adoption received 4/25/2013	
<b>Plan Not Approved</b>	Required Revisions 12/19/2011	
<b>Plan Approvable Pending Adoption</b>	YES – APA issued 8/20/2012	
<b>Plan Approved</b>	YES - 6/28/2013	



## SECTION 1: REGULATION CHECKLIST

**INSTRUCTIONS:** The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT A. PLANNING PROCESS				
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Cover page Acknowledgements: Section 1, p. 3-5; Section 5, p. 115; Appendix B	X		
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Section 1, p. 3-5; Appendix B	X		
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Section 1, p. 3-5; Section 5, p. 115 Appendix B	X		
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Section 1 p. 3-5; Throughout the plan; Appendices A and C	X		
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 5, p. 115-118	X		
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 5, p. 115-118	X		
ELEMENT A: REQUIRED REVISIONS				

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT				
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Section 3, p. 14-73; Section 4, p. 75-76	X		
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6l(2)(i))	Section 3, p. 14-73; Section 4, p. 75-77	X		
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Section 2, p. 10, 13 Section 3, p. 14-73; Section 4, p. 75-77	X		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Section 3, p. 38	X		
<b>ELEMENT B: REQUIRED REVISIONS</b>				
NOTE: The next plan update must provide the latest repetitive loss information post-disaster. In this review, it was overlooked that there was a repetitive loss property from the TS Irene flood disaster. This plan states there are no repetitive loss properties which must be adjusted to reflect this new information.				
ELEMENT C. MITIGATION STRATEGY				
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Cover page Acknowledgements; Section 1, p. 3-4; Section 2, p. 7-8; Section 4, p. 75, 77-95, 98-101, 112-114; Appendix A	X		
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Section 4, p. 71, 112; Section 5, p. 117; Appendix A	X		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Section 4, p. 108-111 (Table 4-12)	X		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Section 4, p. 108-111 (Table 4-12); Appendix C	X		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 4, p. 106-111	X		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Section 4, pages 70-71; Section 5, p. 116-118	X		

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR 201.6 Local Mitigation Plans)				
<b>ELEMENT C: REQUIRED REVISIONS</b>				
<b>ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION</b> (applicable to plan updates only)				
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Section 1, p. 5; Section 2, p. 6-8; Section 3, p. 38-64, 70-71	X		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Section 1, p. 5; Section 4, p. 105, 108-111	X		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 1. p. 5; Section 4, pg. 105- 111	X		
<b>ELEMENT D: REQUIRED REVISIONS</b>				
<b>ELEMENT E. PLAN ADOPTION</b>				
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Appendix D, p. 139 - Certificate of Adoption	X		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	N/A - This is a single jurisdiction plan.	N/A		
<b>ELEMENT E: REQUIRED REVISIONS</b>				
<b>ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)</b>				
F1.				
F2.				
<b>ELEMENT F: REQUIRED REVISIONS</b>				

## SECTION 2: PLAN ASSESSMENT

### A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

#### Element A: Planning Process

**Observation:** In much of the 2013 Hazard Mitigation plan, preparedness and response were frequently confused with mitigation. The purpose of a HM plan is a sustained process leading to a reduction or elimination of long-term risks from natural hazards. While preparedness and response are important and can be included, mitigation of natural hazards should be the focus...and other activities clearly differentiated.

#### Plan Strengths

- The local Mitigation Planning Committee members are clearly identified on the HM plan cover page.
- The Buckland Natural Hazards Planning Committee will meet annually or as needed to monitor, evaluate and oversee plan implementation.
- The 2013 plan notes that future Planning Committee meetings will be organized by the staff of the Town Administrator.
- A proposal was made to add members of the Planning Board and Conservation Commission to the Natural Hazards Planning Committee to improve completion of mitigation actions.
- The 2013 HM plan notes the prior plan was not incorporated into “planning mechanisms to the fullest extent possible”, and identifies how to improve this process (page 117).
- The final plan draft was placed on the town website for public review and comment (page 115). (See comments regarding website use under Opportunities for Improvement).
- The plan is well written and formatted making it easy to read and locate information. References/sources were well cited via footnotes.

#### Opportunities for Improvement

- Consider more clearly indicating how responsibilities for plan development tasks were divided among the town Natural Hazards Mitigation Planning Committee members and assisting regional planning staff. Recommend explicitly stating the committee lead or

chairman.

- The town might consider expanding the Mitigation Planning Committee to include representatives of private, community, or non-profit organizations as well as those from local businesses and adjacent communities.
- It is recommended to identify the specific municipalities and other stakeholders invited to participate, as well as the method of solicitation. Consider publicity to and direct solicitation of comments from more potential participants to gather broader community input throughout the 5-year plan cycle - including during plan monitoring, evaluation, and as plan drafts are developed. Consider tailoring community outreach to include vulnerable populations to ensure their inclusion in the process. This will assist in identifying and mitigating hazard risks for at-risk groups, such as the elderly.

Groups to be contacted might include adjacent communities, the Connecticut Watershed Council, land trusts, state regulatory agencies, major land holders (both government and private), land trusts, community organizations, conservation groups, historic preservation organizations, academic institutions, major employers, and railroad and local businesses.

- Be sure to amend the contents of the plan while under development to reflect ongoing changes in the planning process and manuscript. For example within the 2013 plan, the cover page lists the correct adoption date as April 9, 2013, while page footers give an adoption date of November 13, 2012. Within the Table of Contents, section numbers jump from Section 4 to 6, so that Section 5 is labeled as Section 6. There is no list/table titled *2005 Action Items Completed* as referred to on page 105. Occasional references pointing the reader to particular pages do not give the correct location. For instance, text on page 16 references a map on page 74, which is actually on page 73.
- The federally approved local HM plan is recommended to be continuously available on the official town website *during the entire 5-year plan cycle*, as well as making hard copies available to the public at an identified town office.
- Recommend explaining how and to whom comments could be submitted by the public and stakeholders reviewing the online drafts or hard copies.
- Consider expanding on what did and did not work during the planning process and during the 5-year planning cycle. Connect that information with any modifications incorporated into the next plan.
- Ensure that best available current information, data, reports, studies, plans, maps are used in the plan updates. Indicate this by providing the dates in the footnotes, tables, maps, or wherever appropriate.

- Continue to strengthen the implementation and maintenance of the plan by further developing the specifics on the methods and schedules that address “how” and “when” and by whom these actions will be accomplished. Document the changes and any insights that will be beneficial to the readers and participants of the Town’s planning process.

## **Element B: Hazard Identification and Risk Assessment**

### **Plan Strengths**

- The 2013 plan noted that weather conditions such as drought could increase local wildfire vulnerability.
- Information was included from an Emergency Action Plan for FERC Projects 2323 and 2669 to explain the risk posed from certain dams. Possible results were described for dam failures under conditions of Probable Maximum Flood (PMF) for dams owned by TransCanada, Inc. along the Deerfield River. These effects included the likelihood of catastrophic multiple-cascading dam failures with potential loss of life and high property damage.
- Nine historic structures within the Shelburne Falls National Historic District (Buckland portion) are identified as laying in the local floodplain.
- The plan notes that 551 acres within the town lies in the 100-year floodplain, including 32 acres of developed residential property (page 25). It is noted on page 70 that it is not presently possible to make an accurate determination of land available for development.
- The 2013 plan very clearly identified data deficits adversely affecting vulnerability assessment and for tracking changes in development within floodplains (pages 38-64, 107). These shortfalls included a lack of information on land use, historic and cultural sites, property available for development, hazardous waste storage, and assessor records.
- A good effort was made to include Buckland-specific data and descriptions for past microburst, thunderstorm, lightning, and hail events.
- The plan identifies an economic concern that real estate tax revenues to the town could be reduced by catastrophic damages to floodplain properties (page 62).
- Maps for town zoning and critical facilities are included in the 2013 plan.

### **Opportunities for Improvement**

- In the next updated plan, explain why drought and extreme temperatures are omitted from the town plan. In the 2013 HM plan, no explanation is provided for not addressing these two natural hazards, although these are included in the state HM plan and commonly recognized for the area.
- The next updated plan needs to include a description of each natural hazard's potential extent (magnitude) within the town. Consider expanding on the information provided in the 2013 plan, especially for flooding, severe winter storms, and hurricanes/tropical storms. Wildfire events could be categorized by the acreage involved, and any especially vulnerable locations within the community might be identified.
- In the next plan, *relate* past disaster events *specifically to the town* and describe details of how the community was affected (the impact). A significant oversight is that there is no mention or description of the 2011 flooding from Tropical Storm Irene which damaged buildings in the Village of Shelburne Falls, along with flash flooding elsewhere.

In the 2013 plan, dates for winter storms in the region (page 17) are listed; Though Buckland community impacts are provided for only one, the 2008 ice storm. Eighteen regionally significant flooding events are listed (page 15). However, only a single flood event is described in terms of this town and its community impact, despite the plan naming several sites with "chronic flooding issues" (page 16 and map on page 73).

- Consider describing in greater detail a variety of potential community impacts (including social) from each type of natural hazard event. While hazards are numerically rated for impact severity in Table 3-61, additional in-depth examination and discussion may show other vulnerabilities. A town loss of real estate revenue from flooding was briefly mentioned.
- Ensure that significant natural hazard events occurring prior to the next plan update are included. These should contain information on Tropical Storm Irene which occurred in August 2011.
- Within the next plan, update the out-of-date statement given in the 2013 plan, Section 3, page 38, "According to MEMA, there are no repetitive loss structures in Franklin County." Since Tropical Storm Irene in 2011, three repetitive loss residential properties in Franklin County were recorded by the NFIP; one each in the municipalities of Deerfield, Greenfield, and Leverett. (No repetitive loss properties are located in Buckland.)
- In future plans, correctly explain hazard frequency in terms of "percent statistical chance" (such as for flooding). This should replace the misleading definition given within Table 3-56 (page 65) of the 2013 plan, which stated the percentage reflected a

probability of “once in (2, 4, 5, 50, 100,) year period”.

- Strongly recommend examining the vulnerability of additional infrastructure within the municipality beyond that covered in the 2013 plan. For instance, the shared Buckland-Shelburne water and sewer mains crossing the “Iron Bridge” on Bridge Street were not mentioned in the 2013 plan. The mains may be at risk from flood events - whether a result of flash floods, ice jams (in or outside the vicinity), or dam failure. The Shelburne Falls Fire Station lies within or in close proximity to the Deerfield floodplain and is briefly mentioned (pages 37, 76) in regard to building value/loss, chemical storage, and shelter use. The analysis could be extended to include impacts to community health and safety.
- The town may wish to assess any increased risk of wildfire occurring from trains igniting track side brush.
- Consider further assessing any increased hazardous material risk posed by natural hazard events, such as floods. This information might then be used to develop regulatory actions requiring securing of residential fuel and propane tanks, and/or other actions to mitigate risks at commercial facilities (see comments under Element D).
- Recommend that maps be redesigned for ease of viewing in the next plan update. In the 2013 plan, the resolution and small font size makes it difficult or impossible to read street labels, place names, and source information. Consider placing enlargements of more developed areas such as Shelburne Falls on separate pages.

### **Element C: Mitigation Strategy**

#### **Plan Strengths**

- An update of the local Floodplain District Overlay Zoning Bylaw was proposed in the 2013 HM plan.
- The 2013 plan explained several procedures to improve the incorporation of the 2013 HM plan into local planning (pages 116-118), while identifying that inclusion was not accomplished to the “fullest extent” following the prior plan.
- The 2013 plan proposes applying for outside funding to assist homeowners in retrofitting (tie-down) existing ‘grandfathered’ mobile homes.
- A mitigation action was proposed to regulate wireless communication facilities to prevent wind damage.

#### **Opportunities for Improvement**



- In the next plan update, it is recommended to reconsider the method used to prioritize mitigation actions. In the 2013 plan, it appears mitigation actions were ranked solely based on the hazard priority (pages 106-107).

**Suggestions:**

- Any method of prioritizing actions should be consistently applied. The method in the 2013 plan seemed arbitrarily applied as a number of hurricane-related actions are placed under the Low priority flood hazards, although hurricane actions are rated as Medium priority.
- Consider using STAPLEE or a similar method to weigh economic concerns for each mitigation action. Show how/if economic considerations are utilized when prioritizing actions within the next HM plan. Since 2013 mitigation actions were ranked entirely by hazard, the directly relevant benefits and costs for an activity were not used to determine its priority for implementation. Economic costs were only generally associated with prioritizing each type of natural hazard.

*Analysis and descriptions of mitigation activities and projects could be considerably expanded in the next plan update beyond those given in the 2013 HM plan.*

- Strongly recommend adding *mitigation* actions for each natural hazard in the next plan. The majority of “mitigation” actions included in Table 4-12 of the 2013 plan were actually preparedness and response activities.
- Clearly distinguish mitigation activities, from preparedness or response. Throughout the 2013 plan there appeared to be confusion between mitigation, preparedness and response, including within Table 4-12 titled *Mitigation Prioritized Action Plan*.

For example, the actions which are actually preparedness and response are emergency shelters and supplies, evacuation routes and procedures, a 911 notification system, response coordination, broadcasting emergency information, temporary storage of hazardous waste, the local Emergency Action Plan, the local CEM plan, Regional Debris Management Plan, burning permits, and monitoring potential ice jam locations.

- Many “mitigation actions” were actually data collection for future vulnerability assessments. While helpful, these are best described within the process for updating the plan.
- Several vaguely described “Action Items” under Table 4-12 within the 2013 plan could be more fully developed into mitigation *regulatory actions* or *physical projects* in the next plan update. Many of items were loosely described in terms of “work with”, “research”, “ensure”, “seek”, and “support”.

**Suggestions:**

- Explain the activities involved in the erosion and stream bank stabilization at the Buckland Recreation Center (pages 16, 111).

-Explain the strategies in the Open Space and Recreation Plan relative to floodplains and other hazard areas, which were identified as a single mitigation action within the 2013 hazard mitigation plan (pages 16, 111).

-Name specific actions in support of open space protection. These could be property acquisition within identified hazard areas, and/or remove at-risk property from potential development through conservation easements. Consider working in cooperation with land trusts, environmental organizations, watershed associations, and government agencies such as Mass Wildlife and DCR.

-Provide an educational program targeting residents and landowners with information on specific forestry practices and defensible fire perimeters for buildings. Describe the methods used, such as pamphlet distribution or programs on the local public access channel.

-Implement a long-term cooperative program between the town and utility companies for tree maintenance and/or installation of underground utilities.

-Initiate town regulatory action(s) to reduce or eliminate risk from hazardous materials stored within floodplains or other natural hazard locations, whether for commercial, agricultural or residential use. This might include required securing of fuel and propane tanks.

-Rectify any issues relevant to local enforcement of the Massachusetts State Building code through specified steps by the municipal government.

- Recommend clearly stating if there are town enforcement deficits relative to the state building code and, if so, then identify specific steps needed to rectify the situation. In the 2013 plan, the long-standing required enforcement of the state building code was listed as several separate mitigation actions for different natural hazards. If the described enforcement was just standard operating procedure, the narrative of the next plan might simply describe the current process and benefits. Also, the wording is confusing for the action to enforce the state building code for foundation and crawl space construction as high wind shelters.
- Consider removing a mitigation action under Hurricanes to “disallow mobile homes” (page 109) - as new permanent placements are essentially already prohibited by state regulation.
- Consider mitigation action(s) to reduce the landslide threat identified in the North Street area (page 28).
- Consider adding mitigation actions involving cooperation with adjacent Deerfield River communities to reduce threats arising from ice jams, such as the backwater flooding mentioned on page 28.
- Consider mitigation actions to protect the shared Buckland-Shelburne water and sewer mains crossing the “Iron Bridge” on Bridge Street. This might involve physical shielding

or other retrofitting, if such is not already in place.

- Consider mitigation action(s) to ensure continued use of the Shelburne Falls Fire Station during a flood event, and to prevent damages. Construction of a new station outside of the floodplain would be a possible project.
- Rather than estimating completion dates dependent on uncertain funding, instead provide the project time frame as an estimate of project/activity length - for example, 18 months or 24 months. In some instances, an open-ended “ongoing” completion date may indicate the need to structure a mitigation activity – perhaps using project phases. Consider showing progress by the percentage completed for ‘ongoing’ mitigation actions, as was done for some preparedness actions in the 2013 plan.
- Suggest including cost estimates for each mitigation activity within the next plan update.
- Recommend more specifically identifying funding sources for individual mitigation actions. For example, it can be useful to state the source of Town funds (General fund, DPW budget, bond, etc.) or federal funds such as FEMA grant under HMGP or FMA. If a local match is required then also include that source. Any private and non-profit funding sources should be acknowledged.
- Recommend expanding the description of the town’s participation in the NFIP, including the date the community joined the NFIP and the date for local Flood Insurance Rate Maps (FIRM).
- Consider providing information on any requests for map updates to FIRM’s.

#### **Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)**

##### **Plan Strengths**

- The 2013 plan very clearly identified data deficits adversely affecting the tracking of development changes within floodplains (pages 38-64, 107). Recognized gaps included a lack of information on land use, historic and cultural sites, hazardous waste storage, assessor records, and property available for development.
- Remedial measures for data deficits were proposed (pages 107-111).

##### **Opportunities for Improvement**

- In the next plan, clearly show the status of all mitigation actions from the prior plan. Clearly explain what, if any, mitigation actions from a prior HM plan were *eliminated* and why.

In the 2013 plan, it appears that Table 4-12: *2011 Buckland Local Natural Hazards Mitigation Prioritized Action Plan* includes the status of a completed (preparedness) action. However, the text under the title *Future Mitigation Strategies* (page 105) instead refers to a missing section named *2005 Action Items Completed*.

- The plan might be improved by showing the progress on individual mitigation activities by listing the percentage of the project completed. This description could be applied for those activities carried over from prior HM plans, as was used for some preparedness actions in the 2013 plan.
- Recommend discussing in the next update whether goals were reviewed and changed since the last plan. In the 2013 plan, action items were listed by prioritized hazards and the goal statements were associated with specific hazards; however alterations from prior plan goals were not mentioned.
- Clearly state *how* priorities changed from those in the prior HM plan. The priorities were stated to have been updated in the 2013 plan; however there was no description of how and what was changed.
- Mitigation goals should be the primary focus of the local HM plan and its strategy, not preparedness or response. Consider goals that can be incorporated into the local Comprehensive Plan or other town planning. During the next plan update, it is recommended that the local committee refer to the Plan Handbook and Guidance for developing mitigation goals.

Within the 2013 plan, the first goal was related to preparedness and response. The remaining five goals could be considered a single mitigation goal, even though these were placed under separate hazards.

## B. Resources for Implementing Your Approved Plan

*Consider a variety of sources for grants, guidance, and partnerships, including academic institutions, non-profit foundations, community organizations, and businesses, in addition to governmental agencies.*

### **State Sources of Funds and Technical Assistance**

Contact the **Massachusetts Emergency Management Agency** (MEMA) and the **Department of Conservation and Recreation** (DCR) for further assistance. View agency websites for contact information at <http://www.mass.gov/eopss/home-sec-emerg-resp/hazard-mitigation/> and <http://www.mass.gov/dcr/stewardship/mitigate/index.htm>

The Massachusetts **State Hazard Mitigation Officer (SHMO)** can provide more guidance regarding grants, technical assistance, available publications, and training opportunities.

The **2010 Massachusetts State Hazard Mitigation Plan** identifies potential technical assistance and funding resources for various mitigation activities and offers a statewide approach to natural hazard mitigation.

**Mass GIS Land Use data** is available for year 2005 at <http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/lus2005.html>

### **Beaver Management**

The Massachusetts Division of Fisheries & Wildlife provides technical assistance regarding managing beaver and related permits.

Publications: [http://www.mass.gov/dfwele/dfw/wildlife/facts/mammals/beaver/beaver\\_links.htm](http://www.mass.gov/dfwele/dfw/wildlife/facts/mammals/beaver/beaver_links.htm)

Permits: [http://www.mass.gov/dfwele/dfw/wildlife/facts/mammals/beaver/beaver\\_permits.htm](http://www.mass.gov/dfwele/dfw/wildlife/facts/mammals/beaver/beaver_permits.htm)

### **Federal Funding Opportunities**

<http://reconnectingamerica.org/resource-center/federal-grant-opportunities/>

**U.S. Federal Grants**, Search <http://www.grants.gov/FEMA>

- **FEMA Hazard Mitigation Assistance Unified Guidance**, June 1, 2010, Part I - Funding Opportunity Description, D.5, page 19, FEMA requirements regarding HMGP, PDM, FMA, and SRL grants.  
<http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=4225>
- **USDA, Natural Resources Conservation Service (NRCS)**  
Conservation Technical Assistance  
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/cta>  
Financial Assistance  
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/>  
Conservation Innovation Grant Programs  
<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs>
- **HUD CDBG Disaster Recovery Assistance** provides flexible grants to help cities, counties, and States recover from presidentially declared disasters, especially in low-income areas, subject to availability of supplemental appropriations.  
[http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/comm\\_planning/communitydevelopment/programs/drsi](http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/drsi)

**HUD Sustainable Housing and Communities Initiative** supports regional planning efforts integrating housing and transportation decisions, and increasing state, regional, and local capacity to incorporate livability, sustainability, and social equity values into land use plans, zoning and infrastructure investments. These efforts are compatible with flood plan management. Information is available at

[http://portal.hud.gov/portal/page/portal/HUD/program\\_offices/sustainable\\_housing\\_communities](http://portal.hud.gov/portal/page/portal/HUD/program_offices/sustainable_housing_communities)

### **FEMA publications**

These documents can be downloaded from <http://www.fema.gov/library>. Search in the FEMA library by title/number or use the web links below.

*[Managing Floodplain Development through the NFIP](http://www.fema.gov/library/viewRecord.do?id=2108) provides guidance to municipal officials considering changes to local regulations and zoning. A copy can be downloaded from <http://www.fema.gov/library/viewRecord.do?id=2108>*

FEMA B-797, *[Hazard Mitigation Field Book – Roadways](http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=4271)*  
<http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=4271>

FEMA P-787, *[Catalog of FEMA Wind, Flood & Wildfire Publications, Training Courses & Workshops](http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=3184)*(2012)  
<http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=3184>

*[Flood Hazard Mitigation Handbook for Public Facilities](http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=3724)*  
<http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=3724>

FEMA 386-6, *[Mitigation Planning How To #6: Integrating Historic Property & Cultural Resource Considerations into Hazard Mitigation Planning](http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=1892)*, provides guidance regarding how to involve community-based organizations in mitigation planning.  
<http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=1892>

FEMA P-787, *[Catalog of FEMA Wind, Flood & Wildfire Publications, Training Courses & Workshops](http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=3184)*(2012)  
<http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=3184>

*The following FEMA publications are especially useful in public information/outreach programs and can be ordered in hard copy for public distribution.*

FEMA 232, *[Homebuilders' Guide to Earthquake-Resistant Design and Construction](http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=2103)* provides seismic design and construction guidance for one- and two-family light frame residential structures that can be utilized by homebuilders, homeowners, and other non-engineers.  
<http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=2103>

FEMA 347, *[Above the Flood: Elevating your Flood-prone House](http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=1424)*  
This large publication (69 pages) could be placed in the reference section of a local public library or at a City or Town Hall for lending.  
<http://www.fema.gov/library/viewRecord.do?fromSearch=fromsearch&id=1424>