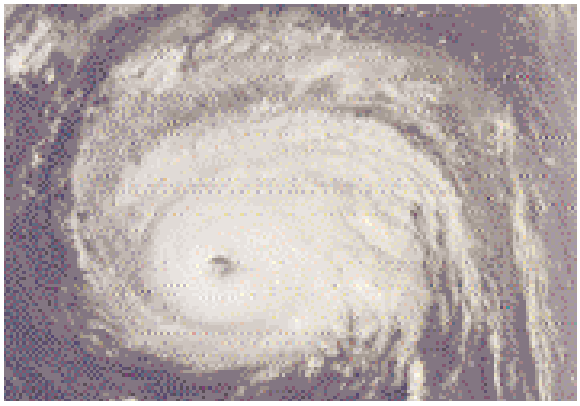
Coastal Hazard Mitigation: An Overview of the Policies, Programs and Activities in the Northeast U.S.



Pamela Pogue and Noëlle F. Lewis

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October 19, 1999

COASTAL HAZARD MITIGATION: AN OVERVIEW OF THE POLICIES, PROGRAMS AND ACTIVITIES IN THE NORTHEAST UNITED STATES

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October 15, 1999

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Acronyms

ASFPM	Association of State Floodplain Managers
Corps	United States Army Corps of Engineers
CRS	Community Rating System
CT-CZMP	Connecticut Coastal Zone Management Program
CT-DEP	Connecticut Department of Environmental Protection
CT-NFIP	Connecticut National Flood Insurance Program
CT-OEM	Connecticut Office of Emergency Management
CSO	Combined Sewage and Stormwater Pipe Overflow
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DRBA	Disaster Recovery Business Alliance
EM Plan	Emergency Management Planning
EMI	Emergency Management Institute
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHMP	Flood Hazard Management Program
FIRM	Floodplain Insurance Rate Maps
FMAP	Flood Mitigation Assistance Program
GIS	Geographic Information System
HazNet	Sea Grant Hazard Network
HazNY	Hazards New York
HMGP	Hazard Mitigation Grant Program
HUD	Housing and Urban Development
IBHS	Institute for Business and Home Safety
MA-DEM	Massachusetts Department of Environmental Management
MAP	Mitigation Assistance Program
MCZM	Massachusetts Coastal Zone Management Office
ME-DEP	Maine Department of Environmental Protection
ME-MCP	Maine Coastal Program
ME-NFIP	Maine National Flood Insurance Program
MEMA	Maine Emergency Management Agency
MEMA	Massachusetts Emergency Management Agency
MGS	Maine Geological Survey
MIT	Massachusetts Institute of Technology
NEFSMA	New England Floodplain & Stormwater Managers Association, Inc.
NESEC	Northeast States Emergency Consortium, Inc.
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
NH-CZMP	New Hampshire Coastal Zone Management Program
NH-NFIP	New Hampshire National Flood Insurance Program
NH-OSP	New Hampshire Office of State Planning
NH-OEM	New Hampshire Office of Emergency Management
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service

NRCS	Natural Resources Conservation Service
NWS	National Weather Service
NY-CRMP	New York Coastal Resources Management Program
NY-SEMO	New York State Emergency Management Office
NY-NFIP	New York National Flood Insurance Program
OCRM	Office of Ocean and Coastal Resource Management
OSP	Office of State Planning
RI-CRMC	Rhode Island Coastal Resources Management Council
RI-DEM	Rhode Island Department of Environmental Management
RIEMA	Rhode Island Emergency Management Agency
SBA	Small Business Administration
SLOSH	Sea Lake Overland Surge from Hurricanes
USGS	United State Geological Survey
WHOI	Woods Hole Oceanographic Institute

Part 1: Introduction

Throughout its history, the United States has experienced natural disasters which have resulted in loss of life, injury and property damage. During the past decade, the United States has been seriously impacted by a series of large-scale hurricanes, earthquakes, floods, winter storms and wildfires that have taken an extraordinary toll in human lives and property. Virtually every region of the country has been affected. Public and private resources which are needed for the advancement of other national priorities and community goals have been diverted for recovery and reconstruction from natural disasters.

Summary of Project Objectives

This report is an assessment of the status of coastal hazard management and hazard mitigation planning in the Northeast region of the United States (states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut and New York). The objective is to produce a regional summary of coastal hazard mitigation activities including**:**

1. An identification of interagency state and federal working relationships
2. An inventory of federal, state and local hazard and mitigation policies, programs, projects and activities among the coastal management programs, floodplain management programs, state and federal emergency management activities and Sea Grant programs
3. Examples of successful cases of coastal hazard mitigation

This task involves investigating how each state addresses coastal hazards management, mitigation planning and implementation in relation to coastal zone emergency and floodplain management. As part of this task, specific case examples and successful tools, programs, projects and policies are identified. Interagency working relationships on a variety of coastal hazard mitigation issues, projects and programs are described.

Methodology

The information gathered for this report was collected through a survey which was distributed to the emergency management director, coastal program manager, state floodplain manager, state hazard mitigation officer and Sea Grant program director and extension leader in each of the coastal states in the Northeast region. Additional feedback and case examples were obtained through a series of regional meetings, telephone interviews, publication and website reviews between January to August 1999.

The states included in this study (Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut and New York) are referred to as “Northeast.” It should be noted that the Federal Emergency Management Agency (FEMA) has subdivided the country into 10 different regions, and the FEMA New England region, Region 1, includes: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut and Vermont. Vermont has not been included in this

study because it does not have a federally approved (by the National Oceanic and Atmospheric Administration (NOAA) coastal management program. New York has been included in this study per NOAA's request because NOAA considers New York within their Northeast Atlantic region. In order to accommodate NOAA, our funders in this project, we have left out Vermont and included New York.

Part 2: Federal and Regional Hazard Mitigation Programs

Federal Emergency Management Agency

FEMA Region 1 Director: Jeffrey Bean, J.W. McCormack, Post Office and Courthouse Building, Room 442, Boston, MA 02109-4595 Tel: 617-223-9540 FAX: 617-223-9519
Website: http://www.fema.org

FEMA Region 2 Director: Lynn G. Canton, 26 Federal Plaza, Suite 1337, New York, NY 10278
Tel: 212-225-7209 FAX: 212-225-7281
Website: http://www.fema.org

In response to the recent loss of life and property damage, FEMA has developed a National Mitigation Strategy to reduce the impacts of natural hazards. The foundation of this strategy is the practice and implementation of hazard mitigation, defined as "any sustained action taken to reduce or eliminate long-term risk to human life and property." The effectiveness of the strategy lies in successfully changing public perception about hazard risk and mitigation of that risk. It is necessary to demonstrate that mitigation is often the most cost-effective and most environmentally-sound approach to reducing losses. The overall goal of the National Mitigation Strategy is "to substantially increase public awareness of natural hazard risk and to significantly reduce the risk of loss of life, injuries, economic costs and disruption of families and communities by natural hazards." (FEMA, *National Mitigation Strategy: Partnerships for Building Safer Communities*, 12/6/95).

Mitigation Assistance Program (pre disaster funding)

FEMA Region 1 contact: Dan Catlett Tel: 617-223-9572
Website: http://www.fema.gov/mit/fldmitast.htm#astprgm

The Mitigation Assistance Program (MAP) provides financial assistance to states for the development and maintenance of a comprehensive statewide hazard mitigation capability to implement pre- and post-disaster mitigation. The three categories of assistance are: 1) State Hazard Mitigation Program assistance, for which all states and territories are eligible; 2) Hurricane Program hazard assistance, for which states and territories subject to tropical storm hazards are eligible; and 3) Earthquake Program hazard assistance, for which states and territories subject to seismic hazards are eligible.

Flood Mitigation Assistance Program (pre disaster funding)

FEMA Region 1 contact: Steve Colman Tel: 617-223-4131
Website: http://www.magnet.state.ma.us/dem/program/mitigation

The FEMA Flood Mitigation Assistance Program (FMAP) provides funding to assist states and communities to implement measures to reduce or eliminate the long-term risk of flood damage to buildings, homes and other structures insurable under the National Flood Insurance Program

(NFIP). A pre-disaster grant program, FMAP was created as part of the National Flood Insurance Reform Act of 1994 (42 U.S.C. 4101) with the goal of reducing or eliminating claims under the NFIP. Two types of grants are available to communities: planning grants and project grants. Planning grants are grants available to states and communities to develop or update flood mitigation plans. Project grants are available to implement measures to reduce flood losses. Eligible projects include: elevation of insured structures, acquisition of insured structures and real property, relocation or demolition of insured structures and dry flood-proofing of insured structures. A project must also conform with the minimum standards of the NFIP Floodplain Management Regulations; be consistent with the applicant's flood mitigation plan and all applicable laws and regulations, such as federal and state environmental standards or local building codes. Eligible applicants can be any state agency, participating NFIP community or a qualified local agency assisting in flood mitigation.

FEMA may contribute up to 75 percent of the total eligible costs, and at least 25 percent of the total eligible costs must be provided by a non-federal source. Of this 25 percent, no more than half can be provided as in-kind contributions from third parties. There are limits on the frequency of grants and the amount of funding that can be allocated to a state or community in any 5-year period.

National Flood Insurance Program (pre disaster funding)

FEMA Region 1 contact: Paul Ford Tel: 617-223-9561
Website: http://www.fema.gov/nfip/

The NFIP is a federal program that makes flood insurance available to flood-prone property owners. Created by Congress in 1968, the basis of the NFIP is an agreement between FEMA and a local unit of government that has been identified as "flood-prone." There are two primary tenets of the NFIP: (1) to ensure that new development in a community's floodplains does not significantly aggravate existing flooding conditions; and (2) to ensure that new or rebuilt floodplain structures are designed and constructed to resist flood damages. These objectives are best achieved through locally enforced land use and construction regulations.

Communities may voluntarily elect to participate in the program. They must adopt and enforce floodplain management measures to reduce future flood risks in exchange for having the flood insurance coverage available to the community. Most flood-prone communities have elected to join the NFIP in order to realize the benefits it provides to property owners, taxpayers and the entire community. Another benefit of participating in the NFIP is that communities receive a comprehensive study of the hydrologic and hydraulic aspects of the flooding problems within their community. These data will then enable communities to systematically identify flood hazard areas and implement a uniform set of criteria to evaluate and minimize the flood risks of new floodplain development.

Table 1. Northeast NFIP Participating Communities (June 1999).*

State	# of Policies	#Communities	Coverage
CT	28,079	176	$3.7B
ME	6,621	948	$715M
MA	37,000	331	$4.6B
NH	4,400	192	$437M
NY**	90,500	1,465	N/A
RI	10,719	39	$1.3B

*Vermont has not been included because this study includes only those states with federally approved coastal zone management programs.
**New York is not in FEMA, Region I, it is in FEMA Region 2.
N/A – Information not available.

Community Rating System (pre disaster funding)

FEMA Region 1 contact: Jim Gibbons Tel: 617-223-9561
Insurance Services Organization contact: Jimmy Chin Tel: 617-734-9424
Website: http://fema.gov/nfip/crs.htm

The Community Rating System (CRS), also under the direction of FEMA, is part of the NFIP and is also voluntary. The objective of the CRS is to reward communities and provide an incentive for implementing new flood protection activities. CRS reduces flood insurance premiums to reflect what a community has accomplished above and beyond the NFIP minimum standards for floodplain regulation. CRS classification designations directly correlate to the percentage reduction in insurance premiums. There are 10 classes: a 10 has no reduction, each class thereafter has a 5 percent reduction which is cumulative (Class 9=5 percent, 8=10 percent, 7=15 percent, etc.) for properties in the community's mapped floodplain. Additionally, Classes 1-9 all provide a 5 percent reduction rate for properties outside of the floodplain.

Table 2. Number of Northeast Communities Participating in CRS 1999.*

State	# of Communities	Amount Saved on Premiums($)
CT	12	77,300
ME	39	68,600
MA	12	413,500
NH	1	300
NY**	25	N/A
RI	3	59,000

*Vermont has not been included because this study includes only those states with federally approved coastal zone management programs.
**New York is not in FEMA, Region I, it is in FEMA Region 2.
N/A – Information not available.

Project Impact (pre disaster funding)

FEMA Region 1 contact: Steve Colman Tel: 617-223-4131
Website: http://www.fema.gov/impact/cities/map_r1.htm

There is a growing acceptance by all Americans of the need to take personal responsibility for making their communities safer. One of the essential aspects of the National Mitigation Strategy involves strengthening partnerships and creating alliances where none previously existed. FEMA is building new federal/state/local partnerships and public/private partnerships as a means of implementing measures to eliminate or reduce the impacts of hazards.

Project Impact is designed to punctuate communities mitigation efforts by providing seed money to be used for construction and non-construction mitigation projects and programs.

FEMA created Project Impact to bring communities together to take actions to prepare for natural disasters in a collaborative effort. There are three underlying principles key to the effectiveness of Project Impact:

1. Preventive actions must be decided at the local level.
2. Private sector participation is vital.
3. Long-term efforts and investments in prevention measures are essential.

To date, FEMA has partnered with 107 pilot communities and 500 businesses across the country. FEMA has offered expertise and technical assistance from the national and regional level and included other federal agencies and states. FEMA has used all the available mechanisms to get the latest technology and mitigation practices into the hands of local communities.

Hazard Mitigation Grant Program (post disaster funding)
Section 404 funding

FEMA Region 1 contact: Paul White Tel: 617-223-4412
Website: http://www.fema.gov

The Hazard Mitigation Grant Program (HMGP) was created in 1988 by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP assists states and local communities in implementing long-term hazard mitigation measures following a major disaster declaration. Eligible applicants must apply through the state, as the state administers the program. In December 1993, the President signed the Hazard Mitigation and Relocation Assistance Act which amends Section 404 to increase federal funding of HMGP projects to 75 percent of the project's total eligible costs (for disasters declared before June 1993, the federal share was 50 percent). The state or local match does not need to be cash, in-kind services or materials may be used.

Table 3. Northeast Project Impact State Coordinators and Communities.*

State	State Coordinator	Communities (Point of Contact)
CT	Scott Choquette	Westport (Dennis McCarthy)
	860-424-3873	Milford (Robert Gregory)
ME	Steve Burgess	Saco (Larry Nadeau)
	207-626-4503	Portland (Brad Roland)
MA	Amanda Orstead	Marshfield (Joan Foster)
	508-820-1447	Quincy (Walter White, Richard Mead)
NH	John Shaunessey	Peterborough(Peter Ryner)
	603-271-2231	Plymouth (Lindley Kirkpatrick)
		Holderness (Paul Weston)
		Salem (John Nadeau)
NY**	Elaine Arnold	Rye (Jeff Stonehill)
	518-485-1797	Freeport (Susan Bergman)
		Buffalo
		East Rockaway***
		Waverly***
		Dreyden***
		Erwin***
		Eden***
RI	Pam Pogue	Warwick (Bill Facente)
	401-946-9996	Pawtucket (Frank Rendine)

*Vermont has not been included because this study includes only those states with federally approved coastal zone management programs.
**New York is not in FEMA, Region I, it is in FEMA Region 2.
*** These communities have not received funding.

The objectives of the program are to:

- Prevent future losses of lives and property due to disasters
- Implement state or local hazard mitigation plans
- Enable mitigation measures to be implemented during immediate recovery from a disaster
- Provide funding for previously identified mitigation measures that benefit the disaster area

The HMGP can be used to fund projects to protect either public or private property. Examples include:

- Structural hazard control such as debris basins or floodwalls
- Retrofitting such as flood proofing to protect structures from future damage
- Acquisition and relocation of structures from hazard-prone areas
- Development of state or local standards to protect new and substantially improved structures from disaster damage

Small Business Administration Low Interest Loans (post disaster funding)

Contact: Wade Butler, Small Business Association, Niagara Falls, NY Tel: 716-282-4612
Website: http://www.fema.gov/fema/sba.htm

Congress recently passed legislation that provides for a new Small Business Administration (SBA) loan program in conjunction with *Project Impact* communities. Fifteen million dollars per year has been authorized.

The SBA provides low-interest (generally 4 percent or less), long-term (up to 30 years) loans to help homeowners, renters and non-farm businesses recover from a disaster. Loan proceeds may be used to repair or replace disaster damaged property that is not fully covered by insurance.

Homeowners may apply for up to $200,000 to repair or replace their primary home to its pre-disaster condition and must meet current required city or county building codes. The loan may not be used to upgrade the home or make additions to the home. Also, loans may be increased by as much as 20 percent for mitigation actions to protect the property from possible future disasters of the same kind.

Homeowners and renters may apply for up to $40,000 to repair or replace damaged or destroyed personal property, such as clothing, furniture and automobiles. The loan proceeds cannot be used to replace extraordinarily expensive or irreplaceable items, such as antiques, collections, pleasure boats or recreational vehicles.

Businesses of all sizes, and private, non-profit organizations may apply for up to $1.5 million to repair or replace damaged business property, such as machinery, equipment, inventory, furniture and fixtures. The loan may not be used for upgrades or additions, but may be increased up to 20 percent (within the $1.5 million limit) for mitigation actions to protect against future disasters of the same kind.

Small businesses and small agricultural cooperatives that do not have credit available from nongovernment sources may apply for Economic Injury Disaster Loans up to $1.5 million to provide working capital to meet obligations until normal operations resume. The total loan amount to any one-business entity (including affiliates) for a combined Physical and Economic Injury Disaster Loan may not exceed $1.5 million. In some cases, when there is substantial damage, SBA may refinance existing mortgages on homes and business property to make the loan affordable.

Farm Service Agency Loan Program (post disaster funding)

Website: http://www.fema.gov/fema/farmhome.htm

The Farm Service Agency can provide emergency loans where property loss or economic injury occur due to a natural disaster that affects farming, ranching or aquaculture operations. Emergency loans will be made to applicants who have suffered qualifying physical and/or

production losses in a county named by FEMA as eligible for federal assistance or determined a disaster by the Secretary of Agriculture.

Farmers, ranchers and aquaculture operators in counties contiguous to declared or designated counties may also qualify. Farm service low-interest loans are available to applicants based on eligibility to overcome effects of a disaster. Funds can be used for:

- Restoring or replacing damaged property
- Paying all or part of production costs associated with the disaster year and/or the year following the disaster
- Paying delinquent installments
- Paying essential family living expenses
- Constructing, buying or improving essential buildings
- Purchasing essential machinery, equipment and foundation livestock
- Paying costs to reorganize a farming system
- Refinancing short, intermediate and long-term debts

Public Assistance Grant Program (post disaster funding)

FEMA Region 1 contact: Robert Teeri Tel: 617-223-4864
Website: http://www.fema.gov/mit/fldmitast.htm#comast

The Public Assistance Grant Program assists in the restoration of community infrastructure. Assistance is generally limited to restoration to pre-disaster design and function. It is a supplemental cost reimbursement program with specific eligibility requirements. FEMA's share of eligible costs will be awarded to the state for their disbursement to the applicant.

FEMA's goal is to provide the funding as efficiently and expeditiously as possible to allow a quick recovery of communities affected by disaster or emergency events. Again, required work must be a result of the declared disaster event and be located within a presidentially-declared disaster area. The Stafford Act as amended, authorizes the Public Assistance Grant Program.

The multi-step funding process under the Public Assistance Grant Program is triggered by a disaster event that starts the application process that may or may not include a Preliminary Damage Assessment. All potential applicants will attend an applicant's briefing. To officially apply for funding, applicants must submit the Request for Public Assistance that is available at the applicants briefing and through electronic means. Each applicant will be assigned to a Public Assistance Coordinator who will hold a meeting with the applicant to begin the process of documenting disaster recovery projects. The coordinator will assist the applicant in completing project worksheets for all projects. Project worksheets will be approved after validation. The funding will be made available to the state which will then disburses the funding to the applicant according to state regulations.

The Public Assistance Grant Program provides assistance for eligible projects (structures) meeting the following criteria:

- Damaged as a result of the disaster event
- Located within a designated disaster area

- The legal responsibility of an eligible applicant
- Actively used at the time of the disaster event
- Not under the authority of any other federal agency to fund
- Authorized in the Stafford Act

In addition, the cost must be a reasonable cost to accomplish eligible work and be in compliance with federal, state and local laws and regulations.

There are two types of repair work:
1. Emergency work, such as debris removal and emergency protective measures. Eligible emergency work must eliminate or reduce immediate threats to life, health, safety or improved property.
2. Permanent work, such as permanent repair or restoration of eligible facilities. Examples of permanent work include roads, bridges, water control facilities, buildings, utility systems and parks.

Applicants are encouraged to consider hazard mitigation opportunities which are defined as any cost-effective measure which will reduce the potential for damage to a facility from a disaster event. Hazard mitigation under the Public Assistance Grant Program must be directly related to the repair of disaster damage to existing facilities. These opportunities should be documented in a hazard mitigation proposal. FEMA has developed a policy to expedite the approval of hazard mitigation measures and has a list of the types of proposals that are pre-approved.

There are four primary steps to obtaining disaster assistance:
1. The applicant submits a Request for Public Assistance.
2. A Public Assistance Coordinator will then be assigned to each applicant and will hold a meeting with the applicant to explain the process and procedures in detail. It is very important for the applicant to ensure that personnel who are familiar with the projects attend this meeting.
3. The applicant presents a list of damages at the meeting. This list is the basis for developing project worksheets that are used to obligate funds.
4. The coordinator works with the applicant to develop all project worksheets and ensure all projects are identified, eligible and complete.
5. Upon approval of the project worksheets, the funds are obligated to the state. The state as the grantee, will disburse public assistance funds to the applicant. Federal funds for small projects will be disbursed after approval, and federal funds for large projects will be disbursed as work is accomplished.

Sustainability/Sustainable Re-development Program (post disaster funding)

Website: http://www.fema.gov/mit/fldmitast.htm#comast

A new initiative and integral part of the mitigation function is the concept of sustainability/sustainable re-development. This brings a relatively new approach to environmental, economic and social thought and has the potential to enhance the achievement of mitigation goals in the pre- and post-disaster environment. Sustainability is development that

maintains or enhances economic opportunity and community well being, while respecting, protecting and restoring the natural environment upon which people and economies depend. Sustainable re-development is simply the application of the concepts and practices of sustainable development to the disaster recovery process.

Emergency Management Institute

16825 South Seton Avenue, Emmitsburg, MD 21727
Website: http://www.fema.gov/emi/mission.htm

The FEMA Emergency Management Institute (EMI) is part of the Preparedness, Training and Exercises Directorate. It is located on the National Emergency Training Center campus in Emmitsburg, Maryland, 75 miles north of Washington, D.C.

EMI serves as the national focal point for the development and delivery of emergency management training to enhance the capabilities of federal, state, and local government officials, volunteer organizations, and the private sector to minimize the impact of disasters on the American public. EMI provides training on U.S. emergency management practices through a nationwide program of resident and non-resident instruction (programs sponsored by EMI and conducted by state emergency management agencies). In addition, EMI provides distance learning programs such as independent study courses and the Emergency Education Network in home communities. Instruction focuses on the four phases of emergency management: mitigation, preparedness, response and recovery.

National Oceanic and Atmospheric Administration

NOAA is a multi-varied environmental, scientific and management agency composed of the National Ocean Service, National Weather Service, National Marine Fisheries Service, National Environmental Satellite Data and Information Service, and Office of Oceanic and Atmospheric Research.

NOAA National Weather Service

Northeast Region NOAA National Weather Service contact: David Vallee Tel: 800-243-1686
Website: http://www.noaa.gov

The National Weather Service provides weather, hydrologic and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. It is composed of headquarters offices, national centers, and regional centers with field offices for meteorological and hydrological services. Its mission is supported through the activities of these offices on a 24-hour, 7-day-a-week basis at the field offices. Many of the field offices maintain websites that can provide information about themselves and their products. Products are provided in the form of alphanumeric observations, forecasts, warnings, advisories (covering their geographical areas of

responsibility), and graphics of various types. The National Weather Service is the sole United States official voice for issuing warnings during life threatening weather situations.

NOAA National Ocean Service

The National Ocean Service is the nation's principal advocate for coastal and ocean stewardship and develops the national foundation for coastal and ocean science, management, response, restoration and navigation. The service maintains its leadership role in coastal stewardship by bridging the gap between science, management and public policy, including coastal hazards mitigation. It provides communities with information, funding and management assistance about coastal hazards so they can better reduce or eliminate the destructive effects of natural events.

NOAA Office of Ocean and Coastal Resource Management

NOAA OCRM Director: Jeff Benoit, 1315 East West Highway, Silver Spring, MD 20910
Tel: 301-713-3155
Website: http://www.noaa.gov

Northeast Region contact: Bill O'Beirne Tel: 301-713-3109 X160
Website: http//www.noaa.gov

Within the National Ocean Service, the OCRM, Coastal Program Division administers the Coastal Zone Management Act (CZMA). The CZMA established a voluntary state/federal partnership to enhance comprehensive management of the nation's shorelines. The key national goals embodied in the CZMA are to protect natural features (e.g., beaches, dunes, wetlands, barrier islands and floodplains) that serve to mitigate coastal hazards, and to manage coastal development to minimize loss of life and property caused by improper development in flood-prone, storm surge, geological hazard and erosion-prone areas and in areas likely to be affected by or vulnerable to sea-level rise, land subsidence and saltwater intrusion. All the states surveyed have a federally-approved coastal management program.

Table 4. NOAA Coastal Zone Program Liaisons.*

State	NOAA Liaison	Phone
CT	Bill O'Beirne	301-713-3109 x160
ME	Joelle Gore	301-713-3117 x177
MA	Joelle Gore	301-713-3117 x177
NH	Elisabeth Morgan	301-713-3109 x166
NY	Helen Farr	301-713-3109 x150
RI	Helen Farr	301-713-3109 x150

*Vermont has not been included because Vermont does not have a federally approved coastal zone management program

Table 5. Northeast Region Coastal Zone Program Managers.*

State	Agency	Person	Phone
CT	Dept. of Environmental Protection	Charles Evans	860-424-3034
ME	Office of State Planning	Kathy Leyden	207-287-3261
MA	Exec. Ofc. of Environmental Affairs	Tom Skinner	617-727-9530
NH	Office of State Planning	David Hartman	603-271-2155
NY	Department of State	George Stafford	518-474-3643
RI	Coastal Resources Mgmt. Council	Grover Fugate	401-222-2476

*Vermont has not been included because Vermont does not have a federally approved coastal zone management program

CZMA 309 Coastal Enhancement Grants Program

Dramatic population growth along the coast brings new challenges to managing national coastal resources. These include challenges in protecting life and property from coastal hazards; in settling conflicts between such competing needs as dredged material disposal, commercial development, recreational uses, national defense needs and port development; and in protecting coastal wetlands and habitats while accommodating needed economic growth.

In 1990, to meet mounting public concern for the well-being of the nation's coastal resources, Congress amended the CZMA, to include a new Coastal Zone Enhancement Grants Program– Section 309 of the CZMA. The Coastal Zone Enhancement Program provides incentives for states and territories to make changes in any of eight areas of national significance. These are:

1. Wetlands protection
2. Coastal hazards
3. Cumulative and secondary impacts of development
4. Public access to the coast
5. Special-area management planning
6. Ocean governance
7. Marine debris
8. Government and energy facility siting

With regard to the coastal hazards enhancement objective, the CZMA provides enhancement funding for "prevention or significantly reducing threats to life and destruction of property by eliminating development and redevelopment in high-hazard areas, managing development in other hazard areas, and anticipating and managing the effects of potential sea-level rise and Great Lakes level rise."

In 1992, coastal states and territories developed assessments that examined their management of the eight enhancement areas. NOAA's OCRM reviewed the assessments and came to agreement with the states and territories on high priority enhancement areas. States and territories then developed five-year strategies to enhance the management of these areas. The strategies included projects that resulted in changes to the states' management program, i.e., a new or revised law, set of regulations, or administrative guidelines. The strategies were ranked, and states and territories were awarded enhancement funds based on this ranking. In 1997, states and territories updated their assessments and strategies to reflect current priorities.

Table 6. How CZM Programs Ranked Coastal Hazards, 1992 and 1997.

State	1992	1997
CT	Medium	Medium
ME	Medium	Medium
MA	High	Medium
NH	Low	Low
NY	Medium	Medium
RI	Medium	Medium

National Sea Grant College Program

National Sea Grant Director: Ronald C. Baird, Sea Grant College Program, 1315 East-West Highway, R/SG, SSMC-3, Room 11837, Silver Spring, MD 20910 Tel: 301-713-2448 X158 FAX: 301-713-0799
Website: http://www.nsgo.seagrant.org

The National Sea Grant College and Program Act was passed by the 89th Congress in 1966 forming an academic/industry/government partnership. The act created a federal program mandated to support activities across the full spectrum of the marine sciences. In the act Congress set forth an approach involving research, education and outreach to promote the wise use of the nation's coastal, ocean and Great Lakes resources for a sustainable economy and environment. The program operates through a university-based network that includes more than 200 universities and marine organizations that work within a core of 29 Sea Grant Colleges and institutions. Federal oversight of the program is conducted by NOAA's National Sea Grant Office. Sea Grant is involved in projects in the areas of aquaculture, biotechnology, coastal and estuarine processes, hazard mitigation, habitat restoration, nonidigenous species, seafood technology and water quality. Today, Sea Grant is a $96.5 million annual operation, of which about 58 percent come from federal appropriations. Matching funds from state partners account for about 33 percent and pass-through funds coming from NOAA and other agencies account for approximately 9 percent.

Sea Grant outreach staff and affiliated university researchers participate in numerous research and demonstration projects that are extremely valuable to the growing knowledge of natural disasters and hazard mitigation. Research projects range from studies of coastal erosion to improved storm prediction.

Sea Grant Hazard Network
Website: http://www.haznet.org

The Sea Grant Hazard Network (HazNet) is an information sharing website network focused on coastal hazards. The purpose of HazNet is to enhance the Sea Grant network's contribution to reducing loss of human life, property and environmental resources from coastal hazards. It provides an organizational framework through which hazard mitigation information is more effectively and efficiently shared among Sea Grant network programs and outside collaborators.

U.S. Army Corps of Engineers, New England and North Atlantic Districts

New England District contact: John Kennelly Tel: 978-318-8505
North Atlantic District Website: www.nae.usace.army.mil/

The U.S. Army Corps of Engineers (Corps) is a federal agency that addresses natural hazards. The Corps has three primary responsibilities within this area:

1. Flood damage reduction
2. Commercial navigation
3. Ecosystem restoration

In terms of flood-control projects in the Northeast, the Corps currently has oversight of: 35 flood-control reservoirs, 58 local protection projects and four hurricane barriers. The total cost of constructing these projects is $496 million, which has been estimated to prevent over $1.5 billion worth of damages. The Corps oversees four different types of programs relating to natural hazard mitigation:

1. General Investigations
2. Continuing Authorities
3. Technical Assistance
4. Congressionally Directed Projects

The Corps has several programs available to help mitigate potential damages caused by natural disasters:

Section 205 Flood Damage Reduction Program
Section 205 Flood Damage Reduction Program has a federal grant limit of $5 million. A feasibility study is required (and cost-shared by the applicant 50/50) of which the first $100,000 is paid for by the Corps. In the 50/50 match, the applicant is allowed to designate in-kind service toward the match. The project implementation is cost-shared with the applicant at a 65/35 federal and non-federal match, respectively. The Corps does not pay for operation and maintenance of the project.

Section 103 Hurricane & Storm Damage Reduction
Section 103 Hurricane & Storm Damage Reduction has a federal funding limit of $2 million. A feasibility study is also required with the same 50/50 cost-share requirement. The first $100,000 is paid for by the Corps and in-kind service is allowed for match. The project implementation is cost-shared with the applicant at a 65/35 federal and non-federal, respectively. The Corps does not pay for operation and maintenance of the project.

Section 14 Emergency Streambank Protection
Section 14 Emergency Streambank Protection is primarily designated for the protection of public infrastructure. This program has a federal funding limit of $1 million. A planning and design analysis is required, and the first $40,000 is paid for by the Corps.

Section 208 Snagging & Clearing
Section 208 Snagging & Clearing is geared toward flood control. The federal funding limit is $500,000, and a planning and design analysis is required, of which the Corps pays for the first $40,000. The project implementation is cost-shared with the applicant at a 65/35 federal and non-federal, respectively. The Corps does not pay for operation and maintenance of the project.

Planning Assistance Programs
The Planning Assistance Program to states is authorized under the Water Resources Development Act of 1974 and is used for water resources planning. This program is cost-shared with the states 50/50 and is established through a single point of contact in each state.

Table 7. Army Corps of Engineers – Northeast Region Contact.

State	Agency	Person	Phone
CT	DEP	Thomas Oullettee	860-424-3034
MA	DEM	Mike Gildesgame	617 727-9800 x 585
NH	OSP	David Neville	603-271-2155
ME	OSP	Lewis Sidell	207 287-8050
NY			212-264-0102
RI	OSP	John O'Brian	401 222-1220

DEM – Department of Environmental Management. DEP – Deportment of Environmental Protection. OSP – Office of State Planning

Floodplain Management Services Program
The Floodplain Management Services Program is authorized under the Flood Control Act of 1960 and involves studies in the areas of flooding, flood-damage reduction and floodplain management. States and local communities are eligible to receive 100 percent federal funding.

Ecosystem Restoration Program
The Ecosystem Restoration Programs involve a change in flow regime or modifications to the substrate of river ecosystems.

Section 1135 Project Modification for Improvements of Environment
Section 1135 Project Modification for Improvements of Environment has a federal funding limit of $5 million. This program is designated for past Corps projects which have caused harm and need to be removed or vastly modified.

Challenge 21
Challenge 21, a new Corps initiative authorized by Congress through the Water Resources Development Act, will allow the Corps to participate in projects for flood-damage reduction and those that are environmentally beneficial. The difference is that, unlike in past practice, non-structural solutions are emphasized. The federal funding limit is $25 million and the cost-share is 65 percent federal and 35 percent non-federal.

Northeast States Emergency Consortium

NESEC Executive Director: Edward S. Fratto, 419 Main Street, Suite #5, Wakefield, MA 01880
Tel: 781-224-9876 FAX: 781-224-4350
Website: http://www.nesec.org

Northeast States Emergency Consortium, Inc. (NESEC) is a not-for-profit natural hazard mitigation, education and emergency management organization located in Wakefield, Massachusetts. NESEC is supported and funded by FEMA. NESEC works in partnership with government and private organizations to reduce losses of life and property when the next natural disaster strikes the Northeast. This includes natural hazard risk evaluation and assessment, public awareness and education programs, hazard mitigation, building codes and information technology transfer.

NESEC is formed by representatives from the states of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont. It is governed by a board of directors, which is comprised of the directors of each state's emergency management agency. There is a full-time executive director, assistant to the executive director, and a part-time support staff.

One of NESEC's main concerns is with the safety and well-being of the K-12 school population. They, with the senior citizens, comprise the most vulnerable segments of the Northeast population to natural hazards.

Power of Prevention Grants

NESEC raises funds from government and private sources to support local mitigation projects. These funds are awarded on a competitive basis in the form of grants in the range of $500-$5,000. The Power of Prevention grants are a solid investment initially and over the long term. In the short term the grant stimulated local contributions. Through a competitive grant award process, in which communities contribution was a key determining factor, NESEC has been able to leverage a 156 percent match for each dollar it invested in a community.

Over the long term, NESEC's initial investment protects literally millions of dollars of property and immeasurable value of human lives. This program was funded at about $50,000 in 1998 and $35,000 in 1997. All grant programs are administered in cooperation with the state office of emergency management. Some of the grant projects that have been funded through NESEC are:

- *Providence, Rhode Island*
  Fox Point Hurricane Barrier
  Goal: Prevent hurricane storm surge from impacting the City of Providence
  NESEC Grant: $5,000
  Community Contribution: $9,900
  Total Project Cost: $14,900
  Value of Property Protected (est.): $15 Billion + (Downtown Providence)
- *Brookline, Massachusetts*
  Backflow preventer and flood-control device

Goal: Prevent flooding of major roadway
NESEC Grant: $3,635
Value of Property Protected (est.): over $1 million

- *Salem, New Hampshire*
  Remote monitoring of water level
  Goal: Prevent flooding of major roadway
  NESEC Grant: $5,000
  Value of Property Protected (est.): over $15 billion

Project Impact

NESEC supports FEMA Project Impact communities in the identification of private and public partners. NESEC, in coordination with the state office of emergency management, meets with communities to develop plans to identify and contact potential private-sector partners.

NESEC also assists FEMA Project Impact communities in the use of FEMA developed HAZUS as a planning platform for incorporating multi-hazard disaster prevention initiatives. HAZUS loss estimation methodology is a software program, originally developed for earthquakes, that uses mathematical formulas and information about building stock, local geology and the location and size of potential multi-hazard disasters, economic data and other information to estimate potential losses. HAZUS uses a geographical information system at a regional scale to map and display the hazard, the pattern of building damage and demographic information. Once the location and size of a hypothetical hazard is identified, HAZUS will estimate the number of buildings damaged, the number of casualties, the amount of damage to transportation systems, the disruption to the electrical and water utilities, the number of people displaced from their homes, and the estimated cost of repairing projected damage. NESEC can produce a HAZUS report for a community that is multi-hazard and usually contains information on wind (hurricanes, thunderstorms, tornadoes, extra tropical cyclones and hail) and flood (riverine and coastal) hazards and earthquakes. All HAZUS support is in coordination with the state office of emergency management.

Emergency Generator Program

During disasters, power outages can interrupt the function of critical facilities (e.g., police, fire communications, hospitals, businesses). NESEC assists communities to establish a partnership with their electric utility and service companies in order to implement cost-saving measures. The monthly savings could be used to fund emergency generators for local critical facilities. The utility or service company could then lease, install and maintain the generators in a community.

Weather Radios in School Program

NESEC has provided Tone Alert weather radios to the 1,200 school districts across the Northeast at no cost. An alarm on the radio alerts school officials to severe weather information that could affect the safety of the children, thus preventing a potential disaster before it occurs.

New England Floodplain and Stormwater Managers Association

Contact: Nick Winter Tel: 617-727-0488 FAX: 617-527-793
E-mail: nick.winter@state.ma.us or nefsma@seacoast.com
Website: http://www.seacoast.com/~nefsma/

New England Floodplain and Stormwater Managers Association, Inc. (NEFSMA) was founded in 1991 by state floodplain managers in the New England area. NEFSMA contributes to training by:

- Promoting public awareness of sound floodplain management practices and to develop the professional status of, and interaction between, individuals concerned with floodplain and stormwater management.
- Encouraging the exchange of information, ideas, and experiences relative to floodplain management, as well as to provide educational opportunities and the dissemination of general and technical information to the public and professionals.

A large part of NEFSMA's membership is involved with the NFIP through their work as NFIP state coordinators, municipal building and/or zoning officials, insurance agents, engineers and surveyors. NEFSMA's 1999 spring conference included sessions on the NFIP for New England insurance agents, floodplain management and FEMA Flood Map Modernization Program. Other topics included estimating substantial damage, hazard mitigation planning, and stormwater management.

NEFSMA and the Corps, New England Division, have conducted seminars on cost-benefit analysis for flood mitigation projects. NEFSMA seeks opportunities to sponsor similar types of seminars or workshops around New England.

NEFSMA Officers and Committee
1999-2000 Board of Directors

Officers

Chair: Nicholas Winter,
Director of Flood Control,
Metro. District Commission,
Boston, MA
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Vice Chair: Peter Richardson,
Green International Affiliates,
Inc., Medford, MA
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Secretary: Donna Nelson,
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State Representatives

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Maine: Lou Sidell,
ME NFIP Coordinator
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Massachusetts: Thomas Gann,
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Tel: 802-244-6951

National Flood Insurance Program Coordinators

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Part 3: Northeast States Hazard Mitigation Efforts: Survey Findings by State

This section includes general information on what each Northeast state experiences in terms of coastal natural hazards and what they have at risk, as well as some information on the damages resulting from past storm events. When available, data have been included on when and how much federal and state funding was received by each state as a result of a presidential- or state-declared disaster.

It is an overview of each of the Northeast state agency (emergency management, flood program and the coastal zone management program) roles, responsibilities, programs, policies and regulations with respect to coastal hazard mitigation. Whether each state has building codes, state comprehensive plans, coastal construction setback regulations, hazard disclosure property laws and public education programs pertinent to coastal hazard mitigation is summarized. A description of what interagency state and federal working relationships are relative to hazard mitigation within each state, and how these partnerships and agencies are sharing financial resources, data and technical assistance is also included. Also examined is the extent to which state and/or local agencies have created partnerships within the private sector. Case examples demonstrate successful interagency collaborations, programs, policies and/or regulations that have made a significant contribution toward implementing hazard mitigation.

State of Connecticut Agencies Involved in Hazard Mitigation

As a coastal state with extensive southern exposure, Connecticut is particularly susceptible to Atlantic Ocean storms moving northward (including hurricanes) which are often exacerbated by tidal effects. The state usually experiences several disruptive winter storms each year that are composed of a variety of possible combinations of liquid and frozen precipitation and high winds. The generally damp climate of the Northeast region gives Connecticut a high annual precipitation rate–over 40 inches–making flooding a frequent source of concern both inland and in coastal areas. In summer, the state is within the path of cold frontal boundaries advancing from northwest to southeast, often triggering severe thunderstorms containing heavy rain, high winds, lightning and occasionally tornadoes and/or hail. While Connecticut does not experience a high degree of seismic activity, it is recognized that several fault lines run through the state, making earthquakes damage a possibility.

Almost every community within the region experiences floods after spring rains, thunderstorms, hurricanes or snow thaws. There is a long history of flood events including the spring floods of 1936 that affected all of the Northeast, caused 24 deaths, a total of $113 million in damages and made 77,000 people homeless. During this single event, a large portion of downtown Hartford was submerged. Significant statewide flooding again occurred in 1938 and 1955. In June 1982, southeastern Connecticut was soaked by 16 inches of rain within 48 hours. This deluge turned meandering streams in New London and Middlesex counties into raging torrents. More than 15,000 homes sustained damage. Vital roads, bridges, railroad tracks and beaches were swept away. It took the state over two years to recover.

Connecticut Department of Environmental Protection

CT DEP contact: Arthur J. Rocque, Jr., Commissioner, Connecticut Department of Environmental Protection, 79 Elm Street, Hartford, CT 06106 Tel: 860-424-3001 FAX: 860-424-4051

In Connecticut, the state Department of Environmental Protection (CT-DEP) administers the NFIP, the state Coastal Zone Management Program (CT-CZMP), hazard mitigation planning and associated FEMA grant programs. The daily administration of the HMGP, FMAP, NFIP, MAP and *Project Impact* fall within with the CT-DEP with the guidance and support the Office of Emergency Management.

The Water and Related Resources Unit is concerned with such programs as control of structures and dredging in navigable waters; the Connecticut Stream Channel Encroachment Line Program; implementation of the tidal wetland program; the Inland Wetland and Watercourses Program; shore erosion control, maintenance of dams and other flood retarding structures; Small Watershed Program, the Soil and Water Conservation District Program; and the Water Resources District Program.

Connecticut Office of Emergency Management

CT OEM contact: Daniel McGuire, Acting Director, Connecticut Office of Emergency Management, 360 Broad Street, Hartford, CT 06105 Tel: 860-685-8300
Website: http://www.state.ct.us/dps/DFEBS/OEM/entrance.htm

State Hazard Mitigation Officer: Alphonse Letendre, CT Department of Environmental Protection, 70 Elm Street, Hartford, CT 06106 Tel: 860-424-3706 FAX: 860-424-4075
E-mail: alphonse.letendre@po.state.ct.us

The Office of Emergency Management (CT-OEM) is responsible for preparation of state and local emergency operations plans to protect life and property against natural and technological disasters. CT-OEM is housed within the Department of the Military and oversees emergency management and statewide emergency telecommunications and provides general mitigation oversight and coordination. CT-OEM also works closely with CT-DEP in the areas of grant administration and planning. An additional state agency, the Department of Public Safety also provides a coordinated, integrated program for the protection of life and property. This department provides fire/building services; reviews/enforces the state building and fire codes; trains and certifies local building and fire officials.

Connecticut Coastal Zone Management Program

Contact: Charles Evans. Coastal Programs, Office of Long Island Sound Programs,
79 Elm Street, Hartford, CT 06106 Tel: 860-424-3034
Website: http://dep.state.ct.us

The Office of Long Island Sound Programs (CT-CZMP) coordinates programs within the CT-DEP which have an impact on Long Island Sound and related coastal land and water. The CT-CZMP is responsible for municipal, state and federal coastal management consistency for all activities landward of the high-tide line. It coordinates closely with coastal permit staff in the review of those which are, in whole or in part, below the high-tide line. Staff are assigned to specific coastal communities and serve as liaisons between these municipalities and other CT-DEP units (such as the CT-OEM), as many coastal projects and issues involve multiple permits and reviews. Specific responsibilities include:

- Monitor compliance of state and municipal planning and regulatory programs pursuant to Sections 22a-97, 22a-98, 22a-100, and 22a-105 through 22a-109 of the Connecticut Coastal Management Act, and initiate, as appropriate, enforcement actions for non-compliance.
- Assist coastal municipalities implementing the act by evaluating coastal site plan review applications when requested or when a project is determined to be of statewide concern. Make specific recommendations for the protection of coastal resources and the preservation and enhancement of water-dependent uses.
- Provide field inspection services for coastal site plan reviews which require specialized technical expertise or which have complex issues to resolve.
- Provide long-range planning assistance to municipalities implementing and updating municipal coastal programs, prepare and amend harbor management plans, and conduct special coastal management studies and projects.

- Review all significant state actions and land-based federal activities within the coastal area for consistency with the applicable policies and standards of the Connecticut Coastal Act. Recommend, where appropriate, specific mitigation measures necessary to protect coastal resources.
- Coordinate with Water Management Bureau staff the review of stormwater discharges in coastal areas to ensure that coastal water quality, particularly in affected or threatened embayments, is protected through appropriate design, mitigation, best management practices, and operation and maintenance.

The technical services section of the CT-CZMP is responsible for providing the technical expertise for the office's resource management efforts. This section works closely with the technical experts throughout the agency to ensure an interdisciplinary approach to coastal resource and ecosystem management. Specific responsibilities include:

- Plan, design and implement restoration of coastal habitats.
- Administer the Long Island Sound research program and its fund.
- Provide technical assistance on coastal resource impact assessments and restoration plans.
- Develop new, and update existing, spatial data for the coastal area to support the overall geographic information systems (GIS) initiative.
- Coordinate with state and federal resource experts in the development and implementation of resource programs and specific efforts.
- Conduct special coastal resource management planning studies of a technical or scientific nature.

Connecticut Flood Insurance Program

Floodplain-NFIP State Coordination/Mitigation Planning & Grants contact: Scott R. Choquette
Tel: 860-424-3873
Website: http://www.dep.state.ct.us

The Connecticut flood program (CT-NFIP) oversees two programs designed to minimize the potential flood damages. The first is the Connecticut Stream Channel Encroachment Line Program that emerged following the 1955 flood disaster. CT-NFIP was designed as a non-structural element in the state's effort to reduce losses due to flood events. Approximately 270 miles of the state's most flood-prone rivers are now regulated under this program. The program is administered by the CT-DEP to ensure that floodplain development is compatible both structurally and hydraulically with the flood flows expected in the rivers. Permits to develop within these areas are granted only if it can be clearly demonstrated that no increase in flood hazard or other adverse consequences will result upon completion of the development and the environmental impacts are acceptable. Permits may be denied on environmental grounds.

The second is the Flood and Erosion Control Board program which provides assistance to municipalities to solve flooding, beach erosion and dam repair problems that impact large segments of a community or a substantial number of properties located on a river, stream, coastal shoreline or impoundment. The program can also implement qualified non-structural flood-damage reduction measures in areas that are frequently damaged by repeated flooding. Also eligible are non-structural measures that mitigate flood damages. Examples of non-structural

projects might include flood warning systems, flood-proofing projects, and sand removal or relocation of severely flood-prone residences.

Funding is provided to towns and cities that apply for assistance through the program on a non-competitive basis. A capitol budget is provided by the Legislature annually; the level of state participation in a project is established by Section 25-71 of the Connecticut General Statutes. Funding is paid to the municipality on a reimbursement basis, unless the state is administering a project for a municipality. In the latter case, the municipality will reimburse the local share of a project.

Table 8. Connecticut NFIP Policy Information (June 1999).**
Total of 176 Communities.

# of Policies**	Coverage**	Repetitive Loss Properties*	$Total Paymnts**	# of CRS Comm
28,079	$3.7B	1,119	$90.1.M	12

*Federal Insurance Administration, May, 31, 1999. **FEMA Community Information System Database.

Army Corps of Engineers Flood Control Projects

New London Hurricane Barrier
Project Personnel: Owned and operated by the City of New London
Project Purpose: Hurricane flood protection
Location: Project is located in Shaws Cove/New London Harbor, in the city of New London
Protected Area: Provides protection from high tides caused by coastal storms and hurricanes as well as from interior flooding caused by overbank flows from Truman Brook to all areas of the Shaws Avenue Urban Development area
Design Hurricane Tide: 10.5 Ft NGVD
Total Cost: $11,500,000
Placed In Operation: January 1985

Pawcatuck Hurricane Protection
Project Personnel: Owned, operated and maintained by the Town of Stonington
Project Purpose: Hurricane flood protection
Location: Project is located on the west bank of the Pawcatuck River about 5 miles from the mouth of the river in the town of Pawcatuck in New London County
Protected Area: The project protects approximately 34 acres of highly industrialized land from hurricane induced tidal surges on the Pawcatuck River
Design Hurricane Tide: 16.5 Ft NGVD
Total Cost: $860,000
Placed In Operation: September 1963

Stamford Hurricane Barrier
Project Purpose: Hurricane flood protection
Location: Project extends from the West Branch eastward across the East Branch of Stamford Harbor, in the City of Stamford, Fairfield County
Protected Area: Approximately 460 acres consisting of principal manufacturing plants of the city, residential sections, and a portion of the main commercial district
Design Hurricane Tide: 14.8 Ft NGVD
Ownership: All features (except navigation gate), operated and maintained by City of Stamford. Navigation gate at East Branch Barrier operated and maintained by Corps
Total Cost: $14,470,000
Placed In Operation: January 1969

Connecticut Sea Grant Program

Director: Edward C. Monahan, Connecticut Sea Grant College Program,
University of Connecticut, 1084 Shennecossett Rd., Groton, CT 06340-6097
Tel: 860-405-9110 or 860-405-9128 FAX: 860-405-9109
Website: http://www.seagrant.uconn.edu/

Objectives/Activities
The Connecticut Sea Grant Extension Program is based at the University of Connecticut, Avery Point campus. The program funds marine research and is a primary source of information about marine and coastal issues, including Long Island Sound. Current key areas of expertise include aquaculture, habitat restoration, introduced species, estuarine ecosystems and watersheds, fisheries, nonpoint pollution, public access, seafood safety and water quality. The program also oversees an intern program in outreach and coastal policy issues at the Yale University School of Forestry, and Environmental Studies Center for Coastal and Watershed Systems. Little is being done concerning hazard mitigation.

State of Connecticut Survey Results

The survey was completed by a representative from the CT-DEP (CT-DEP flood coordinator) with a representative from the Office of the Long Island Sound Program (CT-CZMP), and the extension agent of the Connecticut Sea Grant Program. On a scale of 1-5 (5 being the highest), hazard mitigation within their respective programs was rated "4" out of 5, however, flood management issues were rated "3."

Connecticut Planning & Policy Development

The planning and policy development portion of the survey indicated that Connecticut's policies/regulations/enforcement addressed most aspects of resource protection, except for coastal construction setbacks and the reconstruction of substantially damaged structures. Hazard mitigation and floodplain mitigation regulations were in place and regulated/enforced. With respect to queries on the building code and construction practices within the floodplain and coastal area, Connecticut does have a statewide building code, but no coastal construction codes

are in place**.** As in Rhode Island, the same code is enforced in all communities, the Connecticut code does include coastal construction requirements and many of the same requirement as the NFIP regulations for flood-prone riverine properties. Unlike Massachusetts, Connecticut does not have all of the NFIP minimum requirements in the code. Therefore, the building official in the community is not always the flood program enforcement officer. All Connecticut communities have separate NFIP zoning regulations or ordinances, thus, in every town there exists duplication between the state building code and the NFIP regulations. Respondents were uncertain whether there were building standards regulating building heights and manufactured housing units. Additionally, there are no regulations in place prohibiting reconstruction of substantially damaged structures. (Reconstruction is permitted, but if in a floodplain, the structure must comply with NFIP standards–e.g., elevation or flood proofing.) With regard to coastal development, Connecticut does not have regulations on coastal construction setbacks nor does it have prohibitions on coastal armoring.

Connecticut does have statewide planning in the form of a state plan of conservation and development. It does not, however, contain hazard mitigation elements. Connecticut also has comprehensive planning statutes requiring all municipal governments with planning and zoning commissions to have a local plan of conservation and development, i.e., master plan. Only two Connecticut towns do not have commissions and therefore no plans. In the master plan there is no requirement for mitigation to be included, however, there are policies addressing coastal issues, but do not address hazard mitigation.

Table 9. Policies & Regulations used by Connecticut State Agencies Related to Hazard Mitigation.

Policy/Regulation	***OEM***	***NFIP***	***CZMP***	***SG***
Coastal construction setbacks	no	no	no	dnr
Prohibitions on coastal armoring	yes	yes	yes	dnr
Dune protection	yes	yes	yes	dnr
Wetland restoration	yes	yes	yes	dnr
Public infrastructure prohibited in hazard areas	yes	yes	yes	dnr
State building code	yes	yes	yes	dnr
Building heights	dn	dn	dn	dnr
Building elevations	yes	yes	yes	dnr
Prohibit reconstruction of substantially damaged bldgs	no	no	no	dnr
Building replacement cost info	dnr	dnr	dnr	dnr
Manufactured home construction standards	dn	dn	dn	dnr
Mobile home construction standards	yes	yes	yes	dnr
Wind load standards	yes	yes	yes	dnr
State guide plan	na	na	na	dnr
409 Plan have coastal policies	yes	yes	yes	dnr
§309 CZM program prioritize coastal hazards	yes	yes	yes	dnr
State flood mitigation regulations	yes	yes	yes	dnr

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
OEM – Emergency Management NFIP – State Flood Program CZMP – Coastal Zone Management SG – Sea Grant

Connecticut Program Activities & Tools

Risk Assessment
To identify hazard risks and vulnerabilities, the CT-SEMO, CT-NFIP and CT-CZMP were using Floodplain Insurance Rate Maps (FIRMs), land use, zoning and sea lake overland surge from hurricane (SLOSH) maps. All are using repetitive loss and NFIP data. However, only the CT-CZMP is actively using GIS, and it is unclear to what extent. None of the programs are using critical facility maps nor data on erosion rates or coastal setbacks, therefore, they are probably not addressing beach erosion risks. The number of identifiers used to conduct vulnerability assessments also appeared small.

Training
Regarding program activities, the CT-DEP manages a significant community assistance program addressing training in the areas of mitigation planning and the NFIP. This program includes a minimum of five municipal official workshops as well as workshops for land surveyors, civil engineers in private practice and others. The flood program wants to also include real estate developers and others. The CT-OEM has very extensive response and emergency management training program. The Department of Public Safety has continuing education requirements for local building officials. Most mitigation literature is housed at CT-DEP. The CT-DEP offers technical assistance in the area of coastal construction and development of flood-prone property.

Public Education
However, in terms of public education and awareness, no effort has been given to educating prospective homeowners of the potential natural hazards. In addition, there is no statewide requirement of potential natural hazard disclosure tied to real estate sales or property insurance. Monitoring and evaluation of hazard mitigation efforts does occur, and results are reported to FEMA through the state/federal Performance Partnership Agreement. Hazard mitigation effectiveness or CT-CZMP involvement is not reported through the biannual CZM §312 review. Legislative and congressional staff are not informed of any hazard related activities.

Connecticut Interagency Relationships/Networks

A relatively new initiative is underway to establish a statewide agency collaboration on hazard mitigation issues. A memorandum of agreement has been established between six government agencies. Five are state agencies (CT-DEP, CT-OEM, Office of Policy Management, Department of Public Safety, state building official's office and the Department of Transportation); the sixth agency, the Natural Resources Conservation Service (NRCS), is the federal government agency. Representatives of each of these six agencies form the Connecticut Interagency Hazard Mitigation Committee. Current representation on the committee includes three CT-DEP staff; the state floodplain coordinator; the state and deputy state hazard mitigation officer; two CT-OEM representatives; the lead planning analyst of the mitigation section; one mitigation staff member and one representative of each of the following agencies: Office of Policy Management, Department of Transportation, state building official and NRCS. Other agencies or representatives of existing member agencies may be added as deemed appropriate by the committee.

Table 10. Programs & Tools used by Connecticut State Agencies to Identify Hazard Risks & Vulnerabilities.

Programs/Tools	*OEM*	*NFIP*	*CZMP*	*SG*
FIRMs	yes	yes	yes	dnr
GIS	no	no	yes	dnr
Erosion rates	*in process	no	no	dnr
Zoning maps	yes	yes	yes	dnr
Land use maps	yes	yes	yes	dnr
Critical facilities	no	no	no	dnr
SLOSH maps	yes	yes	yes	dnr
HAZUS	no	no	no	dnr
Building replacement cost info	no	no	no	dnr
Building inventories	yes	yes	yes	dnr
Repetitive loss data	yes	yes	yes	dnr
NFIP data	yes	yes	yes	dnr
Building inventory-100 year floodplain	no	no	no	dnr
Statewide disclosure law	no	no	no	dnr

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dr – Don't know na – Not applicable
OEM – Emergency Management NFIP – State Flood Program CZMP – Coastal Zone Management SG – Sea Grant

Only Stafford Act funds from FEMA have been used for hazard mitigation objectives, nothing from NOAA or the CT-CZMP. State funding does not appear to be available. There seems to be no sharing of financial and technical resources with other agencies and no assistance from the Institute of Business and Home Safety, Sea Grant or the American Planning Association. The Connecticut Flood & Erosion Control Board Program spends significant amounts of state bond money on mitigation (although the definition of mitigation does not always mirror FEMA's). On the regulatory side, the Stream Channel Encroachment Line Program, older than the NFIP, regulates land use along certain stream corridors in the state.

Connecticut Case Examples of Successful Hazard Mitigation Initiatives

Project Impact

Town of Westport

Community Profile: The town of Westport is located in Fairfield County in southwestern Connecticut. Westport is a predominantly suburban residential community located on Long Island Sound. Westport's total land area is 19.9 square miles, and the population is roughly 25,000. There are 10,000 properties in the town. The town is a Class 9 CRS community.

Disaster Risk: Because it is a coastal community, Westport has suffered repeated flooding, erosion and wind and wave damages from storms and hurricanes. Westport is also at considerable risk from the following water courses: Saugatuck River, Aspetuck River, Stony Brook, Dead Man's Brook, Muddy Brook, Sasco Creek, Poplar Plains Brook and Willow Brook. There are approximately 3,000 properties in the flood-hazard area. According to the community information system, there are 1,055 flood insurance policies in force and there have been 819 paid losses for flood insurance claims. There are 76 properties that have sustained repetitive losses.

Table 11. State Interagency Relationships in Connecticut.

	Informal/ Information Sharing	Formal (MOU or Executive Order)	Cost /Grant Sharing	Minimal or None
Federal				
. FEMA Regional Staff			CZMP/NFIP/OEM	
. Army Corps of Engineers			CZMP/NFIP/OEM	
. NRCS - Other (specify)		NFIP/OEM		
State				
. Floodplain Managers		CZMP/OEM		
. Coastal Resource Management Program Staff		NFIP/OEM		
. Emergency Management Staff		CZMP/ NFIP		
. Building Commissioner	CZMP/NFIP/OEM			
. Insurance Commissioner	CZMP/NFIP/OEM			
. Public Utilities				
. Sea Grant/Cooperative Extension	ongoing			
. State Budget Office		CZMP/NFIP/OEM		
. Office of Policy and Management	NFIP/OEM	In progress		
Local				
. Local Building Officials	CZMP/NFIP/OEM			
. Local Planners	CZMP/NFIP/OEM			
. Local Department of Public Works Staff	CZMP/NFIP/OEM			
. Local Emergency Management Officials	CZMP/NFIP/ OEM			
. Local Elected Officials	CZMP/NFIP/OEM			
Private				
. Insurance Industry				CZMP/NFIP/OEM
. Professional Associations	CZMP/NFIP/ OEM			
. Building/Construction Industry	CZMP/NFIP/OEM			
. NEFSMA . NESEC . ASFPM . SEMO	NFIP NFIP/OEM NFIP NFIP/OEM OEM			

NFIP – state flood program CZMP – state coastal program OEM –office of emergency management

Capacity for Public-Private Partnerships: The largest private sector organization in the area is the BIC Corporation. The Private Beach Association has been instrumental in the community's receipt of Hazard Mitigation Grant Funds, which are being used to retrofit and elevate coastal homes. A private resident developed an emergency preparedness brochure and distributed it, using her own resources as well as funding from the American Red Cross and the local Sons of Italy.

Disaster Prevention Commitments/Actions: Westport participates in the CRS. The planning and zoning department's planning assistant also acts as coordinator of the CRS. Westport has been active in the pursuit of Flood Mitigation Assistance Grants and HMGP funds and received significant HMGP funds as a result of DR-972 in December 1992. This grant was used for retrofitting and elevation projects.

City of Milford

Community Profile: Milford is located on Interstate 95, some sixty miles from New York and forty-six miles from Hartford. Over 50,000 residents take advantage of Milford's small town New England charm while being within an hour of the amenities of life in a major metropolitan area. Milford's miles of coastline, its access to the Long Island Sound, and its state park make it a prime destination for tourists.

Disaster Risk: Milford has some 14 miles of shoreline along Long Island Sound and has a long history of experiencing coastal tidal flooding problems from hurricanes and nor'easters. On average, Milford experiences a minimum of two major shoreline floods per year. Many residential areas of the city are located in low-lying, coastal locations. Flood damage takes its toll not only on homes and other structures but to motor vehicles and boats as well.

Capacity for Public-Private Partnerships: Milford is home to corporations like Warner Lambert-Schick,, Subway Franchise World Headquarters, Executone and over 3,000 of smaller companies. A major shopping center with Filenes and J.C. Penney's draws customers from the surrounding area. Milford's business community is diverse and includes manufacturing, retail, distribution and corporate office developments.

Disaster Prevention Commitments/Actions: The City of Milford has taken various measures to try and control these flooding problems. These measures include the installation of flood gates at the mouth of selected creeks, and the installation of check valves to help prevent the back flooding of the storm sewer system by tidal waves. The reduction of damages and the loss of life through an effective program of warnings and public information is and has been a major goal. In February 1991, Milford received $16,662 in HMGP funding for a flood warning system. It also received $42,500 in HMGP funding to install a coastal warning system.

State of Maine Agencies Involved in Hazard Mitigation

Maine has a variety of landscapes and ecosystems including: six large river systems and watersheds, extensive tracts of forests, many lakes and mountaintops, diverse freshwater and saltwater wetlands, a long coastline, thousands of islands and rich marine waters. To many residents and visitors, the State of Maine's identity is closely linked to its coastal environment. More than any other natural feature, the coast defines the character and image of Maine. Each year over six million people visit the Maine coast. Residents are also compelled by its allure: 43 percent of the state's population lives in the coastal region which comprises only 12 percent of the land area. Increased residential and commercial development within the floodplain areas or near the ocean have contributed to the increased losses from flooding. Historically, minor to moderate flooding occurs annually, and those areas affected are prepared to deal with it. Major flooding, while less frequent, has occurred and significant property damage has resulted.

Maine has eight major rivers, more than 5,000 streams and brooks, 6,000 ponds and lakes, and 3,500 miles of coastline, which are vulnerable to the effects of flooding. While minor to moderate flooding may occur at any time, major flooding has frequently occurred with heavy rains and rapidly melting snow and ice; when ice jams have restricted the natural run-off of water; or where high winds, heavy rain or snow, and higher than normal wind-driven tides have combined to cause heavy coastal damage.

On average, Maine experiences five to seven nor'easters per year, one to two hurricanes per year, continuous erosion of southern Maine beaches, and occasional landslides along the coast. Sea-level rise continues at the rate of one foot per century that increases the risks from erosion, flooding and storms. The primary risks from coastal hazards in Maine are the loss of public and private property near the shore caused by a combination of shoreline erosion, storms and sea-level rise. Environmental contamination can occur as well, usually from fuel tanks, septic systems, and debris damaged by flooding and storm events. The state is also losing important natural resources as sea-level rises to cover marshes that cannot extend landward due to constricted by development. These risks are greatest where development is located on or near beaches, marshes and soft bluffs.

The entire state is vulnerable to the primary or secondary effects of a hurricane, the coastal and southern areas of the state most frequently receiving the highest impact. The experience of Hurricane Gloria in September 1985 and Hurricane Bob in 1991 raised awareness of the state's vulnerability. During these events, public works and highway crews provide debris clearance from streets and highways as soon as possible enabling emergency services, as well as routine traffic, to use transportation routes. Power failures frequently occur and utilities activate their resources to the fullest possible extent to restore services as soon as possible to essential facilities, then large metropolitan areas and individual residences. Plans need to be made to evacuate and shelter persons from high-risk areas. Reasonable steps must be taken to protect the public from such effects as drinking water contamination and other hazardous conditions.

There have been two federal disaster declarations caused by coastal storms since 1991. A storm in April 1996 caused over $500,000 in public property damage in coastal towns and coincided

with a landslide that destroyed two private homes. In October 1996, a coastal storm occurred that was estimated at greater than a 500-year rain event and set a new record for rainfall. Extensive flooding caused over $26 million in public and private property damage.

Maine Coastal Program

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Coastal resources must be protected and conserved, yet present and future residents must be able to thrive economically. A balance is needed between human uses and the protection of the very resources that make the area so appealing. The goal of the Maine Coastal Program (MCP) is to help achieve that balance. Established in 1978 and administered by the Maine State Planning Office, MCP is a partnership among local, regional and state agencies. It also collaborates with many private organizations, such as local land trusts and economic development groups. Through this networked program, no one agency or department is responsible for the entire coast. Rather, all partners help ensure coastal management.

Maine's coastal zone encompasses all towns and cities in Maine that have land along the coast or a tidal waterway, such as a river or bay. This includes towns from Kittery to Calais, inland to Augusta along the Kennebec River, and Bangor along the Penobscot River. The zone encompasses Maine's territorial waters, which extend three miles out to sea. Maine's total coastal zone includes 144 towns, 4,568 miles of coastline and 4,613 islands.

The MCP addresses the coastal hazard problem through support and enforcement of land-use laws at the state and local level. It also provides training to town code enforcement officers who enforce local and state land-use laws. The MCP also addresses coastal hazards through research and mapping of areas prone to coastal and bluff erosion. It has taken a number of regulations programs and other activities over the past few years to prevent risks from coastal hazards and provide some regulatory flexibility to shorefront property owners. These actions are listed below.

Natural Resource Protection Act
Construction on coastal sand dunes is regulated by the Sand Dune Rules issued by the Maine Department of Environmental Protection (ME-DEP) under Natural Resource Protection Act. These rules generally restrict the size, location and design of new development and reconstruction on frontal dunes. In 1993 the rules were amended to allow reconstruction and limited expansion of a building that has never been damaged by an ocean storm, provided the reconstruction meets certain design criteria. In 1995 the legislature again amended the act to allow shorefront property owners to temporarily stabilize seawalls and other retaining structures in order to protect property from immediate loss, but homeowners must notify the local code enforcement officer within 12 hours. The structures may stay in place until a permanent project is approved by state and local government.

Coastal Erosion Mapping
The Maine Geological Survey (MGS) has prepared maps showing erosion rates for developed beaches in southern Maine. These rates are based on historic trends that were determined from aerial photography and maps. The maps are now used by MGS to advise ME-DEP in permitting under the Sand Dune Rules of the National Resource Protection Act. Under these rules, new construction is not permitted if it is located in an area that is likely to erode within 100 years. The maps are also being used to educate municipal officials on ways to avoid the damage that will occur by developing in or near the eroding shorelines.

Shoreland Zoning Act
The Mandatory Shoreland Zoning Act requires municipalities to adopt and enforce a zoning ordinance that regulates land use within 250 feet of coastal waters. The ordinance must designate districts within the shoreland zone including a resource protection district for floodplains, steep slopes, coastal wetlands and important wildlife habitat. Construction in this district is restricted. In order to avoid an unconstitutional taking of private property, the legislature created a variance in 1995 to allow construction of a single family home in a resource protection district if certain criteria were met. This change allows some additional construction, but it is not expected to affect a significant number of undeveloped lots in the state.

Mediation of "Takings" Claims
In 1996 the legislature passed a law to allow persons who have been denied a state permit to mediate a claim of an unconstitutional taking of private property for public use, instead of filing a civil action in Superior Court. This mediation process provides the state and permit applicant the opportunity to come to an agreement that allows some use of the property while also protecting the resource.

Bluff Erosion Mapping and Ordinance
MGS is currently preparing maps of soft bluffs along the Maine coast that are vulnerable to erosion. These maps will be incorporated into a guide for municipal officials that explains ways to avoid property losses from eroding bluffs. They will also be used to make changes to state regulation of construction in these eroding areas.

Municipal Floodplain Ordinances
Municipal enforcement of floodplain ordinances has improved dramatically with training of local code enforcement officers. Some towns are also amending their ordinances to increase the rate of upgrading existing structures in coastal hazard areas to meet the NFIP standards. These improvements help decrease flood insurance rates for property owners.

Planning for Sea-Level Rise
The Marine Law Institute, State Planning Office and MGS prepared a study of the impacts of sea-level rise on Maine's coast. Based on this study, specific state and local actions are recommended to mitigate these impacts. The recommendations are based on a policy of retreating development from the shore rather than building fortifications against the rising sea.

Beach Erosion Task Force
ME-DEP, State Planning Office and MGS formed a task force in 1997 to develop recommendations to improve beach systems in southern Maine. The task force consists of the municipalities along southern Maine's coast, property owners, businesses and environmental groups. The major issues being addressed are restoration of eroding beaches and management of human activities on or near beaches. The outgrowth of this task is an effort beginning in 1998 to develop regional beach management plans that recognize and manage beach systems as a unit.

Maine's Strategic Plan:

1. Public Awareness: Public knowledge and acceptance of the risks posed by coastal hazards, especially bluff erosion and sea-level rise, is not widespread. Maine needs to better inform the public of these risks and the costs of development in hazard areas.

   Coastal Hazard Disclosure: The MCP will work with realtors and bankers to adopt a requirement for disclosing the risks of coastal hazards to potential property buyers when real estate is shown for sale or transferred.

2. Municipal Control of Shore Development: Existing development remains at risk in many places because municipal laws allow reconstruction of damaged property that does not conform to the construction standards of the NFIP. Municipal governments also need to use the best available information on coastal erosion rates to reduce the risks for new development in hazard areas.

   Technical Assistance: The MCP will help state agencies provide information to municipalities about the risk of coastal hazards and the most effective ways to reduce the risks. The state has drafted a guide that explains the coastal erosion rates, sea-level rise and economic costs of building in hazard areas. The guide also describes ways to avoid these risks through planning, ordinances and construction techniques.

3. State Regulation of Activities near Eroding Bluffs: Current state law is ambiguous on requirements for development near eroding bluffs, and state agencies lack information on erosion rates for coastal bluffs.

   Technical Guidance: The MCP will provide funding to MGS to prepare maps of eroding bluffs along the coast. It will then work with ME-DEP to establish guidelines in state law or regulation to establish the circumstances in which eroding bluffs should be stabilized to protect development.

4. Southern Maine Beaches: Despite the continual loss of property and natural resources along the coast, there is an ongoing debate about what actions should be taken by the state and municipalities to improve coastal resources and reduce property losses. There are many people and organizations that hold a stake in addressing coastal hazards in southern Maine. In the past, these stakeholders have acted independently or in small coalitions, and each stakeholder has limited resources and authority to address this problem. On this issue the stakeholders need to develop a common agenda that they can work together to implement.

Action Plan for Southern Maine Beaches: The state has assembled a stakeholder group to recommend ways to improve beach systems in southern Maine. The MCP will help implement the recommendations' of the task force. The outgrowth of this task is an effort beginning in 1998 to develop regional beach management plans that recognize and manage beach systems as a unit.

Maine Emergency Management Agency

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The Maine Emergency Management Agency (MEMA) is located within the bureau of the Department of Defense, Veterans and Emergency Management. The mission of the MEMA is to lessen the effects of disaster on the lives and property of the people of Maine through leadership, coordination and support in the four phases of emergency management: mitigation, preparedness, response and recovery.

The Department of Defense, Veterans and Emergency Management and MEMA have the responsibility for dam safety for dams not under federal jurisdiction for licensing and inspection. MEMA has developed a dam safety program, and since November 1996, a professional engineer has inspected 68 dams. Maine uses the National Inventory of Dams as its official registry, and this registry was last updated in November 1996 with information provided by dam owners in the form of a state-wide survey of the owners of all 812 dams.

Most larger dams in Maine are used in conjunction with generation of electricity and, therefore, come under the jurisdiction of the Federal Energy Regulatory Commission's (FERC) regulations regarding safety inspections. These dams are normally more than 35-feet high or impound more than 2,000 acres of water. FERC requires an in-depth, independent inspection every five years, as well as annual inspections by FERC staff. Maine has some 812 known dams in excess of two feet in height. Of these, 170 are non-FERC regulated with "high" or "significant" hazard potential classifications. The Corps assigns hazard potential classifications, and Maine uses these classifications to regulate dams for safety purposes. Dams with "high" hazard potential are those which would likely cause loss of life and significant property loss if they failed. "Significant" hazard dams would likely cause damage to property if failure occurred, loss of life is uncertain. "Low" hazard dams might cause minor damage to isolated uninhabited facilities, and loss of life is not expected under failure conditions. Dam hazard potential classifications have nothing to do with the physical condition of a dam, only the potential for death or destruction due to the size of the dam, the size of the impoundment, and the characteristics of the area downstream.

Maine Floodplain Program

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There are 2,772 square miles of floodplain in Maine and approximately 33,000 structures at risk. In consequence, coastal flooding has resulted in millions of dollars of property damage. Many insurance companies will not insure areas against flooding in Maine because private insurers have found the risk too high. Currently, there are over 6,630 flood insurance policies in effect in Maine, with coverage totaling $703.2 million. Mortgage loans and disaster assistance are severely limited in communities that do not participate in the Maine Floodplain Program (ME-NFIP).

The ME-NFIP provides technical information, floodplain maps and model ordinances to communities interested in joining the ME-NFIP, as well as to participating communities. Program staff also provides information about the ME-NFIP to homeowners, businesses, lenders, realtors and others. The program provides workshops on how to read and use flood maps and on ordinance interpretation. Staff also review local ordinances for compliance with the ME-NFIP standards. Assistance is provided to those communities in the ME-NFIP that seek to lower their flood insurance premiums through the CRS.

The ME-NFIP made several changes to the state floodplain ordinance in 1999. Many of these changes are based on concerns and recommendations from local officials. There are many new sections under Article VI–Development Standards including provisions for accessory structures, containment walls, bridges, and wharves, piers and docks. There is a "conditional use" section which has been added to facilitate the permitting of lobster and fishing sheds located seaward of mean high tide in coastal communities. There are also many less significant changes that were done to clarify and improve the ordinance.

Table 12. Maine NFIP Policy Information.
Total of 948 Communities (June 1999).**

# of Policies**	Coverage**	Rep Loss Properties*	$Total Payments**	# of CRS Comm
6,621	$715M	167	$25.8M	39

*Federal Insurance Administration, May 31, 1999. **FEMA Community Information System Database.

Maine/New Hampshire Sea Grant Program

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Maine Sea Grant funds studies on coastal processes undertaken by scientist from University of Maine, Boston University and the MGS. These researchers present their findings in workshops for planing commissions, zoning boards, legislators, state agencies, shorefront land owners, land developers and others. This research has contributed greatly in the passage of the Maine Sand Dune Law amendment to the state's Wetlands Protection Act. Passage of the act severely limits new construction on beaches and dunes and reconstruction of storm-damaged buildings and seawalls.

Maine/New Hampshire Sea Grant Extension/Outreach Program

Maine/New Hampshire Sea Grant Extension Program serves as the link between the marine community and the university to help citizens and groups solve problems related to marine resources. Extension officers' efforts are focused on three major areas: commercial fisheries and aquaculture, coastal resource development and marine science education. In all of these activities, Maine/New Hampshire Sea Grant works closely with University of New Hampshire Cooperative Extension and University of Maine Cooperative Extension.

The Maine/New Hampshire Sea Grant program indicated that over the past five years there has been no participation in hazard related training that was sponsored by other agencies.

The Maine Sea Grant program has initiated a project "Co-management of Maine's Beaches through Volunteer Monitoring and Annual State-of-Maine Beaches Meetings." This is a 1999 Sea Grant funded program in coordination with the University of Maine and the Maine Geological Survey. This project will be repeated annually and data will be used for future beach replenishment projects.

State of Maine Survey Results

The survey was completed by a representative from MEMA, the ME-NFIP, a member of the MCP and the extension agent of the Maine/New Hampshire Sea Grant Program. On a scale of 1-5 (5 being the highest), the MEMA prioritized hazard mitigation a "5," the ME-NFIP prioritized the importance of addressing hazard mitigation a "4" and the MCP rated hazard mitigation a "3."

Maine Planning & Policy Development

Maine does not have a statewide building code nor a state-planning document. However, some local communities do address issues of post-disaster reconstruction through local building codes. Further, the state floodplain manager indicated through the survey that there are standards for post-disaster redevelopment. Applicable land-use regulations related to coastal hazard mitigation takes place at both state and local levels through the ME-DEP and local code enforcement. Maine does prohibit coastal armoring and enforces regulations on dune protection. Public infrastructure is prohibited in high hazardous areas through implementation of the Coastal Barrier Resources Act.

The ME-NFIP has the reputation of being very strong, and many components of this program serve as a model for other states in the region and country. Both the MEMA and MCP appear to be fairly familiar with the programs, policies and activities of the ME-NFIP.

Table 13. Policies & Regulations used by Maine State Agencies Related to Hazard Mitigation.

Policy/Regulation	***MEMA***	***NFIP***	***MCP***	***SG***
Coastal construction setbacks	yes	no	no	dn
Prohibitions on coastal armoring	yes	yes	yes	dn
Dune protection	yes	yes	yes	dn
Wetland restoration	yes	dn	yes	yes
Public infrastructure prohibited in hazard areas	yes	yes	yes	dn
State building code	no	no	no	na
Building heights	na	na	na	na
Building elevations	na	na	na	na
Prohibit reconstruction of substantially damaged bldgs	no	no	no	dn
Building replacement cost info	no	no	no	na
Manufactured home construction standards	na	na	na	na
Mobile home construction standards	na	na	na	na
Wind load standards	na	na	na	na
State guide plan	yes	no	no	yes
409 Plan have coastal policies	yes	yes	yes	yes
§309 CZM program prioritize coastal hazards	dn	dn	yes	yes
State flood mitigation regulations	yes	yes	yes	yes

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
MEMA – Emergency Management Agency NFIP – State Flood Program CZMP – Coastal Zone Management SG – Sea Grant

Maine Program Activities and Tools

Risk Assessment
This survey indicated that the MEMA is quite sophisticated in its mapping tools used for identifying hazards, risks and vulnerabilities (survey indicates that all mapping tools are used by this agency). Additionally, this agency uses erosion rates, topographic maps and digital data provided by the National Wetland Inventory. MCP indicates that the only information that they use in terms of identifying coastal hazard risks and vulnerabilities is compliance mapping for flood insurance and flood loss and vulnerability data, including ME-NFIP community information, ME-NFIP repetitive loss information and CRS community data.

Public Education
Maine, through the Interagency Hazard Mitigation Team, did introduce legislation requiring hazard disclosure procedures be tied to real estate transactions to alert potential property owners of the risks posed by natural hazards, however, this legislation failed to pass. All three programs claim to house public education and awareness materials. They all have websites that also list sources for additional information on the topics of coastal hazards and hazard mitigation.

Training
All programs have provided training and/or workshops on the topics of hazard mitigation to local elected officials, state environmental staff, code enforcement officers, professional land surveyors, realtors and neighborhood associations. In addition, all provide information on technical and financial resources available to implement mitigation measures within their community. In terms of reporting the results of the various programs, the MCP reports results through the 312 review process, and the MEMA reports through their cooperative agreement with FEMA.

Maine Interagency Relationships/Networks

Maine's interagency relationships/networks are primarily informal. The only formal relationship is that of federal consistency between the MCP and the Corps (a federal requirement). Regarding the sharing of financial and technical resources, FEMA HMGP funds are being spent on coastal hazards programs and activities. MCP is using funds to hire a beach management planner (309 grant). The planner will be housed at the Southern Maine Regional Planning Commission in Sanford, Maine, and will work over the next three years to develop regional beach management plans for southern Maine beaches. MCP is also working with MGS to use their erosion rates data for beaches and coastal bluffs. They worked with MGS and University of Maine on a sea-level rise study jointly funded with the United States Environmental Protection Agency (EPA) which continues to fund MGS for erosion rate data and maps, bluff hazard maps, public education guides, and training programs for environmental permitting staff. MCP provides technical assistance and works with local building officials, FEMA Region I staff, local planners and elected officials. Other examples of how these three programs are sharing financial and technical resources include *Project Impact* in the cities of Saco and Portland, and through all HMGP grants.

Table 14. Programs & Tools used by Maine State Agencies to Identify Hazard Risks & Vulnerabilities.

Programs/Tools	***MEMA***	***NFIP***	***MCP*****	***SG****
FIRMs	yes	yes	yes	yes
GIS	yes	no	yes	yes
Erosion rates	yes	no	yes	yes
Zoning maps	yes	no	no	yes
Land use maps	yes	no	yes	yes
Critical facilities	yes	no	no	no
SLOSH maps	yes	yes	dn	no
HAZUS	yes	yes	dn	no
Building replacement cost information	yes	no	no	na
Building inventories	yes	yes	yes	na
Repeat loss data	yes	yes	no	na
NFIP data	yes	yes	yes	na
Building inventory-100 yr. floodplain	yes	yes	no	na
Statewide disclosure law	yes	yes	no	yes
Coastal barrier resource maps	yes	dnr	yes	no
Aerial photographs	yes	dnr	yes	na

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
MEMA –Emergency Management Agency NFIP – State Flood Program MCP – Maine Coastal Program SG – Sea Grant
**CZMP funds the ME Geological Survey to provide them with data to identify hazard risks and vulnerabilities

MEMA has formal relationships with the local emergency management officials and elected officials. Their informal relationships are with public utilities, local building officials and planners and staff from local departments of public works. MEMA has grant sharing arrangements with FEMA Region I, the Corps, floodplain managers and local emergency management officials. There has been minimal contact with the MCP, the insurance commissioner and the State Budget Office. There is no relationship established between MEMA and the building commissioner or Maine Sea Grant.

The ME-NFIP works closely with code enforcement offices that conduct training and certification programs. This joint collaboration includes 404 reviews, *Project Impact* and the FMAPs. The ME-NFIP has established interagency permit review to ensure flood mitigation issues are addressed.

When asked how the agency could profit from the results of this survey, MEMA indicated that they would review the results and possibly use the report as suggestions for improvement to their program. MCP indicated that they would be very interested in using the results to develop potential scenarios for collaboration and sharing of financial and technical resources.

Table 15. State Interagency Relationships in Maine.

	Informal/ Information Sharing	Formal (MOU or Executive Order)	Cost /Grant Sharing	Minimal or None
Federal				
. FEMA Regional Staff	MCP	NFIP	NFIP/MEMA	
. Army Corps of Engineers		NFIP/MCP	MEMA/NFIP	
. EPA	MCP	NFIP		
State				
. Floodplain Managers	MCP		MEMA	
. Coastal Resource Management Program Staff	MEMA			MEMA
. Emergency Management Staff			NFIP	MCP
. Building Commissioner				MEMA/NFIP
. Insurance Commissioner				MEMA/CZMP
. Public Utilities				NFIP
. Sea Grant/Cooperative Extension		MCP		MEMA/NFIP
. State Budget Office				MEMA/NFIP/ MCP
Local				
. Local Building Officials	MEMA			
. Local Planners	MEMA/NFIP	NFIP/MCP		
. Local Departments of Public Works Staff	MEMA			
. Local Emergency Management Officials		MEMA	MEMA	NFIP
. Local Elected Officials	MCP	MEMA		NFIP
Private				
. Insurance Industry	NFIP			CZMP
. Professional Associations	MCP/NFIP			
. Building/Construction Industry . NEFSMA . NESEC	NFIP NFIP MEMA/NFIP			

MEMA – Maine Emergency Management Agency NFIP – state flood program MCP – Maine coastal program

Maine Case Examples of Successful Hazard Mitigation Efforts

Project Impact

City of Saco

Community Profile: The City of Saco is a coastal community located in southeastern Maine (York County) with a year-round population of approximately 12,000 (about 35 percent larger in the summer). It has a total land area of 40 square miles.

Disaster Risk: Saco is exposed to coastal erosion (primarily in an area known as Camp Ellis), coastal flooding, riverine flooding, and high winds. Major wind/flooding events occurred in

Saco in 1938, 1954, 1972, 1977, 1985, 1986, 1987 1991, 1992 and 1996. Several buildings in Saco have been identified by the NFIP as "repetitive loss" properties. Saco ranks seventh in the state in the amount of NFIP claims paid, more than $1,328,000 since 1978. There are 564 structures at risk in the floodplain, 541 of which are residential buildings. Present and future demands associated with the seasonal tourist industry will further intensify the pressure for development of flood-prone coastal lands.

Capacity for Public-Private Partnerships: Saco is one of the largest industrial, commercial, and service trade centers in southeastern Maine.

Disaster Prevention Commitments/Actions: Mutual aid plans in natural hazard risk reduction are being considered. Saco participates in the CRS and the building official has attended FEMA's Emergency Management Institute for both the retrofitting and NFIP courses. The community has completed a flood hazard mitigation plan using FMAP funds and proposes to do a home retrofit coarse (elevating or flood-proofing utilities) with FMAP project funds.

City of Portland

Community Profile: The City of Portland is located in the southeastern portion of Cumberland County in southern Maine, approximately 100 miles north of the City of Boston. Portland is a major urban and industrial center on the Maine coast, with a population estimated at 64,358 in 1990. The total land area contained within the corporate limits of Portland is 21.6 square miles.

Disaster Risk: The watersheds of the Stroudwater River, Fall Brook, Capisic Brook and Nasons Brook are predominantly residential with scattered industrial development. The area along the Presumpscot River is devoted to major public and institutional use. The properties along the Fore River and the Atlantic Coast are predominantly commercial and industrial. Development on the Portland Islands is mainly residential. Each year, Portland experiences severe nor'easters. The nor'easters can occur at any time of the year but are more prevalent in the winter months, whereas hurricanes occur in the late summer and early fall months. In the past, hurricanes have caused extreme high tides and flooding of low-lying areas along the coast and the Fore River.

Capacity for Public-Private Partnerships: The city serves the region as the major employer, providing jobs both to Portland residents and to residents in neighboring towns.

Disaster Prevention Commitments/Actions: Portland has regulations that apply to construction in areas of flood hazard. The regulations call for modifications "to prevent flotation, collapse, or lateral movement of the structure." Structural flood protection measures along the coast are limited. Portland currently ranks seventh in the state in the amount of NFIP policies in force, has a Class 9 rating in the CRS and has participated in the CRS since October 1, 1993. Portland has 203 structures insured through the NFIP, 185 of which are residential buildings. This amounts to $21,391,900 of insurance in force and $458,235 in NFIP claims paid to Portland since 1978.

State of Massachusetts Agencies Involved in Hazard Mitigation

Flooding from nor'easters, hurricanes, heavy precipitation and riverine flash flooding cause significantly more damage, more frequently, than any other natural hazard in Massachusetts. The most significant natural disaster events within this decade include Hurricane Bob (1991) and the October nor'easter (1991), which combined caused a total of $49 million in damage to uninsured property and infrastructure, in addition to the nearly $125 million paid out by the NFIP in flood insurance claims. The December 1992 coastal storm caused more than $12.6 million in damage to the public infrastructure (roads, bridges, public facilities, public utilities, etc.) which resulted in 1,874 NFIP claims at a cost of nearly $12.7 million.

Massachusetts property owners are paying flood insurance premiums of over $21 million per year (as of Jan. 1998). Most recently, the June 1998 storm and floods caused more than $9 million in damage to private property owners throughout eastern Massachusetts. Approximately 92 percent of these damaged residences were previously flooded during the October 1996 storms. In comparison with the June 1998 floods, the October 1996 event was more severe and caused more than $90 million in flood damage to private and public property in the greater Boston area and surrounding suburbs. Since January 1, 1978, there have been more than 20,801 Massachusetts flood insurance claims filed with over $199 million paid out in claims.

Massachusetts Coastal Zone Management Office

Contact: Tom Skinner, Program Manager. Massachusetts Coastal Zone Management Office, 100 Cambridge Street, Boston, MA 02202 Tel: 617-727-9530
Website: http://www.magnet.state.ma.us/czm/

Massachusetts has over 1,500 miles of coastline that enhance enjoyment and fuel the economy. Businesses, tourists and residents alike are drawn to the coast for the many opportunities it offers. The Coast Alliance recently reported, in *State of the Coasts*, that coastal industries contribute $70.7 billion to Massachusetts' economy. The importance of the tourism, shipping and commercial fishing industries to the state's economy show that in coastal Massachusetts the environment is the economy. Protecting these important coastal resources while promoting responsible economic development is the charge of the Massachusetts Coastal Zone Management Office (MCZM). MCZM serves as the lead policy and technical assistance agency. MCZM is implemented through several agencies within the Executive Office of Environmental Affairs. MCZM brings together a dedicated staff of technical specialists in marine sciences, policy, law and public outreach, along with regional coordinators who serve as liaisons to communities and local organizations. MCZM is an effective state/federal partnership with strong links to local governments.

The MCZM mission is to provide policy leadership, assistance and education to the network of agencies, communities and individuals who are collectively responsible for the stewardship of coastal resources. The goal is to promote well-informed decisions, to protect the integrity of natural systems, and respond effectively to human needs.

The jurisdiction of the MCZM extends from the three-mile limit of the state's territorial sea to 100 feet beyond the first major land transportation route encountered (a road, highway, rail line, etc.). In addition, all of Cape Cod, Martha's Vineyard, Nantucket and Gosnold are included in the coastal zone. Although this area is the focus of the MCZM, the program's concerns go beyond this narrow strip of land and sea, because the coast can be affected by inland and seaward activities. In fact, coastal watersheds (areas that drain into coastal waters) make up the eastern half of the state.

MCZM works with other state and federal agencies to help Massachusetts prepare for and respond to storms and other natural or man-made disasters. With its technical, planning and mapping expertise, MCZM can play an important role in helping communities and individuals minimize risks to property during these emergencies. MCZM serves as the leader of the Commonwealth's Rapid Response Storm Damage Survey Team. This team gathers information about storm damage and supplies this information to the MEMA operations center within one to two days of when the storm hits. MCZM damage assessments efforts focus the response and recovery to the hardest hit areas and enable the governor to rapidly determine the need for assistance.

MCZM is in a unique position to identify the most significant natural coastal areas in the state and to take the lead in creating initiatives for preserving and protecting these resources. MCZM provides technical assistance to the Massachusetts Department of Environmental Management (MA-DEM) for delineation and designation of coastal areas of critical environmental concern. MCZM also plays an active role in identifying potential coastal wetland restoration sites and coordinates and participates in the resulting wetlands restoration efforts and ensures federal consistency. MCZM pays close attention to barrier beaches, salt marshes and other important wetland resource areas because they buffer the coast from storms, waves and flooding. For high-hazard coastal areas (such as barrier beaches) that have been repeatedly battered by coastal storms, MCZM provides technical information and policy development to local officials to help them manage growth in these hazard-prone areas.

Massachusetts Emergency Management Agency

Contact: Stephen J. McGrail, Director, Massachusetts Emergency Management Agency, 400 Worcester Road, PO Box 1496, Framingham, MA 01701 Tel: 508-820-2000
FAX: 508-820-2030

State Hazard Mitigation Officer: Richard Thibideau, Massachusetts Emergency Management Agency, 400 Worcester Road, Framingham, MA 01701 Tel: 508-820-2000
FAX: 508-820-2030
Website: http://www.state.ma.us/mema

The Massachusetts Office of Emergency Services is an umbrella organization that encompasses three emergency service agencies in Massachusetts: the Massachusetts Emergency Management Agency (MEMA), the Massachusetts National Guard and the Department of Fire Services. The Office of Emergency Services was established in 1996 as a part of the Executive Office of Public Safety in an effort to address and enhance the state's emergency management systems.

MEMA carries out its mission under the authority of the following: Class Summary of Laws, Rules and Regulations of MEMA (Civil Defense Act) as Required Acts of 1950, Chapter 639 (as amended); Massachusetts Administrative Order 24; Massachusetts Executive Order 27; Massachusetts Executive Order 34; Massachusetts Executive Order 144; and Massachusetts Executive Order 242.

MEMA coordinates the management and administration during a disaster. It coordinates the state and its political subdivisions in preparing for, mitigating the effects of, coordinating the response to, and recovering from major natural or technological disasters or emergencies. MEMA is also responsible for all the grants received from the federal government under the provisions of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the NFIP, the FMAP, the HMGP and other grant programs.

The director of MEMA is appointed by the governor and is responsible to the governor, through the Secretary of Public Safety. Following a presidential disaster declaration, the Governor's Authorized Representative is appointed under the provisions of the Stafford Act in the FEMA/state agreement and is normally the director of MEMA. The responsibilities include the administration of all federal disaster assistance programs on behalf of the state and local governments and other grant or loan recipients, as well as ensuring state compliance with the FEMA/state agreement. The representative is authorized to execute all necessary documents for disaster assistance and also serves as the grant administrator for all funds provided under the HMGP. The state hazard mitigation officer serves as the point of contact and coordinates all matters relating to hazard mitigation planning and implementation as specified in Subpart M and N of 44 Code of Federal Regulations.

Massachusetts Flood Hazard Management Program

Contact: Richard Zingarelli, FHMP Coordinator. Department of Environmental Management Flood Hazard Management Program, 100 Cambridge Street, Boston, MA 02202
Website: www.state.ma.us/dem/programs/mitigation

Within MA-DEM, the director of the Bureau of Resource Protection is also the state hazard mitigation officer, who is responsible for the oversight and coordination of all natural hazard mitigation activities in Massachusetts. These activities include the management of the state's Flood Hazard Management Program (FHMP) which includes the administration of the FHMP, and the co-administration of the HMGP and the FMAP with the MEMA.

As one of the state agencies involved with mitigating flood damage, this program's specific role is to act in a non-regulatory capacity to provide planning and informational services regarding floodplain management to municipal officials and the general public. This program encourages municipalities to adopt land use bylaws regulating floodplains to ensure public safety and to enable community participation in the FHMP. The FHMP carries out floodplain management practices under the following federal programs: 1) FHMP; 2) CRS; 3) FMAP, in coordination with FEMA and MEMA; and 4) HMGP, in coordination with FEMA and MEMA.

Since 1978, FHMP has provided the following floodplain management assistance measures to municipalities and/or individuals:

- Development of floodplain management bylaws
- Interpretation of FHMP requirements
- Interpretation of Massachusetts State Building Code, Section 3107 (formerly Section 2102), "Flood Resistant Construction"
- Field inspections of community floodplains and follow-up discussions with town officials
- Distribution of technical publications
- Coordination of floodplain management policy among various state agencies involved with wetlands, floodplains, coastal hazard areas, etc.
- Direct the conversion of municipalities from the emergency phase of the FHMP to the regular phase of the FHMP, which affords property owners greater flood insurance protection
- Identify flood hazard mitigation land use options for coastal communities through development of municipal "open space and recreation plans" with municipal planning staff
- Coordinate with MEMA the acquisition of floodplain property through FEMA's FMAP in Massachusetts' communities
- Development of local floodplain management and hazard mitigation plans by local municipalities through funding from FEMA's FMAP
- Following major disasters and in coordination with MEMA oversee the implementation of hazard mitigation strategies in disaster-affected communities through FEMA's HMGP

Table 16. Massachusetts FHMP Policy Information.
Total of 331 Communities (June 1999).**

*# of Policies***	*Coverage***	*Rep Loss Properties**	*$Total Paymnts***	*# of CRS Comm*
37,132	$4.6B	2,168	$204M	12

*Federal Insurance Administration, May 31, 1999. **FEMA Community Information System Database.

Army Corps of Engineers Flood Control Projects

New Bedford Hurricane Barrier
Project Purpose: Hurricane Flood Protection
Location: Project is located in Clark Cove of Buzzard's Bay, New Bedford and in New Bedford Harbor in New Bedford and Fairhaven, Bristol County
Protected Area: Approximately 1400 acres of heavily developed industrial and commercial properties along the waterfront and Acushnet River
Design Hurricane Tide: 16.0 Ft NGVD
Ownership: All features (except navigation gate), operated and maintained by City of New Bedford. Navigation Gate at New Bedford Harbor Barrier operated and maintained by Corps
Total Cost: $18,614,000
Placed In Operation: January 1966

Northern Massachusetts/New Hampshire Hurricane Evacuation Study
This study is conducted under a federally funded program and co-sponsored by the Corps and FEMA. The objective is to provide a technical data report and coastal flood mapping from which the state and local communities can develop/update preparedness plans for coastal storms. Digital elevation data and inundation maps will allow state and local officials to identify evacuation areas and routes of evacuation for various coastal events. The study effort is scheduled for completion in November 1999.

Revere, Lynn, Saugus and Malden Flood Project
Construction on the Roughans Point Project began in October 1997. The coastal flood protection project will cost $6.8 million. The federal project includes measures to stabilize and improve existing seawalls and a new rock revetment to reduce wave runup and storm overtopping. The City of Revere and the MA-DEP are sponsors for the project. Construction is expected to be completed by November 1999.

The Saugus River and Tributaries federal project provides for improvements to reduce coastal flood damage to developed areas behind Revere Beach, Point of Pines, the area east of the Northgate Shopping Center in Revere, and areas in the adjacent cities of Lynn and Malden and the Town of Saugus. It consists of floodgates on the Saugus River and shorefront protection along Revere and Lynn at an estimated cost of $115 million. A recurrence of the February 1978 flood stages could cause damages estimated at over $130 million and require evacuation of over 4,000 residents from 3,100 flooded homes, businesses and industries.

Design efforts for the Saugus River and tributary areas of Revere, Lynn, Malden and Saugus were suspended in 1993 when the Commonwealth declined to support the authorized federal project, electing to further study the feasibility of alternative solutions.

Nantasket Beach, Hull, Storm Damage Protection
A study to determine the feasibility of providing coastal storm damage protection to the 10,000-foot-long North Nantasket Beach in Hull began in November 1994. The investigation examined potential solutions to coastal erosion and backshore flooding at the Nantasket Beach Reservation. The $220,000 study cost is being shared 50 percent from the Corps and 50 percent from the state and the town. A draft report was distributed in January 1997 for review. Both the state and the town requested additional engineering analysis on a locally preferred plan.

Massachusetts Sea Grant Programs

Woods Hole Oceanographic Institution Sea Grant Program
Director: Judith E. McDowell, Sea Grant Program Woods Hole Oceanographic Institution,
193 Oyster Pond Road, MS #2, Woods Hole, MA 02543-1525 Tel: 508-289-2557
FAX: 508-457-2172 E-mail: jmcdowell@whoi.edu
Website http://www.whoi.edu/seagrant/

The efforts of the Woods Hole Oceanographic Institution Sea Grant program's (WHOI Sea Grant) coastal hazards program are directed at integrating a scientific understanding of the

processes that maintain coastal landforms with the management concerns arising from the effects of these processes on coastal towns.

WHOI Sea Grant has a number of publications and videos on coastal processes which are available on loan to educators and community groups. It is currently developing school programs to help young people understand coastal hazards.

Cape Cod Coastal Erosion: A Case Study

Historically, homes and other construction have been built on dynamic systems that naturally migrate as sea level rises or as wave action erodes the coast. Coastal engineering structures built to protect threatened homes can impede the movement of sand. As a result, coastal dunes and barrier beaches are lost and can no longer buffer coastal areas from storms. The Beach Point area of Truro was built on a barrier beach. This beach, where the majority of commercial businesses are located in Truro, is dependent on erosion from coastal bluffs to the south for sand nourishment. Without sand deposition from the eroding bluffs, many properties on Beach Point would be lost.

WHOI and WHOI Sea Grant staff have been studying the geologic depositional and erosional history of the bluff area between the north side of the Pamet River and Beach Point, the source area for most of Beach Point sand. The study has shown that the long-term erosional rate for the bluffs in the area between the Pamet River and Beach Point averages less than 0.5 foot/year or less than 50 feet/century. Many residents and summer homeowners develop a sense of security when property they have owned for decades has not eroded significantly. They are unprepared for sudden erosional events. However, when the bluffs do erode, they erode much more than 0.5 feet/year. The research suggests that the bluffs may erode 10-15 feet over a two- to seven-year period and then remain relatively stable for another 40-50 years. Not all of the bluffs are eroding at any given time. If the timing and severity of these erosional events could be predicted, homeowners could be given information on which to base decisions regarding their property; for example, moving structures back from a bluff which is likely to erode in the near future.

If relative sea level continues to rise and if global warming leads to increased severity of weather patterns and storms, coastal residents of Cape Cod can anticipate more rapid erosion of coastal bluffs and shorelines, including locations where homes presently stand.

By minimizing the number of homes sited in the “danger zone” in the future, costs to society can be reduced. The present work on Truro’s Cape Cod bay shore may provide the basis for evaluation of erosional and depositional patterns in other locations.

Assess Level of Knowledge and Perceived Flood Risk

A WHOI Sea Grant-funded study of Cape Cod coastal residents, led by researchers at WHOI Marine Policy Center, used a survey to determine the relationship between level of knowledge and perceived flood risk. Investigators found that effective communication about flood risk among scientists, policymakers and the public was an influential factor in respondents’ willingness to pay for flood insurance.

WHOI Sea Grant Program Extension/Outreach
WHOI Sea Grant sponsors a variety of educational programs, include exhibits, classes, workshops, internships, grants, fellowships to undergraduate and graduate students, among others.

WHOI Sea Grant is involved with the Woods Hole Science and Technology Education Partnership, a partnership of schools, scientific institutions, businesses, and community resources. Its purpose is to support, promote and expand science and technology education and science literacy in the participating communities.

The WHOI Sea Grant program indicated very minimal participation in training offered by other agencies. The program has only offered one training/education event in the past five years (1996 Coastal Landform Management), however, it does provide on-going education on coastal hazards in the form of coastal processes workshops/field trips and project specific technical assistance. This program is interested in providing hazard related training and would be interested in a Training of Trainers for hazard mitigation.

In October 1997, a workshop 'Coastal Landform Management in Massachusetts' consisted of four invited presentations addressing issues of:

(1) Shoreline change: A coastal landform management dilemma
(2) Managing inner shores
(3) Managing altered shores
(4) Monitoring changes in sustainability

In Spring 2000, as a follow-up to the workshop, Sea Grant, in partnership with the Cape Cod Commission, hopes to develop a schedule with four participating pilot communities to offer training sessions to Conservation Commissions and Planning Boards in each town.

Massachusetts Institute of Technology Sea Grant Program
Director: Chryssostomos Chryssostomidis, MIT Sea Grant Program,
Department of Ocean Engineering, Room E38-330 (E38 - 300 general),
77 Massachusetts Avenue, Cambridge, MA 02139
Tel: 617-253-7041 or 6l7-253-7131 FAX: 6l7-258-5730 E-mail: chrys@deslab.mit.edu
Website http://web.mit.edu/seagrant/

The Massachusetts Institute of Technology Sea Grant Program (MIT Sea Grant) sponsors innovative marine research guided both by the higher educational institutions in Massachusetts and by local and national research needs. To maximize the potential impact of the sponsored projects, research is focused on specific theme areas. Current theme areas are marine biotechnology, coastal management and utilization, technology development, non-indigenous species, and coupled ocean observation and modeling.

Currently, little or no work on hazard mitigation is occurring at the MIT Sea Grant program.

MIT Sea Grant Extension/Outreach Program
MIT Sea Grant sponsors a variety of educational programs, include exhibits, classes, workshops, internships, grants, fellowships to undergraduate and graduate students and MIT undergraduate research opportunity program. Personal communication indicates that currently no work was being done in hazard mitigation training.

The MIT Sea Grant Marine Advisory Program facilitates the exchange of information between marine researchers and the coastal community. The program promotes the sustainable development of coastal resources and focuses on numerous scientific, technological, environmental, social and educational issues.

State of Massachusetts Survey Results

The survey was completed by a representative from the Massachusetts Emergency Management Agency (MEMA) in conjunction with the MA-DEM FHMP representative, a representative of the MCZM and the extension agent of the WHOI Sea Grant Program. On a scale of 1-5 (5 being the highest), the MEMA and the FHMP prioritized the importance of addressing hazard mitigation within their agencies a "5," and the MCZM rated hazard mitigation a "3."

Massachusetts Planning & Policy Development

The planning and policy development portion of the survey indicated that between the three agencies, Massachusetts has a fairly comprehensive policy/regulatory/enforcement program for resource protection and restoration. Areas specifically regulated and enforced were coastal hazard mitigation plans and floodplain mitigation regulations. All FHMP standards regarding development within the floodplain are covered within the state building code. There are also regulations in the River Protection Act (although based on water quality and habitat protection) which must be met when building in floodplains. The MA-DEM regulates coastal armoring and dune protection.

Massachusetts Program Activities and Tools

This section of the survey indicated that Massachusetts is quite sophisticated in its mapping tools used for identifying hazards risks and vulnerabilities (GIS was used by all agencies). However, survey respondents indicated that although the GIS information may be available, it is not available statewide, there are many missing gaps, and the state agencies have assumed no responsibility for its accuracy. Staff has indicated that there is a need to address hazard risks and vulnerabilities on a statewide basis. Presently, hazard risks are being addressed by a few communities only when funding is available (e.g., *Project Impact* communities or communities that have received FEMA FMAP funds).

Centralized public education materials and disclosure on hazard mitigation for real estate purposes does not seem to be well addressed (only MCZM indicated education of land owners on natural hazards). However, agency-sponsored workshops to inform local officials of various financial and technical resources available for implementation of mitigation measures are

available. These agencies monitor and evaluate hazard mitigation effectiveness and reports results to FEMA and NOAA (312 Review and Performance Agreements), however, not to any legislative or congressional body.

Table 17. Policies & Regulations used by Massachusetts State Agencies Related to Hazard Mitigation.

Policy/Regulation	***MEMA***	***FHMP***	***MCZM***	***SG***
Coastal construction setbacks	yes	yes	yes	no
Prohibitions on coastal armoring	yes	yes	yes	yes
Dune protection	yes	yes	yes	yes
Wetland restoration	yes	yes	yes	yes
Public infrastructure prohibited in hazard areas	yes	yes	yes	yes
State building code	yes	yes	no	na
Building heights	no	no	no	na
Building elevations	yes	yes	yes	na
Prohibit reconstruction of subs damaged buildings	yes	yes	no	no
Building replacement cost info	dnr	dnr	no	na
Manufactured home construction standards	yes	yes	yes	na
Mobile home construction standards	yes	yes	yes	na
Wind load standards	yes	yes	yes	na
State guide plan	no	no	yes	yes
409 Plan have coastal policies	yes	yes	yes	yes
§309 CZM program prioritize coastal hazards	no	no	no	yes
State flood mitigation regulations	yes	yes	no	yes

Table 18. Programs & Tools used by Massachusetts State Agencies to Identify Hazard Risks & Vulnerabilities.

Programs/Tools	***MEMA***	***FHMP***	***MCZM***	***WHOI SG***
FIRMs	yes	yes	yes	yes
GIS	yes	yes	yes	no
Erosion rates	yes	yes	yes	yes
Zoning maps	no	no	yes	no
Land use maps	yes	yes	yes	no
Critical facilities	yes	yes	no	no
SLOSH maps	yes	yes	no	no
HAZUS	no	no	no	no
Building replacement cost info	no	no	yes	no
Building inventories	no	no	no	no
Repetitive loss data	yes	yes	no	yes
NFIP data	yes	yes	no	yes
Building inventory-100 yr. floodplain	yes	yes	no	no
Statewide disclosure law	no	no	yes	yes
Coastal barrier resource maps	no	no	yes	yes
Aerial photographs	yes	yes	yes	yes

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
MEMA – Emergency Management FHMP – State Flood Program MCZM – Coastal Zone Management WHOI SG – Sea Grant
MIT Sea Grant did not respond to the survey

Massachusetts Interagency Relationships/Networks

Massachusetts has a unique, statewide effort of interagency cooperation in the administration and management of its hazard mitigation program. This program is a joint effort between the flood program (FHMP) and MEMA. To further integrate this effort, there is a state hazard mitigation team and a State Interagency Hazard Mitigation Committee. The state hazard mitigation team consists of the staff in FHMP hazard mitigation officer at FHMP and the disaster recovery manager at MEMA. This group meets on a monthly basis to coordinate work assignments. The State Interagency Hazard Mitigation Committee consists of representatives of state and federal agencies that play key roles in implementing hazard mitigation in Massachusetts. The committee reviews policies, coordinates mitigation efforts, recommends recipients of hazard mitigation grants and assists in the updating of the state hazard mitigation plan (409 Plan). Following a presidential disaster declaration, this committee in partnership with FEMA serves as the State Interagency Hazard Mitigation Committee (see description under 44 CFR 206.401). Depending on the nature of the particular disaster, additional local, state and federal agencies may be asked to be a temporary State Interagency Hazard Mitigation Committee members by MEMA, GHMP and FEMA. If necessary, MEMA, FHMP and FEMA, within 7 days of the opening of the disaster field office, will agree upon the date of the State Interagency Hazard Mitigation Committee meeting and a timeline for the completion of the Early Implementation Strategy report. This meeting and report are tied into the update of the state hazard mitigation plan (409 Plan).

Massachusetts' interagency relationships/networks are primarily informal. However, MEMA and FHMP network with federal agencies both formally through memorandum of understanding and through cost/grant sharing. They also interact to a minor degree with building and insurance commissioners, public utilities and the State Budget Office. Funds provided by state and federal coastal zone activities, Stafford Act or FMAP are available and being used for hazard mitigation efforts.

All agencies indicated sharing financial and technical resources and jointly conducting hazard mitigation training for local and/or state building, planning, flood mitigation and MCZM officials. MEMA and the FHMP participated in a MCZM workshop recently addressing the benefits of hazard mitigation planning. MCZM staff that participates on a cultural resources committee met with the State Hazard Mitigation Committee and received Housing and Urban Development grants for mitigation. As explained above, staff members from the MCZM serve on the State Hazard Mitigation Committee and work with staff from MEMA and the FHMP to provide workshops for local officials on mitigation and funding sources.

When asked how they could profit from the results of this survey, the agencies mentioned improved performance and evaluation, increased interagency coordination and identification of state initiates that may help in future planning.

Table 19. State Interagency Relationships in Massachusetts.

	Informal/ Information Sharing	Formal (MOU or Executive Order)	Cost /Grant Sharing	Minimal or None
Federal				
FEMA Regional Staff	MCZM/SG	MEMA/FHMP	MEMA/FHMP	
Army Corps of Engineers	MCZM/MEMA/ FHMP/SG		MEMA/FHMP	
HUD NRCS, USGS NWS	MEMA/FHMP MEMA/FHMP SG	MEMA/FHMP	MEMA/FHMP MEMA/FHMP	
State				
Floodplain Managers	MEMA/SG			
Coastal Resource Management Program Staff	MEMA/FHMP/SG			
Emergency Management Staff	FHMP/SG			
Building Commissioner				MEMA/FHMP/SG
Insurance Commissioner				MEMA/FHMP/SG
Public Utilities				MEMA/FHMP/SG
Sea Grant/Cooperative Extension	MCZM			MEMA/FHMP
State Budget Office				MEMA/FHMP
Historical Society MA-DEP Dam Safety Regional Planning Agency	MEMA/FHMP SG/MEMA/FHMP MEMA/FHMP/SG			
Local				
Local Building Officials	MEMA/FHMP/ MCZM/SG			
Local Planners	MEMA/FHMP MCZM/SG			
Local Departments of Public Works Staff	MEMA/FHMP/ MCZM			
Local Emergency Management Officials	MEMA/FHMP/SG			
Local Elected Officials	MEMA/FHMP/ MCZM/SG	MEMA/FHMP	MEMA/FHMP	
Conservation Commissions Beach Committees	MEMA/FHMP/SG SG			
Private				
Insurance Industry				MEMA/FHMP/SG
Professional Associations	MCZM/SG			MEMA/FHMP
Building/Construction Industry	MCZM			MEMA/FHMP/SG
Citizens Neighborhoods NEFSMA NESEC	 MEMA/FHMP MEMA/FHMP			MEMA/FHMP

MEMA – emergency management program FHMP – state flood program MCZM – state coastal program

Massachusetts Case Examples of Successful Hazard Mitigation Initiatives

Project Impact

Town of Marshfield

Community Profile: Marshfield is a coastal community on the south shore of Massachusetts Bay, 32 miles from Boston. The community has been heavily developed in the last 40 years, changing from a summer resort and fishing village to a bedroom community. While many summer homes have been expanded and converted to year-round use, there is still a significant influx of summer residents.

Disaster Risk: Marshfield is impacted primarily by coastal storms, especially nor'easters. The Blizzard of 1978 and the October 1991 and December 1992 nor'easters, all disaster declarations, had a major impact on the community in terms of loss due to flooding. Not only are Marshfield buildings and infrastructure threatened by nor'easters and hurricanes, but evacuation routes can become flooded, particularly in the Brant Rock neighborhood. Marshfield's record of repetitive loss in the NFIP is one of the highest (Class 6) in Region I. According to the Community Information System, there are 149 repetitive loss structures in the town that have resulted in more than $5 million in claims since 1978.

Capacity for Public-Private Partnership: Marshfield's Coastal Advisory Committee has developed strong relationships with FEMA, the town government, state officials and local businesses. The committee has also begun to establish partnerships with insurance, real estate and hardware businesses in the town.

Disaster Prevention Commitments/Actions: Marshfield has been an active CRS community and has achieved the highest CRS rating in Massachusetts (class 6, thereby entitling policyholders to a reduction on their premiums). The town has nearly 1,000 NFIP policies in force. Through the leadership of the committee, the town has adopted and implemented a Repetitive Loss Plan. Marshfield recently received a $500,000 HMGP grant to conduct a major flood proofing and elevation program for flood-prone residential structures.

Quincy

Community Profile: Quincy is a coastal community in Norfolk County on the shore of Massachusetts Bay. The city is heavily developed, with a strong commercial and shopping area. Yet the city maintains some characteristics of a suburban bedroom community, including comfortable and pleasant neighborhoods. Quincy has a total land area of 26.8 square miles and had a 1990 population of 84,985.

Disaster Risk: Quincy is impacted primarily by flooding and high winds from coastal storms, especially nor'easters. The Blizzard of 1978 and the October 1991 and December 1992 nor'easters, all disaster declarations, had a major impact on the community in terms of loss due to flooding. Riverine flooding also impacts Quincy. Several streams flow through the city conveying storm drainage to the ocean. Encroachment on the floodplains, together with heavy development in headwater areas and the placement of substantial portions of the streams in restrictive conduits, has resulted in frequent flooding.

Capacity for Public-Private Partnership**:** Quincy 2000 Corporation, a major conglomerate of community and business leaders is initiating comprehensive development planning in the various commercial areas of the city. Quincy 2000 actively participates in the planning, facilitation and development of a number of real estate and public improvement projects.

Disaster Prevention Commitments/Actions: Quincy has been an active CRS community and has achieved a very high CRS rating (Class 7) in Massachusetts. The town has nearly 2,200 NFIP policies in force. Many projects have been undertaken to lessen the flooding problems over the years. The city has received several hazard mitigation grants to implement a major residential flood mitigation program. Seawalls have been built along parts of Houghs Neck, Squantum, and Wollaston Beach. Dikes have been built around the lower area of Montclair. Drainpipes from many of the low flood-prone coastal areas have tide gates at their outlets. A major flood-prevention project was undertaken on Hayward Creek, and large tunnels have been constructed to relieve flooding from Town Brook.

State of New Hampshire Agencies Involved in Hazard Mitigation

The two most common natural disaster events that put New Hampshire's coast at risk are nor'easters and hurricanes. Communities in New Hampshire have been part of many presidential- declared natural disasters. Most have involved riverine flooding caused by spring thaws and heavy rains, hurricanes, wildfire and river ice jams. Damage sustained from these events caused coastal erosion and extensive damage to public infrastructure, including bridges, culvert dikes and railroad beds.

The New Hampshire Office of Emergency Management (NH-OEM) administers the FEMA hazard mitigation programs and associated training. The New Hampshire Office of State Planning (NH-OSP) houses the NH-NFIP and the NH-CZMP. Several other state and federal agencies have been identified as having involvement in hazard mitigation, these include: U.S. Geological Survey, New Hampshire and Vermont Districts; U.S. Department of Agriculture, Natural Resources Conservation Service and the Corps.

New Hampshire Coastal Zone Management Program

Contact: David Hartman, Coastal Program Manager, New Hampshire Office of State Planning, 2 1/2 Beacon Street, Concord, New Hampshire 03301-4497
Tel: 603-271-2155 FAX: 603-271-1728
Website: http://www.state.nh.us/coastal/program/program.htm

The New Hampshire coastal program (NH-CZMP) boundaries include all coastal waters seaward 3 miles and all lands inland 1,000 feet along the state's Atlantic coast from Seabrook to the Portsmouth/Newington town line. The mission of the NH-CZMP is to balance the preservation of natural resources of the seacoast with the social and economic needs of this and succeeding generations. Specific program objectives relating to natural hazard mitigation are:

- Support a viable economy and an adequate infrastructure on the seacoast that does not compromise the natural integrity of the coastal resources.
- Maintain diversity of uses and ensure that adequate opportunities exist for all citizens to enjoy the coastal lands of New Hampshire.

Although hazard mitigation is not a top priority of the NH-CZMP, they have been involved in hazard mitigation policies and programs for several years. Through the federal CZMA Coastal Enhancement Grants 309 program, the NH-CZMP has been involved with dune restoration projects, tidal saltmarsh restoration and monitoring the state's coastal erosion rates. Currently, the program is taking steps to ensure that dredging and shoreline stabilization work in Hampton Harbor does not create significant shoreline erosion in other off-site areas.

New Hampshire Office of Emergency Management

Contact: Woodbury P. Fogg, New Hampshire Office of Emergency Management, 107 Pleasant Street, Concord, NH 03301 Tel: 603-271-2231

State Hazard Mitigation Officer: John Shaughessy, State Office Park South, 107 Pleasant Street, Concord, NH 03301 Tel: 603-271-2231 FAX: 603-225-7341
E-mail: jshaughessy@nhyorm.state.nh.us
Website: http://www.nhoem.state.nh.us/

The New Hampshire Office of Emergency Management (NH-OEM) is responsible for New Hampshire's hazard mitigation program. Its mission is to be prepared to execute all emergency functions in order to prevent loss of life or property resulting from any natural or manmade causes including: floods, hurricanes, fires, earthquakes, windstorms, wave action, oil spills, or other water contamination requiring emergency action to avert danger.

The primary goals of NH-OEM are mitigation, preparation, emergency operations and recovery. Mitigation involves assisting state agencies and local communities in reducing the threat of disasters whenever possible through legislation, training, physical alterations and other measures that may reasonably reduce hazard vulnerability. Preparation includes assisting state agencies and local communities in preparing for disasters through training, development of plans and procedures, and the addition of equipment that may reasonably enhance emergency preparedness. For emergency operations, NH-OEM acts as the coordinating agency during a disaster. During the recovery stage, NH-OEM assists communities in the process of restoring facilities and services.

The NH-OEM has 40 employees and is organized into four sections (operations, program management, training and field services) that carry out the mandate for public protection. The training and field staff works with New Hampshire's 235 municipalities to develop emergency response procedures and plans. The NH-OEM also provides training opportunities on emergency management and response techniques.

New Hampshire Flood Insurance Program

Flood Program Coordinator: George Muesler, New Hampshire Office of Emergency Management, State Office Park South, 107 Pleasant Street, Concord, NH 03301
Tel: 603-271-2231 FAX: 603-225-7341
E-mail: georm@nhorm.state.nh.us

The NH-OSP in cooperation with the NH-OEM administers and coordinates the New Hampshire flood insurance program (NH-NFIP). The state flood program coordinator works within NH-OSP and is a liaison to all of New Hampshire communities participating in the NFIP. NH-NFIP also works with NH-OEM in administering FEMA's FMAP.

New Hampshire does not have a statewide building code. All code regulation and enforcement must be done at the local level. Statewide, all enforcement on building construction and

floodplain management is administered through the NH-NFIP. NH-NFIP works directly with FEMA and NH-OEM to obtain and disseminate flood data to the communities participating in the NFIP. Over 192 (out of 235) communities in New Hampshire have adopted floodplain management ordinances and are participating in the NFIP. There have been a number of accomplishments within the state flood program, which have successfully involved interagency coordination:

- A Gubernatorial Declaration advised all state agencies to comply with the local floodplain management ordinances.
- All New Hampshire solid waster permits are issued in accordance with NFIP floodplain management regulations.
- Two recently issued New Hampshire Superior Court decisions upheld the communities' responsibility to enforce its local floodplain management ordinance.

Table 20. New Hampshire NFIP Policy Information.
Total of 192 Communities (June 1999).**

# of Policies**	Coverage**	Rep Loss Properties*	$Total Paymts**	# of CRS Comm
4,345	**$437M**	**92**	**$8.8M**	**1**

*Federal Insurance Administration, May, 31, 1999
**FEMA Community Information System Database

New Hampshire U.S. Geological Survey

Contact: Brian Mrazik, District Chief Tel: 603-226-7800 E-mail: bmrazik@usgs.gov

Housed within the U.S. Department of Interior, the United States Geological Survey's (USGS) mission is to provide reliable and timely information needed to minimize the loss of life and property from natural hazards such as floods, droughts and land movement. The USGS collects data and conducts research of hydrologic and geologic hazards that characterize, assess and predict catastrophic events. The USGS works cooperatively with FEMA, EPA and the Corps.

USGS contributes technology and information in support of the New Hampshire's hazard program by interacting directly with NH-OEM and other cooperating state and local agencies. USGS also designs and installs data collection networks and hydrologic models to support forecasting warning and operation activities at the regional, state or local level. USGS would like to be the primary developer of a comprehensive GIS hazards database in support of the New Hampshire hazard program.

Natural Resources Conservation Service

Contact: Gerald J. Lang Tel: 603-868-7581 E-mail: gerald.lang@nh.usda.gov

The Natural Resource Conservation Service (NRCS), formerly the Soil Conservation Service, is a federal agency within the US Department of Agriculture. The mission of the NRCS is to help people conserve, improve and sustain natural resources and the environment. In New Hampshire, the NRCS assists state and local governments in hazard mitigation initiatives by providing timely technical assistance to support recovery and restoration efforts. NRCS can contribute this technical assistance by interacting directly with NH-OEM at the state level and having the field staff working directly with town emergency management officials. Specifically, the NRCS can provide technical assistance to conduct inventories, to complete watershed or site specific plans, or to develop engineering and construction designs that could ultimately help reduce future damages from natural disasters.

The short-term goals of the NRCS are to establish contacts with New Hampshire's local emergency management officials at the field office level to facilitate quicker response times to natural disaster events. Intermediate and long-term objectives are to improve the cooperative efforts of working with NH-OEM and to provide timely technical assistance at the local level.

Some examples of past NRCS mitigation efforts include floodplain management studies for towns, site assessments of stream-flow impairments, stabilization designs to protect structures that could sustain severe damages from a storm event, and watershed plans addressing flooding problems. NRCS has a staff of 45 in-state members and five multi-state members dedicated to hazard mitigation. Support staff include a GIS specialist, computer specialist and public information specialist to assist in providing information for public outreach. NRCS staff provides limited assistance for small projects under present program funding, however, larger projects require reimbursement for planning and design assistance.

New Hampshire Sea Grant Program

New Hampshire Sea Grant College Program Director: Ann Bucklin, Kingman Farm,
University of New Hampshire, Durham, NH 03824-3512
Tel: 603-862-0122 or 603-749-1565 FAX 603-743-3997 E-mail: abucklin@christa.unh.edu
Website: http://www.seagrant.unh.edu/

Maine/New Hampshire Sea Grant Extension/Outreach Program
Maine/New Hampshire Sea Grant Extension Program serves as the link between the marine community and the university to help citizens and groups solve problems related to marine resources. Extension officers' efforts are focused on three major areas: commercial fisheries and aquaculture, coastal resource development and marine science education. In all of these activities, Maine/New Hampshire Sea Grant works closely with University of New Hampshire Cooperative Extension and University of Maine Cooperative Extension.

State of New Hampshire Survey Results

The survey was completed by the director of the NH-OEM, the state hazard mitigation officer and a representative of the NH-CZMP. On a scale of 1-5(5 being the highest), coastal hazard mitigation was rated a "5" by the NH-OEM director and NH-NFIP officer and a "2" by the NH-CZMP representative.

New Hampshire Planning & Policy Development

The planning and policy development portion of the survey indicates that New Hampshire's existing policies, regulations and enforcement provisions address most aspects of resource protection. There were a few inconsistencies between the programs' responses in terms of whether particular regulations exist. With respect to the building code and building practices within the floodplain, New Hampshire does have regulations in place addressing coastal construction zoning, building heights and wind loads. However, because there is no statewide building code, these standards vary by community and implementation occurs at the local level. New Hampshire does not have regulations addressing manufactured housing or mobile homes. The NH-OEM does have policies addressing coastal issues, and the NH-CZMP does have policies addressing hazard mitigation. The NH-CZMP addresses the reduction the impacts caused by natural disasters through the use of Environmental Impact Statement.

Table 21. Policies & Regulations used by New Hampshire State Agencies Related to Hazard Mitigation.

Policy/Regulation	***OEM***	***NFIP***	***CZMP***	***SG***
Coastal construction setbacks	yes	yes	yes	dnr
Prohibitions on coastal armoring	yes	yes	no	dnr
Dune protection	yes	yes	yes	dnr
Wetland restoration	yes	yes	yes	dnr
Public infrastructure prohibited in hazard areas	yes	yes	no	dnr
State building code	no	no	no	dnr
Building heights	yes	yes	yes	dnr
Building elevations	no	yes	yes	dnr
Prohibit reconstruction of subs damaged buildings	no	no	no	dnr
Building replacement cost info	dnr	dnr	no	dnr
Manufactured home construction standards	no	yes	yes	dnr
Mobile home construction standards	no	yes	no	dnr
Wind load standards	yes	yes	yes	dnr
State guide plan or local plans	yes	yes	yes	dnr
409 Plan have coastal policies	yes	yes	yes	dnr
§309 CZM program prioritize coastal hazards	no	no	no	dnr
State flood mitigation regulations	yes	yes	yes	dnr

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
OEM – Office of Emergency Management NFIP – State Flood Program CZMP – Coastal Zone Management SG – Sea Grant

New Hampshire Program Activities & Tools

New Hampshire uses a full suite of GIS mapping tools to identify hazard risks and vulnerabilities within their state. However, these tools have not been applied toward a statewide risk assessment, nor have they been used consistently between the three programs. The NH-CZMP would like better information and data for risk assessments, particularly what is at risk from natural disasters as they affect the natural environment and public infrastructure. Up to this point the NH-CZMP involvement in hazard mitigation projects has included only dredging and shoreline stabilization projects. Currently, the coastal program is taking steps to ensure that dredging in Hampton Harbor does not create erosion in off-site areas. It is also involved in salt marsh restoration and is collaborating with NH-SEMO to ensure that this restoration work will alleviate, not exacerbate, existing flood problems.

Zoning maps are used by some communities, and the NH-CZMP and NH-NFIP use land-use maps; however, these tools are also not used statewide. Information and data on the location and vulnerability factors of critical facilities needs updating. The only data used statewide for identifying and mapping risks and vulnerabilities is FEMA's HAZUS. HAZUS does not include any information on flood and wind risks, only risks from earthquakes. Only the NH-NFIP uses structure and building replacement costs information, though not applied throughout the state. None of the programs use 100-year floodplain building inventories. While the state indicated that it used GIS, it is unclear whether it is located on a state database and whether or not it is available to local communities.

The NH-OEM is the lead agency in hazard mitigation activities for the state. In addition to assisting communities with hazard mitigation activities, NH-OEM houses much of the public education materials and conducts many hazard mitigation related training programs and workshops for local emergency management officials and dam owners. The NH-NFIP runs most of their public education/awareness activities through Community Assisted Visits (CAVs).

One of the primary roles served by the NH-CZMP is the dissemination of information. New Hampshire coastal program has hosted numerous pubic workshops, distributed a newsletter statewide and maintains a web page.

New Hampshire Interagency Relationships/Networks

New Hampshire's interagency relationships/networks are primarily informal. The NH-OEM has an informal relationship with FEMA Region I and the Corps, however, the NH-CZMP does not appear to have any relationship with FEMA Region I. The NH-NFIP networks with FEMA Region I, the Corps, National Weather Service and the US Fish & Wildlife Service through formal agreements. One of the coordinating roles served by the NH-CZMP is through federal consistency review that ensures that any federally funded projects within the coastal zone are consistent with the state laws, policies and regulations. Through this process, the coastal program identifies those projects that could potentially create additional hazards.

Table 22. Programs & Tools used by New Hampshire State Agencies to Identify Hazard Risks & Vulnerabilities.

Programs/Tools	***OEM***	***NFIP***	***CZMP***	***SG***
FIRMs	yes	yes	yes	dnr
GIS	yes	yes	yes	dnr
Erosion rates	yes	yes	yes	dnr
Zoning maps	yes	no	yes	dnr
Land use maps	yes	yes	yes	dnr
Critical facilities	yes	no	yes	dnr
SLOSH maps	yes	no	no	dnr
HAZUS	yes	no	no	dnr
Building replacement cost info	no	no	yes	dnr
Building inventories	yes	no	no	dnr
Repetitive loss data	yes	yes	yes	dnr
NFIP data	yes	yes	no	dnr
Building inventory-100 yr. floodplain	yes	no	yes	dnr
Statewide disclosure law	yes	yes	yes	dnr
Coastal barrier resource maps	no	no	yes	dnr
USGS quad maps	yes	yes	yes	dnr

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
OEM – Office of Emergency Management NFIP – State Flood Program CZMP – Coastal Zone Management SG – Sea Grant

On the state level, the NH-NFIP program also has formal agreements with the NH-SEMO and the State Budget Office. The NH-CZMP has informal relationships with the floodplain managers, emergency management staff, Sea Grant and the State Budget Office, but does not have any relationship with the building and insurance commissioners or public utilities. The NH-OEM appears to have networks established with all the relevant state agencies except for Sea Grant.

The NH-OEM also appears to have a strong network with local communities. The NH-CZMP appears to work with local planners, public works staffs and elected officials. The NH-NFIP has relationships established with the local emergency management officials and local elected officials. In terms of working with the private sector, both NH-OEM and the NH-NFIP have been actively working with the insurance, building and construction industries; the NESEC and the NEFSMA. The NH-CZMP has no affiliations with the private sector.

In terms of the collaboration of financial resources, coastal zone funds have been spent on hazard mitigation activities including dune restoration, shoreline stabilization projects and salt marsh restoration. HMGP funding has been spent on coastal hazard mitigation activities, specifically salt marsh restoration in the Taylor River. State funds have been spent on hazard mitigation activities, for example, mapping coastal properties in high hazard areas.

The NH-NFIP has received technical assistance from Sea Grant, FEMA, IBHS, University of New Hampshire, NH-OSP, USGS, New Hampshire Department of Transport and New

Hampshire Department of Environmental Services. The NH-CZMP has received technical assistance from Sea Grant, NRCS, USGS and the Corps.

When asked how the agency could profit from the results of this survey, the NH-NFIP responded that it would be used as an evaluating tool for future mitigation and planning activities.

Table 23. State Interagency Relationships in New Hampshire.

	Informal/ Information Sharing	**Formal (MOU or Executive Order)**	**Cost /Grant Sharing**	**Minimal or None**
Federal				
FEMA Regional Staff	**OEM**	**NFIP**		
Army Corps of Engineers	**OEM/CZMP**	**NFIP**		
Other (specify)	**OEM/CZMP**	**NFIP**		
State				
Floodplain Managers	**OEM/CZMP**	**NFIP**		
Coastal Resource Management Program Staff	**NFIP/OEM/ CZMP**			
Emergency Management Staff	**OEM/CZMP**	**NFIP**		
Building Commissioner	**NFIP/OEM**			
Insurance Commissioner	**NFIP/OEM**			
Public Utilities	**NFIP/OEM**			
Sea Grant/Cooperative Extension	**Ongoing**			
State Budget Office	**OEM/CZMP**	**NFIP**		
Other (specify)				
Local				
Local Building Officials	**NFIP/OEM**			
Local Planners	**NFIP/OEM/ CZMP**			
Local Departments of Public Works Staff	**NFIP/OEM/ CZMP**			
Local Emergency Management Officials	**OEM**	**NFIP**		
Local Elected Officials	**NFIP/OEM/ CZMP**	**NFIP**		
Other (specify)				
Private				
Insurance Industry	**NFIP/OEM**			
Professional Associations	**NFIP/OEM**			
Building/Construction Industry	**NFIP/OEM**			
Media NESEC NEFSMA	**NFIP** **NFIP** **NFIP**			

OEM – Office of Emergency Management NFIP – State Flood Program CZMP – State Coastal Program

State of New York Agencies Involved in Hazard Mitigation

New York has experienced extensive damages relating to past storms. Twenty-five years ago in New York State's Southern Tier, Hurricane Agnes caused some of the worst flooding on record. The flooding of 1972 caused millions of dollars of damage, cost many lives, and redefined the role of emergency management for local and state entities and FEMA. Hurricane Agnes has been used as the benchmark for all recent events. In 1998 New York State suffered one of the most widespread disasters in its history, with 41 counties impacted by the January thaw and flooding.

Hurricanes and tropical storms impact New York's coast from June to November. Nor'easters also affect New York typically during the winter months. These storms are less intense, but they can have localized wind velocities that reach hurricane strength, and their shoreline erosion impact may be greater because of their large geographic area and their slow speed, thus remaining longer in an area and cause erosion. Over 800 miles of coastline boarders New York's Great Lakes and connecting rivers. Of these, some 200 miles are subject to serious erosion, the south shore of Lake Ontario being the most critical area. Caused primarily by storm-induced wave action and associated longshore currents, the problem becomes critical when high lake levels have submerged the beaches which protect adjoining upland areas that are highly erodible. During high lake levels, wave forces directly impact the toe of bluffs and dunes resulting in rapid erosion. Property damage caused by erosion has been estimated in the millions of dollars.

The south shore of Long Island has been impacted by a number of major storms in recent years. These storms have caused serious coastal flooding, wind damage and erosion in many communities. Hurricanes and tropical storms, with the resulting erosion and sand movement, have played an important role in shaping the present-day shorelines. Long Island is especially vulnerable to erosion because of its composition, a loose mixture of sand and gravel; and its location, facing the ocean in direct opposition to the prevailing wind and water currents moving up the Atlantic Coast.

New York State Coastal Resources Management Program

Contact: George Stafford, Director of Coastal Resources, 41 State Street, Albany, NY 12231-0001 Tel: 518-474-6000 FAX: 518-473-2464 E-mail: coastal@dos.state.ny.us Website: http://www.dos.state.ny.us/cstl/cstlwww.html

The New York State Coastal Resources Management Program (NY-CRMP) is administered by the Division of Coastal Resources and was adopted in 1982 under the Waterfront Revitalization of Coastal Area and Inland Waterways. In voluntary partnership with local governments, the NY-CRMP seeks to meet the needs of coastal residents and visitors, while striving to advance economic development opportunities and protect natural coastal resources.

The coastal area extends over 5,000 miles along the shorelines of Long Island; New York City; the Hudson; St. Lawrence and Niagara rivers; Lakes Erie and Ontario; and major inland waterways, including the Finger Lakes, Lake Champlain and the Barge Canal System. More

than 600 local governments participate in New York's coastal program. The program provides financial and technical assistance to local governments and works with local governments, residents and coastal resource users to promote the beneficial use of New York's coast.

Coastal erosion and flooding prompted initiatives to:

- Establish permanent sand bypassing at Long Island south shore inlets.
- Provide technical assistance to local governments.
- Improve the coastal database to ensure better erosion management decisions.

Relevant Coastal Program Policies

Policy 11

Buildings and other structures will be sited in the coastal area so as to minimize damage to property and the endangering of human lives caused by flooding and erosion.

This policy outlines the building and setback regulations on coastal lands identified as coastal erosion hazard areas and lands subject to high velocity waters caused by storms. It describes what structures can be built or modified on these areas and how the setback is calculated. It also addresses required procedures where human lives may be endangered by major coastal storms.

Policy 12

Activities or development in the coastal area will be undertaken so as to minimize damage to natural resources and property from flooding and erosion by protecting natural features including beaches, dunes, barrier islands and bluffs.

This policy addresses development or activities on natural protective features such as beaches, dunes, barrier islands, bluffs, etc. It requires that all adverse actions that threaten the protective value be minimized.

Policy 13

The construction or reconstruction of erosion protection structures shall be undertaken only if they have a reasonable probability of controlling erosion for at least thirty years as demonstrated in design and construction standards and/or assured maintenance or replacement programs.

This policy ensures that new or damaged erosion protection structures are designed, sited and maintained properly, reducing damage or loss from erosion.

Policy 14

Activities and development, including the construction or reconstruction of erosion protection structures, shall be undertaken so that there will be no measurable increase in erosion or flooding at the site from such activities or development, or at other locations.

This policy addresses damage to or loss of property and endangering human lives due to the use of erosion protection structures such as groins or impermeable docks. These structures can block the littoral transport of sediment to adjacent shorelands.

Policy 16
Public funds shall only be used for erosion prevention structures where necessary to protect human life and new development which requires a location within or adjacent to an erosion hazard area to be able to function, or existing development; and only where the public benefits outweigh the long term monetary and other costs including the potential for increasing erosion and adverse effects on natural protective features.

This policy requires that prior to expending public funds for erosion prevention structures, careful analysis be done of the benefits and long-term costs. The purpose of these structures is protection of human life and existing investment in development or new development which requires a location in proximity to the coastal area or in adjacent waters to be able to function.

Policy 17
Non-structural measures to minimize damage to natural resources and property from flooding and erosion shall be used whenever possible.

This policy defines the types of "non-structural measures" that can be used to reduce adverse impacts of flooding and erosion upon development and upon natural protective features in the coastal area. Also considered are the costs of protection against those hazards. This policy shall apply to the planning, siting and design of proposed activities and development and measures to protect existing activities and development.

New York State Emergency Management Office

Contact: Edward F. Jacoby, Jr., New York State Emergency Management Office,
1220 Washington Avenue, Building 22, Suite 101, Albany, New York 12226-2251
Tel: 518-457-2222 E-mail: edward.jacoby@semo.state.ny.us
Website: http://www.nysemo.state.ny.us/

State Hazard Mitigation Officer: John Dinuzzo, New York State Emergency Management Office, 1220 Washington Avenue, Building 22, Suite 101, Albany NY 12226 Tel: 518-485-1797

The mission of the New York State Emergency Management Office (NY-SEMO) is to provide the highest level of preparedness within New York State in order to mitigate the effects of emergencies and disasters on life and property. The NY-SEMO is a government entity that coordinates emergency management services for the state by providing leadership, planning, education and resources to protect lives, property and the environment.

In order to be better prepared for these hazards, the NY-SEMO provides access to three downloadable computer programs relating to hazard mitigation and emergency planning. These include New York State's Automated Guide to Emergency Management Planning (EM Plan), Hazards New York (HAZNY).

EM Plan is a step-be-step interactive program that guides the plan writer in developing an emergency plan. At this time, it can guide you in writing a county emergency plan. The Empire

County Comprehensive Emergency Management Plan is the sample plan that EM Plan produces. In the future additional emergency plans will be included.

HAZNY is an automated hazard analysis program. It asks questions concerning hazards that you face and, based upon your responses, rates and ranks each hazard. It includes guidance on organizing a team approach in conducting the hazard analysis.

Re: Source is an old but reliable resource management database specifically designed for emergency management.

New York Flood Insurance Program

Contact: Howard Pike, GIS/Floodplain Management, New York State Department of Environmental Conservation, 50 Wolf Road, Room 388, Albany, NY 12233-3507
Tel: 518-457-1617 E-mail: ncpike@gw.dec.state.ny.us
Website: http://www.dec.state.ny.us/

The governor of New York State has designated the New York Department of Environmental Conservation as the coordinating agency for the state's flood insurance program (NY-NFIP). The NY-NFIP bureau and its regional floodplain management coordinators act as the liaison between FEMA and local municipalities. Article 36 of the Environmental Conservation Law is the basis for the NY-NFIP actions in relation to the NFIP. The state legislature acknowledged that if a flood-prone community did not join the NFIP or did not maintain its eligibility, federal grants or mortgages for purchasing or repairing structures in the flood-hazard areas would be denied.

Under Article 36, state agencies are directed to minimize flood hazards and loss in connection with state-owned and state-financed facilities. The criteria that the state must meet are equal to or exceed the floodplain management criteria of the NFIP and ensure that state projects will not negatively impact a community's special flood-hazard areas.

Additionally, Article 36 directs the NY-NFIP to give municipalities any necessary technical assistance to qualify them for the NFIP program. Following is a list of NY-NFIP activities related to the state flood insurance program:

- Explain NFIP requirements for program eligibility to local officials.
- Assist in preparation of local floodplain management regulations.
- Provide model regulations.
- If requested by the community, attend local hearings on regulations to assist in answering questions on NFIP issues.
- Assist local officials in using flood insurance studies and maps.
- Assist the local administrator in permit reviews.
- Be the data and calculations repository used in the preparation of flood insurance studies.
- Monitor community compliance with NFIP.

On the local level, each community must designate a local administrator to manage the community's floodplain regulations. The communities may choose to hire a state employee or enter into an agreement with the county or a private firm.

Table 24. New York NFIP Policy Information.
Total of 1,465 Communities (June 1999).**

# of Policies**	Coverage**	Rep Loss Properties*	$Total Paymts**	# of CRS Comm
144,040	$18.2B	6,976	$598.8M	25

*Federal Insurance Administration, May, 31, 1999.** FEMA Community Information System Database.

Army Corps of Engineers Flood Control Projects

North Atlantic District website: http://www.nan.usace.army.mil/

Flood control projects in New York State are generally a joint venture between a local municipality, the State of New York and the federal government. The Corps is the federal agency that coordinates the study phase, preparation of plans and specifications, and construction of the projects. The guiding criteria for structural solutions to flood problems are based on the benefit/cost ratio. The ratio essentially identifies that the expected annual damage prevented does not exceed the annual cost of the structural solution, thus, maintaining a ratio greater or equal to one. The degree of structural remediation is dictated by the size of the potential damage pool that will be protected.

Table 25 identifies existing flood-control projects in New York State and the structural solutions incorporated.

Table 25. Existing Structural Flood Control Projects.

Flood Control Project	Structural Solutions Incorporated
Ardsley	Concrete flood walls
South Amsterdam	Concrete flood walls
Hoosic Falls	Earthen levees & concrete flood walls
Herkimer	Earthen levees, pump station, ponding areas, stoplog closures
Mount Morris Dam	Concrete gravity dam & storage reservoir
Hammondsport	Concrete flume, gravel & debris stilling basin
Wallkill	Channel improvement

Corps Aid after 11 December 1992 Storm

As a result of the 11 December 1992 storm, several coastal areas were declared eligible for federal assistance under the Stafford Disaster Relief Act. Applications for federal disaster relief were accepted by FEMA beginning 22 December 1992. In addition, the NY-NFIP accelerated

its permit review process by establishing field offices throughout the region. The storm caused two new inlets through the barrier island at Westhampton. The Corps closed the beaches, and by October 1993 the inlets were sealed by construction of a wall and sand nourishment. The project cost was approximately $8 million, of which New York State contributed approximately $4.6 million.

Fire Island Inlet to Moriches Inlet
Reformulation Study: The Corps is developing plans to reduce storm damage along Long Island's South Shore. Public meetings provided opportunities for interested citizens to review and comment on potential alternatives and special studies. The sessions were sponsored by the Corps' New York District and NY-NFIP, in cooperation with the U.S. Fish and Wildlife Service and National Park Service Fire Island National Seashore. The posters presented at the public sessions are available on the WWW at: http://www.nan.usace.army.mil/index.htm

Coastal Processes Monitoring Program for New York's Atlantic Coast
Historically, New York's Atlantic shoreline has been subject to severe long-term erosion and storm-induced erosion resulting in extensive damage to public and private property and infrastructure. In response, the New York Corps, in coordination with the State of New York, New York Sea Grant and the U.S. Army Corps Engineers Waterways Experimentation Station developed the Atlantic Coast monitoring program to define and monitor the coastal processes affecting the south shore of New York City and Long Island.

Data Collection Activities and Analysis–Robert Moses State Park, Fire Island
Data collection activities, programmed on a seasonal (i.e., spring and fall) and post-storm basis, were initiated in the spring of 1995 and are primarily limited to beach profile surveys and aerial photography. The results of the data collection and analysis are being assembled into a comprehensive GIS computer database planned to be accessible to engineers, scientists, coastal managers and other interested parties for purposes of addressing post-storm actions and long-term shoreline erosion control. This GIS computer database will be the primary link in supplying valuable coastal management information to state and local governments.

New York Sea Grant Program

Director: Jay Tanski, Coastal Processes & Facilities Specialist, 121 Discovery Hall,
SUNY at Stony Brook, Stony Brook, NY 11794-5001 Tel: 516-632-6905
FAX: 516-632-6917 E-mail: jjt3@cornell.edu
Website: http://seagrant.sunysb.edu/

Objectives
New York Sea Grant Program maintains a strong presence statewide with central administrative and extension offices located on Long Island and additional extension offices located near the Great Lakes and Hudson River. This network facilitates the transfer of research-based information to a great variety of coastal user groups that include businesses, federal, state and local government decision-makers and managers, the media and the interested public. New York Sea Grant supports more than 60 research and outreach projects annually in the areas of

technology and product development, fisheries, coastal environmental quality and processes, aquatic nuisance species and other areas of special interest.

Activities
Breach Contingency Plan
Real Time Water Level Monitoring and Reporting

GIS Tracking of Coastal Erosion
New York Sea Grant has created a series of coastline maps that show how the position of the shoreline might change over the next 50 and 100 years in response to changes in sea level and how the extent of flooding from a 50-year storm (expected to occur on average only twice a century) could increase as a result of this change. These mapping efforts are part of an ongoing project to use GIS tools to provide decision-makers with information about coastal conditions and processes.

Long Island Sound Management Plan
Though the Long Island Sound Management Plan focuses on improving water quality and habitat management, land use and development is essential to achieve this. The impacts from existing development are significant particularly in urbanized areas and must be reduced to improve coastal water quality. These areas should be targeted for nonpoint source management, including public education, infrastructure upgrades, spill prevention and response, and flood and erosion control.

Primary partners in the Long Island Sound Management Plan include the states of Connecticut and New York; EPA Region 1 in the New England area; and EPA Region 2 in the New York area. A number of committees help to ensure broad input into development and implementation of the plan.

The Long Island Sound Management Plan is an excellent example of how New York Sea Grant can educate, empower and implement action on an issue.
Website: http://www.epa.gov/region01/eco/lis/plan.html

New York Sea Grant Extension/Outreach Program
The Cornell Cooperative Extension's Sea Grant Program (New York's Sea Grant Extension Program) supports more than 60 research and outreach projects annually involving coastal environmental quality and processes, technology and product development, fisheries, and other areas of special interest. Through the program, science-based information on a wide range of coastal issues reaches a variety of audiences through fact sheets, periodicals, books, and videos; seminars, training programs, and satellite conferences; and demonstration projects.

The New York State Sea Grant survey indicated that federal, state and local staff and private industry have been involved in numerous training sessions provided by Sea Grant, state and local agencies and regional groups. New York Sea Grant has provided training on the Long Beach Hurricane Plan, the Breach Contingency Plan, erosion mitigation and hazard monitoring. The program is involved in ongoing training and information sharing/technical assistance efforts

carried out through participation and interaction with several working groups and committees including Project Impact and technical management groups.

State of New York Survey Results

The survey was completed by a representative from the NY-SEMO, the Division Coastal Resources (NY-CRMP) and the Sea Grant Program. There was no response from the State Flood Program. On a scale of 1-5 (5 being the highest) NY-SEMO and the NY-CRMP rated hazard mitigation a "4."

New York Planning & Policy Development

The NY-CRMP has many policies addressing coastal hazards (see previous section on the New York coastal program). Much of this effort is focused on beach-erosion issues, particularly on Long Island and inlet areas. State funds have been spent by the NY-CRMP and the NY-SEMO for hazard mitigation activities for high hazard properties.

New York has led the way in establishing solid networks with the private sector. (See following section on Case Examples–*Joint Loss Reduction Partnership Project*).

Table 26. Policies & Regulations used by New York State Agencies Related to Hazard Mitigation.

Policy/Regulation	***SEMO***	***NFIP***	***CRMP***	***SG***
Coastal construction setbacks	yes	dnr	no	na
Prohibitions on coastal armoring	yes	dnr	yes	yes
Dune protection	yes	dnr	yes	yes
Wetland restoration	yes	dnr	yes	no
Public infrastructure prohibited in hazard areas	yes	dnr	yes	yes
State building code	yes	dnr	yes	na
Building heights	yes	dnr	dn	na
Building elevations	yes	dnr	no	na
Prohibit reconstruction of subs damaged buildings	yes	dnr	yes	na
Building replacement cost info	no	dnr	no	na
Manufactured home construction standards	dn	dnr	dn	na
Mobile home construction standards	yes	dnr	yes	na
Wind load standards	yes	dnr	yes	na
State guide plan or local plans	yes	dnr	dn	yes
409 Plan have coastal policies	yes	dnr	no	yes
§309 CZM program prioritize coastal hazards	yes	dnr	yes	yes
State flood mitigation regulations	yes	dnr	dn	na

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
EMO – Emergency Management NFIP – State Flood Program CRMP – Coastal Management Program SG – Sea Grant

New York Program Activities & Tools

The NY-CRMP and NY-SEMO use GIS data available from federal data sets. Accuracy is questionable. More detailed work with hazard risks and vulnerability assessments occurs in communities that are completing flood mitigation plans.

New York has been very active in providing public education and awareness programs on hazard mitigation. A central clearinghouse of coastal hazard mitigation information has been established through the efforts of NY-SEMO. Additionally, NY-SEMO has organized many training programs for state and local government officials, local emergency managers, local hazard mitigation coordinators, and many from the private sector. Many of these training programs have focused on issues of shoreline erosion. Through these workshops, information and technical resources have been shared, and several working groups have been established to directly address the issue.

New York has also worked with and received technical assistance from IBHS, American Institute of Architects and many large banking institutions and other corporations on Wall Street (for additional information, please see "Joint Loss Reduction Partnership Project under section on Case Examples of Hazard Mitigation Initiatives).

Table 27. Programs & Tools used by New York State Agencies to Identify Hazard Risks & Vulnerabilities.

Programs/Tools	***SEMO***	***NFIP***	***CRMP***	***SG***
FIRMs	yes	dnr	yes	yes
GIS	yes	dnr	yes	yes
Erosion rates	yes	dnr	yes	yes
Zoning maps	yes	dnr	yes	no
Land use maps	yes	dnr	yes	no
Critical facilities	yes	dnr	yes	no
SLOSH maps	yes	dnr	no	no
HAZUS	yes	dnr	no	no
Building replacement cost info	no	dnr	yes	no
Building inventories	no	dnr	no	no
Repetitive loss data	yes	dnr	yes	no
NFIP data	yes	dnr	no	no
Building inventory-100 year floodplain	yes	dnr	yes	no
Soils maps	yes	dnr	no	no
Statewide disclosure law	no	dnr	yes	no
Coastal barrier resource maps	no	dnr	yes	no
Aerial photographs	no	dnr	yes	no
Historical data	yes	dnr	no	no

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
EMO – Emergency Management NFIP – State Flood Program CRMP – Coastal Management Program SG – Sea Grant

New York Interagency Relationships/Networks

The NY-CRMP has a working relationship with the Corps for addressing shoreline erosion issues. The NY-SEMO also has a strong relationship with the Corps and works closely with FEMA Region 2. Much of the state agency interaction occurs through the state Hazard Mitigation Policy Committee. New York appears to be in closer contact with their Sea Grant Program in dealing with coastal hazards than most other state programs (other than Rhode Island). NY-SEMO and Sea Grant have hosted many workshops and public education programs, including information for property owners on the existence of natural hazards and the ramifications.

Table 28. State Interagency Relationships in New York.

	Informal/ Information Sharing	**Formal (MOU or Executive Order)**	**Cost /Grant Sharing**	**Minimal or None**
Federal				
FEMA Regional Staff	**SEMO/SG**	**SEMO/SG**	**SEMO**	**CRMP**
Army Corps of Engineers	**CRMP/SEMO/SG**			
Federal Regulators NPS Red Cross	**CRMP** **SG** **SEMO**	**SG**	**SG**	
State				
Floodplain Managers	**SEMO/SG**	**SEMO**	**SEMO**	**CRMP**
Coastal Resource Management Program Staff	**SEMO/SG**			
Emergency Management Staff	**CRMP/SG**			
Building Commissioner	**SEMO/SG**			**CRMP**
Insurance Commissioner	**SEMO/SG**			**CRMP**
Public Utilities	**SEMO**			**CRMP/SG**
Sea Grant/Cooperative Extension	**SEMO/CRMP**			
State Budget Office	**SEMO/CRMP/SG**	**SEMO**		
Local				
Local Building Officials	**SEMO/SG**	**SG**	**SG**	**SEMO/CRMP**
Local Planners	**SEMO/CRMP/ SG**	**SG**	**SG**	**SEMO**
Local Departments of Public Works Staff	**SEMO/SG**			**SEMO/CRMP**
Local Emergency Management Officials	**SEMO**	**SEMO/SG**	**SEMO**	**SEMO/CRMP**
Local Elected Officials	**SEMO/CRMP/SG**	**SG**		
Private				
Insurance Industry	**SEMO**			**CRMP/SEMO**
Professional Associations	**SEMO/CRMP/SG**			
Building/Construction Industry	**SEMO/SG**			**CRMP/SEMO**

EMO –emergency management program NFIP – state flood program CRMP –coastal program SG – Sea Grant

New York Case Examples of Successful Hazard Mitigation Initiatives

Project Impact

City of Rye

Community Profile**:** The City of Rye, in Westchester County, is a suburban community located on the Long Island Sound about 25 miles north of New York City. This small residential community has a population of 15,000. Single family homes dominate, covering three fifths of the city's six square miles. Less than 10 percent of the property in Rye is used for commercial purposes. Campus-type office buildings that headquarter businesses and corporations are the main features of the economic community. The central business district, primarily intended to serve local residents, consists of about 200 small businesses.

Disaster Risk: Hurricanes, nor'easters and winter storms have caused coastal and riverine flooding.

Capacity for Public-Private Partnerships: Rye officials are working in close partnership with the NY-SEMO, the Westchester County Emergency Management Office and the Westchester County Chamber of Commerce, as well as major corporations such as Consolidated Edison, Inc, to improve the overall level of corporate and private preparedness in the city. Consolidated Edison, New York State's largest utility, has volunteered to chair a New York State *Project Impact* Task Force to support initiatives such as planning for power restoration in the event of a disaster.

Disaster Prevention Commitments/Actions: Approximately 500 residents currently have flood insurance policies. Rye has initiated several flood mitigation projects dealing with erosion controls, elevation, relocation and stream bank improvements that are currently underway. FEMA, through its HMGP, has funded improvements to a breakwater protecting a local fishing pier, as well as the historic Rye Playland amusement park. FEMA's commitment to this project was $350,000.

Village of Freeport

Community Profile**:** The Village of Freeport is located on Long Island's south shore in Nassau County. Freeport covers five square miles and is home to approximately 45,000 people. The principal industry is fishing and there are charter fishing boats and many shops and seafood restaurants.

Disaster Risk: Freeport is particularly vulnerable to hurricanes, nor'easters, back bay flooding and high winds. Freeport has suffered significant repetitive losses caused by flooding and has taken positive steps to reduce the damage caused by these events.

Capacity for Public-Private Partnership: Home Depot, Fleet Bank and local merchants have committed to working with the village's building department, school system, electric company, public works department and mayor's office to plan innovative educational and public awareness programs. Activities currently planned include a presentation on hurricane awareness in the Freeport Public Library; a series of lectures in the public schools for children, senior citizens and

adult education students; and weekly hands-on demonstrations of hurricane proofing workshops and a "Kids Workshop" at Home Depot.

Disaster Prevention Commitments/Actions: Freeport has hired a full-time emergency manager to run its mitigation programs. This, along with various projects, has enabled the community to provide a 10-percent reduction in flood insurance premiums to residents through the NFIP CRS. Mitigation initiatives undertaken by Freeport include elevation projects such as raising streets in hard-hit areas and using a $690,840 FMAP grant to help 23 homeowners affordably elevate their homes three feet above the base flood elevation.

Freeport provides an up-to-date hurricane preparedness guide on its website (www.FreeportNY.com), as well as emergency telephone numbers and evacuation information. Frequent mailings of emergency information are another way the village ensures that its citizens are kept informed.

Joint Loss Reduction Partnership Project

The Joint Loss Reduction Partnership, a statewide business/government partnership**,** is comprised of a cross-section of the state's business community along with key federal, state and local government officials. The project is unique in that it has brought together an impressive group of private- and public-sector representatives from across the state to work together to find solutions to the state's business community's emergency management/loss reduction needs. Participating organizations include:

Albany Times Union, American Red Cross, Bell Atlantic, Chase Manhattan Bank, Consolidated Edison Depository Trust Company, Empire State Development Corporation, Erie County Department of Emergency Services, FEMA, Federal Reserve Bank, Fleet Bank, Goldman Sachs and Company, IBM, J&H Marsh & McLennan, M & T Bank, Merrill Lynch, Monroe County Department of Transportation, Nassau County Emergency Management Office, New York Central Mutual Insurance, New York Clearing House, New York State Emergency Management Office, New York State Emergency Managers Association, New York State Insurance Department, New York State Police, The New York Times, Niagara Mohawk Power Corporation, Ogden Allied, OnSite Energy, Rensselaer County Bureau of Emergency Services, Rochester Chamber of Commerce, The Troy Savings Bank, United Hospital Medical Center, Utica Department of Public Safety, W.W. Grainger, Inc.

The Empire State Development Corporation, the state government’s economic development arm, has offered office space to the new organization in Albany and Manhattan. Ultimately, field offices will be established at other locations in the state. Funding to support the new organization’s activities is expected to come from government sources, corporate charitable contributions and revenue generated by fees for special services.

Major areas identified as needing assistance include:

- Establish systems of communication between sectors
- Develop methods of resource identification
- Share, coordinate and increasing planning
- Improve access of essential personnel and supplies to affected areas during disasters

- Increase training and public awareness of the business community in all areas of loss reduction and emergency management

Services revolve around the use of a toll-free telephone number and a website to respond to requests for assistance and broker needed resources. An important complement to the technological resources will be the new organization's representation at activated emergency operations centers to ensure the maximum integration of public and private resources during area-wide emergencies.

Incentives identified by the organization during 1998 that could motivate businesses to place greater emphasis on emergency preparedness and loss reduction activities will be followed up the during the remainder of 1999. The incentives generally involve insurance, utility and loan discounts for participating businesses.

State of Rhode Island Agencies Involved in Hazard Mitigation

Rhode Island has experienced its share of natural disasters in the past 50 years. Hurricanes and related coastal flooding, winter storms and riverine flooding affect Rhode Island on a recurring basis. Rhode Island's vulnerability to hurricanes is rated high. Many communities in the state have exposed coastal areas that are very vulnerable to a hurricane storm surge, particularly the associated wave actions and wind hazards. Much of the coastline on the Atlantic Ocean consists of barrier beaches that are open to the full force of destructive hurricane waves. Other damages associated with hurricanes include inland flooding, coastal erosion and tornadoes. The most serious inland flooding threats occur when the eye of the hurricane passes just to the west of Rhode Island at a time of high tide. This type of flooding poses an additional health risk as it involves the overflow of storm-sewer systems and is usually caused by inadequate drainage following heavy rain, rapid snow melt or a extreme storm surge up Narragansett Bay.

Flooding can also result from dam failure. The Division of Land Resources at the Rhode Island Department of Environmental Management (RI-DEM) conducts private and publicly owned dam inspections. There are 510 dams in Rhode Island; the state owns and maintains 49 of these, the rest are maintained by cities and towns or are privately owned. Of these dams, 18 have been designated by RI-DEM and the Corps as high hazard potential because their location and size poses a significant threat of loss of life or property damage in the area downstream of the dam. There are 51 significant hazard dams and 453 low hazard dams. The state dam inspection program operates under the authority of legislation written in 1896, which is archaic in language and very general in authority. Rhode Island has one of the most poorly ranked dam programs in the country and is the only state in The Northeast that is not part of the federally financed dam inspection program.

Rhode Island Coastal Resources Management Council

Contact: Grover Fugate, Executive Director, Coastal Resources Management Council,
4808 Tower Hill Road, Wakefield, RI 02879
Tel: 401-222-3577 or 401-222-2476 FAX: 401-222-3922 E-mail: RICRMC@riconnect.com

The Rhode Island General Assembly enacted the Coastal Resources Management Act in 1971 for the purpose of preserving, protecting, developing and restoring Rhode Island's coastal resources. The act establishes the Rhode Island Coastal Resources Management Council (RI-CRMC) which regulates a wide range of coastal development activities. The RI-CRMC is responsible for developing and implementing policies, regulations and programs to establish a balance between competing uses while protecting coastal ecosystems (RIGL 46-23-1).

RI-CRMC's jurisdiction is defined by the area extending from three miles offshore to 200 feet inland from any coastal feature, such as coastal beaches, dunes, wetlands, cliffs, banks, rocky shores and manmade shorelines. Along Rhode Island's 420 miles of shoreline, RI-CRMC regulates any construction project or alteration occurring in and along tidal waters and shoreline features. RI-CRMC is also the permitting agency for any projects or alterations within their jurisdiction. All applicants proposing coastal development must comply with all flood hazard standards and building codes, and certain applications need to undergo a more rigorous review

process (Category B assent) by appearing before the full council. Assents may include stipulations mandating setbacks and buffer zones, among other things.

Construction Standards in Rhode Island's Coastal Areas

Rhode Island has over 40 coastal barriers, ranging from tiny "bay barriers" formed where coastal streams enter Narragansett bay, up to Ninigret Beach–an ocean-fronting barrier that is over three-miles long. Many coastal "V" zones are situated on coastal barriers. The 1982 Coastal Barrier Resources Act and the Coastal Barriers Improvement Act of 1991 prohibits federal funding and/or subsidies for development on coastal barriers. Additionally, federal flood insurance is not available.

Structural design in "V" zones must contend with a variety of environmental extremes, such as gradual shoreline loss, storm-induced scour and short-term shoreline erosion. Foundation systems must be designed for the erosion anticipated during the life of the structure. Nonstructural erosion control is favored over structural control by the RI-CRMC (see RI-CRMC section 300.7).

High winds accompanying severe storms are a second major concern when designing structures in the "V" zone. Wind speed design data and procedures for construction in Rhode Island specify design be for at least 90 MPH wind speeds throughout the state (Chapter 1609.0 of the Rhode Island State Building Code).

Relative to coastal hazards, the RI-CRMC has the following goals and policies: a) preventing activities that will create an erosion or flood hazard; and b) protecting dunes from activities that have a potential to increase wind or wave erosion. In order to uphold this, the state's barrier beaches have been mapped and assigned by the RI-CRMC to one of three categories:

- *Undeveloped*–barrier beaches that are free of houses and commercial/industrial buildings, surfaced roads and structural shoreline protection facilities.
- *Moderately developed*–barrier beaches that are free of houses and commercial/industrial buildings but contain surfaced roads, public recreational structures and/or structural shoreline protection facilities.
- *Developed*–barrier beaches that contain houses and/or commercial industrial structures.

Construction is prohibited on undeveloped barriers except where the primary purpose of the project is restoration or improvement of the feature as a conservation area or storm buffer.

Coastal wetlands are extremely important natural resource as they provide natural protection against tidal flooding. The RI-CRMC and the RI-DEM share responsibility for coastal wetland protection. The director of the RI-DEM, after conducting a public hearing, may designate an area as a coastal wetland. Once designated, they may not be used in any way that would disturb the salt marsh ecology or any other natural functions of wetlands, such as natural buffer protection against storm events. RI-DEM also requires that all designated coastal wetlands be recorded in the local registry of deeds. Regulation of coastal wetlands by RI-CRMC is the same as described above for coastal development.

The RI coastal management program implements policies that further protect the coastline. These policies involve:

- Beach Replenishment–Beach replenishment and structure relocation are the preferred methods for abating erosion concerns. Property owners in areas suffering erosion shall be permitted to relocate any structures and/or conduct beach replenishment projects to abate erosion concerns.
- Temporary Experimental Erosion Control Structures–RI-CRMC, as allowed by NOAA's Office of Ocean and Coastal Resource Management, will entertain proposals utilizing experimental technologies that trap sand as the primary function. Due to the experimental nature of these structures and uncertain effects on adjacent properties, they may only be allowed where the adjoining property owners also participate, file concurrent applications for similar structures, or sign a letter of no objection for the project, and a long-term replenishment plan is to be developed. Any placed structure should be considered a temporary relief mechanism allowed at the discretion of the RI-CRMC and at the direction of the Office of Ocean and Coastal Resource Management. An emergency application shall be filed at RI-CRMC for all requests for temporary structures.

Monitoring for Shoreline Erosion–The RI-CRMC shall require that any temporary experimental technology be monitored. Such monitoring shall be conducted using a RI-CRMC approved series of beach profiles using standard surveying techniques or the Modified Emery Method. RI-CRMC staff and/or University of Rhode Island researchers can assist in training permittees in the Modified Emery Method.

Rhode Island Emergency Management Agency

Executive Director: Raymond LaBelle, Rhode Island Emergency Management Agency, 645 New London Avenue, Cranston, RI 02920 Tel: 401-946-9996 FAX: 401-944-1891
Website: http://www.state.ri.us/riema/mission.htm

State Hazard Mitigation Officer: Joseph Almeida, Jr., Rhode Island Emergency Management Agency, 645 New London Avenue, Cranston, RI 02920 Tel: 401-946-9996
FAX: 401-944-1891

The Rhode Island Emergency Management Agency's (RIEMA) primary function is to protect life and property before, during and after a disaster or emergency situation. RIEMA, as the state's coordinating agency during a disaster, will continue to play an active role to prepare, train and educate the citizens of Rhode Island on all elements of emergency management by concentrating on mitigation efforts to substantially reduce the cost of disasters.

The RIEMA community mitigation efforts during the next year will continue to expand the development of local hazard mitigation councils and the development of local multi-hazard mitigation plans. Four communities have completed their local mitigation plans, three others are nearly completed and 10 communities are presently undergoing plan development (33 communities sent letters of intent). The process of mitigation as a local initiative gives the communities a primary responsibility to define their own standards for mitigation. All 39 separate political entities in Rhode Island are responsible for developing comprehensive

community plans and standards for local building codes and enforcement. Specific objectives are:

- Develop an all hazards multi-objective mitigation plan that improves the state and local jurisdictions' sustained mitigation capabilities.
- Develop and implement for the state and local jurisdictions, a comprehensive program of education, awareness, outreach on mitigation, preparedness, and response and recovery for the public and private sectors.

In terms of training, local mitigation efforts continue to provide incentive training that encompasses all local concerns. The training programs for building emergency management and planning officials continue as an integral part of the RIEMA mitigation goals. Training courses weigh heavily in expanding the benefits of mitigation and are designed to teach and explain the methods and benefits of mitigation.

In order to be prepared, local emergency operation plans must be up to date and accurate. RIEMA provides technical assistance to communities in updating their local emergency plans. It also conducts statewide exercises to test response capabilities, emergency operations plans and available resources in responding to large-scale disaster situations. These full-scale exercises in Rhode Island assist participating agencies in their efforts to improve capabilities and effectiveness.

Rhode Island Floodplain Management Program

Contact: Pam Pogue, State Floodplain Manager, Rhode Island Emergency Management Agency, 645 New London Avenue, Cranston, RI 02920
Tel: 401-946-9996 FAX: 401-944-1891 E-mail: poguep@ri-arng.ngb.army.mil
Website: http://www.state.ri.us/riema

All of Rhode Island's 39 communities are designated as flood-prone communities by FEMA and all participate in the Regular Phase of the NFIP. Flood hazards are identified in all 39 communities. There are 17,000 acres located within the flood hazard velocity "V" zone and another 84,000 acres within the flood hazard "A" zone. Over 10,000 policies providing in excess of $1 billion in coverage are in effect throughout Rhode Island. Today the need for sound floodplain development is more compelling than ever because Rhode Island's coastal communities are among the fastest growing in the Northeast. There is increased interest and development activity in urban revitalization and in the creation of greenways along rivers.

All NFIP construction standards have been incorporated as Chapter 31 of the Rhode Island State Building Code. Although this is implemented in all Rhode Island communities, communities must also include NFIP land-use measures within their zoning, land development and subdivision review ordinances. Incorporation of floodplain management considerations within local land management ordinances has been provided for in the Rhode Island Enabling Act of 1991 (Section 45-24-33(A)(5)).

All of Rhode Island's communities have been in the Regular Phase of the NFIP for a number of years, and they all have adopted the NFIP-required land management measures. Communities

must ensure that all future amendments or revisions to their zoning and/or subdivision ordinances retain the NFIP-required provisions. Local ordinances are periodically reviewed by the State Floodplain Manager or by FEMA for continuing conformance to the NFIP minimum criteria.

State Permit Requirements for Floodplain Development

All development involving the construction of structures is subject to the Rhode Island State Building Code, and all applicants must complete a standard building permit application. The application requires applicants to indicate whether or not the proposed development site is within a flood-hazard area and to furnish the elevations (relative to mean sea level) of the lowest floor (including basement) of the proposed structure and the 100 year flood level. Applicants work with the local building official and the state floodplain manager to ensure that this section of the application is complete and accurate. Local regulations adopted pursuant to the Subdivision and Land Development Review Enabling Act of 1992 cover land development projects and subdivisions (even if the state building code does not cover them). This act requires communities to establish project application and review procedures for three categories of development: administrative subdivisions; minor subdivisions and land development projects; and major subdivisions and land development projects.

Depending upon location and potential impacts, development activities may require permits from any of the following state agencies: RI-DEM (Freshwater Wetlands Act, water quality certifications, individual sewage disposal systems, stormwater management); the RI-CRMC (RI-coastal program permits); and the Corps (Section 404 permits for filling of wetlands).

To preserve the integrity of dunes and the flood protection benefits they provide, the NFIP requires local administrators to prohibit man-made alterations to sand dunes within the "V" zones identified on the community's flood map. This NFIP requirement piggybacks on the RI-the CRMC regulation of beaches and dunes as coastal features. The RI-CRMC policies for dunes seek to limit development to disturbed areas and enforce construction setbacks and buffers to preserve their storm-buffering functions.

Table 29. Rhode Island NFIP Policy Information.
Total of 39 Communities (June 1999).**

# of Policies**	Coverage**	Rep Loss Properties*	$Total Paymts**	# of CRS Comm
10,877	$1.3B	152	$17.5M	3

*Federal Insurance Administration, May, 31, 1999. **FEMA Community Information System Database

Army Corps of Engineers Flood Control Projects

Fox Point Barrier, Providence, RI
Project personnel: Owned and operated by the City of Providence
Project purpose: Hurricane Flood Protection
Location: Project is located on the Providence River at Fox Point, in Providence
Protected area: Provides protection to major portion of the city of Providence that includes the commercial and industrial center of the city, transportation facilities, public utilities and residential areas.
Design hurricane tide: 20.5 Ft NGVD
Total cost: $15,000,000
Placed in operation: January 1966

Rhode Island Sea Grant Program

Director: Scott Nixon, University of Rhode Island, Bay Campus, Narragansett, RI 02882
Tel: 401-874-6800 FAX: 401-874-6817 E-mail: snixon@gso.uri.edu
Website http://seagrant.gso.uri.edu/riseagrant

Objectives

- Develop interagency and private-sector coordination and cooperation for hazard mitigation planning.
- Increase public and local government awareness of threats from natural disasters.
- Advance the basic knowledge of storm and man-made hazards, developing better predictive capabilities for these events, and advancing the understanding of their impacts in order to create sound policy.
- Develop local and statewide management policies and procedures for protecting life and property from coastal hazards.
- Influence national policy and program development of community-based hazard mitigation.

Activities

- As a direct result of Sea Grant input the RI-CRMC policies have been modified to be more explicit and implementation has become more effective.
- Sea Grant researchers and marine advisory service staff have worked with municipalities on beach restoration, shoreline management, and construction of new town facilities.
- Sea Grant research has been used by the Corps to guide preliminary plans for replenishment of Misquamicut Beach in southern Rhode Island.
- Sea Grant recommendations prompted RIEMA to enhance membership on its hazard mitigation committee, which now participates in proactive, pre-disaster efforts at hazard mitigation.
- Sea Grant has initiated a partnership with the insurance industry to develop industry-based incentives to reduce loss.

Rhode Island Sea Grant Extension/Outreach Program
The Rhode Island Sea Grant Extension Program conducts research and outreach projects in fisheries, aquaculture, seafood safety, watersheds and water quality, and sustainable coastal development. Research and outreach programs in coastal development includes reducing the risk of coastal hazards, educating local resource managers, coastal ecosystem health and monitoring and environmental and economic sustainability, among others.

Rhode Island Sea Grant staff has been involved in numerous training sessions provided by FEMA and RIEMA. Rhode Island Sea Grant has provided training to four state agencies, one local department and two private industries. These included a Great Lakes training needs assessment with NOAA's Coastal Service Center, a 1997 program for Rhode Island building officials on the use of building codes as a way to promote for hazard mitigation, a 1998 program to Alabama's RIEMA/CMP/NFIP staff on hazard mitigation techniques, and a 1999 FEMA – interactive exercise on flood mitigation and post-disaster recover with FEMA national office staff and City of Warwick, Rhode Island, officials. Although Rhode Island Sea Grant provides no on-going training, they are interested in providing training.

University of Rhode Island/Coastal Resources Center 1998 Summer Institute
The University of Rhode Island's Coastal Resources Center offers a bi-annual Coastal Resources Summer Institute Training Course, which focuses on coastal management issues worldwide. As part of this, the participants have a day and a half session and field trip on natural hazard mitigation for coastal managers.

FEMA Flood Mitigation & Recovery Exercise
In February 1999, a new exercise for flood mitigation and recovery options for local governments was tested by FEMA in Warwick, Rhode Island. Rhode Island state officials led representatives from the City of Warwick through a two-day flood scenario to determine what would be needed to prepare for, respond to and recover from a flood. City officials worked through 12 tasks, ranging from flood warning to recovery planning. Issues addressed included prioritization for restoring services and clearing debris, protecting industrial areas, and creating policies on rebuilding and/or demolition of damaged buildings. FEMA intends to use this exercise as a national model for other *Project Impact* communities throughout the country. Exercise material available at http://www.fema.gov/priv/g398_2.htm.

Design and Construction Training
A training course for academic credit was developed and sponsored by RIEMA, Rhode Island Sea Grant, IBHS and the State Building Commission on wind and water resistant design and construction techniques. The target audience was building officials and design professionals.

State of Rhode Island Survey Results

The survey was completed by a representative from RIEMA, RI-CRMC and RI-NFIP. On a scale of 1-5 (5 being the highest), the RIEMA and the RI-CRMC rated hazard mitigation a "5" out of 5. The RI-NFIP prioritized the importance of addressing hazard mitigation within their agency as a "4."

Rhode Island Planning & Policy Development

The planning and policy development portion of the survey indicated that between the three agencies, Rhode Island has a fairly comprehensive policy/regulatory/enforcement program for resource protection and restoration. Areas specifically regulated and enforced are:

- Coastal construction and construction setbacks
- Natural coastlines and environmental habitats such as dunes, headlands, barrier beaches and wetlands
- Structures or development which may aggravate coastal erosion
- Local hazard mitigation plans
- Floodplain mitigation regulations

Of note is that Rhode Island has a particularly strong statewide building code with specific standards addressing heavier wind loads and flooding. The building code is implemented through the local building officials but cannot be revised locally. In 1992, Rhode Island enacted legislation requiring all 39 communities to develop and adopt local community comprehensive plans. These plans are consistent with the State Guide Plan.

Table 30. Policies & Regulations used by Rhode Island State Agencies Related to Hazard Mitigation.

Policy/Regulation	***RIEMA***	***NFIP***	***CRMC***	***SG***
Coastal construction setbacks	yes	yes	yes	yes
Prohibitions on coastal armoring	yes	no	yes	yes
Dune protection	yes	yes	yes	yes
Wetland restoration	yes	yes	yes	yes
Public infrastructure prohibited in hazard areas	no	no	yes	yes
State building code	yes	yes	yes	yes
Building heights	yes	yes	no	yes
Prohibit reconstruction substantially damaged buildings.	no	no	yes	yes
Building replacement cost info	no	no	yes	no
Manufactured home construction standards	yes	yes	yes	yes
Mobile home construction standards	yes	yes	yes	yes
Wind load standards	yes	yes	yes	yes
State guide plan	yes	no	yes	yes
409 Plan have coastal policies	yes	yes	yes	yes
§309 CZM gives priority to coastal hazards	yes	dn	yes	yes
State flood mitigation regulations	yes	yes	yes	yes

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
RIEMA – Emergency Management NFIP – State Flood Program CRMC – Coastal Resources Management Council SG – Sea Grant

Rhode Island Program Activities and Tools

The State of Rhode Island currently manages a statewide GIS system that is accessible to state agencies and Rhode Island's cities and towns. RI-CRMC is using GIS to monitor coastal erosion based on erosion rates and uses this information to regulate the location of coastal development. RIEMA, in working with cities and towns on local comprehensive community plans, uses GIS to identify state and local hazard risks and vulnerabilities. The type of data available includes location of public infrastructure such as water, gas and electric lines over bridges, and dams. This information is being used to develop local hazard mitigation plans. However, this information is not available statewide as the data are compiled by communities as they work toward completing the hazard risk and vulnerability assessment portion of their local hazard mitigation plans. Part of this local effort has been the development of GIS risk maps that include information on flood zones, dam locations, land use, rivers and streams, repetitive flood losses and building density. In order to identify vulnerabilities, the GIS maps include information on critical facilities, SLOSH evacuation areas, Red Cross shelters, evacuation routes, bridges and major roads. Currently, RIEMA, RI-NFIP and RI-CRMC are sharing resources to compile a statewide hazard risk and vulnerability assessment.

RIEMA has an established training division and frequently conducts accredited training workshops with the State Building Commission and other state agencies on construction and building practices, building code updates, retrofitting and disaster preparedness exercises. RIEMA frequently holds tabletop exercises for the local emergency managers; and public informational and awareness workshops on hazard mitigation for local planners, the insurance and building industry, local building staffs and members from state agencies.

Table 31. Programs & Tools used by Rhode Island State Agencies to Identify Hazard Risks & Vulnerabilities.

Programs/Tools	***RIEMA***	***NFIP***	***CRMC***	***SG***
FIRMs	yes	yes	yes	yes
GIS	yes	no	no	yes
Erosion rates	yes	no	yes	yes
Zoning maps	yes	no	yes	yes
Land use maps	yes	no	yes	yes
Critical facilities	yes	yes	no	yes
SLOSH maps	yes	yes	yes	yes
HAZUS	yes	no	no	no
Building replacement cost info	yes	no	no	no
Building inventories	yes	yes	no	yes
Repetitive loss data	yes	yes	no	yes
NFIP data	yes	yes	no	yes
Building inventory-100 year floodplain	yes	yes	no	yes
Statewide disclosure law	yes	yes	yes	no
Coastal barrier resource maps	yes	yes	yes	yes
Aerial photographs	yes	yes	yes	yes

*Yes or No indicates tools used by agents and/or researchers. dnr – Did not respond dn – Don't know na – Not applicable
RIEMA – Emergency Management Agency NFIP – State Flood Program CRMC – Coastal Resources Management SG – Sea Grant

Rhode Island Interagency Relationships/Networks

The strongest attribute in Rhode Island in terms of integrating hazard mitigation at the state and local level is the State Hazard Mitigation Committee. This committee not only oversees grants and funding, but more importantly, has a vital role in implementing hazard mitigation policies and programs as well as coordinating with other state agencies and all 39 Rhode Island communities. The committee is comprised of the directors from state agencies and private sectors responsible for:

Emergency Management	Coastal Resources Management
National Flood Insurance Program	Building Commission
Environmental Management	Transportation
Public Utilities	Fire Marshall
Insurance Commission	Banking Commission
RI Builders Association	Dam Safety

The committee is addressing hazard mitigation on a statewide basis, and as a result each director is preparing information on how their agency addresses hazard mitigation issues. This information is being used in the update of the state 409 Hazard Mitigation Plan.

Another recent development that will improve interagency coordination is the relocation of the state flood program from the Department of Administration, Division of Statewide Planning, to RIEMA. The state flood program now assumes responsibility in overseeing the *Project Impact* Program and dissemination of many of FEMA's hazard mitigation grant programs, such as the FMAP and the CRS program, in addition to the development of the state 409 Plan. The result is better communication and program collaboration between the emergency management program and the coastal program.

Rhode Island Case Examples of Successful Hazard Mitigation Initiatives

Project Impact

City of Warwick

Community Profile: The City of Warwick is the second largest community in Rhode Island both in population (approx. 85,427) and in land area (35 sq. miles). It also has the largest amount of shoreline, coves and harbors, and the greatest number of registered boaters. It is a coastal community situated on Narragansett Bay and is the location of the state's major airport.

Disaster Risk: As a coastal community, Warwick is exposed to hazards from erosion, coastal flooding and high winds associated with hurricanes and nor'easters. The Hurricane of 1938 and Hurricane Carol in 1954 caused extensive damage along the entire shoreline. Flooding along the Pawtuxet River has also been a problem. Warwick has 1,537 NFIP (highest number in the state) policies in force, insuring a total property value of nearly $148 million. Warwick also has a heavy concentration of marinas with slips for 2,600 boats and additional moorings for 815 boats.

Table 32. State Interagency Relationships in Rhode Island.

	Informal/ Information Sharing	Formal (MOU or Executive Order)	Cost /Grant Sharing	Minimal or None
Federal				
FEMA Regional Staff	**NFIP/SG**	**RIEMA**	**NFIP/RIEMA/ CRMC**	
Army Corps of Engineers			**CRMC**	
EPA/NMFS US Fish Wildlife Service NWS	**CRMC/SG** **CRMC/SG** **RIEMA/SG**			
State				
Floodplain Managers	**RIEMA/CRMC/ SG**	**RIEMA**	**RIEMA**	
Coastal Resource Management Program Staff	**SG**	**RIEMA**	**SG**	
Emergency Management Staff	**NFIP/CRMC**	**NFIP/ CRMC/SG**	**CRMC/SG**	
Building Commissioner	**NFIP/CRMC**	**RIEMA/SG**		
Insurance Commissioner		**RIEMA/SG**		**CRMC**
Public Utilities	**CRMC**	**RIEMA/SG**		**NFIP**
Sea Grant/Cooperative Extension	**CRMC/NFIP**	**RIEMA**	**RIEMA/CRMC**	
State Budget Office	**CRMC**	**RIEMA**		
Historical Society Dam Safety Program DEM Economic Development Commission	**NFIP** **RIEMA** **CRMC/SG** **RIEMA/ NFIP/SG**	**RIEMA**		
Local				
Local Building Officials	**NFIP/CRMC** **RIEMA/SG**			
Local Planners	**RIEMA/CRMC** **NFIP/SG**			
Local Departments of Public Works Staff	**RIEMA/SG**			
Local Emergency Management Officials	**CRMC/NFIP/SG**	**RIEMA**		
Local Elected Officials	**CRMC/RIEMA/ SG**			
Harbormasters	**CRMC/RIEMA/ SG**			**NFIP**
Private				
Insurance Industry	**NFIP/SG**	**RIEMA**	**SG**	**CRMC**
Professional Associations	**RIEMA/SG**			
Building/Construction Industry	**RIEMA/CRMC/ SG**	**RIEMA**	**RIEMA**	**NFIP**
Citizen Groups DRBA NEFSMA NESEC	**RIEMA/SG** **NFIP/SG** **NFIP** **RIEMA**	**RIEMA**	**RIEMA**	

RIEMA –Emergency Management Agency NFIP – State Flood Program CRMC – Coastal Resources Management Council
SG – Sea Grant

Capacity for Public-Private Partnerships: Warwick is a significant commercial center with several large regional shopping malls, a series of industrial and business parks and the T.F. Green Memorial State Airport. The city is home to many major companies (e.g., Met Life) as well as many small businesses. Warwick also has an active Chamber of Commerce.

Disaster Prevention Commitments/Actions: Warwick has recently become very active in disaster mitigation activities. Warwick has established a local hazard mitigation planning council that is working in cooperation with the University of Rhode Island and RIEMA to develop a local all-hazards mitigation plan. The city participated in an NFIP CRS training course in April 1998, and is currently applying to the CRS. It has also teamed up with Home Depot to develop hazard mitigation techniques for retrofitting and flood proofing homes and to support community training and education.

City of Pawtucket

Community Profile: The City of Pawtucket is located at the southern falls of the Blackstone River and upper tidewater of Narragansett Bay. The city is home to a booming industrial district, has a vibrant retail district and has worked to preserve the unique architecture of its homes and public buildings. McCoy Stadium is home to the Pawtucket Red Sox, the proving ground of many future players for the Boston Red Sox. The city has an estimated population of 72,000.

Disaster Risk: Pawtucket is a flood-prone community in which significant cultural, historical and economic resources are at risk. There are numerous structures in the floodplain vulnerable to basement flooding, including City Hall, which is situated at the lowest elevation in the city. There is currently over $7 million of property covered under the NFIP program. Slater Mill, a national historic landmark and tourist attraction, is also on the bank of the Blackstone River. The community is subject to a variety of natural hazards in addition to riverine flooding, ice storms and river ice jams. Fire is another risk in Pawtucket because of the closely built urban environment that allows fire to spread easily. Pawtucket has been impacted significantly during hurricane events by flooding, sewerage backup and winds damage.

Capacity for Public-Private Partnerships: Municipal officials in Pawtucket have already taken the initiative by creating a collaborative partnership with Blackstone Valley Electric to "cost share" removal of dead/ hazardous trees on public roadways. University of Rhode Island students have undertaken a census of all the street trees in the city. A database being created from the census will allow for the identification of hazardous trees that pose the greatest risk during storms.

Disaster Prevention Commitments/Actions: The city implements and enforces the state building code and participates in NFIP. Pawtucket completed their local hazard mitigation plan in 1998. The plan is held up as a national model and is used by FEMA at their national training institute, the Emergency Management Institution. The city received FMAP grants in 1998 to install a tidal gauge on the Blackstone River. A variety of hazard mitigation strategies were developed following a federal disaster declaration for Hurricane Gloria in 1996. The city revised its Emergency Operations Plan in 1997. The Pawtucket Comprehensive Plan, completed in 1995, outlined actions that can be taken to address increased development pressures, economic stability, open space and recreation issues, and public infrastructure and facilities. The city

leaders have shown the initiative to mitigate against all natural disasters through their plans and actions, which includes an approved comprehensive multi-hazard mitigation strategy.

Rhode Island Hazard Mitigation Project
The University of Rhode Island's Coastal Resources Center/Rhode Island Sea Grant and RIEMA formed a partnership to work with state and federal agencies, municipal governments and the private sector to establish the Rhode Island Hazard Mitigation Project. This partnership is working with several public and private partners including NOAA, FEMA, IBHS, the National Building Code Officials Association and the banking industry to reduce losses from natural hazard events through mitigation.

Grant money allocated by RIEMA and Rhode Island Sea Grant has provided planning and technical assistance for this project. Project partners have been working to develop municipal hazard mitigation strategies throughout the state that will be amended to the statewide hazard mitigation strategy. Two pilot strategies have been approved by FEMA. Several Rhode Island municipalities have formed a hazard mitigation committee to draft a hazard mitigation strategy. This committee typically consists of local government officials including, but not limited to, the planner, emergency management director, building inspector, public works director, town engineer and town manager. As part of the planning process, each community will seek public opinion and input as part of the risk and vulnerability assessment. To accompany the two pilot municipal hazard mitigation strategies, RIEMA and Coastal Resources Center /RI Sea Grant are currently drafting a model guidebook to assist communities with drafting, approving and implementing a multi-hazard mitigation strategy.

State Hazard Mitigation Committee
The director of the Bridges Division of Rhode Island Department of Transportation (and State Hazard Mitigation Committee member) recently completed a report of statewide risk and vulnerability assessment for bridges located in state and local evacuation routes. Bridges were analyzed for vulnerability to high winds, floods, earthquakes, erosion and scouring of foundations. This information is critical as new evacuation routes may be established based on potential bridge failures as provided in the survey. As a result of this survey, public awareness will be increased, bridges will be evaluated for the need of scour protection measures and a seismic and flood database will be developed.

Institute for Business and Home Safety
The Institute for Business and Home Safety (IBHS) is sponsoring a nationwide “Showcase State” program to demonstrate how state governments can benefit from steps taken to reduce deaths, injuries, property damage, economic losses and human suffering caused by natural disasters. The program’s key objectives are to:

- Help states reduce their vulnerability to natural disasters.
- Generate interest from other states by showcasing hazard mitigation successes.
- Identify both successful and failed attempts to reduce the emotional and financial devastation caused by natural disasters.

In December 1998, Rhode Island was designated the first “showcase state for natural disaster resistance,” by an executive order signed by Governor Lincoln Almond. The 14 elements of the

executive order reflect the components needed to reduce the effects of natural disasters. The Rhode Island Showcase State initiative emphasizes that communities do not recover from disasters unless businesses recover–and businesses can not recover unless services are restored.

Retrofits to the Boys and Girls Club, Warwick, and Daycare in Pawtucket
A component of IBHS' Showcase State program is the daycare retrofit project. Volunteers, including insurance company employees, city staff and area builders, undertook a retrofitting project of The Boys and Girls Club in Warwick and a daycare center in Pawtucket. Tasks included bolting bookcases to walls to prevent them from tipping over installing transparent casings over fluorescent light bulbs and putting a clear film over glass windows to prevent shards from flying if the windows shatter in a storm. These procedures will not only prevent injury to children in a daycare during a storm, but will make the clean-up process quicker, enabling the daycare to reopen sooner and parents to get back to work sooner. Participated included RIEMA, IBHS, GIS, Met Life Auto and Home Insurance, Amica Insurance and Holyoke Mutual Insurance.

Disaster Recovery Business Alliance
As part of the Showcase State's Executive Order, in October 1998, a statewide Disaster Recovery Business Alliance (DRBA) was established. DRBA brings together the leadership and expertise of Rhode Island's business, emergency preparedness, engineering and scientific communities. The goal is to develop a public/private partnership to reduce the vulnerability of businesses and the community's marketplace to flooding, severe weather and other natural hazards. Rhode Island Sea Grant has been working in partnership with the IBHS and the DRBA to provide a public/private link for coordinated mitigation, preparedness, response and recovery. The DRBA will provide a vehicle through which recovery of essential economic and commercial systems can be integrated into a community's and a state's disaster planning strategy.

The objectives of the alliance are:
- To provide a forum within which local leaders and planning experts can identify and mitigate risks to essential channels of commerce serving the community.
- To provide members with access to proven and emerging technologies in support of mitigation, disaster monitoring, GIS applications, and sustainable energy and communications.
- To accelerate socioeconomic recovery through coordinated exchange of status and resource information between business members, public sector emergency authorities and volunteer/non-profit organizations active in disasters.

Part 4: Conclusions and Recommendations

Policies, Programs and Activities on Hazard Mitigation in the Coastal Northeast

Between August 1992 and December 1995, as a result of a variety of natural disasters throughout the United States, the country experienced structural losses costing billions of dollars. In the Northeast, flooding from northeast storms, hurricanes, heavy precipitation and riverine flooding cause significantly more damage, more frequently, than any other natural hazard.

The Northeast has much at risk. Compared to other areas of the country, the public infrastructure–including buildings, bridges, wastewater treatment facilities roads and dams–is very old. The Northeast has many dams on virtually every river because dams were built to harness hydropower for mills and factories. Most of these dams exist in densely developed urban areas. Many have not been improved or even inspected in the last century. Publicly owned sewage treatment facilities in the Northeast are among the oldest in the country. Most treatment facilities are located in flood zones. In some cases, combined sewage and stormwater pipe overflow (CSO) during heavy rains and storm events resulting in raw sewage going directly into coastal waters. Highways and bridges supporting major evacuation routes are also very old and many are in serious need of repair. Seawalls, jetties and groins are crumbling after centuries of coastal storms. Coastal armoring constructed many decades ago along the Northeast coast has exacerbated coastal erosion. Coastal development with associated gas, sewer, water and power lines has proliferated in high flood-hazard zones.

In addition to the risks threatening the Northeast's public infrastructure, there is also the issue of how to preserve and protect the Northeast's historic structures in the face of natural disasters. The maritime heritage of the Northeast resides in colonial villages and harbors along the coast. Historic preservation is of grave concern.

The government in the Northeast is characterized by strong home rule and is comprised of a multitude of local boards, commissions and selectmen. Land-use decisions are made by municipal boards and commissions, some volunteer and some not. Most states are tackling local comprehensive planning and growth management issues. The Northeast state coastal programs are addressing coastal development through the enforcement of protection measures for dunes, beaches, wetlands and other coastal features in high hazard coastal areas.

Assessment of Survey Results

The objective of sending out surveys to each of the three state government programs involved in coastal hazard mitigation (coastal zone management, emergency management and floodplain management) was to determine to what extent each of the Northeast states addresses coastal hazard mitigation through management practices, identification of state risks and vulnerabilities, mitigation planning and implementation, and public education and awareness initiatives and activities. Part of this task involved identifying specific programs, policies and tools used by

state agencies. The survey results provided information on how state agencies network with one another and with university-based Sea Grant programs to address common goals of coastal hazard mitigation management.

Regulatory Context and Level of Hazard Mitigation Activities

Survey results are organized according to whether there are state building codes, guide plans, coastal setbacks, and any other programs, policies or regulations related to coastal hazard mitigation, such as protecting the natural environment (prohibiting armoring or protecting dunes) and built environment (building code implementation and practices) which are intended to minimize damage caused by hurricanes, flooding and high winds.

Table 33 indicates whether such a regulation or program exists in each of the Northeast states. An * indicates a contradictory response where one or more agency answered yes and the other(s) answered no within a given state. What the responses reveal is an apparent lack of understanding or knowledge of the responsibilities and activities of each different agency in implementing coastal hazard mitigation. This lack of understanding or knowledge can easily be addressed by a workshop, training or meeting in which all of the relevant staff attend and specifically address those topics pertinent to coastal hazard mitigation activities.

Table 33. Regulatory Context and Hazard Mitigation Activities within the Northeast States.

Regulation/Program	CT	ME	MA	NH	NY	RI
State building code	y	n	n*	n	y	y
State guide plan	n	n*	n*	y	y	y
Coastal setbacks	n	n*	y	y	y	y
Prohibitions on armoring	y	y	y	y*	y	y*
Building inventories in 100 year floodplain	n	n	y*	n	y*	y*
Prohibit for subs damaged buildings	n	y*	y*	n*	y	y*
Rewritten 409 Plan	n	y	y	y	n	n
Local NFIP effort underway	y	y	y	y	y	y
1997 309 CZM coastal hazard priority	m	m	m	l	m	m
Public education/awareness program	a	a	a	a	a	a
Training on hazard mitigation	a	a	a	a	a	a
Hazard disclosure laws	n	n**	n*	y	n*	n

* Indicates that there was a discrepancy in survey response between agencies as to whether or not program/regulation existed
** Initiative underway
y – Yes n – No a – All agencies m – Medium priority l- Low priority

State and Local Coastal Hazard Mitigation Planning

The state agencies in this region are very familiar with the merits of multi-hazard mitigation planning. On the local level, all states provide technical assistance to their communities to help develop and implement local hazard mitigation plans. All of the Northeast states are currently engaged in hazard mitigation planning initiatives. On a statewide level, three states, Maine, Massachusetts and New Hampshire, have rewritten their state 409 Hazard Mitigation Plans in the

past year. Rhode Island is currently in the process of rewriting their 409 plan. These plans more accurately reflect state and local hazard mitigation programs and policies within their state and place the emphasis of statewide efforts on mitigation rather than response. Prior to the implementation of FEMA's National Mitigation Strategy in 1995, 409 plans were written in response to a storm event with little or no focus on how to mitigate future events or how to network with other state agencies to implement coastal hazard mitigation practices.

Public Education and Awareness Activities

All three agencies in each state reported that they invest in public education about natural hazards through state and local workshops, publications, pamphlets and web pages. What is interesting is the lack of awareness of the coastal hazard regulations currently in place, and the lack of awareness of coastal hazard mitigation activities among the state agencies and program staff members.

All of the Northeast states have provided training programs, workshops and public education materials on hazard mitigation. Disclosure laws intended to inform property owners of the vulnerability of their property to coastal hazards exist only in New Hampshire. Maine is currently considering similar legislation. The only states that update state legislature and/or congressional representatives and their staff with information that identifies natural hazard risk and vulnerabilities is the New Hampshire Emergency Management Program and the Rhode Island Emergency Management Program.

Hazard Risk and Vulnerability Assessments

While the Northeast states appear to be quite active in pursuing initiatives in hazard mitigation planning, public education and awareness, one area where there is uniform weakness is hazard risk and vulnerability assessment. There are two primary shortfalls in this area: the lack of understanding or agreement as to what a hazard risk and vulnerability assessment is; and, the type of data that should be collected and applied in order to complete a hazard risk and vulnerability assessment.

No state has completed a comprehensive statewide hazard risk and vulnerability assessment, and the elements of such an assessment vary from state to state. Local community risk assessments do exist in several states that consider the built environment, public infrastructure, and various types of critical facilities. Some of these do consider the potential environmental damage caused by natural resources destruction and degradation resulting from damaged sewage treatment facilities, individual sewage disposal systems, underground storage tanks, etc. What could be of great benefit to the Northeast region is a consistent, uniform methodology or understanding of how to identify what is at risk statewide.

An estimate of the potential losses from future natural disasters is essential to good decisionmaking at all levels of government. Loss estimates can provide the basis for developing mitigation policy and implementing measures designed to reduce potential losses of life and property from future disaster events. Identifying what is at risk and what is vulnerable provides land use and development agencies a basis for planning, zoning, building codes and development

regulations and policies that would reduce the risk posed by hazard events. Understanding vulnerability within a community and the state can be used to evaluate the cost effectiveness of alternative approaches to siting coastal development.

While GIS mapping is available in all Northeast states, not all of the state agencies are using it. It is unclear what data are present on the state GIS systems and whether state programs are using GIS to either share this data or conduct risk and vulnerability assessments. Three states and all of their state programs are using SLOSH maps (Connecticut, Maine and Rhode Island) and only two states (Rhode Island and Maine) are using coastal barrier resource maps to identify coastal flood hazard risks within their coastal permitting process. None of the state coastal programs identify how many critical facilities are located within their coastal zone. For those state programs that use critical facility data, the definition of a critical facility varies and the data used is, in most circumstances, out of date and/or incomplete.

Some state's coastal programs are using shoreline erosion data to determine setback rates for coastal development (New York, Maine and Rhode Island). However, the floodplain and emergency management programs are not using this information. Only Rhode Island has applied erosion data to local hazard mitigation plans. Conversely, there are situations where a coastal program would like to pursue shoreline erosion-rate studies for which there is applicable FEMA money available (FMAP, HMGP), however, the coastal programs do not know of the availability of these resources.

Social and economic vulnerability and the identification of these populations potentially at risk assessment have not been assessed in any of the Northeast states. Social vulnerability addresses what population types are at risk, (e.g., elderly, poor, non-English speaking, etc.). No Northeast state has yet assessed this; yet, recovery of these populations from a disaster is critical since existing social patterns prior to a storm event often determine the degree of vulnerability of certain social populations and how they will be affected. Are the elderly able to seek the help that they need to repair and rebuild? Are non-speaking English populations able to understand the bureaucracy of flood and disaster insurance? Is there unequal access to opportunities and outside resources for post-disaster recovery and reconstruction? It is often social vulnerability that turns a coastal storm or other natural event into a disaster, as socially vulnerable populations often live in precarious circumstances and most typically do not have the resources to pursue quality reconstruction or rebuild.

Economic vulnerability encompasses what the community loses if post-disaster recovery and reconstruction is delayed. Specifically, when local businesses that supply life essentials, such as food, building supplies, clothing, banking services, etc., are severely damaged, what is the cost to the community? To what extent does the ability of these businesses to recover from a storm event affect the ability of the community to recover? No Northeast state has yet identified these types of risks and vulnerabilities.

The Northeast state programs need to share data in order to conduct an accurate risk and vulnerability assessment. Sharing resources would expand and improve the database tremendously. An example of data that are available, but in many instances woefully out of date, are the FIRMs. While state flood programs track the number of flood insurance policies and the

value of the land insured through the NFIP, the FEMA FIRMs are out of date. Floodplain managers are responsible for identifying what properties are located within "A" and "V" flood zones, yet significant problems arise when these determinations are made based on maps that do not reflect the effects of 10 to 20 years of additional coastal development. Making assumptions based on inaccurate and out-of-date flood data puts floodplain managers in precarious and potentially difficult legal circumstances. Unfortunately, this is the only tool used by all the Northeast states and all state programs (Table 34).

Table 34. Tools used By State Agencies to Identify Hazard Risks & Vulnerability Assessments.

Tools/Data	CT	ME	MA	NH	NY*	RI
GIS	c	e, c	a	a	a	e, c
FIRMs	a	a	a	a	a	a
Coastal barrier maps	n	e, c	c	c	c	a
SLOSH maps	a	a	e, f	e	e	a
HAZUS	n	e, f	n	e	e	e
Land use maps	y	e, c	a	a	e, c	e, c
Zoning maps	y	e	c	e, c	e, c	e, c
Critical facilities maps	n	e	e, f	e, c	e, c	e, f

a – All programs n – None c – CZM Program f – Floodplain Management e – Emergency Management
* NY Floodplain Management Program did not respond to survey

Only the Maine, New Hampshire and New York emergency management programs and the Maine floodplain management program uses HAZUS (the FEMA HAZUS loss estimation software that uses mathematical formulas and site information to estimate losses from potential hazards (originally designed for earthquakes)). None of the coastal programs use HAZUS.

Unfortunately, this type of software/loss estimation model is only beginning to be developed for wind and flood hazards that tend to occur more frequently in the Northeast than earthquakes. HAZUS is in the process of being expanded into a multi-hazard methodology by initiating development of nationally applicable standardized modules for estimating potential losses from hurricanes, nor'easters, tornadoes, riverine and coastal flood hazards. The Northeast will experience many floods, hurricanes and winter storms before application of the FEMA HAZUS flood and wind model can be accurately applied.

Regional Training

Though the concept of natural hazard mitigation is relatively old in the Northeast, the reality is that until recently considerably more time was spent on recovery from a natural hazard than planning for a natural hazard. It is only very recently that significant time, effort and resources by many programs, agencies and organizations, both in the government and private sectors, have been focused on mitigation rather than recovery.

FEMA, being the lead federal government agency in hazard mitigation, has had the time and resources to develop, perfect and deliver training courses focused on mitigation techniques. The

result was that the states relied on FEMA to provide technical training through their Emergency Management Institute (EMI). FEMA's first challenge was to convince states, through education and grant money, to buy into hazard mitigation. As states became more aware and able to undertake mitigation, the need for further training is apparent. In addition, as recovery costs escalate, and government, insurance organizations and ultimately the public realize that the way to save money is to focus on pre-disaster strategies. The next step is to develop additional mitigation techniques and train state and local officials, industry and the public on how best to collaborate in order to collectively implement hazard mitigation measures.

Each state has approached this differently, Connecticut has a fairly strong training program in both emergency management and flood hazards for state and local officials. Connecticut does provide significant community assistance addressing training in the areas of mitigation planning and the NFIP. All Maine programs have provided training and/or workshops on the topics of hazard mitigation to local elected officials, state environmental staff, code enforcement officers, professional land surveyors, realtors and neighborhood associations. In addition, all provide information on technical and financial resources available to implement mitigation measures within their community. New Hampshire, with its 16 miles of coastline, has a fair sized training program that works with 235 municipalities.

It is unclear how much interagency training occurs. Massachusetts is quite active in interagency and inter-state training; there are several committees that are staffed from the various agencies and all agencies participate in jointly conducted hazard mitigation training. Massachusetts also undertakes training of local officials, businesses and other interested parties. Rhode Island is working closely with and training many industries and all local governments on various aspects of hazard mitigation. New York state agencies work closely among themselves and with local industries. Both New York and Rhode Island have been very aggressive towards involving large and small institutions. This has lead to an increased understanding by the agencies of the economic and social issues around hazard mitigation, and has given a variety of institutions a forum to voice their ideas, concerns and expertise. One of the best examples of interagency/inter-state cooperation is the established the by New York State Emergency Management Office. This program has been very effective, by involving all stakeholders, in significantly improving the water quality (through interagency exchange) and the public awareness through interagency public training and education.

The state Sea Grant programs also address training in hazard mitigation quite differently. Rhode Island Sea Grant has had one of the stronger training programs in the region. New York Sea Grant has been a strong player in the Long Island Sound Management Plan and has also provided and participated in multiple training sessions. New Hampshire Sea Grant, Massachusetts' MIT and WHOI Sea Grant and Maine Sea Grant appear not to be involved, or only minimally, with any sort of hazard mitigation training.

Recommendations

In terms of embracing and implementing FEMA's National Mitigation Strategy, the Northeast has accomplished much. The concept and practice of "hazard mitigation" is well known throughout the region. The Northeast state programs have jointly held workshops, seminars and/or jointly published and distributed public information on hazard mitigation. All of the Northeast states have had local hazard mitigation plans completed and approved formally by FEMA Region I. Many of the Northeast states have either updated their 409 State Hazard Mitigation Plans to reflect the goals and objectives of the National Mitigation Strategy or are currently pursuing this initiative.

Although the Northeast states have been active in developing hazard mitigation plans, many staff members involved in these efforts comment that the risk and vulnerability assessment portion of these plans are missing data, much of the data are inconsistent with what other state programs use, and none of the assessments have included comprehensive economic or social assessment overviews. In addition, the cost of completing a hazard risk analysis is not trivial. Thus, to be affordable for any agency, agencies should combine resources to developed an accurate and defendable risk analyses. However, currently there is a lack of awareness as to how best share these resources among the agencies.

What is needed in this region, and throughout the country, is guidance on how to conduct a comprehensive and accurate hazard risk and vulnerability assessment. This process must be shared and made available to all state programs: coastal, emergency and flood. Hazard risk and vulnerability assessments need to be required when completing a state or local hazard mitigation plan. How can one mitigate potential future damage unless one can identify what is likely to be damaged? One of the four components of FEMA's Project Impact is the completion of a hazard risk and vulnerability assessment. Project Impact places importance on consideration of economic factors such as the ability of businesses to recover. Social and economic vulnerability assessment should be added to this approach.

By providing guidance on the process, as well as the components of a hazard risk and vulnerability analysis, state agencies can be brought together to share data and other resources. They need to apply some of the tools successfully being used within their state programs to address similar problems related to coastal hazards. State agencies need to begin to collect the data needed to more accurately portray what is at risk. By sharing some of these tools and resources, programs can be strengthened, as well as improving the coordination and collaboration of interagency networks. This is critical as state coastal management programs are typically the only state programs with the regulatory authority over coastal development. Knowledge of what is at risk and vulnerable within their state will provide sounder coastal management decisions, particularly in times of post-disaster reconstruction and recovery.