

Chapter 4: Hazard Identification

4.1: Introduction

The second phase of the planning process is to develop a hazard analysis and risk assessment, which includes: 1) hazard identification, 2) hazard profiling, 3) identification of assets at risk, and 4) loss estimation. Before a community can assess the on-going mitigation activities, evaluate mitigation measures that should be undertaken, or outline a strategy for implementing mitigation projects, it must be aware of those hazards that, if they occur, could harm the community.

Hazard analysis and risk assessment answers the following fundamental question: “What hazards can occur and what would happen if a hazard event occurred in your community?”

Hazard analysis and risk assessment is the process of measuring the potential loss of life, injury, economic loss, and property loss resulting from hazards. Further, risk assessment teaches us:

- ☛ The hazards to which your community is susceptible;
- ☛ What these hazards can do to physical, social, and economic assets;
- ☛ What areas are most vulnerable to damage from these hazards; and
- ☛ The resulting costs of damages or costs avoided through future mitigation activities.

The hazard analysis identifies potential hazards that could affect Marion County and the various jurisdictions in the county for the purposes of mitigation planning. It is important to note the focus of mitigation is on reducing long-term risks of damage or threats to public health and safety caused by hazards and their effects. Thus, in some cases, the hazards identified for mitigation will not necessarily include all of or the same hazards identified for preparedness, response, or recovery.

The risk assessment identifies how people, properties, and structures will be damaged by the event. If the hazard can harm people or damage their homes and other structures, they are vulnerable. Finding the weak points in the system, for example, identifying building types that are vulnerable to damage and anticipating the loss in high risk areas will help the community decide what mitigation measure should be undertaken and how to implement the activities they select.

This chapter covers the first step in the HARA process, the identification of hazards. In order to identify hazards, the planning consultant used the 2007 State of Iowa Hazard Mitigation Plan and local data to create a list of possible hazards and then used the master list and definitions for planning team input to complete the identification. Hazards are identified as either: a) cannot occur, b) can occur but has not occurred, or c) has occurred.

4.2: Hazard Definitions and Descriptions

For this assessment, the following definitions are used for each hazard to be considered:

Dam Failure: A break in or imposed threat from, any water retention fixture in which may endanger population downstream of the containment area.

Drought: A period of prolonged lack of precipitation for weeks at a time producing severe dry conditions.

Earthquake: Any shaking or vibration of the earth caused by the sudden release of energy that may impose a direct threat on life and property.

Expansive Soils: Soils and soft rock that tend to swell or shrink excessively due to changes in moisture content.

Extreme Heat: Summertime weather that is substantially hotter and/or more humid than average for a location at that time of year.

Flash Flood: A flood event occurring with little or no warning where water levels rise at an extremely fast rate.

Grass and Wildland Fire: An uncontrolled fire that threatens life and property in either a rural or wooded area.

Hailstorm: An outgrowth of a severe thunderstorm in which balls or irregularly shaped lumps of ice greater than 1.0 inch in diameter fall with rain.

Landslide: A downward and outward movement of slope-forming materials reacting under the force of gravity.

- Levee Failure: The failure of a formal levee system in the protection of a flood hazard area from flooding due to structural or mechanical failure of the levee, or due to being overtopped.
- River Flood: A rising or overflowing of a tributary or body of water that covers adjacent land not usually covered by water when the volume of water in a stream exceeds the channel's capacity.
- Severe Winter Storm: Severe winter weather conditions that affect day-to-day activities. These can include blizzard conditions, heavy snow, blowing snow, freezing rain, heavy sleet, and extreme cold.
- Sinkhole: The loss of surface elevation due to the removal of subsurface support.
- Thunderstorm and Lightning: Atmospheric imbalance and turbulence that may result in thunder, heavy rains (which may cause flash flooding), and strong winds reaching or exceeding 58 mph resulting in tornadoes, or surface hail of at least 1 inch in diameter, and lightning.
- Tornado: A violent, destructive, rotating column of air taking the shape of a funnel-shaped cloud that progresses in a narrow, erratic path.
- Windstorm: Extreme winds associated with severe winter storms, severe thunderstorms, downbursts, and very strong pressure gradients.
- Air Transportation Incident: Any incident involving a military, commercial, or private aircraft.
- Animal/Crop/Plant Disease: An outbreak of disease that can be transmitted from animal to animal and to plants.
- Communications Failure: The widespread breakdown or disruption of normal communication capabilities.
- Enemy Attack: An intentional attack on the community by an enemy force, which would cause massive destruction and extensive casualties.
- Energy Failure: An extended interruption of electric, petroleum or natural gas service, which could create a potential health problem for the population and possibly mass panic.
- Fixed Hazardous Materials Incident: Accidental release of chemical substances or mixtures that presents danger to public health or safety during production or handling at a fixed facility.
- Fixed Radiological Incident: Accidental release of radiological substances that present danger to public health or safety during production or handling at a fixed facility.
- Highway Transportation Incident: A single or multi-vehicle incident which results in property damage and/or death(s)/injury(s).
- Human Disease Incident: A medical, health, or sanitation threat to the general public (such as contamination, epidemics, plagues, and insect infestation).
- Human Disease Pandemic: A pandemic is defined as a disease that has spread around the world to many people.
- Pipeline Transportation Incident: A break in a pipeline creating a potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation.
- Public Disorder: Mass demonstrations or direct conflict by large groups of citizens, as in marches, protest rallies, riots, and non-peaceful strikes.
- Rail Transportation Incident: A derailment or a train accident that directly threatens life or property, or that adversely impacts a community's capabilities to provide emergency services.
- Structural Failure: The collapse (part or all) of any public or private structure including roads, bridges, towers, and buildings.
- Structural Fire: An uncontrolled fire in populated area that threatens life and property and is beyond normal day-to-day response capabilities.
- Agro-Terrorism: An action causing intentional harm to an agricultural product or vandalism of an agricultural / animal related facility.
- Biological Terrorism: Use of biological agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.
- Chemical Terrorism: Use or threat of chemical agents against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.
- Conventional Terrorism: Use of conventional weapons and explosives against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion or ransom.
- Cyber Terrorism: Electronic attack using one computer system against another in order to intimidate people or disrupt other systems.
- Radiological Terrorism: The use of radiological materials against a person or persons in order to bestow fear upon a larger group of people.

Transportation Hazardous Materials Incident: An accidental release of chemical substances or mixtures that present a danger to public health or safety as a result of transportation.

Transportation Radiological Incident: An incident resulting in a release of radioactive material during transportation.

Waterway/water body Incident: An accident involving any vessel that threatens life or which adversely impacts a community’s capability to provide emergency services.

Chapter 5, the hazard profile, includes detailed descriptions for each of the profiled hazards.

4.3: Potential Hazards in Marion County

The State of Iowa Homeland Security and Emergency Management Division (IHSEMD) has created a list of identified hazards that can occur in the State of Iowa. Such hazards include natural hazards, those that are generally not caused by humans, and non-natural hazards, those that are technological or infrastructure-based, which may or may not be triggered by natural hazards. The State Hazard Mitigation Plan, which was adopted and approved in late 2007, includes 40 hazards—16 of which are natural hazards and 24 of which are not natural hazards. The Marion County planning team did not add to this list. You will notice in the table below that the hazards can sometimes cross the blurry boundary between natural and non-natural. FEMA requires that all natural hazards be studied in the mitigation plan. However, the Marion County Hazard Mitigation Planning Team recognized the need for and importance of planning for non-natural hazards and identified many occurrences of non-natural hazards in Marion County.

Marion County and its Hazard Mitigation Planning Committee identified several hazards that are addressed in the County’s Multi-jurisdictional Hazard Mitigation Plan. The identification process involved several sources: 1) the planning team, 2) public input, 3) past local hazard assessments, 4) the consultant’s experience having grown up and lived all his life within 150 miles of the community, 5) local documents and reports, 6) maps and reports from websites, and 7) the 2007 and 2010 State of Iowa Hazard Mitigation Plans. Throughout this plan, as practical, the natural hazards were listed alphabetically first followed by the non-natural hazards.

Table 4:1: Potential Hazards In Marion County Or One Or More Jurisdictions In The County

| | | Has Occurred | Can Occur | Cannot Occur |
|-----------------|---|--------------|-----------|--------------|
| Natural Hazards | Where Information Found, Planning Team Comments | | | |
| Dam Failure | State Mitigation Plan, Watershed maps, Conservation Board, and the planning team states it can happen at the various smaller to mid-sized earthen public and private dams in and upstream of county, which are not often inspected. The larger Lake Red Rock Dam is inspected regularly but also would cause catastrophic losses if it fails. This event can occur in some jurisdictions. | | X | |
| Drought | State Mitigation Plan, USDA websites, past disaster declarations, local news media, consultant personal experience, planning team indicates droughts are common and affect rural areas severely. | X | | |
| Earthquake | State Mitigation Plan, geological and seismic maps, maps of past events. Minor tremors have been noted in the County in the late 1980s. Epicenters of minor quakes have occurred 175 miles southwest in Fremont County and 200 miles east near Davenport. | X | | |
| Expansive soils | State Mitigation Plan, soils maps, USDA and USGS websites, small areas of expansive soils have occurred in a widespread area in the county due to clay soils, the planning team reports. Officials serving the rural area and many of the towns report this event has happened and the cities and most schools and other entities indicate it can happen. | X | | |
| Extreme heat | State Mitigation Plan, NCDC, NWS, Weather Channel, local news media, consultant personal experience, and planning team comments. Excessive heat occurs at least once most summers. | X | | |
| Flash flood | State Mitigation Plan, past disaster declarations, county/city surveys, NCDC, consultant personal experience, planning team, and local news media. Flash flooding is found in most areas of the county after the heaviest of rains. Some areas have common events. Undersized infrastructure is the main concern or problem, with topography a close | X | | |

Marion County Multi-Jurisdictional Multi-Hazard Mitigation Plan of 2012-2016

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| | second. Most jurisdictions report past events and the remaining indicate potential events. | | | |
| Grass and wildland fire | State Mitigation Plan, local news media, fire dept. reports, planning team, city/county surveys. The team indicates that small grass and forest fires occur during dry seasons annually. Most jurisdictions report past events and most others indicate potential events. | X | | |
| Hailstorm | State Mitigation Plan, NCDC, city/county surveys, NWS, Weather Channel, consultant personal experience, and planning team. Large hail has occurred in all areas of the county and can occur in all seasons. Some buildings may not be susceptible. | X | | |
| Landslide | State Mitigation Plan, city/county surveys, planning team, soils maps, county engineer, and conservation staff. Landslides are small but have occurred in some jurisdictions related to natural waterways, lakeshores, and along roadways. Possibility of homes sliding into Army Corps of Engineers land or even into Red Rock Lake. | X | | |
| Levee failure | State Mitigation Plan, planning team, area maps of Lake Red Rock and Des Moines River; The Des Moines River valley has some levees that protect developed areas. Some have failed in 1993, 2009, and 2010 on a minor scale. The Skunk River valley has a levee near Pella. Areas near Harvey and Clay Twp have been impacted. | X | | |
| River flood | State Mitigation Plan, NCDC, FIRM maps, past disaster declarations, city/county surveys, consultant personal experience, watershed maps, and planning team comments. Flooding can and has occurred in rural areas and several jurisdictions. There are no mapped or locally identified river flood hazard areas in some jurisdiction. | X | | |
| Severe winter storm | State Mitigation Plan, NCDC, past disaster declarations, local news media, Weather Channel, NWS, consultant personal experience, planning team. Heavy snow, ice storms, and/or severe wind chills occur most winters. | X | | |
| Sinkhole | State Mitigation Plan, USGS, maps of past mining and caverns, city/county surveys, planning team. After review of data, planning team identified sinkholes as an issue in most jurisdictions, with recent events, and that can occur in all jurisdictions. | X | | |
| Thunderstorm – lightning | State Mitigation Plan, NCDC, Weather Channel, NWS, local news media, past disaster declarations, consultant personal experience, and planning team. Thunderstorms that are deemed severe by the NWS occur almost every year and most years several occur. | X | | |
| Tornado | State Mitigation Plan, NCDC, Weather Channel, NWS, local news media, past disaster declarations, consultant personal experience, and planning team. Tornadoes of EF0-EF2 occur most years in the county and EF3 and larger have occurred. Warnings and sighting have occurred in all jurisdictions but not necessary all jurisdictions have been directly hit. | X | | |
| Windstorm | State Mitigation Plan, NCDC, Weather Channel, NWS, local news media, past disaster declarations, consultant personal experience, and planning team. Straight-line winds can be over 70 MPH, even on sunny days, and damage has occurred. | X | | |
| Man-made and Combination Hazards | | | | |
| Air transportation incident | State Mitigation Plan, local news media, air flight maps, planning team. Team states that small events have occurred in rural areas and can occur anywhere due to the numerous planes that fly over the county. | X | | |
| Animal/crop/plant disease | State Mitigation Plan, local news media, Iowa Dept. of Public Health website, USDA website, planning team. Team members indicated no major outbreaks but remain concerned over oncoming diseases and pests. | | X | |
| Communications failure | State Mitigation Plan, city/county surveys, planning team, first responders. The hazard has occurred in a few jurisdictions but has not been reported in all. | X | | |
| Enemy attack | State Mitigation Plan, DHS website, planning team. Team indicates with the AFB in Omaha and Camp Dodge in Des Moines, as well as other installations in the region, indirect affects could occur but actual direct attack on the county is unlikely. | | X | |
| Energy failure | State Mitigation Plan, city/county surveys, planning team, first responders, and utility orgs, local news media. Energy failures have occurred all over the county. | X | | |
| Fixed hazardous materials incident | State Mitigation Plan, EPA Tier II facility maps, IDNR incident reports, planning team, first responders, planning team. Events have occurred in rural area and larger towns; can occur in most jurisdictions because of sewer lagoons and agricultural facilities. | X | | |
| Fixed radiological incident | State Mitigation Plan, IDPH and EPA websites, planning committee. There are no appreciable radiological sites identified in the county. Local hospitals have modest levels in controlled environments. The group considers this hazard low risk but an incident could occur and affect some locations. | | X | |
| Highway transportation incident | State Mitigation Plan, IDOT crash data, planning team, first response agencies, and local news media. With the Interstate and other highways, events occur requiring extensive response and road closures each year. Several jurisdictions have had incidents. | X | | |
| Human disease incident | State Mitigation Plan, local news media, Iowa Dept. of Public Health website, Marion County Public Health, planning team. Team indicates that the problem has been minor in scope but occurs in public and populated areas and can occur in all jurisdictions. | X | | |
| Human disease pandemic | State Mitigation Plan, Iowa Dept. of Public Health website, Marion County Public Health, regional TV stations, planning team. Public Health reports past pandemics. | X | | |

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| Pipeline transportation incident | State Mitigation Plan, pipeline maps, Iowa Utilities Board, DOE website, pipeline company websites, planning team, first responders. Most jurisdictions can have events but none of significance has been reported in the county. | | X | |
| Public disorder | State Mitigation Plan, local news media, first responders, planning team. Public disorder is not known to occur, but planning team believes some jurisdictions are large enough in population that events could occur. | | X | |
| Rail transportation incident | State Mitigation Plan, planning team, IDOT maps. Planning team reports minor incidents in the county, mostly many years ago. Minor injuries at best. | X | | |
| Structural failure | State Mitigation Plan, planning team, local news media, visual survey of building condition, assessor's data on age of buildings. Some buildings and structures have collapsed, mostly on a small scale. Can occur in all jurisdictions. | X | | |
| Structural fire | State Mitigation Plan, planning team, local news media, first responders. Structural fires, including those that require expensive assistance to extinguish, are not uncommon in all areas of the county. Has occurred in most jurisdictions. Can occur in all of them. | X | | |
| Terrorism – Agro-terrorism | State Mitigation Plan, DHS website, USDA website, news media, planning team. No reported event in the county but planning team agrees it is possible. | | X | |
| Terrorism – Biological Terrorism | State Mitigation Plan, DHS website, USDA website, news media, planning team. After review of data, team indicates events are possible but have not occurred. | | X | |
| Terrorism – Chemical Terrorism | State Mitigation Plan, DHS website, EPA and other federal websites, news media, planning team. After review of data, team indicates events are possible but have not occurred. | | X | |
| Terrorism – Conventional Terrorism | State Mitigation Plan, DHS website, other federal websites, news media, planning team, first responders. There have been bomb threats at schools and large industries. | X | | |
| Terrorism – Cyber Terrorism | State Mitigation Plan, DHS website, communications websites, news media, planning team. After review of data, team indicates events are possible but have not occurred. | | X | |
| Terrorism – Radiological Terrorism | State Mitigation Plan, DHS website, other federal websites, news media, planning team. After review of data, team indicates events are possible but have not occurred. | | X | |
| Transportation Hazardous Materials | State Mitigation Plan, local news media, planning team, first responders, IDOT and IDNR crash data and incident reports. Trans HAZMAT events have occurred in many areas of the county and can occur in most jurisdictions. | X | | |
| Transportation Radiological Incident | State Mitigation Plan, federal radiological transportation data/plans, planning team. Railroads and Highway 92 are routes for radiological materials, and other routes are also likely (14 and 163), so events could occur in some jurisdictions. Team is not highly concerned due to amount of materials in one shipment is low and containers are sturdy. | | X | |
| Waterway – water body incident | State Mitigation Plan, local lakes maps, conservation staff, first responders, planning team. Drownings have occurred and water bodies are popular in all seasons for fishing, swimming, and boating. | X | | |

During the second planning team meeting, the Marion County Hazard Mitigation Planning Team reviewed all the possible hazards and identified by the State and determined that 28 of the hazards (15 natural and 13 human/combo) have occurred, 12 (1 natural and 11 human/combo) can occur but have not been recorded, and 0 cannot occur in this county.

The following details the Iowa Presidential declarations since 1990.

Table 4.2: Iowa Disaster Declarations (1990 to November 2011)

| Event | Declaration By | Year | Impact on Marion County |
|--|------------------|------|---|
| Severe storms and flooding | Federal, 4018-DR | 2011 | Does not include Marion County |
| Severe storms, straight-line winds, and flooding | Federal, 4016-DR | 2011 | Does not include Marion County |
| Flooding | Federal, 1998-DR | 2011 | Does not include Marion County |
| Severe storms, tornadoes, straight-line winds | Federal, 1977-DR | 2011 | Does not include Marion County |
| Severe storms, flooding, and tornadoes | Federal, 1930-DR | 2010 | Includes Marion County |
| Severe storms and flooding | Federal, 1928-DR | 2010 | Does not include Marion County |
| Severe winter storms | Federal, 1880-DR | 2010 | Does not include Marion County |
| Severe winter storms and snowstorms | Federal, 1877-DR | 2010 | Does not include Marion County |
| Severe Storm | Federal, 1854-DR | 2009 | Does not include Marion County |
| Severe storms, tornadoes, and flooding | Federal, 1763-DR | 2008 | Includes Marion County |
| Severe winter storm (ice storm) | Federal, 1737-DR | 2008 | Includes Marion County – public assistance only |
| Severe storms and flooding | Federal, 1727-DR | 2007 | Does not include Marion County |
| Severe storms, flooding, and tornadoes | Federal, 1705-DR | 2007 | Does not include Marion County |
| Severe winter storms | Federal, 1688-DR | 2007 | Includes Marion County – public assistance only |

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|--|------------------|------|---|
| Snow (Emergency Dec.) | Federal, 3275 | 2007 | Does not include Marion County |
| Hurricane Katrina (Emergency Dec.) | Federal | 2005 | All counties, funds to evacuees |
| Tornadoes and severe storms | Federal, 1518-DR | 2004 | Does not include Marion County |
| Storms and flooding | Federal, 1420-DR | 2002 | Does not include Marion County |
| Storms and flooding | Federal, 1367-DR | 2001 | Does not include Marion County |
| Storms and flooding | Federal, 1282-DR | 1999 | Does not include Marion County |
| Storms, flooding, tornados | Federal, 1277-DR | 1999 | Does not include Marion County |
| Severe storms, flooding, and tornados | Federal, 1230-DR | 1998 | Includes Marion County – individual assistance only |
| Severe snow storm | Federal, 1191-DR | 1997 | Includes Marion County – public assistance only |
| Flooding (second event of year) | Federal, 1133-DR | 1996 | Does not include Marion County |
| Flooding (first event of year) | Federal, 1121-DR | 1996 | Includes Marion County |
| Flooding, severe storm (2 nd event of yr) | Federal, 996-DR | 1993 | Does not include Marion County |
| Flooding, severe storm (1 st event of yr) | Federal, 986-DR | 1993 | Does not include Marion County |
| Flooding, severe storm | Federal, 965-DR | 1992 | Does not include Marion County |
| Ice Storm | Federal, 928-DR | 1991 | Does not include Marion County |
| Flooding, severe storms | Federal, 911-DR | 1991 | Does not include Marion County |
| Flooding, severe storm (2 nd event of yr) | Federal, 879-DR | 1990 | Does not include Marion County |
| Flooding, severe storm (1 st event of yr) | Federal, 868-DR | 1990 | Includes Marion County – individual assistance only |

Source: www.fema.gov

Since 1990 (and even before then), the county has been involved in many incidents, including those that have and have not resulted in Presidential declarations. Since 1990, damages resulting on Federal declarations have occurred eight (8) times in Marion County.

4.4: Hazard Identification by Jurisdiction

It is important to know where the hazards can occur. Hazards are identified by jurisdiction in order to: a) meet DMA 2000 requirements and b) to best distribute resources. All governmental jurisdictions contain land and buildings that can be impacted by various disasters. The following table shows the potential hazards in the county and the jurisdictions in which they have occurred, could occur, or cannot occur.

Table 4.3: Hazard Identification by Jurisdiction

| Hazard | Rural County | City of Bussey | City of Harvey | City of Knoxville | City of Melcher-Dallas | City of Pella | City of Pleasantville | City of Swan | Clay Twp | Indiana Twp | Central College | Knoxville CSD | Melcher-Dallas CSD | Pella CSD | Pleasantville CSD | Twin Cedars CSD | Knoxville Hospital | Pella Hospital |
|-----------------------------|--------------|----------------|----------------|-------------------|------------------------|---------------|-----------------------|--------------|----------|-------------|-----------------|---------------|--------------------|-----------|-------------------|-----------------|--------------------|----------------|
| Dam Failure | P | N | P | N | N | N | N | P | P | N | N | N | N | N | N | N | N | N |
| Drought | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Earthquake | P | P | P | P | P | Y | P | P | P | P | P | P | P | P | P | P | P | P |
| Expansive soils | Y | P | P | P | P | Y | Y | Y | Y | Y | P | P | P | P | N | P | N | N |
| Extreme heat | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Flash flood | Y | Y | Y | Y | Y | Y | Y | Y | P | P | Y | Y | P | P | P | Y | Y | P |
| Grass and wildland fire | Y | P | P | P | P | P | P | P | Y | Y | N | N | N | N | N | P | N | N |
| Hailstorm | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Landslide | Y | N | N | N | N | N | N | N | Y | P | N | N | N | N | N | N | N | N |
| Levee failure | Y | N | P | N | N | N | N | P | Y | N | N | N | N | N | N | N | N | N |
| River flood | Y | Y | Y | Y | Y | Y | P | Y | Y | Y | N | N | N | N | N | N | N | N |
| Severe winter storm | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Sinkhole | Y | P | P | Y | P | Y | P | Y | Y | P | P | P | P | P | P | P | Y | P |
| Thunderstorm – lightning | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Tornado | Y | P | P | P | P | Y | P | P | Y | Y | P | P | P | P | P | P | P | P |
| Windstorm | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Air transportation incident | Y | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| Animal/crop/plant disease | Y | P | P | P | P | P | P | P | P | Y | P | N | N | N | N | N | N | N |

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|----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Communications failure | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Enemy attack | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| Energy failure | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Fixed HAZMAT incident | Y | Y | N | P | P | P | P | N | Y | P | P | P | P | P | P | Y | P | P |
| Fixed radiological incident | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | P | P |
| Highway transportation incident | Y | P | N | P | P | P | P | N | Y | Y | P | N | N | N | N | P | N | N |
| Human disease incident | Y | P | P | Y | Y | Y | Y | P | P | P | Y | Y | Y | Y | Y | Y | Y | Y |
| Human disease pandemic | Y | Y | P | Y | P | Y | P | P | P | P | Y | Y | Y | Y | Y | P | Y | Y |
| Pipeline transportation incident | P | P | N | P | P | P | P | N | P | N | P | P | P | P | P | N | N | P |
| Public disorder | P | P | N | P | N | P | P | N | N | N | P | P | P | P | P | P | P | P |
| Rail transportation incident | Y | P | P | P | P | N | P | P | P | N | N | N | P | N | N | N | N | N |
| Structural failure | Y | Y | Y | Y | Y | P | P | P | Y | P | P | P | P | P | P | P | P | P |
| Structural fire | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | P | P | P | P | P | P | P | P |
| Terrorism – Agro-terrorism | P | P | P | P | P | P | P | P | P | P | N | N | N | N | N | P | N | N |
| Terrorism – Biological | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| Terrorism – Chemical | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| Terrorism – Conventional | P | P | Y | Y | P | Y | P | P | P | P | P | Y | P | P | P | P | P | P |
| Terrorism – Cyber | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| Terrorism – Radiological | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| Transportation HAZMAT Inc. | Y | Y | P | P | P | P | P | P | Y | P | P | P | P | P | P | P | P | P |
| Transportation Radiological Inc. | P | P | P | P | P | P | P | P | P | P | N | N | N | N | N | N | N | N |
| Waterway – water body incident | Y | N | P | P | P | Y | P | N | P | P | P | N | N | N | N | N | N | N |

N= cannot occur in jurisdiction; Y= can occur and has occurred; P= potential hazard that has not occurred to date (at least not reported or known); W=warning but no damage in jurisdiction

Based on local, state, and national data, we have been able to determine with some certainty in which jurisdictions hazards have, can, and cannot occur. Of course, the above list is based on the best available data. Unfortunately, data is incomplete about most man-made hazards, especially about events that happened more than 10 years ago. Many of the events listed as possible are likely to have happened at some point but there is no known record of the event. Hazards that cannot occur have been identified because the conditions needed for the event are impossible, such as a railroad or pipeline transportation event where neither exist in or near a community, or the impacts would be so small that the effect on human life and property would be too minimal to be considered further.

It is important to understand that the various jurisdictions have differing vulnerabilities to hazards, both natural and man-made. No community is impacted or can be impacted by all hazards. The rural area, due to its large area of land and water, and Knoxville and Pella, have more people, land, and assets that can be impacted and have been impacted by more hazard events from more types of hazards. Some hazards are fixed as to where they can occur and do not impact all jurisdictions, such as river flooding, landslides, and dam failure. In this way, small towns are likely to be impacted by fewer hazards, especially man-made hazards. Similarly, schools (i.e., school property) are located in smaller defined areas within only a few of the towns.

Note: it is possible that some hazards can cross boundaries into jurisdictions in which the hazard is not recognized as a hazard occurring in that jurisdiction. One example is dam failures. Dam failures upstream from a town can cause flooding and other impacts to a downstream town, such as Harvey, Swan, and Clay Township.

All the hazards that have occurred and those that can occur in any jurisdictions of the county are included and detailed in the next chapter: Hazard Profile. The profile details the risk to each jurisdiction by hazard.