

Figure 9: Site Map for Gauge at Janesville

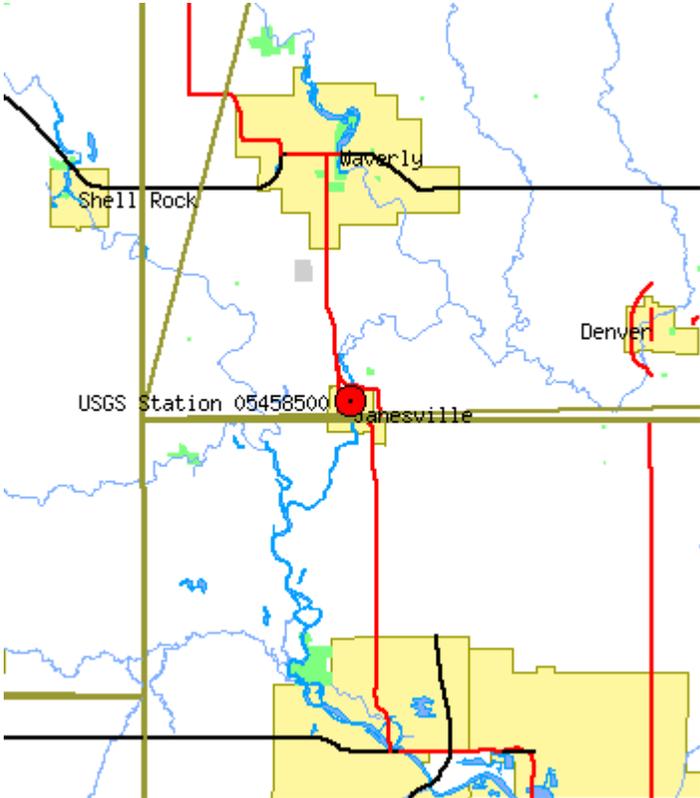


Table 14: Gauge Information

Cedar River at Waverly, Iowa Station number: 05458300	
Latitude (ddmmss)	42°44'14.06"
Longitude(ddmmss)	92°28'11.66"
State Code	19
County.....	Bremer
Hydrologic Unit Code	07080201
Basin Name	Cedar
Drainage Area (square miles).....	1,547
Contributing Drainage Area (square miles) ..	1,547
Gage Datum (feet above NGVD29)	892.64
Base Discharge (cubic ft/sec)	4,000

Table 15: Annual Recorded Peak Flows (Waverly, IA)

Water Year	Station	Date	Stream Flow (CFS)	Peak
2001	05458300	April 14, 2001	25,600	12.95
2002	05458300	August 7, 2002	2,550	5.96
2003	05458300	May 14, 2003	6,310	7.11
2004	05458300	Sept. 18, 2004	25,200	13.16
2005	05458300	Feb. 17, 2005	7,010	7.43
2006	05458300	April 10, 2006	10,400	8.59
2007	05458300	March 24, 2007	10,000	9.00

Figure 10: Site Map for Gauge at Waverly

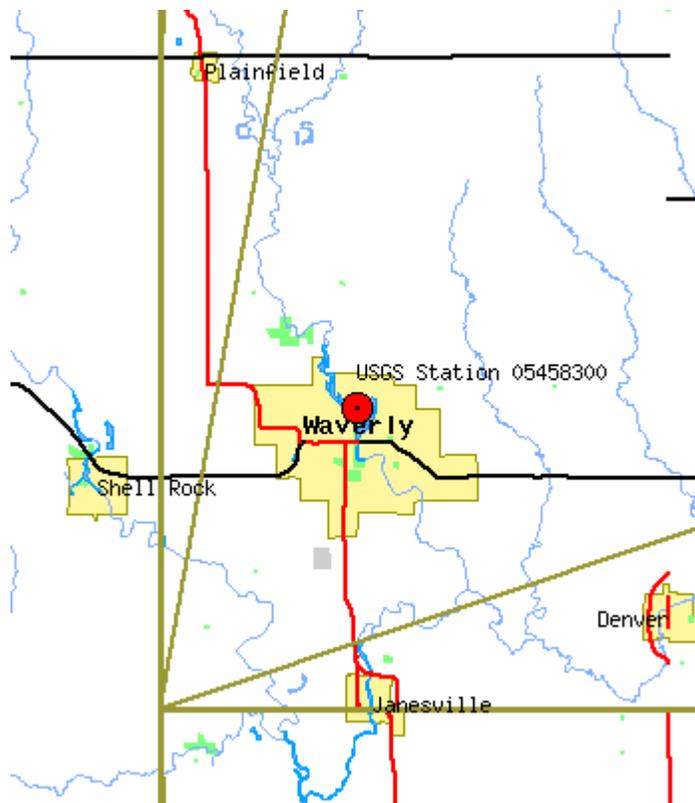


Table 16: Gauge Information

Cedar River at Charles City, Iowa Station number: 05457700	
Latitude (ddmss).....	43°03'45"
Longitude (ddmss).....	92°40'23" NAD 27
State Code	19
County	Bremer
Hydrologic Unit Code.....	07080201
Basin Name	Cedar
Drainage Area (square miles)	1,054
Contributing Drainage Area (square miles)	1,054
Gage Datum (feet above NGVD29)	973.02
Base Discharge (cubic ft/sec).....	4,000

Table 17: Annual Recorded Peak Flows (Charles City, IA)

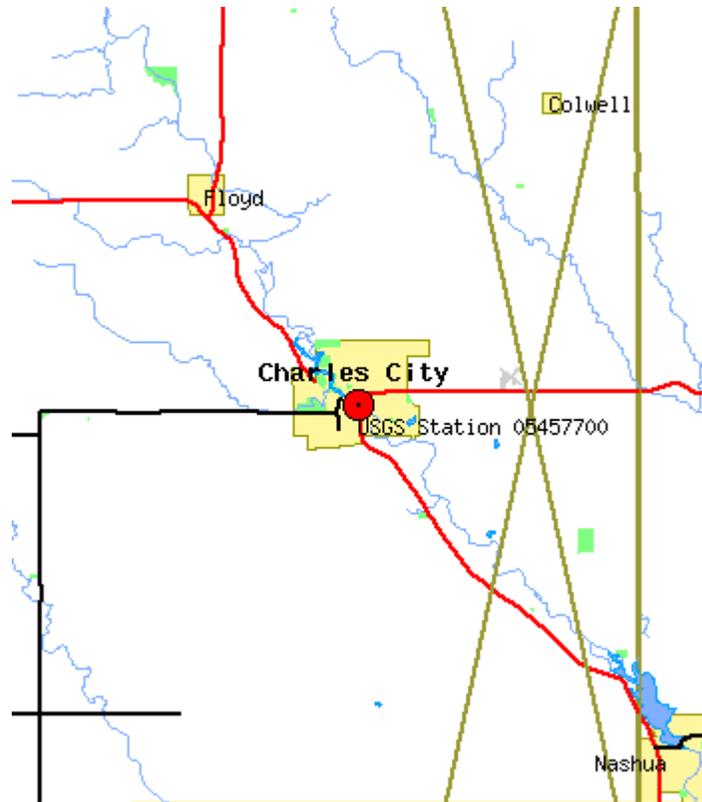
<u>Water Year</u>	<u>Station</u>	<u>Date</u>	<u>Stream Flow (CFS)</u>	<u>Peak</u>
1947	05457700	April 11, 1947	7,470	10.44
1948	05457700	Feb. 28, 1948	16,500	17.00
1949	05457700	March 6, 1949	10,800	13.00
1950	05457700	March 28, 1950	20,000	18.30
1951	05457700	April 8, 1951	21,400	18.90
1952	05457700	April 1, 1952	12,600	14.60
1953	05457700	August 4, 1953	12,300	14.35
1961	05457700	March 27, 1961	29,200	21.53
1962	05457700	March 30, 1962	18,500	18.00
1965	05457700	April 7, 1965	21,000	19.14
1966	05457700	Feb. 10, 1966	7,180	10.15
1967	05457700	June 10, 1967	5,310	8.49
1968	05457700	May 16, 1968	6,080	9.24
1969	05457700	June 30, 1969	16,700	17.96
1970	05457700	May 30, 1970	2,070	4.85
1971	05457700	April 1, 1971	9,090	12.11
1972	05457700	Sept. 29, 1972	5,750	8.99
1973	05457700	April 17, 1973	12,500	14.96
1974	05457700	April 5, 1974	8,220	11.34
1975	05457700	April 29, 1975	9,260	12.04
1976	05457700	March 13, 1976	7,640	10.62
1977	05457700	March 13, 1977	584	2.73
1978	05457700	July 19, 1978	10,800	13.15
1979	05457700	March 31, 1979	13,400	14.93
1980	05457700	August 10, 1980	11,800	13.86
1981	05457700	July 18, 1981	7,930	10.86
1982	05457700	March 19, 1982	5,740	9.44
1983	05457700	March 7, 1983	9,440	12.11
1984	05457700	June 8, 1984	8,600	11.42
1985	05457700	March 11, 1985	2,860	5.88
1986	05457700	March 19, 1986	11,500	13.67
1987	05457700	Oct. 13, 1987	9,160	11.87
1988	05457700	March 4, 1988	1,440	5.71
1989	05457700	March 15, 1989	2,300	
1990	05457700	July 20, 1990	11,300	14.24
1991	05457700	May 19, 1991	11,600	14.29

1992	05457700	March 10, 1992	6,810	9.88
1993	05457700	Aug. 16, 1993	26,400	21.44
1994	05457700	July 21, 1994	5,110	8.29
1995	05457700	May 29, 1995	3,830	6.97
1996	05457700	March 31, 1996	3,770	6.91
1997	05457700	March 12, 1997	10,000	12.54
1998	05457700	June 29, 1998	6,820	9.89
1999	05457700	July 21, 1999	31,200	22.81
2000	05457700	July 12, 2000	17,800	17.58
2001	05457700	April 8, 2001	18,200	17.79
2002	05457700	June 6, 2002	2,370	5.28
2003	05457700	May 12, 2003	5,000	8.08
2004	05457700	Sept. 17, 2004	19,200	20.33
2005	05457700	March 30, 2005	5,500	8.67
2006	05457700	April 8, 2006	9,390	11.76
2007	05457700	March 22, 2007	8,020	10.93

Table 18: Top 10 Peak Flow Recordings at Charles City

<u>Year</u>	<u>Date</u>	<u>Gage at Peak</u>	<u>Discharge</u>
1999	Jul. 21, 1999	22.81	31,200
1961	Mar. 27, 1961	21.53	29,200
1993	Aug. 16, 1993	21.44	26,400
2004	Sept. 17, 2004	20.33	19,200
1965	April 7, 1965	19.14	21,000
1951	April 8, 1951	18.90	21,400
1950	March 28, 1950	18.30	20,000
1962	March 30, 1962	18.00	18,500
2001	April 8, 2001	17.58	18,200
2000	July 12, 2000	17.79	17,800

Figure 11: Site Map for Gauge at Charles City



Communications Failure		
Hazard		
Definition	Communications Failure: When the method of communication fails to deliver the required information as needed.	
Description	Communications Failure occurs when emergency response teams experience radio frequency incompatibility or there is a lack of common terminology used by those responding to an emergency or disaster situation.	Rating
Historical Occurrence	Waverly currently has in place E911 Emergency Assistance. The E911 System is administered through the City of Waverly-Bremer County Law Office. Other communications used by city personnel include pagers, radios, and cellular phones. Regarding common terminology, the Police Department, Fire Department and Ambulance Service an Incident Command process in place that has worked well in the past.	4
Probability	Due to the number of emergency calls the city departments respond to annually, it is somewhat probable that a communication failure could occur.	5
Vulnerability	Potentially the entire community could be vulnerable to a communications failure, especially in the event that the local telephone system and radio system should fail. The cellular phones could be used as a back-up, however, that system could also fail do to the large number of calls going through.	5
Maximum Threat	In the event of a communications failure, the entire community could be impacted, especially if the failure occurred during a community wide hazard event.	6

Severity of Impact	The severity of impact would largely depend on the extent of the hazard the city departments were responding to. In the event of a large hazard event, communication failure could result in the exacerbation of injuries due to the increased response time needed by emergency crews.	6
Speed of Onset	Communications failure would likely result from a break in the system that could not be anticipated. Therefore, there would be little or no warning time for emergency crews responding to a hazard.	8
	Hazard Worksheet Score	34
	Composite Score	59

Hazard	Fire	Rating
Definition	Fire: A fire can engulf a structure in a matter of minutes. Fire can be a hazard on its own, a secondary effect of a hazard, such as lightning, or can result from arson.	
Description	<p>According to FEMA, fire is the fourth largest accidental killer in the United States and the most common disaster experienced by Americans. Most fire deaths occur as a result of fires beginning in the late evening, when people are sleeping. In addition, 84% of fires are accidental, the remaining percentage are set intentionally.</p> <p>Fires may also occur as a secondary effect from an initial disaster, such as lightning, high winds, tornadoes, or transportation disasters.</p>	
Historical Occurrence	There have been a number of fires that have occurred within the City of Waverly in the past, however, nearly all of these fires there have been individual house fires or small fires started by train sparks from the railroad tracks. Many of the home fires were accidental home fires caused by children playing with matches, homeowners' negligence, lightning strikes, or rodents chewing electrical wiring.	7
Probability	There is a high probability of a fire occurring in Waverly in the future.	7
Vulnerability	<p>Any structure within the city could potentially be vulnerable to fire. However, structures in a state of disrepair or with substandard electrical systems are more at risk. At the time of the Waverly condition of housing survey, there were 25 homes identified as being in seriously deteriorated condition.</p> <p>There are also vulnerable populations within Waverly, specifically children and the elderly. At the time of the 2000 Census, there were 1,464 persons in Waverly over the age of 64, 1,927 children under the age of 18, and 450 children under the age of five. According to FEMA, fires kill 5,500 and injure 30,000 persons each year and most often the victims are children and the elderly.</p>	3
Maximum Threat	The maximum threat from fire would be to those older buildings in a state of disrepair or with substandard electrical systems.	3
Severity of Impact	The severity of impact would largely depend on how quickly the emergency agencies, fire, police, and ambulance, became aware that a fire had occurred. The worst-case scenario would occur if the responsive agencies had a delayed response or was not aware of the fire until it had spread to multiple buildings. A fire of this magnitude could cause multiple injuries and deaths.	5
Speed of Onset	Fire spreads very rapidly. Improvements in technology have enabled the development of affordable early warning systems, smoke detectors, which have been installed in many homes and businesses. In addition, those responsible for providing fire, police, and ambulance service in the town participate in ongoing training to improve their response times and abilities.	8

	Hazard Worksheet Score	33
	Composite Score	56

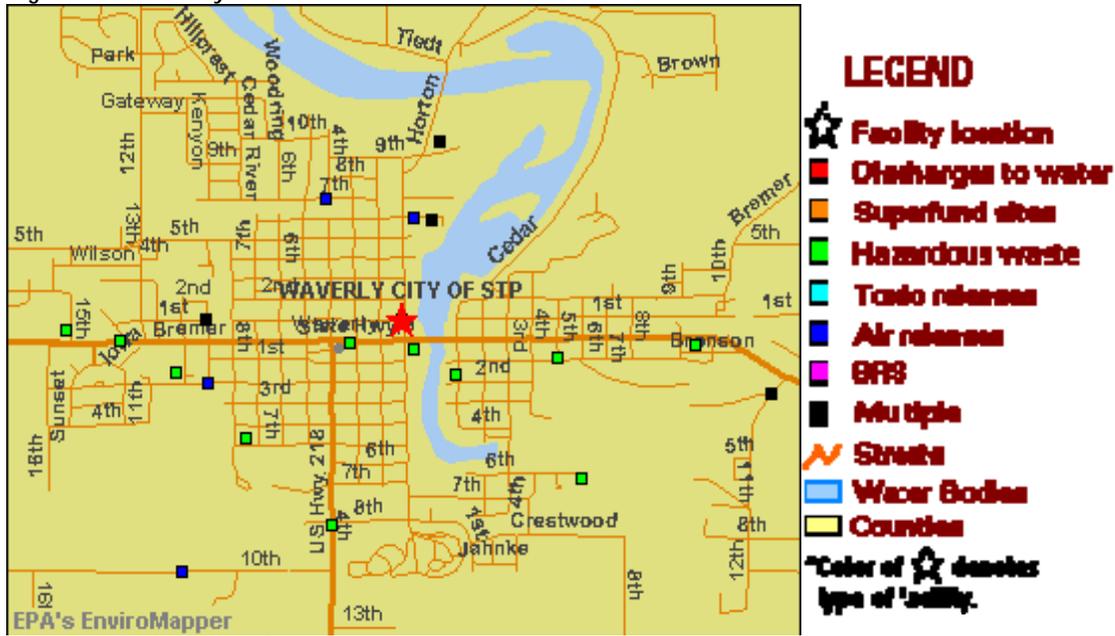
Hazard	Hazardous Materials (Including Methamphetamine Labs)	
Definition	<p>Hazardous Materials: Hazardous materials are chemical substances, which if released or misused can pose a threat to the environment or health. These chemicals are used in industry, agriculture, medicine, research, and consumer goods. Hazardous materials come in the form of explosives, flammable and combustible substances, poisons, and radioactive materials. These substances are most often released as a result of transportation accidents or because of chemical accidents in plants.</p> <p>Methamphetamine Lab: Methamphetamine is made mostly from common household ingredients. When these ingredients are mixed and "cooked" together they make a dangerous drug and potentially harmful chemical mixtures that can remain on household surfaces for months or years after "cooking" is over. There may be health effects in people exposed to lab chemicals before, during and after the drug-making process. Therefore, each drug lab is a potential hazardous waste site, requiring evaluation, and possibly cleanup, by hazardous waste (HazMat) professionals</p>	
Description	<p>Hazardous materials in various forms can cause death, serious injury, long-lasting health effects, and damage to buildings, homes, and other property. Many products containing hazardous chemicals are used and stored in homes routinely. These products are also shipped daily on the nation's highways, railroads, waterways, and pipelines. The Department of Transportation regulates routes and speed limits used by carriers and monitors the types of hazardous materials crossing state lines.</p> <p>Varying quantities of hazardous materials are manufactured, used, or stored at an estimated 4.5 million facilities in the United States--from major industrial plants to local dry cleaning establishments or gardening supply stores.</p> <p>More than 30 states have passed laws giving workers and citizens access to information about hazardous substances in their workplaces and communities. As many as 500,000 products pose physical or health hazards and can be defined as "hazardous chemicals." Each year, over 1,000 new synthetic chemicals are introduced.</p> <p>In addition, in an average city of 100,000 residents, 23.5 tons of toilet bowl cleaner, 13.5 tons of liquid household cleaners, and 3.5 tons of motor oil are discharged into city drains each month.</p> <p>Finally, a large amount of hazardous waste is created as a by-product of the illegal production of methamphetamine. These meth lab sites contain much hazardous waste and require specialized teams and equipment for proper clean-up and disposal of the waste materials.</p>	Rating
Historical Occurrence	<p>According to the Iowa Department of Natural Resources, there were 18 hazardous materials spills in Bremer County from January 2005 to March 2008. Four of those spills occurred in Waverly. The largest spill in Bremer County involved a 20,000-gallon spill involving soil based oils and greases; however, the largest spill in Waverly involved 80-gallons of diesel fuel oil. The Bremer County spills are shown in the table below.</p>	3
Probability	<p>As mentioned above, the four noted hazardous materials spills occurred in Waverly within the last three years. In previous years hazardous spills have been more frequent. For example, from 2000 to 2004 there were eight spills. Meth labs may become a problem in the future. In addition, the railroad and highway that run through the city are also potential sites for hazardous materials spills.</p>	5

Vulnerability	<p>Based on information regarding past occurrences. The possibility of a hazardous materials spill or event is a moderate risk for the community. If a hazardous materials event were to take place, those most vulnerable would be those who live or work near the event. As appropriate, the City has trained its fire and police departments in the handling of hazardous materials. In addition, the City contracts with both the Northeast Iowa Response Group HAZMAT team and the Tri-County Drug Taskforce, which provide assistance with hazmat spills and meth labs.</p> <p>Depending on the event, those living close to hazardous chemical and anhydrous ammonia storage would be more vulnerable to exposure. The risk would decrease with increasing distances from these facilities. Factors such as wind direction and speed would have a significant impact on the area affected by a spill.</p>	4
Maximum Threat	The maximum threat of a hazardous material spill or event would depend upon the size of the spill. A large spill or leak of a hazardous gas could result in the evacuation of entire neighborhoods or the rerouting of the local roads, highways, and/or the interstate.	4
Severity of Impact	The area of the city susceptible to a hazardous material spill or event could potentially be quite large. While a small spill would affect only a small portion of the community, a large spill could require the evacuation of large portions of the city and result in a number of injuries or fatalities.	5
Speed of Onset	Most hazardous materials events happen suddenly and unexpectedly from transportation or other accidents.	8
Hazard Worksheet Score		29
Composite Score		45

Table 19: Bremer County Hazardous Chemical Spills: 2005 - 2007

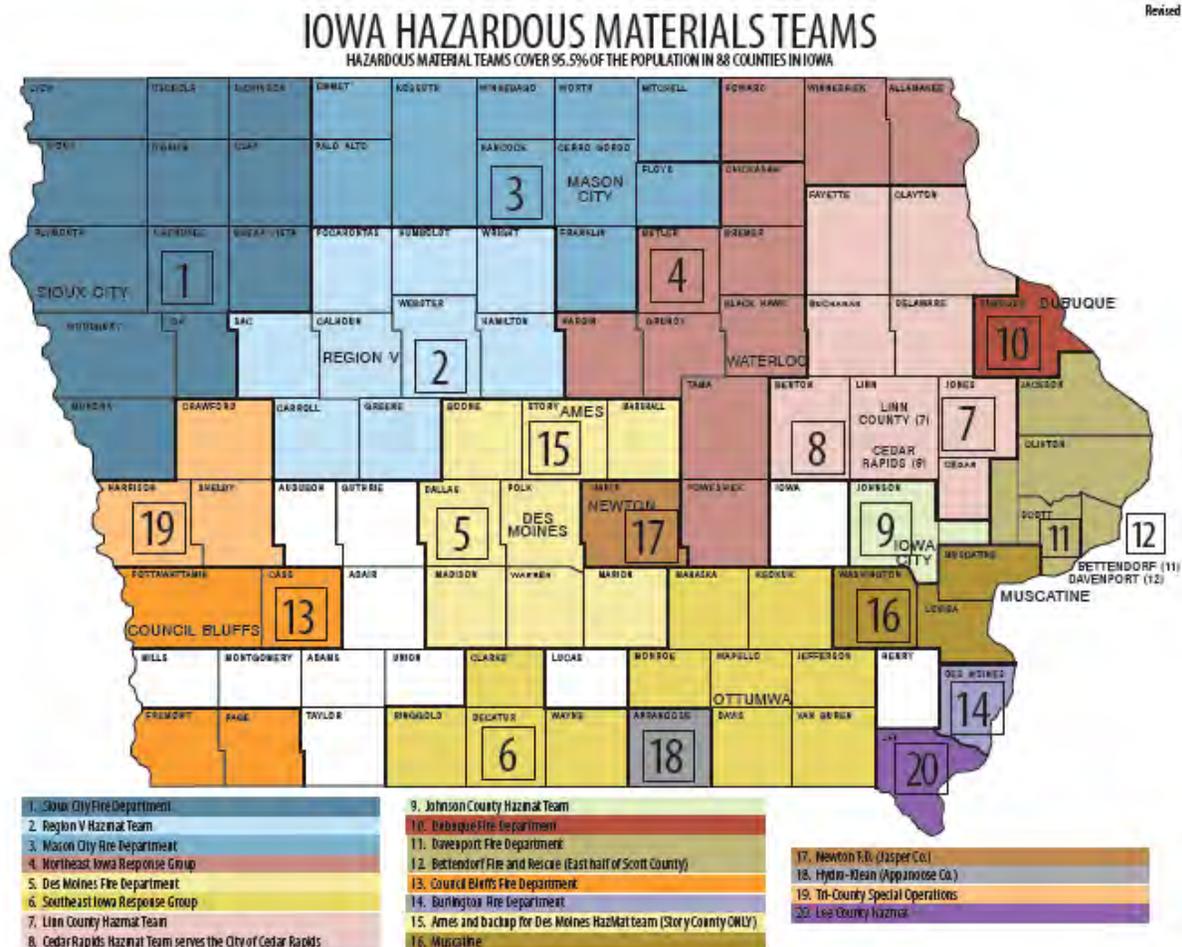
Date	Incident Town	Material	Amount
2/2/2005	Janesville	Gasoline	12 gal
3/17/2005	Waverly	Diesel Fuel	80 gal
4/30/2005	Sumner	Herbicides	100 gal
2/6/2006	Denver	Gasoline	10 gal
6/14/2006	Sumner	PCB	6 gal
9/11/2006	Waverly	Manure	10,000 gal
11/6/2006	Rural	Diammonium Phosphate	10 ton
11/6/2006	Rural	Potash	10 ton
1/31/2007	Waverly	Gasoline	5 gal
2/5/2007	Janesville	Gasoline	15 gal
3/20/2007	Plainfield	Soy-based oils & grease	20,000 gal
3/20/2007	Plainfield	Soy-based grease	80,000 lbs
3/20/2007	Plainfield	Additives	5,000 gal
4/30/2007	Fairbank	Fertilizer	500 gal
5/13/2007	Janesville	Dried Distillers Grain	10 ton
5/15/2007	Waverly	Diesel Fuel	1 unknown unit
12/13/2008	Denver	Diesel Fuel	30 gal

Figure 12: Waverly Hazardous Sites



Source: Environmental Protection Agency

Figure 13: Iowa Hazardous Materials Teams



Hazard	Dam Failure	
Definition	<p>Dam Failure: A dam is any artificial barrier together with appurtenant works that will divert or restrain the flow of a stream or other body of water for the purpose of protecting an area from inundation by floodwaters. Dam failure occurs when the structural integrity of the dam is lost and the structure fails to hold back the water.</p>	
Description	<p>When a dam failure occurs the structure fails to hold back the water, resulting in flooding. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and great property damage if there are people downstream of the dam.</p>	
Historical Occurrence	<p>Dam failure has not occurred in Waverly. If the dam were to fail, the effect would be felt most by those along the river in the southern areas of the city. The dam is inspected each year to ensure it remains in good condition.</p>	Rating 1
Probability	<p>Due to the care and attention given the Waverly dam, the probability of a dam failure due to a breach in the structural integrity of the system is minimal. Even so, there remains a minimal chance of this happening in the future.</p>	2
Vulnerability	<p>If a failure of the Waverly dam should occur majority of the south-central portions of the community would be vulnerable to flooding, especially those areas located in the 100-year floodplain.</p>	6
Maximum Threat	<p>The maximum threat to the community by dam failure is minimal.</p>	6
Severity of Impact	<p>Impact in Waverly from dam failure is moderate. The failure of the dam could have a severe impact on the entire community. Many homes and businesses could be flooded and many roads and bridges damaged.</p>	6
Speed of Onset	<p>In the event of dam failure, advanced notice would likely be minimal and the onset of the event could occur very rapidly.</p>	8
	Hazard Worksheet Score	29
	Composite Score	49

Hazard	Drought	
Definition	<p>Drought: A period of dryness especially when prolonged that causes extensive damage to crops or prevents their successful growth (<i>Webster</i>)</p>	
Description	<p>There are three types of drought conditions that are relevant to Iowa. Meteorologic drought, which refers to precipitation deficiency; hydrological drought, which refers to declining surface and groundwater supplies; and agricultural drought, which refers to soil moisture deficiencies.</p> <p>Droughts can be spotty or widespread and last from weeks to a period of years. A prolonged drought can have serious economic impact 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.</p>	
Historical Occurrence	<p>Since January of 1993 there has been only one recorded period of extreme drought. This drought affected the entire state of Iowa and resulted in approximately 500 million dollars in crop damage statewide. The event occurred in August of 1995 and lasted approximately one month.</p>	Rating 4

Probability	The average annual precipitation for Waverly is 31.4 inches with the vast majority of this falling between April and September. Although, as mentioned earlier, drought can occur in cooler months, it is most prevalent in late summer when the temperatures are high and any moisture evaporates a faster rate. The last recorded drought for the region was in the month of August. Although possible any given year, recent trends would suggest that the likelihood of sustained drought is not likely in Bremer County. Recent theories would suggest that the probability of drought in this portion of the country hinges partially on larger global weather anomalies such as global warming, el Niño, and la Nina in the Pacific Ocean.	4
Vulnerability	Those who depend on rain for their livelihood would be the most vulnerable to a drought. This means that agriculture, agribusiness, and consumers (if the drought lasted long enough or impacted a large area) would be impacted. A drought limits the ability to produce goods and provide services. Because Waverly draws its drinking water from surface water and shallow ground water sources, a prolonged severe drought may impact 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.	5
Maximum Threat	The maximum threat would likely extend far outside the borders of the City of Waverly. Droughts generally affect a large region, as opposed to a small area. Because Waverly lies in the middle of what is primarily an agricultural county the maximum threat would come to those who work directly with agriculture who rely on rainfall for their livelihood. As a result of the negative affects of drought on the farmers in the area, those who supply goods and services to the agricultural community would also stand to suffer substantial financial losses. City services could also be disrupted if the drought resulted in a lower water table, rendering wells inefficient or not allowing enough water for adequate fire fighting purposes.	6
Severity of Impact	Drought in the United State generally does not directly account for loss of human life, although the extreme high temperatures that often accompany droughts could cause severe physical stress and even death. More likely to be affected are wildlife and domesticated animals which could be rendered without water for drinking or without vegetation for consumption.	4
Speed of Onset	Although many efforts are made to anticipate droughts it is nearly impossible to be accurate with these predictions due to unlimited variable that factor in to such a prediction. Warning time is not a concern with a drought as the onset of drought can take weeks, months, and sometimes even years to feel the effects.	1
	Hazard Worksheet Score	24
	Composite Score	29

Hazard	Terrorism (International & Domestic)
Definition	Terrorism: Terrorism is defined in the Code of Federal Regulations as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."
Description	<p>Terrorists often use threats to create fear among the public, to try to convince citizens that their government is powerless to prevent terrorism, and to get immediate publicity for their causes. The effects of terrorism can vary significantly from loss of life and injuries to property damage and disruptions in services such as electricity, water supply, public transportation and communications.</p> <p>The Federal Bureau of Investigation (FBI) categorizes terrorism in the United States as one of two types--domestic terrorism or international terrorism. Domestic terrorism involves groups or individuals whose terrorist activities are directed at elements of our government or population without foreign direction. International terrorism involves groups or</p>

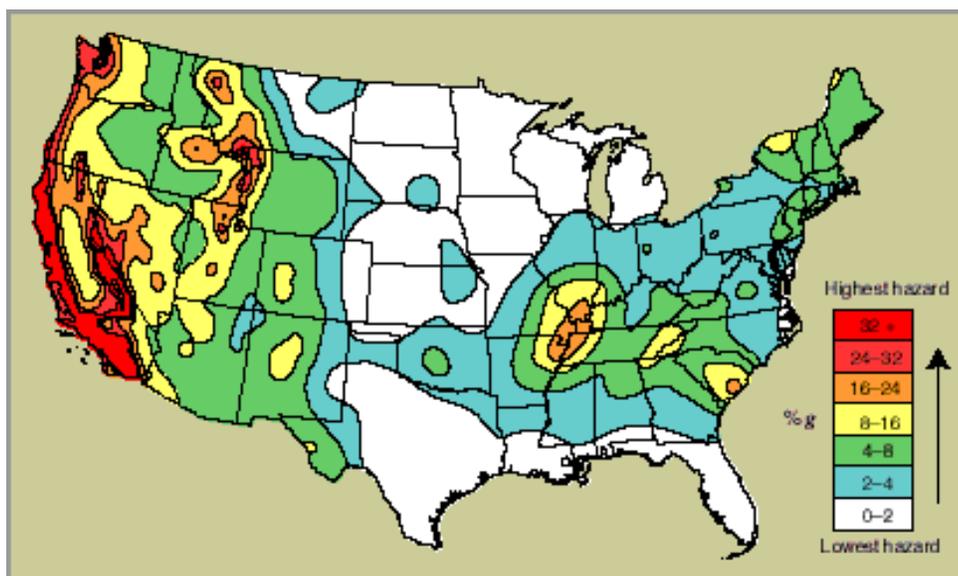
	<p>individuals whose terrorist activities are foreign-based and/or directed by countries or groups outside the United States or whose activities transcend national boundaries. Biological and chemical agents can also be used by terrorists against populations. Biological agents are infectious microbes or toxins used to produce illness or death in people, animals or plants. Biological agents can be dispersed as aerosols or airborne particles. Terrorists may use biological agents to contaminate food or water because they are extremely difficult to detect. Chemical agents kill or incapacitate people, destroy livestock or ravage crops. Some chemical agents are odorless and tasteless and are difficult to detect. They can have an immediate effect (a few seconds to a few minutes) or a delayed effect (several hours to several days).</p> <p>Biological and chemical weapons have been used primarily to terrorize an unprotected civilian population and not as a weapon of war. This is because of fear of retaliation and the likelihood that the agent would contaminate the battlefield for a long period of time. The Persian Gulf War in 1991 and other confrontations in the Middle East were causes for concern in the United States regarding the possibility of chemical or biological warfare. While no incidents occurred, there remains a concern that such weapons could be involved in an accident or be used by terrorists.</p>	<p>Rating</p>
<p>Historical Occurrence</p>	<p>Before the September 11, 2001 attacks in New York and Washington, D.C., most terrorist incidents in the United States had been bombing attacks, involving detonated and undetonated explosive devices, tear gas, pipe bombs, and firebombs (<i>Source: FEMA</i>).</p> <p>On February 29, 1993, a bombing in the parking garage of the World Trade Center in New York City resulted in the deaths of five people and thousands of injuries. The bomb left a crater 200 by 100 feet wide and five stories deep. The World Trade Center was the second largest building in the world and housed 100,000 workers and visitors each day.</p> <p>In the United States, most terrorist incidents have involved small extremist groups who use terrorism to achieve a designated objective. The most startling case of domestic terrorism in the history of the United States occurred in Oklahoma City, Oklahoma. On April 19, 1995, an explosion rocked the Alfred P. Murrah Federal Building. The blast killed 168 people, including 19 children, and injured hundreds more in the nation's deadliest act of terrorism prior to September 11th, 2001. Other examples of domestic terrorism include school violence. On April 20, 1999 two students at Columbine High School in Jefferson County, Colorado killed 12 students, one faculty and injured 23 others. Many other events similar to this act of terrorism have since occurred in schools across the United States.</p> <p>To date, there have been no known or reported instances of any terrorist attacks having been perpetrated in or near the City of Waverly.</p>	<p>1</p>
<p>Probability</p>	<p>The probability of the type of terrorist attacks that have historically occurred in the United States affecting Waverly is unlikely. Conversely, Waverly is extremely vulnerable to several types of terrorist attacks. A few of these possibilities are outlined in greater detail in the following section.</p>	<p>3</p>
<p>Vulnerability</p>	<p>The most glaring vulnerability appears to be in one of four areas. The first area would be a direct assault on the water supply that serves the local population. This contamination would likely occur at the storage point for that water (i.e. water tower). This is the most likely scenario for a direct local assault on the City of Waverly.</p> <p>The second susceptibility to terrorism that would likely have some effect on the residents of the community would be a contamination of the food supply. This is, perhaps, the most extreme concern facing the Midwestern region of the United States today. Bio-terrorism may take the form of a release of genetic diseases against crops or livestock. In addition to the extreme loss of life that could occur from such an attack, at the very least it would result in dramatic financial consequences to the agriculture industry. An industry that Waverly, the State of Iowa, and all the residents therein are largely dependent on.</p> <p>The third major potential threat exists due to Waverly's geographic proximity to a nuclear power plant. The single-unit plant at the Duane Arnold Energy Center is located in Palo, Iowa, 8 miles northwest of Cedar Rapids. Theoretically, although not very likely, this nuclear reactor could be sent into a manmade meltdown infecting everyone within an unknown radius of the plant with radioactive contamination. Waverly is located</p>	

	<p>approximately 69 miles north-northwest of the Duane Arnold plant.</p> <p>Another nuclear power plant is located approximately 151 miles north of Waverly, near Red Wing, Minnesota (Prairie Island Nuclear Power Plant).</p> <p>The fourth major area susceptible to terrorism is the community's schools. Because of the unpredictability of terrorism, any imaginable scenario is possible, and therefore an open mind should be kept when considering potential threats in the community's school system.</p>	4
Maximum Threat	The maximum threat appears to be in the four categories listed in the previous section; danger to the water supply, bio-terrorism, an attack on a nearby nuclear facility and the community schools.	5
Severity of Impact	The severity of impact would largely depend on how quickly the community became aware that an event had occurred. The worst-case scenario would occur if the public had no knowledge until all or most of the population had been contaminated/poisoned before a proper response could be made. This could result in widespread sickness and potentially death.	5
Speed of Onset	Depending on the type of event to occur the speed of onset could vary from immediate (bomb) to days, weeks, even years (poisoned water, poisoned food, financial impacts).	8
Hazard Worksheet Score		26
Composite Score		43

Hazard	Earthquake	
Definition	Earthquake: A shaking or trembling of the earth that is volcanic or tectonic in origin (<i>Webster</i>)	
Description	<p>Although earthquakes have not been an event that has affected Waverly in the past, the community should be aware of the possibility that they can occur. Ground shaking from earthquakes can collapse buildings and bridges; disrupt gas, electric, and phone service; and sometimes trigger flash floods and fires. Buildings with foundations resting on unconsolidated landfill and other unstable soil, and trailers and homes not tied to their foundations are at risk because they can be shaken off their mountings during an earthquake.</p> <p>Although earthquakes are generally associated with plate tectonics or volcanic activity a third type includes artificial earthquakes. In other words, a large explosion can cause the earth to quake resulting in substantial damage.</p>	Rating
Historical Occurrence	<p>Only 12 earthquakes with epicenters in Iowa are known in historic times. The first known occurrence was in 1867 near Sidney in southwest Iowa; the most recent occurrence was in 1948 near Oxford in east-central Iowa. The largest Iowa earthquake (Mercalli magnitude VI) occurred near Davenport in southeast Iowa in 1934. None of these events were instrumentally recorded. Although one of the events was to have been reported on January 26, 1925 in Waterloo that is estimated would have registered a magnitude of II (2) on the Mercalli scale.</p> <p>Historic seismicity in the upper Midwest in relation to the regional structural geology from 1800 to present has been slight. Actual epicenters of events reported in Modified Mercalli Intensity are not known with precision. Only one registered event in Iowa was identified by the report, a three (3) on the Richter scale was reported near the City of Dubuque which lies on the Meekers Grove Anticline which extends from north of Dubuque into Wisconsin to a point south of Madison.</p>	1

<p>Probability</p>	<p>According to the Iowa Geological Survey, <u>Plum Creek River Fault Zone and Structural and Stratigraphic Framework of Eastern Iowa study volume Number 13</u>, printed in 1985, there are several areas with faults in Iowa. The two that appear to be closest and could affect the community in this plan are the Plum River Fault Zone and the Fayette Structural Zone. The Fayette Structural Zone runs through Black Hawk starting north of the City of Waterloo, through Bremer County and into Fayette County towards the City of Oelwein, at a diagonal from the southwest to the northeast. The Plum River Fault Zone can be found below Cedar Rapids and running east towards Rockford Illinois.</p> <p>Historic seismicity in the upper Midwest in relation to the regional structural geology from 1800 to present has been slight. Assuming historic trends remain unchanged the likelihood of an earthquake causing any substantial damage to the City of Waverly is minimal.</p>	<p>2</p>
<p>Vulnerability</p>	<p>Because the likelihood of an earthquake is relatively low the population is not likely to be vulnerable to an earthquake. If an earthquake were to take place, those most vulnerable would be those who live in taller structures, structures with poor foundations, or structures built on less solid ground such as floodplain silt.</p> <p>According to City records, there are approximately 400 houses and 134 commercial/industrial/public structures in Waverly the 100-year floodplain, see <i>Attachment 1, Figure 2: Floodplain Map of the City</i>. Using the average persons per household, 2.36, approximately 936 persons are living in the floodplain.</p>	<p>4</p>
<p>Maximum Threat</p>	<p>The maximum threat of an earthquake would still be rather minimal. It is estimated that even if an earthquake did occur in this area, the effects would be likened to that of a large truck passing on the street.</p>	<p>4</p>
<p>Severity of Impact</p>	<p>When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage. The impact in a city such as Waverly would be minimized in that the buildings are generally not any higher than three stories, with few exceptions.</p>	<p>5</p>
<p>Speed of Onset</p>	<p>Onset of an earthquake cannot be accurately predicted and therefore warning time for such an event would not exist.</p>	<p>8</p>
<p>Hazard Worksheet Score</p>		<p>16</p>
<p>Composite Score</p>		<p>38</p>

Figure 14: Earthquake Probability Chart



Source: <http://geohazards.cr.usgs.gov/eq/graphics/usmap.gif>

Hazard	Bridge Failure	
Definition	<p>Bridge: A bridge is a structure carrying a pathway or roadway over a depression or obstacle. (<i>Webster</i>) Bridge failure occurs when vital structural members of the bridge fail to support the pathway or roadway.</p>	
Description	<p>Bridge failure can occur due to a variety of causes from natural disasters such as earthquakes and floods to terrorism events such as intentional demolition. Depending upon the size and location of the bridge, the impact of a bridge failure on a community can range from a mere nuisance to a disaster involving numerous injuries and fatalities.</p>	
Historical Occurrence	<p>There are three main bridges in the community, all traversing the Cedar River, and a number of smaller bridges over the two small creeks. Even so, there have been no instances of bridge failure in the history of the community. During the 1999 flood the City was concerned structural integrity of the 3rd Street bridge and to date the City is researching possibilities for repair and/or replacement of the bridge in the future.</p>	Rating 1
Probability	<p>Due to the fact that there are three important and many smaller bridges in town, it is possible that one may fail in the future. However, the City has an active bridge inspection program and addresses structural problems as they are identified.</p>	1
Vulnerability	<p>The population vulnerable to bridge failure depends upon which bridge were to fail and the size of the bridge. If a smaller bridge were to fail there are a number of alternate routes available for residents and emergency crews. If one of the larger bridges were to fail, there would still remain two large bridges. This would cause an inconvenience for residents and may reduce emergency response time.</p>	1
Maximum Threat	<p>The maximum threat of bridge failure would occur in the event of a large flood. During the 1999 and 2008 flood all three of the bridges were unusable due to the floodwaters. If the third bridge were also rendered unusable, the two areas of the community would be cut off from each other. Emergency response crews would be seriously hindered in their attempts to assist persons in need.</p>	3
Severity of Impact	<p>If a bridge were to fail while vehicles were crossing it, there could potentially be a large number of injuries and fatalities, depending on the size of the bridge.</p>	2
Speed of Onset	<p>In the event of a bridge failure, advanced notice would be likely minimal and the onset of the event could occur very rapidly.</p>	3
Hazard Worksheet Score		11
Composite Score		11

Hazard	Heat Wave/Extreme Heat	
Definition	<p>Extreme Heat: temperatures that hover 10 degrees or more above the average high temperature for the region and last for several weeks are defined as extreme heat. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. Droughts occur when a long period passes without substantial rainfall. A heat wave combined with a drought is a very dangerous situation.</p> <p>Heat Wave: Heat waves are often associated with blocking patterns in the atmosphere. A heat wave puts an extreme stress on outdoor activities, those without air-conditioning, and vegetation. Heat waves are often accompanied by "drought-like" conditions.</p>	

<p>Description</p>	<p>Because the community is located far away from any large bodies of water to help moderate temperature fluctuations, temperature variations in the area vary dramatically, sometimes reaching extreme peaks, with heat indexes well in excess of 100 degrees Fahrenheit. When these extreme heat events occur, and even more so when they are prolonged, people, livestock, pets, wild animals and plant life are all affected to some degree.</p> <p>Perhaps a more accurate measure of heat and how it can impact animal and plant life is the heat index. Sometimes referred to as the "apparent temperature" the heat index, given in degrees Fahrenheit, is an accurate measure of how hot it really feels when the relative humidity (RH) is added to the actual air temperature. For an example of how the heat index is determined a Heat Index Chart has been included for your review in <i>Illustration #11</i>.</p> <p>In humans, extreme heat events make individuals much more susceptible to such heat related illnesses as heat cramps, heat exhaustion, heat rash, and heat stroke. Several factors affect the body's ability to cool itself during extremely hot weather. When the humidity is high, sweat will not evaporate as quickly, preventing the body from releasing heat quickly. Other conditions related to risk include age (the elderly and young children), obesity, fever, dehydration, heart disease, mental illness, poor circulation, sunburn, and prescription drug use and alcohol use.</p> <p>Many similar physical reactions occur in animals during extreme heat events, but can go unnoticed by an unobservant caretaker. The susceptibility to heat varies on the type of animal and whether or not they have access to water, in order to avoid dehydration.</p> <p>Plant life can also suffer substantially during prolonged heat waves, especially if they occur in conjunction with moderately dry conditions or even drought. This is of substantial concern to the community as the area is surrounded by primarily agricultural uses. Any negative affects on the surrounding farm economy would undoubtedly have some impact on the communities well being.</p>	<p>Rating</p>
<p>Historical Occurrence</p>	<p>Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. Among the large continental family of natural hazards, only the cold of winter -- not lightning, hurricanes, tornadoes, floods, or earthquakes -- takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the disastrous heat wave of 1980, more than 1,250 people died (Source: NOAA).</p> <p>The State of Iowa was impacted by a significant heat wave that occurred in the summer of 1995. In July of that year temperatures and dew point soared to new record levels across the State. The heat wave took a dramatic toll on the State as well as three human fatalities were attributed to the event. A significant loss occurred in livestock. Statewide figures indicate that there were property losses of approximately \$3.8 million. Losses included 4,000 head of cattle, 370 hogs, 1,250,000 chickens, and 250,000 turkeys. On one farm alone 250,000 laying hens perished on the 2nd day of the heat. Another egg producer had 1.5 million laying hens on two farms. They reported a loss of at least 500,000 hens. Disposal became a serious problem as rendering plants were overwhelmed. In addition to problems caused to humans and livestock, there were numerous heat buckles reported on streets and highways around the state (Source: NCDC). It was this same heat wave that was responsible for approximately 525 deaths in the City of Chicago.</p> <p>Another heat wave impacted the area in the summer of 2001. Very warm and humid conditions that began in the last part of July continued into August. Temperatures during the day warmed into the 90s, with overnight lows remaining in the 70s. Dew point temperatures held in the mid 70s to low 80s through most of the time.</p>	

	<p>According to information obtained from the ISU Extension website the highest recorded temperature in the metro area was 105 degrees Fahrenheit. This temperature was reached at least twice, in the months of July and August. July has the highest number of days (10) with record high temperatures equal to or greater than 100 degrees Fahrenheit. In August there are eight days having record temperatures equal to or greater than 100 degree Fahrenheit. In total, there are 13 days that had record high temperature at or above the 100 degree Fahrenheit mark. Perhaps the strangest record high temperature was recorded for the date of April 22nd, which had a high of 100 degrees (year unknown).</p>	5
Probability	<p>The probability of another heat wave in the area is considered to be a certainty at some time in the future based on historical occurrence, climate, and geographic location. How soon the next heat wave may occur cannot be known for sure, but the committee felt that it would likely occur within the next ten years and possibly within the next year.</p>	5
Vulnerability	<p>Everyone in the planning area is susceptible to the impacts of a heat wave/extreme heat event. Those who have an elevated risk include the elderly, young children, chronic invalids, those on certain medications or drugs, persons who are over their recommended weight, alcoholics, and individuals who work outdoors or in confined spaces without air conditioning. Furthermore, those individuals or families who cannot afford air conditioning or do not have access to air conditioning are also more susceptible to the effects of elevated temperatures.</p> <p>The amount of vulnerability can be greatly reduced by taking certain precautionary measures. Such measure include, but are not limited to drinking plenty of water to stay hydrated, staying in air conditioned areas, using sun block, reducing the amount of physical exertion normally expended, etc.</p>	5
Maximum Threat	<p>The maximum threat of a heat wave is generally very far reaching, as opposed to a localized event. It is estimated that the entire population and the entire mitigation planning area would likely be impacted to some degree in the event of another heat wave/extreme heat event.</p>	5
Severity of Impact	<p>The impacts of extreme heat events have historically been known to cause death. This possibility remains today. The severity of a heat wave event would likely be multiplied if it occurred in conjunction with other events such as a drought or a power failure. If the air were extremely dry this would increase the rate of dehydration among plants and animals. If a power failure were to occur, air conditioners, fans, freezers, and refrigerators would cease to operate. As these are items that we use to alleviate the stresses of heat waves their loss would contribute to the severity of the disaster.</p> <p>Because some type of heat event occurs rather often in the Midwest, the committee felt that there would be a limited impact on the populous.</p>	5
Speed of Onset	<p>Heat waves are generally well forecasted; therefore the onset speed is at least 24 hours. When temperatures or heat indexes rise to dangerous levels the National Weather Service will initiate alert procedures.</p>	2
	Hazard Worksheet Score	27
	Composite Score	33

Figure 15: Heat Index Chart

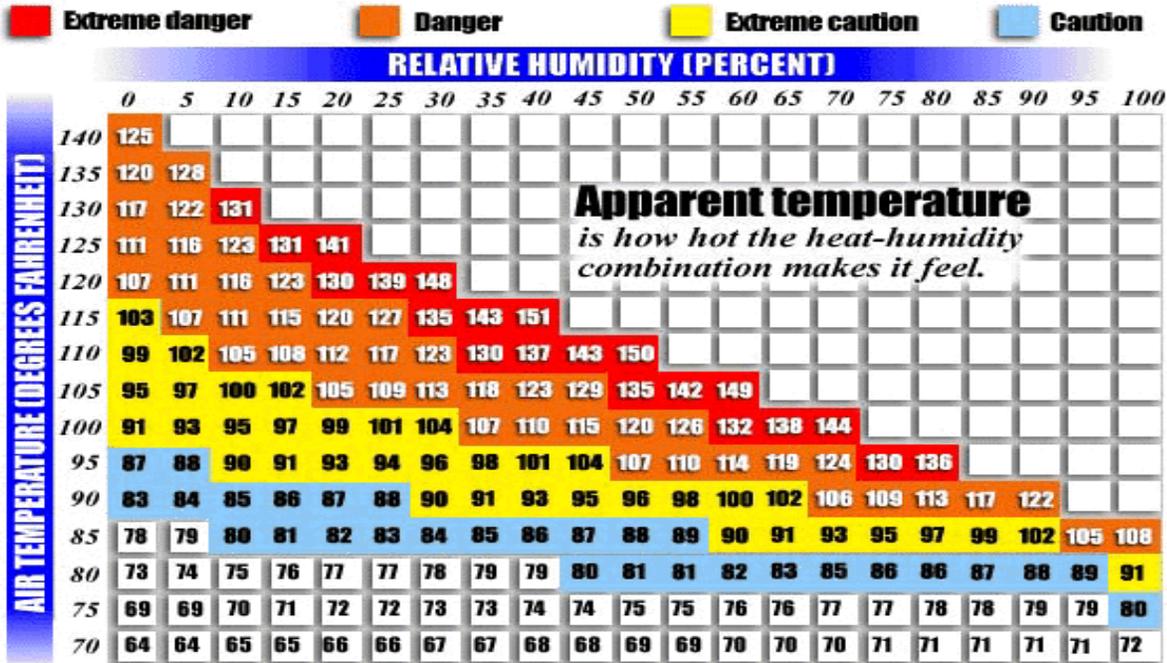
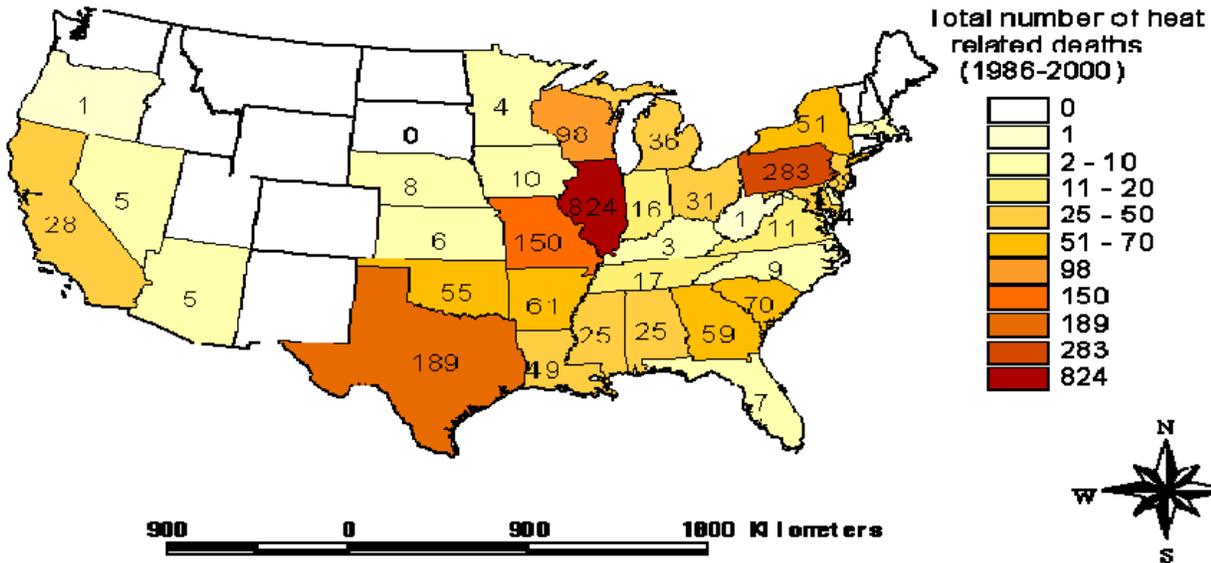


Figure 16: Heat Related Deaths 1986-2000



Source: <http://www.esig.ucar.edu/heat/img/impacts/total.gif>