

BIBLIOGRAPHY

- NH OEM's State of New Hampshire Natural Hazards Mitigation Plan (2000)
- SWRPC's Hazard Mitigation Planning for New Hampshire Communities (2000)
- New Hampshire Employment and Security (2007)
- Town of Brentwood, NH, Hazard Mitigation Plan (2007)
- US Census 2000
- Town of Newfields Master Plan (2002)

APPENDIX A

Definition of Hazards

DEFINITIONS OF HAZARDS

Flooding

Floods are defined as a temporary overflow of water onto lands that are not normally covered by water. Flooding results from the overflow of major rivers and tributaries, storm surges, and/or inadequate local drainage. Floods can cause loss of life, property damage, crop/livestock damage, and water supply contamination. Floods can also disrupt travel routes on roads and bridges.

Inland floods are most likely to occur in the spring due to the increase in rainfall and melting of snow; however, floods can occur at any time of the year. A sudden thaw in the winter or a major downpour in the summer can cause flooding because there is suddenly a lot of water in one place with nowhere to go.

Hurricanes

A hurricane is a tropical cyclone in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. Flooding is often caused from the coastal storm surge of the ocean and torrential rains, both of which accompany the storm. These floods can result in loss of lives and property.

100-year Floodplain Events

Floodplains are usually located in lowlands near rivers, and flood on a regular basis. The term 100 year flood does not mean that flood will occur once every 100 years. It is a statement of probability that scientists and engineers use to describe how one flood compares to others that are likely to occur. It is more accurate to use the phrase "1% annual chance flood". What this means is that there is a 1% chance of a flood of that size happening in any year.

Erosion and Mudslides

Erosion is the process of wind and water wearing away soil. Typically in New Hampshire, the land along river is relatively heavily developed. Mudslides may be formed when a layer of soil atop a slope becomes saturated by significant precipitation and slides along a more cohesive layer of soil or rock.

Erosion and mudslides become significant threats to development during floods. Floods speed up the process of erosion and increase the risk of mudslides.

Rapid Snow Pack Melt

Warm temperatures and heavy rains cause rapid snowmelt. Quickly melting snow coupled with moderate to heavy rains are prime conditions for flooding.

River Ice Jams

Rising waters in early spring often breaks ice into chunks, which float downstream and often pile up, causing flooding. Small rivers and streams pose special flooding risks because they are easily blocked by jams. Ice in riverbeds and against structures present significant flooding threats to bridges, roads, and the surrounding lands.

Dam Breach and Failure

Dam failure results in rapid loss of water that is normally held by the dam. These kinds of floods are extremely dangerous and pose a significant threat to both life and property.

Severe Storms

Flooding associated with severe storms can inflict heavy damage to property. Heavy rains during severe storms are a common cause of inland flooding.

Wind

Significantly high winds occur especially during hurricanes, tornadoes, winter storms and thunderstorms. Falling objects and downed power lines are dangerous risks associated with high winds. In addition, property damage and downed trees are common during high wind occurrences.

Hurricanes

A hurricane is a tropical cyclone in which winds reach speeds of 74 miles per hour or more and blow in a large spiral around a relatively calm center. The eye of the storm is usually 20-30 miles wide and may extend over 400 miles. High winds are a primary cause of hurricane-inflicted loss of life and property damage.

Tornadoes

A tornado is a violent windstorm characterized by a twisting, funnel shaped cloud. They develop when cool air overrides a layer of warm air, causing the warm air to rise rapidly. The atmospheric conditions required for the formation of a tornado include great thermal instability, high humidity and the convergence of warm, moist air at low levels with cooler, drier air aloft. Most tornadoes remain suspended in the atmosphere, but if they touch down they become a force of destruction.

Tornadoes produce the most violent winds on earth, at speeds of 280 mph or more. In addition, tornadoes can travel at a forward speed of up to 70 mph. Damage paths can be in excess of one mile wide and 50 miles long. Violent winds and debris slamming into buildings cause the most structural damage.

The Fujita Scale is the standard scale for rating the severity of a tornado as measured by the damage it causes. A tornado is usually accompanied by thunder, lightning, heavy rain, and a loud “freight train” noise. In comparison with a hurricane, a tornado covers a much smaller area but can be more violent and destructive.

Severe Thunderstorms

All thunderstorms contain lightning. During a lightning discharge, the sudden heating of the air causes it to expand rapidly. After the discharge, the air contracts quickly as it cools back to ambient temperatures. This rapid expansion and contraction of the air causes a shock wave that we hear as thunder, which can damage building walls and break glass.

Lightning

Lightning is a giant spark of electricity that occurs within the atmosphere or between the atmosphere and the ground. As lightning passes through air, it heats the air to a temperature of about 50,000 degrees Fahrenheit, considerably hotter than the surface of the sun. Lightning strikes can cause death, injury and property damage.

Hail

Hailstones are balls of ice that grow as they're held up by winds, known as updrafts, that blow upwards in thunderstorms. The updrafts carry droplets of supercooled water – water at a below freezing temperature – but not yet ice. The supercooled water droplets hit the balls of ice and freeze instantly, making the hailstones grow. The faster the updraft, the bigger the stones can grow. Most hailstones are smaller in diameter than a dime, but stones weighing more than a pound have been recorded. Details of how hailstones grow are complicated, but the results are irregular balls of ice that can be as large as baseballs, sometimes even bigger. While crops are the major victims, hail is also a hazard to vehicles and windows.

Wildfire

Wildfire is defined as an uncontrolled and rapidly spreading fire.

Forest Fires and Grass Fires

A forest fire is an uncontrolled fire in a woody area. They often occur during drought and when woody debris on the forest floor is readily available to fuel the fire. Grass fires are uncontrolled fires in grassy areas.

Ice & Snow Events

Ice and snow events typically occur during the winter months and can cause loss of life, property damage and tree damage.

Heavy Snow Storms

A winter storm can range from moderate snow to blizzard conditions. Blizzard conditions are considered blinding wind-driven snow over 35 mph that lasts several days. A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period.

Ice Storms

An ice storm involves rain, which freezes upon impact. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires and similar objects. Ice storms also often produce widespread power outages.

Earthquakes/Landslides

Geologic events are often associated with California, but New England is considered a moderate risk earthquake zone.

Earthquake

An earthquake is a rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Earthquakes can cause buildings and bridges to collapse, disrupt gas, electric and phone lines, and often cause landslides, flash floods, fires, and avalanches. Larger earthquakes usually begin with slight tremors but rapidly take the form of one or more violent shocks, and end in vibrations of gradually diminishing force called aftershocks. The underground point of origin of an earthquake is called its focus; the point on the surface directly above the focus is the epicenter. The magnitude and intensity of an earthquake is determined by the use of scales such as the Richter scale and Mercalli scale.

Landslides

A landslide is the downward or outward movement of slope forming materials reacting under the force of gravity including: mudflows, mudslides, debris flows, rockslides, debris avalanches, debris slides and earth flows. Landslides have damaged or destroyed roads, railroads, pipelines, electrical and telephone lines, mines, oil wells buildings, canals, sewers, bridges, dams, seaports, airports, forests, parks and farms.

Drought

A drought is defined as a long period of abnormally low precipitation, especially one that adversely affects growing of living conditions. Droughts are rare in New Hampshire. They generally are not as damaging and disruptive as floods and are more difficult to define. The effect of drought is indicated through measurements of soil moisture, groundwater levels and streamflow. However, not all of these indicators will be minimal during a drought. For example, frequent minor rainstorms can replenish the soil moisture without raising groundwater levels or increasing streamflow. Low streamflow also correlates with low groundwater levels because groundwater discharge to streams and rivers maintains streamflow during extended dry periods. Low streamflow and low groundwater levels commonly cause diminished water supply.

APPENDIX B
Summary of Possible Hazard
Mitigation Strategies

I. RIVERINE MITIGATION

A. Prevention

Prevention measures are intended to keep the problem from occurring in the first place, and/or keep it from getting worse. Future development should not increase flood damage. Building, zoning, planning, and/or code enforcement offices usually administer preventative measures.

1. Planning and Zoning

Land use plans are put in place to guide future development, recommending where - and where not - development should occur. Sensitive and vulnerable lands can be designated for uses that would not be incompatible with occasional flood events - such as parks or wildlife refuges. A Capital Improvements Program can recommend the setting aside of funds for public acquisition of these designated lands. The zoning ordinance can regulate development in these sensitive areas by limiting or preventing some or all development - for example, by designating floodplain overlay, conservation, or agricultural districts.

2. Open Space Preservation

Preserving open space is the best way to prevent flooding and flood damage. Open space preservation should not, however, be limited to the flood plain, since other areas within the watershed may contribute to controlling the runoff that exacerbates flooding. Land Use and Capital Improvement Plans should identify areas to be preserved by acquisition and other means, such as purchasing easements. Aside from outright purchase, open space can also be protected through maintenance agreements with the landowners, or by requiring developers to dedicate land for flood flow, drainage and storage.

3. Floodplain Development Regulations

Floodplain development regulations typically do not prohibit development in the special flood hazard area, but they do impose construction standards on what is built there. The intent is to protect roads and structures from flood damage and to prevent the development from aggravating the flood potential. Floodplain development regulations are generally incorporated into subdivision regulations, building codes, and floodplain ordinances.

Subdivision Regulations: These regulations govern how land will be divided into separate lots or sites. They should require that any flood hazard areas be shown on the plat, and that every lot has a buildable area that is above the base flood elevation.

Building Codes: Standards can be incorporated into building codes that address flood proofing for all new and improved or repaired buildings.

Floodplain Ordinances: Communities that participate in the National Flood Insurance Program are required to adopt the minimum floodplain management regulations, as developed by FEMA. The regulations set minimum standards for subdivision regulations and building codes. Communities may adopt more stringent standards than those set forth by FEMA.

4. Stormwater Management

Development outside of a floodplain can contribute significantly to flooding by covering impervious surfaces, which increases storm water runoff. Storm water management is usually addressed in subdivision regulations. Developers are typically required to build retention or detention basins to minimize any increase in runoff caused by new or expanded impervious surfaces, or new drainage systems. Generally, there is a prohibition against storm water leaving the site at a rate higher than it did before the development. One technique is to use wet basins as part of the landscaping plan of a development. It might even be possible to site these basins based on a watershed analysis. Since detention only controls the runoff rates and not volumes, other measures must be employed for storm water infiltration - for example, swales, infiltration trenches, vegetative filter strips, and permeable paving blocks.

5. Drainage System Maintenance

Ongoing maintenance of channel and detention basins is necessary if these facilities are to function effectively and efficiently over time. A maintenance program should include regulations that prevent dumping in or altering watercourses or storage basins; regrading and filling should also be regulated. Any maintenance program should include a public education component, so that the public becomes aware of the reasons for the regulations. Many people do not realize the consequences of filling in a ditch or wetland, or regrading their yard without concern for runoff patterns.

B. Property Protection

Property protection measures are used to modify buildings subject to flood damage, rather than to keep floodwaters away. These may be less expensive to implement, as they are often carried out on a cost-sharing basis. In addition, many of these measures do not affect a building's appearance or use, which makes them particularly suitable for historical sites and landmarks.

1. Relocation

Moving structures out of the floodplain is the surest and safest way to protect against damage. Relocation is expensive, however, so this approach will probably not be used except in extreme circumstances. Communities that have areas subject to severe storm surges, ice jams, etc. might want to consider establishing a relocation program, incorporating available assistance.

2. Acquisition

Acquisition by a governmental entity of land in a floodplain serves two main purposes: 1) it ensures that the problem of structures in the floodplain will be addressed; and 2) it has the potential to convert problem areas into community assets, with accompanying environmental benefits. Acquisition is more cost effective than relocation in those areas that are subject to storm surges, ice jams, or flash flooding. Acquisition, followed by demolition, is the most appropriate strategy for those buildings that are simply too expensive to move, as well as for dilapidated structures that are not worth saving or protecting. Relocation can be expensive, however, there are government grants and loans that can be applied toward such efforts.

3. Building Elevation

Elevating a building above the base flood elevation is the best on-site protection strategy. The building could be raised to allow water to run underneath it, or fill could be brought in to elevate the site on which the building sits. This approach is cheaper than relocation, and tends to be less disruptive to a neighborhood. Elevation is required by law for new and substantially improved residences in a floodplain, and is commonly practiced in flood hazard areas nationwide.

4. Floodproofing

If a building cannot be relocated or elevated, it may be floodproofed. This approach works well in areas of low flood threat. Flood proofing can be accomplished through barriers to flooding, or by treatment to the structure itself.

Barriers: Levees, floodwalls and berms can keep floodwaters from reaching a building. These are useful, however, only in areas subject to shallow flooding.

Dry Flood proofing: This method seals a building against the water by coating the walls with waterproofing compounds or plastic sheeting. Openings, such doors, windows, etc. are closed either permanently with removable shields or with sandbags.

Wet Flood proofing: This technique is usually considered a last resort measure, since water is intentionally allowed into the building in order to minimize pressure on the structure. Approaches range from moving valuable items to higher floors to rebuilding the floodable area. An advantage over other approaches is that simply by moving household goods out of the range of floodwaters, thousands of dollars can be saved in damages.

5. Sewer Backup Protection

Storm water overloads can cause backup into basements through sanitary sewer lines. Houses that have any kind of connection to a sanitary sewer system - whether it is downspouts, footing drain tile, and/or sump pumps, can be flooded during a heavy rain event. To prevent this, there should be no such connections to the system, and all rain and ground water should be directed onto the ground, away from the building. Other protections include:

- Floor drain plugs and floor drain standpipe, which keep water from flowing out of the lowest opening in the house.
- Overhead sewer - keeps water in the sewer line during a backup.
- Backup valve - allows sewage to flow out while preventing backups from flowing into the house.

6. Insurance

Above and beyond standard homeowner insurance, there is other coverage a homeowner can purchase to

protect against flood hazard. Two of the most common are National Flood Insurance and basement backup insurance.

National Flood Insurance: When a community participates in the National Flood Insurance Program, any local insurance agent is able to sell separate flood insurance policies under rules and rates set by FEMA. Rates do not change after claims are paid because they are set on a national basis.

Basement Backup Insurance: National Flood Insurance offers an additional deductible for seepage and sewer backup, provided there is a general condition of flooding in the area that was the proximate cause of the basement getting wet. Most exclude damage from surface flooding that would be covered by the NFIP.

C. Natural Resource Protection

Preserving or restoring natural areas or the natural functions of floodplain and watershed areas provide the benefits of eliminating or minimizing losses from floods, as well as improve water quality and wildlife habitats. Parks, recreation, or conservation agencies usually implement such activities. Protection can also be provided through various zoning measures that are specifically designed to protect natural resources.

1. Wetlands Protection

Wetlands are capable of storing large amounts of floodwaters, slowing and reducing downstream flows, and filtering the water. Any development that is proposed in a wetland is regulated by either federal and/or state agencies. Depending on the location, the project might fall under the jurisdiction of the U.S. Army Corps of Engineers, which in turn, calls upon several other agencies to review the proposal. In New Hampshire, the N.H. Wetlands Board must approve any project that impacts a wetland. And, many communities in New Hampshire also have local wetland ordinances.

Generally, the goal is to protect wetlands by preventing development that would adversely affect them. Mitigation techniques are often employed, which might consist of creating a wetland on another site to replace what would be lost through the development. This is not an ideal practice, however, since it takes many years for a new wetland to achieve the same level of quality as an existing one.

2. Erosion and Sedimentation Control

Controlling erosion and sediment runoff during construction and on farmland is important, since eroding soil will typically end up in downstream waterways. And, because sediment tends to settle where the water flow is slower, it will gradually fill in channels and lakes, reducing their ability to carry or store floodwaters.

Practices to reduce erosion and sedimentation have two principal components: (1) minimize erosion with vegetation and; (2) capture sediment before it leaves the site. Slowing the runoff increases infiltration into the soil, thereby controlling the loss of topsoil from erosion and the resulting sedimentation. Runoff can be slowed by vegetation, terraces, contour strip farming, no-till farm practices, and impoundments (such as sediment basins, farm ponds, and wetlands).

3. Best Management Practices

Best Management Practices (BMPs) are measures that reduce nonpoint source pollutants that enter waterways. Nonpoint source pollutants are carried by storm water to waterways, and include such things as lawn fertilizers, pesticides, farm chemicals, and oils from street surfaces and industrial sites. BMPs can be incorporated into many aspects of new developments and ongoing land use practices. In New Hampshire, the Department of Environmental Services has developed best management practices for a range of activities, from farming to earth excavations.

D. Emergency Services

Emergency services protect people during and after a flood. Many communities in New Hampshire have emergency management programs in place, administered by an emergency management director (very often the local police or fire chief).

1. Flood Warning

On large rivers, the National Weather Service handles early recognition. Communities on smaller rivers must

develop their own warning systems. Warnings may be disseminated in a variety of ways, such as sirens, radio, television, mobile public address systems, or door-to-door contact. It seems that multiple or redundant systems are the most effective, giving people more than one opportunity to be warned.

2. Flood Response

Flood response refers to actions that are designed to prevent or reduce damage or injury, once a flood threat is recognized. Such actions and the appropriate parties include:

- activating the emergency operations center (emergency director)
- sandbagging designated areas (public works department)
- closing streets and bridges (police department)
- shutting off power to threatened areas (public service)
- releasing children from school (school district)
- ordering an evacuation (selectmen/city council/emergency director)
- opening evacuation shelters (churches, schools, Red Cross, municipal facilities)

These actions should be part of a flood response plan, which should be developed in coordination with the persons and agencies that share the responsibilities. Drills and exercises should be conducted so that the key participants know what they are supposed to do.

3. Critical Facilities Protection

Protecting critical facilities is vital, since expending efforts on these facilities can draw workers and resources away from protecting other parts of town. Critical facilities fall into two categories:

Buildings or locations vital to the flood response effort:

- emergency operations centers
- police and fire stations
- hospitals
- highway garages
- selected roads and bridges
- evacuation routes

Buildings or locations that, if flooded, would create secondary disasters

- hazardous materials facilities
- water/wastewater treatment plants
- schools
- nursing homes

All such facilities should have their own flood response plan that is coordinated with the community's plan. Nursing homes, other public health facilities, and schools will typically be required by the state to have emergency response plans in place.

4. Health and Safety Maintenance

The flood response plan should identify appropriate measures to prevent danger to health and safety. Such measures include:

- Patrolling evacuated areas to prevent looting.
- Providing safe drinking water.
- Vaccinating residents for tetanus.
- Clearing streets.
- Cleaning up debris.

The plan should also identify which agencies will be responsible for carrying out the identified measures. A public information program can be helpful to educate residents on the benefits of taking health and safety precautions.

E. Structural Projects

Structural projects are used to prevent floodwaters from reaching properties. These are all man-made structures, and can be grouped into the six types of discussed below. The shortcomings of structural approaches are that:

- They can be very expensive.
- They disturb the land, disrupt natural water flows, and destroy natural habitats.
- They are built to an anticipated flood event, and may be exceeded by a greater-than-expected flood.
- They can create a false sense of security.

1. Reservoirs

Reservoirs control flooding by holding water behind dams or in storage basins. After a flood peaks, water is released or pumped out slowly at a rate the river downstream can handle.

Reservoirs are suitable for protecting existing development, and they may be the only flood control measure that can protect development close to a watercourse. They are most efficient in deeper valleys or on smaller rivers where there is less water to store. Reservoirs might consist of man-made holes dug to hold the approximate amount of floodwaters, or even abandoned quarries. As with other structural projects, reservoirs:

- are expensive;
- occupy a lot of land;
- require periodic maintenance;
- may fail to prevent damage from floods that exceed their design levels; and
- may eliminate the natural and beneficial functions of the floodplain.

Reservoirs should only be used after a thorough watershed analysis that identifies the most appropriate location, and ensures that they would not cause flooding somewhere else. Because they are so expensive and usually involve more than one community, they are typically implemented with the help of state or federal agencies, such as the Army Corps of Engineers.

2. Levees/Floodwalls

Probably the best known structural flood control measure is either a levee (a barrier of earth) or a floodwall made of steel or concrete erected between the watercourse and the land. If space is a consideration, floodwalls are typically used, since levees need more space. Levees and floodwalls should be set back out of the floodway, so that they will not divert floodwater onto other properties.

3. Diversions

A diversion is simply a new channel that sends floodwater to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During flood flows, the stream spills over the diversion channel or tunnel, which carries the excess water to the receiving lake or river. Diversions are limited by topography; they won't work everywhere. Unless the receiving water body is relatively close to the flood-prone stream and the land in between is low and vacant, the cost of creating a diversion can be prohibitive. Where topography and land use are not favorable, a more expensive tunnel is needed. In either case, care must be taken to ensure that the diversion does not create a flooding problem somewhere else.

4. Channel Modifications

Channel modifications include making a channel wider, deeper, smoother, or straighter. These techniques will result in more water being carried away, but, as with other techniques mentioned, it is important to ensure that the modifications do not create or increase a flooding problem downstream.

Dredging: Dredging is often cost-prohibitive because the dredged material must be disposed of somewhere else, and the stream will usually fill back in with sediment. Dredging is usually undertaken only on larger rivers, and then only to maintain a navigation channel.

Drainage modifications: These include man-made ditches and storm sewers that help drain areas where the surface drainage system is inadequate or where underground drainage ways may be safer or more attractive. These approaches are usually designed to carry the runoff from smaller, more frequent storms.

5. Storm Sewers

Mitigation techniques for storm sewers include installing new sewers, enlarging small pipes, street improvements, and preventing back flow. Because drainage ditches and storm sewers convey water faster to other locations, improvements are only recommended for small local problems where the receiving body of water can absorb the increased flows without increased flooding. In many developments, streets are used as part of the drainage system, to carry or hold water from larger, less frequent storms. The streets collect runoff and convey it to a receiving sewer, ditch, or stream. Allowing water to stand in the streets and then draining it slowly can be a more effective and less expensive measure than enlarging sewers and ditches.

F. Public Information

Public information activities are intended to advise property owners, potential property owners, and visitors about the particular hazards associated with a property, ways to protect people and property from these hazards, and the natural and beneficial functions of a floodplain.

1. Map Information

Flood maps developed by FEMA outline the boundaries of the flood hazard areas. These maps can be used by anyone interested in a particular property to determine if it is flood-prone. These maps are available from FEMA, the NH Office of Emergency Management, the NH Office of State Planning, or your regional planning commission.

2. Outreach Projects

Outreach projects are proactive; they give the public information even if they have not asked for it. Outreach projects are designed to encourage people to seek out more information and take steps to protect themselves and their properties. Examples of outreach activities include:

- Mass mailings or newsletters to all residents.
- Notices directed to floodplain residents.
- Displays in public buildings, malls, etc.
- Newspaper articles and special sections.
- Radio and TV news releases and interview shows.
- A local flood proofing video for cable TV programs and to loan to organizations.
- A detailed property owner handbook tailored for local conditions.
- Presentations at meetings of neighborhood groups.

Research has shown that outreach programs work, although awareness is not enough. People need to know what they can do about the hazards, so projects should include information on protection measures. Research also shows that locally designed and run programs are much more effective than national advertising.

3. Real Estate Disclosure

Disclosure of information regarding flood-prone properties is important if potential buyers are to be in a position to mitigate damage. Federally regulated lending institutions are required to advise applicants that a property is in the floodplain. However, this requirement needs to be met only five days prior to closing, and by that time, the applicant is typically committed to the purchase. State laws and local real estate practice can help by making this information available to prospective buyers early in the process.

4. Library

Your local library can serve as a repository for pertinent information on flooding and flood protection. Some libraries also maintain their own public information campaigns, augmenting the activities of the various governmental agencies involved in flood mitigation.

5. Technical Assistance

Certain types of technical assistance are available from the NFIP Coordinator, FEMA, and the Natural Resources Conservation District. Community officials can also set up a service delivery program to provide one-on-one sessions with property owners.

An example of technical assistance is the *flood audit*, in which a specialist visits a property. Following the visit,

the owner is provided with a written report, detailing the past and potential flood depths, and recommending alternative protection measures.

6. Environmental Education

Education can be a great mitigating tool, if people can learn what not to do before damage occurs. And the sooner the education begins, the better. Environmental education programs for children can be taught in the schools, park and recreation departments, conservation associations, or youth organizations. An activity can be as involved as course curriculum development or as simple as an explanatory sign near a river.

Education programs do not have to be limited to children. Adults can benefit from knowledge of flooding and mitigation measures. And decision-makers, armed with this knowledge, can make a difference in their communities.

II. EARTHQUAKES

A. Preventive

1. Planning/zoning to keep critical facilities away from fault lines.
2. Planning, zoning and building codes to avoid areas below steep slopes or soils subject to liquefaction.
3. Building codes to prohibit loose masonry, overhangs, etc.

B. Property Protection

1. Acquire and clear hazard areas.
2. Retrofitting to add braces, remove overhangs.
3. Apply mylar to windows and glass surfaces to protect from shattering glass.
4. Tie down major appliances, provide flexible utility connections.
5. Earthquake insurance riders.

C. Emergency Services

1. Earthquake response plans to account for secondary problems, such as fires and hazardous materials spills.

D. Structural Projects

1. Slope stabilization.

III. DAM FAILURE

A. Preventive

1. Dam failure inundation maps.
2. Planning/zoning/open space preservation to keep area clear.
3. Building codes with flood elevation based on dam failure.
4. Dam safety inspections.
5. Draining the reservoir when conditions appear unsafe.

B. Property Protection

1. Acquisition of buildings in the path of a dam breach flood.
2. Flood insurance.

C. Emergency Services

1. Dam conditioning monitoring.
2. Warning and evacuation plans based on dam failure.

D. Structural Projects

1. Dam improvements, spillway enlargements.
2. Remove unsafe dams.

IV. WILDFIRES

A. Preventive

1. Zoning districts to reflect fire risk zones.
2. Planning and zoning to restrict development in areas near fire protection and water resources.

3. Requiring new subdivisions to space buildings, provide firebreaks, on-site water storage, wide roads multiple accesses.
4. Building code standards for roof materials, spark arrestors.
5. Maintenance programs to clear dead and dry bush, trees.
6. Regulation on open fires.

B. Property Protection

1. Retrofitting of roofs and adding spark arrestors.
2. Landscaping to keep bushes and trees away from structures.
3. Insurance rates based on distance from fire protection.

C. Natural Resource Protection

1. Prohibit development in high-risk areas.

D. Emergency Services

1. Fire Fighting

V. WINTER STORMS

A. Prevention

Building code standards for light frame construction, especially for wind-resistant roofs.

B. Property Protection

1. Storm shutters and windows
2. Hurricane straps on roofs and overhangs
3. Seal outside and inside of storm windows and check seals in spring and fall.
4. Family and/or company severe weather action plan & drills:
 - include a **NOAA** weather radio
 - designate a shelter area or location
 - keep a disaster supply kit, including stored food and water
 - keep snow removal equipment in good repair; have extra shovels, sand, rock, salt and gas
 - know how to turn off water, gas, and electricity at home or work

C. Natural Resource Protection

Maintenance program for trimming tree and shrubs

D. Emergency Services

1. Early warning systems/NOAA Weather Radio
2. Evacuation Plans

APPENDIX C

List of Contacts

I. Agencies

New Hampshire Office of Emergency Management 271-2231
 Hazard Mitigation Section..... 271-2231

Federal Emergency Management Agency 617-223-4175

NH Regional Planning Commissions:

 Central NH Regional Planning Commission..... 796-2129
 Lake Region Planning Commission..... 279-8171
 Nashua Regional Planning Commission 883-0366
 North Country Council 444-6303
 Rockingham Planning Commission..... 778-0885
 Southern New Hampshire Planning Commission..... 669-4664
 Southwest Region Planning Commission 357-0557
 Strafford Regional Planning Commission..... 742-2523
 Upper Valley Lake Sunapee Regional Planning Commission 448-1680

NH Executive Department:

 Governor's Office of Energy and Community Services 271-2611
 New Hampshire Office of State Planning 271-2155

NH Department of Cultural Affairs 271-2540
 Division of Historical Resources..... 271-3483

NH Department of Environmental Services..... 271-3503
 Air Resources 271-1370
 Waste Management..... 271-2900
 Water Resources 271-3406
 Water Supply and Pollution Control 271-3504
 Rivers Management and Protection Program 271-1152
 Bureau of Dams..... 271-3503

NH Fish and Game Department 271-3421

NH Department of Resources and Economic Development 271-2411
 Natural Heritage Inventory..... 271-3623
 Division of Forests and Lands 271-2214
 Division of Parks and Recreation 271-3255

NH Department of Transportation 271-3734

US Department of Commerce:

 National Oceanic and Atmospheric Administration:
 National Weather Service; Gray, Maine 207-688-3216

US Department of Interior:

 US Fish and Wildlife Service 225-1411
 US Geological Survey 225-4681

US Department of Agriculture:

 Natural Resource Conservation Service..... 868-7581

Grafton County Sheriff's Department..... 1-800-564-6911

New Hampshire State Police 846-3333

II. Websites

Sponsor	Internet Address	Summary of Contents
NH Office Emergency Management	http://www.nhoem.state.nh.us	Searchable website with references and links to emergency sites. (State's Plan)
Natural Hazards Research Center, U. of Colorado	http://www.colorado.edu/litbase/hazards/	Searchable database of references and links to many disaster-related web sites.
Atlantic Hurricane Tracking Data by Year	http://wxp.eas.purdue.edu/hurricane	Hurricane track maps for each year, 1886 – 1996
National Emergency Management Association	http://nemaweb.org	Association of state emergency management directors; list of mitigation projects.
NASA-Goodard Space Flight Center "Disaster Finder"	http://www.gsfc.nasa.gov/ndrd/disaster	Searchable database of sites that encompass a wide range of natural disasters.
NASA Natural Disaster Reference Database	http://www.gsfc.nasa.gov/ndrd/main/html	Searchable database of worldwide natural disasters.
U.S. State & Local Gateway	http://statelocal.gov	General information through the federal-state partnership
National Weather Service	http://nws.noaa.gov	Central Page for National Weather Warnings, updated every 60 seconds.
USGS Real Time Hydrologic Data	http://h20.usgs.gov/public/realtime.html	Provisional hydrological data
Dartmouth Flood Observatory	http://www.dartmouth.edu/artsci/geog/floods/	Observations of flooding situations
FEMA, National Flood Insurance Program, Community Status Book	http://fema.gov/fema/csb.htm	Searchable site for access of Community Status Books
Florida State University Atlantic Hurricane Site	http://met.fsu.edu/explores/tropical.html	Tracking and NWS warnings for Atlantic Hurricanes and other links

National Lightning Safety Institute	http://lightningsafety.com	Information and listing of appropriate publications regarding lightning safety.
NASA Optical Transient Detector	http://www.ghcc.msfc.nasa.gov/otd.html	Space-based sensor of lightning strikes
LLNL Geologic & Atmospheric Hazards	http://www-ep.es.llnl.gov/www-ep/ghp.html	General hazard information developed for the Dept. of Energy
The Tornado Project Online	http://www.tornadoproject.com/	Information on tornadoes, including details of recent impacts.
National Severe Storms Laboratory	http://www.nssl.uoknor.edu	Information about and tracking of severe storms
Independent Insurance Agents of America IIAA Natural Disaster Risk Map	http://www.iaa.ix.com/ndcmap.htm	A multi-disaster risk map
Earth Satellite Corporation	http://www.earthsat.com/	Flood risk maps searchable by state
USDA Forest Service Web	http://www.fs.fed.us/land	Information on forest fires and land management.

APPENDIX D
Technical and Financial Assistance for
Hazard Mitigation

◆ HAZARD MITIGATION GRANT PROGRAM - “SECTION 404 MITIGATION”

The Hazard Mitigation Grant Program (HMGP) in New Hampshire is administered in accordance with the 404 HMGP Administration Plan which was derived under the authority of Section 404 of the Stafford Act in accordance with Subpart N. of 44 CFR.

The program receives its funding pursuant to a Notice of Interest submitted by the Governor’s Authorized Representative (or GAR, i.e. the Director of NHOEM) to the FEMA Regional Director within 60 days of the date of a Presidentially Declared Disaster. The amount of funding that may be awarded to the State/Grantee under the HNGP may not exceed 15% of (over and above) the overall funds as are awarded to the State pursuant to the Disaster Recovery programs as are listed in 44 CFR Subpart N. Section 206.431 (d) (inclusive of all Public Assistance, Individual Assistance, etc.). Within 15 days of the Disaster Declaration, an Inter-Agency Hazard Mitigation Team is convened consisting of members of various Federal, State, County, Local and Private Agencies with an interest in Disaster Recovery and Mitigation. From this meeting, a Report is produced which evaluates the event and stipulates the State’s desired Mitigation initiatives.

Upon the GAR’s receipt of the notice of an award of funding by the Regional Director, the State Hazard Mitigation Officer (SHMO) publishes a Notice of Interest (NOI) to all NH communities and State Agencies announcing the availability of funding and solicits applications for grants. The 404 Administrative Plan calls for a State Hazard Mitigation Team to review all applications. The Team is comprised of individuals from various State Agencies.

Eligible Subgrantees include:

- State and Local governments
- Certain Not for Profit Corporations
- Indian Tribes or authorized tribal organizations
- Alaskan corporations not privately owned

Minimum Project Criteria

- Must conform with the State’s “409” Plan
- Have a beneficial impact on the Declared area
- Must conform with:
 - NFIP Floodplain Regulations
 - Wetlands Protection Regulations
 - Environmental Regulations
 - Historical Protection Regulations
- Be cost effective and substantially reduce the risk of future damage
- Not cost more than the anticipated value of the reduction of both direct damages and subsequent negative impacts to the area if future disasters were to occur i.e., min 1:1 benefit/cost ratio
- Both costs and benefits are to be computed on a “net present value” basis
- Has been determined to be the most practical, effective and environmentally sound alternative after a consideration of a range of options
- Contributes to a long-term solution to the problem it is intended to address
- Considers long-term changes and has manageable future maintenance and modification requirements

Eligible Projects may be of any nature that will result in the protection to public or private property and include:

- Structural hazard control or protection projects
- Construction activities that will result in protection from hazards
- Retrofitting of facilities
- Certain property acquisitions or relocations
- Development of State and local mitigation standards
- Development of comprehensive hazard mitigation programs with implementation as an essential component
- Development or improvement of warning systems

◆ FLOOD MITIGATION ASSISTANCE (FMA) PROGRAM

New Hampshire has been a participant in the Flood Mitigation Assistance Program (FMA or FMAP) since 1996/97. In order to be eligible, a community must be a participant in the National Flood Program.

In 1997, the State was awarded funds to assist communities in Flood Mitigation Planning and Projects. A prerequisite of accessing the project funds under FMAP is that a community have a FEMA approved Flood Mitigation Plan in place. A Planning Grant from 1996/97 was awarded to the City of Keene in 1998.

In preparation for the development of the Flood Mitigation Plan, the Planning Department of the City of Keene created a GIS database of its floodplain and digitized its tax assessing maps as well as its Special Flood Hazard Areas in GIS layers. The Keene Flood Hazard Mitigation Plan is considered a Model in the State and its Project development and prioritization approach is especially noteworthy.

In 1998, the FMAP Planning Grant was awarded to the Town of Salem. Given the complexity of the issues in the Spicket River watershed, The Town of Salem sub-contracted a substantial portion of the development of its Plan to a private engineering firm. Salem submitted the State's first Plan and proposed projects in May, 1999 that were approved by FEMA.

The 1999 FMA Planning Grant was awarded to the Town of Hampton, the State's highest policy-holding community and the highest "repetitive loss" community. Hampton employed the services of a Planner from the Rockingham RPC and delivered its Plan to FEMA for review in May.

The 2000 FMA Planning Grant was awarded to Gorham and a Plan is expected by October 2000. Gorham is undertaking its Flood Hazard mitigation planning initiative under FMAP in coordination with its Project Impact inspired All Hazards Mitigation planning process. The program has been (essentially) level funded for federal fiscal year 2001 which began on October 1, 2000.

The State has received and approved a Planning grant application from the Town of Holderness. The Town intends to work with the Lakes Region Planning Commission in the creation of their FMA plan.

FMA Program

- NFIP Funded by a % of Policy Premiums
- Planning Grants
- Technical Assistance Grants to States (10% of project Grant)
- Project Grants to communities
- Communities must have FEMA approved Flood Mitigation Plan to receive Project Funds

Eligible Projects (44 CFR Part 78)

- Elevation of NFIP insured residential structures
- Elevation and dry-proofing of NFIP insured non-residential structures
- Acquisition of NFIP insured structures and underlying real property
- Relocation of NFIP insured structures from acquired or restricted real property to sites not prone to flood hazards
- Demolition of NFIP insured structures on acquired or restricted real property
- Other activities that bring NFIP insured structures into compliance with statutorily authorized floodplain management requirements
- Beach nourishment activities that include planting native dune vegetation and/or the installation of sand-fencing
- Minor physical mitigation projects that do not duplicate the flood prevention activities of other Federal agencies and lessen the frequency of flooding or severity of flooding and decrease the predicted flood damages in localized flood problem areas. These include: modification of existing culverts and bridges, installation or modification of flood gates, stabilization of stream banks, and creation of small debris of flood/storm water retention basins in small watersheds (not dikes, levees, seawalls, etc.)

◆ PRE-DISASTER MITIGATION PROGRAM (PDM)

FEMA has long been promoting disaster resistant communities and retrofit of facilities that are vulnerable to hazards in order to reduce potential damages due to hazard event. The goal is to reduce loss of life, human suffering, economic disruption and disaster costs to the Federal taxpayer. This has been, and continues to be accomplished, through a variety of programs and grant funds.

Although the overall intent is to reduce vulnerability before the next disaster threatens, the bulk of the funding for such projects actually has been delivered through a “post-disaster” funding mechanism, the Hazard Mitigation Grant Program (HMGP). This program has successfully addressed the many hazard mitigation opportunities uniquely available following a disaster. However, funding of projects “pre-disaster” has been more difficult, particularly in states that have not experienced major disasters in the past decade. In an effort to address “pre-disaster mitigation”, FEMA piloted a program from 1997-2001 entitled “Project Impact” that was community based and multi-hazard oriented.

Through the Disaster Mitigation Act of 2000, Congress approved creation of a national Pre-disaster Hazard Mitigation program to provide funding mechanism that is not dependent on a Presidential disaster declaration. For FY2002, \$25 million has been appropriated for the new grant program entitled the Pre-Disaster Mitigation Program (PDM). This new program builds on the experience gained from Project Impact, the HMGP, and other mitigation initiatives.

Here are the high points of the FY2003 PDM program:

The program will be administered by each State, with a base allocation of \$248,375 and additional funds available for competitive pre-disaster mitigation grants, technical assistance and program support for PDM.

Eligible projects include:

- State and Local hazard mitigation planning
- Technical assistance [e.g. risk assessment, project development]
- Mitigation Projects
 - Acquisition or relocation of vulnerable properties
 - Hazard retrofits
 - Minor structural hazard control or protection projects
- Community outreach and education [up to 10% of state allocation]

The emphasis for FY2003 will be on mitigation planning, to help localities meet the new planning requirements of the Disaster Mitigation Act of 2000.

Each State establishes grant selection criteria and priorities base on:

- The State Hazard Mitigation Plan
- The degree of commitment of the community to hazard mitigation
- The cost effectiveness of the proposed project
- The type and degree of hazard being addressed
- For project grants, “good standing” of the community in the National Flood Insurance Program

The funding is 75% Federal share, 25% non-Federal, except as noted below. The grant performance periods will be 24 months for planning grants. Draft mitigation plans must be submitted for review by FEMA within 18 months of award, and final mitigation plans must be submitted to FEMA before the end of the performance period. Special accommodations will be made for “small and impoverished communities”, who will be eligible for 90% Federal share, 10% non-Federal.

◆ DISASTER PREPAREDNESS IMPROVEMENT GRANT (DPIG)

FEMA and the State co-sponsor the DPIG Program, which supports the development and updating of disaster assistance plans and capabilities and promotes educational opportunities with respect to preparedness and mitigation. Authority: See Subchapter E. of 44 CFR.

Past DPIG initiatives include:

- Support of the position of Protection Planner/Hazard Mitigation Officer
- Installation of river gauges
- Support of the NH State Environthon School Program
- Coordinate the Voluntary Organizations Active in Disasters (VOAD) Program (See Resource Profile Annex) NHOEM via the DPIG has sponsored annual meetings with training workshops
- Sponsoring Dam Safety Training initiatives and work shops
- Production and distribution of a handbook for small embankment dam owners
- Inventory of the State's Dams
- Review of Dam Plans
- Sponsored extensive statewide, two day workshops for Granite State Incident Stress Debriefing Teams and funded educational materials
- Community visits and production of informational materials
- Assist with Plan Annex update for local Hazard Mitigation planning.
- Funding workshops for NH Road Agents in cooperation with the T2 program of the Technology Transfer Center at the University of New Hampshire

Present DPIG funded Hazard Mitigation initiatives

- Support the position of Protection Planner/Hazard Mitigation Officer
- Continued support of the Environthon Program
- Development of this Plan
- Providing Technical Assistance to State and local officials
- Development of Emergency Operations Plans (EOPs) for Significant and High Hazard dams

Future DPIG funded Hazard Mitigation initiatives

- Continued Support of the position of Protection Planner/Hazard Mitigation Officer
- Continued support of the Environthon Program
- Update and maintenance of this Plan
- Provide Technical Assistance to State and local officials
- Support of other planning, technical assistance and training as indicated
- Digitization of EOPs for the State's "Significant" and "High Hazard" dams to provide rapid access to information in Emergency situations and to facilitate Plan maintenance

Disaster Preparedness Improvement Grant

- Evaluate natural hazards on a continuing basis and develop programs and actions required to mitigate such hazards
- Provide Technical Assistance
- Grants to States of up to \$50,000 annually
- (50% State match - cash or in kind)

Eligible Projects Include:

- Evaluations of Natural Hazards
- Hazard Mitigation activities (i.e. Plan/policy/program/strategy development)
- Plan updates
- Handbooks: publications & distribution
- Creating exercise materials
- Developing standard Operating Procedures
- Training state employees
- Report of formal analysis of State Enabling legislation and authorities
- Update inventory of State/Local Critical Facilities
- Develop a tracking system of critical actions to be taken post-event
- Creating Damage Assessment Plans and defining procedures
- Developing Plans for Procedures when no Federal Aid is forthcoming
- Creating Plans for Search and Rescue Operations
- Developing Disaster accounting procedures

This list is not exhaustive

◆ COMMUNITY DEVELOPMENT BLOCK GRANT PROGRAM

These Federal funds are provided through the U.S. Department of Housing and Urban Development (HUD) and are administered by the CDBG Program of the New Hampshire Office of State Planning.

Some CDBG disaster related funding has been transferred to FEMA recently and the SHMO is scheduled to receive guidance as to which specific funds and, new program management criteria.

The specific CDBG funds designated for hazard mitigation purposes are made available to address 'unmet needs' pursuant to a given Disaster Declaration to State which request them. For these funds, project selection guidance is provided by NHOEM and NHOSP administers the grant.

Pursuant to Declaration DR-1199-NH, \$557,000 was made available to the State and pursuant to DR-119-NH, the grant award is targeted at \$1,500,000.

In October of 1998, HUD announced the program guidelines for the expenditure of the DR-1144-NH related funding and the community of Salem applied for, and has received preliminary approval for funding to acquire a 19 unit trailer park in the floodplain.

Community Development Block Grant

Projects must meet one of the three National Objectives:

- ◆ Provide a direct benefit to low and moderate income persons or households
- ◆ Prevent or eliminate slums and blight
- ◆ Eliminate conditions which seriously and immediately threaten the public health and welfare

Additional conditions with respect to the expenditure of these funds includes the provision that at least 50% of the grant award must be expended in a manner which benefits individuals who earn 80% or less than the area's (county's) median income.

Mitigation Programs of Other NH State Agencies

The following agencies of the State of New Hampshire are directly or indirectly involved in activities that include Hazard Mitigation Planning and/or program implementation.

NH Department of Transportation Bureau or Repair and Maintenance

NH OSP/NFIP Program

NH OSP Coastal Program

NH DRED Division of Forests and Lands

NH DES Water Resources Division—Dam Safety Program

NH DES Wetlands Program

NH DES Shoreline Protection Program

APPENDIX E

Documentation of the Planning Process

Hazard Mitigation Committee Meeting #1

Town of Newfields

**March 10, 2008
Newfields Town Offices**

Introduction

Purpose of Committee

Why selected to serve on the Committee/Team?
What we're doing and why?

What is Hazard Mitigation Planning?

Discussion on Hazard Mitigation

What must we do to prepare a Hazard Mitigation Plan?

Agree on next committee meeting date

Questions and answers

Set goals for next meeting

Hazard Mitigation Committee Meeting #2

Town of Newfields

April 7, 2008
Newfields Town Offices

Welcome and Introduction

Identify Hazards and conduct Risk Analysis

What are the hazards? – Past and potential
What is at risk from those hazards?

Develop Base Map with Critical Facilities (Step 2)

Identify Critical Facilities on a Base Map.

Vulnerability Assessment (Step 3)

List hazards from hazards map - identify what is at risk/vulnerable
Estimate potential losses

Analyze Development Constraints (Step 4)

Questions and Answers

Set Goals for Next Meeting

Hazard Mitigation Committee Meeting #3

Town of Newfields

April 21, 2008
Newfields Town Offices

Welcome and Introduction

Capability Assessment (Step 5)

Identify Existing Mitigation Strategies

Capability Assessment (Step 6A)

Identify New Mitigation Strategies/Projects

Evaluate Each Strategy/Project (Step 6B)

Using the STAPLEE METHOD.

Prioritize Proposed Mitigation Strategies (Step 7)

- Does the action reduce damage?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures?
- Can the action be implemented quickly?

5. Establish an implementation strategy for each new mitigation Strategy defining the following three questions (Step 8)

- Who will lead the effort?
- How will it be implemented? (*Technical and Financial resources*)
- When will it take place?

6. Discuss Monitoring, Updating and Adoption of Plan

7. Questions and Answers

Hazard Mitigation Committee Meeting #4

Town of Newfields

May 12, 2008
Newfields Town Offices

Welcome and Introduction

Capability Assessment (Step 5)

Identify Existing Mitigation Strategies

Capability Assessment (Step 6A)

Identify New Mitigation Strategies/Projects

Evaluate Each Strategy/Project (Step 6B)

Using the STAPLEE METHOD.

Prioritize Proposed Mitigation Strategies (Step 7)

- Does the action reduce damage?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures?
- Can the action be implemented quickly?

5. Establish an implementation strategy for each new mitigation Strategy defining the following three questions (Step 8)

- Who will lead the effort?
- How will it be implemented? (*Technical and Financial resources*)
- When will it take place?

6. Discuss Monitoring, Updating and Adoption of Plan

7. Questions and Answers

APPENDIX F

**Approval letters from Newfields Board of
Selectmen and FEMA**