

4.0 HAZARD PROFILE

Butler County has experienced many natural disasters in the past one-hundred years. These disasters have ranged from tornadoes and blizzards, to flooding and droughts. The purpose of this document is to identify the number and frequency of disasters in Butler County to better prepare and deal with them when they do occur. The following sections describe the process of determining upon which hazards to focus, general background information on each hazard as well as hazard events that have occurred in Butler County.

4.1 Initial Hazard Assessment

In order to properly evaluate the natural hazards to which Butler County may be susceptible, a three-step process was utilized. This three-step process was completed in order to “narrowdown” the hazards for which Butler County should prepare, and potentially mitigate, in the future. The three steps are described in the following paragraphs.

Step 1 - FEMA’s database was researched to determine which hazards FEMA had documented as possible natural hazards, including future threats, for the State of Ohio. Several hazards that are listed on FEMA’s website include flooding, severe storms, tornadoes and winter storms.

Step 2 – The National Climate Data Center (NCDC) was researched and historic hazard information was reviewed all the way down to the county level. The NCDC website presented each type of hazard and the historic information associated with it for each county, offering several hazard search parameters. These parameters included: droughts, dust storm, flooding, fog, hail, hurricanes, lightning, tornadoes, wild/forest fires, ocean/lake surf, precipitation, snow and ice, temperature extremes and thunderstorms and high winds.

Because NCDC information did not address earthquakes, dams and dam safety, other sources were contacted for this data. The information pertaining to earthquake susceptibility was attained from United States Geographical Survey (USGS) data. The information pertaining to landslides, dams and dam safety was obtained from ODNR.

Step 3 - The State of Ohio Hazard Mitigation Plan Update in 2008 was referenced as well as its Hazard Analysis and Risk Assessment which documents both natural and non-natural (technological) hazard event information.

4.2 Risk Assessment and Ranking

The research compiled during the initial hazard assessment was provided to the Mitigation Overhead and Development Committee for their review and assessment. The committee evaluated all the hazards being considered and ranked them based on the number of historic events and cumulative damage that has occurred. The following list shows the committee’s ranking of hazards with number one being the hazard of the most concern:

1. Summer Storms
2. Floods (Flash/100-year)/Dams
3. Winter Storms/Ice Storms (Sub-Hazard – Energy Emergencies)
4. Tornadoes
5. Droughts (Excessive Heat/Excessive Cold) (*Sub-Hazard – Energy Emergencies*)

6. Earthquakes

4.3 Severe Storms – High/Strong/Thunderstorm Winds, Lightning, Hail

Hazards that fit into the severe weather category include thunderstorms, high winds, lightning and hail. One of the biggest problems associated with severe weather is the lack of public education and awareness. Severe storms can do damage, but are often the precursor for much more severe weather to follow. One example is the direct association of tornadoes with thunderstorms.

A severe thunderstorm watch is issued by the National Weather Service (NWS) when the weather conditions are such that damaging winds of 58 mph or more, or hail 3/4 of an inch in diameter or greater, are likely to develop. Citizens should locate a safe place in the home and tell family members to watch the sky and listen to the radio or television for more information.

A severe thunderstorm warning is issued when a severe thunderstorm has been sighted or indicated by weather radar. At this point, danger is imminent and citizens should move to a safe place, turn on a battery-operated radio or television, and wait for the "all clear" by the authorities. Severe storms are also associated with other hazards such as tornadoes and severe flooding. Since tornadoes and flash flooding are spawned by thunderstorms, people should review what action to take under a tornado warning or a flash flood warning when a "severe thunderstorm warning" is issued. When thunderstorms are forecasted to bring heavy rains (which can cause flash flooding), strong winds, hail, lightning and tornadoes, people should get inside a sturdy building and stay tuned to a battery-operated radio for weather information. People should also be aware that lightning and high winds are also major threats during thunderstorms.

4.3.1 High Winds/Strong Winds/Thunderstorm Winds

Straight-line winds are often responsible for most of the wind damage associated with a thunderstorm. These winds are often confused with tornadoes because of similar damage and wind speeds. However, the strong and gusty winds associated with straight-line winds blow roughly in a straight line unlike the rotating winds of a tornado.

4.3.2 Lightning

Lightning kills between 75 and 100 people a year. It is the second largest killer of natural hazard events, exceeded only by floods. Lightning strikes can happen anywhere and affect anyone. Only 10% of lightning strikes result in death, leaving the rest with various degrees of disability, most being central nervous system issues

4.3.3 Hail

Hail is a type of precipitation composed of balls or irregular lumps of ice. It occurs when super cooled water droplets (remaining in a liquid state despite being below the freezing point, 0 °C/32 °F) in a storm cloud collide with some solid object, such as a dust particle or an already forming hailstone.

Hail often forms in strong thunderstorms, often along a cold front, where the layer of air on top is much colder than that on the bottom. The smaller hailstones can bounce up and down between the warm and cold layers due to updrafts and gravity. The longer the stones bounce around, the larger they grow. These strong, severe, or even supercell thunderstorms can also produce hail in the summer months, even without a cold front.

Hailstones, while most commonly only a few millimeters in diameter, can sometimes grow to several inches or occasionally even bigger. Such large hailstones can do serious damage, notably to automobiles, skylights, and glass-roofed structures. Pea or golf ball-size hailstones are not uncommon in severe storms. Rarely, massive hailstones have been known to cause concussions or to kill people by causing head trauma.

4.3.4 Frequency/Probability of Future Occurrence

Severe storms in Butler County quantitatively have the highest likelihood of occurring on a yearly basis. According to the NCDC, 262 storm events including thunder storms, lightning, strong winds, high winds, and hail were documented for Butler County since 1950. Severe storms in Butler County have caused the most cumulative property damage with estimated total losses of over \$76 million over a 60 year period.

4.4 Floods (including Flash Floods)/Dams

Floods are a naturally recurring event for a river or stream, and are caused by weather phenomena and events that deliver more precipitation to a drainage basin that can be readily absorbed or stored within the basin. Flooding is a localized hazard that is a result of heavy or continuous rainfall exceeding the absorptive capacity of soil and the flow capacity of rivers and streams. Floods can be generally considered in two categories: flash floods, the product of heavy localized precipitation in a short time period over a given location; and riverine floods, caused by precipitation over a longer time period and over a given river basin.

Flash floods occur within a few minutes or hours of heavy amounts of rainfall, from a dam or levee failure, or from a sudden release of water held by an ice jam. Flash floods can destroy buildings and bridges, uproot trees, and scour out new drainage channels. Heavy rains that produce flash floods can also trigger mudslides. Most flash flooding is caused by slow-moving thunderstorms, repeated thunderstorms in a local area, or by heavy rains from hurricanes and tropical storms. Although flash flooding occurs often along mountain streams, it is also common in urban areas where much of the ground is covered by impervious surfaces. Roads and buildings generate greater amounts of runoff than typical forested land. Fixed drainage channels in urban areas may be unable to contain the runoff that is generated by relatively small, but intense, rainfall events.

Riverine flooding refers to periodic flooding of lands adjacent to non-tidal rivers and streams. It is a natural and inevitable occurrence. When stream flow exceeds the capacity of the normal watercourse, some of the above-normal stream flow spills over onto adjacent lands within the floodplain. Riverine flooding is a function of precipitation levels and water runoff volumes within the watershed of the stream or river. The recurrence interval of a flood is defined as the average time interval, in years, expected to take place between the occurrence of a flood of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Flooding is an important issue for the residents and business owners of Butler County. Whether it was riverine flooding or flash flooding events that have occurred in the past, lives have been disrupted or lost and damage has been extensive.

4.4.1 Areas of Special Flood Hazard

Areas of special flood hazards are defined as land in a flood plain that is subjected to a 1% or greater chance of flooding in any given year. Areas of special flood hazard are designated by the Federal Emergency Management Agency (FEMA). Flood Insurance Rate Maps (FIRM) determine the Base Flood Elevation (BFE) for the areas. BFE is defined by the Butler County Flood Plain regulations as “the water surface of the base flood in relation to a specified datum, usually the National Geodetic Vertical Datum of 1929 or the North American Vertical Datum of 1988 and usually expressed in Feet Mean Sea Level (MSL).”

Butler County has special flood hazard areas identified within the county. All unincorporated and incorporated areas in Butler County are in compliance with state floodplain management standards and participate in the National Flood Insurance Program (NFIP).

Map modernization within the county took place in 2005. The floodplain regulations related to the NFIP were reviewed and updated by the Butler County Department of Development between 2008 and 2010.

The following timeline shows the process of the floodplain update:

August 18th 2008 – Scoping Meeting to review floodplain and development

May 15th, 2009 – Preliminary maps created

July 9th, 2009 – Open house held for public to view maps

December 10th, 2009 – March 10th 2010 – Appeals period

June 17th, 2010 – Letter of final determination was drafted

November 15th, 2010 – Maps and regulations adopted by County Commissioners

December 17th, 2010 – Maps and regulations effective

The Butler County Department of Development, per adopted regulations, monitors and enforces floodplain regulations for all areas of the county. This monitoring and enforcement is to ensure development does not occur in the floodplain in a way that will be a detriment to any citizen of Butler County.

4.4.2 Repetitive Loss Properties

In most counties there are areas that periodically suffer damages from floods. They are known as “repetitive loss properties”. Repetitive loss properties are defined as properties with structures that have had two or more insurance claims within a 10 year period. The following is the repetitive loss property information as of 4/30/2011 for Butler County as provided by the State of Ohio EMA.

Butler County unincorporated

5 total buildings – 14 reported losses - \$327,281.87 in damages

Village of Somerville

2 total buildings – 2 reported losses - \$23,825.87 in damages

City of Fairfield

31 total buildings – 92 reported losses - \$826,286.51 in damages

Village of Millville

1 total building – 2 reported losses - \$17,496.74 in damages

City of Hamilton

3 total buildings – 7 reported losses - \$111,052.16 in damages

TOTAL

41 total buildings – 120 reported losses – \$1,331,941.70 in damages

City of Middletown

1 total building – 3 reported losses - \$25,998.87 in damages

Information regarding mitigation strategies for Repetitive loss properties can be found in section 6.3 of this plan

Past floods are indications of what can happen in the future, but mitigation plans are based on the risk of future flooding. Flood studies interpret historical records to determine the statistical potential that storms and floods of certain magnitude will recur. Such events are measured by their recurrence interval.

Recurrence interval, or frequency of occurrence, is defined as the average number of years between storms of a given intensity. Recurrence intervals commonly used in technical studies and design are 100 years and 500 years. Recurrence interval addresses how often a flood of a specific depth will be expected to occur. Structures located within areas considered at higher risk should be prioritized higher as it relates to mitigation.

According to the NCDC, Butler County has experienced 62 flood events since 1993. These floods have caused over \$6 million in damage and 1 death.

4.4.4 Dams in Ohio

A dam is an artificial barrier usually constructed across a stream channel to impound water. Timber, rock, concrete, earth, steel or a combination of these materials may be used to build the dam. In Ohio, most dams are constructed of earth. Dams must have spillway systems to safely convey normal stream and flood flows over, around, or through the dam. Spillways are commonly constructed of non-erosive materials such as concrete. Dams also have a drain or other water-withdrawal facility to control the pool or lake level and to lower or drain the lake for normal maintenance and emergency purposes. Most dams in Ohio are small and are constructed by farmers and other private individuals for water supply, recreation, swimming and fishing. Numerous other, usually larger, dams are built by cities and industry to form reservoirs for water supply or liquefied waste storage. Ownership of dams is diverse and maintained by both public and private interests. The federal government owns and operates over 30 dams for flood control, recreation and water supply. The state of Ohio has more than 100 dams, primarily located instate park and wildlife areas for recreational purposes. Flood control and some water supply are provided by dams owned by watershed conservancy districts.

The oldest dams in Ohio were constructed over 150 years ago to create water supply reservoirs for a network of navigational canals. Buckeye Lake Dam, built in about 1825 as part of the canal system and

located in Licking and Fairfield counties, is the oldest dam in the state. The highest dam in Ohio is located in Jefferson County and is 240 feet high.

4.4.5 History of Dam Safety in Ohio

Construction of dams in Ohio dates back to the early 1800 when reservoirs such as Buckeye Lake and Grand Lake St. Marys were built to supply water to the canal system, which provided a means of transportation for agricultural trade and commerce. Dam construction continued at a modest pace for about the next 100 years with relatively few dams built by private entities. In the early part of the nineteenth century, several large municipally-owned dams and reservoirs were built for public water supply. Severe floods also prompted the formation of conservancy districts which constructed dams for flood control.

Although the true forerunner of current dam safety laws in Ohio was enacted in 1963, legislation pertaining to the construction of dams was enacted as early as 1937. This early set of laws aimed to encourage construction of dams for the storage of water in response to recent drought periods in Ohio and the "dust bowl" days on the Great Plains. The regulatory agency responsible for the enforcement of these early laws was the Division of Conservation and Natural Resources in the State Department of Agriculture.

Due to the availability of large earthmoving equipment after World War II, Ohio saw a significant increase in the number of dams built by individuals and private companies. Although the water storage and recreational capabilities provided by these dams were important benefits, concern about the adequacy of design and construction was prompted by the loss of life and property damage resulting from dam failures, which led to a greater interest in dam safety.

The ODNR's Division of Water has been involved in dam safety since 1963. During this year, the first Ohio law requiring construction permits for building new dams was enacted. In addition, following the failure of several dams in northeast Ohio during the severe flood of 1969, the General Assembly revised the law to include periodic inspections of existing structures. Inspections were required to help assure that the continued operation and use of a dam, dike or levee does not pose a hazard to life, health, or property. In 1972, the failure of Buffalo Creek Dam in West Virginia, which caused great loss of life and severe property damage, led to the enactment of the National Dam Safety Act. This law, administered by the Corp of Engineers, called for an inventory of dams in the United States and the inspection of those dams that could create the most hazards if they failed. The Corps contracted with the Division of Water to inventory roughly 4,500 non-federal dams in Ohio.

4.4.6 Classification of Dams in Ohio

According to Ohio Administrative Code Rule 1501:21-13-01, dams are classified as follows:

Class I: A dam shall be placed in Class I when failure of the dam would result in probable loss of human life. Dams having a storage volume greater than 5,000 acre-feet or a height of greater than 60 feet shall be placed in Class I.

Class II: Dams having a storage volume greater than 500 acre-feet or a height of greater than 40 feet shall be placed in Class II. A dam shall be placed in Class II when failure of the dam would result in at least one of the following conditions, but loss of human life is not envisioned:

(a) Possible health hazard, including but not limited to, loss of a public water supply or wastewater treatment facility.

(b) Probable loss of high-value property, including but not limited to, flooding of residential, commercial, industrial, publicly owned, and/or valuable agricultural structures, structural damage to downstream Class I, II, or III dams, dikes or levees, or other dams, dikes or levees of high value.

(c) Damage to major roads, including but not limited to, interstate and state highways and roads which provide the only access to residential or other critical areas such as hospitals, nursing homes or correctional facilities as determined by the Chief of ODNR's Division of Water.

(d) Damage to railroads, or public utilities.

Class III: Dams having a height of greater than 25 feet, or a storage volume of greater than 50 acre-feet, shall be placed in Class III. A dam shall be placed in Class III when failure of the dam would result in at least one of the following conditions, but loss of human life or hazard to health is not envisioned.

(a) Property losses, including but not limited to, rural buildings not otherwise listed as high-value property in paragraph (A) of this Rule and Class IV dams, dikes and levees not otherwise listed as high-value property in paragraph (A) of this Rule. At the request of the dam owner, the Chief of ODNR's Division of Water may exempt dams from the criterion of this paragraph if the dam owner owns the potentially affected property.

(b) Local roads including but not limited to roads not otherwise listed as major roads in paragraph (A) of this rule.

Class IV: When failure of the dam would result in property losses restricted mainly to the dam and rural lands, and not loss of human life or hazard to health is envisioned, the dam may be placed in Class IV. Dams which are twenty-five feet or less in height and have a storage volume of fifty acre-feet or less, may be placed in Class IV. No proposed dam shall be placed in Class IV unless the applicant has submitted the preliminary design report required by Rule 1501:21-5-02 of the Administrative Code. Class IV dams are exempt from the permit requirements of Section 1521.06 of the Revised Code pursuant to paragraph (A) of Rule 1501:21-19-01 of the Administrative Code.

www.dnr.ohio.gov/water/dsafety/whatdam.htm

There are more than 50,000 dams identified in Ohio. A great majority of these dams are small and do not fall under the jurisdiction of Ohio's Dam Safety Laws. The number of dams, which fall under state law jurisdiction number as of April 2000 and their classifications are as follows:

Class I Dams - 499

Class II Dams - 539

Class III Dams - 704

Class IV Dams - 952

4.4.7 Dams in Butler County

Butler County has 51 total dams within its boundaries. The breakdown of classifications is below:

Class I: 8

Class II: 8

Class III: 14
Class IV: 21
Total: 51

In addition, Butler County has 3 abandoned dams, 7 unclassified dams, and 58 exempt dams, which have been determined by the ODNR's Chief of the Division of Water to not constitute a hazard to life, health or property in the event of a failure.

These dams have been mapped along with Class I and Class II inundation areas. These maps can be seen in Appendix A.

4.4.8 Frequency/Probability of Future Occurrence

Butler County does not have a significant history of dam failure. The State of Ohio Dam Safety Program is in place to monitor and provide dam owners in Butler County pertinent information to support their dam's maintenance requirements. The Dam Safety Program regulates the construction, operation, and maintenance of Ohio's dams, dikes, and levees to protect life and property from damages due to failure. This regulation is accomplished through periodic inspection, new dam construction permits, and regulation of improvements, maintenance and operation of existing dams. The probability of future dam failure occurrences is quite low, however the likelihood of severe damage if a Class I or potentially a Class II Dam were to fail is determined on a case by case basis and could be devastating to areas such as the City of Oxford, City of Hamilton, City of Fairfield, City of Middletown, and West Chester Township due to Class I or II dams located near or directly in the area.

4.5 Winter Storms

A winter storm encompasses several types of storm systems that develop during the late fall to early spring. It deposits any of the following types of precipitation: snow, freezing rain, or ice. Blizzards and ice storms are subcategories of winter storms. A winter storm watch indicates that severe winter weather may affect an area. A winter storm warning indicates that severe winter weather conditions are definitely on the way.

4.5.1 Blizzards

A blizzard warning signifies that large amounts of falling or blowing snow, and sustained winds of at least 35 mph, are expected for several hours. In order to be classified as a blizzard, as opposed to merely a winter storm, the weather must meet several conditions. The storm must decrease visibility to a quarter of a mile for three consecutive hours, include snow or ice as precipitation, and have wind speeds of at least 35 mph. A blizzard is also characterized by low temperatures.

4.5.2 Ice Storms

An ice storm is defined as a weather event containing liquid rain that falls upon cold objects creating 1/4 inch thick or more accumulation of ice buildup. This ice accumulation creates serious damage such as downed trees and power lines, leaving people without power and communication. It also makes for extremely treacherous road conditions. Occasionally, snow will fall after an ice storm has occurred. With the ice covered, it is nearly impossible to determine which travel areas to avoid. When traveling by car, this snow covered ice causes accidents and when walking it causes people to fall, possibly sustaining injuries.

4.5.3. Frequency/Probability of Future Occurrence

According to the NCDC, Butler County has had 50 winter storm occurrences since 1993. These storms have caused over \$19 million in damage and 5 deaths. According to the Butler County Engineer, the annual amount of snow the county receives during the winter season is 24 inches. That number is far less than Northeast Ohio just 250 miles north that receives 80-100 inches per year.

4.6 Tornadoes

Tornadoes are produced from the energy released during a thunderstorm, but account for only a tiny fraction of the overall energy generated. What makes them particularly dangerous is that the energy is concentrated in a small area, perhaps only 100 yards across. Not all tornadoes are the same and science does not yet completely understand how a portion of a thunderstorm's energy becomes focused into something as small as a tornado.

Tornadoes occur mostly in the central plains of North America, east of the Rocky Mountains and west of the Appalachian Mountains. They occur primarily during the spring and summer – the tornado season comes early in the south and later in the north according to the seasonal changes in relation to latitude – usually during the late afternoon and early evening. They have been known to occur in every state in the United States and every continent on the earth, any day of the year, and at any hour.

The damaging strong winds generated from tornadoes can reach 300 mph in the most violent tornadoes, causing automobiles to become airborne, ripping ordinary homes to shreds, and turning broken glass and other debris into lethal missiles. The biggest threat to living creatures, including humans, during tornadoes is flying debris and being tossed about in the wind. Contrary to previous belief, it is not true that the pressure in a tornado contributes to damage by making buildings "explode."

According to the NWS, the development of Doppler radar has made it possible, under certain circumstances, to detect tornado winds with radar. However, spotters remain an important part of the system to detect tornadoes, because not all tornadoes occur in situations where the radar can "see" them. Citizen volunteers comprise what is called the SKYWARN (www.skywarn.org) network of storm spotters, who work with their local communities to watch out for approaching tornadoes to ensure that appropriate action is taken during tornado events. Spotter information is relayed to the NWS, who operates the Doppler radars and issues warnings, usually relayed to the public by radio and TV, for communities ahead of the storms. The NWS utilizes all the information they can obtain from weather maps, modern weather radars, storm spotters, monitoring power line breaks, as well as additional sources for issuing tornado warnings. Although the process by which tornadoes form is not completely understood, scientific research has revealed that tornadoes usually form under certain types of atmospheric conditions. Those conditions can be predicted, but it is not yet possible to predict in advance exactly when and where they will develop, how strong they will be, or precisely what path they will follow.

According to the NWS, there are some "surprises" every year, when tornadoes form in situations that do not look like the right conditions in advance, but these are becoming less frequent. Once a tornado is formed and has been detected, warnings can be issued based on the path of the storm producing the tornado, but even these cannot be perfectly precise regarding who will, or will not, be struck

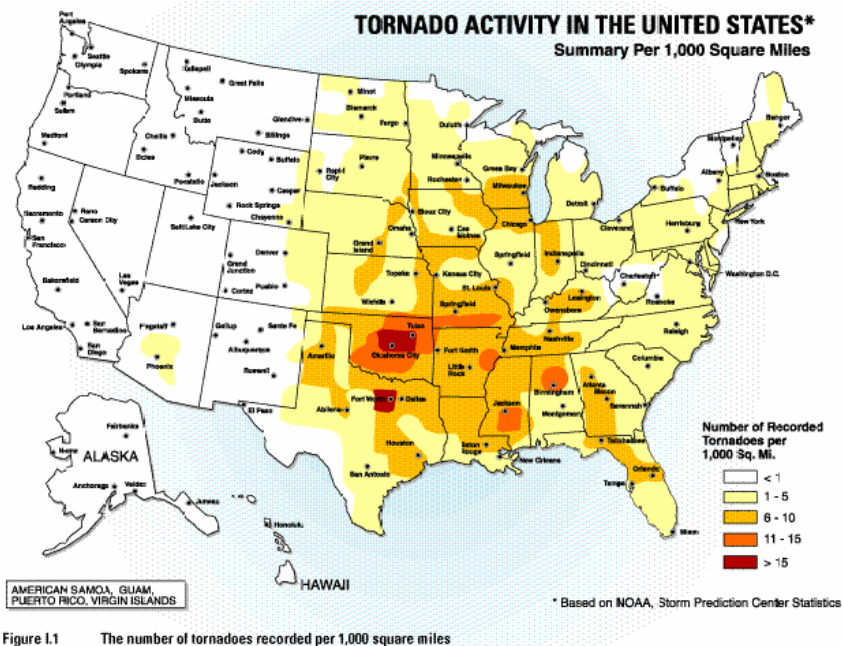


Figure 4.1

Although the number of tornadoes in Ohio does not rank high compared to other states in the United States, the State does average around 14 tornadoes a year. Ohio's peak tornado season runs from April through July, with most tornadoes occurring between 2 p.m. and 10 p.m. Even though June has been the month with the most tornado occurrences, many of the State's major tornado outbreaks have taken place in April and May. However, history has shown that tornadoes can occur during any month of the year and at any time of the day or night.

Tornadoes are considered the most violent atmospheric phenomenon on the face of the earth with their strength being measured by the Fujita Scale as described in Figure 4.2. This scale is the mechanism used to determine the potential type of tornado that may have affected a particular community. It is based on velocity of wind and the type of damage the tornado caused. Many F0 and F1 tornadoes have touched down in Ohio, but Ohio has also been struck by some of the most destructive F5 tornadoes ever, including the April 3, 1974 tornado which devastated Xenia, killing over 30 people and destroying 2,000 buildings.

SCALE	WIND SPEED	POSSIBLE DAMAGE
F0	40-72 mph	Light damage: Branches broken off trees; minor roof damage
F1	73-112 mph	Moderate damage: Trees snapped; mobile home pushed off foundations; roofs damaged
F2	133-157 mph	Considerable damage: Mobile homes demolished; trees uprooted; strong built homes unroofed
F3	158-206 mph	Severe damage: Trains overturned; cars lifted off the ground; strong built homes have outside walls blown away
F4	207-260 mph	Devastating damage: Houses leveled leaving piles of debris; cars thrown 300 yards or more in the air
F5	261-318 mph	Incredible damage: Strongly built homes completely blown away; automobile-sized missiles generated

Figure 4.2

Butler County has experienced 15 tornadoes since 1950, according to NCDC, which have caused over \$60 million in damage as well as killing 1 person and injuring 31 more.

4.6.1 Frequency/Probability of Future Occurrence

Butler County has a significant history of tornado occurrences. According to the NCDC, there have been 15 tornadic events recorded in the county over the past 60 years. On average, 4 tornadoes occur in the county every 10 years. There have been 2 F4 tornadoes documented within the county and one 1 F3 in the past 60 years. The probability of future occurrences is quite high as well as the likelihood of severe damage based on significant population growth in the county.

4.7 Drought

A drought is a period of abnormally dry weather that persists long enough to produce a serious hydrologic imbalance (i.e., crop damage, water supply shortage, etc.) The severity of the drought depends upon the degree of moisture deficiency, the duration and the size of the affected area.

The worst drought in 50 years affected 35 states during the long, hot summer of 1988, when some areas had been suffering from lack of rainfall since 1984. Rainfall totals in 1988 throughout the mid-west, Northern Plains and the Rockies were 50% to 85% below normal. Crops and livestock died, and some areas became desert. Forest fires began over the Northwest that left 4,100,000 acres destroyed by autumn.

4.7.1 Droughts as a Precursor to Other Disasters

Rural counties are susceptible to wild land fires especially during drought conditions. When most people think of wild fires, the first thing that comes to mind is the devastating and disastrous western fires that are quite prevalent during the summer months.

With more people than ever living, working, traveling and recreating in the urban/urban interface, the odds of wild land fires are increasing. Causes of wild land fires include the careless burning of debris, household trash and cigarettes, lightning, equipment and vehicles, railroad accidents, electrical fires, and arson.

Fire fighters talk of the fire triangle in terms of the heat of combustion, fuel and oxygen all being necessary for fire to occur. Wild land fire fighters are concerned with the wild land fire triangle of fuel (grass, brush, forests, crops, etc.), terrain (open flat lands, steep slopes and everything conducive to wild land fire spread) and weather (hot, dry, windy conditions are typical wild land fire weather). During an average year in Ohio, an estimated 15,000 wildfires and natural fuel fires occur. Typically, a reported 1,000 wild land fires burn an average between 4,000 to 6,000 acres in Ohio each year.

According to the NCDC, Butler County has not had any reported wild fires in the past 60 years. While chances of these occurring are minimal, the county still has nearly 130,000 acres of farmland that could be susceptible to fires.

4.7.2 Urban/Rural Fire Interface

The wildland-urban interface can be defined as the zone where structures and other human developments meet or intermingle with undeveloped lands.

Topography plays a major role in how fast a wildfire spreads. Steep slopes are the greatest topographical influence on fire behavior. As the steepness of a slope increases, fires spread more quickly. A fire will spread twice as fast on a 30% slope than it will on level ground. This fast speed is due to the fact that a fire starting at the bottom of a slope has a longer upslope run with more available fuel in its path.

Unlike most hazards, the threat of a drought tends to be dismissed because of the relatively long time a drought takes to have damaging effects.

Figure 4.3 shows the national risk to wild fires as of September 2010.

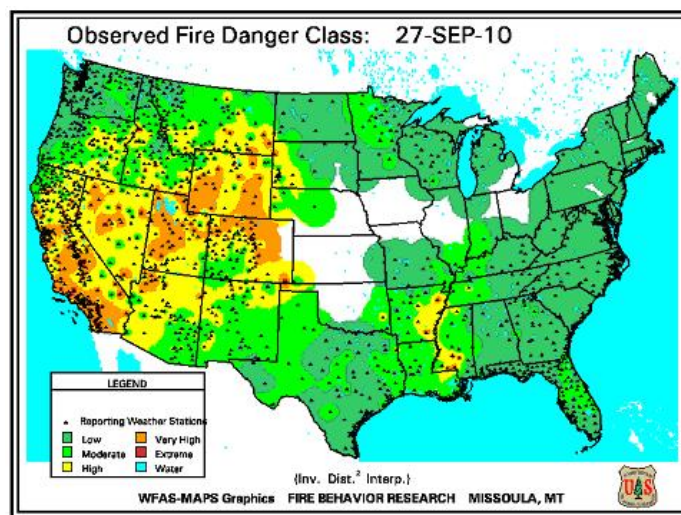


Figure 4.3

4.7.3 Frequency/Probability of Future Occurrence

According to the NCDC, Butler County has experienced 2 droughts of significance since 1999. The odds of future occurrences based on this information are very minimal.

4.8 Earthquakes

Major earthquakes are a low probability, high consequence event. It is because of the potential high consequences that geologists, emergency planners and other government officials have taken a greater interest in understanding the potential for earthquakes in some of the areas of the eastern United States and educating the population as to the risk in their areas. Although there have been great strides in increased earthquake awareness in the eastern United States, the low probability of such events makes it difficult to convince most people that they should be prepared.

It is surprising to many Ohioans that the State has experienced more than 120 earthquakes since 1776, and that 14 of these events have caused minor to moderate damage. The largest historic earthquake in Ohio was centered in Shelby County in 1937. This event, estimated to have had a magnitude of 5.5 on the Richter scale, caused considerable damage in Anna and several other western Ohio communities, where at least 40 earthquakes have been felt since 1875. Northeastern Ohio, east of Cleveland, is the second most active area of the state. At least 20 earthquakes have been recorded in the area since 1836, including a 5.0 magnitude event in 1986 that caused moderate damage. A broad area of southern Ohio has experienced more than 30 earthquakes.

Although the New Madrid Line is in close proximity to the State of Ohio, there has not been an earthquake of any significance since 1875 caused by this fault line. An earthquake on June 18, 1975 caused damage in western Ohio, and affected a total area estimated at over 40,000 square miles. Walls were cracked and chimneys thrown down in Sidney and Urbana. The shock was felt sharply at Jeffersonville, Indiana. The affected area included parts of Illinois, Indiana, Kentucky and Missouri.

4.8.1 Monitoring of Earthquakes

The ODNR Division of Geological Survey has established a 25 station cooperative network of seismograph stations throughout the State, mostly at universities and colleges, in order to continuously record earthquake activity. The network, which went on line in January 1999, ended a five-year gap during which there was only one operating station in Ohio. The State was dependent on seismographs in Kentucky and Michigan to record Ohio earthquakes. Figure 4.4 shows their locations.

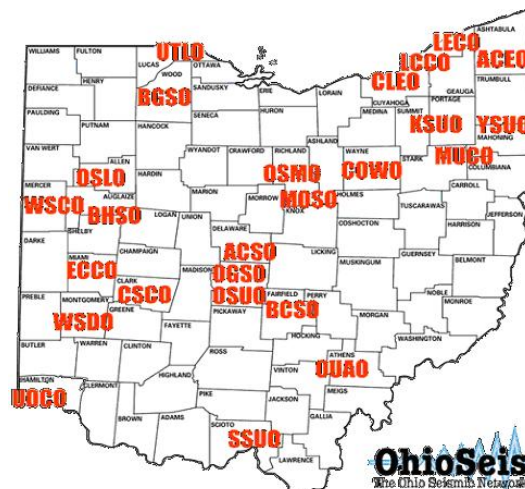


Figure 4.4

The 25 stations of the new seismograph network, which is called OhioSeis, are distributed across the State, but are concentrated in the most seismically active areas or in areas that provide optimal conditions for detecting and locating very small earthquakes that are below the threshold of human notice. These small micro earthquakes are important because they occur more frequently and help to identify the location of faults that may periodically produce larger, potentially damaging earthquakes. Each OhioSeis station is a cooperative effort. Seismometers, the instrument that detects Earth motions and other seismic components were purchased by the Division of Geological Survey with funds provided by FEMA through the OEMA, as part of the National Earthquake Hazards Reduction Program. The computers and Internet connection were purchased and provided by the cooperating institutions.

The Division of Geological Survey is coordinating the seismic network and has established the Ohio Earthquake Information Center at the Horace R. Collins Laboratory at Alum Creek State Park, north of Columbus in Delaware County. This facility functions as a repository and laboratory for rock core and well cuttings, but has a specially constructed room for earthquake recording. The seismograph system allows for very rapid location of the epicenter and calculation of the magnitude of any earthquake in the State. The earthquake records, or seismograms, from at least three seismograph stations are needed to determine earthquake locations (epicenters). These records can be downloaded from the internet at any station on the network, and location and magnitude can be determined. Small earthquakes were in many cases not even detected by distant, out-of-date seismograph stations.

The OhioSeis network provides a whole new dimension of understanding about the pulse of the Earth beneath Ohio. Although the new seismograph network will not predict earthquakes or provide an alert prior to an event, it will provide insight into earthquake risk in the State so that intelligent decisions about building and facility design and construction, insurance coverage and other planning decisions can be made by individuals, business and industry, and governmental agencies.

While Butler County has never had an epicenter directly within the county, earthquakes have been in very close proximity located in northern Hamilton County and southern Montgomery County which have had direct affects on Butler. The locations of past earthquakes' epicenters are shown in figure 4.4.

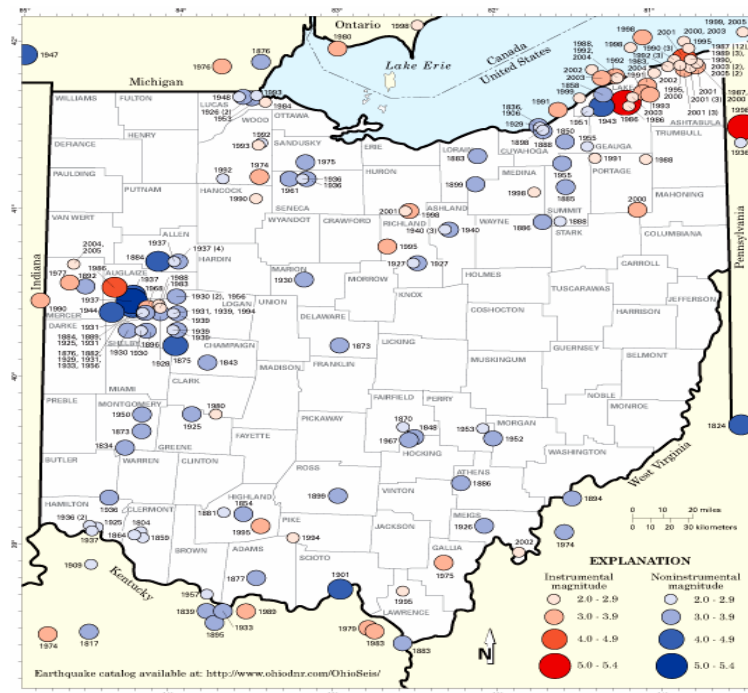


Figure 4.4

4.8.2 Frequency/Probability of Future Occurrence

Based on historical data the odds of an earthquake occurring in southwest Ohio and impacting Butler County are fairly high. The New Madrid fault line, which runs in close proximity to the State of Ohio, has a high probability of activity within the next 50 years according to geologists. Butler County's close proximity to this fault line puts the county at risk for any major earthquakes. A map of the New Madrid fault is shown in Figure 4.5.

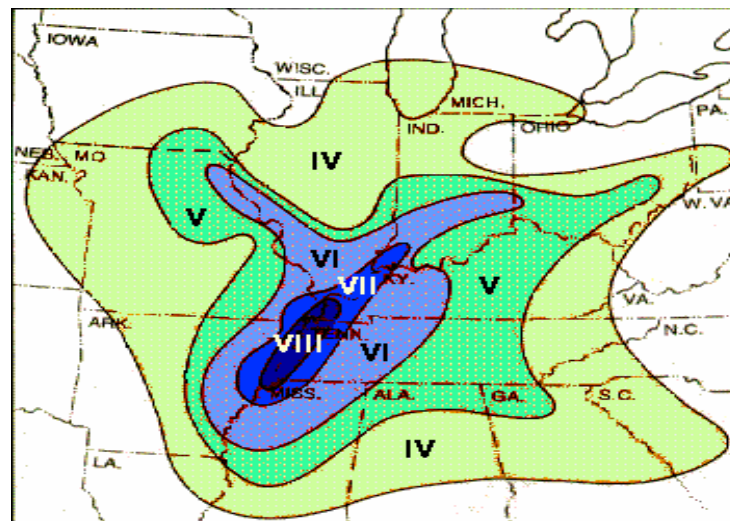


Figure 4.5

