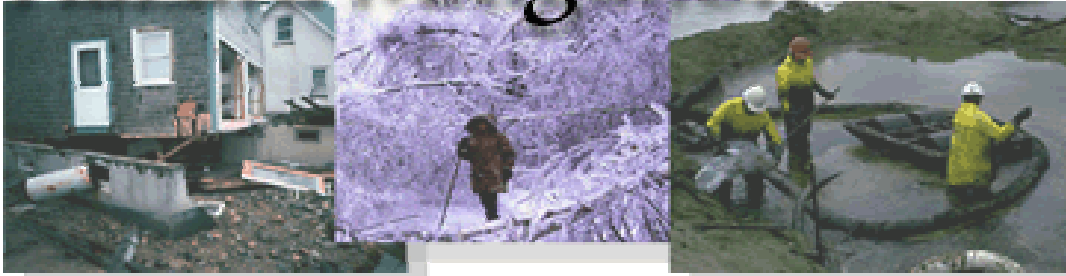


Hazard Mitigation



Managing Risks, Lowering Costs

Natural Hazards Mitigation Planning: A Community Guide

A step-by-step guide
to help Massachusetts
communities deal with
multiple natural
hazards and
to minimize
future losses

Prepared by

Massachusetts Department of Environmental Management
Massachusetts Emergency Management Agency
Massachusetts Hazard Mitigation Team



With assistance from

Federal Emergency Management Agency
Natural Resources Conservation Service



January 2003

Mitt Romney, Governor · Peter C. Webber, DEM Commissioner · Stephen J. McGrail, MEMA Director



Preface

The original version of this workbook was published in 1997 and entitled, *Flood Hazard Mitigation Planning: A Community Guide*. Its purpose was to serve as a guide for the preparation of a streamlined, cost-efficient flood mitigation plan by local governments and citizen groups. Although the main purpose of this revised workbook has not changed from its original mission, this version has been updated to encompass all natural hazards and to assist Massachusetts' communities in complying with the all hazards mitigation planning requirements under the federal Disaster Mitigation Act of 2000 (DMA 2000). The parts of this workbook that correspond with the requirements of DMA 2000 will be noted through the workbook with this symbol:

**DMA 2000
Interim Final Rule
Section 201.6**

The strong home-rule form of government in Massachusetts means that local governments in the Commonwealth are the primary decision-makers for disaster management through land use measures, building codes, zoning, and other regulatory tools. Development of an all hazards mitigation plan at the local level allows a community to effectively address a variety of risks resulting from natural hazards. This step-by-step guide is intended to help expand a community's capability in dealing with all natural hazards, to minimize future disaster losses, to identify mitigation activities and to assist in securing funding for future hazard mitigation projects.

The resulting plans will meet the requirements of the DMA 2000, which calls for communities to have an all hazards mitigation plan in place by November 1, 2004 in order to qualify for future funding under the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP). In addition, these plans can assist a community in applying for other hazard mitigation project funding, such as FEMA's pre-

disaster mitigation program, the Flood Mitigation Assistance (FMA) program, as well as other federal, state and private funding sources.

Although the Commonwealth of Massachusetts has had a statewide Hazard Mitigation Plan in place since 1986, there has been little opportunity for community participation and input in the planning process to minimize future disaster damages. A secondary goal of the workbook is to encourage the development of community-based plans and obtain local input into Massachusetts' state mitigation planning efforts in order to improve the state's capability to plan for disasters and recover from damages. It is our hope that this revised workbook continues to prove useful in tailoring a plan to meet the specific needs of each municipality.

This workbook can also help communities obtain credit under the National Flood Insurance Program Community Rating Systems, or CRS. The CRS provides credits in the form of reduced flood insurance premiums for policyholders in communities performing floodplain management activities beyond minimum standards.

If your community is in CRS or wants to join, up to 210 points credit can be obtained by using this workbook to prepare a Floodplain Management Plan as described in CRS Activity 510. This activity gives communities credit for the planning process undertaken to identify and reduce flood hazards. This workbook covers all the required steps to get credit for preparing a CRS Floodplain Management Plan. The areas corresponding to CRS credit will be noted through the workbook with this symbol:

**CRS
Activity 510.e**

Acknowledgments

The 1997 version of this document was conceived by Richard Thibedeau, former State Hazard Mitigation Officer and Director of the Bureau of Resource Protection of the Massachusetts Department of Environmental Management. The majority of the content in the 1997 version and this revised workbook represents the work not only of Massachusetts's environmental planning staff, but also of floodplain managers and disaster recovery specialists throughout the nation who are striving toward the common goal of reducing future losses from natural disasters. Special recognition is due to the authors of the *Flood Hazard Mitigation in Northeastern Illinois* workbook, the *Wisconsin Community Flood Mitigation Planning Guidebook*, and the *Community Rating System Floodplain Management Plan*. Their excellent publications have helped shape the format and content of this workbook, as have the many additional documents referenced in the Bibliography.

Original Research and Development by

Clancy Phillipsborn, President
The Mitigation Assistance Corporation

Original Writing, Layout and Production by

Michele Steinberg, Regional Planner and Richard Zingarelli, Program Manager,
Massachusetts Department of Environmental Management, Flood Hazard Management Program

1997 Editor

Miriam G. Anderson, Regional Planner
Massachusetts Department of Environmental Management, Flood Hazard Management Program

2002 Editors

Miriam G. Anderson, Regional Planner, Massachusetts Department of Environmental Management,
Flood Hazard Management Program

Donna Nelson, Hazard Mitigation Planner, Massachusetts Emergency Management Agency &
Department of Environmental Management

Candice Tanner, Disaster Recovery Coordinator, Massachusetts Emergency Management Agency

Additional Review and Development Provided by

Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement

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Natural Hazards Can Happen Anywhere

Storm Surge: Furious Nor'easter Pounds Bay State

Boston Herald, March 7, 2001

Blizzard Blasts Coast

*Coastlines,
MA Coastal Zone Management
Newsletter, Spring 2001*

Now is the ideal time to plan for an expansion, giving disaster prevention as much priority as disaster relief.

*The Boston Globe editorial
following Tropical Storm Floyd,
September 23, 1999*

The October 1996 flood was the most destructive small stream flooding since the spring floods of 1987.

*FEMA's Interagency Hazard Mitigation
Team Report, January 1997*

No-Name storm's personal legacy Emotional scars remain a year after furious northeaster

*The Boston Globe,
North Weekly, Oct. 25, 1992*

Bob Blows by, leaves millions without power

*The Boston Globe,
August 20, 1991*

Massachusetts is susceptible to a variety of natural hazards – floods, severe thunderstorms, nor'easters/winter storms, tornadoes, hurricanes, wildfires, and drought. These natural events can happen anywhere, whether in a rural town in the Berkshires, a mill city on the Merrimack River or a summer haven on the Atlantic Ocean. The economic costs of natural hazards, especially the number one hazard in Massachusetts -- flooding -- can be staggering.

In Massachusetts alone, since 1978 there has been over \$197 million paid in flood insurance claims, and an estimated \$108 million worth of damage to public property, with repair paid by federal, state and local tax dollars. Most recently, the March/April 2001 floods caused nearly \$8 million in flood and storm damage along the Massachusetts coastline. Previous flooding in June 1998 caused more than \$9 million in damage throughout eastern Massachusetts. Approximately 92% of these damaged properties were previously damaged during the October 1996 storms which were more severe and caused more than \$90 million in flood damage to private and public property throughout the greater Boston area and surrounding suburbs.

Major events such as the Blizzard of 1978, Hurricane Bob in August 1991 and the October 1991 coastal storm as well as numerous smaller floods, have damaged infrastructure, residences and businesses throughout Massachusetts. In addition to these losses, floods can endanger lives and wreak social and emotional devastation in a community.

Reacting to the overwhelming damage caused by natural hazards is necessary. But merely responding after a flood does nothing to prevent people from becoming future victims or to reduce the damage and the economic losses incurred by floods. Action can be taken ahead of time, however, to prevent or minimize future damages.



March 2001 Coastal storm in Hull, MA

A community plan that identifies actions to be done now can keep your town or city from becoming a disaster area in the future. What can you do to prevent your community from making the headlines? Using this workbook to develop a community Multiple Hazards Mitigation Plan will help your town or city to break the cycle of repeated damages while helping to achieve other community goals as well, such as increasing communication and disaster awareness.

WHAT A HAZARD MITIGATION PLAN WILL DO FOR YOU

What is Hazard Mitigation?

Hazard mitigation is any sustained action taken to reduce or eliminate long-term risk to life and property resulting from natural hazards (flooding, storms, high winds, hurricanes, wildfires, earthquakes, etc.). Mitigation assists in helping to minimize damages that occur as the result of a natural disaster to structures, infrastructure, and other resources.

Why a Community Plan for Natural Hazard Mitigation?

The purpose of this workbook is to help communities develop all hazards mitigation plans *before disaster strikes*. An effective plan will improve your community's ability to deal with natural disasters and will document valuable local knowledge on the most efficient and effective ways to reduce losses to life and property. Preparing a plan to lessen the impact of a disaster before it happens will provide the following benefits to your community:

- Reduce public and private damage costs;
- Reduce social, emotional, and economic disruption;
- Increase access to funding sources for hazard mitigation projects; and
- Improve ability to implement post-disaster recovery projects.



Meet Community Needs: By using this workbook, community officials and residents will be guided through a planning process that promotes coordination with other community needs and relies on public input. Because every community differs in terms of economics, size, geography, governance, demography, land uses, and hazards, the final product will not be the same as any other community's plan. The planning process will help identify the unique problems and solutions for your area.

Address Multiple Objectives: The planning process in this workbook can be used to address flood, wind, seismic and fire hazards, (to name a few) as well as additional objectives, depending

on the community's needs. Developing a plan using this workbook can help your community take a comprehensive approach to finding the best solutions, solve more than one problem with a single solution, and even maintain or improve local environmental and economic integrity.

Promote Public Input: The planning process promotes public input and coordination among all parties. This helps generate ideas for solutions and ensures recognition and local ownership of problems. Public input will help ensure that groups and individuals concerned about damages caused by natural hazards take part in solving problems and implementing planned actions.

Improve Funding Eligibility: Using this planning process also means a community can increase its chances of receiving planning and implementation funds from a variety of sources, as well as become eligible for credit under a program called the Community Rating System (CRS), which provides discounts on National Flood Insurance Protection (NFIP) flood insurance premiums for residents of communities voluntarily participating in

this program. This planning process will also assist communities in meeting the new hazard mitigation planning requirements under the federal Disaster Mitigation Act of 2000 (DMA 2000). DMA 2000 mandates that all communities must have a Multiple Hazards Mitigation Plan in place by November 1, 2004 in order to qualify for future federal post-disaster mitigation grant funding under the Federal Emergency Management Agency's (FEMA) Hazard Mitigation Grant Program (HMGP).

How is Hazard Mitigation Different from Emergency Response?

The term "hazard mitigation" means preventative actions a community can take now to help reduce the destruction caused in a major hazardous event in the future. Hazard elimination and loss prevention are not the same thing as emergency response. Some hazard loss reduction can be achieved by components of response plans and preparedness plans, such as a flood warning system or a plan to evacuate residents in an area stricken by wildfire. However, warning and evacuation deal only with the immediate needs prior to, during, and following a disastrous event. Hazard mitigation is much more effective when it is directed toward reducing the need to respond to emergencies by lessening the impact of the hazard ahead of time.

Much of what your community is doing now may be helping to reduce natural hazards. Developing a long-term hazard mitigation plan allows communities to identify additional actions that can be done now to reduce the future impacts of disasters.

What's So Important About Planning for Disasters?

Natural disasters are a fact of life. When we hear about a natural disaster, such as flooding, earthquake or a wildfire, we are hearing about a natural event where people, structures, and infrastructure are in harm's way. Disasters will occur again and again – but they don't have to mean repeated damages for your community. A plan for reducing the hazardous impacts of disasters is vital if your community has residences, businesses, industries, roads, bridges, or public facilities that are vulnerable to damages.



Disasters cost money. After a major, natural disaster, communities may receive economic assistance from the state or the federal government to repair damages and recover from disaster losses. In these cases, however, communities are still expected to carry a significant share of recovery costs. In an event that does not affect a large area, a city or town may find itself shouldering the entire financial burden for disaster damages to public property. Home and business owners may discover there are few or no grants or loans to help them get back on their feet. These economic realities mean that it is vital for communities to take action now to prevent costly future damages.

Problems can be solved through existing measures. Local governments throughout Massachusetts have many land use regulations, conservation measures, and flood control initiatives in place that go a long way toward reducing future disaster losses. Evaluation of these measures to see where they can be coordinated or strengthened, using the planning process outlined in this workbook, can help ensure that cities and towns are doing all they can to prevent the next disaster.

The Disaster Mitigation Act of 2000

On October 10, 2000, Congress approved the Disaster Mitigation Act of 2000 (DMA 2000), also known as the 2000 Stafford Act amendments. President Clinton signed the bill into law on October 30, 2000, creating Public Law 106-390. DMA 2000 establishes a national program for pre-disaster mitigation while streamlining the federal administration of disaster relief. The purpose of the DMA 2000 tribal and local mitigation planning criteria is to standardize planning requirements over time, and help to eliminate the separate planning requirements currently in place for all FEMA mitigation programs.



Specific rules on the implementation of DMA 2000 were published in February 2002 in the Federal Register as the *Interim Final Rule*, 44 CFR Parts 201 and 206. These rules provide information on the policies and procedures for mitigation planning as required by Section 322 of the Stafford Act 42 U.S.C. 5165. DMA 2000 requires that all communities must have a Multiple Hazards Mitigation Plan in place by November 1, 2004 in order to qualify for future federal disaster mitigation grants under FEMA's HMGP program implemented following a Presidential disaster declaration. The Interim Final Rule and more information on the HMGP program may be found in Appendix C.

How Does This Plan Tie In To The Massachusetts Watershed Initiative?

The Massachusetts Watershed Initiative was launched in December 1993 at a special forum of environmental, business, municipal, and governmental interests. The forum called for a working group to develop a model approach for watershed-based environmental assessment, planning, and decision making, to address non-point source pollution issues and other environmental problems. Central to the success of the watershed approach is a shift from top-down, federal and state-driven environmental management, to bottom-up, locally focused environmental management. For a complete listing of the 15 watershed basin teams and affiliated organizations, go to the website of the Executive Office of Environmental Affairs at www.mass.gov/envir.

This workbook encourages local planning efforts that will address natural hazards as well as community goals of solving environmental problems such as water pollution. Communities can draw on the network of resources afforded by basin teams that will help assess environmental issues that may impact or be impacted by local flood hazards.



February 1978 Blizzard

How Does This Plan Tie In To Post-Disaster Recovery?

The plan you develop using this workbook will emphasize actions to be taken now to reduce or prevent future disaster damages. However, the plan will also be useful in preparing your community to deal with the post-disaster scenario by identifying actions that should be done immediately following the disaster event. This will help guide the recovery of the community in a way that will further reduce future damages.

The plan will help your community to develop policies and programs in the “calm before the storm,” promote a more rapid and efficient recovery, and make the most of post-disaster opportunities for safety improvements. Getting ready for how the community will recover while mitigating hazards in the post-disaster scenario is important, because a natural disaster will increase:

- **Awareness:** the idea of hazard mitigation is more easily understood by the public immediately following a disaster.
- **Opportunities:** during the reconstruction and recovery period, land use and other objectives, as well as hazard mitigation, can be promoted.
- **Assistance:** technical and financial resources from outside the community will be available.
- **Pressure:** community residents will want reconstruction and rebuilding to occur very quickly.

Having a plan that includes post-disaster actions will ensure that opportunities for mitigation are not overlooked or lost in the urgency to rebuild, while facilitating swift reconstruction and recovery.



After the storm: a former home in Scituate.



Before the next storm – mitigation in Mattapoiset

How Do We Use This Workbook?

This workbook is a simple, effective guide for local officials to complete the steps and activities necessary to develop a local natural hazard mitigation plan.

The explanation of each step begins on a new page. For most steps, the explanation will be on the left hand page, with checklists, examples, and references to help you carry out that particular activity on the facing page. At the end of the workbook are several appendices that provide more detailed information, including lists of agency resources and publications, points of contact, and sources of potential financial and technical assistance. By following the steps, a community can develop a plan that identifies the areas at risk from natural disasters and prioritize actions to be taken to increase the protection of vulnerable areas.

How Do We Get Started?

CRS Activity 510.a

As you look through the workbook, you will see that public input and information from different community officials and groups are important to gathering data, identifying problems, and deciding on solutions. The two important tools you need, besides this workbook, are **Community Commitment** and a **Community Planning Team**.

Community commitment ensures that local staff and/or volunteers will be able to spend time planning and implementing activities that will eliminate or reduce natural hazards and prevent or limit losses. Community commitment also means that community leaders recognize that there IS the potential for disasters to occur and that mitigating against disasters is a need that must be addressed. By following the steps in this workbook, a community can begin to address issues and solve problems through planning.

DMA 2000 Interim Final Rule Section 201.6 (b)(c)



In addition to leadership, staff time and some resources are necessary to develop the plan, implement activities, and maintain community interest in natural hazard reduction. Resources may include, for example, the use of phones and office equipment, provision for local travel, and printing and photocopying expenses.

A Community Planning Team is essential to the hazard mitigation effort. Community planning teams should be composed of individuals with a variety of different skills and areas of expertise such as a City Council or Board of Selectmen member or a representative from a local environmental group.

What Will a Community Planning Team Do to Improve the Plan?

- Ø Help ensure better solutions, since no one person in the community has all the answers.
- Ø Help gain community acceptance for the plan, since many viewpoints are represented.
- Ø Help ensure important information and assistance isn't left out.

Recommended Members For Your Community Team

- ü A member of the City Council or Board of Selectmen.
- ü Community planner or a planning board member.
- ü Conservation Commission member.
- ü Building official.
- ü Town/city engineer.
- ü Community health official.
- ü Public works personnel.
- ü Emergency manager (usually the police chief or fire chief).
- ü A member of local watershed association.
- ü One or more community residents living in a hazard-prone area.
- ü One or more representatives from local cultural resources (i.e. libraries, museums, historical society)
- ü One or more representatives of the business community.
- ü Representatives of adjoining communities (if problems and/or solutions are likely to extend outside community boundaries).

If a community seeks state and federal agency input into the planning process, it is likely to be in the form of seeking technical assistance. See Appendix B for a list of contacts for technical assistance.

How To Encourage Team Participation

- ü City or Town Manager, or Chief Elected Official, can appoint team members.
- ü Publicize that a plan will be developed to solve problems related to natural disasters and ask for volunteers.
- ü Emphasize the importance of a diverse team to your effort.
- ü Let people know what to expect for a time commitment – duration and frequency.
- ü Coordination is the key – most of the information and ideas you need already exist.
- ü Give people the option of providing input in other ways (besides being a team member).
- ü Provide specific tasks to each person on the team.
- ü Follow up with each team member – don't leave people hanging.

What Steps Require Public Input?

CRS Activity 510.a

Throughout the planning process, public input will be vital to ensure workable solutions to problems resulting from natural disasters. The steps you will follow in the remainder of this workbook are described below:

DMA 2000 Interim Final Rule Section 201.6 (b)(c)

- Step 1 –** Map the Hazards – *Where Are They?*
- Step 2 –** Determine Potential Damage – *What and Where Are the Risks?*
- Step 3 –** Identify What's Already in Place – *What Are We Already Doing?*
- Step 4 –** Identify What's Not Already Being Done – *Where Are the Gaps in Our Protection?*
- Step 5 –** Brainstorm Alternatives – *What Actions Can Be Taken?*
- Step 6 –** Evaluate Action – *What Is Feasible?*
- Step 7 –** Coordinate With Others – *Who Else Is Doing This?*
- Step 8 –** Select Actions – *What Are Our Priorities?*
- Step 9 –** Develop a Strategy – *How Do We Implement Actions?*
- Step 10 –** Adopt and Monitor the Plan – *Putting It All Together*

An individual or small group can do much of the data collection and analysis. However, even as early as **Step 1**, it will be important to interview local officials and residents to gather historical information on natural hazards. In **Step 5**, solutions to problems must be generated, and in **Steps 6, 7, and 8**, proposed actions must be evaluated and selected. The Community Planning Team will need the input from the wider community to ensure that these steps are completed properly and that ongoing implementation of the plan, as well as monitoring and documenting successes, is accomplished.

Suggested Methods of Getting Public Input

There are several ways the Community Planning Team can ensure that community interests of all kinds are represented in the planning process, and public input is obtained. These methods can include hosting Public Input Workshops, which can take the form of a facilitated meeting, involving a large group of community representatives, businesspeople, and residents. In this type of forum, brainstorming brings problems and issues to the table, as well as ideas for solutions. This can provide a comprehensive approach that allows the public to help identify issues and ways to solve problems.

Another way to get input is through the use of questionnaires. These could be distributed to community residents in utility bills, or posted in the local weekly newspaper. Appendix C includes a copy of the questionnaire developed by the Town of Marshfield's Coastal Advisory Committee to gauge the level of interest in retrofitting and floodproofing projects, as well as to obtain information about flood losses for specific areas of town.

Local access cable television is another potential source for widespread dissemination of information and opportunities for feedback. Meetings on hazard reduction issues can be broadcast to the community and can include video footage of historical or recent natural disaster damages, as well as phone numbers of team members who will accept comments and suggestions.

Planning Steps For Local Natural Hazard Mitigation

Step 1 – Map the Hazards
Where Are They?

Step 2 – Determine Potential Damage
What Are The Risks?

Step 3 – Identify What's Already in Place
What Are We Already Doing?

Step 4 – Identify What's Not Being Done
Where Are The Gaps In Our Protection?

Step 5 – Brainstorm Alternatives
What Actions Can Be Taken?

Step 6 - Evaluate Actions
What Is Feasible?

Step 7 – Coordinate With Others
Who Else Is Doing This?

Step 8 – Select Actions
What Are Our Priorities?

Step 9 – Develop a Strategy
How Do We Implement Actions?

Step 10 – Adopt and Monitor the Plan
Putting It All Together

Step 1: Map The Hazards – Where Are They?

At the end of Step 1, you will have gathered data on your community's natural hazards and developed a base map depicting the hazard-prone areas in relation to structures, infrastructure, and resources.

Completing Step 1 will help a community to depict the natural hazards to viewers; provide a comprehensive view of the community's natural hazard risk areas and help focus effort on specific areas. Completing this step will also help in meeting the requirements of CRS Activity 510.a and DMA 2000 Interim Final Rule Section 201.6 (b)(c).

CRS Activity 510.a

Determining and describing the natural hazards to which your community is exposed will help focus hazard mitigation efforts and gain community interest in mitigation activities. Creating a community hazard map is a useful way to depict the multiple hazard risk areas for your city or town. Much of the information is already available on other types of maps. For example, the 100-year floodplain is mapped for nearly every community in Massachusetts. These maps, known as Flood Insurance Rate Maps, or FIRMs, were developed by the Federal Emergency Management Agency (FEMA) as part of the National Flood Insurance Program (NFIP). These maps are also available on the Internet at FEMA's website at www.fema.gov.

These maps are based upon Flood Insurance Studies (FIS), and the maps and study report together include information for a community on the causes of flooding (coastal, riverine, overland, drainage, ponding, etc.); the depth of flooding; the velocity of floodwaters; the amount of warning time needed; and historical floods and losses.

DMA 2000 Interim Final Rule Section 201.6 (b)(c)

Most Massachusetts communities have additional data for rivers and streams shown on the FIRMs or on a separate but similar map known as the Flood Boundary and Floodway Map. This map shows the high hazard areas of velocity flow for rivers and streams known as the floodway. To ensure you incorporate all the latest changes to the FIRMs, check with FEMA or the state (see Appendix A) to determine if amendments or revisions have been made to the maps.

The FIRMs generally do not cover potential flooding in isolated or low-lying areas or from streams having drainage areas of less than one square mile. Nor do they usually take into consideration small areas of ponding, back up from sewers or drainage system blockages, dam breach hazards, or stormwater runoff problems. Other problem areas may be outside a mapped floodplain due to changes in topography or flood conditions since the date of the maps. Because this information is not included on the FIRM, it's important to draw on the knowledge of local officials and residents familiar with local flood problems, as well as information on any community natural resource, open space, wetlands, or master planning maps, and special zoning districts.

For coastal communities, the Massachusetts Coastal Zone Management (MCZM) office has Historic Shoreline Change Plots (HSCP) available at 1:5000 scale showing three to four historic shorelines from between the mid-1800s to 1978. More refined Historic Shoreline Change Analysis Maps (HSCAM) are available at a 1:10,000 scale on either paper or mylar. These maps provide data on coastal erosion and accretion activity. Orthophotographs (1:10,000 scale) from 1994 aerial photos which can be overlaid with the HSCAM mylars are

also available. These will show structures within a community's high hazard areas, including areas subject to velocity wave action and wave overwash flooding, state and federally designated barrier beaches, and areas subject to erosion. The Shoreline Change Maps are available on the internet at www.state.ma.us/czm/shorelinechangeproject.htm.

Although the most extensive mapping has been conducted for flooding and other flood related hazards through the NFIP, there are more maps and research available on the Internet. One of the best starting points for researching a variety of natural hazards and available maps is the Natural Hazards Center at the University of Colorado, Boulder, which may be reached through www.colorado.edu/hazards/index.html. The Center also publishes a free brochure called The Natural Hazards Observer, which includes the latest trends, research and websites on all types of natural hazards throughout the world.

For a list of natural hazard related websites, see Appendix A of this publication. A couple of good sites to start with are:

- Ø Hazard Maps www.hazardmaps.gov
- Ø FEMA www.fema.gov
- Ø National Weather Service <http://www.nws.noaa.gov/>
- Ø Northeast River Forecast Center <http://www.erh.noaa.gov/nerfc/index.shtml>
- Ø U.S. Geological Survey/Earthquakes <http://earthquake.usgs.gov/>
- Ø National Hurricane Center www.nhc.noaa.gov
- Ø Natural Resources Conservation Service www.nrcs.usda.gov
- Ø NOAA www.noaa.gov

Using Worksheet #1: Hazard Identification and Analysis Matrix

As you are conducting research into each natural hazard, in your community, you can use this opportunity to review the likelihood of a hazard's occurrence, the location of occurrence (refer to your maps!), the impacts of an event and to create a hazard index to measure the most likely and most damaging natural event. This is an excellent activity to delegate to the local Community Planning Team. Your team, which should represent a broad spectrum of experience and knowledge of a community's exposure to natural hazards, can provide the expertise needed to establish a list of the most likely natural hazards, where they will occur, and what the impacts may be. Since predicting the future (or even tomorrow's weather) is not an exact science, it is legitimate to base the prediction of future natural hazard occurrences on past history.

Worksheet #1 organizes the process for tracking this information and assisting in the discussion and decision making process. The natural hazards are categorized into 5 broad categories – flood-related hazards, wind-related hazards, fire-related hazards, geologic hazards and other hazards – that coincide with Massachusetts' State Hazard Mitigation Plan. However, not all communities are susceptible to the same hazards, so care should be taken to inventory and categorize those disasters and hazards typical to a community's region. For example, a community located in western Massachusetts need not focus on coastal flooding as a hazard.

<i>Natural Hazard</i>	<i>Likelihood of Occurrence (i.e. highly, likely, possible, unlikely)</i>	<i>Location (i.e. local or small, medium or regional, multiple communities or large)</i>	<i>Impacts (i.e. catastrophic, critical, limited, negligible)</i>	<i>Hazard Index (i.e. rank by combining how much impact & how frequently this affects your community)</i>
<u>Flood-Related Hazards</u> <ul style="list-style-type: none"> • Riverine • Coastal • Erosion • Dam Failures • Thunderstorms • Winter Storms • Coastal Storms or nor'easters • Hurricanes 				
<u>Wind-Related Hazards</u> <ul style="list-style-type: none"> § Hurricanes § Coastal Storms § Winter Storms § Downspouts § Tornadoes 				
<u>Fire-Related Hazards</u> <ul style="list-style-type: none"> § Drought § Wildfires § Urban Fires § Flooding 				
<u>Geologic Hazards</u> <ul style="list-style-type: none"> § Earthquakes § Landslides, § Sink holes 				
<u>Other Hazards</u>				

Checklist For Step 1

- q Obtain and review existing natural hazard maps and information, especially on the Internet. Gather as much information as possible. See **Appendix A and B** on where to find information. *2002 MA Mitigation Planning Guide 11*
- q **Contact FEMA Region I** at (617) 223-9540, or the state at **DEM/Flood Hazard Management Program** at 617-626-1250 to obtain information about recent map amendments or revisions.
- q Contact the **Massachusetts State Hazard Mitigation Team** at DEM at (617) 626-1386 for recent natural hazard updates to the State Hazard Mitigation Plan.
- q **Contact the Massachusetts Coastal Zone Management** office at (617) 626-1200 to obtain copies of maps for shoreline change, high hazard areas, and orthophotos in coastal communities.
- q **Contact MassGIS** at (617) 626-1000 to determine if existing digital mapping is available which includes open space, floodplain, or other pertinent information.
- q **Contact the Office of Dam Safety in the Department of Environmental Management** at (617) 626-1250 for information on dams and dam safety in your community.
- q Visit the community planning office and the assessor's office to obtain local natural resource maps, open space plans and maps, and master plans, and review for natural hazard information.
- q Visit the local library, community newspaper office or historical society to obtain stories and photographs of historic disasters.
- q Interview local officials and residents on disaster events over the past decade.
- q Use a community assessor's map as a base, draw lines to depict hazard areas.
- q Use different colors or shading to depict erosion hazards, velocity zones, floodway areas, and other hazard areas.
- q Mark any areas subject to flooding from dam failure as a separate special hazard area.
- q Include both a legend defining your map's key hazard areas, and any notes on specific high risk areas and the natural hazard.
- q A first draft of Worksheet #1: Hazard Identification and Analysis Matrix. This worksheet should be reviewed and revised throughout the planning process.

PRODUCT

A base map for your community that depicts hazard areas as derived from a number of local, state, and federal sources as well as a completed hazard identification and analysis matrix.

Step 2: Determine Potential Damage – What Are The Risks?

Now that you have completed Step 1, you have a base map and a matrix for your community showing all known natural hazard areas. Step 2 helps narrow the focus of where actions should be taken to reduce damages following a disaster.

At the end of Step 2, you will have met the requirements of CRS Activity 510.c and DMA 2000 Interim Final Rule, Section 201.6 c (2) and you will have estimated the number of structures, infrastructure and resources in the natural hazard areas, and estimated the disaster losses in the community.

CRS Activity 510.e

Now that the hazard areas have been mapped, you need to determine what could actually be damaged: what structures, infrastructure, and resources are in harm's way. This step will help assess what is at risk, and will further highlight the hazard-prone areas of the community. Later, in Step 6, when the community is evaluating actions to solve specific problems, details will be needed that quantify the risk (e.g., financial and economic impacts, how much damage will a specific neighborhood receive). If a detailed inventory is desired at this point in the process, see the Step 8 checklist for guidance.

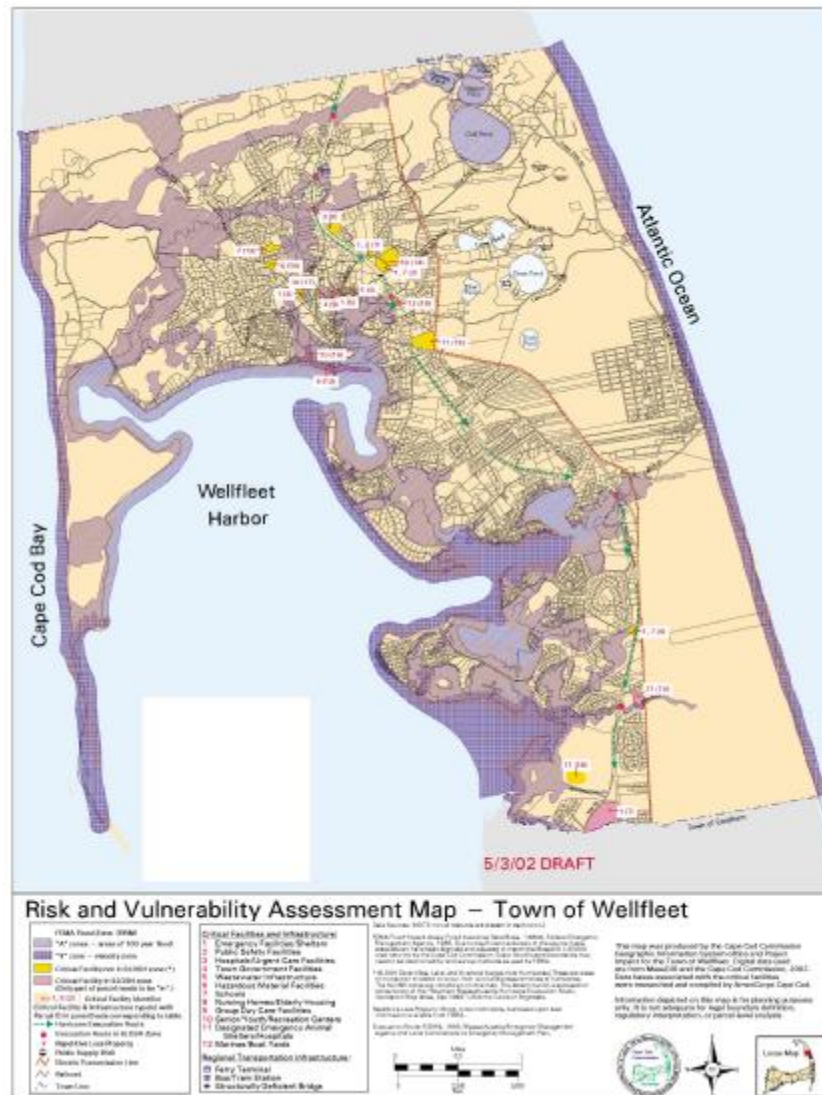
DMA 2000 Interim Final Rule Section 201.6 (c)(2)

To assess what's at risk, the community should inventory the following items using Worksheet #2A & 2B: Risk Assessment Matrix and Vulnerability Summary as a guide for discussion and future information gathering:

- § The estimated number and type of structures in the mapped hazard area identified in Step 1 (assessor's maps can help). Distinguishing between developed and undeveloped land may be useful depending upon a community's needs.
- § The location and number of structures that have suffered repetitive damage. Individual properties carrying flood insurance policies for example, are tracked by the Federal Insurance Administration for claims of over \$1,000. Any property that has sustained two or more claims over \$1,000 over a rolling 10-year period is defined by FEMA as a repetitive loss property. FEMA can provide the address, dates of loss, and number of losses to the community. However, the dollar amount of the loss and the policy holders' names are withheld to comply with the Privacy Act.
- § The number and type of facilities in the hazard area which are critical to disaster response and emergency operations, including emergency operations centers, police and fire stations, public works garages, hospitals, clinics, water filtration and distribution systems, utilities and other locations with critical populations that may need evacuation (day care center, schools, nursing homes).
- § The key bridges and roads for evacuation routes.
- § The number and type of facilities in the hazard area that are critical to public health and safety, including schools, nursing homes, hospitals, correctional facilities, hazardous materials facilities, and water and wastewater treatment plants.

- § Any unique or key historic or other cultural resources in or near high hazard areas (i.e. libraries, museums, cemeteries, public works facilities, parks, etc.).
- § An estimated value or cost of replacement of any of the aforementioned facilities in order to give a community an estimate of the potential financial impact of a natural hazard.
- § An estimate on the number of people that may be affected if the identified facilities or buildings are either destroyed or evacuated.

All this information should be added to the base map created in Step 1 to give a graphic depiction of what's at risk in your community.



Loss Estimates/Area Vulnerability Assessment Matrix

Hazard Area Location: _____
 (Copy and complete this form for each high hazard area in your community)

DEVELOPED LAND				UNDEVELOPED LAND		
	# People	# Buildings (from tax records)	Current Approximate Value (from tax records)	# People (If developed under existing conditions)	# Buildings (If developed under existing conditions)	Approximate Value (Current approx. value times # buildings from previous column)
Residential (use maximum figures)						
Commercial						
Industrial						
Public Buildings & Critical facilities			Replacement Value			
<i>Fire</i>						
<i>Police</i>						
<i>City or town offices</i>						
<i>Public works facilities</i>						
<i>Emergency Operations Centers</i>						
<i>Shelters</i>						
<i>Hospitals</i>						
<i>Schools</i>						
<i>Roads</i>						
<i>Bridges</i>						
<i>Tunnels</i>						

<i>Railroads</i>						
<i>Airports</i>						
<i>Day-care facilities</i>						
<i>Nursing Homes</i>						
<i>Elderly Housing</i>						
<i>Correctional facilities</i>						
<i>Water Treatment Plants</i>						
<i>Drinking water sources (reservoirs, pipelines, etc.) lakes, ponds)</i>						
<i>Sewage Treatment Plants</i>						
<i>Power plants and/or substation</i>						
<i>Hazardous materials facilities</i>						
<i>Cultural and Historic Sites (cemeteries, museums, libraries, historic buildings, etc.)</i>						
<i>Other</i>						
<i>TOTAL</i>						

Total Vulnerability Summary

<i>DEVELOPED LAND</i>					<i>UNDEVELOPED LAND</i>		
Hazard Area Location	Total people	Total Buildings By Type (Residential, Commercial, Industrial, Historical)	Approximate Value	# Critical Facilities	Projected # People	Projected # Buildings	<i>Project Value</i>
Total							

Checklist For Step 2

- q Estimate the types and numbers of structures in the hazard area, using community assessor's information, land use or zoning maps, and the flood hazard overlay map developed in Step 1.
- q **Contact FEMA Region I** at (617) 223-9540, or the state at **DEM/Flood Hazard Management Program** at 617-626-1250 to obtain information about recent map amendments or revisions.
- q Inventory Critical Facilities – are any of the following in the hazard areas?
 - Emergency operations center
 - City or town offices
 - Water and wastewater treatment plants
 - Sewage pumping stations
 - Police or fire stations
 - Schools
 - Hospitals
 - Day-care facilities
 - Power substations
 - Public works garages
 - Nursing homes
 - Elderly housing
 - Correctional facilities
 - Shelters, human and animal
 - Hazardous materials facilities
 - Cultural resources (cemeteries, libraries, museums, historic sites, historical societies, etc.)
 - Power plants
 - Access roads to the above facilities
 - Evacuation routes
- q Mark on the base map the general areas where there are residential structures in the hazard area.
- q Mark on the base map the general areas where there are other types of structures in the hazard area, including industrial, retail, and office buildings.
- q Highlight on the base map the areas that include repetitive loss structures (use different color or flagging method to identify these areas).
- q Mark all identified critical facilities in the hazard area on the base map.

PRODUCT

First, a base map that includes general areas showing structures vulnerable to disaster damages and key infrastructure for disaster response and evacuation. Second, a list of critical facilities in the hazard areas.

Step 3: Identify What's Already in Place – What Are We Already Doing?

In Steps 1 and 2, your Community Planning Team identified the hazard areas and determined what's at risk, effectively describing the extent of the hazard problems for your community.

In Step 3, you will create a summary of what's already being done locally to mitigate hazards by listing the items already in place which work towards solving hazard problems or preventing future losses in your city or town. You will also meet the criteria in CRS Activity 510.e and DMA 2000 Interim Final Rule Section 201.6 (c) (2).

CRS Activity 510.e

Appendix D provides a summary of the types of loss protection systems at the federal and state levels that affect your community. Below is a list of additional protection systems your community may have.

DMA 2000 Interim Final Rule Section 201.6 (c)(2)

What is the community already doing that can protect against future disaster damages?

Prevention/Limitation of Development in Natural Hazard Areas

- Local zoning (e.g., floodplain, wetland buffer zones, water recharge areas)
- State/federal ownership of land that preserves hazardous areas
- Local or non-profit ownership of conservation land, including parks, playgrounds, buffer areas, bicycle paths, wildlife sanctuaries, etc.
- Natural limitations to development (slopes, soils, high water tables, etc.)
- State and local development requirements (Wetlands Protection Act, NFIP, State Building Code, Title V)
- Designated state barrier beaches or federally designated Coastal Barrier Resource Areas

Plans That Take Natural Hazards Into Account

- Natural resources plans
- CRS participation/plans
- Open space/recreation plans
- Emergency/evacuation plans
- Comprehensive or master plans
- Stormwater Management plans
- Public works plans

Physical Protection From Known Hazards

- Elevated structures
- Floodproofed structures
- Acquired or relocated structures
- Seawalls
- Levees
- Berms
- Dams
- Tidegates
- Hurricane barriers
- Buried utilities
- Lightning grounding
- Fire hydrant wells
- Safe Rooms
- Elevated utilities

An Example – Hadley Floodplain District Zoning Bylaw

The Town of Hadley has a floodplain district zoning bylaw that prohibits new residential construction in the floodplain. In addition, town residents with existing homes in the floodplain have been voluntarily elevating their structures so that the lowest floor is above the flood level. Town residents receive technical assistance from the Building Official.



Nahant Bear Pond Drainage

The Town of Nahant proposed building a new stormwater pumping station at Bear Pond (left) after a flooding disaster in 1998. The project, completed in May 2000, upgraded the existing headwall, installed a new drain manhole and rehabilitated the surge tank and outlet structure.

North Andover Pumping Station

The line “Flood 2001” on the Rae’s Pond Pumping Station in North Andover shows the difference hazard mitigation makes. After the October 1996 flood, funding was approved to raise structures in the sewer pumping station above base flood elevation. The station operated smoothly, even during the March 2001 floods.



North Reading Flood Protection

A 400-linear-foot floodwall and a stormwater pumping station within the parking area protect the North Reading Public Safety Building (left). Previously, the lower parking lot and the two-vehicle repair bays used by the police and fire departments, were subject to flooding at least twice a year. The floodwall saved the parking area and building from damage in March 2001 flood when the Ipswich River exceeded the 100-year flood elevation.

Checklist For Step 3

For each of the following items, enter in Column 1 of the accompanying **Existing Protections Matrix** (page 18A) each action, policy, or program in place that provides damage protection. Enter a brief description of each measure in Column 2. Make several copies of the blank matrix page before you begin. In Step 4, you will complete the matrix by evaluating the listed measures.

- q Check local bylaws, ordinances, and open space and master plans for existing protection of hazardous areas. Your community's local zoning may incorporate restrictions such as a prohibition on certain types of uses in the floodplain or wetlands, minimum lot sizes, setback requirements, subdivision regulations, etc.
- q Ask your community planner or contact DEM's Flood Hazard Management Program at (617) 626 – 1250 to determine if your community participates in the Community Rating System. If so, there may already be a repetitive loss plan or floodplain management plan in place that can be expanded into an all hazard mitigation plan.
- q Does the community have a harbor plan? Contact MA Coastal Zone Management (MCZM) at (617) 626 – 1200 to obtain a safe mooring plan checklist for harbor planning, "Harbor Planning Guidelines," and "Rethinking Moorings in Massachusetts: Lessons Learned from 1991 Coastal Storms."
- q Determine if cultural and historic resources are protected – are there plans for protection of local libraries and archives, or for community records?
- q Determine if the community has any type of a disaster warning system (i.e. flood warning, tornado warning, and nuclear warning), an emergency operations system, and/or evacuation plan.
- q Determine where any existing flood control structures are in the community, and approximately how many structures (including critical facilities) they protect. Contact your local Department of Public Works, DEM Waterways and Dam Safety offices, U.S. Army Corps of Engineers, or Natural Resources Conservation Service.
- q Check floodplain maps to see whether Coastal Barrier Resource Areas have been mapped for your community. Contact the MCZM office to obtain maps of state barrier beaches and copies of the original mapping for the Coastal Barrier Resource Areas.
- q Check with the community Building Official to determine if local property owners have demolished, relocated, or retrofitted structures in the disaster hazard areas.
- q Check with the community Building Official on the enforcement of the Massachusetts State Building Code, which contains provisions for earthquake, wind, flood, snow and fire-resistant construction.

PRODUCT

A list of what the community is already doing to protect hazardous areas, placed in Columns 1 and 2 of the Existing Protection Matrix for further evaluation in Step 4.

EXISTING PROTECTION MATRIX

<u>Column 1</u> Type of Existing Protection	<u>Column 2</u> Description	<u>Column 3</u> Area Covered	<u>Column 4</u> Effectiveness and/or Enforcement	<u>Column 5</u> Improvements or Changes Needed
Example: Floodplain District Zoning Bylaw	requires elevation of new or improved structures in floodplain; prohibits hazardous materials in floodplain	100-year floodplain as shown on Flood Insurance Rate Map dated July 15, 1983	enforced by zoning official; variances rarely granted; additional flood areas not included in district	include newly identified flood areas in zoning district; encourage lower development density in the district

Step 4: Identify What's Not Being Done – Where Are The Gaps In Our Protection?

In Step 3, you determined what actions, policies, and programs were already in place to help reduce future disaster-related losses.

In Step 4, you will evaluate the effectiveness of these existing measures, identify where they can be improved, and determine your goals to reduce the risk of disaster damages in vulnerable areas. In Step 4, you will meet the requirements of CRS Activity 510.f and DMA 2000 Interim Final Rule Section 201.6 (c) (3).

CRS Activity 510.e

Step 4 requires an evaluation of the items you listed on the Existing Protection Matrix in Step 3. This evaluation takes into account both the geographic extent of the hazard, asking you to think about literally WHERE the gaps may exist in the community's protections, as well as the

effectiveness of your disaster protection, asking you to consider whether or not what you have in place is enough. If existing protection measures are adequate, your plan will be simply an agreement to continue to enforce existing regulations and maintain existing systems. If there are gaps in hazard protection, your plan should address what actions will be taken to improve disaster damage reduction and hazard elimination.

DMA 2000 Interim Final Rule Section 201.6 (c)(2)

First, consider the geographic aspect. Consider natural hazard protection, such as a floodwall or dike around some, but not all, of the flood areas in a community: Where is the community unprotected? Are there risk areas visible in the mapping you did in the first two steps that are not covered by some sort of existing protection as identified in Step 3? This applies to regulatory protection as well as physical flood control structures: e.g., a zoning ordinance may apply to certain areas or districts, but not to other areas which, as a result of Step 3, were identified as vulnerable to the same condition.

Areas of Residual Risk

**Total Natural Hazard Area - (minus) All Areas With Adequate Existing Protection
= (equals) Areas of Residual Risk**

Second, consider the level of effectiveness of existing policies or programs listed on your matrix. To use the example above, the floodwall may protect structures from 10 or even a 50-year flood, but will be overtopped during the 100-year flood. If this occurs, does the community consider the floodwall to be effective enough as a flood control measure, or are improvements or changes needed? This applies to regulatory measures as well. For instance, is a floodplain district zoning bylaw that only regulates flood areas on the FIRMs sufficiently effective in minimizing the community's risk of flood damages?

The evaluation of geographic areas helps focus efforts on the most vulnerable locations in the community. In some cases, the hazard problems may be widespread enough to justify detailed planning for the entire community. For example, if the community's flood problems are affected by the actions of another community, or if your community's actions can impact a nearby area (for example, a neighboring town sharing the same

harbor, or on the other side of the river), then it makes sense to take a wider approach and coordinate planning with these communities on a regional basis.

If problems are limited to a specific area within the community, then the plan could be tailored to that particular area where natural hazards are most likely to occur or have occurred repeatedly in the past (refer to Worksheet #1 and your base maps). If there are several vulnerable areas, then grouping them by their common elements will make them easier to plan for. For example, one area may consist of existing construction that's currently vulnerable to flooding, while another area may have existing construction that will be at risk only if a dam or seawall fails.

Evaluation of the level of effectiveness calls for more in-depth analysis of the existing protection measures. It involves gauging how well your existing programs, policies, regulations, and structures are actually working to protect vulnerable areas from natural hazards. For example, the community's open space and recreation plans or master plans may not take the threat of earthquakes into account; or the harbor plan may not address hurricane mooring techniques that could be taken by boaters to mitigate the effects of wind. Improving upon what's already in place can help reduce vulnerability community-wide as well as in the especially at-risk areas you have identified.



Having identified the gaps in your protection, you are now ready to develop your goals for hazard elimination and loss reduction. These should not identify specific measures (those will be developed in future steps), but should identify the improvements you want to achieve.

SAMPLE GOAL STATEMENTS ARE:

- § Protect the residential area along Sandy Beach from wave overwash flooding.
- § Incorporate new review parameters into the zoning regulations to ensure that future construction of critical facilities examines soil conditions for susceptibility to earthquake damage.
- § Ensure that wastewater treatment plants in the community will function during flood events.
- § Expand Muddy Field ballpark to provide more recreational uses to serve the surrounding high-growth neighborhoods.

Checklist For Step 4

Using the Existing Protection Matrix which you began filling out in Step 3, perform the following steps for each identified action or program that provides existing protection.

- q Determine the physical area that is being protected and write it in Column 3 on the matrix. This could be the entire community, the 100-foot buffer zone around wetlands, a particular neighborhood, property along a fault line, a heavily treed area, banks of a river, the shoreline, etc.
- q Make a determination of the effectiveness and/or the level of enforcement for each measure. This can be done by noting enforcement measures as in the matrix example (Column 4), or by developing a rating system – good, partial, poor; for example.
- q Depending on how effective a particular measure is, develop some suggestions for improvements to the existing measure, or some additional measures that can be taken. It may be that a measure is very effective in preventing losses – a note to continue to enforce or perform this measure may be all that is needed under Column 5.
- q Using the matrix as a guide, prepare your community's goal statements for hazard reduction and loss prevention. Focus on the geographic areas, which are at risk, as well as needed improvements in existing protection measures. These general goals are useful for communicating to others (especially when coordinating with other agencies, in Step 7) what it is the community wants to do.



PRODUCT

First, a completed matrix that shows areas protected by existing measures, a rating of how well these measures work, and suggestions for improvement to these existing programs or policies. Second, general goal statements derived from the matrix that list the community's future action steps needed to reduce risks and future damages.

Step 5: Brainstorm Alternatives – What Actions Can Be Taken?

In Step 4, the Community Planning Team developed its goals for reducing damages from natural hazards.

Step 5 asks the Community Planning Team to focus further on actions that will reduce future disaster damages. At the end of this step, the community will have a listing of all types of actions that could be taken to reduce disaster losses and eliminate hazards.

CRS Activity 510.g

Some of the actions you identify will be derived from the “Improvements or Changes Needed” that were noted in Column 5 of the Existing Protection Matrix in Step 4. They should reflect what needs to be done to reduce

future damages and is not already being achieved through existing systems or programs.

DMA 2000 Interim Final Rule Section 201.6 (c)(2)

Additional actions will be developed during this step by generating ideas for solutions through a brainstorming process. Later, in Step 8, these ideas will be evaluated according to community criteria.

Brainstorming Rules

100% Participation: Every team member should contribute their ideas towards defining a workable solution for the problem.

Generate Ideas: During this step, strive for quantity over quality; use free association and your imagination. Don’t accept just the “standard” answers as the only possible solutions.

Record All Ideas: Once you get going, you may need someone to keep track of all the ideas – use a flip chart!

No Criticism: Don’t rule anything out during this step. Maintain respect for individual and different ideas. Don’t just focus on activities that fit existing funding programs or items that will get credit under the Community Rating System.

As the community identifies ideas for hazard mitigation, the actions should be kept organized for comparison and discussion. One way to do this is to place each action into one of the following five categories:



Prevention activities include planning, zoning, open space preservation, floodplain and wetland development regulations, stormwater management, dune and beach maintenance, harbor plans, channel maintenance, waterway dumping regulations, watershed protection measures and best management practices, soil erosion and sediment control, building ordinances, subdivision regulations, and requiring buried utilities.

Property Protection activities include acquisition, building relocation, building elevation, barriers, dry/wet floodproofing, utility relocation or floodproofing, sewer backup protection, and insurance.

Public Information activities include providing map information, informational mailings or workshops, real estate disclosure of hazards, environmental education, and technical assistance provided on disaster management issues.

Structural Projects include construction, maintenance or repair of levees, berms, dams, seawalls, floodwalls, tide gates, channel improvements, beach nourishment, drainage and sewer improvements, and detention/retention basins.

Emergency Services include hazard recognition, emergency warning systems, emergency response, protection of critical facilities, and health and safety maintenance.



Checklist For Step 5

- q Hold a brainstorming session with the Community Planning Team to identify actions to reduce hazard damages, using the brainstorming rules.
- q Follow up the brainstorming session by obtaining as much detail as possible about each action. This will help you to perform Step 6, in which you will evaluate possible actions.
- q Use available technical assistance. Invite state or federal staff of the agencies listed in Appendix A to the brainstorming session, or ask them to develop suggestions at a separate forum.
- q Reference published sources that explain different kinds of hazard mitigation actions listed on FEMA's website as well as in Appendix C. This appendix lists specific examples of actions taken by federal agencies, state agencies, and other communities, along with names of people to contact for more information.
- q As actions are suggested, place them under a category listing. This can be done by having easels around the room for the six categories (Prevention, Property Protection, Public Information, Structural Projects, Emergency Services, and Measures for Other Hazards) and writing each suggestion on the appropriate easel.

PRODUCT

A listing of every possible action that your community could take to reduce losses and minimize damages associated with multiple natural hazards.

Step 6: Evaluate Actions – What Is Feasible?

In Step 5, the Community Planning Team developed ideas for disaster loss solutions and began to categorize them by type of solution.

At the end of Step 6, the Community Planning Team will have a list of feasible disaster loss reduction actions, the impacts of which have been considered from several points of view. This step will also meet the requirements of CRS Activity 510 g and DMA 2000 Interim Final Rule Section 201.6 (c) (3).

Once all the possible actions are on the table, there must be a way to determine whether they are appropriate measures to solve the identified problems. Using some basic evaluation criteria can help the community decide which actions will work best.

CRS Activity 510.g

The most important criterion is whether or not the proposed action mitigates the particular hazards or potential losses: Is it effective in reducing wind damage? What will be the degree of impact in wind damage losses if this action is taken? Keep in mind that although some proposed actions might do little to actually reduce the hazards or associated damages when taken alone, they may be small but important steps toward more effective actions.

Each action should also be examined for its compatibility with other goals. For example how does this action impact the environment? It is very important to consider whether the proposed action will meet state and local environmental regulations. Does it affect historical structures, cultural resources or archaeological areas? Does it help achieve multiple community objectives?

DMA 2000 Interim Final Rule Section 201.6 (c)(2)

Another important issue is timing: How quickly does the action have to take place to be effective? Which actions will produce quick results? This is particularly important to consider if funding sources have application time limits, if it's the beginning of "storm season," or if the community is in the post-disaster scenario, where everyone wants to recover at maximum speed.



STAPLE/E Criteria

(Social, Technical, Administrative, Political, Legal, Economic, and Environmental)

STAPLE/E is an acronym for a general set of criteria common to public administration officials and planners. It stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental criteria for making planning decisions. The STAPLE/E approach provides a series of questions to help make planning decisions and determine benefits and costs of various mitigation activities.

Social: *Community development staff, local non-profit organizations, or a local planning board can help answer these questions.* Is the proposed action socially acceptable to the community? Are there equity issues involved that would mean that one segment of the community is treated unfairly? Will the action cause social disruption?

Technical: *The community public works staff, and building department staff can help answer these questions.* Will the proposed action work? Will it create more problems than it solves? Does it solve a problem or only a symptom? Is it the most useful action in light of other community goals?

Administrative: *Elected officials or the city or town administrator can help answer these questions.* Can the community implement the action? Is there someone to coordinate and lead the effort? Is there sufficient funding, staff, and technical support available? Are there ongoing administrative requirements that need to be met?

Political: *Consult the mayor, city council or board of selectmen, city or town administrator, and regional planning agencies to help answer these questions.* Is the action politically acceptable? Is there public support both to implement and to maintain the project?

Legal: *Include legal counsel, land use planners, risk managers, and city council or town planning commission members, among others, in this discussion.* Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity? Are there legal side effects? Could the activity be construed as a taking? Is the proposed action allowed by the comprehensive plan, or must the comprehensive plan be amended to allow the proposed action? Will the community be liable for action or lack of action? Will the activity be challenged?

Economic: *Community economic development staff, civil engineers, building department staff, and the assessor's office can help answer these questions.* What are the costs and benefits of this action? Do the benefits exceed the costs? Are initial, maintenance, and administrative costs taken into account? Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private)? How will this action affect the fiscal capability of the community? What burden will this action place on the tax base or local economy? What are the budget and revenue effects of this activity? Does the action contribute to other community goals, such as capital improvements or economic development? What benefits will the action provide? (This can include dollar amount of damages prevented, number of homes protected, credit under the CRS, potential for funding under the HMGP or the FMA program, etc.)

Environmental: *Watershed councils, watershed basin teams, environmental groups, land use planners and natural resource managers can help answer these questions.* How will the action impact the environment? Will the action need environmental regulatory approvals? Will it meet local and state regulatory requirements? Are endangered or threatened species likely to be affected? Do the actions comply with the state's Environmental Justice Policy?

Checklist For Step 6

- q For each action, first answer the question of whether or not it will minimize the risk or reduce losses. Actions that do not do so should be placed low on the priority list unless they are part of a larger or more effective set of actions.
- q For each action, evaluate whether it is a complete solution or will need to be combined with other measures.
- q For each action, ask the questions listed on the previous page. How well does the action fit the STAPLE/E criteria?
- q Keep track of the responses to the questions in the STAPLE/E criteria for each action. A useful visual tool for tracking responses is the “Moon Matrix” in Appendix B.
- q If actions involve property protection or structural measures to reduce damages to specific properties, an inventory is recommended to help determine costs and benefits of the alternatives. An inventory of individual buildings should include:
 - A sound estimate of the number of structures by use (residential, commercial, industrial) in the area where the action is proposed; and
 - The percentage of structures in a high hazard area (floodway or velocity zone)

PRODUCT

A list of actions with information on how each action fits in with community criteria, and the costs and benefits (social and environmental, as well as economic) of each action.

Step 7: Coordinate With Others – Who Else Is Doing This?

In Step 6, the Community Planning Team evaluated proposed ideas for disaster loss solutions and began to prioritize them using the STAPLE/E criteria.

Step 7 will help the Community Planning Team to prevent duplication of or conflicting efforts by determining what actions other community groups or outside agencies are doing that can help implement or support local hazard reduction action. By completing this step, you will also meet the requirements of CRS Activity 510.c and DMA 2000 Interim Final Rule Section 201.6 (c)(4)(ii).

CRS Activity 510.c

Actions the community wants to take to mitigate a particular hazard's damages should be coordinated with other community priorities, as well as with the hazard mitigation goals of surrounding communities, and federal and state agencies. The advantages of

coordination include:

DMA 2000 Interim Final Rule Section 201.6 (c)(4)(ii)

- Improved access to technical assistance and financial resources (other agencies are more likely to help you if it means meeting their goals as well).
- Better solutions developed for multiple problems.
- Broader support provided for implementation.
- Reduced chances of duplicating or conflicting with existing efforts.

This step will involve submitting the information you have gathered and the actions you have identified and prioritized to the various groups and agencies that are likely to be involved in some sort of mitigation actions, and asking them for their review and comment.



CHECKLIST FOR STEP 7

- q Check with community officials and local organizations first. Examine local and regional plans, including any comprehensive plans, emergency management, economic development, environmental preservation, open space, water quality, parks and recreation, or transportation plans. Do any of these include activities, measures, or proposals for projects in your planning area?
- q Send a cover letter stating your mitigation goals (from Step 4) and a brief description of your identified actions to the following agencies. Make sure the letter requests their review and asks if they have any plans that can be coordinated with any of your identified actions. See Appendix A for websites and Appendix B for the addresses and phone numbers for these agencies.

- Ø **Federal Emergency Management Agency (FEMA) Region I** – disaster assistance programs, National Flood Insurance Program (NFIP), flood insurance map revision plans, multiple natural hazard information, mitigation planning information www.fema.gov
- Ø **Massachusetts Coastal Zone Management Office (MCZM)** – for coastal communities – beach management plans, erosion set-back information, Coastal Facilities projects
www.mass.gov/czm/czm.htm
- Ø **DEM Flood Hazard Management Program (FHMP)** – for information on the State Hazard Mitigation Plan, and the Flood Mitigation Assistance (FMA) program
www.mass.gov/dem/index.htm
- Ø **DEM Office of Natural Resources** – ACEC designations, beach management plans, or other land use plans www.mass.gov/dem
- Ø **Department of Housing and Community Development (DHCD)** – housing and redevelopment plans www.mass.gov/dhcd/default.htm
- Ø **EOEA Conservation Services** – open space preservation, conservation restrictions
www.mass.gov/envir
- Ø **Massachusetts Emergency Management Agency (MEMA)** – emergency response plans and disaster preparedness information and news www.mass.gov/mema
- Ø **MA Riverways Program** – (Massachusetts Department of Fisheries, Wildlife, and Environmental Law Enforcement) – greenway and open space plans, Adopt-A-Stream initiatives www.mass.gov
- Ø **National Parks Service** – rivers and trails planning www.nps.gov
- Ø **U.S. Army Corps of Engineers (USACE)** – water resource projects, Section 22 Planning Assistance program, Flood Plain Management Services program www.usace.army.mil
- Ø **U.S. Fish and Wildlife Service** – wetlands and wildlife conservation plans www.fws.gov

Ø **U.S. Geological Survey** – real-time river and stream gauges and earthquake information
www.usgs.gov

Ø **Adjacent communities** – to check if actions or conditions in adjacent communities impact your community's flood problems, or if actions or conditions in your community affect adjacent communities (e.g., shared harbor area, watershed impacts, transportation links, unsafe dam, shared bridges or culverts)

Ø **Local conservation districts** – soil and water conservation activities

Ø **Local watershed organizations/Watershed Initiative Basin Teams** – watershed plans or activities
www.state.ma.us/envir/mwi/watersheds.htm

Ø **Regional Planning Agencies** – transportation plans, zoning bylaw assistance

Ø **Massachusetts Historical Commission** – historic and cultural preservation programs, identification, evaluation, and protection of historical and archaeological assets.

Ø **A variety of statewide cultural organizations**, such as the Massachusetts Historical Commission/Secretary of the Commonwealth www.state.ma.us/sec/mhc/mhcidx.htm, Massachusetts Cultural Council www.massculturalcouncil.org, the New England Museums Association www.nemanet.org, the Bay State Historical League www.masshistory.org, the Board of Library Commissioners www.mass.gov.

- q Make a note of any comments received on particular actions. This will help in the next steps of selecting and prioritizing actions.

PRODUCT

Notification of all parties who may be affected by or who may be able to assist in helping the community with disaster loss reduction actions.



Step 8: Select Actions – What Are Our Priorities?

In Steps 6 and 7, the Community Planning Team evaluated the proposed actions generated in Step 5 and determined what actions other agencies were taking that could help reduce disaster losses.

Step 8 helps the Community Planning Team select the actions it wants to do and prioritize them in order of importance. Completing this step will also meet the requirements of CRS Activity 510.g and DMA 2000 Interim Final Rule Section 201.6 (c)(3)(iii).

During the evaluation process in Step 6, a sense of a “minimum acceptable level” should have emerged about what kinds of actions the community wants to pursue. Step 6 should have helped to sort the various actions into categories of feasibility and desirability.

CRS Activity 510.g

In order to select actions to best meet the community’s hazard mitigation needs, a formal minimum threshold should be established by the planning team. Of the actions that meet the minimum threshold, select those that do the best job of reducing damages and that meet a majority of the community’s criteria for acceptability. For example, a community may decide not to accept actions that would entail a period of longer than 6 months to obtain all necessary approvals.

Once an array of actions is selected, the Community Planning Team should prioritize them. Prioritization should focus on what is most effective in reducing damages. Some of the most effective actions may be easily achievable, such as conducting outreach workshops to encourage the purchase of flood insurance. Other activities of prime importance may not be so easily implemented, due to lack of funding, current regulations, or lack of technical or staff support. It’s often a good idea to have a few easily achievable projects as top priorities, such as a public education program. This will help build “bite-sized successes” and encourage the community team to go after some of the more challenging projects. The more complex and time-consuming actions can remain as top priorities, and can be implemented as part of the ongoing process of hazard mitigation. One way of developing priorities can be to separate actions into immediate or short-term projects and long-range measures.

DMA 2000 Interim Final Rule Section 201.6 (c)(3)(ii)

AN EXAMPLE OF HOW TO SET PRIORITIES

Floodville has identified several feasible actions using the STAPLE/E criteria in Step 6. However, they have decided to select only those actions that relate to land use, and to prioritize low-cost actions.

Proposed Actions

- Develop and distribute a brochure describing the natural and beneficial functions of floodplains and the regulations for floodplain development.
- Floodproof non-residential structures and/or retrofit residential structures near the river.
- Amend the zoning bylaw to increase minimum lot size for new structures in the floodplain.
- Purchase open space in floodplain areas.
- Build a berm around a shopping area that floods.
- Purchase emergency generators for the water treatment plant.

Selected Actions In Order of Priority

1. Amend the zoning bylaw to increase lot size in floodplain
2. Develop and distribute a brochure on floodplain functions and regulations
3. Purchase open space in floodplain

Checklist For Step 8

- q Establish a minimum acceptable level for actions to be considered. Look at both immediate actions and long-term projects.

Sample Community Minimum Criteria

- § The Town of Deepwater has competing proposals for elevating and retrofitting structures. They have decided to accept only those elevation or retrofit proposals meeting a minimum benefit/cost ratio of 1.0.
- § In Wade City, proposals include various improvements to existing seawalls and berms. The community has decided that at a minimum, any selected action must ensure that a certain number of residential structures are protected to the 100-year flood level.
- § Swampville is strapped for staff and funds to commit to new projects. Knowing these constraints, they will select some immediate actions on the basis of whether they can be successfully undertaken by a group of volunteers. However, they will also prioritize a few long-term projects to focus on while funds and staffing are sought.

- q Select those actions that best fit the community's needs; that is, the actions that do the most to reduce damages while meeting the community's minimum standards, are feasible, and meet all or most of the STAPLE/E criteria.
- q Prioritize actions that will reduce damages in the most vulnerable areas.
- q Include some actions that can be done quickly and easily as top priorities.

PRODUCT

A list of prioritized actions that best meet the community's needs for multiple natural hazard damage reduction.

Step 9: Develop A Strategy – How Do We Implement Actions?

In Step 8, the Community Planning Team selected the actions to be taken and prioritized them.

At the end of Step 9, the Community Planning Team will have developed a clear strategy that tells who will implement the prioritized actions, as well as when and how the actions will be implemented. Completing this step also meets the requirements of CRS Activity 510.h and DMA 2000 Interim Final Rule Section 201.6 (c) (3) (iii).

In Steps 1 through 8, the community determined the WHY, WHAT and WHERE of the plan; WHY damages occur, WHAT you want to do to achieve your goals, and WHERE in the community you want to implement measures to reduce losses. To ensure that the plan will be implemented, these additional questions must be answered.

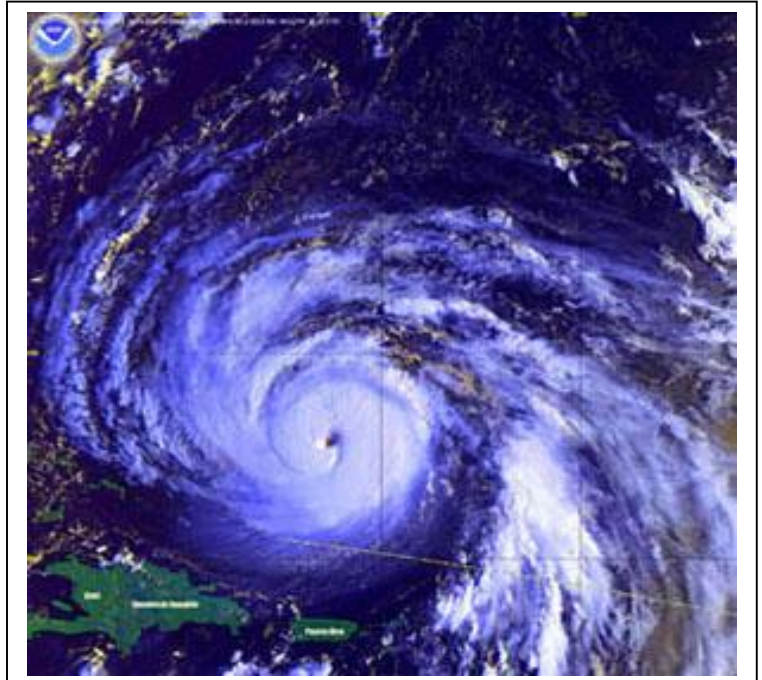
WHO? Who will lead implementation efforts?

A lead person responsible for managing hazard mitigation efforts must be assigned. Who will put together funding requests and applications? Paid staff or volunteers must be assigned to administer mitigation programs.

WHEN? When will these activities be implemented, and in what order? Determine a

**CRS
Activity 510.h**

schedule for implementation. As mentioned above, top priorities may also be the first items to be implemented, or they may have to wait until a bylaw or ordinance is passed or funding is secured. Many activities may be implemented simultaneously.



HOW? How will the community fund these projects? Identify a budget and potential source(s) of funding. How will the community physically implement these projects? Identify technical assistance sources (see Appendix A for Technical and Financial Assistance Resource lists).

Since many of the actions identified may be continuing programs, and since the maintenance of a good plan itself is an ongoing process, action implementation should be incorporated into staff work plans. If volunteer groups are working on the activities or planning, a schedule should be prepared for implementation, and coordination with community officials should be planned. The primary ongoing work will consist of preparing funding proposals for specific activities, whether for the community's review or for outside funding, and scheduling and conducting meetings.

**DMA 2000
Interim Final Rule
Section 201.6 (c)(3)(iii)**

Checklist For Step 9

WHO? Establish Implementation Group

- q Identify person in charge who:
 - Is responsible for ensuring that project(s) continue to make progress.
 - Can dedicate a significant amount of time to this task.
 - Has the ability to obtain assistance from others.
- q Determine how the leader will work with the group.
 - Does leader have authority?
 - Does leader manage people/time/money?
 - Can leader direct others?
 - Can others veto leader's decisions?

WHEN? Prepare an Implementation Schedule

- q Identify all implementation tasks.
- q Determine needed order of completion.
- q Coordinate with other community activities and determine any special scheduling needs (e.g., seasonal climate conditions).
- q Determine start date and target completion date.

HOW? Develop Implementation Process

- q Determine what permits or approvals are needed.
- q Determine what resources are needed for implementation by identifying sources of funding, staff time needs, and technical assistance needs.
- q Reevaluate initial implementation strategy: Is funding available? Is necessary staffing available? Is approval likely from regulators and others? Are the costs still accurate given identified administrative/implementation needs?

PRODUCT

A strategy for implementing the selected mitigation actions, detailing when, how, and by whom the actions will be done, and with what funding source(s).

Step 10: Adopt and Monitor – Putting It All Together

In Step 9, the Community Planning Team developed a strategy for implementing selected actions.

At the end of Step 10, the Community Planning Team will have a formally adopted plan to ensure the actions are completed, with a schedule for monitoring, evaluating, and updating it. The completion of this step will also meet the requirement of CRS Activity 510.i, j and DMA 2000 Interim Final Rule Section 201.6(c)(4) (i)(iii)(5).

CRS Activity 510.i,j

Now that Steps 1-9 have been completed, a formal written plan must be produced. This will serve to document the results of the planning process and provide an opportunity for public review and acceptance.

Drafting the Plan:

The plan will catalog the information gathered in the first 3 steps:

- Hazard Identification (Map the Hazards – *Where Are They?*)
- Risk Assessment (Determine Potential Damage – *What Are the Risks?*)
- Existing Protection Systems (Identify What’s Already in Place – *What Are We Already Doing?*)

It should then identify those items derived from Steps 4 through 8 (Where Are the Gaps in Our Protection? What Actions Can Be Taken? What is Feasible? Who Else is Doing This?):

- Planning areas for each hazard
- Protection needs for each hazard
- Selected actions in order by priority for each hazard (with a brief explanation of how the priorities were determined)

Finally, the plan should detail the implementation strategy developed in Step 9:

- Who administers the plan and implements actions
- How the actions will be done
- When the actions are expected to be completed

DMA 2000 Interim Final Rule Section 201.6 (c)(4)(i)(iii)(5)

Formal Adoption:

It is required by the Disaster Mitigation Act of 2000 that the community’s plan be formally adopted by the Board of Selectmen, City Council or Planning Board, for several reasons. Formal adoption:

- Demonstrates community commitment to hazard mitigation efforts
- Prepares the public for what the community can be expected to do before and after a disaster
- Ensures continuity of all loss reduction efforts over time
- Ensures eligibility for funding under several federal programs
- Allows for additional credit under the Community Rating System if flooding is a selected hazard

Monitoring and Evaluation:

The community multiple hazard mitigation plan should always be evaluated following a disaster. The community should assess how effective the implemented actions have been. The review will provide an opportunity to modify the original plan, implementation schedule or budget based on actual performance and community feedback. In the absence of disasters, monitoring and evaluation of the mitigation plan should be conducted on a 5–year basis (a requirement of DMA 2000).

Checklist For Step 10

- q Draft the plan using results from Steps 1 through 9, as described on the facing page.
- q Use a binder to keep everything together.
- q Circulate draft plan to reviewers, including community planning team, local officials, and your technical assistance contacts, for comments. See sample cover letter in Appendix B. A list of suggested reviewers appears in Step 7.
- q Advertise intent to adopt the plan as appropriate.
- q Have the Board of Selectmen, City Council or Local Planning Board adopt the plan.
- q Prepare to review the plan to monitor action implementation on a yearly basis and revise plan as necessary.
- q Prepare to evaluate the plan regularly, and always following a major hazard event: Are actions being implemented? How effective have they been in reducing losses?

PRODUCT

A plan, adopted by the appropriate board, with a schedule for monitoring, evaluation, and update.

CHECKLIST

Community Rating System (CRS) and Disaster Mitigation Act of 2000 Interim Final Rule Requirements

<input checked="" type="checkbox"/>	Prior -- Determine community commitment and gather a Community Planning Team	CRS Activity 510.a	DMA 2000 Interim Final Rule Section 201.6 (b)(c)
<input type="checkbox"/>	Obtain public input throughout the entire planning process.	CRS Activity 510.a	DMA 2000 Interim Final Rule Section 201.6 (b)(c)
<input type="checkbox"/>	Step 1 – Map the Hazards <i>Where Are They?</i>	CRS Activity 510.a	DMA 2000 Interim Final Rule Section 201.6 (b)(c)
<input type="checkbox"/>	Step 2 – Determine Potential Damage <i>What Are the Risks?</i>	CRS Activity 510.e	DMA 2000 Interim Final Rule Section 201.6 (c)(2)
<input type="checkbox"/>	Step 3 – Identify What’s Already in Place <i>What Are We Already Doing?</i>	CRS Activity 510.e	DMA 2000 Interim Final Rule Section 201.6 (c)(2)
<input type="checkbox"/>	Step 4 – Identify What’s Not Being Done <i>Where Are the Gaps in Our Protection?</i>	CRS Activity 510.e	DMA 2000 Interim Final Rule Section 201.6 (c)(2)
<input type="checkbox"/>	Step 5 – Brainstorm Alternatives <i>What Actions Can Be Taken?</i>	CRS Activity 510.g	DMA 2000 Interim Final Rule Section 201.6 (c)(2)
<input type="checkbox"/>	Step 6 – Evaluate Actions <i>What Is Feasible?</i>	CRS Activity 510.g	DMA 2000 Interim Final Rule Section 201.6 (c)(2)
<input type="checkbox"/>	Step 7 – Coordinate with Others <i>Who Else Is Doing This?</i>	CRS Activity 510.c	DMA 2000 Interim Final Rule Section 201.6 (c)(4)(ii)
<input type="checkbox"/>	Step 8 – Select Actions <i>What Are Our Priorities?</i>	CRS Activity 510.g	DMA 2000 Interim Final Rule Section 201.6 (c)(3)(ii)
<input type="checkbox"/>	Step 9 – Develop a Strategy <i>How Do We Implement Actions?</i>	CRS Activity 510.h	DMA 2000 Interim Final Rule Section 201.6 (c)(3)(iii)
<input type="checkbox"/>	Step 10 – Adopt and Monitor the Plan <i>Putting It All Together</i>	CRS Activity 510.i,j	DMA 2000 Interim Final Rule Section 201.6 (c)(4)(i)(iii)(5)