1 RISK ASSESSMENT

Identifying Hazards

At the Planning Committee's kick-off meeting, participants were introduced to types of hazards to be considered in the Local Hazard Mitigation Plan process. Sources of possible hazards to consider included Federal Emergency Management Agency's (FEMA) required natural hazards and natural hazards from *Scott County, Iowa Multijurisdictional Hazard Mitigation Plan, 2012.* Table 3-1 is a comparison table of natural hazards from each of these sources.

Table 3-1
Comparison of Potential Natural Hazards

FEMA	Scott County 2012
Avalanche	—
Coastal Erosion	—
Coastal Storm	—
Dam Failure	Dam Failure
Drought	Drought
Earthquake	Earthquakes
Expansive Soils	Expansive Soils
Extreme Heat	Extreme Heat
Flood	Flash Flood
—	River Flooding
Hailstorm	Hailstorms
Hurricane	—
Land Subsidence	—
Landslide	Landslide
—	Levee Failure
Severe Winter Storm	Severe Winter Storms
—	Sink Holes
—	Thunderstorm & Lightning
Tornado	Tornados
Tsunami	—
Volcano	—
Wildfire	Grass or Wildland Fire
Windstorm	Windstorm

In addition to natural hazards, which are required for consideration in the Local Hazard Mitigation Plan, the *Scott County, Iowa Multijurisdictional Hazard Mitigation Plan, 2012* addressed man-made or human-caused hazards. Those hazards were not included in this plan due to funding constraints, though profiles for those hazards from the previous plan can be found in Appendix VI-1.

Some natural hazards are not examined because they do not occur in the planning area or their effects are not considered significant in relation to other hazards. Table 3-2 lists these hazards and provides a brief explanation for their elimination.

Table 3-2
Hazards Not Profiled in the Plan

Hazard	Explanation for Omission
Avalanche	There are no mountains in the planning area.
Coastal Erosion	There are no coastal areas near the planning area.
Coastal Storm	There are no coastal areas near the planning area.
Hurricane	There are no coastal areas near the planning area.
Tsunami	There are no coastal areas near the planning area.
Volcano	There are no volcanic mountains in the planning area.

The Planning Committee decided to combine Land Subsidence with Sinkholes, since portions of Scott County are mined, and ground collapse has been known to happen, as will be described in the hazard profile. Scott County also decided that Hailstorms could be combined with Thunderstorm and Lightning.

Based on the process discussed above, the Planning Committee identified a total of 14 hazards for the Scott County planning area. These hazards are listed below in alphabetical order.

Dam Failure

Drought

Earthquake

Expansive Soils

Extreme Heat

Flash Flood

Grass or Wildland Fire

Levee Failure

River Flood

Severe Winter Storm

Sinkholes, Land Subsidence and Landslides

Thunderstorm, Hailstorm, and Lightning

Tornado

Windstorm

Profiling Hazards

The Planning Committee selected to use the format for profiling hazards outlined in the Iowa Hazard Analysis and Risk Assessment: 2003 Guidance. This format provides a worksheet that combines the required elements of hazard profiling for each hazard. The worksheet format was also used by neighboring Muscatine County, Iowa and Rock Island County, Illinois in addition to the *City of Davenport's Pre-Disaster Mitigation Plan 2007*. The worksheet provides space for a narrative description of the following categories:

Definition

Description

Maximum Extent

Historical Occurrence

Probability (of future events)

Vulnerability (of planning area to future events)

Location

Severity of Effects

Speed of Onset

The hazard profiles are provided for all of the Scott County planning area. As part of the multi-jurisdictional participation of this plan, additions or exceptions from the general planning area are noted for individual jurisdictions in their individual risk assessment profiles later in this chapter to the extent available and reported.

Hazard Scoring Methodology

Following the review of the hazard profiles, the Planning Committee utilized the methodology from the 2013 *Iowa Hazard Mitigation Plan* to evaluate the identified hazards for further consideration, ranking, and priority. The participating jurisdictions were asked to discuss each hazard and review data and information for each hazard. The Community School Districts (CSD) did not participate in the hazard scoring exercise due to the duplicative nature of their boundaries. The areas the CSDs serve are already being covered in the hazard scoring process by a participating governmental jurisdiction. It was important for the jurisdictions to score each hazard as a single event. Only effects from that particular hazard were to be considered in the analysis.

This hazard analysis seeks to strike a balance between evaluation criteria; for example, the evaluation of low-probability, high-impact events versus high-probability, and low-impact events. Each category of a particular hazard was rated on a scale of one through four in all the scoring guide tables outlined in Table 3-3 due to the large variation in historical occurrence, probability, percentage of vulnerability and spatial extent, the number of casualties, or the value of the property damaged. Using this scale provided the best option in comparing each aspect of vastly different types of hazards.

Table 3-3
Hazard Scoring Methodology

Probability: Reflects the likelihood of the hazard occurring again in the future, considering both the historical occurrence of the hazard and the projected likelihood of the hazard occurring in any given year		
Score	**Description**	
1	Unlikely	Less than 10% probability in any given year (up to 1 in 10 chance of occurring). History of events is less than 10% likely or the event is unlikely, but there is a possibility of its occurrence.
2	Occasional	Between 10% and 20% probability in any given year (up to 1 in 5 chance of occurring), history of events is greater than 10% but less than 20% the event could possibly occur.
3	Likely	Between 20% and 33% probability in any given year (up to 1 in 3 chance of occurring), history of events is greater than 20% but less than 33% the event is likely to occur.
4	Highly Likely	More than 33% probability in any given year (event has a 1 in 1 chance of occurring), history of events is greater than 33% likely or the event is highly likely to occur.
Magnitude/Severity: Assessment of severity in terms of injuries and fatalities, personal property, and infrastructure, and the degree and extent with which the hazard affects the county		
Score	**Description**	
1	Negligible	Less than 10% of property severely damaged, shutdown of facilities and services for less than 24 hours, and/or injuries/illnesses treatable with first aid.
2	Limited	10% to 25% of property severely damaged, shutdown of facilities and services for more than a week, and/or injuries/illnesses that do not result in permanent disability.
3	Critical	25% to 50% of property severely damaged, shutdown of facilities and services for at least 2 weeks, and/or injuries/illnesses that result in permanent disability.
4	Catastrophic	More than 50% of property severely damaged, shutdown of facilities and services for more than 30 days, and/or multiple deaths.
Warning Time: Rating of the potential amount of warning time that is available before the hazard occurs		
Score	**Description**	
1	More than 24 hours warning time	
2	12 to 24 hours warning time	
3	6 to 12 hours warning time	
4	Minimal or no warning (up to 6 hours warning)	
Duration: A measure of the duration of time that the hazard will affect the state		
Score	**Description**	
1	Less than 6 hours	
2	Less than 1 day	
3	Less than 1 week	
4	More than 1 week	

The hazard scoring worksheet for each jurisdiction was collected and can be found in Appendix III-1. The scores from each jurisdiction were then weighted according to the methodology presented in the 2013 *Iowa Hazard Mitigation Plan*. The formula used for weighing the hazard scores was:

(Probability x .45) + (Magnitude/Severity x .30) + (Warning Time x .15) + (Duration x .10) = Total Weighted Score

Final Hazard Score for Each Jurisdiction

Initially, the scores were then weighted by the jurisdiction's percentage of population within Scott County to reflect the distribution of population affected by each hazard. The scores from each jurisdiction were then added together to create a Scott County-wide hazard ranking. However, as described in the following section, individual scores were removed from the final county-wide ranking.

Table 3-4
Scott County Hazard Scoring

EVENT	PROBABILITY	MAGNITUDE/ SEVERITY	WARNING TIME	DURRATION	RISK
	Likelihood this will occur	*Possibility of death or injury, personal property, and infrastructure*	*Potential amount of warning time before hazard occurs*	*The duration of time that a hazard will affect the state*	*Weighted Score**
SCORE	*1 - Unlikely*	*1 - Negligible*	*1 - More than 24 hours*	*1 - Less than 6 hours*	*The higher the score the greater the risk*
	2 - Occasional	*2 - Limited*	*2 - 12 to 24 hours*	*2 - Less than 1 day*	
	3 - Likely	*3 - Critical*	*3 - 6 to 12 hours*	*3 - Less than 1 week*	
	4 - Highly Likely	*4 - Catastrophic*	*4 - Minimal or no warning (up to 6 hours)*	*4 - More than 1 week*	
Dams	1	2	2	3	**1.65**
Drought	2	2	1	4	**2.05**
Earthquake	1	4	4	1	**2.35**
Expansive Soils	1	2	4	3	**1.95**
Extreme Heat	2	2	1	3	**1.95**
Flash Flood	3	3	3	3	**3.00**
Grass and Wildland Fires	3	2	4	2	**2.75**
Hazardous Spills	4	2	4	3	**3.30**
Landslide/Sinkhole	1	1	4	3	**1.65**
Levee Failure	1	2	2	4	**1.75**
River Flood	4	2	1	4	**2.95**
Severe Winter Storm	4	2	1	3	**2.85**
Thunderstorm, Lightning, Hail	4	2	2	2	**2.90**
Tornado	2	4	4	1	**2.80**
Windstorm	4	2	2	2	**2.90**
AVERAGE SCORE	**2.47**	**2.27**	**2.60**	**2.73**	**0.00**

Prioritizing Hazards

The compiled Scott County-wide hazard scores as ranked by the methodology described above were ranked from highest to lowest. In the *Scott County Multi-Jurisdictional Hazard Mitigation Plan, 2012*, the Planning Committee divided the ranked hazards into three priority levels. This was used as a tool to help each community focus on the most prevalent hazards for their consideration. This plan removes priority levels since the number of hazards considered is drastically less, 15 down from 40. Therefore, a simple ranking based on the scoring methodology noted will suffice.

Federal regulations do not specify particular selection requirements for jurisdictions to prioritize hazards, so three methods were selected. When deciding priority levels for each jurisdiction, the jurisdictions chose between using the compiled Scott County-wide priorities, using their individual jurisdiction hazard score rankings, or altering their individual hazard score rankings to reflect the hazard priority level as seen as appropriate for their jurisdiction. These options were given due to the varying geography and populations of the participating jurisdictions.

After review by FEMA, it was determined that the process by which hazards were scored by individual jurisdictions was not sufficiently evidence-based, and in many cases was based more on anecdotal information. At this phase of plan development, it was not feasible to have every jurisdiction re-rank hazards and have it approved at another official meeting. For this reason, it was decided to remove individual scores from the plan. This will be considered a data deficiency for this plan update, but will be addressed in future updates. Each jurisdiction's priorities are, however, retained in their respective community profiles. Table 3-4 presents hazard rankings as provided by Scott County Emergency Management Agency (EMA)

Future processes should begin with a baseline assessment of hazard priorities from the county EMA with variations between communities being justified on an individual basis and included in discussion of the hazard scoring process.

Assessor Data

Property and building data for Scott County was utilized to create Table 3-5. This table shows the total number of parcels by community as well as the total assessed value of land and existing structures.

Table 3-5 is intended to be used in conjunction with vulnerability assessments of hazards that affect the built environment. For example, if 100% of structures are vulnerable to a particular hazard, the total private structural property loss could be equal to the total value of the structures listed in the table.

Table 3-5
Assessed Value of Land and Structures for Scott County

		Agriculture	Residential	Commercial	Industrial	TOTAL
Bettendorf	No. of Parcels	168	13230	599	37	14034
	Value of Structures	$4,596,730	$2,516,672,360	$353,086,920	$37,443,390	$2,911,799,400
	Land Value	$7,298,660	$619,724,800	$122,806,474	$6,474,650	$756,304,584
Blue Grass	No. of Parcels	45	711	77	5	838
	Value of Structures	$1,973,640	$89,324,460	$15,315,010	$838,440	$107,451,550
	Land Value	$1,882,390	$13,756,950	$3,284,740	$265,510	$19,189,590
Buffalo	No. of Parcels	83	523	38	9	653
	Value of Structures	$1,472,130	$42,822,740	$20,055,670	$5,877,920	$70,228,460
	Land Value	$2,593,500	$7,645,110	$4,427,810	$3,077,240	$17,743,660
Davenport	No. of Parcels	761	33028	2502	129	36420
	Value of Structures	$17,616,130	$3,688,457,534	$1,293,175,051	$119,211,670	$5,118,460,385
	Land Value	$31,579,580	$880,771,620	$421,678,527	$21,859,930	$1,355,889,657
Dixon	No. of Parcels	4	103	7	0	114
	Value of Structures	$ –	$8,304,130	$207,660	$ –	$8,511,790
	Land Value	$7,460	$920,410	$53,020	$ –	$980,890
Donahue	No. of Parcels	10	134	11	0	155
	Value of Structures	$559,450	$16,049,650	$2,426,100	$ –	$19,035,200
	Land Value	$269,670	$2,448,340	$255,660	$ –	$2,973,670
Durant	No. of Parcels	5	28	0	0	33
	Value of Structures	$ –	$4,220,210	$ –	$ –	$4,220,210
	Land Value	$92,340	$696,530	$ –	$ –	$788,870
Eldridge	No. of Parcels	146	2000	192	26	2364
	Value of Structures	$2,711,360	$436,798,690	$71,364,670	$13,660,730	$524,535,450
	Land Value	$8,611,570	$73,997,630	$19,007,940	$2,343,320	$103,960,460
LeClaire	No. of Parcels	39	2075	119	3	2236
	Value of Structures	$987,640	$325,904,830	$26,204,420	$772,390	$353,869,280
	Land Value	$2,018,980	$77,708,840	$12,067,740	$187,000	$91,982,560
Long Grove	No. of Parcels	18	320	5	0	343
	Value of Structures	$10,690	$58,040,810	$458,710	$ –	$58,510,210
	Land Value	$959,790	$9,801,810	$101,070	$ –	$10,862,670
Maysville	No. of Parcels	12	63	4	0	79
	Value of Structures	$615,710	$5,700,860	$208,100	$ –	$6,524,670
	Land Value	$271,640	$974,810	$53,550	$ –	$1,300,000

		Agriculture	Residential	Commercial	Industrial	TOTAL
McCausland	No. of Parcels	6	153	17	0	176
	Value of Structures	$567,740	$14,153,100	$1,184,760	$ –	$15,905,600
	Land Value	$226,920	$2,219,580	$246,690	$ –	$2,693,190
New Liberty	No. of Parcels	$1	$89	$25	$1	$116
	Value of Structures	$35,010	$4,893,450	$616,100	$624,670	$6,169,230
	Land Value	$1,310	$839,440	$181,300	$50,450	$1,072,500
Panorama Park	No. of Parcels	0	68	0	0	68
	Value of Structures	$ –	$6,549,760	$ –	$ –	$6,549,760
	Land Value	$ –	$1,223,230	$ –	$ –	$1,223,230
Park View	No. of Parcels	3	751	29	0	783
	Value of Structures	$ –	$128,400,030	$3,966,630	$ –	$132,366,660
	Land Value	$90,880	$24,836,040	$998,220	$ –	$25,925,140
Princeton	No. of Parcels	34	410	20	6	470
	Value of Structures	$1,307,800	$50,418,010	$2,015,050	$1,417,630	$55,158,490
	Land Value	$1,342,840	$11,328,320	$1,021,590	$211,990	$13,904,740
Riverdale	No. of Parcels	6	169	13	8	196
	Value of Structures	$147,680	$25,179,110	$7,111,490	$2,553,820	$34,992,100
	Land Value	$218,610	$6,257,960	$2,920,100	$779,030	$10,175,700
Walcott	No. of Parcels	44	499	74	5	622
	Value of Structures	$769,520	$62,729,270	$34,549,020	$3,611,120	$101,658,930
	Land Value	$2,798,610	$10,607,630	$13,135,550	$1,652,320	$28,194,110
Scott County	No. of Parcels	6238	4562	166	15	10981
	Value of Structures	$165,439,681	$768,586,750	$50,430,660	$60,277,040	$1,044,734,131
	Land Value	$418,393,770	$238,710,960	$19,471,200	$11,465,310	$688,041,240

Hazard Profiles

Dam Failure

A dam is a barrier constructed across a watercourse in order to store, control, or divert water. Dams are usually constructed of earth, rock, concrete, or mine tailings. The water impounded behind a dam is referred to as the reservoir and is measured in acre-feet, with one acre-foot being the volume of water that covers one acre of land to a depth of one foot. Due to topography, even a small dam may have a reservoir containing many acre-feet of water. A dam failure is the collapse, breach, or other failure of a dam that causes downstream flooding. Another type of failure occurs when erosion through the dam foundation occurs. Both overtopping or erosion dam failure result in a high velocity or debris-heavy water that rushes downstream, causing damage within its path. In addition to natural events causing dam failure, improper design, improper maintenance, negligent operation, or failure of upstream dams may also lead to dam failures.

Dams are constructed for a variety of uses, including flood control, erosion control, water supply impoundment, hydroelectric power generation, and recreation. Flooding, operating error, poor construction, lack of maintenance, damage due to burrowing animals, vandalism, terrorism, and earthquakes can cause dam failure. Dams are classified into three categories based on the potential risk to people and property should a failure occur.

High Hazard – A high hazard area is where dam failure may create a serious threat of loss of human life.

Moderate (Significant) Hazard – A moderate (significant) hazard area is where failure may damage isolated homes or cabins, industrial or commercial buildings, moderately-traveled roads, or interrupt major utility services, but without substantial risk of loss of human life. Structures where the dam and its impoundment are themselves of public importance, such as dams associated with public water supply systems, industrial water supply, or public recreation, or are an integral feature of a private development complex are also classified as moderate hazard dams.

Low Hazard – A low hazard area is where damages from a failure would be limited to loss of the dam, livestock, farm outbuildings, agricultural lands, and lesser used roads, and where loss of human life is considered unlikely.

The classification may change over time because of development downstream from the dam since its construction. Older dams may not have been built to the standards of its new classification. Dam hazard potential classifications have nothing to do with the material condition of a dam, only the potential for death or destruction due to the size of the dam, the size of the impoundment, and the characteristics of the area downstream of the dam. The Iowa Department of Natural Resources tracks all dams in the State of Iowa with a height of at least 25 feet or a total storage of at least 50 acre-feet of water. The inventory excludes all dams less than 6 feet high regardless of storage capacity and dams less than 15 acre-feet of storage regardless of height.

There have been two historical occurrences of dam failure in the State of Iowa; one occurred in 1968 in Waterloo when the Virden Creek Dam failed. The incident claimed one life, and the

dam is no longer in existence. The second occurrence happened at the Lake Delhi Dam in July of 2010 when a 92-year-old dam was breached at a nine-mile long lake that was owned by a local homeowner's recreation association. The breach caused significant property loss, an evacuation of as many as 700 near the dam, as well as severe economic effects to the tourism industry in the area. No dam failures have occurred in Scott County.

Probability. With increased attention to sound design, quality and construction, and continued maintenance and inspection, dam failure probability can be reduced. It is important to consider that by 2020, 85% of the dams in the United States will be more than 50 years old (the design life of a dam). The State Hazard Mitigation Team (SHMT) analysis has evaluated the probability that a dam failure will occur in Iowa as between 1% and 10% in the next year or at least one chance in the next 100 years per the 2013 *Iowa Hazard Mitigation Plan*. Scott County has chosen to define the same probability of occurrence.

Magnitude/Severity. The extent of hazardous conditions due to dam failure is typically limited to those areas in and near the flood plain. People and property outside the floodplain could also be affected depending on the proximity to the dam and the height above the normal water level. Lost Grove Lake and Dam, located in east central Scott County between the Cities of Eldridge and Princeton is Scott County's newest dam. Lost Grove is a 350-acre recreational lake and has been classified as a high hazard dam. There are three other high hazard dams: Lake Canyada Dam on a tributary of Blackhawk Creek, Lake of the Hills on Blackhawk Creek, and Lock & Dam 14 on the Mississippi River. The largest concern would be a series of dam breaks on the Upper Mississippi River that would cause low water levels. This would make barge travel on the Mississippi River unlikely and would have a significant impact on the region's economy. Iowa American Water Company, the water supply company for Bettendorf, Davenport, LeClaire, Riverdale, Panorama Park, and parts of unincorporated Scott County has water intakes in the Mississippi River. If water levels are too low, there would be a lack of water supply to a significant population of Scott County.

There are five significant hazard dams in Scott County: Timber Lakes Estate Dam and Railroad Lake Dam on tributaries of Blackhawk Creek, Blue Grass Lake Dam on Blackhawk Creek, John Deere Davenport Works Dam on a tributary of Silver Creek, and Lake Hunnington on a tributary of Martins Creek (see Map 3-1.) Vershaw Dam, which was originally classified as a high hazard dam, was reclassified to a low hazard dam in September 2011. Inundation maps do not currently exist for the dams in Scott County, so identifying potential losses and potentially affected areas is difficult at this time. The Iowa Department of Natural Resources (IADNR) has stated that it is one of their goals to have inundation areas and Emergency Action Plans on file for all high hazard dams within the state. Scott County will monitor this development and include inundation areas in future plan updates as they become available.

In general terms, jurisdictions potentially affected by dam failure due to downstream proximity are: Scott County, Davenport, Bettendorf, Riverdale, and LeClaire. People and property along streams are most vulnerable. Facilities and lives at considerable distances from the actual impoundment are not immune from the hazard. Depending on the size and volume of the impoundment as well as the channel characteristics, the flash flood can travel a significant distance. In addition to the dams included in the IADNR inventory, there are farm ponds and small dam structures. These and other stormwater detention basins should be checked to see if their holding capacity exceeds the 100-year flood plain area if failure should occur. Data of

which structures are likely to be affected by a dam failure is not currently available; however, if such data becomes available, it will be included in the next update of this plan.

The severity of damage could range from property damage if a small subdivision impoundment failed, up to multiple deaths, injuries, and extensive property damage if a large, high hazard dam failed. Delivery of services may be affected due to flash flooding. If the water being held by the dam was used for source water, secondary source water will be needed until the water level can be restored. Much scouring would take place, and erosion would be extensive. Economic effects would vary widely depending on the damage done by released waters.

Warning Time. A dam failure can be immediate and catastrophic leaving little or no time to warn those downstream of the imminent hazard. With maintenance and monitoring, weak areas and possible failure points can be identified allowing time for evacuation and securing the dam. Most dams are only inspected periodically, thus allowing problems to go undetected until a failure occurs.

Duration. Response to the effect of a dam failure is extensive and requires wide-ranging recovery efforts for reconstruction of the original flood control structures.

Vulnerability. Dam failure is typically an additional or secondary impact of another disaster such as flooding or earthquake. The effects to the planning area and its municipalities from a dam failure would be similar in some cases to those associated with flood events (see the flood hazard vulnerability analysis and discussion). Based on the hazard class definitions, failure of any of the high hazard dams could result in a serious threat of loss of human life and serious damage to residential, industrial, or commercial areas; important public utilities; public buildings; or major transportation facilities. Catastrophic failure of high hazard dams has the potential to result in greater destruction due to the potential speed of onset and greater depth, extent, and velocity of flooding. Another difference is that dam failures could flood areas outside of mapped flood hazards.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2007, 2010 and 2013*
Scott County, Iowa	*Scott County Iowa Multi-Jurisdictional Hazard Mitigation Plan 2012*
City of Davenport	*Pre-Disaster Mitigation Plan, February 2007*
National Dam Safety Program	https://www.fema.gov/national-dam-safety-program
Iowa Department of Natural Resources	http://www.iowadnr.gov/Environmental-Protection/Land-Quality/Dam-Safety
National Inventory of Dams	*http://nid.usace.army.mil/cm_apex/f?p=838:1:0::NO*

Map 3-1 Dams & Levees

Drought

Drought is a period of prolonged lack of precipitation for weeks at a time producing severe dry conditions. There are four types of drought conditions that are relevant to Iowa:

- Meteorological drought – Refers to precipitation deficiency
- Hydrological drought – Refers to declining surface water and groundwater supplies
- Agricultural drought – Refers to soil moisture deficiencies
- Socioeconomic drought – Refers to when physical water shortages begin to affect people

Iowa experiences mainly agricultural and meteorological drought conditions as a result of low soil moisture or decline in recorded precipitation.

Droughts can be spotty or widespread and last from weeks to a period of years. A prolonged drought can have a serious economic effect on a community. Increased demand for water and electricity may result in shortages of resources. Moreover, food shortages may occur if agricultural production is damaged or destroyed by a loss of crops or livestock. While droughts are generally associated with extreme heat, droughts can and do occur during cooler months. One measure of the magnitude of drought conditions is provided by the Palmer Drought Severity Index (PDSI), which provides a scale of differences from the standard soil moisture conditions as follows:

Palmer Classifications	
INDEX	**DEFINITION**
4.0 or more	Extremely wet
3.0 to 3.99	Very wet
2.0 to 2.99	Moderately wet
1.0 to 1.99	Slightly wet
0.5 to 0.99	Incipient wet spell
0.49 to -0.49	Near normal
-0.5 to 0.99	Mild drought
-1.0 to -1.99	Mild drought
-2.0 to -2.99	Moderate drought
-3.0 to -3.99	Severe drought
-4.0 or less	Extreme drought

The National Drought Mitigation Center has a Drought Severity Classification system that takes into account the Palmer Drought Index, soil moisture, streamflow, and the Standardized Precipitation Index. It also looks at droughts as both short-term and long-term. Below is a table explaining the classification system and a graph showing droughts from 2000 until June 2016.

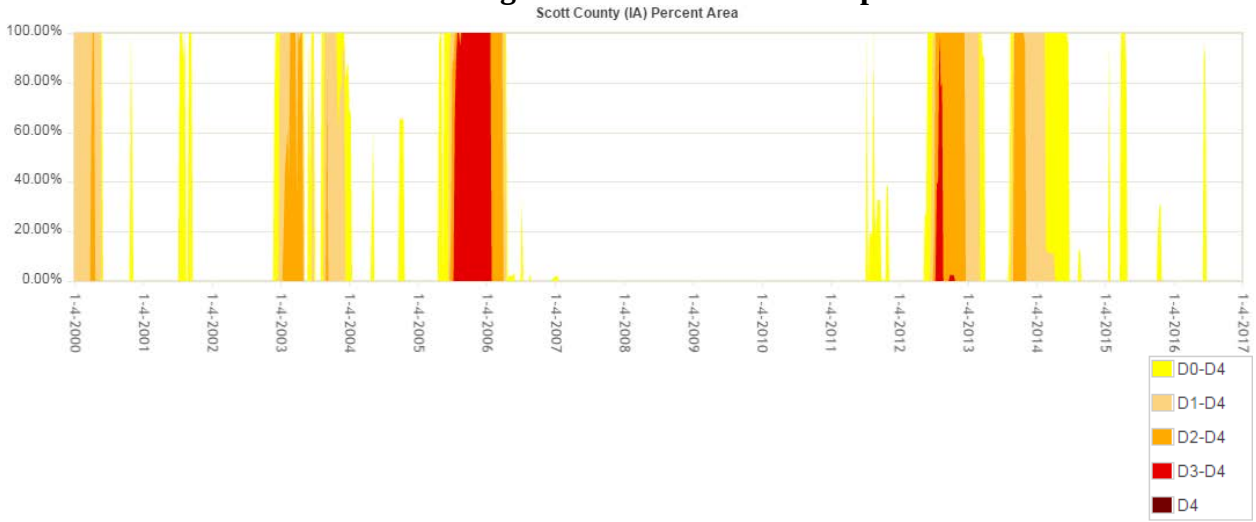
Figure 3-1

Drought Severity Classification

		Ranges					
Category	Description	Possible Impacts	Palmer Drought Index	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Short and Long-term Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered	-1.0 to -1.9	21-30	21-30	-0.5 to -0.7	21-30
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested	-2.0 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed	-3.0 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions	-4.0 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0-2	0-2	-2.0 or less	0-2

Short-term drought indicator blends focus on 1-3 month precipitation. Long-term blends focus on 6-60 months. Additional indices used, mainly during the growing season, include the USDA/NASS Topsoil Moisture, Keetch-Byram Drought Index (KBDI), and NOAA/NESDIS satellite Vegetation Health Indices. Indices used primarily during the snow season and in the West include snow water content, river basin precipitation, and the Surface Water Supply Index (SWSI). Other indicators include groundwater levels, reservoir storage, and pasture/range conditions.

U.S. Drought Monitor Statistics Graph



According to the National Climatic Data Center, there have been five drought periods reported for Scott County between 01/01/1995 and 10/14/2016. Noticeable droughts include:

- **August 1995:** A statewide drought, the dry weather conditions combined with well above normal temperatures produced the 4th warmest August in Iowa's history. Yield losses were greatest over southern Iowa where plantings were delayed by excessive spring rainfall. The dry conditions resulted in deterioration of corn and soybean crops.
- **August 2003:** A moderate to severe drought developed in August 2003. According to the Iowa State Climatologist, August 2003 was the driest on record with a statewide average of only 0.96 inches of rainfall (3.23 inches below the normal). These weather conditions placed extreme stress on corn and soybeans, which are in their main development stage of growing in August. Yields were reduced by 10% for the corn and 30% for the soybeans.
- **July 2005 – March 2006:** The drought of 2005-2006 began with below normal precipitation in June 2005, creating an official drought by July 2005. The drought conditions combined with high heat created unfavorable growing conditions for crops. By August 2005, Iowa's governor declared most of eastern Iowa an Agricultural Disaster Area. November 2005 marked the 10th consecutive month with below normal precipitation with the eastern ⅔ of Iowa in the Extreme Drought category. By March 2006, the drought begun to shrink in size and scope, and precipitation was near normal by April 2006. Total precipitation for 2005 was 17.86 inches (normal is 38.04 inches).
- **July 2012 – November 2012**: The drought of 2012 was a result of above average temperatures and little to no precipitation. The average precipitation for June 1-August 16 was 5.68 inches, or -5.22 inches from the normal amount (normal is 10.90 inches at the Davenport Station). By August 2012, Scott County along with 42 other counties in Iowa had been declared a primary natural disaster area by USDA. (On August 7, 2012, Scott County was listed as in D3-Extreme Drought conditions by the National Drought Mitigation Center). According to the USDA, $12,921,164 of indemnity was paid for Federal Crop Insurance Claims for the crop year 2012.
- **August 2013 to June 2014**: After a wet start to the summer, atmospheric conditions developed in July through September that lead to less precipitation falling across the region. This lead to Severe Drought conditions that were not fully alleviated until the middle of June 2014. Claims for Federal Crop Insurance totaled $12,820,403 for the 2013 crop year.

Probability. Drought is part of normal climate fluctuations. Climatic variability can bring dry conditions to the region for up to years at a time. According to the National Drought Mitigation Center, periods of severe to extreme drought in the Upper Mississippi Basin occur cyclically, about once every ten years. The 2013 *Iowa Hazard Mitigation Plan* estimates that the statewide probability of future droughts in the order of magnitude between -3.0 to -3.9 on the Palmer Drought Severity Index is between 10% and 19% in any given year. Scott County has chosen to define the same probability of occurrence.

Magnitude/Severity. Those dependent on rain would be the most vulnerable to a drought. This means that agriculture, agribusiness, and consumers (if the drought lasted long enough or

affected a large area) would be affected. A drought limits the ability to produce goods and provide services. Because citizens draw their drinking water from surface water and groundwater sources, a prolonged severe drought may affect all citizens if there were to be a dramatic drop in the stream flow coupled with the drop in the water table. Fire suppression can also become a problem due to the dryness of the vegetation and possible lack of water. Claims for Federal Crop Insurance totaled $12,820,403 for the 2013 crop year.

Location. The entire planning area is equally at risk for drought.

Warning Time. Drought warning is based on a complex interaction of many different variables, water uses, and consumer needs. Drought warning is directly related to the ability to predict the occurrence of atmospheric conditions that produce the physical aspects of drought, primarily precipitation and temperature. There are so many variables that can affect the outcome of climatic interactions that it is difficult to predict a drought in advance. In fact, an area may already be in a drought before it is even recognized. While the warning of the drought may not come until the drought is already occurring, the secondary effects of a drought may be predicted and warned against weeks in advance.

Duration. From the historical records for the State of Iowa, most droughts occur for at least one month at a time. It is dependent on the climatic situation at the time of the drought.

Vulnerability. Those dependent on rain would be the most vulnerable to a drought. This means that agriculture, agribusiness, and consumers (if the drought lasted long enough or affected a large area) would be affected. A drought limits the ability to produce goods and provide services. Because citizens draw their drinking water from surface water and ground water sources, a prolonged severe drought may affect all citizens if there was a dramatic drop in the stream flow coupled with the drop in the water table. Fire suppression can also become a problem due to the dryness of the vegetation and possible lack of water.

Drought in the U.S. seldom results directly in the loss of life, and more directly affects agricultural crops, livestock, natural vegetation, wildlife, and stream flows (fish and aquatic vegetation). Effects are costly economically, environmentally, and socially. Many areas could be affected by drought within Scott County, particularly local farms. Additionally, other agriculturally-based communities affected by drought could affect the economic welfare of Scott County. For possible damages to agricultural realty, please refer to Table 3-5, which shows assessed values for agricultural property in Scott County.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2013*
National Drought Mitigation Center	http://www.drought.unl.edu/index.htm
National Climatic Data Center	http://www.ncdc.noaa.gov/oa/climate/severeweather/extremes.html
National Weather Service Quad Cities, IA IL Local Climate	http://www.crh.noaa.gov/dvn/climate/
FEMA	https://www.ready.gov/drought
U.S. Drought Monitor	http://droughtmonitor.unl.edu/
USDA Risk Management Agency	http://www.rma.usda.gov/data/indemnity/

Earthquake

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of the rock beneath the surface of the Earth that may impose a direct threat to life and property. There are three general classes of earthquakes; tectonic, volcanic, and artificially produced. The shaking produced by the earthquake can cause buildings, bridges, and other structures to collapse and disrupt gas, electric, and phone services. Earthquakes also have the potential to trigger landslides, flash floods, and fires.

The effect of an earthquake on the surface of the Earth is called the intensity. The intensity scale takes into consideration responses such as people awakening, movement of furniture, and destruction. The scale that is currently used in the United States is the Modified Mercalli Intensity Scale, which was developed in 1931. The Modified Mercalli Intensity Scale contains 12 levels of increasing intensity, ranked by observed effects.

Modified Mercalli Intensity Scale	
LEVEL	**DEFINITION**
I	Not felt except by a very few under especially favorable conditions.
II	Felt only by a few persons at rest, especially on upper floors of buildings.
III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed, walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Damage slight in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

Source: Iowa Geological Survey (http://www.igsb.uiowa.edu/earthqua/MERCALLI.htm)

Historical Occurrence. According to the State of Iowa Geological Survey, there have been 13 earthquakes in the state between 1867 and 2016, with four of those earthquakes occurring in Scott County. The largest earthquake in Scott County (and the State of Iowa) occurred in the City of Davenport on November 12, 1934. That earthquake registered as a VI on the Modified Mercalli Intensity Scale.

Being near the Mississippi River, Scott County would also feel vibrations from earthquakes with epicenters in Illinois or from the New Madrid seismic zone. The most recent of these was on April 18, 2008 when a Magnitude 5.2 earthquake occurred in the Wabash Valley Seismic Zone, located to the north of the New Madrid seismic zone. The earthquake and subsequent aftershocks were felt widely throughout the central United States with as much as a Mercalli magnitude IV through Illinois and surrounding states to the east.

Probability. Seismologists attempt to forecast earthquakes size and frequency based on data from previous events. In the New Madrid seismic zone, this analysis is difficult because there are few historic moderate to large earthquakes, and the active faults are too deeply buried to monitor effectively. According to the United States Geological Survey (USGS), the chance of a magnitude 6 or higher earthquake in the next 50 years is 25-40% based on the history of past earthquakes in the New Madrid fault zone. The 2013 *Iowa Hazard Mitigation Plan* analysis estimated that the probability of future earthquakes in Iowa at less than 10%. Scott County has chosen to define the same probability of occurrence.

Magnitude/Severity. Most structures built in Scott County and in the State of Iowa are not built to earthquake standards; although the effect of a possible earthquake will most likely be of low intensity resulting in mainly foundational damage. The most vulnerable structures in the county would be those built on poorly consolidated substrate, especially floodplain materials. The 2013 *Iowa Hazard Mitigation Plan* estimates that there would be less than $2,500,000 in damages statewide. Scott County could experience vibrations similar to the passing of a heavy truck; rattling of dishes; creaking of walls and swinging of suspended objects. Fatalities would be very rare, with injuries limited to falls and injury from unsecured objects.

Location. The historical occurrences of earthquakes in Scott County place all four incidents in the City of Davenport, with the possibility of the whole county feeling the effect. Map 3-2 indicates the seismic probability for the state of Iowa is low relative to other areas of the country. The entire planning area is equally at risk for earthquakes.

Warning Time. Earthquake prediction is an inexact science, and even in well monitored areas with scientific instruments, scientists very rarely predict earthquakes.

Duration. Due to the limited effects to Iowa, response to the occurrence of an earthquake would likely be in support of nearby states utilizing mutual aid agreements; in-state response would likely be very limited.

Vulnerability. Most structures in Iowa are not built to earthquake standards, but because of the relatively low magnitude of the possible quake, property damage would likely be minor foundational damage. The most vulnerable structures are those built on poorly consolidated substrate, particularly floodplain materials. Most of Iowa is located in Seismic Zone 0, the lowest risk zone in the United States. This does not mean that the county is not vulnerable to earthquake effects.

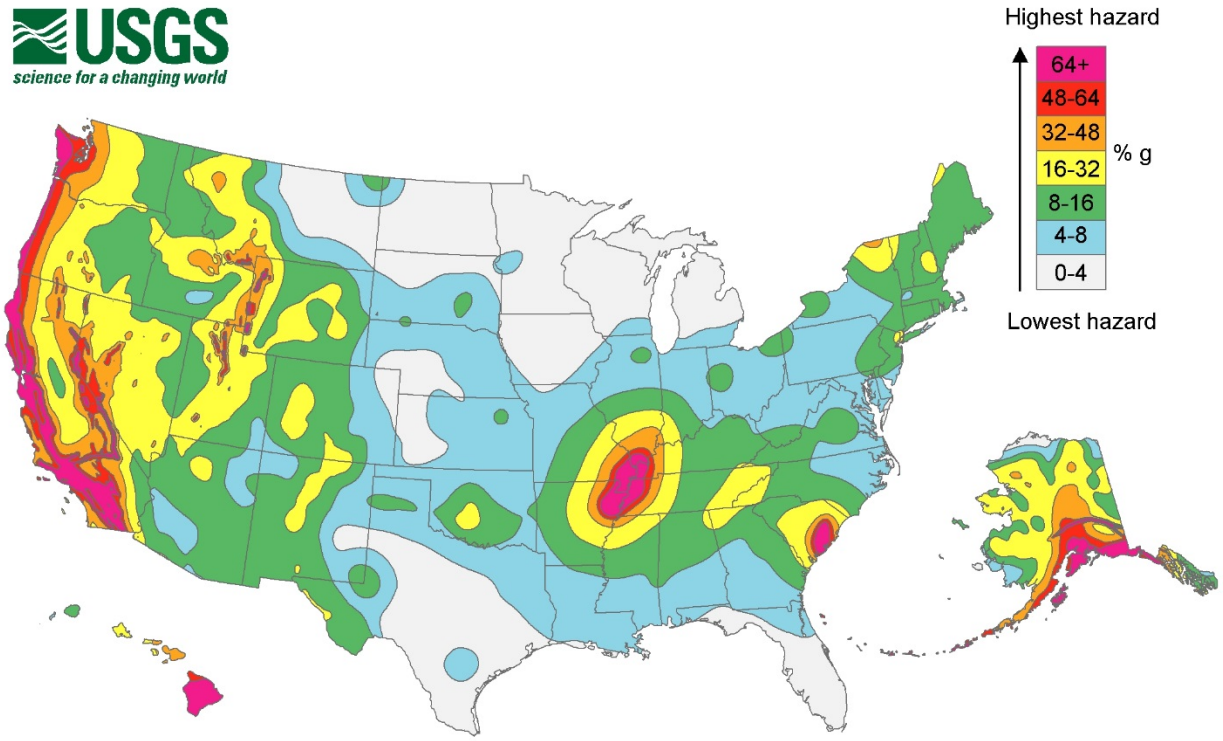
Seismologists attempt to forecast earthquake size and frequency based on data from previous events in the New Madrid Fault Zone, and estimate a 90% chance of a Richter scale 6.0 magnitude earthquake in the New Madrid Fault Zone by the year 2040. A magnitude 6.5 earthquake on the New Madrid Fault would create a Modified Mercalli intensity magnitude four (4) effect in most of Iowa resulting in minimal damages. In the unlikely event of a major

earthquake in Scott County, it is safe to assume that the impact would be devastating considering a majority of the structures in the county are older structures not built to codes that encourage resistance to earthquakes.

As seen in the community profile, roughly 36% of all homes in Scott County were built before 1959. The age of the housing stock in Scott County represents a significant risk for damage from this hazard. Additionally, new construction does not have to comply with any additional codes to ensure earthquake resistance. Overall, the community would suffer severe structural failure, injuries, and death if a major earthquake occurred. A majority of people and buildings could be injured or experience property damage from this hazard. The amount of possible property damage can be seen in Table 3-5 that shows the value of all assessed property in Scott County. All structures would have equal vulnerability to this hazard since the hazard is not confined to a specific geographic area within the county.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2013*
Iowa Geological Survey Bureau	http://www.igsb.uiowa.edu
City of Davenport	*Davenport Pre Disaster Mitigation Plan, 2007*
U.S. Geological Survey	http://earthquake.usgs.gov/earthquakes/byregion/iowa.php

Map 3-2
U.S. Geological Survey 2008 Hazard Map



Expansive Soils

Expansive soils are soils and soft rock that tend to swell or shrink excessively due to changes in moisture content. Expansive soils contain minerals such as clays that are capable of absorbing water. When they absorb water, they increase in volume, and the more water they absorb, the more their volume increases. Expansions of ten percent or more are not uncommon. This change in volume can exert enough force on a building or other structure to cause damage.

Ratings are dependent on the clay content of the soils. Soils that have a linear ability to be extended greater than 3% are of concern for dwellings with basements. In combination with areas of slope, floodplain, and hydric soils, future development should consider the suitability and limitations of soils, especially for dwellings with basements.

Expansive soils will also shrink when they dry out. This shrinkage can remove support from buildings or other structures and result in damaging subsidence. Fissures in the soil can also develop. These fissures can facilitate the deep penetration of water when moist conditions or runoff occurs. This produces a cycle of shrinkage and swelling that places repetitive stress on structures.

The American Society of Civil Engineers estimates that half of the homes in the United States are built on expansive soils, and half of these will have some damage. The group claims that these soils are responsible for more home damage every year than floods, tornados, and hurricanes combined.

The effects of expansive soils are most prevalent in regions of moderate to high precipitation, where prolonged periods of drought are followed by long periods of rainfall. The hazard is most common in the southern, central, and western United States. Recent estimates put the annual damage from expansive soils as high as $7 billion. However, because the hazard develops gradually and seldom presents a threat to life, expansive soils have received limited attention, despite their costly effects.

Historical records of damage due to expansive soils are not kept on a county-wide scale due to the timeframe of such events.

Probability. Probability and frequency analyses have not been prepared because of the nature of occurrence of this hazard. This is consistent with other geologic hazards that occur slowly over time. However, it can be said that the probability of soil expansion is greater in the areas identified above and on Map 3-3, which shows the shrink-swell potential for soils within Scott County. In the 2013 *Iowa Hazard Mitigation Plan*, the State Hazard Mitigation Team evaluated the probability of future expansive soils events in Iowa at a 10-19% chance in any one year. Scott County has chosen to define the same probability of occurrence with some areas being more prone than others.

The majority of the soils in the urban areas of Scott County have a low to moderate shrink-swell potential. However, there are a few areas in the county with high potential for soil expansion. These areas are located in and around the City of Blue Grass, along the Mississippi River south of Davenport, and following the southwest to northeast expanse of bluff from Walcott to Eldridge. There is also a section of northern Scott County near McCausland with a low to high shrink-swell potential.

Magnitude/Severity. There are few direct human effects. Effects commonly involve swelling clays beneath areas covered by buildings and slabs of concrete and asphalt, such as those used in construction of highways, walkways, and airport runways. The most extensive damage from expansive soils occurs to highways and streets. Houses and one-story commercial buildings are more apt to be damaged by expansion of swelling than are multi-story buildings, which usually are heavy enough to counter swelling pressures. The most obvious manifestations of damage to buildings are sticking doors, uneven floors, and cracked foundations, floors, walls, ceilings, and windows. Damage to the upper floors of the building can occur when motion in the structure is significant. Utilities could be affected because of constant pushing and pulling resulting in cracks, breaks, and severing of underground infrastructure. Since this a naturally-occurring phenomenon, environmental effects would be limited to spills and leaks of containment facilities. Economic and financial effects would be felt by individual owners of buildings and facilities. These would occur over time and would not be a one-time effect. Building code requirements may impose undue burden on construction to ensure proper performance of buildings and utilities in areas with expansive soils.

Warning Time. This is consistent with other geologic hazards that occur slowly over time.

Duration. The response tied to damage that occurs due to expansive soils depends largely on the extent of the damage and when the damage is first noticed. Damage can be mitigated on new construction with proper building techniques for the soil type and moisture level. Damage can be mitigated on existing buildings by incorporating some of the same types of techniques used in new construction. This may take longer and cost more than new construction.

Vulnerability. While the entire planning area is vulnerable to some structural damage as a result of shrinking and expanding soils, there is no data available to determine damage estimates for this hazard. In most cases, individual property owners, local governments, and businesses pay for repairs to damages caused by this hazard. Underground utility lines such as water and sewer pipes may be at risk to damages associated with expansive soils. However, there is no data to support damages and costs associated with this hazard at this time.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2013*
USDA NRCS Soil Data Mart	
NRCS	***http://websoilsurvey.nrcs.usda.gov/app***
NRCS	*Using Soil Survey to Identify Areas With Risks and Hazards to Human Life and Property Expanding - Soils and Shrink-Swell Potential- 2004* By Phil Camp, State Soil Scientist, Arizona, USDA, NRCS
Geology.com	Expansive Soil and Expansive Clay - *The hidden force behind basement and foundation problems*

Map 3-3 Expansive Soils

Extreme Heat

An extreme heat event is characterized as a prolonged period of excessive heat and humidity. Conditions for extreme heat are defined by summertime weather that is substantially hotter and/or more humid than average for a location at that time of year. This includes temperatures (including heat index) in excess of 100°F or at least three successive days of 90°F or higher. The heat index is a number in degrees Fahrenheit that tells how hot it really feels when relative humidity and air temperature are calculated together. Exposure to full sunshine can increase the heat index by at least 15°F. A heat advisory is issued when temperatures are greater than 100°F for 1 to 2 days with nighttime temperatures greater than 75°F. An excessive heat warning is issued when a heat event is expected in the next 12 hours with heat indices at least 105°F for more than 3 hours per day for 2 consecutive days or heat indices greater than 115°F for any period of time. Extreme heat can impose stress on humans and animals. Heatstroke, sunstroke, cramps, exhaustion, and fatigue are possible with prolonged exposure or physical activity due to the body's inability to dissipate the heat. Urban areas are particularly at risk because of air stagnation and large quantities of heat absorbing materials such as streets and buildings. Extreme heat can also result in distortion and failure of structures and surfaces such as roadways and railroad tracks.

Incidents of extreme heat are likely to cover a large area. Urban areas pose additional risks in these occurrences when stagnant atmospheric conditions of the heat wave trap pollutants, adding to the stresses of hot weather. The following available information from the National Climatic Data Center and National Weather Service gives an indication of the magnitude and variety of such events. There have been six notable excessive heat events in Scott County since 1950; however, 1936 is still the all-time warmest July on record with 11 days in a row with temperatures over 100°F and an average monthly temperature of 85.0°F (the monthly average for July is 75.4°F, at the Quad City International Airport station).

> **July 1995:** This event covered all of Iowa from July 12 through the evening of July 14, causing three fatalities and $3.8 million in damage. Dew points ranged from the upper 70s to the middle 80s for much of the time, with the highest dew points in the eastern half of the state. High temperatures were between 98°F and 108°F, and the highest temperature of 109°F was recorded in Council Bluffs. Most weather stations across the state broke the century record over the two-day period. The three fatalities were reported in Des Moines, Marshalltown, and Burlington. Two of the fatalities were elderly people. The majority of property damage losses were in the form of livestock.
>
> **July 1997:** Excessive heat indices of 105 to 110 were reached in the eastern half of the state during this event, which lasted through July 27. The highest temperatures were recorded on July 26 when record-setting high minimum temperatures were also experienced. The Quad Cities Bix 7 Run was also on July 26, and the heat caused 12 injuries and one fatality. Minimum property damage was experienced in the form of livestock.
>
> **July 1999:** This event lasted July 19-31. Many heat advisories and warnings were issued for portions of eastern Iowa during this period. Temperatures around 100°F combined with dew points in the 70s produced heat indices of 105°F to 125°F. Although no

fatalities were reported in Iowa, 19 people in Illinois and 27 people in Missouri died from heat-related factors over this time period.

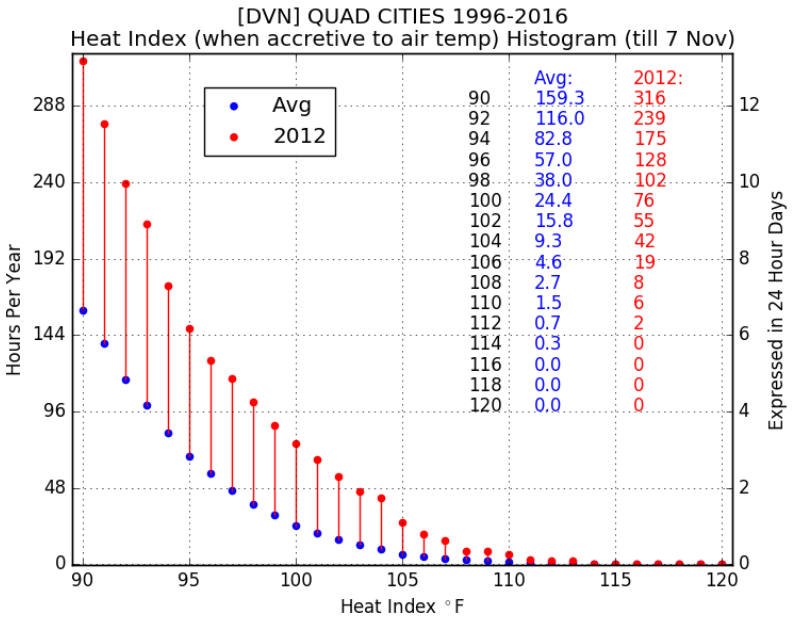
August 2000: No injuries, fatalities, or property damage were reported with this event that spread over middle and eastern Iowa. Temperatures topped out in the lower to middle 90s. These hot temperatures combined with high humidity resulted in dangerous heat indices of 105°F to 115°F during the afternoon.

July 2012: The average temperature was 80.7°F, which makes this the sixth warmest July on record. There were 22 days with temperatures at or above 90° F, with five of those days at or above 100°F. The hottest day reported was on July 7 with a temperature of 104°F and heat indexes of 105-115°F. Genesis hospitals in the Quad Cities Area treated 14 people for heat-related illnesses on the 4th of July.

July 2013: According to the National Weather Service, five consecutive days of temperatures above 90°F were recorded at the Davenport Municipal Airport, despite June-August of 2013 being ranked "Below Normal" for average regional temperature by the National Climatic Data Center.

The histogram below shows the number of hours July 2012 temperatures were above a particular threshold, relative to the average temperature.

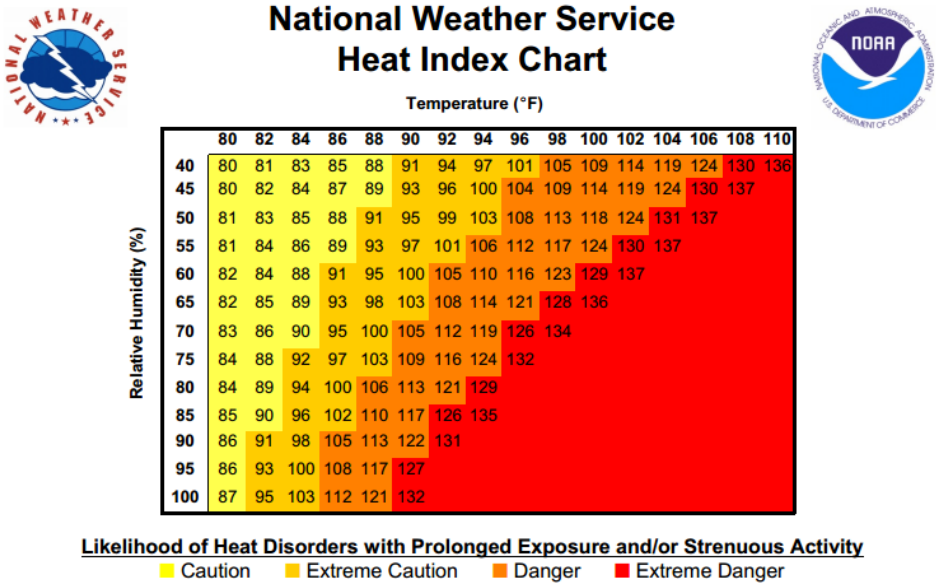
Figure 3-2



Probability. Based on historical information, Iowa will likely experience about 26 days a year with temperatures above 90°F. There is a very good chance that there will be a period of three consecutive days or more with temperatures in the 90s. It is also common for the temperature to hit 100°F or more once every three years during the summer months. The 2013 *Iowa Hazard Mitigation Plan* estimated that the probability of an extreme heat occurrence is between 10% and 19% in any given year. Scott County has chosen to define the same probability of occurrence.

Magnitude/Severity. Certain populations, including the elderly, small children, chronic invalids, and others with medical problems are particularly susceptible to heat reactions. Low-income households without access to fans or air-conditioned rooms, particularly inner city dwellers, may also be more susceptible to heat reactions. The 2013 *Iowa Hazard Mitigation Plan* states that Scott County experiences approximately $3,000 in damages annually from extreme heat. The National Climatic Data Center Storm Event Database does not have any reported property or crop damage reports for extreme heat. Below is the National Weather Service Heat Index Chart that rates the likelihood of heat disorders at various temperatures.

Figure 3-3



Location. The entire planning area is equally at risk for extreme heat.

Warning Time. As with other weather phenomena, periods of extreme heat are predictable within a few degrees within 3 days or so. Variations in local conditions can affect the actual temperature within a matter of hours. The National Weather Service will initiate alert procedures when the heat index is expected to exceed 105°F for at least two consecutive days.

Duration. The State Hazard Mitigation Team has estimated that extreme heat events are likely to exceed one week in duration based on the review of past extreme heat events in the state.

Vulnerability. In Scott County, the majority of the community is at risk to extreme heat, especially elderly persons, small children, chronic invalids, those on certain medications or drugs (especially tranquilizers and anticholinergics), and persons with weight and alcohol problems. Healthy individuals working outdoors in the sun and heat are vulnerable as well. Low-income individuals and families are also susceptible due to poor access to air-conditioned rooms and as mentioned in the community profile, this would likely include the 12.2% of the population of Scott County that lives below the poverty level.

There are a some designated locations that have backup generators to provide shelter from extreme heat in the event of energy disruption, but additional generators are needed at critical

and vulnerable facilities to ensure heat protections for vulnerable populations. Special attention should be given to nursing homes, senior housing facilities, K-12 schools, preschool facilities, and hospitals in the county during extreme heat conditions because of the number of vulnerable residents being served in those institutions. In addition, more rural areas of the county are at an elevated risk for vulnerable populations such as low-income, elderly, and children, who may or may not have adequate transportation to the shelter locations.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2010, 2013*
National Climatic Data Center	http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms https://www.ncdc.noaa.gov/temp-and-precip/us-maps/3/201308#us-maps-select
National Weather Service	https://www.weather.gov/
Iowa Environmental Mesonet	http://mesonet.agron.iastate.edu/plotting/auto/?_wait=no&q=93&network=IA_ASOS&zstation=DVN&year=2012&var=heatindex&ytd=yes&dpi=100&_fmt=png

Flash Flood

A flash flood is an event occurring with little to no warning where water levels rise at an extremely fast rate. Flash flooding results from intense rainfall over a brief period, sometimes combined with rapid snow melt, ice jam release, frozen ground, saturated soil, or impermeable surfaces. Most flash flooding is caused by slow-moving thunderstorms or thunderstorms repeatedly moving over the same area. Flash flooding is an extremely dangerous form of flooding that can reach full peak in only a few minutes and allows little time or no time for protective measures to be taken by those in its path. Flash flood waters move at very fast speeds and can roll boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding often results in higher loss of life, both human and animal, than slower-developing river and stream flooding. Areas in the floodplain, downstream from a dam or levee, or in low-lying areas can be affected by flash flooding. People and property in areas with narrow stream channels, saturated soils, or on land with large amounts of impermeable surfaces are likely to be affected in the event of significant rainfall. Unlike areas affected by river/stream flooding, flash floods can affect areas a good distance from the stream itself. Streets can also become swift-moving rivers, and basements can become deathtraps because flash floods can fill them with water in a matter of minutes.

Floods are the most common and widespread of all natural disasters except fire. According to the National Climatic Data Center, 47 flash flood events have been reported between January 1997 and July 6, 2015, which was the most recent event report available. Of the 47 flash flood events, 14 have occurred since 2010. Below is a sample of the flash flood events.

- **June 1990:** The most devastating episode of local creek flooding occurred on June 16, 1990. Twenty-four hour rain totals of three to ten inches in the Quad Cities Area falling on already saturated soils created flash flooding along Black Hawk Creek and Duck Creek and its tributaries. Approximately two weeks later on June 29, 1990, a second flood event of slightly lesser magnitude occurred. Because the of the close time period of these two floods, they are usually referred to as one event, such as the June 1990 floods.

- **June 14, 2001:** Various locations in Davenport and Bettendorf experienced flash flooding. Streets flooded, including 8-10 inches of water on the road near the intersection of Locust and Scott Streets, and major street flooding on River Drive and State Street. The flash flooding contributed to a five-car accident on the Interstate 74 bridge approach to the Mississippi River in Bettendorf. No injuries were reported. Spencer Creek Bridge at 249th Avenue, a private road and bridge, was under water making the road impassable.

- **June 3-4, 2002:** Heavy rains resulted in significant flash flooding throughout Scott County. The Waspipinicon River rose well above flood stage, and Duck Creek went out of its banks. Several roads were covered in water, especially at Division Street in Davenport, which was impassable in several locations due to high water. River Drive and Middle Road at 53rd Street closed due to flooding. High water inundated two mobile homes east of Highway 61. A driver was rescued from a stranded vehicle before the van was swept away by flood waters. Flooding was so significant that President George W. Bush declared 17 counties in eastern Iowa, including Scott County, a disaster area. In total, the flooding in 8 counties damaged an estimated 1,004 homes. Of those homes, 22

had major damage, and 8 were destroyed. Public property in eastern Iowa was estimated to be at least $7.2 million.

- **March 12-13, 2006:** Thunderstorms in the Quad Cities Metro Area produced rainfall rates exceeding 1 inch per 30 minutes. The National Weather Service reported 2 feet of water over roads on the Davenport/Bettendorf city limits. Two to three feet of water was reported on Second Street in Davenport with River Drive and Third Streets in Davenport flooded with thigh-high levels of water. Numerous streets in Davenport were closed due to high water. The media reported sinkholes developing on some streets in Davenport with some residences flooded. Although unknown at the time, the Federal Building in downtown Davenport had its basement partially flooded. Law enforcement reported water 4 inches deep flowing into the Davenport Police Station on Harrison Street. The highest known rainfall amount for this event occurred in central Davenport where 3.50 inches fell.

- **June 2008:** On June 8, heavy rains resulted in flash flooding of Crow Creek about three miles north of Bettendorf. Heavy rains on June 12-13 resulted in flash flooding of several parts of Davenport and Bettendorf. The depth of the flood waters across much of the metro area ranged from 6 inches to as much as 5 feet. Streets, residential and commercial properties, and area creeks and streams all experienced flooding. Water rescues were performed to save some stranded motorists from high water. Several major traffic arteries were closed due to high flood waters.

- **June 15, 2010:** Heavy rains resulted in flash flooding of the intersections of Kimberly and Division and Kimberly and Marquette in Davenport during the afternoon. In addition, several streets and yards in Park View, IA were flooded. The flood waters in both areas were 8 to 12 inches deep.

Probability. According to the 2013 *Iowa Hazard Mitigation Plan*, the State Hazard Mitigation Team concluded that it is highly likely that a flash flood event will affect Iowa in any given year. Using National Climatic Data Center (NCDC) data for Scott County, an average of 2.6 flash flood events occur in any given year.

Magnitude/Severity. Magnitude of flash flooding varies by watershed based on the effects of amounts of rain over time. Flash floods are the number one weather-related killer in the United States. Four people were reported to have lost their lives within the Quad Cities Area as a result of the 1990 creek flooding event. On July 4, 2007, a man and his son were canoeing on Duck Creek when flash floods overturned their canoe. They were both rescued. Velocity of flash flood waters may be hazardous to people in vehicles. There have been several reports of stalled or stranded vehicles in flash flood waters, and water rescues were performed to remove people from their vehicles. Rescuers are at a significant risk when attempting to work in swift moving floodwaters associated with flash flooding. Flash floods can often leave roads and intersections closed, resulting in the slowing or halting of operations. Fire Station #5 in Davenport is subject to creek flooding, affecting ingress and egress. Personal property can be extensively damaged and destroyed by swift moving water. Facilities and infrastructure can be scoured around, degrading its structural integrity. Because flash flood water is off premises quickly, damages related to standing water are limited, but the current associated with flash floods causes abrasive type damages such as erosion and undercutting. Major damage exceeding 50% of the structural

value has been recorded. Damage to infrastructure of roads and bridges could be severe due to the high velocity of water.

Urbanization increases runoff two to six times over what would occur on natural terrain. As more development occurs in the watersheds, the amount of runoff produced also increases. Often, aging storm systems are not designed to carry the capacity currently needed to handle the increased runoff in certain areas. Particularly at risk are those in low-lying areas; close to dry creek beds or drainage ditches; or near water or downstream from a dam, levee, or storage basin. People and property with insufficient storm sewers and other drainage infrastructure can also be put at risk. Nearly half of all flash flood fatalities are auto-related. Motorists often try to traverse water-covered roads and bridges and are swept away by the current. Six inches of swiftly moving water can float a full-sized automobile. Recreational vehicles and mobile homes located in low-lying areas can also be swept away by water. National Flood Insurance Plan (NFIP) Repetitive loss information is discussed in the River Flooding hazard profile. The 2013 *Iowa Hazard Mitigation Plan* states that Scott County's annual loss estimation for flash flooding is approximately $91,000.

Location. A number of waterways were identified by participating jurisdictions as being particularly susceptible to flash flooding. These include the following: Duck Creek, Crow Creek and its tributaries in Bettendorf; Duck Creek and its tributaries including Silver, Goose, Pheasant Robin and Candlelight Creeks; and Crow and Hickory Creeks in Eldridge.

Warning Time. Flash floods may be unpredictable, but there are factors that can point to the likelihood of the occurrence of a flash flood in the area. As little as a few minutes or hours of excessive rainfall, dam or levee failure, or a sudden release of water held by an ice jam can cause flash flooding. Warnings may not always be possible for the suddenness of flash floods. Predictability of flash floods depends primarily on the data available on the causal rain. Individual basins react differently to precipitation events. Weather surveillance radar is being used to improve monitoring capabilities of intense rainfall. Knowledge of the watershed characteristics, modeling, monitoring, and warning systems increase the predictability of flash floods. Depending on the location in the watershed, warning times can be increased. The National Weather Service forecasts the height of flood crests, the data, and the time the flow is expected to occur at a particular location.

Duration. The response to the effects of flash flooding in Iowa is short in duration due to the nature of the hazard.

Vulnerability. Areas in a flood plain, downstream from a dam or levee, or in low-lying areas can certainly be affected. People and property located in areas with narrow stream channels, saturated soil, or land with large amounts of impermeable surfaces are likely to be affected in the event of a significant rainfall. Unlike areas affected by a river/stream flood, flash floods can affect areas a good distance from the stream itself. Flash flood prone areas are not particularly those areas adjacent to rivers and streams. Streets can become swift moving rivers, and basements can become deathtraps because flash floods can fill them with water in a manner of minutes.

People and property in areas with insufficient storm sewers and other drainage infrastructure can also be put at risk because the drains cannot rid the area of the runoff quick enough. Nearly half of all flash flood fatalities are auto related. Motorists often try to traverse water-covered roads

and bridges and are swept away by the current. Six inches of swiftly moving water can knock a person off of their feet, and only two feet of water can float a full-sized automobile. Recreational vehicles and mobile homes located in low-lying areas can be swept away by the water also.

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff two (2) to six (6) times over what would occur on natural terrain. As more development occurs in the watershed, the amount of runoff produced also increases. If measures are not taken to reduce the amount of runoff (or slow its movement), flash floods will continue to occur and may become more frequent. In certain areas, aging storm sewer systems were not designed to carry the capacity currently needed to handle the increased storm runoff. This combined with rainfall trends (that seem to be moving upwards) and rainfall extremes (that also seem to be patterning higher) all demonstrate the high likelihood, yet unpredictable nature, of flash flooding in the state.

The waterways identified in the location section of this profile are not meant to be an exhaustive list of all potentially affected areas. Additionally, flash flooding can affect a structure without damaging the entire building. Water in basements and lower levels is the most common cause of property damage. Of course, another major concern regarding flash flooding is the risk to people and animals, as fast moving water can quickly become overwhelming. Further data is needed to better assess vulnerability. Plans and ordinances by local communities are encouraged to minimize the impact of heavy rain events and the cost associated with cleanup.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2013*
National Climatic Data Center (NCDC)	http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms
American Red Cross, Preparedness Fast Facts	*Floods* http://www.redcross.org
Federal Emergency Management Agency (FEMA)	http://www.fema.gov/hazard/flood/index.shtm
Scott County	*Scott County Multi-Jurisdictional Hazard Mitigation Plan, 2012*

Grass and Wildland Fires

A grass or wild-land fire is an uncontrolled fire that threatens life and property in either a rural or a wooded area. Grass and wild-land fires can occur when conditions are favorable, such as during periods of drought when natural vegetation would be drier and subject to combustibility.

Keetch and Byram (1968) designed a drought index specifically for fire potential assessment. It is a number representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers. It is a continuous index relating to the flammability of organic material in the ground. The Keetch-Byram Drought Index (KBDI) attempts to measure the amount of precipitation necessary to return the soil to full field capacity. It is a closed system and represents a moisture regime from 0 to 8 inches of water through the soil layer. At 8 inches of water, the KBDI assumes saturation. Zero is the point of no moisture deficiency, and 800 is the maximum drought that is possible. At any point along the scale, the index number indicates the amount of net rainfall that is required to reduce the index to zero or saturation. The inputs for KBDI are weather station latitude, mean annual precipitation, maximum dry bulb temperature, and the last 24 hours of rainfall. Reduction in drought occurs only when rainfall exceeds 0.20 inch (called net rainfall). The KBDI scale and description of moisture conditions is as follows:

KBDI = 0-200: Typical of spring dormant season following winter precipitation. Soil moisture and large class fuel moistures are high and do not contribute to fire intensity.

KBDI = 200-400: Typical of late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity.

KBDI = 400-600: Typical of late summer, early fall. Lower litter and duff layers actively contribute to fire intensity and will burn actively.

KBDI = 600-800: Often associated with more severe drought with increased wildfire occurrence. Intense, deep burning fires with significant downwind spotting can be expected. Live fuels can also be expected to burn actively at these levels.

The Keetch-Byram Drought Index map does not show a reporting weather station that includes Scott County. However, reporting weather stations in surrounding areas of Minnesota, Wisconsin, Illinois, and Missouri all show a KBDI of less than 200, or minimal risk of wildfire hazard.

According to the National Interagency Fire center, there have been 3,330 wildfires spanning 73,962 acres from 2002 to the end of 2015 in Iowa. This number is likely much greater when considering grass fires.

Probability. Grass and wildland fires will occur in areas where conditions are dry. There is a high probability that at least one will occur each year due to natural and human-caused events. Education about grass and wildland fires during prolonged periods may help with limiting human-caused events.

Magnitude and Severity. While wildfires have proven to be most destructive in the western states, they have become an increasingly frequent and damaging phenomenon nationwide.

People choosing to live in wild-land settings are more vulnerable to wildfires, and the value of exposed property is increasing at a faster rate than population. Iowa is less vulnerable to wild-land fire because of the extremely large percentage of land that is developed. Grass fires are often more easily contained and extinguished before there is damage to people or developed property. Fires often burn large portions of field crops in the fall when the crops are dry and the harvesting equipment overheats or throws sparks. This can be quite costly to the farmer in terms of lost production.

Most grass fires are contained to highway right-of-way and rail right-of-way ditches and are less than a few acres in size. High winds can turn a small flame into a multi-acre grassfire within a matter of minutes. The extent is dependent upon conditions such as land use/land cover, moisture, and wind. Significant events in Scott County include:

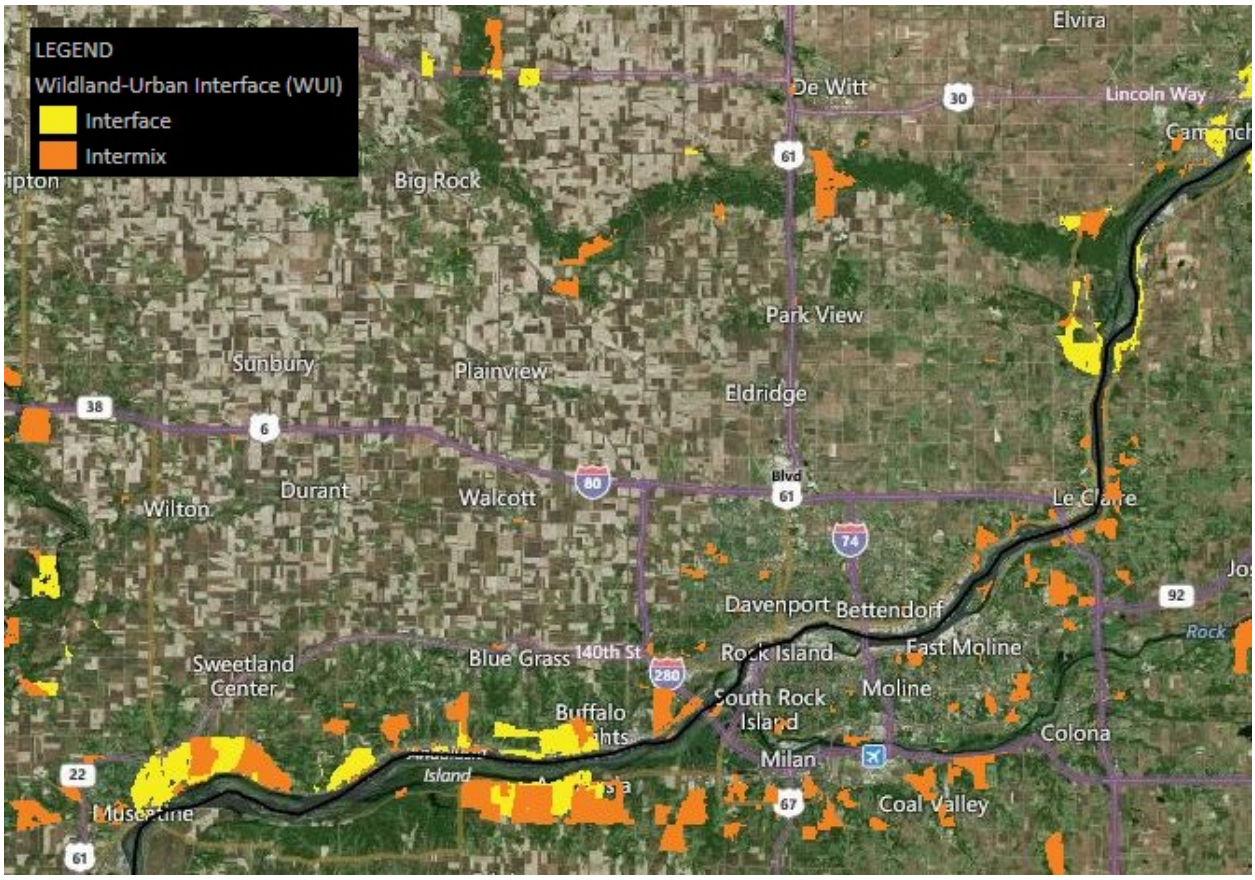
June 2005: Grass fire along Interstate 80 in Northern Davenport.

March 2009: Grass fires occurred throughout Scott County. One of the largest fires was caused by burning leaves that spread to a nearby field and burned approximately 100 acres.

September 2010: Large grass fire in west Davenport.

October 2015: During the period of October 12-20, a combination of very low humidity, strong winds, dry harvested and unharvested fields, and sunshine brought dangerous fire weather conditions. These conditions allowed many fires to spread to hundreds of acres of farmland before being contained.

Location. As shown on Map 3-10, Scott County has a significant amount of farm and grass lands that can become susceptible to fire under the right conditions. Every jurisdiction has the potential to be affected, but the largest communities, Davenport and Bettendorf, have more cropland by area adjacent. The following figure indicates the extent of wild-land urban interface in Scott County as of 2010. Most jurisdictions have at least some wildland urban interface or intermix.



Source: http://silvis.forest.wisc.edu/data/wui_change

Warning Time. As mentioned above, most grassfires occur without warning and travel at a moderate rate. The situation depends on conditions at the time such as moisture, wind, and land cover. However, methods for forecasting the probability of occurrence of conditions most suitable for wildfires to occur has increased with the use of the national wild-land significant fire potential outlook issued by the National Interagency Fire Center and the National Oceanic and Atmospheric Administration (NOAA) Storm Prediction Center.

Duration. The majority of Iowa wildfires occur in short duration in areas of brush and forest lands.

Vulnerability. In Scott County, there is moderate risk to the structures due to grass or wildland fires. Locations that are at the most risk are housing developments outside of corporate limits. These houses are often in close proximity to undeveloped land and tend to be located in areas that have a longer fire response time. However, it is likely that any event from this hazard would be small and limited in scope and would not cause significant damage to life or property.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2010*
U.S. Forest Service – WFAS (Wildland Fire Assessment System)	*http://www.wfas.net/index.php/keetch-byram-index-moisture--drought-49*
Keetch-Byram Drought Index Map (KBDI)	*http://www.fs.fed.us/land/wfas/kbdi.gif*

Levee Failure

The Federal Emergency Management Agency (FEMA) defines a levee as "a manmade structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water in order to reduce the risk from temporary flooding." Levees reduce the risk of flooding, but do not eliminate the risk. Levees and floodwalls are constructed from the earth, compacted soil, or artificial materials, such as concrete or steel. To protect against erosion and scouring, earthen levees can be covered with grass and gravel or hard surfaces like stone, asphalt, or concrete. A levee system comprises one or more levee segments and other features that collectively provide flood risk reduction to a defined area. The levee system is inclusive of all features that are integral to the performance of excluding flood waters from the leveed area. These levee features may consist of embankment sections, floodwall sections, closure structures, pumping stations, and interior drainage works. Highway and railroad embankments or other non-levee features that are integral to the performance of excluding flood water from the leveed area will be considered to be part of a levee system for evaluation purposes. Embankments that function as levees also exist in water conveyance systems, navigation channels, recreation areas, and habitat restoration projects.

Levees typically function in keeping the leveed area free from inundation. Hence, in common language, a levee does not perform ("that fails") when people and property get wet. In technical terms, levees can "non perform" through four principal modes:

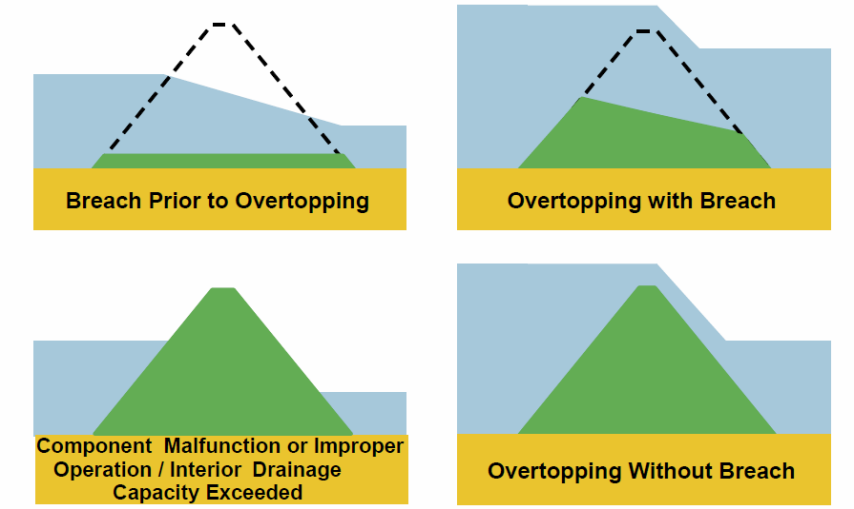
- Breach prior to overtopping
- Overtopping with breach
- Component malfunction or improper operation/interior drainage capacity exceeded
- Overtopping without breach

Levees are designed with an expected water height. Sometimes, this water height corresponds to a flood frequency such as a 10-year, 50-year, or 100-year return period. As longer records are kept, the flood frequencies are changed such that although the height of the levee remains constant, a levee that provided 100-year flood frequency may not always provide assurance that it will provide a leveed area free from inundation.

FEMA provides flood insurance to the nation. Rates for flood insurance are set by an examination of potential flooding using the best available information. Levees can be accredited by FEMA that allows for lower insurance rates if the levee is shown to have sufficient capability to resist nonperformance. Levees that have a minimum performance at the 100-year flood flow frequency can be accredited by FEMA and results in lower flood insurance rates.

It is difficult to assess the historical occurrence of levee failure as most structures of these types are not constructed by federal or state entities. The Department of Natural Resources does not keep records of levees and levee failure. There are many levees located throughout the county in subdivision and agricultural water retention structures.

Figure 3-4
Levee Breach Diagram



The known levees within Scott County are shown on Map 3-1 within the Dam Failure profile. No new levees are known to have been constructed since the 2012 plan was adopted.

Probability. The rate of failure of a levee or floodwall is difficult to predict with sudden failure a possibility. Proper design and construction can limit the probability of a levee failure. Development in the watershed can raise flood levels and make a levee designed and constructed under previous characteristics inadequate for current runoff conditions. According to the 2013 *Iowa Hazard Mitigation Plan*, the State Hazard Mitigation Team found that a levee failure event associated with heavy flooding within the State of Iowa was between 10% and 20% in any given year. Scott County has chosen to define the same probability of occurrence.

Magnitude/Severity. People, property, and utilities in the floodplain are most at risk. Levees and floodwalls give a false sense of security, only temporarily containing the hazard. Information related to the property value and structures affected by a levee failure are available in the Estimating Potential Loss section of this chapter. Any location near a levee may be vulnerable to flooding due to failure, depending on the nature of the levee and its capacity. Levee failure in one area may also prevent flooding in another area. Reference Map 3-1 for more information. Floodwaters breaching a levee are usually contained in the historic floodplain.

Warning Time. The amount of warning time depends on the type of levee failure. Local flood warning systems can help determine the maximum water surface and the timing of a flood situation. Hours or days of warning may be available for high water that may overtop levees, but this does not provide complete security from a rupture in the levee itself. A sudden failure of a portion of the levee may send floodwaters gushing from the break within seconds. Normally, occupants of the floodplain can be warned about potential levee breaches and/or breaks when high water encroaches upon the levee.

Duration. The levee failure would last until flood waters have receded and water has been pumped out of the levee inundation area. This would take several weeks or months depending on the severity of the levee failure and river flooding associated with the failure.

Vulnerability. In addition to river flooding, Scott County Assessor's Office individual property information was used to provide general land and building values for the land classifications of properties located within the planning area levee inundation areas. With the use of GIS mapping, the parcel shapefiles were matched with the Scott County Digital Flood Insurance Rate Map, and IADNR provided inundation areas using the "Intersect" function. This function pulls parcels within and adjacent to the floodplain and inundation areas. Properties with only a portion of the floodplain and inundation areas were classified as completed within the inundation area and floodplain. Should a levee break occur on one of the four levees located within Scott County (see Map 3-1) during a 1% annual chance hazard flood event, the following tables indicate the land classification, land area, and land values of the property likely to be affected. Table 3-7 provides more detail.

Table 3-7
Land Value of Levee Inundation Areas

Bettendorf Levee Inundation Area							
Classification	**Acres**	**% TOTAL Within Inundation Area**	**Land Value**	**Building Value**	**Improved Value**	**Total Value**	**% Total Value of Property Within Inundation Area**
Unclassified	3.73	1.03%	$0	$0	$0	$0	0.00%
Commercial	249.66	69.01%	$15,476,540	$0	$97,604,520	$113,081,060	71.22%
Commercial/Multi-Family	0.38	0.10%	$378,630	$463,395	$917,895	$1,759,920	1.11%
Exempt	41.53	11.48%	$0	$0	$0	$24,116,890	15.19%
Industrial	56.84	15.71%	$2,502,920	$0	$10,381,590	$12,884,510	8.12%
Multi-Family	2.22	0.61%	$226,340	$1,892,980	$0	$2,119,320	1.33%
Residential	7.42	2.05%	$1,059,340	$3,748,720	$0	$4,808,060	3.03%
TOTAL	**361.78**	**100.00%**	**$19,643,770**	**$6,105,095**	**$108,904,005**	**$158,769,760**	**100.00%**

Lost Creek Levee Inundation Area							
Classification	**Acres**	**% TOTAL Within Inundation Area**	**Land Value**	**Building Value**	**Improved Value**	**Total Value**	**% Total Value of Property Within Inundation Area**
Agricultural	555.62	93.41%	$820,630	$0	$0	$823,770	71.09%
Agricultural or Agricultural/Dwelling	39.17	6.59%	$102,510	$214,460	$18,080	$335,050	28.91%
TOTAL	**594.79**	**100.00%**	**$923,140**	**$214,460**	**$18,080**	**$1,158,820**	**100.00%**

Princeton Levee Inundation Area							
Classification	**Acres**	**% TOTAL Within Inundation Area**	**Land Value**	**Building Value**	**Improved Value**	**Total Value**	**% Total Value of Property Within Inundation Area**
Unclassified	6754540.46	6.19%	$0	$0	$0	$0	0%
Agricultural or Agricultural/Dwelling	805193.62	0.74%	$42,860	$156,200	$6,390	$205,450	77%
Exempt	101623252.44	93.08%	$0	$0	$0	$59,650	23%
TOTAL	**109182986.53**	**100.00%**	**$42,860**	**$156,200**	**$6,390**	**$265,100**	**100%**

Davenport Water Treatment Plant							
Classification	**Acres**	**% TOTAL Within Inundation Area**	**Land Value**	**Building Value**	**Improved Value**	**Total Value**	**% Total Value of Property Within Inundation Area**
Unclassified	0.00	0.00%	$0	$0	$0	$0	0%
Agricultural or Agricultural/Dwelling	0.00	0.00%	$0	$0	$0	$0	0%
Exempt	11.90	100.00%	$0	$0	$0	$606,520	100%
TOTAL	**11.90**	**100.00%**	**$0**	**$0**	**$0**	**$606,520**	**100%**

It should be noted that while the assessed property value of the Davenport Water Treatment Plant represents the potential risk to that property, levee failure at the site could negatively affect water supply to the surrounding area. Not enough information is available to calculate the total financial impact of an inundation event for this site.

Sources	
The State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2013*
Scott County, Iowa	*Scott County Multi-Jurisdictional Hazard Mitigation Plan 2012*
USACE National Levee Database	*http://nld.usace.army.mil/egis/f?p=471:1:*
FEMA Factsheet	*What is a Levee* November 11, 2012

River Flood

A river flood is the 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 capacity of the channel. Floods are the most common and widespread of all natural disasters, except fire. Most communities in the United States can experience some kind of flooding after spring rains, heavy thunderstorms, winter snow thaws, waterway obstructions, or levee or dam failures. Often it is a combination of these elements that causes damaging floods. Floodwaters can be extremely dangerous. The force of six inches of swiftly moving water can knock people off their feet, and two feet of water can float a car. Floods can be slow, or fast rising, but generally develop over a period of days. River flooding is a natural and expected phenomenon that occurs annually, usually restricted to specific streams, rivers, or watershed areas.

Flood categories in feet at the National Weather Service gage points in Scott County:

Flood Stages	Wapsipinicon River near DeWitt	Mississippi River at Lock & Dam 14	Mississippi River at Lock & Dam 15
Major Flood Stage (ft.)	12.5	13.5	18
Moderate Flood Stage (ft.)	11.5	12	16
Flood Stage (ft.)	11	11	15
Action Stage (ft.)	10	10	13

The National Climatic Data Center (NCDC) reports 70 flood events within Scott County between 8/16/1993 and 5/31/2016. The 2012 hazard mitigation plan lists 29 flood events, but grouped urban/small stream flooding under the "Flash Flood" profile. Urban/small stream events have been reclassified in the NCDC as flooding, and are now included in the River Flood profile. The 2012 hazard mitigation plan had data on flooding through October 31, 2009. Since then, an additional 18 events have been listed in the NCDC. Flood events listed in the NCDC document flooding on the major rivers in Scott County: the Wapsipinicon River and the Mississippi River and its tributaries. The top ten historic crests at National Weather Service gage points along the Wapsipinicon and Mississippi River are listed on the following page. There are two gage points along the Mississippi River – Lock and Dam 14 near the City of LeClaire and Lock and Dam 15 at Rock Island, IL, across from the City of Davenport. Nine of the top ten historic crests on the Wapsipinicon River occurred in the last 25 years. The Wapsipinicon experienced four of its top ten crests since the 2012 hazard mitigation plan was approved, including its flood of record. It is clear that the Wapsipinicon River is experiencing frequent and higher flooding than in the past. Six of the top ten historic crests on the Mississippi River at LeClaire and Rock Island occurred within the last 25 years. Both river gages on the Mississippi River in Scott County experienced one of its top ten crests after the 2012 hazard mitigation plan was approved.

Mississippi River at Lock & Dam 14:

1. 17.75 ft. on 4/28/1965
2. 16.93 ft. on 4/24/2001
3. 16.56 ft. on 7/08/1993
4. 14.97 ft. on 4/22/2011
5. 14.84 ft. on 6/16/2008
6. 14.61 ft. on 4/19/1997
7. 14.60 ft. on 4/26/1969
8. 14.45 ft. on 7/04/2014
9. 14.03 ft. on 5/09/1975
10. 14.01 ft. on 4/28/1952

Mississippi River at Lock & Dam 15:

1. 22.63 ft. on 7/09/1993
2. 22.48 ft. on 4/28/1965
3. 22.33 ft. on 4/25/2001
4. 22.00 ft. on 3/10/1868
5. 21.49 ft. on 6/16/2008
6. 20.94 ft. on 7/04/2014
7. 20.71 ft. on 4/22/2011
8. 19.66 ft. on 4/20/1997
9. 19.40 ft. on 6/27/1892
10. 19.30 ft. on 4/26/1969

Wapsipinicon River near DeWitt:

1. 14.32 ft. on 7/02/2014
2. 14.19 ft. on 6/17/1990
3. 14.13 ft. on 6/16/2008
4. 13.86 ft. on 10/01/2016
5. 13.79 ft. on 5/30/2004
6. 13.70 ft. on 4/19/2013
7. 13.66 ft. on 5/24/1999
8. 13.56 ft. on 7/30/2010
9. 13.46 ft. on 6/04/2013
10. 13.44 ft. on 6/30/2013

Probability. The 2013 *Iowa Hazard Mitigation Plan* stated that the probability of a flood event in Iowa in any given year is high. Areas delineated on Flood Insurance Rate Maps as Special Flood Hazard Areas (SFHA) indicate floodplains where there is a 1% probability of flooding in any given year. Given that the list of flood events for Scott County includes more than one event in some years, it might be estimated that at least minor flooding could occur nearly every year somewhere in the county.

Magnitude/Severity. The vulnerability from river flooding is quite delineated. The Federal Emergency Management Agency (FEMA) has developed Flood Insurance Studies and Special Flood Hazard Areas in Flood Insurance Rate Maps (FIRMs). The FIRMs show areas where there is a 1% chance of flooding occurring in any given year. Generally, these areas are along streams and rivers. Map 3-5 also shows special flood hazard areas within Scott County. More detailed FIRMs for each participating jurisdiction can be found in Appendix III-2. The State of Iowa is undergoing a floodplain remapping process, and a draft floodplain map has been made available to the cities and floodplain managers. The draft maps do not appear to have a significant impact on incorporated cities. The cities and counties will continue to monitor the remapping process.

The National Flood Insurance Program (NFIP) was established in 1968 to mitigate future flood losses nationwide through sound, community-enforced building and zoning ordinances and to provide access to affordable, federally-backed flood insurance protection for property owners. Participation in the NFIP is based on an agreement between local communities and the Federal Government that states that if a community will adopt and enforce a floodplain ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHAs), the Federal Government will make flood insurance available within the community, as well as

provide financial protection against flood losses. Much work in the area of flood hazard mapping has allowed many communities to restrict development in hazardous areas.

The following jurisdictions have adopted and enforce floodplain ordinances as participating communities in the NFIP and will continue compliance:

- City of Bettendorf
- City of Buffalo
- City of Davenport
- City of Donahue
- City of Eldridge
- City of LeClaire
- City of McCausland
- City of Panorama Park
- City of Princeton
- City of Riverdale
- City of Walcott
- Scott County

The following jurisdictions do not have FIRMs and/or are not participating in the NFIP:

- City of Blue Grass
- City of Dixon
- City of Long Grove
- City of Maysville
- City of New Liberty

Since the 2012, the cities of Princeton and McCausland have begun to participate in the NFIP. The city of Walcott has since stopped participating. The City of Blue Grass has shown interest in taking the necessary steps to participating in the NFIP and are evaluating the merits of participating in the NFIP.

The participation in the NFIP enables residents and businesses access to flood insurance. The NFIP keeps records of the numbers of claims and the claim amount for each address with insurance. The Iowa State Floodplain Manager provided a report that listed 238 repetitive loss properties within Scott County as of June 30, 2016. Repetitive loss properties are any National Flood Insurance Program (NFIP) insured buildings for which two or more claims of more than $1,000 each were paid by the NFIP within any 10-year period. The 238 repetitive loss properties within Scott County account for approximately 770 claims totaling over $16,323,940 in damages. These claims are for both building and content losses. Of the repetitive loss properties in Scott County, there are 11 severe repetitive loss properties. Severe repetitive loss properties are properties with four or more claims exceeding $5,000, each paid by the NFIP within any 10-year period or at least two separate claims within any 10-year period (building damage only) that cumulatively exceed the market value of the building. Map 3-4 shows approximate locations of the repetitive loss and severe repetitive loss properties in Scott County. The 2013 *Iowa Hazard Mitigation Plan* states that an average of $404,000 in damages occur annually in Scott County. According to records provided by Iowa Homeland Security Emergency Management Division, the 2008 flood and windstorms caused extensive damage to publicly owned streets, sidewalks, utilities, and parks as well as the Davenport Community School District's stadium. Over $1 million in public assistance projects were repaired or replaced.

The following table summarizes the location of repetitive loss properties by jurisdictions:

Community	RLPs
Bettendorf	36
Buffalo	7
Davenport	108
LeClaire	4
Princeton	4
Scott Co.	79
Total	**238**

The following table summarizes the property type of each repetitive loss property in Scott County:

Property Class	Count
Unclassified*	9
Agriculture	2
Commercial	25
Commercial/Multi Family	3
Exempt	17
Industrial	2
Multi-Family Residential	2
Residential	178
Total	**238**

Of the 238 repetitive loss properties, nine were considered “unclassified” as a parcel could not be confidently associated with the identified street address.

Flooding effects include potential loss of life. River flooding does not have as high a risk as flash flooding because of the slower onset of the river flood. Personal property can be extensively damaged and destroyed by swift moving water. Facilities and infrastructure can be scoured around, degrading its structural integrity. There are health concerns from contamination of water and the duration of standing flood waters in residential structures. Even when water recedes, the growth of toxic mold can be a lingering health hazard.

Operations could be disrupted from direct effects if facilities are in the floodplain and indirectly from loss of critical services to maintain operations. Back-up power and other services can eliminate the impact to operations. Damage and disruption of communications, transportation, electric service, and community services are likely in severe cases. Water treatment and waste water treatment facilities are often located in or near the floodplain and are at high risk of flooding or eventually being taken offline.

River flooding also produces hazards of fire, health, and transportation accidents. Contamination of water supplies is a likely effect of flooding situations as well. There may be effects to the soils in the floodplain from the removal and deposit of silt, sand, and debris. Crop and livestock losses and interruption of businesses either from direct flooding or loss of the delivery of critical services can have damaging effects on the local economy. River flooding can last for weeks, and the effects can last for months or even years following the flood. Economic effects can be felt with only a few days of disruption.

Warning Time. Gauges along streams and rain gauges throughout the state provide for an early flood warning system. River flooding usually develops over the course of several hours or even days depending on the basin characteristics and the position of the particular reach of the stream. The National Weather Service provides flood forecasts for Iowa. Flood warnings are issued over emergency radio and television messages as well as the National Oceanic and Atmospheric Administration (NOAA) Weather Radio. People in the paths of river floods may have time to take appropriate actions to limit harm to themselves and their property.

Duration. River flooding duration varies from a few hours to a few months depending on the severity of the flooding. The response to the effect of river flooding can be extensive and require many days to weeks to adequately respond to the needs of the county, cities, school districts, citizens, and businesses.

Vulnerability. The Scott County Assessor's Office provides county-wide assessment information for residential, commercial, industrial, agricultural land, and exempt land properties. Data available includes land value, dwelling value, building/improvement value, and total value. Land value refers to just the land on which a structure is built. Dwelling value refers to the value of a habitable (residential) structure. Building/improvement value refers to the value of a structure used for non-residential properties. Total value equals the value of land, dwelling, and building/improvements.

With the use of GIS mapping, the parcel shapefiles were matched with the Scott County Digital Flood Insurance Rate Map (DFIRM) using the "Intersect" function. This function pulls parcels within and adjacent to the floodplain. Properties with only a portion of the floodplain were classified as completely within the inundation area and floodplain. In situations where properties intersected both the 1% and 0.2% boundary, the 1% boundary was used. Following are the property values for properties located within the 1% and 0.2% annual chance special flood hazard areas.

1% Annual Chance Special Flood Hazard Area						
Flood Zone / Property Class*	**Count**	**Total Acres**	**Land Value**	**Dwelling Value**	**Improved Value**	**Total Value**
Unidentified	84	–	$ –	$ –	$ –	$ –
Agricultural	1,280	5055.9	$6,652,179	$23,964,729	$1,392,049	$32,168,949
Commercial	723	1594.0	$96,033,256	$ –	$326,129,758	$474,371,150
Commercial/Multi-family	22	18.6	$1,602,330	$935,651	$2,786,881	$5,483,060
Exempt	786	6709.3	$ –	$ –	$ –	$226,740,190
Industrial	110	1051.1	$23,929,090	$ –	$110,043,000	$138,494,560
Industrial/Multi-family	1	–	$29,250	$549	$101,871	$131,670
Multi-family	70	178.3	$9,319,520	$38,243,870	$ –	$49,327,400
Residential	4,081	4444.2	$149,634,830	$513,432,640	$ –	$667,406,180
Total	**7,157**	**19051.3**	**$287,200,455**	**$576,577,439**	**$440,453,559**	**$1,594,123,159**

0.5% Annual Chance Special Flood Hazard Area						
Flood Zone / Property Class*	**Count**	**Total Acres**	**Land Value**	**Dwelling Value**	**Improved Value**	**Total Value**
Unidentified	2	–	$ –	$ –	$ –	$ –
Agricultural	51	1,262.7	$2,663,260	$2,845,890	$2,408,700	$3,166,590
Commercial	227	97.3	$19,430,520	$ –	$43,710,690	$65,235,360
Commercial/Multi-family	20	0.8	$542,370	$633,868	$1,084,852	$2,270,130
Exempt	51	70.4	$ –	$ –	$ –	$47,368,020
Industrial	37	120.3	$5,749,900	$ –	$39,342,230	$46,015,070
Industrial/Multi-family	1	1.3	$110,660	$31,520	$260,920	$403,100
Multifamily	23	13.9	$1,005,430	$3,512,340	$ –	$4,517,770
Residential	1,415	253.2	$40,009,820	$164,037,580	$ –	$204,143,840
Total	**1,827**	**1,819.8**	**$69,511,960**	**$171,061,198**	**$86,807,392**	**$373,119,880**

Also using GIS mapping, the number of building footprints within the DFIRMs were calculated using the "Intersect" function. Buildings with only a portion of the floodplain were classified as completely within the inundation area and floodplain. Buildings that intersected both the 1% and 0.2 % boundary were associated with the 1% boundary. The "Join by Location" function was used to assign jurisdiction information to the buildings. In cases where the building overlapped a jurisdictional boundary, it was associated with the jurisdiction that contained the majority of the building. The data used to count structures did not have building values or types (residential, commercial, and industrial), so that information has not been provided. It should be noted that the different classifications of structures (Building, Out Building, Houses, Tank Silo, Sheds, Tanks, and Trailers) and their assessed value were not available for this plan. The following information is provided as is, without any assumptions being made.

Number of Building Footprints Within Each Jurisdiction			
Jurisdiction	**Building Type**	**0.2% Floodplain**	**1% Floodplain**
Bettendorf	Building	328	603
	Out Building	147	297
	Tank Silo	16	7
Buffalo	Building	37	144
	Out Building	43	145
	Tank Silo	7	30
	Sheds	0	1
Davenport	Building	612	1300
	Courtyard	2	1
	Houses	935	1182
	Sheds	198	289
	Tank Silo	10	12
	Tanks	16	72
	Trailers	47	131
Donahue	Building	0	9
	Out Building	0	18
	Tank Silo	0	3
Eldridge	Building	0	46
	Out Building	0	12
	Tank Silo	0	3
LeClaire	Building	43	73
	Out Building	24	66
McCausland	Out Building	0	1
Panorama Park	Building	0	12
	Out Building	0	17
Princeton	Building	20	47
	Out Building	23	18
Riverdale	Building	26	37
	Courtyard		10
	Out Building	10	99
	Tank Silo	0	39
Walcott	Building	0	26
	Out Building	0	18
Unincorporated Scott County	Building	16	386
	Out Building	24	488
	Sheds	0	1
	Tank Silo	0	15
	Tank	0	0
	Trailers	0	0

Map 3-4 Flood Hazard Areas with Repetitive Loss Properties

HAZUS-MH

In the *Scott County Multi-Jurisdictional Hazard Mitigation Plan, 2012*, Scott County elected to utilize HAZUS-MH (Hazards U.S. Multi-Hazard) to model and analyze river flooding within the planning area. Since then, they have lost the staffing capacity to run the model in-house. The following analysis is retained as historical information from the previous plan. HAZUS-MH is a regional multi-hazard loss estimation model that was developed by FEMA and the National Institute of Building Sciences (NIBS). The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. It is important to note that the intention of modeling flood events is to see how historic flood events would affect Scott County today. The top four flooding events from the Mississippi River and the Wapsipinicon River surrounding Scott County, Iowa were modeled for this project. For clarification, tailwater refers to the water surface just downstream from a hydraulic structure such as a dam, culvert, or bridge. The tailwaters used for the HAZUS modeling below are the equivalent of the river crests reported for each flood event. Flow refers to the amount of water moving through a hydraulic structure as velocity in cubic feet per second (f^3/s).

The top four events for the Wapsipinicon River are:

Date	Wapsipinicon River Near DeWitt Tailwater (feet)	Wapsipinicon River near DeWitt Flow (f^3/s)
6/17/1990	14.19	40000*
6/16/2008	14.13	38415
5/30/2004	13.79	25400
5/24/1999	13.66	28026*

* Actual flow values for that event were not available. Value calculated from available data.

The top four events from the Mississippi River are:

Date	Lock & Dam 14 Tailwater (feet)	Lock & Dam 14 Flow (f^3/s)	Lock & Dam 15 Tailwater (feet)	Lock & Dam 15 Flow (f^3/s)
4/28/1965	17.75	292075*	22.48	301808*
7/9/1993	16.56	267730	22.63	305498*
4/24/2001	16.93	274787	22.33	298118*
6/16/2008	14.84	236240	21.49	279850*

* Actual flow values for that event were not available. Value calculated from available data.

Each of the flood inundation area models was created using FEMA HAZUS-MH MR5 software for ArcGIS. Each model results represent a Level 1 analysis, which simply means that very little data has been manipulated or edited prior to being input into the model. The results obtained from these models should be considered rough at best, and should not be used to determine exact loss estimates if a similar event were to occur. These estimates are intended to show approximate losses, and a more detailed analysis would need to be made in order to more accurately estimate damages for future events.

Using a Level 1 analysis includes using the default inventory and valuation data that is built into the software. The general building stock data in the software's database is a collection of data primarily from the U.S. Census (2000) and Dun & Bradstreet (2006). Due to the age of the data,

it is expected that some results may (and potentially) be different than actual values. More detailed information about the data used to create the default general building stock database can be found in section 3.2.1.2 of the HAZUS-MH MR5 Flood Technical Manual.

Though most of the data in the analysis was already a part of the HAZUS-MH software, some input data did come from other sources outside of HAZUS. Elevation data, which is a requirement for any level of analysis, was derived from Scott County internal data. The information contained in-house was of a better resolution than that which is available from other sources, so it was used in place of the National Spatial Data Infrastructure (NSDI) data that is recommended to be used if other data is not readily available.

Additionally, information related to the flow rates (tail water and velocity in cubic feet per second) was compiled from several government sources (specifically, the U.S. Army Corps of Engineers RiverGages.com website and the National Weather Service Advanced Hydrologic Prediction Service (AHPS)). Though these data were not 100% available, some interpretation of actual sources has allowed values to be estimated to the best capacity, which should accurately replicate these top flooding events. It is expected that these will not exactly replicate the inundation areas of these historic events, but they should be similar. Table 3-6 is a brief summary of the eight events modeled in HAZUS.

Table 3-6
HAZUS Modeled River Flood Events for Selected Dates

HAZUS Modeled Wapsipinicon River Flood Events				
Modeled Event	**Estimated Number of Displaced Households**	**Estimated Number of People Seeking Short Term Shelter**	**Estimated % of Total Value of Residential Property Affected in County**	**Estimated % of Total Value of Properties Affected in County**
6/17/1990	124	183	0.13%	0.11%
5/24/1999	112	165	0.10%	0.08%
5/30/2004	111	164	0.09%	0.07%
6/16/2008	123	184	0.13%	0.10%

HAZUS Modeled Mississippi River Flood Events				
Modeled Event	**Estimated Number of Displaced Households**	**Estimated Number of People Seeking Short Term Shelter**	**Estimated % of Total Value of Residential Property Affected in County**	**Estimated % of Total Value of Properties Affected in County**
4/28/1965	1367	2810	1.63%	5.36%
7/9/1993	1410	2951	1.64%	5.45%
4/24/2001	1349	2774	1.62%	5.27%
6/16/2008	1227	2539	1.49%	4.90%

The June 6, 2008 flood event on the Wapsipinicon River and the July 9, 1993 flood event on the Mississippi River were reviewed in more detail to ensure the modeling lines up properly with the predicted flood areas. Census blocks were reviewed to determine if structures within the census block would be damaged during a flood event. In addition, Modern Woodman Park was removed from damaged structures because the stadium is flood-proofed to one foot above the 100-year flood stage. The casino boats were also removed from damaged structures. If all properties identified in the HAZUS modeling were to be damaged to the extent similar to that of the Wapsipinicon River on June 6, 2008, approximately $4.5-$6.5 million in total property damage may occur. If all properties identified in the HAZUS modeling were to be damaged to the extent similar to that on the Mississippi River on July 9, 1993, approximately $540-$718 million in total property damage may occur.

HAZUS reports expected building damage by occupancy as part of its analysis. Below are the expected building damage by occupancy data for the June 6, 2008 flood event on the Wapsipinicon River and the July 9, 1993 flood event on the Mississippi River.

HAZUS Modeled 6/19/2008 Wapsipinicon Flood Event						
Estimated Damage by Occupancy Type						
Occupancy	1-10%	11-20%	21-30%	31-40%	41-50%	Substantially
Agriculture	0	0	0	0	0	0
Commercial	0	0	0	0	0	0
Education	0	0	0	0	0	0
Government	0	0	0	0	0	0
Industrial	0	0	0	0	0	0
Religion	0	0	0	0	0	0
Residential	0	0	9	45	9	1
Total	0	0	9	45	9	1

HAZUS Modeled 7/9/1993 Mississippi Flood Event						
Estimated Damage by Occupancy Type						
Occupancy	1-10%	11-20%	21-30%	31-40%	41-50%	Substantially
Agriculture	0	0	0	0	0	0
Commercial	2	14	2	15	8	0
Education	0	0	0	0	0	0
Government	0	1	2	0	0	0
Industrial	0	2	3	2	6	0
Religion	0	0	0	0	0	0
Residential	0	4	15	54	106	220
Total	2	21	22	71	120	220

Conclusions: Recovery from major flood events that damage a large area takes a significant amount of time, but with planning and mitigation, the effects of flooding can be minimized and the recovery period shortened. While river flooding cannot be prevented, there are several mitigation activities that can reduce the effects of flooding, including floodplain management, mitigation of flood prone properties, and recovery planning.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2013*
State of Iowa, IHSEMD	Public Disaster from declarations spreadsheet
Iowa Statewide Floodplain Mapping Project	http://www.iihr.uiowa.edu/iowafloodmaps/
Scott County	*Scott County Multi-Jurisdictional Hazard Mitigation Plan, 2012*
National Climatic Data Center	https://www.ncdc.noaa.gov/stormevents/
American Red Cross	http://www.redcross.org/get-help/prepare-for-emergencies/types-of-emergencies/flood#/Prepare
Department of Homeland Security	https://www.ready.gov/floods
Federal Emergency Management Agency (FEMA)	https://www.floodsmart.gov/floodsmart/
State of Iowa, DNR	State Floodplain Manager Repetitive Loss Report as of 6/30/2016
USACE	Rivergages.com
National Weather Service Advanced Hydrologic Prediction Service	http://water.weather.gov/ahps/

Map 3-5 Slope

Map 3-6 Karst Areas

Severe Winter Storm

Severe winter storms are weather conditions that affect day-to-day activities. These can include blizzard conditions, heavy snow, blowing snow, freezing rain, heavy sleet, and extreme cold. Winter storms may occur at any time between October and April. The various types of extreme winter weather cause considerable damage. Heavy snows can cause immobilized transportation systems, downed trees and power lines, collapsed buildings, and loss of livestock and wildlife. Blizzard conditions are winter storms that last at least three hours with sustained wind speeds of 35 mph or more, reduced visibility of ¼ mile or less, and white-out conditions. Heavy snow of more than six inches in a 12-hour period or freezing rain greater than ¼ inch accumulation may cause hazardous conditions in the community that can slow or stop the flow of vital supplies, and disruptions of emergency and medical services may occur. Loose snow begins to drift when the wind speed reaches 9 to 10 mph under freezing conditions. The potential for some drifting is substantially higher in open country than in urban areas where buildings, trees, and other features obstruct the wind.

Ice storms can result in fallen trees, broken tree limbs, downed power lines and utility poles, fallen communication towers, and impassable transportation routes. Severe ice storms have caused total electric power losses over large areas of Iowa and rendered assistance unavailable to those in need due to impassable roads. Frigid temperatures and wind chills are dangerous to people, particularly the elderly and the very young. Dangers include frostbite or hypothermia. Water pipes, livestock, fish and wildlife, and pets are also at risk from extreme cold and severe winter weather.

There have been 122 winter weather events recorded in Scott County between 1/18/1996 and 6/30/2016 (NCDC). Events included were heavy snowfalls, extreme cold temperatures, blizzard conditions, freezing rain or glazing, blowing snow, frost, and sleet. Below are significant events that have occurred in the county.

- **February 24, 2007:** A widespread and crippling ice/snow storm affected eastern Iowa, northwest and western Illinois, and extreme northeast Missouri. This massive ice storm was the worst to affect the region since January 22-23, 1965. Ice accumulations of around one inch were common, with some reports to near two inches. East winds gusting over 50 mph, combined with the heavy ice accumulation, brought down numerous tree branches and power lines, along with several thousand power poles. Several trees also fell from the weight of the ice. Widespread power outages occurred, affecting over 180,000 people, which lasted more than a week in some of the rural areas. Scott County was part of the declared disaster area and included in the Presidential Disaster Declaration (FEMA -1688-DR; March 14, 2007).
- **January 13-16, 2009:** Heavy snow fell January 13-14 (6-8 inches), then extreme cold temperatures set in on January 14-16. Actual air temperatures were -10° to -20° F (wind chills -30° to -50° F). Cedar Rapids set a record low of -29° F.
- **January 31-February 2, 2011:** A tremendous blizzard affected the region, with snowfall totals ranging from 10 to 20 inches and snow drifts as high as 7 feet. Many roads and interstates were closed. Blizzard conditions were widespread, and visibility was near zero with 55-65 mph wind gusts (Davenport recorded one of the strongest wind gusts of

56 mph). At the height of the blizzard, snowfall rates were as high as 1-3 inches per hour. Davenport received 19.7 inches of snowfall, with 15.0 measured in Park View.

- **February 1, 2015:** A prolonged snow event from the mid-afternoon on January 31 to late February 1 created widespread snow across the region. The heaviest snowfall of 9-15 inches fell along Interstate 80 corridor, with 13.3 inches measures in Davenport. Gusty northwest winds developed behind the system resulting in considerable blowing and drifting snow. Several areas experienced prolonged power outages and downed tree limbs due to heavy snow. The St. Ambrose University Athletic Dome collapsed under the weight on the snow accumulated during this event.

Probability. Most Iowa counties can usually expect 2 or 3 winter storms per season with an extreme storm every 3 to 5 years on average. A snowfall of six inches or more from one storm only occurs in 49% of Iowa winters, while a large winter storm event of 10 inches or more will occur about once every 3 years. A simple average of recorded Scott County events yields about 5 days of winter storm incidents per year.

Magnitude/Severity. Hazardous driving conditions due to snow and ice on highways and bridges lead to many traffic accidents. Rural roads are not plowed after dark as a policy of Scott County's Secondary Roads Department, potentially delaying ambulatory services during winter weather events. About 70% of winter-related deaths occur in automobiles, and about 25% are people caught out in a storm. Those at risk are primarily either engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists), or are elderly or very young. The 2013 *Iowa Hazard Mitigation Plan* reports an average annual loss estimate of $74,898 from severe winter storms in Scott County. The National Climatic Data Center Storm Event Database reported $708,000 in winter storm related property damage between 1/18/1996 and 6/30/2016.

Location. The entire planning area is equally at risk for severe winter storm.

Warning Time. The National Weather Service (NWS) has developed effective weather advisories that are promptly and widely distributed via radio, TV, internet, and weather alert radios. Winter storm information is made available to public officials and the public up to days in advance.

Duration. Winter storms may affect a large area, although local variations in storm intensity and quantity of snow or ice may occur. The duration of the storm will be determined by the local response to snow removal and any associated losses and dangers of electrical outages.

Vulnerability. Hazardous driving conditions due to snow and ice on highways and bridges lead to many traffic accidents. The leading cause of death during winter storms is transportation accidents. About 70% of winter-related deaths occur in automobiles, and about 25% are people caught out in the storm. The majority of these are males over 40 years of age. Emergency services such as police, fire, and ambulance are unable to respond due to road conditions. Emergency needs of remote or isolated residents for food or fuel, as well as feed, water, and shelter for livestock, are unable to be met. The Iowa Department of Transportation, county road departments, and local public works agencies are responsible for the removal of snow and treatment of snow and ice with sand and salt on the hundreds of miles of streets and highways in the county.

Cold temperatures can cause frostbite and hypothermia, especially when combined with wind chills that further reduce the perceived air temperature to exposed skin. Frostbite and hypothermia can affect anyone, but the elderly and the very young are particularly vulnerable. People engaged in outdoor activity (shoveling snow, digging out vehicles, or assisting stranded motorists) also have risk from prolonged exposure. Schools often close during extreme cold or heavy snow to protect children and bus drivers. As seen in the community profile, the some districts in Scott County are large in square area, which could place bus drivers and children at risk in transit to school.

Immobilized transportation (including emergency vehicles) downed trees and electrical wires, building and communication tower collapse, and bodily injury/death are just a few of the effects of a severe winter storm. Vehicle batteries and diesel engines are stressed, and the fuel often gels in extreme cold weather, which can affect transportation, trucking, and rail traffic. Rivers and lakes freeze, and subsequent ice jams threaten bridges and can close major highways. Ice jams can also create flooding problems when temperatures begin to rise. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages. Buried water pipes can burst causing massive ice problems and loss of water and subsequent evacuations during sub-zero temperatures. Fire during winter storms presents a great danger because water supplies may freeze, and firefighting equipment may not function effectively, or personnel and equipment may be unable to get to the fire. If power is out, interiors of homes become very cold and lead to pipes freezing and possibly bursting. Citizens' use of kerosene heaters and other alternative forms of heating create other hazards such as structural fires and carbon monoxide poisoning.

Cold temperature effects on agriculture are frequently discussed in terms of frost and freeze affects early or late growing seasons and unprotected livestock. The cost of snow removal, repairing damage, and loss of business can have large economic effects on the community. The loss of revenue and the economic impact due to property damage and crop damage could be significant for Scott County if they experienced several severe storm events within a short period of time.

In Scott County, a large majority of the community could be injured or experience property damage from this hazard. Winter storms damage the roofs of the structures and can cause the collapse of the roofs when ice and snow build up to a substantial level. The critical structures, however, are cleared of snow frequently to prevent this damage. The major risk is a secondary event of power loss due to the above ground power lines. All structures would have equal vulnerability to this hazard since the hazard is not confined to a specific geographic area within Scott County. There is particular risk to the elderly and children since major storms can trigger loss of electricity and thus and heat in winter months.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2010*
National Climatic Data Center	*http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms*
National Weather Service, Quad Cities	*http://www.crh.noaa.gov/dvn/*
FEMA	*http://www.ready.gov/winter-weather*
American Red Cross	*http://www.redcross.org/prepare/disaster/winter-storm*

Sinkholes, Land Subsidence, and Landslides

Sinkholes, land subsidence, and landslides are all geologic events that involve mass movement of earth. They all have an isolated and narrow effect with a low probability of occurrence in Scott County. For these reasons, they have been combined into a single hazard profile for the purposes of this plan.

Sinkholes and land subsidence are a downward sinking, collapse, or a shifting of the land surface, oftentimes resulting from underground mining. Also, the geology of an area containing karst features may contribute to land subsidence. Karst is defined as a landscape that is characterized by the features of solution weathering and erosion in the subsurface. These features include caves, sinkholes, disappearing streams, and subsurface drainage.

Sinkholes range from broad, regional lowering of the land surface to localized collapse. The primary causes of most subsidence are human activities, such as underground mining of coal or limestone, groundwater or petroleum withdraw, and drainage of organic soils. Sinkholes are due also to erosion of limestone of the subsurface.

Early settlers in Iowa developed underground mines to extract coal. Land areas over these old mines were generally sparsely populated, and if settlement or collapse occurred, homes or other structures were seldom damaged. As towns or cities expanded over mined-out areas, subsidence damage to structures became increasingly common.

The Devonian limestone underlying Scott County has paleo-karst features that are usually found filled with overlying Pennsylvanian-Pottsville sandstone and shale. Observations in the Rock Island, Illinois area show that this limestone has old karst features of dissolved limestone areas forming large open spaces. The limestone in Scott County has been mined for decades in various locations in the county. All mining was done in open pits until the opening of the underground Linwood Mine near Buffalo in the 1960s. Sand and gravel are also extracted in Scott County in several locations. See maps for mines and types of product extracted.

Maximum Extent Damage consists primarily of direct structural damage and property loss and depreciation of land values, but also includes business and personal losses that accrue during periods of repair. In addition to the loss of habitat, land subsidence has the potential to reroute, displace, and contaminate ground water, altering the immediate land and aquatic ecosystems. Land subsidence not only affects the immediate environment, but can pollute and effect ecosystems far from the event with contaminants (hazardous materials, sewage, etc.) being transported throughout the aquifer.

If a pillar system fails in providing regional support within the limestone mine, a wide area collapse is likely to occur with associated surface subsidence.

Landslides occur when susceptible rock, earth, or debris moves downslope under the force of gravity and water. They may impose a direct threat to life and property. Landslides can range from very large to very small and can move at slow to very high speeds. Landslides can be activated by alternate freezing and thawing, ground saturation on steep slopes, steepening of the slopes by erosion or human modification, and removal of stabilizing vegetation.

The Iowa Department of Transportation reconnaissance trips to over 50 active and repaired landslides in Iowa suggest that, in general, landslides in Iowa are relatively shallow (i.e. failure

surfaces less than 6 feet (2 meters) deep) and are either translational or shallow rotational. A translational slide involves planar failure surfaces with movement in which the vector is primarily down slope with no upward component. The movement may be essentially parallel to the original slope surface. A rotational slide includes a large downward component near the top of the slide and an upward component at the bottom of the slide. These slides are deeper than translational slides.

The steep hillsides adjoining the Mississippi and Wapsipinicon Rivers and along the Duck Creek are all prone to landslides or slumping. As shown in Map 3-5, areas with higher slopes can be found near the rivers and creeks within Scott County. Two recent occurrences were in the 2500 block of Middle Road in June 2008 and in March 2009 along the Prospect Terrace Hillside along River Drive both in Davenport. Both landslides occurred in years with excessive amounts of rainfall.

On a statewide basis, the soil most frequently associated with slope failures is undifferentiated fill with 28% of the failures. Glacial till and loess account for 24% and 21% of the landslides, respectively. Alluvium is the soil associated with 13% of the slides, and shale is the material in 7% of the slides.

Most of the landslides in the northeastern and eastern part of Iowa occurred on backslopes (cuts); however, most of the landslides in the southeastern part of Iowa are in foreslopes (embankments). Statewide, 37% of slides are on foreslopes, 32% on backslopes, 26% along streams and riverbanks, and 5% on natural slopes.

Seventy-eight percent of the landslides identified by county engineers that occurred in Iowa from 1993-2001 happened in the spring with the remaining 22% happening in the summer. Fifty percent of the failures were associated with water; 28% of the slope failures occurred after heavy rainfall, and 22% were associated with high ground water table conditions. Twenty-one percent of the slope failures occurred due to design issues. In addition, maintenance or construction activities accounted for 1.4% of the stability problems while loading at the crest of slope, and other causes account for 5% and 10%, respectively. Statewide, 25% of the slides occurred in slopes between 1 foot and 10 feet high, 41% occurred in slopes 11-20 feet high, 21% occurred in slopes 21-30 feet high, and 13% occurred in slopes greater than 30 feet high. Slope was 3:1 on 96% of slopes prior to slope failure. See Map 3-5.

Historical Occurrence. Scott County has not had any recorded subsidence associated with karst topology. However, in 2008, sinkholes developed in a few roads due to excessive runoff. These are documented as there was also severe flooding in the county in 2008. There have been instances of road collapse due to broken water or sewer pipes. These are generally very localized in nature and cause minor disruption to traffic or services.

The Linwood underground mine has been in operation since the 1960s and currently mines approximately 32 acres per year. The structural integrity of the mine is dependent on the geology and deposition of the limestone formation. During the mining operation, there may be areas where the geology (shale, sandstone) may not fully support the material above the mined out area. These areas pose a greater risk for collapse or subsidence. In fact, in 1993, an area of the Scott County landfill, operating above a mined out portion of the mine, subsided. Realizing the potential for this to occur in the future, the Department of Natural Resources has authorized AMSCO to place processed Coal Combustion By-Products, CCB (ash) in the mined out areas,

beginning in areas underlying the landfill. This has successfully prevented a reoccurrence of the subsidence under the operating landfill. AMSCO continues to work with Linwood to determine mine reclamation locations for deposition of AMSCO's product. See the mine operation area for the Linwood Mine and the Davenport Plant on Map 3-6.

There have been no known subsidence issues related to the historic coal mining in Scott County. However, the known coal mining sites are largely located in undeveloped areas. New subdivision development has occurred in the vicinity of the recorded mine shafts north of Buffalo in Section 16. It is not known if any of these houses are located directly over a mined out area. The above ground area of the Blackwell Mine has not had any development occur in the vicinity.

Probability. Land subsidence occurs slowly and continuously over time, or on occasion abruptly, as in the sudden formation of sinkholes or collapse of mined out areas.

According to the Iowa DNR, subsidence of the land surface has occurred over abandoned underground mines in Iowa, and this process can be expected to continue. There is an increased probability of subsidence occurring with the Linwood Mine due to continuing mine operation and the varied underground landscape. However, this is constantly monitored, and remediation solutions are in place to prevent occurrence. There is also increased probability with the small coal mines as no remediation or reclamation of these areas has taken place.

Subsidence due to Karst features in Scott County would be very rare.

Per an IADOT survey of county engineers on the number of landslides that occurred in their county from 1993 to 2001, it was determined that southeast and western Iowa were high-risk areas for landslides. These high-risk areas contain deep to moderately-deep loess. Most of the counties in the eastern part of Iowa had a significant number of landslides from 1993 to 2001, ranging from 6 to more than 15, except Scott County with 1-5 landslides.

Scott County has many large areas of very hilly terrain with slopes exceeding 18%. Scott County is bordered by both the Mississippi and Wapsipinicon Rivers. Both rivers have steep bluffs susceptible to landslides. Because of this, the probability of a landslide occurring somewhere in the county is higher than the rest of the state as a whole. The study of the slopes and outcrops along Duck Creek in Bettendorf in 2008 showed that hill slope instability was not an issue at the time along that portion of the Creek. No clay was found, nor were there any signs of hummocky topography or ponded water. However, future building should not occur on the slopes adjacent to the creek to guard against any future slope degeneration. The 2013 *Iowa Hazard Mitigation Plan* evaluated the probability of a significant landslide event in Iowa and indicated it was between 10% and 19% in any given year.

Location. The Iowa DNR Geological and Water Survey division reports that Scott County has at least one recorded karst feature. This feature is located at the Linwood Stone Company Quarry near Buffalo. A portion of a paleo-karst cavern complex has been preserved without sediment filling. The geology of Scott County consists of several areas with varying levels of karst development and potential. (See Map 3-6)

The Linwood Mine is a large underground limestone mine located in Buffalo Township and adjacent to the former Buffalo Quarry, now the Linwood Stone Company Quarry. This quarry is

an open pit mine. The Linwood Mine is a continuous underground mining operation and one of the largest in the country. The mine operates 12 months of the year. It is mined using the "room and pillar" method, which results in large underground voids on two "floors," 90 and 130 feet below the ground's surface. Linwood Mining and Mineral, Corp. has operated quarry and lime production facilities in this area since the 1940s. The Linwood underground mine has been in operation since the 1960s and currently mines approximately 32 acres per year.

The Iowa DNR Geological and Water Survey division has identified and recorded 37 underground coal mine locations in Scott County. Those records document mine operations as early as 1840 near Jamestown (former mine camp north of Buffalo, near 100th Avenue and Chapel Hill Road) and as late as 1936. Because mining activity was not regulated or documented until the late 1800s, little or no information is available for older mines. Most of the coal mine shaft locations are in Buffalo Township, Sections 2, 3, 5, 6, 9, 19, 11, and 16. There is also a coal seam near the former town of Black Hawk. This is near the intersection of Telegraph Road a few blocks east of Wisconsin Avenue. There is no record of mining in this area as the seam is very thin. Possible small mines were also located in the vicinity of Section 5 in Pleasant Valley Township. Iowa DNR has one underground coal mine map recorded for Scott County. This is for the Blackwell Mine that operated from 1932 to 1936 in the S. E. Part of the N.E. Part of Section 3, T77N, R2W. There are no maps for the other 36 known mines, just general shaft locations pinpointed to the nearest quarter or full section.

Severity.

A. *Health and safety of persons in affected areas:* Generally, land subsidence poses a greater risk to property than to life. Subsidence in open underground sections of the Linwood Mine could pose a severe threat up to and including death to personnel working in that area.

B. *Health and safety of response personnel:* May be minor to moderate danger if an incident occurred in the Linwood Mine where mine personnel need to be rescued or extracted from the mine.

C. *Continuity of operations:* Depends on the area damaged and the facilities and infrastructure involved.

D. *Property, facilities, and infrastructure:* Damage to property, facilities, and infrastructure would occur if the event undermined foundations and roads. There is an underground road system within the Linwood Mine, and facility offices are located in a portion of the mine.

E. *Delivery of services:* Likely not affected.

F. *Environment:* Sinkholes are a naturally-occurring event, and environmental concerns would be minor but could include runoff of farm chemicals or sewage directly into an aquifer polluting the aquifer. There may be some environmental concerns associated with subsidence of the Scott County Landfill, which is located over a portion of the Linwood Mine and in the vicinity of known karst topography. Landfill leachate or Methane gas may be released into groundwater during a subsidence occurrence.

G. *Economic and financial conditions:* Land subsidence events have damaged homes and commercial structures, disrupted gas/electricity, water service, communications, and

could even disrupt transportation routes. A large subsidence at the Linwood Mine would disrupt mine operations and have some minor economic effects on the county.

H. *Regulatory and contractual obligations:* Linwood Mine is subject to mine reclamation regulations under Iowa Code section 208.17, which obligates Linwood Mining to ensure that its mine is stabilized and requires a bond to assure that reclamation of the mine is complete.

I. *Reputation of the entity:* The reputation of Scott County would not be affected. The reputation of the Linwood Mine Company would possibly be affected if a large subsidence occurred.

General landslides may pose a greater risk to property than to life. Sudden landslides may pose a threat to life, if warning signs of slope failure in structures overlooking steep slopes goes undetected or are ignored. According to the United State Geological Survey (U.S.G.S.), landslides threaten lives and property in every state in the nation, resulting in an estimated 25 to 50 deaths and damage exceeding $2 billion annually. Landslides are also a significant component of many major natural disasters and are responsible for greater losses than is generally recognized. Landslide damage is often reported as a result of a triggering event—floods, earthquakes, or volcanic eruptions—even though the losses from land sliding may exceed all other losses from the overall disaster.

Landslides have a significant adverse effect on buildings and infrastructure and threaten transportation corridors, fuel and energy conduits, and communications linkages. Road building and construction often exacerbate the landslide problem in hilly areas by altering the landscape, slopes, and drainages and by changing and channeling runoff, thereby increasing the potential for landslides. Landslides along roads can disrupt the use of that road until repairs are made to stabilize the slope and remove debris. Utilities such as pipelines, phone or fiber optic cables, power poles, etc. are often vulnerable to the downward movement of soil or rock. This may cause disruptions to water or sewer service, electricity, phone service, or internet access.

Landslides and other forms of ground failure also have adverse environmental consequences, such as dramatically increased soil erosion, siltation of streams and reservoirs, blockage of stream drainages, and loss of valuable watershed, grazing, and timber lands. Breakage of sewer mains could release hazardous materials. Breakage of gas pipelines could result in fire and disruption of supply. Landslides impose many direct and indirect costs on society. Direct costs include the actual damage sustained by buildings and property, ranging from the expense of cleanup and repair to replacement. Indirect costs are harder to measure and include business disruption, loss of tax revenues, reduced property values, loss of productivity, losses in tourism, and losses from litigation. The indirect costs often exceed the direct costs.

Homes and businesses in Princeton, LeClaire, Pleasant Valley Area, Bettendorf, Davenport, and homes on the bluffs above Buffalo all have a level of increased vulnerability. Construction can be a key factor in tipping the balance of slope stability. By building above unstable areas, humans create areas that exceed the bearing strength of the slope (the weight limit a slope can bear before failing). Building on these slopes can increase the saturation of unstable materials through runoff, leaky pipes, lawn wetting, and septic systems. No information on damages caused by landslides is available at this time, so estimating potential losses is difficult.

Speed of Onset. Regional lowering occurs gradually over time, while the collapse of abandoned mines can occur suddenly. Subsidence events are very isolated and localized. They are very hard to predict in advance due to undermined and destabilized rock and soil conditions or movements below ground. Many times, warning signs such as cracks and soil settlement do appear in advance and can be closely watched with inspections and over all monitoring of conditions. Events may occur over extended periods of time, although they have occurred very rapidly with little advance warning. New technologies and software are being used by engineers and geologists to prevent mine subsidence in active mines and to fill and close off areas already mined and prone to roof or pillar failure.

Landslide formation can be very slow or can occur very quickly. Landslides are often triggered by other natural hazards. Landslides and heavy rain or flooding and ground saturation can occur together. Landslides can be detected if areas at high risk are monitored for early signs of a slide such as cracks or a scarp at the top of the slope, a bulge at the bottom of the slope, diagonal cracks along the slope, ponded water indicating localized seepage, cattails or willows indicate localized seepage, and tilted tree trunks. Along roadways, instability below a roadway on foreslopes and backslopes can be indicated by pavement settlement, deformed guardrails, or erosion at the outlet of a drain structure. Instability above a roadway on foreslopes can be indicated by debris on the roadway and blocked drainage ditches.

Duration: The response tied to landslides is related to securing the immediate threat to life and property including immediate reroute of traffic from the affected infrastructure and search and rescue in the case of structural collapse. Return to use of facilities and roads could take hours to many days depending on the severity of the landslide and the actions needed to secure the slope.

Vulnerability. Sinkholes can aggravate flooding potential, collapses such as the sudden formation of sinkholes or the collapse of an abandoned mine may destroy buildings, roads, and utilities.

Land subsidence movements are not selective – all structures (building, sidewalks, driveways, fences, streets, curbs, etc.) in the immediate area will be affected with a subsidence event. The type and extent of damage to structures directly relates to their physical orientation and location in the subsidence area. Ground movements can also damage water and sewer lines, as well as other utilities. In most cases, damages range from minor to moderate in severity. Repair or renovations are usually sufficient to restore structural integrity. However, in severe cases, ground settlement and the resulting damages associated with land subsidence may require complete demolition and rebuilding. Due to the limited number of mined areas and their general locations in the county, the actual number of homes located in or near potential subsidence areas, vulnerability is considered to be very low. Greatest vulnerability is in the former coal mine areas north of Buffalo and on property above the Linwood Mine. New development in this area would increase the vulnerability of structures to subsidence. Areas of the Scott County Landfill located over newly mined out areas of the Linwood Mine would be vulnerable to future subsidence.

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Map 3-7 Existing Land Use

Map 3-8 Flood Hazard Areas with Community Assets

Thunderstorm, Hailstorm, and Lightning

Thunderstorms are common in Iowa and can occur singly, in clusters, or in lines. Thunderstorms typically include thunder caused by lightning, heavy rains (which may cause flash flooding), and strong winds reaching or exceeding 58 mph producing tornados, and may also include surface hail of at least 1.00 inch in diameter. They are created from a combination of moisture, rapidly raising warm air, and a lifting mechanism such as clashing warm and cold air masses.

Most thunderstorms produce only thunder, lightning, and rain. Severe storms, however, can produce tornados, straight-line winds and microbursts above 58 mph, hailstorms, and flooding. The National Weather Service considers a thunderstorm severe if it produces hail at least one-inch in diameter, wind 58 mph or higher, or tornados. Straight-line winds can often exceed 60 mph, are common occurrences, and are often mistaken for tornados. A number of thunderstorms have caused other hazards such as flash flooding, river flooding, and tornados. The associated hazards related to thunderstorms are discussed further as separate hazards.

The National Climate Data Center records 474 thunderstorm, lightning, and hail events for Scott County dating from 9/27/1959 to 7/31/2016. Because thunderstorms may occur singly, in clusters, or in lines, it is possible that several thunderstorms may affect the same area in the course of a few hours. The greatest number of fatalities and injuries recorded for one event was on June 21, 1997 with one fatality and 5 injuries. The highest recorded property damage of $2 million occurred on July 12, 2016.

The data for thunderstorms also includes other high wind events. Since windstorms are a separate hazard profile for Scott County, high wind events exceeding 72 MPH will be discussed in that profile. Because most of those windstorms were also associated with thunderstorms, they were not removed from the total number of thunderstorm events. It is common to have multiple entries in the database per day; however, that is being interpreted as separate storm events that can occur in quick succession.

Lightning is an electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a “bolt.” This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches temperatures approaching 50,000 degrees Fahrenheit in a split second. This rapid heating, expansion, and cooling of air near the lightning bolt creates thunder.

Hailstorms are an outgrowth of a severe thunderstorm in which ball- or irregularly-shaped lumps of ice greater than 1 inch in diameter fall with rain. Strong rising currents of air within a storm carry water droplets at a height where freezing occurs. Ice particles grow in size until they are too heavy to be supported by the updraft. Hail can be smaller than a pea or as large as a softball and can be very destructive to plants and crops. Pets and livestock are particularly vulnerable to hail.

A scale of hailstorm intensity has been developed by the Tornado and Storm Research Organization (TORRO) of the United Kingdom. The scale extends from H0 to H10 with its increments of intensity and damage potential related to hail size (distribution and maximum). Hail texture, numbers, fall speed, speed of storm translation, and strength of the accompanying wind are other factors that affect the damage effects. The scale as follows includes hail diameter size in both metric (mm) and inches measurements.

TORRO Hail Size Damage

Size code	Diameter		Description	Damage Effects
	mm	inches		
H0	5-9	0.2-0.4	Pea size	No damage
H1	5-15	0.2-0.8	Marble size	Makes holes in leaves
H2	10-20	0.2-1.2	Penny size	Strips leaves from plants
H3	20-30	0.4-1.8	Nickel size	Breaks glass panels and can scrape paint
H4	20-30	0.6-2.4	Golf ball size	Breaks windows and scrapes paint
H5	30-50	0.8-3.0	Tennis ball size	Breaks some roof tiles, dents cars, strips bark
H6	40-60	1.2-3.9	Baseball size	Breaks many roof tiles, damages roofs
H7	50-75	1.8-4.9	Grapefruit size	Shatter roofs, serious damage to cars
H8	60-90	2.4-5.0	Softball size	Cracks concrete roofs, splits trees, injury to people
H9	75-100	3.2-5.0	Softball size	Marks concrete walls, kills people, fells trees
H10	>100	4.0-7.0	Melon size	Destroys wooden houses, damages brick homes, kills people

Probability. The SHMT analysis evaluated the probability that thunderstorms and lightning affect Iowa as highly likely in any given year. In Scott County, that translates to about four severe thunderstorms annually. With Iowa's location in the interior of the U.S., there is a very high likelihood that a few of these summer storms will become severe and cause damage. Because of the humid continental climate that Iowa experiences, ingredients of severe thunderstorms are usually available (moisture to form clouds and rain, relatively warm and unstable air that can rise rapidly, and weather fronts and convective systems that lift air masses).

Magnitude and Severity. Those in unprotected areas, mobile homes, or automobiles during a storm are at risk. Sudden strong winds often accompany a severe thunderstorm and may blow down trees across roads and power lines. Lightning presents the greatest immediate danger to people and livestock during a thunderstorm. It is the second most frequent weather-related killer in the U.S. with nearly 100 deaths and 500 injuries each year. (Floods and flash floods are the number one cause of weather-related deaths in the U.S.) Livestock and people who are outdoors, especially under a tree or other natural lightning rods, in or on water, or on or near hilltops are at risk from lightning. Hail can be very dangerous to people, pets, and livestock if shelter is not available. Flash floods and tornados can develop during thunderstorms as well. People who are in automobiles or along low-lying areas when flash flooding occurs, and people who are in mobile homes are vulnerable to the effects of severe thunderstorms. For more details on the vulnerabilities from the flooding and tornado hazards, see that specific hazard profile.

Severe thunderstorms can be quite expansive with areas of localized severe conditions. Most severe thunderstorm cells are 5 to 25 miles wide with a larger area of heavy rain and strong winds around the main cell most non-severe thunderstorms have a lifespan of 20 to 30 minutes, while severe thunderstorms last longer than 30 minutes.

Like tornados, thunderstorms, hail, and lightning can cause death, serious injury, and substantial property damage. The power of lightning's electrical charge and intense heat can electrocute people and livestock on contact, split trees, ignite fires, and cause electrical failures. Thunderstorms can also bring large hail that can damage homes and businesses, break glass, destroy vehicles, and cause bodily injury to people, pets, and livestock. Hail only rarely results in loss of life directly, although injuries can occur.

High winds can damage trees, homes (especially mobile homes), and businesses, and can blow vehicles off of the road. Straight-line winds are responsible for most thunderstorm damage. One or more severe thunderstorms occurring over a short period (especially on saturated ground) can lead to flooding and cause extensive power and communication outages as well as agricultural damage. The 2010 *Iowa Hazard Mitigation Plan* estimates that losses from lightning and thunderstorms total approximately $165,824 annually in Scott County. The National Climatic Data Center Storm Event Database lists $6,602,000 in property damage and $470,100 in crop damage from thunderstorm, hail, and lightning events.

Location. The entire planning area is equally at risk for thunderstorm, hailstorm, and lightning.

Warning Time. Some thunderstorms can be seen approaching, while others hit without much warning. The National Weather Service issues severe thunderstorm watches and warnings as well as statements about severe weather and localized storms. These messages are broadcast over NOAA Weather Alert Radios and area TV and radio stations. Advances in weather prediction and surveillance have increased the accuracy of storm location and direction. Weather forecasting and severe weather warnings issued by the National Weather Service usually provide residents and visitors with adequate time to prepare. Isolated problems arise when warnings are ignored.

Duration. Immediate responses related to severe thunderstorms and lightning events are more aptly associated with the cascading effects of multiple events occurring over a short time period in the case of flash and river flooding, and particularly severe thunderstorm events in the case of tornados. Response to thunderstorm events is relatively minor in scope.

Vulnerability. Thunderstorms are hazards unto themselves, but can cause other hazards such as flash flooding, river flooding, and tornados. Those in unprotected areas, mobile homes, or automobiles during a storm are especially at risk. Sudden strong winds often accompany a severe thunderstorm and may blow down trees across roads and power lines. Lightning presents the greatest immediate danger to people and livestock during a thunderstorm. It is the second most frequent weather-related killer in the U.S. with nearly 100 deaths and 500 injuries each year (after flash floods). Livestock and people who are outdoors, especially under a tree (or other natural lightning rods); in or on water; or on or near hilltops are at risk from lightning. Hail can be very dangerous to people, pets, and livestock if shelter is not available. People who are in automobiles or along low-lying areas when flash flooding occurs and people who are in mobile homes are vulnerable to the effects of severe thunderstorms.

In Scott County, a majority of people and buildings are vulnerable and may be injured or experience property damage from this hazard. The amount of possible property damage can be seen in Table 3-5 that shows the value of all assessed property in Scott County. Damage caused by a severe thunderstorm will likely most affect personal property, particularly older structures. Over 83% of the residential buildings in Scott County were built prior to 1980, and may be more likely to experience roofing damage and damage to the siding during high winds and lightning.

Mobile home parks may also sustain wind damage and are at risk for toppling over in high winds. All of the structures within the county, regardless of whether they are critical facilities or not, are at risk of damage due to this hazard.

These hazards could affect a large majority of the population and area of Scott County. However, there is particular risk to the elderly population since lightning and windstorms can trigger loss of electricity, thus cutting off air conditioning in the summer and heat in the cooler winter months. Elderly and children under 18 are populations that would be more adversely affected by loss of power than the remainder of the population.

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TORRO Hailstorm Intensity Scale Storm Track Severe Weather Tables	http://www.torro.org.uk/TORRO/severeweather/hailscale.php http://www.stormtrack.org/library/edu/tables.htm

Tornado

A tornado is a violent whirling wind characteristically accompanied by a funnel-shaped cloud extending down from a cumulonimbus cloud that progresses in a narrow, erratic path. Rotating wind speeds can exceed 300 mph and travel across the ground at average speeds of 25 to 30 mph. A tornado can be a few yards to about a mile wide where it touches the ground, but an average tornado is a few hundred yards wide. It can move over land for distances ranging from short hops to many miles, causing great damage wherever it descends. The funnel is made visible by the dust sucked up and by condensation of water droplets in the center of the funnel.

In the U.S., Iowa is ranked third in the number of tornados per 10,000 square miles. Between 1950 and 2010, Iowa averaged approximately 40-50 tornados per year. In Iowa, most tornados occur in spring and summer months, but they can and have occurred in the fall and winter months. Tornados are most common in late afternoon to evening hours, but they can occur at any time of the day.

According to the National Climatic Data Center, there were 47 tornado reports for Scott County between 1/01/1950 and 6/30/2016. This number does not clearly represent individual tornado events, since there are duplicate reports for the same event or, in one case, multiple tornados on the same day. By analyzing the reports and including the most recent tornados, there appears to be 31 separate tornado events with an average interval of three years over the reporting period. Most of the reports are of F0 or F1 tornados. Notable events include:

- **May 5, 1995:** An F3 tornado touched down between Stockton and New Liberty. The tornado destroyed 26 farm buildings and caused damage to nine homes. Debris from the tornado covered nearby Interstate 80, causing traffic delays. Damages were around $3 million. A disaster emergency was proclaimed by the governor for Scott County.
- **May 18, 1997:** A brief tornado touchdown near the intersection of 18th Street and Middle Road in Bettendorf as part of a very damaging hailstorm.
- **May 10, 2001:** A tornado touched down in LeClaire and was on the ground for five minutes, carving a path towards the Mississippi River. Numerous trees and power lines were down with damages around $75,000.
- **June 14, 2001:** An F2 tornado touched down around the Muscatine-Scott County border near Highway 22 then moved northeast into Scott County where it ripped off the roofs of three homes in Blue Grass. The same storm also produced an F1 tornado in Bettendorf, just east of the Interstate 74-Highway 67 intersection. That tornado was on the ground for three minutes and tore off one roof.
- **April 13, 2006:** An F1 tornado began north of Interstate 80, 4 miles west of LeClaire. The tornado traveled east crossing 257th Avenue just south of 205th Street. The tornado damaged buildings on a nearby farm. Damages were around $60,000.
- **May 30, 2013:** An EF1 tornado touched down in Andalusia, IL and traveled north-northeast into Scott County, IA through eastern sections of Buffalo, IA, affecting a few houses. The primary impact was to the parks on the eastern edge of town. Wind speeds were estimated to be 95 mph. Some large trees were snapped and uprooted along the path. Some of the fallen trees fell onto houses, with total damages at $100,000.

- **November 11, 2015**: An EF-1 Tornado formed Southwest of Le Claire, traveled to the north and east through the town, breaking and uprooting numerous trees, damaging outbuildings and causing roof and siding damage to about 25 homes. One home lost the roof completely. The tornado appeared with virtually no warning and was on the ground for about 2 miles. Total damage to private property exceeded $500,000
- **October 6, 2016:** An EF1 tornado began in western Davenport, tracking to the northeast. Damage began on Credit Island and extended through downtown Davenport, the Village of East Davenport, Bettendorf, and into northeast Scott County. Along the path, damage was primarily to trees and outbuildings but also affected many residences and private properties. Many trees fell on homes and cars. In downtown Davenport, the roof of the jail and the roof of a homeless shelter were also damaged. Peak wind was estimated at 100 mph.
- **March 6, 2017:** An EF2 tornado 1,000 yards wide began in Muscatine County and then tracked into Scott County near Blue Grass, through northwest Davenport and Eldridge. Power poles were snapped, a house lost its roof, and numerous farm buildings and trees were damaged. Estimated wind speed was 120 mph. The tornado path was 25.3 miles.

Probability. The State Hazard Mitigation Team analysis evaluated the probability that damaging tornados will occur in Iowa is highly likely in any given year. Using the number of events in Scott County over the recording period, it is likely that a tornado event will occur every three years.

Maximum Extent: The rating scale used to rate tornado intensity is called the Fujita Scale that estimates wind speeds based on the damage caused by the tornado. This scale has been recently revised as the Enhanced Fujita (EF) Tornado Scale, which includes additional enhanced descriptions of damage to multiple types of structures and vegetation with photographs, a PC-based expert system, and enhanced training materials. The EF scale is still a set of wind estimates based on damage. It uses three-second gusts estimated at the point of damage based on a judgment of 8 levels of damage to 28 indicators. The Enhanced Fujita scale replaced the original as of February 1, 2007 in all tornado damage surveys done in the United States.

Magnitude and Severity. The rating scale used to rate tornado intensity is called the Fujita Scale that estimates wind speeds based on the damage caused by the tornado. This scale has been recently revised as the Enhanced Fujita (EF) Tornado Scale, which includes additional enhanced descriptions of damage to multiple types of structures and vegetation with photographs, a PC-based expert system, and enhanced training materials. The Enhanced Fujita scale replaced the original as of February 1, 2007 in all tornado damage surveys done in the United States.

The Enhanced Fujita (EF) Scale

Fujita Scale			Operational EF Scale	
F Number	Fastest ¼ mile (mph)	3-Second Gust (mph)	EF Number	3-Second Gust (mph)
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-207	162-209	3	136-165
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

Those most at risk from tornados include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements. People in automobiles are also very vulnerable to tornados. The elderly, very young, and the physically and mentally handicapped are most vulnerable because of lack of mobility to escape the path of destruction. People who may not understand the watches and warnings due to language barriers are also at risk.

Generally, the destructive path of a tornado is only a couple of hundred feet in width, but stronger tornados can leave a path of destruction up to a mile wide. Normally, a tornado will stay on the ground for no more than 20 minutes; however, one tornado can touch ground several times in different areas. Large hail; strong, straight-line winds; heavy rains; flash flooding; and lightning are also associated with severe storms and may cause significant damage to a wider area. The 2013 *Iowa Hazard Mitigation Plan* estimates that losses from tornados in Scott County total approximately $574,000 annually. According to the National Climatic Data Center Storm Event Database, $36,196,000 in property damage and $70,050 in crop damage were estimated to have occurred within Scott County between 1/1/1950 and 6/30/16.

Effects can range from broken tree branches, shingle damage to roofs, and some broken windows all the way to the complete destruction and disintegration of well-constructed structures, infrastructure, and trees. Tornados can affect many critical services, mainly electrical power. Buried services are not as vulnerable, but can be affected by their system components that are above ground.

Whole towns have been known to be "wiped off the map." Economic effects can result from direct damage to facilities or business disruption from the lack of critical services such as power, gas, or water. This is considered a countywide hazard. While a tornado is unlikely to affect the entirety of the county on any given occurrence, tornados are likely to strike anywhere within the county.

Location. The entire planning area is equally at risk for tornados.

Warning Time. Tornados strike with an incredible velocity. Wind speed may exceed 300 miles per hour, and the storm can travel across the ground at more than 70 mph. The advancement in weather forecasting has allowed watches to be delivered to those in the path of these storms for up to hours in advance. The best lead time for a specific severe storm and tornado is about 30 minutes. Tornados have been known to change paths very rapidly, thus limiting the time in which to take shelter. Tornados may not be visible on the ground due to blowing dust or driving rain and hail.

Duration. The response to a tornado event is tied to responding to the immediate threat to life and property immediately following the tornado event and in the shelter of affected families and individuals.

Vulnerability. Those most at risk from tornados include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements. People in automobiles are also very vulnerable to tornados. The elderly, very young, and the physically and mentally handicapped are most vulnerable because of the lack of mobility to escape the path of destruction. People who may not understand watches and warnings due to language barriers are also at risk.

In Scott County, possible injury and/or property damage due to this hazard would be widespread. The amount of possible property damage can be seen in Table 3-5 that shows the value of all assessed property in Scott County. A tornado would prove devastating to any structure it hit, regardless of whether it was a critical structure or not. The level of damage would be a total collapse of the structure in the most intense situation, with wind damage to roofs and siding to those structures not directly hit. Also, damage from flying debris could shatter windows and cause roof damage. Some critical structures in Scott County are susceptible to wind damage and if hit directly, would not be able to function. Older buildings, buildings in poor condition, and mobile homes would be especially susceptible.

Mobile home parks would be of particular concern as they are home to a high density of residents with structures not built to withstand high wind speeds. In addition, places with high densities of people such as schools, nursing homes, and large apartment buildings are also vulnerable.

Sources	
National Climatic Data Center/Enhanced Fujita Scale	*http://www.ncdc.noaa.gov/oa/satellite/satelliteseye/educational/fujita.html*
National Climatic Data Center	*http://lwf.ncdc.noaa.gov/oa/climate/severeweather/tornados.html* and *http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms*
The State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2013*
Quad-City Times	*http://qctimes.com/news/local/nws-con%E3%80%80%E3%88%80rms-tornados-from-thursday-s-storm/article_0fa36cb4-8d48-11e6-8c8b-afa76959b8ba.html*

Windstorm

Windstorms can be described as extreme winds associated with severe winter storms, severe thunderstorms, downbursts, and very strong pressure gradients. Windstorms, other than tornados, are experienced in all regions in the United States. It is difficult to separate the various wind components that cause damage from other wind-related natural events that often occur with or generate windstorms.

Although Iowa does not experience direct effects of hurricanes, the state is no stranger to strong, damaging winds. Unlike tornados, windstorms may have a destructive path that is tens of miles wide, and the duration of the event could range from hours to days. These events can produce straight line winds in excess of 64 knots (73 mph) causing some power outages, property damage, impaired visibility, and crop damage. The Beaufort Wind Scale below identifies winds above 73 mph as hurricane force winds.

Beaufort Wind Scale

Windspeed in MPH	Visible Conditions
25-31	Strong breeze large branches in motion; telephone wires whistle; umbrellas used with difficulty
32-38	Moderate gale whole trees in motion; inconvenience in walking against wind
39-46	Fresh gale breaks twigs off trees; generally impedes progress
47-54	Strong gale slight structural damage occurs; chimney pots and slates removed
55-63	Whole gale trees uprooted; considerable structural damage occurs
64-72	Storm very rarely experienced; accompanied by widespread damage
73+	Hurricane devastation occurs

Historically, windstorms are associated with severe thunderstorms and blizzards. The National Weather Service has developed a windstorm warning system similar to other events such as tornado, winter storm, and thunderstorm. Watches are issued when conditions are favorable for windstorms to develop, and they come 12 to 24 hours in advance. Advisories are issued when existing or imminent high winds cover part or all of the forecast area and pose a threat to life and property.

Based on historical statewide averages, Iowa would expect to have 15 to 20 wind events each year where wind speeds exceed 74 mph. The National Climate Data Center (NDCD) records 17 events for Scott County between 1974 and 2016 where high winds were the chief hazard. In some cases, there were multiple instances of wind gusts exceeding 64 knots per a given event. Following are notable events.

- **May 10, 1996:** A thunderstorm created winds of 85 knots (almost 98 mph), the strongest in Scott County's recorded history. This event affected 150 buildings in Parkview and caused over $1 million in total damages. Parkview was part of a larger swath of damage from Durant in Cedar County, Iowa through Fulton in Whiteside County, Illinois.

- **June 21, 1997:** Strong and damaging winds swept through Eastern Iowa and Northwestern Illinois causing several injuries and one fatality. Many large healthy, even landmark, trees were downed. Downed trees caused widespread power outages and blocked roads. The most severe winds tracked along portions of the Wapsipinicon River causing extreme damage to homes and cabins. In the Davenport area, winds reached 80 knots, and a child was killed by a downed tree. Total property damage reported by the NCDC was $140,000.
- **June 6, 1999:** Thunderstorm winds caused $12,000 in damage in Dixon. Winds in excess of 80 mph destroyed a barn. Several trees were uprooted and outbuildings suffered heavy damage. Two pickup trucks were also damaged.
- **September 11, 2000:** Winds estimated in excess of 70 mph at times battered much of the Iowa Quad Cities. The Cities of Bettendorf, Pleasant Valley, Riverdale, and Davenport were hit hardest with numerous trees and power lines knocked down. Twenty-eight thousand homes were without power in the Quad Cities, and many did not have power restored for days. The lack of power forced the cancellation of classes at Scott Community College. The storms also did considerable damage to many of the area's corn and soybean crops. Damage was widespread but variable, with as much as 10 percent of the corn crop damaged in some areas.
- **August 20, 2003:** Thunderstorms developed during the afternoon in Central Iowa along an old stationary front in hot and humid conditions. The thunderstorms moved into Eastern Iowa and became severe. Winds of 50 mph were common along the main gust front breaking many small limbs from trees. The storms reached maximum intensity between 1700 and 1800 CST in Eastern Iowa where a downburst caused severe damage to the National Weather Service (NWS) office in Davenport, Iowa. NWS personnel at Davenport Weather Forecast Office estimated winds of at least 80 knots (92 mph) lasting for 2 or 3 minutes. A total of $91,000 in damages were reported.

Probability. Large-scale extreme wind phenomena are experienced over every region of the United States. Historically, high wind events are associated with severe thunderstorms and blizzards. It is often difficult to separate windstorms and tornado damage when winds get above 64 knots (74 mph). Based on historical information, Scott County can expect to have 1-2 windstorms every one to two years. According to the 2013 *Iowa Hazard Mitigation Plan,* probability that damaging tornados or windstorms will occur in Iowa is highly likely in any given year. Scott County has chosen to define the same probability of occurrence.

Magnitude and Severity. The National Climatic Data center reports a total of $2.891 million in property damage caused by windstorms between 1974 and 2015. The 2013 *Iowa Hazard Mitigation Plan* estimated that windstorms cause approximately $23,060 in losses in Scott County annually. Those most at risk from windstorms include people living in mobile homes, campgrounds, and other dwellings without secure foundations or basements. People in automobiles are also very vulnerable to wind storms, particularly tornados. The elderly, very young, and the physically and mentally handicapped are most vulnerable because of the lack of mobility to seek shelter or escape the path of destruction. People who may not understand watches or warnings due to language barriers are also at risk.

Unlike tornados, windstorms may have a destructive path that is tens of miles wide and several hundred miles long. Large hail, strong straight-line winds, heavy rains, flash flooding, and lightning are also associated with severe storms and may cause significant damage to a wider area. Effects can range from broken tree branches, shingle damage to roofs, and some broken windows all the way to the complete destruction of well-constructed structures, infrastructure, and trees. Crop damage is often associated with windstorms, laying down crops, breaking stalks, and twisting plants, reducing yield and making it difficult to harvest.

Windstorms can affect many critical services, especially electrical power. Disruption of critical services can also affect operations. Employees may be affected and unable to attend work-related functions. Economic effects can result from direct damages to facilities or business disruption from the lack of critical services such as electrical power.

Warning Time. Wind speed may approach 120 miles-per-hour, and the storm can travel across the ground at more than 50 mph. These winds can uproot trees and structures and turn harmless objects into deadly missiles, all in a matter of seconds. The advancement in weather forecasting has allowed watches to be delivered to those in the path of these storms up to hours in advance. The best warning lead time for a specific storm is about 30 minutes.

Location. The entire planning area is equally at risk for windstorms.

Duration. The response tied to windstorm events is one directly related to the immediate protection of vulnerable populations from the direct threat to life and property. Response time is limited to event duration and immediate impact.

Vulnerability. Windstorm is primarily a public safety and economic concern, and the planning area is located in a region with very high frequency of occurrence. Windstorm can cause damage to structures and power lines, which in turn create hazardous conditions for people. Debris flying from high wind events can shatter windows in structures and vehicles and can harm people who are not adequately sheltered.

Although windstorms occur frequently in the planning area and damages to property occur, much of the damage is generally covered by private insurance. This results in less affect to individuals and the community since recovery is facilitated by insurance. Occupants of campers, construction trailers, mobile homes, outbuildings, barns, and sheds and other dwellings without secure foundations or basements are particularly vulnerable as windstorm events in Scott County can be sufficient in magnitude to overturn these lighter structures. Overhead power lines and infrastructure are also vulnerable to damages from windstorms. Potential losses would include cost of repair or replacement of damaged facilities, and lost economic opportunities for businesses. Public safety hazards include risk of electrocution from downed power lines. Specific amounts of estimated losses are not available due to the complexity and multiple variables associated with this hazard.

Sources	
State of Iowa, IHSEMD	*Iowa Hazard Mitigation Plan, 2010, 2013*
National Climatic Data Center	http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

Assessing Vulnerability: Overview

This section analyzes the vulnerability of the county to natural hazards in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities. The first part is a general profile of Scott County that describes the characteristics of the county and its historic development. The format for this profile follows the outline suggested in *Iowa Hazard Analysis and Risk Assessment: 2003 Local Guide.*

Community Profile: Scott County, Iowa

The community profile for Scott County provides highlights on a variety of subjects, including climate and weather; communications; education; labor force, economy, and employment; geography and land use; housing; infrastructure; local history; medical and healthcare; and demographics. These county characteristics provide background on what might be at risk due to natural hazards including people, homes, communications, and economic centers.

Climate and Weather

The climate in Scott County is subhumid midcontinental with an average annual temperature of 51 degrees Fahrenheit. The average July temperature is 75.4 degrees Fahrenheit, and the January average temperature is 22.6 degrees Fahrenheit. The typical precipitation in Scott County is 37.96 inches with an average of 31.6 inches of snowfall, and an average wind speed of 7.4 mph.

Source: National Weather Service Forecast Office. (1981-2010 Normals)

Monthly Normals for Moline Quad City International Airport

Month	Average Temperature	Probability of Precipitation
January	22.6	1.5%
February	27.0	1.6%
March	39.1	2.9%
April	51.4	3.6%
May	61.8	4.3%
June	71.5	4.5%
July	75.4	4.3%
August	73.5	4.5%
September	65.4	3.1%
October	53.2	3.0%
November	40.0	2.6%
December	26.6	2.2%

Source: National Oceanic & Atmospheric Administration. National Environmental Satellite, Data, and Information Service. Moline Quad City International Airport Station. 1981-2010 Station Normals of Temperature, Precipitation and Heating and Cooling Degree Days.

Seasonal Normals for Moline Quad City International Airport

	Winter	Spring	Summer	Fall	Annual
Average Temperature	25.4	50.8	73.5	52.9	50.7
Probability of Precipitation	5.3%	10.8%	13.30%	8.6%	38.0%

Source: National Oceanic & Atmospheric Administration. National Environmental Satellite, Data, and Information Service. Moline Quad City International Airport Station. 1981-2010 Station Normals of Temperature, Precipitation and Heating and Cooling Degree Days.

Communications

There are multiple media communications within the greater Quad Cities Area that serve Scott County from print media, radio, and television, both network and cable. The table below highlights the main media.

Newspapers	Radio Stations	Local TV Stations
The Quad City Times (Davenport, IA)	30 FM Stations	CH 4: –WHBF/CBS – Rock Island
The Dispatch / The Rock Island Argus (Moline, IL)	6 AM Stations	CH 6: KWQC/NBC Davenport
Star Courier (Kewanee, IL)		CH 8: WQAD/ABC Moline
The North Scott Press (Eldridge, IA)		CH 18: KLJB/FOX Davenport
Aledo Times-Record (Aledo, IL)		CH24: WQPT PBS-Moline
The River Cities Reader (Davenport, IA)		CH:26: WBQD-LP - Davenport
		CH 26: KQIN/IPTV Davenport

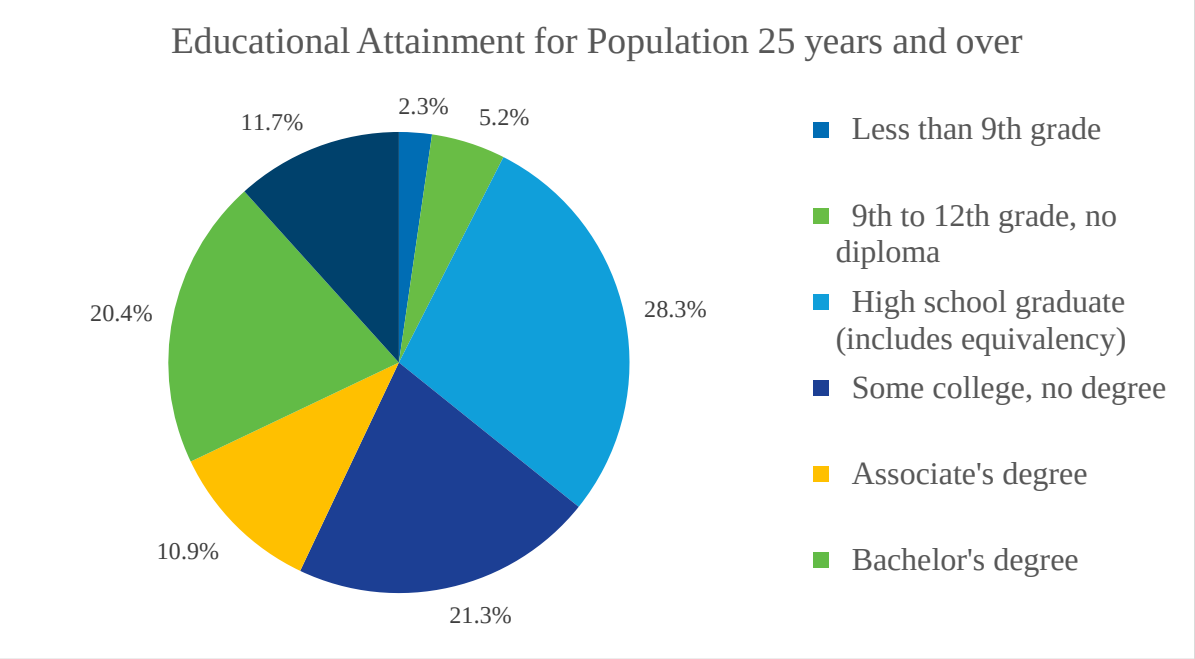
Education

Nearly 62% of the population in Scott County 25 years and over has attained at least a high school education, as shown in the following table and figure. Scott County contains portions of or all of the following school districts: Bettendorf Community School District, Davenport Community School District, North Scott Community School District, and Pleasant Valley Community School District. Colleges and universities within Scott County include Scott Community College, Palmer College of Chiropractic, St. Ambrose University, and technical/trade schools.

Scott County Educational Attainment for the Population 25 years and over	
Population 25 and over	114,193
Less than 9th Grade	2,570
9th to 12th grade (no diploma)	5,893
High School Graduate (included equivalency)	32,303
Some college, no degree	24,283
Associate's Degree	12,490
Bachelor's Degree	23,304
Professional or Graduate Degree	13,350
Percent High School Graduate or Higher	92.6%
Percent Bachelor's Degree or Higher	32.1%

Source: U.S. Census Bureau, American Community Survey, 5-year estimates 2011-2015.

Figure 3-5
Educational Attainment in Scott County (2015)



Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Labor Force, Economy, and Employment

The largest employer in the metropolitan area is the Rock Island Arsenal. While located in Rock Island County, Illinois, it employs residents living in Scott County. In Scott County, Genesis Health Systems, Hy-Vee, and the Davenport School District are the top three employers located at multiple sites. These top employers are followed by Arconic, formerly Alcoa, and Oscar Mayer Foods Corporation. Manufacturing is the largest sector employer.

Figure 3-6
Labor Force 2010-2015

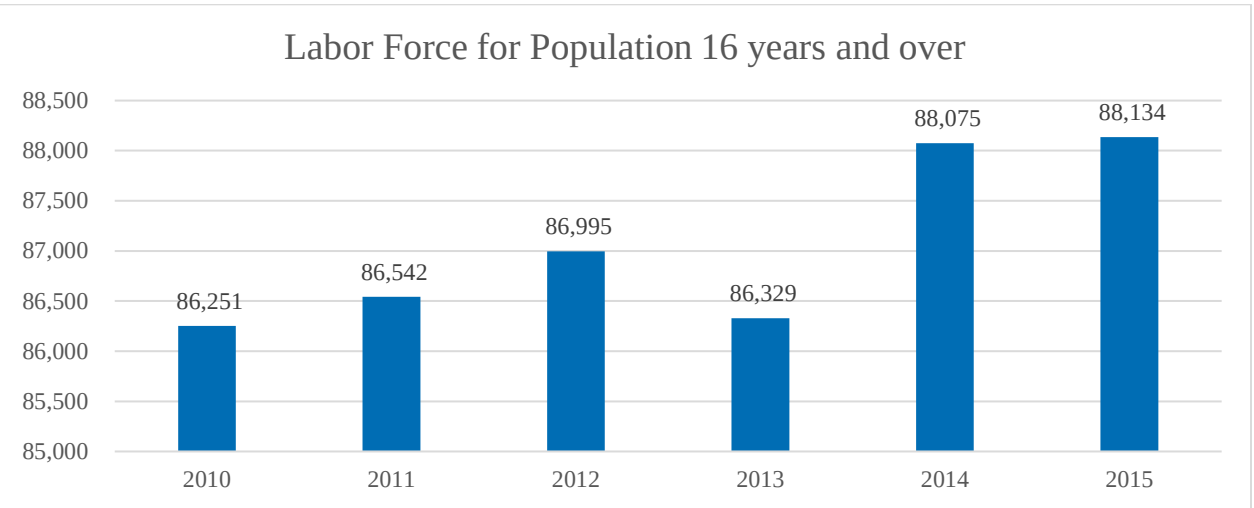
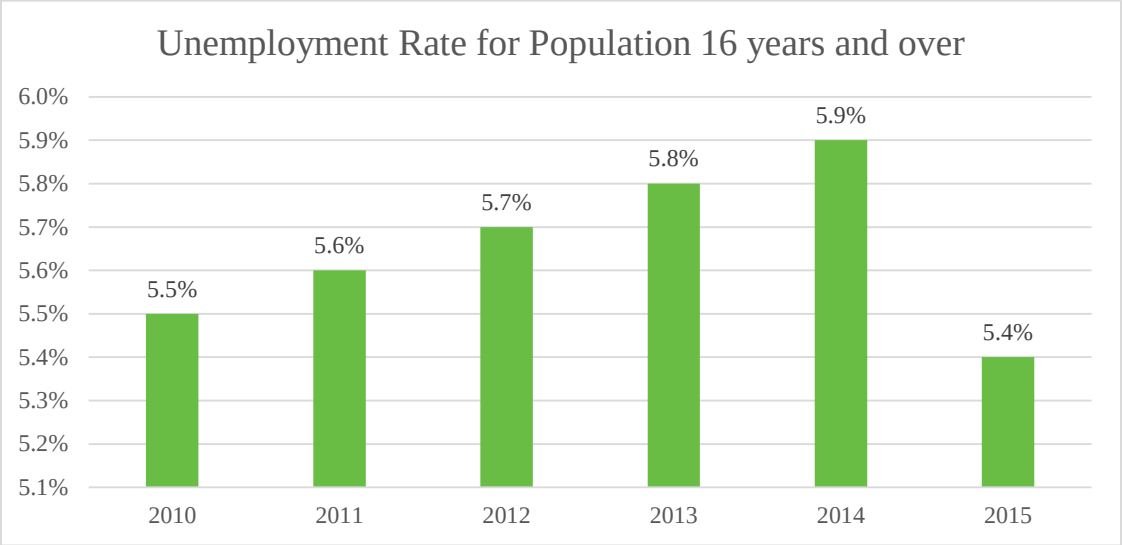
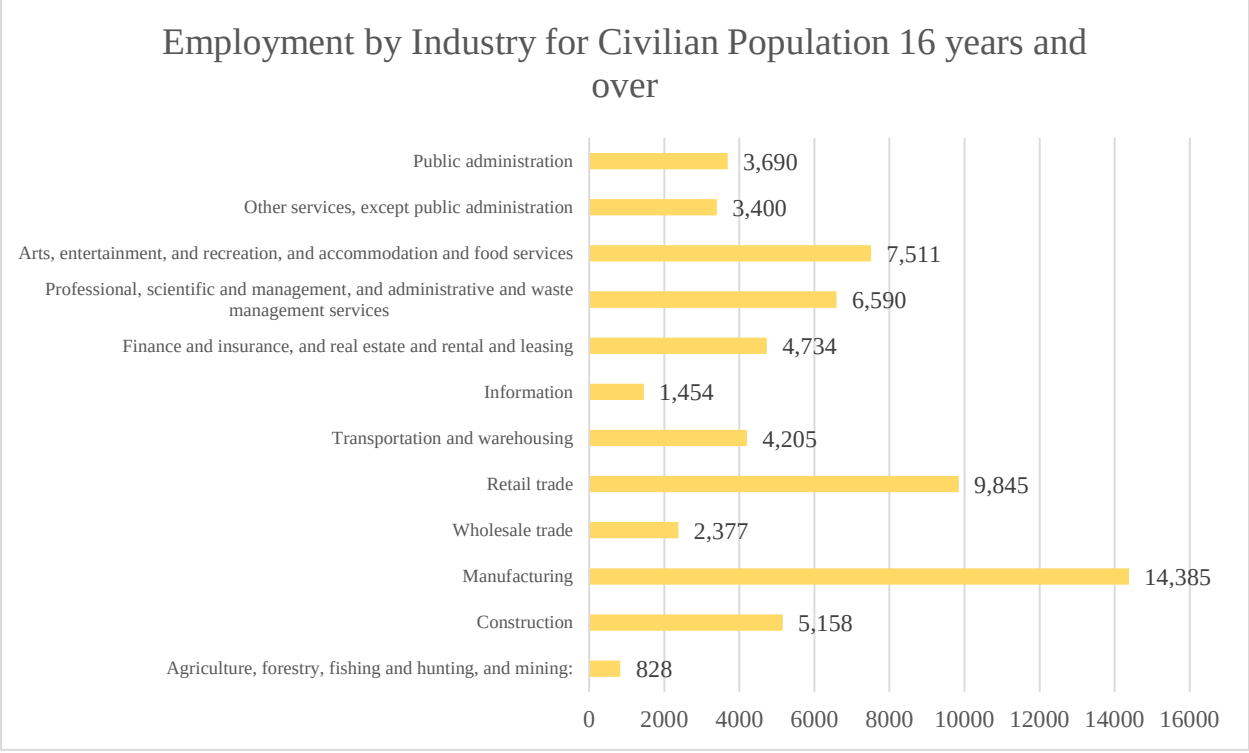


Figure 3-7
Unemployment Rate 2010-2015



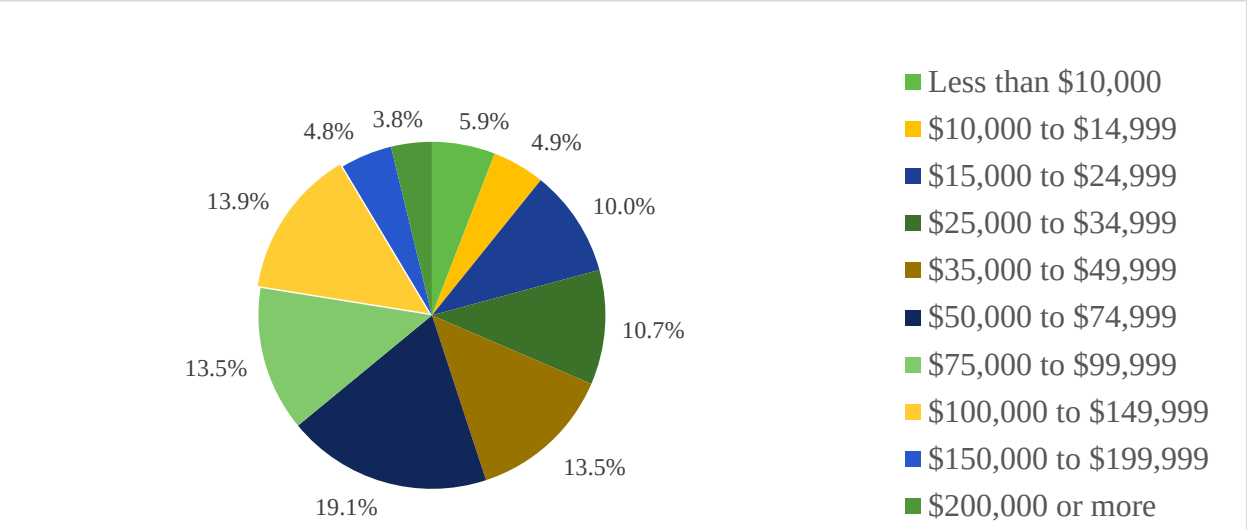
Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2006-2015.

Figure 3-8
Employment by Industry



Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Figure 3-9
Household Income (2015)



Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Top 10 Employers in Scott County, IA		
Employer	Rank	Employees
Genesis Health Systems	1	4,805
Hy-Vee (all Scott Co locations)	2	3,054
Davenport Community School District	3	2,279
Arconic (Alcoa Inc)	4	2,194
Oscar Mayer Foods Corp	5	1,600
Tri City Communications	6	1,100
Isle Casino Hotel Bettendorf	7	1,000
Walmart (all Scott Co locations)	8	992
City of Davenport	9	959
John Deere Davenport Works	10	838

Source: Infogroup, ReferenceUSA GOV and Individual Employers. Data Compiled by Bi-State Regional Commission December 2015 - Spring 2016
Note: Data provided is derived from multiple sources with varying levels of accuracy.

Geography and Land Use

Scott County is located in eastern Iowa where Interstate 80 crosses the Mississippi River. The county is bordered by the Wapsipinicon River and Clinton County, Iowa to the north, the Mississippi River and Rock Island County, Illinois, on the east and south, Muscatine County, Iowa on the southwest, and Cedar County, Iowa on the west. Davenport is the largest city and the county seat.

The soils in Scott County are nearly level to steeply sloping. The topography of the uplands along the Mississippi River has steep side slopes and flat narrow foot slopes with alluvial bottomlands formed in alluvium. A river terrace parallels the Wapsipinicon River, and the

topography in this area is not as steep as along the Mississippi River. The topography switches to gently rolling land away from the rivers in the central and western parts of the county. About half of the county drains to the Mississippi River while the other half flows to the Wapsipinicon River. The Wapsipinicon River flows into the Mississippi River in the northeast corner of Scott County.

According to the *Soil Survey of Scott County,* 1996, the county has been one of the most agriculturally-productive counties in the State of Iowa for over 50 years. This activity continues to this day. Primary crops grown within Scott County include corn, soybeans, and forage crops such as alfalfa and smooth brome. Wheat, oats, barley, sod, some vegetables, nursery stock, and orchard crops are also harvested. The county also has some of the highest priced farmland in the state; however, the agricultural productivity is only a minor portion of the total economy of Scott County due to the large urban center located in the county. Residential areas within Scott County are primarily located within incorporated areas, but approximately 2% or 5,440 acres of the existing land use within unincorporated Scott County is residential developments. The Park View subdivision as well as residential development along the Mississippi River accounts for a large portion of this land area. Commercial and industrial areas are predominantly located within incorporated areas, especially Davenport. Map 3-7 shows existing land use in Scott County.

Map 3-9 Flood Hazard Areas

Housing

The following tables provide information on housing units in Scott County, as well as the years structures were built, and home ownership. Home heating information is also noted.

Units in Structure		
Total Housing Units	72,800	
1-unit detached	50,315	69.1%
1-unit attached	2,688	3.7%
2 units	2,420	3.3%
3 to 4 units	2,513	3.5%
5 to 9 units	4,266	5.9%
10 or more units	8,627	11.9%
Mobile home	1,962	2.7%

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Year Structure Built		
Year	Housing Units	Percent
2014 or later	94	0.1%
2010 to 2013	1,319	1.8%
2000 to 2009	8,167	11.2%
1980 to 1999	12,486	17.1%
1960 to 1979	21,652	29.7%
1940 to 1959	15,911	14.8%
1939 or earlier	13,171	21.9%

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Home Ownership and Median Rent	
Occupied Housing Units	$67,709
Specified Owner Occupied Units	$46,076
Median Value of Owner Occupied Units	$148,200
Specified Renter Occupied Units	$21,633
Median Rent	$715

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

House Heating Fuel		
Total	67,709	
Utility Gas	51,994	76.8%
Bottled, Tank, or LP Gas	3,315	4.9%
Electricity	11,235	16.6%
Fuel oil, Kerosene, etc.	183	0.3%
Coal or Coke	13	0.0%
Wood	218	0.3%
Solar Energy	0	0.0%
Other Fuel	371	0.5%
No Fuel Used	380	0.6%

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Infrastructure

Scott County is traversed by three Interstates 74, 80, and 280 that frame the Iowa Quad Cities Metropolitan Area and carry some of the heaviest traffic in Scott County. Other major highways and roads within Scott County include U.S. Routes 61 and 67, and State Route 22. Five automobile bridges span the Mississippi River within Scott County limits: the I-280 Bridge, the Centennial Bridge, the Government Bridge at Lock and Dam 15, the I-74 Bridge, and the I-80 Bridge. These five crossings carry a total of 173,900 average annual vehicles per day.

There are two airports in the Quad Cities Area: The Quad City International Airport for commercial aviation and the Davenport Municipal Airport for general aviation. The Quad City International Airport, located in Moline, Illinois is the regional airport for Western Illinois and Eastern Iowa. It serves the area with dozens of daily flights and non-stop service to eleven destinations, connecting to multiple national and international destinations. There are two air freight carriers currently at the Quad City International Airport. General aviation needs are met privately by Elliott Aviation in Moline and publically by the Davenport Municipal Airport in Davenport, Iowa. The Davenport Municipal Airport provides vital connections to businesses and their customers.

Currently, there are three rail companies operating in Scott County, the Burlington Northern Santa Fe (BNSF), Canadian Pacific (CP), and Iowa Interstate (IAIS). There is no passenger rail service to Scott County at this time. The two existing rail crossings over the Mississippi River to Scott County are the Crescent Bridge (BNSF) and Government Bridge (IAIS).

Waterways within the county include the commercially-navigable Mississippi River and the Wapsipinicon River (the Wapsipinicon River is a tributary of the Mississippi River). Lock and Dam 14 and Lock and Dam 15 on the Mississippi River are located within the county border and provide movement for barges carrying freight up and down the Mississippi River. There are 19 active barge terminals located within Scott County, seven of which are served by rail. In addition, the Channel Cat, a water taxi/passenger ferry service on the Mississippi River, has docks located in Bettendorf and Davenport. The Channel Cat provides transportation between Bettendorf and Davenport on the Iowa side of the Mississippi River and Moline on the Illinois side.

Source water for municipalities in the county comes from the Mississippi River and wells. The Iowa American Water Company, which serves Davenport, LeClaire, Riverdale, Panorama Park, and unincorporated parts of Scott County, has an average demand of 16,600,000 gallons of water per day. The Cities of Bettendorf, Davenport, Panorama Park, and Riverdale share waste water treatment facilities. The treatment plant has a design capacity of approximately 26 million gallons per day, but can accept up to 60 million gallons per day during storms and can perform at that capacity for 48 hours. Eldridge and LeClaire both have facilities that can operate secondary treatments.

Local History

Native Americans historically lived along the shores of the area rivers and streams where areas of potential archeologically-significant sites may be found. There is a rich history of settlement as westward expansion of the United States created a crossroads of rail and river navigation in the heart of the Quad Cities Metropolitan Area. The first railroad bridge across the Mississippi River was located between Davenport, IA, Rock Island, IL, and the Rock Island Arsenal Island.

Other areas up and down the Mississippi River in Scott County were the sites of Civil War activities.

The area of Scott County first settled in 1833 was in a place called Valley City. Today it is an unincorporated area known as Pleasant Valley. By 1836, the first survey of public land in Iowa was called for, and by March 1837, the Scott County area had been completely surveyed. Scott County was established in 1837 and was named in honor of General Winfield Scott, who presided the signing of the treaty ending the Black Hawk War. The first elections were held in 1838 with the first courthouse being built by 1841. It was located on land donated by Antoine LeClaire in Davenport, IA at the same site as the courthouse today. In addition to Mr. LeClaire and General Scott, another famous resident was William Cody, who was born at the Cody homestead in rural Scott County in 1846 and became known as Buffalo Bill of Wild West fame.

Medical and Healthcare

Scott County is serviced by Genesis Health Systems and Unity Point Health Care, operating a total of three campuses. In addition, Community Health Care, Inc. has an outpatient facility.

Demographics

This plan utilized the newest Census data that was available at the time complied. The individual jurisdiction profiles were updated for the summary below and in the section for each jurisdiction using the American Community Survey 5-year estimates (2011-2015).

The following tables highlight characteristics of the people living in Scott County, Iowa. They include population, age, race, ethnicity, household type, and population change.

Population		
Total	169,994	
Male	83,437	49.1%
Female	86,557	50.9%

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Age		
	Number	Percent
Under 5 years	11,312	6.7%
5 to 14	22,942	13.5%
15 to 19	11,028	6.5%
20 to 34	33,826	19.9%
35 to 54	44,767	26.3%
55 to 64	22,288	13.2%
65 to 84	20,161	11.8%
85 +	3,670	2.2%
Median Age	37.6	

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Race		
	Number	Percent
White alone	146,516	86.2%
Black or African American alone	13,115	7.7%
American Indian and Alaskan Native alone	434	0.3%
Asian alone	3,892	2.3%
Native Hawaiian and Other Pacific Islander alone	16	0.0%
Some other race	1,679	1.0%
Two or more races	4,342	2.6%
Hispanic Ethnicity (of any race)	10,394	6.1%

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Households by Type		
	Number	Percent
Total Households	67,709	100.0%
Family Households	42,662	63.0%
With own children under 18 years	19,194	28.4%
Married couple family	32,896	48.6%
With own children under 18 years	12,727	18.8%
Male householder, no wife present	2,434	3.6%
With own children under 18 years	1,606	2.4%
Female householder, no husband present	7,332	10.8%
With own children under 18 years	4,861	7.2%
Non-Family Households	25,047	37.0%
Householder Living alone	20,589	30.4%
Householder 65 years and over	4,458	6.6%
Average Household Size		2.46 persons
Average Family Size		3.11 persons

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

	1960	1970	1980	1990	2000	2015	% of the County Population	% Change 1960 - 2015
Scott County	119,067	142,687	160,022	150,973	158,668	169,994	100.00%	42.8%
City of Bettendorf	10,534	22,126	27,381	28,139	31,275	34,663	20.4%	229.1%
City of Blue Grass	568	1,032	1,377	1,214	1,169	1,439	0.8%	153.3%
City of Buffalo	1,088	1,513	1,441	1,250	1,321	1,217	0.7%	11.9%
City of Davenport	88,981	98,469	103,264	95,333	98,359	101,863	59.9%	14.5%
City of Dixon	280	276	312	228	276	225	0.1%	-19.6%
City of Donahue	133	216	289	316	293	366	0.2%	175.2%
City of Eldridge	583	1,535	3,279	3,378	4,159	6,017	3.5%	932.1%
City of LeClaire	1,546	2,520	2,899	2,734	2,847	3,888	2.3%	151.5%
City of Long Grove	182	269	596	605	597	894	0.5%	391.2%
City of McCausland	173	226	381	308	299	338	0.2%	95.4%
City of Maysville	126	170	151	170	163	139	0.1%	10.3%
City of New Liberty	145	141	136	139	121	148	0.1%	2.1%
City of Panorama Park	140	219	145	127	111	102	0.1%	-27.1%
City of Princeton	580	633	965	904	946	1,106	0.7%	90.7%
City of Riverdale	477	684	462	419	656	476	0.3%	-0.2%
City of Walcott	664	989	1,425	1,356	1,528	1,575	0.9%	137.2%
Unincorporated Area	12,967	11,669	15,519	14,349	14,548	15,538	9.1%	19.8%

Source: U.S. Census Bureau, Decennial Census 1950 - 2000; U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015.

Recreation and Tourism

There are numerous parks, recreational areas, and open spaces including conservation areas, within Scott County. Scott County Park, a 1,280-acre park located nine miles north of the City of Davenport, is the largest park in Scott County. Its features include picnic areas, camping sites, an equestrian area, playgrounds, a swimming pool, and baseball fields. West Lake Park, located on 110th Avenue west of Interstate 280, is a 620-acre park with four lakes, fishing, swimming, picnic areas, playgrounds, a beach, and campgrounds. The Wapsi River Environmental Education center has been named one of 77 areas in Iowa with premium wildlife viewing. In combination with Sherman Park, the area boasts 432 acres of rich plant and animal diversity. The center also offers environmental education for the public, schools, and other groups. Each jurisdiction within Scott County also has numerous parks, golf courses, pools or aquatic centers, and sports areas, with some of the larger parks being located within the City of Davenport. Credit Island, on the Mississippi River, is approximately 420 acres and has amenities such as a golf course, several sporting areas, biking, hiking, boating, and fishing.

Other tourist attractions include the Buffalo Bill Museum; Figge Art Museum; Family Museum; the Putnam Museum & Giant Screen Theater; Modern Woodmen Park, home of the Quad City River Bandits; Buffalo Bill Cody Homestead; Walnut Grove Pioneer Village; Isle of Capri Casino; Rhythm City Casino; the Adler Theater; the River Center; the Waterfront Convention

Center; and many more entertainment venues. The Mississippi Valley Fairgrounds located in southwest Davenport hosts the Scott County Fair, which is one the largest fairs in Iowa. The fair attracts approximately 300,000 people during its weeklong event with over 600,000 people visiting annually for other events held at the fairgrounds.

In addition to regional attractions and facilities, Scott County's communities host a number of large events throughout the year that draw large numbers of people. These events include Bix 7, Bix Beiderbeck Jazz Festival, River Roots Live, and the LeClaire Tug Fest.

Assessing Vulnerability: Identifying Structures

Determining Community Assets

An outline and definition of assets is from the *State and Local Hazard Mitigation Planning How-to-Guide Understanding your Risks: Identifying Hazards and Estimating Losses*, FEMA document 386-2, published August 2001. The types of community assets that are considered include critical facilities and buildings, vulnerable populations, economic elements, and historical, cultural, and natural resources. Information regarding the presence of these types of assets within the county is discussed as available. Additionally, a description of the assets selected by participating jurisdictions is included within the individual multi-jurisdictional risk assessments found later in this chapter.

Critical Buildings and Facilities

Essential Facilities – These facilities are essential to the health and welfare of the whole population and are especially important following hazard events. The potential consequences of losing them are great; an inventory of these facilities is crucial. These facilities are based on their structural integrity, content value, and the effects on the community if there was an interruption in their functions. ***The vulnerability is based on the service they provide rather than simply their physical aspects.***

- Hospitals
  1. Genesis Medical Centers
  2. Trinity Medical Center
- Other Medical Facilities
- Police and Fire Stations

	Police Department	Fire Department
Bettendorf	X	X
Blue Grass	X	X
Buffalo	X	X
Davenport	X	X
Dixon *		X
Donahue *		X
Eldridge	X	X
LeClaire	X	X
Long Grove *		X
McCausland *		X
Maysville *		X
New Liberty *		X

	Police Department	Fire Department
Panorama Park *		X
Princeton	X	X
Riverdale *		X
Walcott	X	X

* Indicates Volunteer Fire Department

- Emergency Operations Centers

  1. County Wide Emergency Operation Center
  2. City of Bettendorf
  3. City of Davenport

- Evacuation Shelters

  1. Available throughout the county, residents will be notified of the locations as needed.

- Schools and Colleges

  1. Bettendorf Community School District
  2. Davenport Community School District
  3. North Scott Community School District
  4. Pleasant Valley Community School District
  5. St. Ambrose University
  6. Palmer College of Chiropractic
  7. Scott Community College
  8. Kaplan College
  9. Hamilton Technical College

- Transportation Systems

- Airways (Airports and Heliports)

  1. Davenport Municipal Airport
  2. Genesis Medical Center East Campus Heliport
  3. Genesis Medical Center West Campus Heliport

- Highways (Bridges, Tunnels, Roadbeds, Overpasses, and Transfer Centers)

  1. Interstates: I-80, I-280, I-74
  2. U.S. Highways: 6, 61, 67
  3. State Highways: 130
  4. Bridges: Centennial Bridge, Government Bridge (Rock Island Arsenal), I-74 Bridge, I-80 Bridge, and I-280 Bridge.

- Railways

  1. Canadian Pacific
  2. Iowa Interstate

- Waterways (navigable)
    1. Mississippi River
- Lifeline Utility Systems
- Potable Water

	City/Public Water Sources	Local Groundwater Sources	Private Water Source
Bettendorf *			X
Blue Grass		X	
Buffalo		X	
Davenport *			X
Dixon		X	
Donahue		X	
Eldridge	X		
LeClaire *			X
Long Grove		X	
McCausland			X
Maysville		X	
New Liberty		X	
Panorama Park *			X
Princeton		X	
Riverdale *			X
Walcott		X	

* Served by Iowa American Water Company

- Wastewater

	City Wastewater Treatment Facility	Sewage Lagoon	Private Septic Systems
Bettendorf	X		
Blue Grass		X	
Buffalo		X	
Davenport	X		
Dixon		X	
Donahue		X	
Eldridge	X		
LeClaire	X		
Long Grove		X	
McCausland			X
Maysville			X
New Liberty		X	
Panorama Park	X		
Princeton		X	
Riverdale	X		
Walcott		X	

- Oil
- Natural Gas

    1. Alliant Energy Company
    2. Eastern Iowa Light and Power Company
    3. Mid-American Energy Company

- Electric Power

    1. Alliant Energy Company
    2. Eastern Iowa Light and Power Company
    3. Mid-American Energy Company

- Communication Systems
- High Potential Loss Facilities
- Hazardous Material Facilities

Participating jurisdictions provided an inventory of their community assets that could be potentially damaged by a hazard event. They individually determined which facilities were vulnerable. These assets and critical facilities are described in general terms for each participating jurisdiction in the Multi-Jurisdictional Risk Assessment section. While specific site addresses are not included in this document for security reasons, the selected critical facilities have been mapped for the planning area as a whole in relation to Map 3-8.

Vulnerable Populations in Scott County

Vulnerable populations can include small children, persons with disabilities, elderly persons, or non-English speaking residents that may require special response assistance or special medical care after a disaster.

Population	Number	Percent
Total Population under 5 years	11,312	6.7%
Total Population over 65 years	23,831	13.8%
Total Persons with a Disability (all age groups)	17,342	10.3%
Total Population 5 years and over that speak English "less than very well"	3,335	2.1%

Source: U.S. Census Bureau, American Community Survey, 5-year estimates, 2011-2015

Economic Elements

Economic elements could affect the local or regional economy if significantly disrupted.

- Major Employers (see table for major employers at the beginning of this chapter)
- Financial Centers

Special Considerations

Additional areas of high-density residential or commercial development that, if damaged, could result in high death tolls and injury rates.

- Shopping districts and malls
- High density residential developments
- High rise residential or commercial buildings
- High attendance event venues (i.e. sports fields, entertainment facilities)
- College dormitories

Historical, Cultural and Natural Resource Areas

These are areas that could be identified and protected under state and federal laws.

Other Important Facilities

These include facilities that would help ensure a full recovery of the community following a hazard event.

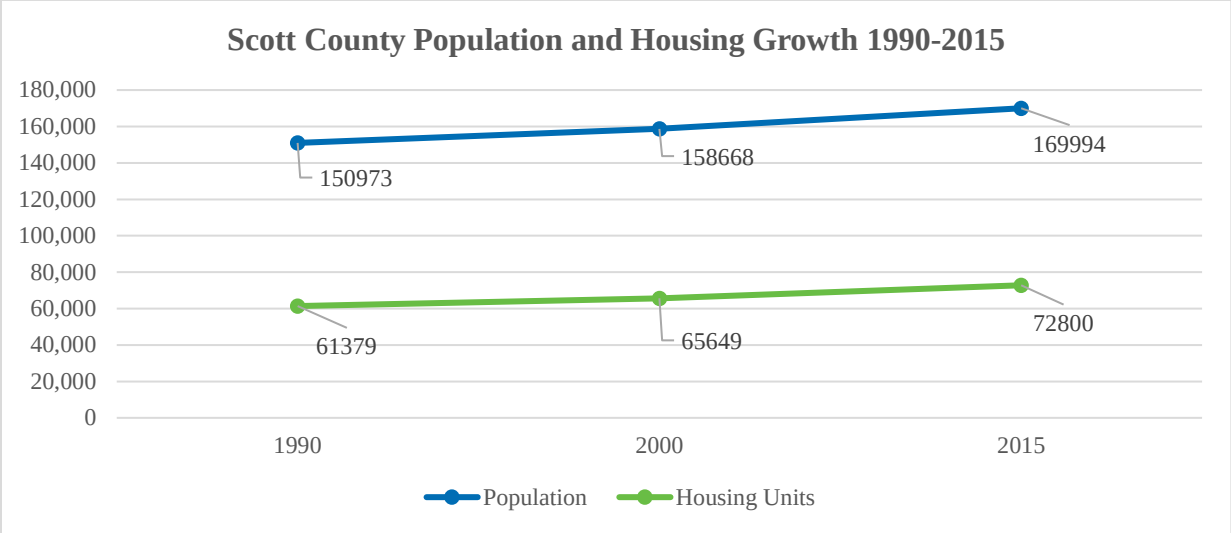
- Government Functions and Facilities
- U.S. Army Facilities
- U.S. Army Reserve Center
- Iowa Army National Guard
- Iowa Army Aviation
- Major Employers
- Banks
- Establishments that provide essential day-to-day needs (i.e. grocery stores, gas stations, pharmacies, and hardware stores)

Assessing Vulnerability: Analyzing Development Trends

Population and Housing Trends

Scott County has shown steady growth in both population size and housing units. Since 1990, the population has increased by 12.6% (19,021), while the housing units have increased by 18.6% (11,421). Figure 3-10 (Scott County Population and Housing Growth 1990-2015) shows the change in population and housing units in more detail.

Figure 3-10



Source: U.S. Census Bureau, Decennial Census 1990 and 2000; American Community Survey, 5-year estimates, 2011-2015.

Residential building permits also reflect the growth of housing units in Scott County. An average of 358 single-family units and an average of 124 multi-family units have been built per year since 2006. In the past few years, private residential building permits have declined, but it still shows there is a need within the county. Table 3-8 shows the residential building permits by year.

Table 3-8
Scott County Privately Owned Residential Building Permits

Year	Single-Family		Multi-Family		Total	
	Buildings	Units	Buildings	Units	Buildings	Units
2006	538	538	18	156	556	694
2007	407	407	26	306	433	713
2008	274	274	11	60	285	334
2009	231	231	16	286	247	517
2010	304	304	9	113	313	417
2011	428	428	5	45	433	473
2012	381	381	1	60	382	441
2013	371	371	2	16	373	387
2014	331	331	7	34	338	365
2015	319	319	11	157	330	476
2016	363	363	8	130	371	493

Source: U.S. Census Bureau - Manufacturing, Mining, and Construction Statistics; Annual Building Permits

The following table provides a summary of how development has occurred in the planning area between 2006 and 2016. The table shows how many building permits have been issued within a given geography. This table only includes hazards that have a geographically defined hazard area. The "Total New Structures" column depicts overall development that would increase exposure for hazards such as windstorms, earthquakes, and winter storms that equal probability of occurring over the entire planning area.

Number of New Structures in Each Community by Geographically Defined Hazard Areas (2006-2016)					
Community	Floodplain 1%	Floodplain 0.2%	Karst	Levee Protected	Total New Structures
Bettendorf	59	5	497	5	1699
Blue Grass	0	0	0	0	95
Buffalo	2	1	10	0	15
Davenport	44	15	61	0	2536
Dixon	0	0	3	0	4
Donahue	1	0	1	0	14
Eldridge	29	0	10	0	456
LeClaire	20	8	256	0	531
Long Grove	0	0	0	0	17
McCausland	0	0	0	0	4
Panorama Park	0	0	0	0	10
Princeton	3	0	53	0	61
Riverdale	1	2	2	0	4
Walcott	1	0	1	0	25
Scott Co	10	1	37	0	356
Total	170	32	931	5	5827

Map 3-10Land Cover

Map 3-11Future Land Use

Existing Land Use

Utilizing the 2002 *Land Cover of the State of Iowa* (Source: U.S. Geological Survey), the current classified land cover in Scott County consists of mainly agriculture (58.08%), of which nearly 33% of the agriculture classifications is corn crops. The remaining areas in the county are classified as grassland (22.41%), forest (7.94%), water and wetlands (3.04%), roadways (2.99%), residential (2.89%), commercial/industrial (2.53%), and other (0.38%). Land cover classifications of the Iowa landscape were derived from satellite imagery collected between May 2002 and May 2003. Refer to Map 3-7 and Map 3-10 for more details.

Future Land Use

Map 3-11 shows future land uses proposed within Scott County. There is a significant increase in industrial future land use areas expected. Manufacturing has been the historical base of Scott County, and it will continue into the future. An industrial expansion is planned for northern Davenport, IA and southern Eldridge, IA along I-80 as well as along Highway 61 in Eldridge. Recent activity includes the relocation of Kraft Foods North America and siting of a new Sterlite facility. As part of the Eastern Iowa Industrial Center, a transload freight facility has been constructed. There are already plans for an expansion of this freight facility. The Davenport Municipal Airport serves as a general aviation facility in this area, providing air service, in addition to highway and rail transportation in this area of Scott County. The City of Buffalo also has industrial expansion planned to the east of the city north of Highway 22. With its multi-modal transportation assets, Scott County has opportunities for freight logistics, both in the agricultural and manufacturing sectors.

Commercial expansions are planned in the Cities of Blue Grass and Walcott. The City of Bettendorf has areas along I-74 and the northern city boarder to expand office areas. A regional sports complex is being located at Middle Road and I-74. The Davenport riverboat casino moved from the river to north Davenport, south of I-80. Low-density residential growth is expected in the northern portions of the Iowa Quad Cities, Blue Grass, Buffalo, Eldridge, and LeClaire. In the rural communities, intermittent residential growth on a smaller scale is envisioned, or retaining quality bedroom communities.

Development Trends by Jurisdiction

	Proposed Commercial Development	Proposed Residential Development	Other Land Use Changes
Unincorporated Scott County	Y	Y	N
Bettendorf	Y	Y	Y
Blue Grass	Y	Y	N
Buffalo	N	N	Y
Davenport	Y	Y	Y
Dixon	N	N	N
Donahue	N	Y	N
Eldridge	Y	Y	Y
LeClaire	Y	Y	Y

	Proposed Commercial Development	Proposed Residential Development	Other Land Use Changes
Long Grove	N	Y	N
Maysville	N	N	N
Panorama Park	N	N	N
Princeton	N	N	N
Riverdale	N	Y	N
Walcott	Y	Y	N

Financial Capabilities

All participating jurisdictions in this plan have taxing authority either as a governmental entity or school district. Communities such as Davenport and Bettendorf prepare five-year comprehensive capital improvement programs. Scott County also prepares a five-year capital improvement plan as part of its annual budget process. Some communities develop strategic plans and have capital improvement projects lists, where they set aside funds for more costly projects beyond operations and maintenance. All cities and the county must submit a budget to the state before March 15 for the fiscal year beginning July 1 and ending the following June 30, in accordance with Iowa Code, and are available on the Iowa Department of Management website by fiscal year. School districts report financial data required by Iowa Code annually through the Department of Education, by September 15 each year. Revenue sources to support hazard mitigation may include existing general funds, TIF district funds, bonds, grants, or loans.

Individual Jurisdiction Risk Assessment Profiles

Included in this section are the individual profiles for each of the jurisdictions, unincorporated Scott County, and participating school districts. Each profile provides a general background of the jurisdiction, including demographic statistics, history, land use, government, critical facilities (Map 3-8, and hazard priorities. Each of the jurisdictions was ranked on population size and land area based on Scott County. The individual jurisdiction profiles have 2015 Census population estimates. Appendix II-5 includes a table with the populations of Scott County from 1950 to 2015 to show population growth and decline within Scott County. Additional information can be found in the hazard profiles and development trends sections of the plan. Detailed Digital Flood Insurance Rate Maps (DFIRMs) for each jurisdiction can be found in Appendix III-2.

City of Bettendorf

Overview

2010 Census Population: 32,490
2015 ACS Population Estimate: 34,663
2021 Population Projection: 37,719
Percent Change (2010-2015): 6.7%
Percent Change (2010-2021): 16.1%
County Rank in Population: 2
Land Area: 21.217 square miles
County Rank in Land Area: 3

Land Use and Geography

The City of Bettendorf is located in south-eastern Scott County in Pleasant Valley Township in between the Cities of Davenport, Riverdale, Panorama Park, and LeClaire. Bettendorf is located along the Mississippi River, which is the prominent natural feature in the county. The major waterways in Bettendorf include Duck Creek, Crow Creek, Pigeon Creek, and Spencer Creek, along with lesser streams and tributaries. These waterways serve as drainage systems for the upland regions of Bettendorf and northern Scott County. According to Bettendorf's 2015 Comprehensive Plan, Bettendorf is primarily residential (47%). The rest of the city is classified as commercial (10%), park and open space (10%), public (7%), and industrial (5%). Part of Bettendorf is in special flood hazard areas (see Appendix III-2); mainly along larger creeks (Duck Creek, Crow Creek, Pigeon Creek, and Spencer Creek). Bettendorf is the only jurisdiction in Scott County that has a levee (see Map 3-1). The levee runs along the Mississippi River from approximately 10th Street (to the west) to the border with Riverdale along where Duck Creek empties into the Mississippi River. The levee was constructed in phases between 1982 and 1988 and protects approximately 449 acres and 294 residents. The entire local flood protection project that included the levee and a flood warning system was completed in 1990 (Army Corp Bettendorf Levee Operation and Maintenance Manual). According to the U.S. Army Corp of Engineers, the levee is valued at $16.3 M. There is no known occurrence of sinkholes or land subsidence in Bettendorf.

Government Structure

Bettendorf is organized as mayor-council form of government. The city council consists of the mayor and seven city council members, one for each of the city's five wards and 2 "at large" council members. The mayor and city council members are elected to four-year terms.

City Departments

- Fire Department
- City Administrator
- Human Resources
- City Attorney
- Library
- City Council
- Mayor
- Community Development
- Family Museum
- Parks and Recreation
- Economic Development
- Police Department
- Engineering
- Public Information Office
- Finance
- Public Works

Boards and Commissions

- Appeals – Building Codes
- Park and Recreation Board
- Electrical Commission
- Planning and Zoning Commission
- Family Museum Board of Trustees
- Plumbing Commission
- Library Board of Trustees
- Zoning Board of Adjustments

Critical Facilities

Bettendorf has identified 220 community assets within the city. The critical facilities include administrative offices, public works facilities, fire stations, the police department, telecommunications towers, and bridges. Two critical facilities and five economic assets are located in the 1% floodplain. Two critical facilities, one vulnerable population area, and three economic assets are located within the 0.2% floodplain. Vulnerable populations include students at the elementary and secondary schools, medical care facilities, day cares, and trailer parks. Medical, economic assets, and other facilities were also identified. These can be seen on Map 3-8.

Hazard Priorities

Following the hazard scoring process, the Bettendorf Hazard Mitigation Committee scored the hazards as shown in Table 3-4 and Table 3-5. The city participates in the National Flood Insurance Program to mitigate flood hazards and will continue to do so. Levee failure is important for Bettendorf because the city has one of three levees within Scott County, and the only levee within an incorporated area. To prevent inundation of the levee, the city acknowledges the importance of routine inspections and maintenance. Hazards such as severe winter storm and windstorm occur frequently within the city and provide consistent damage and additional costs to the city. Downed trees from windstorms, thunderstorm and lightning, and severe winter storms can cause energy failures. Pre-treating roads during severe winter storms is essential in order to ensure safe travel of citizens and emergency responders and will also reduce the risk of highway transportation incidents within the city. While Bettendorf does have housing stock with basements, public education on tornado safety is essential. The city puts an emphasis on planning and public education within their mitigation actions, but also includes structural projects, emergency services, property protection and natural resource protection actions to obtain a full range of mitigation measures. The City of Bettendorf's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Thunderstorm, Lightning, Hail
Flash Flood
Windstorm
Grass and Wildland Fires
Levee Failure
Severe Winter Storm
Extreme Heat
River Flood
Tornado
Drought
Earthquake
Landslide/Sinkhole
Dams
Expansive Soils

City of Blue Grass

Overview

2010 Census Population: 1,382
2015 ACS Population Estimate: 1,483
2021 Population Projection: 1,621
Percent Change (2010-2015): 4.1%
Percent Change (2010-2021): 17.3%
County Rank in Population: 7
Land Area: 2.887 Square Miles
County Rank in Land Area: 8

Geography and Land Use

The City of Blue Grass is located along the southwestern border of Scott County and extends into Muscatine County, Iowa, with the majority of Blue Grass located in Scott County. The city is bordered by unincorporated land with the U.S. Hwy 61 bi-pass running through the northern portion of the city. Blue Grass is primarily residential and agricultural with a small area of industrially and commercially zoned land south of U.S. Hwy 61 in eastern Blue Grass, along the Mayne Street corridor and south of U.S. Hwy 61 along Blue Grass's western corporate limits. No special flood hazard areas (see Appendix III-2) or levees are located within Blue Grass. There are no known occurrences of sinkholes or land subsidence in Blue Grass.

Government Structure

The City of Blue Grass has a mayor-council form of local government. The mayor is elected in two year terms, while the city council consisting of a mayor pro-tem and four other elected officials is elected to four-year staggered terms. The city keeps a city attorney and a city engineer on retainer.

Building Department

- Police Department
- Finance/City Administration
- Public Works
- Fire Department

Boards and Commission

- City Council
- Plan & Zone Commission
- Park Board
- Zoning Board

Critical Facilities

Critical facilities within the City of Blue Grass include City Hall; the Public Safety Building, which houses police, fire, and ambulance; post office; MidAmerican's substation; water plant; wells; and sewage lagoon. Economic assets include local banks, the U.S. Hwy 61, CY Y-40, local grocery and convenience stores, and a lumber yard. Vulnerable populations include the elementary school and local churches. No assets are located within the floodplain.

Hazard Priorities

The City of Blue Grass has elected to utilize their individual hazard scores to create their top priority hazards. The city focused on hazards such as communication failure and energy failure because of their large effect on residents. They are focusing on making sure all public critical facilities are equipped with backup generators. The city understands the importance of flood education and is in the process of joining the National Flood Insurance Program and promoting it to its residents. The city focused on hazards such as thunderstorm and lightning, tornado, and severe winter storm due to their frequency within the city. The city will provide public education on the dangers of these hazards and what to do during a hazard event. The City of Blue Grass's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Tornado
Windstorm
Severe Winter Storm
Thunderstorm, Lightning, Hail
Grass and Wildland Fires
Drought
Extreme Heat
Flash Flood
Earthquake
Dams
Expansive Soils
Landslide/Sinkhole
Levee Failure
River Flood

City of Buffalo

Overview

2010 Census Population: 1,244
2015 ACS Population Estimate: 1,217
2021 Population Projection: 1,452
Percent Change (2010-2015): -2.2%
Percent Change (2010-2021): 16.7%
County Rank in Population: 8
Land Area: 6.445 square miles
County Rank in Land Area: 5

Geography and Land Use

The City of Buffalo lies along the Mississippi River in the southwestern part of Scott County in Buffalo Township. Buffalo is bordered by Davenport to the east and Blue Grass to the north. State Highway 22 runs through downtown along the river. The City of Buffalo has special flood hazard areas that are located along the Mississippi River (see Appendix III-2). There are no levees located within the City of Buffalo. The City of Buffalo is the only jurisdiction in the county to have a known occurrence of land subsidence, which occurred at the Linwood Mine in 1993. Refer to the "Sinkholes and Land Subsidence" hazard profile.

Government Structure

The City of Buffalo has a mayor-council form of government. There are five city council members who serve four year terms. The mayor is elected to two-year terms.

City Departments

- Building Inspections
- Fire Department
- City Attorney
- Floodplain Ordinance Enforcement
- City Clerk – Finance Officer
- Mayor
- City Council
- Police Department
- City Treasurer
- Public Works

Boards and Commissions

- Board of Appeals
- Park Board
- Community Center Commission
- Plan & Zone Commission
- Local Disaster Relief Commission
- Zoning Board of Adjustment

Critical Facilities

Buffalo has identified 21 community assets within the city. The critical facilities include the fire station, police station, public works, and elementary school. Vulnerable populations include students at the primary school, daycares, and larger employers within the city. Economic, historical, and other facilities were also identified. These can be seen on Map 3-8. One critical

facility and one economic asset are located in the 1% floodplain. Three economic assets are located in the 0.2% floodplain.

Hazard Priorities

The city identified hazards such as flooding (flash and river) due to its location on the Mississippi River. The City of Buffalo will focus on constructing and replacing culverts and floodgates to assist in high water times. The city is part of the National Flood Insurance Program and will continue participation. The city also focused on hazards such as windstorm, severe winter storm, and tornado as their top priorities. The city will promote the locations of community shelters and consider safe room construction where adequate facilities are not available. The city will also promote the use of social media as both an education tool and as a warning system for residents. The City of Buffalo's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Landslide/Sinkhole
Windstorm
River Flood
Thunderstorm, Lightning, Hail
Tornado
Severe Winter Storm
Extreme Heat
Grass and Wildland Fires
Flash Flood
Drought
Expansive Soils
Levee Failure
Dams
Earthquake

City of Davenport

Overview

2010 Census Population: 98,325
2015 ACS Population Estimate: 101,863
2021 Population Projection: 107,837
Percent Change (2010-2015): 3.6%
Percent Change (2010-2021): 9.7%
County Rank in Population: 1
Land Area: 62.948 Square Miles
County Rank in Land Area: 2

Geography and Land Use

The City of Davenport is located in south central Scott County. It is the largest incorporated jurisdiction within Scott County in terms of population and land area. It is bordered by the Mississippi River to the south, the City of Buffalo to the southwest, the City of Eldridge to the north, and the City of Bettendorf to the east. The city is primarily within the Mississippi River-Duck Creek watershed of Iowa. The topography is characterized by the low-lying Mississippi River floodplain, the adjacent river bluff, and gentle to rolling uplands dissected by the Mississippi River tributaries. Commercial, industrial, and older residential structures occupy the lowland and bluff areas while the northern portion of the community tends to contain more recent commercial and residential development. The City of Davenport has special floor hazard areas along its creeks and along the Mississippi River (see Appendix III-2). There are no levees located in Davenport, and there is no known occurrence of sinkholes or land subsidence.

Government Structure

Davenport has a mayor-council form of government with an appointed city administrator. Both the mayor and council are elected to 2-year terms. City council consists of ten elected officials with eight of those officials being elected to represent one of the eight wards within the city, and the other two are alderman-at-large. Emergency management operations are shared among the police department, the public works department, and the fire department. The fire department has seven stations located within the city. The Scott County Emergency Communications and Emergency Operations Center is currently under construction. The City of Davenport has not officially incorporated the *Pre-Disaster Mitigation Plan 2007* into any other planning mechanisms; however, certain activities, such as locally funded-volunteer flood buy-out programs, have been funded through the Comprehensive Improvement Plan (CIP).

City Departments

- City Administration
- Human Resources
- Davenport Civil Rights Commission
- Information Technology
- City Assessor
- Legal Department
- Community Planning & Economic Development
- Parks and Recreation
- Finance
- Police Department
- Fire Department
- Public Library
- Public Works

Boards and Commissions

- City Council
- Cable Commission
- Civil Rights Commission
- Citizens Advisory Committee
- Airport Commission
- City Plan and Zone Committee
- Board of Review (Assessor)
- Civil Service Commission
- Davenport Youth Advisory Commission
- Davenport Riverfront Task Force
- Downtown Design Review Board
- Levee Improvement Commission
- Historic Preservation Commission
- Senior Voice
- Housing Code Board of Appeals
- Sister Cities
- Housing Commission
- Zoning Board of Appeals

Critical Facilities

The City of Davenport inventory of community assets included 57 critical facilities. Critical facilities are City Hall, public work center, police department, fire stations, the Water Pollution Control Plant, Scott County Administrative Center, courthouse/sheriff's office, jail annex, engineering & planning, Emergency Communications Center, Iowa Department of Transportation, Army Aviation Support Facility, Army Reserve, U.S. Post Offices, MidAmerican Energy, Iowa American Water Company, AT&T, and communication towers. Of these facilities, five were reported as located within the Special Flood Hazard Area with only the Water Pollution Control Plant having flood mitigation mechanisms. Iowa American Water Co. has been approved for mitigation, though it is not yet underway. The City of Davenport's critical facilities are detailed in Map 3-8. Also included in the map are vulnerable populations, medical facilities, economic assets, and historical, cultural, and natural resources. Vulnerable populations include high-density residential areas, nursing and assisted living homes, schools, and mobile home parks. Three mobile home parks have at least a portion of their facility located within the Special Flood Hazard Area (SFHA). This is down from five in 2012. One mobile home park has mitigation in place, and the other two have some partial mitigation in place. An unknown number of filling stations (including convenience stores) are also located within the SFHA. Five critical facilities, a total of seven areas of vulnerable populations, five economic assets, three historic/cultural buildings, and five other important structures are located within the 1% floodplain. Two critical facilities, two areas of vulnerable population, five economic assets, and eight other important building are located within the 0.2% floodplain.

Hazard Priorities

Creeks within the City of Davenport are susceptible to flash floods, in particular along Duck Creek that cuts through the middle of the city. Flash floods have severely damaged houses along the creeks as well as along the Mississippi River, which routinely floods. The city is making efforts to remove flood damaged properties from the floodplain and will continue to do so when funding is available. The city does participate in the National Flood Insurance Program and the Community Rating Service, and will continue to utilize floodplain and stormwater management to mitigate the effects of flooding. The consolidated emergency dispatch center is located within the City of Davenport. Failure of that dispatch center would severely affect not only Davenport, but the entire county. Severe winter storms, thunderstorm and lightning, windstorms, and hail

frequently occur within the City of Davenport and can cause large amounts of damage to property and result in the loss of power.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Flash Flood
Thunderstorm, Lightning, Hail
Windstorm
Severe Winter Storm
River Flood
Tornado
Grass and Wildland Fires
Earthquake
Extreme Heat
Expansive Soils
Landslide/Sinkhole
Levee Failure
Dams
Drought

City of Dixon

Overview

2010 Census Population: 241
2015 ACS Population Estimate: 225
2021 Population Projection: 261
Percent Change (2010-2015): -6.6%
Percent Change (2010-2021): 8.3%
County Rank in Population: 14
Land Area: 0.148 Square Miles
County Rank in Land Area: 15

Geography and Land Use

Dixon is located in northwest Scott County approximately 1.5 miles south of the Wapsipinicon River. Dixon is situated in eastern Liberty Township and western Allens Grove Township. No highways run through Dixon. The major roads through Dixon are County Road Y40, which runs north/south, and County Road Y4E, which runs east/west. The City of Dixon is primarily residential with Dixon Cemetery located on the west side of the city. A Special Flood Hazard Area exists along Walnut Creek, which is located to the north of the city (see Appendix III-2). There are no levees located within the city, and there are no known occurrences of land subsidence in Dixon.

Government Structure

The City of Dixon has a mayor-council form of local government. The mayor and a five-member city council are elected to four-year staggered terms. The city keeps a city attorney on retainer.

City Departments

- Administration
- Sewer
- Fire Department
- Water
- Police Department (operated by County Sheriff City Boards and Commissions
- Planning and Zoning Board

Critical Facilities

Critical facilities within the City of Dixon include the water tower, lift station, sewer lagoon, and fire department. Locations of all critical facilities can be found on Map 3-8. There are no assets within the floodplain.

Hazard Priorities

The City of Dixon chose to use the countywide Scott County hazard rankings to formulate their first priority level hazards. The city chose to focus on severe winter storms due to their location in the county. The city sits in the northwest corner of the county and has an intergovernmental agreement with the county for plow service. Pre-treating the roads prior to a severe winter storm will assist with necessary travel and lessen the impact on the road service crews. The city also focused on hazards such as thunderstorm and lightning due to frequent occurrences. Continual

public education is essential to keeping the residents informed on the dangers of hazards and what to do during a hazard event. The City of Dixon's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Severe Winter Storm
Windstorm
Tornado
Dams
Drought
Earthquake
Expansive Soils
Extreme Heat
Flash Flood
Grass and Wildland Fires
Landslide/Sinkhole
Levee Failure
River Flood
Thunderstorm, Lightning, Hail

City of Donahue

Overview

2010 Census Population: 366
2015 ACS Population Estimate: 366
2021 Population Projection: 382
Percent Change (2010-2015): 0%
Percent Change (2010-2021): 4.4%
County Rank in Population: 12
Land Area: 0.346 square miles
County Rank in Land Area: 13

Geography and Land Use

The City of Donahue is located in the north central part of Scott County, west of Long Grove in Allen's Grove Township. Donahue is primarily residential and agricultural. The City of Donahue has special flood hazard areas along a tributary of Mud Creek (see Appendix III-2). There are no levees located in Donahue, and no known occurrences of land subsidence.

Government Structure

The City of Donahue has a mayor-council form of government. There are five city council members. The mayor and the city council are elected to four-year terms.

City Departments

- City Attorney
- City Treasurer
- City Clerk
- Floodplain Ordinance Enforcement
- City Council
- Mayor

Boards and Commissions

- Board of Adjustment
- Planning & Zoning Board

Critical Facilities

Critical facilities within the City of Donahue include City Hall, city equipment building, volunteer fire department, water and wastewater treatment plants, elementary school, bank, grain terminal, and a park. Locations of all critical facilities can be found on Map 3-8. Donahue has one historic/cultural structure in the 1% floodplain.

Hazard Priorities

The city identified hazards such as flooding as a top priority due to its proximity to Mud Creek and special flood hazard areas. The city participates in the National Flood Insurance Program and will continue to do so. The city will also put emphasis on maintaining and constructing drainage systems to assist in high water times. The city also focused on hazards such as severe winter storm and thunderstorm and lightning due to their frequency and larger effect on the community. The city recognizes the importance of having roads clear during severe winter

storms to assist with emergency responders. The City of Donahue's mitigation actions are listed in Chapter 4 of this plan.

2017 Ranked Hazards
Thunderstorm, Lightning, Hail
Grass and Wildland Fires
Windstorm
Severe Winter Storm
Drought
Flash Flood
River Flood
Tornado
Extreme Heat
Dams
Levee Failure
Earthquake
Expansive Soils
Landslide/Sinkhole

City of Eldridge

Overview

2010 Census Population: 5,319
2015 ACS Population Estimate: 6,017
2021 Population Projection: 6,839
Percent Change (2010-2015): 13.1%
Percent Change (2010-2021): 28.6%
County Rank in Population: 4
Land Area: 9.482 square miles
County Rank in Land Area: 4

Geography and Land Use

The City of Eldridge is located in the center of Scott County along U.S. Hwy 61 just north of the City of Davenport in Sheridan Township. According to Eldridge's Comprehensive Plan (2011), Eldridge is primarily agricultural (72.69%). The remainder of the city is defined as low-density residential (11.07%), high-density residential (1.55%), commercial (1.55%), heavy industrial (4.05%), light industrial (2.67%), recreational (3.27%), and commercial (1.83%). Residential development is mainly in the northwest section of town while industrial is clustered in the southern portion.

The City of Eldridge has special flood hazard areas along creeks (Crow Creek and Hickory Creek) that mainly affect agricultural areas of the city (see Appendix III-2). There are no levees located in Eldridge, and no known occurrences of land subsidence.

Government Structure

The City of Eldridge has a mayor-council form of government. There are five city council members. Both the mayor and city council members serve four-year terms.

City Departments

- Building Inspections
- Fire Department
- City Administrator
- Mayor
- City Attorney
- Police Department
- City Clerk
- Public Works
- City Council
- Utilities, Water, and Wastewater Departments

Boards and Commissions

- Community Center Board
- Electric, Water, and Utility Board
- Park Board
- Plan & Zone Board
- Zoning Board of Adjustment

Critical Facilities

Eldridge has identified 34 community assets within the city. The critical facilities include City Hall, police department, fire department, water treatment plant, city wells, wastewater treatment

plant, public works, and water towers. Vulnerable populations include students at the elementary and secondary schools, preschools, and medical facilities. Medical, economic assets, and other facilities were also identified. These can be seen on Map 3-8. Eldridge has one critical facility in the 1% floodplain.

Hazard Priorities

The city is focusing on creating a traffic re-routing plan and posting warning signs near facilities. Flooding is also a priority due to the city's location near two creeks. The city is a participant in the National Flood Insurance Program, and enforces floodplain regulations. The city also understands the necessity for essential services during hazard events, they are providing back up power to facilities such as the water treatment plant to ensure residents have all services if possible. Hazards such as thunderstorms and lightning and windstorms can cause energy failures. The city is educating their residents on the importance of tree maintenance and ensuring they are up-to-date on building codes. The city also knows the importance of being prepared for when a drought occurs. They are creating a water conservation plan that will be the guide to maintaining water systems and educating citizens on the importance of water conservation. The City of Eldridge's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Windstorm
Tornado
Thunderstorm, Lightning, Hail
Extreme Heat
Severe Winter Storm
Drought
Earthquake
Grass and Wildland Fires
Flash Flood
Expansive Soils
Dams
Landslide/Sinkhole
Levee Failure
River Flood

City of LeClaire

Overview

2010 Census Population: 3,561
2015 ACS Population Estimate: 3,888
2021 Population Projection: 4,370
Percent Change (2010-2015): 9.2%
Percent Change (2010-2021): 22.7%
County Rank in Population: 5
Land Area: 4.669 Square Miles
County Rank in Land Area: 6

Geography and Land Use

The City of LeClaire is situated in the northeastern portion of the Quad Cities Metropolitan Area in southern LeClaire Township. The Mississippi River and U.S. Hwy 67 borders the eastern and southern part of the community, while Interstate 80 bisects the southwestern third of the community. The unincorporated community of Pleasant Valley is located to the west of LeClaire. An active quarry operates on the north side of the city and taps into bedrock including sandstone, limestone, shale, and dolomite. LeClaire has steep slopes along the riverfront bluff area and in the vicinity of Silver Creek. More gentle slopes are found on top of the bluff west of the riverfront area. LeClaire has special flood hazard areas along the Mississippi River, Silver Creek, McCarty Creek, and Sycamore Creek and their tributaries (see Appendix III-2). There are no levees located in LeClaire and no know occurrences of land subsidence.

According to the LeClaire 2012 Comprehensive Plan, the majority of LeClaire's existing developed land use is low-density residential. Commercial development is located mainly in the downtown Central Business District (CBD) along U.S. 67, as well as south on U.S. 67. Agricultural or unclassified land makes up approximately two-thirds of the community. The 2012 Comprehensive Plan identifies 75.35% of proposed future land use as low-density residential.

Government Structure

LeClaire has a mayor-council form of government with an appointed city administrator. The mayor is elected to a 2-year term while the council members are elected to 4-year staggered terms. City council consists of five elected officials. LeClaire keeps an attorney on retainer.

City Departments

- City Administration
- Police Department
- Fire Department
- Public Works
- Library

Boards and Commissions

- Board of Adjustment
- Recreation Board
- Levee Board
- Library Board
- Park Board
- Tourism Board
- Plan and Zone Commission

Critical Facilities

Critical facilities within the City of LeClaire include City Hall, public works facility, waste water treatment plant and lift stations, police station, fire station, the Mississippi River, I-80 Bridge, Sycamore Creek Bridge, McCarty Creek Bridge, U.S. Hwy 67, Interstate 80, Lock and Dam 14, an electrical substation, natural gas regulating substation, water tower, and water pressure regulating stations. These can be seen on Map 3-8. LeClaire has one critical facility, one historic/cultural structure, and one other important structure in the 1% floodplain. There is one building classified as "other important structure" within the 0.2% floodplain.

Hazard Priorities

The city understands the importance of utilizing traffic calming measures and pretreatment of roadways prior to storms to help lessen the likelihood of a traffic incident. The city also looked at hazards such as windstorm, thunderstorm and lightning, and severe winter storms. These hazards occur more frequently and can affect residents. The city understands the importance of educating residents about tree health, snow removal policies, and shelter locations to lessen the effects during hazard events. The city will identify critical facilities where backup generators could be installed, limiting the effect of energy failures. The city is located along the Mississippi River and numerous creeks. The city is a participant in the National Flood Insurance Program and will look into conducting a watershed study. The city has had historical occurrences of tornado touchdowns and will consider safe room construction where adequate facilities do not exist. The City of LeClaire's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Windstorm
Severe Winter Storm
Thunderstorm, Lightning, Hail
Tornado
Grass and Wildland Fires
Extreme Heat
Flash Flood
Levee Failure
River Flood
Dams
Landslide/Sinkhole
Earthquake
Drought
Expansive Soils

City of Long Grove

Overview

2010 Census Population: 948
2015 ACS Population Estimate: 894
2021 Population Projection: 884
Percent Change (2010-2015): -5.7%
Percent Change (2010-2021): -6.8%
County Rank in Population: 10
Land Area: 1.018 square miles
County Rank in Land Area: 11

Geography and Land Use

The City of Long Grove is located in the north central part of the county, just north of Eldridge in between Donahue and Park View (an unincorporated part of the county) in Winfield Township. Within the city limits, Long Grove is mainly single-family residential and suburban agriculture. There are small commercial districts near the center of the city on First Street and along County Road F-41. Long Grove does not have an industrial land use policy, and there is no industrial district on the Long Grove official zoning map (*Long Grove Comprehensive Plan*, 2007).

The City of Long Grove has a small area of town that is in the special flood hazard area near the sewage lagoon (see Appendix III-2). There are no levees within Long Grove and no known occurrences of land subsidence.

Government Structure

Long Grove is organized as mayor-council form of government. The city council consists of the mayor and five city council members. The mayor is elected to a two-year term and city council members are elected to four-year terms.

City Departments

- City Attorney
- City Council
- City Clerk
- Mayor

Boards and Commissions

- Park Board
- Planning and Zoning Commission

Critical Facilities

Critical facilities within the City of Long Grove include City Hall, fire station, water and wastewater treatment plants, municipal electric system, post office, civic center, and Wellhouse-Shulz Park. An elementary school has been identified as a vulnerable population. These can be seen on Map 3-8. There are no assets within the floodplain.

Hazard Priorities

The City of Long Grove recognizes the importance of keeping building codes current, which aids in limiting the effect of certain hazards like tornados and structural fire. Hazards such as severe winter storms, windstorm, and thunderstorm and lightning are frequent occurrences in the city. The city will look into constructing a new sand/salt storage facility in order to be better prepared for storms. The city will also be examining public facilities that need backup generators to be able to provide residents with essential services during hazard events. The City of Long Grove's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Severe Winter Storm
Windstorm
Thunderstorm, Lightning, Hail
Tornado
Drought
Earthquake
Extreme Heat
Grass and Wildland Fires
Dams
Flash Flood
Expansive Soils
Landslide/Sinkhole
Levee Failure
River Flood

City of Maysville

Overview

2010 Census Population: 231
2015 ACS Population Estimate: 139
2021 Population Projection: 200
Percent Change (2010-2015): -39.8%
Percent Change (2010-2021): -13.4%
County Rank in Population: 15
Land Area: 0.267 square miles
County Rank in Land Area: 14

Geography and Land Use

The City of Maysville is located in the west-central part of Scott County along U.S. Highway 130, north of Walcott and Davenport and west of Eldridge in Hickory Grove Township. Maysville is single-family residential and surrounded by agriculture. Hickory Creek lies to the north of town. There are no special flood hazard areas (see Appendix III-2), levees, or any known occurrences of land subsidence in the City of Maysville.

Government Structure

Maysville is organized as mayor-council form of government. The city council consists of the mayor and five city council members. The mayor and city council members are elected to two-year terms.

City Departments

- City Attorney
- Mayor
- City Clerk
- Treasurer
- City Council

Critical Facilities

The critical facilities of Maysville have been identified as fire station, city water facilities, and community center. These can be seen on Map 3-8. There are no assets within the floodplain.

Hazard Priorities

The city focused on hazards such as severe winter storms and energy failure. These hazards happen frequently within the city and can affect many residents. The city will continue to communicate the location of community shelters to its residents. The city emphasizes that public education of the dangers of tornados and what to do during a storm is very important. The City of Maysville's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Thunderstorm, Lightning, Hail
Grass and Wildland Fires
Severe Winter Storm
Drought
Windstorm
Extreme Heat
Earthquake
Expansive Soils
Tornado
Dams
Flash Flood
Landslide/Sinkhole
Levee Failure
River Flood

City of McCausland (Non-Participating)

Each community in Scott County was invited to participate in this plan update. McCausland chose not to participate, therefore, other than census information, the information below is carried forward from the *Scott County Multi-Jurisdictional Hazard Mitigation Plan, 2012*.

Overview

2010 Census Population: 234
2015 ACS Population Estimate: 338
2021 Population Projection: 260
Percent Change (2010-2015): 44.4%
Percent Change (2010-2021): 11.1%
County Rank in Population: 13
Land Area: 0.543 Square Miles
County Rank in Land Area: 12

Geography and Land Use

McCausland is located in the northeastern corner of Butler Township in northeastern Scott County just south of the Wapsipinicon River. A special flood hazard area is located in the north and south eastern part of the city (see Appendix III-2). There are no levees located in McCausland and no known occurrences of land subsidence. McCausland is primarily agricultural and residential use with a small portion of commercial. McCausland Cemetery is located in the northern part of the city. County Road F33 and Z30 are the major roads running through McCausland.

Government Structure

The City of McCausland has a mayor-council form of government with both the mayor and the 5-member city council serving 4-year staggered terms. McCausland has an attorney on retainer and a volunteer fire department.

City Departments

- Administration
- Police Department
- Maintenance

City Boards and Commissions

- Park Board
- Labor Day Committee

Critical Facilities

The critical facilities of McCausland have been identified as City Hall, fire station, city sewer lagoon, and community center. The city has also identified two local businesses as economic assets. These can be seen on Map 3-8. There are no assets within the floodplain.

Hazard Priorities

The City of McCausland chose to use the overall Scott County hazard rankings to formulate their first priority level hazards. The city identified first priority hazards such as flooding (river and flash) due to their proximity to the Wapsipinicon River. The city has joined the National Flood

Insurance Program and understands the importance of educating their residents about the floodplain. Hazards such as thunderstorms and lightning and windstorms occur frequently within the city, often causing energy failures. The city recognizes the importance of having backup generators at critical facilities and educating the residents about what to do during storms. The city will also look at constructing safe rooms where adequate facilities do not exist. Severe winter storms can affect all residents, so the city will take a proactive approach by pretreating roads and educating their residents about snow removal policies. The City of McCausland's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2012 Ranked Hazards
Tornado
River Flood
Flash Flood
Grass and Wildland Fires
Extreme Heat
Levee Failure
Thunderstorm, Lightning, Hail
Windstorm
Drought
Severe Winter Storm
Landslide/Sinkhole
Expansive Soils
Dams
Earthquake

City of New Liberty (Non-Participating)

Each community in Scott County was invited to participate in this plan update. New Liberty chose not to participate, therefore, other than census information, the information below is carried forward from the *Scott County Multi-Jurisdictional Hazard Mitigation Plan, 2012*.

Overview

2010 Census Population: 150
2015 ACS Population Estimate: 148
2021 Population Projection: 136
Percent Change (2010-2015): -1.3%
Percent Change (2010-2021): -9.3%
County Rank in Population: 16
Land Area: 0.095 square miles
County Rank in Land Area: 16

Geography and Land Use

The City of New Liberty is located in the northwest corner of Scott County in Liberty Township. The city is located on State Hwy 130, which runs directly through town. New Liberty is primarily single-family residential and agriculture. There are no special flood hazard areas (see Appendix III-2), levees, or any known occurrences of land subsidence within the City of New Liberty.

Government Structure

New Liberty is organized as mayor-council form of government. The city council consists of the mayor and five city council members. The mayor is elected to a two-year term, and city council members are elected to four-year terms.

City Departments

- City Clerk
- Mayor
- City Council
- Water Superintendent
- City Treasurer

Critical Facilities

The critical facilities of New Liberty have been identified as City Hall, city water and wastewater facilities, and the city park shelter. These can be seen on Map 3-8. There are no assets within the floodplain.

Hazard Priorities

After reviewing their weighted hazard scores as shown in Table 3-4 of this chapter, the City of New Liberty determined the top 12 hazards ranked by scoring were hazards that the city had little to no control or authority to mitigate. The city reviewed the county-wide hazard priorities and determined those as more appropriate to their city authority and ability; however, river flood, flash flood, and fixed hazardous materials incident were replaced with drought, extreme heat, and grass or wildland fire. The City of New Liberty has no floodplain or areas with known flash

flooding, and there are no fixed hazardous materials sites within the city. The city identified the first priority hazards such as tornados due to historical occurrences within the city. Hazards such as severe winter storm, thunderstorm and lightning, and extreme heat occur frequently in the city. Public education is continually needed about the dangers of the hazards, what to do during a hazard and use of NOAA weather radios. The City of New Liberty's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2012 Ranked Hazards
Thunderstorm, Lightning, Hail
Extreme Heat
River Flood
Severe Winter Storm
Windstorm
Tornado
Earthquake
Grass and Wildland Fires
Landslide/Sinkhole
Dams
Drought
Expansive Soils
Flash Flood
Levee Failure

City of Panorama Park

Overview

2010 Census Population: 139
2015 ACS Population Estimate: 102
2021 Population Projection: 167
Percent Change (2010-2015): -26.6%
Percent Change (2010-2021): 20.1%
County Rank in Population: 17
Land Area: 0.054 Square Miles
County Rank in Land Area: 17

Geography and Land Use

Panorama Park is the city with both the smallest land area and lowest population within Scott County. Panorama Park is completely surrounded by the City of Bettendorf in southern Scott County. Panorama Park is zoned entirely for single-family residential use. A special flood hazard area is located south of 2nd Street to the corporate limits (see Appendix III-2). There are no levees located in Panorama Park and no known occurrences of land subsidence.

Government Structure

The City of Panorama Park has a mayor-council form of local government. Both the mayor and the city council, consisting of five elected officials, are elected to two-year terms.

Critical Facilities

City Hall is Panorama Park's only critical facility and asset. It is not located within the floodplain.

Hazard Priorities

The City of Panorama Park participates in the National Floodplain Insurance Program and puts an emphasis on educating their residents on the dangers of hazards and locations of community shelters. The city consists of all single-family residences and also put a focus on structural fire, by educating the importance of having smoke detectors and what to do during a fire. The City of Panorama Park's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Thunderstorm, Lightning, Hail
Extreme Heat
River Flood
Severe Winter Storm
Windstorm
Flash Flood
Tornado
Earthquake
Grass and Wildland Fires
Landslide/Sinkhole
Drought
Dams
Expansive Soils
Levee Failure

City of Princeton

Overview

2010 Census Population: 966
2015 ACS Population Estimate: 1,106
2021 Population Projection: 1,053
Percent Change (2010-2015): 14.5%
Percent Change (2010-2021): 9.0%
County rank in Population: 9
Land Area: 2.56 square miles
County Rank in Land Area: 9

Geography and Land Use

The City of Princeton is located along the Mississippi River in the northeast part of the county, just north of LeClaire and south of the Wapsipinicon River in Princeton Township. U.S. Highway 67 runs through the city alongside the Iowa-Chicago and Eastern Railroad. According to Princeton's Land Use Plan (2007), Princeton is primarily agriculture (87.99%). The rest of the city is classified as low-density residential (8.21%), high-density residential (1.41%), commercial (0.28%), industrial (0.23%), institutional (0.81%), and recreation (1.06%). The City of Princeton has special flood hazard areas that are located along the Mississippi River and the tributary creeks that drain into the Mississippi River (see Appendix III-2). There are no levees located within Princeton and no known occurrences of land subsidence.

Government Structure

The City of Princeton has a mayor-council form of government. The mayor is elected to two-year terms, and there are five city council members who serve four-year terms.

City Departments

- City Attorney
- City Clerk/Treasurer
- City Council
- City Engineer
- Fire Department
- Mayor
- Police Department
- Public Works

Boards and Commissions

- Board of Adjustment
- Park Board
- Bolls Community Center Board
- Planning & Zoning Commission

Critical Facilities

Princeton has identified 25 community assets within the city. The critical facilities include City Hall, fire and police departments, maintenance buildings, city water and wastewater facilities, and other city buildings. Vulnerable populations include elementary school, mobile home park,

and senior housing. One cultural resource was also identified. These can be seen on Map 3-8. Princeton has three critical facilities located within the 1% floodplain. One building of historical or cultural significance is located in the 0.2% floodplain.

Hazard Priorities

The City of Princeton elected to utilize their individual hazard scores in selecting their top hazard priorities. The city focused on hazards such as flooding (river and flash) in their first priority hazards due to their proximity along the Mississippi River and tributary creeks. The city participates in the National Flood Insurance Program and recognizes the importance of public education regarding flooding and implementing flood control measures that help lessen the impact of an event. They also realize the importance of planning before flooding events and will be creating a detour and road closure plan. Energy failure is a concern for the city, which can be caused by many different events. The city will look into installing backup generators at critical facilities to ensure residents are not without essential services. The city is considering safe room construction in areas where adequate facilities do not exist to be prepared for tornados, windstorms, and other events where residents would need additional shelter. The City of Princeton's First Priority Hazards are listed below and their mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Tornado
River Flood
Flash Flood
Grass and Wildland Fires
Drought
Extreme Heat
Levee Failure
Thunderstorm, Lightning, Hail
Windstorm
Severe Winter Storm
Landslide/Sinkhole
Expansive Soils
Dams
Earthquake

City of Riverdale

Overview

2010 Census Population: 524
2015 ACS Population Estimate: 476
2021 Population Projection: 448
Percent Change (2010-2015): -9.2%
Percent Change (2010-2021): -14.5%
County Rank in Population: 11
Land Area: 1.835 Square Miles
County Rank in Land Area: 10

Geography and Land Use

The City of Riverdale is located in southern Scott County in southern Pleasant Valley Township. Riverdale is bordered by the Mississippi River to the south, and the City of Bettendorf on the east, west, and north. Duck Creek forms part of the western border between Bettendorf and Riverdale. U.S. Hwy 67 and the Iowa Chicago & Eastern Railroad line runs through Riverdale. Arconic (f.k.a. ALCOA, Inc.), with 135 acres under roof, is the largest sheet and plate rolling facility in the U.S. and is located between U.S. Hwy 67 and the Mississippi River, comprising a large amount of Riverdale's land area. Also located within the boundaries of Riverdale are Scott Community College; Pleasant Valley High School; Magellan Pipe Line's tank farm, which holds several million gallons of gasoline and diesel fuel; small commercial and light industry districts; five distinct residential areas; and one 97-acre farm. Arconic, Pleasant Valley High School, and Scott Community College generate a transient population in excess of 7,500 people. A special flood hazard area is located along the Mississippi; however, the majority of the floodplain is located south of U.S. Hwy 67 (see DFIRM in Appendix III-2). There are a few residential homes within the Duck Creek Special Flood Hazard Area near where Duck Creek meets the Mississippi River. After the 1966 Mississippi River flood, Arconic (f.k.a. ALCOA, Inc.) built a private levee around the plant. When the City of Bettendorf built their Mississippi River levee system, a combination levy/flood wall was built on the western side of Duck Creek from U.S. Hwy 67 south to the Mississippi River. On the eastern side of Duck Creek, adjacent to the western end of Wisteria Lane, there is a short flood wall that offers some protection to Riverdale's Havens Acres subdivision. In addition, railroad tracks and a small berm south of Wisteria Lane also provide some protection to Havens Acres subdivision. There are no known occurrences of land subsidence or sinkholes in Riverdale.

Government Structure

The City of Riverdale has a mayor-council form of local government. The mayor is elected in two-year terms while the city council, consisting of five elected officials, is elected to four-year staggered terms. The city keeps a city attorney on retainer. City staff consists of two part-time clerks and a part-time maintenance worker.

City Departments

- City Administration
- Fire Department

Boards and Commissions

- Board of Adjustment
- Zoning Commission

Critical Facilities

Critical facilities within the City of Riverdale include City Hall, fire department, local large businesses, community college campus, high school, and a fuel depot. There were 11 areas of vulnerable populations identified throughout the city as well. These can be seen on Map 3-8. None of Riverdale's assets are located within the floodplain.

Hazard Priorities

The City of Riverdale is located along the Mississippi River and Duck Creek. Although part of the city is protected by private levees, the city recognizes the need for all residents to be prepared for an event and participates in the National Flood Insurance Program. Water enters Havens Acres and floods land south of Havens Acres when the Mississippi River reaches flood stage. Flash flooding of the Pleasant Hills subdivisions occurs when rain exceeds a seven-year return frequency storm because of inadequate control of storm water runoff from Scott Community College. Flash floods occur in Havens Acres because of ice jams in Duck Creek and rain water runoff from greater Scott County. Severe winter storms have immobilized the city for periods of time in excess of 14 hours. Power outages, usually due to severe weather, have lasted as long as three days. The city has experienced a tornado (1979) and understands the importance of advance storm warnings, and would like to add an additional siren in the Havens Acres subdivision that has no storm warning coverage. The city encourages residents to keep a "File of Life" kit that contains all necessary medical information and can be lifesaving during a hazard event. The City of Riverdale's mitigation actions are listed in Chapter 4.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
River Flood
Severe Winter Storm
Tornado
Windstorm
Grass and Wildland Fires
Flash Flood
Drought
Thunderstorm, Lightning, Hail
Extreme Heat
Levee Failure
Dams
Landslide/Sinkhole
Expansive Soils
Earthquake

City of Walcott

Overview

2010 Census Population: 1,570
2015 ACS Population Estimate: 1,575
2021 Population Projection: 1,897
Percent Change (2010-2015): 0.3%
Percent Change (2010-2021): 20.8%
County Rank in Population: 6
Land Area: 3.467 Square Miles
Rank in Land Area: 7

Geography and Land Use

The City of Walcott is located along the western border of Scott County and extends into Muscatine County. The majority of Walcott is located within Scott County. Walcott is located in northwestern Blue Grass Township, southwestern Hickory Grove Township, and southeastern Cleona Township. Iowa Interstate railroad runs through the southern portion of the town, while I-80 runs through the northern portion of the city. Walcott has the world's largest truck stop (Iowa 80) at the I-80 interchange that serves 5,000 customers per day. The City of Walcott is primarily suburban agriculture and single-family residential in the southern portion of the city with industrial uses along the Iowa Interstate Railroad and along Walcott Road and Main Street. There are two-family and multi-family residential areas within Walcott. The Interstate Highway Commercial District is located north of Wolf Road and spans across I-80 to the northern corporate boundary. Walcott participates in the National Flood Insurance Program. A special flood hazard area is located along Mud Creek between Iowa Interstate Railroad and Walcott Road (see DFIRM in Appendix III-2). There are no levees located in Walcott and no known occurrences of land subsidence.

Government Structure

The City of Walcott has a mayor-council form of local government. The mayor and city council, consisting of five elected officials, are elected to four-year staggered terms. Walcott has a city attorney on retainer.

City Departments

- Building Department
- Plan and Zoning Department
- City Clerks Department
- Police Department
- Fire Department
- Public Works Department
- Parks and Recreation Department

Boards and Commissions

- Economic Development Committee
- Plan and Zoning Commission
- Forever Green Tree Board
- Zoning Board of Adjustment
- Parks and Recreation Board

Critical Facilities

Critical facilities within Walcott include City Hall and fire station (same building), police station, water treatment facility, sewer treatment facility, wells, and post office. These can be seen on Map 3-8. One critical facility and one other important building are located in the 1% floodplain.

Hazard Priorities

Hazards such as severe winter storm, thunderstorm and lightning, and windstorm are frequent occurrences within the city. Public education on the dangers of storms and locations of shelters are important to keep residents safe during those times. The city will also consider safe room construction where adequate facilities are not available largely due to the mobile home park in town. While the City of Walcott is not on the Mississippi River, flash flooding on Mud Creek does occur. There are several businesses and residential housing near the creek that are at risk of potential flooding. The City of Walcott's mitigation actions are listed in Chapter 4.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Windstorm
Thunderstorm, Lightning, Hail
Severe Winter Storm
Tornado
Earthquake
Flash Flood
Extreme Heat
Grass and Wildland Fires
Expansive Soils
Landslide/Sinkhole
Drought
Dams
Levy Failure
River Flood

Unincorporated Scott County

Overview

2010 Census Population: 14,494
2015 ACS Population Estimate: 15,538
2021 Population Projection: 16,290
Percent Change (2010-2015): 7.2%
Percent Change (2010-2021): 12.4%
County Rank in Population: 3
Land Area: 340.109 Square Miles
Rank in Land Area: 1

Geography and Land Use

Scott County is located in the eastern part of the State of Iowa. The unincorporated areas of the county are mainly located in the northern half of the county in the northwest and northeast sections. There are two larger unincorporated residential areas within the county: Park View, which is located just east of the City of Long Grove, and Pleasant Valley, which is located in between the Cities of Bettendorf and LeClaire. The Mississippi River is located along the east/southeast boarder, and the Wapsipinicon River is located along the northern border the county. Much of the Mississippi River border is occupied by incorporated cities, while much of the Wapsipinicon River is bordered by unincorporated area. Much of the unincorporated areas of Scott County are classified as agricultural/open space/not classified or park/recreation/ conservation areas, with small pockets of low-density residential. Refer to Map 2-1 and Map 3-7 for more information. The 1% special flood hazard areas of the county are located along the Mississippi River in the northeast corner of the county, along the Wapsipinicon River in the northern part of the county, and along larger streams within the county. A 0.2% special flood hazard area is found in the northeast corner of the county, north of the City of Princeton where the Mississippi and Wapsipinicon Rivers meet. Levees are located in the northeast corner of the county along the Mississippi and Wapsipinicon Rivers. There are approximately six dams located in the unincorporated areas of the county. Refer to Map 3-1 for more information. There are no known occurrences of land subsidence in the unincorporated areas of Scott County. Areas identified as potential karst areas are located in the northwest corner of the county, along the northern border near U.S. Hwy 61, and near the City of Princeton.

Government Structure

Scott County government is organized by a Board of Supervisors. There are five county board members who are elected to 4-year staggered terms. Additionally, the county attorney, auditor, recorder, sheriff, and treasurer are elected positions for 4-year terms.

County Departments

- Administrator
- Assessor
- Community Services
- Conservation
- County Engineer
- Facility and Support Services
- Health Department
- Human Resources
- Information Technology
- Juvenile Detention Center
- Planning and Development
- Secondary Roads

Boards and Commissions

- Board of Adjustment
- Board of Health
- Civil Service Commission
- Conservation Board
- Emergency Management Commission
- Mental Health Board
- Veteran's Commission
- Zoning Commission

Critical Facilities

Critical facilities located within the unincorporated areas include government buildings, pipelines, and pipeline pumping stations. Vulnerable populations include a large senior care facility in Pleasant Valley and the residential areas of Park View and Pleasant Valley. None of Scott County's assets within unincorporated Scott County are in the floodplain.

Hazard Priorities

Flooding (flash and river) is considered due to the county's proximity to numerous creeks, as well as the Mississippi and Wapsipinicon Rivers. The county participates in the National Flood Insurance Program and will continue to do so. Hazards such as thunderstorm and lightning, windstorm, and severe winter storm occur frequently within the county and cause damage and result in additional costs to the county. Public education, promotion of NOAA weather radios, and providing shelters to the community will help reduce the risk to the residents. The unincorporated county's mitigation actions are listed in Chapter 4 of this plan.

The following table lists all considered natural hazards ranked from highest to lowest score as described in the Hazard Scoring Methodology in this chapter.

2017 Ranked Hazards
Flash Flood
River Flood
Thunderstorm, Lightning, Hail
Windstorm
Severe Winter Storm
Tornado
Grass and Wildland Fires
Earthquake
Drought
Expansive Soils
Extreme Heat
Dams
Landslide/Sinkhole
Levee Failure

Bettendorf Community School District (BCSD)

Overview

Schools in District	Location	2017 Enrollment
Bettendorf Community School District (PreK-12)		4,663
Bettendorf High School	3333 18th Street	1,530
Bettendorf Middle School	2030 Middle Road	1,109
Grant Wood Elementary School	1423 Hillside Drive	390
Herbert Hoover Elementary School	3223 S Hampton Drive	462
Mark Twain Elementary School	1620 Lincoln Road	292
Neil Armstrong Elementary School	3311 Central Avenue	300
Paul Norton Elementary School	4485 Greenbrier Drive	448
Thomas Jefferson Elementary School	610 Holmes Street	132
Administration Center	1311 18th Street	
Thomas Edison Academy	438 16th Street	
Operations Center	2727 Tanglefoot	

Land Area

Approximately 9.87 square miles

Geography

Bettendorf Community School district is located in the southern part of Scott County bordering the Mississippi River and serves the western half of the City of Bettendorf and the northeast area of the City of Davenport. See Map 3-12 for district location.

Critical Facilities

Bettendorf Community School District's critical facilities include all eight schools in the district, as well as all school athletic facilities. None of the schools in the district are located in the special flood hazard areas of Scott County. See Bettendorf Community School District Digital Flood Insurance Rate Map (DFIRM) for more details (Appendix III-2).

Hazard Priorities

Bad weather including floods (both flash and river), thunderstorm and lightning, windstorms, severe winter storm, and hailstorms affect the busing of students. One of the largest concerns for the BCSD in terms of mitigation actions is the evaluation and planning for tornado safe rooms within the school district buildings. The hazard mitigation plans consider the students and faculty within school buildings to be vulnerable populations due to the concentration of youth within the buildings. The BCSD wants to evaluate the need for tornado safe rooms and proceed with construction when funding becomes available. Energy failure is also a major issue within the BCSD. School cannot be in session when there is no power in a building. Having back-up generators at each school would ensure that classes can continue with little disturbance. Finally, having the knowledge of impending hazards is important. By having NOAA weather radios at each school and sports field, the BCSD can act before a hazard affects the area and minimize the threat to life and property. The BCSD's mitigation actions are listed in full in Chapter 4.

Davenport Community School District (DCSD)

Overview

Schools in District	Location	2016 Enrollment
Davenport Community School District (PreK-12)		14,380
Adams	3029 N. Division St., Davenport	564
Blue Grass	226 Sycamore St., Blue Grass	302
Buchanan	4515 N. Fairmount St., Davenport	373
Buffalo	1000 Jefferson St., Buffalo	232
Eisenhower	2827 Jersey Ridge Rd., Davenport	437
Fillmore	7307 N. Pacific St., Davenport	397
Garfield	902 E. 29th St., Davenport	394
Harrison	1032 W. 53rd St., Davenport	528
Hayes	622 S. Concord St., Davenport	401
Jackson	1307 Wisconsin Ave., Davenport	332
Jefferson	1027 Marquette St., Davenport	453
Madison	116 E. Locust St., Davenport	381
McKinley	1716 Kenwood Ave., Davenport	381
Monroe	1926 W. 4th St., Davenport	475
Truman	5506 N. Pine St., Davenport	369
Washington	1608 E. Locust St., Davenport	268
Wilson	2002 N. Clark St., Davenport	515
Smart	1934 W. 5th St., Davenport	519
Sudlow	1414 E. Locust St., Davenport	741
Walcott (K-8)	545 E. James St., Walcott	180
Williams	3040 N. Division St., Davenport	691
Wood	5701 N. Division St., Davenport	736
Young	1709 Harrison St., Davenport	327
Central	1120 Main St., Davenport	1,300
North	626 W. 53rd St., Davenport	1,158
West	3505 W. Locust St., Davenport	1,926
Children's Village at Hoover	1002 Spring St., Davenport	
Children's Village West	1757 W 12th St., Davenport	
Kimberly Center	1002 W. Kimberly Rd., Davenport	
Brady Stadium	3501 Brady St., Davenport	
Achievement Service Center	1606 Brady St., Davenport	
Bus Lot	3640 Davenport Ave., Davenport	

Land Area

Approximately 146 square miles.

Geography

The Davenport Community School District is located in the southwest section of Scott County in eastern Iowa along the Mississippi River. The district encompasses both urban and rural areas

and includes the cities of Blue Grass, Buffalo, Davenport, and Walcott. See Map 3-12 for district location.

Critical Facilities

Davenport Community School District's critical facilities include all schools in the district, as well as its athletic, administrative, and operations facilities. None of the schools in the district are located in the special flood hazard areas of Scott County. See Davenport Community School District DFIRM for more details (Appendix III-2).

Hazard Priorities

Eastern Iowa Community College District (EICC) (Scott County Campuses)

Overview

Buildings in Scott County	Location	2011 Enrollment (Spring)
EICC		5,099*
Scott Community College - Main Campus	Riverdale	2,839
Kahl Educational Center	Davenport	785
Blong Technology Center	Davenport	239
Scott Community College - Other Sites	Throughout County	605
Scott Community College - Sites at High Schools[1]	Throughout County	631

* Total enrollment is for Scott County buildings only. EICC total enrollment for all campus in district is 8,846.

1 Locations include: Assumption HS, Bettendorf HS, Davenport Central HS, Davenport North HS, Davenport West HS, North Scott HS, and Pleasant Valley HS.

Land Area

EICC district campuses are located throughout Scott County.

Geography

EICC district covers Clinton, Jackson, Muscatine, and Scott Counties as well as parts of Cedar and Louisa Counties. Campuses are located in Clinton, Muscatine, and Scott Counties. However, for the purposes of this plan, only Scott County will be discussed. Reference Map 3-12 for EICC District location in more detail.

Critical Facilities

EICC's critical facilities include all buildings and facilities in the district. EICC's buildings are located throughout the entire county. No buildings are located in the special flood hazard areas. See Map 3-8 for more details.

Hazard Priorities

The Eastern Iowa Community College District (EICCD), in fact, encompasses the entire county and beyond. That is why the EICCD agreed to use the county-wide hazard scoring. All of the county-wide hazards do affect the EICCD's commuting students, building maintenance, and business. Hazardous weather including floods (both flash and river), thunderstorm and lightning, windstorms, severe winter storm, and hailstorms affect the safety of students, faculty and staff. The EICCD does have a Commercial Driver's License and Trucking School, and that program in particular could be affected by a highway transportation incident. One of the largest concerns for the EICCD in terms of mitigation actions is the evaluation and planning for tornado safe rooms

within the school district buildings. This plan considers the students and faculty within school buildings to be vulnerable populations due to the concentration of youth within the buildings. The EICCD wants to evaluate the need for tornado safe rooms within EICCD-owned and operated buildings and proceed with construction when funding becomes available. Energy failure is also a major issue within the EICCD. School cannot be in session when there is no power in a building. Having back-up generators at each school would ensure that classes can continue with little disturbance. Finally, having the knowledge of impending hazards is crucial to being proactive. By having NOAA weather radios at each school and sports field, the EICCD can act before a hazard affects the area and minimize the threat to life and property. The EICCD's mitigation actions are listed in full in Chapter 4.

North Scott Community School District (NSCSD)

Overview

Schools in District	Location	2016-2017 Enrollment
North Scott Community School District (K-12)		3,242
North Scott Senior High School	Eldridge	957
North Scott Junior High School	Eldridge	484
Alan Shepard Elementary School	Long Grove	419
Edward White Elementary School	Eldridge	562
John Glenn Elementary School	Donahue	260
Neil Armstrong Elementary School	Eldridge	377
Virgil Grissom Elementary School	Princeton	183

Land Area

Approximately 216.28 square miles

Geography

North Scott Community School district is located in the northern half of Scott County and serves the Cities of Dixon, Donahue, Eldridge, Long Grove, Maysville, McCausland, and Princeton. See Map 2-1 for district location.

Critical Facilities

North Scott Community School District's critical facilities include all seven schools in the district, as well as all school athletic facilities. None of the schools in the district are located in the special flood hazard areas of Scott County. See North Scott Community School District DFIRM for more details (Appendix III-2).

Hazard Priorities

The school districts are in a unique situation. The boundaries of the school districts do not line up perfectly with any of the cities within Scott County. The North Scott Community School District (NSCSD) covers a huge expanse of Scott County that serves northern Davenport and Bettendorf, Dixon, Donahue, Eldridge, Long Grove, Maysville, McCausland, and Princeton as well as all of the unincorporated Scott County in between these cities. That is why the school

district agreed to use the county-wide hazard priorities. All of the county-wide hazards do affect the NSCSD's transportation of students, building maintenance, and business. Hazardous weather including floods (both flash and river), thunderstorm and lightning, windstorms, severe winter storm, and hailstorms affect the busing and safety of students. One of the largest concerns for the NSCSD in terms of mitigation actions is the evaluation and planning for tornado safe rooms within the school district buildings. This plan considers the students and faculty within school buildings to be vulnerable populations due to the concentration of youth within the buildings. The NSCSD wants to evaluate the need for tornado safe rooms within NSCSD-owned and operated buildings and proceed with construction when funding becomes available. Energy failure is also a major issue within the NSCSD. School cannot be in session when there is no power in a building. Having back-up generators at each school would ensure that classes can continue with little disturbance. Finally, having the knowledge of impending hazards is crucial to being proactive. By having NOAA weather radios at each school and sports field, the NSCSD can act before a hazard affects the area and minimize the threat to life and property. The North Scott Community School District's mitigation actions are listed in full in Chapter 4.

Pleasant Valley Community School District (PVSCD)

Overview

Schools in District	Location	2015-2016 Enrollment
Pleasant Valley Community School District (K-12)		4,416
Pleasant Valley High School	Riverdale	1,268
Pleasant Valley Junior High School	LeClaire	684
Bridgeview Elementary School	LeClaire	362
Cody Elementary School	LeClaire	321
Hopewell Elementary School	Bettendorf	568
Pleasant View Elementary School	Bettendorf	632
Riverdale Heights Elementary School	Bettendorf	581

Land Area

Approximately 44.96 square miles

Geography

Pleasant Valley Community School District is located in the southeastern section of Scott County and serves the Cities of Bettendorf (eastern half), LeClaire, Panorama Park, and Riverdale. See Map 3-12 for district location.

Critical Facilities

Pleasant Valley Community School District's critical facilities include all seven schools in the district, as well as all school athletic facilities. None of the schools in the district are located in the special flood hazard areas of Scott County. See Pleasant Valley Community School District DFIRM for more details (Appendix III-2).

Hazard Priorities

The school districts are in a unique situation. The boundaries of the school districts do not line up perfectly with any of the cities within Scott County. The Pleasant Valley Community School

District (PVCSD) covers an area that serves most of Bettendorf, as well as Riverdale, Panorama Park, LeClaire and all of the unincorporated Scott County in between these cities. That is why the school district agreed to use the county-wide hazard priorities. All of the county-wide hazards do affect the PVCSD's transportation of students, building maintenance, and business. Hazardous weather including floods (both flash and river), thunderstorm and lightning, windstorms, severe winter storm, and hailstorms affect the busing and safety of students. One of the largest concerns for the PVCSD in terms of mitigation actions is the evaluation and planning for tornado safe rooms within the school district buildings. This plan considers the students and faculty within school buildings to be vulnerable populations due to the concentration of youth within the buildings. The PVCSD wants to evaluate the need for tornado safe rooms within PVCSD-owned and operated buildings and proceed with construction when funding becomes available. Energy failure is also a major issue within the PVCSD. School cannot be in session when there is no power in a building. Having back-up generators at each school would ensure that classes can continue with little disturbance. Finally, having the knowledge of impending hazards is crucial to being proactive. By having NOAA weather radios at each school and sports field, the PVCSD can act before a hazard affects the area and minimize the threat to life and property. The Pleasant Valley Community School District's mitigation actions are listed in full in Chapter 4.

Map 3-12School Districts