Appendix B

Historical Disaster Occurrences

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Acronyms and Abbreviations

FEMA	Federal Emergency Management Agency
NCDC	National Climatic Data Center
NESIS	Northeast Snowfall Impact Scale
NOAA	National Oceanic and Atmospheric Administration
SHMP	State Hazard Mitigation Plan
USACE	U.S. Army Corps of Engineers

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Historical Disaster Occurrences

1.1 Presidentially-Declared Disasters

As described in the Risk Assessment, many hazards discussed in this plan occur concurrently or as a result of one storm event. Therefore, all events that received presidential disaster declarations are listed together in chronologic order in Table B-1. Additional detail on the impacts from each event is provided under the relevant/applicable hazards in the Risk Assessment. Additional information on each of these events is also provided after Table B-1 in chronologic order.

Table B-1: Presidentially-Declared Disasters, 1991-2018

Disaster Name/ Disaster Number	Date of Event	Declared Areas
Hurricane Bob/ FEMA-914-DR-MA	August 1991	Counties of Barnstable, Bristol, Dukes, Essex, Hampden, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
Severe Coastal Storm/ FEMA –920-DR-MA	October 1991	Counties of Barnstable, Bristol, Dukes, Essex, Middlesex, Plymouth, Nantucket, Norfolk, Suffolk
Winter Coastal Storm/ FEMA-975-DR-MA	December 1992	Counties of Barnstable, Dukes, Essex, Plymouth, Suffolk
Blizzard/ FEMA-3103-EM	March 1993	All 14 Counties
Russell Fire/ FEMA-2116-EM	September 1995	DEM and National Guard
Blizzard/ FEMA-1090-EM	January 1996	All 14 Counties
Severe Storms, Flood/ FEMA-1142-DR-MA	October 1996	Counties of Essex, Middlesex, Plymouth, Norfolk, and Suffolk
Heavy Rain, Flood/ FEMA-1224-DR-MA	June 1998	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, and Worcester
Worcester Fire/ FEMA-3153-EM	December 1999	City of Worcester, State Fire Mobilization Communities, and various state agencies
Severe Storms and Flooding/ FEMA-1364-DR-MA	March 2001	Counties of Bristol, Essex, Middlesex, Norfolk, Suffolk, Plymouth, Worcester
Snowstorm/ FEMA-3165-EM	March 2001	Counties of Berkshire, Essex, Franklin, Hampshire, Middlesex, Norfolk, and Worcester
Snowstorm/ FEMA-3175-EM	February 2003	All 14 Counties
Snowstorm/ FEMA-3191-EM	December 2003	Counties of Barnstable, Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, Plymouth, Suffolk, and Worcester

Disaster Name/ Disaster Number	Date of Event	Declared Areas
Flooding/ FEMA-1512-DR	April 2004	Counties of Essex, Middlesex, Norfolk, Suffolk, and Worcester
Snow/ FEMA-3201-EM	January 2005	All 14 Counties
Hurricane Katrina/ FEMA-3252-EM	August 2005	All 14 Counties
Severe Storms and Flooding/ FEMA-3264-EM	October 2005	Bristol County (Taunton Dam)
Severe Storms and Flooding/ FEMA-1614-DR-MA	October 2005	All 14 Counties
Severe Storms and Flooding/ FEMA-1642-DR-MA	May 2006	All 14 Counties
Severe Storms & Inland, Coastal Flooding/ FEMA-1701-DR-MA	April 2007	All 14 Counties
Severe Winter Storm/ FEMA-3296-EM- MA	December 2008	Berkshire, Bristol, Essex, Franklin, Hampden, Hampshire, Middlesex, Suffolk, and Worcester
Severe Storms and Flooding FEMA-1813-DR-MA /	December 2008	All 14 Counties
Severe Storms and Flooding/ FEMA-1895-DR-MA	March-April 2010	Bristol, Essex, Middlesex, Norfolk, Plymouth, Suffolk, Worcester
Severe Winter Storm and Snowstorm/ FEMA-1959-DR-MA	January 2011	Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk, Suffolk
Severe Storms and Tornadoes/ FEMA-1994-DR-MA	June 2011	Hampden, Worcester
Tropical Storm Irene/ FEMA-4028-DR-MA	August 2011	Barnstable, Berkshire, Bristol, Dukes, Franklin, Hampden, Hampshire, Norfolk, Plymouth
Severe Storm and Snowstorm/ FEMA-4051-DR-MA	October 2011	Berkshire, Franklin, Hampden, Hampshire, Middlesex, Worcester
Hurricane Sandy/ FEMA-4097-DR-MA	October-November 2012	Barnstable, Bristol, Dukes, Nantucket, Plymouth, Suffolk
Severe Winter Storm, Snowstorm and Flooding/FEMA-4110-DR-MA	April 2013	All 14 counties
Severe Winter Storm, Snowstorm, and Flooding /FEMA-4214-DR-MA	April 2015	Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, Worcester
Severe Winter Storm and Flooding/FEMA-4372-DR	March 2018	Barnstable, Bristol, Essex, Nantucket, Norfolk, Plymouth
Severe Winter Storm and Snowstorm/FEMA-4379-DR	March 2018	Essex, Middlesex, Norfolk, Suffolk, Worcester

1.1.1 Hurricane Bob (FEMA DR-914)—August 1991

Hurricane Bob was the second named storm and the first hurricane of the 1991 hurricane season, reaching a Category 3 status. Winds reaching 115 mph impacted North Carolina, the Mid-Atlantic states, New England, and Atlantic Canada, causing 15 fatalities. In Massachusetts, this

storm struck the southern coast, causing $900 million in property damage from Westport east to New Bedford, Buzzards Bay, Cape Cod, and the Islands. Damage to crops was approximately $10 million, including a loss of 20 to 50% of the apple crop. Corn and vegetable crops were also seriously damaged or destroyed. The eye of the storm tracked north-northeast between Fall River and Providence, passing through Bristol and Plymouth Counties at a speed of 40 mph. Many boats were either heavily damaged or destroyed. Over 500 boats broke away from their moorings, sank, or were driven ashore. The tidal surge reached 5.8 feet in New Bedford, inundating barrier beaches from Westport to Marion and flooding beaches around Buzzards Bay. Across Cape Cod and the islands, thousands of trees were blown down, causing power outages. Winds exceeded 80 mph with gusts of up to 143 mph, and rainfall totals ranged between two and seven inches in the Commonwealth. This event resulted in a presidential disaster declaration (FEMA DR-914).

1.1.2 Severe Coastal Storm (FEMA DR-920)—October-November 1991

This storm was an unusual event, as the large nor'easter moved south and gained strength when it joined what remained of Hurricane Grace, becoming what some refer to as the Perfect Storm. This storm event, also known as the Halloween Nor'easter of 1991 and the Halloween Storm of 1991, impacted the entire east coast of the United States as well as Puerto Rico. The storm was a devastating extratropical event that developed east of Nova Scotia, Canada and moved unexpectedly west. Winds from this event were measured at over 80 mph, with waves over 30 feet in some parts of the coastline. The storm brought unusual wave periods in excess of 20 seconds, compared to more typical 12 to 14 second periods associated with a typical New England nor'easter. Deepwater wave heights of over 40 feet were also observed. This storm caused flooding, wind damage, and erosion in several counties. Wind gusts greater than 60 miles per hour were recorded in Chatham for over 15 hours straight and gusts of over 70 mph for six hours. On October 30, National Oceanic and Atmospheric Administration (NOAA) buoys reported wave heights up to 31 feet (buoy 44008) and 25 (buoy 44013) southeast of Nantucket and in Massachusetts Bay. Peak water levels of 11.2 feet were recorded in Sandwich. The duration of the storm in Boston was approximately 90 hours, exposing the shoreline to higher than normal water levels for a longer time than previous storm events like the Blizzard of 1978. Had the storm occurred five days earlier, the Stillwater level at Boston would have been about 1.5 feet high, which could have led to extreme coastal damages. Municipalities in Massachusetts received $9,704,600 (1991 dollars) for activities including debris clearance, protective measures, road systems, public utilities, and more from FEMA (USACE, 1994). This event resulted in a presidential disaster declaration (FEMA DR-920).

1.1.3 Winter Coastal Storm (FEMA DR-975)—December 1992

From December 11 to 13, 1992, a strong nor'easter affected the Commonwealth. Impacts included intense snowfall, freezing rain, and heavy rainfall near the coast, coastal flooding, and damaging winds. Storm total snowfall in Massachusetts was as high as 4 feet over the higher elevations of the Berkshires, with 48" reported in Beckett, Savoy, and Peru. Snow drifts as high as 12 feet were created in the Berkshires. Snowfall of 18" to 32" was common over central Massachusetts, with 6 to 20" over interior eastern Massachusetts. Some locations also experienced a coating of ice. Strong winds combined with wet, heavy snow and ice caused considerable tree damage and widespread power outages. The weight of the snow taxed snow removal equipment in many communities and also caused roof damage. There were 135,000 customers without power in the Commonwealth during the storm. The central part of the Commonwealth suffered the brunt of the outages where 30,000 households were without power, just in Worcester County.

Precipitation totals for this storm were extraordinary. Much of southern New England received up to 5 inches of liquid equivalent precipitation during a 2 to 3 day period, with locally close to 8 inches recorded in parts of southeast Massachusetts. Along coastal sections and in some interior valleys, much of the precipitation fell as rain or rain mixed with snow. This caused considerable ponding and localized flooding in poorly drained areas.

The greatest damage from this storm was due to coastal flooding. Serious coastal flooding occurred along the Massachusetts coastline from December 11 to 13, the most damaging storm tide occurring early afternoon on December 12. The Boston tide gage recorded a peak elevation of 14.21 feet above mean lower low water, 1 foot less than the highest elevation on record at that location, from the blizzard of 1978. A 350-foot breach of Hull's Nantasket Beach seawall occurred. Most east-facing shoreline communities from Chatham to Provincetown and Plymouth to the North Shore, as well as Nantucket Island, experienced some level of coastal flood damage. Dunes were washed away in Hull and Duxbury. As much as 20 feet of dune was lost in Sandwich and up to 25 feet in Ipswich. Many coastal road closings occurred. Dock damage occurred, and some cottages were destroyed by the sea. This event resulted in a presidential disaster declaration (FEMA DR-975).

1.1.4 Blizzards, High Winds and Record Snowfall (FEMA EM-3103)—March 13-17, 1993

The March 13-17, 1993 storm brought high winds and heavy snow to Massachusetts. Boston's Logan Airport recorded a wind gust to 81 mph, and a gust to 83 mph occurred at the Blue Hill Observatory. Snowfall was generally 10 to 20 inches across the area except 20 to 30 inches over the Berkshires. Snowfall totals included 12.8 inches at Boston, 20.2 inches at Worcester, and 30 inches at both Florida and Peru in the Berkshires. Blizzard conditions existed for a 3 to 6 hour

period during the afternoon of March 13. Unlike the December 1992 storm, the snow was a dry enough to minimize accumulation on trees and wires. This precluded widespread power outages. The storm's occurrence on the weekend mitigated traffic issues. The coastal flood potential was not realized, since the strongest onshore winds did not correspond to high tide and the duration was not long enough to produce exceptionally large waves. This storm impacted the entire eastern third of the country and resulted in a presidential disaster declaration (FEMA EM-3103).

1.1.5 Hurricane Earl (FEMA EM-3315)—September 2010

Earl was the fifth named storm of the 2010 hurricane season, reaching peak intensity on September 2nd with maximum sustained winds of 145 mph. Hurricane Earl was considered a Category 4 hurricane. Damage was estimated to be low, but one fatality occurred in Massachusetts, as well as three in Florida and two in New Jersey.

1.1.6 Russell Fire (FEMA FM-2116) – September 1995

The most recent large-scale wildfire occurred in the Town of Russell in Hampden County in September 1995. This wildfire, which initiated the federal Fire Suppression Agreement under a presidentially declared disaster (FEMA FM-2116), was finally controlled after two weeks. The fire's location on extremely steep terrain made access particularly difficult. The fire burned several days because of ready fuel and prolonged regional drought conditions. More than 500 acres were burned and several dwellings and farms in the Town of Russell were threatened.

1.1.7 Blizzard (FEMA DR-1090)—January 7-8, 1996

This storm was one of the most significant winter storms to hit southern New England in the past 20 years. It brought record snowfalls to the Mid-Atlantic States to southern New England. Snowfall totals of 13 to 18 inches were reported in Cape Cod. Between 15 and 25 inches fell in Plymouth and Bristol Counties. More than 20 inches were reported in Hampden and Hampshire Counties and more than 30 inches in the Berkshires. Strong to gale-force northeast winds was also associated with this event. Storm surges were between 1.9 and 2.7 feet at the Boston tide gauge. Minor coastal flooding was experienced. On the eastern shore of Nantucket Island, high waves and strong currents eroded sand dunes. The Commonwealth experienced over $350,000 in property damage. MEMA reported damage claims of approximately $32 million from 350 communities, mostly for the cost of snow removal. This event resulted in a presidential disaster declaration (FEMA DR-1090).

1.1.8 Severe Storms and Flooding (FEMA DR-1142)—October 1996

On October 19 through October 20, a slow-moving system produced record-breaking rainfall in northeast Massachusetts. This event also brought strong winds with gusts of over 45 mph and a peak gust of 63 mph. Rainfall totals were nearly eight inches, which resulted in widespread small

stream and tributary flooding. In Essex County (Newburyport), 13.03 inches of rain was reported. There was widespread urban flooding in Boston. In Lowell, the Merrimack River gage recorded the height of the river at 53.10 feet with a discharge of 48,600 cubic feet per second. Major roadways were flooded, and many basements of homes were flooded and homes were severely damaged. Damage was estimated at over $60 million.

1.1.9 Heavy Rain and Flooding (FEMA DR-1224)—June-July 1998

Between June 12 and June 14, a slow moving storm system moved through southeast New England, producing between six and 12 inches of rain over much of eastern Massachusetts. This led to widespread urban, small stream, and river flooding. Between June 15 and June 20, another storm brought thunderstorms to the area, causing several flash floods. Flooding was reported along many brooks, streams, and rivers. Yet another storm on June 30 brought heavy rain and continued the flooding from the previous events.

1.1.10 Worcester Fire (FEMA EM-3153) —December 1999

This six-alarm fire razed a warehouse in Worcester and took the lives of six firemen.

1.1.11 Severe Storms and Flooding (FEMA DR-1364)—March-April 2001

A series of storm events occurred in Massachusetts between March 5 and April 16. On March 5, a major winter storm affected Massachusetts with near-blizzard conditions, high winds, and coastal flooding. Over two feet of snow fell across the interior portion of the Commonwealth. Approximately 80,000 people were without power and businesses and schools were closed for several days. Snowfall totals ranged between two and 30 inches across Massachusetts. During this storm event, high tides ran two to three feet above normal, resulting in widespread coastal flooding along the entire east-facing coastline. Beachfront homes and roadways were flooded and sea walls were damaged. Between March 22 and March 31, a series of flooding events occurred throughout Massachusetts as a result of melting snow and heavy rainfall. The most severe flooding occurred in the Merrimack Valley. Another event occurred on March 30, bringing heavy snow to parts of interior Massachusetts and heavy rain and strong winds to the coastal communities, causing flooding along rivers and streams in the eastern portion. Over six inches of rain fell in some areas.

1.1.12 Heavy Snow (FEMA EM-3165)—March 5-6, 2001

A major winter storm impacted Massachusetts with near blizzard conditions, high winds, and coastal flooding. It brought over two feet of snow across the interior and caused power outages to approximately 80,000 people. Businesses and schools were closed for several days. There were numerous reports of downed trees and wires during the height of the storm. After the storm, the weight of the snow caused several roof collapses throughout the Commonwealth. The highest

snowfall totals were reported from the east slopes of the Berkshires across Worcester County and into northeast Massachusetts. Northeast winds affected much of the east coast and southeast of Massachusetts. Speeds of 50 to 60 mph were observed. High tides during the storm were two to three feet above normal, which resulted in widespread coastal flooding. This event resulted in a presidential emergency declaration (FEMA EM-3165). Those counties included in the declaration received over $21 million in public assistance grants from FEMA.

1.1.13 Winter Storm (FEMA EM-3175)—February 17-18, 2003

A major winter storm struck southern New England, bringing heavy snow and strong winds. This event was the most significant of the 2002-2003 winters, with snowfall totals of one to two feet. The highest totals were around two feet and were reported in two areas: east slopes of the Berkshires into northern Worcester County and over Boston's South Shore communities. This snowstorm ranked in the top 10 for Boston and Worcester. This event resulted in a presidential emergency declaration (FEMA EM-3175). Those counties included in the declaration received over $28 million in public assistance grants from FEMA.

1.1.14 Winter Storm (FEMA EM-3191)—December 6-7, 2003

A major winter storm brought 1 to 3 feet of snow and strong winds to southern New England. In Massachusetts, snowfall amounts averaged between one and two feet across the Commonwealth. Some areas near Cape Cod only received between six and 12 inches. The highest snowfall was reported in Peabody, where 36 inches of snow fell. Minor coastal flooding was reported due to high seas of up to 30 feet off the eastern coast. One fatality was indirectly attributed to the storm. A commuter-rail work was struck by a freight train as they were clearing snow from the tracks near the Wellesley Hills station. This event resulted in a presidential emergency declaration (FEMA EM-3191). Those counties included in the declaration received over $35 million in public assistance grants from FEMA.

1.1.15 Flooding (FEMA DR-1512)—April 2004

Between March 31 and April 2, as much as four inches of rain fell in parts of Massachusetts, with the Merrimack Valley receiving seven inches of rain. The heavy rain, combined with snowmelt produced an excessive runoff of water, causing many streams and rivers to flood. Many roadways were closed due to flooding and some residents were forced to evacuate their homes. A second event occurred on April 15. Two inches of rain fell on already saturated ground from the floods earlier in the month. Assabet River flooded; however, it was minor and there no reports of damage. Massachusetts received over $2.7 million in individual assistance as a result of this event.

1.1.16 Blizzard (FEMA EM-3201)—January 22-23, 2005

A major winter storm brought heavy snow, high winds, and coastal flooding to southern New England. In Massachusetts, blizzard conditions were reported on Nantucket. This was the first blizzard to affect the Commonwealth since the April 1997 storm. Near-blizzard conditions were reported in other areas and brought between one and three feet of snow and produced wind gusts of up to 65 mph.

The highest snowfall totals were reported in eastern Massachusetts (between two and three feet). Minor to moderate coastal flooding was observed around high tide in eastern Massachusetts coast. Coastal flooding was most severe near Hull, Scituate, and Marshfield, where several roads were inundated and evacuations occurred. This event resulted in a presidential emergency declaration (FEMA EM-3201). Those counties included in the disaster received over $49 million in public assistance from FEMA.

1.1.17 Severe Storms and Flooding (FEMA DR-1614)—October 2005

On October 9, the remnants of Tropical Storm Tammy produced significant rain and flooding across western Massachusetts. It was reported that between nine and 11 inches of rain fell. The heavy rainfall washed out many roads in Hampshire and Franklin Counties. The Green River flooded a mobile home park. Several people had to be evacuated from their homes. On October 15, a low pressure system, combined with tropical moisture, resulted in heavy rain and flooding across Massachusetts. Approximately 1,000 evacuations occurred due to severe urban flooding and near record flooding along the Blackstone and Quinebaug Rivers. Many streets were flooded and shut down, including state and interstate highways. This series of storms resulted in a presidential disaster declaration (FEMA-DR-1614) and Massachusetts received over $13 million in individual and public assistance.

1.1.18 Hurricane Katrina (FEMA-EM-3252)—August 2005

The remnants of Hurricane Katrina dropped up to 4.17 in (106 mm) of rain and cause gusty winds that blew down trees and tree limbs.

1.1.19 Severe Storms and Flooding (FEMA-EM-3264)—October 2005

Whittenton Pond Dam, Taunton, an aged timber crib structure, was excessively stressed on October 18, 2005. Around 11.5 inches of rain fell across the Mill River watershed during October 2005. Most of this rain fell within a 6 hour time period. This resulted in the threat of an imminent catastrophic failure of the dam. A dam expert team decided construction of a rock dam/spillway downstream of the aged dam should occur, with a subsequent disassembly of Whittenton Pond Dam. Days later the new spillway was completed, just prior to another significant rainfall episode. The dam did not breach and no one in Taunton was harmed during

this incident; however, approximately 2,000 people were evacuated, including a housing development for the elderly.

1.1.20 Severe Storms and Flooding "Mother's Day Flood" (FEMA DR-1642)—May 2006

Between May 13 and 15, 2006, heavy rain caused widespread flooding across much of eastern Massachusetts. Rainfall totals ranged between eight and 12 inches. Both small streams and main stem rivers flooded. Some areas experienced their worst flooding since the 1938 hurricane and the floods of March 1936. There was also severe urban drainage flooding in portions of the northeast, especially in the Peabody area. This severe storm and flooding event caused two fatalities and the state received over $56 million in individual and public assistance.

1.1.21 Severe Storms and Flooding (Nor'easter) (FEMA DR-1701)—April 2007

An intense coastal storm (April 15-16, 2007) brought wet snow, sleet and rain to parts of western Massachusetts. Snowmelt and heavy rain between three and six inches led to moderate flooding of small streams and creeks in parts of the Commonwealth, particularly in the lower Merrimack River Basin/mainstream and tributaries. This event resulted in a presidential disaster declaration (FEMA DR-1701). Those counties included in this disaster received over $8 million in public assistance from FEMA. The storm was primarily a rain event due to warmer temperatures; however, higher elevations experienced significant snow and ice accumulations.

1.1.22 Severe Winter Storm (FEMA EM-3296- MA)—December 2008

This storm was considered the worst ice storm New England had experienced in a decade. Damage primary occurred as a result of fallen trees and fallen utility wires and poles. The storm resulted in 1.7 million households without power, many of whom were still without power a week after the storm. A public works employee in Massachusetts died as a result of the storm after falling into a reservoir while inspecting damage to trees.

1.1.23 Severe Winter Storm and Flooding "Patriot's Day Storm" (FEMA DR-1813)—December 2008

A major ice storm and significant precipitation affected much of New England on December 11th and 12th. The ice storm struck across interior Massachusetts, southern New Hampshire, and much of northern New England. The hardest hit areas were the Worcester Hills in central Massachusetts and the east slopes of the Berkshires in western Massachusetts. At least half an inch of ice formed on many exposed surfaces. The ice downed many trees, branches, and power lines, which resulted in widespread power outages. More than 300,000 people were without power in the Commonwealth. Heavy rain fell in parts of Massachusetts (Berkshire, Worcester,

Bristol, and Middlesex Counties), leading to minor and moderate flooding and ponding of water in low-lying, poor drainage areas, streams, creeks, and brooks. Several roadways were closed due to flooding. Rainfall totals ranged between one and four inches. There was one death in Massachusetts associated with this storm. Those counties included in the disaster received over $51 million in public assistance from FEMA.

1.1.24 Severe Storm and Flooding Event (FEMA DR-1895)—April 2010

A series of severe storms brought widespread rainfall to Massachusetts in March 2010, causing small streams to rise above their flood stages. Flooding continued into April, with prolonged river, reservoir, and lake flooding. This prolonged flooding, coupled with heavy rain and poor drainage flooding caused three injuries. Massachusetts received over $85 million in individual and public assistance as a result of this storm.

1.1.25 Severe Winter Storm and Snowstorm (FEMA DR-1959)—January 11-12, 2011

A developing Nor'easter coastal storm brought up to two feet of snow across Massachusetts in a 24-hour period. Strong winds, combined with heavy snow, produced numerous downed trees and wires and resulted in power outages to 100,000 homes statewide. Wind gusts between 49 and 57 mph were recorded in Eastham, Barnstable, Harwich, and Chatham. Between seven and 10 inches of snow was reported in southern Bristol County. The County had approximately $75,000 in property damage. This event resulted in a presidential disaster declaration (FEMA DR-1959) for the following counties: Berkshire, Essex, Hampden, Hampshire, Middlesex, Norfolk, and Suffolk. Those counties received over $25 million in public assistance grants.

1.1.26 Severe Storms and Tornadoes (FEMA DR-1994)—June 2011

The most recent tornado occurred June 1, 2011, impacting Hampden and Worcester Counties. Thunderstorms developed during the morning of June 1 and entered western Massachusetts in the form of supercells. A supercell eventually produced a tornado that entered Hampden County from the Berkshires. The cell produced an EF3 tornado, touching down in Westfield and continued on a 38-mile-long path through West Springfield, Springfield, Wilbraham, Monson, Brimfield, and Sturbridge. The tornado was on the ground for approximately 70 minutes. Two hours later, another supercell tracked north of the path of the EF3 tornado. It produced brief tornadoes in Wilbraham, North Brimfield, and Sturbridge. This series of tornadoes caused extensive property damage (over $227 million).

1.1.27 Tropical Storm/Hurricane Irene (FEMA DR-4028)—August 2011

Tropical Storm Irene (August 27-29, 2011) produced significant amounts of rain, storm surge, inland and coastal flooding, and wind damage across southern New England and much of the

east coast of the U.S. In Massachusetts, rainfall totals ranged between 0.03 inches (Nantucket Memorial Airport) to 9.92 inches (Conway, MA). Wind speeds ranged between 46 and 67 mph. Tide data included tides of 6.43 feet at Boston, 4.04 feet at Chatham, 5.57 feet at Fort Point, 5.39 feet at Plymouth, and 3.11 feet at Woods Hole. A presidential disaster was declared (FEMA DR-4028), and the Commonwealth received over $31 million in individual and public assistance from FEMA.

1.1.28 Severe Storm/Nor'easter (FEMA DR-4051)—October 29-30, 2011

A rare October Nor'easter brought heavy snow to portions of southern New England on October 29. Snowfall accumulations of one to two feet were common in the Monadnocks, Berkshires, Connecticut Valley, and higher elevations in central Massachusetts. Up to 31 inches of snow was reported in Plainfield, Massachusetts. The accumulation of the heavy, wet snow on trees and power lines resulted in widespread tree damage and power outages across central and western Massachusetts. At the peak, approximately 665,000 customers in Massachusetts were without power. Seventy-seven shelters were opened and housed over 2,000 residents. Governor Patrick declared a state of emergency on October 29. Six fatalities occurred during and in the aftermath of the storm. The Commonwealth had approximately $300,000 in property damage from this Nor'easter event. This event resulted in a presidential emergency declaration (FEMA EM-3343) for the following counties: Berkshire, Essex, Franklin, Hampden, Hampshire, Middlesex, Norfolk, and Worcester.

1.1.29 Hurricane Sandy (FEMA DR-4097)—October-November 2012

Hurricane Sandy was the largest Atlantic hurricane on record, spanning 1,100 miles in diameter. The storm's winds reached sustained speeds of 110 mph. Total losses in the U.S. as a result of this storm reached above $75 billion. According to NOAA records, a total of 157 deaths were attributed to this storm in the U.S.

1.1.30 Severe Winter Storm, Snowstorm, and Flooding (FEMA DR-4110)—February 8-10, 2013

The storm known as the "Blizzard of 2013" resulted from the convergence of several large low-pressure areas and produced widespread heavy snowfall. The storm caused snowfall greater than two feet in many areas throughout Massachusetts, with snowfall rates of one to two inches per hour at times, as well as wind gusts of up to 74 miles per hour. Many roads flooded, leading to evacuations and school closures. Travel was significantly affected across the Commonwealth and nearly 400,000 customers lost power. At least 15 people died throughout the Northeast as a result of this storm. Governor Patrick declared a state of emergency for all counties in Massachusetts on April 19 2013. The total Public Assistance cost estimate for this event was $43,265,351.

1.1.31 Severe Winter Storm, Snowstorm, and Flooding (FEMA DR-4214) —January 26-29, 2015

This storm brought two to three feet of snow to areas throughout southern New England. Daily snowfall records were set throughout the Commonwealth. Some of the highest totals reported in Massachusetts include Hudson (36 inches), Acton (34 inches), and Methuen (31.5 inches). All of the precipitation associated with this storm fell as snow. Blizzard conditions were reported in Marshfield, Hyannis, Nantucket, Boston, Chatham, Worcester, and Beverly. The storm also produced strong winds with gusts of up to 78 miles per hour in some locations. Significant flooding also occurred, particularly on the coastline south of Boston, where significant shoreline erosion was reported following the storm. The governor declared a travel ban on January 27 and Logan International Airport closed through January 28. 40 shelters opened as a result of this storm, serving 450 individuals. Two fatalities were reported – a 97 year old man who died while trying to clear a vent in his home, and a 53 year old man who died while snow-blowing his neighbor's driveway.

1.1.32 Severe Winter Storm and Flooding (FEMA DR-4372)—March 2-3, 2018

This extraordinary storm caused significant impacts across many communities, including historic flooding and damaging winds to the North Shore, Boston Harbor, South Shore, Cape Cod, and Nantucket. During the storm there were numerous recordings of wind gusts from 80-90 miles per hour, and recordings of gusts reaching 92-97 miles per hour. The strong winds, which reached hurricane-force levels, brought down hundreds of trees, damaged utility company wires, poles, and infrastructure, and caused widespread power outages throughout eastern Massachusetts. At the height of the storm, nearly 450,000 customers were without power. Twenty-seven long-term care facilities and several hospitals operated on backup generator power for up to 72 hours. The event caused widespread beach and dune erosion, flooding, and over wash and erosion affecting coastal roads, buildings, and infrastructure. There were two storm-related deaths: one person was killed by a tree that fell on their car and another person died of carbon monoxide poisoning attributable to the use of a generator at a home without power. The Massachusetts National Guard deployed soldiers and resources into 19 communities to perform 126 high water evacuation and rescue missions. In total, 355 people were rescued from flooded areas and evacuated to safety by the National Guard.

1.1.33 Severe Winter Storm and Snowstorm (FEMA DR-4379)—March 13-14, 2018

This significant severe winter storm occurred less than two weeks after FEMA DR-4372 and was the third event in a series of intense March storms. The storm system created very heavy snowfall, including record and near record snowfall, across much of the region and hurricane-

force wind gusts on Cape Cod and the Islands. Numerous utility poles and trees were downed by the combination of heavy snow and damaging winds. Additional coastal flooding occurred, resulting in further erosion and additional damage to structures impacted by the previous two March storms, including the March 2, 2018 storm whose damage totals far exceeded the state threshold required for a major disaster declaration. Hurricane force wind gusts and temperatures between 32ºF and 34ºF made the impacts on Cape Cod and the Islands far worse, with hundreds of thousands of people yet again without power. The Massachusetts Steamship Authority cancelled all ferry trips to and from Martha's Vineyard and Nantucket. Amtrak service was also suspended between Boston and New York City. According to the National Weather Service, Blizzard conditions were reached at many locations across eastern and southeastern Massachusetts during the storm on March 13, 2018. During the storm, there were recordings of wind gusts from 70-81 miles per hour. The strong winds, which in some areas reached hurricane-force levels, brought down trees; damaged utility company wires, poles, and infrastructure; and caused widespread power outages throughout eastern Massachusetts. At the height of the storm over 218,000 customers were without power. Thirty-one long-term critical care facilities and four hospitals resorted to operating on backup generator power. The Massachusetts Office of Coastal Zone Management reported additional beach and dune erosion, flooding, and over wash and erosion affecting coastal roads, buildings and infrastructure. Possible further damage to seawalls and other shore protection structures originally damaged in the previous March storms was also reported.

1.2 Additional Historical Events

Although the most severe and damaging events receive presidential disaster declarations, many other notable disaster events have occurred in the Commonwealth's history. The amount and type of information available about these events varies by hazard. Sources for each table are provided below the table.

Table B-2: Notable Dam Failure Events (Inland Flooding)

Date	Counties Impacted
May 16, 1874	The Williamsburg Reservoir in Williamsburg, Massachusetts, broke and flooded a valley in the town which contained factories and farms. The flood resulting from the dam failure killed 139 people which made it the deadliest dam failure in the United States at the time. The dam failure was blamed on negligence by the mill owners who owned the dam.
April 20, 1886	The Mud Pond Dam in East Lee, MA, failed and heavy damaged or destroyed approximately 12 shops and industries along Greenwater Brook. This failure killed seven people. The cause of the failure was unknown.
January 7, 1909	The Ashley Dam in Massachusetts failed due to piping during the first filling. No additional information regarding this failure was provided.
March 24, 1968	The Lee Lake Dam near East Lee, Massachusetts failed, destroying six homes, damaging 20 homes and one manufacturing plant. The failure caused two fatalities. The cause of the failure was unknown.
September 1999	Hurricane Floyd caused two dam failures and one overtopping in Massachusetts. One complete failure of a run of the river cyclopean structure almost took out a campground. The first overtopping was of an earthen dam that unraveled and exposed a water line that services a major city. The second overtopping was a roadway dam overtopping and failed; a road had to be closed and a pond was drained in a state park. Information regarding the location of these dam failures and overtopping were not provided.
April 4, 2004	Smiths Pond Dam in Leominster, Massachusetts failed due to heavy rains. The dam overtopped and the spillway was clogged by debris. Divers from the Leominster EMA and crane operators worked to clear the spillway.
February 2010	Forge Pond Dam, Freetown, is an earth filled dam more than 200 years old. In, heavy rains caused the dam to overtop and become unsafe. The DCR Office of Dam Safety determined that the dam posed a serious threat to public safety. Emergency actions were taken to stabilize the privately owned dam and no major damage occurred.

Source: 2013 SHMP, Lemoult, 2017

Table B-3: Landslide

Date	Description
1901	11 landslides occurred along the east face of Mount Greylock after heavy rains. This slide was reactivated again on May 13, 1990 producing an estimated 17,000 cubic yards of material.
1936	One home was destroyed and six others evacuated during a slide in North Adams.
August 7, 1990	A debris flow on Money Brook on the west side of Mount Greylock mobilized 3100 cubic yards of material.
June 13, 1996	Thunderstorms brought torrential rain and strong winds to several municipalities in western and central Franklin County. There were numerous reports of downed trees and power lines in Ashfield, Deerfield, Greenfield, and Whatley. Mudslides and flooding damaged the Ashfield Inn, the Greenfield Senior Citizens Center, and several homes in Greenfield.
April 16, 2007	A strong coastal storm brought heavy snow, strong winds, river and stream flooding, and significant coastal flooding. In Franklin County, multiple roads were closed to flooding. In the Town of Colrain, the flooding caused a mudslide to occur, which closed a portion of Route 112.
September 6, 2008	Remnants of Tropical Storm Hanna brought heavy rain to the area. Rainfall totals ranged between 3.5 to 5.5 inches. This resulted in widespread flooding across central Hampden County. In Wilbraham, multiple roads were flooded, including Main Street and several locations on Routes 20 and 32. Minor mudslides occurred on Route 32.
September 2008	A small landslide occurred in Holyoke covering several cars and a large paved area under several feet of mud and debris. It is thought the cause of this slide was saturated soils due to days of rain and poor urban drainage.
July 7, 2009	A system across southern New England produced showers and thunderstorms. In Middlesex County, numerous roads were flooded, and some were closed due to the rain. The most affected areas include Framingham and Marlborough. In Framingham, roads were closed due to mudslides, as well as flooding, including Routes 126 and 9.
March 14, 2010	Widespread rainfall across portions of Massachusetts totaled between three and six inches. This resulted in major flooding across eastern Massachusetts. A state of emergency was declared which led to a presidential disaster declaration (DR-1985). In Essex County, heavy rain resulted in the rapid erosion of a hill slope in Topsfield. This resulted in a mudslide across Route 1, which closed the road in both directions between Salem Road and the Danvers town line.
March 7, 2011	During this event, heavy rain, combined with melting snow, resulted in flooding of tributaries and major rivers. In Franklin County, in the Town of Greenfield, a water-soaked ridge near the Green River Cemetery gave way, resulting in a mudslide 13 inches deep that slid over Meridian and Water Streets. Three cars were buried, and the mud was up the foundations of three homes. This resulted in the evacuation of 17 people and approximately $100,000 in property damage.
August 2011	Hurricane Irene caused damage throughout portions of the Commonwealth, including a 5.8-mile section of Route 2 that was closed from West Charlemont to South County Road in Florida due to erosion and undercutting of the roadway, damage to retaining walls, debris flows, landslides, and bridge damage. The estimated cost of initial repairs was $23.5 million.
November 13-14, 2011	Landslides occurred in Deerfield in response to the October 31, 2011 snowstorm. These events caused clogging of culverts under the railroad and Routes 5 and 10, leading to siltation of a wetland and subsequent flooding of nearby homes.

Source: Cleland, 1902; New York Times, 1936; Dethier et al., 1992; Mabee and Kopera, 2011.

Table B-4: Notable Coastal Flooding Events

Date	Counties Impacted	Damage Estimates
1/31/2006	Eastern Plymouth, Suffolk, Eastern Essex, Barnstable, Nantucket	$155,000
10/28/2006	Southern Bristol	$10,000
4/15/2007	Southern Bristol, Southern Plymouth, Eastern Plymouth, Eastern Essex, Nantucket, Dukes, Barnstable, Eastern Norfolk, Suffolk	$45,000
4/16/2007	Southern Bristol, Southern Plymouth, Eastern Plymouth, Suffolk, Eastern Essex, Barnstable, Dukes, Nantucket	$45,000
4/17/2007	Suffolk, Eastern Plymouth, Eastern Essex, Eastern Norfolk, Dukes, Barnstable, Nantucket	$85,000
11/3/2007	Eastern Essex, Nantucket, Barnstable	$10,000
1/28/2008	Barnstable	$30,000
3/8/2008	Southern Plymouth	$5,000
11/25/2008	Eastern Essex	N/R
6/21/2009	Eastern Essex	N/R
6/22/2009	Barnstable	$3,000
10/18/2009	Nantucket, Dukes, Eastern Plymouth, Suffolk	N/R
12/3/2009	Southern Bristol	$5,000
1/2/2010	Eastern Essex	N/R
1/2/2010	Suffolk	N/R
1/2/2010	Eastern Plymouth, Eastern Norfolk	N/R
2/25/2010	Eastern Essex, Eastern Plymouth	N/R
3/1/2010	Eastern Essex, Eastern Norfolk	$20,000
3/4/2010	Eastern Plymouth, Eastern Essex	N/R
3/14/2010	Suffolk	N/R
3/15/2010	Eastern Plymouth, Eastern Essex	N/R
9/3/2010	Nantucket	N/R
10/6/2010	Eastern Plymouth	N/R
11/8/2010	Eastern Plymouth	$1,000
12/27/2010	Eastern Norfolk, Suffolk, Eastern Plymouth, Eastern Essex	$2,425,000
10/30/2011	Barnstable, Eastern Essex, Eastern Plymouth	$20,000
11/23/2011	Eastern Plymouth, Suffolk	N/R
6/2/2012	Eastern Essex	N/R
6/3/2012	Suffolk, Eastern Plymouth, Eastern Essex, Barnstable, Eastern Norfolk	$115,000
6/4/2012	Eastern Essex, Eastern Plymouth, Easter Norfolk, Dukes, Eastern Plymouth, Suffolk, Barnstable	$490,000

Date	Counties Impacted	Damage Estimates
10/29/2012	Southern Bristol, Dukes, Barnstable, Nantucket, Suffolk, Eastern Norfolk, Eastern Plymouth, Southern Plymouth	$15,041,000
12/27/2012	Barnstable, Dukes, Southern Plymouth, Eastern Norfolk, Eastern Plymouth, Eastern Essex	N/R
2/9/2013	Eastern Essex	$5,800,000
2/9/2013	Eastern Norfolk	$500,000
2/9/2013	Eastern Plymouth	$9,200,000
2/9/2013	Suffolk	$30,000
2/9/2013	Nantucket	$100,000
2/9/2013	Barnstable	$5,300,000
3/7/2013	Suffolk, Eastern Essex, Barnstable, Eastern Norfolk, Eastern Plymouth, Nantucket	$1,850,000
3/8/2013	Dukes	N/R
12/15/2013	Eastern Plymouth, Eastern Norfolk	N/R
1/2/2014	Eastern Essex, Eastern Plymouth, Suffolk, Eastern Norfolk, Eastern Plymouth	N/R
1/3/2014	Barnstable, Eastern Plymouth, Suffolk, Eastern Norfolk, Eastern Essex, Nantucket, Barnstable	N/R
3/26/2014	Eastern Plymouth, Nantucket, Barnstable	N/R
8/13/2014	Suffolk	N/R
10/22/2014	Eastern Plymouth	$75,000
10/23/2014	Suffolk, Eastern Plymouth, Eastern Norfolk	N/R
11/2/2014	Eastern Plymouth, Barnstable, Nantucket, Eastern Norfolk	N/R
1/27/2015	Eastern Plymouth	$1,500,000
1/27/2015	Barnstable	$750,000
1/27/2015	Eastern Norfolk	N/R
1/27/2015	Suffolk, Eastern Essex, Nantucket, Dukes	$100,000
2/15/2015	Eastern Plymouth, Barnstable, Nantucket	N/R
9/30/2015	Southern Bristol	N/R
10/2/2015	Eastern Plymouth, Suffolk	N/R
1/23/2016	Eastern Plymouth	N/R
1/24/2016	Eastern Plymouth, Eastern Essex, Suffolk, Nantucket	$3,000
2/8/2016	Dukes, Eastern Plymouth, Suffolk, Eastern Norfolk, Nantucket, Eastern Essex	N/R
5/25/2017	Eastern Essex	$40,000

N/R indicates that no damages were reported to the NCDC
Source: NOAA NCDC Storm Events Database

Table B-5: Notable Temperature Events

Low Temperatures		High Temperatures	
Date	Type	Date	Type
1/15/1994	Cold	1/13/1995	Record Warmth
1/18/1994	Cold	7/13/1995	Record Heat
1/19/1994	Cold	2/22/1997	Record Warmth
1/27/1994	Cold	1/3/1998	Record Warmth
1/17/2000	Extreme Cold	3/27/1998	Record Warmth
5/20/2002	Freeze	3/28/1998	Record Warmth
5/22/2002	Freeze	3/31/1998	Record Warmth
10/15/2002	Freeze	9/27/1998	Record Heat
1/15/2004	Extreme Cold/Wind Chill	12/2/1998	Record Warmth
1/25/2007	Cold/Wind Chill	12/7/1998	Record Warmth
2/3/2007	Extreme Cold/Wind Chill	1/24/1999	Record Warmth
1/1/2009	Cold/Wind Chill	2/12/1999	Record Warmth
1/16/2009	Cold/Wind Chill	3/18/1999	Record Warmth
4/29/2009	Frost/Freeze	6/7/1999	Excessive Heat
5/19/2009	Frost/Freeze	6/7/1999	Record Heat
6/1/2009	Frost/Freeze	7/4/1999	Excessive Heat
5/9/2010	Frost/Freeze	7/5/1999	Record Heat
5/13/2010	Frost/Freeze	7/16/1999	Record Warmth
1/23/2011	Extreme Cold/Wind Chill	7/17/1999	Record Warmth
1/22 – 1/24/2013	Cold/Wind Chill	7/18/1999	Record Warmth
1/02/2014	Cold/Wind Chill	9/7/1999	Record Warmth
1/07/2014	Cold/Wind Chill	3/8/2000	Record Warmth
1/21/2014	Cold/Wind Chill	5/8/2000	Record Heat
1/26-1/28/2014	Cold/Wind Chill	5/9/2000	Record Heat
1/7/2015	Extreme Cold/Wind Chill	10/14/2000	Record Warmth
1/30- 2/2/2015	Cold/Wind Chill	12/17/2000	Record Warmth
2/5/2015	Cold/Wind Chill	4/24/2001	Record Heat
2/13/2015	Cold/Wind Chill	5/2/2001	Record Heat
2/15- 2/16/2015	Extreme Cold/Wind Chill	5/3/2001	Record Heat
2/19-2/20/2015	Extreme Cold/Wind Chill	5/4/2001	Record Heat
2/23/2015	Cold/Wind Chill	5/12/2001	Record Heat
2/13-2/14/16	Extreme Cold/Wind Chill	7/6/2010	Excessive Heat
12/15/2016	Cold/Wind Chill	7/21/2011	Excessive Heat
3/11/2017	Cold/Wind Chill	7/5-2/6/2013	Heat
		7/19/2013	Heat

Source: NOAA NCDC Storm Events Database; Masslive.com

Table B-6: Wildfire

Date	Description
May 1957	One of the largest wildfires on record was in Plymouth. This catastrophic fire burned 15,000 acres and destroyed about 40 structures.
1964	Another large fire in the Plymouth area burned 5,500 acres and destroyed cottages on Charge Pond.
July 5-7, 2002	Smoke from wildfires across the Nemiscau region of northern Quebec became trapped under a subsidence inversion and was transported south across western Massachusetts. The fires were started by hot and dry weather conditions over that region of Canada, followed by an unusual amount of thunderstorm activity. The smoke obscured the sky and reduced surface visibility to as low as one mile. Advisories were issued in the Commonwealth, warning people with respiratory issues to remain indoors and all individuals to limit their outside activities.
April 4-5, 2012	Dry conditions, combined with wind gusts between 25 and 30 mph, produced ideal conditions for fire spread. A brush fire in Brimfield moved into an area of blown down debris from a tornado and became difficult to control. Due to a thunderstorm, firefighters had to stop until the storm passed. This brush fire burned approximately 50 acres. No structures were destroyed; however, many homes were threatened.
April 19, 2012	Dry conditions, along with gusty winds, caused a fire in the meadowlands to spread in Dedham. The fire burned approximately one acre just off Route 56 on the Leicester-Paxton line. One firefighter was injured.
April 19-20, 2012	Dry conditions, along with gusty winds, caused a fire to spread near Route 128 on the Dedham-Boston line. Almost 100 acres of meadowlands burned.
March 8-9, 2016	A brush fire on Tekoa Mountain near Westfield, Massachusetts started on March 8, 2016 and spread quickly as a result of very dry weather in the previous days and weeks. Weather on March 8th and 9th was favorable for fire fighters with light winds and relative humidity values around 50%. Despite this, the fire spread to about 60 acres before fire fighters were able to contain it. One of the reasons for the quick fire spread was the lack of hydrants or water lines in the vicinity, requiring fire fighters to carry in water on their backs. By 2pm on March 9, fire fighters deemed the fire 90 percent contained. The area of the fire was very remote and no structures were in the area of the fire.
July 22-24, 2016	Lightning started a fire on Joint Base Cape Cod on July 22nd. The fire was discovered early Saturday (July 23) but burned through the night and into the following day (July 24). The fire was contained to 125 acres after 36 hours of fighting the fire. Dry conditions throughout southern New England contributed to the spread of the fire through dry brush and trees. Four helicopters from the Massachusetts State Police and the Army National Guard shuttled back and forth between Snake Pond in Sandwich and the areas on the base that were inaccessible to firefighters.

Source: 2013 SHMP, Boston Globe

Table B-7: Winter Storm

Year	Date	NESIS Score
1958	Feb 14-17	6.25
1960	Mar 02-05	8.77
1960	Dec 11-13	4.53
1961	Jan 18-21	4.04
1961	Feb 02-05	7.06
1964	Jan 11-14	6.91
1966	Jan 29-31	5.93
1969	Feb 22-28	4.29
1969	Dec 25-28	6.29
1972	Feb 18-20	4.77
1978	Jan 19-21	6.53
1978	Feb 05-07	5.78
1979	Feb 17-19	4.77
1983	Feb 10-12	6.25
1987	Jan 21-23	5.4
1993	Mar 12-14	13.2
1994	Feb 08-12	5.39
1996	Jan 06-08	11.78
2003	Feb 15-18	8.91
2005	Jan 21-24	6.8
2006	Feb 12-13	4.1
2007	Feb 12-15	5.63
2009	Dec 18-21	4.03
2010	Feb 9-11	4.1
2010	Feb 23-28	5.46
2010	Dec 24-28	4.92
2011	Jan 9-13	5.31
2011	Feb 1-3	5.3
2013	Feb 7-10	4.35
2014	Jan 29-Feb 4	4.08
2014	Feb 11-14	5.28
2015	Jan 29-Feb 3	5.42
2016	Jan 22-24	7.66
2017	Mar 12-15	5.03

Source: NESIS storm database

Table B-8: Tornadoes

Location	Date	F/EF Scale*	Deaths/Injuries	Property Damage
Essex Co.	8/21/1951	F2	0/0	$2,500
Dukes Co.	12/18/1951	F2	0/0	$0
Worcester Co.	6/9/1953	F4	90/1,228	$250,000,000
Worcester Co.	6/9/1953	F3	0/1	$2,500,000
Norfolk Co.	6/9/1953	F3	0/15	$2,500,000
Bristol Co.	6/9/1953	F3	0/1	$2,500,000
Franklin Co.	7/14/1954	F1	0/0	$2,500
Hampshire Co.	8/16/1954	F1	0/0	$2,500
Franklin Co.	7/5/1955	F2	0/0	$2,500
Berkshire Co.	7/12/1955	F2	0/0	$0
Worcester Co.	10/24/1955	F1	0/0	$2,500
Middlesex Co.	10/24/1955	F1	0/0	$2,500
Hampden Co.	6/1/1956	F1	0/0	$250,000
Hampden Co.	6/1/1956	F1	0/0	$25,000
Hampden Co.	6/1/1956	F1	0/0	$25,000
Worcester Co.	6/1/1956	F1	0/14	$25,000
Essex Co.	6/13/1956	F1	0/0	$2,500
Hampden Co.	9/12/1956	F1	0/0	$250
Worcester Co.	11/21/1956	F2	0/0	$2,500,000
Essex Co.	11/21/1956	F2	0/0	$25,000
Norfolk Co.	11/21/1956	F2	0/0	$2,500
Essex Co.	12/18/1956	F1	0/0	$250
Franklin Co.	5/10/1957		0/0	$250
Franklin Co.	5/10/1957	F1	0/0	$250
Middlesex Co.	6/19/1957	F1	0/0	$25,000
Middlesex Co.	6/19/1957	F1	0/0	$250
Worcester Co.	6/19/1957	F1	0/0	$25,000
Hampshire Co.	7/5/1957	F1	0/0	$2,500
Worcester Co.	7/5/1957	F2	0/0	$2,500
Hampden Co.	6/26/1958	F1	0/0	$250
Franklin Co.	7/11/1958	F2	0/0	$2,500
Worcester Co.	7/11/1958	F1	0/0	$250
Worcester Co.	7/11/1958	F1	0/0	$2,500
Middlesex Co.	7/11/1958	F2	0/0	$250,000

Location	Date	F/EF Scale*	Deaths/Injuries	Property Damage
Worcester Co.	7/16/1958	F1	0/1	$2,500
Worcester Co.	7/29/1958	F1	0/0	$2,500
Franklin Co.	8/13/1958	F1	0/0	$2,500
Hampshire Co.	8/14/1958	F2	0/0	$250,000
Middlesex Co.	8/25/1958	F2	0/0	$2,500
Berkshire Co.	9/7/1958	F0	0/0	$2,500
Plymouth Co.	9/7/1958	F0	1/1	$2,500
Essex Co.	7/13/1960	F0	0/0	$30
Franklin Co.	7/2/1961	F0	0/0	$25,000
Middlesex Co.	7/3/1961	F0	0/0	$25,000
Hampshire Co.	7/21/1961	F2	0/0	$25,000
Essex Co.	7/21/1962	F1	0/3	$25,000
Worcester Co.	10/12/1962	F2	0/0	$25,000
Franklin Co.	5/20/1963	F2	0/0	$25,000
Worcester Co.	5/20/1963	F2	0/0	$25,000
Worcester Co.	5/20/1963	F2	0/0	$25,000
Worcester Co.	5/20/1963	F2	0/0	$2,500
Middlesex Co.	7/18/1963	F1	0/0	$25,000
Hampden Co.	7/21/1963	F0	0/0	$2,500
Franklin Co.	9/12/1963	F1	0/0	$2,500
Berkshire Co.	10/3/1963	F1	0/0	$2,500
Essex Co.	5/19/1964	F0	0/0	$2,500
Essex Co.	5/19/1964	F1	0/0	$2,500
Plymouth Co.	7/4/1964	F1	0/0	$250,000
Franklin Co.	7/29/1964	F0	0/0	$25,000
Franklin Co.	7/29/1964	F1	0/0	$25,000
Hampshire Co.	5/27/1965	F1	0/0	$250
Plymouth Co.	6/9/1965	F0	0/0	$30
Essex Co.	8/10/1965	F1	0/0	$0
Middlesex Co.	8/28/1965	F2	0/0	$250,000
Berkshire Co.	3/1/1966	F2	0/0	$25,000
Berkshire Co.	8/11/1966	F2	0/0	$25,000
Hampden Co.	8/11/1966	F2	0/0	$250,000
Worcester Co.	8/31/1966	F2	0/0	$0
Worcester Co.	8/31/1966	F0	0/1	$250

Location	Date	F/EF Scale*	Deaths/Injuries	Property Damage
Plymouth Co.	11/18/1967	F2	0/0	$250
Essex Co.	7/1/1968	F1	0/1	$250,000
Worcester Co.	7/17/1968	F1	0/0	$2,500
Hampden Co.	7/19/1968	F0	0/0	$250
Bristol Co.	8/9/1968	F1	0/4	$25,000
Bristol Co.	8/9/1968	F1	0/0	$2,500
Barnstable Co.	8/9/1968	F1	0/0	$2,500
Worcester Co.	5/29/1969	F1	0/0	$2,500
Berkshire Co.	6/18/1970	F1	0/0	$250,000
Middlesex Co.	7/11/1970	F1	0/0	$25,000
Bristol Co.	8/2/1970	F1	0/0	$25,000
Franklin Co.	8/17/1970	F1	0/0	$250,000
Bristol Co.	8/28/1970	F2	0/0	$25,000
Hampden Co.	10/3/1970	F1	0/0	$0
Worcester Co.	10/3/1970	F3	0/0	$250,000
Middlesex Co.	10/3/1970	F3	1/0	$250,000
Middlesex Co.	7/1/1971	F1	0/1	$25,000
Worcester Co.	7/1/1971	F1	0/2	$25,000
Franklin Co.	7/17/1971	F1	0/0	$2,500
Hampshire Co.	9/13/1971	F3	0/0	$25,000
Worcester Co.	11/7/1971	F1	0/0	$2,500
Middlesex Co.	11/7/1971	F1	0/0	$250
Franklin Co.	7/3/1972	F1	0/0	$2,500
Franklin Co.	7/3/1972	F1	0/0	$2,500
Middlesex Co.	7/21/1972	F2	0/4	$2,500,000
Essex Co.	7/21/1972	F1	0/0	$2,500
Hampden Co.	8/9/1972	F1	0/0	$2,500
Norfolk Co.	8/9/1972	F1	1/6	$25,000
Worcester Co.	8/9/1972	F2	0/1	$25,000
Franklin Co.	8/27/1972	F2	0/0	$25,000
Hampden Co.	9/14/1972	F1	0/0	$2,500
Bristol Co.	9/14/1972	F0	0/0	$2,500
Franklin Co.	8/2/1973	F0	0/0	$250
Berkshire Co.	8/28/1973	F4	4/36	$25,000,000
Norfolk Co.	9/6/1973	F1	0/0	$25,000

Location	Date	F/EF Scale*	Deaths/Injuries	Property Damage
Middlesex Co.	9/29/1974	F3	0/1	$250,000
Berkshire Co.	7/13/1975	F2	0/0	$25,000
Hampden Co.	7/24/1975	F2	0/0	$25,000
Worcester Co.	5/3/1976	F1	0/0	$2,500
Hampden Co.	6/29/1977	F1	0/0	$0
Barnstable Co.	8/22/1977	F1	0/2	$25,000
Berkshire Co.	7/27/1978	F0	0/0	$250
Worcester Co.	8/10/1979	F2	2/2	$2,500,000
Hampden Co.	8/10/1979	F1	0/1	$25,000
Worcester Co.	6/22/1981	F3	0/3	$25,000
Middlesex Co.	7/18/1983	F0	0/0	$250
Franklin Co.	8/1/1983	F0	0/0	$30
Hampshire Co.	7/5/1984	F1	0/0	$2,500
Franklin Co.	7/5/1984	F1	0/0	$25,000
Berkshire Co.	7/11/1984	F1	0/0	$25,000
Middlesex Co.	9/27/1985	F1	0/0	$250
Middlesex Co.	8/7/1986	F1	0/0	$250,000
Worcester Co.	8/8/1986	F1	0/0	$2,500
Plymouth Co.	9/16/1986	F1	0/0	$250,000
Worcester Co.	7/10/1989	F1	0/0	$250,000
Worcester Co.	7/10/1989	F1	0/0	$250,000
Worcester Co.	7/10/1989	F1	0/0	$250,000
Worcester Co.	7/10/1989	F1	0/0	$250,000
Norfolk Co.	7/10/1989	F0	0/0	$2,500
Plymouth Co.	7/10/1989	F1	0/1	$25,000
Plymouth Co.	7/10/1989	F0	0/0	$25,000
Norfolk Co.	5/18/1990	F0	0/0	$2,500
Norfolk Co.	5/18/1990	F0	0/0	$2,500
Worcester Co.	8/10/1990	F0	0/0	$300
Essex Co.	8/15/1991	F1	0/0	$250,000
Hampden Co.	6/24/1992	F0	0/0	$0
Franklin Co.	6/27/1992	F0	0/4	$25,000
N. Egremont	5/29/1995	F4	3/24	$250
Florida	7/3/1997	F1	0/0	$15,000
Heath	7/3/1997	F1	0/0	$50,000

Location	Date	F/EF Scale*	Deaths/Injuries	Property Damage
Monterey	7/3/1997	F2	0/0	$1,500,000
West Otis	7/3/1997	F2	0/0	$1,500,000
Charlemont	7/3/1997	F1	0/0	$50,000
Richmond	7/3/1997	F1	0/0	$50,000
Westport	8/6/1997	F0	0/0	$0
Plymouth	8/20/1997	F0	0/0	$0
Leads	6/2/2000	F1	0/0	$0
Princeton	6/17/2001	F1	0/0	$25,000
Bellingham	6/30/2001	F0	0/0	$0
West Brookfield	7/23/2002	F1	0/0	$50,000
Pittsfield	8/20/2004	F0	0/0	$25,000
Franklin	8/21/2004	F1	0/0	$1,500,000
Great Barrington	6/29/2005	F0	0/0	$0
Wendell	7/11/2006	F2	0/0	$200,000
New Braintree	7/19/2007	EF0	0/0	$0
South Swansea	7/23/2008	EF0	0/0	$15,000
Westfield	6/1/2011	EF3	3/200	$227,600,000
Fiskdale	6/1/2011	EF3	0/0	$0
Indian Orchard	6/1/2011	EF1	0/0	$0
Brimfield	6/1/2011	EF1	0/0	$0
Fiskdale	6/1/2011	EF0	0/0	$0
White Horse Beach	7/24/2012	EF0	0/0	$3,000
Stoughton	5/9/2013	EF0	0/0	$20,000
Baconville	9/1/2013	EF0	0/0	$0
North Adams JCT	7/27/2014	EF1	0/0	$0
Chelsea	7/28/2014	EF2	0/2	$4,000,000
South Worcester	8/31/2014	EF0	0/0	$100,000
Wrentham	6/23/2015	EF0	0/0	$20,000
Mantyranta	6/23/2015	EF0	0/0	$25,000
Concord	8/22/2016	EF1	0/0	$1,000,000
Goshen	2/25/2017	EF0	0/0	$34,000
South Ashfield	2/25/2017	EF1	0/1	$400,000
TOTAL:			105/1,561	$534,041,000

Source: NOAA NCDC Storm Events Database

Table B-9: Earthquake

Date	Description
October 16, 1963	The earthquake caused some plaster to fall in Somerville, and a wall was reported cracked and stones fell from a building foundation (Modified Mercali intensity VI). Dishes were broken and many persons were alarmed in Amesbury, and a window was cracked in Winthrop. The other earthquakes did not exceed Modified Mercalli Intensity V. The residents of Nantucket Island were jolted by a moderate earthquake on October 24, 1965. Very slight damage, mostly to ornaments, was reported. Doors, windows, and dishes rattled, and house timbers creaked.
April 2012	A swarm of 12 or more earthquakes occurred off the New England coast on the continental shelf about 250 miles east of Boston. The largest earthquake measured Magnitude 4.4 on the Richter scale. This swarm was of particular concern because of the major earthquake on the continental shelf further north in 1929 that produced a deadly and damaging tsunami in Nova Scotia. In October 2012, a 4.6 earthquake centered in Maine was felt throughout Massachusetts, as well as other New England states.

Sources: 2013 SHMP