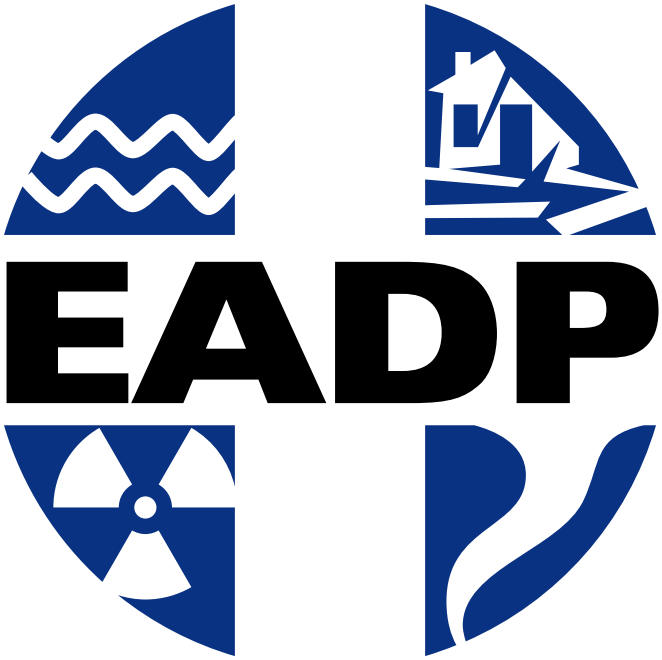
Hazards and Vulnerability Analysis



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Bombing/Terrorism	rare	short	varies	fast	varies	random	low
Building Collapse	rare	short	limited	fast	concentrated	random	low
Civil Disorder/Unrest	rare	varies	varies	varies	varies	random	moderate
Dam Failure	rare	short	widespread	varies	diffuse	random	low
Disease Outbreak	moderate	varies	varies	varies	varies	random	moderate
Drought	frequent	long	widespread	slow	diffuse	seasonal	moderate
Earthquake	rare	short	widespread	fast	diffuse	random	low
Extreme Heat	frequent	long	widespread	slow	diffuse	seasonal	high
Fire	rare/moderate	varies	varies	fast	varies	random/seasonal	moderate
Flood	moderate	varies	widespread	varies	diffuse	random/seasonal	moderate
HAZMAT Incident	rare	varies	varies	fast	varies	random	moderate
Thunderstorm	frequent	varies	widespread	varies	diffuse	seasonal	high
Tornado	rare/moderate	short	varies	fast	concentrated	seasonal	high
Utility Shortage/Outage	rare	varies	widespread	varies	diffuse	random	low
Water Contamination	rare	long	widespread	varies	diffuse	random	low
Winter/Ice Storm	rare/moderate	varies	widespread	varies	diffuse	seasonal	moderate

AVIATION INCIDENT

Background
An aviation incident includes any type of accident involving an aircraft (i.e.: crash, mid-air explosion, emergency landing) that would disrupt the normal operations of UNT. To date, no major aircraft incident has taken place on campus. However, the sky above UNT is traveled heavily by aircraft of varying sizes. Due to this, and the fact there are a number of local, regional, and international airports within a short distance of UNT, there is a high probability that a major aviation incident could take place on campus.

Frequency
Frequency for this type of incident is rare to moderate.

Duration
The duration, though usually short, varies depending upon the crash site location and the specifics of the incident (i.e.: fuel load, aircraft size, number of passengers, etc.).

Areal Extent
Areal extent is usually limited but can vary.

Speed of Onset
Speed of onset is fast.

Spatial Dispersion
Though spatial dispersion is usually concentrated, it can vary depending on the incident.

Temporal Spacing
Temporal spacing is random.

Risk
Risk of occurrence and impact is low to moderate.

Previous Incidents
- January 2002: A small plane went down just north of Denton.
- July 2002: A small plane crashed north of Denton.

Response and Recovery Issues
Even though the risk for this type of incident is low, emergency crews and managers need to prepare to respond to an aviation incident. An important aspect to consider during preparation is that aviation fuel, which is extremely flammable, usually cannot be extinguished with water. Though obtaining the necessary equipment as well as training personnel can be costly, there is the possibility of sharing the cost with the Denton Fire Department or Texas Woman's University. An additional consideration that may result from this type of incident could be ground contamination due to leaked or spilled fuel.

Suggested Course of Action
- Prepare a plan that covers a possible aircraft crash.
- Create and maintain mutual aid agreements with agencies which will be involved in responding to aviation incidents (i.e.: Denton Fire Department, HAZMAT Team).

- Train first responders, employees, and staff on the proper emergency procedures should an aircraft incident occur on UNT property (i.e.: evacuate the area, notify the Fire Department).
- Develop and maintain relationships with local airport authorities.

BOMBING/TERRORISM

Background
A bombing or terrorist attack, either real or threatened, can affect the safety and health of the population in addition to the physical and structural environment of UNT. Terrorism is defined as the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom. Terrorists often use threats to create fear among the public to try to convince citizens that their government is powerless to prevent terrorism and to get immediate publicity for their causes.

Frequency
False alarms/threats are frequent while real events are rare.

Duration
Duration of the actual event is usually short but the effects could be long-term especially if chemical or biological materials are involved.

Areal Extent
Areal extent is usually limited but can vary depending on the incident.

Speed of Onset
Speed of onset is usually quick (i.e.: bombing) but can vary depending on the incident (i.e.: biological attack).

Spatial Dispersion
Spatial dispersion varies depending on the incident.

Temporal Spacing
Temporal Spacing is random, though most terrorist incidents are politically motivated and thus can usually be anticipated.

Risk
Risk of a threat is high, while the risk of a real event at UNT is low.

Previous Incidents
- August, 1966: At the University of Texas' clock tower, a single gunman killed 16 people and wounded 31 others before he himself was killed.
- April, 1999: In Columbine, Colorado, two high school students, wearing long black trench coats, approached their high school, pulled out weapons and began firing at people in the parking lot. They proceed inside the school shooting as they walked. Fifteen people were killed and many more were injured.
- September, 1999: On the campus of the Florida A&M 2 pipe bombs explode on campus.
- August, 2002: A bomb hidden in a bag ripped through a busy cafeteria at Hebrew University in Jerusalem killing seven people (including three Americans) and wounding 80 others.

Response and Recovery Issues
The results of these types of incidents are hard to predict due to numerous unknown factors such as the size of event, time of day, warning time, method of delivery, etc. There are many important issues to consider, one of which is the fact that much of the materials necessary for an explosive device can be

obtained on or near campus. An additional issue to consider is that many terrorist incidents include a secondary incident which is intended to disable or deter response and recovery efforts as well as creating more victims. Even though UNT is not a likely target for a bombing, the effects that would result could be devastating to the school as well as those who are directly affected by the incident (i.e.: students withdrawing, lower enrollment). Due to this fact, terrorism, either domestic or international, should be a high priority to plan and prepare for.

Suggested Course of Action

- Create and maintain procedures regarding UNT's roles and responsibilities during this type of event.
- Prepare, train, and equip the UNT Police Department and other personnel to handle a bombing/terrorism event.
- Create and maintain agreements with the agencies who will provide support (i.e.: Denton Police and Fire Departments).
- Secure and evacuate the area as soon as possible.
- Be cautious of secondary devices.

BUILDING COLLAPSE

Background
The University of North Texas has many buildings of varying sizes which are maintained by the institution. A collapse of one of those buildings could result in loss of life, income, and property damage as well as costly legal liability. There would also be costs associated with clean up, rebuilding, and the probable decline of student enrollment due to the incident.

Frequency
Frequency is rare due to the regular maintenance, up-keep, and replacement of the buildings.

Duration
Duration of the incident would be short while the effects could be long-term depending upon the amount of damage.

Areal Extent
Areal extent of a building collapse would be limited.

Speed of Onset
Speed of onset would be fast.

Spatial Dispersion
Spatial dispersion will usually be concentrated.

Temporal Spacing
Temporal spacing would be random.

Risk
Risk of occurrence is low because the buildings are maintained to safety and building code standards.

Previous Incidents
- February, 1999: In Lake Worth, Texas, three firefighters died while fighting a fire because of the collapse of the roof truss system.
- March, 2000: Within ten minutes, a tornado damaged or destroyed up to 80 homes and 50 office buildings in the Fort Worth area. Many of the deaths and injuries were the result of collapsing buildings.
- September, 2001: The World Trade Center Twin Towers in New York collapsed after an airliner was crashed into each tower. Many first responders, as well as thousands of people who worked in the buildings, were killed. Other buildings in the area also collapsed due the massive amount of damage caused by the initial collapse of the two towers.

Response and Recovery Issues
UNT has a responsibility to the students and faculty to provide assurance that an emergency plan is in place for this type of hazard. Issues to consider would be search and rescue, counseling for the students and faculty, and the desire for parents and students to be in contact each other. Though a building is not likely to collapse without an initial disaster (i.e.: earthquake, fire, tornado, etc.), this type of incident should be prepared for because it is a likely secondary hazard and can be just as devastating.

Suggested Course of Action

- Create a plan to respond to the results (i.e.: debris, temporary housing, etc.) of a building collapse.
- Decide when emergency crews should be allowed access to the site.
- Evacuate buildings located near the incident site due to possible fires, structural problems, gas leaks, etc.
- Keep the public information officer informed regarding the situation, the injured and their status.

CIVIL DISORDER/UNREST

Background
Any domestic situation such as a demonstration, strike, riot, or public panic that has the potential of causing casualties and/or major property damage could be considered civil disorder or unrest. This type of incident could be the result of global events, UNT policies, or the controversial topic a visiting speaker is presenting. The presence of alcohol may also contribute to an already volatile situation.

Frequency
Frequency is rare at UNT.

Duration
The duration will vary depending upon the size of the incident.

Areal Extent
Areal Extent varies depending upon the incident.

Speed of Onset
Speed of onset is usually fast. However, due to the nature of civil unrest, anticipation of an incident is possible.

Spatial Dispersion
Spatial dispersion is concentrated because incidents usually occur within a limited area.

Temporal Spacing
Temporal spacing is random. Incidents usually occur during a volatile situation such as protests, controversial speakers, sporting events, or racial/religious gatherings.

Risk
Risk of a civil disturbance at UNT is moderate and must be considered due to its diverse population.

Previous Incidents
- Los Angeles Rodney King Riot, 1992: Major damage throughout the city resulted from this incident. The rioters and looters greatly out numbered the Los Angeles Police Department personnel.
- Michigan State University Riot, 1999: There was moderate damage caused to the campus and surrounding areas. Examples of the illegal acts that took place included: setting fires, mob violence, and throwing bottles at police.
- Los Angeles Lakers NBA Championship Riot, 2001: Resulted in minimal to moderate damage within a contained area. Mass convergence on the scene of celebration and was followed by vandalizing property, burning police cars, and throwing objects at police.
- University of North Texas, 2001: Anti-abortion protesters held a demonstration on campus and due to the controversial nature of the topic, there were many angry and vocal debates. Fortunately these debates did not get out of hand and no violence took place.

Response and Recovery Issues
A major issue during this type of incident is how to contain and control mob violence. This could be a major concern because the people causing the disturbance usually outnumber the ones trying to maintain order. Additional issues that are looting, damage to property, and mass convergence on the area. Though

UNT has not experienced a major civil disturbance there is still a risk, especially during specific events such as sporting events, religious debates, or civil rights gatherings.

Suggested Course of Action

- Report the incident to the UNT Police immediately.
- Disperse those that are involved in the incident and keep the area clear.
- Increase the number of officers patrolling the campus.
- Request additional assistance from the Denton Police Department if necessary.
- Establish a curfew or any "no-entry" zones that are necessary.

DAM FAILURE

Background
There are two lakes located to the east of the city of Denton. One is Lake Ray Roberts, which is located north-east of Denton and the other is Lake Lewisville which is located south east of Denton. Both lakes are man-made with earthen dams and are maintained by the Army Corp of Engineers. Because of the distance, location, and adequate maintenance of the dams, there is an extremely low probability of a dam failure directly affecting UNT. However, three major watersheds traverse the city of Denton: Cooper Creek, Pecan Creek, and Hickory Creek. If a dam failure did occur it would increase flooding in the city of Denton because the lake's floodwater would drain into the water shed and would indirectly affect UNT.

Frequency
The frequency of occurrence is rare.

Duration
Duration, though usually short, may vary depending upon the type of failure.

Areal Extent
Areal extent of a dam failure would be widespread.

Speed of Onset
Speed of onset of the actual dam failure and the resulting flooding will usually be fast while its effects may be long lasting.

Spatial Dispersion
Spatial dispersion would be diffuse.

Temporal Spacing
Temporal spacing for a dam failure is random though more likely to take place during periods of heavy rainfall like Spring.

Risk
Risk of a dam failure affecting UNT is low.

Previous Incidents
- June, 1889; Johnstown, Pennsylvania: Massive rainfall contributed to the South Fork Dam failure and the resulting flood where 2,209 people where killed and thousand more were injured and left homeless.
- June, 1976; Fremont County, Idaho: Teton Dam failed and released nearly 300,000 acre feet of water, then flooded farmland and towns downstream with the eventual loss of 14 lives and with a cost estimated to be nearly $1 billion. The dam collapsed just as the water behind it was approaching full reservoir capacity for the first time.

Response and Recovery Issues
A dam failure could be a major disaster due to the resulting flooding. Issues such as contaminated drinking water; impassable roadways; unsanitary conditions; relocation of dorms, offices, and classrooms; individuals becoming trapped or drowning; as well as many others are likely to be faced by emergency management officials and responders during such an incident.

Suggested Course of Action

- Take appropriate steps to warn the affected populations.
- Plan evacuation routes that are safe, realistic and which can support a large number of students.
- Establish evacuation criteria for the affected communities and plan temporary shelters.
- Develop a method of accountability for missing personnel and medical treatment for those affected.

DISEASE OUTBREAK

Background
A disease outbreak is an uncontrollable spread of virus or bacteria affecting the health and well being of the population. The disease could result in only a few days of sickness, a life-long infection, or even death in a relatively short time period. Because of the diverse and concentrated population of UNT and the fact that there are many students and faculty who participate in international travel regularly, a serious disease outbreak is very possible and should be considered by UNT officials.

Frequency
The frequency of occurrence of a disease outbreak is moderate.

Duration
Duration varies depending on the disease.

Areal Extent
The areal extent of an outbreak will vary and is dependent on the delivery method and the disease.

Speed of Onset
The speed of onset will vary and is dependent on the characteristics of the disease.

Spatial Dispersion
The spatial dispersion will vary and is dependent on the disease.

Temporal Spacing
The temporal spacing is random.

Risk
The risk of a disease outbreak at UNT is low to moderate.

Previous Incidents
- 2001-2002: At UNT there was one reported case of Meningitis, and 800 people treated.
- 2001-2002: On campus there were two reported cases of Chicken Pox, and 28 treated.
- 2001-2002: There were 15 reported cases of Ecoli and 15 individuals treated at UNT.

Response and Recovery Issues
Prevention and control of outbreaks is dependent on the capability of the medical industry as well as educating the public regarding different diseases and ways they can protect themselves. Identification of the disease itself may prove to be difficult and time consuming during which time the disease may spread. In addition, if there is a large-scale outbreak, having enough medical supplies may become an issue. The UNT health center should be cognizant of disease trends and work closely with other medial professionals in monitoring these trends.

Suggested Course of Action
- Monitor trends in the UNT health center for possible outbreaks.
- Attempt to identify and contain the spread of the disease.

- Begin issuing warnings regarding the disease and vaccinating those affected.
- Find and contain the originating point of the outbreak.

Common Diseases

Hazard	Risk	Frequency	Onset	Duration
Meningitis	low/moderate	annual	0-72hrs	0-12wks
Tuberculosis	low/moderate	annual	1day-6mths	months if not treated
Chicken Pox	moderate	semi-annual	0-72hrs	up to 3wks
Hepatitis	low	1-5yrs	0-6wks	years if not treated
Ecoli	low	1-3yrs	0-72hrs	5-10 days after treatment

DROUGHT

Background
A drought is a long period of abnormally low rainfall, especially one that adversely affects growing or living conditions. Even though UNT may not be directly affected by a drought there will be indirect effects such as water rationing, increased fire hazard, higher risk of heat related illness or death, etc.

Frequency
The historical frequency has averaged one drought to every five years.

Duration
Droughts usually lasts for long periods of time (months or even years).

Areal Extent
Areal extent is widespread and will affect a large area.

Speed of Onset
Speed of onset is slow and lasts for a long period of time.

Spatial Dispersion
All areas will be affected though not equally. For example a farming community would be more adversely affected than an industrial complex.

Temporal Spacing
The temporal spacing for a drought is random; however, it is noticed more during hotter weather.

Risk
The risk of a drought occurring is high. Droughts take place on a regular basis in Texas, but due to the fact that UNT is not reliant upon agriculture, UNT will not be directly affected.

Previous Incidents
- 1983-1988: Over 40 Texas counties were on the list of counties qualifying for emergency drought relief from the U.S. Department of Agriculture.
- 1990-1994: In South Texas, the searing heat had literally baked away almost all moisture in the soil, leaving huge cracks in many areas. Residents in South Texas have not experienced such dry times since the mid-1950s
- 1999-2000: There was such little rainfall that the lakes which provides UNT and most of Denton County with drinking water were more than 15 feet below normal levels. Because of this Denton County began rationing water. Much of the vegetation became dry, which led to many grass fires.

Response and Recovery Issues
Issues pertaining to drought will vary depending upon the location. For UNT, a major issue would be heat related illnesses such as dehydration or heat stroke. Another important issue would be the effects of the drought on the vegetation that is present around the University. If allowed to become too dry the vegetation can poses a fire hazard. Vegetation that perishes will need to be removed and replaced, which can be very costly for the university.

Suggested Course of Action

- Begin to ration water and cut-out non-essential water usage.
- Educate the UNT population (students, faculty, staff) regarding water conservation.
- Educate the UNT population regarding the practice of fire safety, especially regarding the proper extinguishing of cigarettes and cigars.

EARTHQUAKE

Background
An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. It can cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unstable soil are most at risk. Buildings not tied to a reinforced foundation anchored to the ground are also at risk since they can be shaken off their mountings during an earthquake.

Frequency
The frequency of earthquakes at UNT is extremely rare.

Duration
The duration of an earthquake is typically short. Aftershocks produced by the earthquake, which also last a short duration, can be intense and occur hours, days and even months after the initial quake.

Areal Extent
The areal extent of damage to UNT is likely to be widespread. However, if compared to a larger area, Denton County for instance, the damage may be considered limited.

Speed of Onset
Earthquakes happen quickly and there is generally little or no warning.

Spatial Dispersion
Spatial dispersion will vary depending upon factors such as the magnitude and focal point of the earthquake as well as building codes and structural integrity.

Temporal Spacing
Earthquakes can occur at any time of the year.

Risk
The risk of an earthquake at UNT is low. The fault lines nearest UNT are in Arkansas, which was last active over a hundred years ago, and in the North-Central and Western parts of Texas, which contain a number of smaller faults. Historically, however, the most intense earthquakes have taken place in the central United States, so even though the risk is low the results could be disastrous.

Previous Incidents
- August, 1931: As the largest earthquake in Texas history, it had a magnitude of about 6.0 and occurred near the town of Valentine, 220 km southeast of El Paso. It caused severe damage to adobe and brick structures, and was felt by Texans as far away as Dallas.
- April, 1995: An earthquake of magnitude 5.7 took place just outside of the city of Alpine, Texas. There was minor damage and several aftershocks registered.
- May, 1997: In Commerce, Texas a slight tremor jiggled the ground, but it could barely be felt. A minor earthquake of magnitude 3.4, centered near the town, according to the U.S. Geological Survey National Earthquake Information Center. No severe damage or injuries from the tremor were reported.

Response and Recovery Issues

Many response and recovery issues exist after an earthquake. Roads and other infrastructure, such as gas lines (which may cause a fire and lead to a secondary disaster), water lines, communications, etc. could become damaged and unusable. Power outages may occur due to downed power lines that are a hazard themselves. Housing shortages may occur due to damage caused to living facilities. The amount of damage an earthquake can cause is overwhelming. However, through mitigation and preparation, the secondary hazards and other costly effects of an earthquake can be reduced substantially.

Suggested Course of Action

- Maintain blue prints to all the gas, water, and sewer pipes on the campus.
- Maintain an updated resource list, especially of departments (both at UNT and from the outside) responsible for the restoration and repair of vital systems.
- Update mutual aid agreements for debris removal as necessary.
- Keep personnel trained on equipment and procedures necessary to handle such an incident.
- Prepare temporary housing for students who become displaced.
- Plan detour routes in anticipation of road outages.
- Prepare for an influx of phone calls that accompany every disaster.

EXTREME HEAT

Background
Temperatures that are 10 degrees Fahrenheit or more above the average temperature for the region and last for several weeks are considered extreme. Because of its geographic location, the University of North Texas will frequently experience the effects of extreme heat. A secondary hazard that may be produced by extreme heat is a drought.

Frequency
UNT will be affected by extreme heat often.

Duration
The duration will vary although it could span several days, weeks, or even months.

Areal Extent
The area that is affected by extreme heat is going to be widespread.

Speed of Onset
The speed of onset is slow because of the required time before temperatures are considered extreme.

Spatial Dispersion
The spatial dispersion will be diffuse.

Temporal Spacing
The temporal spacing is seasonal with the greatest risk taking place during the Summer months.

Risk
The risk of occurring at UNT is high.

Previous Incidents
- Summer, 2000: The DFW area went a record of 84 days without any rain, 46 of which the temperature exceeded 100 degree Fahrenheit. Temperatures reached up to 112 degrees Fahrenheit at many places in North Texas.
- Summer, 1999: This was the seventh hottest summer on record. The temperatures reached up to 107 degrees Fahrenheit.

Response and Recovery Issues
Heat related illnesses (i.e.: heat stroke, heat cramps, heat exhaustion, sunburn, dehydration), drought, and power shortages, due to high air conditioning usage, are all issues UNT may have to work through during a period of extreme heat.

Suggested Course of Action
- Protect windows with blinds or solar screens to help lower energy consumption.
- Post numbers of local emergency services for easy access by those affected by the extreme heat.
- Educate the public regarding heat related illnesses and issues (i.e.: stay indoors, drink water, etc.).
- Lower unnecessary water use on campus.

FIRE

Background
Fire is the fourth largest accidental killer in the United States. An average of 5,500 people are killed by fire related injuries each year. It is also the disaster that people are mostly likely to experience. Over 80 percent of all fire deaths occur where people sleep, such as in apartments, homes or hotels. Most fires occur when people are likely to be less alert such as between midnight and morning. Eighty-four percent of house and building fires are accidental, caused by poor electrical wiring or careless behavior. However, 16 percent are set intentionally through arson or acts of terrorism.

Frequency
The historical occurrence of an actual fire, not a false alarm on UNT property is moderate.

Duration
Duration depends on response time and material available.

Areal Extent
Areal extent of a fire depends on multiple factors such as response time, material available, responder's skills and knowledge, etc.

Speed of Onset
Speed of onset for a fire is typically fast.

Spatial Dispersion
Spatial dispersion is usually concentrated; however, it can become diffuse if the fire is not contained.

Temporal Spacing
Temporal spacing is random although during the summer when the vegetation is drier the risk is higher.

Risk
The risk of a fire is considered moderate. This is due to the potential a fire has to cause major damage and displace a large number of people, in addition to the fact that most fires are started by people.

Previous Incidents
- March, 2002: An electrical fire on the second floor of Whooten Hall resulted in an evacuation of the building. A Full Box response (two engines, one truck, one medic and a battalion chief) was requested from the Denton Fire Department.
- Maple Hall Fire: Some tissue paper fell behind a refrigerator and came in contact with the coils. The paper ignited and started a small fire. There was major damage caused by the resulting smoke.
- Curr Hall Fire: A water leak dripped onto an electrical switching gear which resulted in a large amount of smoke. The smoke was carried throughout the building via the ventilation system which resulted in major smoke damage.

Response and Recovery Issues
An important factor to note is that UNT does not have its own fire department. Therefore, it must rely upon the local fire departments for fire suppression. Because of this UNT must be able to provide the local fire department with information such as floor plans for the buildings on campus and the approximate

head count in each building. In addition, UNT will need to have mutual aid agreements in place to house any students, faculty, or classes that become dislocated.

Suggested Course of Action

- UNT must cooperate with the local fire departments and plan for fire related incidents.
- The UNT Police Department will assist with evacuation and maintaining a safety perimeter.
- Place fire extinguishers in and throughout every building and have them maintained and checked regularly.
- Install sprinkler systems in all new buildings and retrofit all older buildings if possible.

FLOOD

Background
There are two lakes located to the east of the city of Denton where UNT is located. One is Lake Ray Roberts, which is located north-east of Denton and the other is Lake Lewisville which is located south east of Denton. Though the university itself is not located in a flood plain, there are some surrounding roadways that are located in the 100 year flood plain. If those roadways become flooded, access to the UNT campus would become restricted. A more direct concern for the university might be the potential flooding of the lower level of individual buildings or the possibility of water pipes bursting and causing a flood in a single building.

Frequency
Frequency for flooding in the area around UNT is moderate.

Duration
The duration will vary depending on the kind of flooding which occurs.

Areal Extent
The areal extent of a flood would be widespread.

Speed of Onset
The speed of onset is usually fast, however that may also vary.

Spatial Dispersion
The spatial dispersion would be diffuse.

Temporal Spacing
The temporal spacing for flooding is seasonal.

Risk
The risk for the university experiencing a major flood is moderate.

Previous Incidents
- 1975: Major flooding occurred on Hickory Creek, resulting in blocked roadways and flooded homes.
- 1974: Rainfall of up to ten inches in a twenty four-hour period caused massive flooding in North Texas.
- June, 2001: Within a 24-hour period, tropical storm Allison dumped 25 inches of rain on South Texas. The storm killed 22 people and left thousands stranded and homeless.
- July, 2002: 29 Central and South Texas counties were flooded. At least four people were killed and hundreds of homes were swamped.

Response and Recovery Issues
The largest issue for the university would be access to the campus and the individual buildings. Two major routes to gain access to the university (Carroll Blvd. and Hickory St.) are in the 100 year flood plain and have a high potential to become impassable during a major flood. An issue that UNT is more likely to face is the flooding of the lower floors and basements of individual buildings. This usually happens only during heavy rains and if the sump-pump fails. These areas are monitored when there is a potential for flooding. If

the flooding were severe enough, that particular building may be rendered unusable. A main concern that has to do with basement flooding, is the potential for mold to grow thus creating a possible health issue.

Suggested Course of Action

- Incorporating the city of Denton's flood mitigation plan in correlation with the National Flood Insurance Reform Act of 1994, as well as adapting with the help of FEMA's CRS or Community Rating System program and the city's flood damage prevention ordinance will help reduce the chance of flooding.
- Maintain the plumbing and water pipes throughout the buildings on campus.
- Inform the population of UNT and the local area regarding the methods and techniques that can help decrease the potential for a flood.
- Create and maintain a plan involving notification of UNT's population (i.e.: students, faculty, and staff) regarding the situation and possible evacuation routes should evacuation become necessary.
- Educate the population of UNT regarding the precautions to take during a flood (i.e.: stay away from low-lying areas, do not cross flooded roadways, etc.).

HAZARDOUS MATERIAL INCIDENT

Background
Hazardous materials are chemical substances, which if released or misused can pose a threat to the environment or human health. These chemicals are used in industry, agriculture, medicine, research, and consumer goods. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants. The University of North Texas maintains a supply of numerous chemicals in various buildings on campus (i.e.: science labs, janitorial supply areas, grounds maintenance building, etc.), many of which are considered hazardous .

Frequency
The frequency of spill incidents on campus is rare.

Duration
Duration depends on the type of material and size of spill.

Areal Extent
Areal extent of hazardous material is usually limited. However, in extreme cases it may be diffuse.

Speed of Onset
Speed of onset of a hazardous material incident is fast.

Spatial Dispersion
The spatial dispersion depends on factors such as the spill site, weather, the chemical spilled, etc.

Temporal Spacing
Temporal spacing is random for this type of incident.

Risk
Depending on the type of material and size of spill, the risk is categorized as moderate.

Previous Incidents
- Chemistry Building: A small spill required the Denton Fire Department to evacuate the area.
- General Academic Building: Required evacuation of the immediate area until the material was identified and contained by the Denton Fire Department.

Response and Recovery Issues
The response goals of Denton Fire Department will be threefold; 1) evacuation, 2) confinement, and 3) containment. Denton Fire Department however, is not responsible for large clean up of material. Therefore, UNT must create pre-planned contracts to deal with clean up and disposal issues. Effective and efficient response depends on the availability of correct information. Because of this, documentation of chemicals used and stored in any building needs to be kept current and available to responders. If an off-campus incident occurs that will effect UNT, then preparations should be made to alert the students and staff to remain indoors or evacuate to a cold zone. A likely scenario is a traffic accident involving hazardous materials taking place on I-35E which could indirectly affect UNT by causing traffic related issues or even an evacuation due to a plume cloud blowing toward the university.

Suggested Course of Action

- Educate the population of UNT (students, faculty, and staff) about the proper transportation, use and disposal of chemicals they may come in contact with.
- If the spill is inside a structure, then Denton Fire Department goals will call for evacuation of the area and displacement of students and faculty until the area is deemed safe.
- If the incident occurs as a result of transportation accident (i.e.: Interstate 35) then, depending on environmental factors and material spilled, the university will need to shelter in place or evacuate to a cold zone all the while maintaining contact with the Denton Police and Fire Departments.
- Prepare and maintain mutual aid agreements with agencies which will be involved in a hazardous material spill containment and clean-up.
- Prepare for a large influx of phone calls from concerned parents.

HAZMAT Incidents

Mode of Transportation	Number of Accidents	Associated Deaths	Associated Injuries
Air	1,220	0	153
Highway	41,781	79	1,569
Railway	7,886	1	423
Water	83	1	35
Other	29	0	2
Total	50,999	81	2,182

Hazardous Materials Incidents (totals for the US, 1983 thru 1990)

THUNDERSTORM

Background
A thunderstorm is formed from a combination of moisture, rapidly rising warm air and a force capable of moving air such as a warm and cold front, a sea breeze, or a mountain. All thunderstorms contain lightning which is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. A bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit in a split second, and this rapid heating and subsequent cooling of air near the lightning causes thunder. Thunderstorms may occur singly, in clusters, or in lines. Thus, it is possible for several thunderstorms to affect one location in the course of a few hours. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time. Thunderstorms can produce copious amounts of rainfall which may result in flooding.

Frequency
Thunderstorms frequently affect the University of North Texas.

Duration
The duration will vary depending upon the storm.

Areal Extent
The area that is affected by this type of incident is widespread.

Speed of Onset
The speed of onset for a thunderstorm will be different for each storm.

Spatial Dispersion
The spatial dispersion for a thunderstorm is widespread and diffuse.

Temporal Spacing
Severe thunders storms usually occur during the Spring and Summer months but can take place at any time during the year.

Risk
The risk of experiencing a thunderstorm at UNT is high.

Previous Incidents
- April, 1999: Ellis and Kaufman counties encountered high winds and weak tornadoes due to a thunderstorm in the area. The storm caused damage to trees, power lines, and mobile homes.
- May, 1999: A thunderstorm with large hail and strong damaging winds swept through North-Central Texas and resulted in flooding in some areas.
- March, 2002: During a severe thunderstorm in North Texas, one man was killed by falling hail and several others drown when their cars were swept away in the resulting flood.

Response and Recovery Issues
Thunderstorms are a hazard that the University of North Texas faces on a regular basis and can include additional hazards such as tornadoes, hail, lightning and flooding. Thunderstorms can cause severe damage to buildings and roads, ignite fires, split trees, and cause electrical failures. Because of the numerous

hazards that a thunderstorm can produce, knowing how to respond to all the possible threats can be difficult. However, preparing for this one hazard will help responders to better respond to the secondary hazards that may be produced as well as the original incident.

Suggested Course of Action

- Prepare and maintain an advance warning system for the university.
- Communicate with all departments on campus to help educate the students and faculty of the possible dangers that can be produced by a thunderstorm (i.e.: flooding, hail, lightning, etc.).
- Designate areas in each building that can be used as a storm shelter.
- Keep in contact with the local weather experts and the media to maintain up-to-date weather information.

TORNADO

Background
A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity (which can reach over 100 mph) and wind-blown debris. Though they may occur anytime of the year, tornados are most likely to occur between the months of March and May. 80% of which occur between 3 p.m. and 9 p.m.

Frequency
The frequency of tornados on campus are rare. However, there are a number of tornados which have touched down in the surrounding areas.

Duration
The duration of a tornado is relatively short usually only lasting a few minutes. 69% of the recorded tornados last under 10 minutes, 29% last under 20 minutes, and only 2% last over 20 minutes.

Areal Extent
A tornado may affect an area as large as one mile wide and several mile in length.

Speed of Onset
Tornados occur quickly, with little to no warning, and once they touch down their ground speed averages 30 mph but may move as quickly as 60 mph.

Spatial Dispersion
The spatial dispersion of a tornado would be diffuse.

Temporal Spacing
The temporal spacing is seasonal with the majority of tornados occurring during the Spring months.

Risk
UNT is located in what is referred to as "Tornado Alley" and even though Denton County has rarely experienced tornadoes the risk is high due to the location of the university.

Previous Incidents
- May, 1997: In Jarrel, Texas, a devastating tornado touched down and killed 27 people.
- May, 1987: The city of Saragosa was hit by an F-4 tornado in the late hours of the evening.
- March, 2000: A tornado struck down town Fort Worth and near-by communities in Arlington causing heavy damage.
- April, 2002: A string of tornadoes and thunderstorms tore through North Texas, damaging dozens of homes in Ft. Worth and knocking out power lines throughout the surrounding area.

Response and Recovery Issues
Of all the hazards analyzed, this is one of the most likely to take place at the University of North Texas and cause the most widespread damage. It would also be associated with many secondary hazards such as; fires, building damage/collapse, or utility outages. UNT has a responsibility to the students, many of who

may not be familiar with the precautions to take during a tornado to provide them with a safe environment. This would include educating the students about precautions to take during a tornado as well as providing storm shelters that can be used during times of emergency.

Suggested Course of Action

- Each building on campus should have a designated tornado shelter area and the population should be made aware of where those areas are located.
- Those responsible for activating emergency plans should monitor weather information from a NOAA Weather Radio, as well as local radio and television stations when storms are present.
- In the event of a tornado, the campus weather siren must be activated.
- Notify and maintain contact with the local Police and Fire Departments throughout the incident.
- Buildings must be inspected for gas and water leaks, as well as electrical damage after the incident.
- Photographs of the damaged area must be taken for insurance purposes.

UTILITY SHORTAGE/OUTAGE

Background
Utilities are comprised of multiple facilities such as the systems for drinking water, phone lines, electricity, gas, air conditioning, sewage, etc. During an outage the service is temporarily interrupted, usually due to weather, and only lasts a short period of time. On the other hand, a shortage occurs when demand exceeds supply, thus causing a longer disruption of the service. Though most disturbances are short-term, a long-term shortage of any one of the many utilities could be very disruptive and possibly damaging to the University of North Texas. Even a short-term shortage has the potential to cause a major disturbance.

Frequency
Major utility shortages are rare at UNT. Smaller incidents, such as a power outage during a thunderstorm happen more regularly.

Duration
The duration will vary depending upon the incident.

Areal Extent
Though the areal extent is usually widespread there are events where the extent is limited as well.

Speed of Onset
Speed of onset will vary upon the cause of the utility interruption. For example a main waterline that is damaged will lead to a fast onset, while an increase in the population will lead to a slower onset.

Spatial Dispersion
Spatial dispersion will vary depending upon the incident and the cause.

Temporal Spacing
Though temporal spacing is random there are certain times when a utility shortage (i.e.: hot Summer months) or outage (i.e.: severe thunderstorm) is more likely to occur.

Risk
The risk of a major utility shortage at UNT is low and the outages that are likely to happen will probably not be considered an emergency.

Previous Incidents
- The University of North Texas, 1998: Power shortage on the University of North Texas campus due to unknown causes.
- California, 2000: A state-wide power shortage, leading to rolling black-outs.
- Hurricane Andrew, 1992: All utilities out due to the effects of the storm.

Response and Recovery Issues
Response and recovery issues will vary greatly from one incident to another. The risks involved are dependent upon the utility that is effected as well as other factors such as the time of year the incident takes place. For example, the issues during a power outage in mid-summer in Texas would differ from those associated with the loss of the UNT phone system. In addition, a utility shortage or outage is usually a secondary hazard so these type of incidents can be prepared for during the planning and training for the initial event.

Suggested Course of Action

- Notify staff, students, and parents about the incident and the potential effects.
- Purchase and maintain emergency equipment (i.e.: generators, radios, batteries, etc.).
- During the times of shortage, reduce the use of that particular utility.
- Design and implement conservation measures.
- Be in communication with all power and energy suppliers.

WATER CONTAMINATION

Background
Water contamination is an event, in which ground, aquifers, and surface water are tainted with agents that can harm wildlife, fish, and all other living creatures. Water sources can become contaminated from hazardous spills, chemical dumping, a terrorist act, or even from a small animal dying in the water supply. The main source of water for the University of North Texas is Lake Lewisville. The major concerns are the two highways (U.S. Highway 380 and Interstate 35E) which cross the lake. Both are routes regularly used to transport chemicals and hazardous materials.

Frequency
The University of North Texas has never experienced a major incident of water contamination.

Duration
The duration of the incident would be dependent upon the type of contamination.

Areal Extent
During such an event the areal extent would be widespread.

Speed of Onset
Speed of onset is usually very quick.

Spatial Dispersion
The spatial dispersion for this type of incident is widespread.

Temporal Spacing
Temporal spacing is random.

Risk
The risk to the students and faculty at UNT is low due to the techniques and processes used to treat UNT's water supply.

Previous Incidents
- March, 1989; Exxon Valdez Oil Spill: The Eastern Coast of Alaska is devastated by the massive oil spill. The ecosystem for many animals is completely destroyed.
- April, 1989: The EPA presents a study indicating that more than a million school water fountains still have lead components or lead-lined tanks, posing possible health risks.
- March, 1992: In Austin, Texas the ground water is tainted because a leak at a gasoline tank farm on the east side of the city.
- September, 2001: An oil spill at Barbour's Cut in La Porte, Texas, caused by a collision between a ship and a barge, leaked some 860 barrels of fuel oil into the bay.

Response and Recovery Issues
Water contamination would effect the environment as well as the human population and is an issue that would have to be considered. Depending upon the situation, the effects of the contamination could be long-lasting or even permanent. If the drinking water was to be contaminated, maintaining a supply of

drinkable water as well as containing and cleaning up the contamination source would be the main focus of the responders and managers.

Suggested Course of Action

- Create and maintain mutual aid agreements for another source of water (i.e.: Lake Ray Roberts).
- Train and equip first responders to work with hazardous materials.
- Try to contain and clean-up the source of the contamination as soon as possible.
- Communicate with local, state, and federal agencies about the status of the incident.
- Advise the students, faculty, and staff about issues regarding any specific precautions that may be necessary.

WINTER/ICE STORM

Background
A winter storm can range from moderate snow over a few hours to blizzard conditions with blinding wind-driven snow that last several days. All winter storms are accompanied by low temperatures and blowing snow, which can severely reduce visibility. A severe winter storm is one that drops 4 or more inches of snow during a 12-hour period, or 6 or more inches during a 24-hour span. An ice storm occurs when freezing rain falls from clouds and freezes immediately on impact. In North Texas, ice storms are the more common of the two hazards and usually only affect the driving conditions.

Frequency
There is a moderate chance of a severe winter storm effecting the university for more than a day.

Duration
The duration of a storm will vary but will usually only last a few hours.

Areal Extent
The areal extent would be widespread.

Speed of Onset
The speed of onset will vary.

Spatial Dispersion
The spatial dispersion for a winter storms would be diffuse

Temporal Spacing
The temporal spacing is seasonal for this type of event.

Risk
There is a moderate risk of occurrence.

Previous Incidents
- December, 2000: North Texas, Oklahoma and Arkansas remained under the hold of a stubborn ice storm has shut down many communities, leaving tens of thousands of residents without power and in shelters. The storm brought down power lines and created dangerous driving conditions throughout the areas.
- January, 2001: Two ice storms that hit Arkansas, Oklahoma and Texas left more than 650,000 customers without power, some for over a month. This storm, considered the worst ice storm to hit the region in at least a century, felled hundreds of miles of power lines.

Response and Recovery Issues
Some winter storms may be large enough to affect several states while others may affect only a single community. The University of North Texas generally suffers from ice storms which can cause hazardous conditions and hidden problems for the students and faculty. Problems such as downed power lines, automobile accidents, or fuel shortages are all potential issues that should be prepared for. A severe storm may even create a possible food shortage. During such times the President of the University may decide to cancel classes and close the university for the day.

Suggested Course of Action

- Initiate and maintain contact with local weather stations.
- Educate the students and faculty regarding the dangers winter storms produce as well as what to do in an emergency situation.
- Protect pipes and watch for any freezing of the pipes during the storm.
- Use the media to help distribute pertinent information such as cancellation of classes.
- Encourage students, faculty, and staff to remain indoors and stay off roadways during severe weather.