

BASIC WORKSHOP IN



EMERGENCY MANAGEMENT STUDENT MANUAL

New Jersey State Police Office of Emergency Management
(REV -10/01)

BASIC WORKSHOP IN

EMERGENCY MANAGEMENT

UNIT 1 INTRODUCTION

TABLE OF CONTENTS

UNIT 1 - INTRODUCTION	6
WHAT IS EMERGENCY MANAGEMENT?	7
THE ROLE OF THE EMERGENCY MANAGEMENT COORDINATOR	8
COMPREHENSIVE EMERGENCY MANAGEMENT	8
INTEGRATED EMERGENCY MANAGEMENT SYSTEM	9
TYPES OF DISASTERS.....	11
UNIT 2 - HISTORY OF EMERGENCY MANAGEMENT	1
THE EVOLUTION OF EMERGENCY MANAGEMENT AND CIVIL DEFENSE	3
STATUTES IN EMERGENCY MANAGEMENT	9
EXECUTIVE ORDERS/DIRECTIVES/OPINIONS - GOVERNOR	16
DIRECTIVES ISSUED BY THE STATE OFFICE	19
ATTACHMENTS	24
UNIT 3 - EMERGENCY PLANNING	1
DEVELOPMENT OF AN EMERGENCY OPERATIONS PLAN	3
WHAT IS AN EMERGENCY OPERATING PLAN (EOP)?.....	3
PLAN FORMAT	7
THE FIFTEEN (15) ANNEXES	10
SCHOOL EMERGENCY PLANNING	13
HAZARDOUS MATERIALS EMERGENCY PLANNING	26
ATTACHMENTS	31
UNIT 4 - ROLES OF GOVERNMENT	1
ROLES OF THE STATE AND FEDERAL GOVERNMENTS	3
FEDERAL EMERGENCY MANAGEMENT AGENCY.....	6
FEDERAL RESPONSE PLAN	6
STATE GOVERNMENT.....	9
NJ STATE OFFICE OF EMERGENCY MANAGEMENT	11
DESCRIPTION OF ROLES AND RESPONSIBILITIES	13
COUNTY GOVERNMENT	29
LOCAL GOVERNMENT	31
ROLES AND RESPONSIBILITIES OF A COORDINATOR	33
RESOURCES	40
COORDINATING COMMUNITY RESOURCES	40
ATTACHMENTS	43
UNIT 5 - THE DECLARATION PROCESS	1
DISASTER RECOVERY	3
DECLARING A LOCAL STATE OF EMERGENCY	5
ELEMENTS IN THE DECLARATION PROCESS	5

PRELIMINARY DAMAGE ASSESSMENT REPORT FORM	7
FEMA's PRELIMINARY DAMAGE ASSESSMENT CATEGORIES	8
WINDSHIELD SURVEY	9
ATTACHMENTS	10
UNIT 6 - TRAINING	1
GENERAL INFORMATION	4
PROFESSIONAL DEVELOPMENT SERIES	6
CERTIFIED EMERGENCY MANAGER PROGRAM	9
EMERGENCY DISASTER MANAGEMENT DEGREE	12
COURSE OFFERINGS	13
INCIDENT COMMAND COUNTY COORDINATOR LIST	18
HAZARDOUS MATERIALS TRAINING PROGRAMS	21
COUNTY HAZARDOUS MATERIALS TRAINING COORDINATORS	24
RADIOLOGICAL PREPAREDNESS AND RESPONSE SERIES	25
PROGRAM ELECTIVES	26
RESPONSE AND RECOVERY CURRICULUM	26
PREPAREDNESS CURRICULUM	26
INDEPENDENT STUDY PROGRAM	28
ATTACHMENTS	31
UNIT 7 - EXERCISING	1
EXERCISING	3
HISTORICAL PERSPECTIVE ON EXERCISING	4
CURRENT STATE GUIDELINES FOR EXERCISES	8
TYPES OF EXERCISES	8
THE EIGHT EXERCISE DESIGN STEPS	18
ATTACHMENTS	17
UNIT 8 - CONCLUSION	1
BASIC WORKSHOP FINAL EXAM	3
ATTACHMENTS AND APPENDICES	7
BIBLIOGRAPHY	8

WORKSHOP IN EMERGENCY MANAGEMENT AGENDA

8:30 AM - 9:00 AM	Registration
9:00 AM - 9:45 AM	UNIT 1 - Introduction
9:45 AM - 10:15 AM	UNIT 2 - History of Emergency Management
10:15 AM - 10:45 AM	UNIT 2 - continued
10:45 AM - 12:00 NOON	UNIT 3 - Emergency Planning
12:00 PM - 1:00 PM	LUNCH
1:00 PM - 2:00 PM	UNIT 4 - Roles of Government
2:00 PM - 2:45 PM	UNIT 5 - The Declaration Process
2:45 PM - 3:00 PM	UNIT 6 - Training
3:00 PM - 3:15 PM	BREAK
3:15 PM - 4:00 PM	UNIT 7 - Exercising
4:00 PM - 4:30 PM	UNIT 8 - Summary/Conclusion

UNIT I - INTRODUCTION

OBJECTIVES - At the conclusion of this unit participants will be able to:

1. Define emergency management,
 2. List the different levels of an emergency,
 3. Describe the role of the local OEM coordinator,
 4. State the difference between Comprehensive Emergency Management (CEM) and Integrated Emergency Management System (IEMS), and
 5. Identify the different types of disasters.
-

SCOPE

- C What is Emergency Management?
 - C The Role of the Coordinator-(defined)
 - C CEM & IEMS
 - C Types of Disasters
-

TEACHING METHODS - The instructor sets the stage by defining what emergency management is and the difference between an emergency and a disaster. The instructor describes the most important role of the coordinator -- obtaining resources, and knowing where to obtain the necessary manpower and equipment. The instructor then talks about Comprehensive Emergency Management and the Integrated Emergency Management System. The unit ends by identifying the different types of disasters.

WHAT IS EMERGENCY MANAGEMENT?

INTRODUCTION

Emergency Management is the discipline and profession of applying science, technology, planning and management to deal with extreme events that can injure or kill large numbers of people, do extensive damage to property, and disrupt community life. When these events occur and cause extensive harm, they are called disasters. The word disaster is widely used to describe everything from a flooded basement in New Jersey to the earthquakes in Los Angeles, California.

Emergency Management makes distinctions between emergencies and disasters. Emergencies are generally “routine” events that do not have a community wide impact or do not require the use of resources to bring conditions back to normal. When a community and its response agencies cannot operate within their own standard operating procedures (SOP’s) or when they are required to seek additional resources, we move beyond the “routine” emergency level of operations.

So what constitutes a disaster? A disaster depends largely on the community itself, and its size, resources, and experience in dealing with a certain hazard. It is important that each community develop different levels of progression from an emergency to a disaster. These levels are important in providing guidance to first responders, and even more important, guidance for local officials to make critical decisions that affect you as a citizen.

Here are a few examples of emergency levels:

- Level 1 - Any unexpected occurrence that can be met with a single department’s available resources. The department that handles the occurrence is usually responsible for the decision making to resolve the incident.

- Level 2 - Any unexpected occurrence that requires response by two (2) or more city departments above routine capacity or where outside agencies have been requested to assist. The event requires a coordinated effort and commitment of personnel, equipment and resources from the responding departments. The department that handles the occurrence is usually responsible for the decision making process but a cooperative effort with the agencies responding is required. The Mayor is usually alerted about the situation.

- Level 3 - Any extraordinary occurrence of such magnitude that all departments and resources from the community must be used or where a combination of outside agencies and departments have been mobilized to handle the situation. Decision making is done by the OEM council. On-site commanders make those decisions to protect life and property. Decisions

mitigate and properly resolve the situation is the responsibility of the OEM council. This level usually results in a “Declaration of Emergency” by the mayor.

THE ROLE OF THE EMERGENCY MANAGEMENT COORDINATOR

The emergency management coordinator’s role is to use and implement a variety of resources, techniques and skills to reduce the probability and impact of extreme events and to bring quick restoration to the community.

Emergency management coordinators are “key players” in an emergency or disaster situation. THEY DO NOT NEED TO BE “IN CHARGE”, BUT THEY SHOULD MAKE SURE THAT WHOEVER IS IN CHARGE HAS ACCESS TO THE PROPER RESOURCES, skills, and knowledge necessary to manage the situation effectively.

The most important aspect of an effective emergency management coordinator is making sure that the responsibility, authority, and channels of communication are clearly defined BEFORE the emergency happens.

There are two (2) concepts that assist and define the roles and responsibilities the emergency management coordinator. They are comprehensive emergency management (CEM) and the integrated emergency management system (IEMS).

COMPREHENSIVE EMERGENCY MANAGEMENT

Comprehensive Emergency Management (CEM) is useful before and after a hazard strikes. Since World War II, emergency management has focused on preparing to respond to emergencies.

The Federal Emergency Management Agency adopted this approach for applying the Comprehensive Emergency Management System at the State and local levels. The concept is built on the principle that teamwork, coordination and cooperation among agencies and jurisdictions is essential.

Being prepared is only one phase of Comprehensive Emergency Management. A community must also be able to deal with emergencies before they strike and have the ability to recover after a disaster. This is where the concepts of Comprehensive Emergency Management come into play. These concepts are mitigation, preparedness, response, and recovery.

Mitigation activities are those that eliminate or reduce the probability of a disaster occurrence. Also included are those long-term activities that lessen the undesirable

effects of unavoidable hazards. Some examples include the establishment of building codes, flood plain management, insurance, elevating buildings, and public education programs.

Preparedness activities serve to develop the response capabilities needed in the event of an emergency. Planning, exercising, training and developing public information programs and warning systems are among the activities conducted under this phase.

Response activities include direction and control, warning, evacuation and emergency services; and are designed to address immediate and short-term effects of the onset of an emergency or disaster. They help to reduce casualties and damage and to speed recovery.

Recovery includes both short term and long term activities. Short term operations seek to restore critical services to the community and provide for the basic needs of the public. Long term recovery focuses on restoring the community to its normal, or improved state of affairs. The recovery period is also an opportune time to institute mitigation measures, particularly those related to the recent emergency. Examples of recovery actions would be temporary housing and food, restoration of non-vital government services, and reconstruction of damaged areas.

These phases each have a direct relationship with each other. One phase results from the previous one and establishes the requirements of the next one. Activities in one phase may overlap those in the previous phase. For example; preparedness moves swiftly when a disaster strikes; and response yields to recovery at different times, depending on the extent and type of damage. Recovery should trigger mitigation, making attempts to prevent or reduce the potential of the next disaster.

INTEGRATED EMERGENCY MANAGEMENT SYSTEM

The Integrated Emergency Management System (IEMS) is a way of settling out the details of Comprehensive Emergency Management (CEM). IEMS requires that a community conduct a hazard risk analysis, assess its current capabilities in the areas of mitigation, preparedness, response and recovery, and devise action plans to close the gap between existing and required levels of capability.

Implementing IEMS requires

1. A effective emergency organization,
2. An active Emergency Program Manager,
3. The development of a set of emergency management capabilities.

The larger emergencies associated with a catastrophic event will need special attention

and greater Federal involvement. Initial emphasis will be placed on basic emergency preparedness capabilities -- warning, direction and control, shelter, evacuation and the provision of food, health, medical resources at local levels.

IEMS is designed to:

1. Foster a full Federal, State, and local government partnership with provisions of flexibility for achieving common goals.
2. Implementation of Emergency Management measures which are effective.
3. Build on the foundation of existing emergency management plans, systems and capabilities to broaden their applicability to the full spectrum of emergencies.

The community will begin by developing emergency operating plans that are governed by a national criteria specific enough to provide guidance, but general enough to allow flexibility for communities.

The process begins with:

1. A comprehensive hazard assessment prepared by the community.
2. Identifying the shortfalls of resources.
3. Development of a generic operations plan with annexes for the unique aspects of individual emergencies, maintenance capability, mitigation activities, emergency operations, and policy and guidance and technical and financial assistance.

TYPES OF DISASTERS

Disasters are identified as natural, technological, and civil. Earthquakes, floods, hurricanes, tornados, or nor'easters that have an extreme impact on the community are NATURAL DISASTERS.

Events that have a direct impact on the community but are caused by human omission or error are TECHNOLOGICAL DISASTERS.

Deliberate human acts, such as riots or terrorist acts that cause harm are categorized as CIVIL DISASTERS.

The North American continent is susceptible to numerous natural disasters every year. In New Jersey, a shoreline state, each year we focus on heavy rains, flooding, nor'easters and hurricane threats. Flooding is the natural disaster from which we are most at risk. Although few injuries occur from floods, more deaths and property damage can be attributed to flooding than any other natural disaster. Here are some recent examples of how flooding affected the residents in New Jersey and the cost dollar figures of damages sustained.

NATURAL DISASTERS

FLASH FLOODS - #1 Weather-related Killer in the United States!

HOW DO FLASH FLOODS OCCUR?

Several factors contribute to flash flooding. The two key elements are rainfall intensity and duration. Intensity is the rate of rainfall, and duration is how long the rain lasts. Topography, soil conditions, and ground cover also play an important role.

Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Flash floods can roll boulders, tear out trees, destroy buildings and bridges, and scour out new channels. Rapidly rising water can reach heights of 30 feet or more. Furthermore, flash flood-producing rains can also trigger catastrophic mud slides. You will not always have a warning that these deadly, sudden floods are coming. Most flood deaths are due to flash floods.

Most flash flooding is caused by slow-moving thunderstorms, thunderstorms repeatedly moving over the same area, or heavy rains from hurricanes and tropical storms.

Occasionally, floating debris or ice can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back by the ice jam or debris dam can cause flooding upstream. Subsequent flash flooding can occur downstream if the

obstruction should suddenly release.

June 9, 1972 - Black Hills, Rapid City, Sd, 15 inches of rain in 5 hours, 238 fatalities, \$164M in damages - Source: National Weather Service

Even 6 inches of fast-moving flood water can knock you off your feet, and a depth of 2 feet will float your car! NEVER try to walk, swim, or drive through such swift water. If you come upon flood waters, *STOP! TURN AROUND AND GO ANOTHER WAY.*

SOME HISTORICAL NWS DATA

Dam Break

May 31, 1889 Johnstown, Pennsylvania. . . the worst flood in United States history 36-40 ft. Wall of water . . . 2,200 dead.

River Flood

December 1991/January 1992 - South-central Texas . . . wide- spread river flooding on the Guadalupe, Brazos, Trinity and Colorado River Basins . . . up to 17 inches of rain . . 15 dead ... damages \$100M.

FLASH FLOOD EVENTS

JANUARY 1996 - Delaware River Floods - \$ 4,155,909.00 in damages.

- C PRESIDENTIAL DECLARATION - None.
- C PRELIMINARY DAMAGE ASSESSMENTS CONDUCTED - Public assistance only, no individual assistance done.
- C COUNTIES INVOLVED - Hunterdon, Sussex, Warren and State Agencies.

OCTOBER 1996 - Flooding

- C PRESIDENTIAL DECLARATION - Individual Assistance Declaration.
- C PRELIMINARY DAMAGE ASSESSMENTS CONDUCTED - Individual Assistance.
- C COUNTIES INVOLVED - Hudson, Middlesex, Somerset, Union, Morris.

DECEMBER 1996 - Raritan River Floods - \$ 7, 168,508.00

- C PRESIDENTIAL DECLARATION - None.
- C PRELIMINARY DAMAGE ASSESSMENTS CONDUCTED - Public Sector Damage with a second effort PDAR.
- C COUNTIES INVOLVED - Hudson, Hunterdon, Middlesex, Morris, Somerset, Union, Passaic and State Agencies.

JULY 1997 RAINSTORM - Raritan River Flood - \$ 8,650,000.00

- C PRELIMINARY DAMAGE ASSESSMENTS CONDUCTED - Individual Assistance There was no request to FEMA for any kind of declaration. Most of the damage was estimated damage to homes and businesses. Not much on the public sector.
- C COUNTIES INVOLVED - Essex and Union.
- C PRESIDENTIAL DECLARATION - None.

SEPTEMBER 1999 TROPICAL STORM FLOYD

- C PRESIDENTIAL DECLARATION - Individual and Public Assistance
- C COUNTIES INVOLVED - Mercer, Essex, Union, Hunterdon, Somerset, Bergen, Morris, Passaic, Middlesex, remaining 12 counties “emergency declaration.”
- C \$45 Million eligible damage to public sector
- C \$28 Disaster Housing Assistance
- C \$7 Million for Individual & Family Grant Program
- C \$39 Million in SBA loans approved
- C \$50 Special State Disaster appropriation for individuals, counties, and hazard mitigation activities
- C \$142 Million in National Flood Insurance Claims

AUGUST 2000 - TORRENTIAL RAIN & MUDSLIDES

- PRESIDENTIAL DECLARATION - Individual and Public Assistance
- COUNTIES INVOLVED - Sussex & Morris
- \$9.8 Million eligible damages to public sector
- \$2.5 Million - Disaster Housing Program
- \$170,000 Individual & Family Grant Program
- \$3.9 Million SBA Loans

FLOODING TAKES MANY FORMS. . .

Flash flooding occurs within 6 hours of the rain event. Flooding is a longer term event and may last a week or more.

River Flood - Flooding along rivers is a natural and inevitable part of life. Some floods occur seasonally when winter or spring rains, coupled with melting snows, fill river

basins, with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce river flooding.

Coastal Flood - Winds generated from tropical storms and hurricanes or intense offshore low pressure systems can drive ocean water inland and cause significant flooding. Escape routes can be cut off and blocked by high water. Coastal flooding can also be produced by sea waves called tsunamis, sometimes referred to as tidal waves. These waves are produced by earthquakes or volcanic activity.

Urban Flood - As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff 2 to 6 times over what would occur on natural terrain. During periods of urban flooding, streets can become swift moving rivers, while basements can become death traps as they fill with water.

FLASH FLOODING IN ARROYOS/WASHES

An arroyo is a water-carved gully or normally dry creek bed. Arroyos can fill with fast-moving water very quickly. Flash flooding at this arroyo in Arizona took only 58 seconds to develop.

Ice Jam - Floating ice can accumulate at a natural or manmade obstruction and stop the flow of water.

HOW CAN A FOOT OR TWO OF WATER COST YOU YOUR LIFE?

Water weighs 62.4 lbs. per cubic foot and typically flows downstream at 6 to 12 miles an hour.

When a vehicle stalls in the water, the water's momentum is transferred to the car. For each foot the water rises, 500 lbs. of lateral force are applied to the car.

But the biggest factor is buoyancy. For each foot the water rises up the side of the car, the car displaces 1,500 lbs. of water. In effect, the car weighs 1,500 lbs. less for each foot the water rises.

Two feet of water will carry away most automobiles.

WHAT YOUR COMMUNITY CAN DO:

Assist hospitals and other operations which are critically affected by power failure by arranging for auxiliary power supplies.

River/rainfall readings are valuable to local emergency management agencies (EMA) and the National Weather Service (NWS) in assessing flood conditions and taking appropriate actions.

Advanced warning provided by early detection is critical to saving lives. Automatic flood detection systems are available commercially for flood-prone communities.

Contact your local NWS office or emergency management agency for further information on Local flood warning systems.

NOAA WEATHER RADIO IS THE BEST MEANS TO RECEIVE WARNINGS FROM THE NATIONAL WEATHER SERVICE.

The National Weather Service continuously broadcasts updated weather warnings and forecasts that can be received by NOAA Weather Radios sold in many stores. The average range is 40 miles, depending on topography. Your National Weather Service recommends purchasing a radio that has both a battery backup and a tone-alert feature which automatically alerts you when a watch or warning is issued.

WHAT TO LISTEN FOR. . .

Flash flood or flood watch: Flash flooding or flooding is possible within the designated watch area - be alert.

Flash flood or flood warning: Flash flooding or flooding has been reported or is imminent - take necessary precautions at once.

Urban and small stream advisory: Flooding of small streams, streets, and low-lying areas, such as railroad underpasses and urban storm drains, is occurring.

Flash flood or flood statement: Follow-up information regarding a flash flood/flood event.

INFORMATION FOR THE PUBLIC ...

- C Get out of areas subject to flooding. This includes dips, low spots, canyons, washes, etc.
- C Avoid already flooded and high velocity flow areas. Do not attempt to cross flowing streams.
- C If driving, be aware that the road bed may not be intact under flood waters. Turn around and go another way. NEVER drive through flooded roadways!
- C If the vehicle stalls, *leave it immediately and seek higher ground*. Rapidly rising water may engulf the vehicle and its occupants and sweep them away. Remember, it's better to be wet than dead!

- C Be especially cautious at night when it is harder to recognize flood dangers.
- C Do not camp or park your vehicle along streams and washes, particularly during threatening conditions.

DURING THE FLOOD:

- C Avoid areas subject to sudden flooding.
- C If you come upon a flowing stream where water is above your ankles, STOP! Turn around and go another way.
- C Do not attempt to drive over a flooded road. The depth of water is not always obvious. The road bed may be washed out under the water, and you could be stranded or trapped.
- C Children should never play around high water, storm drains, viaducts, or arroyos.

AFTER THE FLOOD:

- C If fresh food has come in contact with flood waters, throw it out.
- C Boil drinking water before using. Wells should be pumped out and the water tested for purity before drinking. If in doubt, call you local public health authority.
- C Seek necessary medical care at the nearest hospital. Food, clothing, shelter, and first aid are available from the Red Cross.
- C Do not visit disaster areas. Your presence might hamper rescue and other emergency operations.
- C Electrical equipment should be checked and dried before being returned to service.
- C Use flashlights, not lanterns, torches or matches, to examine buildings. Flammable materials may be inside.
- C Report broken utility lines to appropriate authorities.

FAMILY DISASTER PLAN

Families should be prepared for all hazards that affect their area. NOAA's National Weather Service, the Federal Emergency Management Agency, and the American Red Cross urge each family to develop a family disaster plan.

Where will your family be when disaster strikes? They could be anywhere - at work, at

school, or in the car. How will you find each other? Will you know if your children are safe? Disasters may force you to evacuate your neighborhood or confine you to your home. What would you do if basic services - water, gas, electricity or telephones - were cut off?

A DISASTER SUPPLIES KIT SHOULD INCLUDE:

1. A 3-day supply of water (one gallon per person per day) and food that won't spoil
2. One change of clothing and footwear per person
3. One blanket or sleeping bag per person, a first aid kit, including prescription medicines
4. Emergency tools, including a battery-powered NOAA Weather Radio and a portable radio, flashlight, and plenty of extra batteries an extra set of car keys and a credit card or cash.

THUNDERSTORMS

Thunderstorms affect relatively small areas when compared with hurricanes and winter storms. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Nearly 1,800 thunderstorms are occurring at any moment around the world. That's 16 million a year!

Despite their small size, all thunderstorms are dangerous. Every thunderstorm produces lightning, which kills more people each year than tornadoes. Heavy rain from thunderstorms can lead to flash flooding. Strong winds, hail, and tornadoes are also dangers associated with some thunderstorms.

Of the estimated 100,000 thunderstorms that occur each year in the United States, only about 10 percent are classified as severe.

Your National Weather Service considers a thunderstorm severe if it produces hail at least 3/4-inch in diameter, wind 58 mph or higher, or tornadoes.

Lightning

- C Occurs with all thunderstorms.
- C Averages 93 deaths and 300 injuries each year.
- C Causes several hundred million dollars in damage to property and forests annually.

Flash Floods/Floods

- C The number one thunderstorm killer. . . nearly 140 fatalities each year.
- C Most flash flood deaths occur at night and when people become trapped in automobiles.

Straight-line Winds

- C Responsible for most thunderstorm wind damage.
- C Winds can exceed 100 mph!
- C One type of straight-line wind, the **down burst**, can cause damage equivalent to a strong tornado and can be extremely dangerous to aviation.
- C During the summer in the western states, thunderstorms often produce little rain but very strong wind gusts and dust storms.

Large Hail

- C Causes nearly \$1 billion in damage to property and crops annually.
- C Costliest United States hailstorm: Denver, Colorado, July 11, 1990. Total damage was \$625 million.

Tornadoes

- C Nature's most violent storms.
- C Winds can exceed 200 mph.
- C Result in an average of 80 deaths and 1,500 injuries each year.
- C Most fatalities occur when people do not leave mobile homes and automobiles.

WHAT MAKES A THUNDERSTORM?

1. *Moisture* - to form clouds and rain.
2. *Unstable Air* - relatively warm air that can rise rapidly.
3. *Lift* - fronts, sea breezes, and mountains are capable of lifting air to help form thunderstorms.

WHEN ARE THUNDERSTORMS MOST LIKELY?

- C Thunderstorms are most likely to happen in the spring and summer months and during the afternoon and evening hours but can occur year-round and at all hours.
- C Along the Gulf Coast and across the southeastern and western states, most thunderstorms occur during the afternoon.
- C Thunderstorms frequently occur in the late afternoon and at night in the Plains states.
- C Thunder and lightning occasionally accompany snow or freezing rain. During the blizzard of March 1993, lightning resulted in power outages near Washington, D.C.!

THUNDERSTORM WINDS AND HAIL

Down bursts

- C A small area of rapidly descending air beneath a thunderstorm.
- C Can cause damaging winds in excess of 100 mph.
- C The strong winds usually approach from one direction and may be known as “straight-line” winds.
- C In extreme cases, straight-line winds can reach speeds equal to a strong tornado, causing significant damage to some buildings.
- C Strong winds may or may not be accompanied by rain.

Large Hail

- C The strong rising currents of air within a storm, called *updrafts*, carry water droplets to a height where freezing occurs.
- C Ice particles grow in size, finally becoming too heavy to be supported by the updraft and fall to the ground.
- C Large hailstones fall at speeds faster than 100 mph.

WHAT IS LIGHTNING?

- C The action of rising and descending air within a thunderstorm separates positive and negative charges. Water and ice particles also affect the distribution of electrical charge.
- C Lightning results from the buildup and discharge of electrical energy between positively and negatively charged areas.
- C The average flash could light a 100-watt light bulb for more than 3 months.
- C Most lightning occurs within the cloud or between the cloud and ground.
- C Your chances of being struck by lightning are estimated to be 1 in 600,000 but could be reduced by following safety rules.
- C Most lightning deaths and injuries occur when people are caught outdoors. Most lightning casualties occur in the summer months and during the afternoon and early evening.
- C The air near a lightning strike is heated to 50,000 F-*hotter than the surface of the sun!* The rapid heating and cooling of air near the lightning channel causes a shock wave that results in thunder.
- C Many fires in the western United States and Alaska are started by lightning. In the past decade, over 15,000 lightning-induced fires nationwide have resulted in several hundred million dollars a year in damage and the loss of 2 million acres of forest.
- C In recent years, sophisticated lightning detection equipment has monitored cloud-to-ground lightning strikes.
- C

WHICH WAY DOES LIGHTNING TRAVEL?

A cloud-to-ground lightning strike begins as an invisible channel of electrically charged air moving from the cloud toward the ground. When one channel nears an object on the ground, a powerful surge of electricity from the ground moves upward to the cloud and produces the visible lightning strike!

LIGHTNING MYTHS AND FACTS

MYTH: If it is not raining, then there is no danger from lightning.

FACT: Lightning often strikes outside of heavy rain and may occur as far as 10 miles away from any rainfall.

MYTH: The rubber soles of shoes or rubber tires on a car will protect you from being struck by lightning.

FACT: Rubber-soled shoes and rubber tires provide no protection from lightning. However, the steel frame of a hard-topped vehicle provides increased protection if you are not touching metal. Although you may be injured if lightning strikes your car, you are much safer inside a vehicle than outside.

MYTH: People struck by lightning carry an electrical charge and should not be touched.

FACT: Lightning-strike victims carry no electrical charge and should be attended to immediately.

MYTH: "Heat lightning" occurs after very hot summer days and poses not threat.

FACT: What is referred to as "heat lightning" is actually lightning from a thunderstorm too far away for thunder to be heard. However, the storm may be moving in your direction!

To estimate the distance in miles between you and the lightning flash, count the seconds between the lightning and the thunder and divide by five.

ADVANCED WEATHER RADAR SEES "INSIDE" THE STORM

Doppler Radars, which are being strategically deployed around the country, are capable of seeing "inside" a thunderstorm to detect hazardous weather conditions. Doppler radar images can reflect wind direction, precipitation intensity, and the leading edge of the storm's cool-air outflow. (New storms often form along this feature.)

NOAA WEATHER RADIO IS THE BEST MEANS TO RECEIVE WARNINGS FROM THE NATIONAL WEATHER SERVICE

The National Weather Service continuously broadcasts updated weather warnings and forecasts that can be received by NOAA Weather Radios, which are sold in many stores. The average range is 40 miles, depending on topography. Your National Weather Service recommends purchasing a radio that has both a battery backup and a tone-alert feature that automatically alerts you when a watch or warning is issued.

SEVERE THUNDERSTORM WATCH

- C Tells you when and where severe thunderstorms are more likely to occur. Watch the sky and stay tuned to know when warnings are issued. Watches are intended to heighten public awareness and should not be confused with warnings.

SEVERE THUNDERSTORM WARNING

- C Issued when severe weather has been reported by spotters or indicated by radar. Warnings indicate imminent danger to life and property to those in the path of the storm.

FAMILY DISASTER PLAN

Families should be prepared for all hazards that could affect their area. NOAA's National Weather Service, the Federal Emergency Management Agency, and the American Red Cross urge every family to develop a family disaster plan.

Some questions to be considered?

- C Where will your family be when disaster strikes? They could be anywhere-at work, at school, or in the car.
- C How will you find each other?
- C Will you know if your children are safe? Disaster may force you to evacuate your neighborhood or confine you to your home.
- C What would you do if basic services-water, gas, electricity or telephones-were cut off?

TORNADOS

Although tornadoes occur in many parts of the world, these destructive forces of nature are found most frequently in the United States east of the Rocky Mountains during the spring and summer months. In an average year, 800 tornadoes are reported nationwide, resulting in 80 deaths and over 1,500 injuries. A tornado is defined as a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be in excess of one mile wide and 50 miles long. Once a tornado in Borken Bow, Oklahoma, carried a motel sign 30 miles and dropped it in Arkansas!

WHAT CAUSES TORNADOES?

Thunderstorms develop in warm, moist air in advance of eastward-moving cold fronts. These thunderstorms often produce large hail, strong winds, and tornadoes. Tornadoes in the winter and early spring are often associated with strong, frontal systems that form in the Central States and move east. Occasionally, large outbreaks of tornadoes occur with this type of weather pattern. Several states may be affected by numerous severe thunderstorms and tornadoes.

During the spring in the Central Plains, thunderstorms frequently develop along a "dryline," which separates very warm, moist air to the east from hot, dry air to the west. Tornado-producing thunderstorms may form as the dryline moves east during the afternoon hours.

Along the front range of the Rocky Mountains, in the Texas panhandle, and in the southern High Plains, thunderstorms frequently form as air near the ground flows "up slope" toward higher terrain. If other favorable conditions exist, these thunderstorms can produce tornadoes.

Tornadoes occasionally accompany tropical storms and hurricanes that move over land. Tornadoes are most common to the right and ahead of the path of the storm center as it comes onshore.

TORNADO VARIATIONS

Some tornadoes may form during the early stages of rapidly developing thunderstorms. This type of tornado is most common along the front range of the Rocky Mountains, the Plains, and the Western States.

Tornadoes may appear nearly transparent until dust and debris are picked up.

Occasionally, two or more tornadoes may occur at the same time.

Waterspout

Waterspouts are weak tornadoes that form over warm water.

Waterspouts are most common along the Gulf Coast and southeastern states. In the western United States, they occur with cold late fall or late winter storms, during a time when you least expect tornado development. Waterspouts occasionally move inland becoming tornadoes causing damage and injuries.

TORNADO MYTHS:

MYTH: Areas near rivers, lakes, and mountains are safe from tornadoes.

FACT: No place is safe from tornadoes. In the late 1980's, a tornado swept through Yellowstone National Park leaving a path of destruction up and down a 10,000 ft. mountain.

MYTH: The low pressure with a tornado causes buildings to “explode” as the tornado passes overhead.

FACT: Violent winds and debris slamming into buildings cause most structural damage.

MYTH: Windows should be opened before a tornado approaches to equalize pressure and minimize damage.

FACT: Opening windows allows damaging winds to enter the structure. Leave the windows alone; instead, immediately go to a safe place.

Remember, tornadoes occasionally develop in areas in which a severe thunderstorm watch or warning is in effect. Remain alert to signs of an approaching tornado and seek shelter if threatening conditions exist.

TORNADO SAFETY IN SCHOOLS

C Every School Should Have A Plan.

C Develop a severe weather action plan and have frequent drills.

C Each school should be inspected and tornado shelter areas designated by a registered engineer or architect. Basements offer the best protection. Schools without basements should use interior rooms and hallways on the lowest floor and away from windows.

C Those responsible for activating the plan should monitor weather information from NOAA Weather Radio and local radio/television.

- C If the school's alarm system relies on electricity, have a compressed air horn or megaphone to activate the alarm in case of power failure.
- C Make special provisions for disabled students and those in portable classrooms.
- C Make sure someone knows how to turn off electricity and gas in the event the school is damaged.
- C Keep children at school beyond regular hours if threatening weather is expected. Children are safer at school than in a bus or car. Students should not be sent home early if severe weather is approaching.
- C Lunches or assemblies in large rooms should be delayed if severe weather is anticipated. Gymnasiums, cafeterias, and auditoriums offer no protection from tornado-strength winds.
- C Move students quickly into interior rooms or hallways on the lowest floor. Have them assume the tornado protection positions.

Hospitals, nursing homes, and other institutions should develop a similar plan

Your National Weather Service, Federal Emergency Management Agency, and American Red Cross educate community officials and the public concerning the dangers posed by tornadoes. You can prepare for the possibility of a tornado by learning the safest places to seek shelter when at home, work, school, or outdoors. You should also understand basic weather terms and danger signs related to tornadoes. Your chances of staying safe during a tornado are greater if you have a plan for you and your family, and practice the plan frequently.

HURRICANES

HURRICANES are masses of warm moist air rotating around in a low pressure area. These masses develop seasonally over the Atlantic and Caribbean. When they reach speeds of seventy-four miles per hour, they are called hurricanes. Hurricanes can easily change course, subjecting coastal areas to a tidal or storm surge whose effects are much like those of a flash flood. Hurricane Hugo in 1989 inflicted more than seven billion dollars damage on South Carolina.

There are no other storms like hurricanes on earth. Views of hurricanes from satellites located thousands of miles above the earth show how unique these powerful, tightly coiled weather systems are.

Hurricanes are products of the tropical ocean and atmosphere. Powered by heat from the sea, they are steered by the easterly trade winds and the temperate westerlies as well as by their own ferocious energy. Around their core, winds grow with great velocity, generating violent seas. Moving ashore, they sweep the ocean inward while spawning tornadoes and producing torrential rains and floods. Each year on average, ten tropical storms (of which six become hurricanes) develop over the Atlantic Ocean, Caribbean Sea, or Gulf of Mexico. Many of these remain over the ocean. However, about five hurricanes strike the United States coastline every 3 years. Of these five, two will be major hurricanes (category 3 or greater on the Saffir-Simpson Hurricane Scale).

WHAT IS A HURRICANE?

A Hurricane is a type of tropical cyclone--the general term for all circulating weather systems (counterclockwise in the Northern Hemisphere) over tropical waters. Tropical cyclones are classified as follows:

TROPICAL DEPRESSION - An organized system of clouds and thunderstorms with a defined circulation and maximum sustained winds of 38 mph (33 knots) or less.

TROPICAL STORM - An organized system of strong thunderstorms with a defined circulation and maximum sustained winds of 39 to 73 mph (34-63 knots).

HURRICANE - An intense tropical weather system with a well defined circulation and maximum sustained winds of 74 mph (64 knots) or higher. In the western Pacific, hurricanes are called "typhoons," and similar storms in the Indian Ocean are called "cyclones."

Timely warnings have greatly diminished hurricane fatalities in the United States. In spite of this, Property damages continues to mount. There is little we can do about the hurricanes themselves. However, NOAA'S National Hurricane Center and National Weather Service field offices team up with other Federal, state, and local agencies; rescue and relief organizations; the private sector; and the news media in a warning and preparedness effort.

In the eastern Pacific, hurricanes begin forming by mid-May, while in the Atlantic, Caribbean, and Gulf of Mexico, hurricane development starts in June. For the United States, the peak hurricane threat exists from mid-August to late October although the official hurricane season extends through November. Developing hurricanes gather heat and energy through contact with warm ocean waters. The addition of moisture by evaporation from the sea surface powers them like giant heat engines.

The process by which a disturbance forms and subsequently strengthens into a hurricane depends on at least three conditions.

1. Warm waters
2. Moisture

3. Wind patterns near the ocean surface.

Bands of thunderstorms form, allowing the air to further warm and rise higher into the atmosphere. If the winds at these higher levels are relatively light, this structure can remain intact and allow for additional strengthening.

The center, or eye, of a hurricane is relatively calm. The most violent activity takes place in the area immediately around the eye, called the eye wall. At the top of the eye wall most of the air is propelled outward, increasing the air's upward motion. Some of the air moves inward and sinks into the eye, creating a cloud-free area.

WHAT IS STORM SURGE?

Storm surge is a large dome of water often 50 to 100 miles wide that sweeps across the coastline near where a hurricane makes landfall. The surge of high water topped by waves is devastating. The stronger the hurricane and shallower the offshore water, the higher the surge will be. Along the coast, storm surge is the greatest threat to life and property.

SAFFIR-SIMPSON HURRICANE SCALE

Scale Number (Category)	Sustained Winds (MPH)	Damage	Examples
1	74-95	Minimal	Florence 1988 (LA) Charley 1988 (NC)
2	96-110	Moderate	Kate 1985 (FL Panhandle) Bob 1991 (RI)
3	111-130	Extensive	Alicia 1983 (N TX) Emily 1993 (NC Outer Banks)
4	131-155	Extreme	Andrew 1992 (S FL) Hugo 1989 (SC)
5	>155	Catastrophic	Camille 1969 (LA/MS) Labor Day Hurricane 1935 (FL Keys)

WHAT IS STORM TIDE?

If the storm surge arrives at the same time as high tide, the water height will be even greater. The storm tide is a combination of the storm surge and the normal astronomical tide.

INFORMATION OR LOCAL DECISION MAKERS

THE PUBLIC ADVISORY issued by the National Hurricane Center provides critical hurricane warning and forecast information.

THE MARINE ADVISORY issued by the National Hurricane Center provides detailed hurricane track and wind field information.

THE TROPICAL CYCLONE UPDATE issued by the National Hurricane Center provides significant changes in a hurricane that occur between advisories.

PROBABILITIES OF HURRICANE/TROPICAL STORM CONDITIONS provide a measure of the forecast track accuracy. The probabilities have no relation to tropical cyclone intensity.

HURRICANE LOCAL STATEMENTS issued by the local national weather service offices give greater detail on how the storm will impact your area.

TECHNOLOGICAL DISASTERS

Technological disasters, which may or may not involve hazardous materials, usually occur with little or no warning. They also may be insidious, and the victims may not know they have been affected until many years later. Although there are many types of technological disasters, the most common involve fires and explosions. Other kinds of disasters are; transportation accidents, i.e., airplane crashes, structural failures, i.e., building collapses, and rail and highway hazardous materials incidents.

In 1968, Congress established the National Contingency Plan (NCP), to help bring federal agency expertise on incidents involving spills of oil and hazardous substances. The two primary legal authorities for the NCP are the Clean Water Act, which establishes a fund for federal response to oil spills; and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), which established the Superfund for federal responses to release of hazardous materials.

In 1984, after the Bhopal, India disaster in which a cloud of deadly methyl isocyanate gas escaped from a Union Carbide chemical plant, killing more than 25,000 people and leaving tens of thousands injured, Congress enacted legislation mandating disaster planning wherever hazardous materials are in use.

THE SUPERFUND AMENDMENT AND REAUTHORIZATION ACT (SARA) is designed to assist localities and its citizens in preparing for and responding to hazardous

materials incidents. Title III of SARA, also known as the Emergency Planning and Community Right-to-Know Act requires detailed information about the nature of the hazardous substance in or near communities be made available to the public.

CIVIL DISASTERS

Civil disasters are civil disturbances, massacres, and other deliberately destructive human actions that impact our communities. The results that occur are usually widespread illnesses, injuries, destruction of property and long-term social and economic disruption. Terrorism is a civil incident with the potential to lead to civil disaster. Highly destructive weapons and political unrest have made terrorism of particular concern in the United States.

Here are some examples of terrorist activities in the United States:

The FBI has recorded one act of terrorism, one suspected act of terrorism, and two terrorism preventions on U.S. soil in 1995. Terrorism related events--including terrorism trials--occurred in eight states. The most significant terrorist-related events include the following:

FEB 26, 1993, A car bomb at the World Trade Center in New York City exploded, killing 6 people, injuring thousands and causing extensive damage.

FEB. 28, 1995, (4) members of a domestic extremist group violating the Biological Weapons Anti-Terrorism Act of 1989. The subjects manufactured the biological agent RICIN with the intent to kill law enforcement officers.

APRIL 19, 1995, A truck bomb destroyed the Alfred P. Murrah Federal Building in Oklahoma City, killing 168 citizens and injuring hundreds. It was the deadliest terrorist event on US soil.

OCTOBER 9, 1995, A 12 car Amtrak train derailment in Arizona. The derailment killed one (1) person and seriously injured (12) others. Suspected act is still under investigation.

NOVEMBER 11, 1995, FBI prevented an act of terrorism by arresting four US (4) persons in Oklahoma for illegally conspiring to manufacture and possess a destructive device. The subjects were considering attacking civil rights offices, abortion clinics, and federal offices.